

2026

MATHEMATICS

Full Marks – 80

Pass Marks – 20

Time – 3 (Three) Hours

Attempt all questions.

The figures in the right hand margin indicate full marks for the corresponding questions.

For Question Nos. 1-5, write the letter associated with the correct answer.

1. An unbiased coin is tossed 3 times. The number of outcomes favourable to the event of getting at most one head is 1
(A) 1 (B) 2 (C) 3 (D) 4

2. If $\sin \theta = \frac{3}{5}$, $0 \leq \theta \leq 90^\circ$, then $\tan \theta + \cot \theta$ is equal to 1
(A) $\frac{7}{12}$ (B) $\frac{25}{12}$ (C) $\frac{12}{25}$ (D) $\frac{12}{13}$

3. SEBI has developed a centralized web-based system for lodging and tracking investor complaints, known as 1
(A) CORES (B) SCORES
(C) SEBI Redressal Forum (D) SCORAS

4. If the equations $x + 2y + 7 = 0$ and $2x + ky + 14 = 0$ represent coincident lines, then the value of k is 1
(A) 4 (B) -4 (C) 2 (D) $\frac{4}{3}$

5. A cylinder and a cone are of the same base radius and of same height. The ratio of the volume of cone to that of the cylinder is 1
 (A) 2:3 (B) 1:1 (C) 3:1 (D) 1:3
6. Write the full form of IGRC. 1
7. Prove that $(\sec^2 x - 1)(\operatorname{cosec}^2 x - 1) = 1$. 1
8. Find the co-ordinates of the centroid of ΔOAB whose vertices O, A and B are $(0,0)$, $(a,0)$ and $(0,b)$ respectively. 1
9. Find the radius of a circle whose perimeter is π cm. 1
10. Check whether the pair of lines represented by the equations $5x - 4y + 8 = 0$ and $7x + 6y - 9 = 0$ is consistent? 1
11. Write the quadratic equation whose roots are $2 - \sqrt{3}$ and $2 + \sqrt{3}$. 1
12. Find the value of λ if $x - 1$ is a factor of the polynomial $p(x) = x^2 - 2\lambda x + 1$. 1
13. Find the point of intersection of the lines $x = 4$ and $2x - 7y = -6$. 1
14. Prove that area of the sector $= \frac{1}{2} \times \text{radius} \times \text{arc length}$. 2
15. Find the height of a vertical tower AB which casts a shadow BC of length 36m at the time when the shadow QR of a vertical post PQ of length 5m is 3m. 2
16. Find 10th term of the A.P.: 4, 9, 14, 2

17. Prove that the product of two consecutive even integers is divisible by 8. 2
18. Prove that $x^n - a^n$ is divisible by $x + a$ only when n is even. 2
19. Solve graphically the pair of linear equations: $x + y = 5$ and $3x + 2y = 12$. 3
20. If α and β are the roots of the quadratic equation $x^2 + qx + p = 0$, then find the values of (i) $(\alpha + 1)(\beta + 1)$ (ii) $\frac{1}{\alpha} + \frac{1}{\beta}$ and, (iii) $\alpha^3 + \beta^3$ 3
21. Prove that $\frac{1}{\sec A - 1} + \frac{1}{\sec A + 1} = 2 \operatorname{cosec} A \cdot \cot A$. 3
22. Prove that the tangent at any point of a circle is perpendicular to the radius through the point of contact. 3
23. If two apples selected at random from a box containing a lot of apples are found to be good, then the box is approved for sale. What is the chance that a box containing 3 rotten and 12 good apples is approved for sale? 3
24. Factorise: $x(y^2 + z^2) + y(z^2 + x^2) + z(x^2 + y^2) + 3xyz$. 3
25. The hypotenuse of a right triangle is $3m$ longer than twice the shortest side. The remaining side is $2m$ longer than twice the shortest side. Find the lengths of the sides of the triangle. 4

Or,

A takes 6 days than the time taken by B to finish a piece of work. If both A and B together can finish it in 4 days, find the time taken by B to finish the work.

26. If $x, y \in R$ and $xy = 0$, then prove that either $x = 0$ or $y = 0$. 4

27. Find the area of the triangle ABC with vertices $A(x_1, y_1)$, $B(x_2, y_2)$ and (x_3, y_3) . 4

28. State and prove Basic Proportionality Theorem. 5

Or,

State and prove SAS similarity theorem.

29. The shadow of a tower, standing on level ground, is found to be $45m$ longer when the sun's altitude is 30° than when it was at 60° . Find the height of the tower. 5

Or,

The angles of depression of the top and the bottom of a $7m$ tall tree from the top of a tower are 45° and 60° respectively. Find the height of the tower.

30. Construct a pair of tangents to a circle from an external point. Write the steps of construction. $2 + 3 = 5$

31. Find the mean, mode and median for the following data: 6

Marks	Frequency
0-10	8
10-20	16
20-30	36
30-40	34
40-50	6
Total	100

32. A cone is cut into three parts by planes through the points of trisection of its altitude and parallel to the base. Prove that the volumes of the parts are in the ratio $1 : 7 : 19$. 6