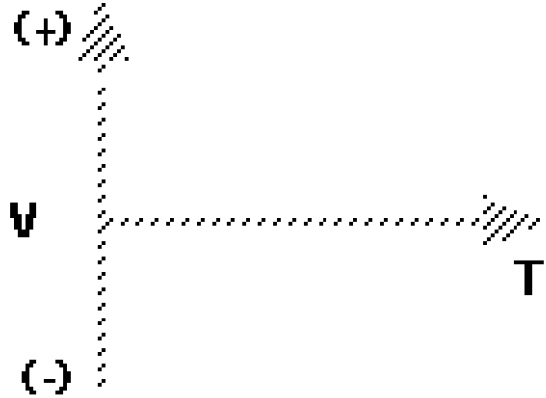## Unit 2 Kinematics Worksheet 1:
Position vs. Time and Velocity vs. Time Graphs

Sketch velocity vs. time graphs corresponding to the following descriptions of the motion of an object:

1. The object moves toward the origin at a steady speed for 10s, then stands still for 10s. (There are two possible graphs)

(+)

V

T

(-)

2. The object moves away from the origin at a steady speed for 10s, reverses direction and moves back toward the origin at the same speed. (There are two possible graphs)
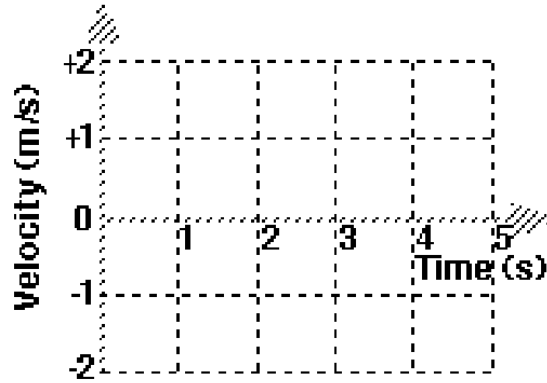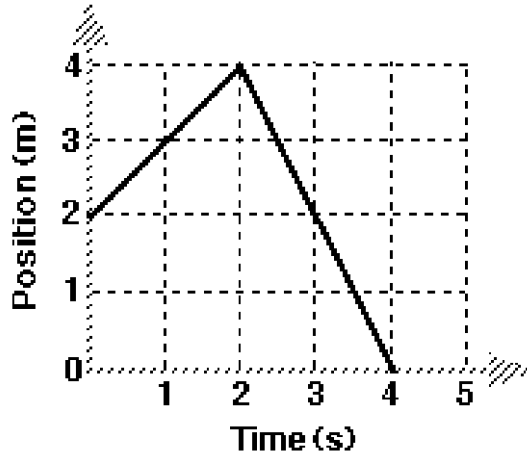
(+)

V

T

(-)
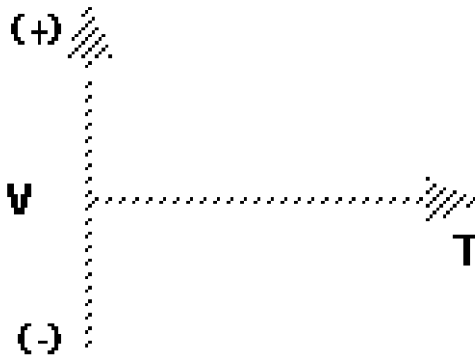
3. a) Draw the velocity vs. time graph for an object whose motion produced the position vs time graph shown below at left.
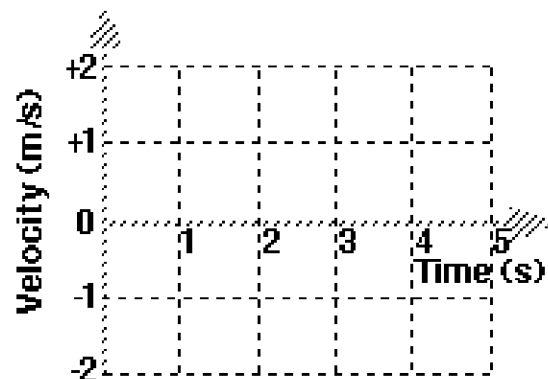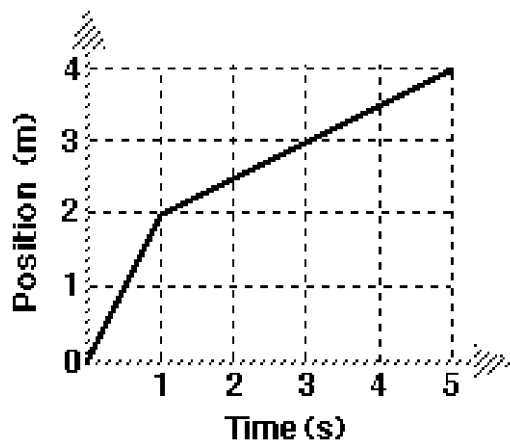
b) Determine the average speed and average velocity for the entire 5 sec trip.

4. a) Draw the velocity vs. time graph for an object whose motion produced the position vs time graph shown below at left.


b) Determine the average speed and average velocity for the entire 4 sec trip.

5. For many graphs, both the **slope** of the plot and the **area** between the plot and the axes have physical meanings.

   a. What does the slope of a position time graph tell you about the motion of an object?

   b. Looking at the velocity time graphs (Questions 3 and 4), determine the units for a square of area on the graph.

   c. What quantity does the area under the velocity-time graph tell you about the motion of an object?

6. Describe the motion in words given the following position vs. time graph (for each segment, mention starting position, direction of motion, rate of motion)

Verbal Description
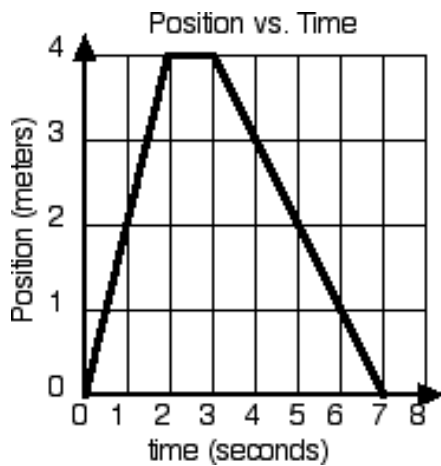
7. Given the following verbal description draw a position vs. time graph.

An object starts at 5 meters and moves to the left at constant speed for 3 seconds. The object stops for 2 seconds and then continues in the same direction and speed as before for 2 more seconds. The object stops for 2 seconds and then moves to the right for 2 seconds at a greater speed.
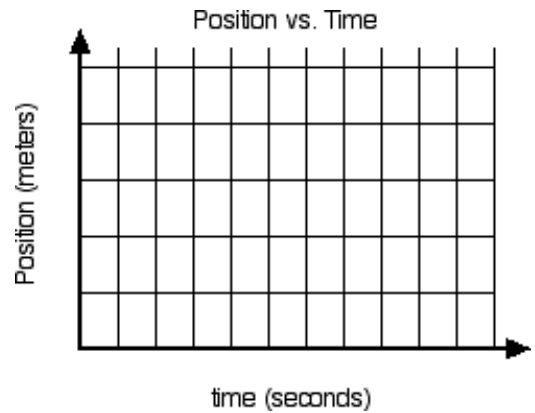
Position vs. Time
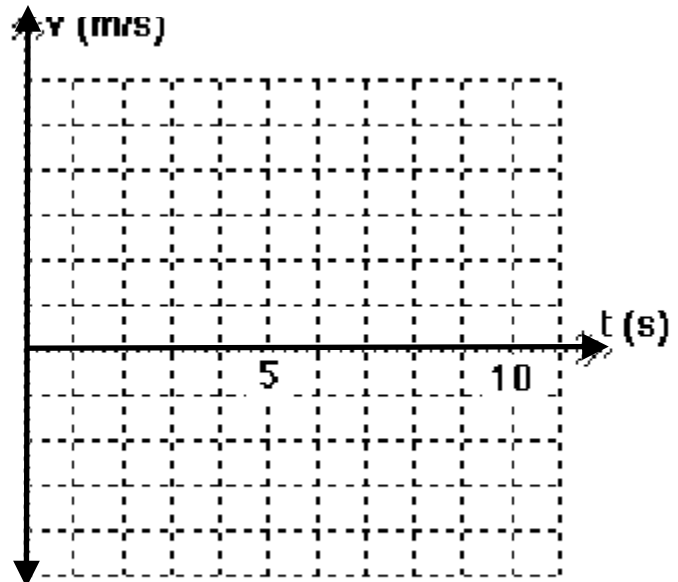
8. From the position vs. time data below, answer the following questions.

   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

x (m)

(A)
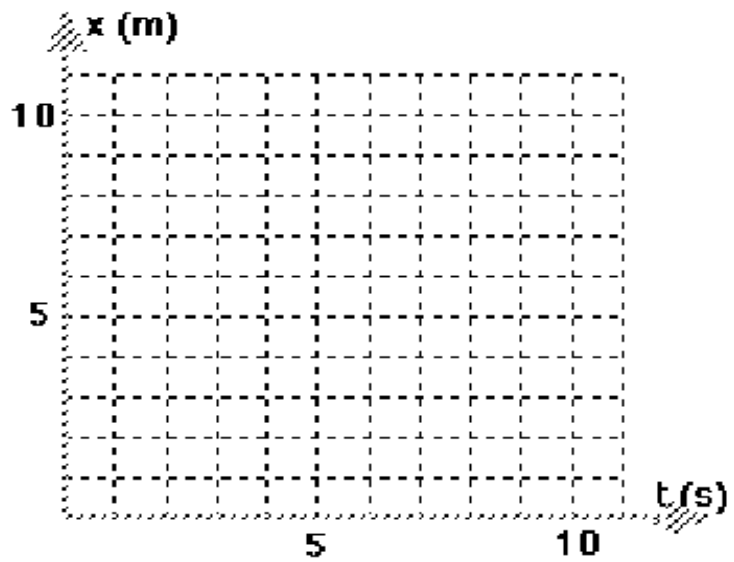
   c. Determine the displacement from t = 3.0s to 5.0s using graph B. Check it by using graph A.

Y (m/s)

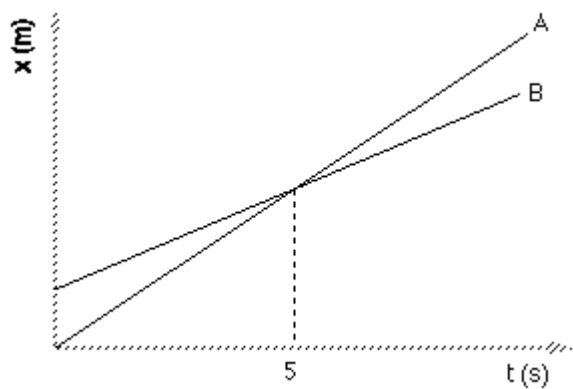   d. Determine the displacement from t = 7.0 s to 9.0 s using graph B. Check it using graph A

(B)

e. Determine the average <u>velocity</u> from t = 0 s to 9.0 s.

f. Determine the average <u>speed</u> from t = 0 s to 9.0 s.

9. Consider the position vs. time graph at left for cyclists A and B.
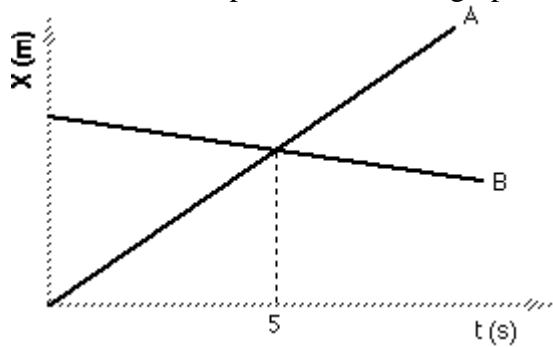a. Do the cyclists start at the same point? How do you know? If not, which is ahead?

b. At t= 7s, which cyclist is ahead? How do you know?

c. Which cyclist is traveling faster at 3s? How do you know?

d. Are their velocities equal at any time? How do you know?

e. What is happening at the intersection of lines A and B?

10. Consider the position vs. time graph below for cyclists A and B.

a. How does the motion of the cyclist A in this graph compare to that of A in the previous graph?

b. How does the motion of cyclist B in this graph compare to that of B in the previous graph on page one?

c. Which cyclist has the greater speed? How do you know?

d. Describe what is happening at the intersection of lines A and B.

e. Which cyclist has traveled further during the first 5 seconds? How do you know?