$\qquad$ Name: $\qquad$ Pd.

## Part 1 Constant Velocity Mathematical Model review:

1.) How was the mathematical model for constant velocity motion $\left[x_{f}=\vec{v}\left(t_{f}-t_{i}\right)+x_{i}\right]$ derived? What does each symbol mean?
2.) What is a 1-D frame of reference and why is it important? Why do you need to establish a frame of reference when you are using the constant velocity mathematical model?
3.) Write out the algebraic steps to get to from this form of the model $x_{f}=\vec{v}\left(t_{f}-t_{i}\right)+x_{i}$ to this form: $\vec{v}=\frac{\Delta x}{\Delta t}$ ? What does each symbol mean in this case?
$\qquad$ Name: $\qquad$ Pd. $\qquad$

## Part 2: Problem Solving using the Solution Explanation Form (SEF)

1. Ms. Barge makes Mr. Barge jog eight times around a 400 meter long track in 12.5 minutes (Can you say NO to your mom?!). Determine Mr. Barge's (a) average speed and (b) average velocity.
a) Write out in your own words what the question is asking.
b) Draw a picture to visualize the problem, list all given information and all assumptions. Establish a Frame of Reference which shows the origin for position and the negative and positive direction.
c) Write out the mathematical model(s) that you will use to solve the problem
d) Solve the problem mathematically using the model as the starting point.
f) Explain the important physics concepts that you used to solve the problem
$\qquad$
$\qquad$ Pd. $\qquad$
2. A Labrador Retriever runs 50.0 meters in 7.20 seconds to retrieve a bird. The dog then runs half way back in 3.85 seconds. Determine the average speed and average velocity of the dog.
a) Write out in your own words what the question is asking.
b) Draw a picture to visualize the problem, list all given information and all assumptions. Establish a Frame of Reference which shows the origin for position and the negative and positive direction.
c) Write out the mathematical model(s) that you will use to solve the problem
d) Solve the problem mathematically using the model as the starting point.
e) Create a qualitatively accurate $\mathbf{x}$ vs. t graph, and qualitatively accurate v vs. t graph (Also, use each of your graphs to independently calculate the displacement)
f) Explain the important physics concepts that you used to solve the problem
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$\qquad$ Pd. $\qquad$
3. A jet travels 2250 km westward at a speed of $960 \mathrm{~km} / \mathrm{hr}$. It then encounters a strong headwind and its speed drops to $805 \mathrm{~km} / \mathrm{hr}$ for the next 1320 km of its westward trip.
What is the average velocity for the trip?
a) Write out in your own words what the question is asking.
b) Draw a picture to visualize the problem, list all given information and all assumptions. Establish a Frame of Reference which shows the origin for position and the negative and positive direction.
c) Write out the mathematical model(s) that you will use to solve the problem
d) Solve the problem mathematically using the model as the starting point.
e) Create a qualitatively accurate $\mathbf{x}$ vs. $\mathbf{t}$ graph, and qualitatively accurate $\mathbf{v}$ vs. t graph (Also, use each of your graphs to independently calculate the displacement)
f) Explain the important physics concepts that you used to solve the problem
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$\qquad$ Pd. $\qquad$
4. Two Metra trains approach each other on separate but parallel tracks. One has a speed of $90 \mathrm{~km} / \mathrm{hr}$, the other $80 \mathrm{~km} / \mathrm{hr}$. Initially, the two trains are 2.71 km apart. How long will it take the two trains to pass each other?
a) Write out in your own words what the question is asking.
b) Draw a picture to visualize the problem, list all given information and all assumptions. Establish a Frame of Reference which shows the origin for position and the negative and positive direction.
c) Write out the mathematical model(s) that you will use to solve the problem
d) Solve the problem mathematically using the model as the starting point.
e) Create a qualitatively accurate $\mathbf{x}$ vs. t graph, and qualitatively accurate v vs. t graph (Also, use each of your graphs to independently calculate the displacement)
f) Explain the important physics concepts that you used to solve the problem
$\qquad$
$\qquad$ Pd. $\qquad$
5. A Ford is traveling with a speed of $15 \mathrm{~m} / \mathrm{s}$ and is 200 meters ahead of a Chevy traveling in the same direction at $20 \mathrm{~m} / \mathrm{s}$. How far will the Chevy travel before catching up to the Ford?
a) Write out in your own words what the question is asking.
b) Draw a picture to visualize the problem, list all given information and all assumptions. Establish a Frame of Reference which shows the origin for position and the negative and positive direction.
c) Write out the mathematical model(s) that you will use to solve the problem
d) Solve the problem mathematically using the model as the starting point.
e) Create a qualitatively accurate $\mathbf{x}$ vs. t graph, and qualitatively accurate v vs. t graph (Also, use each of your graphs to independently calculate the displacement)
f) Explain the important physics concepts that you used to solve the problem
