<table>
<thead>
<tr>
<th>Question No</th>
<th>WORKING</th>
<th>CRITERIA</th>
<th>Marks</th>
<th>Total Mark</th>
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</thead>
<tbody>
<tr>
<td>1a</td>
<td>Sandra paid: 20% of €2150 = €430 €51 × 36 = €1836 Total €2266 Sandra paid €116 more than Karl</td>
<td>Works out 20% of €2150 €430 Works out 51 × 36 Adds instalments and deposit €116</td>
<td>M1 A1 M1 M1 A1</td>
<td>10</td>
</tr>
<tr>
<td>1b</td>
<td>(i) 105% ≡ 113,000 100% ≡ ( \frac{113000 \times 100}{105} = 107619 = 108000 ) (to nearest thousand)</td>
<td>Considers 113,000 to be 105% Uses appropriate reasoning to calculate 100%</td>
<td>M1 M1</td>
<td>108000 A1</td>
</tr>
<tr>
<td></td>
<td>(iia) 112500</td>
<td>For responses below award marks: ( \frac{113000 \times 100}{95} ) ( 95% ) of 113,000</td>
<td>1 mark</td>
<td></td>
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<tr>
<td></td>
<td>(lib) 113499</td>
<td>95% of 113,000</td>
<td>0 mark</td>
<td></td>
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| 2i          | Mean = \( \frac{1}{60} \times (72.5 \times 2 + 7 \times 77.5 + 17 \times 82.5 + 24 \times 87.5 + 9 \times 92.5 + 97.5) \)  
\[ \text{Mean} = \frac{1}{60} \times (145 + 542.5 + 1402.5 + 2100 + 832.5 + 97.5) = \frac{1}{60} \times 5120 = 85.3333 \]

<table>
<thead>
<tr>
<th>Height ( \leq 70 )</th>
<th>( \leq 75 )</th>
<th>( \leq 80 )</th>
<th>( \leq 85 )</th>
<th>( \leq 90 )</th>
<th>( \leq 95 )</th>
<th>( \leq 100 )</th>
</tr>
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<tbody>
<tr>
<td>CF</td>
<td>0</td>
<td>2</td>
<td>9</td>
<td>26</td>
<td>50</td>
<td>59</td>
</tr>
</tbody>
</table>

CF plot – see transparency. A copy of this transparency is given on page 10.

<table>
<thead>
<tr>
<th>2ii</th>
<th>Median height corresponds to 30th or 30.5th toddler: 85.8cm</th>
</tr>
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</table>

| 2iii        | First quartile corresponds to 15th and 3rd quartile to 45th toddler  
First quartile corresponds to 82cm  
Third quartile corresponds to 88.5cm  
Inter quartile range – 6.5 cm |
|-------------|------------------------------------------------------------------|

| 2iv         | When height = 87, CF = 36  
Required probability is \( \frac{36}{60} \) |
|-------------|----------------------------------------------------------------------------------|

| 2v          | Uses middle point of the intervals for working out mean  
Correct process for working out mean 85 or more accurate  
TABLE: 3 entries correct  
TABLE: all entries correct  
Marks are awarded for plot (only when CF table makes sense) as follows.  
Three points correctly plotted  
All points correctly plotted  
Correct method  
85.8 ± 0.5 cm  
First quartile corresponds to 15th OR 3rd quartile corresponds to 45th toddler  
1st quartile or 3rd quartile correct:  
82 ± 0.5 cm OR 88.5 ± 0.5 cm  
Uses Inter quartile range = 3rd – 1st quartile  
Uses CF corresponding to height 87 |
|-------------|-----------------------------------------------------------------------------------------------------------------|

\* FNW stands for “full marks no working” and ft stands for “follow through”.
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| 3a          | $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{3 \pm \sqrt{129}}{4}$  
$x = 3.5894 \text{ or } -2.08945$  
$x = 3.59 \text{ or } x = -2.09$ | Uses appropriate eqt with correct values of $a$, $b$ and $c$  
$\frac{3 \pm \sqrt{129}}{4}$  
Both solutions correct (3.5894 & -2.08945)  
Correct rounding $(x = 3.59 \text{ & } x = -2.09)$  
Xandru’s working is correct  
Explanation | M1  
A1  
A1  
B1  
A1 |
| 3bi         | Xandru’s working is correct –  
Division by 5 is done last, so this needs to be reversed first |            |
| 3bii        | $f(10) = 6 \text{ and } f^{-1}(4) = 0$ |  
Explanation | A1  
A1 |
| 3biii       | $f(x) = \frac{x + 20}{5} \text{ and } f^{-1}(x) = 5x - 20$ |  
Explanation | B2  
B2 |
| 4           | Volume of a cone is $\frac{\pi r^2 h}{3}$  
Volume of frustum is $\frac{\pi \times 8^2 \times 24}{3} - \frac{\pi \times 4^2 \times 12}{3} = 1608.4954 - 201.0619 = 1407.4335$  
$= 1407 \text{ cm}^3$ | Correct eqt for vol of cone or frustum  
Correct substitution for $r$ and $h$ for both cones  
Subtracts vol of small cone from that of large cone  
Volume of frustum = 1407 or more accurate  
Rounds appropriately – and does not round prematurely – 1407 | M1  
M1  
M1  
A1  
A1 |
Question No | WORKING | CRITERIA | Marks | Total Mark
--- | --- | --- | --- | ---
5a | \(x - y = 4\) gives \(y = x - 4\)  
\(\frac{1}{x} + \frac{1}{y} = \frac{2}{3}\) gives \(\frac{y + x}{xy} = \frac{2}{3}\)  
\(3(y + x) = 2xy\)  
Substituting for \(y\) gives \(3(2x - 4) = 2x(x - 4)\)  
\(2x^2 - 8x - 6x + 12 = 0\) or \(2y^2 + 2y - 12 = 0\)  
\(x^2 - 7x + 6 = 0\)  
\((x - 6)(x - 1) = 0\). So \(x = 1\) or \(6\) or \((y + 3)(y - 2) = 0\). So \(y = 2\)  
But \(y = x - 4\) is only positive when \(x = 6\)  
So \(x = 6\) and \(y = 2\) | Writes two equations that sufficiently describe the two given constraints, one mark allowed for each equation  
Uses correct strategy to eliminate one of the unknowns  
Correct manipulation of algebraic fractions  
Factorises/ uses formula for quadratic appropriately  
Correct solution for quadratic  
Correct value for other unknown  
Do not penalise if two solutions for \((x, y)\) are given, i.e. \((6, 2)\) and \((1, -3)\)  
For trial & error correct solution with or without equations, award 3 marks | M2 | 12

5b | 
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<tbody>
<tr>
<td>(q)</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>(p)</td>
<td>0</td>
<td>0.2</td>
<td>0.8</td>
<td>1.8</td>
<td>3.2</td>
<td>20</td>
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| 6i | $p = 50^\circ$ (AB = AD, tangents meeting at a point are equal)  
$q = 80^\circ$ (Sum of angles of a triangle = $180^\circ$)  
$r = 50^\circ$ ($\angle$ in the alternate segment)  
$s = 65^\circ$ (Sum of angles of a triangle = $180^\circ$ & $\triangle BCD$ isosceles) |  
$B1$  
$M1$  
$B1$  
$M1$  
$B1$  
$M1$  
$B1$  
$M1$  
$B1$ |  
10 |
| 6ii | Joanna is right.  
The opposite angles of the quadrilateral do not add up to $180^\circ$ | Joanna is right.  
Appropriate reason |  

7i |  
∠BAV = $120^\circ - 74^\circ = 46^\circ$ |  
Proper interpretation of the foll bearings:  
The bearing of A from V is $300^\circ$  
B is on a bearing of $074^\circ$ from A  
Indicates that $\angle MAV$ is $120^\circ$  
∠BAV = $120^\circ - 74^\circ = 46^\circ$ |  
$M1$  
$M1$  
$M1$  
$A1$ |  

7ii | Bearing of A from B is the indicated reflex angle at B  
Obtuse unmarked angle at B equals $180^\circ - 74^\circ = 106^\circ$ (required angle and $74^\circ$ are interior angles between parallel lines)  
Bearing of A from B is $360^\circ - 106^\circ = 254^\circ$ | Uses appropriate method to find the bearing of A from B |  
$M1$  
$FNW$  
$A1$ |  

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| 7iii        | ![Diagram](https://example.com/diagram.png) | $BV^2 = 12^2 + 5^2 - 2 \times 12 \times 5 \cos 46^\circ = 144 + 25 - 120 \cos 46^\circ = 144 + 25 - 83.359^\#$  
$BV = 9.254m$  
Total distance to be travelled: $(12 + 5 + 9.254) \text{ km} = 26.254\text{ km}$  
No, rescue ship does not have enough fuel  
**OR**  
Uses a scale diagram | Uses cosine formula to find $BV$  
Makes correct substitutions in cosine formula  
Correct arithmetic for working out $BV$ up to $#$  
$BV = 9.254m$ or more accurate  
Makes suitable comparison between total distance of $VA$, $AB$ and $BV$ and $25 \text{ km}$ | M1 | M1 |

**OR**  
Scale diagram method  
5 km drawn to scale  
12 km drawn to scale  
$46^\circ$ drawn accurately  
$BV = 9.254m$ or more accurate  
Makes suitable comparison between total distance of $VA$, $AB$ and $BV$ and $25 \text{ km}$ | M1 | M1 | A1 | M1 |
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<tr>
<td>8i</td>
<td>Eqt of line: $y = 15x$</td>
<td>Eqt of line: $y = 15x$</td>
<td>B1</td>
<td>9</td>
</tr>
<tr>
<td>8ii</td>
<td>A = 50</td>
<td>A = 50</td>
<td>B1</td>
<td></td>
</tr>
<tr>
<td>8iii</td>
<td>$x$ coordinates at the points of intersection of the two graphs are: −3.4, 2.4, 5.9</td>
<td>For the $x$-values accept: $-3.4 \pm 0.05$, $2.45 \pm 0.05$, $5.95 \pm 0.05$</td>
<td>A3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Equation satisfied at points of intersection is $y = x^3 - 5x^2 + 50 = 15x$</td>
<td>$y = x^3 - 5x^2 + 50 = 15x$ or equivalent</td>
<td>A1ft</td>
<td></td>
</tr>
<tr>
<td>8iv</td>
<td>When $x^3 - 5x^2 &gt; 10$, then $x^3 - 5x^2 + 50 &gt; 60$ From graph this is satisfied when $x &gt; 5.2$</td>
<td>Relates inequality $x^3 - 5x^2 &gt; 10$ to the cubic function displayed on graph appropriately</td>
<td>M1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Correct answer: $x &gt; 5.15$ and $x &gt; 5.2$</td>
<td>Looks up the value of $x$ when $y = 60$</td>
<td>M1</td>
<td></td>
</tr>
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<td></td>
<td>For a sensible trial and error solution award 1 mark provided the final answer is within the range $x &gt; 5.1$ and $x &gt; 5.3$</td>
<td>Accept inequalities in the range $x &gt; 5.15$ and $x &gt; 5.2$</td>
<td>A1</td>
<td></td>
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| 9i          | Method 1  
Interest over second year = €1749.6 − €1620 = €129.6  
% interest over the yr = \( \frac{129.6}{1620} \times 100 = 8\% \) | Method 1  
Finds interest over 2\textsuperscript{nd} year  
Divides interest above by 1620  
Obtains 0.08 or 8\%  
\( 8\% \) |
|             | Method 2  
\( 1620(1 + \frac{r}{100}) = 1749.6 \) giving \( (1 + \frac{r}{100}) = 1.08 \)  
and \( r = 8\% \) | Method 2  
Use of formula \( A = P(1 + \frac{r}{100}) \)  
Correct substitution in formula  
\( (1 + \frac{r}{100}) = 1.08 \)  
\( r = 8\% \) |
|             | Method 3  
\( P(1 + \frac{r}{100}) = 1620 \) and \( P(1 + \frac{r}{100})^2 = 1749.60 \)  
Dividing the second equation by the first gives that  
\( 1 + \frac{r}{100} = 1.08 \)  
So the yearly rate of interest is 8\% | Method 3  
Use of formula \( P(1 + \frac{r}{100}) = 1620 \)  
Use of formula \( P(1 + \frac{r}{100})^2 = 1749.60 \)  
Eliminates one unknown from the two eqts  
\( r = 8\% \) |
| 9ii         | 1.08\( P = 1620 \) gives that \( P = 1500 \) | Use of 1.08\( P = 1620 \) or other suitable eqt to find \( P \)  
\( P = 1500 \) |
WORKING/CRITERIA

10i(a)  \( \angle AGH = x \) (\( \Delta AKG \) is isosceles)

OR  \( \angle AGH = \frac{180-x}{4} \) since \( \angle ABC = \frac{180-x}{2} \) and

\( \angle ABC = 2 \times \angle AGH \) (\( \angle ABC \) is exterior angle to \( \Delta GBH \) and equals the two equal interior opp \( \angle^s \))

10i(b)  \( \angle ABC = \frac{180-x}{2} \) (\( \Delta ABC \) is isosceles)

OR  \( \angle ABC = 2 \times \angle AGH = 2x \)

10i(c)  \( \angle HBG = 180 - 2x \) (angles on a str line add up to 180)

(expplanation not required)

OR  \( \angle HBG = 180 - \frac{180-x}{2} = 90 + \frac{x}{2} \) (using angles of \( \Delta BGH = 180 \)) - Award mark for correct expression of \( x \) for \( \angle HBG \) even if this is not simplified

10ii Uses a correct method for finding \( x \)  M2

\[ x = 36^\circ \]

10iii Finds the value of \( \angle HCK \)  1M

Finds the value of \( \angle CKH \)  1M

Deduces that CH = CK  1M

For 10iii, no marks are awarded when candidate seeks to prove two triangles congruent
Transparency for Q2