BK BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS
SENIOR SECONDARY CO-ED DAY CUM BOYS' RESIDENTIAL SCHOOL

PRE BOARD-2, (2024-25)

MATHEMATICS (041)

Class: X
Date: 16/12/24
Admission Number: _____

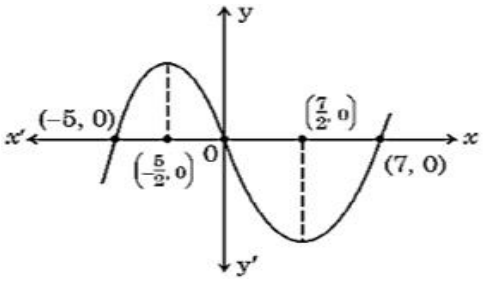
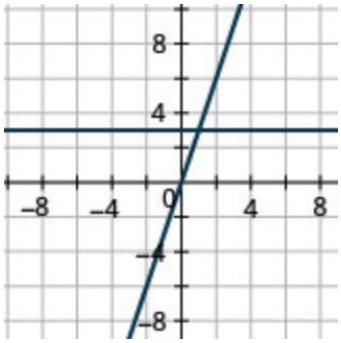
Duration: 3 Hour
Max. Marks: 80
Roll number: ____

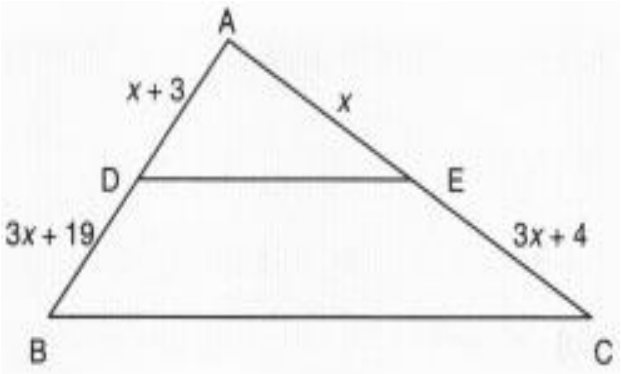
General Instructions:

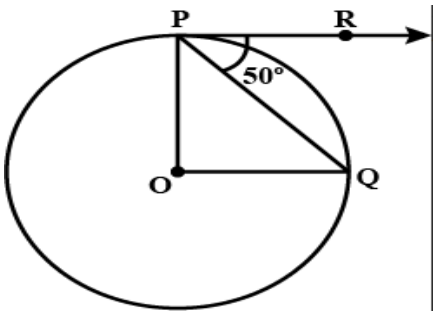
Read the following instructions carefully and follow them:

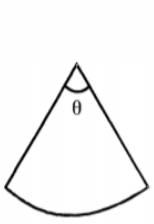
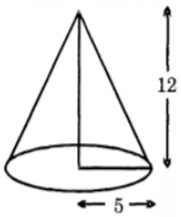
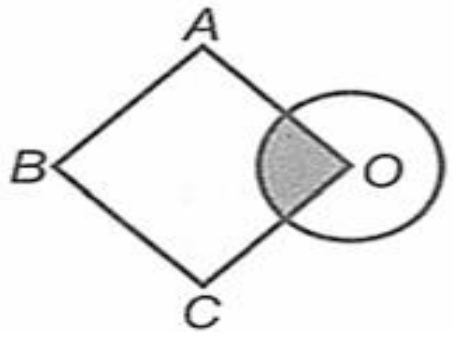
1. This question paper contains 38 questions.
2. This Question Paper is divided into 5 Sections A, B, C, D and E.
3. In Section A, Questions no. 1 - 18 are multiple choice questions (MCQs) and questions no. 19 and 20 are Assertion - Reason based questions of 1 mark each.
4. In Section B, Questions no. 21 - 25 are very short answer (VSA) type questions, carrying 02 marks each.
5. In Section C, Questions no. 26 - 31 are short answer (SA) type questions, carrying 03 marks each.
6. In Section D, Questions no. 32 - 35 are long answer (LA) type questions, carrying 05 marks each.
7. In Section E, Questions no. 36 - 38 are case study - based questions carrying 4 marks each with sub - parts of the values of 1,1 and 2 marks each respectively.
8. All Questions are compulsory. However, an internal choice in 2 Questions of Section B, 2 Questions of Section C and 2 Questions of Section D has been provided. An internal choice has been provided in all the 2 marks questions of Section E.
9. Draw neat and clean figures wherever required.
10. Take$\pi = 22/7$ wherever required if not stated.
11. Use of calculators is not allowed.

	Section A	
1	$\frac{1}{\sqrt{2}}$ is a) none of these	**[1]**

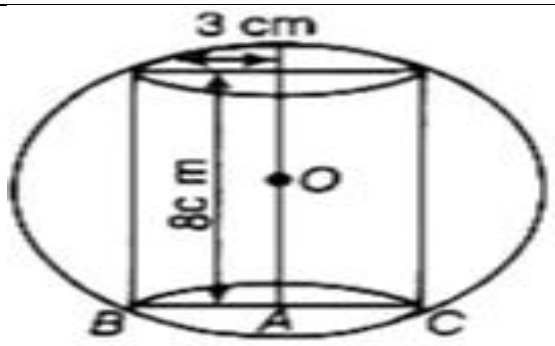
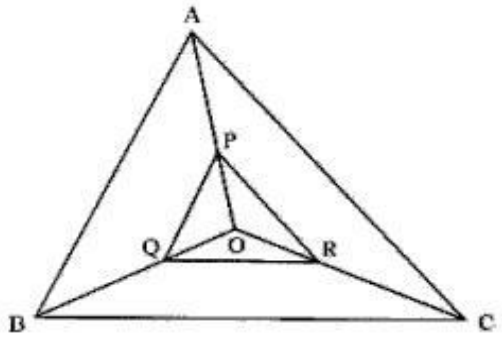
	b) a fraction c) a rational number d) an irrational number	
2	The graph of y = p(x)is given in the adjoining figure. Zeroes of the polynomial p(x)are  a) $-5, \frac{-5}{2}, \frac{7}{2}, 7$ b) - 5, 7 c) - 5, 0, 7 d) $\frac{-5}{2}, \frac{-7}{2}$	**[1]**
3	The number of solutions of two linear equations representing intersecting lines is/are  a) 1 b) 2 c) 0 d) ∞	**[1]**
4	The roots of the equation $x^{\frac{2}{3}} + x^{\frac{1}{3}} - 2 = 0$ are _____. a) 1, - 8 b) - 2, - 8 c) $\frac{2}{3}, \frac{1}{3}$	**[1]**

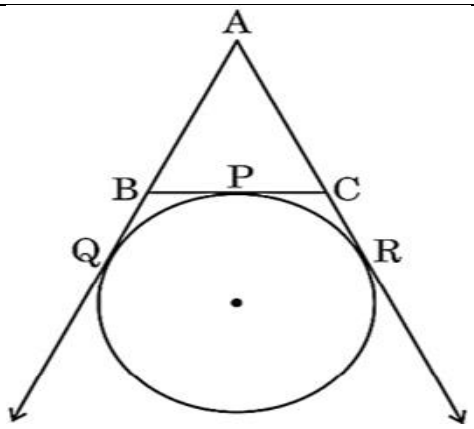
	d) 1, - 2	
5	Two APs have the same common difference. The difference between their 100th terms is 100, then the difference between their 1000th terms is a) 10 b) 10000 c) 100 d) 1000	**[1]**
6	AOBC is a rectangle whose three vertices are A(0, 3), O(0, 0) and B(5, 0). The length of its diagonal is a) 5 b) 3 c) $\sqrt{34}$ d) 4	**[1]**
7	If A = (- 1, 2), B = (2, - 1)and C = (3, 1) are any three vertices of a parallelogram, then find D (a, b) a) a = - 2, b = 0 b) a = 2, b = 0 c) a = - 2, b = 6 d) a = 0, b = 4	**[1]**
8	In the given figure value of x for which DE || BC is  a) 3 b) 2 c) 4	**[1]**

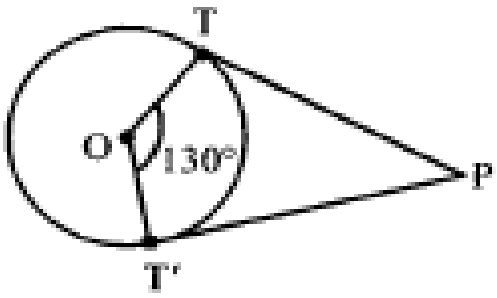
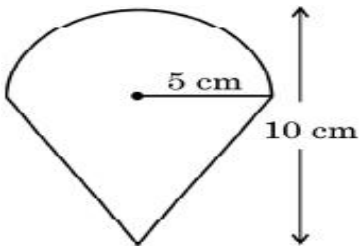
	d) 1	
9	In the given fig., if O is the center of a circle, PQ is a chord and the tangent PR at P makes an angle of50° with PQ, then ∠ POQ is equal to :  a) 75° b) 100° c) 90° d) 80°	**[1]**
10	Let's denote the semi perimeter of a triangle ABC in which BC = a, CA = b, AB = c. If a circle touches the sides BC, CA, AB at D, E and F respectively, find BD. a) b + s b) 3b - s c) 2s + b d) s - b	**[1]**
11	If secθ + tan θ = p, then the value of sin θ is a) $\frac{1-p^2}{p^2+1}$ b) $\frac{p^2-1}{p^2+1}$ c) $\frac{1+p^2}{p^2-1}$ d) $\frac{p^2+1}{p^2-1}$	**[1]**
12	If sinθ + sin ^{2} θ = 1, then cos ^{2} θ + cos ^{4} θ = a) 1 b) 0 c) - 1	**[1]**

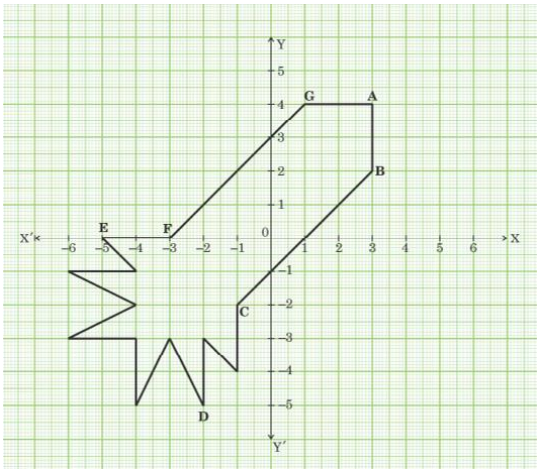
	d) 2	
13	If the height of a tower is half the height of the flagstaff on it and the angle of elevation of the top of the tower as seen from a point on the ground is 30°, then the angle of elevation of the top of the flagstaff as seen from the same point is a) 30° b) 60° c) 45° d) 15^o	**[1]**
14	A piece of paper in the shape of a sector of a circle (see figure 1) is rolled up to form a right - circular cone (see figure 2). The value of angleθ is :  figure 1  figure 2 a) $\frac{5\pi}{13}$ b) $\frac{10\pi}{13}$ c) $\frac{9\pi}{13}$ d) $\frac{6\pi}{13}$	**[1]**
15	O is the centre of a circle of diameter 4 cmand OABC is a square, if the shaded area is$\frac{1}{3}$ area of the square, then the side of the square is _____.  a) $\sqrt{3\pi}$ cm b) $\pi\sqrt{3}$ cm	**[1]**

	c) 3π cm d) $3\sqrt{\pi}$ cm	
16	Two coins are tossed together. The probability of getting at least one tail is: a) $\frac{1}{4}$ b) 1 c) $\frac{1}{2}$ d) $\frac{3}{4}$	**[1]**
17	There are 25 tickets numbered as 1, 2, 3, 4,..... 25 respectively. One ticketis drawn at random. What is the probability that the number on the ticket is a multiple of 3 or 5? a) $\frac{2}{5}$ b) $\frac{12}{25}$ c) $\frac{11}{25}$ d) $\frac{13}{25}$	**[1]**
18	The following distribution gives the daily income of 50 workers of a factory: Income (in ₹) | 400 - 424 | 425 - 449 | 450 - 474 | 475 - 499 | 500 - 524 Number of workers | 12 | 14 | 8 | 6 | 10 The lower limit of the modal class is: a) 425.5 b) 425 c) 449 d) 424.5	**[1]**
19	**Assertion (A):** In the given figure, a sphere circumscribes a right cylinder whose height is 8 cm and radius of the base is 3 cm. The ratio of the volumes of the sphere and the cylinder is 125 : 54	**[1]**

	 **Reason (R):** Ratio of their volume = $\frac{Volume\ of\ sphere}{Volume\ of\ cylinder}$ a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A. c) A is true but R is false. d) A is false but R is true.	
20	**Assertion (A):** Arithmetic mean between 8 and 12 is 10. **Reason (R):** Arithmetic mean between two numbers aand bis given as $\frac{a+b}{2}$. a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A. c) A is true but R is false. d) A is false but R is true.	**[1]**
	Section B	
21	The HCF of two numbers is 23 and their LCM is 1449. If one of the numbers is 161, find the other.	**[2]**
22	In the given figure PQ‖ AB and PR ‖ AC. Prove that QR ‖ BC. 	**[2]**
23	A circle is touching the side BC of$\Delta\ ABC$ at P and touching AB and AC produced at Q and R respectively. Prove that $AQ = \frac{1}{2}(perimeter of \Delta ABC)$.	**[2]**

		
24	Prove the trigonometric identity: $\frac{\tan\theta}{(\sec\theta-1)}+\frac{\tan\theta}{(\sec\theta+1)}=2cosec\theta$ **OR** Prove that if x = a sinθ + b cos θ and y = a cos θ - b sin θ , then $x^2 + y^2 = a^2 + b^2$.	**[2]**
25	Write the area of the sector of a circle whose radius is r and length of the arc is l. **OR** Find the area of the minor and the major sectors of a circle with radius 6 cm, if the angle subtended by the minor arc at the centre is 60^o . (Use π = 3.14)	**[2]**
	Section C	
26	In the Hospital The nurse is supposed to monitor a patient after 84min another at 90 min and the third one at 120 min. For this, she set up alarms accordingly. At what time will all her alarms ring at the same time?	**[3]**
27	Find the zeroes of the polynomial $7y^2 - \frac{11}{3}y - \frac{2}{3}$ by factorisation method and verify the relationship between the zeroes and coefficient of the polynomial.	**[3]**
28	The area of a rectangle gets reduced by 8 m^2 , when its length is reduced by 5 m and its breadth is increased by 3 m. If we increase the length by 3 m and breadth by 2 m, the area is increased by 74 m^2 . Find the length and the breadth of the rectangle. **OR** Solve for x and y: 6x + 5y = 7x + 3y + 1 = 2(x + 6y - 1).	**[3]**
29	In the adjoining figure, PT and PT' are tangents from P to the circle with centre O. If $\angle TOT'$ = 130°, then find $\angle OPT$.	**[3]**

	 **OR** Prove that the parallelogram circumscribing a circle is a rhombus.	
30	If tan θ + sec θ = l , then prove that secθ = $\frac{l^2+1}{2l}$.	**[3]**
31	Find the mode of the following distribution of marks obtained by 80 students : Marks obtained: 0 - 10 | 10 - 20 | 20 - 30 | 30 - 40 | 40 - 50 No. of students: 6 | 10 | 12 | 32 | 2	**[3]**
	Section D	
32	If the equation$(1 + m^2)x^2 + 2mcx + (c^2 - a^2) = 0$ has equal roots, prove that $c^2 = a^2(1 + m^2)$ **OR** The sum of the ages of a father and his son is 45 years. Five years ago, the product of their ages (in years) was 124. Determine their present age.	**[5]**
33	If a line is parallel to a side of a triangle which intersects the other sides into two distinct points, then the line divides those sides in proportion.	**[5]**
34	A vessel is in the form of a hollow hemisphere mounted by a hollow cylinder. The diameter of the hemisphere is 14 cm and the total height of the vessel is 13 cm. Find the inner surface area and the volume of the vessel. **OR** An ice - cream filled cone having radius 5 cm and height 10 cm is as shown in the figure. Find the volume of the ice - cream in 7 such cones. 	**[5]**

35	The mode of the following frequency distribution is 36. Find the missing frequency (f). **Class** | 0 - 10 | 10 - 20 | 20 - 30 | 30 - 40 | 40 - 50 | 50 - 60 | 60 - 70 **Frequency** | 8 | 10 | f | 16 | 12 | 6 | 7	**[5]**
	Section E	
36	**Read the following text carefully and answer the questions that follow:** India is competitive manufacturing location due to the low cost of manpower and strong technical and engineering capabilities contributing to higher quality production runs. The production of TV sets in a factory increases uniformly by a fixed number every year. It produced 16000 sets in 6th year and 22600 in 9th year.  1. Find the production during first year. (1) 2. Find the production during 8th year. (1) 3. Find the production during first 3 years. (2) **OR** In which year, the production is₹ 29,200. (2)	**[4]**
37	**Read the following text carefully and answer the questions that follow:** Ryan, from a very young age, was fascinated by the twinkling of stars and the vastness of space. He always dreamt of becoming an astronaut one day. So he started to sketch his own rocket designs on the graph sheet. One such design is given below:  Based on the above, answer the following questions: 1. Find the mid - point of the segment joining F and G. **(1)**	**[4]**

	2. a. What is the distance between the points A and C? **(2)** **OR** b. Find the coordinates of the point which divides the line segment joining the points A and B in the ratio 1 : 3 internally. **(2)** 3. What are the coordinates of the point D? **(1)**	
38	**Read the following text carefully and answer the questions that follow:** An observer on the top of a 40m tall light house (including height of the observer) observes a ship at an angle of depression 30 ^{o} coming towards the base of the light house along straight line joining the ship and the base of the light house. The angle of depression of ship changes to 45 ^{o} after 6 seconds.  1. Find the distance of ship from the base of the light house after 6seconds from the initial position when angle of depression is 45^{o} . (1) 2. Find the distance between two positions of ship after 6 seconds? (1) 3. Find the speed of the ship? (2) **OR** Find the distance of ship from the base of the light house when angle of depression is 30 ^{o} . (2)	**[4]**