

**ICSE Board**  
**Class X Mathematics**

**Time: 2½ hrs**

**Total Marks: 80**

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**General Instructions:**

1. Answers to this paper must be written on the paper provided separately.
  2. You will **NOT** be allowed to write during the first 15 minutes. This time is to be spent in reading the question paper.
  3. The time given at the head of this paper is the time allowed for writing the answers.
  4. This question paper is divided into two Sections. Attempt **all** questions from **Section A** and any **four** questions from **Section B**.
  5. Intended marks for questions or parts of questions are given in brackets along the questions.
  6. All working, including rough work, must be clearly shown and should be done on the same sheet as the rest of the answer. Omission of essential working will result in loss of marks.
  7. Mathematical tables are provided.
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**SECTION – A (40 Marks)**

*(Answer all questions from this Section)*

**Q. 1**

a)

$$\text{Let } A = \begin{bmatrix} 2 & 1 \\ 0 & -2 \end{bmatrix}, B = \begin{bmatrix} 4 & 1 \\ -3 & -2 \end{bmatrix} \text{ and}$$

$$C = \begin{bmatrix} -3 & 2 \\ -1 & 4 \end{bmatrix}. \text{ Find } A^2 + AC - 5B.$$

[3]

b) Aarushi has a recurring deposit account for 2 years at 6% pa. She receives Rs. 1,125 as interest on maturity.

(i) Find the monthly instalment amount

(ii) Find the maturity amount

[3]

c) All red face cards are removed from a pack of playing cards. The remaining cards are well shuffled and then a card is drawn at random from them. Find the probability that the drawn card is

- (i) a red card
- (ii) a face card and
- (iii) a card of clubs

[4]

**Q. 2**

a)  $3080 \text{ cm}^3$  of water is required to fill a cylindrical vessel completely and  $2310 \text{ cm}^3$  of water is required to fill it upto 5 cm below the top. Find

- (i) the radius of the vessel
- (ii) the height of the vessel
- (iii) the wetted surface area of the vessel when it is half-filled with water

[3]

b) A manufacturer of TV sets produces 600 units in the third year and 700 units in the seventh year. Assuming that the production increases uniformly by a fixed number every year, find

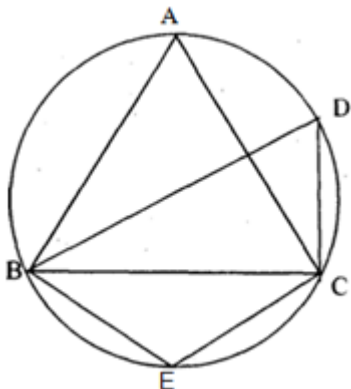
- (i) the production in the first year
- (ii) the production in the 10<sup>th</sup> year
- (iii) the total production in 7 years

[3]

c) In the figure,  $\angle DBC = 58^\circ$ . BD is a diameter of the circle. Calculate

- (i)  $\angle BDC$
- (ii)  $\angle BEC$
- (iii)  $\angle BAC$

[4]



**Q. 3**

a) Find the values of a and b in the polynomial  $f(x) = 2x^3 + ax^2 + bx + 10$  if it is exactly divisible by  $(x + 2)$  and  $(2x - 1)$ . [3]

b) 
$$\frac{\cot^2 \theta (\sec \theta - 1)}{(1 + \sin \theta)} + \frac{\sec^2 \theta (\sin \theta - 1)}{(1 + \sec \theta)} = 0$$
 [3]

c) The following table shows the distribution of the heights of a group of factory workers:

Ht. (cm):	150-155	155-160	160-165	165-170	170-175	175-180	180-185
No. of workers:	6	12	18	20	13	8	6

(i) Determine the cumulative frequencies.

(ii) Draw the 'less than' cumulative frequency curve on graph paper. Use 2 cm = 5 cm height on one axis and 2 cm = 10 workers on the other. [4]

**Q. 4**

a) Solve the following inequation and represent the solution set on the number line.

$$-3 < -\frac{1}{2} - \frac{2x}{3} \leq \frac{5}{6}, x \in \mathbb{R} \quad [3]$$

b) PQRS is a rhombus. The coordinates of Q and S are  $(-3, 4)$  and  $(5, -6)$ , respectively. Find the equation of PR. [3]

c) 
$$\frac{2}{x+1} + \frac{3}{2(x-2)} = \frac{23}{5x}; x \neq 0, -1, 2$$
 [4]

**SECTION - B (40 Marks)**

(Answer **any four questions** from this Section)

**Q. 5**

- a) The second term of a GP is 9 and the sum of its infinite terms is 48. Find its first three terms. [3]
- b) Find the image of point (4, -6) under the following operations:  
(i)  $M_x \cdot M_y$                       (ii)  $M_y \cdot M_x$   
(iii)  $M_0 \cdot M_x$                       (iv)  $M_x \cdot M_0$  [3]
- c) Krithika wants to invest Rs. 10,000 in shares of different companies such that the percentage return on her investment is 8%. She invested Rs. 4,500 in 6% Rs. 100 shares at Rs. 75, Rs. 2,500 in 8% Rs. 100 shares at par and the rest in 16% Rs. 100 shares. Find the rate at which she bought the 16% shares. [4]

**Q. 6**

- a)  
If  $\frac{x}{a} = \frac{y}{b} = \frac{z}{c}$  show that: [3]  
$$\frac{x^3}{a^3} + \frac{y^3}{b^3} + \frac{z^3}{c^3} = \frac{3xyz}{abc}.$$
- b) Prove:  
$$\tan^2 A - \tan^2 B = \frac{\sin^2 A - \sin^2 B}{\cos^2 A \cos^2 B}$$
 [3]
- c) Let  $A = \begin{bmatrix} 3 & 2 \\ 0 & 5 \end{bmatrix}$  and  $B = \begin{bmatrix} 1 & 0 \\ 1 & 2 \end{bmatrix}$ , find (i)  $(A + B)(A - B)$  (ii)  $A^2 - B^2$ . Is (i) equal to (ii)? [4]

**Q. 7**

- a) Find the value of  $p$  for which the quadratic equation  $(p + 1)x^2 - 6(p + 1)x + 3(p + 9) = 0$ ,  $p \neq -1$  has equal roots. Hence, find the roots of the equation. [3]
- b)  $\Delta ABC \sim \Delta PQR$ ,  $AD$  and  $PS$  are altitudes from  $A$  and  $P$  on sides  $BC$  and  $QR$ , respectively. If  $AD:PS = 4:9$ , find the ratio of the areas of  $\Delta ABC$  and  $\Delta PQR$ . [3]
- c)  $ABC$  is a triangle whose vertices are  $A(-4, 2)$ ,  $B(0, 2)$  and  $C(-2, -4)$ .  $D$ ,  $E$  and  $F$  are the midpoints of the sides  $AB$ ,  $CA$  and  $BC$ , respectively. Prove that the centroid of the  $\Delta ABC$  coincides with the centroid of the  $\Delta DEF$ . [4]

**Q. 8**

- a) The numerator of a fraction is 3 less than the denominator. If 2 is added to both numerator and denominator, then the sum of the new fraction and the original fraction is  $\frac{29}{20}$ . Find the original fraction. [3]
- b) Find the arithmetic mean (correct to the nearest whole number) by using the step-deviation method. [3]

x	5	10	15	20	25	30	35	40	45	50
f	20	43	75	67	72	45	39	9	8	6

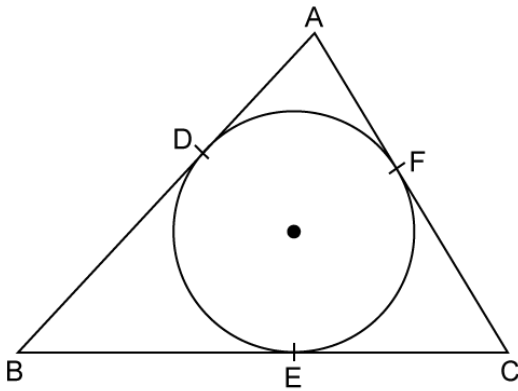
- c) Draw a circle of radius 3 cm. From a point  $P$ , 7 cm away from the centre of the circle, draw two tangents to the circle. Also, measure the lengths of the tangents. [3]

**Q. 9**

- a) A recurring deposit account of Rs. 1,200 per month has a maturity value of Rs. 12,440. If the rate of interest is 8% and the interest is calculated at the end of every month, find the time (in months) of this recurring deposit account. [3]
- b) On a map drawn to a scale of 1:25000, a rectangular plot of land, ABCD, is measured as  $AB = 12$  cm and  $BC = 16$  cm. Calculate the diagonal distance of the plot in km and the plot area in  $\text{km}^2$ . [3]
- c) The height of a cone is 10 cm. The cone is divided into two parts using a plane parallel to its base at the middle of its height. Find the ratio of the volumes of the two parts. [4]

**Q. 10**

- a) In the given figure, a circle inscribed in a triangle ABC touches the sides AB, BC and AC at points D, E and F, respectively. If  $AB = 12$  cm,  $BC = 8$  cm and  $AC = 10$  cm, find the lengths of AD, BE and CF. [3]



- b) Find the values of constants a and b when  $x - 2$  and  $x + 3$  both are the factors of expression  $x^3 + ax^2 + bx - 12$ . [3]
- c) A moving boat is observed from the top of a 150-m high cliff moving away from the cliff. The angle of depression of the boat changes from  $60^\circ$  to  $45^\circ$  in 2 minutes. Find the speed of the boat in m/h. [4]

**Q. 11**

a) If  $S_n$  denotes the sum of the first  $n$  terms of an AP, prove that  $S_{12} = 3(S_8 - S_4)$ . [4]

b) The marks obtained by 200 students in an examination are given below: [6]

Marks	0– 10	10– 20	20– 30	30– 40	40– 50	50– 60	60– 70	70– 80	80– 90	90– 100
No. of Students	5	10	11	20	27	38	40	29	14	6

Using a graph paper, draw an ogive for the above distribution and estimate

(i) the median

(ii) the lower quartile

(iii) the number of students who obtained more than 80% marks in the examination