Description
Due Friday Nov. 2, 2012

Instructions
Chapter 8, #6, 8, 10, 12, 30, 31, 32, 40, 44, 52

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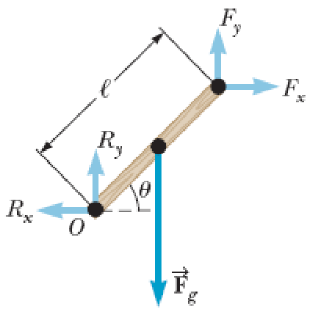
1. Question Details SerCP9 8.P.006. [1594424]

Write the necessary equations of equilibrium of the object shown in the figure below. Take the origin of the torque equation about an axis perpendicular to the page through the point *O*. (Let counterclockwise torque be positive and let forces to the right and up be positive. Use the following as necessary: the forces R_x, R_y, F_x, F_y, and F_g; the length ℓ of the object ; and the angle θ that the object makes with the horizontal.)



$\Sigma F_x =$ = 0

$\Sigma F_y =$ = 0

$\Sigma \tau$ = = 0

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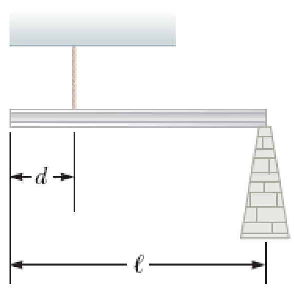
2. Question Details SerCP9 8.P.008. [1636954]

A uniform 34.5-kg beam of length ℓ = 4.90 m is supported by a vertical rope located d = 1.20 m from its left end as in the figure below. The right end of the beam is supported by a vertical column.



(a) Find the tension in the rope.
N upward

(b) Find the force that the column exerts on the right end of the beam.
N upward

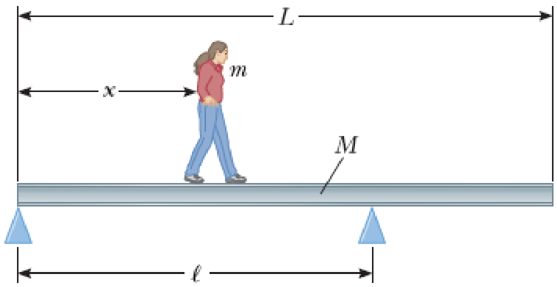
3. Question Details SerCP9 8.P.010. [1588667]

A meter stick is found to balance at the 49.7-cm mark when placed on a fulcrum. When a 40.0-gram mass is attached at the 12.0-cm mark, the fulcrum must be moved to the 39.2-cm mark for balance. What is the mass of the meter stick?

[ ] g

4. Question Details SerCP9 8.P.012. [1594447]

A beam resting on two pivots has a length of L = 6.00 m and mass M = 80.0 kg. The pivot under the left end exerts a normal force n_1 on the beam, and the second pivot placed a distance ℓ = 4.00 m from the left end exerts a normal force n_2. A woman of mass m = 58.0 kg steps onto the left end of the beam and begins walking to the right as in the figure below. The goal is to find the woman's position when the beam begins to tip.



(a) Sketch a free-body diagram, labeling the gravitational and normal forces acting on the beam and placing the woman x meters to the right of the first pivot, which is the origin. (Do this on paper. Your instructor may ask you to turn in this work.)

(b) Where is the woman when the normal force n_1 is the greatest?

[ ]

(c) What is n_1 when the beam is about to tip?

[ ] N

(d) Use the force equation of equilibrium to find the value of n_2 when the beam is about to tip.

[ ] N

(e) Using the result of part (c) and the torque equilibrium equation, with torques computed around the second pivot point, find the woman's position when the beam is about to tip.

[ ] m

(f) Check the answer to part (e) by computing torques around the first pivot point.

[ ] m

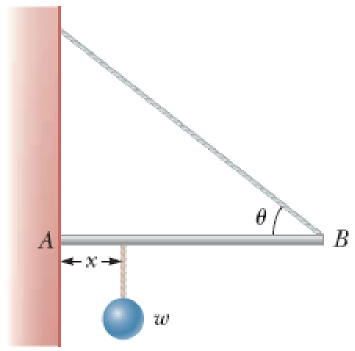
Except for possible slight differences due to rounding, is the answer the same?

- Yes
- No

5. Question Details SerCP9 8.P.030. [1636972]

One end of a uniform 3.40-m-long rod of weight w is supported by a cable at an angle of θ = 37° with the rod. The other end rests against a wall, where it is held by friction (see figure). The coefficient of static friction between the wall and the rod is μ_s = 0.485. Determine the minimum distance x from point A at which an additional weight w (the same as the weight of the rod) can be hung without causing the rod to slip at point A.

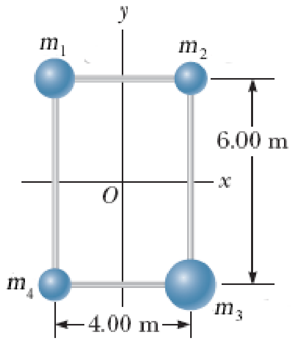
[ ] m



6. Question Details SerCP9 8.P.031. [1594393]

Four objects are held in position at the corners of a rectangle by light rods as shown in the figure below. (The mass values are given in the table.)

m_1 (kg)	m_2 (kg)	m_3 (kg)	m_4 (kg)
2.70	1.90	3.90	2.30



(a) Find the moment of inertia of the system about the x-axis.

[ ] $kg \cdot m^2$

(b) Find the moment of inertia of the system about the y-axis.

[ ] $kg \cdot m^2$

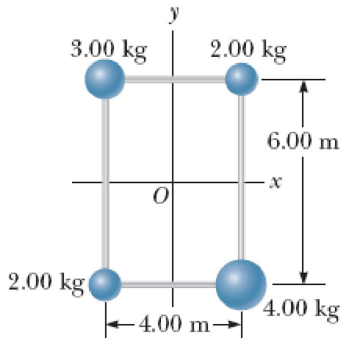
(c) Find the moment of inertia of the system about an axis through O and perpendicular to the page.

[ ] $kg \cdot m^2$

7. Question Details SerCP9 8.P.032.soln. [1589026]

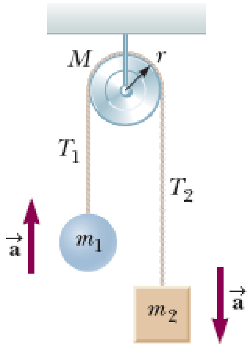
If the system shown in the figure below is set in rotation about each of the axes listed below, find the torque that will produce an angular acceleration of 3.7 rad/s^2 in each case.

x axis		N · m
y axis		N · m
axis through O and perpendicular to the page		N · m



8. Question Details SerCP9 8.P.040. [1594351]

An Atwood's machine consists of blocks of masses m_1 = 13.0 kg and m_2 = 22.0 kg attached by a cord running over a pulley as in the figure below. The pulley is a solid cylinder with mass M = 7.80 kg and radius r = 0.200 m. The block of mass m_2 is allowed to drop, and the cord turns the pulley without slipping.



(a) Why must the tension T_2 be greater than the tension T_1?

(b) What is the acceleration of the system, assuming the pulley axis is frictionless?

m/s^2

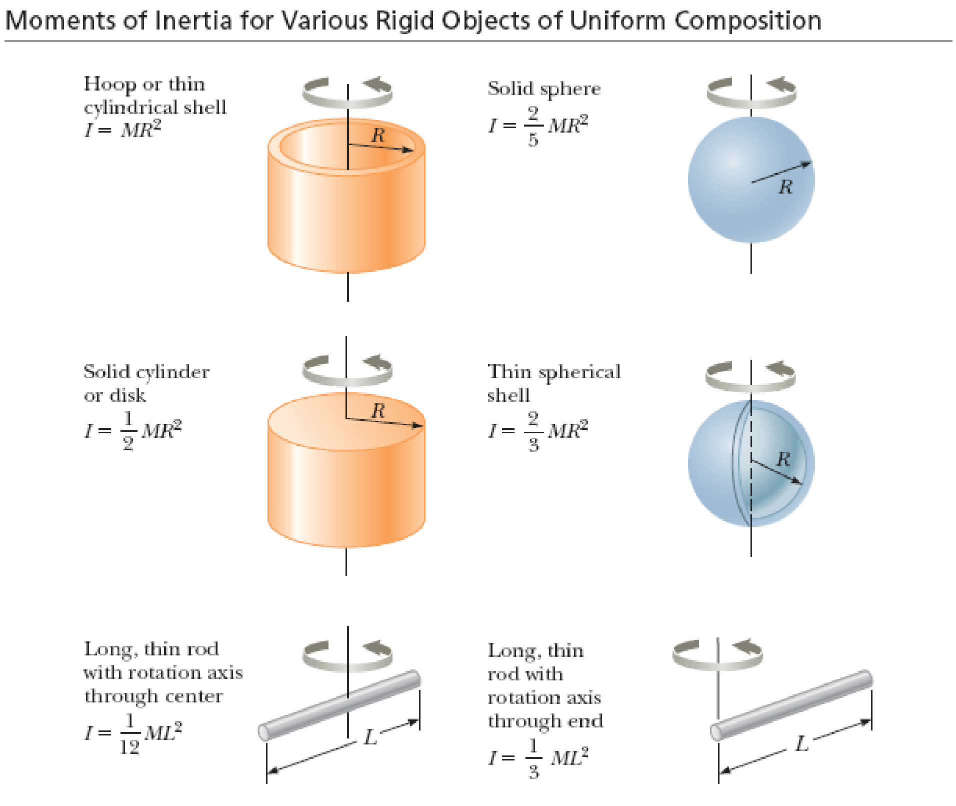
(c) Find the tensions T_1 and T_2.

T_1 = N

T_2 = N

9. Question Details SerCP9 8.P.044. [1588870]

Four objects—a hoop, a solid cylinder, a solid sphere, and a thin, spherical shell—each has a mass of 5.38 kg and a radius of 0.187 m.



(a) Find the moment of inertia for each object as it rotates about the axes shown in the table above.

hoop	______	$kg \cdot m^2$
solid cylinder	______	$kg \cdot m^2$
solid sphere	______	$kg \cdot m^2$
thin, spherical shell	______	$kg \cdot m^2$

(b) Suppose each object is rolled down a ramp. Rank the translational speed of each object from highest to lowest.

- ◯ solid cylinder > thin spherical > solid sphere > hoop
- ◯ solid sphere > solid cylinder > thin spherical > hoop
- ◯ hoop > solid cylinder > solid sphere > thin spherical
- ◯ thin spherical > solid sphere > solid cylinder > hoop

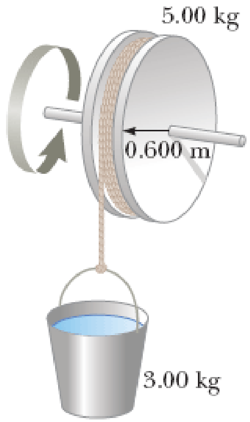
(c) Rank the objects' rotational kinetic energies from highest to lowest as the objects roll down the ramp.

- ◯ solid cylinder > thin spherical > solid sphere > hoop
- ◯ hoop > thin spherical > solid cylinder > solid sphere
- ◯ hoop > solid cylinder > solid sphere > thin spherical
- ◯ thin spherical > solid sphere > solid cylinder > hoop

10. Question Details SerCP9 8.P.052.WI. [1594461]

Use conservation of energy to determine the angular speed of the spool shown in the figure below after the 3.00 kg bucket has fallen 3.95 m, starting from rest. The light string attached to the bucket is wrapped around the spool and does not slip as it unwinds.

[ ] rad/s



Assignment Details