Pre-Board I (2023 – 24)

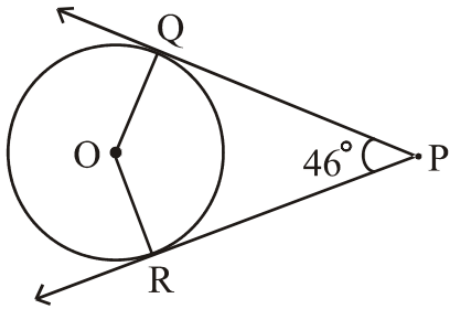
Subject: Mathematics (241)

Class: X **MM: 80**

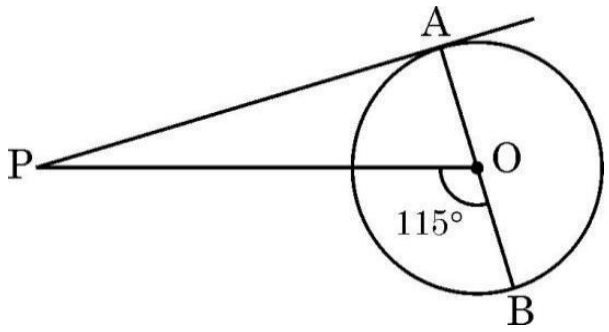
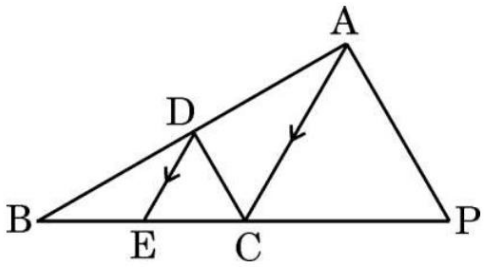
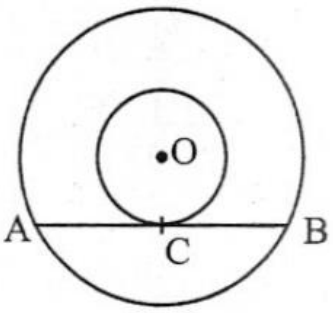
General Instructions:

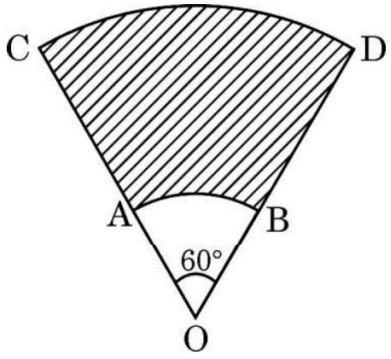
1. **This Question Paper has 5 Sections A-E.**
2. **Section A has 20 MCQs carrying 1 mark each.**
3. **Section B has 5 questions carrying 2 marks each.**
4. **Section C has 6 questions carrying 3 marks each.**
5. **Section D has 4 questions carrying 5 marks each.**
6. **Section E has 3 case based integrated units of assessment (4 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.**
7. **All Questions are compulsory. However, an internal choice in 2 questions of 5 marks, 2 questions of 3 marks and 2 questions of 2 marks has been provided. An internal choice has been provided in the 2 questions of 2 marks of Section E.**
8. **Draw neat figures wherever required. Take π as $22/7$ wherever required, if not stated.**

SECTION – A		
Q.1	HCM × LCF for the numbers 70 and 30 is: (A) 2100 (B) 21 (C) 210 (D) 70	[1]
Q.2	The value of k for which the equations $3x - y + 8 = 0$ and $6x + ky = -16$ represent coincident lines, is: (A) $-\frac{1}{2}$ (B) $\frac{1}{2}$ (C) 2 (D) -2	[1]
Q.3	If $p(x) = 2x^2 - x$, then $p(-1)$ is equal to: (A) -3 (B) 1 (C) 3 (D) -1	[1]
Q.4	The number $\left(8 - 3\sqrt{2} + \sqrt{2}\right)$ is: (A) an integer (B) a rational number (C) an irrational number (D) a whole number	[1]
Q.5	Which of the following ***cannot*** be the probability of an event? (A) $\frac{3}{20}$ (B) $\frac{1.4}{2}$ (C) $\frac{2}{3}$ (D) $\frac{1}{0.2}$	[1]
Q.6	If $\Delta ABC \sim \Delta PQR$ with $\angle A = 32°$ and $\angle R = 65°$, then the measure of $\angle B$ is: (A) 32° (B) 65° (C) 83° (D) 97°	[1]

Q.7	A quadratic polynomial having sum and product of its zeroes as 5 and 0 respectively, is: (A) $x^2 + 5x$ (B) $2x(x - 5)$ (C) $5x^2 - 1$ (D) $x^2 - 5x + 5$	[1]
Q.8	The pair of linear equations x + 2y + 5 = 0 and $-3x - 6y + 1 = 0$ has: (A) a unique solution (B) exactly two solutions (C) infinitely many solutions (D) no solution	[1]
Q.9	Which of the following is **not** a quadratic equation? (A) $2(x - 1)^2 = 4x^2 - 2x + 1$ (B) $2x - x^2 = x^2 + 5$ (C) $\left(\sqrt{2}x + \sqrt{3}\right)^2 + x^2 = 3x^2 - 5x$ (D) $(x^2 + 2x)^2 = x^4 + 3 + 4x^3$	[1]
Q.10	If the perimeter and the area of a circle are numerically equal, then the radius of the circle is: (A) 2 units (B) π units (C) 4 units (D) 2π units	[1]
Q.11	A quadratic equation whose one root is 2 and sum of whose roots is zero, is: (A) $x^2 + 4 = 0$ (B) $x^2 - 2 = 0$ (C) $4x^2 - 1 = 0$ (D) $x^2 - 4 = 0$	[1]
Q.12	$(3\sin^2 30° - 4\cos^2 60°)$ is equal to: (A) $\frac{5}{4}$ (B) $-\frac{3}{4}$ (C) $-\frac{1}{4}$ (D) $-\frac{9}{4}$	
Q.13	An arc of a circle of diameter 42 cm, subtends an angle of 60° at the centre. The length of the arc (in cm) is: [Use π = 22/7] (A) 11 (B) $\frac{22}{7}$ (C) 22 (D) 44	[1]
Q.14	In figure, PQ and PR are two tangents to a circle with centre O. If ∠QPR = 46°, then ∠QOR equals:  (A) 67° (B) 134° (C) 44° (D) 46°	[1]

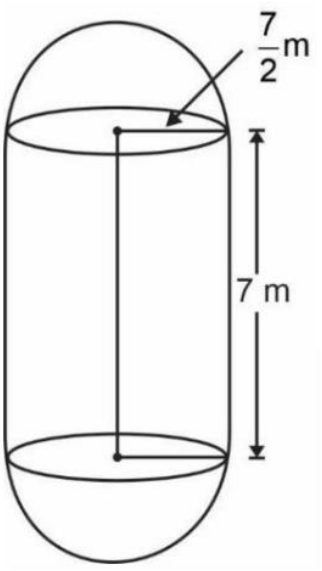
Q.15	A circle is of radius 3 cm. The distance between two of its parallel tangents is: (A) 12 cm (B) 6 cm (C) 3 cm (D) 4.5 cm	[1]
Q.16	A card is drawn at random from a well shuffled pack of 52 cards. The probability that the card drawn is not an ace is: (A) $\frac{1}{13}$ (B) $\frac{9}{13}$ (C) $\frac{4}{13}$ (D) $\frac{12}{13}$	[1]
Q.17	If the mean and median of a data are 12 and 15 respectively, then its mode is: (A) 13.5 (B) 21 (C) 6 (D) 14	[1]
Q.18	The angle subtended by a tower of height 200 m at a point on the ground 200 m from the base is: (A) 30° (B) 45° (C) 60° (D) 0°	[1]
For questions 19 and 20, two statements are given – one labelled Assertion(A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (i), (ii), (iii) and (iv) as given below: **(i) Both A and R are true and R is the correct explanation of A.** **(ii) Both A and R are true but R is not the correct explanation of A.** **(iii) A is true, but R is false** **(iv) A is false, but R is true**		
Q.19	**Assertion (A):** The tangents drawn at the end points of a diameter of the circle are parallel to each other. **Reason (R):** The lengths of the tangents to a circle drawn from an external point are equal. (A) (i) (B) (ii) (C) (iii) (D) (iv)	[1]
Q.20	**Assertion (A):** The equation $8x^2 + 3kx + 2 = 0$ has equal roots then the value of k is $\pm\frac{8}{3}$. **Reason (R):** The equation $ax^2 + bx + c = 0$ has equal roots, if D = $b^2 - 4ac = 0$. (A) (i) (B) (ii) (C) (iii) (D) (iv)	[1]
SECTION – B		
Q.21	Determine in which quadrant, the point lies which divides the line segment joining the points (2, 3) and (5, – 6) in the ratio 1 : 2. **OR** Find the coordinates of a point on y-axis which is equidistant from the points A$(-5, -2)$ and B(3, 2).	[2]

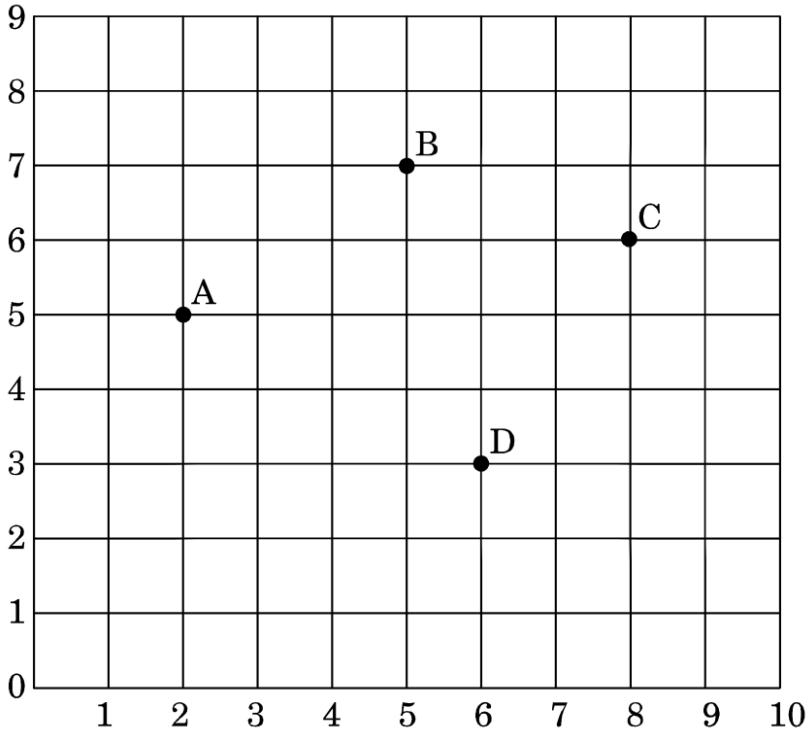
Q.22	In figure, PA is a tangent from an external point P to a circle with centre O. If ∠POB = 115°, find ∠APO.  	[2]
Q.23	In the given figure, DE ∥ AC and $\frac{BE}{EC} = \frac{BC}{CP}$. Prove that DC ∥ AP.  	[2]
Q.24	If $\sqrt{3}\tan\theta = 1$, find the value of $\sin^2\theta - \cos^2\theta$.	[2]
Q.25	Find the discriminant of the quadratic equation $3x^2 - 2x + \frac{1}{3} = 0$ and hence find the nature of its roots. **OR** Find the roots of the quadratic equation $6x^2 - 2x + \frac{1}{6} = 0$.	[2]
	SECTION – C	
Q.26	Prove that the lengths of the tangents drawn from an external point to a circle are equal. **OR** In figure, the chord AB of the larger of the two concentric circles, with centre O, touches the smaller circle at C. Prove that AC = CB.  	[3]

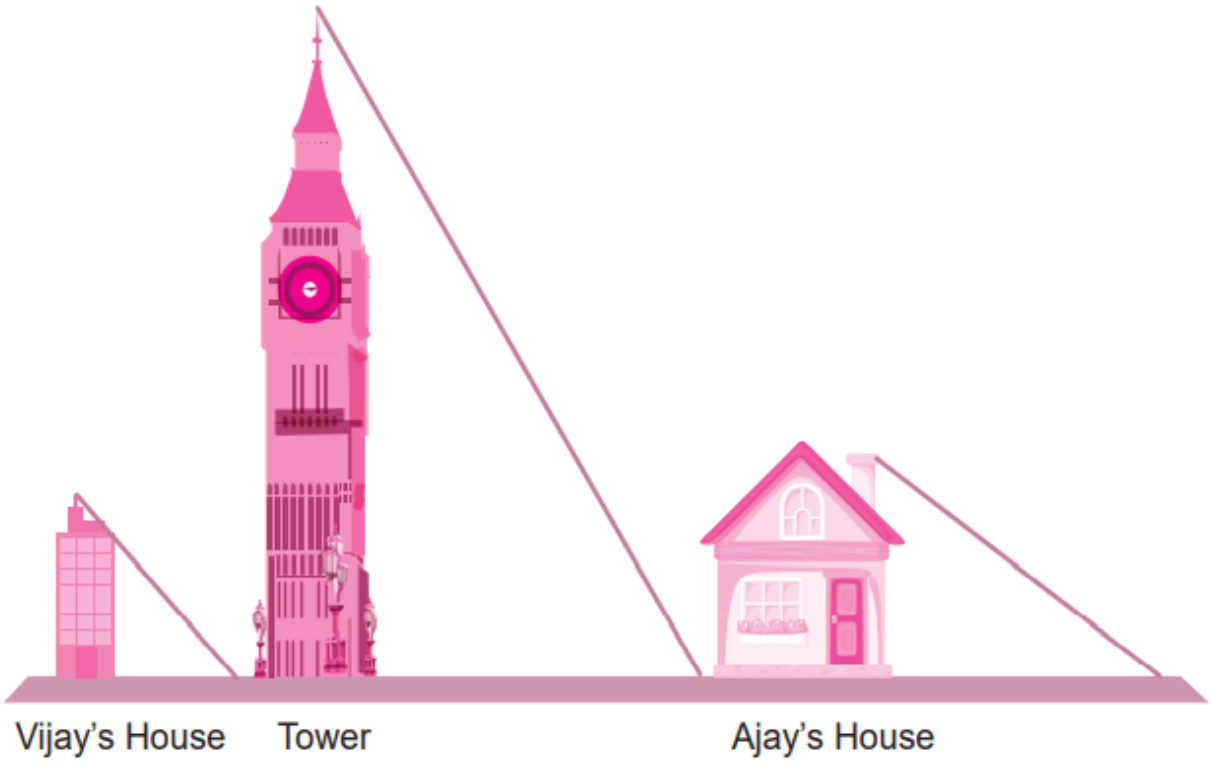
Q.27	AB and CD are arcs of two concentric circles of radii 3.5 cm and 10.5 cm respectively and centred at O. Find the area of the shaded region, if ∠AOB = 60°. Also, find the length of arc CD.  	[3]
Q.28	A pair of dice is thrown once. Find the probability of getting (i) the same number on each dice. (ii) getting a number greater than 3 on each dice. (iii) an even number on each dice.	[3]
Q.29	A lending library has a fixed charge for the first three days and an additional charge for each day thereafter. Ram kept a book for one week and paid ₹ 40, while Shyam paid ₹ 60 for a book kept for 11 days. Find the total charge for a book kept for 20 days. **OR** Find the values of 'm' and 'n' for which the system of linear equations $2x + 3y = 11$; $(m + n)x + (2m - n)y = 33$ has infinitely many solutions.	[3]
Q.30	Find the zeroes of the quadratic polynomial $2x^2 + x - 10$ and verify the relationship between the zeroes and coefficients.	[3]
Q.31	Prove that $\frac{\sin\theta}{1+\cos\theta} + \frac{1+\cos\theta}{\sin\theta} = 2\ \text{cosec}\ \theta$.	[3]
	SECTION – D	
Q.32	A vertical tower stands on a horizontal plane and is surmounted by a flagstaff of height 5 m. From a point on the ground, the angles of elevation of the top and bottom of the flagstaff are 60°and 30° respectively. Find the height of the tower and the distance of the point from the tower. [Use $\sqrt{3}$ = 1.732] **OR** From the top of a tower of height 50 m, the angles of depression of the top and bottom of a pole are 45° and 60° respectively. Find (i) how far the pole is from the bottom of a tower, (ii) the height of the pole. (Use $\sqrt{3}$ = 1·732)	[5]

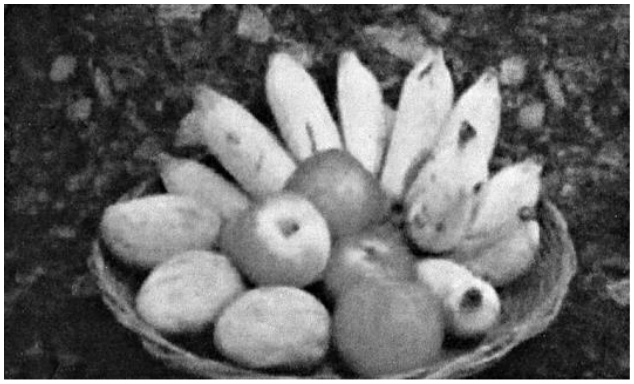
Q.33	The table below shows the daily expenditure on food of 25 households in a locality: Find the mean daily expenditure on food. Also, find the mode of the data.	[5]

Daily Expenditure (₹)	Number of households
100 – 150	4
150 – 200	5
200 – 250	12
250 – 300	2
300 – 350	2

Q.34	The sum of first m terms of an AP is $4m^2 - m$. If its n^{th} term is 107, find the value of n. Also, find the 21st term of this AP. **OR** Ramkali would require ₹ 5000 for getting her daughter admitted in a school after a year. She saved ₹ 150 in the first month and then increased her monthly savings by ₹ 50 every month. Find, if she will be able to arrange the required money after 12 months.	[5]
Q.35	The boilers are used in thermal power plants to store water and then used to produce steam. One such boiler consists of a cylindrical part in middle and two hemispherical parts at its both ends. Length of the cylindrical part is 7 m and radius of cylindrical part is $\frac{7}{2}$ m. Find the total surface area and the volume of the boiler. Also, find the ratio of the volume of cylindrical part to the volume of one hemispherical part.  	[5]

Section – E		
Q.36	**Case Study 1** Students of a school are standing in rows and columns in their school playground to celebrate their annual sports day. A, B, C and D are the positions of four students as shown in the figure.  	[1]
	Based on the above, answer the following questions:	[1]
	(i) Find the distance between A and C.	[2]
	(ii) Find the coordinates of the mid-point of line segment AC.	
	(iii) Find the coordinates of a point P, if P divides the line segment AD in the ratio 1 : 2.	
	OR	
	(iii) If the sports teacher is sitting at the origin, then which of the four students is closest to him? Justify your answer.	

Q.37	**Case Study 2** Vijay is trying to find the average height of a tower near his house. He is using the properties of similar triangles. The height of Vijay's house is 20 m. At some time of day, Vijay's house casts a shadow 10 m long on the ground. At the same time, the tower casts a shadow 50 m long on the ground and the house of Ajay casts 20 m shadow on the ground.  Based on the above, answer the following questions: (i) What is the height of the tower? **OR** What is the height of Ajay's house? (ii) What will be the length of the shadow of the tower when Vijay's house casts a shadow of 12 m? (iii) When the tower casts a shadow of 40 m, same time what will be the length of the shadow of Ajay's house?	[2] [1] [1]

Q.38	**Case Study 3** Khushi wants to organize her birthday party. Being health conscious, she decided to serve only fruits in her birthday party. She bought 36 apples and 60 bananas and decided to distribute equally among all.  Based on the above information, answer the following questions: (i) How many guests Khushi can invite at the most?	[2]
	OR If Khushi decides to add 42 mangoes, how many guests Khushi can invite at the most?	
	(ii) How many apples and bananas will each guest get?	[1]
	(iii) If the cost of 1 dozen of bananas is ₹60, the cost of 1 apple is ₹15 and cost of 1 mango is ₹20, find the total amount spent on 60 bananas, 36 apples and 42 mangoes.	[1]

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