# PROBLEMS
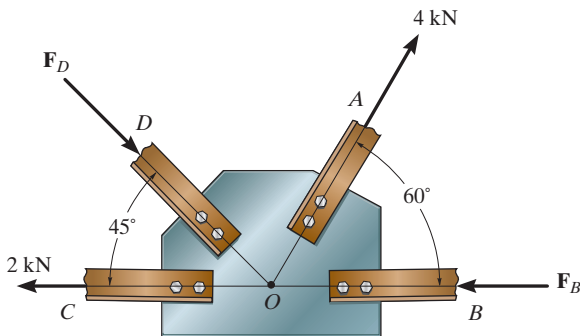
*All solutions must include a free-body diagram.*

**3–1.** Knowing the forces in members $A$ and $C$, determine the forces $\mathbf{F}_B$ and $\mathbf{F}_D$ acting on members $B$ and $D$ that are required for equilibrium. The force system is concurrent at point $O$.

**3–2.** The members of a truss are pin connected at joint $O$. Determine the magnitudes of $\mathbf{F}_1$ and $\mathbf{F}_2$ for equilibrium. Set $\theta = 60°$.
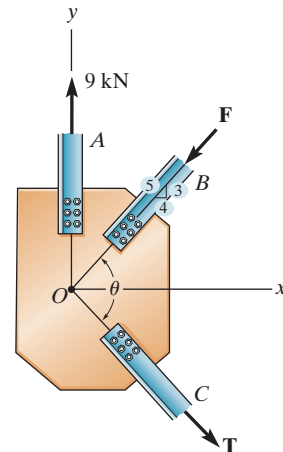
**3–3.** The members of a truss are pin connected at joint $O$. Determine the magnitude of $\mathbf{F}_1$ and its angle $\theta$ for equilibrium. Set $F_2 = 6$ kN.
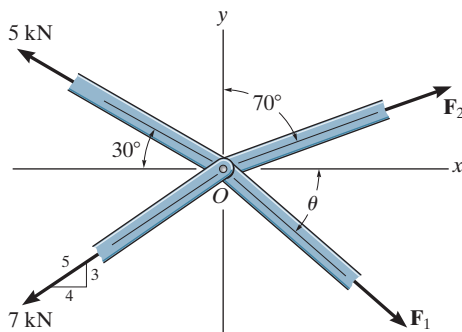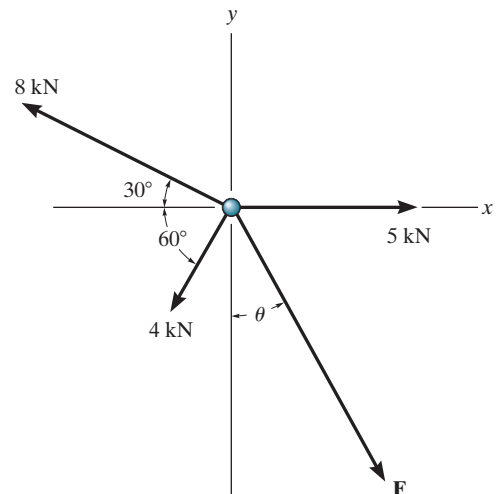
*3–4.** If the forces are concurrent at point $O$, determine the magnitudes of $\mathbf{F}$ and $\mathbf{T}$ for equilibrium. Take $\theta = 90°$.

**3–5.** Determine the force in member $C$ and its angle $\theta$ for equilibrium. The forces are concurrent at point $O$. Take $F = 8$ kN.

**3–6.** Determine the magnitude and direction $\theta$ of $\mathbf{F}$ so that the particle is in equilibrium.
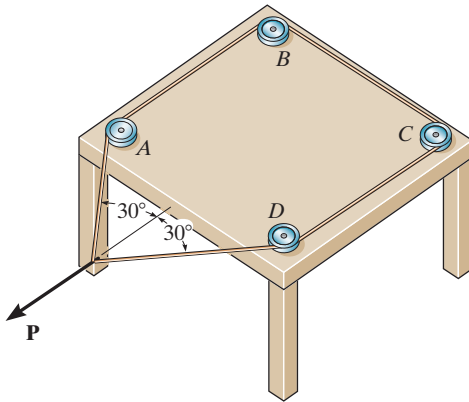
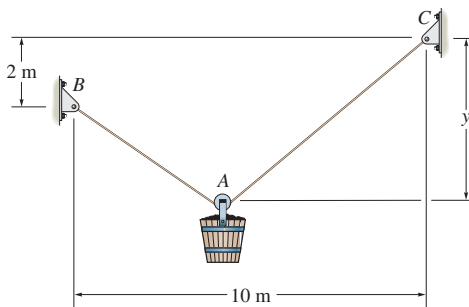

Prob. 3–1



Probs. 3–4/5



Probs. 3–2/3



Prob. 3–6

**3–38.** The wire forms a loop and passes over the small pulleys at $A$, $B$, $C$, and $D$. If its end is subjected to a force of $P = 50$ N, determine the force in the wire and the magnitude of the resultant force that the wire exerts on each of the pulleys.

**3–39.** The wire forms a loop and passes over the small pulleys at $A$, $B$, $C$, and $D$. If the maximum *resultant force* that the wire can exert on each pulley is 120 N, determine the greatest force $P$ that can be applied to the wire as shown.
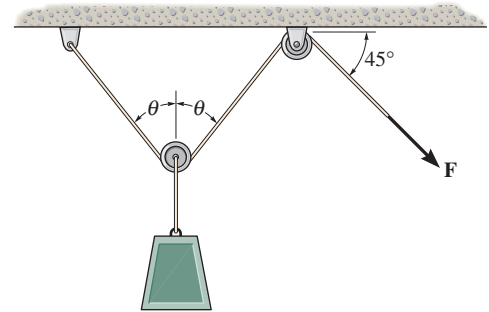
**Probs. 3–38/39**

***3–40.** The pail and its contents have a mass of 60 kg. If the cable is 15 m long, determine the distance $y$ of the pulley for equilibrium. Neglect the size of the pulley at $A$.
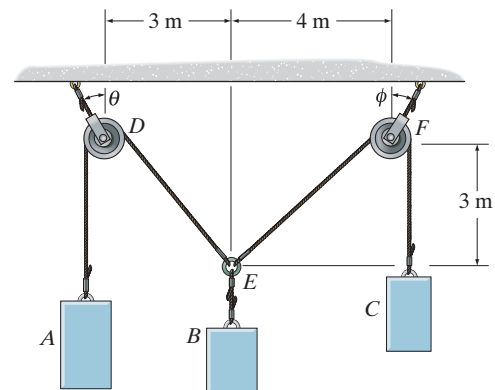
**Prob. 3–40**

**3–41.** The load has a mass of 15 kg and is lifted by the pulley system shown. Determine the force **F** in the cord as a function of the angle $\theta$. Plot the function of force $F$ versus the angle $\theta$ for $0 \leq \theta \leq 90°$.

**Prob. 3–41**

**3–42.** If the mass of the block at $A$ is 20 kg, determine the mass of the block at $B$ and at $C$ for equilibrium. Also, determine the angles $\theta$ and $\phi$.

**Prob. 3–42**