Q5.1

A car engine is suspended from a chain linked at *O* to two other chains. Which of the following forces *should* be included in the free-body diagram for the engine?

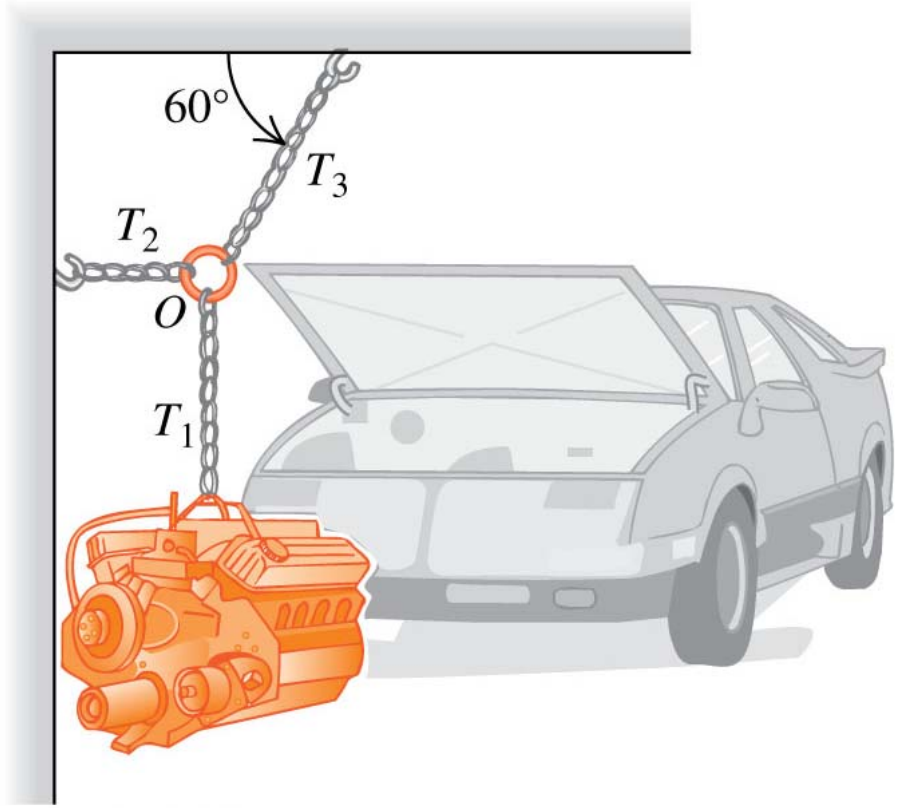
A. tension T_1

B. tension T_2

C. tension T_3

D. two of the above

E. T_1, T_2, and T_3



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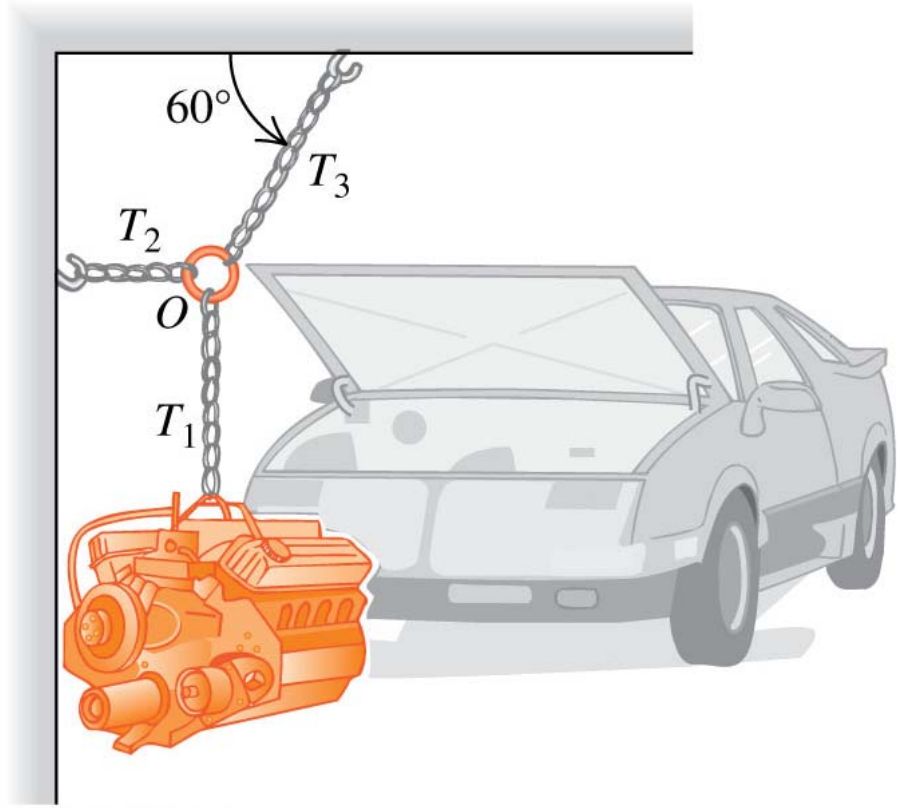


A. tension T_1

B. tension T_2

C. tension T_3

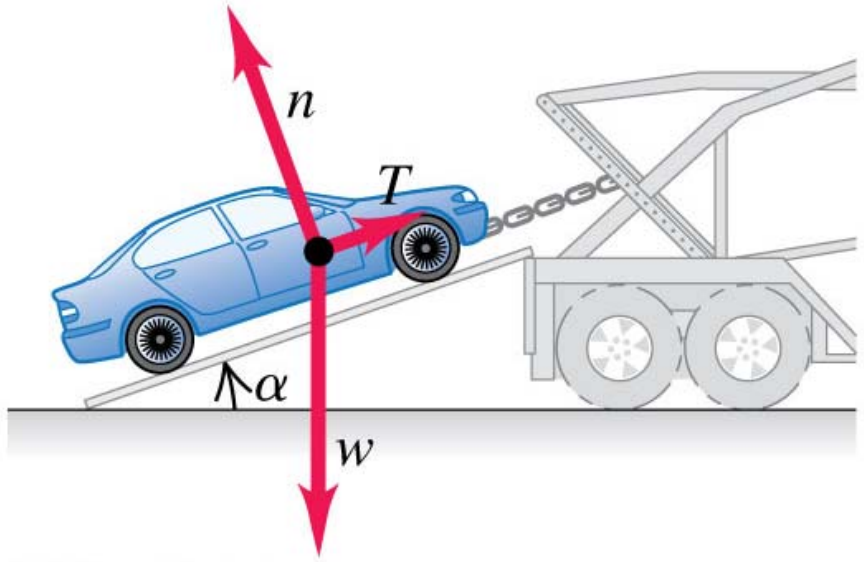
D. two of the above

E. T_1, T_2, and T_3

Q5.2

A cable attached to a car holds the car at rest on the frictionless ramp (angle α).

The ramp exerts a normal force on the car. How does the magnitude n of the normal force compare to the weight w of the car?



A. $n = w$

B. $n > w$

C. $n < w$

D. not enough information given to decide

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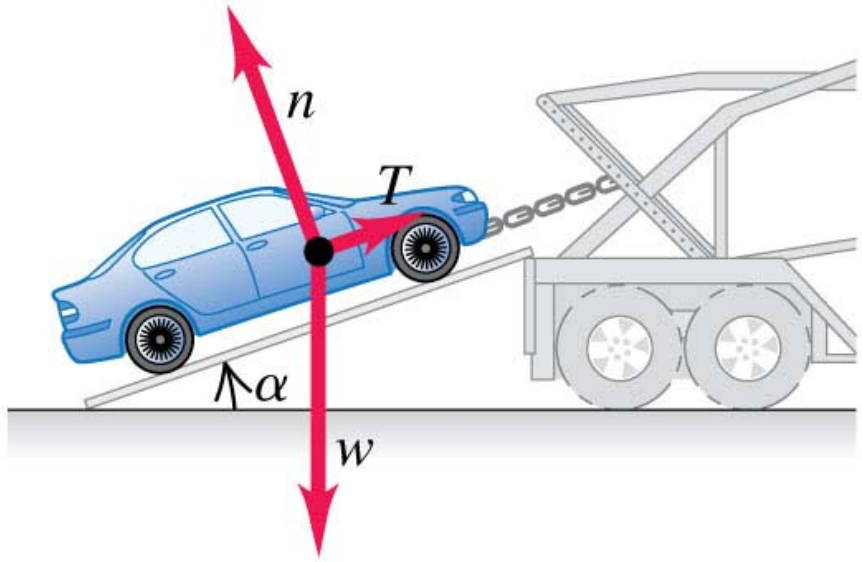


A. $n = w$

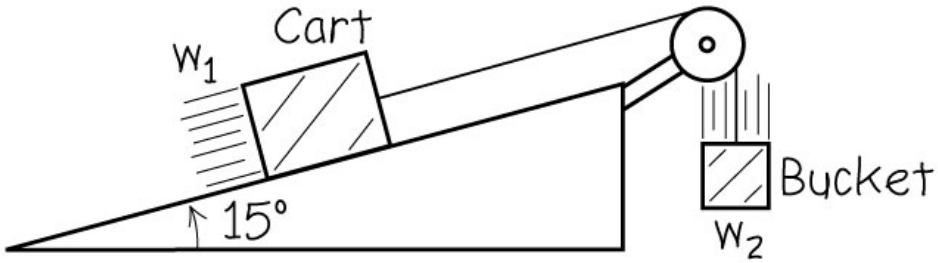
B. $n > w$

✓ C. $n < w$

D. not enough information given to decide

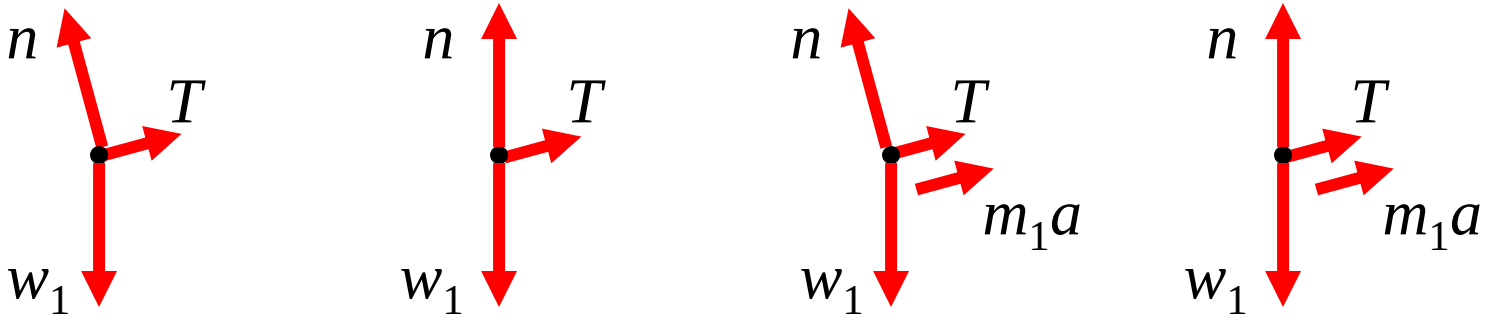
Q5.3

A cart (weight w_1) is attached by a lightweight cable to a bucket (weight w_2) as shown. The ramp is frictionless.



When released, the cart accelerates up the ramp.

Which of the following is a *correct* free-body diagram for the *cart?*



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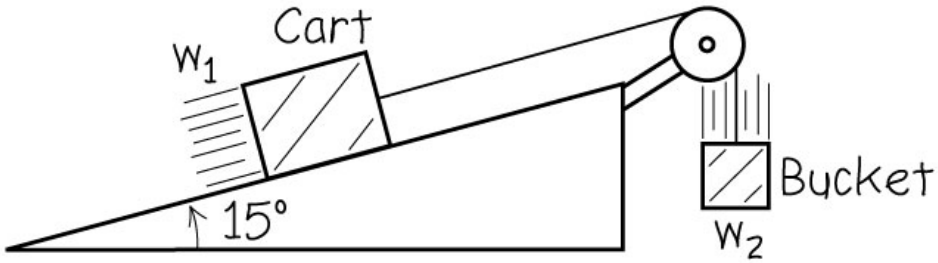

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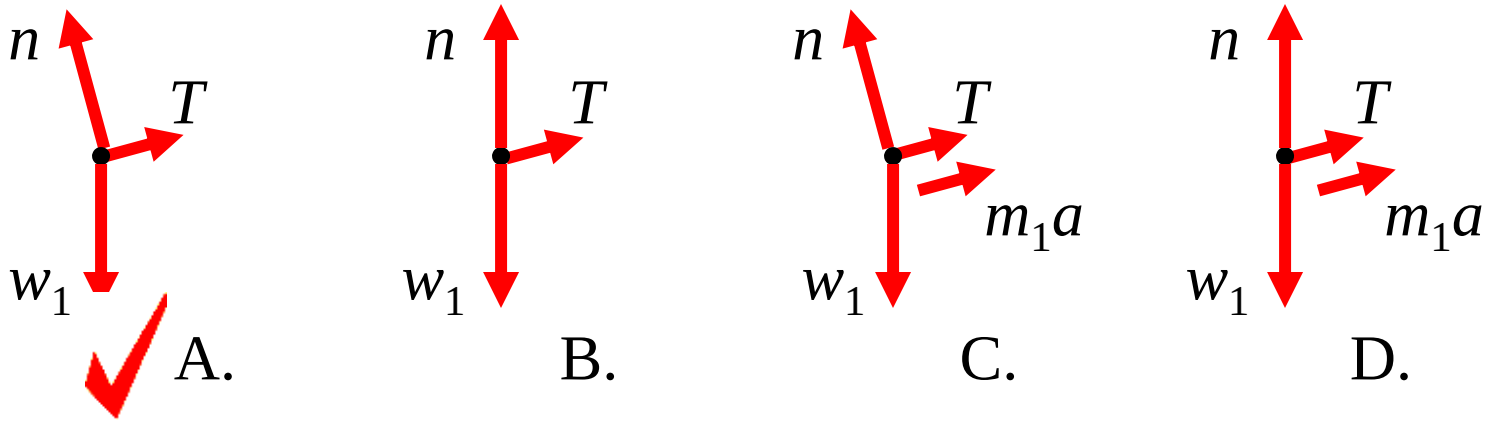
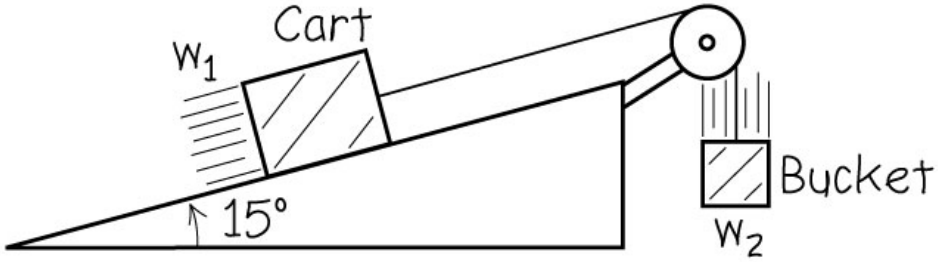


Q5.4

A cart (weight w_1) is attached by a lightweight cable to a bucket (weight w_2) as shown. The ramp is frictionless. The pulley is frictionless and does not rotate.



When released, the cart accelerates up the ramp and the bucket accelerates downward. How does the cable tension T compare to w_2?

A. $T = w_2$

B. $T > w_2$

C. $T < w_2$

D. not enough information given to decide

A5.4

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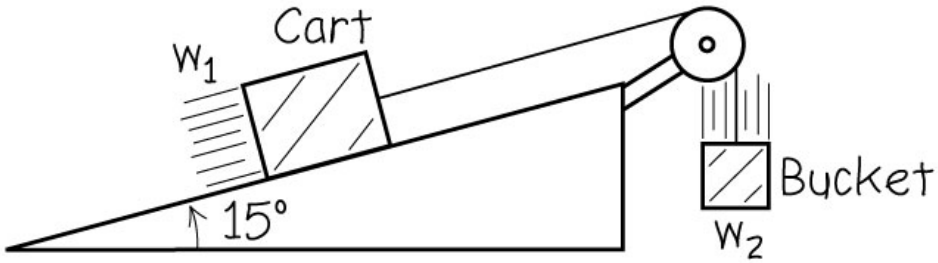


When released, the cart accelerates up the ramp and the bucket accelerates downward. How does the cable tension T compare to w_2?

A. $T = w_2$

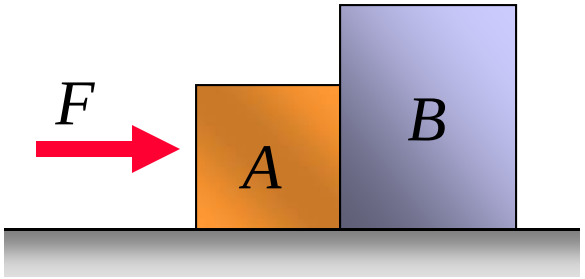
B. $T > w_2$

✓ C. $T < w_2$

D. not enough information given to decide

Q5.5

A lightweight crate (*A*) and a heavy crate (*B*) are side by side on a frictionless horizontal surface. You are applying a horizontal force *F* to crate *A*. Which of the following forces *should* be included in a free-body diagram for crate *B*?



A. the weight of crate *B*

B. the force of crate *B* on crate *A*

C. the force *F* that you exert

D. the acceleration of crate *B*

E. more than one of the above

A5.5

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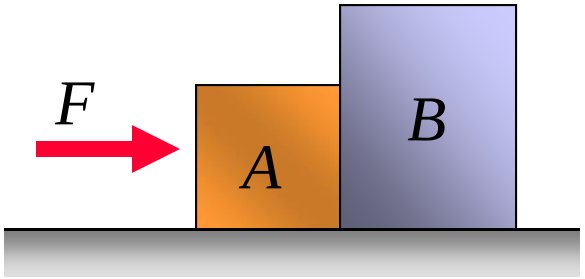


A. the weight of crate *B*

B. the force of crate *B* on crate *A*

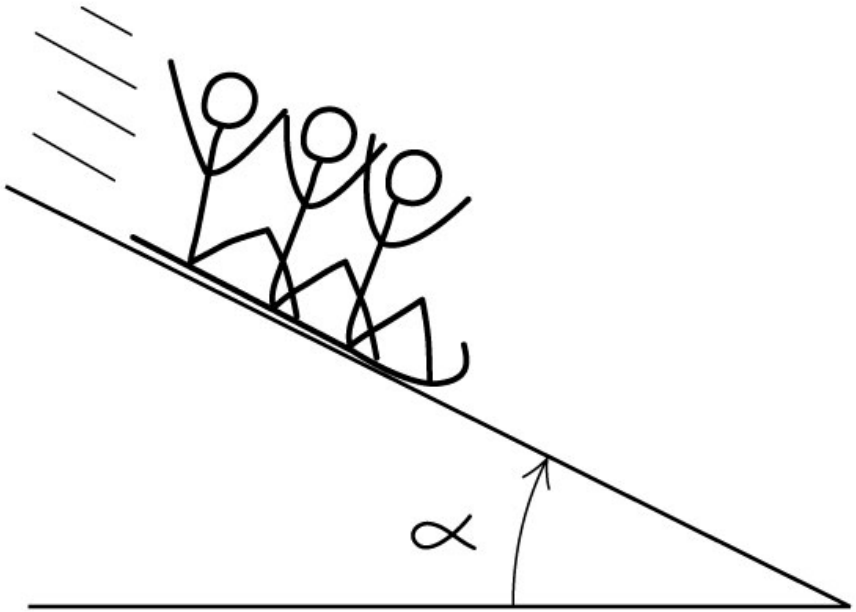
C. the force *F* that you exert

D. the acceleration of crate *B*

E. more than one of the above

Q5.6

A toboggan of weight w (including the passengers) slides down a hill of angle α at a constant speed. Which statement about the normal force on the toboggan (magnitude n) is *correct?*



A. $n = w$

B. $n > w$

C. $n < w$

D. not enough information given to decide

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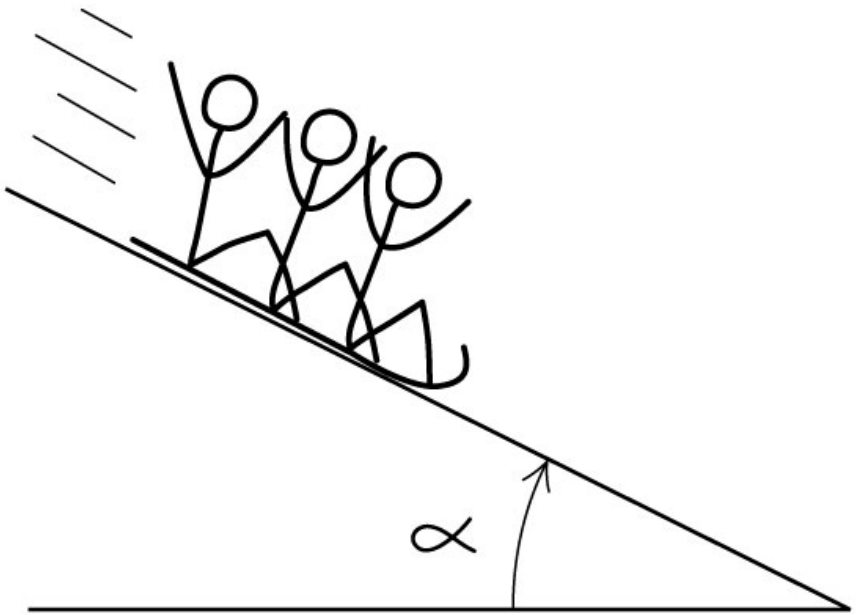


A. $n = w$

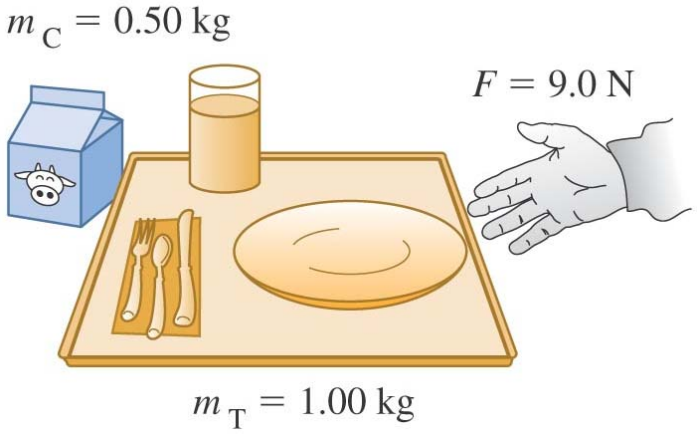
B. $n > w$

✓ C. $n < w$

D. not enough information given to decide

Q5.7

You are pushing a 1.00-kg food tray through the cafeteria line with a constant 9.0-N force. As the tray moves, it pushes on a 0.50-kg milk carton. If the food tray and milk carton *move at constant speed*,



A. the tray exerts more force on the milk carton than the milk carton exerts on the tray.

B. the tray exerts less force on the milk carton than the milk carton exerts on the tray.

C. the tray exerts as much force on the milk carton as the milk carton exerts on the tray.

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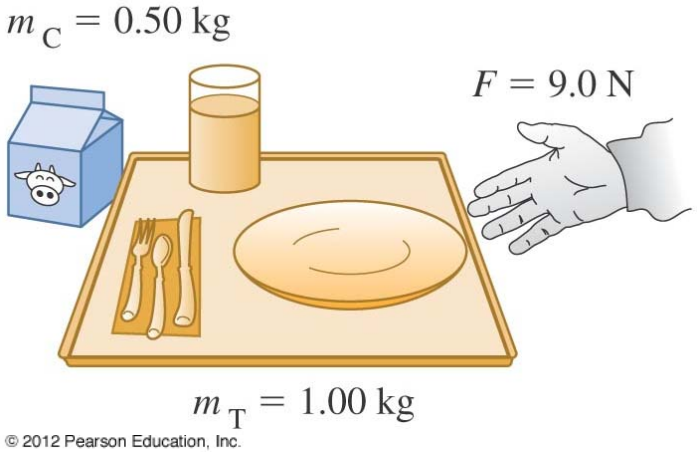


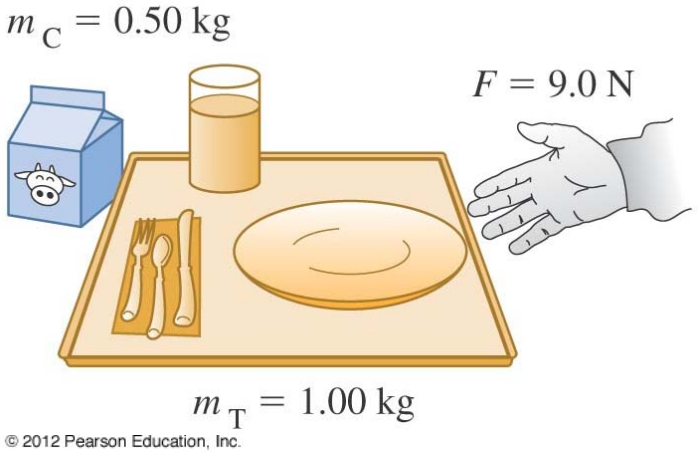
A. the tray exerts more force on the milk carton than the milk carton exerts on the tray.

B. the tray exerts less force on the milk carton than the milk carton exerts on the tray.

✓ C. the tray exerts as much force on the milk carton as the milk carton exerts on the tray.

Q5.8

You are pushing a 1.00-kg food tray through the cafeteria line with a constant 9.0-N force. As the tray moves, it pushes on a 0.50-kg milk carton. If the food tray and milk carton are *accelerating to the left*,



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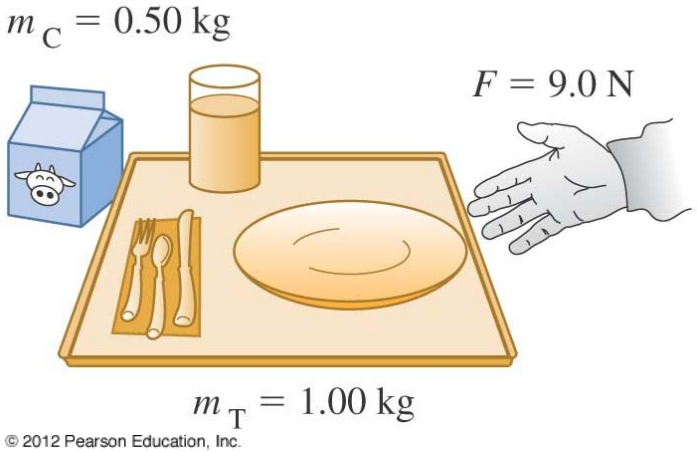

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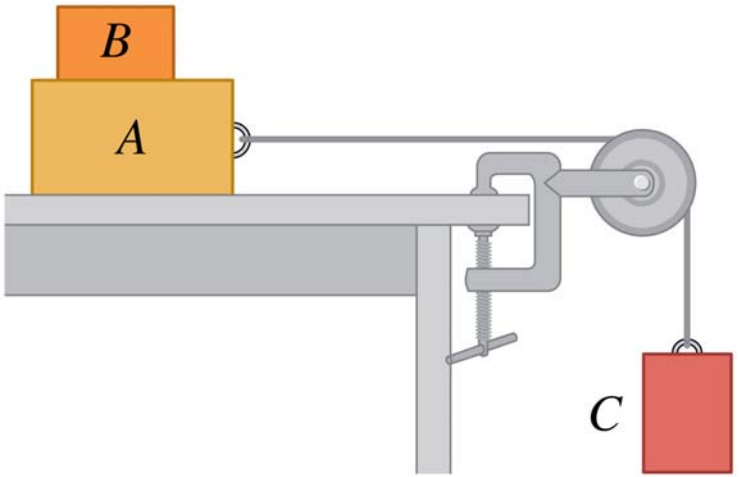
Q5.9

Blocks *A* and *C* are connected by a string as shown. When released, block *A* accelerates to the right and block *C* accelerates downward.



There is friction between blocks *A* and *B*, but not enough to prevent block *B* from slipping. If you stood next to the table during the time that block *B* is slipping on top of block *A*, you would see

A. block *B* accelerating to the right.

B. block *B* accelerating to the left.

C. block *B* moving at constant speed to the right.

D. block *B* moving at constant speed to the left.

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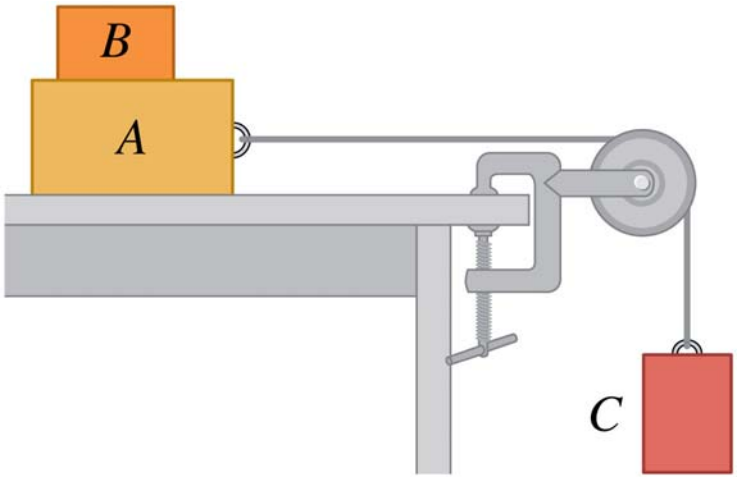
Blocks *A* and *C* are connected by a string as shown. When released, block *A* accelerates to the right and block *C* accelerates downward.



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A. block *B* accelerating to the right.

B. block *B* accelerating to the left.

C. block *B* moving at constant speed to the right.

D. block *B* moving at constant speed to the left.

Q5.10

You are walking on a level floor. You are getting good traction, so the soles of your shoes don't slip on the floor.

Which of the following forces *should* be included in a free-body diagram for your body?

A. the force of kinetic friction that the floor exerts on your shoes

B. the force of static friction that the floor exerts on your shoes

C. the force of kinetic friction that your shoes exert on the floor

D. the force of static friction that your shoes exert on the floor

E. more than one of these

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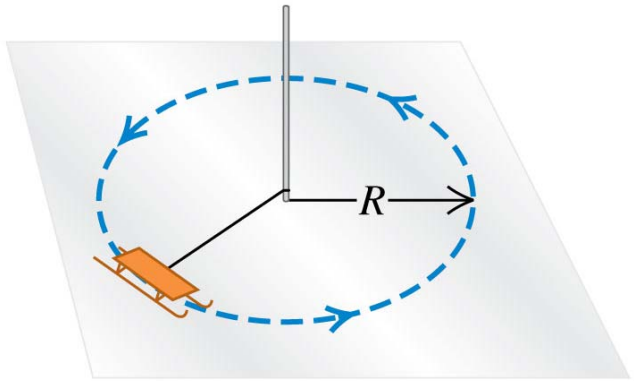
Q5.11

A sled moves on essentially frictionless ice. It is attached by a rope to a vertical post set in the ice. Once given a push, the sled moves around the post at constant speed in a circle of radius *R*.



If the rope breaks,

A. the sled will keep moving in a circle.

B. the sled will move on a curved path, but not a circle.

C. the sled will follow a curved path for a while, then move in a straight line.

D. the sled will move in a straight line.

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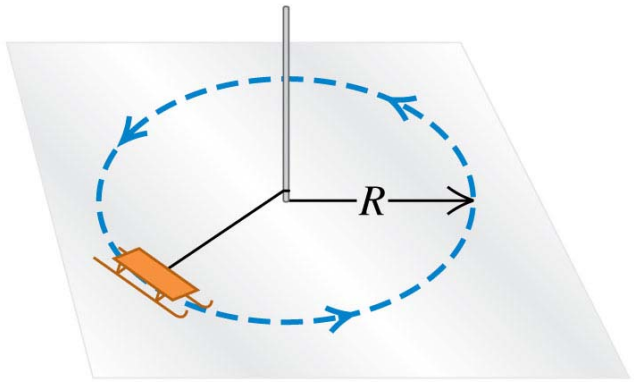

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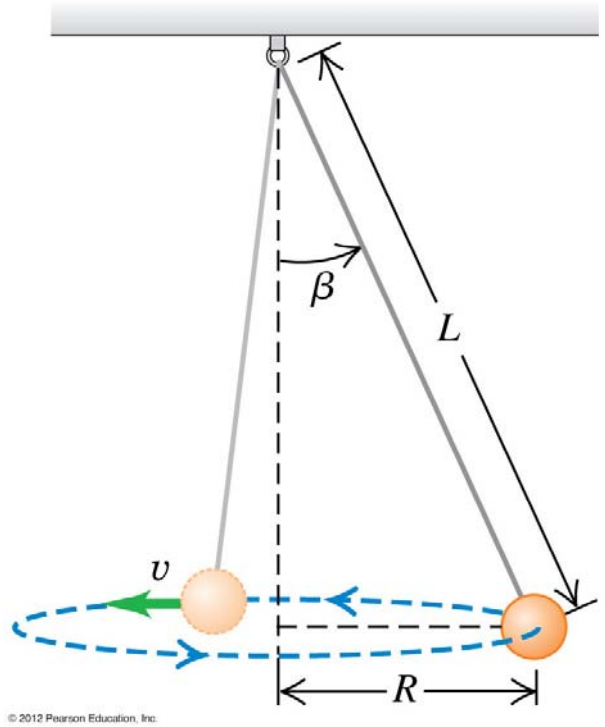
Q5.12

A pendulum bob of mass m is attached to the ceiling by a thin wire of length L. The bob moves at constant speed in a horizontal circle of radius R, with the wire making a constant angle β with the vertical. The tension in the wire



A. is greater than mg.

B. is equal to mg.

C. is less than mg.

D. is any of the above, depending on the bob's speed v.

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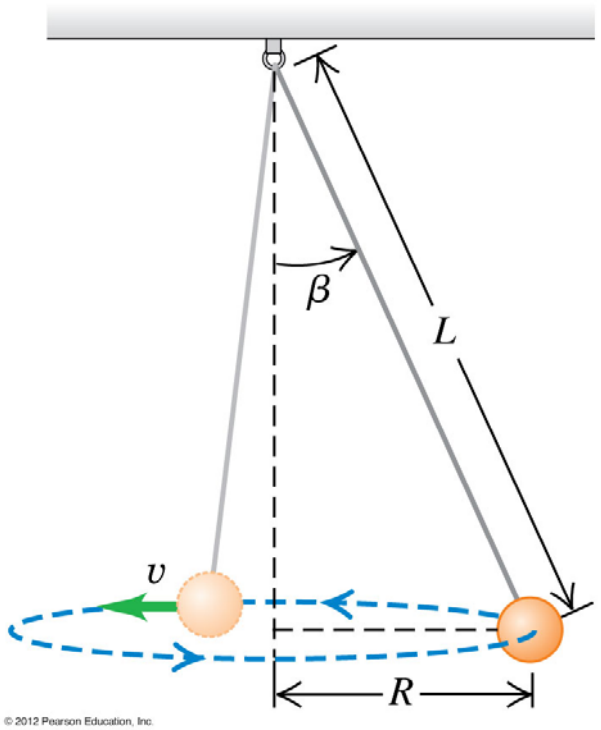


A. is greater than mg.

B. is equal to mg.

C. is less than mg.

D. is any of the above, depending on the bob's speed v.

Q5.13

A pendulum of length L with a bob of mass m swings back and forth. At the low point of its motion (point Q), the tension in the string is $(3/2)mg$. What is the speed of the bob at this point?

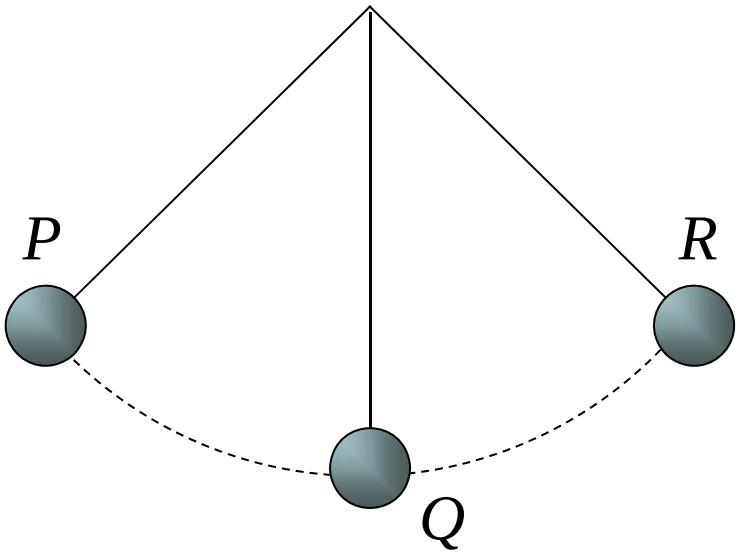
A. $2\sqrt{gL}$

B. $\sqrt{2gL}$

C. $\sqrt{gL}$

D. $\sqrt{\frac{gL}{2}}$

E. $\frac{\sqrt{gL}}{2}$



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C. $\sqrt{gL}$

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E. $\frac{\sqrt{gL}}{2}$