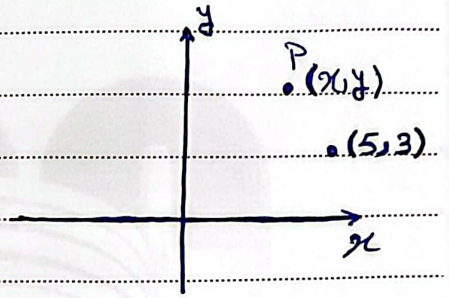
"Vectors"

→ Cartesian Co-ordinate system "rectangular"
"Co-ordinate"

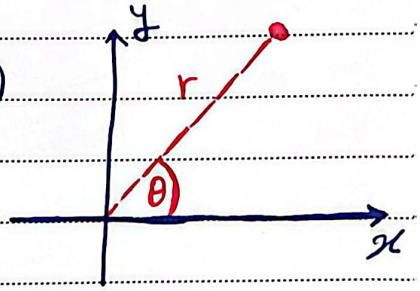
1- x- & y- axes intersect at the origin.

2- Points are labeled (x, y)



→ Polar Co-ordinate system

1- Points are labeled by (r, θ)

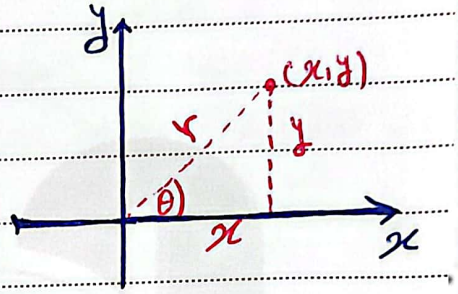


"Scalars"
"Quantities completely discribed by mag. only"
e.g Temp., speed, time

"Vectors"
mag. direction
e.g Velocity, Electric field force

* From Polar To Cartesian Co-ordinates:-

$$x = r\cos\theta \qquad y = r\sin\theta$$



* From Cartesian To Polar Co-ordinates:-

$$\tan\theta = y/x \quad \& \quad r = \sqrt{x^2 + y^2}$$

Examples

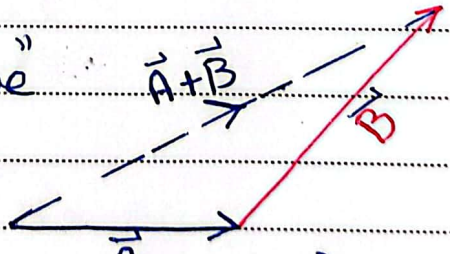
Vector Notation:- $\vec{A}$, Bold Print

$|\vec{A}| \Rightarrow$ magnitude of Vector. → the no.
→ has Physical unit.

Note if $\vec{A} = \vec{B}$, then $\vec{A}$ & $\vec{B}$ are equal in mag. & Direction.

→ Adding Vectors:-

* $\vec{A} + \vec{B} = \vec{B} + \vec{A}$ "Comulative law"
* $\vec{A} + \vec{B} + \vec{C} = \vec{A} + (\vec{B} + \vec{C})$
* When Adding Vectors, all vectors must have the same unit



Negative of a vector:- is vector that, when added to the same original vector gives zero

$$\vec{A} + (-\vec{A}) = 0$$

*any vector has 3 components

$$\vec{A} = A_x \hat{i} + A_y \hat{j} + A_z \hat{K}$$

$\hat{i}, \hat{j}, \hat{K}$ unit vectors

$$\vec{B} = B_x \hat{i} + B_y \hat{j} + B_z \hat{K}$$

$$\vec{A} + \vec{B} = (A_x + B_x)\hat{i} + (A_y + B_y)\hat{j} + (A_z + B_z)\hat{K}$$

$$\vec{R} = R_x \hat{i} + R_y \hat{j} + R_z \hat{K}$$

$$|\vec{R}| = \sqrt{R_x^2 + R_y^2 + R_z^2}$$

$$\theta_x = \cos^{-1}\left(\frac{R_x}{|\vec{R}|}\right) \quad \vec{R} \cdot \hat{i}$$

$$\vec{R} \cdot \hat{i} = |\vec{R}| 1 \times \cos\theta = R_x$$