

OBJECTIVE: Describe motion both qualitatively and quantitatively with respect to distance/displacement, speed/velocity, and acceleration (Obj 1) and Create and interpret position/time, velocity/time, and acceleration/time motion graphs of objects (Obj 2)

LINKS TO RESOURCES:

Tutorial: <https://www.physicsclassroom.com/Class/1DKin/U1L1a.cfm>

Review Questions (see below): <http://www.physicsclassroom.com/reviews/1DKin/1DKinprint.cfm>

Answers: <https://www.physicsclassroom.com/reviews/1DKin/1DKinans.cfm> *I cut some questions out, so you may need to figure out which question goes with which answer.

Part A: Multiple TRUE/FALSE

1. Which of the following statements about vectors and scalars are **TRUE**? Highlight all that apply.

1. A vector is a large quantity and a scalar is a small quantity.
2. A scalar quantity has a magnitude and a vector quantity does not. *both have mag.*
3. A vector quantity is described with a direction and a scalar is not.
4. The quantity 20 m/s, north is a speed and as such is a scalar quantity. *it is v*
5. The quantity 9.8 m/s/s is an acceleration value and as such is a vector quantity. *- needs dir.*

2. Which of the following statements about distance and/or displacement are **TRUE**? Highlight all that apply.

1. Distance is a vector quantity and displacement is a scalar quantity.
2. A person makes a round-trip journey, finishing where she started. The displacement for the trip is 0 and the distance is some nonzero value.
3. A person starts at position A and finishes at position B. The distance for the trip is the length of the segment measured from A to B. *not necessarily A.....B*
4. If a person walks in a straight line and never changes direction, then the distance and the displacement will have exactly the same magnitude.
5. The phrase "20 mi, northwest" likely describes the distance for a motion. *if dir \Rightarrow displacement*
6. The phrase "20 m, west" likely describes the displacement for a motion.

3. Which of the following statements about velocity and/or speed are **TRUE**? Highlight all that apply.

1. Velocity is a vector quantity and speed is a scalar quantity.
2. Both speed and velocity refer to how fast an object is moving. *v is rate away from original pos.*
3. The velocity of an object refers to the rate at which the object's position changes.
4. For any given motion, it is possible that an object could move very fast yet have an abnormally small velocity.
5. The phrase "30 mi/hr, west" likely refers to a scalar quantity. *dir \Rightarrow vector*
6. The average velocity of an object on a round-trip journey would be 0.
7. The direction of the velocity vector is dependent upon two factors: the direction the object is moving ~~and whether the object is speeding up or slowing down.~~

4. Which of the following statements about acceleration are **TRUE**? Highlight all that apply.

1. Acceleration is a vector quantity.
2. Accelerating objects **MUST** be changing their speed. *could be just dir.*
3. Accelerating objects **MUST** be changing their velocity.
4. Acceleration units include the following; m/s², mi/hr/sec, cm/s², km/hr/m.
5. The direction of the acceleration vector is dependent upon two factors: the direction the object is moving and whether the object is speeding up or slowing down.
6. An object which is slowing down has an acceleration.
7. An object which is moving at constant speed in a circle has an acceleration.

8. Acceleration is the rate at which the velocity changes.

9. An object that is accelerating is moving fast. *not necessarily*

10. An object that is accelerating will eventually (if given enough time) be moving fast. *not necessarily*

11. An object that is moving rightward has a rightward acceleration. *if @ motion but slowing down \Rightarrow @ accel.*

12. An object that is moving rightward and speeding up has a rightward acceleration.

13. An object that is moving upwards and slowing down has an upwards acceleration. *if obj. is slowing down then accel. vector is in opp. dir. of motion*

**SKIP #5-7

Part B: Multiple Choice: Highlight the correct answer.

8. If an object has an acceleration of 0 m/s^2 , then one can be sure that the object is not ____.

a. moving

b. changing position

c. changing velocity

9. If car A passes car B, then car A must be ____.

1. accelerating.

2. accelerating at a greater rate than car B.

3. moving faster than car B and accelerating more than car B.

4. moving faster than car B, but not necessarily accelerating.

10. Which one of the following is NOT consistent with a car which is accelerating?

1. A car is moving with an increasing speed.

2. A car is moving with a decreasing speed.

3. A car is moving with a high speed.

4. A car is changing direction.

11. A fullback is running down the football field in a straight line. He starts at the 0-yard line at 0 seconds. At 1 second, he is on the 10-yard line; at 2 seconds, he is on the 20-yard line; at 3 seconds, he is on the 30-yard line; and at 4 seconds, he is on the 40-yard line. This is evidence that

1. he is accelerating

2. he is covering a greater distance in each consecutive second.

3. he is moving with a constant speed (on average).



12. A fullback is running down the football field in a straight line. He starts at the 0-yard line at 0 seconds. At 1 second, he is on the 10-yard line; at 2 seconds, he is on the 20-yard line; at 3 seconds, he is on the 30-yard line; and at 4 seconds, he is on the 40-yard line. What is the player's acceleration? *0 m/s^2 , v is unchanging*

13. Olympic gold medalist Michael Johnson runs one time around the track - 400 meters - in 38 seconds. What is his displacement? *0 m* What is his average velocity? *0 m/s*

14. If an object is moving eastward and slowing down, then the direction of its velocity vector is ____.

a. eastward

b. westward

c. neither

d. not enough info to tell

15. If an object is moving eastward and slowing down, then the direction of its acceleration vector is ____.

~~a. eastward~~

b. westward

c. neither

d. not enough info to tell

*E \rightarrow #14 * Dir of v vector is always the same dir as obj. moves
slowing #15 * Dir of a vector (when slowing down) is in opp dir. of obj. motion*

16. Which one of the following quantities is NOT a vector?

- a. 10 mi/hr, east b. 10 mi/hr/sec, west c. 35 m/s, north **d. 20 m/s**

No dir.

17. Which one of the following quantities is NOT a speed?

- a. 10 mi/hr **b. 10 mi/hr/sec** c. 35 m/s d. 20 m/s

accel.

18. Which one of the following statements is NOT true of a free-falling object? An object in a state of free fall

1. falls with a constant speed of -10 m/s.
2. falls with an acceleration of -10 m/s/s. (*rounded from -9.8 m/s²*)
3. falls under the sole influence of gravity.
4. falls with downward acceleration which has a constant magnitude.

19. The average speed of an object which moves 10 kilometers (km) in 30 minutes is _____. *$\frac{10 \text{ km}}{.5 \text{ hr}} = 20 \text{ km/hr}$*

- a. 10 km/hr **b. 20 km/hr** c. 30 km/hr d. more than 30 km/hr

20. What is the acceleration of a car that maintains a constant velocity of 55 mi/hr for 10.0 seconds?

- a. 0** b. 5.5 mi/hr/s c. 5.5 mi/s/s d. 550 mi/hr/s

21. As an object freely falls, its _____.

- a. speed increases** *constant accel of -9.8 m/s²* b. acceleration increases
c. both of these d. none of these

22. A speedometer is placed upon a free-falling object in order to measure its instantaneous speed during the course of its fall. Its speed reading (neglecting air resistance) would increase each second by _____.

- a. about 5 m/s **b. about 10 m/s** *rounded from -9.8 m/s²* c. about 15 m/s
d. a variable amount e. depends on its initial speed.

23. Ten seconds after being dropped from rest, a free-falling object will be moving with a speed of _____.

- a. about 10 m/s. b. about 50 m/s. **c. about 100 m/s.** d. more than 100 m/s.

24. A baseball pitcher delivers a fast ball. During the throw, the speed of the ball increases from 0 to 30.0 m/s over a time of 0.100 seconds. The average acceleration of the baseball is _____ m/s². *$\frac{30.0 - 0 \text{ m/s}}{.100 \text{ sec}} = 300.$*

- a. 3.00 b. 30.0 **c. 300.** d. 3000 e. none of these

25. On takeoff, a rocket accelerates from rest at a rate of 50.0 m/s² for exactly 1 minute. The rocket's speed after this minute of steady acceleration will be _____ m/s.

- a. 50.0 b. 500. **c. 3.00 x 10³** d. 3.60 x 10³ e. none of these
- $50.0 \text{ m/s}^2 = \frac{v_f - 0 \text{ m/s}}{60 \text{ sec}} = 3000$*

26. When a rock is dropped, it will accelerate downward at a rate of 9.8 m/s². If the same rock is thrown downward (instead of being dropped from rest), its acceleration will be _____. (Ignore air resistance effects.)

- a. less than 9.8 m/s² **b. 9.8 m/s²** c. more than 9.8 m/s²

