

Book Homework

These prompts correspond to “Book Homework” portion of the homework on Canvas. You turn in the answers to these questions online.

1. The heights of men in a certain population follow a normal distribution with mean 69.7 inches and standard deviation 2.8 inches.
 - (a) If 10 men are selected at random, what is the probability their average height is above 72 inches?
 - (b) If exactly one man is selected at random, what is the probability his average height is above 72 inches?
 - (c) What is the 80th percentile for the average height of 10 men?
 - (d) What is the probability the average height of 10 men is between 70 and 71 inches?
2. The population average cholesterol content of a certain brand of egg is 215 milligrams, and the standard deviation is 15 milligrams. Assume the variable is normally distributed.
 - (a) Find the probability the cholesterol content for a single egg is between 210 and 220.
 - (b) Find the probability the average cholesterol content for 25 eggs is between 210 and 220.
 - (c) Find the third quartile for the average cholesterol content for 25 eggs.
 - (d) If we are told the average for 25 eggs is less than 220 mg, what is the probability the average is less than 210 mg?
3. Over 9 months, a random sample of 50 women were asked to record their average menstrual cycle length (in days). The sample average was 28.86 days, with a sample standard deviation of 4.24 days.
 - (a) Calculate the lower bound for the 90% confidence interval for the true average menstrual cycle length.
 - (b) Calculate the upper bound for the 90% confidence interval for the true average menstrual cycle length.
 - (c) Interpret the confidence interval found in (a,b) in terms of the problem.
 - (d) A researcher hypothesized that women's menstrual cycles are typically the same length as a lunar month - 29.5 days. Does your interval from (a,b) support this hypothesis?
 - (e) Are the assumptions for a confident interval met for this problem?
4. As part of a study of natural variation in blood chemistry, serum potassium concentrations were measured in 66 randomly selected healthy women. The sample mean concentration was 4.36 mEq/l, and the sample standard deviation was 0.42 mEq/l.
 - (a) Find the lower bound for the 95% confidence interval for the true serum potassium concentrate in healthy women.
 - (b) Find the upper bound for the 95% confidence interval for the true serum potassium concentrate in healthy women.
 - (c) Interpret your confidence interval found in (a,b) in terms of the problem.
 - (d) Does your interval support the claim that normal serum potassium concentrations are above 2.3?
 - (e) If we were to build a 99% confidence interval instead, would it widen or narrow?
5. Continue with the data from Problem 1 (**The women menstrual cycle length**).
 - (a) If we wanted our confidence interval to have a margin of error of 0.5 days at 90% confidence, how many women should we sample (at least)?
 - (b) If we wanted our confidence interval to have a margin of error of 0.1 days at 90% confidence, how many women should we sample (at least)?
 - (c) What tends to happen to the sample size we need as the margin of error decreases? You may assume everything else remains constant.
 - (d) What tends to happen to the sample size we need as the standard deviation increases? You may assume everything else remains constant.
6. Two treatment costs for a particular medical issue are being compared. The average cost of a sample of 210 randomly selected subjects for treatment *A* was \$490, with a standard deviation of \$32. The average cost for a sample of 180 randomly selected subjects for treatment *B* was \$500, with standard deviation \$48. Assume the $d.f. = 300$.
 - (a) Find the lower bound for the 99% confidence interval for the difference in costs.
 - (b) Find the upper bound for the 99% confidence interval for the difference in costs.
 - (c) Interpret your interval from (a,b) in terms of the problem.
 - (d) Does your interval suggest that the costs are different?
 - (e) If we increased the confidence level (i.e., $(1-\alpha)100\%$), would the new interval be wider or narrower than that found in (a)?
7. Two baby-food manufacturers are competing, and manufacturer of brand A believes that their brand causes more weight gain in infants than manufacturer of brand B. A sample of size 15 fed their babies brand A for two months, and saw an average weight gain of 36.93 ounces, with a standard deviation of 4.23 ounces. A sample of size 25 fed their babies brand B and saw an average weight gain of 31.36 ounces with a standard deviation of 3.35 ounces. Assume the $d.f. = 24$.

- Find the lower bound for the 95% confidence interval for the difference in average weight gain between the two baby food brands.
 - Find the upper bound for the 95% confidence interval for the difference in average weight gain between the two baby food brands.
 - Interpret your interval from (a,b) in terms of the problem.
 - Does your interval suggest one brand of baby food causes more weight gain than the other on average?
 - If the sample sizes increased to 100, but everything else remained constant, would our interval widen or narrow?
8. A medical researcher wishes to see whether the pulse rates of smokers are higher than the pulse rate for non-smokers. Random samples of 65 smokers and 74 non-smokers are selected, and the pulse rate results are shown below. Test the researchers claim at $\alpha = 0.01$. Assume the $d.f. = 137$.

	Smokers	Nonsmokers
Sample Mean	90	88
Sample Standard Deviation	5.2	6.3
Sample Size	65	74

- State the null hypothesis.
 - State the alternative hypothesis.
 - Calculate the test-statistic for this problem.
 - Calculate the range of the p-value for your test-statistic.
 - Interpret the p-value in terms of the problem.
 - Do you reject the null, or fail to reject?
 - State the conclusion in terms of the problem.
9. A scientist recorded the tail lengths (in cm) of two varieties of woodland salamanders: red-backed and lead-backed. The table below shows the summary:

	Redbacked	Leadbacked
Sample Mean	3.2	4.0
Sample Standard Deviation	0.9	0.7
Sample Size	60	27

Assume the $d.f. = 63.5677$. The researchers are interested in if the average tail lengths of the two salamanders are equal.

- State the null hypothesis.
- State the alternative hypothesis.
- Calculate the test-statistic for this problem.
- Calculate the range of the p-value for your test-statistic.
- Interpret the p-value in terms of the problem.
- Do you reject the null, or fail to reject?
- State the conclusion in terms of the problem.

R Homework

These prompts correspond to “R Portion” of the homeworks on Canvas. You use R to find the answers to the following questions, and submit your answers online.

- I. Online you will find the file `student.csv`. It contains information on 1548 introduction to statistics students, and has the following columns:

Column 1: `height`: The height of the student.

Column 2: `hsGPA`: The high school GPA of the student.

Column 3: `pulse`: The pulse rate of the student when measured in class.

- Using R, find the lower bound for the 95% confidence interval for the average students height.
 - Using R, find the upper bound for the 95% confidence interval for the average students height.
 - What is the highest average height you expect a student to have, based on the confidence interval from a/b?
 - Using R, find the lower bound for the 99% confidence interval for the average students pulse.
 - Using R, find the upper bound for the 99% confidence interval for the average students pulse.
 - What is the lowest average pulse you expect a student to have, based on the confidence interval from d/e?
- II. You will be using the dataset `Radish.csv`, which contains the growth rate of radish plants two weeks after germination. The first column is the height of the plants (in cm). The second column is the treatment group, which was either given no fertilizer (the control group, called `Control`) or given fertilizer (the treatment group, called `Fertilized`). Assume the radishes were sampled randomly and independently.
- Find the lower bound for the 90% confidence interval for the difference between the two groups.
 - Find the upper bound for the 90% confidence interval for the difference between the two groups.
 - The fertilizer manufacturer claims that by using their fertilizer, plants will grow more on average than if you use no fertilizer. Does your confidence interval support this claim?
 - What is the largest difference in average growth you could expect with 90% confidence, based on your confidence interval?