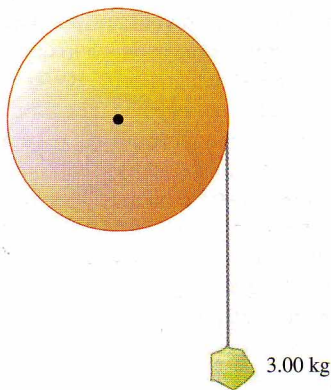


31. ●● A thin uniform bar has two small balls glued to its ends. The bar is 2.00 m long and has mass 4.00 kg, while the balls each have mass 0.500 kg and can be treated as point masses. Find the moment of inertia of this combination about each of the following axes: (a) an axis perpendicular to the bar through its center; (b) an axis perpendicular to the bar through one of the balls; (c) an axis parallel to the bar through both balls.
39. ●● The flywheel of a gasoline engine is required to give up 500 J of kinetic energy while its angular velocity decreases from 650 rev/min to 520 rev/min. What moment of inertia is required?
42. ●● A light string is wrapped around the outer rim of a solid uniform cylinder of diameter 75.0 cm that can rotate without friction about an axle through its center. A 3.00 kg stone is tied to the free end of the string, as shown in Figure 9.28. When the system is released from rest, you determine that the stone reaches a speed of 3.50 m/s after having fallen 2.50 m. What is the mass of the cylinder?



▲ **FIGURE 9.28** Problem 42.

49. ●● A size-5 soccer ball of diameter 22.6 cm and mass 426 g rolls up a hill without slipping, reaching a maximum height of 5.00 m above the base of the hill. We can model this ball as a thin-walled hollow sphere. (a) At what rate was it rotating at the base of the hill? (b) How much rotational kinetic energy did it then have?