CBSE Class 12 Mathematics Compartment 2026

Question Paper

Conducted by the Central Board of Secondary Education (CBSE)

General Instructions :

Read the following instructions very carefully and strictly follow them :

(i) This question paper contains **38 questions**. All questions are compulsory.

(ii) This question paper is divided into **five Sections – A, B, C, D and E.**

(iii) In **Section A**, Questions no. **1 to 18** are multiple choice questions (MCQs) and Questions no. **19 and 20** are Assertion-Reason based questions carrying **1 mark** each.

(iv) In **Section B**, Questions no. **21 to 25** are very short answer (VSA) type questions, carrying **2 marks** each.

(v) In **Section C**, Questions no. **26 to 31** are short answer (SA) type questions, carrying **3 marks** each.

(vi) In **Section D**, Questions no. **32 to 35** are long answer (LA) type questions, carrying **5 marks** each.

(vii) In **Section E**, Questions no. **36 to 38** are case study based questions carrying **4 marks** each.

Section A

1. If

$$A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$$

satisfies $A^T + A = I$, then the value of θ is:

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

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

(A) $A+A^T$ is a symmetric matrix.

(B) AA^T and A^TA are symmetric matrices.

(C) $A+A^T$ is a skew-symmetric matrix.

(D) $A-A^T$ is a skew-symmetric matrix.

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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

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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) $\frac{2\pi}{5}$

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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 $x = 0$.

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6. 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.

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

(A) π

(B) $-\frac{\pi}{3}$

(C) $\frac{\pi}{3}$

(D) $\frac{2\pi}{3}$

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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

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9. If

$$A = \begin{bmatrix} 1 & -2 & 3 \\ 3 & 2 & -1 \end{bmatrix}, \qquad B = \begin{bmatrix} 2 & 3 \\ -1 & 2 \\ 4 & -5 \end{bmatrix}$$

and $C = [c_{ij}] = AB$, then c_{12} is:

(A) 22

(B) -16

(C) 4

(D) 0

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

(A) $\dfrac{e^x}{\sqrt{1-e^{2x}}}$

(B) $-\dfrac{e^x}{\sqrt{1+e^x}}$

(C) $-\dfrac{e^x}{\sqrt{1-e^{2x}}}$

(D) $\dfrac{e^x}{\sqrt{1+e^{2x}}}$

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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) $-3, -\dfrac{1}{3}$

(B) $3, -\dfrac{1}{3}$

(C) $3, \dfrac{1}{3}$

(D) $-3, \dfrac{1}{3}$

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12. If

$$\int_0^1 (9x^2 - 4x - 2k)\,dx = 0,$$

then the value of k is:

(A) 1

(B) 0

(C) $\dfrac{1}{2}$

(D) $-\frac{1}{2}$

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13. The value of

$$\int \left[\frac{1}{\log x} - \frac{1}{(\log x)^2}\right] dx$$

is equal to:

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

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14. If

$$y = \log \sqrt{\tan x},$$

then the value of

$$\frac{dy}{dx}$$

at

$$x = \frac{\pi}{4}$$

is:

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

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

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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

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

(A) $\overline{A}$ and B are independent.

(B) Being independent does not indicate that they are mutually exclusive.

(C) $\mathrm{P}(\overline{A}\cap\overline{B}) = [1-P(\overline{A})][1-P(\overline{B})]$.

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

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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) $\frac{1}{11}$

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19. Assertion (A) : Let R be a relation on set A of all books in a school library 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 from the same library such that $S = \{(p, q) : p$ and q 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 the Assertion (A).

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

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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 line segment joining points A and B.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the 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 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 $\frac{d^2y}{dx^2} = \frac{-48y}{(6y^2+1)^3}$.

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 (Linear Programming Problem) 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 $P(\bar{A}/\bar{B})$.

Section C

26.(a) If R is a relation on the set of natural numbers $\mathbb{N}$ such that

$$R = \{(x, y) : x, y \in \mathbb{N}, x + 2y = 25\},$$

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 $f : \mathbb{R} \to \mathbb{R}$ defined by $f(x) = 2x^3 - 7$, $\forall x \in \mathbb{R}$ (Real numbers) is bijective or not.

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

$$\frac{dy}{dx} = \frac{y}{\sqrt{1-x^2}}.$$

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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 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) Find the equations of the lines AC and BD, if coordinates of points A, B, C and D respectively, are $(3,-4,2), (-1,-2,0), (4,1,-1)$ and $(4,0,5)$. Show that the 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.

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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.(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** α, β, γ **are mutually perpendicular vectors such that** $|\vec{\beta}| = 1$ **and** $|\vec{\alpha}| = |\vec{\gamma}|$**. Find projection of vector** $\vec{\alpha}$ **on** $\vec{\beta}$**. Give reasons to support your answer.**

OR

34.(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** $ABCD$.

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

Section E

36. 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.

(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) Write the vector equation of the path of student B swimming parallel to the path of student A, if at a certain instant he passes through the point with coordinates (2, 4, -1).

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

OR

36.(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.

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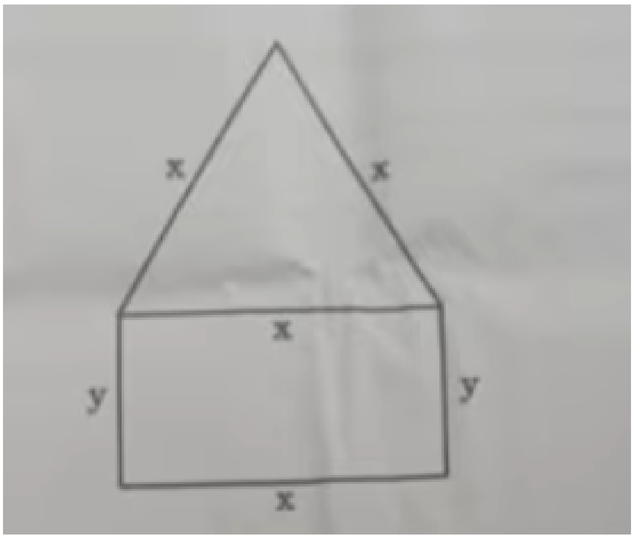
37. A window is in the form of a rectangle of length x and breadth y (in metres), surmounted by an equilateral triangle on its length.

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



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

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

OR

37.(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.

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38. 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.

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

38.(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?
