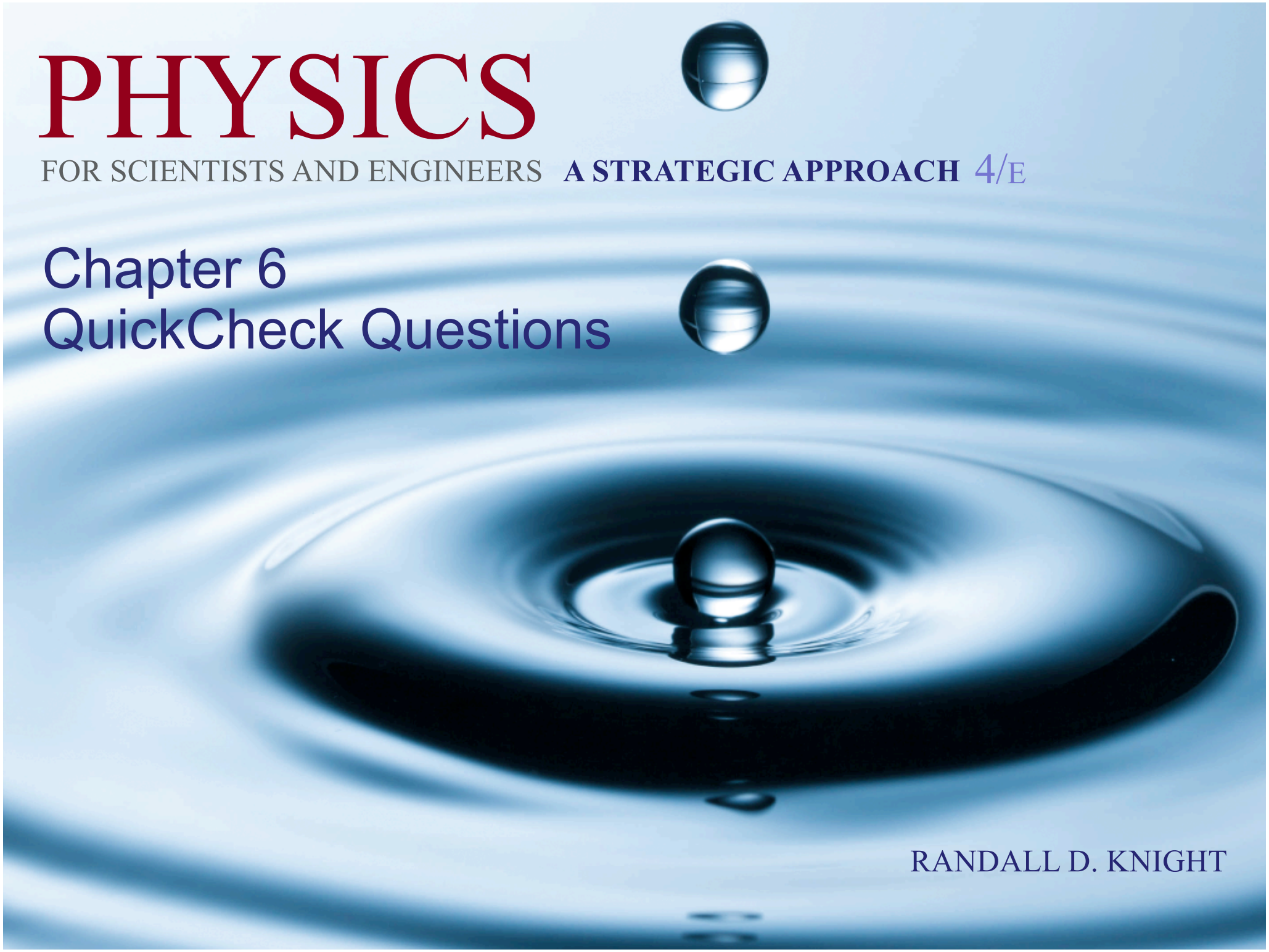
PHYSICS

FOR SCIENTISTS AND ENGINEERS **A STRATEGIC APPROACH** 4/E

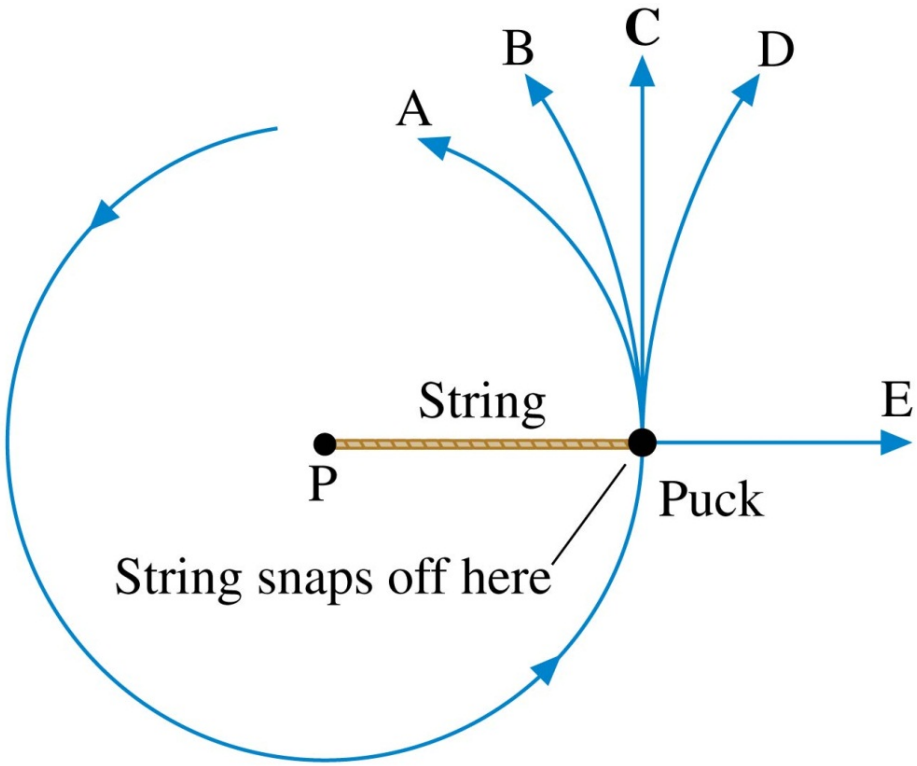
Chapter 6
QuickCheck Questions



RANDALL D. KNIGHT

QuickCheck 6.1

The figure shows the view looking down onto a sheet of frictionless ice. A puck, tied with a string to point P, slides on the ice in the circular path shown and has made many revolutions. If the string suddenly breaks with the puck in the position shown, which path best represents the puck's subsequent motion?



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QuickCheck 6.1

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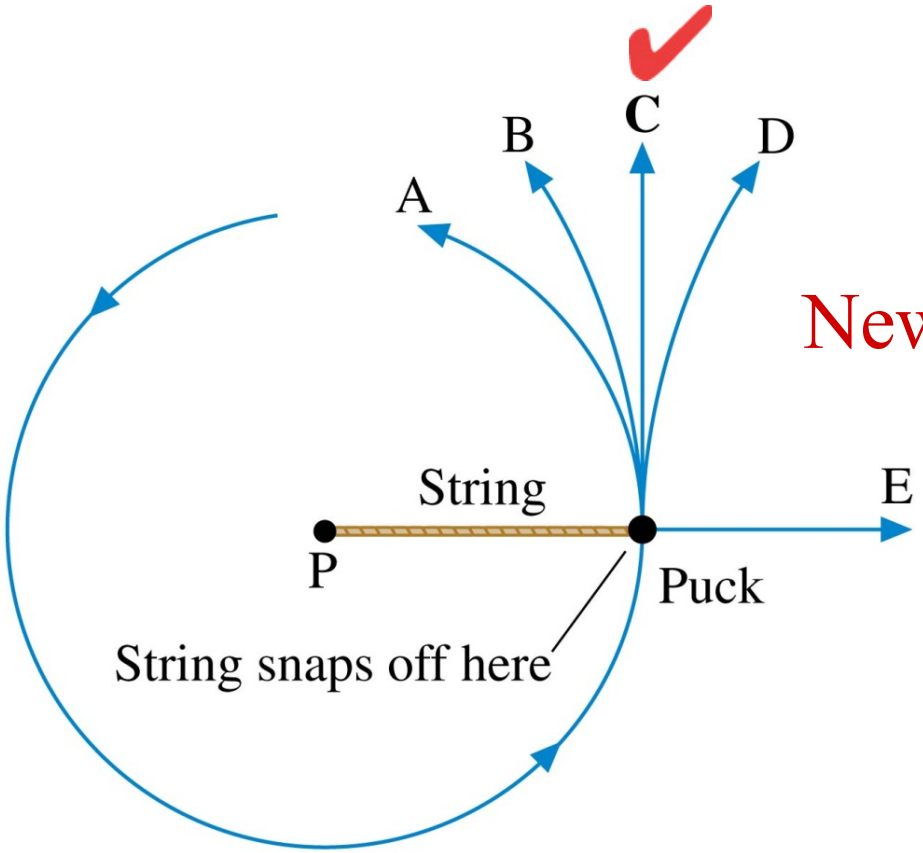

Newton's first law!

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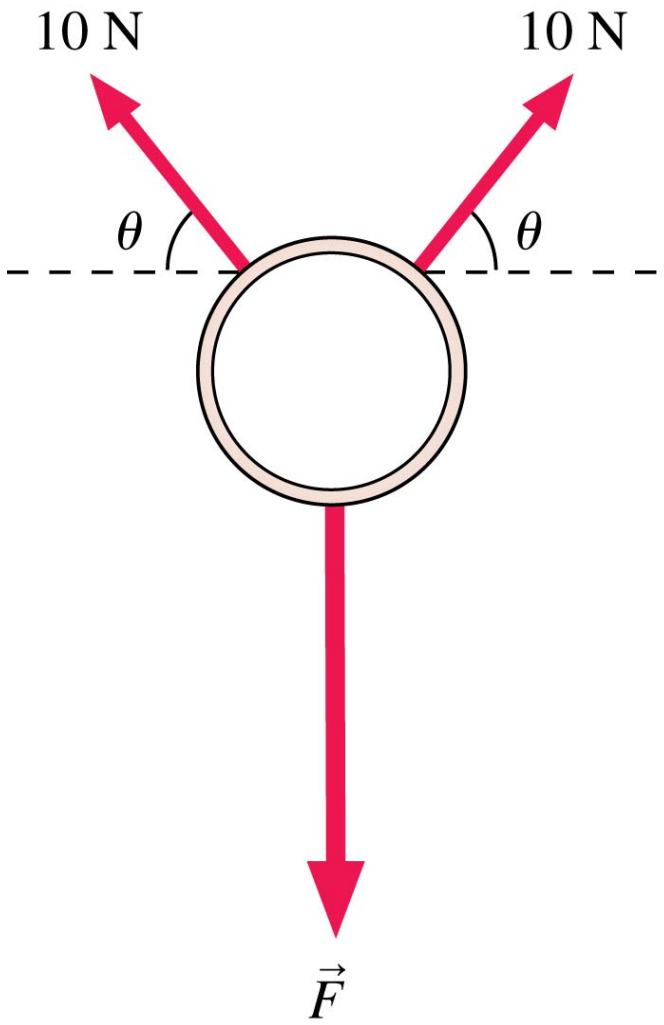
QuickCheck 6.2

A ring, seen from above, is pulled on by three forces. The ring is not moving. How big is the force F?



A. 20 N

B. $10\cos\theta$ N

C. $10\sin\theta$ N

D. $20\cos\theta$ N

E. $20\sin\theta$ N

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QuickCheck 6.2

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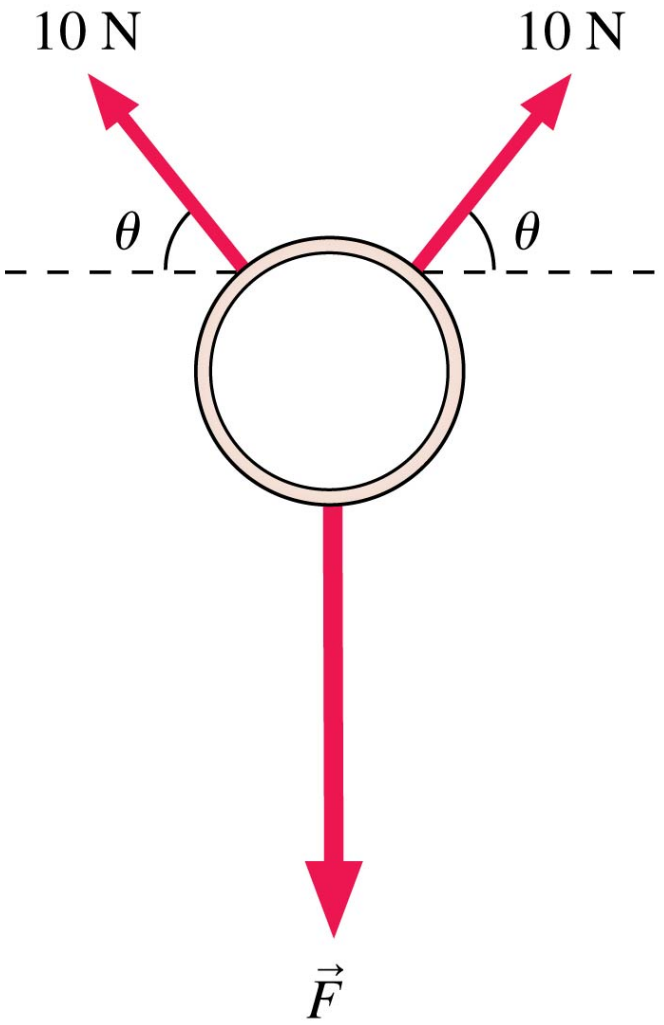

A. 20 N

B. $10\cos\theta$ N

C. $10\sin\theta$ N

D. $20\cos\theta$ N

✔ **E. $20\sin\theta$ N**

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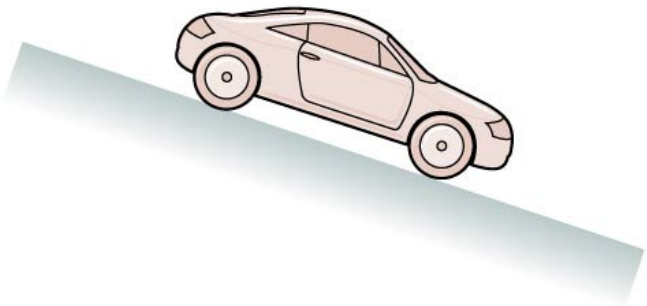
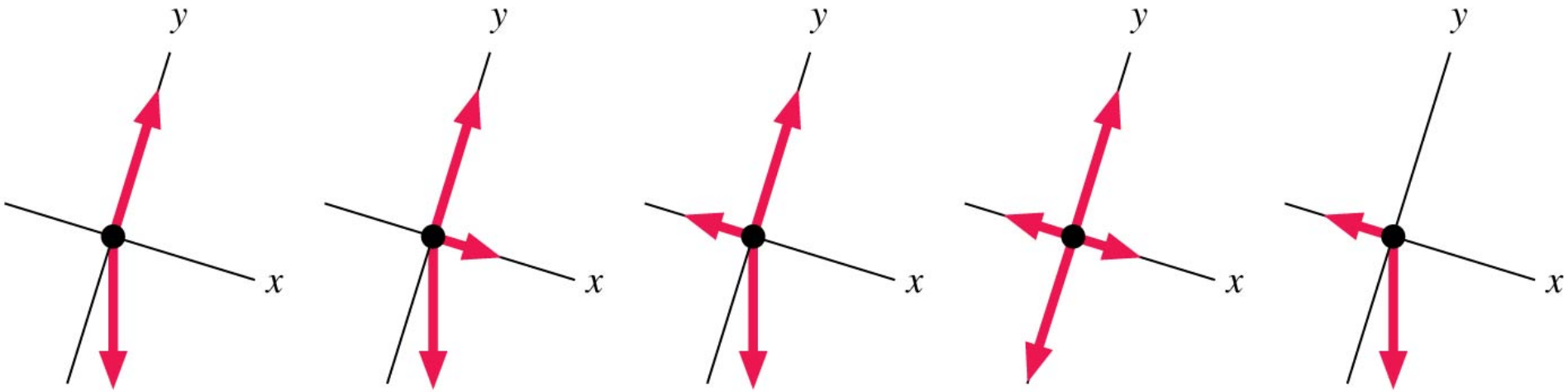
QuickCheck 6.3

A car is parked on a hill. Which is the correct free-body diagram?





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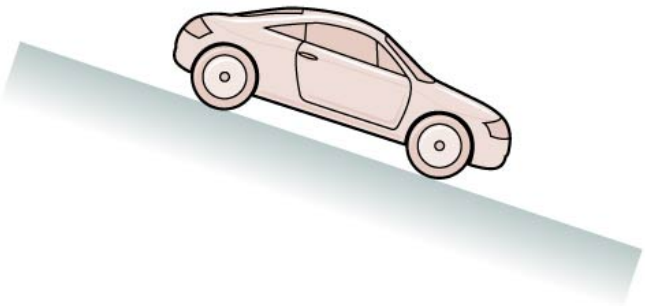

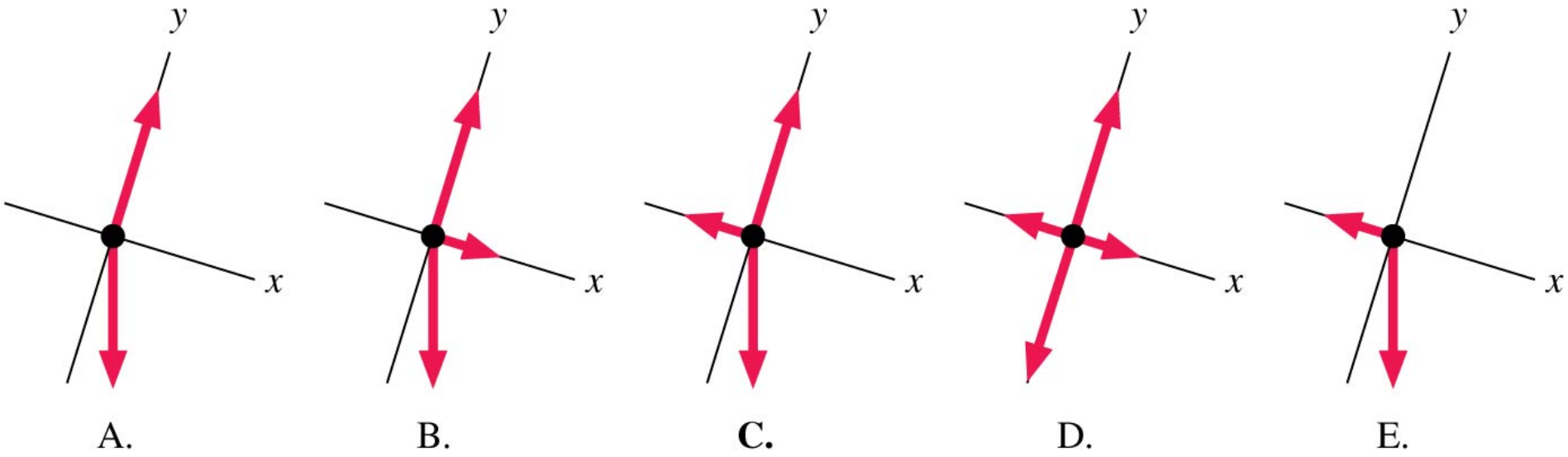

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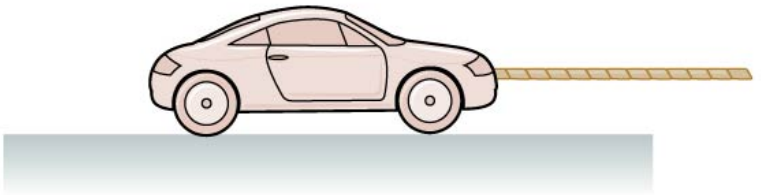
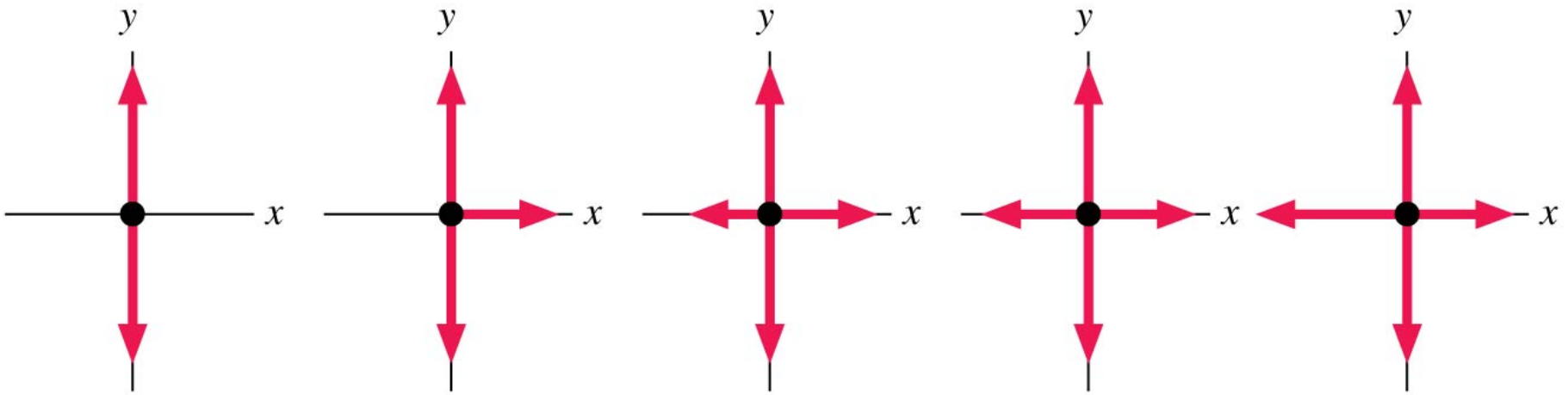
QuickCheck 6.4

A car is towed to the right at constant speed. Which is the correct free-body diagram?





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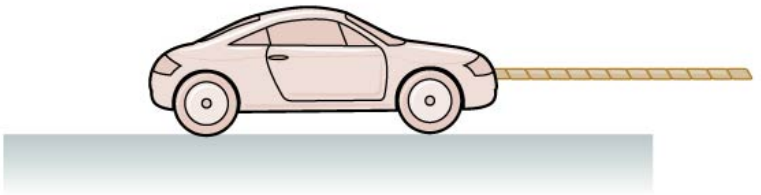

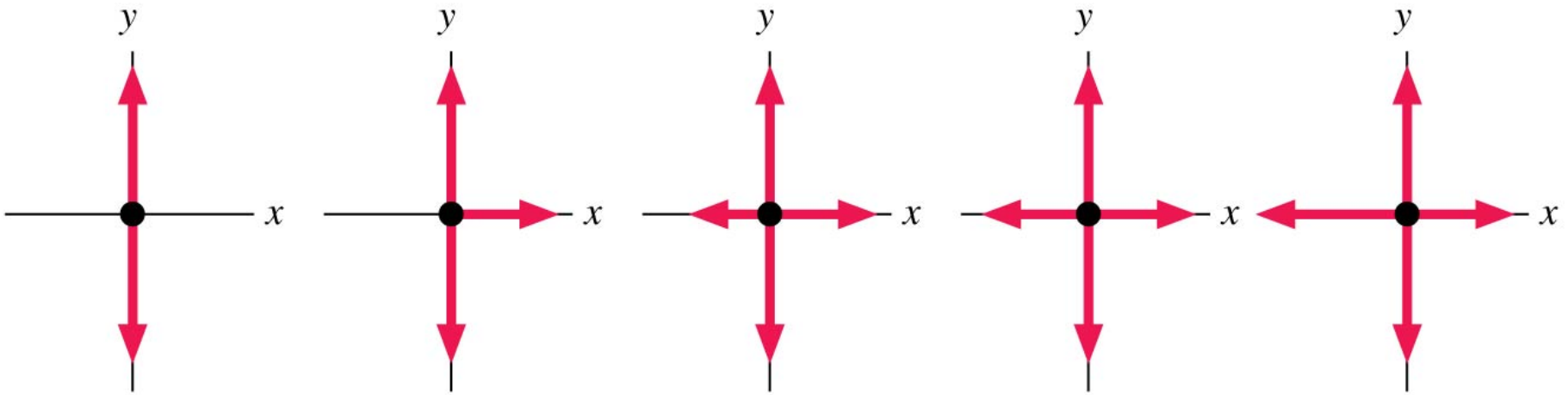

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QuickCheck 6.5

The cart is initially at rest. Force $\vec{F}$ is applied to the cart for time Δt, after which the car has speed v. Suppose the same force is applied for the same time to a second cart with twice the mass. Friction is negligible. Afterward, the second cart's speed will be

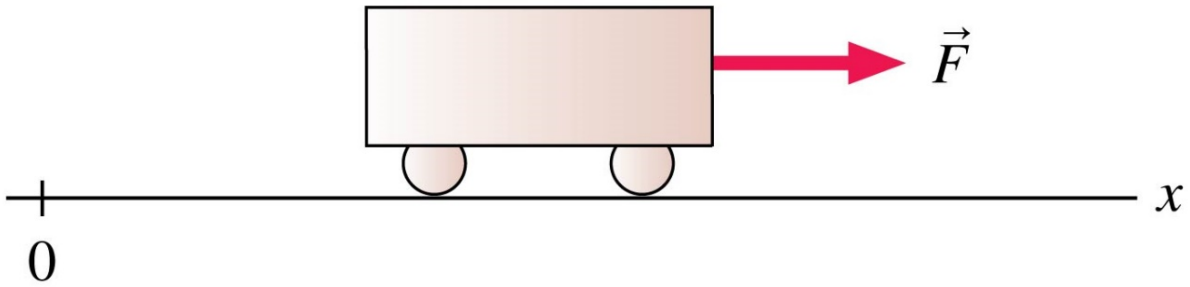
A. $\frac{1}{4}v$

B. $\frac{1}{2}v$

C. v

D. $2v$

E. $4v$



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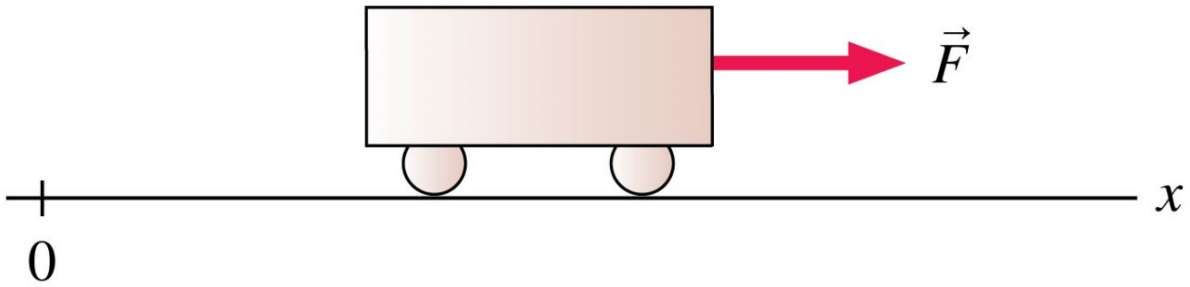

A. $\frac{1}{4}v$

✔ **B.** $\frac{1}{2}v$

C. v

D. $2v$

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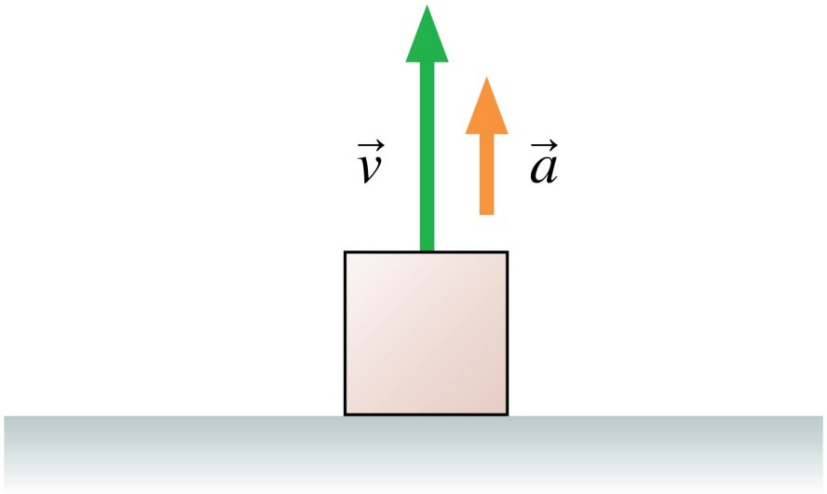
QuickCheck 6.6

The box is sitting on the floor of an elevator. The elevator is accelerating upward. The magnitude of the normal force on the box is



A. $n > mg.$

B. $n = mg.$

C. $n < mg.$

D. $n = 0.$

E. Not enough information to tell.

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QuickCheck 6.6

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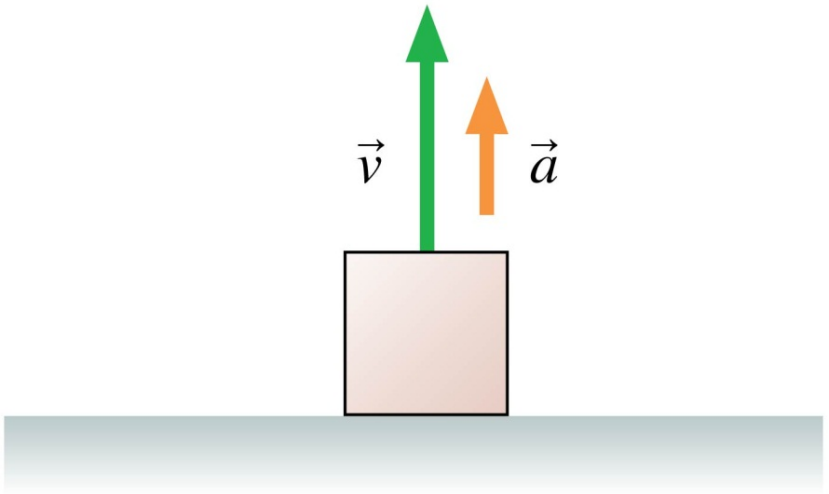

✔ **A. $n > mg$.**

B. $n = mg$.

C. $n < mg$.

D. $n = 0$.

E. Not enough information to tell.

Upward acceleration requires a net upward force.

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QuickCheck 6.8

A 50-kg student ($mg = 490$ N) gets in a 1000-kg elevator at rest and stands on a metric bathroom scale. As the elevator accelerates upward, the scale reads

A. > 490 N

B. 490 N

C. < 490 N but not 0 N

D. 0 N

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QuickCheck 6.8

A 50-kg student ($mg = 490$ N) gets in a 1000-kg elevator at rest and stands on a metric bathroom scale. As the elevator accelerates upward, the scale reads

✔ **A. > 490 N**

B. 490 N

C. < 490 N but not 0 N

D. 0 N

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QuickCheck 6.9

A 50-kg student ($mg = 490$ N) gets in a 1000-kg elevator at rest and stands on a metric bathroom scale. As the elevator accelerates upward, the student's weight is

A. > 490 N

B. 490 N

C. < 490 N but not 0 N

D. 0 N

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QuickCheck 6.9

A 50-kg student ($mg = 490$ N) gets in a 1000-kg elevator at rest and stands on a metric bathroom scale. As the elevator accelerates upward, the student's weight is

✔ **A. > 490 N**

B. 490 N

C. < 490 N but not 0 N

D. 0 N

Weight is reading of a scale on which the object is stationary *relative to the scale.*

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QuickCheck 6.10

A 50-kg student ($mg = 490$ N) gets in a 1000-kg elevator at rest and stands on a metric bathroom scale. Sadly, the elevator cable breaks. What is the student's weight during the few second it takes the student to plunge to his doom?

A. > 490 N

B. 490 N

C. < 490 N but not 0 N

D. 0 N

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QuickCheck 6.10

A 50-kg student ($mg = 490$ N) gets in a 1000-kg elevator at rest and stands on a metric bathroom scale. Sadly, the elevator cable breaks. What is the student's weight during the few second it takes the student to plunge to his doom?

A. > 490 N

B. 490 N

C. < 490 N but not 0 N

✔ **D. 0 N** The bathroom scale would read 0 N. Weight is reading of a scale on which the object is stationary *relative to the scale*.

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QuickCheck 6.11

A 50-kg astronaut ($mg = 490\ \text{N}$) is orbiting the earth in the space shuttle. Compared to on earth,

A. His weight is the same and his mass is less.
B. His weight is less and his mass is less.
C. His weight is less and his mass is the same.
D. His weight is the same and his mass is the same.
E. His weight is zero and his mass is the same.

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QuickCheck 6.11

A 50-kg astronaut ($mg = 490$ N) is orbiting the earth in the space shuttle. Compared to on earth:

A. His weight is the same and his mass is less.

B. His weight is less and his mass is less.

C. His weight is less and his mass is the same.

D. His weight is the same and his mass is the same.

✔ **E. His weight is zero and his mass is the same.**

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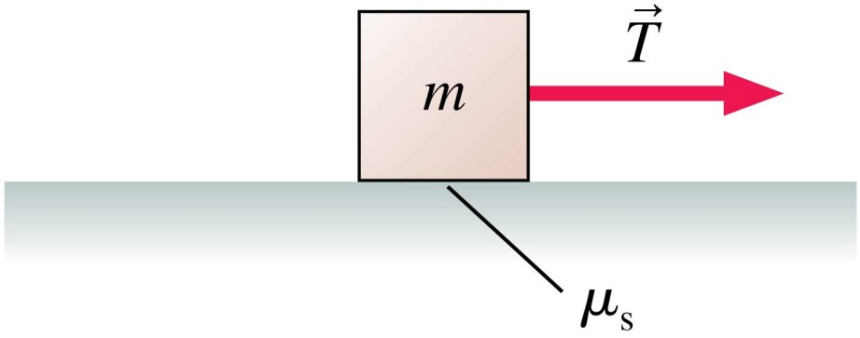
QuickCheck 6.12

A box on a rough surface is pulled by a horizontal rope with tension T. The box is not moving. In this situation,



A. $f_s > T$

B. $f_s = T$

C. $f_s < T$

D. $f_s = \mu_s mg$

E. $f_s = 0$

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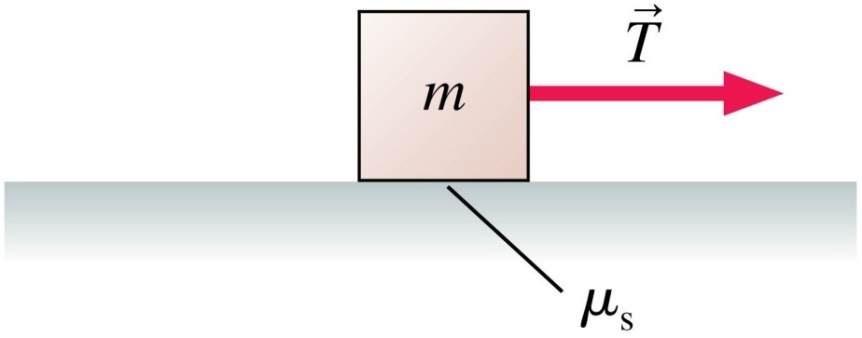
QuickCheck 6.12

A box on a rough surface is pulled by a horizontal rope with tension T. The box is not moving. In this situation,



A. $f_s > T$

✔ **B. $f_s = T$** Newton's first law.

C. $f_s < T$

D. $f_s = \mu_s mg$

E. $f_s = 0$

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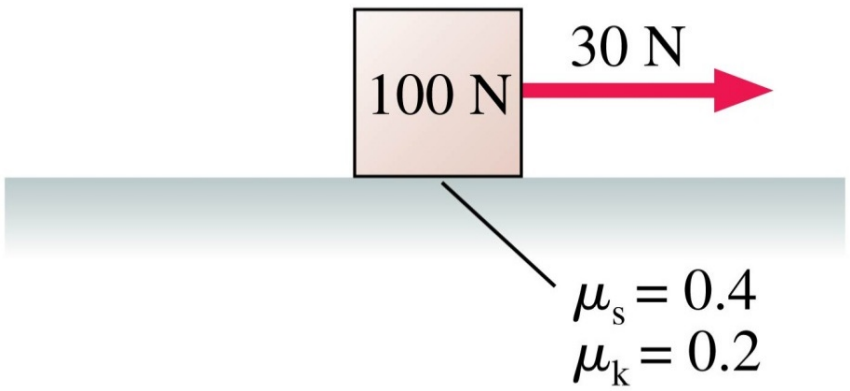
QuickCheck 6.13

A box with a weight of $100\ \mathrm{N}$ is at rest. It is then pulled by a $30\ \mathrm{N}$ horizontal force.

Does the box move?



A. Yes

B. No

C. Not enough information to say.

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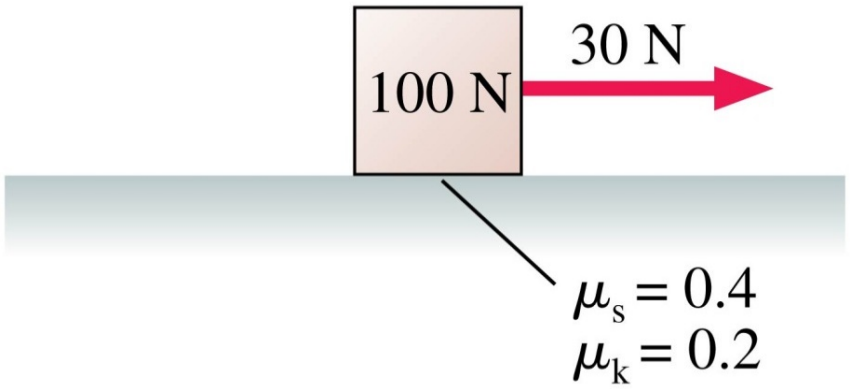
QuickCheck 6.13

A box with a weight of 100 N is at rest. It is then pulled by a 30 N horizontal force.

Does the box move?



A. Yes

✔ **B. No** $30\ \text{N} < f_{s\,\max} = 40\ \text{N}$

C. Not enough information to say.

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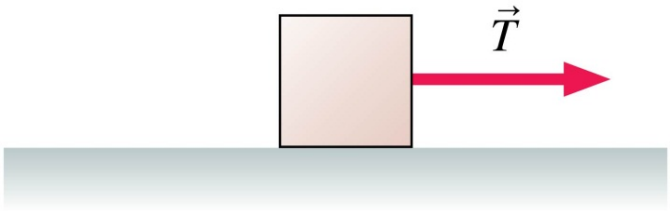
QuickCheck 6.14

A box is being pulled to the right over a rough surface. $T > f_k$, so the box is speeding up. Suddenly the rope breaks.



What happens? The box

A. Stops immediately.
B. Continues with the speed it had when the rope broke.
C. Continues speeding up for a short while, then slows and stops.
D. Keeps its speed for a short while, then slows and stops.
E. Slows steadily until it stops.

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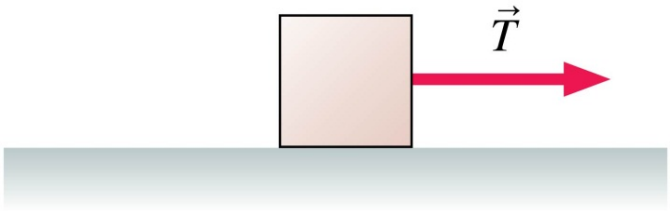
QuickCheck 6.14

A box is being pulled to the right over a rough surface. $T > f_k$, so the box is speeding up. Suddenly the rope breaks.



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D. Keeps its speed for a short while, then slows and stops.
✔ **E. Slows steadily until it stops.**

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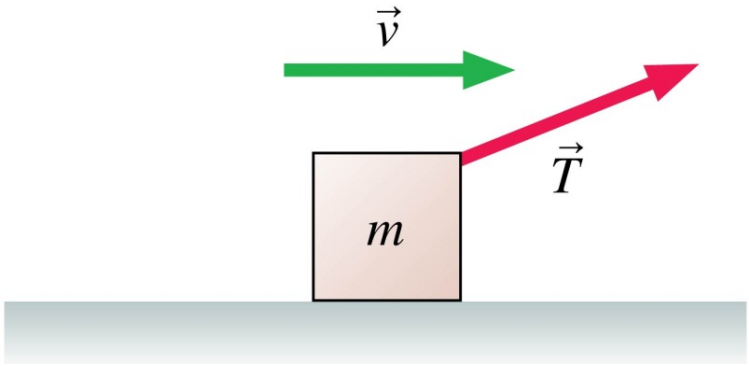
QuickCheck 6.15

A box is being pulled to the right at steady speed by a rope that angles upward. In this situation:



A. $n > mg$

B. $n = mg$

C. $n < mg$

D. $n = 0$

E. Not enough information to judge the size of the normal force.

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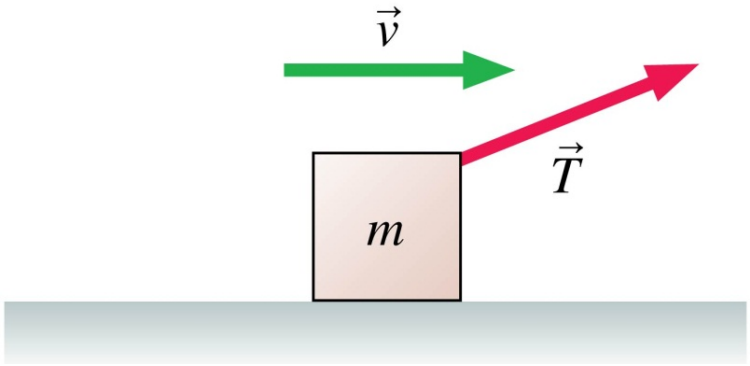
QuickCheck 6.15

A box is being pulled to the right at steady speed by a rope that angles upward. In this situation:



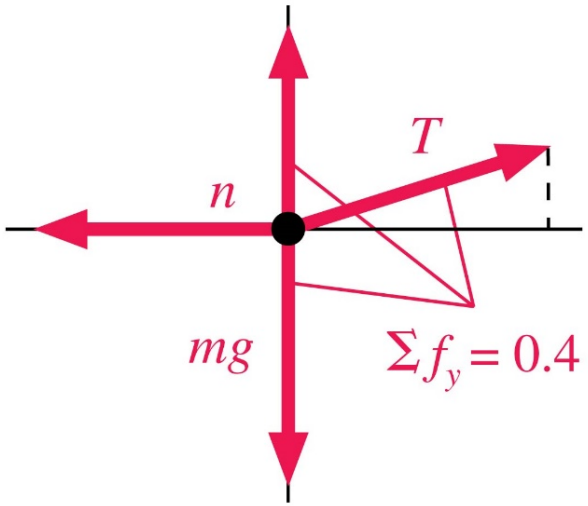
A. $n > mg$

B. $n = mg$

✔ **C. $n < mg$**

D. $n = 0$

E. Not enough information to judge the size of the normal force.



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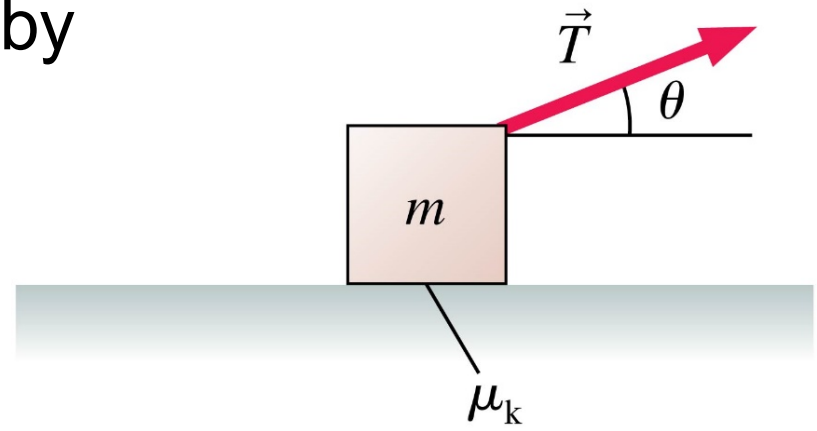
QuickCheck 6.16

A box is being pulled to the right by a rope that angles upward. It is accelerating. Its acceleration is



A. $\frac{T}{m}(\cos\theta + \mu_k \sin\theta) - \mu_k g$

B. $\frac{T}{m}(\cos\theta - \mu_k \sin\theta) - \mu_k g$

C. $\frac{T}{m}(\sin\theta + \mu_k \cos\theta) - \mu_k g$

D. $\frac{T}{m} - \mu_k g$

E. $\frac{T}{m}\cos\theta - \mu_k g$

You'll have to work this one out.
Don't just guess!

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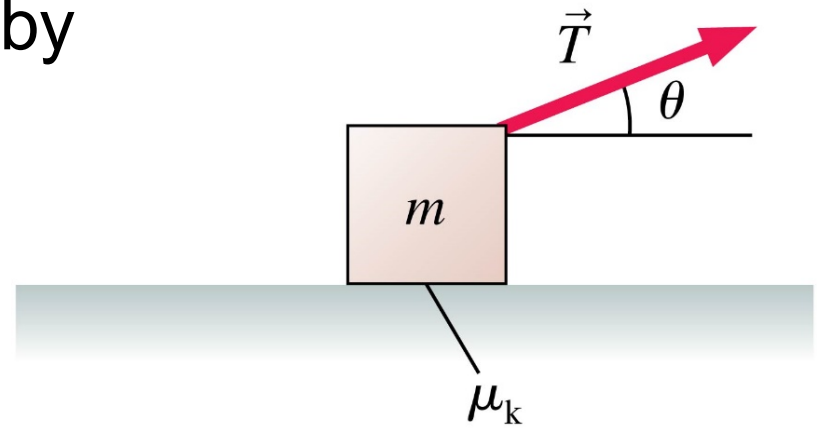

✔ **A.** $\dfrac{T}{m}(\cos\theta + \mu_k \sin\theta) - \mu_k g$

B. $\dfrac{T}{m}(\cos\theta - \mu_k \sin\theta) - \mu_k g$

C. $\dfrac{T}{m}(\sin\theta + \mu_k \cos\theta) - \mu_k g$

D. $\dfrac{T}{m} - \mu_k g$

E. $\dfrac{T}{m}\cos\theta - \mu_k g$

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