

inferences hand in

Dr. Sarah's MAT 1010: Introduction to Mathematics

Consumer Statistics and Probability: To recognize misrepresentations of studies and statistical data in the real world by applying statistical techniques and understanding the role of chance and probability

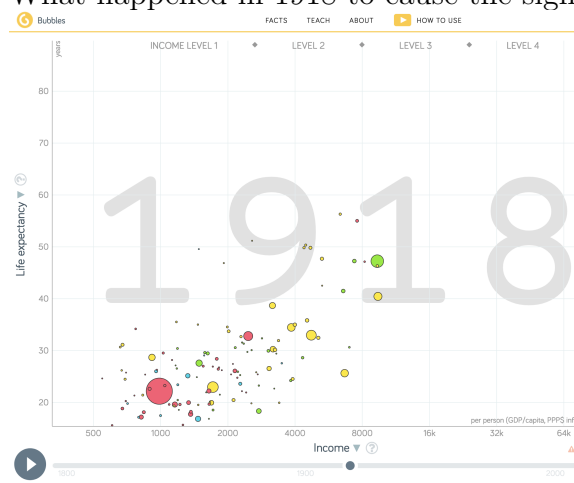
submission instructions: Must be completed on this handout and collated into one single PDF for submission in the inferences hand in assignment

goals:

- critically analyze the role of probability and chance in real world situations, in numerical data and graphical representations
- adapt and use key features in an Excel table to investigate real world data
- explore quantitative connections within geographical regions
- communicate statistics and probability information in written documents

Gapminder: Go to **Gapminder Tools**, which is a webpage available from this assignment on ASULearn.

1. Even without R^2 in front of us, we can visually inspect and categorize relationships. Do you think 2019 Income is at least a statistically moderate predictor of Life expectancy (i.e. moderate/strong versus a no/weak correlation)?
2. Hit the play button at the bottom left of the graph. Is the statistical relationship from #1 similar across all time?
3. What happened in 1918 to cause the significant dips?



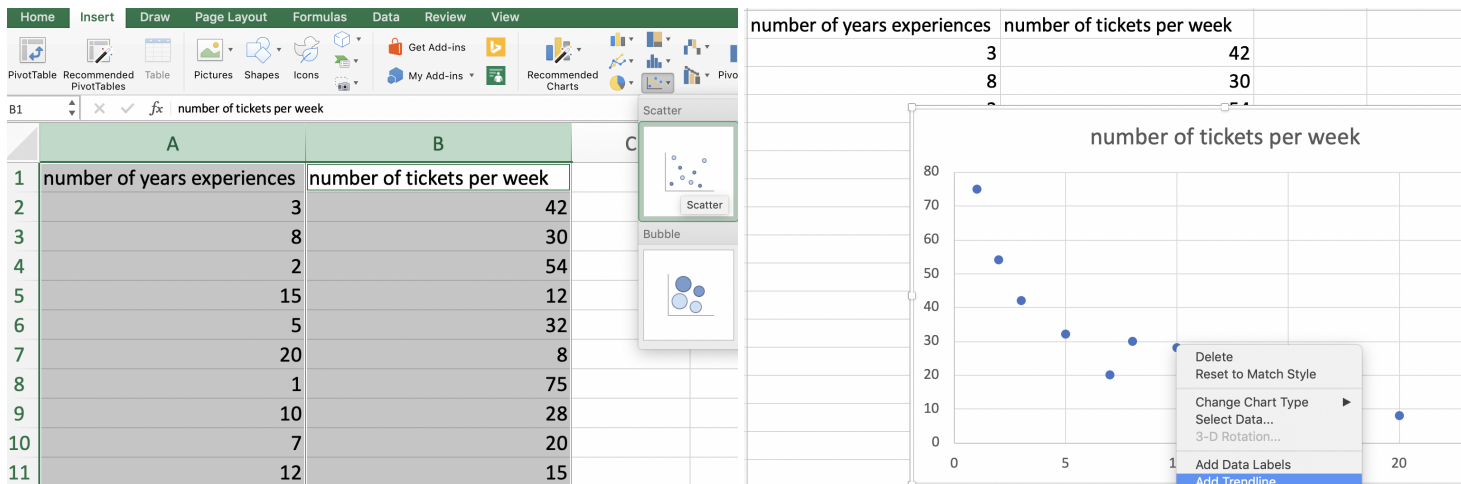
4. Click on and play “How to Use” on the top right (above Level 3 in my browser, it might be elsewhere or under the three line menu bars—what is called the hamburger menu icon—on yours). Next modify the variables on the x and/or y axis, i.e. change Income and/or Life expectancy to explore various relationships, and keep track of ones you found especially revealing. List one set here.
5. Name at least one item that you found interesting or surprising, or that you had a question on.

Egg Bungee Jump Regression: Today we will let you decide how long to make the bungee cord for a fragile jumper—a raw egg. The goal is to make it exciting but not fatal for your jumper.

- Watch the **egg bungee video**, which is accessible from the assignment on ASULearn and record the distance dropped in the following table:

number of rubber bands	distance dropped (cm)
2	
2	
2	
3	
3	
3	
4	
4	
4	
5	
5	
5	

- Enter your data in Excel as two columns in column A and column B.
- To create a scatterplot, best fit line, and R^2 value in Excel:
 - Click on the grey A so the first column is highlighted
 - Hold down the Command (cloverleaf) key on a Mac as you click on the grey B so both columns are highlighted. Something like the Windows key on a PC should work similarly.
 - Under the Insert menu choose the scatterplot. Here is what this looks like for a different data set:



If it didn't come out correctly you may have an extra box selected and may need to repeat the above steps to make sure you didn't have anything else selected by mistake.

–Next use the control key as you click on one of the points on your graph and Add Trendline (see above pic on right).

–Under Format Trendline or Trendline Options select the bottom two options (**Display equation on chart** and **Display R-squared value on chart**). Click on the X to finish it, or OK. Back on the chart, you can drag the equation of the line or resize it if you need to see it better. You'll see the scatterplot, best fit line, and R^2 value.

9. What is the R^2 value, as a percent?

10. Even with the variability in rubber bands and possible measurement inconsistencies, the number of rubber bands should be a strong predictor of the distance traveled because inspector number 22 asserted the stretch ability and similarity of these rubber bands (according to my packaging)! Thus this shows almost a constant slope for the change in distance dropped / change in rubber bands:

$$\frac{\Delta y}{\Delta x} = \frac{\Delta \text{distance dropped}}{\Delta \text{rubber bands}}.$$

Is inspector number 22 correct, i.e. what is the statistical strength of the regression relationship:

0 to 10% no

10% to 25% weak

25% to 65% moderate

above 65% strong

11. What is the equation of the best fit line?

12. EXACTLY what prediction of the number of rubber bands required for 2.0 meters does the equation of the regression line give (plug in 200 cm as the y -value and solve for x using algebra)?
SHOW WORK!

Does Random Number Choice Predict Armspan? From the assignment on ASULearn, access `classdata1.xlsx`

13. Should we expect the choice of random number to be correlated to armspan?

14. Follow the above Excel process for the Random Number and Armspan data to create a scatterplot, line of best fit, and R^2 value. What is the R^2 value, as a percent?

15. What is the statistical strength of the regression relationship (see above in #10)?

Does Armspan Predict Height?

16. Search the web to find information about Leonardo da Vinci's speculation about the relationship between armspan and height. Should we expect armspan to be correlated to height?
17. Follow the Excel process for the Armspan and Height data in **classdata1.xlsx**. What is the R^2 value, as a percent?
18. What is the statistical strength of the regression relationship?
19. Examine the data. Is the data likely feasible for our class? Why or why not?
20. From **pointsremoved.png** on the assignment on ASULearn, take a look at the graph of the same data, but where I removed some points that contradicted the related text that accompanied Leonardo da Vinci's Vitruvian Man: "The length of a man's outspread arms is equal to his height." What is the new R^2 value written as a percent?
21. How does the removal of the points affect the line (is the line steeper or more horizontal)?