## Definition.

(1) Consider two equations, $a_1x + b_1y = 0$ **.....**(i) and $a_2x + b_2y = 0$ **.....**(ii)

Multiplying (i) by $b_2$ and (ii) by $b_1$ and subtracting, dividing by *x,* we get, $a_1b_2 - a_2b_1 = 0$

The result $a_1b_2 - a_2b_1$ is represented by $\begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix}$

Which is known as determinant of order two and $a_1b_2 - a_2b_1$ is the expansion of this determinant. The horizontal lines are called rows and vertical lines are called columns.

Now let us consider three homogeneous linear equations

$a_1x + b_1y + c_1z = 0$, $a_2x + b_2y + c_2z = 0$ and $a_3x + b_3y + c_3z = 0$

Eliminated *x, y, z* from above three equations we obtain

$a_1(b_2c_3 - b_3c_2) - b_1(a_2c_3 - a_3c_2) + c_1(a_2b_3 - a_3b_2) = 0$ .....(iii)

The L.H.S. of (iii) is represented by $\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$

It contains three rows and three columns, it is called a determinant of third order.

Note: The number of elements in a second order is $2^2 = 4$ and the number of elements in a third order determinant is $3^2 = 9$.

(2) **Rows and columns of a determinant:**In a determinant horizontal lines counting from top 1st, 2nd, 3rd,.....respectively known as rows and denoted by $R_1, R_2, R_3$, ...... and vertical lines counting left to right, 1st, 2nd, 3rd,..... respectively known as columns and denoted by $C_1, C_2, C_3$,.....

(3) **Shape and constituents of a determinant:** Shape of every determinant is square. If a determinant of n order then it contains n rows and n columns.

i.e., Number of constituents in determinants = $n^2$

(4) **Sign system for expansion of determinant:** Sign system for order 2, order 3, order 4, are given by $\begin{vmatrix} + & - \\ - & + \end{vmatrix}$, $\begin{vmatrix} + & - & + \\ - & + & - \\ + & - & + \end{vmatrix}$, $\begin{vmatrix} + & - & + & - \\ - & + & - & + \\ + & - & + & - \\ - & + & - & + \end{vmatrix}$,.....