The diagram shows three quadrilaterals on a 1 cm² grid.
(a) Write down the mathematical name of quadrilateral A.

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

(b) Find the area of quadrilateral A.

................................................. cm² [1]

(c) Describe fully the single transformation that maps quadrilateral A onto

(i) quadrilateral B,

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

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

(ii) quadrilateral C.

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

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

(d) On the grid, draw the image of

(i) quadrilateral C after a 90° anticlockwise rotation about the origin,  [2]

(ii) quadrilateral C after a reflection in the line x = 1.  [2]
2 (a) 

Use set notation to describe the shaded region.

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

(b) \( U = \{x : x \text{ is a natural number } \leq 16\} \)

(i) Write down all the square numbers in the universal set, \( U \).

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

(ii) Write down the six prime numbers in the universal set, \( U \).

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

(iii) \( M = \{x : x \text{ is a multiple of 3}\} \)

\( F = \{x : x \text{ is a factor of 15}\} \)

(a) Complete the Venn diagram to show the elements of these sets.
(b) Write down all the odd numbers that are not in set $M$ and not in set $F$.

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

(e) Find $n(M \cap F)$.

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

(d) A number is chosen at random from the universal set, $\mathcal{U}$.

Find the probability that this number is in set $F$.

................................................. [1]
Mr Zhang, his wife and three children go on a holiday from Shanghai to Auckland.

(a) The flight for an adult costs $630.
   The cost for a child is \( \frac{5}{8} \) of the adult cost.

   Show that the total cost of the flight for the family is $2441, correct to the nearest dollar.

(b) The plane leaves Shanghai at 2005 local time on 13th November.
    The plane stops for 2 hours 30 minutes in Sydney.
    The plane lands in Auckland at 1725 local time on 14th November.
    The local time in Auckland is 5 hours ahead of the local time in Shanghai.

(i) Work out how long the plane is flying, in hours and minutes.

(ii) Write your answer to part (b)(i) in hours, correct to 3 decimal places.
(iii) The flight distance from Shanghai to Sydney is 7882 km.
The flight distance from Sydney to Auckland is 2156 km.

Find the total distance the plane flies.

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

(iv) Calculate the average speed of the plane when it is flying.

......................................... km/h [2]

(c) The holiday expenses are in the ratio hotel : car hire : food = 8 : 5 : 6.

The cost of the hotel is $2400.

Show that the total of the holiday expenses is $5700.
The diagram shows a regular polygon.

(a) (i) Write down the mathematical name of this polygon.

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

(ii) Show that the interior angle of this polygon is 135°.

(b) A sequence of diagrams is made by joining these polygons.

(i) Complete the table.

<table>
<thead>
<tr>
<th>Diagram number</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of lines</td>
<td>8</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[3]

(ii) Write down the term to term rule for the number of lines in the sequence.

.................................................................. [1]
(iii) Work out the number of lines in Diagram 9.

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

(iv) Find an expression, in terms of $n$, for the number of lines in Diagram $n$.

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

(v) Diagram $k$ has 113 lines.

Find the value of $k$.

$$k = ...........................................  \quad [2]$$
5  (a) Work out the number of days in seven weeks.

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

(b) The summit of Mount Everest is 8848 metres above sea level.
    Ayding Lake is 154 metres below sea level.

Work out the difference in height between these places.

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

(c) Find two integers that have a sum of \(-12\) and a product of 32.

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

(d) Write \(\frac{3}{8}\) as

   (i) a decimal,

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

   (ii) a percentage.

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

(e) Write down the reciprocal of \(\frac{1}{9}\).

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

(f) Find the value of

   (i) \(4^5\),

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

   (ii) \(\sqrt[3]{512}\).

       .........................................  [1]
(g) (i) Write 587 000 in standard form.

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

(ii) Calculate \(4.9 \times 10^{-3} + 8.1 \times 10^{-4}\). Give your answer in standard form.

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

(h) The height, \(h\) metres, of a fence post is 2.43 m, correct to the nearest centimetre.

Complete the statement about the value of \(h\).

.......................... \(\leq h \leq \) ................... [2]
Maria owns a restaurant with 30 tables. One day she records the number of customers at each table at 7 pm. The bar chart shows the results.

(a) (i) Write down the mode.

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

(ii) Find the range.

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

(iii) Calculate the mean.

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

(b) On the same day she also recorded the number of customers at each table at 1 pm. The results are shown in the table.

<table>
<thead>
<tr>
<th>Number of customers at each table</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of tables</td>
<td>8</td>
<td>13</td>
<td>5</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Write down two comments comparing the results from 7 pm with the results from 1 pm.

1. ..................................................................................................................................................

2. ................................................................................................................................................. [2]
(e) 270 meals are ordered one day at the restaurant. The table shows the number of each type of meal.

<table>
<thead>
<tr>
<th>Meal</th>
<th>Number ordered</th>
<th>Pie chart sector angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meat</td>
<td>117</td>
<td></td>
</tr>
<tr>
<td>Fish</td>
<td>99</td>
<td></td>
</tr>
<tr>
<td>Vegetarian</td>
<td>54</td>
<td>72°</td>
</tr>
</tbody>
</table>

(i) Complete the table.

(ii) Complete the pie chart.
7 (a) Complete the table of values for $y = \frac{15}{x}, x \neq 0$.

<table>
<thead>
<tr>
<th>$x$</th>
<th>-15</th>
<th>-10</th>
<th>-5</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>5</th>
<th>10</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y$</td>
<td>-1.5</td>
<td>-5</td>
<td>-15</td>
<td>15</td>
<td>5</td>
<td>-15</td>
<td>-5</td>
<td>-15</td>
<td>15</td>
<td>5</td>
<td>-15</td>
<td>-5</td>
</tr>
</tbody>
</table>

(b) On the grid, draw the graph of $y = \frac{15}{x}$ for $-15 \leq x \leq -1$ and $1 \leq x \leq 15$. 

[3] [4]
(c) Write down the order of rotational symmetry of the graph.

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

(d) (i) On the grid, draw the lines of symmetry of the graph.  [2]

(ii) Write down the equation of the line of symmetry that does not intersect the graph.

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

(e) Use your graph to solve the equation \( \frac{15}{x} = -6 \).

\[ x = \]  

.................................................  [1]
8 (a)

In the diagram, \( PQ = PR \) and \( QRS \) is a straight line.

(i) Write down the mathematical name of triangle \( PQR \).

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

(ii) Work out angle \( QPR \).

\[
\text{Angle } QPR = ................................................. [3]
\]

(b)

In the diagram, \( D, E \) and \( F \) are points on a circle, centre \( O \).
\( AB \) is a tangent to the circle at \( E \).
Lines \( AB \) and \( CD \) are parallel and angle \( BED = 68^\circ \).
(i) Find angle $CDE$ and give a reason for your answer.

Angle $CDE = \ldots$ because $\ldots$ [2]

(ii) Find angle $DEF$ and give a reason for your answer.

Angle $DEF = \ldots$ because $\ldots$ [2]

(iii) Work out angle $EFD$.
Write down the two further geometrical properties needed to find angle $EFD$.

Angle $EFD = \ldots$ [3]

1. $\ldots$

2. $\ldots$

(c) $POQ$ is a sector of a circle, centre $O$ and radius 7.5 cm.
The sector angle is $60^\circ$.

Calculate the length of the arc $PQ$.

$PQ = \ldots$ cm [2]
9 Ahmed owns a company.

(a) (i) Each year he earns $56,000 plus 3% of the year’s profit.

Calculate the amount he earns in a year when the profit is $320,600.

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

(ii) In the following year the profit is $347,851.

Calculate the percentage increase in the profit.

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

(b) Ahmed employs three people, Budi, Citra and Dian.
Budi earns $17,000, Citra earns $13,600 and Dian earns $6,800.

Find the ratio of their earnings in its simplest form.

(c) Ahmed buys materials from China costing 7560 yuan.

Work out the cost of the materials in dollars when the exchange rate is $1 = 7.06 yuan. Give your answer correct to the nearest dollar.

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

(d) Ahmed borrows $8000 for 3 years at a rate of 5% per year compound interest.

Calculate the amount of interest he will pay at the end of the 3 years.

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