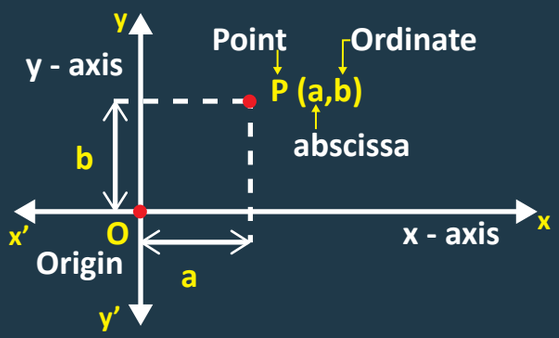
Coordinate Geometry

Coordinate Geometry

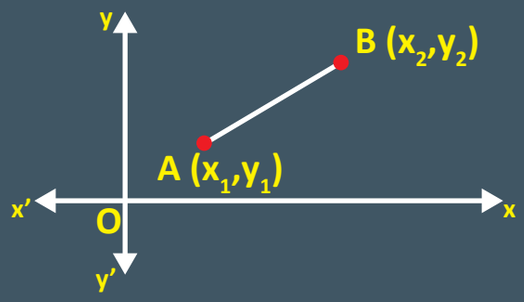
It is a branch of geometry which defines position of point using an ordered pair.



Distance between Two Points

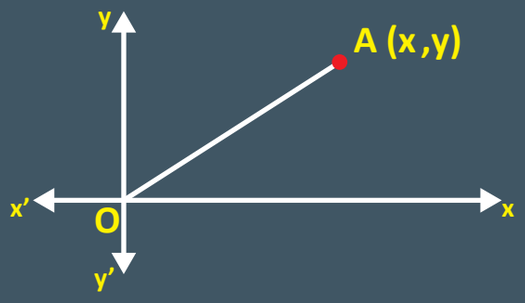
1 . Two points $A(x_1,y_1)$ and $B(x_2,y_2)$

$$d(AB) = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$



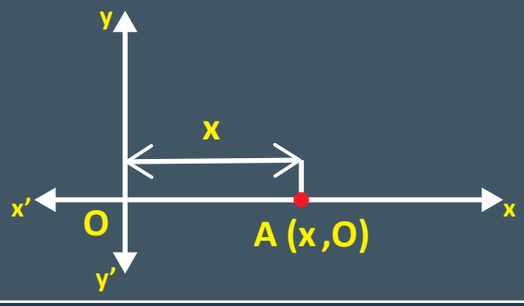
2 . Point A(x,y) and origin

$$d(OA) = \sqrt{x^2 + y^2} \text{ units}$$



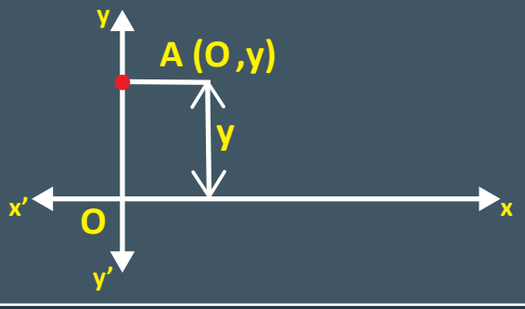
3 . Point on x-axis and origin

d(OA) = x units



4 . Point on y-axis and origin

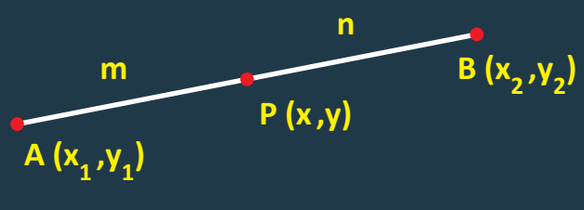
d(OA) = y units



Section Formula

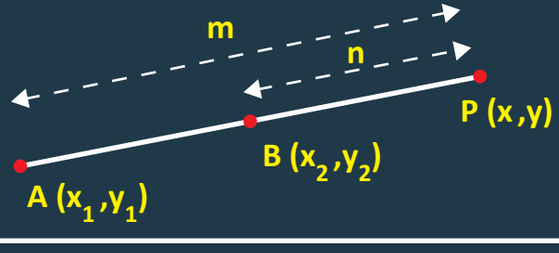
1 . For Internal division :-
P divides AB internally in the ratio **m:n**

$$P(x,y) = \left(\frac{mx_2 + nx_1}{m + n} , \frac{my_2 + ny_1}{m + n} \right)$$



2 . For External division :-
P divides AB externally in the ratio **m:n**

$$P(x,y) = \left(\frac{mx_2 - nx_1}{m - n} , \frac{my_2 - ny_1}{m - n} \right)$$

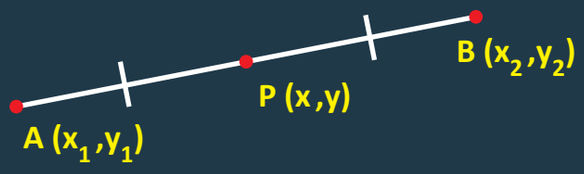


Coordinate Geometry

Midpoint Formula

P is the midpoint of AB

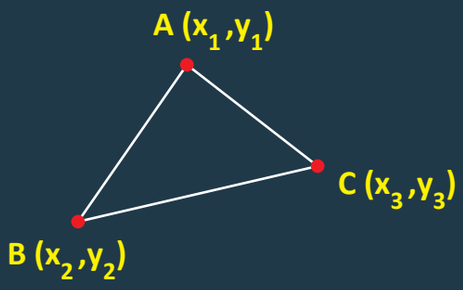
$$P(x,y) = \left(\frac{x_1 + x_2}{2} , \frac{y_1 + y_2}{2} \right)$$



Area of Triangle

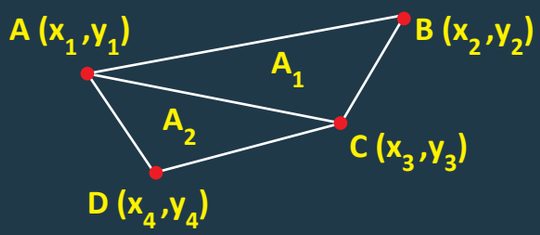
$$A(\Delta ABC) = \left| \frac{1}{2} \left[x_1 (y_2 - y_3) + x_2 (y_3 - y_1) + x_3 (y_1 - y_2) \right] \right|$$

If area of triangle is zero then the 3 points are **collinear**



Area of Quadrilaterals

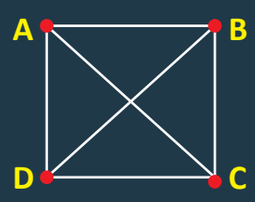
$$A(\square ABCD) = A(\Delta ABC) + A(\Delta ADC)$$
$$= A_1 + A_2$$



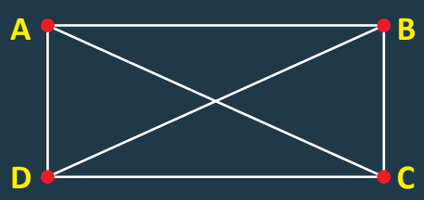
Using Distance Formula to Identify Shapes

1. For 4 points :- 4 points will give us six distances.

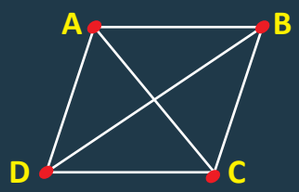
a . If AB = BC = CD = AD and AC = BD then it is a Square



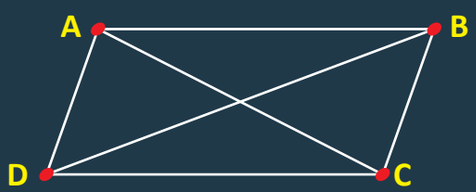
b . If AB = CD , BC = AD and AC = BD then it is a Rectangle



c . If AB = BC = CD = AD then it is a Rhombus



d . If AB = CD , BC = AD then it is a Parallelogram



2. For 3 points :- 3 points will give us 3 distances.

a . If AB = BC = CA then it is Equilateral Triangle

b . If AB = BC ≠ CA or AB = CA ≠ BC or BC = CA ≠ AB then it is an Isosceles Triangle

c . If AB ≠ BC ≠ CA then it is a Scalen Triangle

d . If $AB^2 + BC^2 = AC^2$ or $AB^2 + AC^2 = BC^2$ or $BC^2 + AC^2 = AB^2$ then it is a Right-angled Triangle