PRACTICE MCQs

CLASS 12 MATHS (TERM - I)

MATRICES

BY

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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 * 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 * 12, 12 * 1, 2 * 6, 6 * 2, 3 * 4 and 4 * 3

Hence, total possible order = 6

Question 2:

Given that matrices A and B are of order 3 * n and m * 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.

So, 3 * n = m * 5

=> 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) $\begin{bmatrix} \mathbf{2} & \mathbf{9/2} \\ \mathbf{9/2} & \mathbf{8} \end{bmatrix}$

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:

$x = 1$, $y = 4$, and $z = 3$

Now, $x - y + z = 1 - 4 + 3 = 4 - 4 = 0$

Question 5:

$A = [a_{ij}]_{m*n}$ 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 = $[a_{ij}]_{m*n}$ 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

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 ………….1

a – 2b = -3 ………….2

5c – d = 11 …………..3

4c + 3d = 24 …………..4

Solving equations 1 and 2, we get

a = 1, b = 2

Again, solving equations 3 and 4, we get

c = 3, b = 4

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

(a) 1

(b) 2

(c) 3

(d) 5

Answer: (a) 1

We have $A^2 = A * A$

$$\Rightarrow A^2 = \begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix}\begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix}$$

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

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 * n, 3 * k, 2 * p, n * 3 and p * k respectively. If n = p, then the order of the matrix 7X – 5Z is

(a) p * 2

(b) 2 * n

(c) n * 3

(d) p * n

Answer: (b) 2 * n

Matrix X is of the order 2 * n.

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

Matrix Z is of the order 2 * p, i.e., 2 * 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 * n.

Thus, matrix 7X – 5Z is well-defined and is of the order 2 * 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 and B’ = B ………1

Consider (AB - BA)’ = (AB)’ – (BA)’ [Since (A - B)’ = A’ – B’]

= B'A' – A'B' [Since (AB)' = B'A']

= BA – AB [From equation 1]

= -(AB - BA)

So, (AB - BA)' = - (AB - BA)'

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

Question 11:

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

(a) π/6

(b) π/3

(c) π

(d) 3π/2

Answer: (b) π/3

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

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

Now, A + A' = I

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

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

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

$2\cos\alpha = 1$

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

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

=> $\alpha = \pi/3$

Question 12:

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

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

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

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

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

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

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

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

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

So, the matrix is

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

Now, $A^2 = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

$= \begin{bmatrix} 0 * 0 + 1 * 1 & 0 * 1 + 1 * 0 \\ 1 * 0 + 0 * 1 & 1 * 1 + 0 * 0 \end{bmatrix}$

$= \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

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 $A^2 = A$

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

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

$= I + A.A + 3A + 3A + 7A$ [Since $A^2 = A$ and $I^3 = I$]

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

$= I + A + 13A$ [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

=> $(A^T)^2 = (-A)^2$

=> $(A^T)^2 = A^2$

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 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

=> 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 $A^2 = A$

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

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

$= I + A.A + 3A + 3A - 7A$ [Since $A^2 = A$ and $I^3 = I$]

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

$= I + A + 6A - 7A$ [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, $(A + B)^2 = A^2 + B^2$

=> $A^2 + B^2 + AB + BA = A^2 + B^2$

=> $AB + BA = 0$

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

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

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

=> $2x - y + 2 = 0$ ………1

$-x + 1 = 0$ ………2

$2x - 2 = 0$ ………..3

$-y + 4 = 0$ ………..4

From equation 2 and 4, we get

$x = 1$ and $y = 4$

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

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

Now, $A^2 = A . A$

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

$$= \begin{bmatrix} \alpha^2 + \beta\gamma & \alpha\beta - \alpha\beta \\ \alpha\gamma - \alpha\gamma & \beta\gamma + \alpha^2 \end{bmatrix}$$

$$= \begin{bmatrix} \alpha^2 + \beta\gamma & 0 \\ 0 & \beta\gamma + \alpha^2 \end{bmatrix}$$

Now, $A^2 = 3I$

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

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

On comparing the corresponding elements, we have:

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

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

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

So, $A^T = -A$

Now, $(A^T)^n = (-A)^n = (-1)^n * A^n$

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

=> $(A^T)^n = A^n$

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 matrux of order 2. Below are the matrices created by them. A, B, C are the matrices created by Amit, Biraj and Chirag respectively.

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

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

$= \begin{pmatrix} 1 + 4 + 2 & 2 + 0 + 0 \\ -1 + 1 + 1 & 3 + 5 - 2 \end{pmatrix}$

$= \begin{pmatrix} 7 & 2 \\ 1 & 6 \end{pmatrix}$

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

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

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

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

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

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

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

$= \begin{pmatrix} -2 & 2 \\ -4 & -6 \end{pmatrix}$

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

$AC - BC = \begin{pmatrix} 1 & 2 \\ -1 & 3 \end{pmatrix}\begin{pmatrix} 2 & 0 \\ 1 & -2 \end{pmatrix} - \begin{pmatrix} 4 & 0 \\ 1 & 5 \end{pmatrix}\begin{pmatrix} 2 & 0 \\ 1 & -2 \end{pmatrix}$

$= \begin{pmatrix} 1 * 2 + 2 * 1 & 1 * 0 + 2 * (-2) \\ (-1) * 2 + 3 * 1 & -1 * 0 + 3 * (-2) \end{pmatrix} - \begin{pmatrix} 4 * 2 + 0 * 1 & 4 * 0 + 0 * (-2) \\ 1 * 2 + 5 * 1 & 1 * 0 + 5 * (-2) \end{pmatrix}$

$= \begin{pmatrix} 4 & -4 \\ 1 & -6 \end{pmatrix} - \begin{pmatrix} 8 & 0 \\ 7 & -10 \end{pmatrix}$

$= \begin{pmatrix} 4 - 8 & -4 - 0 \\ 1 - 7 & -6 + 10 \end{pmatrix}$

$= \begin{pmatrix} -4 & -4 \\ -6 & 4 \end{pmatrix}$

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

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

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

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

$= \begin{pmatrix} 8 & 0 \\ 2 & 10 \end{pmatrix}$

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

=> (x - 8)(y + 10) = xy

=> xy + 10x – 8y – 80 = xy

=> 10x – 8y = 80

=> 5x – 4y = 40 ……….1

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

=> total money now = total money before

=> (x + 16)(y - 10) = xy

=> xy - 10x + 16y – 160 = xy

=> -10x + 16y = 160

=> 10x - 16y = -160

=> 5x – 8y = -80 ……….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 ………1

5x – 8y = -80 ………2

Subtracting equations and 2, we get

(5x – 4y) – (5x – 8y) = 40 – (-80)

=> 5x – 4y – 5x + 8y = 40 + 80

=> 4y = 120

=> y = 30

From equation 1, we get

5x – 4 * 30 = 40

=> 5x – 120 = 40

=> 5x = 120 + 40

=> 5x = 160

=> 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

= Rs 960

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