INSTRUCTIONS

1. Write your Name, Class and Class Number in the spaces provided on Page 1.

2. This paper consists of THREE sections, A(1), A(2) and B. Section A(1) carries 30 marks. Section A(2) carries 30 marks. Section B carries 40 marks.

3. Attempt ALL questions in Sections A(1), A(2) and Section B. Write your answers in the spaces provided in this Question-Answer Book. Do not write in the margins.

4. Graph paper and supplementary answer sheets will be supplied on request. Write your Name on each sheet, and fasten them with string INSIDE this book.

5. Write the question numbers of the questions you have attempted in Section B in the spaces provided on Page 1.

6. Unless otherwise specified, all working must be clearly shown.

7. Unless otherwise specified, numerical answers should be either exact or correct to 3 significant figures.

8. The diagrams in this paper are not necessarily drawn to scale.

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This paper must be answered in English
<table>
<thead>
<tr>
<th>FORMULA</th>
<th>DESCRIPTION</th>
<th>FORMULA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SPHERE</strong></td>
<td>Surface area</td>
<td>$4\pi r^2$</td>
</tr>
<tr>
<td></td>
<td>Volume</td>
<td>$\frac{4}{3} \pi r^3$</td>
</tr>
<tr>
<td><strong>CYLINDER</strong></td>
<td>Area of curved surface</td>
<td>$2\pi rh$</td>
</tr>
<tr>
<td></td>
<td>Volume</td>
<td>$\pi r^2 h$</td>
</tr>
<tr>
<td><strong>CONE</strong></td>
<td>Area of curved surface</td>
<td>$\pi rl$</td>
</tr>
<tr>
<td></td>
<td>Volume</td>
<td>$\frac{1}{3} \pi r^2 h$</td>
</tr>
<tr>
<td><strong>PRISM</strong></td>
<td>Volume</td>
<td>base area $\times$ height</td>
</tr>
<tr>
<td><strong>PYRAMID</strong></td>
<td>Volume</td>
<td>$\frac{1}{3} \times$ base area $\times$ height</td>
</tr>
</tbody>
</table>
SECTION A(1) (30 marks)
Answer ALL questions in this section and write your answers in the spaces provided.

1. A number is picked at random from a set of numbers 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.
   Let  \( E = \{ \text{Picking an even number} \} \),  \( F = \{ \text{Picking a number which is a multiple of 3} \} \)
   (a) Find  \( E \cup F \) and  \( E \cap F' \).
   (b) Find  \( P(E \cup F) \) and  \( P(E \cap F') \).  \( \text{(4 marks)} \)

2. If  \( y = \frac{1}{x-1} \),  \( y = 9 \) when  \( x = r \), and  \( y = 7 \) when  \( x = t \), find
   (a)  \( r \) in terms of  \( t \).
   (b) the value of  \( r \) and  \( t \) when  \( r + t = 2 \).  \( \text{(5 marks)} \)
3. X is $028^\circ$ from Y and $122^\circ$ from Z, Y is 34 km due south of Z.

(a) Use the above given to mark all angle(s) and length(s) in the diagram in the right. 

(b) Find the distance of Y from X. 

4. (a) Factorize $y^2 - 2y - 3$. 
(b) Hence solve the equation for $x$ : $(x^2 + 4x)^2 - 2(x^2 + 4x) - 3 = 0$. 
5. A game shop sells 3 sports games, 6 board games and 10 action games.
   (a) Sandy is going to buy a game, how many different games can she choose from?
   (b) Dick is going to buy 2 different kinds of games, how many different ways can he choose from?

(4 marks)

6. Solve the inequality for all integral values of \( x \): \( \frac{-x + 1}{-2} \leq 4 \)

(4 marks)

7. In the figure, the length of the line segment \( AB \) is 5 cm. A moving point \( P \) maintains a fixed distance of 3 cm from the line segment \( AB \). Sketch the locus of \( P \) below.

(3 marks)

\[
\begin{array}{c}
A \quad 5 \text{ cm} \\
\text{B}
\end{array}
\]
8. The cumulative frequency polygon below shows the distribution of the marks scored by 80 students in a test.

(a) Use the left diagram to complete the table below.

<table>
<thead>
<tr>
<th>Marks</th>
<th>Class mark</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 – 19</td>
<td>14.5</td>
<td>5</td>
</tr>
<tr>
<td>20 – 29</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>30 – 39</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40 – 49</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>50 – 59</td>
<td>54.5</td>
<td></td>
</tr>
<tr>
<td>60 – 69</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(2 marks)

(b) From the table, find the mean and standard deviation of the distribution, giving your answers correct to 3 significant figures. (Working need not be shown.) (2 marks)

(c) The teacher added 15 to each mark. Write down the mean and the standard deviation of the new set of marks, giving your answers correct to 3 significant figures. (Working need not be shown.) (2 marks)
9. Darts are being thrown onto a circular dart board divided into 3 regions by 3 concentric circles of radii 10 cm, 20 cm and 30 cm as in the figure. If 2 marks are awarded to a dart landed on region I; 1 mark to region II and no mark to region III. Assume that no dart will land outside the board and the dart has equal chance to land on any place on the board.

(a) In throwing a dart, find the probability of scoring (i) 2 marks; (ii) 1 mark. (2 marks)

(b) Find the probability of scoring at least 1 mark in throwing a dart twice. (2 marks)

(c) If each of 2 men A and B throws 1 dart, find the probability of A getting a higher score. (2 marks)
10. In quadrilateral $ABCD$, $\angle B = 95^\circ$.
$AB = 5$ cm, $BC = 3$ cm, $AD = 7$ cm and $\angle DAC = 37^\circ$.
Find the perimeter and area of quadrilateral $ABCD$.

$(Give$ $the$ $answer$ $correct$ $to$ $3$ $significant$ $figures.)$

$(6$ $marks)$

11. Let $f(x) = x^2 + kx + (k + 3)$ and $g(x) = x^2 - 2kx + (8 - 2k)$, where $k$ is a real number.

(a) Find the range of values of $k$ such that
   (i) $f(x) = 0$ has two distinct real roots,
   (ii) $g(x) = 0$ has no real roots.

$(4$ $marks)$
(b) Using the results of (a), find the value(s) of \( k \), if \( k \) is an integer.  

(2 marks)

12. In the figure, a circle has centre \((3, a)\) and touches the line \( L : 3x + ky - 92 = 0 \) at \( A(12, 14) \).

Find

(a) the value of \( k \),
(b) the value of \( a \),
(c) the equation of the circle in general form. 

(6 marks)
13. The graph of \( y = x^2 + 2x - 24 \), intersects the x-axis at A, B and y-axis at C.

(a) Find the co-ordinates of A, B, C.

(b) Express \( x^2 + 2x - 24 \) in the form \((x + a)^2 + b\), where a and b are constants.

(c) (i) Find the minimum value of \( x^2 + 2x - 28 \).

(ii) Find the maximum value of \(-2(x^2 + 2x - 24) + 1\)

(iii) Find the minimum value of \(2(x^2 + 2x - 24)^2 + 1\)
14. A hemispherical flower pot is hanged from a point $V$ in the ceiling by three strings, each of 30 cm long as shown in the figure. The strings are attached to the points $A$, $B$ and $C$ on the rim of the pot such that $\Delta ABC$ is an equilateral triangle. The angle between each pair of adjacent strings is $40^\circ$.

(a) Find the length of $BC$.  

(b) Find the radius of the pot.  

(c) Use (b) to find the angle between $VC$ and the horizontal.  

(d) How high is $V$ above $\Delta ABC$?  

(c)orrect all your answers to 3 significant figures.
15. In the figure, the graph \( C_1 : y = x(x + 3)(x + k) \) is translated 5 units to the left to obtain the graph \( C_2 : y = g(x) \).

(a) If \( Q(-6, 4) \) is the image of \( P \), find \( P \) and the value of \( k \). (3 marks)

(b) Find \( C_2 \). (2 marks)

(c) If \( C_2 : y = g(x) \) is reflected about x-axis and then reflected about y-axis to obtain the graph \( C_3 : y = h(x) \). Find \( C_3 \). (2 marks)

(d) Are there any intersection point(s) of \( C_1 \) and \( C_3 \)? Explain your answer. (3 marks)
16. \( (\text{Assume that in a normal distribution, 68\%, 95\% and 99.7\% of the data lie within one, two and three standard deviations respectively from the mean.}) \)

In a public examination, the scores of the candidates are normally distributed with mean 61 and standard deviation 11.5.

(a) Find the percentage of candidates with scores above 84. \( (3 \text{ marks}) \)

(b) If the standard score of Tom in this examination is \(-2.1\), find his score. \( (3 \text{ marks}) \)

(c) If 84\% of candidates pass the examination,

(i) find the passing mark of the examination, \( (2 \text{ marks}) \)

(ii) can Tom pass the examination? Explain shortly. \( (2 \text{ marks}) \)