

STAT 400 Homework 10

Spring 2018 / Dalpiaz / UIUC

Due: Friday, April 13, 2:00 PM

Please see the [detailed homework policy document](#) for information about homework formatting, submission, and grading.

Exercise 1

Before it closed, Ron Swanson was a frequent patron of Charles Mulligan's Steakhouse in Indianapolis, Indiana. Ron enjoyed the experience so much, during each visit he took a picture with his steak.



Ron also weighed each steak he consumed. He has a record of eating six “22 ounce” Charles Mulligan’s porterhouse steaks. Ron found that these six steaks weighed

22.4 oz, 20.8 oz, 21.6 oz, 20.2 oz, 21.4 oz, 22.0 oz

Suppose that “22 ounce” Charles Mulligan’s porterhouse steaks follow a $N(\mu, \sigma^2)$ distribution and that Ron’s six steaks were a random sample.

- Compute the sample standard deviation, s , of these six steaks. Do not use a computer. You may only use $+$, $-$, \times , \div , and $\sqrt{\quad}$ on a calculator. Show **all** work.
- Construct a 95% two-sided confidence interval for the true mean weight of a “22 ounce” Charles Mulligan’s porterhouse steak, μ .
- Construct a 95% confidence lower bound for the true mean weight of a “22 ounce” Charles Mulligan’s porterhouse steak, μ .
- Construct a 90% two-sided confidence interval for the true standard deviation of the weight of a “22 ounce” Charles Mulligan’s porterhouse steak, σ .
- Construct a 90% confidence upper bound for the true standard deviation of the weight of a “22 ounce” Charles Mulligan’s porterhouse steak, σ .

Exercise 2

Last year, ballots in Champaign-Urbana contained the following question to assess public opinion on an issue:

“Should the State of Illinois legalize and regulate the sale and use of marijuana in a similar fashion as the State of Colorado?”

Suppose that we would like to understand Champaign-Urbana’s 2017 opinion on marijuana legalization. To satisfy our curiosity, we obtain a random sample of 120 Champaign-Urbansians and find that 87 support marijuana legalization.

(a) Construct a 99% confidence interval for p , the true proportion of Champaign-Urbansians that support marijuana legalization.

(b) Suppose that a pollster wants to estimate the true proportion of Champaign-Urbansians that support marijuana legalization to within 0.04, with 95% confidence. How many Champaign-Urbansians should this pollster poll? Assume the pollster has no prior knowledge about the proportion.

(c) Now assume the pollster believes that support for legalization is somewhere between 65% and 85% and they would like to estimate the true proportion of Champaign-Urbansians that support marijuana legalization to within 0.04, with 90% confidence. How many Champaign-Urbansians should this pollster poll?

Exercise 3

Suppose students in a Statistics class are interested in the average score of an exam, but the instructor has only graded (a random sample of) 13 of the (many) exams. The instructor states that a 90% confidence interval for the true mean is given by (79.14, 82.86) and that you can assume the grades follow a normal distribution.

Using only this information, calculate \bar{x} , s , and finally, a 95% confidence interval for μ , the true mean of the exam.

Exercise 4

Suppose that 10 students visit the Stars Hollow Apple Orchard and each pick (a random sample of) 15 Fuji apples, weigh them, then create a 90% confidence interval for the true mean weight of a Fuji apple at the Stars Hollow Apple Orchard. What is the probably that at most 2 of these intervals do not contain the true mean weight of a Fuji apple at the Stars Hollow Apple Orchard?

