

CBSE Class 12 Mathematics 2026 - 65-7-2 - Compartment

Question Paper

Conducted by the Central Board of Secondary Education (CBSE)



Time Allowed: 3 Hours

Maximum Marks: 80

General Instructions

- (i) This question paper contains **38 questions**. All questions are compulsory.
- (ii) Section A: Questions 1 to 18 are multiple choice questions and Questions 19 and 20 are Assertion-Reason questions. Each carries 1 mark.
- (iii) Section B: Questions 21 to 25 carry 2 marks each.
- (iv) Section C: Questions 26 to 31 carry 3 marks each.
- (v) Section D: Questions 32 to 35 carry 5 marks each.
- (vi) Section E: Questions 36 to 38 carry 4 marks each. These are case study questions.
- (vii) There is no overall choice. Internal choice is provided in 2 questions in Section B, 3 questions in Section C, 2 questions in Section D and 2 questions in Section E.
- (viii) Use of calculators is not allowed.

Section A

1. For $f(x) = -|x + 1| + 5$, which of the following statements is true ?

- (A) Max $f(x) = 0$ at $x = 4$
- (B) Max $f(x) = 5$ at $x = -1$
- (C) Max $f(x) = 4$ at $x = 0$
- (D) $f(x)$ has no maximum value

2. If $f(x) = \begin{cases} \frac{|x|}{x}, & x \neq 0 \\ 0, & x = 0 \end{cases}$, then which of the following statements is **not** correct ?

- (A) f is continuous for every $x < 0$
- (B) f is continuous for every $x \in \mathbb{R}$
- (C) f is continuous for every $x > 0$
- (D) f is continuous for each point except $x = 0$

3. The value of $\cos^{-1} \left[\cos \frac{7\pi}{6} \right]$ is :

- (A) $\frac{7\pi}{6}$
- (B) $\frac{5\pi}{6}$
- (C) $\frac{\pi}{3}$
- (D) $\frac{\pi}{6}$

4. If $\begin{vmatrix} 3x & x+2 \\ 3(x-1) & x-2 \end{vmatrix} = \begin{vmatrix} 1 & 5 \\ 3 & 3 \end{vmatrix}$, then the value of x is :

- (A) 2
- (B) $\frac{1}{3}$
- (C) 5
- (D) 3

5. If A is a square matrix, then which of the following is **not** true ?

- (A) $A + A'$ is a symmetric matrix
- (B) AA' and $A'A$ are symmetric matrices
- (C) $A + A'$ is a skew symmetric matrix
- (D) $A - A'$ is a skew symmetric matrix

6. If $A = \begin{bmatrix} \cos \theta & \sin \theta \\ -\sin \theta & \cos \theta \end{bmatrix}$ satisfies $A' + A = I$, then the value of θ is :

- (A) $\frac{\pi}{6}$
- (B) $\frac{\pi}{3}$
- (C) $\frac{2\pi}{3}$
- (D) $\frac{5\pi}{6}$

7. $[\tan^{-1} \sqrt{3} - \sec^{-1}(-2)]$ is equal to :

- (A) π
- (B) $-\frac{\pi}{3}$
- (C) $\frac{\pi}{3}$
- (D) $\frac{2\pi}{3}$

8. Differential of $\cos^{-1}(e^x)$ with respect to x is :

- (A) $\frac{e^x}{\sqrt{1-e^{2x}}}$
- (B) $\frac{-e^x}{\sqrt{1+e^x}}$
- (C) $\frac{-e^x}{\sqrt{1-e^{2x}}}$
- (D) $\frac{e^x}{\sqrt{1+e^{2x}}}$

9. If $\int_0^1 (9x^2 - 4x - 2k) dx = 0$, then the value of k is :

- (A) 1
- (B) 0
- (C) $\frac{1}{2}$
- (D) $-\frac{1}{2}$

10. If A and B are square matrices of order 3 such that $|A| = 4$ and $|B| = 7$, then $|2AB|$ is :

- (A) 112
- (B) 56
- (C) 28
- (D) 224

11. If the rate of change of the area of a circle is equal to the rate of change of its diameter, then its radius is :

- (A) 2π units
- (B) π units
- (C) $\frac{\pi}{2}$ units
- (D) $\frac{1}{\pi}$ units

12. If vectors $\vec{a} = 3\hat{i} - 2\hat{j} + 4\hat{k}$ and $\vec{b} = \lambda\hat{i} + \hat{j}$ are perpendicular to each other, then the value of λ is :

- (A) 3 (B) -3
(C) $\frac{2}{3}$ (D) $-\frac{2}{3}$

13. $\int [\sin(\log x) + \cos(\log x)] dx$ is equal to :

- (A) $-\cos(\log x) + C$ (B) $\frac{1}{\cos x} + \frac{1}{\sin x} + C$
(C) $\sin(\log x) + C$ (D) $x \sin(\log x) + C$

14. If $y = \sqrt{y + \cos x}$, then $\frac{dy}{dx}$ is equal to :

- (A) $\frac{1}{2\sqrt{y + \cos x}}$ (B) $\frac{\cos x}{2y - 1}$
(C) $\frac{-\sin x}{2\sqrt{y + \cos x}}$ (D) $\frac{\sin x}{1 - 2y}$

15. If $A = \begin{bmatrix} 1 & -2 & 3 \\ 3 & 2 & -1 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 3 \\ -1 & 2 \\ 4 & -5 \end{bmatrix}$ and $C = [C_{ij}] = AB$, then C_{12} is :

- (A) 22 (B) -16
(C) 4 (D) 0

16. If two events A and B are independent, then which of the following statements is **not** correct ?

- (A) $\bar{A}$ and B are independent
(B) Being independent does not indicate that they are mutually exclusive
(C) $P(\bar{A} \cap \bar{B}) = [1 - P(\bar{A})][1 - P(\bar{B})]$
(D) $P(\bar{A} \cap \bar{B}) = [1 - P(A)][1 - P(B)]$

17. If $\int_0^4 \frac{1}{x + \sqrt{x}} dx = k \log 3$, then the value of k is :

- (A) 4 (B) -2
(C) -4 (D) 2

18. For events A and B, if $P(B) = \frac{3}{5}$, $P(A/B) = \frac{1}{2}$ and $P(A \cup B) = \frac{4}{5}$, then $P(A)$ is :

- (A) $\frac{1}{2}$ (B) $\frac{3}{5}$
(C) $\frac{1}{5}$ (D) $\frac{3}{10}$

19. **Assertion (A):** Let R be a relation on set A of all books of a library of a school, given by $R = \{(x, y) : x, y \in$

A, x and y have the same number of pages} and S is a relation on set A given by $S = \{(p, q) : p \text{ and } q \text{ are Mathematics books}\}$. Also, $R \cap S \neq \phi$. Then $R \cap S$ is an equivalence relation.

Reason (R): The intersection of two equivalence relations on a set is an equivalence relation on the set.

- (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

20. **Assertion (A):** Points A(6, -7, 0), B(16, -19, -4) and C(1, -1, 2) are collinear.

Reason (R): Three points A, B and C are collinear, when point C is the mid-point of the line segment joining points A and B.

- (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

Section B

21. Solve the given matrix equation for x , given

$$\text{that } x > 0 : x \begin{bmatrix} 2x & 2 \\ 3 & x \end{bmatrix} + 2 \begin{bmatrix} 8 & 5x \\ 4 & 0 \end{bmatrix} = 2 \begin{bmatrix} x^2 + 8 & 24 \\ 10 & 8 \end{bmatrix}.$$

22. Students are trying to fix thumb pins on a graph sheet on the class notice board. A relation R is defined on the set A of thumb pins as $R = \{(P, Q) : P, Q \in A \text{ and distance between } P \text{ and } Q \text{ is less than } 3 \text{ cm}\}$. Determine if R is an equivalence relation.

23(a). A box contains cards numbered 1 to 22. Two cards are drawn simultaneously without replacement and their numbers are noted. What is the probability that both numbers are even ?

OR

23(b). If $P(A) = \frac{3}{8}$, $P(B) = \frac{1}{2}$ and $P(A \cap B) = \frac{1}{4}$, find $P(\overline{A} / \overline{B})$.

24. For the given Linear Programming Problem, shade the feasible region on the graph and write the coordinates of the corner points.

$$\text{Minimize } Z = 5x + 7y$$

subject to constraints

$$2x + y \geq 8,$$

$$x + 2y \geq 10,$$

$$x, y \geq 0.$$

25(a). Determine a and b if $f(x)$ is a continuous

$$\text{function, where } f(x) = \begin{cases} 2, & x \leq 3 \\ ax + b, & 3 < x < 5. \\ 5, & x \geq 5 \end{cases}$$

OR

25(b). If $2y^3 + y = 2x$, then show that $\frac{d^2y}{dx^2} = \frac{-48y}{(6y^2 + 1)^3}$.

Section C

26(a). Express the matrix $A = \begin{bmatrix} 2 & 4 \\ 5 & 6 \end{bmatrix}$ as the sum of a symmetric matrix and a skew symmetric matrix.

OR

26(b). Two lines are represented by equations $5x - 7y - 2 = 0$ and $7x - 5y - 3 = 0$ in the xy -plane. Using matrix method, find their point of intersection.

27. If $y = (x + \sqrt{x^2 - a^2})^n$, then prove that $\frac{dy}{dx} = \frac{ny}{\sqrt{x^2 - a^2}}$.

28. Find the sum of maximum and minimum values of $f(x) = \sin x(1 + \cos x)$ in the interval $[0, \pi]$.

29. Solve the following Linear Programming Problem graphically :

Minimize $Z = 4x + y$

subject to

$$x + y \geq 3,$$

$$x + 2y \geq 4,$$

$$x, y \geq 0.$$

30(a). Find the equation of a line passing through the point $(1, -1, 2)$ and parallel to the x -axis. Also, find the shortest distance between this line and the line $\vec{r} = 2\hat{i} + \hat{j} - \hat{k} + \mu(3\hat{i} - 5\hat{j} + 2\hat{k})$.

OR

30(b). If coordinates of points A, B, C and D are respectively $(3, -4, 2)$, $(-1, -2, 0)$, $(4, 1, -1)$ and $(4, 0, 5)$, then find the equations of lines AC and BD and show that lines AC and BD are perpendicular to each other.

31(a). If R is a relation on set of natural numbers N such that $R = \{(x, y) : x, y \in N, x + 2y = 25\}$, then find the Domain and Range of the relation R. Also, determine if it is an equivalence relation.

OR

31(b). Determine whether the function $f : \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = 2x^3 - 7$, $\forall x \in \mathbb{R}$ (Real numbers) is bijective or not.

32. Evaluate : $\int_0^{\pi/2} \frac{\sin^2 x}{1 + \sin x \cos x} dx$.

33(a). Let $\vec{\alpha}, \vec{\beta}, \vec{\gamma}$ be three non-zero vectors such that $\vec{\alpha} \times \vec{\beta} = \vec{\gamma}$ and $\vec{\beta} \times \vec{\gamma} = \vec{\alpha}$. Show that $\vec{\alpha}, \vec{\beta}, \vec{\gamma}$ are mutually perpendicular vectors such that $|\vec{\beta}| = 1$ and $|\vec{\alpha}| = |\vec{\gamma}|$. Find the projection of vector $\vec{\alpha}$ on $\vec{\beta}$. Give reasons to support your answer.

OR

33(b). If points $A(3, -1, 2)$, $B(6, -3, 6)$, $C(4, -3, 1)$ and $D(1, -1, -3)$ are vertices of a quadrilateral ABCD, write the position vectors of A, B, C and D and show that ABCD represents a parallelogram. Also, find the area of the parallelogram ABCD.

34. Solve the differential equation $(x + y) dy + (x - y) dx = 0$, given that $y(1) = 1$.

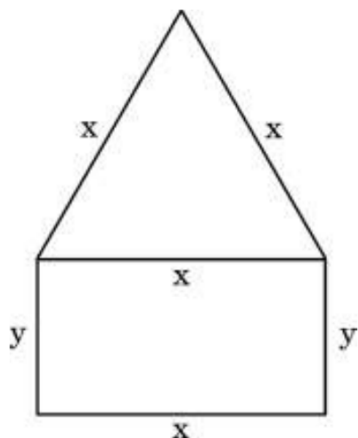
35(a). Using integration, find the area bounded by the curve $y = x^2$ and the line $y = 2$.

OR

35(b). Using integration, find the area bounded by the curve $9x^2 + 16y^2 = 144$ and the lines $x = 2$, $x = -2$.

Section E

36(i). A window is in the form of a rectangle of length x and breadth y (in metres), surmounted by an equilateral triangle on its length.



Based on the above information, answer the following questions :

(i) If the perimeter of the window is 18 m, write the relation between x and y .

36(ii). (ii) From (i), write an expression for the area of the window as a function of x only.

36(iii)(a). (iii)(a) Find the dimensions of the rectangle that will allow maximum light through the window.

OR

36(iii)(b). (iii)(b) If it is given that the area of the window is 100 m^2 , then find the expression for its perimeter in terms of x .

37(i). An organisation needs to select a building construction company to make houses in cities. Three companies X, Y and Z are short-listed with the probability of their selection being $\frac{1}{3}$, $\frac{2}{9}$ and $\frac{4}{9}$ respectively. It was found that there were 20%, 40% and 30% chances respectively, of delivering poor construction quality.

Based on the above information, answer the following questions :

(i) If the building constructed was found to be strong, then what is the probability that the construction contract was given to company X ?

37(ii). (ii) If a part of the newly constructed building falls off, then what is the probability that it was due to the selection of company Y or Z ?

38(i). In a school, the swimming pool is shaped as a cuboid, and the breadth of the pool is represented by line $\frac{-x+2}{-5} = y = z - 3$. Two students A and B are swimming along the length of the pool.

Based on the above information, answer the following questions :

(i) If the path of student A is represented by line $\frac{x+5}{1} = \frac{y+3}{4} = \frac{z-6}{-3p}$, find the value of p .

38(ii). (ii) Write the vector equation of the path of student B, if he swims parallel to the direction of the path of student A and passes through the point $(2, 4, -1)$ at a certain instant.

38(iii)(a). (iii)(a) Find the foot of the perpendicular drawn from $(2, 4, -1)$ to the path of student A.

OR

38(iii)(b). (iii)(b) If a bird flies across the top of the swimming pool with its path represented by $\frac{x+4}{2} = \frac{y+3}{8} = \frac{z-5}{-18}$, then find the shortest distance between its path and the path of student A.

- End of Question Paper -