ICSE Class 10 Maths Selina Solutions Chapter 9: ICSE Class 10 Maths Selina Solutions Chapter 9 Matrices provide a detailed guide to understanding the fundamental concepts of matrices. This chapter covers various topics such as types of matrices, matrix operations, and applications of matrices.

The solutions provided are detailed and easy to follow, ensuring that students can grasp complex concepts with ease.

By studying these solutions, students can build a strong foundation in matrices which is important for higher-level mathematics.

ICSE Class 10 Maths Selina Solutions Chapter 9 Matrices Overview

ICSE Class 10 Maths Selina Solutions for Chapter 9 Matrices are created by the subject experts from Physics Wallah. These solutions cover important topics like different types of matrices, how to perform matrix operations, and how to use them in real-life problems.

The explanations are easy to follow helping students understand the concepts better. With clear steps and examples these solutions help students get ready for their exams.

ICSE Class 10 Maths Selina Solutions Chapter 9 Matrices PDF

ICSE Class 10 Maths Selina Solutions for Chapter 9 Matrices are available in a PDF format. This comprehensive guide prepared by the experts from Physics Wallah covers various matrix concepts and operations in detail.

Students can easily download the PDF from the link provided below, allowing them to study and revise the chapter effectively at their own pace.

ICSE Class 10 Maths Selina Solutions Chapter 9 Matrices PDF

ICSE Class 10 Maths Selina Solutions Chapter 9 Matrices

Below we have provided ICSE Class 10 Maths Selina Solutions Chapter 9 for the ease of the students –

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1. State, whether the following statements are true or false. If false, give a reason.

(i) If A and B are two matrices of orders 3 x 2 and 2 x 3 respectively; then their sum A + B is possible.

(ii) The matrices $A_{2 \times 3}$ and $B_{2 \times 3}$ are conformable for subtraction.

(iii) Transpose of a 2 x 1 matrix is a 2 x 1 matrix.

(iv) Transpose of a square matrix is a square matrix.

(v) A column matrix has many columns and one row.

Solution:

(i) False.

The sum of matrices A + B is possible only when the order of both the matrices A and B are same.

(ii) True

(iii) False

Transpose of a 2 x 1 matrix is a 1 x 2 matrix.

(iv) True

(v) False

A column matrix has only one column and many rows.

2. Given: $\begin{bmatrix} x & y+2 \\ 3 & z-1 \end{bmatrix} = \begin{bmatrix} 3 & 1 \\ 3 & 2 \end{bmatrix}$**, find x, y and z.**

Solution:

If two matrices are said to be equal, then their corresponding elements are also equal.

Therefore,

$x = 3$,

$y + 2 = 1$ so, $y = -1$

$z – 1 = 2$ so, $z = 3$

3. Solve for a, b and c if

(i) $\begin{bmatrix} -4 & a+5 \\ 3 & 2 \end{bmatrix} = \begin{bmatrix} b+4 & 2 \\ 3 & c-1 \end{bmatrix}$

(ii) $\begin{bmatrix} a & a-b \\ b+c & 0 \end{bmatrix} = \begin{bmatrix} 3 & -1 \\ 2 & 0 \end{bmatrix}$

Solution:

If two matrices are said to be equal, then their corresponding elements are also equal.

Then,

(i) a + 5 = 2 ⇒ a = -3

-4 = b + 4 ⇒ b = -8

2 = c – 1 ⇒ c = 3

(ii) a = 3

a – b = -1

⇒ b = a + 1 = 4

b + c = 2

⇒ c = 2 – b = 2 – 4 = -2

4. If A = [8 -3] and B = [4 -5]; find:

(i) A + B (ii) B – A

Solution:

(i) A + B = [8 -3] + [4 -5] = [8+4 -3-5] = [12 -8]

(ii) B – A = [4 -5] – [8 -3] = [4-8 -5-(-3)] = [-4 -2]

5. If A= $\begin{bmatrix} 2 \\ 5 \end{bmatrix}$ **, B =** $\begin{bmatrix} 1 \\ 4 \end{bmatrix}$ **and C =** $\begin{bmatrix} 6 \\ -2 \end{bmatrix}$**; find:**

(i) B + C (ii) A – C

(iii) A + B – C (iv) A – B +C

Solution:

(i)B + C = $\begin{bmatrix}1\\4\end{bmatrix}+\begin{bmatrix}6\\-2\end{bmatrix}=\begin{bmatrix}1+6\\4-2\end{bmatrix}=\begin{bmatrix}7\\2\end{bmatrix}$

(ii)A – C = $\begin{bmatrix}2\\5\end{bmatrix}-\begin{bmatrix}6\\-2\end{bmatrix}=\begin{bmatrix}2-6\\5+2\end{bmatrix}=\begin{bmatrix}-4\\7\end{bmatrix}$

$$A + B - C = \begin{bmatrix}2\\5\end{bmatrix}+\begin{bmatrix}1\\4\end{bmatrix}-\begin{bmatrix}6\\-2\end{bmatrix}$$

(iii) $$=\begin{bmatrix}2+1-6\\5+4+2\end{bmatrix}=\begin{bmatrix}-3\\11\end{bmatrix}$$

$$A - B + C = \begin{bmatrix}2\\5\end{bmatrix}-\begin{bmatrix}1\\4\end{bmatrix}+\begin{bmatrix}6\\-2\end{bmatrix}$$

(iv) $$=\begin{bmatrix}2-1+6\\5-4-2\end{bmatrix}=\begin{bmatrix}7\\-1\end{bmatrix}$$

Exercise 9(B) Page No: 120

1. Evaluate:

(i) 3[5 -2]

Solution:

3[5 -2] = [3×5 3x-2] = [15 -6]

(ii) $7\begin{bmatrix}-1 & 2\\0 & 1\end{bmatrix}$

Solution:

$$7\begin{bmatrix}-1 & 2\\0 & 1\end{bmatrix}=\begin{bmatrix}-7 & 14\\0 & 7\end{bmatrix}$$

(iii) $2\begin{bmatrix}-1 & 0\\ 2 & -3\end{bmatrix}+\begin{bmatrix}3 & 3\\ 5 & 0\end{bmatrix}$

Solution:

$$2\begin{bmatrix}-1 & 0\\ 2 & -3\end{bmatrix}+\begin{bmatrix}3 & 3\\ 5 & 0\end{bmatrix}=\begin{bmatrix}-2 & 0\\ 4 & -6\end{bmatrix}+\begin{bmatrix}3 & 3\\ 5 & 0\end{bmatrix}=\begin{bmatrix}1 & 3\\ 9 & -6\end{bmatrix}$$

(iv) $6\begin{bmatrix}3\\ -2\end{bmatrix}-2\begin{bmatrix}-8\\ 1\end{bmatrix}$

Solution:

$$6\begin{bmatrix}3\\ -2\end{bmatrix}-2\begin{bmatrix}-8\\ 1\end{bmatrix}=\begin{bmatrix}18\\ -12\end{bmatrix}-\begin{bmatrix}-16\\ 2\end{bmatrix}=\begin{bmatrix}34\\ -14\end{bmatrix}$$

2. Find x and y if:

(i) 3[4 x] + 2[y -3] = [10 0]

Solution:

Taking the L.H.S, we have

3[4 x] + 2[y -3] = [12 3x] + [2y -6] = [(12 + 2y) (3x – 6)]

Now, equating with R.H.S we get

[(12 + 2y) (3x – 6)] = [10 0]

12 + 2y = 10 and 3x – 6 = 0

2y = -2 and 3x = 6

y = -1 and x = 2

(ii) $x\begin{bmatrix}-1\\ 2\end{bmatrix}-4\begin{bmatrix}-2\\ y\end{bmatrix}=\begin{bmatrix}7\\ -8\end{bmatrix}$

Solution:

We have,

$$x\begin{bmatrix}-1\\2\end{bmatrix}-4\begin{bmatrix}-2\\y\end{bmatrix}=\begin{bmatrix}7\\-8\end{bmatrix}$$

$$\begin{bmatrix}-x\\2x\end{bmatrix}-\begin{bmatrix}-8\\4y\end{bmatrix}=\begin{bmatrix}-x+8\\2x-4y\end{bmatrix}=\begin{bmatrix}7\\-8\end{bmatrix}$$

So, equating the matrices we get

-x + 8 = 7 and 2x – 4y = -8

x = 1 and 2(1) – 4y = -8

2 – 4y = -8

4y = 10

y = 5/2

3.

$$Given\ A=\begin{bmatrix}2&1\\3&0\end{bmatrix},B=\begin{bmatrix}1&1\\5&2\end{bmatrix}\ and\ C=\begin{bmatrix}-3&-1\\0&0\end{bmatrix};find:$$

(i) 2A – 3B + C (ii) A + 2C – B

Solution:

(i) 2A – 3B + C

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

$$=\begin{bmatrix}4&2\\6&0\end{bmatrix}-\begin{bmatrix}3&3\\15&6\end{bmatrix}+\begin{bmatrix}-3&-1\\0&0\end{bmatrix}$$

$$=\begin{bmatrix}4-3-3&2-3-1\\6-15+0&0-6+0\end{bmatrix}$$

$$=\begin{bmatrix}-2&-2\\-9&-6\end{bmatrix}$$

(ii) A + 2C – B

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

4. $If \begin{bmatrix} 4 & -2 \\ 4 & 0 \end{bmatrix} + 3A = \begin{bmatrix} -2 & -2 \\ 1 & -3 \end{bmatrix}; find\ A.$

Solution:

Given,

$$\begin{bmatrix} 4 & -2 \\ 4 & 0 \end{bmatrix} + 3A = \begin{bmatrix} -2 & -2 \\ 1 & -3 \end{bmatrix}$$
$$3A = \begin{bmatrix} -2 & -2 \\ 1 & -3 \end{bmatrix} - \begin{bmatrix} 4 & -2 \\ 4 & 0 \end{bmatrix}$$
$$3A = \begin{bmatrix} -2-4 & -2+2 \\ 1-4 & -3-0 \end{bmatrix} = \begin{bmatrix} -6 & 0 \\ -3 & -3 \end{bmatrix}$$
$$A = \begin{bmatrix} -2 & 0 \\ -1 & -1 \end{bmatrix}$$

5. $Given\ A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix} and\ B = \begin{bmatrix} -4 & -1 \\ -3 & -2 \end{bmatrix}$

(i) find the matrix 2A + B.

(ii) find a matrix C such that:

$$C + B = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$$

Solution:

(i) 2A + B

$$= 2\begin{bmatrix}1 & 4\\ 2 & 3\end{bmatrix} + \begin{bmatrix}-4 & -1\\ -3 & -2\end{bmatrix}$$
$$= \begin{bmatrix}2 & 8\\ 4 & 6\end{bmatrix} + \begin{bmatrix}-4 & -1\\ -3 & -2\end{bmatrix}$$
$$= \begin{bmatrix}-2 & 7\\ 1 & 4\end{bmatrix}$$

(ii)

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

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1. Evaluate: if possible:

$$(i)\ \begin{bmatrix}3 & 2\end{bmatrix}\begin{bmatrix}2\\ 0\end{bmatrix}$$
$$(ii)\ \begin{bmatrix}1 & -2\end{bmatrix}\begin{bmatrix}-2 & 3\\ -1 & 4\end{bmatrix}$$
$$(iii)\ \begin{bmatrix}6 & 4\\ 3 & -1\end{bmatrix}\begin{bmatrix}-1\\ 3\end{bmatrix}$$
$$(iv)\ \begin{bmatrix}6 & 4\\ 3 & -1\end{bmatrix}\begin{bmatrix}-1 & 3\end{bmatrix}$$

If not possible, give reason.

Solution:

$$(i)\ \begin{bmatrix}3 & 2\end{bmatrix}\begin{bmatrix}2\\0\end{bmatrix}$$

= [6 + 0] = [6]

$$(ii)\ \begin{bmatrix}1 & -2\end{bmatrix}\begin{bmatrix}-2 & 3\\-1 & 4\end{bmatrix}$$

= [-2+2 3-8] = [0 -5]

$$(iii)\ \begin{bmatrix}6 & 4\\3 & -1\end{bmatrix}\begin{bmatrix}-1\\3\end{bmatrix} =$$

$$\begin{bmatrix}-6+12\\-3-3\end{bmatrix} = \begin{bmatrix}6\\-6\end{bmatrix}$$

$$(iv)\ \begin{vmatrix}6 & 4\\3 & -1\end{vmatrix}\begin{bmatrix}-1 & 3\end{bmatrix}$$

The multiplication of these matrices is not possible as the rule for the number of columns in the first is not equal to the number of rows in the second matrix.

2. If $A = \begin{bmatrix}0 & 2\\5 & -2\end{bmatrix}, B = \begin{bmatrix}1 & -1\\3 & 2\end{bmatrix}$ **and I is a unit matrix of order 2×2, find:**

(i) AB (ii) BA (iii) AI

(iv) IB (v) A^2 (iv) B^2A

Solution:

(i) AB

$$= \begin{bmatrix}0 & 2\\5 & -2\end{bmatrix}\begin{bmatrix}1 & -1\\3 & 2\end{bmatrix}$$
$$= \begin{bmatrix}0+6 & 0+4\\5-6 & -5-4\end{bmatrix}$$
$$= \begin{bmatrix}6 & 4\\-1 & -9\end{bmatrix}$$

(ii) BA

$$= \begin{bmatrix} 1 & -1 \\ 3 & 2 \end{bmatrix} \begin{bmatrix} 0 & 2 \\ 5 & -2 \end{bmatrix}$$

$$= \begin{bmatrix} 0-5 & 2+2 \\ 0+10 & 6-4 \end{bmatrix}$$

$$= \begin{bmatrix} -5 & 4 \\ 10 & 2 \end{bmatrix}$$

(iii) AI

$$= \begin{bmatrix} 0 & 2 \\ 5 & -2 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 0+0 & 0+2 \\ 5+0 & 0-2 \end{bmatrix}$$

$$= \begin{bmatrix} 0 & 2 \\ 5 & -2 \end{bmatrix}$$

(iv) IB

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

$$= \begin{bmatrix} 1+0 & -1+0 \\ 0+3 & 0+2 \end{bmatrix}$$

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

(v) A^2

$$= \begin{bmatrix} 0 & 2 \\ 5 & -2 \end{bmatrix} \begin{bmatrix} 0 & 2 \\ 5 & -2 \end{bmatrix}$$

$$= \begin{bmatrix} 0+10 & 0-4 \\ 0-10 & 10+4 \end{bmatrix}$$

$$= \begin{bmatrix} 10 & -4 \\ -10 & 14 \end{bmatrix}$$

(vi) B^2

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

$$= \begin{bmatrix} 1-3 & -1-2 \\ 3+6 & -3+4 \end{bmatrix}$$

$$= \begin{bmatrix} -2 & -3 \\ 9 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} -2 & -3 \\ 9 & 1 \end{bmatrix} \begin{bmatrix} 0 & 2 \\ 5 & -2 \end{bmatrix}$$

$$= \begin{bmatrix} 0-15 & -4+6 \\ 0+5 & 18-2 \end{bmatrix}$$

B^2A $$= \begin{bmatrix} -15 & 2 \\ 5 & 16 \end{bmatrix}$$

3. If $A = \begin{bmatrix} 3 & x \\ 0 & 1 \end{bmatrix}, B = \begin{bmatrix} 9 & 16 \\ 0 & -y \end{bmatrix},$ **find x and y when x and y when A^2 = B.**

Solution:

$$= \begin{bmatrix} 3 & x \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 3 & x \\ 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 9+0 & 3x+x \\ 0+0 & 0+1 \end{bmatrix}$$

A^2 $$= \begin{bmatrix} 9 & 4x \\ 0 & 1 \end{bmatrix}$$

A^2 = B

$$\begin{bmatrix} 9 & 4x \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 9 & 16 \\ 0 & -y \end{bmatrix}$$

On comparing corresponding elements, we have

4x = 16

x = 4

And,

1 = -y

y = -1

4. Find x and y, if:

$$(i)\begin{bmatrix}4 & 3x\\ x & -2\end{bmatrix}\begin{bmatrix}5\\ 1\end{bmatrix}=\begin{bmatrix}y\\ 8\end{bmatrix}$$
$$(ii)\begin{bmatrix}x & 0\\ -3 & 1\end{bmatrix}\begin{bmatrix}1 & 1\\ 0 & y\end{bmatrix}=\begin{bmatrix}2 & 2\\ -3 & -2\end{bmatrix}$$

Solution:

(i)

$$\begin{bmatrix}4 & 3x\\ x & -2\end{bmatrix}\begin{bmatrix}5\\ 1\end{bmatrix}=\begin{bmatrix}y\\ 8\end{bmatrix}$$
$$\begin{bmatrix}20+3x\\ 5x-2\end{bmatrix}=\begin{bmatrix}y\\ 8\end{bmatrix}$$

On comparing the corresponding terms, we have

5x – 2 = 8

5x = 10

x = 2

And,

20 + 3x = y

20 + 3(2) = y

20 + 6 = y

y = 26

$$\begin{bmatrix}x & 0\\ -3 & 1\end{bmatrix}\begin{bmatrix}1 & 1\\ 0 & y\end{bmatrix}=\begin{bmatrix}2 & 2\\ -3 & -2\end{bmatrix}$$
$$\begin{bmatrix}x+0 & x\\ -3+0 & -3+y\end{bmatrix}=\begin{bmatrix}2 & 2\\ -3 & -2\end{bmatrix}$$ (ii)

On comparing the corresponding terms, we have

x = 2

And,

-3 + y = -2

y = 3 – 2 = 1

5. $If\ A = \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}, B = \begin{bmatrix} 1 & 2 \\ 4 & 3 \end{bmatrix}\ and\ C = \begin{bmatrix} 4 & 3 \\ 1 & 2 \end{bmatrix}, find:$

(i) (AB) C (ii) A (BC)

Solution:

(i) (AB)

$$= \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ 4 & 3 \end{bmatrix}$$
$$= \begin{bmatrix} 1+12 & 2+9 \\ 2+16 & 4+12 \end{bmatrix}$$
$$= \begin{bmatrix} 13 & 11 \\ 18 & 16 \end{bmatrix}$$

(AB) C

$$= \begin{bmatrix} 13 & 11 \\ 18 & 16 \end{bmatrix} \begin{bmatrix} 4 & 3 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 52+11 & 39+22 \\ 72+16 & 54+32 \end{bmatrix} = \begin{bmatrix} 63 & 61 \\ 88 & 86 \end{bmatrix}$$

(ii) BC

$$= \begin{bmatrix} 1 & 2 \\ 4 & 3 \end{bmatrix} \begin{bmatrix} 4 & 3 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 4+2 & 3+4 \\ 16+3 & 12+6 \end{bmatrix} = \begin{bmatrix} 6 & 7 \\ 19 & 18 \end{bmatrix}$$

A (BC)

$$= \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix} \begin{bmatrix} 6 & 7 \\ 19 & 18 \end{bmatrix} = \begin{bmatrix} 6+57 & 7+54 \\ 12+76 & 14+72 \end{bmatrix} = \begin{bmatrix} 63 & 61 \\ 88 & 86 \end{bmatrix}$$

Therefore, its seen that (AB) C = A (BC)

6. $Given\ A = \begin{bmatrix} 0 & 4 & 6 \\ 3 & 0 & -1 \end{bmatrix}\ and\ B = \begin{bmatrix} 0 & 1 \\ -1 & 2 \\ -5 & -6 \end{bmatrix}$, **is the following possible:**

(i) AB (ii) BA (iii) A^2

Solution:

(i) AB

$$= \begin{bmatrix} 0 & 4 & 6 \\ 3 & 0 & -1 \end{bmatrix} \begin{bmatrix} 0 & 1 \\ -1 & 2 \\ -5 & -6 \end{bmatrix} = \begin{bmatrix} 0-4-30 & 0+8-36 \\ 0-0+5 & 3+0+6 \end{bmatrix} = \begin{bmatrix} -34 & -28 \\ 5 & 9 \end{bmatrix}$$

(ii) BA

$$= \begin{bmatrix} 0 & 1 \\ -1 & 2 \\ -5 & -6 \end{bmatrix} \begin{bmatrix} 0 & 4 & 6 \\ 3 & 0 & -1 \end{bmatrix} = \begin{bmatrix} 0+3 & 0+0 & 0-1 \\ 0+6 & -4+0 & -6-2 \\ 0-18 & -20+0 & -30+6 \end{bmatrix} = \begin{bmatrix} 3 & 0 & -1 \\ 6 & -4 & -8 \\ -18 & -20 & -24 \end{bmatrix}$$

(iii) A^2 = A x A, is not possible since the number of columns of matrix A is not equal to its number of rows.

7. $Let\ A = \begin{bmatrix} 2 & 1 \\ 0 & -2 \end{bmatrix}, B = \begin{bmatrix} 4 & 1 \\ -3 & -2 \end{bmatrix}\ and\ C = \begin{bmatrix} -3 & 2 \\ -1 & 4 \end{bmatrix}$. **Find A^2 + AC – 5B.**

Solution:

A^2

$$= \begin{bmatrix} 2 & 1 \\ 0 & -2 \end{bmatrix} \begin{bmatrix} 2 & 1 \\ 0 & -2 \end{bmatrix} = \begin{bmatrix} 4+0 & 2-2 \\ 0 & 0+4 \end{bmatrix} = \begin{bmatrix} 4 & 0 \\ 0 & 4 \end{bmatrix}$$

AC

$$= \begin{bmatrix} 2 & 1 \\ 0 & -2 \end{bmatrix} \begin{bmatrix} -3 & 2 \\ -1 & 4 \end{bmatrix} = \begin{bmatrix} -6-1 & 4+4 \\ 0+2 & 0-8 \end{bmatrix} = \begin{bmatrix} -7 & 8 \\ 2 & -8 \end{bmatrix}$$

5B

$$= 5\begin{bmatrix} 4 & 1 \\ -3 & -2 \end{bmatrix} = \begin{bmatrix} 20 & 5 \\ -15 & -10 \end{bmatrix}$$

A^2 + AC – 5B =

$$= \begin{bmatrix} 4 & 0 \\ 0 & 4 \end{bmatrix} + \begin{bmatrix} -7 & 8 \\ 2 & -8 \end{bmatrix} - \begin{bmatrix} 20 & 5 \\ -15 & -10 \end{bmatrix} = \begin{bmatrix} 4-7-20 & 8-5 \\ 2+15 & 4-8+10 \end{bmatrix} = \begin{bmatrix} -23 & 3 \\ 17 & 6 \end{bmatrix}$$

8. If $M = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$ **and I is a unit matrix of the same order as that of M; show that:**

M^2 = 2M + 3I

Solution:

M^2

$$= \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix} = \begin{bmatrix} 1+4 & 2+2 \\ 2+2 & 4+1 \end{bmatrix} = \begin{bmatrix} 5 & 4 \\ 4 & 5 \end{bmatrix}$$

2M + 3I

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

Thus, M^2 = 2M + 3I

9. $If\ A = \begin{bmatrix} a & 0 \\ 0 & 2 \end{bmatrix}, B = \begin{bmatrix} 0 & -b \\ 1 & 0 \end{bmatrix}, M = \begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix}$ **and BA = M^2, find the values of a and b.**

Solution:

BA

$$= \begin{bmatrix} 0 & -b \\ 1 & 0 \end{bmatrix} \begin{bmatrix} a & 0 \\ 0 & 2 \end{bmatrix} = \begin{bmatrix} 0 & -2b \\ a & 0 \end{bmatrix}$$

M^2

$$= \begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix} = \begin{bmatrix} 1-1 & -1-1 \\ 1+1 & -1+1 \end{bmatrix} = \begin{bmatrix} 0 & -2 \\ 2 & 0 \end{bmatrix}$$

So, BA =M^2

$$\begin{bmatrix} 0 & -2b \\ a & 0 \end{bmatrix} = \begin{bmatrix} 0 & -2 \\ 2 & 0 \end{bmatrix}$$

On comparing the corresponding elements, we have

-2b = -2

b = 1

And,

a = 2

10. $$Given\ A = \begin{bmatrix} 4 & 1 \\ 2 & 3 \end{bmatrix} and\ B = \begin{bmatrix} 1 & 0 \\ -2 & 1 \end{bmatrix}, find:$$

(i) A – B (ii) A^2 (iii) AB (iv) A^2 – AB + 2B

Solution:

(i) A – B

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

(ii) A^2

$$= \begin{bmatrix} 4 & 1 \\ 2 & 3 \end{bmatrix} \begin{bmatrix} 4 & 1 \\ 2 & 3 \end{bmatrix} = \begin{bmatrix} 16+2 & 4+3 \\ 8+6 & 2+6 \end{bmatrix} = \begin{bmatrix} 18 & 7 \\ 14 & 8 \end{bmatrix}$$

(iii) AB

$$= \begin{bmatrix} 4 & 1 \\ 2 & 3 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ -2 & 1 \end{bmatrix} = \begin{bmatrix} 4-2 & 0+1 \\ 2-6 & 0+3 \end{bmatrix} = \begin{bmatrix} 2 & 1 \\ -4 & 3 \end{bmatrix}$$

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

$$= \begin{bmatrix}18 & 7\\14 & 11\end{bmatrix} - \begin{bmatrix}2 & 1\\-4 & 3\end{bmatrix} + 2\begin{bmatrix}1 & 0\\-2 & 1\end{bmatrix}$$
$$= \begin{bmatrix}18-2 & 7-1\\14+4 & 11-3\end{bmatrix} + \begin{bmatrix}2 & 0\\-4 & 2\end{bmatrix}$$
$$= \begin{bmatrix}16 & 6\\18 & 8\end{bmatrix} + \begin{bmatrix}2 & 0\\-4 & 2\end{bmatrix}$$
$$= \begin{bmatrix}18 & 6\\14 & 10\end{bmatrix}$$

11. $If = \begin{bmatrix}1 & 4\\1 & -3\end{bmatrix} and\ B = \begin{bmatrix}1 & 2\\-1 & -1\end{bmatrix}, find:$

(i) $(A + B)^2$ (ii) $A^2 + B^2$

(iii) Is $(A + B)^2 = A^2 + B^2$?

Solution:

(i) (A + B)

$$= \begin{bmatrix}1 & 4\\1 & -3\end{bmatrix} + \begin{bmatrix}1 & 2\\-1 & -1\end{bmatrix} = \begin{bmatrix}2 & 6\\0 & -4\end{bmatrix}$$

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

$$= \begin{bmatrix}2 & 6\\0 & -4\end{bmatrix}\begin{bmatrix}2 & 6\\0 & -4\end{bmatrix} = \begin{bmatrix}4+0 & 12-24\\0+0 & 0+16\end{bmatrix} = \begin{bmatrix}4 & -12\\0 & 16\end{bmatrix}$$

$$= \begin{bmatrix}1 & 4\\1 & -3\end{bmatrix}\begin{bmatrix}1 & 4\\1 & -3\end{bmatrix} = \begin{bmatrix}1+4 & 4-12\\1-3 & 4+9\end{bmatrix} = \begin{bmatrix}5 & -8\\-2 & 13\end{bmatrix}$$

(ii) A^2

$$= \begin{bmatrix}1 & 2\\-1 & -1\end{bmatrix}\begin{bmatrix}1 & 2\\-1 & -1\end{bmatrix} = \begin{bmatrix}1-2 & 2-2\\-1+1 & -2+1\end{bmatrix} = \begin{bmatrix}-1 & 0\\0 & -1\end{bmatrix}$$

B^2

$$= \begin{bmatrix} 5 & -8 \\ -2 & 13 \end{bmatrix} + \begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix} = \begin{bmatrix} 4 & -8 \\ -2 & 12 \end{bmatrix}$$

$A^2 + B^2$

Thus, its seen that $(A + B)^2 \neq A^2 + B^{2+}$

12. Find the matrix A, if B = $\begin{bmatrix} 2 & 1 \\ 0 & 1 \end{bmatrix}$ and $B^2 = B + ½A$.

Solution:

B^2

$$= \begin{bmatrix} 2 & 1 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 2 & 1 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 4+0 & 2+1 \\ 0 & 0+1 \end{bmatrix} = \begin{bmatrix} 4 & 3 \\ 0 & 1 \end{bmatrix}$$

$B^2 = B + ½A$

$½A = B^2 – B$

$A = 2(B^2 – B)$

$$= 2(\begin{bmatrix} 4 & 3 \\ 0 & 1 \end{bmatrix} - \begin{bmatrix} 2 & 1 \\ 0 & 1 \end{bmatrix}) = 2\begin{bmatrix} 2 & 2 \\ 0 & 0 \end{bmatrix} = \begin{bmatrix} 4 & 4 \\ 0 & 0 \end{bmatrix}$$

13. If $A = \begin{bmatrix} -1 & 1 \\ a & b \end{bmatrix}$ and $A^2 = I$, find a and b.

Solution:

$$= \begin{bmatrix} -1 & 1 \\ a & b \end{bmatrix} \begin{bmatrix} -1 & 1 \\ a & b \end{bmatrix} = \begin{bmatrix} 1+a & -1+b \\ -a+ab & a+b^2 \end{bmatrix}$$

A^2

And, given $A^2 = I$

So on comparing the corresponding terms, we have

$1 + a = 1$

Thus, a = 0

And, -1 + b = 0

Thus, b = 1

14. If $A = \begin{bmatrix} 2 & 1 \\ 0 & 0 \end{bmatrix}, B = \begin{bmatrix} 2 & 3 \\ 4 & 1 \end{bmatrix} \, and \, C = \begin{bmatrix} 1 & 4 \\ 0 & 2 \end{bmatrix},$ **then show that:**

(i) A(B + C) = AB + AC

(ii) (B – A)C = BC – AC.

Solution:

(i) A(B + C)

$$= \begin{bmatrix} 2 & 1 \\ 0 & 0 \end{bmatrix} \left(\begin{bmatrix} 2 & 3 \\ 4 & 1 \end{bmatrix} + \begin{bmatrix} 1 & 4 \\ 0 & 2 \end{bmatrix} \right) = \begin{bmatrix} 2 & 1 \\ 0 & 0 \end{bmatrix} \begin{bmatrix} 3 & 7 \\ 4 & 3 \end{bmatrix} = \begin{bmatrix} 6+4 & 14+3 \\ 0 & 0 \end{bmatrix} = \begin{bmatrix} 10 & 17 \\ 0 & 0 \end{bmatrix}$$

AB + AC

$$= \begin{bmatrix} 2 & 1 \\ 0 & 0 \end{bmatrix} \begin{bmatrix} 2 & 3 \\ 4 & 1 \end{bmatrix} + \begin{bmatrix} 2 & 1 \\ 0 & 0 \end{bmatrix} \begin{bmatrix} 1 & 4 \\ 0 & 2 \end{bmatrix} = \begin{bmatrix} 4+4 & 6+1 \\ 0 & 0 \end{bmatrix} + \begin{bmatrix} 2+0 & 8+2 \\ 0 & 0 \end{bmatrix}$$
$$= \begin{bmatrix} 8 & 7 \\ 0 & 0 \end{bmatrix} + \begin{bmatrix} 2 & 10 \\ 0 & 0 \end{bmatrix}$$
$$= \begin{bmatrix} 10 & 17 \\ 0 & 0 \end{bmatrix}$$

Thus, A(B + C) = AB + AC

(ii) (B – A)C

$$= \left(\begin{bmatrix} 2 & 3 \\ 4 & 1 \end{bmatrix} - \begin{bmatrix} 2 & 1 \\ 0 & 0 \end{bmatrix} \right) \begin{bmatrix} 1 & 4 \\ 0 & 2 \end{bmatrix} = \begin{bmatrix} 0 & 2 \\ 4 & 1 \end{bmatrix} \begin{bmatrix} 1 & 4 \\ 0 & 2 \end{bmatrix} = \begin{bmatrix} 0 & 0+4 \\ 4+0 & 16+2 \end{bmatrix}$$
$$= \begin{bmatrix} 0 & 4 \\ 4 & 18 \end{bmatrix}$$

BC – AC

$$= \begin{bmatrix} 2 & 3 \\ 4 & 1 \end{bmatrix} \begin{bmatrix} 1 & 4 \\ 0 & 2 \end{bmatrix} - \begin{bmatrix} 2 & 1 \\ 0 & 0 \end{bmatrix} \begin{bmatrix} 1 & 4 \\ 0 & 2 \end{bmatrix} = \begin{bmatrix} 2+0 & 8+6 \\ 4+0 & 16+2 \end{bmatrix} - \begin{bmatrix} 2+0 & 8+2 \\ 0 & 0 \end{bmatrix}$$
$$= \begin{bmatrix} 2 & 14 \\ 4 & 18 \end{bmatrix} - \begin{bmatrix} 2 & 10 \\ 0 & 0 \end{bmatrix}$$
$$= \begin{bmatrix} 0 & 4 \\ 4 & 18 \end{bmatrix}$$

Thus, (B – A)C = BC – AC

15. If $A = \begin{bmatrix} 1 & 4 \\ 2 & 1 \end{bmatrix}, B = \begin{bmatrix} -3 & 2 \\ 4 & 0 \end{bmatrix} and\ C = \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix},$ **simplify: A^2 + BC.**

Solution:

A^2 + BC

$$= \begin{bmatrix} 1 & 4 \\ 2 & 1 \end{bmatrix} \begin{bmatrix} 1 & 4 \\ 2 & 1 \end{bmatrix} + \begin{bmatrix} -3 & 2 \\ 4 & 0 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}$$
$$= \begin{bmatrix} 1+8 & 4+4 \\ 2+2 & 8+1 \end{bmatrix} + \begin{bmatrix} -3+0 & 0+4 \\ 4+0 & 0 \end{bmatrix}$$
$$= \begin{bmatrix} 9 & 8 \\ 4 & 9 \end{bmatrix} + \begin{bmatrix} -3 & 4 \\ 4 & 0 \end{bmatrix}$$
$$= \begin{bmatrix} 6 & 12 \\ 8 & 9 \end{bmatrix}$$

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1. Find x and y, if:

$$\begin{bmatrix} 3 & -2 \\ -1 & 4 \end{bmatrix} \begin{bmatrix} 2x \\ 1 \end{bmatrix} + 2 \begin{bmatrix} -4 \\ 5 \end{bmatrix} = 4 \begin{bmatrix} 2 \\ y \end{bmatrix}$$

Solution:

$$\begin{bmatrix} 3 & -2 \\ -1 & 4 \end{bmatrix} \begin{bmatrix} 2x \\ 1 \end{bmatrix} + 2 \begin{bmatrix} -4 \\ 5 \end{bmatrix} = 4 \begin{bmatrix} 2 \\ y \end{bmatrix}$$
$$\begin{bmatrix} 6x - 2 \\ -2x + 4 \end{bmatrix} + \begin{bmatrix} -8 \\ 10 \end{bmatrix} = \begin{bmatrix} 8 \\ 4y \end{bmatrix}$$
$$\begin{bmatrix} 6x - 2 - 8 \\ -2x + 4 + 10 \end{bmatrix} = \begin{bmatrix} 8 \\ 4y \end{bmatrix}$$
$$\begin{bmatrix} 6x - 10 \\ -2x + 14 \end{bmatrix} = \begin{bmatrix} 8 \\ 4y \end{bmatrix}$$

On comparing the corresponding terms, we have

6x – 10 = 8 and -2x + 14 = 4y

6x = 18 and y = (14 – 2x)/4

x = 3 and y = (14 – 2(3))/4

y = (14 – 6)/ 4

y = 8/4 = 2

Thus, x = 3 and y = 2

2. Find x and y, if:

$$\begin{bmatrix} 3x & 8 \end{bmatrix} \begin{bmatrix} 1 & 4 \\ 3 & 7 \end{bmatrix} - 3 \begin{bmatrix} 2 & -7 \end{bmatrix} = 5 \begin{bmatrix} 3 & 2y \end{bmatrix}$$

Solution:

$$\begin{bmatrix} 3x & 8 \end{bmatrix} \begin{bmatrix} 1 & 4 \\ 3 & 7 \end{bmatrix} - 3 \begin{bmatrix} 2 & -7 \end{bmatrix} = 5 \begin{bmatrix} 3 & 2y \end{bmatrix}$$
$$\begin{bmatrix} 3x + 24 & 12x + 56 \end{bmatrix} - \begin{bmatrix} 6 & -21 \end{bmatrix} = \begin{bmatrix} 15 & 10y \end{bmatrix}$$
$$\begin{bmatrix} 3x + 24 - 6 & 12x + 56 + 21 \end{bmatrix} = \begin{bmatrix} 15 & 10y \end{bmatrix}$$
$$\begin{bmatrix} 3x + 18 & 12x + 77 \end{bmatrix} = \begin{bmatrix} 15 & 10y \end{bmatrix}$$

On comparing the corresponding terms, we have

3x + 18 = 15 and 12x + 77 = 10y

3x = -3 and y = (12x + 77)/10

x = -1 and y = (12(-1) + 77)/10

y = 65/10 = 6.5

Thus, x = -1 and y = 6.5

3. If; $\begin{bmatrix} x & y \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 25 \end{bmatrix}$ and $\begin{bmatrix} -x & y \end{bmatrix}\begin{bmatrix} 2x \\ y \end{bmatrix} = \begin{bmatrix} -2 \end{bmatrix}$ **; find x and y, if:**

(i) x, y ∈ W (whole numbers)

(ii) x, y ∈ Z (integers)

Solution:

From the question, we have

$x^2 + y^2 = 25$ and $-2x^2 + y^2 = -2$

(i) x, y ∈ W (whole numbers)

It can be observed that the above two equations are satisfied when x = 3 and y = 4.

(ii) x, y ∈ Z (integers)

It can be observed that the above two equations are satisfied when x = ± 3 and y = ± 4.

4. $Given \begin{bmatrix} 2 & 1 \\ -3 & 4 \end{bmatrix} .X = \begin{bmatrix} 7 \\ 6 \end{bmatrix} .Write :$

(i) The order of the matrix X.

(ii) The matrix X.

Solution:

(i) Let the order of the matrix be a x b.

Then, we know that

$$\begin{bmatrix} 2 & 1 \\ -3 & 4 \end{bmatrix}_{2X\underline{2}} .X_{\underline{a}Xb} = \begin{bmatrix} 7 \\ 6 \end{bmatrix}_{2X1}$$

Thus, for multiplication of matrices to be possible a = 2

And, form noticing the order of the resultant matrix

b = 1

(ii)

$$\text{Let } X = \begin{bmatrix} x \\ y \end{bmatrix}$$

$$\begin{bmatrix} 2 & 1 \\ -3 & 4 \end{bmatrix} \times \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 7 \\ 6 \end{bmatrix} \Rightarrow \begin{bmatrix} 2x+y \\ -3x+4y \end{bmatrix} = \begin{bmatrix} 7 \\ 6 \end{bmatrix}$$

On comparing the corresponding terms, we have

2x + y = 7 and

-3x + 4y = 6

Solving the above two equations, we have

x = 2 and y = 3

Thus, the matrix X is $X = \begin{bmatrix} 2 \\ 3 \end{bmatrix}$

5. Evaluate:

$$\begin{bmatrix} cos45^o & sin30^o \\ \sqrt{2}cos0^o & sin0^o \end{bmatrix} \begin{bmatrix} sin45^o & cos90^o \\ sin90^o & cot45^o \end{bmatrix}$$

Solution:

$$= \begin{bmatrix} cos45^o & sin30^o \\ \sqrt{2}cos0^o & sin0^o \end{bmatrix} \begin{bmatrix} sin45^o & cos90^o \\ sin90^o & cot45^o \end{bmatrix}$$
$$= \begin{bmatrix} cos45^o sin45^o + sin30^o sin90^o & cos45^o cos90^o + sin30^o cot45^o \\ \sqrt{2}cos0^o sin45^o + sin0^o sin90^o & \sqrt{2}cos0^o cos90^o + sin0^o cot45^o \end{bmatrix}$$
$$= \begin{bmatrix} 1/2 + 1/2 & 0 + 1/2 \\ 1 & 0 + 0 \end{bmatrix}$$
$$= \begin{bmatrix} 1 & 0.5 \\ 1 & 0 \end{bmatrix}$$

6. $If A = \begin{bmatrix} 0 & -1 \\ 4 & -3 \end{bmatrix}, B = \begin{bmatrix} -5 \\ 6 \end{bmatrix} and$ **3A x M = 2B; find matrix M.**

Solution:

Given,

3A x M = 2B

And let the order of the matric of M be (a x b)

$$3\begin{bmatrix} 0 & -1 \\ 4 & -3 \end{bmatrix}_{2\times 2} \times M_{a\times b} = 2\begin{bmatrix} -5 \\ 6 \end{bmatrix}_{2\times 1}$$

Now, it's clearly seen that

a = 2 and b = 1

So, the order of the matrix M is (2 x 1)

$$3\begin{bmatrix} 0 & -1 \\ 4 & -3 \end{bmatrix} \times \begin{bmatrix} x \\ y \end{bmatrix} = 2\begin{bmatrix} -5 \\ 6 \end{bmatrix}$$
$$\begin{bmatrix} 0 & -3 \\ 12 & -9 \end{bmatrix} \times \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -10 \\ 12 \end{bmatrix}$$
$$\begin{bmatrix} -3y \\ 12x - 9y \end{bmatrix} = \begin{bmatrix} -10 \\ 12 \end{bmatrix}$$

Now, on comparing with corresponding elements we have

-3y = -10 and 12x – 9y = 12

y = 10/3 and 12x – 9(10/3) = 12

12x – 30 = 12

12x = 42

x = 42/12 = 7/2

Therefore,

Matrix M = $\begin{bmatrix} 7/2 \\ 10/3 \end{bmatrix}$

7. $If \begin{bmatrix} a & 3 \\ 4 & 1 \end{bmatrix} + \begin{bmatrix} 2 & b \\ 1 & -2 \end{bmatrix} - \begin{bmatrix} 1 & 1 \\ -2 & c \end{bmatrix} = \begin{bmatrix} 5 & 0 \\ 7 & 3 \end{bmatrix},$

find the values of a, b and c.

Solution:

$$\begin{bmatrix} a & 3 \\ 4 & 1 \end{bmatrix} + \begin{bmatrix} 2 & b \\ 1 & -2 \end{bmatrix} - \begin{bmatrix} 1 & 1 \\ -2 & c \end{bmatrix} = \begin{bmatrix} 5 & 0 \\ 7 & 3 \end{bmatrix}$$
$$\begin{bmatrix} a+2 & 3+b \\ 4+1 & 1-2 \end{bmatrix} - \begin{bmatrix} 1 & 1 \\ -2 & c \end{bmatrix} = \begin{bmatrix} 5 & 0 \\ 7 & 3 \end{bmatrix}$$
$$\begin{bmatrix} a+2-1 & 3+b-1 \\ 4+1+2 & 1-2-c \end{bmatrix} = \begin{bmatrix} 5 & 0 \\ 7 & 3 \end{bmatrix}$$
$$\begin{bmatrix} a+1 & b+2 \\ 7 & -1-c \end{bmatrix} = \begin{bmatrix} 5 & 0 \\ 7 & 3 \end{bmatrix}$$

On comparing the corresponding elements, we have

a + 1 = 5 ⇒ a = 4

b + 2 = 0 ⇒ b = -2

-1 – c = 3 ⇒ c = -4

8. $If A = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix} \; and \; B = \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}; find:$

(i) A (BA) (ii) (AB) B.

Solution:

(i) A (BA)

$$= \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix} \left(\begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix} \right)$$
$$= \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix} \left(\begin{bmatrix} 2+2 & 4+1 \\ 1+4 & 2+2 \end{bmatrix} \right)$$
$$= \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix} \begin{bmatrix} 4 & 5 \\ 5 & 4 \end{bmatrix}$$
$$= \begin{bmatrix} 4+10 & 5+8 \\ 8+5 & 10+4 \end{bmatrix}$$
$$= \begin{bmatrix} 14 & 13 \\ 13 & 14 \end{bmatrix}$$

(ii) (AB) B

$$= \left(\begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix} \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix} \right) \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$$
$$= \begin{bmatrix} 2+2 & 1+4 \\ 4+1 & 2+2 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$$
$$= \begin{bmatrix} 4 & 5 \\ 5 & 4 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix} = \begin{bmatrix} 4+10 & 8+5 \\ 5+8 & 10+4 \end{bmatrix}$$
$$= \begin{bmatrix} 14 & 13 \\ 13 & 14 \end{bmatrix}$$

9. Find x and y, if: $\begin{bmatrix} x & 3x \\ y & 4y \end{bmatrix} \begin{bmatrix} 2 \\ 1 \end{bmatrix} = \begin{bmatrix} 5 \\ 12 \end{bmatrix}$

Solution:

$$\begin{bmatrix} x & 3x \\ y & 4y \end{bmatrix} \begin{bmatrix} 2 \\ 1 \end{bmatrix} = \begin{bmatrix} 5 \\ 12 \end{bmatrix}$$
$$\begin{bmatrix} 2x+3x \\ 2y+4y \end{bmatrix} = \begin{bmatrix} 5 \\ 12 \end{bmatrix}$$

Thus, on comparing the corresponding terms, we have

2x + 3x = 5 and 2y + 4y = 12

5x = 5 and 6y = 12

x = 1 and y = 2

10. If matrix $X = \begin{bmatrix} -3 & 4 \\ 2 & -3 \end{bmatrix} \begin{bmatrix} 2 \\ -2 \end{bmatrix} \; and \; 2X - 3Y = \begin{bmatrix} 10 \\ -8 \end{bmatrix},$ **find the matrix 'X' and matrix 'Y'.**

Solution:

$$X = \begin{bmatrix} -3 & 4 \\ 2 & -3 \end{bmatrix} \begin{bmatrix} 2 \\ -2 \end{bmatrix} = \begin{bmatrix} -6-8 \\ 4+6 \end{bmatrix} = \begin{bmatrix} -14 \\ 10 \end{bmatrix}$$

Now,

$$Let \; Y = \begin{bmatrix} x \\ y \end{bmatrix}$$

$$2X - 3Y = 2\begin{bmatrix} -14 \\ 10 \end{bmatrix} - 3\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 10 \\ -8 \end{bmatrix}$$

$$\begin{bmatrix} -28 \\ 20 \end{bmatrix} - \begin{bmatrix} 3x \\ 3y \end{bmatrix} = \begin{bmatrix} 10 \\ -8 \end{bmatrix}$$

$$\begin{bmatrix} -28-3x \\ 20-3y \end{bmatrix} = \begin{bmatrix} 10 \\ -8 \end{bmatrix}$$

On comparing with the corresponding terms, we have

-28 – 3x = 10

3x = -38

x = -38/3

And,

20 – 3y = -8

3y = 28

y = 28/3

Therefore,

$$Y = 1/3\begin{bmatrix} -38 \\ 28 \end{bmatrix}$$

11. Given $A = \begin{bmatrix} 2 & -1 \\ 2 & 0 \end{bmatrix}, B = \begin{bmatrix} -3 & 2 \\ 4 & 0 \end{bmatrix} \; and \;\; C = \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}$ **find the matrix X such that:**

A + X = 2B + C

Solution:

$$\begin{bmatrix} 2 & -1 \\ 2 & 0 \end{bmatrix} + X = 2\begin{bmatrix} -3 & 2 \\ 4 & 0 \end{bmatrix} + \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}$$
$$\begin{bmatrix} 2 & -1 \\ 2 & 0 \end{bmatrix} + X = \begin{bmatrix} -6 & 4 \\ 8 & 0 \end{bmatrix} + \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}$$
$$\begin{bmatrix} 2 & -1 \\ 2 & 0 \end{bmatrix} + X = \begin{bmatrix} -5 & 4 \\ 8 & 2 \end{bmatrix}$$
$$X = \begin{bmatrix} -5 & 4 \\ 8 & 2 \end{bmatrix} - \begin{bmatrix} 2 & -1 \\ 2 & 0 \end{bmatrix}$$
$$X = \begin{bmatrix} -7 & 5 \\ 6 & 2 \end{bmatrix}$$

12. Find the value of x, given that A^2 = B,

$$A = \begin{bmatrix} 2 & 12 \\ 0 & 1 \end{bmatrix} \; and \; B = \begin{bmatrix} 4 & x \\ 0 & 1 \end{bmatrix}$$

Solution:

$$A^2 = \begin{bmatrix} 2 & 12 \\ 0 & 1 \end{bmatrix}\begin{bmatrix} 2 & 12 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 4 & x \\ 0 & 1 \end{bmatrix} = B$$
$$A^2 = \begin{bmatrix} 4+0 & 24+12 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 4 & x \\ 0 & 1 \end{bmatrix} = B$$
$$A^2 = \begin{bmatrix} 4 & 36 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 4 & x \\ 0 & 1 \end{bmatrix} = B$$

Thus, on comparing the terms we get x = 36.

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