1. Write your class, class number in the spaces provided on this cover.

2. This paper consists of TWO sections, A and B. Section A and Section B carry 80 marks and 40 marks respectively.

3. Attempts ALL questions in this paper. Write your answers in the spaces provided in this Question-Answer Book.

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

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

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

<table>
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<th>Question No.</th>
<th>Max. marks</th>
<th>Teacher's Use Only</th>
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SECTION A  Short questions.  (80 marks)
Answer ALL questions in this section.

1. Simplify \( \frac{a^4}{\sqrt[3]{9a}} + (9a)^{\frac{3}{2}} \) and give the answer with positive indices.  (6 marks)

2. a) Factorize: \(-10x^2 + 29x - 21\)

   b) Factorize: \(9a^2 - 6ab + b^2\)

   c) Hence, factorize: \(9a^2 - 6ab + b^2 - c^2\)  (6 marks)
3. The present value of a watch is $1120. One year ago, its value was $1400. 
   a) Find the percentage decrease in its value.

   b) If the value of the watch decreases each year at the same percentage as in (a), find the 
      value of the watch (i) in 4 years’ time, (ii) 4 years ago. (Correct the answers to 2 
      decimal places) (6 marks)

4. Simplify and rationalize the following expression: $2\sqrt{8} + \sqrt{32} - \sqrt{72} - \frac{2}{\sqrt{2}}$ (6 marks)
5. Tom tosses 3 coins once in a certain game. Suppose tossing the coins to obtain 3 heads get an award of 40 coupons, 2 heads get 10 coupons, 1 head gets 5 coupons but getting no heads will lose 100 coupons.

(a) Find the probabilities that Tom gets 3 heads, 2 heads and 1 head respectively.

(b) Find the expected value of award. (6 marks)

6. The following cumulative frequency polygon shows the ages of all the members of Bridge club.

Ages of all the members of Bridge club

![Cumulative Frequency Polygon]

(a) According to the above diagram, complete the following frequency distribution table.

<table>
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<td>Frequency</td>
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</table>
(b) Half of the members have ages less than x. Find the value of x. (6 marks)

Refer to the pyramid shown in the above diagram. The base $PQRS$ is a square. $A$ is the mid-point of PQ, VP = VQ = VR = VS. The projection of point V on the plane PQRS is M, which is also the intersection of PR and SQ.

a) Find the angle between the planes VPQ and PQRS.

(b) Find the angle between the base PQRS and the edge VP. (6 marks)
8. Solve the inequality: \[ \frac{2x - 1}{3} + 0.5(3 - x) < \frac{1}{4} + 0.8x \] (8 marks)
9. In the figure, \( P \) and \( S \) are the mid-points of \( AD \) and \( BC \) respectively. \( PQRS \parallel DC \).

(a) Prove that \( AB \parallel DC \).

(b) If \( AT = 16 \), \( CT = 40 \) and \( DT = 35 \), find \( QT \). (15 marks)
10. A line segment $PQ$ passes through the origin $O$. The coordinates of $P$ and $Q$ are $(-6, -4)$ and $(9, 6)$ respectively.

(a) Find the length of $PQ$.

(b) Find the slope of $PQ$.

(c) Find the ratio $PO : OQ$.

(d) If the point $A$ lies on the line segment $OQ$ such that $OA : AQ = PO : OQ$, find the coordinates of point $A$. (15 marks)
SECTION B  Long Questions. (40 marks)

Answer ALL questions in this section. Each question carries 20 marks.

11. (a) The base radius of a right circular cone is one third of its slant height and the total surface area of the cone is $64\pi \text{ cm}^2$. Find

(i) the base radius,

(ii) the height,

(iii) the volume of the cone.
(b) If a right circular cone $A$ is divided into a solid $C$ and a right circular cone $B$ similar to $A$. See the figure shown on Right Hand Side.

Find the ratio of Volume of $C$ : Volume of $A$

(c) The cone in (a) is cut into 2 portions as done in (b). The lower frustum $C$ is put into a cylindrical vessel containing water. If the base diameter of the vessel is 12 cm and the frustum is completely submerged into the water without overflowing, find the rise in the water level.

(20 marks)
12. In the figure below, AB is an antenna standing upright on top of a radar station BC.

D is a point on the horizontal ground. The angles of elevation of A and B from D are 25° and 15° respectively. E is a point between D and C such that DE = 16 m. If the angle of depression of E from A is 75°, find:

(a) Angle AEC and angle ABD.

(b) The length of EC.
(c) The height BC of the radar station.

(d) The height AB of the antenna. (20 marks)
Rough Work Sheet