Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

MATHEMATICS **0580/23**

Paper 2 (Extended) **October/November 2017**

MARK SCHEME

Maximum Mark: 70

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial marks
1	2h 32 min	1	
2	3.06 or 3.056…	1	
3	66.2 or 66.17 to 66.18	1	
4	Kite	1	
5	$9(2x + 3y)$ final answer	1	
6	$\frac{2}{3}$ oe	1	
7	1263.21	2	M1 for $1200 \times \left(\frac{100+2.6}{100}\right)^2$ oe
8	87.77.. – 8.77.. oe	M1	Allow $\frac{87-8}{90}$ for M1
	$\frac{79}{90}$	A1	Accept $\frac{79k}{90k}$
9	$x \leqslant -1.2$ oe final answer	2	B1 for –1.2 oe or M1 for correct step to collect x's and numbers
10	64.8	3	M2 for $2400 \times 30^3 \div 100^3$ oe or M1 for 30^3 or 0.3^3 soi or *their* volume ÷ 100^3
11	150	3	M2 for $(12 - 2) \times 180 \div 12$ or $180 - 360 \div 12$ or M1 for $(12 - 2) \times 180$ or $360 \div 12$ soi 30
12	1.1[0]	3	M2 for $0.88 \div \frac{100-20}{100}$ oe or M1 for 0.88 associated with 80 [%]

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Question	Answer	Marks	Partial marks
13	$\frac{22}{7}$ or $\frac{5}{4}$ $\quad 2\frac{1}{7} - \frac{1}{4}$	**B1**	Allow $\frac{22k}{7k}$ or $\frac{5k}{4k}$ Correct step for dealing with mixed numbers
	$\frac{88}{28}$ or $\frac{35}{28}$ $\quad 2\frac{4}{28}$ or $\frac{7}{28}$	**M1**	Correct method to find common denominator e.g. $3\frac{4}{28}$ or $1\frac{7}{28}$
	$1\frac{25}{28}$ $\quad 1\frac{25}{28}$	**A1**	
14	$(3x + 5)(x - 4)$ [=0]	**M2**	**M1** for $(3x + b)(x + a)$ where $ab = -20$ or $3a + b = -7$
	4 and $-\frac{5}{3}$ oe	**A1**	If zero scored, **SC1** for 2 correct answers from no working or other methods
15	$25x^2 - 8$ final answer	**3**	**M1** for $(5x - 3)^2 + 6(5x - 3) + 1$ **M1** for $25x^2 - 15x - 15x + 9$ soi or better
16	$\frac{12m}{p-4y}$ or $\frac{-12m}{4y-p}$ final answer	**4**	**M1** for $12m + 4xy = xp$ or $3m = \frac{xp}{4} - xy$ **M1** for $12m = xp - 4xy$ or $3m = x(\frac{p}{4} - y)$ **M1** for $12m = x(p - 4y)$ or $\frac{3m}{\frac{p}{4} - y} = x$ **M1** for $\frac{12m}{p-4y}$ To a maximum of 3 marks for an incorrect answer
17(a)	1, –4 and –9	**1**	
17(b)	Yes because 13 is an integer oe	**3**	**B2** for [n =] 13 or **M2** for $\sqrt{((848 - 3) \div 5)}$ or $5 \times 13^2 + 3$ [= 848] or **M1** for $5n^2 + 3 = 848$ oe
18	73.6 or 73.63 to 73.64	**4**	**B3** for 27.4 or 27.36… OR **M2** for $\frac{5.9\sin 79}{12.6}$ oe or **M1** for $\frac{\sin[C]}{5.9} = \frac{\sin 79}{12.6}$ oe and **M1dep** for 180 – 79 – *their C* (dep on at least **M1** earned)

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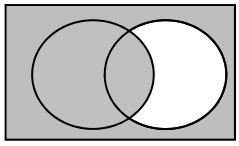
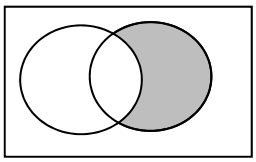
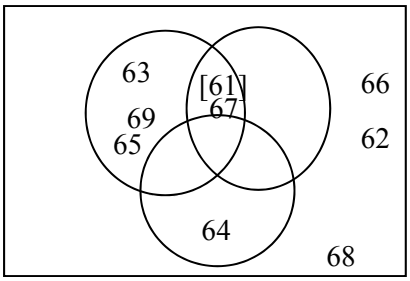
Question	Answer	Marks	Partial marks
19(a)	$\begin{pmatrix} 11 & -6 \\ -5 & 6 \end{pmatrix}$	**2**	**M1** for two correct elements
19(b)	$\frac{1}{12}\begin{pmatrix} -6 & 0 \\ -5 & -2 \end{pmatrix}$ oe isw	**2**	**M1** for $k\begin{pmatrix} -6 & 0 \\ -5 & -2 \end{pmatrix}$ $(k \neq 0)$ or det = 12 soi
20	139 or 139.2 to 139.3	**4**	**M3** for $10^2 + \frac{1}{2} \times \pi \times 5^2$ or **M2** for $\frac{1}{2} \times \pi \times 5^2$ or **M1** for radius = 5 or [area of square]10^2
	cm^2	**1**	
21(a)	3.4	**3**	**M1** for 2 + 5 + 4 + 2 + 1 + 3 + 2 + 7 + 6 + 2 [34] **M1** for *their* 34 ÷ 10
21(b)	5	**2**	**M1** for 5, 5 identified
21(c)	[Day] 10	**1**	
22(a)	19	**1**	
22(b)	138	**3**	**M2** for 180 – (19 + 23) or 67 + (180 – 90 – 19) or better or **M1** for angle *AEB* = 23 or angle *AEC* = 42
22(c)	90	**2**	**M1** for angle *EBC* = 71 or angle *EAB* = 90
23(a)	 $A \cup B'$  $A' \cap B$	**2**	**B1** for each
23(b)(i)		**3**	**B2** for 6 or 7 correct **B1** for 4 or 5 correct

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Question	Answer	Marks	Partial marks
23(b)(ii)	3	**1FT**	**FT** *their* $\mathrm{n}\left(E \cup F \cup G\right)'$
23(b)(iii)	$\varnothing$ or { }	**1FT**	**FT** *their* $E \cap F \cap G$

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Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

MATHEMATICS **0580/23**

Paper 2 (Extended) **October/November 2017**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 70.

This document consists of **11** printed pages and **1** blank page.

DC (KN/SG) 136854/2
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CAMBRIDGE
International Examinations

[Turn over

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1 Ahmed drives his car from London to Cambridge.
He leaves London at 07 45 and arrives in Cambridge at 10 17.

Work out the time, in hours and minutes, that he takes to drive from London to Cambridge.

..... h ..... min [1]

2 Calculate.

$$\sqrt{9+25^{-\frac{1}{3}}}$$

..... [1]

3 Write \$450 as a percentage of \$680.

..... % [1]

4 A quadrilateral has one line of symmetry and no rotational symmetry.

Write down the name of this quadrilateral.

..... [1]

5 Factorise completely.

$$18x + 27y$$

..... [1]

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6 $(\sqrt[3]{10})^2 = 10^p$

Find the value of p.

$p =$ ..... [1]

7 Adilla invests \$1200 at a rate of 2.6% per year compound interest.

Calculate the value of her investment at the end of 2 years.

\$ ..... [2]

8 Write the recurring decimal $0.8\dot{7}$ as a fraction.
Show all your working.

..... [2]

9 Solve the inequality.

$$7 - 8x \geqslant 19 + 2x$$

..... [2]

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10 A model of a house is made using a scale of 1 : 30.
The model has a volume of 2400 cm^3.

Calculate the volume of the actual house.
Give your answer in cubic metres.

..... m^3 [3]

11 Calculate the size of one interior angle of a regular 12-sided polygon.

..... [3]

12 The cost of one litre of fuel in May 2015 was \$0.88 .
This was a decrease of 20% on the cost in May 2014.

Calculate the cost of one litre of fuel in May 2014.

\$ ..... [3]

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13 Work out $3\frac{1}{7} - 1\frac{1}{4}$, giving your answer as a mixed number in its lowest terms.
Do not use a calculator and show all the steps of your working.

..... [3]

14 Solve by factorising.

$$3x^2 - 7x - 20 = 0$$

$x =$ ..... or $x =$ ..... [3]

15 $f(x) = 5x - 3$ $\qquad$ $g(x) = x^2 + 6x + 1$

Find $gf(x)$.
Give your answer in its simplest form.

..... [3]

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16 Make x the subject of $3m + xy = \frac{xp}{4}$.

$x =$ ..... [4]

17 **(a)** The nth term of a sequence is $6 - 5n$.

Write down the first three terms of this sequence.

..... , ... , ... [1]

(b) The nth term of another sequence is $5n^2 + 3$.

Is 848 a term in this sequence?
Explain how you decide.

..... because ..... [3]

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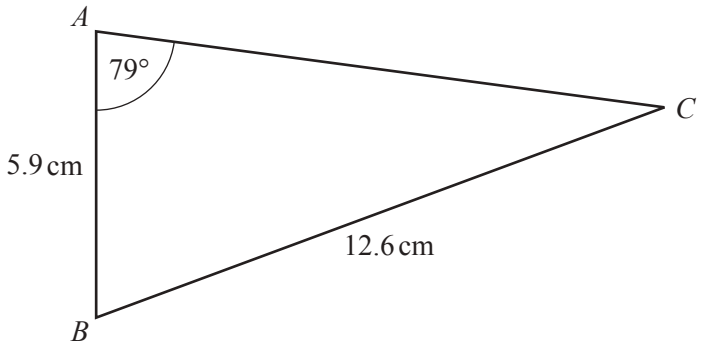
18



NOT TO SCALE

Calculate angle ABC.

Angle ABC = ... [4]

19 $\mathbf{M} = \begin{pmatrix} -2 & 0 \\ 5 & -6 \end{pmatrix}$ $\mathbf{N} = \begin{pmatrix} -3 & 1 \\ 0 & -1 \end{pmatrix}$

(a) Work out **NM**.

$\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [2]

(b) Find $\mathbf{M}^{-1}$, the inverse of **M**.

$\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [2]

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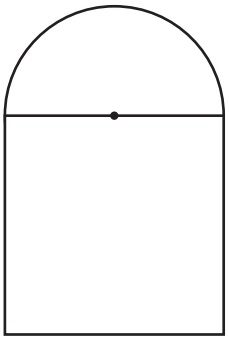
20



NOT TO SCALE

The diagram shows a shape made from a square and a semi-circle.

Calculate the area of the shape.
Give the units of your answer.

.... [5]

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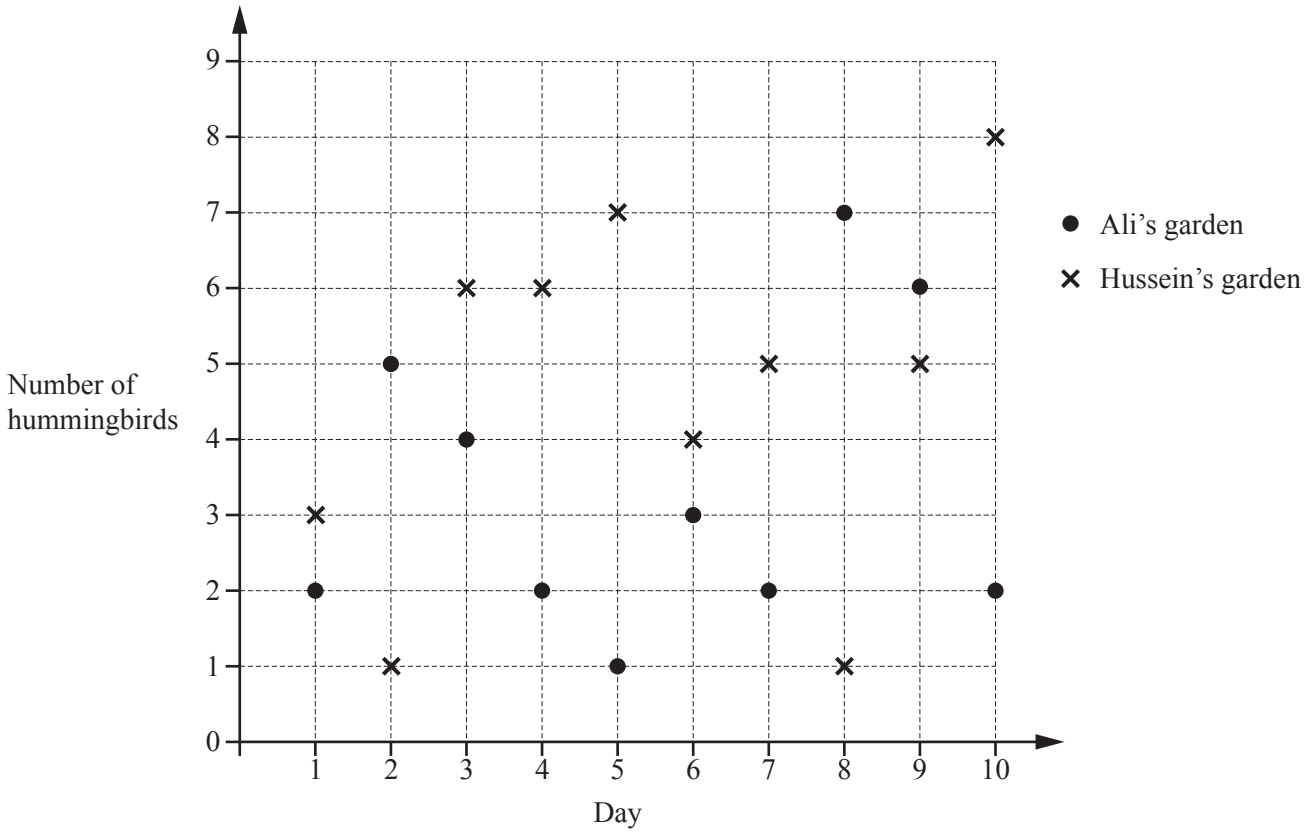
21 The diagram shows the numbers of hummingbirds seen by Ali and Hussein in their gardens each day for 10 days.



(a) Calculate the mean number of hummingbirds seen in Ali's garden each day.

..... [3]

(b) Work out the median number of hummingbirds seen in Hussein's garden each day.

..... [2]

(c) On one of these days there were 4 times as many hummingbirds seen in Hussein's garden as in Ali's garden.

Which day was this?

Day ..... [1]

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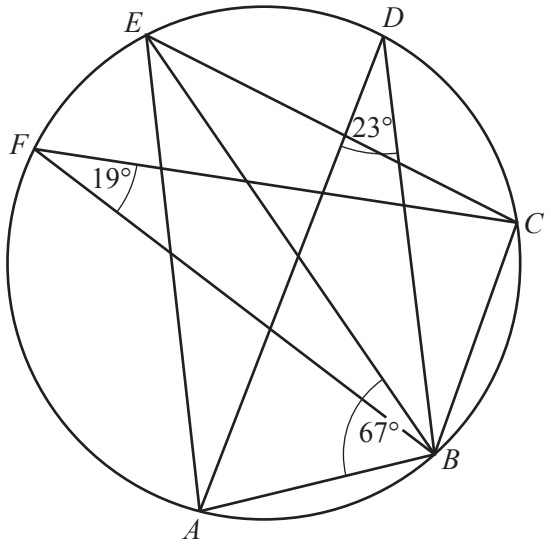
22



NOT TO SCALE

In the diagram, points A, B, C, D, E and F lie on the circumference of the circle.
Angle $BFC = 19°$, angle $ADB = 23°$ and angle $ABE = 67°$.

Work out

(a) angle BEC,

Angle BEC = ... [1]

(b) angle ABC,

Angle ABC = ... [3]

(c) angle BCE.

Angle BCE = ... [2]

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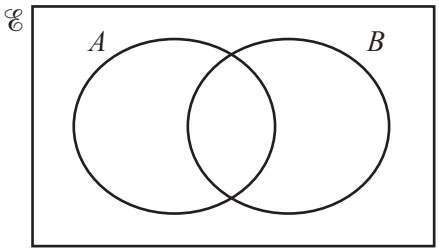
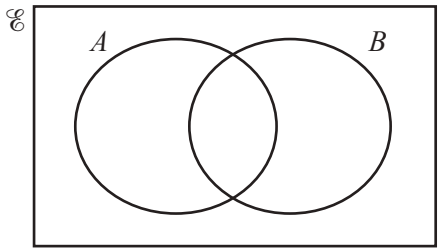
23 **(a)** Shade the required regions on the Venn diagrams.



$A \cup B'$



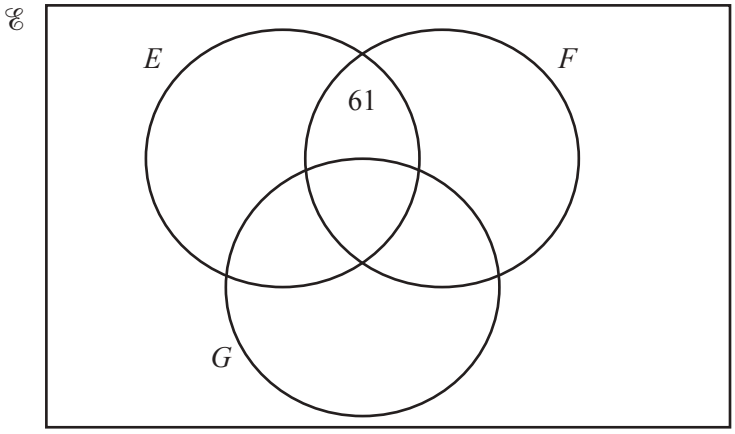
$A' \cap B$

[2]

(b) $\mathscr{E} = \{ x : x \text{ is an integer and } 60 < x < 70 \}$

$E = \{x : x \text{ is an odd number}\}$
$F = \{x : x \text{ is a prime number}\}$
$G = \{x : x \text{ is a square number}\}$

(i) Complete the Venn diagram below to show this information.



[3]

(ii) Find $n(E \cup F \cup G)'$.

..... [1]

(iii) Use set notation to complete the statement.

$E \cap F \cap G =$ ..... [1]

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Grade thresholds – November 2017

Cambridge IGCSE Mathematics (without Coursework) (0580)

Grade thresholds taken for Syllabus 0580 (Mathematics (without Coursework)) in the November 2017 examination.

		minimum raw mark required for grade:						
	maximum raw mark available	A	B	C	D	E	F	G
Component 11	56	–	–	37	31	25	19	13
Component 12	56	–	–	39	32	25	18	11
Component 13	56	–	–	38	32	26	20	14
Component 21	70	59	49	39	33	28	–	–
Component 22	70	64	56	48	43	38	–	–
Component 23	70	53	41	30	24	18	–	–
Component 31	104	–	–	67	56	46	36	26
Component 32	104	–	–	81	68	56	45	34
Component 33	104	–	–	68	55	42	30	18
Component 41	130	94	76	59	48	36	–	–
Component 42	130	108	91	74	64	54	–	–
Component 43	130	83	63	44	33	23	–	–

Grade A* does not exist at the level of an individual component.

The maximum total mark for this syllabus, after weighting has been applied, is **200** for the 'Extended' options and **160** for the 'Core' options.

The overall thresholds for the different grades were set as follows.

Option	Combination of Components	A*	A	B	C	D	E	F	G
AX	11, 31	–	–	–	104	87	71	55	39
AY	12, 32	–	–	–	120	100	81	63	45
AZ	13, 33	–	–	–	106	87	68	50	32
BX	21, 41	179	152	125	98	81	64	–	–
BY	22, 42	189	171	146	122	107	92	–	–
BZ	23, 43	166	135	104	74	57	41	–	–

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Cambridge International General Certificate of Secondary Education

MATHEMATICS **0580/11**

Paper 1 (Core) **October/November 2017**

MARK SCHEME

Maximum Mark: 56

Published

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dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial marks
1	101	**1**	
2	9944	**1**	
3	2	**1**	
4	88	**2**	**M1** for $\frac{68+81+74+89+x}{5} = 80$ oe or **B1** for 400
5(a)	18.8 cao	**1**	
5(b)	19 cao	**1**	
6	1.5 oe	**2**	**B1** for 2.25 oe
7	$3x(4x + 5y - 3)$ final answer	**2**	**B1** for $3(4x^2 + 5xy - 3x)$ or $x(12x + 15y - 9)$ allow in working or correct answer spoiled If zero scored, **SC1** for $3x(4x + 5y - 3)$ with only 2 correct elements in the brackets, allow in working
8	14.25 ……. 14.35	**2**	**B1** for each correct or both correct but reversed
9	63.6 or 63.61 to 63.63	**2**	**M1** for $\pi \times 4.5^2$
10(a)	(–2, 3)	**1**	
10(b)	Correct rhombus with 4th point at (2,2)	**1**	
11(a)	$\frac{5}{9}$ cao	**1**	
11(b)	[0].09 then 9 [%]	**2**	**B1** for each

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Question	Answer		Marks	Partial marks
12	$\frac{5}{3}$	$\frac{2}{3}+\frac{4}{15}$	**B1**	Allow $\frac{5k}{3k}$
	$\frac{25}{15}$ [and $\frac{11}{15}$]	$\frac{10}{15}$ [and $\frac{4}{15}$]	**M1**	Correct method to find common denominator e.g. $\frac{75}{45}$ and $\frac{33}{45}$ Follow through *their* $\frac{5}{3}$ for the **M1** mark
	$\frac{14}{15}$ cao	$\frac{14}{15}$ cao	**A1**	
13(a)	343		**1**	
13(b)	–11		**1**	
13(c)	343		**1**	
14(a)	$\begin{pmatrix}2\\7\end{pmatrix}$		**1**	
14(b)	$\begin{pmatrix}2\\5\end{pmatrix}$		**1**	
14(c)	$\begin{pmatrix}8\\20\end{pmatrix}$		**1**	
15	54		**3**	**M2** for $\frac{180\times(5-2)}{5}$ or $180-\frac{360}{5}$ or **M1** for 180 × (5 − 2) or $\frac{360}{5}$
16	16.1 or 16.12 to 16.13		**3**	**M2** for $\sqrt{(18^2 - 8^2)}$ or better or **M1** for $18^2 = [\ldots]^2 + 8^2$ or better
17(a)	m^{10} final answer		**1**	
17(b)	$20x^5y^2$ final answer		**2**	**B1** for 2 out of 3 elements correct in final answer or correct answer spoiled

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Question	Answer	Marks	Partial marks
18	Correct method to eliminate one variable	**M1**	
	[x =] –2	**A1**	
	[y =] 3	**A1**	If zero scored, **SC1** for both correct but no or wrong working or **SC1** for 2 values satisfying one of the original equations
19(a)(i)	99° 63° 36°	**3**	**B1** for each or **M1** for 162 ÷ 18 or 360 ÷ 40 or better If zero scored, **SC1** for 3 angles that add to 198
19(a)(ii)	Correct labelled pie chart	**1FT**	**FT** *their* table if *their* angles add to 198
19(b)	$\frac{252}{360}$ or better fraction isw	**1**	
20(a)	71.48	**2**	**M1** for 12.8 × 10.4 or 9.2 × 6.7 or for an area of a suitable rectangle from shaded area
20(b)	132	**3**	**M2** for 2 × (8 × 2 + 2 × 5 + 8 × 5) oe or **M1** for at least two of 8 × 2, 8 × 5 and 2 × 5
21(a)(i)	Correct ruled bisector with two pairs of correct arcs	**2**	**B1** for correct ruled bisector missing/wrong arcs or 2 pairs of correct arcs
21(a)(ii)	Correct ruled perpendicular bisector with two pairs of correct arcs	**2**	**B1** for correct ruled bisector missing/wrong arcs or 2 pairs of correct arcs
21(b)	Correct region shaded	**1**	Dep. on at least **B1** in **(a)(i) and B1** in **(a)(ii)**

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MATHEMATICS **0580/12**

Paper 1 (Core) **October/November 2017**

MARK SCHEME

Maximum Mark: 56

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dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial marks
1	14 027	**1**	
2	−3	**1**	
3	1	**1**	
4	[0].00517	**1**	
5	$\frac{31}{50}$, $\frac{5}{8}$, 0.63, 64%	**2**	**B1** for 3 in correct order or **M1** for 0.62 or 62% **and** 0.625 or 62.5% or 4 fractions with a common denominator
6	10.1[0]	**2**	**M1** for [4.5 +] (7 × [0].8) or 450 + 7 × 80
7	2.1	**2**	**B1** for 2.08 or 2.079… or 2.10
8(a)	2, 3, 4, 6	**1**	
8(b)	27, 36 cao	**1**	
9	[x =] 60 [y =] 40	**2**	**B1** for each or for two numbers that add to 100
10	2.5	**2**	**M1** for 2200 or 0.055 seen or **SC1** for answer figs 25
11	32	**2**	**M1** for $\frac{1}{2} \times 33 \times h = 528$ oe
12(a)	Positive	**1**	
12(b)	No correlation oe	**1**	
13	[0].35	**2**	**M1** for 1 – (0.15 + 0.3 + 0.2)
14	361.5	**1**	
	362.5	**1**	If zero scored, **SC1** for both correct but reversed

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Question	Answer	Marks	Partial marks
15	52.2 or 52.19 to 52.20	**2**	**M1** for sin […=] $\frac{6.4}{8.1}$ oe
16(a)	(2, 5)	**1**	
16(b)	Point plotted at (7, −2)	**1**	
16(c)	Isosceles cao	**1**	
17(a)	9	**1**	
17(b)	Midpoint marked	**1**	
17(c)	Perpendicular line drawn	**1**	
18	120 nfww	**3**	**M2** for $180 - \frac{360}{6}$ oe $\frac{180 \times (6-2)}{6}$ or **M1** for $\frac{360}{6}$ soi by 60 or 180 × (6 − 2) soi by 720
19	Correct ruled net	**3**	**B2** for 4 more correct faces in correct position or **B1** for 2 or 3 more correct faces in correct position
20(a)	$3\frac{2}{3}$ cao	**1**	
20(b)	$\frac{3}{12}$[and $\frac{5}{12}$] oe	**M1**	For correct method to find common denominator e.g. $\frac{12}{48}$ and $\frac{20}{48}$
	$\frac{2}{3}$ cao	**A1**	
21	[y =] $0.5x + 2$ oe	**3**	**M2** for [y =] $0.5x + c$ oe $c \neq 2$ or **M1** for $\frac{\text{rise}}{\text{run}}$ and **B1** for $kx + 2$, $k \neq 0$
22(a)(i)	36	**1**	
22(a)(ii)	Add 7 oe	**1**	
22(b)	$4n - 2$ oe	**2**	**M1** for $4n + k$, $k \neq -2$ oe
23(a)	$\frac{5}{14}$ or 0.357 or 0.357…	**2**	**M1** for $7 - 2 = 11n + 3n$ oe or better
23(b)	18	**2**	**M1** for $p - 3 = 3 \times 5$ or $\frac{p}{5} = 3 + \frac{3}{5}$

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Question	Answer	Marks	Partial marks
24(a)	6	**2**	**M1** for $\frac{15}{12.5}$ or $\frac{12.5}{15}$ or $\frac{12.5}{5}$ or $\frac{5}{12.5}$ soi
24(b)	10	**2**	**M1** for $\frac{12.5}{15} \times 12$ or $12 \div \frac{15}{12}$ soi

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MATHEMATICS **0580/13**

Paper 1 (Core) **October/November 2017**

MARK SCHEME

Maximum Mark: 56

Published

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Abbreviations

cao correct answer only
dep dependent
FT follow through after error
isw ignore subsequent working
oe or equivalent
SC Special Case
nfww not from wrong working
soi seen or implied

Question	Answer	Marks	Partial marks
1	2h 32 min	**1**	
2	84	**1**	
3	Kite	**1**	
4	y^9	**1**	
5(a)	0.16	**1**	
5(b)	0.06 0.078 0.42 0.5	**1**	
6(a)	Yellow	**1**	
6(b)	$\frac{3}{16}$ or 0.1875 or 18.75%	**1**	
7	0.25 $\frac{8}{10}$ oe 80	**2**	**B1** for two correct
8	$\begin{pmatrix}11\\-7\end{pmatrix}$	**2**	**B1** for $\begin{pmatrix}11\\k\end{pmatrix}$ or $\begin{pmatrix}k\\-7\end{pmatrix}$ or $\begin{pmatrix}15\\-5\end{pmatrix}$ seen
9	[x =] 5	**2**	**M1** for $5x - 2x = 19 - 4$ or better
10	$\frac{60\times 2}{2+4}$	**M1**	Allow 1 error
	20	**A1**	Dep on no errors in rounding
11	120	**2**	**M1** for $\frac{6}{40}$ [× 800] or $\frac{800}{40}$[×6] oe
12	1263.21	**2**	**M1** for $1200 \times \left(\frac{100+2.6}{100}\right)^2$ oe

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Question	Answer	Marks	Partial marks
13(a)	Moscow	**1**	
13(b)	8	**1**	
13(c)	–7	**1**	
14(a)	Frequencies 4, 5, 6, 3, 2 cao	**2**	**B1** for 3 or 4 correct in frequency column or for fully correct tally if no frequencies
14(b)	100 to 109	**1**	**FT** *their* frequency table
15	150	**3**	**M2** for (12 – 2) × 180 ÷ 12 or 180 – 360 ÷ 12 or **M1** for (12 – 2) × 180 or 360 ÷ 12 soi 30
16	$\frac{22}{7}$ or $\frac{5}{4}$ $\quad 2\frac{1}{7} - \frac{1}{4}$	**B1**	Allow $\frac{22k}{7k}$ or $\frac{5k}{4k}$ Correct step for dealing with mixed numbers
	$\frac{88}{28}$ or $\frac{35}{28}$ $\quad 2\frac{4}{28}$ or $\frac{7}{28}$	**M1**	Correct method to find common denominator e.g. $3\frac{4}{28}$ or $1\frac{7}{28}$
	$1\frac{25}{28}$ $\quad 1\frac{25}{28}$	**A1**	
17	10.9 or 10.91 …	**3**	**M2** for $[BC =]\ \frac{8.6}{\sin 52}$ or **M1** for $\sin 52 = \frac{8.6}{BC}$ oe
18(a)	18 000	**1**	
18(b)	2.15×10^6	**2**	**B1** for answer figs 215 or correct answer not in standard form
19(a)	Ruled line through (0, 0) and (100, 60)	**2**	**B1** for (100, 60) plotted
19(b)(i)	82 to 86	**1**	
19(b)(ii)	31 to 35	**1**	
20(a)(i)	34	**1**	
20(a)(ii)	Add 6 oe	**1**	
20(b)	$3n + 8$ oe	**2**	**B1** for $3n + k$

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Question	Answer	Marks	Partial marks
21(a)	168	**2**	**B1** for 8.4 seen
21(b)	[0]74	**1**	
21(c)	Correct angle bisector with correct arcs meeting *AB*	**2**	**B1** for correct bisector with wrong / no arcs
22	139 or 139.2 to 139.3	**4**	**M3** for $10^2 + \frac{1}{2} \times \pi \times 5^2$ or **M2** for $\frac{1}{2} \times \pi \times 5^2$ or **M1** for radius = 5 or [area of square]10^2
	cm^2	**1**	

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MATHEMATICS **0580/21**

Paper 2 (Extended) **October/November 2017**

MARK SCHEME

Maximum Mark: 70

Published

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dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Mark	Partial marks
1	101	**1**	
2	2	**1**	
3(a)	1.49220….	**1**	
3(b)	1.5	**1FT**	**FT** *their* answer to **(a)** rounded correctly to 2 significant figures
4	88	**2**	**M1** for $\frac{68+81+74+89+x}{5} = 80$ oe or **B1** for 400
5	$3x(4x + 5y - 3)$ final answer	**2**	**B1** for $3(4x^2 + 5xy - 3x)$ or $x(12x + 15y - 9)$ allow in working or correct answer spoiled If zero scored, **SC1** for $3x(4x + 5y - 3)$ with only 2 correct elements in the brackets, allow in working
6(a)	(−2, 3)	**1**	
6(b)	Correct rhombus with 4th point at (2,2)	**1**	
7	Diagonal line from (0, 0) to (30, 12)	**1**	
	and Horizontal line from (30, 12) to (70, 12)	**1FT**	**FT** for horizontal line from (30, k) to (70, k) where k is *their* 12
8	19.65 cao	**2**	**B1** for 6.55 seen (must be evaluated, not 6.5 + 0.05) or **M1** for 3 × (6.5 + 0.05)
9	7615.15	**2**	**M1** for $12\,400 \times \left(1 - \frac{15}{100}\right)^3$ oe

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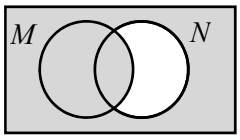
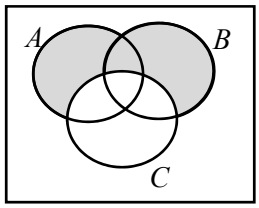
Question	Answer		Mark	Partial marks
10	$\frac{5}{3}$	$\frac{2}{3}+\frac{4}{15}$	**B1**	Allow $\frac{5k}{3k}$
	$\frac{25}{15}$ [and $\frac{11}{15}$]	$\frac{10}{15}$ [and $\frac{4}{15}$]	**M1**	Correct method to find common denominator e.g. $\frac{75}{45}$ and $\frac{33}{45}$ Follow through *their* $\frac{5}{3}$ for the **M1** mark
	$\frac{14}{15}$ cao	$\frac{14}{15}$ cao	**A1**	
11	54		**3**	**M2** for $\frac{180\times(5-2)}{5}$ or $180-\frac{360}{5}$ or **M1** for $180\times(5-2)$ or $\frac{360}{5}$
12(a)	343		**1**	
12(b)	–11		**1**	
12(c)	343		**1**	
13(a)	m^{10} final answer		**1**	
13(b)	$20x^5y^2$ final answer		**2**	**B1** for 2 out of 3 elements correct in final answer or correct answer spoiled
14(a)	(9, −4)		**1**	
14(b)	−5		**2**	**M1** for $t^2+12^2=13^2$ oe or **SC1** for answer 5 or ± 5
15(a)	Fewer than 6 elements from {1, 2, 3, 4, 5, 6} or ∅		**1**	
15(b)			**1**	
			**1**	

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Question	Answer	Mark	Partial marks
16	Enlargement	**1**	
	$\frac{1}{3}$	**1**	
	(2, 1)	**1**	
17(a)	$(y =)\ \frac{72}{(x+1)^2}$ oe	**2**	**M1** for $y = \frac{k}{(x+1)^2}$
17(b)	32	**1FT**	**FT** correct evaluation from *their* equation in **(a)** using 0.5
18	Correct position of *S* with 2 pairs of correct construction arcs for line	**4**	**B3** for correct position of *S* with missing/incorrect construction arcs but correct line or **B2** for correct ruled line equidistant from the two trees with correct arcs or **B1** for correct line with no/wrong arcs or correct arcs with no line and **B1** for arc centre bird bath, radius 5 cm or *S* in correct position with no/incorrect working
19	$\frac{x^2+20x+31}{2(x-3)(x+7)}$ final answer	**4**	**B1** for a common denominator of [2]$(x - 3)(x + 7)$ seen isw **M1** for $2\times5\times(x + 7) + 2\times3\times(x - 3) + (x - 3)(x + 7)$ oe **and** must have attempted to expand all the brackets in the numerator **M1** for $10x + 70 + 6x - 18$ **or** $x^2 - 3x + 7x - 21$ **or** [2]$(5x + 35 + 3x - 9)$ or better
20(a)	1480	**1**	
20(b)	30	**3**	**M2** for $10 \times \sqrt{\frac{3960}{440}}$ or $10 \div \sqrt{\frac{440}{3960}}$ or **M1** for $\sqrt{\frac{3960}{440}}$ or $\sqrt{\frac{440}{3960}}$ or $\left(\frac{h}{10}\right)^2 = \frac{3960}{440}$ oe

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Question	Answer	Mark	Partial marks
21	46.7 or 46.68 to 46.69	**4**	**M3** for tan […=] $\dfrac{9}{\frac{1}{2}\sqrt{12^2+12^2}}$ oe or **M1** for $\left[\frac{1}{2}\times\right]\sqrt{12^2+12^2}$ oe e.g. $\sqrt{\dfrac{12^2}{2}}$ and **M1** for identifying angle *MCE*
22(a)	80 to 84	**2**	**M1** for 116 to 120
22(b)	Correct curve or ruled lines	**3**	**B2** for 7 or 8 correct points **B1** for 5 or 6 correct points
22(c)	26	**2**	**B1** for 156 or 130 or for *their* 130 from *their* **increasing** curve (or lines)
23(a)	$x + y \leqslant 16$ oe $x \geqslant 4$ oe	**2**	**B1** for each mark final answers If zero scored, **SC1** for $x + y < 16$ **and** $x > 4$
23(b)	Correct shading	**3**	**M2** for lines at $x = 4$ **and** $x + y = 16$ or for correct shading of $x < 4$ or $x + y > 16$ or **M1** for line at $x = 4$ or *their* $x = 4$ or for line at $x + y = 16$ or *their* $x + y = 16$
23(c)	144	**2**	**M1** for (8, 8) selected or for $10 \times x + 8 \times y$ for any numerical point which is inside or on the boundary of *their* unshaded region

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MATHEMATICS **0580/22**

Paper 2 (Extended) **October/November 2017**

MARK SCHEME

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oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial marks
1	– 3	**1**	
2	[0].00517	**1**	
3	BC AB oe	**1**	
4(a)	2, 3, 4, 6	**1**	
4(b)	27, 36 cao	**1**	
5	[x =] 60 [y =] 40	**2**	**B1** for each or for two numbers that add to 100
6	2.5	**2**	**B1** for 2200 or 0.055 seen or **SC1** for answer figs 25
7	32	**2**	**M1** for $\frac{1}{2}\times 33\times h = 528$ oe
8	16.5	**2**	**M1** for $\frac{55}{60}$ or speed × time (numerical)
9	1.32×10^{41}	**2**	**M1** for 0.12×10^{41} or 12×10^{40} or **SC1** for figs 132
10	20.75 final answer cao	**2**	**B1** for one of 5.15, 6.25 or 9.35 seen or **M1** for (5.2 – 0.05) + (6.3 – 0.05) + (9.4 – 0.05)
11	$48.\dot{4}\dot{8}$ $-0.\dot{4}\dot{8}$ oe	**M1**	**SC1** for $\frac{48}{99}$ or $\frac{16}{33}$ or equivalent fraction with no/insufficient working
	$\frac{48}{99}$ or $\frac{16}{33}$ or equivalent fraction	**A1**	
12	$15+2n-n^2$ final answer	**2**	**M1** for three terms of $15+5n-3n-n^2$ correct

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Question	Answer	Marks	Partial marks
13(a)	$3\frac{2}{3}$ cao	**1**	
13(b)	$\frac{3}{12}$[and $\frac{5}{12}$] oe	**M1**	For correct method to find common denominator e.g. $\frac{12}{48}$ and $\frac{20}{48}$
	$\frac{2}{3}$ cao	**A1**	
14	–1, 0, 1, 2, 3	**3**	**B2** for $-2 < n \leqslant 3$ or list with one error or omission or **M1** for $-5 + 1 < 2n$ or $2n \leqslant 5 + 1$ or a list with 3 correct and no more than 1 incorrect or if zero scored, **SC1** for 5, 3, 1, –1, –3
15	$\frac{y+x}{xy}$ final answer	**3**	**B1** for $y(x+1) - x(y-1)$ **B1** for common denominator xy or **SC2** for $\frac{y-x}{xy}$ final answer
16(a)	–1	**1**	
16(b)	$-6n + 29$ oe	**2**	**M1** for $-6n + k$ (any k) or $-kn + 29$ $(k \neq 0)$
17	60	**3**	**B2** for $x = 6$ or **M1** for $29x + x = 180$ oe and **M1** for 360 ÷ 6 or 360 ÷ *their x* or $180(n - 2)$ = *their x* × $29n$
18	Correctly eliminating one variable	**M1**	
	[x =] $\frac{2}{3}$ or 0.667 or 0.6666…	**A1**	
	[y =] $\frac{1}{3}$ or 0.333 or 0.333…	**A1**	If zero scored, **SC1** for 2 values satisfying one of the original equations or if no working shown but 2 correct answers given
19	[±] $\sqrt{y^2 - 1}$ final answer	**3**	**M1** for correct squaring **M1** for correct rearranging for x or x^2 term **M1** for correct square root
20	132	**3**	**M2** for $\frac{1}{2}(7 + 15) \times 12$ or **M1** for any correct area

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Question	Answer	Marks	Partial marks
21	$\frac{1}{3}\mathbf{a} + \frac{2}{3}\mathbf{b}$ oe simplified	**3**	**B2** for correct unsimplified vector for $\overrightarrow{OK}$ in terms of **a** and **b** or **M1** for a correct route for $\overrightarrow{OK}$ or $\overrightarrow{AB} = -\mathbf{a} + \mathbf{b}$ or $\overrightarrow{BA} = -\mathbf{b} + \mathbf{a}$ or recognition of $\overrightarrow{OK}$ as a position vector
22	[w =] 54 [x =] 126 [y =] 60	**3**	**B1** for [w =] 54 **B1** for [x =] 126 If **B0 B0** for first two B marks then **B1** for *their w* + *their x* = 180 **B1** for [y =] 60 or for *their w* + *their x* + *their y* = 240
23	[k =] 3 [c =] 9	**3**	**M1** for $\frac{30}{360} \times \pi \times 6^2$ **M1** for $\frac{1}{2} \times 6 \times 6 \times \sin 30$
24(a)	$\frac{5}{14}$ or 0.357 or 0.357…	**2**	**M1** for $7 - 2 = 11n + 3n$ oe or better
24(b)	18	**2**	**M1** for $p - 3 = 3 \times 5$ or $\frac{p}{5} = 3 + \frac{3}{5}$
25(a)	$(x-12)(x+11)$ final answer	**2**	**B1** for $(x+a)(x+b)$ where $ab = -132$ or $a + b = -1$
25(b)	$x(x+2)(x-2)$ final answer	**2**	**B1** for $x(x^2 - 4)$ or $(x+2)(x^2 - 2x)$ or $(x-2)(x^2 + 2x)$
26	21.8 or 21.80…	**4**	**M3** for $\tan = \frac{2}{\sqrt{3^2 + 4^2}}$ oe or **M1** for $\sqrt{3^2 + 4^2}$ or $\sqrt{3^2 + 4^2 + 2^2}$ and **M1** for recognising angle QAC

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Question	Answer	Marks	Partial marks
27(a)	27	**1**	
27(b)	x^2 final answer	**1**	
27(c)	$\frac{y^2}{2}$ or $0.5y^2$ final answer	**2**	**M1** for $\left(\frac{y^6}{8}\right)^{\frac{1}{3}}$ or $\left(\frac{2}{y^2}\right)^{-1}$ or better or **SC1** for answer $\frac{y^2}{c}$ or $\frac{y^k}{2}$ or $\frac{2}{y^2}$

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MATHEMATICS **0580/31**

Paper 3 (Core) **October/November 2017**

MARK SCHEME

Maximum Mark: 104

Published

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SC	Special Case
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soi	seen or implied

Question	Answer	Marks	Partial marks
1(a)(i)	16	**1**	
1(a)(ii)	–15	**1**	
1(b)(i)	Friday	**1**	
1(b)(ii)	6	**1**	
1(c)(i)	1605 or 405 pm	**1**	
1(c)(ii)	4	**1**	
2(a)	180.5[0]	**3**	**M2** for $3 \times 24 + 5 \times 12.50 + 46$ oe or **M1** for 3×24 or 5×12.50 or better, soi by 72 or 62.5
2(b)	69.12	**2**	**M1** for 64×1.08 oe
2(c)	12	**3**	**M2** for $(\frac{280}{250} - 1) \times 100$ or $\frac{280-250}{250} \times 100$ oe or **M1** for $\frac{280}{250} - 1$ or $\frac{280}{250} \times 100$ or $\frac{280-250}{250}$ oe
2(d)	561	**3**	**M1** for 5.5×8.5 soi by 46.75 **M1** for *their* 46.75×12
2(e)	4287.66	**3**	**M2** for $3600 \times (1 + \frac{6}{100})^3$ oe or **M1** for $3600 \times (1 + \frac{6}{100})^2$ oe soi by 4044.96 If zero scored, **SC2** for 687.6576, 687.658, 687.66, 687.65, 687.7, 688 or 690

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Question	Answer	Marks	Partial marks
3(a)(i)	Written test and a valid reason	**1**	
3(a)(ii)	Positive	**1**	
3(a)(iii)	(45,10) indicated	**1**	
3(a)(iv)	42	**1**	
3(b)(i)	29	**2**	**M1** for 6 in the correct order, 8 14 17 21 23 29… or … 29 30 32 39 41 48
3(b)(ii)	27.5 or 27.45 to 27.46	**2**	**M1** for all 11 numbers added, allowing one error or omission, and divided by 11
4(a)(i)	Correct point plotted	**1**	
4(a)(ii)	Right-angled or scalene	**1**	
4(a)(iii)	8 4	**1**	
4(a)(iv)(a)	0.5 oe	**2**	**M1** for attempt at rise ÷ run
4(a)(iv)(b)	[y =] 0.5x oe	**1FT**	Correct or **FT** *their* **(iv)(a)**
4(b)(i)	…1 …–5 –5…1 15	**3**	**B2** for 3 or 4 correct or **B1** for 1 or 2 correct
4(b)(ii)	Correct curve	**4**	**B3FT** for 8 or 9 points correctly plotted **or B2FT** for 6 or 7 points correctly plotted **or B1FT** for 4 or 5 points correctly plotted
4(b)(iii)	–2.8 1.8	**2FT**	**B1FT** for each
5(a)	51.6	**2**	**B1** for 4.3[cm]
5(b)	[0]47	**1**	
5(c)	292	**1**	
5(d)(i)	Arc centre A radius 7 cm	**1**	
	Arc centre C radius 3.5 cm	**1**	
	One point **marked** at intersection of correct arcs	**1**	If zero scored, **SC1** for any arc centred on A or C, or correct point marked with no arcs
5(d)(ii)	504	**2**	**M1** for 84 ÷ *their* time or 84 × 6
5(e)	298	**2**	**M1** for 118 + 180 oe

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Question	Answer	Marks	Partial marks
6(a)(i)	1, 2, 3, 6, 9, 18 only	**2**	**B1** for 4 or 5 correct factors and no extras or 6 correct with one extra
6(a)(ii)	Any multiple of 30	**1**	
6(a)(iii)	46.2	**1**	
6(a)(iv)	15.625	**1**	
6(a)(v)	5	**1**	
6(b)	$2^3 \times 3^2$	**2**	**M1** for a complete factor tree or 2, 2, 2, 3, 3 clearly identified as factors
6(c)	240	**2**	**M1** for [16=] 2^4 or $2 \times 2 \times 2 \times 2(\times 1)$ or [30=] $2 \times 3 \times 5(\times 1)$ or lists of multiples of both at least up to 240, or any product that equals 240 or **B1** for 240*n*
6(d)	20 00 or 8 pm	**3**	**M1** for [LCM of 6 and 9 =] 18(00) or **M1** for lists of multiples **B1FT** for "2 am" + *their* 18 correctly worked out soi OR **B2** for [clock A = 2] 8, 14, 20… and [clock B = 2] 11, 20…. or **B1** for [clock A = 2] 8, 14, 20…or [clock B = 2] 11, 20…
7(a)(i)	$\frac{6}{20}$ oe	**1**	
7(a)(ii)	$\frac{5}{20}$ oe	**1**	
7(a)(iii)	0	**1**	
7(b)	[0].28 oe	**2**	**M1** for 1 – 0.3 – 0.24 – 0.18 oe or 1 – 0.72 oe
7(c)	$\frac{8}{20}$	**1**	Accept 8 ÷ 20
	$\frac{6}{15}$	**1**	Accept 6 ÷ 15
	Comparing the two fractions with equal denominators or as decimals	**1**	e.g. $\frac{8}{20} = \frac{24}{60}$ and $\frac{6}{15} = \frac{24}{60}$ or both shown equal to $\frac{2}{5}$ or [0] .4 or 40%

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Question	Answer	Marks	Partial marks
8(a)	$8x + 7$ final answer	**2**	**B1** for $10x + 15$ or $-2x - 8$ or $8x + j$ or $kx + 7$ as final answer
8(b)(i)	$6x$ final answer	**1**	
8(b)(ii)	$5a$ final answer	**1**	
8(c)	$10y + 12$ or $2(5y + 6)$ final answer	**3**	**M1** for $2(3y + 1) + 2(2y + 5)$ oe **B1** for $10y + j$ or $ky + 12$ ($k \neq 0$)
8(d)	$7(m + 6) + 3m = 182$ or $7m + 42 + 3m = 182$	**2**	**B1** for $m + 6$ or $7t + 3m = 182$
	14	**3**	**M1** for $7m + 42$ [$+ 3m = 182$] **M1** for $7m + 3m = 182 - 42$ or better OR **M2** for [m=] $(182 - (6 \times 7)) / (7 + 3)$ or better or **M1** for $182 - (6 \times 7)$ or better
9(a)(i)	7.5	**2**	**M1** for $\frac{1}{2} \times 5 \times 3$ or evidence of counting squares
9(a)(ii)	Correct enlargement	**2**	**B1** for one line correctly scaled
9(b)(i)	Rotation [centre] (0,0) oe 180°	**3**	**B1** for each
9(b)(ii)	Correct reflection with points (–3,–3), (–1,–5) and (–6,–6)	**2**	**B1** for reflection in $y = k$ or $x = -1$
9(b)(iii)	Correct translation with points (4,4), (2,2) and (–1,5)	**2**	**B1** for a correct horizontal translation (5 to the right) or a correct vertical translation (1 up)
10(a)(i)	30	**1**	
10(a)(ii)	add 8 oe	**1**	
10(a)(iii)	$8n - 10$ oe final answer	**2**	**B1** for $8n + j$ or $kn - 10$ ($k \neq 0$)
10(b)	9	**1**	
10(c)	34	**1**	

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MATHEMATICS **0580/32**

Paper 3 (Core) **October/November 2017**

MARK SCHEME

Maximum Mark: 104

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	45	**1**	
1(a)(ii)	10 10	**1**	
1(a)(iii)	[0].55	**2**	**M1** for (1.66 × 5) – 7.75 oe
1(b)(i)	50	**1**	
1(b)(ii)	2, 7, 4, 5, 6, 6	**2**	**B1** for 4 correct in frequency column or **B1** for correct tallies if frequency column blank or **B1** if 2, 7, 4, 5, 6, 6 seen in tally column with frequency column blank or incorrect
1(b)(iii)	Correctly scaled frequency axis	**1**	
	all heights correct	**1FT**	**FT** *their* table
	consistent width of bars	**1**	
1(b)(iv)	10 [to] 19	**1**	**FT** *their* bar chart if 5 or 6 bars or *their* table if no bar chart
2(a)	Eight thousand [and] forty-five	**1**	
2(b)(i)	64	**1**	
2(b)(ii)	61 or 67	**1**	
2(b)(iii)	68	**1**	
2(c)(i)	2×7^2 or $2 \times 7 \times 7$	**2**	**M1** for 2, 7, 7 or 2, 7^2 or $1 \times 2 \times 7 \times 7$ or $1 \times 2 \times 7^2$
2(c)(ii)	14	**2**	**M1** for (182 =) $2 \times 7 \times 13$ or 2, 7, 13 or **B1** for 2 or 7 or 2×7 as final answer

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Question	Answer	Marks	Partial Marks
2(d)(i)	1296	**1**	
2(d)(ii)	29	**1**	
2(d)(iii)	14	**1**	
2(d)(iv)	0.008 or $\frac{1}{125}$	**1**	
3(a)	2, 6	**2**	**B1** mark for each
3(b)(i)	Triangle at (–3, 1) (–5, 3) (–3, 3)	**2**	**B1** for reflection in $x = k$ or $y = -1$
3(b)(ii)	Triangle at (2, 2) (2, 6) (6, 6)	**2**	**B1** for correct size and orientation, incorrect centre
3(b)(iii)	Translation	**1**	
	$\begin{pmatrix} -5 \\ 3 \end{pmatrix}$	**1**	
4(a)(i)	6 pens and 1.3[0]	**3**	**M1** for $\frac{10}{1.45}$ **M1** for $k \times 1.45$ where k is an integer
4(a)(ii)	4.76	**2**	**M1** for $5.60 \times (1 - \frac{15}{100})$ oe
4(b)	22	**2**	**M1** for ordered list of first 6 or last 6 or **B1** for 19 and 25 both identified
4(c)	3000 1500 2500	**3**	**M2** for $\frac{7000}{6+3+5} \times k$ or better, where k is 6 or 3 or 5 or **M1** for $\frac{7000}{6+3+5}$ or better implied by 500 If no working **M2** implied by one correct answer in correct place If zero scored, **M1** for all correct answers in wrong order
4(d)	909.09 or 909.1[0] or 909.0 or 909	**2**	**M1** for $\frac{1400}{1.54}$
4(e)	2160.09 or 2160.1[0] or 2160.0 or 2160	**3**	**M2** for $2000\,(1 + \frac{2.6}{100})^3$ oe or **M1** for $2000\,(1 + \frac{2.6}{100})^2$ soi by 2105.35

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Question	Answer	Marks	Partial Marks
5(a)	$\frac{90}{360} \times 900$ [= 225]	**1**	
5(b)	45	**2**	**M1** for $\frac{18}{360} \times 900$ oe
5(c)	Correct pie chart	**2**	**B1** for 56° or 50° soi
5(d)(i)	0	**1**	
5(d)(ii)	$\frac{1}{20}$ cao	**2**	**M1** for $\frac{18}{360}$ or $\frac{\textit{their}\textbf{(b)}}{900}$ oe
5(e)	350	**2**	**M1** for $\frac{125}{900} \times 2520$ or $\frac{50}{360} \times 2520$ oe
6(a)(i)	95	**2**	**B1** for 9.5
6(a)(ii)	135	**1**	
6(b)(i)	Correct length and bearing	**2**	**B1** for 7.8 cm from *A* **B1** for 103° from *A*
6(b)(ii)	104	**2**	**M1** for $\frac{78}{45} \times 60$ oe or for $\frac{78}{\text{time}}$
6(c)	Correct region shaded with correct arcs	**5**	**B2** for correct bisector with correct arcs or **B1** for short bisector with correct/incorrect/no arcs or for correct arcs but no line **B2** for arc 7 cm centre *A* or **B1** for short arc 7 cm from centre *A*
7(a)(i)	Pentagon	**1**	
7(a)(ii)	Parallelogram	**1**	
7(a)(iii)	Obtuse	**1**	
7(b)(i)	2400	**2**	**M1** for 25 × 12 × 8
7(b)(ii)	[0] .0024	**1FT**	

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Question	Answer	Marks	Partial Marks
7(c)(i)	Radius	**1**	
7(c)(ii)	Angle [in a] semicircle, [90°]	**1**	
7(c)(iii)	50.3 or 50.26 to 50.27…….	**2**	**M1** for $2 \times 8 \times \pi$ or $16 \times \pi$
7(c)(iv)	11.5 or 11.48 to 11.49	**3**	**M2** for $\sqrt{14^2 - 8^2}$ soi or better or **M1** for $14^2 = 8^2 + CD^2$ or better
8(a)(i)	$12p - 7r$ final answer	**2**	**B1** for $12p + jr$ or $kp - 7r$ j, k can be 0 or $12p + -7r$
8(a)(ii)	$24x^5$ final answer	**1**	
8(b)	$90x + 75y$ final answer	**2**	**B1** for $90x + jy$ or $kx + 75y$ j, k can be 0 or $0.9x + 0.75y$
8(c)	$4p(3p - 2)$ final answer	**2**	**B1** for $4(3p^2 - 2p)$ or $p(12p - 8)$ or $2(6p^2 - 4p)$ or $2p(6p - 4)$
8(d)	5	**3**	**M1** for first correct step **M1FT** for second correct step
8(e)	Correctly equating one set of coefficients	**M1**	
	Correct method to eliminate one variable	**M1**	Dependent on the coefficients being the same for one of the variables. Correct consistent use of addition or subtraction using their equations.
	[x =] 2.5	**A1**	
	[y =] 11	**A1**	If zero scored, **SC1** if no working shown, but 2 correct answers given or **SC1** for 2 values satisfying one of the original equations
9(a)(i)	−6, 6, 14	**3**	**B1** for each
9(a)(ii)	Correct curve	**4**	**B3FT** for 6 or 7 points correctly plotted or **B2FT** for 4 or 5 points correctly plotted or **B1FT** for 2 or 3 points correctly plotted
9(b)(i)	Correct ruled line	**1**	
9(b)(ii)	$1.8 \leqslant x < 2.0$, 5	**1FT**	**FT** intersection of *their* curve with the line $y = 5$

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MATHEMATICS **0580/33**

Paper 3 (Core) **October/November 2017**

MARK SCHEME

Maximum Mark: 104

Published

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oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial marks
1(a)(i)	800	**1**	
1(a)(ii)	48	**2**	**M1** for $\frac{160}{2+5+3}$ [× 3]
1(a)(iii)	60	**1**	
1(b)(i)	43.5[0]	**2**	**M1** for 3 × 7.5[0] + 2 × 10.5[0]
1(b)(ii)	7.6[0]	**2**	**M1** for $9.5\left(1-\frac{20}{100}\right)$ oe
1(c)(i)	102 138	**2**	**M1** for $\frac{85}{300}\times 360$ or $\frac{115}{300}\times 360$ or $\frac{120}{100}\times 85$ or $\frac{120}{100}\times 115$ oe
1(c)(ii)	3 correct sectors	**2FT**	**FT** if *their* angles add to 240° **B1FT** for one correct sector
1(d)	40	**3**	**M2** for $\frac{31.50-22.50}{22.50}\times 100$ or $\left(\frac{31.50}{22.50}-1\right)\times 100$ oe or **M1** for $\frac{31.50-22.50}{22.50}$ or $\frac{31.50}{22.50}-1$ or $\frac{31.50}{22.50}\times 100$ oe
2(a)(i)	9	**1**	
2(a)(ii)	4	**1**	
2(b)(i)	1.4	**1**	
2(b)(ii)	4096	**1**	
2(c)	[0].043 cao	**2**	**M1** for 0.0426… or $\frac{367}{8610}$

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Question	Answer	Marks	Partial marks
2(d)	64.8	**2**	**M1** for $\frac{1}{3}\times 4.5^2\times 9.6$ or $\frac{324}{5}$
2(e)	$\sqrt{5}$ indicated	**1**	
2(f)(i)	300	**1**	
2(f)(ii)	$2^4 \times 5$ or $2 \times 2 \times 2 \times 2 \times 5$	**2**	**M1** for 2, 2, 2, 2, 5 or 2^4,5 or $1 \times 2 \times 2 \times 2 \times 2 \times 5$ or $1 \times 2^4 \times 5$
2(f)(iii)	20	**2**	**B1** for 2 or 4 or 5 or 10 as answer or $2^2 \times 5$ as answer
3(a)(i)	Chord	**1**	
3(a)(ii)	Tangent	**1**	
3(b)(i)	48	**1**	
3(b)(ii)	66	**2**	**M1** for 180 – 48 soi by 132
3(b)(iii)	42	**2FT**	**2FT** for 90 – *their* **(b)(i)** or **B1** for angle OCQ = 90 soi
4(a)	Scalene	**1**	
4(b)	Translation	**1**	
	$\begin{pmatrix}-5\\-4\end{pmatrix}$	**1**	
4(c)	Correct rotation Vertices (2, –1), (2, –4), (3, –2)	**2**	**B1** for correct orientation but wrong position or for rotation of 90° anticlockwise about origin
4(d)(i)	1.5 oe	**1**	
4(d)(ii)	Correct enlargement Vertices (1, 3), (3, 5), (7, 3)	**2**	**B1** for correct size and orientation, incorrect position
4(d)(iii)	4	**2**	**M1** for $\frac{1}{2}\times 6\times 2$ soi by 6 or correct method to find area of *their* triangle

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Question	Answer	Marks	Partial marks
5(a)(i)	$n + 10$	**1**	
5(a)(ii)	$2(n + 10)$ oe isw	**1FT**	
5(a)(iii)	*their* **(ii)** = 52	**M1**	
	16 final answer	**B2**	**M1** for $2n = 52 - 20$ or $n = 26 - 10$ or better
5(a)(iv)	42	**1FT**	**FT** 2 × *their* **(iii)** + 10
5(b)(i)	$\frac{1}{4}$ cao	**2**	**B1** for $\frac{13}{52}$ oe soi
5(b)(ii)	Correct arrow at $\frac{3}{4}$	**1**	
5(c)	2.7[00]	**2**	**B1** for answer figs 27 or for 0.45 seen
5(d)	115 125	**2**	**B1** for one correct or both values correct but reversed
6(a)(i)	4.5	**2**	**M1** for ordered list of at least 6 values or **B1** for 4.3 **and** 4.7 both identified
6(a)(ii)	8	**1**	
6(a)(iii)	5.18	**2**	**M1** for sum of 10 distances ÷ 10
6(b)(i)	15 50 or 3.50 pm	**2**	**M1** for 9 ÷ 6 or 1.5 hours oe seen
6(b)(ii)	100	**2**	**M1** for 6 × 1000 or 6 ÷ 60 soi
6(c)(i)	Positive	**1**	
6(c)(ii)	Point (4, 68) indicated	**1**	
7(a)(i)	–3 –6 6 3	**2**	**B1** for 2 or 3 values correct
7(a)(ii)	Correct curve	**4**	**B3FT** for 7 or 8 correctly plotted points or **B2FT** for 5 or 6 correctly plotted points or **B1FT** for 3 or 4 correctly plotted points
7(a)(iii)	Ruled line $y = -5$	**1**	
7(a)(iv)	–2.5 to –2.3	**1FT**	**FT** intersection of *their* line with *their* curve

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Question	Answer	Marks	Partial marks
7(b)(i)	–0.5 oe	**2**	**M1** for $\frac{\text{rise}}{\text{run}}$
7(b)(ii)	$y = -0.5x + 2$ oe	**1FT**	**FT** *their* gradient
7(b)(iii)	$y = -0.5x + 3$ oe	**2FT**	**B1FT** for $y = -0.5x + k$ oe, $k \neq 2$ or **B1** for $y = mx + 3$ oe, $m \neq -0.5$ or 0
8(a)(i)	Correct trapezium	**2**	**M1** for $AB = 8$ cm and $BC = 6$ cm or AB and DC perpendicular to AD
8(a)(ii)	124	**1FT**	**FT** *their* obtuse angle at C (or B)
8(a)(iii)	4.7	**1FT**	**FT** *their CD*
8(a)(iv)	31.25 to 32.25	**2**	**M1** for $0.5 \times 5 \times (8 +$ *their* **(iii)**$)$ oe
8(b)(i)	17 700 or 17 671 to 17 674	**3**	**M2** for $\pi \times 15^2 \times 25$ or **B1** for 15 seen If zero scored, **SC1** for answer 70 700 or 70 685 to 70 695 or $22\,500\pi$
8(b)(ii)	4800	**3**	**M2** for $2 \times 30 \times 30 + 4 \times 30 \times 25$ oe or better or **M1** for 30×30 and 30×25 or **B1** for cuboid 30 by 30 by 25 soi
9(a)	$y(y + 8)$ final answer	**1**	
9(b)	$2x + 17$ final answer	**2**	**B1** for $6x - 3$ or $-4x + 20$ or $2x + j$ or $kx + 17$ as final answer
9(c)	$\frac{k - 5m}{7}$ oe final answer	**2**	**M1** for $7p = k - 5m$ or $\frac{k}{7} = \frac{5m}{7} + p$
9(d)	Correctly equating one set of coefficients	**M1**	
	Correct method to eliminate one variable	**M1**	Dependent on the coefficients being the same for one of the variables. Correct consistent use of addition or subtraction using their equations.
	$x = 4$	**A1**	
	$y = -3$	**A1**	If zero scored, **SC1** if no working shown, but 2 correct answers given or **SC1** for 2 values satisfying one of the original equations.

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MATHEMATICS **0580/41**

Paper 4 (Extended) **October/November 2017**

MARK SCHEME

Maximum Mark: 130

Published

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isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial marks
1(a)	2915	**2**	**M1** for 10 494 ÷ (13 + 5) oe
1(b)	1056	**2**	**M1** for 384 ÷ (10 – 6) oe
1(c)(i)	52.2 or 52.17…	**2**	**M1** for 20 ÷ 23 or 20 × 60 or 23 ÷ 60 isw If zero scored, **SC1** for answer 52.6 (from use of 0.38)
1(c)(ii)	63[.0] or 63.03 to 63.05…	**5**	**M4** for $\frac{\textit{their } 52.17... - 32}{32} \times 100$ oe or **M3** for $\frac{\textit{their } 52.17... - 32}{32}$ oe or $\frac{\textit{their } 52.17...}{32} \times 100$ oe OR **B2** for $\frac{5}{8}$ [hours] oe or 37.5 [minutes] or **M1** for 20 ÷ 32 or better and **M2** for $\frac{\textit{their } 37.5 - 23}{23} \times 100$ oe or **M1** for $\frac{\textit{their } 37.5 - 23}{23}$ or $\frac{\textit{their } 37.5}{23} \times 100$
1(d)	0.06 final answer nfww	**3**	**M1** for 11.99 ÷ 0.9276 or 12.99 × 0.9276 **A1** for 12.93 or 12.925 to 12.926
1(e)	9750	**3**	**M2** for $7605 \div \left(1 - \frac{22}{100}\right)$ oe or **M1** for (100 – 22)[%] correctly associated with 7605 seen

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Question	Answer	Marks	Partial marks
2(a)	122	**4**	**B3** for 238 or 61 or 58 correctly identified in working or on diagram or **B2** for 952 seen or 74 or 119 or 29 correctly identified in working or on diagram OR Method 1 using sum of interior angles **M1** for (8 – 2) × 180 or 1080 isw **M1** for *their* 1080 – 4 × 32 **M1** for 360 – *their* 952 ÷ 4 OR Method 2 using isosceles triangles and square **M1** for (180 – 32) ÷ 2 or for 90 **M1** for *their* 74 × 2 + 90 or 90 – *their* 74 **M1** for 360 – *their* 74 × 2 + 90 or 90 + 2(90 – *their* 74) OR Method 3 using four kites joined to centre **M1** for 360 ÷ 4 **M1** for (360 – (*their* 90 + 32)) ÷ 2 **M1** for 2(180 – *their* 119) OR Method 4 using square around outside **M1** for 90 – 32 **M1** for (90 – 32) ÷ 2 **M1** for 180 – 2(*their* 29)
2(b)	105	**3**	**M2** for 360 = 2 × y + (2y – 60) oe or 2(180 – y) = 2y – 60 oe or **B1** identifying in working or on diagram a relevant angle in terms of y
3(a)	–2.75 or $-2\frac{3}{4}$	**2**	**M1** for 11x – 3x = –7 – 15 or better
3(b)(i)	(x + 11)(x – 2) final answer	**2**	**M1** for (x + a)(x + b) where ab = –22 or a + b = 9
3(b)(ii)	–11 and 2 final answer	**1**	
3(c)	$[x] = \frac{2a}{2-y}$ or $\frac{-2a}{y-2}$ nfww final answer	**4**	**M1** for clearing the x term in the denominator **M1** for correctly removing the bracket (expand or divide by 2) **M1** for factorising to obtain single x term **M1** for *their* factor and division Incorrect answer scores 3 out of 4 maximum
3(d)	$\frac{x}{x+6}$ nfww final answer	**3**	**M1** for x(x – 6) **M1** for (x + 6)(x – 6)

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Question	Answer	Marks	Partial marks
4(a)	10, 7	**2**	**B1** for each value
4(b)	Correct curve	**4**	**B3 FT** for 10 or 11 correct points **B2 FT** for 8 or 9 correct points **B1 FT** for 6 or 7 correct points **FT** *their* table
4(c)	–1.7 to –1.55	**1**	**FT** *their* graph if one answer
4(d)	Tangent ruled at $x = 3.5$	**B1**	No daylight between tangent and curve at point of contact
	6.5 to 11	**B2**	**dep** on tangent drawn or close attempt at tangent at $x = 3.5$ **M1** for rise/run also dep on tangent or close attempt at $x = 3.5$
4(e)	line $y = 2x + 10$ ruled AND –1.3 to –1.1 1 4.1 to 4.25	**4**	**B3** for correct line (could be short) and 1 correct value or **B2** for correct line (could be short) or **B1** for [$y =$] $2x + 10$ seen If zero scored, **SC1** for no/wrong line and 3 correct values
5(a)	54, 76, 96	**3**	**B1** for each
5(b)	187 or 186.8 to 186.9 nfww	**4**	**M1** for 155, 175, 185, 200, 225 soi **M1** for Σfm with *their* frequencies from **(a)** 155 × *their* 54 + 175 × *their* 76 + 185 × *their* 96 + 200 × 92 + 225 × 42 **M1** (dep on second **M1**) for *their* $\Sigma fm \div 360$
6(a)	18 22 $4n + 2$ oe 17 26 $n^2 + 1$ oe	**6**	**B2** for 18, 22, 17, 26 or **B1** for two or three correct values AND **B2** for $4n + 2$ oe or **B1** for $4n + k$ oe or $pn + 2$ ($p \neq 0$) AND **B2** for $n^2 + 1$ oe or **B1** for $n^2 + k$ oe
6(b)	242	**1**	**FT** *their* $4n + 2$ provided a linear expression
6(c)	15	**1**	
6(d)	3	**2**	**M1** for $2 \times 1^2 + 2 \times 1 + q = 7$ oe

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Question	Answer	Marks	Partial marks
7(a)	–7	**1**	
7(b)	$\frac{4}{64}$ or better	**2**	**M1** for g(4^3) soi or $\frac{4}{4^x}$ or better
7(c)	$\frac{3-x}{2}$ oe final answer	**2**	**M1** for $x = 3 - 2y$ or $2x = 3 - y$ or $\frac{y}{2} = \frac{3}{2} - x$ or $\frac{y-3}{-2}$ oe as final answer
7(d)	4^{3-2x}	**M1**	
	Correctly interprets the indices	**M1**	Dep on previous **M1** e.g. $4^3 \times 4^{-2x}$ or $4^3 \times \frac{1}{4^{2x}}$ or $\frac{4^3}{4^{2x}}$
	$\frac{64}{16^x}$ nfww	**A1**	Correct completion with no errors
7(e)	1.5	**2**	**B1** for $4^x = 8$ or better
8(a)	$\pi \times \frac{5}{2} \times l + \frac{4}{2} \times \pi \times \left(\frac{5}{2}\right)^2 = \frac{115\pi}{4}$ oe or $\frac{115\pi}{4} - \frac{4}{2} \times \pi \times \left(\frac{5}{2}\right)^2 = \pi \times \frac{5}{2} \times l$ oe	**M2**	**M1** for $\pi \times \frac{5}{2} \times l$ or $\frac{4}{2} \times \pi \times \left(\frac{5}{2}\right)^2$
	$\frac{5\pi l}{2} = \frac{65\pi}{4}$ oe or [l =]$\left(\frac{115\pi}{4} - 2 \times \pi \times 2.5^2\right) \div 2.5\pi$ oe	**B1**	nfww oe both terms must be written in terms of π nfww or correct complete method for l with decimals
	[l =] $\frac{65\pi \times 2}{4 \times 5\pi}$ or $\frac{65\pi}{10\pi}$ oe = 6.5	**A1**	Correct calculation with no errors and **B1** earned
8(b)	6	**3**	**M2** for $\sqrt{6.5^2 - 2.5^2}$ or **M1** for $h^2 + 2.5^2 = 6.5^2$ If zero scored, **SC2dep** for answer 4.15[3]…

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Question	Answer	Marks	Partial marks
8(c)	72[.0…] or 71.99… nfww	**4**	**M3** for $\frac{\pi}{3} \times \left(\frac{5}{2}\right)^2 \times$ *their* 6 $+ \frac{1}{2} \times \frac{4\pi}{3} \times \left(\frac{5}{2}\right)^3$ oe or **M1** for $\frac{\pi}{3} \times \left(\frac{5}{2}\right)^2 \times$ *their* 6 oe and **M1** for $\frac{1}{2} \times \frac{4\pi}{3} \times \left(\frac{5}{2}\right)^3$ oe If zero scored, **SC3dep** for $\frac{\pi}{3} \times (5)^2 \times$ *their* 4.15 $+ \frac{1}{2} \times \frac{4\pi}{3} \times (5)^3$ oe or **SC1dep** for $\frac{\pi}{3} \times (5)^2 \times$ *their* 4.15 oe **SC1dep** for $\frac{1}{2} \times \frac{4\pi}{3} \times (5)^3$ oe
8(d)	53.7 or 53.65 to 53.67	**3**	**M1** for figs (*their* **(c)**) × 19.3 × 38.62 or better **M1** for ÷ 1000 soi
9(a)(i)	52	**2**	**M1** for (1 – 0.35) × 80 oe
9(a)(ii)	84	**1**	
9(b)(i)	$\frac{27}{729}$ oe	**2**	**M1** for $\frac{3}{9} \times \frac{3}{9} \times \frac{3}{9}$
9(b)(ii)	$\frac{144}{729}$ oe	**3**	**M2** for $\frac{2}{9} \times \frac{3}{9} \times \frac{4}{9} \times 6$ oe or **M1** for $\frac{2}{9} \times \frac{3}{9} \times \frac{4}{9}$ oe isw
9(c)	$\frac{42}{60}$ oe	**4**	**M3** for $\frac{3}{5} \times \frac{2}{4} \times \frac{1}{3} + \frac{3}{5} \times \frac{2}{4} \times \frac{2}{3} \times 3$ oe or **M2** for $\frac{3}{5} \times \frac{2}{4} \times \frac{2}{3} \times 3$ oe or for $\frac{3}{5} \times \frac{2}{4} \times \frac{1}{3} + \left(\frac{3}{5} \times \frac{2}{4} \times \frac{2}{3}\right)$ [×2] or **M1** for $\frac{3}{5} \times \frac{2}{4} \times \frac{1}{3}$ or $\frac{3}{5} \times \frac{2}{4} \times \frac{2}{3}$ oe isw or for PPG, PGP, GPP and PPP selected soi

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Question	Answer	Marks	Partial marks
10(a)	$12.5^2 = x^2 + 8.5^2 - 2 \times x \times 8.5\cos 60$ oe isw	**M2**	**M1** for $\cos 60 = \dfrac{x^2 + 8.5^2 - 12.5^2}{2 \times x \times 8.5}$
	$156.25 = x^2 + 72.25 - 8.5x$	**A1**	or better
	$2x^2 - 17x - 168 = 0$	**A1**	with no errors or omissions
10(b)	$\dfrac{[--]17 \pm \sqrt{([-]17)^2 - 4(2)(-168)}}{2 \times 2}$	**2**	**B1** for $\sqrt{([-]17)^2 - 4(2)(-168)}$ or better seen and if in form $\dfrac{p + or - \sqrt{q}}{r}$ **B1** for $p = [--]\ 17$ **and** $r = 2 \times 2$
	14.35, –5.85 final answers	**1, 1**	**SC1** for 14.352 to 14.353 and –5.853 to –5.852 seen or 14.3 or 14.4 and –5.8 or –5.9 as final answers or –14.35 and 5.85 as final answers or 14.35 and –5.85 seen in working
10(c)	12.2 or 12.17… nfww	**3**	**M2** for $\dfrac{their\ 14.35 \times \sin 46}{\sin 58}$ or **M1** for $\dfrac{\sin 46}{CD} = \dfrac{\sin 58}{their\ 14.35}$
10(d)	138 or 137.5 to 137.8 nfww	**3**	**M1** for $0.5 \times$ *their* $14.35 \times 8.5\sin 60$ **M1** for $0.5 \times$ *their* $14.35 \times$ *their* $12.2 \times \sin 76$
11(a)(i)	$\begin{pmatrix} 1 & -18 \\ 6 & 13 \end{pmatrix}$	**2**	**M1** for two or three correct elements
11(a)(ii)	$\dfrac{1}{11}\begin{pmatrix} 4 & 3 \\ -1 & 2 \end{pmatrix}$ or better isw	**2**	**M1** for det = 11 or $[k]\begin{pmatrix} 4 & 3 \\ -1 & 2 \end{pmatrix}$ isw
11(b)	Reflection	**1**	
	y-axis oe	**1**	
11(c)	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$	**2**	**B1** for one correct column or row

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Question	Answer	Marks	Partial marks
11(d)(i)	$\frac{1}{7}(4\mathbf{a} + 3\mathbf{b})$ or $\frac{4}{7}\mathbf{a} + \frac{3}{7}\mathbf{b}$	**3**	**M2** for correct unsimplified answer seen or $\overrightarrow{AP} = \frac{3}{7}(\mathbf{b} - \mathbf{a})$ oe or $\overrightarrow{BP} = \frac{4}{7}(\mathbf{a} - \mathbf{b})$ oe or **M1** for $\overrightarrow{AB} = \mathbf{b} - \mathbf{a}$ or $\overrightarrow{BA} = \mathbf{a} - \mathbf{b}$ or correct route for $\overrightarrow{OP}$
11(d)(ii)	$[m =]\ \frac{7}{3}$ $[k =]\ \frac{4}{3}$	**2**	**B1** for each value or **M1** for $\frac{m}{7}(4\mathbf{a} + 3\mathbf{b}) = \mathbf{b} + k\mathbf{a}$ oe

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MATHEMATICS **0580/42**

Paper 4 (Extended) **October/November 2017**

MARK SCHEME

Maximum Mark: 130

Published

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial marks
1(a)(i)	4 : 5	**1**	
1(a)(ii)	4 : 5	**1**	
1(a)(iii)	3 : 4	**2**	**B1** for 12 : 16 or answer 4 : 3
1(b)(i)	26.8 or 26.79…	**3**	**M2** for $\frac{15600-11420}{15600}[\times 100]$ or $\frac{11420}{15600}\times 100$ or **M1** for $\frac{11420}{15600}$
1(b)(ii)	16 000 nfww	**3**	**M2** for $15600\times\frac{100}{100-2.5}$ oe or **M1** for 15600 associated with 97.5[%] seen
1(c)	1.6 or $\frac{8}{5}$	**2**	**M1** for $\frac{200\times x\times 15}{100}=48$ oe or **M1** for figs 16
1(d)	2.5 or $\frac{5}{2}$ cao nfww	**3**	**B2** for 2.49[9…] or 102.4[99…] or 1.024[99…] or 2.50 or 102.5 or 1.025 or **M2** for $\sqrt[10]{\frac{256}{200}}$ oe or **M1** for $256=200(x)^{10}$ seen

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Question	Answer	Marks	Partial marks
2(a)(i)	1070 or 1072. ..	**3**	**M1** for $\pi \times 8^2 \times 2 \times 8$ **M1** for $\frac{4}{3} \times \pi \times 8^3$ or **M2** for $\frac{2}{3}\pi r^3$ or **M1** for $\pi r^2 2r - \frac{4}{3}\pi r^3$
2(a)(ii)	2.58 or 2.580 to 2.581	**3**	**B2** for $r^3 = \frac{36 \times 3}{2\pi}$ or better or **M1** for $\pi \times r^2 \times 2 \times r - \frac{4}{3} \times \pi \times r^3 = 36$ oe
2(b)(i)	4.24 or 4.241 to 4.242	**4**	**M3** for $(\pi \times 5^2 + \pi \times 5 \times \sqrt{5^2 + 12^2})$ or **M2** for $\pi \times 5 \times \sqrt{5^2 + 12^2}$ or **M1** for $5^2 + 12^2$ or $\pi \times 5^2$
2(b)(ii)	64 cao final answer	**3**	**M2** for $\frac{[k\pi] \times 5^2 \times 12}{[k\pi] \times 1.25^2 \times 3}$ or **M1** for $\frac{1}{3} \times \pi \times 5^2 \times 12$ or $\frac{1}{3} \times \pi \times 1.25^2 \times 3$ OR **M2** for 4^3 or $\left(\frac{1}{4}\right)^3$ seen or **M1** for factor 4 or $\frac{1}{4}$ soi
3(a)	7040 or 7035. …	**3**	**M1** for $\frac{1}{2} \times 100 \times 70$ oe **M1** for $\frac{1}{2} \times 100 \times 110 \times \sin 40$ oe
3(b)	374 or 375 or 374.4 to 374.5….	**5**	**M2** for $110^2 + 100^2 - 2 \times 110 \times 100 \times \cos 40$ oe or **M1** for implicit form **A1** for 5250 or 5247. … (or 72.4 or 72.43 to 72.44) **M1** for $70^2 + 100^2$
3(c)	64.3 or 64.27 to 64.28 nfww	**2**	**M1** for $\sin 40 = \frac{\text{distance}}{100}$ oe
3(d)	235	**3**	**B2** for [angle ACB =] 34.99 to 35 or [angle ABC =] 55[.0…] or **M1** for $\tan[ACB] = \frac{70}{100}$ or $\tan[ABC] = \frac{100}{70}$ or equivalent trig ratio

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Question	Answer	Marks	Partial marks
4(a)(i)	Correct translation	**2**	**B1** for translation $\begin{pmatrix} 6 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -2 \end{pmatrix}$
4(a)(ii)	Correct rotation	**2**	**B1** for rotation 180° but other centre
4(a)(iii)	Correct reflection	**2**	**B1** for reflection in $y = -x$
4(b)(i)	Enlargement [factor] $\frac{1}{2}$ or 0.5 [centre] (0, 0) oe	**3**	**B1** for each
4(b)(ii)	$\begin{pmatrix} \frac{1}{2} & 0 \\ 0 & \frac{1}{2} \end{pmatrix}$ oe	**2**	**B1** for matrix of form $\begin{pmatrix} k & 0 \\ 0 & k \end{pmatrix}$ oe, $k \neq 0$ or 1
4(c)	± 2.5	**3**	**B2** for $25u^2 = 156.25$ or $5u = [\pm]12.5$ or **M1** for $(4u)^2 + (3u)^2$
5(a)	3.2 or 3.15 or 3.152 to 3.153 5.2 or 5.19 or 5.20 or 5.196…	**2**	**B1** for each
5(b)	Correct graph for $0.5 \leqslant x \leqslant 3.5$	**4**	**B3FT** for 6 or 7 correct points or **B2FT** for 4 or 5 correct points or **B1FT** for 2 or 3 correct points
5(c)	1.7 to 1.8	**1FT**	**FT** *their* graph if one answer
5(d)(i)	Any integer $k \geqslant -1$	**1**	
5(d)(ii)	Any integer $k < -1$	**1**	
5(e)	Tangent ruled at $x = -3$	**B1**	
	2.5 to 4	**B2**	**dep** on tangent drawn at $x = -3$ or close attempt at tangent at $x = -3$ **M1** for rise/run also dep on tangent at $x = -3$ or close attempt at tangent at $x = -3$

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Question	Answer	Marks	Partial marks
5(f)(i)	$y = 6 - x$ ruled accurately	**M2**	**M1** for correct line but freehand or ruled line gradient –1.1 to –0.9, or through (0, 6) but not $y = 6$
	$2.85 \leqslant x \leqslant 3$	**A1**	
5(f)(ii)	[a =] 8 [b =] –48 [c =] –16	**4**	**B3** for 2 correct or $x^5 + 8x^3 - 48x^2 - 16 = 0$ seen or $-x^5 - 8x^3 + 48x^2 + 16 = 0$ seen or **M2** for correct multiplication by $8x^2$ or **B1** for answers ± 8, ± 48, ± 16 or **M1** for $\frac{x^2 \times x^3 - 8 \times 2}{x^2 \times 8} = 6 - x$ or **M1** for correct multiplication by 8 or **M1** for correct multiplication by x^2
6(a)(i)	280	**1**	
6(a)(ii)	320	**1**	
6(a)(iii)	90	**1**	
6(a)(iv)	10	**2**	**M1** for 90 written
6(b)(i)	250.2 nfww cao	**4**	**M1** for at least 4 correct mid-values **M1** for Σfx **M1 dep on second M1** for $\Sigma fx \div 100$
6(b)(ii)	Correct completion of histogram	**4**	**B1** for each correct block If zero scored, then **SC1** for correct frequency densities seen
6(c)	[22 m] further oe	**1**	
7(a)	$\frac{5}{6}$	**1**	
7(b)	$\frac{4}{36}$ oe	**2**	**M1** for $\frac{2}{6} \times \frac{2}{6}$
7(c)	20	**1**	

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Question	Answer	Marks	Partial marks
7(d)(i)	Diagram completed correctly x x 3 3 3 9 x x 2 2 2 6 x x 2 2 2 6 x x 2 2 2 6 x x 1 1 1 3	**2**	**B1** for 3 correct columns or for 4 correct rows
7(d)(ii)(a)	$\frac{9}{36}$ oe	**1FT**	**FT** *their* **(d)(i)**
7(d)(ii)(b)	$\frac{4}{36}$ oe	**1FT**	**FT** *their* **(d)(i)**
7(e)	$\frac{512}{7776}$ oe	**2**	**M1** for $\left(\frac{4}{6}\right)^k \times \frac{2}{6}$ oe $k = 3$, 4 or 5 only
8(a)(i)	$7a + 9p = 354$ oe final answer	**1**	
8(a)(ii)	[a =] 21 [p =] 23	**3**	**M1** for correctly eliminating one variable **A1** for $a = 21$ **A1** for $p = 23$
8(b)(i)	$\frac{2}{x}$	**1**	
8(b)(ii)(a)	$\frac{2}{x} + \frac{3}{x-1} = 2$	**M1**	
	$2(x-1) + 3x = 2x(x-1)$ oe	**M1dep**	Both sides of the equation could be over $x(x-1)$ at this stage Dep on **M1** or 3 term equation with fractions but one sign error
	$2x - 2 + 3x = 2x^2 - 2x$ oe $2x^2 - 7x + 2 = 0$	**A1**	Answer reached with one correctly expanded line seen and no errors seen
8(b)(ii)(b)	$\sqrt{(-7)^2 - 4(2)(2)}$	**B1**	or for $\left(x - \frac{7}{4}\right)^2$
	$\frac{--7 + \sqrt{q}}{2 \times 2}$ or $\frac{--7 - \sqrt{q}}{2 \times 2}$	**B1**	or for $\frac{7}{4} + \text{or} - \sqrt{-1 + \left(\frac{7}{4}\right)^2}$
	3.19 only	**B2**	**B1** for 3.19 with other root or for 3.2 or 3.186… isw other root or for 0.31 or 0.314 or 0.3138 to 0.3139

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Question	Answer	Marks	Partial marks
9(a)	3	**1**	
9(b)	$-\frac{2}{5}$ oe	**2**	**M1** for $2(1-2x)=x+4$
9(c)	$-2x-7$ final answer	**2**	**M1** for $1-2(x+4)$
9(d)	26	**2**	**B1** for h(5) soi or **M1** for $\left(x^2+1\right)^2+1$
9(e)	$\frac{1-x}{2}$ oe final answer	**2**	**M1** for $x = 1 - 2y$ or $2x = 1 - y$ or $\frac{y}{2}=\frac{1}{2}-x$ or $y - 1 = -2x$
9(f)	[p =] – 20 [q =] 26	**4**	**B3** for [hgf(x)] = $4x^2-20x+26$ seen and not spoilt by further working or **M1** for $(1 - 2x) + 4$ **M1 dep** for $\left(their\ (5-2x)\right)^2+1$ **B1FT dep** for $25 - 10x - 10x + 4x^2$
10(a)	5.68 or 5.684 to 5.685	**5**	**M2** for $2x\sqrt{x^2+x^2}$ oe or $2\times\sqrt{2}\times x^2$ or **M1** for $x\sqrt{2}$ or $\sqrt{x^2+x^2}$ oe soi **M1** for $\frac{270}{360}\times\pi\times x^2$ oe **M1** for $0.5\ x^2$ oe
10(b)	4.4[0] or 4.398 to 4.401	**2**	**dep** on a correct value for k in **(a)** **M1** for $\left[x^2\right]=\frac{110}{their\ k}$

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MATHEMATICS **0580/43**

Paper 4 (Extended) **October/November 2017**

MARK SCHEME

Maximum Mark: 130

Published

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	180 ÷ (2 + 3 + 5) × 5 [= 90]	**1**	with no errors seen
1(a)(ii)	7.05 or 7.053….	**3**	**M2** for $\frac{x}{12} = \sin 36$ oe or better or **B1** for 36 or 54 seen
1(b)(i)	13	**2**	**M1** for 7.8 ÷ 3 soi
1(b)(ii)	36.9 or 36.86 to 36.87	**3**	**B1** for smallest angle identified **M1** for sin[ ] = $\frac{3}{5}$ oe or sin[ ] = $\frac{7.8}{\textit{their}\ \textbf{(b)(i)}}$ oe If zero scored, **SC1** for calculation of 53.1
2(a)	343	**1**	
2(b)(i)	1	**1**	
2(b)(ii)	x^{10} final answer	**1**	
2(b)(iii)	$9x^{16}$ final answer	**2**	**B1** for x^{12} or x^{16} or $(3x^8)^2$ seen
2(c)(i)	$2(x – 3)(x + 3)$ final answer	**2**	**M1** for $(2x + 6)(x – 3)$ or $(2x – 6)(x + 3)$ or $(x – 3)(x + 3)$
2(c)(ii)	$\frac{2(x+3)}{x+10}$ or $\frac{2x+6}{x+10}$ final answer nfww	**3**	**M2** for $(x + 10)(x – 3)$ or **M1** for $(x + a)(x + b)$ where $ab = –30$ or $a + b = 7$

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Question	Answer	Marks	Partial Marks
3(a)(i)	1890	**2**	**M1** for 126 ÷ 4 [× 60] oe If zero scored, **SC1** for answer 31.5
3(a)(ii)	103.95	**4**	**M3** for $0.5 \times \left(\frac{44}{60} + \frac{55}{60}\right) \times 126$ oe or **SC3** for figs 10395 or figs 104 or **M2** for two correct area methods or for a full method without minutes to hours conversion or **M1** for one correct area with or without minutes to hours conversion
3(b)(i)	126 × 1000 ÷ (60 × 60)	**1**	
3(b)(ii)	46.3 or 46.28 to 46.29	**3**	**M2** for (1400 + 220) ÷ 35 oe or **M1** for distance ÷ speed or 1400 + 220
3(c)	180 nfww	**4**	**B3** for final answer 3 OR **M3** for $\frac{217.5}{72.5} \times 60$ oe or **M2** for 217.5 ÷ 72.5 oe or $\frac{210 \text{ to } 220}{72.5} \times 60$ or $\frac{217.5}{72 \text{ to } 74} \times 60$ or **M1** for 217.5 or 72.5 seen or $\frac{215}{73} \times 60$
4(a)	$80 < t \leqslant 100$	**1**	
4(b)	86 nfww	**4**	**M1** for midpoints soi **M1** for use of Σfx with x in correct interval including both boundaries **M1** (dep on 2nd **M1**) for $\Sigma fx \div 150$
4(c)(i)	Reference to not knowing the individual values so we do not know the highest or the lowest values	**1**	
4(c)(ii)	62.4	**2**	**M1** for 26 ÷ 150 or 360 ÷ 150 soi
4(d)	$\frac{22}{150}$ oe	**1**	

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Question	Answer	Marks	Partial Marks
4(e)(i)	$\frac{90}{22350}$ oe	**2**	**M1** for $\frac{10}{150}\times\frac{9}{149}$ After zero scored, **SC1** for answer $\frac{100}{22500}$ oe
4(e)(ii)	$\frac{440}{22350}$ oe	**3**	**M2** for $\frac{10}{150}\times\frac{22}{149}+\frac{22}{150}\times\frac{10}{149}$ oe or **M1** for $\frac{10}{150}\times\frac{22}{149}$ or $\frac{22}{150}\times\frac{10}{149}$ oe After zero scored, **SC1** for answer $\frac{440}{22500}$ oe
4(f)	13, 8.5, 7.25, 1.1	**3**	**B2** for 3 correct or **B1** for 1 correct or for 3 correct FD.s 5.2, 3.4, 2.9, 0.44 oe
5(a)(i)	Image at (0, 1), (0, 2), (–3, 1)	**2**	**B1** for reflection in $y = 0$ or $x = k$
5(a)(ii)	Image at (0, 0), (0, –2), (6, –2)	**2**	**B1** for correct size and correct orientation wrong position or for 2 correct vertices plotted
5(a)(iii)	Image at (–5, 4), (–5, 5), (–2, 4)	**2**	**B1** for translation by $\begin{pmatrix}-5\\k\end{pmatrix}$ or $\begin{pmatrix}k\\3\end{pmatrix}$
5(b)	Rotation 90° clockwise oe (4, –1)	**3**	**B1** for each
5(c)(i)	(4, 1)	**2**	**M1** for $\begin{pmatrix}0&-1\\1&0\end{pmatrix}\begin{pmatrix}1\\-4\end{pmatrix}$
5(c)(ii)	(8, –1)	**2**	**M1** for $\begin{pmatrix}0&-1\\1&0\end{pmatrix}\begin{pmatrix}3&1\\0&2\end{pmatrix}\begin{pmatrix}1\\-4\end{pmatrix}$ or $\begin{pmatrix}0&-2\\3&1\end{pmatrix}\begin{pmatrix}1\\-4\end{pmatrix}$ or $\begin{pmatrix}0&-1\\1&0\end{pmatrix}\begin{pmatrix}-1\\-8\end{pmatrix}$
5(c)(iii)	Rotation 90° anti-clockwise oe Origin oe	**3**	**B1** for each

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Question	Answer	Marks	Partial Marks
6(a)(i)	25.5 or 25.46…	**2**	**M1** for $\pi \times 5^2 \times h = 2000$ oe
6(a)(ii)	9.85 or 9.847…	**3**	**M2** for [r^3=] $2000 \div \left(\frac{2}{3}\pi\right)$ oe or **M1** for $\frac{2}{3}\pi r^3 = 2000$ oe
6(a)(iii)	952 or 952.4….	**3**	**M2** for [6 ×] $\sqrt[3]{2000}^2$ or **M1** for $\sqrt[3]{2000}$ or 6 times *their* area of one face
6(b)(i)	22.5 or 22.49…	**2**	**M1** for $\frac{1}{2} \times 7 \times 10 \times \sin 40$
6(b)(ii)	$\sqrt{(10^2 + 7^2 - 2 \times 10 \times 7 \cos 40)} + 7 + 10$	**M3**	**M2** for $10^2 + 7^2 - 2 \times 10 \times 7 \cos 40$ or **M1** for correct implicit cosine rule
	23.46…	**A2**	**A1** for 6.46… or 41.7 to 41.8
6(c)	64.9 or 64.92 to 64.94	**3**	**M2** for $28.2 - 2 \times 9 = \frac{c}{360} \times 2 \times \pi \times 9$ oe or **M1** for $\frac{c}{360} \times 2 \times \pi \times 9$ soi
7(a)	9, – 6, 9	**3**	**B1** for each
7(b)	Correct graph	**4**	**B3FT** for 6 or 7 correct points or **B2FT** for 4 or 5 correct points or **B1FT** for 2 or 3 correct points
7(c)	–3.5 to –3.35 and 0.8 to 0.9..	**2FT**	**FT** *their* graph **B1FT** for either
7(d)	$a = \frac{5}{4}$ or $1\frac{1}{4}$ or 1.25 $b = -\frac{49}{8}$ or $-6\frac{1}{8}$ or –6.125	**3**	**B2** for either correct or **M1** for $[2]\left(x + \frac{5}{4}\right)^2$ seen isw or for $2x^2 + 4ax + 2a^2 + b$
8(a)(i)	5	**1**	
8(a)(ii)	$-\frac{3}{2}$ oe	**1**	
8(b)	$\left(\frac{4}{5}, 0\right)$ oe	**2**	**M1** for $5x - 4 = 0$ soi

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Question	Answer	Marks	Partial Marks
8(c)	$y = -0.2x + 11$ final answer	**4**	**M2** for $y = -0.2x + c$ oe (any form) **FT** *their* **(a)** or **B1FT** for grad = $\frac{-1}{\textit{their}\ \textbf{(a)(i)}}$ soi and **M1** for substitution of (10, 9) into *their* equation
8(d)	(2, 6)	**3**	**M1** for elimination of one variable **A1** for $x = 2$ or $y = 6$
8(e)	13	**3**	**M2** for $(4 + 9) \times$ *their* $2 \div 2$ oe or **B1** for 9 oe or 4 or –4 seen
9(a)	$\frac{10}{x-0.5}$ oe final answer	**1**	Accept $\frac{20}{2x-1}$
9(b)(i)	$\frac{10}{x-0.5} - \frac{10}{x} = 0.25$ oe	**M1**	**FT** *their* **(a)**
	$10x - 10(x - 0.5) = 0.25x\,(x - 0.5)$ oe	**M1**	Clears algebraic denominators or collects as a single fraction FT *their* algebraic fractions dep on two fractions with algebraic denominators
	$10x - 10x + 5 = 0.25x^2 - 0.125x$ or better	**B1**	Expands brackets
	$2x^2 - x - 40 = 0$	**A1**	Dep on **M1M1B1** and no errors seen
9(b)(ii)	$\frac{--1 \pm \sqrt{(-1)^2 - 4 \times 2 \times -40}}{2 \times 2}$ oe	**B2**	**B1** for $\sqrt{(-1)^2 - 4(2)(-40)}$ or better or **B1** for $\frac{--1+\sqrt{q}}{2\times 2}$ or $\frac{--1-\sqrt{q}}{2\times 2}$ or both
	–4.23 and 4.73 final answers	**B1 B1**	**SC1** for –4.229… **and** 4.729… or for –4.23 **and** 4.73 seen in working or for –4.73 **and** 4.23 as final answer or for –4.2 or –4.22 **and** 4.7 or 4.72 as final answer
9(b)(iii)	2 [hours] 7 [minutes]	**3**	**B2** for 2.11 or 2.114 to 2.115 or 126.8 to 126.9 or 127 or **M1** for $10 \div$ *their* positive root from **(b)(ii)**
10(a)(i)	$2^2 \times 3^2 \times 5$ oe	**2**	**M1** for 3 correct prime factors in a tree or table seen before the first error or for 2, 3, 5 identified
10(a)(ii)	540	**2**	**M1** for $2^2 \times 3^3 \times 5$ or 2×3^3 shown or answer $540k$

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Question	Answer	Marks	Partial Marks
10(b)	$X = 8575$ $Y = 6125$	**4**	**B3** for $X = 8575$ or $Y = 6125$ or **B2** for $a = 5$ or $b = 1$ soi or **B1** for $1225 = 5^2 \times 7^2$ or $42\,875 = 5^3 \times 7^3$ or **M1** for $a^2 \times 7^2$ [= 1225] or $a^3 \times 7^{b+2}$ [= 42 875]

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MATHEMATICS **0580/11**

Paper 1 (Core) **October/November 2017**

1 hour

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 56.

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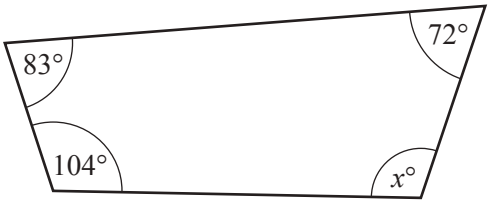
1



NOT TO SCALE

The diagram shows a quadrilateral.

Find the value of x.

x = ... [1]

2 A watch costs \$80.
The exchange rate is \$1 = 124.3 Japanese Yen.

Work out the cost of the watch in Yen.

..... Yen [1]

3 Work out.

$$2^{-4} \times 2^{5}$$

..... [1]

4 Amber's mean mark on five tests is 80.
Her marks on four of these tests are 68, 81, 74 and 89.

Work out her mark on the fifth test.

..... [2]

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5 Write 18.766 correct to

(a) 1 decimal place,

..... [1]

(b) 2 significant figures.

..... [1]

6 Calculate. $\sqrt{2+\frac{0.2}{1.7-0.9}}$

..... [2]

7 Factorise completely.

$$12x^2+15xy-9x$$

..... [2]

8 The time, t seconds, that Jade takes to run a race is 14.3 seconds, correct to 1 decimal place.

Complete this statement about the value of t.

..... $\leqslant t <$ ..... [2]

9 Calculate the area of a circle with diameter 9 cm.

..... cm^2 [2]

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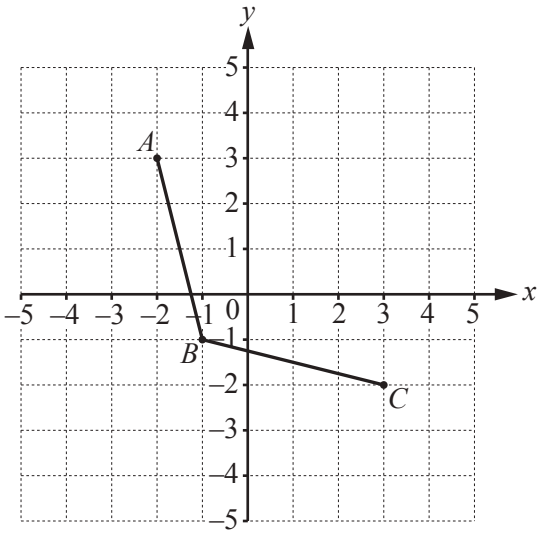
10



The diagram shows two sides of a rhombus *ABCD*.

(a) Write down the co-ordinates of *A*.

(..... , ...) [1]

(b) Complete the rhombus *ABCD* on the grid. [1]

11 **(a)** Write the fraction $\frac{30}{54}$ in its lowest terms.

..... [1]

(b) Complete this table.

Fraction	Decimal	Percentage
$\frac{9}{100}$	=	= .....

[2]

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12 **Without using a calculator**, work out $1\frac{2}{3} - \frac{11}{15}$.
Write down all the steps of your working and give your answer as a fraction in its lowest terms.

..... [3]

13 $\sqrt{5}$ $\quad -7 \quad$ 343 $\quad -11 \quad$ 0.4 $\quad$ 2.5 $\quad \frac{1}{3}$

From this list of numbers, write down

(a) a cube number,

..... [1]

(b) the smallest number,

..... [1]

(c) a natural number.

..... [1]

14 Work out.

(a) $\begin{pmatrix} 3 \\ 2 \end{pmatrix} + \begin{pmatrix} -1 \\ 5 \end{pmatrix}$

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(b) $\begin{pmatrix} 6 \\ 3 \end{pmatrix} - \begin{pmatrix} 4 \\ -2 \end{pmatrix}$

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(c) $4\begin{pmatrix} 2 \\ 5 \end{pmatrix}$

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

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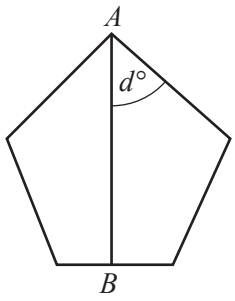
15 The diagram shows a regular pentagon.
AB is a line of symmetry.

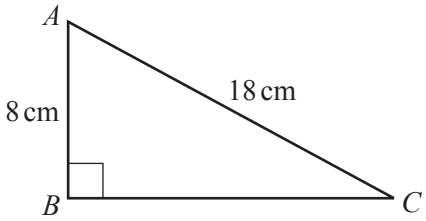
Work out the value of *d*.



NOT TO SCALE

d = ... [3]

16



NOT TO SCALE

Calculate the length of *BC*.

BC = ... cm [3]

17 Simplify.

(a) $(m^5)^2$

..... [1]

(b) $4x^3y \times 5x^2y$

..... [2]

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18 Solve the simultaneous equations.
You must show all your working.

$$3x + 4y = 6$$
$$6x - y = -15$$

$x =$ .....

$y =$ ..... [3]

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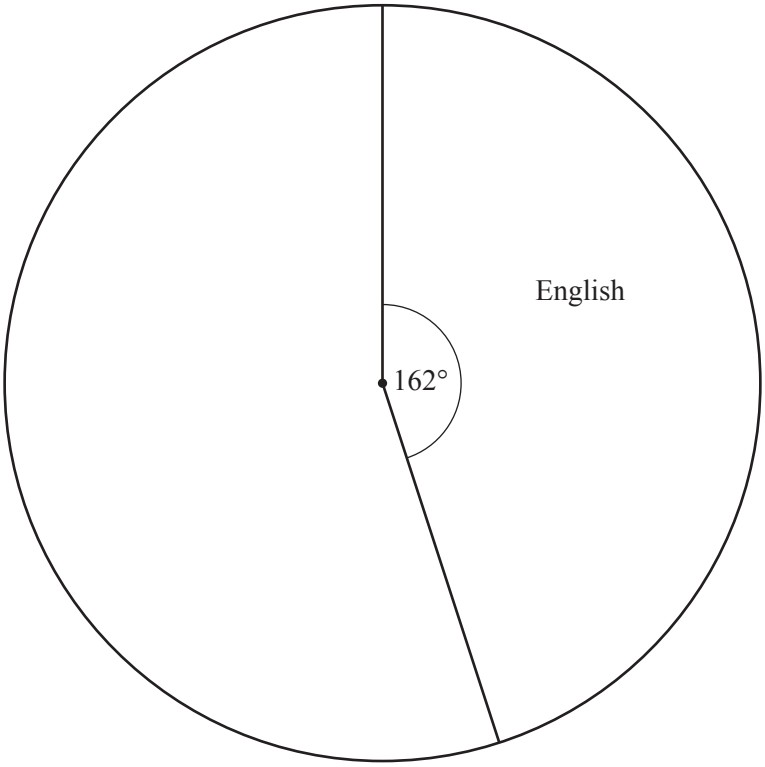
19 **(a)** Juan asks 40 people which language they speak at home.
The table shows the results.

Language	Frequency	Pie chart sector angle
English	18	162°
French	11	
Spanish	7	
Other	4	

Juan wants to draw a pie chart to show this information.

(i) Complete the table. [3]

(ii) Complete the pie chart.



[1]

(b) Mansoor also asks some people which language they speak at home.
In Mansoor's pie chart, the sector angle for Portuguese is 108°.

Write down the fraction of these people who do **not** speak Portuguese at home.

..... [1]

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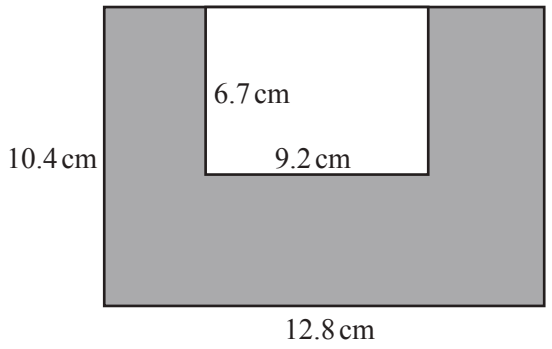
20 (a)



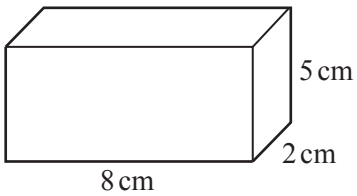
NOT TO SCALE

The diagram shows a small rectangle inside a large rectangle.

Work out the shaded area.

..... cm^2 [2]

(b)



NOT TO SCALE

Work out the surface area of this cuboid.

..... cm^2 [3]

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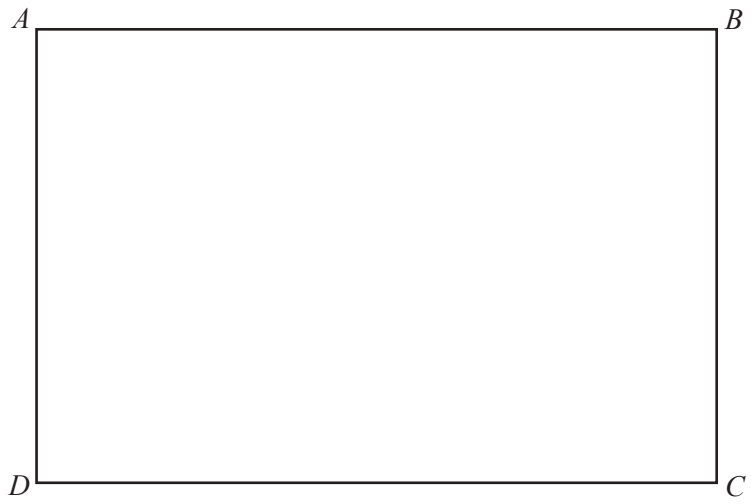
21 The diagram shows a rectangle *ABCD*.



(a) **In this part, use a straight edge and compasses only and show your construction arcs.**

Construct

(i) the bisector of angle *DCB*, [2]

(ii) the perpendicular bisector of *DC*. [2]

(b) Shade the region containing the points inside the rectangle that are

- nearer to *D* than to *C*

and

- nearer to *BC* than to *DC*. [1]

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CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

6170618097

MATHEMATICS **0580/12**

Paper 1 (Core) **October/November 2017**

1 hour

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator Geometrical instruments
Tracing paper (optional)

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
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The total of the marks for this paper is 56.

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1 Write, in figures, fourteen thousand and twenty seven.

..... [1]

2 One day, at noon, in Maseru, the temperature was 17 °C.
At midnight the temperature was 20 °C lower.

Work out the temperature at midnight.

..... °C [1]

3 Write down the value of 12^0.

..... [1]

4 Write 5.17×10^{-3} as an ordinary number.

..... [1]

5 Write the following in order of size, starting with the smallest.

$\frac{31}{50}$ 64% $\frac{5}{8}$ 0.63

..... < ..... < ..... < ..... [2]
smallest

6 A taxi journey costs \$4.50, plus 80 cents for each kilometre travelled.
Julianna travels 7 km.

Work out the cost of her journey.

\$ ..... [2]

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7 Work out.

$$\frac{6.32 + 2.06}{4.15 - 0.12}$$

Give your answer correct to 1 decimal place.

..... [2]

8 **(a)** 1 and 12 are factors of 12.

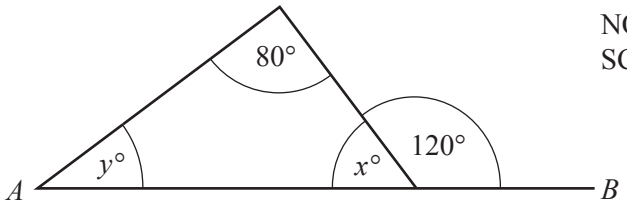
Write down all the other factors of 12.

..... [1]

(b) Write down the multiples of 9 between 20 and 40.

..... [1]

9



NOT TO SCALE

In the diagram, AB is a straight line.

Find the value of x and the value of y.

$x =$ .....

$y =$ ..... [2]

10 Write 55 g as a percentage of 2.2 kg.

..... % [2]

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11 The area of a triangle is 528 cm^2.
The length of its base is 33 cm.

Calculate the perpendicular height of the triangle.

..... cm [2]

12 **(a)** As the temperature increases, the number of ice creams sold increases.
What type of correlation is this?

..... [1]

(b) Write down the type of correlation there is between the height of an adult and the amount of money they earn.

..... [1]

13 Bastian has a bag containing four types of sweet.
He takes a sweet from the bag at random.

Sweet	Mint	Fruit	Toffee	Chocolate
Probability	0.15	0.3		0.2

Complete the table.

[2]

14 The length, l metres, of a ship is 362 m, correct to the nearest metre.

Complete the statement about the value of l.

..... $\leqslant l <$ ..... [2]

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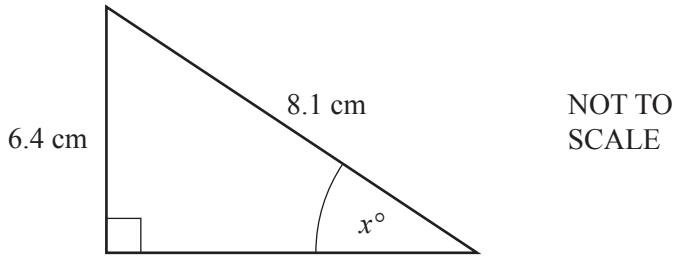
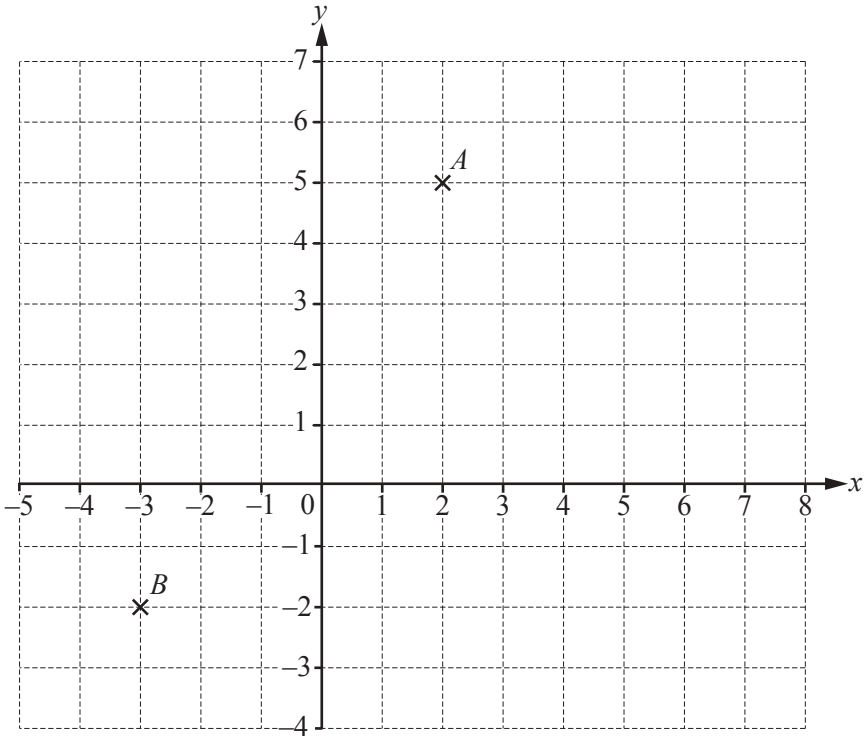
15



Calculate the value of x.

$x =$ ..... [2]

16



(a) Write down the co-ordinates of point A.

(..... , ...) [1]

(b) Plot point C at (7, −2). [1]

(c) Write down the mathematical name of the triangle formed by joining the points A, B and C.

..... [1]

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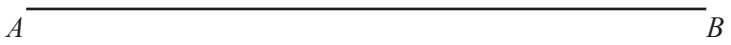
17 *AB* is a straight line.



(a) Measure the length of *AB*.

..... cm [1]

(b) Mark the midpoint of *AB*. [1]

(c) Draw a line perpendicular to *AB*. [1]

18 Find the size of the interior angle of a regular hexagon.

..... [3]

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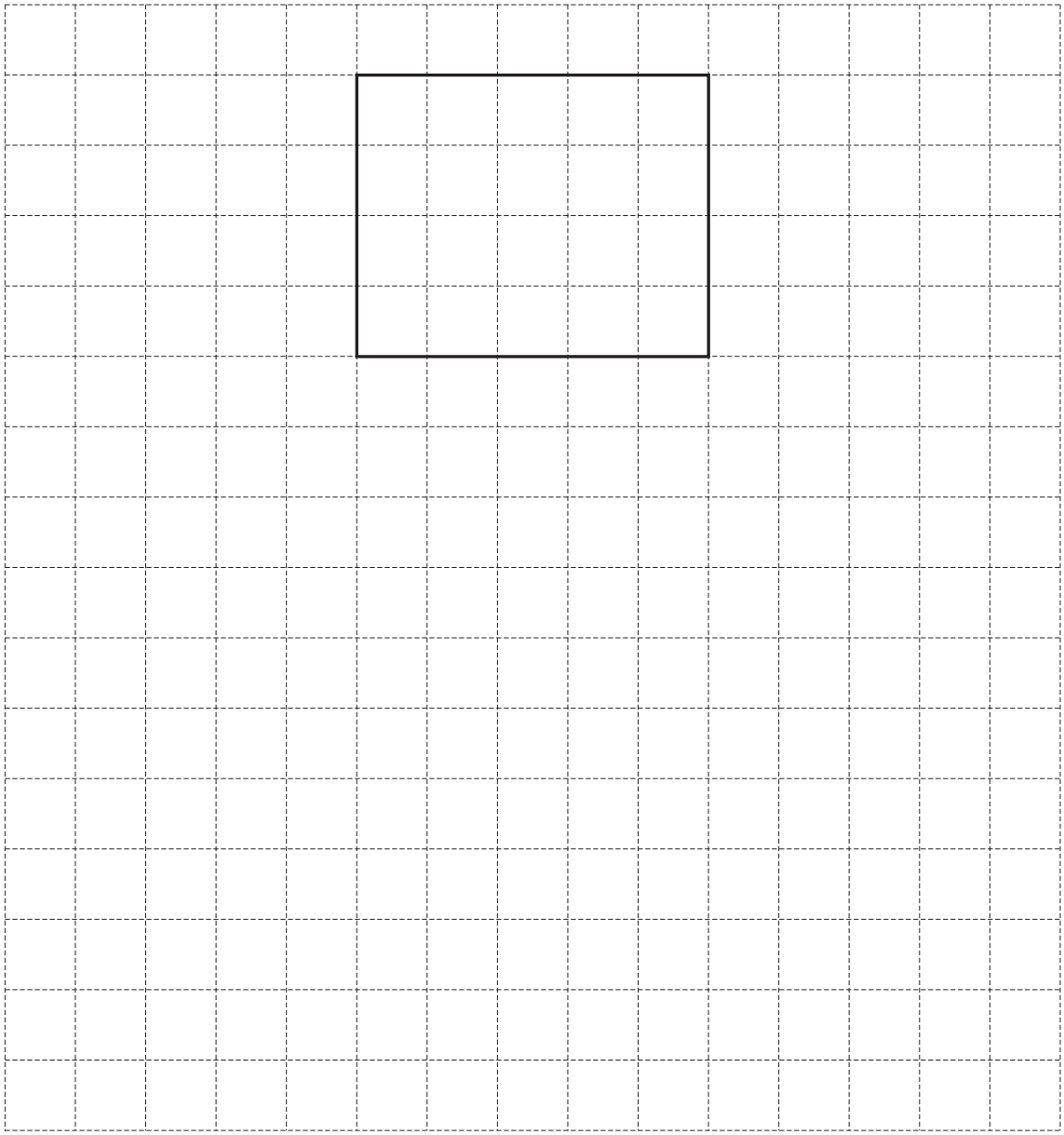
19 A cuboid measures 5 cm by 4 cm by 3 cm.

On the 1 cm^2 grid, draw an accurate net of this cuboid.
One face has been drawn for you.



[3]

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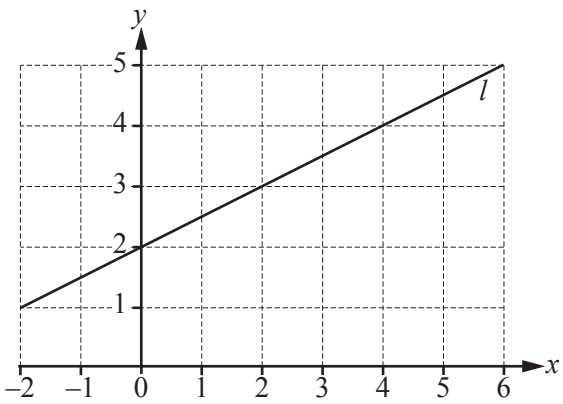
20 **(a)** Write $\frac{11}{3}$ as a mixed number.

..... [1]

(b) **Without using a calculator**, work out $\frac{1}{4} + \frac{5}{12}$.
Show all the steps of your working and give your answer as a fraction in its lowest terms.

..... [2]

21



Find the equation of the line l in the form $y = mx + c$.

$y =$ ..... [3]

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22 **(a)** These are the first four terms of a sequence.

8 15 22 29

(i) Write down the next term.

..... [1]

(ii) Write down the rule for continuing the sequence.

..... [1]

(b) These are the first four terms of a different sequence.

2 6 10 14

Find an expression for the nth term of this sequence.

..... [2]

23 Solve the equations.

(a) $7-3n = 11n+2$

$n =$ ..... [2]

(b) $\frac{p-3}{5} = 3$

$p =$ ..... [2]

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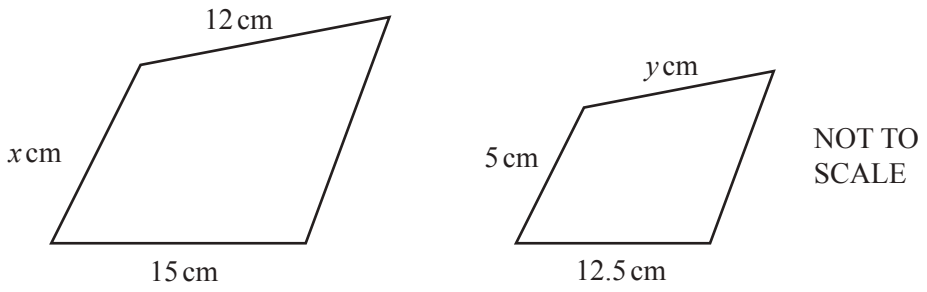
24



The two shapes are mathematically similar.

Find the value of

(a) x,

$x =$ ..... [2]

(b) y.

$y =$ ..... [2]

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CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

MATHEMATICS **0580/13**

Paper 1 (Core) **October/November 2017**

1 hour

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator Geometrical instruments
Tracing paper (optional)

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 56.

This document consists of **12** printed pages.

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1 Ahmed drives his car from London to Cambridge.
He leaves London at 07 45 and arrives in Cambridge at 10 17.

Work out the time, in hours and minutes, that he takes to drive from London to Cambridge.

..... h ..... min [1]

2 Work out 16% of \$525.

\$ ..... [1]

3 A quadrilateral has one line of symmetry and no rotational symmetry.

Write down the name of this quadrilateral.

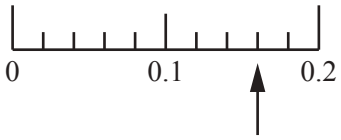
..... [1]

4 Simplify.

$y^4 \times y^5$

.....[1]

5 **(a)**



Write down the number the arrow is pointing to on this scale.

..... [1]

(b) Write these numbers in order of size, starting with the smallest.

0.42 0.06 0.5 0.078

..... < ..... < ..... < .....[1]
smallest

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6 A bag contains 16 counters.
3 are red, 6 are blue and the rest are yellow.
Jay takes a counter from the bag at random.

(a) Write down the colour Jay is most likely to take.

..... [1]

(b) Write down the probability that the counter is red.

..... [1]

7 Complete the table.

Fraction		Decimal		Percentage
$\frac{1}{4}$	=		=	25%
	=	0.8	=	

[2]

8 $\mathbf{s} = \begin{pmatrix} 3 \\ -1 \end{pmatrix}$ $\mathbf{t} = \begin{pmatrix} 4 \\ 2 \end{pmatrix}$

Work out $5\mathbf{s} - \mathbf{t}$.

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [2]

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9 Solve the equation.

$$5x + 4 = 19 + 2x$$

$x =$ ..... [2]

10 By writing each number correct to 1 significant figure, estimate the value of $\dfrac{59.2 \times 1.97}{2.04 + 3.85}$.

..... [2]

11 In a survey of 40 workers, 6 cycle to the office.
The office has a total of 800 workers.

Estimate how many of the 800 workers cycle to the office.

..... [2]

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12 Adilla invests \$1200 at a rate of 2.6% per year compound interest.

Calculate the value of her investment at the end of 2 years.

\$ ..... [2]

13 The table shows the temperature at midday in some cities on 1st February.

City	Temperature
Berlin	6 °C
Moscow	–10 °C
Stockholm	1 °C
Toronto	0 °C
Warsaw	–2 °C

(a) Write down the city with the lowest temperature.

..... [1]

(b) Work out the difference between the temperature in Berlin and the temperature in Warsaw.

..... °C [1]

(c) The temperature in Minsk was 3 °C higher than the temperature in Moscow.

Work out the temperature in Minsk.

..... °C [1]

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14 The mass, correct to the nearest gram, of each of 20 potatoes is shown below.

85	97	125	100	90	102	116	89	96	104
89	107	106	93	84	118	120	98	112	109

(a) Complete the frequency table.
You may use the tally column to help you.

Mass (g)	Tally	Frequency
80 to 89		
90 to 99		
100 to 109		
110 to 119		
120 to 129		

[2]

(b) Write down the modal group.

..... [1]

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15 Calculate the size of one interior angle of a regular 12-sided polygon.

..... [3]

16 Work out $3\frac{1}{7} - 1\frac{1}{4}$, giving your answer as a mixed number in its lowest terms.
Do not use a calculator and show all the steps of your working.

..... [3]

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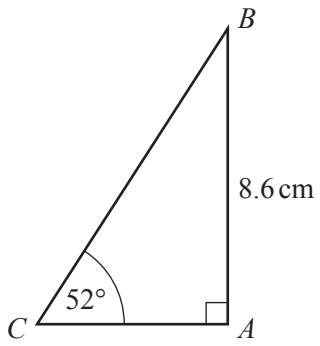
17



NOT TO SCALE

ABC is a right-angled triangle.

Use trigonometry to calculate *BC*.

BC = ... cm [3]

18 **(a)** Write 1.8×10^4 as an ordinary number.

..... [1]

(b) Calculate $(2.9 \times 10^6) - (7.5 \times 10^5)$.
Give your answer in standard form.

..... [2]

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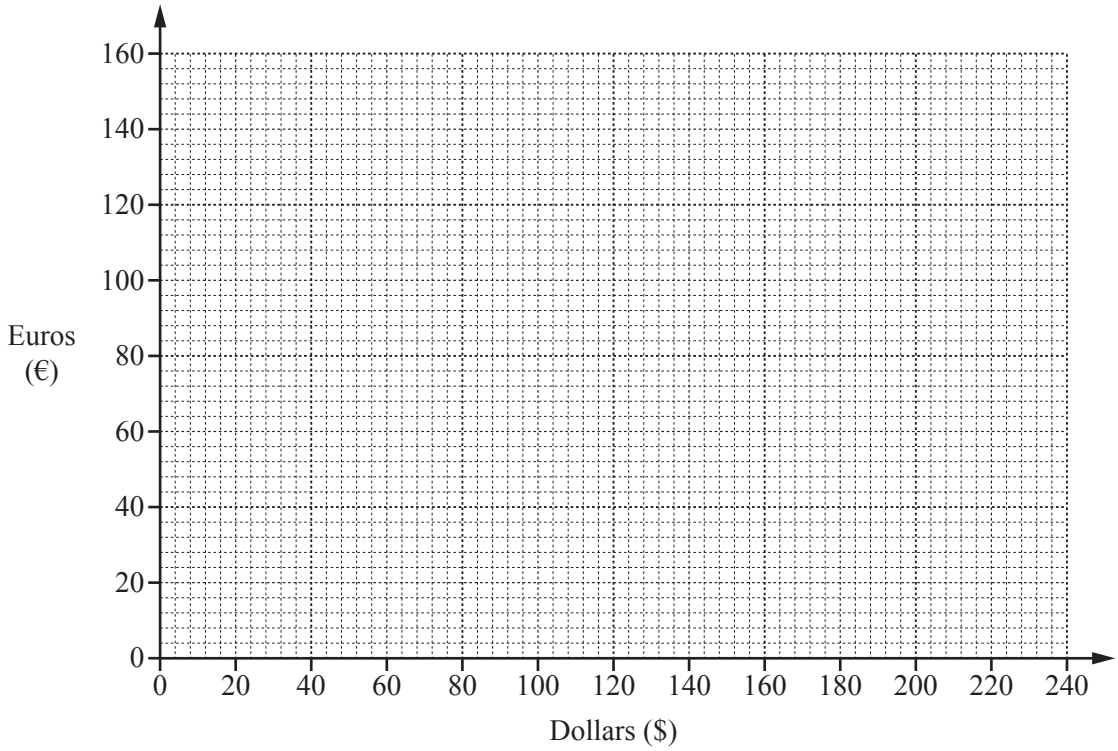
19 Alvin changes some money from dollars ($) to euros (€).
When he changes $100 he receives €60.

(a) On the grid, draw a conversion graph using this information.



[2]

(b) Use your graph to change

(i) $140 to euros,

€ ..... [1]

(ii) €20 to dollars.

$ ..... [1]

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20 **(a)** These are the first five terms of a sequence.

4 10 16 22 28

(i) Write down the next term.

..... [1]

(ii) Write down the rule for continuing the sequence.

..... [1]

(b) These are the first five terms of a different sequence.

11 14 17 20 23

Find an expression for the nth term of this sequence.

..... [2]

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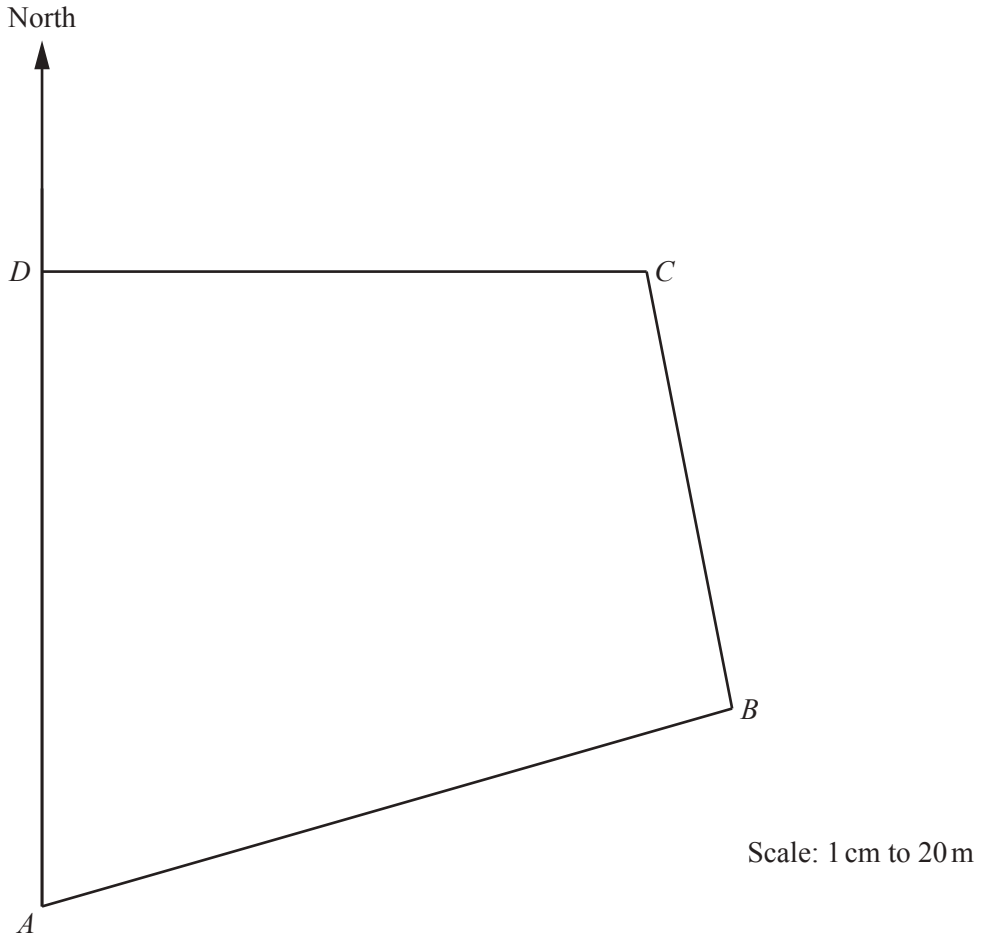
21 The scale drawing shows a park *ABCD*.
The scale is 1 centimetre represents 20 metres.



(a) Find the actual distance *AD*.

..... m [2]

(b) Measure the bearing of *B* from *A*.

..... [1]

(c) There is a path across the park that is equidistant from *CB* and *CD*.

Using a straight edge and compasses only, construct the position of the path.
Show your construction arcs. [2]

Question 22 is printed on the next page.

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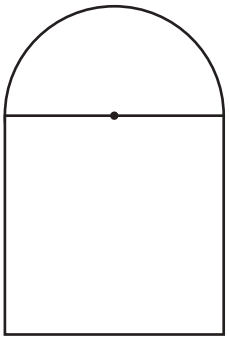
22



NOT TO SCALE

The diagram shows a shape made from a square and a semi-circle.

Calculate the area of the shape.
Give the units of your answer.

.... [5]

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CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

MATHEMATICS **0580/21**

Paper 2 (Extended) **October/November 2017**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

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Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 70.

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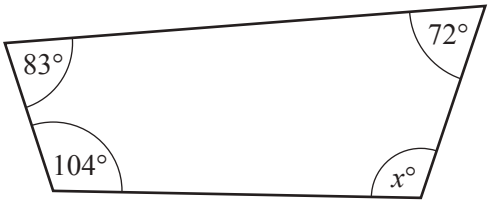

NOT TO SCALE

The diagram shows a quadrilateral.

Find the value of x.

$x =$ ..... [1]

2 Work out.

$$2^{-4} \times 2^{5}$$

..... [1]

3 **(a)** Use a calculator to work out $\dfrac{5^{0.4} - \sqrt{3}}{0.13 - 0.015}$.

Write down all the digits in your calculator display.

..... [1]

(b) Write your answer to **part (a)** correct to 2 significant figures.

..... [1]

4 Amber's mean mark on five tests is 80.
Her marks on four of these tests are 68, 81, 74 and 89.

Work out her mark on the fifth test.

..... [2]

5 Factorise completely.

$$12x^2 + 15xy - 9x$$

..... [2]

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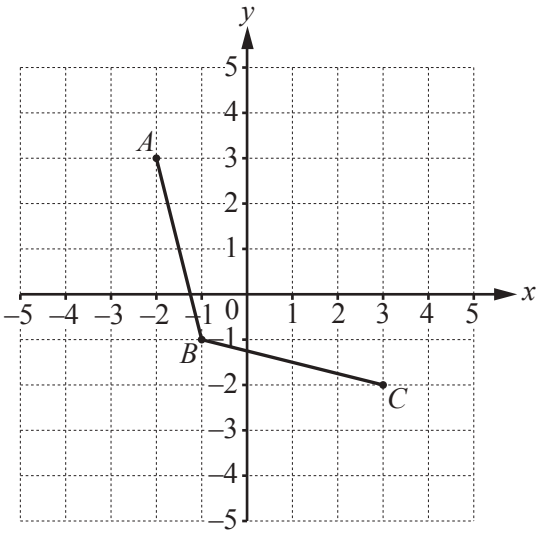
6



The diagram shows two sides of a rhombus *ABCD*.

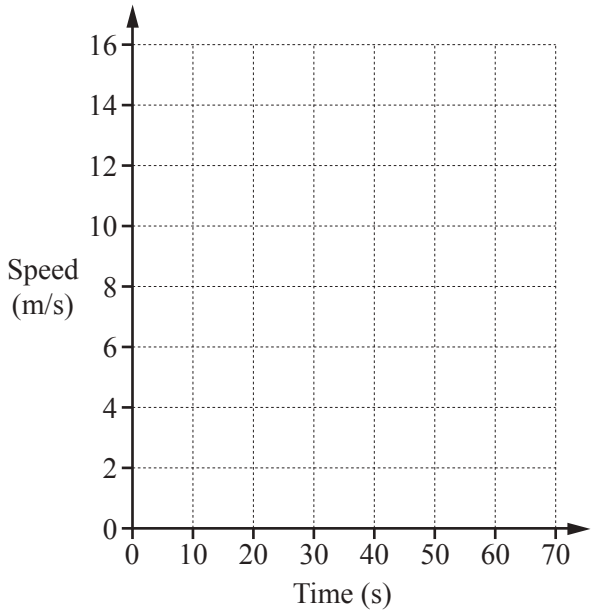
(a) Write down the co-ordinates of *A*.

(..... , ...) [1]

(b) Complete the rhombus *ABCD* on the grid. [1]

7 Petra begins a journey in her car.
She accelerates from rest at a constant rate of 0.4 m/s^2 for 30 seconds.
She then travels at a constant speed for 40 seconds.

On the grid, draw the speed-time graph for the first 70 seconds of Petra's journey.



[2]

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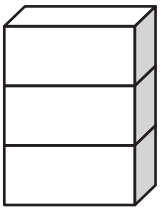

NOT TO SCALE

The diagram shows three identical cuboids in a tower.
The height of one cuboid is 6.5 cm, correct to the nearest millimetre.

Work out the upper bound of the height of the tower.

..... cm [2]

9 The value of a motorbike is \$12 400.
Each year, the value of the motorbike decreases exponentially by 15%.

Calculate the value of the motorbike after 3 years.

\$..... [2]

10 **Without using a calculator**, work out $1\frac{2}{3} - \frac{11}{15}$.
Write down all the steps of your working and give your answer as a fraction in its lowest terms.

..... [3]

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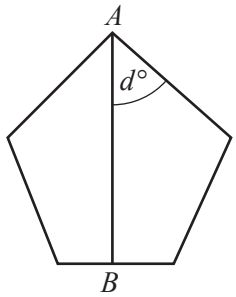
11 The diagram shows a regular pentagon.
AB is a line of symmetry.

Work out the value of *d*.



NOT TO SCALE

$d =$ ..... [3]

12 $\sqrt{5}$ $\quad -7 \quad$ 343 $\quad -11 \quad$ 0.4 $\quad$ 2.5 $\quad \frac{1}{3}$

From this list of numbers, write down

(a) a cube number,

..... [1]

(b) the smallest number,

..... [1]

(c) a natural number.

..... [1]

13 Simplify.

(a) $(m^5)^2$

..... [1]

(b) $4x^3y \times 5x^2y$

..... [2]

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14 **(a)** D is the point (2, –5) and $\overrightarrow{DE} = \begin{pmatrix} 7 \\ 1 \end{pmatrix}$.

Find the co-ordinates of the point E.

(..... , ...) [1]

(b) $\mathbf{v} = \begin{pmatrix} t \\ 12 \end{pmatrix}$ and $|\mathbf{v}| = 13$.

Work out the value of t, where t is negative.

$t =$ ..... [2]

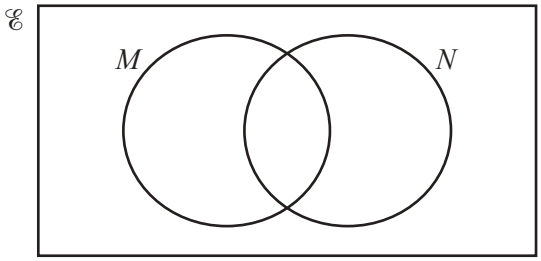
15 **(a)** $Q = \{1, 2, 3, 4, 5, 6\}$

Write down a set P where $P \subset Q$.

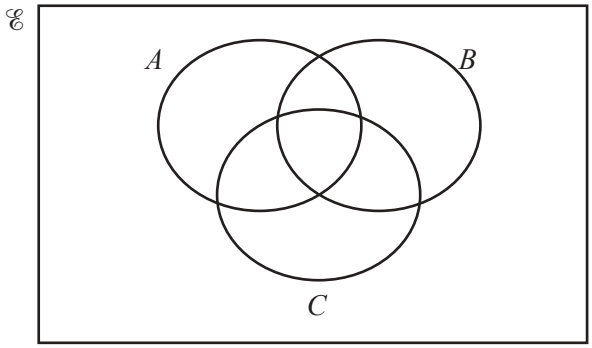
$P =$ ..... [1]

(b) Shade these regions in the Venn diagrams.

$M \cup N'$



$(A \cup B) \cap C'$



[2]

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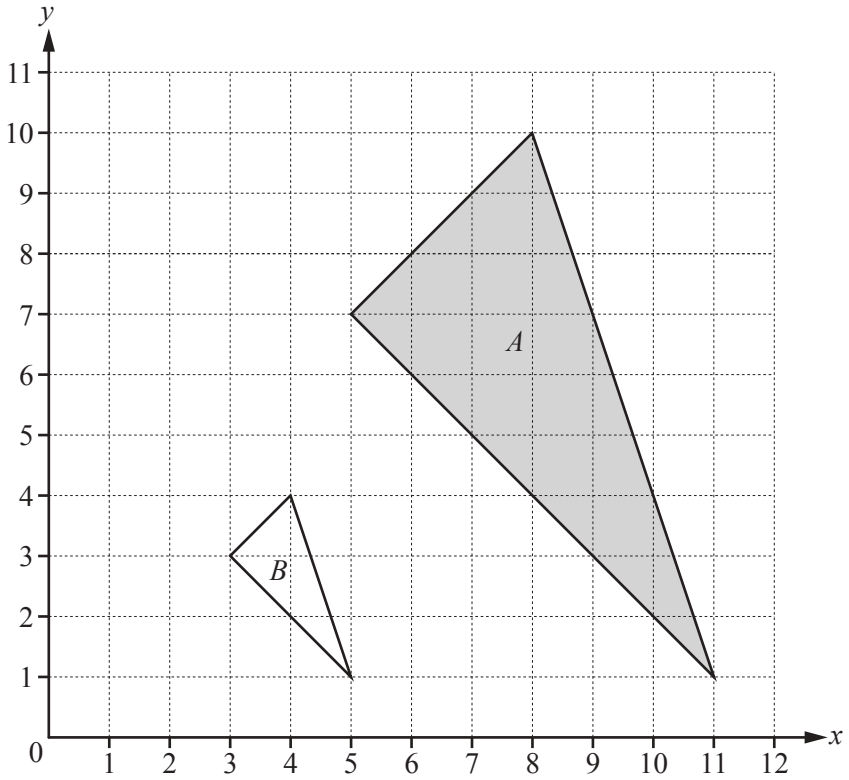

Describe fully the **single** transformation that maps triangle A onto triangle B.

.....

..... [3]

17 y is inversely proportional to $(x+1)^2$.
$y = 50$ when $x = 0.2$.

(a) Write y in terms of x.

$y =$ ..... [2]

(b) Find the value of y when $x = 0.5$.

$y =$ ..... [1]

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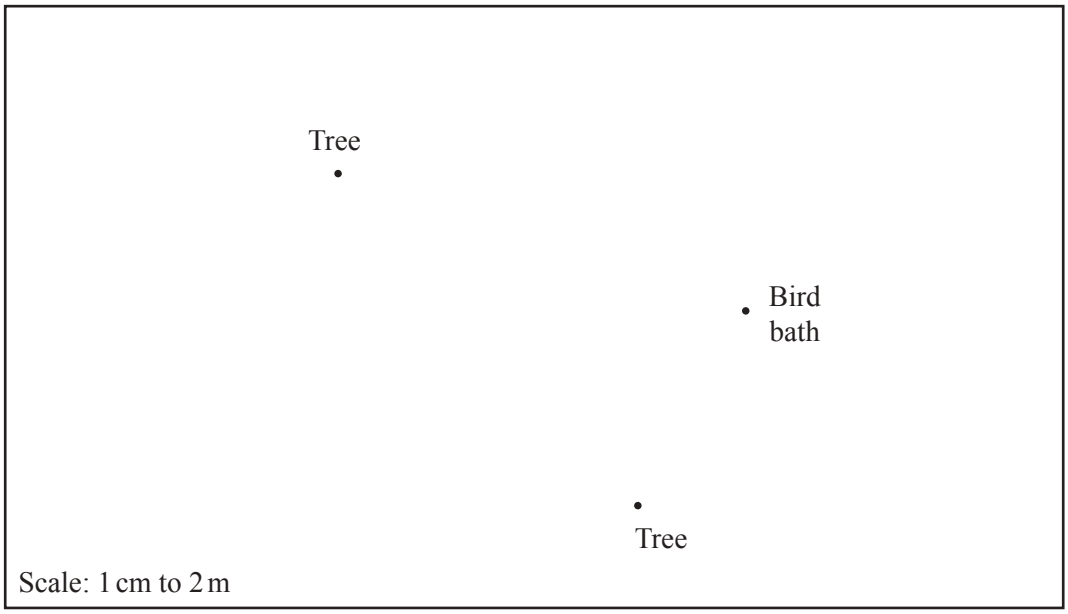
18 The diagram shows a scale drawing of Tariq's garden.
The scale is 1 centimetre represents 2 metres.



Tariq puts a statue in the garden.
The statue is equidistant from the two trees and 10 m from the bird bath.

Find, by construction, the point where Tariq puts the statue.
Label the point S. [4]

19 Write as a single fraction in its simplest form.

$$\frac{5}{x-3}+\frac{3}{x+7}+\frac{1}{2}$$

[4]

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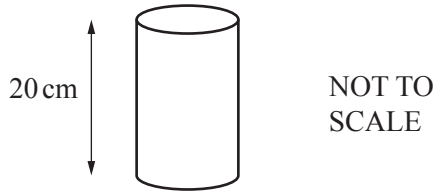
20 **(a)**

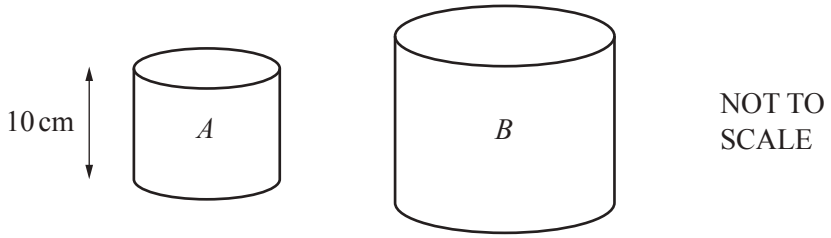


A cylinder has height 20 cm.
The area of the circular cross section is 74 cm^2.

Work out the volume of this cylinder.

..... cm^3 [1]

(b) Cylinder *A* is mathematically similar to cylinder *B*.



The height of cylinder *A* is 10 cm and its surface area is 440 cm^2.
The surface area of cylinder *B* is 3960 cm^2.

Calculate the height of cylinder *B*.

..... cm [3]

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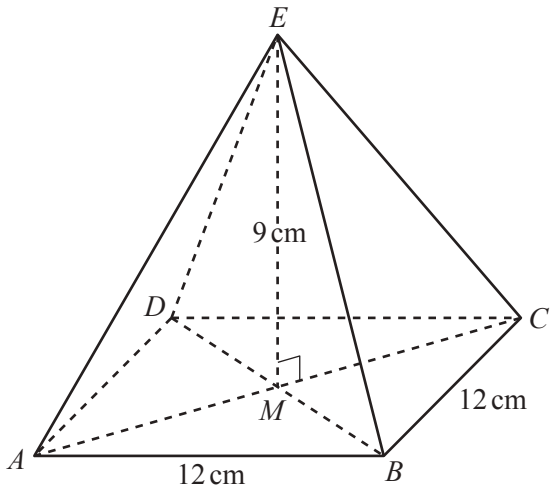
21



NOT TO SCALE

The diagram shows a square-based pyramid *ABCDE*.
The diagonals of the square meet at *M*.
E is vertically above *M*.
$AB = BC = 12$ cm and $EM = 9$ cm.

Calculate the angle between the edge *EC* and the base, *ABCD*, of the pyramid.

..... [4]

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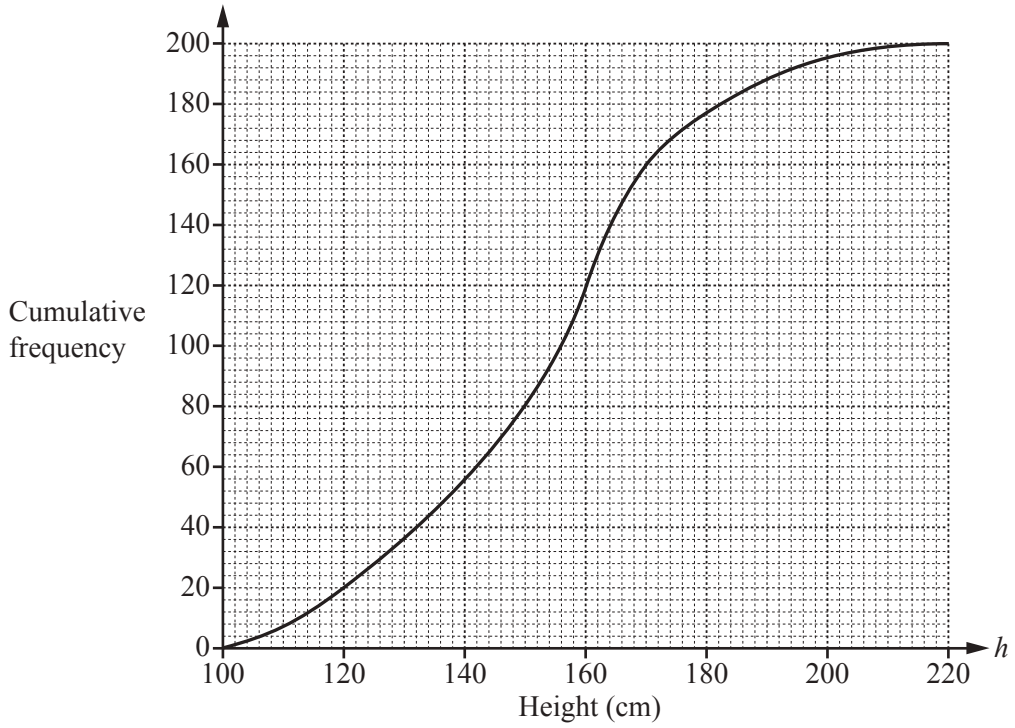
22 Simon records the heights, h cm, of 200 sunflowers in his garden.
The cumulative frequency diagram shows this information.



(a) Find the number of these sunflowers that have a height of more than 160 cm.

..... [2]

(b) Sue records the heights, h cm, of 200 sunflowers in her garden.
The cumulative frequency table shows this information.

Height (h cm)	Cumulative frequency
$h \leqslant 100$	0
$h \leqslant 110$	20
$h \leqslant 120$	48
$h \leqslant 130$	100
$h \leqslant 140$	140
$h \leqslant 150$	172
$h \leqslant 160$	188
$h \leqslant 170$	200

On the grid above, draw another cumulative frequency diagram to show this information. [3]

(c) Work out the difference between the median heights of Simon's sunflowers and Sue's sunflowers.

..... cm [2]

Question 23 is printed on the next page.

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23 In one week, Neha spends x hours cooking and y hours cleaning.
The time she spends cleaning is at least equal to the time she spends cooking.
This can be written as $y \geqslant x$.

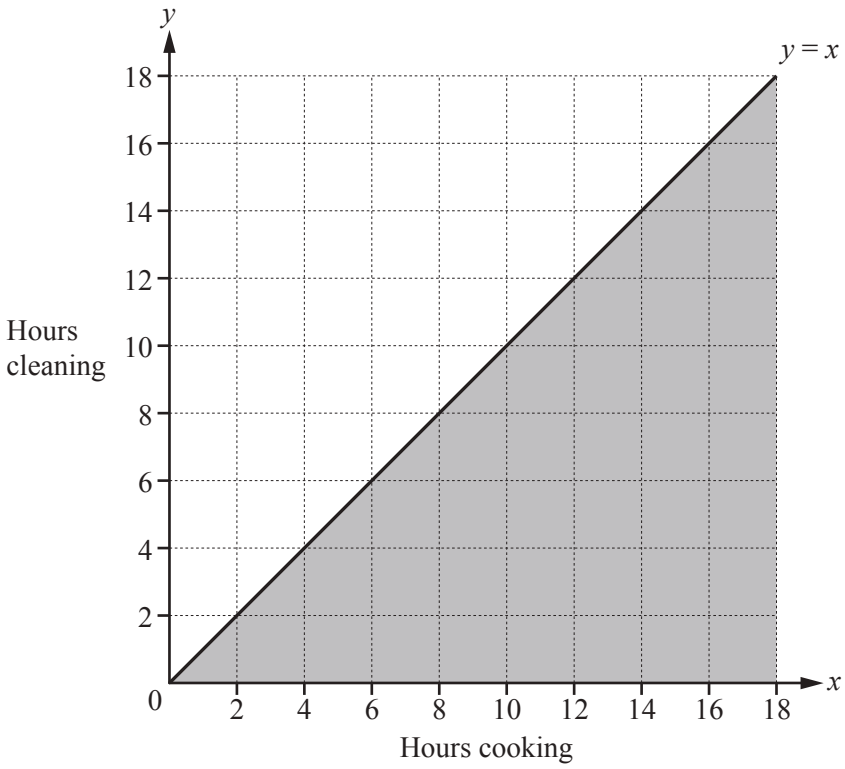
She spends no more than 16 hours in total cooking and cleaning.
She spends at least 4 hours cooking.

(a) Write down two more inequalities in x and/or y to show this information.

.....

..... [2]

(b) Complete the diagram to show the three inequalities.
Shade the **unwanted** regions.



[3]

(c) Neha receives \$10 for each hour she spends cooking and \$8 for each hour she spends cleaning.

Work out the largest amount she could receive.

\$ ..... [2]

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CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

MATHEMATICS **0580/22**

Paper 2 (Extended) **October/November 2017**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator Geometrical instruments
Tracing paper (optional)

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 70.

This document consists of **11** printed pages and **1** blank page.

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[Turn over

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1 One day, at noon, in Maseru, the temperature was 17 °C.
At midnight the temperature was 20 °C lower.

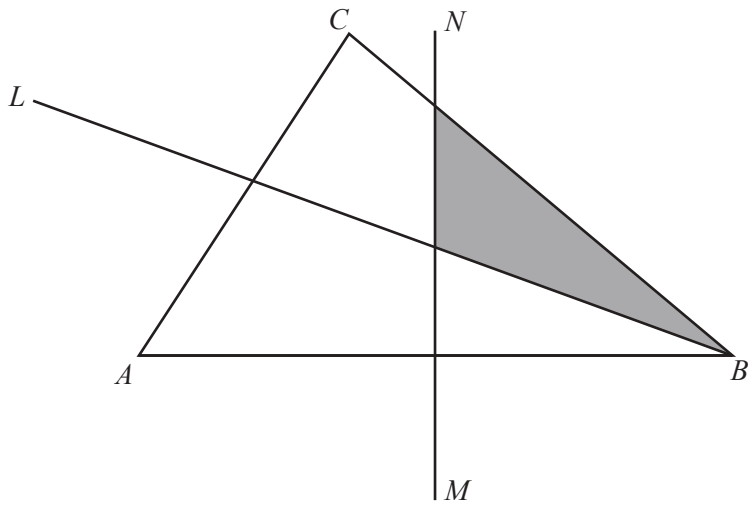
Work out the temperature at midnight.

..... °C [1]

2 Write 5.17×10^{-3} as an ordinary number.

..... [1]

3



In the diagram, *BL* is the bisector of angle *ABC* and *MN* is the perpendicular bisector of *AB*.

Complete the statement.

The shaded region contains the points, inside triangle *ABC*, that are

- nearer to *B* than to *A*

and

- nearer to ..... than to ..... [1]

4 **(a)** 1 and 12 are factors of 12.

Write down all the other factors of 12.

..... [1]

(b) Write down the multiples of 9 between 20 and 40.

..... [1]

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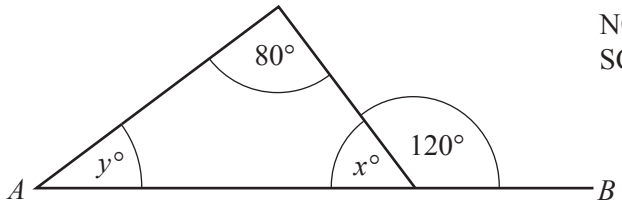
5



NOT TO SCALE

In the diagram, AB is a straight line.

Find the value of x and the value of y.

$x =$ .....

$y =$ ..... [2]

6 Write 55 g as a percentage of 2.2 kg.

..... % [2]

7 The area of a triangle is 528 cm^2.
The length of its base is 33 cm.

Calculate the perpendicular height of the triangle.

..... cm [2]

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8 Amar cycles at a speed of 18 km/h.
It takes him 55 minutes to cycle between two villages.

Calculate the distance between the two villages.

..... km [2]

9 Work out, giving your answer in standard form.

$$1.2 \times 10^{40} + 1.2 \times 10^{41}$$

..... [2]

10 The sides of a triangle are 5.2 cm, 6.3 cm and 9.4 cm, each correct to the nearest millimetre.

Calculate the lower bound of the perimeter of the triangle.

..... cm [2]

11 Write the recurring decimal $0.\dot{4}\dot{8}$ as a fraction.
Show all your working.

[2]

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12 Expand the brackets and simplify.

$$(5-n)(3+n)$$

..... [2]

13 **(a)** Write $\frac{11}{3}$ as a mixed number.

..... [1]

(b) **Without using a calculator**, work out $\frac{1}{4}+\frac{5}{12}$.
Show all the steps of your working and give your answer as a fraction in its lowest terms.

..... [2]

14 Find the integers which satisfy the inequality.

$$-5 < 2n-1 \leqslant 5$$

..... [3]

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15 Write as a single fraction in its simplest form.

$$\frac{x+1}{x} - \frac{y-1}{y}$$

..... [3]

16 Here are the first four terms of a sequence.

23 17 11 5

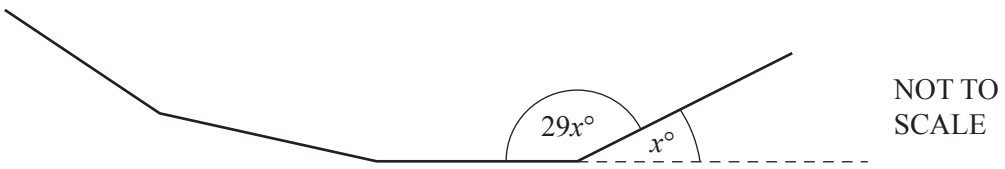
(a) Find the next term.

..... [1]

(b) Find the nth term.

..... [2]

17



The diagram shows part of a regular polygon.
The exterior angle is $x°$.
The interior angle is $29x°$.

Work out the number of sides of this polygon.

..... [3]

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18 Solve the simultaneous equations.
You must show all your working.

$$y = \frac{x}{2}$$
$$2x - y = 1$$

$x =$ .....

$y =$ ..... [3]

19 Make x the subject of the formula.

$$y = \sqrt{x^2 + 1}$$

$x =$ ..... [3]

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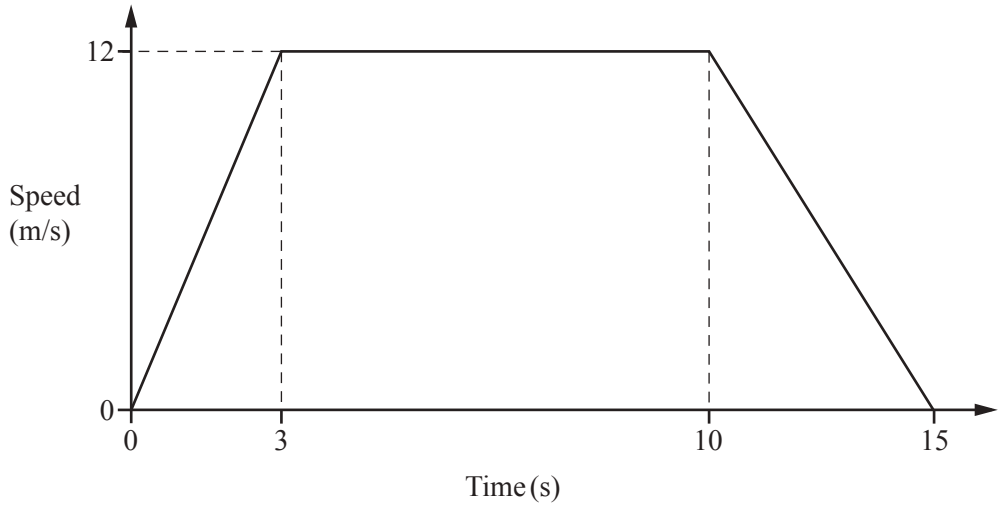
20



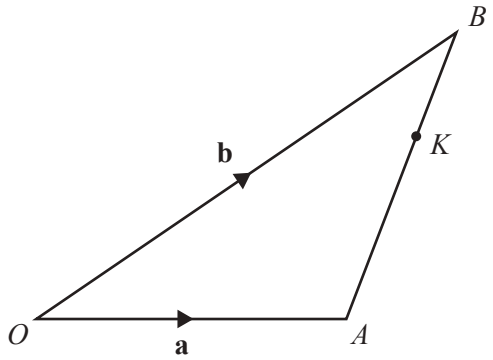
NOT TO SCALE

The diagram shows a speed-time graph.

Calculate the total distance travelled.

..... m [3]

21



NOT TO SCALE

O is the origin and K is the point on AB so that $AK : KB = 2 : 1$.
$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.

Find the position vector of K.
Give your answer in terms of **a** and **b** in its simplest form.

..... [3]

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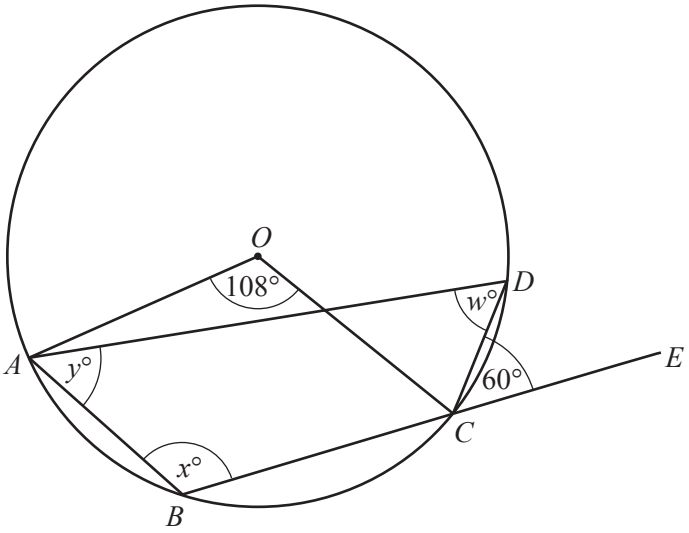
22



NOT TO SCALE

A, B, C and D are points on the circle, centre O.
BCE is a straight line.
Angle $AOC = 108°$ and angle $DCE = 60°$.

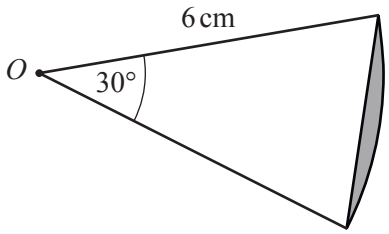
Calculate the values of w, x and y.

$w =$ .....

$x =$ .....

$y =$ ..... [3]

23



NOT TO SCALE

The diagram shows a sector of a circle, centre O and radius 6 cm.
The sector angle is 30°.
The area of the shaded segment is $(k\pi - c)$ cm^2, where k and c are integers.

Find the value of k and the value of c.

$k =$ .....

$c =$ ..... [3]

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24 Solve the equations.

(a) $7-3n = 11n+2$

$n =$ ..... [2]

(b) $\frac{p-3}{5} = 3$

$p =$ ..... [2]

25 Factorise completely.

(a) $x^2 - x - 132$

..... [2]

(b) $x^3 - 4x$

..... [2]

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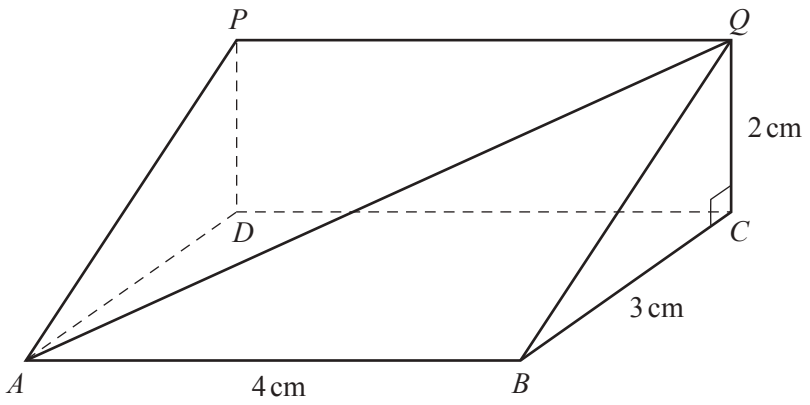
26



NOT TO SCALE

The diagram shows a prism of length 4 cm.
The cross section is a right-angled triangle.
$BC = 3$ cm and $CQ = 2$ cm.

Calculate the angle between the line AQ and the base, $ABCD$, of the prism.

..... [4]

27 Simplify.

(a) $81^{\frac{3}{4}}$

..... [1]

(b) $x^{\frac{2}{3}} \div x^{-\frac{4}{3}}$

..... [1]

(c) $\left(\frac{8}{y^6}\right)^{-\frac{1}{3}}$

..... [2]

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CANDIDATE NAME	

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MATHEMATICS **0580/31**

Paper 3 (Core) **October/November 2017**

2 hours

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator Geometrical instruments
Tracing paper (optional)

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
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For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 104.

This document consists of **16** printed pages.

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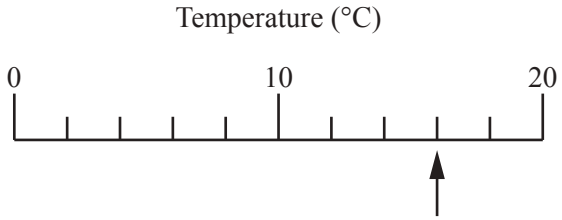
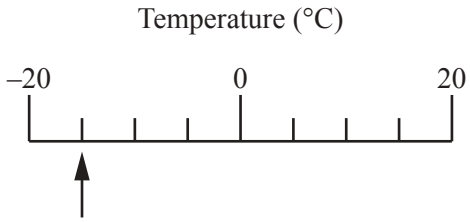
1 **(a)** Write down the temperature shown by each arrow.

(i)



..... °C [1]

(ii)



..... °C [1]

(b) The table shows the daily temperature in Hayville for one week in January.

Day	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Temperature (°C)	–4	2	–1	0	1	–6	–2

(i) Which was the coldest day?

..... [1]

(ii) Find the difference between the temperature on Sunday and the temperature on Monday.

..... °C [1]

(c) In Grassington, the temperature recorded at 07 35 was −3 °C.

(i) The temperature was recorded again $8\frac{1}{2}$ hours later.

At what time was this temperature recorded?

..... [1]

(ii) By this time, the temperature had risen by 7 °C.

Find this temperature.

..... °C [1]

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2 Jeff owns a clothes shop.

(a)

Shirt	Tie	Coat
$24	$12.50	$46

A customer buys 3 shirts, 5 ties and 1 coat.

Calculate the total cost.

$ ..... [3]

(b) A jacket has a price of $64.
Jeff increases this price by 8%.

Calculate the new price.

$ ..... [2]

(c) Jeff also increases the price of a dress from $250 to $280.

Calculate the percentage increase in the price of the dress.

..... % [3]

(d) The shop has a rectangular floor measuring 5.5 m by 8.5 m.
The floor covering costs $12 per square metre.

Calculate the cost of the floor covering.

$ ..... [3]

(e) Jeff invests $3600 for 3 years at a rate of 6% per year compound interest.

Work out the value of the investment at the end of the 3 years.

$ ..... [3]

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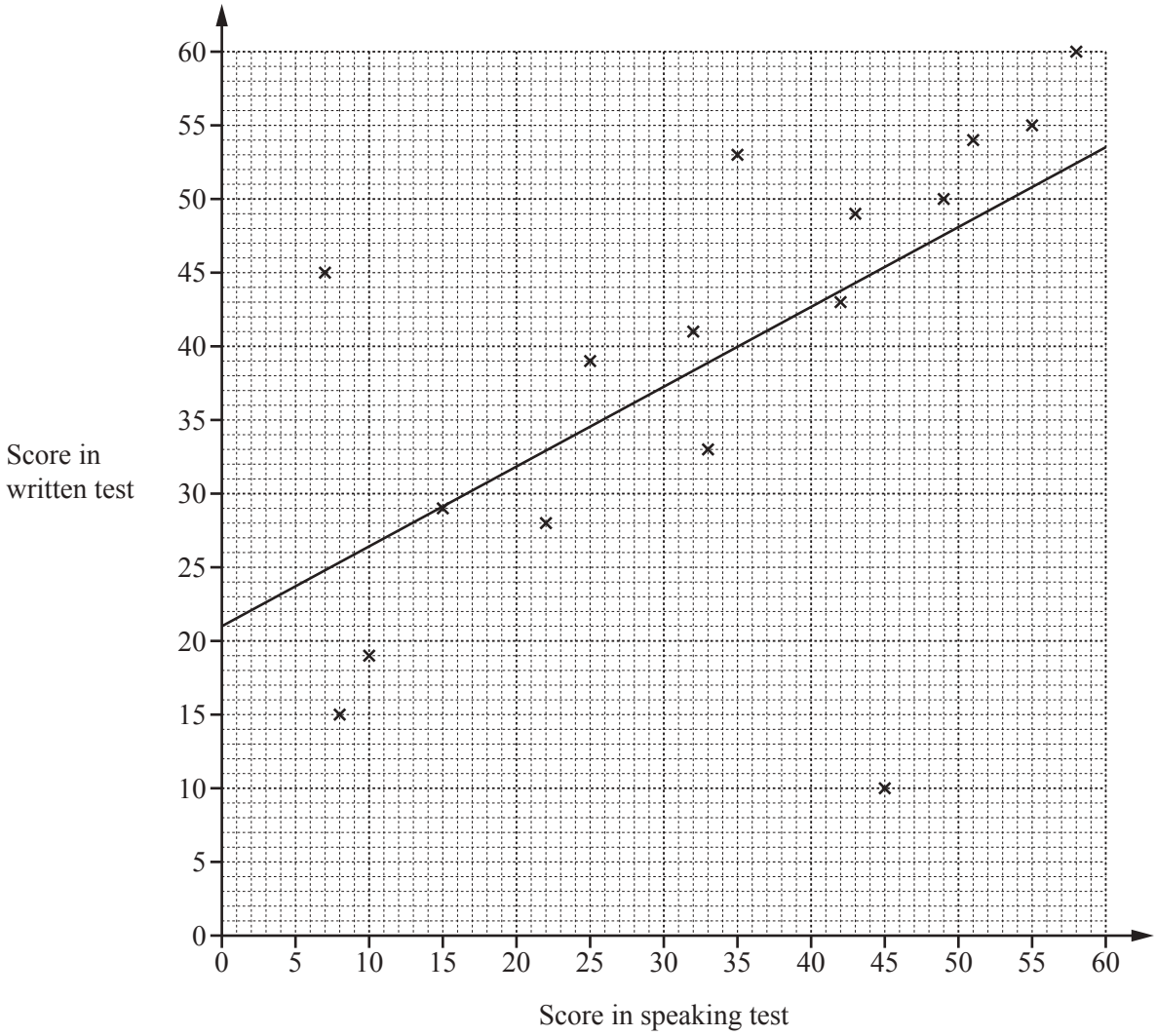
3 **(a)** The scatter diagram shows the scores for each student in class A for the written test and the speaking test in French.
A line of best fit has been drawn.



(i) Each test is marked out of 60.

In which test did the class perform better?
Give a reason for your answer.

..... because .....

..... [1]

(ii) What type of correlation is shown in the scatter diagram?

..... [1]

(iii) One student is much better at speaking French than writing French.

Put a ring around the cross that represents this student. [1]

(iv) One student scored 39 in the speaking test but was absent for the written test.

Use the line of best fit to estimate a score for this student in the written test.

[1]

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(b) Here are the scores in the written test for class B.

21	14	48	32	8	29	41	39	30	23	17

Find

(i) the median,

..... [2]

(ii) the mean.

..... [2]

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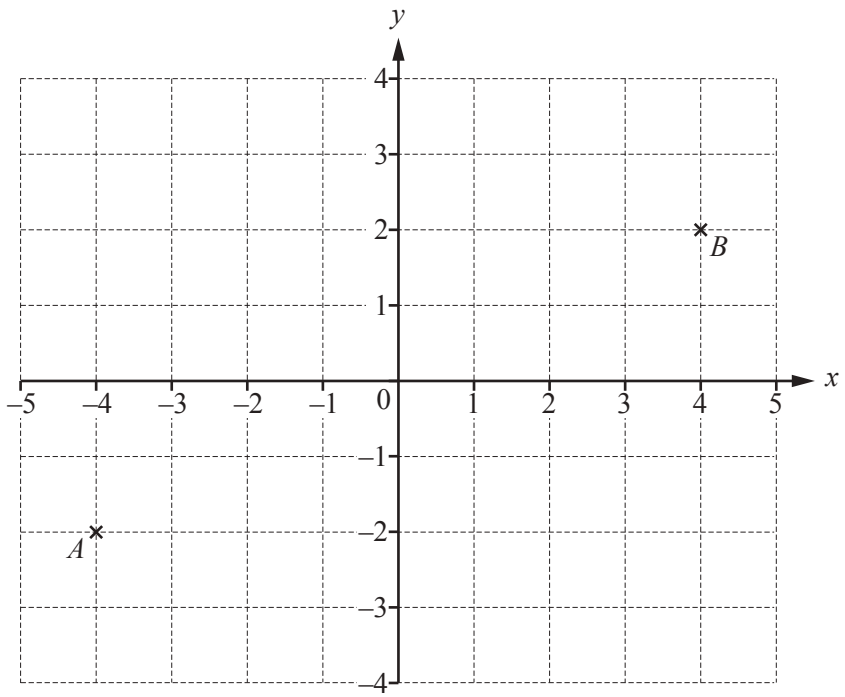
4 **(a)**



(i) Plot point C at (–4, 2). [1]

(ii) Write down the mathematical name of the triangle formed by joining the points A, B and C.

..... [1]

(iii) Write down the vector $\overrightarrow{AB}$.

$\overrightarrow{AB} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(iv) **(a)** Find the gradient of the line AB.

..... [2]

(b) Write down the equation of the line AB.

$y =$ ..... [1]

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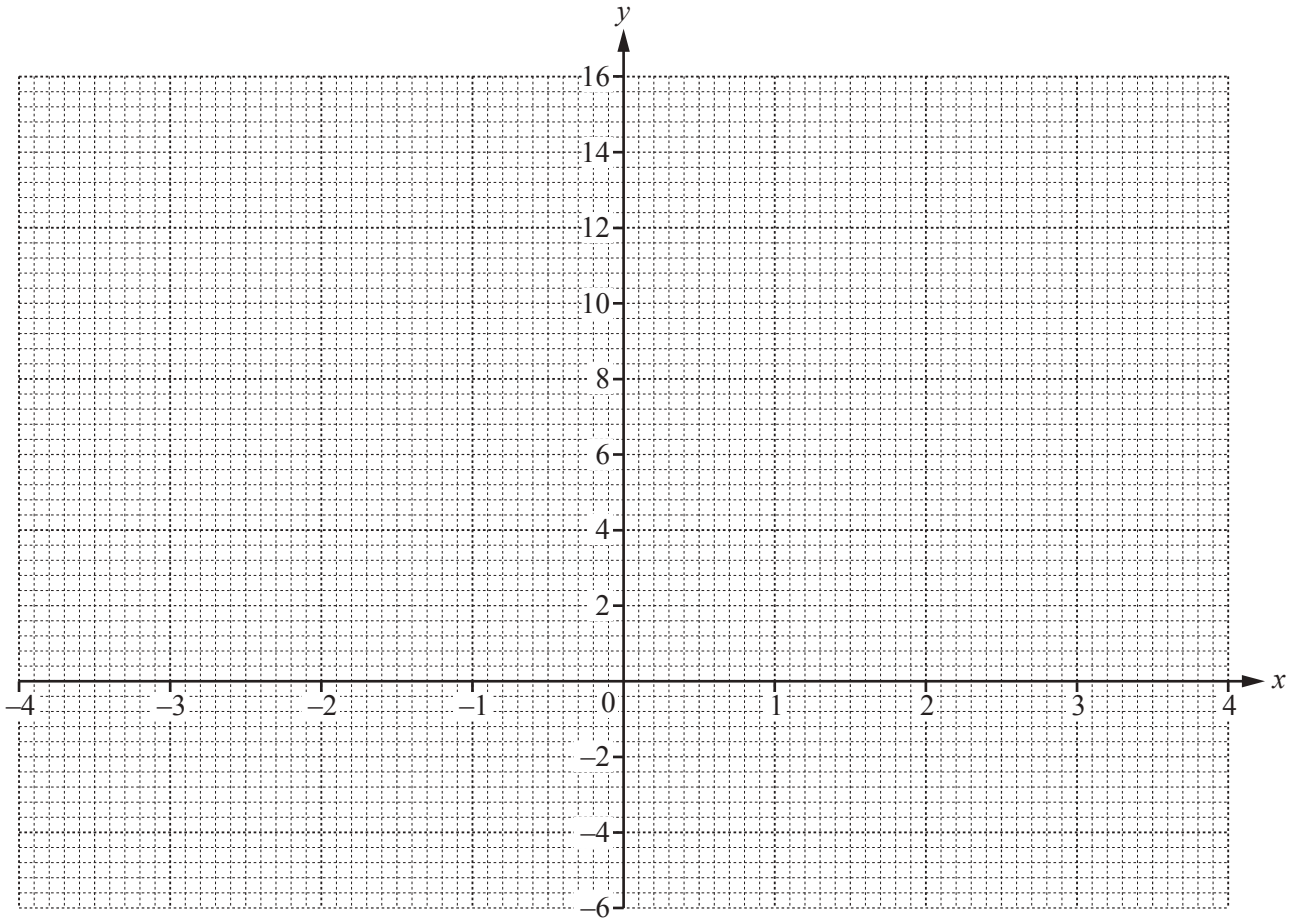
(b) **(i)** Complete the table of values for $y = x^2 + x - 5$.

x	–4	–3	–2	–1	0	1	2	3	4
y	7		–3			–3		7	

[3]

(ii) On the grid below, draw the graph of $y = x^2 + x - 5$ for $-4 \leqslant x \leqslant 4$.



[4]

(iii) Use your graph to solve the equation $x^2 + x - 5 = 0$.

$x =$ ..... or $x =$ ..... [2]

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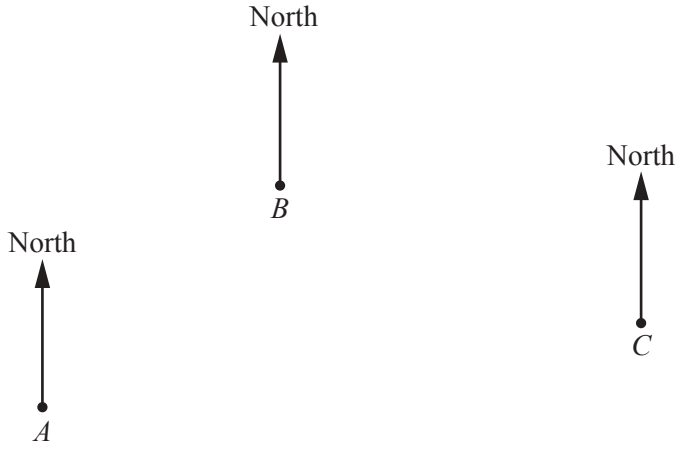
5 The scale drawing shows the positions of three towns *A*, *B* and *C*.
The scale is 1 centimetre represents 12 kilometres.



Scale: 1 cm to 12 km

(a) Find the actual distance between town *A* and town *B*.

..... km [2]

(b) Measure the bearing of town *B* from town *A*.

..... [1]

(c) Measure the bearing of town *B* from town *C*.

..... [1]

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(d) Town D is 84 km from town A and 42 km from town C.

(i) **In this part, use a ruler and compasses only and show your construction arcs.**

On the diagram, construct a possible position for town D.

[3]

(ii) A plane takes 10 minutes to fly the 84 km from town A to town D.

Work out the average speed of the plane in kilometres per hour.

..... km/h [2]

(e) The bearing of town E from town A is 118°.

Work out the bearing of town A from town E.

..... [2]

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6 **(a)** Find

(i) all the factors of 18,

..... [2]

(ii) a multiple of 30,

..... [1]

(iii) $\sqrt{2134.44}$,

..... [1]

(iv) 2.5^3,

..... [1]

(v) $(0.2)^{-1}$.

..... [1]

(b) Write 72 as a product of its prime factors.

..... [2]

(c) Find the lowest common multiple (LCM) of 16 and 30.

..... [2]

(d) Clock A chimes every 6 hours.
Clock B chimes every 9 hours.
Both clocks chime at 2 am.

At what time will the two clocks next chime together?

[3]

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7 **(a)** Bag *A* contains 20 counters.
6 are red, 9 are blue and the rest are white.
Jared takes one counter at random.

Write down the probability that the counter is

(i) red,

..... [1]

(ii) white,

..... [1]

(iii) yellow.

..... [1]

(b) Bag *B* contains green counters, black counters, purple counters and brown counters.
Louise takes one counter at random.

Colour	Green	Black	Purple	Brown
Probability		0.3	0.24	0.18

Complete the table.

[2]

(c) Bag *C* contains 8 red counters and 12 blue counters only.
Bag *D* contains 6 red counters and 9 blue counters only.
A counter is taken at random from each bag.

Show that the probability of taking a red counter from bag *C* is equal to the probability of taking a red counter from bag *D*.

[3]

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8 **(a)** Multiply out the brackets and simplify.

$$5(2x+3)-2(x+4)$$

..... [2]

(b) **(i)** An equilateral triangle has side length $2x$.

Write down an expression, in terms of x, for the perimeter of the triangle.
Give your answer in its simplest form.

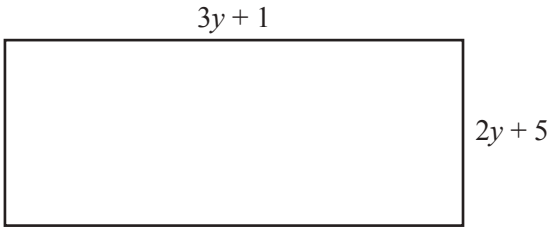
..... [1]

(ii) A square has a perimeter of $20a$.

Write down an expression, in terms of a, for the length of one side of the square.
Give your answer in its simplest form.

..... [1]

(c) The diagram shows a rectangle.



NOT TO SCALE

Find an expression, in terms of y, for the perimeter of the rectangle.
Give your answer in its simplest form.

..... [3]

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(d) One mint costs m cents.
One toffee costs 6 cents more than one mint.
The cost of 3 mints and 7 toffees is 182 cents.

Write an equation, in terms of m, and solve it to find the cost of one mint.

Cost of one mint = ... cents [5]

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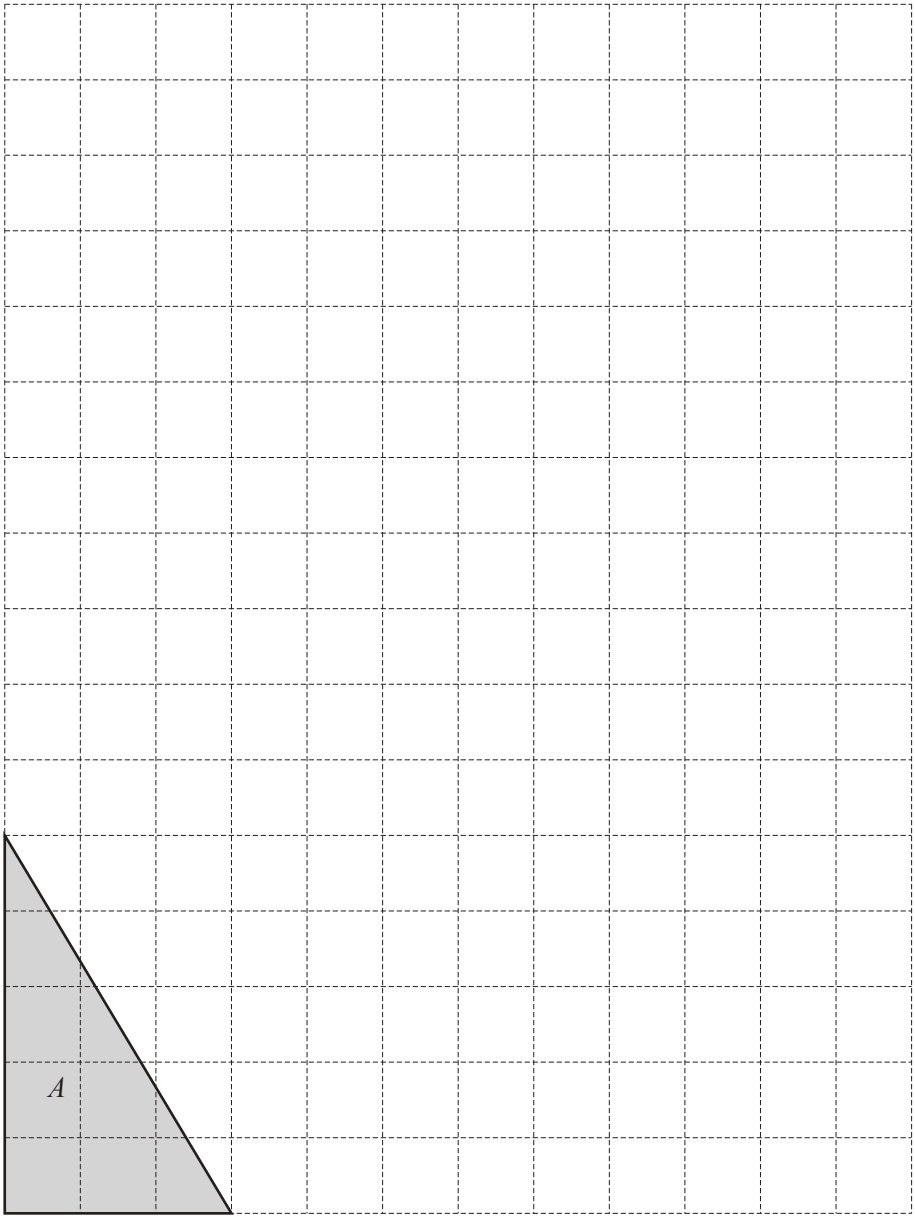
9 **(a)** The diagram shows a triangle, A, on a 1 cm^2 grid.



(i) Find the area of triangle A.

..... cm^2 [2]

(ii) On the grid, draw an enlargement of triangle A with scale factor 2. [2]

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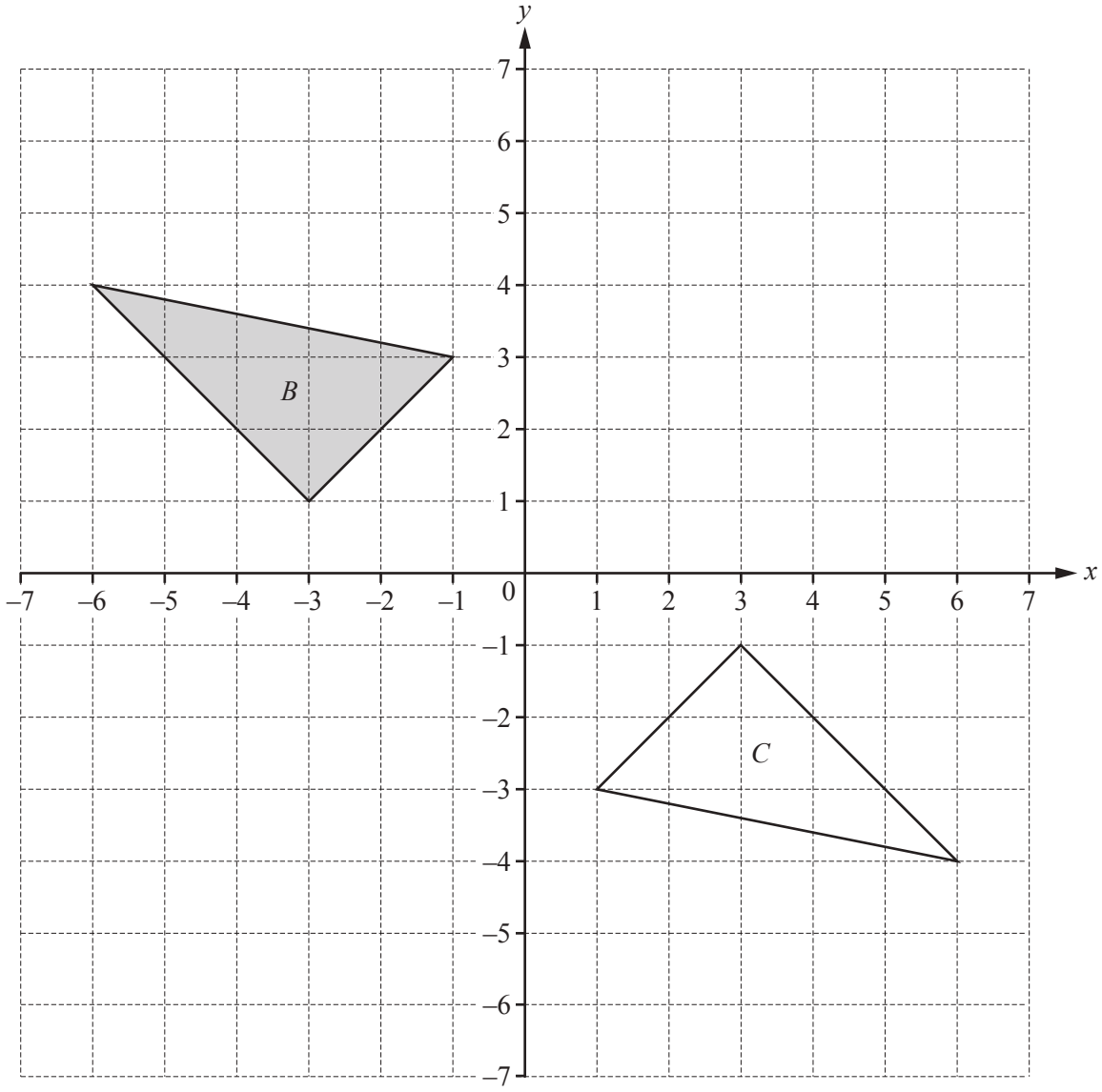
(b)



(i) Describe fully the **single** transformation that maps triangle B onto triangle C.

.....

..... [3]

(ii) Reflect triangle B in the line $y = -1$. [2]

(iii) Translate triangle B by the vector $\begin{pmatrix} 5 \\ 1 \end{pmatrix}$. [2]

Question 10 is printed on the next page.

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10 **(a)** These are the first four terms of a sequence.

$$-2 \qquad 6 \qquad 14 \qquad 22$$

(i) Write down the next term.

..... [1]

(ii) Write down the rule for continuing the sequence.

..... [1]

(iii) Find an expression for the nth term.

..... [2]

(b) The nth term of another sequence is $5(n+1)-6$.

Write down the second term of this sequence.

..... [1]

(c) These are the first four terms of a different sequence.

$$-2 \qquad 1 \qquad 8 \qquad 19$$

Write down the next term of this sequence.

..... [1]

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MATHEMATICS **0580/32**

Paper 3 (Core) **October/November 2017**

2 hours

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 104.

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[Turn over

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1 (a) Pablo leaves home at 0735 and arrives at school at 0820.

(i) Find how many minutes it takes Pablo to get to school.

.....min [1]

(ii) The first lesson starts at 0855 and ends 1 hour 15 minutes later.

Find the time the first lesson ends.

..... [1]

(iii) In one school week of 5 days, Pablo goes to and from school on the bus each day.
He buys a 5-day ticket that costs \$7.75 .
A 1-day ticket costs \$1.66 .

Calculate how much Pablo saves by buying a 5-day ticket.

\$..... [2]

(b) Pablo records the time, correct to the nearest minute, each student in his class spent on their homework.

30	42	56	12	15	10	50	8	58	24	34	41	11	36	18
9	21	48	35	42	27	44	52	15	56	19	22	54	41	30

(i) Find the range.

.....min [1]

(ii) Complete the frequency table.
You may use the tally column to help you.

Time (minutes)	Tally	Frequency
0 to 9		
10 to 19		
20 to 29		
30 to 39		
40 to 49		
50 to 59		
	Total	30

[2]

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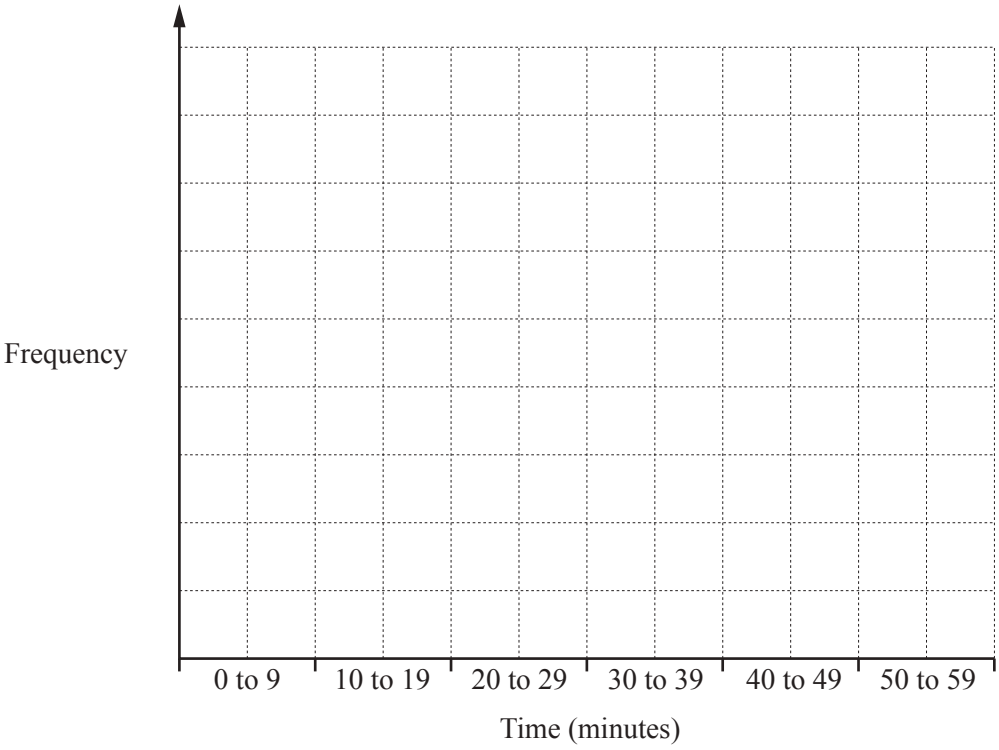
(iii) Draw a bar chart to show this information.
Complete the scale on the frequency axis.



[3]

(iv) Write down the modal class interval.

..... to ..... [1]

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2 **(a)** Write the number 8045 in words.

..... [1]

(b) Write down a number between 60 and 70 that is

(i) a square number,

..... [1]

(ii) a prime number,

..... [1]

(iii) a common multiple of 4 and 17.

..... [1]

(c) **(i)** Write 98 as a product of its prime factors.

..... [2]

(ii) Find the highest common factor (HCF) of 98 and 182.

..... [2]

(d) Find the value of

(i) 6^4,

..... [1]

(ii) $\sqrt[3]{24\,389}$,

..... [1]

(iii) 14^1,

..... [1]

(iv) 5^{-3}.

..... [1]

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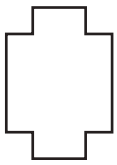
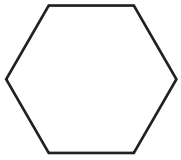
3 **(a)** Write down the order of rotational symmetry of each shape.

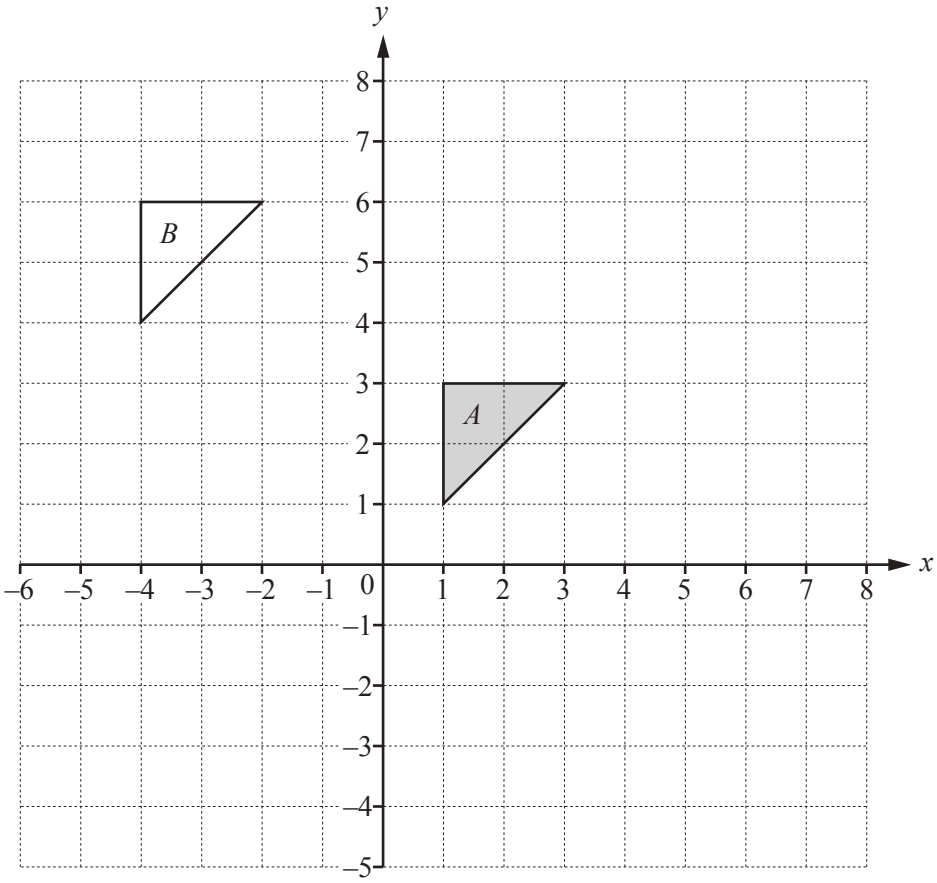




....

[2]

(b)



(i) On the grid, reflect triangle A in the line $x = -1$. [2]

(ii) On the grid, enlarge triangle A by scale factor 2, centre (0, 0). [2]

(iii) Describe fully the **single** transformation that maps triangle A onto triangle B.

.....

..... [2]

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4 Leo, Kim and Priya own a shop.

(a) **(i)** Pens cost \$1.45 each.
Andre has a \$10 note.

Find the greatest number of pens that he can buy and how much change he receives.

Number of pens = ...

Change = \$ ..... [3]

(ii) The price of a pack of printer paper is \$5.60 .
In a sale this price is reduced by 15%.

Calculate the sale price.

\$ ..... [2]

(b) Each day, Kim records the number of people who buy a pen.
The results for 10 days are shown below.

40 7 19 25 18 19 32 57 12 47

Find the median.

..... [2]

(c) The shop makes a profit of \$7000.
The profit is shared in the ratio Leo : Kim : Priya = 6 : 3 : 5.

Calculate the amount they each receive.

Leo = \$ .....

Kim = \$ .....

Priya = \$ ..... [3]

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(d) Leo changed \$1400 into pounds (£).
The exchange rate was £1 = \$1.54 .

Work out how many pounds Leo received.

£..... [2]

(e) Priya invested \$2000 for 3 years at a rate of 2.6% per year compound interest.

Calculate the value of her investment at the end of the 3 years.

\$..... [3]

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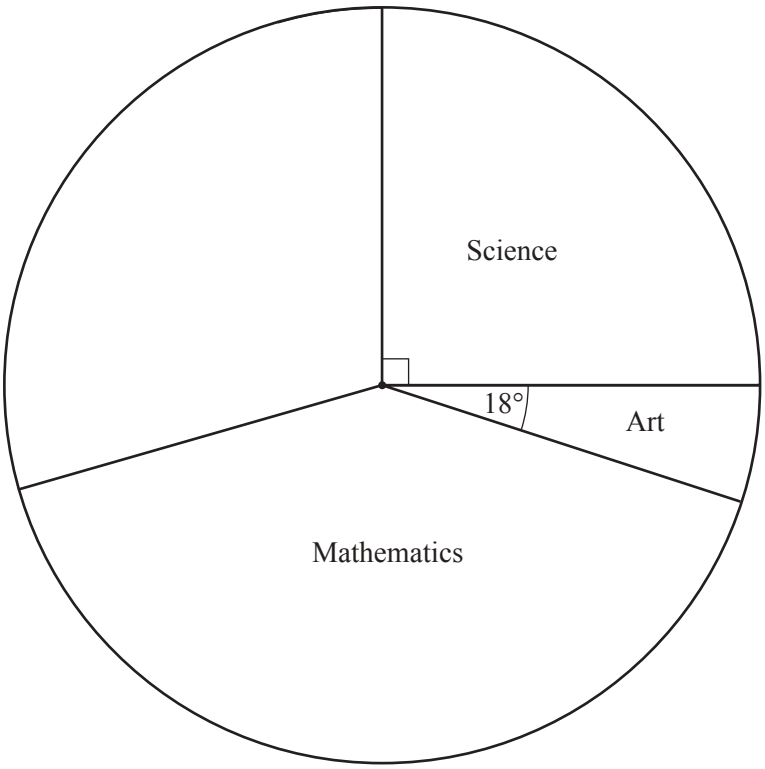
5 Nico asked each of 900 students at her school what their favourite subject is.
The students only chose Science, Art, Mathematics, History or Geography.
The pie chart shows some of this information.



(a) Show that 225 students chose Science.

[1]

(b) Find how many students chose Art.

..... [2]

(c) 125 students chose History and 140 chose Geography.

Complete the pie chart to show this information.

[2]

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(d) One of the 900 students is selected at random.

(i) Write down the probability that their favourite subject is French.

..... [1]

(ii) Find the probability that their favourite subject is Art.
Give your answer as a fraction in its lowest terms.

..... [2]

(e) The total number of students in the school is 2520.

Estimate how many students you would expect to choose History as their favourite subject.

..... [2]

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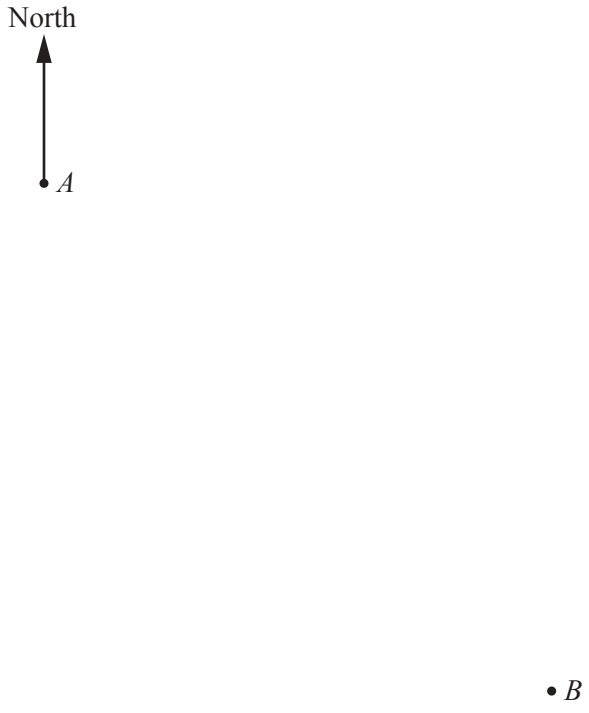
6 The diagram shows the positions of two towns, A and B.
The scale is 1 centimetre represents 10 kilometres.



Scale: 1 cm to 10 km

(a) **(i)** Find the actual distance from A to B.

..... km [2]

(ii) Measure the bearing of B from A.

..... [1]

(b) **(i)** Another town, C, is 78 km from A on a bearing of 103°.

Mark and label the position of town C on the diagram. [2]

(ii) Chailai takes 45 minutes to drive the 78 km from town A to town C.

Calculate her average speed in kilometres per hour.

..... km/h [2]

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(c) In this part, use a ruler and compasses only and show your construction arcs.

Mr Lei is moving house.
He wants to live

- nearer to town *B* than town *A*

and

- less than 70 km from town *A*.

Construct and shade the region on the diagram in which he wants to live. [5]

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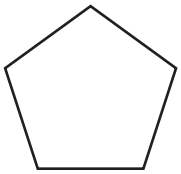
7 **(a)** Write down the mathematical name for this polygon.

(i)

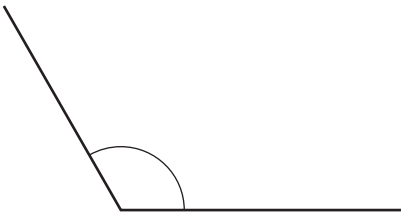


..... [1]

(ii) Write down the mathematical name for this quadrilateral.

..... [1]

(iii) Write down the type of angle shown in this diagram.



..... [1]

(b) A cuboid measures 25 cm by 12 cm by 8 cm.

(i) Calculate the volume.

..... cm^3 [2]

(ii) Write this volume in cubic metres.

.....m^3 [1]

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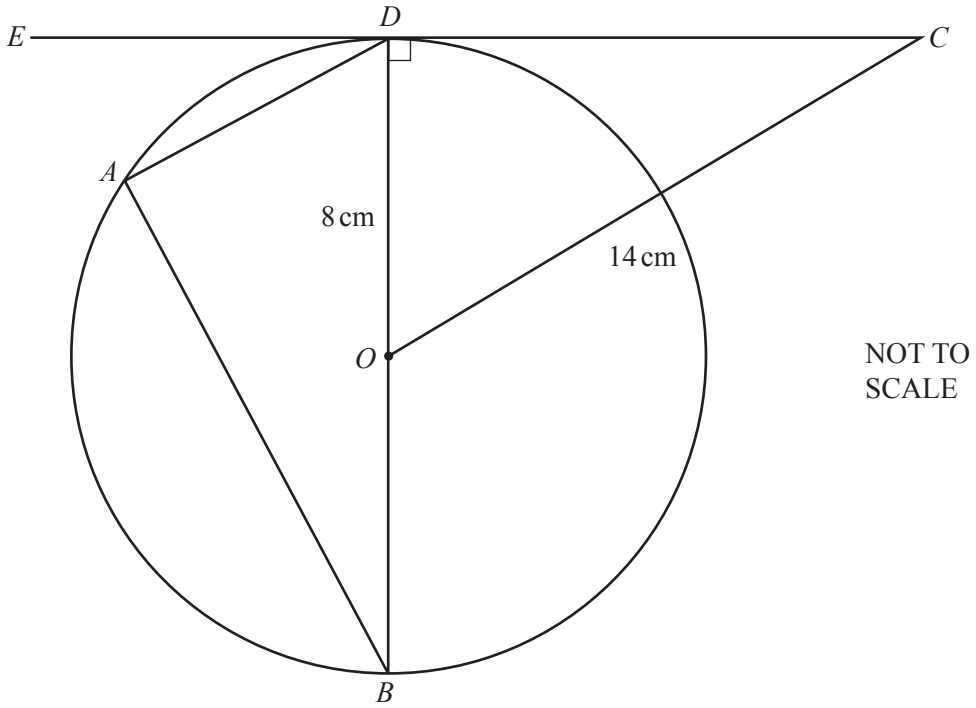
(c)



A, *B* and *D* lie on the circle, centre *O*.
EC is a tangent to the circle at *D*.
OD = 8 cm and *OC* = 14 cm.

(i) Write down the mathematical name for the line *OD*.

..... [1]

(ii) Explain why angle *BAD* is 90°.

..... [1]

(iii) Calculate the circumference of the circle.

..... cm [2]

(iv) Calculate *CD*.

CD = ... cm [3]

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8 **(a)** Simplify.

(i) $8p + 2r + 4p - 9r$

..... [2]

(ii) $4x^3 \times 6x^2$

..... [1]

(b) Write down an expression, in terms of x and y, for the total cost of x cakes at 90 cents each and y drinks at 75 cents each.

..... cents [2]

(c) Factorise completely.

$$12p^2 - 8p$$

..... [2]

(d) Solve.

$$4(7r - 3) = 128$$

$r =$ ..... [3]

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(e) Solve the simultaneous equations.
You must show all your working.

$$4x + 3y = 43$$
$$6x + 7y = 92$$

$x =$ .....

$y =$ ..... [4]

Question 9 is printed on the next page.

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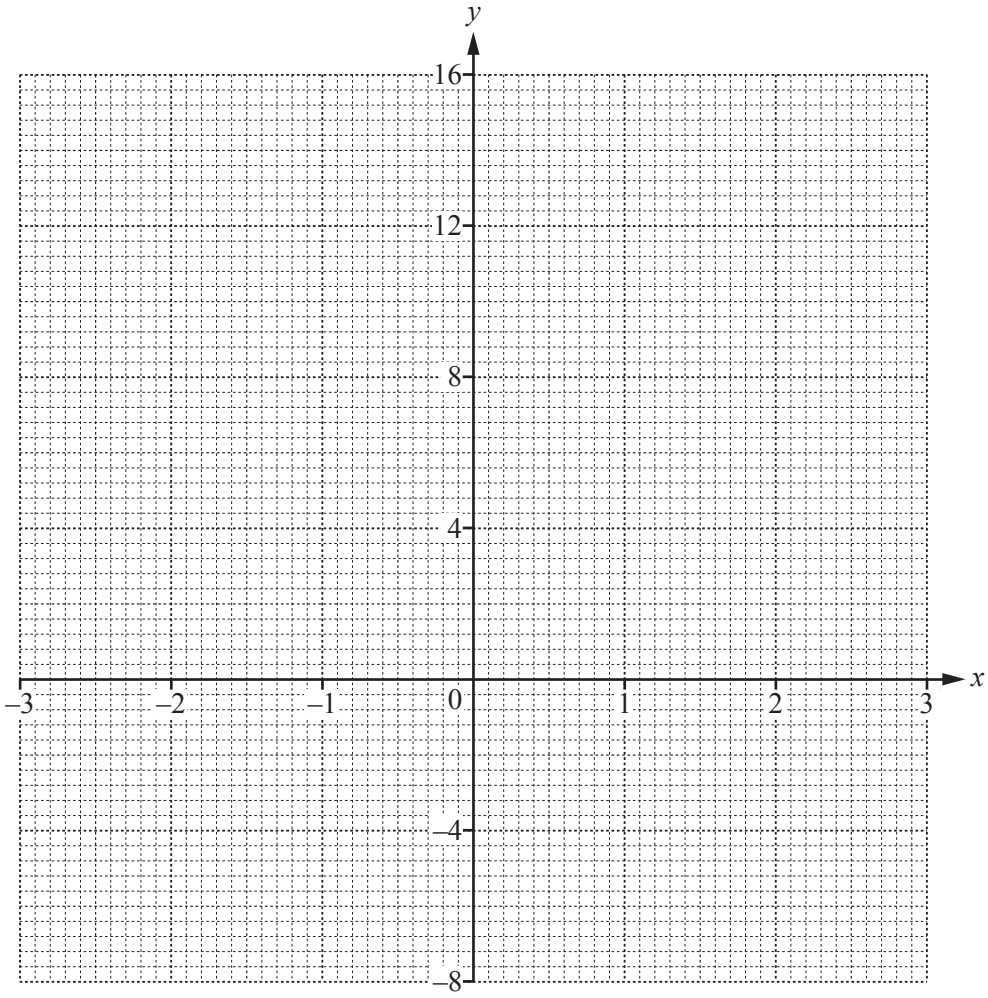
9 **(a)** **(i)** Complete the table of values for $y = x^2 + 3x - 4$.

x	−3	−2	−1	0	1	2	3
y	−4	−6		−4	0		

[3]

(ii) On the grid, draw the graph of $y = x^2 + 3x - 4$ for $-3 \leqslant x \leqslant 3$.



[4]

(b) **(i)** On the same grid, draw the line $y = 5$. [1]

(ii) Write down the co-ordinates of the point of intersection of the line $y = 5$ and the graph of $y = x^2 + 3x - 4$ for $-3 \leqslant x \leqslant 3$.

(..... , ...) [1]

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CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

MATHEMATICS **0580/33**

Paper 3 (Core) **October/November 2017**

2 hours

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator Geometrical instruments
Tracing paper (optional)

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[Turn over

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1 **(a)** Martha makes hats.
Each week she makes 160 hats.

(i) Work out how many hats she makes in 5 weeks.

..... [1]

(ii) The hats are made in the ratio

small : medium : large = 2 : 5 : 3.

Work out how many of the 160 hats are large.

..... [2]

(iii) She sells $\frac{3}{8}$ of the 160 hats.

Work out how many hats she sells.

..... [1]

(b) Nina sells T-shirts.
The prices are shown in the table.

Type	Plain	Striped	Logo
Price	\$7.50	\$9.50	\$10.50

(i) Sam buys 3 plain T-shirts and 2 logo T-shirts.

Work out how much she pays altogether.

\$ ..... [2]

(ii) One day, Nina reduces all prices by 20%.

Work out the new price of a striped T-shirt.

\$ ..... [2]

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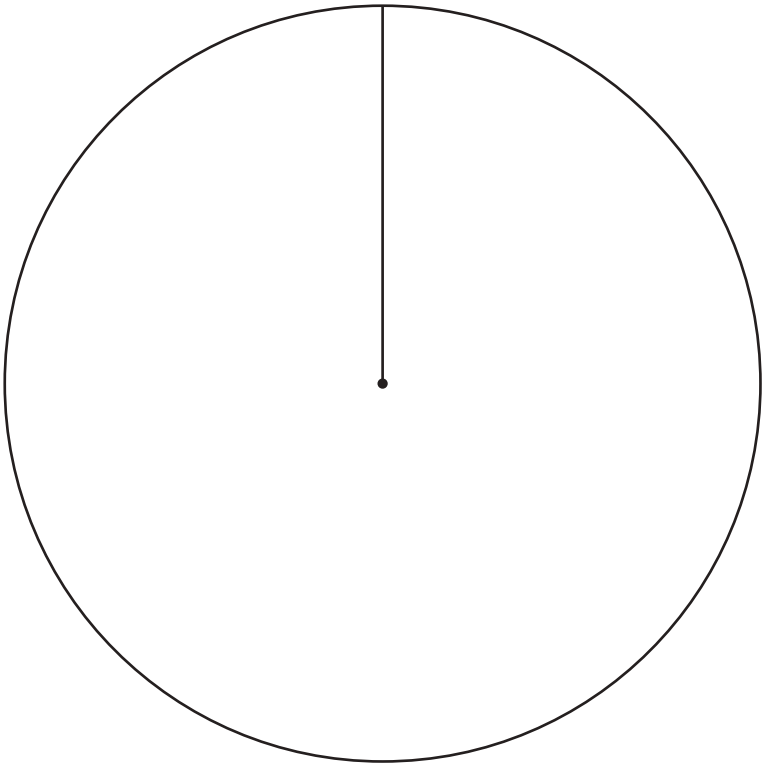
(c) Nina sold 300 T-shirts in September.
She wants to show how many of each type she sold using a pie chart.

Type	Number sold	Pie chart sector angle
Plain	100	120°
Striped	85	
Logo	115	

(i) Complete the table. [2]

(ii) Complete the pie chart.



[2]

(d) Nina paid \$22.50 for a dress.
She sold the dress for \$31.50.

Work out her percentage profit.

..... % [3]

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2 **(a)** Fill in the missing number in each calculation.

(i) $6 + 2 \times$ ..... $= 24$ [1]

(ii) $(10 -$ ..... $) \div 3 = 2$ [1]

(b) Find the value of

(i) $\sqrt{1.96}$,

..... [1]

(ii) 16^3.

..... [1]

(c) Work out $\dfrac{7.82 - 4.15}{5.25 \times 16.4}$.

Give your answer correct to 2 significant figures.

..... [2]

(d) $V = \frac{1}{3}a^2h$

Calculate V when $a = 4.5$ and $h = 9.6$.

$V =$ ..... [2]

(e) Put a ring around the irrational number in the list below.

$\frac{2}{3}$ $\sqrt{5}$ $-\frac{5}{7}$ $\sqrt{36}$ $1\frac{4}{5}$ [1]

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(f) Written as a product of its prime factors, $T = 2^2 \times 3 \times 5^2$.

(i) Work out the value of T.

$T =$ ..... [1]

(ii) Write 80 as a product of its prime factors.

..... [2]

(iii) Find the highest common factor (HCF) of T and 80.

..... [2]

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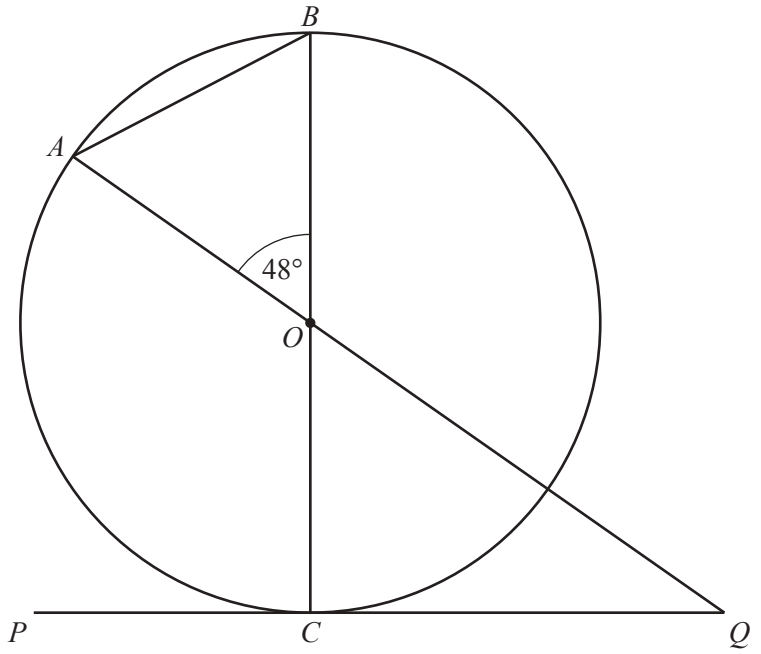
3



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A, *B* and *C* are points on the circumference of the circle, centre *O*.
BC is a diameter of the circle.
PQ touches the circle at *C* and *AOQ* is a straight line.

(a) Write down the mathematical name for

(i) line *AB*,

..... [1]

(ii) *PQ*.

..... [1]

(b) Find the size of

(i) angle *COQ*,

Angle *COQ* = ... [1]

(ii) angle *ABO*,

Angle *ABO* = ... [2]

(iii) angle *OQC*.

Angle *OQC* = ... [2]

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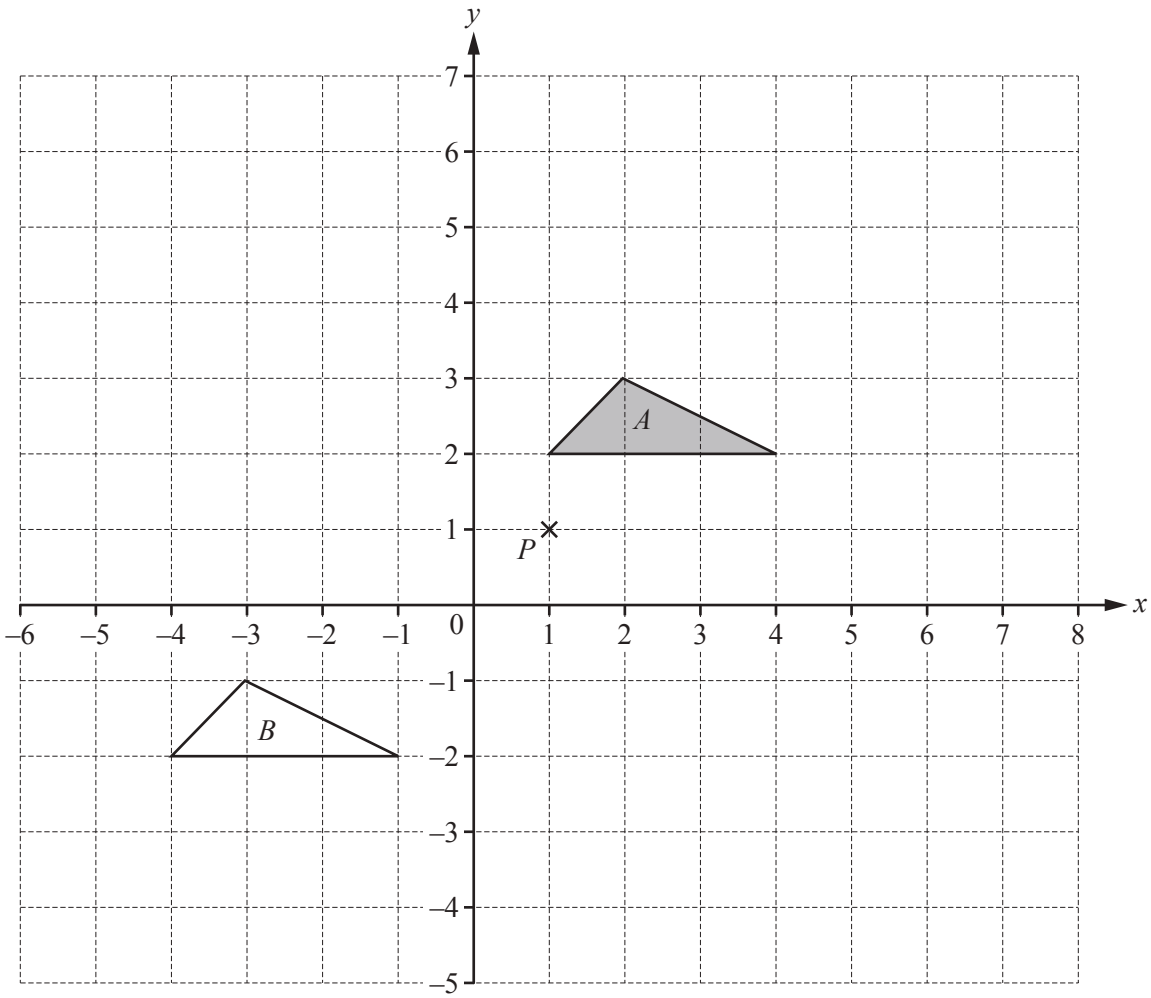
4 The diagram shows two triangles A and B and point P on a 1 cm^2 grid.



(a) Write down the mathematical name for triangle A.

..... [1]

(b) Describe fully the **single** transformation that maps triangle A onto triangle B.

.....

..... [2]

(c) Rotate triangle A by 90° clockwise about (0, 0). [2]

(d) **(i)** Work out the area of triangle A.

..... cm^2 [1]

(ii) Enlarge triangle A with scale factor 2 and centre P. [2]

(iii) Complete the statement.

The area of the enlarged triangle is ..... times the area of triangle A. [2]

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5 **(a)** A small box contains n biscuits.

(i) A medium box contains 10 more biscuits than the small box.

Write an expression, in terms of n, for the number of biscuits in the medium box.

..... [1]

(ii) A large box contains twice as many biscuits as the **medium** box.

Write an expression, in terms of n, for the number of biscuits in the large box.

..... [1]

(iii) There are 52 biscuits in the large box.

Write down an equation, in terms of n, and solve it.

$n =$ ..... [3]

(iv) Olga buys a small box and a medium box of biscuits.

How many biscuits does she have altogether?

..... [1]

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(b) In the large box, 13 of the 52 biscuits are chocolate.
Leo takes a biscuit from the box at random.

(i) Find the probability that Leo's biscuit is chocolate.
Give your answer as a fraction in its lowest terms.

..... [2]

(ii) On the probability scale, draw an arrow to show the probability that Leo's biscuit is **not** chocolate.

[1]

(c) The mass of the large box of biscuits is 450 g.

Work out the total mass of 6 large boxes of biscuits.
Give your answer in kilograms.

..... kg [2]

(d) The mass, m grams, of the small box of biscuits is 120 g, correct to the nearest 10 g.

Complete the statement about the value of m.

..... $\leqslant m <$ .....[2]

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6 **(a)** Luca records the total distance, in kilometres, he walks each day for 10 days.
Here are his results.

4.7 2.4 10.3 3.6 2.3 4.3 5.1 2.6 6.9 9.6

(i) Find the median.

..... km [2]

(ii) Find the range.

..... km [1]

(iii) Calculate the mean.

..... km [2]

(b) **(i)** On another day, Luca walks 9 km.
He starts walking at 14 20 and he walks at an average speed of 6 km/h.

Work out the time he finishes.

..... [2]

(ii) Convert 6 km/h to metres per minute.

.....m/min [2]

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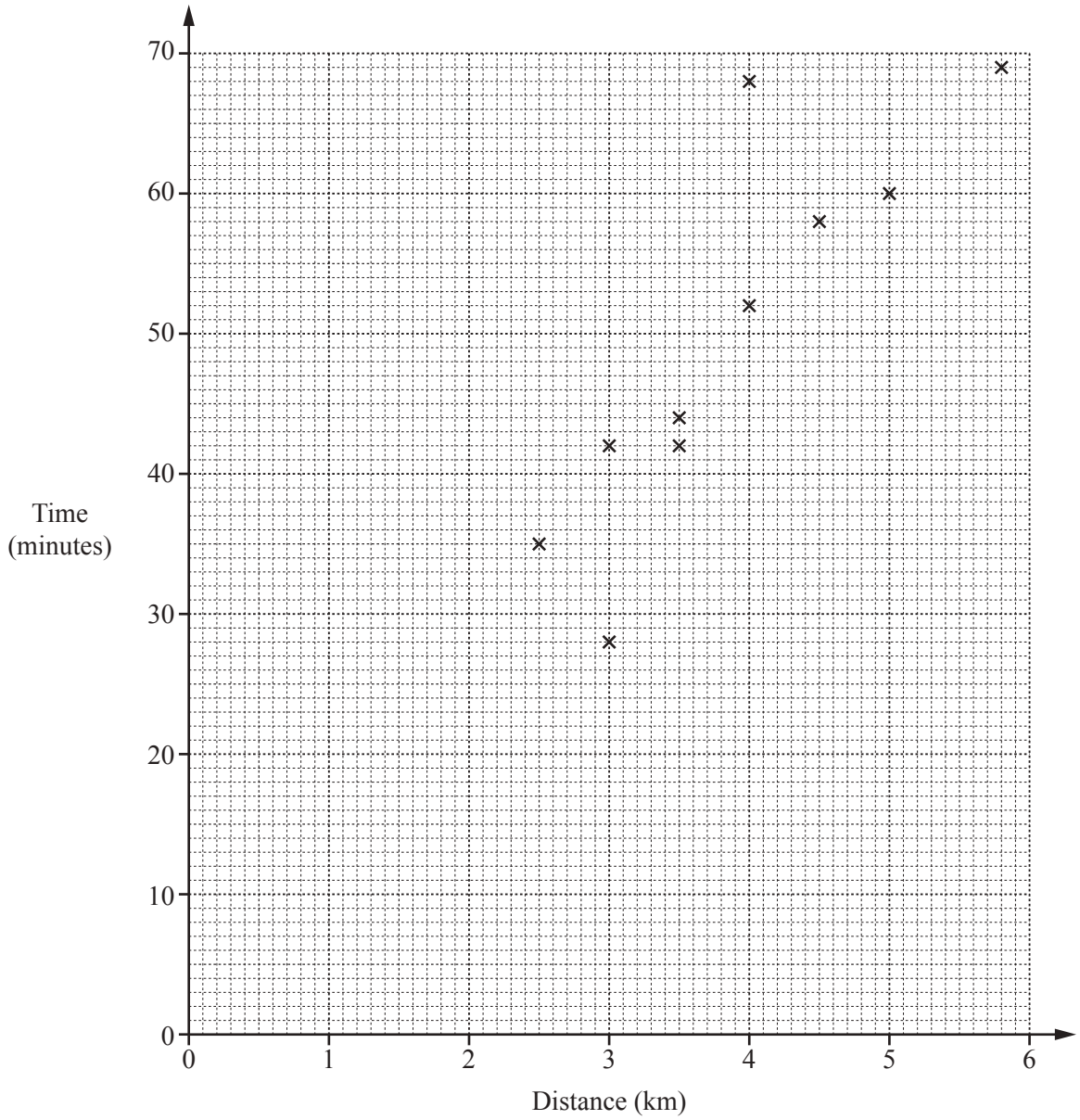
(c) For another 10 days, Luca records the distance he walks each day and the time it takes.
The scatter diagram shows this information.



(i) What type of correlation is shown on the scatter diagram?

..... [1]

(ii) On one of these days, Luca's average speed was much slower than on all of the other days.

Draw a ring around this point on the scatter diagram. [1]

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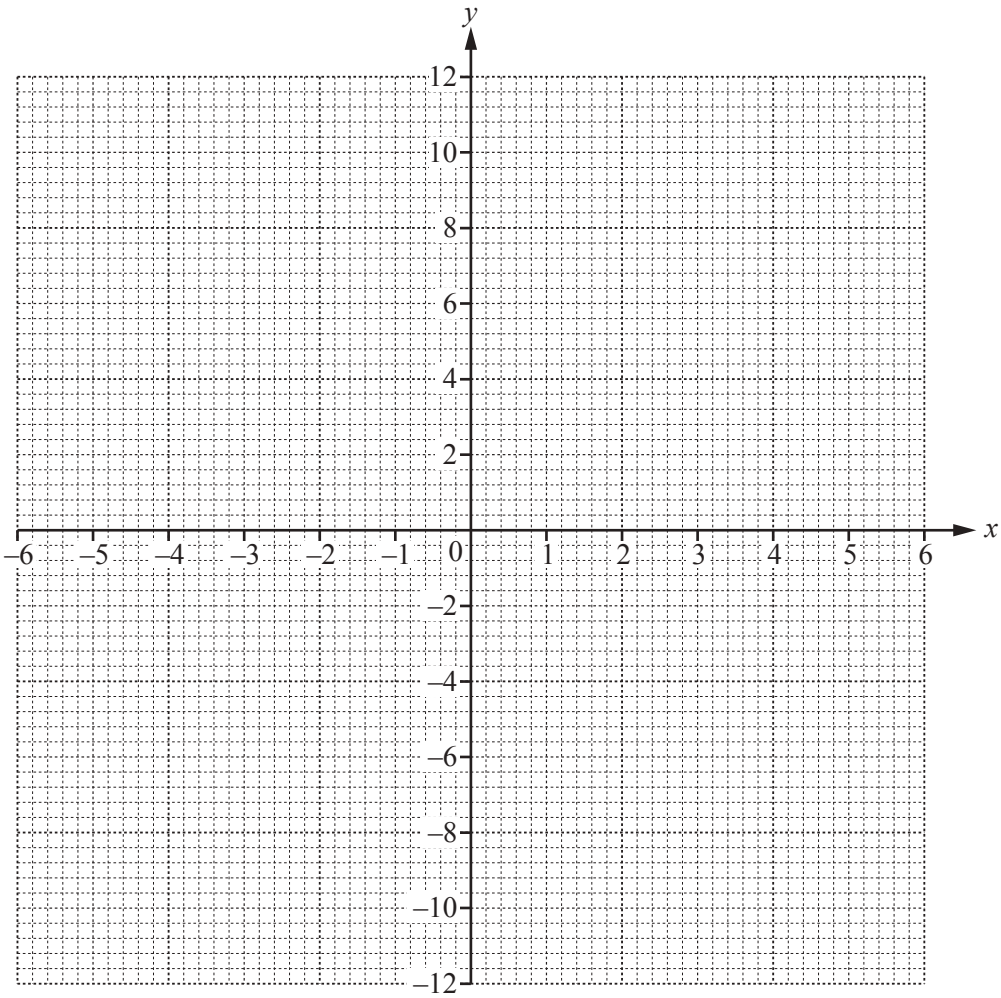
7 **(a)** **(i)** Complete the table of values for $y = \frac{12}{x}$.

x	–6	–4	–2	–1		1	2	4	6
y	–2			–12		12			2

[2]

(ii) On the grid, draw the graph of $y = \frac{12}{x}$ for $-6 \leqslant x \leqslant -1$ and $1 \leqslant x \leqslant 6$.



[4]

(iii) On the grid, draw the line $y = -5$. [1]

(iv) Use your graph to solve the equation $\frac{12}{x} = -5$.

$x =$ ..... [1]

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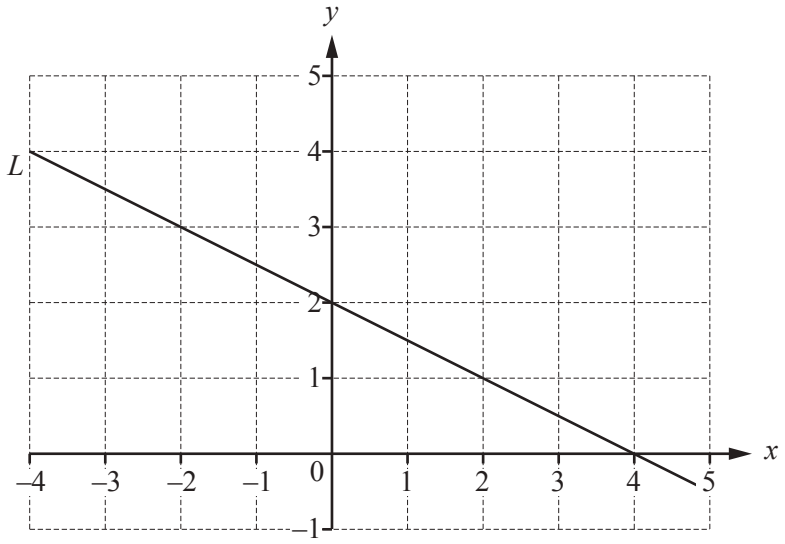
(b) Line L is drawn on the grid.



(i) Find the gradient of line L.

..... [2]

(ii) Find the equation of line L in the form $y = mx + c$.

$y =$ ..... [1]

(iii) Line M is parallel to line L.
Line M passes through the point (0, 3).

Write down the equation of line M.

$y =$ ..... [2]

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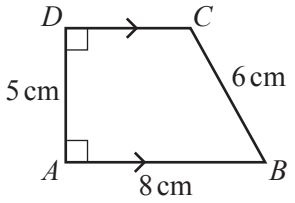
8 **(a)** The diagram shows a trapezium *ABCD*.



NOT TO SCALE

(i) Draw accurately trapezium *ABCD*.
Side *AD* has been drawn for you.

[2]

(ii) Measure the size of the obtuse angle.

..... [1]

(iii) Measure the length of *CD* in centimetres.

..... cm [1]

(iv) Calculate the area of trapezium *ABCD*.

..... cm^2 [2]

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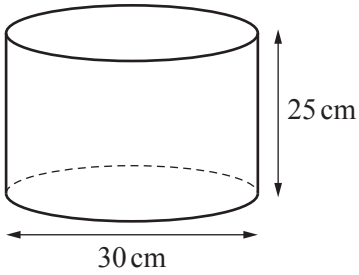
(b)



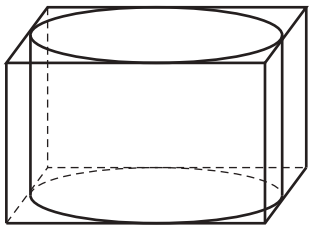
NOT TO SCALE

The diagram shows a cylinder with diameter 30 cm and height 25 cm.

(i) Calculate the volume of the cylinder.

..... cm^3 [3]

(ii) The cylinder is placed inside a cuboid.
The cylinder touches all the faces of the cuboid.



NOT TO SCALE

Calculate the surface area of the cuboid.

..... cm^2 [3]

Question 9 is printed on the next page.

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9 **(a)** Factorise.

$$y^2 + 8y$$

..... [1]

(b) Expand the brackets and simplify.

$$3(2x - 1) - 4(x - 5)$$

..... [2]

(c) Make p the subject of the formula $k = 5m + 7p$.

$p =$ ..... [2]

(d) Solve the simultaneous equations.
You must show all your working.

$$3x + 2y = 6$$
$$2x - 3y = 17$$

$x =$ .....

$y =$ ..... [4]

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CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

MATHEMATICS **0580/41**

Paper 4 (Extended) **October/November 2017**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator Geometrical instruments
Tracing paper (optional)

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Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

This document consists of **19** printed pages and **1** blank page.

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[Turn over

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1 **(a)** A library has a total of 10 494 fiction and non-fiction books.
The ratio fiction books : non-fiction books = 13 : 5.

Find the number of non-fiction books the library has.

..... [2]

(b) The library has DVDs on crime, adventure and science fiction.
The ratio crime : adventure : science fiction = 11 : 6 : 10.
The library has 384 **more** science fiction DVDs than adventure DVDs.

Calculate the number of crime DVDs the library has.

..... [2]

(c) Every Monday, Sima travels by car to the library.
The distance is 20 km and the journey takes 23 minutes.

(i) Calculate the average speed for the journey in kilometres per hour.

..... km/h [2]

(ii) One Monday, she is delayed and her average speed is reduced to 32 km/h.

Calculate the percentage increase in the journey time.

..... % [5]

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(d) In Spain, the price of a book is 11.99 euros.
In the USA, the price of the same book is $12.99 .
The exchange rate is $1 = 0.9276 euros.

Calculate the difference between these prices.
Give your answer in dollars, correct to the nearest cent.

$..... [3]

(e) 7605 books were borrowed from the library in 2016.
This was 22% less than in 2015.

Calculate the number of books borrowed in 2015.

..... [3]

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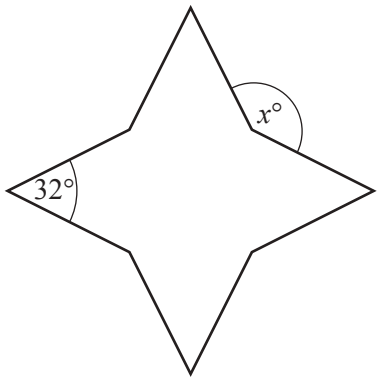
2 **(a)**



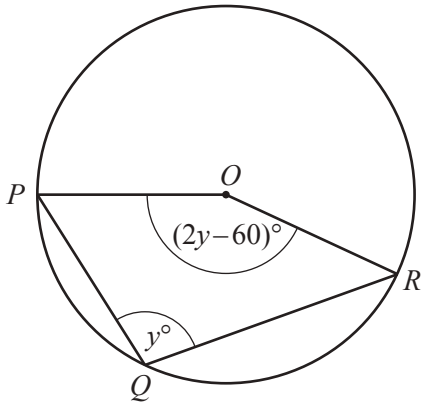
NOT TO SCALE

The diagram shows an octagon.
All of the sides are the same length.
Four of the interior angles are each 32°.
The other four interior angles are equal.

Find the value of x.

x = ... [4]

(b)



NOT TO SCALE

P, Q and R lie on a circle, centre O.
Angle $PQR = y°$ and angle $POR = (2y - 60)°$.

Find the value of y.

y = ... [3]

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3 **(a)** Solve.

$$11x + 15 = 3x - 7$$

$x =$ ..... [2]

(b) **(i)** Factorise.

$$x^2 + 9x - 22$$

..... [2]

(ii) Solve.

$$x^2 + 9x - 22 = 0$$

$x =$ ..... or $x =$ ..... [1]

(c) Rearrange $y = \dfrac{2(x-a)}{x}$ to make x the subject.

$x =$ ..... [4]

(d) Simplify. $\dfrac{x^2 - 6x}{x^2 - 36}$

..... [3]

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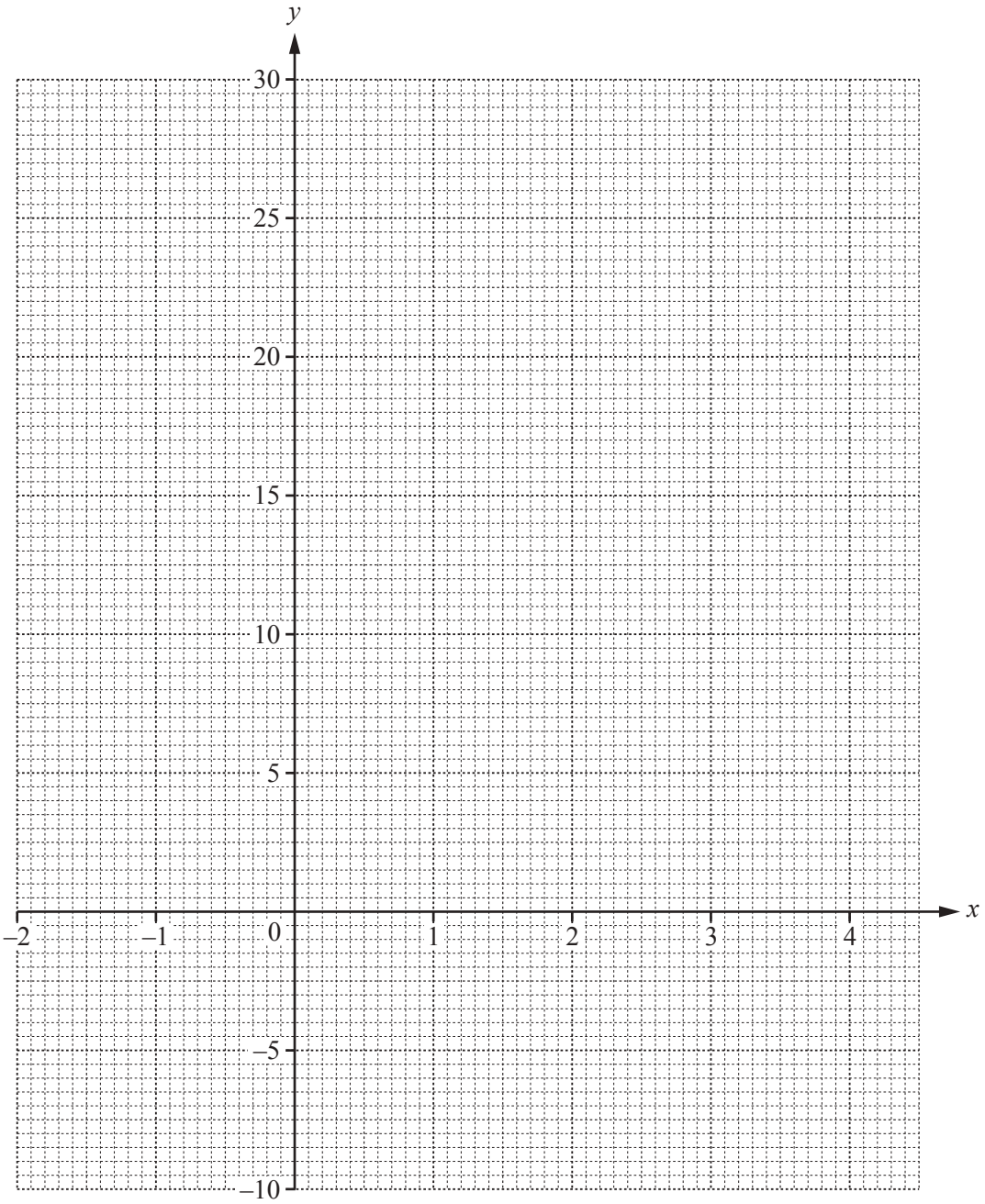
4 $f(x) = x^3 - 4x^2 + 15$

(a) Complete the table of values for $y = f(x)$.

x	–2	–1	–0.5	0	1	2	2.5	3	3.5	4	4.5
y	–9		13.9	15	12		5.6	6	8.9	15	25.1

[2]

(b) On the grid, draw the graph of $y = f(x)$ for $-2 \leqslant x \leqslant 4.5$.



[4]

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(c) Use your graph to solve the equation $f(x) = 0$.

$x =$ ..... [1]

(d) By drawing a suitable tangent, estimate the gradient of the graph of $y = f(x)$ when $x = 3.5$.

..... [3]

(e) By drawing a suitable straight line on the grid, solve the equation $x^3 - 4x^2 - 2x + 5 = 0$.

$x =$ ..... or $x =$ ..... or $x =$ ..... [4]

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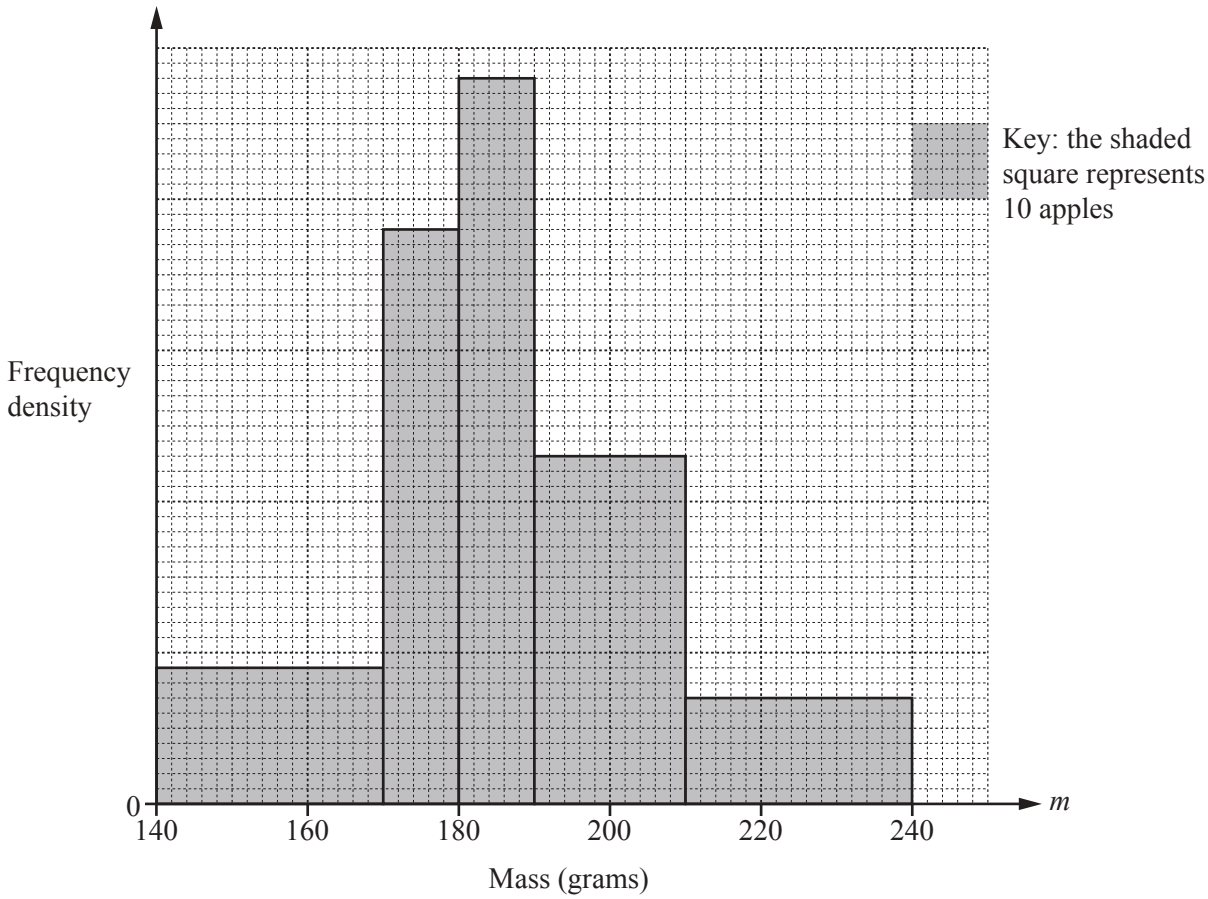
5 The histogram shows the distribution of the masses, m grams, of 360 apples.



(a) Use the histogram to complete the frequency table.

Mass (m grams)	Number of apples
$140 < m \leqslant 170$	
$170 < m \leqslant 180$	
$180 < m \leqslant 190$	
$190 < m \leqslant 210$	92
$210 < m \leqslant 240$	42

[3]

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(b) Calculate an estimate of the mean mass of the 360 apples.

..... g [4]

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6

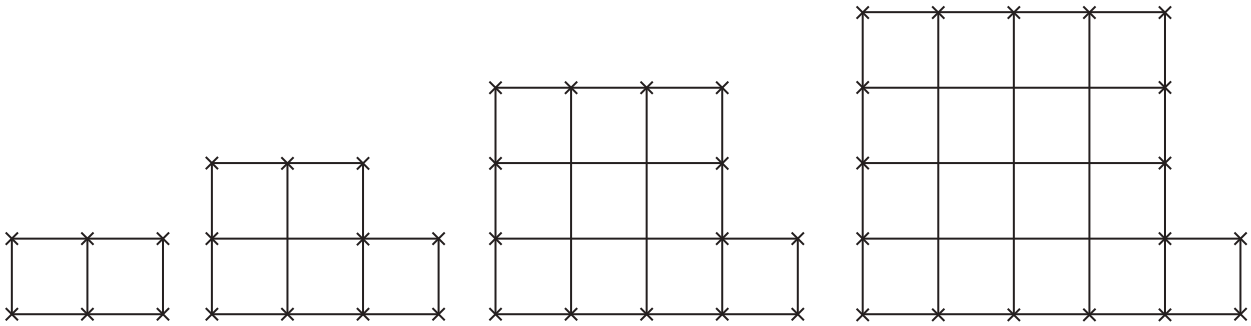

Diagram 1 Diagram 2 Diagram 3 Diagram 4

These are the first four diagrams in a sequence.
Each diagram is made from small squares and crosses.

(a) Complete the table.

Diagram	1	2	3	4	5		n
Number of crosses	6	10	14				
Number of small squares	2	5	10				

[6]

(b) Find the number of crosses in Diagram 60.

..... [1]

(c) Which diagram has 226 squares?

Diagram ..... [1]

(d) The side of each small square has length 1 cm.
The number of lines of length 1 cm in Diagram n is $2n^2 + 2n + q$.

Find the value of q.

q = ... [2]

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7 $f(x) = 3 - 2x$ $g(x) = \frac{4}{x},\ x \neq 0$ $h(x) = 4^x$

(a) Find f(5).

..... [1]

(b) Find gh(3).

..... [2]

(c) Find $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [2]

(d) Show that $hf(x) = \frac{64}{16^x}$.

[3]

(e) Find the value of x when $h(x) = g(0.5)$.

$x =$ ..... [2]

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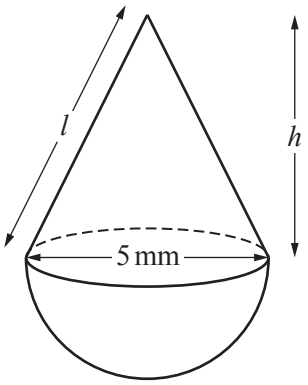
8



NOT TO SCALE

The diagram shows a solid made from a hemisphere and a cone.
The base diameter of the cone and the diameter of the hemisphere are each 5 mm.

(a) The total surface area of the solid is $\frac{115\pi}{4}$ mm^2.

Show that the slant height, l, is 6.5 mm.

[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi rl$.]
[The surface area, A, of a sphere with radius r is $A = 4\pi r^2$.]

[4]

(b) Calculate the height, h, of the cone.

h = ... mm [3]

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(c) Calculate the volume of the solid.

[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

.....mm^3 [4]

(d) The solid is made from gold.
1 **cubic centimetre** of gold has a mass of 19.3 grams.
The value of 1 gram of gold is \$38.62 .

Calculate the value of the gold used to make the solid.

\$..... [3]

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9 **(a)** A bag contains red beads and green beads.
There are 80 beads altogether.
The probability that a bead chosen at random is green is 0.35 .

(i) Find the number of red beads in the bag.

..... [2]

(ii) Marcos chooses a bead at random and replaces it in the bag.
He does this 240 times.

Find the number of times he would expect to choose a green bead.

..... [1]

(b) A different bag contains 2 blue marbles, 3 yellow marbles and 4 white marbles.
Huma chooses a marble at random, notes the colour, then replaces it in the bag.
She does this three times.

Find the probability that

(i) all three marbles are yellow,

..... [2]

(ii) all three marbles are different colours.

..... [3]

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(c) Another bag contains 2 green counters and 3 pink counters.
Teresa chooses three counters at random **without** replacement.

Find the probability that she chooses more pink counters than green counters.

..... [4]

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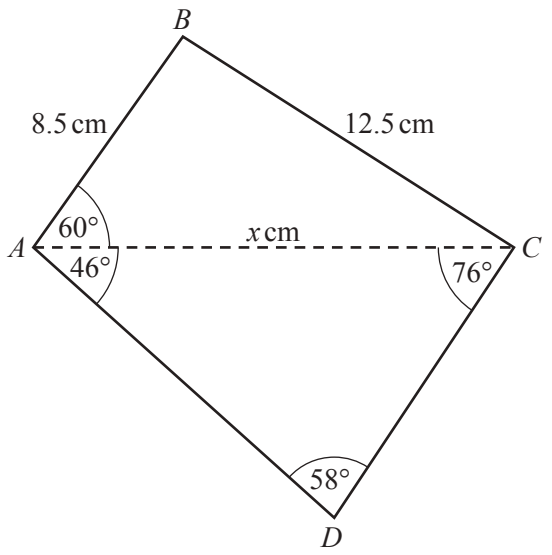
10



NOT TO SCALE

The diagram shows a quadrilateral $ABCD$.

(a) The length of AC is x cm.

Use the cosine rule in triangle ABC to show that $2x^2 - 17x - 168 = 0$.

[4]

(b) Solve the equation $2x^2 - 17x - 168 = 0$.
Show all your working and give your answers correct to 2 decimal places.

x = ... or x = ... [4]

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(c) Use the sine rule to calculate the length of *CD*.

CD = ... cm [3]

(d) Calculate the area of the quadrilateral *ABCD*.

..... cm^2 [3]

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11 **(a)** $\mathbf{A} = \begin{pmatrix} 2 & -3 \\ 1 & 4 \end{pmatrix}$

Find

(i) $\mathbf{A}^2$,

$\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [2]

(ii) $\mathbf{A}^{-1}$, the inverse of $\mathbf{A}$.

$\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [2]

(b) Describe fully the **single** transformation represented by the matrix $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$.

.....

..... [2]

(c) Find the matrix that represents a clockwise rotation of 90º about the origin.

$\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [2]

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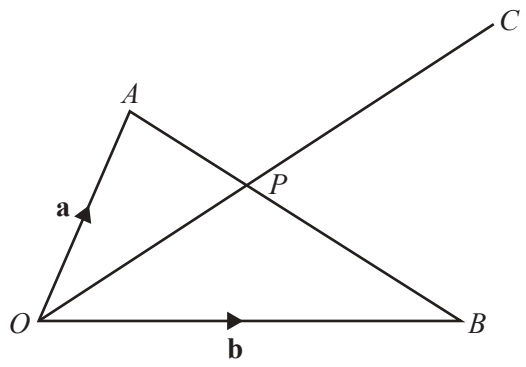
(d)



NOT TO SCALE

In the diagram, O is the origin and P lies on AB such that $AP : PB = 3 : 4$.
$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.

(i) Find $\overrightarrow{OP}$, in terms of **a** and **b**, in its simplest form.

$\overrightarrow{OP}$ = ... [3]

(ii) The line OP is extended to C such that $\overrightarrow{OC} = m\overrightarrow{OP}$ and $\overrightarrow{BC} = k\mathbf{a}$.

Find the value of m and the value of k.

m = ...

k = ... [2]

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CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

MATHEMATICS **0580/42**

Paper 4 (Extended) **October/November 2017**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

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For π, use either your calculator value or 3.142.

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The total of the marks for this paper is 130.

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[Turn over

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1 **(a)** Alex has \$20 and Bobbie has \$25.

(i) Write down the ratio Alex's money : Bobbie's money in its simplest form.

..... : ..... [1]

(ii) Alex and Bobbie each spend $\frac{1}{5}$ of their money.

Find the ratio Alex's remaining money : Bobbie's remaining money in its simplest form.

..... : ..... [1]

(iii) Alex and Bobbie **then** each spend \$4.

Find the new ratio Alex's remaining money : Bobbie's remaining money in its simplest form.

..... : ..... [2]

(b) **(i)** The population of a town in the year 1990 was 15 600.
The population is now 11 420.

Calculate the percentage decrease in the population.

.....% [3]

(ii) The population of 15 600 was 2.5% less than the population in the year 1980.

Calculate the population in the year 1980.

..... [3]

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(c) Chris invests \$200 at a rate of x% per year simple interest.
At the end of 15 years the total interest received is \$48.

Find the value of x.

x = ... [2]

(d) Dani invests \$200 at a rate of y% per year compound interest.
At the end of 10 years the value of her investment is \$256.

Calculate the value of y, correct to 1 decimal place.

y = ... [3]

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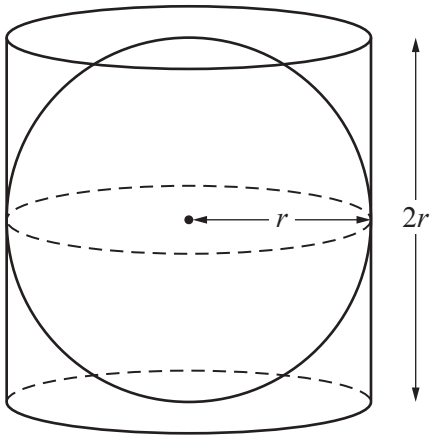
2 **(a)**



NOT TO SCALE

A sphere of radius r is inside a closed cylinder of radius r and height $2r$.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

(i) When $r = 8$ cm, calculate the volume inside the cylinder which is **not** occupied by the sphere.

..... cm^3 [3]

(ii) Find r when the volume inside the cylinder **not** occupied by the sphere is $36\,cm^3$.

$r =$ ..... cm [3]

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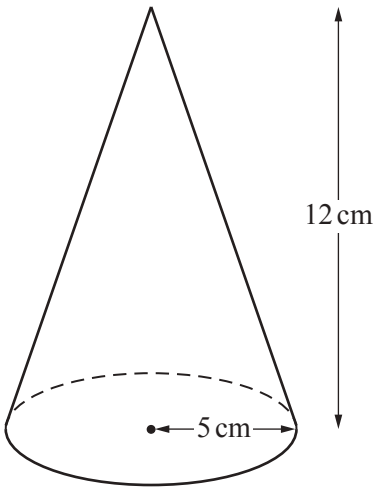
(b)



NOT TO SCALE

The diagram shows a solid cone with radius 5 cm and perpendicular height 12 cm.

(i) The **total** surface area is painted at a cost of \$0.015 per cm^2.

Calculate the cost of painting the cone.

[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi r l$.]

\$ ..... [4]

(ii) The cone is made of metal and is melted down and made into smaller solid cones with radius 1.25 cm and perpendicular height 3 cm.

Calculate the number of smaller cones that can be made.

..... [3]

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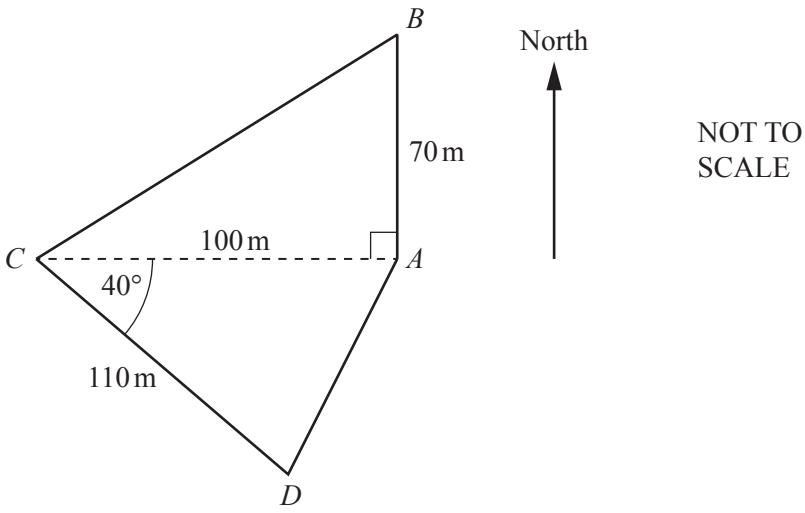

The diagram shows a field *ABCD*.

(a) Calculate the area of the field *ABCD*.

.....m^2 [3]

(b) Calculate the perimeter of the field *ABCD*.

.....m [5]

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(c) Calculate the shortest distance from A to CD.

..... m [2]

(d) B is due north of A.

Find the bearing of C from B.

..... [3]

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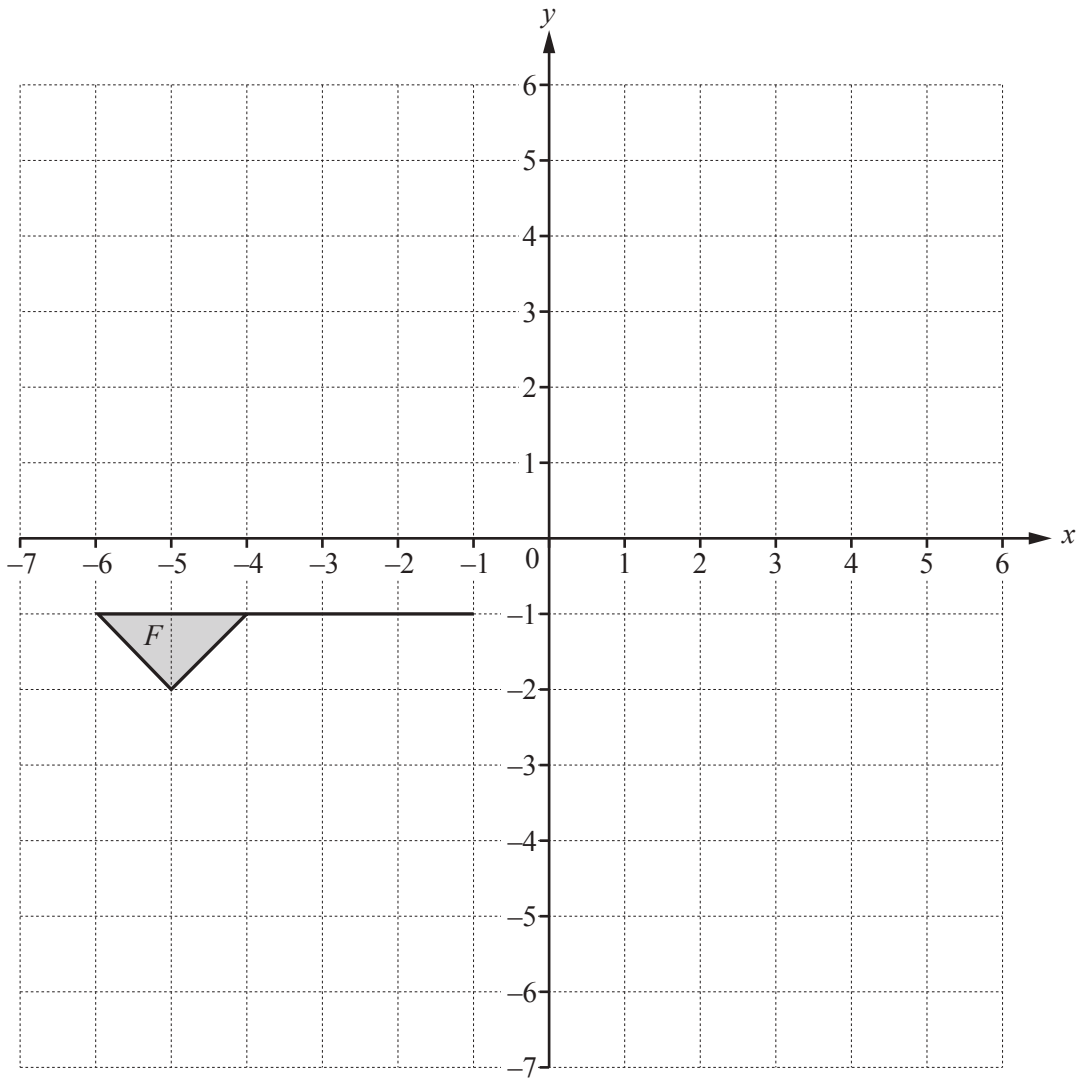
4 **(a)**



Draw the image of

(i) flag F after translation by the vector $\begin{pmatrix} 6 \\ -2 \end{pmatrix}$, [2]

(ii) flag F after rotation through 180° about (– 2, 0), [2]

(iii) flag F after reflection in the line $y = x$. [2]

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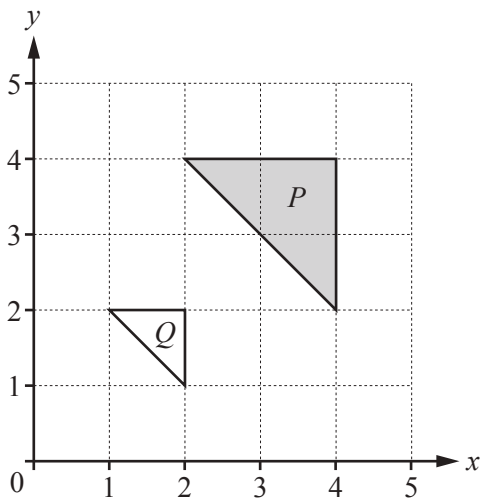
(b)



(i) Describe fully the **single** transformation that maps triangle P onto triangle Q.

.....

..... [3]

(ii) Find the matrix that represents this transformation.

$\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(c) The point A is translated to the point B by the vector $\begin{pmatrix} 4u \\ 3u \end{pmatrix}$.

$|\overrightarrow{AB}| = 12.5$

Find u.

$u =$ ..... [3]

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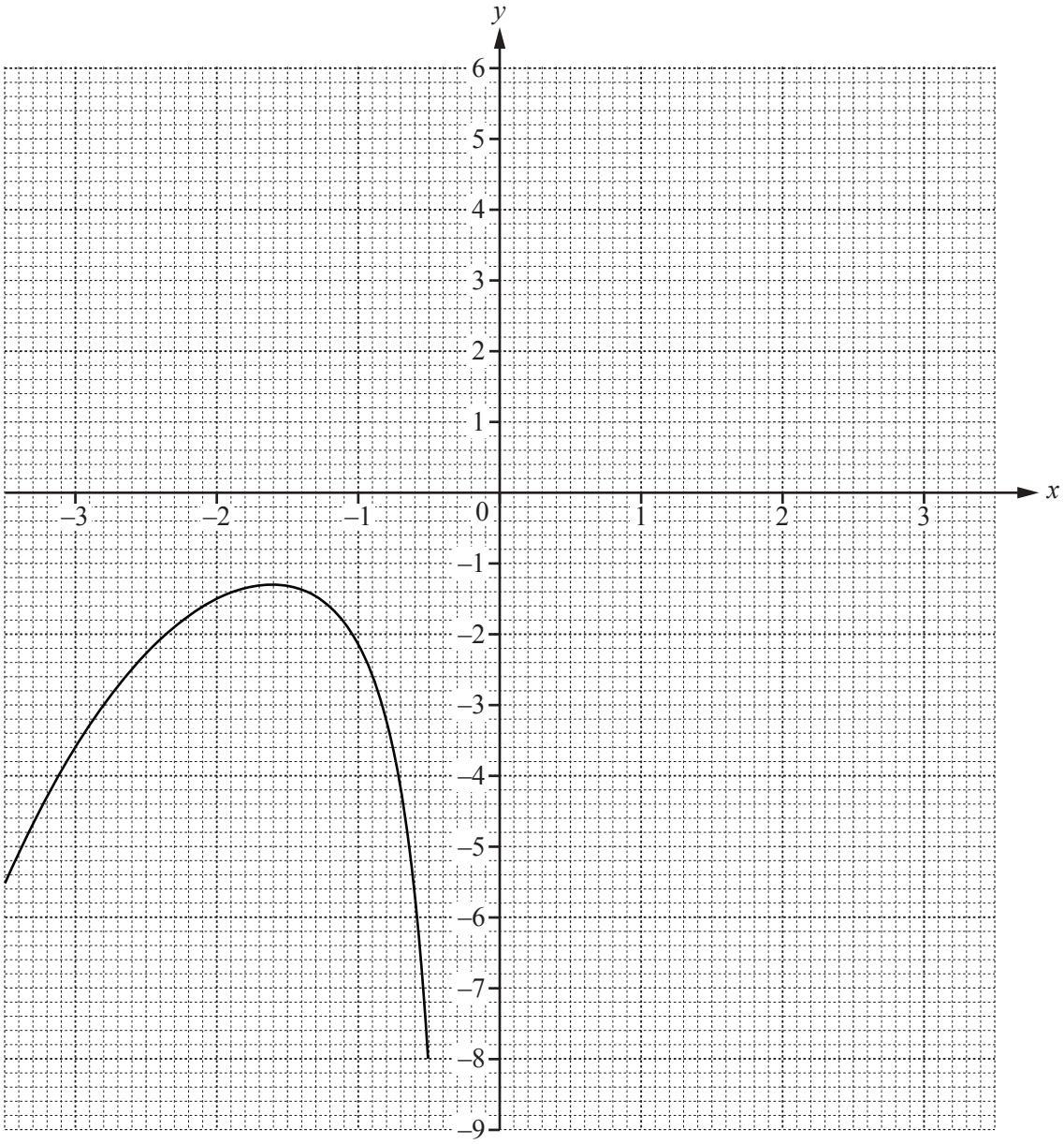
5 $y = \frac{x^3}{8} - \frac{2}{x^2}$, $x \neq 0$

(a) Complete the table of values.

x	0.5	1	1.5	2	2.5	3	3.5
y	−8.0	−1.9	−0.5	0.5	1.6		

[2]

(b)



The graph of $y = \frac{x^3}{8} - \frac{2}{x^2}$ for $-3.5 \leqslant x \leqslant -0.5$ has already been drawn.

On the grid, draw the graph of $y = \frac{x^3}{8} - \frac{2}{x^2}$ for $0.5 \leqslant x \leqslant 3.5$. [4]

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(c) Use your graph to solve the equation $\frac{x^3}{8} - \frac{2}{x^2} = 0$.

$x =$ ..... [1]

(d) $\frac{x^3}{8} - \frac{2}{x^2} = k$ and k is an integer.

Write down a value of k when the equation $\frac{x^3}{8} - \frac{2}{x^2} = k$ has

(i) one answer, $k =$ ..... [1]

(ii) three answers. $k =$ ..... [1]

(e) By drawing a suitable tangent, estimate the gradient of the curve where $x = -3$.

..... [3]

(f) **(i)** By drawing a suitable line on the grid, find x when $\frac{x^3}{8} - \frac{2}{x^2} = 6 - x$.

$x =$ ..... [3]

(ii) The equation $\frac{x^3}{8} - \frac{2}{x^2} = 6 - x$ can be written as $x^5 + ax^3 + bx^2 + c = 0$.

Find the values of a, b and c.

$a =$ .....

$b =$ .....

$c =$ ..... [4]

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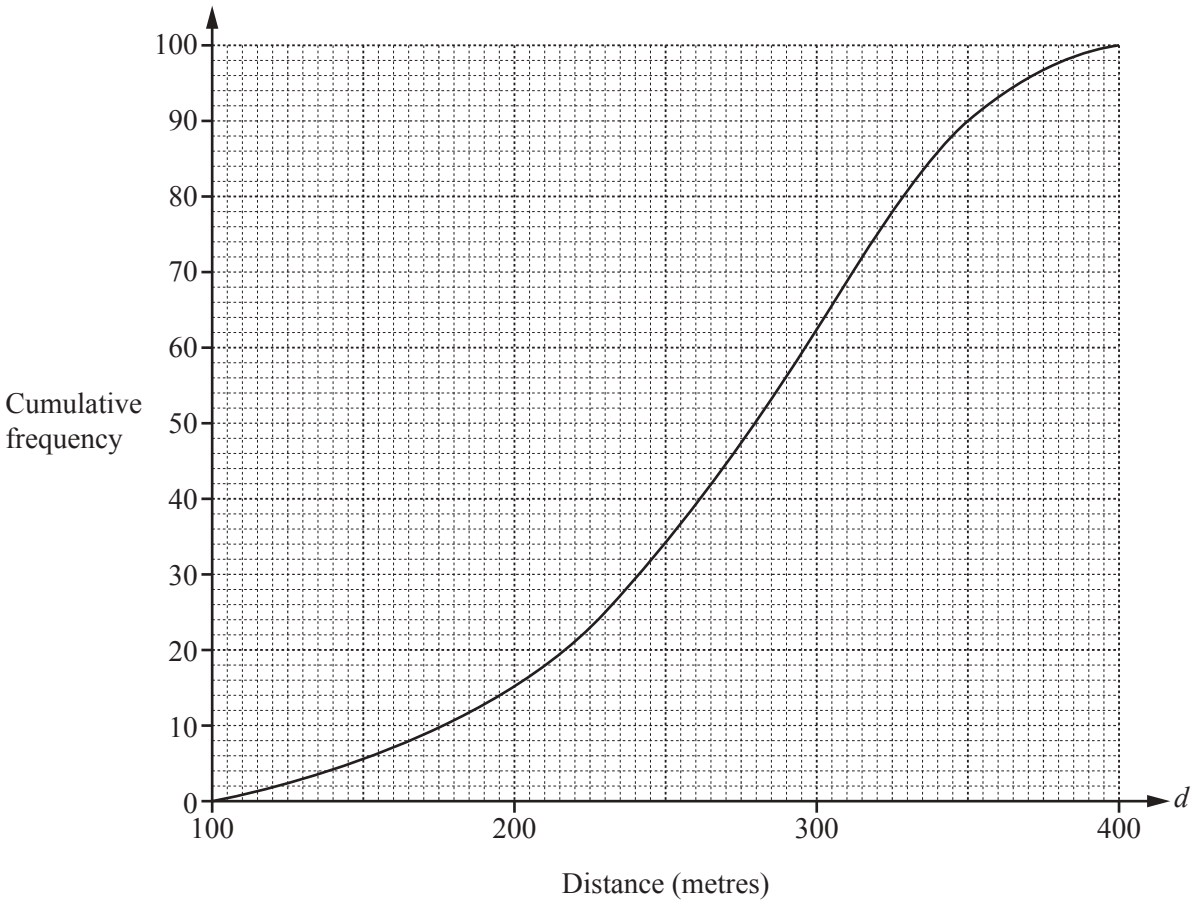
6 **(a)** There are 100 students in group *A*.
The teacher records the distance, *d* metres, each student runs in one minute.
The results are shown in the cumulative frequency diagram.



Find

(i) the median,

..... m [1]

(ii) the upper quartile,

..... m [1]

(iii) the inter-quartile range,

..... m [1]

(iv) the number of students who run more than 350 m.

..... [2]

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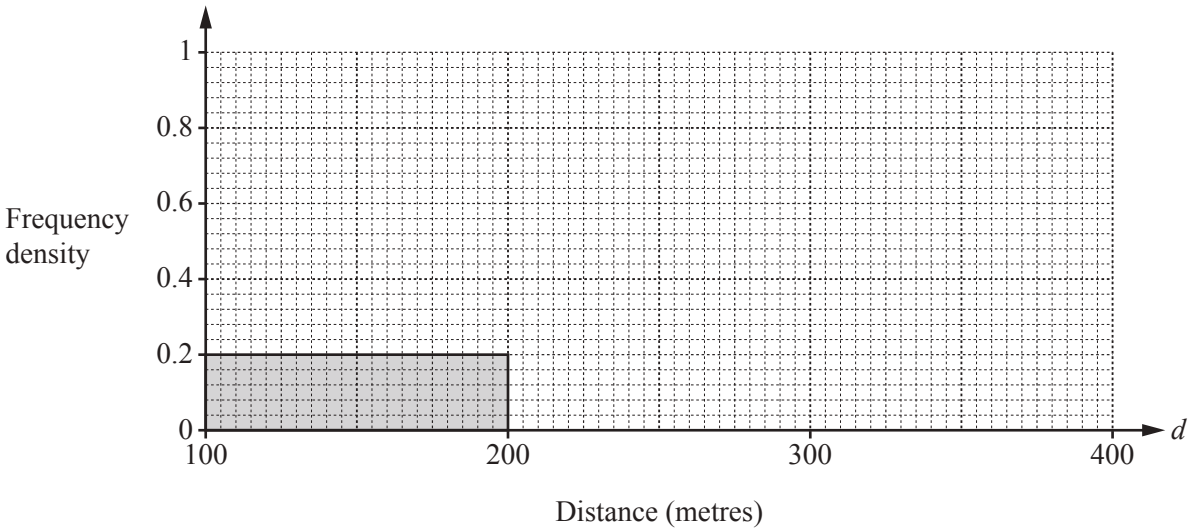
(b) There are 100 students in group B.
The teacher records the distance, d metres, each of these students runs in one minute.
The results are shown in the frequency table.

Distance (d metres)	$100 < d \leqslant 200$	$200 < d \leqslant 250$	$250 < d \leqslant 280$	$280 < d \leqslant 320$	$320 < d \leqslant 400$
Number of students	20	22	30	16	12

(i) Calculate an estimate of the mean distance for group B.

..... m [4]

(ii) Complete the histogram to show the information in the frequency table.



[4]

(c) For the 100 students in group B, the median is 258 m.

Complete the statement.

On average, the students in group A run ..... than the students in group B. [1]

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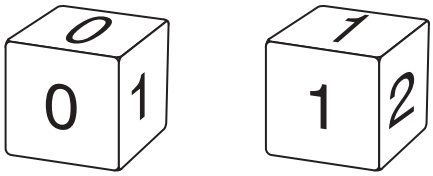
7



A *B*

The diagram shows two fair dice.
The numbers on dice *A* are 0, 0, 1, 1, 1, 3.
The numbers on dice *B* are 1, 1, 2, 2, 2, 3.
When a dice is rolled, the score is the number on the top face.

(a) Dice *A* is rolled once.

Find the probability that the score is not 3.

..... [1]

(b) Dice *A* is rolled twice.

Find the probability that the score is 0 both times.

..... [2]

(c) Dice *A* is rolled 60 times.

Calculate an estimate of the number of times the score is 0.

..... [1]

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(d) Dice *A* and dice *B* are each rolled once.
The product of the scores is recorded.

(i) Complete the possibility diagram.

Dice *B*						
3	0	0				
2	0	0				
2	0	0				
2	0	0				
1	0	0				
1	0	0	1	1	1	3
	0	0	1	1	1	3

Dice *A*

[2]

(ii) Find the probability that the product of the scores is

(a) 2,

..... [1]

(b) greater than 3.

..... [1]

(e) Eva keeps rolling dice *B* until 1 is scored.

Find the probability that this happens on the 5th roll.

..... [2]

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8 **(a)** The cost of 1 apple is a cents.
The cost of 1 pear is p cents.
The total cost of 7 apples and 9 pears is 354 cents.

(i) Write down an equation in terms of a and p.

..... [1]

(ii) The cost of 1 pear is 2 cents more than the cost of 1 apple.

Find the value of a and the value of p.

$a =$ .....

$p =$ ..... [3]

(b) Rowena walks 2 km at an average speed of x km/h.

(i) Write down an expression, in terms of x, for the time taken.

..... h [1]

(ii) Rowena then walks 3 km at an average speed of $(x - 1)$ km/h.
The total time taken to walk the 5 km is 2 hours.

(a) Show that $2x^2 - 7x + 2 = 0$.

[3]

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(b) Find the value of x.
Show all your working and give your answer correct to 2 decimal places.

$x =$ ..... [4]

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9 $f(x) = 1 - 2x$ $g(x) = x + 4$ $h(x) = x^2 + 1$

(a) Find $f(-1)$.

..... [1]

(b) Solve the equation.

$$2f(x) = g(x)$$

$x =$ ..... [2]

(c) Find $fg(x)$.
Give your answer in its simplest form.

..... [2]

(d) Find hh(2).

..... [2]

(e) Find $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [2]

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(f) $\text{hgf}(x) = 4x^2 + px + q$

Find the value of p and the value of q.

$p =$ .....

$q =$ ..... [4]

Question 10 is printed on the next page.

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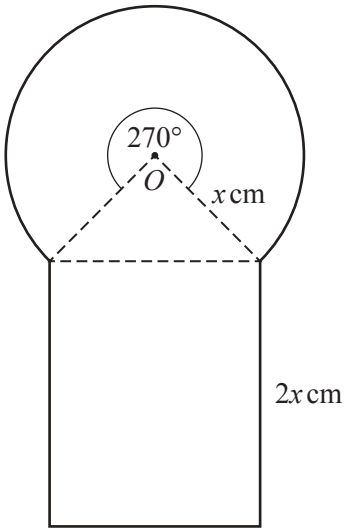
10



NOT TO SCALE

The diagram shows a sector of a circle, a triangle and a rectangle.
The sector has centre O, radius x cm and angle 270°.
The rectangle has length $2x$ cm.

The total area of the shape is kx^2 cm^2.

(a) Find the value of k.

$k =$ ..... [5]

(b) Find the value of x when the total area is 110 cm^2.

$x =$ ..... [2]

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CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

MATHEMATICS **0580/43**

Paper 4 (Extended) **October/November 2017**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

This document consists of **16** printed pages.

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[Turn over

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1 **(a)** The angles of a triangle are in the ratio 2 : 3 : 5.

(i) Show that the triangle is right-angled.

[1]

(ii) The length of the hypotenuse of the triangle is 12 cm.

Use trigonometry to calculate the length of the shortest side of this triangle.

..... cm [3]

(b) The sides of a different right-angled triangle are in the ratio 3 : 4 : 5.

(i) The length of the shortest side is 7.8 cm.

Calculate the length of the longest side.

..... cm [2]

(ii) Calculate the smallest angle in this triangle.

..... [3]

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2 **(a)** Solve.

$$\frac{x}{7} = 49$$

$x =$ ..... [1]

(b) Simplify.

(i) x^0

..... [1]

(ii) $x^7 \times x^3$

..... [1]

(iii) $\dfrac{(3x^6)^2}{x^{-4}}$

..... [2]

(c) **(i)** Factorise completely.

$$2x^2 - 18$$

..... [2]

(ii) Simplify.

$$\frac{2x^2 - 18}{x^2 + 7x - 30}$$

..... [3]

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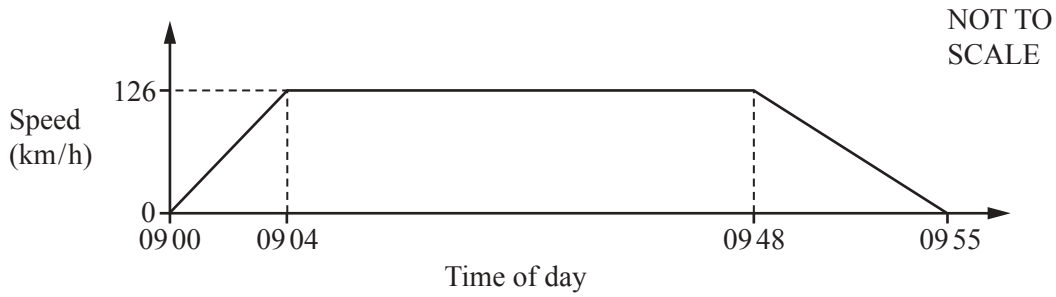
3 The graph shows information about the journey of a train between two stations.



(a) **(i)** Work out the acceleration of the train during the first 4 minutes of this journey.
Give your answer in km/h^2.

..... km/h^2 [2]

(ii) Calculate the distance, in kilometres, between the two stations.

..... km [4]

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(b) **(i)** Show that 126 km/h is the same speed as 35 m/s.

[1]

(ii) The train has a total length of 220 m.
At 09 30, the train crossed a bridge of length 1400 m.

Calculate the time, in seconds, that the train took to completely cross the bridge.

.....s [3]

(c) On a different journey, the train took 73 minutes, correct to the nearest minute, to travel 215 km, correct to the nearest 5 km.

Calculate the upper bound of the average speed of the train for this journey.
Give your answer in km/h.

.....km/h [4]

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4 The table shows information about the time, t minutes, taken for each of 150 girls to complete an essay.

Time (t minutes)	$60 < t \leqslant 65$	$65 < t \leqslant 70$	$70 < t \leqslant 80$	$80 < t \leqslant 100$	$100 < t \leqslant 150$
Frequency	10	26	34	58	22

(a) Write down the interval that contains the median time.

..... $< t \leqslant$ ..... [1]

(b) Calculate an estimate of the mean time.

..... min [4]

(c) Rafay looks at the frequency table.

(i) He says that it is not possible to work out the range of the times.

Explain why he is correct.

.....

..... [1]

(ii) He draws a pie chart to show this information.

Calculate the sector angle for the interval $65 < t \leqslant 70$ minutes.

..... [2]

(d) A girl is chosen at random.

Work out the probability that she took more than 100 minutes to complete the essay.

..... [1]

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(e) Two girls are chosen at random.

Work out the probability that, to complete the essay,

(i) they both took 65 minutes or less,

..... [2]

(ii) one took 65 minutes or less and the other took more than 100 minutes.

..... [3]

(f) The information in the frequency table is shown in a histogram.
The height of the block for the $60 < t \leqslant 65$ interval is 5 cm.

Complete the table.

Time (t minutes)	$60 < t \leqslant 65$	$65 < t \leqslant 70$	$70 < t \leqslant 80$	$80 < t \leqslant 100$	$100 < t \leqslant 150$
Height of block (cm)	5				

[3]

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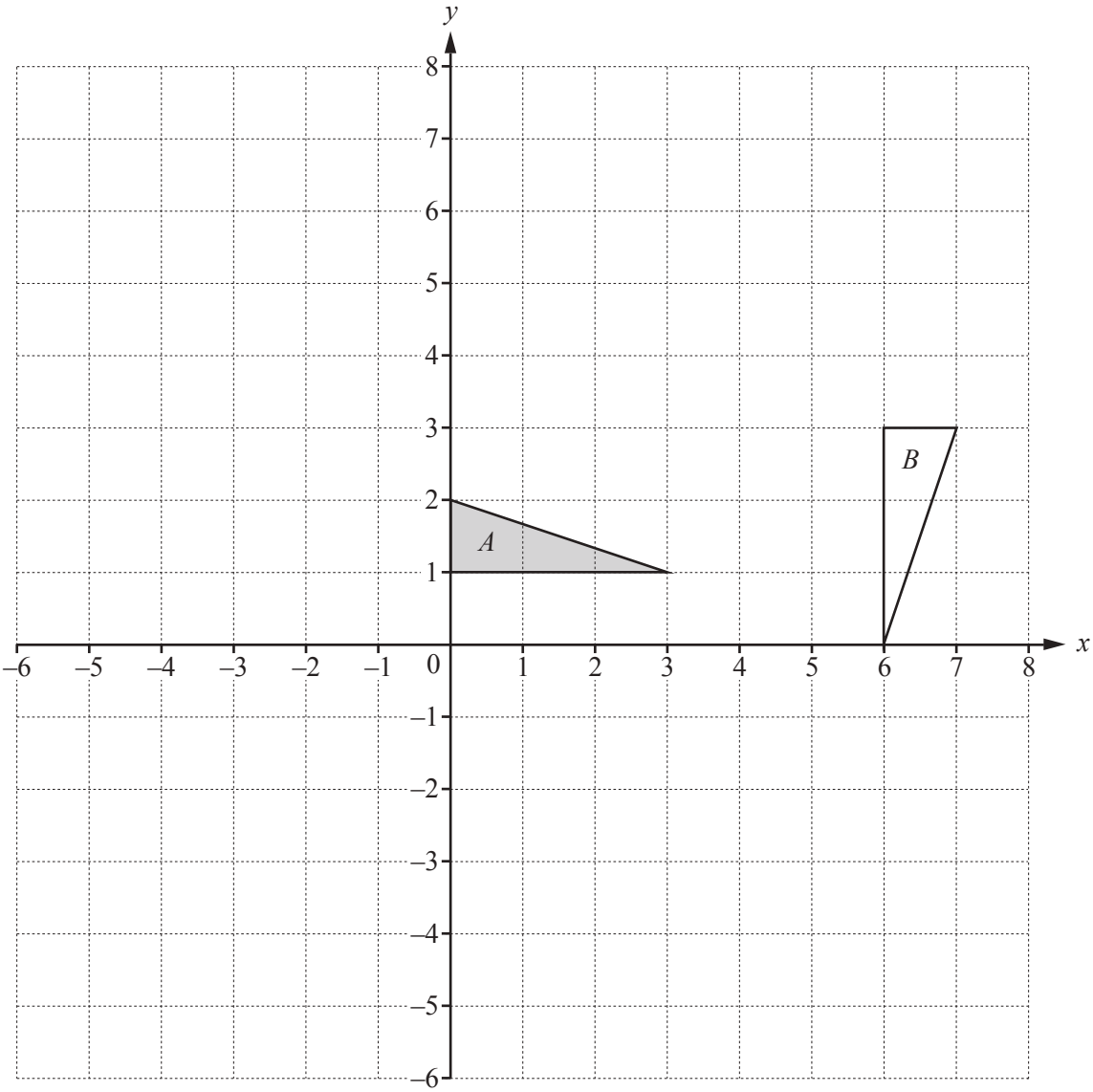
5



(a) Draw the image of

(i) triangle A after a reflection in the line $x = 0$, [2]

(ii) triangle A after an enlargement, scale factor 2, centre (0, 4), [2]

(iii) triangle A after a translation by the vector $\begin{pmatrix} -5 \\ 3 \end{pmatrix}$. [2]

(b) Describe fully the **single** transformation that maps triangle A onto triangle B.

.....

..... [3]

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(c) $\mathbf{T} = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$ $\mathbf{U} = \begin{pmatrix} 3 & 1 \\ 0 & 2 \end{pmatrix}$

Point P has co-ordinates $(1, -4)$.

(i) Find $\mathbf{T}(P)$.

(....., ...) [2]

(ii) Find $\mathbf{TU}(P)$.

(....., ...) [2]

(iii) Describe the **single** transformation represented by the matrix **T**.

.....

..... [3]

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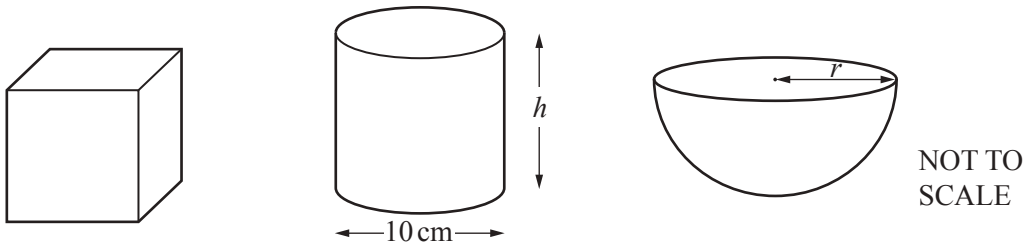
6 **(a)**



The diagrams show a cube, a cylinder and a hemisphere.
The volume of each of these solids is $2000\,\text{cm}^3$.

(i) Work out the height, h, of the cylinder.

$h =$ ..... cm [2]

(ii) Work out the radius, r, of the hemisphere.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

$r =$ ..... cm [3]

(iii) Work out the surface area of the cube.

.....cm^2 [3]

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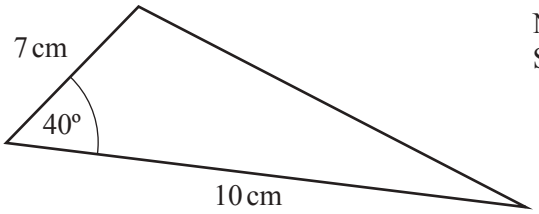
(b)



NOT TO SCALE

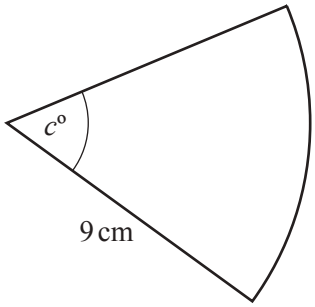
(i) Calculate the area of the triangle.

.....cm^2 [2]

(ii) Calculate the perimeter of the triangle and show that it is 23.5 cm, correct to 1 decimal place. Show all your working.

[5]

(c)



NOT TO SCALE

The perimeter of this sector of a circle is 28.2 cm.

Calculate the value of c.

c = ... [3]

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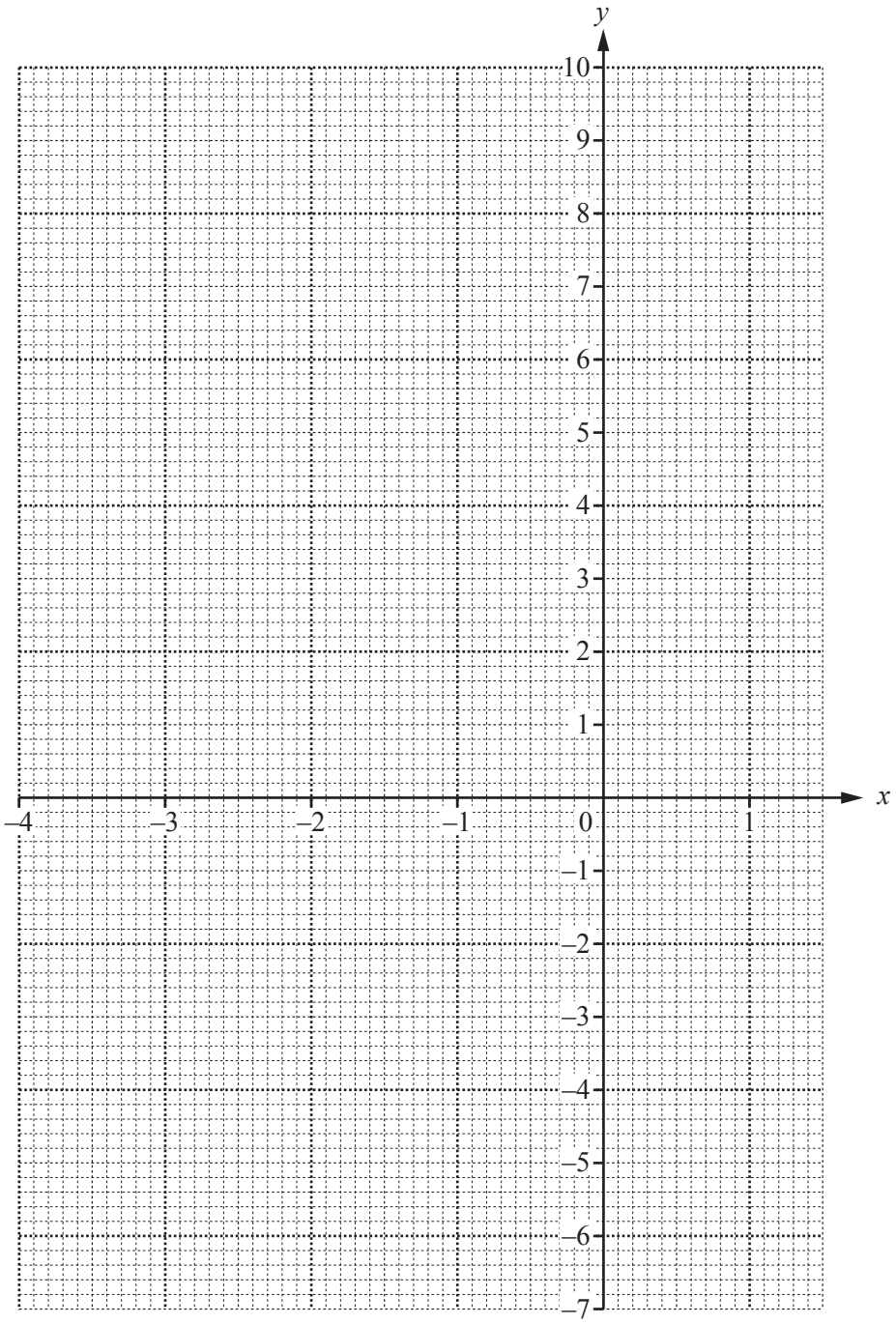
7 The table shows some values of $y = 2x^2 + 5x - 3$ for $-4 \leqslant x \leqslant 1.5$.

x	-4	-3	-2	-1	0	1	1.5
y		0	-5		-3	4	

(a) Complete the table. [3]

(b) On the grid, draw the graph of $y = 2x^2 + 5x - 3$ for $-4 \leqslant x \leqslant 1.5$.



[4]

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(c) Use your graph to solve the equation $2x^2 + 5x - 3 = 3$.

$x =$ ..... or $x =$ ..... [2]

(d) $y = 2x^2 + 5x - 3$ can be written in the form $y = 2(x+a)^2 + b$.

Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [3]

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8 Line A has equation $y = 5x - 4$.
Line B has equation $3x + 2y = 18$.

(a) Find the gradient of

(i) line A,

..... [1]

(ii) line B.

..... [1]

(b) Write down the co-ordinates of the point where line A crosses the x-axis.

(....., ...) [2]

(c) Find the equation of the line perpendicular to line A which passes through the point (10, 9).
Give your answer in the form $y = mx + c$.

$y =$ ..... [4]

(d) Work out the co-ordinates of the point of intersection of line A and line B.

(....., ...) [3]

(e) Work out the area enclosed by line A, line B and the y-axis.

[3]

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9 Luigi and Alfredo run in a 10 km race.
Luigi's average speed was x km/h.
Alfredo's average speed was 0.5 km/h slower than Luigi's average speed.

(a) Luigi took $\frac{10}{x}$ hours to run the race.

Write down an expression, in terms of x, for the time that Alfredo took to run the race.

..... h [1]

(b) Alfredo took 0.25 hours longer than Luigi to run the race.

(i) Show that $2x^2 - x - 40 = 0$.

[4]

(ii) Use the quadratic formula to solve $2x^2 - x - 40 = 0$.
Show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [4]

(iii) Work out the time that Luigi took to run the 10 km race.
Give your answer in hours and minutes, correct to the nearest minute.

..... h ..... min [3]

Question 10 is printed on the next page.

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10 **(a)** **(i)** Write 180 as a product of its prime factors.

..... [2]

(ii) Find the lowest common multiple (LCM) of 180 and 54.

..... [2]

(b) An integer, X, written as a product of its prime factors is $a^2 \times 7^{b+2}$.
An integer, Y, written as a product of its prime factors is $a^3 \times 7^2$.

The highest common factor (HCF) of X and Y is 1225.
The lowest common multiple (LCM) of X and Y is 42 875.

Find the value of X and the value of Y.

$X =$ .....

$Y =$ ..... [4]

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Grade thresholds – March 2018

Cambridge IGCSE Mathematics (without Coursework) (0580)

Grade thresholds taken for Syllabus 0580 (Mathematics (without Coursework)) in the March 2018 examination.

		minimum raw mark required for grade:						
	maximum raw mark available	A	B	C	D	E	F	G
Component 12	56	–	–	38	31	24	16	8
Component 22	70	60	53	46	39	32	–	–
Component 32	104	–	–	62	51	40	29	18
Component 42	130	107	85	63	51	40	–	–

Grade A* does not exist at the level of an individual component.

The maximum total mark for this syllabus, after weighting has been applied, is **200** for the 'Extended' option and **160** for the 'Core' option.

The overall thresholds for the different grades were set as follows.

Option	Combination of Components	A*	A	B	C	D	E	F	G
AY	12, 32	–	–	–	100	82	64	45	26
BY	22, 42	185	167	138	109	90	72	–	–

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MATHEMATICS **0580/12**

Paper 12 (Core) **March 2018**

MARK SCHEME

Maximum Mark: 56

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Cambridge International is publishing the mark schemes for the March 2018 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.

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Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1	40	**1**	
2	$54\frac{1}{2}$ % $\frac{6}{11}$ 0.55	**1**	
3	Positive	**1**	
4	0.65 oe	**1**	
5	5.23×10^{-5}	**1**	
6	6.82 cao	**1**	
7(a)	5	**1**	
7(b)	1	**1**	
8	40 : 80	**2**	**M1** for $\frac{120}{(1+2)}$
9(a)	–5.779266[….]	**1**	
9(b)	–5.7793	**1**	**FT** *their* **(a)**
10(a)	$5+3\times(10-1)=32$	**1**	
10(b)	$3\times2-(4-7)=9$	**1**	
11	26 to 29	**2**	**B1** for $25 \leqslant$ area < 26 or 29 < area $\leqslant$ 30
12(a)	25	**1**	
12(b)	x^{10}	**1**	
13	140	**2**	**M1** for at least 3 multiples of both 28 and of 35 or 5,7 and 2, 2, 7 seen or 4 × 5 × 7 as final answer OR **B1** for final answer $140k$ $k>1$
14	$3e(2d^2-3e)$ final answer	**2**	**M1** for $3(2d^2e-3e^2)$ or $e(6d^2-9e)$

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Question	Answer	Marks	Partial Marks
15	78.25, 78.75	**2**	**B1** for each If 0 scored **SC1** for answers reversed
16	8	**3**	**M2** for $\frac{88-25}{9}$ or **M1** for 88 – 25 soi or a division by 9 If 0 scored, **SC1** for final answer 7
17	92	**3**	**M2** for $[600-](0.18\times 600+\frac{2}{3}\times 600)$ or **M1** for 108 or 400 seen
18	5384.45	**3**	**M2** for $5000\times(1+\frac{2.5}{100})^3$ oe or **M1** for $5000\times(1+\frac{2.5}{100})^2$ oe
19	common denominator 24	**B1**	accept 24*k*
	$\frac{21}{24}$ and $\frac{4}{24}$ oe	**M1**	
	$1\frac{1}{24}$	**A1**	
20	63 corresponding [angles] 59 angles [in a] triangle [add up to] 180° oe	**4**	**B1** for [*a* =] 63 **B1** for corresponding angles **B1FT** for [*b* =] 59 or *their a* + *their b* = 122 **B1** for angles [in a] triangle [add up to] 180° oe
21(a)	Circle drawn with pair of compasses, radius 3.5 cm	**1**	
21(b)	Ruled chord drawn on their circle	**1**	
21(c)	7π or 2 × 3.5π	**M1**	
	21.991… or 21.994	**A1**	
22	Blue 706 or 706.1 to 706.2	**4**	**M1** for 165 × 76.05 or better **M1** for $\frac{180}{[0].0152}$ **A1** for 11842[……]
23(a)	3.22 or 3.224 to 3.225	**2**	**M1** for $[AC^2 =]1.6^2+2.8^2$
23(b)	60.3 or 60.25 to 60.26	**2**	**M1** for tan[=] $\frac{2.8}{1.6}$

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Question	Answer	Marks	Partial Marks
24(a)	Correct ruled perpendicular bisector of *AB* with correct pairs of arcs	**2**	**B1** for correct perpendicular bisector without correct arcs or for correct arcs, with no/wrong line
24(b)	Correct ruled bisector of angle *ABC* with 2 correct pairs of arcs	**2**	**B1** for correct angle bisector without correct arcs or for correct arcs, no/wrong line

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Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

MATHEMATICS **0580/12**

Paper 1 (Core) **February/March 2018**

1 hour

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 56.

This document consists of **8** printed pages.

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[Turn over

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1 Write $\frac{2}{5}$ as a percentage.

..... % [1]

2 Write these numbers in order, starting with the smallest.

$$0.55 \qquad \frac{6}{11} \qquad 54\frac{1}{2}\%$$

..... < ..... < ..... [1]
smallest

3 "We eat more ice cream as the temperature rises."

What type of correlation is this?

..... [1]

4 The probability that it rains tomorrow is 0.35 .

Work out the probability that it does not rain tomorrow.

..... [1]

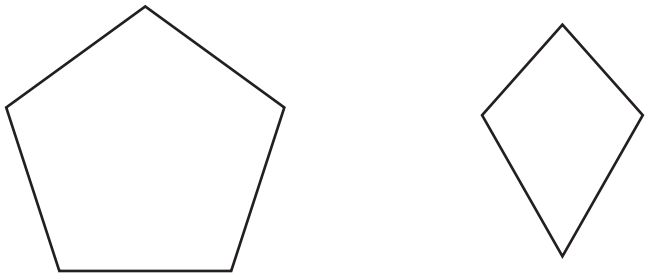
5 Write 0.000 052 3 in standard form.

..... [1]

6 Write 6.8167 correct to 3 significant figures.

..... [1]

7



The diagram shows a regular pentagon and a kite.

Complete the following statements.

(a) The regular pentagon has ..... lines of symmetry. [1]

(b) The kite has rotational symmetry of order ..... . [1]

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8 Divide 120 in the ratio 1 : 2.

..... : ..... [2]

9 **(a)** Calculate $\sqrt[3]{-4.3 \times 6.7^2}$ and write down all the figures shown on your calculator.

..... [1]

(b) Write your answer to **part (a)** correct to 4 decimal places.

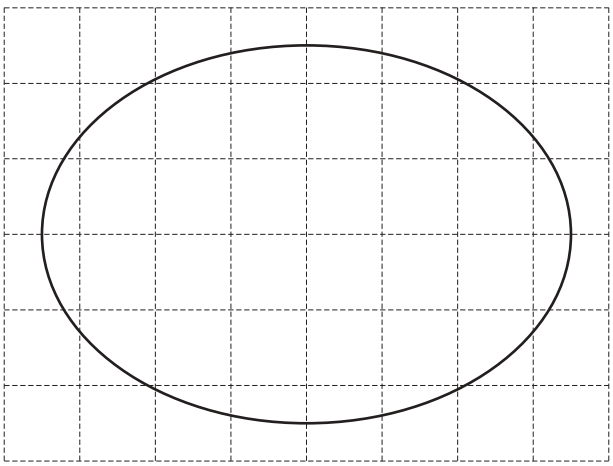
..... [1]

10 Insert one pair of brackets in each of the following to make the statements correct.

(a) $5 + 3 \times 10 - 1 = 32$ [1]

(b) $3 \times 2 - 4 - 7 = 9$ [1]

11



Find an estimate for the area of the shape drawn on this 1 cm^2 grid.

..... cm^2 [2]

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12 **(a)** Find the value of $(\sqrt{25})^2$.

..... [1]

(b) Simplify $(x^5)^2$.

..... [1]

13 Find the lowest common multiple (LCM) of 28 and 35.

..... [2]

14 Factorise completely.

$$6d^2e - 9e^2$$

..... [2]

15 The length, l metres, of a garden is 78.5 metres, correct to the nearest half metre.

Complete this statement about the value of l.

..... $\leqslant l <$ ..... [2]

16 Neelum hires a machine to clean carpets.
It costs \$25 to hire the machine for the first day and \$9 for each extra day after the first day.
Neelum pays a total of \$88 to hire the machine.

Work out the **total** number of days she hires the machine for.

..... [3]

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17 Dev makes 600 cakes.
18% of the 600 cakes go to a hotel and $\frac{2}{3}$ of the 600 cakes go to a supermarket.

Calculate how many cakes he has left.

..... [3]

18 Tomas borrows \$5000 for 3 years at a rate of 2.5% per year compound interest.
He pays back the whole amount, with interest, at the end of 3 years.

Calculate the total amount of money he pays back at the end of the 3 years.

\$..... [3]

19 **Without using your calculator**, work out $\frac{7}{8} + \frac{1}{6}$.

You must show all your working and give your answer as a mixed number in its simplest form.

..... [3]

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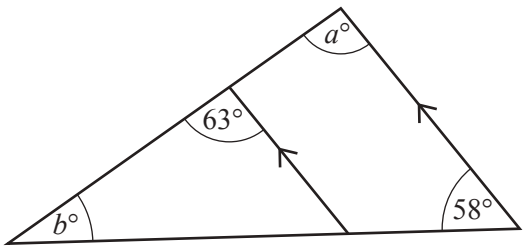
20



NOT TO SCALE

Complete the statements.

a = ... because .....

.....

b = ... because .....

..... [4]

21 **(a)** In the space below, draw a circle with diameter 7 cm.

[1]

(b) On your diagram, draw a chord. [1]

(c) Show that the circumference of the circle is 21.99 cm, correct to 2 decimal places.

[2]

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22 On the internet, Pranay sees a grey jacket for 165 euros (€) and a blue jacket for \$180.

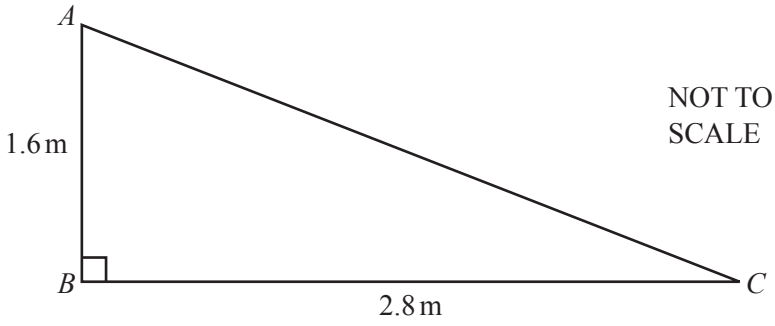
These are the exchange rates.

€1 = 76.05 rupees
1 rupee = \$0.0152

Work out which jacket is the cheapest and by how many rupees.

The ..... jacket is cheapest by ..... rupees [4]

23



(a) Calculate *AC*.

AC = ... m [2]

(b) Calculate the size of angle *BAC*.

Angle *BAC* = ... [2]

Question 24 is printed on the next page.
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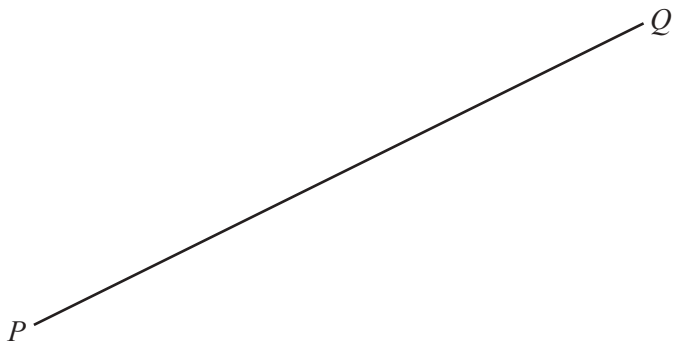
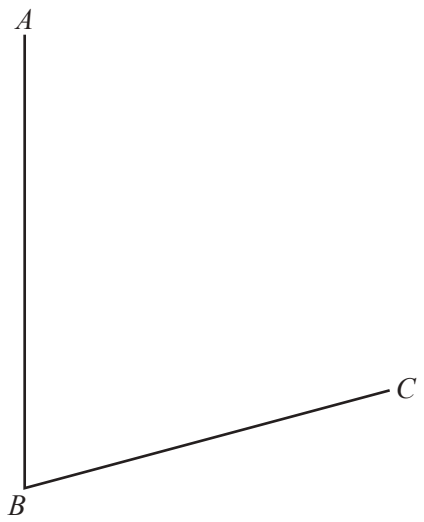
24 In this question, **use a straight edge and compasses only** and show all your construction arcs.

(a) Construct the perpendicular bisector of PQ.



[2]

(b) Construct the bisector of angle ABC.



[2]

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MATHEMATICS **0580/22**

Paper 22 (Extended) **March 2018**

MARK SCHEME

Maximum Mark: 70

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the March 2018 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.

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Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1	Positive	**1**	
2	5.23×10^{-5}	**1**	
3	2.29 or 2.292…	**1**	
4	$\frac{8}{9}$ oe, must be fraction	**1**	
5(a)	5	**1**	
5(b)	1	**1**	
6	$5m\left(3k^2 - 4m^3\right)$ final answer	**2**	**B1** for $5\left(3k^2m - 4m^4\right)$ or $m\left(15k^2 - 20m^3\right)$ or for $5m\left(3k^2 - 4m^3\right)$ with one error in a number
7	2**q** + **p**	**2**	**B1** for $CF = 2(\mathbf{q} + \mathbf{p})$ or $BA = \mathbf{q} + \mathbf{p}$ or $DE = \mathbf{q} + \mathbf{p}$ or $DA = 2\mathbf{q}$ or for correct route
8	21400 or 21430 or 21434.[…]	**2**	**M1** for $23000 \times \left(1 - \frac{1.4}{100}\right)^5$ oe
9	–12	**2**	**B1** for 2^3, 2^{-3}, 2^{12} or 2^{-12}
10	12	**3**	**M2** for $9 \times 8 = 6y$ oe OR **M1** for $y = \frac{k}{x}$ oe **M1** for [y =] *their* $\frac{k}{6}$
11	92	**3**	**M2** for $[600-](0.18 \times 600 + \frac{2}{3} \times 600)$ or **M1** for 108 or 400 seen

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Question	Answer	Marks	Partial Marks
12	common denominator 24	**B1**	accept 24*k*
	$\frac{21}{24}$ and $\frac{4}{24}$ oe	**M1**	
	$1\frac{1}{24}$	**A1**	
13	correctly eliminating one variable	**M1**	
	[*x* =] 7 [*y* =] – 2	**A2**	**A1** for each If **M0** scored **SC1** for 2 values satisfying one of the original equations or **SC1** if no working shown, but 2 correct answers given
14(a)	similar	**1**	
14(b)	11.61	**3**	**M2** for $8.6 \times \sqrt{\frac{65.61}{36}}$ or **M1** for $\sqrt{\frac{65.61}{36}}$ or $\sqrt{\frac{36}{65.61}}$ or $\left(\frac{8.6}{BX}\right)^2 = \frac{36}{65.61}$ oe
15	63 corresponding [angles] 59 angles [in a] triangle [add up to] 180 oe	**4**	**B1** for [*a* =] 63 **B1** for corresponding angles **B1FT** for [*b* =] 59 or *their a* + *their b* = 122 **B1** for angles [in a] triangle [add up to] 180 oe
16(a)	2.24	**2**	**M1** for $0.5 \times 1.6 \times 2.8$
16(b)	3.22 or 3.224 to 3.225	**2**	**M1** for $[AC^2 =]1.6^2 + 2.8^2$

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Question	Answer	Marks	Partial Marks
17	$\dfrac{-7 \pm \sqrt{(7)^2 - 4(2)(-3)}}{2 \times 2}$	**B2**	**B1** for $\sqrt{(7)^2 - 4(2)(-3)}$ or better **B1** for $p = -7$ and $r = 2 \times 2$ if in form $\dfrac{p+\sqrt{q}}{r}$ or $\dfrac{p-\sqrt{q}}{r}$ Completing the square method: **B1** for $(x + 1.75)^2$ oe **B1** for $-1.75 \pm \sqrt{1.5 + 1.75^2}$ oe
	0.39 and – 3.89 final ans cao	**B2**	**B1** for each If **B0**, **SC1** for 0.4 and – 3.9 or 0.386...and – 3.886... or 0.39 and – 3.89 seen in working or – 0.39 and 3.89
18(a)	Correct ruled perpendicular bisector of *AB* with correct pairs of arcs	**2**	**B1** for correct perpendicular bisector without correct arcs or for correct arcs, with no/wrong line
18(b)	Correct ruled bisector of angle *ABC* with 2 correct pairs of arcs	**2**	**B1** for correct angle bisector without correct arcs or for correct arcs, with no/wrong line
19(a)(i)	$\in$	**1**	
19(a)(ii)	$X \cap Y$ oe	**1**	
19(a)(iii)	$\varnothing$	**1**	
19(b)	*u, v, w*	**1**	
19(c)	5	**1**	
20(a)	Rotation [centre] origin oe 90°[anti-clockwise] oe	**3**	**B1** for each
20(b)	Enlargement [centre] (0, 3) [sf] – 2	**3**	**B1** for each
21(a)	2	**2**	**M1** for f(5) or 7– (7 – *x*) or better
21(b)	$30 - 4x$ final answer	**2**	**M1** for $4(7 - x) + 2$ or better or for correct answer then spoilt
21(c)	$15 - 4x^2$ final answer	**2**	**M1** for $15 - (2x)^2$ or better or for correct answer then spoilt

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Question	Answer	Marks	Partial Marks
22(a)	$\frac{9}{20}$ oe	**1**	
22(b)(i)	$\frac{6}{20}\times\frac{5}{19}$	**M1**	
	$\frac{30}{380}$ oe	**A1**	
22(b)(ii)	$\frac{258}{380}$ oe	**4**	**M3** for $1-\frac{3}{38}-\frac{5}{20}\times\frac{4}{19}-\frac{9}{20}\times\frac{8}{19}$ oe or **M2** for $\frac{3}{38}+\frac{5}{20}\times\frac{4}{19}+\frac{9}{20}\times\frac{8}{19}$ oe or $\frac{5}{20}\times\frac{9}{19}+\frac{6}{20}\times\frac{9}{19}+\frac{6}{20}\times\frac{5}{19}$ oe or **M1** for one correct product other than $\frac{6}{20}\times\frac{5}{19}$

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CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

MATHEMATICS **0580/22**

Paper 2 (Extended) **February/March 2018**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 70.

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1 "We eat more ice cream as the temperature rises."

What type of correlation is this?

..... [1]

2 Write 0.000 052 3 in standard form.

..... [1]

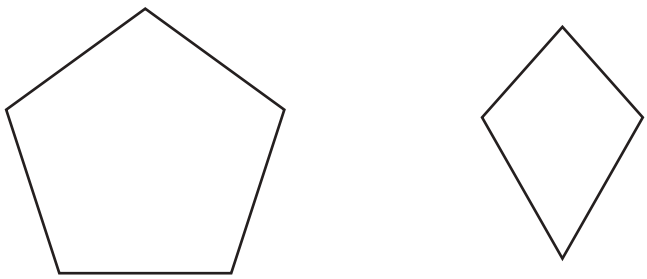
3 Calculate $\sqrt{17.8} - 1.3^{2.5}$.

..... [1]

4 Write the recurring decimal $0.\dot{8}$ as a fraction.

..... [1]

5



The diagram shows a regular pentagon and a kite.

Complete the following statements.

(a) The regular pentagon has ..... lines of symmetry. [1]

(b) The kite has rotational symmetry of order ..... . [1]

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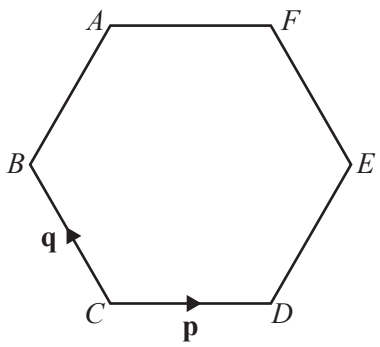
6 Factorise completely.

$$15k^2m - 20m^4$$

..... [2]

7



The diagram shows a regular hexagon *ABCDEF*.
$\overrightarrow{CD} = \mathbf{p}$ and $\overrightarrow{CB} = \mathbf{q}$.

Find $\overrightarrow{CA}$, in terms of **p** and **q**, giving your answer in its simplest form.

$\overrightarrow{CA}$ = ... [2]

8 Newton has a population of 23 000.
The population decreases exponentially at a rate of 1.4% per year.

Calculate the population of Newton after 5 years.

[2]

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9 $2^p = \frac{1}{8^4}$

Find the value of p.

$p =$ ..... [2]

10 y is inversely proportional to x.
When $x = 9$, $y = 8$.

Find y when $x = 6$.

$y =$ ..... [3]

11 Dev makes 600 cakes.
18% of the 600 cakes go to a hotel and $\frac{2}{3}$ of the 600 cakes go to a supermarket.

Calculate how many cakes he has left.

..... [3]

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12 **Without using your calculator**, work out $\frac{7}{8}+\frac{1}{6}$.

You must show all your working and give your answer as a mixed number in its simplest form.

..... [3]

13 Solve the simultaneous equations.
You must show all your working.

$$2x+\frac{1}{2}y = 13$$
$$3x+2y = 17$$

$x =$ .....

$y =$ ..... [3]

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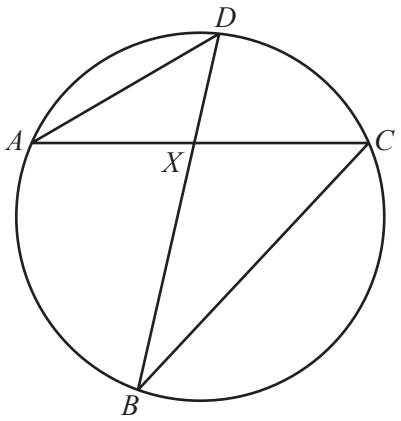
14



NOT TO SCALE

A, B, C and D are points on the circumference of the circle.
AC and BD intersect at X.

(a) Complete the statement.

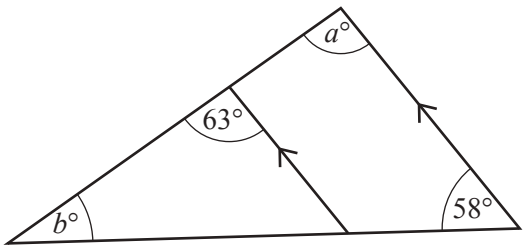
Triangle ADX is ..... to triangle BCX. [1]

(b) The area of triangle ADX is $36\,\text{cm}^2$ and the area of triangle BCX is $65.61\,\text{cm}^2$.
$AX = 8.6\,\text{cm}$ and $DX = 7.2\,\text{cm}$.

Find BX.

$BX =$ ..... cm [3]

15



NOT TO SCALE

Complete the statements.

$a =$ ..... because .....

.....

$b =$ ..... because .....

..... [4]

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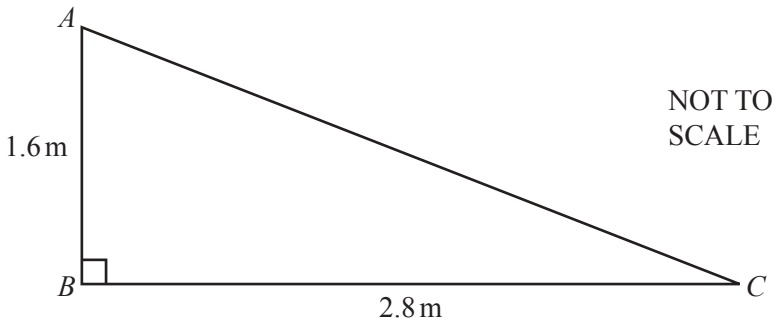
16



(a) Find the area of triangle ABC.

..... m^2 [2]

(b) Calculate AC.

$AC =$ ..... m [2]

17 Solve the equation $2x^2 + 7x - 3 = 0$.
Show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [4]

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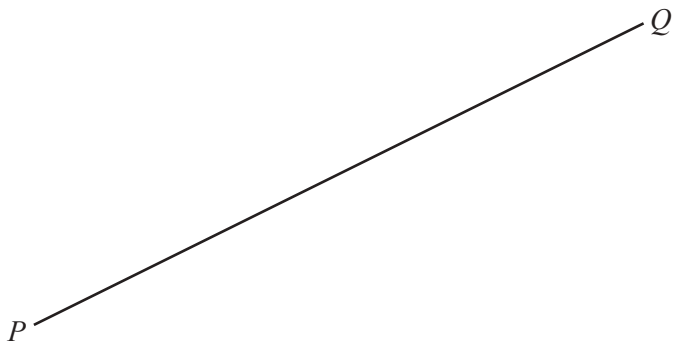
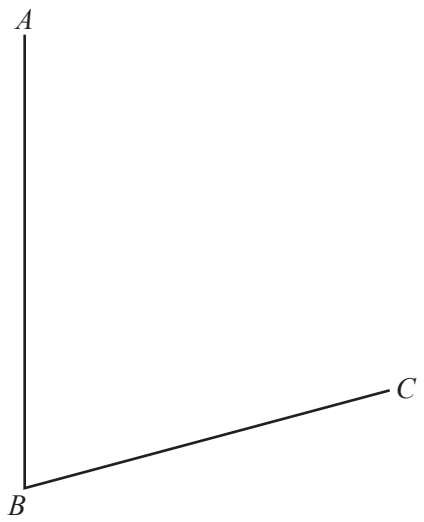
18 In this question, **use a straight edge and compasses only** and show all your construction arcs.

(a) Construct the perpendicular bisector of PQ.



[2]

(b) Construct the bisector of angle ABC.



[2]

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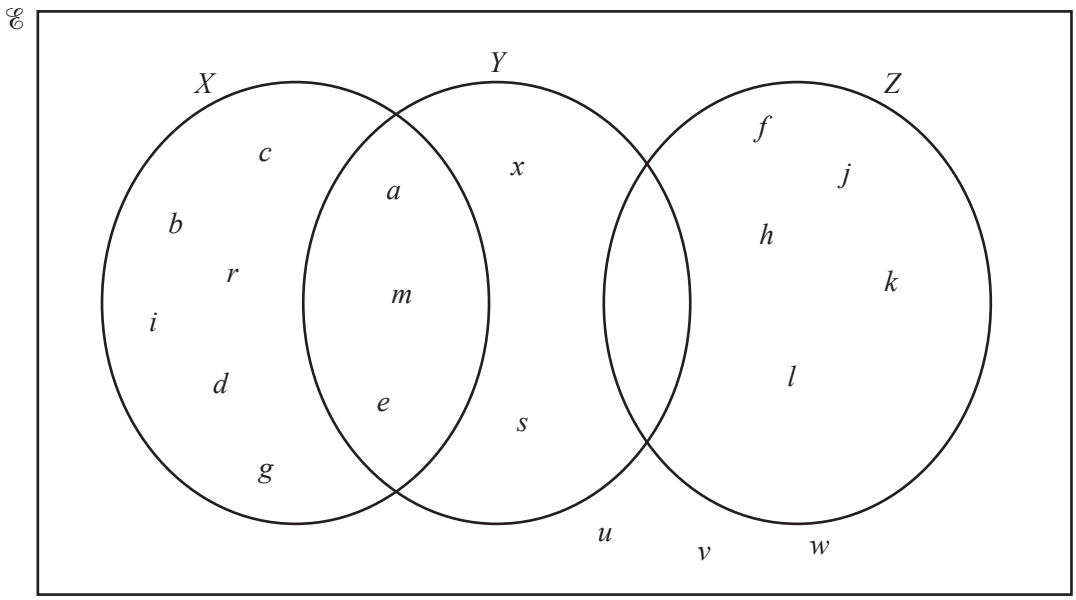
19



(a) Use set notation to complete the statements for the Venn diagram above.

(i) c ..... X [1]

(ii) ..... $= \{ a, m, e \}$ [1]

(iii) $Y \cap Z =$ ..... [1]

(b) List the elements of $(X \cup Y \cup Z)'$.

..... [1]

(c) Find $\mathrm{n}(X' \cap Z)$.

..... [1]

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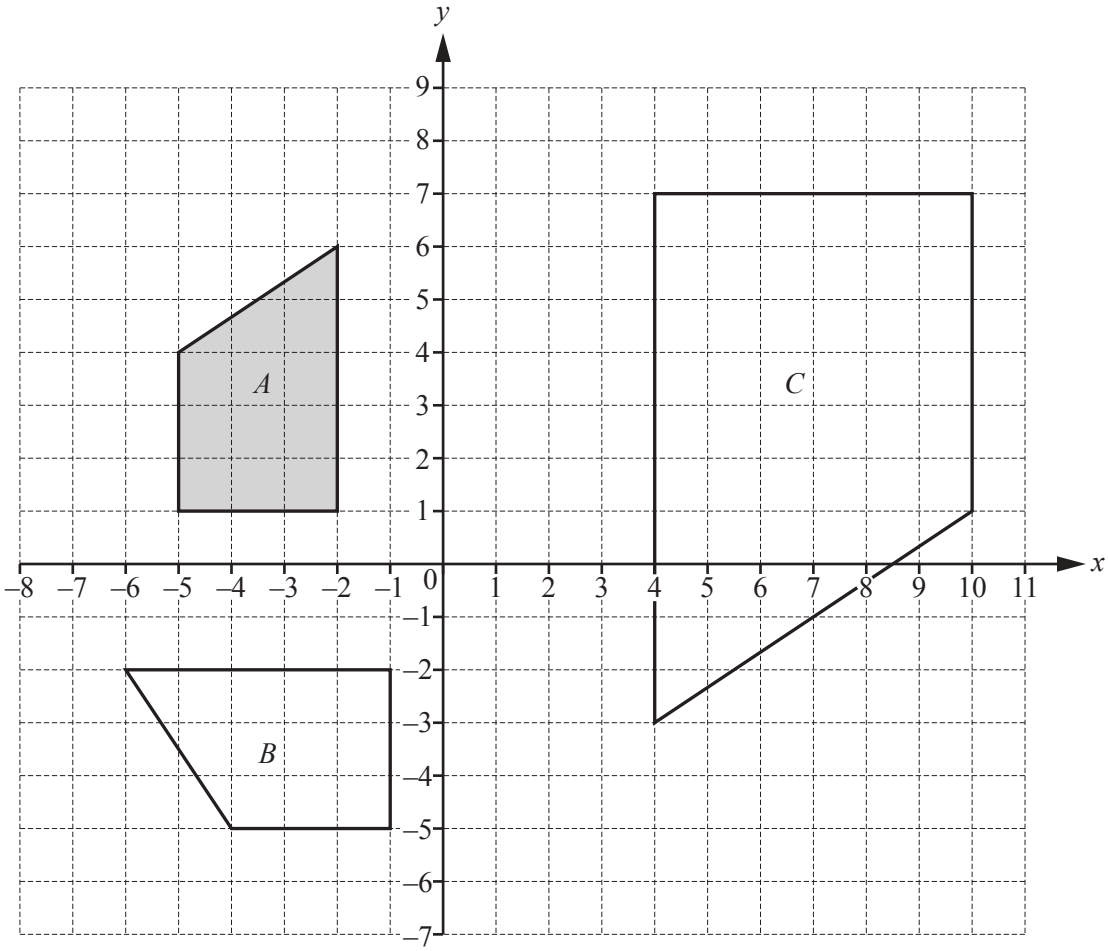
20



Describe fully the **single** transformation that maps

(a) shape *A* onto shape *B*,

.....

..... [3]

(b) shape *A* onto shape *C*.

.....

..... [3]

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21 $f(x) = 7 - x$ $g(x) = 4x + 2$ $h(x) = 15 - x^2$

(a) Find ff(2).

..... [2]

(b) Find gf(x) in its simplest form.

..... [2]

(c) Find h($2x$) in its simplest form.

..... [2]

Question 22 is printed on the next page.

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22 Samira and Sonia each have a bag containing 20 sweets.
In each bag, there are 5 red, 6 green and 9 yellow sweets.

(a) Samira chooses one sweet at random from her bag.

Write down the probability that she chooses a yellow sweet.

..... [1]

(b) Sonia chooses two sweets at random, without replacement, from her bag.

(i) Show that the probability that she chooses two green sweets is $\frac{3}{38}$.

[2]

(ii) Calculate the probability that the sweets she chooses are **not** both the same colour.

..... [4]

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MATHEMATICS **0580/32**

Paper 32 (Core) **March 2018**

MARK SCHEME

Maximum Mark: 104

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

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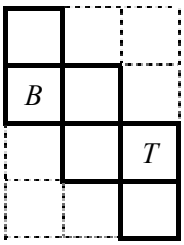
Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	One rectangle is an enlargement of the other oe	**1**	
1(a)(ii)	9	**2**	**M1** for 3^2 or $\frac{1}{3^2}$ or SF is 3 or $\frac{1}{3}$ or 1.5×2.5 and 4.5×7.5 or $\frac{7.5}{2.5}$ or $\frac{4.5}{1.5}$
1(b)(i)	 T in correct square	**1**	
1(b)(ii)	A different correct net drawn	**1**	
1(c)(i)	108	**3**	**M2** for $[2\times](3\times4+3\times6+4\times6)$ oe or **M1** for one of 3×4 ,3×6 ,4×6 evaluated
1(c)(ii)	72	**2**	**M1** for $3\times4\times6$
1(c)(iii)	3 positive numbers (other than 3,4,6) with product 72	**1**	**FT** *their* **(c)(ii)**
2(a)(i)	3043 3061	**2**	**B1** for each
2(a)(ii)	[Column] 7 [Row] 15	**2**	**B1** for each
2(a)(iii)	$20n + 2981$ oe	**2**	**B1** for $20n + k$
2(b)	2 [h] 5 [min]	**2**	**M1** for 100 × 1.25 oe or $1\frac{2}{3}$ ×1.25 oe or 25

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Question	Answer	Marks	Partial Marks
2(c)(i)	3	**1**	
2(c)(ii)	7	**1**	
2(c)(iii)	6.84 or 6.836 to 6.837 or $6\frac{41}{49}$	**3**	**M1** for $5\times27+6\times42+7\times63+8\times64$ **M1** dep for $\frac{\textit{their}\,1340}{196}$
2(c)(iv)	$\frac{132}{196}$ oe	**2**	**M1** for 27+42+63 or 132 or $[1-]\frac{64}{196}$
3(a)(i)	5, 8, 4, 2, 6	**2**	**B1** for one error, or for two errors and total still 25 If 0 scored, **SC1** for all correct tallies if frequency column blank or incorrect
3(a)(ii)	Surfing	**1**	
3(a)(iii)	24	**1**	**FT** *their* frequency for snorkelling ×4
3(b)(i)	3.37pm cao	**1**	
3(b)(ii)	12[h]26[min]	**1**	
3(b)(iii)	12 52[pm]	**1**	
4(a)(i)	4 17 136	**3**	**B2** for two of 4, 17 or 136 in correct place or **M1** for $\frac{120}{15}$ or $\frac{72}{9}$ soi by $8^{[\circ]}$ or $120+72+32+x=360$ oe
4(a)(ii)	32° sector drawn	**1**	
4(b)	36	**1**	
5(a)(i)	Six hundred (and) four thousand, nine hundred (and) twenty five	**1**	Condone Six lakh (and) four thousand, nine hundred (and) twenty five
5(a)(ii)	53 or 59	**1**	
5(a)(iii)	1	**1**	

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Question	Answer	Marks	Partial Marks
5(b)(i)	105	**1**	
5(b)(ii)	64	**1**	
5(b)(iii)	1, 3, 5, 9, 15, 45	**2**	**B1** for 4 or 5 correct factors
5(b)(iv)	Any irrational number between 6 and 7 e.g. $\sqrt{37}$ or 2π	**1**	
6(a)(i)	20	**2**	**M1** for $\frac{4}{12}[\times 60]$
6(a)(ii)	28	**1**	
6(a)(iii)	1528 or 3.28pm	**1**	**FT** 1500 + *their* 28 mins
6(b)(i)	3 : 10	**2**	**M1** for 6 and 20 seen If 0 scored, **SC1** for 10 : 3
6(b)(ii)(a)	Straight lines drawn (1500, 0) to (1520, 2) and (1520, 2) to (1528, 4)	**2**	**B1** for line from (1500, 0) to (1520, 2) **B1FT** for line from (*their* 1520, 2) to (*their* 1520 + 8, 4)
6(b)(ii)(b)	14	**1**	**FT** *their* graph
6(b)(ii)(c)	1.25 to 1.5	**1**	**FT** *their* graph
7(a)	4	**1**	
7(b)(i)	Rotation 90 clockwise oe [centre] (0, –2)	**3**	**B1** for each
7(b)(ii)	Translation $\begin{pmatrix} -4 \\ 2 \end{pmatrix}$	**2**	**B1** for each
7(b)(iii)	Enlargement [scale factor] 2 [centre] (–2, –7)	**3**	**B1** for each
7(c)	Correct reflection	**2**	**B1** for a correct reflection in $x = k$ or for 6 or more vertices plotted correctly If 0 scored, **SC1** for correct reflection in $y = -1$

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Question	Answer	Marks	Partial Marks
8(a)(i)	[1:] 1500 000	**2**	**M1** for 15 000 m seen or [15 ×]1000 × 100
8(a)(ii)	96	**2**	**B1** for 6.4 seen or **M1** for *their* 6.4 × 15
8(a)(iii)	117	**1**	
8(a)(iv)	Correct region shaded	**5**	**B2** for 2 correct arcs drawn, centre *Y* with radius 3 cm and 4 cm or **B1** for 3 cm and 4 cm seen or implied by calculation or for one correct arc drawn **B2** for 2 correct lines drawn or **B1** for 1 correct line drawn **B1** depB1B1 for correct region
8(b)	253	**2**	**M1** for 180 + 73 or 360 – 107 or sketch with alternate angles marked or sketch with 73° and correct bearing marked
9(a)	450	**1**	
9(b)	$10p + 3n = 525$	**2**	**M1** for $10p + 3n$
9(c)	for correctly eliminating one variable	**M1**	**FT**
	[*p*] = 30	**A1**	
	[*n*] = 75	**A1**	If 0 scored, **SC1** for 2 values satisfying one of the original equations or **SC1** for both correct but no working
10(a)	Cala, Elu	**2**	**B1** for one correct and no extras or **B1** for two correct and one extra
10(b)(i)	14	**2**	**M1** for $[s =]\sqrt{19.6 \times 10}$
10(b)(ii)	$[h =]\frac{s^2}{19.6}$	**2**	**M1** for $s^2 = 19.6[\times]h$
11(a)(i)(a)	*C*	**1**	
11(a)(i)(b)	*A*	**1**	
11(a)(i)(c)	*D*	**1**	
11(a)(ii)	10	**2**	**M1** for $-26 = -3x + 4$ or better

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Question	Answer	Marks	Partial Marks
11(b)(i)	39, 0, –9	**3**	**B1** for each
11(b)(ii)	Correct smooth curve	**4**	**B3FT** for 8 or 7 correct plots **B2FT** for 5 or 6 correct plots **B1FT** for 3 or 4 correct plots
11(b)(iii)	(j, k) where $4.4 < j < 6$ and $-28 < k < -24$	**1**	

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Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

6519612675

MATHEMATICS **0580/32**

Paper 3 (Core) **February/March 2018**

2 hours

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 104.

This document consists of **19** printed pages and **1** blank page.

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[Turn over

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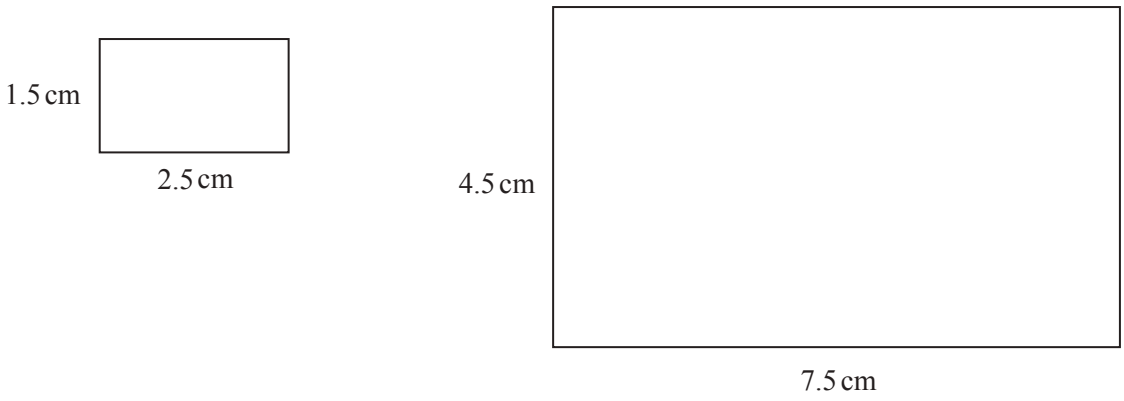
1 **(a)**



(i) Explain why these rectangles are mathematically similar.

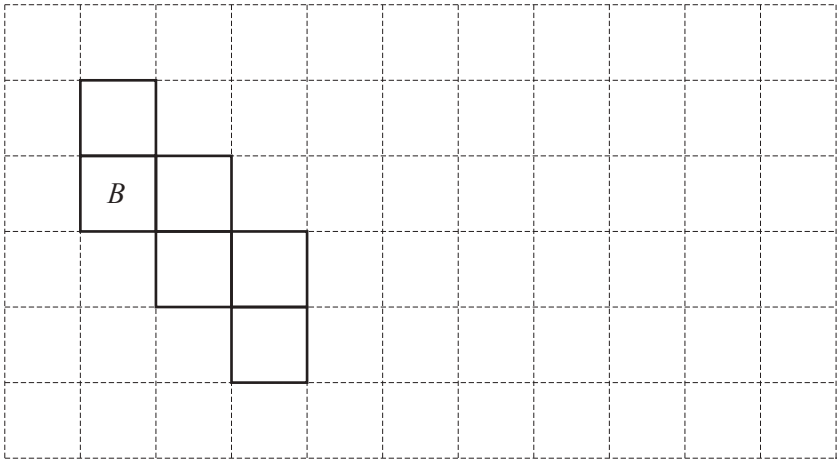
.....

..... [1]

(ii) How many times bigger is the area of the large rectangle than the area of the small rectangle?

..... [2]

(b)



The diagram shows a net of a cube.

(i) The square labelled *B* is the base.

Write the letter *T* in the square that is the top of the cube. [1]

(ii) On the grid, draw a **different** net of this cube. [1]

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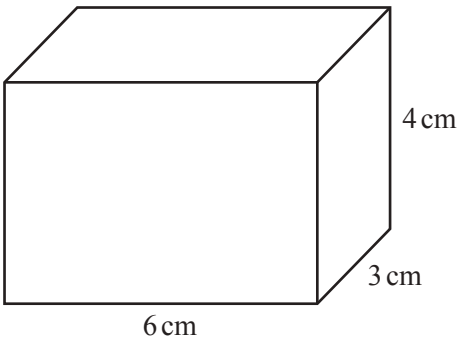
(c) The diagram shows a cuboid.



NOT TO SCALE

(i) Work out the surface area of this cuboid.

..... cm^2 [3]

(ii) Work out the volume of this cuboid.

..... cm^3 [2]

(iii) Write down the dimensions of a different cuboid that has the same volume as this cuboid.

..... cm by ..... cm by ..... cm [1]

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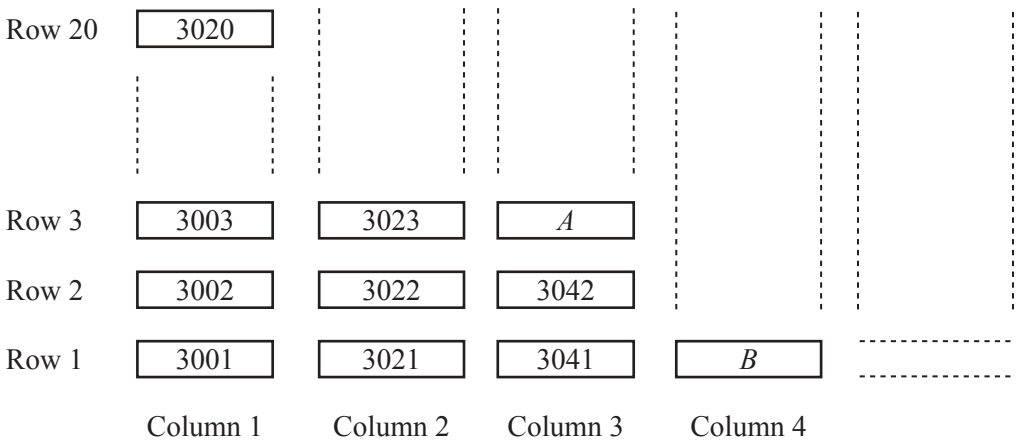
2 **(a)** Each of 196 candidates has a candidate number from 3001 to 3196.
The candidates sit in numerical order in columns and rows, as shown in the diagram.
There are 20 rows.
The diagram shows part of the plan for where the candidates sit.



(i) The diagram shows where candidates *A* and *B* sit.

Write down their numbers.

A .....

B ..... [2]

(ii) Complete this statement.

Candidate 3135 sits in Column ..... , Row ..... [2]

(iii) Candidate *C* sits in Column *n*, Row 1.

Find an expression, in terms of *n*, for the number of candidate *C*.

..... [2]

(b) The geography examination lasts for 1 hour 40 minutes.
Hari is allowed 25% extra time for his geography examination.

Work out the total time Hari has for this examination.
Give your answer in hours and minutes.

..... h ..... min [2]

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(c) The number of examinations that each of the 196 candidates takes is recorded in the table.

Number of examinations	5	6	7	8
Number of candidates	27	42	63	64

(i) Write down the range.

..... [1]

(ii) Find the median.

..... [1]

(iii) Calculate the mean.

..... [3]

(iv) A candidate is selected at random.

Find the probability that the candidate takes fewer than 8 examinations.

..... [2]

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3 **(a)** 25 students go on a water sports trip.
The students each choose their favourite water sport.
These are the results.

Rafting	Fishing	Surfing	Snorkelling	Surfing
Snorkelling	Rafting	Kayaking	Rafting	Snorkelling
Fishing	Surfing	Surfing	Kayaking	Surfing
Fishing	Snorkelling	Surfing	Surfing	Rafting
Rafting	Fishing	Snorkelling	Snorkelling	Surfing

(i) Complete the frequency table for the results.
You may use the tally column to help you.

Favourite water sport	Tally	Frequency
Rafting		
Surfing		
Fishing		
Kayaking		
Snorkelling		

[2]

(ii) Write down the mode.

..... [1]

(iii) Work out the percentage of students whose favourite water sport is snorkelling.

..... % [1]

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(b) The table shows the times of the high and low tides.

Day	1st high tide	1st low tide	2nd high tide	2nd low tide
Monday	00 30	06 09	13 12	18 35
Tuesday	01 30	07 20	14 22	19 52
Wednesday	02 43	08 36	15 37	21 06
Thursday	03 58	09 41	16 44	22 07
Friday	05 00	10 35	17 37	22 58

(i) Write down the time of the 2nd high tide on Wednesday using the 12-hour clock.

..... [1]

(ii) Work out the time between the two low tides on Thursday.

..... h ..... min [1]

(iii) The surfing activity starts $1\frac{1}{2}$ hours before the high tide on Tuesday afternoon.

Write down the time that the surfing activity starts.

..... [1]

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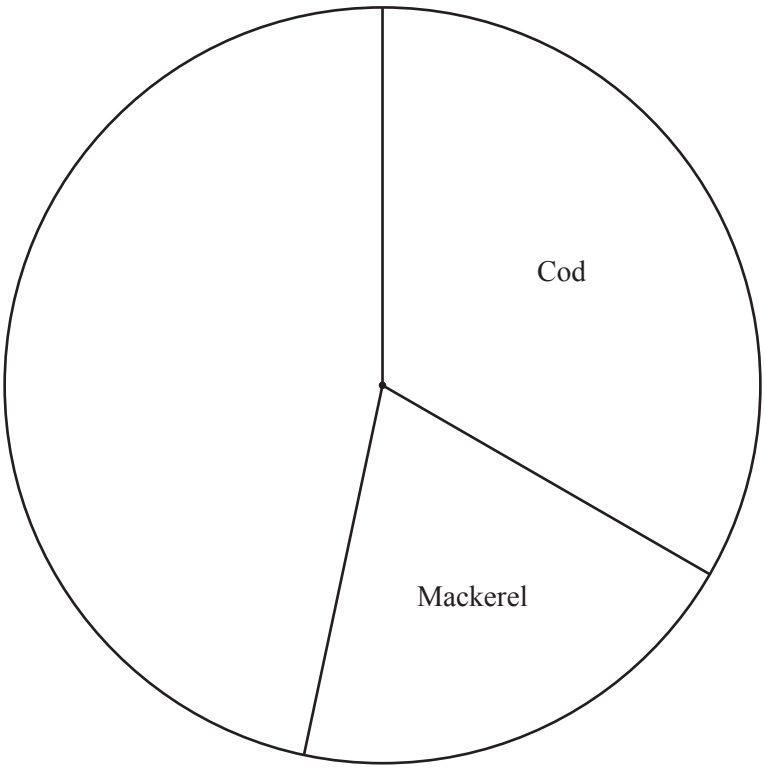
4 **(a)** Some people go fishing and catch four types of fish.
Some information is shown in the table.

Type of fish	Number of fish	Pie chart sector angle
Cod	15	120°
Mackerel	9	72°
Herring		32°
Tuna		

(i) Complete the table. [3]

(ii) Complete the pie chart.



[1]

(b) Records show that $\frac{3}{14}$ of all mullet caught are underweight.
In one day, 168 mullet are caught.

Work out the expected number of mullet that are underweight.

..... [1]

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5 **(a)** Write down

(i) the number 604 925 in words,

.....

..... [1]

(ii) a prime number between 50 and 60,

..... [1]

(iii) the value of 999^0.

..... [1]

(b) Find

(i) the smallest multiple of 7 that is greater than 100,

..... [1]

(ii) the largest cube number that is less than 100,

..... [1]

(iii) the six factors of 45,

..... , ... , ... , ... , ... , ... [2]

(iv) an irrational number between 6 and 7.

..... [1]

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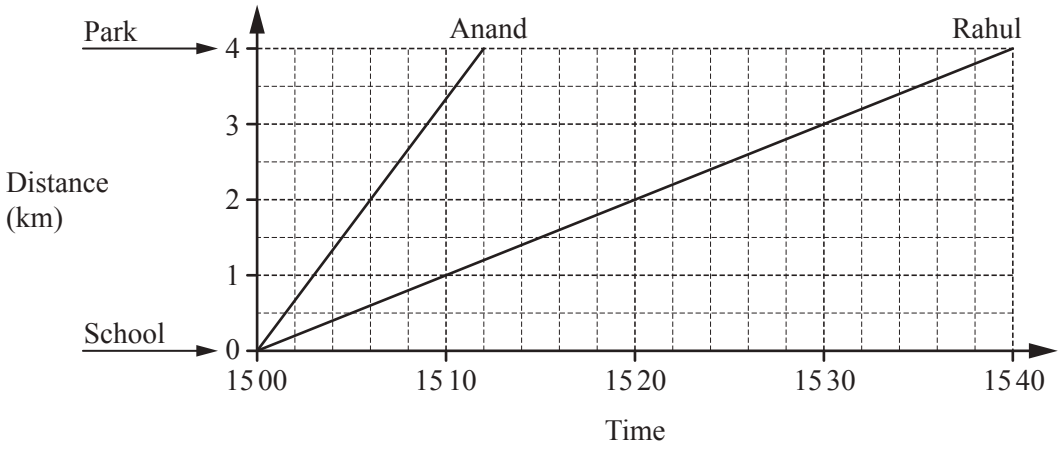
6 Anand, Rahul and Samir go from school to the park each day.

(a) One day, Anand cycles and Rahul walks.
The travel graph shows their journeys.



(i) Work out the speed that Anand cycles.
Give your answer in kilometres per hour.

..... km/h [2]

(ii) Find the number of minutes that Anand arrives at the park before Rahul.

..... min [1]

(iii) Samir cycles at the same speed as Anand.
He arrives at the park at the same time as Rahul.

Find the time that Samir leaves school.

..... [1]

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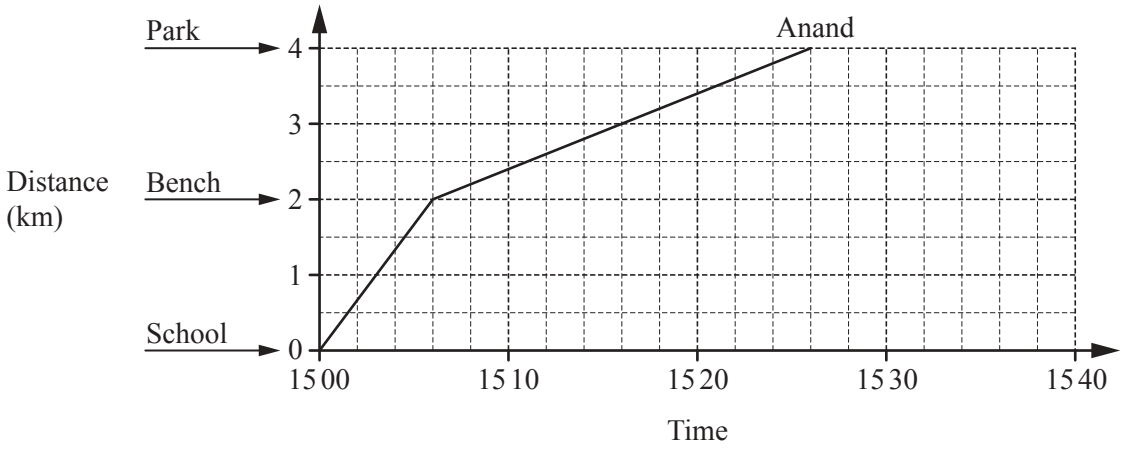
(b) On another day, Anand cycles 2 km to a bench and then walks the rest of the way to the park. The travel graph shows his journey.



(i) Write down the ratio minutes cycling : minutes walking.
Give your answer in its simplest form.

..... : ..... [2]

(ii) Rahul leaves school at the same time as Anand.
Rahul walks 2 km to the bench at a constant speed of 6 km/h.
He then cycles the rest of the way to the park at a constant speed of 15 km/h.

(a) Complete the travel graph for Rahul's journey to the park.

[2]

(b) Use your travel graph to find the number of minutes that Anand arrives at the **bench** before Rahul.

..... min [1]

(c) Find the greatest distance between Anand and Rahul as they travel to the park.

..... km [1]

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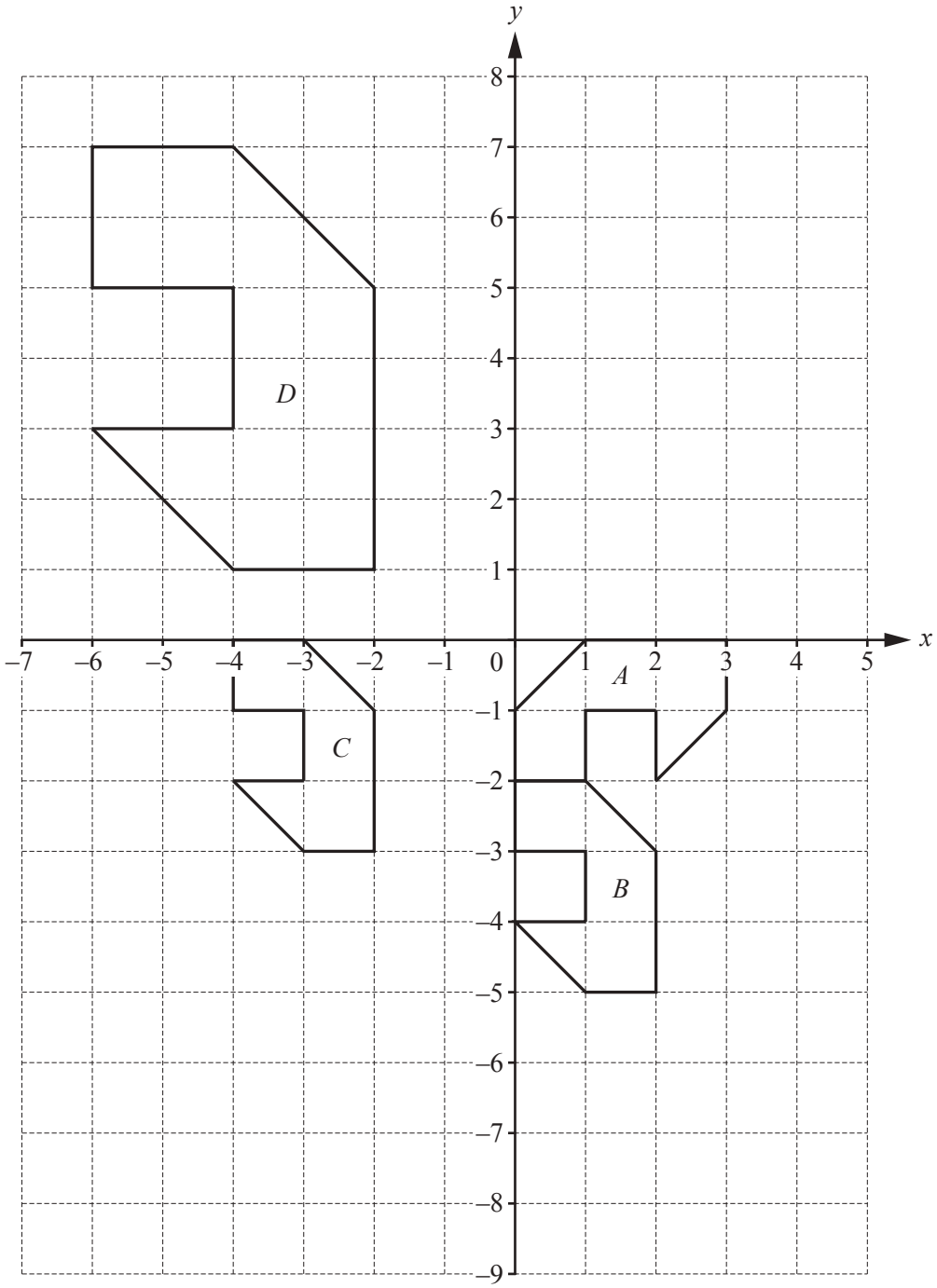
7



The diagram shows four shapes, *A*, *B*, *C* and *D*, drawn on a 1 cm^2 grid.

(a) Find the area of shape *B*.

..... cm^2 [1]

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(b) Describe fully the **single** transformation that maps

(i) shape A onto shape B,

.....

..... [3]

(ii) shape B onto shape C,

.....

..... [2]

(iii) shape C onto shape D.

.....

..... [3]

(c) On the grid, draw the image of shape D after a reflection in the line $x = -1$. [2]

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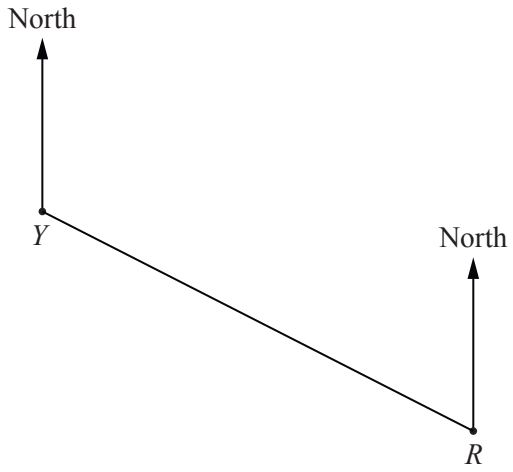
8 **(a)** The scale drawing shows the positions of two towns, Yatterford (Y) and Rexley (R), on a map.
The scale is 1 centimetre represents 15 kilometres.



Scale: 1 cm to 15 km

(i) Write the scale of the map in the form 1: n.

1 : ..... [2]

(ii) Work out the actual distance of Rexley from Yatterford.

..... km [2]

(iii) Measure the bearing of Rexley from Yatterford.

..... [1]

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(iv) A hospital is to be built on an area of land between 45 km and 60 km from Yatterford.
The bearing of the hospital from Yatterford is between 250° and 295°.

On the map, construct and shade the region in which the hospital is to be built.

[5]

(b) The bearing of Bartown from Whitestoke is 073°.

Work out the bearing of Whitestoke from Bartown.

..... [2]

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9 A shop sells pens and notebooks.
The cost of a pen is p cents and the cost of a notebook is n cents.

(a) On Monday, the shop sells 5 pens and 4 notebooks for 450 cents.

Complete the equation.

$$5p + 4n = \text{.....}$$ [1]

(b) On Tuesday, the shop sells 10 pens and 3 notebooks for 525 cents.

Write this information as an equation.

..... = ... [2]

(c) Solve your two equations to find the cost of a pen and the cost of a notebook.
You must show all your working.

Cost of a pen = ... cents

Cost of a notebook = ... cents [3]

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10 **(a)** Seven students want to join the school diving club.
Some information about these students is recorded in the table below.

Name	Month and year of birth	Height (metres)	Distance each student can swim (metres)
Arj	November 2004	1.62	200
Biva	October 2006	1.43	500
Cala	February 2006	1.53	1500
Dainy	January 2007	1.56	1000
Elu	December 2005	1.64	600
Ful	August 2006	1.52	1000
Gani	January 2006	1.46	1000

To join the diving club you must be

- at least 12 years old in March 2018

and

- at least 150 centimetres tall

and

- able to swim at least 0.5 kilometres.

Write down the names of the students who can join the club.

..... [2]

(b) The students dive off boards of different heights.
The speed, s m/s, that they enter the water from a board of height h metres, can be found using this formula.

$$s = \sqrt{19.6h}$$

(i) Calculate the value of s when $h = 10$.

$s =$ ..... [2]

(ii) Make h the subject of the formula.

$h =$ ..... [2]

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11 **(a)** A, B, C and D are four equations of straight line graphs.

A	$y = -3x + 4$	B	$y = 4x - 3$	C	$y = 3x - 4$	D	$y = -4x - 3$

(i) Write down the letter of the graph that

(a) passes through the point $(1, -1)$,

..... [1]

(b) has a y-intercept of 4,

..... [1]

(c) has a gradient of -4.

..... [1]

(ii) The point $(p, -26)$ lies on the line $y = -3x + 4$.

Work out the value of p.

$p =$ ..... [2]

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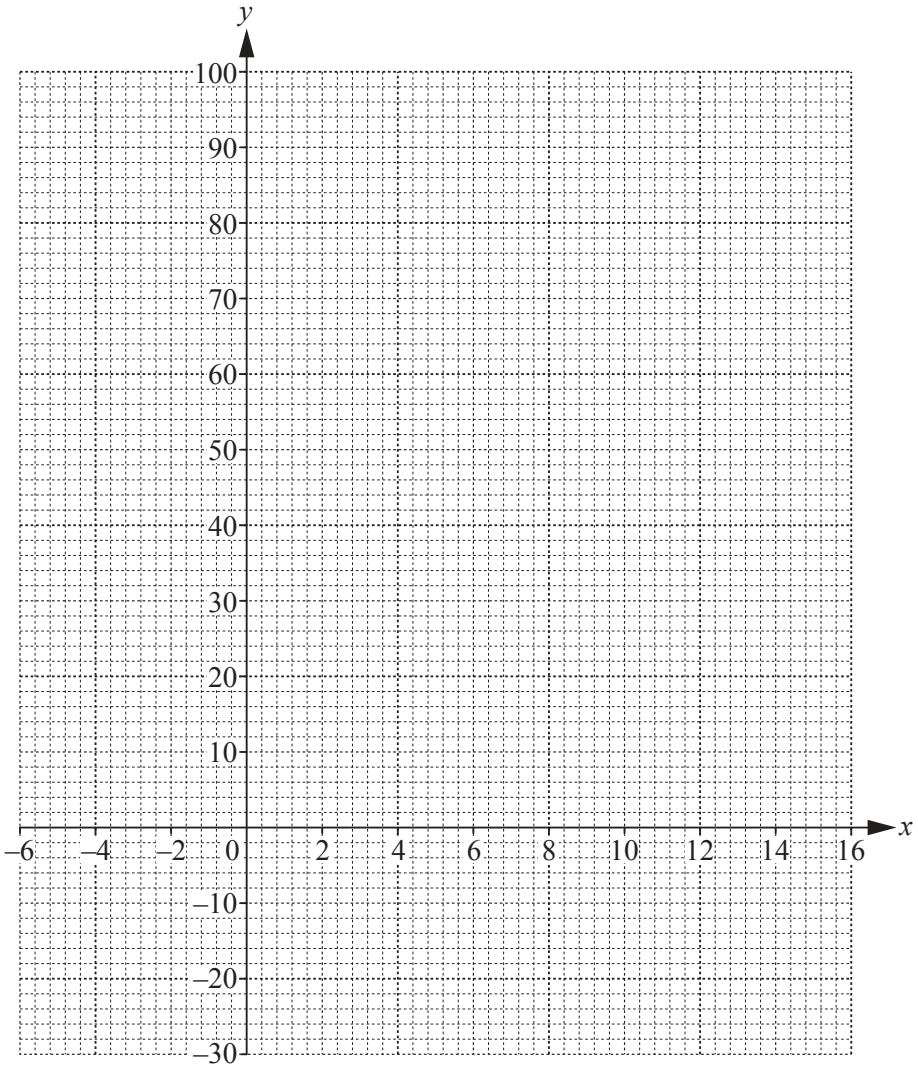
(b) **(i)** Complete the table of values for $y = x^2 - 10x$.

x	-6	-3	0	3	6	9	12	15
y	96			-21	-24		24	75

[3]

(ii) On the grid, draw the graph of $y = x^2 - 10x$ for $-6 \leqslant x \leqslant 15$.



[4]

(iii) Write down the co-ordinates of the lowest point of the graph.

(..... , ...) [1]

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MATHEMATICS **0580/42**

Paper 42 (Extended) **March 2018**

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	23.27 final answer	**2**	**M1** for 9 × 2.97 soi
1(a)(ii)	2.75 final answer	**3**	**M2** for $2.97 \div \frac{108}{100}$ oe or **M1** for 108[%] associated with 2.97 oe
1(b)	12.4[0] or 12.41 to 12.42	**2**	**M1** for 35 ÷ 0.0153 oe If 0 scored, **SC1** for answer 0.19
1(c)	70 nfww	**3**	**M2** for (600 + 2.5) ÷ (9 – 0.5) or **B1** for one of 600 + 2.5 or 9 – 0.5 seen
2(a)	128	**2**	**M1** for $4 \times \frac{1}{2} \times 8 \times 8$ oe
2(b)(i)	18.3 or 18.26 to 18.29…	**3**	**M2** for $\frac{1}{4}(\pi \times 8^2 - \textit{their}\,128)$ oe or **M1** for $\pi \times 8^2 - \textit{their}\,128$ oe or for $\frac{1}{4} \times \pi \times 8^2$ oe OR **SC2dep** for answer 4.56 to 4.57...
2(b)(ii)	23.9 or 23.87 to 23.882	**4**	**M3** for $\frac{90}{360} \times 2 \times \pi \times 8 + \sqrt{8^2 + 8^2}$ oe OR **M1** for $\frac{90}{360} \times 2 \times \pi \times 8$ oe **M1** for $\sqrt{128}$ oe OR **SC3dep** for answer 11.9 or 11.93 to 11.94…
3(a)	0 –0.17 2.4	**3**	**B1** for each
3(b)	Fully correct smooth curve	**4**	**B3FT** for 9 or 10 correct points or **B2FT** for 7 or 8 correct points or **B1FT** for 5 or 6 correct points
3(c)	$x \leqslant 0.17$ to 0.25 and $x \geqslant 2.25$ to 2.3	**3**	**B2** for strict inequalities or one correct or **B1** for 0.17 to 0.25 and 2.25 to 2.3 seen

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Question	Answer	Marks	Partial Marks
3(d)(i)	$y = 4 - x$ oe final answer	2	**B1** for $4 - x$ or $y = k - x$ or $y = 4 + kx$ oe
3(d)(ii)	correct ruled line	1	**FT** if in form $y = mx + c$ oe ($m, c \neq 0$)
	0.125 to 0.2 and 2.15 to 2.2	2	**B1** for each
4(a)	$[\pm]\sqrt{k - s}$ final answer	2	**M1** for $t^2 = k - s$
4(b)(i)	$(x - 5)(x + 5)$ final answer	1	
4(b)(ii)	$\frac{x-5}{x-7}$ nfww final answer	3	**M2** for $(x - 7)(x + 5)$ or **M1** for $x(x + 5) - 7(x + 5)$ or $x(x - 7) + 5(x - 7)$ or $(x + a)(x + b)$ where $a + b = -2$ or $ab = -35$
4(c)	$\frac{4x^2 - 7x - 8}{x(x+1)}$ or $\frac{4x^2 - 7x - 8}{x^2 + x}$ final answer	3	**M1** for $(x - 8)(x + 1) + 3x \times x$ oe isw **B1** for common denominator $x(x + 1)$ oe isw
4(d)	3, 4, 5, 6 nfww	3	**B2** for 3 correct or 4 correct and 1 extra or **M2** for $n > \frac{18}{8}$ oe and $n \leqslant 6$ or **M1** for $18 < 8n$ [$\leqslant 30 + 3n$] or [$18 - 3n <$] $5n \leqslant 30$ seen
5(a)(i)	1930 or 1940 or 1933.4 to 1935.3	5	**B1** for interior angle 120 soi or angle at centre 60 soi or for correct use of Pythagoras' with 7 and 3.5 or with 14 and 7 **M3** for $6 \times \frac{1}{2} \times 7^2 \times \sin 60 \times 15.2$ oe or complete other methods or **M2** for $6 \times \frac{1}{2} \times 7^2 \times \sin 60$ oe OR **M1** for $\frac{1}{2} \times 7^2 \times \sin 60$ oe or other partial area of hexagon **M1dep** for *their* area × 15.2 evaluated

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Question	Answer	Marks	Partial Marks
5(a)(ii)	893 or 892.8 to 893.0…	**3**	**M2** for $6 \times 7 \times 15.2 + 2 \times 6 \times \frac{1}{2} \times 7^2 \times \sin 60$ oe or for 6 × 7 × 15.2 + 2 × *their* area of hexagon from **(a)** oe or **M1** for [6 ×] 7 × 15.2 oe or 2 × *their* area of hexagon from **(a)** oe
5(b)	2.71 or 2.709 to 2.710	**3**	**M2** for $\sqrt[3]{500 \div \left(6 \times \frac{4}{3}\pi\right)}$ oe or **M1** for $500 = 6 \times \frac{4}{3}\pi r^3$ oe If 0 scored, **SC1** for answer 4.92 or 4.923 to 4.924
6(a)	$y > x$	**1**	
	$x \geqslant 15$	**1**	
	$y < 50$	**1**	
	$x + y \leqslant 70$	**1**	
6(b)	Four correct ruled lines and correct region indicated	**5**	all lines ruled **B1** for $y = x$ broken **B1** for $x = 15$ **B1** for $y = 50$ broken **B1** for $x + y = 70$
6(c)	189	**2**	**M1** for (21, 49) seen or for $2x + 3y$ written for a point (x, y) in *their* region where x and y are integers
7(a)(i)	$\frac{9}{160}$ oe	**1**	
7(a)(ii)	58.125 nfww	**4**	**M1** for mid-points soi **M1** for use of Σfx with x in correct interval including both boundaries **M1** (dep on 2nd M1) for $\Sigma fx \div 160$
7(b)	[3 42] 85 140 151 160	**2**	**B1** for 1 error **FT** other values

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Question	Answer	Marks	Partial Marks
7(c)	correct curve	3	**B1FT** *their* **(b)** for 6 correct heights **B1** for 6 points at upper ends of intervals on correct vertical line **B1FT dep on at least B1** for increasing curve through *their* 6 points After 0 scored, **SC1** for *their* 5 correct points plotted
7(d)(i)	57 to 59	1	
7(d)(ii)	36 to 42	2	**B1** for UQ = 76 to 80 or LQ = 38 to 40 soi
7(d)(iii)	92 to 94	2	**B1** for 144 seen
7(d)(iv)	130 to 137	2	**B1** for 23 to 30 seen
8(a)	356 or 356.2 to 356.3	4	**B1** for [Angle *LPM*] = 74 soi **M2** for $\frac{248 \times \sin \textit{their } 74}{\sin 42}$ oe or **M1** for implicit statement
8(b)(i)	320 or 319.9 to 320.2...	3	**B1** for angle *PLM* = 64 soi or for angle between *LM* and perpendicular from *M* = 26 soi or [*PM* =] 333.[1…] **M1** for *their* 356 × sin *their* 64 oe or *their* 356 × cos *their* 26 oe
8(b)(ii)	02 57 or 2 57 am	3	**B2** for 6 hours 12 mins or 372 mins seen or **M1** for 248 ÷ 40 oe If 0 scored, **SC1** for *their* time in hours converted to hours and minutes
9(a)	7.07 or 7.071...	2	**M1** for $(-1)^2 + 7^2$ oe
9(b)	–6	2	**M1** for $6 \times m - 5 \times 2m$ [= 24]
9(c)(i)	(10) final answer	2	**B1** for answer 10 without brackets
9(c)(ii)	$\begin{pmatrix} 2 \\ 6 \end{pmatrix}$ final answer	2	**M1** for $\begin{pmatrix} 2 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 6 \end{pmatrix}$
9(c)(iii)	$\begin{pmatrix} 19 & 55 \\ 33 & 96 \end{pmatrix}$ final answer	2	**M1** for 2 or 3 correct elements
9(c)(iv)	$\frac{1}{3}\begin{pmatrix} 9 & -5 \\ -3 & 2 \end{pmatrix}$ oe isw	2	**B1** for $k\begin{pmatrix} 9 & -5 \\ -3 & 2 \end{pmatrix}$ soi or det = 3 soi

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Question	Answer	Marks	Partial Marks
10(a)	10.8 or 10.81 to 10.82	**3**	**M2** for $\sqrt{(6--3)^2+(-2-4)^2}$ oe or **M1** for $(6--3)^2+(-2-4)^2$ oe
10(b)(i)	(6, 4)	**2**	**B1** for each
10(b)(ii)	2	**2**	**M1** for $\frac{12-(-4)}{10-2}$ oe
10(b)(iii)	$y=-\frac{1}{2}x+4$ oe final answer	**3**	**M1** for gradient = $-\frac{1}{2}$ or $-\frac{1}{\textit{their}\ \textbf{(b)(ii)}}$ **M1** for (2, 3) substituted into *their* $y=mx+c$ or $y-y_1=m(x-x_1)$ oe
11(a)	25 9 16	**3**	**B1** for each
11(b)(i)	$(n-1)^2$ oe	**2**	**B1** for any quadratic of form [1]n^2[+bn+c]
11(b)(ii)	$n+3$ oe	**1**	
11(c)	25	**2**	**M1** for *their* $(n-1)^2 = 576$
11(d)(i)	n^2-3n-2 final answer	**3**	**M1** for *their* $(n-1)^2$ − *their* $(n+3)$ oe or 2nd diff = 2 soi **B1** for $n^2-n-n+1$ or better or $-n-3$ or for expression of form $n^2-2n-n+k$ or correct expression not in simplest form
11(d)(ii)	808 cao	**2**	**M1** for substituting 30 in *their* **(d)(i)**

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CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

MATHEMATICS **0580/42**

Paper 4 (Extended) **February/March 2018**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

This document consists of **15** printed pages and **1** blank page.

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[Turn over

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1 **(a)** A shop sells dress fabric for \$2.97 per metre.

(i) A customer buys 9 metres of this fabric.

Calculate the change he receives from \$50.

\$ ..... [2]

(ii) The selling price of \$2.97 per metre is an increase of 8% on the cost price.

Calculate the cost price.

\$ ..... per metre [3]

(b) A dressmaker charges \$35 or 2300 rupees to make a dress.

Calculate the difference in price when the exchange rate is 1 rupee = \$0.0153 .
Give your answer in rupees.

..... rupees [2]

(c) The dressmaker measures a length of fabric as 600 m, correct to the nearest 5 metres.
He cuts this into dress lengths of 9 m, correct to the nearest metre.

Calculate the largest number of complete dress lengths he could cut.

..... [3]

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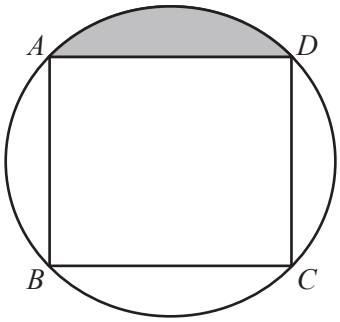
2



NOT TO SCALE

The vertices of a square *ABCD* lie on the circumference of a circle, radius 8 cm.

(a) Calculate the area of the square.

..... cm^2 [2]

(b) **(i)** Calculate the area of the shaded segment.

..... cm^2 [3]

(ii) Calculate the perimeter of the shaded segment.

..... cm [4]

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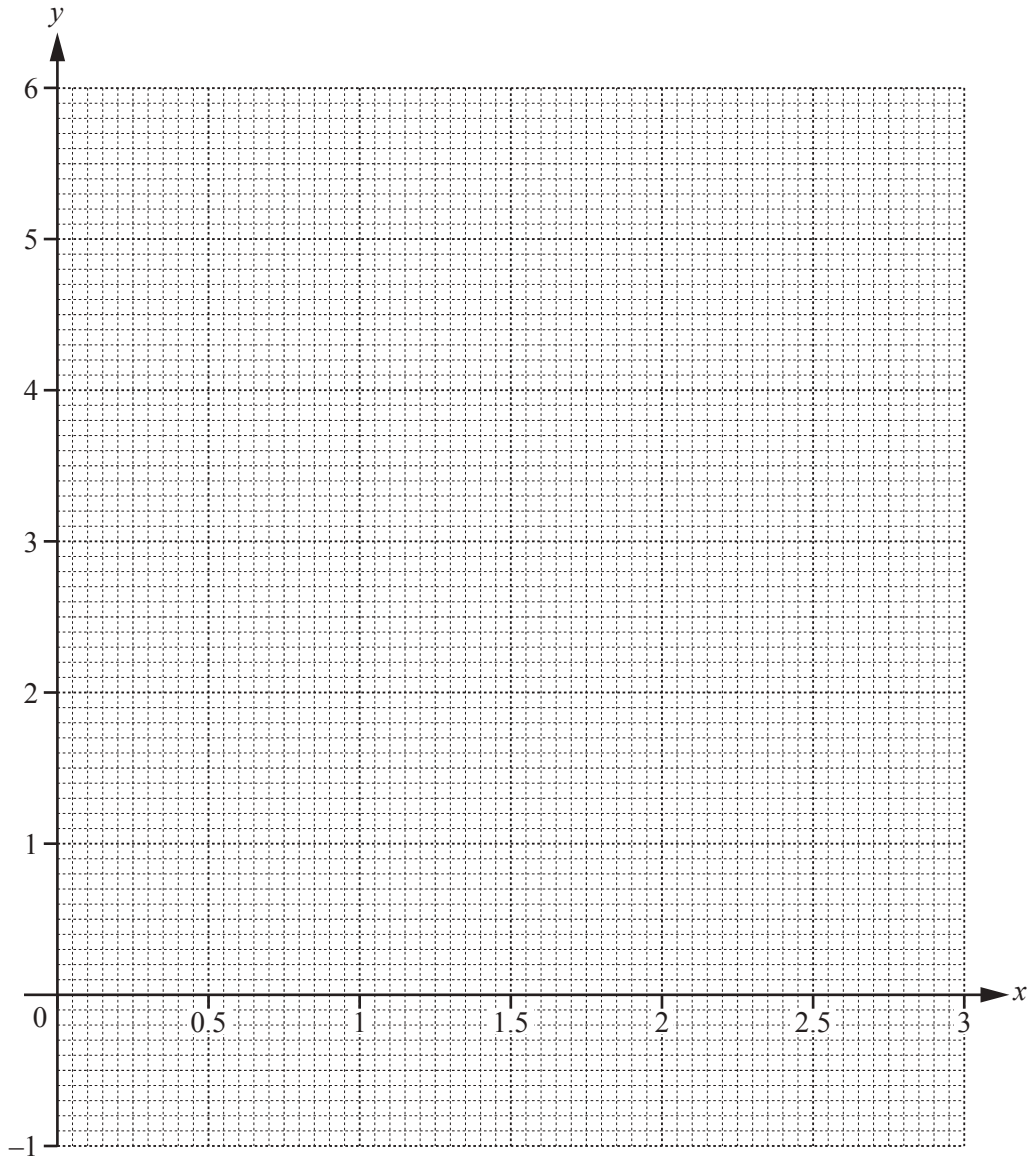
3 The table shows some values for $y = 2x + \frac{1}{x} - 3$ for $0.125 \leqslant x \leqslant 3$.

x	0.125	0.25	0.375	0.5	0.75	1	1.5	2	2.5	3
y	5.25	1.5	0.42			0	0.67	1.5		3.33

(a) Complete the table. [3]

(b) On the grid, draw the graph of $y = 2x + \frac{1}{x} - 3$ for $0.125 \leqslant x \leqslant 3$.



[4]

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(c) Use your graph to solve $2x + \frac{1}{x} - 3 \geqslant 2$.

.....

..... [3]

(d) The equation $\frac{1}{x} = 7 - 3x$ can be solved using your graph in **part (b)** and a straight line.

(i) Write down the equation of this straight line.

..... [2]

(ii) Draw this straight line and solve the equation $\frac{1}{x} = 7 - 3x$.

$x =$ ..... or $x =$ ..... [3]

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4 **(a)** Make t the subject of the formula $s = k - t^2$.

$t =$ ..... [2]

(b) **(i)** Factorise $x^2 - 25$.

..... [1]

(ii) Simplify $\dfrac{x^2 - 25}{x^2 - 2x - 35}$.

..... [3]

(c) Write as a single fraction in its simplest form.

$$\frac{x-8}{x} + \frac{3x}{x+1}$$

..... [3]

(d) Find the **integer** values of n that satisfy the inequality.

$$18 - 2n < 6n \leqslant 30 + n$$

..... [3]

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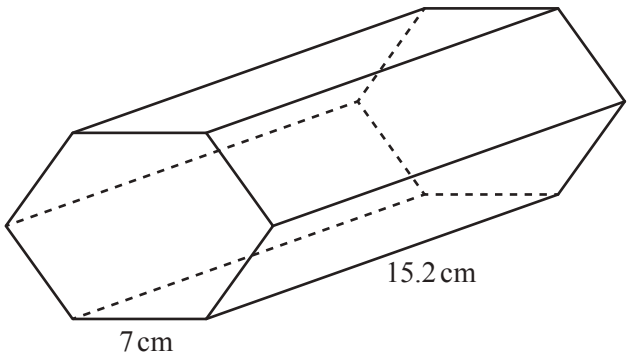
5 **(a)**



NOT TO SCALE

The diagram shows a solid prism with length 15.2 cm.
The cross-section of this prism is a **regular** hexagon with side 7 cm.

(i) Calculate the volume of the prism.

..... cm^3 [5]

(ii) Calculate the total surface area of the prism.

..... cm^2 [3]

(b) Another solid metal prism with volume 500 cm^3 is melted and made into 6 identical spheres.

Calculate the radius of each sphere.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... cm [3]

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6 Klaus buys x silver balloons and y gold balloons for a party.

He buys
- more gold balloons than silver balloons
- at least 15 silver balloons
- less than 50 gold balloons
- a total of no more than 70 balloons.

(a) Write down four inequalities, in terms of x and/or y, to show this information.

.....

.....

.....

..... [4]

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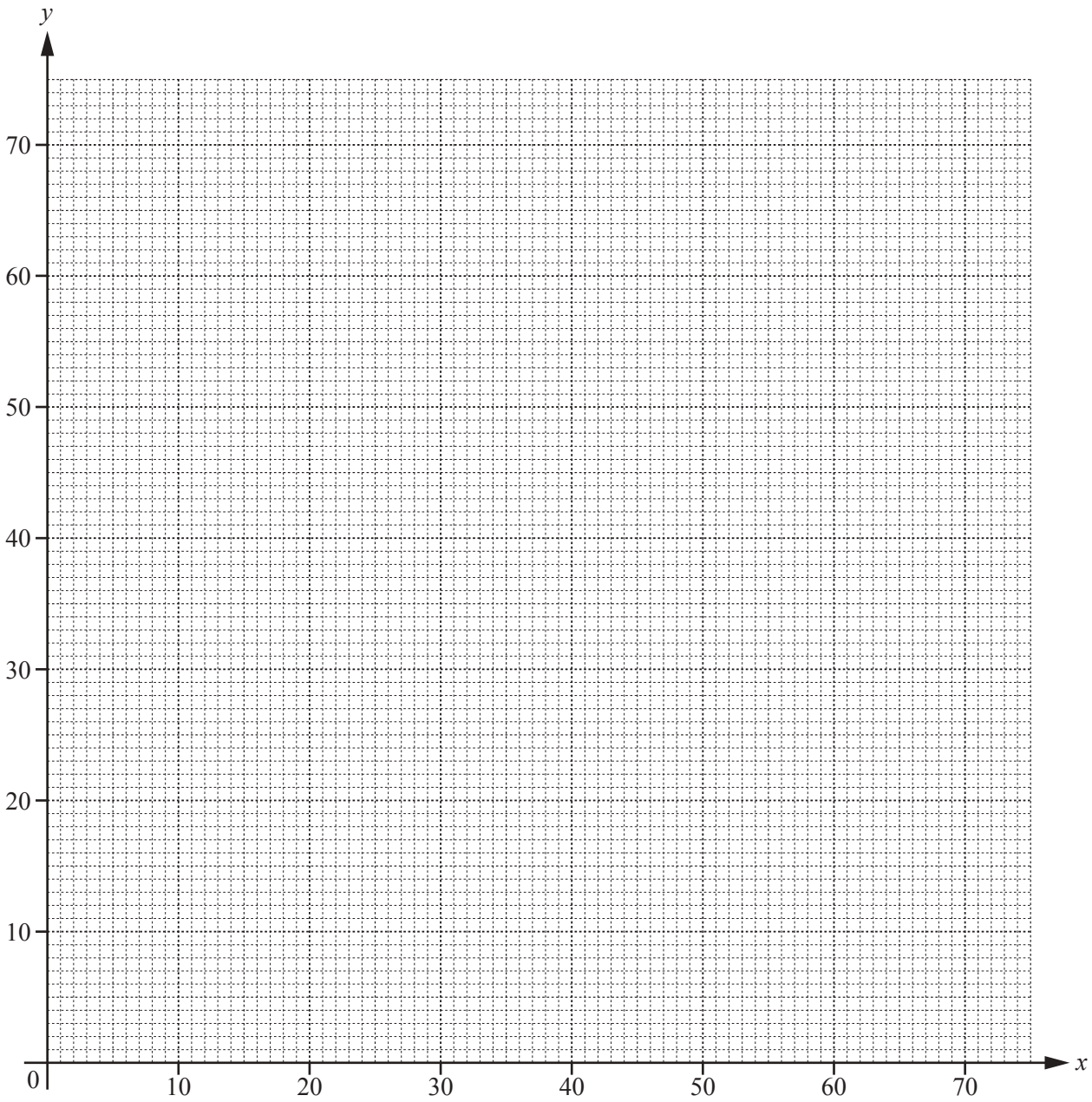
(b) On the grid, show the information from **part (a)** by drawing four straight lines and shading the unwanted regions.



[5]

(c) Silver balloons cost \$2 and gold balloons cost \$3.

Calculate the most that Klaus could spend.

\$ ..... [2]

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7 The frequency table shows information about the time, m minutes, that each of 160 people spend in a library.

Time (m minutes)	$0 < m \leqslant 10$	$10 < m \leqslant 40$	$40 < m \leqslant 60$	$60 < m \leqslant 90$	$90 < m \leqslant 100$	$100 < m \leqslant 120$
Frequency	3	39	43	55	11	9

(a) **(i)** Find the probability that one of these people, chosen at random, spends more than 100 minutes in the library.

..... [1]

(ii) Calculate an estimate of the mean time spent in the library.

..... min [4]

(b) Complete the cumulative frequency table below.

Time (m minutes)	$m \leqslant 10$	$m \leqslant 40$	$m \leqslant 60$	$m \leqslant 90$	$m \leqslant 100$	$m \leqslant 120$
Cumulative frequency	3	42				

[2]

(c) On the grid opposite, draw the cumulative frequency diagram.

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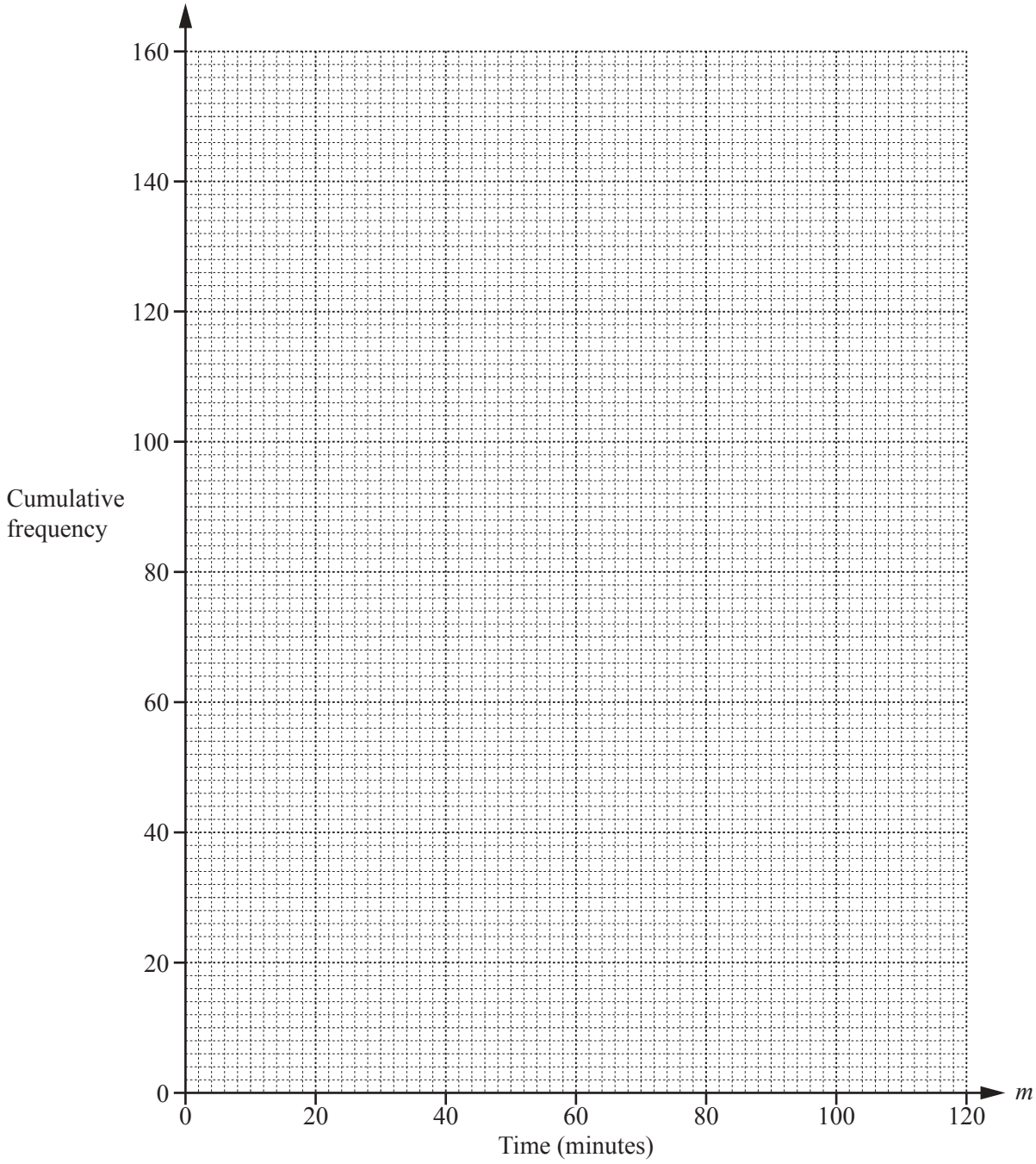

[3]

(d) Use your cumulative frequency diagram to find

(i) the median,

..... min [1]

(ii) the interquartile range,

..... min [2]

(iii) the 90th percentile,

..... min [2]

(iv) the number of people who spend more than 30 minutes in the library.

..... [2]

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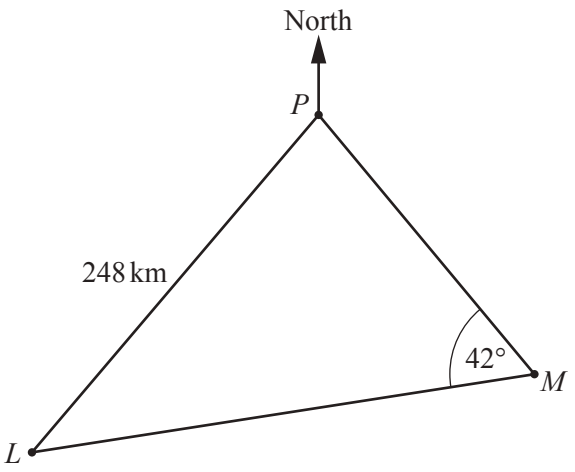
8



NOT TO SCALE

The diagram shows two ports, L and P, and a buoy, M.
The bearing of L from P is 201° and $LP = 248$ km.
The bearing of M from P is 127°.
Angle $PML = 42°$.

(a) Use the sine rule to calculate LM.

$LM =$ ..... km [4]

(b) A ship sails directly from L to P.

(i) Calculate the shortest distance from M to LP.

..... km [3]

(ii) The ship leaves L at 2045 and travels at a speed of 40 km/h.

Calculate the time the next day that the ship arrives at P.

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[3]

9 **(a)** Find the magnitude of the vector $\begin{pmatrix} -1 \\ 7 \end{pmatrix}$.

..... [2]

(b) The determinant of the matrix $\begin{pmatrix} 6 & 2m \\ 5 & m \end{pmatrix}$ is 24.

Find the value of m.

$m =$ ..... [2]

(c) $\mathbf{L} = \begin{pmatrix} 2 & 5 \\ 3 & 9 \end{pmatrix}$ $\mathbf{M} = \begin{pmatrix} -4 \\ 2 \end{pmatrix}$ $\mathbf{N} = \begin{pmatrix} 1 & 7 \end{pmatrix}$

Work out the following.

(i) **NM**

..... [2]

(ii) **LM**

..... [2]

(iii) $\mathbf{L}^2$

..... [2]

(iv) $\mathbf{L}^{-1}$

..... [2]

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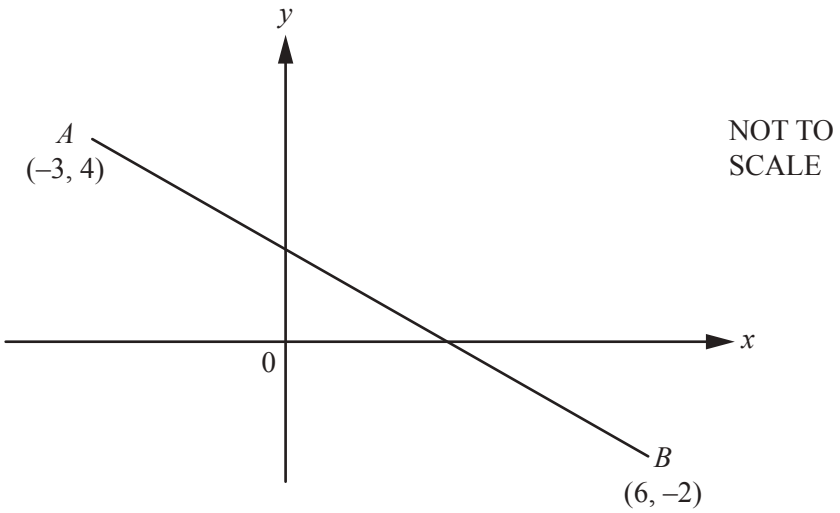
10 **(a)**



Calculate the length of AB.

..... [3]

(b) The point P has co-ordinates $(10, 12)$ and the point Q has co-ordinates $(2, -4)$.

Find

(i) the co-ordinates of the mid-point of the line PQ,

(..... , ...) [2]

(ii) the gradient of the line PQ,

..... [2]

(iii) the equation of a line perpendicular to PQ that passes through the point $(2, 3)$.

[3]

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11 The table shows the first five terms of sequences A, B and C.

Sequence	1st term	2nd term	3rd term	4th term	5th term	6th term
A	0	1	4	9	16	
B	4	5	6	7	8	
C	-4	-4	-2	2	8	

(a) Complete the table. [3]

(b) Find an expression for the nth term of

(i) sequence A,

..... [2]

(ii) sequence B.

..... [1]

(c) Find the value of n when the nth term of sequence A is 576.

n = ... [2]

(d) **(i)** Find an expression for the nth term of sequence C.
Give your answer in its simplest form.

..... [3]

(ii) Find the value of the 30th term of sequence C.

..... [2]

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Cambridge Assessment International Education

Grade thresholds – June 2018

Cambridge IGCSE™ Mathematics (without Coursework) (0580)

Grade thresholds taken for Syllabus 0580 (Mathematics (without Coursework)) in the June 2018 examination.

		minimum raw mark required for grade:						
	maximum raw mark available	A	B	C	D	E	F	G
Component 11	56	–	–	27	22	17	12	7
Component 12	56	–	–	37	31	26	21	16
Component 13	56	–	–	36	30	25	19	13
Component 21	70	56	48	39	31	22	–	–
Component 22	70	57	47	37	30	23	–	–
Component 23	70	58	50	42	36	30	–	–
Component 31	104	–	–	50	42	34	27	20
Component 32	104	–	–	67	56	44	32	20
Component 33	104	–	–	74	66	57	48	39
Component 41	130	95	78	62	49	37	–	–
Component 42	130	105	82	59	46	33	–	–
Component 43	130	99	83	68	53	39	–	–

Grade A* does not exist at the level of an individual component.

The maximum total mark for this syllabus, after weighting has been applied, is **200** for the 'Extended' options and **160** for the 'Core' options.

The overall thresholds for the different grades were set as follows.

Option	Combination of Components	A*	A	B	C	D	E	F	G
AX	11, 31	–	–	–	77	64	51	39	27
AY	12, 32	–	–	–	104	87	70	53	36
AZ	13, 33	–	–	–	110	96	82	67	52
BX	21, 41	176	151	126	101	80	59	–	–
BY	22, 42	182	162	129	96	76	56	–	–
BZ	23, 43	181	157	133	110	89	69	–	–

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MATHEMATICS **0580/11**

Paper 1 (Core) **May/June 2018**

MARK SCHEME

Maximum Mark: 56

Published

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1	4600	**1**	
2	$\frac{7}{1000}$	**1**	
3	136	**1**	
4	2 7 12 cao	**1**	
5(a)	[0].0027	**1**	
5(b)	3.87×10^{-5}	**1**	
6	66	**2**	**B1** for 84 or −18 seen
7	94	**2**	**B1** for *ACB* or *PAB* or *ABC* = 43 or **M1** for $180 - 2 \times 43$ or $\frac{1}{2}x = 90 - 43$
8	1.5 oe	**2**	**M1** for $8x = 7 + 5$ or $x - \frac{5}{8} = \frac{7}{8}$ oe
9(a)	6540	**1**	
9(b)	7.85[0]	**1**	
10	1.715, 1.725	**2**	**B1** for one correct in correct place If zero scored, **SC1** for both correct but reversed or for 171.5 **and** 172.5
11	$7y - 23$ final answer	**2**	**M1** for $12y - 18$ or $-5y - 5$ or **B1** for answer $7y - k$ or $cy - 23$ $c \neq 0$
12(a)	$\begin{pmatrix} -1 \\ 9 \end{pmatrix}$	**1**	
12(b)	$\begin{pmatrix} 3 \\ -4 \end{pmatrix}$	**1**	

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Question	Answer	Marks	Partial Marks
13	126	**2**	**M1** for at least 3 multiples of 18 **and** 21 or 3 × 6 × 7 as final answer or 3 [×] 6 **and** 3 [×] 7 in working or **B1** for final answer 126*k*, integer *k* >1
14	45	**2**	**M1** for $\frac{360}{8}$ If zero scored, **SC1** for answer 135
15(a)	6.58331…	**1**	
15(b)	6.5833	**1**	**FT** *their* **(a)** correctly rounded to 4 dp
16	Correct enlargement drawn	**2**	**B1** for correct sf but wrong position
17(a)	$\frac{8}{15}$ oe	**1**	
17(b)	40	**1**	
18(a)	x^{12}	**1**	
18(b)	–2	**1**	
19	π $\sqrt{3}$	**2**	**B1** for each
20(a)	Rectangle	**1**	
20(b)	Two correct properties e.g. 2 pairs of parallel sides Opposite angles are equal Opposite sides are same length Rotational symmetry order 2 Diagonals are not equal	**2**	**B1** for one correct property
21(a)	Cuboid	**1**	
21(b)	24	**2**	**M1** for 2 × 3 × 4
22(a)	$2(5+8w)$	**1**	
22(b)	$4t(3x-2t)$	**2**	**B1** for answer $4(3tx-2t^2)$ or $t(12x-8t)$ $2(6tx-4t^2)$ or $2t(6x-4t)$

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Question	Answer	Marks	Partial Marks
23	$\frac{7}{4}$	**M1**	or $\frac{k}{4} \times \frac{6}{35}$ where $k > 4$
	$\frac{3}{10}$ cao	**A2**	**A1** for $\frac{42}{140}$ or $\frac{21}{70}$ or $\frac{6}{20}$
24	for correctly equating one set of coefficients	**M1**	
	for correct method to eliminate one variable	**M1**	
	[x =] 7	**A1**	
	[y =] 8.5	**A1**	If zero scored, **SC1** for 2 values satisfying one of the original equations or **SC1** for both answers correct but no working
25(a)(i)	4	**1**	
25(a)(ii)	3.2	**3**	**M1** for Σfx, allow one error or omission and **M1dep** for $\frac{their 128}{40}$
25(b)	27	**2**	**M1** for $\frac{3}{40}$ or $\frac{360}{40}$

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MATHEMATICS **0580/12**

Paper 1 (Core) **May/June 2018**

MARK SCHEME

Maximum Mark: 56

Published

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GENERIC MARKING PRINCIPLE 6:

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dep	dependent
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isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1	2[h] 55[min]	**1**	
2	8g	**1**	
3	7x – 56 final answer	**1**	
4	21	**1**	
5	24	**2**	**B1** for 17 or 41 identified
6	[a =]15 [b =] −27	**2**	**B1** for each or **SC1** for reversed answers
7	293°	**2**	**M1** for 113 + 180 oe or a sketch with the correct angle identified
8(a)	4	**1**	
8(b)	4	**1**	
9	$\frac{2}{55}$ $\frac{1}{27}$ 0.038 5^{-2}	**2**	**M1** for decimals to accuracy minimum 0.04, 0.037, 0.036 or **B1** for 3 in the correct order
10	$2y^2(2x - 3y)$ final answer	**2**	**B1** for $2y(2xy - 3y^2)$ or $2(2xy^2 - 3y^3)$ or $y(4xy - 6y^2)$ or $y^2(4x - 6y)$
11(a)	1.36×10^6 oe	**1**	
11(b)	5.21×10^{-3} oe	**1**	
12	$\begin{pmatrix} -16 \\ -11 \end{pmatrix}$	**2**	**B1** for [3**b** =] $\begin{pmatrix} -21 \\ -9 \end{pmatrix}$ or $\begin{pmatrix} -16 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -11 \end{pmatrix}$
13	[y =] $\frac{5x+7}{2}$ oe	**2**	**M1** for $2y = 5x + 7$ or $-2y = -5x - 7$ or $\frac{5}{2}x - y + \frac{7}{2} = 0$
14	257	**2**	**B1** for 257.4

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Question	Answer	Marks	Partial Marks
15(a)	[w =] 7	**1**	
15(b)	[12x =] 36	**1**	
16	51.3 or 51.31 to 51.32	**2**	**M1** for cos [x =] $\frac{5}{8}$
17	62	**3**	**M1** for [height =] 21 ÷ 7 **M1** for 2(1 × *their*3 + *their*3 × 7 + 1 × 7) oe
18	26.2 or 26.16(.....)	**3**	**M2** for $\sqrt{35.1^2 - 23.4^2}$ or better or **M1** for $35.1^2 = 23.4^2 + BC^2$ or better
19	1410 or 1413 or 1413.1[0 .....]	**3**	**M2** for $1200\left(1+\frac{5.6}{100}\right)^3$ oe or **M1** for $1200\left(1+\frac{5.6}{100}\right)^2$ oe
20(a)	448 or 447.85 to 447.95	**2**	**M1** for $\pi \times 3.6^2 \times 11$
20(b)	[0].448 or [0].44785 to [0].44795	**1**	**FT** *their* **(a)** ÷ 1000
21	13.4[0]	**3**	**M2** for (167.9 – 20.5) ÷ 11 or **M1** for 167.9[0] – 20.5[0]
22(a)	Friday	**1**	
22(b)	74	**2**	**M1** for (67 + 75 + 53 + 68 + 94 + 87) ÷ 6
22(c)	41	**1**	
23(a)	140 000	**1**	
23(b)	Points correctly plotted at (40, 80) and (80, 150)	**1**	
23(c)	Correct ruled line of best fit	**1**	
23(d)	80 000 to 110 000	**1**	**FT** their straight line provided it has positive gradient
24(a)	$\frac{8}{12}$ and $\frac{1}{12}$ oe	**M1**	For correct fractions with a common denominator 12k
	$\frac{7}{12}$ cao	**A1**	

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Question	Answer	Marks	Partial Marks
24(b)	$\frac{24}{7}$ or $\frac{61}{14}$	**B1**	or equivalent improper fractions
	$\frac{their24}{7} \times \frac{14}{their61}$ oe	**M1**	or $\frac{their48}{14} \div \frac{their61}{14}$ oe common denominator
	$\frac{48}{61}$ cao	**A1**	

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MATHEMATICS **0580/13**

Paper 1 (Core) **May/June 2018**

MARK SCHEME

Maximum Mark: 56

Published

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SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1	$\frac{3}{4}$	**1**	
2	$w(1 + w^2)$ final answer	**1**	
3	6.15 or 6.153 to 6.154 or $6\frac{2}{13}$	**1**	
4	12	**1**	
5	[0].0625 or $\frac{1}{16}$	**1**	
6(a)	acute	**1**	
6(b)	diameter	**1**	
7	[0].24 $\frac{1}{4}$ 26[%] $\frac{4}{15}$	**2**	**B1** for three in the correct order or **M1** for .266/.27 .26 .25 seen
8	3, 4, 6, 9, 12, 18	**2**	**B1** for list with one or two errors or omissions or for a complete list of products
9	25.3[0]	**2**	**M1** for $22 \times \frac{15}{100}$ oe or better
10(a)	210 000 cao	**1**	
10(b)	4120 cao	**1**	
11	750	**2**	**M1** for 2500 ÷ (7 + 3) [× 3]
12	162	**2**	**M1** for 225 × 0.72 oe
13(a)	[0].004 82 cao	**1**	
13(b)	5.2×10^7	**1**	

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Question	Answer	Marks	Partial Marks
14	-11	2	**M1** for $1-p=3\times4$ or better or $-\frac{p}{3}=4-\frac{1}{3}$ or better
15	6.15 6.25	2	**B1** for each or **SC1** both correct but reversed
16	9.18 or 9.177…	2	**M1** for sin 35 = $\frac{x}{16}$ or better
17	304	3	**M2** for [2 ×]((10 × 4) + (10 × 8) + (4 × 8)) or **M1** for one of 10 × 4 or 10 × 8 or 4 × 8
18	$\frac{6}{5}$	B1	accept equivalent fractions e.g. $\frac{18}{15}$
	$\frac{2}{3}\times$ *their* $\frac{5}{6}$	M1	or $\frac{10}{15}\div\frac{18}{15}$ oe
	$\frac{5}{9}$ cao	A1	
19(a)(i)	$\begin{pmatrix}7\\5\end{pmatrix}$	1	
19(a)(ii)	$\begin{pmatrix}-20\\8\end{pmatrix}$	1	
19(b)	3, −1	1	
20(a)	5	1	
20(b)	$y = 8x + 6$	2	**M1** for $y = 8x + k$, $k \neq 3$ or 6 or $y = mx + 6$, $m \neq 0$ or 8 or for answer of $8x + 6$
21(a)	5680	1	
21(b)(i)	[0]68	1	
21(b)(ii)	46	2	**B1** for 9.2 [cm]
22(a)	29.4	2	**M1** for 8.4 × 3.5
22(b)	168	2	**M1** for 12 × (10 +18) ÷ 2 oe

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Question	Answer	Marks	Partial Marks
23	correctly multiplying both equations to reach the same coefficient for one variable	**M1**	
	correctly adding or subtracting the equations	**M1**	
	[x =] 7	**A1**	
	[y =] −1	**A1**	If zero scored then **SC1** for both answers correct and no supporting working or for two answers that satisfy one of the original equations
24(a)	correct perpendicular bisector with correct arcs	**2**	**B1** for correct perpendicular bisector without any arcs or with incorrect arcs
24(b)	correct angle bisector with correct arcs	**2**	**B1** for correct angle bisector without any arcs or with incorrect arcs
24(c)	correct region shaded	**1**	Dep on **B1**, **B1**

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MATHEMATICS **0580/21**

Paper 2 (Extended) **May/June 2018**

MARK SCHEME

Maximum Mark: 70

Published

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soi	seen or implied

Question	Answer	Marks	Partial Marks
1	23 or 29	**1**	
2	3.87×10^{-5}	**1**	
3	$\frac{7}{11}$ oe	**1**	
4	66	**2**	**B1** for 84 or –18 seen
5	94	**2**	**B1** for *ACB* or *PAB* or *ABC* = 43 or **M1** for $180-2\times43$ or $\frac{1}{2}x=90-43$
6	81.7 or 81.71 to 81.72…	**2**	**M1** for $\pi\times5.1^2$
7	4.8[0] or 4.802…	**2**	**M1** for $[AC^2 =]\ 2.5^2+4.1^2$
8	$7y-23$ final answer	**2**	**M1** for $12y-18$ or $-5y-5$ or **B1** for answer $7y-k$ or $cy-23\quad c\neq0$
9	–7	**2**	**B1** for 3^{-3} or 3^4 or 3^7 or 3^{-7} seen or **SC1** for final answer 7
10(a)	6.58331…	**1**	
10(b)	6.5833	**1**	**FT** *their* **(a)** correctly rounded to 4 dp
11	$\frac{4}{7}$ oe exact answer	**2**	**B1** for 4 or $\frac{1}{7}$
12	$n<-4.4$ or $n<-4\frac{2}{5}$ final answer	**2**	**M1** for $8n-3n<-5-17$ or better or $3n-8n>17+5$ or better

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Question	Answer	Marks	Partial Marks
13	$\frac{7}{4}$	**M1**	or $\frac{k}{4} \times \frac{6}{35}$ where $k > 4$
	$\frac{3}{10}$ cao	**A2**	**A1** for $\frac{42}{140}$ or $\frac{21}{70}$ or $\frac{6}{20}$
14	19.3 or 19.26 to 19.27 nfww	**3**	**M2** for $[\sin =]5.9 \times \frac{\sin 84.6}{17.8}$ or **M1** for $\frac{5.9}{\sin B} = \frac{17.8}{\sin 84.6}$ oe
15	9	**3**	**M1** for $y = k(x-1)^2$ **M1** for $[y =]$*their* $k(7-1)^2$ OR **M2** for $\frac{4}{(5-1)^2} = \frac{y}{(7-1)^2}$ oe
16	Shape with vertices at (1, 1), (1, 4), (–1, 2), (–1, 4)	**3**	**M2** for 3 correct vertices on grid or in working or **M1** for correct set-up $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}\begin{pmatrix} 2 & 1 & 4 & 4 \\ 1 & -1 & -1 & 1 \end{pmatrix}$ or for rotation, 90° [anti-clockwise], centre *O*
17(a)	2200	**3**	**M2** for $\frac{1}{2}(90+130) \times 20$ or $\frac{1}{2}(10 \times 20) + (90 \times 20) + \frac{1}{2}(30 \times 20)$ or **M1** for one area
17(b)	16.9 or 16.92…	**1**	**FT** *their* **(a)** ÷ 130
18(a)	10 nfww	**2**	**B1** for UQ = 30 or LQ = 20 clearly identified
18(b)	4	**2**	**B1** for 116 indicated
19	46.2 or 46.17 to 46.18	**4**	**M2** for $[\cos =]\frac{16^2 + 19^2 - 14^2}{2 \times 16 \times 19}$ or **M1** for $14^2 = 19^2 + 16^2 - 2 \times 19 \times 16\cos M$ **A1** for 0.692… or $\frac{421}{608}$

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Question	Answer	Marks	Partial Marks
20(a)	$\frac{8}{15}$ oe	**1**	
20(b)	$\frac{168}{210}$ oe	**3**	**M2** for $1-\frac{7}{15}\times\frac{6}{14}$ oe or $3(\frac{7\times8}{15\times14})$ oe or **M1** for $\frac{7}{15}\times\frac{6}{14}$ or $\frac{7}{15}\times\frac{8}{14}$ or $\frac{8}{15}\times\frac{7}{14}$ oe
21	$y \geqslant 1.5$ oe $y \geqslant \frac{3}{4}x$ oe $y < -\frac{1}{2}x + 3$ oe	**4**	**SC3** for $y > 1.5$ oe and $y > \frac{3}{4}x$ oe and $y \leqslant -\frac{1}{2}x + 3$ oe or **B3** for any two correct inequalities or **B1** for $y \geqslant 1.5$ oe and **B2** for $y \geqslant \frac{3}{4}x$ oe **or** $y < -\frac{1}{2}x + 3$ oe or $y = \frac{3}{4}x$ oe **and** $y = -\frac{1}{2}x + 3$ oe or with incorrect inequality signs or **B1** for $y = \frac{3}{4}x$ oe OR $y = -\frac{1}{2}x + 3$ oe or with incorrect inequality signs
22(a)	-17	**2**	**M1** for $f(11)$ seen or $5 - 2(5 - 2x)$ or better
22(b)(i)	$4x^2 + 8$ oe	**1**	
22(b)(ii)	$\frac{5-x}{2}$ oe final answer	**2**	**M1** for $x = 5 - 2y$ or $2x = 5 - y$ or $y - 5 = -2x$ or $\frac{y}{2} = \frac{5}{2} - x$

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Question	Answer	Marks	Partial Marks
23(a)(i)	4	**1**	
23(a)(ii)	3.2	**3**	**M1** for Σfx, allow one error or omission and **M1dep** for $\frac{\textit{their } 128}{40}$
23(b)	27	**2**	**M1** for $\frac{3}{40}$ or $\frac{360}{40}$
24(a)	78.7 or 78.69…	**3**	**M2** for tan = $\frac{5}{2-1}$ oe or **M1** for use of tangent oe
24(b)	$[y =] -\frac{1}{3}x + 12$ final answer	**3**	**M1** for gradient $= -\frac{1}{3}$ **M1** for substituting (6, 10) into *y = their mx + c*

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Cambridge Assessment International Education
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MATHEMATICS **0580/22**

Paper 2 (Extended) **May/June 2018**

MARK SCHEME

Maximum Mark: 70

Published

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dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1	2 [h] 55 [min]	**1**	
2	$7x - 56$ final answer	**1**	
3	[a =] 15 [b =] –27	**2**	**B1** for each or **SC1** for reversed answers
4(a)	[w =] 7	**1**	
4(b)	[$12x$ =] 36	**1**	
5	24	**2**	**B1** for 17 or 41 identified
6	$\frac{8}{12}$ and $\frac{1}{12}$ oe	**M1**	For correct fractions with a common denominator $12k$
	$\frac{7}{12}$ cao	**A1**	
7	320	**2**	**M1** for 180 + 140 oe
8(a)	1.36×10^6 oe	**1**	
8(b)	5.21×10^{-3} oe	**1**	
9	Correct perpendicular bisector of AB with 2 pairs of correct arcs	**2**	**B1** for correct perpendicular bisector of AB with no or wrong arcs or for 2 pairs of correct arcs
10	$(x + 2)(y + 3)$ final answer	**2**	**B1** for $y(x + 2) + 3(x + 2)$ or $x(y + 3) + 2(y + 3)$
11	80	**2**	**M1** for $\left(\frac{12}{3}\right)^2$ or $\left(\frac{3}{12}\right)^2$ oe or $\frac{3^2}{5} = \frac{12^2}{A}$ oe
12	7 cao nfww	**2**	**B1** for 31 + 0.5 or 5 – 0.5 or 31.5 or 4.5 seen
13	15 and 22	**2**	**M1** for 1.5×10 or 1.1×20
14	62	**3**	**M1** for [height =] $21 \div 7$ **M1** for $2(1 \times \textit{their}3 + \textit{their}3 \times 7 + 1 \times 7)$ oe

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Question	Answer	Marks	Partial Marks
15	628 or 628.3 to 628.4 cm^3	**3**	**B2** for 628 or 628.3 to 628.4 or **M1** for $5^2 \times 8 \times \pi$ **B1** for cm^3
16	7.5 nfww	**3**	**M2** for $[OB^2 =] \left(\frac{12}{2}\right)^2 + 4.5^2$ oe or **B1** for recognition of right angle
17	30	**3**	**M2** for ½ (8 + 2) × v [= 150] oe or **M1** for ½ × 6 × v or 2 × v oe
18(a)	$d = 4.9t^2$	**2**	**M1** for $d = kt^2$
18(b)	19.6	**1**	**FT** *their* 4.9 × 4
19	$y > 2$ oe final answer $y \geqslant 3 - x$ oe final answer	**3**	**B1** for $y > 2$ oe final answer **B2** for $y \geqslant 3 - x$ oe final answer or **B1** for $y = 3 - x$ oe soi or **SC2** for $y \geqslant 2$ oe **and** $y > 3 - x$ oe final answer
20(a)	$\mathbf{C}^2$	**2**	**B1** for any correct matrix calculation evaluated
20(b)	–9	**1**	
20(c)	The determinant is 0 oe	**1**	e.g. it is singular.
21(a)	140 000	**1**	
21(b)	Points correctly plotted at (40, 80) and (80, 150)	**1**	
21(c)	Correct ruled line of best fit	**1**	
21(d)	80 000 to 110 000	**1**	**FT** their straight line provided it has positive gradient
22(a)	6**a** – 2**b** or 2(3**a** – **b**)	**2**	**M1** for 4**a** + **b** – (–2**a** + 3**b**) or better
22(b)	5**a** – **b**	**2**	**M1** for a correct route e.g. $\overrightarrow{OD} + \overrightarrow{DE}$, 4**a** + **b** + **a** – 2**b**, $\overrightarrow{OE}$
23(a)	5	**3**	**M2** for $20 - x + x + 8 - x = 23$ or better or **B1** for identifying the correct region $A \cup B$
23(b)	$\frac{7}{30}$ oe	**2**	**B1** for $\frac{7}{c}$ or $\frac{k}{30}$

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Question	Answer	Marks	Partial Marks
24(a)	$\frac{4}{5}$ oe	**2**	**M1** for $\frac{2}{3} \times p = \frac{8}{15}$ or better
24(b)	$\frac{1}{15}$ oe	**3**	**3FT** $(1 - \textit{their}\ \frac{4}{5}) \times \frac{1}{3}$ correctly evaluated **M2** for $(1 - \textit{their}\ \frac{4}{5}) \times (1 - \frac{2}{3})$ oe or **M1** for $1 - \textit{their}\ \frac{4}{5}$ or $1 - \frac{2}{3}$
25(a)	$[y =] - \frac{2}{5}x + 3$ or $[y =] -0.4x + 3$ final answer	**4**	**B2** for [gradient of perpendicular =] $-\frac{2}{5}$ oe or **M1** for [gradient =] $\frac{24-9}{22-16}$ or $-\frac{22-16}{24-9}$ **M1** for substituting (5, 1) into $y = \textit{their}\ mx + c$
25(b)	(20, 19)	**2**	**M1** for $\frac{2}{3}(22-16)+16$ or $\frac{2}{3}(24-9)+9$ oe or **SC1** for answer (18, 14)

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MATHEMATICS **0580/23**

Paper 2 (Extended) **May/June 2018**

MARK SCHEME

Maximum Mark: 70

Published

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Abbreviations

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dep	dependent
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isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1	– 5	**1**	
2	$w(1+w^2)$ final answer	**1**	
3	6.15 or 6.153 to 6.154 or $6\frac{2}{13}$	**1**	
4	3, 4, 6, 9, 12, 18	**2**	**B1** for list with one or two errors or omissions or for a complete list of products
5	25.3[0]	**2**	**M1** for $22 \times \frac{15}{100}$ oe or better
6(a)	210 000 cao	**1**	
6(b)	4120 cao	**1**	
7	162	**2**	**M1** for 225 × 0.72 oe
8(a)	[0].004 82 cao	**1**	
8(b)	5.2×10^7	**1**	
9	– 11	**2**	**M1** for $1-p=3\times4$ or better or $-\frac{p}{3}=4-\frac{1}{3}$ or better
10	$(a+2b)(2-x)$ final answer	**2**	**M1** for $2(a+2b)-x(a+2b)$ or $a(2-x)+2b(2-x)$ or $-a(x-2)-2b(x-2)$
11	$[\pm]\sqrt{\frac{A}{2\pi+y}}$ final answer	**2**	**M1** for $\frac{A}{2\pi+y}=x^2$ **M1** for correctly square rooting their expression in x^2 If zero scored **SC1** for $\frac{[\pm]\sqrt{A}}{2\pi+y}$
12	8	**2**	**M1** for Venn diagram with 1 correct region or for a correct method e.g. $5+13-x+x+10-x=20$ oe or better

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Question	Answer	Marks	Partial Marks
13	$\frac{1}{3-x}$ nfww final answer	2	**B1** for $(3-x)(3+x)$ or $-(x-3)(x+3)$
14	$\frac{2}{3}\mathbf{p}+\frac{1}{3}\mathbf{q}$	2	**M1** for correct route e.g. $\overrightarrow{OT}$ or $\overrightarrow{OQ}+\overrightarrow{QT}$ or for $\overrightarrow{QT}=\frac{2}{3}(-\mathbf{q}+\mathbf{p})$ oe or for $\overrightarrow{PT}=\frac{1}{3}(-\mathbf{p}+\mathbf{q})$ oe
15	$\frac{6}{5}$	B1	accept equivalent fractions e.g. $\frac{18}{15}$
	$\frac{2}{3}\times$ *their* $\frac{5}{6}$	M1	or $\frac{10}{15}\div\frac{18}{15}$ oe
	$\frac{5}{9}$ cao	A1	
16(a)	50 cao nfww	2	**B1** 12.5 seen or **M1** for 12 + 0.5 or better
16(b)	12.3	1	
17(a)	27	1	
17(b)	$3t^9$ final answer	2	**B1** for kt^9 or for $3t^k$ ($k \neq 0$)
18	$6p^2+5p-6$ final answer	3	**B2** for $6p^2+9p-4p-6$ or **B1** for three correct terms
19	150	3	**M1** for $y=k(x-1)^2$ **M1** for $[y=]$ *their* $k\times(6-1)^2$ oe OR **M2** for $\frac{y}{24}=\frac{(6-1)^2}{(3-1)^2}$
20	[w =] 95 [x =] 85 [y =] 48	3	**B1** for each If **B0** scored for x and for y, **SC1** for *their* x + *their* y = 133
21	$\frac{1}{y(y-1)}$ or $\frac{1}{y^2-y}$ final answer	3	**B1** for common denominator of $y(y-1)$ or y^2-y **B1** for $y-(y-1)$ or $y-y+1$
22(a)	$15-4n$ final answer	2	**B1** for $15-kn$ or $p-4n$ ($k \neq 0$)
22(b)	$3\times2^{n-1}$ oe final answer	2	**B1** for recognition of powers of 2 such as 2^k

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Question	Answer	Marks	Partial Marks
23	102.1 or 102.06 to 102.07	**4**	**M2** for [cos x =] $\frac{11^2+5^2-13^2}{2\times11\times5}$ or **M1** for $13^2 = 11^2+5^2-2\times11\times5\cos x$ **A1** for – 0.209…. or $-\frac{23}{110}$
24(a)	25	**2**	**M1** for $\frac{90\times1000}{60\times60}$ oe
24(b)	1.25	**1**	**FT** $\frac{\textit{their}\textbf{(a)}}{20}$ correctly evaluated
24(c)	1250	**2**	**2FT** for *their* **(a)** × 50 correctly evaluated or **M1** for one area e.g. ½(40 + 60) × 25, 25 × 40, ½ × 25 × 20 ½(40 + 60) × 90, 90 × 40, ½ × 90 × 20 ½(40 + 60) × *their* 25, *their* 25 × 40, ½ × *their* 25 × 20
25(a)	1.8	**2**	**M1** for $\frac{10}{8}=\frac{9}{AP}$ oe
25(b)	10.3 or 10.31 to 10.32	**3**	**M2** for $13\times\sqrt[3]{\frac{0.25}{0.5}}$ oe or **M1** for $\sqrt[3]{\frac{0.5}{0.25}}$ oe or $\sqrt[3]{\frac{0.25}{0.5}}$ oe or $\frac{0.5}{0.25}=\left(\frac{13}{h}\right)^3$ oe
26(a)	Enlargement [scale factor] 2 [centre] (7, 0)	**3**	**B1** for each
26(b)	Image at (6, 4), (7, 4), (6, 8)	**3**	**B2** for rotation through 90° clockwise but about other point or **B1** for rotation through 90° anticlockwise about any point or for triangle at (6, 4), (7, 4), (6, k)

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MATHEMATICS **0580/31**

Paper 3 (Core) **May/June 2018**

MARK SCHEME

Maximum Mark: 104

Published

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soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	Tally for 3, 4, 5 increased by two. Tally for 7 increased by one. Frequencies 3, 5, 14, 10, 11, 3, 3, 0, 1	**2**	**M1** for all four tallies correct or **B1** for correct frequency column If 0 scored **SC1** for correct frequency for *their* tallies
1(a)(ii)	8	**1**	
1(a)(iii)	4	**1**	
1(b)(i)	4	**1**	
1(b)(ii)	2 and 3.5 boxes drawn 16, 3 and 9 frequencies	**2**	**B1** **B1**
1(b)(iii)	Comedy	**1**	
1(b)(iv)	5	**1**	**FT** 14 − *their* music frequency
1(b)(v)	$\frac{52}{60}$ or equivalent fraction	**2**	**B1** for $\frac{8}{60}$ oe or 52 or 0.866 to 0.867
2(a)(i)	27360045	**1**	
2(a)(ii)	1, 2, 4, 5, 10, 20	**2**	**B1** for 4 or 5 correct factors
2(a)(iii)	$\frac{7k}{9k}$ where $k \neq 1$	**1**	
2(a)(iv)	31 or 37	**1**	
2(b)(i)	$17 - 3 \times (5 - 3) = 11$	**1**	
2(b)(ii)	$(3 + 2)^2 - 4 = 21$	**1**	
2(c)	17	**1**	

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Question	Answer	Marks	Partial Marks
3(a)(i)	48	**3**	**B1** for 240 **M1** for $\frac{[their\,240]}{10+2+3}[\times 3]$ soi by 16
3(a)(ii)	128	**2**	**M1** for $\frac{k}{15}\times their\,240$ oe where k = 2, 10 or 8 or for *their* **(a)(i)** $\div 3\times k$ oe where k = 2, 10 or 8
3(b)	84.7[0] or 84.69 to 84.7	**3**	**M2** for $600\times\left(1+\frac{4.5}{100}\right)^3$ oe or **M1** for $600\times\left(1+\frac{4.5}{100}\right)^2$ oe
3(c)	223.84	**3**	**M2** for $\frac{600\times 0.864-325}{0.864}$ oe or better or **M1** for 600×0.864 or $\frac{325}{0.864}$
4(a)	Rhombus	**1**	
4(b)(i)	(0, –2)	**1**	
4(b)(ii)	136	**1**	
4(c)(i)	5.4	**1**	
4(c)(ii)	21.5 or 21.6	**1**	**FT** *their* **(c)(i)** × 4
4(d)(i)	Reflection y-axis oe	**2**	**B1** for each
4(d)(ii)	Rotation 180 oe (0, 0) oe	**3**	**B1** for each
4(e)	Triangle (1, –2) (1, –4) (6, –2)	**2**	**B1** for $\begin{pmatrix}1\\k\end{pmatrix}$ or $\begin{pmatrix}k\\-2\end{pmatrix}$
5(a)	4 points correctly plotted	**2**	**B1** for 2 or 3 points correctly plotted
5(b)	(40, 18) indicated	**1**	
5(c)	Positive	**1**	
5(d)	Correct ruled line	**1**	
5(e)	76 to 80	**1**	**FT** their ruled line of best fit

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Question	Answer	Marks	Partial Marks
6(a)	9	**2**	**M1** for $\left(1-\frac{1}{3}\right)\times 13.5$ oe or for $13.5-\left(\frac{1}{3}\times 13.5\right)$ oe or **B1** for 4.5[0]
6(b)(i)	1 45 pm	**1**	
6(b)(ii)	2 [h] 54 [min]	**1**	
6(b)(iii)	13	**2**	**M1** for 16 39 + 46 – 17 12 oe or **B1** for 17 25 or 33 seen
6(c)	Complete correct method	**M2**	**M2** for 0.62... and 0.58… or 0.59 and 0.57 [c/ml] oe or 1.60…or 1.61 and 1.70… and 1.75… [ml/c] oe or **M1** for one correct calculation or correct value
	Extra large	**A1**	
6(d)	19 47	**3**	**M1** for $\frac{76}{48}$ soi or for 18 12 + *their* time **A1** for 1 [h] 35 [min] or 95 [min] seen
7(a)	3300	**2**	**B1** for 11 cm seen
7(b)	117	**1**	
7(c)(i)	Correct ruled perpendicular bisector with 2 pairs of arcs	**2**	**B1** for correct bisector drawn without arcs or for two pairs of correct arcs
7(c)(ii)	*C* marked correctly	**2**	**M1** for clear attempt at a line south from *A*
7(d)	*D* marked correctly twice with correct arc(s) and line seen	**4**	**B1** for line indicating correct bearing of 320 measured **B2** for an arc radius 5.5, centre *A*, [meeting their bearing line at least once], or **B1** for an arc any radius, centre *A*, with *D* marked on it [meeting their bearing line at least once], or **B1** for a complete circle centre *A* of any radius, or **M1** for 1650 ÷ 300 If 0 scored **SC2** for *D* marked correctly within tolerance at least once with incorrect/no arc(s) and incorrect/no line seen

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Question	Answer	Marks	Partial Marks
8(a)	Caroline cycles past Rob oe	**1**	
8(b)	9.6	**2**	**M1** for $\frac{8}{50}[\times 60]$
8(c)	Ruled line from (07 25, 0) to (08 45, 8)	**1**	
8(d)	08 00	**1**	
8(e)	Caroline William Rob	**1**	**FT** from William's straight line, provided it reaches at 8 km
9(a)(i)	Diameter	**1**	
9(a)(ii)	Chord	**1**	
9(b)	Angle [in] semi-circle [is 90]	**1**	
9(c)(i)	67.4 or 67.38…..	**2**	**M1** for $\cos[A=]\frac{20}{52}$ or better
9(c)(ii)	$\left[(BC)^2\right]=\sqrt{52^2-20^2}$	**M2**	**M1** for $20^2+(BC)^2=52^2$
9(c)(iii)	480	**2**	**M1** for $0.5\times 20\times 48$ or better
9(c)(iv)	582 or 581.8 to 582.0	**3**	**M1** for $\left[\frac{1}{2}\times\right]\pi\times\left(\frac{52}{2}\right)^2$ or better **M1** for *their* 338π – *their* **(c)(iii)**
10(a)(i)	– 4	**1**	
10(a)(ii)	$2x+k \quad k\neq 3$	**1**	
10(a)(iii)	(0, –5)	**1**	
10(a)(iv)	2.5	**2**	**M1** for $7=4k-3$ or better
10(b)(i)	1, –5, –3, 1, 7	**3**	**B2** for 4 correct **B1** for 3 correct
10(b)(ii)	Correct smooth curve	**4**	**B3FT** for 8 or 7 correct plots or **B2FT** for 5 or 6 correct plots or **B1FT** for 3 or 4 correct plots
10(b)(iii)	(0.5, h) where $-5.5\leqslant h<-5$	**1**	
10(b)(iv)(a)	Correct line of symmetry drawn	**1**	
10(b)(iv)(b)	$x=0.5$ oe	**1**	

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Cambridge International General Certificate of Secondary Education

MATHEMATICS **0580/32**

Paper 3 (Core) **May/June 2018**

MARK SCHEME

Maximum Mark: 104

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the May/June 2018 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

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- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

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- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	138	**1**	
1(a)(ii)	128	**1**	
1(b)(i)	135	**1**	
1(b)(ii)	121	**1**	
1(b)(iii)	134	**1**	
1(b)(iv)	125	**1**	
1(c)	24	**2**	**B1** for numerator of −24 or denominator of −1 or answer of –24
1(d)	$\frac{20\times\sqrt{9}}{30\div 6}$	**M1**	**M1** for all correct roundings
	12	**A1**	If 0 scored **SC1** for 3 correct roundings or 20.[0] and 9.0[0] and 30.[0] and 6.0[0]
2(a)	Trapezium	**1**	
2(b)	Enlargement [Scale factor] $\frac{1}{3}$ oe [Centre] (−5, −5)	**3**	**B1** for each
2(c)	$\frac{1}{9}$	**3**	**B2** for $\left(\frac{1}{3}\right)^2$ or **B1** for [shaded area] 13.5 or [area of A] 1.5 seen **M1** for $\frac{1.5}{their 13.5}$ oe
2(d)(i)	Image at (−6, 6),(−5, 6),(−5, 5), (−7, 5)	**2**	**B1** for image of A at $\begin{pmatrix}-4\\k\end{pmatrix}$ or $\begin{pmatrix}k\\7\end{pmatrix}$
2(d)(ii)	Image at (1, 1), (1, 2), (3, 2), (2, 1)	**2**	**B1** for 180° rotation with incorrect centre

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Question	Answer	Marks	Partial Marks
2(d)(iii)	Image at (5, −2), (5, −1), (6, −1), (7, −2)	**2**	**B1** for reflection in $y = 2$ or in $x = k$
3(a)	7 : 4 : 5	**2**	**B1** for any correct ratio other than 21 : 12 : 15, not in simplest form
3(b)(i)	$\frac{7}{16}$ oe $\times 1248$	**B1**	
3(b)(ii)	[Mustapha] 312 [Joshua] 390	**2**	**B1** for each or **M1** for $\frac{1248}{21+12+15} \times k$ where $k = 12$ or 15 or $\frac{1248}{their7 + their4 + their5} \times k$ oe where $k = their\ 4$ or $their\ 5$
3(c)	2912	**2**	**M1** for 1248 ÷ 3 [× 7]
3(d)	13 500 – 0.16 × 13 500 − 500 or 0.84 × 13 500 − 500	**M2**	**M1** for 0.16 × 13 500 or 0.84 × 13 500 seen
3(e)(i)	3 × 12 × 340	**B1**	
3(e)(ii)	12.9 or 12.91 to 12.92	**3**	**M2** for $\frac{12240-10840}{10840}[\times 100]$ or $\frac{12240}{10840} \times 100[-100]$ or $\left(\frac{12240}{10840} - 1\right)[\times 100]$ or **M1** for 12240 – 10840 or $\frac{12240}{10840}$ oe
4(a)	−6 4 4 0	**2**	**B1** for 2 or 3 correct
4(b)	Correct smooth curve	**4**	**B3FT** for 7 or 8 correct plots or **B2FT** for 5 or 6 correct plots or **B1FT** for 3 or 4 correct plots
4(c)	$x = 2.5$ cao	**1**	
4(d)(i)	−2 1 5.5	**2**	**B1** for 2 correct
4(d)(ii)	Correct continuous ruled line from $x = -1$ to $x = 6$	**2**	**B1FT** for 2 or 3 correct plots
4(d)(iii)	[x =] −0.6 to −0.4 and 3.9 to 4.1	**2**	**B1FT** for each

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th><th>Partial Marks</th></tr>
<tr><td>5(a)</td><td>250</td><td>2</td><td>B1 for 5 [cm] oe</td></tr>
<tr><td>5(b)</td><td>Correct point E joined to A and D with ruled lines and with arcs</td><td>3</td><td>B2 for correct point E with arcs without lines

or correct ruled shape without arcs

or B1 for drawing AE = 11 cm or drawing DE = 12 cm

or correct point E without arcs and lines</td></tr>
<tr><td>5(c)(i)</td><td>Correct ruled bisector of angle ABC which reaches DE with two correct pairs of arcs</td><td>B2</td><td>B1 for a correct ruled angle bisector with no/wrong arcs or two correct pairs of arcs</td></tr>
<tr><td>5(c)(ii)</td><td>Correct ruled perpendicular bisector of side CD which reaches AE with two correct pairs of arcs</td><td>B2</td><td>B1 for a correct ruled perpendicular bisector with no/wrong arcs or two correct pairs of arcs</td></tr>
<tr><td>5(d)(i)</td><td>Constructed circle, centre 7 cm from B along bisector of ABC, with radius 3 cm</td><td>3</td><td>3FT along their (c)(i)
B1 for a circle, centre 7 cm from B, any radius
M1 for a circle, radius 3 cm seen anywhere</td></tr>
<tr><td>5(d)(ii)</td><td>942 or 943 or 942.4 to 942.6</td><td>2</td><td>M1 for $(2 \times 150)\pi$ or 300π soi</td></tr>
<tr><td>6(a)</td><td><table><tr><th></th><th>F</th><th>G</th><th>S</th><th>I</th><th>J</th><th>Tot</th></tr><tr><td>B</td><td></td><td>21</td><td></td><td></td><td>8</td><td></td></tr><tr><td>G</td><td>30</td><td></td><td></td><td>11</td><td></td><td>139</td></tr><tr><td>Tot</td><td>57</td><td></td><td>102</td><td></td><td>20</td><td></td></tr></table></td><td>3</td><td>B2 for 6 or 7 correct

or B1 for 3, 4 or 5 correct</td></tr>
<tr><td>6(b)(i)</td><td>$\frac{54}{\textit{their}139}$ oe isw</td><td>1</td><td>FT their table</td></tr>
<tr><td>6(b)(ii)</td><td>$\frac{46}{123}$ oe isw</td><td>1</td><td></td></tr>
<tr><td>6(b)(iii)</td><td>$\frac{209}{262}$ oe isw</td><td>1</td><td></td></tr>
<tr><td>6(c)(i)</td><td>[Chemistry] 80°
[Physics] 155°</td><td>2</td><td>B1 for each
or if 0 scored M1 for 125 ÷ 25 or 360 ÷ 72 or 5

If 0 scored SC1 for the two angles adding to 235°</td></tr>
</table>

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Question	Answer	Marks	Partial Marks
6(c)(ii)	Two correct lines on the pie chart	**2**	**2FT** only if **(c)(i)** angles total 235° **B1** for a correct sector of 125° or 80° or 155°
7(a)	10 10	**1**	
7(b)(i)	22.4	**1**	
7(b)(ii)	6.2	**2**	**2FT** *their* **(b)(i)** × 1000 ÷ (60 × 60) oe rounded to 1dp or **M1** for *their* **(b)(i)** × 1000 ÷ (60 × 60) oe or 5600 ÷ (15 × 60) oe
7(c)	Two correct ruled lines	**2**	**B1FT** for a line (09 55, 0) to (*their* **7(a)**, 5.6) **B1FT** for horizontal line (*their* **7(a)**, 5.6) to (*their* **7(a)** + 23, 5.6)
7(d)(i)	12	**2**	**M1** for 5.6 ÷ 28 [× 60]
7(d)(ii)	Correct line	**1**	**FT** line from (10 07, 0) to (10 07 + *their* **(d)(i)**, *their* 5.6)
7(e)(i)	Correct line	**1**	**FT** line from (*their* **7(a)** + 23, 5.6) to (10 54, 0)
7(e)(ii)	16	**2**	**2FT** 5.6 ÷ (*their* time in minutes) × 60 **M1** for 5.6 ÷ 21 [× 60] soi or for 5.6 ÷ (*their* time in minutes)[× 60]
8(a)(i)	116	**1**	
8(a)(ii)	32	**1**	**FT** (180 – *their* **(a)(i)**) ÷ 2
8(b)(i)	Pentagon	**1**	
8(b)(ii)	Angle [between] tangent [and] radius	**1**	
8(b)(iii)	108 Angles [on a straight] line [add up to] 180	**2**	**B1** for angle **B1** for reason
8(b)(iv)	72	**1**	

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Question	Answer	Marks	Partial Marks
8(b)(v)	135	**4**	**B3FT** for (540 – (90 + *their* **(b)(iii)** + *their* **(b)(iv)**)) ÷ 2 oe OR **B2** for 540 or **M1** for (5 – 2) × 180 oe **M1** for (P – (90 + *their* **(b)(iii)** + *their* **(b)(iv)**)) ÷ 2 oe where P is any value >270
9(a)	20 nfww	**3**	**B2** for $6x - 4x = 28 + 12$ or better or **B1** for $6x - 12$ or $4x + 28$ or **B1FT** for correct $ax = b$ after incorrect expansions first step
9(b)(i)	$3a + 8b = 93$	**2**	**B1** for $3a + 8b$
9(b)(ii)	For correctly eliminating one variable	**M1**	For correct method to equate coefficients and eliminate one variable
	[a =] 7	**A1**	
	[b =] 9	**A1**	If 0 scored **SC1** for 2 values satisfying one of the original equations **SC1** if no working shown, but 2 correct answers given

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MATHEMATICS **0580/33**

Paper 3 (Core) **May/June 2018**

MARK SCHEME

Maximum Mark: 104

Published

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isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	Fri[day]	**1**	
1(a)(ii)	7	**1**	
1(a)(iii)	–5	**1**	
1(b)(i)	10 cao	**3**	**M2** for $\frac{6.5\times60}{39}$ oe or **M1** for distance ÷ speed
1(b)(ii)	1149	**4**	**M2** for (6.5 × 1000) ÷ (π × 1.8) oe or **M1** for π × 1.8 oe **A1** for 1149.3 to 1149.5 **B1** for *their* answer to at least 1dp truncated to the integer
1(c)	13 10	**3**	**M2** for [LCM=] 2 × 3 × 3 × 5 or 90 or **M1** for [30=] 2 × 3 × 5 or [45=] 3 × 3 × 5 OR **M2** for listing times or multiples to at least 13 10 or 90 or **M1** for adding times i.e. one correct addition e.g. 12 10
1(d)(i)	47	**1**	
1(d)(ii)	10 21	**1**	
1(e)	8	**2**	**M1** for 437 ÷ 62 oe implied by 7.04… or 7.05
2(a)	[star] 6 correct lines only	**2**	**B1** for 3 correct lines
	[rectangle] 2 correct lines only	**2**	**B1** for only 1 correct line or 2 correct lines and 1 wrong
2(b)	[x =] 66 [y =] 114	**2**	**B1** for one correct angle or for both angles adding to 180

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Question	Answer	Marks	Partial Marks
2(c)	144	**3**	**M1** for 360 ÷ 10 soi by 36 **M1** for [y =] 180 – *their* 36 If 0 scored **SC2** for a correct interior angle of a regular polygon (greater than 90), providing not from wrong working
2(d)	[j =] 53 [k =] 37	**3**	**B2** for one correct angle or **B1** for 90 seen, marked on drawing in the correct place or for both angles adding to 90
2(e)	72	**3**	**M1** for (18 × 35) ÷ 2 implied by 315 **M1** for (18 × 27) ÷ 2 implied by 243
3(a)	51.5	**3**	**M2** for 4 × 8 + 9.5 + 10 oe or **B1** for two from 8 or 32, 9.5 and 10
3(b)	13.4[0]	**3**	**M2** for 4.2[0] + 2 × 2.8[0] + 2 × 1.8[0] oe or **M1** for two correct categories
3(c)	2.2[0]	**2**	**M1** for 6 × 1.3[0] implied by 7.8[0]
3(d)	27 053	**1**	
3(e)	13.7 or 13.70 to 13.71	**3**	**M2** for $\frac{14100-12400}{12400}$ [× 100] or $\frac{14100}{12400}\times 100$ [–100] or $\left(\frac{14100}{12400}-1\right)$[×100] or **M1** for 14100 – 12400 or $\frac{14100}{12400}$ oe
3(f)	2 9 1 5 6 4	**3**	**B1** for each pair of 29, 15 and 64
4(a)(i)	6	**1**	
4(a)(ii)	8.5	**2**	**M1** for $8x - 6x = 2 + 15$ or better
4(b)	$5(x - 3)$ final answer	**1**	
4(c)	$5x - 4y$ final answer	**2**	**B1** for $5x + ky$ or $kx - 4y$ (k could be 0)
4(d)	61	**2**	**B1** for 55 or 6 or **M1** for 5 × 11 – 2 × –3
4(e)	$p=\frac{H+3}{7}$ oe final answer	**2**	**M1** for correct first step
4(f)(i)	7	**1**	
4(f)(ii)	–10	**1**	

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Question	Answer	Marks	Partial Marks
5(a)(i)	1	**1**	
5(a)(ii)	7	**1**	
5(a)(iii)	4 nfww	**2**	**M1** for 1 1 2 3 5 … or … 3 5 6 7 8 or 3 and 5 selected
5(b)(i)	50	**1**	
5(b)(ii)	3.28	**3**	**M1** for [0 × 5] + 1 × 7 + 2 × 8 + 3 × 10 + 4 × 6 + 5 × 4 + 6 × 5 + 7 × 3 + 8 × 2 oe implied by 164 **M1dep** for *their* 164 ÷ *their***(b)(i)**
5(c)(i)	23 38 114	**3**	**B1** for each or if 0 scored **M1** for 123 ÷ 41 or 54 ÷ 18 or 3
5(c)(ii)	correct line	**1**	
6(a)	–1 … –2 … –6 … 6 … 2 … 1	**3**	**B2** for 4 or 5 correct or **B1** for 2 or 3 correct
6(b)	correct smooth curves	**4**	**B3FT** for 9 or 10 points plotted correctly **B2FT** for 7 or 8 points plotted correctly **B1FT** for 5 or 6 points plotted correctly **FT** *their* table
6(c)	correct continuous ruled line	**1**	
6(d)	–1.2 oe	**1**	or **FT** *their* line and *their* graph
7(a)	Enlargement [centre] (3, –1) [s.f.] 2	**3**	**B1** for each
7(b)	Rotation [centre] (0, 0) oe 180° oe	**3**	**B1** for each
7(c)(i)	Correct translation points (–4, 3), (–1, 3), (–3, 7)	**2**	**B1** for a correct horizontal or vertical movement i.e. by $\begin{pmatrix} -6 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 5 \end{pmatrix}$
7(c)(ii)	Correct reflection points (2, –4), (5, –4), (3, –8)	**2**	**B1** for a correct reflection in $y = k$
8(a)(i)	$\frac{6}{14}$ oe isw	**1**	
8(a)(ii)	$\frac{11}{14}$ oe isw	**1**	

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Question	Answer	Marks	Partial Marks
8(a)(iii)	0 isw	**1**	
8(b)(i)	[0].18 oe	**2**	**M1** for [1 –] (0.46 + 0.22 + 0.14) oe
8(b)(ii)	Brown	**1**	
8(b)(iii)	7	**1**	
9(a)(i)	36	**1**	
9(a)(ii)	add 7 oe	**1**	
9(a)(iii)	$7n + 1$ oe final answer	**2**	**B1** for $7n + c$ or $kn + 1$ ($k \neq 0$) or $7n + 1$ or $8 + (n - 1)7$ spoilt
9(b)	11 14 19	**2**	**B1** for 2 correct If 0 scored **SC1** for 10, 11, 14
9(c)	n^3	**1**	

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MATHEMATICS **0580/41**

Paper 4 (Extended) **May/June 2018**

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Generic Marking Principles

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- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

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- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
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- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	$\frac{9}{9+7+4}\times 680$	**1**	
1(b)	238 136	**3**	**B2** for 238 or 136 or **M1** for $\frac{7}{9+7+4}\times 680$ oe or $\frac{4}{9+7+4}\times 680$ oe seen
1(c)	272	**2**	**M1** for 306 ÷ 1.125
1(d)	1.37	**3**	**M2** for $(17.56-5\times 2.69)\div 3$ or **M1** for $17.56-5\times 2.69$ or **B1** for 13.45 [cost of apples]
1(e)	40.8[0]	**3**	**3FT** for 0.3 × *their* 136 from part **(b)** or **M2** for *their* $136(\frac{1}{2}+\frac{1}{5})$ or better or **M1** for *their* $136\times\frac{1}{2}$ or *their* $136\times\frac{1}{5}$ or **B1** for 68 or 27.2 or $\frac{3}{10}$ or 0.3 seen
2(a)(i)	9	**1**	
2(a)(ii)	*ABCD* completed accurately with arcs	**2**	**M1** for intersecting arcs radius *their* 9 cm or for *ABCD* completed accurately with no arcs
2(b)	Correct ruled perpendicular bisector of *AB* with 2 correct pairs of arcs Correct ruled bisector of angle *ABC* with 2 correct pairs of arcs Lines intersecting	**4**	**B2** for correct ruled perpendicular bisector of *AB* with 2 correct pairs of arcs or **B1** for correct perpendicular bisector without/wrong arcs and **B2** for correct ruled bisector of angle *ABC* with 2 correct pairs of arcs or **B1** for correct bisector of angle *ABC* without/wrong arcs If lines do not intersect, max **B3**

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Question	Answer	Marks	Partial Marks
3(a)	6.06 or 6.060 to 6.061	**3**	**M2** for $\frac{82500-77500}{82500}[\times 100]$ oe or **M1** for $\frac{77500}{82500}[\times 100]$ soi
3(b)	13 674 cao	**3**	**M1** for $12000\left(1+\frac{2.2}{100}\right)^6$ **A1** for 13673.7...
4(a)(i)	Translation $\begin{pmatrix}-8\\2\end{pmatrix}$ oe	**2**	**B1** for each
4(a)(ii)	Enlargement [sf =] $\frac{1}{2}$ oe $(-4, 0)$	**3**	**B1** for each
4(a)(iii)	Rotation 90° clockwise oe $(1, -1)$	**3**	**B1** for each
4(b)	Triangle with (1, –1), (5, –1), (1,7)	**2**	**B1** for correct size and orientation in wrong position or for 3 correct points not joined
5(a)(i)	$(2n+m)(m-3)$ final answer	**2**	**M1** for $m(2n+m)-3(2n+m)$ or $2n(m-3)+m(m-3)$
5(a)(ii)	$(2y-9)(2y+9)$ final answer	**1**	
5(a)(iii)	$(t-4)(t-2)$ final answer	**2**	**B1** for $(t-4)(t-2)$ seen and spoiled or **M1** for $t(t-2)-4(t-2)$ or $t(t-4)-2(t-4)$ or $(t+a)(t+b)$ where $a+b=-6$ or $ab=+8$
5(b)	$[x=]\frac{2m}{k+1}$	**4**	**M1** for $xk=2m-x$ or $k=\frac{2m}{x}-1$ **M1** for $xk+x=2m$ or $k+1=\frac{2m}{x}$ **M1** for $x(k+1)=2m$

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Question	Answer	Marks	Partial Marks
5(c)	correctly eliminating one variable	**M1**	
	[x =] 6	**A1**	
	[y =] –2	**A1**	If 0 scored **SC1** for 2 values satisfying one of the original equations or **SC1** if no working shown, but 2 correct answers given
5(d)(i)	$3m-4(m+4)=6m(m+4)$	**M1**	or $\frac{3m-4(m+4)}{m(m+4)}$[= 6] oe
	$3m-4m-16=6m^2+24m$	**M1**	removes brackets correctly
	$6m^2+25m+16=0$	**A1**	with no errors or omissions
5(d)(ii)	$\frac{-25\pm\sqrt{(25)^2-4(6)(16)}}{2\times 6}$ or $\frac{-25}{12}\pm\sqrt{\left(\frac{25}{12}\right)^2-\frac{16}{6}}$	**2**	**B1** for $\sqrt{(25)^2-4(6)(16)}$ or better or **B1** for $\left(m+\frac{25}{12}\right)^2$ and if in form $\frac{p+\sqrt{q}}{r}$ or $\frac{p-\sqrt{q}}{r}$ **B1** for $p=-25$ and $r=2(6)$
	–0.79 and –3.38 final ans cao	**2**	**B1** for each **SC1** for –0.8 and –3.4 or for –0.78 and –3.37 or –0.789... and –3.377... or 0.79 and 3.38 or –0.79 and –3.38 seen in working
6(a)	4.79 or 4.788 to 4.789	**3**	**M2** for $\sqrt[3]{\frac{230\times 3}{2\times\pi}}$ oe or **M1** for $230=\frac{2}{3}\times\pi\times r^3$ oe If 0 scored **SC1** for answer 3.8[0…]
6(b)(i)	8.7[0] or 8.702 to 8.704	**3**	**M2** for $(300-230)\div(1.6^2\pi)$ or **M1** for $\pi\times 1.6^2\times h$
6(b)(ii)	6.4	**3**	**M2** for $1.6\times\sqrt[3]{\frac{19200}{300}}$ oe or **M1** for sf $\sqrt[3]{\frac{19200}{300}}$ or $\sqrt[3]{\frac{300}{19200}}$ oe or for $\left(\frac{1.6}{r}\right)^3=\frac{300}{19200}$

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Question	Answer	Marks	Partial Marks
7(a)	$x = 0$	**1**	
7(b)	Tangent ruled at $x = 0.5$	**B1**	No daylight between tangent and curve at point of contact
	–9 to –6.5	**2**	**dep** on ruled tangent or close attempt at tangent at $x = 0.5$ **M1** for rise/run also dep on tangent or close attempt at tangent at $x = 0.5$
7(c)(i)	0 2.4 or better 4	**3**	**B1** for each
7(c)(ii)	Correct smooth curve	**4**	**B3FT** for 6 or 7 correct plots or **B2 FT** for 4 or 5 correct plots or **B1 FT** for 2 or 3 correct plots **FT** *their* table
7(d)	$x^3 + 3x + 4 = 10 - 8x^2$ and correctly completed	**1**	
7(e)	line $y = -2x + 2$ drawn and –0.45 to –0.35 nfww	**3**	**B2** for ruled $y = -2x + 2$ or **B1** for $-2x + 2$ seen or for line $y = -2x + c$ drawn or for $y = cx + 2$ ($c \neq 0$) drawn and **B1** for –0.45 to – 0.35 nfww
8(a)	18	**3**	**B2** for 20 nfww or **M1** for $8x + x = 180$ or better
8(b)	32	**3**	**B1** for angle $DBC = 58$ **B1** for angle $BCD = 90$
8(c)(i)	24	**2**	**B1** for angle $PRQ = 24$
8(c)(ii)	29.4 or 29.40 to 29.41	**3**	**M2** for $\frac{360-48}{360} \times 2 \times \pi \times 5.4$ or **B2** for answer (minor arc) 4.52 or 4.523 to 4.524… or **M1** for $\frac{48}{360} \times 2 \times \pi \times 5.4$
9(a)	$\frac{5}{8}$ $\frac{3}{8}$ $\frac{1}{6}$ $\frac{5}{6}$ $\frac{7}{10}$ $\frac{3}{10}$	**3**	**B1** for each pair

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Question	Answer	Marks	Partial Marks
9(b)	$\frac{5}{48}$ oe	**2**	**M1FT** for *their* $\frac{5}{8} \times$ *their* $\frac{1}{6}$
9(c)	$\frac{304}{480}$ oe	**3**	**M2** for *their* $\frac{5}{8} \times$ *their* $\frac{5}{6}$ + *their* $\frac{3}{8} \times$ *their* $\frac{3}{10}$ oe or **M1** for *their* $\frac{5}{8} \times$ *their* $\frac{5}{6}$ or *their* $\frac{3}{8} \times$ *their* $\frac{3}{10}$
10(a)	75	**3**	**M2** for 79.5 ÷ 1.06 oe or **M1** for 79.5 associated with 106 [%]
10(b)	962.5 cao	**2**	**B1** for 35 or 27.5 seen
10(c)(i)	16	**1**	
10(c)(ii)	50	**1**	
10(c)(iii)	$\frac{4}{50}$ oe	**2**	**FT** *their* **(c)(ii)** for 1 or 2 marks **B1** for $\frac{4}{k}$, $k > 4$ or $\frac{k}{their 50}$, $k < 50$
10(c)(iv)	19	**1**	
11(a)(i)	12.6 or 12.64 to 12.65	**3**	**M2** for $12^2 + (-4)^2$ OR **B1** for $\begin{pmatrix} 12 \\ -4 \end{pmatrix}$ **M1** for $(their 12)^2 + (their - 4)^2$
11(a)(ii)	$\begin{pmatrix} -11 \\ 13 \end{pmatrix}$	**2**	**B1** for $\begin{pmatrix} -11 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 13 \end{pmatrix}$ or for $[\overrightarrow{BA} =] \begin{pmatrix} -8 \\ 7 \end{pmatrix}$
11(b)	$\frac{1}{2}$**(b – a)** oe	**2**	**M1** for correct route or correct unsimplified answer or **B1** for $\overrightarrow{QS}$ = **b** – **a** oe
11(c)(i)	$\begin{pmatrix} 9 & 50 \\ 10 & 69 \end{pmatrix}$	**2**	**B1** for 2 correct elements
11(c)(ii)	$\frac{1}{11}\begin{pmatrix} 8 & -5 \\ -1 & 2 \end{pmatrix}$ oe isw	**2**	**B1** for $k\begin{pmatrix} 8 & -5 \\ -1 & 2 \end{pmatrix}$ or $\frac{1}{11}\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ or det = 11 soi

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Question	Answer	Marks	Partial Marks
12(a)	18 28	**2**	**B1** for each
12(b)	$3n + 3$ oe	**2**	**B1** for $3n + k$ oe or $cn + 3$ oe $c \neq 0$
12(c)	45	**2**	**M1** for identifying 7th pattern or **M1** for *their* $(3n+3) = 24$
12(d)	$[a =]\frac{3}{2}$ oe $[b =]\frac{13}{3}$ oe	**6**	**M1** for any correct substitution e.g. $\frac{1}{6}(2)^3 + 2^2a + 2b$ **A1** for one of e.g. $\frac{1}{6} + a + b = 6$ oe $\frac{8}{6} + 4a + 2b = 16$ oe $\frac{27}{6} + 9a + 3b = 31$ oe $\frac{64}{6} + 16a + 4b = 52$ oe **A1** for another of the above **M1** for correctly eliminating one variable from *their* equations **A1** for $a = \frac{3}{2}$ **A1** for $b = \frac{13}{3}$ oe

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MATHEMATICS **0580/42**

Paper 4 (Extended) **May/June 2018**

MARK SCHEME

Maximum Mark: 130

Published

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	85	**1**	
1(a)(ii)	455	**2**	**M1** for 260 ÷ 20 × 35 oe
1(a)(iii)	61	**3**	**B2** for 61.5… seen or **M1** for 2000 ÷ 650 soi or for $\frac{x}{2000} = \frac{20}{650}$ oe or other attempt at scaling up with 650 or for 650 ÷ 20 oe
1(b)(i)	40	**3**	**M2** for $\frac{1.89 - 1.35}{1.35}$ [× 100] oe or $\frac{1.89}{1.35} \times 100$ oe or **M1** for oe $\frac{1.89}{1.35}[\times 100]$ soi
1(b)(ii)	1.75 nfww	**3**	**M2** for $1.89 \div \left(\frac{100+8}{100}\right)$ or better or **M1** for 1.89 associated with 108 [%]
1(c)	10.1 or 10.06…	**3**	**M2** for $\sqrt[3]{\frac{20.8}{15.6}}$ oe or **M1** for $15.6 \times k^3 = 20.8$ oe
1(d)(i)	14:15	**3**	**B2** for correct unsimplified 3 term ratio A: B: C or correct unsimplified two term ratio A : C or **M1** for attempt to find common multiple of 4 and 10 or other common value for B or for 7 × $\frac{4}{10}$ oe or 3 × $\frac{10}{4}$ oe

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Question	Answer	Marks	Partial Marks
1(d)(ii)	147	**3**	**M2** for $\frac{45}{15}(14+20\,[+15])$ oe or 45 ÷ 3 × 4 + (45 ÷ 3 × 4) ÷ 10 × 7 [+ 45] or **M1** for 45 ÷ 3 oe or 45 ÷ *their* **(d)(i)** value for C shown
2(a)(i)	20 [< $t \leqslant$] 25	**1**	
2(a)(ii)	25 [< $t \leqslant$] 30	**1**	
2(a)(iii)	28.3 or 28.33..	**4**	**M1** for 22.5, 27.5, 32.5, 37.5, 42.5 soi **M1** for $\sum fx$ where x is in the correct interval including boundaries **M1**dep for $\sum fx$ ÷ 120 or $\sum fx$ ÷ (44 + 32 + 28 + 12 + 4)
2(a)(iv)	$\frac{4}{120}$ oe isw	**1**	
2(b)(i)	76, 104, 116, 120	**2**	**B1** for one error FT other values or for 3 correct
2(b)(ii)	Correct curve	**3**	**B1** for correct horizontal placement for 6 plots **B1FT** for correct vertical placement for 6 plots **B1FT dep on at least B1** for reasonable increasing curve or polygon through *their* 6 points If 0 scored **SC1FT** for 5 out of 6 points correctly plotted
2(b)(iii)	27 to 27.5	**1**	
2(b)(iv)	8.5 to 9.5	**2**	**B1** for [UQ=] 32 to 32.5 or [LQ=] 23 to 23.5
2(b)(v)	8, 9, 10, 11 or 12	**2**	**B1** for 108 to 112 seen or **B1FT** *their* graph reading at 37 mins seen
3(a)(i)	Image at (3, – 3), (7, – 3), (7, – 5)	**2**	**B1** for reflection in any $x = k$ or if 3 correct points not joined
3(a)(ii)	Image at (– 5, 1), (– 1, 1), (– 5, – 1)	**2**	**B1** for translation by $\begin{pmatrix}-2\\k\end{pmatrix}$ or $\begin{pmatrix}k\\4\end{pmatrix}$ or if 3 correct points not joined

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Question	Answer	Marks	Partial Marks
3(a)(iii)	Image at (6, 3), (6, 4), (4, 3)	**3**	**B2** for correct size and orientation but wrong position or if 3 correct points not joined **B1** for enlargement SF ½ with centre (3, 1)
3(b)	Rotation 90° [anticlockwise]oe (– 6, – 2)	**3**	**B1** for each
3(c)	Reflection $y = -x$ oe	**2**	**B1** for each
4(a)(i)	$243p^{10}$ final answer	**2**	**B1** for answer $243p^k$ or kp^{10} $(k \neq 0)$
4(a)(ii)	$9xy^4$ final answer	**2**	**B1** for answer with two correct elements in correct form of expression
4(a)(iii)	$\frac{m^2}{25}$ final answer	**1**	
4(b)	10	**4**	**B2** for $x = 8$ or for [length of rectangle =] 31 or **M1** for $5x - 9 = 3x + 7$ oe or better **M1** for $\frac{310}{(3 \times theirx + 7)}$ or $\frac{310}{(5 \times theirx - 9)}$ <u>Alt method using simultaneous eqns</u> **M1** for $5xw - 9w = 310$ **and** $3xw + 7w = 310$ **M1** for equating coefficients of xw **M1** for subtraction to eliminate term in xw
5(a)	$8^2 + 7^2 - 2 \times 7 \times 8 \times \cos 78$ oe	**M2**	**M1** for correct implicit version
	9.471.. to 9.472	**A2**	**A1** for 89.7…
5(b)	46.3 or 46.29 to 46.30…	**3**	**M2** for [sin OAC =] $\frac{7 \sin 78}{9.47}$ or **M1** for $\frac{\sin OAC}{7} = \frac{\sin 78}{9.47}$

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Question	Answer	Marks	Partial Marks
5(c)	29.5 – (7 + 8 + 9.47)	**M1**	
	$\frac{360\times(29.5-(7+8+9.47))}{2\times\pi\times7}$	**M3**	**M2** for $\frac{x}{360}\times2\times\pi\times7$ = *their* arc length oe or **M1** for $\frac{x}{360}\times2\times\pi\times7$ oe
	41.15 to 41.171..	**B1**	
5(d)	45[.0] or 44.98 to 45.01 nfww	**4**	**M3** for ½ × 8 × 7 × sin 78 oe + $\frac{41.2}{360}\times\pi\times7^2$ oe OR **M1** for ½ × 8 × 7 × sin 78 oe or ½ × 8 × 9.47 × sin *their* **(b)** oe **M1** for $\frac{41.2}{360}\times\pi\times7^2$ oe
6(a)	– 2[.0], – 0.2, 2.5	**3**	**B1** for each
6(b)	Fully correct curve	**5**	**B4** for correct curve, but branches joined or **B3FT** for 9 or 10 correct plots or **B2FT** for 7 or 8 correct plots or **B1FT** for 5 or 6 correct plots and **B1 indep** two separate branches not touching or cutting *y*-axis
6(c)(i)	Correct tangent and 3 ⩽ grad ⩽ 5	**3**	**B2** for close attempt at tangent to curve at *x* = – 2 **and** answer in range OR **B1** for ruled tangent at *x* = – 2, no daylight at *x* = –2 and **M1dep** (dep on **B1** or close attempt at tangent) [at *x* = –2] for $\frac{rise}{run}$
6(c)(ii)	[*y* =] *their***(c)(i)** *x* + *their y*-intercept final answer	**2**	**Strict FT** *their y*-intercept for *their* line **M1** for *y* = *their***(c)(i)** *x* + *any value* or '*c*' oe seen or for *y* = *any value*(non-zero) *x* or '*mx*' + *their y*-intercept seen oe
6(d)(i)	1.05 to 1.25	**1**	
6(d)(ii)	– 2.3 to – 2.2 – 0.4 to – 0.3 0.3 to 0.4	**3**	**B1** for each After 0 scored **B1** for *y* = –4 ruled

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Question	Answer	Marks	Partial Marks
6(e)	[a =] 2 [b =] 24 [n =] 5	**3**	**B2** for 2 correct or for $2x^5 + 24x^2$ [–3 = 0] or **B1** for 1 correct or for $\frac{2x^5 - 3 + 4(6x^2)}{6x^2}$ [= 0] oe If 0 scored **SC1** for $2x^5$ seen in final line of algebra
7(a)	$x^2 + (2x - 3)^2 = 6^2$ oe or $x^2 + 4x^2 - 6x - 6x + 9 = 36$	**M1**	
	$4x^2 - 6x - 6x + 9$ or better	**B1**	
	$5x^2 - 12x - 27 = 0$	**A1**	Dep on **M1B1** with no errors or omissions
7(b)	$\frac{-(-12) \pm \sqrt{(-12)^2 - 4(5)(-27)}}{2 \times 5}$ or better or $\frac{12}{10} \pm \sqrt{\left(\frac{12}{10}\right)^2 + \frac{27}{5}}$	**B2**	**B1** for $\sqrt{(-12)^2 - 4(5)(-27)}$ or for $\left(x - \frac{12}{10}\right)^2$ oe or $\frac{-(-12) + \sqrt{q}}{2 \times 5}$ oe or $\frac{-(-12) - \sqrt{q}}{2 \times 5}$ oe or both
	– 1.42, 3.82 final answers	**B2**	**B1** for each If **B0**, **SC1** for answers – 1.4 or –1.415… to – 1.415 **and** 3.8 or 3.815 to 3.815… or answers –1.41 and 3.81 or – 1.42 **and** 3.82 seen in working or for –3.82 and 1.42 as final ans
7(c)	14.4 or 14.5 or 14.44 to 14.46	**2**	**2FT** for 3 × *their* positive root + 3 evaluated to 3sf or better **M1** for 3 × *their* positive root + 3 oe
7(d)	39.5 or 39.46 to 39.54…	**2**	**M1** for trig statement seen to find either angle sin = $\frac{\textit{their } x}{6}$ oe or sin = $\frac{\textit{their } (2x - 3)}{6}$ oe
8(a)(i)	1	**2**	**M1** for h(0) or for 2^{8-3x}
8(a)(ii)	8	**2**	**M1** for g(¼) or for $\frac{10}{2^x + 1}$

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Question	Answer	Marks	Partial Marks
8(a)(iii)	$\frac{10-x}{x}$ or $\frac{10}{x}-1$ final answer	**3**	**M2** for $x = \frac{10-y}{y}$ or better or $xy = 10 - x$ or better or $y + 1 = \frac{10}{x}$ or **M1** for $x(y + 1) = 10$ or $y(x + 1) = 10$ or $x = \frac{10}{y+1}$ or $x + 1 = \frac{10}{y}$
8(a)(iv)	5	**1**	
8(b)	$\frac{-3x^2+5x+18}{x+1}$ final answer	**3**	**M1** for $\frac{(8-3x)(x+1)+10}{x+1}$ **B1** for $-3x^2 - 3x + 8x + 8$ [+10]
9(a)(i)(a)	62 and Isosceles [triangle] and Angle at centre is twice angle at circumference oe	**3**	**B2** for 62 and one correct reason or **B1** for 62 with no/wrong reason or for angle *EOD* = 124 soi or for no/wrong angle with correct reason
9(a)(i)(b)	62 and [Angles in] same segment oe or angle at centre is twice angle at circumference oe	**2**	**2FT** *their* **(a)(i)(a)** and correct reason **B1FT** for *their* **(a)(i)(a)** with no/wrong reason or for no/wrong angle with correct reason
9(a)(ii)	8	**3**	**M2** for (180 –109) – 28 – 35 oe or **M1** for [angle *AED* =] 180 – 109 oe
9(b)(i)	24	**3**	x = ext angle **B2** for [x =] 15 isw or **M1** for $x + 11x = 180$ oe or for $\frac{180(n-2)}{[n]} = \frac{360}{[n]} \times 11$
9(b)(ii)	3960	**2**	**FT** (*their* 24 – 2) × 180 dep on **(b)(i)** an integer and > 6 **M1** for (*their* 24 – 2) × 180 oe or *their* 24 × 11 × *their* 15 oe or 11 × 360

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Cambridge Assessment International Education
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MATHEMATICS **0580/43**

Paper 4 (Extended) **May/June 2018**

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the May/June 2018 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

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Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

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Abbreviations
cao correct answer only
dep dependent
FT follow through after error
isw ignore subsequent working
oe or equivalent
SC Special Case
nfww not from wrong working
soi seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	13.5	**3**	**M2** for $\frac{45.4[0]-40}{40}$ [× 100] or $\frac{45.4[0]}{40} \times 100$ or **M1** for $\frac{45.4[0]}{40}$ [× 100]
1(a)(ii)	35.5[0]	**3**	**M2** for $42.6[0] \div \left(1+\frac{20}{100}\right)$ or better or **M1** for recognising 42.6[0] as 120[%]
1(b)	150 cao	**2**	**M1** for $\frac{500\times 2\times 15}{100}$ oe
1(c)(i)	7800 cao	**3**	**B2** for 7790 or 7785 to 7786 or **M1** for $21000\times\left(1-\frac{18}{100}\right)^5$ oe isw If 0 or 1 scored, **SC1** for *their* 7785… seen and rounded correctly to nearest 100
1(c)(ii)	9[.00…]	**3**	**M2** for $\sqrt[12]{\frac{42190}{15000}}$ or better or **M1** for $15000\left(1+\frac{x}{100}\right)^{12}=[42190]$
2(a)(i)	1, ….., ….., …., 16	**2**	**B1** for each
2(a)(ii)	14, ….., ….., …., – 2	**2**	**B1** for each
2(b)	Fully correct smooth curves	**6**	**B3** for correct curve of $y=2^x$ or **B2FT** for 4 or 5 correct points or **B1FT** for 2 or 3 correct points **B3** for correct curve of $y=14-x^2$ or **B2FT** for 4 or 5 correct points or **B1FT** for 2 or 3 correct points
2(c)(i)	3.5 to 3.7	**1**	
2(c)(ii)	2.65 to 2.8	**1**	

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Question	Answer	Marks	Partial Marks
2(d)(i)	Correct line	**1**	Ruled, through (4, 2) and gradient −4
2(d)(ii)	Tangent (2, 10)	**2**	**B1** for each
3(a)(i)	Positive	**1**	Ignore strong, weak, etc.
3(a)(ii)	Correct ruled line	**1**	
3(a)(iii)	2	**1**	
3(b)	[mode =] 0 [median =] 1 [mean =] 1.04 or 1.041 to 1.042	**5**	**B1** **B1** **B3** or **M2** for ([10 × 0] + 8 × 1 + 3 × 2 + 2 × 3 + [0 × 4] + 1 × 5) ÷ 24 oe or **M1** for [10 × 0] + 8 × 1 + 3 × 2 + 2 × 3 + [0 × 4] + 1 × 5 oe
3(c)(i)	60.9 or 60.91... nfww	**4**	**M1** for 49, 57, 71 correct **M1** for use of Σfx with x in the correct interval including both boundaries **M1** (dep on 2nd **M1**) for *their* (78 × 49 + 180 × 57 + 162 × 71) ÷ (78 + 180 + 162)
3(c)(ii)	Correct histogram	**4**	**B1** for correct widths in correct position **B1** height 13 **B1** height 18 **B1** height 9 If 0 scored **B1** for 13, 18 and 9 seen
4(a)(i)	$\frac{8}{20}$ oe	**3**	**M2** for $\frac{2}{5}\times\frac{1}{4}+\frac{3}{5}\times\frac{2}{4}$ or **M1** for one of these products OR **M1** for probability tree identifying all 20 outcomes with the correct 8 identified OR **M1** for completed possibility space / 2-way table identifying the 8 possible outcomes out of 20, oe **SC1** for $\frac{13}{25}$ with replacement

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Question	Answer	Marks	Partial Marks
4(a)(ii)	$\frac{9}{25}$ oe	3	**M2** for $\frac{2}{5}\times\frac{3}{5}+\frac{3}{5}\times\frac{1}{5}$ oe or **M1** for one of these products OR **M1** for probability tree identifying all 25 outcomes with the correct 9 identified OR **M1** for completed possibility space / 2-way table identifying the 9 possible outcomes out of 25, oe
4(a)(iii)	Jojo and e.g. $\frac{40}{100}>\frac{36}{100}$	1	**1FT** *their* **(i)** and **(ii)** dep on being in range 0 to 1
4(b)	$\frac{24}{60}$ oe	3	**M2** for $\frac{2}{5}\times\frac{3}{4}\times\frac{1}{3}+\frac{3}{5}\times\frac{2}{4}\times\frac{1}{3}+\frac{3}{5}\times\frac{2}{4}\times\frac{2}{3}$ oe or **M1** for any one correct product OR **M1** for 4, 5, 4 and 5, 4, 4 and 5, 5, 4 clearly identified on a tree or in a list
5(a)	15.6[0]	4	**B3** for $20\,900x = 326\,040$ or better or **M2** for $18\,500x + 2400(x - 2.5[0]) = 320\,040$ or **M1** for $18\,500x$ or $2400(x - 2.5[0])$
5(b)(i)	$(y+12)(y-7)$ final answer	2	**B1** for $(y+a)(y+b)$ where $ab = -84$ or $a + b = 5$ or $y(y+12)-7(y+12)$ or $y(y - 7) + 12(y - 7)$
5(b)(ii)	38 cao	3	**B2** for $y = 7$ or **M1** for $y(y + 5) = 84$ oe
5(c)(i)	$168(m - 0.75) + 207m = 100m(m - 0.75)$ oe OR $207 = 100m - 168 - 75 + \frac{126}{m}$	M2	May be all over common denominator **M1** for $\frac{168}{m}$ or $\frac{207}{m-0.75}$ used
	at least one interim line leading to $50m^2 - 225m + 63 = 0$	A1	No errors or omissions

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Question	Answer	Marks	Partial Marks
5(c)(ii)	$(10m-3)(5m-21)$ OR $m=\dfrac{-(-225)\pm\sqrt{(-225)^2-4(50)(63)}}{2(50)}$ oe OR $m=\dfrac{225}{100}\pm\sqrt{\left(\dfrac{225}{100}\right)^2-\dfrac{63}{50}}$ oe	**B2**	**M1** for $(10m+a)(5m+b)$ where $ab=63$ or $5a+10b=-225$ or $10m(5m-21)-3(5m-21)$ or $5m(10m-3)-21(10m-3)$ OR **M1** for $\sqrt{(-225)^2-4(50)(63)}$ or for $p=-(-225)$, $r=2(50)$ if in form $\dfrac{p+\sqrt{q}}{r}$ or $\dfrac{p-\sqrt{q}}{r}$ OR **M1** for $\left(m-\dfrac{225}{100}\right)^2$ oe
	4.2[0] cao	**B1**	
6(a)(i)	116.6 or 116.56 to 116.57	**4**	**M1** for $\sin[EAD]=\dfrac{6}{12}$ oe **M1** for $\tan[BAC]=\dfrac{6}{12}$ oe **B1** for [angle DAC] = 60
6(a)(ii)	13.4 or 13.41 to 13.42	**2**	**M1** for 12^2+6^2
6(a)(iii)	10.4 or 10.39…	**3**	**M2** for $\sqrt{12^2-6^2}$ or **M1** for $AE^2+6^2=12^2$
6(a)(iv)	130 or 129.5… to 129.6	**4**	**M1** for $0.5\times6\times theirAE$ oe **M1** for $0.5\times12\times12\times\sin 60$ oe **M1** for $0.5\times6\times12$ oe
6(b)(i)	3	**1**	
6(b)(ii)	51.3 or 51.30 to 51.34…	**4**	**M3** for tan = $\dfrac{8}{\sqrt{4^2+5^2}}$ or sin = $\dfrac{8}{\sqrt{4^2+5^2+8^2}}$ oe or **M2** for $\sqrt{4^2+5^2}$ or $\sqrt{4^2+5^2+8^2}$ or **M1** for angle ARB clearly indicated
7(a)	204 or 203.5 to 203.6… nfww	**4**	**M2** for $\pi\times1.5^2\times8\times60\times60$ or **M1** for $\pi\times1.5^2$ **M1** for dividing *their* volume by 1000 If 0 scored **SC1** for an answer figs 204 or figs 2035 to 2036 without working
7(b)(i)	$\pi\times6\times12+\pi\times6^2=108\pi$	**M2**	**M1** for $\pi\times6\times12$

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Question	Answer	Marks	Partial Marks
7(b)(ii)	[x =] 5.2[0] or 5.196… [y =] 6	**4**	**B2** or **M1** for $4\pi x^2 = 108\pi$ seen **B2** or **M1** for $\frac{1}{2}(4\pi y^2) + \pi y^2$ or better seen
8(a)(i)	× ✓ ✓ × × ✓	**4**	**B3** for 5 correct **B2** for 4 correct **B1** for 3 correct
8(a)(ii)	$\begin{pmatrix} 5 \\ 3 \end{pmatrix}$	**1**	Fraction line and/or missing brackets scores 0
8(a)(iii)	$\begin{pmatrix} 4 & 8 \\ 1 & 2 \end{pmatrix}$	**2**	**B1** for 2 or 3 correct elements (dep on 2 × 2 matrix)
8(a)(iv)	$\frac{1}{2}\begin{pmatrix} 3 & -1 \\ -4 & 2 \end{pmatrix}$ oe isw	**2**	**B1** for $k\begin{pmatrix} 3 & -1 \\ -4 & 2 \end{pmatrix}$ or determinant = 2 soi
8(b)	Rotation Origin oe 90 [anticlockwise] oe	**3**	**B1** for each
9(a)	$y = -2x + 5$ oe	**3**	**B2** for $-2x + 5$ or **M1** for gradient = $-1 \div \frac{1}{2}$ or better **M1** for substituting (1, 3) into y = (*their m*)$x + c$ oe If 0 scored **SC1** for (1, 3) satisfying their wrong equation ($c \neq 0$) with gradient $\neq \frac{1}{2}$
9(b)(i)	$x \geqslant 2$ oe $y \leqslant 5$ oe $y \geqslant \frac{1}{2}x$ oe	**4**	**SC3** for $x > 2$ and $y < 5$ and $y > \frac{1}{2}x$ OR **B1** for $x \geqslant 2$ **B1** for $y \leqslant 5$ **B2** for $y \geqslant \frac{1}{2}x$ or **M1** for $y \geqslant kx$ ($k > 0$) OR **SC2** for all three boundary lines identified but with incorrect sign(s) If 0 scored **SC1** for one or two correct boundary lines with incorrect sign(s)

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Question	Answer	Marks	Partial Marks
9(b)(ii)	(5, 4)	**2**	**M1** for one trial of an integer point inside region or for $3x+5y=35$ drawn
10(a)(i)	26	**2**	**M1** for g(5) or for $\left(x^2+1\right)^2+1$
10(a)(ii)	x^2+4x+5	**2**	**M1** for $(x+2)^2+1$
10(a)(iii)	5	**2**	**M1** for $2x-3=7$
10(a)(iv)	$\frac{x+3}{2}$ oe	**2**	**M1** for $x=2y-3$ or $y+3=2x$ or $\frac{y}{2}=x-\frac{3}{2}$ oe
10(b)(i)	[0].70 cao	**2**	**B1** for [0].696 to [0].697
10(b)(ii)	4 cao	**1**	

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CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

MATHEMATICS **0580/11**

Paper 1 (Core) **May/June 2018**

1 hour

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 56.

This document consists of **10** printed pages and **2** blank pages.

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[Turn over

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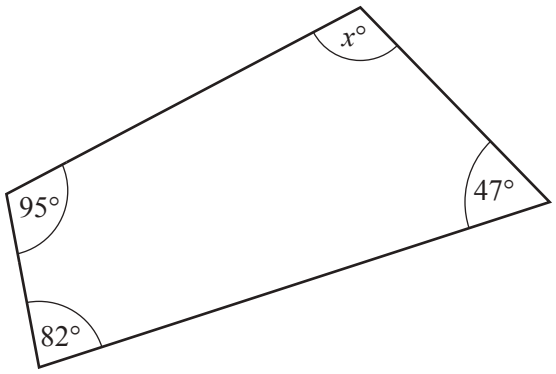
1 Write 4647 correct to the nearest 100.

..... [1]

2 Write 0.007 as a fraction.

..... [1]

3 The diagram shows a quadrilateral.



NOT TO SCALE

Find the value of x.

$x =$ ..... [1]

4 The nth term of a sequence is $5n - 3$.

Write down the first three terms of the sequence.

..... , ... , ... [1]

5 **(a)** Write 0.002 68 correct to 2 significant figures.

..... [1]

(b) Write 0.000 038 7 in standard form.

..... [1]

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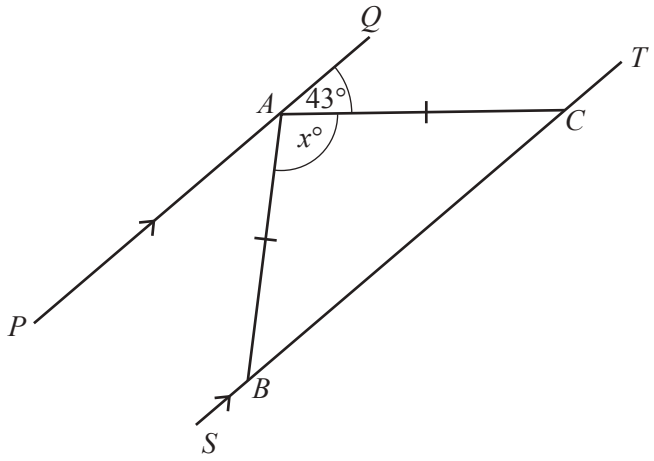
6 Find the value of $7x + 3y$ when $x = 12$ and $y = -6$.

..... [2]

7



NOT TO SCALE

The diagram shows two parallel lines PAQ and $SBCT$.
$AB = AC$ and angle $QAC = 43°$.

Find the value of x.

$x =$ ..... [2]

8 Solve the equation $8x - 5 = 7$.

$x =$ ..... [2]

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9 **(a)** Change 6.54 kilometres into metres.

..... m [1]

(b) Change 7850 cm^3 into litres.

..... litres [1]

10 The height, h metres, of a boy is 1.72 m, correct to the nearest centimetre.

Complete this statement about the value of h.

..... $\leqslant h <$ ..... [2]

11 Expand and simplify.

$$6(2y - 3) - 5(y + 1)$$

..... [2]

12

$$\mathbf{g} = \begin{pmatrix} 2 \\ 5 \end{pmatrix} \qquad \mathbf{h} = \begin{pmatrix} -3 \\ 4 \end{pmatrix}$$

Write as a single vector

(a) $\mathbf{g} + \mathbf{h}$,

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(b) $-\mathbf{h}$.

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

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13 Work out the lowest common multiple (LCM) of 18 and 21.

..... [2]

14 Work out the size of one exterior angle of a regular octagon.

..... [2]

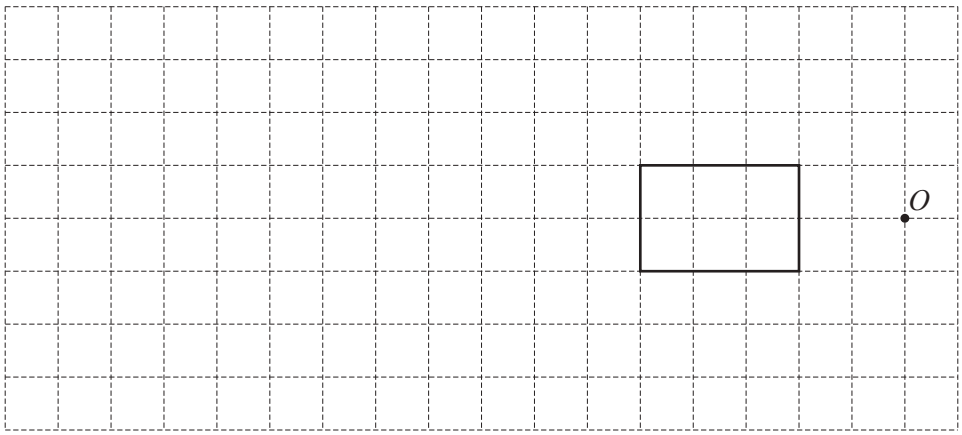
15 **(a)** Calculate $\sqrt{2.38 + 6.4^2}$, writing down your full calculator display.

..... [1]

(b) Write your answer to **part (a)** correct to 4 decimal places.

..... [1]

16 Enlarge the rectangle using a scale factor of 3 and centre of enlargement *O*.



[2]

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17 **(a)** A box contains 3 blue pens, 4 red pens and 8 green pens only.
A pen is chosen at random from the box.

Find the probability that this pen is green.

..... [1]

(b) A cube has only one of its six faces painted yellow.
This cube is rolled 240 times.

Work out the expected number of times that it lands on the yellow face.

..... [1]

18 **(a)** Simplify.

$$(x^3)^4$$

..... [1]

(b) $4^w = \frac{1}{16}$

Find the value of w.

$w =$ ..... [1]

19 π $\quad 3^{-2}$ $\quad 3\frac{4}{7}$ $\quad 33.3\%$ $\quad \sqrt{3}$ $\quad 0.3$ $\quad 3^{999}$

From this list, write down the two numbers that are irrational.

..... , ... [2]

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20 **(a)** Here is a description of a quadrilateral.

It has 4 right angles.
It has 2 lines of symmetry.
It has rotational symmetry of order 2.

Write down the mathematical name of this quadrilateral.

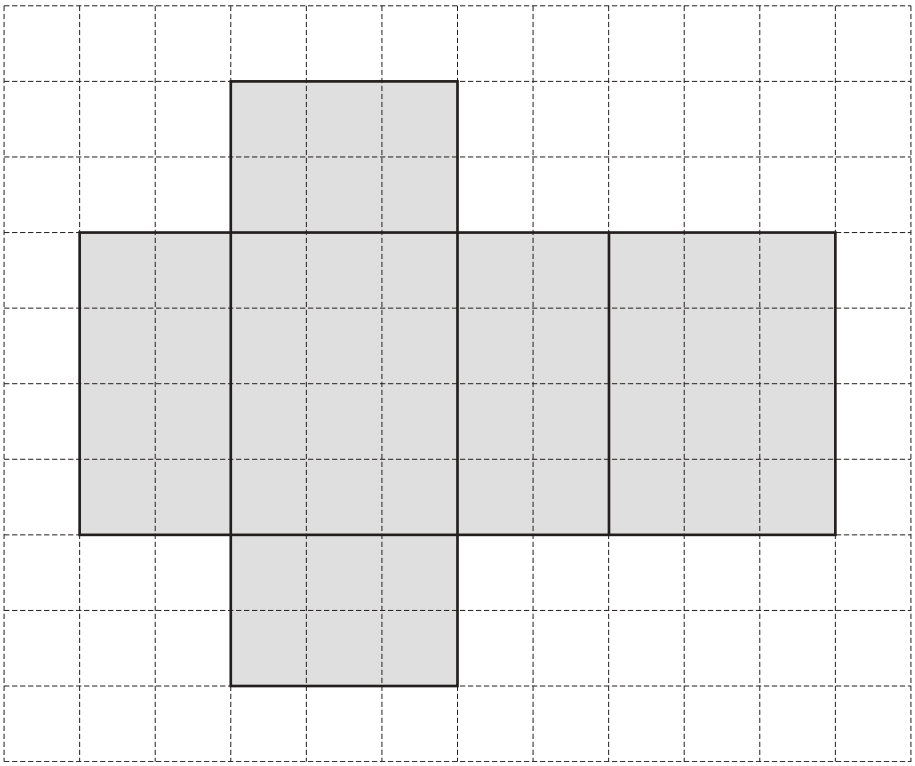
..... [1]

(b) Write down two geometrical properties of a parallelogram.

1. .....

2. ..... [2]

21 The net of a solid is drawn on a 1 cm^2 grid.



(a) Write down the name of the solid made from this net.

..... [1]

(b) Work out the volume of this solid.

.....cm^3 [2]

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22 Factorise completely.

(a) $10 + 16w$

..... [1]

(b) $12tx - 8t^2$

..... [2]

23 **Without using your calculator**, work out $1\frac{3}{4} \times \frac{6}{35}$.

You must show all your working and give your answer as a fraction in its simplest form.

..... [3]

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24 Solve the simultaneous equations.
You must show all your working.

$$3x + 10y = 106$$
$$5x - 4y = 1$$

$x =$ .....

$y =$ ..... [4]

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25 40 people were asked how many times they visited the cinema in one month.
The table shows the results.

Number of cinema visits	0	1	2	3	4	5	6	7
Frequency	5	5	6	6	7	3	6	2

(a) **(i)** Find the mode.

..... [1]

(ii) Calculate the mean.

..... [3]

(b) Omar wants to show the information from the table in a pie chart.

Calculate the sector angle for the people who visited the cinema 5 times.

..... [2]

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CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

MATHEMATICS **0580/12**

Paper 1 (Core) **May/June 2018**

1 hour

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
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For π, use either your calculator value or 3.142.

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1 One morning, Marcia works from 08 20 to 11 15.

Find how long she works for.
Give your answer in hours and minutes.

..... h ..... min [1]

2 Simplify.

$7g - g + 2g$

..... [1]

3 Expand.

$7(x - 8)$

..... [1]

4 Find the value of p when $5^p \div 5^8 = 5^{13}$.

$p =$ ..... [1]

5 22 17 25 41 39 4

Work out the difference between the two prime numbers in the list above.

..... [2]

6 Here is a sequence.

a, 13, 9, 3, –5, –15, b, …

Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [2]

7 The bearing of a lighthouse from a coastguard station is 113°.

Work out the bearing of the coastguard station from the lighthouse.

[2]

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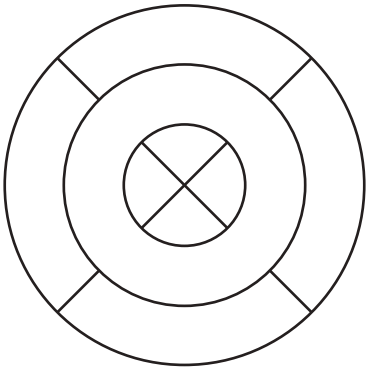
8



For this diagram, write down

(a) the number of lines of symmetry,

..... [1]

(b) the order of rotational symmetry.

..... [1]

9 Write these numbers in order, starting with the smallest.

5^{-2} $\frac{1}{27}$ $\frac{2}{55}$ 0.038

..... < ..... < ..... < .....[2]
smallest

10 Factorise completely.

$4xy^2 - 6y^3$

..... [2]

11 Here are some numbers written in standard form.

3.4×10^{-1} 1.36×10^{6} 7.9×10^{0} 2.4×10^{5} 5.21×10^{-3} 4.3×10^{-2}

From these numbers, write down

(a) the largest number,

..... [1]

(b) the smallest number.

..... [1]

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12

$\mathbf{a} = \begin{pmatrix} 5 \\ -2 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} -7 \\ -3 \end{pmatrix}$

Work out $\mathbf{a} + 3\mathbf{b}$.

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [2]

13 Make y the subject of the equation $5x - 2y + 7 = 0$.

$y =$ ..... [2]

14 Change 600 euros into dinars when the exchange rate is 1 euro = 0.429 dinars.
Give your answer correct to the nearest dinar.

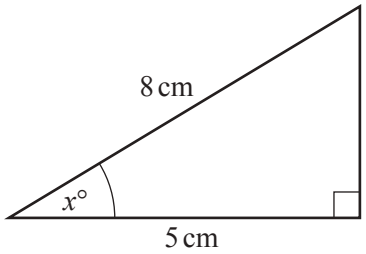
..... dinars [2]

15 Complete these statements.

(a) When $w =$ ..... , $10w = 70$. [1]

(b) When $5x = 15$, $12x =$ ..... [1]

16



NOT TO SCALE

Use trigonometry to calculate the value of x.

$x =$ ..... [2]

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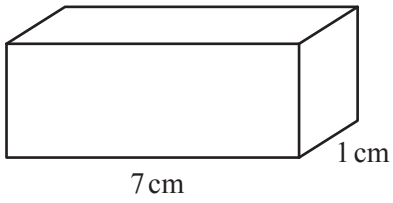
17



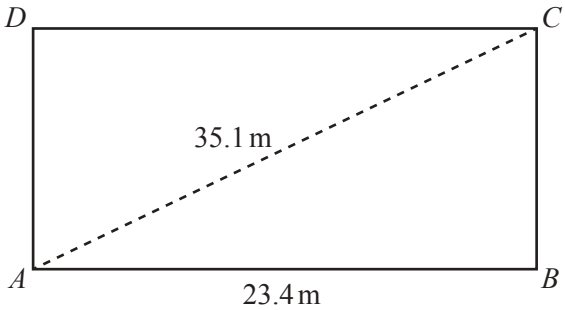
NOT TO SCALE

The diagram shows a solid cuboid with base area $7\,\text{cm}^2$.
The volume of this cuboid is $21\,\text{cm}^3$.

Work out the total surface area.

..... cm^2 [3]

18



NOT TO SCALE

The diagram shows a rectangular playground *ABCD*.
$AB = 23.4\,\text{m}$ and $AC = 35.1\,\text{m}$.

Calculate *BC*.

BC = ... m [3]

19 Friedrich borrows \$1200 for 3 years at a rate of 5.6% per year compound interest.

Work out the total amount he pays back at the end of the 3 years.

\$ ..... [3]

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20 A cylindrical glass has radius 3.6 cm and height 11 cm.
It is filled with water.

(a) Calculate, in cubic centimetres, the volume of water it contains.

..... cm^3 [2]

(b) Write your answer to **part (a)** in litres.

..... litres [1]

21 The cost of hiring a car for 12 days is \$167.90.
The cost of hiring this car for the first day is \$20.50.

Work out the cost per day for the remaining 11 days.

\$ ..... [3]

22

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
67	75	53	68	94	87

The table shows the number of customers in a restaurant on each day it is open during one week.

(a) Write down the day most customers came into the restaurant.

..... [1]

(b) Calculate the mean number of customers per day.

..... [2]

(c) Find the range of the number of customers.

..... [1]

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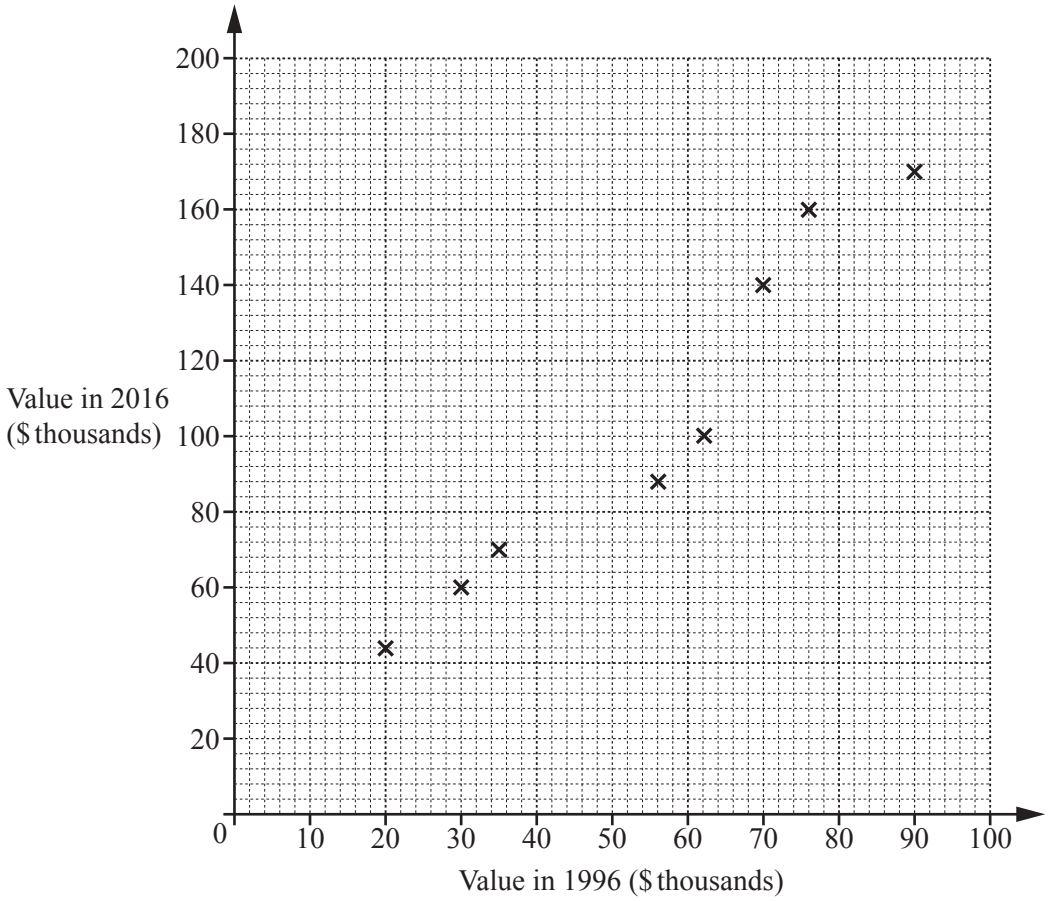
23 The scatter diagram shows the value, in thousands of dollars, of eight houses in 1996 and the value of the same houses in 2016.



(a) One of these eight houses had a value of $70 000 in 1996.

Write down the value of this house in 2016.

$ ..... [1]

(b) The values of two more houses are shown in the table.

Value in 1996 ($ thousands)	40	80
Value in 2016 ($ thousands)	80	150

On the scatter diagram, plot these values. [1]

(c) On the scatter diagram, draw a line of best fit. [1]

(d) Another house had a value of $50 000 in 1996.

Find an estimate of the value of this house in 2016.

$ ..... [1]

Question 24 is printed on the next page.

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24 **Without using your calculator**, work out the following.
You must show all your working and give each answer as a fraction in its simplest form.

(a) $\frac{2}{3} - \frac{1}{12}$

..... [2]

(b) $3\frac{3}{7} \div 4\frac{5}{14}$

..... [3]

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MATHEMATICS **0580/13**

Paper 1 (Core) **May/June 2018**

1 hour

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator Geometrical instruments
Tracing paper (optional)

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1 Write 75% as a fraction in its simplest form.

..... [1]

2 Factorise.

$$w + w^3$$

..... [1]

3 Liz takes 65 seconds to run 400 m.

Calculate her average speed.

..... m/s [1]

4 Calculate.

$$\sqrt{\frac{18^2}{0.5 + 1.75}}$$

..... [1]

5 Work out the value of 4^{-2}.

..... [1]

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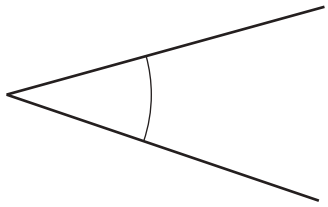
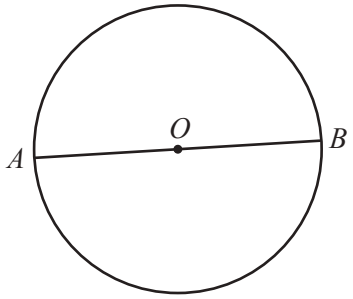
6 **(a)** Write down the mathematical name of the type of angle marked.



..... [1]

(b) A and B are points on the circumference of a circle, centre O.



Write down the mathematical name of the line AB.

..... [1]

7 Write these numbers in order, starting with the smallest.

$\frac{4}{15}$ 26% 0.24 $\frac{1}{4}$

..... < ..... < ..... < ..... [2]
smallest

8 Complete the list of factors of 36.

1, 2, ..., 36 [2]

9 Increase \$22 by 15%.

\$..... [2]

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10 **(a)** Write 209 802 correct to the nearest thousand.

..... [1]

(b) Write 4123 correct to 3 significant figures.

..... [1]

11 Jez and Soraya share \$2500 in the ratio Jez : Soraya = 7 : 3.

Work out how much Soraya receives.

\$..... [2]

12 The probability that Kim wins a game is 0.72 .
In one year Kim will play 225 games.

Work out an estimate of the number of games Kim will win.

..... [2]

13 **(a)** Write 4.82×10^{-3} as an ordinary number.

..... [1]

(b) Write 52 million in standard form.

..... [1]

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14 Solve.

$$\frac{1-p}{3} = 4$$

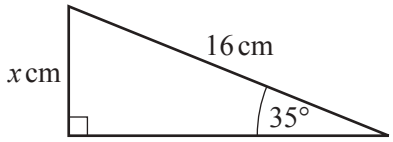
$p =$ ..... [2]

15 The mass, m kilograms, of a package is 6.2 kg, correct to 1 decimal place.

Complete the statement about the value of m.

..... $\leqslant m <$ ..... [2]

16



NOT TO SCALE

The diagram shows a right-angled triangle.

Calculate the value of x.

$x =$ ..... [2]

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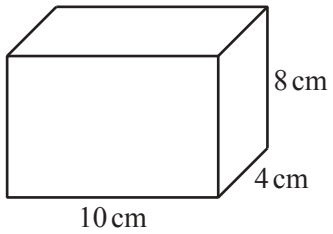
17 The diagram shows a cuboid.



NOT TO SCALE

Work out the surface area of this cuboid.

..... cm^2 [3]

18 **Without using a calculator**, work out $\frac{2}{3} \div 1\frac{1}{5}$.

You must show all your working and give your answer as a fraction in its simplest form.

..... [3]

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19 **(a)** Work out.

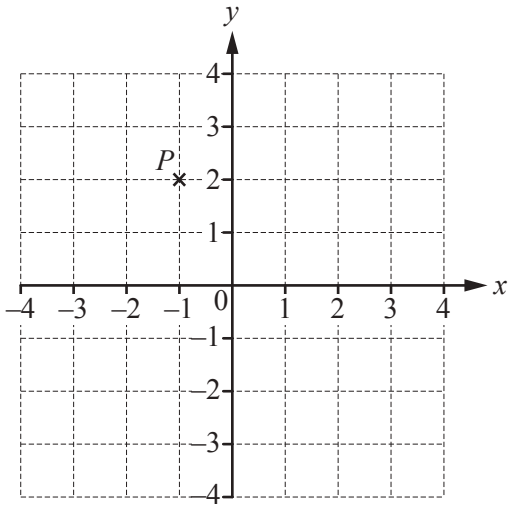
(i) $\begin{pmatrix} 5 \\ -1 \end{pmatrix} + \begin{pmatrix} 2 \\ 6 \end{pmatrix}$

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(ii) $4\begin{pmatrix} -5 \\ 2 \end{pmatrix}$

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(b)



P is the point $(-1, 2)$ and $\overrightarrow{PQ} = \begin{pmatrix} 4 \\ -3 \end{pmatrix}$.

Find the co-ordinates of Q.

(..... , ...) [1]

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20 **(a)** Line L has the equation $y = 5x + 12$.

Write down the gradient of line L.

..... [1]

(b) Another line, M, has the equation $y = 8x + 3$.

Write down the equation of the line parallel to line M that passes through the point (0, 6).

..... [2]

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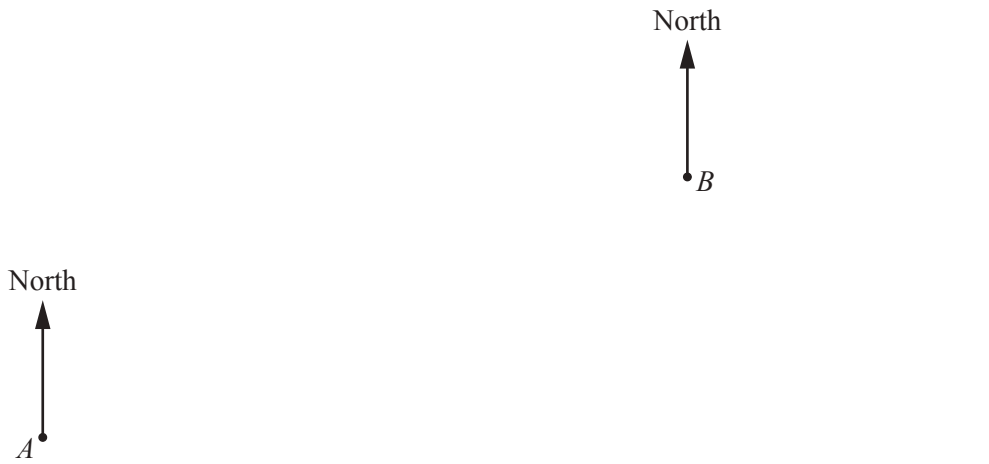
21 **(a)** Change 568 000 cm into metres.

..... m [1]

(b) The scale drawing shows the positions of two towns, *A* and *B*.
The scale is 1 centimetre represents 5 kilometres.



Scale : 1 cm to 5 km

(i) Measure the bearing of town *B* from town *A*.

..... [1]

(ii) Find the actual distance, in kilometres, from town *A* to town *B*.

..... km [2]

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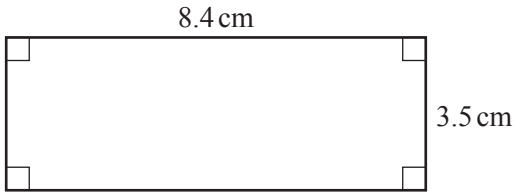
22 Work out the area of each shape.

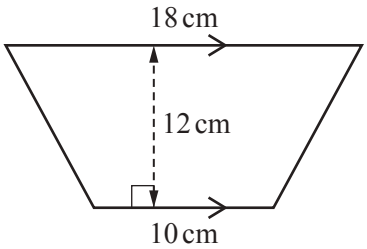
(a)



NOT TO SCALE

..... cm^2 [2]

(b)



NOT TO SCALE

..... cm^2 [2]

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23 Solve the simultaneous equations.
You must show all your working.

$$3x - 2y = 23$$
$$2x + 5y = 9$$

$x =$ .....

$y =$ ..... [4]

Question 24 is printed on the next page.

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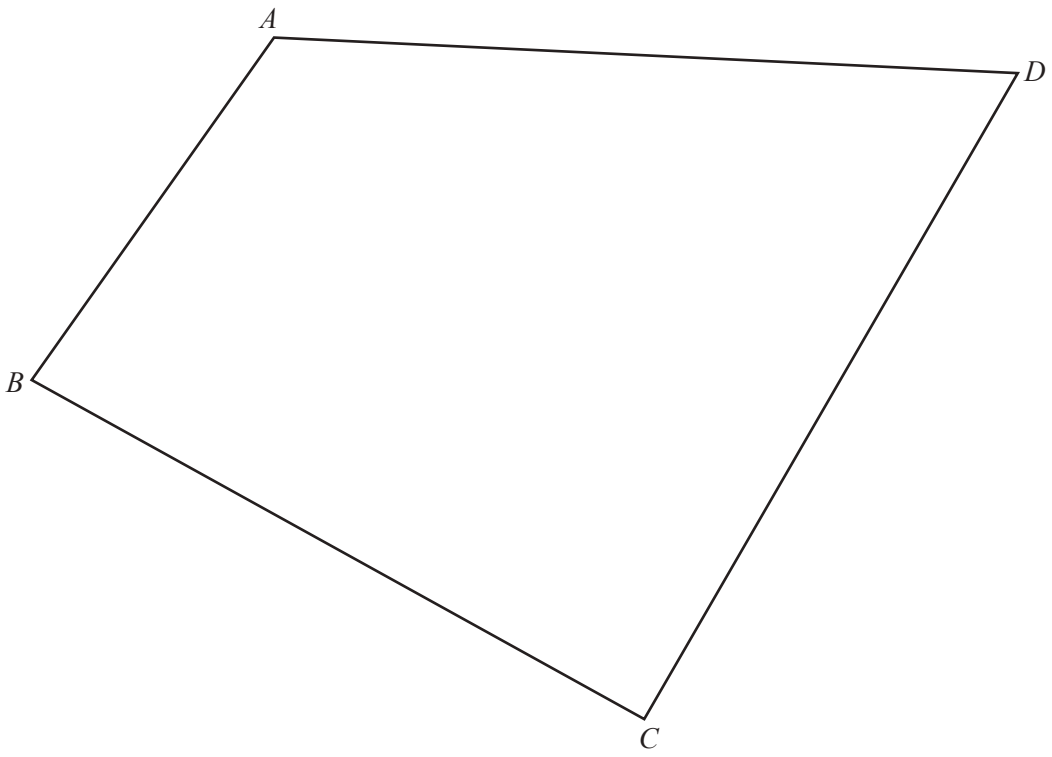
24 *ABCD* is a quadrilateral.



(a) **Using a straight edge and compasses only**, construct the perpendicular bisector of *BC*.
Show all your construction arcs. [2]

(b) **Using a straight edge and compasses only**, construct the bisector of angle *BCD*.
Show all your construction arcs. [2]

(c) Shade the region inside *ABCD* that is

- nearer to *B* than to *C*

and

- nearer to *CD* than to *BC*. [1]

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MATHEMATICS **0580/21**

Paper 2 (Extended) **May/June 2018**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

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1 Write down a prime number between 20 and 30.

..... [1]

2 Write 0.000 038 7 in standard form.

..... [1]

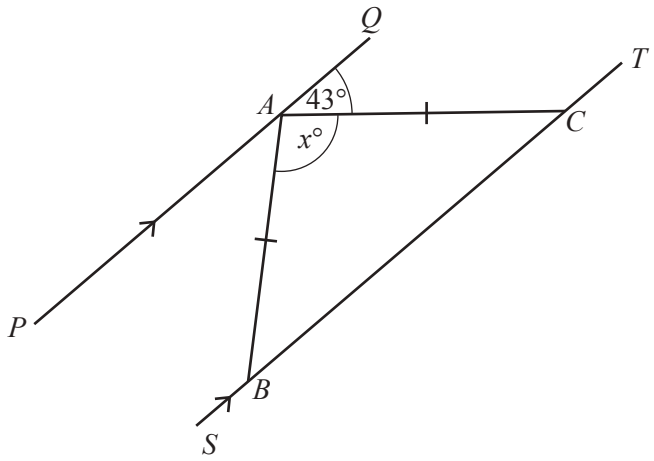
3 Write the recurring decimal $0.\dot{6}\dot{3}$ as a fraction.

..... [1]

4 Find the value of $7x + 3y$ when $x = 12$ and $y = -6$.

..... [2]

5



NOT TO SCALE

The diagram shows two parallel lines PAQ and $SBCT$.
$AB = AC$ and angle $QAC = 43°$.

Find the value of x.

$x =$ ..... [2]

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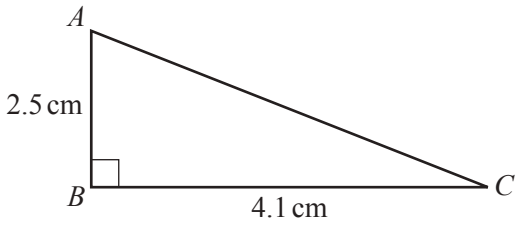
6 Calculate the area of a circle with radius 5.1 cm.

.....cm^2 [2]

7



NOT TO SCALE

Calculate the length of AC.

$AC =$ ..... cm [2]

8 Expand and simplify.

$$6(2y - 3) - 5(y + 1)$$

..... [2]

9 $3^{-q} \times \frac{1}{27} = 81$

Find the value of q.

$q =$ ..... [2]

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10 **(a)** Calculate $\sqrt{2.38 + 6.4^2}$, writing down your full calculator display.

..... [1]

(b) Write your answer to **part (a)** correct to 4 decimal places.

..... [1]

11 Find the exact value of $8^{\frac{2}{3}} \times 49^{-\frac{1}{2}}$.

..... [2]

12 Solve the inequality.

$$3n - 5 > 17 + 8n$$

..... [2]

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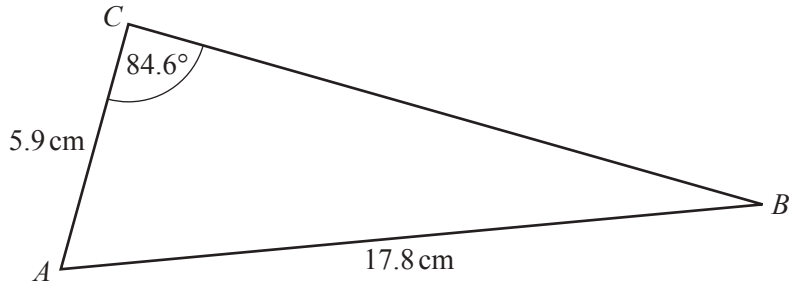
13 **Without using your calculator**, work out $1\frac{3}{4} \times \frac{6}{35}$.

You must show all your working and give your answer as a fraction in its simplest form.

..... [3]

14



NOT TO SCALE

Use the sine rule to find angle *ABC*.

Angle *ABC* = ... [3]

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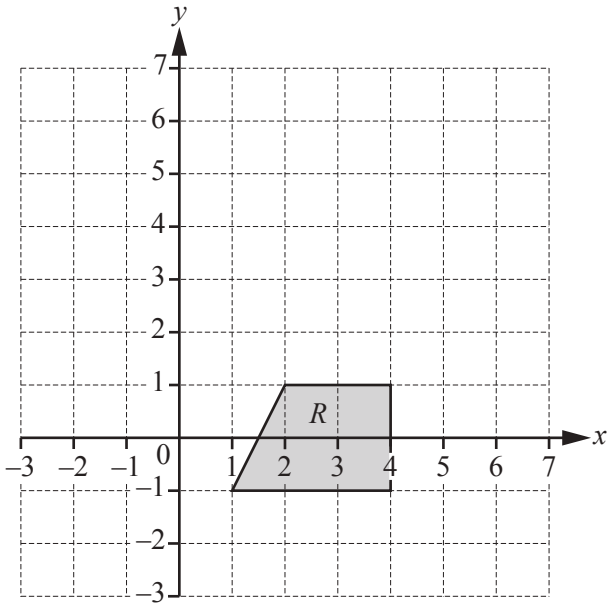
15 y is directly proportional to $(x-1)^2$.
When $x = 5$, $y = 4$.

Find y when $x = 7$.

$y =$ ..... [3]

16



On the grid, draw the image of shape R after the transformation represented by the matrix $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$. [3]

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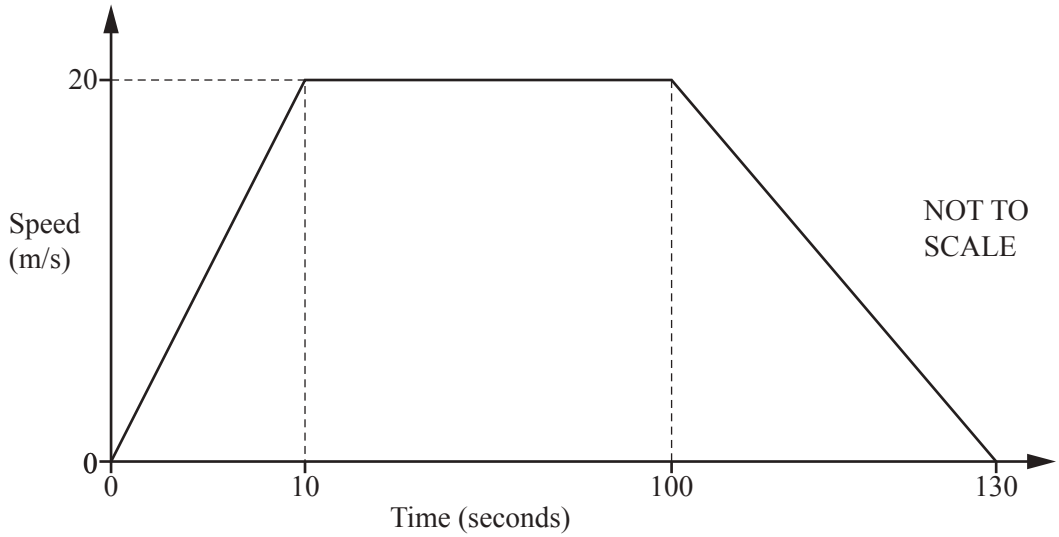
17



The speed–time graph shows information about the journey of a tram between two stations.

(a) Calculate the distance between the two stations.

..... m [3]

(b) Calculate the average speed of the tram for the whole journey.

..... m/s [1]

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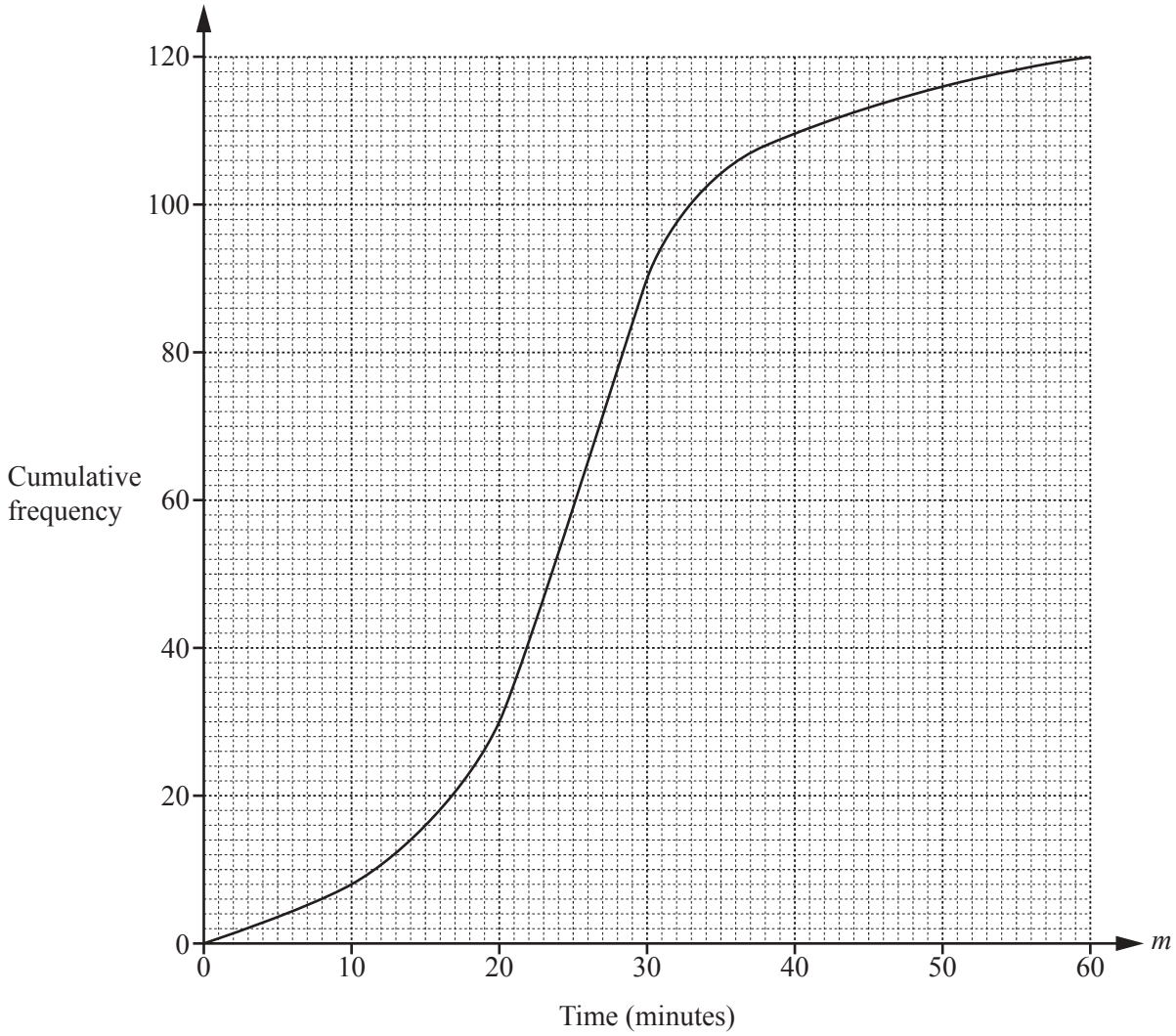
18 The cumulative frequency diagram shows information about the time, m minutes, taken by 120 students to complete some homework.



Use the cumulative frequency diagram to find an estimate of

(a) the interquartile range,

.....min [2]

(b) the number of students who took more than 50 minutes to complete the homework.

..... [2]

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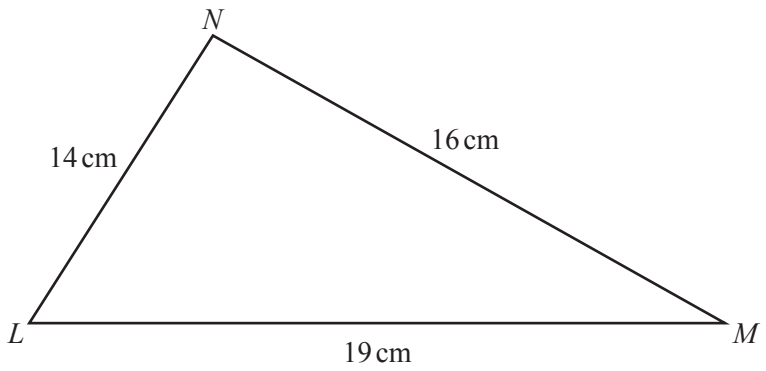
19



NOT TO SCALE

Calculate angle *LMN*.

Angle *LMN* = ... [4]

20 **(a)** A box contains 3 blue pens, 4 red pens and 8 green pens only.
A pen is chosen at random from the box.

Find the probability that this pen is green.

..... [1]

(b) Another box contains 7 black pens and 8 orange pens only.
Two pens are chosen at random from this box without replacement.

Calculate the probability that at least one orange pen is chosen.

..... [3]

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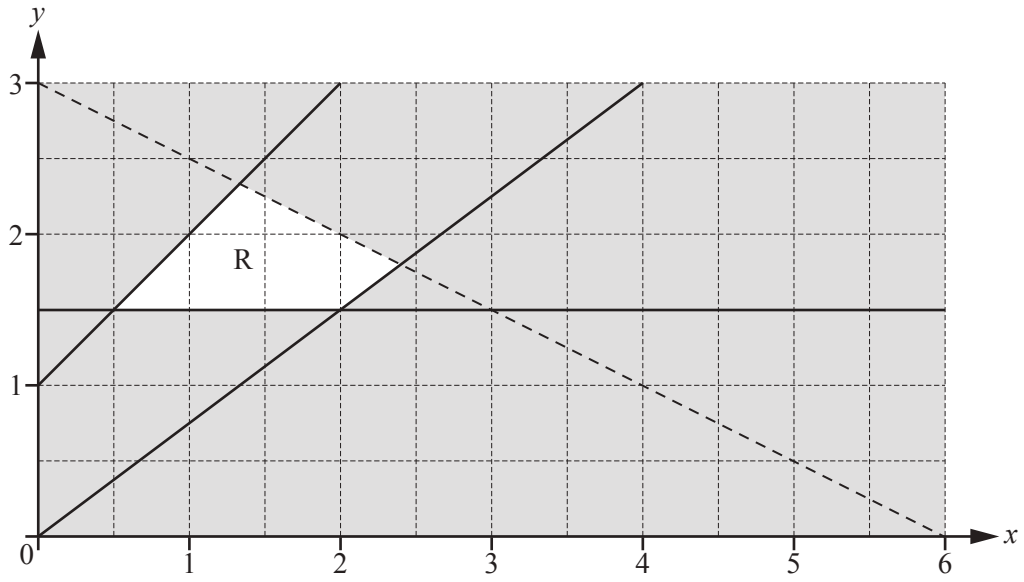
21



There are four inequalities that define the region R.
One of these is $y \leqslant x + 1$.

Find the other three inequalities.

.....

.....

..... [4]

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22 $f(x) = 5 - 2x$ $g(x) = x^2 + 8$

(a) Calculate ff(−3).

..... [2]

(b) Find

(i) $g(2x)$,

..... [1]

(ii) $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [2]

23 40 people were asked how many times they visited the cinema in one month.
The table shows the results.

Number of cinema visits	0	1	2	3	4	5	6	7
Frequency	5	5	6	6	7	3	6	2

(a) **(i)** Find the mode.

..... [1]

(ii) Calculate the mean.

..... [3]

(b) Omar wants to show the information from the table in a pie chart.

Calculate the sector angle for the people who visited the cinema 5 times.

..... [2]

Question 24 is printed on the next page.

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24 **(a)** Point A has co-ordinates (1, 0) and point B has co-ordinates (2, 5).

Calculate the angle between the line AB and the x-axis.

..... [3]

(b) The line PQ has equation $y = 3x - 8$ and point P has co-ordinates (6, 10).

Find the equation of the line that passes through P and is perpendicular to PQ.
Give your answer in the form $y = mx + c$.

$y =$ ..... [3]

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MATHEMATICS **0580/22**

Paper 2 (Extended) **May/June 2018**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 70.

This document consists of **15** printed pages and **1** blank page.

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[Turn over

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1 One morning, Marcia works from 08 20 to 11 15.

Find how long she works for.
Give your answer in hours and minutes.

..... h ..... min [1]

2 Expand.

$7(x - 8)$

..... [1]

3 Here is a sequence.

a, 13, 9, 3, –5, –15, b, …

Find the value of a and the value of b.

a = ...

b = ... [2]

4 Complete these statements.

(a) When w = ... , $10w = 70$. [1]

(b) When $5x = 15$, $12x$ = ... [1]

5 22 17 25 41 39 4

Work out the difference between the two prime numbers in the list above.

..... [2]

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6 **Without using your calculator**, work out $\frac{2}{3} - \frac{1}{12}$.

You must show all your working and give your answer as a fraction in its simplest form.

..... [2]

7 A and B are two towns on a map.
The bearing of A from B is 140°.

Work out the bearing of B from A.

..... [2]

8 Here are some numbers written in standard form.

3.4×10^{-1} 1.36×10^{6} 7.9×10^{0} 2.4×10^{5} 5.21×10^{-3} 4.3×10^{-2}

From these numbers, write down

(a) the largest number,

..... [1]

(b) the smallest number.

..... [1]

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9 **Using a straight edge and compasses only**, construct the locus of points that are equidistant from A and B.

[2]

10 Factorise completely.

$$xy + 2y + 3x + 6$$

..... [2]

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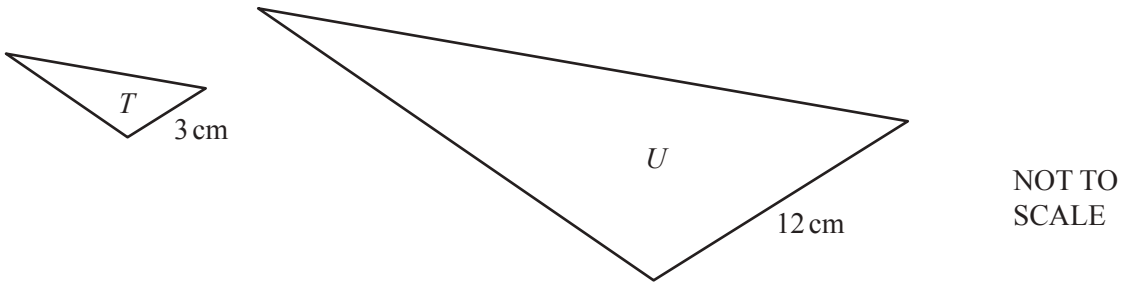
11



The diagram shows two mathematically similar triangles, T and U.
Two corresponding side lengths are 3 cm and 12 cm.
The area of triangle T is 5 cm^2.

Find the area of triangle U.

..... cm^2 [2]

12 Anna walks 31 km at a speed of 5 km/h.
Both values are correct to the nearest whole number.

Work out the upper bound of the time taken for Anna's walk.

..... hours [2]

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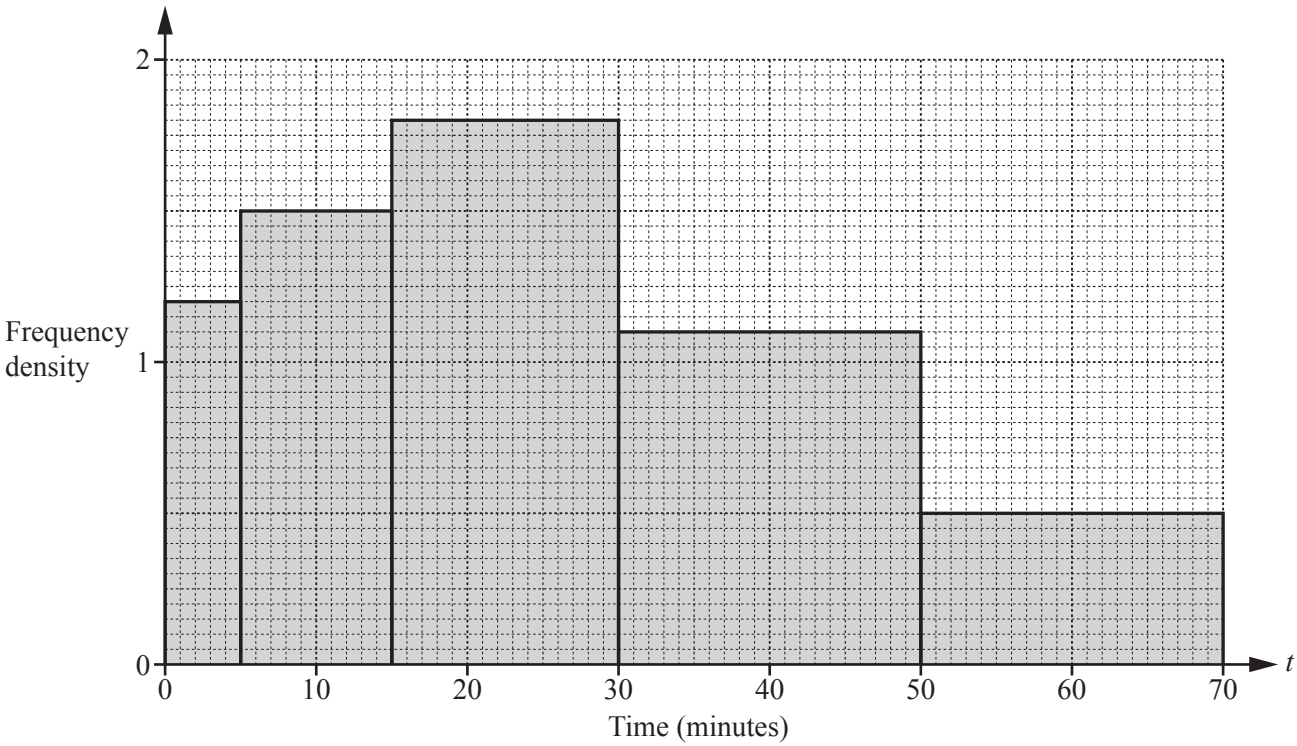
13 The histogram shows information about the time, t minutes, spent in a shop by each of 80 people.

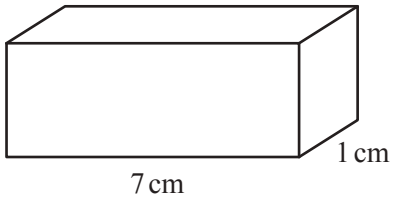


Complete the frequency table.

Time (t minutes)	$0 < t \leqslant 5$	$5 < t \leqslant 15$	$15 < t \leqslant 30$	$30 < t \leqslant 50$	$50 < t \leqslant 70$
Number of people	6		27		10

[2]

14



NOT TO SCALE

The diagram shows a solid cuboid with base area $7\,\text{cm}^2$.
The volume of this cuboid is $21\,\text{cm}^3$.

Work out the total surface area.

..... cm^2 [3]

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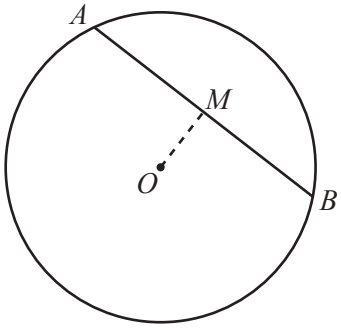
15 Find the volume of a cylinder of radius 5 cm and height 8 cm.
Give the units of your answer.

.... [3]

16



NOT TO SCALE

The diagram shows a circle, centre O.
AB is a chord of length 12 cm.
M is the mid-point of AB and $OM = 4.5$ cm.

Calculate the radius of the circle.

..... cm [3]

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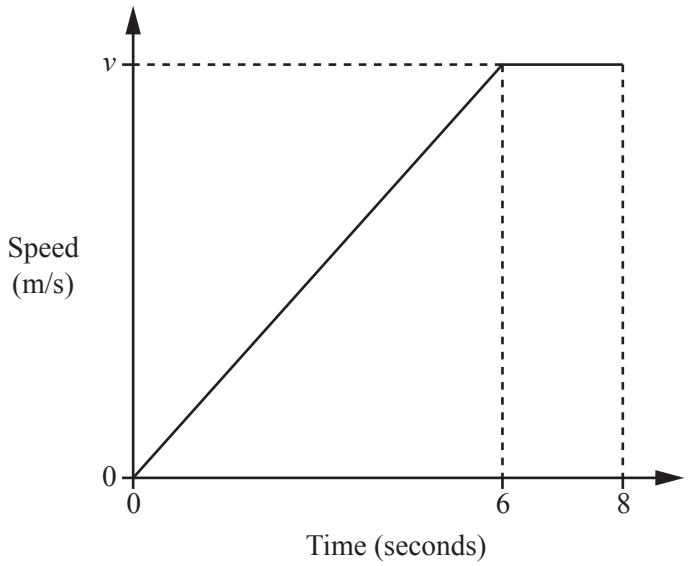
17 The diagram shows information about the first 8 seconds of a car journey.



NOT TO SCALE

The car travels with constant acceleration reaching a speed of v m/s after 6 seconds.
The car then travels at a constant speed of v m/s for a further 2 seconds.
The car travels a total distance of 150 metres.

Work out the value of v.

v = ... [3]

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18 A ball falls d metres in t seconds.
d is directly proportional to the square of t.
The ball falls 44.1 m in 3 seconds.

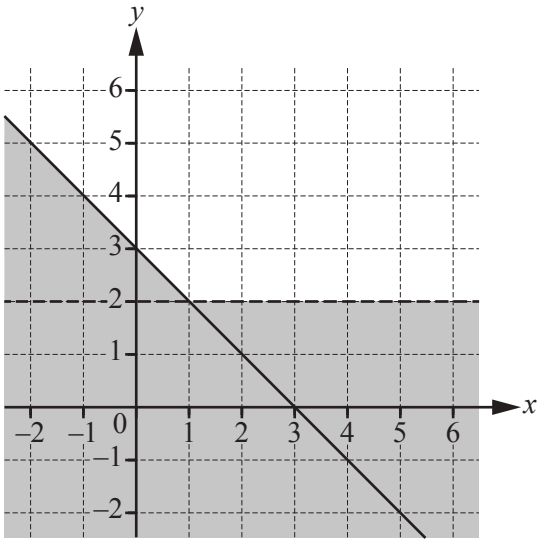
(a) Find a formula for d in terms of t.

$d =$ ..... [2]

(b) Calculate the distance the ball falls in 2 seconds.

..... m [1]

19



Find the two inequalities that define the region on the grid that is **not** shaded.

.....

..... [3]

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20 $\mathbf{A} = \begin{pmatrix} 1 & 1 \\ 9 & 9 \end{pmatrix}$ $\mathbf{B} = \begin{pmatrix} 0 & 1 \\ 9 & 8 \end{pmatrix}$ $\mathbf{C} = \begin{pmatrix} 1 & 1 \\ 3 & 3 \end{pmatrix}$ $\mathbf{I} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

(a) Here are four matrix calculations.

AI **IA** $\mathbf{C}^2$ $\mathbf{B} + \mathbf{I}$

Work out which matrix calculation does **not** give the answer $\begin{pmatrix} 1 & 1 \\ 9 & 9 \end{pmatrix}$.

..... [2]

(b) Find $|\mathbf{B}|$.

..... [1]

(c) Explain why matrix **A** has no inverse.

..... [1]

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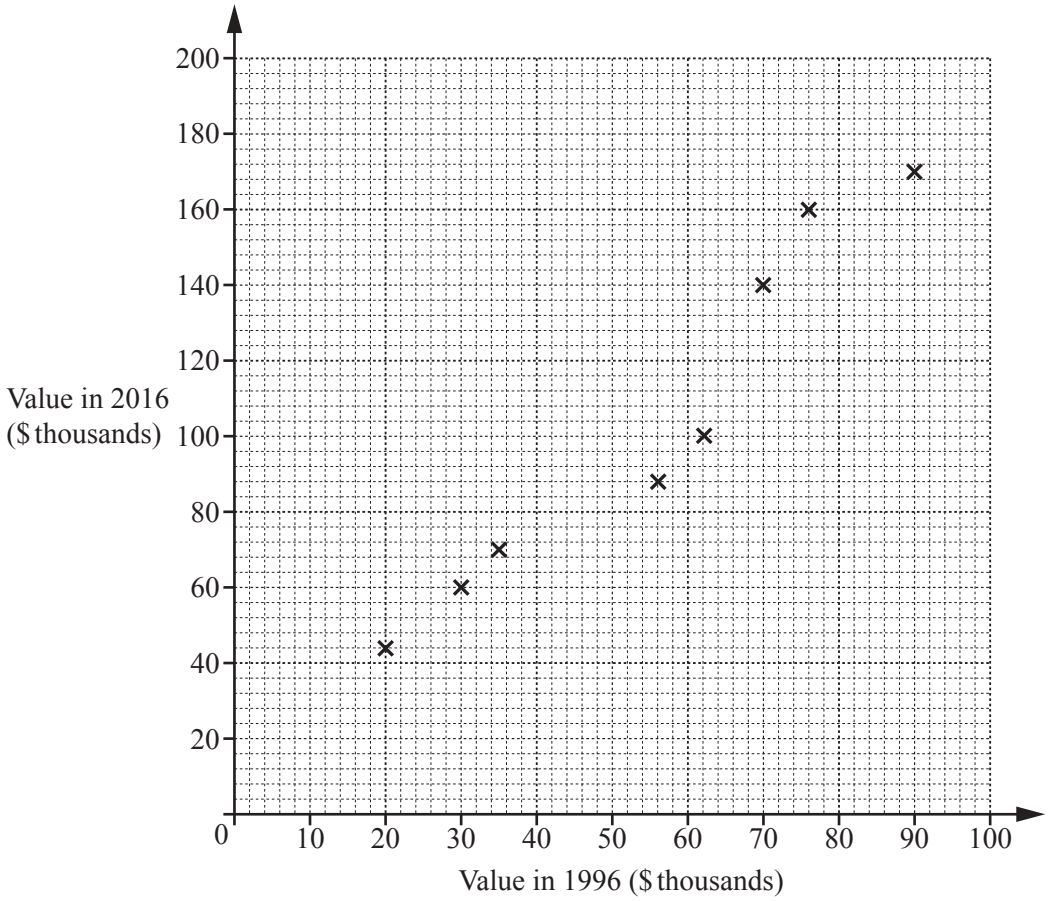
21 The scatter diagram shows the value, in thousands of dollars, of eight houses in 1996 and the value of the same houses in 2016.



(a) One of these eight houses had a value of $70 000 in 1996.

Write down the value of this house in 2016.

$ ..... [1]

(b) The values of two more houses are shown in the table.

Value in 1996 ($ thousands)	40	80
Value in 2016 ($ thousands)	80	150

On the scatter diagram, plot these values. [1]

(c) On the scatter diagram, draw a line of best fit. [1]

(d) Another house had a value of $50 000 in 1996.

Find an estimate of the value of this house in 2016.

$ ..... [1]

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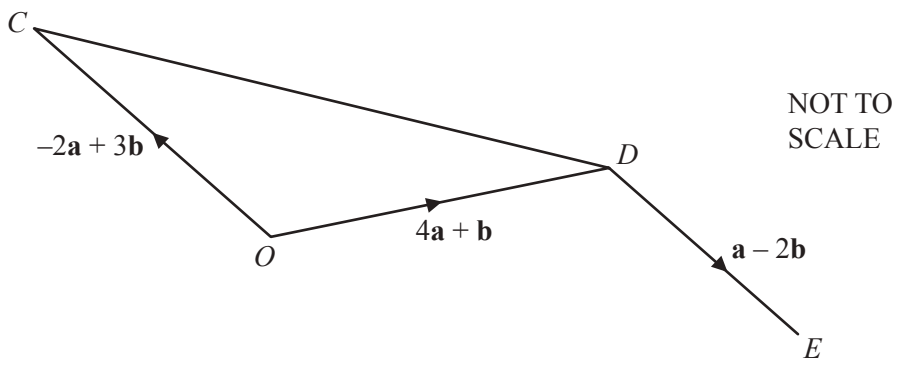

In the diagram, O is the origin, $\overrightarrow{OC} = -2\mathbf{a} + 3\mathbf{b}$ and $\overrightarrow{OD} = 4\mathbf{a} + \mathbf{b}$.

(a) Find $\overrightarrow{CD}$, in terms of **a** and **b**, in its simplest form.

$\overrightarrow{CD} =$ ..... [2]

(b) $\overrightarrow{DE} = \mathbf{a} - 2\mathbf{b}$

Find the position vector of E, in terms of **a** and **b**, in its simplest form.

..... [2]

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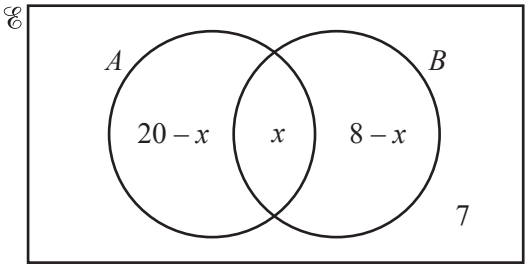
23 The Venn diagram shows information about the number of elements in sets A, B and $\mathscr{E}$.



(a) $n(A \cup B) = 23$

Find the value of x.

$x =$ ..... [3]

(b) An element is chosen at random from $\mathscr{E}$.

Find the probability that this element is in $(A \cup B)'$.

..... [2]

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24 Box A and box B each contain blue and green pens only.
Raphael picks a pen at random from box A and Paulo picks a pen at random from box B.
The probability that Raphael picks a blue pen is $\frac{2}{3}$.
The probability that both Raphael and Paulo pick a blue pen is $\frac{8}{15}$.

(a) Find the probability that Paulo picks a blue pen.

..... [2]

(b) Find the probability that both Raphael and Paulo pick a green pen.

..... [3]

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25 P is the point (16, 9) and Q is the point (22, 24).

(a) Find the equation of the line perpendicular to PQ that passes through the point (5, 1).
Give your answer in the form $y = mx + c$.

$y =$ ..... [4]

(b) N is the point on PQ such that $PN = 2NQ$.

Find the co-ordinates of N.

(..... , ...) [2]

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MATHEMATICS **0580/23**

Paper 2 (Extended) **May/June 2018**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
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Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
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For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 70.

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[Turn over

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1 One day in Chamonix the temperature at noon was 6 °C.
At midnight the temperature was 11 °C lower.

Write down the temperature at midnight.

..... °C [1]

2 Factorise.

$$w + w^3$$

..... [1]

3 Liz takes 65 seconds to run 400 m.

Calculate her average speed.

..... m/s [1]

4 Complete the list of factors of 36.

1, 2, ... , 36 [2]

5 Increase $22 by 15%.

$..... [2]

6 **(a)** Write 209 802 correct to the nearest thousand.

..... [1]

(b) Write 4123 correct to 3 significant figures.

..... [1]

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7 The probability that Kim wins a game is 0.72 .
In one year Kim will play 225 games.

Work out an estimate of the number of games Kim will win.

..... [2]

8 **(a)** Write 4.82×10^{-3} as an ordinary number.

..... [1]

(b) Write 52 million in standard form.

..... [1]

9 Solve.

$$\frac{1-p}{3} = 4$$

$p =$ ..... [2]

10 Factorise completely.

$$2a + 4b - ax - 2bx$$

..... [2]

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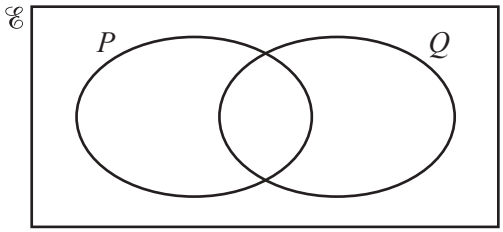
11 $A = (2\pi + y)x^2$

Rearrange the formula to make x the subject.

$x =$ ..... [2]

12



$n(\mathscr{E}) = 20$, $n(P) = 10$, $n(Q) = 13$ and $n(P \cup Q)' = 5$.

Work out $n(P \cap Q)$.
You may use the Venn diagram to help you.

$n(P \cap Q) =$ ..... [2]

13 Simplify.

$$\frac{3+x}{9-x^2}$$

..... [2]

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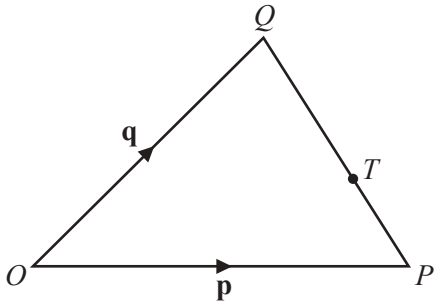
14



NOT TO SCALE

O is the origin, $\overrightarrow{OP} = \mathbf{p}$ and $\overrightarrow{OQ} = \mathbf{q}$.
$QT : TP = 2 : 1$

Find the position vector of T.
Give your answer in terms of **p** and **q**, in its simplest form.

..... [2]

15 **Without using a calculator**, work out $\frac{2}{3} \div 1\frac{1}{5}$.

You must show all your working and give your answer as a fraction in its simplest form.

..... [3]

16 **(a)** The length of the side of a square is 12 cm, correct to the nearest centimetre.

Calculate the upper bound for the perimeter of the square.

..... cm [2]

(b) Jo measures the length of a rope and records her measurement correct to the nearest ten centimetres.
The upper bound for her measurement is 12.35 m.

Write down the measurement she records.

..... m [1]

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17 **(a)** Find the value of $\left(\frac{1}{81}\right)^{-\frac{3}{4}}$.

..... [1]

(b) Simplify. $\sqrt[3]{27t^{27}}$

..... [2]

18 Expand the brackets and simplify.

$$(2p+3)(3p-2)$$

..... [3]

19 y is directly proportional to $(x-1)^2$.
When $x = 3$, $y = 24$.

Find y when $x = 6$.

$y =$ ..... [3]

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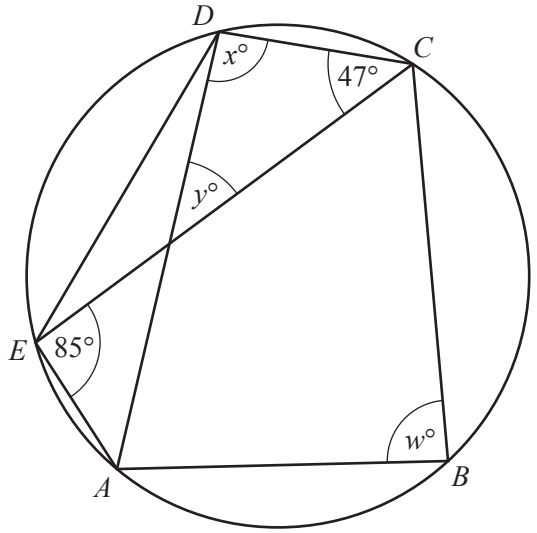
20



NOT TO SCALE

The points A, B, C, D and E lie on the circumference of the circle.
Angle $DCE = 47°$ and angle $CEA = 85°$.

Find the values of w, x and y.

$w =$ .....

$x =$ .....

$y =$ ..... [3]

21 Write as a single fraction in its simplest form.

$$\frac{1}{y-1} - \frac{1}{y}$$

..... [3]

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22 Find an expression for the nth term of each sequence.

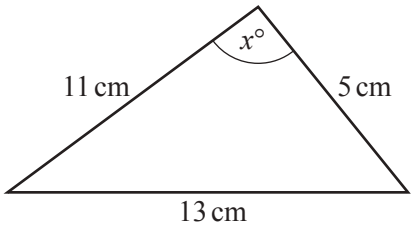
(a) 11, 7, 3, –1, …

..... [2]

(b) 3, 6, 12, 24, …

..... [2]

23



NOT TO SCALE

Calculate the value of x.

x = ... [4]

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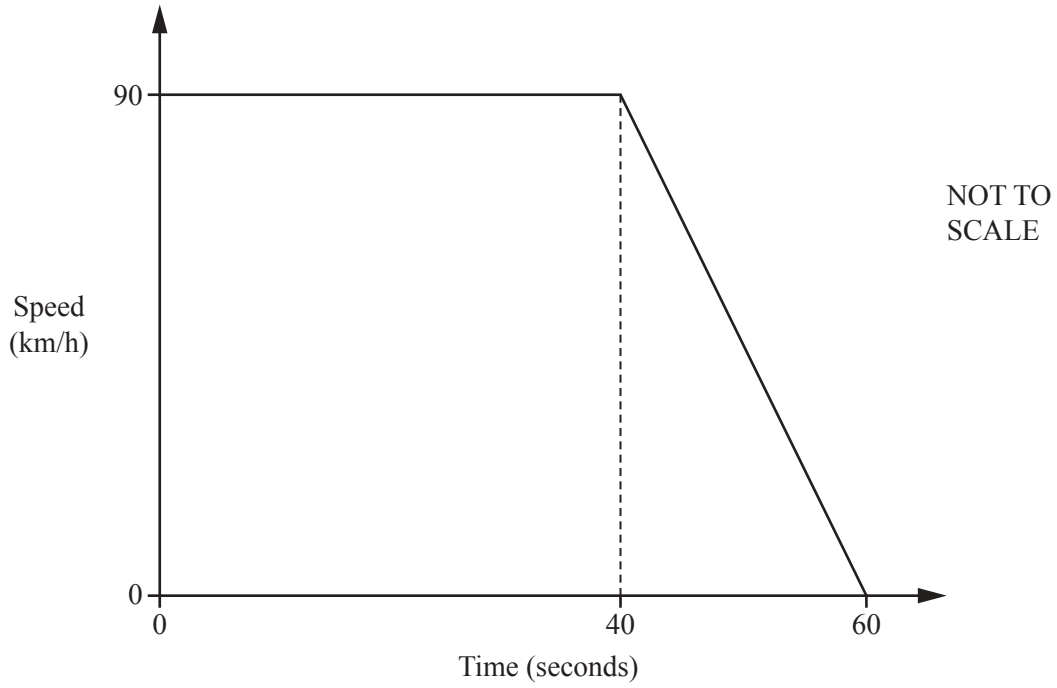
24



The diagram shows the speed–time graph for 60 seconds of a car journey.

(a) Change 90 km/h to m/s.

..... m/s [2]

(b) Find the deceleration of the car in m/s^2.

..... m/s^2 [1]

(c) Find the distance travelled, in metres, in the 60 seconds.

..... m [2]

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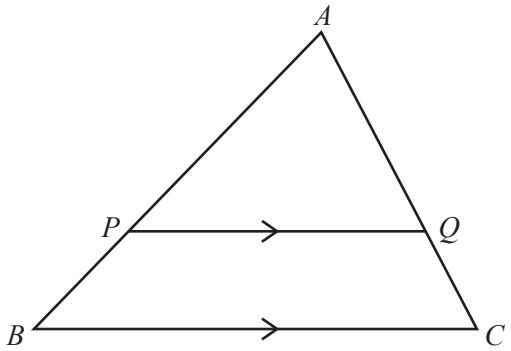
25 (a)



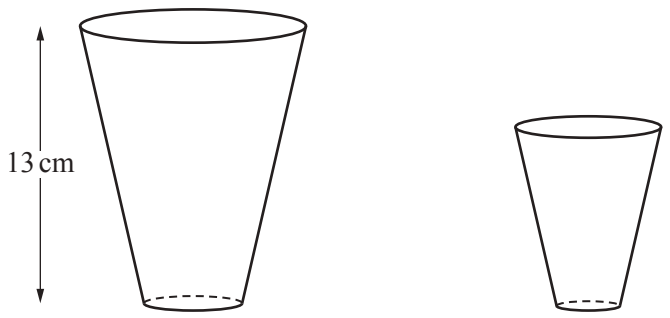
NOT TO SCALE

In the diagram, PQ is parallel to BC.
APB and AQC are straight lines.
$PQ = 8$ cm, $BC = 10$ cm and $AB = 9$ cm.

Calculate PB.

$PB =$ ..... cm [2]

(b)



NOT TO SCALE

The diagram shows two glasses which are mathematically similar.
The larger glass has a capacity of 0.5 litres and the smaller glass has a capacity of 0.25 litres.
The height of the larger glass is 13 cm.

Calculate the height of the smaller glass.

..... cm [3]

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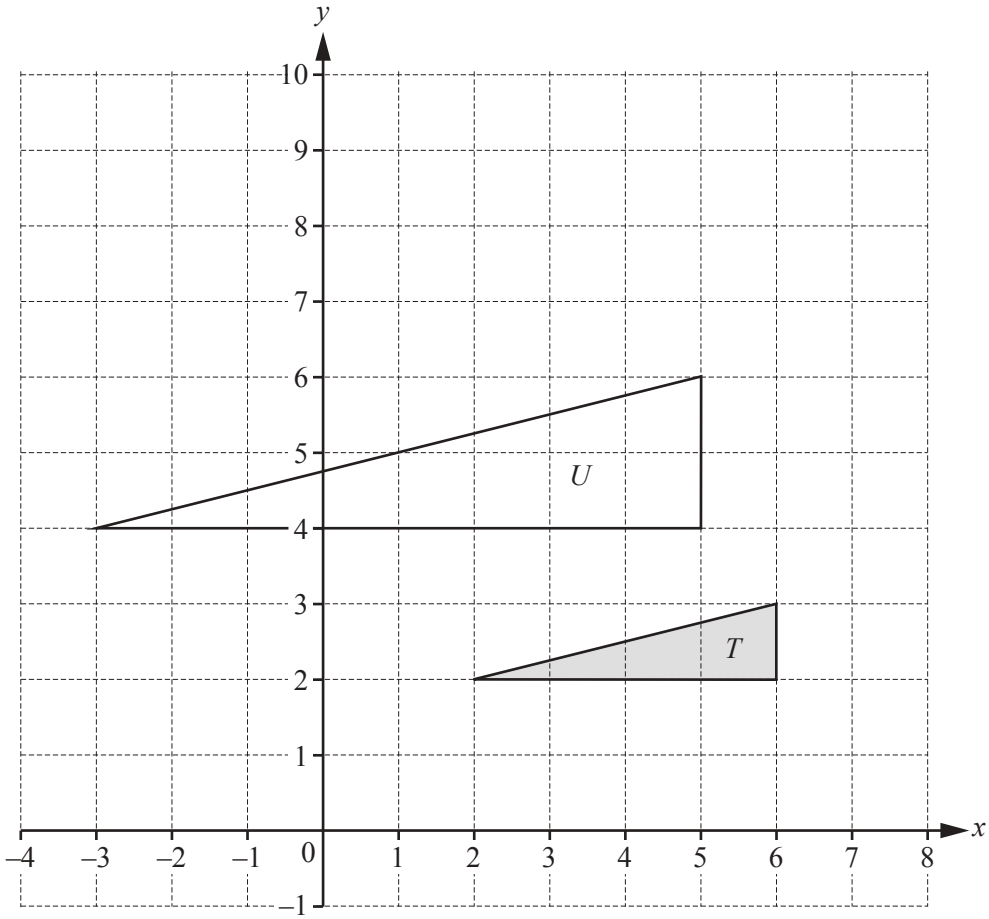

(a) Describe fully the **single** transformation that maps triangle *T* onto triangle *U*.

.....

..... [3]

(b) On the grid, draw the image of triangle *T* after a rotation through 90° clockwise about the point (7, 3). [3]

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MATHEMATICS **0580/31**

Paper 3 (Core) **May/June 2018**

2 hours

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator Geometrical instruments
Tracing paper (optional)

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Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 104.

This document consists of **19** printed pages and **1** blank page.

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[Turn over

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1 Mr Marr asks his mathematics class to complete a statistics project about books.

(a) Olga counts the number of letters in each of the last 50 words in the book she is reading.
She has only counted the letters in 43 words so far.
Her results for these 43 words are shown in the table below.

Number of letters in each word	Tally	Frequency
1	|||	
2	~~||||~~	
3	~~||||~~ ~~||||~~ ||	
4	~~||||~~ |||	
5	~~||||~~ ||||	
6	|||	
7	||	
8		
9	|	

The last seven words in the book that Olga needs to add to the table are

..... and they all lived happily ever after.

(i) Complete the tally and frequency columns in the table. [2]

(ii) Find the range.

..... [1]

(iii) Find the median.

..... [1]

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(b) Billie asks 60 students in his school what their favourite type of book is.
He has started to draw a pictogram to show his results.

Type of book		Frequency
Comedy		
Science fiction		10
Poetry		
Music		
Romance		8
Detective		14

Key: represents ..... books.

The science fiction row in the pictogram is complete.

(i) Complete the key. [1]

(ii) Complete the pictogram. [2]

(iii) Write down the mode.

..... [1]

(iv) Work out how many more students choose detective books than music books.

..... [1]

(v) Work out the fraction of students who did **not** choose romance books.

..... [2]

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2 **(a)** Write down

(i) the number twenty seven million, three hundred and sixty thousand and forty five in figures,

..... [1]

(ii) the six factors of 20,

....., ..., ..., ..., ..., ... [2]

(iii) a fraction that is equivalent to $\frac{7}{9}$,

..... [1]

(iv) a prime number between 30 and 40.

..... [1]

(b) For each statement, insert one pair of brackets to make it correct.

(i) $17 - 3 \times 5 - 3 = 11$ [1]

(ii) $3 + 2^2 - 4 = 21$ [1]

(c) Find $\sqrt[3]{4913}$.

..... [1]

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3 Three boys each have \$600.

(a) Victor spends 40% of his \$600.
He spends the money in the ratio clothes : books : music = 10 : 2 : 3.

(i) Work out how much he spends on music.

\$ ..... [3]

(ii) Work out how much more he spends on clothes than books.

\$..... [2]

(b) Walter invests his \$600 for 3 years at a rate of 4.5% per year compound interest.

Calculate the interest Walter receives at the end of the 3 years.

\$..... [3]

(c) Xavier goes on holiday to Europe and changes his \$600 into euros (€).
He spends €325 whilst he is on holiday.
When he gets home he changes the euros he has left back into dollars.

The exchange rate is \$1 = €0.864 .

Work out how many dollars he has left after his holiday.
Give your answer correct to the nearest cent.

\$ ..... [3]

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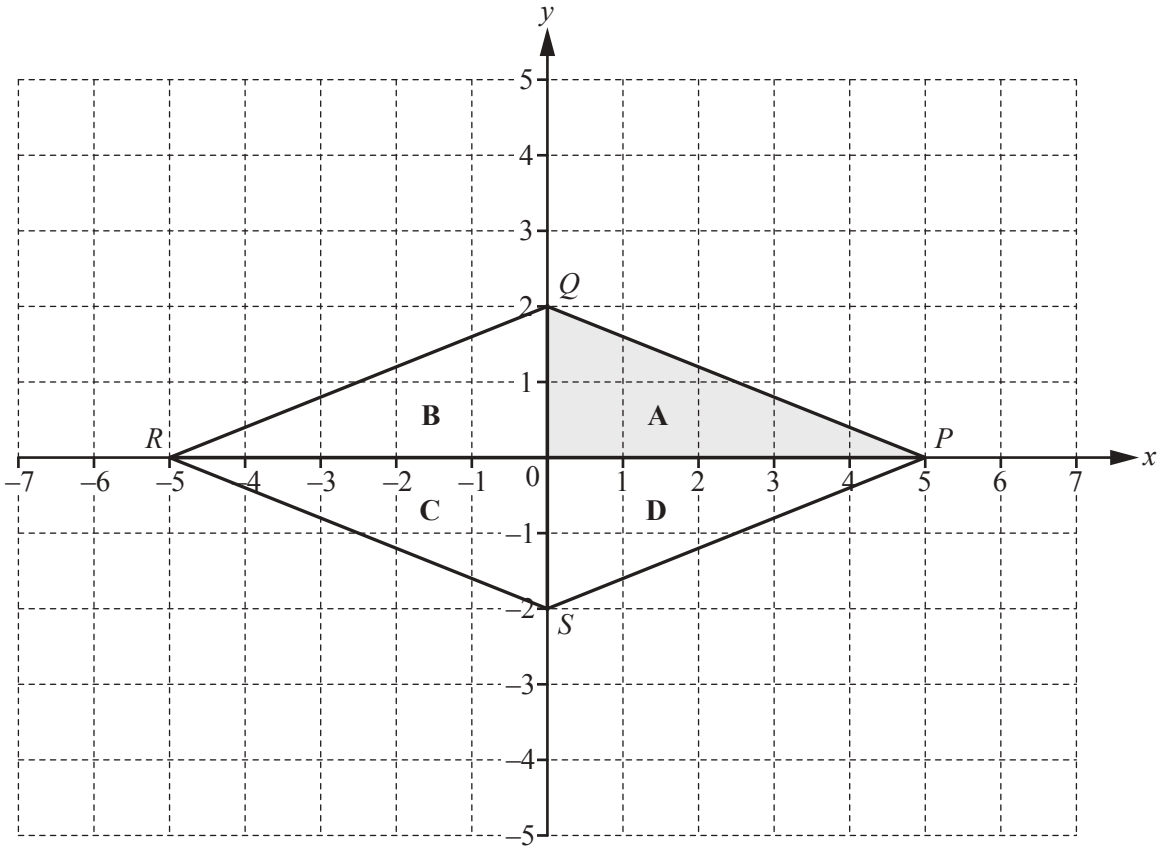
4



The diagram shows a quadrilateral *PQRS* which is made from four congruent triangles **A**, **B**, **C** and **D**.

(a) Write down the mathematical name for the quadrilateral *PQRS*.

..... [1]

(b) **(i)** Write down the co-ordinates of *S*.

(..... , ...) [1]

(ii) Measure the obtuse angle *PSR*.

..... [1]

(c) **(i)** Measure the length of the line *PQ*.

..... cm [1]

(ii) Work out the perimeter of the quadrilateral *PQRS*.

..... cm [1]

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(d) Describe fully the **single** transformation that maps

(i) triangle **A** onto triangle **B**,

.....

..... [2]

(ii) triangle **A** onto triangle **C**.

.....

..... [3]

(e) On the grid, draw the image of triangle **D** after a translation by the vector $\begin{pmatrix} 1 \\ -2 \end{pmatrix}$. [2]

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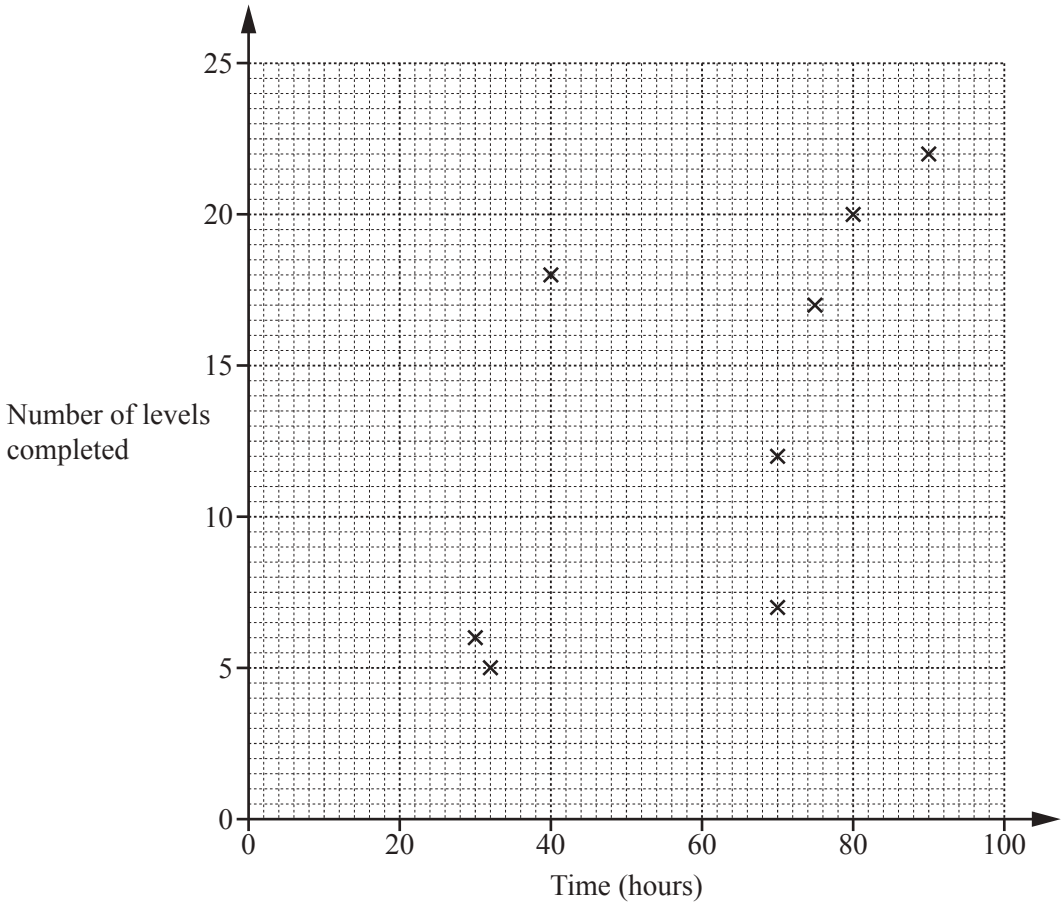
5 Lucy asked 12 people how many hours they each spent playing a computer game and the number of levels they each completed in one month.

The results are shown in the table.

Time spent playing (hours)	90	32	70	75	30	70	40	80	40	65	50	32
Number of levels completed	22	5	12	17	6	7	18	20	8	15	11	9



(a) Complete the scatter diagram.
The first eight points have been plotted for you. [2]

(b) One person completes more levels per hour than any of the others.

On the scatter diagram, put a ring around the point for this person. [1]

(c) What type of correlation does this scatter diagram show?

..... [1]

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(d) On the scatter diagram, draw a line of best fit. [1]

(e) Another person, Monika, completed 19 levels but forgot to record the time spent playing.

Use your line of best fit to estimate the number of hours that Monika spent playing.

..... hours [1]

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6 Georgiana is travelling by train from Redtown to Teignley.

(a) The price of a ticket is \$13.50 .
Georgiana's ticket price is reduced by one-third because she is a student.

Work out how much she pays for her ticket.

\$ ..... [2]

(b) Georgiana travels on two trains.
The first train goes from Redtown to Southford.
The second train goes from Southford to Teignley.
She has written down some information about the times of her trains.

(i) Write 13 45 using the 12-hour clock.

..... [1]

(ii) Work out how long the first train should take to travel from Redtown to Southford.
Give your answer in hours and minutes.

..... h ..... min [1]

(iii) The first train arrives at Southford 46 minutes late.

By how many minutes has Georgiana missed her second train?

..... min [2]

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(c) While Georgiana waits for the next train, she buys a cup of hot chocolate.

NOT TO SCALE

Work out which cup of hot chocolate is the best value.
Show all your working.

..... [3]

(d) The next train from Southford to Teignley is at 18 12.
The journey is 76 km and the train travels at an average speed of 48 km/h.

Work out the time that the train arrives in Teignley.

..... [3]

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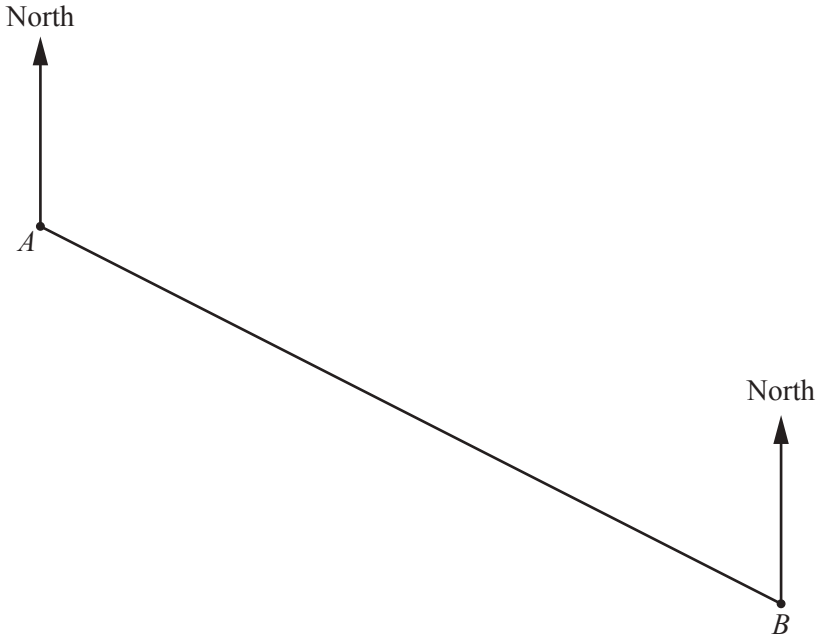
7 The scale drawing shows the positions of Annika's house, A, and Bernhard's house, B, on a map.
The scale is 1 centimetre represents 300 metres.



Scale: 1 cm to 300 m

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(a) Work out the actual distance, in metres, between Annika's house and Bernhard's house.

..... m [2]

(b) Measure the bearing of Bernhard's house from Annika's house.

..... [1]

(c) **(i)** **Using a straight edge and compasses only**, construct the perpendicular bisector of *AB*.
Show all your construction arcs. [2]

(ii) Cordelia's house is

- the same distance from Annika's house and Bernhard's house

and

- due south of Annika's house.

Mark on the map the position of Cordelia's house.
Label this point *C*. [2]

(d) Dougie's house is

- on a bearing of 320° from Bernhard's house

and

- 1650 m from Annika's house.

Mark on the map the two possible positions of Dougie's house.
Label each of these points *D*. [4]

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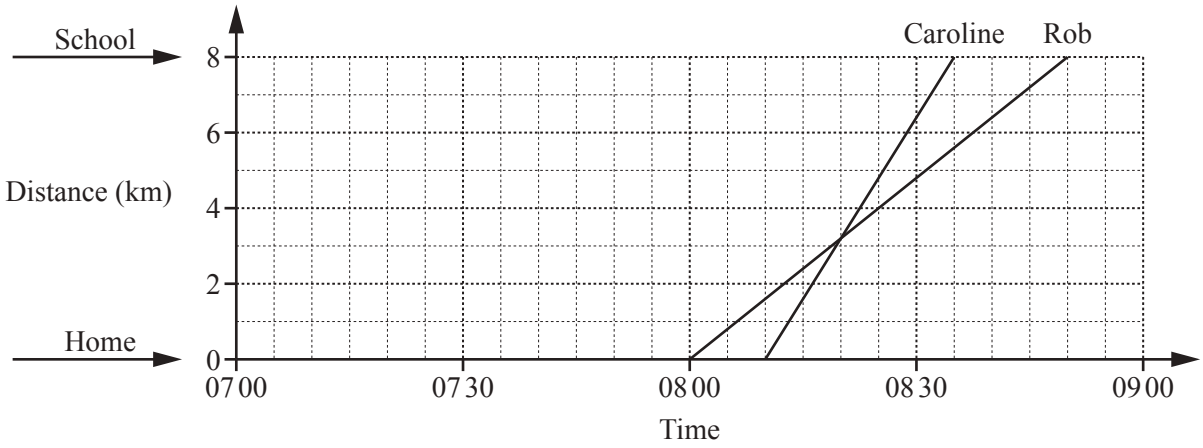
8 Three children from the same family travel from their home to the same school.
Caroline cycles to school.
Rob runs to school.
William walks to school.



The travel graph shows the journeys to school for Caroline and Rob.
Rob leaves home before Caroline.

(a) Explain what is happening when the two lines intersect on the travel graph.

.....

..... [1]

(b) Work out Rob's speed in km/h.

..... km/h [2]

(c) William leaves home at 0725.
He walks to school at a constant speed of 6 km/h.

On the grid, draw William's journey. [1]

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(d) At what time is the distance between Rob and William greatest?

..... [1]

(e) Complete this list of names in the order they arrive at school.

First .....

Second .....

Third ..... [1]

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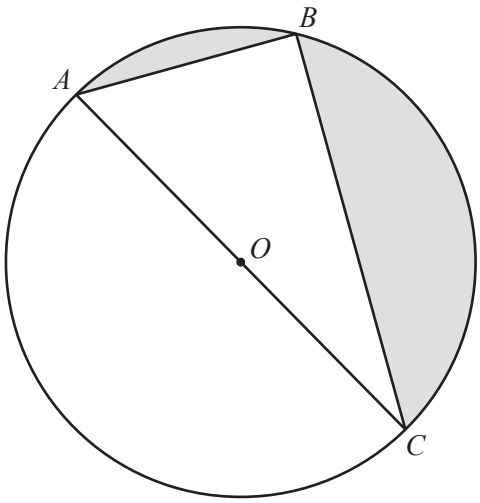

NOT TO SCALE

A, B and C are points on the circumference of a circle, centre O.

(a) Write down the mathematical name for

(i) the straight line AC,

..... [1]

(ii) the straight line AB.

..... [1]

(b) Give a geometrical reason why angle $ABC = 90°$.

..... [1]

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(c) $AB = 20$ cm and $AC = 52$ cm.

(i) Use trigonometry to calculate angle BAC.

Angle BAC = ... [2]

(ii) Show that $BC = 48$ cm.

[2]

(iii) Work out the area of triangle ABC.

..... cm^2 [2]

(iv) Work out the total shaded area.

..... cm^2 [3]

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10 **(a)** **(i)** Write down the gradient of the line $y = -4x + 7$.

..... [1]

(ii) Write down the equation of a line parallel to $y = 2x + 3$.

$y =$ ..... [1]

(iii) Write down the co-ordinates of the point where the graph of $y = 6x - 5$ crosses the y-axis.

(..... , ...) [1]

(iv) The point $(k, 7)$ lies on the line $y = 4x - 3$.

Find the value of k.

$k =$ ..... [2]

(b) **(i)** Complete the table of values for $y = x^2 - x - 5$.

x	-3	-2	-1	0	1	2	3	4
y	7		-3		-5			

[3]

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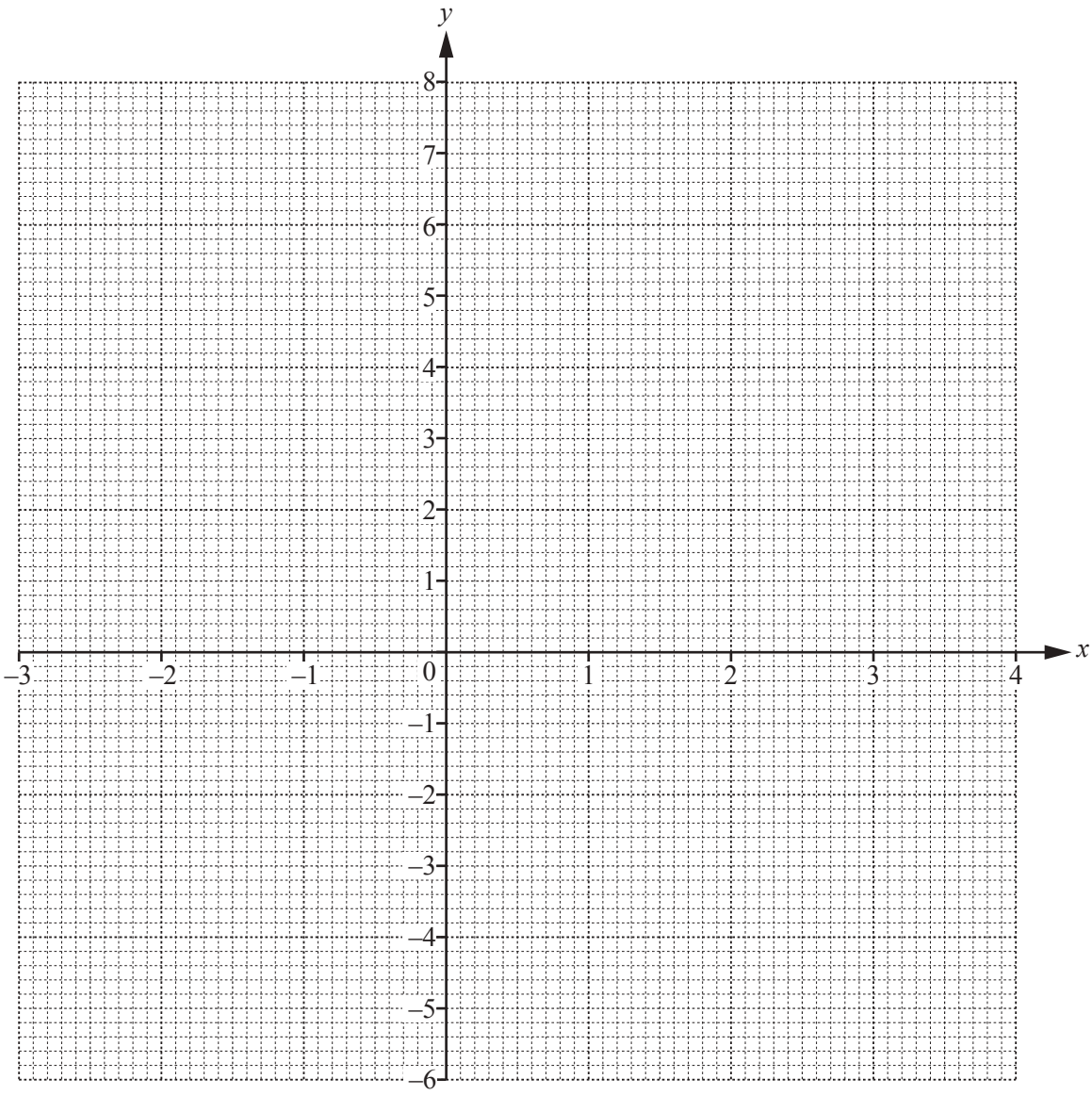
(ii) On the grid, draw the graph of $y = x^2 - x - 5$ for $-3 \leqslant x \leqslant 4$.



[4]

(iii) Write down the co-ordinates of the lowest point on the graph.

(..... , ...) [1]

(iv) **(a)** On the grid, draw the line of symmetry of the graph. [1]

(b) Write down the equation of this line.

..... [1]

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CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

MATHEMATICS **0580/32**

Paper 3 (Core) **May/June 2018**

2 hours

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator Geometrical instruments
Tracing paper (optional)

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1 **(a)** Find the value of

(i) the square root of 19 044,

..... [1]

(ii) 2^7.

..... [1]

(b) n is an integer and $120 < n < 140$.

Find the value of n when it is

(i) a multiple of 45,

$n =$ ..... [1]

(ii) a square number,

$n =$ ..... [1]

(iii) a factor of 402,

$n =$ ..... [1]

(iv) a cube number.

$n =$ ..... [1]

(c) Work out the value of $\dfrac{21 - 15 \times 3}{18 \div 6 - 4}$.

..... [2]

(d) Estimate the value of $\dfrac{19.2 \times \sqrt{8.64}}{31.6 \div 6.32}$ by rounding each number in the calculation to 1 significant figure.

Show all your working by filling in the calculation below.

$$\frac{\ldots\ldots \times \sqrt{\ldots\ldots}}{\ldots\ldots \div \ldots\ldots} = \ldots\ldots$$ [2]

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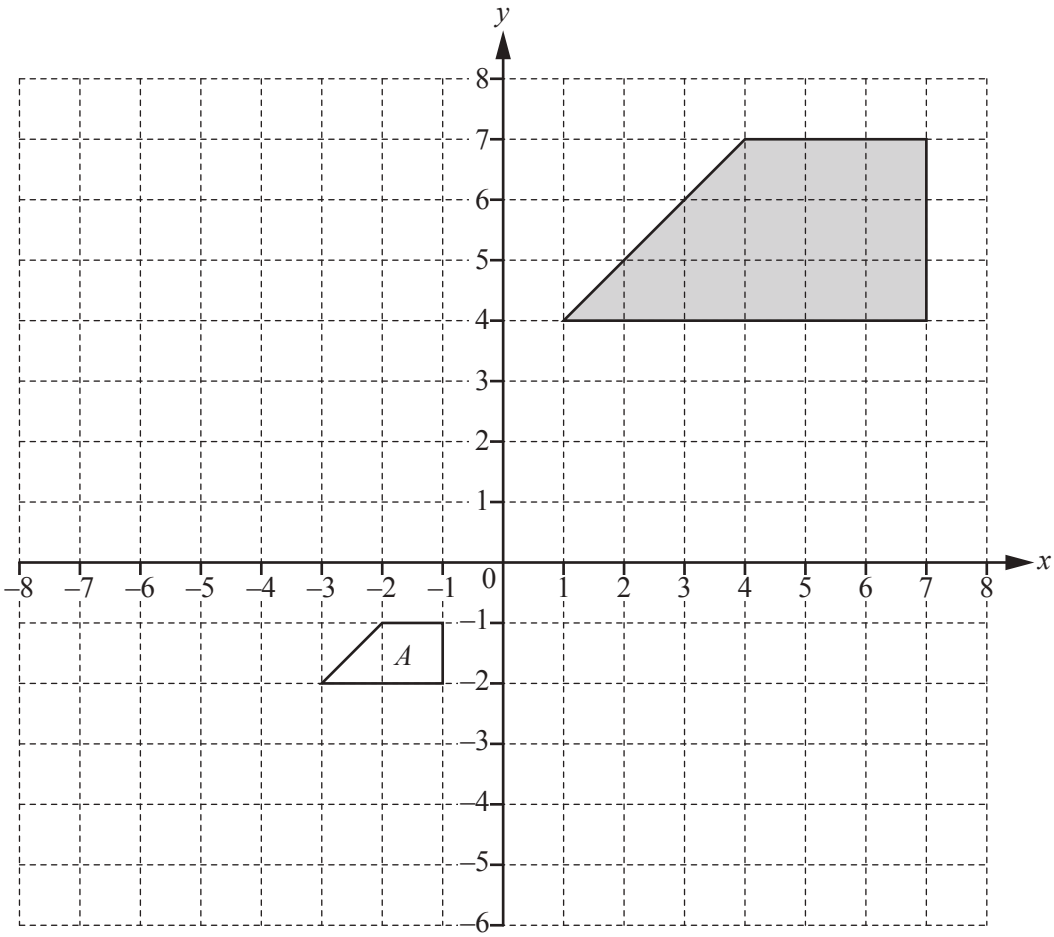
2



(a) Write down the mathematical name of the shaded quadrilateral shown on the grid.

..... [1]

(b) Describe fully the **single** transformation that maps the shaded quadrilateral onto quadrilateral A.

.....

..... [3]

(c) Complete this statement with a fraction in its simplest form.

The area of quadrilateral A is ..... of the area of the shaded quadrilateral. [3]

(d) On the grid, draw the image of

(i) shape A after a translation by the vector $\begin{pmatrix} -4 \\ 7 \end{pmatrix}$, [2]

(ii) shape A after a rotation of 180° about the origin, [2]

(iii) shape A after a reflection in the line $x = 2$. [2]

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3 A car company has three sales people, Anna, Mustapha and Joshua.

(a) During March, Anna sold 21 cars, Mustapha sold 12 cars and Joshua sold 15 cars.

Write down and simplify the ratio of the number of cars they sold during March.

Anna : Mustapha : Joshua = ... : ..... : ..... [2]

(b) Each month, they receive a bonus which is proportional to the number of cars they sell.
The total bonus in March is \$1248.

(i) Show that Anna receives a bonus of \$546.

[1]

(ii) Calculate the bonuses received by Mustapha and Joshua.

Mustapha \$ .....

Joshua \$ ..... [2]

(c) The total bonus of \$1248 is $\frac{3}{7}$ of the total profit in March.

Calculate the total profit in March.

\$ ..... [2]

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(d) Ella wants to buy a car with a price of \$13 500.
The company reduces this price by 16%.
Ella then pays a deposit of \$500.

Show that the amount left for her to pay is \$10 840.

[2]

(e) Ella borrows \$10 840 from a bank.
She pays this back over 3 years at a rate of \$340 per month.

(i) Show that the total amount she pays back during the 3 years is \$12 240.

[1]

(ii) Calculate the percentage increase from \$10 840 to \$12 240.

.....% [3]

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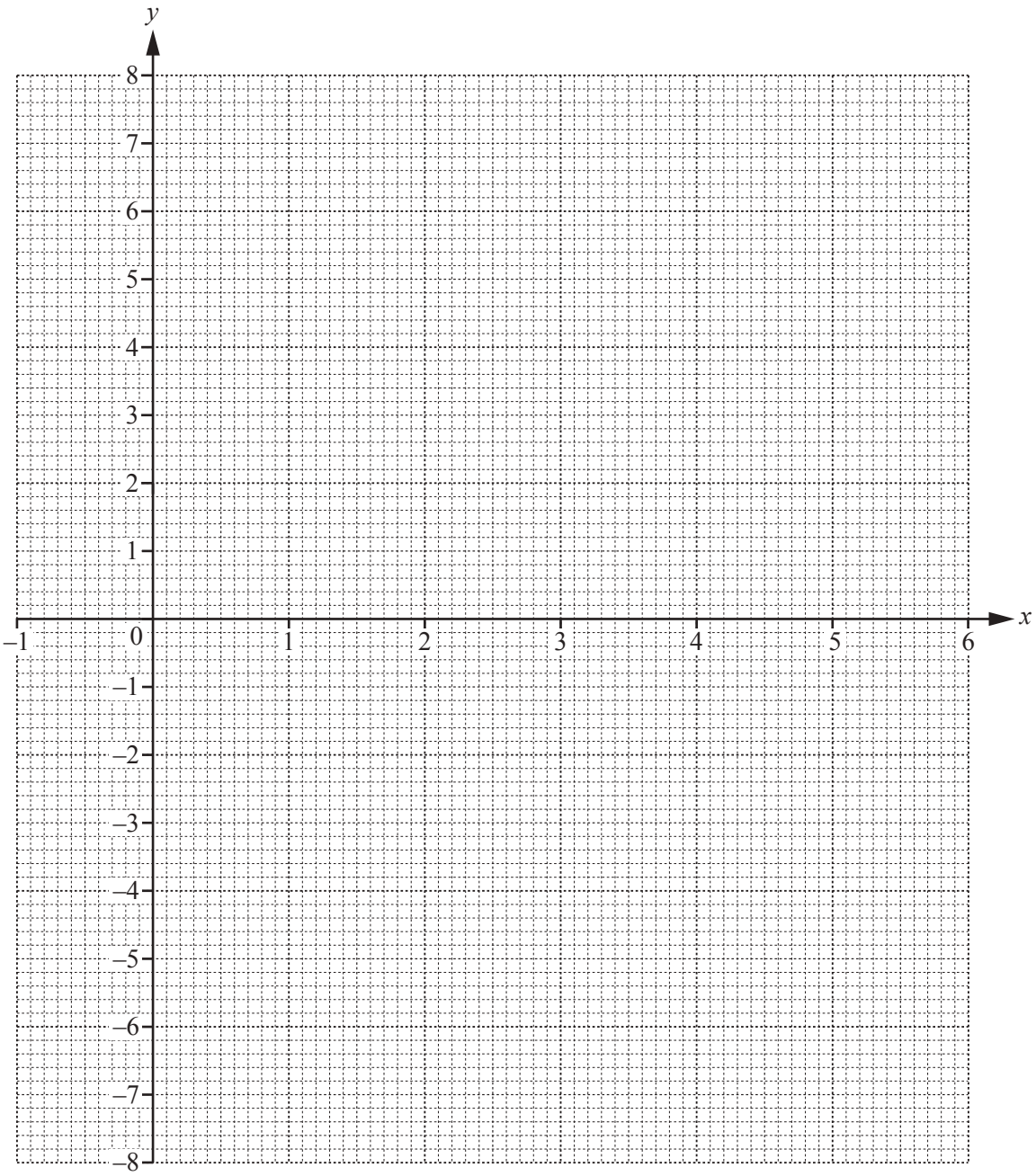
4 **(a)** Complete the table of values for $y = 5x - x^2$.

x	−1	0	1	2	3	4	5	6
y		0		6	6			−6

[2]

(b) On the grid, draw the graph of $y = 5x - x^2$ for $-1 \leqslant x \leqslant 6$.



[4]

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(c) Write down the equation of the line of symmetry of the graph.

..... [1]

(d) **(i)** Complete the table of values for $y = 1.5x - 2$.

x	0	2	5
y			

[2]

(ii) On the grid, draw the graph of $y = 1.5x - 2$ for $-1 \leqslant x \leqslant 6$. [2]

(iii) Use your graphs to write down the solutions to the equation $1.5x - 2 = 5x - x^2$.

$x =$ ..... or $x =$ ..... [2]

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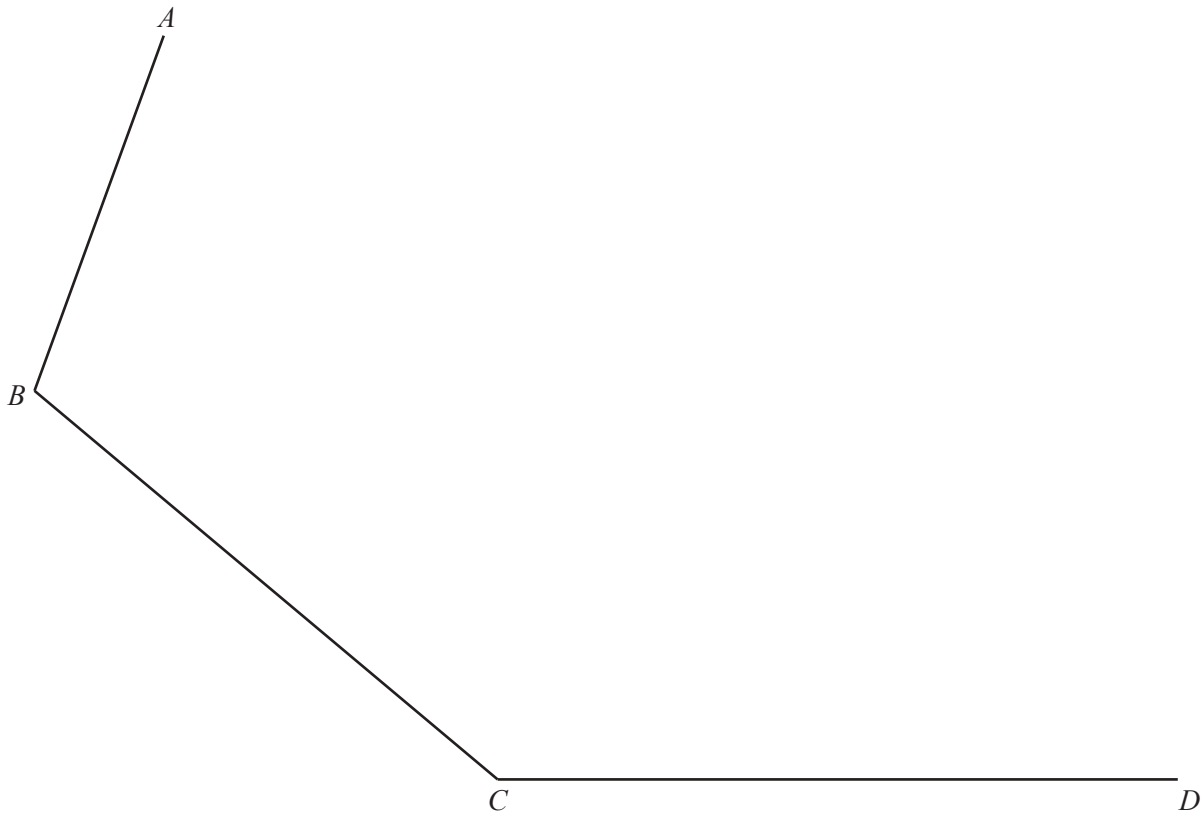
5 The scale drawing represents three sides, *AB*, *BC* and *CD*, of a wildlife park.
The scale is 1 centimetre represents 50 metres.



Scale: 1 cm to 50 m

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(a) Find the actual distance *AB* in metres.

..... m [2]

(b) Point *E* is 550 metres from *A* and 600 metres from *D*.

Use a ruler and compasses only to find the point *E* and draw the lines *AE* and *DE*. [3]

(c) Two straight paths cross the wildlife park, *ABCDE*.

Using a straight edge and compasses only, construct

(i) the path that bisects angle *ABC*, [2]

(ii) the path that is equidistant from point *C* and point *D*. [2]

(d) The path from *B* crosses over a circular lake with radius 150 m.
The centre of the lake is on this path and is 350 m from *B*.

(i) On the scale drawing, construct the lake. [3]

(ii) Calculate the actual circumference of the lake in metres.

..... m [2]

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6 The 262 students at a college each study one of the languages shown in the table.

	French	German	Spanish	Italian	Japanese	Total
Boys	27		48	19		123
Girls		32	54		12	
Total		53		30		262

(a) Complete the table. [3]

(b) Find the probability that

(i) a girl, chosen at random, studies Spanish,

..... [1]

(ii) a boy, chosen at random, studies French or Italian,

..... [1]

(iii) a student, chosen at random, does not study German.

..... [1]

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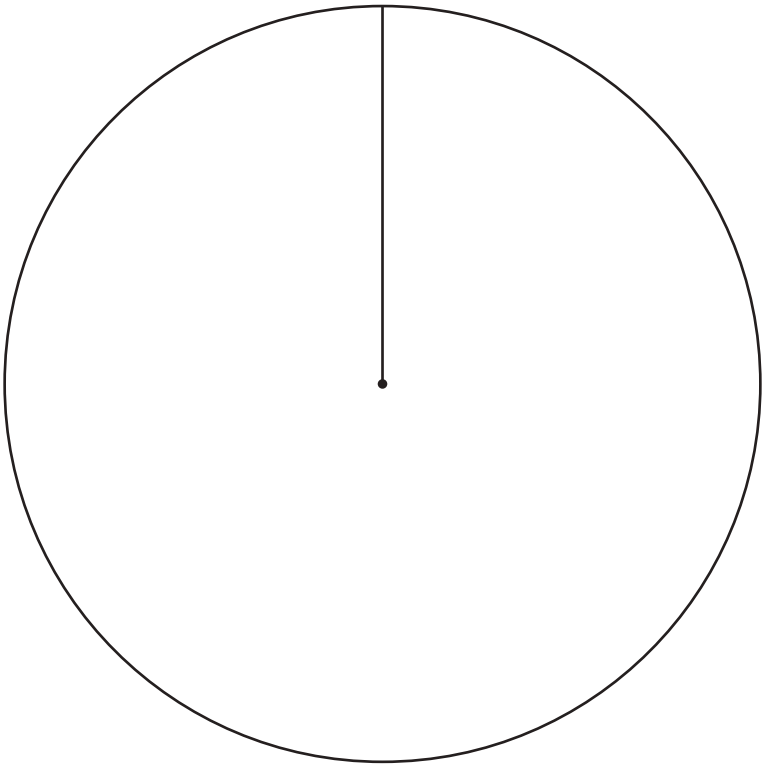
(c) 72 students each study one of the sciences shown in the table.
The results are to be shown in a pie chart.

Science	Number of students	Pie chart sector angle
Biology	25	125°
Chemistry	16	
Physics	31	

(i) Complete the table. [2]

(ii) Complete the pie chart.



[2]

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7 Louise leaves home at 09 55 and cycles the 5.6 km to the supermarket at a constant speed.
She takes 15 minutes to complete the journey.

(a) Write down the time she arrives at the supermarket.

..... [1]

(b) Calculate Louise's average speed from her home to the supermarket

(i) in kilometres per hour,

.....km/h [1]

(ii) in metres per second, giving your answer correct to 1 decimal place.

..... m/s [2]

(c) Louise stays at the supermarket for 23 minutes.

On the grid opposite, draw the travel graph of her journey from home and her stay at the supermarket. [2]

(d) Louise's mother leaves home at 10 07 to meet Louise at the supermarket.
She cycles at a constant speed of 28 km/h.

(i) Work out how long she takes for the 5.6 km journey.
Give your answer in minutes.

.....min [2]

(ii) On the grid, show her mother's journey. [1]

(e) They cycle home together at a constant speed and arrive at 10 54.

(i) On the grid, show their journey home. [1]

(ii) Calculate, in km/h, their constant speed on the journey home.

.....km/h [2]

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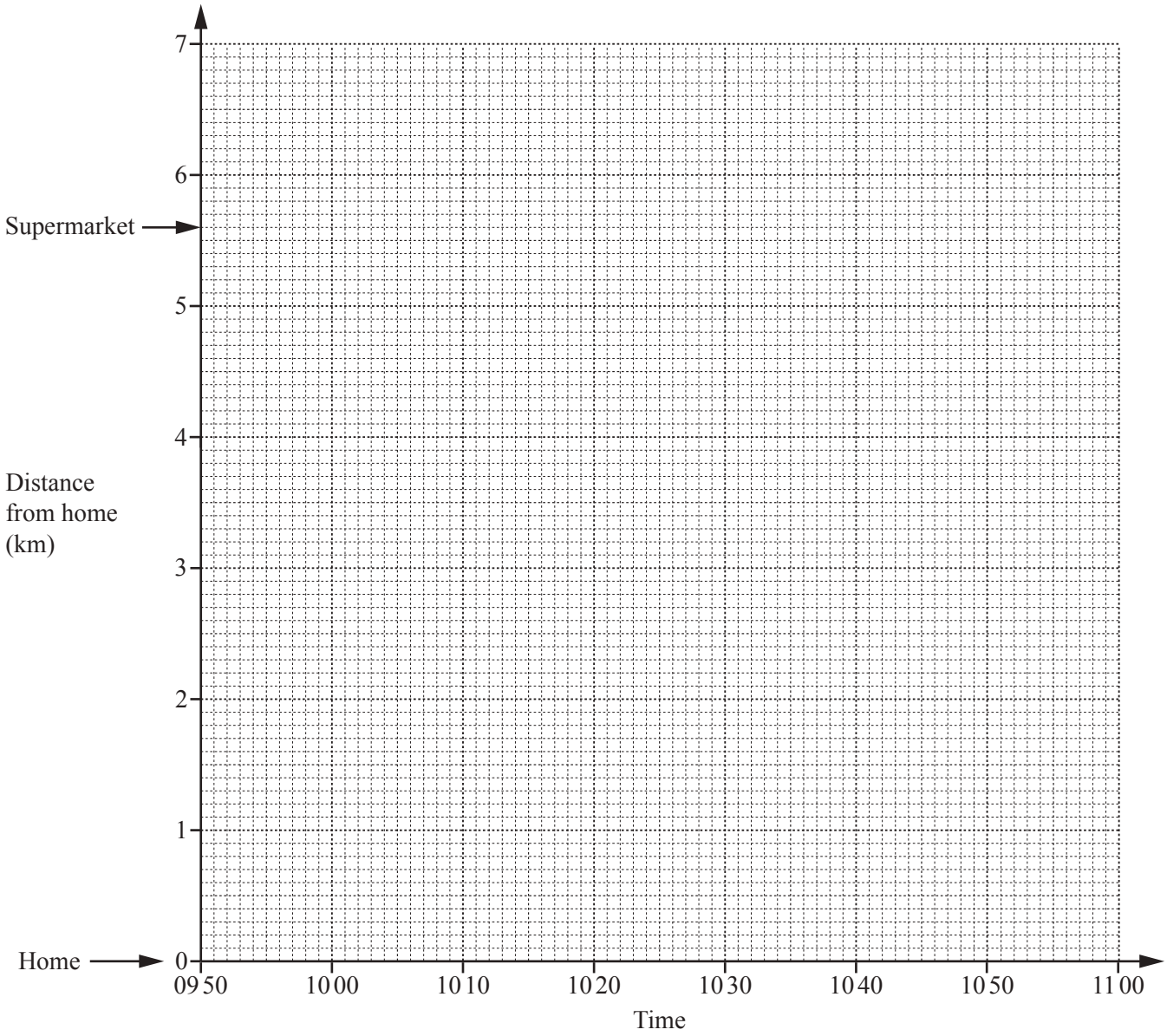

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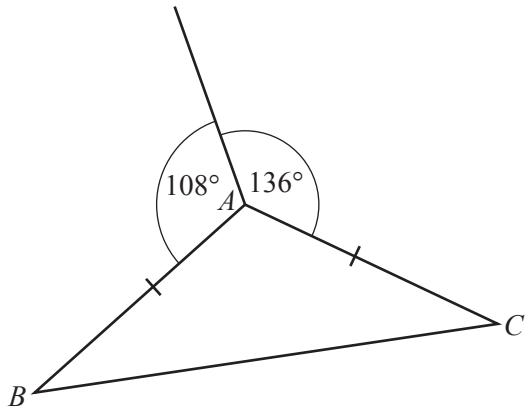
8 **(a)**



NOT TO SCALE

In the diagram, $AB = AC$.

Find

(i) angle BAC,

Angle BAC = ... [1]

(ii) angle ABC.

Angle ABC = ... [1]

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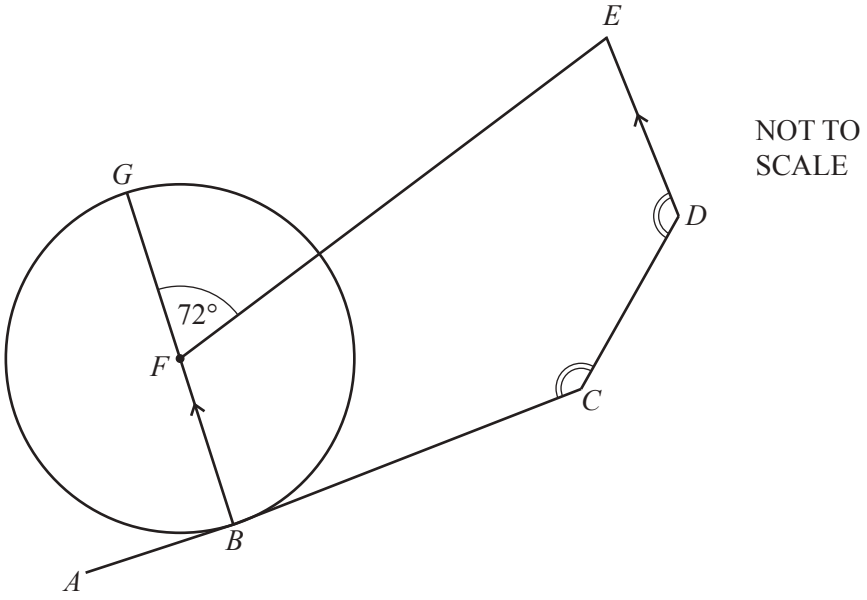
(b)



The diagram shows a circle, centre F and diameter BG.
AC is a tangent to the circle at B.
BF is parallel to DE, angle $GFE = 72°$ and angle BCD = angle CDE.

(i) Write down the mathematical name of the polygon $BCDEF$.

..... [1]

(ii) Explain why angle FBC is a right angle.

..... [1]

(iii) Find angle BFE, giving a reason for your answer.

Angle BFE =..... because .....

..... [2]

(iv) Find angle FED.

Angle FED = ... [1]

(v) Calculate angle BCD.

Angle BCD = ... [4]

Question 9 is printed on the next page.

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9 **(a)** Solve the equation $3(2x - 4) = 4(x + 7)$.

$x =$ ..... [3]

(b) Beindu goes to the market to buy apples and bananas.
She can buy

- 7 apples and 4 bananas for 85 cents

or

- 3 apples and 8 bananas for 93 cents.

Apples cost a cents each and bananas cost b cents each.

(i) This information can be used to write down two equations.
One of these is $7a + 4b = 85$.

Write down the other equation.

..... = ... [2]

(ii) Solve these two simultaneous equations.
You must show all your working.

$a =$ .....

$b =$ ..... [3]

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MATHEMATICS **0580/33**

Paper 3 (Core) **May/June 2018**

2 hours

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 104.

This document consists of **15** printed pages and **1** blank page.

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[Turn over

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1 **(a)** The table shows the temperature at Lexford Station at 10 00 each day for a week.

Day	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Temperature (°C)	−3	4	−1	0	−5	2	1

(i) Write down the day which had the coldest temperature.

..... [1]

(ii) Work out the difference in the temperature between Monday and Tuesday.

..... °C [1]

(iii) The temperature falls 6°C from 10 00 to midnight on Sunday.

Work out the temperature at midnight.

..... °C [1]

(b) The distance between Lexford Station and Crowton Station is 6.5 km.

(i) A train travels between these stations at an average speed of 39 km/h.

Work out how long, in minutes, it takes the train to travel between these stations.

..... min [3]

(ii) Each wheel on the train has a diameter of 1.8 m.

Work out the number of complete turns each wheel makes in travelling the 6.5 km.

..... [4]

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(c) A northbound train leaves Lexford Station every 30 minutes.
A bus leaves Lexford Station every 45 minutes.

At 11 40 a northbound train and a bus leave the station together.

Find the next time when this happens.

..... [3]

(d) Here is part of a timetable for trains going east to west from Lexford Station.

Lexford	09 14	09 47	10 21	11 15	11 48
Crowton	09 26	09 59	10 33	11 27	12 00
Doniton Halt	09 42	10 15	10 49	11 43	12 16
Mosshead	10 01	10 34	11 08	12 02	12 35

(i) Work out the number of minutes the 09 14 train takes to travel from Lexford to Mosshead.

..... min [1]

(ii) Freda must arrive at Mosshead by 11 30.

Write down the latest time she can catch a train from Lexford.

..... [1]

(e) 437 people go on a coach trip.
Each coach seats 62 people.

How many coaches are needed?

..... [2]

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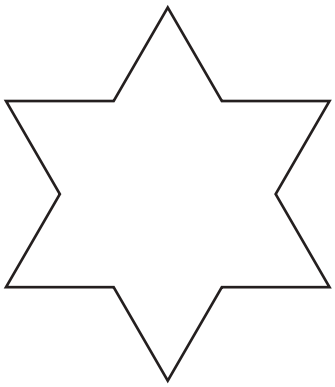
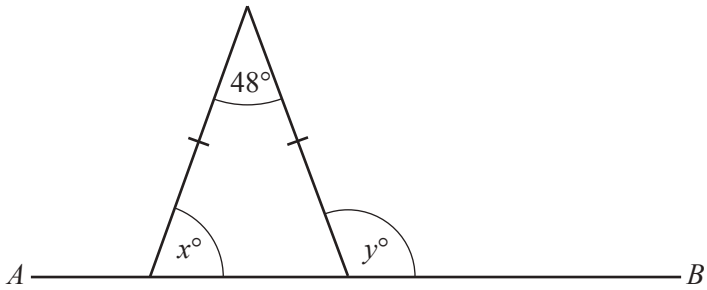
2 **(a)** Draw all the lines of symmetry on each shape.



[4]

(b) The diagram shows an isosceles triangle and a straight line AB.



NOT TO SCALE

Find the value of x and the value of y.

x = ...

y = ... [2]

(c) Find the size of one interior angle of a regular decagon.

..... [3]

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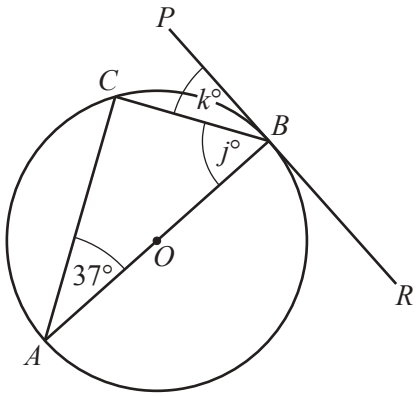
(d)



NOT TO SCALE

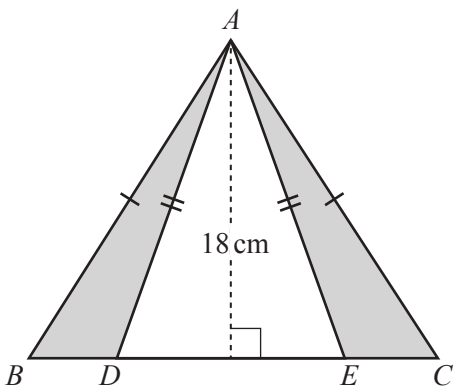
The points A, B and C lie on the circumference of a circle, centre O.
PBR is a tangent to the circle and angle $BAC = 37°$.

Find the value of j and the value of k.

$j =$ .....

$k =$ ..... [3]

(e)



NOT TO SCALE

ABC and ADE are isosceles triangles, each with perpendicular height 18 cm.
$BC = 35$ cm and $DE = 27$ cm.

Find the total area of the two shaded parts of the diagram.

..... cm^2 [3]

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3 **(a)** A museum's opening times are shown in this table.

Day	Opening times
Monday to Thursday	09 00 to 17 00
Friday	08 30 to 18 00
Saturday	09 00 to 19 00
Sunday	Closed

Work out how many hours in a week the museum is open for.

..... hours [3]

(b) The table shows the cost of tickets for the museum.

	Cost
Adult	\$4.20
Senior (aged over 60)	\$2.80
Child (aged 5 to 15)	\$1.80
Child (aged under 5)	Free

The Reeve family visit the museum.
Mrs Reeve is aged 36, her father is 67, her mother is 65, and her three children are 2, 7 and 12.

Work out the total cost for these six people to visit the museum.

\$..... [3]

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(c) Mrs Reeve buys 6 ice creams.
Each ice cream costs \$1.30 .

How much change does she receive from \$10?

\$..... [2]

(d) Last year, the museum had twenty seven thousand and fifty three visitors.

Write this number in figures.

..... [1]

(e) In 2015, there were 12 400 visitors to the museum.
In 2016, there were 14 100 visitors to the museum.

Calculate the percentage increase in the number of visitors from 2015 to 2016.

..... % [3]

(f) The door to the museum has an 8-digit code to unlock it.

- The next odd number after 35 gives digits 1 and 2.
- The next prime number after 23 gives digits 3 and 4.
- The square root of 225 gives digits 5 and 6.
- The value of 2^6 gives digits 7 and 8.

Use this information to complete the door code.
Digits 1 and 2 have been completed for you.

Digit	1	2	3	4	5	6	7	8
Code	3	7						

[3]

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4 **(a)** Solve these equations.

(i) $3x = 18$

$x =$ ..... [1]

(ii) $8x - 15 = 6x + 2$

$x =$ ..... [2]

(b) Factorise.

$$5x - 15$$

..... [1]

(c) Simplify.

$$2x - 6y + 3x + 2y$$

..... [2]

(d) Find the value of $5u - 2v$ when $u = 11$ and $v = -3$.

..... [2]

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(e) Make p the subject of this formula.

$$H = 7p - 3$$

$p =$ ..... [2]

(f) **(i)** Find the value of k when $x^{10} \div x^{k} = x^{3}$.

$k =$ ..... [1]

(ii) Find the value of n when $y^{10} \times y^{n} = 1$.

$n =$ ..... [1]

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5 **(a)** Geoff keeps a record of the number of goals scored in the first eight games played by his football team.

3 1 8 5 7 2 1 6

Find

(i) the mode,

..... [1]

(ii) the range,

..... [1]

(iii) the median.

..... [2]

(b) The table shows the number of goals scored by Geoff's team in each game during one season.

Number of goals	0	1	2	3	4	5	6	7	8
Number of games	5	7	8	10	6	4	5	3	2

(i) How many games did the team play?

..... [1]

(ii) Work out the mean number of goals scored per game.

..... [3]

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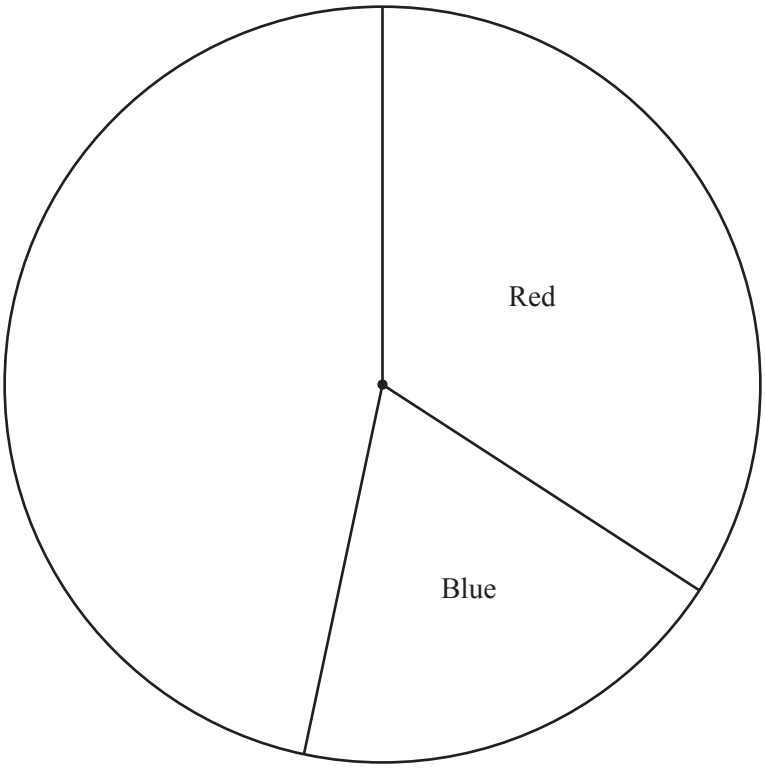
(c) Geoff asks some supporters to choose a new colour for the team's shirts.
The results are to be shown in a pie chart.
The table shows some of this information.

Colour	Frequency	Pie chart sector angle
Red	41	123°
Blue		69°
Green		
Other	18	54°

(i) Complete the table.

[3]

(ii) Complete the pie chart.



[1]

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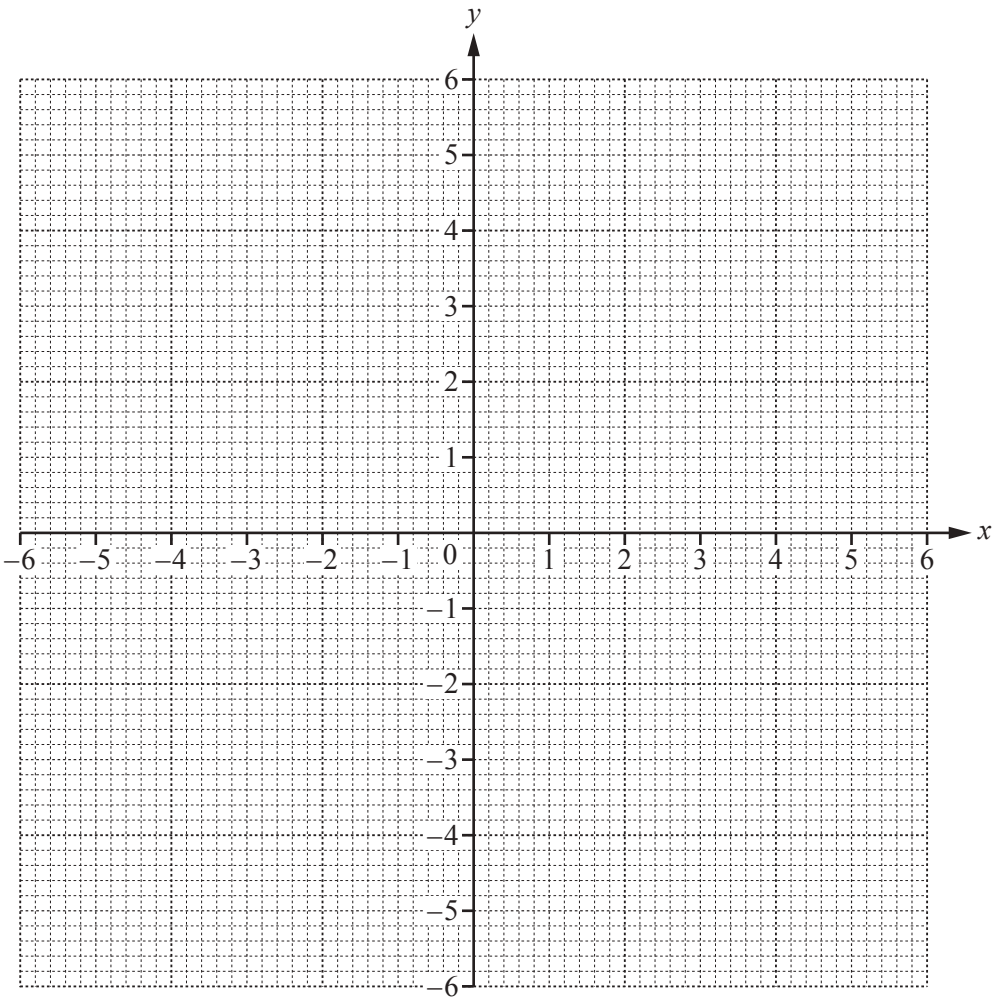
6 **(a)** Complete the table of values for $y = \frac{6}{x}$, $x \neq 0$.

x	-6	-4	-3	-2	-1		1	2	3	4	6
y		-1.5		-3				3		1.5	

[3]

(b) On the grid, draw the graph of $y = \frac{6}{x}$ for $-6 \leqslant x \leqslant -1$ and $1 \leqslant x \leqslant 6$.



[4]

(c) On the grid, draw the line $y = -5$. [1]

(d) Use your graph to solve the equation $\frac{6}{x} = -5$.

$x =$ ..... [1]

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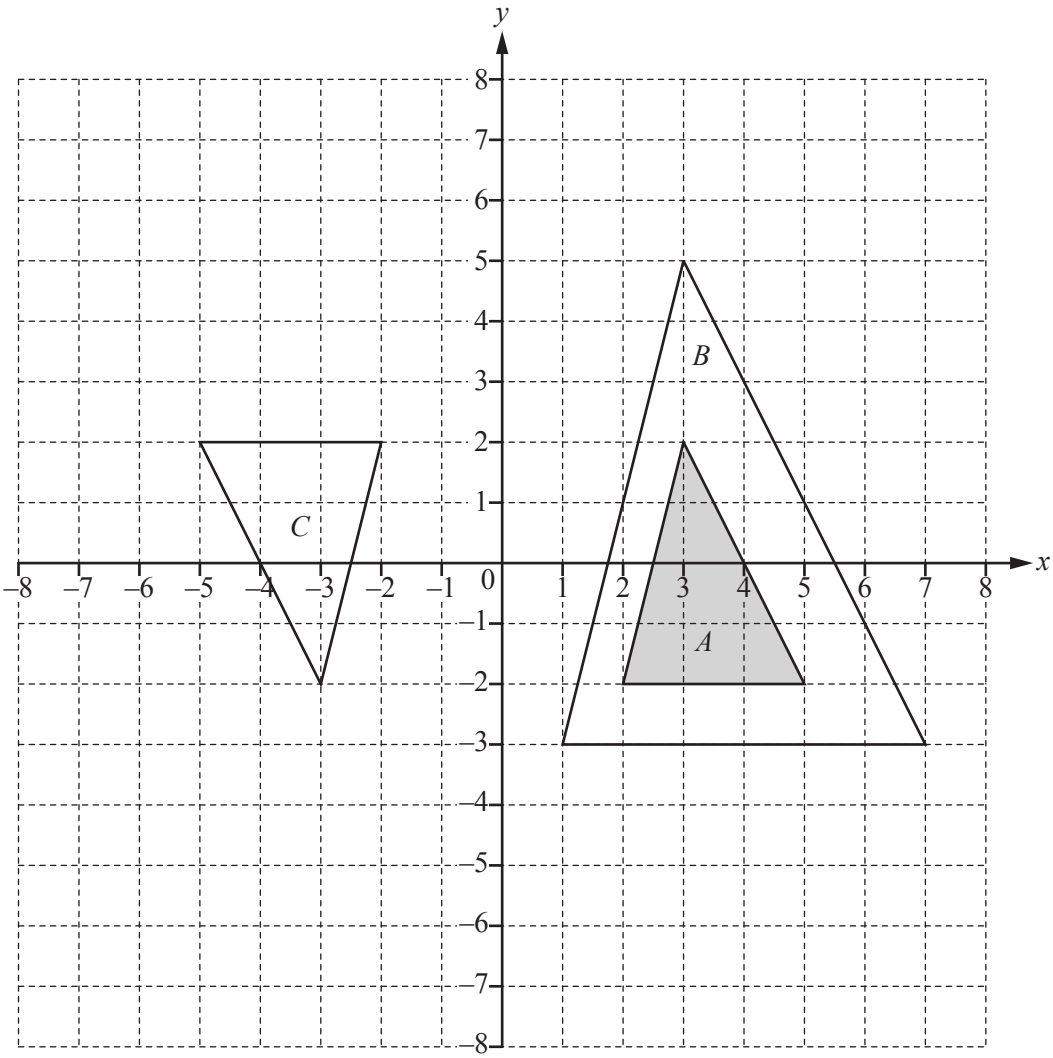
7 The diagram shows three triangles A, B and C.



(a) Describe fully the **single** transformation that maps triangle A onto triangle B.

.....

..... [3]

(b) Describe fully the **single** transformation that maps triangle A onto triangle C.

.....

..... [3]

(c) Draw the image of

(i) triangle A after a translation by the vector $\begin{pmatrix} -6 \\ 5 \end{pmatrix}$, [2]

(ii) triangle A after a reflection in the line $y = -3$. [2]

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8 **(a)** A bag contains 6 green balls, 5 red balls and 3 blue balls only.
A ball is taken from the bag at random.

Find the probability that the ball is

(i) green,

..... [1]

(ii) green or red,

..... [1]

(iii) yellow.

..... [1]

(b) Another bag contains brown balls, white balls, black balls and purple balls only.
A ball is taken from this bag at random.

Colour	Brown	White	Black	Purple
Probability	0.46	0.22	0.14	

(i) Complete the table.

[2]

(ii) Which colour is the most likely to be taken?

..... [1]

(iii) There are 50 balls in this bag.

Work out the number of black balls.

..... [1]

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9 **(a)** These are the first four terms of a sequence.

8 15 22 29

(i) Find the next term of this sequence.

..... [1]

(ii) Describe the rule for continuing this sequence.

..... [1]

(iii) Find an expression for the nth term of this sequence.

..... [2]

(b) Find the first three terms of another sequence whose nth term is $n^2 + 10$.

..... , ... , ... [2]

(c) Write down an expression for the nth term of this sequence.

1 8 27 64

..... [1]

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MATHEMATICS **0580/41**

Paper 4 (Extended) **May/June 2018**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

This document consists of **19** printed pages and **1** blank page.

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[Turn over

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1 Adele, Barbara and Collette share \$680 in the ratio 9 : 7 : 4.

(a) Show that Adele receives \$306.

[1]

(b) Calculate the amount that Barbara and Collette each receives.

Barbara \$ .....

Collette \$ ..... [3]

(c) Adele changes her \$306 into euros (€) when the exchange rate is €1 = \$1.125 .

Calculate the number of euros she receives.

€ ..... [2]

(d) Barbara spends a total of \$17.56 on 5 kg of apples and 3 kg of bananas.
Apples cost \$2.69 per kilogram.

Calculate the cost per kilogram of bananas.

\$ ..... [3]

(e) Collette spends half of her share on clothes and $\frac{1}{5}$ of her share on books.

Calculate the amount she has left.

\$ ..... [3]

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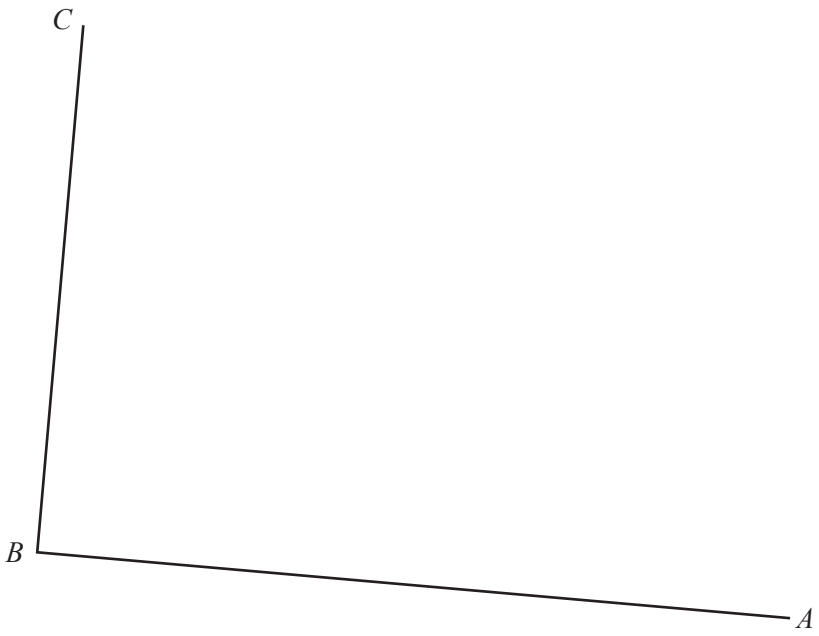
2 The scale drawing shows two boundaries, *AB* and *BC*, of a field *ABCD*.
The scale of the drawing is 1 cm represents 8 m.



Scale: 1 cm to 8 m

(a) The boundaries *CD* and *AD* of the field are each 72 m long.

(i) Work out the length of *CD* and *AD* on the scale drawing.

..... cm [1]

(ii) **Using a ruler and compasses only**, complete accurately the scale drawing of the field. [2]

(b) A tree in the field is

- equidistant from *A* and *B*

and

- equidistant from *AB* and *BC*.

On the scale drawing, construct two lines to find the position of the tree.
Use a straight edge and compasses only and leave in your construction arcs. [4]

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3 **(a)** The price of a house decreased from \$82 500 to \$77 500.

Calculate the percentage decrease.

..... % [3]

(b) Roland invests \$12 000 in an account that pays compound interest at a rate of 2.2% per year.

Calculate the value of his investment at the end of 6 years.
Give your answer correct to the nearest dollar.

\$ ..... [3]

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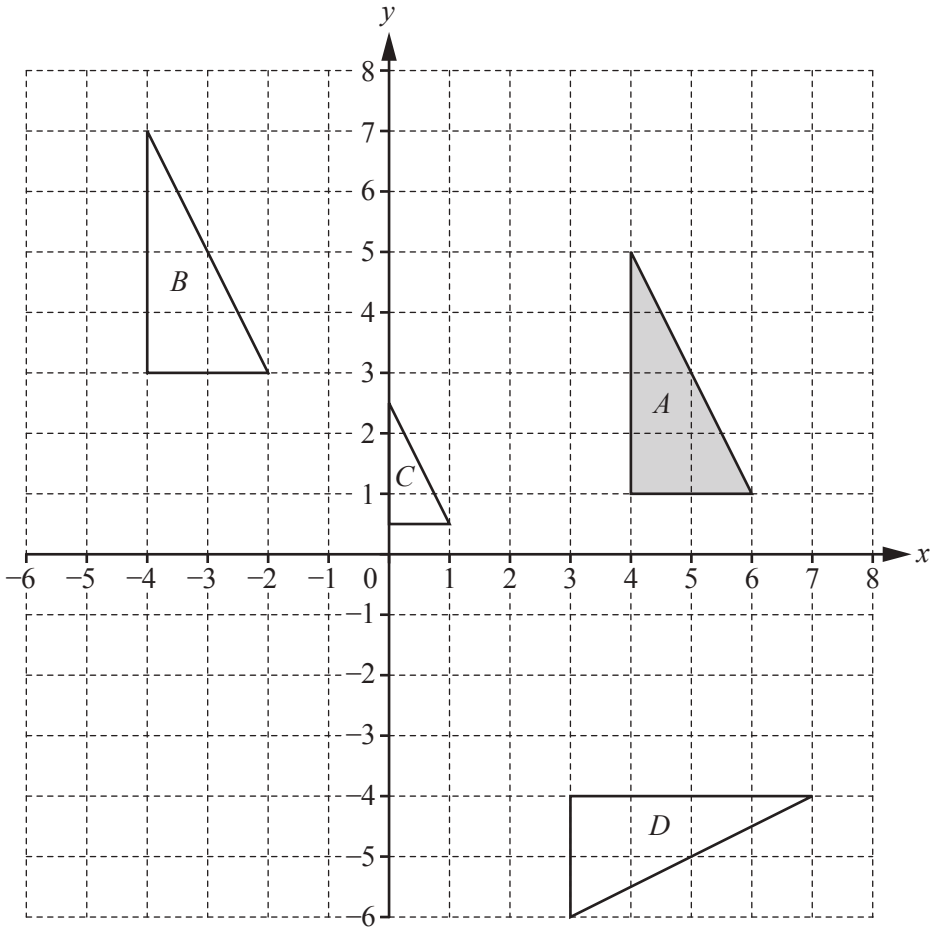
4



(a) Describe fully the **single** transformation that maps

(i) triangle A onto triangle B,

.....

..... [2]

(ii) triangle A onto triangle C,

.....

..... [3]

(iii) triangle A onto triangle D.

.....

..... [3]

(b) On the grid, draw the image of triangle A after an enlargement by scale factor 2, centre $(7, 3)$. [2]

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5 **(a)** Factorise.

(i) $2mn + m^2 - 6n - 3m$

..... [2]

(ii) $4y^2 - 81$

..... [1]

(iii) $t^2 - 6t + 8$

..... [2]

(b) Rearrange the formula to make x the subject.

$$k = \frac{2m - x}{x}$$

$x =$ ..... [4]

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(c) Solve the simultaneous equations.
You must show all your working.

$$\tfrac{1}{2}x - 3y = 9$$
$$5x + y = 28$$

$x =$ .....

$y =$ ..... [3]

(d) $$\frac{3}{m+4} - \frac{4}{m} = 6$$

(i) Show that this equation can be written as $6m^2 + 25m + 16 = 0$.

[3]

(ii) Solve the equation $6m^2 + 25m + 16 = 0$.
Show all your working and give your answers correct to 2 decimal places.

$m =$ ..... or $m =$ ..... [4]

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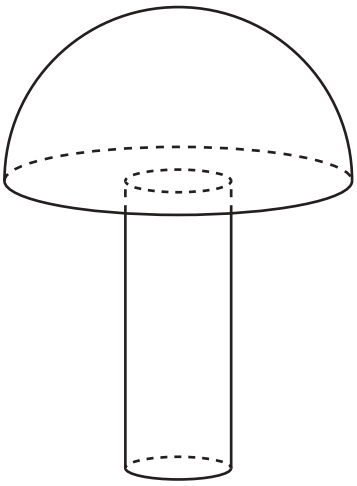
6 A solid hemisphere has volume 230 cm^3.

(a) Calculate the radius of the hemisphere.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... cm [3]

(b) A solid cylinder with radius 1.6 cm is attached to the hemisphere to make a toy.



NOT TO SCALE

The total volume of the toy is 300 cm^3.

(i) Calculate the height of the cylinder.

..... cm [3]

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(ii) A mathematically similar toy has volume 19 200 cm^3.

Calculate the radius of the cylinder for this toy.

..... cm [3]

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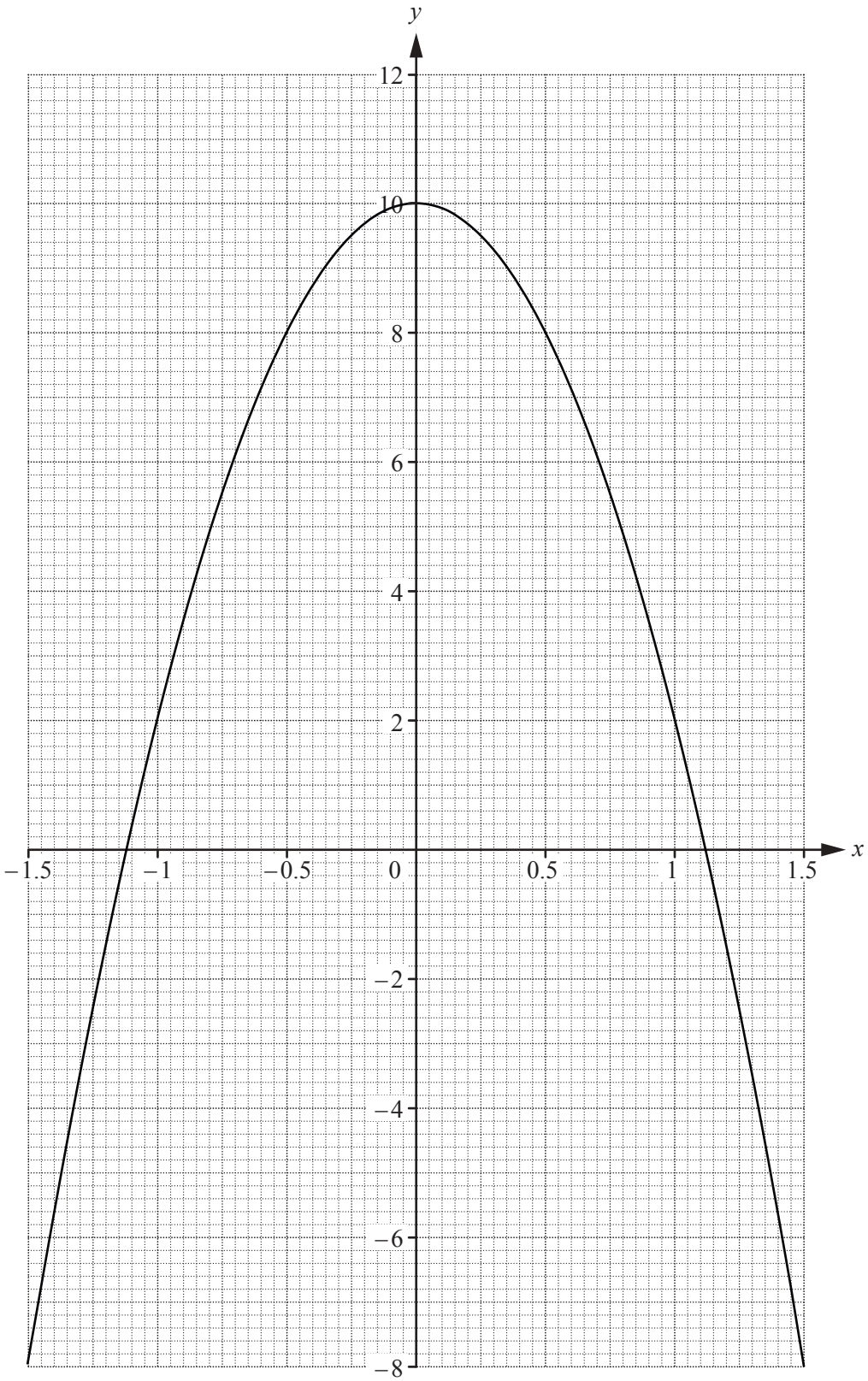
7 The graph of $y = 10 - 8x^2$ for $-1.5 \leqslant x \leqslant 1.5$ is drawn on the grid.



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(a) Write down the equation of the line of symmetry of the graph.

..... [1]

(b) On the grid opposite, draw the tangent to the curve at the point where $x = 0.5$.
Find the gradient of this tangent.

..... [3]

(c) The table shows some values for $y = x^3 + 3x + 4$.

x	-1.5	-1	-0.5	0	0.5	1	1.5
y	-3.9				5.6	8	11.9

(i) Complete the table. [3]

(ii) On the grid opposite, draw the graph of $y = x^3 + 3x + 4$ for $-1.5 \leqslant x \leqslant 1.5$. [4]

(d) Show that the values of x where the two curves intersect are the solutions to the equation $x^3 + 8x^2 + 3x - 6 = 0$.

[1]

(e) By drawing a suitable straight line, solve the equation $x^3 + 5x + 2 = 0$ for $-1.5 \leqslant x \leqslant 1.5$.

$x =$ ..... [3]

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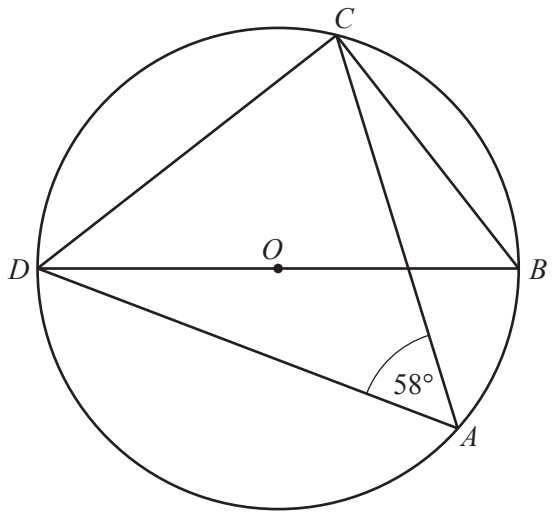
8 **(a)** The exterior angle of a regular polygon is $x°$ and the interior angle is $8x°$.

Calculate the number of sides of the polygon.

..... [3]

(b)



NOT TO SCALE

A, B, C and D are points on the circumference of the circle, centre O.
DOB is a straight line and angle $DAC = 58°$.

Find angle CDB.

Angle CDB = ... [3]

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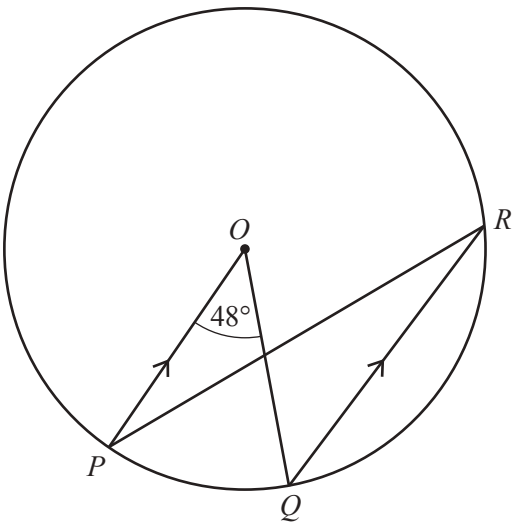
(c)



NOT TO SCALE

P, Q and R are points on the circumference of the circle, centre O.
PO is parallel to QR and angle $POQ = 48°$.

(i) Find angle OPR.

Angle OPR = ... [2]

(ii) The radius of the circle is 5.4 cm.

Calculate the length of the **major** arc PQ.

..... cm [3]

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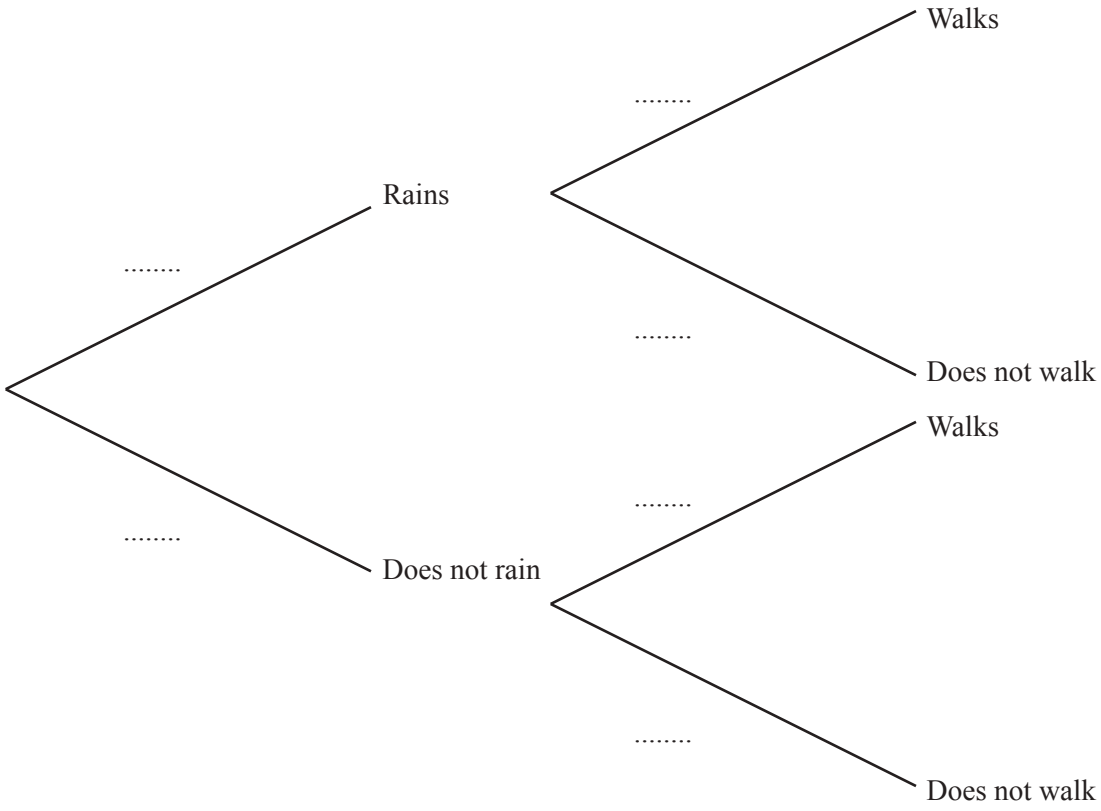
9 The probability that it will rain tomorrow is $\frac{5}{8}$.

If it rains, the probability that Rafael walks to school is $\frac{1}{6}$.

If it does not rain, the probability that Rafael walks to school is $\frac{7}{10}$.

(a) Complete the tree diagram.



[3]

(b) Calculate the probability that it will rain tomorrow and Rafael walks to school.

..... [2]

(c) Calculate the probability that Rafael does not walk to school.

..... [3]

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10 **(a)** In 2017, the membership fee for a sports club was \$79.50 .
This was an increase of 6% on the fee in 2016.

Calculate the fee in 2016.

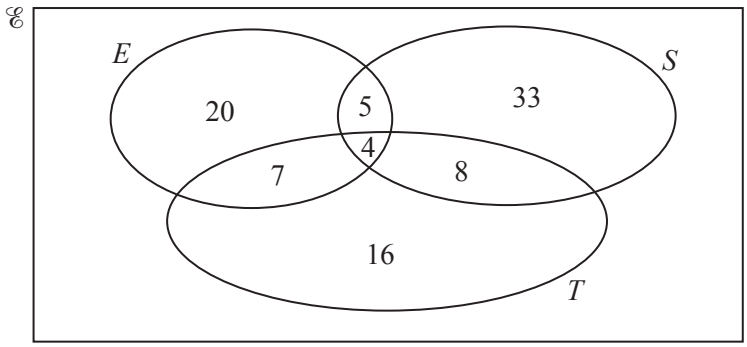
\$ ..... [3]

(b) On one day, the number of members using the exercise machines was 40, correct to the nearest 10.
Each member used a machine for 30 minutes, correct to the nearest 5 minutes.

Calculate the lower bound for the number of minutes the exercise machines were used on this day.

..... min [2]

(c) On another day, the number of members using the exercise machines (E), the swimming pool (S) and the tennis courts (T) is shown on the Venn diagram.



(i) Find the number of members using only the tennis courts.

..... [1]

(ii) Find the number of members using the swimming pool.

..... [1]

(iii) A member using the swimming pool is chosen at random.

Find the probability that this member also uses the tennis courts and the exercise machines.

..... [2]

(iv) Find $n(T \cap (E \cup S))$.

..... [1]

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11 **(a)** $\overrightarrow{OA} = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$ $\overrightarrow{AB} = \begin{pmatrix} 8 \\ -7 \end{pmatrix}$ $\overrightarrow{AC} = \begin{pmatrix} -3 \\ 6 \end{pmatrix}$

Find

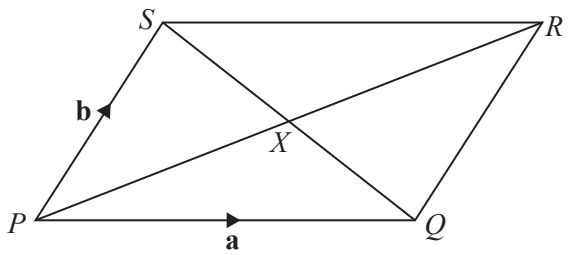
(i) $|\overrightarrow{OB}|$,

$|\overrightarrow{OB}| =$ ..... [3]

(ii) $\overrightarrow{BC}$.

$\overrightarrow{BC} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [2]

(b)



NOT TO SCALE

PQRS is a parallelogram with diagonals *PR* and *SQ* intersecting at *X*.
$\overrightarrow{PQ} = \mathbf{a}$ and $\overrightarrow{PS} = \mathbf{b}$.

Find $\overrightarrow{QX}$ in terms of **a** and **b**.
Give your answer in its simplest form.

$\overrightarrow{QX} =$ ..... [2]

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(c) $\mathbf{M} = \begin{pmatrix} 2 & 5 \\ 1 & 8 \end{pmatrix}$

Calculate

(i) $\mathbf{M}^2$,

$\mathbf{M}^2 = \begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [2]

(ii) $\mathbf{M}^{-1}$.

$\mathbf{M}^{-1} = \begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [2]

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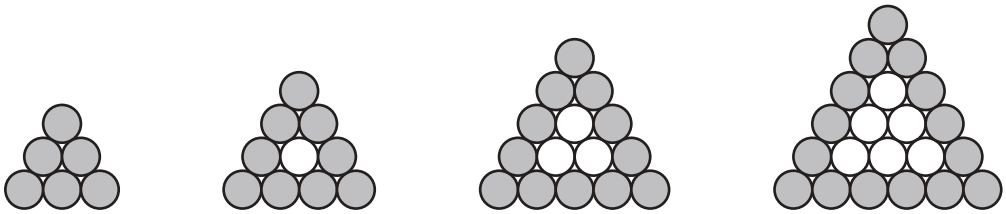
12 Marco is making patterns with grey and white circular mats.



Pattern 1 Pattern 2 Pattern 3 Pattern 4

The patterns form a sequence.
Marco makes a table to show some information about the patterns.

Pattern number	1	2	3	4	5
Number of grey mats	6	9	12	15	
Total number of mats	6	10	15	21	

(a) Complete the table for Pattern 5. [2]

(b) Find an expression, in terms of n, for the number of grey mats in Pattern n.

..... [2]

(c) Marco makes a pattern with 24 grey mats.

Find the total number of mats in this pattern.

..... [2]

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(d) Marco needs a total of 6 mats to make the first pattern.
He needs a total of 16 mats to make the first two patterns.
He needs a total of $\frac{1}{6}n^3 + an^2 + bn$ mats to make the first n patterns.

Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [6]

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MATHEMATICS **0580/42**

Paper 4 (Extended) **May/June 2018**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

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Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

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[Turn over

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1 **(a)** Here is a list of ingredients to make 20 biscuits.

260 g of butter
500 g of sugar
650 g of flour
425 g of rice

(i) Find the mass of rice as a percentage of the mass of sugar.

..... % [1]

(ii) Find the mass of butter needed to make 35 of these biscuits.

..... g [2]

(iii) Michel has 2 kg of each ingredient.

Work out the greatest number of these biscuits that he can make.

..... [3]

(b) A company makes these biscuits at a cost of \$1.35 per packet.
These biscuits are sold for \$1.89 per packet.

(i) Calculate the percentage profit the company makes on each packet.

..... % [3]

(ii) The selling price of \$1.89 has increased by 8% from last year.

Calculate the selling price last year.

\$ ..... [3]

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(c) Over a period of 3 years, the company's sales of biscuits increased from 15.6 million packets to 20.8 million packets.
The sales increased exponentially by the same percentage each year.

Calculate the percentage increase **each year**.

..... % [3]

(d) The people who work for the company are in the following age groups.

Group A	Group B	Group C
Under 30 years	30 to 50 years	Over 50 years

The ratio of the number in group A to the number in group B is 7 : 10.
The ratio of the number in group B to the number in group C is 4 : 3.

(i) Find the ratio of the number in group A to the number in group C.
Give your answer in its simplest form.

..... : ..... [3]

(ii) There are 45 people in group C.

Find the total number of people who work for the company.

..... [3]

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2 The time taken for each of 120 students to complete a cooking challenge is shown in the table.

Time (t minutes)	$20 < t \leqslant 25$	$25 < t \leqslant 30$	$30 < t \leqslant 35$	$35 < t \leqslant 40$	$40 < t \leqslant 45$
Frequency	44	32	28	12	4

(a) **(i)** Write down the modal time interval.

..... $< t \leqslant$ ..... [1]

(ii) Write down the interval containing the median time.

..... $< t \leqslant$ ..... [1]

(iii) Calculate an estimate of the mean time.

..... min [4]

(iv) A student is chosen at random.

Find the probability that this student takes more than 40 minutes.

..... [1]

(b) **(i)** Complete the cumulative frequency table.

Time (t minutes)	$t \leqslant 20$	$t \leqslant 25$	$t \leqslant 30$	$t \leqslant 35$	$t \leqslant 40$	$t \leqslant 45$
Cumulative frequency	0	44				

[2]

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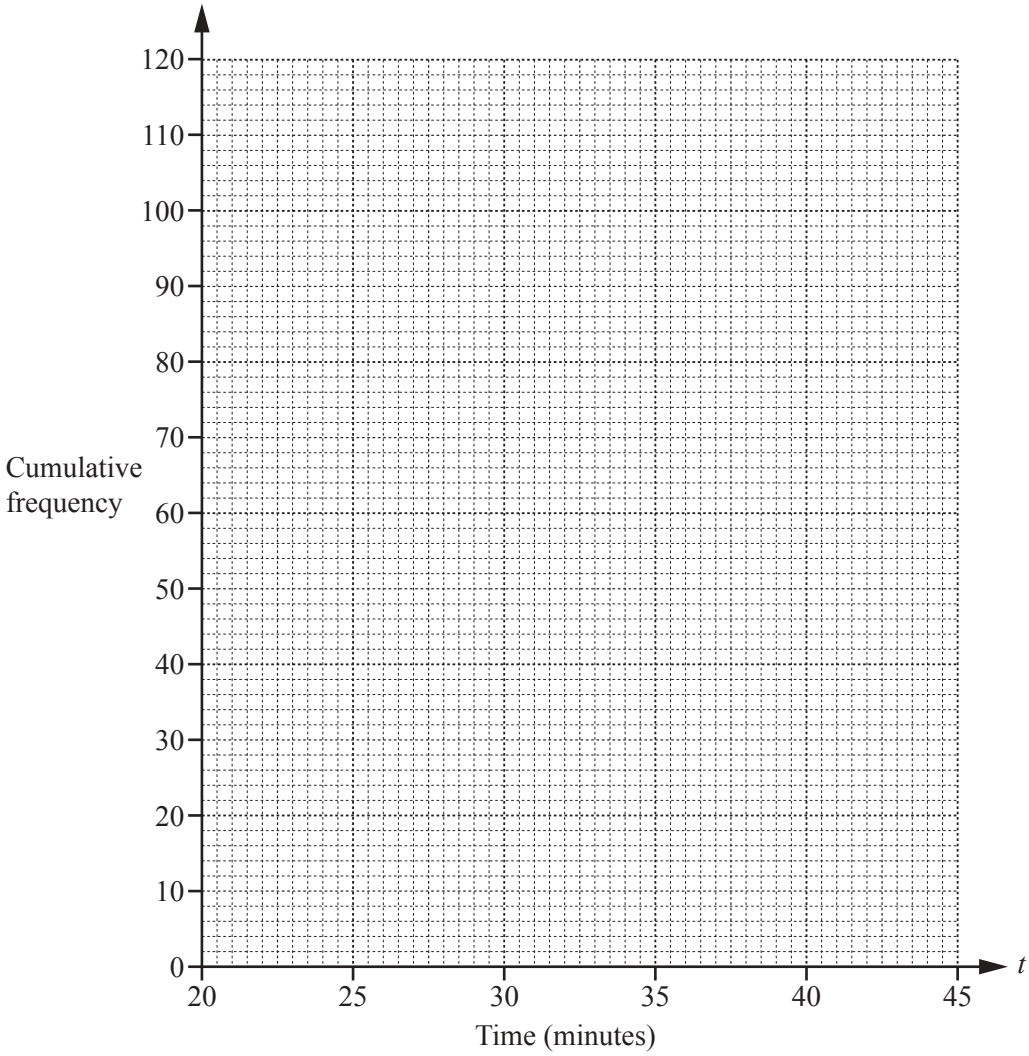
(ii) On the grid, draw a cumulative frequency diagram to show this information.



[3]

(iii) Find the median time.

..... min [1]

(iv) Find the interquartile range.

..... min [2]

(v) Find the number of students who took more than 37 minutes to complete the cooking challenge.

..... [2]

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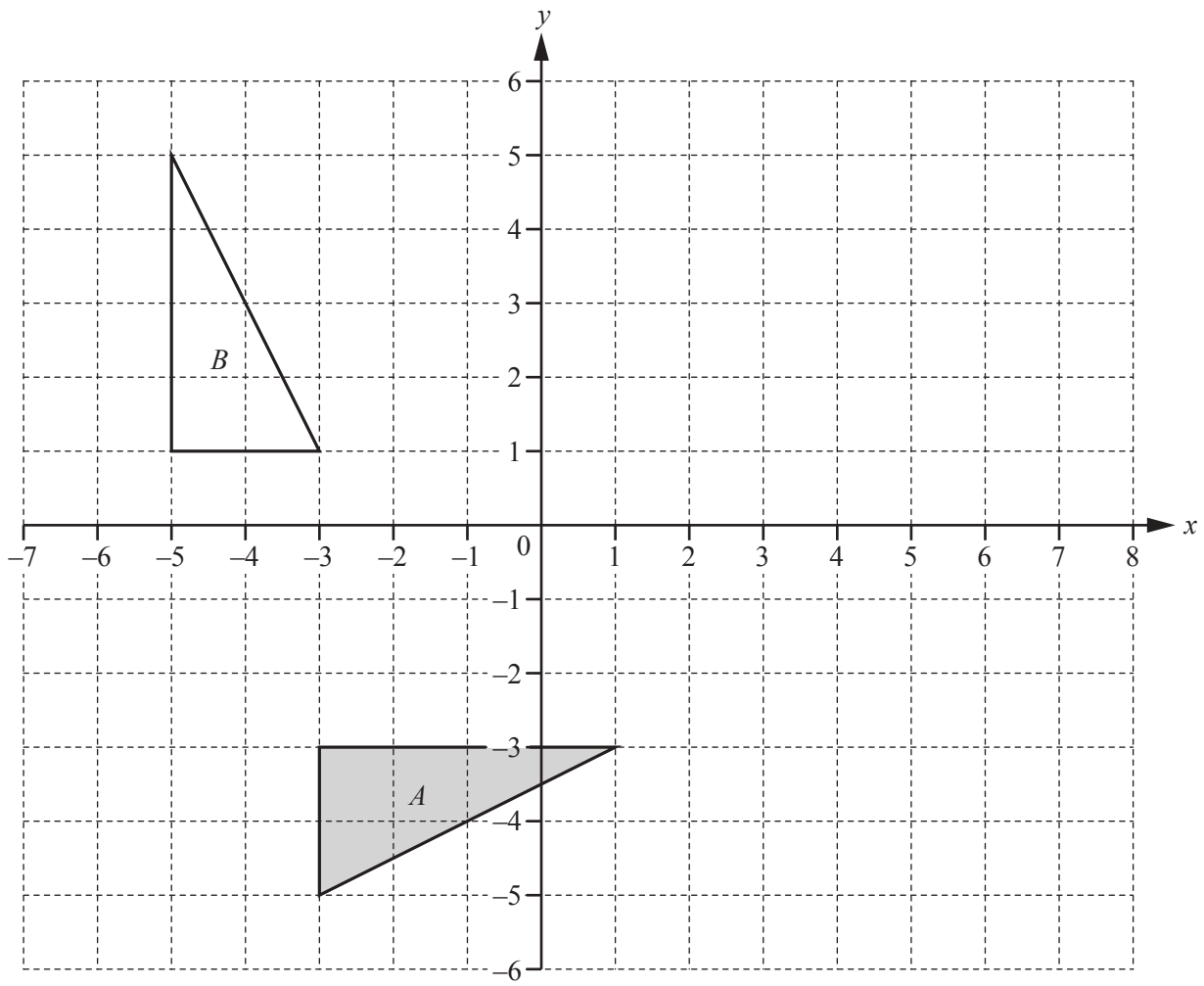
3



(a) **(i)** Draw the image of triangle A after a reflection in the line $x = 2$. [2]

(ii) Draw the image of triangle A after a translation by the vector $\begin{pmatrix} -2 \\ 4 \end{pmatrix}$. [2]

(iii) Draw the image of triangle A after an enlargement by scale factor $-\frac{1}{2}$, centre (3, 1). [3]

(b) Describe fully the **single** transformation that maps triangle A onto triangle B.

.....

..... [3]

(c) Describe fully the **single** transformation represented by the matrix $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$.

.....

..... [2]

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4 **(a)** Simplify.

(i) $(3p^2)^5$

..... [2]

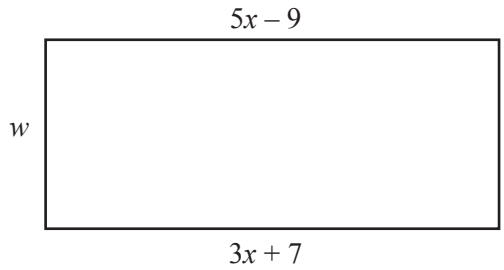
(ii) $18x^2y^6 \div 2xy^2$

..... [2]

(iii) $\left(\frac{5}{m}\right)^{-2}$

..... [1]

(b) In this part, all measurements are in metres.



NOT TO SCALE

The diagram shows a rectangle.
The area of the rectangle is $310\,\text{m}^2$.

Work out the value of w.

$w =$ ..... [4]

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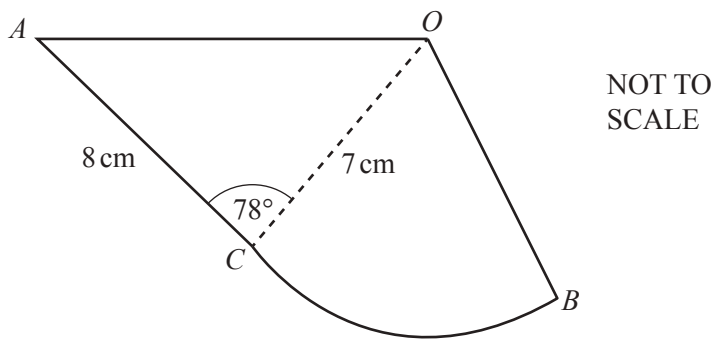
5



The diagram shows a design made from a triangle AOC joined to a sector OCB.
$AC = 8$ cm, $OB = OC = 7$ cm and angle $ACO = 78°$.

(a) Use the cosine rule to show that $OA = 9.47$ cm, correct to 2 decimal places.

[4]

(b) Calculate angle OAC.

Angle OAC = ... [3]

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(c) The perimeter of the design is 29.5 cm.

Show that angle $COB = 41.2°$, correct to 1 decimal place.

[5]

(d) Calculate the total area of the design.

..... cm^2 [4]

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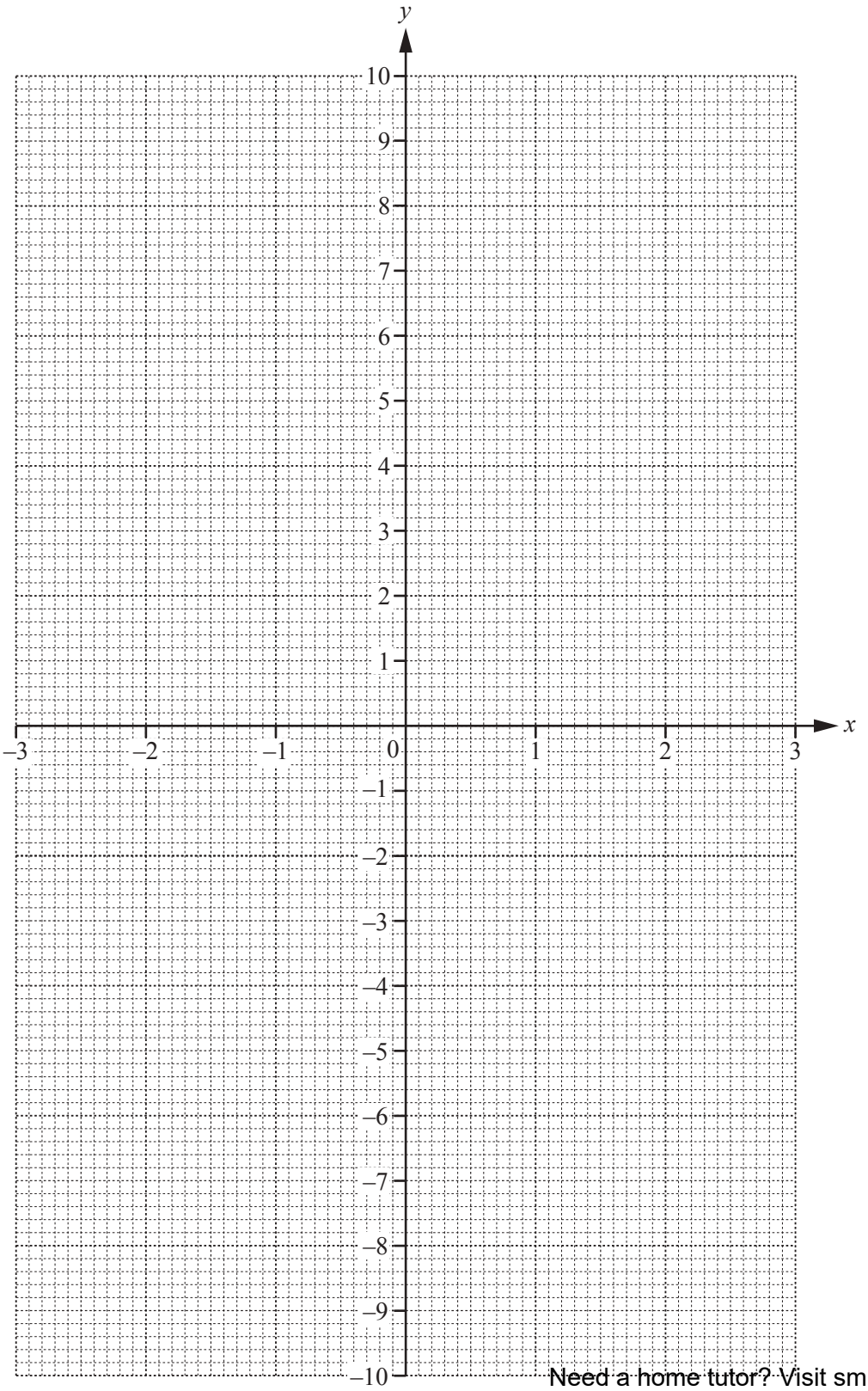
6 **(a)** Complete the table of values for $y = \frac{x^3}{3} - \frac{1}{2x^2}$, $x \neq 0$.

x	-3	-2	-1	-0.5	-0.3		0.3	0.5	1	2	3
y	-9.1	-2.8	-0.8		-5.6		-5.5	-2.0			8.9

[3]

(b) On the grid, draw the graph of $y = \frac{x^3}{3} - \frac{1}{2x^2}$ for $-3 \leqslant x \leqslant -0.3$ and $0.3 \leqslant x \leqslant 3$.



[5]

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(c) **(i)** By drawing a suitable tangent, find an estimate of the gradient of the curve at $x = -2$.

..... [3]

(ii) Write down the equation of the tangent to the curve at $x = -2$.
Give your answer in the form $y = mx + c$.

$y =$ ..... [2]

(d) Use your graph to solve the equations.

(i) $\frac{x^3}{3} - \frac{1}{2x^2} = 0$

$x =$ ..... [1]

(ii) $\frac{x^3}{3} - \frac{1}{2x^2} + 4 = 0$

$x =$ ..... or $x =$ ..... or $x =$ ..... [3]

(e) The equation $\frac{x^3}{3} - \frac{1}{2x^2} + 4 = 0$ can be written in the form $ax^n + bx^{n-3} - 3 = 0$.

Find the value of a, the value of b and the value of n.

$a =$ .....

$b =$ .....

$n =$ ..... [3]

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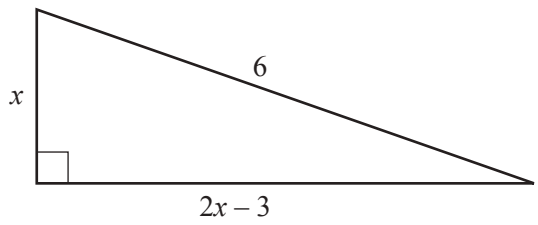
7 In this question, all measurements are in metres.



NOT TO SCALE

The diagram shows a right-angled triangle.

(a) Show that $5x^2 - 12x - 27 = 0$.

[3]

(b) Solve $5x^2 - 12x - 27 = 0$.
Show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [4]

(c) Calculate the perimeter of the triangle.

..... m [2]

(d) Calculate the smallest angle of the triangle.

..... [2]

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8 $f(x) = 8 - 3x$ $g(x) = \frac{10}{x+1}$, $x \neq -1$ $h(x) = 2^x$

(a) Find

(i) $hf\left(\frac{8}{3}\right)$,

..... [2]

(ii) $gh(-2)$,

..... [2]

(iii) $g^{-1}(x)$,

$g^{-1}(x) =$ ..... [3]

(iv) $f^{-1}f(5)$.

..... [1]

(b) Write $f(x) + g(x)$ as a single fraction in its simplest form.

..... [3]

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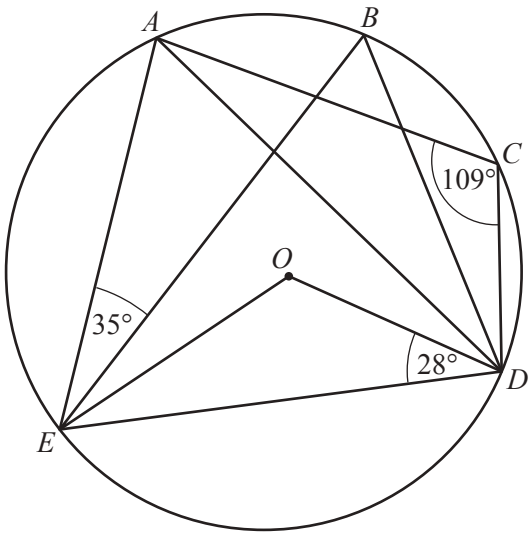
9 **(a)**



NOT TO SCALE

A, *B*, *C*, *D* and *E* lie on the circle, centre *O*.
Angle *AEB* = 35°, angle *ODE* = 28° and angle *ACD* = 109°.

(i) Work out the following angles, giving reasons for your answers.

(a) Angle *EBD* = ... because .....

.....

..... [3]

(b) Angle *EAD* = ... because .....

..... [2]

(ii) Work out angle *BEO*.

Angle *BEO* = ... [3]

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(b) In a regular polygon, the interior angle is 11 times the exterior angle.

(i) Work out the number of sides of this polygon.

..... [3]

(ii) Find the sum of the interior angles of this polygon.

..... [2]

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CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

MATHEMATICS **0580/43**

Paper 4 (Extended) **May/June 2018**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator Geometrical instruments
Tracing paper (optional).

READ THESE INSTRUCTIONS FIRST

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For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

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1 **(a)** Rowena buys and sells clothes.

(i) She buys a jacket for \$40 and sells it for \$45.40 .

Calculate the percentage profit.

..... % [3]

(ii) She sells a dress for \$42.60 after making a profit of 20% on the cost price.

Calculate the cost price.

\$ ..... [3]

(b) Sara invests \$500 for 15 years at a rate of 2% per year simple interest.

Calculate the total interest Sara receives.

\$ ..... [2]

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(c) Tomas has two cars.

(i) The value, today, of one car is \$21 000.
The value of this car **decreases** exponentially by 18% each year.

Calculate the value of this car after 5 years.
Give your answer correct to the nearest hundred dollars.

\$ ..... [3]

(ii) The value, today, of the other car is \$15 000.
The value of this car **increases** exponentially by x% each year.
After 12 years the value of the car will be \$42 190.

Calculate the value of x.

x = ... [3]

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2 **(a)** **(i)** $y = 2^x$

Complete the table.

x	0	1	2	3	4
y		2	4	8	

[2]

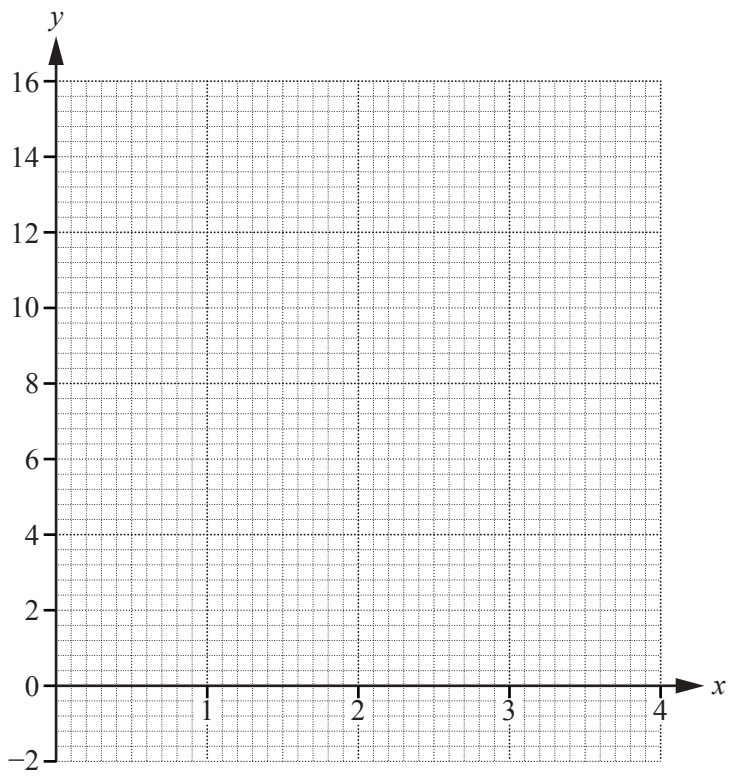
(ii) $y = 14 - x^2$

Complete the table.

x	0	1	2	3	4
y		13	10	5	

[2]

(b) On the grid, draw the graphs of $y = 2^x$ and $y = 14 - x^2$ for $0 \leqslant x \leqslant 4$.



[6]

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(c) Use your graphs to solve the equations.

(i) $2^x = 12$

$x =$ ..... [1]

(ii) $2^x = 14 - x^2$

$x =$ ..... [1]

(d) **(i)** On the grid, draw the line from the point (4, 2) that has a gradient of -4. [1]

(ii) Complete the statement.

This straight line is a ..... to the graph of $y = 14 - x^2$

at the point (..... , ...). [2]

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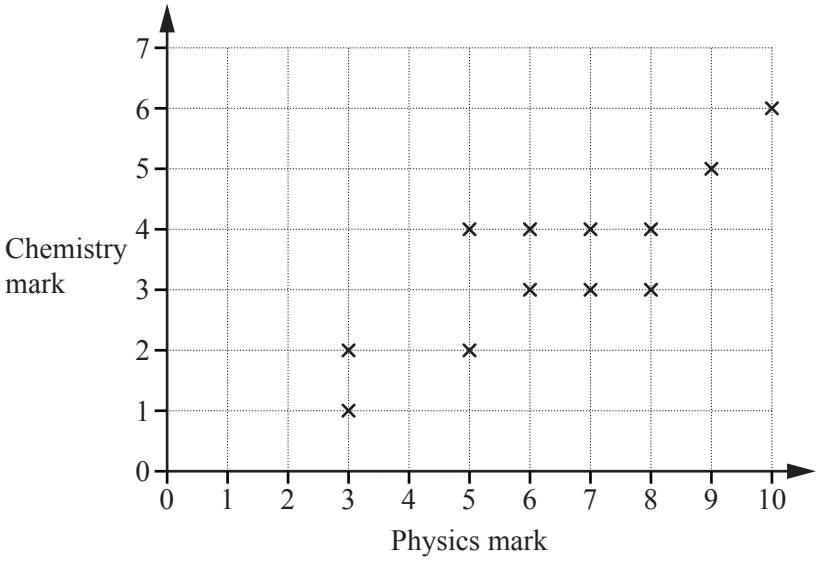
3 **(a)** The scatter diagram shows the physics mark and the chemistry mark for each of 12 students.



(i) What type of correlation is shown in the scatter diagram?

..... [1]

(ii) On the scatter diagram, draw a line of best fit. [1]

(iii) Find an estimate of the chemistry mark for another student who has a physics mark of 4.

..... [1]

(b) A teacher records the number of days each of the 24 students in her class are absent.
The frequency table shows the results.

Number of days	0	1	2	3	4	5
Frequency	10	8	3	2	0	1

Find the mode, the median and the mean.

Mode = ...

Median = ...

Mean = ... [5]

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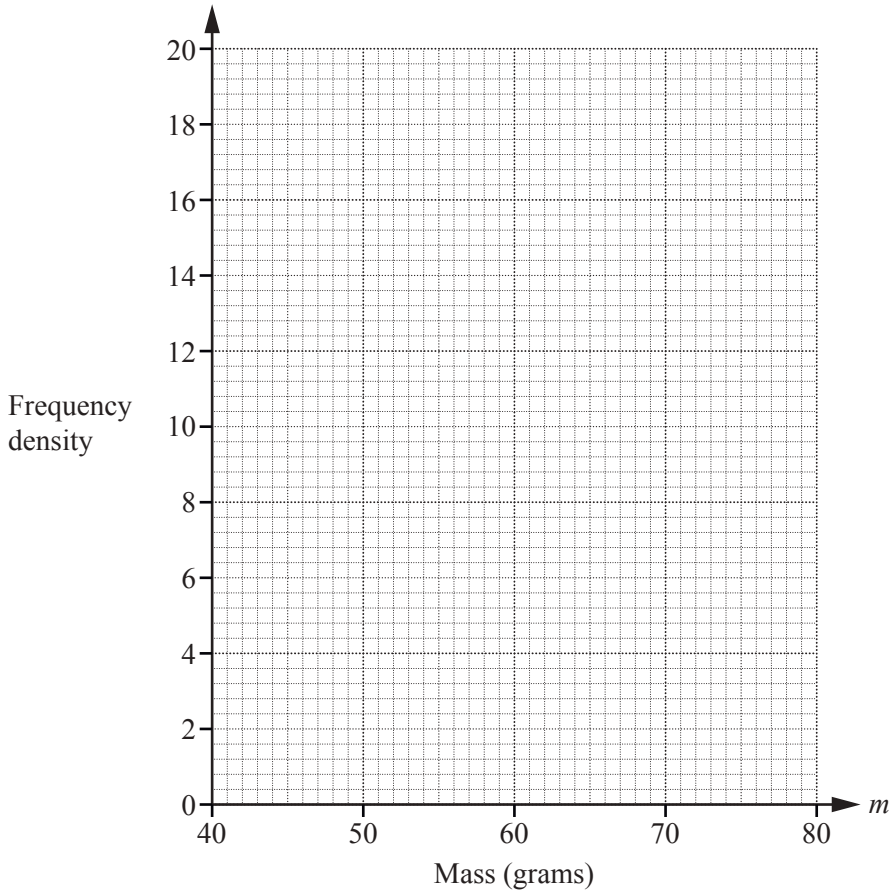
(c) Three sizes of eggs are sold in a shop.
The table shows the number of eggs of each size sold in one day.

Size	Small	Medium	Large
Mass (m grams)	$46 < m \leqslant 52$	$52 < m \leqslant 62$	$62 < m \leqslant 80$
Number of eggs sold	78	180	162

(i) Calculate an estimate of the mean mass.

..... g [4]

(ii) On the grid, draw a histogram to show the information in the table.



[4]

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4 **(a)** The diagram shows two sets of cards.

Set *A*	1	1	2	2	2
Set *B*	0	1	1	1	2

(i) Jojo chooses two cards at random from Set *A* without replacement.

Find the probability that the two cards have the same number.

..... [3]

(ii) Jojo replaces the two cards.
Kylie then chooses one card at random from Set *A* and one card at random from Set *B*.

Find the probability that the two cards have the same number.

..... [3]

(iii) Who is the most likely to choose two cards that have the same number?
Show all your working.

..... [1]

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(b)

Set *C*	4	4	5	5	5

Lena chooses three cards at random from Set *C* without replacement.

Find the probability that the third card chosen is numbered 4.

..... [3]

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5 **(a)** At a football match, the price of an adult ticket is $\$x$ and the price of a child ticket is $\$(x-2.50)$.
There are 18 500 adults and 2400 children attending the football match.
The total amount paid for the tickets is \$320 040.

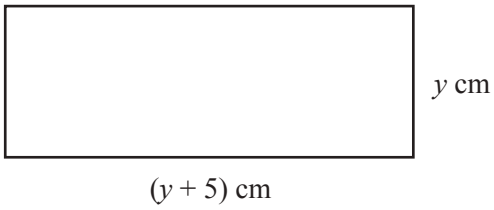
Find the price of an adult ticket.

\$..... [4]

(b) **(i)** Factorise $y^2+5y-84$.

..... [2]

(ii)



NOT TO SCALE

The area of the rectangle is $84\,\text{cm}^2$.

Find the perimeter.

..... cm [3]

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(c) In a shop, the price of a monthly magazine is \$$m$ and the price of a weekly magazine is \$$(m - 0.75)$.
One day, the shop receives
- \$168 from selling monthly magazines
- \$207 from selling weekly magazines.

The total number of these magazines sold during this day is 100.

(i) Show that $50m^2 - 225m + 63 = 0$.

[3]

(ii) Find the price of a monthly magazine.
Show all your working.

\$ ..... [3]

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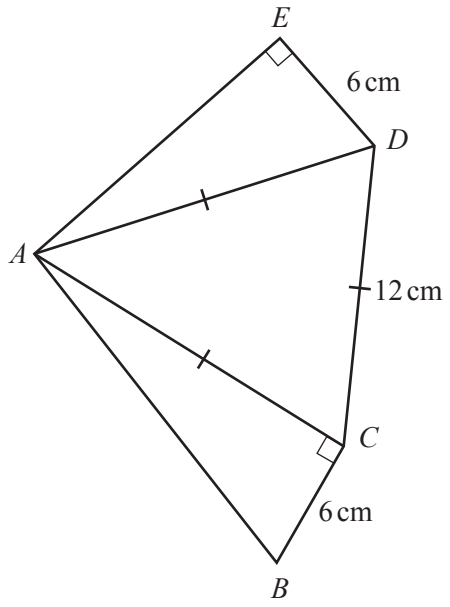
6 **(a)**



NOT TO SCALE

In the pentagon $ABCDE$, angle ACB = angle AED = 90°.
Triangle ACD is equilateral with side length 12 cm.
$DE = BC = 6$ cm.

(i) Calculate angle BAE.

Angle BAE = ... [4]

(ii) Calculate AB.

AB = ... cm [2]

(iii) Calculate AE.

AE = ... cm [3]

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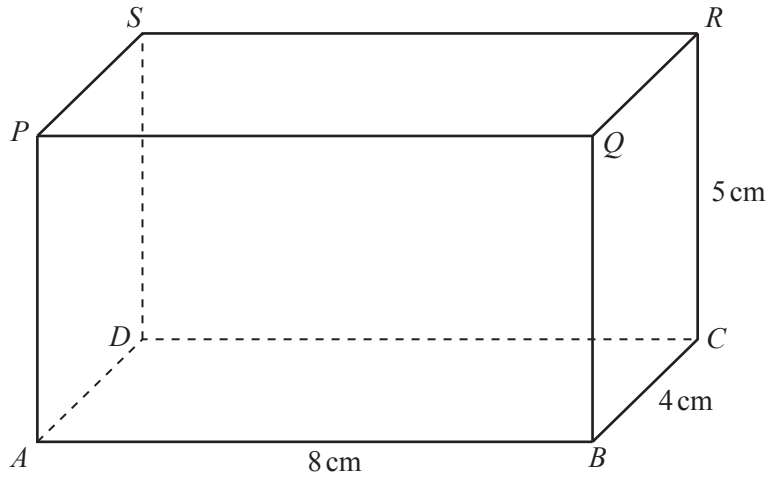
(iv) Calculate the area of the pentagon.

..... cm^2 [4]

(b)



NOT TO SCALE

The diagram shows a cuboid.
$AB = 8$ cm, $BC = 4$ cm and $CR = 5$ cm.

(i) Write down the number of planes of symmetry of this cuboid.

..... [1]

(ii) Calculate the angle between the diagonal AR and the plane $BCRQ$.

..... [4]

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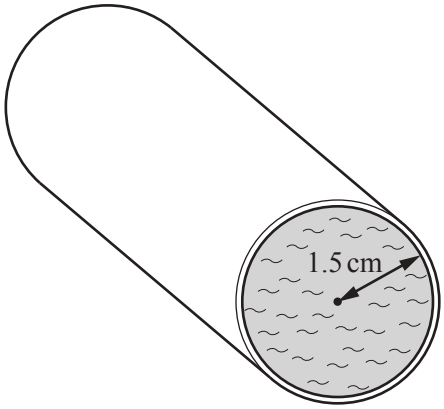
7 (a)



NOT TO SCALE

Water flows through a cylindrical pipe at a speed of 8 cm/s.
The radius of the circular cross-section is 1.5 cm and the pipe is always completely full of water.

Calculate the amount of water that flows through the pipe in 1 hour.
Give your answer in litres.

..... litres [4]

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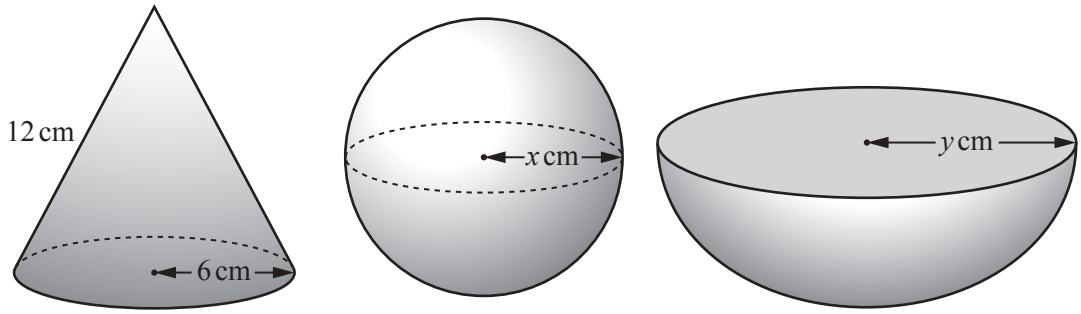
(b)

NOT TO SCALE



The diagram shows three solids.
The base radius of the cone is 6 cm and the slant height is 12 cm.
The radius of the sphere is x cm and the radius of the hemisphere is y cm.
The **total** surface area of each solid is the same.

(i) Show that the total surface area of the cone is 108π cm^2.

[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi rl$.]

[2]

(ii) Find the value of x and the value of y.

[The surface area, A, of a sphere with radius r is $A = 4\pi r^2$.]

x = ...

y = ... [4]

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8 **(a)** $\mathbf{M} = \begin{pmatrix} 2 & 1 \\ 4 & 3 \end{pmatrix}$ $\mathbf{N} = \begin{pmatrix} 1 & 2 \end{pmatrix}$ $\mathbf{P} = \begin{pmatrix} 4 \\ 1 \end{pmatrix}$

(i) For the following calculations, put a tick (✓) if it is possible or put a cross (✗) if it is not possible. There is no need to carry out any of the calculations.

Calculation	✓ or ✗
$\mathbf{N} + \mathbf{P}$	
$\mathbf{NP}$	
$\mathbf{M}^2$	
$\mathbf{N}^2$	
$\mathbf{MN}$	
$\mathbf{NM}$	

[4]

(ii) Work out $\begin{pmatrix} 1 \\ 2 \end{pmatrix} + \mathbf{P}$.

..... [1]

(iii) Work out $\mathbf{PN}$.

..... [2]

(iv) Work out $\mathbf{M}^{-1}$.

..... [2]

(b) Describe fully the **single** transformation represented by the matrix $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$.

.....

..... [3]

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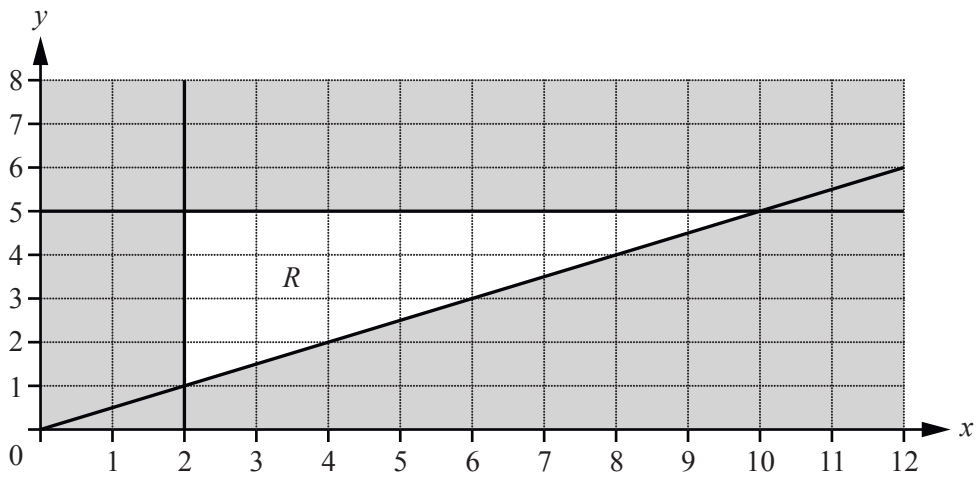
9 **(a)** Find the equation of the straight line that is perpendicular to the line $y = \frac{1}{2}x + 1$ and passes through the point (1, 3).

..... [3]

(b)



(i) Find the three inequalities that define the region R.

.....

.....

..... [4]

(ii) Find the point (x, y), with integer co-ordinates, inside the region R such that $3x + 5y = 35$.

(..... , ...) [2]

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10 **(a)** $f(x) = 2x - 3$ $g(x) = x^2 + 1$

(i) Find gg(2).

..... [2]

(ii) Find $g(x+2)$, giving your answer in its simplest form.

..... [2]

(iii) Find x when $f(x) = 7$.

$x =$ ..... [2]

(iv) Find $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [2]

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(b) $h(x) = x^x$, $x > 0$

(i) Calculate h(0.3).
Give your answer correct to 2 decimal places.

..... [2]

(ii) Find x when $h(x) = 256$.

$x =$ ..... [1]

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MATHEMATICS

Paper 0580/12
Paper 12 (Core)

Key messages

To succeed in this paper candidates need to have completed full syllabus coverage, remember necessary formulae, show all necessary working clearly and use a suitable level of accuracy.

General comments

Overall there was a good response by candidates to the demands of this paper. Working was shown extensively but it still needs emphasising that only candidates showing working will have opportunity for some credit if final answers are incorrect or given to insufficient accuracy.

Candidates should consider more carefully if their answers are sensible in relation to the context or to the form expected for the type of question.

Comments on specific questions

Question 1

Nearly all candidates gained the mark but there were a few answers of 12 15 and 11 15 seen. While the various ways of writing 12 20, such as 12:20 were allowed, writing 12 h 20 min was not acceptable as this indicated a time period rather than an actual time of day.

Answer: 12 20

Question 2

The most common error was an answer of 0.3 but most candidates answered this correctly. A small number gave responses of $\frac{1}{0.97}$ or the original probability as a fraction, $\frac{97}{100}$.

Answer: 0.03

Question 3

Most candidates recognised the types of angle shown in the examples. For those not knowing or remembering the definitions there was a mix of all three incorrect letters offered. Just a few felt a word, rather than a letter, was needed as the answer.

Answer: *C*

Question 4

This question proved challenging for many since the 11 had to be subtracted from −3 rather than added to it, resulting in a very common response of 8. While there were a lot of correct answers there were a significant number who gave 14.

Answer: −14

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Question 5

Only a few of the least able candidates didn't work out the required product of 22 and 15 correctly.

Answer: 330

Question 6

'Angles in a triangle total 180' alone doesn't answer what the given angles total. '55 + 85 + 50 = 190' alone or even 'it doesn't add up to 180' still needs more proof that the statement is incorrect.

Question 7

Some candidates offered 2-dimensional shapes, for example rectangle or triangle, even though a solid suggests 3-dimensions. Other incorrect responses included pyramid, cube or cuboid.

Answer: Triangular prism

Question 8

(a) Some candidates did not start the significant figures at the first non-zero digit resulting in answers of 0.0 or 0.5, while others added extra zeros to replace one or all of the digits dropped. While there were many correct responses, some gave 0.046 by not considering the next digit, 8.

(b) Standard form was well known and the vast majority gained the mark. Common errors were 276×10^4, 2.76×10^4 and 27.6×10^5. A significant number of candidates rounded the figures to 2.7 or 2.8.

Answers: **(a)** 0.047 **(b)** 2.76×10^6

Question 9

Most candidates drew correct reflections but a few slipped up on one of the points to gain 1 mark. A few drew a translation of the shape or a reflection incorrectly positioned.

Question 10

Nearly all candidates correctly listed the six factors although a few missed out one of them, usually 1 or 12. A small number of candidates gave multiples instead of factors.

Answer: 1, 2, 3, 4, 6, 12

Question 11

(a) This was correctly answered by the vast majority. However, a small number of candidates omitted the – sign or did not multiply the second component by 3.

(b) Directed number rules caused quite a few to not score this mark by subtracting a negative number incorrectly. However errors were less common when the subtraction of the vectors was set out in the working space. Just a small number of candidates did not understand vectors and either gave a single component or gave a 'fraction line' between the components.

Answers: **(a)** $\begin{pmatrix} -15 \\ 12 \end{pmatrix}$ **(b)** $\begin{pmatrix} 5 \\ 2 \end{pmatrix}$

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Question 12

(a) While most candidates correctly multiplied the 5 and 3, a significant number added to give an index of 8. There were a few who gave just the index without the letter (in both parts).

(b) This part was also well answered but again a number did not deal correctly with 7 – (−2) leading to responses of w^5 or w^{-9}.

Answers: **(a)** y^{15} **(b)** w^9

Question 13

This question stated it was to be answered without a calculator. Many candidates wrote 104 instead of 100 for the approximate value of 104.3. Another error was incorrectly rounding 8.72 to 8 instead of 9 while quite a significant number did not attempt any rounding, not following the instructions of the question.

Answer: 5 from 100, 9 and 7 used in the calculation

Question 14

While most candidates correctly converted dollars to euros, a significant number multiplied by the exchange rate instead of dividing, leading to 534.85.

Answer: 467.42

Question 15

(a) Many candidates answered this conversion of units correctly but there were many writing 6.45 from dividing by 100 or 6450 from multiplying by 10.

(b) This was not answered well with quite a number of candidates working out 4.1^3. Those who gave answers starting with 41 gave various numbers of zeros; the most common was to multiply by 100.

Answers: **(a)** 64.5 **(b)** 4100000

Question 16

This question had metres for the width and centimetres for the accuracy. This was challenging for many candidates who often gave centimetre bounds, 415 and 425 even though the 'w' was in metres. Others subtracted and added 0.5 instead of 0.05 or did not halve the 10 cm.

Answer: $4.15 \leq w < 4.25$

Question 17

This enlargement with scale factor 3 meant that all sides had to be 3 times the original, namely 6 cm and 12 cm, for the vertical and horizontal sides respectively. Many triangles did not have these lengths of sides. Those who drew construction lines from the centre through the points almost always scored full marks. Candidates must realise that grids are always large enough for correct solutions to be shown.

Question 18

Subtracting 0.0028 from 25000 or dividing 25000 by 0.0028 produce totally unrealistic answers but were seen at times. Errors in the decimal place or number of zeros often led to answers of 7 or 700. Dividing the correct answer by 100 gave another answer which had no meaning for the context.

Answer: 70

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Question 19

This factorising question was quite well answered with only a small minority reducing the answer to a single algebraic expression. However, many did not achieve the complete factorisation, most often giving $2g$ as the common factor of the expression. Others included g in the second term inside the bracket when it was already a common factor.

Answer: $4g\,(2g - 1)$

Question 20

To eliminate y from the equations, a simple addition of them was all that was needed. However many who realised no multiplication was needed subtracted the x terms leading to $4x$ and usually an answer of -1. Some of those who used multiplication to eliminate x did manage to find the correct answers but many made sign errors. Substitution was not really suitable for this case and rarely scored more than the method mark. Just a few ignored the instruction to show all working.

Answer: $x = 3.5$ $y = 3$

Question 21

A significant number of candidates found the volume, rather than the surface area. A correct approach often just resulted in three areas found rather than the required six. Some managed to find one area but then got mixed up between adding and multiplying lengths and areas. A number thought that four of the faces were 12 by 7.5.

Answer: 375

Question 22

The denominator of the fraction for percentage increase has to be the original amount but many candidates used a denominator of 77. Others did not understand the question and found 14% of either 63 or 77. Others who made good progress gave an answer of 22 with the general rule of 3 significant figures not being applied.

Answer: 22.2

Question 23

(a) Nearly all candidates knew the name of this quadrilateral. Rhombus was the most common incorrect answer but others were seen.

(b) Many candidates thought they had to find the area by counting squares and part squares to give an estimate. This question asked for the area to be worked out, not estimated. A significant number did multiply the diagonals and halve the answer while others split the shape into 2 or 4 triangles. When this working was recognised, some credit could be given even if errors were made. Some measured and then added or multiplied the sides. Most candidates gained the mark for the units but some omitted units or gave cm^3.

Answers: **(a)** Kite **(b)** 24 cm^2

Question 24

The question asked for the range but it needed the fifth number found first. While there were a significant number of fully correct answers, many found the two stages challenging. Having found 17 this was often given as the answer rather than continuing to the range. Many who struggled with the question simply gave $12 - 3$ or 9 as the range. While the total, 30, of the four numbers was often found a number then worked from $30x = 9.4 \times 5$ rather than $30 + x = 9.4 \times 5$.

Answer: 14

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Question 25

Division of fractions can be approached by inverting the second fraction and multiplying or working with a common denominator. Quite a number of candidates confused the two methods leading to incorrect solutions. Nearly all changed the mixed number to an improper fraction and most of these progressed to one of the correct methods leading to an improper fraction. However, a large number lost the final mark as they did not change their answer to a mixed number or if they did, it was not in its simplest form.

Answer: $7\frac{1}{2}$

Question 26

(a) While many candidates correctly applied Pythagoras' theorem, the final mark was often lost for answers of 2.9 or 3 without more accuracy in the working. The common error was to square and add the sides, leading to an answer of 6.89. Trigonometry could be used here in two calculations but that rarely produced a correct answer or one that didn't lose accuracy.

(b) Most candidates who were familiar with trigonometry gained the mark for recognising sine and giving the correct fraction, although 8.2 divided by 5.3 was seen. However, many lost the second mark for a variety of reasons. Some did not know how to find the angle from the decimal but most rounded the decimal, for example 0.65, before finding the angle.

Answers: **(a)** 2.95 **(b)** 40.3

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MATHEMATICS

Paper 0580/22
Paper 22 (Extended)

Key messages

To succeed in this paper candidates need to have completed full syllabus coverage, remember necessary formulae, show all necessary working clearly and use a suitable level of accuracy.

General comments

The level of the paper was such that all candidates were able to demonstrate their knowledge and ability. There was no evidence that candidates were short of time, as almost all attempted the last few questions. Candidates showed evidence of good basic skills with particular success in **Questions 2**, **4(b)**, **5**, **6**, **13(a)** and **17(a)**. Candidates were good at showing their working although sometimes stages in the working were omitted and so all method marks were not always awarded. It was rare to see candidates showing just the answers with no working. The main issue seen was not working to an appropriate accuracy; some candidates lost marks due to rounding or truncating prematurely within the working or giving answers to less than the required 3 significant figures.

Comments on specific questions

Question 1

Most candidates obtained the correct answer of -14. The most common incorrect answer was 8 from the working 11 – 3. A rare incorrect answer was 14.

Answer: -14

Question 2

This question was almost always answered correctly. Those with an incorrect answer occasionally attempted some sort of ratio work or made an arithmetic slip.

Answer: 330

Question 3

This question was answered correctly by many candidates. Most used the method that equated the fraction to a letter and multiplied by 100, e.g. $n = 0.2323\ldots$ and $100n = 23.2323\ldots$ and subtracting gives $99n = 23$ from which the correct answer is obtained. Common incorrect answers seen were $\frac{23}{100}$, $\frac{23}{90}$ and $\frac{21}{90}$ obtained from $0.2333\ldots$.

Answer: $\frac{23}{99}$

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Question 4

The majority of candidates understood what was being asked in both parts of this question. More errors were made in part **(a)** with two common errors apparent. The first was to confuse significant figures with decimal places, giving 0.05 as the answer; the second was to add zeros after the second significant figure, e.g. 0.047000. The vast majority of candidates demonstrated that they could convert a value to standard form in part **(b)** with only a few using an incorrect form, e.g. 27.6×10^5 or 276×10^4. Candidates should be aware that an exact answer should not be rounded and a common incorrect answer was 2.8×10^6.

Answer: **(a)** 0.047 **(b)** 2.76×10^6

Question 5

Most candidates produced a fully correct solution to this question. Just a small number incorrectly multiplied, rather than divided, 500 by 1.0697.

Answer: 467.42

Question 6

This was very well answered by most candidates. In a few cases division was used leading to answers of either over 8 million or 1.12×10^{-7}; candidates should consider the common sense of their answers. A small number gave an answer of 7 or 700, presumably from incorrect entry of the digits into the calculator or a misread of the figures. In some cases these candidates showed the correct working and still gained the method marks, even if there was a misread of the figures, but many did not.

Answer: 70

Question 7

This bearings question was one of the more challenging questions on the paper for candidates although many earned full marks. Common incorrect working and answers included $180 - 128 = 52$ and $360 - 128 = 232$.

Answer: 308

Question 8

Many of the less able candidates found this question challenging. Some tried to equate the routes $\overrightarrow{OA}$ and $\overrightarrow{BA}$ in an attempt to solve an equation. Of those who understood the idea some simply added the routes giving $3x - y$, not taking the direction of the routes given into consideration. Candidates who did realise they needed to subtract $\overrightarrow{BA}$ often had a sign error; instead of $2\mathbf{x} + 3\mathbf{y} - (\mathbf{x} - 4\mathbf{y})$ they wrote $2\mathbf{x} + 3\mathbf{y} - \mathbf{x} - 4\mathbf{y}$ so a very common incorrect answer was $\mathbf{x} - \mathbf{y}$. Some candidates were able to gain partial marks for demonstrating an understanding of the meaning of a position vector, e.g. writing the route as the letters *OB*, $OA - BA$ or $OA + AB$.

Answer: $\mathbf{x} + 7\mathbf{y}$

Question 9

A few candidates produced work with the proportional symbol used throughout. Most did start by writing the basic equation $y = k(x - 4)$. Most substituted the values $x = 16$ and $y = 3$ but a common error was to obtain $k = 4$ from $3 = 12k$. Therefore a common incorrect answer was $4(x - 4)$.

Answer: $y = \frac{1}{4}(x - 4)$

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Question 10

The majority of candidates could find the surface area of the cuboid correctly, with many quoting the correct formula at the top of their working. A significant minority thought that four of the faces were the same, the most common being four faces of 12 by 7.5 with a very common incorrect answer of 435 from $12 \times 7.5 \times 4 + 7.5 \times 5 \times 2$. Others did not consider the faces that were hidden on the diagram and so only gave half of the total surface area. The volume of the cuboid was calculated by quite a few candidates.

Answer: 375

Question 11

Many fully correct answers were seen in this question. A few candidates incorrectly gave the percentage increase as 122.2% rather than 22.2%. A small number of candidates divided the increase by 77 rather than by the original amount of 63. Some candidates lost the accuracy mark as the answer was often only given correct to 2 significant figures.

Answer: 22.2

Question 12

This question was generally well answered with most candidates scoring full marks having correctly used the given formula to find the radius. The most common reason for loss of marks was giving the answer correct to only 2 significant figures with 4.2 seen fairly often as the final answer. In some of these cases the working was shown in full and 2 marks could be awarded but in other cases the method was not fully shown so only 1, or occasionally 0, marks could be given. Occasionally candidates prematurely rounded part way through their calculation or did not use a value of π as instructed on the front cover of the exam paper causing a loss of the accuracy mark.

Answer: 4.21

Question 13

In part **(a)** most candidates were able to score the mark for their factorisation. The most common incorrect method involved trying to write the 15 or 7 outside the bracket leading to a fraction inside the bracket. Part **(b)** was a good discriminator as the most challenging question in the paper. A common incomplete solution was to take only the 4 out as a factor and stopping at $4(3(m+p)+2(m+p)^2)$. A correct partial factorisation of $(m+p)$ gained many candidates the B1 mark, e.g. $(m+p)(12+8(m+p))$. A significant number of candidates expanded the brackets but then could not factorise the resulting expression; some were able to factorise by grouping from this point.

Answer: **(a)** $k(7k-15)$ **(b)** $4(m+p)(3+2m+2p)$

Question 14

There were very few candidates confusing simple and compound interest. A common incorrect answer was 7788.60 from $6999.31 \times \left(1+\frac{2.16}{100}\right)^5$. A few used $\left(1-\frac{2.16}{100}\right)^5$. Most candidates gave the correct answer using an unrounded value for $\left(1+\frac{2.16}{100}\right)^5$. Some lost the accuracy mark as they prematurely rounded $\left(1+\frac{2.16}{100}\right)^5$ to a variety of rounded values. Most candidates were able to score 1 mark for $\left(1+\frac{2.16}{100}\right)^5$. Very occasionally 21.6% was used instead of 2.16%.

Answer: 6290

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Question 15

Most candidates found angle *OPA* to be 55° by using the triangle *OPA* and calculating 180 – 104 – 21. Many wrote it in the correct place on the diagram but very few used the correct angle notation. Candidates are advised not to write $P = 55°$ as there are several angles at *P* so it is not clear which one they are referring to without it also marked on the diagram. Many were also able to find angle *BPC* as 55° and again usually this was credited on the diagram. Only the best answers recognised angle *PBC* as half of angle *AOP*. The common incorrect methods assumed that triangle *PBC* was isosceles and from this incorrect assumption they calculated *w* as 62.5°, 55° or 70°. Another common incorrect method was to think that *OAP* and *BCP* were angles in the same segment and so $w = 21°$ was also a common incorrect answer.

Answer: 73

Question 16

Candidates demonstrated an excellent understanding of the term 'tangent' and the vast majority drew it with the accuracy required. The majority then successfully used their tangent to find the correct gradient. Candidates should check to see whether they would expect a negative or positive gradient as some gave a positive value rather than negative. After drawing a good tangent, some candidates then chose points on the curve to find a gradient, rather than finding the gradient of the tangent. Other errors included choosing points too close together to be able to complete an accurate calculation or incorrectly using $\frac{x_2 - x_1}{y_2 - y_1}$.

Answer: –0.7 to –0.3

Question 17

In part **(a)** most candidates gave a correct answer of –3. A small number of candidates incorrectly gave the value of *n* as 5^{-3}. In part **(b)** candidates were more often able to fully simplify the numerical part of the term rather than the algebraic part. Sometimes answers were not presented in their simplest form; for example, a commonly seen partially correct answer was $\frac{0.25}{m^{-1}}$.

Answer: **(a)** –3 **(b)** $\frac{m}{4}$

Question 18

This question was a challenge for many candidates. Many were able to score at least 1 mark for part of the relevant method. Many found the cross-sectional area correctly with only a relatively small number using an incorrect formula such as $2 \times \pi \times 2.6^2$, $\pi \times 2.6^3$ or $2 \times \pi \times 2.6$. Quite a few were also able to find the total length of the water that passed in one hour as $12 \times 60 \times 60 = 43\,200$ cm and many used the correct conversion from cm^3 to litres. However, there were few who managed to do all of these steps correctly. Some common incorrect answers were 0.255 from those who found the number of litres per second, 15.3 which is the number of litres per minute, 255 which is the volume in cm^3 per second or 43.2 which does not take into account the cross-sectional area. A few tried to convert to metres before finding the volume but they were rarely successful. As with other questions on the paper several candidates lost the final mark due to prematurely rounding part way through the calculation.

Answer: 917

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Question 19

This question was well answered. A small number of candidates spoiled their answer of $\frac{b}{a+b}$ by continuing to cancel the *b*'s to arrive at an answer of a or $\frac{1}{a}$. The most common mark was for the correct factorisation of $ab - b^2$. A common error for the denominator was $a^2 - b^2 = (a-b)(a-b)$. A small number of candidates gained the first two marks, then incorrectly cancelled the wrong bracket in the denominator or did not cancel at all. A significant number of candidates did not realise that they needed to factorise and merely incorrectly cancelled one a and one *b* in the numerator and denominator.

Answer: $\frac{b}{a+b}$

Question 20

Part **(a)** was usually correct and working was often shown. Of those that did not score full marks, 1 mark was often scored for two correct elements. The elements were usually found by multiplying a row and a column, but not always the correct row and column. Some candidates made arithmetic slips and it was quite common for the 7 to be 10 (from 2×5 instead of $2 + 5$). Part **(b)** was often answered correctly but less able candidates sometimes did not attempt it. Some candidates used $3x + 7 = 5$ giving $x = -\frac{2}{3}$. The most common incorrect method was to use $\frac{1}{3x-7} = 5$ giving $x = 2.4$.

Answer: **(a)** $\begin{pmatrix} 7 & 8 \\ -11 & 36 \end{pmatrix}$ **(b)** 4

Question 21

A few candidates wrote the mixed number as $\frac{24}{8}$ rather than $\frac{25}{8}$. Most gave the correct working, e.g. $\frac{25}{8} \times \frac{12}{5}$. From this the most efficient method was to cancel down to $\frac{5}{2} \times \frac{3}{1}$ and hence $\frac{15}{2}$ to $7\frac{1}{2}$. A few worked with a common denominator, $\frac{125}{40} \times \frac{96}{40}$, and then $\frac{12000}{1600}$ which was cancelled down to $\frac{15}{2}$ but this made the calculation very difficult without the use of a calculator. Some worked out $\frac{75}{24} \div \frac{10}{24}$ or $\frac{300}{96} \div \frac{40}{96}$ which are much easier to simplify to $\frac{75}{10}$ or $\frac{300}{40}$ and hence to $7\frac{1}{2}$. Very few used decimals although quite a few gave an answer of 7.5 or used 7.5 in the working then changed to $7\frac{1}{2}$. The most common errors were arithmetic errors and a few who attempted to add the fractions.

Answer: $7\frac{1}{2}$

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Question 22

The vast majority of candidates showed the correct calculation to find the acceleration in part **(a)**. More care should be taken with rounding and accuracy as many did not gain the mark available because they gave the answer 1.6, 1.66 or 1.7. Candidates should be reminded to give answers correct to 3 significant figures or indicate the recurring decimal. Some, who did not understand acceleration, calculated the area under the first section of the graph. In part **(b)** the majority of candidates understood the need to calculate the area under the graph in order to find distance travelled and most did this successfully. There were a few errors in the calculation, sometimes forgetting to halve the 15×25 for the first area, or not subtracting, or incorrectly subtracting, 15 from 50 to find the length of time in the second part of the journey. In these cases candidates were showing working and so generally gained a method mark for calculating one of the areas correctly. Candidates who did not score any marks were usually stating that distance is speed multiplied by time and simply multiplied 25 by 50. Candidates are reminded that this formula is only correct for a constant speed.

Answer: **(a)** 1.67 **(b)** 1062.5

Question 23

In part **(a)** most candidates correctly found the co-ordinates of the midpoint. The most common error was for the relevant co-ordinates of *A* and *B* to be subtracted rather than added before division by two. A few candidates wrote the co-ordinates the wrong way around. In part **(b)** candidates found it more challenging to obtain full marks with the most common score being 2. Most candidates were able to correctly find the gradient of *AB.* Fewer candidates were able to correctly find the gradient of the perpendicular to *AB* but still quite a significant number did. Some candidates either omitted to find the gradient of the perpendicular or made an error in doing this. The most common error, having correctly found the perpendicular gradient, was for candidates to find the equation of the perpendicular bisector of *AB*, by using the midpoint from part **(a)**, rather than finding the equation of the perpendicular line through point *A*. Therefore the most common incorrect answer was $y = \frac{5}{8}x - \frac{61}{16}$. A small number gave the value of the gradient of the required line as $\frac{1}{1.6}$ rather than simplifying it to an appropriate fraction or decimal such as $\frac{5}{8}$ or 0.625.

Answer: **(a)** (4.5, –1) **(b)** $y = \frac{5}{8}x + \frac{7}{4}$

Question 24

In part **(a)** most candidates were able to use the sine rule correctly to obtain full marks. Some rounded their answer to 6.0, 5.9 or sometimes just 6. Many of them showed a 3 significant figure or better answer in the working as well and so were able to achieve the final mark as their most accurate answer was credited. Those who did not show a correct figure to a greater accuracy than 2 significant figures lost the final accuracy mark. Some missed the fact that angle *PSR* is marked as 97° and treated the triangle as right-angled. In part **(b)** many candidates were able to use the cosine rule correctly and gain full marks. Some forgot to take the square root and, having reached $RQ^2 = 13.94$, stopped at that point. While most were able to solve correctly, a small number treated the cosine rule as if there were an extra pair of brackets and effectively solved $RQ^2 = (8.5^2 + 7.4^2 - 2 \times 8.5 \times 7.4) \times \cos 26$. Some candidates incorrectly assumed that triangle *PQR* was right- angled and used Pythagoras' theorem or right-angled trigonometry. In both parts of **Question 24** premature rounding part way through the calculation was sometimes a problem.

Answer: **(a)** 5.95 **(b)** 3.73

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MATHEMATICS

Paper 0580/32
Paper 32 (Core)

Key messages

To succeed in this paper candidates need to have completed full syllabus coverage, remember necessary formulae, show all working clearly and use a suitable level of accuracy. Particular attention to mathematical terms and definitions would help a candidate to answer questions from the required perspective.

General comments

This paper gave all candidates an opportunity to demonstrate their knowledge and application of mathematics. Most candidates completed the paper and made an attempt at most questions. Although a number of questions have a common theme, candidates should realise that a number of different mathematical concepts and topics may be tested within the question. The standard of presentation and amount of working shown was generally good. Centres should continue to encourage candidates to show formulae used, substitutions made and calculations performed. Attention should be made to the degree of accuracy required, and candidates should be encouraged to avoid premature rounding in workings as this often leads to an inaccurate answer and the loss of the accuracy mark. Centres should remind candidates that the rubric states that 'For π, use either your calculator value or 3.142'. When candidates change their minds and give a revised answer it is much better to rewrite their answer completely and not to attempt to overwrite their previous answer. Candidates should also be reminded to write digits clearly and distinctly. Candidates should also be encouraged to read questions again to ensure the answers they give are in the required format and answer the question set.

Comments on specific questions

Question 1

(a) (i) This part was generally answered well.

(ii) This part was generally answered well, with the equivalent fractions of $\frac{72}{360}$, $\frac{12}{60}$ and $\frac{1}{5}$ all seen. A common error was in stating the numerical value of 12.

(iii) This part was generally answered well although a common error was using the incorrect method of $\frac{30}{360} \times 100$ giving the unrealistic answer of 8.33 for the number of boys who choose Judo.

(iv) This part was again generally answered well, particularly with a follow through allowed. The equivalent fractions of $\frac{55}{60}$ and $\frac{11}{12}$ were both seen, with few decimal or percentage equivalences given.

(v) This part was generally answered well, although common errors of Swimming and Judo, and the reversed Judo and Tennis were seen.

(b) This part was generally answered correctly and accurately, although a small yet significant number of candidates did not appreciate that the angles for Running and Swimming had changed and consequently repeated the given pie chart.

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(c) This part on interpreting the two given statistical charts proved more challenging although a good number of valid answers were seen. The similarity comment was more successful with 'Swimming is most popular for both boys and girls' the most common statement, although the varieties of comments seen were not always clear or sufficient. The difference comment was less successful, with many candidates not appreciating that the original data came from 'name their favourite sport'. The common valid statements were 'Hockey least popular for girls but Judo least popular for boys', 'more boys choose Hockey than girls', 'twice as many girls chose Judo as boys' and '5 more girls than boys chose Judo', though with 'play' often used in place of 'chose'. Common errors included statements that were not differences, such as '10 chose Hockey' and '5 times as many girls chose Judo than Hockey'.

Answers: **(a)(i)** swimming **(ii)** $\frac{72}{360}$ **(iii)** 5 **(iv)** $\frac{55}{60}$ **(v)** tennis, judo

Question 2

(a) This part was generally answered well, although a small number of candidates left their answer as $\frac{8}{30}$ and so scored the method mark only. Errors included $\frac{8}{22}$ or $\frac{4}{11}$ by comparing shaded and unshaded squares, and a small number, who presumably miscounted the squares, gave answers such as $\frac{8}{25}$ and $\frac{7}{30}$.

Parts **(b)**, **(c)** and **(d)** on fractions were a challenge for a considerable number of candidates with many appearing to use a calculator and work in decimals instead.

(b) Although the common equivalent fractions of $\frac{14}{24}$, $\frac{21}{36}$ and $\frac{70}{120}$ were often seen, common errors included $\frac{583}{1000}$ (coming from $\frac{7}{12} = 0.58333$), $\frac{6}{11}$, $\frac{5}{12}$, $\frac{12}{7}$ and $\frac{-7}{12}$.

(c) Although the fraction of $\frac{11}{13}$ was often seen, and occasionally $\frac{22}{26}$ and $\frac{33}{39}$, common errors included $\frac{13}{11}$, $\frac{11}{11}$ and $\frac{-13}{11}$.

(d) Few candidates appreciated that changing $\frac{7}{9}$ to $\frac{14}{18}$ and $\frac{8}{9}$ to $\frac{16}{18}$ gave $\frac{15}{18}$ or the equivalent $\frac{5}{6}$ as one of the acceptable answers. A very common error was $\frac{7.5}{9}$ which is not an acceptable fraction. A significant number appeared to use their calculator to obtain the decimals of 0.777… and 0.888… and then to find a fraction whose decimal equivalent was between these two values; fractions such as $\frac{7}{8}$, $\frac{6}{7}$ or $\frac{9}{11}$ found in this way were acceptable.

(e) This part was generally answered well, with a good number, though not all, of candidates showing their method by giving each of the numbers as a decimal equivalent first.

Answers: **(a)** $\frac{4}{15}$ **(b)** $\frac{7k}{12k}$ **(c)** $\frac{11k}{13k}$ **(e)** 5.7×10^{-1}, $\frac{4}{7}$, 57.2%, $\sqrt{0.33}$

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Question 3

(a) This part was generally answered well with many candidates able to reach the correct simplest form of the ratio. A significant number gave answers such as 1200 : 1000 : 800, 120 : 100 : 80, 12 : 10 : 8 and 0.4 : 0.333 : 0.266…(from dividing all by 3000), all of which scored the method mark only.

(b) This part was generally answered well, although common errors of 36 000 (15%) and 240 000 – 0.15 = 23 9999.85 were seen.

(c) This part was generally answered well with the majority able to correctly apply the formula and a small number only using a year-on-year method. A small number lost the accuracy mark by premature approximation, usually of $1.035^3 = 1.108$ or 1.11, or by spoiling the method by then adding or subtracting the value of 750. Common errors included incorrect substitution, the use of an incorrect formula, and finding the simple interest.

Answers: **(a)** 6 : 5 : 4 **(b)** 204 000 **(c)** 832

Question 4

(a) This part was generally answered well, although common errors of 80, 88 and 968 were seen.

(b) This part was generally answered well, although common errors of 660, 855 and 879.75 were seen.

(c) The multiple stage method required to answer this part proved challenging for many candidates and was a good discriminator. Very few candidates used the fractional method of $1 - (\frac{1}{40} + \frac{1}{5}) = \frac{31}{40}$. The majority preferred the numerical method of $(880 - \frac{1}{40} \times 880 - \frac{1}{5} \times 880) / 880 = \frac{682}{880} = \frac{31}{40}$ although this was generally done in stages. The common error was performing a partial method only, resulting in answers of 22, 176, 198, $\frac{198}{880}$ and $\frac{9}{40}$.

(d) (i) This part was generally answered well, although common errors of 2.50 and 8.50 were seen.

(ii)(a) This part was not generally answered well, with the common errors of 13 50, 08 50 and 21 50 frequently seen.

(ii)(b) This part was generally answered well with the majority of candidates able to work out the required change.

(iii) This part was generally answered well with the majority of candidates able to work out the saving made. A small yet significant number did not appreciate that the four times given corresponded to four visits and that the four costs needed to be found first. The common error was adding the four given times together to reach 27 hours and 2 mins, although this often included an arithmetic error as well, and then attempting to use this figure to calculate costs and/or savings.

Answers: **(a)** 800 **(b)** 220 **(c)** $\frac{31}{40}$ **(d)(i)** 4.50 **(ii)(a)** 09 50 **(ii)(b)** 11.50 **(iii)** 6.50

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Question 5

(a) This part was generally answered correctly by the majority of candidates.

(b) This part was generally answered correctly by the majority of candidates.

(c) This part was generally answered well although the common errors of $2t - 6$, $2t + 2$ and $t + 2$ were seen.

(d) This part was generally answered well, particularly with a follow through method mark available. Two distinct methods were equally used. One was to use the formula from part **(c)**, which was generally followed by a correct substitution and the calculation of the correct answer. The second was to use the pattern from the diagrams, 18 + 18 + 3 + 3, or more commonly to continue the sequence from the table, 16, 18, 20, 22, ……42. Common errors included 18 × 8 = 144 or a numerical error in either of the two methods mentioned.

(e) This part was also generally answered well, particularly with a follow through method mark available. Two distinct methods were equally used. One was to use the formula from part **(c)**, which was generally followed by a correct substitution and the calculation of the correct answer, although a common error here was 2 × 80 + 6 = 166. The second was to use the pattern from the diagrams, 37 + 37 + 3 + 3, or more commonly to continue the sequence from the table, 16, 18, 20, 22, ……80. Common errors included $\frac{80}{8} = 10$ or a numerical error in either of the two methods mentioned.

Answers: **(b)** 14, 16, 18 **(c)** $2t + 6$ **(d)** 42 **(e)** 37

Question 6

(a) This part was generally answered well with the majority of candidates able to work out the required time taken as 55 minutes, although a common error was to give the arrival time of 09 55.

(b) This part was not generally answered well. Common errors included misreading the distance scale and using 30 or 19, misreading the time scale and using 15 or 20 minutes, incorrectly or omitting the conversion of the time units to hours, or the use of an incorrect formula such as $18 \times \frac{10}{60}$.

Those candidates who converted the time separately needed to show the working of $\frac{10}{60}$ and also then to use the correct 3 significant figure of 0.167 rather than 0.16 or 0.17 or 0.166.

(c) The multiple stage travel graph required to answer this part proved challenging for many candidates and was a good discriminator with the full range of marks seen. Errors were varied but included the misreading of one or both scales, plotting the library at a distance of 32 km, not appreciating the symmetry of the graph implied by the second piece of given information, incorrectly plotting the arrival time back at Keela station at 12 00 rather than using the fifth piece of information to obtain a journey time of 15 minutes and hence an arrival time of 11 35.

Answers: **(a)** 55 **(b)** 108

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Question 7

(a) This part was generally answered well with the majority of candidates able to work out the required actual distance.

(b) This part on the measurement of a bearing was not generally answered well. Common errors of 135, 225 and 315 were frequently seen.

(c) This part was generally answered well with many candidates able to correctly and accurately draw the required perpendicular bisector. A small yet significant number however did not show or use the required two pairs of arcs, commonly using one set of arcs with the midpoint determined by the use of a ruler despite the instructions given in the question. A small number did not appreciate the construction required and drew incorrect straight lines, often parallel to the given line *AT*.

(d) This part on finding the two possible positions from the data given proved more challenging although a number of totally correct answers showing all construction lines and arcs were seen. Not all candidates appreciated that they needed to draw a line from *A* at the bearing of 203°, and to draw an arc centred on *T* to show the distance of 8.8 km, and then the required positions were at the two intersections of this line and arc.

(e) This part was not generally answered well, with few candidates appreciating the method to be used when finding a reverse bearing. A very common error was 42, possibly from 360 – 318. Few candidates drew a sketch to help them with this part. A small number did attempt to draw a scale drawing but often lost the accuracy mark.

Answers: **(a)** 19.2 **(b)** 045 **(e)** 138

Question 8

(a) This part on finding the equation of a given line on a grid was reasonably well answered and proved to be a good discriminator with the full range of marks seen. Common errors included the calculation of the gradient as $\frac{1}{2}$, –2, 2 and $-\frac{1}{3}$, incorrect values for *c* due to not appreciating that the intercept could be read directly.

(b) (i) Not all candidates appreciated that the substitution of $x = 9$ into the given equation was the method to be used, although those who did were generally correct in their solution. Common errors included attempts at using the gradient.

(ii) Not all candidates appreciated that the substitution of $y = 3$ into the given equation was the method to be used, and those who did were not always correct in their solution. Common errors included an incorrect substitution giving $b = \frac{2}{3} \times 3 - 7$; following the correct $3 = \frac{2}{3}b - 7$ an incorrect second line of $9 = 2b - 7$; and again attempts at using the gradient.

(c) (i) The table was generally completed very well with the majority of candidates giving 3 correct values.

(ii) This part was well answered by many candidates who scored full marks for accurate, smoothly drawn curves. Most others scored partial marks, the marks being most commonly lost for one or more points being plotted out of tolerance, or for just plotting the points without drawing the curve through them. Other common errors included misreading the vertical scale, and plotting (1, 2) and (2, 2) at (1, –2) and (2, –2).

(iii) This part was not generally answered well, with few candidates appreciating the point to be used. Common errors included (2, 2) and (–4, –28) although many other incorrect answers were seen.

Answers: **(a)** $y = -\frac{1}{2}x + 3$ **(b)(i)** –1 **(ii)** 15 **(c)(i)** –28, –4, 2 **(iii)** (1.5, 2.25)

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Question 9

(a) (i) This part was not generally answered well, with many candidates not appreciating the method to be used to find the value required to complete the given statement. There were very few instances of either $\frac{60}{4} = 15$ or $\frac{120}{8} = 15$ seen. Common errors included 0.01, 0.1, 100 and 1000.

(ii) The multiple stage method required to answer this part proved challenging for many candidates and was a good discriminator with all possible marks seen including a number of fully correct answers with full and clear working. Common errors included, answers of 360 from just considering the rectangle; 548 from 428 + 60 + 60; finding the area of the running track rather than the total length; using two circles rather than two semi-circles; and the use of incorrect formulae.

(iii) This part was not generally answered well and few fully correct answers were seen. However many candidates were able to score the first method mark, particularly with the follow through allowed, by calculating their distance divided by 1.4. A number of candidates were then unable to convert this time in seconds into minutes. A further common error was writing 5.10 minutes as 5 minutes 10 seconds.

(b) (i) This part was generally answered well with many candidates able to work out the required number of laps. Common errors included the use of 80 seconds as 1.2 minutes, 80 × 60, 80 ÷ 60, 60 × 80 ÷ 60, 60 × 60 and 60 × 60 × 80.

(ii) This part was not generally answered well, with the majority candidates not appreciating the method to be used to find the values required to complete the given statement, although a small number of fully correct answers with clear and sufficient working were seen. Few candidates appreciated that the LCM of 88 and 80 = 880 could then be used to find the values, or that the two lists of 80, 160, 240, ……, 880 and 88, 176, 264, …..880 could be used. The common errors included, calculating the number of laps completed in one hour by 3600 ÷ 88 = 41 and 3600 ÷ 80 = 45 so 41 and 45 laps; and 88 ÷ 80 = 1.1 so 1.1 and 1 laps.

Answers: **(a)(i)** 15 **(ii)** 428 **(iii)** 5 minutes 6 seconds **(b)(i)** 45 **(ii)** 11, 10.

Question 10

(a) This part was generally answered well with many candidates able to construct the required equilateral triangle. Common errors included, drawing an isosceles triangle; omitting the construction arcs; and inaccurate measurement or drawing.

(b) This part was generally answered well with the majority of candidates able to state the correct formula for the area of a trapezium and then able to correctly work out the required area. Common errors included, use of the incorrect formula $(a + b) \times h$; incorrect calculation possibly due to the inefficient or incorrect use of a calculator when dealing with the brackets leading to the incorrect answers of 176, 124, 344 and 236.

(c) This part proved challenging for many candidates and was a good discriminator. Very few candidates used the exterior angle method of 360 ÷ (180 – 162) but those who did usually were successful and scored full marks. A small number were able to use the interior angle method to score full marks, but the majority of candidates who used this method usually made errors in the formula used, the manipulation stages or a numerical error.

(d) This part was generally answered reasonably well with many candidates able to correctly calculate the required value and score full marks. Common errors included, $363 = \frac{1}{2} \times h \times 6$; $363 = \frac{1}{2} \times h \times 6h = \frac{1}{2} \times 7h$; and transposition errors such as 363 ÷ 2.

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(e) The multiple stage method required to answer this part proved challenging for many candidates and was a good discriminator with all possible marks seen including a small number of fully correct answers with full and clear working. Common errors included the use of, $\frac{1}{2} \times \pi \times 7^2 + \frac{1}{2} \times \pi \times 3^2$; $\pi \times 7^2 \pm \pi \times 3^2$; $\frac{1}{2} \times \pi \times (7 + 3)^2$; $\frac{1}{2} \times \pi \times (7 - 3)^2$; incorrect formulae; calculating the perimeter; and a loss of accuracy due to the use of $\frac{22}{7}$.

Answers: **(b)** 280 **(c)** 20 **(d)** 11 **(e)** 62.8

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MATHEMATICS

Paper 0580/42
Paper 42 (Extended)

Key messages

The recall and application of formulae and mathematical facts to apply in varying situations is required as well as the ability to interpret situations mathematically and problem solve with unstructured questions.

Work should be clearly and concisely expressed with answers written to an appropriate accuracy.

Candidates should show full working with their answers to ensure that method marks can be awarded.

General comments

Solutions were usually well-structured with clear methods shown in the space provided on the question paper. Candidates had sufficient time to complete the paper and omissions were due to lack of familiarity with the topic or difficulty with the question rather than lack of time.

Most candidates followed the rubric instructions with respect to the values for π and three significant figure accuracy for answers. A few approximated values in the middle of a calculation in some parts and lost accuracy for the final answer as a result. On mensuration questions it is important to show the numeric substitution into formulae to obtain method marks.

The topics that were done very well included transformations, ratio, probability, use of scale and construction, algebraic graphs, statistics, standard function work, simultaneous equations and proportion. The topics that were found more challenging were using time correctly in calculations, problem solving with mensuration and similar shapes and dealing with mixed units, dealing with negative coefficients in inequalities, and generally in questions where candidates were asked to show working or show a particular result ensuring that each step in working was shown with no omissions and that answers, where appropriate, were rounded correctly.

Comments on specific questions

Question 1

(a) This part was almost always answered correctly.

(b) Most candidates completed this part correctly. The most common error was to multiply by 4.15 rather than 4.25. Other errors included calculating the time incorrectly or not having the correct form of the distance/time/speed formula.

(c) Whilst many candidates scored full marks on this question, there were a number of errors seen in both the working out of the time period and the conversion of the 1 hour 43 minutes into a suitable form, such as $1\frac{43}{60}$ or $\frac{103}{60}$. Errors in the time period usually came from candidates using 100 rather than 60 minutes in one hour. As in part **(b)**, some candidates used an incorrect formula. Other errors involved premature approximation of the decimal time interval, e.g. using 1.72.

(d) Most candidates answered this correctly. The most common incorrect answer was 850.5 from 17 × 50 + 0.5. Other errors included 16.5 × 50 and 17.05 × 50 and 17.5 × 50.5.

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(e) This part was almost always answered correctly. Occasionally there were slight inaccuracies in the answer, e.g. 10.3.

(f) (i) Whilst a number of candidates answered this correctly, a variety of errors were seen. These included calculating 29 × 68 = 1972 and then rounding to 2000, or only rounding the parcel value to 1 significant figure and calculating 29 × 70, or omitting to show 30 and 70 before the answer 2100.

(ii) The most successful candidates clearly stated that both the number of the parcels and the value of the parcels had been rounded up. Candidates who did not refer to both numbers, or who did not state the numbers used in the estimate were greater, did not score.

Answers: **(a)** 473 **(b)** 212.5 **(c)** 31.5 **(d)** 875 **(e)** 10.4 **(f)(i)** 30 × 70 and 2100 **(ii)** both values rounded up

Question 2

(a) (i) This part was answered well, with almost all candidates stating that it is a reflection. Most then gave the correct equation for the line of reflection, but a small number gave $y = 1.5$.

(ii) Candidates also responded well to this part with the majority scoring full marks. A small number omitted the angle of rotation and a few omitted or gave incorrect co-ordinates for the centre of rotation. It was extremely rare to see an answer giving two transformations.

(b) (i) This part proved to be challenging for some candidates**.** Most drew 'ray' lines from the vertices of triangle *A*, through (3, 0) but did not give the correct image, either as a result of assuming a scale factor of $\frac{1}{2}$ or using an incorrect distance from (3, 0).

(ii) This part was answered very well with just a small number giving an incorrect translation, such as misinterpreting the vector as, e.g. $\begin{pmatrix} -3 \\ -1 \end{pmatrix}$.

(iii) Many candidates recognised that the transformation matrix represents a reflection in $y = x$ and most used this to draw the correct image. A small number thought that the matrix represents a reflection in the *y*-axis and some gave a rotation. Some used the matrix multiplication method and gave the correct calculation and drew the correct image. Others incorrectly set up the multiplication with the 2 by 2 transformation matrix on the right-hand side and some made errors in the calculation.

Answers: **(a)(i)** Reflection, $x = 1.5$ **(ii)** Rotation, 90° anticlockwise, (0, –1)

Question 3

(a) Almost all candidates were able to give the correct probability of $\frac{10}{18}$ or its simplified version.

(b) Most candidates demonstrated a good understanding of probability and were able to give the correct probability. Finding the probability of only one of the two combinations, almost always red then blue, was the most common error. Multiplication of the probabilities of the two combinations was rarely seen but a few slips with the arithmetic were seen. A small number based their working on replacement of the balls.

(c) Candidates were generally more successful in this part than the previous part with many earning full marks. A small number gave only the probability of three reds and a small number gave answers that seemed to be based on picking three pairs. Again, a small number based their working on replacement of the balls.

Answers: **(a)** $\frac{5}{9}$ **(b)** $\frac{80}{153}$ **(c)** $\frac{11}{51}$

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Question 4

(a) The vast majority of candidates drew the line *AD* accurately. Most errors usually involved candidates attempting to draw angle *BDA* as 75° and misreading the protractor or drawing angle *XDA* as 75°.

(b) Almost all candidates were able to measure *BC* accurately and use it to find the actual length. Errors usually involved the inaccurate use of a ruler or using an incorrect method, such as division by 5, for the conversion.

(c) A majority of candidates were able to complete the three constructions correctly and then identify the correct region. In cases where full marks were not awarded, candidates were more likely to have drawn the arc correctly, followed by the angle bisector. In some cases, candidates drew the bisectors without showing all of the appropriate arcs or deleted them after completing the bisectors.

(d) Although many candidates were able to complete the ratio correctly, a significant number did not understand what was required and answers of 1 : 5 were very common. Other errors usually involved answers such as 50 or 5000. A number of candidates made no attempt at this part.

Answers: **(b)** 47.5 **(d)** 500

Question 5

(a) Nearly all candidates completed the table of values correctly.

(b) The graph was usually well drawn although a number of candidates joined some, or sometimes all, of the points with a ruled line. The equation of the graph indicates that this is a curve, which means that a ruler should not be used when joining the points. Candidates should draw a smooth curve with a pencil that is not so thick as to make further answers inaccurate.

(c) Many candidates drew the required straight line using a ruler. The values of *x* were usually within the accepted ranges although the answer $x = -2$ was a common error; the intersection is close to $x = -2$ but clearly to the left of it and the value must reflect this. A few omitted this part or tried an algebraic approach rather than a graphical approach to find the solutions without success.

(d) This was answered well with most candidates giving a correct answer for their curve. A few gave a fraction or decimal answer here by trying to read off the values of *x*.

Answers: **(a)** –2.1, 1.6, –1.7, 2.1 **(c)** –2.15 to –2.01, –0.45 to –0.2, 2.25 to 2.45

Question 6

(a) Whilst a number of candidates completed this part successfully, many other candidates were unable to correctly find the sector angle. Common misconceptions included assuming that angle *DOE* was 45° or that the sector area could be found using 270° and subtracting the area of the triangle *ODE* or using the minor sector angle 150° rather than 210°. Most candidates used $2\pi r$ correctly but the internal length *OA* was sometimes seen added incorrectly to the perimeter. In addition some candidates used a longer method to find angle *DOE*. These usually involved Pythagoras' theorem and then sine or tangent but frequently limited workings were shown and inaccurate figures seen.

(b) Again a number of candidates completed this part successfully. However, as with part **(a)**, there were common misconceptions with the sector angle. Most used the 'correct formula' for the area of a circle but often with an incorrect sector angle and there were a few errors seen combining the sector area with 0.75, the area of the rectangle, including some who also added the area of triangle *ODE*.

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(c) (i) This part was answered well by some candidates using the approach $\frac{their\,(\mathbf{b})}{77.44} = \frac{0.5^2}{r^2}$ and correctly rearranging to find *r* from this equation. Errors seen included rearranging incorrectly, or not squaring or square rooting correctly. Some candidates used a longer method of finding the proportion of their answer to part **(b)** that was the sector area and applying this proportion to the 77.44 to find the sector area of the larger logo. Provided they equated this to $\frac{210}{360}\pi r^2$ they were often successful in finding *r*. A number did not use the properties of the areas of similar shapes and made little progress.

(ii) A number of candidates completed this accurately and took care to convert the units from mm to cm and g to kg correctly. Common errors involved issues with the changes of units including not changing the 15 mm to cm or changing incorrectly, e.g. 150, not dividing by 1000 correctly or giving an inaccurate answer of 2.2 without any more accurate answer seen. Other errors included dividing by 19 instead of multiplying or using $V = \frac{1}{3}Al$ or $V = \frac{1}{2}Al$.

Answers: **(a)** 5.83 **(b)** 1.21 **(c)(i)** 4 **(ii)** 2.20704

Question 7

(a) (i) Most candidates were able to find the correct mid-interval values and calculate the mean correctly, although some rounded their answer and gave an answer of 111.3 or 111. Some made a slip in calculating the mid-value of an interval, e.g. $125 < p \leq 150$. A small number of candidates multiplied the frequency by the group width or found the frequency density.

(ii) Almost all candidates answered this part correctly.

(iii) Most candidates answered this correctly. The most common error was an answer of $\frac{17}{20}$, the probability of a mass less than 150 g. Some used a denominator of 200 rather than 20.

(b) Many candidates were able to find the correct frequencies. Some candidates used the values in the first column in a proportion calculation and gave frequencies 40 and 24, without considering the different group widths.

(c) (i) Many candidates were able to set up a correct equation in terms of *x* for the mean and most went on to solve it correctly. Some errors were seen in simplifying the sum of the products or in the elimination of the fraction from the equation. Some candidates reached the correct answer of 5 using a trial and error approach. A common error was to set up an incorrect equation of $\frac{45+x}{8} = 4.28$ or $\frac{179+7x}{45x} = 4.28$ or $\frac{179+7x}{45} = 4.28$.

(ii) Most candidates answered this correctly. Common errors were an answer of 2, the most common frequency, or 16, the highest frequency.

(iii) Many correct answers were seen. Common incorrect answers were 5, 9.5 or 4.5, where candidates had found the median of the frequencies or of the number of books read.

Answers: **(a)(i)** 111.25 **(ii)** 2 7 11 17 **(iii)** $\frac{3}{20}$ **(b)** 20 6 **(c)(i)** 5 **(ii)** 3 **(iii)** 4

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Question 8

(a) Almost all candidates answered this part correctly.

(b) Many candidates answered this part correctly, either giving the answer as a fraction or a decimal rounded to 3 significant figures. Some gave an answer of 1.1, but they usually showed a correct method leading to this. Some candidates evaluated f(2) correctly as 0.75, but then found $\frac{3}{0.75}$ rather than $\frac{3}{0.75+2}$.

(c) Most candidates understood how to set up the expression for the function of a function and many reached the correct answer. Common errors resulted from arithmetic slips, either $8 \times 8 = 16$ or $-40 - 5 = -35$. Some did not subtract 5 from $8(8x - 5)$ and a small number found $(8x - 5)^2$.

(d) Most candidates found the inverse function correctly. Some answers were given in terms of y rather than x and some candidates made a sign error in their rearrangement.

(e) It was common to see a correct first step of the numerator $(8x - 5)(x + 2) - 3$ with a common denominator of $(x + 2)$. Some candidates made errors in collecting terms after their expansion, usually in the negative terms. A few candidates omitted brackets around $8x - 5$ in the numerator of their expression, although some recovered from this error, and others found $f(x) - g(x)$.

(f) (i) Some clearly set out responses were seen with sufficient steps shown to demonstrate the result. It is important that candidates do not omit any steps or any terms from their working. In some cases, candidates omitted = 0 from the final equation or made slips in their working such as omitting the x in $80x$, omitting + 6 or using an incorrect sign. Some candidates missed out the $80x$ term when squaring $(8x - 5)$.

(ii) Most candidates quoted the quadratic formula correctly and showed correct substitution into this formula. Some made errors with the negative terms, often omitting brackets around $(-20)^2$. Most candidates reached the correct solutions, although they were not always given to the required accuracy. It was common to see 1.07 rather than 1.08, and 0.174 rather than 0.17.

Answers: **(a)** –3 **(b)** $\frac{12}{11}$ **(c)** $64x - 45$ **(d)** $\frac{x+5}{8}$ **(e)** $\frac{8x^2 + 11x - 13}{x+2}$ **(f)(ii)** 0.17 and 1.08

Question 9

(a) (i)(a) Some candidates were able to use the correct set notation, but answers such as € or $\subset$ were also seen in place of the correct element symbol. Many candidates used the subset symbol.

(i)(b) Most candidates answered this part correctly. The most common incorrect answer was $A \cup B$.

(ii) Most candidates gave a correct answer, with the most common error being $A' \cup B$.

(b) Most candidates shaded the correct region. Some shaded $C \cup D'$ or D'.

(c) (i) Candidates who identified that the key information was 19 studied two or three subjects usually set up a correct equation and clearly showed $x = 4$. Some used the fact that $x = 4$ to complete the Venn diagram to start with, and then used the values found to set up an equation which was a circular argument so not given credit.

(ii) Many candidates completed the Venn diagram correctly. Some inserted 23 in place of 8.

(iii) Many candidates used correct set notation for the empty set, although an answer of 0 was also common.

(iv) Many correct answers were seen but some candidates were unable to interpret the set notation.

Answers: **(a)(i)(a)** $\in$ **(i)(b)** $A \cap B$ **(ii)** B or A' **(c)(ii)** 8, 18 and 5 **(iii)** $\varnothing$ or { } **(iv)** 15

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Question 10

(a) This part was answered very well by candidates. A small minority who made sign errors in eliminating one of the variables, were still able to gain some credit for their work. Some candidates used their calculators to find the solutions and did not show working as required.

(b) This part was answered particularly well. Only a few candidates didn't use the fact that the proportionality was inverse and a few made arithmetic errors within an otherwise correct method.

(c) This part was answered less well. Nearly all candidates were able to multiply out the brackets correctly and to collect the terms in x and the numerical values correctly on either side of the inequality sign. Those who had $-20 < 4x$ were usually able to continue to give a correct answer. The difficulty arose for those who had $-4x < 20$. Many of these knew that if they divided both sides by a negative number (-4), they must also reverse the inequality sign, but many neglected to do this, giving an incorrect final answer. Some used equals signs throughout and although method marks were awarded, the final answer was incorrect.

Answers: **(a)** $x = 7$ and $y = -3$ **(b)** 2 **(c)** $x > -5$

Question 11

(a) (i) This part was generally well answered. A large majority of candidates gave the correct answer for the sixth term in sequence *A*, using differences of successive terms. The answer for the sixth term of sequence *B* was sometimes omitted and quite a number of candidates did not realise that all the terms are powers of 3 and attempted to use the differences of successive terms, the method that had worked for sequence *A*. This led to a variety of incorrect answers.

(ii)(a) This part produced a mixed response. Some candidates omitted this part and those giving a response often used the difference method, frequently giving the second differences as 4 but were not able to make further progress. Others using this method were not always able to give the correct expression but recognised that it was quadratic. Some assumed that the sequence was linear and gave incorrect answers such as $4n + 3$. A small number of candidates were able to reach the correct answer by solving three simultaneous equations.

(ii)(b) Some found this part challenging although, as in part **(a)(i)**, those who identified the terms as powers of 3 wrote down the correct answer. A small number gave the answer as 3^n. Some who had used the difference method in the previous part tried to use it in this part.

(b) (i) Almost all candidates answered this part correctly.

(ii) This part was answered well with many candidates giving the correct answer. The most frequent method used was to write down some working such as $4n^2 + n = 495$ and then to use a trial and improvement method, although not necessarily writing down the results of any trials apart from the correct answer of 11. The minority of candidates who gave the quadratic equation $4n^2 + n - 495 = 0$ and then solved it usually did so by using the quadratic formula, rather than by factorisation.

Answers: **(a)(i)** 77 243 **(ii)(a)** $2n^2 + 5$ **(ii)(b)** 3^{n-1} **(b)(i)** 21 **(ii)** 11

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Grade thresholds – March 2019

Cambridge IGCSE™ Mathematics (without Coursework) (0580)

Grade thresholds taken for Syllabus 0580 (Mathematics (without Coursework)) in the March 2019 examination.

		minimum raw mark required for grade:						
	maximum raw mark available	A	B	C	D	E	F	G
Component 12	56	–	–	36	29	22	15	8
Component 22	70	59	52	45	37	29	–	–
Component 32	104	–	–	66	54	42	30	18
Component 42	130	112	91	70	59	48	–	–

Grade A* does not exist at the level of an individual component.

The maximum total mark for this syllabus, after weighting has been applied, is **200** for the 'Extended' option and **160** for the 'Core' option.

The overall thresholds for the different grades were set as follows.

Option	Combination of Components	A*	A	B	C	D	E	F	G
AY	12, 32	–	–	–	102	83	64	45	26
BY	22, 42	187	171	143	115	96	77	–	–

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

MATHEMATICS **0580/12**

Paper 1 (Core) **March 2019**

MARK SCHEME

Maximum Mark: 56

Published

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Generic Marking Principles

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GENERIC MARKING PRINCIPLE 1:

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- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1	12 20	**1**	
2	[0].03 oe	**1**	
3	*C*	**1**	
4	–14	**1**	
5	330	**1**	
6	correct explanation	**1**	need to see 190 and 180
7	triangular prism	**1**	
8(a)	0.047	**1**	
8(b)	2.76×10^6	**1**	
9	correct reflection	**2**	**B1** for 5 vertices correct
10	1, 2, 3, 4, 6, 12	**2**	**B1** for 4 correct factors and no errors or 5 factors and 1 error
11(a)	$\begin{pmatrix} -15 \\ 12 \end{pmatrix}$	**1**	
11(b)	$\begin{pmatrix} 5 \\ 2 \end{pmatrix}$	**1**	
12(a)	y^{15} cao	**1**	
12(b)	w^9 cao	**1**	
13	$\sqrt{100}$ and $9 - 7$	**M1**	
	5	**A1**	
14	467.42 or 467	**2**	**M1** for 500 ÷ 1.0697
15(a)	64.5	**1**	
15(b)	4 100 000 oe	**1**	

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Question	Answer	Marks	Partial Marks
16	4.15, 4.25	**2**	**B1** for each one in correct position. If 0 scored **SC1** for both correct but reversed.
17	correctly enlarged triangle	**2**	**M1** for an enlargement scale factor 3 but incorrect position
18	70	**2**	**M1** for 25 000 × 0.0028 oe
19	$4g(2g-1)$	**2**	**M1** for $2g(4g-2)$, $g(8g-4)$ or $4(2g^2-g)$ or $2(4g^2-2g)$ or $2^2g(2g-1)$ as final answers
20	$[x=]3.5$, $[y=]3$ with supporting working	**2**	**M1** for a correct equation in terms of x or y. If 0 scored **SC1** for both answers correct.
21	375	**3**	**M2** for $2(12\times5+12\times7.5+5\times7.5)$ oe or **M1** for 12 × 5 or 12 × 7.5 or 5 × 7.5
22	$22\frac{2}{9}$ or 22.2 or 22.22...	**3**	**M2** for $\frac{77-63}{63}[\times100]$ oe or $\frac{77}{63}\times100$ [– 100] oe or **M1** for $\frac{77}{63}$ oe
23(a)	kite	**1**	
23(b)	24	**2**	**B1** for any relevant correct area calculated or **M1** for a fully correct method
	cm^2	**1**	
24	14	**4**	**M1** for 5×9.4 **M1** for *their* $(5\times9.4)-(3+5+10+12)$ **M1dep** for *their* greatest number − 3
25	$\frac{25}{8}$	**B1**	or $\frac{75}{24}$
	their $\frac{25}{8}\times\frac{12}{5}$ or *their* $\frac{75}{24}\div\frac{10}{24}$ oe	**M1**	$\frac{75}{24}\times\frac{24}{10}$
	their $\frac{300}{40}$ oe	**M1**	oe e.g. $\frac{1800}{240}$, $\frac{75}{10}$, $\frac{60}{8}$, $\frac{30}{4}$, $\frac{15}{2}$
	$7\frac{1}{2}$ cao	**A1**	

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Question	Answer	Marks	Partial Marks
26(a)	2.95 or 2.954 to 2.955	**3**	**M2** for $\sqrt{5.3^2 - 4.4^2}$ or better or **M1** for $5.3^2 = 4.4^2 + y^2$ or better
26(b)	40.3 or 40.26 to 40.27…	**2**	**M1** for $\sin[x =]\frac{5.3}{8.2}$

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MATHEMATICS **0580/22**

Paper 2 (Extended) **March 2019**

MARK SCHEME

Maximum Mark: 70

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

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Abbreviations

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dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1	–14	**1**	
2	330	**1**	
3	$\frac{23}{99}$	**1**	
4(a)	0.047	**1**	
4(b)	2.76×10^6	**1**	
5	467.42 or 467	**2**	**M1** for 500 ÷ 1.0697
6	70	**2**	**M1** for 25 000 × 0.0028 oe
7	308	**2**	**M1** for 180 + 128 oe or 52 seen
8	**x** + 7**y**	**2**	**M1** for a correct route
9	$[y =]\frac{1}{4}(x-4)$ oe final answer	**2**	**M1** for $y = k(x-4)$
10	375	**3**	**M2** for $2(12\times5+12\times7.5+5\times7.5)$ oe or **M1** for 12 × 5 or 12 × 7.5 or 5 × 7.5
11	$22\frac{2}{9}$ or 22.2 or 22.22...	**3**	**M2** for $\frac{77-63}{63}[\times100]$ oe or $\frac{77}{63}\times100$ [– 100] oe or **M1** for $\frac{77}{63}$ oe
12	4.21 or 4.212....	**3**	**M2** for $\sqrt{\frac{275\times3}{14.8\times\pi}}$ oe or **M1** for $275=\frac{1}{3}\times\pi\times r^2\times14.8$ oe

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Question	Answer	Marks	Partial Marks
13(a)	$k(7k-15)$ final answer	1	
13(b)	$4(m+p)(3+2m+2p)$ final answer	2	**B1** for $(m + p)(12 + 8(m + p))$ or $(m + p)(12 + 8m + 8p)$ or $(4m + 4p)(3 + 2m + 2p)$ or $(2m + 2p)(6 + 4m + 4p)$ or $2(2m + 2p)(3 + 2m + 2p)$ or $2(m + p)(6 + 4m + 4p)$
14	6290[.0…]	3	**M2** for $\dfrac{6999.31}{\left(1+\dfrac{2.16}{100}\right)^5}$ or **M1** for $[A]\left(1+\dfrac{2.16}{100}\right)^5$
15	73	3	**B1** for angle $PBC = 52$ **B1** for APO or $BPC = 55$ or APC or $OPB = 125$
16	tangent ruled at $x = 2$	**B1**	
	–0.7 to –0.3	**B2**	**dep on B1** or a close attempt at tangent at $x = 2$ or **M1** for rise/run for their tangent at $x = 2$ must see correct or implied calculation from a drawn tangent
17(a)	– 3	1	
17(b)	$\dfrac{m}{4}$ or $0.25m$ final answer	2	**B1** for $\dfrac{1}{4}$ or 0.25 or 4^{-1} or m correct in final answer
18	917 or 918 or 917.4 to 917.6	3	**M2** for $\pi \times 2.6^2 \times 12 \times 60 \times 60 \div 1000$ or **M1** for $\pi \times 2.6^2$ isw or $12 \times 60 \times 60 \div 1000$ isw If 0 scored **SC1** for figs 917 to 918
19	$\dfrac{b}{a+b}$ final answer	3	**B1** for $b(a-b)$ **B1** for $(a+b)(a-b)$
20(a)	$\begin{pmatrix} 7 & 8 \\ -11 & 36 \end{pmatrix}$	2	**B1** for 2 correct elements
20(b)	4	2	**M1** for $3x-(-1)\times(-7)=5$ or better

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Question	Answer	Marks	Partial Marks
21	$\frac{25}{8}$	**B1**	or $\frac{75}{24}$
	their $\frac{25}{8}\times\frac{12}{5}$ or *their* $\frac{75}{24}\div\frac{10}{24}$ oe	**M1**	$\frac{75}{24}\times\frac{24}{10}$
	their $\frac{300}{40}$ oe	**M1**	oe e.g. $\frac{1800}{240}$, $\frac{75}{10}$, $\frac{60}{8}$, $\frac{30}{4}$, $\frac{15}{2}$
	$7\frac{1}{2}$ cao	**A1**	
22(a)	$1\frac{2}{3}$ or 1.67 or 1.666 to 1.667	**1**	
22(b)	1062.5	**3**	**M2** for $\frac{25}{2}(50+35)$ oe or **M1** for one area
23(a)	(4.5, – 1)	**2**	**B1** for each
23(b)	$[y=]\frac{5}{8}x+\frac{7}{4}$	**4**	**M1** for $\frac{-5-3}{7-2}$ oe **M1** for –1/ *their* $-\frac{8}{5}$ **M1** for 3 = 2 × *their* gradient + *c* oe
24(a)	5.95 or 5.954...	**3**	**M2** for $\frac{7.4}{\sin 97}\times\sin 53$ or **M1** for $\frac{\sin 97}{7.4}=\frac{\sin 53}{SR}$ oe
24(b)	3.73 or 3.733 to 3.734	**4**	**M2** for $8.5^2+7.4^2-2\times8.5\times7.4\times\cos 26$ or **M1** for implicit form **A1** for 13.9[4...]

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MATHEMATICS **0580/32**

Paper 3 (Core) **March 2019**

MARK SCHEME

Maximum Mark: 104

Published

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GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

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Abbreviations

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isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	Swimming	**1**	
1(a)(ii)	$\frac{72}{360}$ oe	**1**	
1(a)(iii)	5 cao	**2**	**M1** for $\frac{30}{360}[\times 60]$ or $\frac{60}{360}[\times 30]$ or for $\frac{360}{60}$ soi by 6
1(a)(iv)	$\frac{55}{60}$ oe	**1**	**FT** $\frac{60 - \textit{their}\textbf{(a)(iii)}}{60}$ oe
1(a)(v)	Tennis, Judo	**1**	
1(b)	2 sectors drawn: Running 60° Swimming 132°	**2**	**M1** for use of 12° implied by 60° or 132° seen or for 10 [boys] or 22 [boys] seen
1(c)	A valid correct similarity and difference	**2**	**B1** for each
2(a)	$\frac{4}{15}$ cao	**2**	**M1** for $\frac{8}{30}$
2(b)	$\frac{7k}{12k}$ $k \neq 1$	**1**	
2(c)	$\frac{11k}{13k}$	**1**	
2(d)	Any correct fraction	**1**	
2(e)	5.7×10^{-1}, $\frac{4}{7}$, 57.2% , $\sqrt{0.33}$	**2**	**B1** for 3 in correct order **M1** for 3 of 0.57, 0.571[….], 0.574[….], 0.572

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Question	Answer	Marks	Partial Marks
3(a)	6 : 5 : 4	**2**	**M1** for 1200 : 1000 : 800 or better
3(b)	204 000	**2**	**M1** for $240000\times\left(1-\frac{15}{100}\right)$ oe
3(c)	832 or 831.5 or 831.53 or 831.54 or 831.538…	**3**	**M2** for $750\times\left(1+\frac{3.5}{100}\right)^3$ oe or **M1** for $750\times\left(1+\frac{3.5}{100}\right)^2$ oe
4(a)	800	**2**	**M1** for $\frac{10}{10+1}[\times 880]$ or $\frac{880}{10+1}[\times 10]$ oe
4(b)	220	**1**	
4(c)	$\frac{31}{40}$ or equivalent fraction	**3**	**M2** for $1-\left(\frac{1}{40}+\frac{1}{5}\right)$ oe or **M1** for $\frac{1}{40}+\frac{1}{5}$ oe OR **B2** for 682 or **M1** for $\frac{1}{40}\times 880$ soi by 22 or $\frac{1}{5}\times 880$ soi by 176
4(d)(i)	4.5[0]	**1**	
4(d)(ii)(a)	09 50	**1**	
4(d)(ii)(b)	11.5[0]	**1**	
4(d)(iii)	6.5[0]	**3**	**B2** for 32.5 or **M2** for ([0] + 8.5 + 12 + 12) – 26 or **M1** for [0] + 8.5 + 12 + 12
5(a)	4 tables and 14 chairs correctly drawn	**1**	
5(b)	14, 16, 18	**2**	**B1** for 2 correct or k, $k + 2$, $k + 4$
5(c)	$2t+6$ oe final answer	**2**	**B1** for $2t+j$ or $kt+6$, $k\neq 0$
5(d)	42 cao	**2**	**M1** for 18 correctly substituted into *their* **(c)**, provided a linear expression
5(e)	37 cao	**2**	**M1** for *their* **(c)** $=80$

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Question	Answer	Marks	Partial Marks
6(a)	55	**1**	
6(b)	108	**2**	**M1** for $\frac{18}{10}\times[60]$ oe
6(c)	Correct graph Ruled lines (09 55, 31.5) to (10 30, 31.5) (10 30, 31.5) to (10 50, 30) (10 50, 30) to (11 10, 12) (11 10, 12) to (11 20, 12) (11 20, 12) to (11 35, 0)	**4**	**B1** for ruled lines (09 55, 31.5) to (10 30, 31.5) and (10 30, 31.5) to (10 50, 30) **B1** for ruled line from (*their* 10 50, 30) to (*their* 10 50+20, 12) **B1** for ruled line from (*their* 11 10, 12) to (*their* 11 10+10, 12) **B1** for ruled line (*their* 11 20, 12) to (*their* 11 20+15, 0) or for 15 mins soi
7(a)	19.2	**2**	**B1** for 9.6 cm seen
7(b)	[0]45	**1**	
7(c)	Correct ruled perpendicular bisector with 2 pairs of arcs	**2**	**B1** for correct bisector drawn without arcs or for two pairs of correct arcs
7(d)	*K* marked correctly twice	**4**	**B1** for line indicating correct bearing of 203° measured **B2** for an arc radius 4.4 cm, centre *T*, the arc length being fit for purpose or **B1** for an arc of any radius, centre *T* or **M1** for 8.8 ÷ 2 soi by 4.4 *K* marked correctly once implies 3 marks
7(e)	138	**2**	**M1** for $318-180$ or a correct diagram seen

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Question	Answer	Marks	Partial Marks
8(a)	$[y=]-\frac{1}{2}x+3$	**3**	**B2** for $[y=]-\frac{1}{2}x+c$ or **M1** for $\frac{rise}{run}$ or $m=\pm\frac{1}{2}$ oe and **B1** for $[y=]kx+3$, $k\neq 0$ or $c=3$
8(b)(i)	–1	**2**	**M1** for $[a=]\frac{2}{3}\times 9-7$ or better
8(b)(ii)	15	**2**	**M1** for $3=\frac{2}{3}b-7$ or better
8(c)(i)	–28, –4, 2	**3**	**B1** for each
8(c)(ii)	correct smooth curve	**4**	**B3FT** for 6 or 7 correct plots or **B2FT** for 4 or 5 correct plots or **B1FT** for 2 or 3 correct plots
8(c)(iii)	(1.5 , 2.25)	**1**	accept (x, y) where $1<x<2$ and $2<y<4$
9(a)(i)	15	**2**	**B1** for 4 cm or 8 cm
9(a)(ii)	428 or 429 or 428.4 or 428.5 or 428.49 to 428.52	**3**	**M2** for $120\times 2+60\pi$ or **M1** for 60π If 0 scored **SC1** for 28.6 or 28.56 to 28.57
9(a)(iii)	5 minutes 6 seconds	**3**	**FT** *their* **(a)(ii)** **M1** for $\frac{\textit{their}\ \textbf{(a)(ii)}}{1.4}$ **M1dep** for ÷ 60
9(b)(i)	45	**2**	**M1** for $\frac{60\times 60}{80}$ oe
9(b)(ii)	11, 10	**3**	**B2** for 880 or $8\times 10\times 11$ oe or **B1** for 880k, $k>1$ or **M1** for 80, 160, 240.. and 88, 176, 264,… or 8×10 and 8×11 seen

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Question	Answer	Marks	Partial Marks
10(a)	correct triangle drawn with arcs	**2**	**B1** for correct triangle without arcs or for correct arcs
10(b)	280	**2**	**M1** for $\frac{1}{2}(24+16)\times 14$ oe
10(c)	20	**3**	**M2** for $\frac{360}{180-162}$ or better or **M1** for $180-162$ or $(n-2)\times 180=162n$ or better
10(d)	11	**3**	**M2** for $h^2=\frac{363}{3}$ or better or **M1** for $\frac{1}{2}\times h\times 6h=363$ oe
10(e)	62.8 or 62.83 to 62.84	**3**	**M2** for $\frac{1}{2}\pi\times 7^2-\frac{1}{2}\pi\times 3^2$ oe or **M1** for $\left[\frac{1}{2}\times\right]\pi\times 7^2$ or $\left[\frac{1}{2}\times\right]\pi\times 3^2$

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MATHEMATICS **0580/42**

Paper 4 (Extended) **March 2019**

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the March 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **8** printed pages.

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Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	473	**2**	**M1** for 645 ÷ (11 + 4)
1(b)	212.5	**2**	**M1** for 50×4.25
1(c)	31.5 or 31.45 to 31.46	**3**	**M2** for $54 \div 1\frac{43}{60}$ oe or **M1** for time =1h 43min or 103 [mins] or 54 ÷ *their* time
1(d)	875	**1**	
1(e)	10.4 or 10.38 to 10.39	**1**	
1(f)(i)	30 [×] 70 and 2100	**1**	
1(f)(ii)	both numbers rounded up oe	**1**	
2(a)(i)	Reflection $x = 1.5$	**2**	**B1** for each
2(a)(ii)	Rotation (0, –1) 90° [anticlockwise] oe	**3**	**B1** for each
2(b)(i)	Image at (5, –1) (6, –1) (6, –3)	**2**	**B1** for correct size and orientation but wrong position If 0 scored, **SC1** for enlargement SF $\frac{1}{2}$ with centre (3, 0)
2(b)(ii)	Image at (–6, 3) (–4, 3) (–6, 7)	**2**	**B1** for translation $\begin{pmatrix} -3 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 1 \end{pmatrix}$
2(b)(iii)	Image at (2, –1) (2, –3) (6, –3)	**3**	**M2** for 3 correct coordinates soi or **M1** for $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}\begin{pmatrix} -1 & -3 & -3 \\ 2 & 2 & 6 \end{pmatrix}$ or **B1** for stating reflection in $y = x$

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Question	Answer	Marks	Partial Marks
3(a)	$\frac{5}{9}$ oe	**1**	
3(b)	$\frac{80}{153}$ oe	**3**	**M2** for $2\times\frac{10}{18}\times\frac{8}{17}$ oe or **M1** for $\frac{10}{18}\times\frac{8}{17}$ oe If 0 scored, **SC1** for $\frac{160}{324}$ oe
3(c)	$\frac{11}{51}$ oe	**4**	**M3** for $\frac{10}{18}\times\frac{9}{17}\times\frac{8}{16}+\frac{8}{18}\times\frac{7}{17}\times\frac{6}{16}$ oe or **M2** for $\frac{10}{18}\times\frac{9}{17}\times\frac{8}{16}$ oe or $\frac{8}{18}\times\frac{7}{17}\times\frac{6}{16}$ oe or **M1** for $\frac{10}{18},\frac{9}{17},\frac{8}{16}$ or $\frac{8}{18},\frac{7}{17},\frac{6}{16}$ If 0 scored, **SC1** for $\frac{1512}{5832}$ oe
4(a)	Correct ruled line with *D* marked	**2**	**B1** for correct ruled line or short line
4(b)	47.5	**2**	**B1** for 9.5 or 95 mm seen or for answer figs 465 to figs 485
4(c)	Correct arc radius 7 cm	**2**	**B1** for complete arc other radius, centre *A* or correct but short arc
	Correct ruled perpendicular bisector of *BC* with correct pairs of arcs	**2**	**B1** for correct perpendicular bisector without correct arcs or for correct arcs, no/incorrect line
	Correct ruled bisector of angle *BCD* with correct pairs of arcs	**2**	**B1** for correct angle bisector without correct arcs or for correct arcs, no/incorrect line
	correct region shaded	**1**	Dep on at least **B1B1B1** and five boundaries one of which is an arc
4(d)	[1 :] 500	**1**	

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Question	Answer	Marks	Partial Marks
5(a)	–2.1, 1.6, –1.7, 2.1	**3**	**B2** for 3 correct or **B1** for 2 correct
5(b)	Fully correct curve	**4**	**B3FT** for 8 or 9 correct plots or **B2FT** for 6 or 7 correct plots or **B1FT** for 4 or 5 correct plots
5(c)	line $y = \frac{1}{2}(1-x)$ ruled	**M2**	**M1** for line with gradient $-\frac{1}{2}$ **M1** for line through $(0, \frac{1}{2})$ but not $y = \frac{1}{2}$
	–2.15 to –2.01 –0.45 to –0.2 2.25 to 2.45	**B2**	**B1** for two correct
5(d)	number of intersections of *their* curve and the line $y = 1$	**1**	strict **FT** for *their* curve
6(a)	5.83 or 5.832 to 5.833	**5**	**B2** for sector angle = 210 soi or **M1** for $[\cos DOE =]\frac{0.25}{0.5}$ oe **M2** for $\frac{their210}{360} \times 2 \times \pi \times 0.5 + 2 \times 1.5 + 2 \times 0.5$ oe or **M1** for $\frac{their210}{360} \times 2 \times \pi \times 0.5$ oe isw
6(b)	1.21 or 1.208…	**3**	**M2** for $\frac{their210}{360} \times \pi \times 0.5 \times 0.5 + 1.5 \times 0.5$ oe or **M1** for $\frac{their210}{360} \times \pi \times 0.5 \times 0.5$ oe isw
6(c)(i)	4[.00...]	**3**	**M2** for $0.5 \times \sqrt{\frac{77.44}{their(\mathbf{b})}}$ oe or **M1** for $\sqrt{\frac{77.44}{their(\mathbf{b})}}$ or $\sqrt{\frac{their(\mathbf{b})}{77.44}}$ or for $\frac{their(\mathbf{b})}{77.44} = \frac{0.5^2}{r^2}$ oe
6(c)(ii)	2.20704	**3**	**M2** for 77.44 × 1.5 × 19 ÷ 1000 oe or **M1** for figs 2207[04] or figs 221 seen or [vol =] 77.44 × 1.5

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Question	Answer	Marks	Partial Marks
7(a)(i)	111.25	**4**	**M1** for midpoints **soi** (25, 75, 112.5, 137.5, 175) **M1** for $\sum fx$ with x in correct interval including both boundaries **M1** (dep on 2nd **M1**) for $\sum fx \div 20$
7(a)(ii)	2 7 11 17	**2**	**B1** for three correct
7(a)(iii)	$\frac{3}{20}$ oe	**1**	
7(b)	20 6	**2**	**B1** for one correct value or [SF =] 5 or $\frac{1}{5}$ oe
7(c)(i)	5 nfww	**3**	**M2** for $\sum fx \div \sum f = 4.28$ oe or **M1** for $179 + 7x$ oe or $4.28 \times (45 + x)$ oe seen
7(c)(ii)	3	**1**	
7(c)(iii)	4	**1**	
8(a)	–3	**1**	
8(b)	$\frac{12}{11}$ oe	**2**	**M1** for $\dfrac{3}{\frac{3}{x+2}+2}$ soi
8(c)	$64x - 45$ final answer	**2**	**M1** for $8(8x-5)-5$ isw
8(d)	$\frac{x+5}{8}$ oe final answer	**2**	**M1** for a correct first step $y+5=8x$, $\frac{y}{8}=x-\frac{5}{8}$ or $x=8y-5$
8(e)	$\frac{8x^2+11x-13}{x+2}$ final answer	**3**	**M1** for $(8x-5)(x+2)-3$ oe isw **B1** for common denominator $(x+2)$

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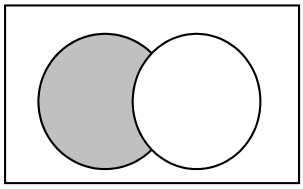
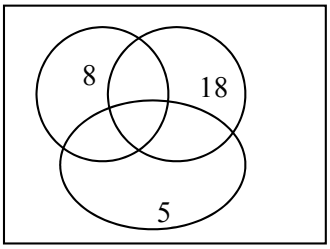
Question	Answer	Marks	Partial Marks
8(f)(i)	$(8x-5)^2+6 = 19$	**M1**	
	$64x^2-40x-40x+25$	**B1**	
	$64x^2-40x-40x+25+6=19$ oe leading to $16x^2-20x+3=0$	**A1**	with no errors and must show $(8x-5)^2+6 = 19$ with no omissions after this
8(f)(ii)	$\dfrac{[--]20\pm\sqrt{([-]20)^2-4(16)(3)}}{2\times16}$ oe	**2**	**B1** for $\sqrt{([-]20)^2-4(16)(3)}$ or better or **B1** for $\dfrac{[--]20+\sqrt{q}}{2(16)}$ oe or $\dfrac{[--]20-\sqrt{q}}{2(16)}$
	0.17 and 1.08 final ans	**2**	**B1** for each If 0 scored, **SC1** for answer 0.2 and 1.1 or answer – 0.17 and –1.08 or 0.174... and 1.075 to 1.076 seen or 0.17 and 1.08 seen in working
9(a)(i)(a)	$\in$	**1**	
9(a)(i)(b)	$A\cap B$	**1**	
9(a)(ii)	B or A'	**1**	
9(b)		**1**	
9(c)(i)	$3x+7=19$ oe	**M1**	must see 19 and 7
	$3x=19-7$ or better leading to $x = 4$	**A1**	with no errors seen
9(c)(ii)		**2**	**B1** for 2 correct
9(c)(iii)	$\varnothing$ or { }	**1**	
9(c)(iv)	15	**1**	

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Question	Answer	Marks	Partial Marks
10(a)	correctly equating one set of coefficients	**M1**	or making x or y the subject of one equation correctly
	correct method to eliminate one variable	**M1**	or substitution for x or y for *their* rearranged formula
	$x = 7$ $y = -3$	**A2**	**A1** for one correct value If A0 scored, **SC1** for 2 values satisfying one of the original equations or if no working shown, but 2 correct answers given
10(b)	2	**3**	**M1** for $y = \frac{k}{(x+3)^2}$ oe **M1** for $y = \frac{their\ k}{(7+3)^2}$ oe OR **M2** for $8(2+3)^2 = y(7+3)^2$ oe
10(c)	$x > -5$ final answer	**3**	**M1** for $3x - 6 < 7x + 14$ **M1** for $their(-6) - their14 < 7x - 3x$ oe
11(a)(i)	77 243	**2**	**B1** for each
11(a)(ii)(a)	$2n^2 + 5$ oe	**2**	**M1** for a quadratic expression as the answer or **B1** for common 2nd difference of 4
11(a)(ii)(b)	3^{n-1} oe	**2**	**B1** for 3^k oe where k is a linear function of n
11(b)(i)	21	**1**	
11(b)(ii)	11	**3**	**B2** for $(4n+45)(n-11)$ seen or **B1** for $4n^2 + n + 3 = 498$ oe

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CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

MATHEMATICS **0580/12**

Paper 1 (Core) **February/March 2019**

1 hour

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 56.

This document consists of **10** printed pages and **2** blank pages.

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[Turn over

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1 A mathematics lesson starts at 11 05.
The lesson lasts for 75 minutes.

Work out the time that the lesson ends.

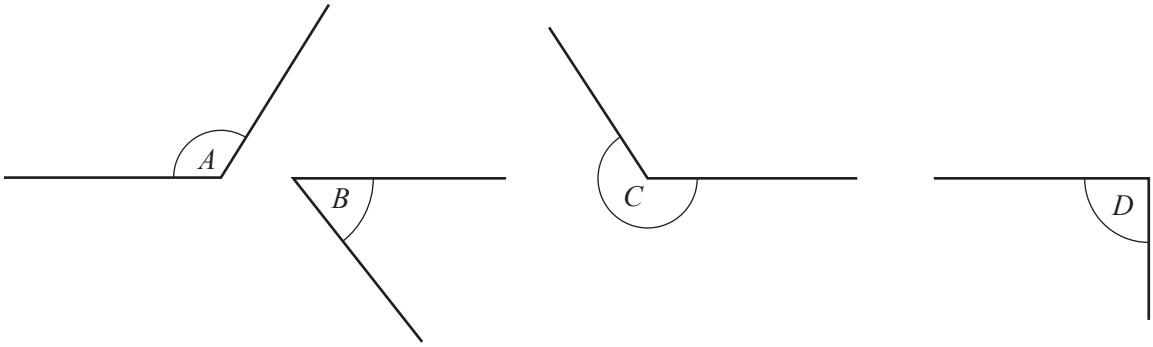
..... [1]

2 The probability that it will be sunny tomorrow is 0.97 .

Work out the probability that it will not be sunny tomorrow.

..... [1]

3



Complete the statement.

Angle ..... is a reflex angle.

[1]

4 The temperature at 07 00 is −3 °C.
This temperature is 11 °C higher than the temperature at 01 00.

Find the temperature at 01 00.

..... °C [1]

5 Jodi swims 22 lengths of a swimming pool to raise money for charity.
She receives $15 for each length she swims.

Calculate how much money Jodi raises for charity.

$ ..... [1]

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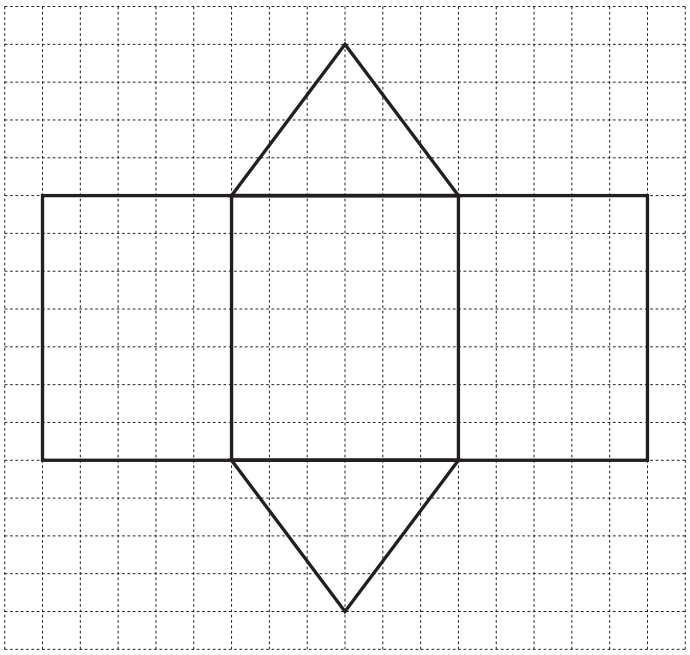
6 A student measures the angles in a triangle as 55°, 85° and 50°.

Explain why the student is incorrect.

..... [1]

7 The diagram shows a net of a solid.



Write down the mathematical name of the solid.

..... [1]

8 **(a)** Write 0.046 875 correct to 2 significant figures.

..... [1]

(b) Write 2 760 000 in standard form.

..... [1]

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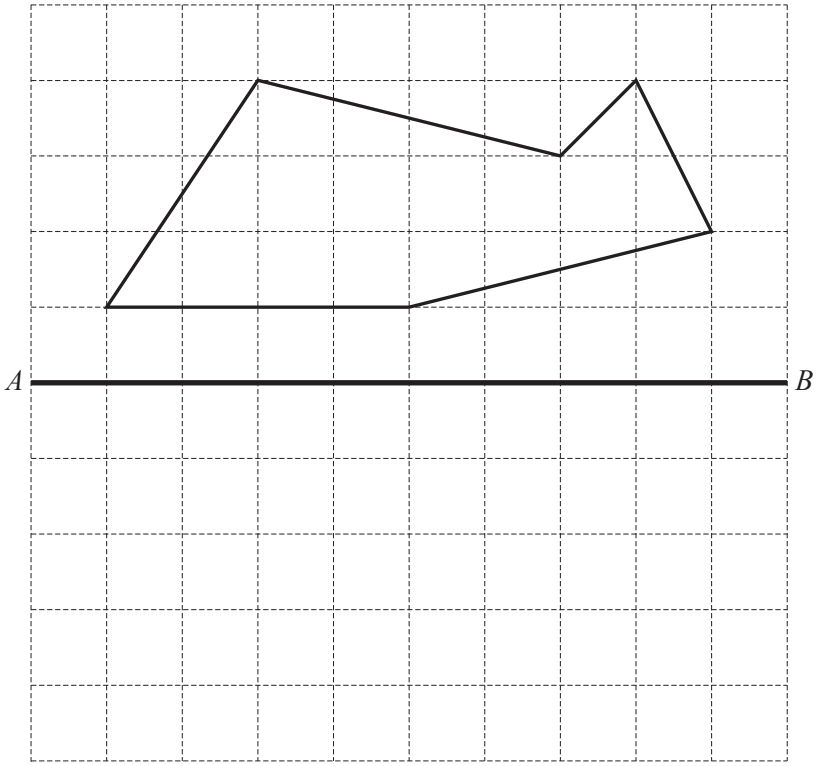
9 Reflect this shape in the line AB.



[2]

10 Write down the six factors of 12.

....., ..., ..., ..., ..., ... [2]

11

$$\mathbf{e} = \begin{pmatrix} -5 \\ 4 \end{pmatrix} \qquad \mathbf{f} = \begin{pmatrix} 0 \\ 6 \end{pmatrix}$$

Write as a single vector

(a) $3\mathbf{e}$,

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(b) $\mathbf{f} - \mathbf{e}$.

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

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12 Simplify.

(a) $(y^5)^3$

..... [1]

(b) $w^7 \div w^{-2}$

..... [1]

13 **Without using a calculator**, estimate, by rounding each number correct to 1 significant figure,

$$\frac{\sqrt{104.3}}{8.72 - 7.389}.$$

You must show all your working.

..... [2]

14 A tourist changes \$500 to euros (€) when the exchange rate is €1 = \$1.0697 .

Calculate how many euros he receives.

€..... [2]

15 **(a)** Change 645 mm into cm.

..... cm [1]

(b) Change 4.1 m^3 into cm^3.

.....cm^3 [1]

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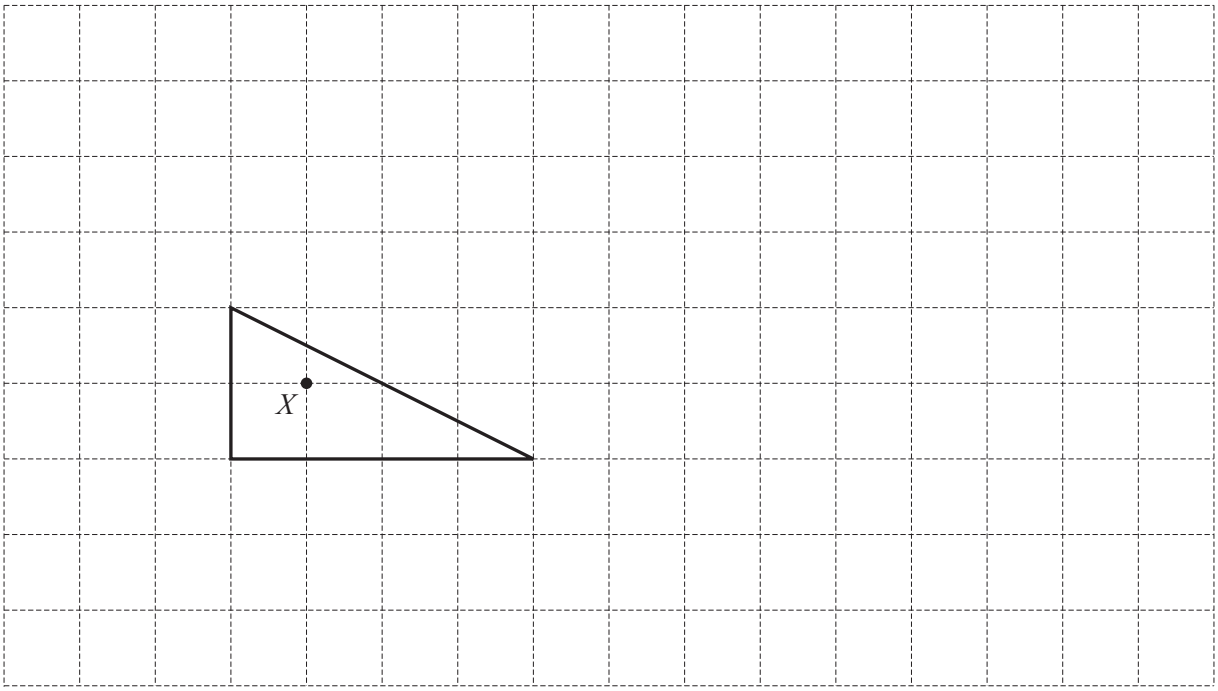
16 The width, w metres, of a room is 4.2 metres, correct to the nearest 10 centimetres.

Complete this statement about the value of w.

..... $\leqslant w <$ ..... [2]

17



Draw the enlargement of the triangle by scale factor 3, centre X.

[2]

18 The probability that a sweet made in a factory is the wrong shape is 0.0028 .
One day, the factory makes 25 000 sweets.

Calculate the number of sweets that are expected to be the wrong shape.

..... [2]

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19 Factorise completely.

$$8g^2 - 4g$$

..... [2]

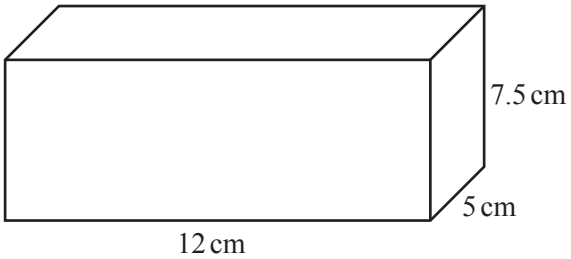
20 Solve the simultaneous equations.
You must show all your working.

$$6x - 3y = 12$$
$$2x + 3y = 16$$

$x =$ .....

$y =$ ..... [2]

21



NOT TO SCALE

Calculate the total surface area of the cuboid.

.....cm^2 [3]

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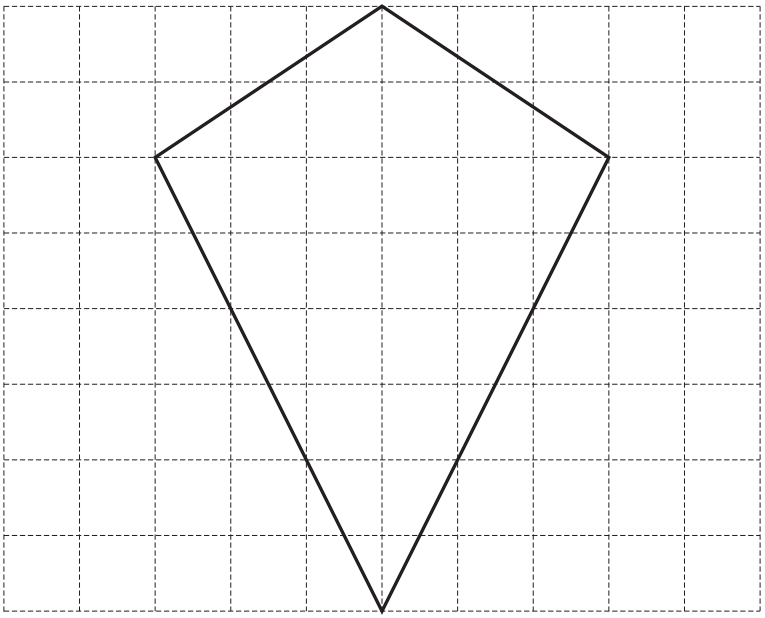
22 The number of passengers on a train increases from 63 to 77.

Calculate the percentage increase.

.....% [3]

23



The diagram shows a quadrilateral on a 1 cm^2 grid.

(a) Write down the mathematical name of this quadrilateral.

..... [1]

(b) Work out the area of this quadrilateral.
Give the units of your answer.

.... [3]

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24 Five numbers have a mean of 9.4 .
Four of the numbers are 3, 5, 10 and 12.

Work out the range of the five numbers.

..... [4]

25 **Without using a calculator**, work out $3\frac{1}{8} \div \frac{5}{12}$.
You must show all your working and give your answer as a mixed number in its simplest form.

..... [4]

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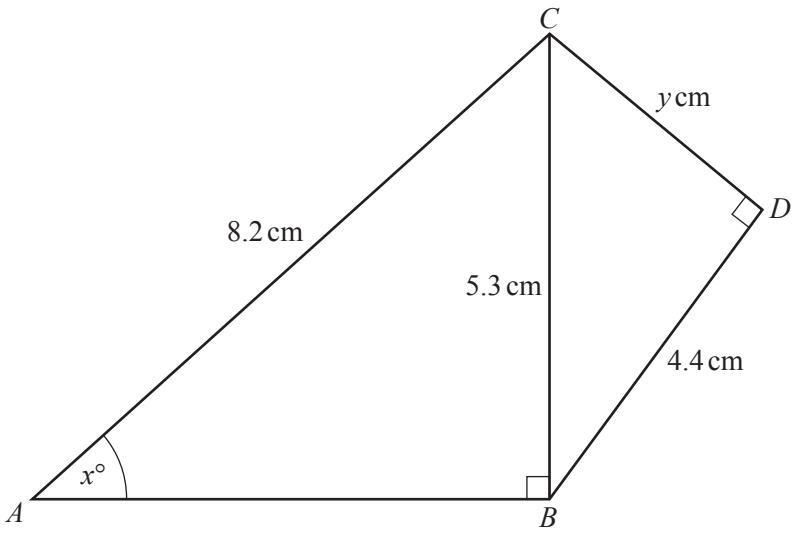

NOT TO SCALE

Triangles *ABC* and *BCD* are both right-angled triangles.

(a) Calculate the value of y.

$y =$ ..... [3]

(b) Calculate the value of x.

$x =$ ..... [2]

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CANDIDATE NAME	

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MATHEMATICS **0580/22**

Paper 2 (Extended) **February/March 2019**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 70.

This document consists of **11** printed pages and **1** blank page.

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[Turn over

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1 The temperature at 07 00 is −3 °C.
This temperature is 11 °C higher than the temperature at 01 00.

Find the temperature at 01 00.

..... °C [1]

2 Jodi swims 22 lengths of a swimming pool to raise money for charity.
She receives \$15 for each length she swims.

Calculate how much money Jodi raises for charity.

\$ ..... [1]

3 Write the recurring decimal $0.\dot{2}\dot{3}$ as a fraction.

..... [1]

4 **(a)** Write 0.046 875 correct to 2 significant figures.

..... [1]

(b) Write 2 760 000 in standard form.

..... [1]

5 A tourist changes \$500 to euros (€) when the exchange rate is €1 = \$1.0697 .

Calculate how many euros he receives.

€ ..... [2]

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6 The probability that a sweet made in a factory is the wrong shape is 0.0028 .
One day, the factory makes 25 000 sweets.

Calculate the number of sweets that are expected to be the wrong shape.

..... [2]

7 The bearing of Alexandria from Paris is 128°.

Calculate the bearing of Paris from Alexandria.

..... [2]

8 O is the origin, $\overrightarrow{OA} = 2\mathbf{x} + 3\mathbf{y}$ and $\overrightarrow{BA} = \mathbf{x} - 4\mathbf{y}$.

Find the position vector of B, in terms of $\mathbf{x}$ and $\mathbf{y}$, in its simplest form.

..... [2]

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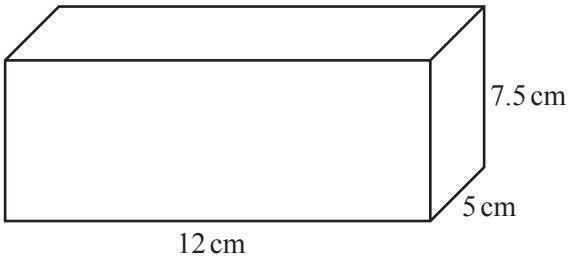
9 y is directly proportional to $(x-4)$.
When $x = 16$, $y = 3$.

Find y in terms of x.

$y =$ ..... [2]

10



NOT TO SCALE

Calculate the total surface area of the cuboid.

..... cm^2 [3]

11 The number of passengers on a train increases from 63 to 77.

Calculate the percentage increase.

..... % [3]

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12 A cone with height 14.8 cm has volume 275 cm^3.

Calculate the radius of the cone.

[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm [3]

13 Factorise.

(a) $7k^2 - 15k$

..... [1]

(b) $12(m+p) + 8(m+p)^2$

..... [2]

14 Eric invests an amount in a bank that pays compound interest at a rate of 2.16% per year.
At the end of 5 years, the value of his investment is \$6 999.31 .

Calculate the amount Eric invests.

\$ ..... [3]

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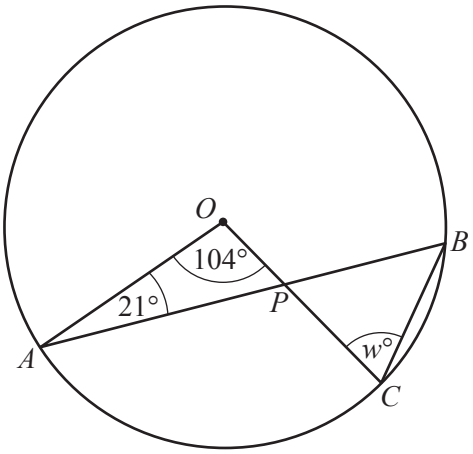
15



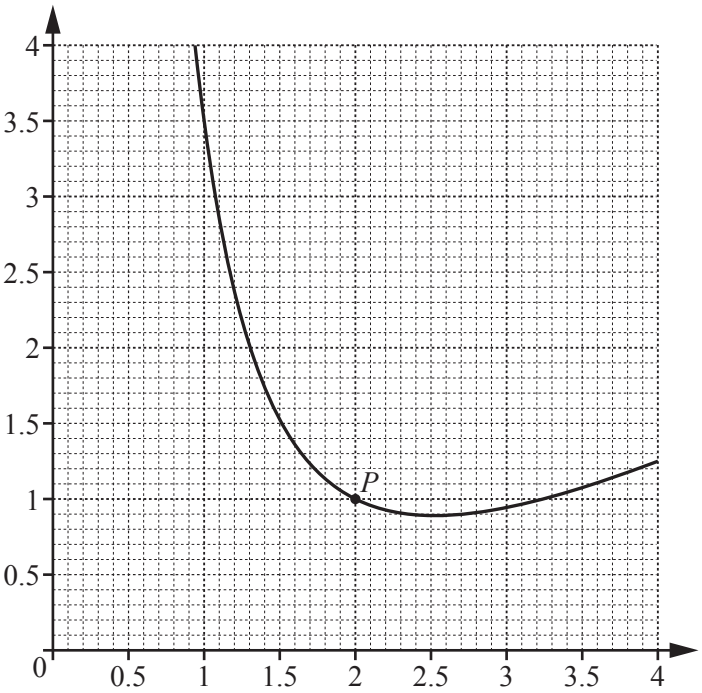
NOT TO SCALE

A, B and C are points on the circle, centre O.
AB and OC intersect at P.

Find the value of w.

$w =$ ..... [3]

16



By drawing a suitable tangent, estimate the gradient of the curve at the point P.

[3]

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17 **(a)** Find the value of n when $5^n = \frac{1}{125}$.

$n =$ ..... [1]

(b) Simplify $\left(\frac{64}{m^3}\right)^{-\frac{1}{3}}$.

..... [2]

18 A pipe is full of water.
The cross-section of the pipe is a circle, radius 2.6 cm.
Water flows through the pipe into a tank at a speed of 12 centimetres per second.

Calculate the number of litres that flow into the tank in one hour.

..... litres [3]

19 Simplify. $\frac{ab - b^2}{a^2 - b^2}$

..... [3]

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20 **(a)** Work out $\begin{pmatrix} 2 & -1 \\ 4 & 3 \end{pmatrix}\begin{pmatrix} 1 & 6 \\ -5 & 4 \end{pmatrix}$.

$\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [2]

(b) Find the value of x when the determinant of $\begin{pmatrix} 3 & -1 \\ -7 & x \end{pmatrix}$ is 5.

$x =$ ..... [2]

21 **Without using a calculator**, work out $3\frac{1}{8} \div \frac{5}{12}$.
You must show all your working and give your answer as a mixed number in its simplest form.

..... [4]

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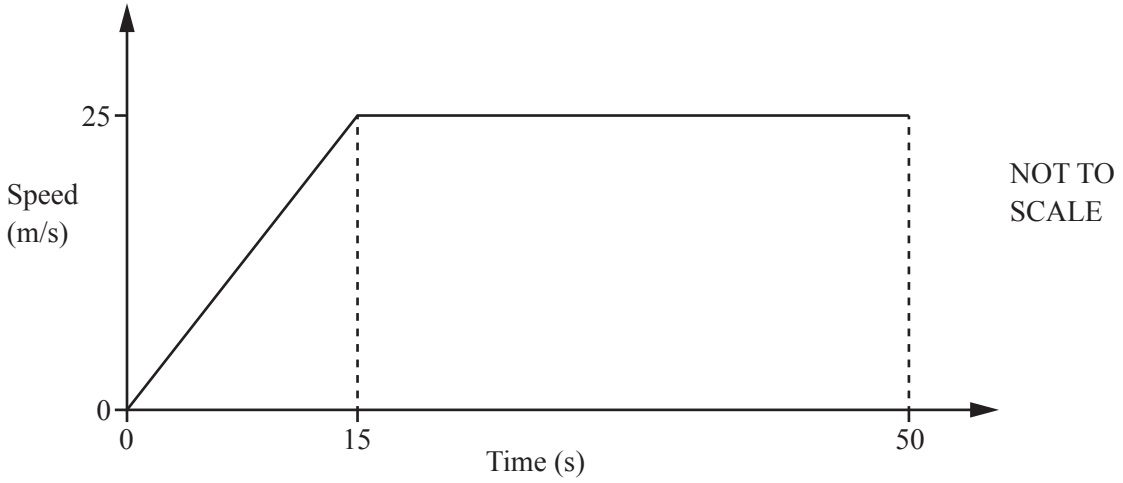

The speed–time graph shows the first 50 seconds of a journey.

Calculate

(a) the acceleration during the first 15 seconds,

..... m/s^2 [1]

(b) the distance travelled in the 50 seconds.

..... m [3]

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23 A is the point (2, 3) and B is the point (7, −5).

(a) Find the co-ordinates of the midpoint of AB.

(....., ...) [2]

(b) Find the equation of the line through A that is perpendicular to AB.
Give your answer in the form $y = mx + c$.

$y =$ ..... [4]

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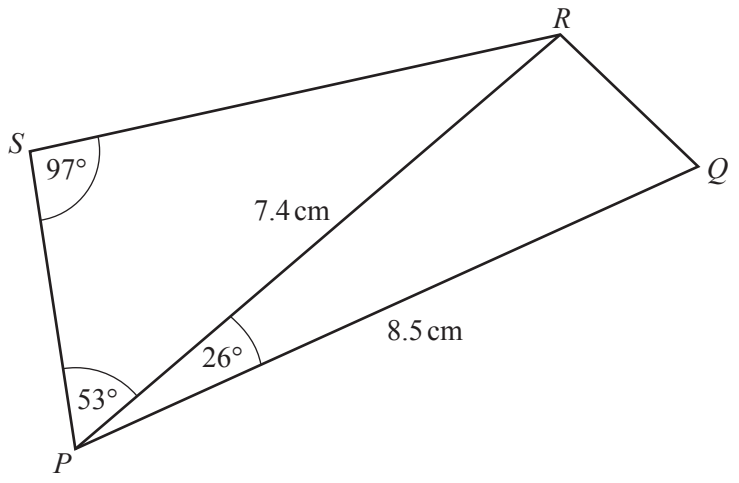
24



NOT TO SCALE

Calculate

(a) SR,

$SR =$ ..... cm [3]

(b) RQ.

$RQ =$ ..... cm [4]

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CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

7998121363

MATHEMATICS **0580/32**

Paper 3 (Core) **February/March 2019**

2 hours

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

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Write your centre number, candidate number and name on all the work you hand in.
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Answer **all** questions.
If working is needed for any question it must be shown below that question.
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If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 104.

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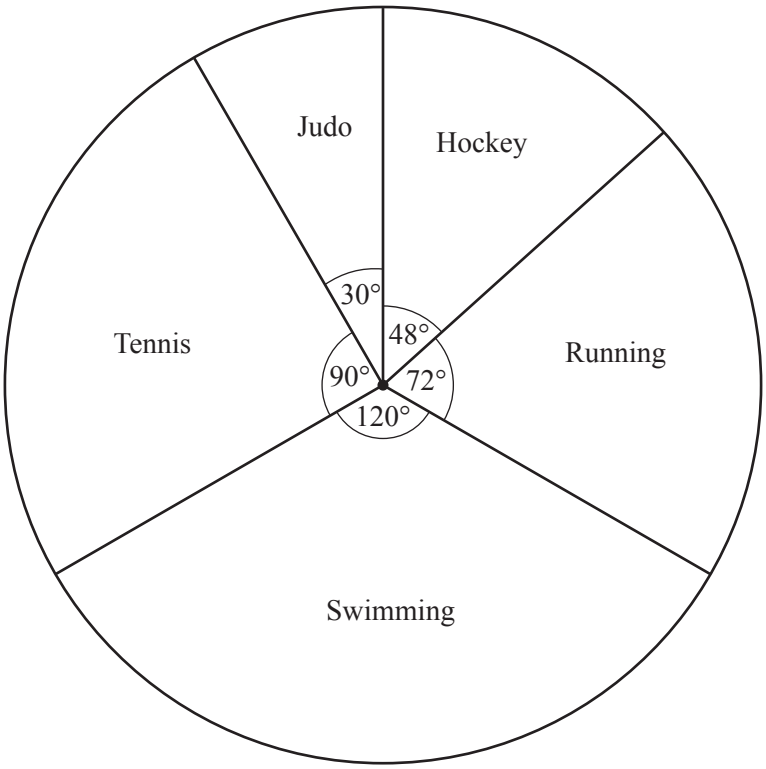
1 **(a)** 60 boys are asked to name their favourite sport.
The results are shown in the pie chart.



(i) Write down the most popular sport.

..... [1]

(ii) Write down the fraction of boys who choose Running.

..... [1]

(iii) Work out how many boys choose Judo.

..... [2]

(iv) One of the boys is chosen at random.

Work out the probability that his favourite sport is **not** Judo.

..... [1]

(v) Complete this statement.

Three times as many boys choose ..... than choose ..... [1]

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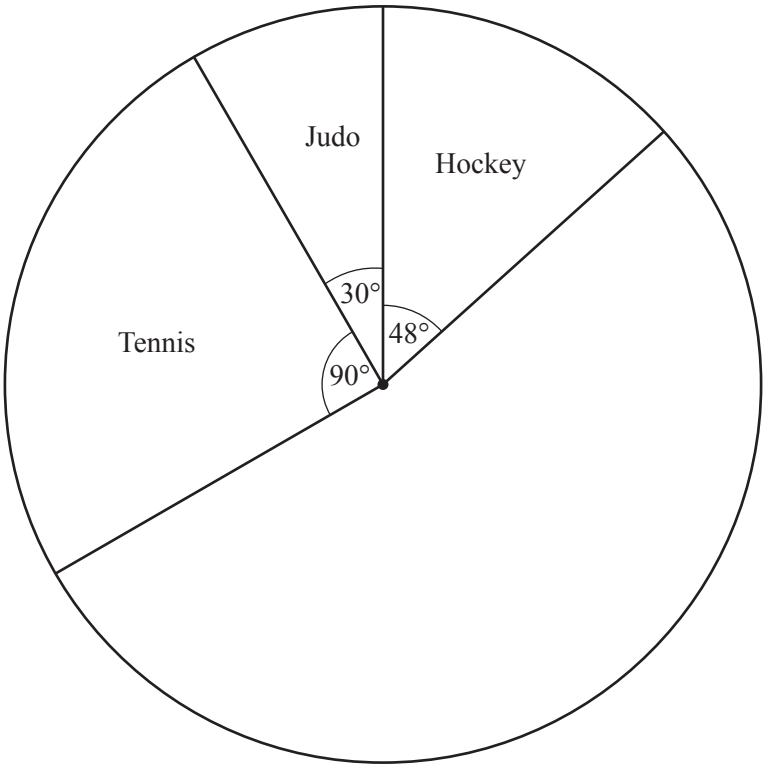
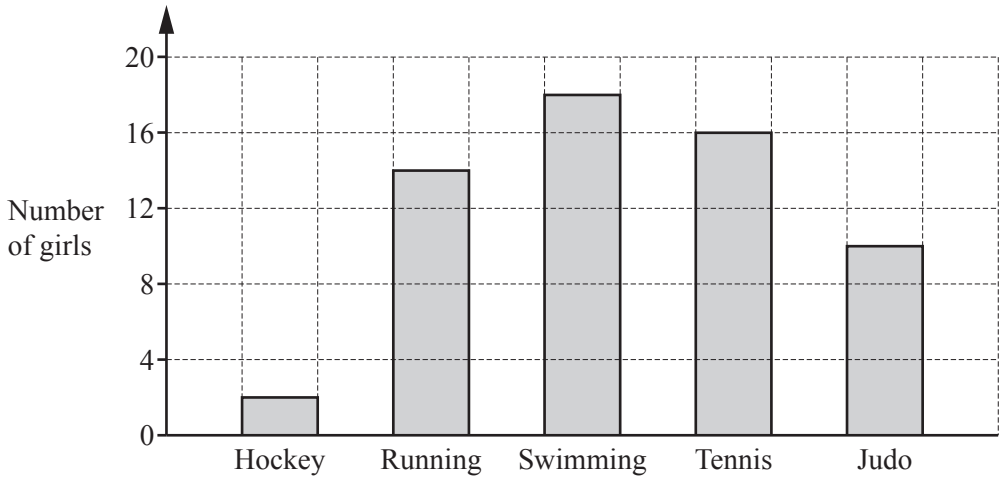
(b) Two of the boys in **part (a)** then change their choice from Running to Swimming.

Complete the pie chart after this change.
The Tennis, Judo and Hockey sectors have been drawn for you.



[2]

(c) 60 girls are asked to name their favourite sport.
Their results are shown in the bar chart below.



Using your pie chart in **part (b)** and the bar chart above, write down one similarity and one difference between the girls' results and the boys' results.

Similarity .....

Difference ..... [2]

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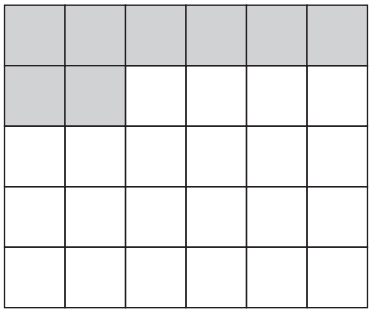
2 **(a)**



Write down the fraction of the rectangle that is shaded.
Give your answer in its simplest form.

..... [2]

(b) Write down a fraction that is equivalent to $\frac{7}{12}$.

..... [1]

(c) Write down a fraction that completes this calculation.

$$\frac{13}{11} \times \frac{\text{.....}}{\text{.....}} = 1$$

[1]

(d) Find a fraction that makes this statement true.

$$\frac{7}{9} < \frac{\text{.....}}{\text{.....}} < \frac{8}{9}$$

[1]

(e) Write these numbers in order, starting with the smallest.

5.7×10^{-1} $\frac{4}{7}$ $\sqrt{0.33}$ 57.2%

..... < ..... < ..... < ..... [2]
smallest

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3 **(a)** Maia shares \$3000 between her three children.
She gives the eldest child \$1200, the second eldest child \$1000 and the rest to the youngest child.

Write this information as a ratio in its simplest form.

..... : ..... : ..... [2]
eldest *youngest*

(b) Yani's house is for sale.
She decides to reduce the selling price of \$240 000 by 15%.

Calculate the new selling price.

\$ ..... [2]

(c) Hawa invests \$750 at a rate of 3.5% per year compound interest.

Calculate the value of his investment at the end of 3 years.

\$ ..... [3]

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4 A car park has 880 parking spaces.

(a) Some of the spaces are reserved.
The ratio of reserved spaces : not reserved spaces = 1 : 10.

Work out the number of spaces that are not reserved.

..... [2]

(b) 25% of the 880 spaces are on the top floor.

Work out the number of spaces that are on the top floor.

..... [1]

(c) At 06 00 one morning, $\frac{1}{40}$ of the 880 spaces are filled.
By 06 30, no cars have left the car park but another $\frac{1}{5}$ of the 880 spaces are filled.

Work out the fraction of the 880 spaces that are empty at 06 30.

..... [3]

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(d) The cost of each visit to the car park is shown in the table.

Length of visit	Cost ($)
Up to 20 minutes	Free
More than 20 minutes and up to 2 hours	2.50
More than 2 hours and up to 4 hours	4.50
More than 4 hours and up to 8 hours	8.50
More than 8 hours and up to 24 hours	12.00

(i) Samarth arrives at 11 40 and leaves at 15 30.

Find the cost of his visit.

$ ..... [1]

(ii) Radhika leaves the car park at 17 50 and pays $8.50 .

(a) Work out the earliest time she could have arrived at the car park.

..... [1]

(b) Work out the change she receives from a $20 note.

$ ..... [1]

(iii) Dhruv bought a weekly car park ticket for $26.
That week, he visited the car park four times.
These are the lengths of time he parked his car for.

17 minutes $6\frac{1}{2}$ hours 11 hours $9\frac{1}{4}$ hours

Work out how much he saved by buying a weekly ticket.

$ ..... [3]

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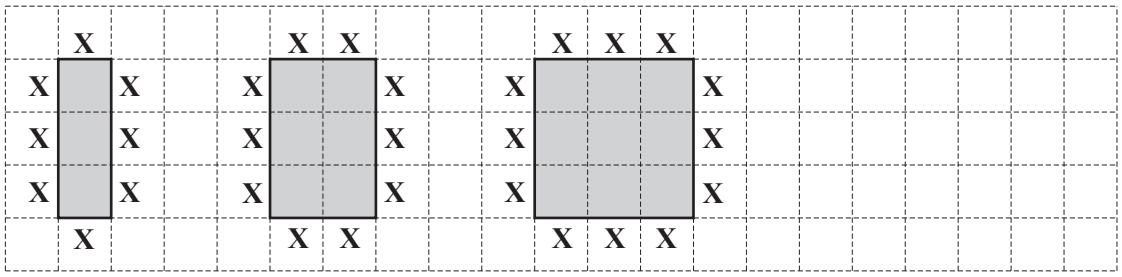
5 Mrs Verma has a restaurant.
In the restaurant each table has 8 chairs.
Sometimes she puts tables together.
The diagrams show how the tables are put together and the position of each chair (**X**).



1 table 2 tables 3 tables 4 tables

The pattern of tables and chairs forms a sequence.

(a) Draw the diagram for 4 tables. [1]

(b) Complete the table.

Number of tables (t)	1	2	3	4	5	6
Number of chairs (c)	8	10	12			

[2]

(c) Find a formula for the number of chairs, c, in terms of the number of tables, t.

$c =$ ..... [2]

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(d) 18 tables are put together in this way.

Work out the number of chairs needed.

..... [2]

(e) Work out the number of tables, put together in this way, when 80 chairs are needed.

..... [2]

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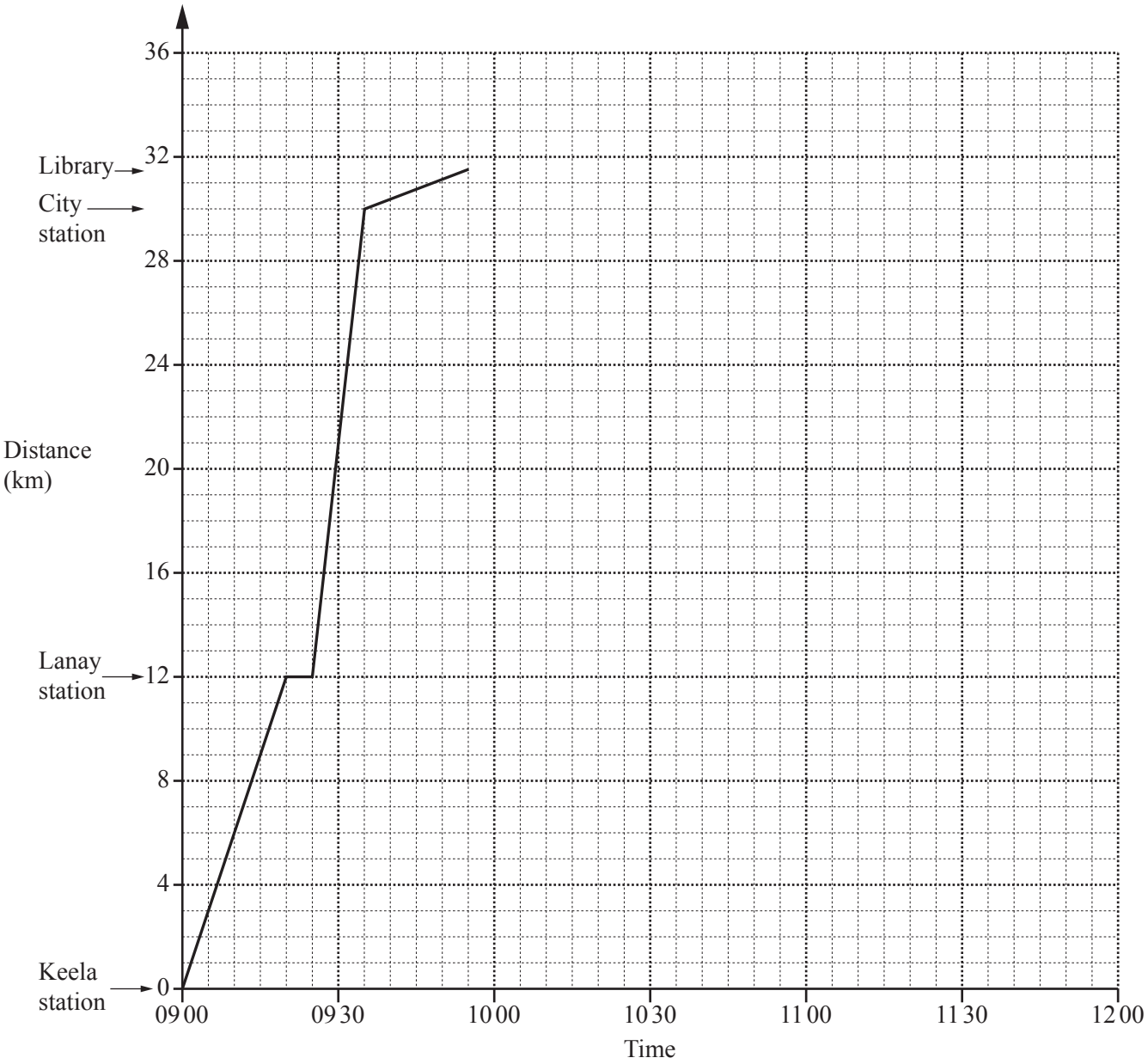
6 Mr Patel is travelling by train to the city.
He is going to the library.



The travel graph shows his journey from Keela station to the library.

(a) Write down the total time it takes Mr Patel to travel from Keela station to the library.

..... min [1]

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(b) Work out the speed of the train between Lanay station and City station in km/h.

..... km/h [2]

(c) Use the following information to complete the travel graph for Mr Patel.

- He spends 35 minutes at the library.
- He walks back to City station at the same constant speed he walked to the library.
- The train takes 20 minutes to travel from City station to Lanay station.
- The train stops for 10 minutes at Lanay station.
- The train travels at a constant speed of 48 km/h from Lanay station to Keela station.

[4]

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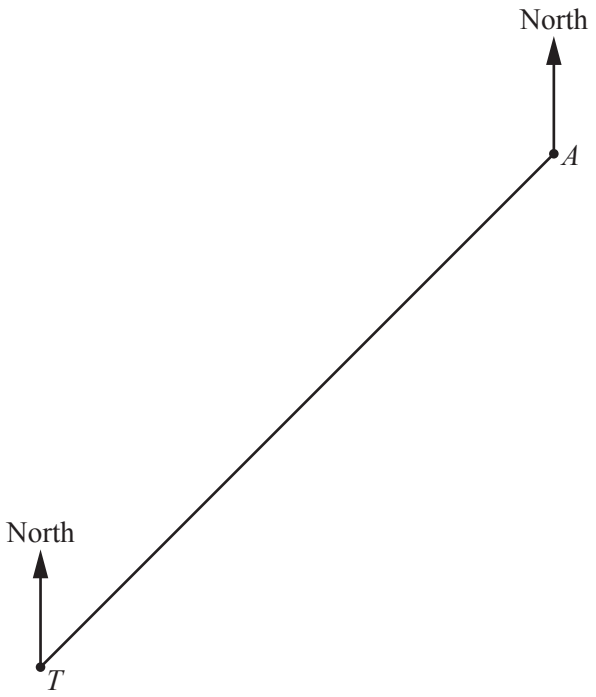
7 The scale drawing shows the positions of an airport (A) and a train station (T) on a map.
The scale is 1 centimetre represents 2 kilometres.



Scale: 1 cm to 2 km

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(a) Work out the actual distance, in kilometres, of the train station from the airport.

..... km [2]

(b) Measure the bearing of the airport from the train station.

..... [1]

(c) There is a straight road that is equidistant from *T* and *A*.

Using a straight edge and compasses only, construct the position of the road on the map.
Show all your construction arcs. [2]

(d) Krishna's house is

- on a bearing of 203° from the airport

and

- 8.8 km from the train station.

On the map, mark the two possible positions of Krishna's house.
Label each of these points *K*. [4]

(e) The bus station is not shown on the map.
The bearing of the bus station from the train station is 318°.

Work out the bearing of the train station from the bus station.

..... [2]

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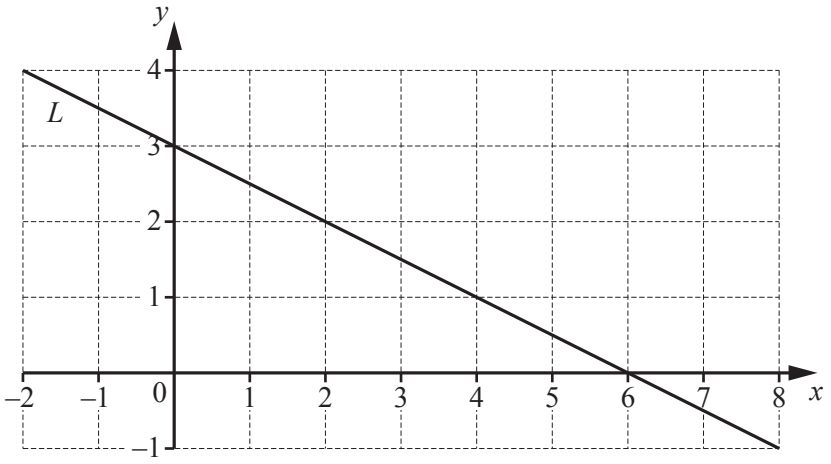
8 **(a)**



Line L is drawn on the grid.

Find the equation of line L.
Give your answer in the form $y = mx + c$.

$y =$ ..... [3]

(b) The points $(9, a)$ and $(b, 3)$ lie on the line $y = \frac{2}{3}x - 7$.

Work out the value of

(i) a,

$a =$ ..... [2]

(ii) b.

$b =$ ..... [2]

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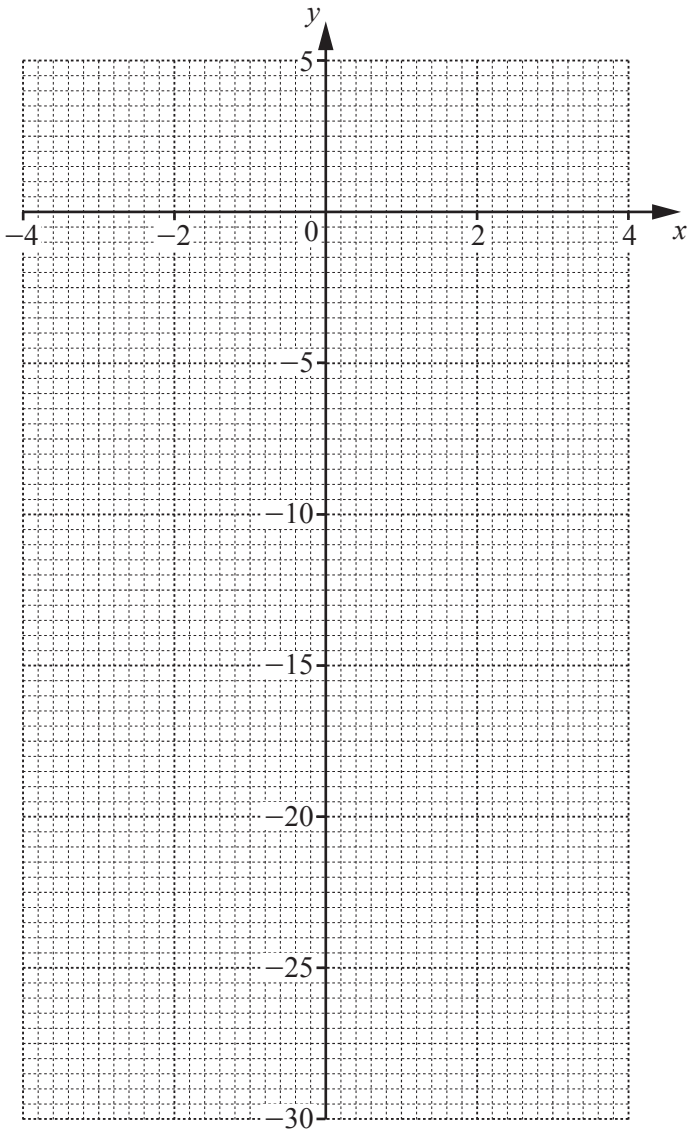
(c) **(i)** Complete the table of values for $y = x(3 - x)$.

x	-4	-2	-1	0	1	2	4
y		-10		0	2		-4

[3]

(ii) On the grid, draw the graph of $y = x(3 - x)$ for $-4 \leqslant x \leqslant 4$.



[4]

(iii) Write down the co-ordinates of the highest point of the graph for $-4 \leqslant x \leqslant 4$.

(..... , ...) [1]

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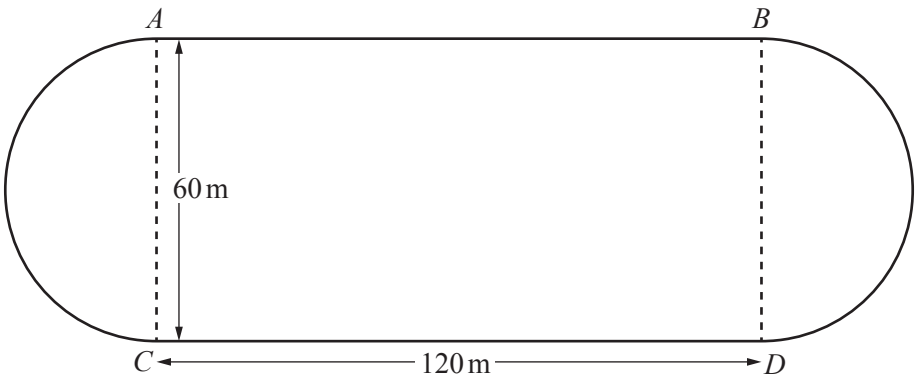
9 The diagram shows a rectangle and two semicircles with diameters AC and BD.
This diagram is a scale drawing of a running track.
$AC = BD = 60\,\text{m}$
$AB = CD = 120\,\text{m}$



(a) **(i)** Complete the statement.

1 centimetre represents ..... metres. [2]

(ii) Work out the total length of the running track in metres.

..... m [3]

(iii) Shreva walks at 1.4 m/s.

Work out how long it will take her to walk once around the track.
Give your answer in minutes and seconds, correct to the nearest second.

..... minutes ..... seconds [3]

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(b) Talan completes one lap of the track every 80 seconds.

(i) Work out how many laps he can complete in one hour.

..... [2]

(ii) Naima completes one lap of the track every 88 seconds.
Talan and Naima start running from point *A* on the track at the same time.
They each complete a number of laps of the track.

Work out the smallest number of laps they each complete before they are both at point *A* again at the same time.

Talan completes ..... laps and Naima completes ..... laps. [3]

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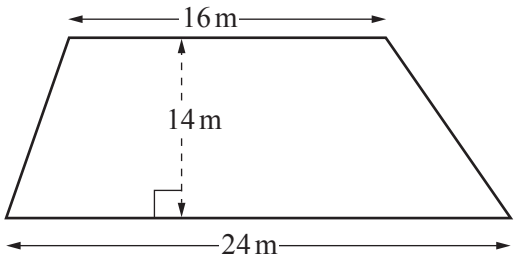
10 **(a)** **Using a straight edge and compasses only**, construct the equilateral triangle *ABC*.
The base *AB* has been drawn for you.

[2]

(b)



NOT TO SCALE

Calculate the area of this trapezium.

..... m^2 [2]

(c) Each interior angle of a regular polygon is 162°.

Calculate the number of sides of the polygon.

..... [3]

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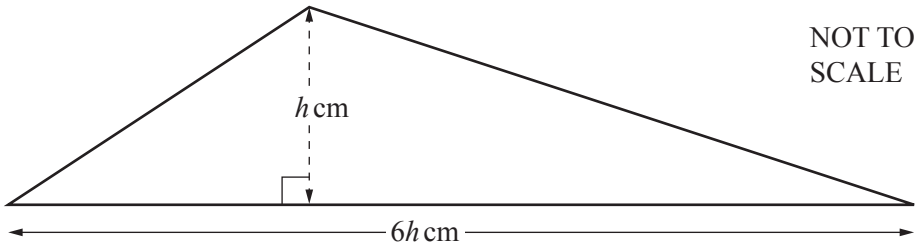
(d)

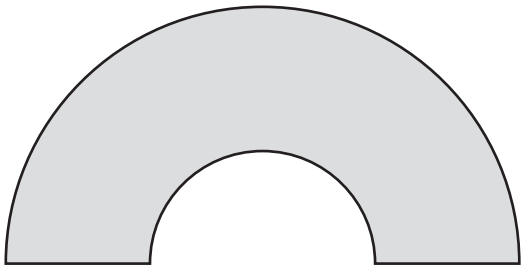


The area of this triangle is 363 cm^2.

Calculate the value of h.

$h =$ ..... [3]

(e)



This shape is drawn using two semicircles that have the same centre.
The large semicircle has radius 7 cm.
The small semicircle has radius 3 cm.

Calculate the area of the shape.

..... cm^2 [3]

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CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

MATHEMATICS **0580/42**

Paper 4 (Extended) **February/March 2019**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

This document consists of **19** printed pages and **1** blank page.

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[Turn over

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1 Amol and Priya deliver 645 parcels in the ratio Amol : Priya = 11 : 4.

(a) Calculate the number of parcels Amol delivers.

..... [2]

(b) Amol drives his truck at an average speed of 50 km/h.
He leaves at 07 00 and arrives at 11 15.

Calculate the distance he drives.

..... km [2]

(c) Priya drives her van a distance of 54 km.
She leaves at 10 55 and arrives at 12 38.

Calculate her average speed.

..... km/h [3]

(d) Priya has 50 identical parcels.
Each parcel has a mass of 17 kg, correct to the nearest kilogram.

Find the upper bound for the total mass of the 50 parcels.

..... kg [1]

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(e) 67 of the 645 parcels are damaged on the journey.

Calculate the percentage of parcels that are damaged.

..... % [1]

(f) **(i)** 29 parcels each have a value of $68.

By writing each of these numbers correct to 1 significant figure, find an estimate for the total value of these 29 parcels.

$ ..... [1]

(ii) Without doing any calculation, complete this statement.

The actual total value of these 29 parcels is less than the answer to **part (f)(i)**

because ..... [1]

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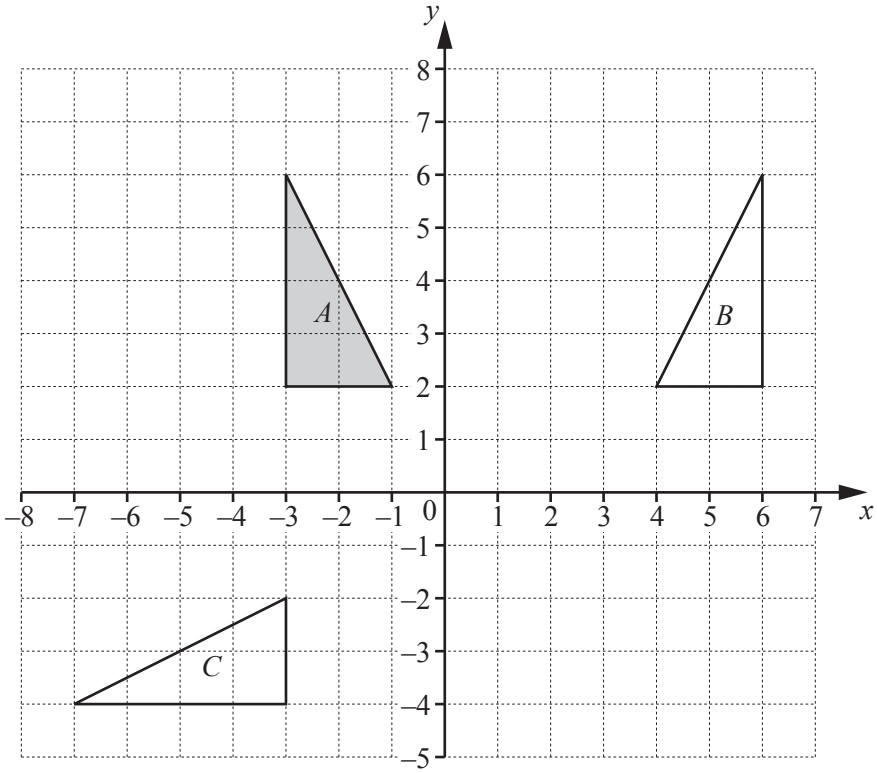
2



(a) Describe fully the **single** transformation that maps

(i) triangle A onto triangle B,

.....

..... [2]

(ii) triangle A onto triangle C.

.....

..... [3]

(b) On the grid, draw the image of

(i) triangle A after an enlargement, scale factor $-\frac{1}{2}$, centre (3, 0), [2]

(ii) triangle A after a translation by the vector $\begin{pmatrix} -3 \\ 1 \end{pmatrix}$, [2]

(iii) triangle A after the transformation that is represented by the matrix $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$. [3]

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3 Sushila, Ravi and Talika each have a bag of balls.
Each of the bags contains 10 red balls and 8 blue balls.

(a) Sushila takes one ball at random from her bag.

Find the probability that she takes a red ball.

..... [1]

(b) Ravi takes two balls at random from his bag, without replacement.

Find the probability that one ball is red and one ball is blue.

..... [3]

(c) Talika takes three balls at random from her bag, without replacement.

Calculate the probability that the three balls are the same colour.

..... [4]

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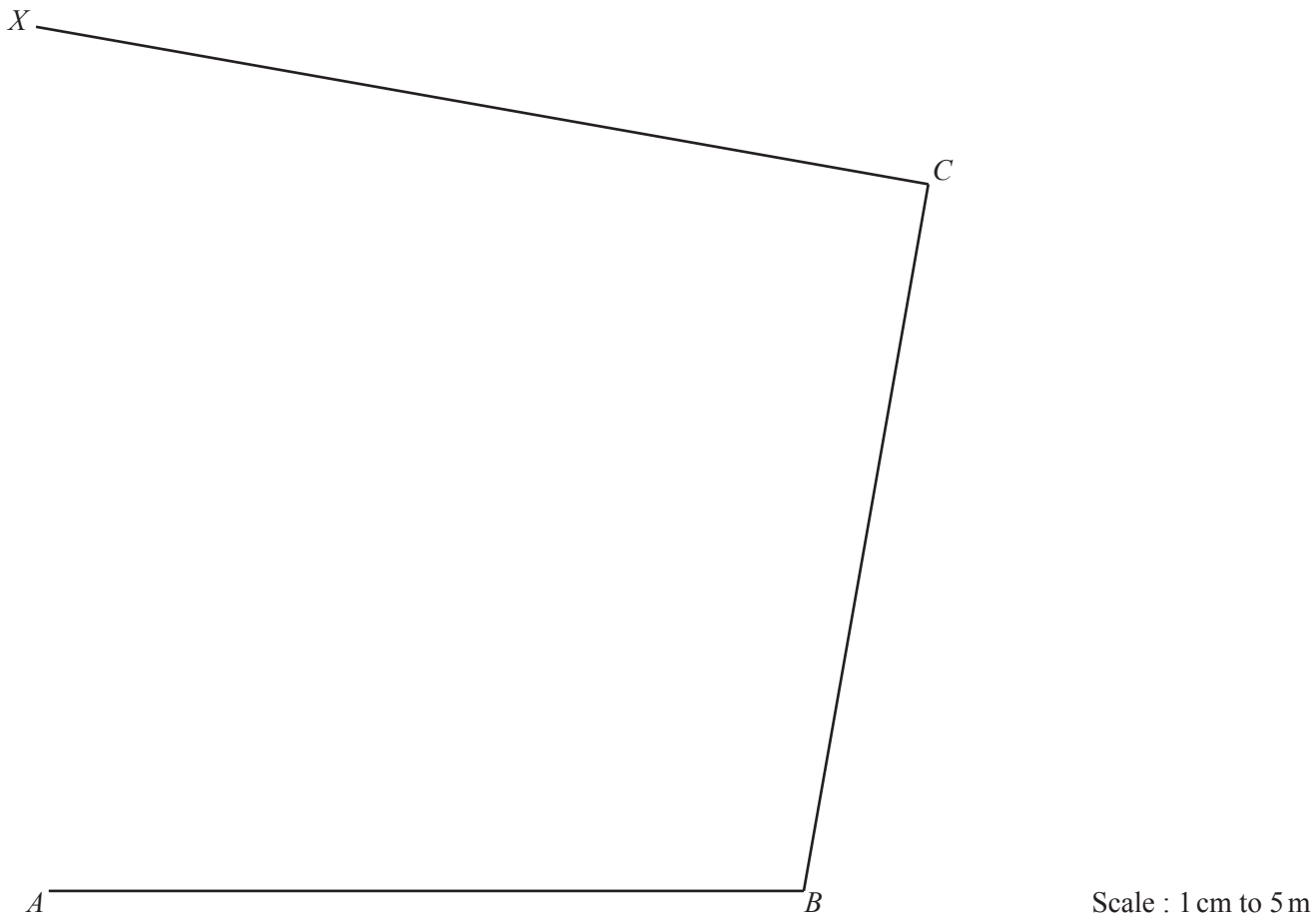
4 The diagram shows an incomplete scale drawing of a market place, *ABCD*, where *D* is on *CX*.
The scale is 1 centimetre represents 5 metres.



D lies on *CX* such that angle $DAB = 75°$.

(a) On the diagram, draw the line *AD* and mark the position of *D*. [2]

(b) Find the actual length of the side *BC* of the market place.

..... m [2]

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(c) In this part, use a ruler and compasses only.

Street sellers are allowed in the part of the market place that is

- more than 35 metres from A

and

- nearer to C than to B

and

- nearer to CD than to BC.

On the diagram, construct and shade the region where street sellers are allowed. [7]

(d) Write the scale of the drawing in the form $1 : n$.

1 : ..... [1]

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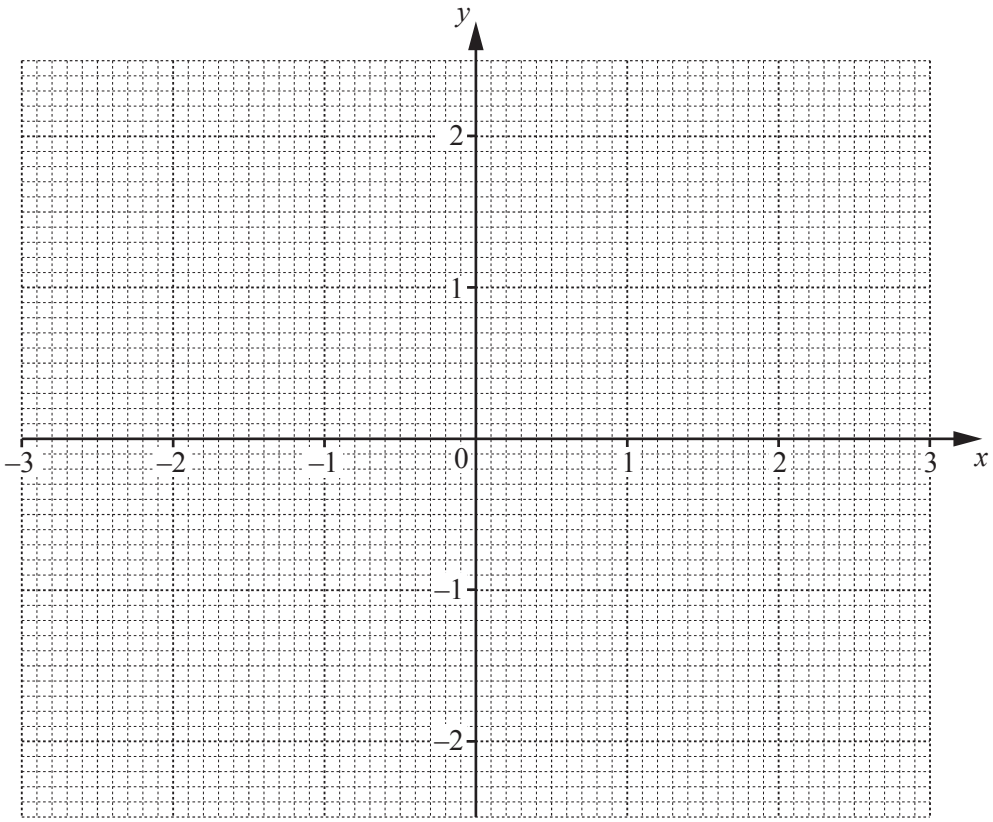
5 The table shows some values for $y = \frac{3}{10}x^3 - 2x$ for $-3 \leqslant x \leqslant 3$.

x	−3	−2	−1.5	−1	0	1	1.5	2	3
y			2.0	1.7	0		−2.0	−1.6	

(a) Complete the table. [3]

(b) On the grid, draw the graph of $y = \frac{3}{10}x^3 - 2x$ for $-3 \leqslant x \leqslant 3$.



[4]

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(c) On the grid opposite, draw a suitable straight line to solve the equation $\frac{3}{10}x^3 - 2x = \frac{1}{2}(1 - x)$ for $-3 \leqslant x \leqslant 3$.

$x =$ ..... or $x =$ ..... or $x =$ ..... [4]

(d) For $-3 \leqslant x \leqslant 3$, the equation $\frac{3}{10}x^3 - 2x = 1$ has n solutions.

Write down the value of n.

$n =$ ..... [1]

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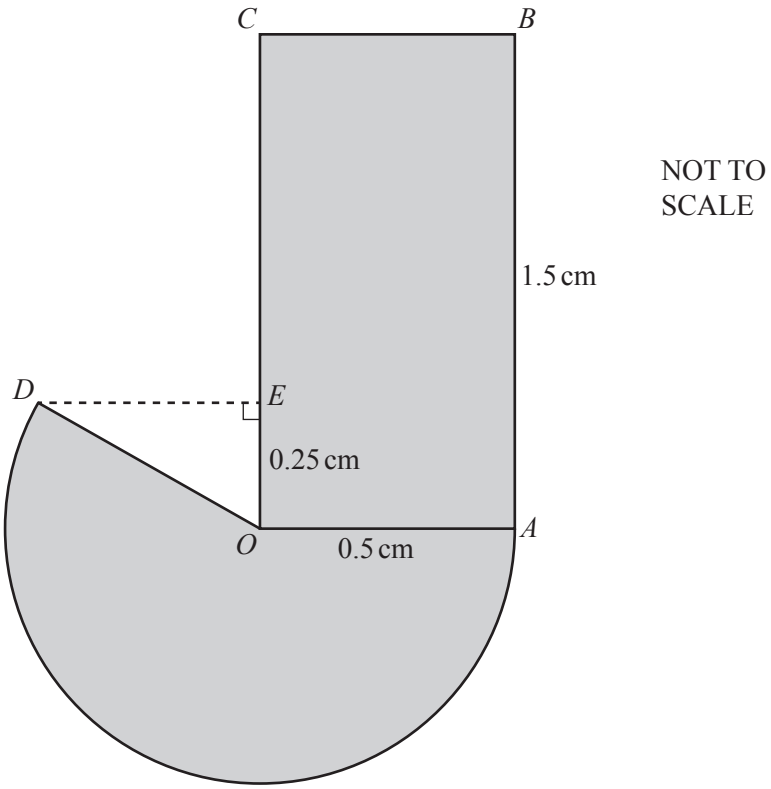
6



The diagram shows a company logo made from a rectangle and a major sector of a circle.
The circle has centre O and radius OA.
$OA = OD = 0.5$ cm and $AB = 1.5$ cm.
E is a point on OC such that $OE = 0.25$ cm and angle $OED = 90°$.

(a) Calculate the perimeter of the logo.

..... cm [5]

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(b) Calculate the area of the logo.

..... cm^2 [3]

(c) A mathematically similar logo is drawn.
The area of this logo is $77.44\,cm^2$.

(i) Calculate the radius of the major sector in this logo.

..... cm [3]

(ii) A gold model is made.
This model is a prism with a cross-section of area $77.44\,cm^2$.

This gold model is 15 mm thick.
One cubic centimetre of gold has a mass of 19 grams.

Calculate the mass of the gold model in kilograms.

..... kg [3]

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7 **(a)** 20 students each record the mass, p grams, of their pencil case.
The table below shows the results.

Mass (p grams)	$0 < p \leqslant 50$	$50 < p \leqslant 100$	$100 < p \leqslant 125$	$125 < p \leqslant 150$	$150 < p \leqslant 200$
Frequency	2	5	4	6	3

(i) Calculate an estimate of the mean mass.

..... g [4]

(ii) Use the frequency table above to complete the cumulative frequency table.

Mass (p grams)	$p \leqslant 50$	$p \leqslant 100$	$p \leqslant 125$	$p \leqslant 150$	$p \leqslant 200$
Cumulative frequency					20

[2]

(iii) A student is chosen at random.

Find the probability that this student has a pencil case with a mass greater than 150 g.

..... [1]

(b) Some students each record the mass, m kg, of their school bag.
Adil wants to draw a histogram to show this information.

Complete the table below.

Mass (m kg)	$0 < m \leqslant 4$	$4 < m \leqslant 6$	$6 < m \leqslant 7$	$7 < m \leqslant 10$
Frequency	32			42
Height of bar on histogram (cm)	1.6	2	1.2	2.8

[2]

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(c) The frequency table below shows information about the number of books read by some students in a reading marathon.

Number of books read	1	2	3	4	5	6	7	8
Frequency	2	2	16	10	9	4	x	2

(i) The mean number of books read is 4.28 .

Find the value of x.

$x =$ ..... [3]

(ii) Write down the mode.

..... [1]

(iii) Write down the median.

..... [1]

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8 $\mathrm{f}(x) = \dfrac{3}{x+2}$, $x \neq -2$ $\mathrm{g}(x) = 8x - 5$ $\mathrm{h}(x) = x^2 + 6$

(a) Work out $\mathrm{g}\left(\dfrac{1}{4}\right)$.

..... [1]

(b) Work out $\mathrm{ff}(2)$.

..... [2]

(c) Find $\mathrm{gg}(x)$, giving your answer in its simplest form.

..... [2]

(d) Find $\mathrm{g}^{-1}(x)$.

$\mathrm{g}^{-1}(x) =$ ..... [2]

(e) Write $\mathrm{g}(x) - \mathrm{f}(x)$ as a single fraction in its simplest form.

..... [3]

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(f) **(i)** Show that $\text{hg}(x) = 19$ simplifies to $16x^2 - 20x + 3 = 0$.

[3]

(ii) Use the quadratic formula to solve $16x^2 - 20x + 3 = 0$.
Show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [4]

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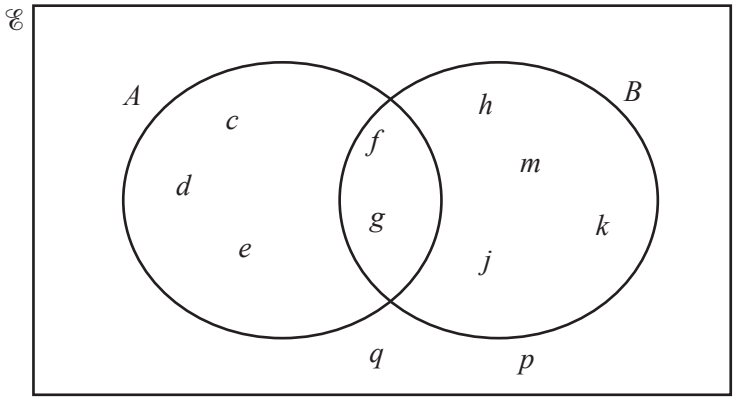
9 **(a)** The Venn diagram shows two sets, A and B.



(i) Use set notation to complete the statements.

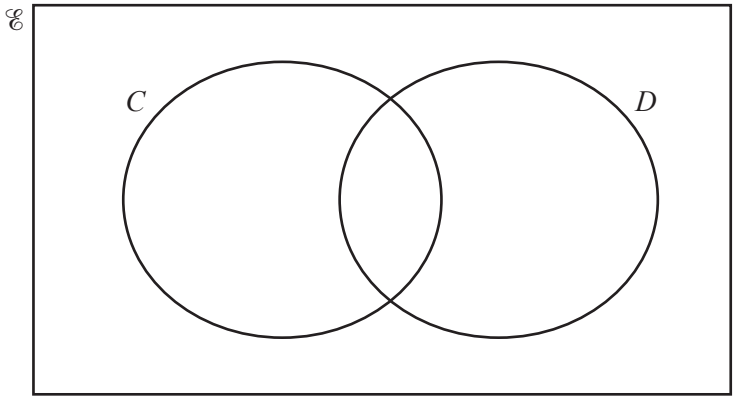
(a) d ..... A [1]

(b) $\{f, g\} =$ ..... [1]

(ii) Complete the statement.

n (.....) = 6 [1]

(b) In the Venn diagram below, shade $C \cap D'$.



[1]

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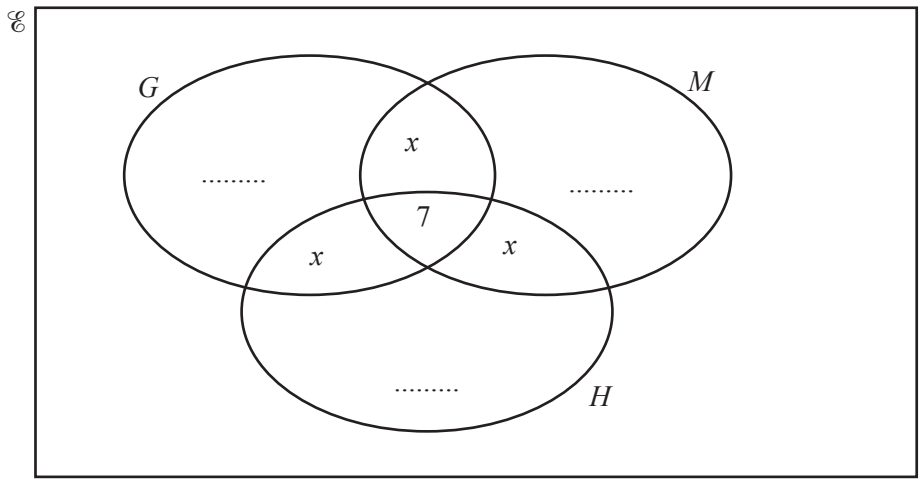
(c) 50 students study at least one of the subjects geography (G), mathematics (M) and history (H).

18 study only mathematics.
19 study two or three of these subjects.
23 study geography.

The Venn diagram below is to be used to show this information.



(i) Show that $x = 4$.

[2]

(ii) Complete the Venn diagram. [2]

(iii) Use set notation to complete this statement.

$(G \cup M \cup H)' =$ ..... [1]

(iv) Find $\mathrm{n}(G \cap (M \cup H))$.

..... [1]

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10 **(a)** Solve the simultaneous equations.
You must show all your working.

$$6x + 5y = 27$$
$$5x - 3y = 44$$

$x =$ .....

$y =$ ..... [4]

(b) y is inversely proportional to $(x+3)^2$.
When $x = 2$, $y = 8$.

Find y when $x = 7$.

$y =$ ..... [3]

(c) Solve the inequality.

$$3(x-2) < 7(x+2)$$

..... [3]

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11 **(a)** The table shows the first five terms of sequence A and sequence B.

Term	1	2	3	4	5	6
Sequence A	7	13	23	37	55	
Sequence B	1	3	9	27	81	

(i) Complete the table for the 6th term of each sequence. [2]

(ii) Find the nth term of

(a) sequence A,

..... [2]

(b) sequence B.

..... [2]

(b) The nth term of another sequence is $4n^2 + n + 3$.

Find

(i) the 2nd term,

..... [1]

(ii) the value of n when the nth term is 498.

$n =$ ..... [3]

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Grade thresholds – June 2019

Cambridge IGCSE™ Mathematics (without Coursework) (0580)

Grade thresholds taken for Syllabus 0580 (Mathematics (without Coursework)) in the June 2019 examination.

		minimum raw mark required for grade:						
	maximum raw mark available	A	B	C	D	E	F	G
Component 11	56	–	–	36	31	26	20	14
Component 12	56	–	–	35	29	24	19	14
Component 13	56	–	–	36	30	25	19	13
Component 21	70	53	45	38	29	21	–	–
Component 22	70	55	46	38	31	25	–	–
Component 23	70	57	48	40	34	28	–	–
Component 31	104	–	–	67	59	52	45	38
Component 32	104	–	–	62	51	40	30	20
Component 33	104	–	–	71	63	55	48	41
Component 41	130	88	72	56	46	35	–	–
Component 42	130	108	87	66	53	40	–	–
Component 43	130	94	78	61	46	32	–	–

Grade A* does not exist at the level of an individual component.

The maximum total mark for this syllabus, after weighting has been applied, is **200** for the 'Extended' options and **160** for the 'Core' options.

The overall thresholds for the different grades were set as follows.

Option	Combination of Components	A*	A	B	C	D	E	F	G
AX	11, 31	–	–	–	103	90	78	65	52
AY	12, 32	–	–	–	97	80	64	49	34
AZ	13, 33	–	–	–	107	93	80	67	54
BX	21, 41	165	141	117	94	75	56	–	–
BY	22, 42	183	163	133	104	84	65	–	–
BZ	23, 43	176	151	126	101	80	60	–	–

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MATHEMATICS **0580/11**

Paper 1 (Core) **May/June 2019**

MARK SCHEME

Maximum Mark: 56

Published

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GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1	[0].75	**1**	
2	7.5 oe	**1**	
3	$y(5 - 6p)$ final answer	**1**	
4(a)	[0].62 oe	**1**	
4(b)	0	**1**	
5(a)	7	**1**	
5(b)	−5	**1**	
6	5	**2**	**M1** for $180 \div 6^2$ oe
7(a)	6.4×10^5	**1**	
7(b)	6×10^{-4}	**1**	
8(a)	$\begin{pmatrix} 3 \\ -7 \end{pmatrix}$	**1**	
8(b)	$\begin{pmatrix} 18 \\ 0 \end{pmatrix}$	**1**	
9	630	**2**	**M1** for $2100 \div (3 + 7)$ [× 3] soi 210
10	8.15 8.25	**2**	**B1** for each If 0 scored, **SC1** for both correct but reversed
11(a)	t^{14} final answer	**1**	
11(b)	u^{25} final answer	**1**	
12	6.88 or 6.882 to 6.883	**2**	**M1** for sin 35 [=] $\frac{x}{12}$ oe or better

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Question	Answer	Marks	Partial Marks
13(a)	$\frac{2+10^2}{6-4}$	**M1**	
	51	**A1**	
13(b)	58.6	**1**	
14(a)	28	**1**	
14(b)	27	**1**	
14(c)	29 or 31	**1**	
15	$\frac{5}{6} + \frac{4}{6}$ oe	**M1**	2 correct fractions with a suitable common denominator $6k$
	$1\frac{1}{2}$ cao	**A2**	**A1** for $\frac{9}{6}$ oe
16(a)	17	**1**	
16(b)	$3n + 2$ oe final answer	**2**	**B1** for $3n + k$ or $cn + 2$, $c \neq 0$
17(a)	angle A = angle P, angle B = angle Q, angle C = angle R	**1**	accept any two of these or any other correct reason
17(b)	9	**2**	**M1** for 27 ÷ 3 or **B1** for $\frac{18}{6}$ or $\frac{6}{18}$ or $\frac{18}{27}$ or $\frac{27}{18}$ or for [sf=] 3 or $\frac{1}{3}$ or $\frac{2}{3}$ or 1.5 oe
18	8 [min] 20 [sec]	**3**	**M1** for $\frac{10}{20}$ [× 1000] soi 0.5 or 500 **A1** for 500 [sec] or 8.33…[min] **B1** for correctly converting *their* answer in seconds providing *their* answer is > 60 or decimal minutes to minutes and seconds
19(a)(i)	2 correct lines of symmetry only	**1**	
19(a)(ii)	4 correct lines of symmetry only	**2**	**B1** for only 2 or 3 correct lines of symmetry
19(b)	Rectangle or rhombus	**1**	
20(a)	36.7[0]	**1**	
20(b)(i)	117	**2**	**B1** for 7.8
20(b)(ii)	137	**1**	

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Question	Answer	Marks	Partial Marks
21(a)	[0]8 10	**1**	
21(b)(i)	8	**1**	
21(b)(ii)	30	**1**	
21(c)	Line is steeper	**1**	accept any correct reason
22(a)	−3, −1	**1**	
22(b)	1.5 oe	**2**	**M1** for rise ÷ run e.g. $\frac{6}{4}$
22(c)	[y =] $1.5x - 1$ oe	**2**	**B1** for $jx - 1$ $j \neq 0$ or $1.5x + k$ or *their***(b)**$x + k$

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MATHEMATICS **0580/12**

Paper 1 (Core) **May/June 2019**

MARK SCHEME

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GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

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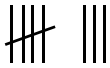
Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1	Thirty thousand six hundred [and] eighty-two	**1**	
2	436 500	**1**	
3	$4 \times (6 - 2) + 1 = 17$	**1**	
4	48	**1**	
5(a)	999 877	**1**	
5(b)	–7	**1**	
6(a)	Trapezium	**1**	
6(b)	Obtuse	**1**	
7(a)	Any 15 blocks shaded	**1**	
7(b)	2 correct squares shaded	**1**	
8(a)	*b*	**1**	
8(b)	*d*	**1**	
9		**2**	**B1** for 11, 14, 9, 5, 3 allow one error or omission or for 50 − 42 seen or for 8 purple
10(a)	0.048 cao	**1**	
10(b)	5.27×10^{-3}	**1**	
11	6	**2**	**M1** for $2 \times 3^2 \times 5$ or $2^4 \times 3$ or for 2×3 as final answer or **B1** for 2 or 3 as final answer
12	14.7	**2**	**M1** for $\frac{1}{2} \times 8.4 \times 3.5$ oe
13	74.4 or 74.36…	**2**	**M1** for $\cos[x =]\ \frac{6.2}{23}$ oe

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Question	Answer	Marks	Partial Marks
14(a)	160	**1**	
14(b)	Cone, [square based] pyramid	**2**	**B1** for each
15(a)	3 : 8 cao	**2**	**B1** for 6 : 16 or $1:\frac{8}{3}$ or $1:2\frac{2}{3}$ or 1 : 2.67 or $\frac{3}{8}$:1 or 0.375:1 If 0 scored, **SC1** for 8 : 3
15(b)	0	**1**	
16(a)	$x^3 - 7x^2$ final answer	**2**	**B1** for $x^3 - jx^k$ $j \neq 0$ or $nx^p - 7x^2$ $n \neq 0$ as answers If 0 scored, **SC1** for correct answer seen then spoilt
16(b)	$y(y + 1)$ final answer	**1**	
17(a)	$7^2 = 49$ and $8^2 = 64$ or √49 = 7 and √64 = 8	**2**	**B1** for $7^2 = 49$ or $8^2 = 64$ or 49 and 64 or values of at least √50 (or √51) and√59 (or √60) without further comment
17(b)	53 or 59	**1**	
18(a)	720	**1**	
18(b)	175 cao	**2**	**M1** for $\frac{2.8\times1000}{80}$[×5] or $\frac{2.8\times1000\times45}{their\textbf{(a)}}$ or **B1** for figs 175
19(a)	$10m^5$ final answer	**2**	**B1** for $10m^k$ or km^5 as final answer
19(b)	x^{24} final answer	**1**	
20	$\frac{9}{4}\times\frac{7}{3}$ or $\frac{63}{28}\div\frac{12}{28}$ oe with common denominator	**M2**	**B1** for $\frac{9}{4}$ oe seen or **M1** for *their* $\frac{9}{4}\times\frac{7}{3}$
	$5\frac{1}{4}$ cao	**A1**	
21	23.1 or 23.137 to 23.139 or 23.14	**3**	**M2** for $\frac{9\pi}{2}$ oe or **M1** for 9π oe
22	10.5 oe isw	**3**	**B2** for 630 or **M1** for 630*k* or **B1** for 3 correct multiples of each

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Question	Answer	Marks	Partial Marks
23	$x=\sqrt{\frac{7y+8}{5}}$ oe final answer	**3**	**M1** for $5x^2=4y+3y+8$ or better **M1** for $x^2=\frac{their(4y+3y)+8}{5}$ or better **M1** for $x=\sqrt{\frac{their(7y)+8}{5}}$ An incorrect final answer scores a maximum of 2
24(a)(i)	Ruled bisector of *AB* with 2 pairs of correct arcs	**2**	**M1** for 2 pairs of correct arcs or **B1** for correct ruled bisector with incomplete or no arcs
24(a)(ii)	Arc centre *C* radius 4 cm	**1**	
24(b)	Closed region shaded	**1**	

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MATHEMATICS **0580/13**

Paper 1 (Core) **May/June 2019**

MARK SCHEME

Maximum Mark: 56

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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Generic Marking Principles

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GENERIC MARKING PRINCIPLE 1:

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- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

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Abbreviations

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dep	dependent
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isw	ignore subsequent working
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Question	Answer	Marks	Partial Marks
1	3.06 cao	**1**	
2	$\frac{9}{20}$	**1**	
3	$x(2x - 1)$	**1**	
4	(0, −8)	**1**	
5	$\frac{5}{24}$ or 0.208 or 0.2083…	**1**	
6	0.73 oe	**1**	
7	Mode	**1**	
8(a)	6	**1**	
8(b)	2.15 or 2.154....	**1**	
9	$14x + 13y$ final answer	**2**	**B1** for $14x$ or $13y$ as answers If 0 scored, **SC1** for correct answer seen then spoilt
10(a)	31 or $\sqrt{121}$	**1**	
10(b)	$\sqrt{13}$	**1**	
11	$\begin{pmatrix}13\\18\end{pmatrix}$	**2**	**B1** for $\begin{pmatrix}10\\0\end{pmatrix}$ or $\begin{pmatrix}3\\18\end{pmatrix}$ or $\begin{pmatrix}13\\m\end{pmatrix}$ or $\begin{pmatrix}n\\18\end{pmatrix}$
12(a)	Negative	**1**	
12(b)	Positive	**1**	
13	L correctly marked	**2**	**B1** for 6.8 cm to 7.2 cm **B1** for 123° to 127°
14	$[w =]\ \frac{P}{2} - h$ or $\frac{P-2h}{2}$ final answer	**2**	**M1** for $w + h = \frac{P}{2}$ or $2w + 2h = P$

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Question	Answer	Marks	Partial Marks
15	119.5 120.5	**2**	**B1** for each If 0 scored, **SC1** for both correct but reversed
16	3	**2**	**M1** for $7x = 16 + 5$ or $x - \frac{5}{7} = \frac{16}{7}$ or better
17	$\frac{84}{315}$ or $\frac{4}{35} \times \frac{7}{3}$ or $\frac{12}{5} \times \frac{1}{9}$ or $\frac{4}{5} \times \frac{1}{3}$	**M1**	Accept any correct cancelling
	$\frac{4}{15}$ cao	**A1**	
18	7	**2**	**M1** for $\frac{5.5}{7.7}$ or $\frac{7.7}{5.5}$ or $\frac{9.8}{7.7}$ or $\frac{7.7}{9.8}$ oe
19	48.72	**3**	**M1** for $800\left(1+\frac{3}{100}\right)^2$ oe **A1** for 848.72
20	For correct method to equate coefficients and eliminate one variable	**M1**	
	[x =] 4 [y =] −3	**A2**	**A1** for each If 0 scored, **SC1** for 2 values satisfying one of the original equations **SC1** if no working shown, but 2 correct answers given
21(a)(i)	−13	**1**	
21(a)(ii)	97	**1**	
21(b)	$3n + 2$ oe final answer	**2**	**B1** for $3n + j$ or $kn + 2$ $k \neq 0$
22(a)	40	**2**	**M1** for $5 \times 4 \times 2$
22(b)	4 correct rectangles only, added in correct positions	**2**	**B1** for 2 correct rectangles in correct positions
23	126	**4**	**M3** for $\frac{360-[180-(360 \div 5)]}{2}$ or $\frac{360-180\times(5-2)\div 5}{2}$ or **M2** for $\frac{180\times(5-2)}{5}$ or $180 - \frac{360}{5}$ or **M1** for $180 \times (5 - 2)$ or $\frac{360}{5}$

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Question	Answer	Marks	Partial Marks
24(a)	9.23 or 9.234 to 9.235	**2**	**M1** for $\sin 38 = \frac{BD}{15}$ or better
24(b)	14.1 or 14.13.....	**2**	**FT** *their* **(a)** **M1** (*their* **(a)**)^2 + 10.7^2
25(a)	84°	**1**	
25(b)	60	**2**	**M1** for $\frac{45}{360} \times 480$ oe
25(c)	[Geography] sector 75°	**2**	**M1** for $\frac{100}{480} \times 360$ oe or $\frac{100}{\textit{their}\ \textbf{(b)}} \times 45$

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MATHEMATICS **0580/21**

Paper 2 (Extended) **May/June 2019**

MARK SCHEME

Maximum Mark: 70

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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- the specific skills defined in the mark scheme or in the generic level descriptors for the question
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GENERIC MARKING PRINCIPLE 3:

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- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

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isw	ignore subsequent working
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nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1	7.5 oe	**1**	
2	$y(5-6p)$ final answer	**1**	
3	4.01 or 4.007 to 4.008	**1**	
4	46.5	**1**	
5	5	**2**	**M1** for $180 \div 6^2$ oe
6(a)	t^{14} final answer	**1**	
6(b)	u^{25} final answer	**1**	
7	6.88 or 6.882 to 6.883	**2**	**M1** for $\sin 35$ [=] $\frac{x}{12}$ oe or better
8	100	**2**	**M1** for reflex angle = 2 × 130 or opposite angle of a cyclic quadrilateral shown = 50
9	47.77…– 4.77… oe	**M1**	
	$\frac{43}{90}$	**A1**	Allow equivalent fractions If **M0** then **SC1** for $\frac{43}{90}$ or equivalent fraction with no/insufficient working
10	$5 - 2x$ final answer	**2**	**M1** for $2(1 - x) + 3$ oe
11	$\frac{2}{20}$ oe	**2**	**M1** for $\frac{2}{5} \times \frac{1}{4}$ oe
12(a)	28	**1**	
12(b)	27	**1**	
12(c)	29 or 31	**1**	

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Question	Answer	Marks	Partial Marks
13	[a =] 2 [b =] – 13	**3**	**B2** for either correct or $(x + 2)^2 - 13$ OR **M1** for $2a = 4$ soi **M1** for $a^2 + b = -9$ soi OR **M1** for $x^2 + ax + ax + a^2$ [$+b$] or better
14	$\frac{5}{6} + \frac{4}{6}$ oe	**M1**	2 correct fractions with a suitable common denominator $6k$
	$1\frac{1}{2}$ cao	**A2**	**A1** for $\frac{9}{6}$ oe
15	$3x^2 - 3x + 2$ final answer	**3**	**B2** for $x^2 + 2x + x + 2 + 2x^2 - 6x$ oe or **B1** for 3 correct terms of $x^2 + 2x + x + 2$ oe
16	[±] 0.6 oe	**3**	**M1** for $y = \frac{k}{\sqrt{x+1}}$ **M1** for $y = \frac{theirk}{\sqrt{99+1}}$ OR **M2** for $\frac{2\sqrt{8+1}}{\sqrt{99+1}}$ or **M1** for $2\sqrt{8+1} = y\sqrt{99+1}$
17(a)	$(p-q)(p+q)$ final answer	**1**	
17(b)	$\frac{7}{2}$ oe	**2**	**M1** for $2 \times (p + q) = 7$ or for $(2+q)^2 - q^2 = 7$ or $p^2 - (p-2)^2 = 7$
18(a)	$27y^{12}$ final answer	**2**	**B1** for ky^{12} or $27y^k$ in final answer
18(b)	$\frac{3}{2}$ oe	**1**	
19	1500	**3**	**M2** for $12 \div \left(\frac{20}{100}\right)^3$ oe or **M1** for $\left(\frac{20}{100}\right)^3$ or $\left(\frac{100}{20}\right)^3$ oe OR **M1** for $\div 20^3$ oe **M1** for $\times 100^3$ oe

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Question	Answer	Marks	Partial Marks
20	$\frac{x-5}{(x+2)(3x-1)}$ final answer	**3**	**B1** for common denominator isw expansion **M1** for $3x-1-2(x+2)$ or better
21	60.5 or 60.50…	**4**	**M3** for tan = $\frac{10}{\frac{1}{2}\sqrt{8^2+8^2}}$ oe or **M2** for $[\frac{1}{2}\times]\ \sqrt{8^2+8^2}$ or **M1** for 8^2+8^2 or 4^2+4^2 or **B1** for recognising the angle required
22(a)(i)	17	**1**	
22(a)(ii)	$3n + 2$ oe final answer	**2**	**B1** for $3n + k$ or $cn + 2$, $c \neq 0$
22(b)	$\frac{31}{12}$ oe	**1**	
23(a)	$\begin{pmatrix} 11 & 7 \\ 14 & 18 \end{pmatrix}$	**2**	**B1** for 2 or 3 correct elements
23(b)	$\frac{1}{10}\begin{pmatrix} 4 & -1 \\ -2 & 3 \end{pmatrix}$ oe isw	**2**	**B1** for $k\begin{pmatrix} 4 & -1 \\ -2 & 3 \end{pmatrix}$ or for det = 10 soi
24(a)	2	**1**	
24(b)	1300	**3**	**M2** for $\frac{20}{2}\times(60+70)$ oe or **M1** for any relevant area
25(a)	$\frac{1}{3}\mathbf{p} - \frac{1}{2}\mathbf{q}$ oe simplified	**2**	**M1** for a correct unsimplified answer or a correct route
25(b)	$\frac{5}{6}\mathbf{p} + \frac{3}{4}\mathbf{q}$ oe simplified	**2**	**M1** for a correct unsimplified answer or a correct route

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Question	Answer	Marks	Partial Marks
26(a)	$y = 2x - 3$ oe	**3**	**B2** for $2x - 3$ or $y = \textit{their}\, m\, x - 3$ or $y = 2x + c$ or **M1** for $\frac{9-(-3)}{6-0}$ oe or $9 = 6m - 3$ oe or **B1** for $2x$ seen or $[y =]mx - 3$ $m \neq 0$
26(b)	$y = -\frac{1}{2}x + 2$ oe	**2**	**FT** *their* **(a)** $y = -\frac{1}{\textit{their}\, m}x + 2$ **B1** for gradient $-\frac{1}{2}$, gradient **FT** *their* **(a)** or for $y = mx + 2$ $m \neq 0$

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MATHEMATICS **0580/22**

Paper 2 (Extended) **May/June 2019**

MARK SCHEME

Maximum Mark: 70

Published

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soi	seen or implied

Question	Answer	Marks	Partial Marks
1	53 or 59	**1**	
2	0.839 or 0.8386 to 0.8387	**1**	
3	$\frac{7}{9}$	**1**	
4(a)	Trapezium	**1**	
4(b)	Obtuse	**1**	
5	56.4 or 56.44…	**2**	**M1** for $\frac{254}{their\ 4.5}$ or $\frac{254}{their\ 270}[\times 60]$
6	2	**2**	**M1** for $9f - 3f$ oe or 23 – 11 oe
7	14.7	**2**	**M1** for $\frac{1}{2}\times 8.4\times 3.5$ oe
8(a)	0.048 cao	**1**	
8(b)	5.27×10^{-3}	**1**	
9	6	**2**	**M1** for $2 \times 3^2 \times 5$ or $2^4 \times 3$ or for 2×3 as final answer or **B1** for 2 or 3 as final answer
10	2.1	**2**	**M1** for $\frac{33.6\times 25000^2}{100000^2}$ oe or answer figs 21
11	$\begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix}$	**2**	**B1** for one row or one column correct in a 2 by 2 matrix in the final answer or **SC1** for $\begin{pmatrix} 0 & 3 \\ 3 & 0 \end{pmatrix}$
12(a)	$10m^5$ final answer	**2**	**B1** for $10m^k$ or km^5 as final answer
12(b)	x^{24} final answer	**1**	

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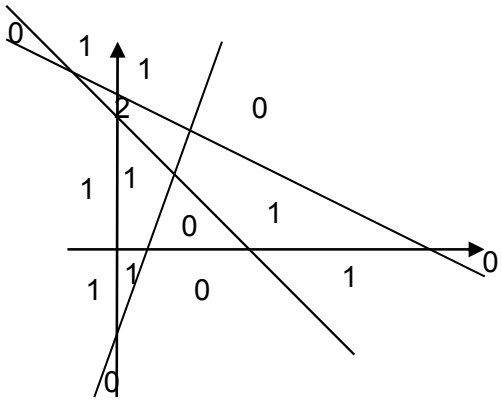
Question	Answer	Marks	Partial Marks
13	$\frac{9}{4}\times\frac{7}{3}$ or $\frac{63}{28}\div\frac{12}{28}$ oe with common denominator	**M2**	**B1** for $\frac{9}{4}$ oe seen or **M1** for *their* $\frac{9}{4}\times\frac{7}{3}$
	$5\frac{1}{4}$ cao	**A1**	
14	Correctly eliminating one variable	**M1**	
	[x =] – 4 [y =] 3	**A2**	**A1** for one correct If **M0** scored, **SC1** for 2 values satisfying one of the original equations
15	495	**3**	**M2** for $435.6 \div \frac{100-12}{100}$ oe or **B1** for recognising 435.6 as 88[%]
16(a)	*R* identified correctly	**2**	**B** marks 
16(b)	7	**1**	
17	$\frac{3x^2-4x+9}{(x+3)(x-5)}$ final answer	**3**	**B1** for common denominator $(x+3)(x-5)$ oe isw **M1** for $2x(x-5)+(x+3)(x+3)$ or better
18	12.8 4.4 0.8	**3**	**B2** for 2 correct heights or 3 correct freq densities or **B1** for 1 correct height or 2 correct freq densities

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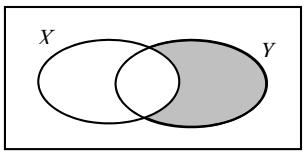
Question	Answer	Marks	Partial Marks
19	$m = \frac{k}{P-1}$ final answer	**4**	**B3** for final answer $\frac{k}{P-1}$ OR **M1** for multiplying or dividing by *m* correctly **M1** for term(s) in *m* on one side correctly and terms not in *m* on the other side correctly **M1** for correctly factorising *m* with a 2-term bracket oe **M1** for correct division by *their* 2-term bracket with *m* as the subject To a maximum of **M3** for an incorrect answer
20	$\frac{-(-2) \pm \sqrt{(-2)^2 - 4(3)(-10)}}{2 \times 3}$	**B2**	**B1** for $\sqrt{(-2)^2 - 4(3)(-10)}$ or better and if in form $\frac{p+\sqrt{q}}{r}$ or $\frac{p-\sqrt{q}}{r}$ then **B1** for $p = -(-2)$ and $r = 2(3)$
	–1.52 and 2.19 final ans cao	**B1B1**	If B0B0, **SC1** for –1.5 and 2.2 or –1.523 to –1.522... and 2.189.... or 1.52 and –2.19 or –1.52 and 2.19 seen in working
21(a)		**1**	
21(b)(i)	$\frac{9}{16}$ oe	**2**	**B1** for $\frac{9}{k}$ or $\frac{k}{16}$ provided fraction is less than 1
21(b)(ii)	46	**1**	
22(a)	$\begin{pmatrix} 6 & 15 \\ 3 & 7 \end{pmatrix}$	**2**	**B1** for 2 correct elements
22(b)	$\begin{pmatrix} -3 & 7 \\ 1 & -2 \end{pmatrix}$ oe isw	**2**	**B1** for $k\begin{pmatrix} 3 & -7 \\ -1 & 2 \end{pmatrix}$ soi or det = – 1 soi

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Question	Answer	Marks	Partial Marks
23(a)	$\frac{5}{3}\mathbf{p}-2\mathbf{q}$ oe simplified	**2**	**M1** for correct unsimplified answer or $c\mathbf{p}-2\mathbf{q}$ or $\frac{5}{3}\mathbf{p}+c\mathbf{q}$ $c \neq 0$ or for a correct route
23(b)	$\frac{5}{6}$	**2**	**B2FT** for $\frac{\textit{their } c}{2}$ if *their* **(a)** is $c\mathbf{p}-2\mathbf{q}$ oe **M1** for $\overrightarrow{MX} = \frac{5}{6}\mathbf{p}-\mathbf{q}$ or $\overrightarrow{MX} = \frac{1}{2}$ *their* **(a)** or $\overrightarrow{BX} = \frac{1}{2}\overrightarrow{AN}$ or $\mathbf{q} + \frac{1}{2}$ *their* **(a)** or $\mathbf{q} + \overrightarrow{MX} - k\mathbf{p} = 0$ oe
24	31.9 or 31.85...	**4**	**M3** for tan = $\frac{12}{\sqrt{18^2+7^2}}$ oe or **M2** for $\sqrt{18^2+7^2}$ or **M1** for 18^2+7^2 or **B1** for identifying correct angle *CAG*
25(a)	Rotation 90° clockwise oe (1, 0)	**3**	**B1** for each
25(b)	Enlargement – 2 (0, 2)	**3**	**B1** for each

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Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

MATHEMATICS **0580/23**

Paper 2 (Extended) **May/June 2019**

MARK SCHEME

Maximum Mark: 70

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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Generic Marking Principles

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- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

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- marks are awarded when candidates clearly demonstrate what they know and can do
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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1	1.90 cao	**1**	
2	$x(2x - 1)$	**1**	
3	$\frac{5}{24}$ or 0.208 or 0.2083…	**1**	
4	Mode	**1**	
5(a)	(0, –8)	**1**	
5(b)	3	**1**	
6(a)	6	**1**	
6(b)	2.15 or 2.154…	**1**	
7(a)	31 or $\sqrt{121}$	**1**	
7(b)	$\sqrt{13}$	**1**	
8(a)	32	**1**	
8(b)	Positive	**1**	
9	$\frac{84}{315}$ or $\frac{4}{35}\times\frac{7}{3}$ or $\frac{12}{5}\times\frac{1}{9}$ or $\frac{4}{5}\times\frac{1}{3}$	**M1**	Accept any correct cancelling
	$\frac{4}{15}$ cao	**A1**	
10	[w =] $\frac{P}{2} - h$ or $\frac{P-2h}{2}$ final answer	**2**	**M1** for $w + h = \frac{P}{2}$ or $2w + 2h = P$
11	$2m + 1$	**2**	**B1** for $2m + c$ or $km + 1$ ($k \neq 0$)
12	72.8 or 72.79 to 72.80…	**2**	**M1** for $\frac{217}{360}\times\pi\times 6.2^2$

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Question	Answer	Marks	Partial Marks
13(a)	4	**1**	
13(b)	Accurate drawing with correct construction arcs	**2**	**B1** for accurate drawing without the correct arcs
14(a)	3	**2**	**M1** for $a \times 7^2 + a = 150$ oe
14(b)	–7	**1**	
15	13.9 or 13.92 to 13.93	**3**	**M2** for $\sqrt{(7-2)^2+(12--1)^2}$ oe or **M1** for $(7-2)^2+(12--1)^2$ oe
16	6 nfww	**3**	**B1** for 10 + 0.5 or 4 – 0.5 soi **M1** for [b =] $\frac{2A}{h}$ soi
17	$\frac{x^2}{x-5}$ final answer	**3**	**B1** for $x^2(x + 5)$ **B1** for $(x – 5)(x + 5)$
18	0.14 oe	**3**	**M1** for $y=\frac{k}{(x+1)^2}$ **M1** for $y=\frac{their\ k}{(4+1)^2}$ OR **M2** for $\frac{0.875(1+1)^2}{(4+1)^2}$ or **M1** for $y(4 + 1)^2 = 0.875(1 + 1)^2$
19	36	**4**	**B1** for angle *KNL* or *MNJ* = 76 **B2** for angle *LJM* or *LKM* = 68 or **B1** for angle *LMJ* = 90 or *LKJ* = 90 or *LCM* = 136 (*C* = centre) OR **B1** for *MKJ* = 22 **B2** for *LJM* or *LKM* = 68 or **B1** for *LKJ* = 90 or *KJL* = 54 OR **B1** for *MNL* = 104 **B1** for *LMN* = 54 **B1** for *LMJ* = 90

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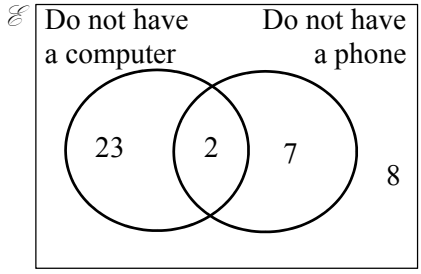
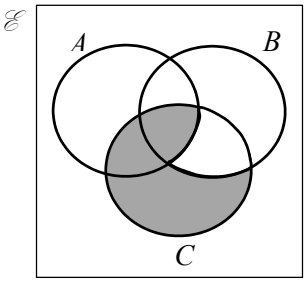
Question	Answer	Marks	Partial Marks
20(a)(i)	$\frac{8}{15}$ oe	**1**	
20(a)(ii)		**2**	**B1** for 2 or 3 correct out of 4 regions
20(b)		**1**	
21(a)	$\begin{pmatrix} 15 & 20 \\ 25 & 0 \end{pmatrix}$	**1**	
21(b)	$\begin{pmatrix} 4 & 8 \\ 2 & 2 \end{pmatrix}$	**1**	
21(c)	$\begin{pmatrix} -9 & 20 \\ 5 & 20 \end{pmatrix}$	**2**	**B1** for two correct elements
22(a)	$-\mathbf{s}+\mathbf{t}$	**1**	
22(b)	$-\frac{4}{5}\mathbf{s}-\frac{1}{5}\mathbf{t}$ oe simplified	**3**	**M2** for correct unsimplified e.g. $-\mathbf{t}+\frac{4}{5}(-\mathbf{s}+\mathbf{t})$ or $-\mathbf{s}-\frac{1}{5}(-\mathbf{s}+\mathbf{t})$ or **M1** for a correct route e.g. $\overrightarrow{CB}+\overrightarrow{BN}$ or [$\overrightarrow{BN}$ =] $\frac{4}{5}(-\mathbf{s}+\mathbf{t})$ or [$\overrightarrow{DN}$ =] $-\frac{1}{5}(-\mathbf{s}+\mathbf{t})$
23(a)(i)	5	**1**	
23(a)(ii)	2.4 to 2.6	**2**	**B1** for [LQ=] 3.4 to 3.6 or [UQ=] 6
23(b)	26, 74	**2**	**B1** for each

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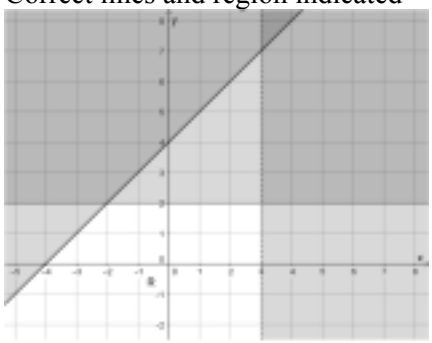
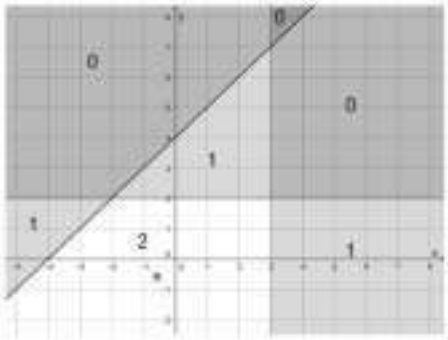
Question	Answer	Marks	Partial Marks
24	Correct lines and region indicated 	**5**	**B1** for $y = 2$ solid line **B1** for $x = 3$ dashed line **B1** for $y = x + 4$ solid line **B2, B1 or B0** for region 
25(a)	126	**4**	**M3** for $\frac{360-\left[180-\left(360\div 5\right)\right]}{2}$ or $\frac{360-180\times\left(5-2\right)\div 5}{2}$ or **M2** for $\frac{180\times\left(5-2\right)}{5}$ or $180-\frac{360}{5}$ or **M1** for $180 \times (5 - 2)$ or $\frac{360}{5}$
25(b)	7 : 2	**2**	**M1** for $\sqrt{\frac{73.5}{6}}$ or $\sqrt{\frac{6}{73.5}}$

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MATHEMATICS **0580/31**

Paper 3 (Core) **May/June 2019**

MARK SCHEME

Maximum Mark: 104

Published

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soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	6.8[0]	**1**	
1(b)	4.9[0]	**2**	**M1** for 3.4[0] + 2 × [0].85 soi
1(c)(i)	280.5[0]	**1**	
1(c)(ii)	379.5[0]	**2**	**FT** *their* **(c)(i)** + 99 **M1** for 8 × 1.5 × 8.25 soi or (8 × 1.5 + 34) × 8.25 soi
1(d)	33	**2**	**M1** for 7.5, 7, 8, 10.5
1(e)	85.20 cao	**3**	**B2** for 85.1999… OR **M1** for 9395 ÷ 110.27 **B1** for *their* answer to at least 3 dp correctly rounded to 2 dp
1(f)	13 891.5[0]	**3**	**M2** for 12 000 × $(1 + \frac{5}{100})^3$ oe or **M1** for 12 000 × $(1 + \frac{5}{100})^2$ oe
2(a)	6	**1**	
2(b)	3 + 2 × (12 – 4) = 19	**1**	
2(c)	$\frac{11}{15}$ [0].749 $\frac{3}{4}$ 76[%]	**2**	**B1** for 3 in the correct order or 0.75, (0.749) , 0.76, 0.73… or 75%, 74.9%, (76%), 73….%
2(d)(i)	16.3	**1**	
2(d)(ii)	512	**1**	
2(e)	2	**1**	
2(f)	1 2 3 6 9 18	**2**	**B1** for 4 or 5 correct factors only or 6 correct factors with one extra or 1 × 18, 2 × 9, 3 × 6
2(g)	4 or 8	**1**	

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Question	Answer	Marks	Partial Marks
2(h)	$\frac{1}{5}$ cao	**1**	
2(i)	352	**2**	**M1** for 160 ÷ 5 [× 11]
3(a)(i)	Correct bar	**3**	**M1** for 5, 12, 17 or 34 **M1** for 40 – *their*34
3(a)(ii)	5	**1**	
3(a)(iii)	Adult	**1**	**FT**
3(a)(iv)	$\frac{12}{40}$ oe	**1**	
3(b)(i)	86	**1**	
3(b)(ii)	45	**2**	**M1** for 18, 27, 31, 45, or 45, 60, 72, 104
3(b)(iii)	51	**2**	**M1** for (104 + 18 + 72 + 31 + 27 + 45 + 60) ÷ 7 soi $\frac{357}{7}$
4(a)	56	**2**	**M1** for 180 – 118 soi by 62
4(b)	144	**3**	**M2** for 180 – (360 ÷ 10) oe **M1** for 360 ÷ 10 soi by 36
4(c)	32 58	**2**	**B1** for each or for *their x* + *their y* = 90 or angle *F* marked as 90
4(d)	28 alternate	**2**	**B1** for each
4(e)	35	**2**	**M1** for $21^2 + 28^2$ or better
5(a)(i)	18*a* final answer	**2**	**M1** for 2 × (7*a* + 2*a*) oe
5(a)(ii)	$14a^2$ final answer	**2**	**M1** for 7*a* × 2*a*
5(b)	6 9 14	**2**	**B1** for 2 correct or 5 6 9
5(c)(i)	−4 −6 −12 6 4 3	**3**	**B2** for 4 or 5 correct or **B1** for 2 or 3 correct
5(c)(ii)	Correct curve	**4**	**B3FT** for 9 or 10 points correctly plotted or **B2FT** for 7 or 8 points correctly plotted or **B1FT** for 5 or 6 points correctly plotted
5(c)(iii)	Correct ruled line drawn	**1**	
5(c)(iv)	1.3 to 1.7	**1**	**FT** *their* curve and *their* line
6(a)	4 points correctly plotted	**2**	**B1** for 2 or 3 points correctly plotted
6(b)	Positive	**1**	

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Question	Answer	Marks	Partial Marks
6(c)	(40, 20) indicated	**1**	
6(d)	Ruled line of best fit	**1**	
6(e)	33 to 42	**1**	**FT** their positive line
7(a)	Rotation [centre] (0, 0) oe 90[°] clockwise oe	**3**	**B1** for each
7(b)	Enlargement [centre] (5, −7) [sf=] 3	**3**	**B1** for each
7(c)	Correct shape plotted with points (6, −1) (8, −1) (6, −3) (8, −3) (6, −5)	**2**	**B1** for a correct translation of $\begin{pmatrix}3\\k\end{pmatrix}$ or $\begin{pmatrix}k\\1\end{pmatrix}$
7(d)	Correct shape plotted with points (−2, 5) (−6, 5) (−2, 7) (−4, 5) (−4, 7)	**2**	**B1** for reflection in $y = k$ or $x = 1$
8(a)	$\pi \times 6^2 \times 17$	**M1**	
	1922.6 to 1922.91	**A1**	
8(b)	36.5 or 36.53 to 36.54…	**5**	**B2** for 100.53 to 100.54… or 32π or **M1** for [0.5 ×] $\pi \times 8^2$ oe and **B2** for 64 or **M1** for [0.5 ×] 16 × 8 oe
9(a)	$6a + 4b$ final answer	**2**	**B1** for $6a + kb$ or $ka + 4b$
9(b)	30	**2**	**M1** for $4 \times 3^2 + 3 \times -2$ or better
9(c)(i)	80	**1**	
9(c)(ii)	7	**2**	**M1** for $3x = 16 + 5$ or $x - \frac{5}{3} = \frac{16}{3}$ or better
9(c)(iii)	2.2 oe	**3**	**M1** for $10x + 5$ [= 27] or $2x + 1 = \frac{27}{5}$ **M1** for second correct step
9(d)	$\frac{p+5}{3}$ or $\frac{p}{3} + \frac{5}{3}$ final answer	**2**	**M1** for $p + 5 = 3r$ oe or $\frac{p}{3} = r - \frac{5}{3}$

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Question	Answer	Marks	Partial Marks
10(a)	Correct angle bisector with two pairs of correct arcs	**2**	**B1** for correct angle bisector with no/incorrect arcs or two pairs of correct arcs with no line
10(b)	Correct arc with radius 10.5 cm centre *C* and correct region shaded	**3**	**B2** for correct arc or **B1** for any arc centre *C* or 10.5 seen **B1**dep for shading correct region dep on at least **(a) B1(b) B1**

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MATHEMATICS **0580/32**

Paper 3 (Core) **May/June 2019**

MARK SCHEME

Maximum Mark: 104

Published

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soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	0.26 cao	**1**	
1(a)(ii)	$\frac{48}{100}$ or equivalent fraction	**1**	
1(b)(i)	$\frac{5k}{9k}$ where $k \neq 1$	**1**	
1(b)(ii)	13	**1**	
1(b)(iii)	Any decimal between 0.0467 and 0.0468	**1**	
1(c)(i)	8	**1**	
1(c)(ii)	26 244	**1**	
1(c)(iii)	1	**1**	
1(d)	112	**2**	**B1** for any multiple of 7 greater than 100 seen
1(e)	$\sqrt{10}$	**1**	
2(a)	4	**1**	
2(b)	3 correct bars drawn on bar chart	**4**	**B1** for Mr Smith bar drawn height 15 **M2** for *their* $(80-(18+14+15))\div 3[\times 2]$ or **M1** for $80-(18+14+15)$ oe
2(c)	Mrs Brown	**1**	**FT** *their* bar chart provided 5 bars drawn
2(d)(i)	$\frac{14}{80}$ oe	**1**	

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Question	Answer	Marks	Partial Marks
2(d)(ii)	$\frac{48}{80}$ oe	**2**	**FT** their bar chart **M1** for $80-(18+14)$ or $\frac{18+14}{80}$ oe OR **M1FT** for adding heights of bars for (Mr Jones, Mrs Brown and Mr Smith)
2(e)	81	**2**	**M1** for $\frac{360}{80}[\times 18]$ or $\frac{18}{80}[\times 360]$
3(a)	8.08	**2**	**B1** for 192 or 1.92 or 808 or **M1** for $10-6\times 0.32$ or $1000-6\times 32$
3(b)	3.96	**3**	**M2** for $0.6\times 3.1+2.8\times\frac{3}{4}$ oe or **M1** for 0.6×3.1 oe or $2.8\times\frac{3}{4}$ oe
3(c)	16	**1**	
3(d)	2.4[0]	**2**	**M1** for [1.5 +] $1.5\times\frac{60}{100}$ oe
3(e)(i)	6	**1**	
3(e)(ii)	4	**1**	
3(e)(iii)	3.26	**3**	**M1** for $\sum fx$ **M1 dep** for $\sum fx \div 50$
4(a)	322	**1**	
4(b)	96	**2**	**B1** for [*AB* =] 12 cm
4(c)	800 000	**1**	
4(d)	Ruled line *CX* drawn on map	**1**	
4(e)(i)	11 27	**1**	
4(e)(ii)(a)	1[h] 17 [min]	**3**	**FT** *their***(b)** **M2** for $\frac{\textit{their}\,\mathbf{(b)}}{75}\times 60$ oe or **M1** for $\frac{\textit{their}\,\mathbf{(b)}}{75}$

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Question	Answer	Marks	Partial Marks
4(e)(ii)(b)	10 10	**1**	**FT** *their* **(e)(i)** and *their* **(e)(ii)(a)**
5(a)(i)	16	**1**	
5(a)(ii)	12	**1**	
5(b)(i)	(5, 2)	**1**	
5(b)(ii)(a)	(−5, 2)	**1**	
5(b)(ii)(b)	(5, 10)	**2**	**B1** for (5, *k*) or (7, 2)
5(b)(iii)	$\begin{pmatrix} 44 \\ -14 \end{pmatrix}$	**2**	**FT** *their* **(b)(i)** **B1** for $\begin{pmatrix} 44 \\ k \end{pmatrix}$ or $\begin{pmatrix} 49 - their5 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -14 \end{pmatrix}$ or $\begin{pmatrix} k \\ -12 - their2 \end{pmatrix}$
5(c)(i)	Enlargement (SF) 0.5 oe (centre) (−3, 1)	**3**	**B1** for each
5(c)(ii)	Rotation 180° (centre) (4, 8)	**3**	**B1** for each
6(a)(i)	Diagram 4 correctly drawn	**1**	
6(a)(ii)	28	**1**	
6(a)(iii)	$8n - 4$ oe final answer	**2**	**M1** for $kn - 4$ $(k \neq 0)$ or $8n \pm c$
6(a)(iv)	38	**2**	**M1** for *their* **(a)(iii)** = 300 provided *their* **(a)(iii)** is linear
6(a)(v)	686	**2**	**M1** for $7 \times 7 \times 14$ or $0.07 \times 0.07 \times 0.14$ or $70 \times 70 \times 140$ oe
	cm^3	**1**	Units must be consistent with working or numerical answer
6(b)(i)	3	**1**	
6(b)(ii)	– – – 10 – 1 – 6 – – 9 16	**2**	**B1** for 3 or 4 correct
6(b)(iii)	$[t =]n^2$ oe	**1**	

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Question	Answer	Marks	Partial Marks
6(b)(iv)	$\frac{1}{2}\times 3(3+1)$ or $\frac{1}{2}\times 3^2+\frac{1}{2}\times 3$	**M1**	
	[=] 6	**A1**	
6(b)(v)	[w =] 120	**1**	
	[g =] 105 [t =] 225	**2**	**B1** for each If **B0B0** scored award **B1** if *their* w + *their* g = *their* t or FT**(b)(iii)** for *their t* if *their***(b)(iii)** is quadratic
7(a)	42, 42	**1**	
7(b)	22.5	**4**	**B3** for $14x=315$ or **M2** for $45+3x+5x+6x=360$ oe or **M1** for $45+3x+5x+6x$ oe or $14x$ If 0 scored and $45+bx=360$ or better seen then **SC1** for $x=\frac{360-45}{b}$ oe OR **B3** for $\frac{360-45}{14}$ or **B1** for 14 and **B1** for $360-45$ oe
7(c)	162	**3**	**M2** for $180-\frac{360}{20}$ oe or $\frac{(20-2)180}{20}$ oe or **M1** for $\frac{360}{20}$ or $(20-2)180$
7(d)	7.75 or 7.74[9…]	**2**	**M1** for $\left[x^2=\right]7.4^2+2.3^2$ or better
7(e)	29 angle [in a] semicircle [is] 90°	**2**	**B1** for each
8(a)(i)	(0, −3)	**1**	
8(a)(ii)	$y=6x$ oe	**1**	
8(b)(i)	$y=-2$ drawn, ruled	**1**	
8(b)(ii)	$y=-2x$ drawn, ruled	**1**	

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Question	Answer	Marks	Partial Marks
8(c)	For correct method seen to eliminate one variable	**M1**	$3x+13=7x-3$ oe
	$x=4$	**A1**	
	$y=25$	**A1**	If **M0** scored, **SC1** for 2 values that substitute to give $y-3x$ rounding to 13.0, or $y-7x$ rounding to -3.0 or **SC1** if no working shown, but 2 correct answers given
9(a)	23.25 23.75	**2**	**B1** for each If 0 scored, **SC1** for both correct and in reverse order
9(b)	3157	**2**	**M1** for $\frac{861}{3}\left[\times(3+8)\text{ or }\times 8\right]$ oe
9(c)	242	**4**	**M1** for changing to euros **M1FT** for 45% or 55% calculated **M1FT** for changing to pounds or **M1** for 45% or 55% calculated **M1FT** for changing to euros **M1FT** for changing to pounds

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Cambridge International General Certificate of Secondary Education

MATHEMATICS **0580/33**

Paper 3 (Core) **May/June 2019**

MARK SCHEME

Maximum Mark: 104

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Cambridge International is publishing the mark schemes for the May/June 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

This document consists of **6** printed pages.

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Generic Marking Principles

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GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

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- marks are awarded when candidates clearly demonstrate what they know and can do
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- marks are not deducted for omissions
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GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	1 302 596	**1**	
1(b)(i)	−5 −7	**2**	**B1** for −7 **B1FT** for 2 + *their* −7
1(b)(ii)	−180 −15 12	**3**	**B1** for −15 **B1** for 12 and **B1FT** for *their* −15 × *their* 12
1(c)	1.83×10^{-1} 18.4% $\frac{5}{27}$ 5^{-1}	**2**	**M1** for 3 in correct order or for three of [$\frac{5}{27}$ =]0.185.... , [18.4% =] 0.184, [1.83×10^{-1} =] 0.183, [5^{-1}=] 0.2
1(d)	46.7 or 46.71...	**1**	
1(e)(i)	14	**2**	**B1** for answer of 2 or 7 or 2 × 7 or 2 × 2 × 7 and 2 × 7 × 7 or list (28 =) 2, 2, 7 and (98 =)2, 7, 7
1(e)(ii)	196	**2**	**B1** for 28, 56, 84, 112,… and 98, 196 or [1 ×]2 × 2 × 7 × 7 or 196*k*
1(f)	3880 or 3879[·…] or 3.88(0...) × 10^3 or 3.879… × 10^3	**2**	**M1** for $2.25 \times 10^8 \div 5.8 \times 10^4$ oe or figs (388 or 3879…) as the answer
2(a)	Trapezium	**1**	
2(b)(i)	16 or 15.8 to 16.2	**1**	
2(b)(ii)	14	**1**	
2(c)(i)	Translation $\begin{pmatrix}-9\\-8\end{pmatrix}$	**2**	**B1** for each
2(c)(ii)	Rotation 90° clockwise oe [about] (0, 0) oe	**3**	**B1** for each

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Question	Answer	Marks	Partial Marks
2(d)(i)	Correct shape Vertices (−1, 4), (−1, 6), (−5, 6), (−5, 1)	**2**	**B1** for reflection in $x = k$ or $y = 1$
2(d)(ii)	Correct shape Vertices (3, 0.5), (3, 3), (1, 3), (1, 2)	**2**	**B1** for any enlargement, SF $\frac{1}{2}$ with different centre
3(a)	12 : 5 : 4	**2**	**B1** for 36 : 15 : 12 oe
3(b)(i)	$\frac{9}{(9+2+1)} \times 36$	**1**	
3(b)(ii)	[Cellos] 6 [Double basses] 3	**2**	**B1** for each
3(c)	8	**2**	**B1** for 3 [oboes] seen
3(d)	5	**2**	**B1** for 4 [trumpets] seen
3(e)(i)	[Woodwind] 3255 [Brass] 2652	**1**	
3(e)(ii)	10 623	**1**	**FT** *their* **(e)(i)**
3(f)	3718.05	**2**	**M1** for (1 – 0.65) × *their* **(e)(ii)** oe
4(a)	−3 5 2	**2**	**B1** for 2 correct
4(b)	Correct curve	**4**	**B3FT** for 6 or 7 points correct **B2FT** for 4 or 5 points correct **B1FT** for 2 or 3 points correct
4(c)(i)	Ruled line $x = 1$ drawn	**1**	
4(c)(ii)	$x = 1$	**1**	
4(d)	−0.5 to −0.3 and 2.3 to 2.5	**2**	**B1** for each If 0 scored, **B1** for $y = 4$ drawn
4(e)(i)	Correct ruled continuous line	**1**	
4(e)(ii)	[y =] $2x + 4$	**3**	**B2** for [y =] $2x + k$ or **M1** for $\frac{\text{rise}}{\text{run}}$ **B1** for $kx + 4$, $k \neq 0$, or $c = 4$
5(a)	10.8 to 12	**2**	**B1** for 3.6 cm to 4.0 cm measured
5(b)	191 to 220	**3**	**B1** for 11.8 to 12.2 measured or 35.4 to 36.6 **M1** for 0.5 × *their* **(a)** × *their* actual *EC* oe

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Question	Answer	Marks	Partial Marks
5(c)	Correct ruled bisector of angle *BCD* with correct arcs	**2**	**B1** for correct angle bisector with no/incorrect arcs, or two pairs of supporting arcs or correct line short of *AB* with or without arcs
5(d)(i)	25.1 or 25.13 to 25.14	**2**	**M1** for $8 \times \pi$ oe
5(d)(ii)	50.3 or 50.26 to 50.272	**2**	**M1** for $\pi\ (0.5 \times 8)^2$ oe
6(a)(i)(a)	34 Isosceles [triangle]	**2**	**B1** for each
6(a)(i)(b)	*Their p* Alternate [angles]	**2**	**B1** for each
6(a)(ii)	[*r* =] 112 [*s* =] 56	**2**	**B1** for 180 − 34 − *their* **(a)(i)(a)** **B1** for 90 − *their* **(a)(i)(b)**
6(a)(iii)	34 Corresponding [angles] or angles [on a straight] line [add up to] 180	**2**	**B1** for each
6(b)	90 Angle [between] tangent [and] radius (or diameter)	**2**	**B1** for each
7(a)(i)	120	**2**	**M1** for 90 ÷ *their* time for *A* to *B* [× 60] or **B1** for 2[km/min]
7(a)(ii)	10	**1**	
7(a)(iii)	Ruled line from (1440, 90) to (1520, 155)	**1**	
7(a)(iv)	*A* [and] *B*	**1**	
7(b)(i)	2 [hours] 30 [minutes]	**2**	**M1** for 155 ÷ 62
7(b)(ii)	1515	**1**	**FT** *their* **(b)(i)** + 1245
7(b)(iii)	Ruled line from (1245, 155) to (*their*7(***b***)(***ii***), 0)	**1**	
7(b)(iv)	58 to 63	**1**	**FT** *their* crossing point
8(a)(i)	Correct frequencies 8 5 3 5 2 1	**2**	**B1** for 1 frequency incorrect or 2 incorrect but total still 24 or 8 5 3 5 2 1 in tally column If 0 scored, **B1** for completely correct tallies
8(a)(ii)	1	**1**	

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Question	Answer	Marks	Partial Marks
8(a)(iii)	5	**1**	
8(a)(iv)	2	**1**	
8(a)(v)	2.625	**3**	**M1** for $\sum fx$ $1 \times 8 + 2 \times 5 + 3 \times 3 + 4 \times 5 + 5 \times 2 + 6 \times 1$ **M1** dep for *their* $\sum fx \div 24$
8(a)(vi)	$\frac{5}{24}$ oe	**1**	**FT** *their* table
8(b)	Correct bar chart	**2**	**B1** for 2 or 3 correct bars or for all 4 heights correct
8(c)	Correct generalised comparison	**1**	
9(a)	23	**4**	**M3** for $2 \times 32.4 + 4 \times 24.4 - 115 - 24.4$ oe OR **B2** for 162.4[0] or $2 \times 32.4 + 4 \times 24.4$ oe or **M1** for 2×32.4 or 4×24.4 **B1** for 139.4[0]
9(b)	4 [h] 55[min]	**1**	
9(c)	75	**2**	**M1** for $318 \div 4.24$

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MATHEMATICS **0580/41**

Paper 4 (Extended) **May/June 2019**

MARK SCHEME

Maximum Mark: 130

Published

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isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	Image at (1, 7), (4, 7), (4, 9), (3, 9)	**2**	**B1** for translation by $\begin{pmatrix} -1 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ 6 \end{pmatrix}$
1(a)(ii)	Image at (5, 3), (6, 3), (8, 5), (5, 5)	**2**	**B1** for 180° rotation with wrong centre
1(a)(iii)	Rotation 180˚ (4.5, 6) OR Enlargement, [factor] – 1 (4.5, 6)	**3**	**B1** for rotation **B1** for 180° **B1FT** for centre from *their* (a)(i) **B1** for enlargement **B1** for – 1 **B1FT** for centre from *their* **(a)(i)**
1(b)(i)	Image at (1, 2), (1, 5), (3, 5), (3, 4)	**2**	**B1** for $y = x$ drawn or for 3 correct points
1(b)(ii)	$\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$	**2**	**B1** for one correct row or one column within a 2 by 2 matrix
2(a)	2, 2, 6	**3**	**B1** for each
2(b)	Correct graph	**4**	**B3FT** for 10 or 11 correct plots or **B2FT** for 8 or 9 correct plots or **B1FT** for 6 or 7 correct plots
2(c)	–3.3 to –3.1	**1**	**FT** *their* graph
2(d)	$y = -2x$ ruled	**M1**	or **B1** for $y = -2x$ stated
	–2.6 to –2.45	**A1**	
2(e)	3 or 4 or 5	**1**	**FT** *their* graph Allow more than one correct value

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Question	Answer	Marks	Partial Marks
3(a)	530	**4**	**B3** for [*DE*] = 130 m and [*DC*] = 80 m or **B2** for [*DE*] = 130 m or [*DC*] = 80 m or **M1** for $50^2 + 120^2$ or $170^2 - 150^2$
3(b)	52.9 or 52.89…	**4**	**M2** for $\frac{100^2 + 150^2 - 120^2}{2 \times 100 \times 150}$ or **M1** for $120^2 = 100^2 + 150^2 - 2 \times 100 \times 150\cos(\ldots)$ **A1** for 0.603 or 0.6033…or $\frac{181}{300}$
3(c)(i)	28.1 or 28.07…	**2**	**M1** for $\cos = \frac{15}{17}$ oe
3(c)(ii)	331.9 or 331.9…	**2**	**FT** 360 – *their* **(c)(i)** **M1** for 360 – *their* **(c)(i)** oe
3(d)	1.5[0] or 1.498… nfww	**4**	**M1** for $\frac{1}{2} \times 50 \times 120$ oe **M1** for $\frac{1}{2} \times 100 \times 150 \sin(\textit{their}\textbf{(b)})$ oe **M1** for $\frac{1}{2} \times 150 \times \textit{theirCD}$ oe or $\frac{1}{2} \times 150 \times 170 \times \sin \textit{their}\textbf{(c)(i)}$ If 0 scored, **SC1** for dividing *their* area by 10 000
4(a)(i)	range = 7	**1**	
	mode = 21	**1**	
	median = 22.5	**2**	**M1** for evidence of middle value
	mean = 22.7 or 22.71…	**2**	**M1** for use of $\Sigma x \div 14$
4(a)(ii)	$\frac{3}{14}$ oe	**1**	
4(b)	$x - n + 1$ final answer	**3**	**M2** for $nx - (n-1)(x+1)$ or **M1** for $(n-1)(x+1)$
4(c)(i)	16.6 or 16.60 to 16.61 nfww	**4**	**M1** for 5, 12.5, 17.5, 22.5, 30 soi **M1** for Σfx where *x* is in correct interval, including boundaries **M1 dep** on second M1 for $\frac{\Sigma fx}{50 + 85 + 100 + 120 + 10}$

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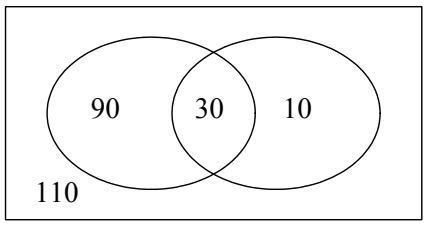
Question	Answer	Marks	Partial Marks
4(c)(ii)	Correct histogram	**4**	**B1** for each correct block If 0 scored, **SC1** for 5, 20, 24, 1 seen
5(a)	4.73 or 4.730 to 4.731...	**3**	**M2** for $3 \times 1.2 + \pi \times 0.6^2$ oe or **M1** for $\pi \times 0.6^2$ or $\frac{1}{2} \times \pi \times 0.6^2$ or 3×1.2
5(b)	946 or 946.0 to 946.2...	**3**	**M2** for *their* **(a)** $\times 0.2 \times 1000$ oe or **M1** for *their* **(a)** $\times 0.2$ or 20 implied by figs 946[0] to 9462
5(c)	1.28 or 1.29 or 1.284 to 1.290	**3**	**M2** for $\frac{(1007 - \textit{their}(\mathbf{b})) \div 1000}{\textit{their}(\mathbf{a})} \times 100$ oe or for $\frac{1007 - \textit{their}(\mathbf{b})}{\textit{their}(\mathbf{b})} \times 20$ oe or **M1** for figs $\frac{1007 - \textit{their}(\mathbf{b})}{\textit{their}(\mathbf{a})}$ or figs $\frac{1007}{\textit{their}(\mathbf{a})}$ or for $\frac{1007 - \textit{their}(\mathbf{b})}{\textit{their}(\mathbf{b})}$ or $\frac{1007}{\textit{their}(\mathbf{b})} \times 20$ oe
6(a)		**2**	**B1** for any one correct
6(b)	110	**1**	**FT** *their* 110 in Venn diagram
6(c)	$\frac{10}{240}$ oe	**1**	**FT** $\frac{\textit{their}10}{240}$

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Question	Answer	Marks	Partial Marks
6(d)	$\frac{870}{1560}$ oe	**3**	**M2** for $\frac{their30}{40} \times \frac{their30-1}{39}$ or **M1** for $\frac{p}{q} \times \frac{p-1}{q-1}$ $p < q$ or for $\frac{their30}{40}$ soi
7(a)(i)	1.991×10^3	**4**	**B3** for 1991 or 1.99×10^3 or $1.991\ldots \times 10^3$ or **B2** for 1990 or 1991. … OR **M1** for $104.3 \times 26.5 + \frac{1}{2} \times (-2.2) \times 26.5^2$ oe **B1** for *their* seen value correctly rounded to 4 sf **B1** for *their* seen value correctly converted into standard form
7(a)(ii)	$\frac{2(s-ut)}{t^2}$ oe final answer	**3**	**M1** for correct multiplication by 2 oe **M1** for correct rearrangement to isolate term with a **M1** for correct division by t^2 for 3 marks e.g. cannot have a fraction in denominator nor $\div t^2$ in numerator
7(b)(i)	$(2x+3)(x-1)-(x+1)(x-2)=62$	**M1**	
	$2x^2+3x-2x-3$ oe or $x^2+x-2x-2$ oe	**B1**	
	$x^2+2x-63=0$	**A1**	Established with no errors or omissions
7(b)(ii)	$(x+9)(x-7)$	**2**	**B1** for $(x+a)(x+b)$ where $ab=-63$ or $a+b=2$ or for $x(x-7)+9(x-7)$ or for $x(x+9)-7(x+9)$
7(b)(iii)	20	**2**	**FT** $2 \times$ *their* positive root $+ 6$ **M1** for substituting *their* positive root into four lengths or for stating $2x+6$

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Question	Answer	Marks	Partial Marks
8(a)	6 nfww	**3**	**M2** for $\frac{2.65-2.50}{2.50}[\times 100]$ or for $\frac{2.65}{2.50}\times 100$ or **M1** for $\frac{2.65}{2.50}$
8(b)	552.5[0]	**3**	**B2** for 52.5[0] or **M2** for $500\times\frac{1.5}{100}\times 7+500$ oe or **M1** for $500\times\frac{1.5}{100}$ $[\times 7]$ oe
8(c)	37.4 or 37.36…	**2**	**M1** for $\left(1+\frac{1.6}{100}\right)^{20}$ oe soi 1.37…
8(d)	4[.00...]	**3**	**M2** for $\sqrt[22]{\frac{2607}{6400}}$ or **M1** for $6400\times x^{22}=2607$ oe or better
9(a)	82	**2**	**M1** for $(3^x)^2+1$ soi by $(3^2)^2+1$ or g(9) isw
9(b)	$\frac{x+2}{7}$ final answer	**2**	**M1** for $y+2=7x$ or $\frac{y}{7}=x-\frac{2}{7}$ or $x=7y-2$
9(c)	[a =] 1, [b =] 2, [c =] 2	**3**	**B2** for $x^4+x^2+x^2+1+1$ or **M1** for $(x^2+1)^2+1$
9(d)	$\frac{6}{7}$ oe	**3**	**M2** for $7x-2=4$ or **M1** for $3^x=81$ soi f(x) = 4 or for $3^{7x-2}=81$ or better
10(a)	10	**1**	
10(b)	6.2[0] or 6.203 to 6.204	**3**	**M2** for [x^3 =] $1000\div\frac{4}{3}\pi$ oe or better or **M1** for $\frac{4}{3}\pi x^3=1000$
10(c)	7.82 or 7.815 to 7.816	**4**	**B3** for [x^3 =]$1000\div\frac{1}{3}\pi\div 2$ oe or better or **M1** for $\left(x\sqrt{5}\right)^2-x^2$ soi by $4x^2$ or $2x$ **M1dep** for $\frac{1}{3}\pi\times x^2\times theirh[=1000]$

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10(d)	$6\frac{2}{3}$ or 6.67 or 6.666 to 6.667	**4**	**B3** for $[x^3 =]1000 \div \frac{27}{8}$ oe or $\frac{3x}{2} = 10$ or better or **M2** for $\frac{1}{2} \times x \times \frac{x}{2} \times \frac{27x}{2} = 1000$ oe or **M1** for $\frac{1}{2} \times x \times \frac{x}{2}$ If 0 scored, **SC2** for answer 5.29 or 5.291..
11	[Total time =]16 h 6 min or 16.1 h	**2**	**B1** for 22 h 6 min or 22.1h or 966 mins If 0 scored, **SC1** for 9 h 41 min
	[Distance to airport in New York =] 16.5	**2**	**M1** for 18×55
	[Arc length =] 6200 or 6199 to 6200. …	**3**	**M2** for $\frac{55.5}{360} \times 2 \times \pi \times 6400$ or **M1** for $\frac{55.5}{360}$ or $2 \times \pi \times 2400$
	[Distance Geneva to Chamonix =] 104	**2**	**M1** for 65×1.6 or 65×96 oe
	392 to 393	**2**	**M1** for $\frac{6316 \text{ to } 6322.4}{\textit{their}\,16.1}$ Must be correct value in numerator

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Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

MATHEMATICS **0580/42**

Paper 4 (Extended) **May/June 2019**

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the May/June 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

This document consists of **9** printed pages.

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- marks are awarded when candidates clearly demonstrate what they know and can do
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- marks are not deducted for omissions
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GENERIC MARKING PRINCIPLE 4:

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GENERIC MARKING PRINCIPLE 5:

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GENERIC MARKING PRINCIPLE 6:

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	16.5 or 16.49...	**3**	**M2** for $\frac{1.13-0.97}{0.97}[\times 100]$ oe or $\frac{1.13}{0.97}\times 100$ oe or **M1** for $\frac{1.13}{0.97}$ oe
1(b)(i)	35	**2**	**M1** for $60 \div (5+7)$
1(b)(ii)	140	**1**	
1(c)	$1.26 final answer	**3**	**B2** for 1.259... or 1.26 but not as final answer or **M1** for $2.25 \div 0.9416$ If 0 scored, **SC1** for 1.13 × 0.9416
1(d)	15[.0…]	**3**	**M2** for $\sqrt[21]{\frac{58000}{1763000}}$ oe or **M1** for $58000 = 1763000\ (k)^{21}$
1(e)	1239.75	**2**	**B1** for 43 + 0.5 or 28 + 0.5 oe seen
2(a)	103	**3**	**M1** for angle *ABC* or angle *ACB* = $\frac{1}{2}(180-26)$ oe **M1** for angle *ABF* = 26 or angle *CBD* or angle *FBE* = 77 or exterior angle *ACB* = 103 correctly identified or in correct position

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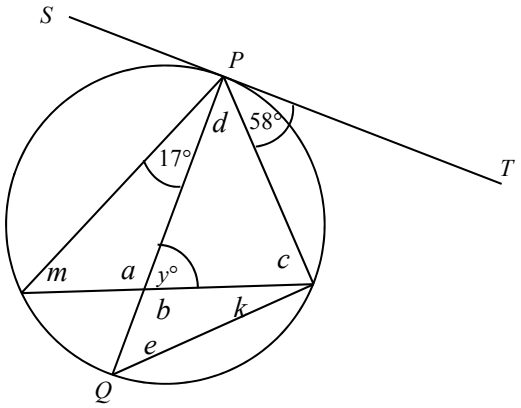
Question	Answer	Marks	Partial Marks
2(b)	75	**5**	**B4** for 105 at *a* or *b* **or** 73 at *c* **and** 32 at *d* or **B3** for 58 at *m* **or** 58 at *e* **and** 17 at *k* or **B2** for 32 at *d* **and** 90 soi at (*c*+*k*) **or** 32 at *d* **and** 17 at *k* **or** 73 at *c* or **B1** for 90 soi at (*c* + *k*) or between tangent and radius **or** 32 at *d* **or** 17 at *k* 
3(a)	$1 - r$	**1**	
3(b)(i)	$(1 - r)(1.3 - r)$ [= 0.4]	**1**	**FT** *their***(a)** dep on **(a)** being an expression in *r*
3(b)(ii)	$1.3 - 1.3r - r + r^2$ or better nfww	**M1**	**FT** *their* **(b)(i)**
	$0.9 - 2.3r + r^2 [= 0]$ OR $13 - 13r - 10r + 10r^2 = 4$ oe	**M1**	**Strict FT** *their* expansion to a quadratic then equating to 0.4 and then collecting to 3 terms on 'one side' OR **Strict FT** *their* expansion to a quadratic = 0.4 all multiplied by 10
	$10r^2 - 23r + 9 = 0$	**A1**	no errors or omissions seen

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Question	Answer	Marks	Partial Marks
3(b)(iii)	$(5r-9)(2r-1)$ [= 0]	**B2**	or **B2** for e.g. $5r(2r-1)-9(2r-1)$ **and then** $5r-9=0$ **and** $2r-1=0$ or **B1** for $5r(2r-1)-9(2r-1)$ [= 0] or $2r(5r-9)-1(5r-9)$ [= 0] or $(5r+a)(2r+b)$ [= 0] where a, b are integers and $ab = +9$ or $2a+5b=-23$ If 0 scored, **SC1** for $5r-9$ **and** $2r-1$ seen but not in factorised form
	[r =] $\frac{9}{5}$ oe [r =] $\frac{1}{2}$ oe	**B1**	
3(b)(iv)	0.8 or $\frac{4}{5}$ oe	**1**	
4(a)(i)	1.5 oe	**1**	
4(a)(ii)	(0, 2)	**1**	
4(b)(i)	$y=-2x+6$ oe final answer	**3**	**B2** for $y=-2x+c$ oe or $y=mx+6$ oe $m \neq 0$ or for answer $-2x+6$ or **B1** for [gradient =] $-\frac{6}{3}$ oe or $c = +6$ soi
4(b)(ii)	$y=0.5x-1.5$ oe final answer	**3**	**B1** for [gradient =] – 1 divided by *their* gradient from **(b)(i)** evaluated soi **M1** for substitution of (9, 3) into $y = (\textit{their } m)x + c$ seen in working
4(c)(i)	12.6 or 12.64 to 12.65	**3**	**M2** for $\sqrt{(8--4)^2+(5-1)^2}$ oe or **M1** for $(8--4)^2+(5-1)^2$ oe
4(c)(ii)	(2, 3)	**2**	**B1** for each
5(a)	2.45, 0.25, – 0.25	**3**	**B1** for each
5(b)	Fully correct smooth curve	**4**	**B3FT** for 6 or 7 points or **B2 FT** for 4 or 5 points or **B1 FT** for 2 or 3 points
5(c)	0.7 to 0.8	**1**	**FT** *their* curve
5(d)(i)	Correct ruled line	**2**	**M1** for good freehand, or ruled line with gradient –1.05 to –0.95 or ruled line through (0, 2) but not line $y = 2$

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Question	Answer	Marks	Partial Marks
5(d)(ii)	Both intersections of *their* **(b)** and *their* **(d)(i)**	**2**	**Strict FT** intersection of *their* **(b)** and *their* **(d)(i)** **B1FT** for one correct OR **B2** for 0.27 to 0.28 **and** 2.38 to 2.39
5(e)	Substitutes $x = \sqrt{2}$ into $\frac{1}{2x} - \frac{x}{4}$ OR Identifies $y = 0$ oe OR Correctly manipulates to a single fraction e.g. $\frac{2-x^2}{4x}$ oe seen	**M1**	
	Concludes 'read the graph at $y = 0$' oe OR Manipulates $0 = \frac{1}{2x} - \frac{x}{4}$ oe leading to $x^2 = 2$ OR States $\frac{2-x^2}{4x}$ oe $= 0$ leading to $x^2 = 2$	**A1**	
6(a)	$x^2 + 4x - 21$ final answer	**2**	**B1** for three of $x^2, +7x, -3x, -21$
6(b)(i)	$5q^2(3p^2 - 5q)$ final answer	**2**	**B1** for $5(3p^2q^2 - 5q^3)$ or $q^2(15p^2 - 25q)$ or $q(15p^2q - 25q^2)$ or $5q(3p^2q - 5q^2)$ or for correct answer seen
6(b)(ii)	$(2g + 5k)(2f + 3h)$ final answer	**2**	**B1** for $2g(2f + 3h) + 5k(2f + 3h)$ or $2f(2g + 5k) + 3h(2g + 5k)$ or for correct answer seen
6(b)(iii)	$(9k + m)(9k - m)$ final answer	**2**	**M1** for $(9 + m)(9 - m)$ or for correct answer seen

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Question	Answer	Marks	Partial Marks
6(c)	5.5	**4**	**M1** for $5\times3(x-4)+x+2=5\times6$ **M1** for $15x-60+x+2=30$ **FT** *their* first step or $3x-12+\frac{x+2}{5}=6$ If M0M0, **SC1** for $3x - 12 + x + 2 = 30$ oe **M1dep** for $16x=88$ **FT** *their* previous steps
7(a)	$180-\frac{360}{5}$ or $\frac{(5-2)\times180}{5}$ or $\frac{(2\times5-4)\times90}{5}$ or $\frac{5\times180-360}{5}$	**M2**	or **M1** for $\frac{360}{5}$ or $(5-2)\times180$ or $90(2 \times 5 - 4)$ or $3 \times 180 \div 5$ or $6 \times 90 \div 5$ or $5 \times 180 - 360$ If 0 scored, **SC1** for $\frac{5-2\times180}{5}$
7(b)(i)	7.05 or 7.053…	**3**	**M2** for $12 \times \cos54$ oe or **M1** for implicit form or **B1** for length of edge of pentagon = 14.1 to 14.11 If 0 scored, **SC1** for right angle at *M*
7(b)(ii)(a)	22.8 or 22.81 to 22.83… nfww	**3**	**M2** for $\frac{\textit{their}\ \textbf{(b)(i)}}{\cos 72}$ oe or **M1** for implicit form oe or **B1** for *AX* = 36.9 or 36.93 to 36.94
7(b)(ii)(b)	179 or 179.1 to 179.3…	**3**	**M2** for $\frac{1}{2}\times12\times\textit{their}\ AX\times\sin54$ oe or $\frac{1}{2}\times12\times\textit{their}\ OX\times\sin108$ oe or $\frac{1}{2}\times\textit{their}\ AX\times\textit{their}\ OX\times\sin18$ or $\frac{1}{2}\times12^2\times\sin72+\text{area}\ OBX$ oe or $\frac{1}{2}\times12^2\times\sin72+\text{area}\ OMB+\text{area}\ MBX$ oe or **M1** for a correct method to find area of one relevant triangle *AOB*, *OMB*, *MBX*, *OBX* or *ONX* **seen**
8(a)(i)	15.7 or 15.70...	**4**	**M2** for $16.5^2+12.4^2-2\times16.5\times12.4\times\cos64$ or **M1** for implicit form **A1** for 246 to 247

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Question	Answer	Marks	Partial Marks
8(a)(ii)	18.7 or 18.68 to 18.69	**4**	**B1** for 32 or angle *DBM* = 37 or angle *CBM* = 58 **M2** for $\frac{12.4 \times \sin 53}{\sin 32}$ oe or **M1** for implicit form oe
8(b)(i)	116.1 or 116.08 to 116.09...	**2**	**M1** for $\frac{y}{360} \times 2 \times \pi \times 3.8 = 7.7$ oe
8(b)(ii)	14.6 or 14.61 to 14.63…	**2**	**M1** for $\frac{\textit{their}\textbf{(b)(i)}}{360} \times \pi \times 3.8^2$ oe
9(a)	12.8[0]	**4**	**M1** for midpoints **soi** **M1** for use of $\sum fm$ with *m* in correct interval including both boundaries **M1** (dep on 2nd **M1**) for $\sum fm \div 100$
9(b)	54 84 93	**2**	**B1** for 2 correct or 1 error and 2 correct or **FT**
9(c)	correct diagram with all points correctly plotted	**3**	**B1FT** *their* **(b)** for plots at 5 correct heights **B1** for 5 points at upper ends of intervals on correct vertical line **B1FT** (dep on at least **B1**) for increasing curve or polygon through 5 points After 0 scored, **SC1FT** for 4 correct points plotted
9(d)(i)	9 to 9.8 final answer	**1**	
9(d)(ii)	8.5 to 11.5	**2**	**B1** for [UQ =] 15.5 to 17.5 or [LQ =] 6 to 7 seen
9(d)(iii)	10, 11 or 12	**2**	**B1** for 88 to 90 seen or for answer between 10 and 12
10(a)(i)	18[.0] or 17.99 to 18.00…	**3**	**M2** for $\sqrt[3]{\frac{24430 \times 3}{4\pi}}$ oe or **M1** for $\frac{4}{3}\pi r^3 = 24430$
10(a)(ii)	447 or 446.8 to 446.9...	**3**	**M2** for $\pi \times 50^2 \times 60 - 24430$ oe or **M1** for $\pi \times 50^2 \times 60$ oe

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Question	Answer	Marks	Partial Marks
10(b)	4 [hours] 30 [mins] nfww	**4**	**B3** for 16200 or 4.5 or 270 or **M2** for $\frac{\text{figs } 18 \times \text{figs } 15 \times \text{figs } 12}{\text{figs } 2}$ oe or **M1** for figs 18 × figs 15 × figs 12 oe
10(c)	12.5 or 12.50…	**3**	**M2** for $17 \times \sqrt{\frac{159.5}{295}}$ oe or **M1** for $\sqrt{\frac{159.5}{295}}$ or $\sqrt{\frac{295}{159.5}}$ seen or for $\frac{159.5}{295} = \frac{x^2}{17^2}$ oe
11(a)	40 54 26 34	**4**	**B1** for each
11(b)	$n^2 + 3n$ or $n(n+3)$ oe	**2**	**B1** for a quadratic expression or for 2nd common difference 2 (at least 2 shown) or for 2 correct equations seen or for subtracting n^2
11(c)	100	**2**	**M1** for *their* **(b)** = 10300 seen
11(d)	[a =] $\frac{1}{2}$ oe and [b =] $\frac{5}{2}$ oe	**2**	**B1** for each or **M1** for one correct equation or for 2nd difference = 1 soi (at least 2 shown)

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MATHEMATICS **0580/43**

Paper 4 (Extended) **May/June 2019**

MARK SCHEME

Maximum Mark: 130

Published

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isw ignore subsequent working
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SC Special Case
nfww not from wrong working
soi seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	6h 27 mins	**2**	**B1** for answer .....h 27 mins
1(a)(ii)	150 km/h	**3**	**M2** for $\frac{90}{36} \times 60$ or **M1** for $\frac{90}{\textit{their}\text{ time}}$ or **B1** for 36 [mins] seen
1(a)(iii)	780	**4**	**M3** for $\left(90 \times \frac{35}{3600}\right) \times 1000 - 95$ oe or **M2** for $\left(90 \times \frac{35}{3600}\right) \times 1000$ oe or **B1** for figs 875 or **M1** for $90 \times \frac{35}{3600}$ seen or for $90 \times \frac{1000}{3600}$ oe If 0 scored, **SC1** for *their* distance (> 95) – 95
1(b)(i)	7 : 5	**1**	
1(b)(ii)	66.7 or 66.66 to 66.67	**3**	**M2** for $\frac{140-84}{84}$ [× 100] oe or for $\frac{140}{84} \times 100$ oe or **M1** for $\frac{140}{84}$ oe
1(b)(iii)	24 576	**5**	**M4** for complete method, 40 × 60 + 0.7 × 220 × 84 + 0.3 × 220 × 140 oe OR **B1** for 40 [children] **M1** for 0.7 × 220 × 84 oe **M1** for 0.3 × 220 × 140 oe **B1** for 2400 or 12936 or 9240 nfww

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Question	Answer	Marks	Partial Marks
1(c)	3.5×10^5 nfww	**3**	**M2** for $3.08 \times 10^5 \div \left(\frac{100-12}{100}\right)$ oe or **M1** for $3.08\ [\times 10^5]$ associated with (100–12)%
2(a)	–10	**2**	**M1** for $-17 - 3 = 7x - 5x$ oe or better
2(b)	−1, 0, 1, 2 final answer	**3**	**B2** for 3 correct values and no incorrect values or 4 correct values and one incorrect value or **M2** for $-\frac{7}{4} < n \leqslant 2$ oe or **M1** for $-\frac{7}{4} < n \leqslant k$ or $k < n \leqslant 2$ oe
2(c)(i)	a^9	**1**	
2(c)(ii)	$125x^3y^6$ final answer	**2**	**B1** for 2 correct elements if in form kx^ny^m
2(c)(iii)	$\frac{4y^{[1]}}{3x^4}$ final answer	**3**	**B2** for $\left(\frac{3x^4}{4y^{[1]}}\right)^{[-1]}$ oe seen OR **B1** for $3x^4$ or $4y^{[1]}$ **and** **M1** for $\left(\frac{64y^3}{27x^{12}}\right)^{\left[\frac{1}{3}\right]}$ oe If 0 scored, **SC1** for $\frac{64y^{[1]}}{27x^4}$ or $\frac{0.333x^{-4}}{0.25y^{-1}}$ seen
3(a)(i)	Image at (–5, 4), (–2, 4), (–4, 6)	**2**	**B1** for translation by $\begin{pmatrix}-3\\k\end{pmatrix}$ or $\begin{pmatrix}k\\2\end{pmatrix}$
3(a)(ii)	Image at (2, 1), (4, –1), (2, –2)	**2**	**B1** for reflection in $y = -x$ or $y = x$ drawn
3(b)	Rotation 90°[anticlockwise] oe (1, –1)	**3**	**B1** for each
3(c)(i)	$\begin{pmatrix}-2 & 0\\0 & -2\end{pmatrix}$	**2**	**B1** for 2 by 2 matrix with one correct row or column
3(c)(ii)	Strict **FT** *their* **(c)(i)**	**1**	Answer not equal to zero **FT** *their* **(c)(i)** only if 2 by 2

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Question	Answer	Marks	Partial Marks
4(a)(i)	$\frac{1}{2}\times\frac{4}{3}\times\pi\times5.6^3$	**M1**	
	367.8... to 367.9	**A1**	
4(a)(ii)	3.06 or 3.060 to 3.061...	**4**	**M1** for 0.8 × 368 [= 294.4] **M2** for [r^2 =] $\frac{their\ 294.4}{10\pi}$ oe or **M1** for $\pi r^2 \times 10 = their$ 294.4 oe
4(b)(i)	44[.0] or 43.98 to 43.99 nfww	**5**	**B2** for [slant height =] $\frac{25}{4}$ oe or **M1** for [l^2 =] $6^2 + 1.75^2$ oe **M2** for $\pi\times1.75\times their\ l+\pi\times1.75^2$ or **M1** for $\pi\times1.75\times their\ l$ or $\pi\times1.75^2$
4(b)(ii)(a)	SF = $\frac{1}{4}$ oe soi	**B1**	
	$\frac{1}{3}\pi\times1.75^2\times6-\frac{1}{3}\pi\times their\ 0.4375^2\times1.5$ **OR** $\frac{1}{3}\pi\times1.75^2\times6\times\left(1-\left(\frac{1}{4}\right)^3\right)$ oe	**M2**	**M1** for $\frac{1}{3}\pi\times1.75^2\times6$ or $\frac{1}{3}\pi\times their\ 0.4375^2\times1.5$ **OR** **M1** for $1-\left(\frac{1}{4}\right)^3$ oe
	18.94 or 18.939 to18.944…	**A1**	
4(b)(ii)(b)	95 final answer	**3**	**B2** for 94.5 or 94.69 to 94.722 OR **M2** for $18.9\times10^3\div200$ oe or **M1** for 18.9×10^3 or $200\div10^3$ or figs 189..÷ 200 or 18.9.. ÷ figs 2
5(a)(i)	–3	**1**	
5(a)(ii)	6.2 to 6.4 oe	**2**	**M1** for 3 seen or used
5(b)	$y = 5 - 3x$ ruled	**2**	**B1** for $y = 5 - 3x$ soi or ruled line with gradient – 3 or with y – intercept at 5 (but not $y = 5$) or **B1FT** for incorrect line equation/expression shown in working and *their* line correctly drawn
	– 0.3 to – 0.2 1.65 to 1.8	**2**	**B1** for each, dep on $y = 5 - 3x$ drawn or **FT** *their* line provided equation/expression shown in working, dep on B1FT for line

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Question	Answer	Marks	Partial Marks
5(c)	Tangent ruled at $x = -2$	**1**	**B1** for correct tangent
	–4.5 to –2.5	**2**	**Dep** on B1 for tangent or close attempt at tangent at $x = -2$ **M1** for rise/run **also dep on** tangent drawn or close attempt at correct tangent Must see correct or implied calculation from a drawn tangent
5(d)(i)	8, 4, 0.25 oe	**3**	**B1** for each
5(d)(ii)	Correct graph	**3**	**B2FT** for 6 or 7 correct plots or **B1FT** for 4 or 5 correct plots
5(d)(iii)	1.8 to 1.9	**1**	
6(a)	40.5 or 40.45[8..] or 40.46 nfww	**4**	**M1** for 25, 32.5, 37.5, 50, 80 soi **M1** for Σft **M1 dep** for their $\Sigma ft \div 120$
6(b)	Fully correct histogram	**4**	**B1** for each correct bar If 0 scored, **SC1** for frequency densities of 5.4, 4.2, 0.8 and 0.45 seen
7(a)	[y =] $4x + 5$	**3**	**B2** for answer [y =] $4x + c$ oe (c can be numeric or algebraic) OR **M2** for $\frac{y-9}{x-1} = \frac{9-(-3)}{1-(-2)}$ oe OR **M1** for $\frac{9--3}{1--2}$ oe or for **M1** for correct substitution of (–2, –3) or (1, 9) into $y = (their\ m)x + c$ oe
7(b)	76[.0] or 75.96...	**2**	**M1** for tan[ ] = 4 oe

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Question	Answer	Marks	Partial Marks
7(c)(i)	$[y =]\ -\frac{1}{4}x+\frac{23}{8}$ oe	**3**	**B2FT** for $[y =]\ -\frac{1}{\textit{their}\text{ gradient from }\textbf{(a)}}x+c$ oe (c can be numeric or algebraic) OR **M2** for $\frac{y-2}{x-3.5}=-\frac{1}{\textit{their}\text{ gradient from }\textbf{(a)}}$ oe OR **M1** for $-\frac{1}{\textit{their}\text{ gradient from }\textbf{(a)}}$ soi **M1** for correct substitution of (3.5, 2) into $y = (\textit{their } m)x + c$ oe
7(c)(ii)	(–4.5, 4)	**2**	**B1** for each value or for $\begin{pmatrix}-8\\2\end{pmatrix}$ seen
8(a)(i)	$\frac{x-1}{x+2}$	**2**	**B1** for either numerator or denominator correct
8(a)(ii)(a)	$\frac{x}{x+3}\times\frac{x-1}{x+2}=\frac{7}{15}$	**B1**	**FT** *their* **(a)(i)** = $\frac{7}{15}$
	$15x(x – 1) = 7(x + 3)(x + 2)$	**M1**	Removes all algebraic fractions **FT** *their* equation if in comparable form
	$15x^2 – 15x = 7x^2 + 21x + 14x + 42$	**M1**	Correctly expands all brackets **FT** *their* equation if in comparable form
	$[8x^2 – 50x – 42 = 0]$ $4x^2 – 25x – 21 = 0$	**A1**	With no errors or omissions seen and one further stage seen after final M1
8(a)(ii)(b)	$(4x + 3)(x – 7)$ [= 0]	**M2**	**M1** for $4x(x – 7) + 3(x – 7)$ or $x(4x + 3) – 7(4x + 3)$ or for $(4x + a)(x + b)$ where either $ab = –21$ or $4b + a = –25$ If 0 scored, **SC1** for $4x + 3$ **and** $x – 7$ seen but not in factorised form
	7 and $-\frac{3}{4}$	**B1**	
8(a)(ii)(c)	7	**1**	**FT** *their* positive solution

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Question	Answer	Marks	Partial Marks
8(b)	$\frac{1}{6}$ oe	**4**	**M3** for $\frac{5}{9}\times\frac{4}{8}\times\frac{3}{7}+\frac{4}{9}\times\frac{3}{8}\times\frac{2}{7}$ or **M2** for $\frac{5}{9}\times\frac{4}{8}\times\frac{3}{7}$ or $\frac{4}{9}\times\frac{3}{8}\times\frac{2}{7}$ or **M1** for $\frac{5}{9},\frac{4}{8},\frac{3}{7}$ seen or $\frac{4}{9},\frac{3}{8},\frac{2}{7}$ seen If 0 scored, **SC1** for $\frac{5^3+4^3}{729}$ oe
9(a)(i)	$\angle ACD = 46$ soi or $\angle CDE = 44$ soi	**B2**	**B1** for angle $ADC = 108$ or angle $DCB = 18$
	$\frac{58\sin 108}{\sin \textit{their} 46}$	**M2**	**M1** for $\frac{\sin 108}{x}=\frac{\sin \textit{their} 46}{58}$ oe
	76.68… nfww	**A1**	
9(a)(ii)	10.9 or 10.91 to 10.94	**3**	**B2** for [AB =] 68.9 or 68.91 to 68.94 or **M2** for a correct explicit statement for AB or BD or **M1** for $\frac{AB}{76.7}$ = cos26 oe
9(b)(i)	10.4 or 10.43 to 10.44	**4**	**M3** for $\sqrt{\frac{70}{\sin 40}}$ oe or **M2** for $x^2 \times \sin 40 = 70$ oe or **M1** for $\frac{1}{2}x \times 2x \times \sin 40 = 70$
9(b)(ii)	140	**1**	
10(a)(i)	3, –1	**2**	**B1** for each
10(a)(ii)	$23 - 4n$ oe final answer	**2**	**M1** for $k - 4n$ or $23 - jn$ ($j \neq 0$)
10(a)(iii)	22	**2**	**M1** for *their* **(a)(ii)** = –65
10(b)	23	**2**	**B1** for 37 or 60

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CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

MATHEMATICS **0580/11**

Paper 1 (Core) **May/June 2019**

1 hour

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 56.

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[Turn over

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1 Write $\frac{3}{4}$ as a decimal.

..... [1]

2 Work out \$1.20 as a percentage of \$16.

.....% [1]

3 Factorise $5y - 6py$.

..... [1]

4 A bag contains green balls and red balls only.
A ball is taken at random from the bag.
The probability of taking a green ball is 0.38 .

Write down the probability of taking

(a) a red ball,

..... [1]

(b) a blue ball.

..... [1]

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5 **(a)** On Monday the temperature at midday is 4 °C and the temperature at midnight is −3 °C.

Work out the difference between these two temperatures.

..... °C [1]

(b) On Wednesday the temperature at midday is −1 °C.
By 7 pm the temperature has fallen by 4 °C.

Work out the temperature at 7 pm.

..... °C [1]

6 The volume of a cuboid is 180 cm^3.
The base is a square of side length 6 cm.

Calculate the height of this cuboid.

..... cm [2]

7 Write the following numbers in standard form.

(a) 640 000

..... [1]

(b) 0.0006

..... [1]

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8 Work out.

(a) $\begin{pmatrix} 4 \\ -2 \end{pmatrix} - \begin{pmatrix} 1 \\ 5 \end{pmatrix}$

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(b) $6\begin{pmatrix} 3 \\ 0 \end{pmatrix}$

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

9 Asif and Ben share \$2100 in the ratio Asif : Ben = 3 : 7.

Work out how much Asif receives.

\$ ..... [2]

10 The length of a truck, L metres, is 8.2 m, correct to 1 decimal place.

Complete this statement about the value of L.

..... $\leqslant L <$ ..... [2]

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11 Simplify.

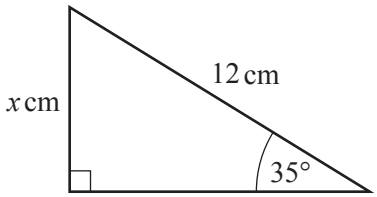
(a) $t^{21} \div t^{7}$

..... [1]

(b) $(u^{5})^{5}$

..... [1]

12



NOT TO SCALE

The diagram shows a right-angled triangle.

Calculate the value of x.

$x =$ ..... [2]

13

$$p = \frac{1.6 + 9.6^{2}}{5.9 - 4.3}$$

(a) By writing each number correct to 1 significant figure, work out an estimate for p.
You must show all your working.

..... [2]

(b) Calculate the exact value of p.

..... [1]

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14 27 28 29 30 31 32 33

From the list of numbers, write down

(a) a multiple of 7,

..... [1]

(b) a cube number,

..... [1]

(c) a prime number.

..... [1]

15 **Without using a calculator**, work out $\frac{5}{6}+\frac{2}{3}$.

You must show all your working and give your answer as a mixed number in its simplest form.

..... [3]

16 These are the first four terms of a sequence.

5 8 11 14

(a) Write down the next term.

..... [1]

(b) Find an expression, in terms of n, for the nth term.

..... [2]

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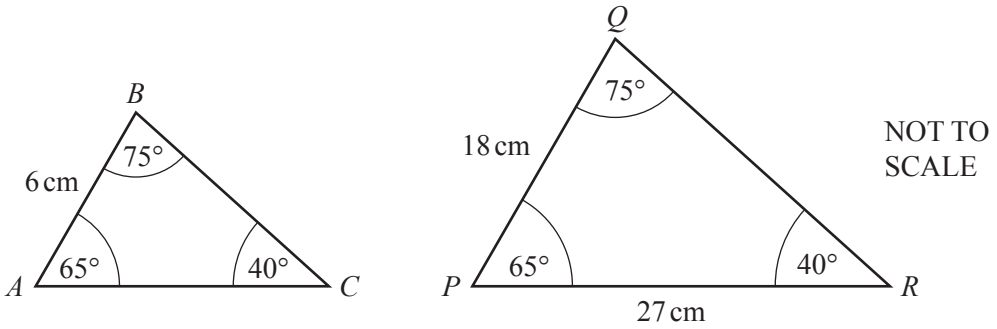
17



(a) Explain why triangle *ABC* and triangle *PQR* are similar.

.....

..... [1]

(b) Find *AC*.

AC = ... cm [2]

18 A car travels at a constant speed of 20 m/s.

Work out the time it takes for the car to travel 10 km.
Give your answer in minutes and seconds.

..... minutes ..... seconds [3]

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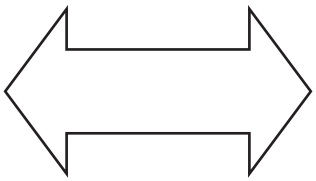
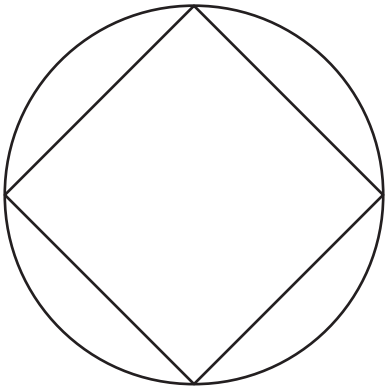
19 **(a)** On each shape, draw all the lines of symmetry.

(i)



[1]

(ii)



[2]

(b) Write down the name of a quadrilateral that has

- rotational symmetry of order 2

and

- exactly two lines of symmetry.

..... [1]

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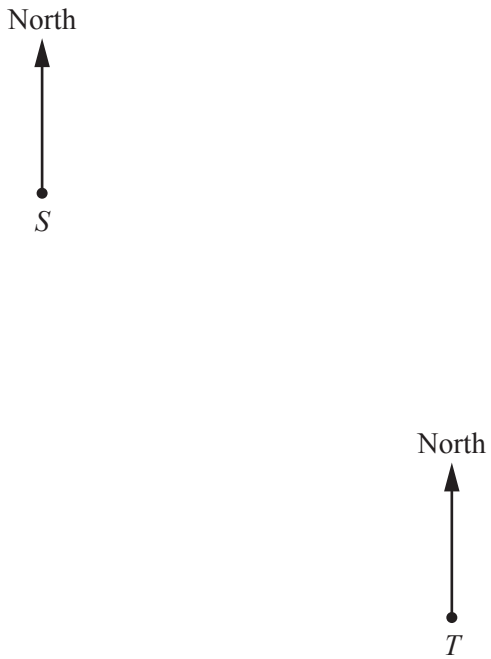
20 **(a)** Change 3670 centimetres to metres.

..... m [1]

(b) The scale drawing shows the positions of town *S* and town *T*.
The scale is 1 centimetre represents 15 kilometres.



Scale: 1 cm to 15 km

(i) Find the actual distance between these two towns.

..... km [2]

(ii) Measure the bearing of town *T* from town *S*.

..... [1]

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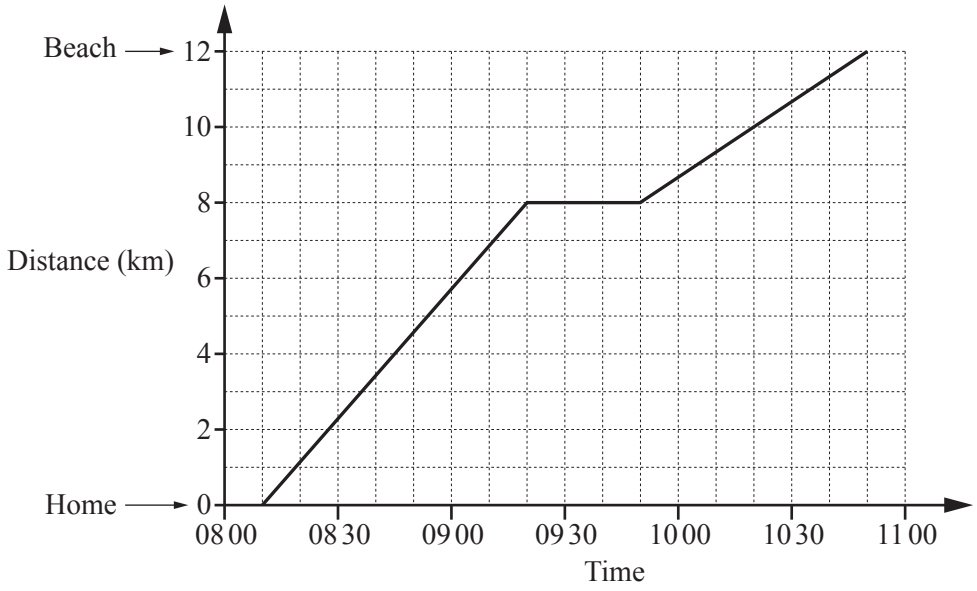
21 The travel graph shows Michael's journey from his home to the beach.



(a) At what time did he start his journey?

..... [1]

(b) On the journey he stopped for a rest.

(i) Find the distance he was from home when he stopped for a rest.

.....km [1]

(ii) For how many minutes did he stop?

.....min [1]

(c) Explain how the graph shows that Michael travelled faster before he stopped than after he stopped.

..... [1]

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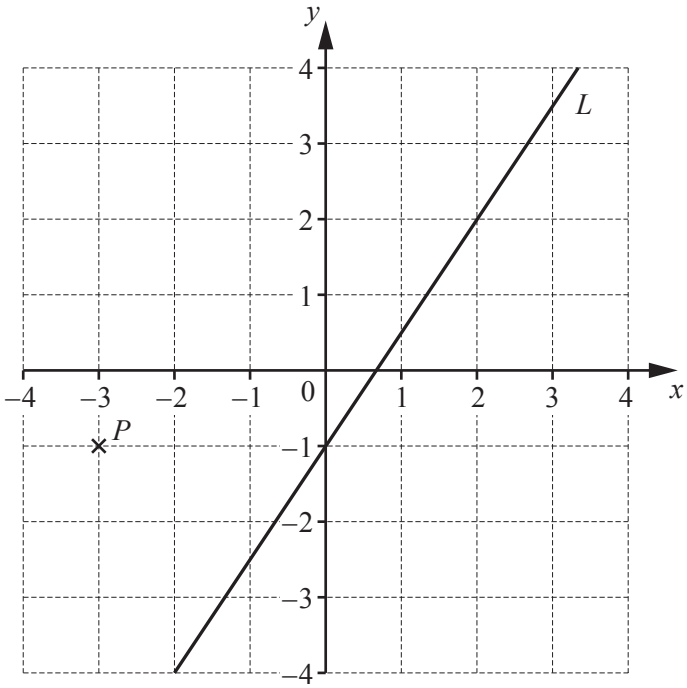
22 The diagram shows a point P and a line L.



(a) Write down the co-ordinates of point P.

(....., ...) [1]

(b) Find the gradient of line L.

..... [2]

(c) Write down the equation of line L in the form $y = mx + c$.

$y =$ ..... [2]

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CANDIDATE NAME	

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MATHEMATICS **0580/12**

Paper 1 (Core) **May/June 2019**

1 hour

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

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[Turn over

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1 Write 30 682 in words.

..... [1]

2 Change 4365 metres into centimetres.

..... cm [1]

3 Insert one pair of brackets to make this statement correct.

$$4 \times 6 - 2 + 1 = 17$$

[1]

4 The probability that Tommy has his calculator for his mathematics lesson is 0.4 .
There are 120 mathematics lessons in one year.

Work out an estimate of the number of mathematics lessons in one year that Tommy has his calculator.

..... [1]

5 **(a)** Subtract 123 from 1 million.

..... [1]

(b) Subtract 9 from 2.

..... [1]

6 Complete each statement.

(a) A quadrilateral with only one pair of parallel sides is called a ..... . [1]

(b) An angle greater than 90° but less than 180° is called ..... . [1]

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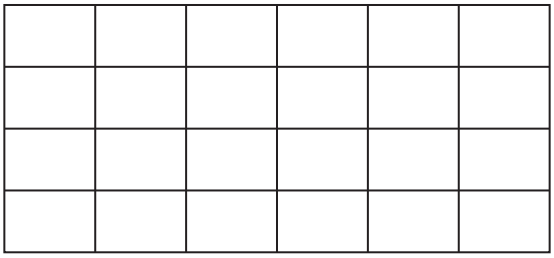
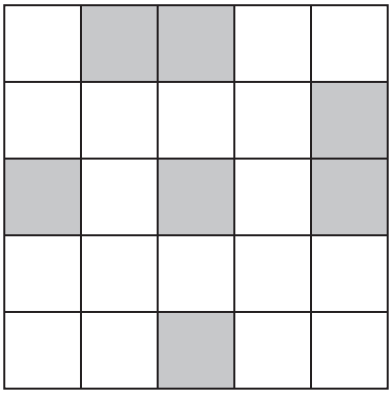
7 **(a)** Shade five-eighths of this rectangle.



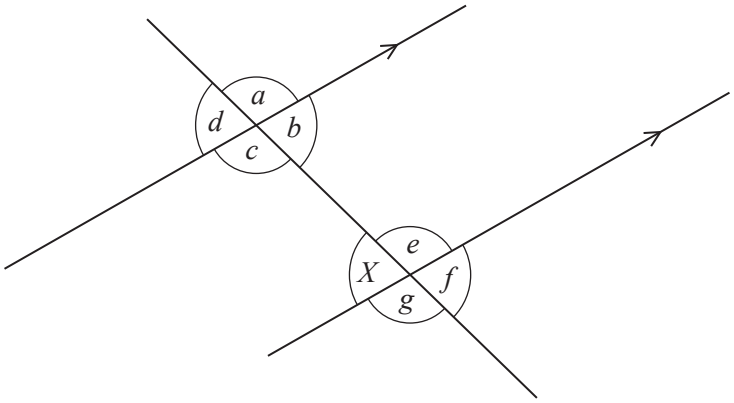
[1]

(b) Shade two more squares so that this grid has rotational symmetry of order 4.



[1]

8



The diagram shows two parallel lines and a straight line crossing them.

Write down, using letters from *a* to *g*,

(a) the angle that is alternate to angle *X*,

..... [1]

(b) the angle that is corresponding to angle *X*.

..... [1]

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9 50 students each choose their favourite colour from a list of six colours.
The results for the colours Red, Orange, Yellow, Green and Blue are shown in the tally chart.

Complete the tally chart.

Favourite colour	Tally
Red	卌 卌 I
Orange	卌 卌 IIII
Yellow	卌 IIII
Green	卌
Blue	III
Purple	

[2]

10 **(a)** Write 0.047 883 correct to 2 significant figures.

..... [1]

(b) Write 0.005 27 in standard form.

..... [1]

11 Find the highest common factor (HCF) of 90 and 48.

..... [2]

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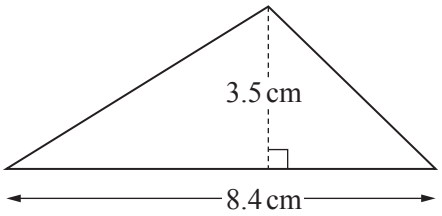
12

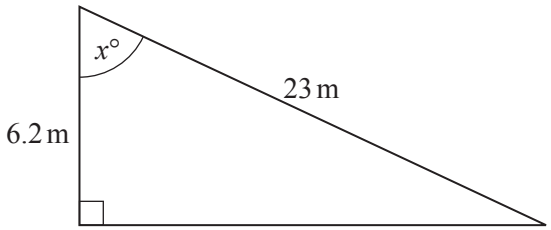


NOT TO SCALE

Calculate the area of this triangle.

..... cm^2 [2]

13



NOT TO SCALE

The diagram shows a right-angled triangle.

Calculate the value of x.

x = ... [2]

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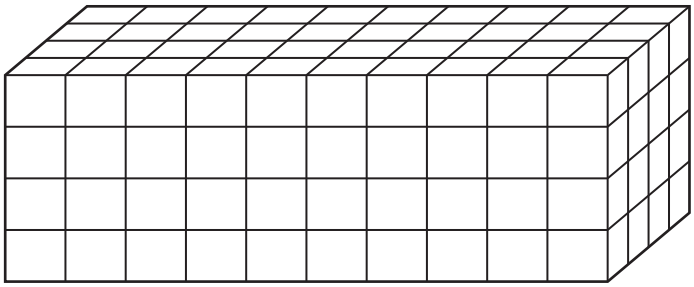
14 **(a)** The diagram shows a solid cuboid made of identical cubes.

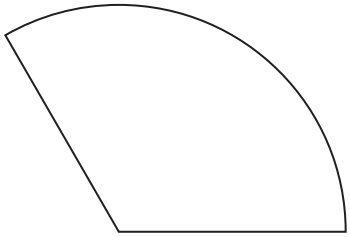


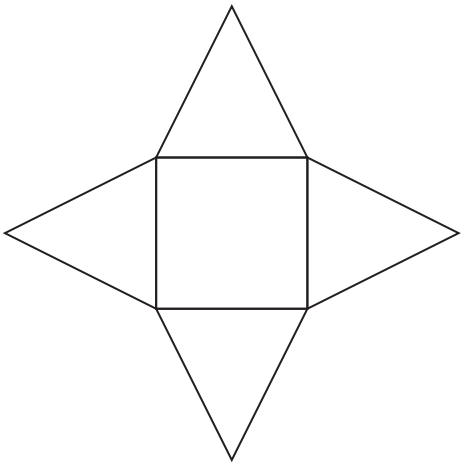
NOT TO SCALE

Work out the number of cubes in the cuboid.

..... [1]

(b) The diagram shows the nets of two solids.
Write down, under each net, the mathematical name for the solid.





.... [2]

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15 A box contains 22 coloured pencils.
6 pencils are pink, 9 pencils are blue and 7 pencils are yellow.

(a) Write down the ratio pink pencils : not pink pencils.
Give your answer in its simplest form.

..... : ..... [2]

(b) A pencil is taken at random from the box.

Write down the probability that this pencil is green.

..... [1]

16 **(a)** Expand.

$$x^2(x-7)$$

..... [2]

(b) Factorise.

$$y^2+y$$

..... [1]

17 **(a)** Show that there is not a square number between 50 and 60.

[2]

(b) Write down a prime number between 50 and 60.

..... [1]

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18 A machine always takes 5 minutes to paint an 80 metre white line on a road.

(a) Work out the number of metres painted in 45 minutes.

..... m [1]

(b) Work out the number of minutes taken to paint a 2.8 km line.

..... min [2]

19 Simplify.

(a) $5m^2 \times 2m^3$

..... [2]

(b) $\left(x^8\right)^3$

..... [1]

20 **Without using a calculator**, work out $2\frac{1}{4} \div \frac{3}{7}$.

You must show all your working and give your answer as a mixed number in its simplest form.

..... [3]

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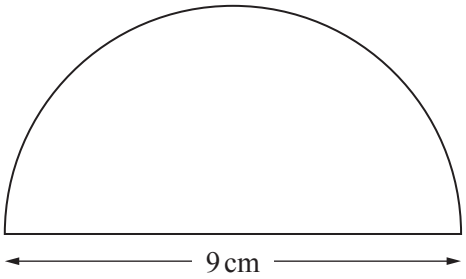

NOT TO SCALE

The diagram shows a semicircle with diameter 9 cm.

Calculate the total perimeter of this semicircle.

..... cm [3]

22 Gerry and Alain run around a running track.

To run around the track once
- Gerry always takes 90 seconds
- Alain always takes 105 seconds.

They start together at the same point.

After how many minutes are they next together at that point?

..... min [3]

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23 Rearrange this formula to make x the subject.

$$5x^2 - 3y = 4y + 8$$

$x =$ ..... [3]

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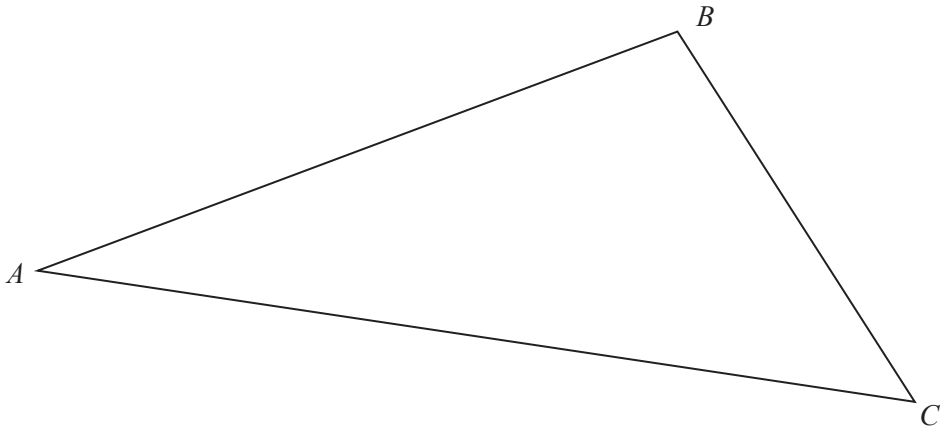

(a) **(i)** **Using a straight edge and compasses only**, construct the perpendicular bisector of AB.
Show all your construction arcs. [2]

(ii) **Using a ruler and compasses only**, construct the locus of points inside the triangle that are 4 cm from C. [1]

(b) Shade the region inside the triangle that is

- more than 4 cm from C

and

- closer to B than to A.

[1]

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CANDIDATE NAME	
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MATHEMATICS **0580/13**

Paper 1 (Core) **May/June 2019**

1 hour

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
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You may use an HB pencil for any diagrams or graphs.
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For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 56.

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[Turn over

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1 Write 3.058 correct to 3 significant figures.

..... [1]

2 Write 0.45 as a fraction in its simplest form.

..... [1]

3 Factorise $2x^2 - x$.

..... [1]

4 Find the co-ordinates of the point where the line $y = 3x - 8$ crosses the y-axis.

(..... , ...) [1]

5 Giulio's reaction times are measured in two games.
In the first game his reaction time is $\frac{1}{3}$ of a second.
In the second game his reaction time is $\frac{1}{8}$ of a second.

Find the difference between the two reaction times.

..... s [1]

6 The probability that Alex wins a prize is 0.27 .

Find the probability that Alex does not win a prize.

..... [1]

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7 The table shows the different methods of travel for 20 people going to work.

Method of travel	Frequency
Car	10
Walk	5
Bike	3
Bus	2

Which type of average, mean, median or mode, can be used for this information?

..... [1]

8 Calculate.

(a) $-12 \div -2$

..... [1]

(b) $\sqrt[3]{2^3 + 2}$

..... [1]

9 Simplify.

$$4x - 12y + 10x + 25y$$

..... [2]

10 Here is a list of numbers.

21 $\quad \frac{2}{3} \quad \sqrt{13} \quad$ 31 $\quad \sqrt{121} \quad$ 51 $\quad$ 0.7

From this list, write down

(a) a prime number,

..... [1]

(b) an irrational number.

..... [1]

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11 $\mathbf{p} = \begin{pmatrix} 5 \\ 0 \end{pmatrix}$ $\mathbf{q} = \begin{pmatrix} 1 \\ 6 \end{pmatrix}$

Work out $2\mathbf{p} + 3\mathbf{q}$.

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [2]

12 Write down the type of correlation you would expect for the following.

(a) The average speed of a train and the time taken for a journey.

..... [1]

(b) The distance travelled by a car and the amount of fuel used.

..... [1]

13 The scale drawing shows a rock, *R*.
The scale is 1 centimetre represents 30 metres.
A lighthouse, *L*, is 210 m from *R*, on a bearing of 125°.

On the diagram, mark the position of *L*.

Scale : 1 cm to 30 m

[2]

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14 Rearrange $2(w+h) = P$ to make w the subject.

$w =$ ..... [2]

15 Genaro measures the length, l cm, of his desk as 120 cm, correct to the nearest centimetre.

Complete the statement about the value of l.

..... $\leqslant l <$ ..... [2]

16 Solve.

$$7x - 5 = 16$$

$x =$ ..... [2]

17 **Without using a calculator**, work out $\frac{12}{35} \times \frac{7}{9}$.
You must show all your working and give your answer as a fraction in its simplest form.

..... [2]

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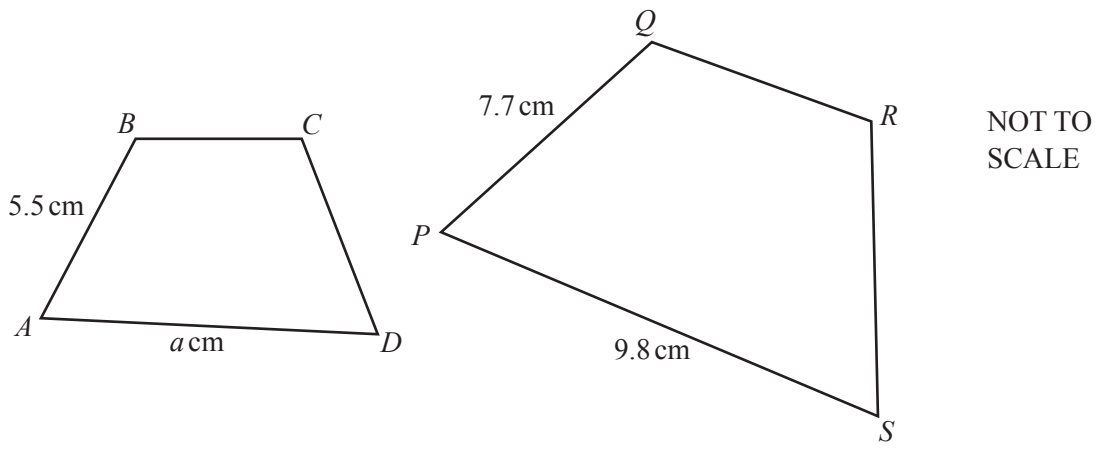
18



Shape *ABCD* is similar to shape *PQRS*.

Work out the value of *a*.

a = ... [2]

19 Harry invests \$800 for 2 years at a rate of 3% per year compound interest.

Calculate the amount of interest he receives at the end of the 2 years.

\$ ..... [3]

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20 Solve the simultaneous equations.
You must show all your working.

$$5x - 2y = 26$$
$$7x + 6y = 10$$

$x =$ .....

$y =$ ..... [3]

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21 **(a)** Write down the next term in each sequence.

(i) 12, 7, 2, −3, −8, ... [1]

(ii) 4, 7, 13, 25, 49, ... [1]

(b) Find an expression, in terms of n, for the nth term of this sequence.

5, 8, 11, 14, …

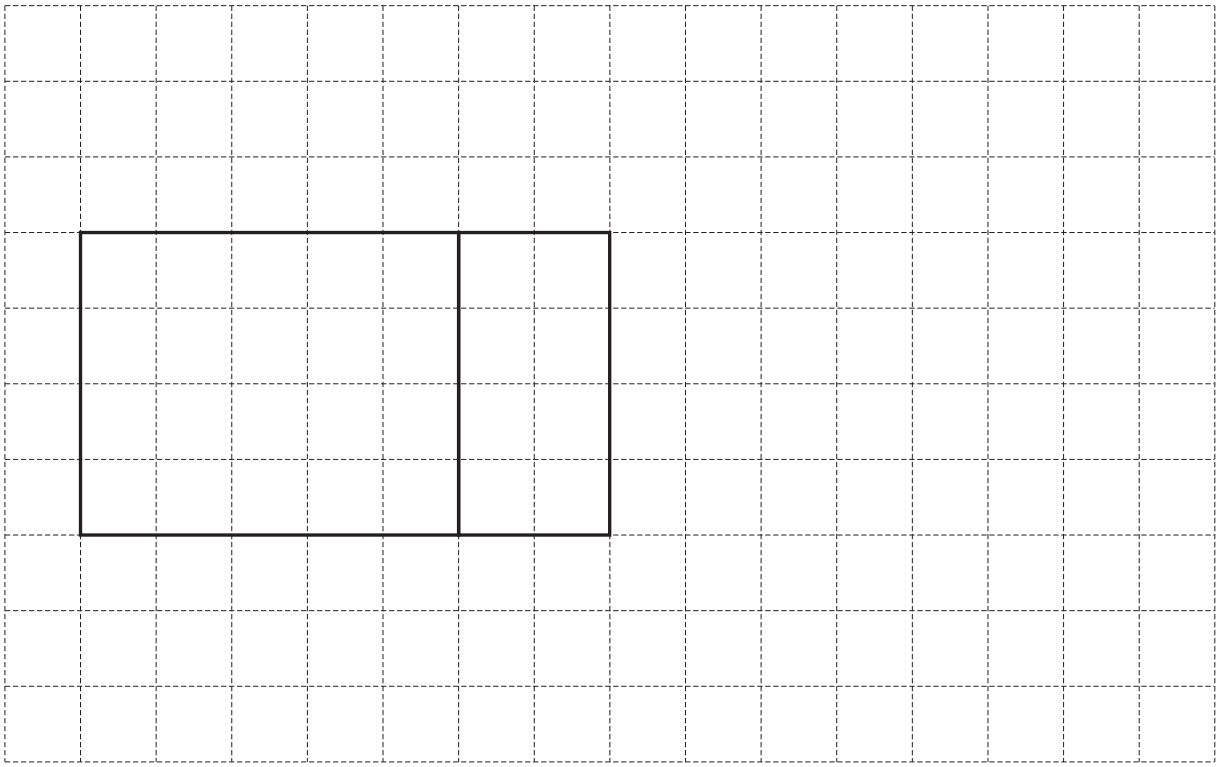
..... [2]

22 A closed box in the shape of a cuboid has length 5 cm, width 4 cm and height 2 cm.

(a) Calculate the volume of the box.

..... cm^3 [2]

(b) On the 1 cm^2 grid, complete the net of this box.



[2]

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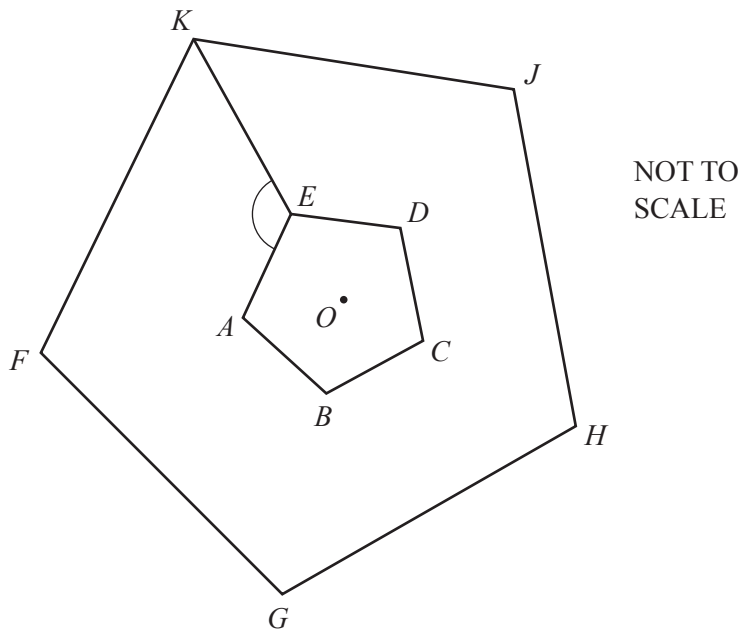
23



The diagram shows two regular pentagons.
Pentagon *FGHJK* is an enlargement of pentagon *ABCDE*, centre *O*.

Find angle *AEK*.

Angle *AEK* = ... [4]

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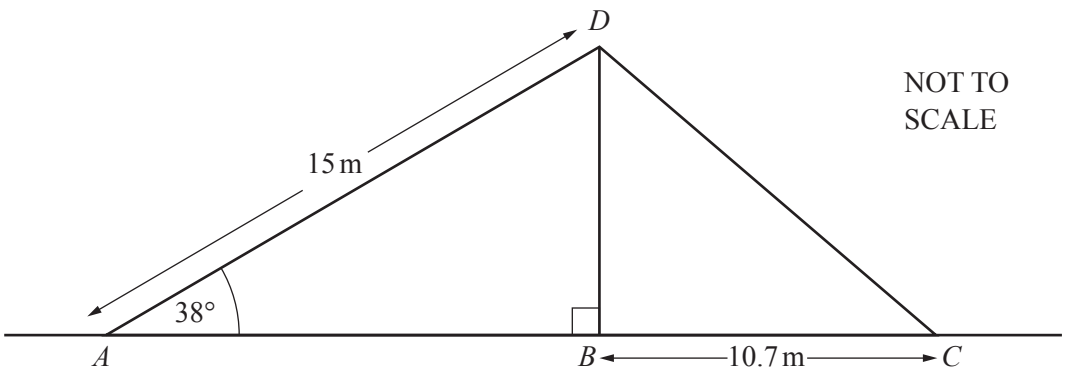

A vertical flagpole, BD, stands on horizontal ground and is held by two ropes, AD and CD.
$AD = 15\,\text{m}$, $BC = 10.7\,\text{m}$ and angle $DAB = 38°$.

(a) Using trigonometry, calculate BD.

$BD =$ ..... m [2]

(b) Calculate CD.

$CD =$ ..... m [2]

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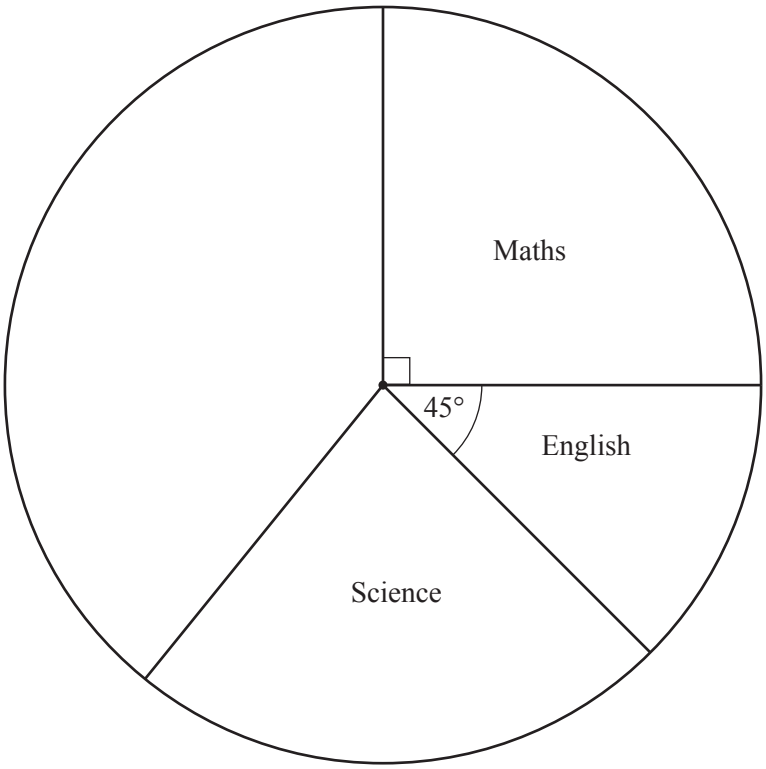
25 Jason spends 480 minutes at school each day.
The pie chart shows the time he spends in three of his lessons.



(a) Measure the sector angle for science.

..... [1]

(b) Work out the time, in minutes, Jason spends in English.

..... min [2]

(c) Jason spends 100 minutes in geography and the rest of the day is free time.

Complete the pie chart.

[2]

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MATHEMATICS **0580/21**

Paper 2 (Extended) **May/June 2019**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator Geometrical instruments
Tracing paper (optional)

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For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 70.

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[Turn over

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1 Work out \$1.20 as a percentage of \$16.

.....% [1]

2 Factorise $5y - 6py$.

..... [1]

3 Calculate $\sqrt[3]{8.1^2 - 1.3^{0.8}}$.

..... [1]

4 An equilateral triangle has sides of length 15 cm, correct to the nearest centimetre.

Calculate the upper bound of the perimeter of this triangle.

..... cm [1]

5 The volume of a cuboid is 180 cm^3.
The base is a square of side length 6 cm.

Calculate the height of this cuboid.

..... cm [2]

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6 Simplify.

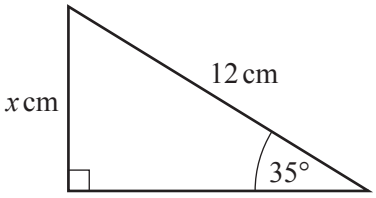
(a) $t^{21} \div t^{7}$

..... [1]

(b) $(u^{5})^{5}$

..... [1]

7



NOT TO SCALE

The diagram shows a right-angled triangle.

Calculate the value of x.

$x =$ ..... [2]

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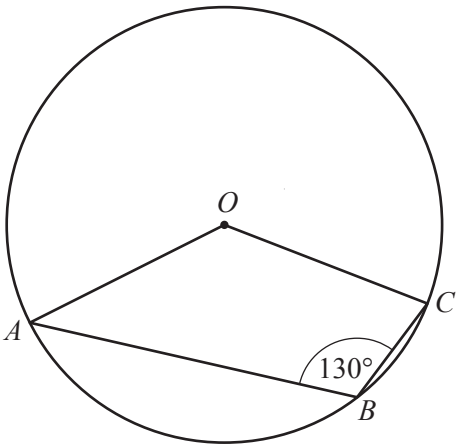

NOT TO SCALE

A, B and C are points on the circle, centre O.

Find the obtuse angle AOC.

Angle AOC = ... [2]

9 Write the recurring decimal $0.4\dot{7}$ as a fraction.
Show all your working.

..... [2]

10 $\mathrm{f}(x) = 2x + 3$

Find $\mathrm{f}(1 - x)$ in its simplest form.

..... [2]

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11

1	2	3	4	5

The diagram shows five cards.
Two of the cards are taken at random, without replacement.

Find the probability that both cards show an even number.

..... [2]

12 27 28 29 30 31 32 33

From the list of numbers, write down

(a) a multiple of 7,

..... [1]

(b) a cube number,

..... [1]

(c) a prime number.

..... [1]

13 $x^2 + 4x - 9 = (x + a)^2 + b$

Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [3]

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14 **Without using a calculator**, work out $\frac{5}{6}+\frac{2}{3}$.

You must show all your working and give your answer as a mixed number in its simplest form.

..... [3]

15 Expand and simplify.

$$(x+1)(x+2)+2x(x-3)$$

..... [3]

16 y is inversely proportional to the square root of $(x + 1)$.
When $x = 8$, $y = 2$.

Find y when $x = 99$.

$y =$ ..... [3]

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17 **(a)** Factorise $p^2 - q^2$.

..... [1]

(b) $p^2 - q^2 = 7$ and $p - q = 2$.

Find the value of $p + q$.

..... [2]

18 **(a)** Simplify $\left(81y^{16}\right)^{\frac{3}{4}}$.

..... [2]

(b) $2^3 = 4^p$

Find the value of p.

$p =$ ..... [1]

19 A model of a car has a scale 1 : 20.
The volume of the actual car is $12\,\text{m}^3$.

Find the volume of the model.
Give your answer in cubic centimetres.

.....cm^3 [3]

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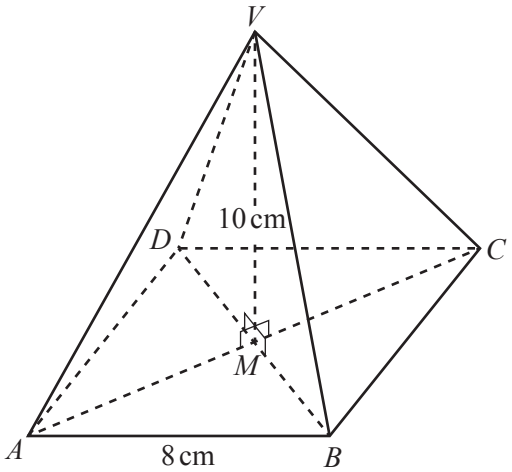
20 Write as a single fraction in its simplest form.

$$\frac{1}{x+2} - \frac{2}{3x-1}$$

..... [3]

21



NOT TO SCALE

The diagram shows a pyramid with a square base $ABCD$ of side length 8 cm.
The diagonals of the square, AC and BD, intersect at M.
V is vertically above M and $VM = 10$ cm.

Calculate the angle between VA and the base.

..... [4]

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22 **(a)** These are the first four terms of a sequence.

5 8 11 14

(i) Write down the next term.

..... [1]

(ii) Find an expression, in terms of n, for the nth term.

..... [2]

(b) These are the first five terms of another sequence.

$\frac{1}{2}$ $\frac{3}{4}$ $\frac{7}{6}$ $\frac{13}{8}$ $\frac{21}{10}$

Find the next term.

..... [1]

23 $\mathbf{P} = \begin{pmatrix} 3 & 1 \\ 2 & 4 \end{pmatrix}$

(a) Find $\mathbf{P}^2$.

$\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [2]

(b) Find $\mathbf{P}^{-1}$.

$\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [2]

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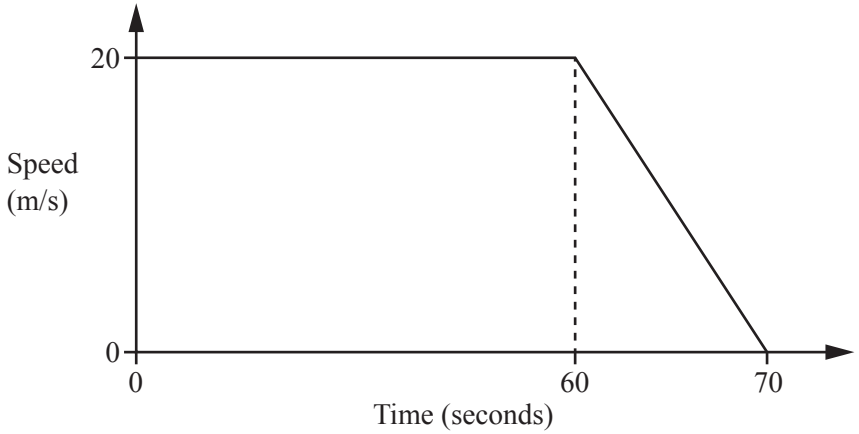

NOT TO SCALE

The diagram shows information about the final 70 seconds of a car journey.

(a) Find the deceleration of the car between 60 and 70 seconds.

.....m/s^2 [1]

(b) Find the distance travelled by the car during the 70 seconds.

.....m [3]

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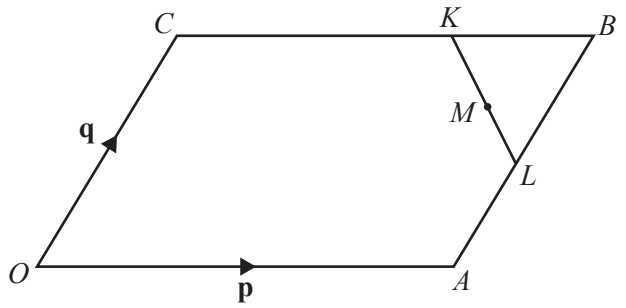
25



NOT TO SCALE

$OABC$ is a parallelogram and O is the origin.
$CK = 2KB$ and $AL = LB$.
M is the midpoint of KL.
$\overrightarrow{OA} = \mathbf{p}$ and $\overrightarrow{OC} = \mathbf{q}$.

Find, in terms of **p** and **q**, giving your answer in its simplest form

(a) $\overrightarrow{KL}$,

$\overrightarrow{KL} =$ ..... [2]

(b) the position vector of M.

..... [2]

Question 26 is printed on the next page.

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26 Line L passes through the points $(0, -3)$ and $(6, 9)$.

(a) Find the equation of line L.

..... [3]

(b) Find the equation of the line that is perpendicular to line L and passes through the point $(0, 2)$.

..... [2]

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MATHEMATICS **0580/22**

Paper 2 (Extended) **May/June 2019**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

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For π, use either your calculator value or 3.142.

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1 Write down a prime number between 50 and 60.

..... [1]

2 Use your calculator to work out $\sqrt{1-(\sin 33°)^2}$.

..... [1]

3 Write the recurring decimal $0.\dot{7}$ as a fraction.

..... [1]

4 Complete each statement.

(a) A quadrilateral with only one pair of parallel sides is called a ..... . [1]

(b) An angle greater than 90° but less than 180° is called ..... . [1]

5 The distance between Prague and Vienna is 254 kilometres.
The local time in Prague is the same as the local time in Vienna.
A train leaves Prague at 1520 and arrives in Vienna at 1950 the same day.

Calculate the average speed of the train.

..... km/h [2]

6 Solve the equation.

$$9f + 11 = 3f + 23$$

$f =$ ..... [2]

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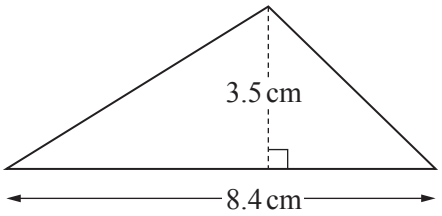

NOT TO SCALE

Calculate the area of this triangle.

..... cm^2 [2]

8 **(a)** Write 0.047 883 correct to 2 significant figures.

..... [1]

(b) Write 0.005 27 in standard form.

..... [1]

9 Find the highest common factor (HCF) of 90 and 48.

..... [2]

10 On a map with scale 1 : 25 000, the area of a lake is 33.6 square centimetres.

Calculate the actual area of the lake, giving your answer in square kilometres.

..... km^2 [2]

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11 Write down the matrix that represents an enlargement, scale factor 3, centre (0, 0).

$\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [2]

12 Simplify.

(a) $5m^2 \times 2m^3$

..... [2]

(b) $\left(x^8\right)^3$

..... [1]

13 **Without using a calculator**, work out $2\frac{1}{4} \div \frac{3}{7}$.

You must show all your working and give your answer as a mixed number in its simplest form.

..... [3]

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14 Solve the simultaneous equations.
You must show all your working.

$$5x + 8y = 4$$
$$\tfrac{1}{2}x + 3y = 7$$

$x =$ .....

$y =$ ..... [3]

15 Shona buys a chair in a sale for \$435.60 .
This is a reduction of 12% on the original price.

Calculate the original price of the chair.

\$..... [3]

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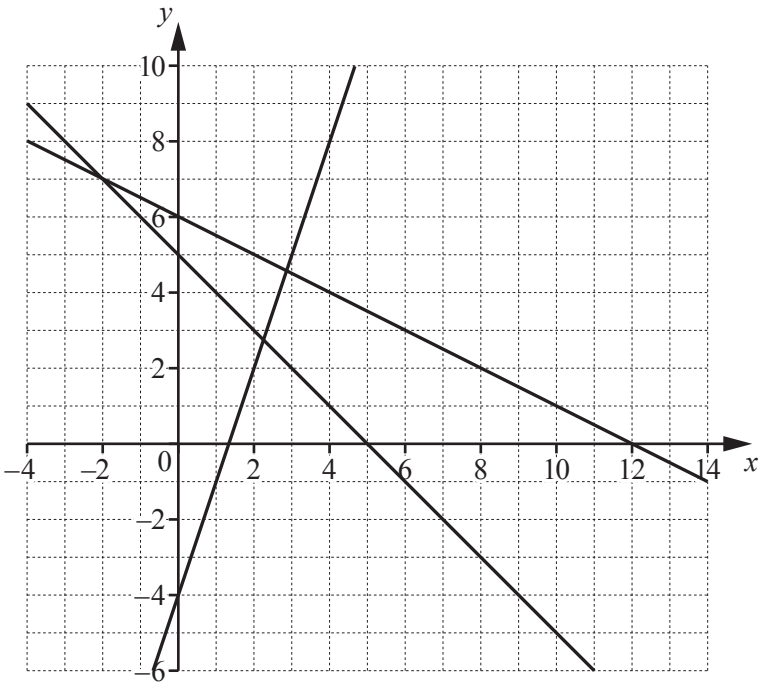

$y \leqslant -\frac{1}{2}x + 6 \qquad y \geqslant 3x - 4 \qquad x + y \geqslant 5$

(a) By shading the **unwanted** regions of the grid, find and label the region R that satisfies the three inequalities. [2]

(b) Find the largest value of $x + y$ in the region R, where x and y are integers.

..... [1]

17 Write as a single fraction in its simplest form.

$$\frac{2x}{x+3} + \frac{x+3}{x-5}$$

..... [3]

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18 The table shows the number of people in different age groups at a cinema.

Age (y years)	$15 < y \leqslant 25$	$25 < y \leqslant 30$	$30 < y \leqslant 50$	$50 < y \leqslant 80$
Number of people	35	32	44	12

Dexter draws a histogram to show this information.
The height of the bar he draws for the group $15 < y \leqslant 25$ is 7 cm.

Calculate the height of each of the remaining bars.

$25 < y \leqslant 30$ ..... cm

$30 < y \leqslant 50$ ..... cm

$50 < y \leqslant 80$ ..... cm [3]

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19 Rearrange this formula to make m the subject.

$$P = \frac{k+m}{m}$$

..... [4]

20 Solve the equation $3x^2 - 2x - 10 = 0$.
Show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [4]

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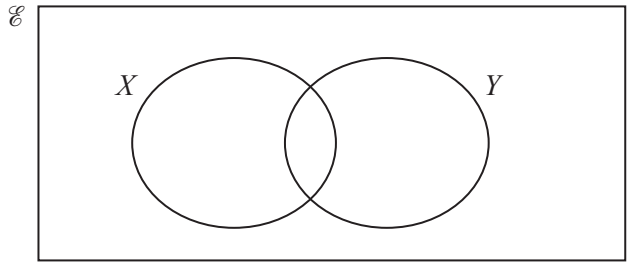
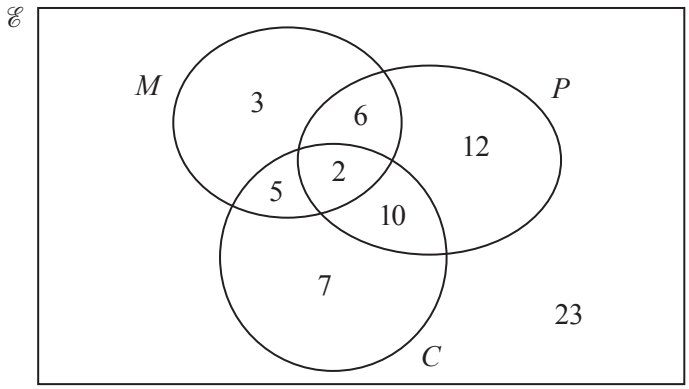
21 **(a)** In the Venn diagram, shade $X' \cap Y$.



[1]

(b) The Venn diagram below shows information about the number of gardeners who grow melons (M), potatoes (P) and carrots (C).



(i) A gardener is chosen at random from the gardeners who grow melons.

Find the probability that this gardener does not grow carrots.

..... [2]

(ii) Find $n((M \cap P) \cup C')$.

..... [1]

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22 $\mathbf{A} = \begin{pmatrix} 2 & 7 \\ 1 & 3 \end{pmatrix}$ $\mathbf{B} = \begin{pmatrix} 3 & 4 \\ 0 & 1 \end{pmatrix}$

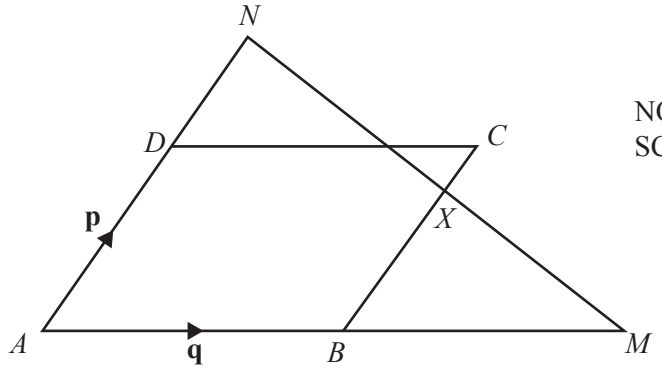
(a) Calculate **AB**.

$\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [2]

(b) Find $\mathbf{A}^{-1}$, the inverse of **A**.

$\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [2]

23



NOT TO SCALE

$ABCD$ is a parallelogram with $\overrightarrow{AB} = \mathbf{q}$ and $\overrightarrow{AD} = \mathbf{p}$.
ABM is a straight line with $AB : BM = 1 : 1$.
ADN is a straight line with $AD : DN = 3 : 2$.

(a) Write $\overrightarrow{MN}$, in terms of **p** and **q**, in its simplest form.

$\overrightarrow{MN}$ = ... [2]

(b) The straight line NM cuts BC at X.
X is the midpoint of MN.
$\overrightarrow{BX} = k\mathbf{p}$

Find the value of k.

$k =$ ..... [2]

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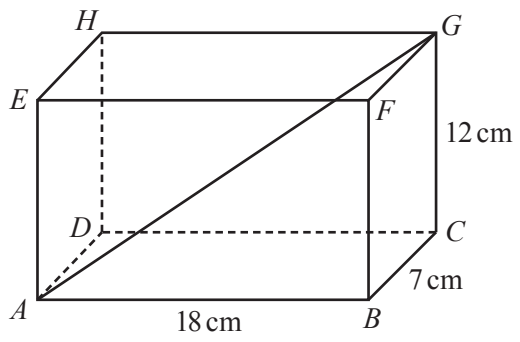

NOT TO SCALE

ABCDEFGH is a cuboid.
$AB = 18$ cm, $BC = 7$ cm and $CG = 12$ cm.

Calculate the angle that the diagonal *AG* makes with the base *ABCD*.

..... [4]

Question 25 is printed on the next page.

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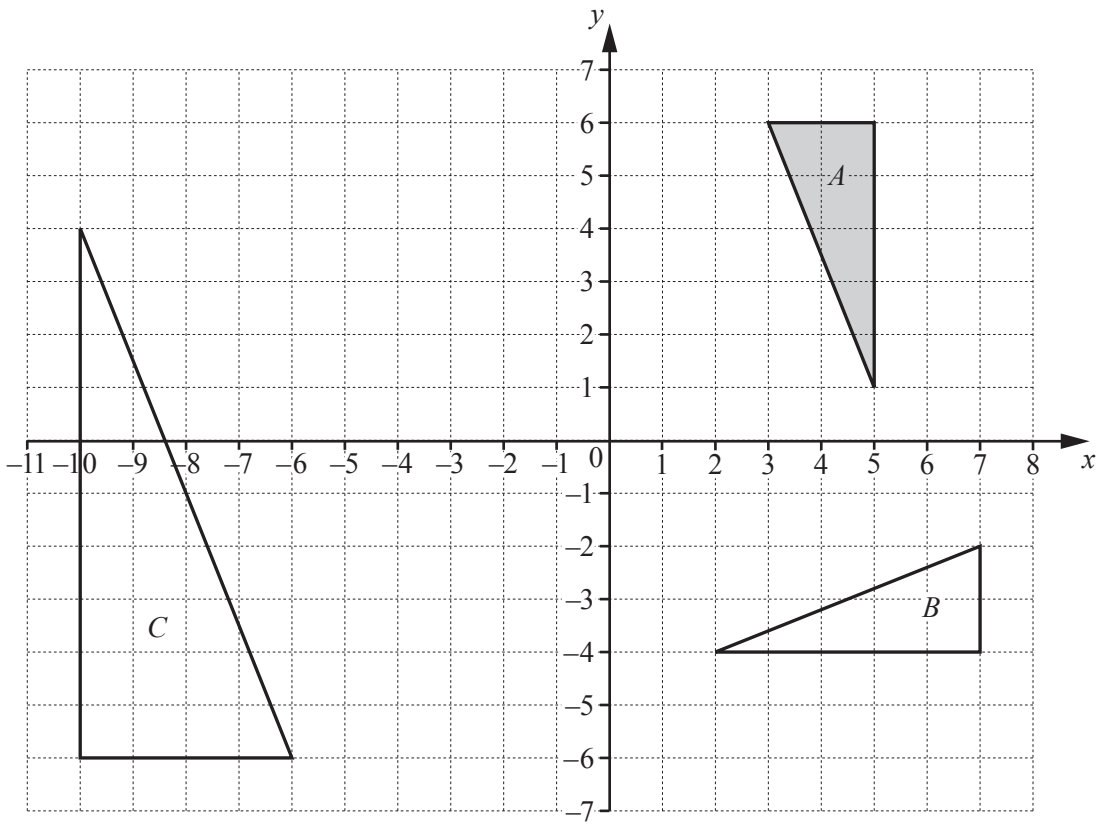
25



Describe fully the **single** transformation that maps

(a) triangle A onto triangle B,

.....

..... [3]

(b) triangle A onto triangle C.

.....

..... [3]

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MATHEMATICS **0580/23**

Paper 2 (Extended) **May/June 2019**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 70.

This document consists of **15** printed pages and **1** blank page.

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[Turn over

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1 Write 1.8972 correct to 2 decimal places.

..... [1]

2 Factorise $2x^2 - x$.

..... [1]

3 Giulio's reaction times are measured in two games.
In the first game his reaction time is $\frac{1}{3}$ of a second.
In the second game his reaction time is $\frac{1}{8}$ of a second.

Find the difference between the two reaction times.

..... s [1]

4 The table shows the different methods of travel for 20 people going to work.

Method of travel	Frequency
Car	10
Walk	5
Bike	3
Bus	2

Which type of average, mean, median or mode, can be used for this information?

..... [1]

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5 **(a)** Find the co-ordinates of the point where the line $y = 3x - 8$ crosses the y-axis.

(..... , ...) [1]

(b) Write down the gradient of the line $y = 3x - 8$.

..... [1]

6 Calculate.

(a) $-12 \div -2$

..... [1]

(b) $\sqrt[3]{2^3 + 2}$

..... [1]

7 Here is a list of numbers.

21	$\frac{2}{3}$	$\sqrt{13}$	31	$\sqrt{121}$	51	0.7

From this list, write down

(a) a prime number,

..... [1]

(b) an irrational number.

..... [1]

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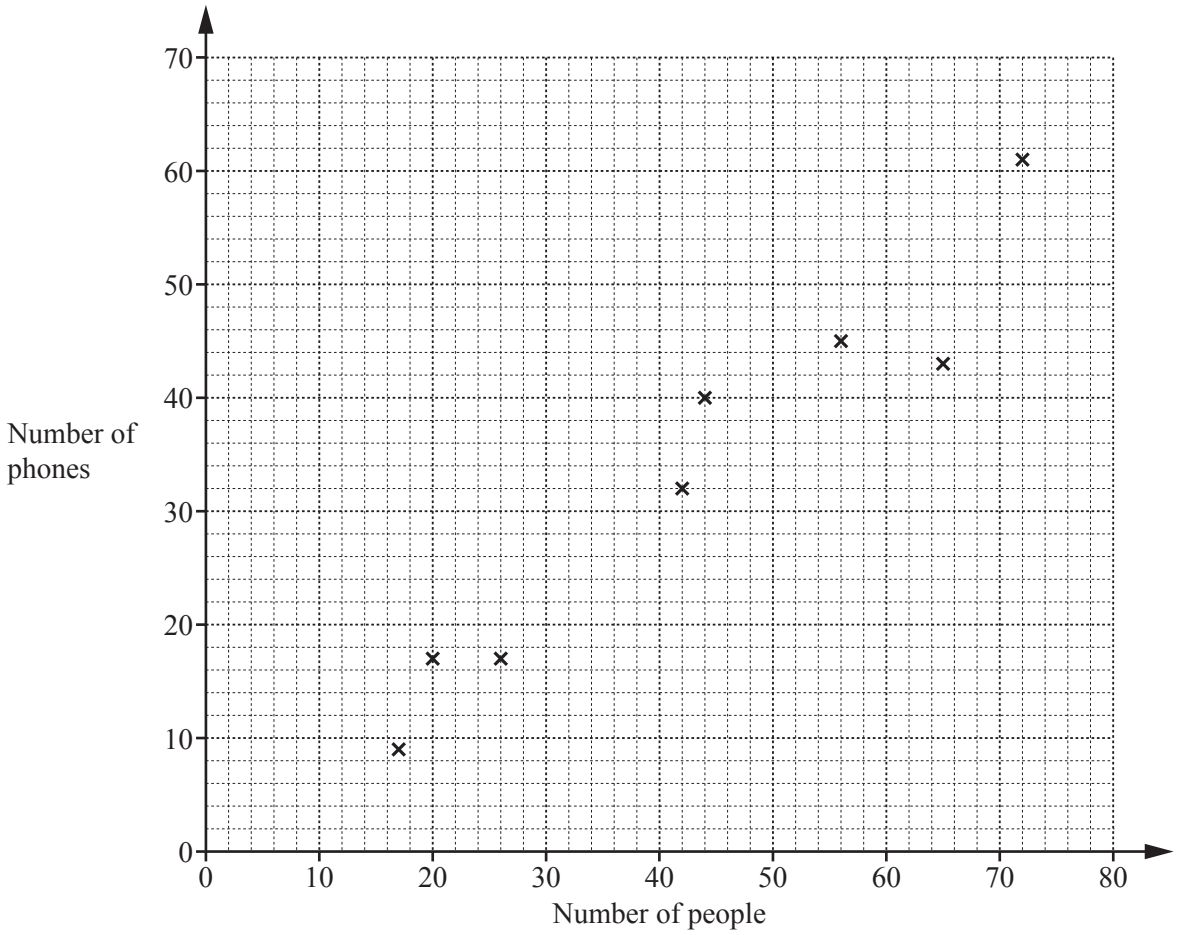
8 The scatter diagram shows the number of people and the number of phones in each of 8 buildings.



(a) One of the buildings contains 42 people.

Write down the number of phones in this building.

..... [1]

(b) What type of correlation is shown in the scatter diagram?

..... [1]

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9 **Without using a calculator**, work out $\frac{12}{35} \times \frac{7}{9}$.
You must show all your working and give your answer as a fraction in its simplest form.

..... [2]

10 Rearrange $2(w+h) = P$ to make w the subject.

$w =$ ..... [2]

11 Complete this statement with an expression in terms of m.

$$18m^3 + 9m^2 + 14m + 7 = (9m^2 + 7)(\text{.....})$$

[2]

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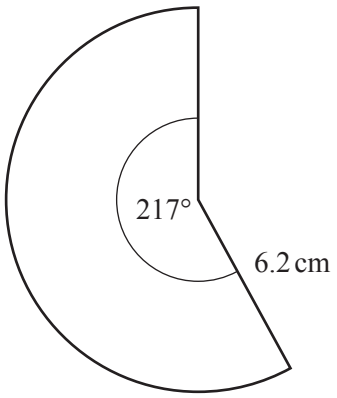
12



NOT TO SCALE

The diagram shows a sector of a circle with radius 6.2 cm and sector angle 217°.

Calculate the area of this sector.

..... cm^2 [2]

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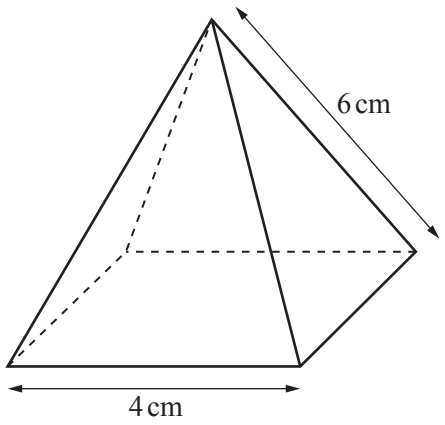
13



NOT TO SCALE

The diagram shows a pyramid with a square base.
The triangular faces are congruent isosceles triangles.

(a) Write down the number of planes of symmetry of this pyramid.

..... [1]

(b) **Using a ruler and compasses only**, construct an accurate drawing of one of the triangular faces of the pyramid.

[2]

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14 One solution of the equation $ax^2 + a = 150$ is $x = 7$.

(a) Find the value of a.

$a =$ ..... [2]

(b) Find the other solution.

$x =$ ..... [1]

15 A is the point $(7, 12)$ and B is the point $(2, -1)$.

Find the length of AB.

..... [3]

16 $$A = \frac{b \times h}{2}$$

$A = 10$, correct to the nearest whole number.
$h = 4$, correct to the nearest whole number.

Work out the upper bound for the value of b.

..... [3]

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17 Simplify $\dfrac{x^3+5x^2}{x^2-25}$, giving your answer as a single fraction.

..... [3]

18 y is inversely proportional to the square of $(x+1)$.
$y = 0.875$ when $x = 1$.

Find y when $x = 4$.

$y =$ ..... [3]

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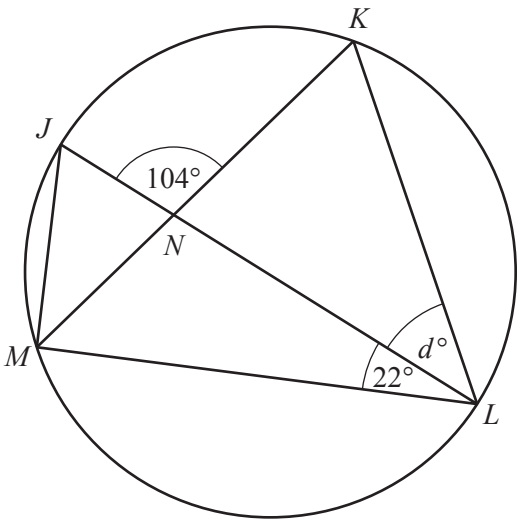
19



NOT TO SCALE

J, K, L and M are points on the circumference of a circle with diameter JL.
JL and KM intersect at N.
Angle $JNK = 104°$ and angle $MLJ = 22°$.

Work out the value of d.

$d =$ ..... [4]

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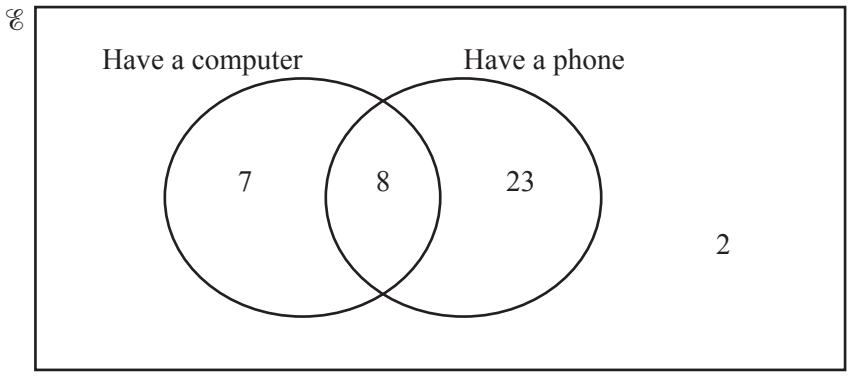
20 **(a)** 40 children were asked if they have a computer or a phone or both.
The Venn diagram shows the results.

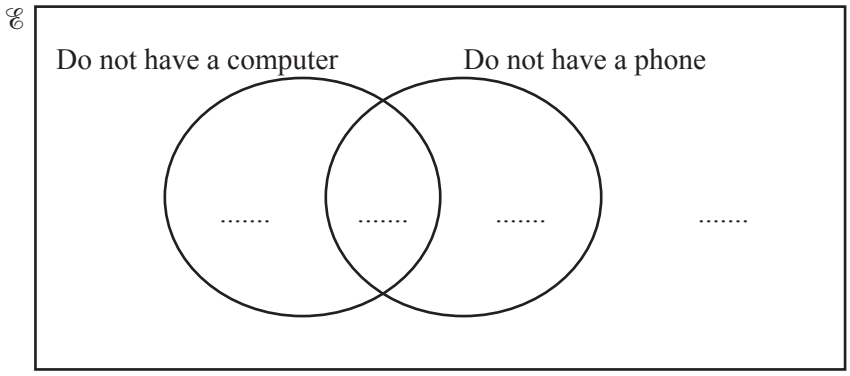


(i) A child is chosen at random from the children who have a computer.

Write down the probability that this child also has a phone.

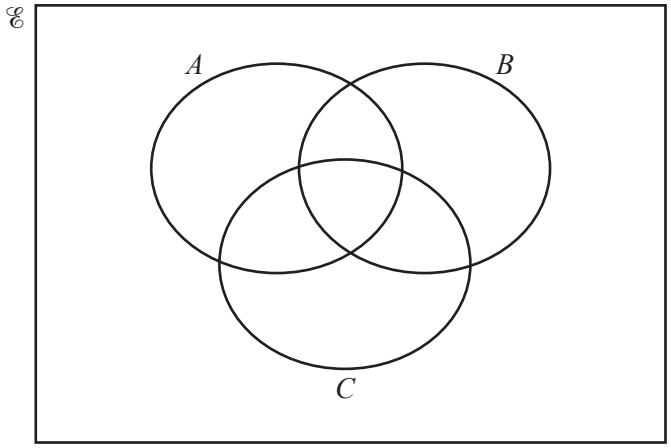
..... [1]

(ii) Complete the Venn diagram.



[2]

(b) In this Venn diagram, shade the region $(A \cup B') \cap C$.



[1]

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21 $\mathbf{A} = \begin{pmatrix} 3 & 4 \\ 5 & 0 \end{pmatrix}$ $\mathbf{B} = \begin{pmatrix} 1 & 4 \\ -3 & 2 \end{pmatrix}$

Find

(a) $5\mathbf{A}$,

$\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [1]

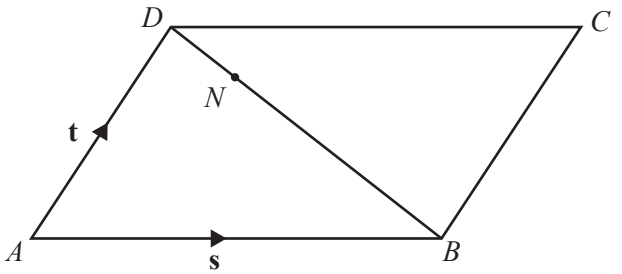
(b) $\mathbf{A} + \mathbf{B}$,

$\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [1]

(c) $\mathbf{AB}$.

$\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [2]

22



NOT TO SCALE

$ABCD$ is a parallelogram.
N is the point on BD such that $BN : ND = 4 : 1$.
$\overrightarrow{AB} = \mathbf{s}$ and $\overrightarrow{AD} = \mathbf{t}$.

Find, in terms of **s** and **t**, an expression in its simplest form for

(a) $\overrightarrow{BD}$,

$\overrightarrow{BD} =$ ..... [1]

(b) $\overrightarrow{CN}$.

$\overrightarrow{CN} =$ ..... [3]

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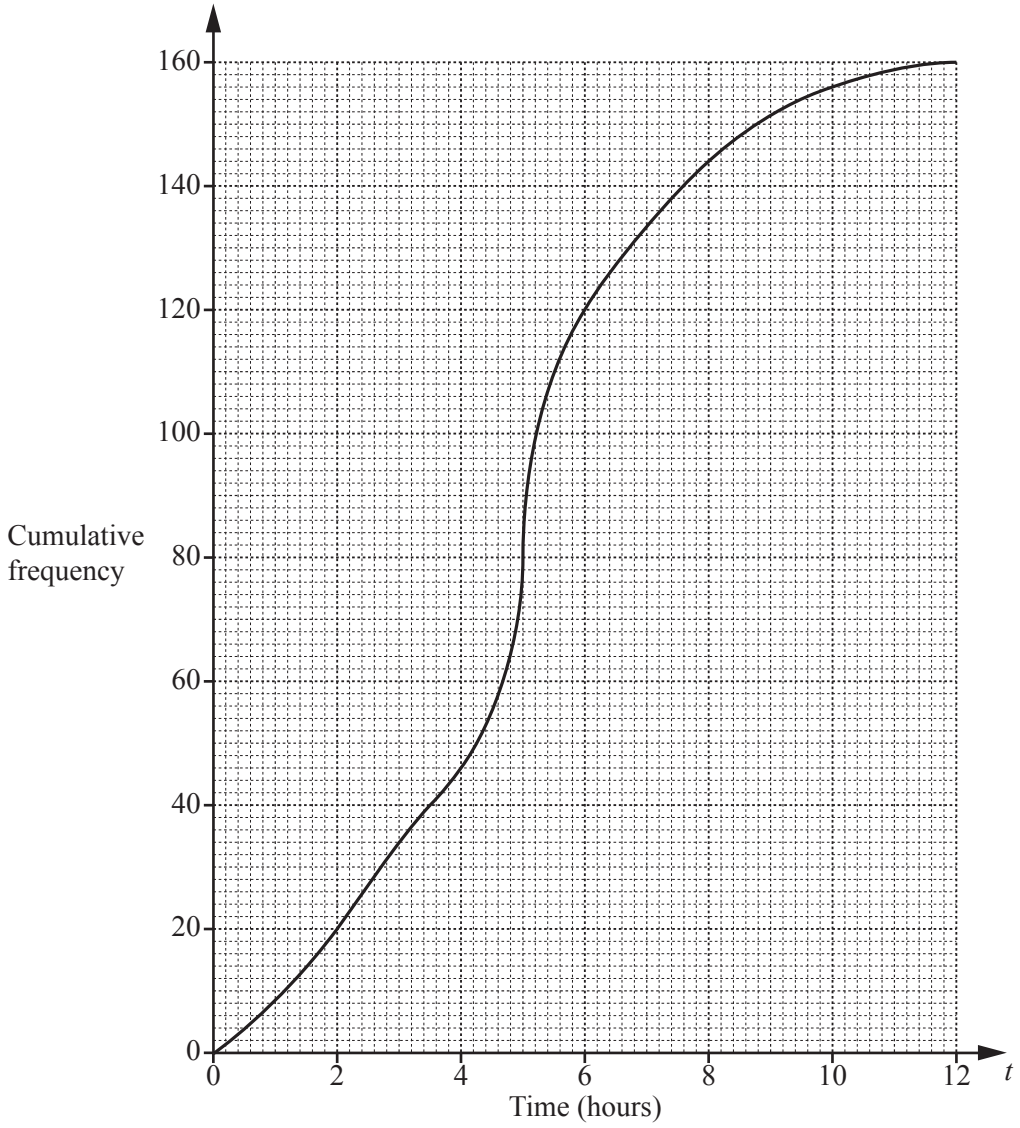
23 160 students record the amount of time, t hours, they each spend playing computer games in a week. This information is shown in the cumulative frequency diagram.



(a) Use the diagram to find an estimate of

(i) the median,

..... hours [1]

(ii) the interquartile range.

..... hours [2]

(b) Use the diagram to complete this frequency table.

Time (t hours)	$0 < t \leqslant 2$	$2 < t \leqslant 4$	$4 < t \leqslant 6$	$6 < t \leqslant 8$	$8 < t \leqslant 10$	$10 < t \leqslant 12$
Frequency	20			24	12	4

[2]

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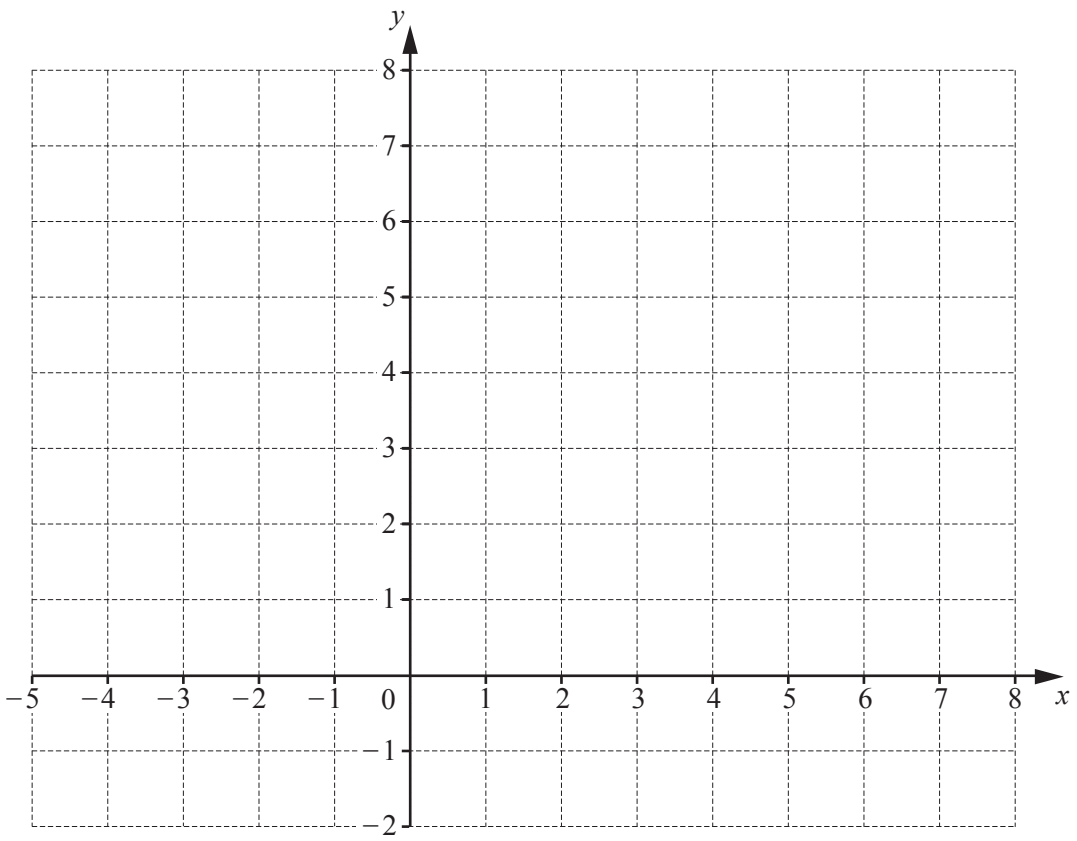

By shading the **unwanted** regions of the grid, draw and label the region R which satisfies the following three inequalities.

$y \leqslant 2$ $\qquad$ $x < 3$ $\qquad$ $y \leqslant x + 4$

[5]

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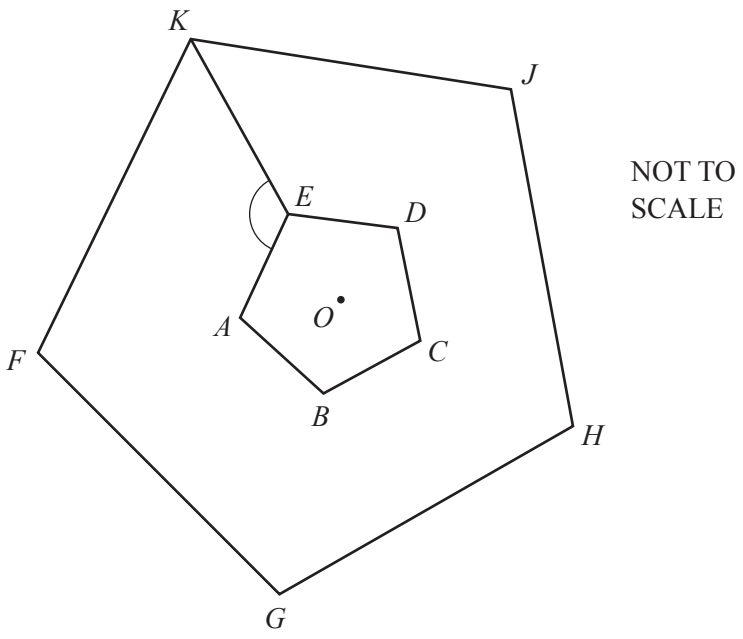
25



The diagram shows two regular pentagons.
Pentagon *FGHJK* is an enlargement of pentagon *ABCDE*, centre *O*.

(a) Find angle *AEK*.

Angle *AEK* = ... [4]

(b) The area of pentagon *FGHJK* is 73.5 cm^2.
The area of pentagon *ABCDE* is 6 cm^2.

Find the ratio perimeter of pentagon *FGHJK* : perimeter of pentagon *ABCDE* in its simplest form.

..... : ..... [2]

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MATHEMATICS **0580/31**

Paper 3 (Core) **May/June 2019**

2 hours

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
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Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 104.

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[Turn over

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1 Here is part of the menu for Jamie's café.

Menu	
	Price ($)
Tea	2.35
Coffee	3.40
Lemonade	1.80
Cake	4.45
Biscuit	0.85

(a) Sue has one tea and one cake.

Calculate how much she pays.

$ ..... [1]

(b) Derrick has one coffee and two biscuits.

How much change does he receive from a $10 note?

$ ..... [2]

(c) Harriet works at the café for 34 hours each week.
She is paid $8.25 for each hour.

(i) Work out the amount she is paid each week.

$ ..... [1]

(ii) One week she works 8 hours extra.
The extra hours are paid at 1.5 times her usual rate of $8.25 for each hour.

Work out the total amount she is paid for that week.

$ ..... [2]

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(d) Peter works these hours each week at the café.

Day	Time
Monday	08 30 to 16 00
Tuesday	10 00 to 17 00
Thursday	08 30 to 16 30
Saturday	08 00 to 18 30

Work out the number of hours he works in one week.

..... hours [2]

(e) Jamie buys a clock for the café from Japan for 9395 yen.
The exchange rate is \$1 = 110.27 yen.

Work out the cost of the clock in dollars, correct to the nearest cent.

\$ ..... [3]

(f) Jamie invests \$12 000 at a rate of 5% per year compound interest.

Calculate the value of his investment at the end of 3 years.

\$ ..... [3]

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2 **(a)** Work out $48 \div 3 - 5 \times 2$.

..... [1]

(b) Insert one pair of brackets to make this statement correct.

$$3 + 2 \times 12 - 4 = 19$$ [1]

(c) Write the following in order, starting with the smallest.

$\frac{3}{4}$ 0.749 76% $\frac{11}{15}$

..... < ..... < ..... < ..... [2]
smallest

(d) Find the value of

(i) $\sqrt{265.69}$,

..... [1]

(ii) 8^3.

..... [1]

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(e) Write down the smallest prime number.

..... [1]

(f) Write down all the factors of 18.

..... [2]

(g) Write down a common factor of 16 and 72 that is greater than 2.

..... [1]

(h) Write $\frac{28}{140}$ as a fraction in its simplest form.

..... [1]

(i) Jeff and his friends win a prize.
Jeff's share is \$160 which is $\frac{5}{11}$ of the prize.

Work out the value of the prize.

\$ ..... [2]

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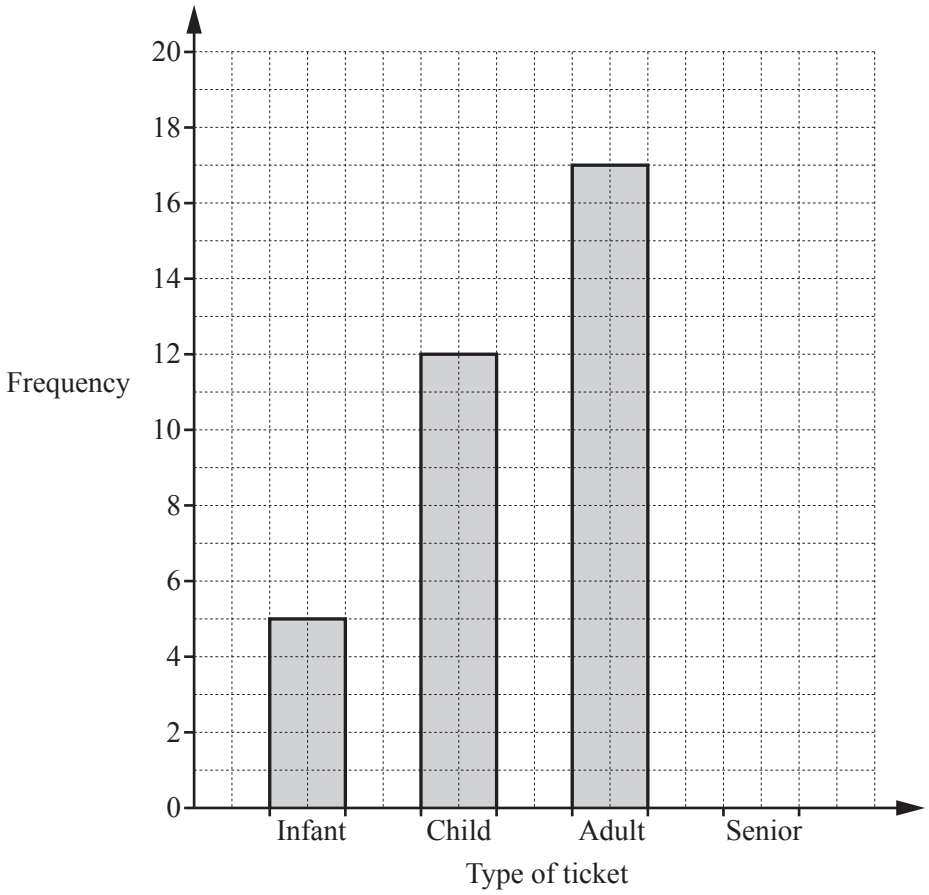
3 **(a)** On Monday, Main Street station sells 40 tickets.
There are four types of ticket; infant, child, adult and senior.
The bar chart shows the number of infant, child and adult tickets sold.



(i) Complete the bar chart. [3]

(ii) Find how many more adult tickets were sold than child tickets.

..... [1]

(iii) Write down the modal type of ticket.

..... [1]

(iv) One of these 40 people is chosen at random.

Find the probability that this person is a child.

..... [1]

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(b) At Donville station the number of tickets sold each day is recorded for seven days.

104 18 72 31 27 45 60

Find

(i) the range,

..... [1]

(ii) the median,

..... [2]

(iii) the mean.

..... [2]

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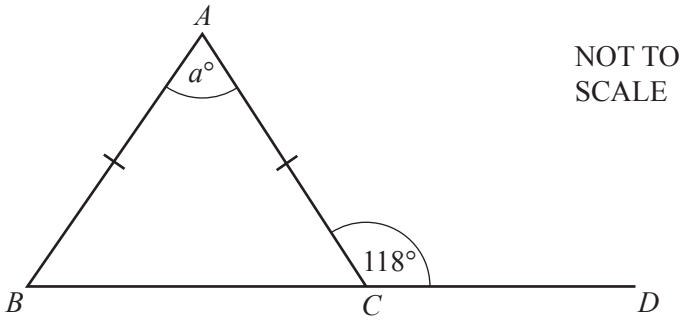
4 **(a)**



NOT TO SCALE

ABC is an isosceles triangle.
BCD is a straight line.

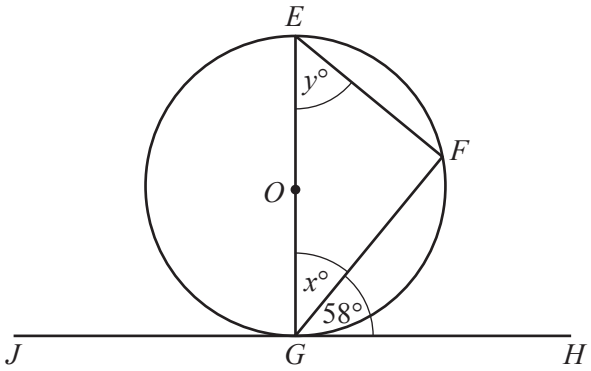
Find the value of *a*.

a = ... [2]

(b) Find the size of one interior angle of a regular 10-sided polygon.

..... [3]

(c)



NOT TO SCALE

The points *E*, *F* and *G* lie on the circumference of a circle, centre *O*.
JGH is a tangent to the circle.

Find the value of *x* and the value of *y*.

x = ...

y = ... [2]

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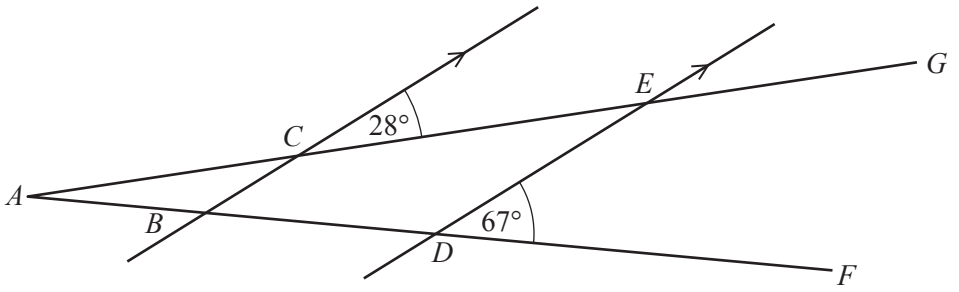
(d)



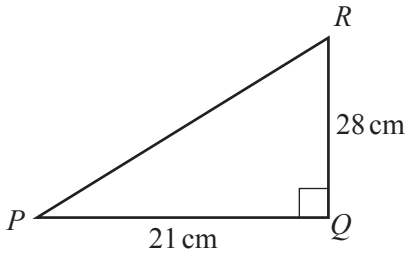
NOT TO SCALE

In the diagram *AG* and *AF* are straight lines.
Lines *BC* and *DE* are parallel.

Find angle *CED* and give a reason for your answer.

Angle *CED* = ... because ..... [2]

(e)



NOT TO SCALE

Calculate *PR*.

PR = ... cm [2]

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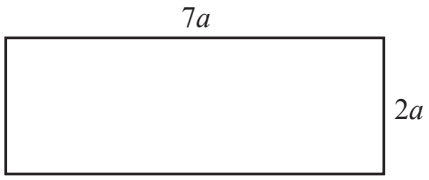
5 **(a)** The diagram shows a rectangle with length $7a$ and width $2a$.



NOT TO SCALE

Write an expression, in its simplest form, for

(i) the perimeter,

..... [2]

(ii) the area.

..... [2]

(b) The nth term of a sequence is $n^2 + 5$.

Find the first three terms of this sequence.

..... , ... , ... [2]

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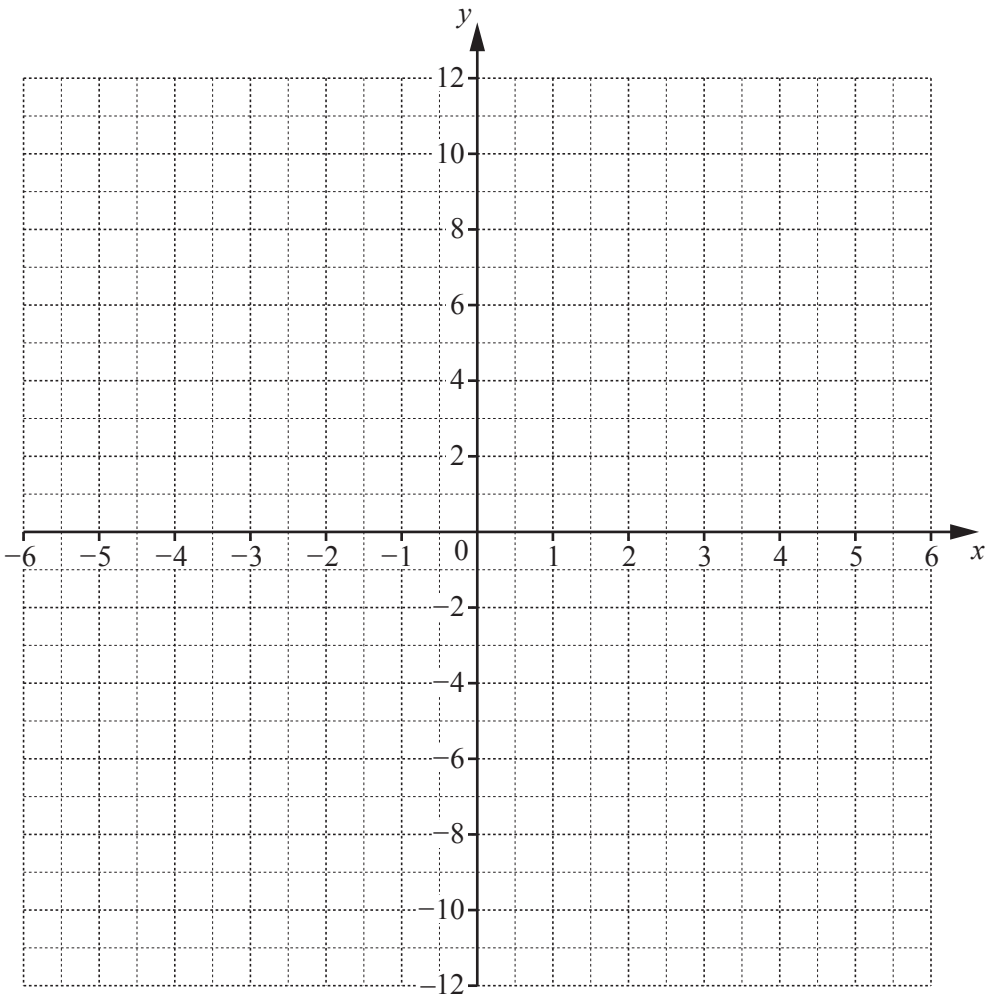
(c) **(i)** Complete the table of values for $y = \frac{12}{x}$, $x \neq 0$.

x	-6	-4	-3	-2	-1		1	2	3	4	6
y	-2	-3					12				2

[3]

(ii) On the grid, draw the graph of $y = \frac{12}{x}$ for $-6 \leqslant x \leqslant -1$ and $1 \leqslant x \leqslant 6$.



[4]

(iii) On the grid, draw the line $y = 8$. [1]

(iv) Use your graph to solve $\frac{12}{x} = 8$.

$x =$ ..... [1]

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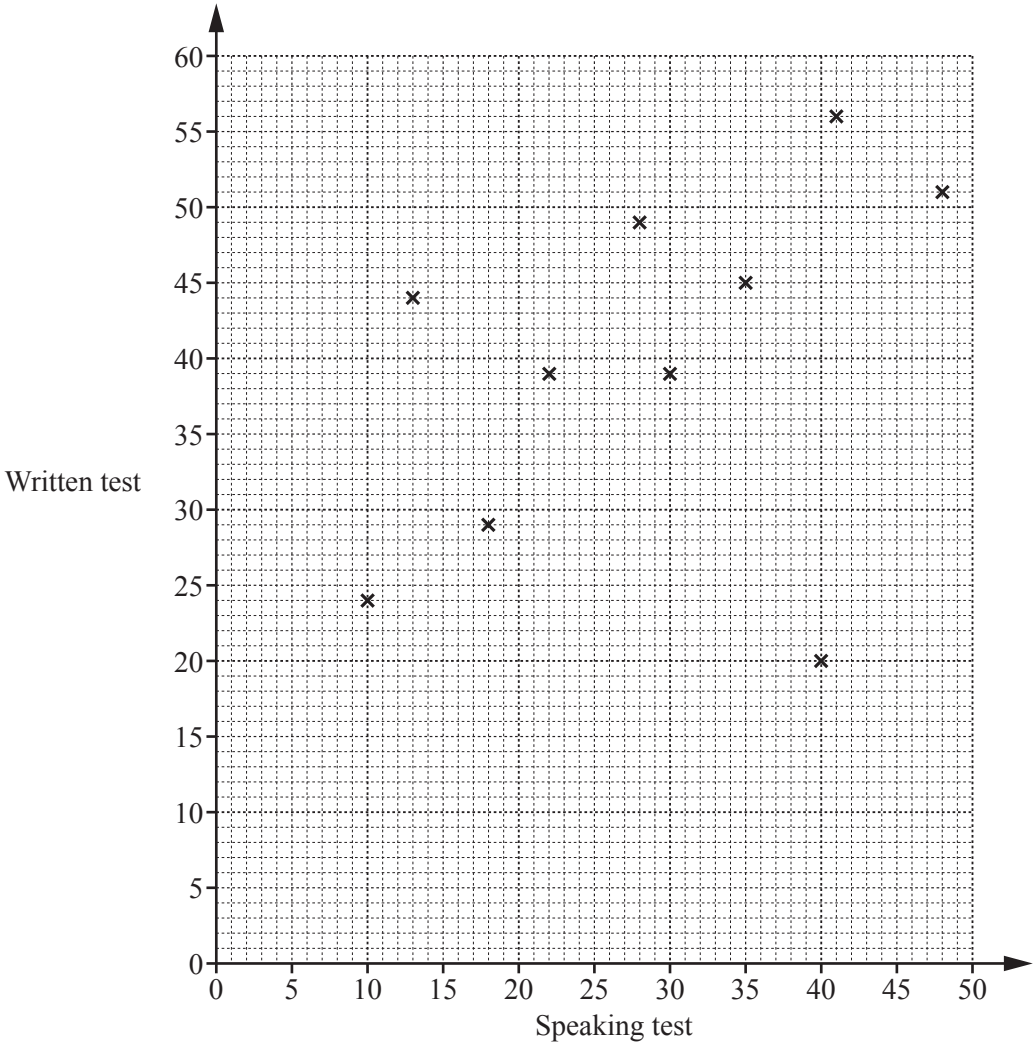
6 Fourteen students each take two tests in French, a speaking test and a written test.
The table shows the scores.

Speaking test	10	13	48	30	35	18	41	40	22	28	20	44	37	46
Written test	24	44	51	39	45	29	56	20	39	49	33	52	44	52

(a) Complete the scatter diagram.
The first ten points have been plotted for you.



[2]

(b) What type of correlation is shown in this scatter diagram?

..... [1]

(c) One student has a high score in the speaking test and a low score in the written test.

On the scatter diagram, put a ring around this point. [1]

(d) On the scatter diagram, draw a line of best fit. [1]

(e) Use your line of best fit to estimate a score in the written test for a student who scored 25 in the speaking test.

..... [1]

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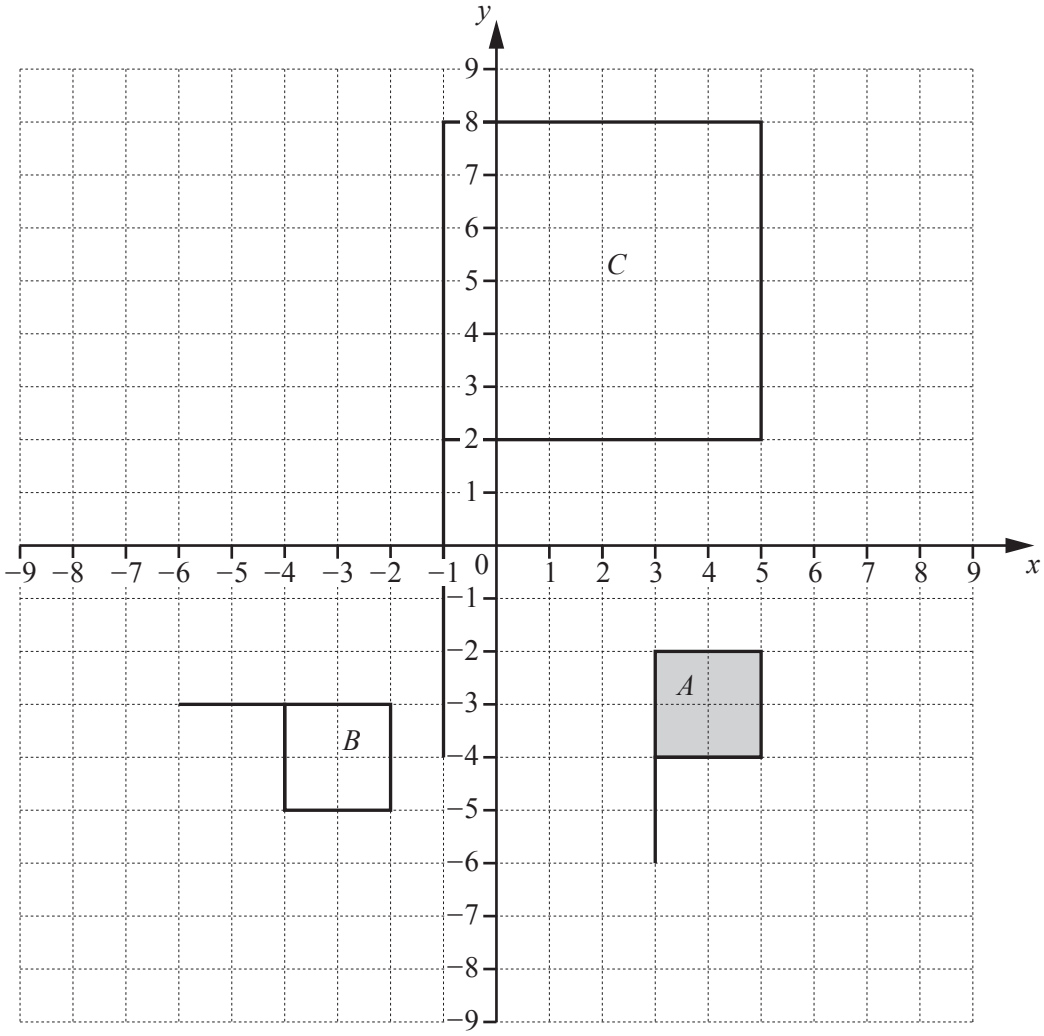
7



(a) Describe fully the **single** transformation that maps shape *A* onto shape *B*.

.....

..... [3]

(b) Describe fully the **single** transformation that maps shape *A* onto shape *C*.

.....

..... [3]

(c) On the grid, draw the image of shape *A* after a translation by the vector $\begin{pmatrix} 3 \\ 1 \end{pmatrix}$. [2]

(d) On the grid, draw the image of **shape *B*** after a reflection in the line $y = 1$. [2]

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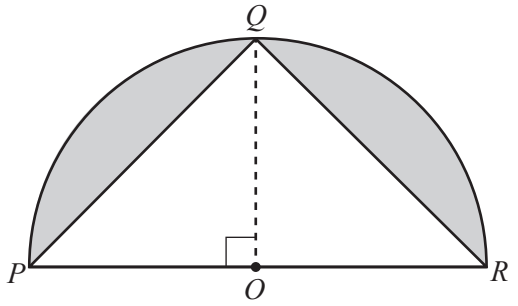
8 **(a)** A cylinder has a radius of 6 cm and a height of 17 cm.

Show that the volume of this cylinder is 1923 cm^3, correct to 4 significant figures.

[2]

(b)



NOT TO SCALE

Points P, Q and R are on the circumference of a semicircle, centre O and radius 8 cm.
Angle $POQ = 90°$.

Calculate the shaded area.

.....cm^2 [5]

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9 **(a)** Simplify $8a + 3b - 2a + b$.

..... [2]

(b) Calculate the value of $4x^2 + xy$ when $x = 3$ and $y = -2$.

..... [2]

(c) Solve these equations.

(i) $\frac{x}{4} = 20$

$x =$ ..... [1]

(ii) $3x - 5 = 16$

$x =$ ..... [2]

(iii) $5(2x + 1) = 27$

$x =$ ..... [3]

(d) Make r the subject of this formula.

$$p = 3r - 5$$

$r =$ ..... [2]

Question 10 is printed on the next page.

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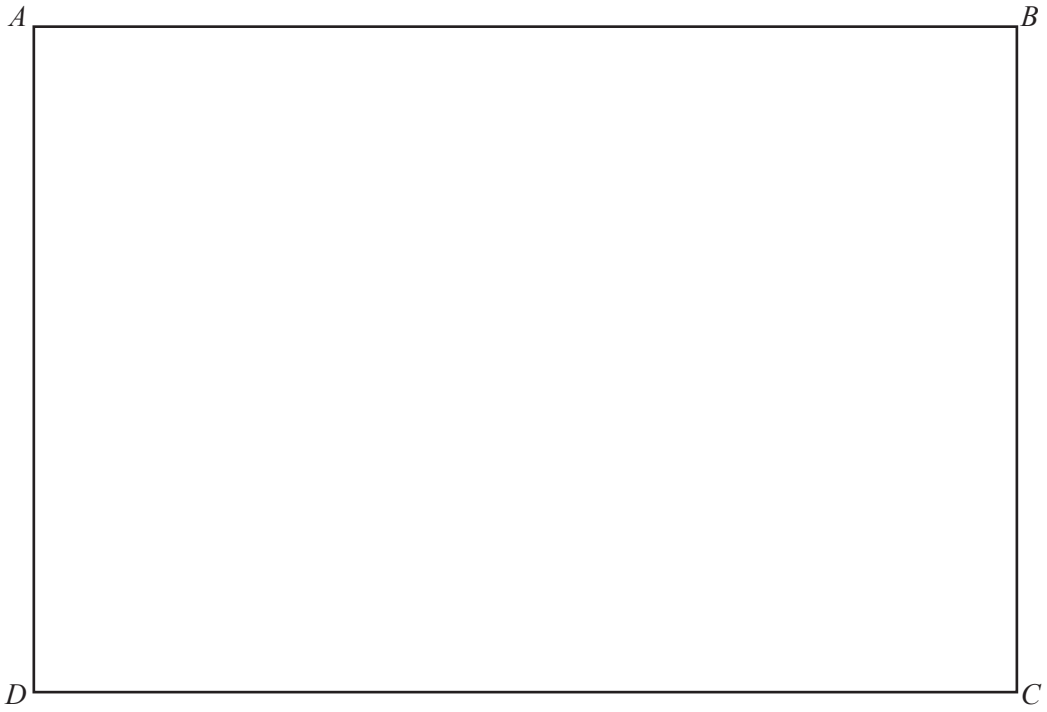
10 The scale drawing shows a rectangle *ABCD*.
The scale is 1 centimetre represents 20 metres.



Scale: 1 cm to 20 m

(a) **Using a straight edge and compasses only**, construct the bisector of angle *ADC*.
Show all your construction arcs. [2]

(b) Shade the region inside the rectangle that is

- nearer to *DA* than to *DC*

and

- less than 210 m from *C*.

[3]

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MATHEMATICS **0580/32**

Paper 3 (Core) **May/June 2019**

2 hours

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 104.

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[Turn over

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1 **(a)** **(i)** Write 26% as a decimal.

..... [1]

(ii) Write 0.48 as a fraction.

..... [1]

(b) Write down

(i) a fraction that is equivalent to $\frac{5}{9}$,

..... [1]

(ii) the 7th odd positive number,

..... [1]

(iii) a decimal number that is larger than 0.0467 but smaller than 0.0468 .

..... [1]

(c) Find the value of

(i) $\sqrt[3]{512}$,

..... [1]

(ii) $\frac{6^8}{2^6}$,

..... [1]

(iii) 7^0.

..... [1]

(d) Find the first even multiple of seven that is greater than 100.

..... [2]

(e) 6^{-1} $\sqrt{10}$ 8.97×10^{-3} $\frac{7}{5}$ $\sqrt{64}$

From the list, write down the irrational number.

..... [1]

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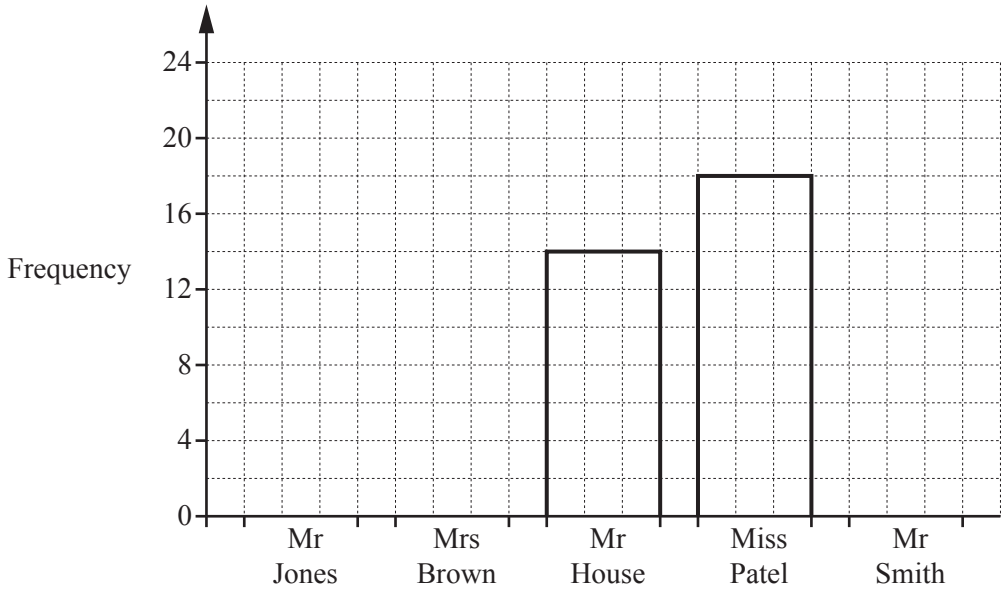
2 80 students each record the name of their mathematics teacher.
The number of these students taught by Mr House and by Miss Patel are shown in the bar chart.



(a) How many more students are taught by Miss Patel than by Mr House?

..... [1]

(b) 15 students are taught by Mr Smith.
Twice as many students are taught by Mrs Brown than by Mr Jones.

Use this information to complete the bar chart.

[4]

(c) Write down the mode.

..... [1]

(d) One of these students is chosen at random.

Work out the probability that this student

(i) is taught by Mr House,

..... [1]

(ii) is not taught by either Mr House or Miss Patel.

..... [2]

(e) This information is also to be shown in a pie chart.

Work out the sector angle for Miss Patel.

[2]

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3 Mr Lester has a fruit and vegetable shop.

(a) Apples cost 32 cents each.
Suki buys 6 apples.

Work out the change Mr Lester gives Suki when she pays with a \$10 note.

\$ ..... [2]

(b) Green grapes cost \$3.10 per kilogram.
Red grapes cost \$2.80 per kilogram.

Work out the total cost of buying 0.6 kg of green grapes and $\frac{3}{4}$ kg of red grapes.

\$ ..... [3]

(c) George spends \$12 on fruit each week.
The total amount he spends on food is \$75.

Work out the percentage of the \$75 he spends on fruit.

..... % [1]

(d) Mr Lester buys pineapples for \$1.50 each.
He makes 60% profit when he sells them.

Work out the selling price of a pineapple.

\$ ..... [2]

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(e) The table shows the number of bananas bought by the last 50 customers.

Number of bananas bought	Frequency
0	14
1	0
2	2
3	5
4	11
5	8
6	10

(i) Find the range.

..... [1]

(ii) Work out the median.

..... [1]

(iii) Calculate the mean.

..... [3]

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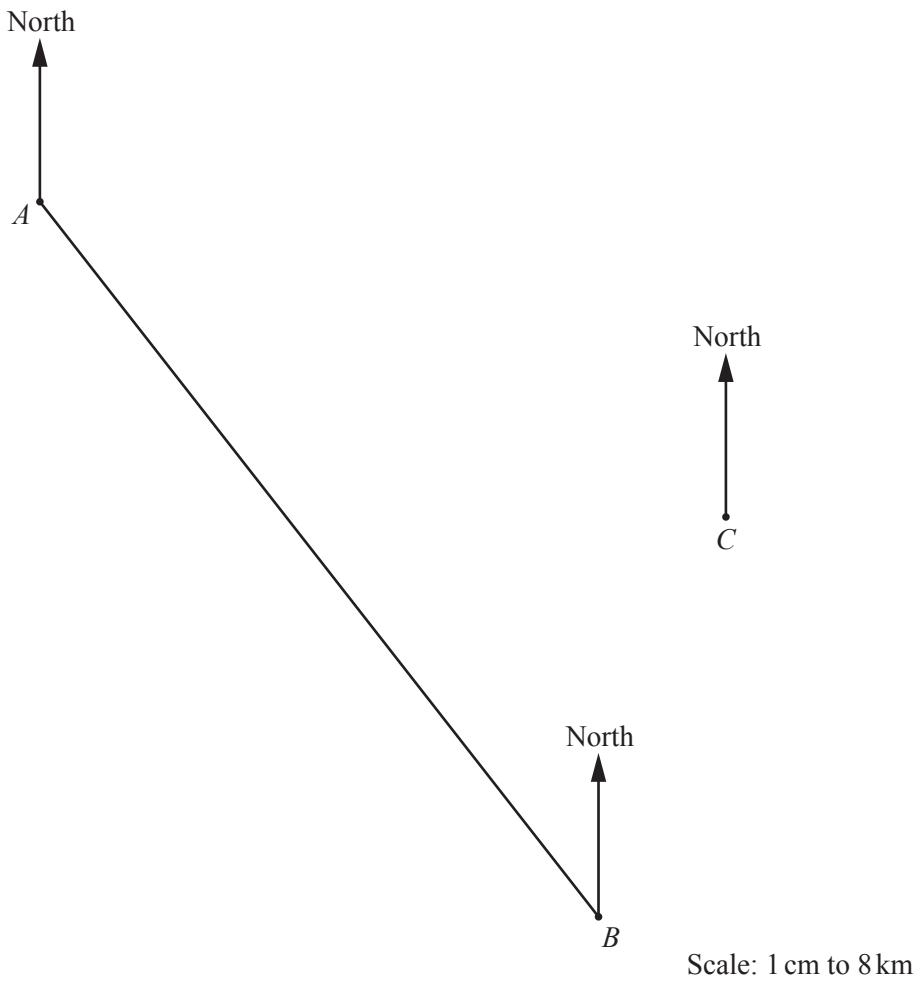
4 The scale drawing shows town *A*, town *B* and town *C* on a map.
There is a straight road between town *A* and town *B*.
The scale of the map is 1 centimetre represents 8 kilometres.



(a) Measure the bearing of town *A* from town *B*.

..... [1]

(b) Work out the actual distance, in kilometres, between town *A* and town *B*.

..... km [2]

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(c) Write the scale of the map in the form 1 : n.

1 : ..... [1]

(d) A straight road from town C is on a bearing of 246°.
It meets the road from town A to town B at point X.

On the map, draw the road from town C to point X.
Label the position of X.

[1]

(e) **(i)** Josie is at point X at 10 50.
She arrives at town B 37 minutes later.

Work out the time that she arrives at town B.

..... [1]

(ii) Sammy leaves town A and travels to town B at a constant speed of 75 km/h.

(a) Work out the time for this journey.
Give your answer in hours and minutes, correct to the nearest minute.

..... h ..... min [3]

(b) Sammy wants to arrive at town B at the same time as Josie.

Work out the time that Sammy must leave town A.

..... [1]

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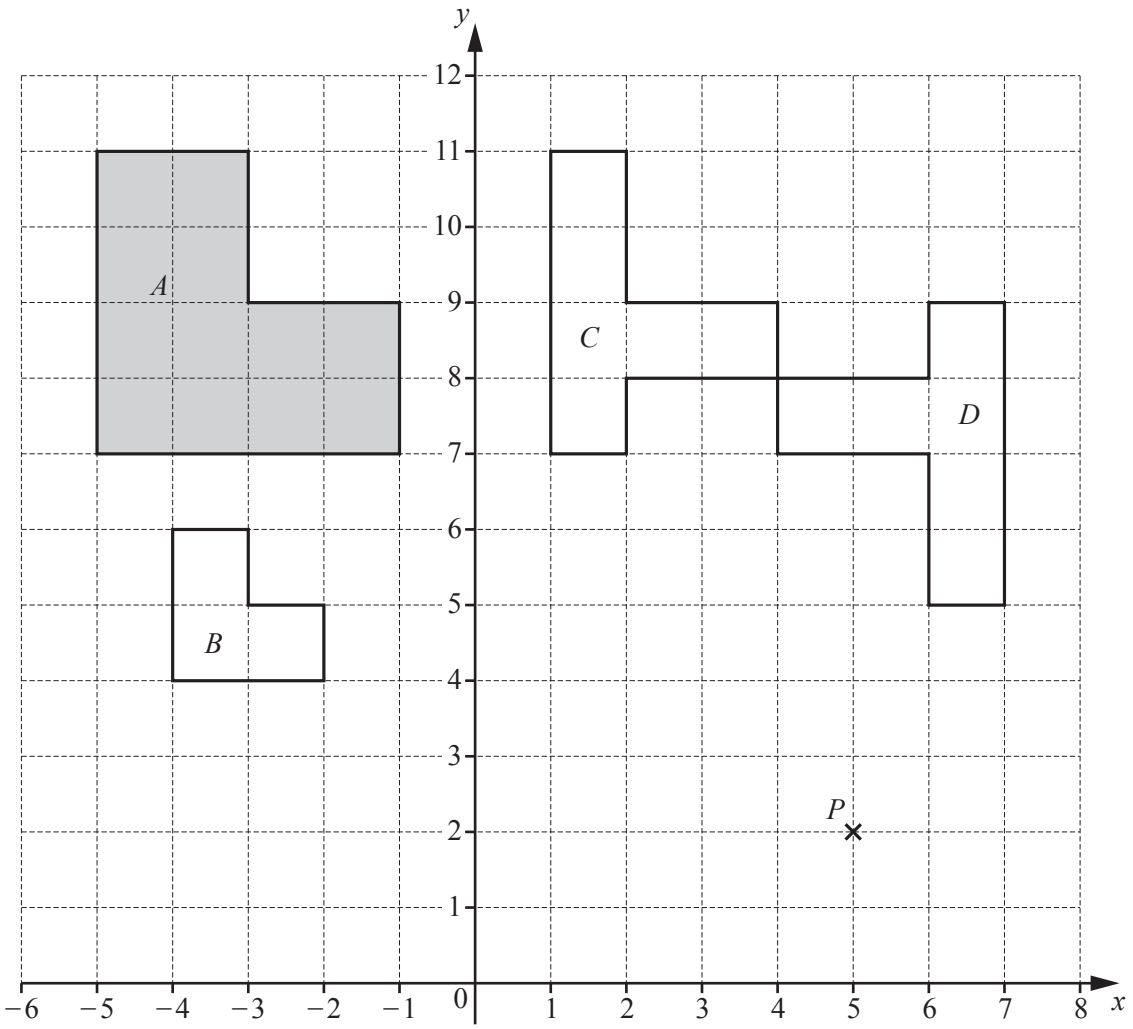
5 The diagram shows four shapes A, B, C and D and a point P on a 1 cm^2 grid.



(a) Find

(i) the perimeter of shape A,

..... cm [1]

(ii) the area of shape A.

.....cm^2 [1]

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(b) **(i)** Write down the co-ordinates of point P.

(..... , ...) [1]

(ii) Find the co-ordinates of the image of point P when

(a) P is reflected in the y-axis,

(..... , ...) [1]

(b) P is reflected in the line $y = 6$.

(..... , ...) [2]

(iii) Find the vector that translates point P to the point $(49, -12)$.

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [2]

(c) Describe fully the **single** transformation that maps

(i) shape A onto shape B,

.....

..... [3]

(ii) shape C onto shape D.

.....

..... [3]

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6 **(a)** The grid shows the first three diagrams in a sequence.

Each diagram is made using identical small squares.
Each square has sides that are 1 unit long.

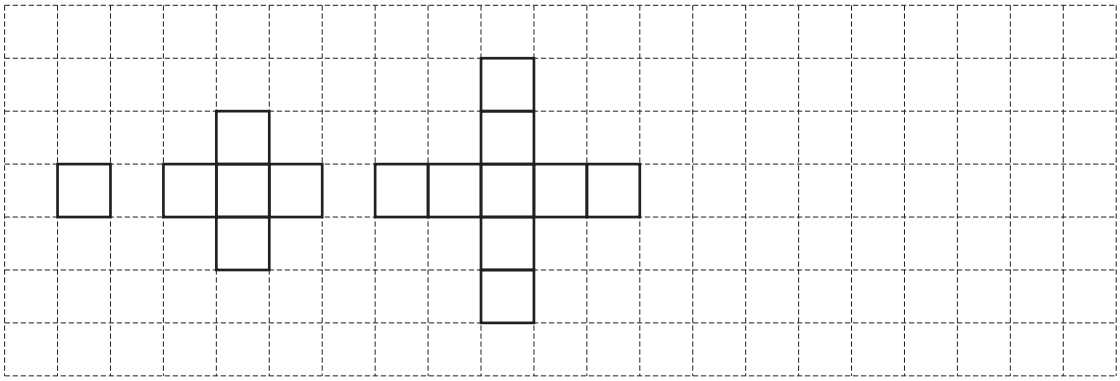

Diagram 1 Diagram 2 Diagram 3 Diagram 4

(i) On the grid, draw Diagram 4. [1]

(ii) Complete the table.

Diagram number	1	2	3	4
Perimeter	4	12	20	

[1]

(iii) Find an expression, in terms of n, for the perimeter of Diagram n.

..... [2]

(iv) For one of the diagrams in the sequence the perimeter is 300 units.

Work out its Diagram number.

..... [2]

(v) **Diagram 3** is drawn on a piece of card.
The side of each small square is 7 cm.
The diagram is the net of an open box.

Calculate the volume of this box.
Give the units of your answer.

.... [3]

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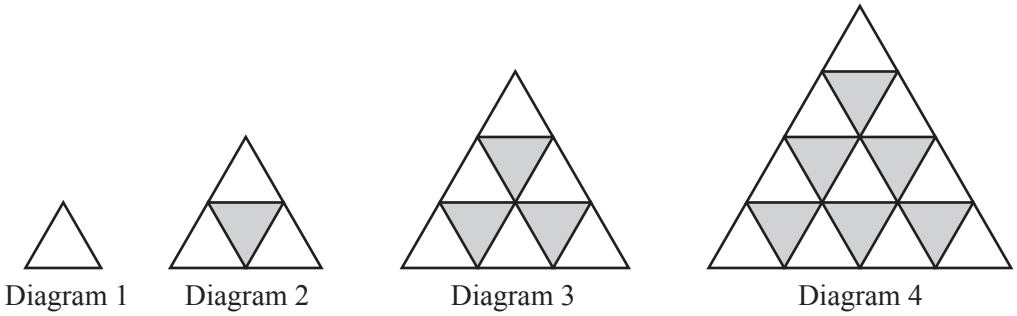
(b) These are the first four diagrams in a sequence.
Each diagram is made from small equilateral triangles.



(i) Write down the number of lines of symmetry of Diagram 3.

..... [1]

(ii) Complete the table.

Diagram number (n)	1	2	3	4
Number of white triangles (w)	1	3	6	
Number of grey triangles (g)	0		3	
Total number of small triangles (t)	1	4		

[2]

(iii) Find a formula, in terms of n, for the total number of small triangles, t, in Diagram n.

$t =$ ..... [1]

(iv) The formula for the number of white triangles, w, in Diagram n is $w = \frac{1}{2}n(n+1)$.

Show that this formula gives the correct number of white triangles when $n = 3$.

[2]

(v) Complete this statement for Diagram 15.

When $n = 15$, $w =$ ..... , $g =$ ..... and $t =$ ..... [3]

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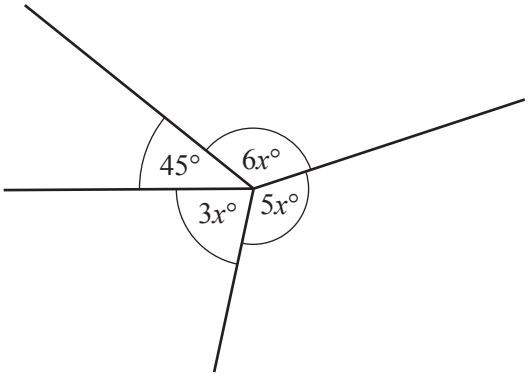
7 **(a)** A triangle is isosceles.
One of its angles is 96°.

Find the other two angles.

..... and ..... [1]

(b)



NOT TO SCALE

Find the value of x.

x = ... [4]

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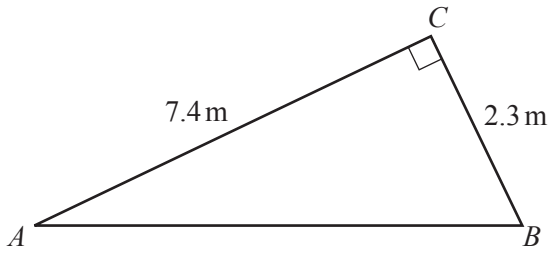
(c) Work out the size of one interior angle of a regular polygon with 20 sides.

..... [3]

(d)



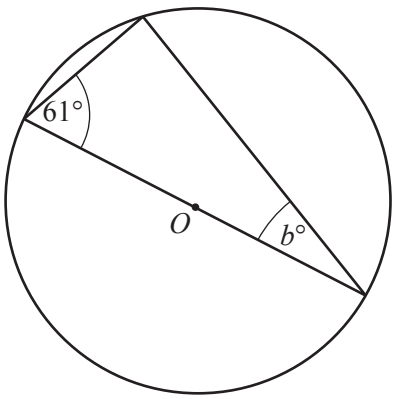
NOT TO SCALE

The diagram shows a right-angled triangle *ABC*.

Calculate the length of *AB*.

AB = ... m [2]

(e) The diagram shows the vertices of a triangle lying on the circumference of a circle with centre *O*.



NOT TO SCALE

Find the value of *b*.
Give a reason for your answer.

b = ... because ..... [2]

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8 **(a)** **(i)** Write down the co-ordinates of the point where the line $y = 6x - 3$ crosses the y-axis.

(..... , ...) [1]

(ii) Write down the equation of the straight line that

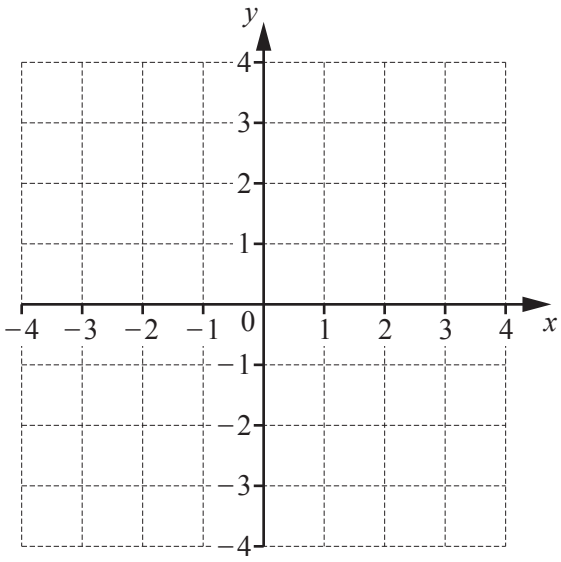
- passes through the origin

and

- is parallel to $y = 6x - 3$.

..... [1]

(b)



(i) On the grid, draw the line through the point $(-3, -2)$ that is perpendicular to the y-axis.

[1]

(ii) On the grid, draw the line $y = -2x$.

[1]

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(c) The equations of two straight lines are $y = 3x + 13$ and $y = 7x - 3$.

Use algebra to solve these two simultaneous equations to find the co-ordinates of the point where the lines meet.
You must show all your working.

(..... , ...) [3]

Question 9 is printed on the next page.

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9 Zach goes on holiday.

(a) The mass, m kilograms, of his suitcase is 23.5 kg, correct to the nearest 500 g.

Complete this statement about the value of m.

..... $\leqslant m <$ ..... [2]

(b) The ratio of the costs flights : hotels = 3 : 8.
The cost of the flights is \$861.

Work out the total cost of flights and hotels.

\$ ..... [2]

(c)

\$1 = 0.88 euros
£1 = 1.15 euros

Zach changes \$575 into euros.
He spends 45% of the euros in France.
He changes the euros he does not use into pounds (£) to spend in England.

Work out how many pounds he receives.

£ ..... [4]

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CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

MATHEMATICS **0580/33**

Paper 3 (Core) **May/June 2019**

2 hours

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
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Answer **all** questions.
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Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

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The total of the marks for this paper is 104.

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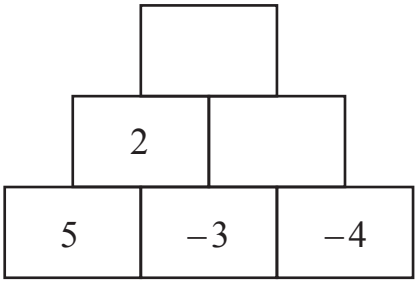
1 **(a)** Write this number in figures.

One million three hundred and two thousand five hundred and ninety-six.

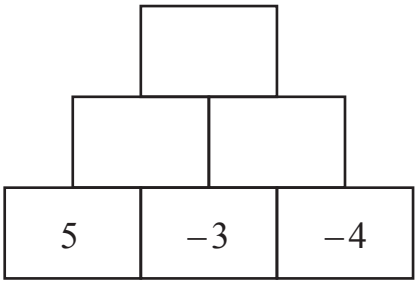
..... [1]

(b) **(i)** Two numbers are **added** together to give the number in the box immediately above.



Complete the diagram. [2]

(ii) Two numbers are **multiplied** together to give the number in the box immediately above.



Complete the diagram. [3]

(c) Write these in order of size, starting with the smallest.

$\frac{5}{27}$ 18.4% 1.83×10^{-1} 5^{-1}

..... < ..... < ..... < ..... [2]
smallest

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(d) Work out 142 as a percentage of 304.

..... % [1]

(e) **(i)** Find the highest common factor (HCF) of 28 and 98.

..... [2]

(ii) Find the lowest common multiple (LCM) of 28 and 98.

..... [2]

(f) The average distance from Earth to Mars is 2.25×10^8 km.
A space ship travels from Earth to Mars at an average speed of 5.8×10^4 km/h.

Find how long, in hours, the journey takes.

..... hours [2]

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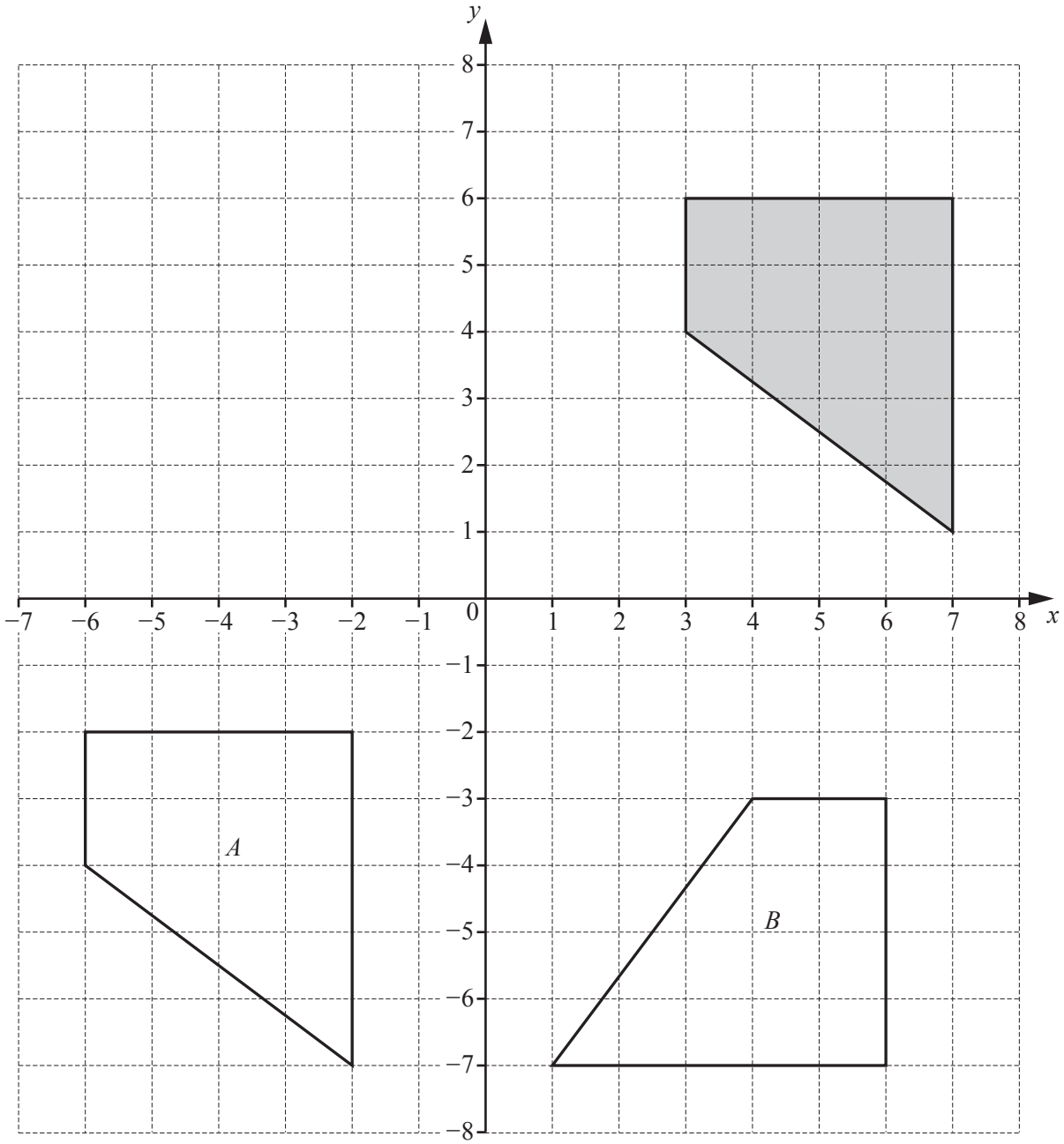
2 Three quadrilaterals are shown on a 1 cm^2 grid.



(a) Write down the mathematical name of the shaded quadrilateral.

..... [1]

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(b) For the shaded quadrilateral

(i) **measure** the perimeter,

..... cm [1]

(ii) work out the area.

..... cm^2 [1]

(c) Describe fully the **single** transformation that maps the shaded quadrilateral onto

(i) quadrilateral A,

.....

..... [2]

(ii) quadrilateral B.

.....

..... [3]

(d) On the grid,

(i) reflect the shaded quadrilateral in the line $x = 1$, [2]

(ii) enlarge the shaded quadrilateral by scale factor $\frac{1}{2}$, centre $(-1, 0)$. [2]

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3 The music teacher at a school forms an orchestra.
The instruments in the orchestra are 36 string, 15 woodwind and 12 brass.

(a) Write the ratio string : woodwind : brass in its simplest form.

..... : ..... : ..... [2]

(b) The 36 string instruments are violins, cellos and double basses in the ratio

violins : cellos : double basses = 9 : 2 : 1.

(i) Show that the number of violins is 27.

[1]

(ii) Work out the number of cellos and the number of double basses.

Cellos .....

Double basses ..... [2]

(c) The 15 woodwind instruments are oboes, flutes and clarinets.
20% of these instruments are oboes.
There are twice as many flutes as clarinets.

Find the number of flutes.

..... [2]

(d) Of the 12 brass instruments, $\frac{1}{3}$ are trumpets, 3 are trombones and the remainder are horns.

Find the number of horns.

..... [2]

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(e) The music teacher needs to buy all the instruments for the orchestra.

	Number of instruments	Price of each instrument ($)	Cost ($)
String	36	131	4716
Woodwind	15	217	
Brass	12	221	

(i) Complete the table. [1]

(ii) Find the total cost of all the instruments.

$ ..... [1]

(f) The school is given 65% of the total cost of all the instruments.

Find how much more money is needed.

$ ..... [2]

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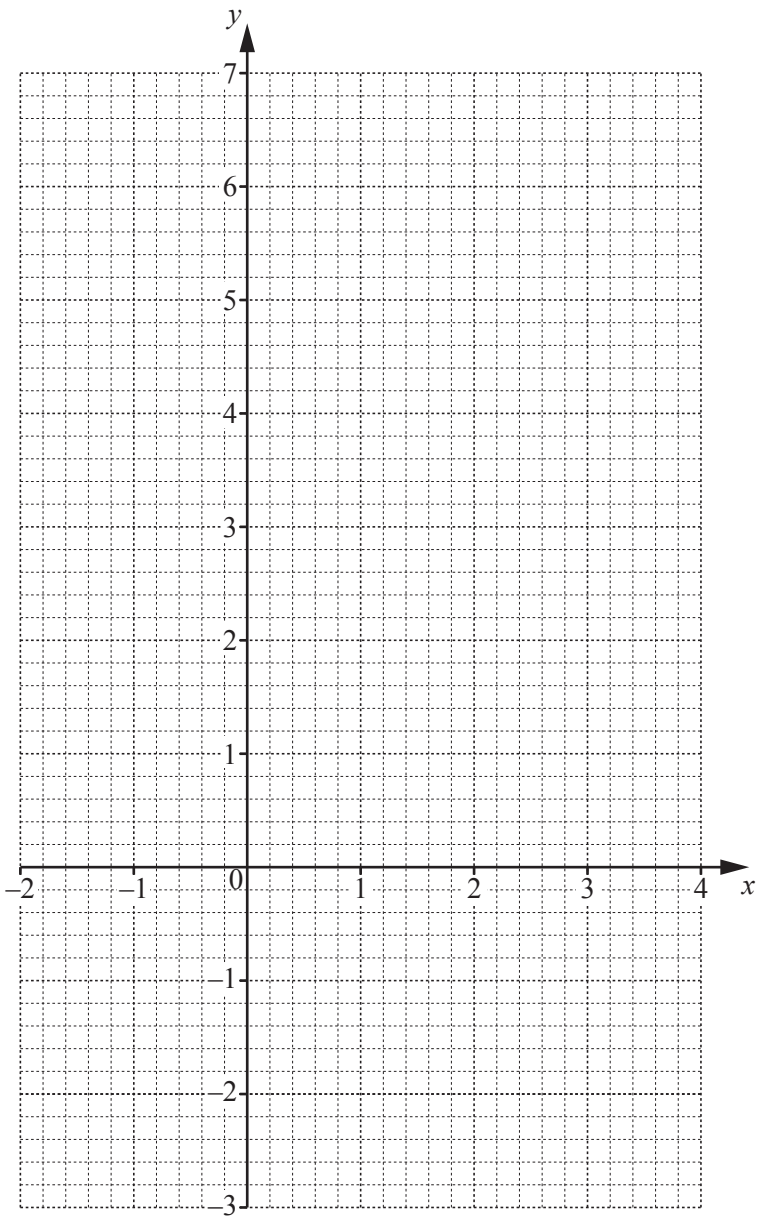
4 **(a)** Complete the table of values for $y = 5 + 2x - x^2$.

x	-2	-1	0	1	2	3	4
y		2	5	6			-3

[2]

(b) On the grid, draw the graph of $y = 5 + 2x - x^2$ for $-2 \leqslant x \leqslant 4$.



[4]

(c) **(i)** On the grid, draw the line of symmetry. [1]

(ii) Write down the equation of the line of symmetry.

..... [1]

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(d) Use your graph to find the solutions of the equation $5+2x-x^2=4$.

$x =$ ..... or $x =$ ..... [2]

(e) **(i)** On the grid, draw a line from $(-1, 2)$ to $(1, 6)$. [1]

(ii) Find the equation of this line in the form $y = mx + c$.

$y =$ ..... [3]

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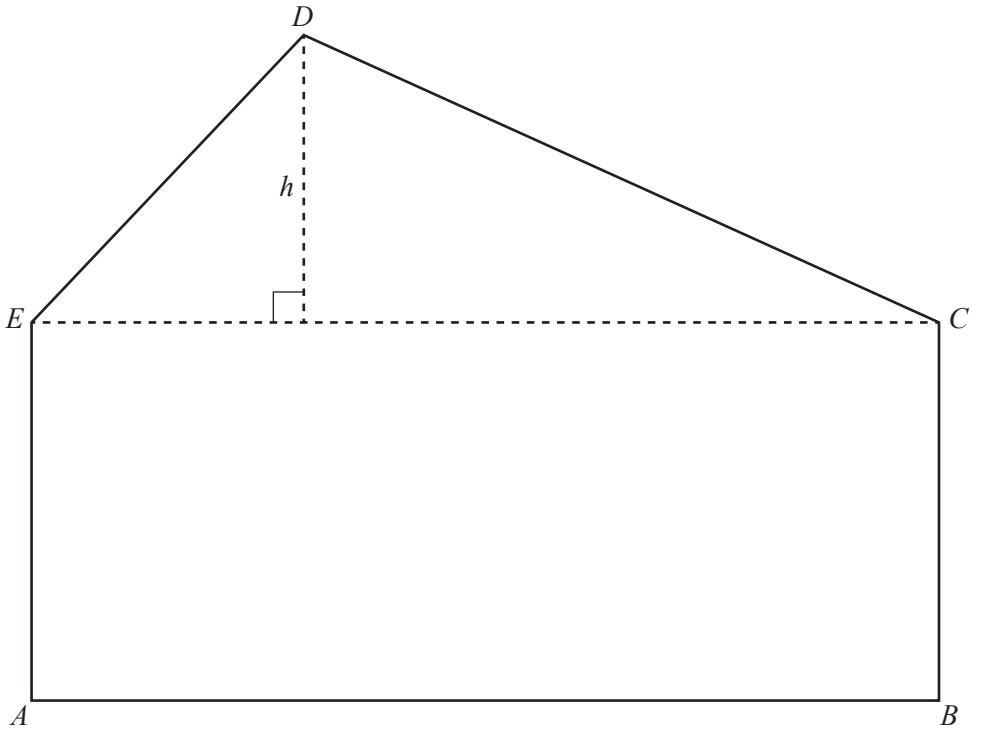
5 The scale drawing shows a play area, *ABCDE*.
The scale is 1 centimetre represents 3 metres.



Scale: 1 cm to 3 m

(a) Find the actual distance h in metres.

$h =$ ..... m [2]

(b) Find the actual area of triangle *CDE*.

..... m^2 [3]

(c) A straight path crosses the play area from *C* to *AB*.
It is equidistant from *CB* and *CD*.

Using a straight edge and compasses only, construct the path.
Show all your construction arcs. [2]

(d) There is a circular pool in the play area.
The pool has a diameter of 8 m.

Calculate

(i) the circumference of the pool,

..... m [2]

(ii) the area of the pool.

..... m^2 [2]

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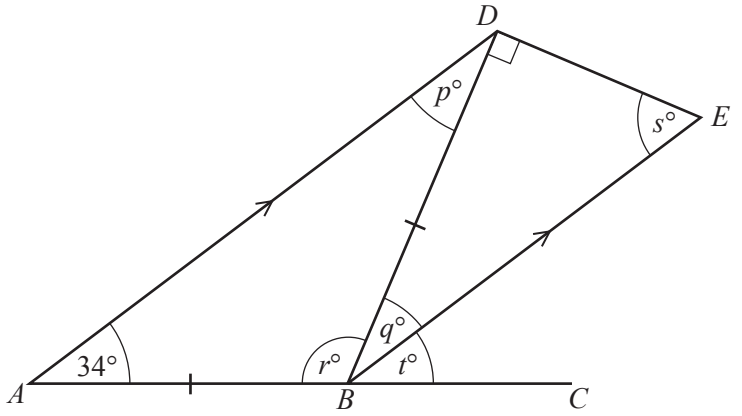
6 **(a)**



NOT TO SCALE

In the diagram, ABC is a straight line.
AD is parallel to BE, angle $BAD = 34°$ and $AB = BD$.

(i) Complete the statements.

(a) $p =$ ..... because ..... [2]

(b) $q =$ ..... because ..... [2]

(ii) Work out the value of r and the value of s.

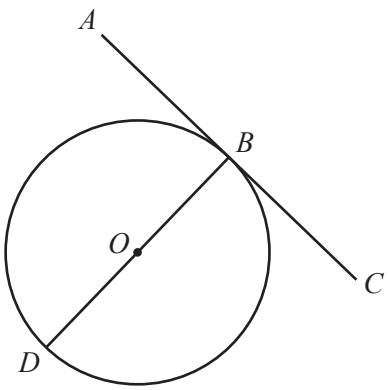
$r =$ .....

$s =$ ..... [2]

(iii) Find the value of t and give a reason for your answer.

$t =$ ..... because ..... [2]

(b)



NOT TO SCALE

In the diagram, B and D are points on the circumference of a circle, centre O.
AC is a straight line touching the circle at B only and BD is a straight line through O.

Complete the statement.

Angle $ABD =$ ..... because .....

..... [2]

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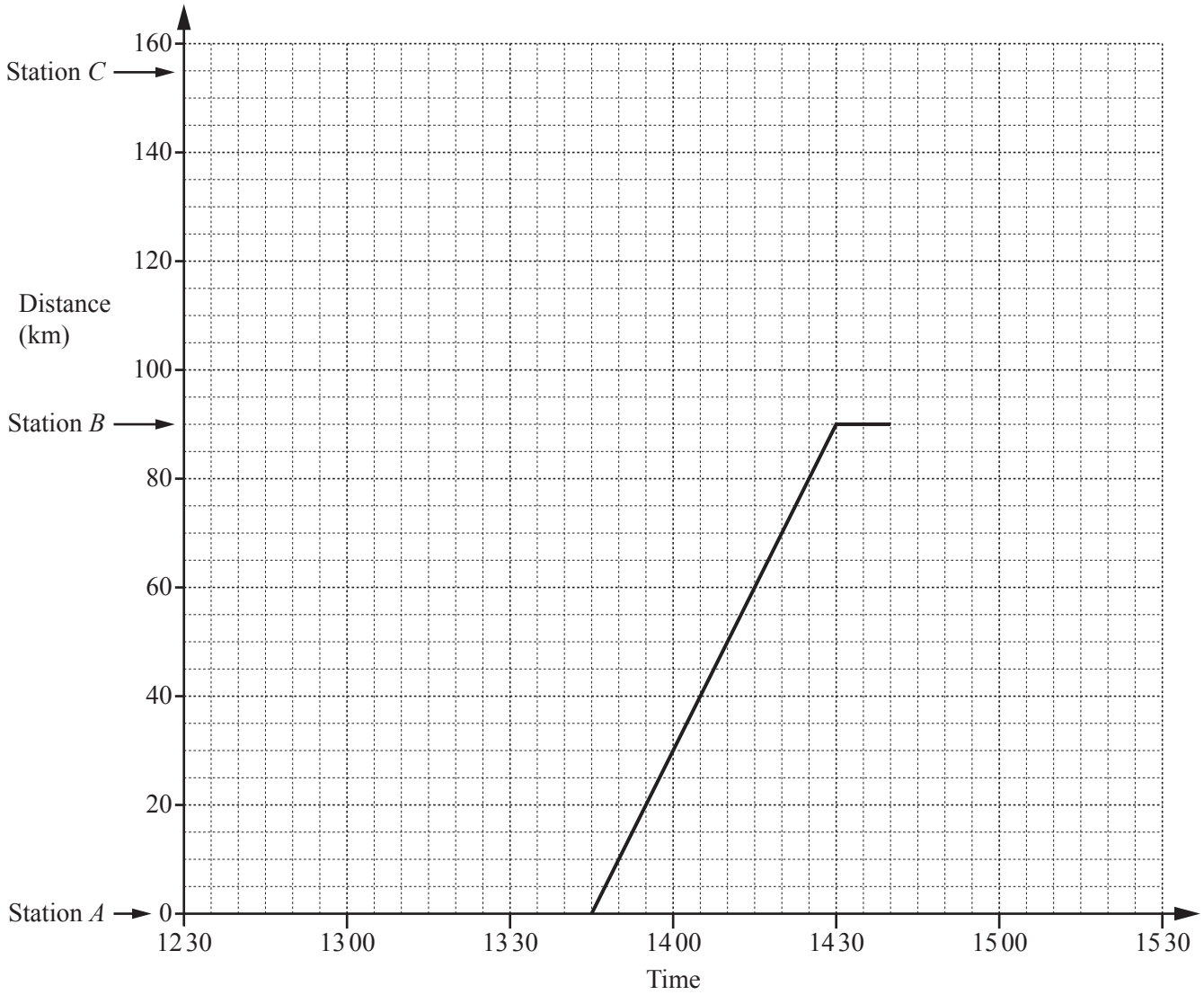
7 The travel graph shows part of a train journey between station *A* and station *C*.



(a) **(i)** Calculate, in km/h, the speed of the train between station *A* and station *B*.

.....km/h [2]

(ii) The train leaves station *B* at 1440.

For how many minutes did the train stop at station *B*?

.....min [1]

(iii) The train travels at a constant speed between station *B* and station *C*, arriving at 1520.

Complete the travel graph for the journey between station *B* and station *C*. [1]

(iv) On which part of the journey was the train travelling faster?

Between station ..... and station ..... [1]

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(b) Another train leaves station *C* at 12 45.
It travels to station *A* at a constant speed of 62 km/h without stopping at station *B*.

(i) Work out how long, in hours and minutes, this journey takes.

..... h ..... min [2]

(ii) Write down the time this train arrives at station *A*.

..... [1]

(iii) On the grid, show the journey of this train. [1]

(iv) Find the distance from station *A* when the two trains pass each other.

..... km [1]

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8 **(a)** Kyung records the number of people in each of 24 cars on Wednesday.
His results are shown below.

1	3	6	1	2	2	4	5
3	4	1	5	3	2	4	1
1	1	2	4	4	1	2	1

(i) Complete the frequency table.
You may use the tally column to help you.

Number in a car	Tally	Frequency
1		
2		
3		
4		
5		
6		

[2]

(ii) Write down the mode.

..... [1]

(iii) Work out the range.

..... [1]

(iv) Work out the median.

..... [1]

(v) Calculate the mean.

..... [3]

(vi) One of these cars is chosen at random.

Find the probability that the number of people in this car is 4.

[1]

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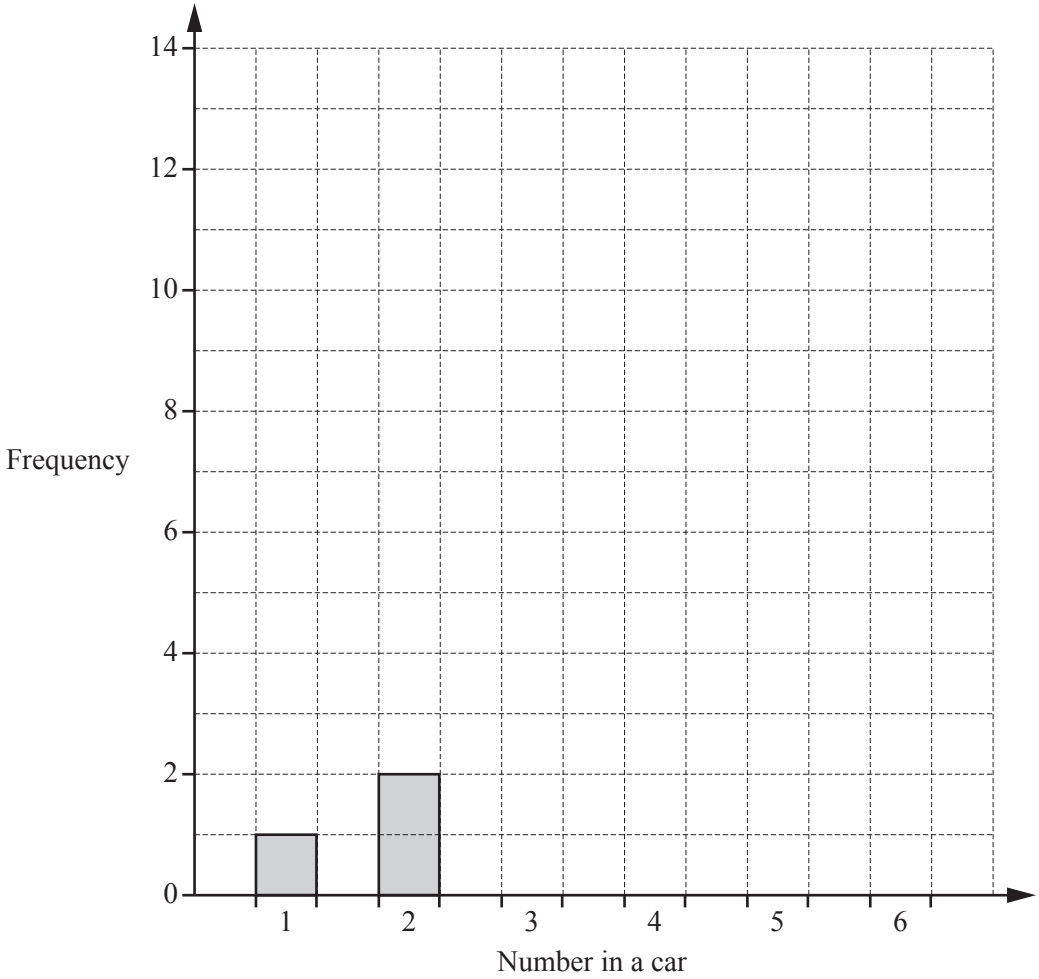
(b) Kyung also records the number of people in each of 24 cars on Saturday.
The table shows the results.

Number in a car	1	2	3	4	5	6
Frequency	1	2	5	13	2	1

On the grid, complete the bar chart to show these results.



[2]

(c) Write down one comparison between the frequency tables in **part (a)(i)** and **part (b)**.

.....

..... [1]

Question 9 is printed on the next page.

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9 Mr Razif travels by bus from Singapore to Kuala Lumpur with his wife and his four children.

(a)

Ticket Price	
Adult	\$32.40
Child	\$24.40
Family (2 adults and 3 children)	\$115.00

Work out how much Mr Razif saves if he buys a family ticket and one child ticket rather than six individual tickets.

\$ ..... [4]

(b) The bus leaves Singapore at 1240 and arrives in Kuala Lumpur at 1735.

Work out, in hours and minutes, the time this journey takes.

..... h ..... min [1]

(c) Mr Razif changes some dollars into Malaysian ringgits.
He receives 318 ringgits when the exchange rate is \$1 = 4.24 ringgits.

Work out how many dollars he changes.

\$ ..... [2]

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MATHEMATICS **0580/41**

Paper 4 (Extended) **May/June 2019**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

This document consists of **16** printed pages.

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[Turn over

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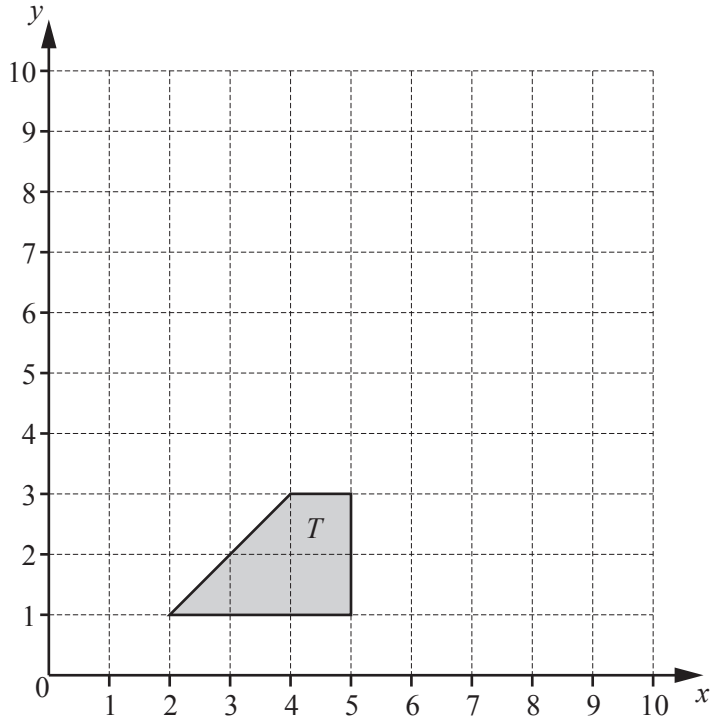
1



(a) **(i)** Translate shape T by the vector $\begin{pmatrix} -1 \\ 6 \end{pmatrix}$.

Label the image A. [2]

(ii) Rotate shape T about the point (5, 3) through 180°.
Label the image B. [2]

(iii) Describe fully the **single** transformation that maps shape A onto shape B.

.....

..... [3]

(b) **(i)** Reflect shape T in the line $y = x$. [2]

(ii) Find the matrix that represents the transformation in **part (b)(i)**.

$\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [2]

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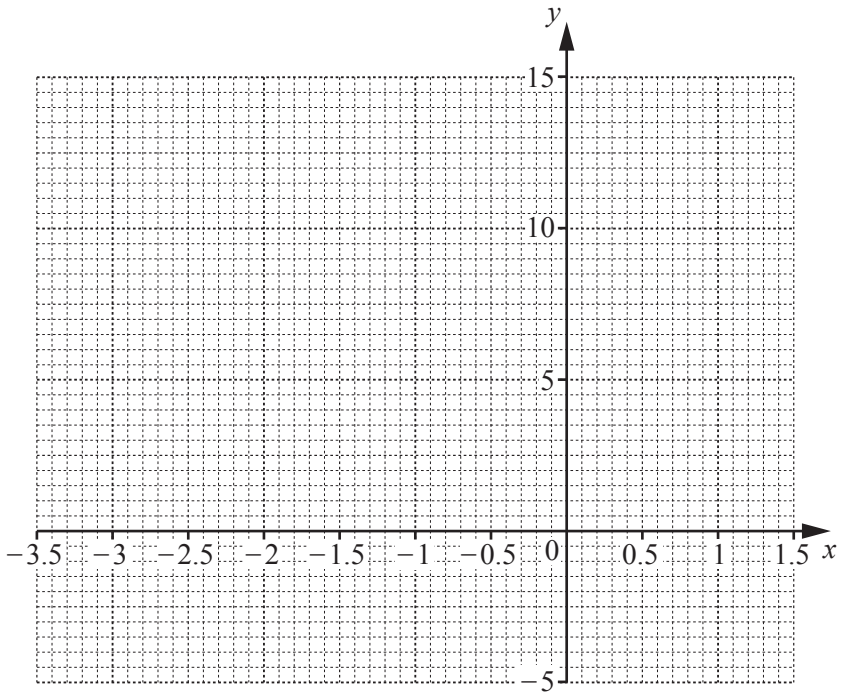
2 The table shows some values for $y = x^3 + 3x^2 + 2$.

x	−3.5	−3	−2.5	−2	−1.5	−1	−0.5	0	0.5	1	1.5
y	−4.1		5.1	6	5.4	4	2.6		2.9		12.1

(a) Complete the table. [3]

(b) On the grid, draw the graph of $y = x^3 + 3x^2 + 2$ for $-3.5 \leqslant x \leqslant 1.5$.



[4]

(c) Use your graph to solve the equation $x^3 + 3x^2 + 2 = 0$ for $-3.5 \leqslant x \leqslant 1.5$.

$x =$ ..... [1]

(d) By drawing a suitable straight line, solve the equation $x^3 + 3x^2 + 2x + 2 = 0$ for $-3.5 \leqslant x \leqslant 1.5$.

$x =$ ..... [2]

(e) For $-3.5 \leqslant x \leqslant 1.5$, the equation $x^3 + 3x^2 + 2 = k$ has three solutions and k is an integer.

Write down a possible value of k.

$k =$ ..... [1]

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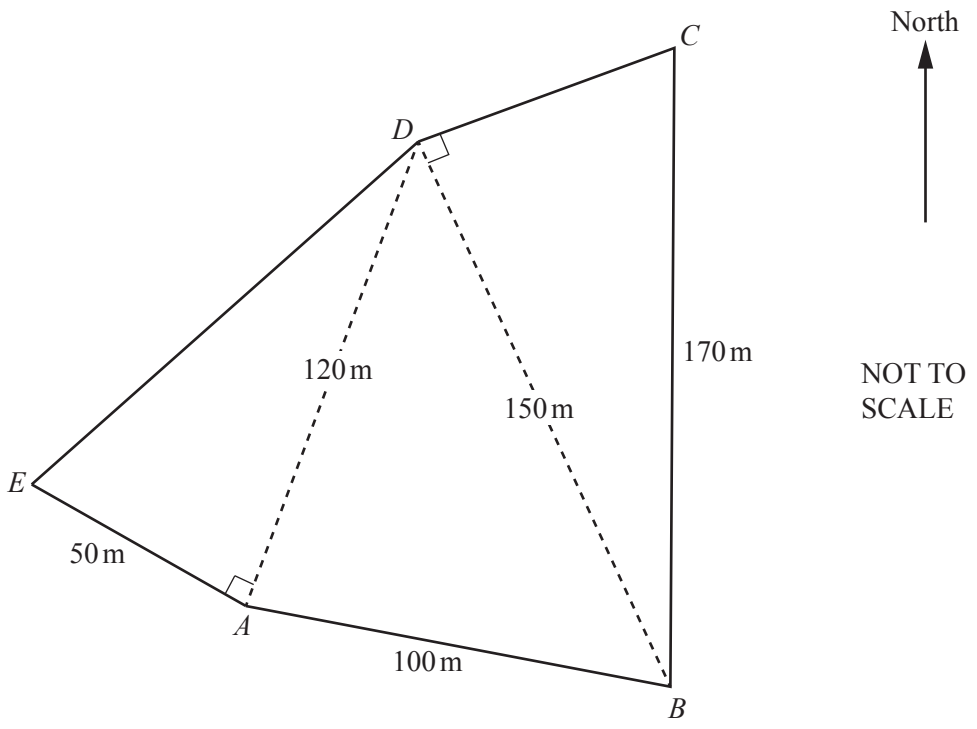
3



The diagram shows a field *ABCDE*.

(a) Calculate the perimeter of the field *ABCDE*.

..... m [4]

(b) Calculate angle *ABD*.

Angle *ABD* = ... [4]

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(c) **(i)** Calculate angle *CBD*.

Angle *CBD* = ... [2]

(ii) The point *C* is due north of the point *B*.

Find the bearing of *D* from *B*.

..... [2]

(d) Calculate the area of the field *ABCDE*.
Give your answer in hectares.
[1 hectare = 10 000 m^2]

..... hectares [4]

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4 **(a)** The test scores of 14 students are shown below.

21 21 23 26 25 21 22 20 21 23 23 27 24 21

(i) Find the range, mode, median and mean of the test scores.

Range = ...

Mode = ...

Median = ...

Mean = ... [6]

(ii) A student is chosen at random.

Find the probability that this student has a test score of more than 24.

..... [1]

(b) Petra records the score in each test she takes.

The mean of the first n scores is x.
The mean of the first $(n - 1)$ scores is $(x + 1)$.

Find the nth score in terms of n and x.
Give your answer in its simplest form.

..... [3]

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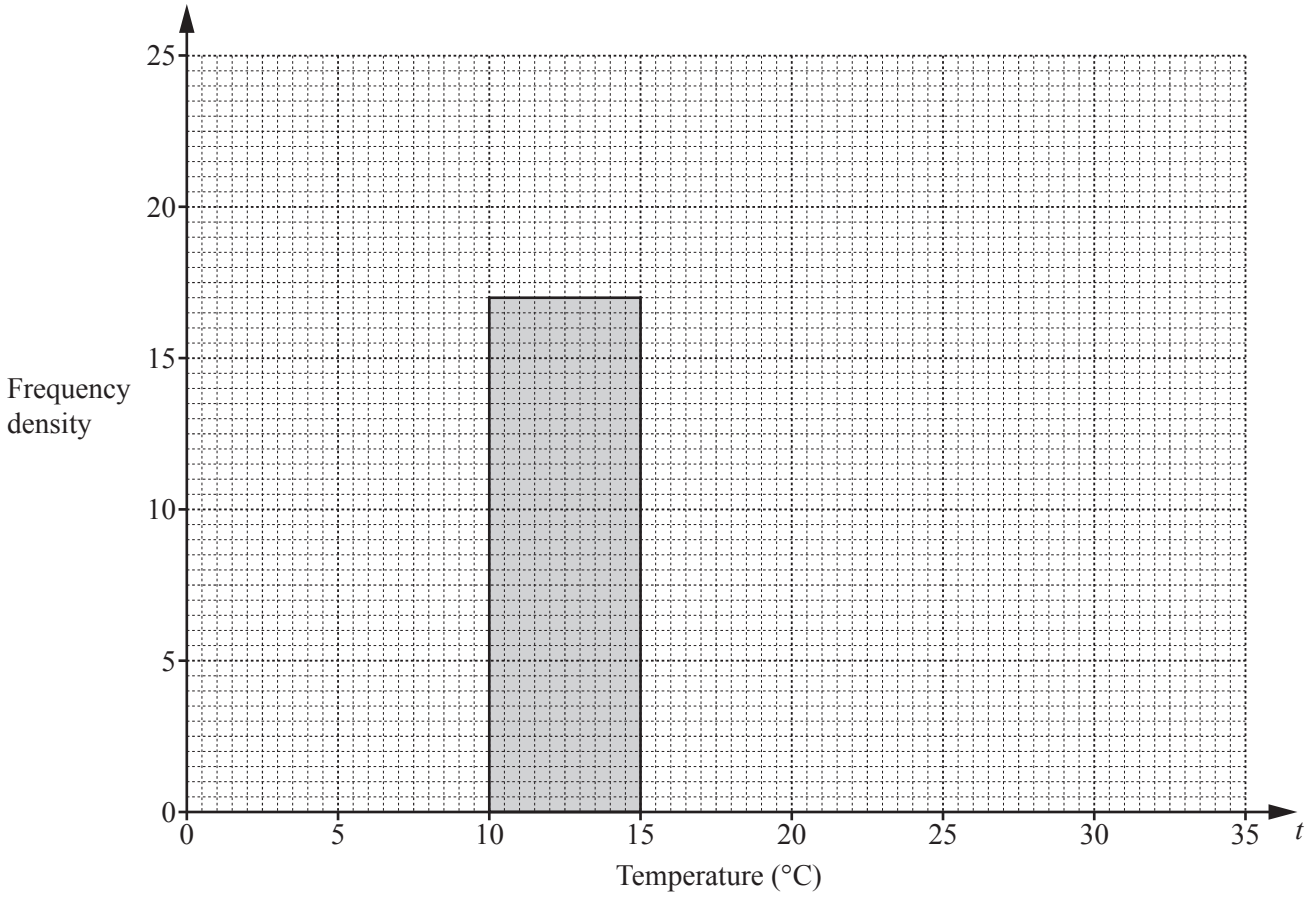
(c) During one year the midday temperatures, t°C, in Zedford were recorded.
The table shows the results.

Temperature (t°C)	$0 < t \leqslant 10$	$10 < t \leqslant 15$	$15 < t \leqslant 20$	$20 < t \leqslant 25$	$25 < t \leqslant 35$
Number of days	50	85	100	120	10

(i) Calculate an estimate of the mean.

..... °C [4]

(ii) Complete the histogram to show the information in the table.



[4]

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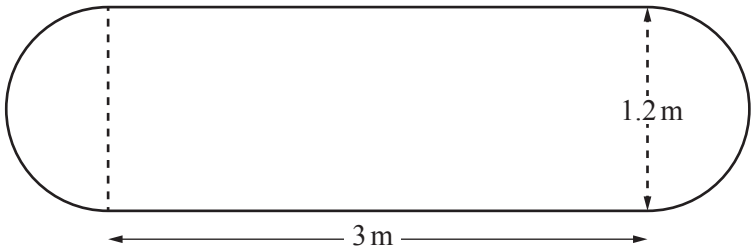
5



NOT TO SCALE

The diagram shows the surface of a garden pond, made from a rectangle and two semicircles.
The rectangle measures 3 m by 1.2 m.

(a) Calculate the area of this surface.

..... m^2 [3]

(b) The pond is a prism and the water in the pond has a depth of 20 cm.

Calculate the number of litres of water in the pond.

..... litres [3]

(c) After a rainfall, the number of litres of water in the pond is 1007.

Calculate the increase in the depth of water in the pond.
Give your answer in centimetres.

..... cm [3]

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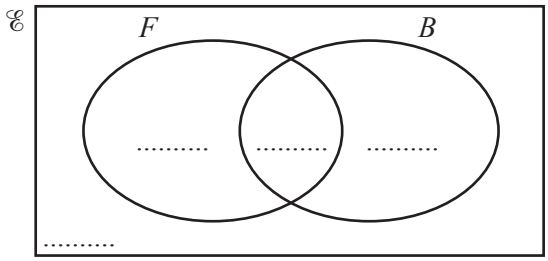
6 $\mathscr{E}$ = {students in a school}
F = {students who play football}
B = {students who play baseball}

There are 240 students in the school.

- 120 students play football
- 40 students play baseball
- 90 students play football but not baseball.

(a) Complete the Venn diagram to show this information.



[2]

(b) Find $n(F' \cap B')$.

..... [1]

(c) A student in the school is chosen at random.

Find the probability that this student plays baseball but not football.

..... [1]

(d) Two students who play baseball are chosen at random.

Find the probability that they both also play football.

..... [3]

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7 **(a)** $s = ut + \frac{1}{2}at^2$

(i) Find s when $t = 26.5$, $u = 104.3$ and $a = -2.2$.
Give your answer in standard form, correct to 4 significant figures.

$s =$ ..... [4]

(ii) Rearrange the formula to write a in terms of u, t and s.

$a =$ ..... [3]

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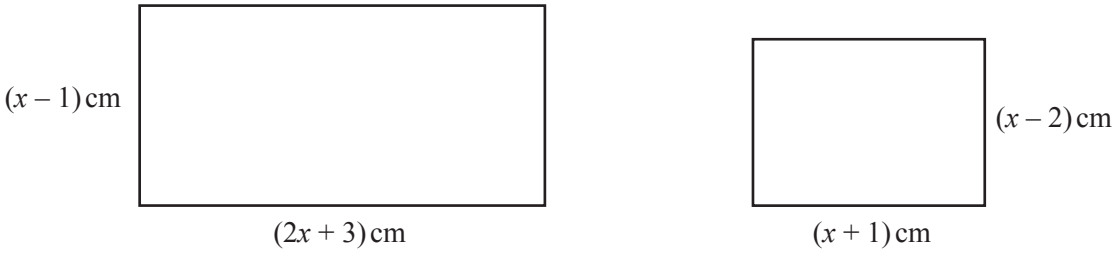
(b)



The difference between the areas of the two rectangles is $62\,\text{cm}^2$.

(i) Show that $x^2 + 2x - 63 = 0$.

[3]

(ii) Factorise $x^2 + 2x - 63$.

..... [2]

(iii) Solve the equation $x^2 + 2x - 63 = 0$ to find the difference between the perimeters of the two rectangles.

..... cm [2]

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8 **(a)** The price of a book increases from \$2.50 to \$2.65 .

Calculate the percentage increase.

..... % [3]

(b) Scott invests \$500 for 7 years at a rate of 1.5% per year simple interest.

Calculate the value of his investment at the end of the 7 years.

\$..... [3]

(c) In a city the population is increasing exponentially at a rate of 1.6% per year.

Find the overall percentage increase at the end of 20 years.

..... % [2]

(d) The population of a village is 6400.
The population is decreasing exponentially at a rate of r% per year.
After 22 years, the population will be 2607.

Find the value of r.

r = ... [3]

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9 $f(x) = 7x - 2$ $g(x) = x^2 + 1$ $h(x) = 3^x$

(a) Find gh(2).

..... [2]

(b) Find $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [2]

(c) $gg(x) = ax^4 + bx^2 + c$

Find the values of a, b and c.

$a =$ .....

$b =$ .....

$c =$ ..... [3]

(d) Find x when $hf(x) = 81$.

$x =$ ..... [3]

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10 The volume of each of the following solids is $1000\,\text{cm}^3$.

Calculate the value of x for each solid.

(a) A cube with side length x cm.

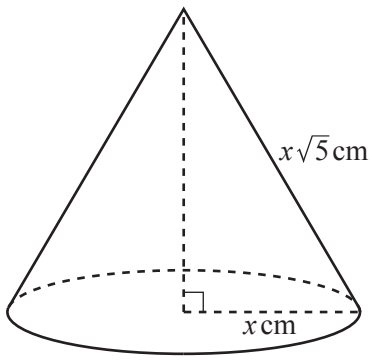
$x =$ ..... [1]

(b) A sphere with radius x cm.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

$x =$ ..... [3]

(c)



NOT TO SCALE

A cone with radius x cm and slant height $x\sqrt{5}$ cm.

[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

$x =$ ..... [4]

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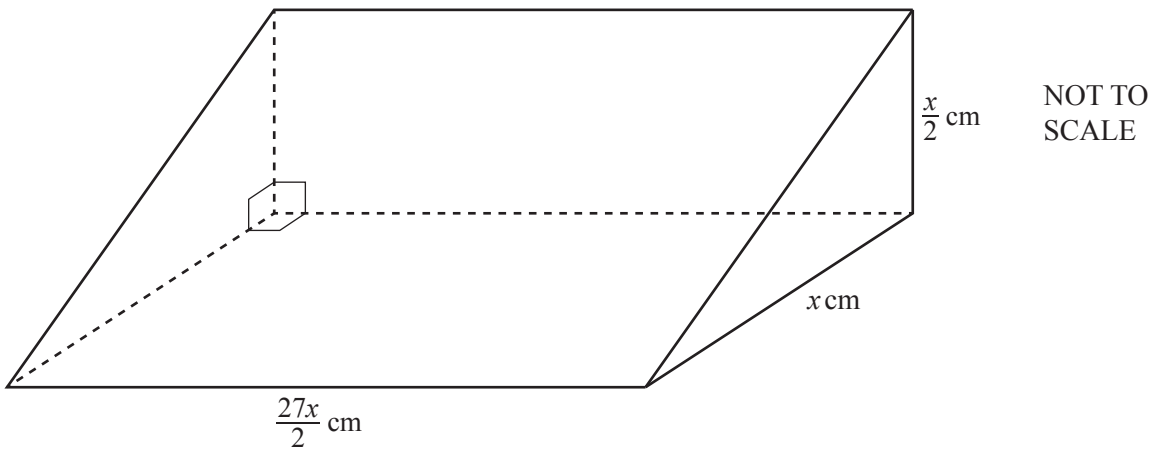
(d)



A prism with a right-angled triangle as its cross-section.

$x =$ ..... [4]

Question 11 is printed on the next page.

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11 Brad travelled from his home in New York to Chamonix.

- He left his home at 16 30 and travelled by taxi to the airport in New York.
  This journey took 55 minutes and had an average speed of 18 km/h.

- He then travelled by plane to Geneva, departing from New York at 22 15.
  The flight path can be taken as an arc of a circle of radius 6400 km with a sector angle of 55.5°.
  The local time in Geneva is 6 hours ahead of the local time in New York.
  Brad arrived in Geneva at 11 25 the next day.

- To complete his journey, Brad travelled by bus from Geneva to Chamonix.
  This journey started at 13 00 and took 1 hour 36 minutes.
  The average speed was 65 km/h.
  The local time in Chamonix is the same as the local time in Geneva.

Find the overall average speed of Brad's journey from his home in New York to Chamonix.
Show all your working and give your answer in km/h.

..... km/h [11]

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MATHEMATICS **0580/42**

Paper 4 (Extended) **May/June 2019**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

This document consists of **19** printed pages and **1** blank page.

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[Turn over

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1 **(a)** The price of a newspaper increased from \$0.97 to \$1.13 .

Calculate the percentage increase.

..... % [3]

(b) One day, the newspaper had 60 pages of news and advertisements.
The ratio number of pages of news : number of pages of advertisements = 5 : 7.

(i) Calculate the number of pages of advertisements.

..... [2]

(ii) Write the number of pages of advertisements as a percentage of the number of pages of news.

..... % [1]

(c) On holiday Maria paid 2.25 euros for the newspaper when the exchange rate was \$1 = 0.9416 euros.
At home Maria paid \$1.13 for the newspaper.

Calculate the difference in price.
Give your answer in dollars, correct to the nearest cent.

\$ ..... [3]

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(d) The number of newspapers sold decreases exponentially by x% each year.
Over a period of 21 years the number of newspapers sold decreases from 1 763 000 to 58 000.

Calculate the value of x.

x = ... [3]

(e) Every page of the newspaper is a rectangle measuring 43 cm by 28 cm, both correct to the nearest centimetre.

Calculate the upper bound of the area of a page.

..... cm^2 [2]

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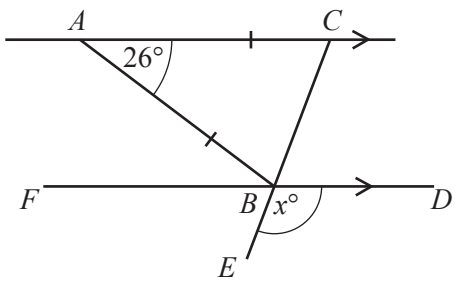
2 **(a)**



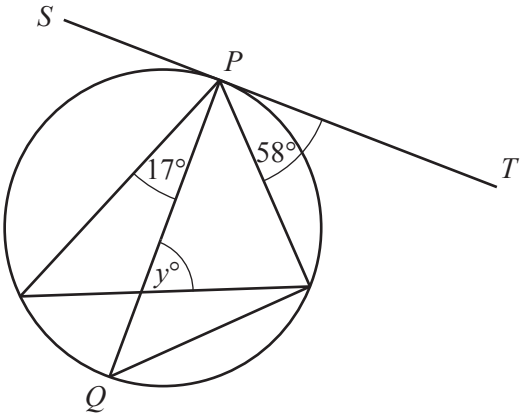
NOT TO SCALE

AC is parallel to *FBD*, *ABC* is an isosceles triangle and *CBE* is a straight line.

Find the value of *x*.

x = ... [3]

(b)



NOT TO SCALE

The diagram shows a circle with diameter *PQ*.
SPT is a tangent to the circle at *P*.

Find the value of *y*.

y = ... [5]

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3 The probability that Andrei cycles to school is r.

(a) Write down, in terms of r, the probability that Andrei **does not** cycle to school.

..... [1]

(b) The probability that Benoit **does not** cycle to school is $1.3 - r$.
The probability that both Andrei and Benoit **do not** cycle to school is 0.4 .

(i) Complete the equation in terms of r.

(.....) × (.....) = 0.4 [1]

(ii) Show that this equation simplifies to $10r^2 - 23r + 9 = 0$.

[3]

(iii) Solve by factorisation $10r^2 - 23r + 9 = 0$.

r = ... or r = ... [3]

(iv) Find the probability that Benoit **does not** cycle to school.

..... [1]

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4 **(a)** The equation of a straight line is $2y = 3x + 4$.

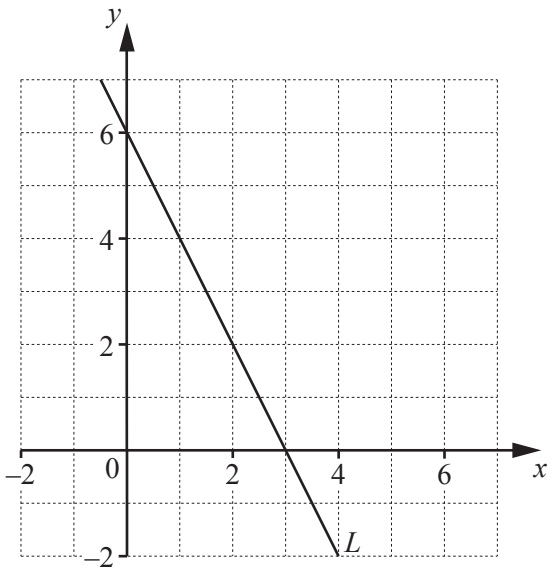
(i) Find the gradient of this line.

..... [1]

(ii) Find the co-ordinates of the point where the line crosses the y-axis.

(..... , ...) [1]

(b) The diagram shows a straight line L.



(i) Find the equation of line L.

..... [3]

(ii) Find the equation of the line perpendicular to line L that passes through (9, 3).

..... [3]

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(c) A is the point (8, 5) and B is the point $(-4, 1)$.

(i) Calculate the length of AB.

..... [3]

(ii) Find the co-ordinates of the midpoint of AB.

(..... , ...) [2]

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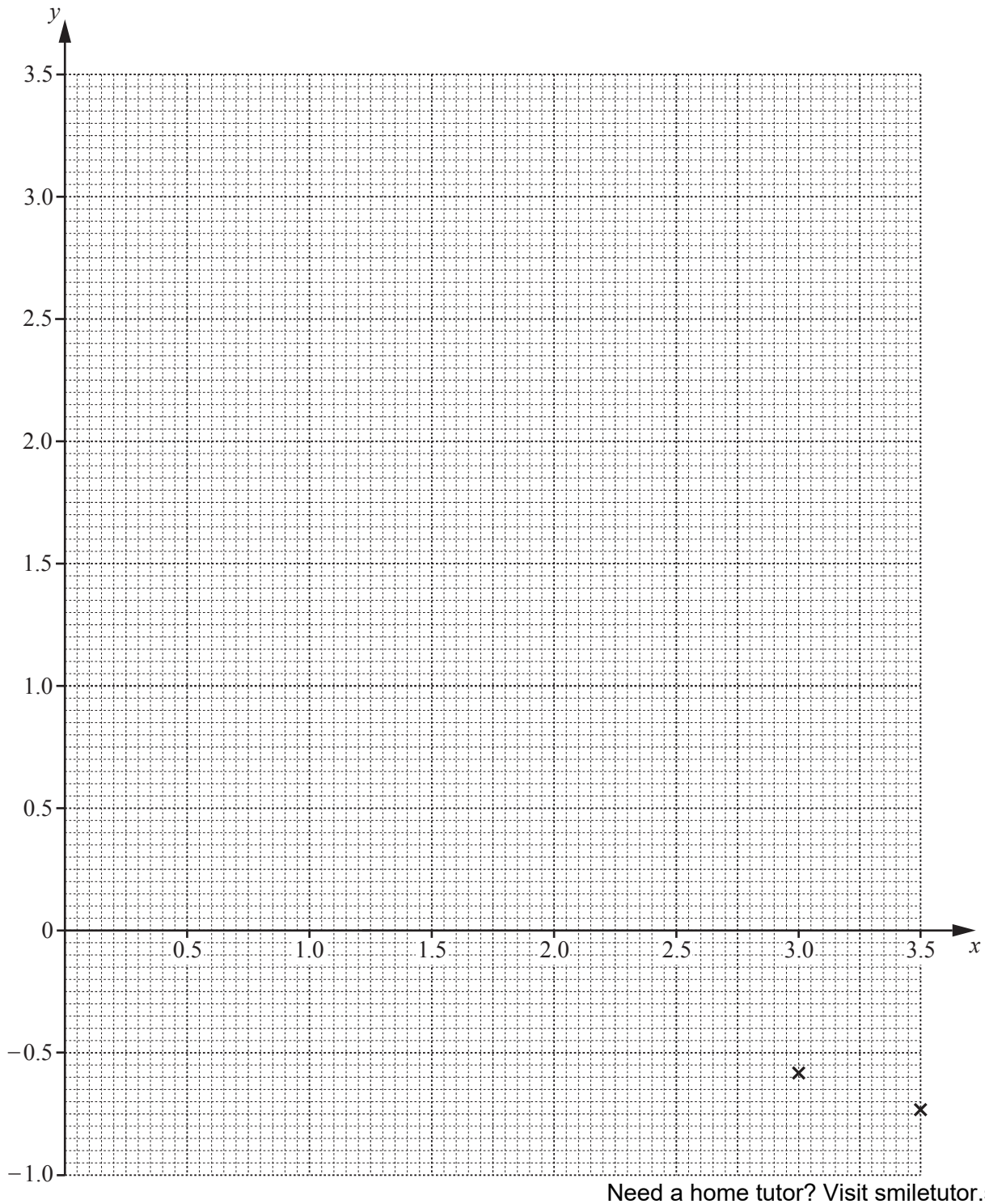
5 The table shows some values of $y = \frac{1}{2x} - \frac{x}{4}$ for $0.15 \leqslant x \leqslant 3.5$.

x	0.15	0.2	0.5	1	1.5	2	2.5	3	3.5
y	3.30		0.88		−0.04		−0.43	−0.58	−0.73

(a) Complete the table. [3]

(b) On the grid, draw the graph of $y = \frac{1}{2x} - \frac{x}{4}$ for $0.15 \leqslant x \leqslant 3.5$.

The last two points have been plotted for you.



[4]

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(c) Use your graph to solve the equation $\frac{1}{2x} - \frac{x}{4} = \frac{1}{2}$ for $0.15 \leqslant x \leqslant 3.5$.

$x =$ ..... [1]

(d) **(i)** On the grid, draw the line $y = 2 - x$. [2]

(ii) Write down the x co-ordinates of the points where the line $y = 2 - x$ crosses the graph of $y = \frac{1}{2x} - \frac{x}{4}$ for $0.15 \leqslant x \leqslant 3.5$.

$x =$ ..... and $x =$ ..... [2]

(e) Show that the graph of $y = \frac{1}{2x} - \frac{x}{4}$ can be used to find the value of $\sqrt{2}$ for $0.15 \leqslant x \leqslant 3.5$.

[2]

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6 **(a)** Expand and simplify.

$$(x+7)(x-3)$$

..... [2]

(b) Factorise completely.

(i) $15p^2q^2 - 25q^3$

..... [2]

(ii) $4fg + 6gh + 10fk + 15hk$

..... [2]

(iii) $81k^2 - m^2$

..... [2]

(c) Solve the equation.

$$3(x-4) + \frac{x+2}{5} = 6$$

$x =$ ..... [4]

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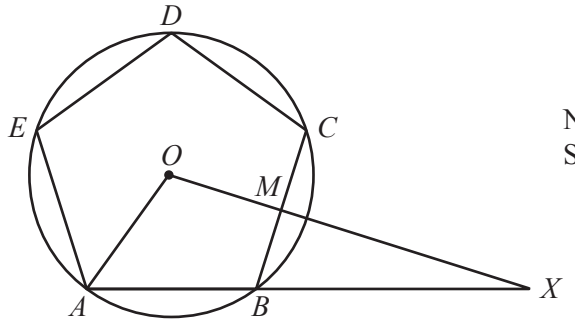
7 **(a)** Show that each interior angle of a regular pentagon is 108°.

[2]

(b)



NOT TO SCALE

The diagram shows a regular pentagon *ABCDE*.
The vertices of the pentagon lie on a circle, centre *O*, radius 12 cm.
M is the midpoint of *BC*.

(i) Find *BM*.

BM = ... cm [3]

(ii) *OMX* and *ABX* are straight lines.

(a) Find *BX*.

BX = ... cm [3]

(b) Calculate the area of triangle *AOX*.

..... cm^2 [3]

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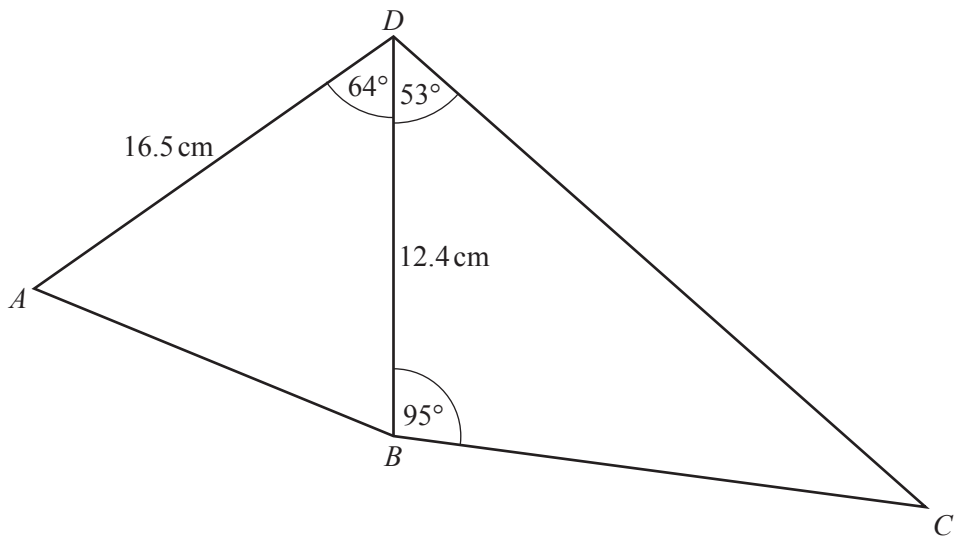
8 **(a)**



NOT TO SCALE

The diagram shows two triangles *ABD* and *BCD*.
AD = 16.5 cm and *BD* = 12.4 cm.
Angle *ADB* = 64°, angle *BDC* = 53° and angle *DBC* = 95°.

(i) Find *AB*.

AB = ... cm [4]

(ii) Find *BC*.

BC = ... cm [4]

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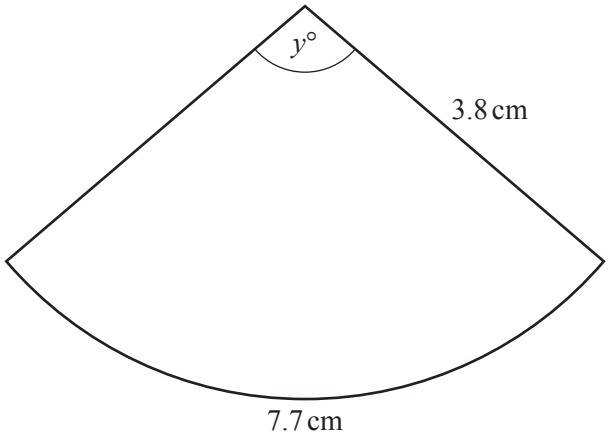
(b)



NOT TO SCALE

The diagram shows a sector of a circle of radius 3.8 cm.
The arc length is 7.7 cm.

(i) Calculate the value of y.

y = ... [2]

(ii) Calculate the area of the sector.

..... cm^2 [2]

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9 100 students were each asked how much money, $\$m$, they spent in one week.
The frequency table shows the results.

Amount ($\$m$)	$0 < m \leqslant 5$	$5 < m \leqslant 10$	$10 < m \leqslant 20$	$20 < m \leqslant 30$	$30 < m \leqslant 50$
Frequency	16	38	30	9	7

(a) Calculate an estimate of the mean.

$ ..... [4]

(b) Complete the cumulative frequency table below.

Amount ($\$m$)	$m \leqslant 5$	$m \leqslant 10$	$m \leqslant 20$	$m \leqslant 30$	$m \leqslant 50$
Cumulative frequency	16				100

[2]

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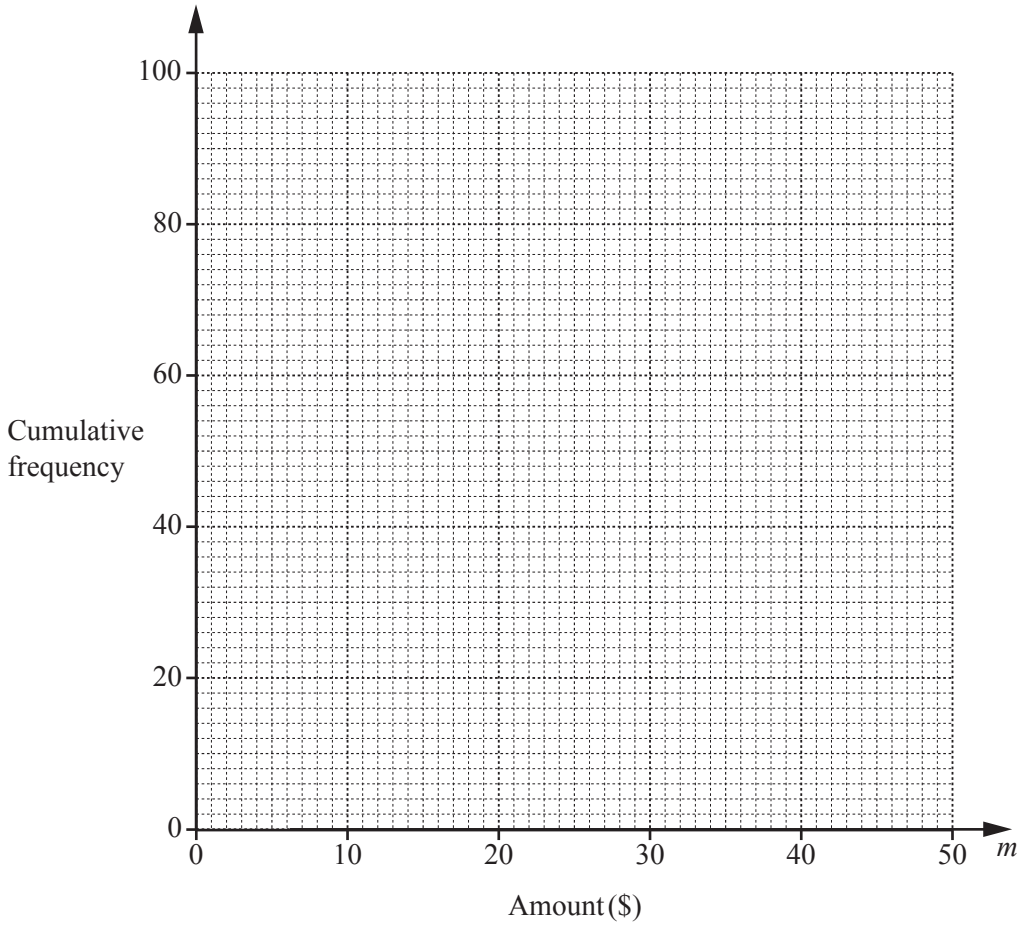
(c) On the grid, draw the cumulative frequency diagram.



[3]

(d) Use your cumulative frequency diagram to find an estimate for

(i) the median,

$ ..... [1]

(ii) the interquartile range,

$ ..... [2]

(iii) the number of students who spent more than $25.

..... [2]

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10 **(a)** The volume of a solid metal sphere is $24\,430\,\text{cm}^3$.

(i) Calculate the radius of the sphere.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... cm [3]

(ii) The metal sphere is placed in an empty tank.
The tank is a cylinder with radius 50 cm, standing on its circular base.
Water is poured into the tank to a depth of 60 cm.

Calculate the number of litres of water needed.

..... litres [3]

(b) A different tank is a cuboid measuring 1.8 m by 1.5 m by 1.2 m.
Water flows from a pipe into this empty tank at a rate of $200\,\text{cm}^3$ per second.

Find the time it takes to fill the tank.
Give your answer in hours and minutes.

..... h ..... min [4]

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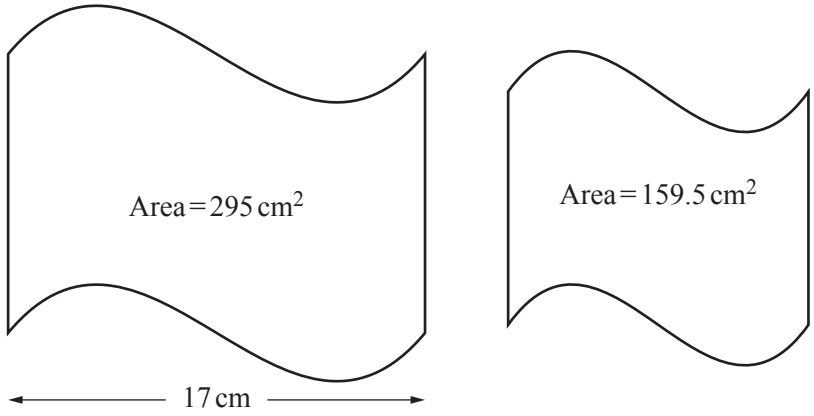
(c)



NOT TO SCALE

The diagram shows two mathematically similar shapes with areas 295 cm^2 and 159.5 cm^2.
The width of the larger shape is 17 cm.

Calculate the width of the smaller shape.

..... cm [3]

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11

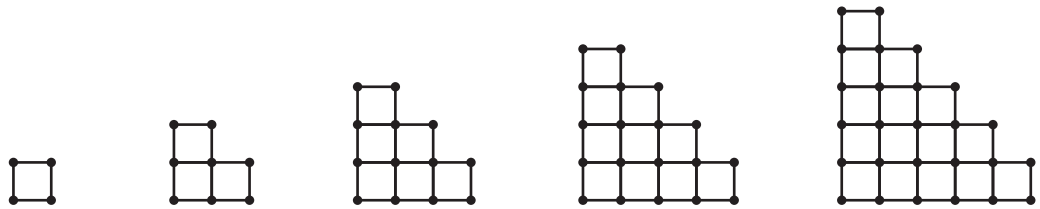

Diagram 1 Diagram 2 Diagram 3 Diagram 4 Diagram 5

The sequence of diagrams above is made up of small lines and dots.

(a) Complete the table.

	Diagram 1	Diagram 2	Diagram 3	Diagram 4	Diagram 5	Diagram 6
Number of small lines	4	10	18	28		
Number of dots	4	8	13	19		

[4]

(b) For Diagram n find an expression, in terms of n, for the number of small lines.

..... [2]

(c) Diagram r has 10 300 small lines.

Find the value of r.

$r =$ ..... [2]

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(d) The number of dots in Diagram n is $an^2 + bn + 1$.

Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [2]

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CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

MATHEMATICS **0580/43**

Paper 4 (Extended) **May/June 2019**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator Geometrical instruments
Tracing paper (optional)

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
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1 Here is part of a train timetable for a journey from London to Marseille.
All times given are in local time.
The local time in Marseille is 1 hour ahead of the local time in London.

London	07 19
Ashford	07 55
Lyon	13 00
Avignon	14 08
Marseille	14 46

(a) **(i)** Work out the total journey time from London to Marseille.
Give your answer in hours and minutes.

..... h ..... min [2]

(ii) The distance from London to Ashford is 90 km.
The local time in London is the same as the local time in Ashford.

Work out the average speed, in km/h, of the train between London and Ashford.

..... km/h [3]

(iii) During the journey, the train takes 35 seconds to completely cross a bridge.
The average speed of the train during this crossing is 90 km/h.
The length of the train is 95 metres.

Calculate the length, in metres, of this bridge.

..... m [4]

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(b) The fares for the train journey are shown in the table below.

From London to Marseille	Standard fare	Premier fare
Adult	\$84	\$140
Child	\$60	\$96

(i) For the **standard fare**, write the ratio adult fare : child fare in its simplest form.

..... : ..... [1]

(ii) For an **adult**, find the percentage increase in the cost of the standard fare to the premier fare.

..... % [3]

(iii) For one journey from London to Marseille, the ratio

number of adults : number of children = 11 : 2.

There were 220 adults in total on this journey.
All of the children and 70% of the adults paid the standard fare.
The remaining adults paid the premier fare.

Calculate the total of the fares paid by the adults and the children.

\$ ..... [5]

(c) There were 3.08×10^5 passengers that made this journey in 2018.
This was a 12% decrease in the number of passengers that made this journey in 2017.

Find the number of passengers that made this journey in 2017.
Give your answer in standard form.

..... [3]

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2 **(a)** Solve.

$$5x - 17 = 7x + 3$$

$x =$ ..... [2]

(b) Find the integer values of n that satisfy this inequality.

$$-7 < 4n \leqslant 8$$

..... [3]

(c) Simplify.

(i) $a^3 \times a^6$

..... [1]

(ii) $(5xy^2)^3$

..... [2]

(iii) $\left(\dfrac{27x^{12}}{64y^3}\right)^{-\frac{1}{3}}$

..... [3]

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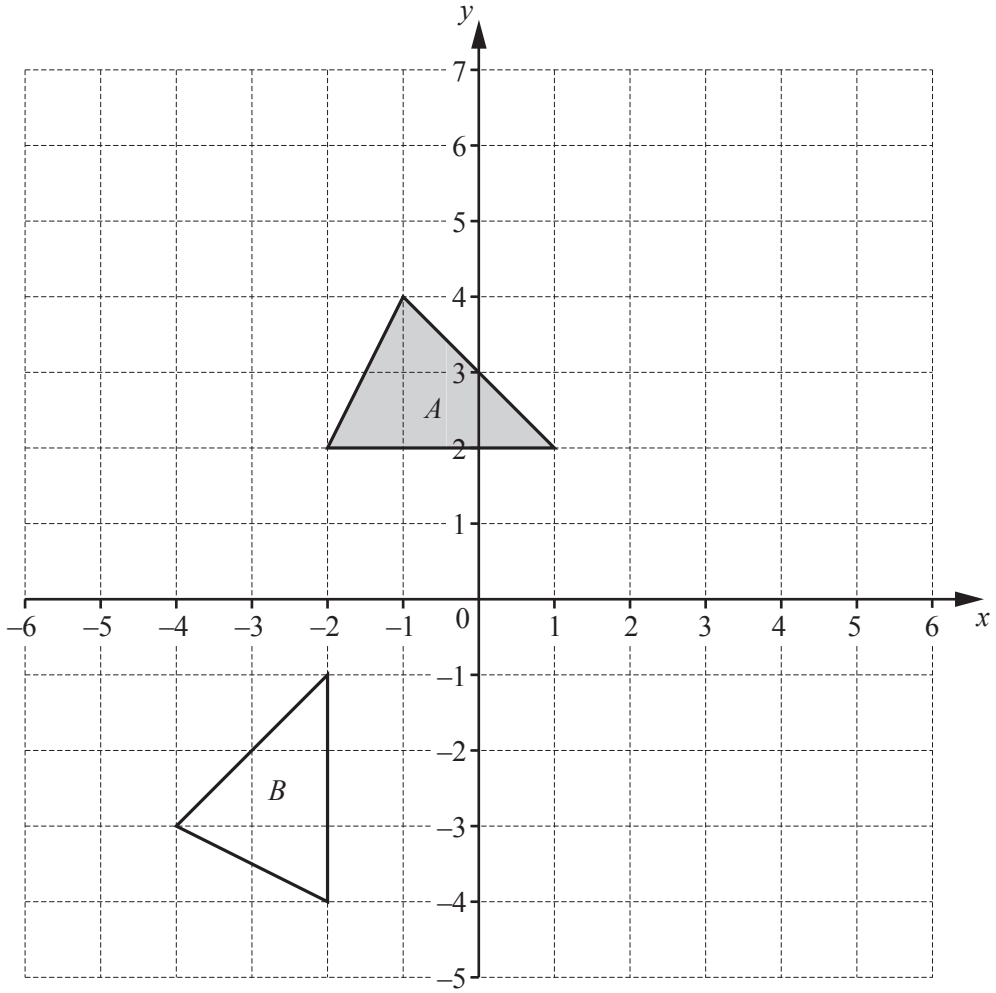
3



(a) On the grid, draw the image of

(i) triangle A after a translation by the vector $\begin{pmatrix} -3 \\ 2 \end{pmatrix}$, [2]

(ii) triangle A after a reflection in the line $y = x$. [2]

(b) Describe fully the **single** transformation that maps triangle A onto triangle B.

.....

..... [3]

(c) **(i)** Find the matrix that represents an enlargement, scale factor -2, centre (0, 0).

$\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [2]

(ii) Calculate the determinant of the matrix in **part (c)(i)**.

..... [1]

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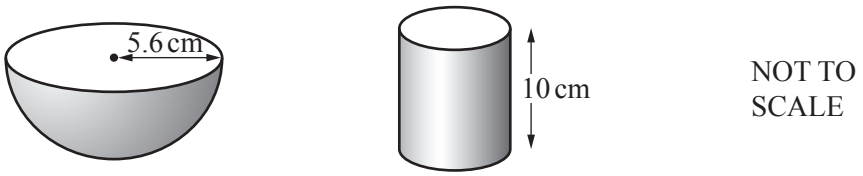
4 **(a)**



The diagram shows a hemispherical bowl of radius 5.6 cm and a cylindrical tin of height 10 cm.

(i) Show that the volume of the bowl is 368 cm^3, correct to the nearest cm^3.
[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

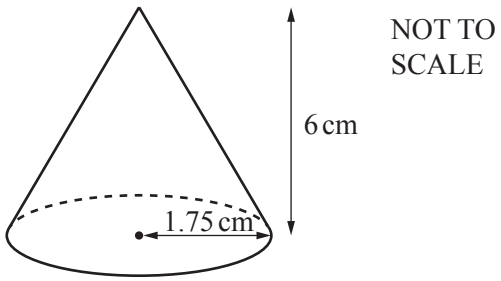
[2]

(ii) The tin is completely full of soup.
When all the soup is poured into the empty bowl, 80% of the volume of the bowl is filled.

Calculate the radius of the tin.

..... cm [4]

(b)



The diagram shows a cone with radius 1.75 cm and height 6 cm.

(i) Calculate the total surface area of the cone.
[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi rl$.]

..... cm^2 [5]

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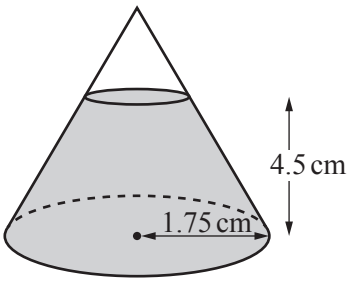
(ii)



NOT TO SCALE

The cone contains salt to a depth of 4.5 cm.
The top layer of the salt forms a circle that is parallel to the base of the cone.

(a) Show that the volume of the salt inside the cone is $18.9\,\text{cm}^3$, correct to 1 decimal place.
[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

[4]

(b) The salt is removed from the cone at a constant rate of $200\,\text{mm}^3$ per second.

Calculate the time taken for the cone to be completely emptied.
Give your answer in seconds, correct to the nearest second.

..... s [3]

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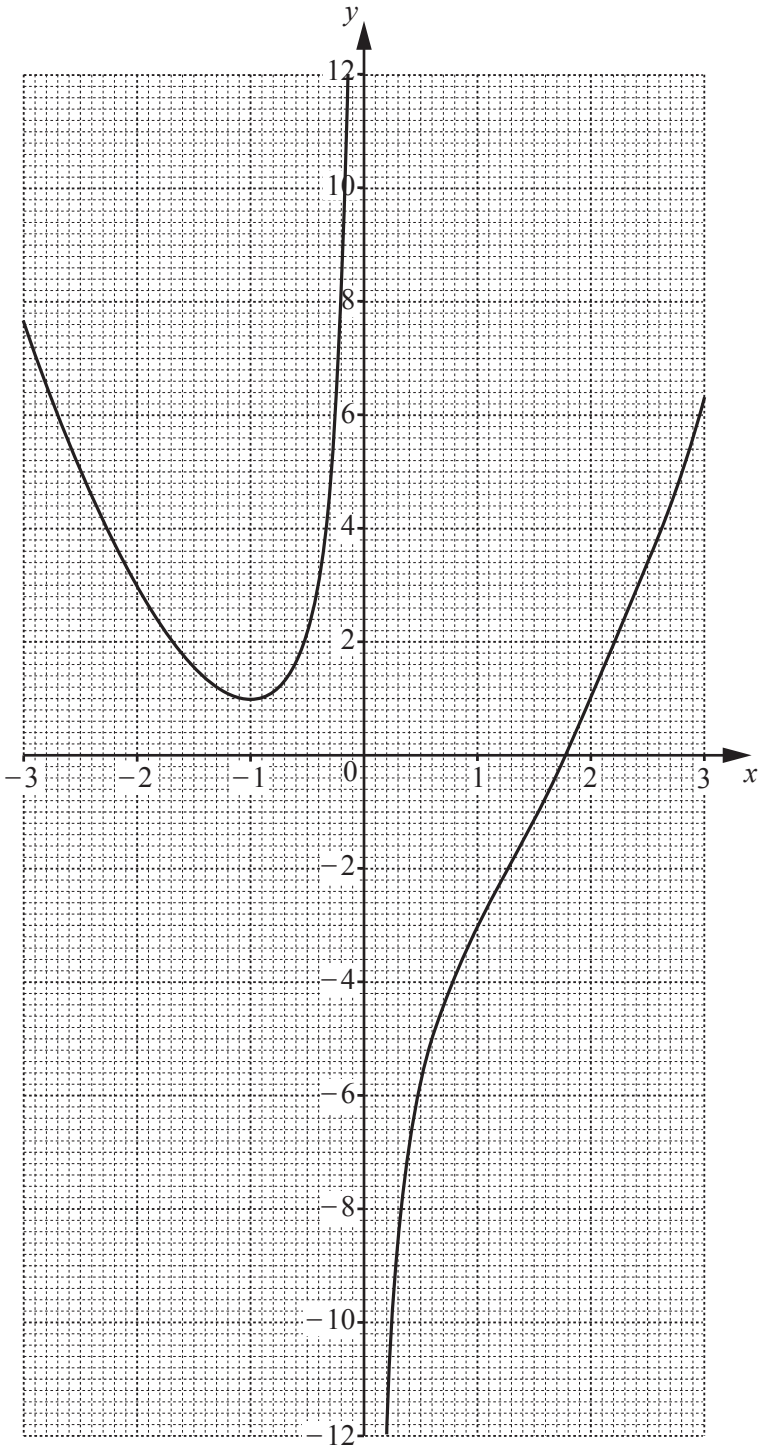
5 The diagram shows the graph of $y = \mathrm{f}(x)$ where $\mathrm{f}(x) = x^2 - \frac{2}{x} - 2, x \neq 0$.



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(a) Use the graph to find

(i) f(1),

..... [1]

(ii) ff(−2).

..... [2]

(b) On the grid opposite, draw a suitable straight line to solve the equation

$x^2 - \frac{2}{x} - 7 = -3x$ for $-3 \leqslant x \leqslant 3$.

$x =$ ..... or $x =$ ..... [4]

(c) By drawing a suitable tangent, find an estimate of the gradient of the curve at $x = -2$.

..... [3]

(d) **(i)** Complete the table for $y = \mathrm{g}(x)$ where $\mathrm{g}(x) = 2^{-x}$ for $-3 \leqslant x \leqslant 3$.

x	−3	−2	−1	0	1	2	3
y			2	1	0.5		0.125

[3]

(ii) On the grid opposite, draw the graph of $y = \mathrm{g}(x)$. [3]

(iii) Use your graph to find the **positive** solution to the equation $\mathrm{f}(x) = \mathrm{g}(x)$.

$x =$ ..... [1]

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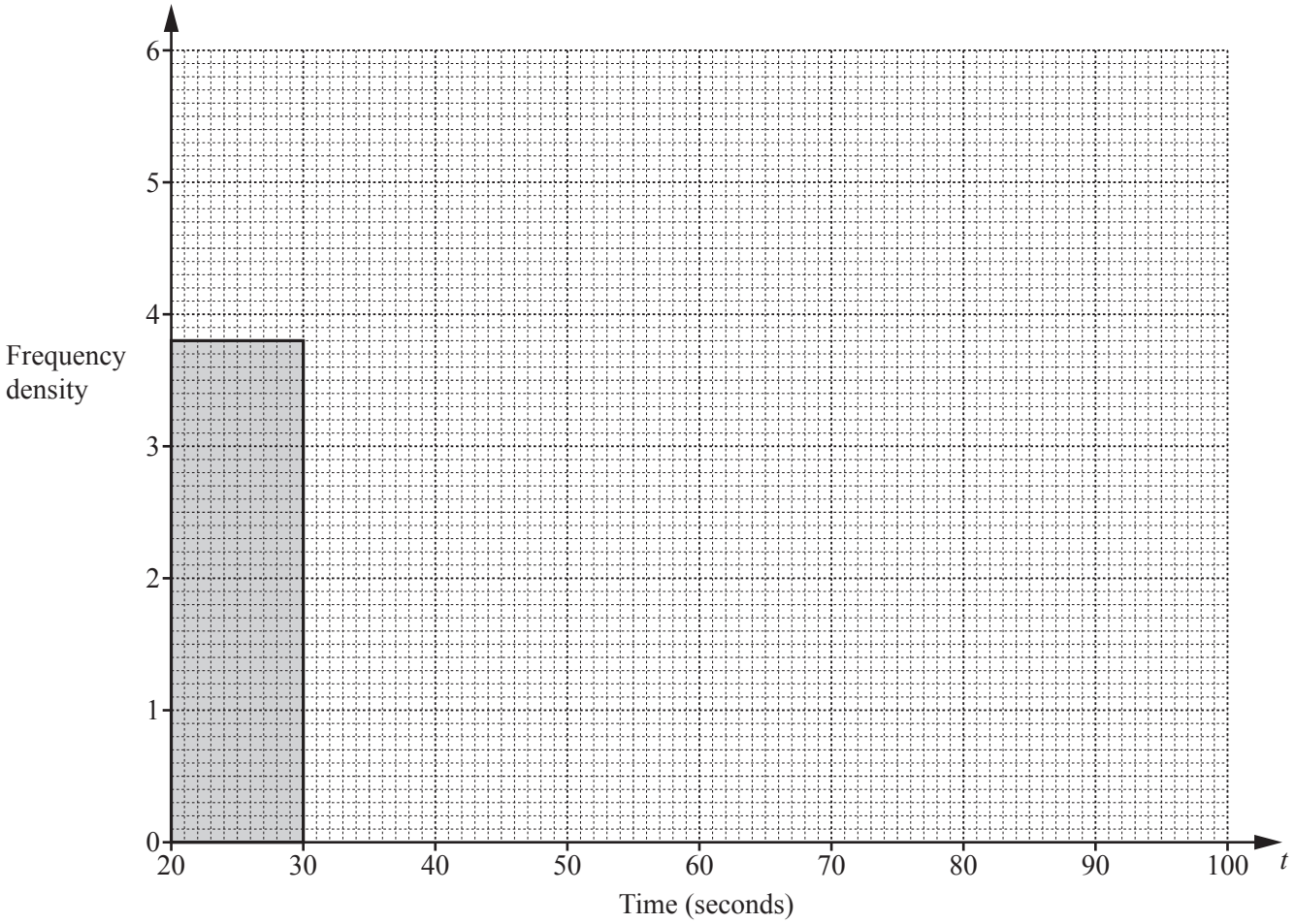
6 The table shows the time, t seconds, taken by each of 120 boys to solve a puzzle.

Time (t seconds)	$20 < t \leqslant 30$	$30 < t \leqslant 35$	$35 < t \leqslant 40$	$40 < t \leqslant 60$	$60 < t \leqslant 100$
Frequency	38	27	21	16	18

(a) Calculate an estimate of the mean time.

..... s [4]

(b) On the grid, complete the histogram to show the information in the frequency table.



[4]

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7 A straight line joins the points A (−2, −3) and C (1, 9).

(a) Find the equation of the line AC in the form $y = mx + c$.

$y =$ ..... [3]

(b) Calculate the acute angle between AC and the x-axis.

..... [2]

(c) $ABCD$ is a kite, where AC is the longer diagonal of the kite.
B is the point (3.5, 2).

(i) Find the equation of the line BD in the form $y = mx + c$.

$y =$ ..... [3]

(ii) The diagonals AC and BD intersect at (−0.5, 3).

Work out the co-ordinates of D.

(..... , ...) [2]

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8 **(a)** Angelo has a bag containing 3 white counters and x black counters.
He takes two counters at random from the bag, without replacement.

(i) Complete the following statement.

The probability that Angelo takes two black counters is

$$\frac{x}{x+3} \times \frac{\dots\dots\dots\dots}{\dots\dots\dots\dots}.$$

[2]

(ii) The probability that Angelo takes two black counters is $\frac{7}{15}$.

(a) Show that $4x^2 - 25x - 21 = 0$.

[4]

(b) Solve by factorisation.

$$4x^2 - 25x - 21 = 0$$

$x =$ ..... or $x =$ ..... [3]

(c) Write down the number of black counters in the bag.

..... [1]

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(b) Esme has a bag with 5 green counters and 4 red counters.
She takes three counters at random from the bag without replacement.

Work out the probability that the three counters are all the same colour.

..... [4]

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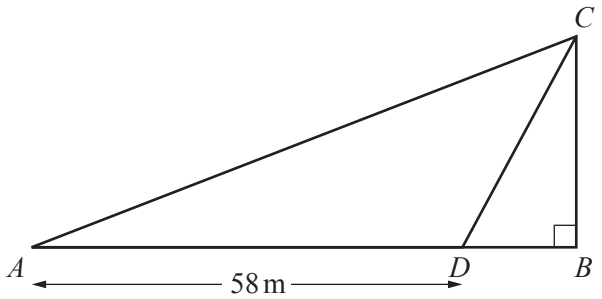
9 **(a)**



NOT TO SCALE

In the diagram, BC is a vertical wall standing on horizontal ground AB.
D is the point on AB where $AD = 58$ m.
The angle of elevation of C from A is 26°.
The angle of elevation of C from D is 72°.

(i) Show that $AC = 76.7$ m, correct to 1 decimal place.

[5]

(ii) Calculate BD.

$BD =$ ..... m [3]

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(b) Triangle EFG has an area of $70\,\text{m}^2$.
$EF : FG = 1 : 2$ and angle $EFG = 40°$.

(i) Calculate EF.

$EF =$ ..... m [4]

(ii) A **different** triangle PQR also has an area of $70\,\text{m}^2$.
$PQ : QR = 1 : 2$ and $PQ = EF$.

Find angle PQR.

Angle $PQR =$ ..... [1]

Question 10 is printed on the next page.

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10 **(a)** 19, 15, 11, 7, ...

(i) Write down the next two terms of the sequence.

..... , ... [2]

(ii) Find the nth term of this sequence.

..... [2]

(iii) Find the value of n when the nth term is -65.

$n =$ ..... [2]

(b) Another sequence has nth term $2n^2 + 5n - 15$.

Find the difference between the 4th term and the 5th term of this sequence.

..... [2]

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Grade thresholds – November 2019

Cambridge IGCSE™ Mathematics (without Coursework) (0580)

Grade thresholds taken for Syllabus 0580 (Mathematics (without Coursework)) in the November 2019 examination.

		minimum raw mark required for grade:						
	maximum raw mark available	A	B	C	D	E	F	G
Component 11	56	–	–	40	34	28	23	18
Component 12	56	–	–	39	32	25	19	13
Component 13	56	–	–	41	35	29	23	17
Component 21	70	56	46	36	30	25	–	–
Component 22	70	58	49	41	36	31	–	–
Component 23	70	56	46	37	30	24	–	–
Component 31	104	–	–	69	57	45	34	23
Component 32	104	–	–	71	60	49	39	29
Component 33	104	–	–	71	59	47	34	21
Component 41	130	95	77	60	49	38	–	–
Component 42	130	102	87	72	63	54	–	–
Component 43	130	95	77	58	46	33	–	–

Grade A* does not exist at the level of an individual component.

The maximum total mark for this syllabus, after weighting has been applied, is **200** for the 'Extended' options and **160** for the 'Core' options.

The overall thresholds for the different grades were set as follows.

Option	Combination of Components	A*	A	B	C	D	E	F	G
AX	11, 31	–	–	–	109	91	73	57	41
AY	12, 32	–	–	–	110	92	74	58	42
AZ	13, 33	–	–	–	112	94	76	57	38
BX	21, 41	176	151	123	96	79	63	–	–
BY	22, 42	181	160	136	113	99	85	–	–
BZ	23, 43	176	151	123	95	76	57	–	–

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MATHEMATICS **0580/11**

Paper 1 (Core) **October/November 2019**

MARK SCHEME

Maximum Mark: 56

Published

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Abbreviations
cao – correct answer only
dep – dependent
FT – follow through after error
isw – ignore subsequent working
oe – or equivalent
SC – Special Case
nfww – not from wrong working
soi – seen or implied

Question	Answer	Marks	Partial Marks
1	460	**1**	
2	5	**1**	
3	1.25	**1**	
4	$p(5 + t)$ final answer	**1**	
5(a)	Arrow at $\frac{1}{2}$	**1**	
5(b)	Arrow at $\frac{11}{16}$	**1**	
6(a)	8470 cao	**1**	
6(b)	16.09 cao	**1**	
7	37% $\frac{3}{7}$ 0.43 $\frac{9}{19}$	**2**	**B1** for 3 in correct order as answer or **M1** for two of 0.47... 0.42... 0.37
8	Correct triangle with sides 6 cm and 4 cm **and** correct arcs	**2**	**B1** for correct triangle with no or incorrect arcs or correct arcs with no or inaccurate sides drawn
9	4.6 cao nfww	**2**	**B1** for 4.57 or 4.58 or 4.579 to 4.580 If 0 scored, **SC1** for their calculation rounded to 2 sf if more than 2sf seen
10	148 370	**2**	**M1** for 518 ÷ (2 + 5)
11(a)	Fifteen thousand [and] sixty	**1**	
11(b)	$1.506[0] \times 10^4$	**1**	
12	$3c - 4d$ final answer	**2**	**B1** for $3c + kd$ or $kc - 4d$
13	452 or 452.3 to 452.4...	**2**	**M1** for $12^2 \times \pi$
14	85	**2**	**M1** for 24650 ÷ 290

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Question	Answer	Marks	Partial Marks
15	1.5	**2**	**M1** for $\frac{600 \times r \times 10}{100} = 90$ oe or better
16	$\frac{5}{16} \times \frac{8}{7}$	**M1**	
	$\frac{5}{14}$ cao	**A1**	
17	$6x^5$ final answer	**2**	**B1** for kx^5 or $6x^k$
18	75% $\frac{1}{5}$ oe fraction [0].08	**3**	**B1** for each
19(a)	35	**2**	**M1** for first 6 or last 6 values listed in order or for 32 **and** 38 identified
19(b)	85	**1**	
20(a)	15	**1**	
20(b)	He stopped or arrived at the shop	**1**	
20(c)	Ruled line from (15 15, 15) to (16 15, 0)	**1**	
21	16.4 or 16.40 to 16.41	**3**	**M2** for [x =] $\frac{12}{\cos 43}$ or [x =] $\frac{12}{\sin 47}$ or **M1** for cos [43][=] $\frac{12}{x}$ or sin 47 [=] $\frac{12}{x}$
22(a)	4	**2**	**M1** for $8w + 8 \times 11 = 120$ or $w + 11 = 120 \div 8$
22(b)	11	**2**	**M1** for $x - 2 = 3 \times 3$ oe or $\frac{x}{3} = 3 + \frac{2}{3}$ oe or better

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Question	Answer	Marks	Partial Marks
23	Correctly equating one set of coefficients	**M1**	
	Correct method to eliminate one variable	**M1**	
	[x =] 4	**A1**	
	[y =] –2.5 oe	**A1**	If 0 scored, **SC1** for 2 values satisfying one of the original equations or for 2 correct values
24(a)	–1.6 2 1.6	**2**	**B1** for 2 correct
24(b)	Fully correct curve	**4**	**B3FT** for 9 or 10 points correctly plotted or **B2FT** for 7 or 8 points correctly plotted or **B1FT** for 5 or 6 points correctly plotted

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MATHEMATICS **0580/12**

Paper 1 (Core) **October/November 2019**

MARK SCHEME

Maximum Mark: 56

Published

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SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1	$7t$	**1**	
2	6.8	**1**	
3	113°	**1**	
4(a)	576	**1**	
4(b)	13	**1**	
5(a)	E cao	**1**	
5(b)	H cao	**1**	
6(a)	1.2	**1**	
6(b)	10	**1**	
7	$\frac{5}{7}$ 78% 0.8 $\frac{7}{8}$	**2**	**B1** for three in correct order or **M1** for two of 0.875, 0.71[4…] and 0.78
8	135	**2**	**M1** for $\frac{12}{12+7+9+4}[\times 360]$ or $\frac{360}{12+7+9+4}[\times 12]$ oe
9	440 or 440.2 to 440.3	**2**	**M1** for 30 000 ÷ 68.14
10	3500 14 000	**2**	**B1** for each
11	90	**2**	**M1** for 135 ÷ *their* time
12	Ruled line of best fit	**B1**	
	6400 to 7400	**B1**	**FT** *their* straight line of best fit with negative gradient if answer is not in range

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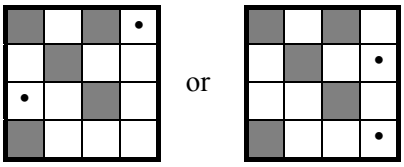
Question	Answer	Marks	Partial Marks
13(a)	37	**1**	
13(b)	[0].0016 or 1.6×10^{-3} or $\frac{1}{625}$	**1**	
14(a)		**1**	
14(b)	2 2	**2**	**B1** for each
15(a)	8	**1**	
15(b)	12 nfww	**2**	**M1** for (18 + 13 + 15 + 8 + 9 + 17 + 12 + 8 + 6 + 14) ÷ 10 or for 120 ÷ 10
16	576	**3**	**M2** for [2 ×] (15 × 4 + 12 × 4 + 12 × 15) oe or **M1** for one correct area, 15 × 4 or 12 × 4 or 12 × 15
17	$\frac{29}{8}$ or $\frac{5}{3}$; $2\frac{5}{8} - \frac{2}{3}$	**M1**	Allow $\frac{29k}{8k}$ or $\frac{5k}{3k}$ Correct step for dealing with mixed numbers
	$\frac{87}{24}$ and $\frac{40}{24}$; $[2]\frac{15}{24}$ and $\frac{16}{24}$	**M1**	Correct method to find common denominator e.g. $3\frac{15}{24}$ and $1\frac{16}{24}$
	$1\frac{23}{24}$ cao	**A1**	
18	791 or 791.2…. nfww	**3**	**M2** for $750 \times \left(1 + \frac{1.8}{100}\right)^3$ oe or **M1** for $750 \times \left(1 + \frac{1.8}{100}\right)^2$ oe
19	7.55 or 7.552…	**3**	**M2** for $8.5^2 - 3.9^2$ oe or **M1** for $8.5^2 = 3.9^2 + x^2$ oe
20(a)	1.5 oe nfww	**2**	**M1** for $\frac{\text{rise}}{\text{run}}$, e.g. $\frac{9}{6}$ or $\frac{y_2 - y_1}{x_2 - x_1}$ for 2 points on the line
20(b)	$1.5x + 1$	**1**	**FT** *their* 1.5

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Question	Answer	Marks	Partial Marks
21(a)	*C*	**1**	
21(b)	Trapezium	**1**	
21(c)	*B* and *G*	**1**	Both correct
21(d)	*D* and *F* or *B* and *G*	**1**	Both correct
22(a)	$2.45x + 3.15y$ final answer	**2**	**B1** for one correct term in final answer If 0 scored, **SC1** for $245x + 315y$
22(b)	13	**2**	**M1** for $60.55 - 2.45 \times 8$ oe
23	Bisector of angle *Q* accurate with two pairs of correct arcs and Arc centre *R*, radius 6.5 cm With bird table correctly indicated or implied by correct intersecting constructions	**4**	**M2** for bisector of angle *Q* accurate with two pairs of correct arcs or **M1** for accurate bisector with no/wrong arcs **M2** for arc centre *R*, radius 6.5 cm or **M1** for arc centre *R* Maximum 3 marks if incorrect position/region is labelled, or there is no label and a region is shaded, or *their* constructions do not intersect

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MATHEMATICS **0580/13**

Paper 1 (Core) **October/November 2019**

MARK SCHEME

Maximum Mark: 56

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soi	seen or implied

Question	Answer	Marks	Partial Marks
1	acute	**1**	
2	[0].56[0]	**1**	
3	40 300	**1**	
4	$3(4x + 5)$ final answer	**1**	
5(a)	$8 + (6 – 2) \times 5 = 28$	**1**	
5(b)	$(8 + 6 – 2) \times 5 = 60$	**1**	
6(a)	−10	**1**	
6(b)	8	**1**	
7(a)	27	**1**	
7(b)	47	**1**	
8(a)	indication at $\frac{5}{8}$ cao	**1**	
8(b)	indication at 1 cao	**1**	
9	459.2[0]	**2**	**M1** for $560 \times (1 - \frac{18}{100})$ oe
10	28.3 or 28.27 to 28.28	**2**	**M1** for $2 \times \pi \times 4.5$ oe
11(a)	7.2×10^4	**1**	
11(b)	1.8×10^{-3}	**1**	
12	$x^2 + 8x + 15$ final answer	**2**	**M1** for three terms correct from $x^2 + 5x + 3x + 15$
13(a)	9 cao	**1**	
13(b)	6 cao	**1**	

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Question	Answer	Marks	Partial Marks
14	$\sqrt{31^2 + 28^2}$ oe	**M1**	
	41.77…	**A1**	
15(a)	5 7 3 5	**2**	**B1** for 2 correct frequencies in frequency column or for all correct tallies if frequency column blank or for 5, 7, 3, 5 seen in tally column with frequency column blank or incorrect
15(b)	grey cao	**1**	**FT** *their* table
16	298	**3**	**M2** for [2×] (5×7 + 5× 9.5 + 7 × 9.5) oe or **M1** for one correct area, 5 × 7 or 5 × 9.5 or 7 × 9.5
17(a)	−1 1	**1**	
17(b)	5 −3	**1**	
17(c)	8 −20	**1**	
18	275 5 500 125	**3**	**B2** for 3 correct or **B1** for 2 correct or **M1** for multiplying by 2.5 oe
19	30	**3**	**M2** for $3 \times 150 = 361 + 2n + n - 1$ oe or **B1** for $361 + 2n + n - 1$
20(a)	7 3	**1**	
20(b)	point plotted at (1, 3)	**1**	
20(c)	rhombus	**1**	
20(d)	2	**1**	strict **FT** *their* diagram
21(a)	46	**1**	
21(b)	appropriate explanation e.g. reading at 42 × 10 oe	**1**	accept any correct explanation
21(c)	correct ruled line	**2**	**B1** for any correct plotted point other than (0, 0)

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Question	Answer	Marks	Partial Marks
22(a)	12.88	**1**	
22(b)	two correct points plotted	**1**	
22 (c)	ruled line of best fit	**1**	
22(d)	negative	**1**	
23(a)	correct line with two correct pairs of correct arcs	**2**	**B1** for correct line with no or incorrect arcs
23(b)	arc centre *C* radius 7 cm and from *AC* to *BC*	**2**	**B1** for any arc centre *C* from *AC* to *BC* or arc radius 7 cm from *C* not reaching *AC* and/or *BC*
23(c)	correct region shaded	**1**	Dep on at least **B1 B1**

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MATHEMATICS **0580/21**

Paper 2 (Extended) **October/November 2019**

MARK SCHEME

Maximum Mark: 70

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SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1	1.25	**1**	
2	$p(5+t)$ final answer	**1**	
3	4.6 cao nfww	**2**	**B1** for 4.57 or 4.58 or 4.579 to 4.580 If 0 scored, **SC1** for their calculation rounded to 2 sf if more than 2sf seen
4(a)	Fifteen thousand [and] sixty	**1**	
4(b)	$1.506[0] \times 10^4$	**1**	
5	$3c-4d$ final answer	**2**	**B1** for $3c+kd$ or $kc-4d$
6	11	**2**	**M1** for $x-2=3\times3$ oe or $\frac{x}{3}=3+\frac{2}{3}$ oe or better
7	$6x^5$ final answer	**2**	**B1** for kx^5 or $6x^k$
8	$\frac{5}{16}\times\frac{8}{7}$	**M1**	
	$\frac{5}{14}$ cao	**A1**	
9	1.5	**2**	**M1** for $\frac{600\times r\times10}{100}=90$ oe or better
10	$\frac{16}{x^4}$ or $16x^{-4}$	**2**	**M1** for $\left(\frac{x}{2}\right)^{-4}$ or $\left(\frac{8}{x^3}\right)^{\frac{4}{3}}$ or $\left(\frac{x^{12}}{4096}\right)^{-\frac{1}{3}}$ or better or **B1** for $\frac{16}{x^k}$ or $16x^k$ or $\frac{k}{x^4}$ or kx^{-4} final answer
11	$\frac{P}{2+\pi}$	**2**	**M1** for $P=r(2+\pi)$
12	229.5225 final answer cao	**2**	**M1** for $(15.1+0.05)^2$ or **B1** for 15.15 seen

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Question	Answer	Marks	Partial Marks
13	45[.0] or 44.99 to 45.00	**2**	**M1** for $\frac{1}{2}\times 13\times 11\times \sin 39$ oe
14	49 000	**3**	**M1** for $4.9\times(10\,000\,000)^2$ **M1** for $\div(100\,000)^2$ OR **M1** for 1 cm : 100 km **M1** for $4.9\times(\textit{their}\ 100)^2$ OR **M2** for $(\sqrt{4.9}\times 10\,000\,000\div 100\,000)^2$ or **M1** for $\sqrt{4.9}\times 10\,000\,000\div 100\,000$
15	128	**3**	**M1** for $y=\frac{k}{x^2}$ **M1** for $y=\frac{\textit{their}\ k}{\left(\frac{1}{2}\right)^2}$ OR **M2** for $\frac{2\times 4^2}{\left(\frac{1}{2}\right)^2}$ or **M1** for $2\times 4^2=y\times\left(\frac{1}{2}\right)^2$
16	109.3 or 109.26 to 109.27	**3**	**M2** for $\frac{12\sin 39}{8}$ or **M1** for $\frac{8}{\sin 39}=\frac{12}{\sin(...)}$ oe
17	6.28 or 6.283 to 6.284	**3**	**M2** for $\frac{45}{360}\times\pi\times 5^2$ oe **and** $\frac{45}{360}\times\pi\times 3^2$ oe or **M1** for $\frac{45}{360}\times\pi\times 5^2$ oe or $\frac{45}{360}\times\pi\times 3^2$ oe or $\pi\times 5^2-\pi\times 3^2$ oe
18	$\frac{x^2-3x-8}{2(x+1)}$ or $\frac{x^2-3x-8}{2x+2}$ final answer	**3**	**B1** for common denominator $2(x+1)$ or $2x+2$ **M1** for $x(x+1)-2(2x+4)$ or better
19(a)	$\begin{pmatrix}19 & 22\\ 43 & 50\end{pmatrix}$	**2**	**B1** for 2 or 3 elements correct

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Question	Answer	Marks	Partial Marks
19(b)	–2 final answer	**1**	
20	$\frac{147}{160}$ oe	**3**	**M2** for $\frac{1}{10}\times\frac{3}{4}+\frac{9}{10}\times\frac{15}{16}$ or **M1** for $\frac{1}{10}\times\frac{3}{4}$ or $\frac{9}{10}\times\frac{15}{16}$
21(a)	Translation $\begin{pmatrix}-1\\-5\end{pmatrix}$	**2**	**B1** for each
21(b)	Correct reflection at (6, 2), (6, 6), (7, 6), (7, 3)	**2**	**B1** for three correct vertices
22	2592	**4**	**M3** for $1.2\times100\times60\times60\times6\div1000$ oe or **M2** for $1.2\times60\times60\times6$ oe or **M1** for figs $12\times$ figs 6 or 60×60 or correct conversion e.g. their value in $\text{cm}^3\div1000$ their value in $\text{m}^3\times1000$ 1.2×100 $6\div10\,000$
23	2, 5 3 $A.....B'$ $\subset$	**4**	**B1** for each
24(a)	19	**2**	**M1** for $3(2^x)-5$ soi or for f(8)
24(b)	$\frac{x+5}{3}$ oe final answer	**2**	**M1** for correct first step $y+5=3x$ or $\frac{y}{3}=x-\frac{5}{3}$ or $x=3y-5$
25(a)	$-\frac{1}{3}\mathbf{q}+\frac{1}{2}\mathbf{p}$ oe	**2**	**M1** for correct unsimplified answer or correct route
25(b)	$\frac{1}{2}\mathbf{p}+\frac{1}{2}\mathbf{q}$ oe	**2**	**M1** for correct unsimplified answer or correct route

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Question	Answer	Marks	Partial Marks
26	380	**5**	**B2** for time = 8, implied by 23 on t-axis or **M1** for $\frac{20}{t} = 2.5$ or $\frac{20}{t-15} = 2.5$ or $\frac{0-20}{t-15} = -2.5$ oe **M2** for $\frac{1}{2}$(*their* 23 + 15) × 20 or $20 \times 15 + \frac{1}{2} \times$ *their* 8×20 oe or **M1** for any relevant area found

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MATHEMATICS **0580/22**

Paper 2 (Extended) **October/November 2019**

MARK SCHEME

Maximum Mark: 70

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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Marks awarded are always **whole marks** (not half marks, or other fractions).

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- marks are not deducted for omissions
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GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

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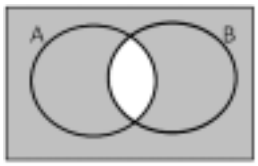
Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1	6.8	**1**	
2	7.6[0] or 7.604 to 7.605	**1**	
3	$a^4 + 3a$ final answer	**1**	
4		**1**	
5(a)	23	**1**	
5(b)	One extreme value oe	**1**	
6	135	**2**	**M1** for $\frac{12}{12+7+9+4}[\times 360]$ or $\frac{360}{12+7+9+4}[\times 12]$ oe
7	440 or 440.2 to 440.3	**2**	**M1** for $30\,000 \div 68.14$
8	282	**2**	**M1** for 180 + 102 or 360 – (180 – 102)
9	$x < -10$ final answer	**2**	**M1** for $-12 - 13 > 3x - \frac{x}{2}$ oe
10	$67.\dot{7} - 6.\dot{7}$ oe	**M1**	
	$\frac{61}{90}$	**A1**	If 0 scored, **SC1** for $\frac{k}{90}$

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Question	Answer		Marks	Partial Marks
11	$\frac{29}{8}$ or $\frac{5}{3}$	$2\frac{5}{8}-\frac{2}{3}$	**M1**	Allow $\frac{29k}{8k}$ or $\frac{5k}{3k}$ Correct step for dealing with mixed numbers
	$\frac{87}{24}$ and $\frac{40}{24}$	$[2]\frac{15}{24}$ and $\frac{16}{24}$	**M1**	Correct method to find common denominator e.g. $3\frac{15}{24}$ and $1\frac{16}{24}$
	$1\frac{23}{24}$ cao		**A1**	
12	90		**3**	**M2** for 360 ÷ (180 – 176) oe or **M1** for $180(n-2) = 176n$ oe or 180 – 176
13	352		**3**	**B2** for figs 352 or **M1** for $\left(\frac{75}{30}\right)^3$ oe or $\left(\frac{30}{75}\right)^3$ oe OR **M2** for $5.5\times\left(\frac{30}{75}\right)^3\times 1000$
14	Gradient = $\frac{5}{4}$ oe		**M1**	**M** marks can be in any order
	$y = k-\frac{4}{5}x$ oe and gradient = $-\frac{4}{5}$ oe		**M1**	
	Use of product of gradients is −1 oe		**M1**	
15(a)	$2.45x + 3.15y$ final answer		**2**	**B1** for one correct term in final answer If 0 scored, **SC1** for $245x + 315y$
15(b)	13		**2**	**M1** for 60.55 – 2.45 × 8 oe
16	$y = 5$ ruled $y = x + 1$ ruled Correct region indicated		**4**	**B2** for two correct lines or **B1** for one correct line **B2** for indication of correct region or **B1** for shading that satisfies two of the inequalities

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Question	Answer	Marks	Partial Marks
17	Bisector of angle Q accurate with two pairs of correct arcs and Arc centre R, radius 6.5 cm With bird table correctly indicated or implied by correct intersecting constructions	**4**	**M2** for bisector of angle Q accurate with two pairs of correct arcs or **M1** for accurate bisector with no/wrong arcs **M2** for arc centre R, radius 6.5 cm or **M1** for arc centre R Maximum 3 marks if incorrect position/region is labelled, or there is no label and a region is shaded, or *their* constructions do not intersect
18(a)	0.3 oe	**2**	**M1** for 0.4×0.75
18(b)	0.975 oe	**2**	**M1** for $1 - 0.4 \times 0.25 \times 0.25$ oe or $0.6 + 0.4 \times 0.75 + 0.4 \times 0.25 \times 0.75$ or $0.6 +$ *their* **(a)** $+ 0.4 \times 0.25 \times 0.75$
19(a)	$180 - 4x$	**1**	
19(b)	$90 - 2x$	**1**	**FT** *their* **(a)** $\div 2$ in its simplest form dep on expression in x in **(a)**
19(c)	$90 + x$	**2**	**FT** $180 -$ *their* **(b)** $- x$ oe dep on expression in x in **(b)** then fully simplified **M1** for $180 - (90 - 2x + x)$ oe or $180 -$ *their* **(b)** $- x$ oe dep on expression in x in **(b)**
20(a)	$(3y + 2x)(6 - a)$ oe final answer	**2**	**M1** for $3y(6 - a) + 2x(6 - a)$ oe or $6(2x + 3y) - a(2x + 3y)$ oe
20(b)	$3(x + 4y)(x - 4y)$ final answer	**3**	**M2** for $(3x + 12y)(x - 4y)$ or $(3x - 12y)(x + 4y)$ or **M1** for $3(x^2 - 16y^2)$ or for $(x + 4y)(x - 4y)$
21(a)	6	**2**	**B1** for 3^4 or 3^{x-2} or **M1** for $3^x = 81 \times 3^2$ or better
21(b)	8	**3**	**M2** for $x^{\frac{5}{3}} = 32$ or better or **M1** for $\frac{1}{x^{\frac{1}{3}}} = \frac{32}{x^2}$ or better or $x^{-\frac{1}{3}--2} = 32$ or better
22(a)	$\begin{pmatrix} 2 & 17 \\ 10 & -25 \end{pmatrix}$	**2**	**B1** for 2 correct elements

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Question	Answer	Marks	Partial Marks
22(b)	2	**2**	**M1** for $-3 - 5k = -13$ oe
22(c)	$\frac{1}{10}\begin{pmatrix} 0 & -2 \\ 5 & 3 \end{pmatrix}$ oe isw	**2**	**M1** for $k\begin{pmatrix} 0 & -2 \\ 5 & 3 \end{pmatrix}$ or for det = 10 or soi
23(a)	Tangent ruled at $t = 24$	**B1**	
	– 0.7 to – 0.3	**B2**	**B2** dep on correct tangent or close attempt at tangent **M1** for rise/run **also dep on** correct tangent drawn or close attempt at tangent. Must see correct or implied calculation from a drawn tangent.
23(b)	acceleration or deceleration oe	**1**	
23(c)	68	**2**	**M1** for $(22 - 5) \times 4$

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MATHEMATICS **0580/23**

Paper 2 (Extended) **October/November 2019**

MARK SCHEME

Maximum Mark: 70

Published

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Abbreviations

cao	correct answer only
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isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1	–10	**1**	
2	6	**1**	
3(a)	27	**1**	
3(b)	47	**1**	
4	21	**2**	**M1** for [84 =] 2 × 2 × 3 × 7 or [105 =] 3 × 5 × 7 or 3 × 7 as final answer or **B1** for 3 or 7 as final answer
5(a)	7.2×10^4	**1**	
5(b)	1.8×10^{-3}	**1**	
6	$x^2 + 8x + 15$ final answer	**2**	**M1** for three terms correct from $x^2 + 3x + 5x + 15$
7	$-\frac{2}{5}$ or – 0.4	**2**	**M1** for gradient = $\frac{5}{2}$ oe soi
8(a)	21.1 or 21.10…	**1**	
8(b)	158.9 or 158.8 to 158.9	**1**	**FT** 180 – *their* **(a)** providing answer is an obtuse angle
9	298	**3**	**M2** for [2 ×] (5 × 7 + 5 × 9.5 + 7 × 9.5) oe or **M1** for one correct area, 5 × 7 or 5 × 9.5 or 7 × 9.5
10	30	**3**	**M1** for $\frac{391+n+n-1}{3} = 5n$ oe **M1** for correct first step for solving *their* equation e.g. $391+n+n-1 = 3\times 5n$, $\frac{390+2n}{3} = 5n$
11(a)	$3(4x + 5)$ final answer	**1**	
11(b)	$(x + 3)(y – 2)$ final answer	**2**	**B1** for $y(x + 3) – 2(x + 3)$ or $x(y – 2) + 3(y – 2)$ or correct answer seen then spoilt

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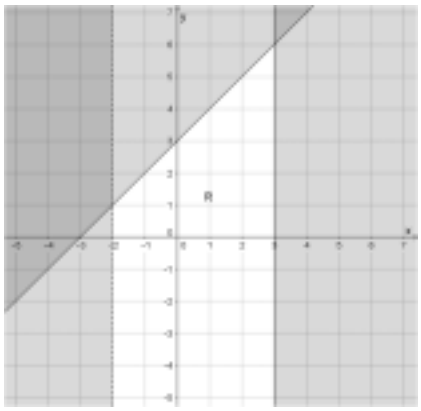
Question	Answer	Marks	Partial Marks
12	7.62 or 7.615 to 7.616	**3**	**M2** for $\sqrt{(9-2)^2+(4-1)^2}$ oe or **M1** for $(9-2)^2+(4-1)^2$ oe or 58
13	2.75 oe	**3**	**M2** for $6--5=2(3k-k)$ oe or better or **M1** for $\frac{6--5}{3k-k}$ oe If 0 scored, **SC1** for -2.75 oe as answer
14(a)	$\frac{1}{2n}$ oe final answer	**1**	
14(b)	5^{n-1} oe final answer	**2**	**M1** for recognition of terms being powers of 5
15	$\frac{2}{12}$ oe or $\frac{1}{2}\times\frac{1}{3}$; $\frac{2}{3}\left(1+\frac{1}{4}\right)$	**M1**	**M1** for correct first step to deal with multiplication
	$\frac{8}{12}[+]\frac{2}{12}$ oe ; $\frac{2}{3}\times\frac{5}{4}$	**M1**	**M1** for correct working for common denominator with *their* $\frac{2}{12}$ oe or correct evaluation of bracket
	$\frac{5}{6}$ cao	**A2**	**A1** for $\frac{10}{12}$ oe
16(a)	12.88	**1**	
16(b)	two correct points plotted	**1**	
16(c)	ruled line of best fit	**1**	
16(d)	negative	**1**	
17		**4**	**B1** for $x = -2$ dashed ruled line and $x = 3$ solid ruled line **B1** for $y = x + 3$ solid ruled line **B2** for indication of correct region or **B1** for shading that satisfies two of the inequalities, e.g. two of $x > -2$, $x \leqslant 3$ and $y \leqslant x + 3$

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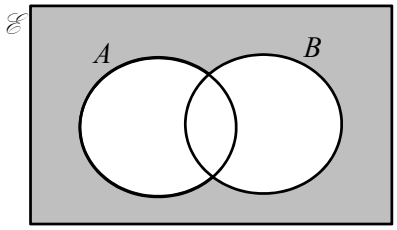
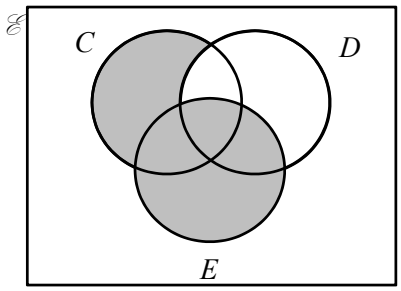
Question	Answer	Marks	Partial Marks
18(a)(i)	4	**1**	
18(a)(ii)	At least one and fewer than four numbers from {2, 3, 4, 5}	**1**	
18(b)	 	**2**	**B1** for each
19(a)	0.3 or $\frac{3}{10}$	**1**	
19(b)	760	**3**	**M2** for correct complete area statement e.g. $70 \times 10 + \frac{1}{2} \times 20 \times 6$ oe or **M1** for one of these area calculations 70×10, $\frac{1}{2} \times 20 \times 6$, 50×10 or $\frac{1}{2} \times (16 + 10) \times 20$
20(a)	$\frac{45}{(x+1)^2}$ final answer	**2**	**M1** for $t = \frac{k}{(x+1)^2}$
20(b)	4	**2**	**M1** for $1.8 \times (x + 1)^2$ = *their* 45 or better
21(a)	$\frac{1}{5}\begin{pmatrix} -5 & -10 \\ -1 & -3 \end{pmatrix}$ oe isw	**2**	**M1** for $k\begin{pmatrix} -5 & -10 \\ -1 & -3 \end{pmatrix}$ or det = 5 soi
21(b)	[x =] 6 [y =] 7	**3**	**B1** for $x = 6$ **B2** for $y = 7$ or **M1** for $2 \times 1 + 9y = 65$ or $2 \times -4 + 2y = 6$

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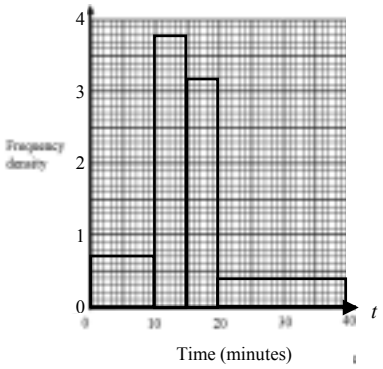
Question	Answer	Marks	Partial Marks
22	15.2	**5**	**M4** for $\left(\pi\times5^2\times12-\frac{1}{3}\times\pi\times5^2\times4.8\right)\div\left(\pi\times5^2\right)$ or **M3** for $\pi\times5^2\times12-\frac{1}{3}\times\pi\times5^2\times4.8$ or **M1** for $\pi\times5^2\times12$ **M1** for $\frac{1}{3}\times\pi\times5^2\times4.8$
23(a)	10 [< t ⩽] 15	**1**	
23(b)	Correct histogram  	**3**	**B1** for each correct block If 0 scored, **SC1** for correct frequency densities 3.8, 3.2, 0.4 soi by correct heights

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Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

MATHEMATICS **0580/31**

Paper 3 (Core) **October/November 2019**

MARK SCHEME

Maximum Mark: 104

Published

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FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
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soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	Correct bar	**1**	
1(a)(ii)	December	**1**	
1(a)(iii)	82	**1**	
1(a)(iv)	16.4	**1**	**FT** *their* **(a)(iii)**÷5
1(b)(i)	28.3[0]	**2**	**M1** for 15.3 + (2 × 6.5) oe
1(b)(ii)	2.5[0]	**2**	**M1** for [10 –](2 × 3.75) oe
1(b)(iii)	85.7	**1**	
1(b)(iv)	1645	**1**	
1(b)(v)	55	**3**	**B1** for 72 or 1.2 seen **M1** for 66 ÷ *their* time
2(a)(i)	Chord correctly drawn	**1**	
2(a)(ii)	Angle [in a] semicircle [is 90º]	**1**	
2(b)	384	**2**	**M1** for 8 × 8[× 6]
2(c)(i)	40	**2**	**M1** for 5 × 4 × 2
	cm^3	**1**	
2(c)(ii)	Correct net	**3**	**B2** for 4 more correct faces in correct position **B1** for 2 or 3 more correct faces in correct position
3(a)(i)	97	**1**	
3(a)(ii)	Obtuse	**1**	
3(b)	39	**1**	
3(c)	99	**2**	**M1** for (180 – 18) ÷ 2 soi by 81

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Question	Answer	Marks	Partial Marks
3(d)	135	**3**	**M2** for 180 – (360 ÷ 8) oe or $\frac{180\times(8-2)}{8}$ oe **M1** for 360 ÷ 8 soi by 45 or 180 × (8 – 2) oe soi by 1080
4(a)	418072	**1**	
4(b)	1 2 4 8 16	**2**	**B1** for 3 or 4 correct and no extra or all correct and one extra
4(c)	31 or 37	**1**	
4(d)(i)	27	**1**	
4(d)(ii)	5832	**1**	
4(d)(iii)	1	**1**	
4(e)	$\frac{7}{15}$ cao	**3**	**M2** for $\frac{5}{15}+\frac{3}{15}$ or $\frac{8k}{15k}$ or $\frac{320}{600}$ or $\frac{280}{600}$ or $\frac{7k}{15k}$, k must be an integer or **M1** for $\frac{1}{5}+\frac{1}{3}$ or 120 + 200 or 320 or 280 or 600 – 120 − 200 oe If **M0** scored, **SC1** for answer of $\frac{47}{100}$ $\frac{467}{1000}$ $\frac{4667}{10000}$
4(f)	135	**2**	**M1** for listing at least 3 multiples of 15 and 27 or [15=]3 × 5 and [27=]3 × 3 × 3 or 3^3 or **B1** for 135k as final answer or **B1** for 3 × 3 × 3 × 5 or $3^3 \times 5$
4(g)	$2^4 \times 3^3$ or 2 × 2 × 2 × 2 × 3 × 3 × 3	**2**	**M1** for a complete correct factor tree or 2,2,2,2,3,3,3 clearly identified as factors or **B1** for a correct product that equals 432
4(h)	4145.7[3] or 4145.70 or 4150 or 4146	**3**	**M2** for $4000 \times \left(1+\frac{1.2}{100}\right)^3$ oe or **M1** for $4000 \times \left(1+\frac{1.2}{100}\right)^2$ oe

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Question	Answer	Marks	Partial Marks
5(a)(i)	Rotation 90° clockwise oe [centre] (0, 0) oe	**3**	**B1** for each
5(a)(ii)	Enlargement [sf] 0.5 oe [centre] (1, 2)	**3**	**B1** for each
5(b)(i)	Triangle at (3, 2) (1, 5) (1, 2)	**2**	**B1** for translation of $\begin{pmatrix} 6 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -2 \end{pmatrix}$
5(b)(ii)	Triangle at (–3, –2) (–5, –2) (–5, –5)	**2**	**B1** for reflection in $y = k$ or $x = 1$
6(a)	$4x + 2$	**3**	**B2** for $4x + c$ or **B1** for $mx + 2$, $m \neq 0$ and **M1** for rise/run of $\frac{4k}{k}$
6(b)(i)	3	**1**	
6(b)(ii)	(0, –4)	**1**	
6(c)	Correct ruled line from $x = -4$ to $x = 5$	**3**	**B2** for 2 correct points plotted or **B1** for one correct point plotted soi or **M1** for line with gradient –2 If **B0** or **M0** scored, **SC1** for a correct table with a minimum of 3 correct coordinates
7(a)(i)	Two correct lines drawn	**2**	**B1** for one correct, no extras or two correct and one extra
7(a)(ii)	2.16	**2**	**M1** for 1.2 × 1.8
7(b)	40	**3**	**M2** for $\frac{21-15}{15}$ [× 100] or $\left(\frac{21}{15}-1\right)$ [×100] or $\frac{21}{15}$ × 100 [−100] oe or **M1** for $\frac{21}{15}$ or 21−15
7(c)(i)	$\frac{11}{30}$ oe	**1**	
7(c)(ii)	$\frac{25}{30}$ oe	**1**	
7(c)(iii)	0	**1**	

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Question	Answer	Marks	Partial Marks
7(d)	1.6	**2**	**M1** for $\frac{2.4}{1.8}$ or $\frac{1.8}{2.4}$ or $\frac{1.8}{1.2}$ or $\frac{1.2}{1.8}$ soi
7(e)	26.2 or 26.24 to 26.25	**2**	**M1** for $25^2 + 8^2$ or better
8(a)(i)	220	**2**	**M1** for 11
8(a)(ii)	[0]80°	**1**	
8(a)(iii)	*C* in correct position	**2**	**B1** for correct distance of 6 cm or bearing of 300° from *B*
8(a)(iv)	Correct line drawn with 2 pairs of correct arcs	**2**	**B1** for correct line with no or incorrect arcs or correct arcs but no line
8(b)	134.5, 135.5	**2**	**B1** for one correct or both correct but reversed
8(c)	0.41	**2**	**M1** for 1 – (0.35 + 0.04 + 0.2)
8(d)	–2	**1**	
8(e)	15.68 cao	**2**	**M1** for $(1+\frac{12}{100}) \times 14$ oe
8(f)	72	**2**	**M1** for $\frac{9}{25} \times 200$ oe
9(a)(i)	41	**1**	
9(a)(ii)	Add 3 oe	**1**	
9(b)(i)	6, 9, 14	**2**	**B1** for one correct term in correct position If 0 scored, **SC1** for 5, 6, 9
9(b)(ii)	$n^2 + 5 = 261$ or $261 - 5 = 256$ or $256 + 5 = 261$ or $\sqrt{261-5}$	**M1**	
	$(n =)\sqrt{256} = 16$ or 256 is a square number	**A1**	
9(c)	$6n + 21$ oe final answer	**2**	**M1** for $6n + j$ or $kn + 21$ $k \neq 0$

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Cambridge International General Certificate of Secondary Education

MATHEMATICS **0580/32**

Paper 3 (Core) **October/November 2019**

MARK SCHEME

Maximum Mark: 104

Published

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This document consists of **6** printed pages.

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Question	Answer	Marks	Partial Marks
1(a)(i)	Friday	**1**	
1(a)(ii)	25	**1**	
1(a)(iii)	15	**1**	
1(b)	58.5	**2**	**B1** for 21 [hours] or 37.5 [hours] or 9.75 [hours] soi or **M1** for $6\left(3\frac{1}{2}+6\frac{1}{4}\right)$ oe
1(c)	2302.8[0] final answer	**2**	**M1** for (4 × 38 + 2 × 25) × 11.40 oe
1(d)	120	**3**	**M2** for $\frac{48}{4}\times(5+4+1)$ oe or **M1** for $\frac{48}{4}$ soi by 12
1(e)	68.5	**4**	**M1** for 35 × 22 + 5 × 14.5 oe **M2** for $\frac{\textit{their}\,842.50-500}{500}$ [× 100] or $\left(\frac{\textit{their}\,842.50}{500}-1\right)$ [× 100] or $\frac{\textit{their}\,842.50}{500}$ × 100 [– 100] or **M1** for $\frac{\textit{their}\,842.50}{500}$ or *their* 842.50 – 500
2(a)	47.85 15[.00] 65.75	**2**	**B1** for one of first two values correct
2(b)(i)	12.9	**2**	**M1** for 1.8 × 5.3 + 2.4 × (3.2 – 1.8) oe or 3.2 × 2.4 + 1.8 × (5.3 – 2.4) oe or 5.3 × 3.2 – (5.3 – 2.4) × (3.2 – 1.8) oe
2(b)(ii)	806.25	**2**	**FT** *their* (b)(i) × 62.5 **M1** for *their* (b)(i) ÷ 8 × 500 oe

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Question	Answer	Marks	Partial Marks
2(c)	160 100	**2**	**B1** for each or for 4 and 2.5 seen
2(d)	4.05	**2**	**M1** for $\frac{1}{2}\times(1.9+2.6)\times 1.8$ oe
2(e)	251 or 251.3 to 251.4	**2**	**M1** for $\pi \times 80$ oe
3(a)(i)	1, 2, 3, 6, 9, 18	**2**	**B1** for 4 or 5 correct and no extras or 6 correct and one extra
3(a)(ii)	36 or 49	**1**	
3(a)(iii)	97	**1**	
3(b)(i)	$24 \div (6 + 2) \times 3$	**1**	
3(b)(ii)	$24 \div (6 + 2 \times 3)$	**1**	
3(c)	2.33 nfww	**2**	**B1** for 2.32[648…] If 0 scored, **SC1** for rounding *their* answer given to 3dp or more correctly to 2dp
3(d)(i)	18	**2**	**B1** for 2 or 3 or 6 or 9 or $2 \times 3 \times 3$ as final answer or for [36 =] $2 \times 2 \times 3 \times 3$ or $2^2 \times 3^2$ and [90 =] $2 \times 3 \times 3 \times 5$ or $2 \times 3^2 \times 5$
3(d)(ii)	180	**2**	**B1** for answer 180*k* where *k* is a positive integer or $2 \times 2 \times 3 \times 3 \times 5$
3(e)(i)	[0].0042	**1**	
3(e)(ii)	8.89×10^5	**2**	**B1** for figs 889
4(a)(i)	Table completed correctly 0 ||||| /// 8 1 ||||| / 6 2 ||||| ||||| 10 3 ||||| ||||| // 12 4 ||||| /// 8 5 ||||| / 6	**2**	**B1** for tallies correct or frequencies correct If 0 scored, **SC1** for correct frequency for *their* tallies
4(a)(ii)	5	**1**	
4(a)(iii)	3	**2**	**B1** for 25th and 26th seen or these values identified

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Question	Answer	Marks	Partial Marks
4(a)(iv)	16	**1**	**FT** *their* table (*their* 8 × 2)
4(a)(v)	$\frac{7}{25}$ final answer	**2**	**B1FT** for $\frac{their\,8 + their\,6}{50}$ oe seen
4(b)	750	**2**	**B1** for 0.75[litres] 2000 [ml] or 0.25 [litres] or 1250 [ml] or 1.25 [litres] soi
4(c)	1.45 , 1.55	**2**	**B1** for one value correct or for both values correct but reversed
4(d)	577 or 577.2 to 577.3…	**3**	**M2** for $\pi \times \left(\frac{7}{2}\right)^2 \times 15$ or **M1** for $\pi \times \left(\frac{7}{2}\right)^2$ If 0 scored, **SC1** for $\pi \times 7^2 \times 15$
5(a)(i)	Correct triangle with correct arcs	**2**	**B1** for correct triangle with incorrect/no arcs or for two correct arcs seen If 0 scored, **SC1** for triangle with arcs but with $AC = 5$ cm and $BC = 7$ cm
5(a)(ii)	Angle *ABC* measured correctly	**1**	STRICT **FT** *their* angle *ABC*
5(b)(i)	57	**2**	**M1** for 180 – 32 – 25 oe or 123
5(b)(ii)	98	**2**	**M1** for 180 – 25 – *their* (b)(i) oe or 180 – 2 × *their* (b)(i) + 32 or **B1** for angle *PSQ* = 66
5(c)(i)	27	**2**	**M1** for $180 - 90 - 63$ oe or **B1** for angle *FDE* = 90 soi
5(c)(ii)	5.45 or 5.447 to 5.448	**2**	**M1** for $\cos 63 = \frac{DF}{12}$ or $\sin 27 = \frac{DF}{12}$ oe
6(a)	9, 3, 9	**2**	**B1** for two correct
6(b)	Correct curve	**4**	**B3FT** for 7 or 8 correctly plotted points or **B2FT** for 5 or 6 correctly plotted points or **B1FT** for 3 or 4 correctly plotted points
6(c)	0.6 to 0.8, 4.2 to 4.4	**2**	**FT** *their* curve **B1** for each

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Question	Answer	Marks	Partial Marks
7(a)(i)	12	**1**	
7(a)(ii)	Subtract 5 oe	**1**	
7(b)	3 8 15	**2**	**B1** for two correct in correct positions If 0 scored, **SC1** for 0 3 8
7(c)(i)	10 14 18 22	**2**	**B1** for 2 or 3 correct
7(c)(ii)	$4n + 2$ oe final answer	**2**	**B1** for $4n + j$ or $kn + 2$, $k \neq 0$
7(c)(iii)	All patterns use an even number of lines oe	**1**	
8(a)(i)	(–2, –5)	**1**	
8(a)(ii)	$\begin{pmatrix} -3 \\ 2 \end{pmatrix}$	**1**	
8(b)(i)	Enlargement [SF] 2 [Centre] (5, 3)	**3**	**B1** for each
8(b)(ii)	Correct translation Vertices (5, 2), (5, –1), (6, 1)	**2**	**B1** for translation by $\begin{pmatrix} 4 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -2 \end{pmatrix}$
8(b)(iii)	Correct rotation Vertices (1, –1), (4, –1), (3, –2)	**2**	**B1** for correct orientation, incorrect position or for 90° anticlockwise rotation about (0, 0)
9(a)(i)	46	**2**	**M1** for $5 \times 8 - 2 \times -3$ or better
9(a)(ii)	$\frac{c+2b}{5}$ oe or $\frac{c}{5}+\frac{2b}{5}$ oe final answer	**2**	**M1** for $c + 2b = 5a$ oe or $\frac{c}{5} = a - \frac{2b}{5}$ oe
9(b)	$3(x + 4)$ final answer	**1**	
9(c)	$2xy + x^2$ final answer	**2**	**B1** for $2xy$ or x^2 or for $2xy + x^2$ not as final answer
9(d)	$n + 2n + 2n + 3 = 58$ or $5n + 3 = 58$ leading to [n =] 11	**4**	**M2** for any correct equation which would lead to $5n + 3 = 58$ or **B1** for $2n$ or $2n + 3$ seen **M1** for $5n = 55$ or for rearranging *their* linear equation to $an = b$ **B1** for [n =]11

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Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

MATHEMATICS **0580/33**

Paper 3 (Core) **October/November 2019**

MARK SCHEME

Maximum Mark: 104

Published

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soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	[0].25	**1**	
1(b)	$\frac{9}{13}$ cao	**1**	
1(c)	80	**1**	
1(d)	1, 2, 3, 4, 6, 8, 12, 24	**2**	**B1** for 6 or 7 correct factors and no extras or 8 correct factors and at most one extra
1(e)	12	**2**	**B1** for 2, 3, 4 or 6 as final answer or 2 × 2 × 3 or for 2 × 2 × 2 × 3 and 2 × 2 × 3 × 3 × 3
1(f)	Accept any irrational number between 3 and 9	**1**	
1(g)	1	**1**	
1(h)	598.29 cao	**3**	**M2** for $8400\times\left(1+\frac{3.5}{100}\right)^2$ oe OR **M1** for $8400\times\left(1+\frac{3.5}{100}\right)^2$ oe **A1** for 8998.29
1(i)	$\frac{5}{15}$ or $\frac{12}{15}$ or $\frac{35}{15}$	**B1**	allow denominators with multiples of 15 e.g. $\frac{35k}{15k}$, $\frac{5k}{15k}$
	[2] $\frac{5}{15}$ [+] $\frac{12}{15}$ or $\frac{35}{15}$ [+] $\frac{12}{15}$	**M1**	allow other common denominators
	[2] $\frac{17}{15}$ or $\frac{47}{15}$ leading to $3\frac{2}{15}$ cao	**A1**	with no errors or omissions seen
2(a)(i)	3.5	**2**	**B1** for 1, 1, 2, 2, 3, 3, 4 or 3, 4, 4, 4, 5, 5, 7 or 3 and 4 identified
2(a)(ii)	4	**1**	

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Question	Answer	Marks	Partial Marks
2(a)(iii)	6	**1**	
2(b)(i)	3.76	**3**	**M2** for $(1 \times 3 + 2 \times 1 + 3 \times 5 + 4 \times 8 + 5 \times 6 + 6 \times 2) \div 25$ or **M1** for $1 \times 3 + 2 \times 1 + 3 \times 5 + 4 \times 8 + 5 \times 6 + 6 \times 2$ or 94
2(b)(ii)	$\frac{16}{25}$ oe	**2**	**B1** for 16
2(c)(i)	136 164 36	**2**	**B1** for one correct
2(c)(ii)	Correct pie chart	**2**	**FT** for 1 or 2 marks provided their 3 angles add to 336° **B1** for one correct sector
3(a)	Reflection $y = -1$	**2**	**B1** for each
3(b)	Rotation [centre] (0, 0) oe 90° [anticlockwise] oe	**3**	**B1** for each
3(c)	Correct triangle vertices (0, −2), (3, −2) and (3, 0)	**2**	**B1** for translation of $\begin{pmatrix} -2 \\ k \end{pmatrix}$ or $\begin{pmatrix} k \\ -3 \end{pmatrix}$
3(d)	Correct triangle vertices (2, 1), (−1, 1) and (−1, −1)	**2**	**B1** for a correct 180° rotation with incorrect centre
4(a)	22 50	**4**	**M1** for 3840 ÷ 720 **A1** for 5[h] 20[m] **M1dep** for 15 30 + *their* 5[h] 20[m] [+2] or 17 30 + *their* 5[h] 20[m]
4(b)	75	**2**	**M1** for 2610 ÷ 34.8
4(c)	6.5	**3**	**M2** for $\frac{19.17 - 18}{18}$ [× 100] oe or $\left(\frac{19.17}{18} - 1\right)$ [× 100] oe or $\frac{19.17}{18} \times 100$ [– 100] oe or **M1** for $\frac{19.17}{18}$ or 19.17 – 18

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Question	Answer	Marks	Partial Marks
4(d)	8	**2**	**M1** for $\frac{36}{2+7}$
5(a)	$4x - 3y$ final answer	**2**	**B1** for $4x$ or $-3y$ or $4x - 3y$ not as final answer
5(b)	−2	**3**	**M1** for $35 = 4 \times a \times 5 + 3 \times 5^2$ or better **M1** for $35 - \textit{their } 3 \times 5^2 = \textit{their } 4 \times 5 \times a$ or better or **M1** for $P - 3b^2 = 4ab$ or better **M1** for $35 - 3 \times 5^2 = 4 \times 5 \times a$ or better
5(c)(i)	[0].5 or $\frac{1}{2}$	**1**	
5(c)(ii)	2.8 oe	**2**	**M1** for $7x - 2x = 11 + 3$ or better
5(c)(iii)	5	**3**	**M1** for correct first step i.e. $6x - 3$ [= 27] or $2x - 1 = 9$ **M1** for correct second step leading to $ax = b$
5(d)	[p =] $\frac{T}{5} - 2$ or $\frac{T-10}{5}$ final answer	**2**	**M1** for $\frac{T}{5} = p + 2$ oe or $T = 5p + 10$
5(e)	Correct method to eliminate one variable	**M1**	If 0 scored, **SC1** for two values that satisfy one of the original equations or **SC1** if no working shown, but 2 correct answers given
	[x =] 7	**A1**	
	[y =] −1	**A1**	
6(a)(i)	115	**1**	
6(a)(ii)	63.6	**2**	**B1** for 5.3 [cm]
6(a)(iii)	Correct position of town C	**2**	**B1** for indication on diagram of either a bearing of 064° from A or a bearing of 028° from B
6(b)	[0]65	**2**	**M1** for 245 – 180 oe or for a complete diagram with North lines at D and E and 245° marked correctly at E and 65° marked correctly at D
6(c)(i)	P Q	**1**	

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Question	Answer	Marks	Partial Marks
6(c)(ii)	144	**3**	**M2** for 180 – (360 ÷ 10) oe or $\frac{180\times(10-2)}{10}$ **M1** for 360 ÷ 10 or 180 × (10 – 2) oe
7(a)(i)	112	**2**	**B1** for 14 or 15 or **M1** for 9 + 32 + 24 + 18 + *their* 14 + *their* 15 or 2(24 + 32)
7(a)(ii)	558	**2**	**M1** for 24 × 18 + 9 × *their* 14 oe or 32 × 9 + 18 × *their* 15 oe or 32 × 24 − *their* 14 × *their* 15 oe
7(b)(i)	52	**1**	
7(b)(ii)	52	**1**	**FT** *their* (b)(i)
7(b)(iii)	65	**1**	**FT** 180 – 63 − *their* (b)(i) or 180 – 63 − *their* (b)(ii)
7(c)	12.4	**3**	**M2** for (18.6 × 16.4 × 10.2) ÷ (30.6 × 8.2) oe or **M1** for 18.6 × 16.4 × 10.2 or 3111.408 or 30.6 × 8.2 × *h* or 250.92*h*
7(d)	68 nfww	**2**	**M1** for $\frac{48}{6}$ or $\frac{6}{48}$ or $\frac{8.5}{6}$ or $\frac{6}{8.5}$ oe
8(a)(i)	3 3	**1**	
8(a)(ii)	Correct curve	**4**	**B3FT** for 6 or 7 points correctly plotted or **B2FT** for 4 or 5 points correctly plotted or **B1FT** for 2 or 3 points correctly plotted
8(b)(i)	27	**1**	
8(b)(ii)	Add 6 oe	**1**	
8(b)(iii)	$6n - 3$ oe final answer	**2**	**B1** for $6n + a$ or $bn - 3$ ($b \neq 0$)
9(a)	$\frac{10+30}{[0].4\times 5}$	**M1**	
	$\frac{40}{2}$ [= 20]	**A1**	
9(b)	$\frac{333}{106}$ 3.1416 3.142 $\frac{22}{7}$	**2**	**B1** for 3.1428[…] or 3.143 and 3.1415[…] or for 3 in the correct order

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Question	Answer	Marks	Partial Marks
9(c)	9.75 9.85	**2**	**B1** for one correct or both correct and reversed
9(d)	4.1×10^{-4} cao	**2**	**B1** for $4.07[6\ldots] \times 10^{-4}$ or 4.08×10^{-4} or figs 41

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MATHEMATICS **0580/41**

Paper 4 (Extended) **October/November 2019**

MARK SCHEME

Maximum Mark: 130

Published

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- the standard of response required by a candidate as exemplified by the standardisation scripts.

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Marks must be awarded **positively**:

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- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)	[p =] 132 [q =] 77	**3**	**B1** for 132 [=p] **B2** for 77 [=q] or **M1** for 180 – (55 + 48) oe or for *their* p – 55
1(b)	74	**3**	**B2** for $5x - 10 = 360$ or **M1** for $x + (x + 5) + (2x - 25) + (x + 10) = 360$ or for $5x - 10 = k$
1(c)	175	**3**	**M2** for $180 - \frac{360}{72}$ or for $\frac{180(72-2)}{72}$ or **M1** for $\frac{360}{72}$ or for 180 (72 – 2)
1(d)	[u =] 30 [v =] 60 [w =] 60 [x =] 120 [y =] 40	**6**	**B1** for 30 **B1** for 60 **B1** for 60 FT *their v* **B1** for 120 FT 2 × *their w* **B2** for 40 or **B1** for angle BDC = 20 or angle ADO = 30 or angle ADB = 70
1(e)	26	**4**	**B3** for $360 - 22 = 10x + 3x$ oe or better or for $5x + 1.5x = 180 - 11$ oe or better or **M2** for $360 - (3x + 22) = 2 \times 5x$ oe or for $5x + \frac{1}{2}(3x + 22) = 180$ oe or **SC2** for $360 + 22 = 10x + 3x$ oe or better or **M1** for $180 - 5x$, $10x$ or $360 - (3x + 22)$ correctly placed on the diagram or identified or for angle A + angle $C = 5x$
2(a)	[Ali] 2700 [Mo] 2100	**3**	**B2** for one correct or for correct values reversed or **M1** for 600 ÷ (9 – 7) or for any equation that would lead to an answer of 300, 2700 or 2100, or 4800 (for the total)

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Question	Answer	Marks	Partial Marks
2(b)	11	**3**	**M2** for $\frac{220-195.8}{220}[\times 100]$ or for $[100-]\frac{195.8}{220}\times 100$ or **M1** for 220 – 195.8 or for $\frac{195.8}{220}$ or a correct implicit equation for percentage reduction or for $\frac{195.8-220}{220}$
2(c)	84	**3**	**M2** for $\frac{63}{1-\frac{25}{100}}$ oe or **M1** for associating 63 with (100 – 25)% or a correct implicit equation for the original price.
3(a)	662.45	**2**	**M1** for $600\times\left(1+\frac{2}{100}\right)^5$ oe
3(b)(i)	800	**2**	**M1** for $x\left(1+\frac{5}{100}\right)^2=882$ oe or **SC1** for answer 82
3(b)(ii)	5 nfww	**2**	**M1** for trial with $882\times\left(1+\frac{5}{100}\right)^n$ with $n>1$
4(a)(i)	955 or 955.0 to 955.2	**2**	**M1** for $2\times\pi\times 8\times 19$ oe
4(a)(ii)	812 or 811.7 to 811.9...	**2**	**FT** *their* (i) × 0.85 **M1** for *their* (i) × 0.85 or *their* (i) × 85
4(b)(i)	$\frac{\frac{4}{3}\times\pi\times 6^3}{\frac{1}{3}\times\pi\times 8^2}$ or cancelling clearly seen to reach 13.5	**M2**	**M1** for $\frac{4}{3}\times\pi\times 6^3=\frac{1}{3}\times\pi\times 8^2\times h$
4(b)(ii)	15.7 or 15.69...	**2**	**M1** for $8^2+13.5^2$ or better
4(b)(iii)	394 or 395 or 394.3 to 394.6...	**1**	**FT** $\pi\times 8\times$ *their* (b)(ii)

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Question	Answer	Marks	Partial Marks
4(c)	567	**3**	**M2** for $\frac{168}{V} = \left(\frac{80}{180}\right)^{\frac{3}{2}}$ oe or better or **M1** for $\left(\frac{180}{80}\right)^{\frac{1}{2}}$ or $\left(\frac{80}{180}\right)^{\frac{1}{2}}$ oe seen or better
4(d)	51.3 or 51.34...	**3**	**M2** for tan = $\frac{5}{4}$ oe or **M1** for recognition of angle *PBX*
5(a)	4.29 or 4.285 to 4.286	**3**	**M2** for $\frac{150}{\frac{450}{3.6} - \frac{120}{4} - \frac{180}{3}}$ or **M1** for [time =] 120 ÷ 4 or 180 ÷ 3 or 450 ÷ 3.6 or $3.6 = \frac{150+180+120}{\text{total time}}$
5(b)	82.8 or 82.81 to 82.82 using cosine rule	**4**	**M2** for $\frac{150^2 + 120^2 - 180^2}{2 \times 150 \times 120}$ or **M1** for $180^2 = 120^2 + 150^2 - 2 \times 120 \times 150 \cos(...)$ **A1** for $\frac{4500}{36000}$ oe
5(c)(i)	127.2 or 127.1 to 127.2 or 127	**1**	**FT** 210 – *their* (b)
5(c)(ii)	307.2 or 307.1 to 307.2 or 307	**2**	**FT** 180 + *their*(c)(i) **M1** for 180 + *their* (c)(i)
5(d)	15 or 14.99 to 15.04	**2**	**M1** for $\cos(\textit{their}\ (\text{b})) = \frac{\text{dist}}{120}$ oe
6(a)(i)	34	**1**	
6(a)(ii)	18	**2**	**B1** for [l.q. =] 25 or [u.q. =] 43 seen
6(a)(iii)	60	**2**	**M1** for 140 written
6(b)(i)	49	**1**	
6(b)(ii)	20	**1**	
6(b)(iii)	10	**1**	
6(b)(iv)	220	**2**	**M1** for 3 × 1 + 1 × 2 + 3 × 5 + 2 × 10 + 4 × 20 + 2 × 50
6(b)(v)	14.7 or 14.66 to 14.67	**1**	**FT** *their* (iv) ÷ 15

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Question	Answer	Marks	Partial Marks
6(c)	13.25 nfww	**6**	**B2** for frequencies 30, 40, 30 soi or **B1** for 2 of these **M1** for 5, 12.5, 22.5 **M1** Σfx with *their* frequencies (if seen) and each x in correct interval including boundaries **M1 dependent** for $\frac{\Sigma fx}{100}$ (dependent on second M1) **OR** **Alternative Method** **B2** for frequencies 15, 15, 40, 10, 10, 10 soi or **B1** for 2 of 15, 40, 10 **M1** for 2.5, 7.5, 12.5, 17.5, 22.5, 27.5 **M1** Σfx with *their* frequencies (if seen) and each x in correct interval including boundaries **M1 dependent** for $\frac{\Sigma fx}{100}$ (dependent on second M1)
7(a)	9	**3**	**M2** for $0.42x + 0.42 = 4.2$ oe or better or **M1** for $0.21x + 0.21(x + 2)$ oe [= 420 or 4.20] or for $21x + 21(x + 2)$ oe [= 420 or 4.20] or for $420 \div 21$ oe [=20]
7(b)	$5r + p = 245$	**B1**	
	$2r + 3p = 215$	**B1**	
	45	**3**	Finds p **M1** for correctly equating coefficients of r **M1** for correct method to eliminate r OR **M1** for correctly making r the subject of one of *their* equations **M1** for correctly substituting *their* correct r to form an equation in p OR Finds r first **M1** for correctly eliminating p from *their* equations **M1** for correctly substituting *their* value of r to find p

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Question	Answer	Marks	Partial Marks
7(c)(i)	$\frac{12}{x}+\frac{6}{x-1}[=5]$	**M1**	
	$12(x-1)+6x=5x(x-1)$	**M1**	**Dependent** on previous M1 earned May be over common denominator
	$5x^2-23x+12=0$ reached, with at least one more line of working and with no errors or omissions	**A1**	
7(c)(ii)	$(5x-3)(x-4)$ final answer	**2**	**B1** for $(5x+a)(x+b)$ with $ab=12$ or $a+5b=-23$ or for $5x(x-4)-3(x-4)$ or $x(5x-3)-4(5x-3)$
7(c)(iii)	$\frac{3}{5}$ oe and 4	**1**	**FT** from their two brackets in (c)(ii)
7(c)(iv)	3 cao	**1**	
8(a)(i)	$\frac{4}{5}$ oe	**1**	
8(a)(ii)	$\frac{4}{5}$ oe	**1**	
8(b)(i)	$\frac{6}{20}$ oe nfww	**3**	**M2** for $\frac{1}{5}\times\frac{3}{4}+\frac{3}{5}\times\frac{1}{4}$ oe or $2\times\frac{1}{5}\times\frac{3}{4}$ oe or **M1** for $\frac{1}{5}\times\frac{3}{4}$ alone or $\frac{3}{5}\times\frac{1}{4}$ alone or for answer $\frac{3}{20}$ nfww After 0 scored, **SC1** for answer $\frac{6}{25}$
8(b)(ii)	$\frac{8}{20}$ oe nfww	**3**	**M2** for $1-\frac{4}{5}\times\frac{3}{4}$ or $\frac{1}{5}\times1+\frac{4}{5}\times\frac{1}{4}$ oe or $2\times\frac{1}{5}\times1$ or $2\times\frac{1}{5}\times\frac{3}{4}+2\times\frac{1}{5}\times\frac{1}{4}$ or *their* (b)(i) + $2\times\frac{1}{5}\times\frac{1}{4}$ or **M1** for answer $\frac{2\text{ or }4\text{ or }5\text{ or }6\text{ or }7}{20}$ oe nfww After 0 scored, **SC1** for answer $\frac{8}{25}$

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9(a)	$x + y \geqslant 6$ oe $y \leqslant x$ oe $x \leqslant 8$	**3**	**B1** for each
9(b)	$4x + 6y \leqslant 60$	**1**	
9(c)	Correct region indicated cao	**6**	**B1** for $x + y = 6$ ruled and long enough **B1** for $x = y$ ruled and long enough **B1** for $x = 8$ ruled and long enough **B2** for $2x + 3y = 30$ ruled and long enough or **B1** for ruled line through (0, 10) or (15, 0) but not $y = 10$ or $x = 15$
9(d)(i)	6, 6	**1**	
9(d)(ii)	34	**2**	**M1** for trying $4x + 6y$ with (4, 3) or (5, 2) or (6, 1) or (7, 0)
10(a)	-7 $13 - 4n$ oe 36 $(n + 1)^2$ oe 125 n^3 oe 128 2^{n+2} oe	**11**	**B1** **B2** or **B1** for $13 - kn$ ($k \neq 0$) or for $k - 4n$ **B1** **B2** or **B1** for any quadratic **B1** **B1** **B1** **B2** or **B1** for 2^k oe
10(b)	...., ..., 6, 10, 16 .... , 3, 4, 7, ... 2, ..., 1, 0, ...	**3**	**B1** for each correct row
10(c)(i)	$\frac{q}{p+q}$	**1**	
10(c)(ii)	$\frac{18}{29}$	**1**	

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MATHEMATICS **0580/42**

Paper 4 (Extended) **October/November 2019**

MARK SCHEME

Maximum Mark: 130

Published

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FT	follow through after error
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oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	5 : 6	**1**	
1(a)(ii)	2.0736[0] × 10^5 final answer	**3**	**B2** for 207360 oe or **M1** for 16 × 18 × 720
1(b)(i)	26780	**2**	**M1** for 18540 ÷ 9 soi
1(b)(ii)	1.36	**2**	**M1** for 0.85 × 1.6 oe or **B1** for 0.51 or 51
1(c)	66.7 or 66.66 to 66.67	**5**	**M4** for $\frac{(2.3-1.5\times0.92)}{1.5\times0.92}$[×100] oe or $\frac{2.3\times100}{1.5\times0.92}$ oe **OR** **<u>Working in euros</u>** **B2** for [€]1.38 or **M1** for 1.5[0] × 0.92 **M2dep on B2 or M1** for $\frac{2.3-\textit{their}\,1.38}{\textit{their}\,1.38}$[×100] oe or $\frac{2.3-\textit{their}\,1.38}{\textit{their}\,1.38}\times100$ oe or **M1** for 2.3 – *their* 1.38 or $\frac{2.3}{\textit{their}\,1.38}$ **OR** **<u>Working in dollars</u>** **B2** for [$]2.50 or **M1** for or 2.3[0] ÷ 0.92 **M2dep on B2 or M1** for $\frac{\textit{their}\,2.5-1.5}{1.5}$[×100] oe or $\frac{\textit{their}\,2.5}{1.5}\times100$ or **M1** for *their* 2.5 – 1.5 or $\frac{\textit{their}\,2.5}{1.5}$

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Question	Answer	Marks	Partial Marks
1(d)	219 000 or 218814[.3….] rounded to 4 sf or more	**3**	**B2** for 414000 or 414414[.3….] rounded to 4 sf or more or **M2** for $195600 \times \left(1+\frac{8.7}{100}\right)^9$ [– 195600] or **M1** for $195600 \times \left(1+\frac{8.7}{100}\right)^k$ or better (k >1 and an integer)
2(a)(i)	54	**1**	
2(a)(ii)	29	**2**	**M1** for [UQ =] 65 or [LQ =] 36
2(a)(iii)	32	**1**	
2(a)(iv)	17, 18 or 19	**2**	**M1** for 61 to 63 written or for decimal answer in range 17 to 19
2(b)(i)	18, 26, 26	**2**	**B1** for 1 or 2 correct
2(b)(ii)	51 nfww	**4**	**M1** for 10 , 30 , 50 , 70 , 90 soi **M1** for Σfx **M1 dep** for *their* $\sum fx \div \sum f$
2(c)(i)	75	**1**	
2(c)(ii)	IQR is bigger for the girls with [boys =] 20 seen oe	**2**	**FT** *their* IQR from (a)(ii) **M1** for IQR for boys = 20 isw or for girls IQR is bigger than boys IQR oe isw **FT** *their* IQR from (a)(iii)
3(a)(i)	(3, 5.5)	**2**	**B1** for either value correct
3(a)(ii)	$\frac{5}{4}x+\frac{7}{4}$ final answer	**3**	**B2** for answer $\frac{5}{4}x + c$ oe or for correct equation in different form or **M1** for $\frac{8-3}{5-1}$ oe **and M1** for correct substitution shown of (1, 3) or (5, 8) or *their* (a)(i) into $y = (\textit{their } m)x + c$ oe
3(b)(i)	(6, 1) (10, 6)	**2**	**B1** for 2 or 3 values correct
3(b)(ii)	(–3, 1) (–8, 5)	**2**	**B1** for 2 or 3 values correct If 0 scored, **SC1** for (3, –1) and (8, –5)
3(b)(iii)	(3, 3) (–1, 8)	**2**	**B1** for 2 or 3 values correct but not for (1, 3) and (5, 8)

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Question	Answer	Marks	Partial Marks
3(b)(iv)	(5, –3) (11, –8)	**2**	**B1** for either or **M1** for $\begin{pmatrix} -1 & 2 \\ 0 & -1 \end{pmatrix}\begin{pmatrix} 1 \\ 3 \end{pmatrix}$ or $\begin{pmatrix} -1 & 2 \\ 0 & -1 \end{pmatrix}\begin{pmatrix} 5 \\ 8 \end{pmatrix}$
3(c)	Enlargement –2 Origin oe	**3**	**B1** for each
4(a)	452 or 452.2 to 452.4…	**2**	**M1** for $\left[\frac{1}{2}\times\right]\frac{4}{3}\times\pi\times 6^3$
	cm^3	**1**	
4(b)(i)(a)	400 or 399.6 to 399.9	**6**	**B3** for [CD =] $\sqrt{72.96}$ or [angle CBD =] 58.7 or 58.66 to 58.67 or **M2** for $\sqrt{10^2 - 5.2^2}$ oe or [CBD =] $\cos^{-1}\left(\frac{5.2}{10}\right)$ oe or **M1** for $(CD)^2 + 5.2^2 = 10^2$ oe or cos [CBD] = $\frac{5.2}{10}$ oe or sin [CDB] = $\frac{5.2}{10}$ oe **M1dep** for $\frac{5.2\times \textit{their CD}}{2}$ oe or $\frac{1}{2}$ × 5.2 ×10 × sin(*their CBD*) oe **M1** for *their* area × 18 oe
4(b)(i)(b)	14.6 or 14.62 to 14.63…	**4**	**M3** for sin BEC = $\frac{5.2}{\sqrt{10^2+18^2}}$ oe or **M2** for [BE=] $\sqrt{10^2+18^2}$ oe seen or [EC =] $\sqrt{18^2+10^2-5.2^2}$ oe seen or **M1** for [BE^2 =] $10^2 + 18^2$ oe seen or [EC^2=] $18^2 + 10^2 - 5.2^2$ seen
4(b)(ii)	125 or 124.9 to 125.0…	**3**	**B2** for 55[.0…] seen or **M2** for 180 – $\tan^{-1}\left(\frac{10}{7}\right)$ oe or cos EGB = $\frac{11^2+(10^2+7^2)-(10^2+18)^2}{2\times 11\times\sqrt{10^2+7^2}}$ oe or **M1** for tan[ ] = $\left(\frac{10}{7}\right)$ oe or for $(10^2 + 18^2) = 11^2 + (10^2 + 7^2) - 2\times 11\times$ $\sqrt{10^2+7^2}$ cos EGB oe

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Question	Answer	Marks	Partial Marks
5(a)	3.5, 15, 3.9	**3**	**B1** for each
5(b)	Correct graph	**5**	**B4** for correct curves but branches joined or touching y-axis or **B3FT** 10 or 11 points or **B2FT** for 8 or 9 points or **B1FT** for 6 or 7 points **B1indep** two separate branches not touching or crossing y-axis
5(c)	0.5 to 0.6 and 1.3 to 1.6	**2**	**B1** for each or both correct but in reverse order
5(d)	1	**1**	
5(e)(i)	$y = 3x + 1$ ruled and 0.3 to 0.49	**3**	**B2** for correct ruled line that crosses *their* curve or **B1** for $y = 3x + 1$ soi or freehand line or ruled line with gradient 3 or with y – intercept at 1 (but not $y = 1$)
5(e)(ii)	[a =] –6 [b =] –2 [c =] –4	**3**	**M2** for $x^4 + 2 - 4x = 6x^3 + 2x^2$ or better seen or **B1** for each correct value to a maximum of 2 marks If 0 scored, **SC1** for answer [a =] 6,[b =] 2 and [c =] 4 or for $x^5 + 2x - 4x^2 = 6x^4 + 2x^3$ or better
6(a)(i)	13.9[0…] from cosine rule	**4**	**M2** for $8^2 + 13^2 - 2 \times 8 \times 13\cos 79$ or **M1** for $\cos 79 = \frac{13^2 + 8^2 - BC^2}{2 \times 8 \times 13}$ **A1** for 193 ....
6(a)(ii)	66.6 or 66.60… to 66.65 from sine rule	**3**	**M2** for [$\sin ACB$ =] $\frac{13 \times \sin 79}{their(a)(i)}$ or **M1** for $\frac{\sin ACB}{13} = \frac{\sin 79}{their(a)(i)}$ oe
6(b)(i)	$\frac{1}{2}(x+4)(4x-5)\sin 30 = 70$	**M1**	
	$4x^2 + 16x - 5x - 20 = 280$	**M2**	**Dep on M1** **B1** for $4x^2 + 16x - 5x - 20$ or better
	Leading to $4x^2 + 11x - 300 = 0$	**A1**	with no errors or omissions seen

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Question	Answer	Marks	Partial Marks
6(b)(ii)	$\frac{-11 \pm \sqrt{11^2 - 4 \times 4 \times -300}}{2 \times 4}$	**B2**	**B1** for $\sqrt{11^2 - 4(4)(-300)}$ or better or for $\frac{-11+\sqrt{q}}{2\times 4}$ or $\frac{-11-\sqrt{q}}{2\times 4}$
	–10.14 and 7.39	**B2**	**B1** for each or **SC1** for final answers –10.1 or –10.144 to –10.143 **and** 7.4 or 7.393 to 7.394 or –10.14 **and** 7.39 seen in working or for –7.39 **and** 10.14 as final answer
6(b)(iii)	11.4 or 11.39…	**1**	**FT** *their* positive root + 4
7(a)(i)	13	**1**	
7(a)(ii)	3	**2**	**M1** for $\text{h}\left(\frac{10}{30}\right)$ oe soi or $27^{\frac{10}{x}}$
7(a)(iii)	$\frac{7-x}{2}$ oe final answer	**2**	**M1** for $x = 7 - 2y$ or $y - 7 = -2x$ or $7 - y = 2x$ or $-\frac{y}{2} = -\frac{7}{2} + x$ oe
7(b)	0.75 oe final answer	**3**	**M1** for $\frac{10}{2x+1} = 4$ **M1** for $10 = 8x + 4$ or better
7(c)	$\frac{70-19x}{x(7-2x)}$ or $\frac{70-19x}{7x-2x^2}$ final answer	**3**	**M1** for $x + 10(7 - 2x)$ or better isw **B1** for common denominator $x(7 - 2x)$ oe isw
7(d)	3 final answer	**1**	
8(a)(i)	$\frac{m-7}{5}$ oe final answer	**2**	**M1** for $5p = m - 7$ or $p + \frac{7}{5} = \frac{m}{5}$
8(a)(ii)	$[\pm]\sqrt{\frac{y^2-h}{2}}$ or $[\pm]\sqrt{\frac{h-y^2}{-2}}$ oe final answer	**3**	**M1** for first correct step isolate term in p or divide by ±2 **M1** for second correct step FT *their* first step
8(b)(i)	$\begin{pmatrix} 0 \\ 5 \end{pmatrix}$	**1**	
8(b)(ii)	$\begin{pmatrix} -3 \\ -1 \end{pmatrix}$	**1**	

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Question	Answer	Marks	Partial Marks
8(b)(iii)	3.22 or 3.216... to 3.220...	**6**	**B3** for [angle AOB =] 36.8 or 36.9 or 36.84 to 36.87 or **M2** for tan[AOB] = $\frac{3}{4}$ oe or for [AOB =]2 × $\sin^{-1}$ $\left(\frac{\sqrt{(5-4)^2+(0--3)^2}}{10}\right)$ oe or for cos [AOB =] $\frac{5^2+5^2-\left(\sqrt{(5-4)^2+(0--3)^2}\right)^2}{2\times5\times5}$ oe or **M1** for recognition of right-angle with perpendicular from B to OA or x-axis or for [AB^2 =] $(5-4)^2+(0--3)^2$ or better oe or (*their* AB)^2 = $5^2 + 5^2 - 2 \times 5 \times 5 \times \cos OAB$ oe **M2** for $\frac{\textit{their}\text{ angle } AOB}{360}\times2\times\pi\times5$ oe or **M1** for radius = 5 soi
9(a)	171 or 171.0…	**3**	**M2** for $\frac{7.6}{160}\times60\times60$ oe or **M1** for $\frac{7.6}{160}$ or $\frac{7.6}{2\frac{2}{3}}$ or $\frac{7.6}{2\text{ min }40\text{ sec}}$ If 0 scored, **SC1** for answer 189 or 188.6 to 188.7
9(b)(i)	77 [min] 20 [s]	**4**	**M3** for $\frac{32}{12}\times29$ oe or **B2** for 4640 or 1.29 or 1.288 to 1.289, $\frac{58}{45}$ oe or 32 laps or 29 laps or **M2** for $2^5\times 5 \times 29$ oe or **M1** for 2 m 40 sec ÷ (2 m 40 sec – 2 m 25 sec) soi for 2 m 25 sec ÷ (2 m 40 sec – 2 m 25 sec) soi or for an attempt to find LCM or 23 200 seen or correctly find prime factors of 145 or 160 or for $\frac{7.6}{145}$ or $\frac{7.6}{2\frac{5}{12}}$ or $\frac{7.6}{2\text{ min }25\text{ sec}}$ oe, provided SC1 not earned in part (a)
9(b)(ii)	220.4	**2**	**M1** for *their* (b)(i) ÷ 2min 40 sec [× 7.6] oe or *their* (a) × *their* (b)(i) ÷ 60 oe

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Cambridge International General Certificate of Secondary Education

MATHEMATICS **0580/43**

Paper 4 (Extended) **October/November 2019**

MARK SCHEME

Maximum Mark: 130

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **8** printed pages.

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Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

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Abbreviations

cao	correct answer only
dep	dependent
FT	follow through after error
isw	ignore subsequent working
oe	or equivalent
SC	Special Case
nfww	not from wrong working
soi	seen or implied

Question	Answer	Marks	Partial Marks
1(a)(i)	1254	**2**	**M1** for 342 ÷ 3
1(a)(ii)	27.3 or 27.27…	**1**	
1(b)	867	**2**	**M1** for $1020\times\frac{15}{100}$ oe or $1020\times\left(1-\frac{15}{100}\right)$ oe
1(c)	4.5[0]	**3**	**M2** for $\frac{79.5[0]}{100+6}[\times 6]$ oe or $\frac{79.5[0]}{100+6}\times 100$ oe or **M1** for 79.5[0] associated with 106[%]
1(d)	22.6 or 22.58… nfww	**4**	**M1** for $\frac{45}{20}$ or better and **M2** for $\frac{60+45}{\textit{their}\ 2\text{h}\ 24\text{min}+\textit{their}\ \frac{45}{20}}$ or **M1** for *their* $\frac{45}{20}$ + *their* 2h 24min
1(e)	91.6[0] to 91.61	**3**	**M2** for $480\times\left(1+\frac{2.1}{100}\right)^4-430$ oe OR **M1** for $480\times\left(1+\frac{2.1}{100}\right)^4$ oe **A1** for 522, 521.6[0] to 521.61
1(f)	112.8125	**2**	**B1** for 2.5 or 9.5 seen

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Question	Answer	Marks	Partial Marks
2(a)(i)	$2a + a + 2b + 3b + 10 = 180$ leading to $3a + 5b = 170$ without error or omission	**1**	
2(a)(ii)	$8a + 3a + 2b + b + 50 + 4b - 2a = 360$ leading to $9a + 7b = 310$ without error or omission	**1**	
2(a)(iii)	Correct method to eliminate one variable	**M1**	
	[a =]15 [b=]25	**A2**	**A1** for each correct value If 0 scored, **SC1** for two values that satisfy one of the equations or for two correct answers with no/incorrect working
2(a)(iv)	30	**1**	
2(b)	-1.5 or $-1\frac{1}{2}$ or $-\frac{3}{2}$	**2**	**M1** for $6x = -12 + 3$ or better
2(c)	$\frac{3x+3}{2}$ oe final answer	**3**	**M1** for $8x - 2y = 5x - 3$ or $4x - y = \frac{1}{2}(5x - 3)$ **M1FT** for isolating the y term correctly
2(d)	$9x^6$	**2**	**M1** for $(3x^3)^2$ or $\left(729x^{18}\right)^{\frac{1}{3}}$ seen or for $9x^k$ or kx^6 as final answer
2(e)	$\frac{x}{x-5}$ final answer nfww	**3**	**M1** for $x(x + 5)$ **M1** for $(x - 5)(x + 5)$
3(a)	5, –3, 21	**3**	**B1** for each
3(b)	Fully correct curve	**4**	**B3 FT** for 9 or 10 points or **B2 FT** for 7 or 8 points or **B1 FT** for 5 or 6 points
3(c)	–2.9 to –2.7 0 1.7 to 1.9	**2**	**B1** for 2 correct values

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Question	Answer	Marks	Partial Marks
3(d)	Tangent ruled at $x = 2$	**B1**	
	10 to 14	**B2**	Dep on correct tangent or close attempt at tangent at $x = 2$ **M1** for rise/run **also dep on** correct tangent drawn or close attempt at tangent Must see correct or implied calculation from a drawn tangent
3(e)	6	**1**	
4(a)	36.8 or 36.84…	**2**	**M1** for $\frac{h}{107} = \tan 19$ or $\frac{h}{\sin 19} = \frac{107}{\sin 71}$ oe or better
4(b)	42.1 or 42.12… from cosine rule	**4**	**M2** for $[\cos BAC =]\frac{158^2 + 132^2 - 107^2}{2 \times 158 \times 132}$ or **M1** for implicit version **A1** for $[\cos BAC =]\frac{30939}{41712}$ or 0.7417…
4(c)	35.8 or 35.84… from sine rule	**3**	**M2** for $\frac{86 \times \sin 116}{132}[= 0.58557...]$ or **M1** for $\frac{\sin CAD}{86} = \frac{\sin 116}{132}$ oe
4(d)	9670 or 9669 to 9676	**3**	**M2** for $\frac{1}{2} \times 158 \times 132 \times \sin(\textit{their}\ (\text{b}))$ oe and $\frac{1}{2} \times 86 \times 132 \times \sin(64 - \textit{their}\ (\text{c}))$ oe or **M1** for either area
4(e)	214.2 or 214.1… or 214	**2**	**M1** for [180 +]70–*their* (c) oe
5(a)(i)	52	**1**	
5(a)(ii)	36	**1**	
5(a)(iii)	26	**1**	**FT** 62 – *their* (a)(ii) evaluated correctly
5(b)	Valid comment	**1**	Strict **FT** *their* (a)(iii), e.g. distances for females are more varied
5(c)	$\frac{11}{20}$ oe	**2**	**M1** for 27 written or answer of $\frac{27}{60}$ oe
5(d)(i)	[18 9] 14 12 5 [2]	**2**	**B1** for 1 correct value

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Question	Answer	Marks	Partial Marks
5(d)(ii)	48.75 nfww	**4**	**M1** for midpoints soi **M1** for use of $\sum fx$ with *their* frequencies **M1** (dep on 2nd M1) for $\sum fx \div$ (60 or by *their* $\sum f$)
6(a)(i)	Angle *ABC*=52 nfww	**B1**	ALTERNATIVE [Reflex] angle *AOC* = 256
	Opposite angles in cyclic quad oe Angles in opposite segments	**B1**	Angle at centre=2 × angle at circumference/arc
	[Angle *AOC*=104] Angle at centre=2 × angle at circumference/arc nfww	**B1**	Angles around a point
6(a)(ii)	22 nfww	**2**	**B1** for angle *OAC* = 38 or angle *CAD* = 24
6(a)(iii)	28	**1**	
6(a)(iv)	36.6 or 36.62 to 36.63 nfww	**3**	**B2** for 7.4 or 17.42 to 17.43 or **M2** for $9.6\times 2+\frac{104}{360}\times 2\times\pi\times 9.6$ or **M1** for $\frac{104}{360}\times 2\times\pi\times 9.6$
6(b)(i)	81	**3**	**M2** for $\frac{A}{36}=\left(\sqrt[3]{\frac{2187}{648}}\right)$ oe or better or for $A\times\frac{648}{36}\times\sqrt[3]{\frac{2187}{648}}=2187$ oe or better or **M1** for $\frac{A^3}{36^3}=\frac{2187^2}{648^2}$ oe or $\sqrt[3]{\frac{2187}{648}}$ or $\sqrt[3]{\frac{648}{2187}}$
6(b)(ii)	8.05 or 8.051 to 8.052…	**3**	**M2** for $\left[r^3=\right]\frac{2187\times 3}{4\times\pi}$ oe or **M1** for $\frac{4\pi r^3}{3}=2187$ **SC2** for $\frac{648\times 3}{4\times\pi}$ or **SC1** for $\frac{4\pi r^3}{3}=648$
7(a)	Reflection $y=-1$	**2**	**B1** for each
7(b)(i)	Image at (–6, 5) (–6, 7) (–5, 7) (–4, 5)	**2**	**B1** for translation by $\begin{pmatrix}-3\\k\end{pmatrix}$ or $\begin{pmatrix}k\\4\end{pmatrix}$

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Question	Answer	Marks	Partial Marks
7(b)(ii)	Image at (1, –1) (3, –1) (3, –3) (2, –3)	**2**	**B1** for shape correct size and orientation but wrong position
7(b)(iii)	Image at (1, 2) (1, 6) (3, 6) (5, 2)	**2**	**B1** for shape correct size and orientation, wrong position
8(a)(i)	$\frac{2}{5}$ oe	**2**	**M1** for $\frac{4}{6}\times\frac{3}{5}$
8(a)(ii)	$\frac{3}{5}$ oe	**1**	**FT** 1 – *their* $\frac{12}{30}$ oe
8(b)	$\frac{5}{7}$ oe nfww	**4**	**M3** for $\frac{2}{7}+\frac{5}{7}\times\frac{2}{6}+\frac{5}{7}\times\frac{4}{6}\times\frac{2}{5}$ oe or for $1-\frac{5}{7}\times\frac{4}{6}\times\frac{3}{5}$ oe or **M1** for each of $\frac{5}{7}\times\frac{2}{6}$ and $\frac{5}{7}\times\frac{4}{6}\times\frac{2}{5}$ oe or completed tree diagram with appropriate probabilities shown
9(a)(i)	5	**1**	
9(a)(ii)	1	**2**	**M1** for h(0) or 3^{9-x^2} or better
9(a)(iii)	$9 – 4x^2$ final answer	**1**	
9(a)(iv)	$15 – 2x^2$ final answer	**2**	**M1** for $2(9 – x^2) –3$ or better
9(b)	$\frac{x+3}{2}$ final answer	**2**	**M1** for $x = 2y – 3$ or $y + 3 = 2x$ or better or $\frac{y}{2}=x-\frac{3}{2}$
9(c)	1.8 or $1\frac{4}{5}$ or $\frac{9}{5}$	**2**	**M1** for $10x-15=3$ or $2x-3=\frac{3}{5}$
9(d)	–1 and 4 nfww	**4**	**M1** for $9 – (2x – 3)^2= –16$ **A1** for $4x^2 – 12x – 16[= 0]$ oe **M1** (dep on first M1) for correct factors or use of formula or completing the square for their 3-term quadratic OR **M1** for $9 – y^2= –16$ **A1** for $y^2 = 25$ **M1** (dep on first M1) for $2x – 3= \pm5$
9(e)	$\frac{1}{9}$	**1**	

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Question	Answer	Marks	Partial Marks
10	$x + 1 - 2x = 3x(x + 1)$	**M2**	**M1** for a common denominator of $x(x + 1)$ seen or attempt to multiply through by denominators or for $\frac{x+1-2x}{x(x+1)} = 3$
	$3x^2 + 4x - 1[= 0]$ oe nfww	**A1**	
	$[x =]\frac{-4 \pm \sqrt{4^2 - 4 \times 3 \times (-1)}}{2 \times 3}$	**B2**	**B1FT** for $\sqrt{4^2 - 4 \times 3 \times (-1)}$ or better or for $\left(x + \frac{2}{3}\right)^2$ **B1FT** for $\frac{-4+\sqrt{q}}{2 \times 3}$ or $\frac{-4-\sqrt{q}}{2 \times 3}$ or for $-\frac{2}{3} \pm \sqrt{\frac{1}{3} + \left(\frac{2}{3}\right)^2}$
	–1.55 and 0.22 final answers	**B2**	**B1** for each or **B1** for –1.548 to –1.549 **and** 0.215… or for –1.55 **and** 0.22 seen in working or for –0.22 **and** 1.55 as final answer or for –1.5 or –1.54 **and** 0.2 or 0.21 as final answer
11(a)(i)	8**b** – 4**a** oe	**1**	
11(a)(ii)	6**b**	**1**	
11(a)(iii)	6**b** – 2**a** or 2(3**b** – **a**)	**1**	**FT** –2**a** + *their* (a)(ii)
11(b)	2 : 1 oe final answer	**3**	Dep on correct $\overrightarrow{BC}$ or correct $\overrightarrow{AC}$ seen **B2** for $\overrightarrow{BC}$ = 4**b**–2**a** or **M1** for a correct route for $\overrightarrow{BC}$ in terms of **a** and **b** or for a correct route for $\overrightarrow{AC}$ in terms of **a** and **b** If no/incorrect working seen then **SC1** for final answer of 2 : 1 (oe)

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CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

MATHEMATICS **0580/11**

Paper 1 (Core) **October/November 2019**

1 hour

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 56.

This document consists of **10** printed pages and **2** blank pages.

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[Turn over

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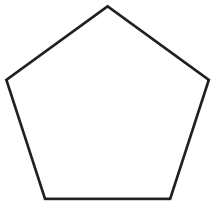
1 Change 4.6 metres to centimetres.

..... cm [1]

2



Write down the order of rotational symmetry of this regular pentagon.

..... [1]

3 Work out 5% of $25.

$ ..... [1]

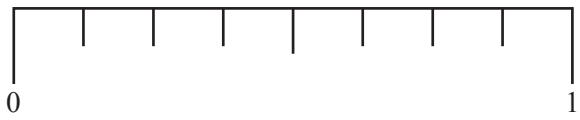
4 Factorise $5p + pt$.

..... [1]

5 Rui has a bag containing 5 black pens, 8 red pens and 3 blue pens only.
He takes a pen out of the bag at random.

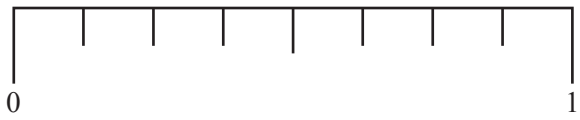
Draw an arrow (↓) on the probability scale to show the probability that Rui takes

(a) a red pen,



[1]

(b) a red pen or a blue pen.



[1]

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6 **(a)** Write 8473 correct to the nearest ten.

..... [1]

(b) Write 16.086 correct to 2 decimal places.

..... [1]

7 Write these in order of size, starting with the smallest.

$\frac{9}{19}$ $\frac{3}{7}$ 37% 0.43

..... < ..... < ..... < ..... [2]
smallest

8

The diagram shows the base of a triangle.
The lengths of the other two sides are 6 cm and 4 cm.

Using a ruler and compasses only, construct the other two sides of the triangle.
Show all your construction arcs. [2]

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9 Calculate.

$$\frac{16.379 - 0.879}{4.2} \times 1.241$$

Give your answer correct to 2 significant figures.

..... [2]

10 Share 518 in the ratio 2 : 5.

..... , ... [2]

11 Write 15 060

(a) in words,

..... [1]

(b) in standard form.

..... [1]

12 Simplify $5c - d - 3d - 2c$.

..... [2]

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13 Calculate the area of a circle with radius 12 cm.

..... cm^2 [2]

14 Levante changes 24 650 Hungarian forints to dollars.
The exchange rate is \$1 = 290 forints.

Calculate how many dollars Levante receives.

\$ ..... [2]

15 Paula invests \$600 at a rate of r% per year simple interest.
At the end of 10 years, the total interest earned is \$90.

Find the value of r.

r = ... [2]

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16 **Without using a calculator**, work out $\frac{5}{16} \times 1\frac{1}{7}$.

You must show all your working and give your answer as a fraction in its simplest form.

..... [2]

17 Simplify $2x^3 \times 3x^2$.

..... [2]

18 Complete the table.

Fraction		Decimal		Percentage
$\frac{3}{4}$	=	0.75	=	
	=	0.2	=	20%
$\frac{2}{25}$	=		=	8%

[3]

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19

27 14 8 93 32 55 14 38 73 47

From this list of numbers find

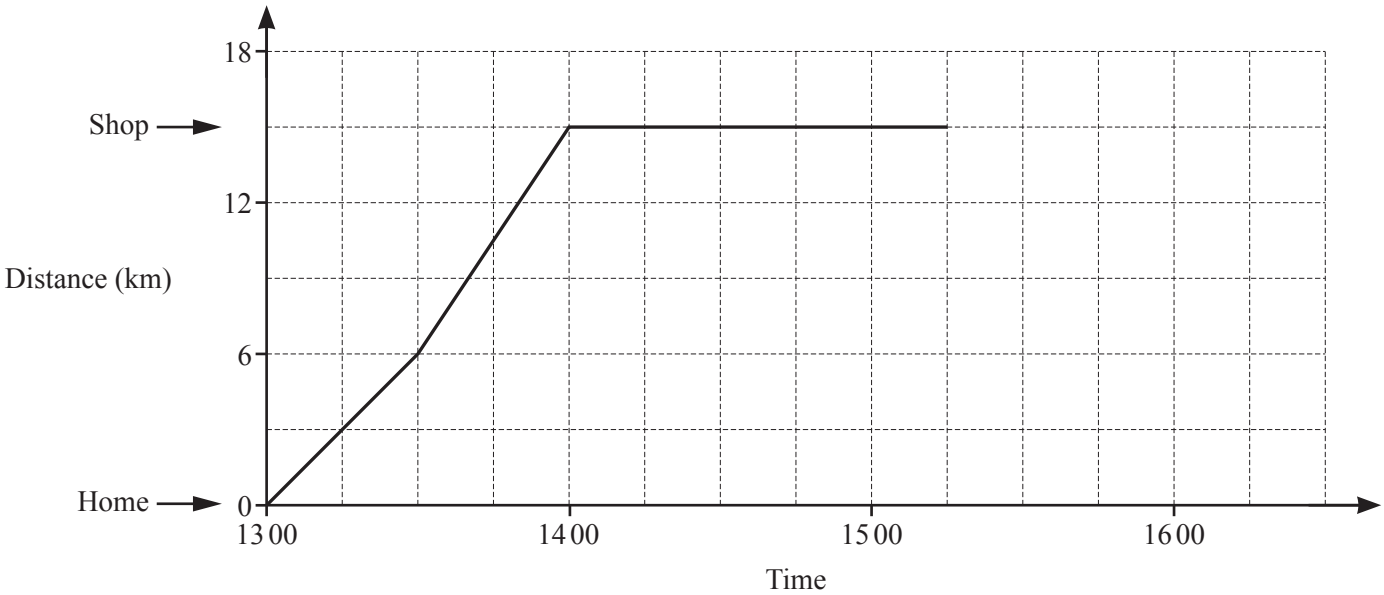
(a) the median,

..... [2]

(b) the range.

..... [1]

20 Juan travels from his home to a shop.
The travel graph shows his journey.



(a) Find the distance Juan travels to the shop.

..... km [1]

(b) Write down what happens at 1400.

..... [1]

(c) Juan travels home at a constant speed of 15 km/h.
He leaves the shop at 1515.

Complete the travel graph. [1]

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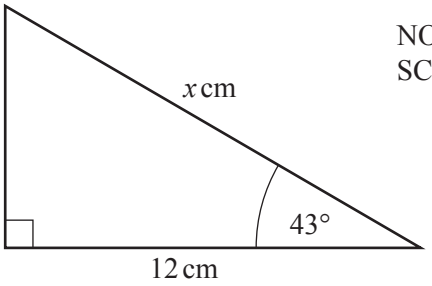
21



Use trigonometry to calculate the value of x.

$x =$ ..... [3]

22 Solve.

(a) $8(w + 11) = 120$

$w =$ ..... [2]

(b) $\frac{x-2}{3} = 3$

$x =$ ..... [2]

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23 Solve the simultaneous equations.
You must show all your working.

$$5x + 4y = 10$$
$$7x - 6y = 43$$

$x =$ .....

$y =$ ..... [4]

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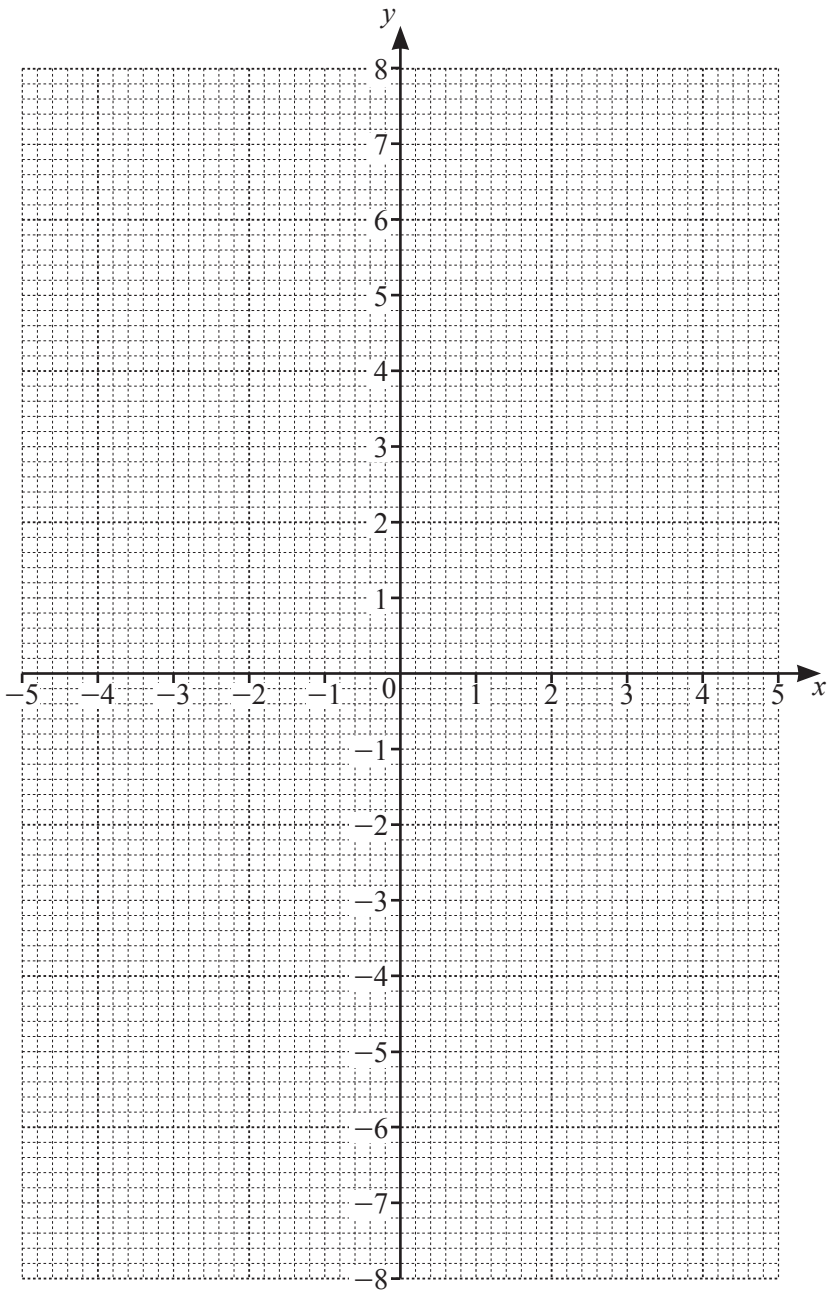
24 **(a)** Complete the table of values for $y = \frac{8}{x}$.

x	-5	-4	-3	-2	-1		1	2	3	4	5
y		-2	-2.7	-4	-8		8	4	2.7		

[2]

(b) On the grid, draw the graph of $y = \frac{8}{x}$ for $-5 \leqslant x \leqslant -1$ and $1 \leqslant x \leqslant 5$.



[4]

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MATHEMATICS **0580/12**

Paper 1 (Core) **October/November 2019**

1 hour

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 56.

This document consists of **12** printed pages.

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[Turn over

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1 Simplify $5t + 4t - 2t$.

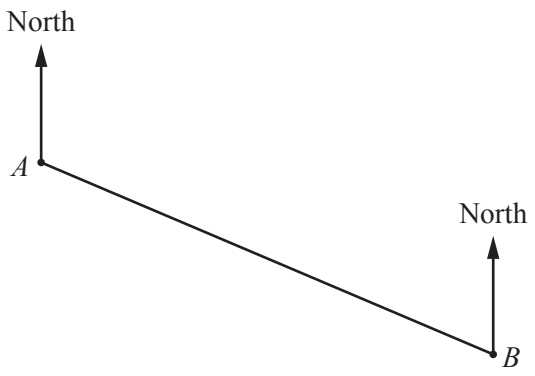
..... [1]

2 The lowest temperature recorded at Scott Base in Antarctica is $-57.0\,°C$.
The highest temperature recorded at Scott Base is $63.8\,°C$ more than this.

What is the highest temperature recorded at Scott Base?

..... °C [1]

3



Measure the bearing of B from A.

..... [1]

4 Find the value of

(a) 24^2,

..... [1]

(b) $\sqrt[3]{2197}$.

..... [1]

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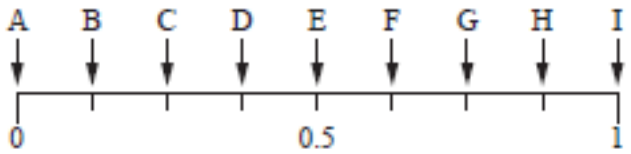
5 A bag contains 3 green balls, 4 red balls and 1 blue ball only.
Matt takes a ball from the bag at random.

Some probabilities are marked on the probability scale.



Write down the letter that shows the probability that

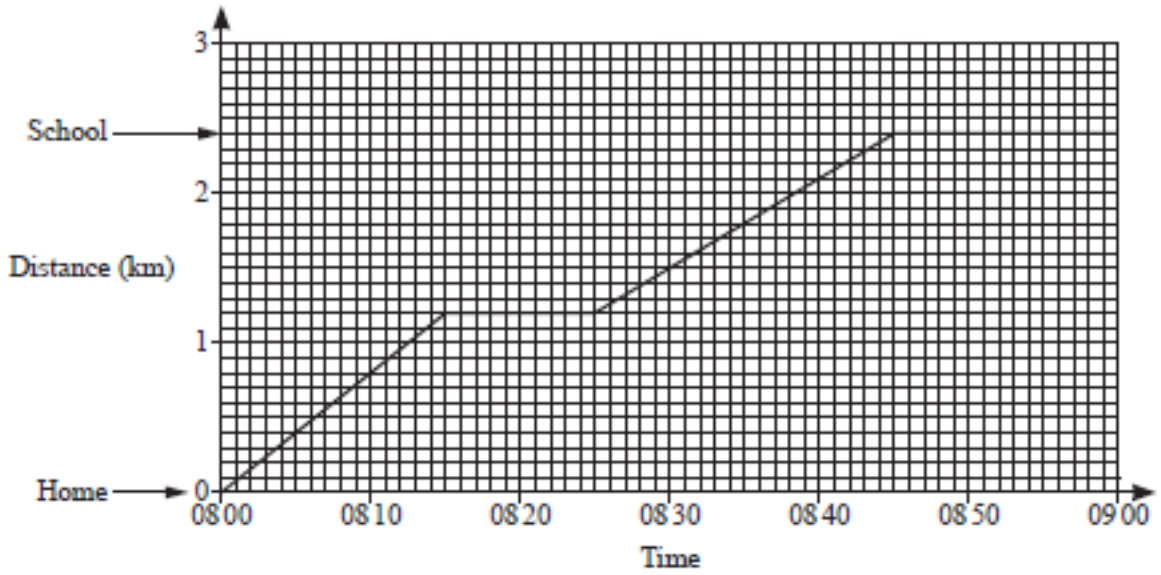
(a) Matt takes a red ball,

..... [1]

(b) Matt does **not** take a blue ball.

..... [1]

6 Sara walks from home to school.
The travel graph shows her journey.



(a) Sara stops at a shop on her way to school.

Find the distance of the shop from her home.

..... km [1]

(b) School starts at 08 55.

Find the number of minutes between the time Sara arrives at school and the time school starts.

..... min [1]

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7 Write these in order of size, starting with the smallest.

$\frac{7}{8}$ $\frac{5}{7}$ 0.8 78%

..... < ..... < ..... < ..... [2]
smallest

8 The table shows how children in Ivan's class travel to school.

Travel to school	Number of children
Walk	12
Car	7
Bicycle	9
Bus	4

Ivan wants to draw a pie chart to show this information.

Find the sector angle for children who walk to school.

..... [2]

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9 Rashid changes 30 000 rupees to dollars when the exchange rate is \$1 = 68.14 rupees.

How many dollars does he receive?

\$ ..... [2]

10 Complete the statements.

3.5 kg = ... g

1.4 m^2 = ... cm^2 [2]

11 Kiran leaves home at 9.45 am.
She drives 135 km to visit a friend.
She arrives at her friend's house at 11.15 am.

Work out her average speed in km/h.

..... km/h [2]

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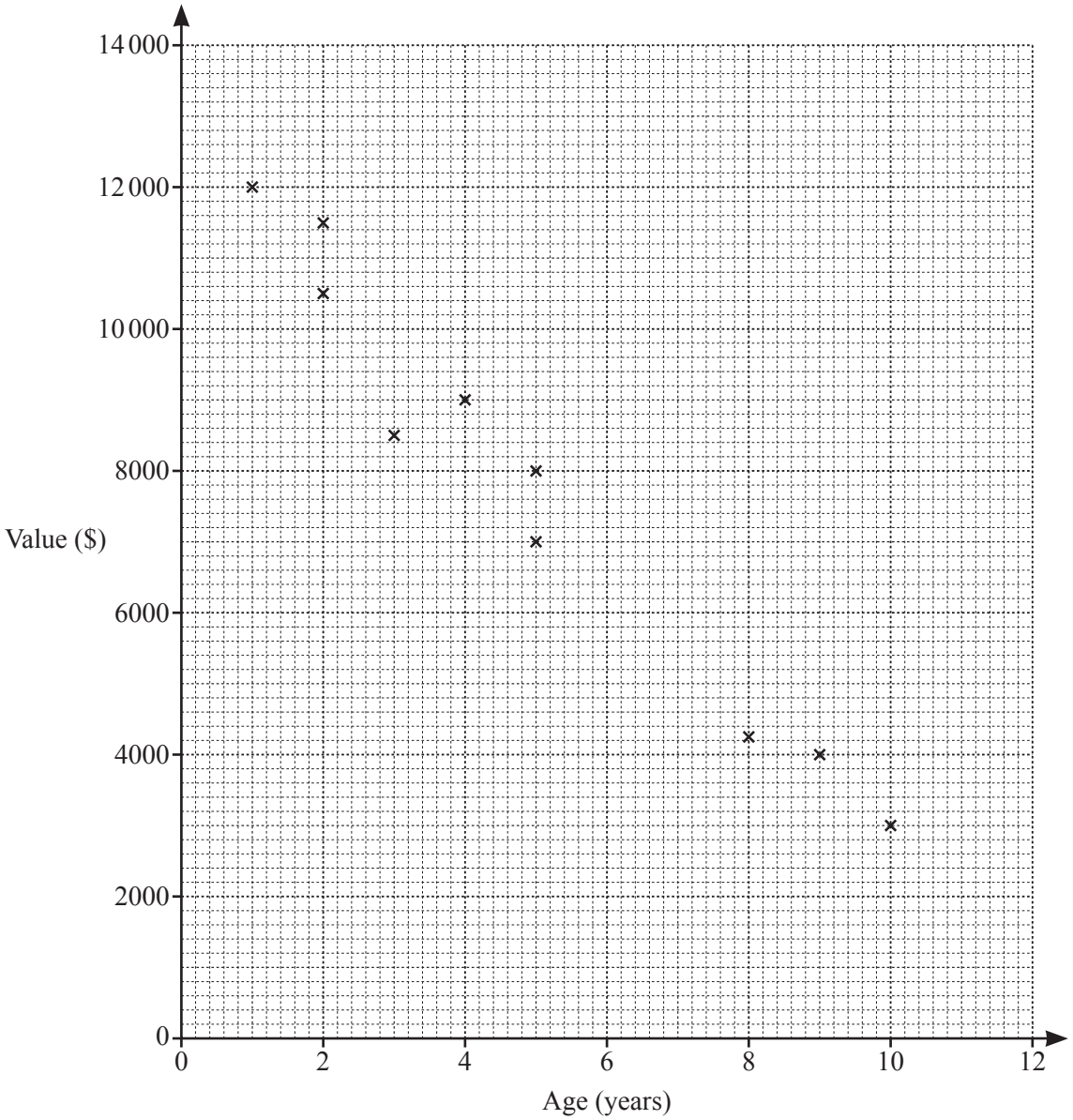
12 The scatter diagram shows the age and value of each of ten cars, all of the same model.



By drawing a line of best fit, estimate the value of a car that is 6 years old.

$ ..... [2]

13 Find the value of

(a) $6^0 + 6^2$,

..... [1]

(b) 5^{-4}.

..... [1]

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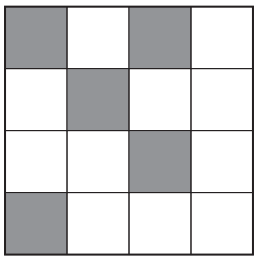
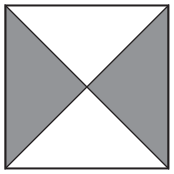
14 **(a)**



Shade two more small squares to give a pattern with exactly one line of symmetry. [1]

(b)



Complete the description of this pattern.

The pattern has ..... lines of symmetry

and order of rotational symmetry ..... [2]

15 These are the number of texts sent one day by each of 10 students.

18 13 15 8 9 17 12 8 6 14

(a) Write down the mode.

..... [1]

(b) Calculate the mean.

..... [2]

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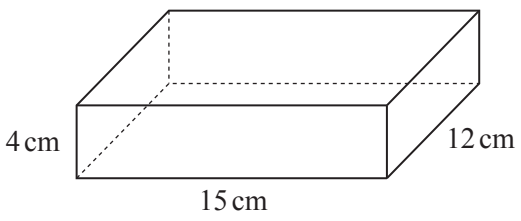
16



NOT TO SCALE

The diagram shows a cuboid measuring 15 cm by 12 cm by 4 cm.

Calculate the surface area of the cuboid.

..... cm^2 [3]

17 **Without using a calculator**, work out $3\frac{5}{8} - 1\frac{2}{3}$.
You must show all your working and give your answer as a mixed number in its simplest form.

..... [3]

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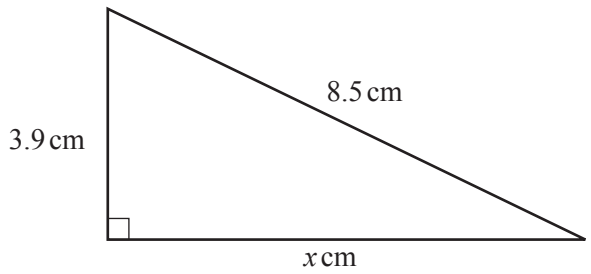
18 Javier invests \$750 for 3 years at a rate of 1.8% per year compound interest.

Calculate the value of his investment at the end of the 3 years.

\$ ..... [3]

19



NOT TO SCALE

The diagram shows a right-angled triangle.

Calculate the value of x.

x = ... [3]

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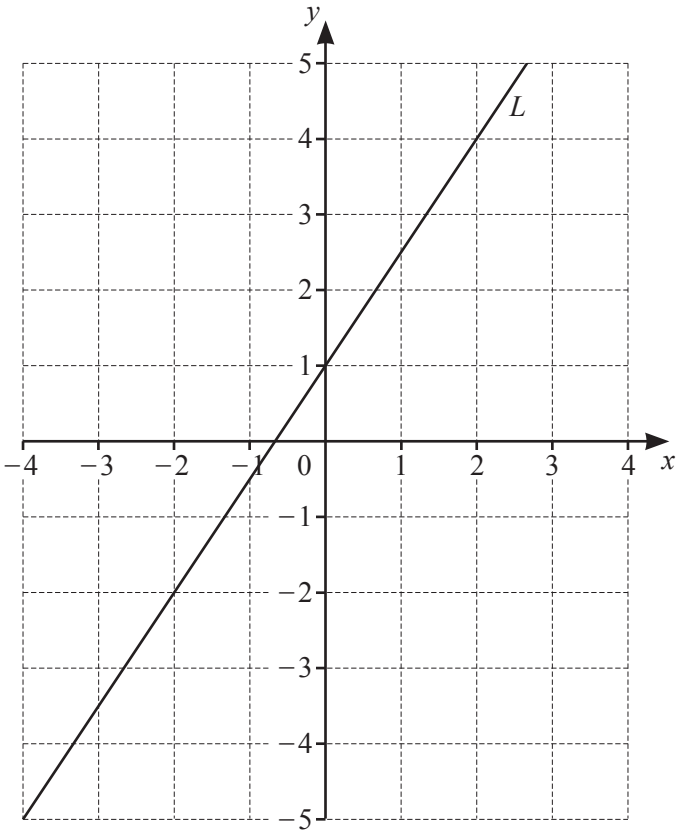
20 The line L is shown on the grid.



(a) Find the gradient of the line L.

..... [2]

(b) Find the equation of the line L in the form $y = mx + c$.

$y =$ ..... [1]

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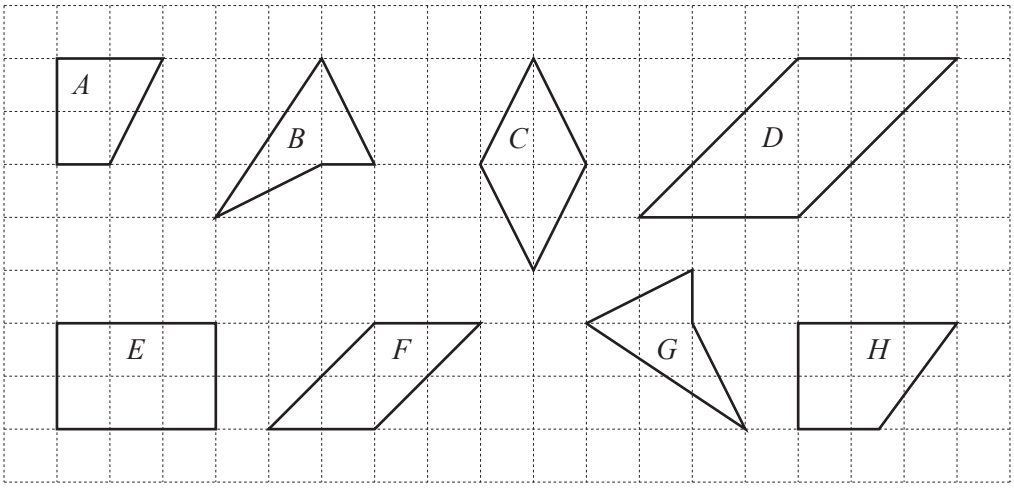
21



The diagram shows some quadrilaterals.

Complete the statements.

(a) Quadrilateral ..... is a rhombus. [1]

(b) Quadrilateral *A* is a ..... [1]

(c) Quadrilaterals ..... and ..... are congruent. [1]

(d) Quadrilaterals ..... and ..... are similar. [1]

22 Esme buys x magazines at \$2.45 each and y cards at \$3.15 each.

(a) Write down an expression, in terms of x and y, for the total cost, in dollars, of the magazines and the cards.

\$ ..... [2]

(b) Esme spends \$60.55 in total.
She buys 8 magazines.

How many cards does she buy?

..... [2]

Question 23 is printed on the next page.

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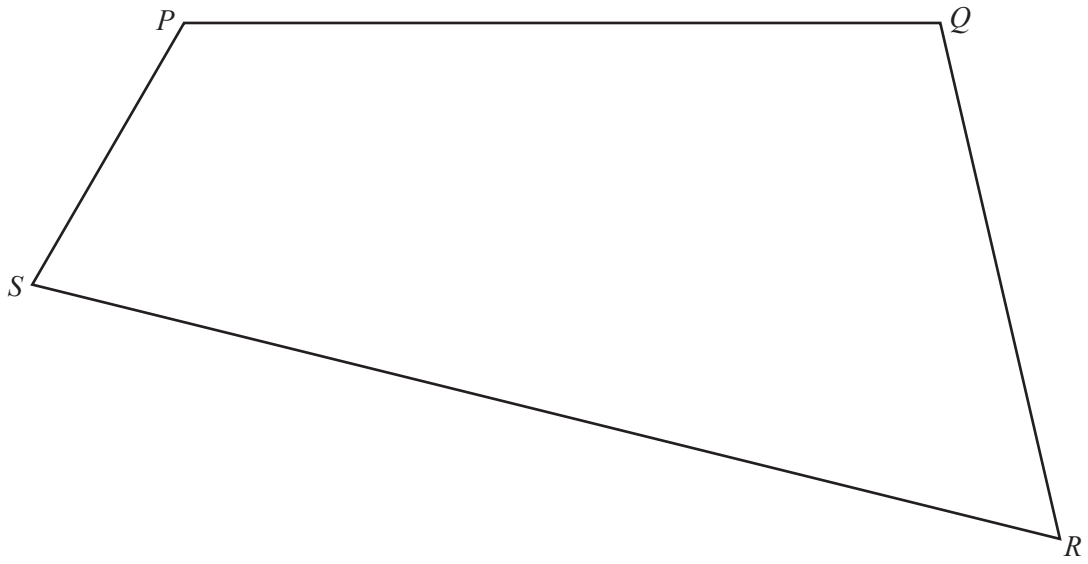
23 The diagram shows a scale drawing of Lei's garden, *PQRS*.
The scale is 1 centimetre represents 2 metres.



Scale: 1 cm to 2 m

Lei has a bird table in the garden that is

- equidistant from *PQ* and *QR*

and

- 13 m from *R*.

On the diagram, construct the position of the bird table.
Use a ruler and compasses only and show all your construction arcs. [4]

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MATHEMATICS **0580/13**

Paper 1 (Core) **October/November 2019**

1 hour

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

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For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 56.

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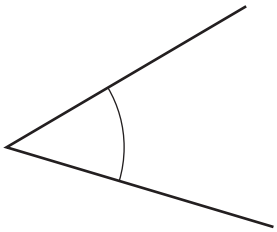
1 Write down the mathematical name of this type of angle.



..... [1]

2 Change 560 metres into kilometres.

..... km [1]

3 Write the number forty thousand three hundred in figures.

..... [1]

4 Factorise $12x + 15$.

..... [1]

5 Put one pair of brackets into each calculation to make it correct.

(a) $8 + 6 - 2 \times 5 = 28$ [1]

(b) $8 + 6 - 2 \times 5 = 60$ [1]

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6 **(a)** Write down the temperature that is 7 °C below −3 °C.

..... °C [1]

(b) Work out the difference in temperature between −4 °C and 4 °C.

..... °C [1]

7 Here is a list of numbers.

87 77 57 47 27

From this list, write down

(a) a cube number,

..... [1]

(b) a prime number.

..... [1]

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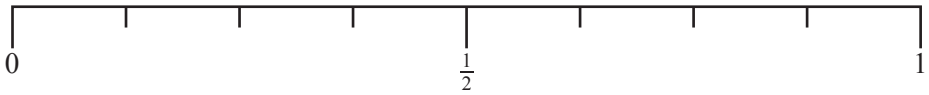
8 A bag contains 6 red balls and 10 blue balls only.

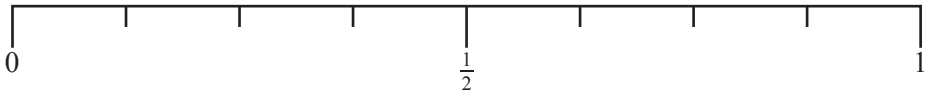
On the probability scale, draw an arrow (↓) to show the probability that a ball taken at random is

(a) blue,



[1]

(b) red or blue.



[1]

9 The price of a television is \$560.
This price is reduced by 18% in a sale.

Work out the sale price.

\$ ..... [2]

10 Calculate the circumference of a circle with radius 4.5 cm.

..... cm [2]

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11 Write in standard form.

(a) 72 000

..... [1]

(b) 0.0018

..... [1]

12 Expand and simplify $(x+3)(x+5)$.

..... [2]

13 **(a)** $x^3 \times x^6 = x^m$

Find the value of m.

$m =$ ..... [1]

(b) $\left(x^2\right)^n = x^{12}$

Find the value of n.

$n =$ ..... [1]

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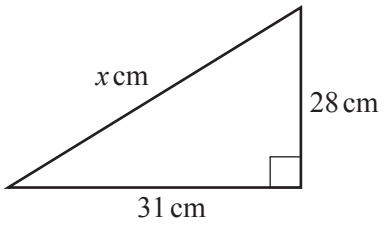
14 The diagram shows a right-angled triangle.



NOT TO SCALE

Show that the value of x is 41.8, correct to 3 significant figures.

[2]

15 Davina records the colour of each car passing her house one morning.

red	grey	black	red	grey
white	white	black	black	white
grey	red	grey	white	grey
black	grey	black	white	grey

(a) Complete the frequency table.
You may use the tally column to help you.

Colour of car	Tally	Frequency
Black		
Grey		
Red		
White		

[2]

(b) Write down the mode.

..... [1]

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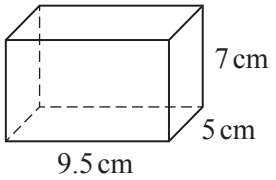
16 A cuboid measures 5 cm by 7 cm by 9.5 cm.



NOT TO SCALE

Work out the surface area of this cuboid.

..... cm^2 [3]

17 Work out.

(a) $\begin{pmatrix} -3 \\ 5 \end{pmatrix} + \begin{pmatrix} 2 \\ -4 \end{pmatrix}$

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(b) $\begin{pmatrix} 6 \\ 2 \end{pmatrix} - \begin{pmatrix} 1 \\ 5 \end{pmatrix}$

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(c) $4\begin{pmatrix} 2 \\ -5 \end{pmatrix}$

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

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18 Here is a list of ingredients to make 12 pancakes.

110 g	flour
2	eggs
200 ml	milk
50 g	butter

Complete the list of ingredients below to make 30 pancakes.

..... g	flour
.....	eggs
..... ml	milk
..... g	butter

[3]

19 The mean of three numbers is 150.
The numbers are 361, $2n$ and $(n-1)$.

Find the value of n.

$n =$ ..... [3]

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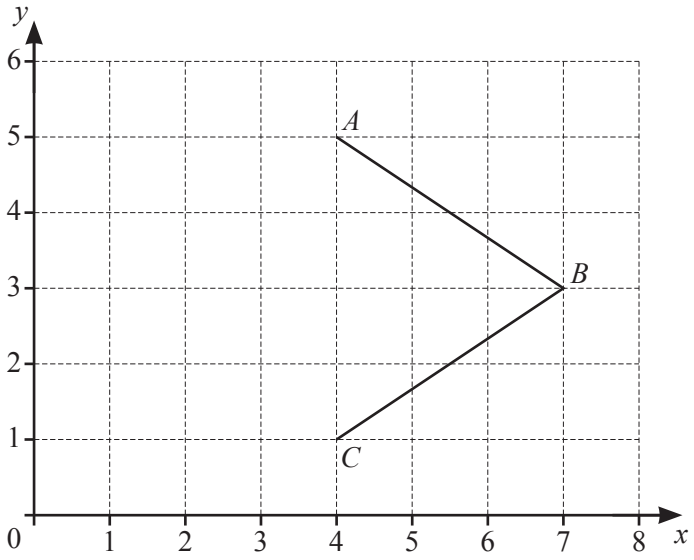
20



(a) Write down the co-ordinates of point B.

(..... , ...) [1]

(b) The quadrilateral $ABCD$ has $x = 4$ as a line of symmetry.

On the grid, plot point D. [1]

(c) Write down the mathematical name of quadrilateral $ABCD$.

..... [1]

(d) Write down the order of rotational symmetry of quadrilateral $ABCD$.

..... [1]

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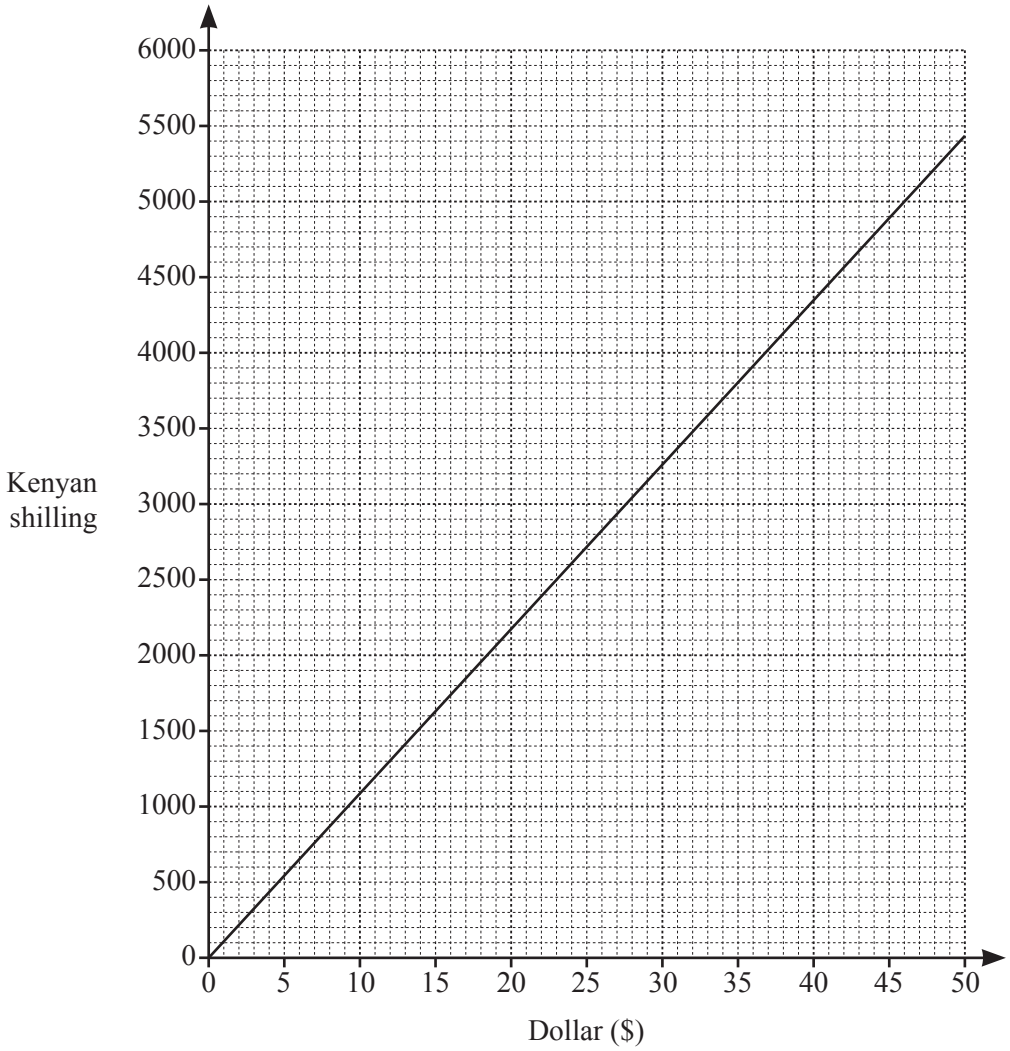
21 The diagram shows a conversion graph for dollars and Kenyan shillings.



(a) Use the graph to change 5000 shillings to dollars.

$..... [1]

(b) Explain how to use this graph to change $420 to shillings.

.....

..... [1]

(c) The exchange rate is now $1 = 90 shillings.

On the grid, draw another line to show this exchange rate. [2]

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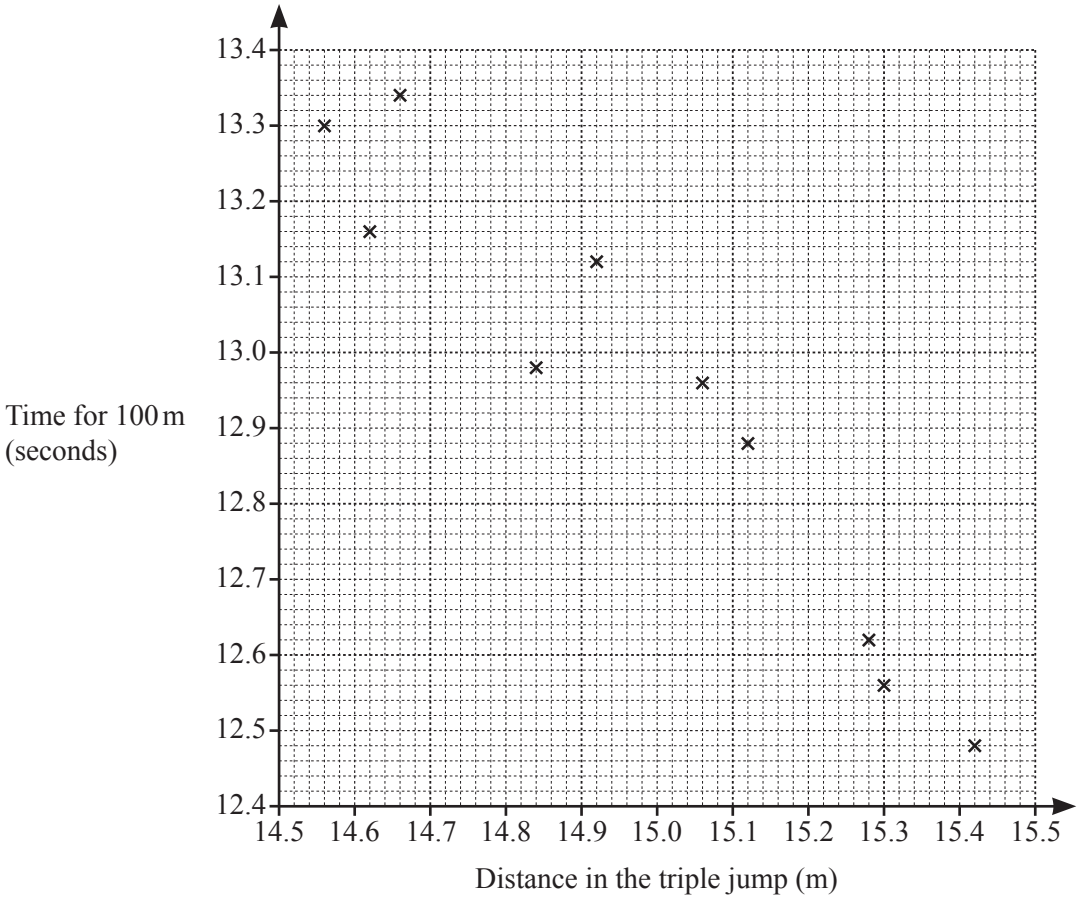
22 Ten athletes compete in both the 100 metre race and the triple jump.
Their results are shown in the scatter diagram.



(a) One of these athletes jumps 15.12 m in the triple jump.

Write down his time for the 100 metre race.

..... s [1]

(b) The values for two other athletes are shown in the table.

Distance in the triple jump (m)	14.74	15.2
Time for 100 m (seconds)	13.2	12.76

On the scatter diagram, plot these points. [1]

(c) On the scatter diagram, draw a line of best fit. [1]

(d) What type of correlation is shown in the scatter diagram?

..... [1]

Question 23 is printed on the next page.

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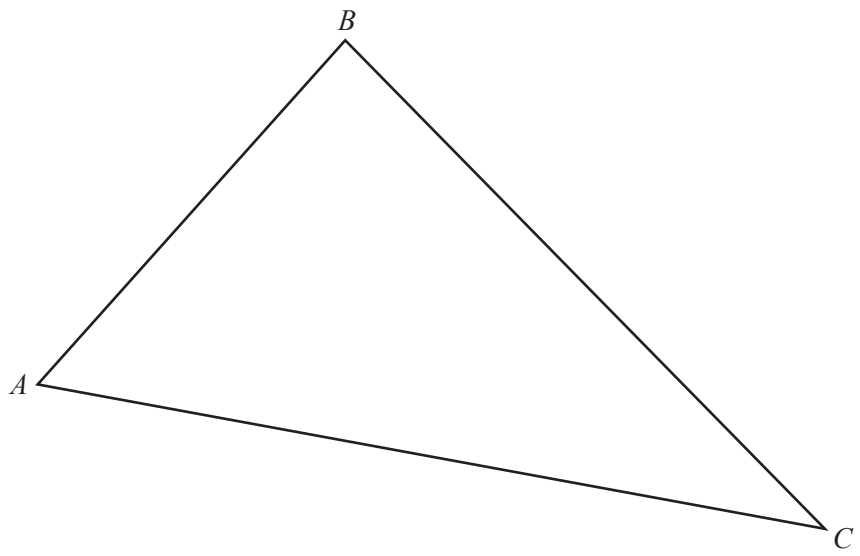
23 The scale drawing shows a triangle *ABC*.
The scale is 1 centimetre represents 8 kilometres.



Scale : 1 cm to 8 km

(a) **Using a straight edge and compasses only**, construct the bisector of angle *BAC*.
Show all your construction arcs. [2]

(b) Draw the locus of points inside triangle *ABC* that are 56 km from *C*. [2]

(c) Shade the region inside triangle *ABC* that is

- more than 56 km from *C*

and

- nearer to *AC* than to *AB*.

[1]

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MATHEMATICS **0580/21**

Paper 2 (Extended) **October/November 2019**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

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[Turn over

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1 Work out 5% of \$25.

\$ ..... [1]

2 Factorise $5p + pt$.

..... [1]

3 Calculate.

$$\frac{16.379 - 0.879}{4.2} \times 1.241$$

Give your answer correct to 2 significant figures.

..... [2]

4 Write 15 060

(a) in words,

..... [1]

(b) in standard form.

..... [1]

5 Simplify $5c - d - 3d - 2c$.

..... [2]

6 Solve. $\frac{x-2}{3} = 3$

$x =$ ..... [2]

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7 Simplify $2x^3 \times 3x^2$.

..... [2]

8 **Without using a calculator**, work out $\frac{5}{16} \times 1\frac{1}{7}$.

You must show all your working and give your answer as a fraction in its simplest form.

..... [2]

9 Paula invests \$600 at a rate of r% per year simple interest.
At the end of 10 years, the total interest earned is \$90.

Find the value of r.

r = ... [2]

10 Simplify.

$$\left(\frac{x^3}{8}\right)^{-\frac{4}{3}}$$

..... [2]

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11 $P = 2r + \pi r$

Rearrange the formula to write r in terms of P and π.

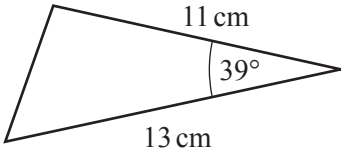
$r =$ ..... [2]

12 The sides of a square are 15.1 cm, correct to 1 decimal place.

Find the upper bound of the area of the square.

..... cm^2 [2]

13



NOT TO SCALE

Calculate the area of the triangle.

..... cm^2 [2]

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14 The scale of a map is 1 : 10 000 000.
On the map, the area of Slovakia is 4.9 cm^2.

Calculate the actual area of Slovakia.
Give your answer in square kilometres.

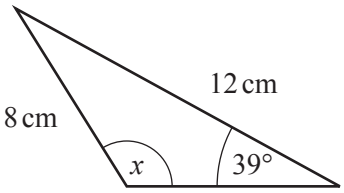
..... km^2 [3]

15 y is inversely proportional to x^2.
When $x = 4$, $y = 2$.

Find y when $x = \frac{1}{2}$.

$y =$ ..... [3]

16



NOT TO SCALE

Calculate the **obtuse** angle x in this triangle.

$x =$ ..... [3]

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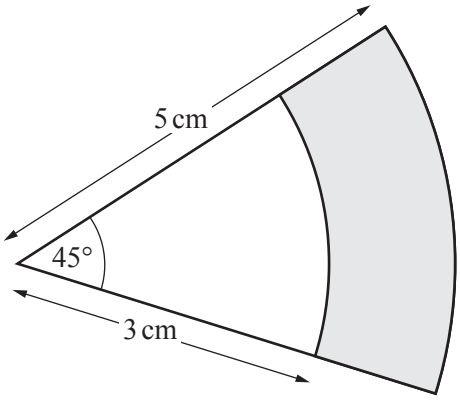

NOT TO SCALE

The diagram shows two sectors of circles with the same centre.

Calculate the shaded area.

..... cm^2 [3]

18 Write $\frac{x}{2} - \frac{2x+4}{x+1}$ as a single fraction, in its simplest form.

..... [3]

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19 $\mathbf{M} = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ $\mathbf{P} = \begin{pmatrix} 5 & 6 \\ 7 & 8 \end{pmatrix}$

(a) Find **MP**.

$\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [2]

(b) Find $|\mathbf{M}|$.

..... [1]

20 The probability that the school bus is late is $\frac{9}{10}$.

If the school bus is late, the probability that Seb travels on the bus is $\frac{15}{16}$.

If the school bus is on time, the probability that Seb travels on the bus is $\frac{3}{4}$.

Find the probability that Seb travels on the bus.

..... [3]

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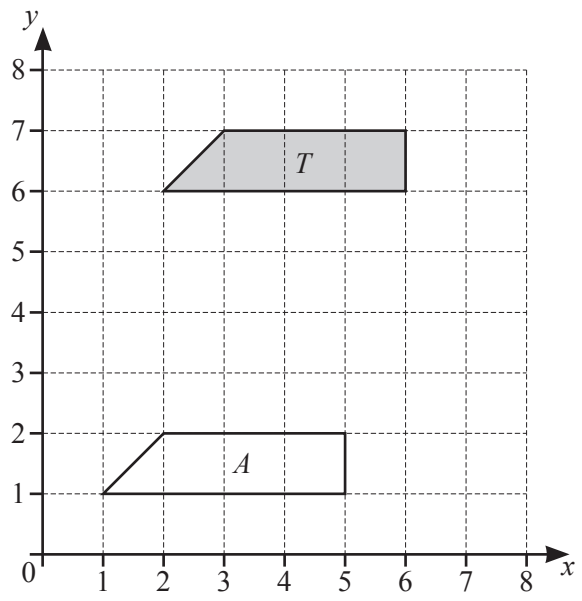
21



(a) Describe fully the **single** transformation that maps shape T onto shape A.

.....

..... [2]

(b) On the grid, reflect shape T in the line $y = x$. [2]

22 A pipe is completely full of water.
Water flows through the pipe at a speed of 1.2 m/s into a tank.
The cross-section of the pipe has an area of 6 cm^2.

Calculate the number of litres of water flowing into the tank in 1 hour.

..... litres [4]

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23 $\mathscr{E} = \{0, 1, 2, 3, 4, 5, 6\}$ $A = \{0, 2, 4, 5, 6\}$ $B = \{1, 2, 5\}$

Complete each of the following statements.

$A \cap B = \{.....\}$

$n(B) = ...$

$\{0, 4, 6\} = ... \cap .....$

$\{2, 4\}$ ..... A [4]

24 $f(x) = 3x - 5$ $g(x) = 2^x$

(a) Find fg(3).

..... [2]

(b) Find $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [2]

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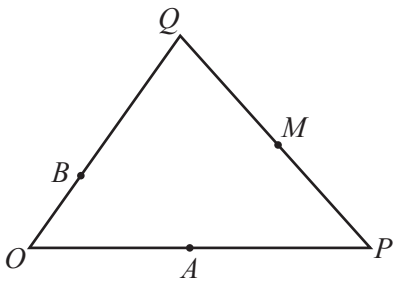

NOT TO SCALE

O is the origin, $\overrightarrow{OP} = 2\overrightarrow{OA}$, $\overrightarrow{OQ} = 3\overrightarrow{OB}$ and $\overrightarrow{PM} = \overrightarrow{MQ}$.

$\overrightarrow{OP} = \mathbf{p}$ and $\overrightarrow{OQ} = \mathbf{q}$.

Find, in terms of **p** and **q**, in its simplest form

(a) $\overrightarrow{BA}$,

$\overrightarrow{BA} =$ ..... [2]

(b) the position vector of M.

..... [2]

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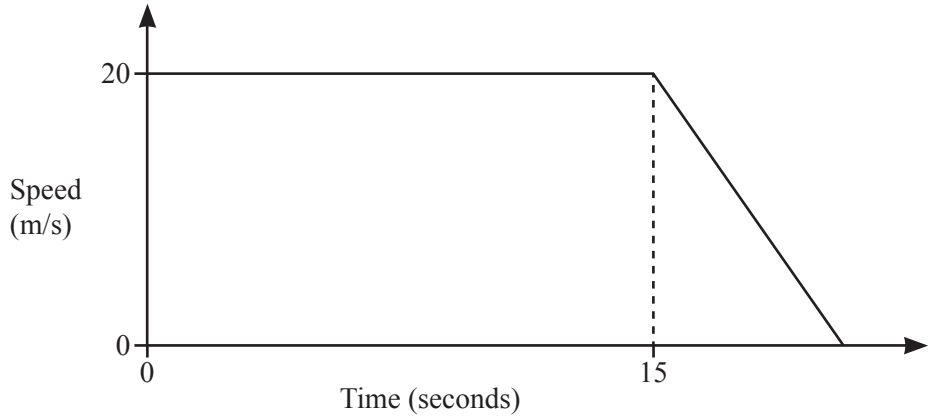
26



NOT TO SCALE

A car travels at 20 m/s for 15 seconds before it comes to rest by decelerating at 2.5 m/s^2.

Find the total distance travelled.

..... m [5]

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MATHEMATICS **0580/22**

Paper 2 (Extended) **October/November 2019**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

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[Turn over

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1 The lowest temperature recorded at Scott Base in Antarctica is −57.0 °C.
The highest temperature recorded at Scott Base is 63.8 °C more than this.

What is the highest temperature recorded at Scott Base?

..... °C [1]

2 Calculate.

$$\frac{5}{8} + \sqrt[3]{340}$$

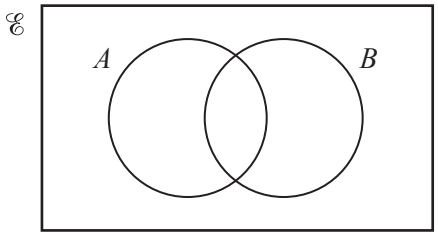
..... [1]

3 Expand.

$$a(a^3 + 3)$$

..... [1]

4 On the Venn diagram, shade the region $(A \cap B)'$.



[1]

5 The mass, correct to the nearest kilogram, of each of 11 parcels is shown below.

24 23 23 26 25 27 18 96 16 17 32

(a) Find the mode.

..... kg [1]

(b) Give a reason why the mean would be an unsuitable average to use.

..... [1]

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6 The table shows how children in Ivan's class travel to school.

Travel to school	Number of children
Walk	12
Car	7
Bicycle	9
Bus	4

Ivan wants to draw a pie chart to show this information.

Find the sector angle for children who walk to school.

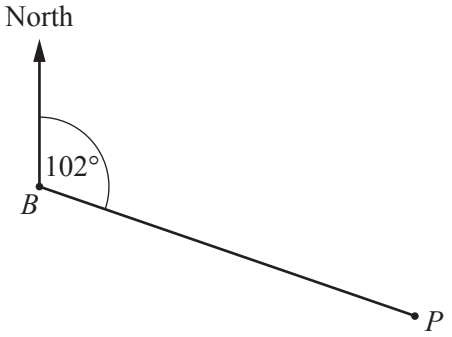
..... [2]

7 Rashid changes 30 000 rupees to dollars when the exchange rate is \$1 = 68.14 rupees.

How many dollars does he receive?

\$ ..... [2]

8



NOT TO SCALE

The bearing of P from B is 102°.

Find the bearing of B from P.

..... [2]

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9 Solve the inequality.

$$\frac{x}{2} - 13 > 12 + 3x$$

..... [2]

10 Write the recurring decimal $0.6\dot{7}$ as a fraction.
Show all your working and give your answer in its simplest form.

..... [2]

11 **Without using a calculator**, work out $3\frac{5}{8} - 1\frac{2}{3}$.
You must show all your working and give your answer as a mixed number in its simplest form.

..... [3]

12 A regular polygon has an interior angle of 176°.

Find the number of sides of this polygon.

..... [3]

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13 Two mathematically similar containers have heights of 30 cm and 75 cm.
The larger container has a capacity of 5.5 litres.

Calculate the capacity of the smaller container.
Give your answer in millilitres.

..... ml [3]

14 Show that the line $4y = 5x - 10$ is perpendicular to the line $5y + 4x = 35$.

[3]

15 Esme buys x magazines at \$2.45 each and y cards at \$3.15 each.

(a) Write down an expression, in terms of x and y, for the total cost, in dollars, of the magazines and the cards.

\$ ..... [2]

(b) Esme spends \$60.55 in total.
She buys 8 magazines.

How many cards does she buy?

..... [2]

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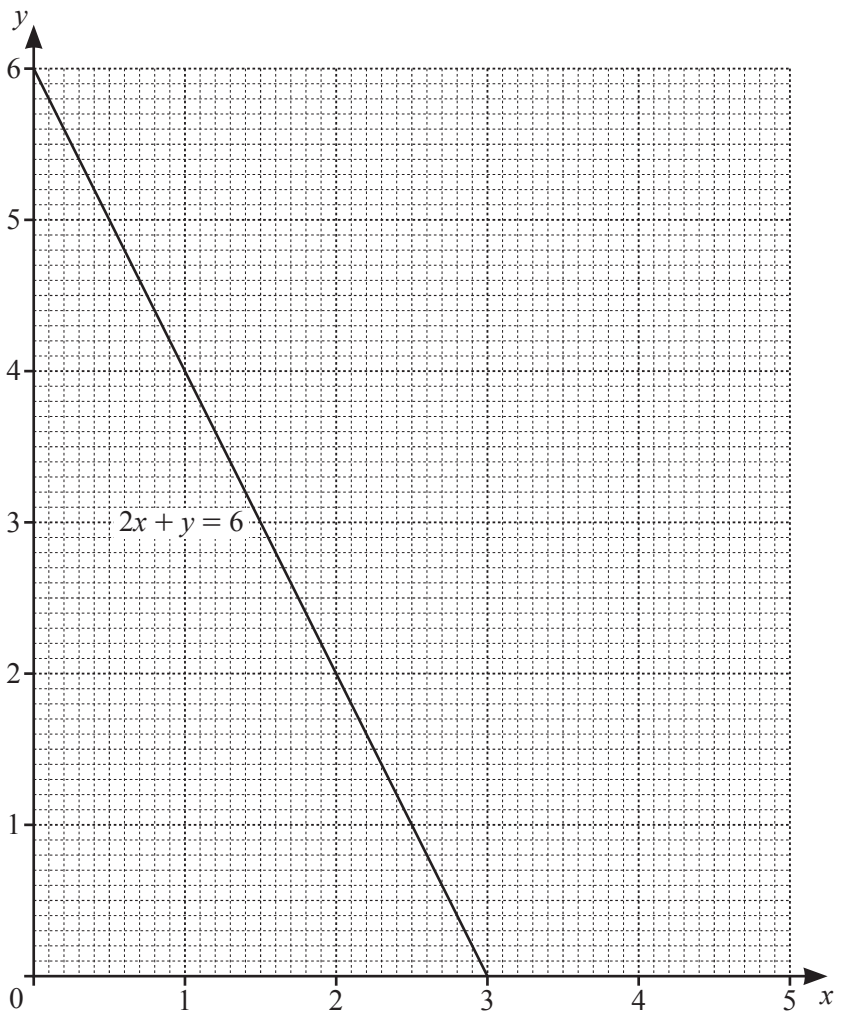

By shading the **unwanted** regions of the grid, find and label the region R that satisfies the following inequalities.

$y \leqslant 5$ $\qquad$ $2x + y \geqslant 6$ $\qquad$ $y \geqslant x + 1$ [4]

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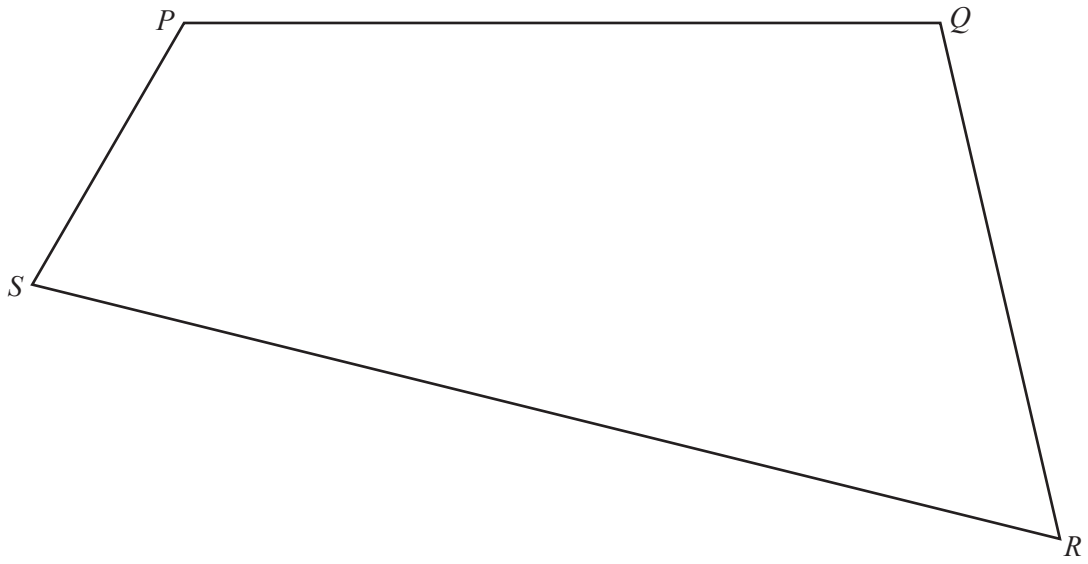
17 The diagram shows a scale drawing of Lei's garden, *PQRS*.
The scale is 1 centimetre represents 2 metres.



Scale: 1 cm to 2 m

Lei has a bird table in the garden that is

- equidistant from *PQ* and *QR*

and

- 13 m from *R*.

On the diagram, construct the position of the bird table.
Use a ruler and compasses only and show all your construction arcs. [4]

18 Harris is taking a driving test.
The probability that he passes the driving test at the first attempt is 0.6 .
If he fails, the probability that he passes at any further attempt is 0.75 .

Calculate the probability that Harris

(a) passes the driving test at the second attempt,

..... [2]

(b) takes no more than three attempts to pass the driving test.

..... [2]

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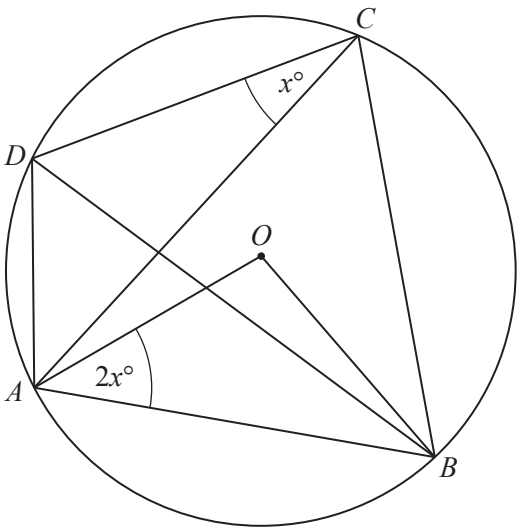

NOT TO SCALE

In the diagram, A, B, C and D lie on the circumference of a circle, centre O.
Angle $ACD = x°$ and angle $OAB = 2x°$.

Find an expression, in terms of x, in its simplest form for

(a) angle AOB,

Angle AOB = ... [1]

(b) angle ACB,

Angle ACB = ... [1]

(c) angle DAB.

Angle DAB = ... [2]

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20 **(a)** Factorise.

$$18y - 3ay + 12x - 2ax$$

..... [2]

(b) Factorise.

$$3x^2 - 48y^2$$

..... [3]

21 **(a)** $3^{-2} \times 3^x = 81$

Find the value of x.

$x =$ ..... [2]

(b) $x^{-\frac{1}{3}} = 32x^{-2}$

Find the value of x.

$x =$ ..... [3]

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22 $\mathbf{A} = \begin{pmatrix} 3 & 2 \\ -5 & 0 \end{pmatrix}$ $\mathbf{B} = \begin{pmatrix} -2 & 5 \\ 4 & 1 \end{pmatrix}$ $\mathbf{C} = \begin{pmatrix} -1 & k \end{pmatrix}$

(a) Find **AB**.

$\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [2]

(b) $\mathbf{CA} = \begin{pmatrix} -13 & -2 \end{pmatrix}$

Find the value of k.

$k =$ ..... [2]

(c) Find $\mathbf{A}^{-1}$.

$\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [2]

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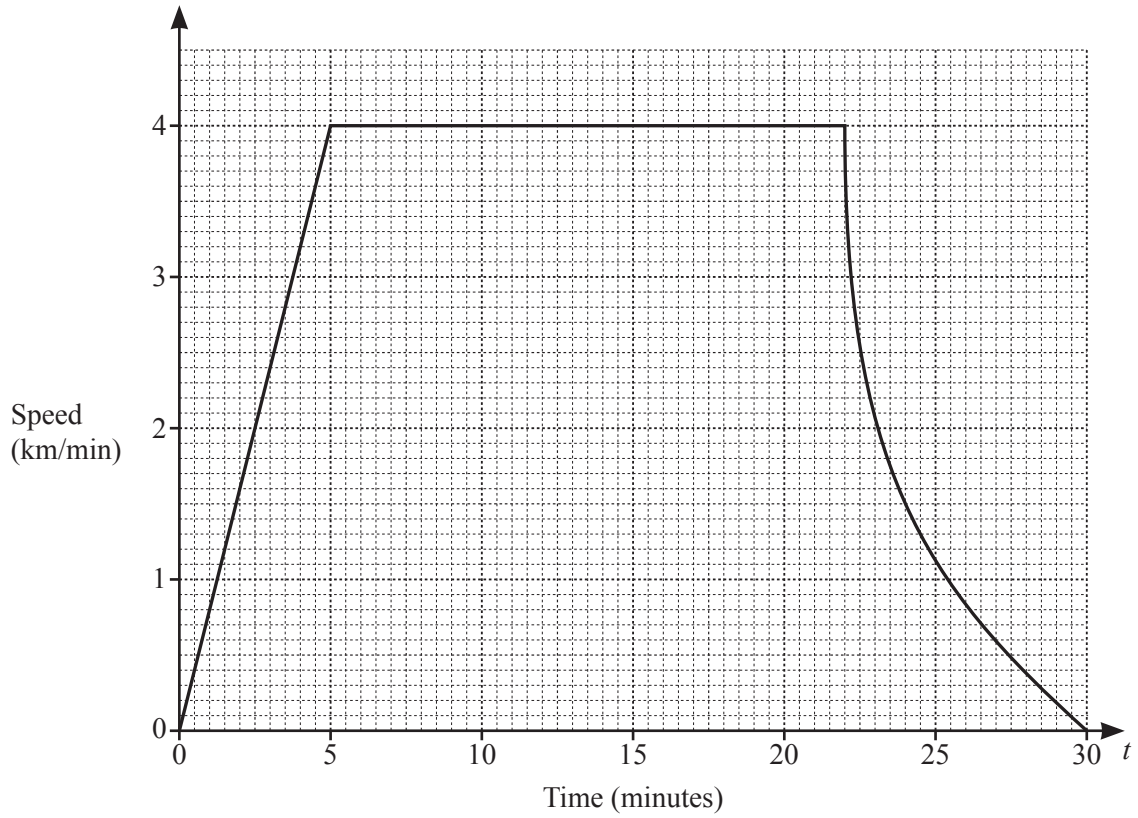

The speed–time graph shows information about a train journey.

(a) By drawing a suitable tangent to the graph, estimate the gradient of the curve at $t = 24$.

..... [3]

(b) What does this gradient represent?

..... [1]

(c) Work out the distance travelled by the train when it is travelling at constant speed.

..... km [2]

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MATHEMATICS **0580/23**

Paper 2 (Extended) **October/November 2019**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
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Geometrical instruments

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[Turn over

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1 Write down the temperature that is 7 °C below −3 °C.

..... °C [1]

2 Calculate $\sqrt{256^{0.25} + 4 \times 8}$.

..... [1]

3 Here is a list of numbers.

87 77 57 47 27

From this list, write down

(a) a cube number,

..... [1]

(b) a prime number.

..... [1]

4 Find the highest common factor (HCF) of 84 and 105.

..... [2]

5 Write in standard form.

(a) 72 000

..... [1]

(b) 0.0018

..... [1]

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6 Expand and simplify $(x+3)(x+5)$.

..... [2]

7 Find the gradient of the line that is perpendicular to the line $2y = 3 + 5x$.

..... [2]

8 When $\sin x° = 0.36$, find

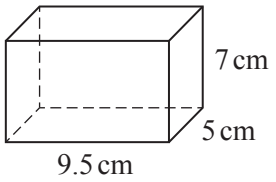
(a) the acute angle $x°$,

..... [1]

(b) the obtuse angle $x°$.

..... [1]

9 A cuboid measures 5 cm by 7 cm by 9.5 cm.



NOT TO SCALE

Work out the surface area of this cuboid.

..... [3]

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10 $5n$ is the mean of the three numbers 391, n and $n - 1$.

Find the value of n.

$n =$ ..... [3]

11 Factorise.

(a) $12x + 15$

..... [1]

(b) $xy - 2x + 3y - 6$

..... [2]

12 A is the point (2, 1) and B is the point (9, 4).

Find the length of AB.

..... [3]

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13 A straight line joins the points $(3k, 6)$ and $(k, -5)$.
The line has a gradient of 2.

Find the value of k.

$k =$ ..... [3]

14 Find the nth term of each sequence.

(a) $\frac{1}{2}, \frac{1}{4}, \frac{1}{6}, \frac{1}{8}, \frac{1}{10}, \ldots$

..... [1]

(b) 1, 5, 25, 125, 625, ...

..... [2]

15 **Without using a calculator**, work out $\frac{2}{3} + \frac{1}{4} \times \frac{2}{3}$.
Write down all the steps of your working and give your answer as a fraction in its simplest form.

..... [4]

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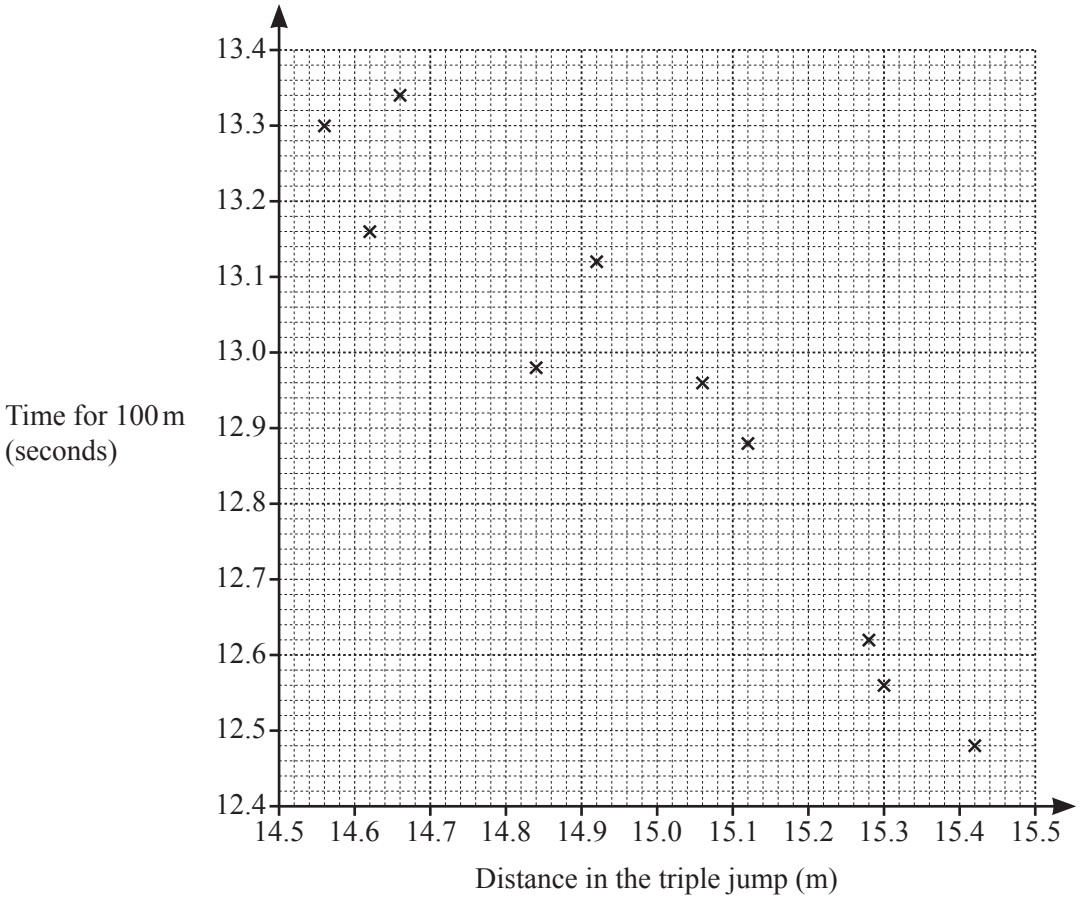
16 Ten athletes compete in both the 100 metre race and the triple jump.
Their results are shown in the scatter diagram.



(a) One of these athletes jumps 15.12 m in the triple jump.

Write down his time for the 100 metre race.

..... s [1]

(b) The values for two other athletes are shown in the table.

Distance in the triple jump (m)	14.74	15.2
Time for 100 m (seconds)	13.2	12.76

On the scatter diagram, plot these points. [1]

(c) On the scatter diagram, draw a line of best fit. [1]

(d) What type of correlation is shown in the scatter diagram?

..... [1]

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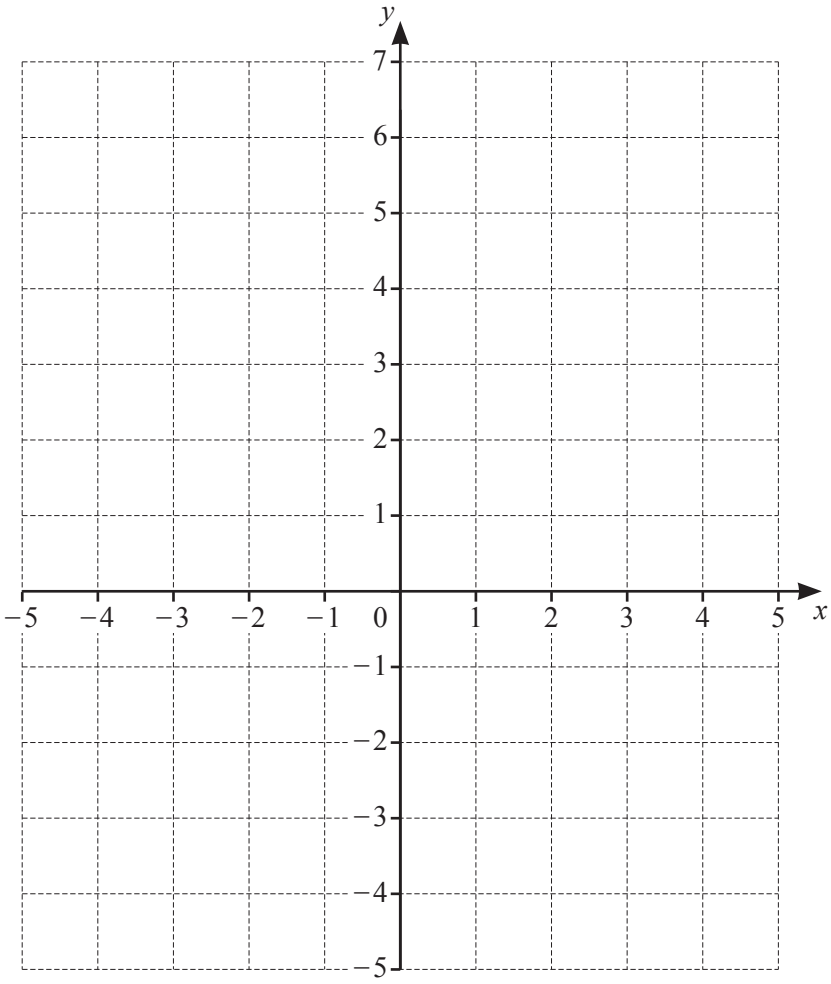
17



By shading the **unwanted** regions on the grid, draw and label the region R that satisfies the following inequalities.

$$-2 < x \leqslant 3 \qquad\qquad y \leqslant x + 3$$

[4]

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18 **(a)** $M = \{x : x \text{ is an integer and } 2 \leqslant x < 6\}$

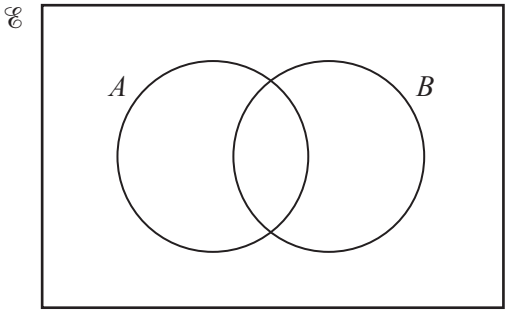
(i) Find n(M).

..... [1]

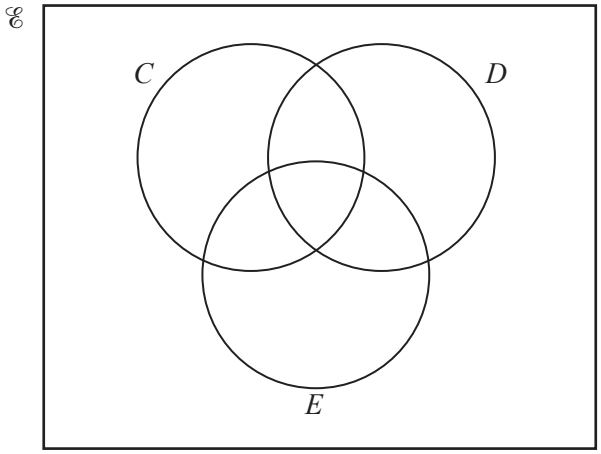
(ii) Write down a set N where $N \subset M$ and $N \neq \varnothing$.

{.....} [1]

(b) In each Venn diagram, shade the required region.



$(A \cup B)'$



$(C \cap D') \cup E$

[2]

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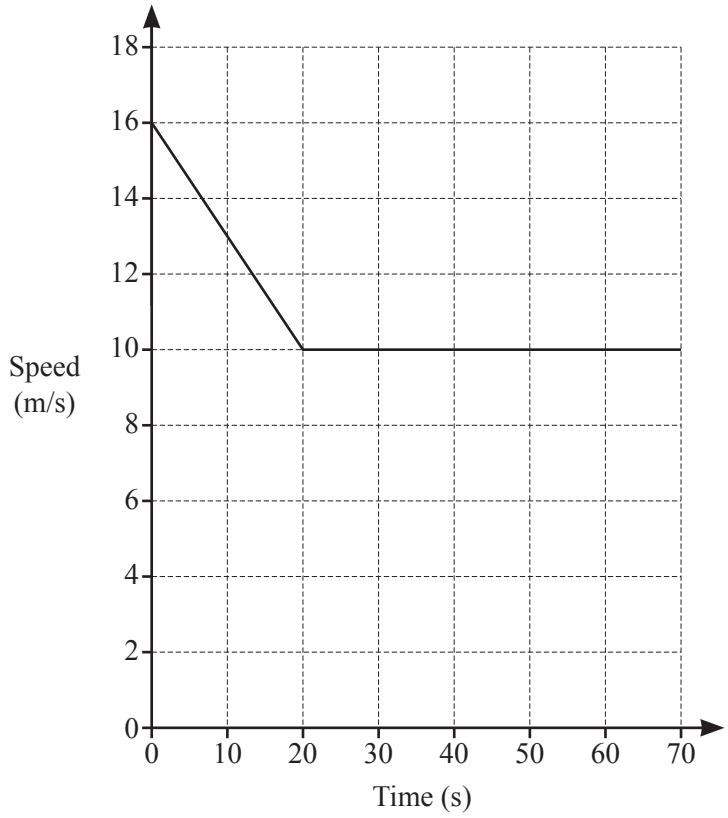

The diagram shows the speed–time graph for 70 seconds of a car journey.

(a) Calculate the deceleration of the car during the first 20 seconds.

..... m/s^2 [1]

(b) Calculate the total distance travelled by the car during the 70 seconds.

..... m [3]

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20 t is inversely proportional to the square of $(x + 1)$.
When $x = 2$, $t = 5$.

(a) Write t in terms of x.

$t =$ ..... [2]

(b) When $t = 1.8$, find the positive value of x.

$x =$ ..... [2]

21 **(a)** Work out the inverse of the matrix $\begin{pmatrix} -3 & 10 \\ 1 & -5 \end{pmatrix}$.

$\begin{pmatrix} \quad & \quad \\ \quad & \quad \end{pmatrix}$ [2]

(b) Work out the value of x and the value of y in this matrix calculation.

$$\begin{pmatrix} 1 & 5 \\ 2 & y \end{pmatrix}\begin{pmatrix} -4 & 1 \\ 2 & 9 \end{pmatrix} = \begin{pmatrix} x & 46 \\ 6 & 65 \end{pmatrix}$$

$x =$ .....

$y =$ ..... [3]

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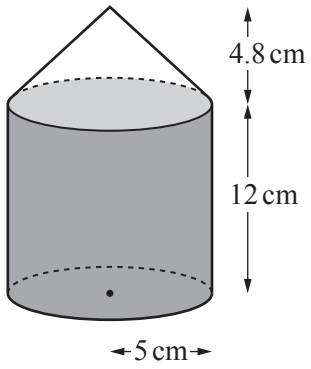
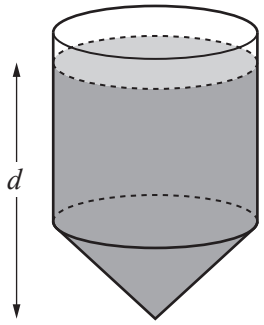
22 A container is made from a cylinder and a cone, each of radius 5 cm.
The height of the cylinder is 12 cm and the height of the cone is 4.8 cm.



NOT TO SCALE

The cylinder is filled completely with water.
The container is turned upside down as shown below.



NOT TO SCALE

Calculate the depth, d, of the water.
[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

d = ... cm [5]

Question 23 is printed on the next page.

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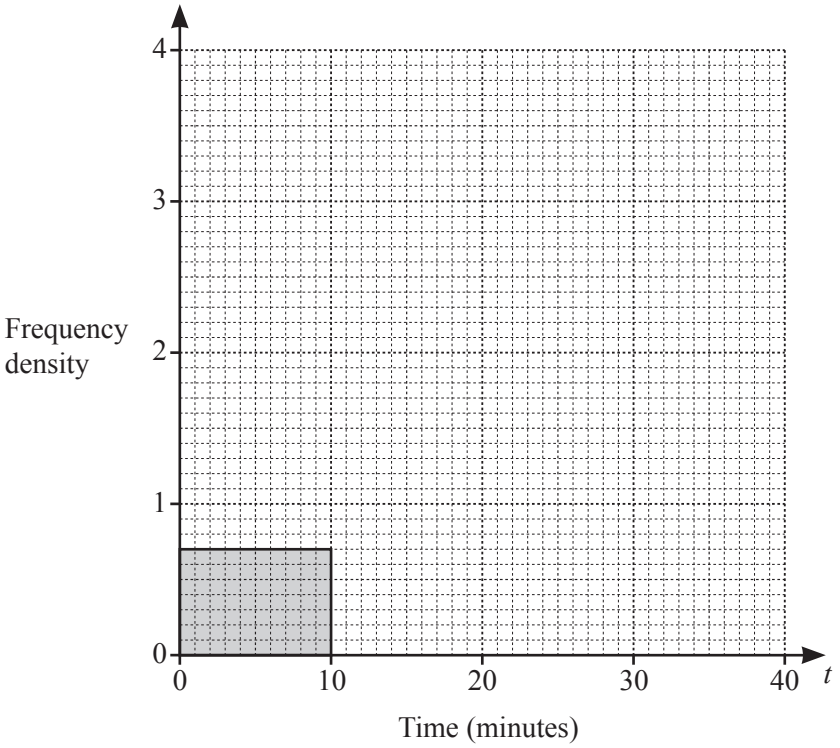
23 The time, t minutes, it takes each of 50 students to travel to school is recorded.
The table shows the results.

Time (t minutes)	$0 < t \leqslant 10$	$10 < t \leqslant 15$	$15 < t \leqslant 20$	$20 < t \leqslant 40$
Frequency	7	19	16	8

(a) Write down the modal class.

..... $< t \leqslant$ ..... min [1]

(b) On the grid, complete the histogram to show the information in the table.



[3]

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MATHEMATICS **0580/31**

Paper 3 (Core) **October/November 2019**

2 hours

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 104.

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[Turn over

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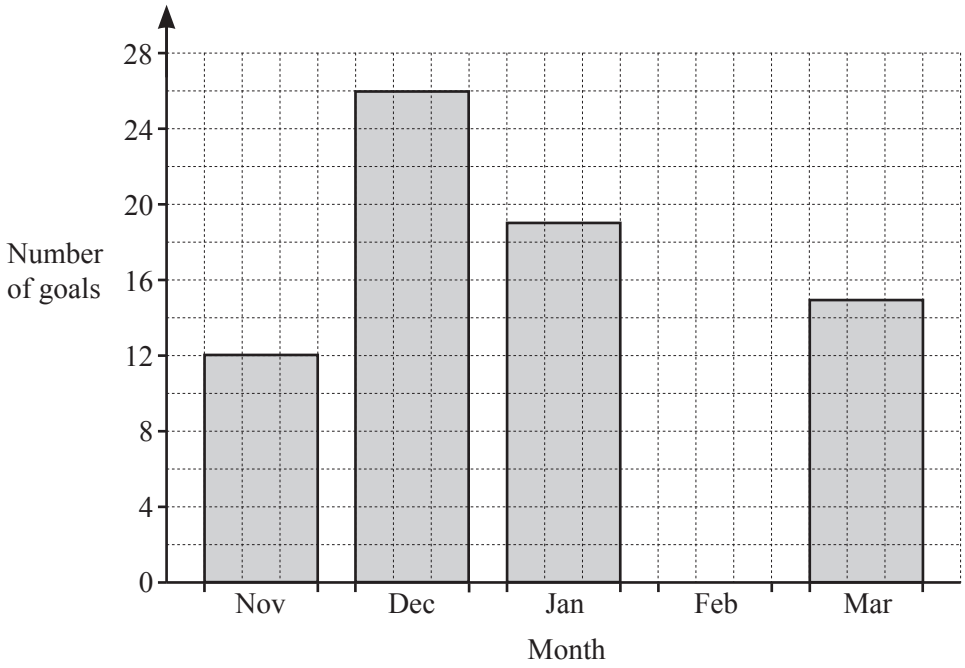
1 **(a)** José manages a football team.
He records the number of goals scored by the team for each of five months.
Some of the results are shown on the bar chart.



(i) In February, 10 goals were scored.

Complete the bar chart. [1]

(ii) Write down the month in which most goals were scored.

..... [1]

(iii) Find the total number of goals scored.

..... [1]

(iv) Calculate the mean number of goals scored each month.

..... [1]

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(b) Jodie and her two children go to a football match.

(i) Ticket prices are \$15.30 for an adult and \$6.50 for a child.

Calculate the total cost of the three tickets.

\$..... [2]

(ii) A match programme costs \$3.75 .
Jodie buys two match programmes.

Calculate the change she receives from a \$10 note.

\$..... [2]

(iii) 540 tickets out of 630 are sold for this match.

Calculate the percentage of tickets sold.

..... % [1]

(iv) The match starts at 1455 and ends 1 hour 50 minutes later.

Work out the time the match ends.

..... [1]

(v) Jodie travels 66 km to get home after the match.
She leaves at 5 pm and arrives home at 6.12 pm.

Calculate her average speed in kilometres per hour.

..... km/h [3]

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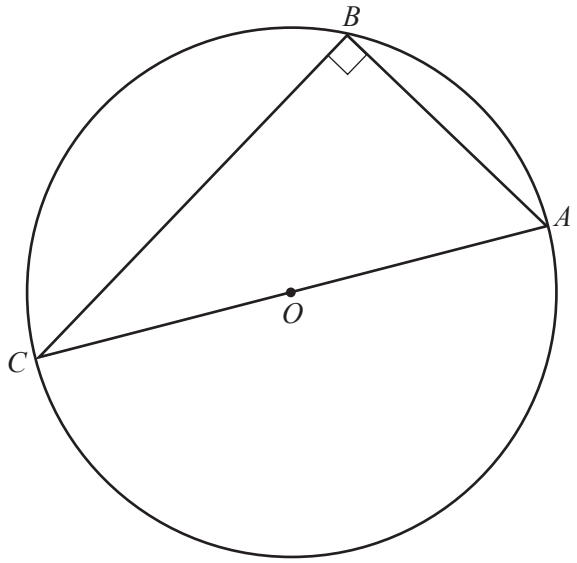
2 **(a)**



In the diagram, A, B and C are points on the circle, centre O.

(i) On the diagram, draw a chord. [1]

(ii) Explain why angle ABC is 90°.

..... [1]

(b) The length of the edge of a cube is 8 cm.

Calculate the surface area of this cube.

..... cm^2 [2]

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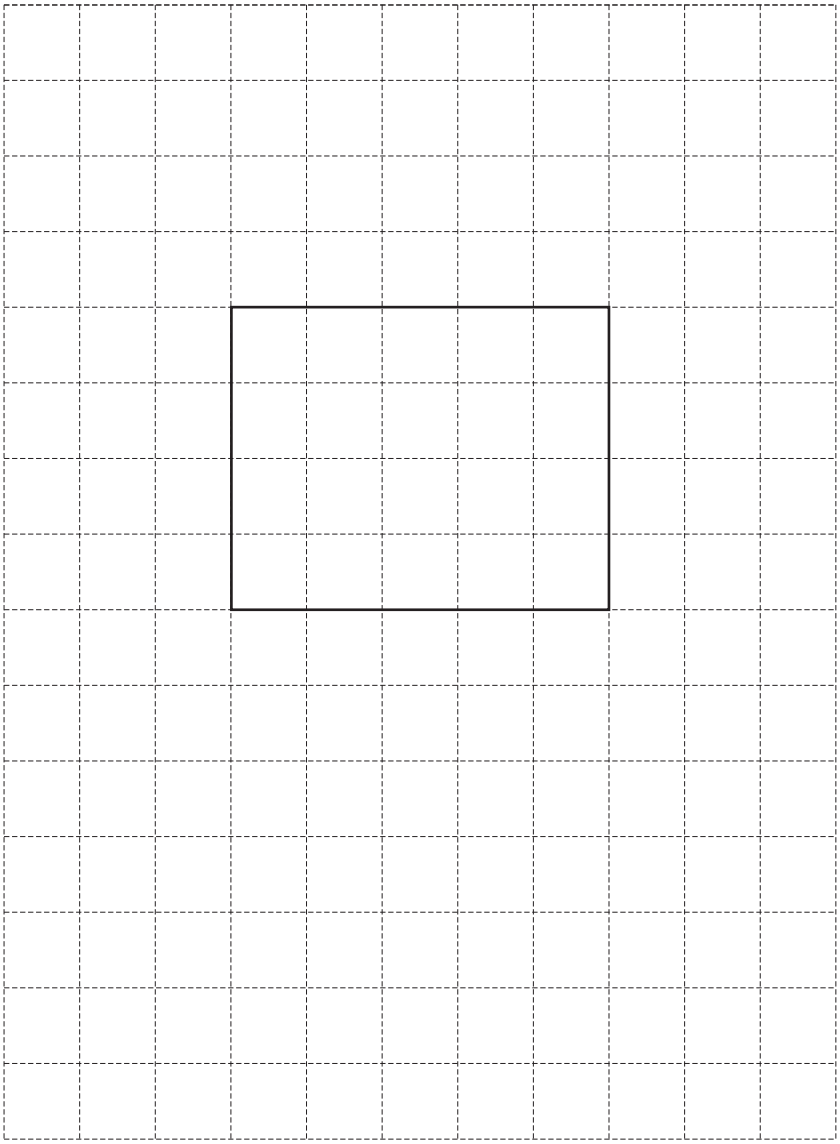
(c) A cuboid measures 5 cm by 4 cm by 2 cm.

(i) Calculate the volume of this cuboid.
Give the units of your answer.

.... [3]

(ii) On the 1 cm^2 grid, draw an accurate net of this cuboid.
One face has been drawn for you.



[3]

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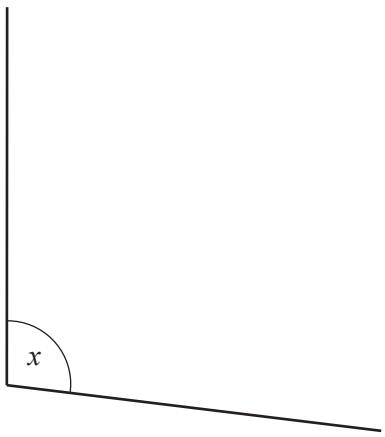
3 **(a)**



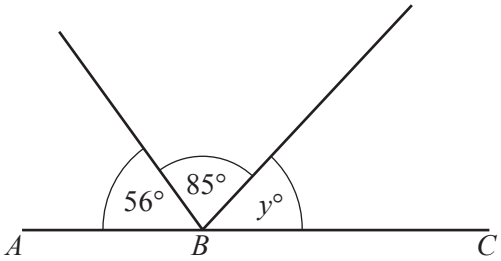
(i) Measure the size of angle x.

..... [1]

(ii) Write down the mathematical name of this type of angle.

..... [1]

(b) ABC is a straight line.



NOT TO SCALE

Find the value of y.

$y =$ ..... [1]

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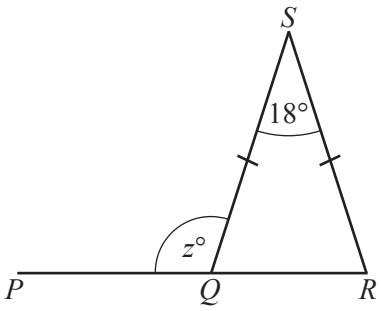
(c) *QRS* is an isosceles triangle and *PQR* is a straight line.



NOT TO SCALE

Find the value of z.

$z =$ ..... [2]

(d) Find the size of one interior angle of a regular octagon.

..... [3]

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4 **(a)** Write the number four hundred and eighteen thousand and seventy two in figures.

..... [1]

(b) Write down all the factors of 16.

..... [2]

(c) Write down a prime number between 30 and 40.

..... [1]

(d) Find the value of

(i) $\sqrt{729}$,

..... [1]

(ii) 18^3,

..... [1]

(iii) 7^0.

..... [1]

(e) Saskia has \$600.

She spends $\frac{1}{5}$ of the \$600 on a coat and gives $\frac{1}{3}$ of the \$600 to her son.

What fraction of the \$600 does she have left?
Give your answer in its simplest form.

..... [3]

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(f) Find the lowest common multiple (LCM) of 15 and 27.

..... [2]

(g) Write 432 as the product of its prime factors.

..... [2]

(h) Ella invests $4000 for 3 years at a rate of 1.2% per year compound interest.

Calculate the value of her investment at the end of the 3 years.

$ ..... [3]

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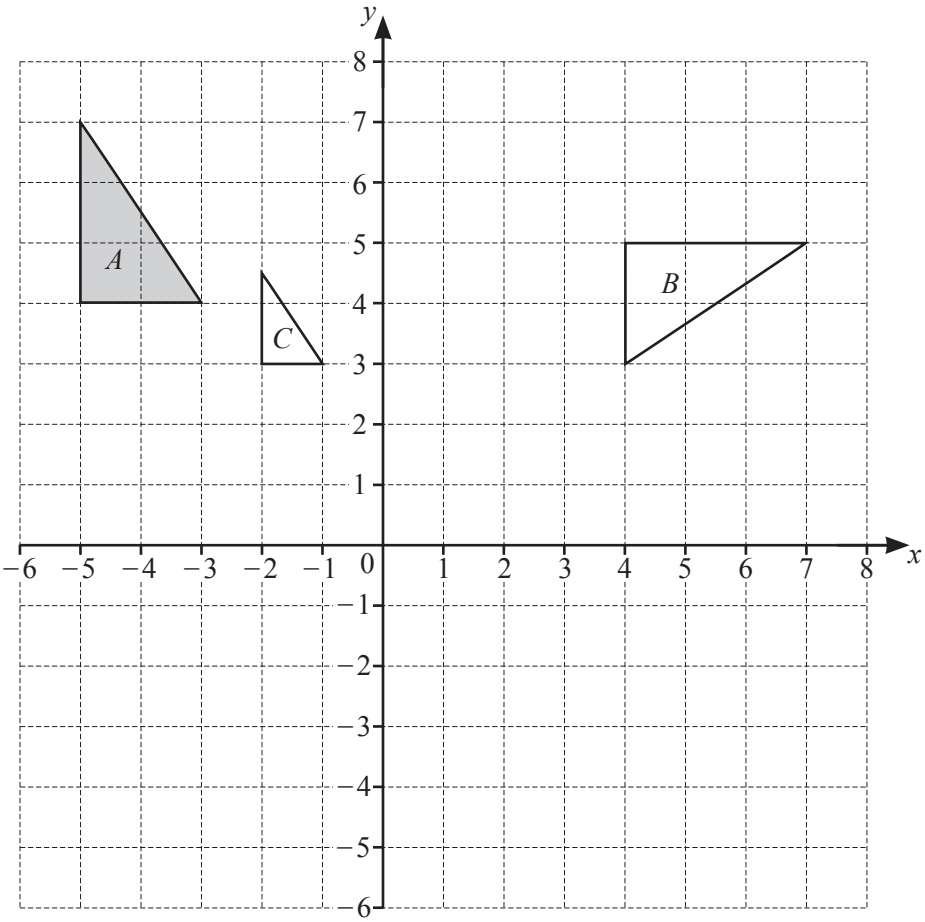
5 Triangles A, B and C are shown on the grid.



(a) Describe fully the **single** transformation that maps

(i) triangle A onto triangle B,

.....

..... [3]

(ii) triangle A onto triangle C.

.....

..... [3]

(b) On the grid,

(i) translate triangle A by the vector $\begin{pmatrix} 6 \\ -2 \end{pmatrix}$, [2]

(ii) reflect triangle A in the line $y = 1$. [2]

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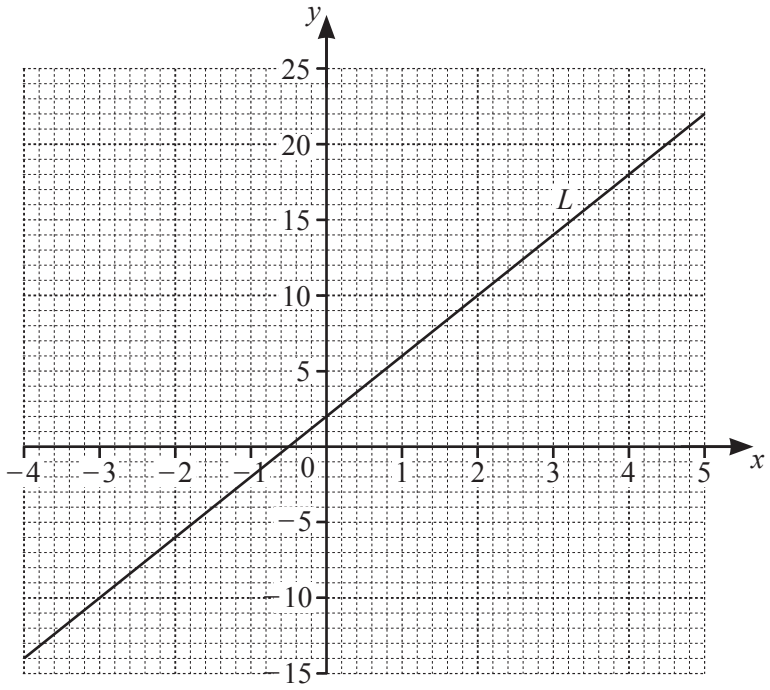
6 The line L is shown on the grid.



(a) Find the equation of the line L in the form $y = mx + c$.

$y =$ ..... [3]

(b) The equation of a different line is $y = 3x - 4$.

(i) Write down the gradient of this line.

..... [1]

(ii) Write down the co-ordinates of the point where this line crosses the y-axis.

(..... , ...) [1]

(c) On the grid, draw the graph of $y = -2x + 1$ for $-4 \leqslant x \leqslant 5$. [3]

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7 **(a)** Soraya makes rectangular flags.

(i) On the rectangle, draw the lines of symmetry. [2]

(ii) Each flag measures 1.2 m by 1.8 m.

Calculate the area of one flag.

..... m^2 [2]

(b) Each flag costs \$15 to make.
Soraya sells one flag for \$21.

Calculate the percentage profit.

..... % [3]

(c) Soraya makes 30 flags.
11 flags are pink, 7 are yellow, 5 are blue, 4 are silver and 3 are green.
Soraya takes a flag at random.

Find the probability that the flag she takes is

(i) pink,

..... [1]

(ii) not blue,

..... [1]

(iii) red.

..... [1]

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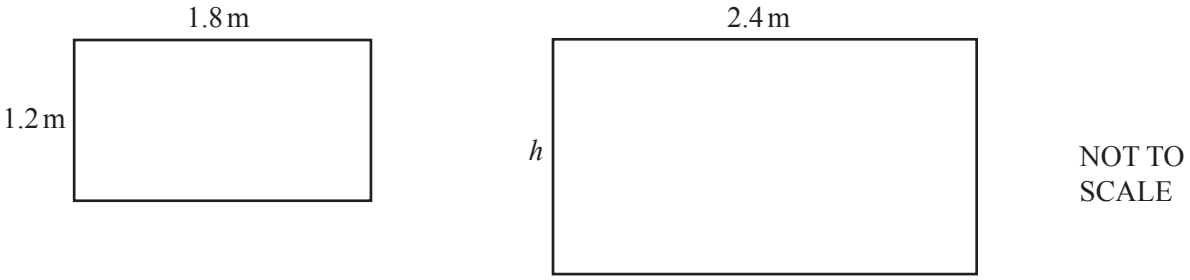
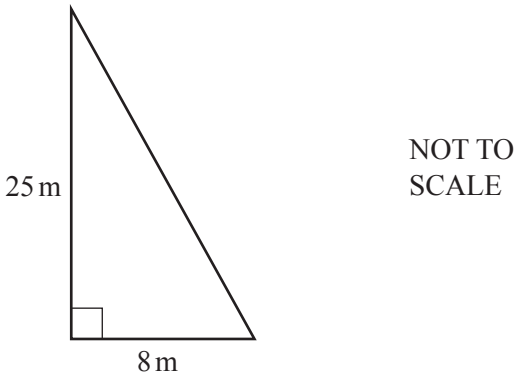
(d) Soraya decides to make a mathematically similar flag.



Calculate the height, h, of the new flag.

h = ... m [2]

(e)



The diagram shows a flagpole in Soraya's garden.
The flagpole has height 25 m.
A rope from the top of the flagpole is tied to the ground 8 m from its base.

Calculate the length of this rope.

..... m [2]

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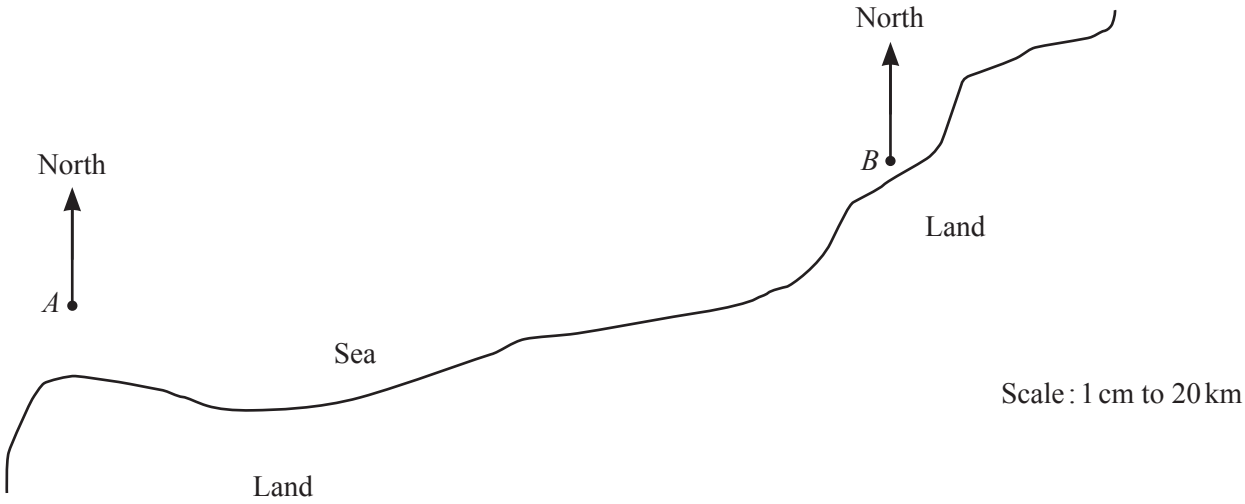
8 **(a)** The scale drawing shows the positions of two buoys, *A* and *B*, in the sea.
The scale is 1 centimetre represents 20 kilometres.



(i) Work out the actual distance between buoy *A* and buoy *B*.

..... km [2]

(ii) Measure the bearing of buoy *B* from buoy *A*.

..... [1]

(iii) Buoy *C* is 120 km from buoy *B* on a bearing of 300°.

On the scale drawing, mark the position of buoy *C*. [2]

(iv) Marco sails his boat so that he is always equidistant from buoy *A* and buoy *B*.

On the scale drawing, **use a straight edge and compasses only** to construct the path of the boat.
Show all your construction arcs. [2]

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(b) The amount of fuel, t litres, in the boat's fuel tank is 135 litres, correct to the nearest litre.

Complete the statement about the value of t.

..... $\leqslant t <$ ..... [2]

(c) Marco has ropes of four different colours.
He takes a rope at random.

Colour	Brown	White	Red	Green
Probability	0.35		0.04	0.2

Complete the table. [2]

(d) When Marco arrives at a port the temperature is 5 °C.
At midnight the temperature has fallen by 7 °C.

Find the temperature at midnight.

..... °C [1]

(e) Last year the cost to keep a boat at the port was \$14 per night.
This year the cost has increased by 12%.

Calculate the cost this year.

\$..... [2]

(f) Marco watched 25 boats enter the port, of which 9 had a mast.
There are a total of 200 boats in the port.

Calculate an estimate of the number of boats in the port that have a mast.

..... [2]

Question 9 is printed on the next page.

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9 **(a)** These are the first four terms of a sequence.

29 32 35 38

(i) Write down the next term.

..... [1]

(ii) Write down the rule for continuing this sequence.

..... [1]

(b) The nth term of another sequence is $n^2 + 5$.

(i) Find the first three terms.

..... , ... , ... [2]

(ii) Show that 261 is a term in this sequence.

.....

..... [2]

(c) These are the first four terms of a different sequence.

27 33 39 45

Find the nth term of this sequence.

..... [2]

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MATHEMATICS **0580/32**

Paper 3 (Core) **October/November 2019**

2 hours

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
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Answer **all** questions.
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The total of the marks for this paper is 104.

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[Turn over

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1 Nadira owns a clothes shop.

(a) The pictogram shows the number of skirts that were sold each day in one week.

Day	Number of skirts
Monday	○ ◖
Tuesday	○
Wednesday	○ ○ ◖
Thursday	○ ○ ◖
Friday	○ ○ ○ ○
Saturday	○ ○ ○ ◖

Key: ○ = 10 skirts

(i) On which day were most skirts sold?

..... [1]

(ii) How many skirts were sold on Wednesday?

..... [1]

(iii) Work out how many more skirts were sold on Friday than on Thursday.

..... [1]

(b) The shop is open for 6 days each week.
On each day, the shop is open from 09 30 until 13 00 and from 14 15 until 20 30.

Work out the total number of hours the shop is open in one week.

..... hours [2]

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(c) Nadira pays 6 people to work in the shop.

In one week
- 4 people each work for 38 hours
- 2 people each work for 25 hours.

They are each paid $11.40 for each hour they work.

Calculate the total amount Nadira pays these 6 people in one week.

$ ..... [2]

(d) Nadira has some T-shirts that are either white or blue or green.
The numbers of T-shirts are in the ratio white : blue : green = 5 : 4 : 1.
48 of the T-shirts are blue.

Work out the total number of T-shirts.

..... [3]

(e) Nadira buys a pack of 40 dresses and pays $500.
She sells 35 of these dresses for $22 each.
She sells the remaining 5 dresses for $14.50 each.

Calculate the percentage profit she makes when she sells all 40 dresses.

..... % [4]

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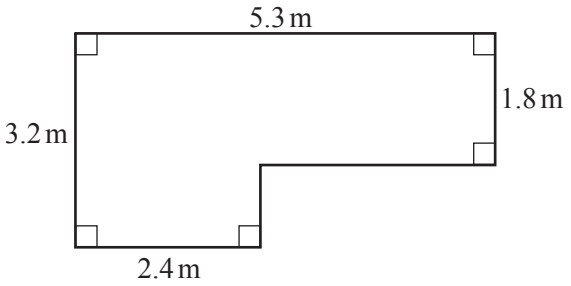
2 Henry decorates a room.

(a) Complete Henry's shopping bill.

Item	Cost ($)
3 tins of paint at $15.95 each	
2 brushes at $7.50 each	
1 roll of tape at $2.90	2.90
Total	

[2]

(b)



NOT TO SCALE

The diagram shows the floor of the room.

(i) Calculate the area of the floor.

..... m^2 [2]

(ii) Henry buys varnish for the floor of the room.
500 ml of varnish covers 8 m^2 of floor.

Calculate the amount of varnish Henry needs.

..... ml [2]

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(c) This scale drawing shows the window in the room.
The scale is 1 centimetre represents 40 centimetres.

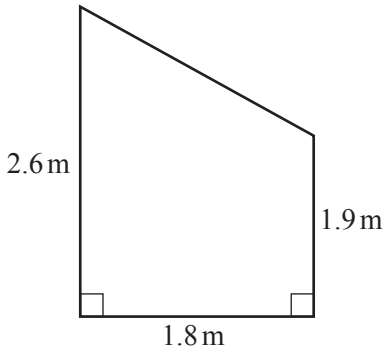
Scale: 1 cm to 40 cm

Work out the actual length and height of the window.

Length = ... cm

Height = ... cm [2]

(d)



NOT TO SCALE

The diagram shows one wall of the room.

Calculate the area of the wall.

..... m^2 [2]

(e) Henry buys a circular mirror for the room.
The diameter of the mirror is 80 cm.

Calculate the circumference of the mirror.

..... cm [2]

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3 **(a)** Write down

(i) all the factors of 18,

..... [2]

(ii) a square number between 30 and 50,

..... [1]

(iii) a prime number between 90 and 100.

..... [1]

(b) Put **one** pair of brackets into each calculation to make it correct.

(i) $24 \div 6 + 2 \times 3 = 9$ [1]

(ii) $24 \div 6 + 2 \times 3 = 2$ [1]

(c) Calculate.

$$\frac{4.85 \times 6.14}{8.91 + 3.89}$$

Give your answer correct to 2 decimal places.

..... [2]

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(d) **(i)** Find the highest common factor (HCF) of 36 and 90.

..... [2]

(ii) Find the lowest common multiple (LCM) of 36 and 90.

..... [2]

(e) **(i)** Write 4.2×10^{-3} as an ordinary number.

..... [1]

(ii) Calculate $(8.1 \times 10^5) + (7.9 \times 10^4)$.
Give your answer in standard form.

..... [2]

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4 **(a)** 50 students each record the number of glasses of water they drink in one day.
The results for 10 of the students are shown below.

2 5 1 3 2 1 0 0 1 1

(i) The results for the remaining 40 students are recorded in the table.

Complete the table to show the results for all 50 students.

Number of glasses of water	Tally	Frequency
0	卌 |	
1	||	
2	卌 |||	
3	卌 卌 |	
4	卌 |||	
5	卌	
	Total	50

[2]

(ii) Write down the range.

..... [1]

(iii) Find the median.

..... [2]

(iv) Find the percentage of the 50 students who drink 4 glasses of water.

..... % [1]

(v) One of the 50 students is chosen at random.

Find the probability that this student drinks fewer than 2 glasses of water in one day.
Give your answer as a fraction in its lowest terms.

..... [2]

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(b) Musa has a glass that holds 250 ml of water.
He drinks 5 of these glasses of water.
He fills his glass from a 2-litre bottle of water.

Work out how much water is left in the bottle.
Give your answer in millilitres.

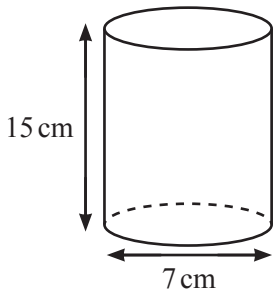
..... ml [2]

(c) The amount of water, w litres, in a jug is 1.5 litres, correct to the nearest 0.1 litre.

Complete this statement about the value of w.

..... $\leqslant w <$ ..... [2]

(d)



NOT TO SCALE

Another glass is in the shape of a cylinder.
The cylinder has height 15 cm and diameter 7 cm.

Calculate the volume of the glass.

..... cm^3 [3]

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5 **(a)** In triangle ABC, $AC = 7$ cm and $BC = 5$ cm.

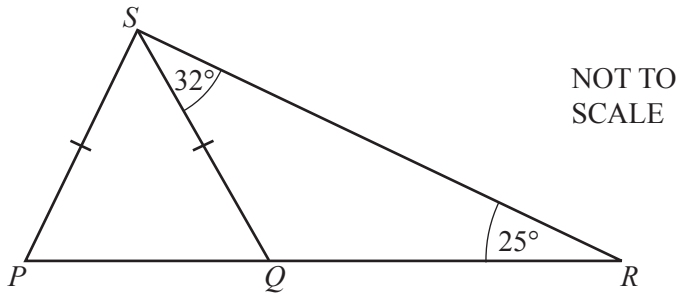
(i) **Using a ruler and compasses only**, construct triangle ABC.
AB has been drawn for you.

[2]

(ii) Measure angle ABC.

..... [1]

(b)



The diagram shows triangle PRS and a straight line QS.
Q is a point on PR.
Angle $QRS = 25°$, angle $RSQ = 32°$ and $PS = QS$.

(i) Find angle PQS.

Angle PQS = ... [2]

(ii) Find angle PSR.

Angle PSR = ... [2]

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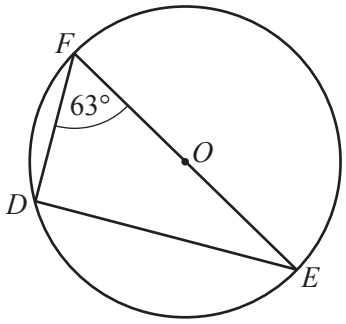
(c)



NOT TO SCALE

The diagram shows a circle, centre O, with diameter EF.
Angle $DFE = 63°$.

(i) Find angle DEF.

Angle DEF = ... [2]

(ii) $EF = 12\,\text{cm}$

Calculate DF.

DF = ... cm [2]

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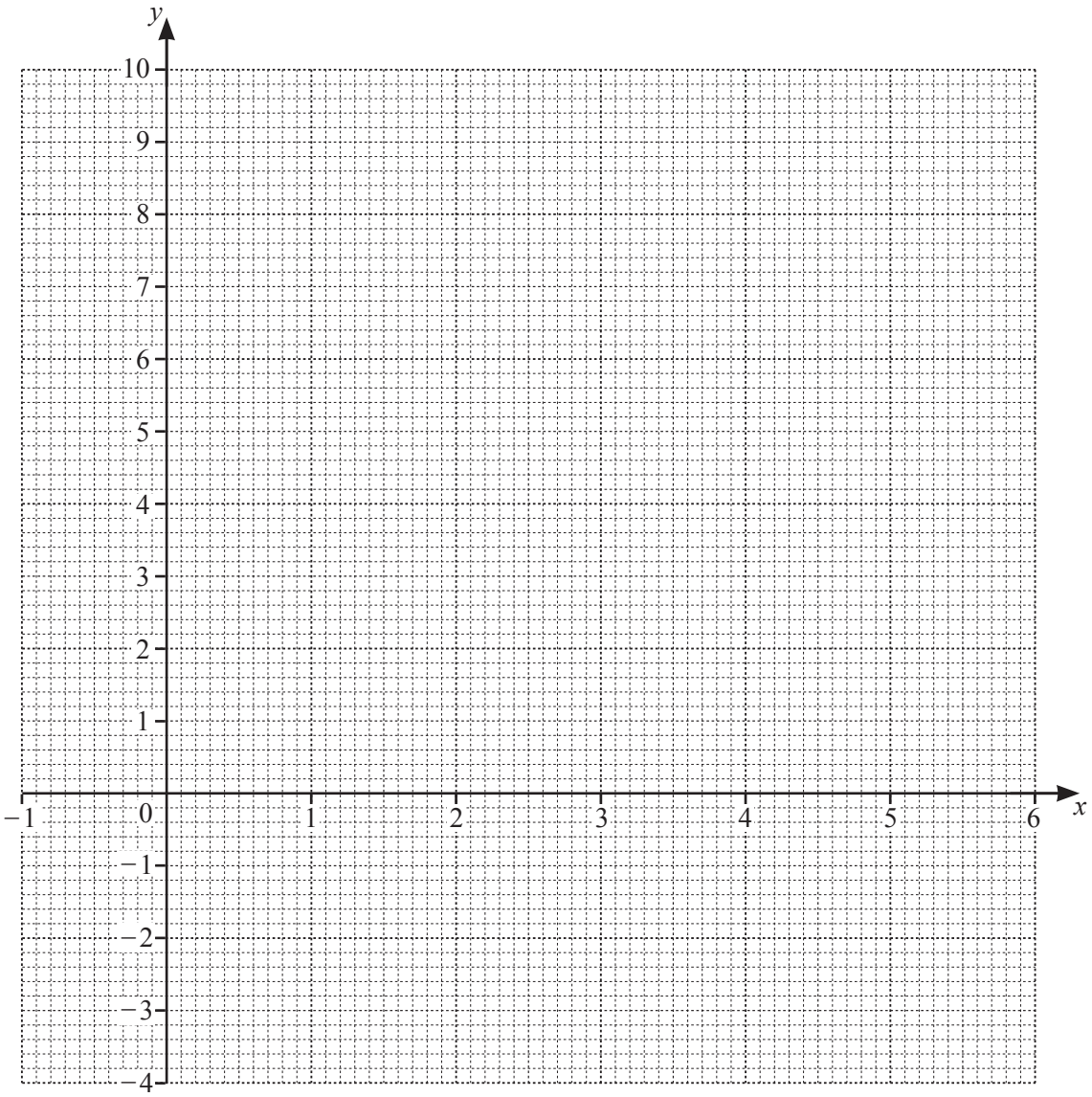
6 **(a)** Complete the table of values for $y = x^2 - 5x + 3$.

x	−1	0	1	2	3	4	5	6
y			−1	−3	−3	−1	3	

[2]

(b) On the grid, draw the graph of $y = x^2 - 5x + 3$ for $-1 \leqslant x \leqslant 6$.



[4]

(c) Use your graph to solve the equation $x^2 - 5x + 3 = 0$.

$x =$ ..... or $x =$ ..... [2]

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7 **(a)** Here are the first four terms of a sequence.

32 27 22 17

(i) Write down the next term.

..... [1]

(ii) Write down the rule for continuing the sequence.

..... [1]

(b) The nth term of another sequence is $n^2 + 2n$.

Find the first three terms of this sequence.

..... , ... , ... [2]

(c) Here are the first three patterns in a sequence.

Pattern 1 Pattern 2 Pattern 3

(i) Complete the table.

Pattern	1	2	3	4	5
Number of lines	6				

[2]

(ii) Find an expression, in terms of n, for the number of lines in Pattern n.

..... [2]

(iii) Jake says that he can make one of these patterns using exactly 105 lines.

Explain, without doing any working, why he is wrong.

..... [1]

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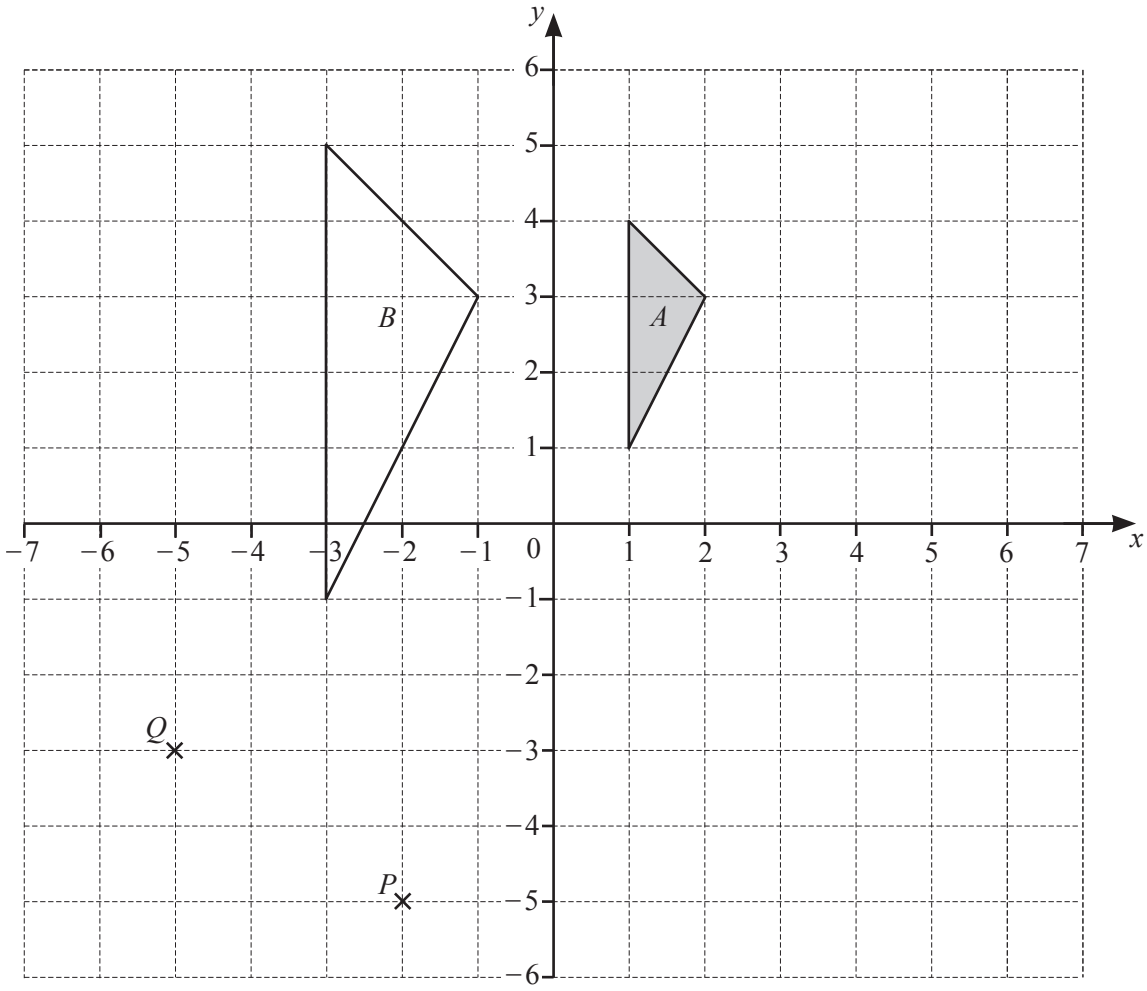
8 The diagram shows two triangles, A and B, and two points P and Q.



(a) **(i)** Write down the co-ordinates of point P.

(..... , ...) [1]

(ii) Write down the column vector $\overrightarrow{PQ}$.

$\overrightarrow{PQ} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

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(b) **(i)** Describe fully the **single** transformation that maps triangle A onto triangle B.

.....

..... [3]

(ii) On the grid, draw the image of triangle A after a translation by the vector $\begin{pmatrix} 4 \\ -2 \end{pmatrix}$. [2]

(iii) On the grid, draw the image of triangle A after a rotation through 90° clockwise about (0, 0). [2]

Question 9 is printed on the next page.

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9 **(a)** $c = 5a - 2b$

(i) Find the value of c when $a = 8$ and $b = -3$.

..... [2]

(ii) Make a the subject of the formula $c = 5a - 2b$.

$a =$ ..... [2]

(b) Factorise $3x + 12$.

..... [1]

(c) Expand $x(2y + x)$.

..... [2]

(d) Cara has n pencils.
Alice has twice as many pencils as Cara.
Leon has three more pencils than **Alice**.
The three children have a total of 58 pencils.

Use this information to write down an equation and solve it to find the value of n.

$n =$ ..... [4]

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MATHEMATICS **0580/33**

Paper 3 (Core) **October/November 2019**

2 hours

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 104.

This document consists of **16** printed pages.

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[Turn over

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1 **(a)** Write $\frac{1}{4}$ as a decimal.

..... [1]

(b) Write $\frac{36}{124}$ as a fraction in its lowest terms.

..... [1]

(c) Work out $\frac{5}{8}$ of 128.

..... [1]

(d) Write down all the factors of 24.

..... [2]

(e) Find the highest common factor (HCF) of 24 and 108.

..... [2]

(f) Write down an irrational number between 3 and 9.

..... [1]

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(g) Write down the value of 25^0.

..... [1]

(h) \$8400 is invested for 2 years at a rate of 3.5% per year compound interest.

Work out the total amount of interest earned by the end of the 2 years.

\$..... [3]

(i) **Without using a calculator**, work out $2\frac{1}{3} + \frac{4}{5}$.
You must show all your working and give your answer as a mixed number in its simplest form.

..... [3]

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2 **(a)** Emma records the number of letters in each word in a sentence.

7 1 5 4 2 4 5 3 3 1 2 4

Find

(i) the median,

..... [2]

(ii) the mode,

..... [1]

(iii) the range.

..... [1]

(b) Jack records the number of letters in 25 words.

Number of letters in a word	Number of words
1	3
2	1
3	5
4	8
5	6
6	2

(i) Calculate the mean.

..... [3]

(ii) Priti picks one of Jack's words at random.

Find the probability that this word has 4 or more letters.

[2]

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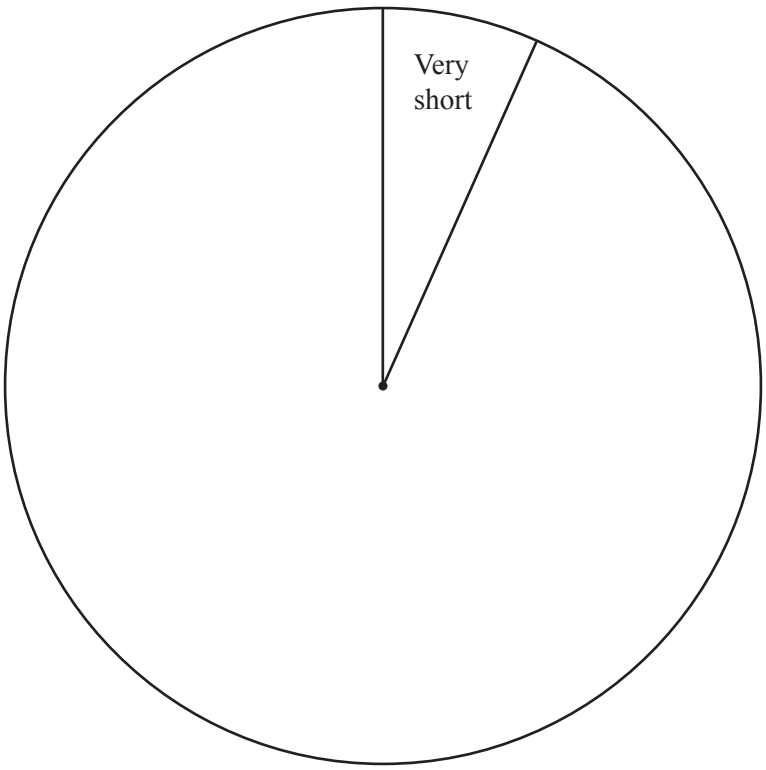
(c) The table shows information about the first 90 words in a book.

(i) Complete the table.

Length of word	Frequency	Pie chart angle
Very short	6	24°
Short	34	
Medium	41	
Long	9	

[2]

(ii) Complete the pie chart to show this information.



[2]

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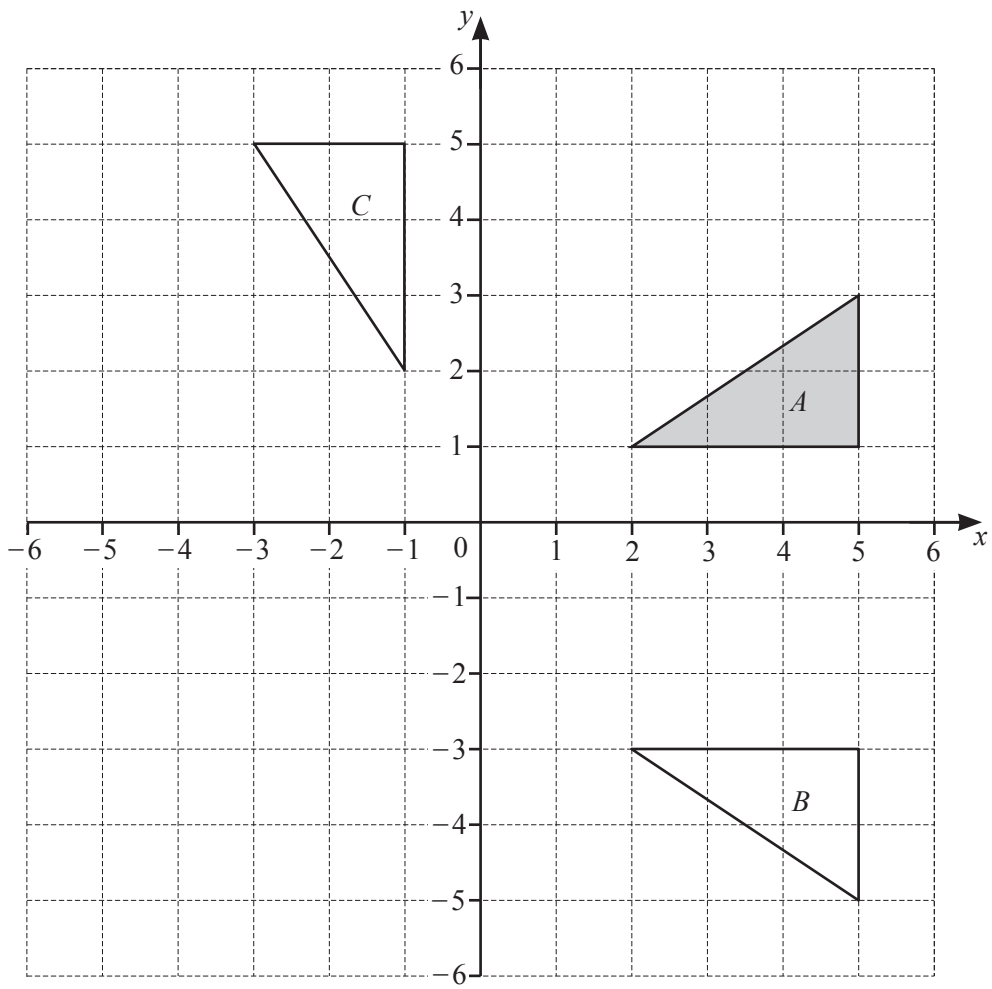
3



(a) Describe fully the **single** transformation that maps triangle *A* onto triangle *B*.

.....

..... [2]

(b) Describe fully the **single** transformation that maps triangle *A* onto triangle *C*.

.....

..... [3]

(c) On the grid, draw the image of triangle *A* after a translation by the vector $\begin{pmatrix} -2 \\ -3 \end{pmatrix}$. [2]

(d) On the grid, draw the image of triangle *A* after a rotation of 180° about (2, 1). [2]

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4 **(a)** A plane leaves Karachi at 1530 to fly to Bangkok.
The distance is 3840 km.

The plane flies at an average speed of 720 km/h.
The local time in Bangkok is 2 hours ahead of the local time in Karachi.

Find the local time in Bangkok when the plane arrives.

..... [4]

(b) In Bangkok a watch costs 2610 baht.
The exchange rate is \$1 = 34.8 baht.

Find the cost of the watch in dollars.

\$..... [2]

(c) The price of another watch increases from \$18 to \$19.17 .

Find the percentage increase in the price of this watch.

..... % [3]

(d) Raoul makes a profit when he sells his watch for \$36.
The ratio of the price Raoul paid for the watch and the profit he makes is price paid : profit = 7 : 2.

Work out the profit that Raoul makes.

\$..... [2]

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5 **(a)** Simplify.

$$9x - 2y - 5x - y$$

..... [2]

(b) $P = 4ab + 3b^2$

Work out the value of a when $P = 35$ and $b = 5$.

$a =$ ..... [3]

(c) Solve.

(i) $10x = 5$

$x =$ ..... [1]

(ii) $7x - 3 = 2x + 11$

$x =$ ..... [2]

(iii) $3(2x - 1) = 27$

$x =$ ..... [3]

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(d) Rearrange $T = 5(p+2)$ to make p the subject.

$p =$ ..... [2]

(e) Solve the simultaneous equations.
You must show all your working.

$$3x - y = 22$$
$$x + 2y = 5$$

$x =$ .....

$y =$ ..... [3]

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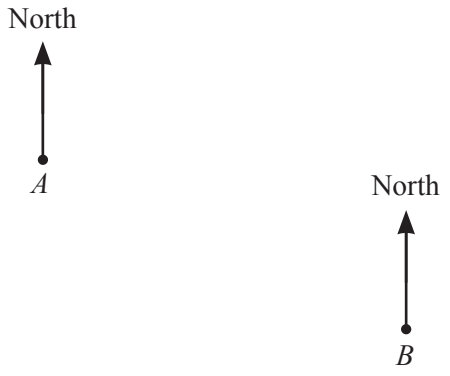
6 **(a)** The scale drawing shows the positions of town *A* and town *B*.
The scale is 1 centimetre represents 12 kilometres.



Scale : 1 cm to 12 km

(i) Measure the bearing of town *B* from town *A*.

..... [1]

(ii) Find the actual distance from town *A* to town *B*.

..... km [2]

(iii) Town *C* is on a bearing of 064° from town *A* and 028° from town *B*.

On the scale drawing, mark the position of town *C*. [2]

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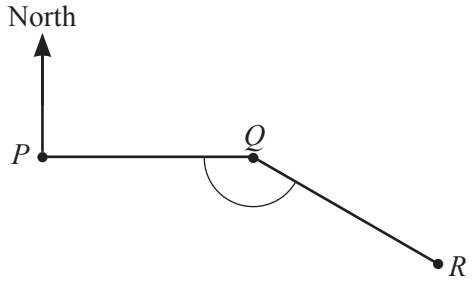
(b) The bearing of town D from town E is 245°.

Work out the bearing of town E from town D.

..... [2]

(c) The diagram shows three towns, P, Q and R.



NOT TO SCALE

The bearing of town Q from town P is 090°.

(i) Complete the statement.

Town ..... is due west of town ..... . [1]

(ii) PQ and QR are two sides of a regular decagon.

Work out angle PQR.

Angle PQR = ... [3]

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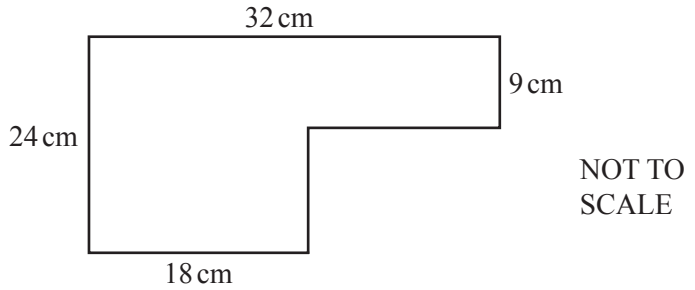
7 **(a)** The diagram shows a shape made from two rectangles.



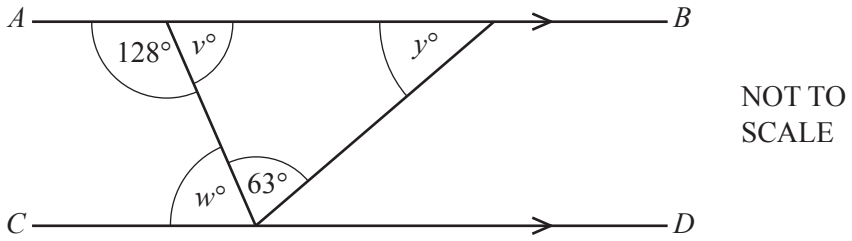
(i) Work out the perimeter.

..... cm [2]

(ii) Work out the area.

..... cm^2 [2]

(b) The diagram shows a triangle between two parallel lines, *AB* and *CD*.



Find the value of

(i) v,

v = ... [1]

(ii) w,

w = ... [1]

(iii) y.

y = ... [1]

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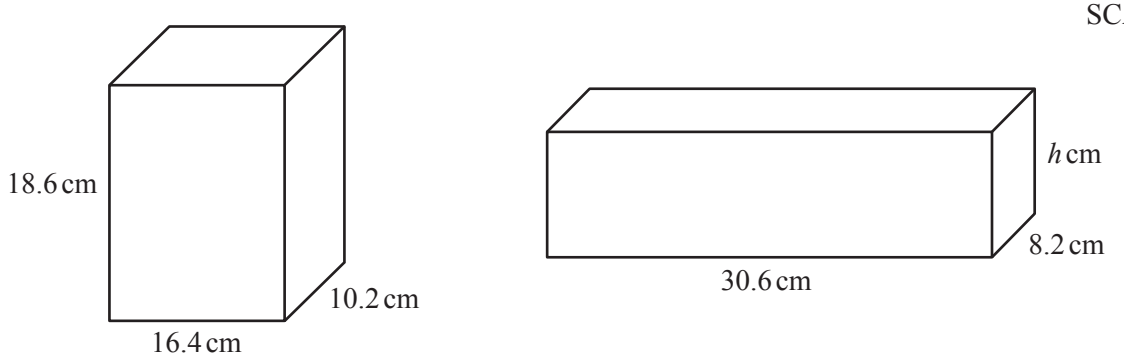
(c) These two cuboids have the same volume.

NOT TO SCALE

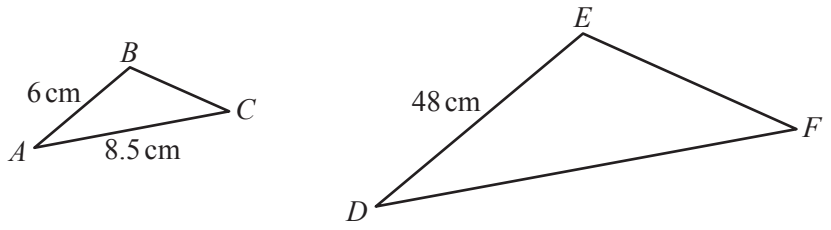


Find the value of h.

h = ... [3]

(d) The diagram shows two similar triangles, ABC and DEF.

NOT TO SCALE



Calculate DF.

DF = ... cm [2]

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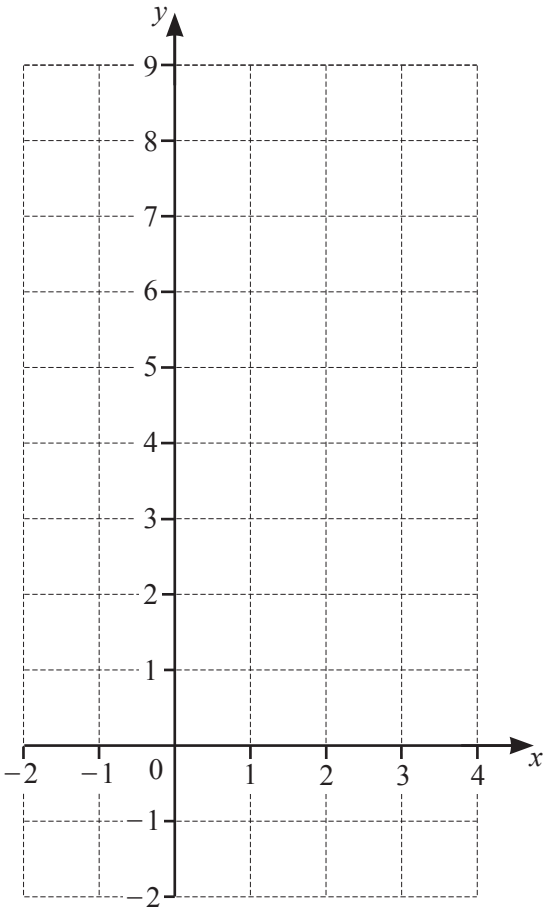
8 **(a)** **(i)** Complete the table of values for $y = x^2 - 2x$.

x	–2	–1	0	1	2	3	4
y	8		0	–1	0		8

[1]

(ii) On the grid, draw the graph of $y = x^2 - 2x$ for $-2 \leqslant x \leqslant 4$.



[4]

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(b) Here are the first four terms of a sequence.

3 9 15 21

(i) Find the next term.

..... [1]

(ii) Write down the rule for continuing this sequence.

..... [1]

(iii) Find the *n*th term of this sequence.

..... [2]

Question 9 is printed on the next page.

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9 **(a)** By rounding each number correct to 1 significant figure, show that an estimate for this calculation is 20.

$$\frac{9.78 + 31.562}{0.381 \times 5.09}$$

[2]

(b) Write these numbers in order, smallest first.

$\frac{22}{7}$ 3.142 $\frac{333}{106}$ 3.1416

..... < ..... < ..... < ..... [2]
smallest

(c) The length, p cm, of a pencil is 9.8 cm, correct to 2 significant figures.

Complete the statement about the value of p.

..... $\leqslant p <$ ..... [2]

(d) Calculate $3.142 - \frac{52\,163}{16\,604}$.

Give your answer in standard form correct to 2 significant figures.

..... [2]

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MATHEMATICS **0580/41**

Paper 4 (Extended) **October/November 2019**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

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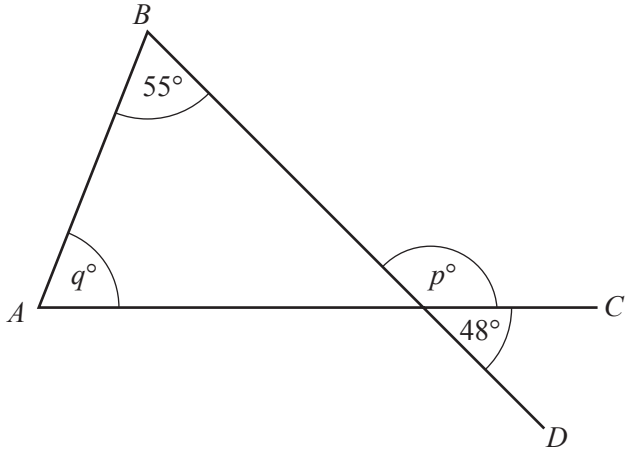
1 **(a)**



NOT TO SCALE

In the diagram, AC and BD are straight lines.

Find the value of p and the value of q.

$p =$ .....

$q =$ ..... [3]

(b) The angles of a quadrilateral are $x°$, $(x+5)°$, $(2x-25)°$ and $(x+10)°$.

Find the value of x.

$x =$ ..... [3]

(c) A regular polygon has 72 sides.

Find the size of an interior angle.

..... [3]

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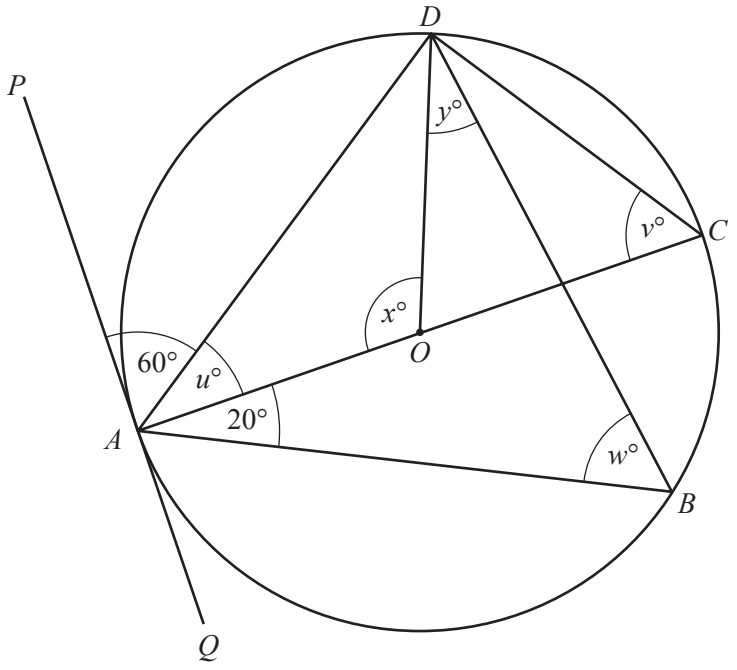
(d)



NOT TO SCALE

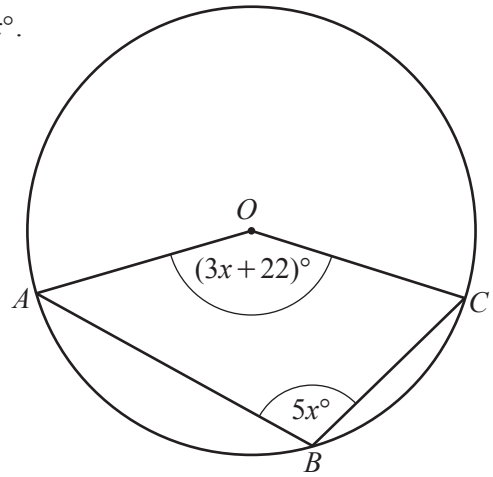
A, B, C and D lie on the circle, centre O, with diameter AC.
PQ is a tangent to the circle at A.
Angle $PAD = 60°$ and angle $BAC = 20°$.

Find the values of u, v, w, x and y.

$u =$ ....., $v =$ ....., $w =$ ....., $x =$ ....., $y =$ ..... [6]

(e) A, B and C lie on the circle, centre O.
Angle $AOC = (3x + 22)°$ and angle $ABC = 5x°$.

Find the value of x.



NOT TO SCALE

$x =$ ..... [4]

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2 **(a)** Ali and Mo share a sum of money in the ratio Ali : Mo = 9 : 7.
Ali receives \$600 more than Mo.

Calculate how much each receives.

Ali \$ .....

Mo \$ ..... [3]

(b) In a sale, Ali buys a television for \$195.80 .
The original price was \$220.

Calculate the percentage reduction on the original price.

..... % [3]

(c) In the sale, Mo buys a jacket for \$63.
The original price was reduced by 25%.

Calculate the original price of the jacket.

\$ ..... [3]

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3 **(a)** Dina invests \$600 for 5 years at a rate of 2% per year compound interest.

Calculate the value of this investment at the end of the 5 years.

\$ ..... [2]

(b) The value of a gold ring increases exponentially at a rate of 5% per year.
The value is now \$882.

(i) Calculate the value of the ring 2 years ago.

\$ ..... [2]

(ii) Find the number of complete years it takes for the ring's value of \$882 to increase to a value greater than \$1100.

..... [2]

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4 **(a)** **(i)** Calculate the **external curved** surface area of a cylinder with radius 8 m and height 19 m.

..... m^2 [2]

(ii) This surface is painted at a cost of \$0.85 per square metre.

Calculate the cost of painting this surface.

\$ ..... [2]

(b) A solid metal sphere with radius 6 cm is melted down and all of the metal is used to make a solid cone with radius 8 cm and height h cm.

(i) Show that $h = 13.5$.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

[2]

(ii) Calculate the slant height of the cone.

..... cm [2]

(iii) Calculate the curved surface area of the cone.
[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi r l$.]

..... cm^2 [1]

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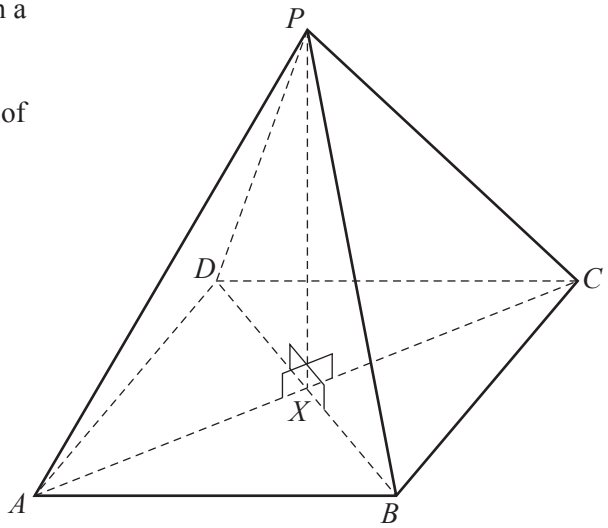
(c) Two cones are mathematically similar.
The total surface area of the smaller cone is $80\,\text{cm}^2$.
The total surface area of the larger cone is $180\,\text{cm}^2$.
The volume of the smaller cone is $168\,\text{cm}^3$.

Calculate the volume of the larger cone.

..... cm^3 [3]

(d) The diagram shows a pyramid with a square base $ABCD$.
$DB = 8\,\text{cm}$.
P is vertically above the centre, X, of the base and $PX = 5\,\text{cm}$.



NOT TO SCALE

Calculate the angle between PB and the base $ABCD$.

..... [3]

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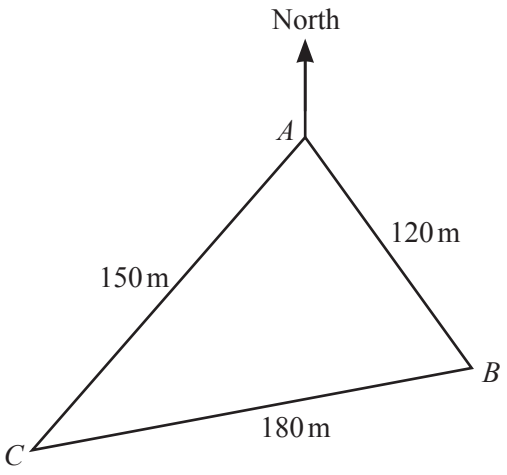
5



NOT TO SCALE

The diagram shows a triangular field, *ABC*, on horizontal ground.

(a) Olav runs from *A* to *B* at a constant speed of 4 m/s and then from *B* to *C* at a constant speed of 3 m/s.
He then runs at a constant speed from *C* to *A*.
His average speed for the whole journey is 3.6 m/s.

Calculate his speed when he runs from *C* to *A*.

..... m/s [3]

(b) Use the cosine rule to find angle *BAC*.

Angle *BAC* = ... [4]

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(c) The bearing of C from A is 210°.

(i) Find the bearing of B from A.

..... [1]

(ii) Find the bearing of A from B.

..... [2]

(d) D is the point on AC that is nearest to B.

Calculate the distance from D to A.

..... m [2]

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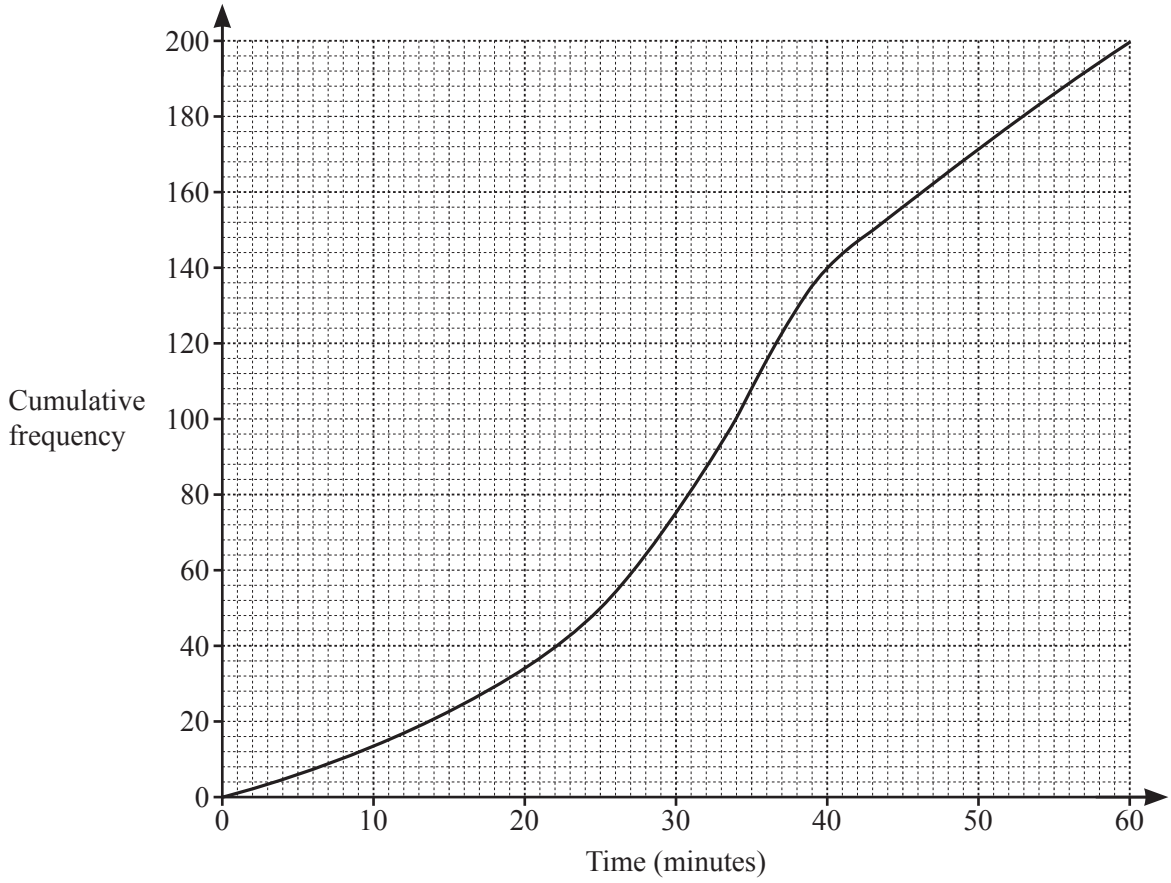
6 **(a)** The cumulative frequency diagram shows information about the times taken by 200 students to solve a problem.



Use the cumulative frequency diagram to find an estimate for

(i) the median, ... min [1]

(ii) the interquartile range,

..... min [2]

(iii) the number of students who took more than 40 minutes.

..... [2]

(b) Roberto records the value of each of the coins he has at home.
The table shows the results.

Value (cents)	1	2	5	10	20	50
Frequency	3	1	3	2	4	2

(i) Find the range. ..... cents [1]

(ii) Find the mode. ..... cents [1]

(iii) Find the median.

..... cents [1]

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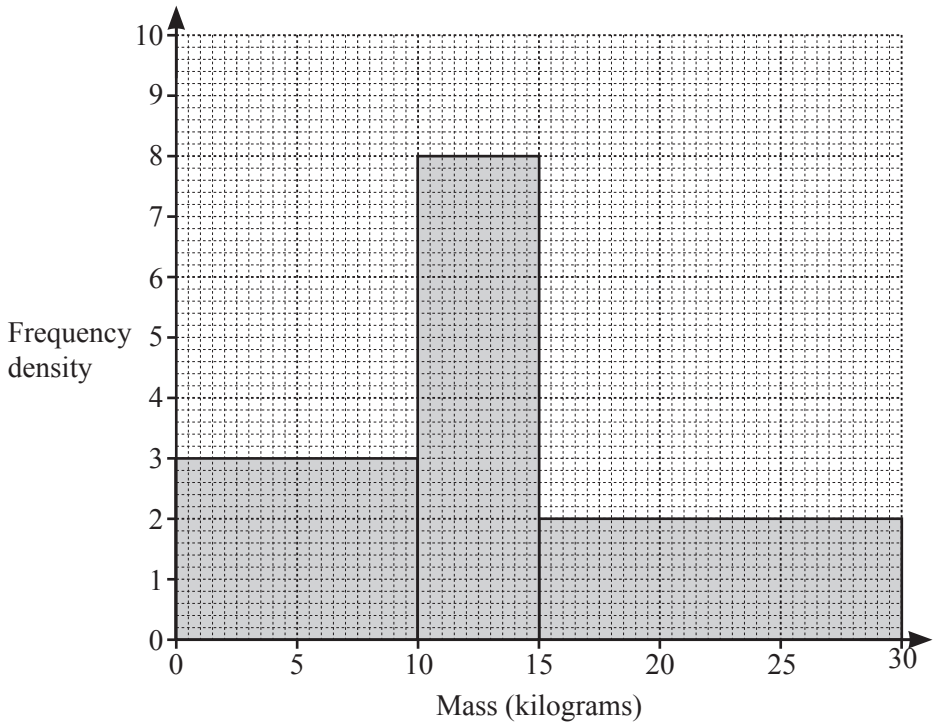
(iv) Work out the total value of Roberto's coins.

..... cents [2]

(v) Work out the mean.

..... cents [1]

(c) The histogram shows information about the masses of 100 boxes.



Calculate an estimate of the mean.

..... kg [6]

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7 **(a)** Oranges cost 21 cents each.
Alex buys x oranges and Bobbie buys $(x+2)$ oranges.
The total cost of these oranges is \$4.20 .

Find the value of x.

$x =$ ..... [3]

(b) The cost of one ruler is r cents.
The cost of one protractor is p cents.

The total cost of 5 rulers and 1 protractor is 245 cents.
The total cost of 2 rulers and 3 protractors is 215 cents.

Write down two equations in terms of r and p and solve these equations to find the cost of one protractor.

..... cents [5]

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(c) Carol walks 12 km at x km/h and then a further 6 km at $(x-1)$ km/h.
The total time taken is 5 hours.

(i) Write an equation, in terms of x, and show that it simplifies to $5x^2 - 23x + 12 = 0$.

[3]

(ii) Factorise $5x^2 - 23x + 12$.

..... [2]

(iii) Solve the equation $5x^2 - 23x + 12 = 0$.

$x =$ ..... or $x =$ ..... [1]

(iv) Write down Carol's walking speed during the final 6 km.

..... km/h [1]

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8

The diagram shows 5 cards.

(a) Donald chooses a card at random.

(i) Write down the probability that the number of dots on this card is an even number.

..... [1]

(ii) Write down the probability that the number of dots on this card is a prime number.

..... [1]

(b) Donald chooses two of the five cards at random, without replacement.
He works out the total number of dots on these two cards.

(i) Find the probability that the total number of dots is 5.

..... [3]

(ii) Find the probability that the total number of dots is an odd number.

..... [3]

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9 A car hire company has x small cars and y large cars.
The company has at least 6 cars in total.
The number of large cars is less than or equal to the number of small cars.
The largest number of small cars is 8.

(a) Write down three inequalities, in terms of x and/or y, to show this information.

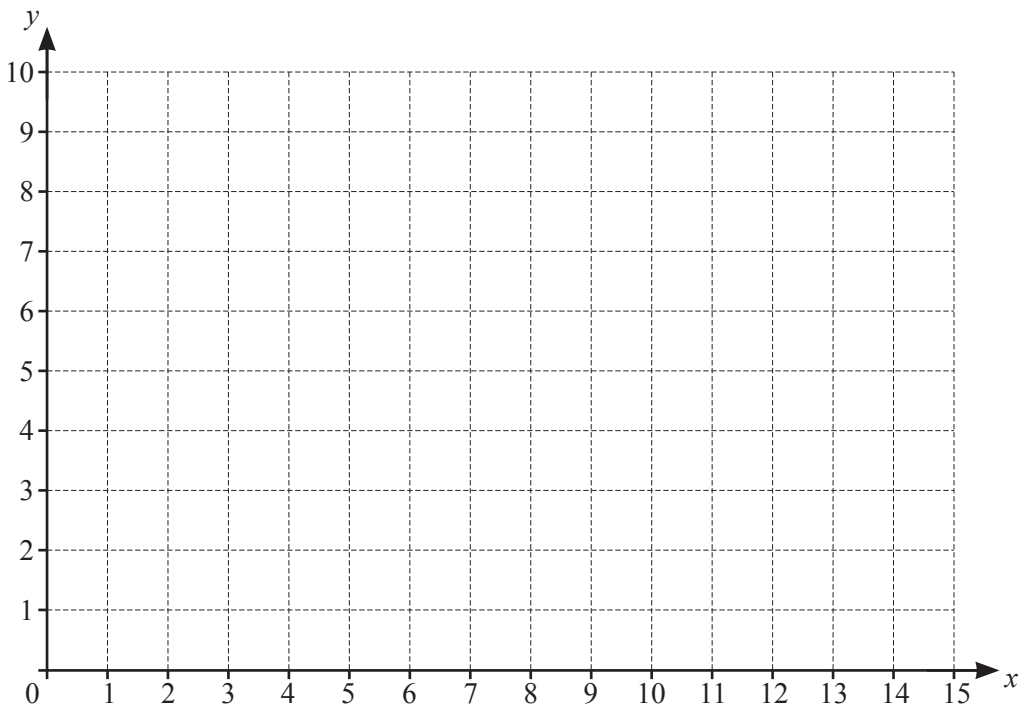
..... , ... , ... [3]

(b) A small car can carry 4 people and a large car can carry 6 people.
One day, the largest number of people to be carried is 60.

Show that $2x + 3y \leqslant 30$.

[1]

(c)



By shading the **unwanted** regions on the grid, show and label the region R that satisfies all four inequalities. [6]

(d) **(i)** Find the number of small cars and the number of large cars needed to carry exactly 60 people.

..... small cars, ... large cars [1]

(ii) When the company uses 7 cars, find the largest number of people that can be carried.

..... [2]

Question 10 is printed on the next page.

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10 **(a)** Complete the table for the 5th term and the nth term of each sequence.

1st term	2nd term	3rd term	4th term	5th term		nth term
9	5	1	−3			
4	9	16	25			
1	8	27	64			
8	16	32	64			

[11]

(b) 0, 1, 1, 2, 3, 5, 8, 13, 21, …

This sequence is a Fibonacci sequence.
After the first two terms, the rule to find the next term is "add the two previous terms".
For example, $5 + 8 = 13$.

Use this rule to complete each of the following Fibonacci sequences.

2 4 ....

1 11

..... −1 1

[3]

(c) $\frac{1}{3}$, $\frac{3}{4}$, $\frac{4}{7}$, $\frac{7}{11}$, $\frac{11}{18}$, …

(i) One term of this sequence is $\frac{p}{q}$.

Find, in terms of p and q, the next term in this sequence.

..... [1]

(ii) Find the 6th term of this sequence.

..... [1]

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MATHEMATICS **0580/42**

Paper 4 (Extended) **October/November 2019**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

This document consists of **18** printed pages and **2** blank pages.

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[Turn over

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1 **(a)** Mohsin has 600 pear trees and 720 apple trees on his farm.

(i) Write the ratio pear trees : apple trees in its simplest form.

..... : ..... [1]

(ii) Each apple tree produces 16 boxes of apples each year.
One box contains 18 kg of apples.

Calculate the total mass of apples produced by the 720 trees in one year.
Give your answer in standard form.

..... kg [3]

(b) **(i)** One week, the total mass of pears picked was 18 540 kg.
For this week, the ratio mass of apples : mass of pears = 13 : 9.

Find the mass of apples picked that week.

..... kg [2]

(ii) The apples cost Mohsin $0.85 per kilogram to produce.
He sells them at a profit of 60%.

Work out the selling price per kilogram of the apples.

$ ..... [2]

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(c) Mohsin exports some of his pears to a shop in Belgium.
The shop buys the pears at \$1.50 per kilogram.
The shop sells the pears for 2.30 euros per kilogram.
The exchange rate is \$1 = 0.92 euros.

Calculate the percentage profit per kilogram made by the shop.

..... % [5]

(d) Mohsin's earnings increase exponentially at a rate of 8.7% each year.
During 2018 he earned \$195 600.

During 2027, how much **more** does he earn than during 2018?

\$ ..... [3]

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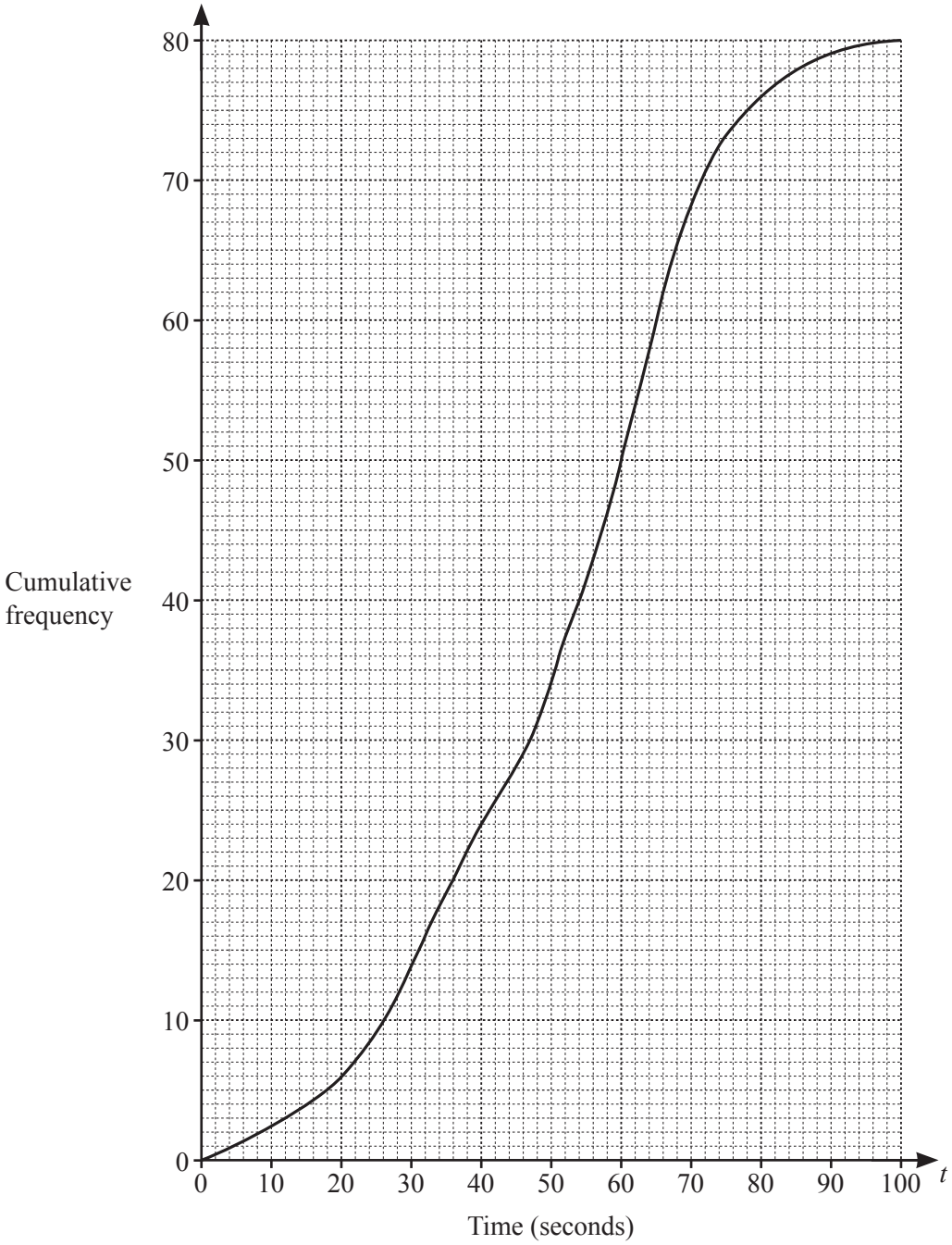
2 The cumulative frequency diagram shows information about the time taken, t seconds, for a group of girls to each solve a maths problem.



(a) Use the cumulative frequency diagram to find an estimate for

(i) the median,

..... s [1]

(ii) the interquartile range,

..... s [2]

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(iii) the 20th percentile,

..... s [1]

(iv) the number of girls who took more than 66 seconds to solve the problem.

..... [2]

(b) **(i)** Use the cumulative frequency diagram to complete the frequency table.

Time (t seconds)	$0 < t \leqslant 20$	$20 < t \leqslant 40$	$40 < t \leqslant 60$	$60 < t \leqslant 80$	$80 < t \leqslant 100$
Frequency	6				4

[2]

(ii) Calculate an estimate of the mean time.

..... s [4]

(c) A group of boys solved the same problem.
The boys had a median time of 60 seconds, a lower quartile of 46 seconds and an upper quartile of 66 seconds.

(i) Write down the percentage of boys with a time of 66 seconds or less.

..... % [1]

(ii) Howard says

The boys' times vary more than the girls' times.

Explain why Howard is incorrect.

.....

..... [2]

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3 A line joins A (1, 3) to B (5, 8).

(a) **(i)** Find the midpoint of AB.

(..... , ...) [2]

(ii) Find the equation of the line AB.
Give your answer in the form $y = mx + c$.

$y =$ ..... [3]

(b) The line AB is transformed to the line PQ.

Find the co-ordinates of P and the co-ordinates of Q after AB is transformed by

(i) a translation by the vector $\begin{pmatrix} 5 \\ -2 \end{pmatrix}$,

P (..... , ...)

Q (..... , ...) [2]

(ii) a rotation through 90° anticlockwise about the origin,

P (..... , ...)

Q (..... , ...) [2]

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(iii) a reflection in the line $x = 2$,

P (..... , ...)

Q (..... , ...) [2]

(iv) a transformation by the matrix $\begin{pmatrix} -1 & 2 \\ 0 & -1 \end{pmatrix}$.

P (..... , ...)

Q (..... , ...) [2]

(c) Describe fully the **single** transformation that maps the line AB onto the line PQ where P is the point $(-2, -6)$ and Q is the point $(-10, -16)$.

.....

..... [3]

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4 **(a)**

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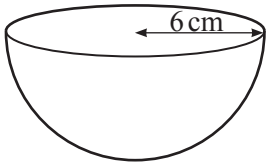


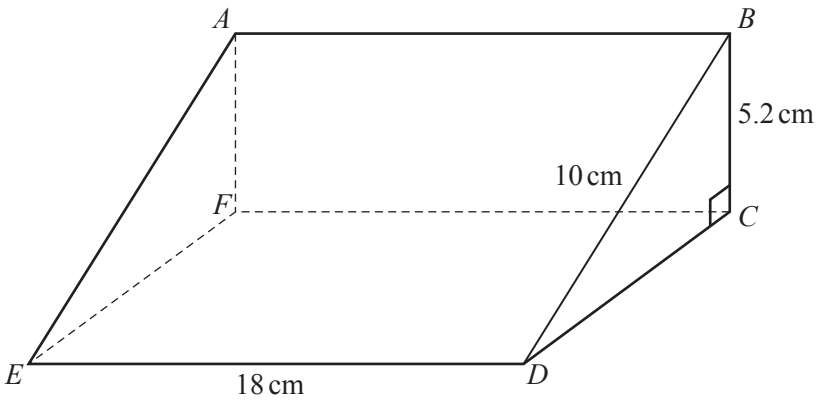
The diagram shows a hemisphere with radius 6 cm.

Calculate the volume.
Give the units of your answer.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

.... [3]

(b)



NOT TO SCALE

The diagram shows a prism *ABCDEF*.
The cross-section is a right-angled triangle *BCD*.
$BD = 10$ cm, $BC = 5.2$ cm and $ED = 18$ cm.

(i) **(a)** Work out the volume of the prism.

..... cm^3 [6]

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(b) Calculate angle *BEC*.

Angle *BEC* = ... [4]

(ii) The point *G* lies on the line *ED* and *GD* = 7 cm.

Work out angle *BGE*.

Angle *BGE* = ... [3]

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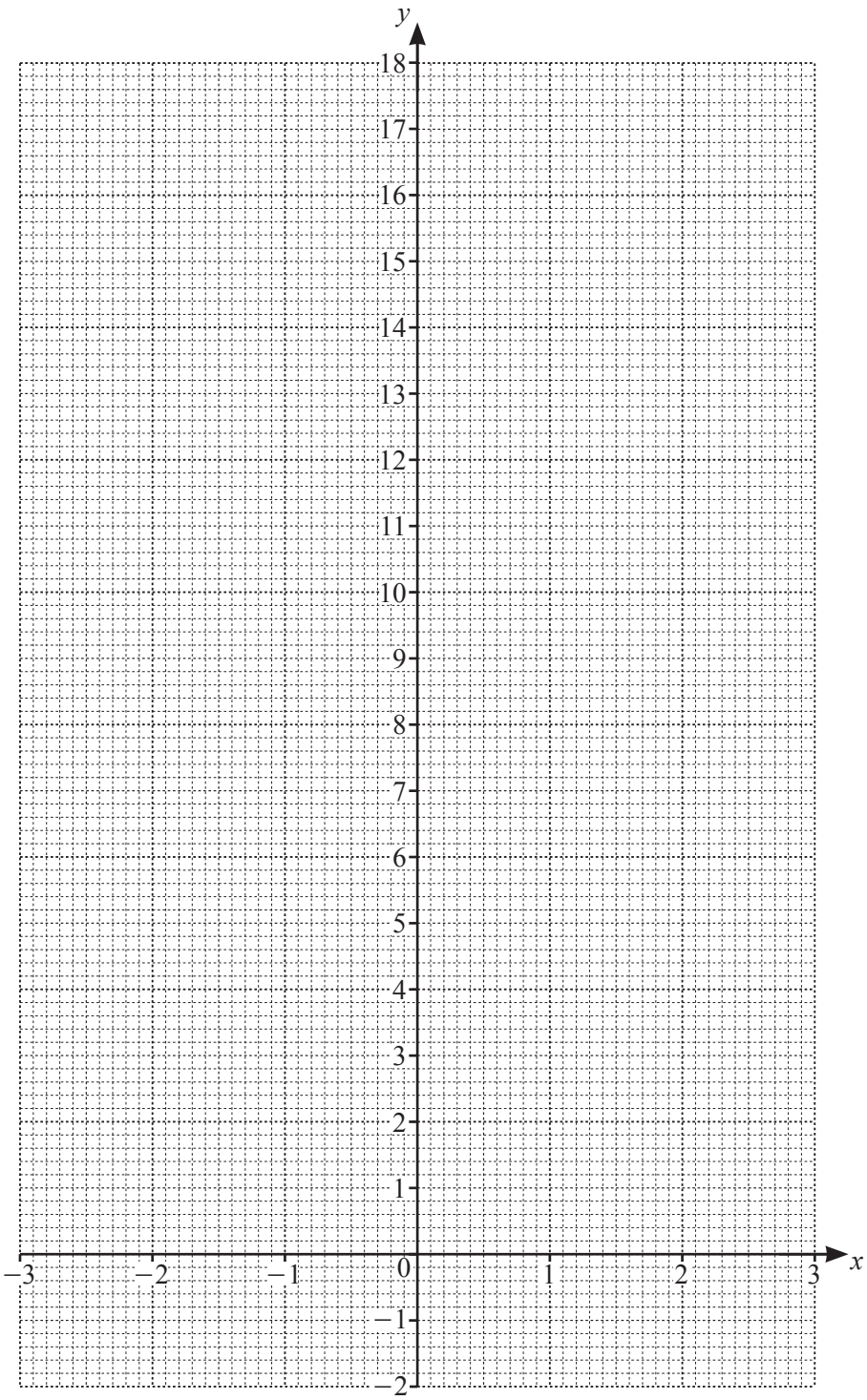
5 The table shows some values of $y = \frac{x^2}{2} + \frac{1}{x^2} - \frac{2}{x}$, $x \neq 0$.

x	-3	-2	-1	-0.5	-0.3		0.2	0.3	0.5	1	2	3
y	5.3	3.3		8.1	17.8			4.5	0.1	-0.5	1.3	

(a) Complete the table. [3]

(b) On the grid, draw the graph of $y = \frac{x^2}{2} + \frac{1}{x^2} - \frac{2}{x}$ for $-3 \leqslant x \leqslant -0.3$ and $0.2 \leqslant x \leqslant 3$.



[5]

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(c) Use your graph to solve $\frac{x^2}{2}+\frac{1}{x^2}-\frac{2}{x}\leqslant 0$.

..... $\leqslant x \leqslant$ ..... [2]

(d) Find the smallest positive integer value of k for which $\frac{x^2}{2}+\frac{1}{x^2}-\frac{2}{x}=k$ has two solutions for $-3\leqslant x\leqslant -0.3$ and $0.2\leqslant x\leqslant 3$.

..... [1]

(e) **(i)** By drawing a suitable straight line, solve $\frac{x^2}{2}+\frac{1}{x^2}-\frac{2}{x}=3x+1$ for $-3\leqslant x\leqslant -0.3$ and $0.2\leqslant x\leqslant 3$.

$x =$ ..... [3]

(ii) The equation $\frac{x^2}{2}+\frac{1}{x^2}-\frac{2}{x}=3x+1$ can be written as $x^4+ax^3+bx^2+cx+2=0$.

Find the values of a, b and c.

$a =$ .....

$b =$ .....

$c =$ ..... [3]

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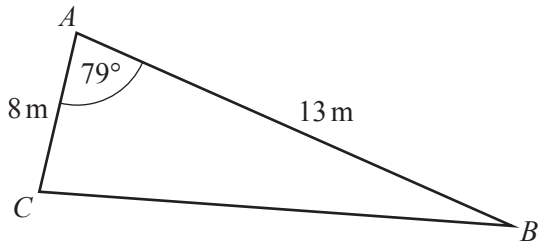
6 **(a)**



NOT TO SCALE

The diagram shows triangle *ABC*.

(i) Use the cosine rule to calculate *BC*.

BC = ... m [4]

(ii) Use the sine rule to calculate angle *ACB*.

Angle *ACB* = ... [3]

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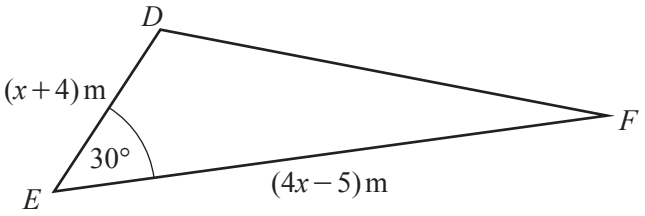
(b)



NOT TO SCALE

The area of triangle DEF is $70\,\text{m}^2$.

(i) Show that $4x^2 + 11x - 300 = 0$.

[4]

(ii) Use the quadratic formula to solve $4x^2 + 11x - 300 = 0$.
Show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [4]

(iii) Find the length of DE.

$DE =$ ..... m [1]

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7 $\mathrm{f}(x) = 7 - 2x$ $\mathrm{g}(x) = \dfrac{10}{x}$, $x \neq 0$ $\mathrm{h}(x) = 27^x$

(a) Find

(i) $\mathrm{f}(-3)$,

..... [1]

(ii) $\mathrm{hg}(30)$,

..... [2]

(iii) $\mathrm{f}^{-1}(x)$.

$\mathrm{f}^{-1}(x) =$ ..... [2]

(b) Solve.

$$\mathrm{g}(2x+1) = 4$$

$x =$ ..... [3]

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(c) Simplify, giving your answer as a single fraction.

$$\frac{1}{f(x)} + g(x)$$

..... [3]

(d) Find $h^{-1}(19\,683)$.

..... [1]

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8 **(a)** Make p the subject of

(i) $5p + 7 = m$,

$p =$ ..... [2]

(ii) $y^2 - 2p^2 = h$.

$p =$ ..... [3]

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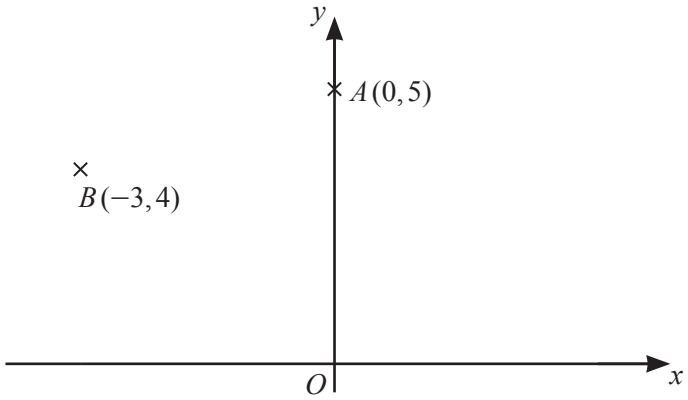
(b)



NOT TO SCALE

(i) Write $\overrightarrow{OA}$ as a column vector.

$\overrightarrow{OA} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(ii) Write $\overrightarrow{AB}$ as a column vector.

$\overrightarrow{AB} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(iii) A and B lie on a circle, centre O.

Calculate the length of the arc AB.

..... [6]

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9 Car *A* and car *B* take part in a race around a circular track.
One lap of the track measures 7.6 km.

Car *A* takes 2 minutes and 40 seconds to complete each lap of the track.
Car *B* takes 2 minutes and 25 seconds to complete each lap of the track.
Both cars travel at a constant speed.

(a) Calculate the speed of car *A*.
Give your answer in kilometres per hour.

..... km/h [3]

(b) Both cars start the race from the same position, *S*, at the same time.

(i) Find the time taken when both car *A* and car *B* are next at position *S* **at the same time**.
Give your answer in minutes and seconds.

..... min ..... s [4]

(ii) Find the distance that car *A* has travelled at this time.

..... km [2]

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MATHEMATICS **0580/43**

Paper 4 (Extended) **October/November 2019**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Tracing paper (optional)
Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.

This document consists of **19** printed pages and **1** blank page.

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Cambridge Assessment International Education

[Turn over

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1 **(a)** In a cycling club, the number of members are in the ratio males : females = 8 : 3.
The club has 342 females.

(i) Find the total number of members.

..... [2]

(ii) Find the percentage of the total number of members that are female.

..... % [1]

(b) The price of a bicycle is $1020.
Club members receive a 15% discount on this price.

Find how much a club member pays for this bicycle.

$ ..... [2]

(c) In 2019, the membership fee of the cycling club is $79.50 .
This is 6% more than last year.

Find the **increase** in the cost of the membership.

$ ..... [3]

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(d) Asif cycles a distance of 105 km.
On the first part of his journey he cycles 60 km in 2 hours 24 minutes.
On the second part of his journey he cycles 45 km at 20 km/h.

Find his average speed for the whole journey.

..... km/h [4]

(e) Bryan invested \$480 in an account 4 years ago.
The account pays compound interest at a rate of 2.1% per year.
Today, he uses some of the money in this account to buy a bicycle costing \$430.

Calculate how much money remains in his account.

\$ ..... [3]

(f) The formula $s = \frac{1}{2}at^2$ is used to calculate the distance, s, travelled by a bicycle.

When $a = 3$ and $t = 10$, each correct to the nearest integer, calculate the lower bound of the distance, s.

..... [2]

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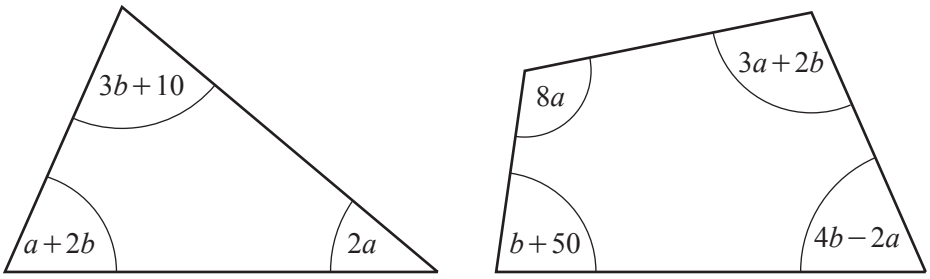
2 **(a)** The diagram shows a triangle and a quadrilateral.
All angles are in degrees.



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(i) For the triangle, show that $3a+5b=170$.

[1]

(ii) For the quadrilateral, show that $9a+7b=310$.

[1]

(iii) Solve these simultaneous equations.
Show all your working.

$a =$ .....

$b =$ ..... [3]

(iv) Find the size of the smallest angle in the triangle.

..... [1]

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(b) Solve the equation $6x - 3 = -12$.

$x =$ ..... [2]

(c) Rearrange $2(4x - y) = 5x - 3$ to make y the subject.

$y =$ ..... [3]

(d) Simplify.

$$(27x^9)^{\frac{2}{3}}$$

..... [2]

(e) Simplify.

$$\frac{x^2 + 5x}{x^2 - 25}$$

..... [3]

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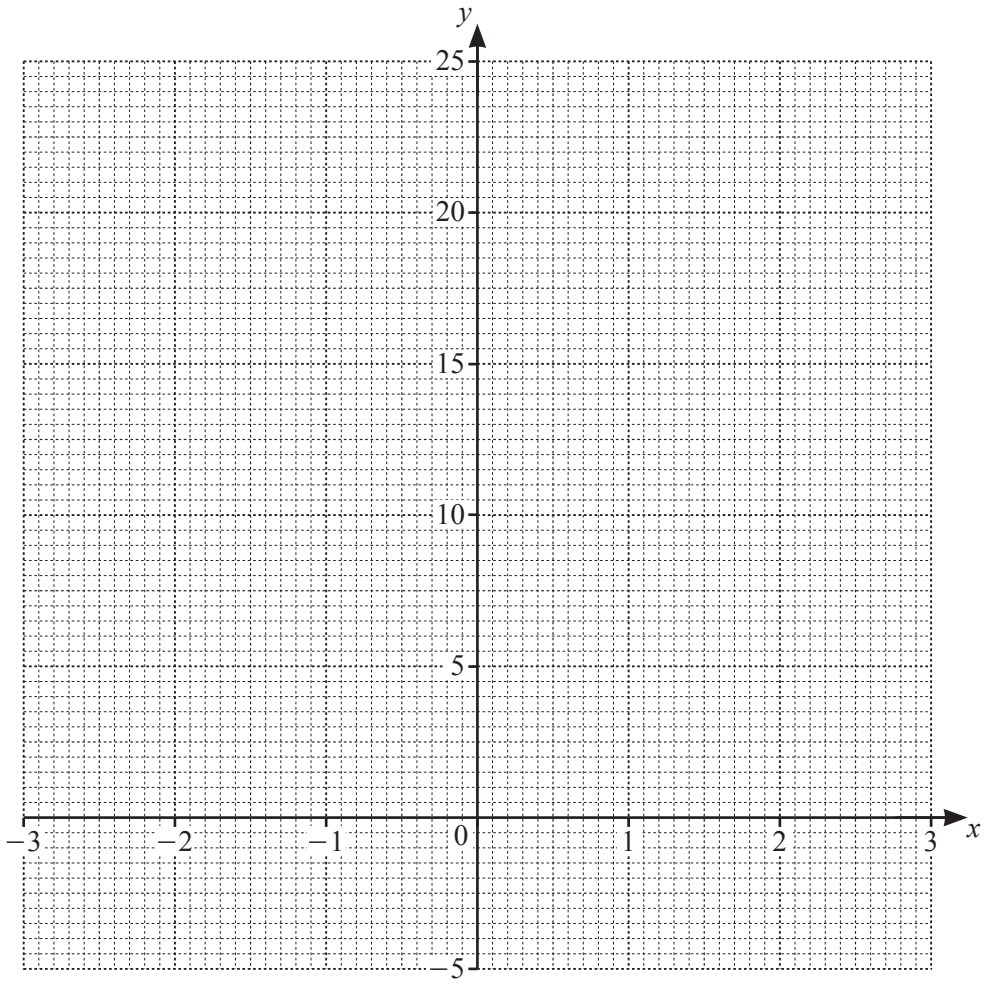
3 The table shows some values for $y = x^3 + x^2 - 5x$.

x	-3	-2	-1.5	-1	0	1	1.5	2	2.5	3
y	-3	6	6.4		0		-1.9	2	9.4	

(a) Complete the table. [3]

(b) On the grid, draw the graph of $y = x^3 + x^2 - 5x$ for $-3 \leqslant x \leqslant 3$.



[4]

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(c) Use your graph to solve the equation $x^3 + x^2 - 5x = 0$.

$x =$ ..... or $x =$ ..... or $x =$ ..... [2]

(d) By drawing a suitable tangent, find an estimate of the gradient of the curve at $x = 2$.

..... [3]

(e) Write down the largest value of the integer, k, so that the equation $x^3 + x^2 - 5x = k$ has three solutions for $-3 \leqslant x \leqslant 3$.

$k =$ ..... [1]

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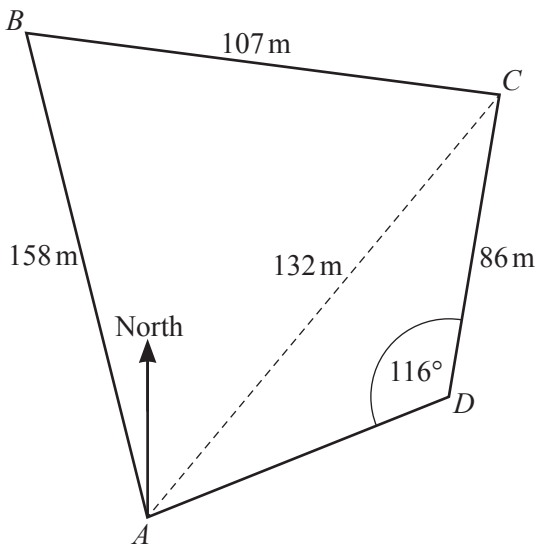
4



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The diagram shows a field, *ABCD*, on horizontal ground.

(a) There is a vertical post at *C*.
From *B*, the angle of elevation of the top of the post is 19°.

Find the height of the post.

..... m [2]

(b) Use the cosine rule to find angle *BAC*.

Angle *BAC* = ... [4]

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(c) Use the sine rule to find angle *CAD*.

Angle *CAD* = ... [3]

(d) Calculate the area of the field.

..... m^2 [3]

(e) The bearing of *D* from *A* is 070°.

Find the bearing of *A* from *C*.

..... [2]

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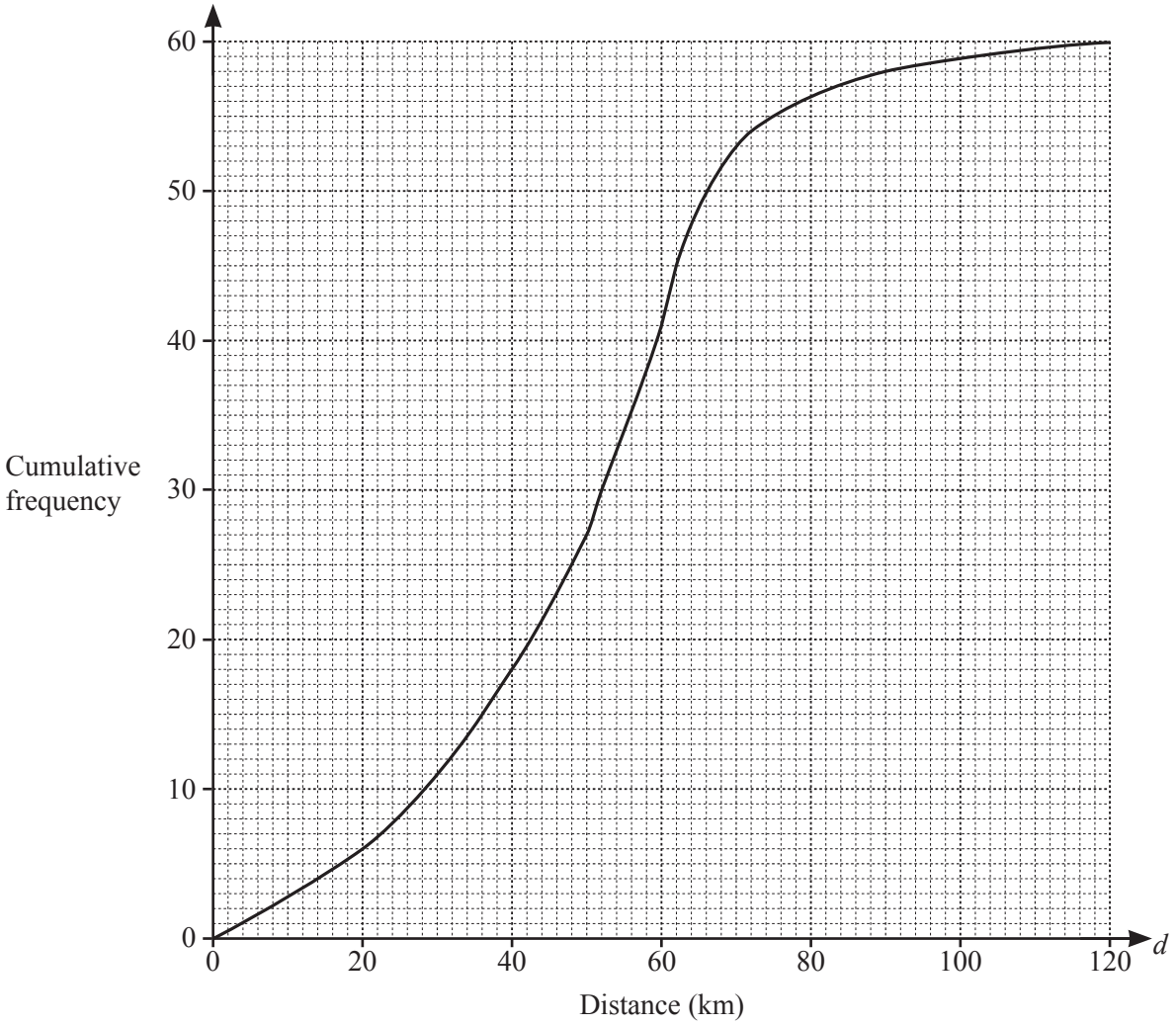
5 The cumulative frequency diagram shows information about the distance, d km, travelled by each of 60 male cyclists in one weekend.



(a) Use the cumulative frequency diagram to find an estimate of

(i) the median,

..... km [1]

(ii) the lower quartile,

..... km [1]

(iii) the interquartile range.

..... km [1]

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(b) For the same weekend, the interquartile range for the distances travelled by a group of female cyclists is 40 km.

Make one comment comparing the distribution of the distances travelled by the males with the distribution of the distances travelled by the females.

.....

..... [1]

(c) A male cyclist is chosen at random.

Find the probability that he travelled more than 50 km.

..... [2]

(d) **(i)** Use the cumulative frequency diagram to complete this frequency table.

Distance (d km)	Number of male cyclists
$0 < d \leqslant 40$	18
$40 < d \leqslant 50$	9
$50 < d \leqslant 60$	
$60 < d \leqslant 70$	
$70 < d \leqslant 90$	
$90 < d \leqslant 120$	2

[2]

(ii) Calculate an estimate of the mean distance travelled.

..... km [4]

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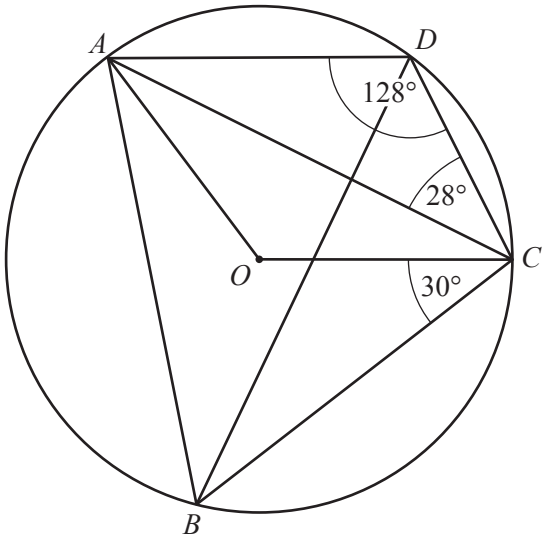
6 **(a)**



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In the diagram, A, B, C and D lie on the circle, centre O.
Angle $ADC = 128°$, angle $ACD = 28°$ and angle $BCO = 30°$.

(i) Show that obtuse angle $AOC = 104°$.
Give a reason for each step of your working.

[3]

(ii) Find angle BAO.

Angle BAO = ... [2]

(iii) Find angle ABD.

Angle ABD = ... [1]

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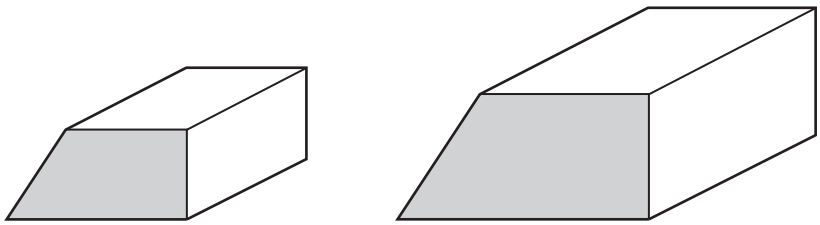
(iv) The radius, OC, of the circle is 9.6 cm.

Calculate the total perimeter of the sector $OADC$.

..... cm [3]

(b)



NOT TO SCALE

The diagram shows two mathematically similar solid metal prisms.
The volume of the smaller prism is 648 cm^3 and the volume of the larger prism is 2187 cm^3.
The area of the cross-section of the smaller prism is 36 cm^2.

(i) Calculate the area of the cross-section of the larger prism.

..... cm^2 [3]

(ii) The larger prism is melted down into a sphere.

Calculate the radius of the sphere.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... cm [3]

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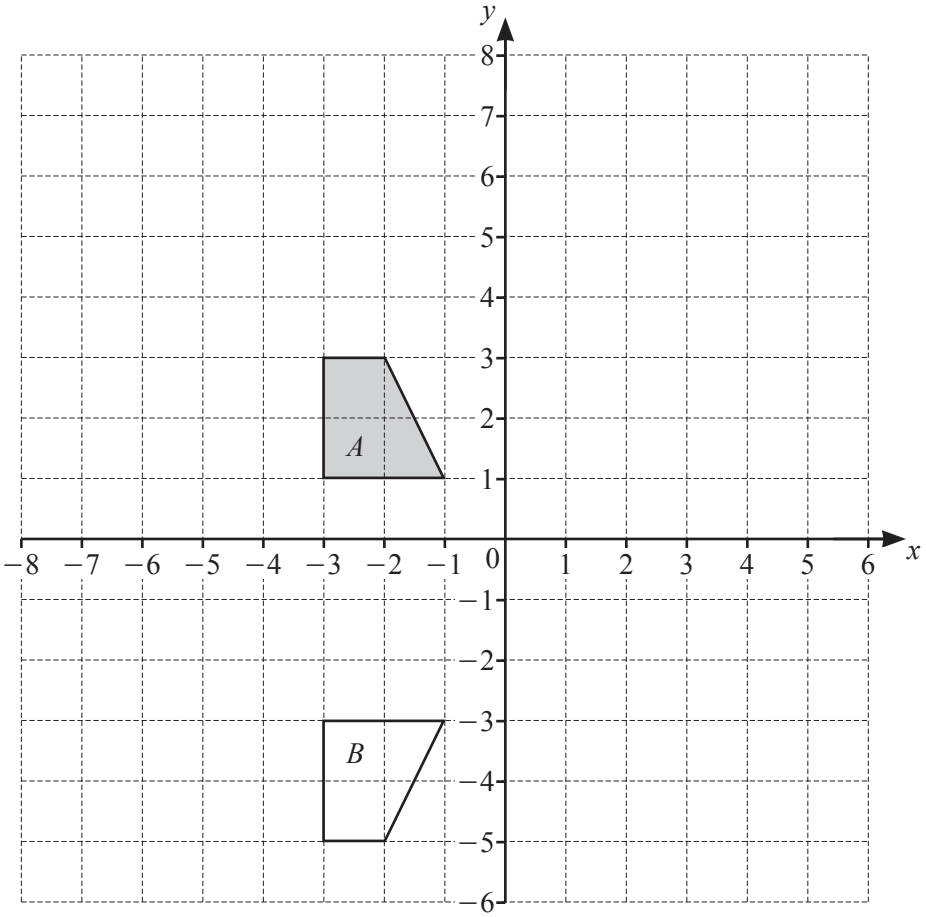
7



(a) Describe fully the **single** transformation that maps shape *A* onto shape *B*.

.....

..... [2]

(b) On the grid, draw the image of

(i) shape *A* after a translation by the vector $\begin{pmatrix} -3 \\ 4 \end{pmatrix}$, [2]

(ii) shape *A* after a rotation through 180° about (0, 0), [2]

(iii) shape *A* after an enlargement, scale factor 2, centre (−7, 0). [2]

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8 **(a)** A bag contains 4 red marbles and 2 yellow marbles.
Behnaz picks two marbles at random without replacement.

Find the probability that

(i) the marbles are both red,

..... [2]

(ii) the marbles are not both red.

..... [1]

(b) Another bag contains 5 blue marbles and 2 green marbles.
Bryn picks one marble at random without replacement.
If this marble is not green, he picks another marble at random without replacement.
He continues until he picks a green marble.

Find the probability that he picks a green marble on his first, second or third attempt.

..... [4]

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9 $f(x) = 2x - 3$ $g(x) = 9 - x^2$ $h(x) = 3^x$

(a) Find

(i) $f(4)$,

..... [1]

(ii) $hg(3)$,

..... [2]

(iii) $g(2x)$ in its simplest form,

..... [1]

(iv) $fg(x)$ in its simplest form.

..... [2]

(b) Find $f^{-1}(x)$.

$f^{-1}(x) =$ ..... [2]

(c) Find x when $5f(x) = 3$.

$x =$ ..... [2]

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(d) Solve the equation $\mathrm{gf}(x) = -16$.

$x =$ ..... or $x =$ ..... [4]

(e) Find x when $\mathrm{h}^{-1}(x) = -2$.

$x =$ ..... [1]

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10 Solve.

$$\frac{1}{x} - \frac{2}{x+1} = 3$$

Show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [7]

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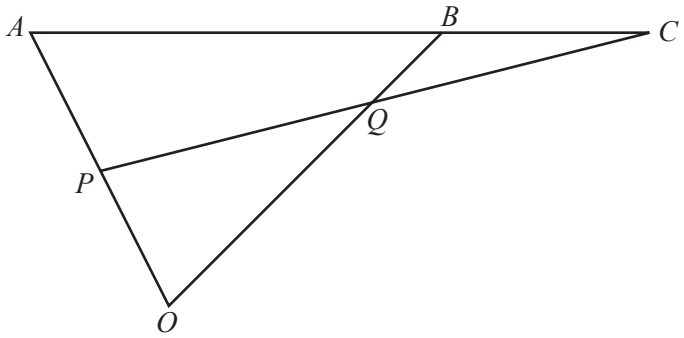

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OAB is a triangle and ABC and PQC are straight lines.
P is the midpoint of OA, Q is the midpoint of PC and $OQ : QB = 3 : 1$.
$\overrightarrow{OA} = 4\mathbf{a}$ and $\overrightarrow{OB} = 8\mathbf{b}$.

(a) Find, in terms of **a** and/or **b**, in its simplest form

(i) $\overrightarrow{AB}$,

$\overrightarrow{AB} =$ ..... [1]

(ii) $\overrightarrow{OQ}$,

$\overrightarrow{OQ} =$ ..... [1]

(iii) $\overrightarrow{PQ}$.

$\overrightarrow{PQ} =$ ..... [1]

(b) By using vectors, find the ratio $AB : BC$.

..... : ..... [3]

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