Problem set 9

Online S520

Upload your answers through the Assignments tab on Canvas

1. (8 points.) In a May 2016 Gallup poll,[1] 61% of a sample of 1025 U.S. adults supported same-sex marriage.

   (a) Treating the data as a simple random sample, find a 95% confidence interval for the percentage of all U.S. adults who support same-sex marriage.

   (b) Suppose we wanted to have a 95% confidence interval for the percentage of all U.S. adults who support same-sex marriage with total length 2% (i.e. 0.02.) How large a simple random sample would we need?

2. (5 points) Trosset chapter 10 Problem Set A, question 1.

3. (5 points) "Glycemic index" is a measure of how quickly blood sugar level rises after eating a particular food. (Glucose has a glycemic index of 100, while water has a glycemic index of 0.) A group of researchers wished to study glycemic index when dates and coffee were consumed together by individuals with type 2 diabetes. They performed a study on 10 subjects with diabetes. Firstly, they measured glycemic index for each patient after consuming dates without coffee. The mean was 53 with standard deviation 19. Then (several days later) they measured glycemic index for each patient after consuming dates with coffee. The mean was 41.5 with standard deviation 17. The differences between the measurements ("without coffee" minus "with coffee") had mean 11.5 with standard deviation 21.

   (a) What is the experimental unit? What measurements are taken on the experimental units?

   (b) Give null and alternative hypotheses for an appropriate two-tailed t-test, and calculate the t-statistic.

   (c) The P-value (significance probability) was calculated to be 0.12, so the null hypothesis was not rejected. From this and the other information given, is it correct to conclude that we are sure that on average, dates have the same glycemic index with or without coffee? Explain.

[1] `http://www.gallup.com/poll/191645/americans-support-gay-marriage-remains-high.aspx` . Note: The margin of error Gallup states is different from what we would calculate, because they adjust for the fact that they are not taking a true simple random sample.

4. (5 points) Crustaceologists counted the number of horseshoe crabs on 25 beaches in Delaware Bay in both of the 2011 and 2012 breeding seasons. They wish to know whether changes in the number of crabs from one year to the next can be attributed to chance. The data is available in the file `crab-counts.txt`.

   One researcher tests the null hypothesis that the mean change in crabs counts is zero. He uses R to perform a one-sample t-test on the changes in crab counts, resulting in a P-value of 0.045. However, this test might not be a good idea.

   Draw a graph and convince the researcher that a paired t-test may not be the best method for this data.

5. (7 points) Trosset chapter 10 Problem Set D, questions 1 & 2. (Note: You will be graded on the basis of how well you argued on behalf of your choice, not on the basis of what you choose.)