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 NOT TRUE?

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) All of the statements are TRUE.

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

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

E.3 = a
E.4 The Mars Pathfinder spacecraft traveled about $3 \times 10^8$ miles to reach Mars. It moved at an average speed of $1.5 \times 10^6$ 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

\[20 \text{ mi/hr} + (3 \text{ mi/hr} \times 8 \text{ sec}) = \text{ sec}\]

\[20 \text{ mi/hr} + 24 \text{ mi/hr} = 44 \text{ mi/hr}\]

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) $2.9 \times 10^8$ m/s$^2$

b) $4 \times 10^3$ m/s$^2$

c) 4 m/s$^2$

d) 0.25 m/s$^2$

e) none of the above is correct

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

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