(a) Evaluate \(3 + 5(3 - 1.4)\) .

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

(b) Evaluate \(0.2 \times 0.07\) .

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

(a) Evaluate \(3 \frac{2}{3} - 2 \frac{4}{5}\) .

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

(b) Express \(\frac{48}{84}\) in its lowest terms.

Answer ....................................... [1]
3 (a) Write the following numbers in order of size, starting with the smallest.

\[0.67 \quad \frac{7}{9} \quad \frac{2}{3} \quad 66\%\]

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

(b) During one month, the volume of perfume in a bottle decreased from 5 ml to 4 ml.

Calculate the percentage decrease.

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

4 (a) Add 55 minutes to 2.4 hours, giving your answer in hours and minutes.

Answer \([\ldots\text{hours}, \ldots\text{minutes}]\) [1]

(b) The mass of a bag of sugar is given as 1.5 kg, correct to the nearest tenth of a kilogram.

Write down the upper bound of this mass, giving your answer in grams.

Answer \([\ldots\text{g}]\) [1]
5 Given that \( f(x) = \frac{2x + 3}{5x} \), find \( f^{-1}(x) \).

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

6 By making suitable approximations, estimate the value of \( \frac{304.3 \times \sqrt{15.98}}{0.1975} \).

Answer ................................. [2]
7 Find the values of $x$ and $y$, where

$$
2 \left( \begin{array}{c} x \\ 7 \end{array} \right) = 3 \left( \begin{array}{c} -2 \\ y \end{array} \right) - \left( \begin{array}{c} 4 \\ -2 \end{array} \right).
$$

Answer $x = \underline{\hspace{2cm}}$  

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

8 A large tank contained $2.3 \times 10^6$ litres of oil.  
During a 4 week period, $1.2 \times 10^5$ litres were used.

(a) Calculate how many litres of oil remain in the tank after the 4 weeks.  
Give your answer in standard form.

Answer $\underline{\hspace{2cm}}$ [1]

(b) Giving your answer in standard form, calculate the average number of litres used each week.

Answer $\underline{\hspace{2cm}}$ [1]
It is given that \(13 < 7 - 2x < 18\) has the solution \(a < x < b\).

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

**Answer**

\[a = \ldots\]  
\[b = \ldots\]  [2]

---

Factorise completely \(2xy - 3x - 10y + 15\).  

**Answer**  \(\ldots\)  [2]
11

| parallelogram | rectangle | rhombus | square |

Which of these quadrilaterals have

(a) exactly 2 lines of symmetry,

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

(b) rotational symmetry of order 2,

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

(c) diagonals that are equal?

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

12 The diagram shows a thermometer, with a circular dial, that records temperatures in °C.

(a) Write down the temperature indicated by the pointer.

Answer .................................. °C [1]

(b) When the temperature increases from –20 °C to 40 °C, the pointer turns through an angle of 300°. Calculate the angle through which the pointer turns when there is a 7 °C rise in temperature.

Answer ..................................... °C [1]

(c) On one particular day, the temperature at 1 a.m. was 4 °C.
    By 6 a.m. it had fallen by 9 °C.
    Calculate the temperature at 6 a.m.

Answer .................................. °C [1]
13 A map has a scale of 2 cm to 5 km.

(a) Express this scale in the form $1 : n$.

\[ \text{Answer} \quad 1 : \quad \text{.........................} \quad [1] \]

(b) The actual distance between two places is 35 km.

Calculate the distance on the map between these two places.

\[ \text{Answer} \quad \text{......................... cm} \quad [1] \]

(c) On the map, the area of a lake is 8 cm$^2$.

Calculate the actual area of the lake.

\[ \text{Answer} \quad \text{......................... km}^2 \quad [1] \]
14 The table shows the results when a 6-sided die was thrown 50 times.

<table>
<thead>
<tr>
<th>Score</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>6</td>
<td>10</td>
</tr>
</tbody>
</table>

(a) Write down the modal score.

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

(b) Calculate the mean score.

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

15 \( \mathcal{E} = \{ x : x \text{ is an integer and } x > 5 \} \)

\( P = \{ x : x \text{ is a prime number } \} \)

\( F = \{ x : x \text{ is a multiple of } 4 \} \)

\( S = \{ x : x \text{ is a multiple of } 6 \} \)

The Venn diagram shows the Universal set and the set F.

(a) Draw and label the two sets P and S to complete the Venn diagram.

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

(b) Write down a possible element \( y \) such that \( y \) is an even number and \( y \in (F \cup S)' \).

Answer \( y = \) ........................................ [1]
The diagram shows a solid prism of length 20 cm. The cross-section, $ABCD$, is a trapezium.

$AB = 2\text{ cm}$, $BC = 5\text{ cm}$, $CD = 6\text{ cm}$, $DA = 3\text{ cm}$ and angle $ADC = 90^\circ$.

(a) Calculate the area of trapezium $ABCD$.

Answer $\ldots \ldots \ldots \ldots \text{ cm}^2$ [1]

(b) Calculate the total surface area of the prism.

Answer $\ldots \ldots \ldots \ldots \text{ cm}^2$ [2]
In the diagram, $B$ is the point $(8, 2)$.
The equation of the line $AB$ is $y = 2$ and the equation of the line $AC$ is $2x - y = 3$.
$BC$ produced passes through the origin.

(a) $AC$ produced intersects the $y$-axis at $D$.

Find the coordinates of $D$.

Answer $(.........., ..........)$ [1]

(b) The region inside triangle $ABC$ is defined by three inequalities.
One of these is $y < 2$.

Find the other two inequalities.

Answer .......................... [2]
18 (a) Simplify \((3a^4)^2\).

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

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

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

(c) Given that \(x^3 = 27^0\), find \(x\).

Answer \(x = \) .................................. [1]

(d) Evaluate \(\frac{12^\frac{1}{2}}{3^\frac{1}{2}}\).

Answer .................................. [1]
A regular polygon has interior angles of $160^\circ$.

(a) Calculate the number of sides of the polygon.

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

(b) The diagram shows three sides, $AB$, $BC$ and $CD$, of this polygon.

(i) Calculate $BAC$.

\[ \text{Answer} \quad \ldots \ldots \ldots \ldots \ldots \ldots \quad [1] \]

(ii) Calculate $ACD$.

\[ \text{Answer} \quad \ldots \ldots \ldots \ldots \ldots \ldots \quad [1] \]
20 A series of shapes, made of matchsticks, is shown below.

(a) Draw Shape 4.  

(b) The table shows the numbers of matchsticks used to make Shapes 1 and 2.

<table>
<thead>
<tr>
<th>Shape</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of matchsticks</td>
<td>12</td>
<td>18</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Complete the table for Shapes 3 and 4.

(c) Find an expression, in terms of $n$, for the number of matchsticks used to make Shape $n$.

Answer .......................................  

(d) Explain why there is not a shape that is made of 100 matchsticks.

Answer ..............................................................................................................................................
...........................................................................................................................................................
......................................................................................................................................................  

............................................................................................................................................................ [1]
The time taken to fill a tank with water varies inversely as the area of cross-section of the inlet pipe. The time taken is 40 minutes when the area is 3 cm².

(a) Find the number of minutes taken to fill the tank when the area is 5 cm².

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

(b) It is given that the area is $A$ square centimetres.

Find the expression, in terms of $A$, for the number of minutes taken to fill the tank.

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

(c) Water flowed into the empty tank through a pipe of area 4 cm². It flowed for 9 minutes.

Find, in its simplest form, the fraction of the tank that now contained water.

Answer ....................................... [1]
22 \[ A = \begin{pmatrix} 5 & 2 \\ -1 & 1 \end{pmatrix} \]

(a) Find the determinant of \( A \).

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

(b) Write down \( A^{-1} \).

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

(c) Find the matrix \( X \), where \( AX = \begin{pmatrix} 11 \\ -5 \end{pmatrix} \).

Answer ....................................... [2]
Ali and Ben each made a journey between two towns, P and Q, that are 60 km apart. These two journeys are shown on the travel graph.

(a) Calculate Ali’s speed.

\[ \text{Answer} \quad \ldots \ldots \ldots \ldots \ldots \ldots \text{km/h} \quad [1] \]

(b) Find the number of minutes after 3 p.m. that Ali and Ben passed each other.

\[ \text{Answer} \quad \ldots \ldots \ldots \ldots \ldots \ldots \quad [1] \]

(c) Find how far Ben had travelled when he met Ali.

\[ \text{Answer} \quad \ldots \ldots \ldots \ldots \ldots \ldots \text{km} \quad [1] \]

(d) Chris left P at 3 p.m. and travelled to Q at a speed of 30 km/h.

On the diagram, draw the graph that represents Chris’s journey. \quad [1]
In the diagram, \(ABCD\) is a parallelogram.
\(P\) is the midpoint of \(BC\).
\(DQ : QP = 1 : 2\).
\(\overrightarrow{AB} = p\) and \(\overrightarrow{AD} = q\).

(a) Express \(\overrightarrow{DP}\) in terms of \(p\) and \(q\).

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

(b) Express \(\overrightarrow{DQ}\) in terms of \(p\) and \(q\).

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

(c) Express \(\overrightarrow{AQ}\) in terms of \(p\) and \(q\), giving your answer in its simplest form.

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

(d) \(R\) is the point on \(BC\) produced such that \(\overrightarrow{BR} = k\overrightarrow{BP}\).

(i) Express \(\overrightarrow{AR}\) in terms of \(p\) and \(q\) and \(k\).

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

(ii) Given that \(A\), \(Q\) and \(R\) lie on a straight line, find the value of \(k\).

Answer \(k = \) ....................................... [1]
The diagram below shows quadrilateral $ABCD$.

(a) Measure $\hat{A}BC$.

Answer $\hat{A}BC =$ .................................. [1]

(b) On the diagram, construct the locus of points, inside the quadrilateral, that are

I 4 cm from $AD$,

II equidistant from $A$ and $D$. [2]

(c) On the diagram, shade the region inside the quadrilateral, containing the points that are more than 4 cm from $AD$ and nearer to $D$ than to $A$. [1]

(d) The point $P$ is 4 cm from $AD$ and as near as possible to $C$.

Mark, and label, the position of $P$ on the diagram. [1]
26 In the diagram, $AB$ touches the circle, centre $O$, at $T$.

$OB$ intersects the circle at $C$.

(a) State, with a reason, the value of $\angle BTO$.

*Answer* $\angle BTO = \ldots\ldots$ because $\ldots\ldots$ [1]

(b) Given that $TB = 40$ cm, $CB = 10$ cm, and the radius of the circle is $x$ centimetres, form an equation in $x$, and hence find the radius of the circle.

*Answer* $\ldots\ldots$ cm [4]