<u>Definition :</u> A rectangular array of numbers consisting of m horizontal rows and n vertical columns

$$\begin{bmatrix} A_{11} & A_{12} & \cdots & A_{1n} \\ A_{21} & A_{22} & \cdots & A_{2n} \\ & \vdots & & \\ A_{m1} & A_{m2} & \cdots & A_{mn} \end{bmatrix}$$

is called an $m \times n$ **matrix** or a **matrix of size** $m \times n$.

For the entry $A_{i\,j}$, we call i the **row subscript** and j the **column subscript**.

Such a matrix is often denoted $\left[A_{ij}\right]$ or $\left[A_{ij}\right]_{m\times n}$.

A matrix with exactly 1 (one) row is called a **row vector**.

A matrix with exactly 1 (one) column is called a **column vector**.

<u>Definition :</u> Matrices $A = \left[A_{ij}\right]$ and $B = \left[B_{ij}\right]$ are **equal** if and only if they have the same size and $A_{ij} = B_{ij}$ for each i and j.

<u>Definition :</u> The **transpose** of an $m \times n$ matrix A, denoted A^T, is the $n \times m$ matrix whose i^{th} row is the i^{th} column of A.

The matrix A is **symmetric** if $A^T = A$.

An $m \times n$ matrix whose entries are all 0 is called the $m \times n$ **zero matrix** and is denoted $\mathbf{0}_{m \times n}$ or simply $\mathbf{0}$ if size is understood.

A matrix having the same number of columns as rows, say n rows and n columns, is called a **square matrix of order** n.

In a square matrix, $A = \left[\, A_{ij} \,\right]$, of order n, the entries

$$A_{11},\ A_{22},\ A_{33},\ A_{44},\ \cdots\ A_{nn}$$

lie on a diagonal from top left to bottom right and are said to constitute the **main diagonal**.

A square matrix A is called a **diagonal matrix** if all entries that are off the main diagonal are zero $\left(A_{ij} = 0 \text{ for } i \neq j\right)$.