INSTRUCTIONS

Answer all questions.

- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do not use an erasable pen or correction fluid.
- Do not write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 104.
- The number of marks for each question or part question is shown in brackets [ ].
1  
(a) One day, Mahika records the number of teachers and students who cycle to school.

<table>
<thead>
<tr>
<th>Tally</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers</td>
<td><img src="image" alt="Tally" /></td>
</tr>
<tr>
<td>Students</td>
<td><img src="image" alt="Tally" /></td>
</tr>
</tbody>
</table>

(i) Complete the frequency column in the table. [1]

(ii) Work out the percentage of people who cycle that are students.

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

(b) Mahika records how 120 students from Year 1 and Year 2 travel to school. Each student walks, cycles or travels by bus.

- 48 students are in Year 1.
- 77 students walk.
- 5 students in Year 2 cycle.
- 36 students travel by bus.
- \( \frac{4}{9} \) of the students who travel by bus are in Year 1.

(i) Complete the table.

<table>
<thead>
<tr>
<th>Walk</th>
<th>Cycle</th>
<th>Bus</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td><img src="image" alt="Tally" /></td>
<td><img src="image" alt="Tally" /></td>
<td><img src="image" alt="Tally" /></td>
</tr>
<tr>
<td>Year 2</td>
<td><img src="image" alt="Tally" /></td>
<td><img src="image" alt="Tally" /></td>
<td><img src="image" alt="Tally" /></td>
</tr>
<tr>
<td>Total</td>
<td><img src="image" alt="Tally" /></td>
<td><img src="image" alt="Tally" /></td>
<td><img src="image" alt="Tally" /></td>
</tr>
</tbody>
</table>

[3]

(ii) One of the 120 students is chosen at random.

Work out the probability that this student does not travel by bus to school.

................................................. [2]
(c) There have been 24 complaints about one of the buses.

The complaints are:

- The bus is late.
- The price is too high.
- The bus is crowded.

(i) Complete the table.

<table>
<thead>
<tr>
<th>Complaint</th>
<th>Frequency</th>
<th>Pie chart sector angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Late</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Price</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Crowded</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

(ii) Complete the pie chart.
2 (a) Calculate the interior angle of a regular pentagon.

(b) The diagram shows three congruent regular pentagons and a triangle.

(i) Work out the value of $x$.
Give a geometrical reason for your answer.

$$x = \ldots \ldots \text{ because } \ldots \ldots$$

............................................................................................................................................. [2]
(ii) Work out the value of $y$.
Give a geometrical reason for your answer.

$$y = \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots $$

because .............................................................................................................................................  [3]

(iii) Find the ratio $x:y$.
Give your answer in its simplest form.

.................... : ....................  [1]
3 (a) The diagram shows three quadrilaterals, $A$, $B$ and $C$, on a $1\text{cm}^2$ grid.

(i) (a) Write down the mathematical name for quadrilateral $B$.

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

(b) Work out the area of quadrilateral $B$.
Give the units of your answer.

................................................. [3]

(ii) Measure angle $w$.

Angle $w =$ ................................................. [1]
(iii) Describe fully the single transformation that maps

(a) quadrilateral $A$ onto quadrilateral $B$,

.....................................................................................................................................
..................................................................................................................................... [3]

(b) quadrilateral $A$ onto quadrilateral $C$.

.....................................................................................................................................
..................................................................................................................................... [3]

(b) The diagram shows a parallelogram and a line $AB$ on a $1\text{cm}^2$ grid.

On the grid, complete a triangle, $ABC$, that has the same area as the parallelogram.

[2]
4 (a)

$X, Y$ and $Z$ lie on a circle, centre $O$.

(i) Write down the mathematical name of the line

(a) $OX$, ............................................... [1]

(b) $YZ$. ............................................... [1]

(ii) Measure the length of $OX$.

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

(b) Another circle has a radius of 18 cm.

Calculate the circumference of this circle.

............................................ cm [2]
(e) In this part, all angles are in degrees.

\[ \begin{align*}
9x + 3y &= \ldots \quad [2] \\
18x - 4y &= \ldots
\end{align*} \]

(ii) Solve your simultaneous equations.
You must show all your working.

\[ \begin{align*}
x &= \ldots \quad [3] \\
y &= \ldots
\end{align*} \]
5 (a) A closed box, in the shape of a cuboid, has length 5 cm, width 4 cm and height 2 cm.

(i) Draw a net of the box on the $1\text{cm}^2$ grid.
(ii) A container is a cube with volume $1 \text{ m}^3$.

Work out the maximum number of these boxes that can be packed into this container.

......................................  [3]

(b) A shop sells three different sized boxes of rice.
The boxes all have the same cost per kilogram.

<table>
<thead>
<tr>
<th>Box</th>
<th>Cost</th>
<th>Mass</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>80 rupees</td>
<td>750 g</td>
</tr>
<tr>
<td>B</td>
<td>1.35 kg</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>$3.50</td>
<td></td>
</tr>
</tbody>
</table>

(i) Work out the cost in rupees of box $B$.

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

(ii) $1 = 64$ rupees.

Calculate the mass of box $C$.
Give your answer in kilograms.

...................................... kg  [3]

(e) Change 75 cm$^3$ into litres.
Give your answer in standard form.

...................................... litres  [2]
The diagram shows a fair 9-sided spinner. The numbers on the spinner are 2, 3, 5, 5, 5, 6, 6, 7 and 8.

(i) The spinner is spun once.

Write down the probability that the spinner lands on

(a) the number 8,

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

(b) a number less than 7.

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

(ii) The spinner is spun 135 times.

Work out the expected number of times the spinner lands on the number 6.

................................................. [1]
(b) Hitesh throws a dice 80 times. The results are shown in the table.

<table>
<thead>
<tr>
<th>Number thrown</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>6</td>
<td>15</td>
</tr>
</tbody>
</table>

(i) Write down the mode.

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

(ii) Work out the range.

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

(iii) Work out the median.

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

(iv) Calculate the mean.

........................................................................................................... [3]
7  (a)  1 mile = 1.609344 kilometres

Change 6 miles into metres.
Give your answer correct to the nearest metre.

............................................. m [3]

(b)  (i)  The bearing of a boat from a harbour is 322°.
Work out the bearing of the harbour from the boat.

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

(ii)  The boat is 12 km from the harbour.
At 2.30 pm the boat starts to sail to the harbour.
The speed of the boat is 5 km/h.
Work out the time the boat arrives at the harbour.

................................................. [3]
(e) The scale drawing shows the positions of Shakti’s house, $S$, and Mairi’s house, $M$, on a map. The scale is 1 cm represents 4 km.

(i) Measure the bearing of $M$ from $S$.

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

(ii) Mark the position of Mairi’s house, $M$, on this map.

This scale drawing shows another map with Shakti’s house, $S$, marked on it. The scale of this map is 1 cm represents 5 km.

Mark the position of Mairi’s house, $M$, on this map.
8  (a)  (i) Complete the table of values for \( y = x^2 + 6x - 160 \).

<table>
<thead>
<tr>
<th>( x )</th>
<th>-20</th>
<th>-15</th>
<th>-10</th>
<th>-5</th>
<th>0</th>
<th>5</th>
<th>10</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y )</td>
<td>120</td>
<td>-120</td>
<td>-165</td>
<td>-160</td>
<td>-105</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(ii) On the grid, draw the graph of \( y = x^2 + 6x - 160 \) for \(-20 \leq x \leq 15\).
(iii) (a) Write down the equation of the line of symmetry of the graph.

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

(b) Find the coordinates of the lowest point on the graph.

(...................... , ......................) [1]

(iv) Use your graph to solve the equation \( x^2 + 6x - 160 = 0 \).

\[ x = ................ \text{ or } x = ................ \] [2]

(b) Rearrange the formula \( y = mx + c \) to make \( x \) the subject.

\[ x = ........................................... \] [2]
Tarak has two fields. He grows wheat, barley and corn in his fields.

(a) The diagram shows Tarak’s two triangular fields, $PQR$ and $PRS$.

Angle $RPS = 90^\circ$ and angle $PRS = 53^\circ$.

$PQ = 174\text{ m}$, $QR = 120\text{ m}$ and $PR = 126\text{ m}$.

(i) Show that angle $PRQ = 90^\circ$.

(ii) Calculate the area of the quadrilateral $PQRS$.

Give your answer correct to 4 significant figures.

\[.............................. \text{ m}^2 \] [5]
(b)  (i)  The mass, $m$ tonnes, of wheat grown in 2021 is 4.3 tonnes, correct to 1 decimal place.

Complete this statement about the value of $m$.

.......................... $\leq m < \ldots$ [2]

(ii)  In 2020, 2.6 tonnes of barley is grown.
In 2021, 3.25 tonnes of barley is grown.

Show that the percentage increase in barley grown from 2020 to 2021 is 25%.

(iii) In 2019, 2.4 tonnes of corn is grown.
In 2020, 20% more corn is grown than in 2019.
In 2021, 20% less corn is grown than in 2020.

Calculate the amount of corn grown in 2021.

......................................... tonnes [3]