Instructions to Candidates

- Answer all questions.
- This paper carries a total of 25 marks.
- Calculators and protractors are NOT ALLOWED.
1. What is the **volume** of water this cylinder can hold when full?
   Give your answer in terms of \( \pi \).

   Ans ______________ (2 marks)

2. Continue the following procedure to draw a regular **octagon**, each side of length **fifty** turtle steps.

   PD
   REPEAT ____ [FD____ RT ____]
   END

   (2 marks)

3. What is the **bearing** of X from Y?

   Ans ______________ (3 marks)

4. This can holds 4.5 litres of paint. Alexia mixes it with 10% water.
   What is the total volume of the mixture?

   Ans ______________ (2 marks)
5. To be admitted into Baker University, students must be 17 years or older but younger than 25 years.
   
a) Fill in the boxes with the missing symbols:

   17 years [ ] Age of students to be admitted [ ] 25 years.

b) Represent the above information on the number line below:

   (2 marks)

6. A greengrocer bought a box of apples at a price of €1 per kg. He sold 4 kg at €2 per kg and the remaining 6 kg at €1.50 per kg. What is the percentage profit?

   Ans ______________  (3 marks)

7. Gabriel invests €5000 for 5 years and gets an interest of €500. What is the rate of interest?

   Ans ______________  (2 marks)
8. Work out \( 3^2 \times 2^{-2} \), giving your answer as a fraction.

\[
8. \quad \text{Work out } 3^2 \times 2^{-2}, \text{ giving your answer as a fraction.}
\]

Ans ______________ (2 marks)

9. Brown colour is made up by mixing three other colours: red, blue and yellow with volumes in the ratio \( 3 : 2 : 1.5 \).

a) Simplify the above ratio.

Ans ______________

b) Priscilla buys 39 ml of brown colour. How much yellow colour does it contain?

Ans ______________ (3 marks)

10. In his fridge, Ted has 2 full cartons of milk and another carton which is \text{half empty}. In Emma’s fridge there is 1 full carton of milk, another one which is \( \frac{1}{4} \) empty and another carton which is \( \frac{1}{3} \) empty. What is the total amount of cartons with milk that Ted and Emma have altogether?

Ans ______________ (4 marks)
1. a) The distance between planet Earth and the sun is 149,597,870.7 km.
   
i) Write this number correct to 2 significant figures.
   Ans ______________
   
   ii) Write this number in standard form, correct to 2 significant figures.
   Ans ______________

2. On the right pan of a scale, Catherine puts a 1 kg weight.
   On the left pan, Will puts three weights: a heavy one and two lighter identical ones.
   Suggest 2 possible sets of values for the weights on the left pan for the scale to be balanced.
   Ans: _____g, _____g, _____g and _____g, _____g, _____g.
3. Simplify: \( \frac{4x + 12y}{x^2 + 3xy} \)

\[ \text{Ans } \]

(3 marks)

4. a) Use this diagram to prove that the angle in a semicircle is equal to 90°.

\[ \text{Ans } \]

b) O is the centre of this circle and ROQ is a diameter. \( \angle \text{PRO} = 57^\circ \) and \( \angle \text{SOR} = 62^\circ \). Calculate, by giving reasons, the value of:

i) \( \angle \text{PQO} \)

\[ \text{Ans } \]

Reason _________________________________

ii) \( \angle \text{OSQ} \)

\[ \text{Ans } \]

Reason _________________________________

(5 marks)

5. a) i) Expand \( 2a(a + 7) \)

\[ \text{Ans i) } \]

ii) Expand and simplify \( (x + 3)(x - 2) \)

\[ \text{Ans ii) } \]

b) Simplify: \( 3ab^2 \times 4a^2b^3 \)

\[ \text{Ans } \]
c) Rearrange \(3b + fb = 7\) to make \(f\) the subject of the formula.

\[
3b + fb = 7
\]

Ans \______________\ (6 marks)

6. Two large rods, A and B, are made up of smaller rods as shown in the diagram below. The letter \(x\) represents an unknown length of some of the smaller rods. Rods A and B are of equal length. All measurements are in metres and the diagram is not to scale.

Rod A

\[
\begin{array}{c|c|c|c|c}
 & x & x & 7 & x & x & x \\
\end{array}
\]

Rod B

\[
\begin{array}{c|c|c|c|c|c|c}
 & x & 6 & x & x & 6 & x \\
\end{array}
\]

a) What is the total length of rod A? Simplify your answer.

Ans \______________\ 

b) What is the total length of rod B? Simplify your answer.

Ans \______________\ 

c) Form an equation in \(x\) and solve it.

Ans \______________\ (4 marks)
7. From a point C on a ship, the captain notices a man at point M. Z is a point vertically below C and horizontally to the left of M. CZ is 5 m long and the angle of elevation of C from M is 20°.

a) What is the value of \( \angle MCZ \)?

Ans ______________

b) Use a scale of \( 1 \text{ cm} : 1 \text{ m} \) to draw triangle CZM accurately. Point Z has already been drawn for you.

\[ \text{Z} \]

\[ \text{M} \]

\[ \text{C} \]

\[ \text{5 m} \]

\[ 20° \]

c) Make the necessary measurement on your diagram to calculate, in metres, the actual distance ZM. Give your answer correct to 1 decimal place.

Ans ______________

(4 marks)
8. On a spreadsheet, Abigail constructs a sequence. In cell B2 she types \(=B1*3+5\), in cell C2 she types \(=C1*3+5\), in cell D2 she types \(=D1*3+5\) and so on for all the cells in row 2. Columns E to Y are not shown in this diagram.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Value of (n)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>25</td>
</tr>
<tr>
<td>2</td>
<td>Sequence</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a) What is the number obtained in cell B2?
   Ans ______________

b) What is the formula that should be typed in cell Z2?
   Ans ______________

c) What is the \(n\)th term of the sequence formed in row 2?
   Ans ______________

d) Which cell, in row 2, contains the value 35?
   Ans ______________ (4 marks)


   a) Use €\(w\) to represent the price of a bottle of water and €\(s\) to represent the price of a salad and write down two equations from the above information.
   Ans ______________, ______________.

   b) Use the equations you wrote in part (a) to find the cost of a salad.
   Ans \(s = \) ______________. (5 marks)
10. During a fund raising activity, the people’s donations were summarised in the table below:

<table>
<thead>
<tr>
<th>Donation (€)</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>10</td>
<td>54</td>
</tr>
<tr>
<td>20</td>
<td>16</td>
</tr>
</tbody>
</table>

a) How many **people** made a donation in this activity?

   Ans ______________

b) What is the **range** of donations?

   Ans ______________

c) Work out the **median** donation.

   Ans ______________

d) The diagram below is to be used to draw a bar graph representing the information given in the table.

   i) Label the vertical axis of the bar graph.

   ii) Shade the correct number of rectangles to represent the information given in the table.

![Bar Graph Diagram]

   Donation

   €2  €5  €10  €20

   56

e) A donor is picked at random. What is the probability, in its simplest form, that this donor has donated €10 or less?

   Ans ______________

(10 marks)
11. The monthly fee charged by a telephone company is: **€5 as a fixed charge plus €0.40 per call.**
In January, Joseph makes 30 calls, Charlene makes 40 calls and Tim makes 80 calls.

a) In each column of this table, the company works out the final bill for each person. Complete the table.

<table>
<thead>
<tr>
<th>Number of calls</th>
<th>Fee charge</th>
<th>Joseph 30 calls</th>
<th>Charlene 40 calls</th>
<th>Tim 80 calls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed charge of €5</td>
<td>5</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Charge of €0.40 per call</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final bill (€)</td>
<td>21</td>
<td>37</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b) Use the table in part (a) to continue plotting this graph of **Final bill** against **Number of calls**.

c) Find the **gradient** of the plotted line.

Ans ______________

d) Write down the **intercept**, on the y-axis, of the plotted line.

Ans ______________

e) If the ‘Number of calls’ is represented by $x$ and the ‘Final bill’ is represented by $y$, form an **equation** in $x$ and $y$ to represent the plotted line.

Ans ______________

f) Tim has made twice as many calls as Charlene. However, his final bill is not twice that of Charlene. Give an explanation.

Ans _______________________________ (8 marks)
12. Cody stands on the horizontal rooftop RB which is 1.5 m long. He wants to get onto another horizontal rooftop PQ where Q is 4 m vertically above R. He puts a ladder AB, 5 m long, in a position as shown in the diagram. In the following questions, give all your answers correct to 1 decimal place.

a) Calculate the length QB.

Ans ______________

b) Work out the size of \( \angle BQR \).

Ans ______________

c) What is the value of AQ?

Ans ______________

d) On the ladder there is a note saying, “For safety reasons, this ladder must be between 80° and 85° to the horizontal.” According to this note, is it safe for Cody to use the ladder as shown in the diagram? Explain why.

Ans _____________________________________________________________________

__________________________________________________________________________

(7 marks)
13. a) Draw the **reflection** of shape A in the *x*-axis. Label it B.

b) **Rotate** shape A 180° about (0, 0) and label it C.

c) Draw the **enlargement** of shape A using (2, 7) as the centre and scale factor 2. Label it D.

d) Describe the transformation that maps shape D to shape X.

   ______________________________
   ______________________________


e) Describe the transformation that maps shape Y to shape X.

   ______________________________
   ______________________________

(7 marks)

14. a) A is a sector of a circle of radius 3 m. The angle at the centre is 60°. What is the **area** of sector A? Give your answer to the nearest m².

   Ans ______________

b) Kylie cuts three pieces of black paper exactly like the shape of sector A. She also cuts three **identical** pieces of black paper in the shape of another sector B, of radius 2 m. To construct the design on the right, Kylie places all the pieces on a white circular paper of radius 3 m.

What is the **total area** of the white parts of the design? Give your answer correct to the nearest m².

   Ans ______________

(6 marks)