

- 12. SAT Scores.** A simple random sample of SAT scores is obtained, and the population has a distribution that is approximately normal. The sample statistics are  $n = 41$ ,  $\bar{x} = 1503$ ,  $s = 352$ . Construct the 95% confidence interval estimate of the population mean.
- 13. Crash Hospital Costs.** A study was conducted to estimate hospital costs for accident victims who wore seat belts. Twenty randomly selected cases have a distribution that appears to be approximately bell-shaped with a mean of \$9,004 and a standard deviation of \$5,629 (based on data from the U.S. Department of Transportation).
- Construct the 95% confidence interval for the mean of all such costs.
  - If you are a manager for an insurance company that provides lower rates for drivers who wear seat belts and you want a conservative estimate for a worst-case scenario, what amount should you use as the possible hospital cost for an accident victim who wears a seat belt?
- 14. Forecast and Actual Temperatures.** One of the authors compiled a list of actual high temperatures and the corresponding list of three-day-forecast high temperatures. The difference for each day was then found by subtracting the three-day-forecast high temperature from the actual high temperature; the result was a list of 31 values with a mean of  $-0.419^\circ$  and a standard deviation of  $3.704^\circ$ .
- Construct a 95% confidence interval estimate of the mean difference between all actual high temperatures and three-day-forecast high temperatures.
  - Does the confidence interval include  $0^\circ$ ? If the confidence interval does include  $0^\circ$ , can we conclude that the three-day-forecast temperatures are inaccurate?
- 15. Estimating Car Pollution.** Each car in a sample of seven cars was tested for nitrogen-oxide emissions (in grams per mile), and the following results were obtained: 0.06, 0.11, 0.16, 0.15, 0.14, 0.08, 0.15 (based on data from the Environmental Protection Agency).
- Assuming that this sample is representative of cars in use, construct a 95% confidence interval estimate of the mean amount of nitrogen-oxide emissions for all cars.
  - The Environmental Protection Agency requires that nitrogen-oxide emissions be less than 0.165 gram/mile. Someone claims that nitrogen-oxide emissions have a mean equal to 0.165 gram/mile. Does the confidence interval suggest that this claim is not valid? Why or why not?
- 16. Monitoring Lead in Air.** Listed below are measured amounts of lead (in micrograms per cubic meter, or  $\mu\text{g}/\text{m}^3$ ) in the air.
- 5.40 1.10 0.42 0.73 0.48 1.10

The Environmental Protection Agency has established an air quality standard for lead of  $1.5 \mu\text{g}/\text{m}^3$ . The measurements were recorded at Building 5 of the World Trade Center site on different days immediately following the destruction caused by the terrorist attacks of September 11, 2001. After the collapse of the two World Trade Center buildings, there was considerable concern about the quality of the air. Use the given values to construct a 95% confidence interval estimate of the mean amount of lead in the air. Is there anything about this data set suggesting that the confidence interval might not be very good? Explain.

**Hypothesis Tests.** In Exercises 17–24, test the given claim.

- 17. Sugar in Cereal.** A simple random sample of 16 different cereals is obtained, and the sugar content (in grams of sugar per gram of cereal) is measured for each cereal selected. Those amounts have a mean of 0.295 gram and a standard deviation of 0.168 gram. Use a 0.05 significance level to test the claim of a cereal lobbyist that the mean for all cereals is less than 0.3 gram.
- 18. Testing Wristwatch Accuracy.** Students randomly selected 30 people and measured the accuracy of their wristwatches, with positive errors representing watches that were ahead of the correct time and negative errors representing watches that were behind the correct time. The 30 values have a mean of 117.3 seconds and a standard deviation of 185.0 seconds. Use a 0.05 significance level to test the claim that the population of all watches has a mean equal to 0 seconds. What can be concluded about the accuracy of people's wristwatches?
- 19. Baseballs.** In previous tests, baseballs were dropped 24 feet onto a concrete surface, and they bounced an average of 92.84 inches. In a test of a sample of 20 new balls, the bounce heights had a mean of 92.67 inches and a standard deviation of 1.79 inches (based on data from Brookhaven National Laboratory and *USA Today*). Use a 0.05 significance level to determine whether there is sufficient evidence to support the claim that the new balls have bounce heights with a mean different from 92.84 inches. Does it appear that the new baseballs are different?
- 20. Reliability of Aircraft Radios.** The mean time between failures for a Telekronic Company radio used in light aircraft is 420 hours. After 15 new radios were modified in an attempt to improve reliability, tests were conducted to measure the times between failures. The 15 radios had a mean time between failures of 442 hours with a standard deviation of 44.0 hours. Use a 0.05 significance level to test the claim that modified radios have a mean time between failures that is greater than 420 hours. Does it appear that the modifications improved reliability?