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

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

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

\[ 19\% \quad \frac{1}{5} \quad \sqrt{0.038} \quad \sin 11.4^\circ \quad 0.719^5 \]

*Answer* ....................... < ....................... < ....................... < ....................... < ....................... [2]

2 Use a calculator to work out the following.

(a) \[ 3 (-4 \times 6^2 - 5) \]

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

(b) \[ \sqrt{3} \times \tan 30^\circ + \sqrt{2} \times \sin 45^\circ \]

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

3 Find the circumference of a circle of radius 2.5 cm.

*Answer* ......................................... cm [2]

4 Bruce plays a game of golf.
His scores for each of the 18 holes are shown below.

\[
\begin{array}{cccccccc}
2 & 3 & 4 & 5 & 4 & 6 & 2 & 3 & 4 \\
4 & 5 & 3 & 4 & 3 & 5 & 4 & 4 & 4 \\
\end{array}
\]

The information is to be shown in a pie chart.

Calculate the sector angle for the score of 4.

*Answer* ............................................... [2]
5  (a) Add **one** line to the diagram so that it has two lines of symmetry.

(b) Add **two** lines to the diagram so that it has rotational symmetry of order 2.

6  Rearrange the formula to make \( x \) the subject.

\[ y = x^2 + 4 \]

Answer \( x = \) .................................  [2]
Find the area of the trapezium.

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

8 A hemisphere has a radius of 12 cm.

Calculate its volume.

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

Answer ........................................ cm$^3$ [2]

9 The exterior angle of a regular polygon is 36°.

What is the name of this polygon?

Answer ........................................... [3]
10 The table shows how the dollar to euro conversion rate changed during one day.

<table>
<thead>
<tr>
<th>Time</th>
<th>1000</th>
<th>1100</th>
<th>1200</th>
<th>1300</th>
<th>1400</th>
<th>1500</th>
<th>1600</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1</td>
<td>£1.3311</td>
<td>£1.3362</td>
<td>£1.3207</td>
<td>£1.3199</td>
<td>£1.3200</td>
<td>£1.3352</td>
<td>£1.3401</td>
</tr>
</tbody>
</table>

Khalil changed $500 into euros (€).

How many more euros did Khalil receive if he changed his money at the highest rate compared to the lowest rate?

Answer € ................................................  [3]

11 The speed, \( v \), of a wave is inversely proportional to the square root of the depth, \( d \), of the water.

\[ v = 30 \text{ when } d = 400. \]

Find \( v \) when \( d = 25. \)

Answer \( v = \) ...............................................  [3]

12 A circle has a radius of 8.5 cm correct to the nearest 0.1 cm.

The lower bound for the area of the circle is \( p\pi \text{ cm}^2 \).

The upper bound for the area of the circle is \( q\pi \text{ cm}^2 \).

Find the value of \( p \) and the value of \( q \).

Answer \( p = \) ..................................................

\( q = \) ...............................................  [3]
Pam wins the student of the year award in New Zealand. She sends three photographs of the award ceremony by post to her relatives.

- one of size 13 cm by 23 cm to her uncle in Australia
- one of size 15 cm by 23 cm to her sister in China
- one of size 23 cm by 35 cm to her mother in the UK

<table>
<thead>
<tr>
<th>Maximum lengths</th>
<th>Australia</th>
<th>Rest of the world</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 cm by 23.5 cm</td>
<td>$1.90</td>
<td>$2.50</td>
</tr>
<tr>
<td>15.5 cm by 23.5 cm</td>
<td>$2.40</td>
<td>$2.90</td>
</tr>
<tr>
<td>23 cm by 32.5 cm</td>
<td>$2.80</td>
<td>$3.40</td>
</tr>
<tr>
<td>26 cm by 38.5 cm</td>
<td>$3.60</td>
<td>$5.20</td>
</tr>
</tbody>
</table>

The cost of postage is shown in the table above. Use this information to calculate the total cost.

_Answer_ $ ................................................ [3]

14

\[ \angle DAB = 142^\circ \]

\[ \angle ACB = \text{ } \]

\[ A, B \text{ and } C \text{ are points on the circumference of a circle centre } O. \]
\[ OAD \text{ is a straight line and angle } DAB = 142^\circ. \]

Calculate the size of angle \( ACB \).

_Answer_ Angle \( ACB = \) ............................................... [3]
15 Find the co-ordinates of the point of intersection of the two lines.

\[ 2x - 7y = 2 \]
\[ 4x + 5y = 42 \]

\[ \text{Answer (..........., ...........)} \ [3] \]

16 Solve the inequality.

\[ \frac{x}{2} + \frac{x - 2}{3} < 5 \]

\[ \text{Answer \ ...........................................} \ [4] \]
17

\[ M = \begin{pmatrix} 2 & 1 \\ 4 & 6 \end{pmatrix} \quad N = \begin{pmatrix} 5 & 0 \\ 1 & 5 \end{pmatrix} \]

(a) Work out \( MN \).

Answer (a) \( MN = \) [2]

(b) Find \( M^{-1} \).

Answer (b) \( M^{-1} = \) [2]
18 \( A(5, 23) \) and \( B(-2, 2) \) are two points.

(a) Find the co-ordinates of the midpoint of the line \( AB \).

\[ \text{Answer(a) (......... , .........) } \quad [2] \]

(b) Find the equation of the line \( AB \).

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

(c) Show that the point \( (3, 17) \) lies on the line \( AB \).

\[ \text{Answer(c)} \]
$O$ is the origin.
$ABCDEF$ is a regular hexagon and $O$ is the midpoint of $AD$.

$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OC} = \mathbf{c}$.

Find, in terms of $\mathbf{a}$ and $\mathbf{c}$, in their simplest form

(a) $\overrightarrow{BE}$.

Answer (a) $\overrightarrow{BE} =$ ...............................................  [2]

(b) $\overrightarrow{DB}$.

Answer (b) $\overrightarrow{DB} =$ ...............................................  [2]

(c) the position vector of $E$.

Answer (c) ...............................................  [2]
During one day 48 people visited a museum.
The length of time each person spent in the museum was recorded.
The results are shown on the cumulative frequency diagram.

Work out
(a) the median,

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

(b) the 20th percentile,

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

(c) the inter-quartile range,

Answer(c) ............................................ h [2]

(d) the probability that a person chosen at random spends 2 hours or less in the museum.

Answer(d) ............................................ [2]

Question 21 is printed on the next page.
In triangle $ABC$, $AB = 6$ cm, $BC = 4$ cm and angle $BCA = 65^\circ$.

Calculate

(a) angle $CAB$,

(b) the area of triangle $ABC$.

Answer (a) Angle $CAB = \ldots$ [3]

Answer (b) $\ldots$ cm$^2$ [3]
READ THESE INSTRUCTIONS FIRST

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

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

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [  ] at the end of each question or part question.
The total of the marks for this paper is 70.
1 Christa had a music lesson every week for one year.
Each of the 52 lessons lasted for 45 minutes.
Calculate the total time that Christa spent in music lessons.
Give your time in hours.

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

2 Three of the vertices of a parallelogram are at (4, 12), (8, 4) and (16, 16).

Write down the co-ordinates of two possible positions of the fourth vertex.

Answer (........... , ...........) and (........... , ...........) [2]

3 Solve the equation \( 1 + 2x = -15 \).

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

4 Write the following in order of size, smallest first.

\[
\cos 100^\circ \quad \tan 100^\circ \quad \frac{1}{100} \quad 100^{-0.1}
\]

Answer ........................................... < ....................................... < ....................................... < ....................................... [2]
5 Write

(a) 60 square metres in square centimetres,

\[ \text{Answer (a)} \quad \text{\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots cm}^2 \quad [1] \]

(b) 22 metres per second in kilometres per hour,

\[ \text{Answer (b)} \quad \text{\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots km/h} \quad [2] \]

6 In 2012 the cost of a ticket to an arts festival was $30. This was 20% more than the ticket cost in 2011.

Calculate the cost of the ticket in 2011.

\[ \text{Answer } \$ \quad \text{\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots} \quad [3] \]

7 The solutions of the equation \( x^2 - 6x + d = 0 \) are both integers. \( d \) is a prime number.

Find \( d \).

\[ \text{Answer } d = \text{\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots} \quad [3] \]
8  \( m \) varies directly as the cube of \( x \).
\( m = 200 \text{ when } x = 2 \).

Find \( m \) when \( x = 0.4 \).

Answer \( m = \ldots \) [3]

_____________________________________________________________________________________

9  (a) Expand and simplify \( (a + b)^2 \).

Answer(a) \( \ldots \) [2]

(b) Find the value of \( a^2 + b^2 \) when \( a + b = 6 \) and \( ab = 7 \).

Answer(b) \( \ldots \) [1]
10

Calculate the length $h$.
Give your answer correct to 2 significant figures.

Answer $h =$ ........................................... m [3]

11

Work out the following.

(a) $AI$

Answer (a) $AI =$ [1]

(b) $A^{-1}$

Answer (b) $A^{-1} =$ [2]
12 Write the answer to the following calculations in standard form.

(a) \(600 \div 8000\)

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

(b) \(10^8 - 7 \times 10^6\)

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

13

The vertices of the rectangle \(ABCD\) lie on a circle centre \(O\). \(MN\) is a line of symmetry of the rectangle. \(AC\) is a diameter of the circle and angle \(ACD = 42^\circ\).

Calculate

(a) angle \(CAM\),

Answer(a) Angle \(CAM\) = ........................................... [2]

(b) angle \(DCM\).

Answer(b) Angle \(DCM\) = ........................................... [2]
14 (a) Simplify \((64q^{-2})^{\frac{1}{2}}\).

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

(b) \(5^7 \div 5^9 = p^2\)

Find \(p\).

Answer (b) \(p = \) ............................................... [2]
(a) Construct the locus of all the points which are 3 cm from vertex \( A \) and outside the rectangle. [2]

(b) Construct, using a straight edge and compasses only, one of the lines of symmetry of the rectangle. [2]
16 The diagram shows the entrance to a tunnel.
The circular arc has a radius of 3 m and centre $O$.
$AB$ is horizontal and angle $AOB = 120^\circ$.

During a storm the tunnel filled with water, to the level shown by the shaded area in the diagram.

(a) Calculate the shaded area.

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

(b) The tunnel is 50 m long.

Calculate the volume of water in the tunnel.

\[ \text{Answer(b)} \]
17 $(p, q)$ is the image of the point $(x, y)$ under this combined transformation.

$$\begin{pmatrix} p \\ q \end{pmatrix} = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} + \begin{pmatrix} 3 \\ 2 \end{pmatrix}$$

(a) Draw the image of the triangle under the combined transformation.

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

Answer (b) ........................................................................................................................................ [2]
A gardener measured the lengths of 50 green beans from his garden. The results have been used to draw this cumulative frequency diagram.

Work out

(a) the median,

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

(b) the number of green beans that are longer than 26 cm,

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

(c) the inter-quartile range,

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

(d) the probability that a green bean chosen at random is more than 14 cm long.

Answer (d) ................................................ [2]
19 \( f(x) = 2x + 3 \quad g(x) = x^2 \)

(a) Find \( fg(6) \).

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

(b) Solve the equation \( gf(x) = 100 \).

Answer(b) \( x = \ldots \) or \( x = \ldots \) [3]

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

Answer(c) \( f^{-1}(x) = \ldots \) [2]

(d) Find \( ff^{-1}(5) \).

Answer(d) ............................................... [1]
READ THESE INSTRUCTIONS FIRST

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

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

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

(a) In one week, David sells 120 kg of tomatoes and 80 kg of grapes.

(i) Write 80 kg as a fraction of the total mass of tomatoes and grapes.

\[
\frac{80}{120 + 80} = \frac{80}{200} = \frac{2}{5}
\]

\[\text{Answer (a)(i)} \quad \frac{2}{5} \quad \text{[1]}\]

(ii) Write down the ratio mass of tomatoes : mass of grapes.

\[\text{Answer (a)(ii)} \quad 120 : 80 = 3 : 2 \quad \text{[1]}\]

(b) (i) One day he sells 28 kg of oranges at $1.56 per kilogram.

He also sells 35 kg of apples.

The total he receives from selling the oranges and the apples is $86.38.

Calculate the price of 1 kilogram of apples.

\[\text{Answer (b)(i)} \quad \$ \quad \text{[2]}\]

(ii) The price of 1 kilogram of oranges is $1.56.

This is 20% more than the price two weeks ago.

Calculate the price two weeks ago.

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

(c) On another day, David received a total of $667 from all the fruit he sold.

The cost of the fruit was $314.20.

David worked for \(10\frac{1}{2}\) hours on this day.

Calculate David’s rate of profit in dollars per hour.

\[\text{Answer (c)} \quad \text{[2]}\]
2 Emily cycles along a path for 2 minutes.  
She starts from rest and accelerates at a constant rate until she reaches a speed of 5 m/s after 40 seconds.  
She continues cycling at 5 m/s for 60 seconds.  
She then decelerates at a constant rate until she stops after a further 20 seconds.  

(a) On the grid, draw a speed-time graph to show Emily’s journey.

(b) Find Emily’s acceleration.

Answer(b) ........................................ m/s² [1]

(c) Calculate Emily’s average speed for the journey.

Answer(c) ........................................ m/s [4]
The diagram shows a cone of radius 5 cm and slant height 13 cm.

(i) Calculate the curved surface area of the cone.
[The curved surface area, \(A\), of a cone with radius \(r\) and slant height \(l\) is \(A = \pi rl\).]

Answer (a)(i) ........................................ cm\(^2\) [2]

(ii) Calculate the perpendicular height, \(h\), of the cone.

Answer (a)(ii) \(h = \) ......................................... cm [3]

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

Answer (a)(iii) ......................................... cm\(^3\) [2]

(iv) Write your answer to part (a)(iii) in cubic metres.
Give your answer in standard form.

Answer (a)(iv) ......................................... m\(^3\) [2]
The cone is now cut along a slant height and it opens out to make the sector $AOB$ of a circle.

Calculate angle $AOB$.

\[ \text{Answer (b) Angle } AOB = \text{ } \] \hspace{1cm} [4]
The diagram shows a school playground $ABCD$. $ABCD$ is a trapezium.
$AB = 55$ m, $BD = 70$ m, angle $ABD = 40^\circ$ and angle $BCD = 32^\circ$.

(a) Calculate $AD$.

Answer (a) $AD = \ldots\ldots\ldots\ldots\ldots\ldots\ldots\text{ m}$ [4]

(b) Calculate $BC$.

Answer (b) $BC = \ldots\ldots\ldots\ldots\ldots\ldots\ldots\text{ m}$ [4]
(c) (i) Calculate the area of the playground $ABCD$.

Answer (c)(i) ................................. m$^2$ [3]

(ii) An accurate plan of the school playground is to be drawn to a scale of 1:200.

Calculate the area of the school playground on the plan.
Give your answer in cm$^2$.

Answer (c)(ii) ................................. cm$^2$ [2]

(d) A fence, $BD$, divides the playground into two areas.

Calculate the shortest distance from $A$ to $BD$.

Answer (d) ................................. m [2]
(i) Draw the reflection of triangle \( T \) in the line \( y = 5 \). \[2\]

(ii) Draw the rotation of triangle \( T \) about the point \((4, 2)\) through \(180^\circ\). \[2\]

(iii) Describe fully the **single** transformation that maps triangle \( T \) onto triangle \( U \).

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

(iv) Find the \( 2 \times 2 \) matrix which represents the transformation in part (a)(iii).

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

\[ \begin{pmatrix} \ \ \ \ \ \ \ \ \ \ \ \end{pmatrix} \] \[2\]
In the pentagon $OPQRS$, $OP$ is parallel to $RQ$ and $OS$ is parallel to $PQ$.
$PQ = 2OS$ and $OP = 2RQ$.
$O$ is the origin, $\overrightarrow{OP} = p$ and $\overrightarrow{OS} = s$.

Find, in terms of $p$ and $s$, in their simplest form,

(i) the position vector of $Q$,

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

(ii) $\overrightarrow{SR}$.

Answer (b)(ii) $\overrightarrow{SR} =$ ...............................................  [2]

(c) Explain what your answers in part (b) tell you about the lines $OQ$ and $SR$.

Answer (c) ..................................................................................................................................  [1]
The diagram shows the graph of \( y = f(x) \) for \(-3 \leq x \leq 3\).

(i) Find \( f(2) \).

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

(ii) Solve the equation \( f(x) = 0 \).

\[ \text{Answer (a)(ii)} x = \]

(iii) Write down the value of the largest integer, \( k \), for which the equation \( f(x) = k \) has 3 solutions.

\[ \text{Answer (a)(iii)} k = \]

(iv) By drawing a suitable straight line, solve the equation \( f(x) = x \).

\[ \text{Answer (a)(iv)} x = \text{ or } x = \text{ or } x = \]
(b) \[ g(x) = 1 - 2x \quad h(x) = x^2 - 1 \]

(i) Find \( gh(3) \).

\[ Answer(b)(i) \]  

(ii) Find \( g^{-1}(x) \).

\[ Answer(b)(ii) g^{-1}(x) = \]  

(iii) Solve the equation \( h(x) = 3 \).

\[ Answer(b)(iii) x = \text{ or } x = \]  

(iv) Solve the equation \( g(3x) = 2x \).

\[ Answer(b)(iv) x = \]
120 students are asked to answer a question. The time, $t$ seconds, taken by each student to answer the question is measured. The frequency table shows the results.

<table>
<thead>
<tr>
<th>Time</th>
<th>$0 &lt; t \leq 10$</th>
<th>$10 &lt; t \leq 20$</th>
<th>$20 &lt; t \leq 30$</th>
<th>$30 &lt; t \leq 40$</th>
<th>$40 &lt; t \leq 50$</th>
<th>$50 &lt; t \leq 60$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>6</td>
<td>44</td>
<td>40</td>
<td>14</td>
<td>10</td>
<td>6</td>
</tr>
</tbody>
</table>

(a) Calculate an estimate of the mean time.

Answer(a) ............................................ s [4]

(b) (i) Complete the cumulative frequency table.

<table>
<thead>
<tr>
<th>Time</th>
<th>$t \leq 10$</th>
<th>$t \leq 20$</th>
<th>$t \leq 30$</th>
<th>$t \leq 40$</th>
<th>$t \leq 50$</th>
<th>$t \leq 60$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cumulative frequency</td>
<td>6</td>
<td></td>
<td>104</td>
<td>120</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(ii) On the grid below, draw a cumulative frequency diagram to show this information.

[3]
(iii) Use your cumulative frequency diagram to find the median, the lower quartile and the 60th percentile.

\[ \text{Answer}(b)(iii) \quad \text{Median} \quad \text{Lower quartile} \quad \text{60th percentile} \]

(c) The intervals for the times taken are changed.

(i) Use the information in the frequency table on the opposite page to complete this new table.

<table>
<thead>
<tr>
<th>Time</th>
<th>(0 &lt; t \leq 20)</th>
<th>(20 &lt; t \leq 30)</th>
<th>(30 &lt; t \leq 60)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td></td>
<td></td>
<td>40</td>
</tr>
</tbody>
</table>

(ii) On the grid below, complete the histogram to show the information in the new table. One column has already been drawn for you.
8 \( \text{(a)} \) Solve the equation \( 8x^2 - 11x - 11 = 0 \).
Show all your working and give your answers correct to 2 decimal places.

\[
Answer(a) \quad x = \ldots \quad \text{or} \quad x = \ldots \quad [4]
\]

\( \text{(b)} \) \( y \) varies directly as the square root of \( x \).
\( y = 18 \) when \( x = 9 \).

Find \( y \) when \( x = 484 \).

\[
Answer(b) \quad y = \ldots \quad [3]
\]
(c) Sara spends $x$ on pens which cost $2.50 each. 
She also spends $(x - 14.50)$ on pencils which cost $0.50 each. 
The total of the number of pens and the number of pencils is 19. 

Write down and solve an equation in $x$.

\[ \text{Answer}(c) \quad x = \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots
\]
(a) Find the equations of the lines $L_1$, $L_2$ and $L_3$.

Answer (a) $L_1$ .............................................

$L_2$ .............................................

$L_3$ ............................................. [5]

(b) Write down the three inequalities that define the shaded region, $R$.

Answer (b) .............................................

.............................................

............................................. [3]
(c) A gardener buys \( x \) bushes and \( y \) trees. 
The cost of a bush is $30 and the cost of a tree is $200.
The shaded region \( R \) shows the only possible numbers of bushes and trees the gardener can buy.

(i) Find the number of bushes and the number of trees when the total cost is $720.

Answer

\[ \text{(i) } \text{ ...................................... bushes } \]
\[ \text{ ...................................... trees } [2] \]

(ii) Find the number of bushes and the number of trees which give the greatest possible total cost. Write down this greatest possible total cost.

Answer

\[ \text{(ii) } \text{ .......................................... bushes } \]
\[ \text{ .......................................... trees } \]
\[ \text{ Greatest possible total cost } = \$ \text{ .............................................. } [3] \]
10 (a)

\[
\begin{align*}
1 & = 1 \\
1 + 2 & = 3 \\
1 + 2 + 3 & = 6 \\
1 + 2 + 3 + 4 & = 10 \\
\end{align*}
\]

(i) Write down the next line of this pattern.

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

(ii) The sum of the first \( n \) integers is \( \frac{n(n + 1)}{2} \).

Show that \( k = 2 \).

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

(iii) Find the sum of the first 60 integers.

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

(iv) Find \( n \) when the sum of the first \( n \) integers is 465.

\[\text{Answer (a)(iv) } n = \]

(v) \( 1 + 2 + 3 + 4 + \ldots + x = \frac{(n - 8)(n - 7)}{2} \)

Write \( x \) in terms of \( n \).

\[\text{Answer (a)(v) } x = \]

© UCLES 2013

0580/41/O/N/13
(b) 

\[
\begin{align*}
1^3 &= 1 \\
1^3 + 2^3 &= 9 \\
1^3 + 2^3 + 3^3 &= 36 \\
1^3 + 2^3 + 3^3 + 4^3 &= 100
\end{align*}
\]

(i) Complete the statement.

\[1^3 + 2^3 + 3^3 + 4^3 + 5^3 = \ldots \ldots \ldots = (\ldots \ldots \ldots)^2\]

(ii) The sum of the first \(n\) integers is \(\frac{n}{2}(n + 1)\).

Find an expression, in terms of \(n\), for the sum of the first \(n\) cubes.

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

(iii) Find the sum of the first 19 cubes.

\[
\text{Answer (b)(iii) } \ldots \ldots \ldots \ldots \ldots [2]
\]
READ THESE INSTRUCTIONS FIRST

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

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

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.
1 Last year Mukthar earned $18,900.
He did not pay tax on $5,500 of his earnings.
He paid 24% tax on his remaining earnings.

(a) (i) Calculate how much tax Mukthar paid last year.

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

(ii) Calculate how much Mukthar earned each month after tax had been paid.

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

(b) This year Mukthar now earns $19,750.50.

Calculate the percentage increase from $18,900.

\[ \text{Answer (b) } \% \quad \] \[ \text{[2]} \]

(c) Mukthar has $1,500 to invest in one of the following ways.

- **Account A** paying **simple** interest at a rate of 4.1% per year
- **Account B** paying **compound** interest at a rate of 3.3% per year

Which account will be worth more after 3 **years** and by how much?

\[ \text{Answer (c) Account } \quad \text{by } \$ \quad \] \[ \text{[5]} \]
The diagram shows the cross section, \(ABCD\), of a ramp.

(a) Calculate angle \(DBC\).

\[\text{Answer (a) Angle } DBC = \ldots \] \[2\]

(b) (i) Show that \(BD\) is exactly 3 m.

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

(ii) Use the cosine rule to calculate angle \(ABD\).

\[\text{Answer (b)(ii) Angle } ABD = \ldots \] \[4\]

(c) The ramp is a prism of width 4 m.

Calculate the volume of this prism.

\[\text{Answer (c) } \ldots \text{ m}^3 \] \[3\]
3 (a) Write as a single fraction in its simplest form.

\[ \frac{2x - 1}{2} - \frac{3x + 1}{5} \]

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

(b) Expand and simplify.

\[(2x - 3)^2 - 3x(x - 4)\]

Answer(b) ............................................... [4]

c (i) Factorise.

\[2x^2 + 5x - 3\]

Answer(c)(i) ............................................... [2]

(ii) Simplify.

\[\frac{2x^2 + 5x - 3}{2x^2 - 18}\]

Answer(c)(ii) ............................................... [3]
A wedge of cheese in the shape of a prism is cut from a cylinder of cheese of height $h$ cm. The radius of the cylinder, $OA$, is 8 cm and the angle $AOB = 42^\circ$.

(a) (i) The volume of the wedge of cheese is 90 cm$^3$.

Show that the value of $h$ is 3.84 cm correct to 2 decimal places.

*Answer (a)(i)*

(ii) Calculate the total surface area of the wedge of cheese.

*Answer (a)(ii) ........................................ cm$^2$ [5]*

(b) A mathematically similar wedge of cheese has a volume of 22.5 cm$^3$.

Calculate the height of this wedge.

*Answer (b) ......................................... cm [3]*
5 (a) Complete the table of values for \( y = \frac{2}{x^2} - \frac{1}{x} - 3x \).

<table>
<thead>
<tr>
<th>x</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
<th>-0.5</th>
<th>-0.3</th>
<th>0.3</th>
<th>0.5</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>9.6</td>
<td>6</td>
<td>26.5</td>
<td>18.0</td>
<td>-2</td>
<td>-6</td>
<td>-9.1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(b) Draw the graph of \( y = \frac{2}{x^2} - \frac{1}{x} - 3x \) for \(-3 \leq x \leq -0.3\) and \(0.3 \leq x \leq 3\).
(c) Use your graph to solve these equations.

(i) \( \frac{2}{x^2} - \frac{1}{x} - 3x = 0 \)

Answer(c)(i) \( x = \ldots \ldots \ldots \) [1]

(ii) \( \frac{2}{x^2} - \frac{1}{x} - 3x - 7.5 = 0 \)

Answer(c)(ii) \( x = \ldots \ldots \ldots \) or \( x = \ldots \ldots \ldots \) or \( x = \ldots \ldots \ldots \) [3]

(d) (i) By drawing a suitable straight line on the graph, solve the equation \( \frac{2}{x^2} - \frac{1}{x} - 3x = 10 - 3x \).

Answer(d)(i) \( x = \ldots \ldots \ldots \) or \( x = \ldots \ldots \ldots \) [4]

(ii) The equation \( \frac{2}{x^2} - \frac{1}{x} - 3x = 10 - 3x \) can be written in the form \( ax^2 + bx + c = 0 \) where \( a, b \) and \( c \) are integers.

Find the values of \( a, b \) and \( c \).

Answer(d)(ii) \( a = \ldots \ldots \ldots \), \( b = \ldots \ldots \ldots \), \( c = \ldots \ldots \ldots \) [3]
Prettie picks a card at random from the 11 cards above and does not replace it. She then picks a second card at random and does not replace it.

(a) Find the probability that she picks

(i) the letter L and then the letter G,

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

(ii) the letter E twice,

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

(iii) two letters that are the same.

Answer (a)(iii) ............................................... [2]
(b) Prettie now picks a third card at random.

Find the probability that the three letters

(i) are all the same,

(ii) do not include a letter E,

(iii) include exactly two letters that are the same.

\[ \text{Answer}(b)(i) \] ...............................................  [2]

\[ \text{Answer}(b)(ii) \] ...............................................  [2]

\[ \text{Answer}(b)(iii) \] ...............................................  [5]
7 Noma flies from Johannesburg to Hong Kong. Her plane leaves Johannesburg at 1845 and arrives in Hong Kong 13 hours and 25 minutes later. The local time in Hong Kong is 6 hours ahead of the time in Johannesburg.

(a) At what time does Noma arrive in Hong Kong?

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

\[ \text{................................. [2]} \]

(b) Noma sleeps for part of the journey. The time that she spends sleeping is given by the ratio

\[ \text{slepping : awake} = 3 : 4. \]

Calculate how long Noma sleeps during the journey. Give your answer in hours and minutes.

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

\[ \text{............... h ............... min [2]} \]
(c) (i) The distance from Hong Kong to Johannesburg is 10 712 km. 
The time taken for the journey is 13 hours and 25 minutes.

Calculate the average speed of the plane for this journey.

Answer (c)(i) ...................................... km/h [2]

(ii) The plane uses fuel at the rate of 1 litre for every 59 metres travelled.

Calculate the number of litres of fuel used for the journey from Johannesburg to Hong Kong. 
Give your answer in standard form.

Answer (c)(ii) ...................................... litres [4]

(d) The cost of Noma’s journey is 10 148 South African Rand (R). 
This is an increase of 18% on the cost of the journey one year ago.

Calculate the cost of the same journey one year ago.

Answer (d) R  ............................................... [3]
8 \( f(x) = 4x + 3 \quad g(x) = \frac{7}{x + 1} \quad (x \neq -1) \quad h(x) = x^2 + 5x \)

(a) Work out

(i) \( h(-3) \),

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

(ii) \( hg(13) \),

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

(b) Find \( f^{-1}(x) \).

\[ \text{Answer (b) } f^{-1}(x) = \]

\[ \text{ } \]

\[ \text{ } \]
(c) (i) Solve the equation \( f(x) = 23 \).

Answer (c)(i) \( x = \) ............................................... [2]

(ii) Solve the equation \( h(x) = 7 \).

Show all your working and give your answers correct to 2 decimal places.

Answer (c)(ii) \( x = \) ......................... or \( x = \) ......................... [5]
(a) Describe fully the **single** transformation that maps triangle $A$ onto

(i) triangle $B$,

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

(ii) triangle $C$,

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

(iii) triangle $D$.

Answer(a)(iii) ................................................................. [3]
(b) On the grid, draw

(i) the rotation of triangle $A$ about $(6, 0)$ through $90^\circ$ clockwise, [2]

(ii) the enlargement of triangle $A$ by scale factor $-2$ with centre $(0, -1)$, [2]

(iii) the shear of triangle $A$ by shear factor $-2$ with the $y$-axis invariant. [2]

(c) Find the matrix that represents the transformation in part (b)(iii).

Answer(c) \[
\begin{pmatrix}
\end{pmatrix}
\] [2]

Question 10 is printed on the next page.
10 Complete the table for the following sequences.
The first row has been completed for you.

<table>
<thead>
<tr>
<th>Sequence</th>
<th>Next two terms</th>
<th>nth term</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 5 9 13</td>
<td>17 21</td>
<td>$4n - 3$</td>
</tr>
<tr>
<td>(a) 12 21 30 39</td>
<td></td>
<td>[3]</td>
</tr>
<tr>
<td>(b) 80 74 68 62</td>
<td></td>
<td>[3]</td>
</tr>
<tr>
<td>(c) 1 8 27 64</td>
<td></td>
<td>[2]</td>
</tr>
<tr>
<td>(d) 2 10 30 68</td>
<td></td>
<td>[2]</td>
</tr>
</tbody>
</table>
READ THESE INSTRUCTIONS FIRST

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

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

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 130.
1 (a) (i) In a camera magazine, 63 pages are used for adverts. The ratio number of pages of adverts: number of pages of reviews = 7:5.

Calculate the number of pages used for reviews.

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

(ii) In another copy of the magazine, 56 pages are used for reviews and for photographs. The ratio number of pages of reviews: number of pages of photographs = 9:5.

Calculate the number of pages used for photographs.

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

(iii) One copy of the magazine costs $4.90.

An annual subscription costs $48.80 for 13 copies.

Calculate the percentage discount by having an annual subscription.

Answer(a)(iii) ............................................... % [3]
(b) In a car magazine, 25% of the pages are used for selling second-hand cars, 62\(\frac{1}{7}\)% of the remaining pages are used for features, and the other 36 pages are used for reviews.

Work out the total number of pages in the magazine.

Answer\((b)\) .......................................................... [4]
2 A field, $ABCD$, is in the shape of a quadrilateral. A footpath crosses the field from $A$ to $C$.

(a) Use the sine rule to calculate the distance $AC$ and show that it rounds to 119.9 m, correct to 1 decimal place.

Answer (a)

(b) Calculate the length of $BC$.

Answer (b) $BC = \ldots$ m [4]
(c) Calculate the area of triangle $ACD$.

Answer (c) ........................................... m$^2$ [2]

(d) The field is for sale at $4.50$ per square metre.

Calculate the cost of the field.

Answer (d) $ ...........................................$ [3]
3 A rectangular metal sheet measures 9 cm by 7 cm. A square, of side $x$ cm, is cut from each corner. The metal is then folded to make an open box of height $x$ cm.

(a) Write down, in terms of $x$, the length and width of the box.

Answer (a) Length = .............................................

Width = ............................................. [2]

(b) Show that the volume, $V$, of the box is $4x^3 - 32x^2 + 63x$.

Answer (b)

(c) Complete this table of values for $V = 4x^3 - 32x^2 + 63x$.

<table>
<thead>
<tr>
<th>$x$</th>
<th>0</th>
<th>0.5</th>
<th>1</th>
<th>1.5</th>
<th>2</th>
<th>2.5</th>
<th>3</th>
<th>3.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V$</td>
<td>0</td>
<td>35</td>
<td>36</td>
<td>30</td>
<td>9</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[2]

(d) On the grid opposite, draw the graph of $V = 4x^3 - 32x^2 + 63x$ for $0 \leq x \leq 3.5$. Three of the points have been plotted for you.

© UCLES 2013
(e)  The volume of the box is at least 30 cm$^3$.
Write down, as an inequality, the possible values of $x$.

Answer(e) ...............................................  [2]

(f)  (i)  Write down the maximum volume of the box.

Answer(f)(i) ........................................ cm$^3$  [1]

(ii)  Write down the value of $x$ which gives the maximum volume.

Answer(f)(ii) ...............................................  [1]
4  (a) One angle of an isosceles triangle is 48°.

Write down the possible pairs of values for the remaining two angles.

Answer(a) .................... and ....................

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

(b) Calculate the sum of the interior angles of a pentagon.

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

c) Calculate the sum of the angles a, b, c, d, e, f and g shown in this diagram.

Answer(c) ............................................ [2]
(d) The trapezium, $ABCD$, has four angles as shown. All the angles are in degrees.

(i) Show that $7x + 4y = 390$.

Answer $(d)(i)$

(ii) Show that $2x + 3y = 195$.

Answer $(d)(ii)$

(iii) Solve these simultaneous equations.

Answer $(d)(iii)$ $x =$ .............................................

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

(iv) Use your answer to part $(d)(iii)$ to find the sizes of all four angles of the trapezium.

Answer $(d)(iv)$ ........................ , ........................ , ........................ , ........................ [1]
5 (a) 80 students were asked how much time they spent on the internet in one day. This table shows the results.

<table>
<thead>
<tr>
<th>Time (t hours)</th>
<th>$0 &lt; t \leq 1$</th>
<th>$1 &lt; t \leq 2$</th>
<th>$2 &lt; t \leq 3$</th>
<th>$3 &lt; t \leq 5$</th>
<th>$5 &lt; t \leq 7$</th>
<th>$7 &lt; t \leq 10$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of students</td>
<td>15</td>
<td>11</td>
<td>10</td>
<td>19</td>
<td>13</td>
<td>12</td>
</tr>
</tbody>
</table>

(i) Calculate an estimate of the mean time spent on the internet by the 80 students.

Answer (a)(i) ......................... hours [4]

(ii) On the grid, complete the histogram to show this information.
(b) The probability that Chaminda uses the internet on any day is \( \frac{3}{5} \).

The probability that Niluka uses the internet on any day is \( \frac{3}{4} \).

(i) Complete the tree diagram.

![Tree Diagram](image)

(ii) Calculate the probability, that on any day, at least one of the two students uses the internet.

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

(iii) Calculate the probability that Chaminda uses the internet on three consecutive days.

Answer(b)(iii) ............................................... [2]
6 Sandra has designed this open container. The height of the container is 35 cm.

The cross section of the container is designed from three semi-circles with diameters 17.5 cm, 6.5 cm and 24 cm.

(a) Calculate the area of the cross section of the container.

Answer(a) ........................................ cm² [3]

(b) Calculate the external surface area of the container, including the base.

Answer(b) ........................................ cm² [4]
(c) The container has a height of 35 cm. Calculate the capacity of the container. Give your answer in litres.

Answer(c) .......................................................... litres [3]

(d) Sandra’s container is completely filled with water. All the water is then poured into another container in the shape of a cone. The cone has radius 20 cm and height 40 cm.

(i) The diagram shows the water in the cone. Show that \( r = \frac{h}{2} \).

Answer(d)(i) [1]

(ii) Find the height, \( h \), of the water in the cone. [The volume, \( V \), of a cone with radius \( r \) and height \( h \) is \( V = \frac{1}{3} \pi r^2 h \).]

Answer(d)(ii) \( h = \) ............................................... cm [3]
7 (a) The co-ordinates of P are (−4, −4) and the co-ordinates of Q are (8, 14).

(i) Find the gradient of the line PQ.

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

(ii) Find the equation of the line PQ.

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

(iii) Write \( \overrightarrow{PQ} \) as a column vector.

\[ \text{Answer(a)(iii) } \overrightarrow{PQ} = \begin{pmatrix} \ 
\end{pmatrix} \]

(iv) Find the magnitude of \( \overrightarrow{PQ} \).

\[ \text{Answer(a)(iv) } \]
In the diagram, \( \overrightarrow{OA} = 4a \) and \( \overrightarrow{OB} = 3b \).

\( R \) lies on \( AB \) such that \( \overrightarrow{OR} = \frac{1}{5}(12a + 6b) \).

\( T \) is the point such that \( \overrightarrow{BT} = \frac{3}{2} \overrightarrow{OA} \).

(i) Find the following in terms of \( a \) and \( b \), giving each answer in its simplest form.

(a) \( \overrightarrow{AB} \)

\[ \text{Answer(b)(i)(a) } \overrightarrow{AB} = \text{............................................... [1] } \]

(b) \( \overrightarrow{AR} \)

\[ \text{Answer(b)(i)(b) } \overrightarrow{AR} = \text{............................................... [2] } \]

(c) \( \overrightarrow{OT} \)

\[ \text{Answer(b)(i)(c) } \overrightarrow{OT} = \text{............................................... [1] } \]

(ii) Complete the following statement.

The points \( O, R \) and \( T \) are in a straight line because ............................................................................................................................. [1]

(iii) Triangle \( OAR \) and triangle \( TBR \) are similar.

Find the value of \( \frac{\text{area of triangle } TBR}{\text{area of triangle } OAR} \).

\[ \text{Answer(b)(iii) } \text{............................................... [2] } \]
8 (a) Rearrange \( s = ut + \frac{1}{2}at^2 \) to make \( a \) the subject.

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

(b) The formula \( v = u + at \) can be used to calculate the speed, \( v \), of a car.

\[ u = 15, \ a = 2 \text{ and } t = 8, \text{ each correct to the nearest integer}. \]

Calculate the upper bound of the speed \( v \).

\[
Answer(b) \quad \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots [3]
\]
(c) The diagram shows the speed-time graph for a car travelling between two sets of traffic lights.

(i) Calculate the deceleration of the car for the last 5 seconds of the journey.

\[
\text{Answer (c)(i)} \quad \text{\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots m/s}^2 \quad [1]
\]

(ii) Calculate the average speed of the car between the two sets of traffic lights.

\[
\text{Answer (c)(ii)} \quad \text{\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots m/s} \quad [4]
\]
9 The first four diagrams in a sequence are shown below.

Diagram 1  Diagram 2  Diagram 3  Diagram 4

The diagrams are made from dots (●) and squares (□) joined by lines.

(a) Complete the table.

<table>
<thead>
<tr>
<th>Diagram</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of dots</td>
<td>6</td>
<td>9</td>
<td>12</td>
<td></td>
<td></td>
<td>(\frac{1}{2}n(n-1))</td>
</tr>
<tr>
<td>Number of squares</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of triangles</td>
<td>4</td>
<td>9</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of lines</td>
<td>9</td>
<td>18</td>
<td>30</td>
<td>45</td>
<td>63</td>
<td>(\frac{3}{2}(n+1)(n+2))</td>
</tr>
</tbody>
</table>

(b) Which diagram has 360 lines?

Answer (b) .................................................. [2]
(c) The total number of lines in the first $n$ diagrams is
\[ \frac{1}{2}n^3 + pn^2 + qn. \]

(i) When $n = 1$, show that $p + q = 8 \frac{1}{2}$.

Answer(c)(i)

[1]

(ii) By choosing another value of $n$ and using the equation in part (c)(i), find the values of $p$ and $q$.

Answer(c)(ii) $p =$ ...............................................

$q =$ .................................................. [5]

Question 10 is printed on the next page.
10 (a) Simplify.
\[
\frac{x^2 - 3x}{x^2 - 9}
\]

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

(b) Solve.
\[
\frac{15}{x} - \frac{20}{x + 1} = 2
\]

Answer(b) \(x = \ldots\ldots\) or \(x = \ldots\ldots\) [7]
This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners’ meeting before marking began, which would have considered the acceptability of alternative answers.

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

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2013 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.
### Abbreviations
- **cao**: correct answer only
- **cso**: correct solution only
- **dep**: dependent
- **ft**: follow through after error
- **isw**: ignore subsequent working
- **oe**: or equivalent
- **SC**: Special Case
- **www**: without wrong working
- **soi**: seen or implied

### Question 1
- **Answers**: 19% 0.7195 √0.038 sin11.4 1/5
- **Mark**: 2
  - **Part Marks**: B1 for decimals [0.19], [0.2], 0.194…, 0.197…, 0.192… seen
  - Or for four in correct order

### Question 2
- **(a)** -447
- **(b)** 2
- **Mark**: 1
- **Part Marks**: 1

### Question 3
- **Answers**: 15.7 or 15.70 to 15.71
- **Mark**: 2
  - **Part Marks**: M1 for 2 × π × 2.5

### Question 4
- **Answers**: 160
- **Mark**: 2
  - **Part Marks**: M1 for \(\frac{8}{18} \times 360\) oe

### Question 5
- **(a)**
- **(b)** Some possible answers:
- **Mark**: 1
- **Part Marks**: 1

### Question 6
- **Answers**: [±]√y−4 final answer
- **Mark**: 2
  - **Part Marks**: M1 for first move completed correctly
  - M1 for second move completed correctly on answer line

### Question 7
- **Answers**: 170
- **Mark**: 2
  - **Part Marks**: M1 for \(\frac{1}{2} \times (12 + 22) \times 10\) oe

### Question 8
- **Answers**: 3619 to 3620
- **Mark**: 2
  - **Part Marks**: M1 for \(\frac{1}{2} \times \frac{4}{3} \times \pi \times 12^2\) or better

### Question 9
- **Answers**: decagon
- **Mark**: 3
  - **Part Marks**: M1 for 360 ÷ 36 oe
  - A1 for 10

### Question 10
- **Answers**: 10.1[0]
- **Mark**: 3
  - **Part Marks**: M1 for 1.3199 and 1.3401 seen
  - and M1 for 500 \(\times\) 1.3199 or 500 \(\times\) 1.3401
  - or for 500 \(\times\) (their highest – their lowest) oe

### Question 11
- **Answers**: 120
- **Mark**: 3
  - **Part Marks**: M1 for \(v = \frac{k}{\sqrt{d}}\)
  - A1 for \(k = 600\)
<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>
| 12 | \( p = 71.4025 \text{ cao} \) \( q = 73.1025 \text{ cao} \) | 3 | B1 for 8.45 and 8.55 seen  
   M1 for their LB \([\pi]\) or their UB \([\pi]\)  
   If 0 scored, SC1 for one correct. |
| 13 | 10[.00] | 3 | M2 for 1.90 and 2.90 and 5.20 only  
   or M1 for two of 1.90, 2.90, 5.20 in a list of three or  
   two values from the table  
   or SC1 FOR 1.90, 2.90, 4.30 \( \left[ \frac{3.40 + 5.20}{2} \right] \) |
| 14 | 52 | 3 | B2 for \( AOB = 104 \)  
   or B1 for \( OAB \) or \( OBA = 38 \) |
| 15 | (8, 2) | 3 | M1 for correctly eliminating one variable  
   A1 for \( x = 8 \)  
   A1 for \( y = 2 \)  
   If 0 scored, SC2 for correct substitution and correct  
   evaluation to find the other value. |
| 16 | \( x < 6.8 \) | 4 | B3 for 6.8 with wrong inequality or equal as answer.  
   Or  
   M1 for first move completed correctly  
   and M1 for second move completed correctly  
   and M1 for third move completed correctly |
| 17 | (a) \( \begin{pmatrix} 11 & 5 \\ 26 & 30 \end{pmatrix} \)  
   (b) \( \frac{1}{8} \begin{pmatrix} 6 & -1 \\ -4 & 2 \end{pmatrix} \) oe | 2 | SC1 for one correct row or column  
   or B1 for \( k \begin{pmatrix} 6 & -1 \\ -4 & 2 \end{pmatrix} \)  
   or B1 for \( \frac{1}{8} \begin{pmatrix} a & b \\ c & d \end{pmatrix} \) |
| 18 | (a) \( (1.5, 12.5) \) oe  
   (b) \( y = 3x + 8 \) oe | 2 | B1 for either coordinate  
   or B2 for \( y = mx + 8 \) or \( y = 3x + c \) or \( 3x + 8 \)  
   or B1 for gradient (or \( m \)) = 3 and B1 for \( c = 8 \)  
   If 0 scored, SC1 for 23 = their \( mx + 5 + c \)  
   or for 2 = their \( mx - 2 + c \)  
   or for 12.5 = their \( mx \times 1.5 + c \) |
|   | (c) Most common methods:  
   Correctly substituting \( P(3, 17) \) into  
   \( y = 3x + 8 \)  
   Showing the gradient of \( AP \) or \( BP = 3 \)  
   Other methods possible. | 1 |   |
<table>
<thead>
<tr>
<th></th>
<th>Question</th>
<th>Mark Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>(a) $-2a - 2c$ oe</td>
<td>2 M1 for $BO = -a - c$ or for any correct route or correct unsimplified expression</td>
</tr>
<tr>
<td></td>
<td>(b) $2a + c$</td>
<td>2 M1 for any correct route or correct unsimplified expression</td>
</tr>
<tr>
<td></td>
<td>(c) $-a - c$ oe</td>
<td>2FT FT their (a) or correct answer Or M1 for a correct non direct route from O to E or for correct unsimplified expression or for correct FT unsimplified</td>
</tr>
<tr>
<td>20</td>
<td>(a) 4.05 to 4.2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(b) 2.6 to 2.75</td>
<td>2 B1 for 9.6 seen</td>
</tr>
<tr>
<td></td>
<td>(c) 2.05 to 2.25</td>
<td>2 B1 for [UQ] 5.0 to 5.1 and [LQ] 2.85 to 2.95 seen</td>
</tr>
<tr>
<td></td>
<td>(d) $\frac{5}{48}$</td>
<td>2 M1 for 5</td>
</tr>
<tr>
<td>21</td>
<td>(a) 37.2 or 37.17 to 37.19</td>
<td>3 M2 for $\sin[ ] = \frac{4 \times \sin 65}{6}$ or M1 for $\frac{4}{\sin[ ]} = \frac{6}{\sin 65}$ oe</td>
</tr>
<tr>
<td></td>
<td>(b) 11.7 or 11.72 to 11.74</td>
<td>3 M1 for $[B = ] 160 - 65 -$ their (a) M1 for $\frac{1}{2} \times 4 \times 6 \times \sin$ their 77.8</td>
</tr>
</tbody>
</table>
This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners’ meeting before marking began, which would have considered the acceptability of alternative answers.

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

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2013 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.
<table>
<thead>
<tr>
<th>Qu.</th>
<th>Answers</th>
<th>Mark</th>
<th>Part Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>39</td>
<td>2</td>
<td>M1 for 52 × 45 ÷ 60 oe</td>
</tr>
<tr>
<td>2</td>
<td>Any two of (20, 8) (–4, 0) (12, 24)</td>
<td>2</td>
<td>B1 for one correct</td>
</tr>
<tr>
<td>3</td>
<td>–8</td>
<td>2</td>
<td>M1 for 2x = –16 or (\frac{1}{2} + x = –7.5) oe or better</td>
</tr>
<tr>
<td>4</td>
<td>tan 100, cos 100, 1/100, 100^{-0.1}</td>
<td>2</td>
<td>B1 for decimals –0.1[7..], –5.[67..], [0.01], 0.6[3..] or for three in the correct order</td>
</tr>
<tr>
<td>5</td>
<td>(a) 600 000</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(b) 79.2</td>
<td>2</td>
<td>M1 for 22 × 60 × 60 ÷ 1000 oe</td>
</tr>
<tr>
<td>6</td>
<td>25[.00]</td>
<td>3</td>
<td>M2 for 30 × (\frac{100}{120}) oe or M1 for 30 associated with 120% e.g. 1.2x = 30</td>
</tr>
<tr>
<td>7</td>
<td>5</td>
<td>3</td>
<td>M2 for ((x – 5)(x – 1)) or M1 for evidence of a factorisation which gives the correct coefficient of (x) or positive prime constant term e.g. ((x – 7)(x + 1), (x – 4)(x – 2), (x – 3)(x – 1))</td>
</tr>
<tr>
<td>8</td>
<td>1.6 oe</td>
<td>3</td>
<td>M1 for (m = kx^3) A1 for (k = 25)</td>
</tr>
<tr>
<td>9</td>
<td>(a) (a^2 + 2ab + b^2)</td>
<td>2</td>
<td>B1 for (a^2 [+] ab [+] ab [+] b^2) or better seen</td>
</tr>
<tr>
<td></td>
<td>(b) 22</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>160</td>
<td>3</td>
<td>M1 for (\sin 15 = \frac{\pi}{628}) oe or better</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>11</td>
<td>(a) $\begin{pmatrix} 3 &amp; -1 \ 4 &amp; 2 \end{pmatrix}$</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(b) $\frac{1}{10} \begin{pmatrix} 2 &amp; 1 \ -4 &amp; 2 \end{pmatrix}$ oe</td>
<td>2</td>
<td>B1 for $\begin{pmatrix} a &amp; b \ c &amp; d \end{pmatrix}$ or B1 for $\begin{pmatrix} 2 &amp; 1 \ -4 &amp; 3 \end{pmatrix}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>(a) $7.5 \times 10^{-2}$</td>
<td>2</td>
<td>M1 for $0.075$ or $\frac{3}{40}$ or $\frac{6}{80}$ or $0.75 \times 10^{-1}$ oe</td>
</tr>
<tr>
<td></td>
<td>(b) $9.3 \times 10^7$</td>
<td>2</td>
<td>M1 for $93,000,000$ or $93 \times 10^6$ or $0.93 \times 10^8$ oe</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>(a) 24</td>
<td>2</td>
<td>M1 for $MOC = 48$</td>
</tr>
<tr>
<td></td>
<td>(b) 24</td>
<td>2</td>
<td>M1 for $ACM = 66$ or B1 for $48 - their$ (a)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>(a) $8q^{-1}$ or $\frac{8}{q}$</td>
<td>2</td>
<td>B1 for $8q^k$ or $kq^{-1}$</td>
</tr>
<tr>
<td></td>
<td>(b) 1/5 or 0.2</td>
<td>2</td>
<td>M1 for $5^{-2}, \frac{1}{5^2}$ or [0].04 seen oe</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>(a) Circle, radius 3 cm, centre $A$, not inside the rectangle</td>
<td>2</td>
<td>M1 for arc or full circle centre $A$ radius 3 cm or for an incorrect size circle at $A$ outside rectangle</td>
</tr>
<tr>
<td></td>
<td>(b) One line of symmetry with correct arcs. E.g.:</td>
<td>2</td>
<td>B1 for correct ruled line (must reach or cross two sides) B1 for 2 pairs of intersecting arcs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>(a) 8.61 or 8.609 to 8.6102</td>
<td>4</td>
<td>M1 for $\frac{1}{2} \times 3^2 \times \pi \times \sin 120$ M1 for $\frac{30}{360} \times \pi \times 3^2 [\times 2]$ M1 for area of triangle + 2 sectors</td>
</tr>
<tr>
<td></td>
<td>(b) 430 or 431 or 430.4 to 430.41</td>
<td>1FT</td>
<td>FT their (a) $\times 50$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>------</td>
<td>---</td>
</tr>
</tbody>
</table>
|   |   | (a)  | triangle at (0, 3) (2, 3) and (2, 4) | 3 | **B1** for each correct vertex  
|   |   | (b)  | reflection in \( y \) axis | 2 | **B1** for reflection  
|   |   |      |                                |   | **B1** for \( y \) axis or \( x = 0 \) |
|   |   | 18   |   |   |
|   |   | (a)  | 19–19.1 | 1 |   |
|   |   | (b)  | 3 | 2 | **M1** for 47 seen |
|   |   | (c)  | 4.9 to 5.7 | 2 | **B1** for [UQ] 21.7 to 22.2 and [LQ] 16.5 to 16.8 |
|   |   | (d)  | \( \frac{45}{50} \) \( oe \) | 2 | **B1** for 45 seen or  
|   |   |      |                                |   | **SC1** for \( \frac{5}{50} \) isw |
|   |   | 19   |   |   |
|   |   | (a)  | 75 | 2 | **B1** for \( g(6) = \) 36 |
|   |   | (b)  | 3.5 \( -6.5 \) | 3 | **M1** for \((2x + 3)^2 = 100\)  
|   |   |      |                                |   | **M1** for \(2x + 3 = \pm 10\)  
|   |   |      |                                |   | If 0 scored, **SC1** for one correct value as answer |
|   |   | (c)  | \( \frac{x - 3}{2} \) \( oe \) final answer | 2 | **M1** for \(x = 2y + 3\) or \(y - 3 = 2x\) or \(\frac{y}{2} = x + \frac{3}{2}\)  
|   |   |      |                                |   | or better |
|   |   | (d)  | 5 | 1 |   |
This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners’ meeting before marking began, which would have considered the acceptability of alternative answers.

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

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2013 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.
### Abbreviations

cao  correct answer only  
cso  correct solution only  
dep  dependent  
ft   follow through after error  
isw  ignore subsequent working  
oe   or equivalent  
SC   Special Case  
www  without wrong working  
art  anything rounding to  
soi  seen or implied

<table>
<thead>
<tr>
<th>Qu</th>
<th>Answers</th>
<th>Mark</th>
<th>Part Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(a) (i) (\frac{2}{5}) cao</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(ii) 3 : 2 cao</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(b) (i) 1.22</td>
<td>2</td>
<td>M1 for 86.38 – 28 × 1.56</td>
</tr>
</tbody>
</table>
|    | (ii) 1.3 [0] nfww | 3    | M2 for 1.56 ÷ 1.2 oe  
|    |           |      | or M1 for 1.56 = 120% soi |
|    | (c) 33.6[0] | 2    | M1 for (667 – 314.2) ÷ 10.5 oe |
| 2  | (a) 3 correct lines on grid  
|    | (0, 0) to (40, 5)  
|    | (40, 5) to (100, 5)  
|    | (100, 5) to (120, 0)  
|    | 1 | 2 | Allow good freehand  
|    | SC1FT for 2 lines correct, FT from an incorrect line  
|    | (b) \(\frac{5}{40}\) oe | 1    |            |
|    | (c) 3.75 | 4    | M2 for \(0.5 \times 40 \times 5 + 60 \times 5 + 0.5 \times 20 \times 5\) oe  
|    |           |      | [450]  
|    |           |      | or M1 for evidence of a relevant area = distance  
<p>|    |           |      | and M1dep their area (or distance) ÷ 120 |</p>
<table>
<thead>
<tr>
<th>Qu</th>
<th>Answers</th>
<th>Mark</th>
<th>Part Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>(a) (i) 204 or 204.2 to 204.23</td>
<td>2 M1</td>
<td>for $\pi \times 5 \times 13$ implied by answer in range 204.1 to 204.3</td>
</tr>
<tr>
<td></td>
<td>(ii) 12 cao</td>
<td>3 M2</td>
<td>for $\sqrt{13^2 - 5^2}$ or states 5, 12, 13 triangle or M1 for $13^2 = 5^2 + h^2$ or better</td>
</tr>
<tr>
<td></td>
<td>(iii) 314 or 314.1 to 314.2</td>
<td>2 M1</td>
<td>for $\frac{1}{3} \times \pi \times 5^2 \times$ their (a) (ii) implied by answer in range 314 to 314.3</td>
</tr>
<tr>
<td></td>
<td>(iv) $3.14 \times 10^{-4}$ or 3.141 to $3.142 \times 10^{-4}$</td>
<td>2FT</td>
<td>their (a) (iii) $\div 100^3$ correctly evaluated and given in standard form to 3 sig figs or better or M1 FT for their (a) (iii) $\div 100^3$ or SC1 for conversion of their $m^3$ into standard form only if negative power</td>
</tr>
<tr>
<td></td>
<td>(b) 138 or 138.3 to 138.5</td>
<td>4 M3</td>
<td>for $\frac{10\pi}{26\pi} \times 360$ oe or $\frac{\pi \times 5 \times 13}{\pi \times 13^2}$ their (a)(i) $\times 360$ oe or M2 for a correct fraction without $\times 360$ or M1 for $\pi \times 2 \times 13$ oe [81.6 to 81.8] seen or $\pi \times 13^2$ oe [530.6 to 531.2] seen</td>
</tr>
<tr>
<td>4</td>
<td>(a) 45.[0] or 45.01 to 45.02 nfww</td>
<td>4 M2</td>
<td>for $55^2 + 70^2 - 2.55.70 \cos 40$ or M1 for correct implicit equation A1 for 2026. ….</td>
</tr>
<tr>
<td></td>
<td>(b) 84.9 or 84.90 to 84.92</td>
<td>4 B1</td>
<td>for angle BDC = 40 soi</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M2 for $\frac{70 \sin (their \ 40)}{\sin 32}$ or M1 for correct implicit equation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(c) (i) 4060 or 4063 to 4064 nfww</td>
<td>3 M2</td>
<td>for $\frac{1}{2} \left(55 \times 70 \sin 40\right) + \frac{1}{2} \left(70 \times \sin (b) \sin (180 - their \ 40 - 32)\right)$ oe or M1 for correct method for one of the triangle areas</td>
</tr>
<tr>
<td></td>
<td>(ii) 1020 or 1015 to 1016</td>
<td>2FT</td>
<td>their (c) (i) $\div 4$ oe correctly evaluated or M1 their (c) (i) $\div$ figs 4 oe</td>
</tr>
<tr>
<td></td>
<td>(d) 35.4 or 35.35… nfww</td>
<td>2 M1</td>
<td>for $\sin 40 = \frac{distance}{55}$ or better or for $\frac{1}{2} \left(55 \times 70 \sin 40\right) = (70 \times \text{distance}) \div 2$ or better</td>
</tr>
<tr>
<td>Qu</td>
<td>Answers</td>
<td>Mark</td>
<td>Part Marks</td>
</tr>
<tr>
<td>----</td>
<td>---------</td>
<td>------</td>
<td>------------</td>
</tr>
<tr>
<td>5</td>
<td>(a) (i) Correct reflection to (4, 8) (2, 9) (4, 9)</td>
<td>2</td>
<td>SC1 for reflection in line ( x = 5 ) or reflection in ( y = k ) Ignore additional triangles</td>
</tr>
<tr>
<td></td>
<td>(ii) Correct rotation to (4, 2), (4, 3) (6, 3)</td>
<td>2</td>
<td>SC1 for rotation 180° with incorrect centre Ignore additional triangles</td>
</tr>
<tr>
<td></td>
<td>(iii) Shear, ( x )-axis oe invariant, [factor] 2</td>
<td>3</td>
<td>B1 each (independent)</td>
</tr>
</tbody>
</table>
|    | (iv) \[
\begin{pmatrix}
1 & 2 \\
0 & 1
\end{pmatrix}
\] | 2FT | FT *their* shear factor B1FT for one correct column or row in 2 by 2 matrix but not identity matrix or SC1FT for \[
\begin{pmatrix}
1 & 0 \\
2 & 1
\end{pmatrix}
\] |
<p>| (b) | (i) ( p + 2s ) final answer | 2 | M1 for recognising ( \overrightarrow{OQ} ) as position vector soi |
|    | (ii) ( s + \frac{1}{2}p ) final answer | 2 | B1 for ( s + kp ) or ( ks + \frac{1}{2}p ) or correct route ( (k \neq 0) ) |
|    | (c) parallel and ( OQ = 2SR ) oe | 1 | |
| 6  | (a) (i) 1.4 to 1.6 | 1 | |
|    | (ii) 1.15 to 1.25 | 1 | |
|    | (iii) – 1 | 1 | |
|    | (iv) – 2.25 to – 2.1 (- 0.9 to – 0.75 ) ( 2.2 to 2.35 ) | 3 | B2 for 2 correct or B1 for one correct or B1 for ( y = x ) drawn ruled to cut curve 3 times |
| (b) | (i) – 15 | 2 | B1 for ( [h(3) =] ) 8 seen or M1 for ( 1 – 2(x^2 – 1) ) or better |
|    | (ii) ( \frac{1–x}{2} ) or ( \frac{1–x}{2} ) oe final answer | 2 | M1 for ( 2x = 1 – y ) or ( x = 1–2y ) or better |
|    | (iii) – 2, 2 | 3 | M1 for ( x^2 – 1 = 3 ) or better B1 for one answer |
|    | (iv) ( \frac{1}{8} ) oe nfww | 3 | M2 for ( 8x = 1 ) or ( 8x – 1 = 0 ) or M1 for ( 1 – 2(3x) [= 2x] ) |</p>
<table>
<thead>
<tr>
<th>Qu</th>
<th>Answers</th>
<th>Mark</th>
<th>Part Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>(a) 24.7 or 24.66 to 24.67</td>
<td>4</td>
<td>M1 for midpoints soi (condone 1 error or omission) (5, 15, 25, 35, 45, 55) and M1 for use of $\sum fx$ with $x$ in correct interval including both boundaries (condone 1 further error or omission) and M1 (dependent on second M) for $\sum fx \div 120$</td>
</tr>
<tr>
<td></td>
<td>(b) (i) 50, 90, 114</td>
<td>2</td>
<td>B1 for 2 correct</td>
</tr>
<tr>
<td></td>
<td>(ii) Correct curve or ruled polygon</td>
<td>3</td>
<td>Ignore section to left of $t = 10$ B1 for 6 correct horizontal plots and B1FT for 6 correct vertical plots If 0 scored SC1 for 5 out of 6 correct plots and B1FT for curve or polygon through at least 5 of their points dep on an increasing curve/polygon that reaches 120 vertically</td>
</tr>
<tr>
<td></td>
<td>(iii) 21.5 to 23 15 to 16.5 24 to 26</td>
<td>4</td>
<td>B1 B1 B2 or B1 for 72 or 72.6 seen</td>
</tr>
<tr>
<td></td>
<td>(c) (i) 50, 30</td>
<td>2</td>
<td>B1 each</td>
</tr>
<tr>
<td></td>
<td>(ii) Correct histogram</td>
<td>3FT</td>
<td>B1 for blocks of widths 0 – 20, 30 – 60 (no gaps) B1FT for block of height 2.5 or their 50 ÷ 20 and B1FT for block of height 1 or their 30 ÷ 30</td>
</tr>
<tr>
<td>Qu</td>
<td>Answers</td>
<td>Mark</td>
<td>Part Marks</td>
</tr>
<tr>
<td>----</td>
<td>---------</td>
<td>------</td>
<td>------------</td>
</tr>
<tr>
<td>8</td>
<td>(a) (\sqrt{(-11)^2 - 4(8)(-11)}) or better &lt;br&gt; (p = -(11), r = 2(8)) or better</td>
<td>B1</td>
<td>Seen anywhere or for (\left(x - \frac{11}{16}\right)^2) &lt;br&gt; Must be in the form (\frac{p + \sqrt{q}}{r}) or (\frac{p - \sqrt{q}}{r}) or B1 for (\frac{11 + \left(\frac{11}{16}\right)}{8} + \frac{11}{16}) &lt;br&gt; (-0.67, 2.05) final answers</td>
</tr>
<tr>
<td></td>
<td>(b) 132</td>
<td>3</td>
<td>M1 for (y = k\sqrt{x}) oe or (\sqrt{x} = ky) oe &lt;br&gt; A1 for (k = 6) oe or better or for (k = 0.1666) to (0.167) ([k = 6 \implies M1A1]) oe &lt;br&gt; (c) 20 with supporting algebraic working</td>
</tr>
<tr>
<td>9</td>
<td>(a) (y = 2) oe (y = 2x) oe (y = \frac{1}{2} x + 5) oe</td>
<td>1</td>
<td>M1 for (y = kx, k \neq 0) or gradient 2 soi &lt;br&gt; M1 for gradient (-\frac{1}{2}) soi or (y = kx + 5)oe or (x + 2y = k) (k \neq 0) oe &lt;br&gt; If (L^2) and (L^3) both correct but interchanged then SC3</td>
</tr>
<tr>
<td></td>
<td>(b) (y \geq 2) oe (y \leq 2x) oe (y \leq \frac{1}{2} x + 5) oe</td>
<td>3</td>
<td>B1 for each correct inequality, allow in any order &lt;br&gt; After 0 scored, SC1 for all inequalities reversed</td>
</tr>
<tr>
<td></td>
<td>(c) (i) 4 [bushes], 3 [trees]</td>
<td>2</td>
<td>M1 for any correct trial using integer coordinates in region &lt;br&gt; or (30x + 200y = 720) seen</td>
</tr>
<tr>
<td></td>
<td>(ii) 2 [bushes], 4 [trees]</td>
<td>2</td>
<td>M1 for any correct trial using integer coordinates in region</td>
</tr>
</tbody>
</table>

© Cambridge International Examinations 2013
<table>
<thead>
<tr>
<th>Qu</th>
<th>Answers</th>
<th>Mark</th>
<th>Part Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 (a) (i)</td>
<td>$1 + 2 + 3 + 4 + 5 = 15$</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
| (ii) | Correct substitution equating to sum
e.g. $\frac{2(2 + 1)}{k} = 3$ and $k = 2$ stated with no errors seen | 2 | M1 for using a value of $n$ in $\frac{n(n+1)}{k}$
e.g. $\frac{2(2 + 1)}{k} = 3$
or for a verification using $k = 2$
e.g. $\frac{2(2 + 1)}{2} = 3$
| (iii) | 1830 | 1 |  |
| (iv) | 30 | 2 | M1 for $\frac{n(n+1)}{2} = 465$ or better |
| (v) | $n - 8$ | 1 |  |
| (b) (i) | 225, 15 | 2 | B1 either |
| (ii) | $\frac{n^2(n+1)^2}{4}$ oe | 1 |  |
| (iii) | 36100 | 2 | M1 for $\frac{19^2(19+1)^2}{4}$ oe or $190^2$ |
This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners’ meeting before marking began, which would have considered the acceptability of alternative answers.

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

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2013 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.
<table>
<thead>
<tr>
<th>Correct answer</th>
<th>Mark</th>
<th>Part marks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong>&lt;br&gt; (a) (i) 3216 Final answer</td>
<td>2</td>
<td>M1 for ((18900 - 5500) \times 0.24) oe&lt;br&gt; FT ((18900 - \text{their} ,(a)(i)) \div 12) correctly evaluated&lt;br&gt; M1 for ((18900 - \text{their} ,(a)(i)) \div 12)</td>
</tr>
<tr>
<td>(ii) 1307 Final answer</td>
<td>2FT</td>
<td></td>
</tr>
</tbody>
</table>
| (b) 4.5[%] nfww | 2 | M1 for \(19750.50 [-18900] \times 100\)
| **| | or \(19750.50 - 18900\) \times 100 |
| (c) A by 31.05… or 31.04 to 31.05 or 31.1[0] | 5 | M1 for \(1500 \times 4.1/100 \times 3 \ [+ 1500]\) oe<br> M1 for \(1500 \times 1.033^3 [- 1500]\) oe<br> A1 for 1684.5 or 184.5 or 1653.45... or 153.45...
| **| | and M1dep for subtraction of their amounts or their interests |
| **2**<br> (a) 36.9° or 36.86 to 36.87 | 2 | M1 for \(\tan[DBC] = 1.8/2.4\) oe |
| (b) (i) \(1.8^2 + 2.4^2\) leading to \(\sqrt{9}\) | 2 | M1 for \(1.8^2 + 2.4^2\) or better |
| (ii) \([\cos ABD] = \frac{6.46^2 + 3^2 - 8.6^2}{2 \times 6.46 \times 3}\) 127 or 126.8… | M2 | M1 for correct cos rule but implicit version<br> A2 for \(-0.599…\)
<p>| **| | After (\theta) scored, SC2 nfww for answer 127 or 126.8 to 126.96 from other methods or no working shown |
| (c) 39.6 or 39.7 or 39.59 to 39.68 | 3 | M2 for (\frac{1}{2} (2.4 + 8.6) \times 1.8 \times 4) oe&lt;br&gt; Or M1 for (\frac{1.8}{2} (2.4 + 8.6)) oe soi by 9.9 to 9.92 |
| 3 | (a) ( \frac{4x - 7}{10} ) final answer nfww | 3 | M2 for ( \frac{5(2x-1) - 2(3x+1)}{2 \times 5} ) or ( \frac{5(2x-1) - 2(3x+1)}{5 \times 2} ) or M1 for attempt to convert to common denominator of 10 or multiple of 10 with one error in numerator |
| (b) ( x^2 + 9 ) final answer nfww | 4 | B3 for ( 4x^2 - 6x - 6x + 9 - 3x^2 + 12x ) or correct answer given and then spoil or B1 for ( 4x^2 - 6x - 6x + 9 ) seen and B1 for ( -3x^2 + 12x ) or ( -3x^2 - 12x ) seen or M1 for 2( x^2 - 9 ) seen |
| (c) (i) ( (2x - 1)(x + 3) ) isw solving | 2 | M1 for ( (2a + b)(x + b) ) where ( ab = -3 ) or ( 2b + a = 5 ) with integers ( a ) and ( b ) |
| (ii) ( \frac{2x - 1}{2(x - 3)} ) or ( \frac{2x - 1}{2x - 6} ) final answer nfww | 3 | M2 for ( 2(x + 3)(x - 3) ) or ( 2(x - 6)(x + 3) ) or ( 2(x + 6)(x - 3) ) seen or M1 for ( 2x^2 - 9 ) seen |
| 4 | (a) (i) ( 90 ÷ \left( \frac{42}{360} \times \pi \times 8^2 \right) ) o.e. 3.836 to 3.837 | M3 | M2 for ( 42/360 \times \pi \times 8^2 \times h = 90 ) or M1 for ( 42/360 \times \pi \times 8^2 ) |
| (ii) 131 or 130.75 to 130.9 nfww | A1 | or M1 for ( 42/360 \times \pi \times 8^2 ) |
| (b) 2.42 or 2.416 to 2.419 | 5 | M2 for ( 42/360 \times \pi \times 2 \times 8 \times 3.84 ) oe [22.48 to 22.53] or M1 for ( 42/360 \times \pi \times 2 \times 8 ) oe soi [5.86 to 5.87] and M1 for ( 2 \times (8 \times 3.84) ) [61.37 to 61.44] and M1 for ( 2 \times (42/360 \times \pi \times 8^2) ) [46.88 to 47] |
| | | | M2 for ( 3.84 \times \sqrt[3]{\frac{22.5}{90}} ) oe or ( h = \sqrt[3]{\frac{3.84^3 \times 22.5}{90}} ) or M1 for ( \sqrt[3]{\frac{22.5}{90}} ) oe or ( \sqrt[3]{\frac{90}{22.5}} ) oe seen or ( \frac{3.84^3}{h^3} = \frac{90}{22.5} ) oe |</p>
<table>
<thead>
<tr>
<th></th>
<th>Mark Scheme</th>
<th>Syllabus</th>
<th>Paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>(a) 7, 11.5, 4.5</td>
<td>1,1,1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(b) Correct curve cao</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(c) (i) $0.69 &lt; x &lt; 0.81$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
|   | (ii) $-2.3 < x < -2.2$  
$-0.8 < x < -0.6$  
$0.35 < x < 0.5$ |       |       |
|   | (d) (i) $y = 10 - 3x$ ruled correctly |       |       |
|   |   
$-0.55 < x < -0.45$  
$0.35 < x < 0.45$ |       |       |
|   | (ii) $10 \quad 1 \quad -2$  
or $-10 \quad -1 \quad 2$ |       |       |
|   | B3FT for 10 correct plots, on correct vertical grid line and within correct 2 mm square vertically  
Or B2FT for 8 or 9 correct plots  
Or B1FT for 6 or 7 correct plots  
and B1 indep for two separate branches on either side of $y$-axis | 5 | 6080 | 42 |
|   | B1 for each correct  
After 0 scored, allow SC1 for drawing line $y = 7.5$ long enough to cross curve at least once long enough to cross curve twice.  
B1 for ruled line gradient $-3$ or $y$ intercept at 10 but not $y = 10$  
Or B1 for ‘correct’ but freehand | 3 |       |       |
|   | B1dep Dependent on at least B1 scored for line  
B1dep |       |       |
|   | After 0 scored, SC2 for $-0.5$ and $0.4$ [from solving equation]  
B2 for $2 - x - 10x^2 = 0$ oe  
Or B1 for $\frac{2}{x^2} - \frac{1}{x} - 10 = 0$ oe Correctly eliminating $-3x$  
Or B1 for $2 - x - 3x^3 = 10x^2 - 3x^3$ oe Correctly clearing fractions | 3 |       |       |
<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>(a) (i)</td>
<td>$\frac{1}{110}$ oe</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>(ii)</td>
<td>$\frac{6}{110}$ oe</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>(iii)</td>
<td>$\frac{8}{110}$ oe</td>
<td>2</td>
</tr>
<tr>
<td>(b) (i)</td>
<td>$\frac{6}{990}$ oe</td>
<td>2</td>
<td>M1 for $\frac{3}{11} \times \frac{2}{10} \times \frac{1}{9}$</td>
</tr>
<tr>
<td></td>
<td>(ii)</td>
<td>$\frac{336}{990}$ oe</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>(iii)</td>
<td>$\frac{198}{990}$ oe</td>
<td>5</td>
</tr>
</tbody>
</table>

or M1 for $\frac{3}{11} \times \frac{2}{10} \times \frac{8}{9}$ oe seen and M1 for $\frac{2}{11} \times \frac{1}{10} \times \frac{9}{9}$ oe seen
<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>7</strong></td>
<td><strong>(a)</strong></td>
<td>14 10 or 2 10 pm final answer</td>
<td><strong>2</strong></td>
</tr>
<tr>
<td></td>
<td><strong>(b)</strong></td>
<td>5 hours 45 minutes cao</td>
<td><strong>2</strong></td>
</tr>
<tr>
<td></td>
<td><strong>(c)</strong></td>
<td>(i) 798 or 798.2 to 798.4….</td>
<td><strong>2</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(ii) $1.82 \times 10^5$ or $1.815 \times 10^5$ to $1.816 \times 10^5$</td>
<td><strong>4</strong></td>
</tr>
<tr>
<td></td>
<td><strong>(d)</strong></td>
<td>8600</td>
<td><strong>3</strong></td>
</tr>
<tr>
<td><strong>8</strong></td>
<td><strong>(a)</strong></td>
<td>(i) $-6$</td>
<td><strong>1</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(ii) 2.75 oe</td>
<td><strong>2</strong></td>
</tr>
<tr>
<td></td>
<td><strong>(b)</strong></td>
<td>$\frac{x-3}{4}$ or $\frac{x}{4} - \frac{3}{4}$ Final answer</td>
<td><strong>2</strong></td>
</tr>
<tr>
<td></td>
<td><strong>(c)</strong></td>
<td>(i) 5</td>
<td><strong>2</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(ii) $x^2 + 5x - 7 = 0$</td>
<td><strong>B1</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$\frac{-5 \pm \sqrt{5^2 - 4(1)(-7)}}{2(1)}$ oe</td>
<td><strong>B1</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$1.14$ and $-6.14$ final answers</td>
<td><strong>B1</strong></td>
</tr>
</tbody>
</table>

© Cambridge International Examinations 2013
| 9 | (a) (i) Reflection \( x = -2 \) oe | 2 | B1 for either |
|   | (ii) Translation \( \left( \begin{array}{c} -7 \\ 2 \end{array} \right) \) oe | 2 | B1 for either |
|   | (iii) Stretch x-axis oe invariant [factor] 3 | 3 | B1 for each |
|   | (b) (i) Triangle with coords at (8, 2) (7, 3) and (7, 5) | 2 | B1 for rotation about (6, 0) but 90° anticlockwise Or for rotation 90° clockwise around any point |
|   | (ii) Triangle with coords at \((-2, -5) (-6, -5) \) and \((-8, -7) \) | 2 | B1 for 2 correct points or for enlargement of SF -2 any centre |
|   | (iii) Triangle with coords at (1, -1) (4, -6) and (3, -5) | 2 | B1 for 2 correct points or coordinates of 2 points shown |
|   | (c) \( \left( \begin{array}{cc} 1 & 0 \\ -2 & 1 \end{array} \right) \) | 2 | B1 for one row or one column correct but not identity matrix. Or SC1 for \( \left( \begin{array}{cc} 1 & -2 \\ 0 & 1 \end{array} \right) \) |
| 10 | (a) 48 and 57, \( 9n + 3 \) oe | 1 | 2 | B1 for \( 9n + k \) oe |
|   | (b) 56 and 50, \( 86 - 6n \) oe | 1 | 2 | B1 for \( k - 6n \) oe |
|   | (c) 125 and 216, \( n^3 \) oe | 1 | 1 |
|   | (d) 130 and 222 \( n^3 + n \) oe | 1 | 1FT | FT their (c) + \( n \) dep on expression in \( n \) in (c) |
This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners’ meeting before marking began, which would have considered the acceptability of alternative answers.

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

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2013 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.
<table>
<thead>
<tr>
<th>Qu.</th>
<th>Answers</th>
<th>Mark</th>
<th>Part Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (a) (i)</td>
<td>45</td>
<td>2 M1 for $5 \times 63 \div 7$</td>
<td></td>
</tr>
<tr>
<td>(ii)</td>
<td>20</td>
<td>2 M1 for $5 \times 56 \div 14$</td>
<td></td>
</tr>
<tr>
<td>(iii)</td>
<td>23.4 or 23.38 to 23.41</td>
<td>3 M2 for $\frac{13 \times 4.9 - 48.8}{13 \times 4.9} \times 100$ or $\frac{4.9 - 48.8}{4.9} \times 100$</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Or</td>
<td></td>
</tr>
</tbody>
</table>
| | | M1 for $\frac{13 \times 4.9 - 48.8}{13 \times 4.9}$ or $\frac{48.8}{13 \times 4.9} \times 100$ or 76.6...
| (b) | 128 | 4 Using fractions (percentages / decimals): |
| | | M1 for $\frac{3}{4} \times \frac{3}{8} = \frac{9}{32}$ or $\frac{75}{100} \times 37.5$ = 28.125%
| | | A1 for $\frac{9}{32}$ or 28.125%
| | | M1 for $36 \div \frac{9}{32}$ oe |
| | | or $36 \times \frac{100}{28.125}$ oe |
| | | Partial percentages |
| | | M1 for (Remaining) $\frac{100 \times 36}{37.5}$ = 96
<p>| | | A1 for 96 |
| | | M1 for $96 \div \frac{75}{100}$ oe |
| | | SC1 for 288 |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>
| 2 (a) | 119.94[...] nfww | 3 | M2 for $\frac{62 \times \sin 122}{\sin 26}$
|      | or M1 for $\frac{\overline{AC}}{\sin 122} = \frac{62}{\sin 26}$ oe SC2 for correct answer from alternative methods |
| (b) | 109 or 108.7 to 108.8 nfww | 4 | M2 for $119.9..^2 + 55^2 - 2 \times 119.9.. \times 55 \cos 65$
|      | A1 for $11827[...]$ or $11834$ to $11835[...]$ or M1 for implicit version |
| (c) | 1970 or 1969 to 1970.4 | 2 | M1 for $\frac{1}{2} \times 119.9.. \times 62 \times \sin 32$
| (d) | 22300 or 22310 to 22320 | 3 | M2 for $(\text{their} (c) + 0.5 \times 55 \times 119.9.. \times \sin 65) \times 4.5$
|      | or M1 for \text{their} (c) + 0.5 \times 55 \times 119.9.. \times \sin 65 |
|   |   |   |   |
| 3 (a) | $9 - 2x, \ 7 - 2x$ oe | 2 | B1 for each, accept in any order |
| (b) | $x(9 - 2x)(7 - 2x)$
|      | $4x^3 - 32x^2 + 63x$ | M1FT M1FT | Correct expansion and simplification with no errors |
| (c) | 24 20 | 2 | B1 for each correct value |
| (d) | Correct curve | 3 | B2FT for 5 correct plots
|      | or B1FT for 3 or 4 correct plots |
| (e) | 0.65 to 0.75 $\leq x \leq 2$ oe | 2 | B1 for 0.65 to 0.75 seen |
| (f) (i) | 36 to 37 | 1 |   |
|      | (ii) | 1.2 to 1.4 | 1 |   |
|   |   |   |   |
| 4 (a) | 48 and 84
|      | 66 and 66 | 2 | B1 for each pair |
| (b) | 540 | 2 | M1 for $3 \times 180$ or $(2 \times 5 - 4) \times 90$
|      | or $5 \times (180 - 360 \div 5)$ oe |
| (c) | 1620 | 2 | M1 for $7 \times 360 - \text{their} 540 - 360$
| (d) (i) | $2x + 5 + 3y - 20 + 4x - 5 + x + y - 10 = 360$ oe | 1 | Allow partial simplification but not $7x + 4y - 30 = 360$
|      | (ii) | $2x + 5 + 3y - 20 = 180$ | 1 |   |
|      | (iii) | $[x = 30, \ y = 45$ nfww | 4 | M1 for correct multiplication
|      | M1 for correct elimination |
|      | A1 $x = 30$ or $y = 45$ |   |   |
|      | If 0 scored SC1 for correct substitution to find the other variable |
|      |   |   |   |
| (iv) | 65, 115, 115, 65 | 1 | Accept in any order |

© Cambridge International Examinations 2013
| 5 (a) (i) | 3.81 or 3.812 to 3.813 or 3h 49min nfww | 4 M1 for midpoints soi (condone 1 error or omission and M1 for use of $\sum fx$ with $x$ in correct interval including both boundaries (condone 1 further error or omission) and M1 (dep on 2nd M1) for $\sum fx \div 80$ (305 ÷ 80) |
| (ii) | Correct histogram | 4 B1 for each correct block and B1 for correct widths |
| (b) (i) | $\frac{2}{5}, \frac{1}{4}, \frac{3}{4}, \frac{1}{4}$ oe | 2 B1 for $\frac{2}{5}$ or both $\frac{1}{4}$s in correct place |
| (ii) | $\frac{18}{20}$ nfww $\left[ \frac{9}{10} \right]$ | 3 M2 FT for $1 - \text{their} \ \frac{2}{5} \times \text{their} \ \frac{1}{4}$ or $\frac{3}{5} \times \frac{3}{4} + \frac{3}{5} \times \text{their} \ \frac{1}{4} + \text{their} \ \frac{2}{5} \times \frac{3}{4}$ oe or M1 FT for $\text{their} \ \frac{2}{5} \times \text{their} \ \frac{1}{4}$ or $\frac{3}{5} \times \text{their} \ \frac{1}{4} + \text{their} \ \frac{2}{5} \times \frac{3}{4}$ oe |
| (iii) | $\frac{27}{125}$ [0.216] | 2 M1 for $\frac{3}{5} \times \frac{3}{5} \times \frac{3}{5}$ |

| 6 (a) | 329.7 to 330 | 3 M2 for $\frac{1}{2}\pi(12^2 + 8.75^2 - 3.25^2)$ oe or M1 for $\frac{1}{2}\pi12^2$ or $\frac{1}{2}\pi8.75^2$ or $\frac{1}{2}\pi3.25^2$ |
| (b) | 2970 or 2967 to 2969.[…] | 4 M3 for $\frac{1}{2}\pi(24 + 17.5 + 6.5) \times 35 + \text{their} \ (a)$ or M2 for $\frac{1}{2}\pi(24 + 17.5 + 6.5) \times 35$ or M1 for $\frac{1}{2}\pi \times 24$ or $\frac{1}{2}\pi \times 17.5$ or $\frac{1}{2}\pi \times 6.5$ |
| (c) | 11.5 or 11.6 or 11.53 to 11.55 | 3FT M1 for their $(a) \times 35$ A1 for 11500 or 11530 to 11550 |

© Cambridge International Examinations 2013
<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>
| (d) (i) | \[
\frac{r}{h} = \frac{20}{40} \quad \text{or} \quad \frac{r}{20} = \frac{h}{40}
\] | 1 | Accept \(20 : 40 = r : h\) leading to \(40r = 20h\) \([r = h/2]\)
|   | \[
\frac{20}{40} = \frac{1}{2} \quad \text{and} \quad \frac{r}{h} = \frac{1}{2}
\] |   | \[
\frac{20}{40} = \frac{1}{2}
\] and \[
\frac{r}{h} = \frac{1}{2}
\]
| (ii) | 35.3 or 35.31 to 35.34 | 3 | M2 for \(\sqrt[3]{\frac{\text{their } 11545 \times 12}{\pi}}\) oe or \(2 \times \text{their } r\)
or
|   |   |   | M1 for \(\text{their } 11545 = \frac{1}{3} \times \pi \times \left(\frac{h}{2}\right)^2 \times h\) oe
|   |   |   | or \(\text{their } 11545 = \frac{1}{3} \times \pi \times r^2 \times 2r\) oe
| (a) (i) | \(\frac{3}{2}\) or 1.5 | 2 | M1 for \(\frac{14 - (-4)}{8 - (-4)}\) oe
| (ii) | \(y = \frac{3}{2}x + 2\) oe | 2 | B1 for \(y = \text{their } \frac{3}{2}x + c\) o.e.
or \(y = mx + 2, m \neq 0\)
| (iii) | \(\begin{bmatrix} 12 \\ 18 \end{bmatrix}\) | 1 | SC1 for \(\frac{3}{2}x + 2\)
| (iv) | 21.6 or 21.63[...] | 2 | M1 FT for \(12^2\) + \(\text{their } 18^2\) oe
| (b) (i) | (a) \(3b - 4a\) | 1 |   |
|   | (b) \(\frac{1}{5} (6b - 8a)\) oe simplified | 2 | M1 for \(\frac{1}{5} (12a + 6b) - 4a\) or \(AR = AO + OR\)
|   | (c) \(6a + 3b\) oe simplified | 1 |   |
| (ii) | \(\overline{OR}\) is parallel to \(\overline{OT}\) | 1 | Dep on \(\overline{OT}\) correct
| (iii) | \(\frac{9}{4}\) or 2.25 | 2 | M1 for \(\left(\frac{3}{2}\right)^2\)
| 8 (a) | \( \frac{2(s - ut)}{t^2} \) oe nfww | 3 | M1 for a correct rearrangement to isolate the \( a \) term and 
M1 for a correct multiplication by 2 and 
M1 for a correct division by \( t^2 \) 
(b) | 36.75 cao | 3 | M2 for 15.5 + 2.5 \times 8.5 
B1 for two of 15.5, 2.5, 8.5 seen 
(c) (i) | \( \frac{16}{5} \) or better [3.2] | 1 | 
(ii) | 11.2 | 4 | M2 for \( \frac{1}{2}(25 + 10)16 \) (= 280) 
or M1 for appreciation of distance from area and M1 for \( their \) 280 ÷ 25 (dep on M1) 
9 (a) | 15  18  3n + 3 or 3(n + 1)  
6  10 
25  36  \((n + 1)^2\) | 9 | B2 for 15, 6, 25 
or B1 for two correct values 
B3 for 18, 10, 36 
or B1 for each correct value 
B2 for 3n + 3 oe 
or M1 for 3n + k, for any k 
B2 for \((n + 1)^2\) oe 
or M1 for a quadratic expression 
(b) | 14 | 2 | M1 for \( (n + 1)(n + 2) = 240 \) or better 
or 15 \times 16 = 240 
(c) (i) | \( \frac{1}{2} + p + q = 9 \) | 1 | 
(ii) | \([p = ] 3\) 
\([q = ] \frac{11}{2}\) | 5 | B2 for 4p + 2q = 23 
or B1 for \( \frac{1}{2} \times 2^3 + p \times 2^2 + q \times 2 \) oe 
M1 for correct multiplication and subtraction of \( their \) equations 
A1 for \([p = ] 3\) or \([q = ] \frac{11}{2}\) 
If 0 scored then SC1 for either correct |
| 10 (a) | \( \frac{x}{x+3} \) cao | 3 | B1 for \((x+3)(x-3)\)  
B1 for \(x(x-3)\) |
|---|---|---|---|
| (b) | \( \frac{3}{2} \) and \(-5\) | 7 | M2 for \(15(x+1) - 20x = 2x(x+1)\)  
or M1 for multiplication by one denominator only  
or \(\frac{15(x+1) - 20x}{x(x+1)}\)  
and B2 for \(2x^2 + 7x - 15 [= 0]\)  
or B1 for \(15x + 15 - 20x\) or \(2x^2 + 2x\)  
and M2 for \((2x - 3)(x + 5)\) or *their correct factors* or *formula*  
or M1 for \((2x + a)(x + b)\)  
where \(ab = -15\) or \(a + 2b = 7\)  
A1 for \(x = \frac{3}{2}\) and \(-5\) |