**imageJ Instructions to Count Bacterial Colonies**

1. Download your images from your email.
2. Open imageJ on the laptop and go to File-Open and find your image in the Downloads folder.
3. Use the Circle tool to draw a circle around your dish.
4. Select Image – Crop or Cntrl+Shift+X
5. Use the Circle tool to draw a circle on the inside of your petri dish to just capture the portion of the dish you want to count.
6. Select Edit – Clear Outside
7. Select Image – Type – 8 bit
8. Select Image – Adjust – Threshold
9. Adjust the scale as needed to help isolate the colonies or hit Auto and Apply
10. Select Analyze – Analyze Particles
11. Change the following
    1. size to 0.01 – Infinity
    2. circularity 0.03 – 1.00
    3. show – outlines
    4. select Display Results, Clear Results, Summarize, Exclude on Edges
12. Hit OK
13. Look in the summary box to find your colony count
14. Calculate your transformation efficiency

**imageJ Instructions to Measure Bacterial Colonies**

1. Download your images from your email.
2. Open imageJ on the laptop and go to File-Open and find your image in the Downloads folder.
3. Use the Circle tool to draw a circle around your dish, make sure you have some of the table in your image.
4. Select Image – Crop or Cntrl+Shift+X
5. In order to make accurate measurements, we need to tell imageJ the scale you are using
6. Select the line tool and measure across the petri dish from edge to edge.
7. Select Analyze – Set Scale
8. We know that these petri dishes are 60 mm wide.
9. Enter 60 in Known Distance and mm in Unit of Length and select ok
10. Visualize your petri dish in four quadrants. You will be randomly measuring a total of 10 colonies throughout the entire dish.
11. Click on an area you want to zoom into, and hit Ctrl+ to zoom into an area.
12. Select the polygon tool and select around one colony
13. Select Analyze – Measure or press Ctrl +M
14. Hit Ctrl- to zoom out and repeat zooming in to various areas until you have a total of 10 randomly selected measurements throughout the entire dish.
15. Once you have 10 colonies measured, on the Results screen select Edit – Select All – Copy
16. Paste it into an excel (NOT GOOGLE SHEETS) spread sheet
17. The only data you need is the colony trial number and the area, delete the rest. Label your columns.
18. Calculate the Average, Standard Deviation, and Standard Error
19. Repeat for the pGLO w/o arabinose
20. Make a bar graph with error bars of the average of the two samples. Print and put in your notebook.
21. Collect 10 data samples with from 2 other students so that you have a total of 30 sample size. (you may just want to create a Google Sheet to share the raw data)
22. Calculate the Average, Standard Deviation, and Standard Error for the 30 samples
23. Repeat for the pGLO w/o arabinose
24. Make a bar graph with error bars of the average of the two samples. Print and put in your notebook.