Conceptual Question C6.1

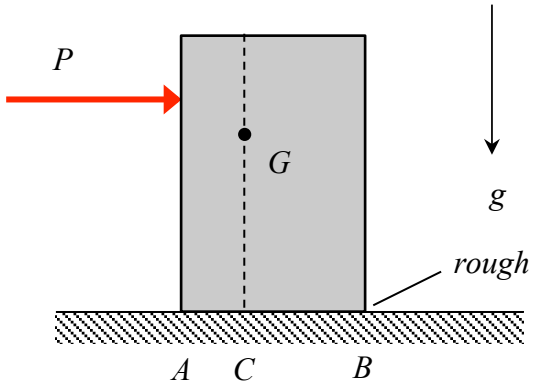
Given: A block with its center of mass at point G rests on a rough horizontal surface. A horizontal force P is then applied to the block. As a result of this applied force, the block remains in static equilibrium and is not in a state of impending motion.

Find:

Circle the correct response below regarding the location of the normal component of the reaction force N acting on the block by the horizontal surface on which the block rests:

- N acts at corner point A.
- N acts between points A and C.
- N acts at point C, directly under the center of mass G of the body.
- N acts between points C and B.
- N acts at corner point B.

Provide an explanation for your answer.



Conceptual Question C6.2

Given: A block with its center of mass at point G is placed on a rough, inclined plane. On release, it is known that the block does not remain in equilibrium on the incline. Because of this, a force P is applied to the block to hold the block in place.

Find: It is desired to understand the MINIMUM force P that can be applied to the block and have the block remain in equilibrium.

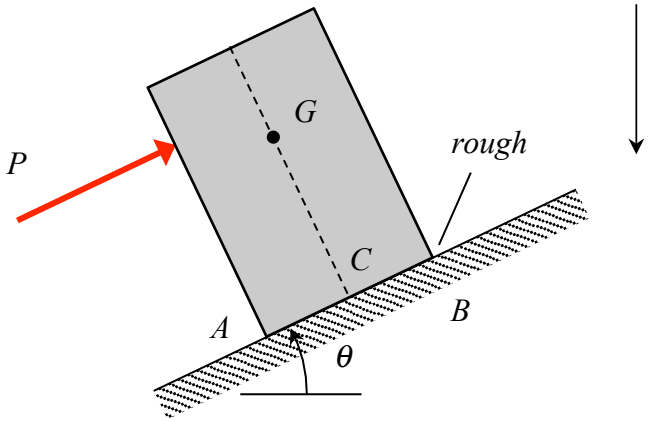
For the minimum force P needed to hold the block in place, circle the correct response below:

- Impending tipping would occur about corner point A.
- Impending tipping would occur about midpoint C.
- Impending tipping would occur about corner point B.

For the minimum force P needed to hold the block in place, circle the correct response below:

- The friction force acting on the block points up the incline.
- The friction force acting on the block is zero.
- The friction force acting on the block points down the incline.

Provide explanations for your answers.



Conceptual Question C6.3

Given: A block with its center of mass at point G is placed on a rough, inclined plane. On release, it is known that the block does not remain in equilibrium on the incline. Because of this, a force P is applied to the block to hold the block in place.

Find: It is desired to understand the MAXIMUM force P that can be applied to the block and have the block remain in equilibrium.

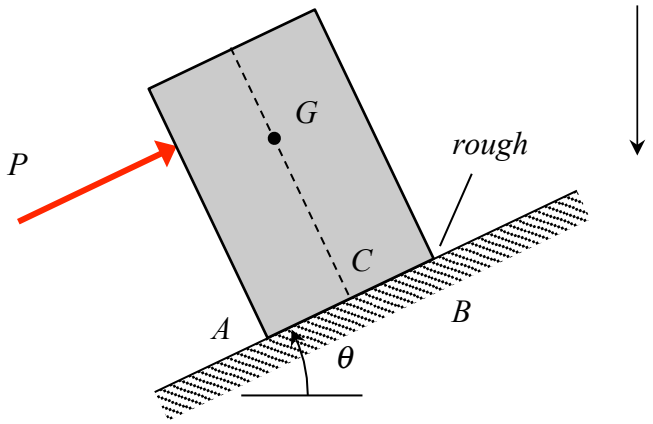
For the maximum force P that can be applied and hold the block in place, circle the correct response below:

- Impending tipping would occur about corner point A.
- Impending tipping would occur about midpoint C.
- Impending tipping would occur about corner point B.

For the maximum force P that can be applied and hold the block in place, circle the correct response below:

- The friction force acting on the block points up the incline.
- The friction force acting on the block is zero.
- The friction force acting on the block points down the incline.

Provide explanations for your answers.



Conceptual Question C6.4

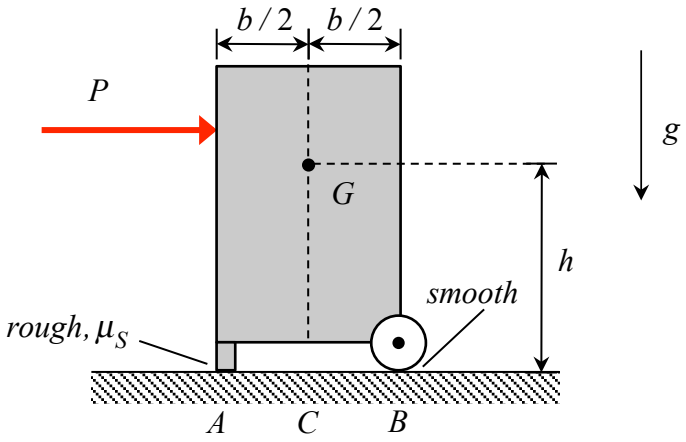
Given: A block with its center of mass at point G is placed on a horizontal surface. The block is supported by a peg at corner A and by a wheel at corner B. The contact between the peg and the horizontal surface is rough, whereas the wheel is able to move over the surface with any frictional resistance. A horizontal force P acts on the side of the block, as shown in the figure.

Find: It is desired to move the block with the load P.

Circle the correct response regarding the motion of the block as the load P is increased:

- The block will tip.
- The block will slide.
- More information is needed regarding the problem in order to determine the motion of the block.

Provide an explanation for your answer.



Conceptual Question C6.5

Given: A homogeneous disk having a weight of W is placed between a fixed, vertical wall and a block that is resting on an inclined ramp. The contacts are all rough. On release, the disk remains in equilibrium.

Find: It is desired to move the block with the load P.

Circle the correct response regarding the direction of the friction force on the disk at contact A at impending motion of the block:

- The friction force on the disk at A is down the incline.
- The friction force on the disk at A is zero.
- The friction force on the disk at A is up the incline.

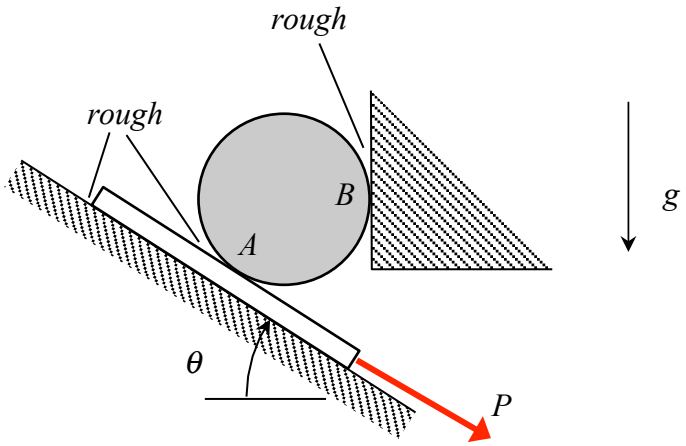
Circle the correct response regarding the direction of the friction force on the disk at contact B at impending motion of the block:

- The friction force on the disk at B is down along the wall.
- The friction force on the disk at B is zero.
- The friction force on the disk at B is up along the wall.

Circle the correct response regarding the relative sizes of the friction forces on the disk at A (f_A) and B (f_B):

- $|f_A| > |f_B|$
- $|f_A| = |f_B|$
- $|f_A| < |f_B|$

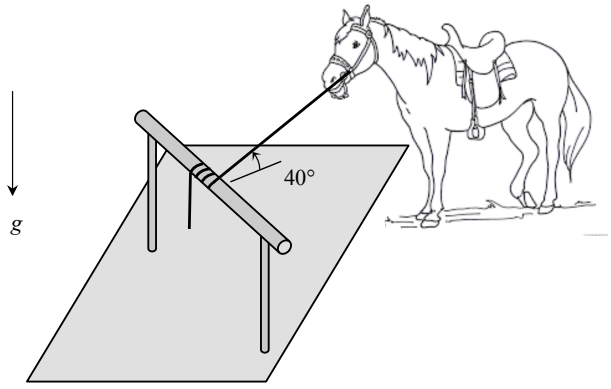
Provide explanations for your answers.



Conceptual Question C6.6

Given: The reins of a horse are wrapped around the horizontal section of a western hitching post, as shown below. A short segment of the rein weighing $W = 4$ oz hangs from the end, The coefficient of static friction between the rein and the hitching post is $\mu_S = 0.6$.

Find: With what force does the horse need to pull on the rein in order to escape from the hitching post?



Conceptual Question C6.7

Given: A wedge supports a disk having a weight of W, where the disk is pinned to arm OC. The contacts between the disk and the wedge, and between the wedge and the floor, are rough, having a static coefficient of friction of μ_S at each contact. The weights of arm OC and of the wedge can be considered to be negligible as compared to the weight of the disk. The wedge is known to be self-locking.

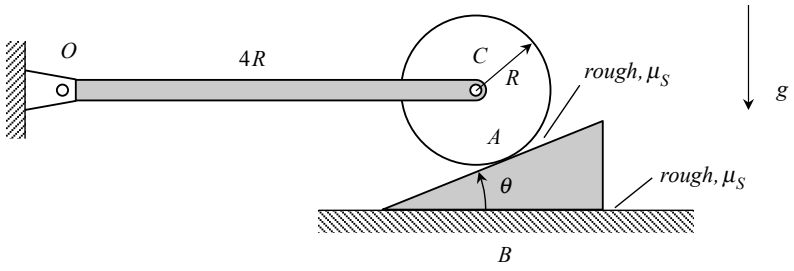
Find: For this problem:

Circle the correct response regarding the size of the friction force f_A acting on the disk due to the wedge (where N_A is the normal force acting on the disk due to the wedge:

- $f_A = 0$
- $0 < f_A < \mu_S N_A$
- $f_A = \mu_S N_A$

Provide an explanation for your answer.

Also, determine the minimum μ_S required for the wedge to be self-locking.



Conceptual Question C6.8

Given: A crate having a weight of W is being acted upon by a load $P = \alpha W$, where $\alpha > 0$, as the crate rests on a horizontal floor.

Find: For this problem:

- Assuming that the crate does not tip, what is the minimum coefficient of static friction μ_S between the crate and the floor for which the crate remains in equilibrium? Express your answers in terms of the parameters shown in the figure.
- Determine the location of the normal contact force acting on the crate by the floor on which it rests.