

Homework 5: T-procedures and Proportions

1 Matched Pairs Example from page 477 of your text

Does a football filled with helium travel farther than one filled with ordinary air? To test this, the Columbus Dispatch conducted a study. Two identical footballs, one filled with helium and one filled with ordinary air, were used. A casual observer was unable to detect a difference in the two footballs. A novice kicker was used to punt the footballs. A trial consisted of kicking both footballs in a random order. The kicker did not know which football (the helium-filled or the air-filled football) he was kicking. The distance of each punt was recorded. Then another trial was conducted. A total of 39 trials were run. The data is found in the attached minitab file inside C1 and C2.

Questions

1. Compute the differences, these do not need to be listed here, just tell me your order.
2. Create a Boxplot of your Differences.
3. Conduct the appropriate Test of Hypothesis based upon your differences. Write out your Null and Alternative Hypotheses and show your minitab output.
4. Interpret your results in regards to this question.
5. Create and Interpret a 95% Confidence Interval in regards to this problem.

2 Two-Sample T procedure from page 508 21.52

Different varieties of the tropical flower *Heliconia* are fertilized by different species of hummingbirds. Over time, the lengths of the flowers and the forms of the hummingbirds' beaks have evolved to match each other. The data on the lengths in millimeters of two color varieties of the same species of flower on the island of Dominica are given in the attached minitab file in C4 and C5. Is there evidence that the mean lengths of the two varieties differ?

1. Create a side-by-side Boxplot
2. Conduct the appropriate Test of Hypothesis. Write out your Null and Alternative Hypotheses and show your minitab output.
3. Interpret your results in regards to this question.
4. Create and Interpret a 95% Confidence Interval in regards to this problem.

3 Proportions

A certain organization wants to know the opinion of the adult residents, 35 years of age or older, of the 'XXX' City with a total population of 55,000 (similar size of Johnson City) about lowering the drinking age to 18. Specifically they want to know what proportion of those adults favor lowering the drinking age to 18. They organize a survey and select a simple random sample of 200 adult residents (35 years of age or older) and ask them "Do you think that the drinking age should be reduced to 18?" . In the sample, 140 people answered "yes".

1. What is the population of interest in this case?
 - A. The people that belong to the organization
 - B. All 18 year old people in XXX City
 - C. The 55,000 people in the city
 - D. All adult residents (35 years and older) of the XXX City
 - E. The 200 adults interviewed
2. What is the parameter to be estimated
 - A. 140
 - B. 0.7
 - C. 18
 - D. The proportion of adults (35 years or older) in the city that favor lowering the drinking age to 18
 - E. All adults (35 years or older) in the city.
3. Based on the sample collected, what is the estimated value of the parameter?
 - A. 140
 - B. 200
 - C. 0.7

- D. 0.3
- E. 18

4. In other places the proportion of the adult population that favor lowering the drinking age to 18 is 0.6 but we think that in XXX City that proportion is higher. How would you write the null and the alternative hypothesis in order to perform a test?

- A. $H_0: \hat{p} = 0.6$ $H_a: \hat{p} > 0.6$
- B. $H_0: p = 0.6$ $H_a: p > 0.6$
- C. $H_0: \mu = 0.6$ $H_a: \mu > 0.6$
- D. $H_0: p = 0.6$ $H_a: p < 0.6$
- E. $H_0: p = 0.7$ $H_a: p > 0.7$

5. Which of these options better describes the type I error in this case

- A. We say in XXX City the proportion is higher but actually it is the same like in other places
- B. We say in XXX City the proportion is the same like in other places but actually is higher
- C. We say in XXX City the proportion is lower actually it is the same like in other places
- D. We say in XXX City the proportion is the same like in other places but actually is lower
- E. We have a 'self selected sample' instead of a simple random sample.

6. Use the information given to test the hypotheses $H_0: p = 0.6$ $H_a: p > 0.6$
Which is the value of the test statistic?

- A. 2.89
- B. -2.89
- C. 3.08
- D. -3.08
- E. 0.0019

7. Calculate the p-value

- A. 0.9981
- B. -0.0019
- C. 0.0019
- D. 0.7
- E. 0.3

8. Which is your conclusion about this problem? (when we talk about 'adult population' here we are talking about the people that are 35 years or

older)

- A. In XXX City less than 60% of the adult population favor lowering the drinking age to 18.
- B. In XXX City more than 60% of the adult population favor lowering the drinking age to 18.
- C. In XXX City exactly 60% of the adult population favor lowering the drinking age to 18.
- D. In XXX City more than 60% of the adult population are against lowering the drinking age to 18.
- E. In XXX City exactly 70% of the adult population favor lowering the drinking age to 18.

9. With 95% confidence , between which values do you think that the proportion of the adult population (35 years or older) of XXX City that favor lowering the drinking age to 18 is?

- A. 0.6 ± 0.0635
- B. 0.7 ± 0.0635
- C. 0.6 ± 0.0679
- D. 0.7 ± 0.0679
- E. 200 ± 0.0679

10. An important person in the organization says that we worked with a too small sample size and that we should repeat this study. She wants us to work still with 95% confidence but she wants the margin of error for our estimation to be 0.05 . How large should the sample for our next study (in the same city) be?

- A. 400
- B. $200(0.05)$
- C. 323
- D. $200(0.95)$
- E. 9