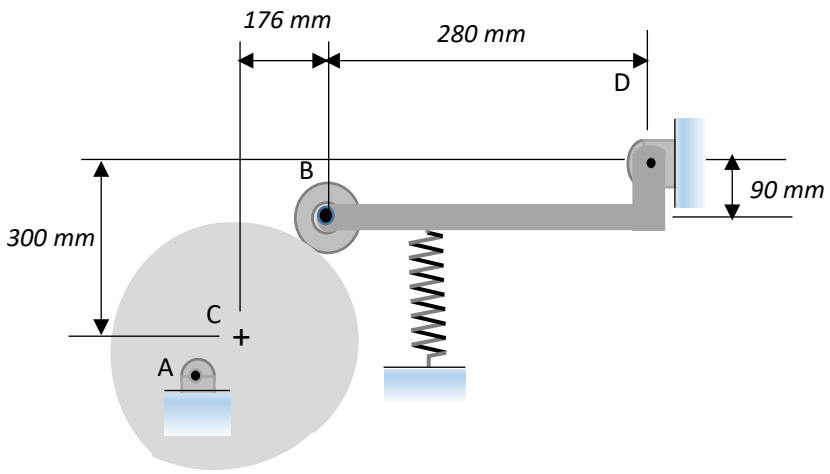
Examples for Chapter 10 CLASS PROBLEMS

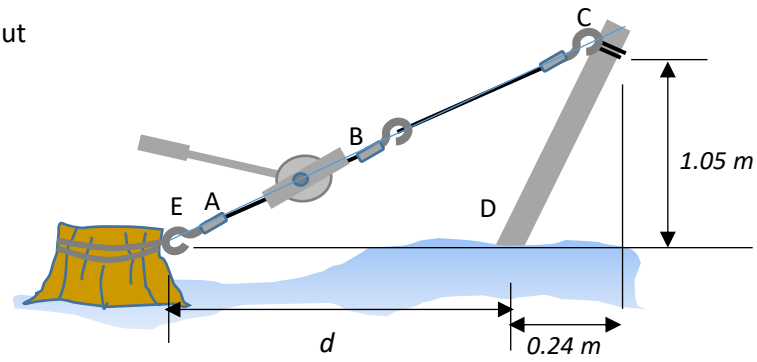
Example 1

A 64-mm-diameter circular follower B is held against a cam A. Knowing that the cam exerts on the follower a force of magnititud 80 N directed along the common normal BC, determine the torque produced by the force about pin D.



Example 2

It is known that a force with a torque of 1152 N.m about D is required to straighten the fence post CD. If the capacity of the winch puller AB is 2880 N, determine the minimum value of distance ***d*** to create the specified tourqe about point D.



Example 3

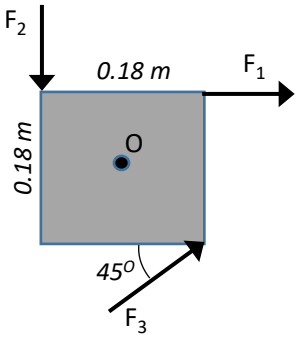
A square metal plate 0.180 m on each side is pivoted about an axis through point O at its center and perpendicular to the plate. Calculate the net torque about this axis due to the three forces shown if the magnititude of the forces are:

F_1 = 18.0 N

F_2 = 26.0 N

F_3 = 14.0 N

The plate and all forces are in the plane of of the page.



Example 4

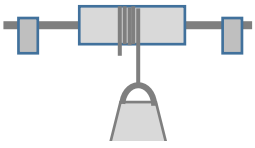
A 15.0-kg bucket of water is suspended by a very light rope wrapped around a solid uniform cylinder 0.300 m in diameter with mass 12.0 kg. The cylinder pivots on a frictionless axle through its center. The bucket is released from rest at the top of a well and falls 10.0 m to the water.

a) What is the tension in the rope while the bucket is falling?

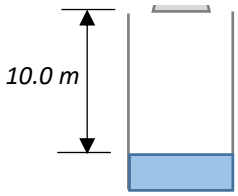
b) With what speed does the bucket srtike the water?

c) What is the time of fall?

d) While the bucket is falling, what is the force exerted on the



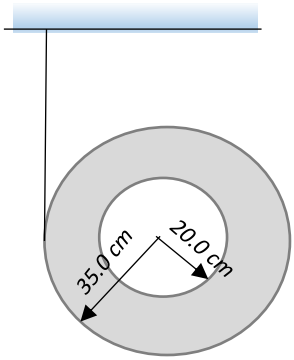
cylinder by the axle?



Example 5

A thin, light string is wrapped around the outer rim of a uniform hollow cylinder of mass 4.75 kg having inner and outer radii as shown. The cylinder is then released from rest.

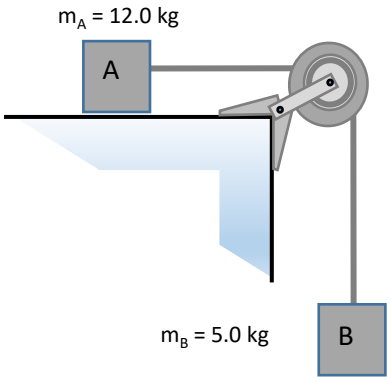
a) How far must the cylinder fall before its center is moving at 6.66 m/s?
b) If you just dropped this cylinder without any string, how fast would its center be moving when it had fallen the distance in part a)?
c) Why do you get two different answer when the cylinder falls the same distance in both cases?



Example 6

A 12.0 kg box resting on a horizontal, frictionless surface is attached to a 5.0 kg weight by a thin, light wire that passes over a frictionless pulley. The pulley has the shape of a uniform solid disk of mass 2.0 kg and diameter 0.50 m. After the system is released, find

a) the tension in the wire on both sides of the pulley.
b) the acceleration of the 12.0 kg box, and
c) the horizontal and vertical component of the force that the axle exerts on the pulley.



Problem 7

A uniform marble rolls down a symmetrical bowl, starting from rest at the top of the left side. The top of each side is a distance *h* above the bottom of the bowl.

The left half of the bowl is rough enough to cause the marble to roll without slipping, but the right half has no friction because it is coated with oil.

a) Haw far up the the smooth side will the marble go, measured vertically from the bottom?
b) How high would the marble go if both sides were as rough as the left side?
c) How do you account for the fact that the marble goes higher with friction on the right side than without friction?