

Class X Session 2024-25
Subject - Mathematics (Standard)
Sample Question Paper - 4

Time Allowed: 3 hours

Maximum Marks: 80

General Instructions:

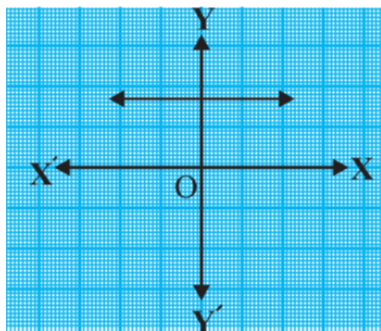
1. This Question Paper has 5 Sections A, B, C, D and E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 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 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section A

1. $7 \times 11 \times 13 + 13$ is a/an: [1]

- | | |
|---------------------------------|---------------------|
| a) odd number but not composite | b) square number |
| c) prime number | d) composite number |

2. The graph of $y = p(x)$ in a figure given below, for some polynomial $p(x)$. Find the number of zeroes of $p(x)$. [1]



- | | |
|------|------|
| a) 4 | b) 0 |
| c) 1 | d) 2 |
3. The pair of linear equations $y = 0$ and $y = -6$ has: [1]



- a) no solution
b) only solution (0, 0)
c) infinitely many solutions
d) a unique solution

4. The equation $x^2 - 8x + k = 0$ has real and distinct roots if [1]

- a) $k = 8$
b) $k > 16$
c) $k = 16$
d) $k < 16$

5. If S_n denote the sum of n terms of an A.P. with first term a and common difference d such that $\frac{S_x}{S_{kx}}$ is independent of x , then [1]

- a) $a = 2d$
b) $d = a$
c) $d = -a$
d) $d = 2a$

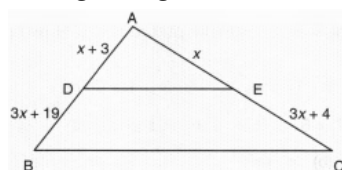
6. If three points $(0,0)$, $(3, \sqrt{3})$ and $(3, \lambda)$ form an equilateral triangle, then $\lambda =$ [1]

- a) -4
b) None of these
c) -3
d) 2

7. The coordinates of the mid-point of the line segment joining the points $(-2, 3)$ and $(4, -5)$ are [1]

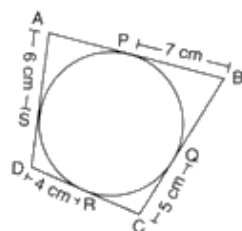
- a) $(0, 0)$
b) $(-1, 1)$
c) $(1, -1)$
d) $(-2, 4)$

8. In the given figure value of x for which $DE \parallel BC$ is [1]



- a) 3
b) 2
c) 4
d) 1

9. In the given figure, the perimeter of ABCD is [1]



- a) 44 cm
b) 36 cm
c) 40 cm
d) 48 cm

10. Quadrilateral ABCD is circumscribed to a circle. If $AB = 6$ cm, $BC = 7$ cm and $CD = 4$ cm then the length of AD is [1]

11. If $\sin\theta + \cos\theta = \sqrt{2} \cos\theta$, then the value of $\cos\theta - \sin\theta$ is **[1]**

12. If $\tan \theta = \frac{a}{b}$, then $\frac{a \sin \theta + b \cos \theta}{a \sin \theta - b \cos \theta}$ is [1]

13. An observer 1.5 m tall is 28.5 m away from a tower and the angle of elevation of the top of the tower from the eye of the observer is 45° . The height of the tower is **[1]**

14. O is the centre of a circle of diameter 4 cm and OABC is a square, if the shaded area is $\frac{1}{3}$ area of the square, then the side of the square is _____.



16. In the given figure, JKLM is a square with sides of length 6 units. Points A and B are the mid-points of sides KL and LM respectively. If a point is selected at random from the interior of the square. What is the probability that the point will be chosen from the interior of $\triangle JAB$? **[1]**



- a) 20
- b) 18

c) 15

d) 10

18. Consider the frequency distribution of the heights of 60 students of a class:

[1]

| Height (in cm) | No. of Students | Cumulative Frequency |
|----------------|-----------------|----------------------|
| 150-155 | 16 | 16 |
| 155-160 | 12 | 28 |
| 160-165 | 9 | 37 |
| 165-170 | 7 | 44 |
| 170-175 | 10 | 54 |
| 175-180 | 6 | 60 |

The sum of the lower limit of the modal class and the upper limit of the median class is

a) 320

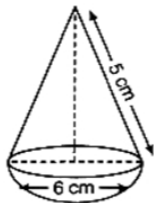
b) 315

c) 330

d) 310

19. **Assertion (A):** The given figure represents a hemisphere surmounted by a conical block of wood. The diameter of their bases is 6 cm each and the slant height of the cone is 5 cm. The volume of the solid is 196 cm^3

[1]



Reason (R): The volume hemisphere is given by $\frac{2}{3}\pi r^3$

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):** Sum of first 10 terms of the arithmetic progression -0.5, -1.0, -1.5, ... is 27.5

[1]

Reason (R): Sum of n terms of an A.P. is given as $S_n = \frac{n}{2}[2a + (n - 1)d]$ where a = first term, d = common difference.

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.

Section B

21. Find the least number which when divided by 12, 16 and 24 leaves remainder 7 in each case.

[2]

22. In $\triangle ABC$, P and Q are points on sides AB and AC respectively such that $PQ \parallel BC$. If AP = 4 cm, PB = 6 cm and PQ = 3 cm, determine BC.

[2]

23. If a circle touches the side BC of a triangle ABC at P and extended sides AB and AC at Q and R, respectively, prove that

[2]

$$AQ = \frac{1}{2}(BC + CA + AB)$$

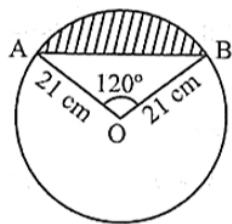
24. Prove that: $\sin^4 A - \cos^4 A = \sin^2 A - \cos^2 A = 2\sin^2 A - 1 = 1 - 2\cos^2 A$

[2]

OR

Prove that: $\frac{1-\cos A}{1+\cos A} = (\cot A - \operatorname{cosec} A)^2$

25. Find the area of the segment shown in Fig., if radius of the circle is 21 cm and $\angle AOB = 120^\circ$ (Use $\pi = \frac{22}{7}$) [2]



OR

A car has two wipers which do not overlap. Each wiper has a blade of length 25cm sweeping through an angle of 115° . Find the total area cleaned at each sweep of the blades.

Section C

26. Maya has two pieces of cloth. One piece is 36 inches wide and the other piece is 24 inches wide. She wants to cut both pieces into strips of equal width that are as wide as possible. How wide should she cut the strips? [3]
27. If α and β are zeroes of the quadratic polynomial $4x^2 + 4x + 1$, then form a quadratic polynomial whose zeroes are 2α and 2β . [3]
28. The sum of the digits of a two-digit number is 9. Also, nine times this number is twice the number obtained by reversing the order of the digits. Find the number. [3]

OR

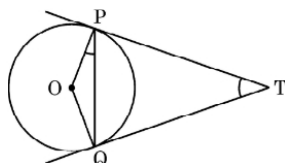
Graphically, solve the following pair of equations:

$$2x + y = 6$$

$$2x - y + 2 = 0$$

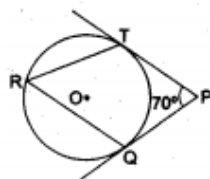
Find the ratio of the areas of the two triangles formed by the lines representing these equations with the x-axis and the lines with the y-axis.

29. Two tangents TP and TQ are drawn to a circle with centre O from an external point T. Prove that $\angle PTQ = 2 \angle OPQ$. [3]



OR

In the given figure, O is the centre of a circle. PT and PQ are tangents to the circle from an external point P. If $\angle TPQ = 70^\circ$, find $\angle TRQ$.



30. If $1 + \sin^2 \theta = 3 \sin \theta \cos \theta$, then prove that $\tan \theta = 1$, or $\frac{1}{2}$. [3]
31. Find median for the following data: [3]

| Class Interval | Frequency |
|----------------|-----------|
| 10 - 19 | 2 |
| 20 - 29 | 4 |

| | |
|---------|---|
| 30 - 39 | 8 |
| 40 - 49 | 9 |
| 50 - 59 | 4 |
| 60 - 69 | 2 |
| 70 - 79 | 1 |

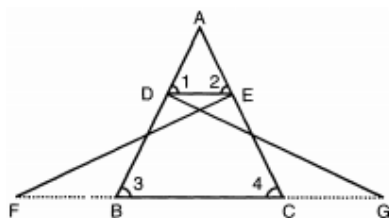
Section D

32. A train travels at a certain average speed for a distance of 360 km. It would have taken 48 minutes less to travel the same distance if its speed was 5 km/hour more. Find the original speed of the train. [5]

OR

If the roots of the quadratic equation $(x - a)(x - b) + (x - b)(x - c) + (x - c)(x - a) = 0$ are equal. Then show that $a = b = c$

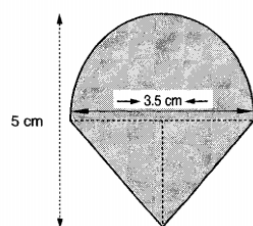
33. In the following figure, $\triangle FEC \cong \triangle GBD$ and $\angle 1 = \angle 2$ Prove that $\triangle ADE \cong \triangle ABC$. [5]



34. A rocket is in the form of a right circular cylinder closed at the lower end and surmounted by a cone with the same radius as that of cylinder. The diameter and height of cylinder are 6 cm and 12 cm, respectively. If the slant height of the conical portion is 5 cm, then find the total surface area and volume of rocket. (Use $\pi = 3.14$) [5]

OR

Rasheed got a playing top (lattu) as his birthday present, which surprisingly had no colour on it. He wanted to colour it with his crayons. The top is shaped like a cone surmounted by a hemisphere. The entire top is 5 cm in height and the diameter of the top is 3.5 cm. Find the area he has to colour. (Take $\pi = \frac{22}{7}$).



35. Find the missing frequencies in the following distribution, if the sum of the frequencies is 120 and the mean is 50. [5]

| Class | 0-20 | 20-40 | 40-60 | 60-80 | 80-100 |
|-----------|------|-------|-------|-------|--------|
| Frequency | 17 | f_1 | 32 | f_2 | 19 |

Section E

36. Read the text carefully and answer the questions: [4]

Deepa has to buy a scooty. She can buy scooty either making cashdown payment of ₹ 25,000 or by making 15 monthly instalments as below.

Ist month - ₹ 3425, IInd month - ₹ 3225, Illrd month - ₹ 3025, IVth month - ₹ 2825 and so on



- (a) Find the amount of 6th instalment.
- (b) Total amount paid in 15 instalments.

OR

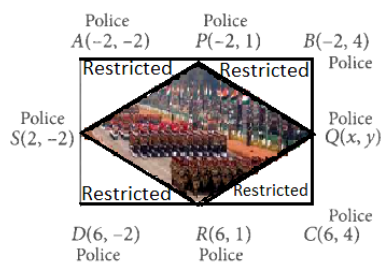
If Deepa pays ₹2625 then find the number of instalment.

- (c) Deepa paid 10th and 11th instalment together find the amount paid that month.

37. Read the text carefully and answer the questions:

[4]

In order to facilitate smooth passage of the parade, movement of traffic on certain roads leading to the route of the Parade and Tableaux are restricted. To avoid traffic on the road Delhi Police decided to construct a rectangular route plan, as shown in the figure.



- (a) If Q is the mid point of BC, then what are the coordinates of Q?
- (b) What is the length of the sides of quadrilateral PQRS?

OR

What is the length of route ABCD?

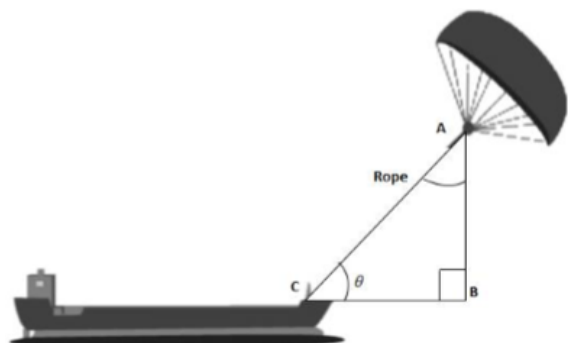
- (c) What is the length of route PQRS?

38. Read the text carefully and answer the questions:

[4]

Skysails is the genre of engineering science that uses extensive utilization of wind energy to move a vessel in the seawater. The 'Skysails' technology allows the towing kite to gain a height of anything between 100 metres - 300 metres. The sailing kite is made in such a way that it can be raised to its proper elevation and then brought back with the help of a 'telescopic mast' that enables the kite to be raised properly and effectively.

Based on the following figure related to sky sailing, answer the following questions:



- (a) In the given figure, if $\sin \theta = \cos(\theta - 30^\circ)$, where θ and $\theta - 30^\circ$ are acute angles, then find the value of θ .
- (b) What should be the length of the rope of the kite sail in order to pull the ship at the angle θ (calculated above) and be at a vertical height of 200m?

OR

What should be the length of the rope of the kite sail in order to pull the ship at the angle θ (calculated above) and be at a vertical height of 150m?

- (c) In the given figure, if $\sin \theta = \cos(3\theta - 30^\circ)$, where θ and $3\theta - 30^\circ$ are acute angles, then find the value of θ .