



Using Computer Spreadsheets

Computer spreadsheets provide an easy way to organize and evaluate data that you collect from an experiment. Numbers are typed into boxes called “cells.” The cells are organized in rows and columns. You can find the average of a lot of numbers or do more complicated calculations by writing formulas into the cells. Each cell has a name based on its column letter and row number. For example, the first cell in most spreadsheets is “A1.”

By the end of this project you will have experience doing the following tasks:

1. Recording data in a computer spreadsheet program.
2. Doing simple calculations for many data values at once using the spreadsheet.
3. Making a graph with the data set.

	A	B	C	D	E
1	Time (sec)	Temp (deg C)	Slope		
2	0	22.5			
3	30	23.0			
4	60	23.5			
5	90	24.0			
6	120	25.5			
7	150	27.5			
8	180	30.0			
9	210	32.5			
10	240	35.0			
11	270	37.5			
12	300	40.0			
13					
14					
15					

MATERIALS

- Simple calculator
- Access to a computer with a spreadsheet program

DIRECTIONS

1. **Adding data:** Open the spreadsheet program on your computer. You will see a window open that has rows and columns. The rows are numbered. The columns are identified by a letter.
 - a. As shown in the graphic above, add headings for columns A, B, and C:
 cell A1, type “Time (sec)”
 cell B1, type “Temp (deg C)”
 cell C1, type “Slope”
NOTE: You can change the width of the columns on your spreadsheet by clicking on the right-hand border and dragging the border to the left or right.
 - b. Highlight column B. Then, go to the **Format** menu item and click on **Cells**. Make the format of these cells **Number** with one decimal place. Highlight column C and make the format of these cells **Number** with two decimal places.
 - c. Type in the data for Time and Temperature as shown in the graphic above.
2. **Making a graph:** Now, you will use the data you have added to the skill sheet to make a graph.
 - a. Use your mouse to highlight the titles and data in columns A and B.
 - b. Then, go to **Insert** and click on **Chart**.
 - c. In step 1 of the chart wizard, choose the **XY (Scatter)** format for your chart and click “Next.”
 - d. In step 2 of the chart wizard, you will see a graph of your data. Click “Next” again to get to step 3. Here, you can change the appearance of the graph.

- e. In step 3 of the chart wizard add titles and uncheck the show legend-option. In the box for the chart title write “Temperature vs. Time.” In the box for the value x-axis, write “Time (seconds).” In the box for the value for y-axis, write “Temperature (deg Celsius).”
- f. In step 4 of the chart wizard, click the option to show the graph as an object in Sheet 2. At this point you will finish your work with the chart wizard.
- g. Setting the scale on the x-axis. Place the cursor on the x-axis and double click. Set the minimum of the scale to be 0, the maximum to be 310. Set the major unit to be 100 and the minor unit to be 20. Then, click OK. *Note: Make sure the boxes to the left of the changed values are NOT checked.*
- h. Setting the scale on the y-axis. Place the cursor on the y-axis and double click. Set the minimum of the scale to be 20, the maximum to be 41. Set the major unit to be 10 and the minor unit to be 2. Then, click OK. *Note: Make sure the boxes to the left of the changed values are UNchecked.*
- i. You are now finished with your graph. It is located on Sheet 2 of your spreadsheet.

3. Performing calculations:

- a. Return to Sheet 1 of your spreadsheet.
- b. The third column of data, “Slope,” will be filled by performing a calculation using data in the other two columns.
- c. Highlight the second cell from the top in the Slope column (cell C2). Type the following and hit enter:

$$= (B3-B2)/(A3-A2)$$

Explanation of the formula: The equal sign (=) indicates that the information you type into the cell is a formula. The formula for the slope of a line is as follows. Do you see why the formula for cell C2 is written the way it is?

$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1}$$

- d. Adding the formula to all the cells: Highlight cell C2, then drag the mouse down the column until the cells (C2 to C11) are highlighted. Then click **Edit**, then **Fill**, then **Down**. The formula will copy into each cell in column C. However, the formula pattern will be appropriate for each cell. For example, the formula for C2 reads: = (B3-B2)/(A3-A2). The formula for C3 reads: = (B4-B3)/(A4-A3). Note: The “=” sign is important. Do not forget to add it to the formula.
- e. In column C, you will see the slope for pairs of data points. Now, answer the questions below.

QUESTIONS ?

- a. Which is the independent variable—time or temperature? Which is the dependent variable?
- b. When setting up the data in a spreadsheet, which data set goes in the first column, the independent variable or the dependent variable?
- c. Use the graph you created in step 2 of the directions to describe the relationship between temperature and the time it takes to heat up a volume of water.
- d. Look at the values for slope. How do these values change for the graph of temperature versus time?

PRACTICE 

- a. The following data is from an experiment in which the temperature of a substance was taken as it was heated. Transfer this data into an Excel file and make an XY(Scatter) graph.

Time (seconds) Independent data	Temperature (°C) Dependent data
10	7.5
20	10.8
30	11.6
40	11.9
50	13.3
60	21.9
70	26.3
80	26.6
90	29.1
100	31.1

- b. Use the following data set to make a graph in Excel. Find the slope for pairs of data points along the plot of the graph. Is the slope the same for every pair of points?

Independent data	Dependent data
1	5
2	7
2.5	8
3.2	9.4
1.5	6
0.5	4
4	11
2.8	8.6
4.2	11.4
5	13