Chapter 2 Review Problems

Topics to Study

- Confidence Interval Key Terms
- Statistics and Parameters
- Sampling Distributions
- Know how to interpreting confidence intervals
- T-distribution
- Table summarizing critical value, standard error, margin of error and confidence intervals
- Confidence Interval Assumptions
- Bootstrapping
- Two-population confidence intervals

1. Determine if each of the following symbols are a mean, standard deviation, proportion, slope, or correlation coefficient. Also, decide if it is a sample statistic or a population parameter.

(N , n , π , $\hat{p}$, μ , $\bar{x}$, σ , s , ρ , r , β_1 , b_1, σ^2, s^2)

2. For each number determine the symbol used from the following list and if it is a statistic or a parameter.

(N , n , π , $\hat{p}$, μ , $\bar{x}$, σ , s , ρ , r , β_1 , b_1, σ^2, s^2)

a) "We tested a sample of incoming college freshman and found that their sample mean average IQ was 101.9, a sample standard deviation of 14.8 and a sample variance of 219.04. We think the population mean IQ is 100, the population standard deviation for IQ scores is 15, and the population variance is 225."

b) "We want to check and see if the population correlation coefficient could be zero and the population slope could be about 20 pounds per degree Fahrenheit. The sample correlation coefficient was 0.338 and the sample slope was 13.79 pounds per degree Fahrenheit."

c) "Our study found that of the people tested in the sample, only 3% showed side effects to the medication. We think the population percentage of side effects is closer to 1.5%".

d) "We took a random sample of 238 people from a population of about 5 million people."

3. List the assumptions that need to be checked before you make a one-population mean confidence interval.

4. List the assumptions that need to be checked before you make a one-population variance or standard deviation confidence interval.

5. List the assumptions that need to be checked before you make a one-population proportion confidence interval.

6. List the assumptions that need to be checked before you make a two-population mean confidence interval.

7. List the assumptions that need to be checked before you make a two-population proportion confidence interval.

8. List the assumptions for a bootstrap confidence interval.

9. Define the following terms: Population, Census, Sample, Statistic, Parameter, Sampling Distribution, Sampling Variability, Point Estimate, Margin of Error, Standard Error, Confidence Interval, 95% Confident, 90% Confident, 99% Confident, Bootstrapping, Bootstrap Sample, Bootstrap Statistic, Bootstrap Distribution

10. Write a sentence to explain the following confidence intervals. Assume the confidence intervals came from unbiased random sample data that met all of the assumptions.

a) Explain the one-population mean confidence interval (55.6 pounds, 69.4 pounds). *Confidence Level = 99%*

b) Explain the one-population proportion confidence interval (0.352 , 0.411). *Confidence Level = 90%*

c) Explain the one-population standard deviation confidence interval (3.1 pounds, 4.7 pounds). *Confidence Level = 95%*

d) Explain the one-population variance confidence interval (461.8 square inches, 591.3 square inches). *Confidence Level = 99%*

e) Explain the two-population mean confidence interval (+13.2 kg, +14.8 kg). *Confidence Level = 95%* Is there a significant difference between the populations? Explain why.

f) Explain the two-population mean confidence interval (−$3.79, +$4.13). *Confidence Level = 90%* Is there a significant difference between the populations? Explain why.

g) Explain the two-population proportion confidence interval (−0.024, +0.017). *Confidence Level = 95%* Is there a significant difference between the populations? Explain why.

h) Explain the two-population proportion confidence interval (−0.072, −0.057). *Confidence Level = 99%* Is there a significant difference between the populations? Explain why.

11. Explain what a sampling distribution is and how we can use it to find the population parameter, standard error and better understand sampling variability.

12. Explain how a critical value Z-score or T-score and standard error can be used to calculate the margin of error. How can we use margin of error to make the confidence interval.

13. In one-population variance confidence intervals, how does the computer use the chi-squared critical values, the degrees of freedom and the sample variance to make the confidence interval?

14. Answer the following questions about the T-distribution.

a) Who invented the T-distribution?
b) What company did he work for?
c) Why did he invent T-scores?
d) Why did he have to publish the T-distribution discovery under a pseudonym?
e) What pseudonym did he use?
f) When are T-scores significantly larger than Z-scores?
g) When are T-scores and Z-scores almost the same?
h) What types of confidence intervals use Z-scores?
i) What types of confidence intervals use T-scores?
j) How is degrees of freedom usually calculated for one quantitative data set?

15. Explain the ideas behind the Central Limit Theorem.

16. Explain the process of bootstrapping and how a bootstrap distribution may be used to calculate a confidence interval without a formula. What assumptions are necessary to make a bootstrap confidence interval? How is a bootstrap distribution different from a sampling distribution?
