Spreadsheet Tutorial

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Subject(s)

- Physics
- Computers/Technology Education
- Math

Grade Level(s)

- High School—I will be applying it to advanced 9th Graders and 12th Graders

Purpose

- To give students a brief introduction to using the Microsoft® Excel spreadsheet program & applying it as a means of creating data tables and graphs for lab reports.

Lesson Objectives

- The students will demonstrate the ability to move from cell to cell within a spreadsheet.
- The students will demonstrate the ability to change the format and size of cells in a spreadsheet.
- The students will enter data into a spreadsheet in column form.
- The students will use equations to manipulate the data they have entered into the spreadsheet.
- The students will use the chart function of the program to graph the entered data.
- The students will use the program to determine the line of best fit for their graphed data.
- The students will demonstrate an ability to change the characteristics (color, line thickness, font size) of their graph.

Student Assessment

- Informal assessment as teacher circulates
- Student-generated graphs from data on worksheet

Time Required for Lesson Plan

- One 50-minute class period + overnight time to finish (if needed)

Required Materials

- Computers or Laptops with the Microsoft® Office suite installed
- Projector with appropriate hook-up for teacher computer
- Printer

Supplemental Materials

- Worksheet with data values

Procedure

- Hand out following worksheet & have students boot-up and load Microsoft® Excel
- With teacher's computer projected onto a screen, the teacher walks the students through the first set of data—entering values to plotting the graph to finding the best fit line.
- The 2nd set of data is for the students to enter, manipulate, graph and find the best-fit line on their own.
- Teacher is to move about the room, checking on every student and assisting where needed.
- Students staple together and turn in their graphs.

Accommodations for Students with Special Needs

It would be best if every student had access to their own laptop, so each can gain experience constructing data tables and graphs with Excel.

List of Applicable Sunshine State Standards

- MA.A.1.3.3
- MA.A.2.3.2
- MA.A.3.3.1
- MA.A.3.3.3
- MA.B.1.3.2
- MA.D.1.3.1
- MA.D.2.3.1
- MA.E.1.3.1

Extensions

- Spreadsheets can be used for any experiment—physics, math, chemistry, etc…—whenever data is recorded and a graph needs to be plotted from it. I am simply giving my students a crash course in basic function of the Excel program as they can be used for lab reports in my physics classes.

Teaching Tips/Hints

- Be sure to circulate the room to see if everyone understands what is required of them and to see that they can do it.

Name: _____

Excel Spreadsheet Tutorial

Directions: Check out a laptop, boot-up, and start Microsoft® Excel. We will be working through the first data set as a class. The 2nd data set is for you to enter in, manipulate, graph, and determine the line of best-fit on your own.

Data Set #1

1. Use the mouse or the cursor keys to select cell A2. Type in "Time" and hit enter. Cell A3 should now be highlighted. Type "(s)" and hit enter.
2. Use the mouse or cursor keys to select cell B2. Type in "Displacement" and hit enter. Cell B3 is now highlighted. Type in "(m)" and hit enter.
3. Use the mouse or cursor keys to select cell B2. Type in "Velocity" and hit enter. Cell B3 is now highlighted. Type in "(m/s)" and hit enter.
4. Click and hold the left mouse button while selecting cells A3, B3 and C3. Hold the [crtl] and [1] keys together. This brings up the Format Cells window. Hit the border tab at the top. This allows you to set the types of lines that surround the cells. Use the mouse to select a solid line then hit the bottom border button. Hit the [ok] button when you are finished.
5. In the cells A4 – A24, enter the time values from the following table. In the cells B4 – B24, enter the displacement values from the following table.

x (m)	0.0	1.9	4.1	5.9	8.0	9.9	11.8	14.1	16.2	18.0	
t (s)	0	1	2	3	4	5	6	7	8	9	
x (m)	19.9	22.2	24.0	26.1	28.1	30.2	31.8	33.9	36.0	37.8	40.1
t (s)	10	11	12	13	14	15	16	17	18	19	20

6. Now we are going to manipulate the data we have entered. Average velocity is defined as a change in displacement divided by change in time: $\boldsymbol{v} = {}^{\Delta x}/_{\Delta t} = (\boldsymbol{x}_f - \boldsymbol{x}_i)/(t_f - t_i)$. One feature of Excel is that it can perform simple calculations. Select cell C4. You must input the equation for Excel to calculate. The thing to remember is the variables in the equation $\boldsymbol{v} = (\boldsymbol{x}_f - \boldsymbol{x}_i)/(t_f - t_i)$ refer to numbers in cells of your spreadsheet. To calculate the average velocity for cell C4, type "= ((B5) – (B4)) / ((A5) – (A4))" and hit enter.
7. Select cell C4 and hit [crtl] + [c] together (copy). The cell will now be highlighted. Use the arrow keys to select cell C5 and hit [crtl] + [v] (paste). This will paste the equation you entered into cell C4 into C5 and it automatically adjusts the cells it uses to make the calculation. Repeat the paste function for cells C6 – C23.
8. Now to graph the data you've entered in. Use the cursor to select cells A4 – B24 (two columns of numbers). Now you can either hit the chart wizard button, or under the insert menu command, select chart.
    a. Select XY(Scatter) chart, then hit the [next] button.
    b. On step 2 of the chart wizard, hit the [series] tab at the top. Make sure that the ***x***-values for the graph are the time values (A-cells) and the ***y***-values are the displacement values (B-cells). Hit the next button.
    c. On step 3 of the wizard, you must now input the title for the graph and the names for the ***x***- and ***y***-axes. Under the Gridlines tab, click which axis gridlines you want shown on the graph. Under the Legend tab, de-select the legend (you don't want it shown for this graph). Now hit the next button.
    d. On step 4, you have the choice of making the graph its own page, or embedding it as part of your spreadsheet page. Select "as new sheet" and hit Finish.
9. Under the Chart menu command, select the Add Trendline option. Depending on the shape of the data you have on your graph, you must choose which type of line will best fit the data points. For this sample data, a linear best-fit is required. Hit the Options tab. Select the "Display equation on chart" option and hit the [ok] button.
10. Now it is time to cosmetically tweak the graph. Double clicking on the grey background will allow you to select a new color—white often looks best. You can double click on any of the titles and change the font or font size. Drag the line's equation off to the top right side of the graph.
11. Repeat steps 8, 9 and 10 for the values in columns A & C. Construct a Velocity vs. Time graph. On step 2 of the wizard, make sure the ***x***-values are the time numbers (A-cells) and the ***y***-values are the velocity values (C-cells).

Data Set #2

Repeat this process for the following data on your own. Print out the two graphs (Displacement vs. Time and Velocity vs. Time) for the second data set, put your name on it and turn it in.

x (m)	3	5	25	65	120	195	290	400	530	675	
t (s)	0	1	2	3	4	5	6	7	8	9	
x (m)	840	1025	1225	1445	1680	1935	2210	2500	2810	3135	3480
t (s)	10	11	12	13	14	15	16	17	18	19	20