MATHEMATICS STANDARD 2023

SECTION - A

20 Marks

(Section - A consists of Multiple Choice type questions of 1 mark each.)

1. The pair of linear equations $2x = 5y + 6$ and $15y = 6x - 18$ represents two lines which are:

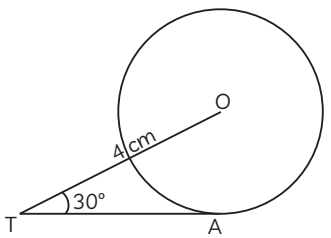
(a) intersecting

(b) parallel

(c) coincident

(d) either intersecting or parallel 1

2. In the given figure, TA is a tangent to the circle with centre O such that OT = 4 cm, $\angle OTA = 30°$, then length of TA is:



(a) $2\sqrt{3}$ cm (b) 2 cm

(c) $2\sqrt{2}$ cm (d) $\sqrt{3}$ cm 1

3. The ratio of HCF to LCM of the least composite number and the least prime number is:

(a) 1 : 2 (b) 2 : 1

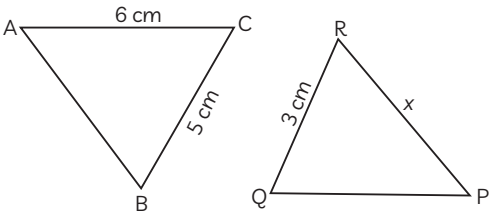
(c) 1 : 1 (d) 1 : 3 1

4. If a pole 6 m high casts a shadow $2\sqrt{3}$ m long on the ground, then sun's elevation is:

(a) 60° (b) 45°

(c) 30° (d) 90° 1

5. In the given figure, $\Delta ABC \sim \Delta QPR$. If AC = 6 cm, BC = 5 cm, QR = 3 cm and PR = x; then the value of x is:



(a) 3.6 cm (b) 2.5 cm

(c) 10 cm (d) 3.2 cm 1

6. The distance of the point (–6, 8) from origin is:

(a) 6 (b) –6

(c) 8 (d) 10 1

7. The next term of the A.P. : $\sqrt{7}, \sqrt{28}, \sqrt{63}$ is:

(a) $\sqrt{70}$ (b) $\sqrt{80}$

(c) $\sqrt{97}$ (d) $\sqrt{112}$ 1

8. $(\sec^2\theta - 1)(\text{cosec}^2\theta - 1)$ is equal to:

(a) –1 (b) 1

(c) 0 (d) 2 1

9. Two dice are thrown together. The probability of getting the difference of numbers on their upper faces equals to 3 is:

(a) $\frac{1}{9}$ (b) $\frac{2}{9}$

(c) $\frac{1}{6}$ (d) $\frac{1}{12}$ 1

10. 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

11. The roots of the equation $x^2 + 3x - 10 = 0$ are:

(a) 2, –5 (b) –2, 5

(c) 2, 5 (b) –2, –5 1

12. If α, β are zeroes of the polynomial $x^2 - 1$, then value of $(\alpha + \beta)$ is:

(a) 2 (b) 1

(c) –1 (d) 0 1

13. If α, β are the zeroes of the polynomial $p(x) = 4x^2 - 3x - 7$, then $\left(\frac{1}{\alpha} + \frac{1}{\beta}\right)$ is equal to:

(a) $\frac{7}{3}$ (b) $\frac{-7}{3}$

(c) $\frac{3}{7}$ (d) $\frac{-3}{7}$ 1

14. What is the area of a semi-circle of diameter 'd'?

(a) $\frac{1}{16}\pi d^2$ (b) $\frac{1}{4}\pi d^2$

(c) $\frac{1}{8}\pi d^2$ (d) $\frac{1}{2}\pi d^2$ 1

15. For the following distribution:

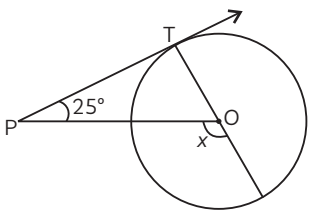
Marks Below	10	20	30	40	50	60
Number of Students	3	12	27	57	75	80

The modal class is:

(a) 10–20 (b) 20–30

(c) 30–40 (d) 50–60 1

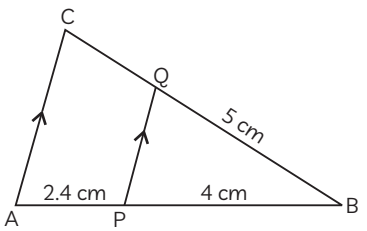
16. In the given figure, PT is a tangent at T to the circle with centre O. If $\angle TPO = 25°$, then x is equal to:



(a) 25° (b) 65°

(c) 90° (d) 115° 1

17. In the given figure, PQ || AC. If BP = 4 cm, AP = 2.4 cm and BQ = 5 cm, then length of BC is:



(a) 8 cm (b) 3 cm

(c) 0.3 cm (d) $\frac{25}{3}$ cm 1

18. The points (–4, 0), (4, 0) and (0, 3) are the vertices of a:

(a) right triangle

(b) isosceles triangle

(c) equilateral triangle

(d) scalene triangle 1

DIRECTION: In the question number 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option.

19. Assertion (A): The probability that a leap year has 53 Sundays is $\frac{2}{7}$.

Reason (R): The probability that a non–leap year has 53 Sundays is $\frac{5}{7}$.

(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 and 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. 1

20. Assertion (A): a, b, c are in A.P. if and only if $2b = a + c$.

Reason (R): The sum of first n odd natural numbers is n^2.

(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 and 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. 1

SECTION – B

10 Marks

(Section - B consists of Very Short Answer (VSA) type questions of 2 marks each.)

21. Find the sum and product of the roots of the quadratic equation $2x^2 - 9x + 4 = 0$.

OR

Find the discriminant of the quadratic equation $4x^2 - 5 = 0$ and hence comment on the nature of roots of the equation. 2

22. Evaluate $2\sec^2\theta + 3\operatorname{cosec}^2\theta - 2\sin\theta\cos\theta$ if $\theta = 45°$.

OR

If $\sin\theta - \cos\theta = 0$, then find the value of $\sin^4\theta + \cos^4\theta$. 2

23. If a fair coin is tossed twice, find the probability of getting 'atmost one head'. 2

24. Two numbers are in the ratio 2 : 3 and their LCM is 180. What is the HCF of these numbers? 2

25. If one zero of the polynomial $p(x) = 6x^2 + 37x - (k - 2)$ is reciprocal of the other, then find the value of k. 2

SECTION – C

18 Marks

(Section - C consists of Short Answer (SA) type questions of 3 marks each.)

26. Find the value of '*p*' for which one root of the quadratic equation $px^2 - 14x + 8 = 0$ is 6 times the other. 3

27. From an external point, two tangents are drawn to a circle. Prove that the line joining the external point to the centre of the circle bisects the angle between the two tangents. 3

28. Two concentric circles are of radii 5 cm and 3 cm. Find the length of the chord of the larger circle which touches the smaller circle. 3

29. How many terms are there in A.P. whose first and fifth term –14 and 2, respectively and the last term is 62.

OR

Which term of the A.P. : 65, 61, 57, 53, ... is the first negative term? 3

30. Prove that $\frac{\sin A - 2\sin^3 A}{2\cos^3 A - \cos A} = \tan A$.

OR

Prove that sec A (1 – sin A) (sec A + tan A) = 1. 3

31. Prove that $\sqrt{5}$ is an irrational number. 3

SECTION – D

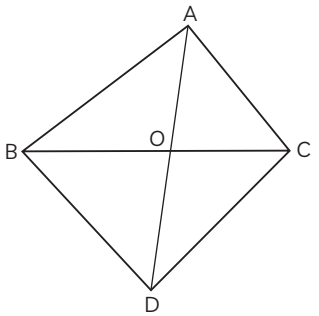
20 Marks

(Section - D consists of Long Answer (LA) type questions of 5 marks each.)

32. In a ΔPQR, N is a point on PR, such that $QN \perp PR$. If $PN \times NR = QN^2$, prove that $\angle PQR = 90°$.

OR

In the given figure, ΔABC and ΔDBC are on the same base BC. If AD intersects BC at O, prove that $\frac{ar(\Delta ABC)}{ar(\Delta DBC)} = \frac{AO}{DO}$



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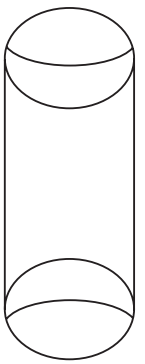
33. A wooden article was made by scooping out a hemisphere from each end of a solid cylinder, as shown in the figure. If the height of the cylinder is 10 cm and its base is of radius 3.5 cm, find the total surface area of the article.



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34. The monthly expenditure on milk in 200 families of a Housing Society is given below:

Monthly Expenditure (in ₹)	1000-1500	1500-2000	2000-2500	2500-3000	3000-3500	3500-4000	4000-4500	4500-5000
Number of families	24	40	33	*x*	30	22	16	7

Find the value of *x* and also, find the median and mean expenditure on milk. 5

35. A straight highway leads to the foot of a tower. A man standing on the top of the 75 m high tower observes two cars at angles of depression of 30° and 60°, which are approaching the foot of the tower. If one car is exactly behind the other on the same side of the tower, find the distance between the two cars. (use $\sqrt{3} = 1.73$)

OR

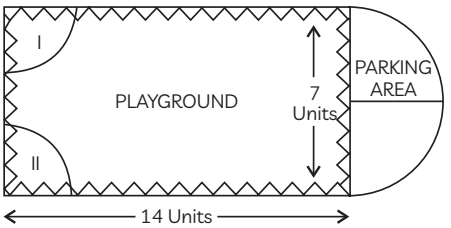
From the top of a 7 m high building, the angle of elevation of the top of a cable tower is 60° and the angle of depression of its foot is 30°. Determine the height of the tower. 5

SECTION – E

12 Marks

(Section – E consists of three Case Study Based questions of 4 marks each.)

36. *Governing council of a local public development authority of Dehradun decided to build an adventurous playground on the top of a hill, which will have adequate space for parking.*



After survey, it was decided to build rectangular playground, with a semi–circular area allotted for parking at one end of the playground. The length and breadth of the rectangular playground are 14 units and 7 units, respectively. There are two quadrants of radius 2 units on one side for special seats.

Based on the above information, answer the following questions:

(A) What is the total perimeter of the parking area? 1

(B) What is the total area of parking and the two quadrants?

OR

What is the ratio of area of playground to the area of parking area? 2

(C) Find the cost of fencing the playground and parking area at the rate of ₹ 2 per unit. 1

37. *Two schools 'P' and 'Q' decided to award prizes to their students for two games of Hockey ₹ x per student and Cricket ₹ y per student. School 'P' decided to award a total of ₹ 9,500 for the two games to 5 and 4 students respectively; while school 'Q' decided to award ₹ 7,370 for the two games to 4 and 3 students respectively.*

Based on the given information, answer the following questions:

(A) Represent the following information algebraically (in terms of *x* and *y*). 1

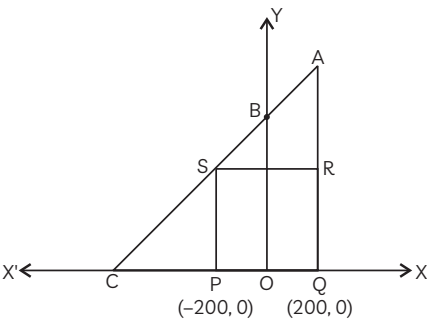
(B) What is the prize amount for hockey?

OR

Prize amount on which game is more and by how much? 2

(C) What will be the total prize amount if there are 2 students each from two games? 1

38. *Jagdish has a field which is in the shape of a right angled triangle AQC. He wants to leave a space in the form of a square PQRS inside the field for growing wheat and the remaining for growing vegetables (as shown in the figure). In the field, there is a pole marked as O.*



Based on the above information, answer the following questions:

(A) Taking O as origin, coordinates of P are (–200, 0) and of Q are (200, 0). PQRS being a square, what are the coordinates of R and S? 1

(B) What is the area of square PQRS?

OR

What is the length of diagonal PR in square PQRS? 2

(C) If S divides CA in the ratio K : 1, what is the value of K, where point A is (200, 800)? 1