



SUBJECT NAME – MATHEMATICS

QUESTION BANK

TOPIC: MATRICES & DETERMINANTS (GRADE XII)

(3) Matrices and Determinants

MCQ (1 Marks)

1. If a matrix has 6 elements, then number of possible orders of the matrix can be
 - (a) 2
 - (b) 4
 - (c) 3
 - (d) 6
2. Total number of possible matrices of order 2×3 with each entry 1 or 0 is
 - (a) 6
 - (b) 36
 - (c) 32
 - (d) 64
3. If A is a square matrix such that $A^2=A$, then $(I + A)^2 - 3A$ is
 - (a) I
 - (b) 2A
 - (c) 3I
 - (d) A
4. If matrices A and B are inverse of each other then
 - (a) $AB = BA$
 - (b) $AB = BA = I$
 - (c) $AB = BA = 0$
 - (d) $AB = 0, BA = I$
5. The diagonal elements of a skew symmetric matrix are
 - (a) all zeroes
 - (b) are all equal to some scalar $k(\neq 0)$
 - (c) can be any number
 - (d) none of these



6. If a matrix A is both symmetric and skew symmetric then matrix A is

- (a) a scalar matrix
- (b) a diagonal matrix
- (c) a zero matrix of order $n \times n$
- (d) a rectangular matrix

7. $A = [a_{ij}]_{m \times n}$ is a square matrix, if

- (A) $m < n$
- (B) $m > n$
- (C) $m = n$
- (D) None of these .

8. The number of all possible matrices of order 3×3 with each entry 0 or 1 is:

- (a) 27
- (b) 18
- (c) 81
- (d) 512

9. The restriction on n , k and p so that $PY + WY$ will be defined are:

- (A) $k = 3, p = n$
- (B) k is arbitrary, $p = 2$
- (C) p is arbitrary, $k = 3$
- (D) $k = 2, p = 3$

10. If $n = p$, then the order of the matrix $7X - 5Z$ is:

- (A) $p \times 2$
- (B) $2 \times n$
- (C) $n \times 3$
- (D) $p \times n$

11. If A, B are symmetric matrices of same order, then $AB - BA$ is a

- (A) Skew symmetric matrix
- (B) Symmetric matrix
- (C) Zero matrix
- (D) Identity matrix

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

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

13. If the matrix A is both symmetric and skew symmetric, then

- (A) A is a diagonal matrix
- (B) A is a zero matrix
- (C) A is a square matrix
- (D) None of these

14. If A is square matrix such that $A^2 = A$, then $(I + A)^3 - 7A$ is equal to



- (A) A (B) I - A (C) I (D) 3A

Question 15.

Assertion(A) : Only square Matrices can be multiplied

Reason(R) : Square matrices have the same order

- a) Assertion is true and Reason is true . Reason is correct explanation for Assertion.
b) Assertion is true and Reason is true . Reason is not the correct explanation for Assertion.
c) Assertion is true and Reason is false.
d) Assertion is false but Reason is true.

Question 16.

Assertion(A) : A Square matrix can be expressed as sum of two different Matrix

Reason(R) : These matrices essentially are symmetric and skew symmetric

- a) Assertion is true and Reason is true . Reason is correct explanation for Assertion.
b) Assertion is true and Reason is true . Reason is not the correct explanation for Assertion.
c) Assertion is true and Reason is false.
d) Assertion is false but Reason is true.

Very Short Answer Question(2 marks)

Q1.If $\begin{bmatrix} x + 3y & y \\ 7 - x & 4 \end{bmatrix} = \begin{bmatrix} 4 & -1 \\ 0 & 4 \end{bmatrix}$ Find the value of x and y.

Q.2 A matrix has 2 rows and 3 columns. How many elements a matrix has?

Q.3 Evaluate $\begin{bmatrix} \sin^2 x & 1 \\ \cot^2 x & 0 \end{bmatrix} + \begin{bmatrix} \cos^2 x & 0 \\ -\operatorname{cosec}^2 x & 1 \end{bmatrix} + \begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix}$

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Q.4 If $A = \begin{bmatrix} X & 0 \\ 0 & X \end{bmatrix}$ Find A^{16} .

Q5 Find x, if $x + \begin{bmatrix} 2 & -1 \\ 3 & -1 \end{bmatrix} = \begin{bmatrix} 2 & 4 \\ 5 & 0 \end{bmatrix}$

Q.6 If $X_{m \times 3} \times Y_{p \times 4} = Z_{2 \times b}$ for three matrices, find the value of m, p and b

Q.7 If $F(\theta) = \begin{bmatrix} \cos \theta & \sin \theta \\ \sin \theta & \cos \theta \end{bmatrix}$, Write $F(x + y)$.

Q.8 Construct a 2×2 matrix $A = [a_{ij}]$ where $a_{ij} = \frac{(3i-j)^2}{2}$

Q.9 If $A = \begin{bmatrix} 8 & 0 \\ 4 & -2 \\ 3 & 6 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -2 \\ 4 & 2 \\ 5 & -1 \end{bmatrix}$ then find the matrix X such that $2A + 3X = 5B$

Q.10 Find X and Y if $X + Y = \begin{bmatrix} 5 & 2 \\ 0 & 9 \end{bmatrix}$ and $X - Y = \begin{bmatrix} 3 & 6 \\ 0 & -1 \end{bmatrix}$.

Q.11 If $A = \begin{bmatrix} \sin x & \cos x \\ -\cos x & \sin x \end{bmatrix}$, then verify that $A' A = I$.

Q.12 Construct a 3×1 matrix $A = [a_{ij}]$ whose elements a_{ij} are given by $\frac{1}{2} |-3i - j|$

Q.13 How many orders are possible for a matrix having 15 elements?

Q.14 Find a and b $\begin{bmatrix} a + b & 2 \\ 5 & ab \end{bmatrix} = \begin{bmatrix} 6 & 2 \\ 5 & 8 \end{bmatrix}$

Q.15. A is square matrix of order 3 and $|A| = 7$. Write the value of $|\text{adj. } A|$.

Short Answer questions

(19 x 3 = 57)

Question 1.

If $3A - B = \begin{bmatrix} 5 & 0 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & 3 \\ 2 & 5 \end{bmatrix}$ then find the value of matrix A.

Question 2.

Find the value of $x - y$, if

$$2 \begin{bmatrix} 1 & 3 \\ 0 & x \end{bmatrix} + \begin{bmatrix} y & 0 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 5 & 6 \\ 1 & 8 \end{bmatrix}$$

Question 3.

If A is a square matrix such that $A^2 = I$, then find the simplified value of $(A - I)^3 + (A + I)^3 - 7A$.

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Question 4.

Write the number of all possible matrices of order 2×2 with each entry 1, 2 or 3.

Question 5.

If $[2 \ 1 \ 3] \begin{bmatrix} -1 & 0 & -1 \\ -1 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix} \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix} = A$, then write the order of matrix A

Question 6.

Write the element a_{ij} of a 3×3 matrix $A = [a_{ij}]$, whose elements are given by $a_{ij} = |i-j|/2$

Question 7.

If $[2x \ 3] \begin{bmatrix} 1 & 2 \\ -3 & 0 \end{bmatrix} \begin{bmatrix} x \\ 3 \end{bmatrix} = 0$, find x

Question 8.

If $2 \begin{bmatrix} 3 & 4 \\ 5 & x \end{bmatrix} + \begin{bmatrix} 1 & y \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 7 & 0 \\ 10 & 5 \end{bmatrix}$ then find $(x - y)$

Question 9.

Solve the following matrix equation for x.

$$[x \ 1] \begin{bmatrix} 1 & 0 \\ -2 & 0 \end{bmatrix} = 0$$

Question 10.

If A is a square matrix such that $A^2 = A$, then write the value of $7A - (I + A)^3$, where I is an identity matrix.

Question 11.

If, $\begin{bmatrix} x - y & z \\ 2x - y & w \end{bmatrix} = \begin{bmatrix} 5 & 0 \\ 4 & 1 \end{bmatrix}$ then find the value of $x + y$.

Question 12.

If, $\begin{bmatrix} a + 4 & 3b \\ 8 & -6 \end{bmatrix} = \begin{bmatrix} 2a + 2 & b + 2 \\ 8 & a - 8b \end{bmatrix}$ then write the value of $a - 2b$

Question 13.

If $\begin{bmatrix} xy & 4 \\ z + 6 & x + y \end{bmatrix} = \begin{bmatrix} 8 & w \\ 0 & 6 \end{bmatrix}$ then write the value of $(x + y + z)$

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Question 14.

The elements a of a 3×3 matrix are given by $a_{ij} = 2|-3i + j|$. Write the value of element a_{32} .

Question 15.

If $[2x \ 4] \begin{bmatrix} x \\ -8 \end{bmatrix} = 0$, then find the positive value of x .

Question 16.

If $2 \begin{bmatrix} 1 & 3 \\ 0 & x \end{bmatrix} + \begin{bmatrix} y & 0 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 7 & 0 \\ 10 & 5 \end{bmatrix}$ then find the value of $(x + y)$.

Question 17.

Find the value of a , if $\begin{bmatrix} a - b & 2a + c \\ 2a - b & 3c + d \end{bmatrix} = \begin{bmatrix} -1 & 5 \\ 0 & 13 \end{bmatrix}$

Question 18.

If matrix $A = \begin{bmatrix} 5 & -5 \\ -5 & 5 \end{bmatrix}$ and $A^2 = \lambda A$, then write the value of λ .

Question 19.

Simplify

$$\cos \theta \begin{bmatrix} \cos a & \sin a \\ -\sin a & \cos a \end{bmatrix} + \sin \theta \begin{bmatrix} \sin a & -\cos a \\ \cos a & \sin a \end{bmatrix}$$

Long Answer questions

(8 x 5=40)

Question 20.

Solve using matrices

$$x + y + z = 9$$

$$x + z = 5$$

$$y + z = 7$$

Question 21.

If $A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$ then find the values of $(A^2 - 5A)$

Question 22.

Let $A = \begin{bmatrix} 2 & -1 \\ -3 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 5 & 2 \\ 7 & 4 \end{bmatrix}$, $C = \begin{bmatrix} 2 & 5 \\ 3 & 8 \end{bmatrix}$ find a matrix D such that $CD - AB = 0$

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Question 23.

If $A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$ then find $A^2 - 5A + 4I$ and hence find a matrix X such that

$$A^2 - 5A + 4I + X = 0$$

Question 24.

If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & x \\ -2 & 2 & -1 \end{bmatrix}$ is a matrix satisfying $AA' = 9I$, find x

Question 25.

If the matrix $A = \begin{bmatrix} 0 & a & -3 \\ 2 & 0 & -1 \\ b & 1 & 0 \end{bmatrix}$ is skew-symmetric, find the values of 'a' and 'b'.

Question 26.

Matrix $A = \begin{bmatrix} 0 & 2b & -2 \\ 3 & 1 & 3 \\ 3a & 3 & -1 \end{bmatrix}$ is given to be symmetric, find the values

of a and b

Question 27.

Write 3×3 matrix which is both symmetric and skew-symmetric.

Question 28.

Show that all the diagonal elements of a skew-symmetric matrix are zero.

And calculate the total number of different inputs a 100×100 symmetric and skew symmetric matrix have.

Very Short Answer questions

(10 x

2=20)

Question 1.

Find $|AB|$, if $A = \begin{bmatrix} 0 & 2 & -2 \\ 3 & 1 & 3 \\ 3 & 3 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 7 & 2b & -6 \\ 3 & 1 & 3 \\ 4 & 6 & 5 \end{bmatrix}$

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Question 2.

Find the maximum value of the determinant $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1 + \sin a & 1 \\ 1 & 1 & 1 + \cos a \end{vmatrix}$

Question 3.

If $\begin{vmatrix} x & \sin a & \cos a \\ -\sin a & -x & -1 \\ \cos a & 1 & x \end{vmatrix} = 8$, write the value of x.

Question 4.

If $A = \begin{bmatrix} 5 & 6 & -3 \\ 2 & 1 & 3 \\ 3 & 3 & -1 \end{bmatrix}$ then write the cofactor of the element a_{21} of its 2nd row.

Question 6.

In the interval it $\pi/2 < x < \pi$, find the value of x for which the matrix $\begin{bmatrix} 2 \sin x & 3 \\ 1 & 2 \sin x \end{bmatrix}$ is singular.

Question 7.

If A_{ij} is the cofactor of the element a of the determinant $\begin{vmatrix} 1 & -3 & 5 \\ 6 & 0 & 4 \\ 2 & 1 & 3 \end{vmatrix}$, then write the value of $a_{32} \cdot A_{32}$.

Question 8.

What is the value of determinant $\begin{vmatrix} 1 & -3 & 5 \\ 6 & 0 & 4 \\ 2 & 1 & 3 \end{vmatrix}$

Question 9.

Find the minor of the element of second row and third column (a_{23}) in the following

Determinant $\begin{vmatrix} 2 & 3 & 5 \\ 6 & 0 & 4 \\ 3 & 6 & 0 \end{vmatrix}$

Question 10.

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solve the following for x $\begin{vmatrix} a+x & a-x & a-x \\ a-x & a+x & a-x \\ a-x & a-x & a+x \end{vmatrix}$

SHORT answer questions(3 Marks)

1. Find values of x for which $\begin{vmatrix} 3 & x \\ x & 1 \end{vmatrix} = \begin{vmatrix} 3 & 2 \\ 4 & 1 \end{vmatrix}$

2. Evaluate $\Delta = \begin{vmatrix} 3 & 2 & 3 \\ 2 & 2 & 3 \\ 3 & 2 & 3 \end{vmatrix}$

3. Let $\begin{vmatrix} 4 & y \\ x & 1 \end{vmatrix} = \begin{vmatrix} 4 & 2 \\ 4 & 1 \end{vmatrix}$ find all the possible value of x and y if x and y are natural numbers.

4. Find minors and cofactors of all the elements of the determinant $\begin{vmatrix} 1 & -2 \\ 4 & 3 \end{vmatrix}$

5. Show that $\begin{vmatrix} \sin 10^\circ & -\cos 10^\circ \\ \sin 80^\circ & \cos 80^\circ \end{vmatrix}$

6. Find adj A for $A = \begin{bmatrix} 2 & 3 \\ 4 & 1 \end{bmatrix}$

7. If matrix $A = \begin{bmatrix} 1 & -2 & 3 \\ 1 & 2 & 1 \\ x & 2 & -3 \end{bmatrix}$ is singular, find x.

8. $A = \begin{vmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{vmatrix}$ prove that $\det A = \det A'$

Long Answer type question

(7 x 5 = 35)

Question 11.

For what values of k the system of linear equations

$x + y + z = 2$



$$2x + y - z = 3$$

$3x + 2y + kz = 4$ has a unique solutions?

Question 12.

A square matrix has an unique inverse: prove this statement.

Question 13.

Solve the system of equations $x + y + z = 6$, $x + 2z = 7$, $3x + y + z = 12$.

Question 14.

A total amount of ₹ 7000 is deposited in three different savings bank accounts with annual interest rates of 5%, 8% and 8 12 %, respectively. The total annual interest from these three accounts is ₹ 550. Equal amounts have been deposited in the 5% and 8% savings accounts. Find the amount deposited in each of the three accounts, with the help of matrices.

Question 15.

Using matrices, solve the following system of equations.

$$x - y + 2z = 7$$

$$3x + 4y - 5z = -5$$

$$2x - y + 3z = 12$$

Question 16.

Using matrices, solve the following system of linear equations.

$$x + y - z = 3$$

$$2x + 3y + z = 10$$

$$3x - y - 7z = 1$$

Question 17.

Using matrices, solve the following system of equations.

$$4x + 3y + 2z = 60$$

$$x + 2y + 3z = 45$$

$$6x + 2y + 3z = 70$$

CASE STUDY

(4 marks)



Matrices and Determinants

Q1. Two schools P and Q want to award their selected students on the values of Tolerance, Kindness, and Leadership. The school P wants to award Rs x each, Rs y each and Rs z each for the three respective values to 3, 2 and 1 students respectively with total award money of Rs. 2200.

School Q wants to spend Rs 3100 to award its 4, 1 and 3 students on the respective values (by giving the same award money to the three values as school P). If the total amount of award for one prize on each value is Rs1200, using matrices, find the following:

1. What is award money for Tolerance?
 1. 350
 2. 300
 3. 500
 4. 400
2. What is the award money for Leadership?
 1. 300
 2. 280
 3. 450
 4. 500
3. What is the award money for Kindness?
 1. 500
 2. 400
 3. 300
 4. 550
4. If a matrix A is both symmetric and skew-symmetric, then
 1. A is a diagonal matrix
 2. A is a scalar matrix
 3. A is a zero matrix
 4. A is a square matrix
5. If A and B are two matrices such that $AB = B$ and $BA = A$, then B^2 is equal to
 1. B

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2. A
3. 1
4. 0

Q2. Read the case study carefully and answer any four out of the following questions:

Three friends Ravi, Raju and Rohit were buying and selling stationery items in a market. The price of per dozen of Pen, notebooks and toys are Rupees x , y and z respectively.

Ravi purchases 4 dozen of notebooks and sells 2 dozen pens and 5 dozen toys.

Raju purchases 2 dozen toys and sells 3 dozen pens and 1 dozen of notebooks.

Rohit purchases one dozen of pens and sells 3 dozen notebooks and one dozen toys.

In the process, Ravi, Raju and Rohit earn ₹ 1500, ₹ 100 and ₹ 400 respectively.



1. What is the price of one dozen of pens?
 1. ₹ 100
 2. ₹ 200
 3. ₹ 300
 4. ₹ 400

2. What is the total price of one dozen of pens and one dozen of notebooks?
 1. ₹ 100
 2. ₹ 200
 3. ₹ 300

4. ₹ 400

3. What is the sale amount of Ravi?

1. ₹ 1000
2. ₹ 1100
3. ₹ 1300
4. ₹ 1200

4. What is the amount of purchases made by all three friends?

1. ₹ 1200
2. ₹ 1500
3. ₹ 1300
4. ₹ 1400

5. What is the price of sales made by all three friends?

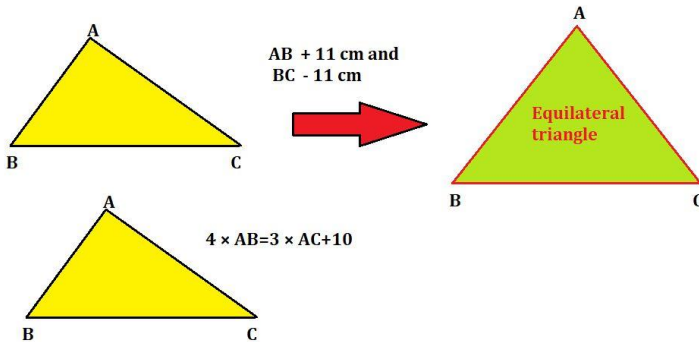
1. ₹ 3000
2. ₹ 2500
3. ₹ 2700
4. ₹ 2400

Q3. Read the case study carefully and answer any four out of the following questions:

Once a mathematics teacher drew a triangle ABC on the blackboard. Now he asked Jose, "If I increase AB by 11 cm and decrease the side BC by 11 cm, then what type of triangle it would be?"

Jose said, "It will become an equilateral triangle."

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Again teacher asked Suraj, "If I multiply the side AB by 4 then what will be the relation of this with side AC?"

Suraj said it will be 10 cm more than the three times AC.

Find the sides of the triangle using the matrix method and answer the following questions:

- What is the length of the smallest side?
 - 54 cm
 - 43 cm
 - 30 cm
 - 35 cm
- What is the length of the largest side?
 - 54 cm
 - 43 cm
 - 65 cm
 - 35 cm
- What is the perimeter of the triangle?
 - 150 cm
 - 160 cm
 - 165 cm
 - 162 cm
- What is the side of the equilateral triangle formed?
 - 54 cm
 - 43 cm
 - 30 cm



4. 35 cm
5. What is the order of the matrix formed?
1. 3×3
 2. 2×3
 3. 3×2
 4. 2×2