Name _____

$v = \frac{\Delta x}{\Delta t}$
$x = \bar{v}t$, where $\bar{v}$ is average velocity
If 2 or more objects involved, each object has its own equation describing its motion. Based on the problem, decide how the 2 objects are linked, i.e. are their distances related, or is the time the same?

1. A tortoise and a hare race a distance of 2m. The tortoise moves at a steady pace of $0.07m/s$ without stopping until it reaches the finish line. When the hare moves, it always hops along at a constant speed of $0.2m/s$. It moves forward for the first half meter, stops for $6s$, then moves forward $1m$ and immediately turns around and hops back half a meter, stops for $2s$ and finally hops forward until it passes the finish line. Which one wins the race?

   A. Tortoise

   B. Hare

   C. They tie

2. Average speed cameras work by placing two cameras a distance apart, taking a picture of your car at each point and recording the time it took you to travel from one camera to the other. If your average speed is greater than the speed limit, you could get a ticket. (Why would just slowing down in front of each of the cameras not help you in avoiding a ticket?)
   If you are speeding as you pass the first camera, you could avoid a ticket by slowing down below the speed limit to bring your average speed to the speed limit or below. Let's say you were going a steady $90mi/hr$ as you passed the first camera and the speed limit is $70mi/hr$. The sign says the average speed is monitored for $10mi$, so you know the second camera is $10mi$ away from the first. If it takes you 3 minutes ($0.05hr$) to realize what happened and reduce your speed, what is the maximum constant speed you should travel the rest of the way to avoid a ticket?

3. You are running in the woods and you notice a bear running towards you $20m$ away from you. You know you are close to your car, which is in the opposite direction. Your speed is $4m/s$ and you know bears can run as fast as $6m/s$. If you are $50m$ away from your car, will you make it safely? Assume you are both running at a constant speed.

   A Yes, you'll make it

   B You just barely make it

   C No, you won't make it

   What is the maximum possible distance you could be from the car to make it safely?
   Hint: Remember that each object has its own equations describing its motion, so write them out separately and label things carefully. Then think about what physical quantity or quantities connect the two objects, i.e. do they both go the same distance or experience the same amount of time?

4. You walk south to the store for 20 minutes and your watch says you do so at a steady pace of $100m/min$. Then you realize you dropped your wallet and turn around and run north to fetch it. At that point, your watch says your overall average velocity was $20m/min$ south and a total time of 30 minutes has elapsed.

   (a) How far north did you go?

   (b) How long were you going north?

   (c) What was your average speed going north?