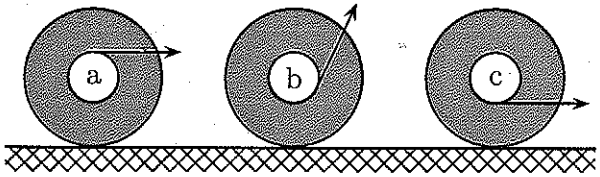
This print-out should have 15 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering. The due time is Central time.

Concept 08 20

10:07, highSchool, multiple choice, < 1 min, fixed.

001

A spool (similar to a yo-yo) is pulled in three ways, as shown below. There is sufficient friction for rotation.



In what direction will each spool move (in the order spool a, spool b, spool c)?

1. right; right; right
2. right; left; left
3. right; left; right
4. right; right; left
5. left; right; right
6. None of these is correct.

Serway CP 08 31

10:08, trigonometry, numeric, > 1 min, normal.

002

A model airplane whose mass is 0.75 kg is tethered by a wire so that it flies in a circle 30 m in radius. The airplane engine provides a net thrust of 0.8 N perpendicular to the tethering wire.

Find the torque the net thrust produces about the center of the circle. Answer in units of N · m.

003

Find the angular acceleration of the airplane when it is in level flight. Answer in units of rad/s^2.

004

Find the linear acceleration of the airplane tangent to its flight path. Answer in units of m/s^2.

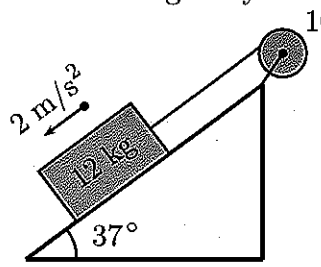
Serway CP 08 60

10:08, trigonometry, numeric, > 1 min, normal.

005

A 12 kg object is attached to a cord that is wrapped around a wheel of radius 10 cm, as shown. The acceleration of the object down the frictionless incline is measured to be 2 m/s^2. Assume the axle of the wheel to be frictionless.

The acceleration of gravity is 9.8 m/s^2.



Note: Figure is not drawn to scale

Find the tension in the rope. Answer in units of N.

006

Find the moment of inertia of the wheel. Answer in units of kg · m^2.

007

Find the angular speed of the wheel 2 s after it begins rotating, starting from rest. Answer in units of rad/s.

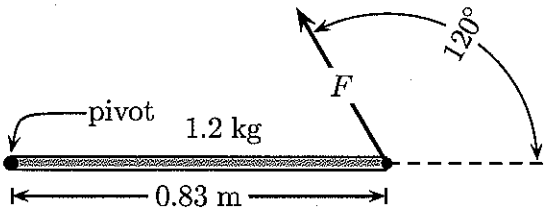
Accelerating About a Pivot

10:08, trigonometry, numeric, > 1 min, normal.

008

A uniform horizontal rod of mass 1.2 kg and length 0.83 m is free to pivot about one end as shown. The moment of inertia of the rod about an axis perpendicular to the rod and through the center of mass is given by

$$I = \frac{m\ell^2}{12}.$$



If 5.1 N force at an angle of 120° to the horizontal acts on the rod as shown, what is the magnitude of the resulting angular acceleration about the pivot point? The acceleration of gravity is 9.8 m/s^2. Answer in units of rad/s^2.

Cable Over a Pulley

10:08, trigonometry, numeric, > 1 min, normal.

009

A cable passes over a pulley. Because the cable grips the pulley and the pulley has nonzero mass, the tension in the cable is not the same on opposite sides of the pulley. The force on one side is 120 N, and the force on the other side is 100 N.

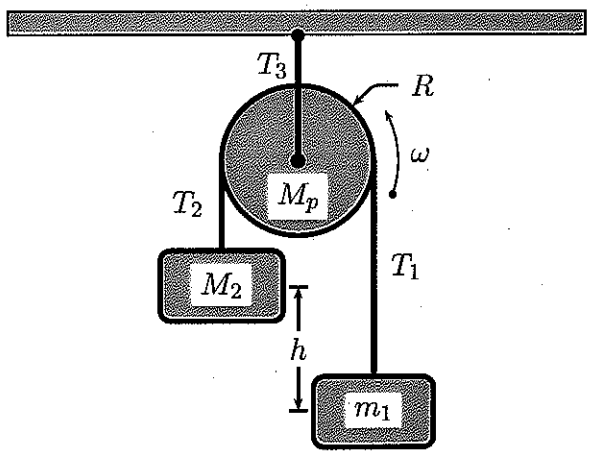
Assuming that the pulley is a uniform disk of mass 2.1 kg and radius 0.81 m, determine the magnitude of its angular acceleration. Answer in units of rad/s^2.

Atwood with Massive Pulley 01

10:08, trigonometry, multiple choice, > 1 min, fixed.

010

A pulley (in the form of a uniform disk) with mass M_p and radius R_p is attached to the ceiling in a uniform gravitational field g and rotates with no friction about its pivot. Mass M_2 is larger than mass m_1, and they are connected by a massless inextensible cord. T_1, T_2, and T_3 are magnitudes of the tensions.



What is the relationship between the tension T_1 and $m_1\, g$?

1. $T_1 = m_1\, g$

2. $T_1 > m_1\, g$

3. $T_1 < m_1\, g$

4. Not enough information is available.

011

What is the relationship between the magnitudes of the accelerations?

1. $a_{M_2} > a_{m_1}$.

2. $a_{M_2} < a_{m_1}$.

3. $a_{M_2} = a_{m_1}$.

4. Not enough information is available.

012

The center of mass of $m_1 + M_2$

1. accelerates down.

2. accelerates up.

3. does not accelerate.

4. Not enough information is available.

013

What is the relationship between the magnitudes of T_1 and T_2?

1. $T_2 > T_1$

2. $T_2 < T_1$

3. $T_2 = T_1$

4. Not enough information is available.

014

What is the relationship between the magnitudes of T_3, T_2, and T_1?

1. $T_1 + T_2 > T_3$

2. $T_1 + T_2 < T_3$

3. $T_1 + T_2 = T_3$

4. Not enough information is available.

015

What is the relation between the magnitudes of T_3, m_1, M_2, and M_p?

1. $T_3 > (m_1 + M_2 + M_p)\, g$

2. $T_3 < (m_1 + M_2 + M_p)\, g$

3. $T_3 = (m_1 + M_2 + M_p)\, g$

4. Not enough information is available.