Dr. Sarah's MAT 1010: Introduction to Mathematics

Part A: Answer all 19 questions below and post your responses and any questions you have on ASULearn in the inferences think-pair-share forum. Add a new discussion topic with the subject as your preferred name and the post as your responses.

Part B: Respond separately to at least two of your classmates postings in a meaningful way. Use their preferred name (like Dr. Sarah is mine), with something new that justifies your position on (at least) one of the questions. Don't just say, "Yeah, I agree." Instead, say, "Yes preferred name, but we also need to consider..." Or, "Preferred name, I don't agree because..." You might also pose questions, answer questions, extend ideas, or compare and contrast your responses and summarize what you chose and why.

1. General Electric (GE) funded the National Research Council (NRC) of the National Academy of Sciences to study how worker productivity is tied to lighting during a 1924 illumination study. What do you think the NRC concluded?

   a) turn up the lighting slightly (but noticeably) and productivity goes up

   b) dim the lighting slightly (but noticeably) and productivity goes up

   c) productivity stays the same in both cases

   d) productivity goes up in both cases

   e) productivity goes down in both cases

2. What was the main point of Fisher's experiment on the Lady Tasting Tea?

   a) sample size and random representative selection is what is important—not the percentage of the overall population

   b) we can't assume that unusual data is incorrect

   c) statistical significance can be obtained by deciding in advance the level of confidence we accept as persuasive and to collect data to make reasoned inferences
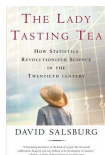
Front cover for *The Lady Tasting Tea* by David Salsburg   `https://news.gallup.com/poll/207671/affordable-care-act-gains-majority-approval-first-time.aspx`

3. On April 4, 2017, Gallup published poll results under the headline, "Affordable Care Act Gains Majority Approval for First Time." For 2012, Gallup gives a 95% confident margin of error of 3%, which had 48% of the sample "approved." For 2017, 55% of the sample "approved" and the margin of error was plus or minus 4% for the 95% confidence level. Is the headline statistically valid?

4. Assume little to no bias and truly a random sample. If a polling company conducted 100 such polls with a 95% confidence interval, then about how many of them are likely to include the true population percentage?

5. Is there any way to know which intervals from the 100 polls contain the true percentage and which ones don't?

6. Search for the percentage of people in the US that have a phone? List your response and source.

7. Search for how many US adults do NOT use the internet? List your response and your source.

8. Gallup typically targets both landline and cellphone users in its polls. Are there any voices that are left out?

9. How should we interpret the margin of error if the sample is biased?

   a) it is still valid as is

   b) garbage in garbage out, so the margin of error would not represent the entire population, although it could still be useful to interpret whatever biased sample it did represent

10. For a simple random sample at the 95% confidence level, what sample size would be required to achieve a 1% margin of error (use the conservative computation as in the inferences intro)?

11. In which of the following examples will the margin of error be the smallest? Assume each refers to a random sample that is not biased for a 95% confidence interval.

    a) a sample of $n = 400$ from a population of 50,000

    b) a sample of $n = 1000$ from a population of 10 million

    c) a sample of $n = 2500$ from a population of 200 million

12. In the inferences practice you worked with data from a study comparing the number of years of experience of New York City police to the number of tickets they give per week. What does the y-intercept mean when x=#years experience and y=#tickets police give out per week and the best fit line is $y = -2.932x + 55.038$?

    a) police give out about 55 tickets as they start the job

    b) tickets are going down by about 3 tickets with every extra year of experience

13. Using the same data as the last question, if $r = -.86$ so that $r^2 = 73.96\%$, this tells us that

    a) if we use the line to predict we would get it right about 74% of the time

    b) the y-value distances of the data to the best fit line are small so the data indicates experience is a statistically strong predictor of tickets

14. The r^2 value is strong but the line $y = -2.932(25) + 55.038$ predicts that the police *receives* tickets after 25 years, rather than give them out. Resolve the apparent conflict.

    a) a typo—the actual r^2 value should fit into weak (10% to 25%) rather than strong (over 65%)

    b) the mathematics of the r^2 value and the prediction are correct: the police gets sloppy as they get older, causing them to be penalized

    c) there are other reasons why the prediction doesn't hold up like extrapolation

15. If the r^2 value was 100% for a stock in the stock market, would we be assured to make money by using the best fit line to predict the future performance?

16. Write down your response to #5 on the inferences hand in assignment about what you found interesting or surprising, or that you had a question on in the Gapminder exploration.

17. In the egg bungee experiment on the inferences hand in assignment the similarity of the rubber bands led to an almost constant slope of $\dfrac{\Delta y}{\Delta x} = \dfrac{\Delta \text{distance dropped}}{\Delta \text{rubber bands}}$

    a) egg-sactly

b) egg-stremely close

c) somewhat

d) not at all

18. How many rubber bands would you have used? (I'll share a video of the results in my response to this think-pair-share—egg-spect some egg splatting!)

19. As a researcher, was it ethical to remove the armspan/height points that I eliminated from the class data and keep the remaining points in the inferences hand in?