29. Four objects are held in position at the corners of a rectangle by light rods as shown in Figure P8.29. Find the moment of inertia of the system about
(a) the $x$-axis,
(b) the $y$-axis, and
(c) an axis through $O$ and perpendicular to the page.
30. If the system shown in Figure P8.29 is set in rotation about each of the axes mentioned in Problem 29, find the torque that will produce an angular acceleration of 1.50 rad/s² in each case.
47. The system of small objects shown in Figure P8.47 is rotating at an angular speed of 2.0 rev/s. The objects are connected by light, flexible spokes that can be lengthened or shortened. What is the new angular speed if the spokes are shortened to 0.50 m?

(An effect similar to that illustrated in this problem occurred in the early stages of the formation of our galaxy. As the massive cloud of dust and gas that was the source of the stars and planets contracted, an initially small angular speed increased with time.)
51. The puck in Figure P8.51 has a mass of 0.120 kg. Its original distance from the center of rotation is 40.0 cm, and it moves with a speed of 80.0 cm/s. The string is pulled downward 15.0 cm through the hole in the frictionless table. Determine the work done on the puck. [Hint: Consider the change in kinetic energy of the puck.]
55. A cylinder with moment of inertia $I_1$ rotates with angular velocity $\omega_0$ about a frictionless vertical axle. A second cylinder, with moment of inertia $I_2$, initially not rotating, drops onto the first cylinder (Fig. P8.55). Since the surfaces are rough, the two cylinders eventually reach the same angular speed $\omega$.

(a) Calculate $\omega$.

(b) Show that kinetic energy is lost in this situation, and calculate the ratio of the final to the initial kinetic energy.
36. A 5.00-kg cylindrical reel with a radius of 0.600 m and a frictionless axle starts from rest and speeds up uniformly as a 3.00-kg bucket falls into a well, making a light rope unwind from the reel (Fig. P8.36). The bucket starts from rest and falls for 4.00 s.

(a) What is the linear acceleration of the falling bucket?

(b) How far does it drop?

(c) What is the angular acceleration of the reel?
40. Use conservation of energy to determine the angular speed of the spool shown in Figure P8.36 after the 3.00-kg bucket has fallen 4.00 m, starting from rest. The light string attached to the bucket is wrapped around the spool and does not slip as it unwinds.