

Name Key

Unit #7: Extended Trigonometry

Lesson 9: Velocity and Force Vectors MA3A10

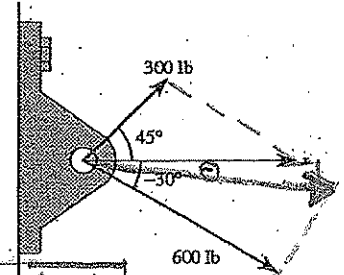
1. Forces of 300 lb and 600 lb act on a machine part at angles of 45° and -30° , respectively, with the x-axis. Find the direction and magnitude of the resultant vector.

$$F_1 = 300 \langle \cos 45^\circ, \sin 45^\circ \rangle$$

$$F_2 = 600 \langle \cos(-30^\circ), \sin(-30^\circ) \rangle$$

$$*F_1 + F_2 = \langle 731.75, -87.87 \rangle$$

$$\|F_1 + F_2\| = \sqrt{(731.75)^2 + (-87.87)^2} = 737.01 \text{ lb} \quad \tan^{-1}\left(\frac{-87.87}{731.75}\right) = -6.85^\circ = \theta$$



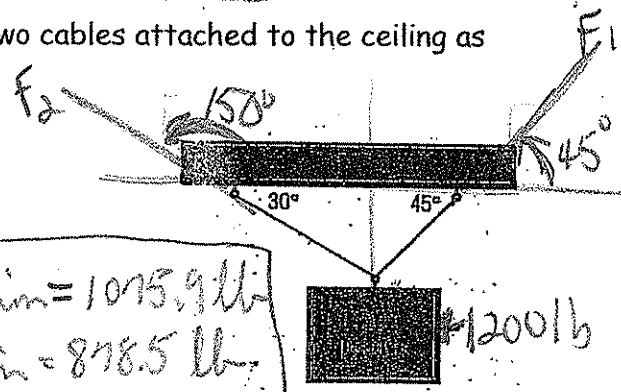
2. A box of supplies that weighs 1200 lb is suspended by two cables attached to the ceiling as shown below. What is the tension of the two cables?

$$\|F_1\| \cos 45^\circ + \|F_2\| \cos 150^\circ = 0$$

$$\|F_1\| \sin 45^\circ + \|F_2\| \sin 150^\circ = 1200$$

$$\begin{bmatrix} .70711 & -.866 & 0 \\ .70711 & .5 & 1200 \end{bmatrix}$$

$$\begin{aligned} \text{Right Cable Tension} &= 1075.9 \text{ lb} \\ \text{Left Cable Tension} &= 878.5 \text{ lb} \end{aligned}$$



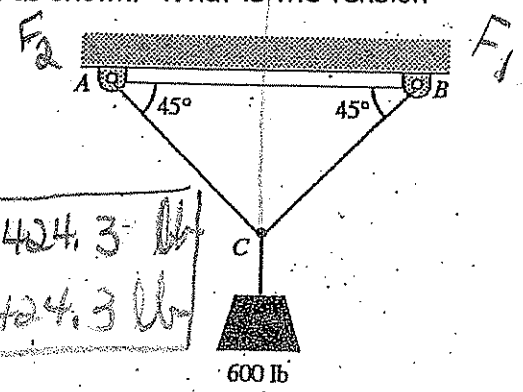
3. A 600 lb weight is suspended by two cables attached to a beam as shown. What is the tension on the two cables?

$$\|F_1\| \cos 45^\circ + \|F_2\| \cos 135^\circ = 0$$

$$\|F_1\| \sin 45^\circ + \|F_2\| \sin 135^\circ = 600$$

$$\begin{bmatrix} .7071 & -.7071 & 0 \\ .7071 & .7071 & 600 \end{bmatrix}$$

$$\begin{aligned} \text{Right Cable Tension} &= 424.3 \text{ lb} \\ \text{Left Cable Tension} &= 424.3 \text{ lb} \end{aligned}$$



4. A person is standing on a tightrope, as shown below. The total weight of the person and the balancing pole is 200 lb. Find the tension in each end of the tightrope.

$$\|F_1\| \cos 5^\circ + \|F_2\| \cos 173^\circ = 0$$

$$\|F_1\| \sin 5^\circ + \|F_2\| \sin 173^\circ = 200$$

$$\begin{bmatrix} .99619 & -.9925 & 0 \\ .08716 & .12187 & 200 \end{bmatrix}$$

$$\begin{aligned} \text{Right Cable Tension} &= 954.8 \text{ lb} \\ \text{Left Cable Tension} &= 958.3 \text{ lb} \end{aligned}$$

