Using Spreadsheets

Purpose

The purpose of this pre-lab exercise is to introduce the basic spreadsheet skills required in this course and to provide some practice with those skills. We will be using Google Sheets in this course, so that groups can collaborate during labs. You should use Google Sheets to complete this lab. If you are familiar with Excel (or another spreadsheet program), much of this will be familiar, though the exact commands and menu options will be different.

This exercise is intended to be done individually. You should complete it before your first lab.

Training Videos

Before beginning this practice, you should watch the three training videos linked on the course website. If you are familiar with the basics of entering and formatting text and numbers in a spreadsheet, you can skip to Video 2. If you are familiar with the basics of entering functions in spreadsheets (finding sums, averages, medians and so on of a list of numbers), you can skip to Video 3. Everyone should watch Video 3 unless you are very proficient with spreadsheets and have used them extensively in the past to do advanced work.

Part I: Functions, Copying, and Scatter Plots

Open the spreadsheet for this lab (105L Training) and make a copy, renaming it with your name. While it is not required, it may be a good idea to create yourself a folder on Google Drive for your spreadsheets. We will use many of them this semester!

You will see the following data in Columns A, B, and C of the first tab.

t	d	v
1.2	7.056	11.76
3.4	56.64	33.32
4.1	82.369	40.18
4.9	117.649	48.02
5.3	137.64	51.94
7.1	247.009	69.58

1. Make two scatter plots; one for each of the following pairs of lists.

   (a) v vs. t; (i.e., put v on the vertical axis, and t on the horizontal axis)
   (b) v vs. d

2. In Column D, insert and copy down formulas to compute $\frac{v}{t}$. Be sure you are copying formulas rather than typing a new formula in each cell of the column. If you did this correctly, then there will be a noticeable feature of the numbers in this column.

3. In Column E, Make a list whose entries are the differences of consecutive elements of the d (which is in Column B). That is, Cell $E2$ should contain the difference of Cell $B3$ and $B2$. Insert this formula, and copy it down. You should have one less entry in Column E than in Column B. Why? We denote these new values by Δd.

4. Do the same for t (contained in Column A) in Column F to compute Δt.

5. Next, compute $\frac{\Delta d}{\Delta t}$ in Column G. Your column should contain five entries, the first of which is about 22.5382.

Part II: Scatter Plots, Linear Trends, and Line Plotting

In the second tab of the spreadsheet for this lab, you will find data for some x and y values.

6. First, let's make this data a little easier to read: format column B so that number are displayed to two decimal places.

7. Create a scatter plot of y vs. x.

8. We will now add a linear trendline to your graph:

   - Open the Chart editor if it isn't already open by double clicking on your chart.
   - Click on 'Customize', then 'Series'.
   - Check the 'Trendline' box, then select 'Use Equation' in the 'Label' pulldown menu.

This data was created by adding some random noise to the line $y = 10x + 7$. As you should be able to see, the trendline is not quite that line. Next, we will generate data for that line, add it to the chart, and see how to play with the slope and y-intercept. These are skills you will need in the first two labs of the semester.

9. In the cells next to the 'Slope' and 'y-intercept' labels ($C13$ and $C14$ respectively), enter the slope and y-intercept of the above line.

10. In Column C, enter a formula to calculate the y values on this line (given the x values in Column A). Be sure to use the values in the cells you just entered! You should not put '$= 10 * A2 + 7$' in Cell $C2$!

    Also, when you're copying the formula down to fill Column C, be sure you're still multiplying by the correct slope and y-intercept. If not, or if you are not sure how to use dollar ($) signs in spreadsheets, you probably want to go back and rewatch the third video.

11. Once again, open the Chart editor by double clicking on your chart. On the 'Setup' tab, click on the little grid next to the 'Add Series'. Select the data in Column C. The points in the column should appear on your chart.

12. The easiest way to add a linear line to a plot is to generate data like you just did, then add a linear trendline for it (it will be the exact right line). Under the 'Customize' tab, change the Series to 'y (modelled)', change the Point size to 'None', the Trendline to 'Linear', and the Label to 'Use equation'. You should see the line added to the chart, and its equation displayed.

13. Now change the slope and y-intercept in Cells $C13$ and $C14$ respectively. If you did all the above correctly, you should see the line changing on your chart! If not, you may not have followed the instructions in Question 10. Go back, read that question, and redo your formulas in column C.

Submitting this Assignment

To submit this assignment on Gradescope, share the spreadsheet in Google Sheets (Click the 'Share' button), change 'General Access' to 'Anyone with the link', and change 'Viewer' to 'Commenter'. Then click the 'Copy Link' button, and paste the link into Gradescope in the text box that opens with the assignment there.

The assignment is due by 8am on the day of your first lab (Thursday, Week 1). As always, by submitting the assignment, you are certifying that you did all the work on your own.