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three significant figures. Give answers in degrees to one decimal place.
For \( \pi \), use either your calculator value or 3.142, unless the question requires the answer in terms of \( \pi \).

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.
Answer all the questions.

1 (a) Correct 5196.28 to 3 significant figures.

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

(b) Evaluate \( \frac{268.221 \times (7.562)^2}{(1.998)^3} \), giving your answer correct to 1 decimal place.

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

2 (a) Arrange the following numbers in ascending order.

\( -\frac{1}{4}, 0.33, \sqrt{2}, -1.45 \)

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

(b) Represent the numbers in (a) on the given number line.

Answer (b):
3 Kevin cycled at a speed of 8 km/h for 84 minutes for the first part of a journey. He then decided to slow down and continued to cycle for another 13 km at a speed of 5 km/h for the rest of the journey. Calculate
(a) the distance travelled in the first part of the journey,

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

(b) the average speed for the whole journey.

Answer: (b) ......................... km/h  [2]

4 Andy wanted to buy a pair of shoes which costs $240. The shopkeeper gave Andy a discount and Andy paid $225 for the pair of shoes instead. Calculate the percentage discount.

Answer: ......................... %  [2]
5. Showing your workings clearly, evaluate
(a) \(-22 - 6 + (-2)\).

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

(b) \((-\frac{1}{3})^2 - \left(-\frac{4}{9}\right)\).

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

6. Factorise the following completely.
(a) \(9qx - 12x^2\)

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

(b) \((2y - 3) + x(3 - 2y)\)

Answer: (b) ........................................... [2]
7. Solve the following equations.

(a) \[ 5x - 25 = 3(3x + 2) \]

(b) \[ \frac{x}{3} - \frac{x - 1}{6} = 2 \]

Answer: (a) \[ x = \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \] [3]

Answer: (b) \[ x = \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \] [3]
8. (a) Find the prime factorization of 2772, expressing your answer in index notation.

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

(b) Given that the prime factorization of 4200 is $2^3 \times 3 \times 5^2 \times 7$, find the highest common factor of 2772 and 4200.

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

(c) Find the smallest integer $k$ such that $(2772 \times 4200k)$ is a square number.

Answer: (c) $k =$........................................ [1]
The diagram shows part of a regular 16-sided polygon.

Calculate
(a) $\angle BCD$,

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

(b) the size of the exterior angle.

Answer: (b) ................................ [1]
10 The first four terms of a sequence are 8, 13, 18, 23.
(a) Write down the 7th term of the sequence.

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

(b) Find an expression, in terms of \( n \), for the \( n \)th term of the sequence.

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

(c) Find the 65th term of the sequence.

Answer: (c) .................................. [1]
11 (a) Find the values of $x$, $y$ and $z$ in the following diagram, stating your reasons clearly.

![Diagram with angles labeled]

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

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

.................................................. [1]
(b) $ABCD$ is a quadrilateral. Given that $\angle BAD = 100^\circ$, $\angle ADC = 82^\circ$ and $\angle BCD = 64^\circ$, find the value of $p$.

Answer: (b) $p = \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots$  [2]
The pie chart below represents the favourite fruits of students in a class.

(a) Find the value of $x$.

Answer: \( (a) \quad x = \ldots \ldots \quad [2] \)

(b) Find the percentage of students whose favourite fruit is apple.

Answer: \( (b) \quad \ldots \ldots \ldots \ldots \ldots \quad \% \quad [2] \)

(c) Given that there are a total of 40 students in the class, find the number of students whose favourite fruit is orange.

Answer: \( (c) \quad \ldots \ldots \ldots \ldots \ldots \quad [2] \)
13 (a) In the diagram, $ABCD$ is a parallelogram. $AB = 15$ cm, $BC = 4$ cm and $AE = 11$ cm. $AE$ is perpendicular to $BE$ and $DF$ is perpendicular to $BF$.

(i) Find the area of parallelogram $ABCD$.

Answer: (a) (i) $\ldots \ldots \ldots \ldots \ldots \text{cm}^2$ [1]

(ii) Find the length of $DF$.

Answer: (a) (ii) $\ldots \ldots \ldots \ldots \ldots \text{cm}$ [2]
(b) In the diagram, \( PQRS \) is a quadrilateral. \( PQ = 5 \text{ cm}, RS = 9 \text{ cm}, PS = 6 \text{ cm}, TR = 5 \text{ cm} \) and \( OP \) is parallel to \( RS \).

(i) State the special name of quadrilateral \( PQRS \).

(ii) Find the area of quadrilateral \( PQRS \).

\[
\text{Answer: (b) (i) } \ldots \ldots \ldots \ldots \text{ [1]}
\]

\[
\text{(ii) } \ldots \ldots \ldots \text{ cm}^2 \text{ [2]}
\]
1(a) 5200  
1(b) 1923.0  
2(a) $-1.45, -\frac{1}{4}, 0.33, \sqrt{2}$  
3(a) $11.2 \div 11 \frac{1}{5}$ km  
3(b) $\cdot 6.05 \div 6 \frac{1}{20}$ km/h  
4 $6.25 \div 6 \frac{1}{4}$ %  
5(a) $-19$  
5(b) $\frac{5}{9}$  
6(a) $3x(3q - 4x)$  
6(b) $(2y - 3)(1 - x)$  
7(a) $x = -7 \frac{3}{4}$  
7(b) $x = 11$  
8(a) $2772 = 2^2 \times 3^2 \times 7 \times 11$  
8(b) HCF = 84  
8(c) $k = 66$  
9(a) $157.5^\circ$  
9(b) $22.5^\circ$  
10(a) 38  
10(b) $3 + 5n$  
10(c) 328  
11(a) $x = 50$  
$n = 50$  
$z = 74$  
11(b) $p = 114$  
12(a) $x = 54$  
12(b) 27.5%  
12(c) 19  
13(a) $\frac{44}{4} \text{cm}^2$  
$\frac{14}{2} \text{cm}$  
$\frac{15}{5} \text{cm}$  
13(b) Trapezium  
$35 \text{cm}^2$
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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.
1 (a) Correct 5196.28 to 3 significant figures.

\[ 5196.28 = 5200 \text{ (3 s.f.)} \]  \hspace{1cm} [B1]

Answer: (a) 5200 \hspace{1cm} [1]

(b) Evaluate \[ \frac{268.221 \times (7.562)^2}{(1.998)^3} \], giving your answer correct to 1 decimal place.

\[ \frac{268.221 \times (7.562)^2}{(1.998)^3} = 1923.0 \text{ (1 d.p.)} \]  \hspace{1cm} [B1]

Answer: (b) 1923.0 \hspace{1cm} [1]

2 (a) Arrange the following numbers in ascending order.

\[-\frac{1}{4}, 0.33, \sqrt{2}, -1.45\]

\[-1.45, -\frac{1}{4}, 0.33, \sqrt{2} \]  \hspace{1cm} [B1]

Answer: (a) \(-1.45, -\frac{1}{4}, 0.33, \sqrt{2}\) \hspace{1cm} [1]

(b) Represent the numbers in (a) on the given number line.

Answer (b):

\[-1.45\] \hspace{0.5cm} \(-\frac{1}{4}\) \hspace{0.5cm} 0.33 \hspace{0.5cm} \sqrt{2} \hspace{1cm} [-1 for any mistake]
3 Kevin cycled at a speed of 8 km/h for 84 minutes for the first part of a journey. He then decided to slow down and continued to cycle for another 13 km at a speed of 5 km/h for the rest of the journey. Calculate
(a) the distance travelled in the first part of the journey,

\[ 84 \text{ min} \rightarrow 1.4h \]
Distance travelled = \(8 \times 1.4 = 11.2 \text{ km} \) [B1]

**Answer:** (a) \(11.2 / 11 \frac{1}{5} \text{ km} \) [1]

(b) the average speed for the whole journey.

Time travelled for 2nd part = 2.6h

Average speed = \( \frac{11.2 + 13}{2.6 + 1.4} \) [M1]

\[ = 6.05 \text{ km/h} \] [A1]

**Answer:** (b) \(6.05 / 6 \frac{1}{20} \text{ km/h} \) [2]

4 Andy wanted to buy a pair of shoes which costs $240. The shopkeeper gave Andy a discount and Andy paid $225 for the pair of shoes instead. Calculate the percentage discount.

Percentage discount = \( \frac{240 - 225}{240} \times 100\% \) [M1]

\[ = 6.25\% \] [A1]

**Answer:** \(6.25 / 6 \frac{1}{4}\% \) [2]
5. Showing your workings clearly, evaluate
   (a) \(-22 - 6 + (-2)\).
   \[-22 - 6 + (-2) = -22 + 3\] \[= -19\] \[M1\] \[A1\]
   Answer: (a) \(-19\) \[2\]

   (b) \(-\left(\frac{1}{3}\right)^2 - \left(-\frac{4}{9}\right)\).
   \[-\left(\frac{1}{3}\right)^2 - \left(-\frac{4}{9}\right) = \left(\frac{1}{9}\right) - \left(-\frac{4}{9}\right)\] \[= \frac{5}{9}\] \[M1\] \[A1\]
   Answer: (b) \(\frac{5}{9}\) \[2\]

6. Factorise the following completely.
   (a) \(9gx - 12x^2\)
   \[9gx - 12x^2 = 3x(3g - 4x)\] \[B1\]
   Answer: (a) \(3x(3g - 4x)\) \[1\]

   (b) \((2y - 3) + x(3 - 2y)\)
   \[(2y - 3) + x(3 - 2y) = (2y - 3) - x(2y - 3)\] \[M1\]
   \[= (2y - 3)(1 - x)\] \[A1\]
   Answer: (b) \((2y - 3)(1 - x)\) \[2\]
7 Solve the following equations.

(a) \[5x - 25 = 3(3x + 2)\]

\[
\begin{align*}
5x - 25 &= 9x + 6 \quad \text{[M1]} \\
5x - 9x &= 25 + 6 \quad \text{[M1]} \\
-4x &= 31 \\
x &= -\frac{3}{4} \quad \text{[A1]}
\end{align*}
\]

Answer: (a) \(x = -\frac{3}{4}\) [3]

(b) \(\frac{x}{3} - \frac{x-1}{6} = 2\)

\[
\begin{align*}
\frac{2x}{6} - \frac{x-1}{6} &= 2 \quad \text{[M1]} \\
\frac{2x-(x-1)}{6} &= 2 \\
2x - (x-1) &= 12 \\
2x - x + 1 &= 12 \quad \text{[M1]} \\
x &= 11 \quad \text{[A1]}
\end{align*}
\]

Answer: (b) \(x = 11\) [3]

For Examiners' Use

Turn over
8 (a) Find the prime factorization of 2772, expressing your answer in index notation.

2772
/ \ 
2 1386
/ \ 
2 693
/ \ 
3 231
/ \ 
3 77
/ \ 
7 11 [M1] – factor tree

2772 = 2^2 \times 3^2 \times 7 \times 11 [A1]

**Answer:** (a) \(2772 = 2^2 \times 3^2 \times 7 \times 11\) [2]

(b) Given that the prime factorization of 4200 is \(2^3 \times 3 \times 5^2 \times 7\), find the highest common factor of 2772 and 4200.

HCF = 84 [B1]

**Answer:** (b) \(\text{HCF} = 84\) [1]

(c) Find the smallest integer \(k\) such that \((2772 \times 4200k)\) is a square number.

\(k = 66\) [B1]

**Answer:** (c) \(k = 66\) [1]
The diagram shows part of a regular 16-sided polygon.

Calculate

(a) \( \angle BCD \),

Sum of interior angles = \( (16 - 2) \times 180^\circ \)  
\[ = 2520^\circ \]

\( \angle BCD = \frac{2520^\circ}{16} \)
\[ = 157.5^\circ \]

Answer: (a) 157.5° [2]

(b) the size of the exterior angle.

Exterior angle = \( 360^\circ / 16 \)
\[ = 22.5^\circ \]

Answer: (b) 22.5° [1]
10. The first four terms of a sequence are 8, 13, 18, 23.
   (a) Write down the 7th term of the sequence.

   \[ 7^{\text{th}} \text{ term} = 38 \quad \text{[B1]} \]

   \[ \text{Answer: (a) 38 [1]} \]

   (b) Find an expression, in terms of \( n \), for the \( n \)th term of the sequence.

   \[ n^{\text{th}} \text{ term} = 3 + 5n \quad \text{[B1]} \]

   \[ \text{Answer: (b) } 3 + 5n \quad [1] \]

   (c) Find the 65th term of the sequence.

   \[ 65^{\text{th}} \text{ term} = 328 \quad \text{[B1]} \]

   \[ \text{Answer: (c) 328 [1]} \]
11 (a) Find the values of $x$, $y$ and $z$ in the following diagram, stating your reasons clearly.

$130^\circ + x^\circ = 180^\circ$ (interior angles)
$x = 50$ [B1]

$y^\circ = x^\circ$ (alternate angles)
$y = 50$ [B1]

$z^\circ = 24^\circ + y^\circ$ (exterior angle of a triangle)
$z = 74$ [B1]

Answer : (a) $x = 50$ [1]
         $y = 50$ [1]
         $z = 74$ [1]
(b) \(ABCD\) is a quadrilateral. Given that \(\angle BAD = 100^\circ\), \(\angle ADC = 82^\circ\) and \(\angle BCD = 64^\circ\), find the value of \(p\).

\[
100^\circ + 82^\circ + p^\circ + 64^\circ = 360^\circ \quad \text{(angle sum of quad.)} \quad [M1]
\]

\[p = 114\quad [A1]\]

Answer: (b) \(p = 114\) \([2]\)
12 The pie chart below represents the favourite fruits of students in a class.

\[
\begin{align*}
\text{Apple} & \quad (2x - 9) \degree \\
\text{Kiwi} & \quad (3x + 9) \degree \\
\text{Orange} & \quad x \degree
\end{align*}
\]

(a) Find the value of \(x\).

\[
(2x - 9) + (3x + 9) + 36 + x = 360 \quad [M1]
\]

\[
x = 54 \quad [A1]
\]

Answer: (a) \(x = 54\) [2]

(b) Find the percentage of students whose favourite fruit is apple.

Percentage of students = \(\frac{59}{360} \times 100\%\) \quad [M1]

\[
= 27.5\% \quad [A1]
\]

Answer: (b) 27.5\% [2]

(c) Given that there are a total of 40 students in the class, find the number of students whose favourite fruit is orange.

Number of students = \(\frac{171}{360} \times 40\) \quad [M1]

\[
= 19 \quad [A1]
\]

Answer: (c) 19 [2]

[Turn over]
(a) In the diagram, \(ABCD\) is a parallelogram. \(AB = 15\) cm, \(BC = 4\) cm and \(AE = 11\) cm. \(AE\) is perpendicular to \(BE\) and \(DF\) is perpendicular to \(BF\).

(i) Find the area of parallelogram \(ABCD\).

\[
\text{Area of parallelogram} = 4 \times 11 = 44\text{ cm}^2 \quad [B1]
\]

Answer: (a) (i) 44 cm\(^2\) [1]

(ii) Find the length of \(DF\).

\[
DF = 44 + 15 = 21\frac{14}{15} \quad [M1]
\]

Answer: (a) (ii) \(2\frac{14}{15}\) cm [2]
(b) In the diagram, \( PQRS \) is a quadrilateral. \( PQ = 5 \text{ cm} \), \( RS = 9 \text{ cm} \), \( PS = 6 \text{ cm} \), \( TR = 5 \text{ cm} \) and \( QP \) is parallel to \( RS \).

(i) State the special name of quadrilateral \( PQRS \).

(ii) Find the area of quadrilateral \( PQRS \).

(i) Trapezium \hspace{1cm} [B1]

(ii) Area of quadrilateral \( PQRS = \frac{1}{2} (5 + 9)(5) \) \hspace{1cm} [M1]

\[ = 35 \text{ cm}^2 \] \hspace{1cm} [A1]

Answer: (b) (i) Trapezium \hspace{1cm} [1]

(ii) 35 cm\(^2\) \hspace{1cm} [2]

~ End of Paper ~
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For \( \pi \), use either your calculator value or 3.142, unless the question requires the answer in terms of \( \pi \).

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.
1 Subtract $11x^2 - 5$ from $8x^2 + 3x - 1$.  

2 Simplify $\frac{3a + 4b}{6} - \frac{5b - a}{5} + b$.  

3 Buses for service number 231, 235 and 238 leave Toa Payoh bus interchange every 8 minutes, 3 minutes and 6 minutes respectively. If buses for all three service numbers left the interchange at 1900 hour, what is the next time when buses for all three service numbers leave the interchange at the same time again?  

4 If $\frac{1}{R} = \frac{1}{P} + \frac{1}{Q}$, find the value of $P$ when $R = 5$ and $Q = \frac{2}{3}$.  

5 Solve the equation $\frac{2x + 1}{x - 3} = 2 \frac{1}{3}$.  

6 Factorise $a(5x - 1) - b(5x - 1)$.
Hence, find the value of $20 \times 99 - 10 \times 99$.  

7 An interior angle of a regular polygon is five times its exterior angle. Find the number of sides of the polygon.
The nutritional information of a Snickers bar is shown in the diagram below.

(a) Find the ratio in mass of Total Fat : Saturated Fat : Sugars. [2]
(b) Calculate the percentage of the mass of sodium in one bar of Snickers. [2]
(c) If a student burns 30 calories by walking to school in 15 minutes, calculate the time taken, in hours, he will need to burn all the calories in one bar of Snickers. [2]

Answer the whole question on a blank piece of paper provided.

9 Draw a quadrilateral $ABCD$ given that $AB = 8.6$ cm, $AD = 4.4$ cm, $\angle ADC = 120^\circ$,
$\angle BAD = 70^\circ$ and $\angle ABC = 100^\circ$. [3]
(a) Construct the angle bisector of $\angle BCD$. [1]
(b) Construct the perpendicular bisector of $CD$. [1]
(c) Label the point $X$ where the angle bisector and the perpendicular bisector meet.
Construct a circle with centre $X$ which passes through points $C$ and $D$. [1]
(d) Write down the radius of the circle. [1]
10 The diagram below shows a cross-section of a solid prism with a hole of radius 3.5 m drilled through it. \(WXYZ\) is a trapezium, where \(WX = 20\) m, \(XY = 12\) m, \(YZ = 15\) m, \(WZ = 13\) m and \(\angle WXY = 90^\circ\).

The length of the solid is 24 m.

\[\begin{array}{c}
\text{Find} \\
(a) \text{ the area of the cross-section, leaving your answer in terms of } \pi, \\
(b) \text{ the volume of the solid,} \\
(c) \text{ the total surface area of the solid.}
\end{array}\]

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

11 The table below shows some values of \(x\) and the corresponding values of \(y\) for the function \(6y + 2x = 5\).

<table>
<thead>
<tr>
<th>(x)</th>
<th>-5</th>
<th>-2</th>
<th>1</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>(y)</td>
<td>2.5</td>
<td>(p)</td>
<td>0.5</td>
<td>-0.5</td>
</tr>
</tbody>
</table>

(a) Calculate the value of \(p\). [1]
(b) Using a scale of 2 cm to 1 unit on the \(x\)-axis for \(-5 \leq x \leq 4\) and 4 cm to 1 unit on the \(y\)-axis for \(-1 \leq y \leq 3\), draw the graph of \(6y + 2x = 5\). [3]
(c) Find the gradient of the line. [1]
(d) From the graph, find
   (i) the value of \(x\) when \(y = 2\), [1]
   (ii) the value of \(y\) when \(x = -1\). [1]
(e) Draw and label the graph of \(x = 2\). Hence, state the co-ordinates of point of intersection of the two graphs. [2]

--- End of Paper ---
Answers

1 \(-3x^2 + 3x + 4\)

2 \(\frac{21a + 26b}{30}\)

3 24 min, 1924 h

4 \(-\frac{10}{23}\)

5 24

6 \((5x-1)(a-b), 990\)

7 12

8(a) \(8 : 3 : 18\)

(b) 0.275 %

(c) \(12\frac{1}{12}\) hours

9(d) 5 cm

10(a) \(210 - 12.25\pi \) m²

(b) 4120 m³

(c) 2310 m²

11(a) \(p = 1.5\)

(c) \(-\frac{1}{3}\)

(d)(i) \(x = -3.5\)

(ii) \(y = 1.15\)

(c) \((2, 0.15)\)
BEATTY SECONDARY SCHOOL
END-OF-YEAR EXAMINATION 2015
MARKING SCHEME

SUBJECT: Mathematics  LEVEL: Sec 1 Express
PAPER: 2  DURATION: 1 hour 30 minutes
SETTER: Ms Yuen Shu Yan  DATE: 9 October 2015

CLASS:  NAME:  REG NO:

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The total number of marks for this paper is 50.
1 Subtract 11x² - 5 from 8x² + 3x - 1.

\[(8x^2 + 3x - 1) - (11x^2 - 5) = 8x^2 + 3x - 1 - 11x^2 + 5\]
\[= -3x^2 + 3x + 4\]  
M1
A1

2 Simplify \(\frac{3a + 4b}{6} - \frac{5b - a}{5} + b\).

\[\frac{3a + 4b}{6} - \frac{5b - a}{5} + b = \frac{5(3a + 4b) - 6(5b - a) + 30b}{30}\]
\[= \frac{15a + 20b - 30b + 6a + 30b}{30}\]
\[= \frac{21a + 20b}{30}\]  
M1
M1
A1

3 Buses for service number 231, 235 and 238 leave Toa Payoh bus interchange every 8 minutes, 3 minutes and 6 minutes respectively. If buses for all three service numbers left the interchange at 1900 hour, what is the next time when buses for all three services numbers leave the interchange at the same time again?

\[8 = 2^3\]
\[3 = 1 \times 3\]  
M1

\[6 = 2 \times 3\]  
M1

\[\text{LCM} = 2^3 \times 3\]
\[= 24\]

Next time when buses of all three services leave = 1924 hour or 7.24 pm. A1

4 If \(\frac{1}{R} = \frac{1}{P} + \frac{1}{Q}\), find the value of \(P\) when \(R = 5\) and \(Q = \frac{2}{5}\).

When \(R = 5\), \(Q = \frac{2}{5}\),

\[\frac{1}{5} = \frac{1}{P} + \frac{1}{2}\]  
M1

\[\frac{1}{P} = -\frac{23}{10}\]  
M1

\[P = -\frac{10}{23}\]  
A1
5 Solve the equation \( \frac{2x+1}{x-3} = \frac{2}{3} \).

\[
\begin{align*}
\frac{2x+1}{x-3} &= \frac{7}{3} \\
3(2x+1) &= 7(x-3) \\
6x+3 &= 7x-21 \\
x &= 24
\end{align*}
\]

6 Factorise \( a(5x-1) - b(5x-1) \).

\[
(5x-1)(a-b) \quad \text{B1}
\]

Let \( x = 20, a = 20, b = 10 \),

\[
20 \times 99 - 10 \times 99 = \left[ 5(20) - 1 \right] \left[ 20 - 10 \right] \\
= (100 - 1)(10) \\
= 99 \times 10 \\
= 990 \quad \text{A1}
\]

7 An interior angle of a regular polygon is five times its exterior angle. Find the number of sides of the polygon.

\[
\frac{(n-2) \times 180}{n} = \frac{360}{n} \times 5 \quad \text{M1}
\]

\[
\frac{180n-360}{n} = \frac{1800}{n} \\
180n-360 = 1800 \\
180n = 2160 \\
n = 12 \quad \text{A1}
\]
8 The nutritional information of a Snickers bar is shown in the diagram below.

(a) Find the ratio in mass of Total Fat : Saturated Fat : Sugars. [2]
(b) Calculate the percentage of the mass of sodium in one bar of Snickers. [2]
(c) If a student burns 30 calories by walking to school in 15 minutes, calculate the time taken, in hours, he will need to burn all the calories in one bar of Snickers. [2]

(a) Ratio of Total Fat, Sat Fat and Sugars
   \[ = \frac{12}{3} : \frac{4.5}{3} : \frac{27}{3} = 4 : 1.5 : 9 = 8 : 3 : 18 \]
   \[ \text{M1} \]
   \[ \text{A1} \]

(b) Percentage of mass of sodium
   \[ = \frac{0.12}{12 + 4.5 + 27 + 0.12} \times 100\% \]
   \[ = 0.275\% \]
   \[ \text{M1} \]
   \[ \text{A1} \]

(c) Time required
   \[ = \frac{15}{30} \times 250 \]
   \[ = 125 \text{ minutes} \]
   \[ = 2 \frac{1}{12} \text{ hours} \]
   \[ \text{M1} \]
   \[ \text{A1} \]
Answer the whole question on a blank piece of paper provided.

9. Draw a quadrilateral $ABCD$ given that $AB = 8.6$ cm, $AD = 4.4$ cm $\angle ADC = 120^\circ$, $\angle BAD = 70^\circ$ and $\angle ABC = 100^\circ$.

(a) Construct the angle bisector of $\angle BCD$.

(b) Construct the perpendicular bisector of $CD$.

(c) Label the point $X$ where the angle bisector and the perpendicular bisector meet. Construct a circle with centre $X$ which passes through points $C$ and $D$.

(d) Write down the radius of the circle.
The diagram below shows a cross-section of a solid prism with a hole of radius 8 m drilled through it. \( WXZ \) is a trapezium, where \( WX = 26 \text{ m}, XY = 12 \text{ m}, YZ = 15 \text{ m}, WZ = 13 \text{ m} \) and \( \angle WXZ = 90^\circ \).

The length of the solid is 24 m.

Find

(a) the area of the cross-section, leaving your answer in terms of \( \pi \), [3]
(b) the volume of the solid, [2]
(c) the total surface area of the solid, [3]

\[ \text{(a) Area of trapezium} = \frac{1}{2} (12)(15 + 20) \]
\[ = 210 \text{ m}^2 \]

Area of circle \[ = \pi (3.5)^2 \]
\[ = 12.25\pi \text{ m}^2 \]

Area of cross-section \[ = (210 - 12.25\pi) \text{ m}^2 \] A1

(b) Volume of solid \[ = (210 - 12.25\pi) \times 24 \]
\[ = 4120 \text{ m}^3 \text{ (to 3 sig fig)} \] A1

(c) Surface area of trapezium \[ = 2(210 - 12.25\pi) + (20 + 12 + 15 + 13) \times 24 \]
\[ = 2(210 - 12.25\pi) + 1440 \text{ m}^2 \] M1

Curved surface area of hole \[ = 2\pi (3.5) \times 24 \]
\[ = 168\pi \text{ m}^2 \] M1

Total surface area \[ = [2(210 - 12.25\pi) + 1440] + 168\pi \]
\[ = 2310 \text{ m}^2 \text{ (to 3 sig fig)} \] A1
Answer the whole of this question on a sheet of graph paper.

The table below shows some values of $x$ and the corresponding values of $y$ for the function $6y + 2x = 5$.

<table>
<thead>
<tr>
<th>$x$</th>
<th>$-5$</th>
<th>$-2$</th>
<th>$1$</th>
<th>$4$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y$</td>
<td>2.5</td>
<td>$p$</td>
<td>0.5</td>
<td>$-0.5$</td>
</tr>
</tbody>
</table>

(a) Calculate the value of $p$. [1]

(b) Using a scale of 2 cm to 1 unit on the $x$-axis for $-5 \leq x \leq 4$ and 4 cm to 1 unit on the $y$-axis for $-1 \leq y \leq 3$, draw the graph of $6y + 2x = 5$. [3]

(c) Find the gradient of the line. [1]

(d) From the graph, find

(i) the value of $x$ when $y = 2$. [1]

(ii) the value of $y$ when $x = -1$. [1]

(e) Draw and label the graph of $x = 2$. Hence, state the co-ordinates of point of intersection of the two graphs. [2]
(1) Graph of \(6y + 2x = 15\)

Table of \(6y + 2x = 15\)

<table>
<thead>
<tr>
<th>(x)</th>
<th>-5</th>
<th>-2</th>
<th>1</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>(y)</td>
<td>2.5</td>
<td>1.5</td>
<td>0.5</td>
<td>-0.5</td>
</tr>
</tbody>
</table>

(a) \(x = 1.5\)  (b) \(y = \frac{2}{3}\)

(c) \(2x = y\)

(d) \(x = 2\)  (e) \(y = 2.5\)

(f) Intersection: \((2, 0.25)\)

\(x = 2\)
Mathematics

Paper 1

Candidates answer on the Question Paper.

1 Oct 2015
1 hour 15 minutes

READ THESE INSTRUCTIONS FIRST

Write your class, register number and name 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, 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 when 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.

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.

Calculator Model:

For Examiner’s Use

Seter: Mdnu CHOR O.M. Chrisnna
Vener: Ms Stella TOH Y.M.

This document consists of 9 printed pages.
Answer all the questions

1. (a) Given that $48 = 2^4 \times 3$ and $954 = 2 \times 3^2 \times 53$, find the
   (i) HCF of 48 and 954, and
   (ii) LCM of 48 and 954.
(b) Round off 30993 to the nearest 100.
(c) Express 1.2855, correct to 3 decimal places.

   Answer  (a)  (i) ................................... [1]
   (ii) ................................... [1]
   (b) ................................... [1]
   (c) ................................... [1]

2. (a) Fill in the blanks with ‘+’, ‘-’, ‘×’, ‘÷’ or ‘=’ to form a correct
    mathematical statement.
    You may use the signs more than once.
    
    $-8 \ ____ \ 7 = 112 \ ____ \ 168 = -56$ [1]

   (b) State the irrational number(s) from the list of numbers given below.
    $\sqrt{8}, \sqrt{5}, \pi^2, \sqrt{225}$

   Answer  (b) ................................... [1]
3 (a) Solve the inequality $11x < 33$.
(b) Hence, represent the solution from (a) on the number line given below.

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

Answer (b)

\[ \begin{array}{cccccccc}
\text{Answer (b)} & & & & & & & \\
\text{Number Line} & & & & & & & \\
\text{\(-4\)} & & & & & & & \\
\text{\(-3\)} & & & & & & & \\
\text{\(-2\)} & & & & & & & \\
\text{\(-1\)} & & & & & & & \\
\text{0} & & & & & & & \\
\text{1} & & & & & & & \\
\text{2} & & & & & & & \\
\text{3} & & & & & & & \\
\text{4} & & & & & & & \\
\text{5} & & & & & & & \\
\end{array} \]

[1]

4 (a) Rewrite each of the following as an algebraic expression.
(i) Subtract 3 from the product of $2ab$ and $5c$.
(ii) Divide twice the sum of 4 and $7p$ by the cube of $q$.
(b) Evaluate $\frac{a^2 + b}{2ab}$ when $a = -3$ and $b = 11$.

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

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

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

5 (a) Convert 280.8 km/h to m/s.
(b) A washing machine takes 40 minutes to wash a laundry load of 2.5 kg.
    Find
    (i) the rate of washing in kg/min, and
    (ii) the time required to wash a laundry load of 26 kg.

Answer (a) ........................................ m/s [1]

Answer (b) (i) ...................... kg/min [1]

(ii) ...................... minutes [1]
6 (a) Simplify \(16d^2 - 8d \times 2d + 5(-3d)\).

(b) Solve the equation \(-5x - 3 = 18 + 2x\).

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

(b) \(x = \) .................................................. [2]

7 The pie chart below shows the proportion of time spent on various activities on a particular Sunday (24 hours) by Miley, a secondary one pupil.

(a) Find the number of hours she spent on the birthday celebration.

(b) 40% of the time at the CCA camp is spent on learning survival skills.

Find the size of the angle represented by the CCA camp, if the time spent on learning survival skills is 2 hours.

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

(b) ......................... [2]
8 The pictogram below shows the number of students who like different types of kendama: Digital kendama (type A), Baseball kendama (type B) and Wooden-doll kendama (type C).

<table>
<thead>
<tr>
<th>Digital kendama (type A)</th>
<th>🎈🎈🎈🎈</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseball kendama (type B)</td>
<td>🎈🎈</td>
</tr>
<tr>
<td>Wooden-doll kendama (type C)</td>
<td>🎈🎈*</td>
</tr>
</tbody>
</table>

(*)& represents 20 students

(a) Find the ratio of the number of students who like type A to the number of students who like type C.

(b) Express the number of students who like type B as a percentage of the number of students who like type A.

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

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

9 (a) Given that \((3, a)\) lies on the graph of \(y = -4 + 3x\), find the value of \(a\).

(b) The graph of \(y = \frac{5}{4}x + 1\) cuts the \(x\)-axis at point \(A\).

Find the coordinates of \(A\).

Answer (a) \(a = \ldots\) ........................................  [1]

Answer (b) \((\ldots, \ldots)\) ........................................  [2]
10 In the diagram below, $AE$ and $BCD$ are parallel lines.

$AB = AC$ and $\angle BAC = 105^\circ$.

Find, by stating your reason(s) clearly in the space below,

(a) $\angle CAE$, and

(b) reflex $\angle ACD$.

**Answer**

(a) $\angle CAE \approx \ldots \ldots \ldots \ldots \ldots \ldots \ldots$ [2]

(b) Reflex $\angle ACD = \ldots \ldots \ldots \ldots$ [1]

11 (a) Express 2.75 years as a percentage of 15 months.

(b) Find the value of the unknown in the following expression: $215\%$ of $x$ is 6.88.

**Answer**

(a) $\ldots \ldots \ldots \ldots \ldots \ldots \ldots \%$ [2]

(b) $x = \ldots \ldots \ldots \ldots \ldots \ldots \ldots$ [2]
12 (a) Given that the sum of two parallel sides in a trapezium is 16 m and its perpendicular height is 3 m, calculate the area of the trapezium.

(b) The diagram below shows the top surface of a cylindrical ballot box. The top surface has a rectangular slit $PQRS$ in the centre for voters to drop their ballot papers into the box.

Given that the diameter, $d$, of the top surface is 30 cm, $RS = 10$ cm and $PS = 1.5$ cm, calculate the area of the shaded region in $m^2$.

```
Answer (a) ....................... $m^2$ [2]
(b) ....................... $m^2$ [3]
```
The diagram below shows a triangular prism that is a designer's flower vase. It is filled up with water to a height of 70 cm. $AB = 50$ cm, $BC = 30$ cm and $AC = 40$ cm.

(a) Find the volume of water in the vase.

(b) If 3468 cm$^3$ of water is drained from the vase, find the new water level.

Answer

(a) ................................ cm$^3$ [2]

(b) ................................ cm [3]
Lines \( AB \) and \( BC \) have been drawn for you in the diagram below.

(a) Given that \( AD = 4.8 \text{ cm} \) and \( CD = 6.2 \text{ cm} \), construct the quadrilateral \( ABCD \). [2]

(b) Draw the angle bisector of \( \angle ADC \). [1]

(c) Draw the perpendicular bisector of \( BC \). [1]

(d) The bisectors from parts (b) and (c) intersect at point \( X \).

Measure and write down the length of \( BX \).

Answer (d) ....................... cm [1]

End-of-Paper 1
### Marking Scheme

<table>
<thead>
<tr>
<th>Question</th>
<th>Solution</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1(a)(i)</td>
<td>6</td>
<td>B1</td>
</tr>
<tr>
<td>1(a)(ii)</td>
<td>7632</td>
<td>B1</td>
</tr>
<tr>
<td>1(b)</td>
<td>31000</td>
<td>B1</td>
</tr>
<tr>
<td>1(c)</td>
<td>1.286</td>
<td>B1</td>
</tr>
<tr>
<td>2(a)</td>
<td>$x, -$</td>
<td>B1</td>
</tr>
<tr>
<td>2(b)</td>
<td>$\sqrt{5}, \pi^2$</td>
<td>B1</td>
</tr>
<tr>
<td>3(a)</td>
<td>$x &lt; 3$</td>
<td>B1</td>
</tr>
<tr>
<td>3(b)</td>
<td>$x &lt; 3$</td>
<td>B1</td>
</tr>
<tr>
<td></td>
<td><img src="#" alt="Diagram" /></td>
<td></td>
</tr>
<tr>
<td>4(a)(i)</td>
<td>$10abc - 3$</td>
<td>B1 Accept (2abx5c)-3</td>
</tr>
<tr>
<td>4(a)(ii)</td>
<td>$\frac{2(4 + 7p)}{q^3}$</td>
<td>B1</td>
</tr>
<tr>
<td>4(b)</td>
<td>$-\frac{10}{33}$ or $-0.303$</td>
<td>B1</td>
</tr>
<tr>
<td></td>
<td>Reject: $-0.303$ (3 s.f.)</td>
<td></td>
</tr>
<tr>
<td>5(a)</td>
<td>78</td>
<td>B1</td>
</tr>
<tr>
<td>5(b)(i)</td>
<td>$0.0625$ or $\frac{1}{16}$</td>
<td>B1</td>
</tr>
<tr>
<td>5(b)(ii)</td>
<td>416</td>
<td>B1</td>
</tr>
<tr>
<td>6(a)</td>
<td>$16d^2 - 16d - 15d$</td>
<td>B1</td>
</tr>
<tr>
<td></td>
<td>$-15d$</td>
<td>A1</td>
</tr>
<tr>
<td>6(b)</td>
<td>$-5x - 2x = 18 + 3$</td>
<td>B1</td>
</tr>
<tr>
<td></td>
<td>$-7x = 21$</td>
<td>A1</td>
</tr>
<tr>
<td></td>
<td>$-3$</td>
<td></td>
</tr>
<tr>
<td>7(a)</td>
<td>$3.5$ or $\frac{31}{2}$</td>
<td>B1</td>
</tr>
<tr>
<td>7(b)</td>
<td>$\frac{100%}{40%} \times 2$ hours</td>
<td>B1</td>
</tr>
<tr>
<td></td>
<td>$= 5$ hours</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$\frac{5}{24} \times 360'$</td>
<td>A1</td>
</tr>
<tr>
<td></td>
<td>75</td>
<td>A1</td>
</tr>
<tr>
<td>8(a)</td>
<td>80 : 45</td>
<td>M1</td>
</tr>
<tr>
<td></td>
<td>16 : 9</td>
<td>A1</td>
</tr>
</tbody>
</table>

*Prepared by Mdm Chor O.M. Christina*
<table>
<thead>
<tr>
<th>8(b)</th>
<th>$\frac{1.5 \times 20}{80} \times 100%$</th>
<th>M1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$37.5$ or $37\frac{1}{2}$</td>
<td>A1</td>
</tr>
<tr>
<td>9(a)</td>
<td>$5$</td>
<td>B1</td>
</tr>
<tr>
<td>9(b)</td>
<td>$0 = \frac{5}{4}x + 1$</td>
<td>M1</td>
</tr>
<tr>
<td></td>
<td>$\left(-\frac{4}{5}, 0\right)$ or $(-0.8, 0)$</td>
<td>A1</td>
</tr>
</tbody>
</table>

Note: For question 10(a) below, overall maximum deduction of 1 mark applies if all working is correct but the respective reason(s) is/are missing or wrong.

<table>
<thead>
<tr>
<th>10(a)</th>
<th>[ \angle ACB = \frac{180^\circ - 105^\circ}{2} ] (base $\angle s$ of isos. $\triangle$) [ \angle = 37.5^\circ ] [ \angle CAE = 37.5^\circ ] (alt. $\angle s$, $AE \parallel BCD$)</th>
<th>M1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Marks deducted for not writing $\angle s$ and $AE \parallel BCD$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$37.5$ or $37\frac{1}{2}$</td>
<td>A1</td>
</tr>
<tr>
<td>10(b)</td>
<td>$217.5$ or $217\frac{1}{2}$</td>
<td>B1</td>
</tr>
<tr>
<td>11(a)</td>
<td>$\frac{2.75 \times 12}{15} \times 100%$</td>
<td>M1</td>
</tr>
<tr>
<td></td>
<td>220</td>
<td>A1</td>
</tr>
<tr>
<td>11(b)</td>
<td>$\frac{215}{100} = 6.88$</td>
<td>M1</td>
</tr>
<tr>
<td></td>
<td>$3.2$ or $3\frac{1}{5}$</td>
<td>A1</td>
</tr>
<tr>
<td>12(a)</td>
<td>$\left(\frac{1}{2} \times 16 \times 3\right) m^2$</td>
<td>M1</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>A1</td>
</tr>
<tr>
<td>12(b)</td>
<td>[ \pi \times 15^2 \text{ } m^2 - (1.5 \times 10) \text{ } m^2 ] [ = 692 \text{ } cm^2 (3s.f.) \text{ or } 691.85 \ldots \text{ } cm^2 (-1 \text{ mark for premature rounding}) ]</td>
<td>M1</td>
</tr>
<tr>
<td></td>
<td>$0.0692$</td>
<td>A1</td>
</tr>
<tr>
<td>13(a)</td>
<td>$\left(\frac{1}{2} \times 30 \times 40\right) \text{ } cm^2 \times 70 \text{ } cm$</td>
<td>M1</td>
</tr>
<tr>
<td></td>
<td>42 000</td>
<td>A1</td>
</tr>
<tr>
<td>13(b)</td>
<td>$3468 \text{ } cm^3 + 600 \text{ } cm^3$</td>
<td>M1</td>
</tr>
<tr>
<td></td>
<td>$= 5.78 \text{ } cm$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$(70 - 5.78) \text{ } cm$</td>
<td>M1</td>
</tr>
<tr>
<td></td>
<td>64.22</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reject: 64.2 (3 s.f.)</td>
<td></td>
</tr>
<tr>
<td>14(a)</td>
<td>$(a) - (d) \text{ answers: (marker to advise)}$</td>
<td>B1 $\times 5$</td>
</tr>
<tr>
<td></td>
<td>$(d) 4.2 \pm 0.1 \text{ cm (marked according to student's drawing.)}$</td>
<td></td>
</tr>
</tbody>
</table>

----- The End -----
Bukit Merah Secondary School
End-of-Year Examination 2015
Secondary 1 Express

MATHEMATICS

Paper 2

Additional Materials: Writing Paper (4 sheets)
Graph Paper (1 sheet)

8 Oct 2015
1 hour 30 minutes

READ THESE INSTRUCTIONS FIRST

Write your class, register number and name 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, highlighters, glue or correction fluid/tape.

Answer all questions on writing papers.
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 when 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 \( \pi \), use either your calculator value or 3.142.

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 60.

Begin each question on a fresh page.

Calculator Model:

For Examiner’s Use

Seres: Mdm CHOR O.M. Christina
Verifier: Ms Stella TOH J.M.

This document consists of 6 printed pages.
Answer all the questions

1

(a) (i) The number 1071, expressed in index notation, is $1071 = 3^a \times 7 \times 17$. Find the value of $a$. [2]

(ii) Given that $8748 = 2^2 \times 3^7$, find the smallest value of $k$ such that $8748k$ is a perfect cube. [2]

(b) (i) Without using a calculator, find the value of $8 + (-2)^3 + 4$. [2]

(ii) Mei Xi thinks that a fraction cannot be expressed as a recurring decimal. Do you agree or disagree with her? Support your answer with an example of a fraction that can or cannot be expressed as a recurring decimal. [2]

2

(a) In a supermarket, a 300-ml bottle of Shampoo A costs $11.80 and a 350-ml bottle of Shampoo B costs $13.98. Without the use of a calculator and by using only estimation, decide which shampoo is better value for money. [3]

(b) A black pen costs $x$ cents. A pink pen costs 5 cents more than twice the cost of a black pen.

(i) Express the cost of a pink pen in terms of $x$. [1]

(ii) Express the total cost of ten black pens and two pink pens in terms of $x$. [2]

3

(a) Solve the equation $\frac{2x - 1}{4} + \frac{x + 4}{8} = \frac{1}{2}$. [3]

(b) Find the greatest odd integer value of $x$ that satisfies the inequality $-7x \geq -112$. [2]
(a) If \(a:b = 11:8\) and \(b:c = 5:11\), calculate

(i) \(a:b:c\), and \([2]\)

(ii) \(a:c\). \([1]\)

(b) Nick drove a car at a speed of 75 km/h for 15 minutes and then stopped the car for \(\frac{1}{4}\) hour. He then continued to drive at 120 km/h for 10 minutes on an expressway.

Find the average speed of his entire journey in km/h. \([3]\)

5

The diagram below shows the cross-section of a hollow circular pipe. The outer radius is 6 cm while the inner radius is \(x\) cm.

(a) Write an algebraic expression for the shaded area of the diagram in terms of \(\pi\) and \(x\), and then completely factorise it. \([2]\)

(b) Given that the shaded area of the diagram is 28 cm\(^2\), form an algebraic equation and solve it to find the value of \(x\). \([3]\)
(a) In the diagram below, $AOB$, $COD$ and $EOF$ are straight lines. $CG$ and $AOB$ are parallel lines.

By stating your reason(s) clearly, find the values of

(i) $a$, and

(ii) $b$. [2]

(b) (i) Find the size of an interior angle of a regular octagon. [2]

(ii) Two of the exterior angles of a $n$-sided polygon are $25^\circ$ and $23^\prime$, and the remaining exterior angles are $24^\circ$ each.
Find the value of $n$. [2]
The diagram below shows a trapezoidal sticker $ABCD$ with 'COOL' printed on it. The shaded area of 'COOL' is $15 \text{ cm}^2$.

$AB = 17 \text{ cm}, CD = 10 \text{ cm}$ and the perpendicular height, $h$, of $ABCD$ is $5 \text{ cm}$.

(a) Find the area of the unshaded region, in $\text{cm}^2$. [2]

(b) If the shaded area is reduced by $18 \%$, calculate the new shaded area, in $\text{cm}^2$. [2]

(c) The cost of printing 300 stickers after a discount of $10 \%$ is $\$711$. Find the cost of printing one sticker before discount, giving your answer to the nearest cent. [2]
6 The diagram shows the base, \( PQTRS \), of a metal prism. The base is made up of a parallelogram \( PQRS \) and a semicircle \( RTQ \). \( PQ = RS = 30 \text{ cm}, PS = RQ = 28 \text{ cm} \), and the height of the parallelogram, \( h = 24 \text{ cm} \).

Find
(a) the area of \( PQTRS \), in \( \text{cm}^2 \), [3]
(b) the total surface area of the metal prism, in \( \text{cm}^2 \), given that the vertical height of the solid from its base is 50 cm, and [3]
(c) the length of one side of a cube, in cm, given that the metal prism is recast into a cube. [2]

9 Answer the whole of question 9 on a piece of graph paper.

(a) Given that \( y = 3x - 3 \), find the values of \( a \) and \( b \).

\[
\begin{array}{|c|c|c|c|}
\hline
x & -3 & 1 & 5 \\
\hline
y = 3x - 3 & -12 & a & b \\
\hline
\end{array}
\]

[2]

(b) Plot the pairs of values of \((x, y)\) from the table and draw the graph of \( y = 3x - 3 \) using the scale of 1 cm to 1 unit on the \( x \)-axis and 1 cm to 2 units on the \( y \)-axis. [3]

(c) Using the graph, find the value of \( x \) when \( y = -6 \). [1]

(d) Find the gradient of a line drawn from \((3, 6)\) and the point of origin. [2]
Sec 1 Express EOY Examinations 2015 Mathematics Paper 2
Marking Scheme

Overall deduction of maximum 1 mark applies for the entire Paper 2 if there is any missing or wrong unit in a student’s solutions or answer.

<table>
<thead>
<tr>
<th>Question</th>
<th>Solution</th>
<th>Mark</th>
</tr>
</thead>
</table>
| 1(a)(i)  | \(3^e = \frac{1071}{7 \times 17}\)  
Accept:  
- \(1071 \div 7 \div 17\)  
- \(3^3 \times 7 \times 17 = 1071\)  
- Prime factorisation or tree diagram of 1071 | M1 |
|          | \(a = 2\) | A1 |
| 1(a)(ii) | \(k = 2 \times 3^3\)  
Accept:  
\(k = \frac{2^3 \times 3^2}{2^2 \times 3^2}\) | M1 |
|          | \(k = 18\) | A1 |
| 1(b)(i)  | \(8 + (-2)\) or \(8 - 2\) | M1 |
|          | Note:  
1. Deduction of 1 mark for no bracket: \(8 + -2\).  
2. If \(8 + -2\) is written first before \(8 - 2\), and final answer is correct, deduction of 1 mark applies for the lack of brackets. |  |
|          | \(= 6\) | A1 |
| 1(b)(ii) | Disagree.  
Reject: “Yes” or “No” single answers. | B1 |
|          | \(\frac{1}{3} = 0.3\)  
Accept: other fractions that can be expressed as a recurring decimal. | B1 |
|          | Note: Examples must be well-supported by showing a recurring decimal. |  |
| 2(a)     | 1st estimate: \(11.80 \approx \$12\), and  
2nd estimate: \(13.98 \approx \$14\) | M1 (show either 1st or 2nd estimate) |
|          | 50 ml – \$2 (Shampoo A and B)  
Accept:  
\(51 - 25 \text{ ml (Shampoo A and B)}\)  
Or  
\(\$14 - 12 = \$2\), and  
Shampoo B (300 ml): \(\$1(14 - 2) = \$12 > \$11.80\)  
(Shampoo A)  
Or  
Shampoo A (350 ml): \(\$12 + 2 = \$14 > \$13.98\) (Shampoo B)  
Reject if student showed only \(\$14 - 12 = \$2\), which is merely the difference of 1st and 2nd estimates. | M1 |
|          | Shampoo A.  
Reason: \(\$12 - \$11.80 = \$0.20\), and  
\(\$14 - \$13.98 = \$0.02\) |  |

Prepared by Mdm Chor O.M. Christina
Note: For question 2(b)(i) and 2(b)(ii) below, overall maximum deduction of 1 mark applies if final answers are correct but no brackets are used.

<table>
<thead>
<tr>
<th>Question</th>
<th>Expression</th>
<th>Mark Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>2(b)(i)</td>
<td>$(2x + 5)$ cents</td>
<td>B1</td>
</tr>
<tr>
<td></td>
<td>Accept: $5(2x + 0.05)$</td>
<td></td>
</tr>
<tr>
<td>2(b)(ii)</td>
<td>$10x + 2(2x + 5)$</td>
<td>M1 (show $10x + 4x$)</td>
</tr>
<tr>
<td></td>
<td>$= 10x + 4x + 10$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Accept: $10x + 4x + 0.10$ or $10x + 4x + 0.1$</td>
<td>A1</td>
</tr>
<tr>
<td>(14x + 10) cents</td>
<td>Accept: $5(14x + 0.10)$ or $(14x + 0.1)$</td>
<td></td>
</tr>
<tr>
<td>3(a)</td>
<td>$\frac{4x - 2 + x + 4}{8} = \frac{1}{2}$</td>
<td>M1 (correct fraction on LHS, after multiplying both sides by LCM or by re-writing a fraction so that both fractions have the same denominator)</td>
</tr>
<tr>
<td></td>
<td>$4x - 2 + x + 4 = 4$</td>
<td>M1 (no fractions on both sides, correct LHS and correct RHS)</td>
</tr>
<tr>
<td></td>
<td>Or $5x + 2 = 4$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Or $5x = 2$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$x = \frac{2}{5}$ or 0.4</td>
<td>A1</td>
</tr>
</tbody>
</table>

Note: For question 3(b) below, overall deduction of 1 mark applies if a student did not solve the inequality as taught during Maths lessons.

<table>
<thead>
<tr>
<th>Question</th>
<th>Expression</th>
<th>Mark Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>3(b)</td>
<td>$-7x \geq -112$</td>
<td>M1 (show $\frac{-7x}{-7} \leq \frac{-112}{-7}$ or $x \leq 16$)</td>
</tr>
<tr>
<td></td>
<td>$\frac{-7x}{-7} \leq \frac{-112}{-7}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$x \leq 16$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Accept but not preferred: $-7(15) \geq -112$ [trial and error method]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Or $-7x = -112$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$\frac{-7x}{-7} = \frac{-112}{-7}$ [equation method]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$x = 16$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Greatest odd integer is 15.</td>
<td>A1</td>
</tr>
<tr>
<td>4(a)(i)</td>
<td>$\frac{a}{b} : \frac{c}{d}$</td>
<td>M1 (show $8 \times 5$ or 40)</td>
</tr>
<tr>
<td></td>
<td>$= \frac{11 \times 5}{55} : \frac{8 \times 5}{40} : \frac{11 \times 8}{88}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$= \frac{55}{55} : \frac{40}{88}$</td>
<td>A1</td>
</tr>
<tr>
<td>4(a)(ii)</td>
<td>$5 : 8$</td>
<td>B1</td>
</tr>
<tr>
<td>4(b)</td>
<td>Total distance</td>
<td>M1 (total distance)</td>
</tr>
<tr>
<td></td>
<td>$= 75km / h \times \frac{15}{60} + 120km / h \times \frac{10}{60}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$= 38.75km$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total time taken</td>
<td>M1 (total time taken)</td>
</tr>
<tr>
<td></td>
<td>$= \frac{(15 + 10)}{60} + \frac{1}{4}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$= \frac{2}{3} h$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Accept: $(15+10+15) \text{ mins} = 40 \text{ mins}$</td>
<td></td>
</tr>
</tbody>
</table>
Average speed
\[
\frac{2}{3}h
= 58\frac{1}{8} \text{ km/h}
\]
Accept: 58.125 km/h
Reject: 58.1 km/h (3 s.f.)

5(a) \[\pi (6)^2 - \pi x^2 = \pi (36 - x^2)\] M1 (show both \(\pi (6)^2\) and \(\pi x^2\))

Note: For question 5(b) below,
- no marks awarded if a student did not form a correct equation in any part of the working to solve it,
- deduction of 1 mark applies if a student wrote 3.142 or \(\frac{22}{7}\) in any part of the working, and
- deduction of 1 mark applies if there is premature approximation in any part of the working, given that the final answer in 3 s.f. is correct.

5(b) \[\pi (36 - x^2) = 28\]

M1 (show a correct equation)

Note: allow e.c.f. from previous algebraic expression obtained from 5(a)

\[
36 - x^2 = \frac{28}{\pi}
\]

\[
x^2 = 36 - \frac{28}{\pi}
\]

or
\[
x^2 = 27.087...
\]

Accept: \(36 - \frac{28}{\pi} = 27.087...\)

M1

\[
x = \sqrt{36 - \frac{28}{\pi}}
\]

= 5.20 (3 s.f.)

A1

Note: For question 6 below, overall maximum deduction of 1 mark applies if all working is correct but the respective reason(s) is/are missing or wrong.

6(a)(i) \[\angle DOE = a^\circ \text{ (vert. opp. } \angle s)\]

\[2a^\circ + a^\circ + a^\circ + 20^\circ = 180^\circ \text{ (adj. } \angle s \text{ on a str. line)}\]

Accept:
\[4a^\circ + 2a^\circ + 2a^\circ + 40^\circ = 360^\circ \text{ (} \angle s \text{ at a point)}\]

M1 (show a correct equation)

Deduction of 1 mark if student writes this:
\[360^\circ - 40^\circ = 320^\circ\]
\[320^\circ : 8a = 40^\circ\]
Reason: presentation error. It should have been \(a^\circ = 320^\circ + 8 = 40^\circ\).

\[a = 40\]

A1

6(a)(ii) \[b^\circ = \angle AOD \text{ (cont. } \angle s. CG//AOB)\]

\[= \angle AOE + \angle DOE\]

\[= 2 \times 40^\circ + 40^\circ\]

M1 (correct last step of working)

Note:
1. Students are not penalised if there is no mention of vert. opp. \(\angle s\) in their working this time.
2. Allow e.c.f. from the value of \(a\) obtained from 6(a)(ii)
3. Accept other workings that are supported by (ah) \(\angle s. CG//AOB\)

Prepared by Mdm Chor O.M. Christina
Deduction of 1 mark if student writes this: 
60° - 180° = 120° 

\[ b = 120 \]

Reason: presentation error. It should have been 180° - 60° = 120°.

<table>
<thead>
<tr>
<th>6(b)(i)</th>
<th>( \frac{(8 - 2) \times 180^\circ}{8} )</th>
</tr>
</thead>
</table>
| Accept: | 360° ÷ 8 = 45°  
       | 180° - 45° = 135° |

<table>
<thead>
<tr>
<th>6(b)(ii)</th>
<th>( 25^\circ + 23^\circ + (n - 2) \times 24^\circ = 360^\circ )</th>
</tr>
</thead>
</table>
|         | \( 24n' = 360^\circ \)  
|         | \( n = 15 \) |

Number of sides = 15

7(a) Total area 
\[ = \frac{1}{2} (10 + 17)(5) \text{ cm}^2 \]

<table>
<thead>
<tr>
<th></th>
<th>Unshaded area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[ = \frac{1}{2} (10 + 17)(5) - 15 \text{ cm}^2 ]</td>
</tr>
<tr>
<td></td>
<td>= 52.5 cm²</td>
</tr>
</tbody>
</table>

7(b) 82 \times 15 cm² 
Or 
0.82 \times 15 cm² 
Or 
18% - 2.7 cm² 

12.3 cm²

7(c) 90% = $711 
Or 
90% = \$\frac{711}{300} 

Reject: 110% = \$711 

100% = \$790 
Cost per sticker 
\[ = \frac{\$790}{300} \] 
\[ = \$2.63 \text{ (nearest cent)} \]

Accept 263 cents (nearest cent) 
Reject: $2.60 or 260 cents.
Note:
1. For whole of question 8, overall deduction of 1 mark applies if a student did not correct a final answer to 3 s.f. given that the respective final answer is correct.
2. For whole of question 8, overall deduction of 1 mark applies if a student wrote 3.142 or \( \frac{22}{7} \) in any part of their working given that the required working is correct.
3. For questions 8(b) and 8(c), overall deduction of 1 mark applies if a student used 1030 cm\(^2\) in their working, given that their final answers for 8(b) and 8(c) are correct.

| 8(a) | \[ (30 \times 24) + \frac{1}{2} \pi \left( \frac{28}{2} \right)^2 \text{ cm}^2 \] | M1 (show 30 \times 24 to find the area of a parallelogram) 
M1 (show \( \frac{1}{2} \pi \left( \frac{28}{2} \right)^2 \) to find the area of a semi-circle) |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>=1027.87... cm(^2) =1030 cm(^2) (3 s.f.)</td>
<td>A1</td>
</tr>
</tbody>
</table>

| 8(b) | \[ 2(1027.87...) cm^2 + \left[ 28 + 30 + 30 + \frac{1}{2} \pi (28) \right] cm \times 50 cm \] | M1 (show \( \frac{1}{2} \pi (28) \) to find half the circumference of a circle) 
M1 (show 2 x base areas + perimeter of base area \times height, and correct method to find the perimeter of base area) |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>= 8654.8... cm(^2) = 8650 cm(^2) (3 s.f.)</td>
<td>A1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>8(c)</th>
<th>( \sqrt[3]{1027.87... \times 50 \text{ cm}} )</th>
<th>M1 (show cube root of the product of base area and height)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>= 37.179... cm = 37.2 cm (3 s.f.)</td>
<td>A1</td>
</tr>
</tbody>
</table>

Note:
For whole of question 9, overall deduction of 1 mark applies if
1. a student did not draw both axes on the grid line of the graph paper, and/or
2. a student showed negative \( y \) values above \( x \)-axis and negative \( x \) values to the right of the \( y \)-axis given that the student showed the correct scale i.e. 1 cm to 1 unit on the \( x \)-axis and 1 cm to 2 units on the \( y \)-axis.

<table>
<thead>
<tr>
<th>9(a)</th>
<th>( a = 3(1) - 3 = 0 ) ( b = 3(5) - 3 = 12 )</th>
<th>B1</th>
</tr>
</thead>
</table>
| 9(b) | 1. Correct plotting of all points from the table. 
2. Straight line passing through all points only if there is correct plotting of points. 
3. Correct scales for both axes are drawn. | B1 |
9(c) Using the graph, \( x = -1 \) when \( y = -6 \)

9(d) Point of origin = \((0, 0)\)
As given, the other point is \((3, 6)\).

Gradient = \( \frac{6 - 0}{3 - 0} \) or \( \frac{0 - 6}{0 - 3} \)
= 2

----- The End -----
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, highlighters, glue or correction tape/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 \( \pi \), use either your calculator value or 3.142, unless the question requires the answer in terms of \( \pi \).

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 number of marks for this paper is 60.

<table>
<thead>
<tr>
<th>For Examiner's Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper 1</td>
</tr>
<tr>
<td>Paper 2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>

Setters: Miss Lee CP

This question paper consists of 14 printed pages including the cover page.
1 State which of the following numbers are irrational.

\[ \sqrt{2} \times \sqrt{8}, \quad \frac{22}{7}, \quad \pi, \quad 3\sqrt{5}, \quad 2.6 \]

Answer .................................................. [1]

2 Consider the following numbers.

\[ 942 \frac{1}{3}, \quad 3\pi, \quad \frac{471}{50}, \quad 9.43 \]

Arrange the numbers in descending order.

Answer .......................... .............. .............. .............. .............. [1]

3 (a) The area of a circle is 108\pi square centimetres. Find the length of radius of the circle correct to the nearest centimetre.

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

(b) Round off 198.45 to 2 significant figures.

Answer (b) ........................................ [1]
4. Estimate, without the use of a calculator, \( \frac{20.14 \times (2.04)^4}{\sqrt{2512}} \) correct to 1 significant figure.

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

5. (a) Express \( \frac{3}{20} \) as a decimal number.

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

(b) A man bought a television set at a price of $1440 after a 20% discount during a sale. Find the marked price of the television set.

Answer (b): ........................................................ [1]
6. Solve $9x - (2x - 6) = 8 - x$.

Answer $x = \ldots$ [2]

7. (a) The $n$th term of a sequence is given by $2n^2 + 2$.

Write down the first 4 terms.

Answer (a) \ldots \ldots \ldots \ldots \ldots [1]

(b) The first 4 terms of another sequence are 2, 8, 18, 32, ...

(i) Write down the next term.

Answer (b)(i) \ldots \ldots \ldots \ldots \ldots [1]

(ii) By comparing this sequence with your answer to (a), write down the $n$th term.

Answer (b)(ii) \ldots \ldots \ldots \ldots \ldots [1]
8. Showing your working clearly, without the use of a calculator, evaluate
\[ \frac{-7}{3} + \left[ \left( \frac{-1}{5} - \frac{2}{3} \right) \times 15 \right] - \left( -\frac{1}{4} \right). \]

\[ \text{Answer} \] \[ \quad \] \[ \text{[2]} \]

9. Given that \( \frac{a}{b} = \sqrt{\frac{b^2 - 2c}{2}} \), find the value of \( c \) when \( a = -1 \) and \( b = 2 \).

\[ \text{Answer} \quad c = \ldots \] \[ \text{[2]} \]
10 Petrol costs \( w \) cents per litre.

(i) Find an expression, in terms of \( w \), for the number of litres of petrol that can be bought with 1 cent.

\[ \text{Answer (i)} \]

(ii) Find an expression, in terms of \( w \) and \( x \), for the number of litres of petrol that can be bought with \( x \) dollars.

\[ \text{Answer (ii)} \]

11 If the interior angles of a hexagon are in the ratio 2 : 3 : 3 : 4 : 4 : 4, find the largest exterior angle.

\[ \text{Answer} \]
12 (a) Factorise completely $y(x + 2) + 3(x + 2)$.

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

(b) Expand and simplify $3(x - 2y) - 2[(3x - y) - 2x]$.

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

13 (a) Solve the inequality $x - 8 < 29 - 3x$.

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

(b) Express the solution in (a) on a number line.

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

(c) Find the largest prime number which satisfies the inequality.

Answer (c) ......................................................... [1]
The graph shows the charges made by two companies for telephone calls lasting up to 10 minutes.

Singshop charges 40 cents for calls for the first 3 minutes and 10 cents per minute for each subsequent minute.

Starshop charges a connection fee of \( p \) cents and all calls are charged at a constant rate of \( q \) cents per minute.

Using these graphs, find

(a) the cost of a 7-minute call made using Singshop,

\[ \text{Answer (a)} \$ \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots [1] \]

(b) the value of \( p \),

\[ \text{Answer (b)} \ p = \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots [1] \]

(c) the value of \( q \),

\[ \text{Answer (c)} \ q = \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots [1] \]
15 The figure is made up of a right-angled triangle $PQR$ and a semicircle. $POQ$ is the diameter of the semicircle with centre $O$.

![Diagram of a right-angled triangle with a semicircle]

Given that $PR = 8$ cm, $QR = 6$ cm and $POQ = 10$ cm, find

(a) the perimeter of the figure, leaving your answer in the form $(a + b\pi)$ cm,

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

(b) the area of the figure.

Answer (b) ............................................. cm$^2$ $[2]$
16 The figure shows a sketch of the world's largest gold bar that is 45.5 cm long. It is a solid prism with uniform cross section of a trapezium.

(a) Find the volume of the gold bar.

\[ \text{Answer (a)} \quad \text{cm}^3 \quad [2] \]

(b) The gold bar is melted and made into rectangular gold metal sheets of dimension 297 mm by 210 mm. Each sheet has a thickness of 2 mm. Find the maximum number of gold metal sheets that can be made using the gold bar.

\[ \text{Answer (b)} \quad \text{gold sheets} \quad [2] \]
Mrs Tan sponsored a total of 96 hot dogs, 72 packets of fruit juice and 48 cake slices for a class picnic.

(a) Given that each student will receive the same amount of each item, find the maximum number of students that can attend the class picnic.

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

(b) How many hot dogs, packets of fruit juice and cake slices will each student receive?

Answer (b) .................. hot dogs . ............... packet fruit juice. ............... cake slices [1]
In the diagram, $\triangle DEF$ is an isosceles triangle and $EFGH$ is a rhombus. It is given that $\angle FGE = 61^\circ$, $\angle FKE = 81^\circ$, $DE = FE$ and both $DEH$ and $DKF$ are straight lines.

By stating your reasons clearly, calculate:

(a) $\angle EHG$,

(b) reflex $\angle FGH$,

(c) $\angle KFG$,

(d) $\angle DEK$.

**Answer (a)** $\angle EHG = \ldots \ldots \ldots \ldots^\circ$ [2]

**Answer (b)** reflex $\angle FGH = \ldots \ldots \ldots \ldots^\circ$ [1]

**Answer (c)** $\angle KFG = \ldots \ldots \ldots \ldots^\circ$ [2]

**Answer (d)** $\angle DEK = \ldots \ldots \ldots \ldots^\circ$ [1]
19 (a) (i) Express 180 as the product of its prime factors.

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

(ii) The lowest common multiple of 12, 15, x is 180. Find the two possible values of x which are odd numbers and are greater than 1.

Answer (a)(ii) x = ................. , ................. [1]

(b) The numbers 2520 and 3375, written as the products of their prime factors, are

\[ 2520 = 2^3 \times 3^2 \times 5 \times 7, \quad 3375 = 3^3 \times 5^3 \]

Find

(i) \[ \sqrt{3375}, \]

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

(ii) the smallest positive integer value of n for which 2520n is a multiple of 3375,

Answer (b)(ii) n = ........................................... [1]

(iii) the smallest positive integer k such that \[ \frac{2520}{k} \] is a perfect square.

Answer (b)(iii) k = ........................................... [1]
20 (a) Using ruler, set square, protractor and compasses only, construct

(i) a trapezium \( PQRS \) such that \( PQ \) is parallel to \( SR \), \( PQ = 9.4 \) cm,
\[ QR = 5.2 \text{ cm}, \quad RS = 3.8 \text{ cm} \quad \text{and} \quad \angle PQR = 80^\circ, \] [2]

(ii) the angle bisector of \( \angle PQR \) such that it cuts \( PS \) at point \( T \), [1]

(iii) the perpendicular bisector of \( QR \) such that it cuts \( PS \) at point \( U \). [1]

*Answer for (a)(i), (a)(ii), (a)(iii)*

(b) Measure and write down the length of \( TQ \).

*Answer (b) \( TQ = \) ......................... cm [1]*

(c) Measure the smallest interior angle of trapezium \( PQRS \).

*Answer (c) ................................. ^\circ [1]*

- End of Paper -
### Answer Key

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$\pi$, $3\sqrt{5}$</td>
<td>2</td>
<td>$9.43$, $3\pi$, $942\frac{1}{3}$, $471\frac{1}{50}$</td>
<td>3(a)</td>
</tr>
<tr>
<td>3(b)</td>
<td>200</td>
<td>4</td>
<td>3.2</td>
<td>5(a)</td>
</tr>
<tr>
<td>5(b)</td>
<td>$$1800$</td>
<td>6</td>
<td>$x = \frac{1}{4}$ or $0.25$</td>
<td>7(a)</td>
</tr>
<tr>
<td>7(b)(i)</td>
<td>50</td>
<td>7(b)(ii)</td>
<td>$2n^2$.</td>
<td>8</td>
</tr>
<tr>
<td>9</td>
<td>$c = \frac{7}{4}$ or $1.75$</td>
<td>10(i)</td>
<td>$\frac{1}{w}$</td>
<td>10(ii)</td>
</tr>
<tr>
<td>11</td>
<td>$108^\circ$</td>
<td>12(a)</td>
<td>$(x + 2)(y + 3)$</td>
<td>12(b)</td>
</tr>
<tr>
<td>13(a)</td>
<td>$x &lt; \frac{37}{4}$ or $x &lt; 9\frac{1}{4}$</td>
<td>13(b)</td>
<td></td>
<td>13(c)</td>
</tr>
<tr>
<td>14(a)</td>
<td>$$0.80$</td>
<td>14(b)</td>
<td>30</td>
<td>14(c)</td>
</tr>
<tr>
<td>15(a)</td>
<td>$(5\pi + 14)$ cm</td>
<td>15(b)</td>
<td>$63.7$ cm$^2$ (3 s.f.)</td>
<td>16(a)</td>
</tr>
<tr>
<td>16(b)</td>
<td>131 gold sheets</td>
<td>17(a)</td>
<td>24</td>
<td>17(b)</td>
</tr>
<tr>
<td>18(a)</td>
<td>$58^\circ$</td>
<td>18(b)</td>
<td>$238^\circ$</td>
<td>18(c)</td>
</tr>
<tr>
<td>18(d)</td>
<td>20$^\circ$</td>
<td>19(a)(i)</td>
<td>$180 = 2^2 \times 3^2 \times 5$</td>
<td>19(a)(ii)</td>
</tr>
<tr>
<td>19(b)(i)</td>
<td>15</td>
<td>19(b)(ii)</td>
<td>75</td>
<td>19(a)(iii)</td>
</tr>
</tbody>
</table>

20(a) [Image of a diagram]

20(b) $TQ = 6.9 \pm 0.1$ cm

20(c) $48 \pm 1^\circ$
<table>
<thead>
<tr>
<th>No</th>
<th>Working</th>
<th>Description</th>
<th>Marks Allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>( \pi, 3\sqrt{5} )</td>
<td></td>
<td>B1</td>
</tr>
</tbody>
</table>
| 2  | \( 942 \frac{1}{3} = 9.42333... \)  
\( 3\pi = 9.424777961 \)  
\( \frac{471}{50} = 9.42 \)  
\( \star \)  
\( 9.43 = 9.4344343... \)  
Descending order: \( 9.43, 3\pi, 942 \frac{1}{3}, \frac{471}{50} \) | | B1 |
| 3(a) | Radius of circle, \( r = \sqrt{108\pi + \pi} = 10.39230... \)  
=10 cm | | B1 |
| 3(b) | 200 | | B1 |
| 4  | \( \frac{20.14 \times (2.04)^3}{\sqrt{2512}} \)  
\( = \frac{20 \times 2^3}{\sqrt{2500}} \)  
\( = \frac{20 \times 8}{50} \)  
\( = 3.2 = 3 \) | No working but correct answer, award A1 | M1 |
| 5(a) | \( \frac{3}{20} \% = 0.0015 \) | | B1 |
| 5(b) | Sale price = $1440  
Marked price = $1440 \times \frac{100}{80} = $1800  
Or  
80% \( ------ \) $1440  
100% \( ------ \) $1440 \times 100 = $1800 | | B1 |
| 6  | \( 9x - (2x - 6) = 8 - x \)  
\( 9x - 2x + 6 = 8 - x \)  
\( 7x + x = 8 - 6 \)  
\( 8x = 2 \)  
\( x = \frac{1}{4} \) or 0.25 | Expansion of bracket; must be correct for both terms | M1 |
<p>| 7(a) | 4, 10, 20, 34 | All correct | B1 |
| 7(b)(i) | 50 | | B1 |
| 7(b)(ii) | 2n² | | B1 |</p>
<table>
<thead>
<tr>
<th>No</th>
<th>Working</th>
<th>Description</th>
<th>Marks Allocation</th>
</tr>
</thead>
</table>
| 8  | \(-\frac{7}{3} \left[ \left( -\frac{1-2}{5} \right) \times 15 \right] - \left( -\frac{1}{4} \right)\)  
\(= -\frac{7}{3} \left[ \left( -\frac{3-10}{15} \right) \times 15 \right] + \frac{1}{4}\)  
\(= -\frac{7}{3} \left[ (-13) \right] + \frac{1}{4}\)  
\(= -\frac{7}{3} \times \frac{1}{13} + \frac{1}{4}\)  
\(= \frac{7}{39} + \frac{1}{4}\)  
\(= \frac{57}{156}\) | [Convert division to multiplication and reciprocate fraction of inner bracket correctly] | M1 A1 |
| 9  | \(a = \frac{\sqrt{b^2-2c}}{2}\), find the value of \(c\) when \(a = -1\) and \(b = 2\).  
\(-\frac{1}{2} = \sqrt{\frac{2^2-2c}{2}}\)  
\(= \frac{1}{2} = \sqrt{\frac{4-2c}{2}}\)  
\(-\frac{1}{2} = \sqrt{2-c}\)  
\(= \frac{1}{4} = 2-c\)  
\(\Rightarrow 2 = 2c\)  
\(\Rightarrow 4 = 4c\)  
\(\Rightarrow c = \frac{7}{4}\) or 1.75 | Remove square root | M1 A1 |
| 10(i) | \(w\) cents buys 1 litres  
1 cent buys \(\frac{1}{w}\) litres | | B1 |
| 10(ii) | 100 cents buys \(\frac{100}{w}\) litres  
1 dollar buys \(\frac{100}{w}\) litres  
x dollars buys \(\frac{100x}{w}\) litres | | B1 |
<table>
<thead>
<tr>
<th>No</th>
<th>Working</th>
<th>Description</th>
<th>Marks Allocation</th>
</tr>
</thead>
</table>
| 11 | Ratio of interior angle: 2:3:4:4:4<br>20 units represent $(6 - 2) \times 180^\circ = 720^\circ$<br>1 unit represents $36^\circ$
|     | Largest exterior angle $= 180^\circ - 2(36^\circ) = 108^\circ$ |   | M1 M1 A1 |
| 12(a) | $y(x + 2) + 3(x + 2)$<br>$= (x + 2)(y + 3)$ |   | B1 |
| 12(b) | $3(x - 2y) - 2[(3x - y) - 2x]$<br>$= 3x - 6y - 2[3x - y - 2x]$<br>$= 3x - 6y - 2[x - y]$<br>$= 3x - 6y - 2x + 2y$<br>$= x - 4y$ | Expand the brackets correctly for $2^{nd}$ bracket | M1 A1 |
| 13(a) | $x - 8 < 29 - 3x$
$x + 3x < 29 + 8$
$4x < 37$
$x < \frac{37}{4}$ or $x < 9\frac{1}{4}$ | Collecting the like terms correctly | M1 A1 |
| 13(b) | ![Graph](image) |   | B1 |
| 13(c) | 7 | FTI (if reasonable) | B1 |
| 14(a) | $\$0.80 |   | B1 |
| 14(b) | 30 |   | B1 |
| 14(c) | 6 |   | B |
| 15(a) | Perimeter $= \text{Arc PQ} + \text{PR} + \text{RQ}$
$= \frac{1}{2} \pi (10) + 6 + 8$
$= (5\pi + 14) \text{ cm}$ | Method for arc PQ | M1 A1 |
| 15(b) | Area $= \text{Area of semicircle} + \text{Area of triangle}$
$= \frac{1}{2} \pi (5)^2 + \frac{1}{2} (8 \times 6)$
$= 63.269$
$= 63.3 \text{ cm}^2$ (3 s.f.) | Mtd for area of semicircle | M1 A1 |
<p>|     | If answer left in terms of $\frac{25}{2}\pi + 24 \text{ cm}^2$, accept answer. | If answer not rounded off to 3 s.f. correctly, no marks | |</p>
<table>
<thead>
<tr>
<th>No</th>
<th>Working</th>
<th>Description</th>
<th>Marks Allocation</th>
</tr>
</thead>
</table>
| 16(a) | Volume of prism/figure  
= Area of trapezium × height/length  
= $\frac{1}{2} (20 + 22.5) \times 17 \times 45.5$  
= 16436.875 or 16400 cm$^3$ (3 s.f.) | Formula for trapezium | M1, A1 |
| 16(b) | Volume on 1 metal sheet = 297 mm × 210 mm × 2 mm  
= 29.7 cm × 21 cm × 0.2 cm  
= 124.74 cm$^3$ | If work out volume of 1 metal sheet or show division of Vol. of prism by volume of 1 metal sheet give method marks | M1 |
| | No. of gold sheets = Volume of figure ÷ Volume of 1 metal sheet  
= 16436.875 ÷ 124.74  
= 131.769  
= 131 sheets | | A1 |
| 17(a) | 3  
8  
4 | 96  
32  
4  
72  
24  
3  
48  
16  
2  
: Greatest no. of students = HCF of 96, 72 and 48  
= 3×8  
= 24 | | M1, A1 |
| 17(b) | Each student received 4 hot dogs, 3 can fruit juice and 2 slices of cakes | | B1 |
| 18(a) | $\angle EHG = 180° - \angle HGE - \angle HEG$ (Angle sum of triangle and  
$\angle HEG = 61°$, as Alt angle, FG//EH)  
$\angle EHG = 180° - 61° - 61°$  
= 58° | | M1 |
| 18(b) | Reflex $\angle FGH = 360° - 61° - 61°$ (angles at a pt)  
= 238° | | B1 |
| 18(c) | $\angle FED = \angle GFE$ (Alt angles, FG//EH)  
= 58°  
$\angle KFE = (180° - 58°) ÷ 2$ (Base angle of isos. $\Delta$)  
= 61°  
$\angle KFG = 61° + 58°$  
= 119° | Find angle KFE | B1 |
| OR  
18(c) | $\angle FED = \angle GFE$ (Alt angles, FG//EH)  
= 58°  
$\angle FDE = (180° - 58°) ÷ 2 = 61°$ (Base angle of isosceles triangle)  
$\angle KFG = 180° - 61° = 119°$ (interior angles, FG//DE) | Find angle FDE | B1 |
<table>
<thead>
<tr>
<th>No</th>
<th>Working</th>
<th>Description</th>
<th>Marks Allocation</th>
</tr>
</thead>
</table>
| 18(d) | \[\angle DEK = 81^\circ - 61^\circ = 20^\circ \] (Ext. angle of \( \triangle \))<br>Or<br>\[\angle DEK = \angle FED - \angle FEK\]
\[= 58^\circ - 38^\circ = 20^\circ\] | | B1 |
| 19(a) | | | |
| (i) | \[
\begin{array}{c|c}
2 & 180 \\
2 & 90 \\
3 & 45 \\
3 & 15 \\
5 & 5 \\
\hline
1 & \\
\end{array}
\]
\[\therefore 180 = 2^2 \times 3^2 \times 5\] | | B1 |
| 19(a) | 9, 45 | | B1 |
| (ii) | | | |
| 19(b) | 15 | | B1 |
| (i) | | | |
| (ii) | Smallest integer, \( n = 75 \) | | B1 |
| (iii) | Smallest integer, \( k = 70 \) | | B1 |
| 20(a) | | B1 for parallel lines for trapezium<br>B1 for trapezium | |
| (i) | | B1 for (ii) | |
| (ii) | | B1 for (iii) | |
| 20(a) | | | |
| (iii) | | | |
| 20(b) | \( \overline{PQ} = 6.9 \pm 0.1 \text{ cm} \) | | B1 |
| 20(c) | \( 48 \pm 1^\circ \) | | B1 |
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, highlighters, glue or correction fluid/tape.

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

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 total number of marks for this paper is 60.
La Paz, the capital city of Bolivia, is located at an altitude of 3640 m above sea level while Baku, the capital city of Azerbaijan, is located at an altitude of 28 m below sea level.

(a) Represent the altitude of Baku using a negative number.

\[ \text{Answer (a) } \quad \text{...} \quad [1] \]

(b) Hence, find the difference in altitude between La Paz and Baku.

\[ \text{Answer (b) } \quad \text{...} \quad \text{m} \quad [1] \]

Suzy’s monthly income consists of a basic salary of $700 and a commission of 5.5% on her sales for the month. If Suzy’s income is $1690 for a particular month, find her sales for that month.

\[ \text{Answer } \quad S \quad \text{...} \quad [3] \]
The rates of exchange between American dollars (US$), Singapore dollars (S$) and Korean won (₩) are US$1 = S$1.2467 and S$100 = ₩83917.

Convert the following into Singapore dollars, giving your answer correct to the nearest cent.

(a) US$365

\[ \text{Answer (a)} \] S$ \[ \quad \] [2]

(b) ₩20 000

\[ \text{Answer (b)} \] S$ \[ \quad \] [2]
4  The first three figures of a sequence are as shown below.

Figure 1  Figure 2  Figure 3

(a) Draw Figure 4 of the sequence in the space below.

Answer (a)

Figure 4

(b) Complete the table below.

Answer (b)

<table>
<thead>
<tr>
<th>Figure Number, n</th>
<th>Number of Circles at Base of the Figure, n</th>
<th>Total Number of Circles, $T_n$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>$1 = 1 = \frac{1\times2}{2}$</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>$1 + 2 = 3 = \frac{2\times3}{2}$</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>$1 + 2 + 3 = 6 = \frac{3\times4}{2}$</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\vdots$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$n$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(c) Find the total number of circles in Figure 100.

Answer (c) \( \ldots \ldots \ldots \) circles \( [1] \)
A survey was conducted among 240 students to find out the mode of transport that they used to travel to school. The results of the survey are shown below.

<table>
<thead>
<tr>
<th>Mode of Transport</th>
<th>Number of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>By parent's car</td>
<td>70</td>
</tr>
<tr>
<td>By bus and/or MRT</td>
<td>100</td>
</tr>
<tr>
<td>By foot, i.e. walking</td>
<td>30</td>
</tr>
<tr>
<td>Others</td>
<td>40</td>
</tr>
</tbody>
</table>

(a) The results of the survey are to be represented in the form of a pie chart. Complete the table below, showing your workings clearly.

*Answer (a)*

<table>
<thead>
<tr>
<th>Mode of Transport</th>
<th>Angle of Sector in a Pie Chart</th>
</tr>
</thead>
<tbody>
<tr>
<td>By parent's car</td>
<td></td>
</tr>
<tr>
<td>By bus and/or MRT</td>
<td></td>
</tr>
<tr>
<td>By foot, i.e. walking</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td></td>
</tr>
</tbody>
</table>

(b) Hence, represent the results of the survey in the pie chart below.

*Answer (b)*
6 The diagram below shows a rectangular football field with a semi-circular patch of recreational ground of radius 35 m at each end of the field. A running track with a uniform width of 10 m is built around the football field and the two semi-circular patches of recreational ground.

(a) Find the perimeter of the shaded region. (Take \( \pi \) to be 3.142)
6 (b) Find the area of the running track. (Take $\pi$ to be 3.142)

$\text{Answer (b)} \quad \ldots \ldots \ldots \ldots \quad \text{m}^2 \quad [3]$
Smartphone price plans usually include a fixed monthly component and a variable component depending on the monthly usage. Two student price plans offered by a local telecommunication company are shown in the table below.

<table>
<thead>
<tr>
<th>Student Price Plan</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monthly subscription</td>
<td>$28</td>
<td>$42</td>
</tr>
<tr>
<td>Contract duration</td>
<td>24 months</td>
<td></td>
</tr>
<tr>
<td>Free local outgoing calls</td>
<td>Unlimited</td>
<td></td>
</tr>
<tr>
<td>Free local outgoing calls</td>
<td>150 minutes</td>
<td>100 minutes</td>
</tr>
<tr>
<td>Free local data bundle</td>
<td>1 GB</td>
<td>3 GB</td>
</tr>
</tbody>
</table>

* If outgoing calls exceed the free minutes provided, excess usage is charged at $0.002/minute.

* If data usage exceeds free data bundle provided, excess usage is charged at $10/GB and capped at $30 monthly.

(a) Jinny made 120 minutes of local outgoing calls and used 2 GB of local data in June 2015. Calculate her phone bill for the month of June 2015 if

(i) she had signed up for Student Price Plan A,

Answer (a)(i) $ ___________________________ [2]

(ii) she had signed up for Student Price Plan B.

Answer (a)(ii) $ ___________________________ [2]

(b) Other than the monthly subscription fee, list 1 other factor Jinny should consider when deciding which plan to sign up for.

Answer (b)
8 Express each of the following as a fraction in its simplest form.

(a) \( \frac{2a + 3b}{4} = \frac{a - 2b}{3} \)

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

(b) \( \frac{5(x + 4)}{6} + \frac{x + 2}{3} + 1 \)

Answer (b) ........................... [3]
Luis has some two-dollar, five-dollar and ten-dollar notes in his wallet. The number of two-dollar notes is thrice the number of ten-dollar notes. There are 2 more five-dollar notes than ten-dollar notes in his wallet.

(a) Given that Luis has $x$ ten-dollar notes in his wallet, write down an expression, in terms of $x$, for the number of five-dollar notes he has in his wallet.

*Answer (a)*

(b) Luis gave his sister, Lucy, 4 two-dollar notes for her daily allowance.

(i) Write down an expression, in terms of $x$, for the number of two-dollar notes Luis has in his wallet after giving Lucy her daily allowance.

*Answer (b)(i)*

Luis has $\$44$ left in his wallet after giving Lucy her daily allowance.

(ii) Form an equation, in terms of $x$, to represent the above information, and show that it can be simplified to $21x + 2 = 44$.

*Answer (b)(ii)*

(c) Solve the equation in (b)(ii) to find the value of $x$.

*Answer (c)* \[ x = \quad \]
10 The diagram below shows a model of a Lego block. The model is made up of a cuboid measuring 8 cm by 8 cm by 6 cm, and 4 identical cylinders each with a base diameter of 3 cm and height of 1 cm.

(a) Find the total volume of the model.

Answer (a) ......................... cm$^3$ [3]

(b) Find the total surface area of the model.

Answer (b) ......................... cm$^2$ [3]
11 In the figure, \( ABCDE \) is a regular pentagon and \( APQRSTUE \) is a regular octagon. The two polygons share a common side \( AE \), and \( QP \) is parallel to \( RA \).

\[ \begin{array}{c}
Q \\
R \\
P \\
A \\
B \\
E \\
C \\
D \\
T \\
U \\
S \\
\end{array} \]

(a) By stating your reason(s) clearly, find

(i) \( \angle PQR \),

\[ \text{Answer (a)(i)} \quad \angle PQR = \ldots \ldots \ldots \circ \quad [2] \]

(ii) \( \angle EDU \).

\[ \text{Answer (a)(ii)} \quad \angle EDU = \ldots \ldots \ldots \circ \quad [3] \]

(b) Show that \( \angle SRA \) is a right angle.

\[ \text{Answer (b)} \]

[2]
12 Answer the whole of this question on a sheet of graph paper.

The total fare for a taxi ride can be represented by the equation

\[ y = 0.50x + 3.2 \]

where \( y \) represents the total fare in dollars, and \( x \) represents the distance travelled by the taxi in kilometres.

The table below shows some values of \( x \) and \( y \).

<table>
<thead>
<tr>
<th>( x )</th>
<th>( 0 )</th>
<th>( 2 )</th>
<th>( 5 )</th>
<th>( 8 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y )</td>
<td>( 3.2 )</td>
<td>( 4.2 )</td>
<td>( p )</td>
<td>( 7.2 )</td>
</tr>
</tbody>
</table>

(a) Find the value of \( p \). \hspace{1cm} [1]

(b) Using a scale of 1 cm to represent 1 km, draw a horizontal \( x \)-axis for \( 0 \leq x \leq 8 \).

Using a scale of 2 cm to represent $1, draw a vertical \( y \)-axis for \( 0 \leq y \leq 8 \).

Plot the pairs of values in the table above and draw the graph of \( y = 0.50x + 3.2 \). \hspace{1cm} [3]

(c) From your graph,

(i) find the total fare for a taxi ride of 7 km, \hspace{1cm} [1]

(ii) find the distance travelled by a taxi when the total fare is $5.20. \hspace{1cm} [1]

(d) What does the gradient of the graph represent? \hspace{1cm} [1]

(e) Explain why the fare can never be less than $3.20. \hspace{1cm} [1]
<table>
<thead>
<tr>
<th>Qn No.</th>
<th>Workings</th>
<th>Description</th>
<th>Mark Allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1(a)</td>
<td>28</td>
<td></td>
<td>B1</td>
</tr>
</tbody>
</table>
| 1(b)   | Difference in altitude  
= 3640 - (-28)  
= 3668 m |             | B1              |
| 2      | Commission earned  
= 1690 - 700  
= $990  
5.5% rep $990  
1% rep $\frac{990}{5.5}$  
100% rep $\frac{990}{5.5} \times 100$  
= $18000$ |             | M1 A1           |
| 3(a)   | US$1 = S$1.2647  
US$365 = S$1.2647 \times 365  
= S$461.62 \text{ (to nearest cent)} | A1 cannot be awarded if answer is not given to nearest cent | M1 A1           |
| 3(b)   | S$100 = \$83917  
\$1 = S$\frac{100}{83917}$  
\$20000 = S$\frac{100}{83917} \times 20000$  
= S$23.83 \text{ (to nearest cent)} | A1 cannot be awarded if answer is not given to nearest cent | M1 A1           |
| 4(a)   | $\bigcirc$  
$\bigcirc$  
$\bigcirc$  
$\bigcirc$  
$\bigcirc$  
$\bigcirc$  
$\bigcirc$  
$\bigcirc$  |             | B1              |
| 4(b)   | 1st row  
4 , 1 + 2 + 3 + 4 = 10 = \frac{4 \times 5}{2}$  
2nd row  
n , 1 + 2 + 3 + ... + n = \frac{n \times (n+1)}{2}$ | B2 if all correct  
B1 if 1 or 2 incorrect  
B0 if > 2 incorrect | B2              |
<p>| 4(c)   | \frac{100 \times (100+1)}{2} = 5050 circles |             | B1              |</p>
<table>
<thead>
<tr>
<th>Qu No.</th>
<th>Workings</th>
<th>Description</th>
<th>Mark Allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>5(a)</td>
<td>Angle of sector representing By parent's car $\frac{70}{240} \times 360^\circ = 105^\circ$ By bus and/or MRT $\frac{100}{240} \times 360^\circ = 150^\circ$ By foot $\frac{30}{240} \times 360^\circ = 45^\circ$ Others $\frac{40}{240} \times 360^\circ = 60^\circ$</td>
<td>B2 if all correct B1 if 1 or 2 incorrect B0 if &gt;2 incorrect</td>
<td>B2</td>
</tr>
<tr>
<td>5(b)</td>
<td><img src="image" alt="Diagram" /></td>
<td>B2 if angles of all 4 sectors correct B1 if angles of 2 sectors incorrect B0 if angles of &gt;2 sectors incorrect</td>
<td>B2</td>
</tr>
<tr>
<td>6(a)</td>
<td>Required perimeter $= (110 \times 2) + \frac{1}{2} \times 2 \pi (35)$ $= 220 + 70(3.142)$ $= 439.94 \text{ m} \text{ or } 440 \text{ m (to 3 s.f.)}$</td>
<td></td>
<td>M1</td>
</tr>
<tr>
<td>6(b)</td>
<td>Area of curved parts of track $= 2\left(\frac{1}{2} \pi (45^2) - \frac{1}{2} \pi (35^2)\right)$ $= 800(3.142)$ $= 2513.6 \text{ m}^2$ Area of straight parts of track $= 2 \times (110 \times 10)$ $= 2200 \text{ m}^2$ Area of running track $= 2513.6 + 2200$ $= 4713.6 \text{ m}^2 \text{ or } 4710 \text{ m}^2 \text{ (to 3 s.f.)}$</td>
<td></td>
<td>M1</td>
</tr>
<tr>
<td>Qn No.</td>
<td>Workings</td>
<td>Description</td>
<td>Mark Allocation</td>
</tr>
<tr>
<td>--------</td>
<td>----------</td>
<td>-------------</td>
<td>-----------------</td>
</tr>
</tbody>
</table>
| 7(a)(i) | Phone bill under Student Price Plan A  
= 28 + (2 - 1)(10)  
= $38 | | M1 A1 |
| 7(a)(ii) | Phone bill under Student Price Plan B  
= 42 + (120 - 100)(60)(0.002)  
= 42 + 2.40  
= $44.40 | | M1 A1 |
| 7(b) | She should consider whether she makes more outgoing calls or uses more data when making her decision. | Accept any other logical answers. | B1 |
| 8(a) | \[
\frac{2a + 3b}{4} - \frac{a - 2b}{3} = \frac{3(2a + 3b) - 4(a - 2b)}{12} = \frac{6a + 9b - 4a + 8b}{12} = \frac{2a + 17b}{12}
\]  
Change to common denominator | M1 |
| 8(b) | \[
\frac{5(x + 4)}{6} + \frac{x + 2}{3} + 1 = \frac{5(x + 4) + 2(x + 2) + 6}{6} = \frac{5x + 20 + 2x + 4 + 6}{6} = \frac{7x + 30}{6}
\]  
Change to common denominator | M1 |
| 9(a) | \[x + 2\] | | B1 |
| 9(b)(i) | \[3x - 4\] | | B1 |
| 9(b)(ii) | \[x(10) + (x + 2)(5) + (3x - 4)(2) = 44\]  
\[10x + 5x + 10 + 6x - 8 = 44\]  
\[21x + 2 = 44\] (Shown) | B1 for forming equation correctly  
B1 for correct simplification | B1 B1 |
<table>
<thead>
<tr>
<th>Qn No.</th>
<th>Workings</th>
<th>Description</th>
<th>Mark Allocation</th>
</tr>
</thead>
</table>
| 9(c)   | $21x + 2 = 44$  
|        | $21x = 42$  
|        | $\therefore x = 2$  
|        | 44 - 2 simplified correctly | M1  
|        | A1  |
| 10(a)  | Volume of cuboid  
|        | $= 8 \times 8 \times 6$  
|        | $= 384 \text{ cm}^3$ | M1  
|        | Volume of 4 cylinders  
|        | $= 4 \times [\pi \left( \frac{3}{2} \right)^2 (1)]$  
|        | $= 9(3.142)$  
|        | $= 28.278 \text{ cm}^3$ | M1  
|        | Total volume  
|        | $= 384 + 28.278$  
|        | $= 412.278 \text{ cm}^3$ or $412 \text{ cm}^3$ (to 3 s.f.) | A1  |
| 10(b)  | Total surface area of the model  
|        | = surface area of cuboid +  
|        | curved surface area of 4 cylinders | Mark awarded for correct total S.A of cuboid (320)  
|        | $= 2(8 \times 8) + 4(8 \times 6) + 4[\pi (3)(1)]$  
|        | $= 128 + 192 + 12(3.142)$  
|        | $= 357.704 \text{ cm}^2$ or $358 \text{ cm}^2$ (to 3 s.f.) | A1  |
| 11(a)(i) | $\angle PQR$  
|        | $= \frac{(8 - 2) \times 180^\circ}{8}$ (sum of int. $\angle s$ of octagon) | M1  
|        | $= 1080^\circ$  
|        | $= 135^\circ$ | A1  |
| 11(a)(ii) | $\angle AEU = \angle PQR$  
|        | $= 135^\circ$  
|        | $\angle AED$  
|        | $= \frac{(5 - 2) \times 180^\circ}{5}$  
|        | $= 540^\circ$  
<p>|        | $= 108^\circ$ |  |</p>
<table>
<thead>
<tr>
<th>Qu No.</th>
<th>Workings</th>
<th>Description</th>
<th>Mark Allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>11(a)(ii)</td>
<td>$\angle DEU = 360^\circ - \angle AEU - \angle AED$ &lt;br&gt; ($\angle$ s at a pt.) &lt;br&gt; $= 360^\circ - 135^\circ - 108^\circ$ &lt;br&gt; $= 117^\circ$</td>
<td></td>
<td>M1</td>
</tr>
<tr>
<td></td>
<td>Since $EU = AE$ and $ED = AE$, $EU = ED$</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$\angle EDU$ &lt;br&gt; $= \frac{180^\circ - 117^\circ}{2}$ (base $\angle$ s of isos. $\Delta$) &lt;br&gt; $= \frac{63^\circ}{2}$ &lt;br&gt; $= 31.5^\circ$</td>
<td></td>
<td>M1, A1</td>
</tr>
<tr>
<td>11(b)</td>
<td>$\angle ARQ$ &lt;br&gt; $= 180^\circ - \angle PQR$ (int. $\angle$ s, $PQ\parallel AR$) &lt;br&gt; $= 180^\circ - 135^\circ$ &lt;br&gt; $= 45^\circ$</td>
<td></td>
<td>B1</td>
</tr>
<tr>
<td></td>
<td>$\angle ARS$ &lt;br&gt; $= \angle QRS - \angle ARQ$ &lt;br&gt; $= 135^\circ - 45^\circ$ &lt;br&gt; $= 90^\circ$ (Proved)</td>
<td></td>
<td>B1</td>
</tr>
<tr>
<td>12(a)</td>
<td>When $x = 5, y = p$: $p = 0.50(5) + 3.2$ &lt;br&gt; $p = 2.5 + 3.2$ &lt;br&gt; $= 5.7$</td>
<td></td>
<td>B1</td>
</tr>
<tr>
<td>12(b)-12(e)</td>
<td>Refer to next page.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12(d)</td>
<td>The gradient of the graph represents the taxi fare charged per kilometer travelled by the taxi.</td>
<td></td>
<td>B1</td>
</tr>
<tr>
<td>12(e)</td>
<td>The fare can never be less than $3.20 because the distance travelled by the taxi will always start from zero, at which point the (starting) fare will be $3.20.</td>
<td></td>
<td>B1</td>
</tr>
</tbody>
</table>
END-OF-YEAR EXAMINATION 2015
SECONDARY 1 EXPRESS
MATHEMATICS PAPER 1

Date: 8 Oct 2015
Duration: 1 h 30 min

Read these instructions first

Write your name, class and index number 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 paper clips, glue or correction tape/liquid.

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

If working is needed for any question it must be shown in the space below the question.
Omission of essential working will result in loss of marks.
The total of the marks for this paper is 60

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 \pi, use either your calculator value or 3.142.

Set by: Ms Cheryl Chew
Vetted by: Mdm Hayati
Ms Goh Lay Ching
2

Answer all the questions.

1 By rounding each number to the nearest whole number, estimate the value of
\[
\frac{\sqrt{9.3}}{\sqrt{26.9}}.
\]

Answer

2 (a) The number of spectators at a football match is 149 500 when rounded off to 4 significant figures.

What is the smallest number of spectators that were present?

(b) Arrange the following numbers in ascending order.

\[30\%, -0.3, \frac{16}{50}, 0.3, 0.33.\]

Answer (a) 

(b) 

[2]
3 For the following diagram,

write down

(a) the number of lines of symmetry,

(b) the order of rotational symmetry.

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

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

4 Consider the following numbers.

\[-8, \frac{\pi}{5}, \frac{9}{\sqrt{3}}, \sqrt{5}, \sqrt[8]{8}, 125.\]

Write down

(a) all irrational number(s),

(b) all perfect cube number(s),

(c) all prime number(s).

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

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

(c) ................................. [1]
5  (a)  Solve the inequality $-2x \geq -27 + x$.

(b)  Hence write down the largest prime number $x$ that satisfies the inequality $-2x \geq -27 + x$.

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

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

6  (a)  (i)  Express 56 as a product of its prime factors.

(ii)  Find the smallest integer, $n$, such that $56n$ is a perfect square.

(b)  $p$ leaves a remainder of 1 when divided by 2, 3 or 7.

Find the smallest integer value of $p$.

Answer  (a)(i) 56 = ............................ [1]

(ii)  $n =$ ............................... [1]

(b)  ................................. [2]
7 Susan has a mass of $3x$ kg and Charlene has a mass that is 6 kg less than Susan. The mass of Kelly is half of the total mass of Susan and Charlene.

Write an expression, in terms of $x$, for

(a) Charlene's mass,

(b) the average mass of the 3 girls.

Answer (a) \[ \text{kg} \] \[ 1 \]

(b) \[ \text{kg} \] \[ 2 \]

8 (a) Simplify $a \times a + 3a \times b - 2b \times a$.

(b) Factorise $5x^2 y^2 - 20xy^2$ completely.

Answer (a) \[ \text{ } \] \[ 1 \]

(b) \[ \text{ } \] \[ 1 \]
9 (a) The solid shown below is made up of cubes. Draw the front view and top view of the solid in the answer space below.

```
Answer (a)

Front View | Top View
```

(b) Draw a sketch of the solid that can be formed by the net shown below.

```
Answer (b)
```
10. The first three members of a family of hydrogen, H, and carbon, C, compounds have bonding structures as shown below.

\[
\begin{align*}
&\text{1st Member} & & \text{2nd Member} & & \text{3rd Member} \\
& H & & H & & H \\
& H & & C & & C & & H \\
& H & & C & & C & & C & & H \\
& H & & H & & H & & H & & H \\
\end{align*}
\]

(a) Draw the bonding structure for the 4th member of the family.

Answer (a) [1]

The table below shows the number of carbon atoms and hydrogen atoms in each member of the family of chemical compounds.

<table>
<thead>
<tr>
<th>n</th>
<th>Number of Carbon atoms</th>
<th>Number of Hydrogen atoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>n</td>
<td>n</td>
<td>(T_a)</td>
</tr>
</tbody>
</table>

(b) Find the number of hydrogen atoms in the structure for the 10th member of the family.

(c) Find the general term, \(T_a\), for the number of hydrogen atoms for the n-th member of the family.

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

(c) ............................................. [1]
11 In June, Sarah spent 20% of her income and saved the rest. Sarah's monthly income is $2000.

(a) Find the amount she spent in the month of June.

(b) In July, Sarah increased her expenditure and spent 30% of her income. Find the percentage increase in her expenditure from June to July.

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

(b) .......................................... % [2]

12 The sum of exterior angles of a polygon with \( n \) sides is \( \frac{1}{3} \) the sum of its interior angles.

(a) Find the value of \( n \).

(b) Name this polygon.

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

(b) ........................................... [1]
13. In the diagram, \(ABCD\) is a trapezium with \(DC = 12\) cm, \(AD = 10\) cm and \(AB = 16\) cm. \(DC\) is parallel to \(AB\) and \(AD\) is parallel to \(NC\).

Given that the area of trapezium \(ABCD = 112\) cm\(^2\), calculate

(a) the value of \(h\),

(b) the area of parallelogram \(ANCD\).

Answer (a) \(h = \) ......................... [2]

(b) ......................... cm\(^2\) [2]

\(\frac{124}{3}\)
14 The lengths of three sides of triangle ABC are \((3x + 2y)\) cm, \((8x - 8y - 2)\) cm and \((4x + 7y + 1)\) cm.

(a) Write down and simplify, an expression in terms of \(x\) and \(y\), for the perimeter of the triangle.

(b) It is given that \(x = 4\frac{1}{2}\) and \(y = 1\).

(i) Find the perimeter of the triangle.

(ii) What type of triangle is triangle ABC?

Answer (a) \(\quad \) cm \([2]\)

(b) (i) \(\quad \) cm \([1]\)

(ii) \(\quad \) \([1]\)
The charges for printing and framing photographs at Filmhub and Picturehub are given in the table below.

<table>
<thead>
<tr>
<th>Service</th>
<th>Filmhub</th>
<th>Picturehub</th>
</tr>
</thead>
<tbody>
<tr>
<td>Printing</td>
<td>$0.15 per</td>
<td>$0.18 per</td>
</tr>
<tr>
<td>service</td>
<td>photograph</td>
<td>photograph</td>
</tr>
<tr>
<td>Framing</td>
<td>$3 per</td>
<td>$2.80 per</td>
</tr>
<tr>
<td>service</td>
<td>photograph</td>
<td>photograph</td>
</tr>
</tbody>
</table>

(a) Calculate

(i) the amount you need to pay to print 80 photographs at Filmhub,

(ii) the number of photographs you can frame at Picturehub with $392.

(b) You need to print and frame 50 photographs.

Find the amount you would save if you use the services at Picturehub instead of Filmhub.

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

(ii) ....................... [2]

(b) S. ....................... [2]
16 (a) Subtract \((2 + x + 4y)\) from \((5x - 2y)\). Leave your answer in its simplest form.

(b) Simplify

(i) \(\frac{-x}{2} + 3y - 2(4y - x)\),

(ii) \(\frac{3(x - 3)}{2} - \frac{2x}{5}\).

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

(b) (i) .......................................... [2]

(ii) ............................................ [2]
17 In a quadrilateral $ABCD$, $AB = 6.5 \text{ cm}$, $BC = 4.8 \text{ cm}$ and $CD = 8.5 \text{ cm}$. It is also given that $\angle ABC = 115^\circ$, $\angle BCD = 98^\circ$.

The side $AB$ is drawn in the answer space below.

(a) Using a ruler and compasses, construct quadrilateral $ABCD$. [2]

(b) Measure and write down $\angle DAB$. [1]

(c) On the same diagram, construct and label clearly

(i) the perpendicular bisector of $AD$. [1]

(ii) the angle bisector of $\angle ADC$. [1]

(d) Mark the point $M$ where the two bisectors meet. Measure the length of $AM$.

Answer (a), (c) and (d)

\[ \begin{array}{c}
A \\
\hline
B
\end{array} \]

Answer (b) $\angle DAB = \ldots \ldots \ldots \ldots$ [1]

(d) $\ldots \ldots \ldots \ldots \text{cm}$ [1]

END OF PAPER
## Answer Key

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>10b</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>2a</td>
<td>149 450</td>
<td>10c</td>
<td>2x + 2</td>
<td></td>
</tr>
<tr>
<td>2b</td>
<td>-0.3, 30%, $\frac{16}{50}$, 0.33, 0.3</td>
<td>11a</td>
<td>$400$</td>
<td></td>
</tr>
<tr>
<td>3a</td>
<td>0</td>
<td>11b</td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>3b</td>
<td>3</td>
<td>12a</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>4a</td>
<td>$\frac{\pi}{5}$, $\frac{9}{\sqrt{3}}$, $\sqrt{5}$</td>
<td>12b</td>
<td>Octagon</td>
<td></td>
</tr>
<tr>
<td>4b</td>
<td>-8, 125</td>
<td>13a</td>
<td>$h = 8$</td>
<td></td>
</tr>
<tr>
<td>4c</td>
<td>$\sqrt{8}$</td>
<td>13b</td>
<td>96cm$^3$</td>
<td></td>
</tr>
<tr>
<td>5a</td>
<td>$x \leq 9$</td>
<td>14a</td>
<td>$(15x + y - 1)$cm</td>
<td></td>
</tr>
<tr>
<td>5b</td>
<td>7</td>
<td>14b</td>
<td>$67\frac{1}{2}$cm</td>
<td></td>
</tr>
<tr>
<td>6ai</td>
<td>$2^3 \times 7$</td>
<td>14c</td>
<td>Isosceles triangle or Acute-angled triangle.</td>
<td></td>
</tr>
<tr>
<td>6a(ii)</td>
<td>14</td>
<td>15ai</td>
<td>$12$</td>
<td></td>
</tr>
<tr>
<td>6b</td>
<td>43</td>
<td>15b</td>
<td>140</td>
<td></td>
</tr>
<tr>
<td>7a</td>
<td>$3x - 6$</td>
<td>15b</td>
<td>$8.50$</td>
<td></td>
</tr>
<tr>
<td>7b</td>
<td>$3x - 3$</td>
<td>16a</td>
<td>$4x - 6y - 2$</td>
<td></td>
</tr>
<tr>
<td>8a</td>
<td>$a^2 + ab$</td>
<td>16b(i)</td>
<td>$\frac{3x - 5y}{2}$</td>
<td></td>
</tr>
<tr>
<td>8b</td>
<td>$5xy^2(x - 4)$</td>
<td>16b(ii)</td>
<td>$11x - 45$</td>
<td></td>
</tr>
</tbody>
</table>

**9a** Front View  
Top View

<table>
<thead>
<tr>
<th>9b</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>10a</th>
<th></th>
<th>17a</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>17b</td>
<td>81°</td>
</tr>
<tr>
<td></td>
<td></td>
<td>17d</td>
<td>5.4 cm</td>
</tr>
<tr>
<td>Qn</td>
<td>Answer</td>
<td>Marks</td>
<td>Remarks</td>
</tr>
<tr>
<td>----</td>
<td>--------</td>
<td>-------</td>
<td>---------</td>
</tr>
<tr>
<td>1a</td>
<td>$\sqrt{\frac{9.3}{26.9}}$</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$= \sqrt{\frac{9}{27}}$</td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$= 1$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2a</td>
<td>149,450</td>
<td>B1</td>
<td></td>
</tr>
<tr>
<td>2b</td>
<td>$-0.3, 30%, \frac{16}{50}, 0.33, 0.3$</td>
<td>B1</td>
<td></td>
</tr>
<tr>
<td>3a</td>
<td>0</td>
<td>B1</td>
<td></td>
</tr>
<tr>
<td>3b</td>
<td>3</td>
<td>B1</td>
<td></td>
</tr>
<tr>
<td>4a</td>
<td>$\frac{\pi}{5}, \frac{9}{\sqrt{3}}, \sqrt{5}$</td>
<td>B1</td>
<td></td>
</tr>
<tr>
<td>4b</td>
<td>$-8, 125$</td>
<td>B1</td>
<td></td>
</tr>
<tr>
<td>4c</td>
<td>$\sqrt{8}$</td>
<td>B1</td>
<td></td>
</tr>
<tr>
<td>5a</td>
<td>$-2x \geq -27 + x$</td>
<td>M1</td>
<td>Award M1 if student wrote $27 \geq 3x$ instead</td>
</tr>
<tr>
<td></td>
<td>$-3x \geq -27$</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$x \leq \frac{-27}{-3}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$x \leq 9$</td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td>5b</td>
<td>7</td>
<td>B1</td>
<td></td>
</tr>
<tr>
<td>6ai</td>
<td>$56 = 2^3 \times 7$</td>
<td>B1</td>
<td></td>
</tr>
<tr>
<td>6a(ii)</td>
<td>$n = 2 \times 7$</td>
<td>B1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$= 14$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6b</td>
<td>LCM = $2 \times 3 \times 7$</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$= 42$</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$p = 42 + 1$</td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$= 43$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7a</td>
<td>$3x - 6$</td>
<td>B1</td>
<td></td>
</tr>
<tr>
<td>7b</td>
<td>Kelly's weight = $\frac{3x + 3x - 6}{2}$</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$(3x - 3)$ kg</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average weight = $\frac{3x + 3x - 6 + 3x - 3}{3}$</td>
<td>A1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$(3x - 3)$ kg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8a</td>
<td>$a \times a + 3a \times b - 2b \times a$</td>
<td>B1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$= a^2 + ab$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8b</td>
<td>$5x^2 y^2 - 20xy^2$</td>
<td>B1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$= 5xy^2 (x - 4)$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
9a) Front View

9b) 

9c) Top View

B1 (each)
Award mark for front view even if student did not shade the squares.

Do not award marks if rectangles instead of squares are drawn

B1
Do not accept plane figure

10a)

10b) 

10c)

2\(a + 2 = 22\)

11a) 
Amount spent in June = \(\frac{20}{100} \times 2000\)

= $400

B1

11b) 
July's expenditure = \(\frac{30}{100} \times 2000\)

= $600

Percentage increase in expenditure from June to July

= \(\frac{600 - 400}{400} \times 100\%\)

= 50%

M1

12a) sum of interior angles = 360° \times 3

= 1080°

\((n - 2) \times 180° = 1080°\)

\(n = \frac{1080}{180} + 2\)

= 8

M1

A1

12b) Octagon

B1

13a) 
\(\frac{1}{2} \times (12 + 16) \times h = 112\)

\(h = 8\)

M1

A1
<table>
<thead>
<tr>
<th>13b</th>
<th>Area of parallelogram $A\text{NCD} = 12 \times 8$ [= 96\text{ cm}^2]</th>
<th>M1</th>
<th>A1</th>
</tr>
</thead>
<tbody>
<tr>
<td>14a</td>
<td>Perimeter $= 3x + 2y + 8x - 8y - 2 + 4x + 7y + 1$ [= (15x + y - 1)\text{ cm}]</td>
<td>M1</td>
<td>A1</td>
</tr>
<tr>
<td>14b</td>
<td>Perimeter $= 15(4 \frac{1}{2}) + 1 - 1$ [= 67 \frac{1}{2} \text{ cm}]</td>
<td>B1</td>
<td></td>
</tr>
<tr>
<td>14c</td>
<td>Isosceles triangle or Acute-angled triangle.</td>
<td>B1</td>
<td>Do not award mark for spelling error</td>
</tr>
<tr>
<td>15ai</td>
<td>Amount I need to pay $= 80 \times $0.15 [= $12]</td>
<td>M1</td>
<td>A1</td>
</tr>
<tr>
<td>15a(ii)</td>
<td>Number of photographs $= \frac{$392}{$2.80}$ [= 140]</td>
<td>M1</td>
<td>A1</td>
</tr>
<tr>
<td>15b</td>
<td>Amount saved per photograph [= ($0.15 + $3) - ($0.18 + $2.80)] [= $0.17]</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total amount saved for 50 photographs [= 50 \times $0.17] [= $8.50]</td>
<td></td>
<td>A1</td>
</tr>
<tr>
<td></td>
<td>$Alternative method:$</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Amount cost at Filmhub [= 50 \times ($0.15 + $3)] [= $157.50]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Amount cost at Picturehub [= 50 \times ($0.18 + $2.80)] [= $149]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total amount saved [= $157.50 - $149] [= $8.50]</td>
<td></td>
<td>A1</td>
</tr>
<tr>
<td>16a</td>
<td>$5x - 2y - (2 + x + 4y)$ [= 5x - 2y - 2 - x - 4y] [= 4x - 6y - 2]</td>
<td>M1</td>
<td>A1</td>
</tr>
<tr>
<td>16bi</td>
<td>$- \frac{x}{2} + 3y - 2(4y - x) = - \frac{x}{2} + 3y - 8y + 2x$ [= \frac{3x}{2} - 5y]</td>
<td>M1</td>
<td>Do not accept $\frac{1}{2}x - 5y$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>16bii</td>
<td>( \frac{3(x-3)}{2} - \frac{2x}{5} = \frac{15x - 45 - 4x}{10} )</td>
<td>M1</td>
<td>A1</td>
</tr>
<tr>
<td></td>
<td>( = \frac{11x - 45}{10} )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17a</td>
<td>Refer to the last page.</td>
<td>B1</td>
<td>(BC)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B1</td>
<td>(CD)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B1</td>
<td>(perpen. Bisector)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B1</td>
<td>(Angle Bisector)</td>
</tr>
<tr>
<td>17b</td>
<td>81°</td>
<td>B1</td>
<td>Accept 81° ± 1°</td>
</tr>
<tr>
<td>17d</td>
<td>5.4 cm</td>
<td>B1</td>
<td>Accept (5.4 ± 0.1) cm</td>
</tr>
</tbody>
</table>
END-OF-YEAR EXAMINATION 2015
SECONDARY 1 EXPRESS
MATHEMATICS PAPER 2

Date: 2 Oct 2015
Duration: 1 h 30 min

**Additional Materials:**
5 sheets of Writing Paper
1 sheet of Graph Paper

---

**READ THESE INSTRUCTIONS FIRST**

Write your name, class and index number 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 paper clips, glue or correction tape/liquid.

Answer **ALL** questions.

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

If working is needed for any question it must be shown in the space below the question.

Omission of essential working will result in loss of marks.

The total of the marks for this paper is 60

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.

**Set by:** Mdm Hayati

**Vetted by:** Ms Goh Lay Ching
Answer all the questions.

1. In an election, 87% of the people who were eligible to vote cast their votes.

There were 3 candidates in the election.

The table below illustrates the number of votes received by each candidate.

<table>
<thead>
<tr>
<th>Candidates</th>
<th>Number of votes received</th>
</tr>
</thead>
<tbody>
<tr>
<td>Candidate X</td>
<td>( x )</td>
</tr>
<tr>
<td>Candidate Y</td>
<td>49 938</td>
</tr>
<tr>
<td>Candidate Z</td>
<td>21 402</td>
</tr>
</tbody>
</table>

(a) The number of votes for the 3 candidates, X, Y, Z, were in the ratio 4 : 7 : 3.
Calculate the value of \( x \). \[2\]

(b) Calculate the total number of people who were eligible to vote. \[2\]

(c) Jane drew a pictogram to represent the results of the election.

<table>
<thead>
<tr>
<th>Candidate X</th>
<th>[Diagram of votes]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Candidate Y</td>
<td>[Diagram of votes]</td>
</tr>
<tr>
<td>Candidate Z</td>
<td>[Diagram of votes]</td>
</tr>
</tbody>
</table>

\( \Box \) represents 7000 votes

(i) Explain why the pictogram may be considered misleading. \[1\]

(ii) Amy wants to represent the data using a pie chart instead.

Explain why using a pie chart is a better representation of the data? \[1\]
2. (a) In the diagram, the line $AB$ is parallel to $CED$.\[\angle CEF = 125^\circ \text{ and } \angle EFD = 72^\circ.\]

![Diagram of AB parallel to CED with angles labeled]

Calculate

(i) $\angle EDF$ \[1\]

(ii) reflex $\angle ABD$ \[2\]

(b) In the diagram $TSR$, $TPU$ and $PQR$ are straight lines.\[\angle PTS = 56^\circ \text{ and } \angle TSQ = 114^\circ.\]

Find the value of $m + n$. \[2\]

![Diagram of TSR, TPU, and PQR with angles labeled]

3. Shirley opened a saving account by investing $2400. The account pays simple interest at the rate of 4.8% per year.

(a) Calculate the total amount in Shirley's account after 3 years. \[2\]

(b) Karen deposited $P$ in her saving account. This account pays simple interest at the rate of 4% per year. At the end of 3 years, the amount of interest Karen received is twice as much as the interest Shirley received.

Calculate the value of $P$. \[3\]
4 (a) A submarine is 68 m below sea level.

(i) A jet fighter which is 354 m above sea level dropped a bomb to hit the submarine.

Find the vertical distance travelled by the bomb. [1]

(ii) A falcon is midway between the submarine and the jet fighter.

Find the distance of the falcon above sea level. [2]

(b) A rectangular room measures 6 m by 5.5 m.
A contractor wants to tile the floor with identical square tiles to fit the room.

(i) Find the largest possible length of each tile. [2]

(ii) Find the maximum number of tiles needed. [1]

5 (a) Evaluate

\[ \sqrt{7^2 + 2 \times (-8.2) \times \frac{3}{4}}, \]
giving your answer correct to 2 significant figures. [2]

(b) Solve

(i) \( \frac{1}{3} (x + 6) = 3 - (2 - x), \) [2]

(ii) \( \frac{10}{2x + 5} - 3 = 0. \) [2]
Jessie bought a few books during her trip to Melbourne. The diagram below shows the receipt issued by the book store. Some of the printouts on the receipt have faded and they are indicated by the black boxes. You have to help Jessie recover the details of her purchases.

All purchases are made in Australian Dollar (AUD).

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QTY</th>
<th>PRICE AUD</th>
<th>DISC AUD</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>ART OF CHARLIE CHAN</td>
<td>1</td>
<td>29.90</td>
<td></td>
<td>29.90</td>
</tr>
<tr>
<td>YOU SAY, I SAY</td>
<td>1</td>
<td>15.40</td>
<td></td>
<td>11.55</td>
</tr>
<tr>
<td>STYLISTICS</td>
<td>1</td>
<td>30.80</td>
<td>15.40</td>
<td>15.40</td>
</tr>
</tbody>
</table>

[Total Discount = 19.25 ]

ITEMS PURCHASED: 3
TOTAL AUD 93.25
10% GST INCLUDED IN TOTAL
27/8/2015 17:19 001 Slip: 123456789
TEMP100001 Trans: 465123
You were served by Jasmina DAVIS

(a) Find total amount, in AUD, in Jessie’s receipt. [1]
(b) Find the percentage discount given to the book “You Say, I Say”. [2]
(c) The total amount is inclusive of 10% GST. Calculate the GST amount, in AUD. [2]
(d) On 27 Aug 2015 the rate of exchange between Australian Dollar (AUD) and Singapore Dollar (SGD) was 1 AUD = 1.18 SGD. Calculate the total amount of the purchases in SGD. [1]
(e) Jessie claims that the original price of the book “Stylistics” is 50% more than the book “You Say, I Say”. Do you agree with Jessie? Justify your answer with clear working. [2]
(a) During the 2015 SEA Games, Singapore national swimmer Quah Zheng Wen set a new national record of 25.27 s in the 50 m backstroke event.

Express his speed in km/h, giving your answer correct to 2 decimal places. \[ \text{[2]} \]

(b) Kelly makes a trip from office A to office B for a meeting. The distance between office A and office B is 250 km.

(i) Kelly travels \( x \) km for the first part of her trip at an average speed of 60 km/h before she stops to have her lunch.

Write down an expression, in terms of \( x \), for the time taken, in hours, to travel the first part of her trip. \[ \text{[1]} \]

(ii) After her lunch, Kelly continues the second part of her trip, travelling the remaining distance at an average speed of 80 km/h to office B.

Write down an expression, in terms of \( x \), for the time taken, in hours, to travel the second part of her trip. \[ \text{[1]} \]

(iii) Given that the total time taken for the whole trip is \( 3 \frac{1}{2} \) hours, form an equation in \( x \) and solve it. \[ \text{[3]} \]

(iv) Find the time taken, in hours, for the second part of her trip. \[ \text{[1]} \]
8  (a) The diagram shows a triangle $ABC$. 
$A$ is $(-4, 6)$, $B$ is $(-1, 4)$ and $C$ is $(-1, 0)$.

\[ \begin{array}{c}
\text{$A$ ($-4, 6$)} \\
\text{$B$ ($-1, 4$)} \\
\text{$C$ ($-1, 0$)}
\end{array} \]

(i) Write down the gradient of the line $AB$. [1]

(ii) $ABDC$ is a parallelogram. 
Write down the coordinates of point $D$. [1]

(iii) A point $E$ lies on the $x$-axis such that triangle $EBC$ has the same area as triangle $ABC$. 
Write down one possible coordinates of the point $E$. [1]

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

(i) The variables $x$ and $y$ are connected by the equation $2x + y = 3$.
Some corresponding values of $x$ and $y$ are given in the table below.

<table>
<thead>
<tr>
<th>$x$</th>
<th>$-2$</th>
<th>0</th>
<th>1</th>
<th>$p$</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y$</td>
<td>7</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>$-5$</td>
</tr>
</tbody>
</table>

Find the value of $p$. [1]

(ii) Using a scale of 2 cm to 1 unit on $x$-axis and 1 cm to 1 unit on $y$-axis, plot the points in the table. 
Draw and label clearly the graph $2x + y = 3$. [2]

(iii) On the same axes, draw the graph $y = -2$.
Write down the $x$-coordinate of the point where the two graphs intersect. [2]
9 The diagram shows a solid prism whose cross-section is a triangle \(ABC\). \(AC = 24\) cm, \(BX = 15\) cm and \(AD = 50\) cm.

![Diagram of a prism with dimensions labeled]

[Take \(\pi = 3.142\)]

(a) Find the volume of the prism. \([2]\)

(b) The solid prism was melted and recast into 5 identical cylindrical solids with radius 6 cm and height \(h\) cm.
One such cylindrical solid is shown in the diagram below.

![Diagram of a cylinder with dimensions labeled]

Show that the height, \(h\), of each cylindrical solid, when rounded to the nearest whole number, is 16 cm. \([2]\)

(c) (i) Kevin wanted to paint the external surfaces of the 5 cylindrical solids using spray paint.

Using the value of \(h\) in part (b), find the total area of the surfaces to be painted.
Leave your answer in terms of \(\pi\). \([2]\)

(ii) One can of spray paint covers an area of 600 cm\(^2\).

Given that a can of spray paint costs $5.50, calculate the amount of money Kevin would have to spend on painting. \([2]\)

END OF PAPER
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1(a)</td>
<td>$x = 28,536$</td>
<td>7(a)</td>
</tr>
<tr>
<td>1(b)</td>
<td>Total number of people eligible to vote = 114,800</td>
<td>7(b)(i)</td>
</tr>
<tr>
<td>1(c)(i)</td>
<td>The symbols to represent the number of votes are unequal in size. The pictogram seems to show that Candidate Y received a lot more votes than the actual number of votes.</td>
<td>7(b)(ii)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7(b)(iii)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1(c)(ii)</td>
<td>Pie chart is able to show proportion of each candidate in comparison with the total number of votes.</td>
<td>7(b)(iv)</td>
</tr>
<tr>
<td>2(a)(i)</td>
<td>$\angle EDF = 53^\circ$</td>
<td>8(a)(i)</td>
</tr>
<tr>
<td>2(a)(ii)</td>
<td>Reflex $\angle ABD = 233^\circ$</td>
<td>8(a)(ii)</td>
</tr>
<tr>
<td>2(b)</td>
<td>$m + n = 170$</td>
<td>8(a)(iii)</td>
</tr>
<tr>
<td>3(a)</td>
<td>Total amount = $2745.60</td>
<td>8(b)(i)</td>
</tr>
<tr>
<td>3(b)</td>
<td>$P = $5760</td>
<td>8(b)(ii)</td>
</tr>
<tr>
<td>4(a)(i)</td>
<td>Vertical distance = 422 m</td>
<td></td>
</tr>
<tr>
<td>4(a)(ii)</td>
<td>Dist above sea level = 143 m</td>
<td></td>
</tr>
<tr>
<td>4(b)(i)</td>
<td>Largest length = 50 cm</td>
<td></td>
</tr>
<tr>
<td>4(b)(ii)</td>
<td>Max number of tiles = 132</td>
<td></td>
</tr>
<tr>
<td>5(a)</td>
<td>6.1 (correct to 2 sig fig)</td>
<td></td>
</tr>
<tr>
<td>5(b)(i)</td>
<td>$x = \frac{1}{2}$</td>
<td></td>
</tr>
<tr>
<td>5(b)(ii)</td>
<td>$x = -\frac{5}{6}$</td>
<td></td>
</tr>
<tr>
<td>6(a)</td>
<td>Total amount = 56.85 AUD</td>
<td></td>
</tr>
<tr>
<td>6(b)</td>
<td>$%$ discount = 25%</td>
<td></td>
</tr>
<tr>
<td>6(c)</td>
<td>GST = 5.17 AUD</td>
<td></td>
</tr>
<tr>
<td>6(d)</td>
<td>67.08 SGD</td>
<td></td>
</tr>
<tr>
<td>6(e)</td>
<td>I don’t agree with Jessie’s claim. If “Stylistics” is 50% more than “You Say, I Say” then its price should be $150 \times 15.40 = 2310$ AUD and not 30.80 AUD. OR If “Stylistics” is 50% more than “You Say, I Say” then its price should be $15.40 \times 100% = 100%$ more than the price of “You Say, I Say”.</td>
<td>8(b)(iii)</td>
</tr>
<tr>
<td>8(a)</td>
<td>Volume of prism = 9000 cm$^3$</td>
<td></td>
</tr>
<tr>
<td>9(b)</td>
<td>$\pi \times 6^2 \times h = 1800$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$h = \frac{1800}{36\pi} = 16\text{ cm}$</td>
<td></td>
</tr>
<tr>
<td>9(c)(i)</td>
<td>Total surface area = 1320$\pi$</td>
<td></td>
</tr>
<tr>
<td>9(c)(ii)</td>
<td>Cost = $38.50</td>
<td></td>
</tr>
</tbody>
</table>
End-of-Year Examination 2015 Marking Scheme  
See 1 Express Mathematics Paper 2

<table>
<thead>
<tr>
<th>Question</th>
<th>Scheme</th>
<th>Methodology</th>
<th>Mark Scheme</th>
<th>Mark</th>
<th>Total Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (a)</td>
<td></td>
<td>$x = \frac{49938}{7} \times 4$</td>
<td>M1</td>
<td>A1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$= 28536$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b)</td>
<td></td>
<td>Total number of votes received</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$= 28536 + 49938 + 21402$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$= 99876$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>No of ppl eligible to vote</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$= \frac{99876}{87} \times 100$</td>
<td>M1</td>
<td>A1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$= 114800$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c) (i)</td>
<td></td>
<td>The symbols to represent the number of votes are unequal in size. The pictogram seems to show that Candidate Y received a lot more votes than the actual number of votes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(ii)</td>
<td>Using pie chart is a better representation as pie chart is able to show proportion of each candidate in comparison with the total number of votes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 (a)</td>
<td>(i)</td>
<td>$\angle EDF = 125^\circ - 72^\circ$</td>
<td>B1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$= 53^\circ$ (exterior $\angle$ of $\Delta$)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(ii)</td>
<td></td>
<td>$\angle ABD = 180^\circ - 53^\circ$</td>
<td>M1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$= 127^\circ$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reflex $\angle ABD = 360^\circ - 127^\circ$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$= 233^\circ$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b)</td>
<td></td>
<td>$180 - n + 180 - m + 56 + 114 = 360$</td>
<td>M1</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$170 - n - m = 0$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$m + n = 170$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 (a)</td>
<td></td>
<td>Interest $= 2400 \times \frac{4.8}{100} \times 3$</td>
<td>M1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$= $345.60$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total amount $= 2400 + 345.60$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$= $2745.60$</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Holy Innocents' High School

Secondary 1 Express  
Mathematics Paper2
<table>
<thead>
<tr>
<th>Exercise No.</th>
<th>Question</th>
<th>Marking Points</th>
<th>Miami</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 (b)</td>
<td>$P \times \frac{4}{100} \times 3 = 2(345.60)$</td>
<td>M1</td>
<td>M1</td>
<td>M1 for forming equation correctly.</td>
</tr>
<tr>
<td></td>
<td>$P = \frac{691.2 \times 100}{12}$</td>
<td>M1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$= 55760$</td>
<td>A1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4 (a) (i)</td>
<td>Vertical distance $= 354 - (-68)$</td>
<td>B1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$= 422$ m</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(ii)</td>
<td>Dist above sea level $= 354 - \left( \frac{422}{2} \right)$</td>
<td>M1</td>
<td></td>
<td>M1 for $\left( \frac{422}{2} \right)$</td>
</tr>
<tr>
<td></td>
<td>$= 143$ m</td>
<td>A1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>(b) (i)</td>
<td>$6 \text{ m} = 600 \text{ cm}$</td>
<td>M1</td>
<td></td>
<td>M1 for prime factorisation</td>
</tr>
<tr>
<td></td>
<td>$= 2^3 \times 3 \times 5^2$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$5.5 \text{ m} = 550 \text{ cm}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$= 2 \times 5^2 \times 11$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HCF $= 2 \times 5^2 = 50 \text{ cm}$</td>
<td>A1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Largest length $= 50 \text{ cm}$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(ii)</td>
<td>No of tiles $= \frac{600 \times 550}{50 \times 50}$</td>
<td>B1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$= 12 \times 11$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$= 132$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 (a)</td>
<td>$6.058$</td>
<td>B1</td>
<td>B1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$\approx 6.1$ (correct to 2 sig fig)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) (i)</td>
<td>$\frac{1}{3}x + 2 = 3 - 2 + x$</td>
<td>M1</td>
<td></td>
<td>M1 for correct expansion</td>
</tr>
<tr>
<td></td>
<td>$\frac{2}{3}x = 1$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$x = 1 \frac{1}{2}$</td>
<td>A1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>(ii)</td>
<td>$10 = 3(2x + 5)$</td>
<td>M1</td>
<td></td>
<td>M1 for eliminating the denominator</td>
</tr>
<tr>
<td></td>
<td>$10 = 6x + 15$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$x = \frac{5}{6}$</td>
<td>A1</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
### Question 6

<table>
<thead>
<tr>
<th>(a)</th>
<th>Total amount</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(29.90 + 11.55 + 15.40)</td>
</tr>
<tr>
<td></td>
<td>(= 56.85) AUD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(b)</th>
<th>Discount</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(15.40 - 11.55 = 3.85)</td>
</tr>
<tr>
<td></td>
<td>% discount (= \frac{3.85}{15.4} \times 100% \approx 25%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(c)</th>
<th>GST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(\frac{10}{110} \times 56.85)</td>
</tr>
<tr>
<td></td>
<td>(= 5.17) AUD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(d)</th>
<th>1 AUD = 1.18 SGD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>56.85 AUD = (56.85 \times 1.18) SGD</td>
</tr>
<tr>
<td></td>
<td>(= 67.083)</td>
</tr>
<tr>
<td></td>
<td>(\approx 67.08) SGD</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(e)</th>
<th>50% more than “You Say, I Say”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(\frac{150}{100} \times 15.40)</td>
</tr>
<tr>
<td></td>
<td>(= 23.10) AUD</td>
</tr>
</tbody>
</table>

The price of “Stylistics” is 30.80 AUD not 23.10 AUD. Therefore the price of “Stylistics” is not 50% more than “You Say, I Say”. I don't agree with Jessie's claim.

### Question 7

<table>
<thead>
<tr>
<th>(a)</th>
<th>Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(\frac{50}{25.27}) m/s</td>
</tr>
<tr>
<td></td>
<td>(= \frac{50 \times 3600}{25.27 \times 1000})</td>
</tr>
<tr>
<td></td>
<td>(= 7.123)</td>
</tr>
<tr>
<td></td>
<td>(\approx 7.12) km/h (correct to 2 dp)</td>
</tr>
</tbody>
</table>

### Question 7 (b)

<table>
<thead>
<tr>
<th>(i)</th>
<th>Time taken</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(\frac{x}{60})</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(ii)</th>
<th>Time taken</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(\frac{250-x}{80})</td>
</tr>
</tbody>
</table>

| (iii) | \(\frac{x}{60} + \frac{250-x}{80} = \frac{3}{2}\) |
|       | \(4x + 3(250-x) = \frac{3}{2}\) |
|       | \(4x + 750 - 3x = 840\) |
|       | \(x = 90\) |

M1 for forming correct equation
7 (iv) \[ \text{Time} = \frac{250 - 90}{80} = 2 \, \text{h} \] B1 1

8 (a) (i) Gradient of \( AB = \frac{2}{3} \) B1 1
(ii) \( D(2, -2) \) B1 1
(iii) \( E(-4, 0) \) or \( E(2, 0) \) B1 1 B1 for either one of the coordinates

(b) (i) \[ p = \frac{1}{2} \] B1 1
(ii) Draw axes and plot all points correctly Draw straight line graph through all points P1 C1 2

\[
\begin{array}{c}
\text{y} \\
\hline
7 & 6 & 5 & 4 & 3 & 2 & 1 & 0 & 1 & 2 & 3 & 4 & x \\
-2 & -1 & 0 & 1 & 2 & 3 & 4 & -2 & -1 & 0 & 1 & 2 & 3 & 4 & 5
\end{array}
\]

\[
2x + y = 3
\]

(iii) The line \( y = -2 \) drawn correctly. B1
\[ x = 2 \frac{1}{2} \] B1 2

9 (a) Cross sectional area = \( \frac{1}{2} \times 24 \times 15 \) = 180 cm\(^2\) M1
Volume = 180 \times 50 = 9000 cm\(^3\) A1 2

(b) Volume of each solid = \( \frac{9000}{5} \) = 1800 M1
\[ \pi \times 6^2 \times h = 1800 \]
\[ \frac{1800}{36\pi} = 15.91 \]
\( \approx 16 \) (nearest whole number) A1 2
<table>
<thead>
<tr>
<th>Question No.</th>
<th>Marking Point</th>
<th>Mark</th>
<th>Answer Mark</th>
<th>Remarks</th>
</tr>
</thead>
</table>
| 9 (c) (i)   | Total surface area  
= \(5\left(2 \times \pi \times 6^2 + 2 \times \pi \times 6 \times 16\right)\)  
= \(5\left(72\pi + 192\pi\right)\)  
= 1320\pi  | M1 |   | M1 for correct area of 2 circles or curved surface area |
|             | No of bottle  
= \(\frac{1320\pi}{600}\)  
= 6.91  
\(\approx 7\) bottles  | M1 |   |  |
|             | Cost  
= 7 \times 5.5  
= $38.50 | A1 | 2 |  |
READ THESE INSTRUCTIONS FIRST

INSTRUCTIONS TO CANDIDATES

1. Write your name, register number and class in the spaces at the top of this page.
2. Answer all the questions.
3. Write your answers and working in the spaces provided on the question paper.
4. All working must be written in dark blue or black ink.
5. Omission of essential working will result in loss of marks.
6. Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.
7. The use of calculators is NOT allowed for this paper.

INFORMATION FOR CANDIDATES

1. The number of marks is given in brackets [ ] at the end of each question or part question.
2. The total number of marks for this paper is 50.
3. You are reminded of the need for clear presentation in your answers.

This document consists of 10 printed pages.
Setter: GT/CP
NANYANG GIRLS' HIGH SCHOOL
1. Arrange the following in ascending order:

   $0.21 , \frac{1}{5} , \frac{21}{100} , -0.21 , -0.2\bar{1}$

   Answer: ____________________________________________ [2]

2. Alex reads $\frac{3}{5}$ of a book on Monday and $\frac{1}{3}$ of the remaining pages on Tuesday.

   If he has 64 pages left to read after Tuesday, how many pages does the book have?

   Answer: ________________ pages [2]
3. Evaluate the following:

(a) \[ 2 - 3[5 - (-8)] \times 7 - (6 + 4) \]

(b) \[ \frac{5}{2} + \frac{2}{2} \left( -\frac{1}{4} \right)^2 + \frac{2}{3} \left( -\frac{14}{9} \right) \]

Answer: (a) ______________________ [2]

(b) ______________________ [2]

3

[Turn Over]
4. Even numbers are arranged in a table comprising three columns C1 to C3 for the 1st to 4th rows as shown below:

<table>
<thead>
<tr>
<th></th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st row</td>
<td>2</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>2nd row</td>
<td>8</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>3rd row</td>
<td>14</td>
<td>16</td>
<td>18</td>
</tr>
<tr>
<td>4th row</td>
<td>20</td>
<td>22</td>
<td>24</td>
</tr>
<tr>
<td>5th row</td>
<td>a</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>n th row</td>
<td>...</td>
<td>k</td>
<td>...</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>100 th row</td>
<td>...</td>
<td>...</td>
<td>x</td>
</tr>
</tbody>
</table>

(a) Write down the value of *a*.
(b) The number *k* is in the *n* th row of column C2. Write down and simplify an equation connecting *n* and *k*.
(c) The number *x* is in the 100 th row of column C3. Calculate the value of *x*.

Answer: (a) *a* = 
(b) 
(c) *x* =
5. (a) Express 48 as the product of its prime factors.

(b) What is the smallest natural number, \( n \), for which \( 48n \) is a multiple of 315?

(c) Find the smallest value of \( m \) such that the product \( 48m \) is a perfect cube.

(d) Using your result in (c), evaluate \( \sqrt[3]{48m} \).

Answer: (a) 48 = \______________ \[1\]

(b) \( n = \______________ \) \[2\]

(c) \( m = \______________ \) \[2\]

(d) \______________ \[1\]

[Turn Over]
6. (a) Estimate the value of \( \frac{5.112 \times 39.998}{0.199} \) correct to 1 significant figure. Show all workings clearly.

(b) Use your result in (a) to estimate the value of \( \frac{0.5112 \times 0.39998}{1.99} \).

(c) Using as much of the information below as necessary, evaluate \( \sqrt{0.00486} \).
   \[ \sqrt{48.6} = 6.97 \quad \sqrt{4.86} = 2.20 \]

Answer: (a) __________________________ [2]

(b) __________________________ [2]

(c) __________________________ [2]
7. In the diagram, $ABDF$ is a parallelogram. $GJ$ is a straight line parallel to $AB$ and $FD$ that cuts $DB$ at $C$. $BE$ is a straight line that cuts $GJ$ at $H$. $\triangle BCJ$ is an isosceles triangle with $BC = JC$. $\angle AGH = 80^\circ$ and $\angle BED = 50^\circ$. Calculate the following angles, stating your reasons clearly.

(a) $\angle BDE$
(b) $\angle BHG$
(c) $\angle BJC$

Answer: (a) $\angle BDE = \:\:\\$ [2]
(b) $\angle BHG = \:\:\\$ [2]
(c) $\angle BJC = \:\:\\$ [2]
8. Expand and simplify each of the following expressions:

(a) \((2x + 3y)^2\)
(b) \(2r[1 - 3s - 2(r - s + 1) - r]\)
(c) \(3(2x - y)(x + y) - (x + 2y)(x - 2y)\)

Answer: (a) \(\quad\)
(b) \(\quad\)
(c) \(\quad\)
9. Factorise the following completely:

(a) \(12u^2 + 9u - 3\)

(b) \(16x^2 - 25\)

(c) \(3ac + ad - 6bc - 2bd\)

Answer: (a) 

(b) 

(c) 

[Turn Over]
10. (a) Simplify the following, giving your answer as a single fraction in its simplest form:

\[ 3 - \frac{2(x - 2)}{3} + \frac{x}{4} \]

(b) Solve \( \frac{3}{x - 4} = \frac{2}{1 + 2x} \).

(c) A company has \( x \) male employees and \( y \) female employees. The average yearly income of 1 employee is $30,000. If the average yearly income of 1 female employee is $\( x - 5000 \), write down an algebraic expression in a single fraction that represents the average yearly income of 1 male employee.

Answer: (a) ________________________ [3]

(b) \( x = \) ________________________ [2]

(c) ________________________ [3]
2015 Sec 1 EOY P1 Marking Scheme

<table>
<thead>
<tr>
<th>No.</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$-0.21, -0.21, \frac{1}{5}, \frac{21}{100}, 0.21$</td>
</tr>
</tbody>
</table>
| 2   | $\frac{1}{3}$ of the remaining $\frac{2}{5}$ of the book = $\frac{2}{15}$  
  By Tuesday, he has read $\frac{3}{5} + \frac{2}{15} = \frac{11}{15}$ of the book.  
  64 pages represents $\frac{4}{15}$ of the book.  
  No. of pages the book has = $64 \div 4 \times 15 = 240$ |
| 3a  | $2 - 3[5 - (-8)] \times 7 - (6 + 4)$  
  = $2 - 3(13) \times 7 - 10$  
  = $2 - 273 - 10$  
  = $-281$ |
| 3b  | $-\frac{5}{2} + 2\left(\frac{1}{4}\right)^2 + \frac{2}{3} \times \left(\frac{-14}{9}\right)$  
  = $-\frac{5}{2} + 2\left(\frac{1}{16}\right) + \frac{2}{3} \times \left(\frac{-9}{14}\right)$  
  = $\frac{19}{8} - \frac{3}{7}$  
  = $\frac{157}{56}$  
  = $-\frac{245}{56}$ |
| 4a  | $a = 26$ |
| 4b  | $k = 4 + 6(n - 1)$  
  = $6n - 2$ |
| 4c  | $x = 6 + 6(100 - 1)$  
  = 600  
  Or $x = 100 \times 6 = 600$ |
| 5a  | $48 = 2^4 \times 3$ |
| 5b  | $315 = 3^2 \times 5 \times 7$  
  $n = 3 \times 5 \times 7 = 105$ |
| 5c  | $m = 2^2 \times 3^2 = 36$ |
| 5d  | $\sqrt[4]{88m} = \sqrt[4]{2^4 \times 3^2 \times 2^2 \times 3^2}$  
  = $\frac{1}{2} \times 3 \times 2 \times 3$  
  = $12$ |
| 6a  | $\frac{5.112 \times 39.998}{0.199} \approx \frac{5.1 \times 40}{0.2}$  
  = $\frac{204}{0.2}$  
  = $1020$ |
| 6b  | $0.5112 \times 0.39989$  
  $\frac{1.99}{1.99 \times 10}$  
  $\approx 0.1$ |
| 6c  | $\sqrt{0.00486} = \sqrt{48.6 \times 10000}$  
  = $6.97 \times 100$  
  = 0.0697 |
| 7a  | $\angle GCB = 180^\circ - 80^\circ$ (int $\angle$, $GA \parallel CB$)  
  = $100^\circ$  
  $\angle BDE = 100^\circ$ (corr. opp. $\angle$)  
  $\angle BDE = 100^\circ$ (corr. opp. $\angle$, $GJ \parallel FD$) |
| 7b  | $\angle EHC = 180^\circ - 50^\circ$ ( supp $\angle$)  
  = $130^\circ$  
  $\angle BHC = 130^\circ$ (vert. opp. $\angle$) |
| 7c  | $\angle BCG = \angle BDE = 100^\circ$ (corr. opp. $\angle$, $GJ \parallel FD$)  
  $\angle BJC = 100^\circ + 2$  
  (ext. $\angle$ = sum of opp. int. $\angle$)  
  = $50^\circ$ |
| 8a  | $(2x + 3y)^2$  
  = $4x^2 + 12xy + 9y^2$ |
| 8b  | $2r[1 - 3s - 2(r - s + 1) - r]$  
  = $2r[1 - 3s - 2r + 2s - 2 - r]$  
  = $2r[-1 - s - 3r]$  
  = $-2r - 2rs - 6r^2$ |
| 8c  | $3(2x - y)(x + y) - (x + 2y)(x - 2y)$  
  = $3(2x^2 + 2xy - xy - y^2) - (x^2 - 4y^2)$  
  = $3(2x^2 + xy - y^2) - x^2 + 4y^2$  
  = $6x^2 + 3xy - 3y^2 - x^2 + 4y^2$  
  = $5x^2 + 3xy + y^2$ |
<table>
<thead>
<tr>
<th>Question</th>
<th>Expression</th>
</tr>
</thead>
</table>
| 9a | $12u^2 + 9u - 3$  
$= 3(4u^2 + 3u - 1)$  
$= 3(4u - 1)(u + 1)$  
OR  
$12u^2 + 9u - 3$  
$= (4u - 1)(3u + 3)$  
$= 3(4u - 1)(u + 1)$  |
| 9b | $16x^2 - 25$  
$= (4x)^2 - 5^2$  
$= (4x - 5)(4x + 5)$  |
| 9c | $3ac + ad - 6bc - 2bd$  
$= a(3c + d) - 2b(3c + d)$  
$= (a - 2b)(3c + d)$  |
| 10a | $3 = \frac{2(x - 2)}{3} + \frac{x}{4}$  
$= \frac{36 - 8(x - 2) + 3x}{12}$  
$= \frac{36 - 8x + 16 + 3x}{12}$  
$= \frac{52 - 5x}{12}$  
$= \frac{2}{3}$  |
| 10b | $3 = \frac{2}{x - 4}$  
$1 + 2x$  
$3(2x + 1) = -2(x - 4)$  
$6x + 3 = -2x + 8$  
$8x = 5$  
x $= \frac{5}{8}$  |

10c)  
Total yearly income of all the staff in $\$ = 30000(x + y)$  

Total yearly income of female employees in $\$  
$= y(x - 5000)$  

Total yearly income of male employees in $\$  
$= 30000(x + y) - y(x - 5000)$  
$= 30000x + 30000y - xy + 5000y$  
$= 30000x - xy + 35000y$  

Average yearly income of male employees in $\$  
$= \frac{30000x - xy + 35000y}{x}$
### INSTRUCTIONS TO CANDIDATES

1. Write your name, register number and class in the spaces at the top of this page.
2. Answer all the questions from number 1 to 10 before attempting the Bonus Question number 11.
3. Write your answers and working on the separate writing paper provided.
4. All working must be written in dark blue or black ink.
5. Omission of essential working will result in loss of marks.
6. Write your name, register number and class on each separate sheet of paper that you use and fasten the separate sheets together with the string provided. Do not staple your answer sheets together.
7. Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.
8. The use of calculators is allowed for this paper.

### INFORMATION FOR CANDIDATES

1. The number of marks is given in brackets [ ] at the end of each question or part question.
2. The total number of marks for this paper is 50.
3. You are reminded of the need for clear presentation in your answers.

Parent’s Signature: __________________________ Score: __________________________
1. **Answer the whole of this question on the piece of plain paper provided.**
   Using only a ruler and a pair of compasses, construct
   (a) \( \triangle ABC \) such that \( AB = 12 \text{ cm}, BC = 8 \text{ cm} \) and \( AC = 10 \text{ cm}, \) \[1\]
   (b) the angle bisector of \( \angle BAC, \) \[1\]
   (c) the perpendicular bisector of \( BC, \) \[1\]
   (d) a circle which passes through the vertices \( A, B \) and \( C. \) \[2\]

2. A building has a perimeter of 8 cm, with a gate of width 0.5 cm on a map. If the actual perimeter of the building is 0.56 km,
   (a) find the scale of the map in the form \( 1 : r. \) \[1\]

   A model of the building is made to another scale of \( 1 : 5000. \) Calculate
   (b) (i) the width of the gate in centimetres as represented by the second scale, \[1\]
   (ii) the floor area of the building model in square centimetres if the actual
   floor area of the building is 16 000 \( \text{m}^2. \) \[2\]

3. In 2008, the price of a car was \$45 000. In 2015, the price of the same car is \$85 000.
   (a) Calculate the percentage increase in the price of the car, leaving your answer
   to 1 decimal place. \[2\]

   (b) In 2015, the dealer decides to cut down the price of the car by 5%. Calculate
   the new price of the car. \[2\]

4. (a) In the Lifeskills Camp, 6 litres of milo is given to a class of 30 students as
   supper. Find the additional volume of milo needed for a class of 35 if each
   student is to get the same amount of milo. \[2\]

   (b) A small tap can fill up a tank with water in 5 hours. A big tap can fill up the
   same tank in 3 hours. If both taps were switched on at the same time, how
   long would it take to fill up 2 of such tanks? \[2\]
5. In an octagon, four of the interior angles are $2x^\circ$ each and the other four angles are $(2x+15)^\circ$, $(2x+25)^\circ$, $(2x+35)^\circ$ and $(3x-15)^\circ$ respectively. Find

(a) the value of $x$. 

(b) the size of the smallest exterior angle.

6. Given that $x^2+y^2=26$ and $xy=-5$, evaluate

(a) \( \left(\frac{x-y}{2}\right)^2 \),

(b) $(x+y)^4$.

7. Simplify \( \sqrt{\frac{15x^2y^2}{25x^2}} + \frac{12x + 12y}{2x^2} \times \left(3\frac{x+y}{-2xy}\right)^3 \), giving your answer as a single fraction in its simplest form.

8. Ann’s car can travel $x$ km on each litre of petrol. She travelled $(x+10)$ km on Monday.

(a) Write down, in terms of $x$, the number of litres of petrol she used on Monday.

(b) Given that she travelled $(2x+15)$ km on Tuesday and used 1.25 litres of petrol more on Tuesday than on Monday, form an equation in $x$ and solve it.

(c) Calculate the total distance that she travelled on Monday and Tuesday.

9. | Number of books borrowed | 0 | 1 | 2 | 3 | 4 | 5 |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of students</td>
<td>7</td>
<td>$x$</td>
<td>6</td>
<td>2</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

The table above shows the number of books borrowed by the students of a class.

(a) If the mean is 2.25, form an equation in $x$ and use it to find the value of $x$.

(b) Find the largest possible value of $x$ if the median number of books borrowed is 2.
10. In this question, take $\pi = 3.142$ and leave all your answers to 2 decimal places.

[Volume of a cone with height $h$ and base radius $r$ is $\frac{1}{3} \pi r^2 h$, Curved surface area of cone with slant height $l$ and base radius $r$ is $\pi rl$.]

[Volume and surface area of a sphere with radius $r$ are $\frac{4}{3} \pi r^3$ and $4\pi r^2$ respectively.]

![Figure 1](image1.png)

![Figure 2](image2.png)

**Figure 1** shows a solid object made up of a right cone with height 24 cm, and slant height 25 cm, and a cylinder with diameter 14 cm and height 2 cm. For the solid object in Figure 1, calculate.

(a) (i) the surface area, [2]  
(ii) the volume. [2]

The object in Figure 1 is then melted down to form another solid object as shown in Figure 2. It is made up of a triangular prism and a hemisphere resting at the top of it. The triangular prism has thickness 8 cm and its triangular face has base 14 cm, perpendicular height 24 cm and slant height 25 cm. For the solid object in Figure 2, calculate

(b) (i) the radius of the hemisphere, [3]  
(ii) the total surface area. [3]
Bonus Question

11. Without the use of calculator, evaluate

\[
\frac{1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \frac{1}{5} - \frac{1}{6} + \ldots + \frac{1}{2005} - \frac{1}{2006}}{1 + \frac{1}{2007} + \frac{1}{2 + 2008} + \ldots + \frac{1}{1003 + 3009}}
\]
<table>
<thead>
<tr>
<th></th>
<th>Construction on separate piece</th>
</tr>
</thead>
<tbody>
<tr>
<td>2a</td>
<td>0.560 km = 56 000 cm</td>
</tr>
<tr>
<td></td>
<td>56000 ÷ 8 = 7000</td>
</tr>
<tr>
<td></td>
<td>Scale of map = 1 : 7000</td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>2b</td>
<td>0.5 x 7000 + 5000</td>
</tr>
<tr>
<td></td>
<td>= 0.7 cm</td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>2i</td>
<td>Conversion</td>
</tr>
<tr>
<td></td>
<td>1 cm² = 0.0001 m²</td>
</tr>
<tr>
<td></td>
<td>On the scale model,</td>
</tr>
<tr>
<td></td>
<td>1 : 5000</td>
</tr>
<tr>
<td></td>
<td>1 cm² : 25 000 000 cm²</td>
</tr>
<tr>
<td></td>
<td>Actual floor area of building</td>
</tr>
<tr>
<td></td>
<td>16 000 m² = 160 000 000 cm²</td>
</tr>
<tr>
<td></td>
<td>Floor area of building model = 160 000 000 + 25 000 000</td>
</tr>
<tr>
<td></td>
<td>= 6.4 cm²</td>
</tr>
<tr>
<td>3a</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>85000 - 45000</td>
</tr>
<tr>
<td></td>
<td>45000 x 100</td>
</tr>
<tr>
<td></td>
<td>= 88.9%</td>
</tr>
<tr>
<td>3b</td>
<td>0.95 x 85000</td>
</tr>
<tr>
<td></td>
<td>= $80750</td>
</tr>
<tr>
<td>4a</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Additional volume of milo</td>
</tr>
<tr>
<td></td>
<td>= 35 - 30</td>
</tr>
<tr>
<td></td>
<td>30 x 6</td>
</tr>
<tr>
<td></td>
<td>= 15</td>
</tr>
<tr>
<td>4b</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Small tap fills up 1/5 of the tank in 1 hr</td>
</tr>
<tr>
<td></td>
<td>Big tap fills up 1/3 of the tank in 1 hr</td>
</tr>
<tr>
<td></td>
<td>With both taps switched on,</td>
</tr>
<tr>
<td></td>
<td>1 + 1 = 8</td>
</tr>
<tr>
<td></td>
<td>5 3 15</td>
</tr>
<tr>
<td></td>
<td>of the tank is filled up in 1 hr.</td>
</tr>
<tr>
<td></td>
<td>Time taken to fill up 2 of such tanks</td>
</tr>
<tr>
<td></td>
<td>= 15 ÷ 2</td>
</tr>
<tr>
<td></td>
<td>= 3.75 hrs</td>
</tr>
<tr>
<td>5a</td>
<td>Sum of interior angles of an octagon</td>
</tr>
<tr>
<td></td>
<td>= 180°(8 - 2)</td>
</tr>
<tr>
<td></td>
<td>= 1080°</td>
</tr>
<tr>
<td></td>
<td>1080° = 4 x 2x + 2x + 15° + 2x + 25°</td>
</tr>
<tr>
<td></td>
<td>1080° = 17x + 60°</td>
</tr>
<tr>
<td></td>
<td>17x = 1020°</td>
</tr>
<tr>
<td></td>
<td>x = 60</td>
</tr>
<tr>
<td>5b</td>
<td>Smallest exterior angle =</td>
</tr>
<tr>
<td></td>
<td>180° - [3 x 60° - 15°]</td>
</tr>
<tr>
<td></td>
<td>= 15°</td>
</tr>
<tr>
<td>6a</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>(x - y)²</td>
</tr>
<tr>
<td></td>
<td>= (x² - 2xy + y²) / 4</td>
</tr>
<tr>
<td></td>
<td>= 26 - 2(-5)</td>
</tr>
<tr>
<td></td>
<td>= 26 + 10</td>
</tr>
<tr>
<td></td>
<td>= 9</td>
</tr>
<tr>
<td>6b</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>(x + y)⁴</td>
</tr>
<tr>
<td></td>
<td>= [(x + y)²] / 2</td>
</tr>
<tr>
<td></td>
<td>= (x² + 2xy + y²)³</td>
</tr>
<tr>
<td></td>
<td>= (26 + 2(-5))³</td>
</tr>
<tr>
<td></td>
<td>= 16³</td>
</tr>
<tr>
<td></td>
<td>= 256</td>
</tr>
<tr>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>
| 7  | \[
\frac{16x^2 y^2}{25z^4} \times \frac{12x + 12y}{2x^2 z^2} \times \frac{3(x + y)}{-2xz}
\]
|    | = \[
\frac{4x^5 y \times 2x^3 z^3 \times 27(x + y)³}{5z^2 \times 12(x + y) \times -8x^2 z^2}
\]
|    | = \[
\frac{-9xy(x + y)^2}{20z^2}
\]
### 8a

\[
\text{litres} = \frac{x + 10}{x} + 1.25 = \frac{2x + 15}{x}
\]

\[
\begin{align*}
2.25x + 10 &= 2x + 15 \\
0.25x &= 5 \\
x &= 20
\end{align*}
\]

### 8b

Total dist travelled = \(20 + 10 + 2(20) + 15\) = 85 km

### 9a

\[
\begin{align*}
2.25(x + x = 6 + 2 + 4 + 5) &= x + 12 + 6 + 16 + 25 \\
54 + 2.25x &= x + 59 \\
1.25x &= 5 \\
x &= 4
\end{align*}
\]

### 10a

**Total surface area =**

**Surface area of cone + surface area of cylinder + base area**

Total surface area =

\[
3.142 \times 7 \times 25 + 3.142 \times 14 \times 2 + 3.142 \times 7 \times 7
\]

\[
= 549.85 + 87.976 + 153.958
\]

\[
= 791.78 \text{ cm}^2
\]

### 10ai

Total vol = vol of cone + vol of cylinder

Total Volume

\[
= \frac{1}{3} \times 3.142 \times 7 \times 7 \times 24 + 3.14 \times 7 \times 7 \times 2
\]

\[
= 1231.664 + 307.916
\]

\[
= 1539.58 \text{ cm}^3
\]

### 10bi

Vol of hemisphere + vol of prism = total vol from (ai)

Let the radius of the hemisphere be \(r\)

\[
\left(\frac{1}{2}\right)(4)(3.142)r^3 + \left(\frac{1}{2}\right)(14)(24)(8) = 1539.58
\]

\[
\left(\frac{2}{3}\right)(3.142)r^3 + 1344 = 1539.58
\]

\[
\left(\frac{2}{3}\right)(3.142)r^3 = 195.58
\]

\[
r^3 = 93.37046
\]

\[
r = 4.54 \text{ (to 3 sf)}
\]

### 10bii

Surface area of hemisphere

\[
= \left(\frac{1}{2}\right)(4)(3.142)(4.54)^2
\]

\[
= 129.52 \text{ cm}^2
\]

Surface area of top of pyramid without the area covered by hemisphere

\[
= (14 \times 8) - (3.142)(4.54^2)
\]

\[
= 112 - 64.762
\]

\[
= 47.238 \text{ cm}^2
\]

Surface area of the triangular faces

\[
= \left(\frac{1}{2}\right)(14)(24)(2) + (2)(8)(25)
\]

\[
= 336 + 400
\]

\[
= 736 \text{ cm}^2
\]

Total surface area

\[
= 736 + 47.238 + 129.52
\]

\[
= 912.76 \text{ cm}^2 \text{ (to 2 dp)}
\]
11. \[
\frac{\frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5} + \frac{1}{6} + \cdots + \frac{1}{2005} + \frac{1}{2006}}{1 + \frac{1}{2007} + \frac{1}{2 + 2008} + \cdots + \frac{1}{1003 + 3009}}
\]
\[
= \frac{1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \cdots + \frac{1}{2005} + \frac{1}{2006} \cdot \frac{1}{2008} + \frac{1}{2009 + \cdots + 4012}}{2 + \frac{1}{2005} \cdot \frac{1}{2006} \cdot \frac{1}{1 + \frac{1}{2005} + \frac{1}{2 + \frac{1}{3} + \cdots + \frac{1}{1003}}}.
\]
\[
= \frac{1 + \frac{1}{1004} + \frac{1}{1005} + \cdots + \frac{1}{2006}}{1 + \frac{1}{2004} + \frac{1}{1005} + \cdots + \frac{1}{2006}}
\]
\[
= 2.
\]
READ THESE INSTRUCTIONS FIRST

Write your name, class and index 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, 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 are NOT ALLOWED in this paper.

Give answers in degrees to one decimal place.
For \( \pi \), use 3.142 unless the question requires the answer in terms of \( \pi \).

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

\[
\begin{array}{c}
\text{50}
\end{array}
\]

This question paper consists of 10 printed pages.

Setter: Mr Ngoh Kia Joon
Vetter: Miss Zoe Pow

\[\text{Turn over}\]

We Nurture Students to Think, Care and Lead with P.R.I.D.E.
Answer all the questions.

1. Showing your working clearly, evaluate $5 - \left( \frac{2}{0.1} - 14 \right)^2$.

Answer ........................................... [2]

2. Represent the numbers $-2.5, \sqrt{4}, 0.7$ and $4 \frac{1}{5}$ on the number line below.

Answer

[2]

3. (a) (i) Express 300 as a product of its prime factors.

Answer (a)(i) $300 =$ ........................................... [2]

(ii) Given that $300k$ is a perfect square, write down the smallest possible integer value of $k$.

Answer (a)(ii) $k =$ ........................................... [1]
(b) Farmer Sam has 54 apples, 132 oranges and 30 pears. He wishes to distribute each type of fruits equally into boxes.

Find the largest number of boxes that farmer Sam needs.

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

4 (a) Express \( \frac{4}{25} \) as a percentage.

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

(b) Jonathan spent 24 minutes running in a 2-hour gym session.

Express the time spent running as a percentage of the total time spent in the gym session.

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

5 Simplify the following expressions

(a) \( 4(2a - 3) - 11(2 + a) \),

Answer (a) .................................... [2]
(b) \[
\frac{2(5m + n)}{5} - \frac{2m - n}{2}.
\]

\[\text{Answer (b)} \quad \text{[3]}\]

6. The following diagram shows a series of figures formed using dots.

\[
\begin{array}{|c|c|c|c|}
\hline
\text{Figure 1} & \text{Figure 2} & \text{Figure 3} & \text{Figure 4} \\
\hline
\cdot & \cdot & \cdot & \cdot \\
\cdot & \cdot & \cdot & \cdot \\
\cdot & \cdot & \cdot & \cdot \\
\cdot & \cdot & \cdot & \cdot \\
\hline
\end{array}
\]

(a) Draw Figure 5 in the answer space below.

\[\text{Answer} \]

[1]

(b) Write down an expression, in terms of \(n\), for the number of dots in Figure \(n\).

\[\text{Answer (b)} \quad \text{[1]}\]

(c) Use your answer to part (b) to find the number of dots in Figure 30.

\[\text{Answer (c)} \quad \text{[1]}\]
7. Factorise the following expressions completely.
(a) \(6xy - 12y^2 + 3y\),

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

(b) \(14 - 28y - a + 2ay\).

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

8. (a) Plot the points \(A(-2, 1), B(5, 1), C(5, 6)\) and \(D(0, 6)\) in the graph below.

**Answer**

![Graph with points A(-2,1), B(5,1), C(5,6), and D(0,6) plotted.]

(b) Name the shape of figure \(ABCD\).

**Answer (b)** ........................................ [1]
9. Solve the following equations

(a) \[ 7(2x - 5) = 4(x + 1), \]

Answer (a) \[ \text{[2]} \]

(b) \[ \frac{x - 9}{2} + 3 = \frac{3x + 1}{5}. \]

Answer (b) \[ \text{[3]} \]

10. (a) Solve the inequality \[ 4x + 12 < 65. \]

Answer (a) \[ \text{[2]} \]

(b) Hence, state the largest possible value of \( x \) if \( x \) is a prime number.

Answer (b) \( x = \text{[1]} \)
In the diagram below, $\triangle AFE$ is an isosceles triangle, $ABDE$ is a parallelogram, $AC$ and $FD$ are straight lines, $\angle FAE = 44^\circ$ and $\angle BDC = 60^\circ$.

Giving your reasons, find

(a) $\angle AEF$,  

(b) $\angle DBC$,  

(c) $\angle BCD$.

---

**Answer (a)**  \[ \text{...} \]°  

**Answer (b)**  \[ \text{...} \]°  

**Answer (c)**  \[ \text{...} \]°
12 The diagram below shows a regular pentagon $PQSTU$ and triangle $QRS$. $PQR$ and $TSR$ are straight lines.

Find $\angle QRS$.

Answer $\theta$\[3\]

13 The table below shows the number of meals eaten in a day by a group of students.

<table>
<thead>
<tr>
<th>Number of meals</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of students</td>
<td>6</td>
<td>11</td>
<td>$x$</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Given that the mean number of meals eaten in a day is 3.5, find the value of $x$.

Answer $x =$\[3\]
14 The diagram below shows a trapezoidal prism. $AB = 5\text{ cm}$, $CD = 11\text{ cm}$, $DF = 20\text{ cm}$, $EF = 12\text{ cm}$ and $AC = h\text{ cm}$.

(a) Show that the cross-sectional area of the trapezoidal prism is $8h\text{ cm}^2$.

Answer

(b) Given that the volume of the trapezoidal prism is $1600\text{ cm}^3$, calculate the value of $h$.

Answer (b) $h =$ ................. [2]
(c) Hence, find the total surface area of the trapezoidal prism.

Answer (c) .........................cm$^2$  [3]

End of Paper
1. \(-31\)

2. 
   ![Number line with points marked at -2.5, 0.7, \(\sqrt{4}\), 4\(\frac{1}{5}\), and intervals marked at -3, -2, -1, 0, 1, 2, 3, 4, 5.]

3. (a)(i) \(588 = 2^2 \times 3 \times 5^2\)
   (a)(ii) 3
   (b) Largest no. of boxes = 6

4. (a) 16%
   (b) 20%

5. (a) \(-3a - 34\)
   (b) \(\frac{10m + 9n}{10}\)

6. (a) 
   ![Diagram of a point marked with dots and a line segment]
   (b) \(3n - 2\)
   (c) 88

7. (a) \(3y(2x - 4y + 1)\)
   (b) \((14 - a)(1 - 2y)\)

8. (a) 
   ![Diagram of a coordinate plane with points A, B, and C marked.
   (b) Trapezium

9. (a) \(x = 3.9\)
   (b) \(x = -17\)

10. (i) \(x < 13\frac{1}{4}\)
    (ii) \(x = 13\)
11  (a)  \( \angle AEF = 68^\circ \)
    (b)  \( \angle BDE = 68^\circ \)
    (c)  \( \angle BCD = 52^\circ \)

12  \( \angle QRS = 36^\circ \)

13  \( x = 16 \)

14  (a)  Area of trapezium = \( 8h \) cm\(^2\) (Shown)
    (b)  \( h = 10 \)
    (c)  Total surface area = 920 cm\(^2\)
1 \[ 5 - \left( \frac{2}{0.1} - 14 \right)^2 \]
\[ = 5 - (6)^2 \]
\[ = 5 - 36 \]
\[ = -31 \]

2
\[ \begin{array}{cccc}
-2.5 & 0.7 & \sqrt{4} & \frac{4}{5} \\
-3 & -2 & -1 & 0 & 1 & 2 & 3 & 4 & 5 \\
\end{array} \]

B2* - 1 mistake
deduct 1 mark

3
(a)(i)
\[ \begin{array}{c}
2 \\
2 \\
3 \\
5 \\
5 \\
\end{array} \]
\[ 300 \\
150 \\
75 \\
25 \\
5 \\
\]

\[ 588 = 2^2 \times 3 \times 5^2 \]

(a)(ii) 3
(b)
\[ \begin{array}{c}
2 \\
3 \\
\end{array} \]
\[ \begin{array}{cccc}
54 & 132 & 30 \\
27 & 66 & 15 \\
9 & 22 & 5 \\
\end{array} \]

Largest no. of boxes = 6

4
(a)
\[ \frac{4}{25} \times 100 \]
\[ = 16\% \]
(b) 2 hours = 120 mins
\[ \frac{24}{120} \times 100 \]
\[ = 20\% \]
5. (a) \[4(2a - 3) - 11(2 + a) = 8a - 12 - 22 - 11a - 3a - 34\]

(b) \[
\begin{align*}
\frac{5}{10m + 2n} - \frac{2m - n}{10} & = \frac{20m + 4n}{10} - \frac{10m - 5n}{10} \\
& = \frac{20m + 4n - (10m - 5n)}{10} \\
& = \frac{10m + 9n}{10} \\
\end{align*}
\]

M1

A1

M1 (common denominator)

M1 (expansion of -)

A1

6. (a) 

(b) \[3n - 2\]

(c) \[3(30) - 2 = 88\]

7. (a) \[6xy - 12y^2 + 3y = 3y(2x - 4y + 1)\]

(b) \[14 - 28y - a + 2ay = 14(1 - 2y) - a(1 - 2y) = (14 - a)(1 - 2y)\]

B1

B1

M1 (identical group)

A1

8. (a) 

(b) Trapezium

B2 (2 marks for 4 correct, 1 mark for 3 correct)

B1
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>(a) (7(2x - 5) = 4(x + 1)) &amp; M1 (expansion)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(14x - 35 = 4x + 4) &amp; A1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(10x = 39) &amp; A1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(x = 3.9) &amp; A1</td>
<td></td>
</tr>
</tbody>
</table>

|   | (b) \(\frac{x - 9}{2} + 3 = \frac{3x + 1}{5}\) & M1 (Removal of denominator) |
|   | \(\frac{x - 9 + 6}{2} = \frac{3x + 1}{5}\) & M1 (Expansion) |
|   | \(5(x - 3) = 2(3x + 1)\) & A1 |
|   | \(5x - 15 = 6x + 2\) & A1 |
|   | \(x = -17\) & A1 |

| 10 | (i) \(4x + 12 < 65\) & M1 |
|    | \(4x < 65 - 12\) & M1 |
|    | \(4x < 53\) & A1 |
|    | \(x < 13\frac{1}{4}\) & A1 |
|    | (ii) \(x = 13\) & B1 |

| 11 | (a) \(\angle AEF = \frac{180 - 44}{2}\) (Base angle of isos. \(\Delta\)) & B1 |
|    | \(= 68^\circ\) & B1 |
|    | (b) \(\angle AEF = \angle BDE\) (Corr. \(\angle s\), \(AE \parallel BD\)) & M1 |
|    | \(\angle BDE = \angle DBC\) (Alt \(\angle s\), \(AE \parallel BD\)) & A1 |
|    | \(= 68^\circ\) & A1 |
|    | (c) \(\angle BCD = 180 - 68 - 60\) (Angle sum of triangle) & B1 |
|    | \(= 52^\circ\) & B1 |

| 12 | 1 interior angle = \(\frac{(5 - 2) \times 180}{5}\) & M1 (formula for 1 int. angle) |
|    | \(= 108^\circ\) & M1 (For finding both angles) |
|    | \(\angle QSR = \angle SQR = 180 - 108\) (Adj. angle on a str line) & A1 |
|    | \(= 72^\circ\) & A1 |
|    | \(\angle QRS = 180 - 72 - 72\) (\(\angle s\) sum of triangle) & A1 |
|    | \(= 36^\circ\) & A1 |
\[
\frac{(2 \times 6) + (3 \times 11) + 4x + (5 \times 1) + (6 \times 2)}{6 + 11 + x + 1 + 2} = 3.5
\]
\[
62 + 4x = 3.5(20 + x)
\]
\[
62 + 4x = 70 + 3.5x
\]
\[
0.5x = 8
\]
\[
x = 16
\]

M1 (Correct Formula)

M1 (remove deno.)

14

(a)

Area of trapezium = \( \frac{1}{2} \times (5 + 11) \times h \)

= \( 8h \) cm\(^2\) (Shown)

(b)

\( 8h \times 20 = 1600 \)

\( 160h = 1600 \)

\( h = 10 \)

(c)

Area of trapezium = \( 8 \times 10 \)

= \( 80 \) cm\(^2\)

Area of sides = \( (5 + 10 + 11 + 12) \times 20 \)

= \( 760 \) cm\(^2\)

Total surface area = \( 760 + 2(80) \)

= \( 920 \) cm\(^2\)

A1

B1

M1 (formation of formula)

A1

M1

M1

A1
READ THESE INSTRUCTIONS FIRST

Write your name, class and index 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, 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.
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 number of marks for this paper is 50.

For Examiner’s Use

50

This question paper consists of 9 printed pages.

Setter: Mr Wilson Wee
Vetter: Ms Zoe Pow
Answer all the questions.

1 (a) Calculate \( \frac{9.52 + \sqrt{24.03}}{\sqrt{52} - 1.28} \).

Write down the first five digits on your calculator display.

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

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

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

2 The graph below shows triangle \( ABC \).

Find

(a) the gradient of \( AC \),

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

(b) the area of \( \triangle ABC \).

Answer (b) .................................. unit^2 [2]
3. The table shows the record of the scores of 20 students in a test.

<table>
<thead>
<tr>
<th>24</th>
<th>18</th>
<th>28</th>
<th>33</th>
<th>25</th>
<th>29</th>
<th>25</th>
<th>22</th>
<th>30</th>
<th>18</th>
</tr>
</thead>
<tbody>
<tr>
<td>26</td>
<td>36</td>
<td>30</td>
<td>30</td>
<td>26</td>
<td>28</td>
<td>23</td>
<td>19</td>
<td>31</td>
<td>39</td>
</tr>
</tbody>
</table>

The total score was 40 marks and the scores were tabulated in an ordered stem-and-leaf diagram below.

*Answer (a)*

<table>
<thead>
<tr>
<th>Stem</th>
<th>Leaf</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

Key: 1 | 8 represents 18 marks

(a) Complete the stem-and-leaf diagram. [1]

(b) Find
(i) the modal score,

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

(ii) the median score.

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

(c) The passing mark for the test is 20. The scores of another 5 students were added to the record and the percentage of the number of students who passed dropped to 76%. How many of the newly added students passed the test?

*Answer (c) ....................... students [2]*
4 The frequency table below shows the monthly salary of 30 workers in a company.

**Answer (a)**

<table>
<thead>
<tr>
<th>Salary ($$$)</th>
<th>Mid-value ($x$)</th>
<th>Frequency ($f$)</th>
<th>$fx$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1000 &lt; S \leq 2000$</td>
<td></td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>$2000 &lt; S \leq 3000$</td>
<td></td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>$3000 &lt; S \leq 4000$</td>
<td></td>
<td>7</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>Total = 30</strong></td>
<td><strong>Total =</strong></td>
<td></td>
</tr>
</tbody>
</table>

(a) Complete the table above. [2]

(b) Hence, calculate an estimate of the mean monthly salary.

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

5 The original price of a bicycle in January was $212. In February, its price increased by 15%. In March, its price was 20% lesser than the price in February. Calculate the price of the bicycle in March.

**Answer $.............$** [3]
6 Gopal sold $x$ chicken pies at $2 each and 32 muffins at $1.50 each at his school's charity fair. At the end of the day, he received at least $135.

(a) Write down an inequality in terms of $x$.

\[ \text{Answer (a)} \] 

(b) Solve the inequality to find the minimum number of chicken pies sold.

\[ \text{Answer (b)} \] 

7 The ratio of the weights of Beatrice, Linda and Henry was $20 : 24 : 33$. After 1 year, they weighed again and found that only Linda's weight was unchanged. The ratio of the weights of Beatrice, Linda and Henry became $7 : 8 : 13$. Given that Linda weighs 48 kg, find the change in weight for Beatrice and Henry respectively.

\[ \text{Answer Beatrice: } \text{……………} \text{kg} \]

\[ \text{Henry: } \text{……………} \text{kg} \]
Two different sizes of tins of fruit juice are shown below. The small tin has a radius of 6 cm and a height of 13 cm. The price of the fruit juice is given on the respective tins.

(a) Find the volume of the small tin.

(b) Which size of tin gives the better value? You must show all your working clearly.

\[ \text{Answer (a)} \quad \text{cm}^3 \quad [2] \]

\[ \text{Answer (b)} \quad \text{tin} \quad [2] \]
A piece of metal is cut into the shape as shown in the diagram below. \( AOCB \) is a semicircle of radius 5 cm and \( BDOE \) is an inscribed circle of the semicircle with \( OB \) as the diameter.

(a) Calculate the area of the shaded region.

(b) Calculate the perimeter of the shaded region.

Answer (a) ......................... cm\(^2\) \[3\]

Answer (b) ......................... cm \[3\]
10 A lorry and a van were travelling towards each other at uniform speeds. They were 210 km apart at 1300 h and passed each other at 1430 h. The speed of the van was 75 km/h. Find the speed of the lorry.

\[\text{Answer} \ \ \ \ \text{km/h} \quad [4]\]

11 (a) Tap A can fill a tank in 10 minutes.
What fraction of the tank is filled in 1 minute?

\[\text{Answer (a)} \ \ \ \ \text{[1]}\]

(b) Tap B can fill a tank in 5 minutes.
What fraction of the tank is filled in 1 minute?

\[\text{Answer (b)} \ \ \ \ \text{[1]}\]

(c) How long will it take to fill the tank when both taps A and B are turned on?

\[\text{Answer (c)} \ \ \ \ \text{min} \quad [2]\]
12 Answer the whole of this question on a piece of graph paper.

The table below shows some values for the equation $y = 2 - 2x$.

<table>
<thead>
<tr>
<th></th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6</td>
<td>$p$</td>
<td>2</td>
<td>0</td>
<td>$g$</td>
</tr>
</tbody>
</table>

(a) Calculate the values of $p$ and $g$. [2]

(b) Using a scale of 2 cm to 1 unit for the $y$-axis and 4 cm to 1 unit for the $x$-axis, draw the graph $y = 2 - 2x$ for $-2 \leq x \leq 2$. [3]

(c) Using your graph, find the value of $x$ when $y = 3.5$. [1]

(d) On the same axes, draw the line $x = -1.5$. Find the coordinates of the point of intersection of the two lines. [2]

End of Paper
## Answer Key for Math 1E SA2 P2 2015

<table>
<thead>
<tr>
<th>Qn</th>
<th>Marking Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>1(a)</td>
<td>5.8805</td>
</tr>
<tr>
<td>1(b)</td>
<td>5.9</td>
</tr>
<tr>
<td>2(a)</td>
<td>$-1 \frac{1}{2}$</td>
</tr>
<tr>
<td>2(b)</td>
<td>6 units²</td>
</tr>
<tr>
<td>3(a)</td>
<td>Stem</td>
</tr>
<tr>
<td>1</td>
<td>8 8 9</td>
</tr>
<tr>
<td>2</td>
<td>2 3 4 5 5 6 6 8 8 9</td>
</tr>
<tr>
<td>3</td>
<td>0 0 0 1 3 6 9</td>
</tr>
<tr>
<td>Key: 18 represents 18 marks</td>
<td></td>
</tr>
<tr>
<td>3(b)(i)</td>
<td>30 marks</td>
</tr>
<tr>
<td>3(b)(ii)</td>
<td>27 marks</td>
</tr>
<tr>
<td>3(c)</td>
<td>2</td>
</tr>
</tbody>
</table>

### 4(a)

<table>
<thead>
<tr>
<th>Salary ($S$)</th>
<th>Mid-value ($x$)</th>
<th>Frequency ($f$)</th>
<th>$fx$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1000 &lt; S \leq 2000$</td>
<td>1500</td>
<td>9</td>
<td>13500</td>
</tr>
<tr>
<td>$2000 &lt; S \leq 3000$</td>
<td>2500</td>
<td>14</td>
<td>35000</td>
</tr>
<tr>
<td>$3000 &lt; S \leq 4000$</td>
<td>3500</td>
<td>7</td>
<td>24500</td>
</tr>
<tr>
<td><strong>Total = 30</strong></td>
<td><strong>Total = 73000</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 4(b)

$2433.33$

### 5

$195.04$

### 6(a)

$2x + 48 \geq 135$

### 6(b)

$x \geq 43.5$

Minimum number of chicken pies sold is 44.

### 7

Change in weight for Beatrice = 2 kg

Change in weight for Henry = 12 kg
| 8(a)  | 1470 cm³ |
| 8(b)  | Large tin is cheaper. |
| 9(a)  | 19.6 cm² |
| 9(b)  | 41.4 cm |
| 10    | 65 km/h |
| 11(a) | $\frac{1}{10}$ |
| 11(b) | $\frac{1}{5}$ |
| 11(c) | $3\frac{1}{3}$ min |
| 12(a) | $p = 4$ and $q = -2$ |
| 12(b) |  |
| 12(c) | $x = -0.75$ |
| 12(d) | $(-1.5, 5)$ |
Marking Scheme for Math 1E SA2 P2 2015

<table>
<thead>
<tr>
<th>Qn</th>
<th>Marking Point</th>
<th>Marks Awarded</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1(a)</td>
<td>5.8805</td>
<td>B1</td>
<td></td>
</tr>
<tr>
<td>1(b)</td>
<td>5.9</td>
<td>B1</td>
<td></td>
</tr>
</tbody>
</table>

2(a) \[ \text{Gradient} = -\frac{6}{4} = -1\frac{1}{2} \]

2(b) \[ \frac{1}{2} \times 3 \times 4 = 6 \text{ units}^2 \]

3(a) \[ \begin{array}{c|c}
\text{Stem} & \text{Leaf} \\\n1 & 8 \ 8 \ 9 \ 2 & 2 \ 3 \ 4 \ 5 \ 5 \ 6 \ 6 \ 8 \ 8 \ 9 \ 3 & 0 \ 0 \ 0 \ 1 \ 3 \ 6 \ 9 \\
\end{array} \]

Key: 1 | 8 represents 18 marks

3(b)(i) Modal score = 30 marks

3(b)(ii) Median score = 26 + 8 \[ \frac{2}{2} = 27 \text{ marks} \]

3(c) Number of students who passed the test
\[ = \frac{76}{100} \times 25 = 19 \]

New students who passed the test
\[ = 19 - 7 = 2 \]

4(a) | Salary (SS) | Mid-value (x) | Frequency (f) | \( fx \) |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1000 &lt; S \leq 2000</td>
<td>1500</td>
<td>9</td>
<td>13500</td>
<td></td>
</tr>
<tr>
<td>2000 &lt; S \leq 3000</td>
<td>2500</td>
<td>14</td>
<td>35000</td>
<td></td>
</tr>
<tr>
<td>3000 &lt; S \leq 4000</td>
<td>3500</td>
<td>7</td>
<td>24500</td>
<td></td>
</tr>
<tr>
<td>Total = 30</td>
<td>Total = 73000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[ \text{M1 - Correct values for Mid-value column} \]
\[ \text{A1 - Correct values for}\ fx\ \text{column} \]
<table>
<thead>
<tr>
<th>4(b)</th>
<th>Mean monthly salary = ( \frac{73000}{30} ) = $2433.33</th>
<th>M1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A1</td>
</tr>
<tr>
<td>5</td>
<td>Price in February = ( \frac{115}{100} \times 212 ) = $243.80</td>
<td>M1</td>
</tr>
<tr>
<td></td>
<td>Price in March = ( \frac{80}{100} \times 243.80 ) = $195.04</td>
<td>M1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A1</td>
</tr>
<tr>
<td>6(a)</td>
<td>( 2x + 48 \geq 135 )</td>
<td>B1</td>
</tr>
<tr>
<td>6(b)</td>
<td>( 2x + 48 \geq 135 )</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( 2x \geq 87 )</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( x \geq \frac{87}{2} )</td>
<td></td>
</tr>
<tr>
<td></td>
<td>( x \geq 43.5 )</td>
<td>M1</td>
</tr>
<tr>
<td></td>
<td>Minimum number of chicken pies sold is 44.</td>
<td>A1</td>
</tr>
<tr>
<td>7</td>
<td>Beatrice: Linda: Henry</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Old ratio 20 : 24 : 33</td>
<td>M1</td>
</tr>
<tr>
<td></td>
<td>New ratio 7 : 8 : 13</td>
<td></td>
</tr>
<tr>
<td></td>
<td>= 21 : 24 : 39</td>
<td></td>
</tr>
<tr>
<td></td>
<td>24 units ----- 48 kg</td>
<td>M1</td>
</tr>
<tr>
<td></td>
<td>1 unit ----- ( \frac{48}{24} ) = 2 kg</td>
<td>M1</td>
</tr>
<tr>
<td></td>
<td>Beatrice increased in weight by 21 - 20 = 1 unit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Henry increased in weight by 39 - 33 = 6 units</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Change in weight for Beatrice = 2 kg</td>
<td>A1</td>
</tr>
<tr>
<td></td>
<td>Change in weight for Henry = ( 6 \times 2 ) = 12 kg</td>
<td>A1</td>
</tr>
<tr>
<td>Question</td>
<td>Volume of small tin $= \pi \times 6^2 \times 13$ $= 1470 \text{ cm}^3$</td>
<td>M1</td>
</tr>
<tr>
<td>----------</td>
<td>-------------------------------------------------------------------</td>
<td>----</td>
</tr>
<tr>
<td>8(b)</td>
<td>Price per cm$^3$ for small tin $= 480 \div 1470$ $= 0.33$ cents</td>
<td>M1</td>
</tr>
<tr>
<td></td>
<td>Price per cm$^3$ for large tin $= 1880 \div 11310$ $= 0.17$ cents</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Large tin is cheaper.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question</th>
<th>Area of semicircle $ABC = \frac{1}{2} \times \pi \times 5^2 \text{ cm}^2$ $= 39.27 \text{ cm}^2$</th>
<th>M1</th>
</tr>
</thead>
<tbody>
<tr>
<td>9(a)</td>
<td>Area of circle $BEOD = \pi(2.5)^2 \text{ cm}^2$ $= 19.63 \text{ cm}^2$</td>
<td>M1</td>
</tr>
<tr>
<td></td>
<td>Area of shaded region $= 39.27 - 19.63 \text{ cm}^2$ $= 19.6 \text{ cm}^2$</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question</th>
<th>Arc length of semicircle $ABC = \frac{1}{2} \times 2 \times \pi \times 5$ $= 15.71 \text{ cm}$</th>
<th>M1</th>
</tr>
</thead>
<tbody>
<tr>
<td>9(b)</td>
<td>Circum. of circle $BEOD = 2 \times \pi \times 2.5$ $= 15.71 \text{ cm}$</td>
<td>M1</td>
</tr>
<tr>
<td></td>
<td>Perimeter of the shaded region $= 15.71 + 15.71 + 5 + 5$ $= 41.4 \text{ cm}$</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question</th>
<th>Distance travelled by van $= 75 \times 1.5$ $= 112.5 \text{ km}$</th>
<th>M1</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Distance travelled by the lorry $= 210 - 112.5$ $= 97.5 \text{ km}$</td>
<td>M1</td>
</tr>
<tr>
<td></td>
<td>Speed of the lorry $= 97.5 \div 1.5$ $= 65 \text{ km/h}$</td>
<td>M1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
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<tr>
<td>11(a)</td>
<td>Tap A can fill $\frac{1}{10}$ of the tank in 1 min.</td>
<td>B1</td>
</tr>
<tr>
<td>11(b)</td>
<td>Tap B can fill $\frac{1}{5}$ of the tank in 1 min.</td>
<td>B1</td>
</tr>
</tbody>
</table>
| 11(c) | $\frac{1}{10} + \frac{1}{5}$  
$= \frac{1}{10} + \frac{2}{10}$  
$= \frac{3}{10}$  
Of the tank is filled up in 1 min if both taps are turned on.  
$\frac{3}{10}$ of tank ---- 1 min  
1 tank ---- $\frac{10}{3}$  
$= 3\frac{1}{3}$ min | M1 |
| 12(a) | $p = 4$ and $q = -2$ | B2 |
| 12(b) | As drawn on attached graph. | B3 |
| 12(c) | $x = -0.75$ | B1 |
| 12(d) | As drawn on attached graph.  
$(-1.5, 5)$ | B1 |

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12(a) $p = 4$ and $q = -2$  

12(b) As drawn on attached graph.  

12(c) $x = -0.75$  

12(d) As drawn on attached graph.  

$(-1.5, 5)$  

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12(a) $p = 4$ and $q = -2$  

12(b) As drawn on attached graph.  

12(c) $x = -0.75$  

12(d) As drawn on attached graph.  

$(-1.5, 5)$