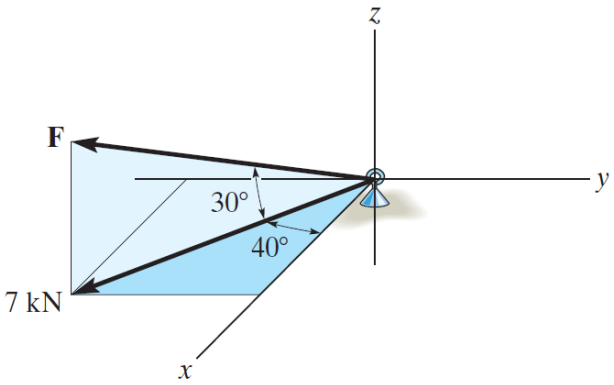
Problem 2-62

Determine the magnitude and coordinate direction angles of the force **F** acting on the support. The component of **F** in the x–y plane is 7 kN.



Prob. 2–62

Solution

Let $\mathbf{F}'$ be the component of **F** in the xy-plane.

$$F' = F\cos 30^\circ = 7 \text{ kN}$$

Solve for F.

$$F = \frac{7 \text{ kN}}{\cos 30^\circ} \approx 8.08 \text{ kN}$$

Now that the magnitude is known, the force **F** can be written.

$$\mathbf{F} = \frac{7 \text{ kN}}{\cos 30^\circ}\langle \cos 30^\circ \cos 40^\circ, -\cos 30^\circ \sin 40^\circ, \sin 30^\circ \rangle$$

The direction cosines are as follows.

$$\cos\alpha = \cos 30^\circ \cos 40^\circ$$

$$\cos\beta = -\cos 30^\circ \sin 40^\circ$$

$$\cos\gamma = \sin 30^\circ$$

Take the inverse cosine of both sides to get the direction angles.

$$\alpha \approx 48.4^\circ$$

$$\beta \approx 124^\circ$$

$$\gamma = 60^\circ$$