

Mathematics MCQ Practice

+2 2nd Year (Class XII)

50 questions · 13 chapters · answers with explanations

How to use: attempt each chapter's questions without looking, then check the Answer Key at the end. Read the one-line explanation for every question you got wrong, and revise that topic in your notes.

Relations and Functions

- A relation R on A is an equivalence relation if it is
 - reflexive only
 - reflexive, symmetric and transitive
 - symmetric only
 - transitive only
- A function $f : A \rightarrow B$ is one-one (injective) if

$f(a) = f(b) \Rightarrow a = b$ f is constant	- every element of B has a pre-image $A = B$
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- If $f(x) = 2x + 3$, then $f^{-1}(x)$ is

$(x - 3)/2$ $2x - 3$	$(x + 3)/2$ $1/(2x + 3)$
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- If $f(x) = x + 1$ and $g(x) = 2x$, then $(f \circ g)(x)$ is

$2x + 1$ $x + 2$	$2x + 2$ $2x$
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Inverse Trigonometric Functions

- The principal value of $\sin^{-1}(1/2)$ is

$\pi/6$ $5\pi/6$	$\pi/3$ $\pi/4$
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- $\tan^{-1}(1)$ equals

$\pi/4$ $\pi/3$	$\pi/2$ 0
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- $\sin^{-1}x + \cos^{-1}x$ equals

π 0	$\pi/2$ 1
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- The principal value of $\cos^{-1}(-1)$ is

0 $-\pi$	π $\pi/2$
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Matrices

9. If A is a 2×3 matrix and B is a 3×4 matrix, the order of AB is
 (a) 2×4 (b) 3×3
 (c) 4×2 (d) not defined
10. A square matrix A is symmetric if
 (a) $A^T = A$ (b) $A^T = -A$
 (c) $A^2 = A$ (d) $A = 0$
11. $(AB)^T$ equals
 (a) $A^T B^T$ (b) $B^T A^T$
 (c) AB (d) BA
12. The identity matrix I satisfies
 (a) $AI = A$ (b) $AI = I$
 (c) $AI = 0$ (d) $AI = 2A$

Determinants

13. The value of the determinant with rows (2, 3) and (1, 4) is
 (a) 5 (b) 8
 (c) 11 (d) -5
14. If two rows of a determinant are identical, its value is
 (a) 1 (b) 0
 (c) -1 (d) doubled
15. A square matrix A has an inverse only if
 (a) $\det A = 0$ (b) $\det A \neq 0$
 (c) A is symmetric (d) A is 2×2
16. If A is a 3×3 matrix, $\det(2A)$ equals
 (a) $2 \det A$ (b) $4 \det A$
 (c) $8 \det A$ (d) $6 \det A$

Continuity and Differentiability

17. The derivative of e^x is
 (a) e^x (b) $x e^{x-1}$
 (c) $\log x$ (d) $1/x$
18. The derivative of $\log x$ (natural log) is
 (a) x (b) $1/x$
 (c) e^x (d) $\log x$
19. $f(x) = |x|$ at $x = 0$ is
 (a) continuous but not differentiable (b) differentiable but not continuous
 (c) neither (d) both continuous and differentiable
20. The derivative of $\sin(2x)$ is
 (a) $\cos 2x$ (b) $2 \cos 2x$
 (c) $-2 \cos 2x$ (d) $2 \sin 2x$

Applications of Derivatives

21. A function is increasing on an interval where
- (a) $f'(x) > 0$ (b) $f'(x) < 0$
 (c) $f'(x) = 0$ (d) $f(x) = 0$
22. At a local maximum
- (a) $f' = 0$ and $f'' < 0$ (b) $f' = 0$ and $f'' > 0$
 (c) $f' > 0$ (d) $f'' = 0$ always
23. The slope of the tangent to $y = x^2$ at $x = 3$ is
- (a) 3 (b) 6
 (c) 9 (d) 2
24. The radius of a circle increases at 2 cm/s. The rate of change of area when $r = 5$ cm is
- (a) 10π cm²/s (b) 20π cm²/s
 (c) 25π cm²/s (d) 4π cm²/s

Integrals

25. $\int x^2 dx$ equals
- (a) $x^3/3 + C$ (b) $2x + C$
 (c) $x^3 + C$ (d) $3x^2 + C$
26. $\int (1/x) dx$ equals
- (a) $\log |x| + C$ (b) $x + C$
 (c) $-1/x^2 + C$ (d) $e^x + C$
27. $\int \cos x dx$ equals
- (a) $\sin x + C$ (b) $-\sin x + C$
 (c) $\cos x + C$ (d) $\tan x + C$
28. $\int$ from 0 to 1 of $x dx$ equals
- (a) 1 (b) $1/2$
 (c) 0 (d) 2
29. $\int e^x dx$ equals
- (a) $e^x + C$ (b) $x e^x + C$
 (c) $e^{x+1} + C$ (d) $\log x + C$

Applications of Integrals

30. The area under $y = x$ from $x = 0$ to $x = 2$ is
- (a) 2 (b) 4
 (c) 1 (d) 8
31. The area of a circle of radius a found by integration is
- (a) πa^2 (b) $2\pi a$
 (c) πa (d) $4\pi a^2$
32. Area bounded by $y = x^2$, the x -axis and $x = 0$ to $x = 3$ is
- (a) 9 (b) 27
 (c) 3 (d) 6

Differential Equations

33. The order of $d^2y/dx^2 + 3 dy/dx + y = 0$ is
 (a) 1 (b) 2
 (c) 3 (d) 0
34. The degree of $(dy/dx)^3 + y = x$ is
 (a) 1 (b) 2
 (c) 3 (d) 0
35. The solution of $dy/dx = y$ is
 (a) $y = Ce^x$ (b) $y = x + C$
 (c) $y = Cx$ (d) $y = \log x$
36. The number of arbitrary constants in the general solution of a second-order equation is
 (a) 1 (b) 2
 (c) 3 (d) 0

Vectors

37. The dot product of two perpendicular vectors is
 (a) 1 (b) 0
 (c) -1 (d) their product
38. The magnitude of $3i + 4j$ is
 (a) 5 (b) 7
 (c) 1 (d) 25
39. $i \times j$ equals
 (a) k (b) $-k$
 (c) 0 (d) 1
40. The cross product of two parallel vectors is
 (a) 1 (b) the zero vector
 (c) their product (d) a unit vector

Three-Dimensional Geometry

41. The direction cosines l, m, n of a line satisfy
 (a) $l + m + n = 1$ (b) $l^2 + m^2 + n^2 = 1$
 (c) $lmn = 1$ (d) $l = m = n$
42. The direction cosines of the x-axis are
 (a) 1, 0, 0 (b) 0, 1, 0
 (c) 0, 0, 1 (d) 1, 1, 1
43. The distance of the plane $x + 2y + 2z = 6$ from the origin is
 (a) 1 (b) 2
 (c) 3 (d) 6

Linear Programming

44. In an LPP, the optimal value occurs at
 (a) any interior point
 (b) a corner point of the feasible region
 (c) the origin only
 (d) outside the region

45. The function to be maximised or minimised in an LPP is called the
(a) constraint (b) objective function
(c) feasible region (d) variable
46. The common region satisfying all constraints is called the
(a) objective region (b) feasible region
(c) infeasible region (d) optimal line

Probability

47. If A and B are independent, $P(A \cap B)$ equals
(a) $P(A) + P(B)$ (b) $P(A) P(B)$
(c) $P(A)/P(B)$ (d) 0
48. $P(A|B)$ is defined as
(a) $P(A \cap B)/P(B)$ (b) $P(A \cap B)/P(A)$
(c) $P(A) P(B)$ (d) $P(B)/P(A)$
49. Bayes' theorem is used to find
(a) prior probability (b) posterior (reverse) probability
(c) mean (d) variance
50. For a binomial distribution with $n = 10$ and $p = 0.5$, the mean is
(a) 5 (b) 10
(c) 2.5 (d) 0.5

Answer Key with Explanations

Relations and Functions

1. (b) reflexive, symmetric and transitive — All three properties are needed.
2. (a) $f(a) = f(b) \Rightarrow a = b$ — Different inputs give different outputs.
3. (a) $(x - 3)/2$ — Solve $y = 2x + 3$ for x .
4. (a) $2x + 1$ — $f(g(x)) = 2x + 1$.

Inverse Trigonometric Functions

5. (a) $\pi/6$ — $\sin(\pi/6) = 1/2$, inside $[-\pi/2, \pi/2]$.
6. (a) $\pi/4$ — $\tan(\pi/4) = 1$.
7. (b) $\pi/2$ — Standard identity for x in $[-1, 1]$.
8. (b) π — Range of $\cos^{-1}$ is $[0, \pi]$.

Matrices

9. (a) 2×4 — $(2 \times 3)(3 \times 4) \rightarrow 2 \times 4$.
10. (a) $A^T = A$ — It equals its transpose.
11. (b) $B^T A^T$ — The order is reversed.
12. (a) $AI = A$ — I is the multiplicative identity.

Determinants

13. (a) 5 — $2 \times 4 - 3 \times 1 = 5$.
14. (b) 0 — A basic property of determinants.
15. (b) $\det A \neq 0$ — $A^{-1} = \text{adj } A / \det A$.
16. (c) $8 \det A$ — Each of 3 rows gets a factor 2 $\rightarrow 2^3$.

Continuity and Differentiability

17. (a) e^x — e^x is its own derivative.
18. (b) $1/x$ — Standard result, $x > 0$.
19. (a) continuous but not differentiable — There is a sharp corner at 0.
20. (b) $2 \cos 2x$ — Chain rule.

Applications of Derivatives

21. (a) $f'(x) > 0$ — A positive slope means it is going up.
22. (a) $f' = 0$ and $f'' < 0$ — Second-derivative test.
23. (b) 6 — $dy/dx = 2x = 6$.
24. (b) $20\pi \text{ cm}^2/\text{s}$ — $dA/dt = 2\pi r dr/dt = 2\pi \times 5 \times 2$.

Integrals

25. (a) $x^3/3 + C$ — Power rule.
26. (a) $\log |x| + C$ — Standard integral.
27. (a) $\sin x + C$ — $d/dx(\sin x) = \cos x$.
28. (b) $1/2$ — $[x^2/2]$ from 0 to 1 = $1/2$.
29. (a) $e^x + C$ — e^x is its own integral.

Applications of Integrals

30. (a) 2 — Triangle area = $\frac{1}{2} \times 2 \times 2$.
31. (a) πa^2 — $4 \times \int$ from 0 to a of $\sqrt{(a^2 - x^2)} dx = \pi a^2$.
32. (a) 9 — $[x^3/3]$ from 0 to 3 = 9.

Differential Equations

33. (b) 2 — The highest derivative is the second.
34. (c) 3 — The power of the highest-order derivative.
35. (a) $y = Ce^x$ — $dy/y = dx \rightarrow \log y = x + c$.

36. (b) 2 — It equals the order.

Vectors

37. (b) 0 — $\cos 90^\circ = 0$.

38. (a) 5 — $\sqrt{9 + 16} = 5$.

39. (a) k — Right-hand rule.

40. (b) the zero vector — $\sin 0^\circ = 0$.

Three-Dimensional Geometry

41. (b) $l^2 + m^2 + n^2 = 1$ — Basic property.

42. (a) 1, 0, 0 — It makes 0° with x, 90° with y and z.

43. (b) 2 — $6/\sqrt{1 + 4 + 4} = 6/3 = 2$.

Linear Programming

44. (b) a corner point of the feasible region — Corner-point theorem.

45. (b) objective function — Example: $Z = 3x + 4y$.

46. (b) feasible region — Every point in it is a possible solution.

Probability

47. (b) $P(A)P(B)$ — Definition of independent events.

48. (a) $P(A \cap B)/P(B)$ — Conditional probability.

49. (b) posterior (reverse) probability — It updates probability using new evidence.

50. (a) 5 — Mean = np.