1. Describe why frame of reference is important and give two examples of how a choice of frame of reference can give two different results for the same object in motion.

2. Suppose you are in a car traveling 75 km/h East; relative to you, what is the velocity of the following cars (velocities given are relative to an observer on the side of the road)
    a. A bus is driving 85 km/h [E].

    b. A minivan is driving 45 km/h [E].

    c. A truck is driving 100 km/h [W].

    d. A police car is driving 75 km/h [W].

3. What is the different between an object's distance traveled and position?

4. What is the difference between speed and velocity?

5. In what situations are the magnitudes of speed and velocity the same? Different?

6. Give an example when an object's average velocity is zero but its average speed is not zero.

7. Define acceleration. Why is deceleration a poor choice of wording?

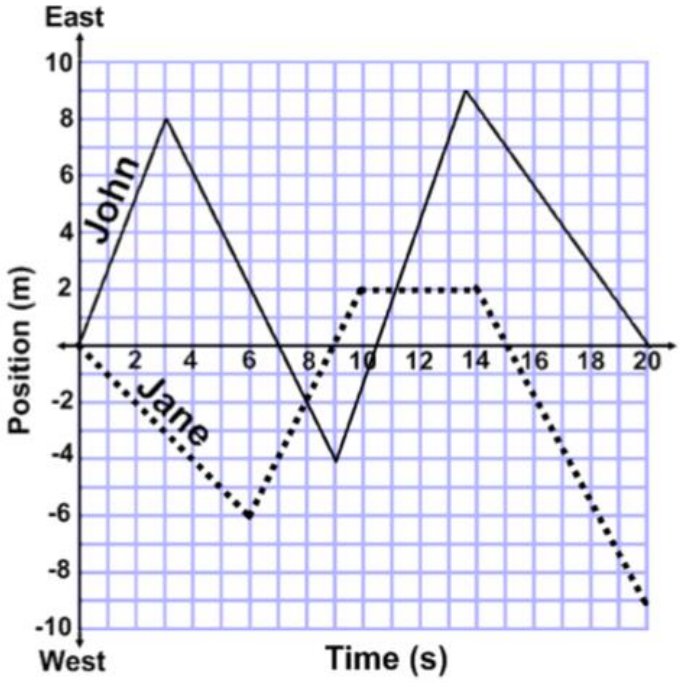
8. An object is moving at 20 m/s [E] and after 10 seconds it is moving 5 m/s [E].
   a. What is the direction of the object after the 10 seconds?

   b. What is the direction of the acceleration during the 10 seconds?

9. Is it possible for an object to have an instantaneous velocity of zero but still be accelerating? If so, provide an example.

10. Is uniform acceleration considered uniform motion? Provide a brief explanation.

11. Use the following Position-Time graph to answer a – h.



a. At what times did John change direction?

b. Calculate the velocity of each person at the 2 second mark.

c. Calculate the distance traveled during the first 10 seconds for each person.

   d. Calculate the distance traveled west by each person.

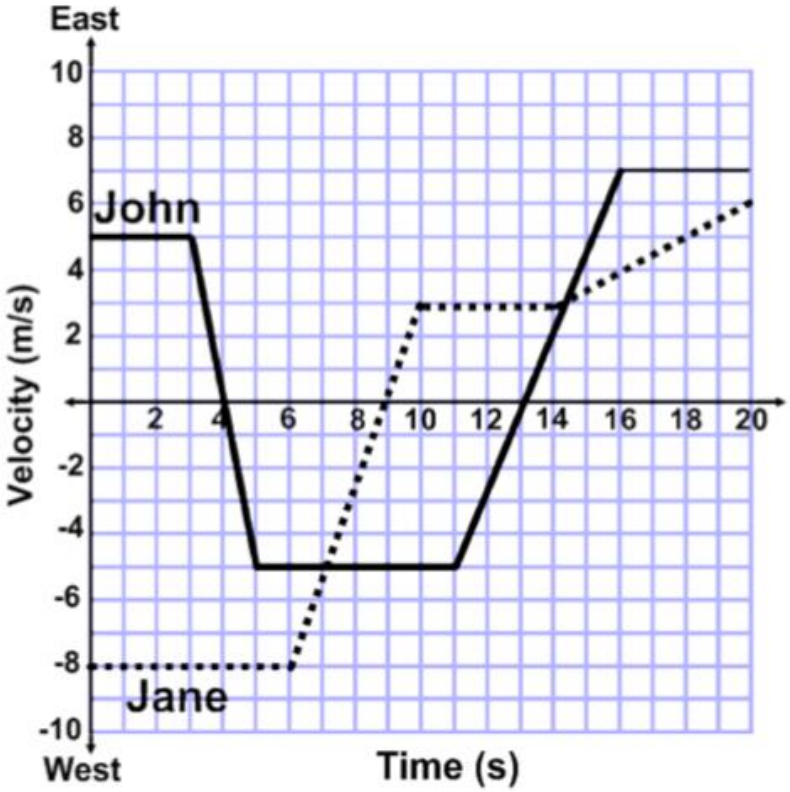
   e. At what times did each person return to the starting position?

f. For each person, during what time intervals were the people east of the starting point but traveling west.

g. At what times was each person the same position from the starting point?

h. Calculate the average speed and average velocity for each person for the full 20 s.

12. Use the following Velocity-Time graph for the remaining questions.



a. At what times did each person change their direction?

b. Calculate each person's acceleration at 4 and 8 seconds.

c. At what time did John return to the starting position?

d. At what times did each person have the same velocity? Where they in the same position?

e. During what time intervals was each person's velocity west but the acceleration was east?

f. For how many seconds was each person not accelerating?

g. Calculate the total distance and final position for each person.

h. Calculate the average speed and average velocity for each person.