

Solutions to Period 3 Exercises

E.1 Which of the following is TRUE?

- a) 3 meters/second is not a rate.
- b) 2 beers a week is not a rate.
- c) 12 feet at 3 o'clock is not a rate.
- d) 45 miles per hour is not a rate.
- e) all of the above are rates

12 feet at 3 o'clock is not a rate because the time **elapsed** is not indicated.

E.1 = c

E.2 Which of the following statements about forces is FALSE?

- a) A net force is required to change the velocity of an object.
- b) If an object does not move, there must be no forces acting on it.
- c) When two forces act in the same direction on an object, the net force equals the sum of the forces.
- d) When two forces act in opposite directions on an object, the net force equals the difference between the forces.
- e) None of the above statements is FALSE.

Forces can act on a stationary object. For example, two forces of equal strength can act in opposite directions and cancel each other. The object does not move.

E.2 = b

E.3 If you see a lightning bolt during a thunderstorm and hear the thunder from it 6 seconds later, how far away was the lightning? Assume that the speed of sound in air is about 340 meters/second and that you can see a stroke of lightning instantly.

- a) 2,040 meters
- b) 57 meters
- c) 1.8 meters
- d) 0.017 meters
- e) none of the above is correct

$$s = \frac{D}{t} \quad D = s t = \frac{340 \text{ m}}{\text{sec}} \times 6 \text{ sec} = 2,040 \text{ m}$$

E.3 = a

E.4 The Mars Pathfinder spacecraft traveled about 3×10^8 miles to reach Mars. It moved at an average speed of 1.5×10^6 miles per day. How many days did it take to reach its destination?

- a) 400 days
- b) 365 days
- c) 200 days
- d) 80 days
- e) 30 days

$$s = \frac{D}{t} \quad t = \frac{D}{s}$$

$$3 \times 10^8 \text{ mi} \times \frac{1 \text{ day}}{1.5 \times 10^6 \text{ mi}} = \frac{3 \times 10^8 \text{ days}}{1.5 \times 10^6}$$

$$= 2 \times 10^2 \text{ days} = 200 \text{ days}$$

E.4 = c

E.5 If you drive your car at 20 miles/hour and then accelerate at a rate of 3 miles/hour every second, how fast will you be going after 8 seconds?

- a) 20 miles/hour
- b) 24 miles/hour
- c) 31 miles/hour
- d) 44 miles/hour
- e) 60 miles/hour

$$V_{final} = V_{initial} + a t$$

$$V_{final} = 20 \text{ mi/hr} + \left(\frac{3 \text{ mi/hr}}{\text{sec}} \times 8 \text{ sec} \right) =$$

$$V_{final} = 20 \text{ mi/hr} + 24 \text{ mi/hr} = 44 \text{ mi/hr}$$

E.5 = d

E.6 The engine of a 8,000 kg race car exerts a net force of 32,000 newtons in the horizontal direction. What is the acceleration of the car?

- a) $2.9 \times 10^8 \text{ m/s}^2$
- b) $4 \times 10^3 \text{ m/s}^2$
- c) 4 m/s^2
- d) 0.25 m/s^2
- e) none of the above is correct

$$F = M a$$

$$\frac{F}{M} = a = \frac{32,000 \text{ N}}{8,000 \text{ kg}} = \frac{32,000 \cancel{\text{ kg}} \text{ m/s}^2}{8,000 \cancel{\text{ kg}}}$$
$$= 4 \text{ m/s}^2$$

E.6 = c

Solutions to Period 3 Exercises

E.1 = c

E.2 = b

E.3 = a

E.4 = c

E.5 = d

E.6 = c