

5. In 1995, a fully functional pencil with a mass of 24 kg and a length of 2.74 m was made. Suppose this pencil is suspended at its midpoint and a force of 1.8 N is applied perpendicular to its end, causing it to rotate. What is the angular acceleration of the pencil?
6. The turbines at the third power plant at Grand Coulee, in the state of Washington, have rotors with a mass of  $4.07 \times 10^5$  kg and a radius of 5.0 m each. What angular acceleration would one of these rotors have if a torque of  $5.0 \times 10^4$  N·m were applied? Assume the rotor is a uniform disk.
7. In just over a month in 1962, a shaft almost  $4.00 \times 10^2$  m deep and with a radius of 4.0 m was drilled in South Africa. The mass of the soil taken out was about  $1.0 \times 10^8$  kg. Imagine a rigid cylinder with a mass, radius, and length equal to these values. If this cylinder rotates about its symmetry axis so that it undergoes a constant angular acceleration from rest to 0.080 rad/s in 60.0 s, how large a torque must be applied to the cylinder?
8. The heaviest member of British Parliament ever was Sir Cyril Smith. Calculate his peak mass from the following: if Sir Cyril were to ride on a merry-go-round with a radius of 8.0 m, a torque of  $7.300 \times 10^3$  N·m would be needed to provide him with an angular acceleration of  $0.60$  rad/s<sup>2</sup>.
9. In 1993, a bowl was filled with strawberries in Canada. The mass of the bowl and strawberries combined was 2390 kg, and the moment of inertia about the symmetry axis was estimated to be  $2.40 \times 10^3$  kg·m<sup>2</sup>. Suppose a constant angular acceleration is applied to the bowl so that it makes its first two complete rotations in 6.00 s. How large is the torque that has been applied to the bowl?
10. A steel ax with a mass of  $7.0 \times 10^3$  kg and a length of 18.3 m was made in Canada. If Paul Bunyan were to take a swing with such an ax, what torque would he have to apply in order for the blade to have a tangential acceleration of 25 m/s<sup>2</sup>? Assume that the blade follows a circle with a radius equal to the ax handle's length and that nearly all of the mass is concentrated in the blade.
11. The largest tricycle ever built had rear wheels that were almost 1.70 m in diameter. Neglecting the mass of the spokes, the moment of inertia of one of these wheels is equal to that of a thin hoop rotated about its symmetry axis. Find the wheel's mass if a torque of 125 N·m is applied to the wheel so that in 2.00 s the wheel's angular speed increases from 0.00 rad/s to 12.00 rad/s.
12. In 1975, a centrifuge at a research center in England made a carbon-fiber rod spin about its center so fast that the tangential speed of the rod's tips was about 2.0 km/s. The length of the rod was 15.0 cm. If it took 80.0 s for a torque of 0.20 N·m to bring the rod to rest from its maximum speed, what was the rod's moment of inertia?
13. Francis Johnson of Minnesota made a ball of string with a mass of  $1.0 \times 10^4$  kg and a radius of 2.0 m. Suppose this ball rolls down an incline with an angular acceleration of  $6.13$  rad/s<sup>2</sup>. What is the torque acting on the ball?