Math 341 Spring 2021, Homework 6

1. In each part below, information about a sample is given. Assuming that the sampling distribution is symmetric and bell-shaped, use the information to give a 95% confidence interval, and indicate the parameter being estimated.

a. $\bar{x} = 70$ and the standard error (SE) is 2

b. $r = 0.34$ and the standard error is 0.02

c. The standard error is 0.04 and
$$\hat{p} = 0.6$$

d. The margin of error for 95% confidence is 0.04 and
$$\hat{p}_1 - \hat{p}_2 = 0.07$$

2. The Higher Education Research Institute conducts "Your First College Year" survey every year. The 2018 srvey included 5204 first-year full-time collge students in the US. The survey was administered at the end of the first year and 35.6% of the students said they had changed their choice of major over the course of the year.

a. Is the information given from a sample or population?

b. Is the 35.6% a parameter or a statistic? Write it with its correct notation.

c. Give a 95% confidence interval for the quantity being estimated, if the standard error for the estimate is 0.007.

3. In each part below, a sample is given. Is it a possible bootstrap sample from this original sample: 17, 10, 15, 21, 13, 18?

a. 10, 12, 17, 18, 20, 21

b. 10, 15, 17

c. 18, 13, 21, 13, 21, 17, 15

4. To study how many ants would climb on a piece of peanut butter sandwich left on the ground near an ant hill, a student in Australia left a piece of a sandwich for several minutes, then covered it with a jar and counted the number of ants. He did this eight times and the the number of ants each time were: 43, 59, 22, 25, 36, 47, 19, 21

a. Find the mean and standard deviation of the sample.

b. Describe how we could use eight slips of paper to create one bootstrap statistic. Be specific.

c. What do we expect the shape and center of the bootstrap distribution to be?

d. Use the code linked to the HW 6 assignment to give a bootstrap distribution of 5000 bootstrap statistics from this sample. Find the standard error and use it to find and interpret a 95% confidence interval for the population parameter.

e. Use the 2.5th and 97.5th quantiles to estimate a 95% confidence interval and compare to (d).

5. The following is a bootstrap distribution generated for a sample mean. Use it to give a 95% confidence interval with the correct notation for the parameter being estimated.

☐ Left Tail ☐ Two-Tail ☐ Right Tail

samples = 2000
mean = 15.909
std. error = 2.146

15.909
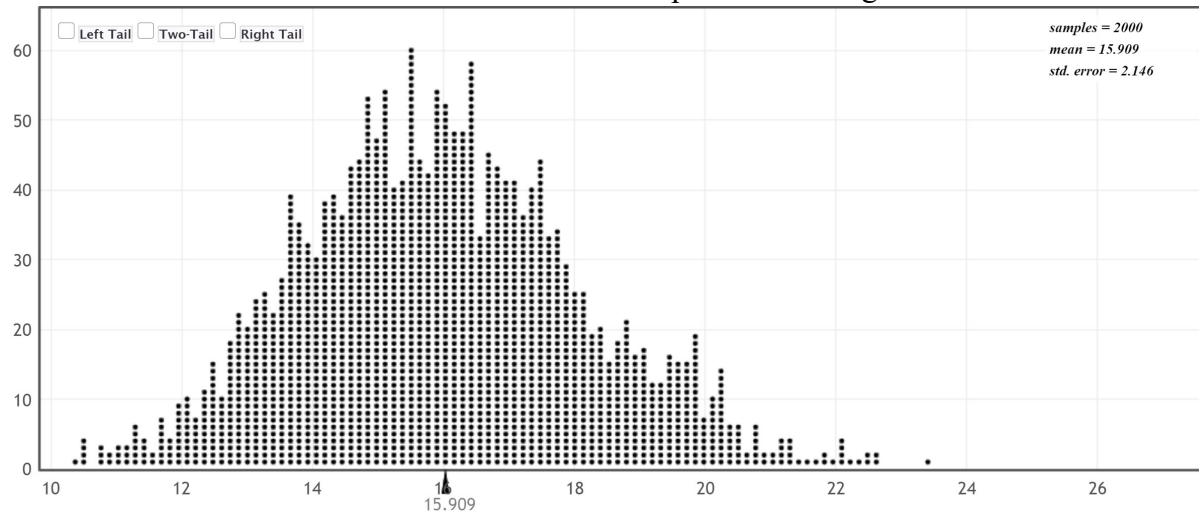
6. The following is a bootstrap distribution generated for a sample proportion. Use it to give a 95% confidence interval with the correct notation for the parameter being estimated.

☐ Left Tail ☐ Two-Tail ☐ Right Tail

samples = 2000
mean = 0.519
std. error = 0.051

0.519
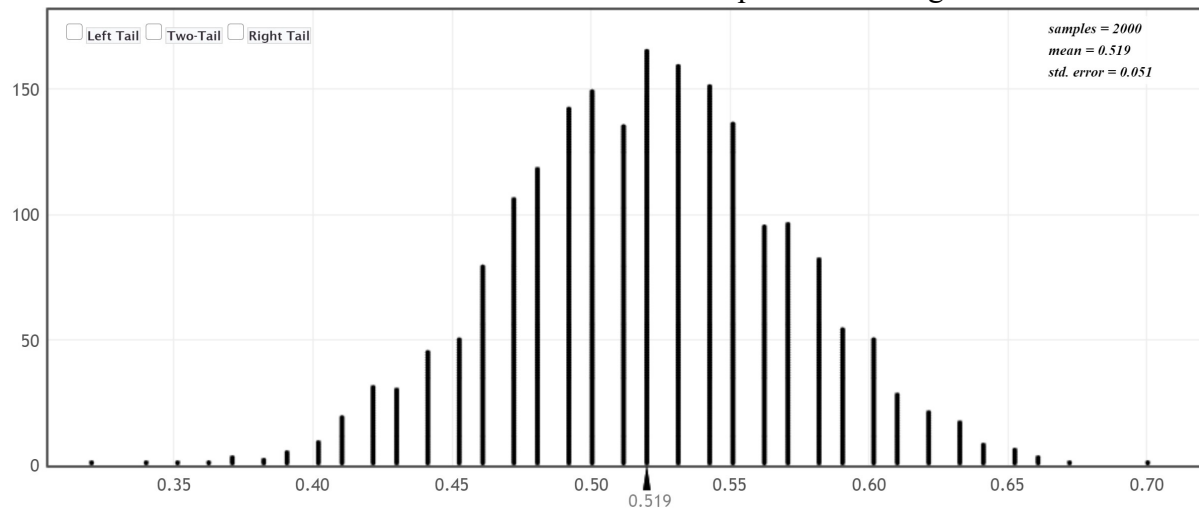
7. The following is a bootstrap distribution generated for a sample correlation coefficient. Use it to give a 95% confidence interval with the correct notation for the parameter being estimated.
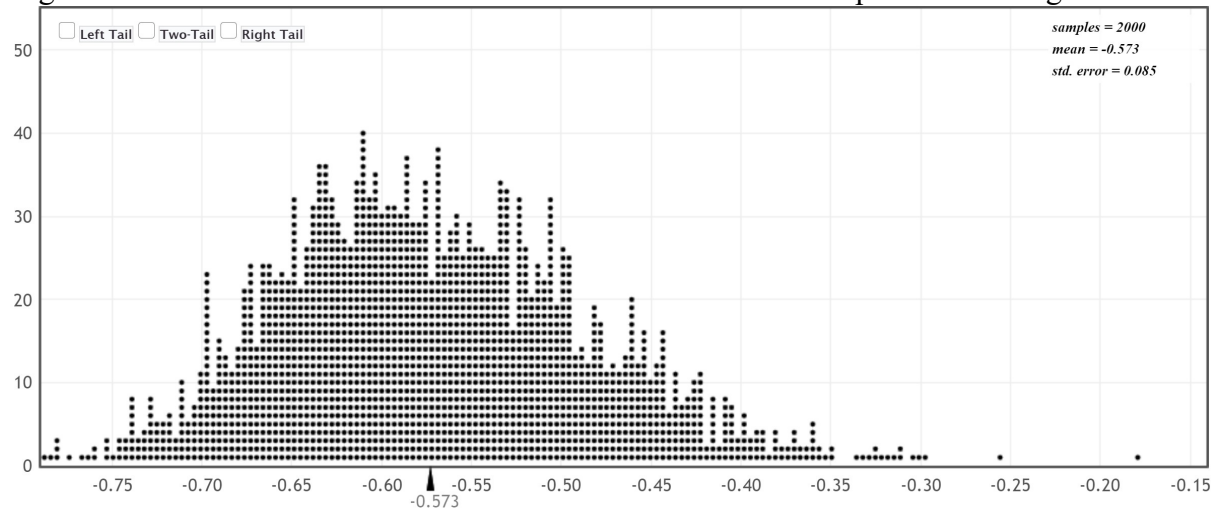
8. The R script *samplingBabies.R* linked to HW 6 (and written by Chris Luke) uses a data file that gives the birth weight, date, and gestational period collected as part of the Child Health and Development Studies in the U.S. in 1961 and 1962. **In this problem, you are going to treat the sample of 1236 observations as if it were a population.** The R code creates sampling distributions for the birth weight (in ounces) of the babies. Run the code to:

a. Find the value of the population parameter (use correct notation). Explain how you found it.

b. Find the standard error and the sample size given in the R script.

c. Find the bootstrap statistic and the bootstrap standard error and use these to estimate a 95% confidence interval for the population parameter. Then find the 2.5 and 97.5 percentiles for the bootstrap distribution. Use these to estimate a 95% confidence interval. How do the confidence intervals compare?

d. Run the code again and use it to do part (c) again. What (if anything) about the confidence intervals changed?

e. What sample size is used (in the R code) for the bootstrap distribution?

f. Double the sample size in the R code and redo parts (c) and (d). What (if anything) about the confidence intervals changed?