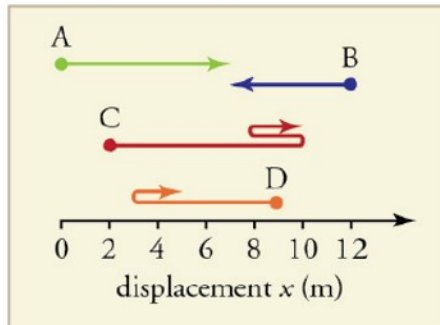


WA2 Answer Key

Monday, August 19, 2019 11:41 AM

1. Question Details

Find the following for path A in the figure below.



(a) the distance traveled (in m)

7 m

(b) the magnitude of the displacement (in m) from start to finish

7 m

(c) the displacement (in m) from start to finish

7 m

2. Question Details

OSColPhysAP2016 2.1.WA.001. [3570305]

A truck travels due east for a distance of 1.7 km, turns around and goes due west for 9.0 km, and finally turns around again and travels 2.5 km due east.

(a) What is the total distance that the truck travels?

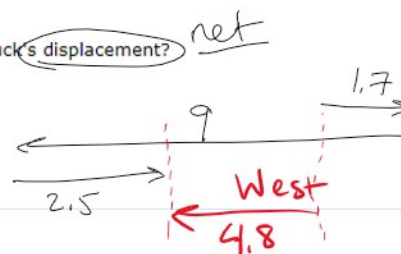
13.2 km

Add ... $1.7 + 9 + 2.5 = 13.2$

(b) What are the magnitude and direction of the truck's displacement?

magnitude 4.8 km

direction west



3. Question Details

OSColPhysAP2016 2.3

A helicopter blade spins at exactly 105 revolutions per minute. Its tip is 5.50 m from the center of rotation.

(a) Calculate the average speed (in m/s) of the blade tip in the helicopter's frame of reference.

60.5 m/s

$$\frac{105 \text{ rev}}{\text{min}} \times \frac{1 \text{ min}}{60 \text{ sec}} \times \frac{34.55 \text{ m}}{1 \text{ rev}} = 60.5 \text{ m/s}$$

(b) What is its average velocity (in m/s) over one revolution?

0 m/s

$$\text{velocity} = \frac{\text{displacement}}{\text{time}} = \frac{0}{\text{time}}$$

1 revolution = 1 circumference

$$C = 2\pi r$$

$$C = 2\pi(5.5)$$

$$C = 34.55 \text{ m}$$

4. Question Details

OSColPhysAP2016 2.3.P.007. [3604517]

4. Question Details

OSColPhysAP2016 2.3.P.007. [3604517]

The North American and European continents are moving apart at a rate of about 3 cm/y. At this rate how long will it take them to drift 560 km farther apart than they are at present?

 1.87e+07 y

$$560 \text{ km} \times \frac{\text{Year}}{3 \text{ cm}} \times \frac{100 \text{ cm}}{1 \text{ m}} \times \frac{1000 \text{ m}}{1 \text{ km}} = 18,666,666 \text{ years}$$

5. Question Details

OSColPhysAP2016 2.3.P.009. [3604576]

On May 26, 1934, a streamlined, stainless steel diesel train called the Zephyr set the world's nonstop long-distance speed record for trains. Its run from Denver to Chicago took 13 hours, 4 minutes, 58 seconds, and was witnessed by more than a million people along the route. The total distance traveled was 1633.8 km. What was its average speed in km/h?

 125 km/h

What was its average speed in m/s?

 34.7 m/s

$$V_{\text{avg}} = \frac{\Delta x}{\Delta t} = \frac{1633.8 \text{ km}}{13.0828 \text{ h}} = 125 \text{ km/h}$$

what decimal of an hour is this?

$$1 \text{ hr} = 3600 \text{ sec}$$

$$4 \text{ min } 58 \text{ sec} = 298 \text{ sec}$$

$$\frac{125 \text{ km}}{\text{hr}} \times \frac{1 \text{ hr}}{3600 \text{ s}} \times \frac{1000 \text{ m}}{1 \text{ km}} = 34.7 \text{ m/s}$$

$$\frac{298}{3600} = 0.0828$$

6. Question Details

OSColPhysAP2016 2.3.WA.005. [3570221]

Nerve impulses in the human body travel at a speed of about 100 m/s. A 1.7 m tall man accidentally drops a hammer on his toe. How long does it take for the nerve impulse to travel from his toe to his brain?

 0.017 s

time

$$t = \frac{\Delta x}{v} = \frac{1.7}{100} = 0.017 \text{ s}$$

7. Question Details

OSColPhys

A car moves in a straight line at 24.0 m/s for 8.0 miles, then at 30.0 m/s for another 8.0 miles.

(a) Is the car's average speed less than, greater than, or equal to 27.0 m/s?

- ☒ less than 27.0 m/s
☐ equal to 27.0 m/s
☐ greater than 27.0 m/s

$$8 \text{ miles} \times \frac{1600 \text{ m}}{1 \text{ mile}} = 12800 \text{ m} = 12.8 \text{ km}$$

$$V_{\text{avg}} = \frac{\Delta x_{\text{tot}}}{\Delta t_{\text{tot}}} = \frac{\Delta x_1 + \Delta x_2}{\Delta t_1 + \Delta t_2} = \frac{25600 \text{ m}}{533 + 426}$$

(b) Calculate the car's average speed. (Enter your answer to three significant figures.)

 26.7 m/s

$$V_{\text{avg}} = 26.7 \text{ m/s}$$

More time on slow speed

$$V_1 = 24 \text{ m/s}$$

$$\Delta x_1 = 12.8 \text{ km}$$

$$\Delta t_1 = 533 \text{ sec.}$$

$$V_2 = 30 \text{ m/s}$$

$$\Delta x_2 = 12.8 \text{ km}$$

$$t_2 = 426.6 \text{ s}$$

8. Question Details

OSColPhysAP2016 2.3.WA.010. [3570204]

You walk for 6.44 km with at a constant velocity of 2.56 m/s due west, turn around, and then walk with an average velocity of 0.430 m/s due east. From your starting point to your destination, your overall average velocity is 1.24 m/s due west. During the trip, how far east did you walk?

 855 m

$$\Delta x_1 = 6440 \text{ m}$$

$$V_1 = 2.56 \text{ m/s}$$

$$t_1 = 2516 \text{ s}$$

$$V_{\text{avg}} = \frac{\Delta x_{\text{tot}}}{\Delta t_{\text{tot}}} = \frac{6440 - \Delta x_2}{2516 + t_2}$$

$$1.24 = \frac{6440 - \Delta x_2}{2516 + \Delta x_2 / 0.43}$$

56

$$3119 + 2.88 \Delta x_2 = 6440 - \Delta x_2$$

$$3.88 \Delta x_2 = 3320$$

$$\Delta x_2 = ?$$

$$V_2 = 0.43$$

$$t_2 = ?$$

$$x_{\text{tot}} = 6440 - x_2$$

$$V_{\text{avg}} = 1.24$$

$$t_{\text{tot}} = 2516 + t_2$$

$$v_2 = ?$$

$$t_{\text{tot}} = 25/6 + t_2$$

$$3119 + 2.88 \Delta x_2 = 6440 - \Delta x_2$$

$$3.88 \Delta x_2 = 3320$$

$$\Delta x_2 = 856 \text{ m}$$

$$t_2 = \frac{\Delta x_2}{0.43}$$

9. Question Details

OSColPhysAP2

A cheetah can accelerate from rest to a speed of 29.5 m/s in 6.00 s. What is its acceleration (in m/s²)?

4.92 m/s²

$$\Delta x = \text{?} \quad a = \text{?}$$

$$v_i = 0 \quad \Delta t = 6$$

$$v_f = 29.5$$

$$v_f = v_i + at$$

$$29.5 = 0 + a(6)$$

$$a = 4.92 \text{ m/s}^2$$

10. Question Details

OSColPhysAP2

An Olympic-class sprinter starts a race with an acceleration of 4.10 m/s².

(a) What is her speed (in m/s) 2.10 s later?

8.61 m/s

$$v_f = v_i + at$$

$$v_f = 0 + (4.1)(2.10)$$

$$v_f = 8.61 \text{ m/s}$$

(b) Sketch a graph of her position vs. time for this period.

