shishuvan

MATHEMATICS (Std X)
(Two hours and a half)

Answers to this Paper must be written on the paper provided separately.
You will not be allowed to write during the first 15 minutes.
This time is to be spent in reading the question paper.
The time given at the head of this Paper is the time allowed for writing the answers.

Attempt all questions from Section A and any four questions from Section B.
All working, including rough work, must be clearly shown and must be done on the same sheet as the rest of the answer. Omission of essential working will result in loss of marks. The intended marks for questions or parts of questions are given in brackets [ ]. Mathematical tables are provided.
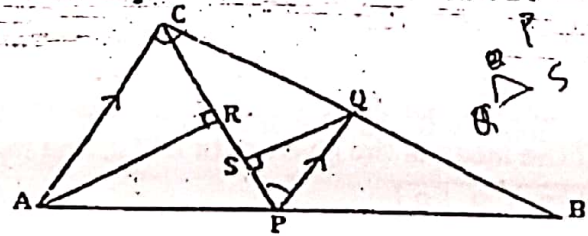

SECTION A (40 Marks)
Attempt all questions from this Section

Question 1

A. Solve for x and give your answers correct up to three significant figures: [3]
$x^2 - 10x + 6 = 0$

B. If $(x - 2)$ is a factor of $2x^3 - x^2 - px - 2$, [3]
   (i) find the value of p,
   (ii) with the value of p, factorize the expression completely.

C. In the given figure, P is a point on AB such that AP : BP = 4 : 3, PQ is parallel to AC. [4]

i) Calculate the ratio PQ : AC, giving reason for your answer.
ii) In △ARC, ∠ARC = 90° and in △PQS, ∠PSQ = 90°. Given that QS = 6 cm, calculate the length of AR.

Question 2

A. Solve the following inequation. Represent the solution on the number line. [3]
$-\frac{8}{3} \le x + \frac{1}{3} < 3 + \frac{1}{3}, x \in R$

B. If a, b, c, d are in G.P. Prove that $a + b, b + c, c + d$ are also in GP. [3]

C In the given figure O is the centre of the circle. Tangents at A and B meet at C. If $\angle ACO = 30°$, find (i) $\angle BCO$ (ii) $\angle AOB$ (iii) $\angle APB$. **[4]**
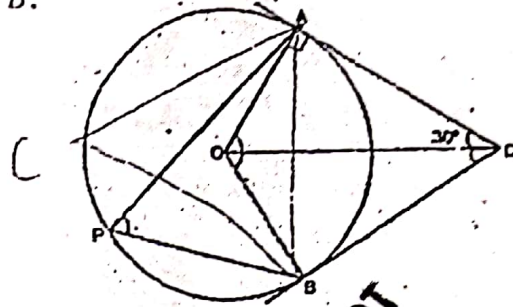
Question 3

A If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$, show that $A^2 - 5A + 7I_2 = 0$. **[3]**

B Prove that: **[3]**
$$\frac{1}{\cos\theta + \sin\theta} + \frac{1}{\sin\theta - \cos\theta} = \frac{2\sin\theta}{1 - 2\cos^2\theta}$$

C Ramesh has a cumulative time deposit account in a bank. He deposits ₹ 600 per month for 6 years. If at the end of maturity period he gets ₹ 53712, find the rate of interest. **[4]**

Question 4

A Marks obtained by 40 students in a short assessment is given below, where a and b are two missing data. If the mean of the given data is 7.2, find the value of a and b. **[3]**

Marks	5	6	7	8	9
No. of students	6	a	16	13	b

B Tickets numbered from 1 to 20 are mixed up together and then a ticket is drawn at random. What is the probability that the ticket has a number which is a multiple of 3 or 7 ? **[3]**

C The volume of a conical tent is 1232m³ and the area of the bare floor is 154m². Calculate the **[4]**

   (i)   radius of the floor,
   (ii)   height of the tent,
   (iii) length of the canvas required to cover this conical tent if its width is 2m.

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SECTION B (40 Marks)

Attempt any four questions from this section

QUESTION 5:

A. The 4th term of an A.P. is equal to 3 times the first term and 7th term exceeds twice the third term by 1. Find the first term and the common difference. [3]

B. If $\begin{bmatrix} x-y & 2x+z \\ 2x-y & 3z+w \end{bmatrix} = \begin{bmatrix} -1 & 5 \\ 0 & 13 \end{bmatrix}$, find the values of x, y, z and w. [3]

C. Use graph paper for this question (Take 1cm =1unit on both the axes). [4]
   (i)   Plot A (4,4) , B(4,−6) and C(8,0), the vertices of a triangle ABC.
   (ii) Reflect ABC on the y-axis and name it as A′B′C′.
   (iii) Write the co-ordinates of the images A′,B′and C′.
   (iv) Give a geometrical name for the figure AA′C′B′BC.

QUESTION 6:

A. Write down the coordinates of the point P which divides the line joining A(−4,1) and B (17,10) in the ratio 1:2. Calculate the distance OP, where O is the origin. In what ratio does the y-axis divide the line AB? [3]

B. If sin A + cos A = p and sec A + cosec A = q, then prove that q (p² − 1) = 2p. [3]

C. In the given figure, ABC is a triangle with ∠EDB=∠ACB. Prove that ΔABC~ΔEBD. If BE=6 cm, EC = 4 cm, BD = 5 cm and area ΔBED = 9 cm², calculate [4]
   (i)   length of AB,
   (ii) area of ΔABC.
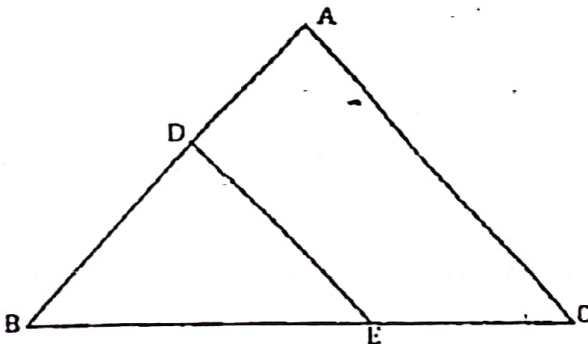
QUESTION 7:

A   Prove the following statement – [3]
The angle between a tangent and a chord through the point of contact is equal to angle in the alternate segment.

B   Solve the equation: $1 + 4 + 7 + 10 + \ldots + x = 287$ [3]

C   In a school the weekly pocket money of 50 students is as follows: [4]
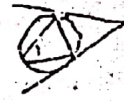
Weekly pocket money in ₹	40-50	50-60	60-70	70-80	80-90	90-100
No. of students	2	8	12	14	8	6

Draw a histogram and find the mode from the graph.

QUESTION 8:

A   A cylindrical tub of radius 12 cm contains water to a depth of 20 cm. A spherical iron [3] ball is dropped into the tube and thus the level of the water is raised by 6.75 cm. What is the radius of the ball?

B   Find the value of k, if the lines represented by $kx - 5y + 4 = 0$ and $4x - 2y + 5 = 0$ are [3] perpendicular to each other.

C   Using the ruler and compasses only: [4]
Construct triangle ABC with the following data: AB = 3·5cm, BC = 6cm and $\angle ABC = 120°$.
In the same diagram, draw a circle with BC as diameter. Find a point P on the circumference of the circle which is equidistant from AB and BC.
Measure angle $\angle BCP$.

QUESTION 9:

A   In an auditorium seats are arranged in rows and columns. The number of rows was [4] equal to the number of seats in each row. When the number of rows was doubled and number of seats in each row was reduced by 10, total number of seats increased by 300.
Find :
   (i)   The number of rows in the original arrangement.
   (ii) The number of seats in the auditorium after the re-arrangement.

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B   Marks obtained by 200 students in an examination are given below   [6]

| Mark	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Freq	5	11	10	20	28	37	40	29	14	6

Draw an ogive for the given distribution taking 1cm = 10marks on one axis and 1cm = 20 students on the other axis. Using graph, determine :

(i)   Median marks

(ii) The number of students who failed if minimum marks required to pass is 40.

QUESTION 10:

A. In the figure, AC is the diameter of the circle with centre O. Chord BD is   [3]
perpendicular to AC. Write down the angles p, q and r in terms of x.
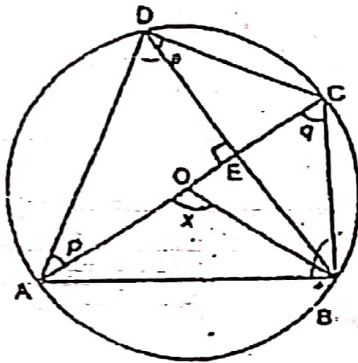
B   Using the properties of proportion, solve for x, given   [3]
$$\frac{x^4 + 1}{2x^2} = \frac{17}{8}$$

C   From the top of a church spire 96m high, the angles of depression of two vehicles on   [4]
a road, at the same level as the base of the spire and on the same side of it are $x°$ and
$y°$, where $\tan x° = \frac{3}{4}$ and $\tan y° = \frac{1}{3}$. Calculate the distance between the vehicles.

QUESTION 11: 25

A What sum should Ashok invest in ₹ 25 shares, selling at ₹ 36 to obtain an income of ₹ 720, if the dividend declared is 12%? Also, find

    (i)   the number of shares bought by Ashok,

    (ii)   the percentage return on his investment.

B In a triangle ABC, A(3 ,5), B(7, 8), C(1, −10). Find the equation of the median through A.

C Ruler and compass should be used in this question.

Construct a triangle ABC, in which AB = 6 cm, BC = 8 cm and angle ABC = 90°. Draw BD perpendicular to AC. Construct a circle through B, C and D. Construct the tangents from A to the circle.

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