FPS – Unit 2 Review

Name_____ Period_____

Conceptual Understanding

1. What is a frame of reference and why do we need one?

   Frame of reference is an object or set of objects selected to observe relative motion. It is necessary to pick a good frame of reference to accurately observe motion, typically a fixed or stationary frame of reference, to determine speed and direction of motion.

2. Give an example of a scenario in which you need a frame of reference.

   Riding in a car, riding in a train, walking on a train, walking….anything where motion is occurring.

3. What is a distance?

   The measure of a length or a path taken.

4. What is the SI Unit for distance?

   Meters (kilometers and centimeters are used when measuring large and small distances, but they themselves are not the SI unit.)

5. What is a displacement?

   The straight change in position from the starting position to the final position and its direction, making it a vector.

6. How is displacement different from distance?

   It includes direction.

7. What is the SI Unit for displacement?

   Meters

8. What is a vector quantity?

   Includes magnitude and direction.

9. What is a resultant vector?

   Combination (or sum) of all vectors involved.

10. What is speed? What are the SI units for speed?

Speed is the measure of how fast an object is moving using the ratio of distance per time. SI units are meters per second (m/s).

11. How is instantaneous speed different from average speed?

Instantaneous speed provides the speed at a precise moment, average speed provides the distance traveled in the total time.

12. What information does a speedometer provide you with?

Instantaneous speed.

13. What is velocity? How is it different from speed?

Velocity is the speed of an object in a particular direction. It is different from speed because it includes the direction of motion.

14. What is acceleration? What are the ways an object can accelerate?

Acceleration is the rate of the change of velocity. An object can accelerate by changing speed (decreasing or increasing), changing direction, or by changing both speed and direction.

15. What is the value of acceleration due to gravity?

Acceleration due to gravity is always 9.8 m/s^2.

16. Define the ways each of the examples are accelerating: a horse on a carousel, a roller coaster, a plane taking off, a car stopping in a straight line.

Horse on a carousel: changing direction

Roller coaster: changing speed and direction

Plane taking off: changing speed and direction

Car stopping in straight line: changing speed

17. Define constant acceleration. How does it look on a speed-time graph? How does it look on a distance-time graph?

Constant acceleration is motion of an object that changes velocity at a constant rate. On a speed-time graph, it is a straight diagonal line. On a distance-time

graph, it is a curved nonlinear graph.

18. Write the equation for velocity and for acceleration and label all variables.

$$a = \frac{vf - vi}{t}$$

$$v = \frac{d}{t}$$

Applying Concepts

19. List three vector quantities.

Displacement, velocity, acceleration

20. You are riding in a car that is travelling 50 km/hr east. You look out the window and see a train that seems to also be moving in a similar velocity, and you see some trees as well. Which is the better frame of reference for the car's motion? Why?

Trees are better because they are stationary and will actually provide information for relative motion. Relative motion with the train shows virtually no change.

21. You walk 1.2 miles east to school from home. Then, you walk 0.2 east to the store, and then return home. What is your total displacement? Distance?

Displacement: 0 m Distance: 2.8 miles

22. You walk 1.4 miles east to the store, and then walk 0.2 miles west to school. What is your total displacement? Distance?

Displacement: 1.2 miles east Distance: 1.6 miles

23. You walk 3 blocks west and then 6 blocks north to get to school, but your crow flies straight to school and beats you there. Explain what this example demonstrates and in the total displacement of this scenario.

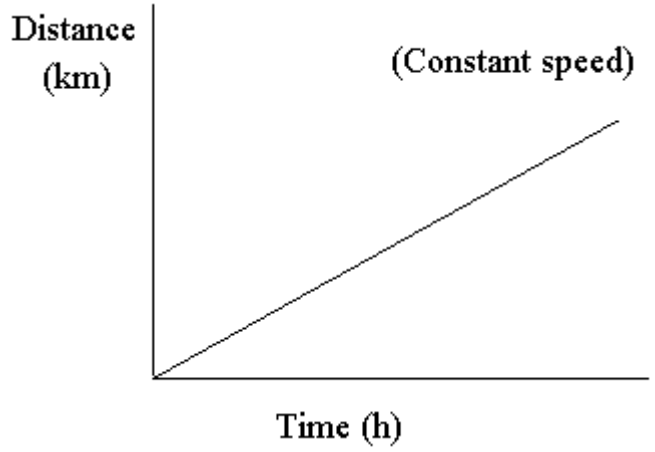
My path is the total distance traveled, but the pet crow demonstrates the displacement—which is the straight vector from the initial position to the final position, and is shorter in this case than the distance.

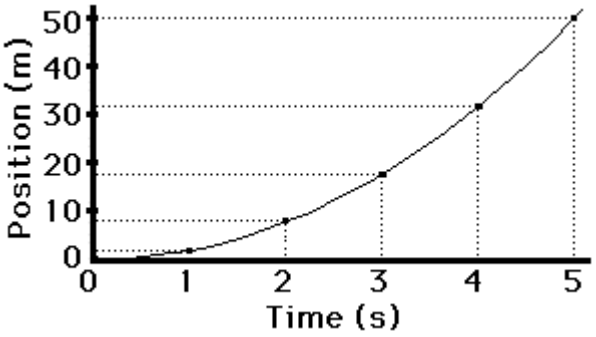
24. A rock free falls for 3 seconds. At what speed does it hit the ground with? (Think of gravity.)

Acceleration of gravity is 9.8 m/s^2, so after 3 seconds from rest the rock would hit the ground with a speed of 29.4 m/s.

25. On a distance-time graph, what would the curve describing constant speed look like? Constant acceleration? Describe and sketch them.

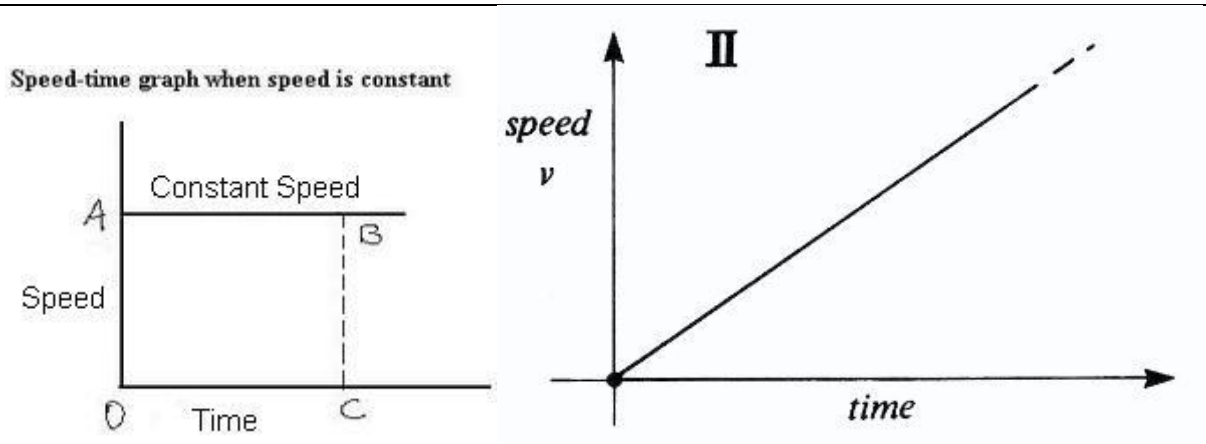
Constant speed would look like a straight diagonal line, constant acceleration would look like a curved line.





26. On a speed-time graph, what would the line describing constant speed look like? Constant acceleration? Describe and sketch them.

Constant speed would look like a straight horizontal line, constant acceleration would look like a straight diagonal line.

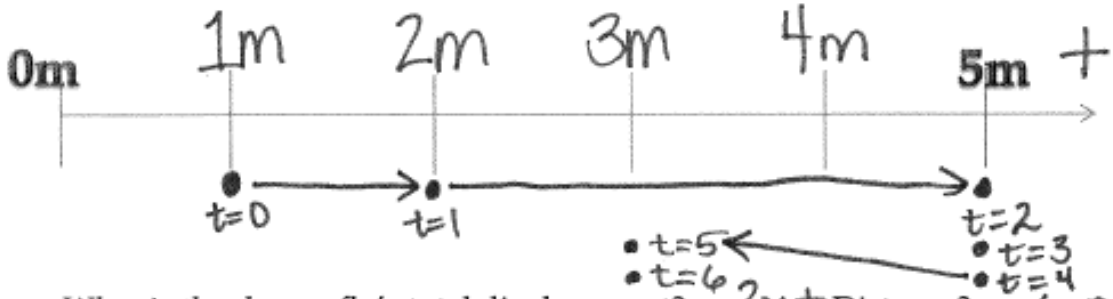


27. If an object is traveling with constant velocity, what do you know about the acceleration?

If the velocity is not changing at all, the acceleration would be zero.

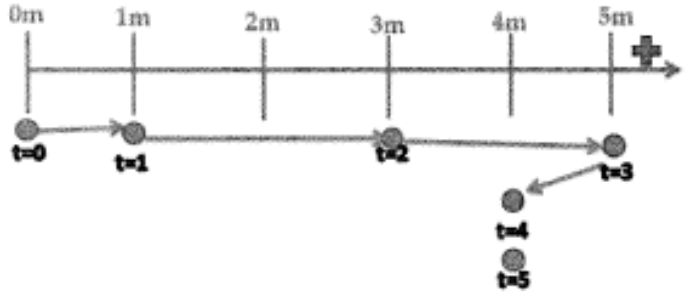
Calculations & Graphing

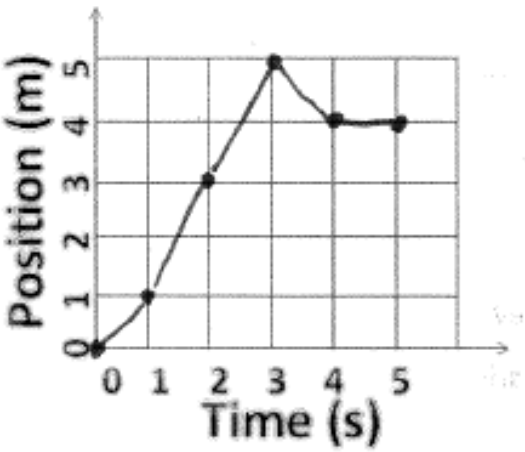
28. A dragonfly flies from 1m to 2m in 1 sec. Then she zooms to 5m in 1 sec and stays there for 2 sec. Then, she flies to 3m in another second and stays there for anotehr second. Create the motion map.



What is the dragonfly's total displacement? 2m+ Distance? 6m

29. From the motion map, create a position v. time graph.





Describe the motion of the object.

Moves to 1m in 1 sec.
Increases speed & Travels 4m (1-3; 3-5) in 2sec
Turns around & returns to 4m in 1 sec.
stationary for 1 sec.

28. Describe what is occurring in the following speed-time graph from 0-20 seconds.

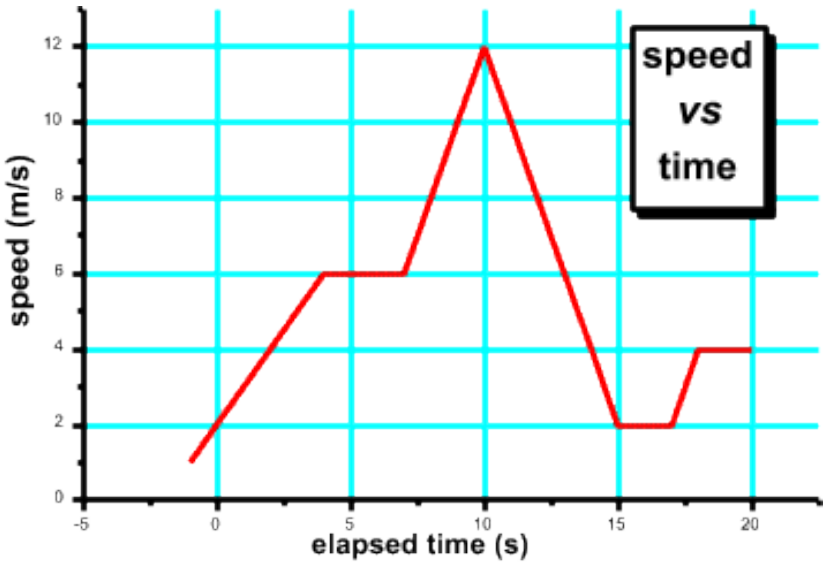
increasing speed 0-4 s, constant speed 4-6 s, increasing speed 6-10s, decreasing speed 10-15 s, constant speed 15-17 s, increasing speed 17-18s, constant speed 18-20 s.

29. Referring to the same graph, is the object ever stationary? How do you know?

NO—because the graph never reaches 0 m/s of speed.

30. During which approximate time intervals is the object accelerating?

0-4s, 6-10s, 10-15s, 17-18s.



33. Plot a speed-time graph with the following data. Don't forget all appropriate labels!

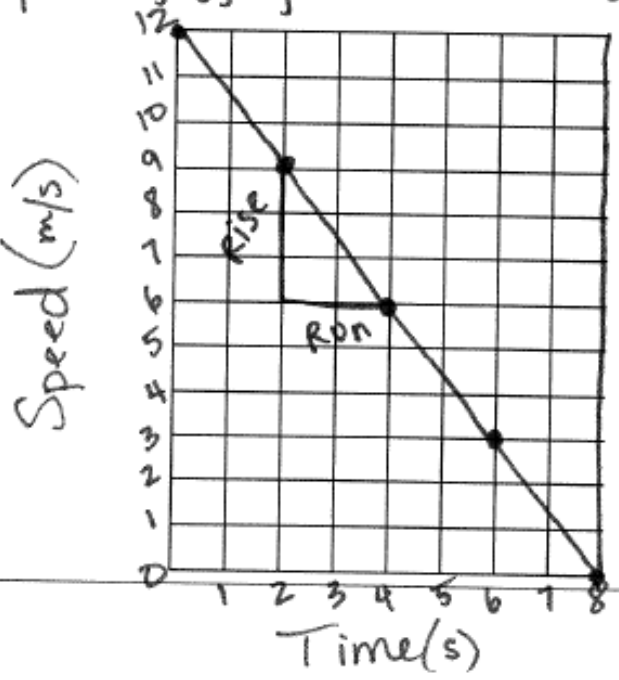
a. What is the slope of the line? $-1.5\ m/s^2$

b. Is the acceleration positive, negative, or zero? How do you know? slope is negative

c. Is the object ever at constant velocity? Constant acceleration? no yes

d. Describe a story for the motion depicted on the graph. A person jogging slows to a complete stop.

Speed	Time
12 m/s	0 s
9 m/s	2 s
6 m/s	4 s
3 m/s	6 s
0 m/s	8 s



$slope = \frac{-3\ m/s}{2\ s} = -1.5\ m/s^2$