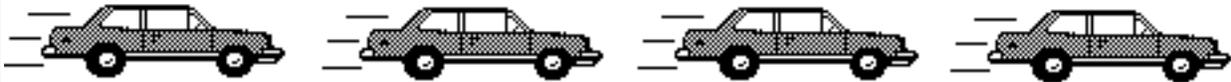


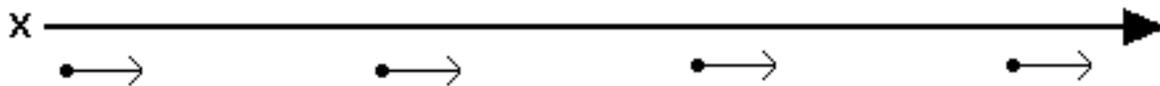
Constant Velocity Particle Model Reading: Motion Maps

A motion map can represent the position, velocity, and acceleration of an object at various clock readings. (At this stage of the class, you will be representing position and velocity only.)

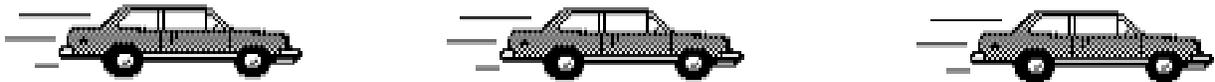
Suppose that you took a series of pictures of a car moving to the right at constant velocity where each image showed the position of the car at one-second intervals.



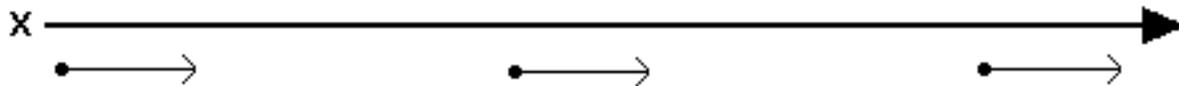
This is the motion map that represents the car (or the object). We model the position of the car (or the object) with a small point or dot. At each position, the car's (or object's) velocity is represented by an arrow (or vector). In this motion map, the four dots represent the car at each of four seconds. The arrows (vectors) are all the same length and point in the same direction because the car is always traveling with the same speed (arrow length) and in the same direction (arrow points to the right).



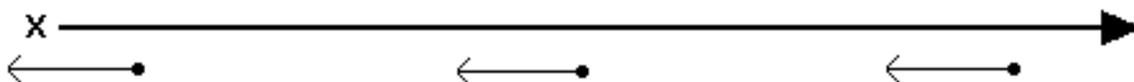
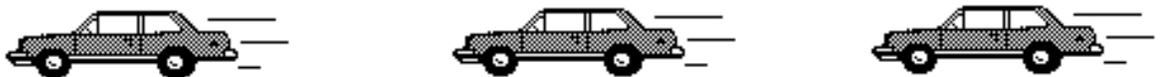
If the car were traveling at greater velocity, the series of pictures might look like this:



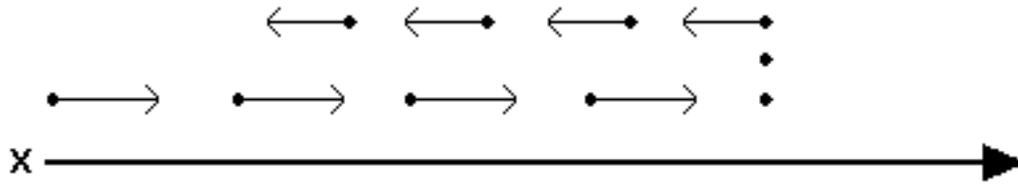
The corresponding motion map has the points spaced farther apart (because the car would go a further distance in each second), and the velocity vectors (arrows) are longer, because the car is moving faster. The vectors all point to the right because the car was always moving to the right.



If the car were moving to the left at constant velocity, the photo and motion map might look like this:



More complicated motion can be represented as well.



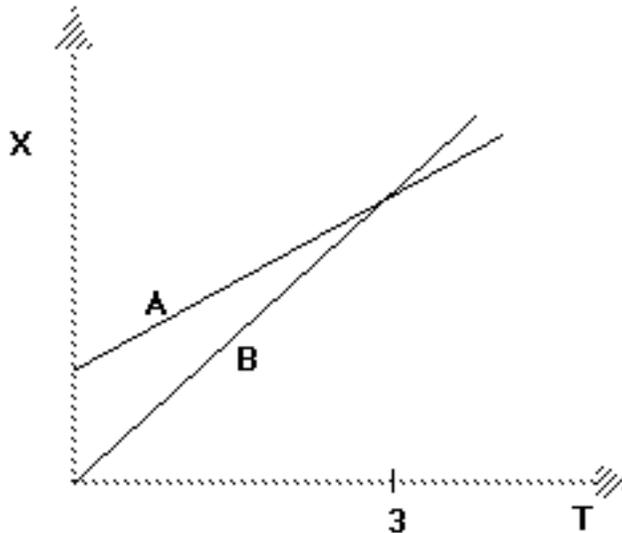
Here, an object moves to the right at constant velocity, stops and remains in place for two seconds, then moves to the left at a slower constant velocity. Remember, the dot represents the object (car) at each second.

Consider the interpretation of the motion map below. At time $t = 0$, cyclist A starts moving to the right at constant velocity, at some position to the right of the origin.



Cyclist B starts at the origin and travels to the right at a constant, though greater velocity than cyclist A. At $t = 3$ s, B overtakes A (i.e., both have the same position, but B is moving faster).

A graphical representation of the behavior of cyclists A and B would like this:



Throughout this semester, you will be representing the behavior of objects in motion in multiple ways: verbally, diagrammatically (motion maps) and graphically.

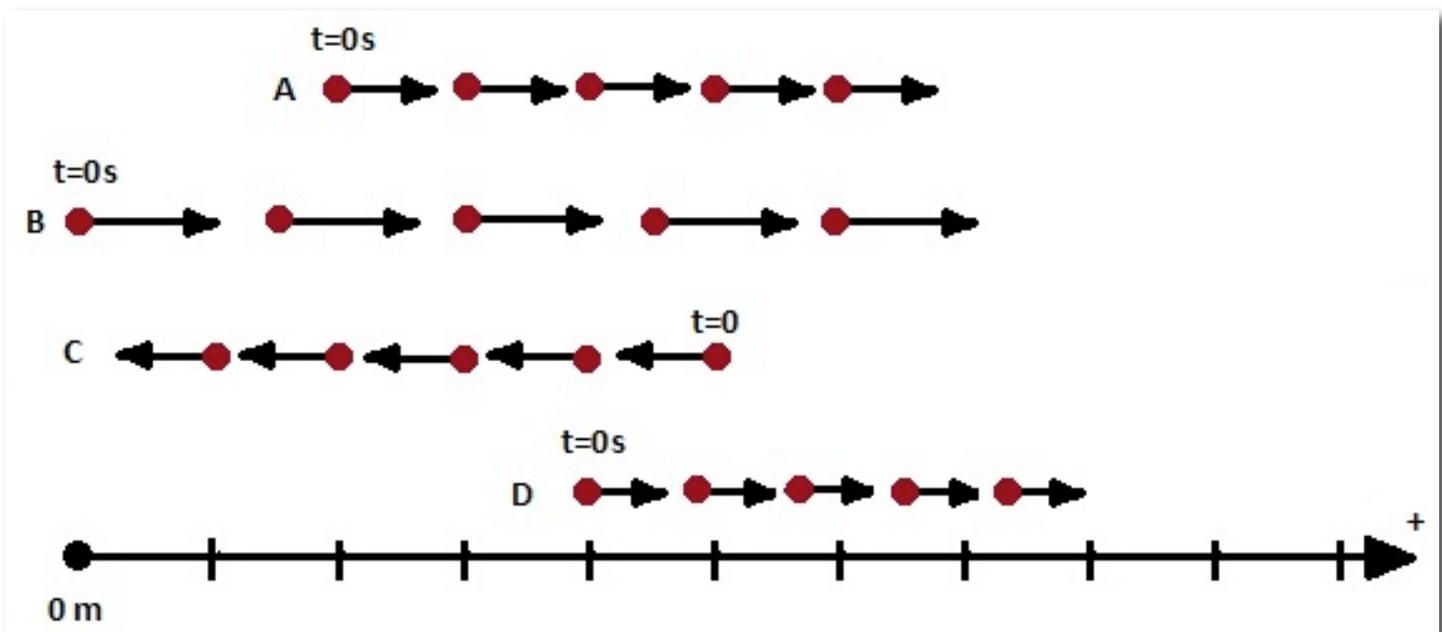
You might find this video helpful if this handout was confusing:

<http://www.youtube.com/watch?v=uF7XyddBgQ4> Falconphysics Democast - Making Sense of Motion Maps

Hints on drawing your own motion maps:

1. Draw dots indicating the position of the object at equal time intervals, i.e. each second.
2. Attach arrows to the dots indicating the direction of motion. Make the arrow length half of the space between the dots to make your motion map easy to read.
3. When an object is stopped for several time intervals, draw multiple dots at the same position.
4. Make sure your sequence of arrows has a logical flow so that the motion is clearly communicated. If the object changes direction, remember to change the direction of your arrows.

We may use this picture in class. Feel free to look at the four different motion maps below and try to answer such question as written below. (They are like puzzles.)



1. Which object, A, B, C, or D, has the fastest speed? How do you know?
2. Which object has the slowest speed? How do you know?
3. Which two objects have the same speed but are traveling in different directions? How do you know?
4. Which object was traveling toward the origin? How do you know?
5. Which object(s) (if any) traveled with a constant speed? How do you know?
6. Which object(s) (if any) traveled for more than 5 seconds? How do you know?
7. Which object(s) (if any) traveled stopped traveling after 3 seconds? How do you know?