Chapter 18

2. LSAT The LSAT has a mean score of 151 with a standard deviation of 9 and a unimodal, symmetric distribution of scores. A test preparation organization teaches small classes of 9 students at a time. A larger organization teaches classes of 25 students at a time. Both organizations publish the mean scores of all their classes.
a) What would you expect the distribution of mean class scores to be for each organization?
b) If either organization has a graduating class with a mean score of 160, they'll take out a full-page ad in the local school paper to advertise. Which organization is more likely to have that success? Explain.
c) Both organizations advertise that if any class has an average score below 145, they'll pay for everyone to retake the LSAT. Which organization is at greater risk to pay?

3. *t*-models, part I Using the *t* tables, software, or a calculator, estimate
a) the critical value of *t* for a 90% confidence interval with df = 17.
b) the critical value of *t* for a 98% confidence interval with df = 88.

4. *t*-models, part II Using the *t* tables, software, or a calculator, estimate
a) the critical value of *t* for a 95% confidence interval with df = 7.
b) the critical value of *t* for a 99% confidence interval with df = 102.

7. Home sales The housing market has recovered slowly from the economic crisis of 2008. Recently, in one large community, realtors randomly sampled 36 bids from potential buyers to estimate the average loss in home value. The sample showed the average loss was $9,560 with a standard deviation of $1500.
a) What assumptions and conditions must be checked before finding a confidence interval? How would you check them?
b) Find a 95% confidence interval for the mean loss in value per home.
c) Interpret this interval and explain what 95% confidence means in this context.

8. Home sales again In the previous exercise, you found a 95% confidence interval to estimate the average loss in home value.
a) Suppose the standard deviation of the losses had been $3000 instead of $1500. What would the larger standard deviation do to the width of the confidence interval (assuming the same level of confidence)?
b) Your classmate suggests that the margin of error in the interval could be reduced if the confidence level were changed to 90% instead of 95%. Do you agree with this statement? Why or why not?
c) Instead of changing the level of confidence, would it be more statistically appropriate to draw a bigger sample?

13. Jelly A consumer advocate wants to collect a sample of jelly jars and measure the actual weight of the product in the container. They need to collect enough data to construct a confidence interval with a margin of error of no more than 2 grams with 99% confidence. The standard deviation of these jars is usually 4 grams. What do you recommend for their sample size?

37. Marriage In 1960, census results indicated that the age at which American men first married had a mean of 23.3 years. It is widely suspected that young people today are waiting longer to get married. We want to find out if the mean age of first marriage has increased during the past 40 years.
a) Write appropriate hypotheses.
b) We plan to test our hypothesis by selecting a random sample of 40 men who married for the first time last year. Do you think the necessary assumptions for inference are satisfied? Explain.
c) Describe the approximate sampling distribution model for the mean age in such samples.
d) The men in our sample married at an average age of 24.2 years, with a standard deviation of 5.3 years. What's the P-value for this result?
e) Explain (in context) what this P-value means.
f) What's your conclusion?

(Things have changed even more. Check out the census data. Also at end.)

43. Chips Ahoy! In 1998, as an advertising campaign, the Nabisco Company announced a "1000 Chips Challenge," claiming that every 18-ounce bag of their Chips Ahoy! cookies contained at least 1000 chocolate chips. Dedicated Statistics students at the Air Force Academy (no kidding) purchased some randomly selected bags of cookies, and counted the chocolate chips. Some of their data are given below. (*Chance,* 12, no. 1 [1999])

1219 1214 1087 1200 1419 1121 1325 1345 1244 1258 1356 1132 1191 1270 1295 1135

a) Check the assumptions and conditions for inference. Comment on any concerns.

b) Create a 95% confidence interval for the average number of chips in bags of Chips Ahoy! cookies.

c) What does this evidence say about Nabisco's claim? Use your confidence interval to test an appropriate hypothesis and state your conclusion.

45. Maze Psychology experiments sometimes involve testing the ability of rats to navigate mazes. The mazes are classified according to difficulty, as measured by the mean length of time it takes rats to find the food at the end. One researcher needs a maze that will take rats an average of about one minute to solve. They test one maze on several rats, collecting the data shown.

[data in Minitab]

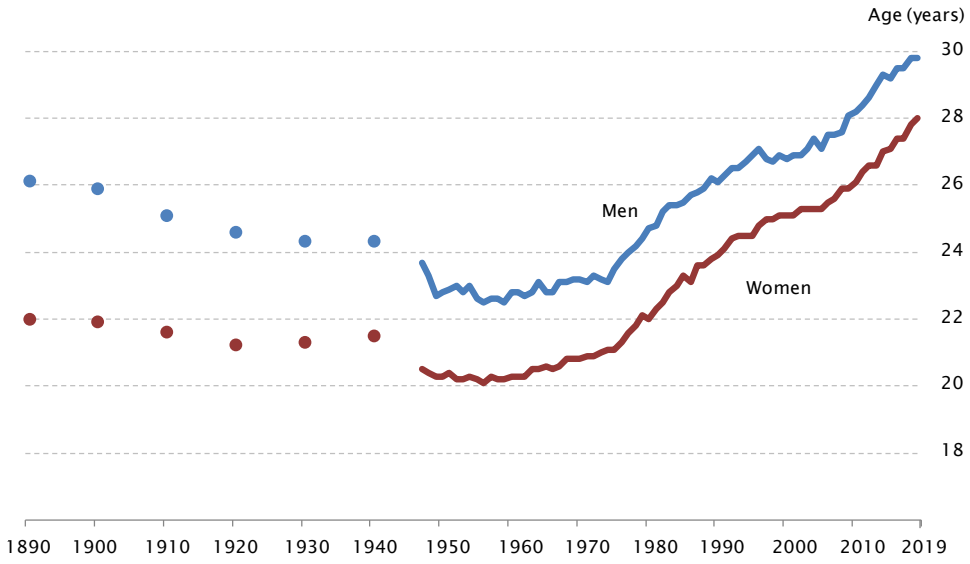
a) Plot the data. Do you think the conditions for inference are satisfied? Explain.

b) Test the hypothesis that the mean completion time for this maze is 60 seconds. What is your conclusion?

c) Eliminate the outlier, and test the hypothesis again. What is your conclusion?

d) Do you think this maze meets the "one-minute average" requirement? Explain.

Figure MS-2
Median age at first marriage: 1890 to present



United States Census Bureau | U.S. Department of Commerce
Economics and Statistics Administration
U.S. CENSUS BUREAU
census.gov

Source: U.S. Census Bureau, Decennial Censuses, 1890 to 1940, and Current Population Survey, Annual Social and Economic Supplements, 1947 to 2019.
Note: Starting in 2019, estimates for marriages now include same-sex married couples.