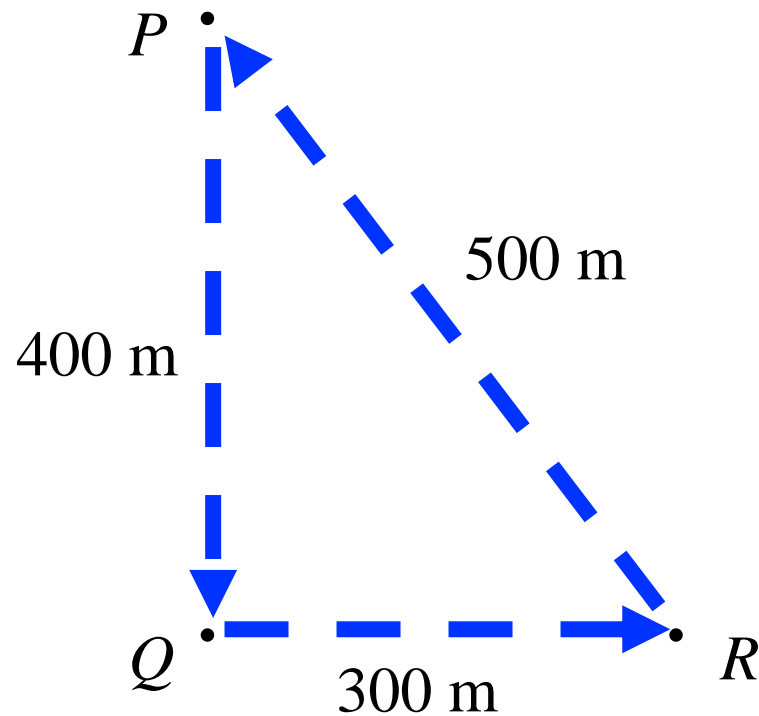


Q3.1



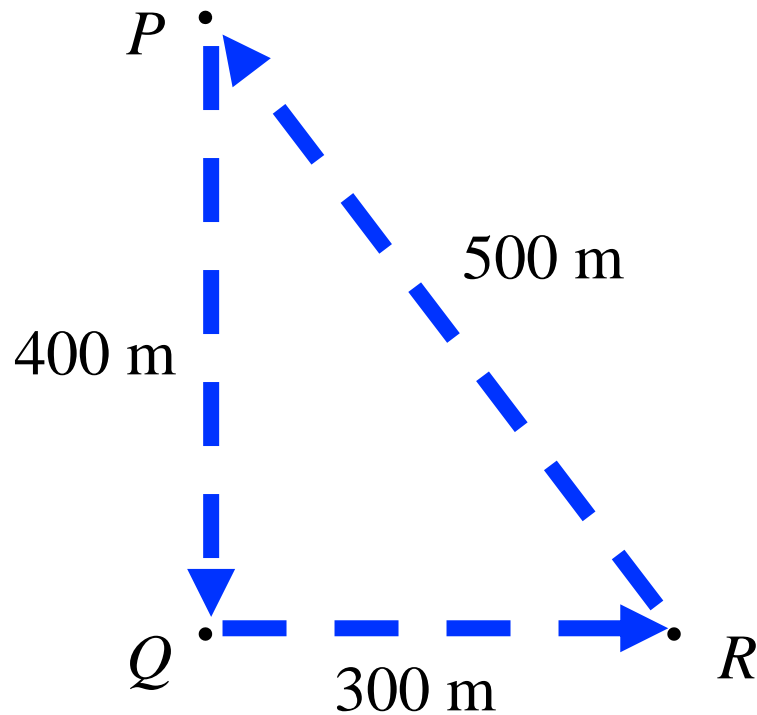
A bicyclist starts at point P and travels around a triangular path that takes her through points Q and R before returning to point P . What is the magnitude of her net displacement for the entire round trip?



- A. 100 m
- B. 200 m
- C. 600 m
- D. 1200 m
- E. zero

A3.1

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A. 100 m

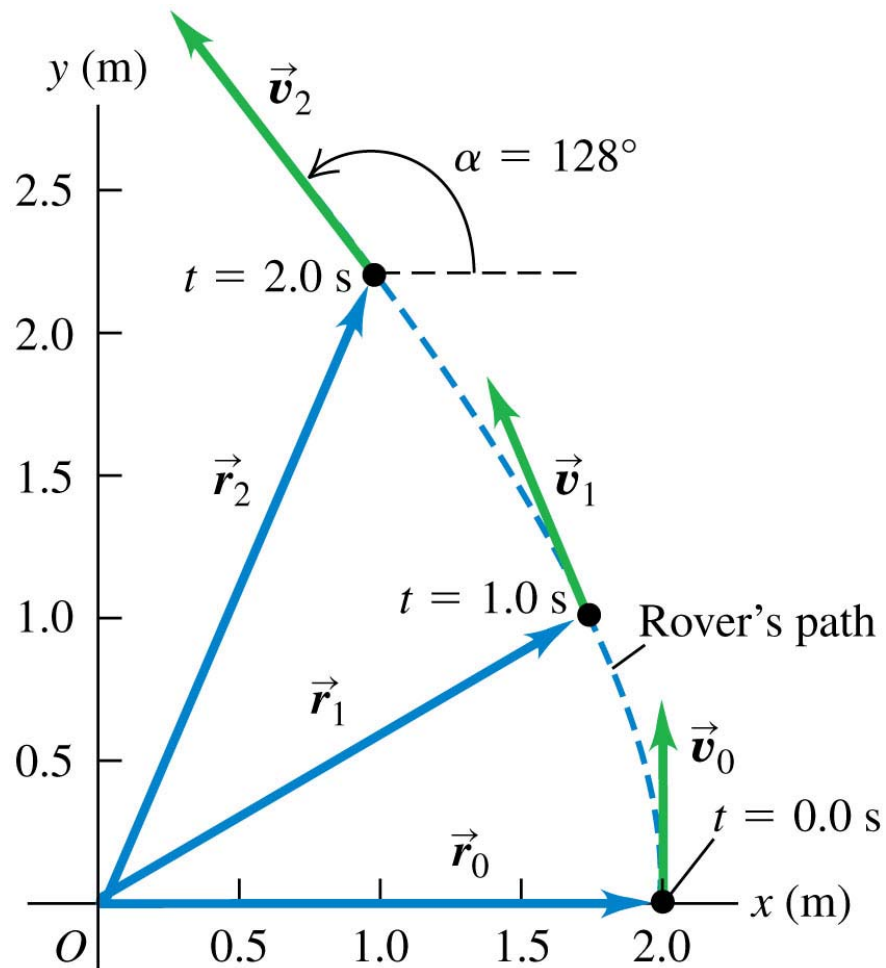
B. 200 m

C. 600 m

D. 1200 m

✓ E. zero

Q3.2

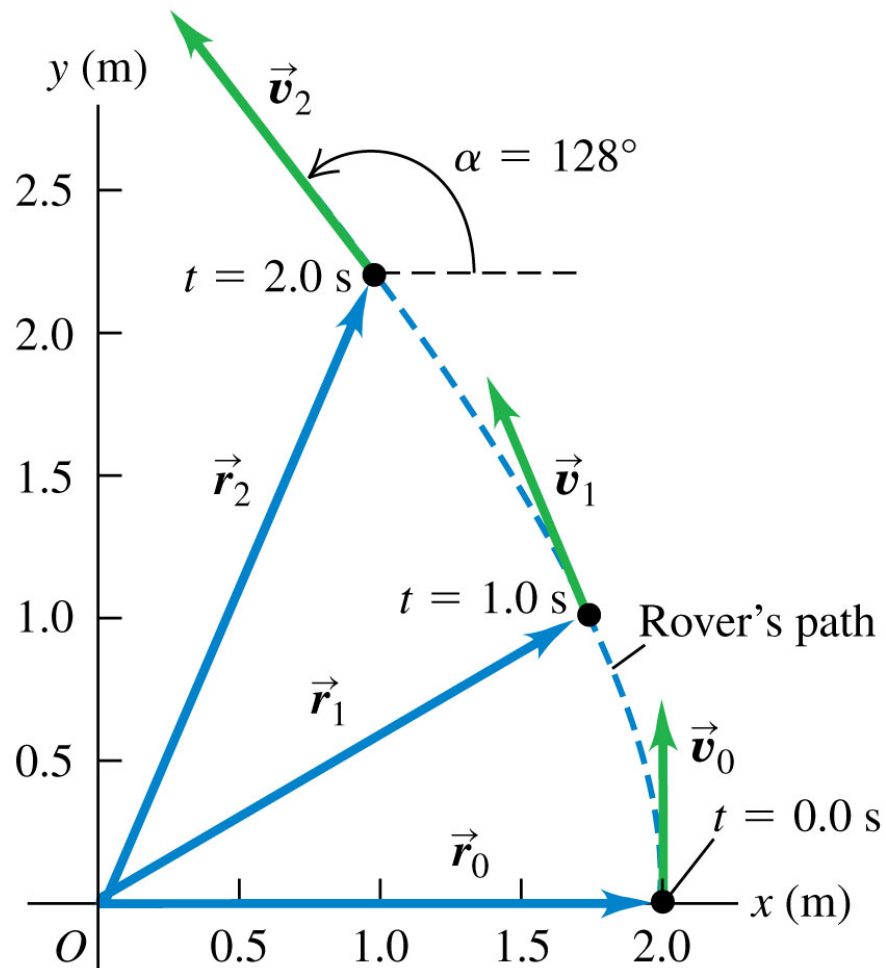


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This illustration shows the path of a robotic vehicle, or rover. What is the direction of the rover's average acceleration vector for the time interval from $t = 0.0$ s to $t = 2.0$ s?

- A. up and to the left
- B. up and to the right
- C. down and to the left
- D. down and to the right
- E. none of the above

A3.2



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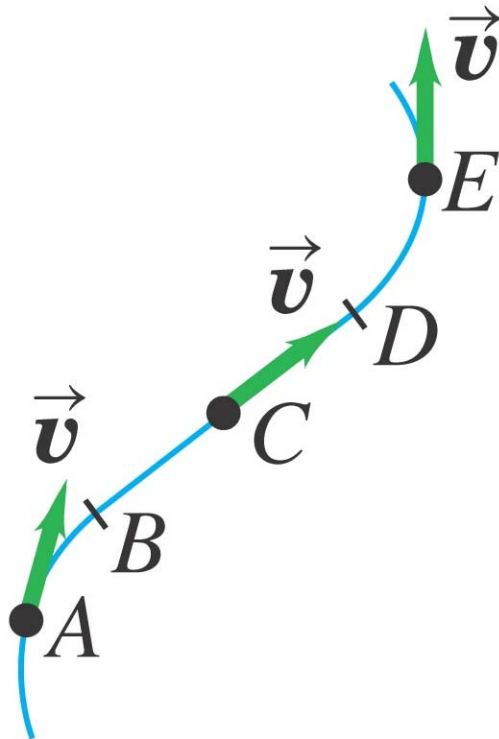
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Q3.3



The motion diagram shows an object moving along a curved path at constant speed. At which of the points A , C , and E does the object have *zero* acceleration?

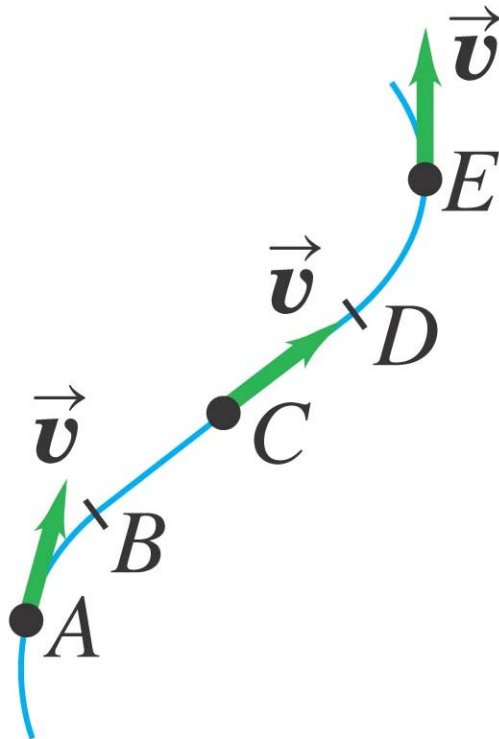


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- A. point A only
- B. point C only
- C. point E only
- D. points A and C only
- E. points A , C , and E

A3.3

The motion diagram shows an object moving along a curved path at constant speed. At which of the points A , C , and E does the object have *zero* acceleration?



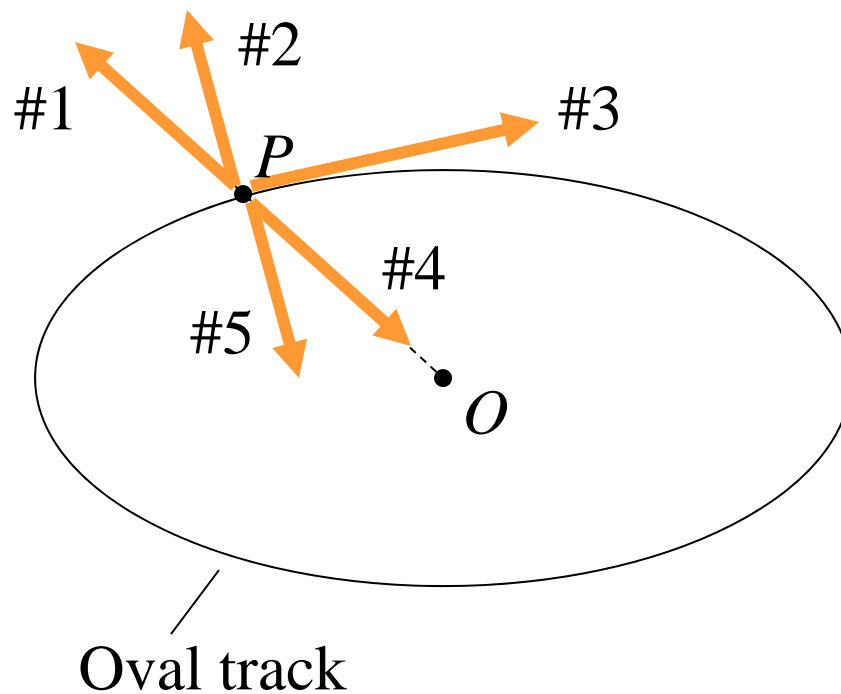
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- A. point A only
- ✓ B. point C only
- C. point E only
- D. points A and C only
- E. points A , C , and E

Q3.4



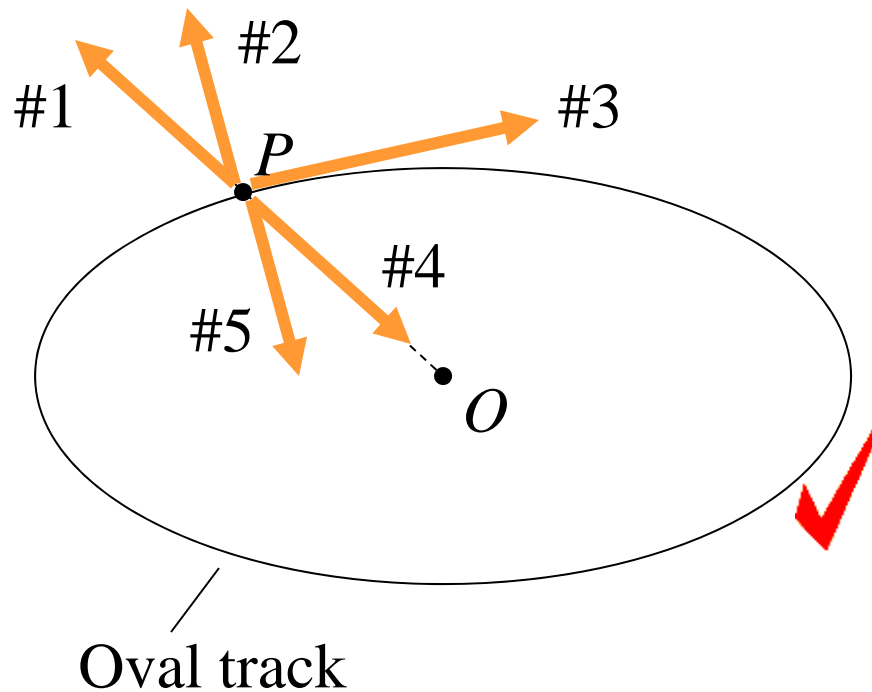
An object moves at a constant speed in a clockwise direction around an oval track. The geometrical center of the track is at point O . When the object is at point P , which arrow shows the direction of the object's acceleration vector?



- A. #1 (directly away from O)
- B. #2 (perpendicular to the track)
- C. #3 (in the direction of motion)
- D. #4 (directly toward O)
- E. #5 (perpendicular to the track)

A3.4

An object moves at a constant speed in a clockwise direction around an oval track. The geometrical center of the track is at point O . When the object is at point P , which arrow shows the direction of the object's acceleration vector?



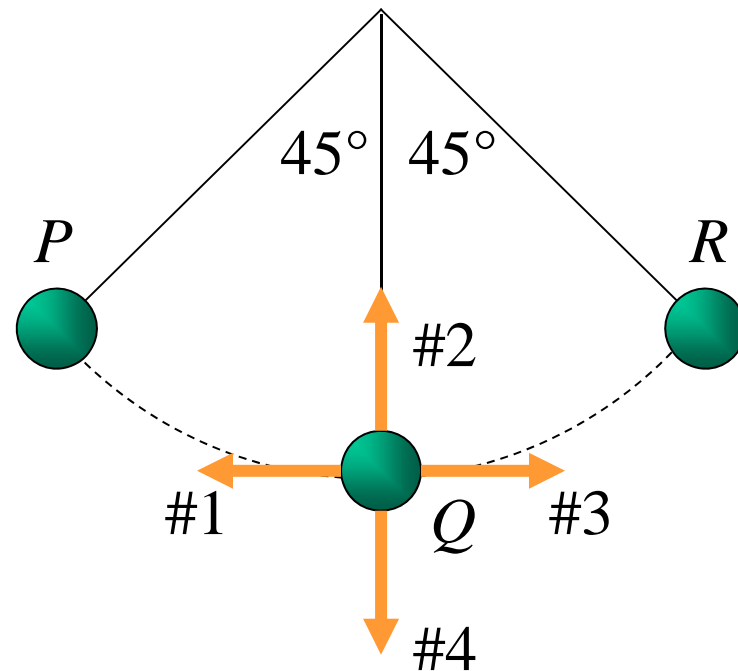
- A. #1 (directly away from O)
- B. #2 (perpendicular to the track)
- C. #3 (in the direction of motion)
- D. #4 (directly toward O)
- E. #5 (perpendicular to the track)

Q3.5



A pendulum swings back and forth, reaching a maximum angle of 45° from the vertical. Which arrow shows the direction of the pendulum bob's acceleration as it moves from left to right through point Q (the low point of the motion)?

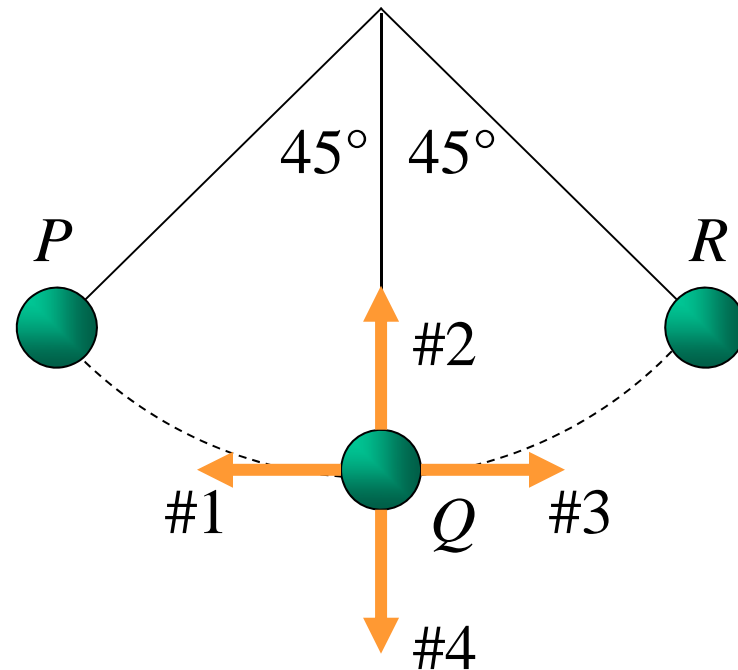
- A. #1 (to the left)
- B. #2 (straight up)
- C. #3 (to the right)
- D. #4 (straight down)
- E. misleading question—the acceleration is zero at Q



A3.5

A pendulum swings back and forth, reaching a maximum angle of 45° from the vertical. Which arrow shows the direction of the pendulum bob's acceleration as it moves from left to right through point Q (the low point of the motion)?

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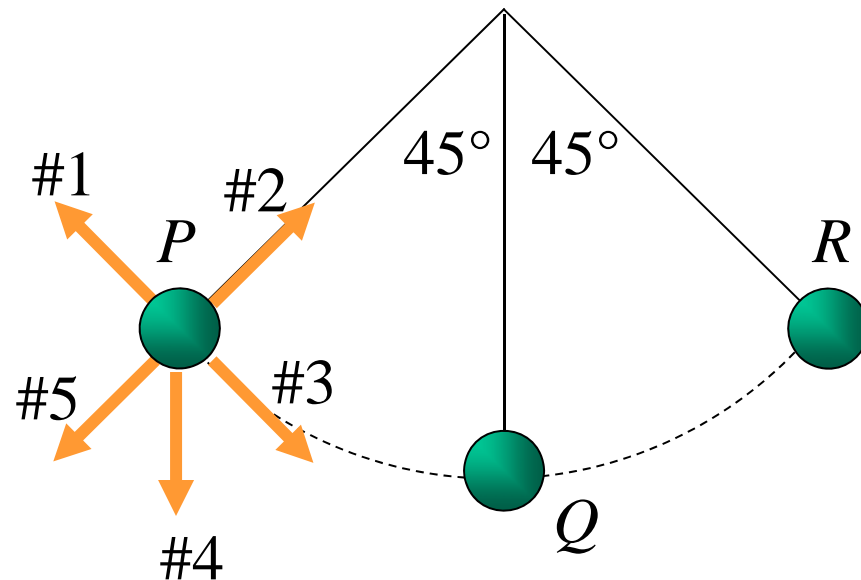


Q3.6



A pendulum swings back and forth, reaching a maximum angle of 45° from the vertical. Which arrow shows the direction of the pendulum bob's acceleration at P (the far left point of the motion)?

- A. #1 (up and to the left)
- B. #2 (up and to the right)
- C. #3 (down and to the right)
- D. #4 (straight down)
- E. #5 (down and to the left)



A3.6

A pendulum swings back and forth, reaching a maximum angle of 45° from the vertical. Which arrow shows the direction of the pendulum bob's acceleration at P (the far left point of the motion)?

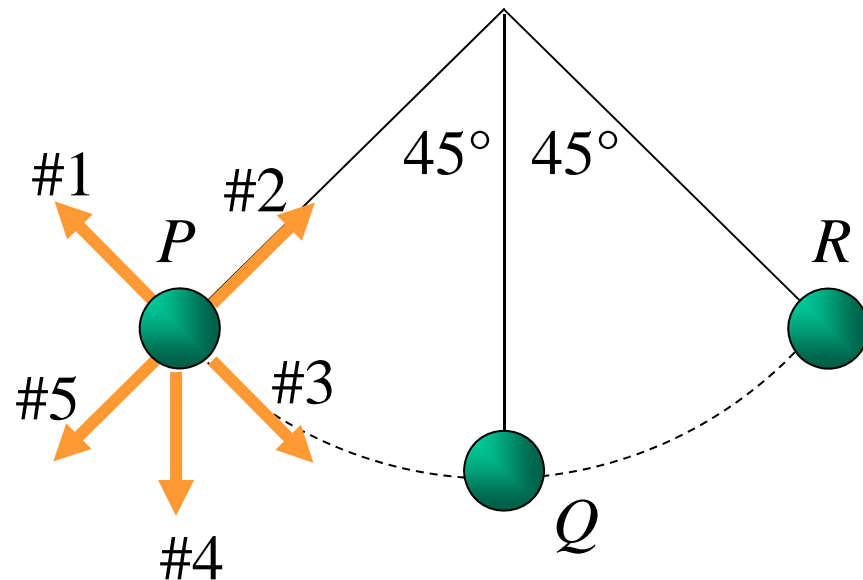
A. #1 (up and to the left)

B. #2 (up and to the right)

C. #3 (down and to the right)

D. #4 (straight down)

E. #5 (down and to the left)



Q3.7



The velocity and acceleration of an object at a certain instant are

$$\vec{v} = (3.0 \text{ m/s})\hat{j}$$

$$\vec{a} = (0.5 \text{ m/s}^2)\hat{i} - (0.2 \text{ m/s}^2)\hat{j}$$

At this instant, the object is

- A. speeding up and following a curved path.
- B. speeding up and moving in a straight line.
- C. slowing down and following a curved path.
- D. slowing down and moving in a straight line.
- E. none of these is correct


A3.7

The velocity and acceleration of an object at a certain instant are

$$\vec{v} = (3.0 \text{ m/s})\hat{j}$$

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- D. slowing down and moving in a straight line.
- E. none of these is correct

Q3.8



The velocity and acceleration of an object at a certain instant are

$$\vec{v} = (2.0 \text{ m/s}^2)\hat{i} + (3.0 \text{ m/s})\hat{j}$$

$$\vec{a} = (0.5 \text{ m/s}^2)\hat{i} - (0.2 \text{ m/s}^2)\hat{j}$$

At this instant, the object is

- A. speeding up and following a curved path.
- B. speeding up and moving in a straight line.
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- D. slowing down and moving in a straight line.
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A3.8

The velocity and acceleration of an object at a certain instant are

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$$\vec{a} = (0.5 \text{ m/s}^2)\hat{i} - (0.2 \text{ m/s}^2)\hat{j}$$

At this instant, the object is

-  A. speeding up and following a curved path.
- B. speeding up and moving in a straight line.
- C. slowing down and following a curved path.
- D. slowing down and moving in a straight line.
- E. none of these is correct

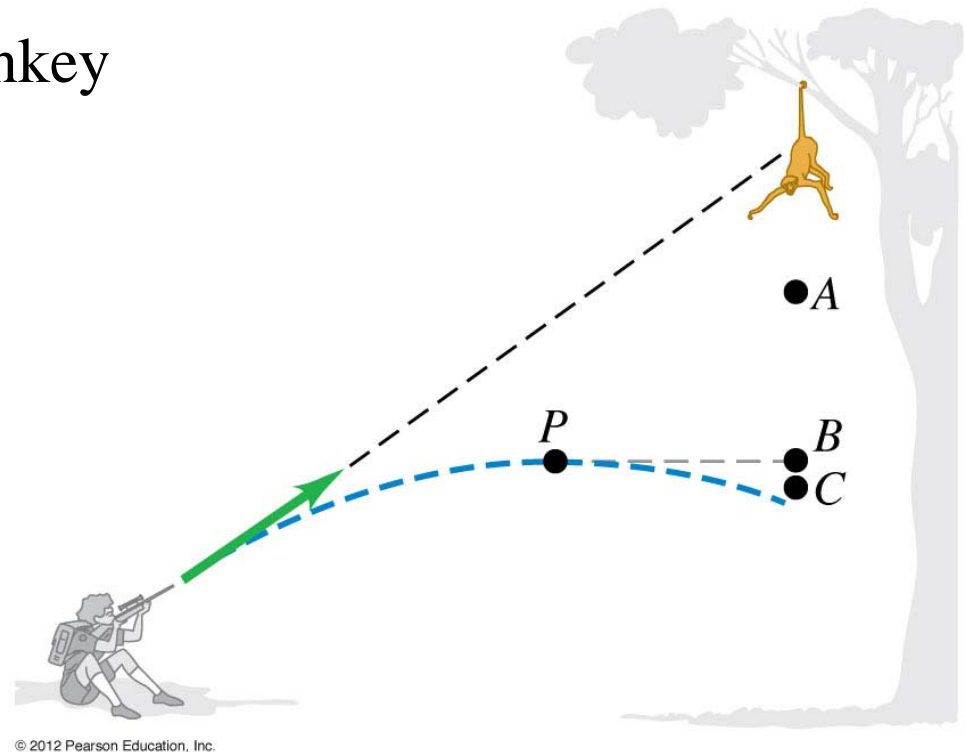
Q3.9



A zookeeper fires a tranquilizer dart directly at a monkey. The monkey lets go at the same instant that the dart leaves the gun barrel. The dart reaches a maximum height P before striking the monkey. Ignore air resistance.

When the dart is at P , the monkey

- A. is at A (higher than P).
- B. is at B (at the same height as P).
- C. is at C (lower than P).
- D. not enough information given to decide

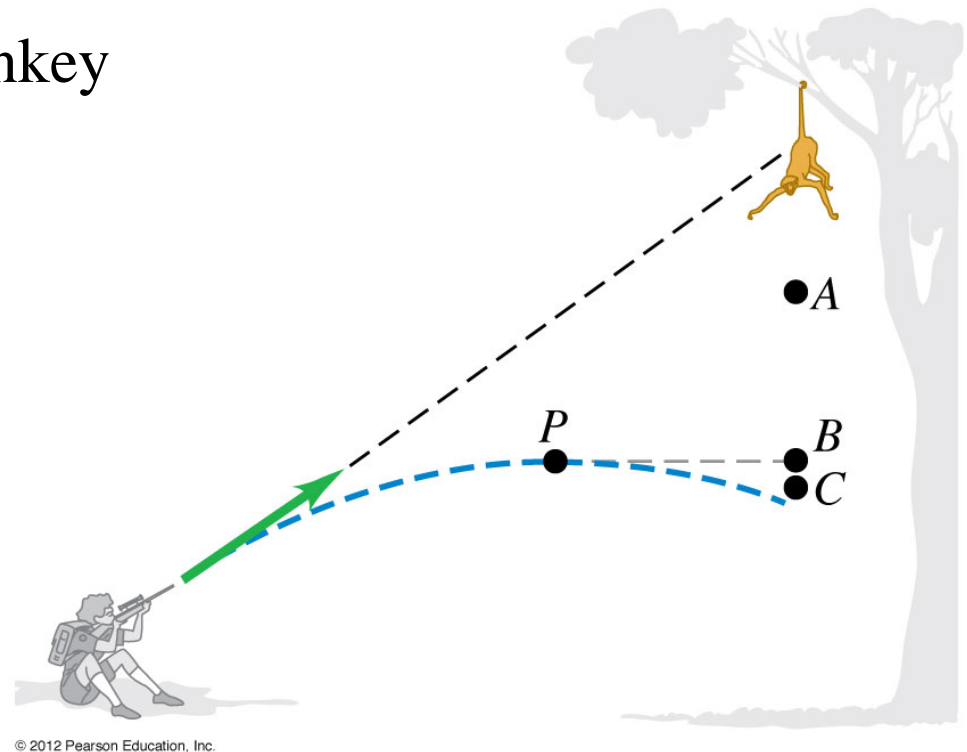


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- C. is at C (lower than P).
- D. not enough information given to decide



Q3.10




A projectile is launched at a 30° angle above the horizontal. Ignore air resistance. The projectile's acceleration is greatest

- A. at a point between the launch point and the high point of the trajectory.
- B. at the high point of the trajectory.
- C. at a point between the high point of the trajectory and where it hits the ground.
- D. misleading question—the acceleration is the same (but nonzero) at all points along the trajectory
- E. misleading question—the acceleration is zero at all points along the trajectory

A3.10

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- E. misleading question—the acceleration is zero at all points along the trajectory

Q3.11




You drive a race car around a circular track of radius 100 m at a constant speed of 100 km/h. If you then drive the same car around a different circular track of radius 200 m at a constant speed of 200 km/h, your acceleration will be

- A. 8 times greater.
- B. 4 times greater.
- C. twice as great.
- D. the same.
- E. half as great.

A3.11

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- D. the same.
- E. half as great.

Q3.12



The pilot of a light airplane with an airspeed of 200 km/h wants to fly due west. There is a strong wind of 120 km/h blowing from the north.


If the pilot points the nose of the airplane north of west so that her ground track is due west, what will be her ground speed?

- A. 80 km/h
- B. 120 km/h
- C. 160 km/h
- D. 180 km/h
- E. It would impossible to fly due west in this situation.

A3.12

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