Rotation Homework Problems:
p. 157: #24, 26, 27, 28, 29, 31

Problems taken from the school's old textbook:
Giancoli, D. (1980). *Physics*, 2nd Ed. Englewood Cliffs, NJ: Prentice Hall.

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24. A person exerts a force of 18 N on the end of a door 84 cm wide. What is the magnitude of the torque if the force is exerted
    a) perpendicular to the face of the door?
    b) at a 60^o angle to the face of the door?

26. Calculate the moment of inertia of a 12.0-kg sphere of radius 0.205 m when the axis of rotation is through its center. The moment of inertia of a sphere that rotates about its center is $2/5mr^2$. Here m is the mass of the sphere and r is the radius of the sphere.

27. Calculate the moment of inertia of a 66.7-cm-diameter bicycle wheel. The rim and tire have a combined mass of 1.13 kg. The mass of the hub can be ignored. (Why?)

28. A small 12.4-kg ball on the end of a light rod is rotated in a horizontal circle of radius 2.20 m. Calculate:
    a) the moment of inertia of the system about the axis of rotation.
    b) the torque needed to keep the ball rotating at constant angular velocity if air resistance exerts a force of 0.0200 N on the ball.

29. A grinding wheel is a uniform cylinder of radius 8.25 cm and mass 0.880 kg. Calculate:
    a) its moment of inertia.
    b) the torque needed to accelerate it from rest to 1200 rpm in 4.00 seconds if a frictional torque of 0.0145 N·m is also acting.

31. A 1.84-m-diameter sphere can be rotated about an axis through its center by a torque of 12.3 N·m which accelerates it uniformly from rest through a total of 180 revolutions in 15.0 seconds. What is the mass of the sphere?

ANSWERS:

24a. 15.12 N·m
24b. 13.1 N·m
26. 0.202 $kg \cdot m^2$
27. 0.125 $kg \cdot m^2$; the hub can be ignored because it is relative small, but also it is at the center of the wheel; its "r" is relatively small and therefore its contribution to the overall moment of inertia is small.
28a. 60.0 $kg \cdot m^2$
28b. 0.044 N·m
29a. 2.99×10^{-3} $kg \cdot m^2$
29b. 0.108 N·m
31. 3.61 kg