MATHEMATICS STANDARD 2024

SECTION - A

20 Marks

*(This section consists of **20** questions of **1** mark each.)*

1. A bag contains 3 red balls, 5 white balls and 7 balck balls. The probability that a ball drawn from the bag at random will be neither red nor black is:

(a) $\frac{1}{3}$ (b) $\frac{1}{5}$

(c) $\frac{7}{15}$ (d) $\frac{8}{15}$ 1

2. The probablity of getting a bad egg in a lot of 400 eggs is 0.045. The number of good eggs in the lot is:

(a) 18 (b) 180

(c) 382 (d) 220 1

3. Perimeter of a sector of a circle whose central angle is 90° and radius 7 cm is:

(a) 35 cm (b) 11 cm

(c) 22 cm (d) 25 cm 1

4. A pair of irrational numbers whose product is a rational number is:

(a) $(\sqrt{16},\sqrt{4})$ (b) $(\sqrt{5},\sqrt{2})$

(c) $(\sqrt{3},\sqrt{27})$ (d) $(\sqrt{36},\sqrt{2})$ 1

5. Maximum number of common tangents that can be drawn to two circles intersecting at two distinct points is:

(a) 4 (b) 3

(c) 2 (d) 1 1

6. From a point on the ground, which is 30 m away from the foot of a vertical tower, the angle of elevation of the top of the tower is found to be 60°. The height (in metres) of the tower is:

(a) $10\sqrt{3}$ (b) $30\sqrt{3}$

(c) 60 (d) 30 1

7. Given HCF (2520, 6600) = 40, LCM (2520, 6600) = 252 × k, then the value of k is:

(a) 1650 (b) 1600

(c) 165 (d) 1625 1

8. The mean of five numbers is 15. If we include one more number, the mean of six numbers becomes 17. The included number is:

(a) 27 (b) 37

(c) 17 (d) 25 1

9. The pair of linear equations $x + 2y + 5 = 0$ and $-3x = 6y - 1$ has:

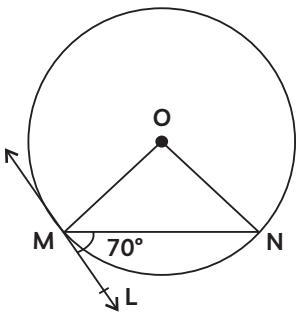
(a) unique solution

(b) exactly two solutions

(c) infinitely many solutions

(d) no solution 1

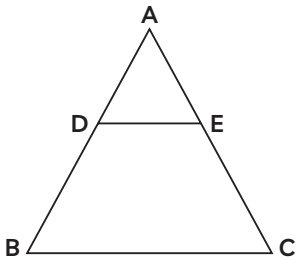
10. In the given figure, O is the centre of the circle. MN is the chord and the tangent ML at point M makes an angle of 70° with MN. The measure of ∠MON is:



(a) 120° (b) 140°

(c) 70° (d) 90° 1

11. In ΔABC, DE || BC (as shown in the figure). If AD = 2 cm, BD = 3 cm, BC = 7.5 cm, then the length of DE (in cm) is:



(a) 2.5 (b) 3

(c) 5 (d) 6 1

12. Two dice are thrown together. The probablity that they show different numbers is:

(a) $\frac{1}{6}$ (b) $\frac{5}{6}$

(c) $\frac{1}{3}$ (d) $\frac{2}{3}$ 1

13. If $\sin\alpha = \frac{\sqrt{3}}{2}$, $\cos\beta = \frac{\sqrt{3}}{2}$ then $\tan\alpha . \tan\beta$ is:

(a) $\sqrt{3}$ (b) $\frac{1}{\sqrt{3}}$

(c) 1 (d) 0 1

14. What should be added from the polynomial $x^2 - 5x + 4$, so that 3 is the zero of the resulting polynomial?

(a) 1 (b) 2

(c) 4 (d) 5 1

15. The smallest irrational number by which $\sqrt{20}$ should be multipled so as to get a rational number, is:

(a) $\sqrt{20}$ (b) $\sqrt{2}$

(c) 5 (d) $\sqrt{5}$ 1

16. If the diagonals of a quadrilateral divide each other proportionally, then it is a:

(a) parallelogram (b) rectangle

(c) square (d) trapezium 1

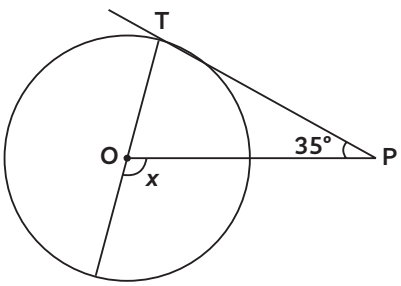
17. The common difference of the A.P.

$\frac{1}{2x}, \frac{1-4x}{2x}, \frac{1-8x}{2x}$, ... is:

(a) $-2x$ (b) -2

(c) 2 (d) $2x$ 1

18. In the given figure, if PT is a tangent to a circle with centre O and $\angle TPO = 35°$, then the measure of $\angle x$ is



(a) 110° (b) 115°

(c) 120° (d) 125° 1

Directions: Question number 19 and 20 are Asssertion and Reason based questions carrying 1 mark each. Two statements are given, one labelled as Assertion (A) and the other is labelled as Reason (R). Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below:

(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.

19. Assertion (A): The point which divides the line segment joining the points A (1, 2) and B (–1, 1) internally in the ratio 1 : 2 is $\left(\frac{-1}{3}, \frac{5}{3}\right)$.

Reason (R): The coordinates of the point which divides the line segment joining the points A(x_1, y_1) and B(x_2, y_2) in the ratio $m_1 : m_2$ are $\left(\frac{m_1x_2 + m_2x_1}{m_1 + m_2}, \frac{m_1y_2 + m_2y_1}{m_1 + m_2}\right)$ 1

20. Assertion (A): In a cricket match, a batsman hits a boundary 9 times out of 45 balls he plays. The probalitiliy that in a given ball, he does not hit the boundary is $\frac{4}{5}$.

Reason (R): P(E) + P(not E) = 1. 1

SECTION - B

10 Marks

*(This section consists of **5** questions of **2** marks each.)*

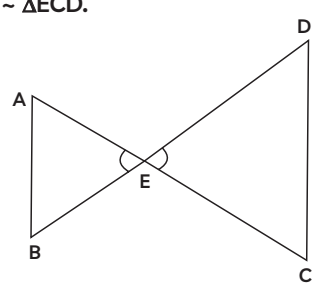
21. If $2x + y = 13$ and $4x - y = 17$, find the value of $(x - y)$.

OR

Sum of two numbers is 105 and their difference is 45. Find the numbers. 2

22. Evaluate: $\frac{5\tan 60°}{(\sin^2 60° + \cos^2 60°)\tan 30°}$ 2

23. In the given figure, $\frac{EA}{EC} = \frac{EB}{ED}$, prove that $\Delta EAB \sim \Delta ECD$.



2

24. One card is drawn at random from a well shuffled deck of 52 cards. Find the probablity that the card drawn

(A) is queen of hearts;

(B) is not a jack. 2

25. Find a relation between x and y such that the point P(x, y) is equidistant from the points A(7, 1) and B(3, 5).

OR

Points A(-1, y) and B(5, 7) lie on a circle with centre O(2, $-3y$) such that AB is *a* diameter of the circle. Find the value of y. Also, find the radius of the circle. 2

SECTION - C

18 Marks

*(This section consists of **6** questions of **3** marks each.)*

26. Find the ratio in which the line segment joining the points (5, 3) and (–1, 6) is divided by Y-axis.

OR

P(–2, 5) and Q(3, 2) are two points. Find the coordinates of the point R on line segment PQ such that PR = 2QR. 3

27. If the sum of first 7 terms of an A.P. is 49 and that of first 17 terms is 289, find the sum of its first 20 terms.

OR

The ratio of the 10^{th} term to its 30^{th} term of an A.P. is 1 : 3 and the sum of its first six terms is 42. Find the first term and the common difference of A.P. 3

28. Solve the following system of linear equations graphically:

$$x - y + 1 = 0$$
$$x + y = 5$$ 3

29. Find the zeroes of the quadratic polynomial $x^2 - 15$ and verify the relationship between the zeroes and the coefficients of the polynomial. 3

30. From an external point P, two tangents PA and PB are drawn to the circle with centre O. Prove that OP is the perpendicular bisector of chord AB. 3

31. Prove that:

$(\text{cosec}\,\theta - \sin\theta)(\sec\theta - \cos\theta)(\tan\theta + \cot\theta) = 1$ 3

SECTION - D

20 Marks

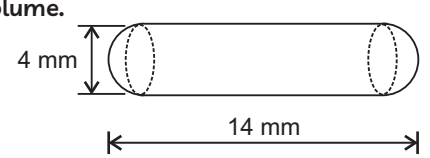
*(This section consists of **4** questions of **5** marks each.)*

32. A man on a cliff observes a boat at an angle of depression of 30° which is approaching the shore to the point immediately beneath the observer with a uniform speed. Six minutes later, the angle of depression of the boat is found to be 60°. Find the time taken by the boat from here to reach the shore. 5

33. A solid iron pole consists of a solid cylinder of height 200 cm and base diameter 28 cm, which is surmounted by another cylinder of height 50 cm and radius 7 cm. Find the mass of the pole, given that 1 cm^3 of iron has approximately 8 g mass.

OR

A medicine capsule is in the shape of a cylinder with two hemispheres stuck to each of its ends. The length of the entire capsule is 14 mm and the diameter of the capsule is 4 mm, find its surface area. Also, find its volume.



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34. In flight of 2800 km, an aircraft was slowed down due to bad weather. Its average speed is reduced by 100 km/h and by doing so, the time of flight is increased by 30 minutes. Find the original duration of the flight.

OR

The denominator of a fraction is one more than twice the numerator. If the sum of the fraction and its reciprocal is $2\frac{16}{21}$, find the fraction. 5

35. In ΔABC, if $AD \perp BC$ and $AD^2 = BD \times DC$, then prove that $\angle BAC = 90°$. 5

SECTION - E

12 Marks

*(This section consists of **3** case study based questions of **4** marks each.)*

36. *Vocational training complements traditional education by providing practical skills and hands-on exprience. While education equips individuals with a broad knowledge base, vocational training focuses on job-specific skills, enhancing employability thus making the student self-reliant. Keeping this in view, a teacher made the following table giving the frequency distribution of students/adults undergoing vocational training from the training institute.*

Age (in years)	15–19	20–24	25–29	30–34	35–39	40–44	45–49	50–54
Number of participants	62	132	96	37	13	11	10	4

From the above answer the following questions:

(A) What is the lower limit of the modal class of the above data? 1

(B) Find the median class of the above data.

OR

Find the number of participants of age less than 50 years who undergo vocational training. 2

(C) Give the empirical relationship between mean, median and mode. 1

37. *Teaching Mathematics through activities is a powerful approach that enhances students' understanding and engagement. Keeping this in mind, Ms. Mukta planned a prime number game for class 5 students. She announces the number 2 in her class and asked the first student to multiply it by a prime number and then pass it to second student. Second student also multiplied it by a prime number and passed it to third student. In this way by multiplying to a prime number, the last student got 173250.*

Now, Mukta asked some questions as given below to the students:

(A) What is the least prime number used by students? 1

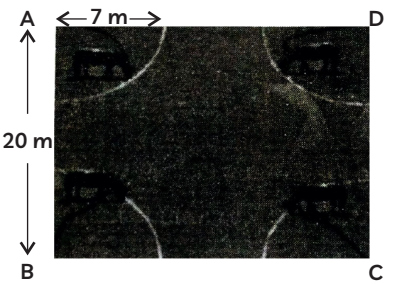
(B) How many students are in the class?

OR

What is the highest prime number used by students? 2

(C) Which prime number has been used maximum times? 1

38. *A stable owner has four horses. He usually tie these horses with 7 m long rope to pegs at each corner of a square shaped grass field of 20 m length, to graze in his farm. But tying with rope sometimes results in injuries to his horses, so he decided to build fence around the area so that each horse can graze.*



Based on the above, answer the following questions:

(A) Find the area of the square shaped grass field. 1

(B) Find the area of the total field in which these horses can graze.

OR

If the length of the rope of each horse is increased from 7 m to 10 m, find the area grazed by one horse.

(Use $\pi = 3.14$) 2

***(C) What is area of the field that is left ungrazed, if the length of the rope of each horse is 7 m?** 1