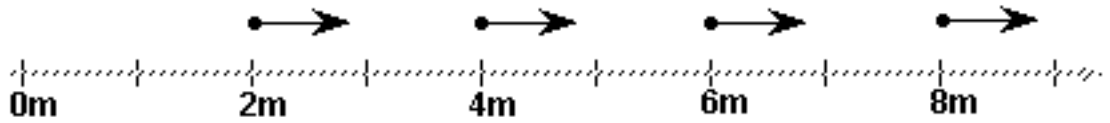
Name_____

Date_____ Pd____

Constant Velocity Model Worksheet 4:

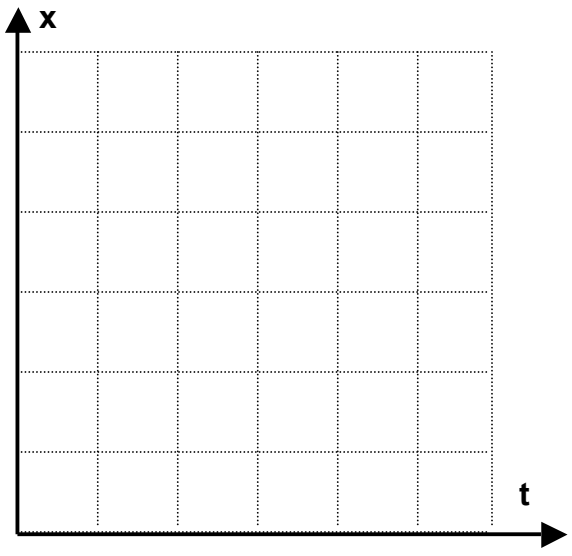
Velocity vs. Time Graphs and Displacement

1. This motion map shows the position of an object once every second. From the motion map, answer the following:

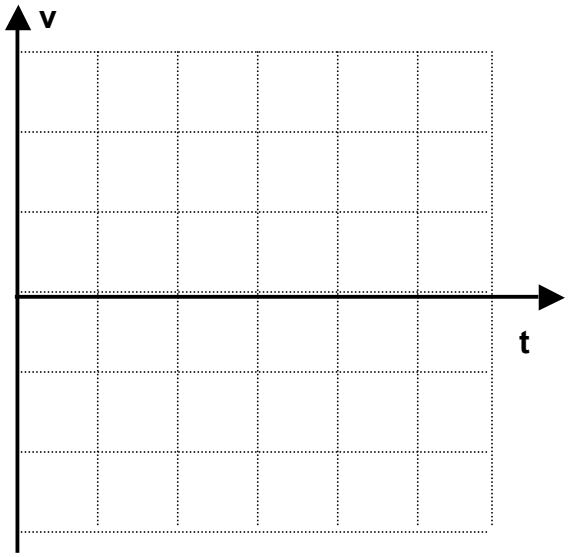


a. Describe the motion of the object.

b. Represent the motion with a quantitative **x** vs. **t** graph.



c. Represent the motion with a quantitative **v** vs. **t** graph.



d. Write a mathematical expression that represents the relationship between position and time.

e. Write a mathematical expression that represents the relationship between velocity and time.

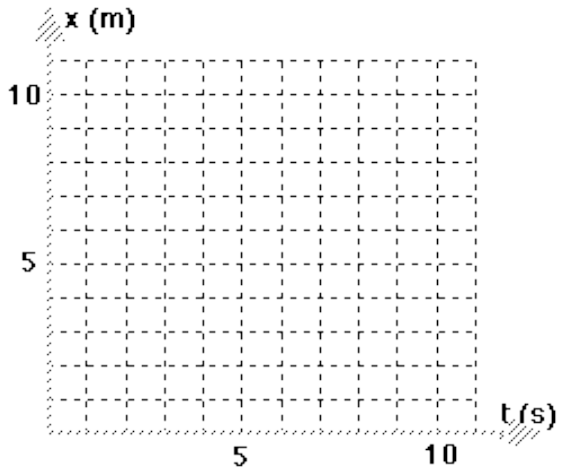
f. Cross hatch the area under the velocity-time graph. What are the units of this area? Describe what the area under the v-t graph represents and find its value.

2. From the position vs. time data below, answer the following questions.

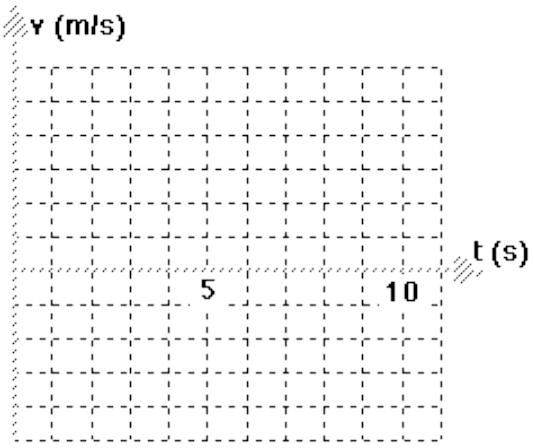
a. Construct a graph of position vs. time.

b. Construct a graph of velocity vs. time.

t (s)	x (m)
0	0
1	2
2	4
3	4
4	7
5	10
6	10
7	10
8	5
9	0

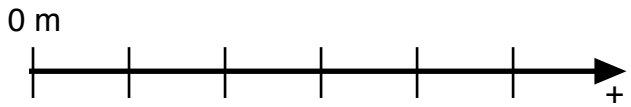


(A)



(B)

c. Draw a motion map for the object.



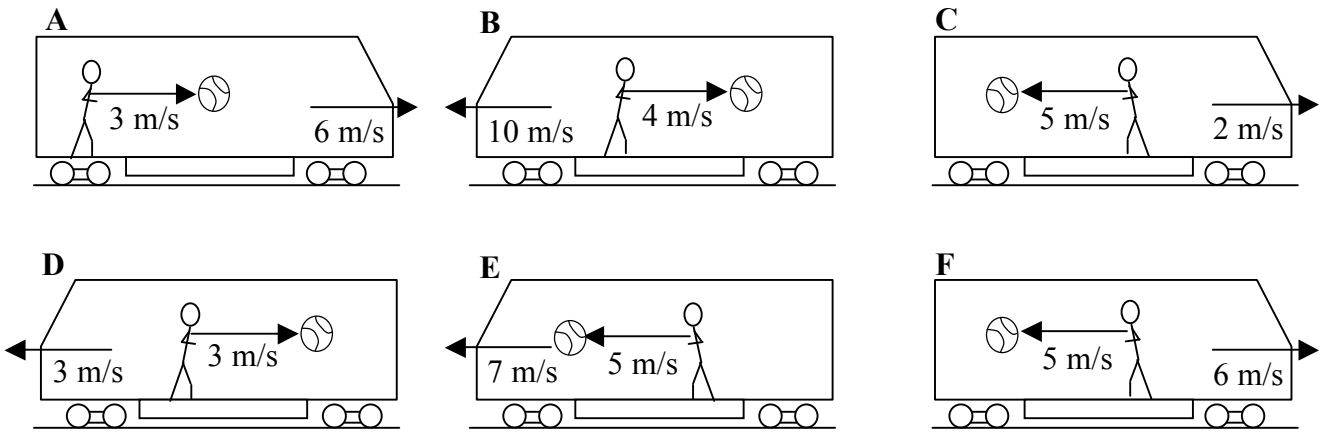
d. Determine the displacement from t = 3.0s to 5.0s using the velocity vs. time graph.

e. Determine the displacement from t = 7.0 s to 9.0 s using the velocity vs. time graph.

f. Determine the average **velocity** from t = 4 s to 8 s.

g. Determine the average **speed** from t = 4 s to 8 s.

3. In the following situations, a passenger is throwing a baseball on a moving train. Rank the baseball's speed and velocity relative to the ground. Motion to the left is negative and to the right is positive.



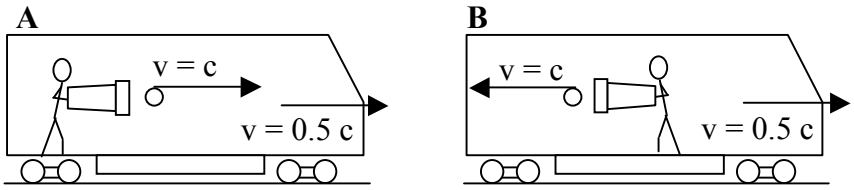
a. Most pos. velocity → _____ _____ _____ _____ _____ _____ ← most neg. velocity

b. Fastest speed → _____ _____ _____ _____ _____ _____ ← slowest speed

c. What is the difference between speed and velocity?

Constant velocity extension (relativity):

4. In the following situation, the person holds a laser. A pulse of light emerges from the laser at the speed of light, c. Our train (or spaceship) now travels at half the speed of light.



a. How fast does the light pulse travel away from the person on the train in situations A and B? Explain your reason for your answer.

b. How fast does the light pulse travel relative to the ground in situations A and B? Explain your reason for your answer.

c. Does the speed of light

i. depend upon the motion of the light source relative to the observer?
If so, can we say that the speed of light is a constant?

ii. remain constant, regardless of the motion of the light source to the observer?
If so, how can the speed of the light pulse relative to the person in the train and relative the person on the ground be reconciled?