2. MATRICes

MATRICes:-

a system of number arranged in a rectangular format along with coloumns, ~~ros~~ row. bounded by close ([ ]) braket. & called as MATRICes.

Ex - {1,2,3,4,5,6,7,8,9}

If we form matrices of this ~~3by3 order~~ 3x3 order
They it becomes ~~then~~

$$A \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}_{3\times 3}$$

Braket के अंदर वाले element Small letter में लिखना और बाहर वाले elements capital letter लिखना होता है.

- The Name of matrices always denoted by A capital ~~le~~ letter.
- The element of matrices is always represented by small letter.

orders of MATRICes

The numders of rows and The numders of coloumns present in the MATRICes called as orders of MATRICes.

E.x -

$$\begin{array}{cc} & \\ A = & \begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 6 & 4 \end{bmatrix} \begin{array}{l} - R_1 \\ - R_2 \\ - R_3 \end{array} \\ & \begin{array}{cc} C_1 & C_2 \end{array} \quad \boxed{3\times 2} \end{array}$$

The order of MATRICes is not comitative except in square matrix.

Ex - $\boxed{2\times 3 \neq 3\times 2}$

order are not comitative becaus matrices are change.

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In the order of matrices the first element of the order is always represented by number of rows and element of the order of matrices is always represented by number of columns of a MATRICES

$\boxed{e.x.\ 2\times 3}$

in this order of matrices 2 is represented by number of rows and 3 is represented by number of columns.

e.g If we take $m\times n$ order of a matrix them.

$$A = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ a_{31} & a_{32} & \cdots & a_{3n} \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{bmatrix}_{m\times n}$$

① e.g ~~formation~~ in materix of order $\boxed{2\times 3}$ 20/9/24

$$A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \end{bmatrix}_{2\times 3}$$

$A = \cancel{4}$

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}_{2\times 3}$$

2) e.g form. in materix of order $\boxed{4\times 3}$

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 5 & 8 & 12 \\ 7 & 10 & 9 \\ 6 & 2 & 4 \end{bmatrix}_{4\times 3}$$

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▽ Types of materices.

1. Row of materices:-

Materice Contenig only one Row andnnumber of colums is called as Row matersices.

e.g. $A = [1, 2, 3, 4 \ldots n]_{1\times n}$

$A = [a, d, i, t, i]_{1\times 5}$

Row materices:- have a only one Row

2. Coloum matrices:-

The materice Contaning only one ~~colums~~ coloum and m number of Row is called as coloum matrices.

e.g. $A = \begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \\ \vdots \\ m \end{bmatrix}_{[m\times 1]}$ $A = \begin{bmatrix} A \\ d \\ i \\ t \\ i \end{bmatrix}_{5\times 1}$

Coloum matrices. have a only one Coloum

Home Work.

Form the following matrices.

1) 2×3

$\Rightarrow$ ~~A~~ $A \begin{bmatrix} 1 & 3 & 7 \\ 2 & 6 & 5 \end{bmatrix}_{2\times 3}$

~~2) 10×20~~

~~3, 6, 9, 1, 11, 5, 7, 10, 12, 14, 2, 6, 10, 15, 7, 1, 3, 4~~

3
6
8
8
3
5
1
9
10
11

3) 9×1

$A = \begin{bmatrix} 7 \\ 5 \\ 2 \\ 1 \\ 3 \\ 4 \\ 7 \\ 9 \\ 8 \end{bmatrix}_{9\times 1}$

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2) 10×20

$$A = \begin{bmatrix} 2,36,6,1,5 & 6 & 7 & 9 & 8 & 1 & 11 & 13 & 5 & 4 & 1 & 6 & 7 & 9 & 8 & 2 \\ 3,4,6,7 & 2 & 3 & 5 & 3 & 1 & 7 & 6 & 3 & 7 & 7 & 11 & 10 & 3 & 7 & 9 & 4 \\ 6,7,8,4 & 8 & 2 & 5 & 6 & 2 & 4 & 8 & 2 & 4 & 5 & 1 & 2 & 4 & 5 & 8 & 3 \\ 8 & 5 & 11 & 6 & 9 & 3 & 6 & 8 & 12 & 6 & 11 & 3 & 6 & 2 & 9 & 5 & 2 & 11 & 1 & 5 \\ 3 & 2 & 9 & 5 & 7 & 9 & 4 & 3 & 4 & 9 & 5 & 5 & 5 & 3 & 3 & 6 \\ 5 & 3 & 5 & 2 & 6 & 5 & 7 & 5 & 3 & 5 & 2 & 2 & 1 & 10 & 13 & 9 & 4 & 3 & 13 & 6 \\ 7 & 4 & 9 & 1 & 1 & 2 & 3 & 7 & 2 & 9 & 1 & 6 & 3 & 2 & 1 & 5 & 3 & 10 & 5 & 7 \\ 9 & 12 & 1 & 10 & 4 & 6 & 9 & 9 & 5 & 1 & 10 & 9 & 6 & 11 & 2 & 7 & 2 & 1 & 4 & 8 \\ 10 & 2 & 11 & 2 & 5 & 10 & 12 & 10 & 7 & 11 & 2 & 7 & 9 & 9 & 11 & 4 & 6 & 4 & 1 & 9 \\ 11 & 1 & 9 & 3 & 13 & 1 & 2 & 11 & 4 & 9 & 3 & 4 & 5 & 4 & 4 & 7 & 5 & 6 & 7 & 10 \end{bmatrix}_{10 \times 20}$$

4) 9×15

$$A \begin{bmatrix} 2 & 1 & 3 & 7 & 8 & 2 & 3 & 6 & 7 & 1 & 7 & 6 & 3 & 4 & 2 \\ 3 & 5 & 6 & 9 & 1 & 4 & 5 & 8 & 9 & 2 & 9 & 8 & 5 & 6 & 4 \\ 6 & 2 & 3 & 6 & 8 & 1 & 3 & 5 & 7 & 9 & 3 & 5 & 7 & 9 & 2 \\ 8 & 4 & 5 & 7 & 9 & 2 & 4 & 6 & 8 & 2 & 4 & 6 & 8 & 1 & 3 \\ 3 & 5 & 7 & 6 & 2 & 1 & 4 & 7 & 6 & 5 & 2 & 1 & 4 & 2 & 5 \\ 5 & 7 & 4 & 9 & 8 & 2 & 1 & 5 & 4 & 7 & 6 & 2 & 5 & 1 & 8 \\ 7 & 8 & 2 & 10 & 8 & 4 & 6 & 5 & 10 & 2 & 2 & 9 & 5 & 8 & 2 \\ 9 & 8 & 7 & 8 & 8 & 10 & 1 & 8 & 2 & 8 & 6 & 4 & 7 & 9 & 2 \\ 1 & 1 & 2 & 4 & 1 & 6 & 2 & 7 & 3 & 4 & 8 & 9 & 5 & 1 & 3 \end{bmatrix}_{9 \times 15}$$

5) 10×16

$$A = \begin{bmatrix} 3 & 5 & 4 & 8 & 1 & 2 & 5 & 7 & 8 & 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ 6 & 7 & 6 & 9 & 4 & 1 & 6 & 9 & 2 & 5 & 7 & 8 & 4 & 3 & 9 & 3 \\ 3 & 4 & 7 & 8 & 3 & 2 & 4 & 2 & 1 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ 5 & 9 & 2 & 4 & 4 & 3 & 6 & 9 & 8 & 7 & 6 & 5 & 4 & 3 & 2 & 1 \\ 7 & 2 & 3 & 10 & 12 & 3 & 5 & 5 & 4 & 3 & 2 & 8 & 3 & 4 & 2 & 1 \\ 4 & 4 & 5 & 7 & 8 & 7 & 4 & 6 & 7 & 5 & 8 & 5 & 7 & 8 & 9 & 2 \\ 2 & 6 & 8 & 9 & 4 & 2 & 7 & 9 & 4 & 6 & 1 & 6 & 9 & 1 & 5 & 3 \\ 7 & 9 & 7 & 2 & 1 & 3 & 4 & 2 & 3 & 5 & 7 & 10 & 5 & 3 & 2 & 4 \\ 2 & 2 & 1 & 10 & 2 & 5 & 1 & 6 & 4 & 3 & 2 & 3 & 4 & 5 & 6 & 7 \\ 3 & 4 & 5 & 6 & 7 & 3 & 4 & 9 & 5 & 6 & 7 & 6 & 7 & 6 & 9 & 2 \end{bmatrix}_{10 \times 16}$$

6) 1×5

$A = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 \end{bmatrix}_{1\times 5}$

7) 6×10

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 2 & 3 & 5 & 2 & 9 & 8 \\ 3 & 6 & 7 & 10 & 3 & 4 \\ 4 & 8 & 9 & 4 & 5 & 6 \\ 5 & 1 & 2 & 7 & 8 & 9 \\ 6 & 7 & 4 & 6 & 8 & 2 \\ 7 & 5 & 8 & 3 & 2 & 1 \\ 8 & 2 & 3 & 9 & 8 & 7 \\ 9 & 1 & 4 & 5 & 6 & 2 \\ 10 & 2 & 3 & 1 & 2 & 4 \end{bmatrix}_{6\times 10}$$

8) ~~2×2~~ 8) 2×2

$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}_{2\times 2}$

9) 6×3

$$A \begin{bmatrix} 1 & 5 & 3 \\ 2 & 6 & 7 \\ 3 & 8 & 9 \\ 4 & 1 & 2 \\ 5 & 3 & 5 \\ 6 & 7 & 8 \end{bmatrix}_{6\times 3}$$

5 10) 5×5

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 \\ 2 & 6 & 7 & 8 & 9 \\ 3 & 10 & 2 & 5 & 4 \\ 4 & 2 & 6 & 7 & 8 \\ 5 & 9 & 3 & 4 & 5 \end{bmatrix}_{5\times 5}$$

11) 3×1

$A \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}_{3\times 1}$ ~~4~~

8(12) 9×7

$$A \begin{bmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ 2 & 9 & 8 & 7 & 6 & 5 & 4 \\ 3 & 1 & 2 & 5 & 6 & 7 & 2 \\ 4 & 3 & 4 & 6 & 7 & 2 & 9 \\ 5 & 8 & 2 & 3 & 4 & 5 & 6 \\ 6 & 2 & 3 & 4 & 5 & 6 & 7 \\ 7 & 8 & 9 & 2 & 3 & 4 & 5 \\ 8 & 6 & 7 & 8 & 9 & 1 & 2 \\ 9 & 3 & 4 & 5 & 6 & 7 & 8 \end{bmatrix}_{9\times 7}$$

13) 3×1

$A \begin{bmatrix} 3 \\ 4 \\ 5 \end{bmatrix}_{3\times 1}$

14) 1×1

$A \begin{bmatrix} 1 \end{bmatrix}_{1\times 1}$

15) 2×1

$A \begin{bmatrix} 1 \\ 2 \end{bmatrix}_{2\times 1}$ ~~3~~

16) 1×2

$A \begin{bmatrix} 1 & 2 \end{bmatrix}_{1\times 2}$

17) 6×2

$$A \begin{bmatrix} 1 & 6 \\ 2 & 3 \\ 3 & 7 \\ 4 & 8 \\ 5 & 9 \\ 6 & 10 \end{bmatrix}_{6\times 2}$$

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18) 5×15

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 4 & 5 & 3 & 2 & 1 & 5 \\ 2 & 5 & 8 & 7 & 2 & 7 & 3 & 1 & 2 & 6 & 1 & 5 & 9 & 2 & 2 \\ 3 & 1 & 9 & 6 & 1 & 8 & 4 & 9 & 3 & 7 & 2 & 6 & 1 & 3 & 8 \\ 4 & 2 & 4 & 5 & 3 & 9 & 5 & 8 & 4 & 8 & 3 & 7 & 4 & 7 & 4 \\ 5 & 3 & 5 & 3 & 9 & 2 & 6 & 7 & 5 & 9 & 4 & 8 & 5 & 1 & 5 \end{bmatrix}_{5 \times 15}$$

19) 15×5

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 \\ 2 & 9 & 8 & 7 & 6 \\ 3 & 5 & 4 & 3 & 2 \\ 4 & 1 & 9 & 5 & 9 \\ 5 & 6 & 7 & 8 & 9 \\ 6 & 7 & 8 & 9 & 1 \\ 7 & 8 & 9 & 1 & 2 \\ 8 & 9 & 1 & 2 & 3 \\ 9 & 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 & 9 \\ 11 & 9 & 2 & 4 & 5 \\ 12 & 7 & 8 & 9 & 1 \\ 7 & 8 & 9 & 1 & 2 \\ 8 & 3 & 7 & 9 & 8 \\ 3 & 5 & 2 & 3 & 1 \end{bmatrix}_{15 \times 5}$$

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Type of matrice	defination	example.
1) Row matrice	Row matrice contening only one Row.	$A:[1 \cdot 2]_{1\times 2}$ $A:[1,2,3\ldots n]_{1\times n}$
2) coloum matrice	coloum matrice contening only one coloum.	$A=\begin{bmatrix}1\\2\\3\end{bmatrix}_{3\times 1}$ $A\begin{bmatrix}1\\2\\3\\ \vdots \\ m\end{bmatrix}$
3) Square matrice	A matrice ~~conten~~ in Wich the number of Row and number of coloum are equal it is called ~~as~~ square matrice.	$A=\begin{bmatrix}1 & 2\\3 & 4\end{bmatrix}_{2\times 2}$ $B=\begin{bmatrix}a_{11} & a_{12} & a_{13}\\a_{21} & a_{22} & a_{23}\\a_{31} & a_{32} & a_{33}\end{bmatrix}_{3\times 3}$
4) Diagonal matrice have a Principle Diagonal	Principle Diagonal :- it is an imaginary line drawn over a squar matrix that passes throw a element that are located at position With row number equal to coloum number is called principle Diagonal	Principle Diagonal. $A\begin{bmatrix}a_{11} & a_{12} & a_{13}\\a_{21} & a_{22} & a_{23}\\a_{31} & a_{32} & a_{33}\end{bmatrix}_{3\times 3}$
Diagonal matrice. $(a_{ij}=0,\ i\neq j)$	a square matrix contaning only the principle Diagonal element With the rest all element being zero is called Diagonal matrix.	$\begin{array}{cccc} & & a_{12} & a_{13}\\ A & \begin{bmatrix}a_{11} & 0 & 0\\0 & a_{22} & 0\\0 & 0 & a_{13}\end{bmatrix}_{3\times 3} \end{array}$
5) Scalar matrix.	a Diagonal matrix contaning all ~~Diagonal~~ principle Diagonal element are equal is called ~~principle~~ Scalar matrix	$A\begin{bmatrix}2 & 0 & 0\\0 & 2 & 0\\0 & 0 & 2\end{bmatrix}_{3\times 3}$
6) unit matrix or Idenity matrix.	a scalar matrix in Which all the principle Diagonal elements are 1 is called as Idenitity or unit matrix.	$A=\begin{bmatrix}1 & 0 & 0\\0 & 1 & 0\\0 & 0 & 1\end{bmatrix}_{3\times 3}$
7) upper Triangular matrix	a Square matrix in Which all the element below the principle Diagonal are zero is called as upper Triangular matrix.	$A=\begin{bmatrix}1 & 3 & 6\\0 & 2 & 4\\0 & 0 & 5\end{bmatrix}$

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~~Principle~~ Square matrix

Square matrix मे number of Row और number of coloum Same होते है

Ex
$$A = \begin{bmatrix} 2 & 2 \\ 3 & 4 \end{bmatrix}_{2\times 2}$$

Principle Diagonal

Principle Diagonal मे row number और ~~colom~~ coloum number same होते है.

Ex
$$A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$$

a_{ij} Where. $i = j$ $i, j \in IR$

$\boxed{A = [a_{ij}],\ i, j \in IR}$

Diagonal Matrix

Diagonal matrix मे principle Diagonal को छोडके सारे element zero (0) होते है.

Ex-
$$A = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}_{3\times 3}$$

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Scalar Matrix

Scalar matrix मे Principle Diagonal equal होते है.

Ex
$$\begin{bmatrix} 3 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{bmatrix}_{3\times 3}$$

~~Where, $a_{11} = a_{22} = a_{33}$~~.

unit or Idenity matrix

Idenity or unit matrix मे Principle Diagonal equal होके ~~एक~~ (1) होते है.

$$A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}_{3\times 3}$$

upper Triangular matrix.

upper Triangular matrix मे principle Diagonal निचे वाले elements zero होते है.

$$A = \begin{bmatrix} 1 & 5 & 6 \\ 0 & 2 & 3 \\ 0 & 0 & 3 \end{bmatrix}_{3\times 3}$$

lower Triangular matrix

lower Triangular matrix मे Principle Diagonal के ऊपर वाले element zero होते है.

$$A = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 3 & 0 \\ 4 & 5 & 6 \end{bmatrix}_{3\times 3}$$

8) **Lower Triangular matrix**

a squar matrix in which all element above the principle Diagonal are zero is called as lower Triangular matrix.

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

9) **Symmetric matrix**

 # Transpose of a matrix

Interchanging rows and coloum of a matrix called as Transpose a matrix. it's denoted by $\boxed{A^T}$ or $\boxed{A'}$

where T - is Transpose of matrix.

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}_{3\times 3}$$

$$A^T \text{ or } A' = \begin{bmatrix} 1 & 4 & 7 \\ 2 & 5 & 8 \\ 3 & 6 & 9 \end{bmatrix}$$

Symmetric matrix.

a matrix A is called as symmetric matrix.

if $\boxed{A^T = A}$

$$A = \begin{bmatrix} 3 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{bmatrix}_{3\times 3}$$

Transpose of a matrix

$$A = \begin{bmatrix} 3 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{bmatrix}_{3\times 3}$$

General form of symmetric matrix.

$$A = \begin{bmatrix} x & a & b \\ a & y & c \\ b & c & z \end{bmatrix}_{3\times 3}.$$

10) **Skew symmetric matrix.**

a matrix A is called as skew symmetric matrix,

if $\boxed{A^T = -A}$

General form of skew symmetric matrix.

$$A = \begin{bmatrix} 0 & a & b \\ -a & 0 & c \\ -b & -c & 0 \end{bmatrix}_{3\times 3}$$

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

in a skew symmetric matrix all principle Diagonal element are zero

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Symmetric matrix

Transpose of a matrix.

Transpose of a matrix में Rows and coloums की interchanging होती है. मतलब Row की जगह coloum और coloum की जगह Row आते है.

⇒ ex

① $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}_{3\times3}$ A^t or $A' = \begin{bmatrix} 1 & 4 & 7 \\ 2 & 5 & 8 \\ 3 & 6 & 9 \end{bmatrix}_{3\times3}$

② $\begin{bmatrix} 4 & 2 & 3 & 1 \\ 5 & 6 & 7 & 8 \\ 9 & 1 & 2 & 3 \\ 5 & 2 & 1 & 4 \end{bmatrix}_{4\times4}$ A^t or $A' = \begin{bmatrix} 4 & 5 & 9 & 5 \\ 2 & 6 & 1 & 2 \\ 3 & 7 & 2 & 1 \\ 1 & 8 & 3 & 4 \end{bmatrix}_{4\times4}$

Symmetric matrix

all scalar matrix are symmetrix matrix

Skew symmetric matrix

Skew symmetrix matrix में $A^T = -A$ होता है

⇐ ex ⇓

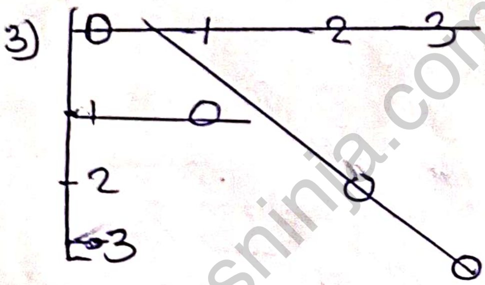
1) $\begin{bmatrix} 0 & 5 & 7 \\ -5 & 0 & 8 \\ -7 & -8 & 0 \end{bmatrix}_{3\times3}$

② $A = \begin{bmatrix} 0 & -5 & -7 \\ 5 & 0 & -8 \\ 7 & 8 & 0 \end{bmatrix}_{3\times3}$

⇓

$A = \begin{bmatrix} 0 & 5 & 7 \\ -5 & 0 & 8 \\ -7 & -8 & 0 \end{bmatrix}_{3\times3}$

3)



③ $A = \begin{bmatrix} 0 & -5 & -7 & -8 \\ 5 & 0 & -9 & -2 \\ 7 & 9 & 0 & -4 \\ 8 & 2 & 4 & 0 \end{bmatrix}_{4\times4} = -A \begin{bmatrix} 0 & 5 & 7 & 8 \\ -5 & 0 & 9 & 2 \\ -7 & -9 & 0 & 4 \\ -8 & -2 & -4 & 0 \end{bmatrix}_{4\times4}$

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11) Null matrix or zero matrix	a matrix containg all it's entrys or element are zero is called as Null or zero matrix.	$A \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}_{2\times2}$
12) singular matrix	a square matrix A is called as singular matrix. i.e $\boxed{\|A\|=0}$	$A = \begin{bmatrix} 2 & 1 \\ 6 & 3 \end{bmatrix}_{2\times2}$ $\|A\| = 2\times3 - 1\times6 = \boxed{6-6=0}$.
13) non singular matrix	a square matrix A is called as non-singular matrix. it is diterminat is $\boxed{\|A\| = \text{is non zero } 0}$ i.e $\|A\| \neq 0$.	$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}_{2\times2}$ $\|A\|\ 4\times1 = 2\times3 = 4-$ $= -2$.
14) orthogonal matrix	a matrix A is called as othogonal matrix. if $\boxed{AA^T = I}$ where, T is Transpor of A & I is identity matrix. $\boxed{AA^T = I}$	$T = \theta + \theta$ $T = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}_{2\times2}$ $AA^T = I$

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Null or Zero Matrix:

Null or zero matrix मे सारे element zero (0) होते है.

$$A\begin{bmatrix}0&0&0\\0&0&0\\0&0&0\end{bmatrix}_{3\times3}.$$

Singular Matrix

Singular matrix मे elements की का multiplication होके जो Ans. आता है उसका (−) ~~होता है.~~ के ~~A के~~ (0) Ans आता है उसे singular matrix कहते है.

ex: $A=\begin{bmatrix}2&1\\6&3\end{bmatrix}_{2\times2}$

$= 2\times3 - 1\times6$

$= 6 - 6$

$= \boxed{0}$

Non Singular Matrix

Non singular matrix मे element का multiplication होके जो Ans. आता है उसका (−) होके जो Ans. आता है वो Non-zero होता है.

$\boxed{|A| = \text{is non zero}}$

ex: $A=\begin{bmatrix}1&2\\3&4\end{bmatrix}_{2\times2}$

$= 1\times4 - 2\times3$

$= 4 - 6$

$\boxed{= -2}$

orthogonal ~~Matt~~ matrix

orthogonal matrix मे Row & coloum की Transpose करके जब identity matrix आते है उसे orthogonal matrix कहते है.

Algebra of Matrix.

a) Addition of a Matrices.

let, A and B be two matrix than addition of matrices A to matrix be is the Addition of element from matrix A to matrix be are same position.

\# for matrix addition the necessary condition is that the matrices must be in same order.

e.g ① $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}_{2\times 2}$ $B = \begin{bmatrix} 4 & 0 \\ 2 & 1 \end{bmatrix}$ $= A+B \begin{bmatrix} 1+4 & 2+0 \\ 3+2 & 4+1 \end{bmatrix}$ $A+B = \begin{bmatrix} 5 \\ 5 \end{bmatrix}$

② $A = \begin{bmatrix} 1 & 2 & 3 \\ 5 & 9 & 2 \\ 2 & 2 & 4 \end{bmatrix}_{3\times 3}$ $B \begin{bmatrix} 2 & 1 & 3 \\ 10 & 6 & 5 \\ 0 & 1 & 2 \end{bmatrix}$ $= A+B \begin{bmatrix} 1+2 & 2+1 & 3+3 \\ 5+10 & 9+6 & 2+5 \\ 2+0 & 2+1 & 4+2 \end{bmatrix}$ $A+B = \begin{bmatrix} 3 \\ 15 \\ 2 \end{bmatrix}$

General Addition of matrix.

$A \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}$ $B = \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix}$ $A+B = \begin{bmatrix} a_{11}+b_{11} & a_{12}+b_{12} \\ a_{21}+b_{21} & a_{22}+b_{22} \end{bmatrix}$

Properties of Algebra of matrices.

let, A and B be two matrices.

a) Commutative :-

The addition of Two matrices is commutative.

$A+B = B+A$

b) Associative property :-

$(2+3)+9 = 14$

$2+(3+9) = 14$

$(2+9)+3 = 14$

the addition of the matrices is Associative.

let, A, B and C be Three matrix of same order Then.

$(A+B)+C = A+(B+C) = (A+C)+B$.

$= A+(B+C)$

Home Work

1) $A = \begin{bmatrix} 2 & 3 & 5 \\ 0 & 1 & 2 \\ 3 & 3 & 9 \end{bmatrix}_{3\times3}$ $B = \begin{bmatrix} 0 & 2 & 3 \\ 0 & 0 & 0 \\ 9 & 2 & 1 \end{bmatrix}_{3\times3}$ $C = \begin{bmatrix} 3 & 3 & 6 \\ 2 & 5 & 1 \\ 0 & 0 & 1 \end{bmatrix}_{3\times3}$ $A+B+C = ?$

$A+B+C = \begin{bmatrix} 2+0+3 & 3+2+3 & 5+3+6 \\ 0+0+2 & 1+0+5 & 2+0+1 \\ 3+9+0 & 3+2+0 & 9+1+1 \end{bmatrix} = A+B+C = \begin{bmatrix} 5 & 8 & 14 \\ 2 & 6 & 3 \\ 12 & 5 & 11 \end{bmatrix}$

II) prove that. $A+B = B+A$

1st example. order of matrix is 3×3.

$A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}_{3\times3}$ $B = \begin{bmatrix} 2 & 4 & 5 \\ 7 & 8 & 9 \\ 2 & 1 & 3 \end{bmatrix}_{3\times3}$.

$A+B = \begin{bmatrix} 1+2 & 2+4 & 3+5 \\ 4+7 & 5+8 & 6+9 \\ 7+2 & 8+1 & 9+3 \end{bmatrix} = \begin{bmatrix} 3 & 6 & 8 \\ 11 & 13 & 15 \\ 9 & 9 & 12 \end{bmatrix}_{3\times3}$.

$B+A \begin{bmatrix} 2+1 & 4+2 & 5+3 \\ 7+4 & 8+5 & 9+6 \\ 2+7 & 1+8 & 3+9 \end{bmatrix} = \begin{bmatrix} 3 & 6 & 8 \\ 11 & 13 & 15 \\ 9 & 9 & 12 \end{bmatrix}_{2\times3}$.

$\boxed{A+B = B+A}$

2nd Example order of matrix is 4×4

$$A = \begin{bmatrix} 2 & 3 & 4 & 5 \\ 1 & 7 & 8 & 6 \\ 9 & 0 & 2 & 1 \\ 5 & 0 & 0 & 3 \end{bmatrix}_{4\times 4} \qquad B = \begin{bmatrix} 7 & 4 & 9 & 3 \\ 4 & 6 & 10 & 2 \\ 5 & 7 & 1 & 3 \\ 2 & 8 & 2 & 1 \end{bmatrix}$$

$$A+B = \begin{bmatrix} 2+7 & 3+4 & 4+9 & 5+3 \\ 1+4 & 7+6 & 8+10 & 6+2 \\ 9+5 & 0+7 & 2+1 & 1+3 \\ 5+2 & 0+8 & 0+2 & 3+1 \end{bmatrix} = \begin{bmatrix} 9 & 7 & 13 & 8 \\ 5 & 13 & 18 & 8 \\ 14 & 7 & 3 & 4 \\ 7 & 8 & 2 & 4 \end{bmatrix}$$

$$B+A \begin{bmatrix} 7+2 & 4+3 & 9+4 & 5+3 \\ 4+1 & 7+6 & 10+8 & 2+6 \\ 5+9 & 7+0 & 1+2 & 3+1 \\ 2+5 & 8+0 & 2+0 & 1+3 \end{bmatrix} = \begin{bmatrix} 9 & 7 & 13 & 8 \\ 5 & 13 & 18 & 8 \\ 14 & 7 & 3 & 4 \\ 7 & 8 & 2 & 4 \end{bmatrix}$$

iii) prove that. $(A+B)+C = A+(B+C) = (A+C)+B = ?$

$(4+6)+2 = 4+(6+2) = (4+2)+6 = ?$

$$\boxed{12 \quad = \quad 12 \quad = \quad 12}$$

$(4+6)+2 = 12$

$4+(6+2) = 12$

$(4+2)+6 = 12$

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v. Additive identity

Additive identity in matrix is zero

e.g $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}_{2\times2} + \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}_{2\times2}$

$\boxed{i = A+0 = A}$

Square matrix का Addition जब zero matrix के साथ होती है तब उसे Additive identity कहते हैं.

e.g = $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}_{2\times2} + \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}_{2\times2}$

$A\cancel{+B} = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}_{2\times2} + B = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}_{2\times2} = A+B \begin{bmatrix} 1+0 & 2+0 \\ 3+0 & 4+0 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}_{2\times2}$

4 Existence of inverse.

In matrix Addition negative of it's matrix is a inverse of matrix.

that is $\boxed{A+(-A) = (-A)+A = 0}$

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

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

Existence of inverse में Positive matrix की Addition Negative matrix के साथ होती है

e.g = $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}_{2\times2}$ $-A = \begin{bmatrix} -1 & -2 \\ -3 & -4 \end{bmatrix}$

v) left Cancelation Rule

that is $\boxed{\cancel{A}+B = \cancel{A}+C = B = C}$

vi) Right cancelation Rule.

$\boxed{B+\cancel{A} = C+\cancel{A} = B+A \quad B=C}$

∇ Substraction of matrices

Substraction of matrices is the substraction of elements of the matrices A to the element of matrix B at some position.

Substraction of matrix मतलब दो matrices का substraction होना.

e.g: $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}_{2\times 2}$ B $\begin{bmatrix} 5 & 4 \\ 2 & 1 \end{bmatrix}_{2\times 2}$

$A - B = \begin{bmatrix} 1-5 & 2-4 \\ 3-2 & 4-1 \end{bmatrix} = \begin{bmatrix} -4 & -2 \\ 2 & 3 \end{bmatrix}_{2\times 2}$

∇ Equality of matrix

Let, A and B be two matrices then, matrix A and matrix B are said to be equal.

(A) & (B) are said to be equal if and only if.

i) order of (A) = order of (B)

ii) $a_{ij} = b_{ij}$ $a \in A$ & $b \in B$.

e.g $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}_{2\times 2}$ $B = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

find the value of x & y iff A & B are equal.

$A \begin{bmatrix} x & 2 \\ 3 & y \end{bmatrix}$, $B = \begin{bmatrix} 3 & 2 \\ 3 & 1 \end{bmatrix}$ $\therefore$ $x = 3$, $y = 1$ $\begin{bmatrix} 3 & 2 \\ 3 & 1 \end{bmatrix} \Leftarrow A \& B$

$A = \begin{bmatrix} x^2 - x & 2 \\ 0 & y^2 + 2y \end{bmatrix}$, $B = \begin{bmatrix} 6 & 2 \\ 0 & 8 \end{bmatrix}$

$x^2 - x = 6$

$x^2 - x - 6 = 0$

$x^2 - 3x + 2x - 6 = 0$

$x(x-3)\ 2(x-3) = 0$

$(x-3)(x+2) = 0$

$x - 3 = 0$ or $x + 2 = 0$

$\boxed{x = 3}$ or $\boxed{x = -2}$

~~y+4=0 or~~ ~~y-2=0~~ ~~28/9/24~~

$y^2+2y=8$

$y^2+2y-8=0$

$y^2+4y-2y-8=0$

$y(y+4)-2(y+4)=0$

$(y+4)(y-2)=0$

$(y+4)=0 \quad (y-2)=0$

$y+4=0$ or $y-2=0$

$\boxed{y=-4}$ or $\boxed{y=2}$

wow.
very Nice..
This is complete & cleare Notebook.

30-09-2024.

suggestion:- No need to any suggestion.
only Read.

1-10-24

Addition of matrix - e.g.

① $A=\begin{bmatrix}2 & -3\\ 3 & 4\end{bmatrix}_{2\times2}$, $B=\begin{bmatrix}4 & 5\\ 3 & -2\end{bmatrix}_{2\times2}$ find $3A+4B$

Given : $A=\begin{bmatrix}2 & -3\\ 3 & 4\end{bmatrix}_{2\times2}$, $B=\begin{bmatrix}4 & 5\\ 3 & -2\end{bmatrix}_{2\times2}$

find : $3A+4B$.

multiply matrix A and B By 3 and 4.

$3A=3\begin{bmatrix}2 & -3\\ 3 & 4\end{bmatrix} = \begin{bmatrix}6 & -9\\ 9 & 12\end{bmatrix}$ — ①

$4B=4\begin{bmatrix}4 & 5\\ 3 & -2\end{bmatrix} = \begin{bmatrix}16 & 20\\ 12 & -8\end{bmatrix}$ - ⑪

By equation ① & ⑪ Take a Addition of matrix A and B.

$$3A+4B = \begin{bmatrix} 6+16 & -9+20 \\ 9+12 & 12+(-8) \end{bmatrix}$$

$$3A+4B = \begin{bmatrix} 22 & 11 \\ 21 & 4 \end{bmatrix}_{2\times 2}$$

2) $A = \begin{bmatrix} 2 & -3 \\ 3 & 4 \end{bmatrix}$ $B = \begin{bmatrix} 4 & 5 \\ 3 & 2 \end{bmatrix}$ $C = \begin{bmatrix} 3 & -1 \\ 0 & 6 \end{bmatrix}$ find $3A+4B-2C$

Given $A = \begin{bmatrix} 2 & -3 \\ 3 & 4 \end{bmatrix}$ $B = \begin{bmatrix} 4 & 5 \\ 3 & 2 \end{bmatrix}$ $C = \begin{bmatrix} 3 & -1 \\ 0 & 6 \end{bmatrix}$

find : $3A+4B-2C$

multiply matrices A, B & C by 3, 4 and 2

$$3A = 3\begin{bmatrix} 2 & -3 \\ 3 & 4 \end{bmatrix} = \begin{bmatrix} 6 & -9 \\ 9 & 12 \end{bmatrix} \quad -①$$

$$4B = 4\begin{bmatrix} 4 & 5 \\ 3 & 2 \end{bmatrix} = \begin{bmatrix} 16 & 20 \\ 12 & -8 \end{bmatrix} \quad -⑪$$

$$2B : 2\begin{bmatrix} 3 & -1 \\ 0 & 6 \end{bmatrix} = \begin{bmatrix} 6 & -2 \\ 0 & 12 \end{bmatrix} \quad -\text{(III)}$$

By eqn ① & ⑪ Take a Addition

$$A+B = \begin{bmatrix} 6 & -9 \\ 9 & 12 \end{bmatrix} \begin{bmatrix} 16 & 20 \\ 12 & -8 \end{bmatrix}$$

$$\begin{bmatrix} 6+16 & -9+20 \\ 9+12 & 12+(-8) \end{bmatrix}$$

$$A+B \begin{bmatrix} 22 & 11 \\ 21 & 4 \end{bmatrix} \quad -⑪$$

By eqn III & II Take substra

$$\begin{bmatrix} 22 & 11 \\ 21 & 4 \end{bmatrix} \begin{bmatrix} 6 & -2 \\ 0 & 12 \end{bmatrix}$$

$$\begin{bmatrix} 22-6 & 11-(-2) \\ 21-0 & 4-12 \end{bmatrix}$$

$$A+B-C = \begin{bmatrix} 16 & 13 \\ 21 & -8 \end{bmatrix}_{2\times 2}$$

✓ Matrix multiplication

Multiplication of matrix में R_1 का multiply C_1 or C_2 के साथ होता है or R_2 का multiply भी C_1 or C_2 के साथ होता है

Let, $A = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}_{2\times2}$ $B = \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix}_{2\times2}$

$$A\times B \text{ or } AB = \begin{bmatrix} a_{11}\times b_{11} + a_{12}\times b_{21} & a_{11}\times b_{12} + a_{12}\times b_{22} \\ a_{22}\times b_{22} + a_{22}\times b_{21} & a_{21}\times b_{12} + a_{22}\times b_{22} \end{bmatrix}$$

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

$$\begin{bmatrix} 1\times1 + 2\times0 & 1\times3 + 2\times1 \\ 3\times1 + 4\times0 & 3\times3 + 4\times(-1) \end{bmatrix}_{2\times2}$$

$$A\times B \text{ or } AB = \begin{bmatrix} 1+0 & 3+2 \\ 3+0 & 9+(-4) \end{bmatrix}$$

$$A\times B = \begin{bmatrix} 1 & 5 \\ 3 & 13 \end{bmatrix}_{2\times2}$$

② $A = \begin{bmatrix} 1 & -5 \\ 6 & 4 \end{bmatrix}$ $B = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$

$$A\times B \text{ or } AB = \begin{bmatrix} 1\times1 + (-5)\times0 & 1\times0 + (-5)\times(-1) \\ 6\times1 + 4\times0 & 6\times0 + 4\times(-1) \end{bmatrix}$$

$$\begin{bmatrix} 1+0 & 0+5 \\ 6+0 & 0+(-4) \end{bmatrix}$$

$$A\times B = \begin{bmatrix} 1 & 5 \\ 6 & -4 \end{bmatrix}_{2\times2}$$

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Home Work.

1) $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}_{2\times3}$ $B = \begin{bmatrix} 1 \\ 9 \\ 8 \end{bmatrix}_{3\times2}$ find AB

Given :- $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}_{2\times3}$, $B = \begin{bmatrix} 1 \\ 9 \\ 8 \end{bmatrix}_{3\times2}$

find : AB.

multiply 1st Row By colaum. and also multiply 2nd Row by colaum.

$$A\times B = \begin{bmatrix} 1\times1 + 2\times9 + 3\times8 \\ 4\times1 + 5\times9 + 6\times8 \end{bmatrix} = \begin{bmatrix} 1+18+24 \\ 4+45+48 \end{bmatrix} = \begin{bmatrix} 43 \\ 97 \end{bmatrix}$$

or AB

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2) $A = \begin{bmatrix} 4 & 2 \\ 8 & 4 \end{bmatrix}$ $B = \begin{bmatrix} 2 & 6 \\ -4 & -12 \end{bmatrix}$ find AB

Given :- $A = \begin{bmatrix} 4 & 2 \\ 8 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 6 \\ -4 & -12 \end{bmatrix}$

find = AB.

multiply 1st Row By colaum 1 and 2 and also multiply 2nd Row By colaum 1&

~~4×2 + 2×−4~~ ~~4×6 + 2×(−12)~~

~~8×(−4) + 4×~~

$$AB = \begin{bmatrix} 4\times2 + 2\times(-4) & 4\times6 + 2\times(-12) \\ 8\times2 + 4\times(-4) & 8\times6 + 4\times(-12) \end{bmatrix}$$

$$\begin{bmatrix} 8 + (-8) & 24 + (-24) \\ 16 + (-16) & 48 + (-48) \end{bmatrix}$$

$$AB = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}_{2\times2}.$$

3) $A = \begin{bmatrix} 3 & 4 & -2 \\ 2 & 1 & 0 \end{bmatrix}_{2\times 3}$ $B = \begin{bmatrix} 2 & -1 \\ 3 & 4 \\ 0 & 2 \end{bmatrix}_{2\times 2}$

Given :- $A = \begin{bmatrix} 3 & 4 & -2 \\ 2 & 1 & 0 \end{bmatrix}$ $B = \begin{bmatrix} 2 & -1 \\ 3 & 4 \\ 0 & 2 \end{bmatrix}$

multiply 1 Row By coloum 1 and 2. and also multiply ~~colu~~ 2 Row by coloum 1 and 2.

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

$$AB = \begin{bmatrix} 6 + 12 + 0 & -3 + 16 + (-4) \\ 4 + 3 + 0 & -2 + 4 + 0 \end{bmatrix} = \begin{bmatrix} 18 & 13 - 4 \\ 7 & 2 \end{bmatrix}$$

$$AB = \begin{bmatrix} 18 & 9 \\ 7 & 2 \end{bmatrix}_{2\times 2}$$

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4) $A = \begin{bmatrix} 1 & 2 \\ 5 & 3 \end{bmatrix}$ $B = \begin{bmatrix} 2 & 6 \\ -3 & 4 \end{bmatrix}$ find AB

Given :- $A = \begin{bmatrix} 1 & 2 \\ 5 & 3 \end{bmatrix}$ $B = \begin{bmatrix} 2 & 6 \\ -3 & 4 \end{bmatrix}$

find = $A \cdot B$.

multiply 1st Row by coloum 1 and 2. & also multiply 2nd Row by coloum 1 and 2.

$$A\times B \text{ or } AB = \begin{bmatrix} 1\times 2 + 2\times(-3) & 1\times 6 + 2\times 4 \\ 5\times 2 + 3\times(-3) & 5\times 6 + 3\times 4 \end{bmatrix}$$

$$= \begin{bmatrix} 2 + (-6) & 6 + 8 \\ 10 + (-9) & 30 + 12 \end{bmatrix} = \cancel{2-6} \begin{bmatrix} -4 & 2 \\ 1 & 42 \end{bmatrix}_{2\times 2}$$

$$AB = \begin{bmatrix} -4 & 2 \\ 1 & 42 \end{bmatrix}_{2\times 2}$$

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

Given :- $A = \begin{bmatrix} 1 & -3 \\ 1 & 5 \end{bmatrix}$ $B = \begin{bmatrix} 3 & -1 & 2 \\ 1 & 0 & 1 \end{bmatrix}$

multiply I row by coloum 1,2 and 3 also multiply 2 row by coloum 1,2 & 3

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

$$A\times B \text{ or } AB = \begin{bmatrix} 3+(-3) & -1+0 & 2+(-3) \\ 3+5 & -1+0 & 2+5 \end{bmatrix} = \begin{bmatrix} 0 & -1 & -1 \\ 8 & -1 & 7 \end{bmatrix}_{2\times 3}.$$

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6) $A = \begin{bmatrix} 2 & -5 & 8 \\ 0 & 1 & 2 \end{bmatrix}$ $B = \begin{bmatrix} 6 & 1 \\ 0 & 4 \\ 5 & 7 \end{bmatrix}$

Given :- $A = \begin{bmatrix} 2 & 5 & 6 \\ 0 & 1 & 2 \end{bmatrix}$ $B = \begin{bmatrix} 6 & 1 \\ 0 & 4 \\ 5 & 7 \end{bmatrix}$

find AB.

multiply 1st Row ~~bn~~ by coloum 1 & 2. and also multiply 2nd Row by coloum 1 & 2

$$AB = \begin{bmatrix} 2\times 6 + 5\times 0 + 6\times 5 & 2\times 1 + 5\times 4 + 6\times 7 \\ 0\times 6 + 1\times 0 + 2\times 5 & 0\times 1 + 1\times 4 + 2\times 7 \end{bmatrix}$$

$$\begin{bmatrix} 12+0+30 & 2+20+42 \\ 0+0+10 & 0+4+14 \end{bmatrix}$$

$$\begin{bmatrix} 12+30 & 22+42 \\ 10 & 4+14 \end{bmatrix}$$

$$= \begin{bmatrix} 42 & 64 \\ 10 & 18 \end{bmatrix} \quad AB = \begin{bmatrix} 42 & 64 \\ 10 & 18 \end{bmatrix}_{2\times 2}$$

Examples of addition and Subtraction matrix.

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

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

find that $3x+y$

multiply 1st matrix by 3

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

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

Take a Addition of x matrix and y matrix.

$$3x+y = \begin{bmatrix} 3 & 6 \\ -9 & 12 \end{bmatrix} + \begin{bmatrix} 4 & 5 \\ 1 & -3 \end{bmatrix}$$

$$3x+y = \begin{bmatrix} 3+4 & 6+5 \\ -9+1 & 12+(-3) \end{bmatrix}$$

$$\boxed{3x+y = \begin{bmatrix} 7 & 11 \\ -8 & 9 \end{bmatrix}_{2\times 2}}$$

2) $A = \begin{bmatrix} 5 & 3 \\ -1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -1 \\ 3 & 2 \end{bmatrix}$ find $2A-3B$

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

find the $2A-3B$.

multiply 1st matrix by 2 and 2nd matrix by 3.

$$2A = 2\begin{bmatrix} 5 & 3 \\ -1 & 1 \end{bmatrix} = \cancel{10} \ \cancel{15} \ \cancel{-5} \begin{bmatrix} 10 & 6 \\ -2 & 2 \end{bmatrix} \quad \text{—(i)}$$

$$3B = 3\begin{bmatrix} 2 & -1 \\ 3 & 2 \end{bmatrix} = \begin{bmatrix} 6 & -3 \\ 9 & 6 \end{bmatrix} \quad \text{—(ii)}$$

By eqn (i) and (ii) Take a Addition. subtraction.

$$A-B \begin{bmatrix} 10 & 6 \\ -2 & 2 \end{bmatrix} - \begin{bmatrix} 6 & -3 \\ 9 & 6 \end{bmatrix} -$$

$$2A-3B = \begin{bmatrix} 10 & 6 \\ -2 & 2 \end{bmatrix} - \begin{bmatrix} 6 & -3 \\ 9 & 6 \end{bmatrix}$$

$$= \begin{bmatrix} 10-6 & 6-(-3) \\ -2-9 & 2-6 \end{bmatrix}$$

$\cancel{10-6}$ $\cancel{6+3}$

$$\boxed{2A-3B = \begin{bmatrix} 4 & 9 \\ -11 & -4 \end{bmatrix}_{2\times 2}}$$

3) $A = \begin{bmatrix} 2 & 3 & 2 \\ 0 & -1 & 5 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 2 & 1 \\ 0 & -1 & 3 \end{bmatrix}$ Evaluate $3A - 4B$

Given :- $A = \begin{bmatrix} 2 & 3 & 2 \\ 0 & -1 & 5 \end{bmatrix}$ $B = \begin{bmatrix} 1 & 2 & 1 \\ 0 & -1 & 3 \end{bmatrix}$

find the - $3A - 4B$.

multiply 'A' matrix by 3 and B matrix by 4.

$$3A = 3\begin{bmatrix} 2 & 3 & 2 \\ 0 & -1 & 5 \end{bmatrix} = \begin{bmatrix} 6 & 9 & 6 \\ 0 & -3 & 15 \end{bmatrix} - (i)$$

$$4B = 4\begin{bmatrix} 1 & 2 & 1 \\ 0 & -1 & 3 \end{bmatrix} = \begin{bmatrix} 4 & 8 & 4 \\ 0 & -4 & 12 \end{bmatrix} - (ii)$$

from eqn (i) and (ii) Take a subtraction

$$\begin{bmatrix} 6 & 9 & 6 \\ 0 & -3 & 15 \end{bmatrix} \begin{bmatrix} 4 & 8 & 4 \\ 0 & -4 & 12 \end{bmatrix} \Leftarrow 3A - 4B$$

$$\begin{bmatrix} 6-4 & 9-8 & 6-4 \\ 0-0 & -3-(-4) & 15-12 \end{bmatrix}$$

$$\begin{bmatrix} 6-4 & 9-8 & 6-4 \\ 0-0 & -3+4 & 15-12 \end{bmatrix}$$

$$3A - 4B = \begin{bmatrix} 2 & 1 & 2 \\ 0 & 1 & 3 \end{bmatrix}_{2\times 3}$$

---

4) $A = \begin{bmatrix} 2 & -3 \\ 3 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 4 & 5 \\ 3 & -2 \end{bmatrix}$, $C = \begin{bmatrix} 3 & -1 \\ 0 & 6 \end{bmatrix}$. find $3A + 4B - 2C$

Given :- $A = \begin{bmatrix} 2 & -3 \\ 3 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 4 & 5 \\ 3 & -2 \end{bmatrix}$ $C = \begin{bmatrix} 3 & -1 \\ 0 & 6 \end{bmatrix}$

find that : $3A + 4B - 2C$.

multiply A, ~~matrix~~ B, C matrix by 3, 4, 2

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

$$\begin{bmatrix} 6 & -9 \\ 9 & 12 \end{bmatrix} + \begin{bmatrix} 16 & 20 \\ 12 & -8 \end{bmatrix} - \begin{bmatrix} 6 & -2 \\ 0 & 12 \end{bmatrix}$$

Take a A 1st Addition of A and B.

$$A+B = \begin{bmatrix} 6 & -9 \\ 9 & 12 \end{bmatrix} + \begin{bmatrix} 16 & 20 \\ 12 & -8 \end{bmatrix}$$

$$\begin{bmatrix} 6+16 & -9+20 \\ 9+12 & 12+(-8) \end{bmatrix}$$

$$\begin{bmatrix} 22 & 11 \\ 21 & 4 \end{bmatrix}_{2\times 2} \Leftarrow A+B$$

Take a subtraction of $A+B-C$

$$\begin{bmatrix} 22 & 11 \\ 21 & 4 \end{bmatrix} - \begin{bmatrix} 6 & -2 \\ 0 & 12 \end{bmatrix} \Leftarrow A+B-C$$

$$A+B-C = \begin{bmatrix} 22-6 & 11-(-2) \\ 21-0 & 4-12 \end{bmatrix}$$

$$A+B-C = \begin{bmatrix} 16 & 13 \\ 21 & -8 \end{bmatrix}_{2\times 2}.$$

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5) $A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 4 & 5 \\ 7 & 8 & 9 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 0 & 3 \\ 4 & 0 & -1 \\ 2 & 3 & 1 \end{bmatrix}$ find $2A - 3B$.

Given:- $A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 4 & 5 \\ 7 & 8 & 9 \end{bmatrix}$ $B = \begin{bmatrix} 2 & 0 & 3 \\ 4 & 0 & -1 \\ 2 & 3 & -1 \end{bmatrix}$

find the : $2A - 3B$

multiply matrix A and B by 2 and 3

$$2A = 2\begin{bmatrix} 1 & 2 & 3 \\ 0 & 4 & 5 \\ 7 & 8 & 9 \end{bmatrix} = \begin{bmatrix} 2 & 4 & 6 \\ 0 & 8 & 10 \\ 14 & 16 & 18 \end{bmatrix} \quad -(i)$$

$$3B = 3\begin{bmatrix} 2 & 0 & 3 \\ 4 & 0 & -1 \\ 2 & 3 & -1 \end{bmatrix} = \begin{bmatrix} 6 & 0 & 9 \\ 12 & 0 & -3 \\ 6 & 9 & -3 \end{bmatrix} \quad -(ii)$$

from eqn (i) and (ii) Take a subtraction.

$$\begin{bmatrix} 2 & 4 & 6 \\ 0 & 8 & 10 \\ 14 & 16 & 18 \end{bmatrix} - \begin{bmatrix} 6 & 0 & 9 \\ 12 & 0 & -3 \\ 6 & 9 & -3 \end{bmatrix} \Leftarrow 2A - 3B$$

$$\begin{bmatrix} 2-6 & 4-0 & 6-9 \\ 0-12 & 8-0 & 10-(-3) \\ 14-6 & 16-9 & 18-(-3) \end{bmatrix}$$

$$2A - 3B = \begin{bmatrix} -4 & 4 & -3 \\ -12 & 8 & 13 \\ 8 & 7 & 15 \end{bmatrix}_{3\times 3}$$

6) find matrix x such that $\begin{bmatrix} 4 & 5 \\ -3 & 6 \end{bmatrix} + x = \begin{bmatrix} 10 & -1 \\ 0 & -6 \end{bmatrix}$

Given:- $\begin{bmatrix} 4 & 5 \\ -3 & 6 \end{bmatrix} + x = \begin{bmatrix} 10 & -1 \\ 0 & -6 \end{bmatrix}$

$$x = \begin{bmatrix} 10 & -1 \\ 0 & -6 \end{bmatrix} - \begin{bmatrix} 4 & 5 \\ -3 & 6 \end{bmatrix}$$

$$x = \begin{bmatrix} 10-4 & -1-5 \\ 0-(-3) & -6-6 \end{bmatrix}$$

$$x = \begin{matrix} 6 & \cancel{-6} \\ \cancel{3} & \cancel{-12} \end{matrix} \qquad x = \begin{bmatrix} 6 & -6 \\ 3 & -12 \end{bmatrix}_{2\times 2}.$$

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7) $A = \begin{bmatrix} 3 & 2 \\ 1 & -1 \\ 0 & 4 \end{bmatrix}$ $B = \begin{bmatrix} -1 & -1 \\ 3 & 2 \\ 4 & 2 \end{bmatrix}$ verify that, $A+B = B+A$

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

verify : $A+B = B+A$.

Take a Addition of $A+B$ matrix A and matrix B.

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

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

Now, Take a Addition of $B+A$ matrix B and matrix A.

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

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

$$B+A = \begin{bmatrix} 2 & 1 \\ 4 & 1 \\ 4 & 6 \end{bmatrix}_{3\times 2}$$

$A+B$ and $B+A$ are same.

8) $A = \begin{bmatrix} 2 & -1 \\ 4 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & -2 \\ -1 & 4 \end{bmatrix}$. Find the matrix '$x$' such that $2A + x = 3B$.

Given : $A = \begin{bmatrix} 2 & -1 \\ 4 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 3 & -2 \\ -1 & 4 \end{bmatrix}$

$$2A + x = 3B$$

$$x = 3B - 2A.$$

multiply matrix B by 3 and matrix A by 2

$$3\begin{bmatrix} 3 & -2 \\ -1 & 4 \end{bmatrix} = \begin{bmatrix} 9 & -6 \\ -3 & 12 \end{bmatrix} \quad - (1)$$

$$2\begin{bmatrix} 2 & -1 \\ 4 & 3 \end{bmatrix} = \begin{bmatrix} 4 & -2 \\ 8 & 6 \end{bmatrix} \quad - (11)$$

~~Take~~ from eqn (1) and (11)

Take a subtraction.

$$x = \begin{bmatrix} 9-4 & -6-(-2) \\ -3-8 & 12-6 \end{bmatrix}$$

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

$$x = \begin{bmatrix} 5 & -4 \\ -11 & 6 \end{bmatrix}$$

$$x = \begin{bmatrix} 5 & -4 \\ -11 & 6 \end{bmatrix}_{2\times 2}$$

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9) Find A if, $2A + 3\begin{bmatrix}1 & 3\\ 2 & 5\end{bmatrix} = \begin{bmatrix}5 & 7\\ 6 & 3\end{bmatrix}$

Given $2A + 3\begin{pmatrix}1 & 3\\ 2 & 5\end{pmatrix} = \begin{bmatrix}5 & 7\\ 6 & 3\end{bmatrix}$

Find 'A'

multiply 1st matrix by 3.

$$3\begin{bmatrix}1 & 3\\ 2 & 5\end{bmatrix} = \begin{bmatrix}3 & 9\\ 6 & 15\end{bmatrix}$$

~~2A = Take et~~ Addition ~~of~~
~~1st matrix and 2nd matrix~~.

~~2A~~ = 5 7

Take a subtraction.

$$2A = \begin{bmatrix}5 & 7\\ 6 & 3\end{bmatrix} - \begin{bmatrix}3 & 9\\ 6 & 15\end{bmatrix}$$

$$2A = \begin{bmatrix}5-3 & 7-9\\ 6-6 & 3-15\end{bmatrix} = \begin{bmatrix}2 & -2\\ 0 & -12\end{bmatrix}$$

$$2A = \frac{1}{2}\begin{bmatrix}2 & -2\\ 0 & -12\end{bmatrix} = \begin{bmatrix}\frac{2}{2} & \frac{-2}{2}\\ \frac{0}{2} & \frac{-12}{2}\end{bmatrix}$$

$$A = \begin{bmatrix}1 & 1\\ 0 & -6\end{bmatrix}$$

10) $A = \begin{bmatrix}x & 2 & -5\\ 3 & 1 & 2y\end{bmatrix}$ and $B = \begin{bmatrix}2y+5 & 6 & -15\\ 9 & 3 & -6\end{bmatrix}$ and if $3A = B$ find x, y.

Given:- $\begin{bmatrix}x & 2 & -5\\ 3 & 1 & 2y\end{bmatrix}$, $B = \begin{bmatrix}2y+5 & 6 & -15\\ 9 & 3 & -6\end{bmatrix}$ and 3A

find x, y.

multiply matrix A by 3.

$$3\begin{bmatrix}x & 2 & -5\\ 3 & 1 & 2y\end{bmatrix} = \begin{bmatrix}3x & 6 & -15\\ 9 & 3 & 6y\end{bmatrix}$$

$$\begin{bmatrix}3x & 6 & -15\\ 9 & 3 & 6y\end{bmatrix} = \begin{bmatrix}2y+5 & 6 & -15\\ 9 & 3 & -6\end{bmatrix}$$

By equality of matrix.

$6y = -6$

$3x = 2y + 5$

$3x = 2 + 5 = 3$

put

$\therefore \boxed{y = -1}$

$3x = 2y + 5$

$3x = 2(-1) + 5$

$3x = -2 + 5$

$3x = 3$

$x = \frac{3}{3}$

$\boxed{x = 1}$

$\boxed{y = -1}$ and $\boxed{x = 1}$

11) $\cancel{A = \begin{bmatrix} 3 & 1 \\ 2 & 4 \end{bmatrix}}$ $A = \begin{bmatrix} 2 & 3 \\ 4 & 7 \end{bmatrix}, B = \begin{bmatrix} 1 & 3 \\ 4 & 6 \end{bmatrix}$ find $2A+3B-4I$ where I is the unit matrix.

Given:- $A = \begin{bmatrix} 2 & 3 \\ 4 & 7 \end{bmatrix}$ $B = \begin{bmatrix} 1 & 3 \\ 4 & 6 \end{bmatrix}$

matrix A is 2×2 and matrix B is also 2×2. $4I$ where I is unit matrix

We have to find $2A+3B-4I$

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

multiply matrix A, B and I by 2, 3, 4

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

$\begin{bmatrix} 4 & 6 \\ 8 & 14 \end{bmatrix} = \begin{bmatrix} 3 & 9 \\ 12 & 18 \end{bmatrix} = \begin{bmatrix} 4 & 0 \\ 0 & 4 \end{bmatrix}$

Take a Addition of A and B.

$A+B = \begin{bmatrix} 4 & 6 \\ 8 & 14 \end{bmatrix} + \begin{bmatrix} 3 & 9 \\ 12 & 18 \end{bmatrix}$

$A+B = \begin{bmatrix} 4+3 & 6+9 \\ 8+12 & 14+18 \end{bmatrix} = \begin{bmatrix} 7 & \\ 20 & \end{bmatrix}$

Now, subtract the $A+B-I$

$A+B-I = \begin{bmatrix} 7 & 15 \\ 20 & 32 \end{bmatrix} - \begin{bmatrix} 4 & 0 \\ 0 & 4 \end{bmatrix}$

$\begin{bmatrix} 7-4 & 15-0 \\ 20-0 & 32-4 \end{bmatrix}$

$A+B-I = \begin{bmatrix} 3 & 15 \\ 20 & 28 \end{bmatrix}_{2\times2}$

12) $A = \begin{bmatrix} 3 & -1 \\ 2 & 4 \end{bmatrix}, B = \begin{bmatrix} 1 & 2 \\ -3 & 0 \end{bmatrix}$ then find the matrix 'x' such $2x+3A-4B=I$ where I is identity matrix of order 2.

Given :- $A = \begin{bmatrix} 3 & -1 \\ 2 & 4 \end{bmatrix}$ $B = \begin{bmatrix} 1 & 2 \\ -3 & 0 \end{bmatrix}$

$2x+3A-4B = I$, $2x = I+4B-3A$

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

multiply B and A By 4 and 3

$B = 4\begin{bmatrix} 1 & 2 \\ -3 & 0 \end{bmatrix} = \begin{bmatrix} 4 & 8 \\ -12 & 0 \end{bmatrix}$.

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

Take a Addition of I and B.

$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} + \begin{bmatrix} 4 & 8 \\ -12 & 0 \end{bmatrix} = I+B$

$\begin{bmatrix} 1+4 & 0+8 \\ 0+(-12) & 1+0 \end{bmatrix}$

$I+B = \begin{bmatrix} 5 & 8 \\ -12 & 1 \end{bmatrix}$

Take a subtraction of $I+B-A$

$\begin{bmatrix} 5 & 8 \\ -12 & 1 \end{bmatrix} - \begin{bmatrix} 9 & -3 \\ 6 & 12 \end{bmatrix}$

$I+B-C = \begin{bmatrix} 5-9 & 8-(-3) \\ -12-6 & 1-12 \end{bmatrix}$

$I+B-C = \begin{bmatrix} -4 & 11 \\ -18 & -11 \end{bmatrix}$

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13) $A = \begin{bmatrix} 1 & 3 & 2 \\ -1 & 2 & 0 \\ 4 & 0 & 3 \end{bmatrix}$; $B = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 2 & 0 \\ 1 & 0 & 3 \end{bmatrix}$ and $C = \begin{bmatrix} 2 & 1 & 2 \\ 2 & 2 & 1 \\ 1 & 2 & 2 \end{bmatrix}$

then find the matrix D such that $2A - 3B - D = C$.

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

$2A - 3B - D = C$, $2A - 3B - C = D$.

multiply A and B by 2 and 3.

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

$D = \begin{bmatrix} 2 & 6 & 4 \\ -2 & 4 & 0 \\ 8 & 0 & 3 \end{bmatrix} - \begin{bmatrix} 3 & 0 & 0 \\ 3 & 6 & 0 \\ 3 & 0 & 9 \end{bmatrix}$ ∴ subtraction of A and B.

$= \begin{bmatrix} 2-3 & 6-0 & 4-0 \\ -2-3 & 4-6 & 0-0 \\ 8-3 & 0-0 & 6-9 \end{bmatrix} = \begin{bmatrix} -1 & 6 & 4 \\ -5 & -2 & 0 \\ 5 & 0 & -3 \end{bmatrix}$

Now Take a subtraction of A - B and C.

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

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

~~A+B~~ ∴ $\boxed{A - B - C = \begin{bmatrix} -3 & 5 & 2 \\ -7 & -4 & -1 \\ 4 & -2 & -5 \end{bmatrix}_{3\times3}}$

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14) x, y, z if $\begin{bmatrix} 2+x & -1 & 3 \\ 0 & y & 2 \\ 4 & 1 & 3 \end{bmatrix} + \begin{bmatrix} 1+x & 2 & 3 \\ 0 & 1+y & 4 \\ 2 & 3 & 5 \end{bmatrix} = \begin{bmatrix} 6 & 1 & 6 \\ 0 & -1 & 6 \\ 6 & 4 & 8 \end{bmatrix}$

Given :-
$$\begin{bmatrix} 2+x & -1 & 3 \\ 0 & y & z \\ 4 & 1 & 3 \end{bmatrix} + \begin{bmatrix} 1+x & 2 & 3 \\ 0 & 1+y & 4 \\ 2 & 3 & 5 \end{bmatrix} = \begin{bmatrix} 6 & 1 & 6 \\ 0 & -1 & 6 \\ 6 & 4 & 8 \end{bmatrix}$$

We have to find x, y, z.

Adding matrices of L.H.S.

$$\begin{bmatrix} 2+x & -1 & 3 \\ 0 & y & z \\ 4 & 1 & 3 \end{bmatrix} + \begin{bmatrix} 1+x & 2 & 3 \\ 0 & 1+y & 4 \\ 2 & 3 & 5 \end{bmatrix}$$

$$\begin{bmatrix} 2+x+1y & -1+2 & 3+3 \\ 0+0 & y+1+y & z+4 \\ 4+2 & 1+3 & 3+5 \end{bmatrix}$$

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

By equality of matrices,

$$3+2x = 6$$
$$2x = 6-3$$
$$2x = 3$$
$$\boxed{x = \frac{3}{2}}$$

$$1+2y = -1$$
$$2y = -1-1$$
$$2y = -2$$
$$y = \frac{-2}{2}$$
$$\boxed{y = -1}$$

$$z+4 = 6$$
$$\cancel{z = 6-4}$$
$$z = 6-4$$
$$\boxed{z = 2}$$

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Condition of multiplication -

For matrix multiplication the matrices need not be always square matrices.

Necessary condition of matrix multiplication.

The number of elements in the row of matrix 'A' must be equal to the number of elements in the coloum of matrix B or vice-versa.

Row of matrix A. के जितने element होते है उतने ही element coloum of matrix के होने चाहिये तब ही matrix of multiplication होता है.

e.g = $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}, B = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$

Multiplication of matrix A & B are not possible because A has an Two element in it's row and b has an Three element in it's coloum.

But multiplication of matrix BA is possible.
Because ~~The row of matrix B is 3~~ B has an 3 element in it's row and A has an 3 element in it's coloum.

If $[A]_{m\times n}$ order & $[B]_{n\times m}$ order Them $[AB]_{m\times m}$ or $n\times n$ order, Whiever Has smaller!

Properties of matrix multiplication.

a) Commutative.

matrix multiplication is not commutative except in Diagonal matrices.

ie. $\boxed{AB \neq BA}$. but in diagonal matrices $\boxed{AB = BA}$.

e.g :

① $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}$ $B = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$ find AB.

= $AB \neq BA$.

multiplication of matrix A & B are not possible because: A has an 2 element ~~and~~ b ~~has an~~ in it's Row and b has an 3 element in it's coloum.

2) $A = \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 0 \\ 0 & 5 \end{bmatrix}$, find AB and BA.

= multiplication of AB.

$$\begin{bmatrix} R_1 \times C_1 & R_1 \times C_2 \\ R_2 \times C_1 & R_2 \times C_2 \end{bmatrix}$$

$$AB = \begin{bmatrix} 1\times 3 + 0\times 0 & 1\times 0 + 0\times 5 \\ 0\times 3 + 2\times 0 & 0\times 0 + 2\times 5 \end{bmatrix} = \begin{bmatrix} 3+0 & 0+0 \\ 0+0 & 0+10 \end{bmatrix}$$

$AB = \begin{bmatrix} 3 & 0 \\ 0 & 10 \end{bmatrix}_{2\times 2}$. multiplication of ~~a~~ AB is $\begin{bmatrix} 3 & 0 \\ 0 & 10 \end{bmatrix}_{2\times 2}$

= Multiplication of BA.

$$\begin{bmatrix} R_1 \times C_1 & R_1 \times C_2 \\ R_2 \times C_1 & R_2 \times C_2 \end{bmatrix}$$

$$BA = \begin{bmatrix} 3\times 1 + 0\times 0 & 3\times 0 + 0\times 2 \\ 0\times 1 + 5\times 0 & 0\times 0 + 5\times 2 \end{bmatrix} = \begin{bmatrix} 3+0 & 0+0 \\ 0+0 & 0+10 \end{bmatrix}$$

$BA = \begin{bmatrix} 3 & 0 \\ 0 & 10 \end{bmatrix}_{2\times 2}$ multiplication of AB and BA are equal.

$\boxed{AB = BA.}$