

By O.P. GUPTA

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$



MULTIPLE CHOICE TYPE QUESTIONS

For CBSE 2026 Exams - Mathematics (041) - Class 12

Topics : Determinants

Max. Marks : 50

☑ Select the correct option in the followings. Each question carries 1 mark.

Q01. For the matrix $A = \begin{bmatrix} 0 & -2023 & 2022 \\ 2023 & 0 & -2024 \\ -2022 & 2024 & 0 \end{bmatrix}$, the value of $\text{Det.}(A)$ is given by

- (a) 0 (b) -2023 (c) -1 (d) 1

Q02. Let A be a square matrix of order 3 such that its det. value is '-2'. Then $|3A| =$

- (a) 54 (b) -54 (c) -6 (d) 6

Q03. Let $A = [a_{ij}]_{3 \times 3}$ such that $A \cdot (\text{adj.}A) = 5I$. Then $|\text{adj.}(2A)| =$

- (a) 16 (b) 25 (c) 1600 (d) 50

Q04. The cofactor of element 3 in $\begin{vmatrix} 1 & 3 \\ 6 & 0 \end{vmatrix}$ is

- (a) 6 (b) -1 (c) 1 (d) -6

Q05. Let $\begin{vmatrix} x & -\sin \theta & \cos \theta \\ \sin \theta & -x & 1 \\ \cos \theta & 1 & x \end{vmatrix} = kx^m$. Then $m - k$ equals

- (a) -1 (b) 3 (c) 2 (d) 4

Q06. If $\begin{vmatrix} 1 & 3 & 1 \\ 1 & 9 & 3 \\ 1 & x & y \end{vmatrix} = 0$ gives an equation of line $x = \lambda y$, then $\lambda =$

- (a) 0 (b) -3 (c) 1 (d) 3

Q07. If A and B are matrices of order 3×3 such that $|A| = 5$, $|B| = 2$, then the value of $|2AB|$ is

- (a) 10 (b) 80 (c) 20 (d) 40

Q08. Let $A = \begin{bmatrix} -4 & 3 \\ -1 & 0 \end{bmatrix}$. Then inverse of matrix A is

- (a) $\frac{1}{3} \begin{bmatrix} 0 & -3 \\ 1 & -4 \end{bmatrix}$ (b) $\frac{1}{3} \begin{bmatrix} 4 & -1 \\ 3 & 0 \end{bmatrix}$ (c) $\begin{bmatrix} 0 & -3 \\ 1 & -4 \end{bmatrix}$ (d) $\begin{bmatrix} 4 & -1 \\ 3 & 0 \end{bmatrix}$

- Q09. Let $A = \begin{bmatrix} \cos 30^\circ & -\sin 60^\circ \\ \sin 60^\circ & \cos 30^\circ \end{bmatrix}$. Then $|A| =$
- (a) $\frac{3}{2}$ (b) $\frac{1}{2}$ (c) $\frac{3}{4}$ (d) $\frac{1}{4}$
- Q10. The determinant value of a square matrix of order 3 is known to be 4. Then the determinant value of the matrix formed by replacing each element by its cofactor will be
- (a) 4 (b) 16 (c) 64 (d) 0
- Q11. If $A = \begin{bmatrix} \frac{x}{6} & 2 \\ 1 & 3 \end{bmatrix}$ is a singular matrix, then
- (a) $x = \pm 4$ (b) $x = -4$ (c) $x = 4$ (d) $x \in \mathbb{R} - \{4\}$
- Q12. If A' represents the transpose of matrix $A = \begin{pmatrix} \cos \omega & -\sin \omega \\ \sin \omega & \cos \omega \end{pmatrix}$, then $|A'| =$
- (a) -1 (b) 0 (c) ± 1 (d) 1
- Q13. For $\text{diag.}(1 \ 2 \ 3)$, the determinant value is
- (a) 6 (b) 0 (c) 36 (d) 216
- Q14. If $\Delta = \begin{vmatrix} 1 & a & a^2 \\ a & a^2 & 1 \\ a^2 & 1 & a \end{vmatrix} = -4$, then the value of $\begin{vmatrix} a^3 - 1 & 0 & a - a^4 \\ 0 & a - a^4 & a^3 - 1 \\ a - a^4 & a^3 - 1 & 0 \end{vmatrix}$ is
- (a) -4 (b) 16 (c) -64 (d) 0
- Q15. If $[.]$ represents the greatest integer function, and $-1 \leq x < 0, 0 \leq y < 1, 1 \leq z < 2$ then, the value of the determinant $\begin{vmatrix} [x]+1 & [y] & [z] \\ [x] & [y]+1 & [z] \\ [x] & [y] & [z]+1 \end{vmatrix}$ is given by
- (a) 0 (b) -1 (c) 1 (d) 2
- Q16. For the matrix $A = \begin{bmatrix} 1 & -1 & 2 \\ 3 & 0 & -2 \\ 1 & 0 & 3 \end{bmatrix}$, the value of $|A^{-1}|$ will be
- (a) 11 (b) $-\frac{1}{11}$ (c) -11 (d) $\frac{1}{11}$
- Q17. Let $A = \begin{bmatrix} 5 & 0 & 4 \\ 2 & 3 & 2 \\ 1 & 2 & 1 \end{bmatrix}$. Then the value of $|A| + |\text{adj.}A|$ is
- (a) 0 (b) -1 (c) 1 (d) 2

- Q18. If $\begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix} A \begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix} = \begin{bmatrix} -2 & 4 \\ 3 & -1 \end{bmatrix}$, then the matrix A is
- (a) $\begin{bmatrix} -24 & 13 \\ -34 & -18 \end{bmatrix}$ (b) $\begin{bmatrix} 24 & 13 \\ -34 & -18 \end{bmatrix}$ (c) $\begin{bmatrix} 24 & 13 \\ -34 & 18 \end{bmatrix}$ (d) $\begin{bmatrix} 24 & 13 \\ 34 & -18 \end{bmatrix}$
- Q19. Let $(A^{-1})' = (A')^{-k}$. Then 'k' equals
- (a) 0 (b) -1
(c) 1, when A is a non-singular matrix (d) 1, when A can be any square matrix
- Q20. For the matrix $A = \begin{pmatrix} 7 & 2 \\ 6 & 3 \end{pmatrix}$, $A \cdot (\text{adj.}A) =$
- (a) 9 (b) $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ (c) ± 9 (d) $\begin{pmatrix} 9 & 0 \\ 0 & 9 \end{pmatrix}$
- Q21. The value of $\begin{vmatrix} 1 & 1 & 1 \\ \alpha + \beta & \beta + \gamma & \gamma + \alpha \\ \gamma & \alpha & \beta \end{vmatrix}$ is
- (a) 0 (b) $\alpha + \beta + \gamma$ (c) $1 + \alpha + \beta + \gamma$ (d) $(\alpha - \beta)(\beta - \gamma)(\gamma - \alpha)$
- Q22. For the matrix $A = \begin{pmatrix} 3 & 4 & 5 \\ 2 & -1 & 8 \\ 5 & -2 & 7 \end{pmatrix}$, $|-A| =$
- (a) 136 (b) -136 (c) 1 (d) 0
- Q23. Let $A = \begin{pmatrix} 1 & -\sin \theta & -1 \\ \sin \theta & 1 & -\sin \theta \\ 1 & \sin \theta & 1 \end{pmatrix}$, where $\theta \in [0, 2\pi]$ such that $|A| \in [m, n]$. Then $n^m =$
- (a) [2, 4] (b) 4 (c) 16 (d) 2
- Q24. If x, y, z are all non-zero real numbers then, $\begin{bmatrix} x & 0 & 0 \\ 0 & y & 0 \\ 0 & 0 & z \end{bmatrix}^{-1}$ equals
- (a) $\begin{bmatrix} x & 0 & 0 \\ 0 & y & 0 \\ 0 & 0 & z \end{bmatrix}$ (b) $\begin{bmatrix} z & 0 & 0 \\ 0 & y & 0 \\ 0 & 0 & x \end{bmatrix}$ (c) $\begin{bmatrix} z^{-1} & 0 & 0 \\ 0 & y^{-1} & 0 \\ 0 & 0 & x^{-1} \end{bmatrix}$ (d) $\begin{bmatrix} x^{-1} & 0 & 0 \\ 0 & y^{-1} & 0 \\ 0 & 0 & z^{-1} \end{bmatrix}$
- Q25. If $A_m = \begin{bmatrix} m & m-1 \\ m-1 & m \end{bmatrix}$ and $|A_1| + |A_2| + |A_3| + \dots + |A_{2024}| = k^2$, ($k > 0$). Then $k =$
- (a) 2024 (b) 2024^2 (c) 2023 (d) 2023^2

Q26. If $A = \begin{pmatrix} 1 & 2 \\ 3 & 5 \end{pmatrix}$, then the value of $|A^{2023}|$ is

- (a) 1 (b) -1 (c) 2023 (d) -2023

Q27. $\begin{bmatrix} 1 & -\tan \frac{\theta}{2} \\ \tan \frac{\theta}{2} & 1 \end{bmatrix} \begin{bmatrix} 1 & \tan \frac{\theta}{2} \\ -\tan \frac{\theta}{2} & 1 \end{bmatrix}^{-1} =$

- (a) $\begin{bmatrix} \cos \theta & \sin \theta \\ -\sin \theta & \cos \theta \end{bmatrix}$ (b) $\begin{bmatrix} \cos \theta & \sin \theta \\ \sin \theta & -\cos \theta \end{bmatrix}$ (c) $\begin{bmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{bmatrix}$ (d) $\begin{bmatrix} -\cos \theta & \sin \theta \\ \sin \theta & \cos \theta \end{bmatrix}$

Q28. For the matrix $A = \begin{pmatrix} 3 & -1 & 1 \\ -15 & 6 & -5 \\ 5 & -2 & 2 \end{pmatrix}$, $A^{-1} \cdot A =$

- (a) $\begin{bmatrix} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & -1 \end{bmatrix}$ (b) $\begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$ (c) $\begin{bmatrix} 0 & 0 & -1 \\ 0 & -1 & 0 \\ -1 & 0 & 0 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

Q29. If the system of linear equations $x + y + z = 2$, $2x + y - z = 3$, $3x + 2y + kz = 4$ has a unique solution, then

- (a) $k \neq 0$ (b) $k = 0$ (c) $k \in \mathbb{R}$ (d) None of these

Q30. The given system of equations $x + 2y + z = 7$, $x + 3z = 11$, $2x - 3y = 1$ can be expressed as

- (a) $\begin{bmatrix} x \\ y \\ z \end{bmatrix} \begin{bmatrix} 1 & 2 & 1 \\ 1 & 0 & 3 \\ 2 & -3 & 0 \end{bmatrix} = \begin{bmatrix} 7 \\ 11 \\ 1 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 2 & 1 \\ 1 & 0 & 3 \\ 2 & -3 & 0 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 7 \\ 11 \\ 1 \end{bmatrix}$
 (c) $\begin{bmatrix} 1 & 2 & 1 \\ 1 & 0 & 3 \\ 2 & -3 & 0 \end{bmatrix} \begin{bmatrix} 7 \\ 11 \\ 1 \end{bmatrix} = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$ (d) $\begin{bmatrix} x \\ y \\ z \end{bmatrix} \begin{bmatrix} 7 \\ 11 \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & 2 & 1 \\ 1 & 0 & 3 \\ 2 & -3 & 0 \end{bmatrix}$

Q31. For matrix $A = \begin{pmatrix} 2 & 3 & 10 \\ 4 & -6 & 5 \\ 6 & 9 & -20 \end{pmatrix}$, the value of $\frac{|\text{adj.}A|}{|A|}$ is

- (a) 1440000 (b) $\frac{1}{1200}$ (c) 1200 (d) $\frac{1}{1440000}$

Q32. $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 0 & 2 \\ 3 & 1 & 1 \end{vmatrix} =$

- (a) -4 (b) 2 (c) -2 (d) 4

Q33. Minor of element '2' in $\begin{vmatrix} 0 & -1 & 3 \\ -2 & 0 & 2 \\ 3 & 4 & 5 \end{vmatrix}$ is

- (a) 3 (b) -3 (c) 17 (d) -17

Q34. Let $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 0 & 3 \\ 1 & -2 & 1 \end{bmatrix}$. Then adjoint of matrix A is

- (a) $\begin{bmatrix} 6 & 2 & -2 \\ -3 & 0 & 3 \\ 3 & -2 & -1 \end{bmatrix}$ (b) $\begin{bmatrix} 6 & -3 & 3 \\ 2 & 0 & -2 \\ -2 & 3 & -1 \end{bmatrix}$ (c) $\begin{bmatrix} -6 & -2 & 2 \\ 3 & 0 & -3 \\ -3 & 2 & 1 \end{bmatrix}$ (d) $\begin{bmatrix} -6 & 3 & -3 \\ -2 & 0 & 2 \\ 2 & -3 & 1 \end{bmatrix}$

Q35. If A is a square matrix of order 3 such that $A(\text{adj.}A) = \begin{bmatrix} -2 & 0 & 0 \\ 0 & -2 & 0 \\ 0 & 0 & -2 \end{bmatrix}$, then $|A|$ is

- (a) 2 (b) 1 (c) -2 (d) -1

Q36. If $A = \begin{bmatrix} \alpha & 2 \\ 2 & \alpha \end{bmatrix}$ and $|A^3| = 27$, then the value of α is

- (a) ± 1 (b) ± 2 (c) $\pm\sqrt{5}$ (d) $\pm\sqrt{7}$

Q37. If $\begin{vmatrix} 5 & 3 & -1 \\ -7 & x & -3 \\ 9 & 6 & -2 \end{vmatrix} = 0$, then the value of x is

- (a) 9 (b) 5 (c) 7 (d) 3

Q38. If $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 59 & 69 & -1 \end{bmatrix}$, then A^{-1}

- (a) is $(-A)$ (b) is A (c) is A^2 (d) does not exist

Q39. The determinant $\begin{vmatrix} y+k & y & y \\ y & y+k & y \\ y & y & y+k \end{vmatrix}$ is equal to

- (a) $k(3y+k^2)$ (b) $3y+k^3$ (c) $k^2(3y+k)$ (d) $3y+k^2$

Q40. If $A = \begin{bmatrix} 1 & -2 & 4 \\ 2 & -1 & 3 \\ 4 & 2 & 0 \end{bmatrix}$ is the adjoint of a square matrix B, then B^{-1} is equal to

- (a) $\pm A$ (b) $\pm\sqrt{2}A$ (c) $\pm\frac{1}{\sqrt{2}}B$ (d) $\pm\frac{1}{\sqrt{2}}A$

Q41. The value of $\begin{vmatrix} \underline{1} & \underline{2} & \underline{3} \\ \underline{2} & \underline{3} & \underline{4} \\ \underline{3} & \underline{4} & \underline{5} \end{vmatrix}$ is

- (a) -24 (b) -12 (c) 24 (d) 12

Q42. If $\begin{bmatrix} 1 & -\tan\theta \\ \tan\theta & 1 \end{bmatrix} \begin{bmatrix} 1 & \tan\theta \\ -\tan\theta & 1 \end{bmatrix}^{-1} = \begin{bmatrix} a & -b \\ b & a \end{bmatrix}$, then

- (a) $a^2 \times b^2 = 1$ (b) $a^2 + b^2 = 1$ (c) $a^2 - b^2 = 1$ (d) $b^2 - a^2 = 1$

Q43. If $A = [a_{ij}]$ is a 3×3 matrix and A_{ij} denotes the cofactors of the corresponding elements a_{ij} 's then, the value of $a_{21}A_{11} + a_{22}A_{12} + a_{23}A_{13} =$

- (a) $|A|$ (b) $-|A|$ (c) 0 (d) $|\text{adj.}A|$

Q44. If $\begin{vmatrix} x+1 & x-1 \\ x-3 & x+2 \end{vmatrix} = \begin{vmatrix} 4 & -1 \\ 1 & 3 \end{vmatrix}$, then the value of x will be

- (a) -3 (b) 1 (c) 3 (d) 2

Q45. If $A = [a_{ij}]_{3 \times 3}$ is a matrix, such that $\text{Det.}(A) = -15$ and C_{ij} represents the cofactor of a_{ij} , then the value of $a_{11}C_{11} + a_{12}C_{12} + a_{13}C_{13} =$

- (a) -15 (b) 15 (c) 0 (d) 1

Q46. Let $A = [a_{ij}]$ be a square matrix of order 3, such that $a_{ij} = \begin{cases} 1, & \text{if } i = j \\ 0, & \text{if } i \neq j \end{cases}$.

Then $a_{31}C_{31} + a_{32}C_{32} + a_{33}C_{33} =$

- (a) 0 (b) 1 (c) -1 (d) 111

Question numbers 47 to 50 are Assertion and Reason based questions. Two statements are given, one labelled **Assertion (A)** and the other labelled **Reason (R)**. Select the correct answer from the codes (a), (b), (c) and (d) as given below.

- (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 and 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.

Q47. **Assertion (A)** : If $\Delta = \begin{vmatrix} 0 & a-b & a-c \\ b-a & 0 & b-c \\ c-a & c-b & 0 \end{vmatrix}$, then $\Delta = 0$.

Reason (R) : The determinant value of a skew-symmetric matrix is always zero.

Q48. **Assertion (A)** : The matrix given by $M = \begin{bmatrix} -3 & 4 \\ -1 & 1 \end{bmatrix}$ is a non-invertible matrix.

Reason (R) : A singular matrix is always non-invertible.

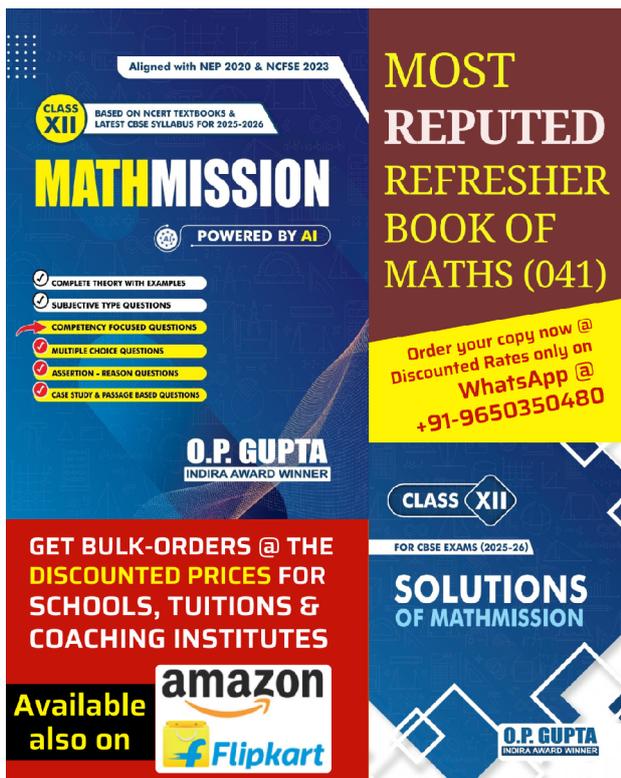
Q49. **Assertion (A)** : If $X = \begin{bmatrix} 1 & 2 \\ 1 & 4 \end{bmatrix}$, then $\text{adj.}X = \begin{bmatrix} 4 & -2 \\ -1 & 1 \end{bmatrix}$.

Reason (R) : For a matrix $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$, adjoint of the matrix will be given by $\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$.

Q50. **Assertion (A) :** Matrix $M = \begin{bmatrix} x & 0 & 0 \\ 0 & y & 0 \\ 0 & 0 & z \end{bmatrix}$ will have a determinant value given as 'xyz'.

Reason (R) : For a square matrix P of order n, we always have $|\text{adj.P}| = |P|^{n-1}$.

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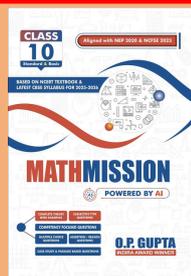
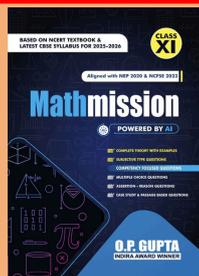
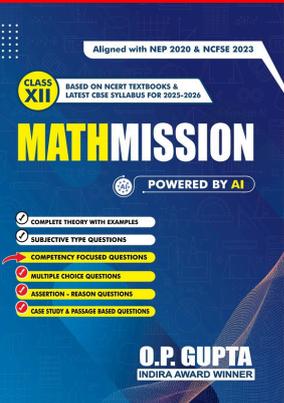
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