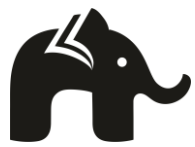


PRACTICE MCQS

CLASS 12 MATHS (TERM - I)
MATRICES

BY
learn-o-hub
learning simplified





Question 1:

If a matrix has 12 elements, then the number of possible order it can have, is

- (a) 2
- (b) 4
- (c) 6
- (d) 8

Answer: (c) 6

We know that if a matrix is of the order $m \times n$, it has mn elements.

Thus, to find all the possible orders of a matrix having 12 elements, we have to find all the ordered pairs of natural numbers whose product is 12.

The ordered pairs are: (1, 12), (12, 1), (2, 6), (6, 2), (3, 4) and (4, 3).

So, the possible orders of a matrix having 24 elements are:

$1 \times 12, 12 \times 1, 2 \times 6, 6 \times 2, 3 \times 4$ and 4×3

Hence, total possible order = 6

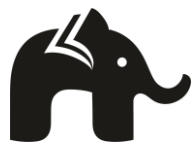
Question 2:

Given that matrices A and B are of order $3 \times n$ and $m \times 5$ respectively, then the order of matrix $C = 5A + 3B$ is:

- (a) 3×5 and $m = n$
- (b) 3×5
- (c) 3×3
- (d) 5×5

Answer: (b) 3×5

Given that matrices A and B are of order $3 \times n$ and $m \times 5$ respectively.



To find $5A + 3B$, the order of matrix A and B must be same.

$$\text{So, } 3 * n = m * 5$$

$$\Rightarrow n = 5$$

So, the order of matrix $C = 5A + 3B$ is $3 * 5$

Question 3:

A $2 * 2$ matrix, $X = [a_{ij}]$, whose elements are given by $a_{ij} = (i + j)^2/2$, is

(a) $\begin{bmatrix} 2 & 9 \\ 9 & 4 \end{bmatrix}$

(b) $\begin{bmatrix} 1 & 9/2 \\ 9/2 & 4 \end{bmatrix}$

(c) $\begin{bmatrix} 2 & 9/2 \\ 9/2 & 8 \end{bmatrix}$

(d) $\begin{bmatrix} 2 & 9 \\ 9/2 & 8 \end{bmatrix}$

Answer: (c) $\begin{bmatrix} 2 & 9/2 \\ 9/2 & 8 \end{bmatrix}$

Given, $a_{ij} = (i + j)^2/2$

In general a $2 * 2$ matrix is given by $A = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}$

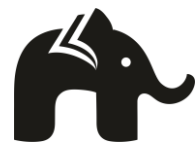
Now,

$$a_{11} = (1 + 1)^2/2 = 4/2 = 2$$

$$a_{12} = (1 + 2)^2/2 = 9/2$$

$$a_{21} = (2 + 1)^2/2 = 9/2$$

$$a_{22} = (2 + 2)^2/2 = 16/2 = 8$$



Therefore, the required matrix is $A = \begin{bmatrix} 2 & 9/2 \\ 9/2 & 8 \end{bmatrix}$

Question 4:

If $\begin{bmatrix} 4 & 3 \\ x & 5 \end{bmatrix} = \begin{bmatrix} y & z \\ 1 & 5 \end{bmatrix}$, then the value of $x - y + z$ is

- (a) 0
- (b) 1
- (c) 2
- (d) 3

Answer: (a) 0

Given, $\begin{bmatrix} 4 & 3 \\ x & 5 \end{bmatrix} = \begin{bmatrix} y & z \\ 1 & 5 \end{bmatrix}$

As the given matrices are equal, their corresponding elements are also equal.

Comparing the corresponding elements, we get:

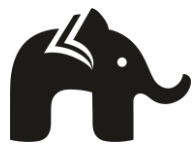
$$x = 1, y = 4, \text{ and } z = 3$$

$$\text{Now, } x - y + z = 1 - 4 + 3 = 4 - 4 = 0$$

Question 5:

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

- (a) $m < n$
- (b) $m > n$
- (c) $m = n$



(d) None of these

Answer: (c) $m = n$

It is known that a given matrix is said to be a square matrix if the number of rows is equal to the number of columns.

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

Question 6:

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

(a) 27

(b) 81

(c) 256

(d) 512

Answer: (d) 512

The given matrix of the order 3×3 has 9 elements and each of these elements can be either 0 or 1.

Now, each of the 9 elements can be filled in two possible ways.

Therefore, by the multiplication principle, the required number of possible matrices is $2^9 = 512$

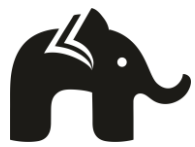
Question 7:

If $\begin{bmatrix} 2a + b & a - 2b \\ 5c - d & 4c + 3d \end{bmatrix} = \begin{bmatrix} 4 & -3 \\ 11 & 24 \end{bmatrix}$, then value of $a + b - c + 2d$ is:

(a) 8

(b) 10

(c) 4



(d) -8

Answer: (a) 8

$$\text{Given, } \begin{bmatrix} 2a + b & a - 2b \\ 5c - d & 4c + 3d \end{bmatrix} = \begin{bmatrix} 4 & -3 \\ 11 & 24 \end{bmatrix}$$

As the given matrices are equal, their corresponding elements are also equal.

Comparing the corresponding elements, we get:

$$2a + b = 4 \quad \dots\dots\dots 1$$

$$a - 2b = -3 \quad \dots\dots\dots 2$$

$$5c - d = 11 \quad \dots\dots\dots 3$$

$$4c + 3d = 24 \quad \dots\dots\dots 4$$

Solving equations 1 and 2, we get

$$a = 1, b = 2$$

Again, solving equations 3 and 4, we get

$$c = 3, d = 4$$

$$\text{Now, } a + b - c + 2d = 1 + 2 - 3 + 2 * 4$$

$$= 1 + 2 - 3 + 8$$

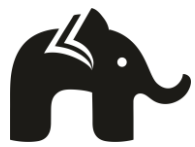
$$= 11 - 3$$

$$= 8$$

Question 8:

If $A = \begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then the value of k so that

$$A^2 = kA - 2I, \text{ is}$$



- (a) 1
- (b) 2
- (c) 3
- (d) 5

Answer: (a) 1

We have $A^2 = A * A$

$$\begin{aligned} \Rightarrow A^2 &= \begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix} \begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix} \\ &= \begin{bmatrix} 3 * 3 + (-2) * 4 & 3 * (-2) + (-2) * (-2) \\ 4 * 3 + (-2) * 4 & 4 * (-2) + (-2) * (-2) \end{bmatrix} = \begin{bmatrix} 1 & -2 \\ 4 & -4 \end{bmatrix} \end{aligned}$$

Now, $A^2 = kA - 2I$

$$\Rightarrow \begin{bmatrix} 1 & -2 \\ 4 & -4 \end{bmatrix} = k \begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix} - 2 \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} 1 & -2 \\ 4 & -4 \end{bmatrix} = \begin{bmatrix} 3k & -2k \\ 4k & -2k \end{bmatrix} - \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$$

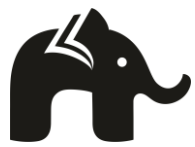
$$\Rightarrow \begin{bmatrix} 1 & -2 \\ 4 & -4 \end{bmatrix} = \begin{bmatrix} 3k - 2 & -2k \\ 4k & -2k - 2 \end{bmatrix}$$

Comparing the corresponding elements, we have:

$$3k - 2 = 1$$

$$\Rightarrow 3k = 3$$

$$\Rightarrow k = 1$$



Question 9:

Assume X, Y, Z, W and P are matrices of order $2 \times n$, $3 \times k$, $2 \times p$, $n \times 3$ and $p \times k$ respectively. 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) $p \times n$

Answer: (b) $2 \times n$

Matrix X is of the order $2 \times n$.

Therefore, matrix $7X$ is also of the same order.

Matrix Z is of the order $2 \times p$, i.e., $2 \times n$ [Since $n = p$]

Therefore, matrix $5Z$ is also of the same order.

Now, both the matrices $7X$ and $5Z$ are of the order $2 \times n$.

Thus, matrix $7X - 5Z$ is well-defined and is of the order $2 \times n$.

Question 10:

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

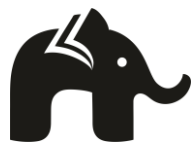
- (a) Symmetric matrix
- (b) Skew symmetric matrix
- (c) Zero matrix
- (d) Identity matrix

Answer: (b) Skew symmetric matrix

A and B are symmetric matrices, therefore, we have:

$$A' = A \text{ and } B' = B \dots\dots\dots 1$$

$$\text{Consider } (AB - BA)' = (AB)' - (BA)' \quad [\text{Since } (A - B)' = A' - B']$$



$$= B'A' - A'B' \quad [\text{Since } (AB)' = B'A']$$

$$= BA - AB \quad [\text{From equation 1}]$$

$$= -(AB - BA)$$

$$\text{So, } (AB - BA)' = - (AB - BA)'$$

Thus $(AB - BA)'$ is a skew-symmetric matrix.

Question 11:

If $A = \begin{pmatrix} \cos \alpha & -\sin \alpha \\ \sin \alpha & \cos \alpha \end{pmatrix}$, then $A + A' = I$, if the value of α is

- (a) $\pi/6$
- (b) $\pi/3$
- (c) π
- (d) $3\pi/2$

Answer: (b) $\pi/3$

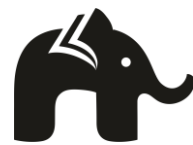
$$\text{Given, } A = \begin{pmatrix} \cos \alpha & -\sin \alpha \\ \sin \alpha & \cos \alpha \end{pmatrix}$$

$$\text{So, } A' = \begin{pmatrix} \cos \alpha & \sin \alpha \\ -\sin \alpha & \cos \alpha \end{pmatrix}$$

Now, $A + A' = I$

$$\Rightarrow \begin{pmatrix} \cos \alpha & -\sin \alpha \\ \sin \alpha & \cos \alpha \end{pmatrix} + \begin{pmatrix} \cos \alpha & \sin \alpha \\ -\sin \alpha & \cos \alpha \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

$$\Rightarrow \begin{pmatrix} 2\cos \alpha & 0 \\ 0 & 2\cos \alpha \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$



Comparing the corresponding elements of the two matrices, we have:

$$2\cos \alpha = 1$$

$$\Rightarrow \cos \alpha = 1/2$$

$$\Rightarrow \cos \alpha = \pi/3$$

$$\Rightarrow \alpha = \pi/3$$

Question 12:

If $A = [a_{ij}]$ is a square matrix of order 2 such that $a_{ij} = \begin{cases} 1, & \text{when } i \neq j \\ 0, & \text{when } i = j \end{cases}$

, then A^2 is:

(a) $\begin{pmatrix} 1 & 0 \\ 1 & 0 \end{pmatrix}$

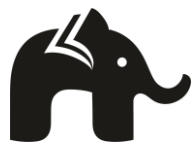
(b) $\begin{pmatrix} 1 & 1 \\ 0 & 0 \end{pmatrix}$

(c) $\begin{pmatrix} 1 & 1 \\ 1 & 0 \end{pmatrix}$

(d) $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

Answer: (d) $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

Let the matrix is $A = \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix}$



$$\text{Given, } a_{ij} = \begin{cases} 1, & i = j \\ 0, & i \neq j \end{cases}$$

$$\text{Now, } a_{11} = 0, a_{22} = 0, a_{12} = 1, a_{21} = 1$$

So, the matrix is

$$A = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$$

$$\begin{aligned} \text{Now, } A^2 &= \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} \\ &= \begin{pmatrix} 0 * 0 + 1 * 1 & 0 * 1 + 1 * 0 \\ 1 * 0 + 0 * 1 & 1 * 1 + 0 * 0 \end{pmatrix} \\ &= \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \end{aligned}$$

Question 13:

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

- (a) $I + A$
- (b) $I + 6A$
- (c) $I + 8A$
- (d) $I + 14A$

Answer: (d) $I + 14A$

Given, A is square matrix and $A^2 = A$

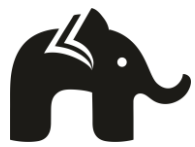
$$(I + A)^3 = I^3 + A^3 + 3I^2A + 3IA^2 + 7A$$

$$= I^3 + A.A^2 + 3I^2A + 3IA^2 + 7A$$

$$= I + A.A + 3A + 3A + 7A \quad [\text{Since } A^2 = A \text{ and } I^3 = I]$$

$$= I + A^2 + 6A + 7A$$

$$= I + A + 13A \quad [\text{Since } A^2 = A]$$



$$= I + 14A$$

Question 14:

If A is a skew symmetric matrices then A^2 is a/an _____ matrix.

- (a) symmetric
- (b) skew symmetric
- (c) identity
- (d) zero

Answer: (a) symmetric

A square matrix A is said to be skew-symmetric if $A^T = -A$

Now, consider $A^T = -A$

By taking square on both sides, we get

$$\Rightarrow (A^T)^2 = (-A)^2$$

$$\Rightarrow (A^T)^2 = A^2$$

So, A^2 is a symmetric matrix.

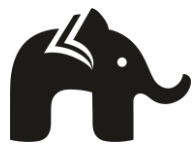
Question 15:

If A is a matrix of order $m * n$ and B is a matrix of order $n * p$ then order of AB is

- (a) $n * m$
- (b) $m * p$
- (c) $n * n$
- (d) AB is not possible

Answer: (b) $m * p$

Given, A is a matrix of order $m * n$ and B is a matrix of order $n * p$



If a number of columns of matrix A are equal to a number of rows in matrix B,
Then AB is possible.

Now, order of AB = $m * p$ $\{m * n * n * p = m * p, n \text{ is omitted}\}$

Question 16:

If $A = \begin{pmatrix} 4 & x + 2 \\ 2x - 3 & x + 1 \end{pmatrix}$ is symmetric then $x =$

- (a) 2
- (b) 5
- (c) 8
- (d) 11

Answer: (b) 5

Given, matrix A is symmetric

i.e. $A = A^T$

$$\begin{pmatrix} 4 & x + 2 \\ 2x - 3 & x + 1 \end{pmatrix} = \begin{pmatrix} 4 & 2x - 3 \\ x + 2 & x + 1 \end{pmatrix}$$

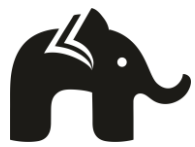
Now, $2x - 3 = x + 2$

$\Rightarrow x = 5$

Question 17:

If A is matrix of order $m * n$ and B is a matrix such that AB' and $B'A$ are both defined, then order of matrix B is

- (a) $m * m$
- (b) $n * n$
- (c) $n * m$
- (d) $m * n$



Answer: (d) $m * n$

AB' is defined only when order of B' is $n * x$

$B'A$ is defined only when order of B' is $n * m$, i.e., $x = m$

So, the order of matrix B is $m * n$

Question 18:

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

- (a) A
- (b) $I + A$
- (c) $I - A$
- (d) I

Answer: (d) I

Given, A is square matrix and $A^2 = A$

$$(I + A)^3 = I^3 + A^3 + 3I^2A + 3IA^2 - 7A$$

$$= I^3 + A.A^2 + 3I^2A + 3IA^2 - 7A$$

$$= I + A.A + 3A + 3A - 7A \quad [\text{Since } A^2 = A \text{ and } I^3 = I]$$

$$= I + A^2 + 6A - 7A$$

$$= I + A + 6A - 7A \quad [\text{Since } A^2 = A]$$

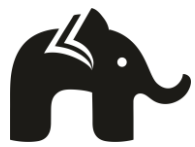
$$= I + 7A - 7A$$

$$= I$$

Question 19:

If $A = \begin{pmatrix} 1 & -1 \\ 2 & -1 \end{pmatrix}$, $B = \begin{pmatrix} x & 1 \\ y & -1 \end{pmatrix}$ and $(A + B)^2 = A^2 + B^2$, then $x + y =$

- (a) 1
- (b) 5



(c) 12

(d) 20

Answer: (b) 5

Given, $(A + B)^2 = A^2 + B^2$

$$\Rightarrow A^2 + B^2 + AB + BA = A^2 + B^2$$

$$\Rightarrow AB + BA = 0$$

$$\Rightarrow \begin{pmatrix} 1 & -1 \\ 2 & -1 \end{pmatrix} \begin{pmatrix} x & 1 \\ y & -1 \end{pmatrix} + \begin{pmatrix} x & 1 \\ y & -1 \end{pmatrix} \begin{pmatrix} 1 & -1 \\ 2 & -1 \end{pmatrix} = \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$$

$$\Rightarrow \begin{pmatrix} x - y & 2 \\ 2x - y & 3 \end{pmatrix} + \begin{pmatrix} x + 2 & -x - 1 \\ y - 2 & -y + 1 \end{pmatrix} = \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$$

$$\Rightarrow \begin{pmatrix} 2x - y + 2 & -x + 1 \\ 2x - 2 & -y + 4 \end{pmatrix} = \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$$

$$\Rightarrow 2x - y + 2 = 0 \quad \dots\dots\dots 1$$

$$-x + 1 = 0 \quad \dots\dots\dots 2$$

$$2x - 2 = 0 \quad \dots\dots\dots 3$$

$$-y + 4 = 0 \quad \dots\dots\dots 4$$

From equation 2 and 4, we get

$$x = 1 \text{ and } y = 4$$

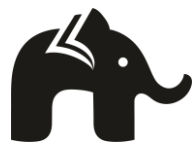
$$\text{So, } x + y = 1 + 4 = 5$$

Question 20:

If A and B are 2 * 2 matrices, then which of the following is true?

(a) $(A + B)^2 = A^2 + B^2 + 2AB$

(b) $(A - B)^2 = A^2 + B^2 - 2AB$



$$(c) (A - B)(A + B) = A^2 + AB - BA - B^2$$

$$(d) (A + B)(A - B) = A^2 - B^2$$

Answer: (c) $(A - B)(A + B) = A^2 + AB - BA - B^2$

$$(A + B)^2 = A^2 + B^2 + AB + BA$$

$$(A - B)^2 = A^2 + B^2 - AB - BA$$

$$(A - B)(A + B) = A^2 + AB - BA - B^2$$

$$(A + B)(A - B) = A^2 - AB + BA - B^2$$

Question 21:

If A and B are two matrices conformable to multiplication such that their product $AB = O$ (zero matrix), then which of the following is true?

- (a) A and B are both zero matrices
- (b) Either of A is or B is a zero matrix
- (c) Neither of them may be a zero matrix
- (d) All of the above

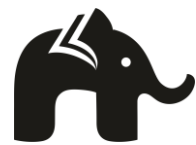
Answer: (d) All of the above

Given, If A and B are two matrices conformable to multiplication such that their product $AB = O$ (Zero matrix).

When we multiply two matrices and their product is a zero matrix then it may be possible that both are zero matrices or none of them is zero matrix or either of them is a zero matrix.

Question 22:

If $A = \begin{pmatrix} \alpha & \beta \\ \gamma & -\alpha \end{pmatrix}$ is such that $A^2 = 3I$, then



(a) $1 + \alpha^2 + \beta\gamma = 0$

(b) $1 - \alpha^2 - \beta\gamma = 0$

(c) $3 - \alpha^2 - \beta\gamma = 0$

(d) $3 + \alpha^2 + \beta\gamma = 0$

Answer: (c) $3 - \alpha^2 - \beta\gamma = 0$

Given,

$$A = \begin{pmatrix} \alpha & \beta \\ \gamma & -\alpha \end{pmatrix}$$

Now, $A^2 = A \cdot A$

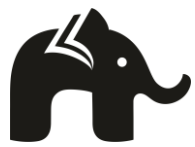
$$\begin{aligned} &= \begin{pmatrix} \alpha & \beta \\ \gamma & -\alpha \end{pmatrix} \begin{pmatrix} \alpha & \beta \\ \gamma & -\alpha \end{pmatrix} \\ &= \begin{pmatrix} \alpha^2 + \beta\gamma & \alpha\beta - \alpha\beta \\ \alpha\gamma - \alpha\gamma & \beta\gamma + \alpha^2 \end{pmatrix} \\ &= \begin{pmatrix} \alpha^2 + \beta\gamma & 0 \\ 0 & \beta\gamma + \alpha^2 \end{pmatrix} \end{aligned}$$

Now, $A^2 = 3I$

$$\Rightarrow \begin{pmatrix} \alpha^2 + \beta\gamma & 0 \\ 0 & \beta\gamma + \alpha^2 \end{pmatrix} = 3 \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

$$\Rightarrow \begin{pmatrix} \alpha^2 + \beta\gamma & 0 \\ 0 & \beta\gamma + \alpha^2 \end{pmatrix} = \begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix}$$

On comparing the corresponding elements, we have:



$$\alpha^2 + \beta\gamma = 3$$

$$\Rightarrow 3 - \alpha^2 - \beta\gamma = 0$$

Question 23:

If A is a skew symmetric matrix and n is even positive integer, then A^n is

- (a) a symmetric matrix
- (b) a skew symmetric matrix
- (c) a diagonal matrix
- (d) None of these

Answer: (a) a symmetric matrix

Given, A is skew symmetric matrix

$$\text{So, } A^T = -A$$

$$\text{Now, } (A^T)^n = (-A)^n = (-1)^n * A^n$$

Since, n is even, so $(-1)^n = 1$

$$\Rightarrow (A^T)^n = A^n$$

Hence, A^n is a symmetric matrix.

Case study based questions

Question 24:

Amit, Biraj and Chirag were given the task of creating a square matrix of order 2. Below are the matrices created by them. A, B, C are the matrices created by Amit, Biraj and Chirag respectively.



$$A = \begin{pmatrix} 1 & 2 \\ -1 & 3 \end{pmatrix} \quad B = \begin{pmatrix} 4 & 0 \\ 1 & 5 \end{pmatrix} \quad C = \begin{pmatrix} 2 & 0 \\ 1 & -2 \end{pmatrix}$$

If $a = 4$ and $b = -2$, based on the above information answer the following:

(i). Sum of the matrices A, B and C, $A + (B + C)$ is

(a) $\begin{pmatrix} 1 & 6 \\ 2 & 7 \end{pmatrix}$

(b) $\begin{pmatrix} 6 & 1 \\ 7 & 2 \end{pmatrix}$

(c) $\begin{pmatrix} 7 & 2 \\ 1 & 6 \end{pmatrix}$

(d) $\begin{pmatrix} 2 & 1 \\ 1 & 6 \end{pmatrix}$

(ii). $(A^T)^T$ is equal to

(a) $\begin{pmatrix} 1 & 2 \\ -1 & 3 \end{pmatrix}$

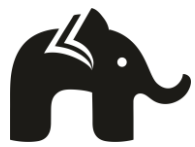
(b) $\begin{pmatrix} 2 & 1 \\ 3 & -1 \end{pmatrix}$

(c) $\begin{pmatrix} 1 & -1 \\ 2 & 3 \end{pmatrix}$

(d) $\begin{pmatrix} 2 & 3 \\ -1 & 1 \end{pmatrix}$

(iii). $(bA)^T$ is equal to

(a) $\begin{pmatrix} -2 & -4 \\ 2 & -6 \end{pmatrix}$



$$(b) \begin{pmatrix} -2 & -4 \\ -4 & -6 \end{pmatrix}$$

$$(c) \begin{pmatrix} -2 & 2 \\ -6 & -4 \end{pmatrix}$$

$$(d) \begin{pmatrix} -6 & -2 \\ 2 & 4 \end{pmatrix}$$

(iv). $AC - BC$ is equal to

$$(a) \begin{pmatrix} -4 & -6 \\ -4 & 4 \end{pmatrix}$$

$$(b) \begin{pmatrix} -4 & -4 \\ 4 & -6 \end{pmatrix}$$

$$(c) \begin{pmatrix} -4 & -4 \\ -6 & 4 \end{pmatrix}$$

$$(d) \begin{pmatrix} -6 & 4 \\ -4 & -4 \end{pmatrix}$$

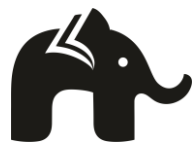
(v). $(a + b)B$ is equal to

$$(a) \begin{pmatrix} 0 & 8 \\ 10 & 2 \end{pmatrix}$$

$$(b) \begin{pmatrix} 2 & 10 \\ 8 & 0 \end{pmatrix}$$

$$(c) \begin{pmatrix} 8 & 0 \\ 2 & 10 \end{pmatrix}$$

$$(d) \begin{pmatrix} 2 & 0 \\ 8 & 10 \end{pmatrix}$$



Answers:

(i). (c) $\begin{pmatrix} 7 & 2 \\ 1 & 6 \end{pmatrix}$

$$\begin{aligned} A + B + C &= \begin{pmatrix} 1 & 2 \\ -1 & 3 \end{pmatrix} + \begin{pmatrix} 4 & 0 \\ 1 & 5 \end{pmatrix} + \begin{pmatrix} 2 & 0 \\ 1 & -2 \end{pmatrix} \\ &= \begin{pmatrix} 1+4+2 & 2+0+0 \\ -1+1+1 & 3+5-2 \end{pmatrix} \\ &= \begin{pmatrix} 7 & 2 \\ 1 & 6 \end{pmatrix} \end{aligned}$$

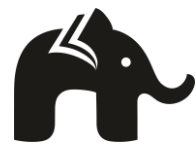
(ii). (a) $\begin{pmatrix} 1 & 2 \\ -1 & 3 \end{pmatrix}$

$$(A^T)^T = A = \begin{pmatrix} 1 & 2 \\ -1 & 3 \end{pmatrix}$$

(iii). (b) $\begin{pmatrix} -2 & 2 \\ -4 & -6 \end{pmatrix}$

$$(bA)^T = b * A^T$$

$$\begin{aligned} &= (-2) * \begin{pmatrix} 1 & 2 \\ -1 & 3 \end{pmatrix}^T \\ &= (-2) * \begin{pmatrix} 1 & -1 \\ 2 & 3 \end{pmatrix} \\ &= \begin{pmatrix} -2 * 1 & -2 * (-1) \\ -2 * 2 & -2 * 3 \end{pmatrix} \\ &= \begin{pmatrix} -2 & 2 \\ -4 & -6 \end{pmatrix} \end{aligned}$$



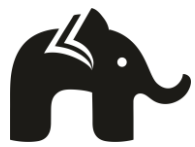
$$(iv). (c) \begin{pmatrix} -4 & -4 \\ -6 & 4 \end{pmatrix}$$

$$\begin{aligned} AC - BC &= \begin{pmatrix} 1 & 2 \\ -1 & 3 \end{pmatrix} \begin{pmatrix} 2 & 0 \\ 1 & -2 \end{pmatrix} - \begin{pmatrix} 4 & 0 \\ 1 & 5 \end{pmatrix} \begin{pmatrix} 2 & 0 \\ 1 & -2 \end{pmatrix} \\ &= \begin{pmatrix} 1 * 2 + 2 * 1 & 1 * 0 + 2 * (-2) \\ (-1) * 2 + 3 * 1 & -1 * 0 + 3 * (-2) \end{pmatrix} - \begin{pmatrix} 4 * 2 + 0 * 1 & 4 * 0 + 0 * (-2) \\ 1 * 2 + 5 * 1 & 1 * 0 + 5 * (-2) \end{pmatrix} \\ &= \begin{pmatrix} 4 & -4 \\ 1 & -6 \end{pmatrix} - \begin{pmatrix} 8 & 0 \\ 7 & -10 \end{pmatrix} \\ &= \begin{pmatrix} 4 - 8 & -4 - 0 \\ 1 - 7 & -6 + 10 \end{pmatrix} \\ &= \begin{pmatrix} -4 & -4 \\ -6 & 4 \end{pmatrix} \end{aligned}$$

$$(v). (c) \begin{pmatrix} 8 & 0 \\ 2 & 10 \end{pmatrix}$$

$$(a + b)B = (4 + (-2))B = (4 - 2)B = 2 * B$$

$$\begin{aligned} &= 2 * \begin{pmatrix} 4 & 0 \\ 1 & 5 \end{pmatrix} \\ &= \begin{pmatrix} 2 * 4 & 2 * 0 \\ 2 * 1 & 2 * 5 \end{pmatrix} \\ &= \begin{pmatrix} 8 & 0 \\ 2 & 10 \end{pmatrix} \end{aligned}$$

**Question 25:**

On her birth day, Seema decided to donate some money to children of an orphanage home. If there were 8 children less, everyone would have got Rs.10 more. However, if there were 16 children more, everyone would have got Rs. 10 less. Let the number of children be x and the amount distributed by Seema for one child be y (in Rs.).



Based on the information given above, answer the following questions:

(i). The equations in terms x and y are

(a) $5x - 4y = 40$

$5x - 8y = -80$

(b) $5x - 4y = 40$

$5x - 8y = 80$

(c) $5x - 4y = 40$

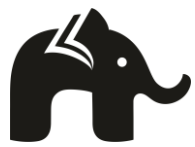
$5x + 8y = -80$

(d) $5x + 4y = 40$

$5x - 8y = -80$

(ii). Which of the following matrix equations represent the information given above?

(a)
$$\begin{pmatrix} 5 & 4 \\ 5 & 8 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 40 \\ -80 \end{pmatrix}$$



$$(b) \begin{pmatrix} 5 & -4 \\ 5 & -8 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 40 \\ 80 \end{pmatrix}$$

$$(c) \begin{pmatrix} 5 & -4 \\ 5 & -8 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 40 \\ -80 \end{pmatrix}$$

$$(d) \begin{pmatrix} 5 & 4 \\ 5 & -8 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 40 \\ -80 \end{pmatrix}$$

(iii). The number of children who were given some money by Seema, is

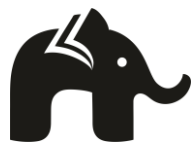
- (a) 30
- (b) 40
- (c) 23
- (d) 32

(iv). How much amount is given to each child by Seema?

- (a) Rs 32
- (b) Rs 30
- (c) Rs 62
- (d) Rs 26

(v). How much amount Seema spends in distributing the money to all the students of the Orphanage?

- (a) Rs 609
- (b) Rs 960
- (c) Rs 906
- (d) Rs 690



Answer:

(i). (a) $5x - 4y = 40$, $5x - 8y = -80$

Let the number of children = x

Amount distributed by Seema for one child = Rs y

So, total amount = xy

And total money will remain the same.

Given, if there were 8 children less, everyone would have got Rs 10 more

=> total money now = total money before

$$\Rightarrow (x - 8)(y + 10) = xy$$

$$\Rightarrow xy + 10x - 8y - 80 = xy$$

$$\Rightarrow 10x - 8y = 80$$

$$\Rightarrow 5x - 4y = 40 \quad \text{.....1}$$

Again, if there were 16 children more, everyone would have got Rs 10 less

=> total money now = total money before

$$\Rightarrow (x + 16)(y - 10) = xy$$

$$\Rightarrow xy - 10x + 16y - 160 = xy$$

$$\Rightarrow -10x + 16y = 160$$

$$\Rightarrow 10x - 16y = -160$$

$$\Rightarrow 5x - 8y = -80 \quad \text{.....2}$$

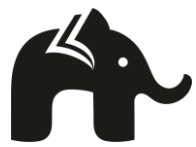
Thus two equations are: $5x - 4y = 40$ and $5x - 8y = -80$

(ii). (c) $\begin{pmatrix} 5 & -4 \\ 5 & -8 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 40 \\ -80 \end{pmatrix}$

Given equations are:

$$5x - 4y = 40$$

$$5x - 8y = -80$$



We can write it

$$\begin{pmatrix} 5 & -4 \\ 5 & -8 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 40 \\ -80 \end{pmatrix}$$

(iii). (d) 32

Given equations are:

$$5x - 4y = 40 \quad \dots\dots\dots 1$$

$$5x - 8y = -80 \quad \dots\dots\dots 2$$

Subtracting equations and 2, we get

$$(5x - 4y) - (5x - 8y) = 40 - (-80)$$

$$\Rightarrow 5x - 4y - 5x + 8y = 40 + 80$$

$$\Rightarrow 4y = 120$$

$$\Rightarrow y = 30$$

From equation 1, we get

$$5x - 4 * 30 = 40$$

$$\Rightarrow 5x - 120 = 40$$

$$\Rightarrow 5x = 120 + 40$$

$$\Rightarrow 5x = 160$$

$$\Rightarrow x = 32$$

So, the number of children = $x = 32$

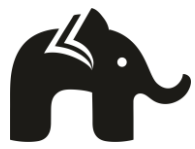
(iv). (b) 30

Amount given to each child = Rs $y =$ Rs 30

(v). (b) Rs 960

Total amount = Number of students * Money spent per student

$$= xy$$



$$= 32 * 30$$

$$= \text{Rs } 960$$
