NAME:	NO:	CLASS:

ADMIRALTY SECONDARY SCHOOL

MID-YEAR EXAMINATION 2016

SUBJECT	: Mathematics
PAPER	: 1
LEVEL/STREAM	: Secondary 2 Express
DATE	: 6 May 2016
TIME	: 0800h – 0900h
DURATION	: 1 hour

Instructions to candidates:

1. Write your name, class and index number.

2. Answer **ALL** questions.

3. Calculators should be used where appropriate.
   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, unless the question requires the answer in terms of π.

4. Essential workings must be shown. Omission of essential workings and illegible handwriting will result in loss of marks.

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DO NOT TURN OVER THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

This question paper consists of **9** printed pages including this cover page.

Answer **all** the questions.

1. **(a)** Expand and simplify $(3a-4)(-a+6)$.

(b) Simplify $(-2z^2)(-2z)^2$.

Answer (a) ..... [2]

(b) ..... [2]

2. Solve each of the following equations. Show your working clearly.

(a) $(x+3)(2x-4)=0$

(b) $(x+8)^2=25$

Answer (a) $x=$ ..... [2]

(b) $x=$ ..... [3]

3. Simplify the following.

(a) $\frac{20s}{3q^2} \times \frac{9pq^3}{5r}$

(b) $\frac{20a}{x-y} \div \frac{5}{x^2-y^2}$

Answer (a) ..... [2]

(b) ..... [3]

4. A map is drawn to a scale of 1 : 75000.

(a) This scale can be expressed as 1 cm represents n km. Find n.

(b) The distance between two towns on the map is 25 cm.
Find the actual distance, in kilometres, between the two towns.

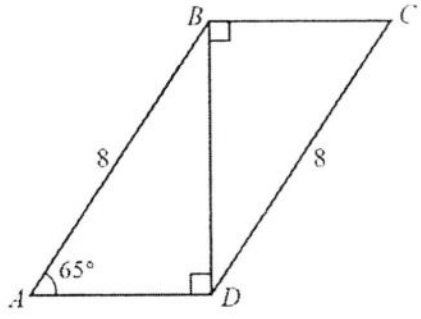
(c) A lake has an actual area of 3.5 km^2.
Find the area, in square centimetres, of the lake on the map.
Give your answer correct to 3 significant figures.

Answer (a) $n =$ ..... [1]

(b) ..... km [1]

(c) ..... cm^2 [2]

5. In the diagram below, it is given that $AB = DC = 8$ cm, $\angle CBD = \angle ADB = 90°$ and $\angle BAD = 65°$. Given that ΔCBD and ΔADB are congruent, find reflex $\angle ADC$.



Answer reflex $\angle ADC =$ ..... ° [3]

6. The volume of a ball, V cm^3, is directly proportional to the cube of its radius, r.
When $r = 7.5$, $V = 562.5\pi$ cm^3.

(a) Find the equation connecting V and r.
Give the value of k, the constant, in terms of π.

(b) Calculate the value of V when $r = 9$, giving your answer in terms of π.

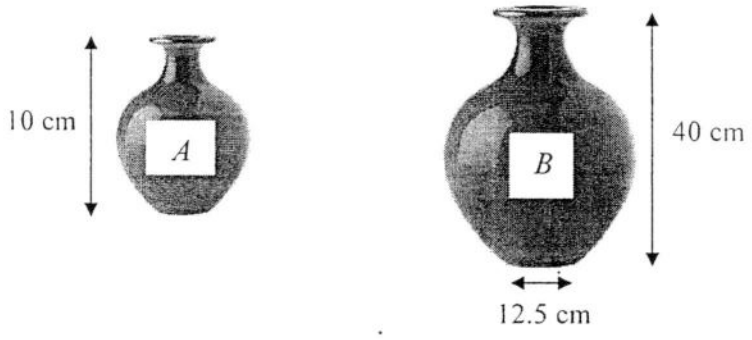
Answer (a) ..... [3]

(b) ..... [2]

7. In the figure below, the two vases A and B are geometrically similar. The heights of vases A and B are 10 cm and 40 cm respectively.

   (a) If the diameter of the base of vase B is 12.5 cm, calculate the diameter of the base of vase A.

   (b) Another vase C has a base of 20 cm and height of 75 cm. Is vase C similar to vase B? Show your working clearly in the space below.



Answer (a) ..... cm [2]

(b) Vase C is / is not (circle the right answer) similar to Vase B [3]

8. The volume of a hemisphere is given as $V = \frac{2}{3}\pi r^3$.

(a) Express r as the subject of the formula.

(b) Hence, find the value of r when $V = 1152\pi$ cm^3.

Answer (a) $r =$ ..... [3]

(b) $r =$ ..... cm [2]

9. Factorise the following expressions, showing all your working clearly.

(a) $21ax - 35ab - 9x + 15b$

(b) $2x^2 - 7x - 15$

Answer (a) ..... [2]

(b) ..... [2]

10. **(a)** Expand $(2x-4z)^2$.

(b) Hence, given that $x^2+4z^2=12$ and $xz=7$, find the value of $(2x-4z)^2$.

Answer (a) ..... [2]

(b) ..... [3]

11. **(a)** Factorise the expression $-x^2+3x+10$.

(b) Find the value of y when $x=0$ for the equation $y=-x^2+3x+10$.

(c) State the roots of the graph $y=-x^2+3x+10$.

(d) State the y - intercept of the graph $y=-x^2+3x+10$.

Answer (a) ..... [1]

(b) ..... [1]

(c) The root(s) is/are ..... [2]

(d) y - intercept = ... [1]

NAME:	NO:	CLASS:

ADMIRALTY SECONDARY SCHOOL

MID-YEAR EXAMINATION 2016

SUBJECT	: Mathematics
PAPER	: 2
LEVEL/STREAM	: Secondary 2 Express
DATE	: 12 May 2016
TIME	: 0800h – 0930h
DURATION	: 1 hour 30 minutes

Instructions to candidates:

1. Write your name, class and index number.

2. Answer **ALL** questions.

3. Calculators should be used where appropriate.
   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, unless the question requires the answer in terms of π.

4. Essential workings must be shown. Omission of essential workings and illegible handwriting will result in loss of marks.

50

DO NOT TURN OVER THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

This question paper consists of **8** printed pages including this cover page.

Answer **all** the questions.

1. **(a)** **(i)** Simplify $(a+2)(a-2)$.

(ii) **Hence**, evaluate 38×42.

(b) **(i)** Simplify $(x-2)^2$.

(ii) **Hence**, evaluate 78^2.

Show your working clearly.

Answer (a) (i) ..... [1]

(ii) ..... [2]

(b) (i) ..... [1]

(ii) ..... [2]

2. a is directly proportional to b and inversely proportional to the square of c such that $a=\frac{kb}{c^2}$, where k is a constant.

(a) When $a=3$, $b=1$ and $c=2$. Find k.

(b) Find b when $a=4$ and $c=-2$.

Answer (a) k = ... [2]

(b) b = ... [2]

3. Expand and simplify the following.

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

(b) $x(7x+2)+5(-x+5)$

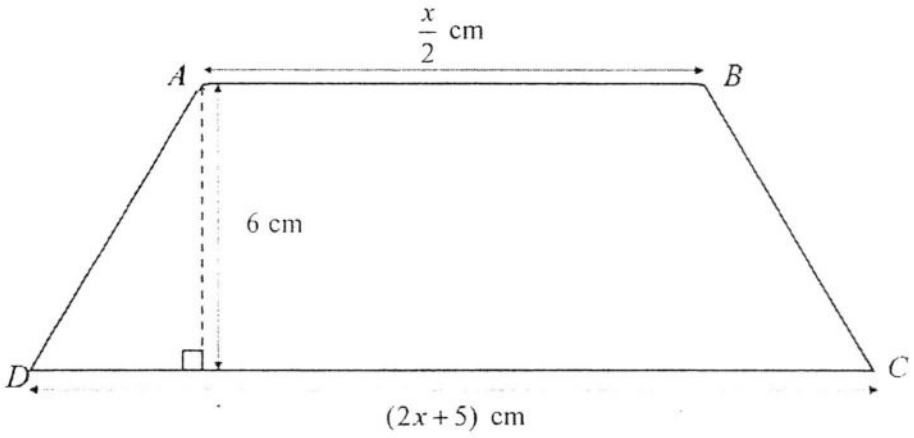
Answer (a) ..... [2]

(b) ..... [2]

4. $ABCD$ is a trapezium with height of 6 cm.

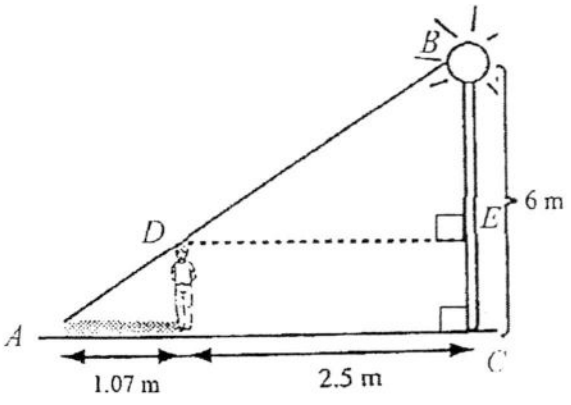
$AB = \frac{x}{2}$ cm and $DC = (2x + 5)$ cm.

Find the area of trapezium $ABCD$ in terms of x.



Answer ..... cm^2 [2]

5. A man is standing at a distance of 2.5 m away from a lamp post with a height of 6 m. The length of the man's shadow is 1.07 m. Using the concept of similar triangles, find the man's height, correct to 1 decimal place.



Answer ..... m [3]

6. Three quantities a, b and c are related by the formulae

$$b = \frac{2a+3}{4-a} \text{ and } c = \sqrt[3]{3-\frac{a}{4}}$$

(a) Express a in terms of b.

(b) Express a in terms of c.

(c) Express b in terms of c.

(d) Hence, find the value of b when $c = 2$.

Answer (a) $a =$ ..... [3]

(b) $a =$ ..... [3]

(c) $b =$ ..... [3]

(d) $b =$ ..... [2]

7. A wine barrel contains 240 litres of wine.
A large tap and a small tap are attached to the wine barrel.

(a) The small tap pours out x litres of wine per minute.
Write down an expression, in terms of x, for the number of minutes it takes to empty the barrel using the small tap.

(b) The large tap pours out $(x + 2)$ litres of wine per minute.
Write down an expression, in terms of x, for the number of minutes it takes to empty the barrel using the large tap.

(c) It takes 10 minutes longer to empty the barrel using the small tap than using the large tap.
Write an equation in x, and show that it simplifies to

$$x^2 + 2x - 48 = 0.$$ [3]

(d) Solve the equation $x^2 + 2x - 48 = 0$.

(e) From **(d)**, which answer is rejected? Why?

(f) Find the time taken, in minutes, to empty the barrel using the small tap.

Answer (a) ..... [1]

(b) ..... [1]

(d) $x =$ ..... [2]

(e) .....

..... [2]

(f) ..... min [1]

8. *Answer the whole of this question on a piece of graph paper.*

x	-2	0	-1	1	2	3	4
$y=-2x^2+5x+7$	-11	7	0	p	9	q	-5

(a) Find the value of p and q from the table above. [2]

(b) Using a scale of 2 cm to represent 1 unit on the horizontal x - axis and 1 cm to represent 1 unit on the vertical y - axis, draw the graph of $y=-2x^2+5x+7$ for $-2 \le x \le 4$. [3]

(c) Use your graph in **(b)** to estimate the value of x for which the value of y is maximum. [1]

(d) Using the graph in **(b)**, state the two roots of the equation $-2x^2+5x+7=0$. [2]

(e) Without the use of **(b)**, give an alternative method to solve the equation $-2x^2+5x+7=0$. Show all working clearly. [2]

End of Paper

1	a) $(3a-4)(-a+6)$ $=-3a^2+18a+4a-24$ $=-3a^2+22a-24$	 B1 B1
	b) $(-2z^3)(-2z)^2$ $=(-2z^3)(4z^2)$ $=-8z^4$	 B1 B1
2	a) $(x+3)(2x-4)=0$ $x+3=0$ OR $2x-4=0$ $x=-3$ $2x=4$ $x=2$	 B1 each (Final answers)
	b) $(x+8)^2=25$ $x+8=\pm\sqrt{25}$ $x+8=\pm5$ $x+8=5$ $x+8=-5$ $x=5-8$ OR $x=-5-8$ $x=-3$ $x=-13$	 B1 B2 (1 mark for each answer)
3	a) $\frac{20s}{3q^2}\times\frac{9pq^3}{5r}$ $=\frac{4s}{1}\times\frac{3pq}{r}$ $=\frac{12pqs}{r}$	 B1 B1
	b) $\frac{20a}{x-y}\div\frac{5}{x^2-y^2}$ $=\frac{20a}{x-y}\times\frac{x^2-y^2}{5}$ $=\frac{20a}{x-y}\times\frac{(x+y)(x-y)}{5}$ $=\frac{20a(x+y)}{5}$ $=4a(x+y)$ *A lot of students did not simplify answers.*	 M1 (Multiply by reciprocal) M1 (using algebraic rule) A1

4	a) $n = 0.75$	B1
	b) Map : Actual 1 cm : 0.75 km Actual distance between 2 towns $= 25 \times 0.75$ km $= 18.75$ km	 B1
	c) Map : Actual 1 cm : 0.75 km $1\ \text{cm}^2 : 0.5625\ \text{km}^2$ $3.5\ \text{km}^2 \div 0.5625\ \text{km}^2$ $= 6.22\ \text{cm}^2$	 M1 A1
5	$\angle BDC = \angle ABD = 180^\circ - 90^\circ - 65^\circ$ $= 25^\circ$ ($\angle$s of congruent figures) Reflex $\angle ADC = 360^\circ - 90^\circ - 25^\circ$ $= 245^\circ$	B1 M1 A1
6	a) $V = kr^3$ When $r = 7.5$, $V = 562.5\pi$, $562.5\pi = k(7.5)^3$ $k = \dfrac{562.5\pi}{7.5^3}$ $k = \dfrac{4}{3}\pi$ $V = \dfrac{4}{3}\pi r^3$	 B1 (Substitution) B1 (Correct value of k) B1
	b) When $r = 9$, $V = \dfrac{4}{3}\pi(9)^3$ $= \dfrac{4}{3}\pi(729)$ $= 972\pi\ \text{cm}^3$	 M1 (e.c.f. from (a); correct substitution) A1
7	a) $\dfrac{10}{40} = \dfrac{\text{diameter of base of vase } A}{12.5}$ Diameter of base of vase $A = (10 \times 12.5) \div 40$ $= 3.125$ cm	B1 B1
	b) $\dfrac{12.5}{20} = \dfrac{5}{8}$ $\dfrac{40}{75} = \dfrac{8}{15}$ $\dfrac{5}{8} \neq \dfrac{8}{15}$ $\therefore$ Vase C is not similar to vase B.	B1 (accept inverse) B1 B1

8	a) $V = \frac{2}{3}\pi r^3$ $V \div \frac{2}{3}\pi = r^3$ $r^3 = V \times \frac{3}{2\pi}$ $r^3 = \frac{3V}{2\pi}$ $r = \sqrt[3]{\frac{3V}{2\pi}}$	M1 A1
	b) When $V = 1152\pi$. $r = \sqrt[3]{\frac{3(1152\pi)}{2\pi}}$ $= \sqrt[3]{1728}$ $= 12$	B1 B1
9	a) $21ax - 35ab - 9x + 15b$ $= 7a(3x - 5b) + 3(-3x + 5b)$ $= 7a(3x - 5b) - 3(3x - 5b)$ $= (7a - 3)(3x - 5b)$ OR $21ax - 35ab - 9x + 15b$ $= 21ax - 9x - 35ax + 15b$ $= 3x(7a - 3) + 5b(-7a + 3)$ $= 3x(7a - 3) - 5b(7a - 3)$ $= (3x - 5b)(7a - 3)$	M1 (Taking out common factor) A1 M1 (Taking out common factor) A1
	b) $2x^2 - 7x - 15$ $x \times -5 \mid -10x$ $2x \times 3 \mid 3x$ $2x^2 \quad -15 \mid -7x$ $= (x - 5)(2x + 3)$	 B1 (Working) B1

10	a) $(2x-4z)^2$ $=(2x)^2-2(2x)(4z)+(4z)^2$ $=4x^2-16xz+16z^2$	 M1 A1
	b) $x^2+4z^2=12$ $4x^2+16z^2$ $=4(x^2+4z^2)$ $=4(12)$ $=48$ $16xz$ $=16\times 7$ $=112$ $(2x-4z)^2$ $=4x^2+16z^2-16xz$ $=48-112$ $=-64$	 B1 B1 B1
11	a) $-x^2+3x+10$ $-x$ 5 $5x$ x 2 $-2x$ $-x^2$ 10 $3x$ $=(-x+5)(x+2)$	 B1
	b) When $x=0$, $y=-0^2+3(0)+10$ $=10$	 B1
	c) The root(s) is/are 5 and -2.	B1 each
	d) y - intercept = 10	B1

1	a) i) $(a+2)(a-2)=a^2-4$	B1
	ii) $(40-2)(40+2)$ $=40^2-2^2$ OR 40^2-4	M1
	$=1600-4$ $=1596$	A1
	b) i) $(x-2)^2=x^2-4x+4$	B1
	ii) 78^2 $=(80-2)^2$ $=80^2-2(80)(2)+2^2$ OR $80^2-4(80)+4$	M1
	$=6400-320+4$ $=6084$	A1
2	a) When $a=3$, $b=1$ and $c=2$, $3=\frac{k(1)}{2^2}$	B1
	$k=3\times4$ $k=12$	B1
	b) When $a=4$, $c=-2$, $4=\frac{12(b)}{(-2)^2}$	M1
	$4\times4=12b$ $b=\frac{16}{12}=\frac{4}{3}$	A1
3	a) $(x-2)-15x^2-9x$ $=x-2-15x^2-9x$	
	$=-15x^2-9x+x-2$	B1 (2nd and 3rd step)
	$=-15x^2-8x-2$	B1
	b) $x(7x+2)+5(-x+5)$	B1 (expansion)
	$=7x^2+2x-5x+25$ $=7x^2-3x+25$	B1

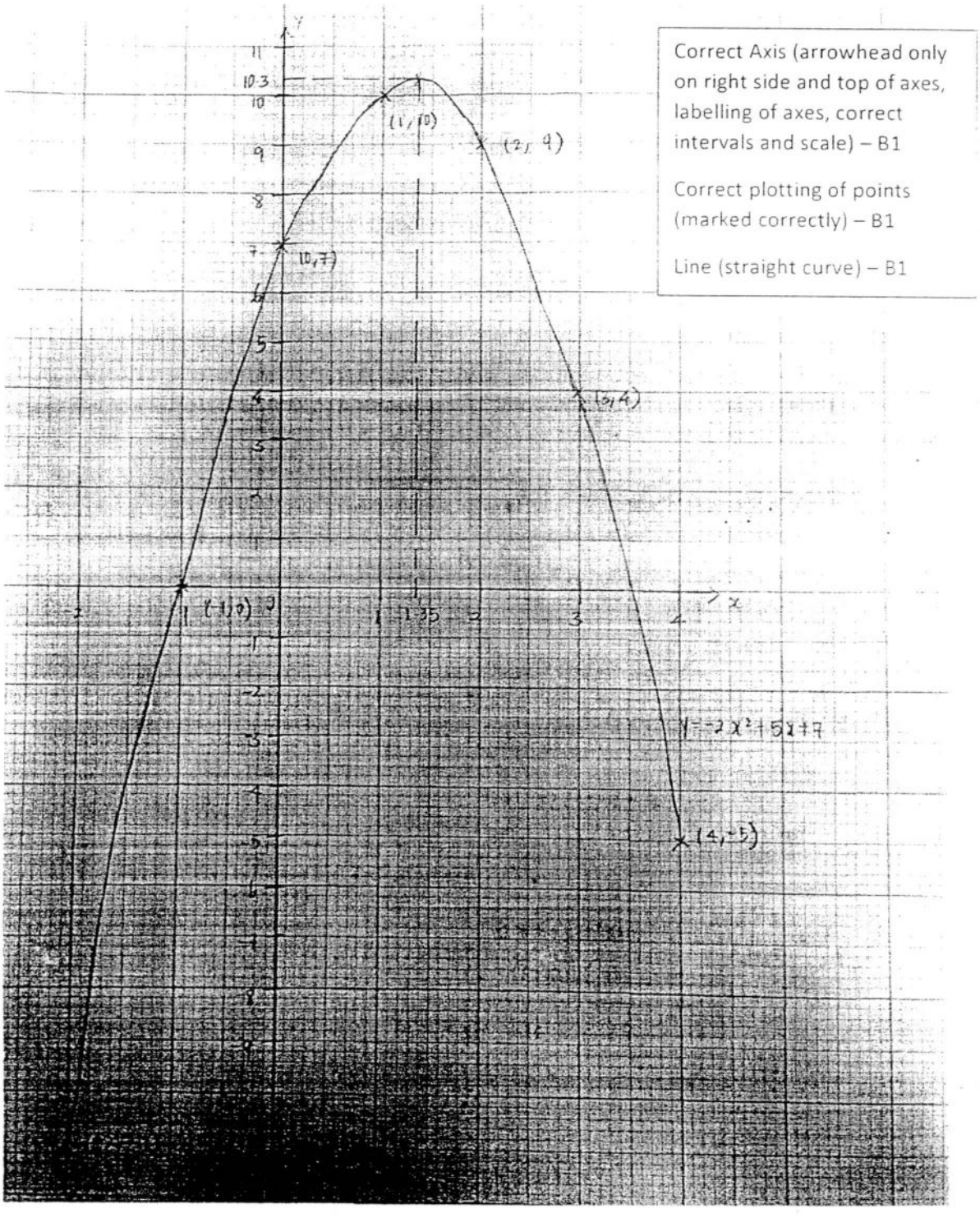
4	Area of trapezium $= \frac{1}{2} \times 6 \times \left[\frac{x}{2} + (2x + 5) \right]$	B1
	$= 3 \times \left[\frac{x}{2} + (2x + 5) \right]$	
	$= \frac{3x}{2} + 6x + 15$	
	$= 7.5x + 15$ OR $\frac{15x}{2} + 15$ OR $\frac{15x + 30}{2}$	B1
5	Let the height of the man be x.	
	$\frac{2.5}{1.07 + 2.5} = \frac{6 - x}{6}$	B1 (Correct ratio)
	$6(2.5) = (6 - x)(3.57)$	
	$21.42 - 3.57x = 15$	B1 (Correct manipulation to linear form)
	$-3.57x = -6.42$	
	$x = 1.8$ (1 d.p.)	B1 (Final answer)
	The man's height is 1.8 m.	
	OR	
	$\frac{1.07}{2.5 + 1.07} = \frac{CE}{6}$	B1 (Correct ratio)
	$CE = \frac{6(1.07)}{3.57}$	B1 (Correct numerical manipulation to get CE)
	$CE = 1.8$ (1 d.p.)	
	The man's height is 1.8 m.	B1 (Final answer)
	OR	
	$\frac{2.5}{2.5 + 1.07} = \frac{BE}{6}$	B1 (Correct ratio)
	$BE = \frac{2.5}{3.57} \times 6$	
	$BE = 4.201680672$	
	$6 - 4.401680672 = 1.798319328 \approx 1.8$	B1 (Subtracting from 6)
	The man's height is 1.8 m.	B1

6	a) $b=\dfrac{2a+3}{4-a}$	
	$b(4-a)=2a+3$	M1 (Multiplying)
	$4a-ab=2a+3$	
	$-ab-2a=3-4b$	
	$a(-b-2)=3-4b$	M1 (Isolating a)
	$a=\dfrac{3-4b}{-b-2}$	A1
	b) $c=\sqrt[3]{3-\dfrac{a}{4}}$	
	$c^3=3-\dfrac{a}{4}$	M1 (cube)
	$c^3-3=-\dfrac{a}{4}$	
	$\dfrac{a}{4}=3-c^3$	M1 (Moving terms unrelated to a to one side)
	$a=4(3-c^3)$	A1
	c) $b=\dfrac{2\left[4(3-c^3)\right]+3}{4-4(3-c^3)}$	M1 (e.c.f. Substitution)
	$=\dfrac{8(3-c^3)+3}{4-12+4c^3}$	M1 (Correct BIDMAs)
	$=\dfrac{24-8c^3+3}{-8+4c^3}$	
	$=\dfrac{27-8c^3}{-8+4c^3}$	A1
	d) When $c=2$,	
	$b=\dfrac{27-8(2)^3}{-8+4(2)^3}$	M1 (e.c.f. Substitution)
	$=\dfrac{27-8(8)}{-8+4(8)}$	
	$=\dfrac{27-64}{-8+32}$	
	$=\dfrac{-37}{24}$	
	$=-1\dfrac{13}{24}$	A1

A1 for question 7 means that answer is not totally correct.

7	a) $\frac{240}{x}$ $240 \div x$ and $240 \times \frac{1}{x}$ *Accepted this time round but will be wrong from next assessment onwards.*	B1
	b) $\frac{240}{x+2}$	B1
	c) $\frac{240}{x} - \frac{240}{x+2} = 10$ $\frac{240(x+2)-240x}{x(x+2)} = 10$ $\frac{240x+480-240x}{x^2+2x} = 10$ $480 = 10(x^2+2x)$ $\therefore x^2+2x = 48$ $x^2+2x-48 = 0$	B1 (e.c.f.) B1 (combine fraction) B1
	d) $x^2+2x-48=0$ $x \times 8 = 8x$ $x \times -6 = -6x$ $x^2 \quad -48 \quad 2x$ $(x+8)(x-6)=0$ $x=-8$ or $x=6$	B1 B1
	e) $x=-8$ is rejected. Amount of water cannot be negative.	B1 B1
	f) Time taken (min) to empty barrel $= \frac{240}{6}$ $= 40$	B1
8	a) $p=10$ $q=4$	B1 B1
	c) Value of x when y is maximum $\doteqdot 1.25 \pm 0.1$	B1
	d) Roots $= 3.5 \pm 0.1$ and -1 ± 0.1	B1 B1
	e) $-2x^2+5x+7=0$ $x \times 1 = -2x$ $-2x \times 7 = 7x$ $-2x^2 \quad 7 \quad 5x$ $(x+1)(-2x+7)=0$ $x=-1$ or $x=3.5$	B1 B1

8 b)



Correct Axis (arrowhead only on right side and top of axes, labelling of axes, correct intervals and scale) – B1

Correct plotting of points (marked correctly) – B1

Line (straight curve) – B1

Class	Index Number	Candidate Name

ANG MO KIO SECONDARY SCHOOL
MID-YEAR EXAMINATION 2016
SECONDARY TWO EXPRESS

MATHEMATICS 4048/01
Paper 1

Thursday 12 May 2016 1 hour 15 minutes

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Answer **all** questions.
If working is needed for any question it must be shown with the answer.
Omission of essential working will result in loss of marks.
Calculators should be used where appropriate.
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, unless the question requires the answer in terms of π.

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 **60**.

For Examiner's Use
60

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

1 The temperature at 0800 is $-6\,^{\circ}C$. It rises to $26\,^{\circ}C$ at 1600.

(a) Find the difference between the two temperatures.

Answer (a) ..... °C [1]

(b) Assuming that the temperature rises at a steady rate, find the time when the temperature is $8\,^{\circ}C$.

Answer (b) ..... [2]

2 13 students working 7 hours a day can complete a project in 40 days. How many days will 8 students working 5 hours a day need to complete the same project?

Answer ..... days [2]

3 Estimate the value of $\frac{276.93}{0.05039}$ to 1 significant figure.

Answer [2]

4 (a) Express 250 g : 2 kg as a ratio in its simplest form.

....

Answer *(a)* ..... : ..... [2]

(b) A speedboat travels at an average speed of 114 km/h. Find, in metres, the distance travelled by the speedboat in 36 seconds.

Answer *(b)* ..... metres [2]

5 Solve the following simultaneous equations

$$2y - 3x = 5,$$
$$5x - 6y = 21.$$

Answer $x =$ ..... , $y =$ [3]

6 Expand and simplify

(a) $(2x^2 + x - 1)(3x + 5)$,

.....

Answer *(a)* ..... [2]

(b) $x(3x - 1) - (2x + 3)^2$.

Answer *(b)* ..... [3]

7 The numbers 198 and 972, written as the products of their prime factors, are $198 = 2 \times 3^2 \times 11$ and $972 = 2^2 \times 3^5$. Find,

(a) the highest common factor of 198 and 972,

Answer *(a)* ..... [1]

(b) the smallest integer, k, such that $198k$ is a perfect cube,

Answer *(b)* $k =$ ..... [1]

(c) the smallest positive integer value of n for which $198n$ is a multiple of 972.

Answer *(c)* $n =$ [1]

8 y is inversely proportional to the square of x. Given that $y = 10$ for a particular value of x, find the value of y when this value of x is halved.

.....

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

9 Simplify

(a) $\dfrac{4x^2y^3}{3z^4} \div \dfrac{2x^4y^2}{9yz^2}$,

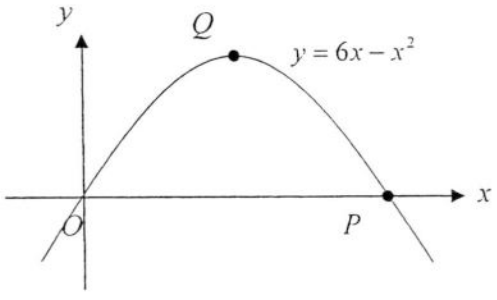
Answer *(a)* ..... [2]

(b) $\dfrac{9m^2 - 1}{3m^2 - 5m - 2}$.

Answer *(b)* [3]

10 The diagram below shows the graph of $y = 6x - x^2$. The graph passes through the origin and cuts

the x-axis again at point P.



(a) Write down the coordinates of P.

Answer *(a)* $P =$ (..... , ...) [1]

(b) Write down the equation of the line of symmetry of the graph.

Answer *(b)* ..... [1]

(c) Find the coordinates of the maximum point Q.

Answer *(c)* $Q =$ (..... , ...) [1]

(d) Calculate the area of ΔOPQ.

Answer *(d)* ..... sq. units [1]

11 **(a)** The total cost of an advertisement in a newspaper is obtained by adding together a fixed charge of 50 cents and a charge of 12 cents per word.

If an advertisement containing n words costs C cents to advertise, write down an algebraic expression for C in terms of n.

.....

Answer *(a)* ..... [1]

(b) Solve the equation $4x-3(x+1)=2(x-1)-16$.

Answer *(b)* $x=$ ..... [2]

12 Factorise completely

(a) $3x^2-9xz+9xy-27yz$.

Answer *(a)* ..... [3]

(b) $20x^3y-5xy$.

Answer *(b)* [2]

13 Express $\frac{8}{(x-2)^2}+\frac{5}{4-2x}$ as a single fraction in its simplest form.

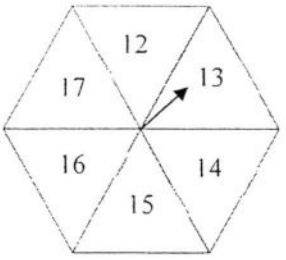
.....

Answer ..... [3]

14 A customer bought a LCD TV at $4250 on hire purchase by paying a down payment of 10% of the selling price and the remaining to be paid in monthly installments over 2 years at a simple interest of 4.2% per annum. Calculate the monthly installment, giving your answer to the nearest 10-cents.

Answer $ [3]

15 The diagram shows a spinner divided into 6 equal sectors.



When the pointer is spun, find the probability that the pointer will stop at the sector with

(a) a prime number,

Answer *(a)* ..... [1]

(b) a single digit number.

Answer *(b)* ..... [1]

16 Solve the following equations

(a) $3p^2 = 12p$,

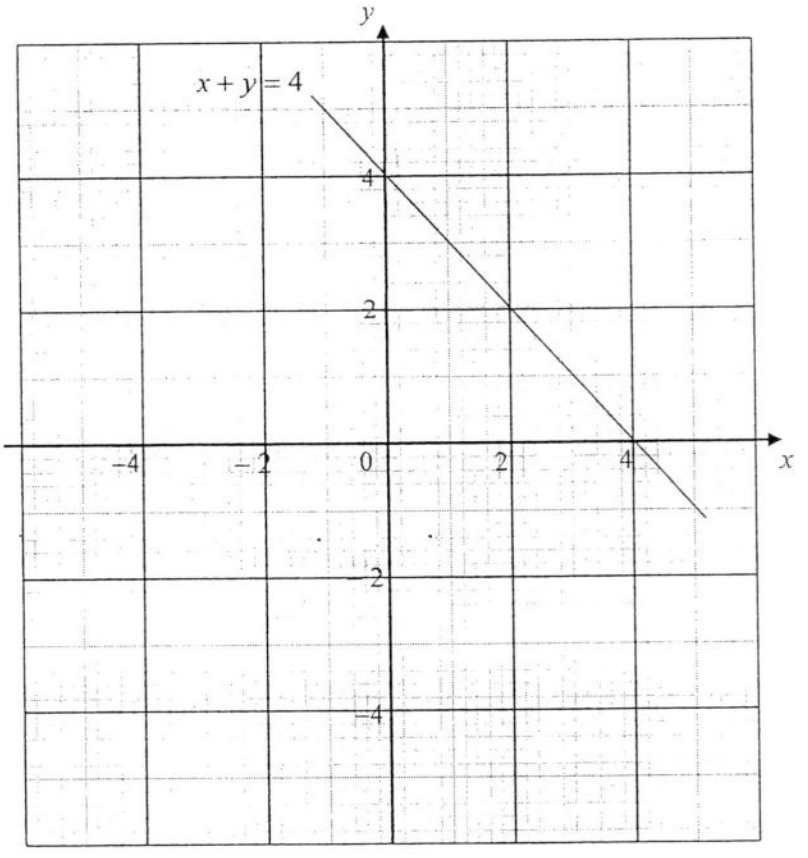
Answer *(a)* $p =$ ..... or ..... [2]

(b) $4x^2 - 5 = x(x-14)$.

Answer *(b)* $x =$ ..... or ..... [3]

17 The diagram shows the graph of the straight line $x + y = 4$.

Answer (a)(ii)



(a) The table below shows corresponding x and y values for the equation $2y - x = 2$.

x	-2	0	4
y	m	1	3

(i) Find the value of m.

Answer (a)(i) $m =$ ..... [1]

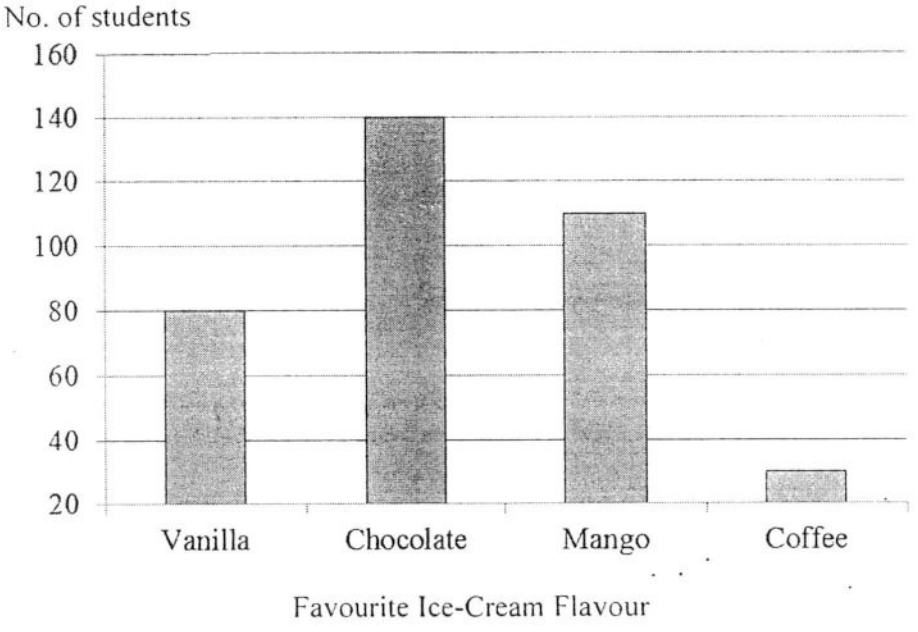
(ii) Draw and label the graph of $2y - x = 2$ for $-2 \leq x \leq 4$ on the same axes above. [1]

(b) Use your graph to solve the simultaneous equations

$$x + y = 4,$$
$$2y - x = 2.$$

Answer (b) $x =$ ..... , $y =$ ..... [2]

18 The bar graph below shows the survey result of a group of Secondary One Students on their preference of ice-cream flavour.



June observed the bar graph and claimed that the number of students who prefer Chocolate flavour is twice the number of students who prefer Vanilla flavour. State whether you agree or disagree with the statement. Explain clearly how you make your decision.

Answer ....., because .....

.....

..... [2]

END OF PAPER

Class	Index Number	Name

ANG MO KIO SECONDARY SCHOOL
MID-YEAR EXAMINATION 2016
SECONDARY TWO EXPRESS

MATHEMATICS 4048/02
Paper 2

Tuesday 10 May 2016 1 hours 30 minutes

Additional Materials: Answer Paper
Graph paper (1 sheet)

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Answer **all** questions.
If working is needed for any question it must be shown with the answer.
Omission of essential working will result in loss of marks.
The use of an approved scientific calculator is expected, where appropriate.
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, unless the question requires the answer in terms of π.

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 60.

This document consists of **6** printed pages.

[Turn Over

Answer **all** the questions.

1 The amount of fertilizer that is absorbed by a plant, F, is directly proportional to the square root of the height increment of the plant, h. When the plant absorbs 1 ml of the fertilizer, the height increment of the plant is 0.0625 cm.

Calculate

(a) the amount of fertilizer needed for the plant to grow by 9 cm, [2]

(b) the height increment of the plant when 3 ml of fertilizer is absorbed. [2]

---

2 A shop sold a LCD TV at \$5280 after offering a discount of 12%. Despite offering the discount, the shop is still able to make a profit of 5%.

Calculate

(a) the price of the TV before discount, [2]

(b) the cost price of the TV. [2]

---

3 **(a)** Expand $\left(x+\frac{3}{x}\right)^2$. [2]

(b) **Hence**, find the value of $x^2+\frac{9}{x^2}$ if $x+\frac{3}{x}=4$. [2]

---

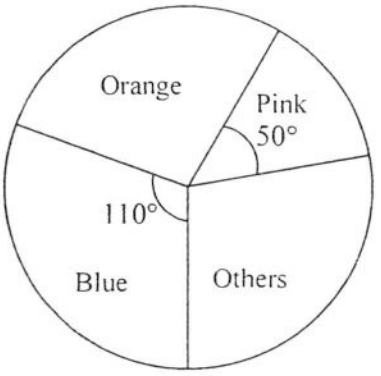
4 Given that $\sqrt{\frac{z-y}{y}}=\frac{1}{x}$.

(a) Express y in terms of x and z. [3]

(b) **Hence**, find the value of y if $x = 1$ and $z = 2$. [1]

---

5 The pie chart below shows the survey data of the favourite colours by a group of students.



(a) If 90 students liked Blue more than Pink, find the total number of students who did the survey. [1]

(b) If there were 1.5 times as many students who liked Orange as compared to Pink, express the number of students who chose Others as a ratio of the total number of students. [2]

(c) If 20% of the students who liked Blue were females, how many male students liked Blue? [2]

---

6 A box contains 30 balls, of which 12 are yellow and 18 are green. A ball is drawn at random from the box.

(a) Find the probability of drawing a yellow ball. [1]

(b) Find the number of yellow balls to be removed so that the probability of drawing a green ball from the remaining balls in the box is $\frac{3}{4}$. [2]

---

7 Gilbert cycled at a speed of $(x + 4)$ km/h for $2x$ hours. He then jogged at a speed of $(x - 7)$ km/h for x hours. The total distance travelled is 4 km.

(a) Find an expression for the distance he cycled. [1]

(b) Form an equation in x and shows that it reduces to $3x^2 + x - 4 = 0$. [2]

(c) Solve the equation $3x^2 + x - 4 = 0$. [2]

(d) Find the average speed for Gilbert's journey and state the reason why one of the values of x is rejected. [2]

---

8 The first three lines of a sequence are:

$$1^2 - 0^2 = 1 + 0 = 1$$
$$2^2 - 1^2 = 2 + 1 = 3$$
$$3^2 - 2^2 = 3 + 2 = 5$$

(a) The tenth line is $a^2 - b^2 = c + 9 = d$.
Write down the values of a, b, c and d. [2]

(b) Write down the n^{th} line, in terms of n. [1]

(c) One of the lines is written as $M^2 - N^2 = M + N = P$.

(i) Explain why P cannot be 106. [1]

(ii) Find the value of M and the value of N when $P = 109$. [2]

---

9 Given that $x = -1$ is one of the solutions to the equation $2x^2 + ax - 4 = 0$, find

(a) the value of a, [2]

(b) the other solution to the equation. [2]

---

10 Jessica decided to change S$2500 for her holiday trip to Tokyo. The rate of exchange between the Singapore dollars and the Japanese Yen was S$100 = ¥8240.

(a) Calculate the amount that she has in Japanese Yen. [1]

(b) If Jessica spent ¥145,000 in Tokyo and she decided to change the remaining amount of Japanese Yen back to Singapore dollars, how much will she get back if the exchange rate was ¥8150 = S$90. [2]

(c) Calculate the amount of money lost in Singapore dollars (S$) after the trip. [2]

---

11 **Answer the whole of this question on a piece of graph paper**

The table below gives some values of x and the corresponding values of y, where $y = x^2 - 3x - 5$.

x	-2	-1	0	1	2	3	4	5
y	5	-1	-5	-7	b	-5	-1	5

(a) Calculate the value of b. [1]

(b) Using a scale of 2 cm to 1 unit, draw a horizontal x-axis for $-2 \le x \le 5$.
Using a scale of 1 cm to 1 unit, draw a vertical y-axis for $-7 \le y \le 7$.
On your axes, plot the points given in the table and join them with a smooth curve. [3]

(c) Use your graph to find

(i) the minimum value of y, [1]

(ii) the values of x when $y = 2$, [1]

(iii) the coordinates of the points where the graph of $y = x^2 - 3x - 5$ cuts the x-axis. [2]

---

12 The diagram below shows the ticket prices of Luge & Skyride at Sentosa Island.

Luge & Skyride Combo

The Skyride transports you to the top of the luge tracks, where you jump onboard and ride to the bottom of the track. "Once is never enough"

Luge & Skyride	S$18 / Person
Three Luge & Skyrides	S$25 / Person
Five Luge & Skyrides	S$38 / Person
Seven Luge & Skyrides	S$41 / Person
Child Doubling *(children under 6 years or less then 110cm may ride in tandem with a full paying adult)*	S$3 per ride

*Combo tickets are valid per person only, luge rides can not be shared.
Per person rate applies to ages 6 years and taller then 110cm riding solo.
Children under 110cm can ride tandem with a paying adult.

Family Combo Deals*

A family pass includes luge rides and skyrides to be shared amongst family members.
**At least one family member must be aged 15 years or younger.*

Four ride family pass *(Share 4 luge rides & 4 skyrides)*	S$48
Eight ride family pass *(Share 8 luge rides & 8 skyrides)*	S$68
Twelve ride family pass *(Share 12 luge rides & 12 skyrides)*	S$88
Child Doubling *(children under 6 years or less than 110cm may ride in tandem with a full paying adult)*	S$3 per ride

(a) What is the cost of taking a luge and skyride for an adult and a child who is less than 110 cm? [1]

(b) Mr and Mrs Toh plan to bring their two children on a luge and skyride.

(i) Referring to the **Luge & Skyride Combo**, calculate the total cost for the family of four, given that the older child is 153 cm tall and the younger child is 105 cm. [2]

(ii) Mr Toh wants each family member to ride the luge and skyride twice. Is it more worthwhile to buy the "Eight ride family pass" from the **Family Combo Deals** or to buy individual tickets from the **Luge & Skyride Combo** for each member? Explain your answer clearly. [3]

END OF PAPER

2E EM P1 MYE 2016 Answer Scheme

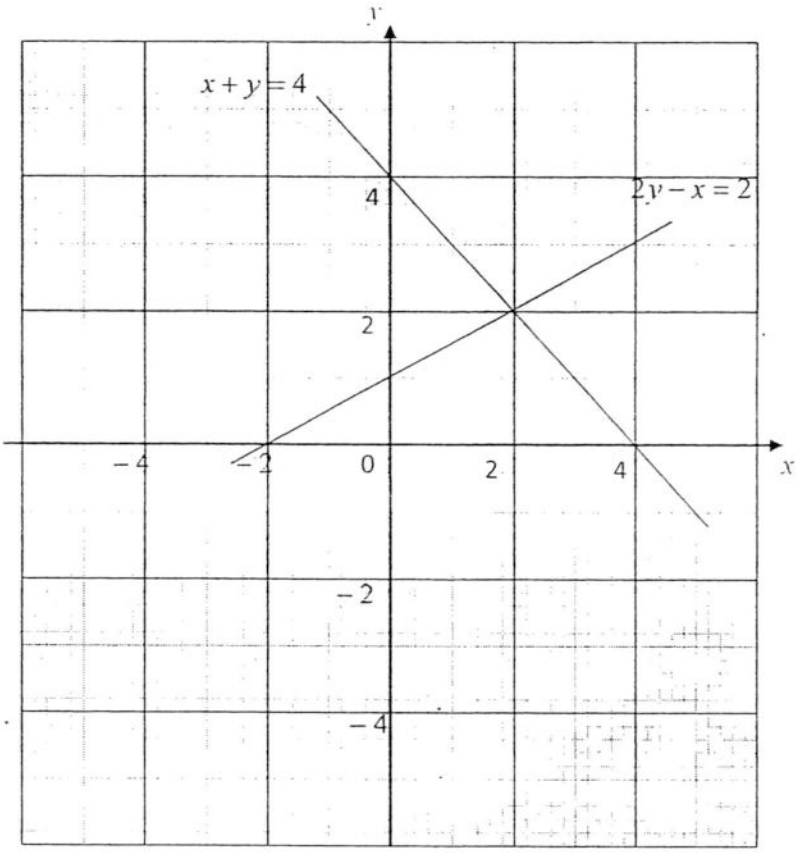
Qn	Answers	Marking Scheme	Marker's Remark
1(a)	$26-(-6)=32°C$	B1	
1(b)	Rate of temp increase $=\frac{32}{8}=4°C/h$ Temp rise from $-6 \rightarrow 8°C = 14°C$ Time taken $=\frac{14}{4}=3.5$ hours $\Rightarrow$ Time = 1130	M1 A1	
2	13 students → 7 × 40 = 280 hours 1 student → 280 × 13 hours 8 students → (280 × 13) ÷ 8 = 455 hours No. of days = 455 ÷ 5 = 91 days	 M1 A1	
3	$\frac{276.93}{0.05039} \approx \frac{280}{0.050}$ $= 5600$ = 6000 (1 significant figure)	M1 A1	
4(a)	250 g : 2 kg 250 g : 2000 g 5 : 40 1 : 8	 M1 A1	
4(b)	$114 \text{ km/h} = \frac{114 \times 1000}{60 \times 60} \text{ m/s}$ Distance travelled $=\frac{114000}{3600} \times 36$ = 1140 m	M1 A1	
5	$2y-3x=5$ .....(1) $5x-6y=21$ .....(2) (1) × 3: $6y-9x=15$ .....(3) (2) + (3): $-4x=36$ $x=-9$ Subst into (1): $2y-3(-9)=5$ $2y=5-27=-22$ $y=-11$	 M1 A1 A1	
QR (alternate method)	$2y-3x=5$ .....(1) $5x-6y=21$ .....(2) From (1): $2y=3x+5$ subst into (2) $5x-3(3x+5)=21$ M1 $-4x=36$ $x=-9$ A1		

	$2y = 5 - 27 = -22$ $y = -11$ A1		
6(a)	$(2x^2 + x - 1)(3x + 5)$ $= 6x^3 + 10x^2 + 3x^2 + 5x - 3x - 5$ $= 6x^3 + 13x^2 + 2x - 5$	 M1 A1	
6(b)	$x(3x-1) - (2x+3)^2$ $= 3x^2 - x - (4x^2 + 12x + 9)$ – expand $(2x+3)^2$ $= 3x^2 - x - 4x^2 - 12x - 9$ – changing of signs $= -x^2 - 13x - 9$	 M1 M1 A1	
7(a)	$\text{HCF} = 2 \times 3^2 = 18$	B1	
7(b)	$k = 2^2 \times 3 \times 11^2 = 1452$	B1	
7(c)	$n = 2 \times 3^3 = 54$	B1	
8	$y = \frac{k}{x^2}$ when $y = 10, 10 = \frac{k}{x^2}$ new $y = \frac{k}{\left(\frac{x}{2}\right)^2} = \frac{4k}{x^2}$ $= 4 \times 10 = 40$	 M1 A1	
OR	$y = \frac{k}{x^2}$ when $y = 10, k = 10x^2$ new $y = \frac{k}{\left(\frac{x}{2}\right)^2} = \frac{4k}{x^2}$ M1 $= \frac{4 \times 10x^2}{x^2}$ $= 4 \times 10 = 40$ A1		
9(a)	$\frac{4x^2y^3}{3z^4} \div \frac{2x^4y^2}{9yz^2}$ $= \frac{4x^2y^3}{3z^4} \times \frac{9yz^2}{2x^4y^2}$ $= \frac{6y^2}{x^2z^2}$	 M1 A1	
9(b)	$\frac{9m^2 - 1}{3m^2 - 5m - 2}$ $= \frac{(3m+1)(3m-1)}{(3m+1)(m-2)}$ – by difference of 2 squares – by cross method $= \frac{3m-1}{m-2}$	 M1 M1 A1	

10(a)	$6x - x^2 = 0$ $x(6-x) = 0$ $x = 0$ or $x = 6$ $P = (6, 0)$	 B1	
10(b)	$x = 3$	B1	
10(c)	$y = 6(3) - (3)^2 = 9$ $Q = (3, 9)$	 B1	
10(d)	$\frac{1}{2}(6)(9)$ $= 27 \text{ units}^2$	 B1	
11(a)	$C = 50 + 12n$	B1	
11(b)	$4x - 3(x+1) = 2(x-1) - 16$ $4x - 3x - 3 = 2x - 2 - 16$ $-x = -15$ $x = 15$	 M1 A1	
12(a)	$3x^2 - 9xz + 9xz - 27yz$ $= 3x(x - 3z) + 9y(x - 3z)$ $= (3x + 9y)(x - 3z)$ $= 3(x + 3y)(x - 3z)$	 M1 M1 A1	
12(b)	$20x^3y - 5xy$ $= 5xy(4x^2 - 1)$ $= 5xy(2x + 1)(2x - 1)$	 M1 A1	
13	$\frac{8}{(x-2)^2} + \frac{5}{4-2x}$ $= \frac{8}{(x-2)^2} + \frac{5}{-2(x-2)}$ $= \frac{8(2) - 5(x-2)}{2(x-2)^2}$ $= \frac{16 - 5x + 10}{2(x-2)^2}$ $= \frac{26 - 5x}{2(x-2)^2}$	 M1 M1 A1	
14	Loan taken up $= 0.9 \times 4250 = \$3825$ Total interest for 2 years $= (3825 \times 0.042) \times 2$ $= \$321.30$ Monthly installment $= \frac{3825 + 321.30}{24}$ $= \$172.80$	 M1 M1 A1	

15(a)	$\frac{2}{6} = \frac{1}{3}$	B1	
15(b)	0	B1	
16(a)	$3p^2 = 12p$ $3p^2 - 12p = 0$ $3p(p-4) = 0$ $p = 0$ or $p = 4$	 M1 A1	
16(b)	$4x^2 - 5 = x(x-14)$ $4x^2 - 5 = x^2 - 14x$ $3x^2 + 14x - 5 = 0$ $(3x-1)(x+5) = 0$ $x = \frac{1}{3}$ or $x = -5$	 M1 M1 A1	
17(a)	$m = 0$	B1	
17(b)	Correct graph drawn (see attached)	B1	
17(c)	$x = 2$ $y = 2$	A1 A1	
18	I disagree, because the vertical axis does not start at 0. Or I disagree, because the number of students who preferred chocolate is 140 instead of 160.	B1, B1	

17(b)



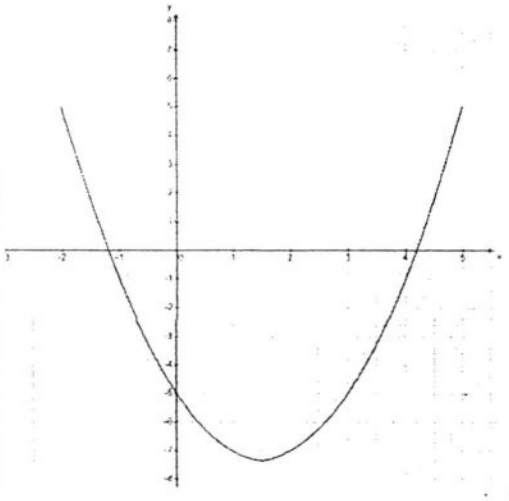
2E EM P2 MYE 2016 Answer Scheme

Qn	Answers	Marking Scheme	Marker's Remark
1(a)	$F = k\sqrt{h}$ $1 = k\sqrt{0.0625}$ $k = 4$ $\Rightarrow F = 4\sqrt{h}$ when $h = 9$ $F = 4\sqrt{9} = 12$ ml	M1 A1	
1(b)	$F = 4\sqrt{h}$ when $F = 3$ $3 = 4\sqrt{h}$ $h = (0.75)^2$ $= 0.5625$ cm	M1 A1	
2(a)	$\frac{5280}{88} \times 100$ = \$6000	M1 A1	
2(b)	$\frac{5280}{105} \times 100$ = \$5028.57 * No A1 if answer is rounded off to \$5029 or \$5028.60	M1 A1	
3(a)	$\left(x + \frac{3}{x}\right)^2 = x^2 + 2(x)\left(\frac{3}{x}\right) + \left(\frac{3}{x}\right)^2$ $= x^2 + 6 + \frac{9}{x^2}$	M1 A1 or B2	
3(b)	$\left(x + \frac{3}{x}\right)^2 = x^2 + 6 + \frac{9}{x^2}$ $4^2 = x^2 + \frac{9}{x^2} + 6$ $x^2 + \frac{9}{x^2} = 16 - 6 = 10$	 M1 A1	

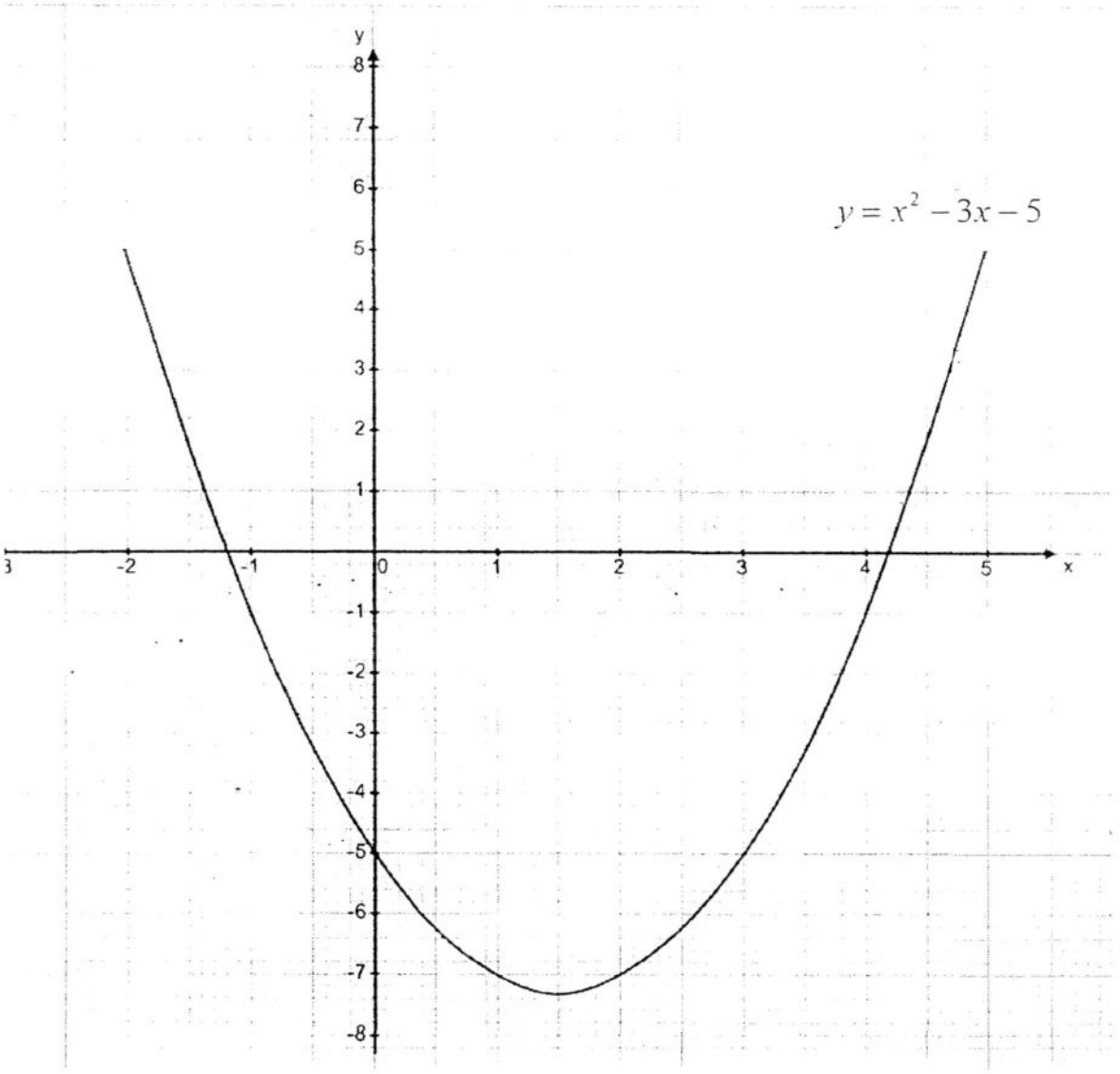
4(a)	$\sqrt{\frac{z-y}{y}} = \frac{1}{x}$ $\frac{z-y}{y} = \frac{1}{x^2}$ $y = x^2(z-y)$ $y = x^2 z - x^2 y$ $y(1+x^2) = x^2 z$ $y = \frac{x^2 z}{1+x^2}$	M1 M1 A1	
4(b)	$y = \frac{1(2)}{1+1} = 1$	B1	
5(a)	$60° \rightarrow 90$ students $360° \rightarrow \frac{90}{60} \times 360$ $= 540$ students	B1	
5(b)	Students who chose Orange $\rightarrow 1.5 \times 50 = 75°$ Others: Total $360 - 110 - 50 - 75 : 360$ $125 : 360$ $25 : 72$	M1 A1	
5(c)	80% of $110 = 88°$ $60° \rightarrow 90$ students $88° \rightarrow \frac{90}{60} \times 88$ $= 132$ male students	M1 A1	
6(a)	$\frac{12}{30} = \frac{2}{5}$	B1	
6(b)	Let no. of yellow balls to be removed $= x$ $\frac{18}{30-x} = \frac{3}{4}$ $72 = 90 - 3x$ $3x = 18$ $x = 6$ $\Rightarrow 6$ yellow balls to be removed.	M1 A1	
7(a)	$2x(x+4)$ km	B1	
7(b)	$2x(x+4) + x(x-7) = 4$ $2x^2 + 8x + x^2 - 7x - 4 = 0$ $3x^2 + x - 4 = 0$ (shown)	M1 M1	

7(c)	$3x^2 + x - 4 = 0$ $(3x + 4)(x - 1) = 0$ $x = -1\frac{1}{3}$ or $x = 1$	 M1 A1	
7(d)	Ave speed $= \frac{4}{2(1)+1} = 1.33$ km/h $x = -1\frac{1}{3}$ is rejected because time cannot be a negative value. * No B1 if speed is given as a fraction.	 B1 B1	
8(a)	$a = 10,\ b = 9$ $c = 10,\ d = 19$	B1 B1	
8(b)	$n^2 - (n-1)^2 = n + (n-1) = 2n - 1$	B1	
8c(i)	P must be odd and 106 is not an odd number	B1	
8c(ii)	$2n - 1 = 109$ $2n = 110$ $n = 55$ $\Rightarrow M = 55,\quad N = 54$	 M1 A1	
9(a)	$x = -1$, $2(-1)^2 - a - 4 = 0$ $-a - 2 = 0$ $a = -2$	 M1 A1	
9(b)	$2x^2 - 2x - 4 = 0$ $(x + 1)(2x - 4) = 0$ $x = -1$ or $x = 2$ The other solution is $x = 2$	 M1 A1	
10(a)	S\$100 → ¥8240 S\$2500 → $\frac{8240}{100} \times 2500$ = ¥206 000	 B1	
10(b)	Amount of ¥ to change back to S\$ = 206 000 – 145 000 = ¥61 000 ¥8150 → S\$90 ¥61000 → $\frac{90}{8150} \times 61000$ = S\$673.62	 M1 A1	

10(c)	Using the original rate, ¥61000 → $\frac{100}{8240} \times 61000$ = S\$740.29 Amount lost = 740.29 – 673.62 = S\$66.67	 M1 A1	

11(a)	$b = -7$	B1	
11(b)	Refer to graph Correct scale and label – 1 mark Correct points plotted – 1 mark Smooth curve joining all points – 1 mark	M3	
			
11(c)(i)	Min $y = -7.3$ (accept -7.5 to -7.1)	B1	
11(c)(ii)	$x = -1.65$ (accept -1.75 to -1.55), $x = 4.5$ (accept 4.4 to 4.6)	B1	
11(c)(iii)	$(-1.2, 0)$ and $(4.2, 0)$ x-coordinate $\pm$ 0.1	B1, B1	
12(a)	$18 + 3 = \$21$	B1	
12(b)	$3(18) + 3 = \$57$	B2	
12(c)	Eight ride family pass: Total cost = \$68 Individual passes: Total cost $= 2(57) = \$114$ It is more worthwhile to get a eight ride family pass as it is cheaper.	M1 M1 A1	
OR	Eight ride family pass (+ child doubling): Total cost = 68 + 6 = \$74 Individual passes: Total cost $= 2(57) = \$114$ It is more worthwhile to get a eight ride family pass as it is cheaper.	M1 M1 A1	
OR	Eight ride family pass (+ child doubling): Total cost = 68 + 6 = \$74 Individual passes: Total cost $= 2(57) = \$114$ It is more worthwhile to get a eight ride family pass as at least one of the adults gets to ride more than 2 times.	M1 M1 A1	

Q11(b)



5

10

BEATTY SECONDARY SCHOOL
END OF YEAR EXAMINATION 2016

SUBJECT : Mathematics **LEVEL : Sec 2 Express**

PAPER : 1 **DURATION : 1 hour 15 minutes**

DATE : 12 Oct 2016

CLASS :	NAME :	REG NO :

.....

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number in the spaces on the top of this page.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.

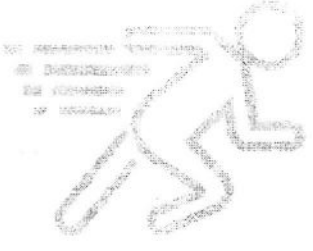
If working is needed for any question, it must be shown with the answer.
Omission of essential working will result in loss of marks.
You are expected to use a scientific calculator to evaluate explicit numerical expressions.
If the degree of accuracy is not specified in the question, and if the answer 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, unless the question requires the answer in terms of π.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is **50**.

For Examiner's Use
50

This paper consists of **11** printed pages (including this cover page)

[Turn Over



For examiner's use

For examiner's use

Answer ALL questions.

1 Expand and simplify the following expressions.

(a) $3a(4-2b)-b(a-3c)$

(b) $3(1-2d)^2-d(d-3)$

Answer (a) ..... [2]

(b) ..... [2]

2 Factorise the following expressions completely.

(a) $2x^2-9x+9$

(b) $8y^2-18z^2$

Answer (a) ..... [2]

(b) ..... [2]

For examiner's use

3 The kinetic energy of a moving car, E, is directly proportional to the square of its speed v. Given that $E = 324$ when $v = 2$, find

(a) the equation connecting E and v,

(b) the value of v when $E = 1024$.

Answer (a) ..... [2]

(b) $v =$ ..... [2]

For examiner's use

[Turn over

For examiner's use

For examiner's use

4 **(a)** Solve the following pair of simultaneous equations.

$$\frac{1}{2}x - y + 5 = 0$$
$$2x - y - 1 = 0$$

(b) State the coordinates of the point of intersection between the lines $\frac{1}{2}x - y + 5 = 0$ and $7x - 3y = 3 + x$.

Answer (a) $x =$.....

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

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

[Turn over

For examiner's use

5 **(a)** Solve the quadratic equation $3x^2 + 11x - 20 = 0$.

(b) Hence, solve the quadratic equation $3(y-1)^2 + 11(y-1) - 20 = 0$.

Answer (a) $x =$ ..... [3]

(b) $y =$ ..... [2]

6 Simplify each of the following.

(a) $\dfrac{4a^2 + 12a}{a^2 - 9}$

(b) $\dfrac{4a^2b}{cd^3} \times \dfrac{c}{6ab}$

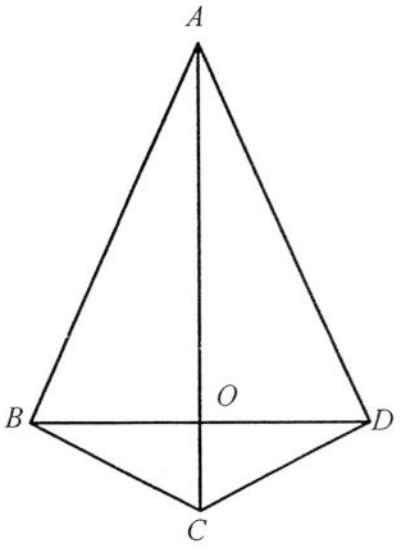
Answer (a) ..... [2]

(b) ..... [2]

For examiner's use

For examiner's use

7



The diagram above shows a kite $ABCD$. The straight lines AC and BD intersect at the point O.

Write down **all the pairs** of congruent triangles in the figure.

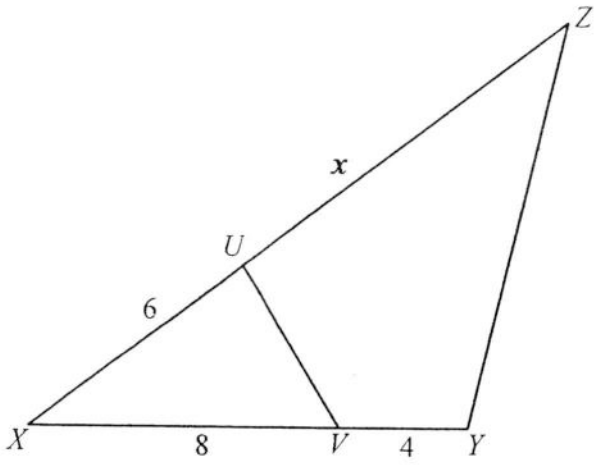
Answer .....

.....

..... [2]

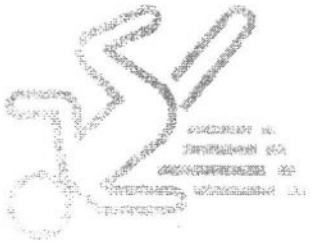
For examiner's use

8



In the diagram above, triangle XYZ is similar to triangle XUV. Given that $XV = 8$ cm, $VY = 4$ cm, $XU = 6$ cm and $UZ = x$ cm, find the value of x.

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



For examiner's use

For examiner's use

9

1	4	4	6	6	6	8	11	12

Nine cards, numbered 1, 4, 4, 6, 6, 6, 8, 11, and 12 are well-shuffled and placed face down on a table.

One of the nine cards is drawn at random. Find

(a) the probability of drawing an even number,

(b) the probability of drawing a 3,

(c) the number whose probability of being drawn is $\frac{1}{3}$,

(d) the probability of drawing a number which is at least 6.

Answer (a) ..... [1]

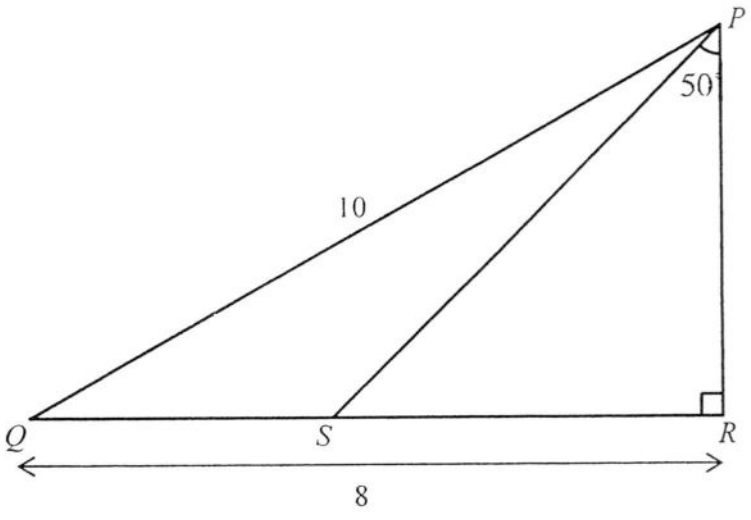
(b) ..... [1]

(c) ..... [1]

(d) ..... [1]

For examiner's use

10



In the diagram above, PQR is a right-angled triangle with angle $PRQ = 90°$, $QR = 8$ cm and $PQ = 10$ cm. S is a point on the line QR such that angle $SPR = 50°$. Find

(a) the length of PR,

(b) the length of SR,

(c) angle SPQ.

Answer (a) ..... cm [2]

(b) ..... cm [1]

(c) ..... ° [2]

[Turn over

For examiner's use

For examiner's use

11 (a) Simplify the expression $\dfrac{gh-2k}{4-2h} \div \dfrac{1+h}{2h^2-2h-4}$.

(b) Given that $s=\dfrac{2t-1}{t+4}$, express t in terms of s.

Answer (a) ..... [3]

(b) $t =$ ..... [2]

[Turn over

12 The stem-and-leaf diagram below shows the scores obtained in a science test by a group of Secondary Two students from class 2*A*.

Stem	Leaf					
1	5					
6	5	7				
7	6	6	8			
8	3	3	5	5	5	7
9	4	4	8			

Key: 6 | 5 means 65 marks.

(a) Find the median score of this group of students.

(b) Find the mean score of this group of students, giving your answer correct to 1 decimal place.

(c) Mr Sng claims that the mean score is a better guage of the performance of this group of students as compared to the median score. Do you agree with him? Explain your answer.

(d) It was later discovered that the score of 1 student was accidentally omitted from the data above, and the actual median score was x. Write down the largest possible value of x.

Answer (a) ..... [1]

(b) ..... [2]

(c) Agree/Disagree, because.....

.....

..... [2]

(d) ..... [1]

END OF PAPER

Answer Key:

1(a) $12a-7ab+3bc$ (b) $3-9d+11d^2$

2(a) $(2x-3)(x-3)$ (b) $2(2y+3z)(2y-3z)$

3(a) $E=81v^2$ (b) $v=3\frac{5}{9}$ or 3.56 (to 3 s.f.)

4(a) $x=4, y=7$ (b) (4, 7)

5(a) $x=5$ or $1\frac{1}{3}$ (b) $y=-4$ or $2\frac{1}{3}$

6(a) $\frac{4a}{a-3}$ (b) $\frac{2a}{3d^3}$

8. $x=10$

9(a) $\frac{7}{9}$ (b) 0 (c) 6 (d) $\frac{2}{3}$

10(a) 6 cm (b) 7.15 (c) 3.1°

11(a) $2k-gh$ (b) $t=\frac{4s+1}{2-s}$

12(a) 83 (b) 78.1 (d) 84

4 1

Calculator Model :		
Class	Full Name	Index Number

bowen
SECONDARY
I believe, therefore I am

END OF YEAR EXAMINATION 2016

O

4048 /02

MATHEMATICS
Paper 2

Secondary 2 Express
10th October 2016

1 hour 15 min

Additional Materials: Writing Papers
Graph Paper (1 sheet)

READ THESE INSTRUCTIONS FIRST

Write your name, class and register number in the spaces provided.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

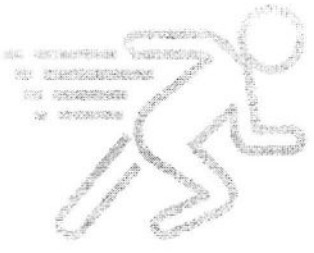
Answer **all** questions.
If working is needed for any question, it must be shown with the answer.
Omission of essential working will result in loss of marks.
Calculators should be used where appropriate.
If the degree of accuracy is not specified in the question and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142, unless the question requires the answer in terms of π.

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 50.

DO NOT OPEN THIS PAPER UNTIL YOU ARE TOLD TO DO SO

For Examiner's Use
50

This document consists of 6 printed pages, including this cover page.

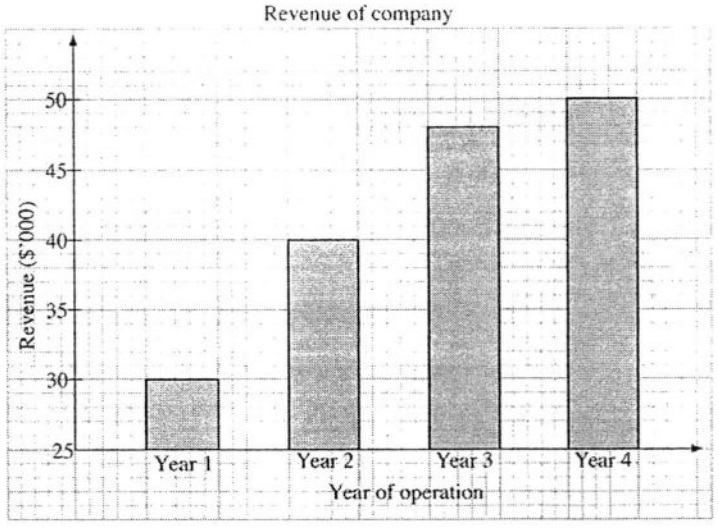


ANSWER ALL QUESTIONS

1 **(a)** Given that $\frac{p}{x} = 21 - 3p$, find the value of x when $p = 4$. [1]

(b) Given that $S = \sqrt{M} + 5\pi$, express M in terms of π and S. [2]

2 The bar chart below shows the revenue of a company in its first four years of operation.



Hazeeq concluded that the company's revenue in Year 2 is three times the revenue earned in Year 1. Do you agree? Justify your answer. [2]

3 The total cost of 7 pencils and 5 pens is \$10.85.
The total cost of 9 pencils and 10 pens is \$18.95.

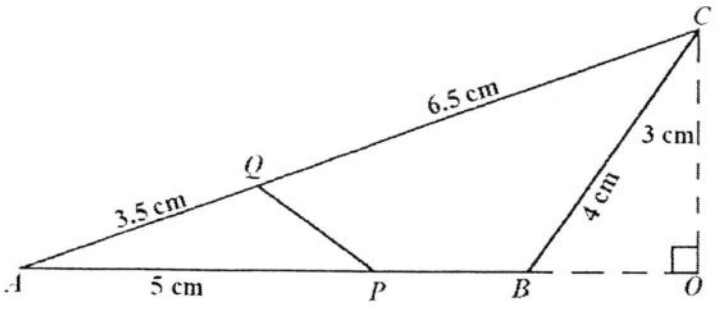
(a) Let the price of 1 pencil be \$ x and the price of 1 pen be \$ y.
Write down two equations, in terms of x and y. [2]

(b) Solve the simultaneous equations. [3]

(c) Hence, find the total cost of 17 pencils and 23 pens, in dollars. [1]

4 In the figure, ΔAPQ is similar to ΔACB.

$AP = 5$ cm, $BC = 4$ cm, $AQ = 3.5$ cm, $QC = 6.5$ cm and $OC = 3$ cm.



Find

(a) the length of AB, [2]

(b) angle CAB, [2]

(c) shortest distance from B to AC. [2]

5 **(a)** Express $\dfrac{1}{x+2} + \dfrac{3x-2}{3x^2+4x-4} - \dfrac{3}{4-x^2}$ as a single fraction in its **simplest form**. [3]

(b) The force, F, between two particles is inversely proportional to the square of the distance between them. The force is 36 units when the distance between the particles is r metres. Find the force when the distance is $2r$ metres. [2]

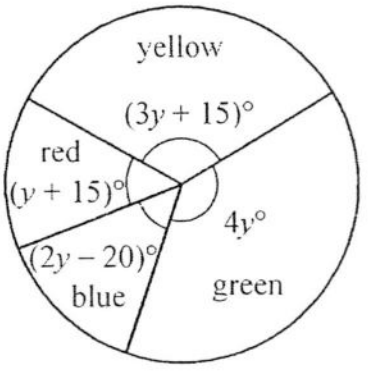
6 Some students were asked how long they spent on the internet every day. The table shows the result.

Number of hours	0	1	2	3	4	5
Number of students	7	6	11	13	7	x

(a) It is given that the mode is 3. Write down the largest possible value of x. [1]

(b) It is given that the median is 3. Write down the smallest possible value of x. [2]

7 The pie chart shows the number of different coloured balls in a bag.



(a) Find the value of y. [2]

(b) Find the probability of choosing a ball, in random, which is neither blue nor yellow. [1]

8 The weekly wages of 100 workers who work in a factory are given in the table below.

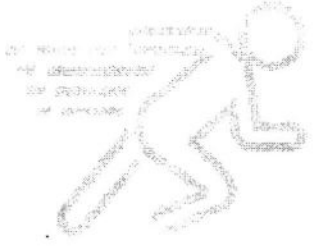
Weekly wage ($x)	$180 < x \leq 220$	$220 < x \leq 260$	$260 < x \leq 300$	$300 < x \leq 340$
Number of workers	15	50	23	k

(a) Find the value of k. [1]

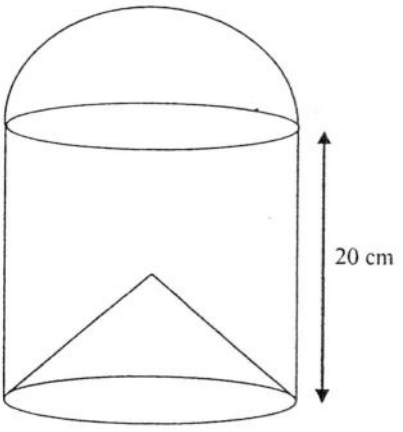
(b) Find, from the distribution of weekly wages, an estimate of the mean wage. [2]

(c) One worker is chosen at random from those who work in the factory.

Expressing your answer as a fraction in its lowest terms, find the probability that the



9 A model consists of a solid hemisphere attached to a solid cylinder. Part of the cylinder in the shape of a cone is removed as shown in the diagram. The height of the cylinder is 20 cm and the area of its base is 201 cm^2.



(a) Find the radius of the cylinder. [2]

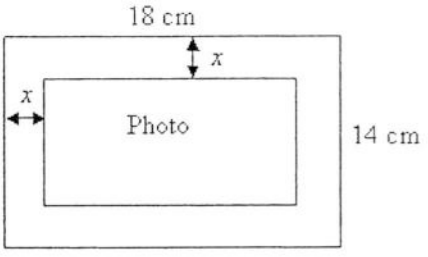
(b) Given that the volume of the cone removed is 662 cm^3, calculate the height of the cone. [2]

(c) Given that the model is made from material of density 0.5g/cm^3, calculate its mass correct to the nearest gram. [3]

(d) Taking the area of the curved surface of the cone to be 251cm^2, calculate the total surface area of the model. Leave your answer correct to two decimal places. [3]

Answer the whole of this question on a sheet of graph paper.

10 A photo of area 96 cm^2 is placed on a photo frame of 18 cm by 14 cm with a border of uniform width as shown.



(a) Form an equation in x and show that it reduces to $x^2 - 16x + 39 = 0$. [3]

The area of the photo is represented by $y = x^2 - 16x + 39$.

Some corresponding values of x and y, are given in the table below.

x	0	2	4	6	8	10	12	14
y	39	11	−9	−21	p	−21	−9	11

(b) Calculate the value of p. [1]

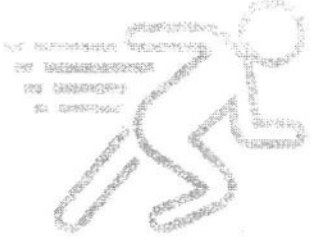
(c) Using a scale of 2 cm to represent 2 units, draw a horizontal x-axis for $2 \le x \le 16$.

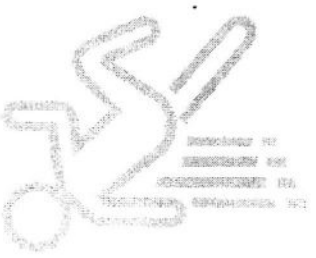
Using a scale of 2 cm to represent 10 units, draw a vertical y-axis for $-30 \le y \le 40$.

On your axes, plot the points given in the table and join them with a smooth curve. [3]

(d) From your graph, find the values of x when $y = 0$. [1]

END OF PAPER





SEC 2 EXPRESS SA2 PAPER 2 (2016) MARKING SCHEME

1)	(a)		$\frac{p}{x} = 21 - 3p$ $\frac{4}{x} = 21 - 3(4)$ $4 = 9p$ $p = \frac{4}{9}$ $---A1$
	(b)		$S = \sqrt{M} + 5\pi$ $S - 5\pi = \sqrt{M}$ $---M1$ $M = (S - 5\pi)^2$ $---A1$
2)			No, I do not agree. -A1 The revenue in year 2 is 4/3 times of the revenue earned in year1.---A1
3)	(a)		The two equations are: $7x + 5y = 10.85$ $---A1$ $9x + 10y = 18.95$ $---A1$
	(b)		$7x + 5y = 10.85$ $---(1)$ *Eqn* (1) × 2, $14x + 10y = 21.70$ $---(2)$ $9x + 10y = 18.95$ $---(3)$ (2) − (3), $5x = 2.75$ $x = 0.55$ $---A1$ *Subst.* $x = 0.55$ into (1), $7(0.55) + 5y = 10.85$ $y = 1.40$ $---A1$ $\therefore x = 0.55, y = 1.40$ (*M1 for any correct part of workings,any method*)
	(c)		*Total* cost $= 17(\$0.55) + 23(\$1.40)$ $= \$41.55$ $---A1$
4)	(a)		$\frac{AB}{AQ} = \frac{AC}{AP}$ $\frac{AB}{3.5} = \frac{6.5 + 3.5}{5}$ $---M1$ $AB = 7\ cm$ $---A1$

	(b)		$\sin \angle CAO = \frac{3}{10}$ $---M1$ $\angle CAO = 17.4576°$ $\therefore \angle CAB = 17.5°$ $---A1$
	(c)		Let the shortest distance be BX. *Method 1* $\frac{1}{2} \times BX \times 10 = \frac{1}{2} \times 7 \times 3$ $---M1$ $BX = 2.1\ cm$ $---A1$ *Method 2* $\sin 17.4576 = \frac{BX}{7}$ $---M1$ $BX = 2.1\ cm$ $---A1$
5	(a)		$\frac{1}{x+2} + \frac{3x-2}{3x^2+4x-4} - \frac{3}{4-x^2}$ $= \frac{1}{x+2} + \frac{3x-2}{(3x-2)(x+2)} - \frac{3}{(2-x)(2+x)}$ $---M1$ $= \frac{1}{x+2} + \frac{1}{x+2} - \frac{3}{(2-x)(2+x)}$ $= \frac{2}{x+2} - \frac{3}{(2-x)(2+x)}$ $= \frac{2(2-x)-3}{(2-x)(2+x)}$ $---M1$ $= \frac{4-2x-3}{(2-x)(2+x)}$ $= \frac{1-2x}{(2-x)(2+x)}$ $---A1$
	(b)		$F = \frac{k}{d^2}$, *where k is a constant* $36 = \frac{k}{r^2}$ $k = 36r^2$ $---M1$ $New\ F = \frac{36r^2}{(2r)^2}$ $= \frac{36r^2}{4r^2}$ $= 9$ $---M1$
6	(a)		Largest possible value of x = 12 --- A1
	(b)		$7+6+11 = 12+7+x$ $---M1$ $x = 5$ $---A1$

7	(a)		$3y+15+4y+2y-20+y+15=360 \quad ---M1$ $10y=350$ $y=35 \quad ---A1$
	(b)		$\text{Probability}=\frac{5(35)+15}{360}$ $=\frac{19}{36} \quad ---A1$
8	(a)		k = 12 --- A1
	(b)		$Mean=\frac{200(15)+240(50)+280(23)+320(12)}{100} \quad ---M1$ $=\frac{25280}{100}$ $=\$252.80 \quad ---A1$
	(c)		$\text{Probability}=\frac{23+12}{100}$ $=\frac{7}{20} ---A1$
9	(a)		$\pi r^2=201---M1$ $r=7.99877$ $\approx 8.00 \quad cm---A1$
	(b)		$\frac{1}{3}\pi(7.99877)^2 h=662 \quad ---M1$ $h=9.8806$ $\approx 9.88\,cm \quad ---M1$
	(c)		$Volume=\left(\frac{1}{2}\times\frac{4}{3}\times\pi\times 7.99877^{\,3}\right)+\left(\pi\times 7.99877^2\times 20\right)-662---M1$ $=4429.8379$ $\approx 4430cm^3$ $Mass=4429.8379\times 0.5---M1$ $=2214.91895$ $\approx 2215g---A1$
	(d)		

			$Slant\ height\ of\ cone = \sqrt{9.8806^2 - 7.99877^2}$ $= 9.0345cm - - - M1$ $Total\ surface\ area = 251 + (2 \times \pi \times 7.99877 \times 20) + (\pi \times 7.99877 \times 9.035) - - - M1$ $= 1483.19cm^2 - - - A1$	
10			Graph	

Name:	Index Number:	Class:

HUA YI SECONDARY SCHOOL

2E End-of-Year Examination 2016 **2E**

Mathematics

Paper 1 10 October 2016

1 h 30 min

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your name, class and register number on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Answer **all** the questions.
If working is needed for any question, it must be shown with the answer.
Omission of essential working will result in loss of marks.
The use of an approved scientific calculator is expected, where appropriate.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to 3 significant figures. Give answers in degrees to 1 decimal place. For , use either your calculator value or 3.142, unless the question requires the answer in terms of .

The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **10** printed pages including the cover page.

[Turn Over

For Examiner's Use

1. Solve the following simultaneous equations.

$3x - 4y = 30$ --- (1)

$7y = 2x - 33$ --- (2)

Answer ..... [3]

---

2. Given that m is inversely proportional to $(n-2)^2$, and that $m = -2$ when $n = 5$. Find

(a) an equation involving m and n.

(b) the value(s) of n when $m = -4\frac{1}{2}$.

(a) ..... [2]

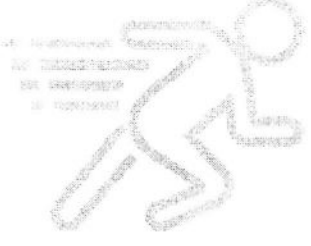
(b) ..... [3]

3. Expand and simplify the following.

(a) $(3p - 7q)(2p + 5q)$

(b) $2(3m - 4)^2$

(c) $(x - 2)(x + 2)(x^2 + 4)$



(a) ..... [2]

(b) ..... [2]

(c) ..... [2]

For Examiner's Use

4. Factorise the following completely.

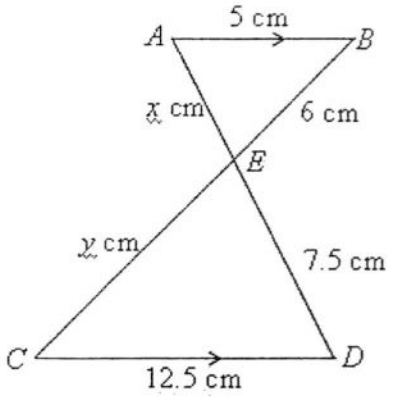
(a) $2m^2 + 5mn - 3n^2$

(b) $px - py + qy - qx$

(a) ..... [2]

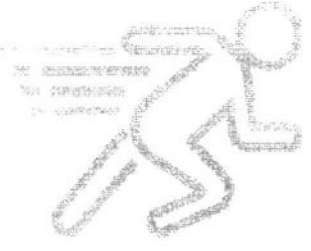
(b) ..... [2]

5. In the figure shown below, AB // CD.



(a) Name a pair of similar triangles.

(b) Find the value of x and y.



(a) ..... [1]

(b) ..... [2]

For Examiner's Use

6. Map A is drawn to a scale of 1 : 60 000.

(a) Find the distance between 2 towns on the map if the actual distance between the 2 towns is 12.6 km.

(b) A lake on the map has an area of 3.7 cm^2. Find the actual area of the lake in km^2.

(a) ..... [1]

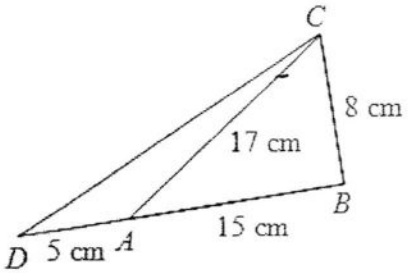
(b) ..... [2]

7. Given that $\sqrt{\frac{z-y}{y}} = \frac{1}{x}$, express y in terms of x and z.

Answer ..... [3]

For Examiner's Use

8. In triangle ABC, $AB = 15\,\text{cm}$, $BC = 8\,\text{cm}$ and $AC = 17\,\text{cm}$.



(a) Explain why triangle ABC is a right angle triangle.

(b) BA is produced to D and $AD = 5\,\text{cm}$. Find the length of DC.

(c) Find $\angle DAC$.

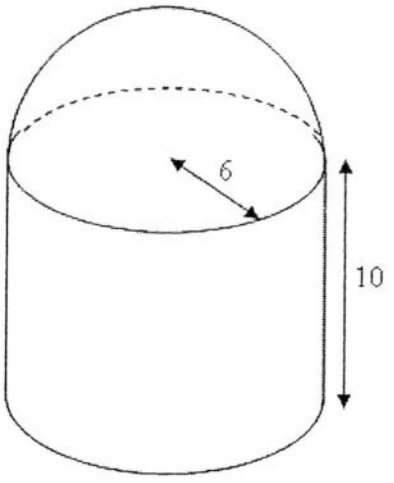
(a) [2]

(b) ..... [2]

(c) ..... [2]

For Examiner's Use

9. The iron solid is made up of a hemisphere joined to a cylinder with a radius of 6 cm and a height of 10 cm.



Calculate

(a) the volume of the solid,

(b) the surface area of the solid.

(a) ..... [3]

(b) ..... [3]

For Examiner's Use

10. A box contains 30 balls. of which 14 are yellow, 8 are green and the rest are blue. A ball is drawn at random from the box.

(a) Find the probability that the ball is yellow.

(b) Find the probability that the ball is either blue or green.

(c) Find the number of yellow balls that need to be removed so that the probability of drawing a yellow ball is $\frac{1}{3}$.

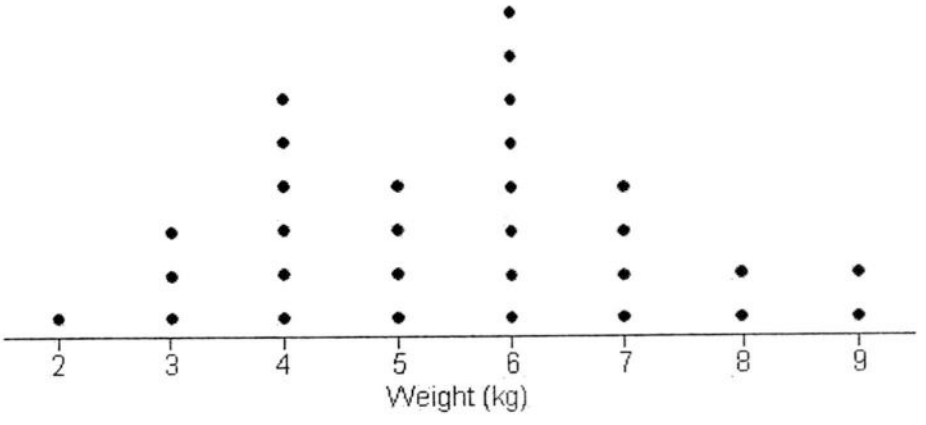
(a) ..... [1]

(b) ..... [1]

(c) ..... [1]

---

11. The dot diagram below shows the weight of 30 boxes.



(a) Write down the modal weight.

(b) Find the median weight.

(c) If the standard weight of a box is between 3 kg to 7 kg, find the percentage of the boxes that have standard weight.

(a) ..... [1]

(b) ..... [1]

(c) ..... [1]

For Examiner's Use

12. **(a)** Solve the inequality $4 - 3x \geq -15$ and represent its solution on a number line given.

(b) State the

(i) greatest rational number.

(ii) smallest prime number.

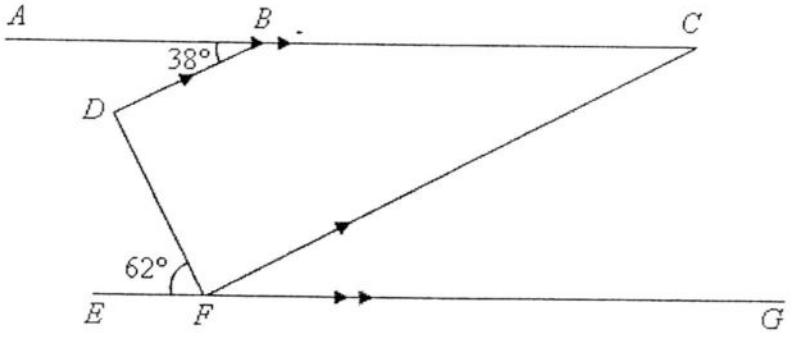
(a) ..... [2]

(b) (i) ..... [1]

(b) (ii) ..... [1]

---

13. In the diagram, the straight line ABC is parallel to EFG and DB is parallel to FC. It is given that $\angle ABD = 38°$ and $\angle DFE = 62°$.



Stating your reasons clearly, find

(a) $\angle BDF$,

(b) $\angle CFG$.

(a) ..... [2]

(b) ..... [1]

For Examiner's Use

14. **(a)** Given that $AD = 6.2$ cm and $BD = 10.4$ cm, construct the quadrilateral $ABCD$.

(b) Construct a line which is equidistant from B and C.

(c) Construct another line which is equidistant from AB and BC.

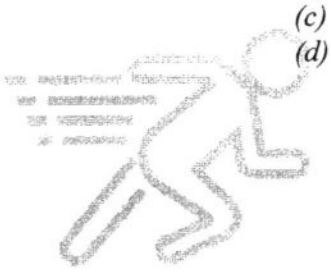
(d) A point M is equidistant from B and C, but is nearer to AB than BC. Mark and label the point M.

(a) [2]

(b) [1]

(c) [1]

(d) [1]



For Examiner's Use

15. In 2014, the price of a television set is $1000, which was an increase of 8% from 2013.

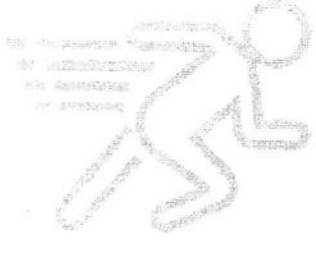
(a) Find the price of the television set in 2013.

(b) Ahmad bought the television set in 2014 and sold it in 2015 for a profit of 5%. Find the selling price of the television.

(a) ..... [2]

(b) ..... [1]

---- END OF PAPER ---



Name:	Index Number:	Class:

HUA YI SECONDARY SCHOOL

2E End-of-Year Examination 2016 **2E**

Mathematics

Paper 1 10 October 2016

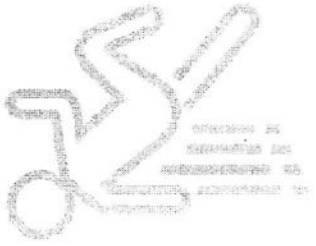
1 h 30 min

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Marking Scheme

[Turn Over



1. Solve the following simultaneous equations.

$3x - 4y = 30$ --- (1)

$7y = 2x - 33$ --- (2)

$3x = 30 + 4y$

$x = \dfrac{30 + 4y}{3}$ --- (1b)

Sub (1b) into (2). **[M1 any method]**

$7y = 2\left(\dfrac{30 + 4y}{3}\right) - 33$

$7y = \dfrac{8y}{3} - 13$

$y = -3$ **[A1]**

Sub $y = -3$ into (1b),

$x = 6$ **[A1]**

Answer ..... [3]

---

2. Given that m is inversely proportional to $(n-2)^2$, and that $m = -2$ when $n = 5$. Find

(a) an equation involving m and n.

(b) the value(s) of n when $m = -4\dfrac{1}{2}$.

(a) $m = \dfrac{k}{(n-2)^2}$

$-2 = \dfrac{k}{(5-2)^2}$

$k = -18$ **[M1]**

$m = \dfrac{-18}{(n-2)^2}$ **[A1]**

(b) $-4\dfrac{1}{2} = \dfrac{-18}{(n-2)^2}$

$(n-2)^2 = 4$ **[M1]**

$n - 2 = -2$ or 2

$n = 0$ or 4 **[A1,A1]**

(a) ..... [2]

(b) ..... [3]

3. Expand and simplify the following.

(a) $(3p-7q)(2p+5q)$

(b) $2(3m-4)^2$

(c) $(x-2)(x+2)(x^2+4)$

(a) $6p^2+15pq-14pq-35q^2$ **[M1]**

$=6p^2+pq-35q^2$ **[A1]**

(b) $2(9m^2-24m+16)$ **[M1]**

$=18m^2-48m+32$ **[A1]**

(c) $(x^2-4)(x^2+4)$ **[M1]**

$=x^4-16$ **[A1]**

(a) ..... [2]

(b) ..... [2]

(c) ..... [2]

---

4. Factorise the following completely.

(a) $2m^2+5mn-3n^2$

(b) $px-py+qy-qx$

(a) $2m-n \mid -mn$

$m+3n \mid 6mn$

$2m^2-3n^2 \mid 5mn$ **[M1]**

$(2m-n)(m+3n)$ **[A1]**

(b) $p(x-y)+q(y-x)$

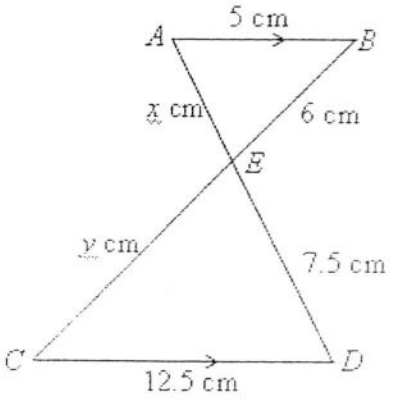
$=p(x-y)-q(x-y)$ **[M1]**

$=(p-q)(x-y)$ **[A1]**

(a) ..... [2]

(b) ..... [2]

5. In the figure shown below, $AB \parallel CD$.



(a) Name a pair of similar triangles.
(b) Find the value of x and y.

(a) ΔECD and ΔEBA **[A1]**
(b) $x = 3, y = 15$ **[A1,A1]**

(a) ..... [1]

(b) ..... [2]

---

6. Map A is drawn to a scale of 1 : 60 000.
(a) Find the distance between 2 towns on the map if the actual distance between the 2 towns is 12.6 km.
(b) A lake on the map has an area of 3.7 cm^2. Find the actual area of the lake in km^2.

(a) map distance $= \frac{1260000}{60000}$
$= 21$ cm **[A1]**
(b) Area scale = 1 cm^2 : 0.36 km^2 **[M1]**
Actual area $= 3.7 \times 0.36$
$= 1.332$ km^2 **[A1]**

(a) ..... [1]

(b) ..... [2]

7. Given that $\sqrt{\frac{z-y}{y}} = \frac{1}{x}$, express y in terms of x and z.

$\frac{z-y}{y} = \frac{1}{x^2}$ **[M1]**

$zx^2 - yx^2 = y$

$zx^2 = yx^2 + y$

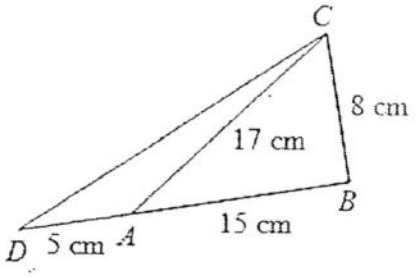
$y(x^2+1) = zx^2$ **[M1]**

$y = \frac{zx^2}{x^2+1}$ **[A1]**

Answer ..... [3]

---

8. In triangle ABC, $AB = 15$ cm, $BC = 8$ cm and $AC = 17$ cm.



(a) Explain why triangle ABC is a right angle triangle.
(b) BA is produced to D and $AD = 5$ cm. Find the length of DC.
(c) Find $\angle DAC$.

(a) $AC^2 = 17^2 = 289$
$AB^2 + BC^2 = 15^2 + 8^2 = 289$ **[M1]**
Since $AC^2 = AB^2 + BC^2$, by pythagoras thereom,
triangle ABC is a right angle triangle **[A1]**

(b) $DC^2 = 20^2 + 8^2$ **[M1]**
$DC = 21.5$ cm **[A1]**

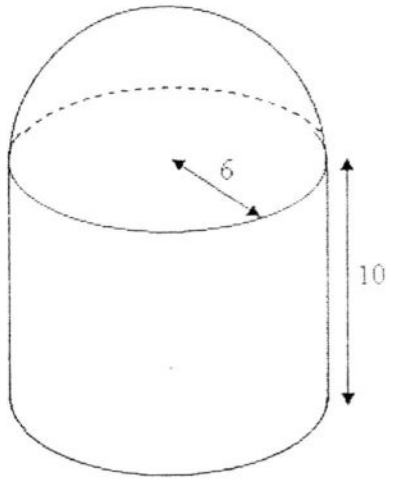
(c) $\angle CAB = \sin^{-1}(\frac{8}{17})$
$= 28.072°$ **[M1]**
$\angle DAC = 180° - 28.072°$
$= 151.9°$ **[A1]**

(a) Answer in the spaces provided [2]

(b) ..... [2]

(c) ..... [2]

9. The iron solid is made up of a hemisphere joined to a cylinder with a radius of 6 cm and a height of 10 cm.



Calculate
(a) the volume of the solid,
(b) the surface area of the solid.

(a) Vol $= \frac{2}{3}\pi(6^3) + \pi(6^2)(10)$ **[M1,M1]**

$= 1580 \text{ cm}^3$ (3sf) **[A1]**

(b) Surface area $= 2\pi(6^2) + 2\pi(6)(10) + \pi(6^2)$ **[M1 for hemisphere, M1 for curved surface]**

$= 716 \text{ cm}^2$ (3sf) **[A1]**

(a) ..... [3]

(b) ..... [3]

10. A box contains 30 balls, of which 14 are yellow, 8 are green and the rest are blue. A ball is drawn at random from the box.

(a) Find the probability that the ball is yellow.

(b) Find the probability that the ball is either blue or green.

(c) Find the number of yellow balls that need to be removed so that the probability of drawing a yellow ball is $\frac{1}{3}$.

(a) $\frac{7}{15}$ **[B1]**

(b) $\frac{8}{15}$ **[B1]**

(c) 2 units – 16 balls
1 unit – 8 balls
Number to be removed = 6 **[B1]**

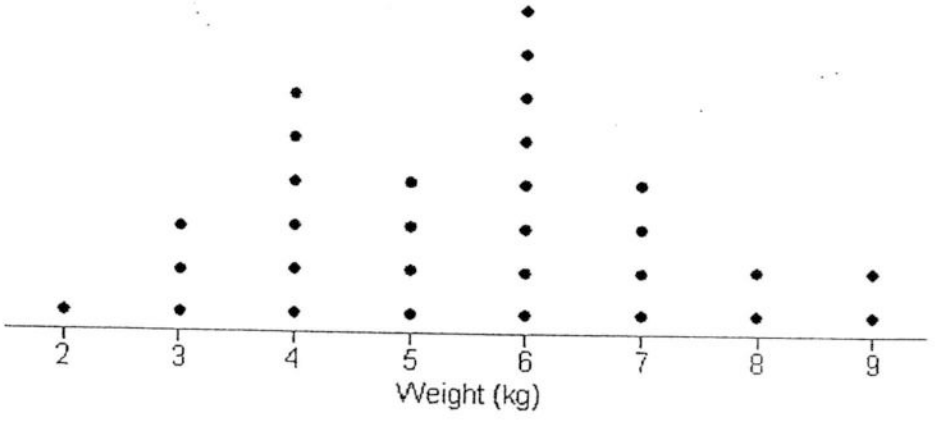
(a) ..... [1]

(b) ..... [1]

(c) ..... [1]

---

11. The dot diagram below shows the weight of 30 boxes.



(a) Write down the modal weight.

(b) Find the median weight.

(c) If the standard weight of a box is between 3 kg to 7 kg, find the percentage of the boxes that have standard weight.

(a) 6 kg **[B1]**

(b) 6 kg **[B1]**

(c) $\frac{18}{30} \times 100 = 60\%$ **[A1]**

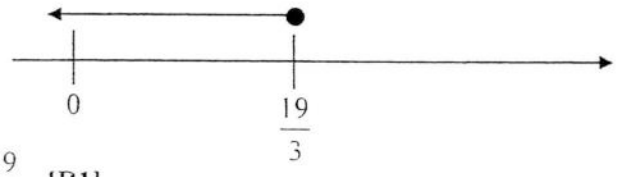
(a) ..... [1]

(b) ..... [1]

(c) ..... [1]

12. **(a)** Solve the inequality $4-3x \geq -15$ and represent its solution on a number line given.
(b) State the
(i) greatest rational number.
(ii) smallest prime number.

(a)



[A1 for solution, A1 for arrow]

(b)(i) $\frac{19}{3}$ **[B1]**

(ii) 2 **[B1]**

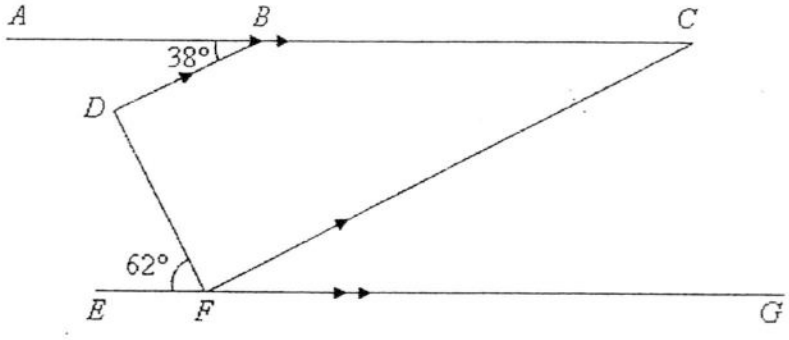
(a) ..... [2]

(b) (i) ..... [1]

(b) (ii) ..... [1]

---

13. In the diagram, the straight line ABC is parallel to EFG and DB is parallel to FC. It is given that $\angle ABD = 38°$ and $\angle DFE = 62°$.



Stating your reasons clearly, find
(a) $\angle BDF$,
(b) $\angle CFG$.

(a) $\angle BDF = 38° + 62°$ **[M1]**
$= 100°$ **[A1]** (alt $\angle$)

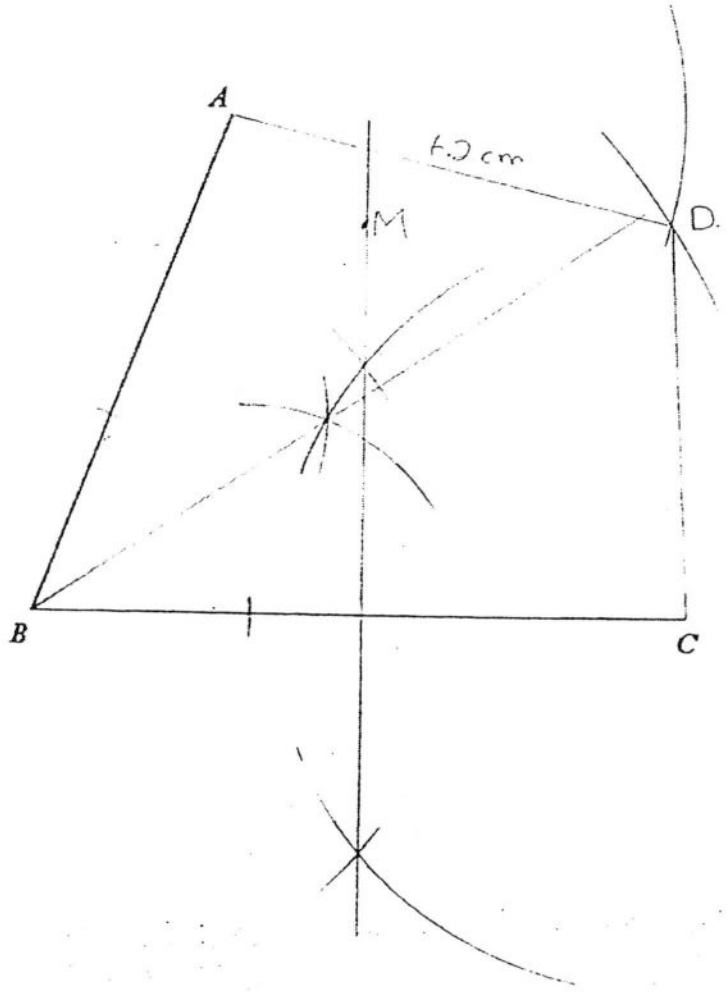
(b) $\angle CFG = 38°$ **[B1]** (corres. $\angle$)

(a) ..... [2]

(b) ..... [1]

(c)

14. (a) Given that $AD = 6.2$ cm and $BD = 10.4$ cm, construct the quadrilateral $ABCD$.
(b) Construct a line which is equidistant from B and C.
(c) Construct another line which is equidistant from AB and BC.
(d) A point M is equidistant from B and C, but is nearer to AB than BC. Mark and label the point M.



(a) Answer in the spaces provided [2]
(b) Answer in the spaces provided [1]
(c) Answer in the spaces provided [1]
(d) Answer in the spaces provided [1]

15. In 2014. the price of a television set is $1000, which was an increase of 8% from 2013.
(a) Find the price of the television set in 2013.
(b) Ahmad bought the television set in 2014 and sold it in 2015 for a profit of 5%. Find the selling price of the television.

(a) price in 2013 $= \frac{1000}{108} \times 100$ **[M1]**
$= \$925.93$ **[A1]**

(b) selling price $= \frac{1000}{100} \times 105$
$= \$1050$ **[A1]**

(a) ..... [2]

(b) ..... [1]

---- END OF PAPER ---

2 5

Marsiling Secondary School

End-of-Year Examination 2016

Subject: Mathematics Paper 1 Level: Sec 2 Stream: Express

Date: 14 October 2016 Duration: 1 hour 30 minutes

Name: _____ Index No: _____ Class: _____

Additional Material: NIL

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class on the cover page.
Write in dark blue or black ink in the spaces provided on the Question Paper.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer all questions.
If working is needed for any question it must be shown in the space below that question.
Omission of essential working will result in loss of marks.
Calculator should be used where appropriate.
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, unless the question requires the answer in terms of π.

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 60.

FOR EXAMINER'S USE	
TOTAL	/ 60

Setter : Mr Phua Kian Wee

This question paper consists of 14 printed pages, including the cover page.

Mathematical Formulae

Mensuration

Curved surface area of a cone = πrl

Surface area of a sphere = $4\pi r^2$

Volume of a cone = $\frac{1}{3}\pi r^2 h$

Volume of a sphere = $\frac{4}{3}\pi r^3$

Answer all the questions.

1 (a) Calculate $\dfrac{5+\sqrt{99-3\times(-2)}}{3+\pi}$.

Write down the first five digits on your calculator display.

Answer (a) ..... [1]

(b) Write your answer to part (a) correct to 3 decimal places.

Answer (b) ..... [1]

2 The number of students who sat for the Primary School Leaving Examination in 2014 was 42 300 when rounded off to the nearest hundred.

Write down

(a) the least possible value of the number of students,

Answer (a) ..... [1]

(b) the greatest possible value of the number of students.

Answer (b) ..... [1]

The size of each interior angle of a regular polygon is three times the size of each exterior angle.

Find the number of sides that the polygon has.

Answer ..... [2]

4 (a) Express 504 as the product of its prime factors.

Answer (a) .. [1]

(b) Find the greatest integer that will divide both 504 and 630 exactly.

Answer (b) [1]

(c) Find the smallest positive integer k such that $\frac{504}{k}$ is a square number.

Answer (c) $k =$ [1]

5 Write as a single fraction in its simplest form

(a) $\frac{5x-1}{4}+\frac{x+2}{3}$,

Answer (a)

(b) $\frac{7x}{x^2-9}+\frac{4}{x+3}$.

Answer (b) ..... [2]

6 A metal pipe is 35 cm long.
Nigel cuts the pipe into two parts so that the ratio of the lengths is 5 : 2.

(a) Calculate the difference in length between the two parts of the pipe.

Answer (a) ..... cm [2]

(b) Nigel cuts a certain length of pipe, x cm, from each of the two parts on the pipe.
The ratio of the remaining lengths is 6 : 1.

Calculate the value of x.

Answer (b) $x =$ ..... [2]

7 Joseph bought an oil painting for $950.
He sold it five years later for a profit of 120% of the cost price.

Calculate the selling price.

Answer $ ..... [2]

8 The fastest speed attained by a car powered by biogas was 364.6 km/h.

Convert 364.6 km/h into m/s.
Give your answer correct to three significant figures.

Answer .... m/s [2]

9 It is given that $y = \dfrac{x-2}{x}$.

Express x in terms of y.

Answer .... [2]

10 Expand and simplify $(5x-3)^2$.

Answer ..... [2]

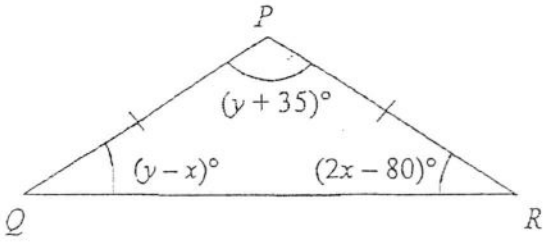
11 (a) Factorise $6a+3ay-4b-2by$.

Answer (a) ... [2]

(b) Factorise fully $6x^3-27x^2+30x$.

Answer (b) .. [2]

12 Triangle PQR is isosceles with $PQ = PR$.
The angles are as shown on the diagram.



(a) Write down two simultaneous equations, in terms of x and y, to represent this information.

Answer (a) ... .. [2]

(b) Solve these two equations to find the value of x and the value of y.

Answer (b) x = ...

y = ... [3]

For Examiner's Use

13 f is directly proportional to the square root of T.
When $f = 8$, $T = 16$.

(a) Find an equation connecting f and T.

Answer (a) ..... [2]

(b) Find the value of f when this value of T is halved.

Answer (b) ..... [2]

14 50 workers took 6 hours to clean up the National Stadium after the National Day Parade.

How many more workers are needed if they need to clean up the stadium in 4 hours?

Answer ..... [2]

15 $\xi = \{ \text{integers } x : 0 \leq x < 10 \} = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$
$A = \{ \text{prime numbers} \} = \{2, 3, 5, 7\}$
$B = \{ \text{multiples of 3} \} = \{3, 6, 9\}$

(a) List all the elements in $A \cap B$.

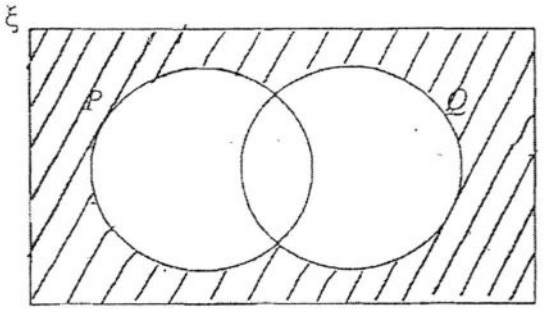
Answer (a) ..... [1]

(b) Find $n(A' \cup B)$.

Answer (b) ..... [1]

---

16 On the Venn diagram, shade the region which represents $(P \cup Q)'$.



[1]

---

17 A class of 14 girls and 26 boys took a quiz.
The mean mark for the girls was 27.
The mean mark for the boys was 26.5.

Find the mean mark for the whole class.

Answer ..... [2]

---

18 One solution of the equation $x^2 + bx - 6 = 0$, where b is a constant, is $x = -2$.

(a) Find the value of b.

Answer (a) $b =$ ..... [1]

(b) Hence, find the second solution of the equation.

Answer (b) $x =$ ..... [1]

19 The table below summarises the number of watches that a group of students have.

Number of watches	0	1	2	3
Frequency	2	7	x	5

(a) Write down the largest possible value of x if the mode is 1.

Answer (a) $x =$ ..... [1]

(b) Write down the value of x if the median is 1.5.

Answer (b) $x =$ ..... [1]

Marsiling Secondary School

End-of-Year Examination 2016

Subject: Mathematics Paper 1 Level: Sec 2 Stream: Express

Date: 14 October 2016 Duration: 1 hour 30 minutes

Name: MARKING SCHEME Index No: Class:

Additional Material: NIL

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

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Calculator should be used where appropriate.
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The total of the marks for this paper is 60.

FOR EXAMINER'S USE	
TOTAL	60

Setter : Mr Phua Kian Wee

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Volume of a cone = $\frac{1}{3}\pi r^2 h$

Volume of a sphere = $\frac{4}{3}\pi r^3$

For Examiner's Use

Answer all the questions.

1 (a) Calculate $\frac{5+\sqrt{99-3\times(-2)}}{3+\pi}$.

Write down the first five digits on your calculator display.

Answer (a) 2.4825 [1] [B1]

(b) Write your answer to part (a) correct to 3 decimal places.

Answer (b) 2.483 [1] [B1]

---

2 The number of students who sat for the Primary School Leaving Examination in 2014 was 42 300 when rounded off to the nearest hundred.

Write down

(a) the least possible value of the number of students,

Answer (a) 42 250 [1] [B1]

(b) the greatest possible value of the number of students.

Answer (b) 42 349 [1] [B1]

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3 The size of each interior angle of a regular polygon is three times the size of each exterior angle.

Find the number of sides that the polygon has.

$\frac{(n-2)\times 180^\circ}{n} = 3\left(\frac{360^\circ}{n}\right)$ [M1]

or $(n-2)\times 180^\circ = 1080^\circ$

Let x be the size of each ext. $\angle$

$3x + x = 180^\circ$ [M1]

$4x = 180^\circ$

$x = 45^\circ$

$\therefore n = \frac{360^\circ}{45^\circ}$

$= 8$

$n-2 = \frac{1080^\circ}{180^\circ}$

$= 6$

$\therefore n = 8$ #

Answer 8 [2] [A1]

Accept guess-and-check method

For Examiner's Use

4 (a) Express 504 as the product of its prime factors.

$$\begin{array}{r|l} 2 & 504 \\ 2 & 252 \\ 2 & 126 \\ 3 & 63 \\ 3 & 21 \\ 7 & 7 \\ & 1 \end{array}$$

Answer (a) $2^3 \times 3^2 \times 7$ [1] [B1]

(b) Find the greatest integer that will divide both 504 and 630 exactly.

$$\begin{array}{r|ll} 2 & 504 & 630 \\ 3 & 252 & 315 \\ 3 & 84 & 105 \\ 7 & 28 & 35 \\ & 4 & 5 \end{array}$$

$HCF = 2 \times 3 \times 3 \times 7$

$= 126$

Answer (b) 126 [1] [B1]

(c) Find the smallest positive integer k such that $\frac{504}{k}$ is a square number.

$$\frac{2^3 \times 3^2 \times 7}{k} = 2^2 \times 3^2$$

$\therefore k = 2 \times 7$

$= 14$

Answer (c) $k =$ 14 [1] [B1]

For Examiner's Use

5 Write as a single fraction in its simplest form

(a) $\frac{5x-1}{4}+\frac{x+2}{3}$,

$$\frac{3(5x-1)+4(x+2)}{12} \quad [M1]$$

$$= \frac{15x-3+4x+8}{12}$$

$$= \frac{19x+5}{12}$$

Answer (a) $\frac{19x+5}{12}$ [2] [A1]

(b) $\frac{7x}{x^2-9}+\frac{4}{x+3}$.

$$\frac{7x+4(x-3)}{(x+3)(x-3)} \quad [M1]$$

$$= \frac{7x+4x-12}{(x+3)(x-3)}$$

$$= \frac{11x-12}{(x+3)(x-3)}$$

OR

$$\frac{7x(x+3)+4(x^2-9)}{(x^2-9)(x+3)}$$

$$= \frac{7x^2+21x+4x^2-36}{(x^2-9)(x+3)}$$

$$= \frac{11x^2+21x-36}{(x^2-9)(x+3)}$$

$$= \frac{(11x-12)(x+3)}{(x^2-9)(x+3)} \quad [M1]$$

$$= \frac{11x-12}{x^2-9} \quad [A1]$$

Answer (b) $\frac{11x-12}{(x+3)(x-3)}$ [2] [A1]

6 A metal pipe is 35 cm long.
Nigel cuts the pipe into two parts so that the ratio of the lengths is 5 : 2.

(a) Calculate the difference in length between the two parts of the pipe.

Difference $= \frac{35}{7} \times (5-2)$ [M1]

$= 15$

Answer (a) 15 cm [2] [A1]

(b) Nigel cuts a certain length of pipe, x cm, from each of the two parts on the pipe.
The ratio of the remaining lengths is 6 : 1.

Calculate the value of x.

Length of longer pipe $= \frac{35}{7} \times 5 = 25$

Length of shorter pipe $= \frac{35}{7} \times 2 = 10$

$\frac{25-x}{10-x} = \frac{6}{1}$ [M1]

$25 - x = 6(10-x)$

$= 60 - 6x$

$5x = 60 - 25$

$= 35$

$\therefore x = 7$

Answer (b) $x =$ 7 [2] [A1]

---

7 Joseph bought an oil painting for $950.
He sold it five years later for a profit of 120% of the cost price.

Calculate the selling price.

Profit $= \frac{120}{100} \times \$950$ or $\frac{220}{100} \times \$950$ [M1]

$= \$1140$ $= \$2090$

Selling price

$= \$950 + \$1140$ [M1]

$= \$2090$

Answer $ 2090 [A1] [2]

8 The fastest speed attained by a car powered by biogas was 364.6 km/h.

Convert 364.6 km/h into m/s.
Give your answer correct to three significant figures.

$\frac{364.6 \times 1000 \text{ m}}{3600 \text{ s}}$ [M1] or $\frac{364.6}{3.6}$ [M1]

≈ 101 m/s (to 3 s.f.)

Answer 101 m/s [2] [A1]

---

9 It is given that $y = \frac{x-2}{x}$.

Express x in terms of y.

$xy = x - 2$ [M1]

$xy - x = -2$ or $2 = x - xy$

$x(y-1) = -2$ $2 = x(1-y)$

$\therefore x = \frac{-2}{y-1}$ [A1] $x = \frac{2}{1-y}$ [A1]

Answer $x = \frac{2}{1-y}$ [A1] [2]

or $x = \frac{-2}{y-1}$ [A1]

10 Expand and simplify $(5x-3)^2$.

$(5x-3)(5x-3)$

$= 25x^2 - 15x - 15x + 9$ [M1]

$= 25x^2 - 30x + 9$

or

$(5x)^2 - 2(5x)(3) + 3^2$ [A1]

Answer $25x^2 - 30x + 9$ [2] [A1]

---

11 (a) Factorise $6a + 3ay - 4b - 2by$.

$6a - 4b + 3ay - 2by$

$= 2(3a - 2b) + y(3a - 2b)$ [M1]

$= (3a - 2b)(2 + y)$

or $6a + 3ay - 4b - 2by$

$= 3a(2 + y) - 2b(2 + y)$ [M1]

Answer (a) $(3a-2b)(2+y)$ [2] [A1]

(b) Factorise fully $6x^3 - 27x^2 + 30x$.

$3x(2x^2 - 9x + 10)$ [M1]

$= 3x(2x - 5)(x - 2)$

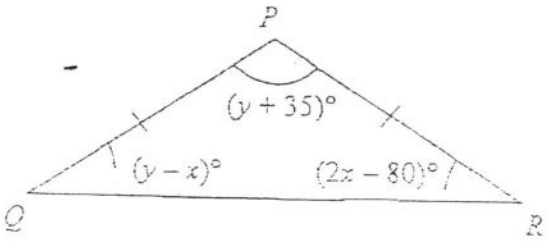
or $x(6x - 15)(x - 2)$

or $x(2x - 5)(3x - 6)$

Answer (b) $3x(2x-5)(x-2)$ [2] [A1]

For Examiner's Use

12 Triangle PQR is isosceles with $PQ = PR$.
The angles are as shown on the diagram.



(a) Write down two simultaneous equations, in terms of x and y, to represent this information.

$y - x = 2x - 80$, $\quad y + 35 + y - x + 2x - 80 = 180$

$y = 3x - 80$ $\quad 2y + x - 45 = 180$

$2y = 225 - x$

Answer (a) $y = 3x - 80$ [B1]

$2y = 225 - x$ [2] [B1]

(b) Solve these two equations to find the value of x and the value of y.

$y = 3x - 80$

$2y = 6x - 160$, $\quad 2y = 225 - x$

$6x - 160 = 225 - x$ [M1]

$7x = 385$

$x = 55$

$y = 3(55) - 80$

$= 85$

Answer (b) $x =$ 55 [A1]

$y =$ 85 [3] [A1]

13 f is directly proportional to the square root of T.
When $f = 8$, $T = 16$.

(a) Find an equation connecting f and T.

$f = k\sqrt{T}$

$8 = k\sqrt{16}$ [M1]

$= 4k$

$k = \frac{8}{4}$

$= 2$

Answer (a) $f = 2\sqrt{T}$ [2] [A1]

(b) Find the value of f when this value of T is halved.

New $T = 16 \times \frac{1}{2} = 8$ [M1]

New $f = 2\sqrt{8}$

≈ 5.6569 (to 4 d.p.)

Answer (b) 5.6569 (to 4 d.p.) [2]
or 5.66 (to 3 s.f.)

14 50 workers took 6 hours to clean up the National Stadium after the National Day Parade.

How many more workers are needed if they need to clean up the stadium in 4 hours?

Workers	Hours
50	6
↓ ×6	↓ ÷6
300	1
↓ ÷4	↓ ×4
75	4

[M1]

$75 - 50 = 25$

Answer 25 [2] [A1]

For Examiner's Use

15 ξ = { integers x : $0 \le x < 10$ } = {0, 1, 2, 3, 4, 5, 6, 7, 8, 9}
A = { prime numbers } = {2, 3, 5, 7}
B = { multiples of 3 }
= {3, 6, 9}

(a) List all the elements in $A \cap B$.

Answer (a) 3 [1] [B1]

(b) Find $n(A \cup B)$. $A' = \{0, 1, 4, 6, 8, 9\}$

$A' \cup B = \{0, 1, 3, 4, 6, 8, 9\}$

Answer (b) 7 [1] [B1]

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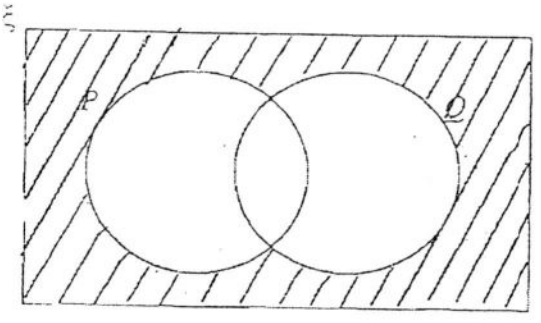
16 On the Venn diagram, shade the region which represents $(P \cup Q)'$.



[B1]

[1]

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17 A class of 14 girls and 26 boys took a quiz.
The mean mark for the girls was 27.
The mean mark for the boys was 26.5.

Find the mean mark for the whole class.

$$\text{mean} = \frac{27 \times 14 + 26 \times 26.5}{14 + 26} \quad [M1]$$

$$= \frac{1067}{40}$$

Answer 26.675 [2] [A1]

≈ 26.7 [A0] or $26\frac{27}{40}$

For Examiner's Use

18 One solution of the equation $x^2 + bx - 6 = 0$, where b is a constant, is $x = -2$.

(a) Find the value of b. $(-2)^2 + b(-2) - 6 = 0$

$-2b - 2 = 0$

$-2 = 2b$

$b = -1$

Answer (a) $b =$ -1 [1] [B1]

(b) Hence, find the second solution of the equation.

$x^2 - x - 6 = 0$

$(x + 2)(x - 3) = 0$

$x - 3 = 0$

Answer (b) $x =$ 3 [1] [B1]

19 The table below summarises the number of watches that a group of students have.

Number of watches	0	1	2	3
Frequency	2	7	x	5

(a) Write down the largest possible value of x if the mode is 1.

Answer (a) $x =$ 6 [1] [B1]

(b) Write down the value of x if the median is 1.5.

Answer (b) $x =$ 4 [1] [B1]