

Data Processing, Graphing, and Analysis of Apple Fungal Lesion Lab

I. Using Excel to Calculate Averages

1. Open the Apple Lesion Excel file on Mrs. Inman's website (inmanbiology.weebly.com). Go to the Biology page and the first unit. The file link says, "Data File" This contains data from all classes.
2. To calculate the averages for all three apple types, go to the cell (box) of the average you would like to calculate and type in **=average** ; select (double-click) the average option that pops up in the list.
3. Go to the data set you want to calculate the average of and highlight all numbers in the set. Once highlighted, press "enter." Notice the average is now in the average cell. Round the number to the nearest tenth of a centimeter by using the right arrow decimal button in the menu up top.
4. Repeat this process for the other two data sets.
5. Standard deviation is a measure of how much the data varies from the average. A large standard deviation tells you the data set has numbers that are all over the place (vary greatly from each other). A small standard deviation tells you the data set is relatively consistent and the numbers are very similar to each other. These standard deviation values can also be calculated in Excel. You will calculate the standard deviation for each of the three data sets of apples.
6. Go to the cell of the standard deviation you would like to calculate and type in **=std** and double-click the "STDEV.S", which is the standard deviation of a sample.
7. Highlight the data set for which you would like to calculate the standard deviation and then hit "Enter."
8. Round this number to the nearest 0.1cm like you did the averages by using the right arrow decimal button.
9. These standard deviation values will later be placed on the graph as error bars to show how much the data varies from the average.

II. Graphing

1. Highlight just the cells that have the apple names and the averages (don't highlight the SD!).
2. Go to "Insert" and select the first bar graph image.
3. You will see the graph pop up.
4. Click on the graph and then the "Design" tab. Using the "Add Chart Element" button (often seen as a "+" on the right of the graph). Check the box for "Axis Titles."

Label the y-axis "Average fungal lesion diameter (+/-0.1cm)"

Label the x-axis "Apple Variety"

5. Give your graph a detailed title: **Average fungal lesion diameter (+/-0.1cm) in Gala, Golden Delicious, and Granny Smith apples after 4 days of growth.** Yes, type IT ALL!
6. Now to put the error bars to represent the standard deviation of each data set...
7. Find the "Error Bars" option in the "+" tab next to the graph. Click on the tiny arrow next to "Error Bars" and select "More options."
8. At the bottom, select "Custom" and "Specify value."
9. When the customizable box pops up, click the little graph icon/arrow icon and doing this will allow you to go highlight all your standard deviations (SD) in a row (JUST THE NUMBERS) for all three apple types. Do this for the Positive Error Value and the Negative Error Value and then select "OK."
10. Double-check that the error bars are showing up as the correct values for the standard deviations that you have in your table.
11. Save this Excel file to your student account. Send the file to your partner via email.

III. T-test

1. A t-test allows you to compare two groups to see if the two groups are statistically significantly different from each other.
2. Google "Graphpad Quickcalcs t-test" and click on the link that pops up.
<https://www.graphpad.com/quickcalcs/ttest1.cfm>
3. You should see two columns for data entry. Start with comparing Gala and Golden Delicious; enter these names as the category names.
4. Using the Excel file, you will need to enter ALL the data from the gala column into the Graphpad page, and ALL the data from the golden delicious column into the second column. An efficient way to do this is to have your partner read the numbers to you from their phone.
5. Once both data sets are entered, click the "Calculate now" button.
6. Read the first section on statistical significance to see if there is a statistically significant difference between the two groups.
7. Repeat this process to compare gala and granny smith apples.
8. Write both results for both t-tests down so you will have them for your evidence section of your CER.