Physics I Motion Test

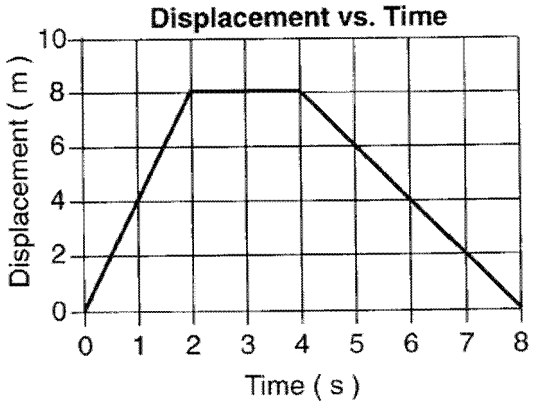
Name: _____ **Date:** _____

1. What is the average velocity of a car that travels 30. kilometers due west in 0.50 hour?

   A. 15 km/hr B. 60. km/hr

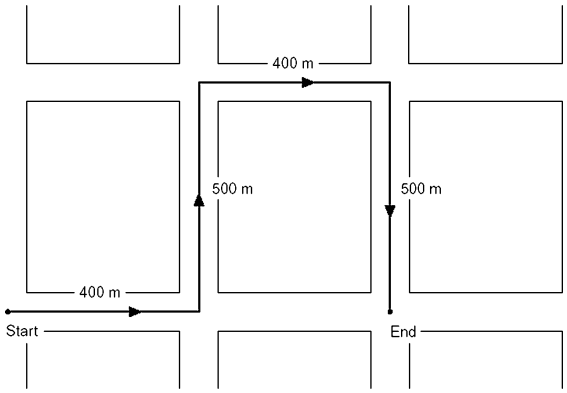
   C. 15 km/hr west D. 60. km/hr west

2. Base your answer(s) to the following question(s) on the graph, which represents the relationship between the displacement of an object and its time of travel along a straight line.



   What is the magnitude of the object's total displacement after 8.0 seconds?

   A. 0 m B. 2 m C. 8 m D. 16 m

3. 

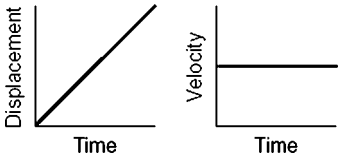
   The accompanying map shows the route traveled by a school bus.

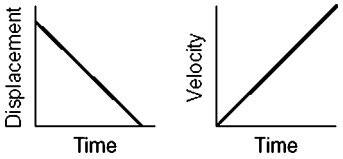
   What is the magnitude of the total displacement of the school bus from the start to the end of its trip?

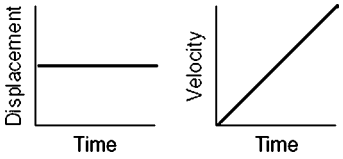
   A. 400 m B. 500 m

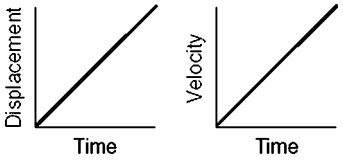
   C. 800 m D. 1,800 m

4. Which pair of graphs represent the same motion?

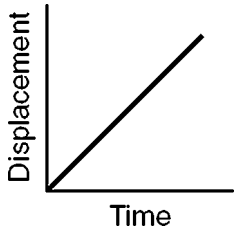
A.


B.


C.


D.


5. The accompanying graph represents the motion of an object.



According to the graph, as time increases, the velocity of the object

A. decreases B. increases

C. remains the same

6. A projectile is launched with an initial velocity of 200 meters per second at an angle of 30° above the horizontal. What is the magnitude of the vertical component of the projectile's initial velocity?

A. $200\,\text{m/s} \times \cos 30^\circ$ B. $200\,\text{m/s} \times \sin 30^\circ$

C. $\dfrac{200\,\text{m/s}}{\sin 30^\circ}$ D. $\dfrac{200\,\text{m/s}}{\cos 30^\circ}$

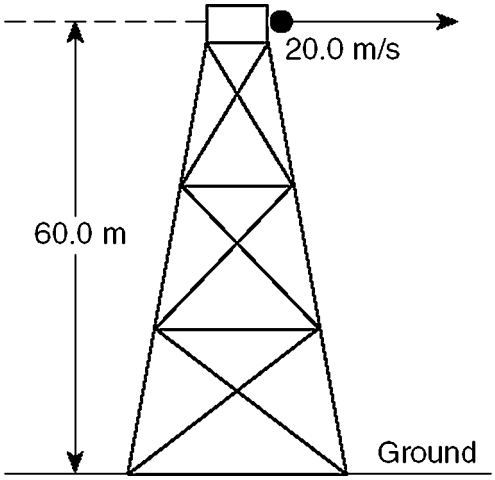
7. A football player kicks a ball with an initial velocity of 25 meters per second at an angle of 53° above the horizontal. The vertical component of the initial velocity of the ball is

A. 25 m/s B. 20. m/s

C. 15 m/s D. 10. m/s

8. Base your answer(s) to the following question(s) on the information and diagram below.

A ball is thrown horizontally with an initial velocity of 20.0 meters per second from the top of a tower 60.0 meters high.



What is the initial vertical velocity of the ball?

A. 0 m/s B. 9.81 m/s

C. 20.0 m/s D. 60.0 m/s

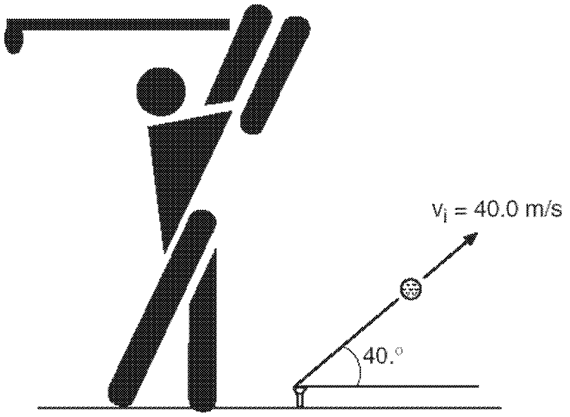
9. What is the horizontal velocity of the ball just before it reaches the ground? [Neglect air resistance.]

A. 9.81 m/s B. 20.0 m/s

C. 34.3 m/s D. 68.6 m/s

10. Base your answer(s) to the following question(s) on the information and diagram below

A golf ball leaves a golf club with an initial velocity of 40.0 meters per second at an angle of 40.° with the horizontal.

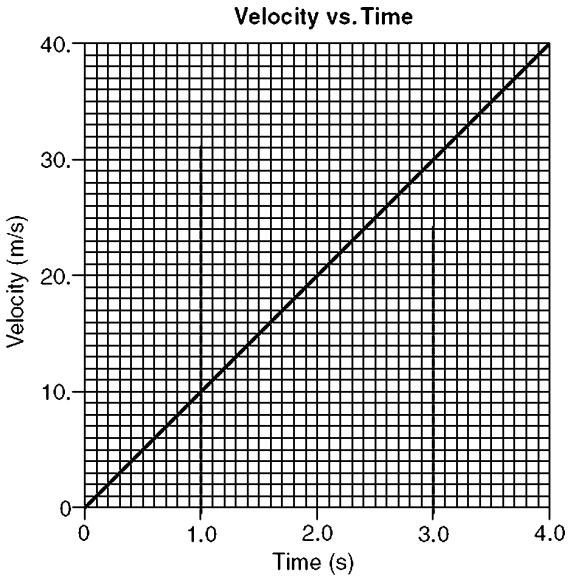


What is the vertical component of the golf ball's initial velocity?

A. 25.7 m/s B. 30.6 m/s

C. 40.0 m/s D. 61.3 m/s

11. The accompanying graph shows the velocity of a race car moving along a straight line as a function of time.



What is the magnitude of the displacement of the car from $t = 2.0$ seconds to $t = 4.0$ seconds?

A. 20. m B. 40. m C. 60. m D. 80. m

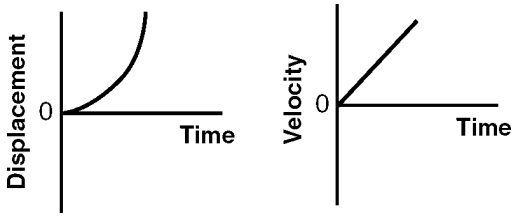
12. Velocity is to speed as displacement is to

A. acceleration B. time

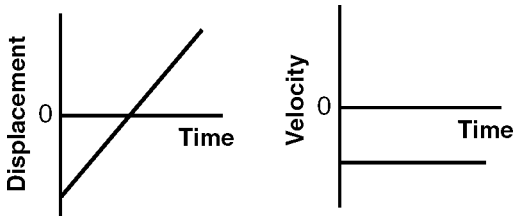
C. momentum D. distance

13. Which pair of graphs represents the same motion of an object?

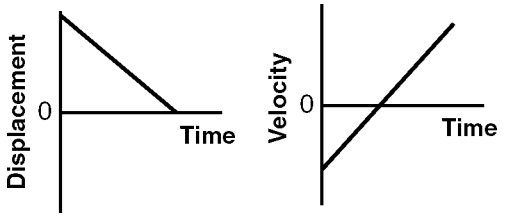
A.



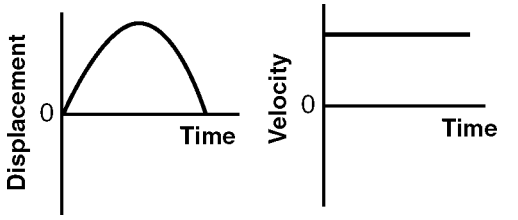
B.



C.

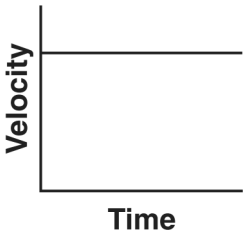


D.

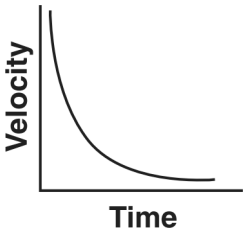


14. Which graph best represents the relationship between the velocity of an object thrown straight upward from Earth's surface and the time that elapses while it is in the air? [Neglect friction.]

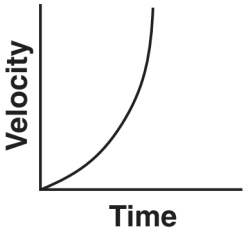
A.



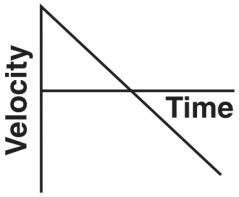
B.



C.



D.



15. The speedometer in a car does *not* measure the car's velocity because velocity is a

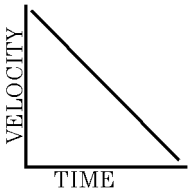
A. vector quantity and has a direction associated with it

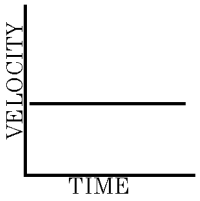
B. vector quantity and does not have a direction associated with it

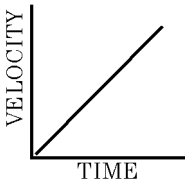
C. scalar quantity and has a direction associated with it

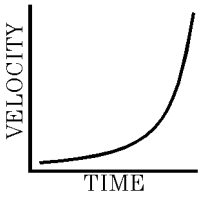
D. scalar quantity and does not have a direction associated with it

16. A steel ball is dropped from a height of 100 meters. Which velocity-time graph best describes the motion of the ball?

A. 

B. 

C. 

D. 

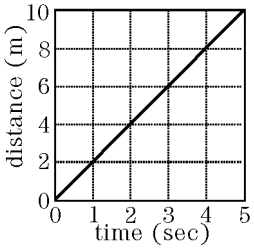
17. The uniform motion of a cart is shown in the distance versus time graph. What is the average speed of the cart?

A. 0.5 m/sec

B. 2 m/sec

C. 5 m/sec

D. 50 m/sec



18. A car travels 300 meters in 15 seconds. What is the average velocity of the car?

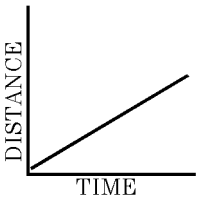
A. 5.0 m/sec

B. 15 m/sec

C. 20 m/sec

D. 30 m/sec

19. The distance-time graph shown represents the motion of a laboratory cart. According to this graph, the cart is



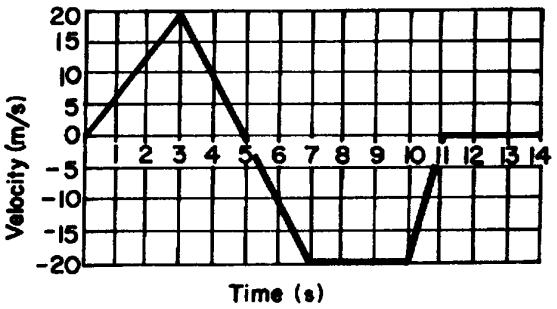
A. slowing down

B. speeding up

C. not moving

D. moving at a constant speed

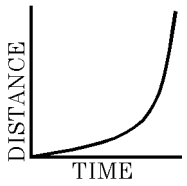
20. The graph shown represents the relationship between velocity and time for a 2.0-kilogram cart that is initially at rest and starts moving northward.



In which direction is the cart that is shown traveling at $t = 4$ seconds?

A. north B. east C. south D. west

21. The diagram shows a graph of distance as a function of time for an object in straight-line motion. According to the graph, the object most likely has



A. a constant momentum

B. a decreasing acceleration

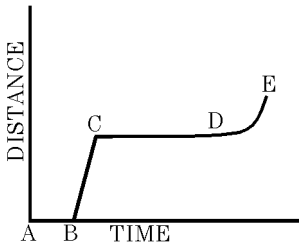
C. a decreasing mass

D. an increasing speed

22. The graph shown represents the relationship between distance and time for an object in motion. During which interval is the speed of the object changing?

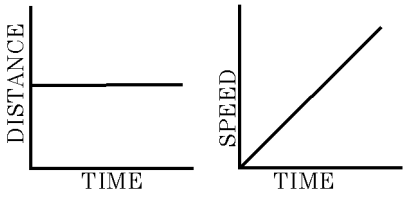
A. *AB* B. *BC*

C. *CD* D. *DE*

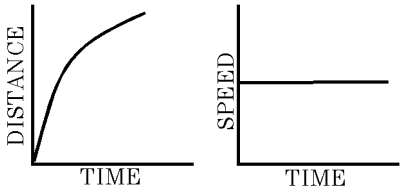


23. Which pair of graphs represent the same motion?

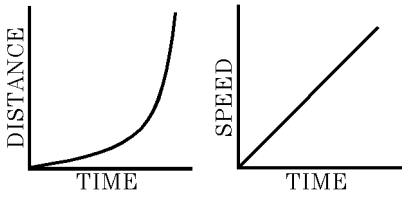
A.



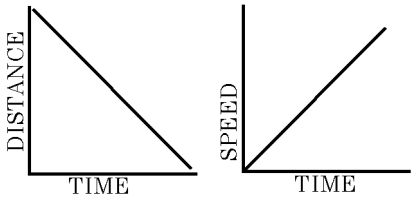
B.



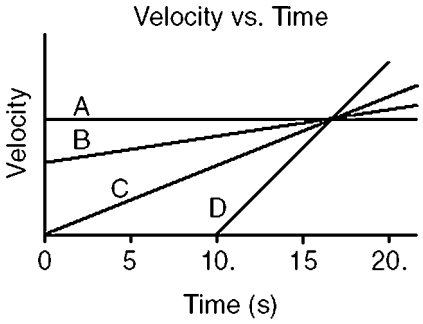
C.



D.



24. The accompanying diagram represents the relationship between velocity and time of travel for four cars, A, B, C, and D, in straight-line motion.



Which car has the greatest acceleration during the time interval 10. seconds to 15 seconds?

A. A B. B C. C D. D

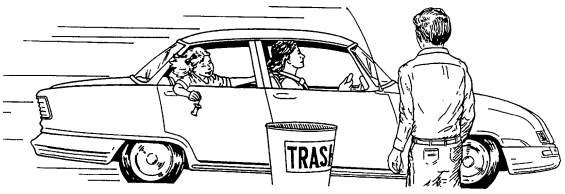
25. A red ball and a green ball are simultaneously thrown horizontally from the same height. The red ball has an initial speed of 40. meters per second and the green ball has an initial speed of 20. meters per second. Compared to the time it takes the red ball to reach the ground, the time it takes the green ball to reach the ground will be

A. the same

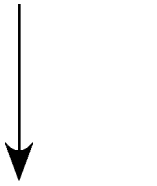
B. twice as much

C. half as much

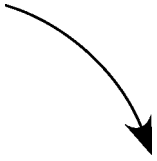
D. four times as much

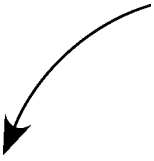
26. 

Look at the picture above. Suppose the passenger dropped an apple core into the roadside trash can as the car moved past at 15 km/hr. Which arrow shows the path the apple core would take as seen by the man standing nearby? (Assume the car is traveling from your left to your right, and there is absolutely no wind.)

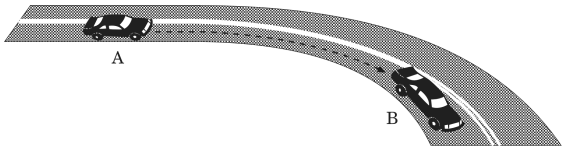
A. 

B. 

C. 

D. 

27. A car travels from A to B at a constant 100 km/hr.



Which of the following changes?

A. speed

B. velocity

C. frame of reference

D. speed and velocity

28. A bowling ball was dropped from the same height and at the same time that a softball was thrown horizontally. Neglecting air resistance, which statement is true?

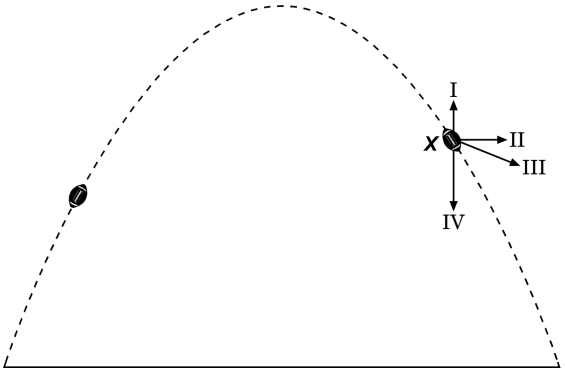
A. The bowling ball hit the ground first.

B. The softball hit the ground first.

C. The bowling ball and softball hit the ground at the same time.

D. The bowling ball fell faster than the softball.

29. The path of a kicked football is shown in the diagram. The dashed line shows the path of the ball if the air resistance is neglected. Point *X* is a point along the path.



Which arrow points in the direction of the acceleration?

A. I B. II C. III D. IV

30. A baseball is thrown across a field. Neglecting air resistance, which *best* describes the horizontal components of the ball's velocity and acceleration while it is in the air?

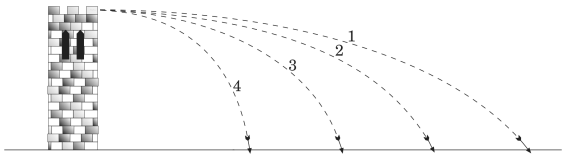
A. Velocity is constant; acceleration is decreasing.

B. Velocity is constant; acceleration is constant.

C. Velocity is decreasing; acceleration is decreasing.

D. Velocity is increasing; acceleration is constant.

31. Four arrows are shot horizontally from the top of a tower, as shown below.

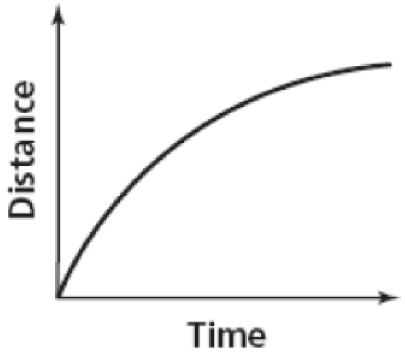


Which path represents the arrows with the *greatest* horizontal velocity?

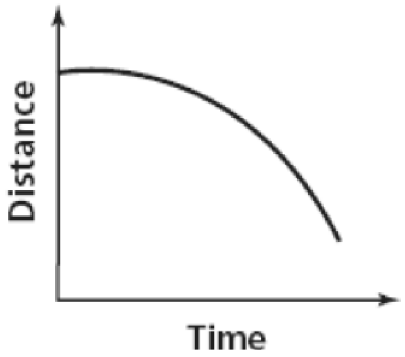
A. 1 B. 2 C. 3 D. 4

32. After a baseball is thrown up into the air, it will eventually fall back down to Earth. Which graph *best* demonstrates the relationship between time and distance from Earth as the baseball falls?

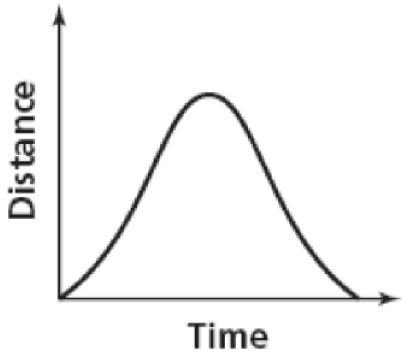
A.



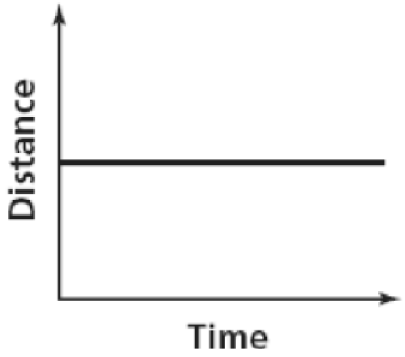
B.



C.

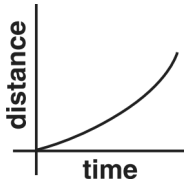


D.

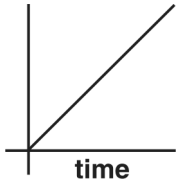


33. An object moves away from a motion detector with a constant speed. Which graph *best* represents the motion of the object?

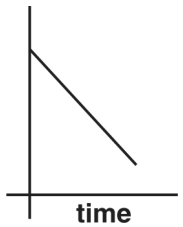
A.



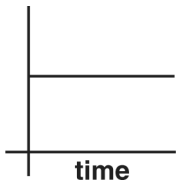
B.



C.



D.

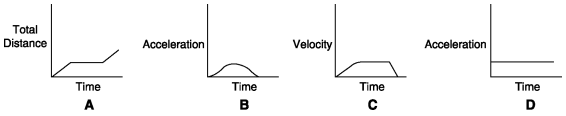


34. Centuries ago the British physicist Sir Isaac Newton stated three laws that describe the ways in which things move. These are Newton's three laws of motion:

- **The first law:** Unless acted upon by an outside force, a body at rest tends to stay at rest, and a body in motion tends to stay in motion.
- **The second law:** Acceleration is equal to the net force acting on a body divided by its mass.
- **The third law:** For every action force there is an equal and opposite reaction force.

A driver starts her car and steps on the gas pedal. The car gradually accelerates to 50 km/hr. A few minutes later, the driver suddenly slams on the brakes to avoid hitting a box in the road. As the car comes to a stop, the driver's body appears to lurch forward in the seat until it is restrained by the seatbelt.

Use the following graphs to answer the next question(s).



Which graph best matches the motion of the car described in the paragraph above?

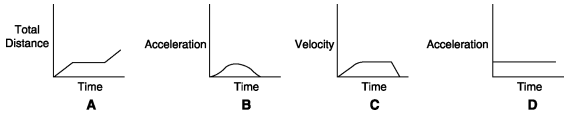
A. A B. B C. C D. D

35. Centuries ago the British physicist Sir Isaac Newton stated three laws that describe the ways in which things move. These are Newton's three laws of motion:

- **The first law:** Unless acted upon by an outside force, a body at rest tends to stay at rest, and a body in motion tends to stay in motion.
- **The second law:** Acceleration is equal to the net force acting on a body divided by its mass.
- **The third law:** For every action force there is an equal and opposite reaction force.

A driver starts her car and steps on the gas pedal. The car gradually accelerates to 50 km/hr. A few minutes later, the driver suddenly slams on the brakes to avoid hitting a box in the road. As the car comes to a stop, the driver's body appears to lurch forward in the seat until it is restrained by the seatbelt.

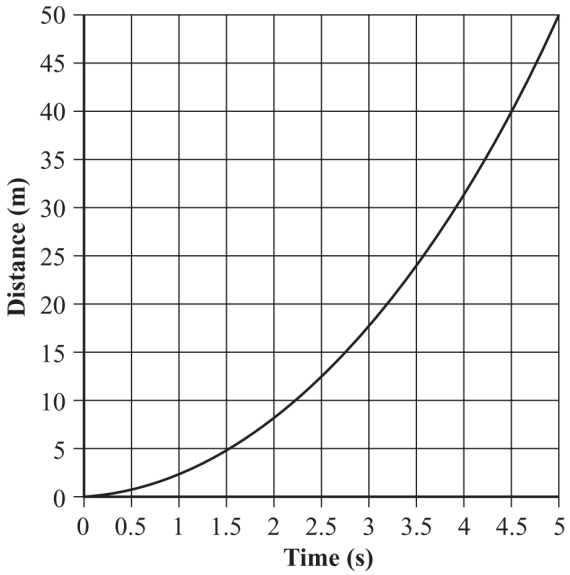
Use the following graphs to answer the next question(s).



A student rides her bicycle from her home to the library. She stays there for a while and then goes to a friend's house. Which graph best matches this situation?

A. A B. B C. C D. D

36. The distance vs. time graph below shows data collected as a remote-controlled car moved across a level parking lot.



According to the graph, which of the following conclusions about the car's motion is supported?

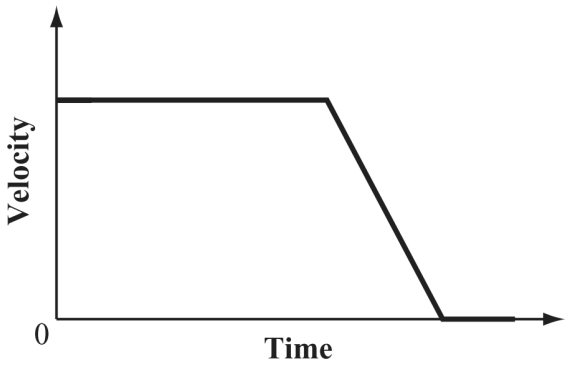
A. The car is accelerating.

B. The car is stopping and starting.

C. The car is traveling at a constant velocity.

D. The car is moving through an obstacle course.

37. The graph below relates velocity to time.



The graph would *most likely* apply to which of the following events?

A. A soccer ball that is at rest is suddenly kicked.

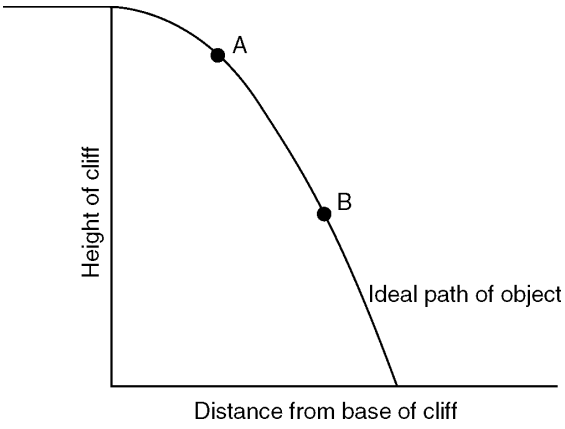
B. A ball is thrown upward and returns to the ground.

C. A person who is running at a constant speed decides to run faster.

D. A car traveling at a constant speed applies its brakes and comes to a stop.

38. Base your answer(s) to the following question(s) on the information and diagram below.

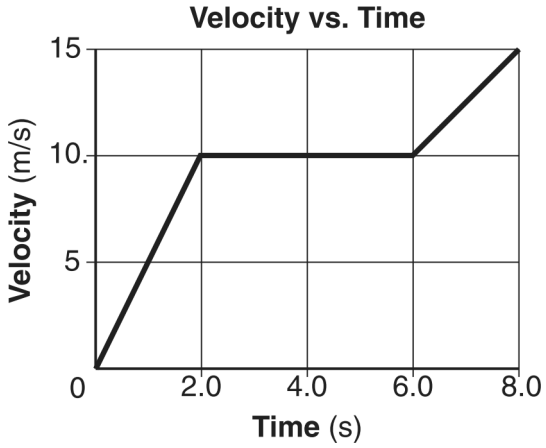
An object was projected horizontally from a tall cliff. The diagram below represents the path of the object, neglecting friction.



How does the magnitude of the horizontal component of the object's velocity at point *A* compare with the magnitude of the horizontal component of the object's velocity at point *B*?

39. How does the magnitude of the vertical component of the object's velocity at point *A* compare with the magnitude of the vertical component of the object's velocity at point *B*?

40. The graph below represents the velocity of an object traveling in a straight line as a function of time.



Determine the magnitude of the total displacement of the object at the end of the first 6.0 seconds.

Physics I Motion Test 12/03/2013

1. Answer: D

2. Answer: A

3. Answer: C

4. Answer: A

5. Answer: C

6. Answer: B

7. Answer: B

8. Answer: A

9. Answer: B

10. Answer: A

11. Answer: C

12. Answer: D

13. Answer: A

14. Answer: D

15. Answer: A

16. Answer: C

17. Answer: B

18. Answer: C

19. Answer: D

20. Answer: A

21. Answer: D

22. Answer: D

23. Answer: C

24. Answer: D

25. Answer: A

26. Answer: C

27. Answer: B

28. Answer: C

29. Answer: D

30. Answer: B

31. Answer: A

32. Answer: B

33. Answer: B

34. Answer:

35. Answer:

36. Answer: A

37. Answer:

38. Answer: They are the same.

39. Answer: Velocity (or vertical velocity) at A is less than at B.

40. Answer: 50. m