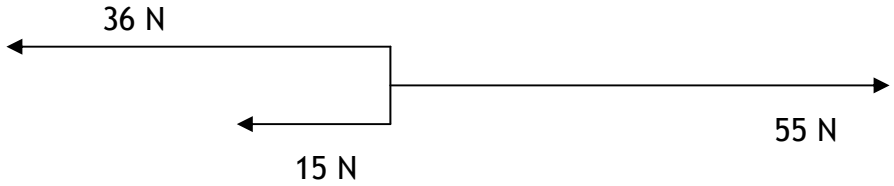
Vector Applications - Forces

Recall: Resultant is the sum of 2 or more vectors → $\vec{R}$

Equilibrant is the opposite vector to the resultant → $\vec{E} = -\vec{R}$

Force:
- a vector quantity,
- a push or a pull
- measured in newtons (1N = 1Kgm/s^2
- $\vec{F} = m\vec{a}$
- $\overrightarrow{F_g} = m\vec{g}$, $\vec{g} = 9.8m/s^2$ [down]

Ex 1: Find the resultant of the following forces:



remember: East/right is positive

$$\vec{R} = 55 + (-36) + (-15)$$
$$= 4N[right]$$

Ex 2: Find the equilibrant of three forces, one of 115N acting west, the other of 220N acting East, and the third of 105N acting East

$$\vec{R} = 220 + 105 + (-115)$$
$$= 210N[E]$$

$$\vec{E} = -\vec{R}$$
$$= -210[E]$$
$$= 210[W]$$

Note: forces in equilibrium cause a net change of zero

$\therefore$ in 1-D the forces "cancel out"
2-D the addition of forces forms a closed Δ

Force Question
Find the magnitude and direction of the equilibrant of two forces of 80 N and 50 N which act on the same object at an angle of 70 degrees to each other.

Hanging Object Question
A sign with a mass of 100 kg is suspended from 2 wires which are attached to a ceiling. One wire makes an angle of 43 degrees with the ceiling and the other one makes an angle of 60 degrees with the ceiling. Find the tensions in the wires.

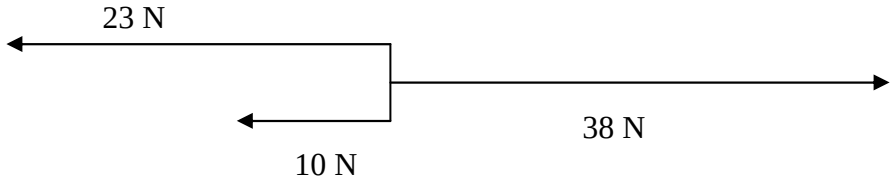
Many Vector Questions
When asked to find the resultant or equilibrant of more than two vectors you should use algebraic vectors.

Find the resultant of the following forces:

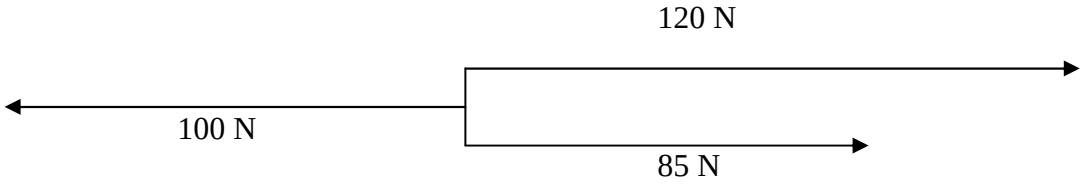
58 N at $S25°W$
34 N at $E10°S$
40 N at $N40°W$
68 N at $N55°E$

Vector Applications - Forces

1. Find the resultant of the following forces: {5N Right}



2. Find the equilibrant of the following forces: {105N Left}



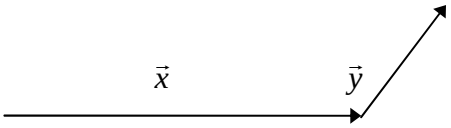
3. Forces of 15 N and 23 N act at a point at an angle of 130 degrees to each other. Find the magnitude and direction of the resultant. {17.62 N, 40.7° to 23N force}

4. An object of mass 5kg is suspended from a horizontal ceiling by two strings making angles of 35 degrees and 62 degrees with the ceiling. Calculate the tensions in these strings.
{35 degree string has a tension of 23N and the 62 degree string has a tension of 40N

5. Determine the resultant of the following forces:

25 N acting S30° W	17 N acting N70° E
13 N acting N25° W	30 N acting E
11 N acting SE	{37.7 N acting S72° E}

6. Given : $|\vec{x}| = 9$ and $|\vec{y}| = 4$ as illustrated, determine $|3\vec{x} - \vec{2}y|$ given that $|\vec{x} + 2\vec{y}| = 15$.



{23.5}