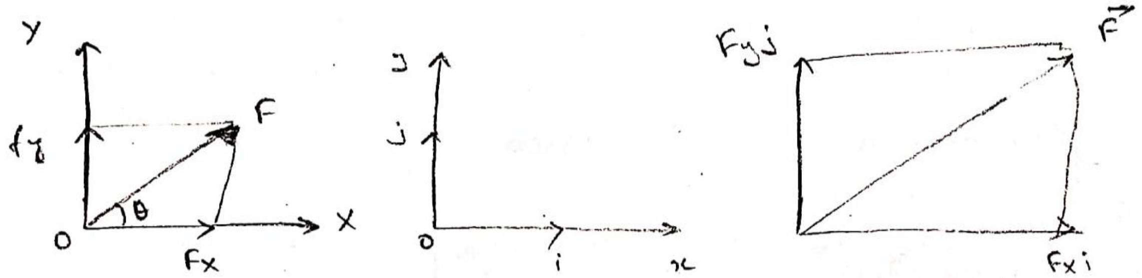
Forces in SPACE

Vector Approach for a 2D Problem.

It is very difficult to follow trigonometrical method for the forces in space since finding the scalar components of a force in 3D is complicated. Hence the vector approach is followed.

Though vector approach is convenient and efficient for 3D, it can also be applied for the forces in two dimensions

Rectangular component of a force.



In triangular method (a) the force F has been resolved into two components Fx & Fy along x axis and Y axis respectively, called rectangular components of the force F where

$F_x = F \cos\theta$; $F_y = F \sin\theta$.

F_x & F_y are the scalar quantities.

In vector approach,

unit vectors i and j introduced along the position x and y axes (Fi unit vector is a vector of unit magnitude i.e are unit in length) fig (b).

To get vector quantities of the given force along x and y axes, multiply the scalar quantities Fx & F with respective unit vectors i & j fig (c)

$$\vec{F_x} = F_x \cdot i \quad \& \quad \vec{F_y} = F_y \cdot j$$

$$\therefore \vec{F} = \vec{F_x} + \vec{F_y} \quad (or) \quad \vec{F} = F_x i + F_y j$$

$$\vec{F} = F\cos\theta\, i + F\sin\theta\, \theta j$$

from which the magnitude of the force.

$$F = \sqrt{(F_x)^2 + (F_y)^2}$$

Trigonometrical Approach	vector Approach.
θ is measured from x axis, may have either clockwise (or) anti clock wise direction	θ is measured from positive direction of x & y axis either in clockwise or in anticlockwise direction.
θ takes the value from 0 to 90°	θ takes the value 0°, 360° hence all the quantities like ΣF_x, ΣF_y etc sign (+ve. (or) -ve) should be attached.
clockwise rotation is taken as positive	Anticlockwise rotation is taken as positive

Force in vector form:

Force vector interms of θ_x & θ_y.

$$\vec{F} = F\cos\theta_x i + F\sin\theta_y j$$

But in usual pratical, to express $\vec{F}$ interms of only cosine (cos) ratios.

In fig $\sin\theta_x = \cos\theta_y$.