



MODEL EXAMINATION, NOVEMBER-2024

MATHEMATICS

Grade: X
Date :18/11/2024

Duration: 3 hours
Max Marks: 80

INSTRUCTIONS:

Read the following instructions very carefully and strictly follow them.

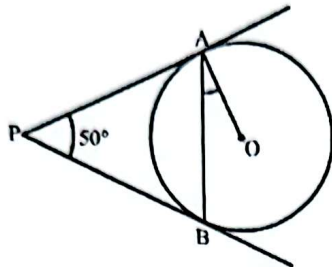
1. This question paper contains 38 questions. All questions are compulsory.
2. This question paper has 5 Sections- A, B, C, D, and E.
3. In Section A, Questions no. 1 to 18 are multiple choice questions (MCQs) and questions number 19 and 20 are Assertion -Reason based questions of 1 mark each.
4. In Section B, Questions no. 21 to 25 are very short answer (VSA) type questions, carrying 2 marks each.
5. In Section C, Questions no. 26 to 31 are short answer (SA) type questions, carrying 3 marks each.
6. In Section D, Questions no. 32 to 35 are long answer (LA) type questions carrying 5 marks each.
7. In Section E, Questions no. 36 to 38 are case study- based questions carrying 4 marks each.
8. Draw neat figures wherever required. Take $\pi = 22/7$ wherever required, if not stated.
9. Use of calculator is not allowed.

Section A

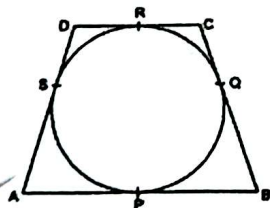
Section A consists of 20 questions of 1 mark each

1. The roots of the quadratic equation $3x^2 - 4x + 3 = 0$ are 1
(a) real and unequal (b) real and equal
(c) not real (d) not real and equal
2. The shadow of a tower is equal to its height at 10:45 a.m. The sun's elevation at that time is 1
(a) 30° (b) 45° (c) 60° (d) 90°

3. In the figure, if PA and PB are tangents to the circle with centre O such that $\angle APB = 50^\circ$, then $\angle OAB$ is



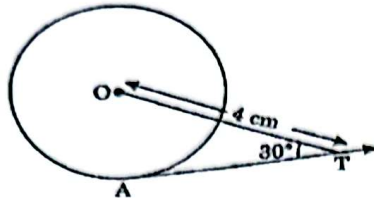
- (a) 25° (b) 30° (c) 40° (d) 50°
4. The radius (in cm) of the largest right circular cone that can be cut out from a cube of edge 4.2 cm is
- (a) 4.2 cm (b) 2.1 cm (c) 8.1 cm (d) 1.05 cm
5. The probability that the drawn card from a pack of 52 cards is neither an ace nor a spade is
- (a) $\frac{9}{13}$ (b) $\frac{35}{52}$ (c) $\frac{10}{13}$ (d) $\frac{19}{26}$
6. In the given figure, a circle touches all the four sides of a quadrilateral ABCD whose three sides $AB = 6\text{ cm}$, $BC = 7\text{ cm}$ and $CD = 4\text{ cm}$. The length of AD is
- (a) 3 cm (b) 4 cm (c) 5 cm (d) 1 cm



7. If A and B are acute angles such that $\sin A = \frac{1}{2}$ and $\tan B = \frac{1}{\sqrt{3}}$, then the value of $\cos(A + B)$ is
- (a) $\frac{1}{\sqrt{2}}$ (b) $\frac{\sqrt{3}}{2}$ (c) 1 (d) $\frac{1}{2}$

8. If $k, 2k - 1, 2k + 1$ are three consecutive terms of an Arithmetic Progression, then the value of k is 1
- (a) 1 (b) 2 (c) 3 (d) 4
9. If $A(3, \sqrt{3}), B(0,0)$ and $C(3,k)$ are the three vertices of an equilateral triangle ABC, then the value of k is 1
- (a) 2 (b) ± 3 (c) $\pm \sqrt{3}$ (d) $\sqrt{3}$
10. If $x = r \sin \theta$ and $y = r \cos \theta$, then the value of $x^2 + y^2$ is 1
- (a) r (b) r^2 (c) $\frac{1}{r}$ (d) 1
11. The system of equations: $4x+5y-5=0$ and $5x+4y-4=0$ is 1
- (a) consistent with infinitely many solutions (b) inconsistent
(c) consistent with unique solution (d) dependent
12. The value of a for which point $P(\frac{a}{3}, 2)$ is the midpoint of the line segment joining the points $Q(-5,4)$ and $R(-1,0)$ is 1
- (a) -9 (b) -3 (c) -6 (d) 3
13. For the following distribution, the lower limit of the modal class is 1
- | | | | | | |
|----------------|-------|--------------|-------|-------|-------|
| Class Interval | 10-15 | <u>15-20</u> | 20-25 | 25-30 | 30-35 |
| Frequency | 4 | <u>12</u> | 7 | 8 | 2 |
- (a) 10 (b) 25 (c) 20 (d) 15
14. If $2x+3y=15$ and $3x+2y=25$, then the value of $x-y$ is 1
- (a) -10 (b) 8 (c) 10 (d) -8
15. There are 25 tickets bearing numbers from 1 to 25. One ticket is drawn at random. The probability that the number on it is a multiple of 5 or 6 is 1
- (a) $\frac{7}{25}$ (b) $\frac{13}{25}$ (c) $\frac{11}{12}$ (d) $\frac{9}{25}$

16. In the figure, AT is a tangent to the circle with centre O such that OT = 4 cm and $\angle OTA = 30^\circ$. Then AT is equal to



- (a) 4 cm (b) 2 cm (c) $2\sqrt{3}$ cm (d) $4\sqrt{3}$ cm
17. A solid spherical ball fit exactly inside a cubical box of side $2a$. The volume of the ball is 1
- (a) $\frac{16}{3}\pi a^3$ (b) $\frac{1}{6}\pi a^3$ (c) $\frac{32}{3}\pi a^3$ (d) $\frac{4}{3}\pi a^3$
18. Which of the following relation is correct? 1
- (a) Mean = $\frac{\text{Mode} - 2\text{Median}}{2}$ (b) Mode = $\frac{3\text{Mean} - 2\text{Median}}{3}$
(c) Median = $\frac{\text{Mode} + 2\text{Mean}}{3}$ (d) Mean = $\frac{2\text{Mode} + 3\text{Median}}{2}$

Direction for questions 19 & 20: In question numbers 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option.

19. **Assertion(A):** $-5, -\frac{5}{2}, 0, \frac{5}{2}, \dots$ is in Arithmetic Progression 1
Reason (R): The terms of an Arithmetic Progression cannot have positive and negative rational numbers.
- (a) Both Assertion(A) and Reason(R) are true and Reason(R) is the correct explanation of Assertion(A)
(b) Both Assertion(A) and Reason(R) are true but Reason(R) is not the correct explanation of Assertion(A).
(c) Assertion (A) is true but Reason (R) is false. •
(d) Assertion (A) is false but Reason(R) is true.

20. **Assertion(A):** If the length of the minute hand of a clock is 7 cm, then the area swept by it in 5 minutes is $\frac{77}{6}\text{cm}^2$ 1
Reason (R): The length of an arc of a sector of angle θ and radius r is given by $\frac{\theta}{360^\circ} \times 2\pi r$

- (a) Both Assertion(A) and Reason(R) are true and Reason(R) is the correct explanation of Assertion(A)
 (b) Both Assertion(A) and Reason(R) are true but Reason(R) is not the correct explanation of Assertion(A). •
 (c) Assertion(A) is true but Reason(R) is false.
 (d) Assertion (A) is false but Reason(R) is true.

Section B

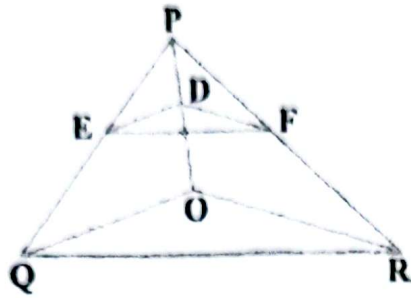
Section B consists of 5 questions of 2 marks each

- ✓ 21. Find a relation between x and y such that the point $P(x, y)$ is equidistant from the points $A(-5, 3)$ and $B(7, 2)$ 2
 $12x - y = 19/2$
- ✓ 22. If three coins are tossed simultaneously, 2
 (i) Find the probability of getting at least one head. $7/8$
 (ii) Find the probability of getting at most two heads. $7/8$
- ✓ 23. Prove that $\sqrt{\frac{1-\cos A}{1+\cos A}} = \operatorname{cosec} A - \cot A$ 2
- ✓ 24. Find the values of k for the following quadratic equation $kx(x - 2) + 6 = 0$ so that it has two real and equal roots. $k = 6$ 2
- ✓ 25. Find the ratio in which y axis divides the line segment joining the points $A(5, -6)$ and $B(-1, -4)$. Also find the co-ordinates of the point of division. 2
 $5:1$ $0, -13/3$

SECTION C

Section C consists of 6 questions of 3 marks each.

- ✓ 26. Sides of a right triangular field are 25 m, 24 m and 7 m. At the three corners of the field, a cow, a buffalo and a horse are tied separately with ropes of 3.5 m each to graze in the field. Find the area of the field that cannot be grazed by these animals. 64.35 m^2 3
- ✓ 27. Prove that $\frac{\sin\theta - \cos\theta + 1}{\sin\theta + \cos\theta - 1} = \sec\theta + \tan\theta$ 3
- ✓ 28. In the figure, if $DE \parallel OQ$ and $DF \parallel OR$, then show that $EF \parallel QR$. 3



29. Calculate the median of the following data: 3

Marks	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50
Number of students	5	15	30	8	2

30. Find the area of minor segment of a circle of radius 14 cm, when its central angle is 60° . Also find the area of corresponding major segment. 3

17.9 2333
 (Use $\pi = \frac{22}{7}$, $\sqrt{3} = 1.73$) 598.1

31. In a flight of 600 km, an aircraft was slowed down due to bad weather. Its average speed for the trip was reduced by 200 km/hr from its usual speed and the time of flight increased by 30 minutes. Find the original duration of flight. 3

SECTION D
Section D consists of 4 questions of 5 marks each

32. The angle of elevation of an aeroplane from a point on the ground is 45° after flying for 15 seconds, the elevation changes to 30° . If the aeroplane is flying at a height of 2500 meters, find the speed of the aeroplane. (Use $\sqrt{3} = 1.73$) 5

33. A book store shopkeeper gives books on rent for reading. He takes a fixed charge for the first two days and an additional charge for subsequent day. Amruta paid ₹ 22 for a book and kept for 6 days; while Radhika paid ₹ 16 for keeping the book for 4 days. 5

- (i) Find the fixed charges and additional charges for each subsequent day for a book. $x=10, y=3$
- (ii) What is the total amount paid by both, if both of them have kept the book for 2 more days. 50

34. The mean of the following frequency distribution is 91. Compute the values of x and y if the sum of the frequencies is 150. 5

Classes	0 - 30	30 - 60	60 - 90	90 - 120	120 - 150	150 - 180
Frequency	12	21	x	52	y	11

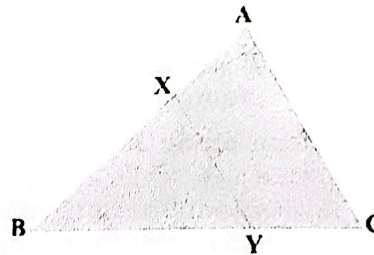
35. a) Prove that the length of tangents from a point to a circle are equal. 5
- b) Show that a parallelogram circumscribing a circle is a rhombus.

SECTION E

Case Study based questions are compulsory

36. Case study 1:

In one of the residential colonies of the city, there is a triangular park ABC. The Residential Welfare Association of the colony wishes to divide this park into two parts of equal area—one for planting trees and the other for providing a play area for children. One of the members suggested dividing the park with a fence XY which is parallel to AC.



Based on the above information, answer the following questions.

- (i) Which similarity criteria will you use to prove $\Delta BXY \sim \Delta BAC$? 1
- (ii) If $BX = (x + 2)m$, $XA = (x - 6)m$, $BY = x m$, $YC = (x - 2)m$, find the value of x . 1
- (iii) In ΔABC , if $\frac{BX}{XA} = \frac{3}{4}$, $BY = 5 m$ and $BC = 14 m$, then check whether $XY \parallel AC$. 2

37. Case study 2:

Reema, being a keen plant observer, decided to open a nursery and bought several beautiful plants in pots. She wants to arrange the pots in such a way that the number of pots in the first row is 3, in the second row 5, in the third row 7, in the fourth row 9, and so on. This carefully

planned layout not only maximizes space but also creates an aesthetically pleasing display that draws the eye. Reema hopes that by showcasing her plants in this unique formation, she will attract more customers and inspire them to develop a love for gardening just like she has.



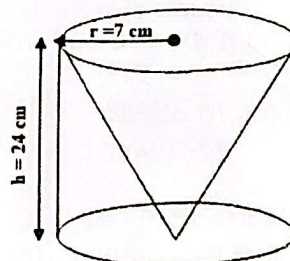
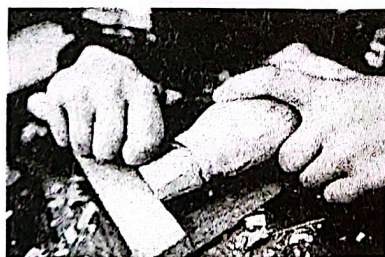
Using the information provided above, answer the following questions.

- (i) Find the difference in number of pots placed in 8th row and 3rd row. 10 1
- (ii) If Reema has sufficient space for 15 rows, then how many pots can she place with same arrangement? 255 1
- (iii) If Reema wants to place a total of 120 pots, then find the total number of rows formed in this arrangement? 10 2

38. **Case study 3:**

One day, while going home from school, Rinku saw a carpenter working on wood. She noticed that he was carving a cone with the same height and diameter from a cylinder. The height of the cylinder was 24 cm, and the base radius was 7 cm. While observing this, a few questions came to Rinku's mind.

Help Rinku to solve the following questions:



- (i) Find the slant height of the conical cavity. 25 cm 1

✓ (ii) Find the curved surface area of the conical cavity. 550 cm^2

1

✓ (iii) Find the volume of wood left after carving the cone.

2

2464 cm^3
