

CBSE Class 12 Mathematics 2026 - 65-7-1 - 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. 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) $\frac{5\pi}{6}$

2. 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

3. 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

4. The value of $\sin^{-1} \left(\sin \frac{3\pi}{5} \right)$ is :

- (A) $\frac{3\pi}{5}$ (B) $\frac{\pi}{5}$
(C) $\frac{7\pi}{5}$ (D) $\frac{2\pi}{5}$

5. 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 $x = 0$

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

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

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. 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

9. 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

10. 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) $\frac{e^x}{\sqrt{1 + e^{2x}}}$

11. The values of x for which the rate of increase of $f(x) = x^3 - 5x^2 + 6x - 7$ is thrice the rate of increase of x , are :

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

12. 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) $-\frac{1}{2}$

13. $\int \left[\frac{1}{\log x} - \frac{1}{(\log x)^2} \right] dx$ is equal to :

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

14. If $y = \log \sqrt{\tan x}$, the value of $\frac{dy}{dx}$ at $x = \frac{\pi}{4}$ is :

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

15. 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) $-\frac{2}{3}$

16. 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

17. 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) $P(\bar{A} \cap \bar{B}) = [1 - P(A)][1 - P(B)]$

18. If A and B are independent events such that $P(A) = 0.45$ and $P(A \cup B) = 0.5$, then $P(B)$ is equal to :

- (A) $\frac{1}{29}$ (B) $\frac{10}{11}$
(C) $\frac{10}{29}$ (D) $\frac{1}{11}$

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

$\{(x, y) : x, y \in$

$A, x \text{ and } y \text{ have the same number of pages}\}$ 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.

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|---|--|
| (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.

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|---|--|
| (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 matrix equation for x and y :

$$\begin{bmatrix} x^2 \\ y^2 \end{bmatrix} - 3 \begin{bmatrix} x \\ 3y \end{bmatrix} = \begin{bmatrix} -2 \\ -20 \end{bmatrix}.$$

22(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

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

23. 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.

24. For an LPP with constraints $2x + y \leq 70$, $x + y \leq 40$, $x, y \geq 0$, shade the feasible region on the graph and write the coordinates of its corner points.

25(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

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

Section C

26(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

26(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.

27. Differentiate $y = e^{\cos^{-1} \sqrt{1-x^2}}$ with respect to x and hence show that $\frac{dy}{dx} = \frac{y}{\sqrt{1-x^2}}$.

28. Find the values of 'a' and 'b', if $y = \frac{ax - b}{(x-1)(x-4)}$ has a critical point $(3, 1)$.

29(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

29(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.

30(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

30(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.

31. Solve the following Linear Programming Problem graphically :

Minimize $Z = 4x + y$

subject to

$$x + y \geq 3,$$

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

$$x, y \geq 0.$$

Section D

32. Evaluate : $\int_{\pi/6}^{\pi/3} \frac{\sin x + \cos x}{\sqrt{\sin 2x}} dx$.

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

OR

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

34. Solve the differential equation $x^2 dy + y(x + y) dx = 0$, given that $y = 1$ when $x = 1$.

35(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

35(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.

Section E

36(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 .

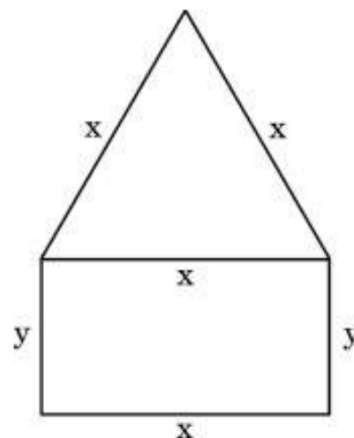
36(ii). (ii) Write the vector equation of the path of student B, if he swims parallel to the direction of the path of student A and passes through the point $(2, 4, -1)$ at a certain instant.

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

OR

36(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.

37(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 .

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

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

OR

37(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 .

38(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 ?

38(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 ?

- End of Question Paper -