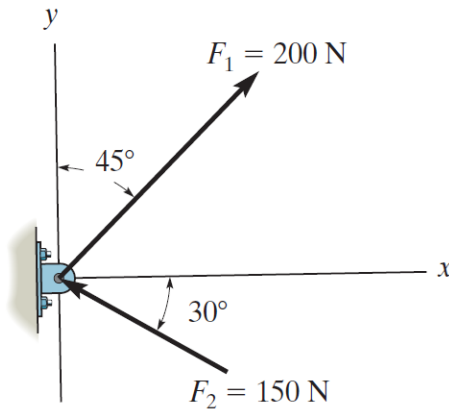


Problem 2-32

Determine the magnitude of the resultant force and its direction, measured counterclockwise from the positive x axis.



Prob. 2-32

Solution

Write each of the forces in component form.

$$\mathbf{F}_1 = 200 \langle \sin 45^\circ, \cos 45^\circ \rangle \text{ N}$$

$$\mathbf{F}_2 = 150 \langle \cos 30^\circ, -\sin 30^\circ \rangle \text{ N}$$

Add them together to get the resultant force \mathbf{F}_R .

$$\begin{aligned} \mathbf{F}_R &= \mathbf{F}_1 + \mathbf{F}_2 \\ &= \langle 200 \sin 45^\circ + 150 \cos 30^\circ, 200 \cos 45^\circ - 150 \sin 30^\circ \rangle \text{ N} \\ &\approx \langle 271, 66.4 \rangle \text{ N} \end{aligned}$$

Its magnitude is

$$\begin{aligned} |\mathbf{F}_R| &= \sqrt{(200 \sin 45^\circ + 150 \cos 30^\circ)^2 + (200 \cos 45^\circ - 150 \sin 30^\circ)^2} \text{ N} \\ F_R &\approx 279 \text{ N}, \end{aligned}$$

and the direction it points in counterclockwise from the positive x -axis is

$$\tan \phi = \frac{200 \cos 45^\circ - 150 \sin 30^\circ}{200 \sin 45^\circ + 150 \cos 30^\circ} \rightarrow \phi \approx 13.8^\circ.$$