Instructions

Due Week 12 · Friday, November 13

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Complete the following problems and upload your answers as a PDF file to **Blackboard**. Upload your `.do` file as well.

Sleep Among MPA Students

1. You are a Maxwell researcher studying the daily sleep duration among MPA students. You know that data at the population level is Normally distributed with mean $\mu = 7.13$ and standard deviation $\sigma = 1.67$. You plan to draw an SRS of size $n = 60$ from that population and compute the average time in your sample.
   a. What is the standard error of the average time?

   b. What are the 68, 95, and 99.7 percent confidence intervals around the mean? *(You may round.)*

   c. What do these confidence intervals mean? Provide an interpretation.

   d. What is the probability that your average will be at or below 6.9 hours?

Commute Times in Sudbury

2. You are the head of a research consulting firm. A client wants to know the population mean for commute times to work for the City of Sudbury, where they want to establish their new headquarters. You tell your team of statisticians to find an answer, with a reasonable degree of confidence, for the client based on a sample of commuters from the city.

   Your team collects a random sample of 100 commuters from the city and records their travel times, and the sample mean is 35 minutes. Your firm also knows from past experience that the population standard deviation of commute times for that city is 15 minutes.

   a. What would the margin of error be at a 90% level of confidence?

b. What about a 95% level of confidence?

c. You decide to present your findings with the confidence interval based on the higher confidence level. What would you show them and how would you explain this confidence interval to the client?

A Training Program

3. You're tasked with estimating the effect of a training program intended to boost the productivity of workers in a social services office, and it isn't clear whether the program would boost productivity or lower it. Before the introduction of the training program, workers were processing 30 applications per day on average. After its introduction, you take a random sample of 50 workers to evaluate the program. The manager wants to know whether any observed difference is likely to be real, or just due to the sample of workers taken.
   a. What would the null and alternative hypotheses be in this scenario?

   b. Is the alternative hypothesis one-sided or two-sided?

A Workplace Intervention

4. A firm wants to improve the efficiency of its workforce, and decides to implement an intervention with some of its employees to see if their efficiency improves. After the intervention, the firm collects the following data.

	No Intervention	Intervention
Improved Job Performance	16	4
No Change in Performance	10	9
Worse Job Performance	6	18

   The firm asks you to analyze this data for them.

   a. What is the null hypothesis here?

   b. What is the alternative hypothesis?

   c. What kind of analysis would you run to test statistical significance?

   d. Analyze the data. Is there a statistically significant relationship between the intervention and job performance?

   e. How would you report on the results of the analysis to the firm? Did their intervention work? Is it "statistically significant"?