

Maxprap. Chapter wise Series Class 12th - Determinants

Class : 12th

Subject: Mathematics

Max. Marks : 50

Duration : 2 Hrs

Sections: A (MCQs), B (Short Answer-I), C (Short Answer-II), D (Long Answer), E (Case-Based).

General Instructions:

- All questions are compulsory.
- This question paper contains 23 questions divided into five Sections A, B, C, D and E. (iii). Section A comprises of 10 MCQs of 1 mark each. Section B comprises of 5 questions of 2 marks each. Section C comprises of 4 questions of 3 marks each. Section D comprises of 2 question of 5 marks each and Section E comprises of 2 Case Study Based Questions of 4 marks each.
- There is no overall choice.
- Use of Calculators is not permitted.

Section A

Questions 1 to 10 carry 1 mark each

1. $\begin{vmatrix} x+1 & x-1 \\ x^2+x+1 & x^2-x+1 \end{vmatrix}$ is equal to:

- a) 2 b) $2x^3 - 2$ c) $2x^3$ d) 0

2. If $A = \begin{bmatrix} 1 & 2 \\ -1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 2 \\ 3 & 1 \end{bmatrix}$, then $|AB|$ is equal to

- a) 14 b) - 14 c) 11 d) 12

3. For which value of x, are the determinants $\begin{vmatrix} 2x & -3 \\ 5 & x \end{vmatrix}$ and $\begin{vmatrix} 10 & 1 \\ -3 & 2 \end{vmatrix}$ equal?

- a) ± 2 b) 2 c) ± 3 d) - 3

4. If A is a square matrix of order 3 and $|A| = 5$, then $|\text{adj } A| =$

- a) 125 b) $\frac{1}{5}$ c) 5 d) 25

5. The area of the triangle, whose vertices are (3, 8), (-4, 2) and (5, 1), is

- a) 60 sq. units b) 61 sq. units c) 30 sq. units d) $\frac{61}{2}$ sq. units

6. If $A = \begin{bmatrix} 2 & -1 \\ 1 & 3 \end{bmatrix}$, then $A^{-1} = ?$

- a) $\begin{bmatrix} \frac{3}{7} & \frac{-1}{7} \\ \frac{1}{7} & \frac{2}{7} \end{bmatrix}$ b) $\begin{bmatrix} \frac{1}{3} & \frac{1}{7} \\ \frac{1}{7} & \frac{2}{7} \end{bmatrix}$ c) $\begin{bmatrix} \frac{1}{5} & \frac{2}{7} \\ \frac{1}{7} & \frac{3}{7} \end{bmatrix}$ d) $\begin{bmatrix} \frac{3}{7} & \frac{1}{7} \\ \frac{-1}{7} & \frac{2}{7} \end{bmatrix}$

7. If A and B are invertible matrices, then which of the following is not correct?

- a) $\text{adj } A = |A| \cdot A^{-1}$ b) $(AB)^{-1} = B^{-1} A^{-1}$
c) $(A + B)^{-1} = B^{-1} + A^{-1}$ d) $\det(A)^{-1} = [\det(A)]^{-1}$

8. If the points A(3, - 2), B(k, 2) and C(8, 8) are collinear then the value of k is
a) 5 b) - 4 c) 2 d) - 3

Assertion(A)/Reason(R) Based (9-10): In the following questions, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

- a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

9. Assertion (A): The points A(a, b + c), B (b, c + a) and C (c, a + b) are collinear.

Reason (R): Area of a triangle with three collinear points is zero.

10. Assertion (A): If $\begin{vmatrix} x & 2 \\ 18 & x \end{vmatrix} = \begin{vmatrix} 6 & 2 \\ 18 & 6 \end{vmatrix}$ then $x = \pm 6$.

Reason (R): If A is a skew - symmetric matrix of odd order, then $|A| = 0$.

SECTION – B

Questions 11 to 15 carry 2 marks each

11. Find value of k if area of triangle is 4 sq. units and vertices are : (k ,0), (4, 0), (0,2).

12. If $A = \begin{bmatrix} 1 & 1 & -2 \\ 2 & 1 & -3 \\ 5 & 4 & -9 \end{bmatrix}$ find $|A|$.

13. Show that $A = \begin{bmatrix} 6 & 5 \\ 7 & 6 \end{bmatrix}$ satisfies the equation $x^2 - 12x + 1 = 0$. Thus, find A^{-1}

14. Find the matrix X for which: $\begin{bmatrix} 3 & 2 \\ 7 & 5 \end{bmatrix} X \begin{bmatrix} -1 & 1 \\ -2 & 1 \end{bmatrix} = \begin{bmatrix} 2 & -1 \\ 0 & 4 \end{bmatrix}$

15. Solve the system of linear equation, using matrix method $2x - y = -2$; $3x + 4y = 3$.

SECTION – C

Questions 16 to 19 carry 3 marks each

16. If $A = \begin{bmatrix} 9 & -1 \\ 6 & -2 \end{bmatrix}$ and $B = \begin{bmatrix} -4 & 3 \\ 5 & -4 \end{bmatrix}$, verify that $(AB)^{-1} = B^{-1} A^{-1}$.

17. If $A = \begin{bmatrix} 1 & -2 & 0 \\ 2 & 1 & 3 \\ 0 & -2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 7 & 2 & -6 \\ -2 & 1 & -3 \\ -4 & 2 & 5 \end{bmatrix}$ find AB. Hence, solve the system of equations: $x - 2y = 10$, $2x + y + 3z = 8$ and $-2y + z = 7$

18. Two factories decided to award their employees for three values of (a) adaptable to new techniques, (b) careful and alert in difficult situations and (c) keeping calm in tense situations, at the rate of ₹ x, ₹ y and ₹ z per person respectively. The first factory decided to honour respectively 2, 4 and 3 employees with a total prize money of ₹ 29000. The second factory decided to honour respectively 5, 2 and 3 employees with the prize money of ₹ 30500. If the three prizes per person together cost ₹ 9500, then

- represent the above situation by a matrix equation and form linear equations using matrix multiplication.
 - Solve these equations using matrices.
- Which values are reflected in the questions?

19. Find the inverse of the matrix $A = \begin{bmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix}$. Using the inverse A^{-1} , solve the system of linear equations; $x - y + 2z = 1$; $2y - 3z = 1$; $3x - 2y + 4z = 3$.

SECTION – D

Questions 20 to 21 carry 5 marks each

20. If $A = \begin{bmatrix} 2 & -3 & 5 \\ 3 & 2 & -4 \\ 1 & 1 & -2 \end{bmatrix}$, find A^{-1} . Using A^{-1} solve the system of equations $2x - 3y + 5z = 11$; $3x + 2y - 4z = -5$; $x + y - 2z = -3$

21. If $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$, verify that $A^3 - 6A^2 + 9A - 4I = 0$ and hence find A^{-1}

SECTION – E (Case Study Based Questions)

Questions 22 & 23 carry 4 marks each

22. Read the following text carefully and answer the questions that follow:

Area of a triangle whose vertices are (x_1, y_1) , (x_2, y_2) and (x_3, y_3) is given by the determinant

$$\Delta = \frac{1}{2} \begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}$$

Since, area is a positive quantity, so we always take the absolute value of the determinant Δ . Also, the area of the triangle formed by three collinear points is zero.

- Find the area of the triangle whose vertices are $(-2, 6)$, $(3, -6)$, and $(1, 5)$. (1)
- If the points $(2, -3)$, $(k, -1)$ and $(0, 4)$ are collinear, then find the value of $4k$. (1)
- If the area of a triangle ABC, with vertices $A(1, 3)$, $B(0, 0)$ and $C(k, 0)$ is 3 sq. units, then find the value of k . (2)

OR

Using determinants, find the equation of the line joining the points $A(1, 2)$ and $B(3, 6)$. (2)

23. Read the following text carefully and answer the questions that follow:

The monthly incomes of two sister Rita and Ritika are in the ratio 3 : 4 and their monthly expenditures are in the ratio 5 : 7. Each sister saves ₹ 15,000 per month.



- a) What is the system of linear equations representing the given information about the monthly income of Rita and Ritika are ₹ 3x and ₹ 4x, respectively and their monthly expenditures are ₹ 5y and ₹ 7y, respectively. (1)

- b) What is the matrix equation representing the given system of linear equations? (1)

$$3x - 5y = 15000$$

$$4x - 7y = 15000$$

- c) If $A = \begin{bmatrix} 3 & -5 \\ 4 & -7 \end{bmatrix}$ then what is the value of A^{-1} ? (2)

OR

What is the monthly income of Rita and Ritika? (2)

Determinants Paper Details – Analysis		
Objective Questions		
MCQ	1 marks x 8 question = 8	
Assertion Reason	1 marks x 2 question = 2	
Subjective		
Short type I	2 marks x 5 question = 10	
Short type II	3 marks x 4 question = 12	
Long Type	5 marks x 2 question = 10	
Case Studies Based		
Case 1	4 marks	
Case 2	4 marks	

Total = 50 marks Your Score =