Matrices:

$$\begin{bmatrix} a & c \\ b & d \end{bmatrix} \quad \begin{bmatrix} a \\ b \\ c \end{bmatrix} \quad \begin{bmatrix} a & b & c \end{bmatrix} \quad \begin{bmatrix} a & 6 & e \\ c & d & 7 \end{bmatrix}$$

Matrices are a method to solve algebric expressions

$$3x + 4y = 6$$
$$4x + 8y = 0$$

$$\begin{bmatrix} 3 & 4 \\ 4 & 8 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 6 \\ 0 \end{bmatrix}$$

Elements of matrices.

$$\begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

a, b, c & d are Elements of matrices

Element of a matrix is denoted by a_{ij}.

where i = row & j = coloumn

$$\begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}$$

a_{11} is 1st row 1st coloum element

a_{21} is 2nd row 1st coloumn elem

a_{12} 1st row 2nd coln

a_{22} 2nd row 2nd col.

$A = [a_{ij}]$ $\quad [a_{ij}] = \frac{(i+j)^3}{6}$ $\quad 3 \times 2$

No. row & No. of colowms.

$$\begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}_{m \times n}$$

where m = rows

n = colowns.

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

A matrix is always represented using alphabet generally 'A' used

$$A = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \\ a_{31} & a_{32} \end{bmatrix}_{3 \times 2}$$

$a_{11} = \frac{(1+1)^3}{6} = \frac{8}{6}$

$a_{12} = \frac{(1+2)^3}{6} = \frac{27}{6}$

$a_{21} = \frac{(2+1)^3}{6} = \frac{27}{6}$

$a_{22} = \frac{(2+2)^3}{6} = \frac{64}{6}$

$a_{31} = \frac{(3+1)^3}{6} = \frac{64}{6}$

$a_{32} = \frac{(3+2)^3}{6} = \frac{125}{6}$

$$A = \begin{bmatrix} 8 & 3 & 7 & 6 & 0 \\ 9 & 8 & 7 & -8 & 0 \\ 5 & 2 & -\sqrt{8} & 0 & 1 \\ 6 & 0 & -\sqrt{3} & -2 & 1 \end{bmatrix}$$

$a_{ij} = \frac{1}{2}\,|-3i + j|$.

a_{32} ; a_{41} , ~~a_{83}~~ ; a_{44} ;

$a_{32} \Downarrow 2$

$a_{41} \Downarrow 6$

$a_{44} \Downarrow -2$

$a_{ij} = \frac{(i+2j)^2}{2}$

2×2

Types of matrix

1. Colomn matrix

$$\begin{bmatrix} a_{11} \\ a_{21} \\ a_{31} \end{bmatrix}_{m \times 1} \text{ or } \begin{bmatrix} 8 \\ -3 \\ \sqrt{7} \end{bmatrix}_{m \times 1}$$

2. Row matrax

$$\begin{bmatrix} a_{11} & a_{12} & a_{13} \end{bmatrix}_{1 \times n} \text{ or } \begin{bmatrix} 6 & 0 & 3 & -\sqrt{8} \end{bmatrix}_{1 \times n}$$

3. Square matrix

$m = n$.

$$\begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}_{2 \times 2}$$

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

$\boxed{m = n}$

No. of rows = no. of colomns.

(4) Diagonal matrix

Can be only possible in Square matrix

$$\begin{bmatrix} a_{11} & 0 & 0 \\ 0 & a_{21} & 0 \\ 0 & 0 & a_{31} \end{bmatrix} \text{ or } \begin{bmatrix} a_{11} & 0 \\ 0 & a_{21} \end{bmatrix} \text{ or } \begin{bmatrix} 4 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 6 \end{bmatrix}$$

(5) Scarlar matrix

Diagonal matrix where dialognal elements are all same

$$\begin{bmatrix} 4 & 0 \\ 0 & 4 \end{bmatrix} \text{ or } \begin{bmatrix} \sqrt{3} & 0 & 0 \\ 0 & \sqrt{3} & 0 \\ 0 & 0 & \sqrt{3} \end{bmatrix}$$

only possible in Square matrix

⑥ Identity matrix

$$I = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}_{3\times3}$$

Diagonal elements should be equal to 1

Should be a Square matrix $(m=n)$.

⑦ Zero matrix

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

Equality of matrix

$$\begin{bmatrix} x+3 & z+4 & 2y-7 \\ -6 & a-1 & 0 \\ b-3 & -21 & 0 \end{bmatrix} = \begin{bmatrix} 0 & 6 & 3y-2 \\ -6 & -3 & 2c+2 \\ 2b+4 & -21 & 0 \end{bmatrix}$$

Find ; a, b, c, x, y & z

$x+3=0$ (1)

$z+4=6$ (2)

$2y-7=3y-2$ (3)

$a-1=-3$ (4)

$2c+2=0$ (5)

$b-3=2b+4$ (6)

$x=-3$

$z=+2$

$y=-5$

$a=-2$

$c=-1$

$b=-7$

$$\begin{bmatrix} x+y+z \\ x+z \\ y+z \end{bmatrix} = \begin{bmatrix} 9 \\ 5 \\ 7 \end{bmatrix}$$

$$x+y+z = 9$$

$$x+z = 5$$

$$y+z = 7$$

$$x+z+y = 9$$

$$5+y = 9$$

$$y = 4$$