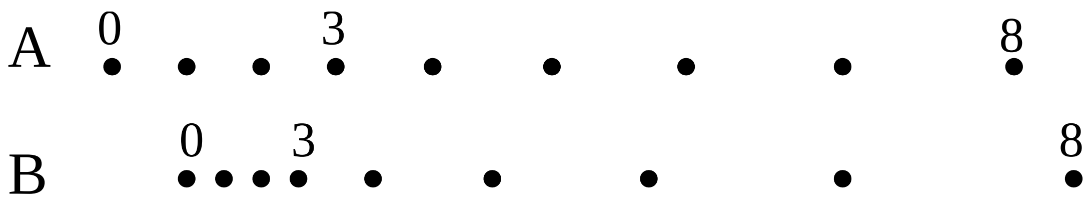
1. The figure shows nine frames from the motion diagrams of two cars. Both cars begin to speed up, with constant acceleration, at time 3.



a. Which car has the largest initial speed?____ The largest final speed?____

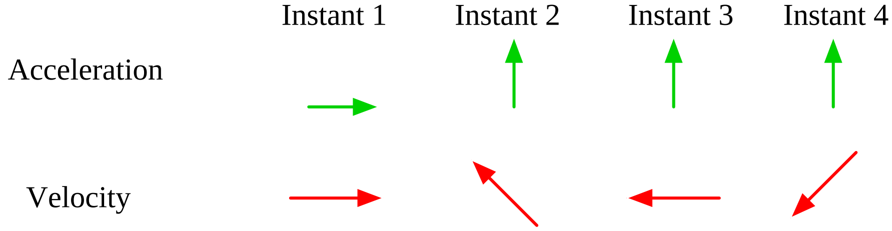
b. Which car has the largest acceleration after time 3? How can you tell?

c. Between which two frames do the two cars have the same speed? How can you tell?

d. For car B, make a labeled dot at the approximate position of the car at time 7.5. How does the speed at time 7.5 ($v_{7.5}$) relate to the speeds at time 7 (v_7) and at time 8 (v_8)?

2. Make a five-dot motion diagram for an object which is accelerating by changing only its direction. Let the object be turning right and let the magnitude of the object's acceleration be constant. Let the object enter the space below in the lower left, and exit at the lower right.

3. Each diagram shows arrows representing the velocity and acceleration vectors for an object at a certain instant in time. Describe the motion of the object at each instant.



4. Some object is found to have constant acceleration. Choose the x direction as being the direction of that constant acceleration, and write the constant acceleration as a_{x0}.

a. Since by definition $a_x(t) \equiv dv_x(t)/dt$, therefore $v_x(t) = \int a_x(t)dt + C$. Do the necessary integration to produce the x-velocity equation; let the x-velocity at time zero be v_{x0}.

b. Since by definition $v_x(t) \equiv dx(t)/dt$, therefore $x(t) = \int v_x(t)dt + C$. Do the necessary integration to produce the x-position equation; let the x-position at time zero be x_0.

c. Solve for time in equation (a); use that to eliminate time from (b), and solve for displacement $\Delta x \equiv x_f - x_i = x(t) - x_0$. Simplify as much as possible.

d. Average x-velocity is defined by $\bar{v}_x \equiv \Delta x/\Delta t$. If we choose $t_i = 0$, then $\Delta t = t$. Use (b) to solve for $\bar{v}_x$ and use (a) to eliminate $a_{x0}t$ from the resulting expression. Interpret your result.