Tutorial 5: Questions

February 14, 2018

Preliminaries

- **Do 7.3.28, 7.4.42**

Question 7.1.6, Page 285

On the basis of extensive tests, the yield point of a particular type of mild steel-reinforcing bar is known to be normally distributed with $\sigma = 100$. The composition of bars has been slightly modified, but the modification is not believed to have affected either the normality or the value of σ.

(a) Assuming this to be the case, if a sample of 25 modified bars resulted in a sample average yield point of 8439 lb, compute a 90% CI for the true average yield point of the modified bar.

(b) How would you modify the interval in part (a) to obtain a confidence level of 92%?

Question 7.1.10, Page 285

A random sample of $n = 15$ heat pumps of a certain type yielded the following observations on lifetime (in years):

2.0	1.3	6.0	1.9	5.1	0.4	1.0	5.3
15.7	0.7	4.8	0.9	12.2	5.3	0.6	

(a) Assume that the lifetime distribution is exponential and use an argument parallel to that of Example 7.5 to obtain a 95% CI for expected (true average) lifetime.

(b) How should the interval of part (a) be altered to achieve a confidence level of 99%?

(c) What is a 95% CI for the standard deviation of the lifetime distribution? [Hint: What is the standard deviation of an exponential random variable?]

Question 7.2.14, Page 293

Some super long story... Among the children in the study, 514 came from households that used coal for cooking or heating or both. Their FEV1 mean was 1427 with a standard deviation of 325.

(a) Calculate and interpret a 95% (two-sided) CI for true average FEV1 level in the population of all children from which the sample was selected. Does it appear that the parameter of interest has been accurately estimated?

(b) Suppose the investigators had made a rough guess of 320 for the value of s before collecting data. What sample size would be necessary to obtain an interval width of 50 ml for a confidence level of 95%?

Question 7.2.20, Page 294

TV advertising agencies face increasing challenges in reaching audience members because viewing TV programs via digital streaming is gaining in popularity. The Harris poll reported on November 13, 2012, that 53% of 2343 American adults surveyed said they have watched digitally streamed TV programming on some type of device.

(a) Calculate and interpret a CI at the 99% confidence level for the proportion of all adult Americans who watched streamed programming up to that point in time.

(b) What sample size would be required for the width of a 99% CI to be at most 0.05 irrespective of the value of $\widehat{p}$?

Question 7.3.32, Page 302

Investigators developed a new test that adds cyclic strain to a level well below breakage and determines the number of cycles to break a condom. A sample of 20 condoms of one particular type resulted in a sample mean number of 1584 and a sample standard deviation of 607. Calculate and interpret a CI at the 99% confidence level for the true average number of cycles to break. [Note: The article presented the results of hypothesis tests based on the t distribution; the validity of these depends on assuming normal population distributions.]