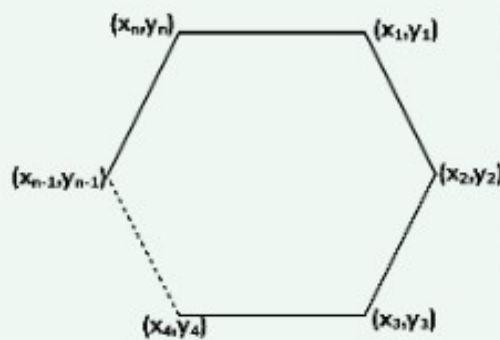## Area of Polygon (Δ)

$$\Delta = \frac{1}{2} \begin{vmatrix} x_1 & y_1 \\ x_2 & y_2 \\ x_3 & y_3 \\ \vdots & \vdots \\ x_n & y_n \\ x_1 & y_1 \end{vmatrix} = \begin{cases} \left| \frac{1}{2}[(x_1 y_2 - y_1 x_2) + (x_2 y_3 - y_2 x_3) + \ldots + (x_n y_1 - y_n x_1)] \right| \\ \left| \frac{1}{2}[(x_1 y_2 + x_2 y_3 + \ldots + x_n y_1) - (y_1 x_2 + y_2 x_3 + \ldots + y_n x_1)] \right| \end{cases}$$

(x_n, y_n) (x_1, y_1)

(x_{n-1}, y_{n-1}) (x_2, y_2)

(x_4, y_4) (x_3, y_3)

If Points are taken anticlockwise

$\Lambda = +ve$

If Points are taken clockwise

$\Lambda = -ve$

Area of Triangle (Δ)

$$\Delta = \begin{cases} \frac{1}{2} \begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} \\ \\ \frac{1}{2} \begin{vmatrix} x_1 & y_1 \\ x_2 & y_2 \\ x_3 & y_3 \\ x_1 & y_1 \end{vmatrix} \\ \\ \left| \frac{1}{2}[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)] \right| \end{cases}$$

$A(x_1, y_1)$

$B(x_2, y_2)$ $C(x_3, y_3)$