

Name \_\_\_\_\_ Date \_\_\_\_\_ Partners \_\_\_\_\_

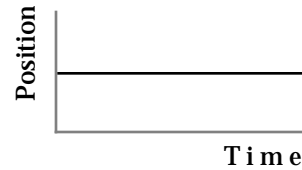
## HOMWORK FOR UNIT 3 INTRODUCTION TO MOTION

### 1. Position-Time Graphs

Unless otherwise noted each numbered question is worth 2 points

Answer the following questions in the spaces provided.

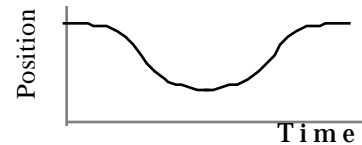
1. What do you do to create a horizontal line on a position vs. time graph?



2. How do you move so the graph goes up steeply at first, and then goes down gradually?

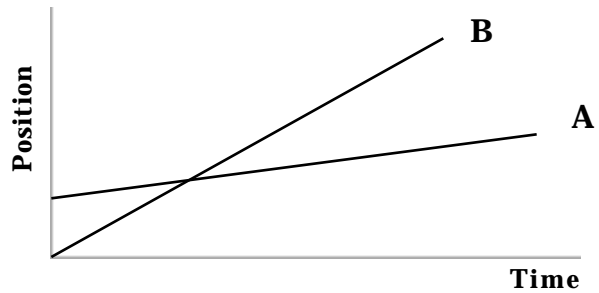


3. How do you walk to create a u-shaped graph?



Answer the following questions about two objects, A and B, whose motion is represented by the graphs shown below.

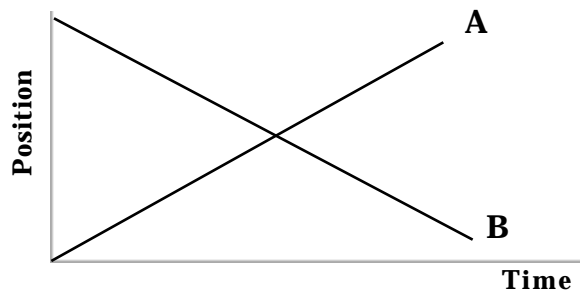
4. (a) Which object is moving faster, A or B?



- (b) Which object starts ahead? What do you mean by ahead?

3. What does the intersection mean?

5. (a) Which object is moving faster, A or B?



- (b) Which object has negative velocity according to the convention we have set?

Sketch the position-time graph corresponding to each of the following descriptions of the motion of an object. Mark the time scale on the graphs for questions 7 and 8.

6. The object moves with a steady velocity away from the origin.



7. The object moves toward the origin with a steady velocity for 5 seconds and then stands still for 5 seconds.



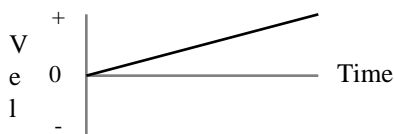
8. The object moves away from the origin for 5 seconds and then reverses direction and moves with the same speed toward the origin for 5 seconds.



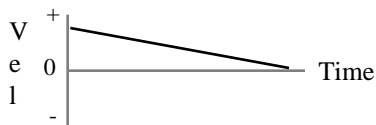
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## 2. Velocity-Time Graphs

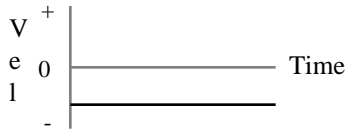
9. How do you move to create a straight-line velocity-time graph that slopes up from zero, as shown below?



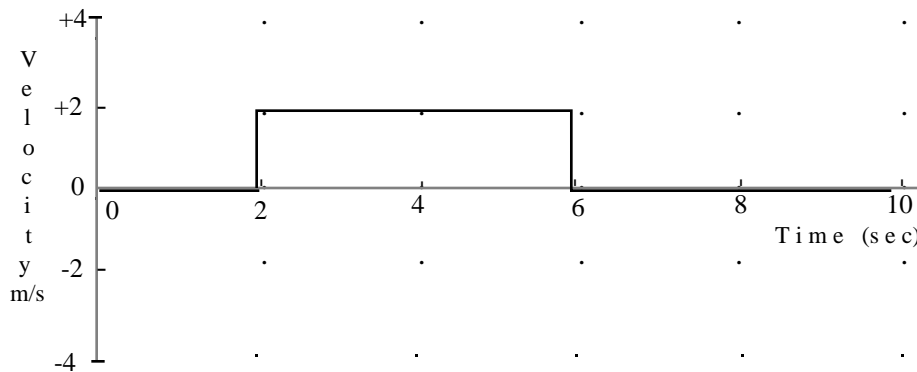
10. How do you move to create a straight-line velocity-time graph that slopes down, as shown below?



11. How do you move to make a horizontal line in the negative part of a velocity-time graph, as shown below?

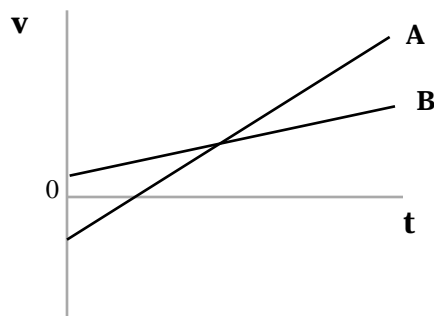


12. The velocity-time graph of an object is shown below. Figure out the total change in position (*displacement*) of the object. Show your work!



Displacement = \_\_\_\_\_ meters.

The *velocity* graph below shows the motion of two objects, A and B. Answer the following questions. Explain your answers when necessary.

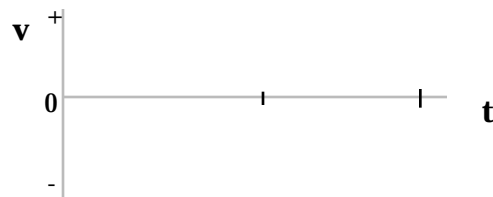


13. (4 pts) (a) Is one object moving at a greater speed (i.e. moving faster) than the other? If so, which one is faster? (A or B)

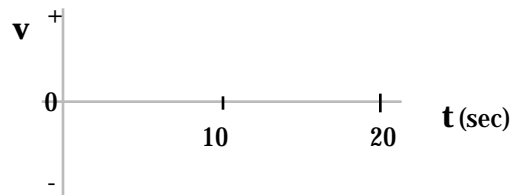
- (b) What does the intersection of the two graphs mean?
- (c) Can one tell which object is "ahead"? (define "ahead")
- (d) Does either object A or B reverse direction? Explain.

Sketch the velocity-time graph corresponding to each of the following descriptions of the motion of an object.

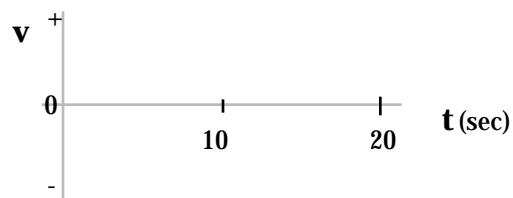
14. The object is moving away from the origin at a steady velocity.



15. The object moves toward the origin at a steady (constant) velocity for 10 seconds, and then stands still for 10 seconds.



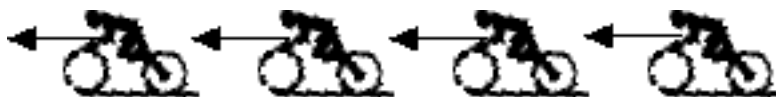
16. The object moves away from the origin at a steady (constant) velocity for 10 seconds, reverses direction and moves back toward the origin at the same speed for 10 seconds.



**Note:** On Q14-Q16, the sketches represent idealized graphs. A real object cannot "stop on a dime". Real motions would have more gradual transitions from one velocity to another.

### Position-Velocity Motion Diagrams

A position-velocity motion diagram can be used to sketch a quick picture of the changes in motion that an object might undergo that almost anyone can understand. A motion diagram represents to position and velocity of an object at several equally spaced times. At each position the object's velocity is represented by an arrow. Two sample motion diagrams are shown in the figures below.



**Figure 1:** A motion diagram of a bike moving to the left with a constant velocity. The acceleration is zero because the velocity is not changing.



**Figure 2:** A motion diagram for a bike moving to the right with a decreasing speed.

17. Construct a motion diagram for a dog running to the right with a decreasing speed.
  
18. Construct a motion diagram for a truck moving to the left with increasing speed.
  
19. Construct a motion diagram for a rocket moving vertically downward at an increasing speed.