

Chapter 1 Problems

1. Tectonic plates are large segments of the earth's crust that move slowly. Suppose one such plate has an average speed of 3.5 cm per year.

(a) What distance does it move in 96 seconds at this speed?

_____ m

(b) What is its speed in miles per million years?

_____ mi/My

2.(a) A car speedometer has a 7% uncertainty. What is the range of possible speeds when it reads 120 km/h?

_____ km/h (lowest)

_____ km/h (highest)

(b) Convert this to miles per hour.

_____ mi/h (lowest)

_____ mi/h (highest)

3. State how many significant figures are proper in the results of the following calculations:

(a) (106.7) (95.6) (46.210) (1.01)

(b) (18.7)2

(c) (2.9 × 10⁻¹⁹) (3712)

4.(a) How many significant figures are in the numbers 99.0 and 100.0?

99.0 _____

100.0 _____

(b) If the uncertainty in each number is 1, what is the percent uncertainty in each? (Give your answer to 3 significant figures.) If  displayed express number like 100 to 2 or 3 significant figures, use scientific notation example, 1.0e3 or 1.00e3

99.0		%
100.0		%

c) Which is a more meaningful way to express the accuracy of these two numbers, significant figures or percent uncertainties?

☐ significant figures

☐ percent uncertainties

5. If a marathon runner averages 6.3 mi/h, how long does it take him or her to run a 26.22-mi marathon?

_____ h

6. A generation is about one-third of a lifetime. Approximately how many generations have passed since the beginning of recorded history?

_____ Generations

7. Find the following for path A in Figure 2.21.

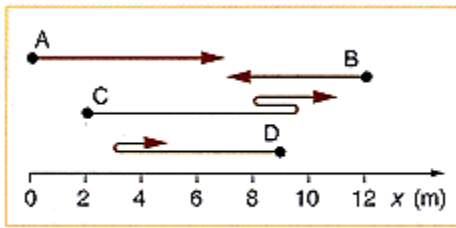


Figure 1-21.

(a) the total distance traveled

_____ m

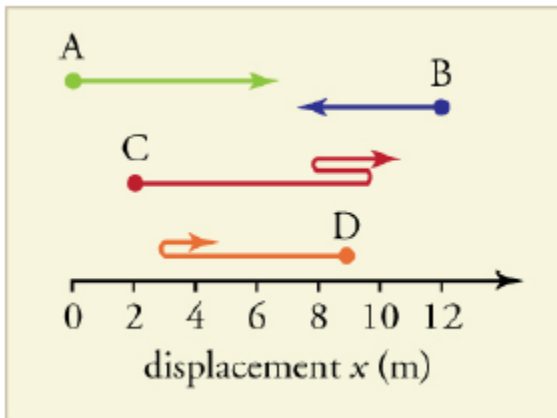
(b) the distance from start to finish

_____ m

(c) the displacement from start to finish

_____ m

8. Find the following for path A in the figure below.



(a) The distance traveled.

_____ m

(b) The magnitude of the displacement from start to finish.

_____ m

(c) The displacement from start to finish.

_____ m

9. 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? _____ km/h

What was its average speed in m/s? _____ m/s

10. A student drove to the university from her home and noted that the odometer on her car increased by 16.0 km. The trip took 20.0 min.

(a) What was her average speed? _____ km/h

(b) If the straight-line distance from her home to the university is 10.3 km in a direction 25.0° south of east, what was her average velocity? _____ km/h (25° S of E)

(c) If she returned home by the same path 7 h 30 min after she left, what were her average speed and velocity for the entire trip?

average speed _____ km/h

average velocity _____ km/h

11. A cheetah can accelerate from rest to a speed of 25.5 m/s in 4.50 s. What is its acceleration? _____ m/s²

12. Assume that an MX missile goes from rest to a suborbital velocity of 3.50 km/s in 70.0 s (the actual speed and time are classified). What is its average acceleration in m/s²? _____ m/s²

What is its average acceleration in multiples of g? _____ g

13. At the end of a race a runner decelerates from a velocity of 8.00 m/s at a rate of 0.500 m/s².

(a) How far does she travel in the next 16.0 s? _____ m

(b) What is her final velocity? _____ m/s

14. An unwary football player collides with a padded goalpost while running at a velocity of 6.50 m/s and comes to a full stop after compressing the padding and his body 0.250 m.

(a) How long does the collision last? _____ s

(b) What is his deceleration? _____ m/s²

15. A swimmer bounces straight up from a diving board and falls feet first into a pool. She starts with a velocity of 5.00 m/s, and her takeoff point is 1.30 m above the pool.

(a) How long are her feet in the air? _____ s

(b) What is her highest point above the board? _____ m

(c) What is her velocity when her feet hit the water? _____ m/s

16. A soft tennis ball is dropped onto a hard floor from a height of 1.90 m and rebounds to a height of 1.51 m. (Assume that the positive direction is upward.)

(a) Calculate its velocity just before it strikes the floor. _____ m/s

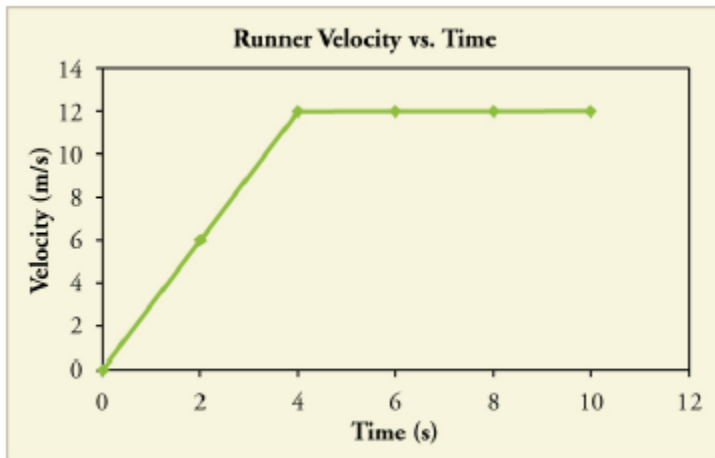
(b) Calculate its velocity just after it leaves the floor on its way back up. _____ m/s

(c) Calculate its acceleration during contact with the floor if that contact lasts 3.50 ms. _____ m/s²

(d) How much did the ball compress during its collision with the floor, assuming the floor is absolutely rigid?

_____ m

17. A graph of $v(t)$ is shown for a world-class track sprinter in a 100-m race. (See figure below).



- (a) What is his average velocity for the first 4 s? _____ m/s
- (b) What is his instantaneous velocity at $t = 4$ s? _____ m/s
- (c) What is his average acceleration between 0 and 4 s? _____ m/s^2
- (d) What is his time for the race? _____ s