Question 2.1  Walking the Dog

You and your dog go for a walk to the park. On the way, your dog takes many side trips to chase squirrels or examine fire hydrants. When you arrive at the park, do you and your dog have the same displacement?

a) yes  
b) no
Question 2.2

Does the displacement of an object depend on the specific location of the origin of the coordinate system?

a) yes
b) no
c) it depends on the coordinate system
If the position of a car is zero, does its speed have to be zero?

a) yes  
b) no  
c) it depends on the position
Question 2.4  Odometer

Does the odometer in a car measure distance or displacement?

a) distance
b) displacement
c) both
Question 2.5

Does the speedometer in a car measure velocity or speed?

a) velocity
b) speed
c) both
d) neither
You drive for 30 minutes at 30 mi/hr and then for another 30 minutes at 50 mi/hr. What is your average speed for the whole trip?

a) more than 40 mi/hr
b) equal to 40 mi/hr
c) less than 40 mi/hr
You drive 4 miles at 30 mi/hr and then another 4 miles at 50 mi/hr. What is your average speed for the whole 8-mile trip?

a) more than 40 mi/hr  
b) equal to 40 mi/hr  
c) less than 40 mi/hr
If the average velocity is non-zero over some time interval, does this mean that the instantaneous velocity is never zero during the same interval?

a) yes  
b) no  
c) it depends
Question 2.8a  Acceleration I

If the velocity of a car is non-zero \((v \neq 0)\), can the acceleration of the car be zero?

a) yes
b) no
c) depends on the velocity
**Question 2.8b**  
**Acceleration II**

When throwing a ball straight up, which of the following is true about its velocity $v$ and its acceleration $a$ at the highest point in its path?

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
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<tbody>
<tr>
<td>a)</td>
<td>both $v = 0$ and $a = 0$</td>
</tr>
<tr>
<td>b)</td>
<td>$v \neq 0$, but $a = 0$</td>
</tr>
<tr>
<td>c)</td>
<td>$v = 0$, but $a \neq 0$</td>
</tr>
<tr>
<td>d)</td>
<td>both $v \neq 0$ and $a \neq 0$</td>
</tr>
<tr>
<td>e)</td>
<td>not really sure</td>
</tr>
</tbody>
</table>


You throw a ball straight up into the air. After it leaves your hand, at what point in its flight does it have the maximum value of acceleration?

a) its acceleration is constant everywhere
b) at the top of its trajectory
c) halfway to the top of its trajectory
d) just after it leaves your hand
e) just before it returns to your hand on the way down
Alice and Bill are at the top of a building. Alice throws her ball downward. Bill simply drops his ball. Which ball has the greater acceleration just after release?

a) Alice’s ball
b) it depends on how hard the ball was thrown
c) neither—they both have the same acceleration
d) Bill’s ball
You throw a ball upward with an initial speed of 10 m/s. Assuming that there is no air resistance, what is its speed when it returns to you?

a) more than 10 m/s
b) 10 m/s
c) less than 10 m/s
d) zero
e) need more information
Alice and Bill are at the top of a cliff of height $H$. Both throw a ball with initial speed $v_0$, Alice straight down and Bill straight up. The speeds of the balls when they hit the ground are $v_A$ and $v_B$. If there is no air resistance, which is true?

a) $v_A < v_B$
b) $v_A = v_B$
c) $v_A > v_B$
d) impossible to tell
### Question 2.11  Two Balls in the Air

A ball is thrown straight upward with some initial speed. When it reaches the top of its flight (at a height $h$), a second ball is thrown straight upward with the same initial speed. Where will the balls cross paths?

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
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<tbody>
<tr>
<td>a)</td>
<td>at height $h$</td>
</tr>
<tr>
<td>b)</td>
<td>above height $h/2$</td>
</tr>
<tr>
<td>c)</td>
<td>at height $h/2$</td>
</tr>
<tr>
<td>d)</td>
<td>below height $h/2$ but above 0</td>
</tr>
<tr>
<td>e)</td>
<td>at height 0</td>
</tr>
</tbody>
</table>
You drop a rock off a bridge. When the rock has fallen 4 m, you drop a second rock. As the two rocks continue to fall, what happens to their separation?

a) the separation increases as they fall
b) the separation stays constant at 4 m
c) the separation decreases as they fall
d) it is impossible to answer without more information
You drop a rock off a bridge. When the rock has fallen 4 m, you drop a second rock. As the two rocks continue to fall, what happens to their velocities?

a) both increase at the same rate  
b) the velocity of the first rock increases faster than the velocity of the second  
c) the velocity of the second rock increases faster than the velocity of the first  
d) both velocities stay constant
Question 2.13a  Graphing Velocity I

The graph of position versus time for a car is given below. What can you say about the velocity of the car over time?

a) it speeds up all the time
b) it slows down all the time
c) it moves at constant velocity
d) sometimes it speeds up and sometimes it slows down
e) not really sure
The graph of position vs. time for a car is given below. What can you say about the velocity of the car over time?

a) it speeds up all the time
b) it slows down all the time
c) it moves at constant velocity
d) sometimes it speeds up and sometimes it slows down
e) not really sure
Consider the line labeled A in the \( v \) vs. \( t \) plot. How does the speed change with time for line A?

- a) decreases
- b) increases
- c) stays constant
- d) increases, then decreases
- e) decreases, then increases
Consider the line labeled B in the \( v \) vs. \( t \) plot. How does the speed change with time for line B?

a) decreases  
b) increases  
c) stays constant  
d) increases, then decreases  
e) decreases, then increases
You drop a rubber ball. Right after it leaves your hand and before it hits the floor, which of the above plots represents the $v$ vs. $t$ graph for this motion? (Assume your $y$-axis is pointing up).
You toss a ball straight up in the air and catch it again. Right after it leaves your hand and before you catch it, which of the above plots represents the $v$ vs. $t$ graph for this motion? (Assume your y-axis is pointing up).
You drop a very bouncy rubber ball. It falls, and then it hits the floor and bounces right back up to you. Which of the following represents the $v$ vs. $t$ graph for this motion?