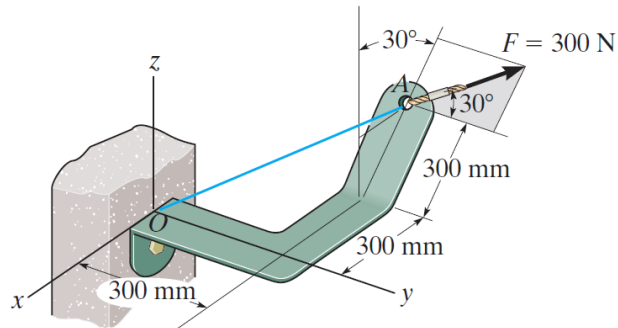


Problem 2-136

Determine the magnitudes of the projected components of the force $F = 300$ N acting along the x and y axes.



Probs. 2-136/137

Solution

Write the force in component form.

$$\mathbf{F} = 300 \langle -\sin 30^\circ \sin 30^\circ, \cos 30^\circ, \sin 30^\circ \cos 30^\circ \rangle \text{ N}$$

Take the dot product of \mathbf{F} with $\langle 1, 0, 0 \rangle$ to get the component of the force along the x -axis.

$$\begin{aligned} \mathbf{F} \cdot \langle 1, 0, 0 \rangle &= 90 \langle -\cos 60^\circ \sin 45^\circ, \cos 60^\circ \cos 45^\circ, \sin 60^\circ \rangle \cdot \langle 1, 0, 0 \rangle \text{ N} \\ &= -90 \cos 60^\circ \sin 45^\circ \text{ N} \\ &\approx -31.8 \text{ N} \end{aligned}$$

Therefore, the magnitude of the force's component along the x -axis is

$$|\mathbf{F} \cdot \langle 1, 0, 0 \rangle| = 90 \cos 60^\circ \sin 45^\circ \text{ N} \approx 31.8 \text{ N}.$$

Take the dot product of \mathbf{F} with $\langle 0, 1, 0 \rangle$ to get the component of the force along the y -axis.

$$\begin{aligned} \mathbf{F} \cdot \langle 0, 1, 0 \rangle &= 90 \langle -\cos 60^\circ \sin 45^\circ, \cos 60^\circ \cos 45^\circ, \sin 60^\circ \rangle \cdot \langle 0, 1, 0 \rangle \text{ N} \\ &= 90 \cos 60^\circ \cos 45^\circ \text{ N} \\ &\approx 31.8 \text{ N} \end{aligned}$$

Therefore, the magnitude of the force's component along the y -axis is

$$|\mathbf{F} \cdot \langle 0, 1, 0 \rangle| = 90 \cos 60^\circ \cos 45^\circ \text{ N} \approx 31.8 \text{ N}.$$