Motion Graphs - Problems and Mini Lab

**PROBLEM 1: Distance vs. Time Graph**  This is the graph of Perry moving away from Dr. Doofenshmirtz.

![Distance vs. Time Graph]

1a) The slope of a distance vs. time graph has units of ________, so it represents ________________.

1b) What is Perry’s velocity in segment #1 (from 0-4 sec.)? (Just find the slope!) ________________

1c) What is Perry’s velocity in segment #2 (from 4-6 sec.)? (Just find the slope!) ________________

1d) A flat line on the graph means the object is __________________________.

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**Mini Lab - Fun With Distance vs. Time Graphs using a LabQuest**

* Turn on LabQuest (top left corner) that has dark green motion detector attached.
* Hit button in the turquoise circle w/3 sheets of paper on it until File Graph Analyze are on the top of the screen.
* Face the wall. When you’re ready, tap the green play button on the screen and it will start graphing your motion.
* Want to try it again? Hit the green play button again. 😊 You may discard your data.

2a) Play with it and try to make **your top RED graph** that looks something like the one below. (Your lines will not be as straight.) You will need to walk forward, backward or stand still to match the different segments.

![Distance vs. Time Graph]

**SUMMARIZE PART A:** Distance vs. Time graphs

1. What units would the slope be in for a **distance vs. time** graph? __________________________

2. What quantity does the slope of a **distance vs. time** graph measure? __________________________
   (i.e. distance, speed, or acceleration, etc.)

3. What would you do to make your **distance vs. time** graph have a **horizontal line**? __________________________

Make sure everyone in your group can do this. Your teacher will pick one of you. Teacher’s initials: ☐ ☐

© Give your LabQuest to another group or plug it in by the sinks and move onto Velocity vs. Time graphs
Problem 3: Velocity vs. Time Graphs
This is the graph of Scooby Doo running to get Scooby snacks.

3a) The slope of a velocity vs. time graph has units of ______, so it represents ______________________.

3b) What is Scooby Doo’s acceleration for segment #1 (from 0-5 sec.)? (Just find the slope!) __________

What is Scooby Doo’s acceleration for segment #2 (from 5-10 sec.)? (Just find the slope!) __________

3c) A flat line on a velocity vs. time graph means the object is ________________________________.

3d) Calculate how far Scooby Doo traveled by solving for the area under the line. (Hint: Break it into a right triangle and a rectangle.)

3e) The area under the line on a velocity vs. time graph has units of ___________, so it represents the object’s _________________________.

3f) Use the \( \Delta x = v_t \Delta t + \frac{1}{2}a\Delta t^2 \) equation to measure the distance traveled during segment #1 by plugging in numbers from the graph for your variables.

*Explain what you would have to do to match the graph below. (Remember, velocity on y-axis!)

SUMMARIZE PART B: Velocity vs. Time Graphs
1. The slope of a velocity vs. time graph has units of ______ and measures ______________________
2. A horizontal line on a velocity vs. time graph means the object is ______________________
3. The area under the line (solved for using either shapes or 1-D motion equations) has units of ______, so it represents the object’s _______________________.

vel. (m) s

\( \Delta x = v_t \Delta t + \frac{1}{2}a\Delta t^2 \)