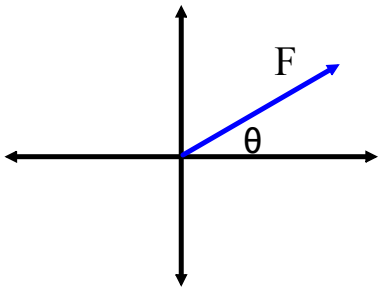
Section 2.4: Component Forces

Forces don't always act in the N, S, E, or W direction. Quite often they act at an angle, which means that part of the force will act in the x-direction and part of the force will act in the y-direction. Using basic trigonometry we can determine how much of a given force acts in the x-direction and how much acts in the y-direction.

Consider the following force which is acting at an angle, θ.



Component Method

Steps:

1. Draw each vector separately in the x-y plane.

2. Find the vertical (Fy) and horizontal (Fx) components of all forces. Include direction with each component and compile them in two separate columns.

3. Find the sum of the x-components.
   Find the sum of the y-components.

4. Use Pythagorean Theorem and Right Triangle Trigonometry to find the resultant.

Examples

1 A lawnmower is pushed across a lawn by applying a force of 95 N along the handle of the mower. The handle makes an angle of 30º with the vertical.

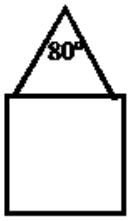
A) What are the horizontal and vertical components of the force?

B) The handle is lowered so that it makes an angle of 30º with the horizon, what are the horizontal and vertical components of the force?

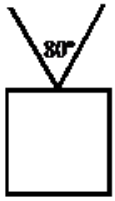
2. Two forces, $\boldsymbol{F}1$ and $\boldsymbol{F}2$ act on the same object. Find the resultant if $\boldsymbol{F}1 = 4500$ N [30^o NE] and $\boldsymbol{F}2 = 6000$ N [50^o SE].

3. Two forces $\boldsymbol{F}1$ and $\boldsymbol{F}2$ act on the same object. Find the resultant if $\boldsymbol{F}1 = 1200$ N [E 70^o S] and $\boldsymbol{F}2 = 800$ N [W 40^o S].

4. The picture shown below weighs 60.0 N. The angle made by the string at the nail is 80.0º. Determine the tension in the strings.



5. Find the tension in the string if the picture is hung as shown below. The weight is still 60.0 N and the angle between the string is 80.0º.



6. What is the force, F, provided by the rotor, if the helicopter shown is travelling in level flight?

7. A sign weighing 200.0 N is held in place by two wires as shown in the picture. One wire is horizontal and the other makes an angle of 60.0^{o} with the top support. Find the tensional forces, F_1 and F_2 in the wires.

6 A sign is held by 2 wires as shown. What is the tension in each wire?

7 A sign hangs from 2 cables as shown. If the tension in each wire is 425 N, what is the mass of the sign?