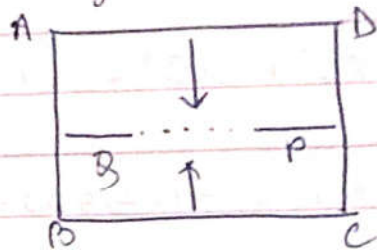


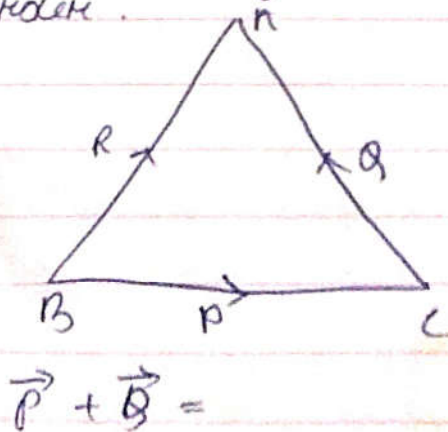
Principle Of Transmissibility Of Forces

It states if a force acts at any point on a rigid body, it may also be considered to act at any other point on its line of action, provided this point is rigidly connected with the body.



Triangle law of Forces

It states if two forces acting simultaneously on a particle, be represented in magnitude and direction by the two sides of a triangle taken in same order, their resultant may be represented in magnitude and direction by the third side of the triangle taken in opposite order.



Converse of Triangle Law

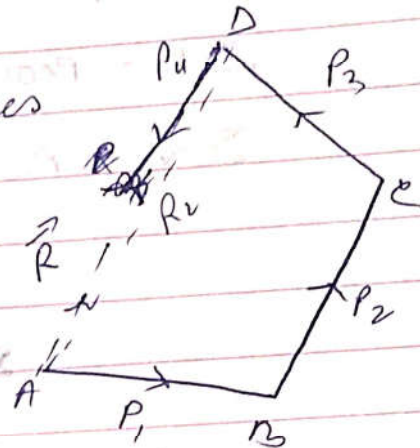
If a number ^{three} of forces acting at a point be represented in magnitude and direction by the sides three sides of a triangle taken in order, then the forces shall be in equilibrium.

Polygon Law of forces

It states if a number of forces are acting simultaneously on a particle, be represented in magnitude and direction by the sides of a polygon taken in order, then the resultant

of all these forces may be represented in magnitude and direction by the closing side of the polygon taken in opposite order.

$$\therefore \vec{P} + \vec{Q} + \vec{S} = \vec{R}$$



Converse of Polygon Law :

If a no. of forces acting at a point be represented in magnitude and direction by the sides of a closed polygon taken in order, then the forces shall be in equilibrium.

$$\tan \theta = \frac{-85}{5}$$

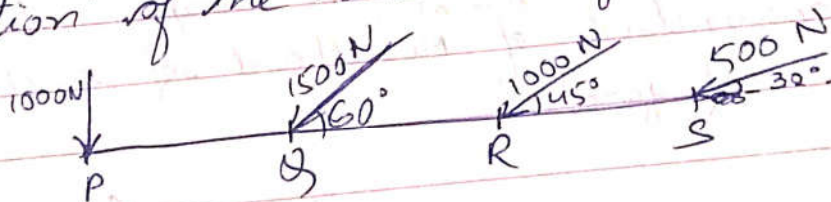
$$= -17$$

$$\theta = \tan^{-1}(-17)$$

$$= 86.6^\circ$$

Since, ΔH is positive and ΔV is negative therefore the resultant lies betⁿ 270° and 360°

Q. A horizontal line PQRS is 12m long where PQ = QR = RS = 4m. Forces of 1000N, 1500N, 1000N and 500N act at P, Q, R and S respectively with downward direction. The lines of action of these forces make angles of 90° , 60° , 45° and 30° respectively with PS. Find the magnitude, direction of the resultant force.



$$\Sigma H = 0 + 750 + 500 \times \sqrt{2} + 250 \times \sqrt{3}$$

$$= -1890.12 \text{ N}$$

$$\Sigma V = -1000 - 750\sqrt{3} - 500\sqrt{2} - 250$$

$$= -3256.14$$

$$R = \sqrt{(-1890.12)^2 + (-3256.14)^2}$$

$$= \sqrt{3572553.614 + 10602447.7}$$

$$1500 \cos 60^\circ$$

$$1500 \sin 60^\circ$$

$$1500 \times \frac{\sqrt{3}}{2}$$

$$2 \sqrt{1500}$$

$$\frac{750}{100}$$

$$1000 \cos 45^\circ$$

$$1000 \times \frac{1}{\sqrt{2}}$$

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$$500 \cos 30^\circ$$

$$500 \times \frac{\sqrt{3}}{2}$$

$$2 \times 500$$

$$= \sqrt{14175001.31}$$

$$3912.31 \text{ N}$$

$$= 3762.97 \text{ N}$$

$$\tan \theta = \frac{\sum V}{\sum H}$$

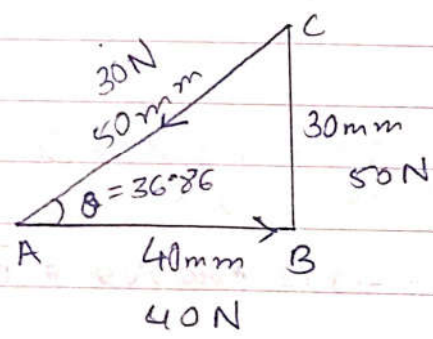
$$= \frac{-3425.4}{-1890.12}$$

$$\theta = 61.07^\circ$$

~~270.07~~

$$\frac{270.08}{61.07} = 108.53$$

Q. A triangle ABC has its sides AB = 40mm along +ve x direction and side BC = 30mm along +ve y-axis. Three forces of 40 N, 50N and 30N act along the sides AB, BC and CA resp. Determine the magnitude & direction of resultant of such a system of force.



$$\cos \theta = \frac{b}{h}$$

$$= \frac{40}{50}$$

$$\cos \theta = 0.8$$

$$\theta = 36.86^\circ$$

$$\begin{aligned} \text{Again, } AC^2 &= AB^2 + BC^2 \\ &= 40^2 + 30^2 \\ &= 1600 + 900 \\ &= 2500 \end{aligned}$$

$$\therefore AC = 50 \text{ mm}$$

$$\begin{aligned} \Sigma H &= 30 \times 40 + 0 - 10 \cdot 8 \\ &= 40 - 20.04 \\ &= 16 \text{ N} \end{aligned}$$

5000

50 \times 0

50 \times 0

0.76

$$\begin{aligned} \Sigma V &= 0 + 50 + 30 \times 31.2 - 36.86 \\ &= 32 \end{aligned}$$

$$\begin{aligned} R &= \sqrt{16^2 + 32^2} \\ &= \sqrt{256 + 1024} \\ &= \sqrt{1280} \\ &= 35.78 \text{ N} \end{aligned}$$

$$\tan \theta = \frac{16}{32}$$

$$= \frac{1}{2}$$

$$\begin{aligned} \therefore \theta &= \tan^{-1} 2 \\ &= 63.43^\circ \end{aligned}$$