# Chapter 10

10.6 • A metal bar is in the *xy*-plane with one end of the bar at the origin. A force $\vec{F} = (7.00\ \text{N})\hat{\imath} + (-3.00\ \text{N})\hat{\jmath}$ is applied to the bar at the point $x = 3.00$ m, $y = 4.00$ m. (a) In terms of unit vectors $\hat{\imath}$ and $\hat{\jmath}$, what is the position vector $\vec{r}$ for the point where the force is applied? (b) What are the magnitude and direction of the torque with respect to the origin produced by $\vec{F}$?

10.19 • A 2.20-kg hoop 1.20 m in diameter is rolling to the right without slipping on a horizontal floor at a steady 3.00 rad/s. (a) How fast is its center moving? (b) What is the total kinetic energy of the hoop? (c) Find the velocity vector of each of the following points, as viewed by a person at rest on the ground: (i) the highest point on the hoop; (ii) the lowest point on the hoop; (iii) a point on the right side of the hoop, midway between the top and the bottom. (d) Find the velocity vector for each of the points in part (c), but this time as viewed by someone moving along with the same velocity as the hoop.

Chapter 11

11.1 •• A 0.120-kg, 50.0-cm-long uniform bar has a small 0.055-kg mass glued to its left end and a small 0.110-kg mass glued to the other end. The two small masses can each be treated as point masses. You want to balance this system horizontally on a fulcrum placed just under its center of gravity. How far from the left end should the fulcrum be placed?

Figure **P11.77**
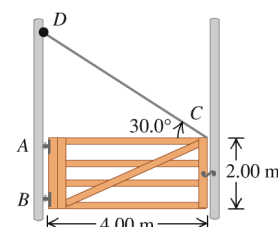
11.77 • **The Farmyard Gate.** A gate 4.00 m wide and 2.00 m high weighs 500 N. Its center of gravity is at its center, and it is hinged at *A* and *B*. To relieve the strain on the top hinge, a wire *CD* is connected as shown in Fig. P11.77. The tension in *CD* is increased until the horizontal force at hinge *A* is zero. (a) What is the tension in the wire *CD*? (b) What is the magnitude of the horizontal component of the force at hinge *B*? (c) What is the combined vertical force exerted by hinges *A* and *B*?

Chpater 12

12.61 • An open barge has the dimensions shown in Fig. P12.61. If the barge is made out of 4.0-cm-thick steel plate on each of its four sides and its bottom, what mass of coal can the barge carry in freshwater without sinking? Is there enough room in the barge to hold this amount of coal? (The density of coal is about 1500 kg/m³.)

Figure **P12.61**
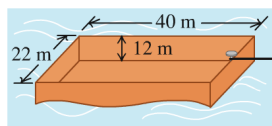
Chapter 13

13.9 •• A particle of mass 3*m* is located 1.00 m from a particle of mass *m*. (a) Where should you put a third mass *M* so that the net gravitational force on *M* due to the two masses is exactly zero? (b) Is the equilibrium of *M* at this point stable or unstable (i) for points along the line connecting *m* and 3*m*, and (ii) for points along the line passing through *M* and perpendicular to the line connecting *m* and 3*m*?