

ISC Class 12 • Mathematics

Important Questions 2027

Most repeated questions from the last few years of board and sample papers, grouped chapter-wise.

Relations and Functions

1. If a relation R on the set $\{a, b, c\}$ defined by $R = \{(b, b)\}$, then classify the relation.

Seen in: Sample 2024, 2025, 2026

2. A relation R is defined on Z as aRb if and only if $a^2 - 7ab + 6b^2 = 0$. Then R is: (a) reflexive and symmetric (b) transitive but not reflexive (c) symmetric but not reflexive (d) reflexive but not symmetric

Seen in: Board 2024 · Sample 2027

3. Let $f(x) = 4 - (x - 7)^3$ be an invertible function, then find $f^{-1}(x)$.

Seen in: Board 2023, 2024, 2026

4. Write the smallest equivalence relation from the set A to A , where $A = \{1, 2, 3\}$.

Seen in: Board 2025 · Sample 2023

5. If $f: R \rightarrow R$ is defined by $f(x) = (2x-7)/4$, show that $f(x)$ is one-one and onto.

Seen in: Board 2023, 2024

Inverse Trigonometric Functions

6. Solve: $\sin^{-1}(x) + \sin^{-1}(1 - x) = \cos^{-1} x$.

Seen in: Board 2024 · Sample 2025, 2026

7. The value of $\operatorname{cosec}(\sin^{-1}(-1/2)) - \sec(\cos^{-1}(-1/2))$ is equal to: (a) -4 (b) 0 (c) -1 (d) 4

Seen in: Board 2024 · Sample 2023

Matrices

8. For what value of x , is $A = \begin{bmatrix} 0 & 1 & -2 \\ -1 & 0 & 3 \\ x & -3 & 0 \end{bmatrix}$ a skew symmetric matrix?

Seen in: Board 2023, 2025

Determinants

9. A ball is thrown vertically downwards from the top of a cliff, tracked from when first thrown until it hits the ground. The height above the ground after t seconds is $S(t) = at^2 + bt + c$, where a, b, c are real constants and S is in meters. After 1 second the ball is 285 m above the ground; after 2 seconds its height is 260 m; after 4 seconds it is 180 m. Set up and solve a matrix equation to find the height of the cliff.

Seen in: Board 2024, 2026 · Sample 2024, 2025, 2026, 2027

10. The value of the determinant of a matrix A of order 3 is 3. If C is the matrix of cofactors of the matrix A , then what is the value of determinant of C^2 ?

Seen in: Sample 2025, 2026

11. Find the value of the determinant given below, without expanding it at any stage. | $bg, 1, a(b+g)$; $ga, 1, b(g+a)$; $ab, 1, g(a+b)$ |

Seen in: Board 2023, 2024

Continuity, Differentiability and Differentiation

12. If $y = x^3 \log(1/x)$, then prove that $x \frac{d^2y}{dx^2} - 2 \frac{dy}{dx} + 3x^2 = 0$.

Seen in: Board 2023, 2024, 2025, 2026 · Sample 2023, 2025, 2026

13. Determine the value of k for which the following function is continuous at $x = 3$. $f(x) = \left\{ \begin{array}{l} ((x+3)^2 - 36)/(x-3), x \neq 3 \\ k, x = 3 \end{array} \right\}$

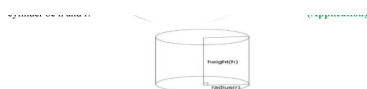
Seen in: Board 2023, 2024

Applications of Derivatives

14. The surface of a spherical balloon is increasing at the rate of $4 \text{ cm}^2/\text{sec}$. Find the rate of change of volume when its radius is 12 cm.

Seen in: Board 2023, 2024, 2025, 2026 · Sample 2025

15. A person manufactured a water tank as a closed right circular cylinder of volume $539/2$ cubic units with height h and radius r . (a) Express h in terms of radius r and given volume. (b) Express the total surface area S of the closed cylinder tank in terms of radius r . (c) If the total surface area of the tank is minimum, prove that radius $r = 7/2$ units. (d) Find the height of the tank.

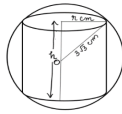


Seen in: Sample 2025, 2026

16. Find the point on the curve $y = (x - 2)^2$ at which the tangent is parallel to the chord joining the end points $(2, 0)$ and $(4, 4)$.

Seen in: Board 2024 · Sample 2026

17. A paper weight manufacturer designs a paper weight as a cylinder inscribed in a sphere and wants the volume of the cylinder to be maximum. The radius of the sphere is $3\sqrt{3}$ cm. Find the maximum volume of the cylinder.



Seen in: Sample 2023, 2024

18. Find the point on the curve $y = 2x^2 - 6x - 4$ at which the tangent is parallel to the x-axis.

Seen in: Board 2025 · Sample 2024

19. Find the interval in which the function $f(x) = x^2 e^{-x}$ is strictly increasing or decreasing.

Seen in: Board 2023 · Sample 2025

20. Sumit bought a closed cylindrical dustbin of radius r cm and height h cm with volume 20π cm³.
 (a) Express h in terms of r using the volume. (b) Prove the total surface area is $2\pi r^2 + 40\pi/r$.
 (c) Cost of painting base and top is rupees 2 per cm² and curved side is rupees 25 per cm²; find the total cost in terms of r . (d) Calculate the minimum cost for painting the dustbin.



(a) Express ' h ' in terms of ' r ', using the given volume.

Seen in: Board 2024 · Sample 2024

Integrals

21. Using properties of definite integral, calculate the value of: $\int_0^{\pi/2} \sin^2 x / (1 + \sin x \cos x) dx$

Seen in: Board 2024, 2025, 2026 · Sample 2023, 2026

22. The value of $\int_0^{3/2} |x| dx$ is: (a) $1/8$ (b) $9/8$ (c) $9/4$ (d) $3/4$

Seen in: Board 2023, 2024, 2026 · Sample 2023, 2024

23. Evaluate: $\int 5/\sqrt{2x+7} dx$

Seen in: Board 2023, 2025 · Sample 2024

24. Evaluate: $\int (x^2 + x + 1)/((x + 2)(x^2 + 1)) dx$

Seen in: Board 2023, 2025 · Sample 2026

25. Evaluate: $\int (\log x)^2 dx$

Seen in: Board 2024, 2025 · Sample 2024

26. Evaluate: $\int \sqrt{\sec(x/2) - 1} \, dx$

Seen in: Sample 2023, 2025

27. If $\int x^5 \cos(x^6) \, dx = k \sin(x^6) + C$, find the value of k .

Seen in: Board 2023 · Sample 2026

28. Evaluate: $\int e^x \operatorname{cosec} x (1 - \cot x) \, dx$

Seen in: Board 2024 · Sample 2025

29. Evaluate: $\int (2x^3 - 1)/(x^4 + x) \, dx$

Seen in: Board 2023 · Sample 2025

30. Evaluate: $\int \sin x \, dx / (\cos x (1 - \sin x))$

Seen in: Board 2025, 2026

Differential Equations

31. Solve the following differential equation: $dx/dy = x/y + f(x/y)/f'(x/y)$

Seen in: Board 2023, 2024, 2025, 2026 · Sample 2025, 2026, 2027

32. Solve the following differential equation: $(1 + x^2) \, dy/dx + 2xy = 4x^2$

Seen in: Sample 2023, 2024, 2026

33. Show that the general solution of the differential equation $dy/dx = y \cot 2x$ is $\log y = (1/2) \log |\sin 2x| + C$.

Seen in: Board 2023 · Sample 2023, 2026

34. Find the particular solution for the following differential equation: $\sqrt{1 - y^2} \, dx = (\sin^{-1} y - x) \, dy$, given that $y(0) = 0$

Seen in: Board 2023, 2025, 2026

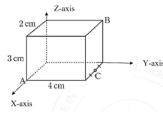
Vectors

35. Statement 1: If a and b represent two adjacent sides of a parallelogram then the diagonals are represented by $a + b$ and $a - b$. Statement 2: If a and b represent two diagonals of a parallelogram then the adjacent sides are represented by $2(a + b)$ and $2(a - b)$. Which is correct? (a) Statement 1 is true and Statement 2 is false. (b) Statement 2 is true and Statement 1 is false. (c) Both the statements are true. (d) Both the statements are false.

Seen in: Sample 2025, 2026

36. Shown is a cuboid (with sides 2 cm, 3 cm, 4 cm). Find $\vec{BA} \cdot \vec{BC}$.

(v) Shown below is a cuboid. Find $\vec{BA} \cdot \vec{BC}$.



(Analysis)

Seen in: Sample 2025, 2026

37. What are the values of x for which the angle between the vectors $2x^2 \mathbf{i} + 3x \mathbf{j} + \mathbf{k}$ and $\mathbf{i} - 2\mathbf{j} + x^2 \mathbf{k}$ is obtuse?

Seen in: Sample 2025, 2026

38. The projection of $\mathbf{i} + 2\mathbf{j} - 3\mathbf{k}$ on $2\mathbf{i} - \mathbf{j} + \mathbf{k}$ is: (a) $\sqrt{3}/\sqrt{2}$ (b) $-\sqrt{3}/\sqrt{2}$ (c) $-3/2$ (d) $-\sqrt{3}/2$

Seen in: Board 2024, 2026

39. Find a vector of magnitude 20 units parallel to the vector $2\mathbf{i} + 5\mathbf{j} + 4\mathbf{k}$.

Seen in: Board 2024 · Sample 2023

40. If $\mathbf{a}$ and $\mathbf{b}$ are two non-zero vectors such that $|\mathbf{a} \times \mathbf{b}| = \mathbf{a} \cdot \mathbf{b}$, find the angle between $\mathbf{a}$ and $\mathbf{b}$.

Seen in: Board 2024 · Sample 2023

Three-dimensional Geometry

41. If the direction cosines of a line are $\langle 1/c, 1/c, 1/c \rangle$ then: (a) $c > 0$ (b) $0 < c < 1$ (c) $c = \pm\sqrt{3}$ (d) $c > 2$

Seen in: Sample 2025, 2026

42. Find the equation of the plane containing the line $x/(-2) = (y-1)/3 = (1-z)/1$ and the point $(-1, 0, 2)$.

Seen in: Sample 2025, 2026

Linear Programming

43. Raunak sells sewing machines in a rural market with total capital of rupees 5,760 and a godown storing a maximum of 20 machines. Electronic sewing machine costs him rupees 360; manually operated costs him rupees 240. Profit is rupees 22 on an electronic machine and rupees 18 on a manually operated one. Using Linear Programming, find the number of sewing machines of each type Raunak should sell to maximise his profit.

Seen in: Board 2024, 2026 · Sample 2024

44. A linear programming problem is given by $Z = px + qy$ where $p, q > 0$ subject to the constraints $x + y \leq 60$, $5x + y \leq 100$, $x \geq 0$ and $y \geq 0$. (a) Solve graphically to find the corner points of the feasible region. (b) If $Z = px + qy$ is maximum at $(0, 60)$ and $(10, 50)$, find the relation of p and q . Also mention the number of optimal solution(s) in this case.

Seen in: Sample 2025, 2026

45. Maximise $Z = 4x - 3y$, subject to the constraints $2x + y \leq 20$, $3x - 2y \geq 16$, $x \leq 9$, $y \geq 1$. Also, find Z 's maximum value.

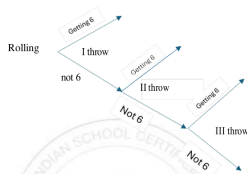
Seen in: Board 2023 · Sample 2024

Probability

46. In a large organisation, only 1 out of every 1,500 emails contains a harmful attachment. An automated filter correctly marks a harmful email as dangerous 97% of the time and correctly marks a safe email as safe 97% of the time. (a) Find the probability that the email is safe. (b) Find the probability that given the email is harmful the filter marks it safe. (c) One email has been flagged as dangerous by the system. Find the probability that this email is actually safe.

Seen in: Board 2023, 2024, 2025 · Sample 2023, 2026, 2027

47. Kiran plays a game of throwing a fair die 3 times but quits as and when she gets a six. Kiran gets +1 point for a six and -1 for any other number. (i) If X denotes the random variable 'points earned', what are the possible values X can take? (ii) Find the probability distribution of X . (iii) Find the expected value of the points she gets.



Seen in: Board 2024 · Sample 2024, 2025, 2026

48. Five numbers x_1, x_2, x_3, x_4, x_5 are randomly selected from 1, 2, 3, ..., 18 and arranged in increasing order such that $x_1 < x_2 < x_3 < x_4 < x_5$. What is the probability that $x_2 = 7$ and $x_4 = 11$? (a) $26/51$ (b) $3/104$ (c) $1/68$ (d) $1/34$

Seen in: Sample 2025, 2026

49. Given two events A and B such that $P(A/B) = 0.25$ and $P(A \cap B) = 0.12$. The value $P(A' \cap B)$ is: (a) 0.36 (b) 0.48 (c) 0.88 (d) 0.036

Seen in: Sample 2025, 2026

50. There are three machines and 2 of them are faulty. They are tested one by one in a random order till both the faulty machines are identified. What is the probability that only two tests are needed to identify the faulty machines?

Seen in: Sample 2025, 2026

- 51.** A gardener plants saplings on a day when rain is not predicted. Forecast: probability of rain today is 0.4; if it rains today, probability of raining tomorrow is 0.8; if it does not rain today, probability it will rain tomorrow is 0.7. (i) What is the probability that he will not plant the saplings tomorrow? (ii) Find the probability that he will plant them tomorrow. (iii) Given that he does not plant them tomorrow, what is the probability that he did not plant them today? (iv) What is the probability that he can plant saplings on both the days?

Seen in: Board 2026 · Sample 2025