

## Unit 01 Review

1. Define the following terms

(a) distance

**Solution:** total amount traveled by an object (a scalar)

(b) displacement

**Solution:** how far an object is from its starting point (a vector)

(c) speed

**Solution:** how fast an object travels (a scalar)

(d) velocity

**Solution:** speed and direction (a vector)

(e) acceleration

**Solution:** the rate that velocity changes (a vector)

2. What is the acceleration of a ping-pong ball that is initially traveling at 15 m/s, and then is returned to the other player with a velocity of  $-15$  m/s in 0.2 s?

**Solution:**

$$v_i = 15 \text{ m/s}$$

$$v_f = -15 \text{ m/s}$$

$$t = 0.2 \text{ s}$$

$$a = ?$$

$$\begin{aligned} a &= \frac{v_f - v_i}{t} \\ &= \frac{-15 - 15}{0.2} \\ &= -150 \text{ m/s}^2 \end{aligned}$$

3. What is the final velocity of an ice cream truck that has an initial velocity of 5 m/s, and accelerates at  $2.1 \text{ m/s}^2$  for 7.3 s?

**Solution:**

$$v_i = 5 \text{ m/s}$$

$$a = 2.1 \text{ m/s}^2$$

$$t = 7.3 \text{ s}$$

$$v_f = ?$$

$$\begin{aligned} a &= \frac{v_f - v_i}{t} \\ 2.1 &= \frac{v_f - 5}{7.3} \\ 15.33 &= v_f - 5 \\ 20.33 \text{ m/s} &= v_f \end{aligned}$$

4. How much time will it take an octopus that swims at 23 m/s to travel 82 m?

**Solution:**

$$v = 23 \text{ m/s}$$

$$d = 82 \text{ m}$$

$$t = ?$$

$$\begin{aligned} v &= \frac{d}{t} \\ 23 &= \frac{82}{t} \\ 23t &= 82 \\ t &= 3.57 \text{ s} \end{aligned}$$

Name:

Number:

Date:

5. What does it mean to say that an object is accelerating at  $10 \text{ m/s}^2$ ?

**Solution:** The object's velocity is changing by  $10 \text{ m/s}$  every second.

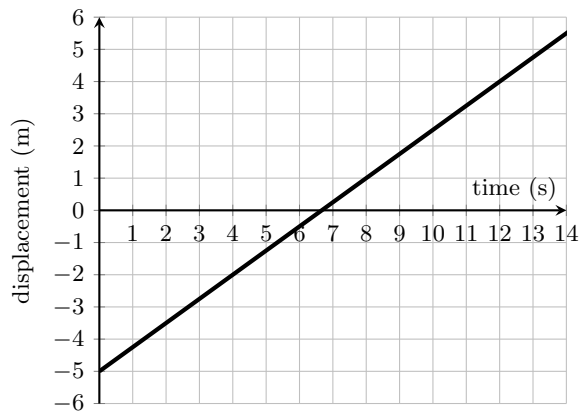
6. Consider this graph of a motor boat's displacement over time.

- (a) The object is moving  
☒ **forward**    ☐ backward
- (b) The object is  
☐ speeding up  
☐ slowing down  
☒ **moving at a constant speed**
- (c) Calculate the velocity.

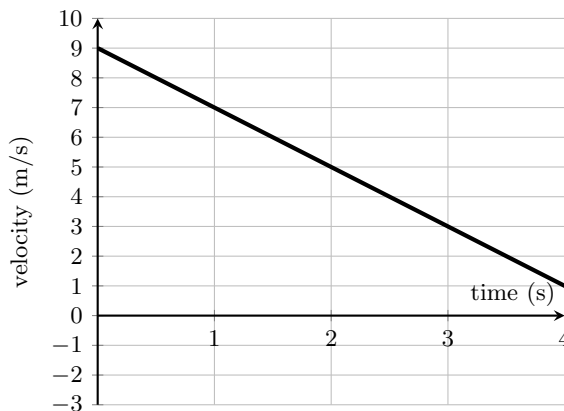
**Solution:**  $0.75 \text{ m/s}$

- (d) Calculate the acceleration.

**Solution:**  $0 \text{ m/s}^2$



7. Consider this graph of this train's velocity over time.



- (a) The object is moving  
☒ **forward**    ☐ backward
- (b) The object is  
☐ speeding up  
☐ slowing down  
☒ **moving at a constant speed**
- (c) Calculate the acceleration.

**Solution:**  $-2 \text{ m/s}^2$

8. A bear walks  $50 \text{ m}$  east in  $60 \text{ s}$ . Then, he turns around and walks  $50 \text{ m}$  west back to his starting point in  $120 \text{ s}$ . What is his (a) speed and (b) velocity for the entire trip?

**Solution:**

$$\text{distance} = 50 \text{ m} + 50 \text{ m} = 100 \text{ m}$$

$$\text{displacement} = 50 \text{ m} - 50 \text{ m} = 0$$

$$\text{total time} = 60 \text{ s} + 120 \text{ s} = 180 \text{ s}$$

$$\text{speed} = \frac{\text{distance}}{\text{time}} = \frac{100}{180} = 0.56 \text{ m/s}$$

$$\text{velocity} = \frac{\text{displacement}}{\text{time}} = \frac{0}{180} = 0 \text{ m/s}$$

