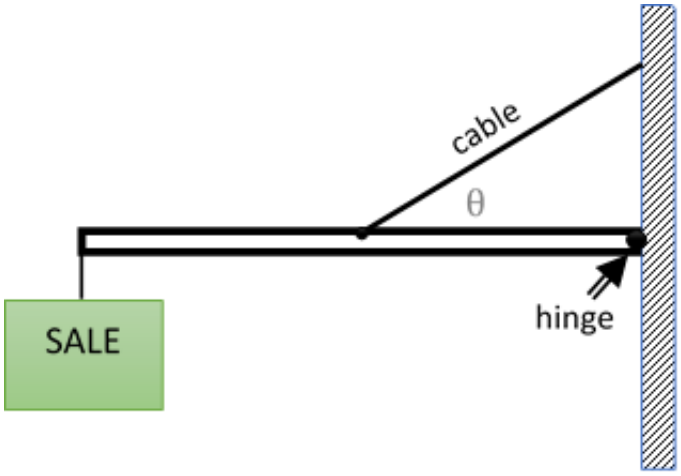
Question 1 (2 points)

A sign that weighs 680 N is mounted at the end of a 1.27 m long rod of negligible weight as shown. The supporting cable is connected to the center of the rod at an angle of θ = 40°.

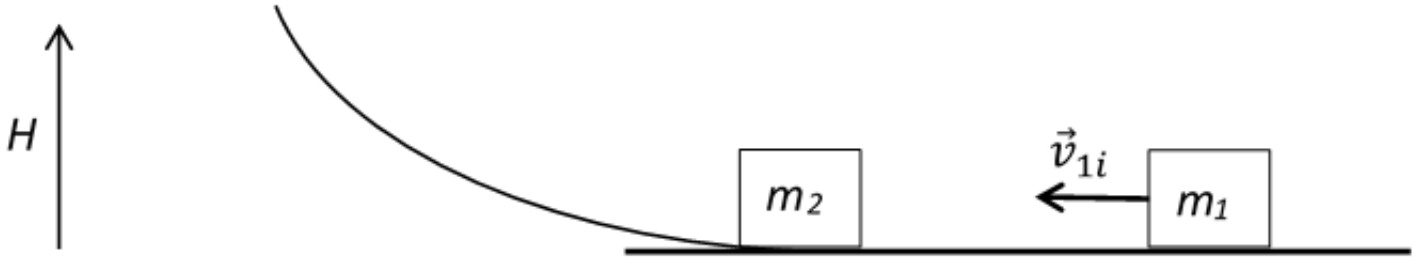


Find the tension in the supporting cable

- a) 680 N
- b) 1400 N
- c) 2100 N
- d) 1800 N
- e) 890 N
- f) 1100 N

Question 2 (2 points)

A chunk of ice of mass m_1 is sliding with a horizontal velocity of magnitude v_{1i} on the floor of an ice-covered valley when it collides with and sticks to another chunk of ice of mass m_2 that is initially at rest at the base of a hill. The two blocks stick together and move up the hill together. Since the valley and hill are icy, there is no friction between the chunks and the ground.



Which conservation laws may be applied to understand the motion of the ice chunks in this problem?

A) Conservation of energy

B) Conservation of angular momentum

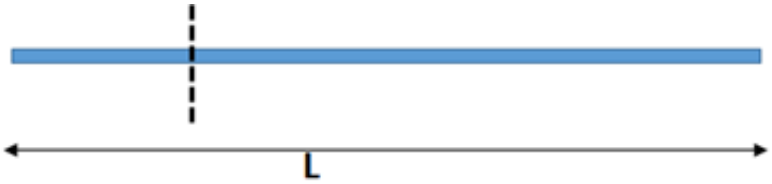
C) Conservation of linear momentum

D) Newton's second law and kinematics

- a) A only
- b) B only
- c) C only
- d) A and B
- e) A and C
- f) D only

Question 3 (2 points)

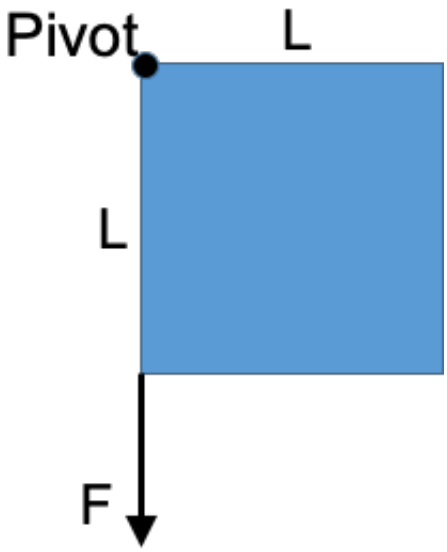
Consider a uniform thin rod of length L and mass M rotated about an axis perpendicular to the rod and passing a point L/4 from left end. What is the moment of inertia of the rod about this point?



- a) $\frac{1}{3}ML^2$
- b) $\frac{1}{9}ML^2$
- c) $\frac{7}{48}ML^2$
- d) $\frac{1}{12}ML^2$
- e) $\frac{8}{36}ML^2$

Question 4 (2 points)

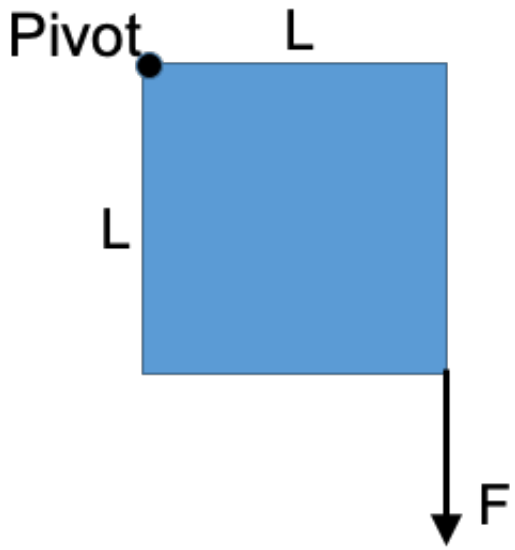
A uniform square plate is pivoted at one corner as shown. For this pivot, what is the torque created by the force F?



- ◯ LF out of the page
- ◯ LF into the page
- ◯ $LF\sin(45)$ out of the page
- ◯ $LF\sin(45)$ into the page
- ◯ 0 (no torque)

Question 5 (2 points)

A uniform square plate is pivoted at one corner as shown. For this pivot, what is the torque created by the force F?



- ◯ $\left(\sqrt{2}L\right)F\sin(45)$ out of the page
- ◯ $\left(\sqrt{2}L\right)F\sin(45)$ into the page
- ◯ $LF\sin(45)$ out of the page
- ◯ $LF\sin(45)$ into the page
- ◯ 0 (no torque)

Question 6 (2 points)

A ball of mass *m* strikes a wall perpendicularly with a speed *v*, and it bounces off the wall perpendicularly with a speed *v*/3. What is the magnitude of the **impulse** delivered to the wall by the ball?

- ◯ *mv*
- ◯ *mv/3*
- ◯ *2mv/3*
- ◯ *4mv/3*
- ◯ *2mv*

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