E Chapter 8 Exercises

Note: *For all exercises in this section, you may assume that all samples of a given size have an equal probability of being chosen. Unless otherwise indicated, assume that the population standard deviation is unknown.*

Confidence Intervals and Margins of Error

Find each specified confidence interval or margin of error.

1. A survey of 21 accountants finds that they spend a mean of $45.00 each week on lunch with a standard deviation of $3.63. Using a margin of error of $2.00, give an interval estimate for the mean amount of money accountants spend on lunch each week, and interpret the interval. Assume that the population is normally distributed.

2. In a random sample of 35 students at a local college, 19 regularly carry a laptop computer to class. Using this sample and a margin of error of 12.1%, construct and interpret an interval estimate for the proportion of all students at the college who carry a laptop computer to class.

3. Out of 300 randomly selected sets of wireless speakers chosen off of an assembly line, a manufacturer found that only 2% were defective. Using a 95% level of confidence, calculate the margin of error for the proportion of all sets of wireless speakers from this manufacturer that are defective.

4. A random sample of 253 working mothers was surveyed regarding the cost of health care. The mean amount of money spent on health care by these working mothers each year was $1300. Suppose that the population standard deviation is known to be $289 per year. Calculate the margin of error for the population mean using a 98% level of confidence.

5. Fifteen randomly selected dentists were timed while brushing their own teeth for a recent study. The mean amount of time spent on brushing their teeth was 2.13 minutes with a standard deviation of 0.45 minutes. Calculate the margin of error for the mean amount of time all dentists spend brushing their teeth. Use a 99% level of confidence. Assume that the population is normally distributed.

6. Of 600 bags of rice randomly selected from a train after a wreck, 230 were damaged in the train wreck. The insurance company needs to estimate the proportion of bags of rice on the entire train that were damaged in the wreck. Construct and interpret a 99% confidence interval for the proportion of all bags of rice that were damaged.

7. From a random sample of 49 stray dogs, a veterinarian finds that their mean weight is 41.0 pounds with a standard deviation of 8.5 pounds. Construct and interpret a 98% confidence interval for the mean weight of all stray dogs in this area.

8. Although male polar bears weigh only about one pound at birth, the mean weight of a random sample of 10 adult male polar bears is 1200 pounds with a standard deviation of 100 pounds. Construct and interpret a 98% confidence interval for the mean weight of all adult male polar bears. Assume that the population is normally distributed.

9. The following sample of volumes of soda (in ounces) was taken from 14 cans randomly selected from an assembly line.

12.01	12.02	11.95	11.99	11.94	12.01	12.03
11.98	12.00	12.03	11.98	12.05	11.93	11.98

Build and interpret a 95% confidence interval for the population variance for the volumes of soda in all the soda cans that come off that particular assembly line.

10. The following is a random sample of the numbers of daily hits a website receives. Construct and interpret a 99% confidence interval for the mean number of hits the website gets if the population standard deviation is known to be 3822.1.

7881	10,101	16,157	17,377	16,690	16,363	13,282	6882	8207	12,098	13,971
17,968	16,615	14,310	8401	10,689	19,011	18,222	17,538	16,005	13,192	7344

Minimum Sample Sizes for Interval Estimates

Calculate the minimum sample size needed to construct a confidence interval with the desired characteristics.

11. A researcher wants to interview military personnel returning from war regarding their experiences overseas. The researcher wants to know the proportion of soldiers who would not choose to return to combat duty overseas if given the choice. If the researcher desires to construct a 90% confidence interval with a 5% margin of error, how many soldiers must the researcher interview? An estimate for the proportion of soldiers who would not return to combat duty overseas if given the choice is 76%.

12. Juan is interning for the summer at a marketing firm. One of his assignments is to conduct research to estimate the percentage of Americans who shop at after-Christmas sales. He needs his results to have a 99% level of confidence and a maximum error of 2%. If previous estimates have shown the percentage to be 20%, how many people must Juan survey?

13. A researcher is looking to estimate the mean LSAT score of law school applicants who completed their undergraduate degrees at small liberal arts colleges. She wants a 99% level of confidence and a maximum margin of error of 2 points. How many applicants must she survey if previous studies show the standard deviation to be approximately 9 points?

For each of the following scenarios, determine whether the normal distribution, t-distribution, or neither distribution can be used to create a confidence interval.

14. A fashion publication wants to estimate the average amount of money that women spend on cosmetics per month. A sample of 250 women is chosen at random and the sample mean computed to be $34.65 with a standard deviation of $7.30. The population standard deviation is unknown.

15. A manufacturer wishes to evaluate the durability of their reciprocating saw blades by estimating the average number of hours of work that their blades can withstand. A sample of 95 blades saw a mean of 42.7 hours of work before breaking, with a standard deviation of 5.1 hours. The population standard deviation is known to be 5 hours.

16. A geologist wants to estimate the average temperature of a particular soil layer deep within the earth's strata. He takes temperature readings at randomly selected times over the course of a month. The collected sample of 75 temperature readings is approximately normal with an average of 58.3 and a standard deviation of 2.9 degrees. Assume the population standard deviation is known to be 2 degrees.

17. A spin instructor wishes to estimate the number of calories his clients burn during a regular one-hour class. He randomly chooses 18 different clients over the course of 3 weeks and, based on the estimates given by their bikes, determines that the mean number of calories burned is 535 with a standard deviation of 40 calories. The distribution is found to be skewed right and the population standard deviation is unknown.