Matrix

A **matrix** can be defined as a rectangular array of numbers, parameters or variables, each of which has a carefully ordered place within the matrix. The plural of matrix is matrices.

Examples of matrices are:

$$A = \begin{bmatrix} 2 & 4 & 6 \\ 1 & 3 & 4 \end{bmatrix} B = \begin{bmatrix} 1 \\ 6 \\ 7 \\ x \end{bmatrix} C = \begin{bmatrix} 3 & 0 & 1 \end{bmatrix} D = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$$

$$E = \begin{bmatrix} a & b, & c, & d, & e \ldots & z \\ b & & & \cdots & & \vdots \\ \vdots & & & \cdots & & b \\ z, & y, & x, & w, & & \ldots a \end{bmatrix} F = \begin{bmatrix} 4 & 2 \\ 1 & 9 \end{bmatrix} G = \begin{bmatrix} 1 & 5 \\ 9 & 6 \\ 1 & x \end{bmatrix}$$

The number or variables in a **horizontal** line are called **Rows**, while the number variables in the vertical lines are called **columns**. The number of rows(r) and columns (c) defines the order or the dimensions of the matrix. That is, the order or a matrix is given by the number of rows and columns the matrix has. The dimension or order of a matrix is given by (r × c), which is read (r) by (c). The row number always precedes the column number. The order of a matrix is also called the **size of the matrix.**

In the examples given earlier, A is a 2 by 3 matrix i.e. (2×3) therefore it has 6 elements. B is a 4 by 1 matrix, C is a 1 by 3 matrix, D is a 3 by 3 matrix, E is a 26 by 26 matrix, F is a 2 by 2 matrix while G is a 3 by 2 matrix. Each element in a matrix is strategically or orderly positioned to occupy a given row and a given column. This implies that no single element has less than 1 row or column; neither can any element claim more than a row or column. For example, given that:

$$X = \begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix}_{3X3}$$

Then, 1 is the element in row 1 and column 1, therefore its position is given as a_{11}, 6 is the element in the 2nd row and the 3rd column, so its position is given as a_{34}. The position of elements in matrix X above can be presented as thus:

$$X = \begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix}_{3X3}$$

Types of Matrices

1) **Vector:** A vector is a matrix that has either one row or one column. A vector with one row is called row vector while a vector with one column is called column vector. Consequently, the dimension of a vector is either n x 1 and 1 x n For Example

$$A = \begin{vmatrix} 2 & 4 & 6 \end{vmatrix}_{1X3}$$

$$B = \begin{vmatrix} 3 \\ 4 \\ 7 \end{vmatrix}_{3X1}$$

Square Matrix: A **square matrix** is a matrix that has the same number of rows and column. That is, a matrix is a square matrix when the number of rows it possesses equals the number of columns it has. A square matrix is any matrix whose order is *m*
by *n* where *m = n*. Examples of a square matrix are:

$$X = \begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix}_{3X3}$$

$$A = \begin{vmatrix} 2 & 4 \\ 6 & 3 \end{vmatrix}_{2X2}$$

Null or Zero Matrixes: This is a matrix that has all its elements as zero e.g.

$$A = \begin{vmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{vmatrix}$$