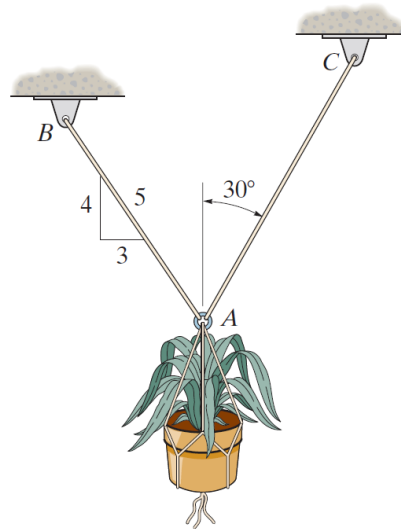


Problem R3-3

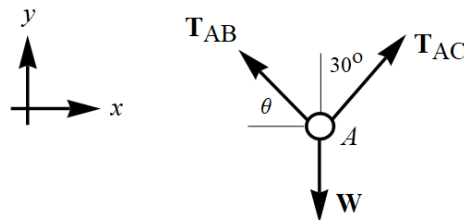
Determine the maximum weight of the flowerpot that can be supported without exceeding a cable tension of 50 lb in either cable AB or AC .



Prob. R3-3

Solution

Draw a free-body diagram for the ring at A . Let θ be the angle that cable AB makes with the horizontal.



In order for the system to be in equilibrium, the sum of the forces must be zero in each direction.

$$\sum F_x = 0 : \quad T_{AC} \sin 30^\circ - T_{AB} \cos \theta = 0$$

$$\sum F_y = 0 : \quad T_{AC} \cos 30^\circ + T_{AB} \sin \theta - W = 0$$

Use the fact that $\cos \theta = 3/5$ and $\sin \theta = 4/5$.

$$T_{AC} \sin 30^\circ - T_{AB} \left(\frac{3}{5} \right) = 0$$

$$T_{AC} \cos 30^\circ + T_{AB} \left(\frac{4}{5} \right) - W = 0$$

If we set $T_{AB} = 50$ lb, then the system yields

$$T_{AC} = 60.0 \text{ lb}$$

$$W = 10(4 + 3\sqrt{3}) \text{ lb} \approx 92.0 \text{ lb},$$

which is unacceptable because $T_{AC} > 50$ lb. If we set $T_{AC} = 50$ lb, then the system yields

$$T_{AB} = \frac{125}{3} \text{ lb} \approx 41.7 \text{ lb}$$

$$W = \frac{100 + 75\sqrt{3}}{3} \text{ lb} \approx 76.6 \text{ lb},$$

which is fine.