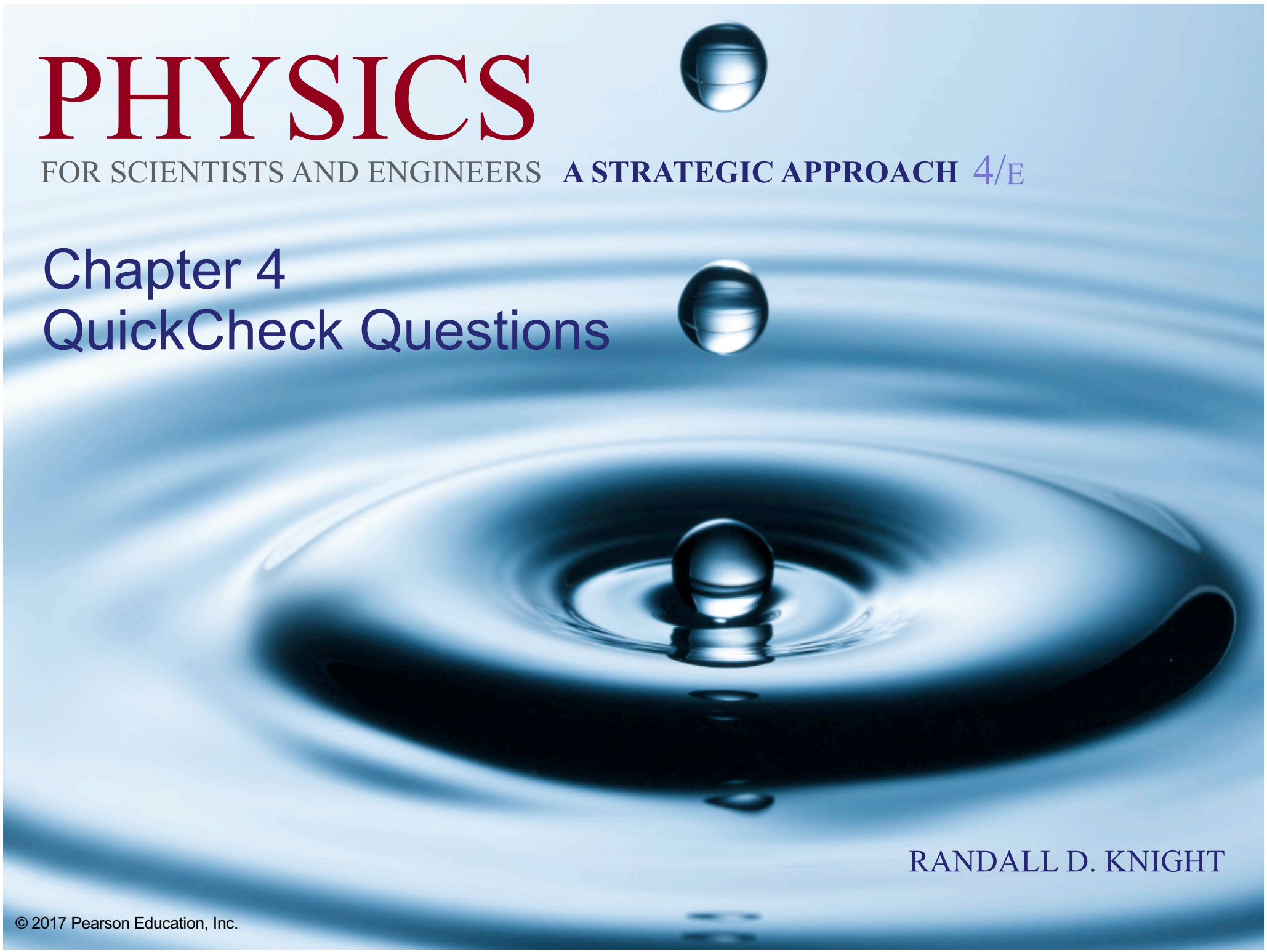
PHYSICS

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

Chapter 4
QuickCheck Questions



RANDALL D. KNIGHT

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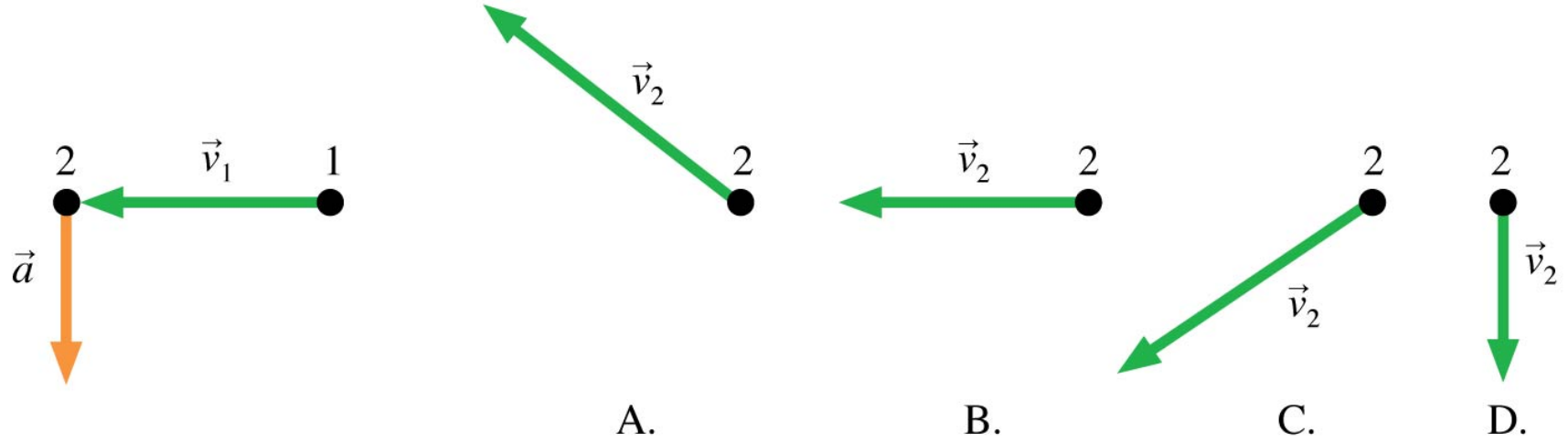
QuickCheck 4.1

A particle undergoes acceleration $\vec{a}$ while moving from point 1 to point 2. Which of the choices shows the velocity vector $\vec{v}_2$ as the object moves away from point 2?



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QuickCheck 4.1

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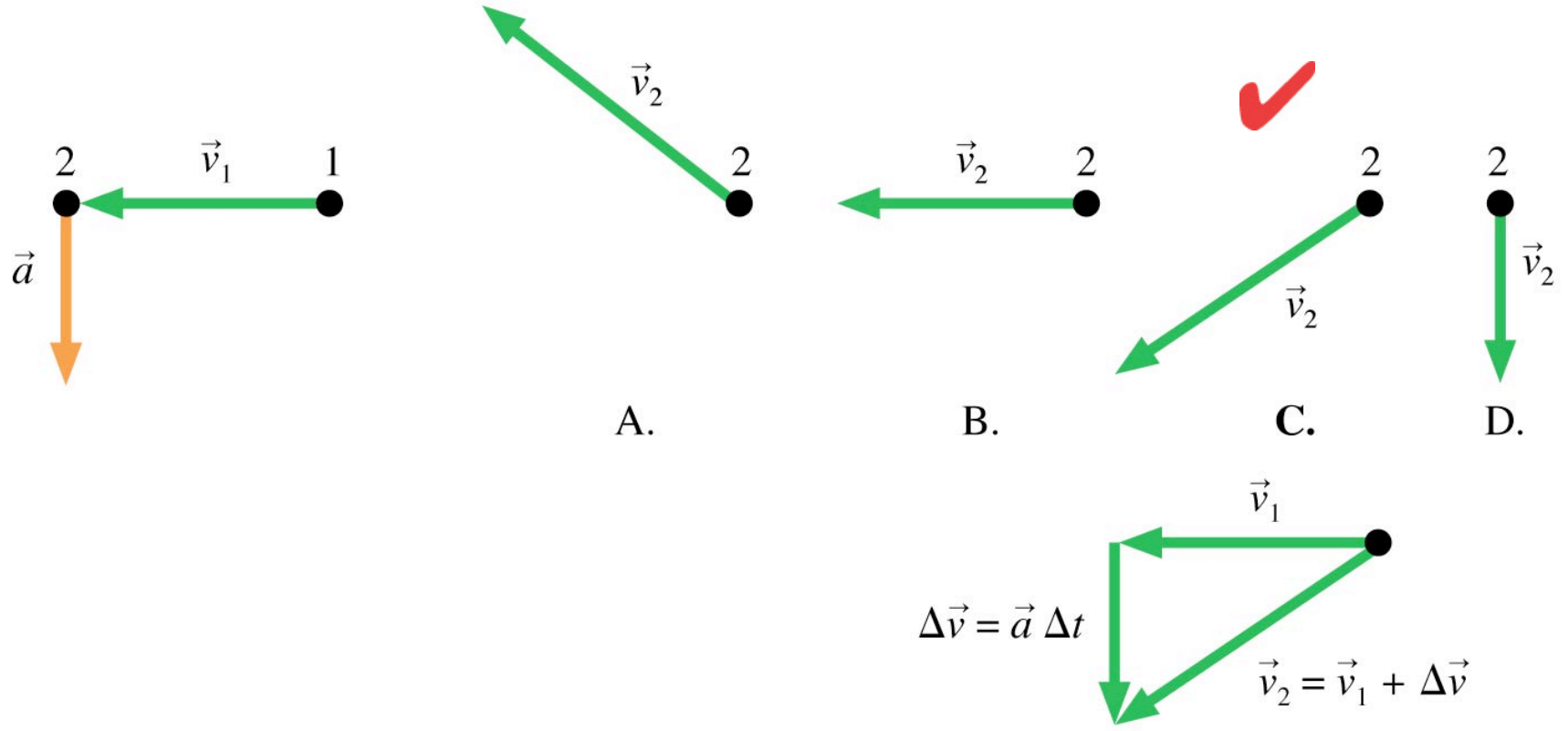

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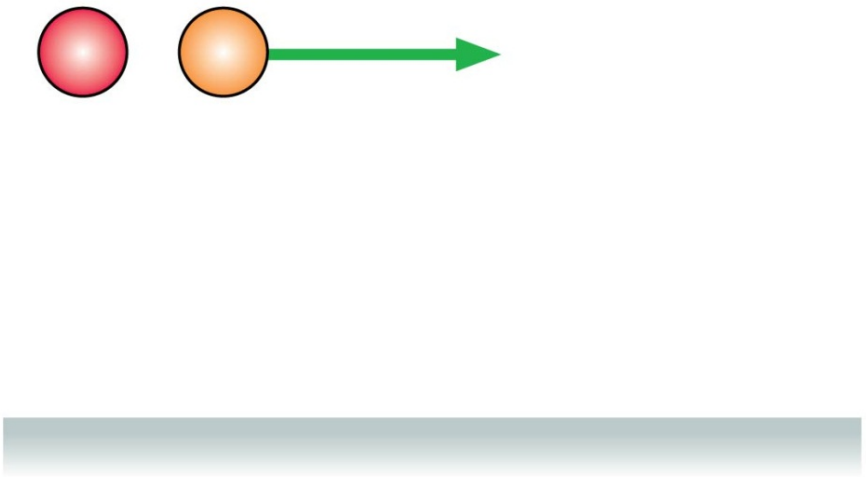
QuickCheck 4.2

A heavy red ball is released from rest 2.0 m above a flat, horizontal surface. At exactly the same instant, a yellow ball with the same mass is fired horizontally at 3.0 m/s. Which ball hits the ground first?



A. The red ball hits first.

B. The yellow ball hits first.

C. They hit at the same time.

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QuickCheck 4.2

A heavy red ball is released from rest 2.0 m above a flat, horizontal surface. At exactly the same instant, a yellow ball with the same mass is fired horizontally at 3.0 m/s. Which ball hits the ground first?

A. The red ball hits first.

B. The yellow ball hits first.

✔ **C. They hit at the same time.**

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QuickCheck 4.3

A 100 g ball rolls off a table and hits 2.0 m from the base of the table. A 200 g ball rolls off the same table with the same speed. It lands at distance

A. 1.0 m.
B. Between 1 m and 2 m.
C. 2.0 m.
D. Between 2 m and 4 m.
E. 4.0 m.

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QuickCheck 4.3

A 100 g ball rolls off a table and hits 2.0 m from the base of the table. A 200 g ball rolls off the same table with the same speed. It lands at distance

A. 1.0 m.
B. Between 1 m and 2 m.
✔ **C. 2.0 m.**
D. Between 2 m and 4 m.
E. 4.0 m.

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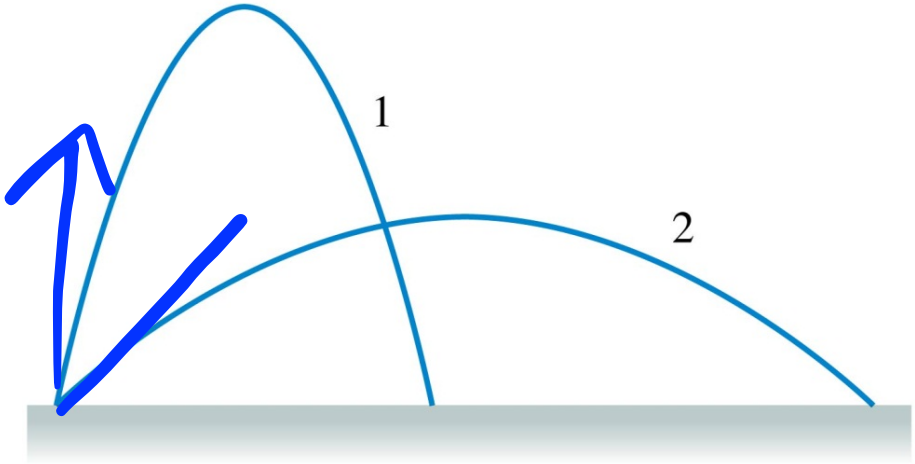
QuickCheck 4.4

Projectiles 1 and 2 are launched over level ground with the same speed but at different angles. Which hits the ground first? Ignore air resistance.



A. Projectile 1 hits first.

B. Projectile 2 hits first.

C. They hit at the same time.

D. There's not enough information to tell.

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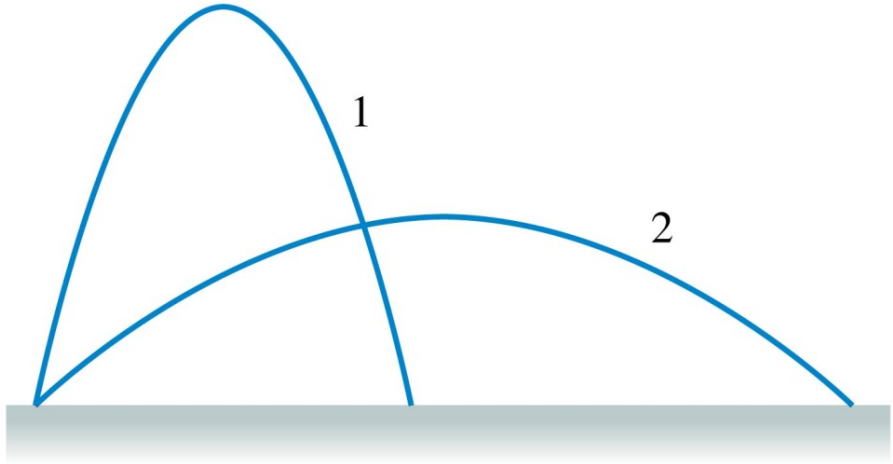
QuickCheck 4.4

Projectiles 1 and 2 are launched over level ground with the same speed but at different angles. Which hits the ground first? Ignore air resistance.



A. Projectile 1 hits first.

✔ **B. Projectile 2 hits first.**

C. They hit at the same time.

D. There's not enough information to tell.

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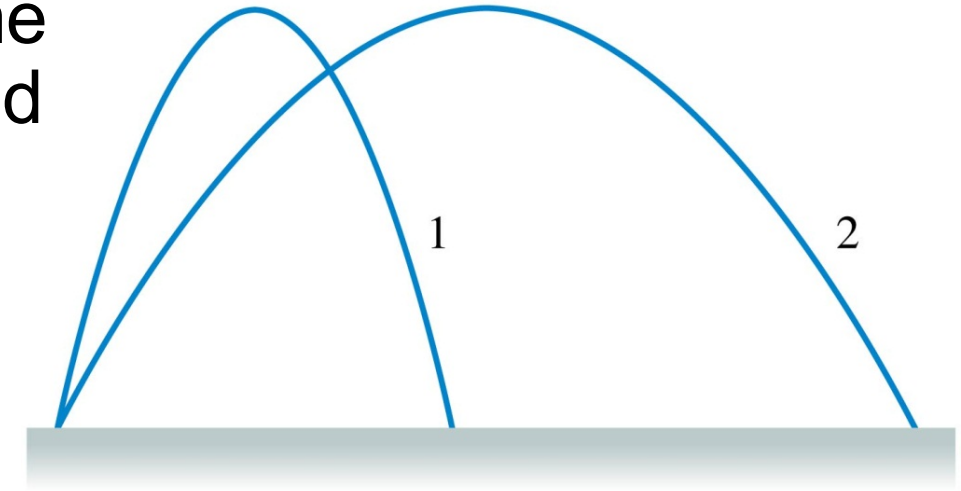
QuickCheck 4.5

Projectiles 1 and 2 are launched over level ground with different speeds. Both reach the same height. Which hits the ground first? Ignore air resistance.



A. Projectile 1 hits first.

B. Projectile 2 hits first.

C. They hit at the same time.

D. There's not enough information to tell.

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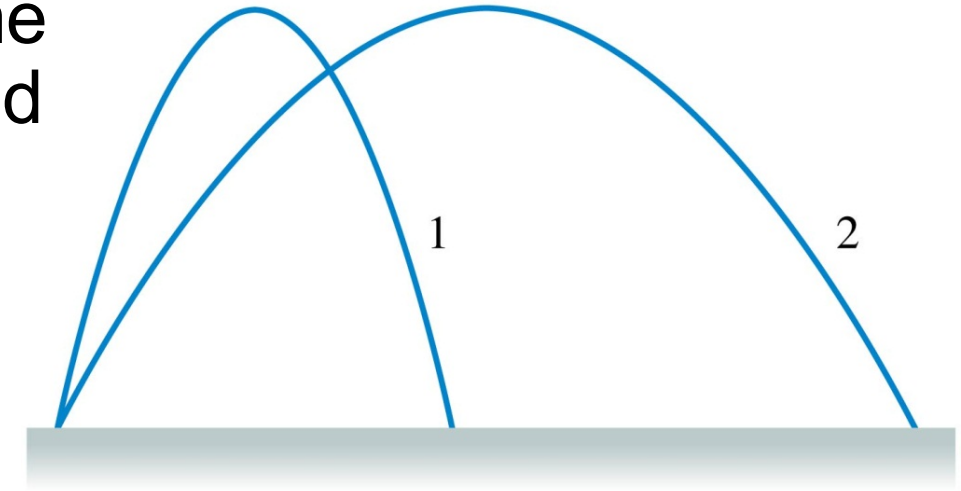
QuickCheck 4.5

Projectiles 1 and 2 are launched over level ground with different speeds. Both reach the same height. Which hits the ground first? Ignore air resistance.



A. Projectile 1 hits first.

B. Projectile 2 hits first.

✔ **C. They hit at the same time.**

D. There's not enough information to tell.

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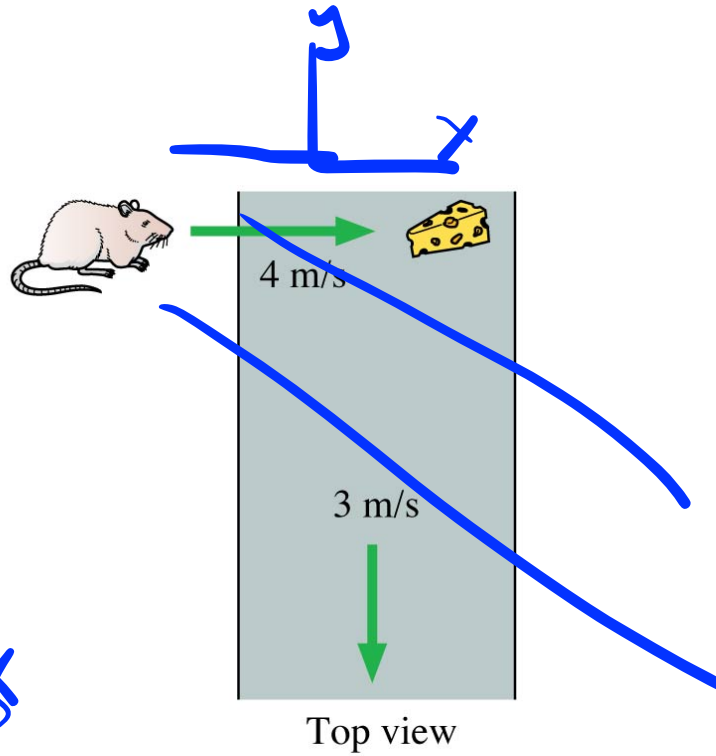
QuickCheck 4.6

A factory conveyor belt rolls at 3 m/s. A mouse sees a piece of cheese directly across the belt and heads straight for the cheese at 4 m/s. What is the mouse's speed relative to the factory floor?



A. 1 m/s
B. 2 m/s
C. 3 m/s
D. 4 m/s
E. 5 m/s

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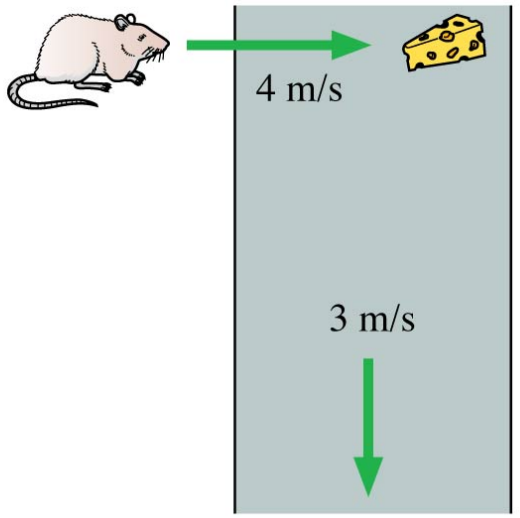
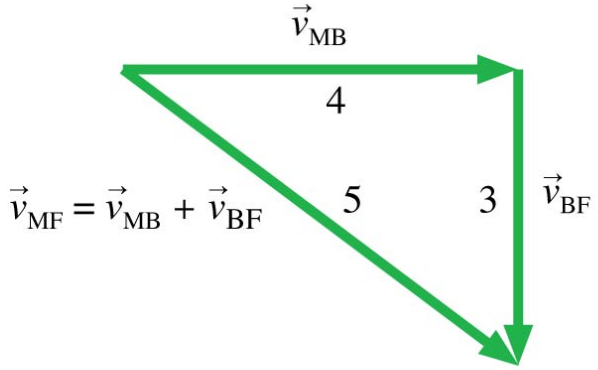
QuickCheck 4.6

A factory conveyor belt rolls at 3 m/s. A mouse sees a piece of cheese directly across the belt and heads straight for the cheese at 4 m/s. What is the mouse's speed relative to the factory floor?



Top view

A. 1 m/s
B. 2 m/s
C. 3 m/s
D. 4 m/s
✔ **E. 5 m/s**



3-4-5 right triangle

M = mouse
B = belt
F = floor

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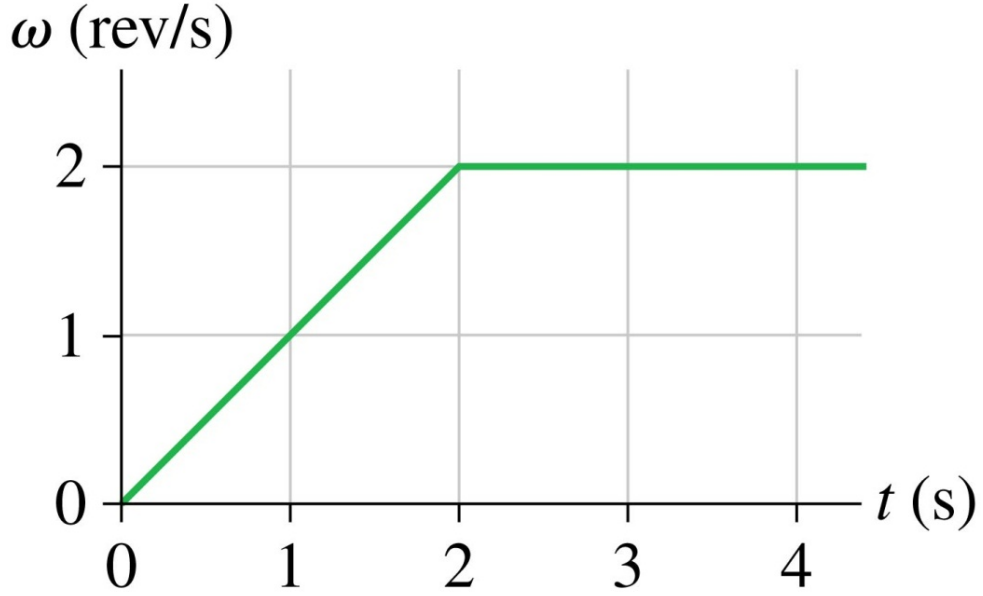
QuickCheck 4.7

This is the angular velocity graph of a wheel. How many revolutions does the wheel make in the first 4 s?



A. 1
B. 2
C. 4
D. 6
E. 8

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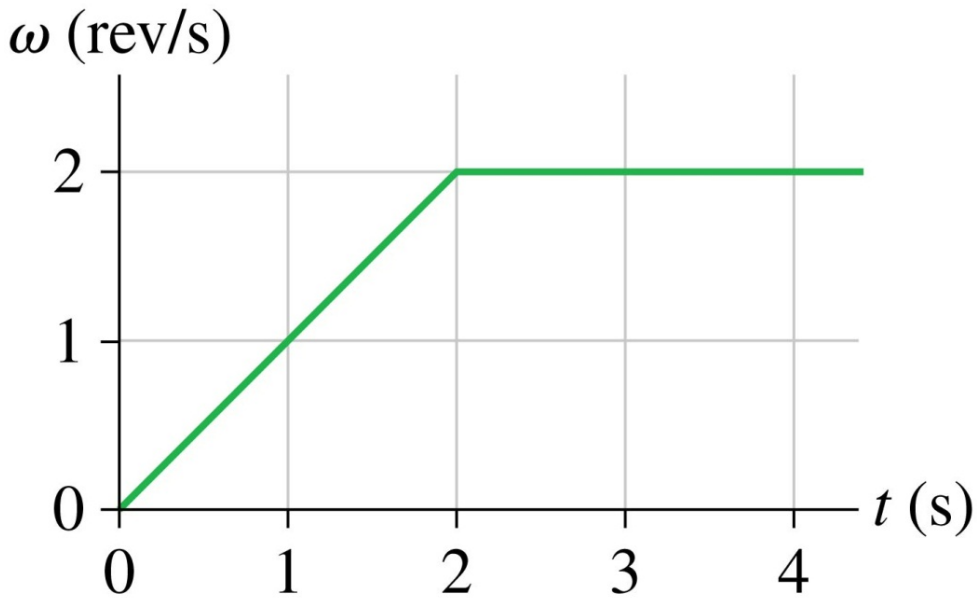
QuickCheck 4.7

This is the angular velocity graph of a wheel. How many revolutions does the wheel make in the first 4 s?



A. 1
B. 2
C. 4
✔ **D. 6**
E. 8

$\Delta\theta$ = area under the angular velocity curve

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QuickCheck 4.8

A ball rolls around a circular track with an angular velocity of 4π rad/s. What is the period of the motion?

A. $\frac{1}{2}$ s

B. 1 s

C. 2 s

D. $\frac{1}{2\pi}$ s

E. $\frac{1}{4\pi}$ s

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QuickCheck 4.8

A ball rolls around a circular track with an angular velocity of 4π rad/s. What is the period of the motion?

✔ A. $\frac{1}{2}$ s

$$T = \frac{2\pi}{\omega}$$

B. 1 s

C. 2 s

D. $\frac{1}{2\pi}$ s

E. $\frac{1}{4\pi}$ s

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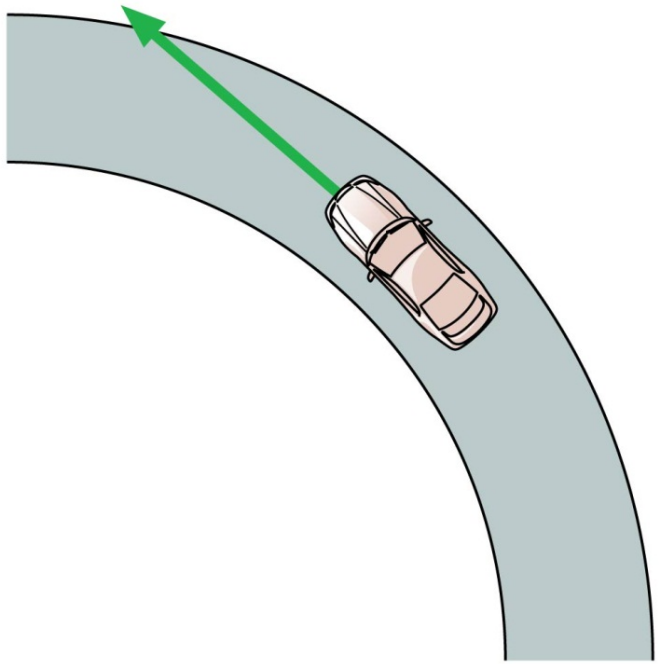
QuickCheck 4.9

A car is traveling around a curve at a steady 45 mph. Is the car accelerating?



A. Yes

B. No

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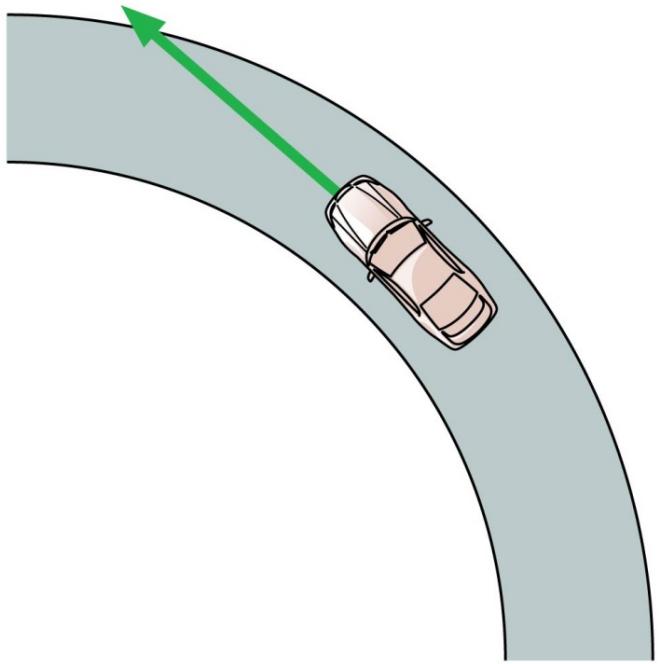
QuickCheck 4.9

A car is traveling around a curve at a steady 45 mph. Is the car accelerating?



✔ **A. Yes**

B. No

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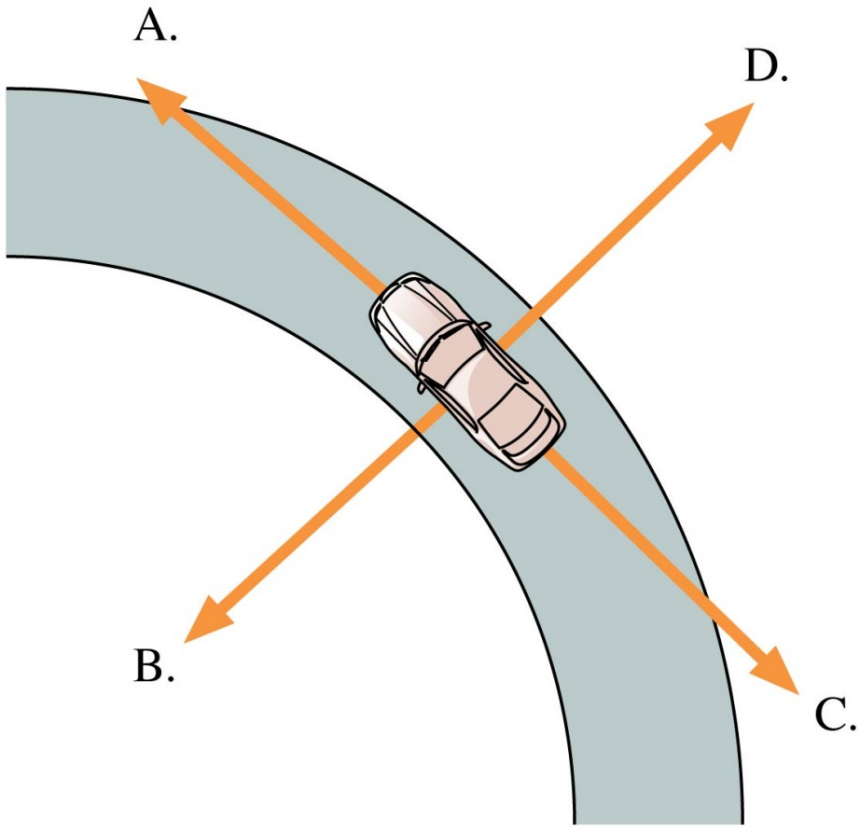
QuickCheck 4.10

A car is traveling around a curve at a steady 45 mph. Which vector shows the direction of the car's acceleration?



E. The acceleration is zero.

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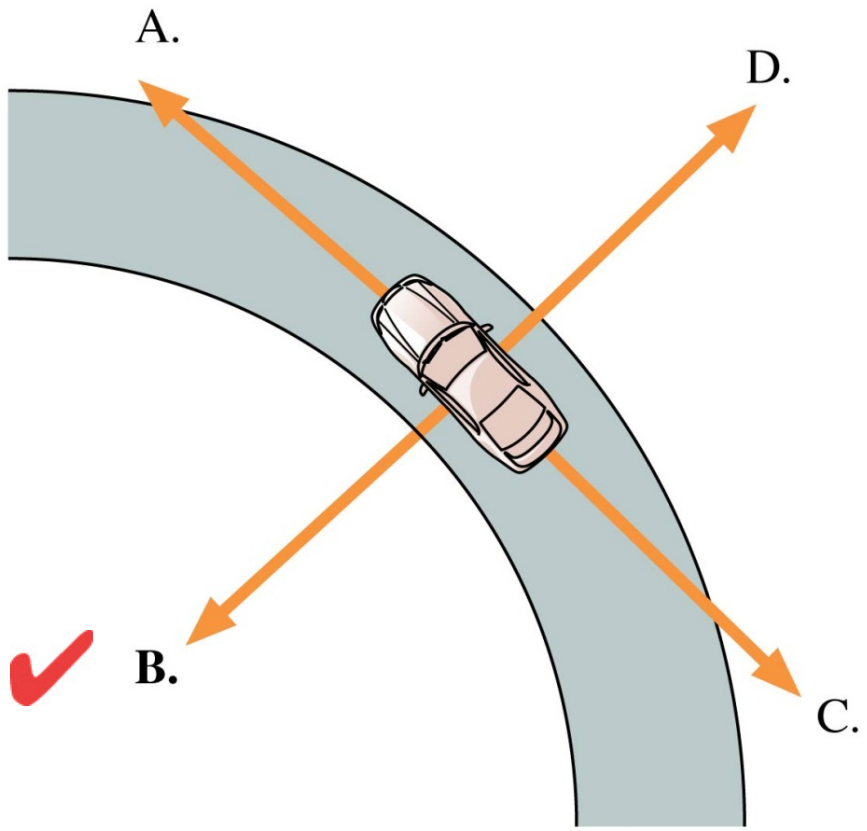
QuickCheck 4.10

A car is traveling around a curve at a steady 45 mph. Which vector shows the direction of the car's acceleration?



E. The acceleration is zero.

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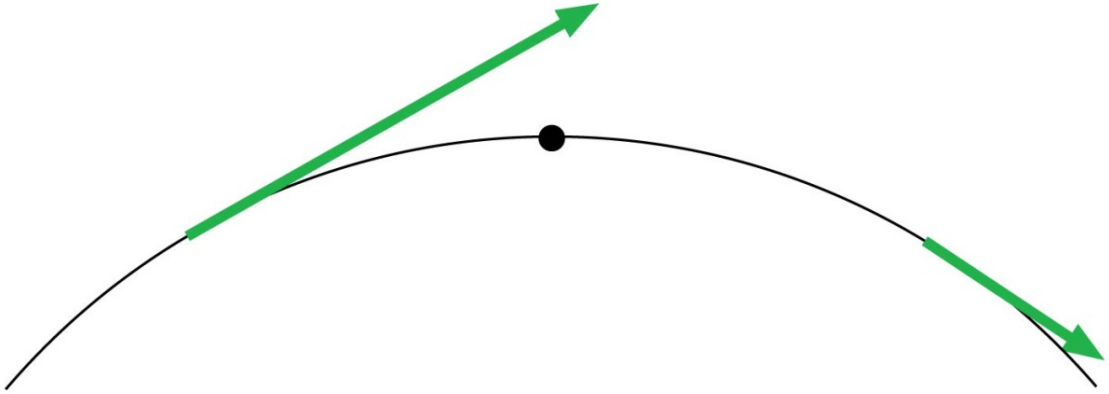
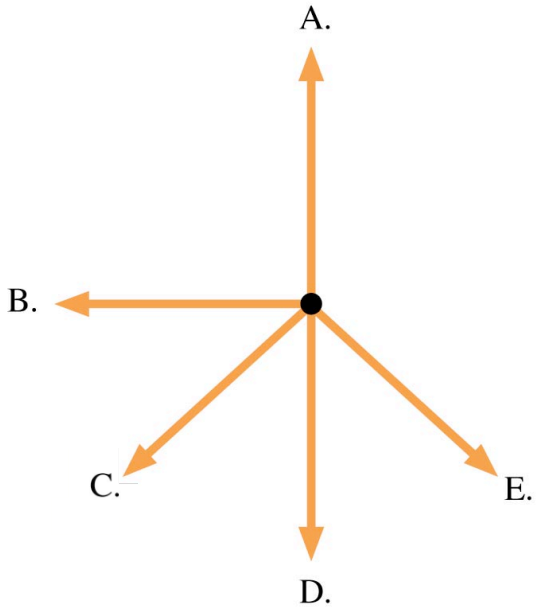
QuickCheck 4.11

A car is slowing down as it drives over a circular hill.



Which of these is the acceleration vector at the highest point?



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QuickCheck 4.11

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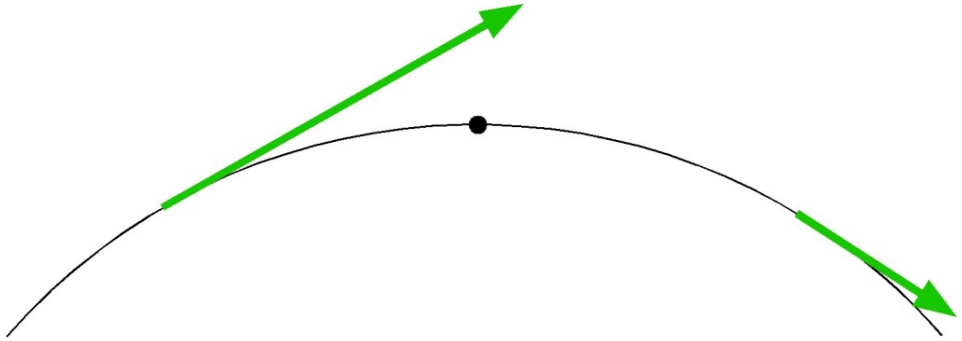

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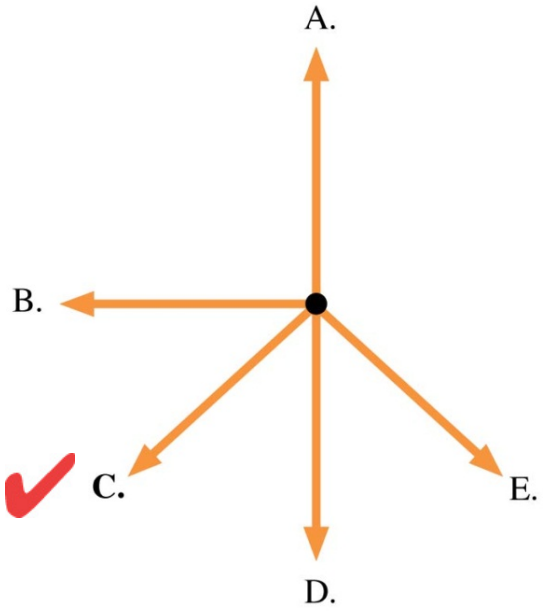

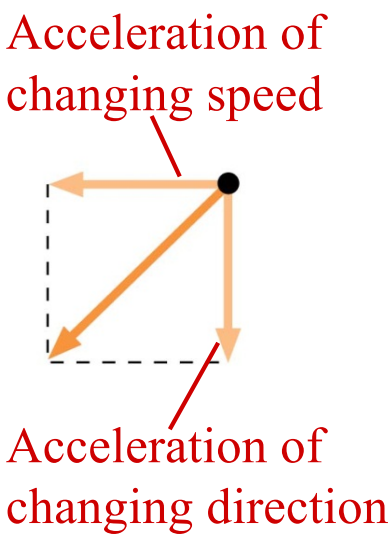

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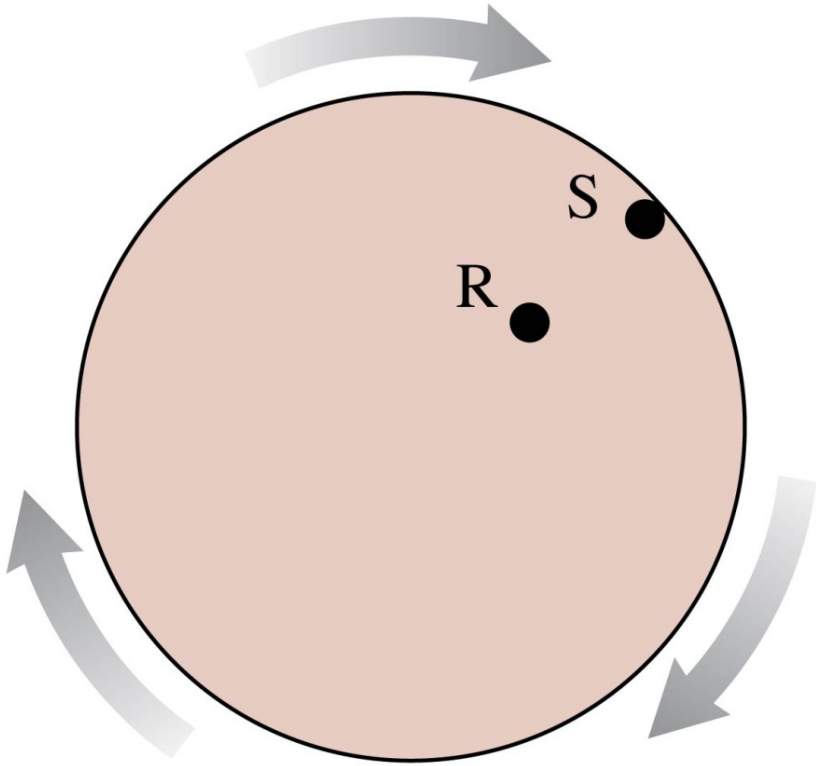
QuickCheck 4.12

Rasheed and Sofia are riding a merry-go-round that is spinning steadily. Sofia is twice as far from the axis as is Rasheed. Sofia's angular velocity is _____ that of Rasheed.



A. half

B. the same as

C. twice

D. four times

E. We can't say without knowing their radii.

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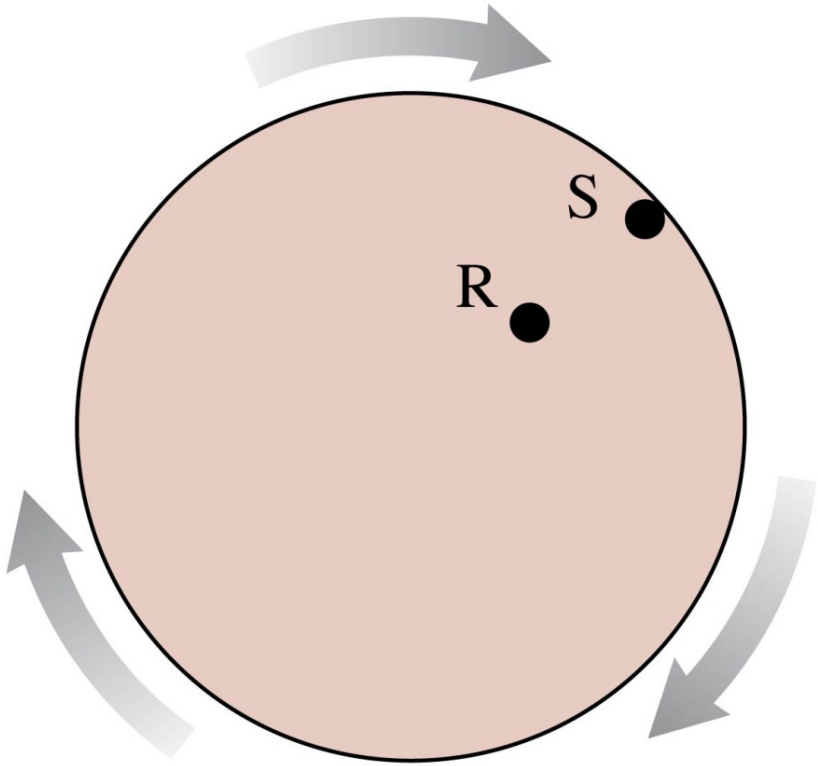
QuickCheck 4.12

Rasheed and Sofia are riding a merry-go-round that is spinning steadily. Sofia is twice as far from the axis as is Rasheed. Sofia's angular velocity is _____ that of Rasheed.



A. half

✔ **B. the same as**

C. twice

D. four times

E. We can't say without knowing their radii.

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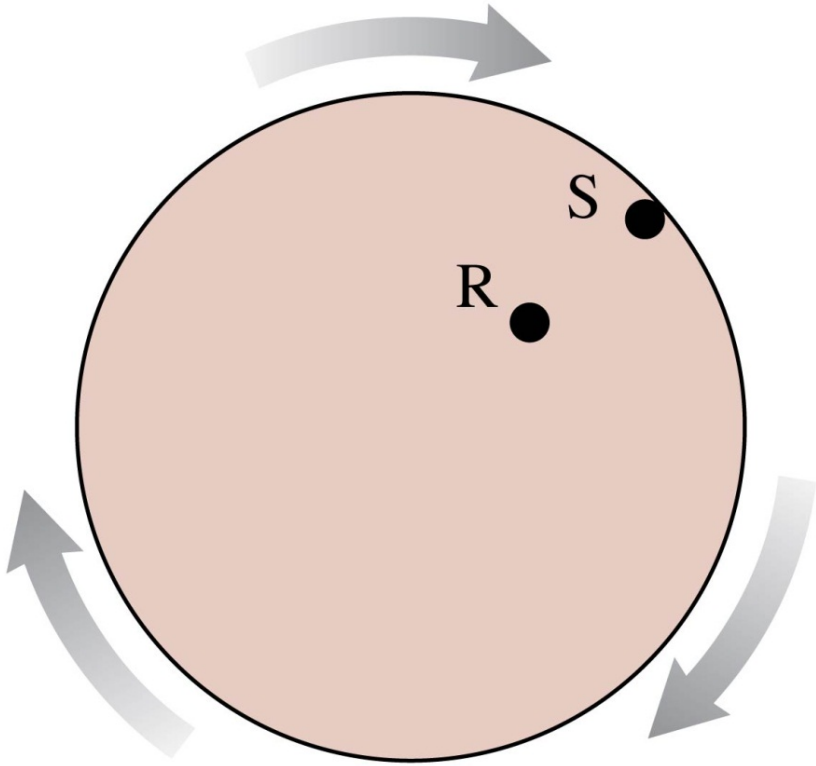
QuickCheck 4.13

Rasheed and Sofia are riding a merry-go-round that is spinning steadily. Sofia is twice as far from the axis as is Rasheed. Sofia's speed is _____ that of Rasheed.



A. half

B. the same as

C. twice

D. four times

E. We can't say without knowing their radii.

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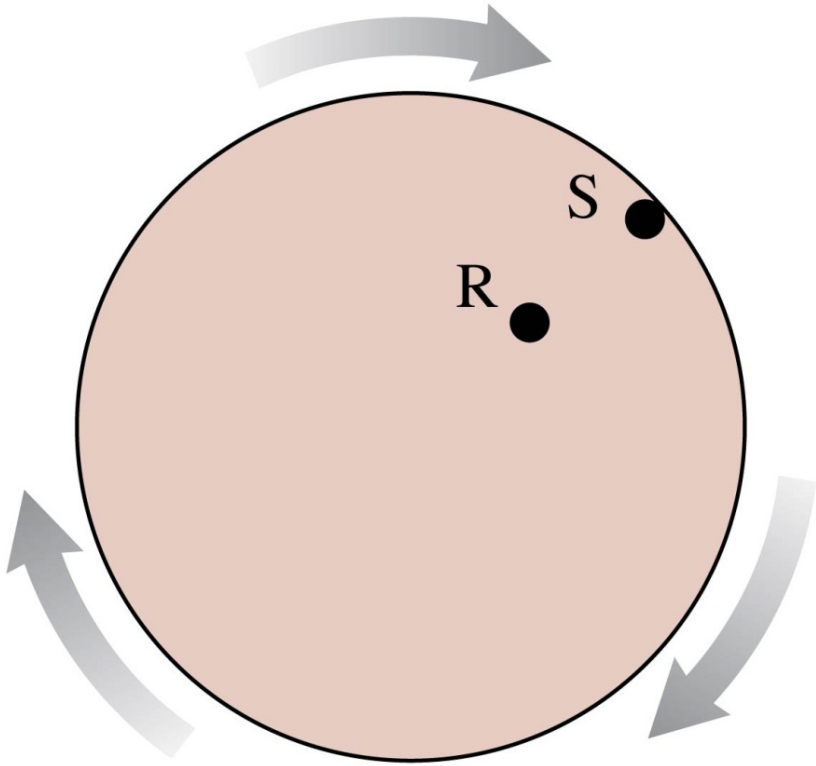
QuickCheck 4.13

Rasheed and Sofia are riding a merry-go-round that is spinning steadily. Sofia is twice as far from the axis as is Rasheed. Sofia's speed is _____ that of Rasheed.



A. half

B. the same as

✔ **C. twice** $v = \omega r$

D. four times

E. We can't say without knowing their radii.

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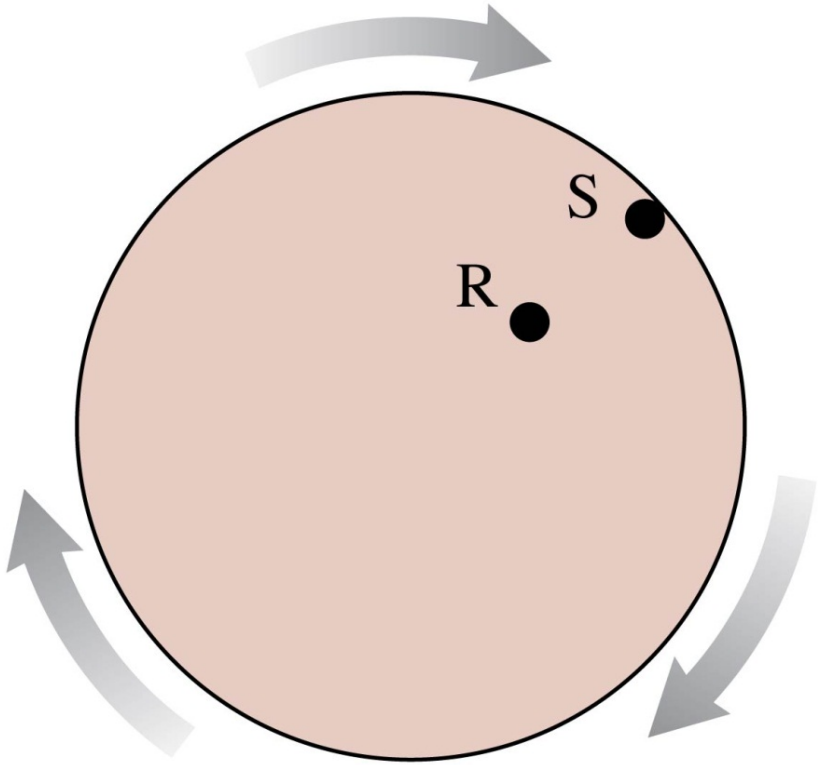
QuickCheck 4.14

Rasheed and Sofia are riding a merry-go-round that is spinning steadily. Sofia is twice as far from the axis as is Rasheed. Sofia's acceleration is _____ that of Rasheed.



A. half

B. the same as

C. twice

D. four times

E. We can't say without knowing their radii.

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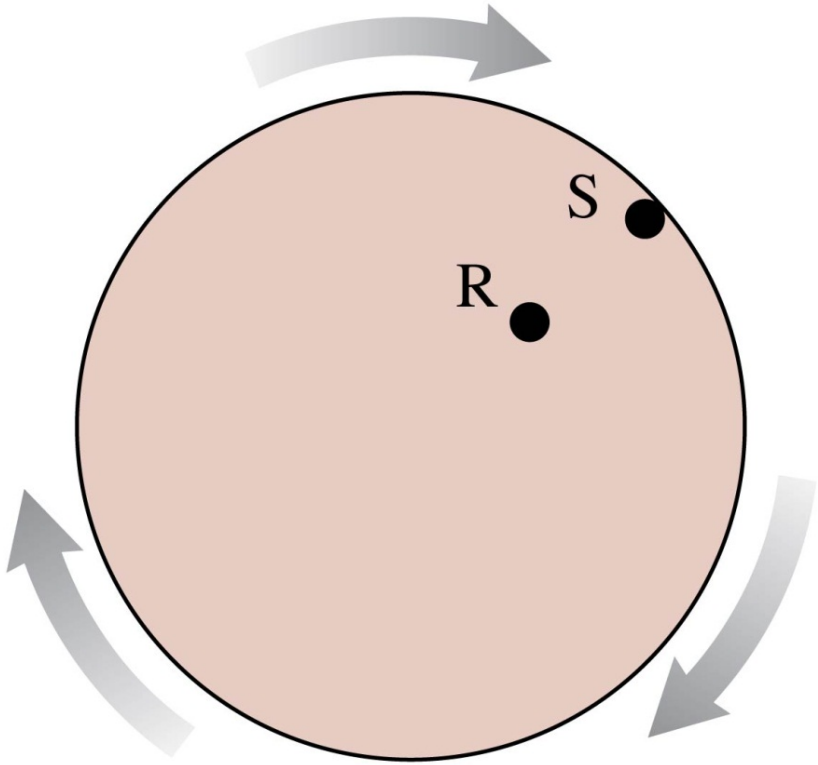
QuickCheck 4.14

Rasheed and Sofia are riding a merry-go-round that is spinning steadily. Sofia is twice as far from the axis as is Rasheed. Sofia's acceleration is _____ that of Rasheed.



A. half

B. the same as

✔ **C. twice**

D. four times

E. We can't say without knowing their radii.

Centripetal acceleration $a = \frac{v^2}{r} = \omega^2 r$

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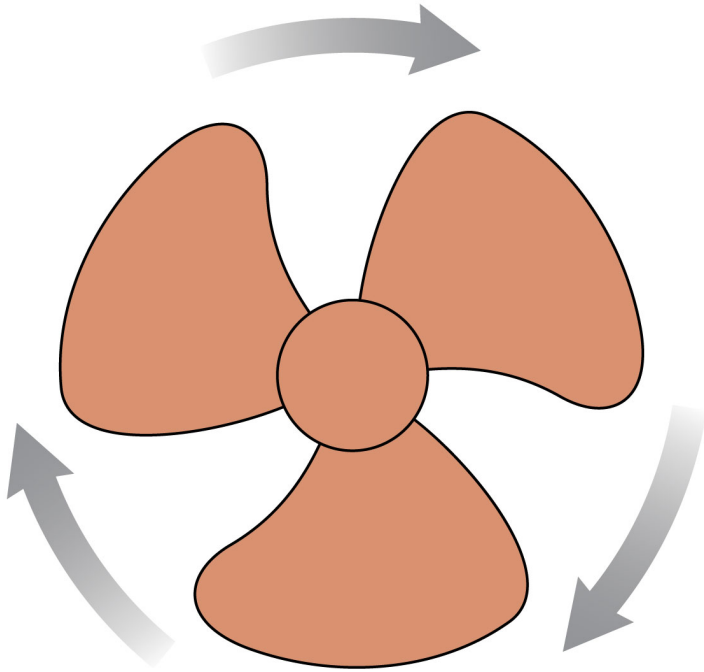
QuickCheck 4.15

The fan blade is slowing down. What are the signs of ω and α?



A. ω is positive and α is positive.

B. ω is positive and α is negative.

C. ω is negative and α is positive.

D. ω is negative and α is negative.

E. ω is positive and α is zero.

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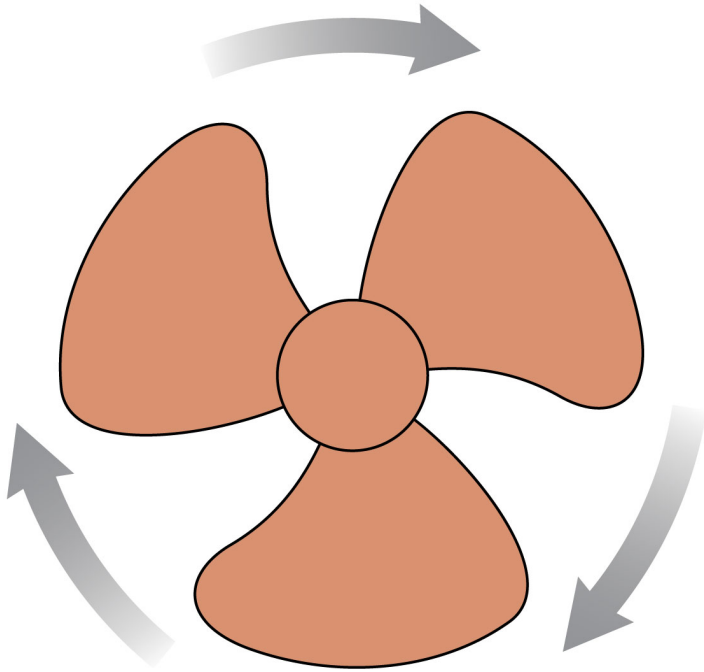
QuickCheck 4.15

The fan blade is slowing down. What are the signs of ω and α?



A. ω is positive and α is positive.

B. ω is positive and α is negative.

✔ **C. ω is negative and α is positive.**

D. ω is negative and α is negative.

E. ω is positive and α is zero.

"Slowing down" means that ω and α have opposite signs, not that α is negative

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QuickCheck 4.16

Starting from rest, a wheel with constant angular acceleration turns through an angle of 25 rad in a time t. Through what angle will it have turned after time $2t$?

A. 25 rad

B. 50 rad

C. 75 rad

D. 100 rad

E. 200 rad

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QuickCheck 4.16

Starting from rest, a wheel with constant angular acceleration turns through an angle of 25 rad in a time t. Through what angle will it have turned after time $2t$?

A. 25 rad

B. 50 rad

C. 75 rad

✔ **D. 100 rad** $\Delta\theta \propto (\Delta t)^2$

E. 200 rad

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QuickCheck 4.17

Starting from rest, a wheel with constant angular acceleration spins up to 25 rpm in a time t. What will its angular velocity be after time $2t$?

A. 25 rpm

B. 50 rpm

C. 75 rpm

D. 100 rpm

E. 200 rpm

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QuickCheck 4.17

Starting from rest, a wheel with constant angular acceleration spins up to 25 rpm in a time t. What will its angular velocity be after time $2t$?

A. 25 rpm

✔ **B. 50 rpm**

C. 75 rpm

D. 100 rpm

E. 200 rpm

$$\Delta\omega \propto \Delta t$$

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