Instructions to Candidates

- Answer all questions.
- This paper carries a total of 20 marks.
- Calculators and protractors are NOT ALLOWED.
<table>
<thead>
<tr>
<th>No.</th>
<th>Question</th>
<th>Space for working if required</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Simplify the expression: $3a^2b \times 2ab^4$</td>
<td>Ans:___________</td>
</tr>
<tr>
<td>2</td>
<td>VAT is charged at 18%. <strong>How much VAT</strong> should be paid for an item costing €1900?</td>
<td>Ans:___________</td>
</tr>
<tr>
<td>3</td>
<td>Give the <strong>largest value</strong> of $x$ given that $(2x + 3)(x - 1) = 0$</td>
<td>Ans: $x = ________$</td>
</tr>
<tr>
<td>4</td>
<td>Simplify: $\sqrt{x^2y^8}$</td>
<td>Ans:___________</td>
</tr>
<tr>
<td>5</td>
<td>$x^3 = \frac{8}{27}$. What is the value of $x$?</td>
<td>Ans: $x = _____$</td>
</tr>
<tr>
<td>6</td>
<td>A straight line passes through the points $(-2, -5)$ and $(9, 17)$. What is the <strong>gradient</strong> of this line?</td>
<td>Ans:___________</td>
</tr>
<tr>
<td>7</td>
<td>Work out by taking out a common factor: $4.7 \times 3.2 + 9.4 \times 3.4$</td>
<td>Ans:___________</td>
</tr>
<tr>
<td>8</td>
<td>Evaluate: $0.1^{-2}$</td>
<td>Ans:___________</td>
</tr>
</tbody>
</table>
Name___________________________________  Class___________

<p>| | |</p>
<table>
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<tbody>
<tr>
<td>9</td>
<td><strong>Expand and simplify</strong> the expression: $3(1 + 3x) - (4x + 1)$</td>
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<td></td>
<td>Ans: _______________</td>
</tr>
</tbody>
</table>

| 10 | A bag contains 3 **red** spheres and 3 **black** spheres. The probability tree shows all the outcomes when two spheres are picked at random. What is the probability that two **red** spheres are picked?  |
|    | Ans: ________  |

| 11 | The diagram shows the graph of $y = 3x - x^2$.  |
|    | ![Graph of $y = 3x - x^2$.](image)  |
|    | *The maximum* value of $y$ is:  |
|    | (A) 0  (B) 1.5  (C) 2.25  (D) 3  |
|    | Ans: ________  |
### Question 12
Which of the following is false?

- (A) \( c = b \sin \theta \)
- (B) \( a = b \cos \theta \)
- (C) \( a = c \tan \theta \)
- (D) \( c = a \tan \theta \)

Ans: _______

![Triangle Diagram]

### Question 13
This travel graph shows a journey from P to S and back to P.
Which of the following shows the highest speed?

- (A) P to Q
- (B) Q to R
- (C) R to S
- (D) S to P

Ans: _______

### Question 14
\( A = 9.63 \times 10^2 \) and \( B = 8 \times 10^{-1} \)
Calculate: \( A - B \). Give your answer in standard form.

Ans: __________

### Question 15
A shape T is similar but not congruent to Shape T₁. **Underline** the correct transformation of shape T to shape T₁.

Translation, Rotation, Reflection, Enlargement by scale factor 2.
<table>
<thead>
<tr>
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<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>AB is a tangent to the circle at B. Calculate the angle marked $x$.</td>
<td></td>
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<tr>
<td></td>
<td><img src="image" alt="Diagram" /></td>
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<tr>
<td></td>
<td>Ans: ________</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Convert 1,200,000 cm$^3$ into m$^3$.</td>
<td>______</td>
</tr>
<tr>
<td>18</td>
<td>A sycamore tree is now 30 m tall. It grows at a rate of 8% each year. Choose the correct working which shows the size of the tree in 2 years time.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(A) $30 \times 2 \times 1.08$</td>
<td>______</td>
</tr>
<tr>
<td></td>
<td>(B) $30 \times 2 \times 0.92$</td>
<td>______</td>
</tr>
<tr>
<td></td>
<td>(C) $30 \times 0.92 \times 0.92$</td>
<td>______</td>
</tr>
<tr>
<td></td>
<td>(D) $30 \times 1.08 \times 1.08$</td>
<td>______</td>
</tr>
<tr>
<td>19</td>
<td>A room is 4 m long and 2.5 m wide. It has to be covered by identical square tiles. The largest square tile that can be used is:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(A) 20 cm long</td>
<td>______</td>
</tr>
<tr>
<td></td>
<td>(B) 25 cm long</td>
<td>______</td>
</tr>
<tr>
<td></td>
<td>(C) 50 cm long</td>
<td>______</td>
</tr>
<tr>
<td></td>
<td>(D) 75 cm long</td>
<td>______</td>
</tr>
<tr>
<td>20</td>
<td>Give the area of the shaded sector in terms of $\pi$. Simplify your answer.</td>
<td>______</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Diagram" /></td>
<td></td>
</tr>
</tbody>
</table>
1. A boy has €400 in his bank account. Each week he takes out 10%.

Complete the above table enough to find:

(a) The amount in the account after 3 weeks.

Ans: €________

(b) The number of weeks when the original amount is reduced by half.

Ans: ________

CALCULATORS ARE ALLOWED BUT ALL NECESSARY WORKING MUST BE SHOWN. ANSWER ALL QUESTIONS.

Volume of sphere \( \frac{4}{3} \pi r^3 \)  

Solutions of the equation \( ax^2 + bx + c \)  

\[
x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}
\]
2. (a) Solve the equation: \( \frac{3x - 2}{2} = \frac{4(1 + x)}{3} \)

Ans: \( x = \) _______

(b) (i) Rearrange the formula \( a = 2 \sqrt{\frac{x}{y}} \) to make \( x \) the subject.

Ans: \( x = \) _______

(ii) Find the value of \( x \) when \( a = 4.5 \) and \( y = 16 \).

Ans: \( x = \) _______
3.

(a) Write an expression for the area of triangle QRP in terms of $a$ and $h$.

Ans: _______________

(b) Write an expression for the area of triangle SRP in terms of $b$ and $h$.

Ans: _______________

(c) Use your answers in (a) and (b) to show that the area of the trapezium PQRS is $\frac{1}{2}h(a + b)$.

__________________________________________________________

___________

___________

(4 marks)
4. Two vertical poles stand on horizontal ground and are 40 m apart. The shorter pole AB is 3 m high. The angle of elevation of the top of the longer pole CD from the top of the shorter pole is 8°.

(a) **Complete the diagram** to represent the situation.

(b) Calculate the **height of the longer pole CD**. Give your answer in metres correct to the nearest 10 cm.

Ans: __________

5. A sequence of numbers starts as follows:

23, 27, 31, 35, 39, …

(a) Find an expression for the $n$th term of the sequence.

Ans: $n$th term = __________

(b) Show that 100 **cannot** be a term of this sequence.
6. Lines AB and PQ intersect at T.

(a) Use ruler and compasses only to:

(i) Construct the locus of points which are equidistant from the lines AB and PQ.

(ii) Draw the locus of the points 3 cm away from T.

(b) Mark, each with an \( \times \), all the points that satisfy both the loci in (i) and (ii).
7. (a) Factorise completely:
   (i) \(16a^2 - 4a^2x\)  
   (ii) \(9x^2 - y^2\)

   Ans: ______________  
   Ans: ______________

(b) (i) Show that \(2x^2 - x = 30\).

(ii) Solve the equation \(2x^2 - x = 30\) to find the breadth of the rectangle, correct to 2 decimal places.

(ii) Solve the equation \(2x^2 - x = 30\) to find the breadth of the rectangle, correct to 2 decimal places.

Ans: \(x = \_________\)
8. (a) Mark a point C to complete the rectangle OABC. **Draw** the rectangle OABC.

(b) **Draw and label** the reflection of OABC in the line \( x = 4 \), to form rectangle \( O_1A_1B_1C_1 \).

(c) Rotate rectangle OABC 90° anticlockwise about the origin to form \( OA_2B_2C_2 \). **Draw and label** rectangle \( OA_2B_2C_2 \). 

\[ \text{Diagram showing reflections and rotations of OABC.} \]
9. The diagram shows a pepper pot. It consists of a cylinder and a hemisphere. The cylinder and hemisphere are of diameter 3 cm. The cylinder is 8 cm high.

(a) Calculate the volume of the pepper pot correct to 3 significant figures.

Ans: _________ cm$^3$

(b) The pepper takes up $\frac{2}{3}$ of the volume of the pepper pot.

   Calculate the depth of the pepper marked $x$, correct to the nearest cm.

Ans: $x = _________$
10. ABCD is a quadrilateral. E is a point inside the quadrilateral such that AE = DE.

(a) Calculate:

(i) angle BCE

Ans: \( \angle BCE = \) _______

(ii) angle DEC

Ans: \( \angle DEC = \) _______

(iii) angle EDC

Ans: \( \angle EDC = \) _______

(iv) angle EAD

Ans: \( \angle EAD = \) _______

(v) angle EAB

Ans: \( \angle EAB = \) _______

(b) Explain why the quadrilateral ABCD must be cyclic.

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(7 marks)
11. (a) Complete the table for \( y = \frac{x^2}{2} \).

<table>
<thead>
<tr>
<th>( x )</th>
<th>-4</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y = \frac{x^2}{2} )</td>
<td>8</td>
<td></td>
<td>0.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(b) **Draw and label** a pair of axes with \(-4 \leq x \leq 4\) and \(0 \leq y \leq 8\).

(c) Draw the graphs of \( y = \frac{x^2}{2} \) and \( y = 5.8 \)

(d) Use your graphs to **solve the equation** \( \frac{x^2}{2} = 5.8 \) correct to 1 decimal place.

Ans: \( x = \ldots, \ldots \)
12. The frequency chart shows raw data that has been grouped.

(a) Which is the class interval in which the median lies?

Ans: _________________

(b) (i) Draw another frequency chart for the same raw data using the following class intervals:

0 – 0.5, 0.5 – 1, 1 – 1.5, 1.5 – 2, 2 – 2.5 and 2.5 – 3

(ii) What is the modal class?

Ans: _________________

_____________________________________________________________________

(8 marks)

End of Paper