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CLASS X, MODEL EXAMINATION (2022-23)
SUBJECT: MATHEMATICS

Time: 3Hrs.

M.M : 80

SECTION –A (1 MARKS each)

- Which of the following is a measure of central tendency?
(a) Frequency (b) Cumulative Frequency (c) Mean (d) class-limit
- The distance between two parallel tangents to a circle of radius 7 cm is
(a) 7 cm (b) 14 cm (c) $\frac{7}{2}$ cm (d) 0 cm
- Simplified form of $\cos^4 x - \sin^4 x$ is
(a) $\sin^2 x$ (b) $\cos^2 x$ (c) $1 - 2\sin^2 x$ (d) $\tan^2 x$
- The mean and median of a distribution are 16 & 17 respectively. The value of mode is
(a) 17 (b) 19 (c) 16 (d) 15
- If $\tan^2 45^\circ - \cos^2 30^\circ = x \sin 30^\circ \cos 60^\circ$ then value of x is
(a) 0 (b) 2 (c) 1 (d) -1.
- C is midpoint of PQ, if P is (4,x), C is (y,-1) and Q (2,-4) then x & y respectively are
(a) -6 & 1 (b) -6 & 2 (c) 6 & -1 (d) 6 & -2.
- The nature of roots of the quadratic equation $3x^2 - 4\sqrt{3}x + 4 = 0$ is :
(a) real & equal roots (b) No real roots (c) distinct real roots (d) None.
- Distance between the points P(2,-3) & Q(10,y) is 10 units then value of y is :
(a) (2,7) (b) (2,-7) (c) (3,9) (d) (3,-9).
- For what value of k , the system of equations $2x - ky - 3 = 0$ and $3x + 2y - 1 = 0$ has no solution
(a) K=3 (b) -4 (c) $-\frac{3}{4}$ (d) $-\frac{4}{3}$.
- If $2^3 \times 3^a \times b \times 7$ is the prime factorization of 2520, then $5a + 2b$ is equal to
(a) 5 (b) 20 (c) 10 (d) 14.
- In a circle of radius 21 cm, an arc subtends an angle of 60° at the centre, then length of the arc is :
(a) 22cm (b) 20cm (c) 21cm (d) 19cm.
- The discriminant of the quadratic equation $6x^2 - 7x + 2 = 0$ is
(a) 0 (b) -1 (c) 1 (d) 2.
- Two dice are thrown together. The probability that sum of the two numbers will be multiple of 4 is:
(a) $-\frac{1}{4}$ (b) $\frac{1}{2}$ (c) $-\frac{1}{2}$ (d) $\frac{1}{4}$.
- In a $\triangle ABC$, D and E are points on the sides AB and AC respectively such that $DE \parallel BC$. If $\frac{AD}{DB} = \frac{2}{3}$ and $AC = 18$ cm, then value of AE is
(a) 5 cm (b) 6.2 cm (c) 8 cm (d) 7.2 cm.
- If $3 \cos A = 1$ then value of $\operatorname{cosec} A$ is :
(a) $\frac{1}{\sqrt{2}}$ (b) $\frac{5}{\sqrt{2}}$ (c) $\frac{2\sqrt{2}}{3}$ (d) $\frac{3}{2\sqrt{2}}$.
- Perimeter of a quadrant of a circle of radius 'r' is :
(a) $r(\pi + 4)$ (b) $\frac{r}{2}(\pi + 4)$ (c) $2r(\pi + 4)$ (d) $\frac{r}{2}$.
- the probability of drawing at random a green coloured ball from a bag containing 6 red and 5 black balls is:
(a) 0 (b) $\frac{1}{2}$ (c) $\frac{3}{5}$ (d) 1.

18. If a tower 6m high casts a shadow on the ground that is $2\sqrt{3}m$ long then elevation of the sun is
 (a) 60° (b) 45° (c) 30° (d) 90° .

Directions Prove that: In the question number 19 and 20, a statement of Assertion(A) is followed by the statement of Reason (R). choose the correct answer out of the following choices

- (a) Both A and R are true and R is correct explanation of A.
 (b) Both A and R are true and R is not correct explanation of A.
 (c) A is true but R is false
 (d) R is true but A is false.
19. Assertion(A): if the circumference of circle is 176cm then its radius is 28cm.
 Reason(R): Circumference = $2\pi \times$ radius.
20. Assertion(A): if the value of mode and mean is 60 and 66 respectively then value of median is 64.
 Reason(R): Median = Mode + 2 Mean.

SECTION –B(2 marks each)

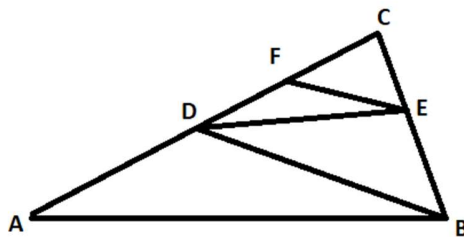
21. Assuming that $\sqrt{2}$ is irrational, show that $5\sqrt{2}$ is an irrational number.
 22. Prove that lengths of the tangent drawn from an external point to a circle are equal.
 23. If σ and β are the zeroes of quadratic polynomial $2x^2 - 13x + 6$ then find the values of $\frac{\sigma}{\beta} + \frac{\beta}{\sigma}$.
 24. Find the roots of the equation $2x^2 + 6\sqrt{3}x - 60 = 0$ using quadratic formula.
 25. Find 23rd term of the A.P. 9,13,17,21.....

OR

In an A.P if $a_n = 3n^2 - 2$ find $a_4 - a_2$.

SECTION –C(3 marks each)

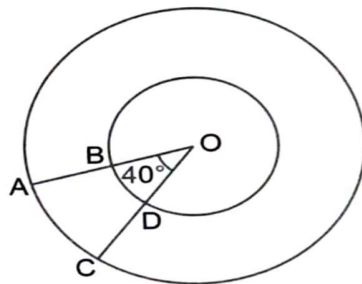
26. A triangle ABC is such that the points are on the side AC & BC & DE||AB, EF||BD Prove that $DC^2 = CF \times AC$.



27. If α and β are the zeroes of quadratic polynomial $f(x) = x^2 + x - 2$, then find the polynomial whose zeroes are $2\alpha + 1$ and $2\beta + 1$.
 28. Three chairs and two tables cost Rs 1850 , Five chairs and three tables cost Rs 2850, Find the total cost of seven chairs and three tables.
 29. From a window 120m high above the ground of a house in a street, angle of elevation and depression of the top and foot of another house on opposite side of a street are 60° and 45° respectively. Show that height of the opposite house is $120(1+\sqrt{3})m$.

OR

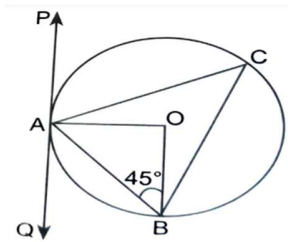
Find the area of the shaded region in the given figure, if radii of the two concentric circles with centre O are 7cm and 14cm respectively and $\angle AOC = 40^\circ$.



30. Cars marked with numbers 4 to 99 are placed in a box and mixed thoroughly. One card is drawn from the box. Find the probability that the number on the card .

- (i) a perfect square (ii) a multiple of 7 (iii) a prime number less than 30.

31. In the given figure, PAQ is tangent to a circle with centre O at a point A. if $\angle OBC = 45^\circ$, find the value of $\angle BAQ$.



OR

Prove that the angle between two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line segment joining the points of contact at the centre.

SECTION -D (5 MARKS each)

32. If $\cos x + \sin x = \sqrt{2} \cos x$. Prove that $\cos x - \sin x = \sqrt{2} \sin x$

OR

Prove that $\frac{\cos A}{1+\sin A} + \frac{1+\sin A}{\cos A} = 2 \sec A$.

33. The median of distribution given below is 14.4. find the values of x and y, if the sum of the frequency is 20.

Class interval	0-6	6-12	12-18	18-24	24-30
Frequency	4	x	5	y	1

OR

Find the mode of following data

Class interval	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
frequency	7	14	13	12	20	11	15	8

34. State and prove basic proportionality theorem.

35. Solve for x: $\frac{1}{a+b+x} = \frac{1}{a} + \frac{1}{b} + \frac{1}{x}$.

OR

A cottage industry produces a certain number of pottery articles in a day. It was observed on a particular day that the cost of production of each articles in rupees was 3 more than twice the number of articles produced on that day. If the total cost of production on that day was Rs 90, Find the number of articles produced and cost of each articles.

SECTION E(case study)(4 marks each)

36. If $p(x)$ is a quadratic polynomial, then $p(x) = 0$ is a quadratic equation. Hence $p(x) = ax^2 + bx + c = 0$ is known as quadratic equation. The root of the quadratic equation $ax^2 + bx + c = 0$ and zeroes of the quadratic polynomial $ax^2 + bx + c = 0$ are same. The roots of the quadratic equation are obtained by solving the quadratic by factorization and by using quadratic formula or discriminant method. The roots of quadratic equation may be equal or unequal or not real

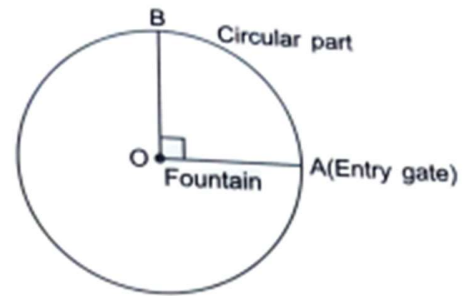
Answer the question based on above :

- (i) Find the roots of quadratic equation $\sqrt{3}x^2 + 8x + 5\sqrt{3} = 0$ by factorization.
- (ii) Find the nature of roots of the quadratic equation $100x^2 - 20x + 1 = 0$.
- (iii) If k be any real number, then find the nature of roots of quadratic equation $2x^2 - (2 + k)x + k = 0$.

OR

Find the nature of roots of the equation $x^4 + 1 + x^2 = 0$.

37. A park is designed in the form of circle as shown. At the centre of the circle there is fountain. The entry gate is shown at A.



Consider coordinate of fountain (centre O) of a circle is $(2a-1, 7)$ and coordinate of point A is $(-3, -1)$.

- (i) If the radius of circle is 10 units. Then find the values of a .
- (ii) Find the distance AB.
- (iii) If we consider, point A lies on x axis, then find the possible value of x-coordinate of A, take $a=2$.

OR

(ii) If we consider point B lies on y axis, then find the possible value of y-coordinate of B, take $a=2$.

38. Varun has been selected by his school to design logo for sports Day T-shirts for students and staff. The logo design is as given in the figure and he is working on the fonts and different colours according to the theme. In given figure a circle with centre O is inscribed in a ΔABC , such that it touches the sides cm and AB, BC and CA at points D, E and F respectively. The lengths of sides AB, BC and CA are 12cm, 8cm and 10cm respectively.



- (i) Find the length of AD.
- (ii) Find the length of BE.
- (iii) If radius of the circle is 4cm. Find the area of ΔOAB .

OR

Find area of ΔABC .
