

Motion In One Dimension

Section Study Guide**Teacher Notes and Answers****DISPLACEMENT AND VELOCITY**

1. Yes, from t_1 to t_4 and from t_6 to t_7 .
2. Yes, from t_4 to t_5
3. greater than
4. greater than
5. Yes, from 0 to t_1 and from t_5 to t_6 .
6. Yes, from t_1 to t_2 , from t_2 to t_4 , from t_4 to t_5 , and from t_6 to t_7 .
7. -5.0 m (or 5.0 m to the west of where it started)

ACCELERATION

1. $v_f = 0$. The car is stopped.
2. $v_i = \frac{2\Delta x}{\Delta t}$
3. $a = \frac{-v_i}{\Delta t}$
4. $a = \frac{-v_i^2}{2\Delta x}$
5. $v_i = -a\Delta t \quad \Delta x = \frac{1}{2}v_i\Delta t$

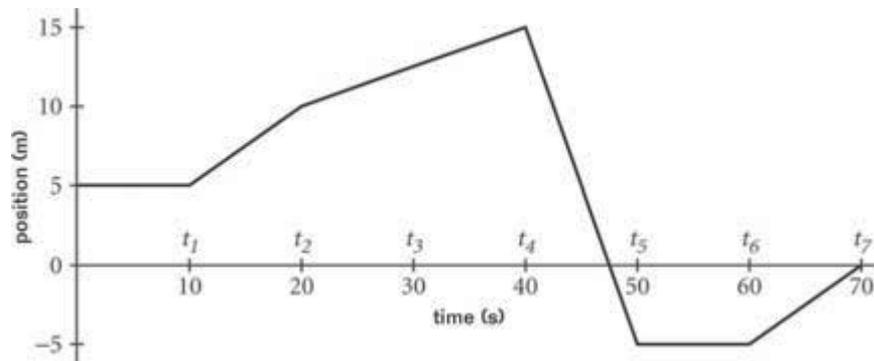
FALLING OBJECTS

1. a. $-g$
b. initial speed = $g(\Delta t/2)$
c. elapsed time = $\Delta t/2$
d. height = $g\Delta t^2/8$
2. a. -9.81 m/s²
b. 12 m/s
c. 1.2 s

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Graph Skills**Displacement and Velocity**

A minivan travels along a straight road. It initially starts moving toward the east. Below is the position-time graph of the minivan. Use the information in the graph to answer the questions.



1. Does the minivan move to the east? If so, during which time interval(s)?

2. Does the minivan move to the west? If so, during which time interval(s)?

3. Is the minivan's speed between t_1 and t_2 greater than, less than, or equal to its speed between t_2 and t_3 ?

4. Is the minivan's speed between t_4 and t_5 greater than, less than, or equal to its speed between t_6 and t_7 ?

5. Does the minivan ever stop completely? If so, at which time(s)?

6. Does the minivan ever move with a constant velocity? If so, at which time(s)?

7. What is the total displacement of the minivan during the trip?

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Math Skills**Acceleration**

A car is traveling down a straight road. The driver then applies the brake, and the car decelerates with a constant acceleration until it stops. Refer to the equations below to answer the questions.

$$\Delta x = \frac{1}{2}(v_i + v_f)\Delta t \quad v_f = v_i + a(\Delta t)$$

$$\Delta x = v_i(\Delta t) + \frac{1}{2}a(\Delta t)^2 \quad v_f^2 = v_i^2 + 2a\Delta x$$

1. What is the car's final speed v_f ? Explain your answer.

2. You are given the distance the car travels and the length of time it takes for the car to come to a complete stop after the driver applies the brakes. What is the expression for the car's initial speed?

3. You are given the car's initial speed and the length of time it takes for the car to come to a full stop after the driver applies the brakes. What is the expression for the magnitude of the car's acceleration?

4. You are given the car's initial speed and the distance the car travels before it comes to a complete stop after the driver applies the brakes. What is the expression for the magnitude of the car's acceleration?

5. You are given the magnitude of the car's acceleration and the length of time it takes for the car to come to a full stop after the driver applies the brakes. What is the expression for the initial speed of the car, and what is the expression for the distance it traveled before it came to a complete stop?

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Math Skills**Falling Objects**

A juggler throws a ball straight up into the air. The ball remains in the air for a time Δt before it lands back in the juggler's hand.

$$\Delta y = v_i(\Delta t) + \frac{1}{2}a(\Delta t)^2$$

$$v_f = v_i + a(\Delta t)$$

$$v_f^2 = v_i^2 + 2a\Delta y$$

1. Answer the following questions in terms of Δt and g .
 - a. What is the acceleration of the ball during the entire time the ball is in the air?

 - b. With what speed did the juggler throw the ball into the air? (Hint: What is the total displacement of the ball during the time it is in the air?)

 - c. How much time elapsed before the ball reached its maximum height?

 - d. How high above the point of release did the ball rise?

2. Assume that the ball was in the air for 2.4 s. Answer the following questions:
 - a. What is the acceleration of the ball during the entire time the ball is in the air?

 - b. With what speed did the juggler throw the ball into the air?

 - c. How much time elapsed before the ball reached its maximum height?
