**Speed Problems**

1. What two units of measurement are necessary for describing speed?

2. Distinguish average speed from instantaneous speed.

3. What is the average speed of a horse that gallops a distance of 15 km in a time interval of 30 minutes?

4. How far does a horse travel if it gallops at an average speed of 25 km per hour for ½ hour?

5. Distinguish between speed and velocity.

6. If a car moves with a constant velocity, does it also move with a constant speed? Explain.

7. How long does it take a car to travel 100 km at a speed of 25 km per hour?

8. What is the average speed of a tank that covers 30 m in a time 10 seconds?

9. How long does it take a pitch of a baseball thrown at an average speed of 1.94 x 101 m per second to travel 18.4 meters (~60 feet)?

10. It takes a baseball player 13.2 seconds to round the bases (assume each base is 27.6 meters) after hitting an inside the park home run. What was this baseball player’s average speed?

11. A bullet leaves the nozzle of a gun at a speed of 6.728 x 102 m/s. How far will that bullet travel in meters if it hits a target straight ahead of it in 0.8 seconds? (Assume no air resistance) Convert your answer into kilometers.

12. A care moving east at 45 km/h turns and travels west at 30 km/h. What are the magnitude and direction of the change in velocity?

13. You are riding in a bus moving slowly through heavy traffic at 2 m/s. You hurry to the front of the bus at 4 m/s relative to the bus. What is your speed relative to the ground?

14. You are riding in a bus moving slowly through heavy traffic at 4 m/s. You hurry from the front of the bus to the rear at 4 m/s relative to the bus. What is your speed relative to a person watching you from the street?

15. A boat is rowed directly upriver at a speed of 2.5 m/s relative to the water. Viewers on the shore find that it is moving at only 0.5 m/s relative to the shore. What is the speed of the river? Is it moving with or against the boat?

**Speed Problems**

1. What two units of measurement are necessary for describing speed?

d

 *Distance in meters time in seconds*

t

v

2. Distinguish average speed from instantaneous speed.

 *Average speed is total distance divided by total time or the sum of several trials of speed divided by the total number of trials*

 *Instantaneous speed is the speed at a given moment in time*

3. What is the average speed of a horse that gallops a distance of 15 km in a time interval of 30 minutes?

 *V = d/t = 15 km / 30 min = 0.5 km/min or 5 x 101 km/min*

4. How far does a horse travel if it gallops at an average speed of 25 km per hour for ½ hour?

 *d = v t = 25 km/hr x 0.5 hr = 12.5 hours or 1.25 x 10****1*** *hr*

5. Distinguish between speed and velocity.

 *Speed is a scalar quantity (no direction); velocity is a vector quantity (magnitude + direction)*

6. If a car moves with a constant velocity, does it also move with a constant speed? Explain.

 *The magnitude of speed and velocity are identical. If velocity is constant, then speed is also constant. Speed, however, gives no indication of direction.*

7. How long does it take a car to travel 100 km at a speed of 25 km per hour?

 *t = d/v = 100 km / 25 km/hr = 4 hours*

8. What is the average speed of a tank that covers 30 m in a time 10 seconds?

 *Avg speed = total distance / total time = 30 m / 10 s = 3 m/s*

9. How long does it take a pitch of a baseball thrown at an average speed of 1.94 x 101 m per second (70 mph) to travel 18.4 meters (~60 feet)?

 *t = d/v = 18.4 m / 1.94 x 101 m/s = 0.95 s or 9.5 x 10****-1*** *s*

10. It takes a baseball player 13.2 seconds to round the bases (assume each base is 27.6 meters) after hitting an inside the park home run. What was this baseball player’s average speed?

 *V = d/t = (27.6 m/base x 4 bases) / 13.2 s = 8.4 m/s or ~19 mph (that's fast!!)*

11. A bullet leaves the nozzle of a gun at a speed of 6.728 x 102 m/s. How far will that bullet travel in meters if it hits a target straight ahead of it in 0.8 seconds? (Assume no air resistance) Convert your answer into kilometers.

 *d = v t = 6.728 x 10****2*** *m/s x 0.8 s = 5.38 x 10****2*** *m or 0.538 km*

12. A car moving east at 45 km/h turns and travels west at 30 km/h. What are the magnitude and direction of the change in velocity?

 *= 45 km/h - (-30 km/h) = 75 km/h to the west … you have to indicate direction with each measurement, so when the car reverses direction, the magnitude is negative (-).*

13. You are riding in a bus moving slowly through heavy traffic at 2 m/s. You hurry to the front of the bus at 4 m/s relative to the bus. What is your speed relative to the ground?

 *= + 2 m/s + 4 m/s = 6 m/s relative to the ground … you are moving in the same direction as the bus so both velocities add together.*

14. You are riding in a bus moving slowly through heavy traffic at 4 m/s. You hurry from the front of the bus to the rear at 4 m/s relative to the bus. What is your speed relative to a person watching you from the street?

 *= + 4 m/s - 4 m/s = 0 m/s relative to the person watching from the street. To that person on the street it looks like you are not moving at all.*

15. A boat is rowed directly upriver at a speed of 2.5 m/s relative to the water. Viewers on the shore find that it is moving at only 0.5 m/s relative to the shore. What is the speed of the river? Is it moving with or against the boat?

 *2.5 m/s - River speed = 0.5 m/s = 2.5 m/s – 0.5 m/s = 2.0 m/s river speed which is “against” the boat because the boat appears to be moving slower than it really is.*