Homework III
Z-Test and Dependent Sample $t$-test

Due Monday 2/16

1. Referring once again, to the bovine data and the electric fence, let's say that we want to know how intelligent the breed of Brown Swiss are— the cows used to make Miss Swiss Hot Chocolate. We sample 9 Brown Swiss cows and find they touch the electric fence an average of 13 times per day. The combined information gives us the following:

\[ \mu = 10; \ \theta = 13; \ \sigma = 1.5; \ n = 9 \]

a. Write the Null hypothesis, two One-tailed Alternative (Research) hypotheses, and a Two-Tailed hypothesis.
b. Using the appropriate critical values test each hypothesis above.
c. Report your results in proper APA format (Be sure to report the highest level of significance achieved)
d. What does this tell us in the context of the null and each of the research hypotheses?

2. Let's say that we now want to know if the breed of Guernsey cows are more or less intelligent than the national average. We sample 25 Guernsey cows and find that they touch the electric fence an average of 10.5 times per day. The combined information gives us the following:

\[ \mu = 10; \ \theta = 10.5; \ \sigma = 1.5; \ n = 25 \]

a. Write the Null hypothesis, two One-tailed Alternative (Research) hypotheses, and a Two-Tailed hypothesis.
b. Using the appropriate critical values test each hypothesis above.
c. Report your results in proper APA format (Be sure to report the highest level of significance achieved)
d. What does this tell us in the context of the null and each of the research hypotheses?

3. Referring back to Cartoon 9.2, let's say that instead of fraternity members we are now interested in sorority members and the amount they spend monthly on clothes. Once again, from a questionnaire administered at All-American U we know the average amount of money spent by all women is $60.00. We randomly sample 36 sorority members and find that they spend an average of $75.00 per month on clothes, with a corresponding standard deviation of $24.00. The combined information gives us the following:

\[ \mu = 60; \ \theta = 75; \ \sigma = 24; \ n = 36 \]

a. Write the Null hypothesis, two One-tailed Alternative (Research) hypotheses, and a Two-Tailed hypothesis.
b. Using the appropriate critical values test each hypothesis above.
c. Report your results in proper APA format (Be sure to report the highest level of significance achieved)
d. What does this tell us in the context of the null and each of the research hypotheses?

4. Based on the cartoon below, assume that we want to know if the toxic waste really had an effect on the cockroaches. So we compare the average size of 25 cockroaches kept in Binkly's basement for two weeks (60 cm.) to the average size of all cockroaches in the United States (50 cm.). Further assume that we only know the standard deviation (20) for the sample and not the population.

a. Write the Null hypothesis, two One-tailed Alternative (Research) hypotheses, and a Two-Tailed hypothesis.
b. Using the appropriate critical values test each hypothesis above.
c. Report your results in proper APA format (Be sure to report the highest level of significance achieved)
d. What does this tell us in the context of the null and each of the research hypotheses?

5. Assume that this time we are interested in finding out if cockroaches exposed to toxic waste like dijon mustard more or less that the total population of cockroaches. So we gave a sample of 75 cockroaches exposed to toxic waste a questionnaire about mustard preference and were given a dijon liking score that ranged between 1(totally hate dijon) to 7 (totally love dijon), the average score for our sample was 1.5 with a standard deviation of (s = 3.5). We also know the population average dijon liking score for all cockroaches (2.2).

a. Write the Null hypothesis, two One-tailed Alternative (Research) hypotheses, and a Two-Tailed hypothesis.
b. Using the appropriate critical values test each hypothesis above.
c. Report your results in proper APA format (Be sure to report the highest level of significance achieved)
d. What does this tell us in the context of the null and each of the research hypotheses?

6. For any of the two-tailed analyses above that are not significant, how may subjects would be needed in order for the t obtained to be considered significant?

7. For all of the analyses above, what is the resulting t obtained if you double the sample size? What is the t obtained if you cut the sample size in half?