Lab 2-1: Graphical Analysis of Motion

Purpose:
1. To analyze the motion of a person walking with constant speed and a car speeding up by making the following graphs: Position vs. Time and Average Velocity vs. Time.
2. To use Graphical Analysis as a simple spreadsheet.

Procedure: *As discussed in class.*

Data:
Trial 1: Constant Speed "Forwards" Trial 2: Constant Speed "Backwards" Trial 3: Speeding Up

	Trial 1	*Trial 2*	*Trial 3*
Position (m)	Time (s)	Time (s)	Time (s)
0	0		0
2			
4			
6			
8			
10			
12			
14			
16			
18			
20		0	

Graph:
Use Graphical Analysis to make graphs of Position vs. Time and Average Velocity vs Time.
1. Double-click on the "X" in the Data Set window. This will bring up a window where you can enter the labels and units (and also enter series automatically.) Call this "Position" with "x" as the short name, "m" for the units, and generate the numbers and click on "Done"
2. Double-click on the "Y". Call this "Time" with "t" for the short name and "s" for the units. Click on "Done" and then enter the times.
3. To calculate the speeds, under "Data" choose "New Calculated Column..." Name it "Average Velocity", short name "v", units "m/s" and then enter the equation for the data. In this case, use the pull down menus to make the function "delta("Position")/delta("Time") Click on "Done."
4. To enter in a second set of data with the same column headings and equations, under "Data" choose "New Data Set" and it will create a "Data Set 2" in which you only have to enter the numbers for Trial 2. Repeat this for Trial 3.
5. Now make the graphs: Put at least 2 on a piece of paper.
6. If a graph is horizontal, put in the statistics for that graph.
7. If a graph is linear, put in a regression line for that graph.
8. Title the graphs on the top "Lab 2-1: Person" or "Lab 2-1: Car", check with your teacher, and then print copies for your group.

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Conclusions:

1. Compare and contrast the position verses time graphs for the three motions.

2. Compare and contrast the average speed verses time graphs for the three motions.

3. If possible, what were the equations that described the position or velocity of the person or car as a function of time?

4. What does the slope of a position verses time graph represent?

5. How can you tell if a graph of position vs. time shows constant speed or not?

6. All the position verses time graphs look "nice," yet the average velocity verses time graphs were very scattered. Why is that?

7. Why does the graph of the position of the car speeding up become linear?

8. What is meant by the term *Average Velocity*? Why didn't we just call it *Velocity* or even *Speed* in this lab?

9. Sketch what the average velocity verses time graphs should have looked like. (Make sure you label them.)