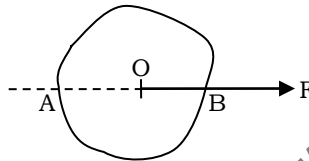


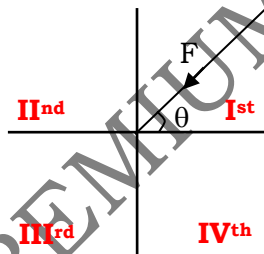
## Principle of Transmissibility of Force

### Statement:-

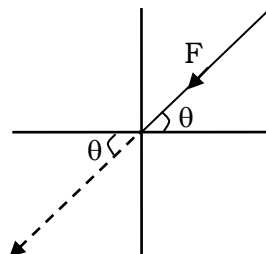
“If a force acts at a point on a rigid body, it is assumed to act at any other point on the line of action of the force within the body”.



**Example:** A force push in the first quadrant means the same force pull in the third quadrant.



Step 1



Step 2

## Composition of Forces

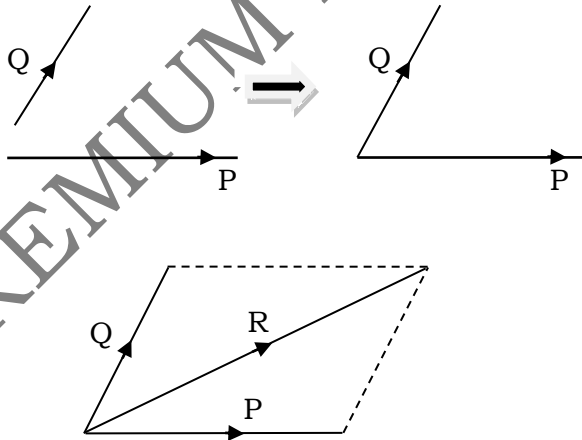
“The process of finding out the resultant force of a given system of forces is called as composition of forces”.

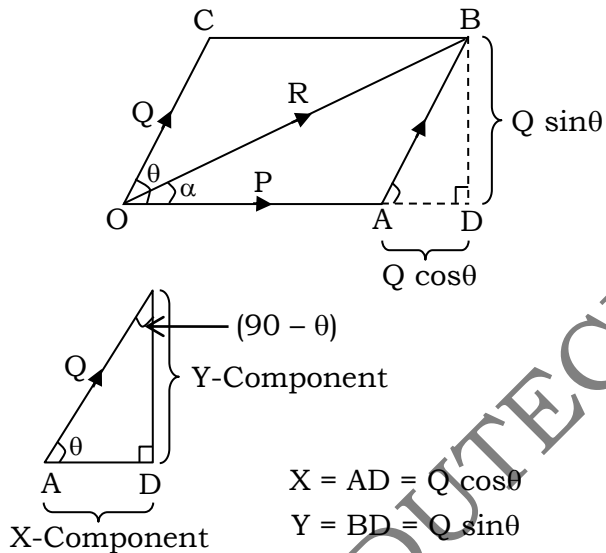
### Resultant Force:-

“Resultant of number of forces acting on a body is defined as a single force, which can produce the same effect as it is produced by the number of forces acting together”.

### Parallelogram Law of Force:-

“If two forces acting at and away from the point be represented in magnitude and direction by the two adjacent sides of a parallelogram, then the diagonal of the parallelogram passing through the point of intersection of the two forces, represents the resultant in magnitude and direction”.





$OC \parallel AB$

$OC = AB = Q$

$AD = Q \cos \theta$

$BD = Q \sin \theta$

In  $\Delta ODB$ ,

Apply Pythagoras theorem,

$$OB^2 = OD^2 + BD^2$$

$$\therefore OD = OA + AD$$

$$OB^2 = (OA + AD)^2 + BD^2$$

$$OB^2 = OA^2 + AD^2 + 2OAAD + BD^2$$

$$\therefore (a + b)^2 = a^2 + b^2 + 2ab$$

$$OB^2 = OA^2 + (Q\cos\theta)^2 + 2OA Q\cos\theta + (Q\sin\theta)^2$$

$$R^2 = P^2 + Q^2 \cos^2\theta + 2PQ \cos\theta + Q^2 \sin^2\theta$$

$$R^2 = P^2 + Q^2 \cos^2\theta + Q^2 \sin^2\theta + 2PQ \cos\theta$$

$$R^2 = P^2 + Q^2 (\cos^2\theta + \sin^2\theta) + 2PQ \cos\theta$$

$$\therefore \cos^2\theta + \sin^2\theta = 1$$

$$\therefore R^2 = P^2 + Q^2 + 2PQ \cos\theta \quad \text{----}$$

**Magnitude**

$$\tan \alpha = \frac{BD}{OD}$$

$$\tan \alpha = \frac{BD}{OA + AD}$$

$$\therefore \tan \alpha = \frac{Q \sin \theta}{P + Q \cos \theta} \quad \text{---- Direction}$$

$\therefore \theta$  is the angle between two forces P & Q