Area of trapezium = \( \frac{1}{2} (a + b)h \)

Volume of prism = (area of cross-section) \( \times \) length

In any triangle \( ABC \)

Sine rule \( \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \)

Cosine rule \( a^2 = b^2 + c^2 - 2bc \cos A \)

Area of triangle = \( \frac{1}{2} ab \sin C \)

Volume of sphere = \( \frac{4}{3} \pi r^3 \)

Surface area of sphere = \( 4\pi r^2 \)

Volume of cone = \( \frac{1}{3} \pi r^2 h \)

Curved surface area of cone = \( \pi rl \)

The Quadratic Equation

The solutions of \( ax^2 + bx + c = 0 \), where \( a \neq 0 \), are given by

\[ x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \]
Here is a grid with two triangles, T and A.

(a) Describe fully the single transformation that maps triangle T onto triangle A.

_________________________________________________________________________
_________________________________________________________________________

(b) Enlarge triangle T with scale factor 3 and centre P (4, 0).
This is a graph for converting Pounds (£) to Danish Kroner (DKK).

(a) Use the graph to convert £6 to Danish Kroner (DKK).

(a) ___________________________ DKK [1]

(b) Work out the gradient of the line.

(b) ___________________________ [2]

(c) Explain what this gradient represents.

______________________________________________________________________ [1]

(d) Convert 152 DKK to Pounds.

(d) £ _____________________________ [2]
3   (a) Here is a list of numbers.

39  43  57  79  91  111

Write down all the numbers in this list which are prime numbers.

(a) ________________________ [1]

(b) Write 42 as a product of its prime factors.

(b) ________________________ [2]

(c) Find the lowest common multiple of 24 and 42.

(c) ________________________ [2]

(d) A travel firm has to take 95 pupils on a visit.
It has taxis which take 7 passengers and minibuses which take 15 passengers.
They do not want to have any empty seats.

Work out how many taxis and minibuses they need to use.

(d) taxis = ________________________

minibuses = ________________________ [2]
Here is a diagram of a barn.

(a) The front elevation of the barn is sketched below.

Calculate the length $x$.

Not to scale

(a) _____________________ m [3]
(b) (i) Draw the **plan view** of the barn on the grid below using a scale of 1 cm to 1 m.

(ii) Draw the **side elevation** of the barn on the grid below using a scale of 1 cm to 1 m.
5 Here are the first four terms of a sequence.

\[ 17 \quad 23 \quad 29 \quad 35 \]

Write an expression for the \(n\)th term.

\[ \text{Expression for the } n\text{th term} \] [2]

6 (a) Multiply out the brackets and simplify.

\[ 5(x - 3) + 2(x + 5) \]

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

(b) Solve.

\[ 12x - 11 = 4x + 9 \]

(b) \[ x = \text{Expression} \] [3]
Golf scores are recorded on cards. The table summarises the scores for one day.

<table>
<thead>
<tr>
<th>Score</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 – 66</td>
<td>10</td>
</tr>
<tr>
<td>67 – 73</td>
<td>15</td>
</tr>
<tr>
<td>74 – 80</td>
<td>14</td>
</tr>
<tr>
<td>81 – 87</td>
<td>4</td>
</tr>
</tbody>
</table>

(a) Calculate an estimate of the mean score.

(b) A card is picked at random. Work out the probability that the score on the card is 73 or below.
The diagram shows a circular pond with paving stones around the edge making up a square. The length of each side of the square is 12 m.

Calculate the shaded area.

__________________________ m$^2$ [4]
9  (a) Calculate.

\[ \sqrt{18.5^2 - 11.1^2} \]

(a) ________________________ [1]

(b) Here are three cards.

A  \[ \frac{1}{2.5^2 - 1.5^2} \]

B  \( \left( \frac{35}{54} \right)^2 \)

C  \( \sqrt{0.06} \)

Work out the values written on each card.
Put the values in order, smallest first.

(b) ____________  ____________  ____________ [2] smallest
10 (a) The equation $x^3 - x^2 - 40 = 0$ has a solution between $x = 3$ and $x = 4$.

Find this value of $x$ correct to 1 decimal place.
Show clearly your trials and the values of their outcomes.

<table>
<thead>
<tr>
<th>$x$</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(a) $x =$ ____________________________ [3]

(b) Solve.

$$\frac{(x - 5)}{3} + \frac{(3x + 4)}{2} = 15$$

(b) $x =$ ____________________________ [4]
Here are three sketch graphs.

Write the equation of each graph in the spaces on the answer line. Choose your answers from this list.

\[ y = -4x - 4x^2 \quad y = 4x \quad y = x^3 - 4x + 4 \quad y = 4x^2 - 4x \]
\[ y = -4x + 4 \quad y = x^3 - 4x \quad y = 4x - 4x^2 \quad y = x + 4 \]

Graph A is \( y = \) ____________________________

Graph B is \( y = \) ____________________________

Graph C is \( y = \) ____________________________ \[3\]
12 (a) Write 16 000 in standard form.

(a) ________________ [1]

(b) Here are some facts about four planets.

<table>
<thead>
<tr>
<th></th>
<th>Mercury</th>
<th>Venus</th>
<th>Earth</th>
<th>Mars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass (kg)</td>
<td>$3.30 \times 10^{23}$</td>
<td>$4.87 \times 10^{24}$</td>
<td>$5.97 \times 10^{24}$</td>
<td>$6.42 \times 10^{23}$</td>
</tr>
<tr>
<td>Volume (m³)</td>
<td>$6.08 \times 10^{19}$</td>
<td>$9.28 \times 10^{20}$</td>
<td>$1.08 \times 10^{21}$</td>
<td>$1.63 \times 10^{20}$</td>
</tr>
</tbody>
</table>

(i) Complete this sentence, giving your answer correct to 3 significant figures.

The volume of Venus is ________________ times the volume of Mercury. [2]

(ii) Show that the Earth has the greatest density. Make all your working clear. [3]
13 Make $c$ the subject of this formula.

$$E = mc^2$$

$c = \underline{\hspace{2cm}}$ [2]

14 $y$ is directly proportional to $x^2$ and $y = 80$ when $x = 4$.

Write a formula for $y$ in terms of $x$.

$\underline{\hspace{2cm}}$ [3]
Mr Chalmers gave a GCSE paper to all the 32 pupils in his class. The results are summarised in this cumulative frequency graph.

(a) Use the graph to find

(i) the number of pupils who scored 30 marks or fewer,

(ii) the median,

(iii) the interquartile range.

(a)(i) ______________________ [1]

(ii) ______________________ [1]

(iii) ______________________ [2]
(b)* The marks for each grade for the GCSE paper are given in the table below.

<table>
<thead>
<tr>
<th>Mark</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 9</td>
<td>U</td>
</tr>
<tr>
<td>10 to 24</td>
<td>E</td>
</tr>
<tr>
<td>25 to 40</td>
<td>D</td>
</tr>
<tr>
<td>41 to 54</td>
<td>C</td>
</tr>
<tr>
<td>55 to 69</td>
<td>B</td>
</tr>
<tr>
<td>70 to 84</td>
<td>A</td>
</tr>
<tr>
<td>85 to 100</td>
<td>A*</td>
</tr>
</tbody>
</table>

The percentage of students nationally achieving a grade C, or better, for the paper was 55%. Mr Chalmers says that his pupils' results are better than this.

Is he correct?
Show your working clearly.

(c) Explain why this may not be a sensible comparison.
16 A golfer records the distances he hits golf balls.

(a) The table shows the distances with *Flylite* balls.

<table>
<thead>
<tr>
<th>Distance (d metres)</th>
<th>0 ≤ d &lt; 150</th>
<th>150 ≤ d &lt; 200</th>
<th>200 ≤ d &lt; 225</th>
<th>225 ≤ d &lt; 250</th>
<th>250 ≤ d &lt; 300</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>60</td>
<td>84</td>
<td>58</td>
<td>20</td>
<td>15</td>
</tr>
</tbody>
</table>

Complete the histogram for this information.
The shaded values have been drawn for you.
(b) The histogram below summarises the distances with the *Arrowe* balls.

Make two different comments comparing the distances he hits these two types of ball. Calculations are not necessary.

Comment 1
_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________

Comment 2
_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________

[2]
Here are the equations of two graphs.

\[ y^2 = x^2 - 2x + 10 \]
\[ y = 3x + 2 \]

(a) Show that the point of intersection of these graphs satisfies the equation \( 4x^2 + 7x - 3 = 0 \). [3]

(b) Solve the equation \( 4x^2 + 7x - 3 = 0 \), giving your answers correct to 2 decimal places.

(b) \( x = \) ________________ and \( x = \) ________________ [3]
18 ABC is a triangle.

Calculate angle $x$. 

$\text{________________________ } ^\circ$ [3]
A building project is expected to cost £4 500 000. The agreed completion date is 1 January 2014. After this date, for every month it is delayed, the cost increases by 2% of the cost for the previous month.

(a) Calculate the cost on 1 April 2014.

(a) £ _____________________________ [1]

(b) When the cost first exceeds £5 500 000, for how many months has the project been delayed?

(b) _______________________________ [3]
WXYZ is a frustum of a cone.

The base radius, $AY$, of the frustum is 10 m and the top radius, $BZ$, is 4 m. $VB = 6$ m and $BA = 9$ m.

Calculate the volume of the frustum.

$\text{Volume} = \frac{1}{3} \pi h (R^2 + r^2 + Rr)$

where $h$ is the height, $R$ is the base radius, and $r$ is the top radius.

$\text{Volume} = \frac{1}{3} \pi (9) (10^2 + 4^2 + 10 \times 4) \text{ m}^3$

$\text{Volume} = \frac{1}{3} \pi (9) (100 + 16 + 40) \text{ m}^3$

$\text{Volume} = \frac{1}{3} \pi (9) \times 156 \text{ m}^3$

$\text{Volume} = 468 \pi \text{ m}^3$

Therefore, the volume of the frustum is $468 \pi \text{ m}^3$. 

$\text{Volume} = 468 \pi \text{ m}^3 \approx 1467.13 \text{ m}^3$
21 ABCDEFGH is a cuboid.

Calculate the angle GAF.

\[ \text{____________________________ } \degree [5] \]