Matrix # → it is an ordered Rectangular array in which number or function are present. and these no are Known as Elements of Matrix.

Ex:- Neeraj Marks 10 → $[10]$ ✓

Ex.- Neeraj Marks 10, Pens 5 → $\begin{bmatrix} 10 & 5 \end{bmatrix}$ or $\begin{bmatrix} 10 \\ 5 \end{bmatrix}$

Ex:-

	Marks	Pens	Books
Neeraj	10	05	08
Mayank	07	10	06

$$\Rightarrow \begin{array}{c} \text{Column} \\ \downarrow \end{array} \quad \begin{array}{cl} \begin{bmatrix} 10 & 5 & 8 \\ 7 & 10 & 6 \end{bmatrix} & \begin{array}{l} \to \text{Row} \to \text{Neeraj} \\ \to \text{Mayank} \end{array} \\ \begin{array}{ccc} \text{Mark.} & \text{Pens} & \text{Books} \end{array} & \end{array}$$

OR

$$\begin{array}{cc|l} \text{Neeraj} & \text{Mayank} & \\ \hline 10 & 7 & \to \text{Marks} \\ 5 & 10 & \to \text{Pens} \\ 8 & 6 & \to \text{Books} \end{array}$$

Ex:- $\begin{bmatrix} \cos x & -1 & 0 \\ 0 & \sin x & 1 \end{bmatrix}$

Matrix # —

Ex:-

$$A = \begin{array}{c c} \begin{array}{ccc} C_1 & C_2 & C_3 \end{array} & \\ \begin{bmatrix} 0 & 1 & 2 \\ -5 & 7 & 3 \\ 1 & 9 & 4 \end{bmatrix} & \begin{array}{c} \to R_1 \\ \to R_2 \\ \to R_3 \end{array} \end{array}_{3\times 3}$$

$$A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}_{3\times 3}$$

3 → Row, 3 → Column

General form of a Matrix:-

$$A = \begin{array}{c c} & \begin{array}{cccccccc} & & & & j^{th}\text{ column} & & n^{th}\text{ column} \end{array} \\ & \begin{bmatrix} a_{11} & a_{12} & a_{13} & \cdots & a_{1j} & \cdots & a_{1n} \\ a_{21} & a_{22} & a_{23} & \cdots & a_{2j} & \cdots & a_{2n} \\ a_{31} & a_{32} & a_{33} & \cdots & a_{3j} & \cdots & a_{3n} \\ \vdots & \vdots & \vdots & & \vdots & & \vdots \\ a_{i1} & a_{i2} & a_{i3} & \cdots & a_{ij} & \cdots & a_{in} \\ \vdots & \vdots & \vdots & & \vdots & & \vdots \\ a_{m1} & a_{m2} & a_{m3} & \cdots & a_{mj} & \cdots & a_{mn} \end{bmatrix} \end{array}$$

i^{th} row → a_{i1}; m^{th} row → a_{m1}

$$\boxed{A = [a_{ij}]_{m\times n}}$$

Where:- $1 \le i \le m$

$1 \le j \le n$

Matrix # –

Ques: Create a Matrix of order 3×2 if $a_{ij} = \frac{i+j}{2}$

Sol^n:-

$$A = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \\ a_{31} & a_{32} \end{bmatrix}_{3\times 2} = \begin{bmatrix} 1 & 3/2 \\ 3/2 & 2 \\ 2 & 5/2 \end{bmatrix}_{3\times 2}$$

$\Rightarrow a_{11} \Rightarrow i = 1,\ j = 1$

$a_{11} = \frac{1+1}{2} = \frac{2}{2} = 1$

$\rightarrow a_{12} = i = 1,\ j = 2$

$a_{12} = \frac{1+2}{2} = \frac{3}{2}$

$\rightarrow a_{21} = i = 2,\ j = 1$

$a_{21} = \frac{2+1}{2} = 3/2$

$a_{22} \Rightarrow i = 2,\ j = 2$

$a_{22} = \frac{2+2}{2} = 2$

$a_{31} \Rightarrow i = 3,\ j = 1$

$a_{31} = \frac{3+1}{2} = 2$

$a_{32} \Rightarrow i = 3,\ j = 2,\ a_{32} = \frac{3+2}{2} = 5/2$

General form of a Matrix:-

$$A = \begin{array}{r|ccccccc|} & & & & & j^{th}\text{ column} & & n^{th}\text{ colu.} \\ & a_{11} & a_{12} & a_{13} & \cdots & a_{1j} & \cdots & a_{1n} \\ & a_{21} & a_{22} & a_{23} & \cdots & a_{2j} & \cdots & a_{2n} \\ & a_{31} & a_{32} & a_{33} & \cdots & a_{3j} & \cdots & a_{3n} \\ & \vdots & \vdots & \vdots & & \vdots & & \vdots \\ i^{th}\text{ row}\rightarrow & a_{i1} & a_{i2} & a_{i3} & \cdots & a_{ij} & \cdots & a_{in} \\ & \vdots & \vdots & \vdots & & \vdots & & \vdots \\ m^{th}\text{ row}\rightarrow & a_{m1} & a_{m2} & a_{m3} & \cdots & a_{mj} & \cdots & a_{mn} \end{array}$$

$$\boxed{A = [a_{ij}]_{m\times n}}$$

Where:- $1 \leq i \leq m$

$1 \leq j \leq n$