Instructions to Candidates

- Answer all questions. There are 20 questions to answer.
- Each question carries 1 mark.
- Calculators and protractors are not allowed.
- You are not required to show your working. However space for working is provided if you need it.
<table>
<thead>
<tr>
<th>No.</th>
<th>QUESTION</th>
<th>Space for Working if Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Write in <strong>descending</strong> order: $9^4$, $3^5$, $27^2$, 81.</td>
<td></td>
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<tr>
<td></td>
<td>Ans: ____, ____ , ____ , ____ .</td>
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</tr>
<tr>
<td>2</td>
<td>Factorise: $9x^2 - 4y^2$</td>
<td></td>
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<tr>
<td></td>
<td>Ans: ________________________</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Express 0·007 km$^2$ in m$^2$</td>
<td></td>
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<tr>
<td></td>
<td>Ans: _______m$^2$</td>
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<tr>
<td>4</td>
<td>The area of uniform cross section of a prism-shaped container is 400 cm$^2$. Calculate the <strong>length</strong> of the prism if it has a capacity of 30 litres.</td>
<td></td>
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<tr>
<td></td>
<td>Ans: ___________ cm</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Make $a$ the subject of the formula: $b = \sqrt{x - a}$</td>
<td></td>
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<tr>
<td></td>
<td>Ans: ________________________</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>The points (0, 2), (1, 4), (2, 6) and (7, $n$) all lie on the same straight line. What is the value of $n$?</td>
<td></td>
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<tr>
<td></td>
<td>Ans: _______</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>A satellite is launched from the earth. At a certain height it starts to orbit the earth as shown in the diagram. Which graph represents the distance of the satellite from the earth, from the time it was launched?</td>
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<tr>
<td></td>
<td>Ans: _______________</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Question</td>
<td>Answer</td>
</tr>
<tr>
<td>---</td>
<td>-------------------------------------------------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>8</td>
<td>Calculate the <strong>overall percentage change</strong>: A 40% increase and then a 30% decrease.</td>
<td>Ans:_________</td>
</tr>
<tr>
<td>9</td>
<td>Simplify: $\sqrt[6]{\frac{100a^2b^4}{c^6}}$</td>
<td>Ans:_________</td>
</tr>
<tr>
<td>10</td>
<td>Evaluate: $\left(\frac{2}{3}\right)^{-2} + \frac{1}{(3^0 + 3^{-1})}$</td>
<td>Ans:_________</td>
</tr>
<tr>
<td>11</td>
<td>Expand and simplify: $(5x - 1)^2$</td>
<td>Ans:_________</td>
</tr>
<tr>
<td>12</td>
<td>Find and simplify an expression for the <strong>area</strong> of this trapezium.</td>
<td>Ans:_________</td>
</tr>
<tr>
<td>13</td>
<td>The shaded design is made up from four of the triangle shown. What is the <strong>perimeter</strong> of the shape?</td>
<td>Ans:_________</td>
</tr>
<tr>
<td>14</td>
<td>The minute hand of a clock is 10 cm long. Which one of the following is the distance travelled by the tip of the minute hand in 24 minutes, correct to the nearest cm?</td>
<td>Ans:_________</td>
</tr>
</tbody>
</table>

(A) 35 cm  (B) 30 cm  (C) 25 cm  (D) 20 cm
15 Describe **fully** the single transformation from R to Q.

Ans: __________________________________________________

16 QR is a tangent to the circle centre O. TR is a chord.
The angle marked $x$ is equal to:

A) $180^\circ - 2y$
B) $y$
C) $4y$
D) $2y$

Ans: _______

17 The mass of a house mouse is $1.2 \times 10^{-2}$ kg while that of an elephant is $6.0 \times 10^3$ kg. Complete: The mass of an elephant is _________ times the mass of a house mouse.

18 Solve the equation: $5(2x + 3) = 7(x + 6)$

Ans: _______

19 A rectangular room is 360 cm long and 336 cm wide. Its floor has to be covered with **square** tiles. What is the **length** of the largest tile that can be used?

Ans: _______ cm

20 This frequency table shows the distribution of marks in a test of a group of students. Which **class interval** contains the **median** mark?

<table>
<thead>
<tr>
<th>Marks</th>
<th>1 − 5</th>
<th>6 − 10</th>
<th>11 − 15</th>
<th>16 − 20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>2</td>
<td>3</td>
<td>6</td>
<td>8</td>
</tr>
</tbody>
</table>

Ans: ___________
1) Christian invested €800 into a bank account which paid 3% interest per annum. He left the money in the account.
   a) Calculate the final amount after 2 years.

   Ans: ____________________

   b) For how many complete years will he have to leave the money in the account for the amount to become at least €955?

   Ans: ________

(4 marks)
2) 

a) Solve the equation: \[ \frac{3x - 2}{5} + \frac{x + 2}{2} = 5 \]

Ans: ___________

b) Solve the equation \( 2x^2 + 5x - 1 = 0 \) giving your answers correct to 2 decimal places.

\[ x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \]

Ans: ___________

(7 marks)

3) A right angled triangle is cut from the corner of a rectangular piece of card 15 cm by 8 cm. The base of the triangle is \( 4x \) cm and its height is \( (x + 2) \) cm. The remaining (shaded) part of the card has an area of 90 cm\(^2\).

a) Find the area of the triangle in terms of \( x \).

Ans: _______________

b) i) Show that: \( x^2 + 2x - 15 = 0 \)  
   (ii) Solve the equation in (i).

Ans: _______________  
Ans: _______________

(8 marks)
4) ABC is a triangular field where AB = 157 m and BC = 98 m. B is on a bearing of 124° from A. 
C is on a bearing of 214° from B.

a) Find the angle marked x.

Ans: ________

b) Calculate \( \angle ABC \).

Ans: ________

c) Calculate the bearing of C from A correct to the nearest degree.

Ans: ________

5) A spinning top is made up of a hemisphere of radius 4 cm and a cone of base radius 4 cm and height 5.5 cm. Show that the volume of the spinning top is \( 72\pi \).

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

Volume of cone = \( \frac{1}{3}\pi r^2h \)

(3 marks)
6) Enlarge shape A by scale factor $-2$ using the origin as the centre of enlargement.

7) Lines AB and CD are parallel. The equation of line AB is $2x + y = 4$ and CD passes through the point $(0,1)$. Write down the equation of the line CD.

Ans: ________________________

(4 marks)
8) ABCD is a cyclic quadrilateral. PBC, PAD, QAB and QDC are straight lines.

a) Write ∠ABC in terms of \( x \). Give a reason for your answer.

Ans: 
Reason: _________________________________________

b) Find \( x \).

Ans: 

9) A square based pyramid has a vertical height of 24 cm and a volume of 392 cm\(^3\). Calculate the length \( x \) of the square base.

Volume of a pyramid = \( \frac{1}{3} \) base area \( \times \) height

Ans: 

(4 marks)
10)  

a) Complete the table of values for \( y = 3 + x - x^2 \).

<table>
<thead>
<tr>
<th>( x )</th>
<th>-1.5</th>
<th>-1</th>
<th>-0.5</th>
<th>0</th>
<th>0.5</th>
<th>1</th>
<th>1.5</th>
<th>2</th>
<th>2.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y )</td>
<td>-0.75</td>
<td>2.25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b) Draw the graph of \( y = 3 + x - x^2 \), for values of \( x \) from -1.5 to 2.5 and values of \( y \) from -1 to 4. Take 4 cm for each unit on the \( x \) axis and 2 cm for each unit on the \( y \) axis.

c) What is the maximum value of: \( 3 + x - x^2 \)?

Ans: __________

d) Use your graph to solve the equation: \( 3 + x - x^2 = 0 \)

Ans: ________________

e) Draw also the graph: \( y = x + 2 \).

f) Use your graph to solve the simultaneous equations: \( y = 3 + x - x^2 \) and \( y = x + 2 \).

Ans: ____________________

(13 marks)
11) Leo’s cat has a litter of kittens: five are female and three are male. The vet examines them randomly one by one.
   a) Complete the tree diagram.

\[
\begin{align*}
\text{P(Male)} &= \frac{3}{8} \\
\text{P(Female)} &= \frac{5}{8}
\end{align*}
\]

b) Calculate the probability that the first three kittens examined:
   i) will all be male.

\[
\text{Ans:} \quad \boxed{\frac{27}{512}}
\]

ii) will include two males and a female.

\[
\text{Ans:} \quad \boxed{\frac{15}{512}}
\]

iii) will include \textbf{at least} one female.

\[
\text{Ans:} \quad \boxed{\frac{45}{512}}
\]

(11 marks)
12) 

a) The perpendicular distance of a point $P$ to the line $AB$ is 10 cm. By drawing appropriate loci of points, shade the region which is $\leq 6$ cm away from the point $P$ and $\leq 7$ cm away from the line.

\[ P \cdot \]

b) Take the necessary measurements to calculate the area of the region correct to the nearest cm$^2$.

**Ans:** __________

(6 marks)
13) The diagram shows part of a sequence of shapes made from squares with a dot at each corner and a dot in the middle.

[Diagram of shapes]

a) Complete the table to show the number of dots in each of the first five shapes.

<table>
<thead>
<tr>
<th>Shape number (n)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of dots (d)</td>
<td>5</td>
<td>8</td>
<td>11</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b) Write down a formula which can be used to calculate the number of dots $d$ in terms of the shape number $n$.

Ans: ______________

c) Use the formula you found in (b) to find the number of dots in shape 59.

Ans: __________

d) Which shape contains 107 dots?

Ans: __________

(7 marks)
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