Vectors

It is a directed line segment.

An example, $\vec{PQ} = \langle x_2 - x_1, y_2 - y_1, z_2 - z_1 \rangle$

The length or magnitude of \vec{PQ} is $|\vec{PQ}| = \sqrt{(x_2-x_1)^2, (y_2-y_1)^2, (z_2-z_1)^2}$

Given \vec{u}, \vec{v}

$$ec{u}+ec{v}=\langle u_1+v_1,u_2+v_2,u_3+v_3
angle$$

$$ec{u}-ec{v}=\langle u_1-v_1,u_2-v_2,u_3-v_3
angle$$

Properties

Definition: Vector Addition

Let \mathbf{u} , \mathbf{v} and \mathbf{w} be vectors and a and b be scalars.

1.
$$u + v = v + u$$
 2. $(u + v) + w = u + (v + w)$ 3. $u + 0 = u$

3.
$$u + 0 = u$$

4.
$$\mathbf{v} + (-\mathbf{v}) = \mathbf{0}$$
 5. $0\mathbf{v} = \mathbf{0}$

5.
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6.
$$1v = v$$

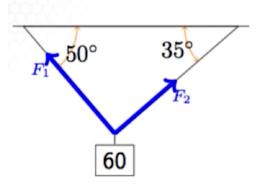
7.
$$a(b\mathbf{v}) = (ab)\mathbf{v}$$

7.
$$a(b\mathbf{v}) = (ab)\mathbf{v}$$
 8. $a(\mathbf{u} + \mathbf{v}) = a\mathbf{u} + a\mathbf{v}$

9.
$$(a+b)\mathbf{v} = a\mathbf{v} + b\mathbf{v}$$

Example:

A 60-N weight is suspended by two wires as shown below. Find the forces \mathbf{F}_1 and \mathbf{F}_2 acting in both wires.



 $\vec{F}_{1} = ||\vec{F}_{1}|| \langle -\cos 50^{\circ}, \sin 35^{\circ} \rangle$ $\vec{F}_{2} = ||\vec{F}_{2}|| \langle \cos 35^{\circ}, \sin 35^{\circ} \rangle$ $\vec{F}_{1} + ||\vec{F}_{2}|| \langle \cos 35^{\circ}, \sin 35^{\circ} \rangle$ $-||\vec{F}_{1}|| \cos 50^{\circ} + ||\vec{F}_{2}|| \cos 35^{\circ} = 0$ $||\vec{F}_{1}|| \sin 50^{\circ} + ||\vec{F}_{2}|| \sin 35^{\circ} = 60$ $||\vec{F}_{1}|| \approx 49.34 \text{ N} \quad ||\vec{F}_{2}|| = 38.71 \text{ N}$