1

For the diagram above write down

(a) the order of rotational symmetry,

\[ \text{Answer(a)} \] \[ \text{[1]} \]

(b) the number of lines of symmetry.

\[ \text{Answer(b)} \] \[ \text{[1]} \]

2 (a) Use your calculator to work out

\[ \frac{1-(\tan 40^\circ)^2}{2(\tan 40^\circ)}. \]

\[ \text{Answer(a)} \] \[ \text{[1]} \]

(b) Write your answer to part (a) in standard form.

\[ \text{Answer(b)} \] \[ \text{[1]} \]

3 Xsara throws a ball three times at a target.
Each time she throws the ball, the probability that she hits the target is 0.2.
Calculate the probability that she does not hit the target in any of the three throws.

\[ \text{Answer} \] \[ \text{[2]} \]
4 Write the following in order of size, **smallest** first.

\[
\cos 100^\circ \quad \sin 100^\circ \quad \tan 100^\circ
\]

**Answer** .......................... < .......................... < .......................... [2]

5 A tin of soup has the following information on the label.

<table>
<thead>
<tr>
<th>200 grams of soup contains</th>
<th>Protein</th>
<th>Carbohydrate</th>
<th>Fat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4 g</td>
<td>8.7 g</td>
<td>5.8 g</td>
</tr>
</tbody>
</table>

(a) What fraction of the soup is Protein? Give your answer in its simplest form.

**Answer(a)** .................................................. [1]

(b) What percentage of the soup is Carbohydrate?

**Answer(b)** .................................................. % [1]

6 Carmen spends 5 minutes, correct to the nearest minute, preparing one meal. She spends a total time of \( T \) minutes preparing 30 meals. Between what limits does \( T \) lie?

**Answer** .......................... \( \leq T \leq ................. \) [2]

7 \( M = \begin{pmatrix} 1 & 1 \\ 1 & 2 \end{pmatrix} \)

\[
M^2 = \begin{pmatrix} 2 & 3 \\ 3 & 5 \end{pmatrix} \quad M^3 = \begin{pmatrix} 5 & 8 \\ 8 & 13 \end{pmatrix}
\]

Find \( M^4 \).

**Answer** .......................... \( M^4 = \begin{pmatrix} \vdots \\ \vdots \end{pmatrix} \) [2]
8 On the Venn diagrams shade the regions

(a) \( A' \cap C' \),

(b) \( (A \cup C) \cap B \).

9 Write down

(a) an irrational number,

\[ \text{Answer(a)} \]  

(b) a prime number between 60 and 70.

\[ \text{Answer(b)} \]  

10 Write as a fraction in its simplest form

\[ \frac{x-3}{4} + \frac{4}{x-3} \].

\[ \text{Answer} \]  

11 \( A = \begin{pmatrix} x & 8 \\ 2 & x \end{pmatrix} \).

(a) Find \( |A| \), the determinant of \( A \), in terms of \( x \).

\[ \text{Answer (a)} \]

(b) Find the values of \( x \) when \( |A| = 9 \).

\[ \text{Answer (b)} \quad x = \ldots \quad \text{or} \quad x = \ldots \]

12

By shading the \textit{unwanted} parts of the grid above, find and label the region \( R \) which satisfies the following three inequalities

\[ y \geq 3, \quad y \geq 5x \quad \text{and} \quad x + y \leq 6. \]

13 The quantity \( y \) varies as the cube of \( (x+2) \).
\( y = 32 \) when \( x = 0 \).
Find \( y \) when \( x = 1 \).

\[ \text{Answer } y = \ldots \]
The diagram shows three touching circles.  
\( A \) is the centre of a circle of radius \( x \) centimetres.  
\( B \) and \( C \) are the centres of circles of radius 3.8 centimetres. Angle \( ABC = 70^\circ \).  
Find the value of \( x \).

\[ \text{Answer } x = \ldots \] [3]

15 Two unbiased spinners are used in a game.  
One spinner is numbered from 1 to 6 and the other is numbered from 1 to 3.  
The scores on each spinner are \textbf{multiplied} together. The table below shows the possible outcomes.

<table>
<thead>
<tr>
<th>First Spinner</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6</td>
</tr>
<tr>
<td>1 [ 1 ] [ 2 ] [ 3 ] [ 4 ] [ 5 ] [ 6 ]</td>
</tr>
<tr>
<td>Second Spinner</td>
</tr>
<tr>
<td>2 [ 2 ] [ 4 ] [ 6 ] [ 8 ] [ 10 ] [ 12 ]</td>
</tr>
<tr>
<td>3 [ 3 ] [ 6 ] [ 9 ] [ 12 ] [ 15 ] [ 18 ]</td>
</tr>
</tbody>
</table>

(a) Find the probability that the outcome is even.

\[ \text{Answer(a) } \ldots \] [1]

(b) When the outcome is even, find the probability that it is also greater than 11.

\[ \text{Answer(b) } \ldots \] [2]
16 The function \( f(x) \) is given by

\[ f(x) = 3x - 1. \]

Find, in its simplest form,

(a) \( f^{-1}(x) \),

Answer(a) ......................................................... [1]

(b) \( ff(x) \).

Answer(b) ......................................................... [2]

17 (a) \( \sqrt[3]{32} = 2^p \). Find the value of \( p \).

Answer(a) \( p = \) ......................................................... [2]

(b) \( \frac{\sqrt{8}}{3} = 2^q \). Find the value of \( q \).

Answer(b) \( q = \) ......................................................... [2]

18 The equation of a straight line can be written in the form \( 3x + 2y - 8 = 0 \).

(a) Rearrange this equation to make \( y \) the subject.

Answer(a) \( y = \) ......................................................... [2]

(b) Write down the gradient of the line.

Answer(b) ......................................................... [1]

(c) Write down the co-ordinates of the point where the line crosses the \( y \) axis.

Answer(c) \( (\ldots, \ldots) \) [1]
P, Q, R and S lie on a circle, centre O.
TP and TQ are tangents to the circle.
PR is a diameter and angle PSQ = 64°.

(a) Work out the values of w and x.

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

(b) Showing all your working, find the value of y.

Answer(b) \( y = \) ........................................ [2]
The diagram shows a map of part of a coastline. 1 centimetre represents 40 metres.

(a) A ferry leaves a port $P$ and travels between two islands so that it is always equidistant from $A$ and $B$. Using a straight edge and compasses only, draw this locus.

(b) For safety reasons the ferry must be at least 120 metres from a ship at $D$. Draw the locus of the points which form the boundary of safety around $D$.

(c) When the ferry is 120 metres from $D$ it must change direction. How far is the ferry from the port $P$ then?

Answer (c) .............................. m [1]
The diagram shows part of a journey by a truck.

(a) The truck accelerates from rest to 18 m/s in 30 seconds. Calculate the acceleration of the truck.

Answer(a) \[ \text{m/s}^2 \] [1]

(b) The truck then slows down in 10 seconds for some road works and travels through the road works at 12 m/s. At the end of the road works it accelerates back to a speed of 18 m/s in 10 seconds. Find the total distance travelled by the truck in the 100 seconds.

Answer(b) \[ \text{m} \] [3]
Kalid and his brother have $2000 each to invest for 3 years.

(a) North Eastern Bank advertises savings with **simple** interest at 5% per year. Kalid invests his money in this bank. How much money will he have at the end of 3 years?

$$Answer(a)$$

(b) South Western Bank advertises savings with **compound** interest at 4.9% per year. Kalid’s brother invests his money in this bank. At the end of 3 years, how much **more** money will he have than Kalid?

$$Answer(b)$$

Question 23 is on the next page.
The largest possible circle is drawn inside a semicircle, as shown in the diagram. The distance $AB$ is 12 centimetres.

(a) Find the shaded area.

Answer (a) ........................................... cm$^2$ [4]

(b) Find the perimeter of the shaded area.

Answer (b) ........................................... cm [2]