Section 8.2

7. **Heights of 1-Year-Olds** The average 1-year-old (both genders) is 29 inches tall. A random sample of 30 1-year-olds in a large day care franchise resulted in the following heights. At $\alpha = 0.05$, can it be concluded that the average height differs from 29 inches? Assume $\sigma = 2.61$.

25	32	35	25	30	26.5	26	25.5	29.5	32
30	28.5	30	32	28	31.5	29	29.5	30	34
29	32	27	28	33	28	27	32	29	29.5

Source: www.healthepic.com

8. **Salaries of Government Employees** The mean salary of federal government employees on the General Schedule is \$59,593. The average salary of 30 randomly selected state employees who do similar work is \$58,800 with $\sigma = \$1500$. At the 0.01 level of significance, can it be concluded that state employees earn on average less than federal employees?

Source: *New York Times Almanac.*

9. **Operating Costs of an Automobile** The average cost of owning and operating an automobile is \$8121 per 15,000 miles including fixed and variable costs. A random survey of 40 automobile owners revealed an average cost of \$8350 with a population standard deviation of \$750. Is there sufficient evidence to conclude that the average is greater than \$8121? Use $\alpha = 0.01$.

Source: *New York Times Almanac 2010.*

10. **Heights of NBA Players** The average height of an NBA player is 6.698 feet. A random sample of 30 players' heights from a major college basketball program found the mean height was 6.75 feet with a standard deviation of 5.5 inches. At $\alpha = 0.05$, is there sufficient evidence to conclude that the mean height differs from 6.698 feet?

11. **Speeding Ticket Costs** The average cost of a speeding ticket plus court fees is approximately \$150. A random sample of 38 speeding ticket court cases showed that the mean cost was \$152.59. At the 0.01 level of significance, is that greater than \$150? The population standard deviation is \$10.78.

12. **Student Expenditures** The average expenditure per student (based on average daily attendance) for a certain school year was \$10,337 with a population standard deviation of \$1560. A survey for the next school year of 150 randomly selected students resulted in a sample mean of \$10,798. Do these results indicate that the average expenditure has changed? Choose your own level of significance.

Source: *World Almanac.*

13. **Ages of U.S. Senators** The mean age of Senators in the 109th Congress was 60.35 years. A random sample of 40 senators from various state senates had an average age of 55.4 years, and the population standard deviation is 6.5 years. At $\alpha = 0.05$, is there sufficient evidence that state senators are on average younger than the Senators in Washington?

Source: *CG Today.*

14. **Prison Sentences** The average length of prison term in the United States for white collar crime is 34.9 months. A random sample of 40 prison terms indicated a mean stay of 28.5 months with a standard deviation of 8.9 months. At $\alpha = 0.04$, is there sufficient evidence to conclude that the average stay differs from 34.9 months?

Source: californiawatch.org

15. State whether the null hypothesis should be rejected on the basis of the given *P*-value.
    a. *P*-value = 0.258, $\alpha = 0.05$, one-tailed test
    b. *P*-value = 0.0684, $\alpha = 0.10$, two-tailed test
    c. *P*-value = 0.0153, $\alpha = 0.01$, one-tailed test
    d. *P*-value = 0.0232, $\alpha = 0.05$, two-tailed test
    e. *P*-value = 0.002, $\alpha = 0.01$, one-tailed test

16. **Soft Drink Consumption** A researcher claims that the yearly consumption of soft drinks per person is 52 gallons. In a sample of 50 randomly selected people, the mean of the yearly consumption was 56.3 gallons. The standard deviation of the population is 3.5 gallons. Find the *P*-value for the test. On the basis of the *P*-value, is the researcher's claim valid?

Source: U.S. Department of Agriculture.

17. **Stopping Distances** A study found that the average stopping distance of a school bus traveling 50 miles per hour was 264 feet. A group of automotive engineers decided to conduct a study of its school buses and found that for 20 randomly selected buses, the average stopping distance of buses traveling 50 miles per hour was 262.3 feet. The standard deviation of the population was 3 feet. Test the claim that the average stopping distance of the company's buses is actually less than 264 feet. Find the *P*-value. On the basis of the *P*-value, should the null hypothesis be rejected at $\alpha = 0.01$? Assume that the variable is normally distributed.

Source: Snapshot, *USA TODAY.*

18. **Copy Machine Use** A store manager hypothesizes that the average number of pages a person copies on the store's copy machine is less than 40. A random sample of 50 customers' orders is selected. At $\alpha = 0.01$, is there enough evidence to support the claim? Use the *P*-value hypothesis-testing method. Assume $\sigma = 30.9$.

2	2	2	5	32
5	29	8	2	49
21	1	24	72	70
21	85	61	8	42
3	15	27	113	36
37	5	3	58	82
9	2	1	6	9
80	9	51	2	122
21	49	36	43	61
3	17	17	4	1

19. **Burning Calories by Playing Tennis** A health researcher read that a 200-pound male can burn an average of 546 calories per hour playing tennis. Thirty-six males were randomly selected and tested. The mean of the number of calories burned per hour was 544.8. Test the claim that the average number of calories burned is actually less than 546, and find the P-value. On the basis of the P-value, should the null hypothesis be rejected at $\alpha = 0.01$? The standard deviation of the population is 3. Can it be concluded that the average number of calories burned is less than originally thought?

20. **Breaking Strength of Cable** A special cable has a breaking strength of 800 pounds. The standard deviation of the population is 12 pounds. A researcher selects a random sample of 20 cables and finds that the average breaking strength is 793 pounds. Can he reject the claim that the breaking strength is 800 pounds? Find the P-value. Should the null hypothesis be rejected at $\alpha = 0.01$? Assume that the variable is normally distributed.

21. **Farm Sizes** The average farm size in the United States is 444 acres. A random sample of 40 farms in Oregon indicated a mean size of 430 acres, and the population standard deviation is 52 acres. At $\alpha = 0.05$, can it be concluded that the average farm in Oregon differs from the national mean? Use the P-value method.

Source: *New York Times Almanac*.

22. **Farm Sizes** Ten years ago, the average acreage of farms in a certain geographic region was 65 acres. The standard deviation of the population was 7 acres. A recent study consisting of 22 randomly selected farms showed that the average was 63.2 acres per farm. Test the claim, at $\alpha = 0.10$, that the average has not changed by finding the P-value for the test. Assume that σ has not changed and the variable is normally distributed.

23. **Transmission Service** A car dealer recommends that transmissions be serviced at 30,000 miles. To see whether her customers are adhering to this recommendation, the dealer selects a random sample of 40 customers and finds that the average mileage of the automobiles serviced is 30,456. The standard deviation of the population is 1684 miles. By finding the P-value, determine whether the owners are having their transmissions serviced at 30,000 miles. Use $\alpha = 0.10$. Do you think the α value of 0.10 is an appropriate significance level?

24. **Speeding Tickets** A motorist claims that the South Boro Police issue an average of 60 speeding tickets per day. These data show the number of speeding tickets issued each day for a randomly selected period of 30 days. Assume σ is 13.42. Is there enough evidence to reject the motorist's claim at $\alpha = 0.05$? Use the P-value method.

72	45	36	68	69	71	57	60
83	26	60	72	58	87	48	59
60	56	64	68	42	57	57	
58	63	49	73	75	42	63	

25. **Sick Days** A manager states that in his factory, the average number of days per year missed by the employees due to illness is less than the national average of 10. The following data show the number of days missed by 40 randomly selected employees last year. Is there sufficient evidence to believe the manager's statement at $\alpha = 0.05$? $\sigma = 3.63$. Use the P-value method.

0	6	12	3	3	5	4	1
3	9	6	0	7	6	3	4
7	4	7	1	0	8	12	3
2	5	10	5	15	3	2	5
3	11	8	2	2	4	1	9

Extending the Concepts

26. Suppose a statistician chose to test a hypothesis at $\alpha = 0.01$. The critical value for a right-tailed test is $+2.33$. If the test value were 1.97, what would the decision be? What would happen if, after seeing the test value, she decided to choose $\alpha = 0.05$? What would the decision be? Explain the contradiction, if there is one.

27. **Hourly Wage** The president of a company states that the average hourly wage of her employees is \$8.65. A random sample of 50 employees has the distribution shown. At $\alpha = 0.05$, is the president's statement believable? Assume $\sigma = 0.105$.

Class	Frequency
8.35–8.43	2
8.44–8.52	6
8.53–8.61	12
8.62–8.70	18
8.71–8.79	10
8.80–8.88	2

Technology Step by Step

TI-84 Plus Step by Step

Hypothesis Test for the Mean and the z Distribution (Data)

1. Enter the data values into L_1.
2. Press **STAT** and move the cursor to TESTS.
3. Press **1** for ZTest.

Exercises 8–3

1. In what ways is the t distribution similar to the standard normal distribution? In what ways is the t distribution different from the standard normal distribution?

2. What are the degrees of freedom for the t test?

3. Find the critical value (or values) for the t test for each.
   a. $n = 10, \alpha = 0.05$, right-tailed
   b. $n = 18, \alpha = 0.10$, two-tailed
   c. $n = 6, \alpha = 0.01$, left-tailed
   d. $n = 9, \alpha = 0.025$, right-tailed

4. Find the critical value (or values) for the t test for each.
   a. $n = 15, \alpha = 0.05$, right-tailed
   b. $n = 23, \alpha = 0.005$, left-tailed
   c. $n = 28, \alpha = 0.01$, two-tailed
   d. $n = 17, \alpha = 0.02$, two-tailed

5. Using Table F, find the P-value interval for each test value.
   a. $t = 2.321, n = 15$, right-tailed
   b. $t = 1.945, n = 28$, two-tailed
   c. $t = -1.267, n = 8$, left-tailed
   d. $t = 1.562, n = 17$, two-tailed

6. Using Table F, find the P-value interval for each test value.
   a. $t = 3.025, n = 24$, right-tailed
   b. $t = -1.145, n = 5$, left-tailed
   c. $t = 2.179, n = 13$, two-tailed
   d. $t = 0.665, n = 10$, right-tailed

For Exercises 7 through 23, perform each of the following steps.
   a. State the hypotheses and identify the claim.
   b. Find the critical value(s).
   c. Find the test value.
   d. Make the decision.
   e. Summarize the results.

Use the traditional method of hypothesis testing unless otherwise specified.

Assume that the population is approximately normally distributed.

7. **Strawberry Seeds** The average strawberry has approximately 200 seeds. A very patient student selected a random sample of 10 strawberries and found a sample mean of 185.2 seeds with a standard deviation of 10. At the 0.05 level of significance, can it be concluded that the mean is less than 200?

8. **Cost of Braces** The average cost for teeth straightening with metal braces is approximately \$5400. A nationwide franchise thinks that its cost is below that figure. A random sample of 28 patients across the country had an average cost of \$5250 with a standard deviation of \$629. At $\alpha = 0.025$, can it be concluded that the mean is less than \$5400?

9. **Heights of Tall Buildings** A researcher estimates that the average height of the buildings of 30 or more stories in a large city is at least 700 feet. A random sample of 10 buildings is selected, and the heights in feet are shown. At $\alpha = 0.025$, is there enough evidence to reject the claim?

485	511	841	725	615
520	535	635	616	582

Source: *Pittsburgh Tribune-Review.*

10. **Number of Words in a Novel** The National Novel Writing Association states that the average novel is at least 50,000 words. A particularly ambitious writing club at a college-preparatory high school had randomly selected members with works of the following lengths. At $\alpha = 0.10$, is there sufficient evidence to conclude that the mean length is greater than 50,000 words?

48,972	50,100	51,560
49,800	50,020	49,900
52,193		

11. **Television Viewing by Teens** Teens are reported to watch the fewest total hours of television per week of all the demographic groups. The average television viewing for teens on Sunday from 1:00 to 7:00 P.M. is 1 hour 13 minutes. A random sample of local teens disclosed the following times for Sunday afternoon television viewing. At $\alpha = 0.01$, can it be concluded that the average is greater than the national viewing time? (*Note:* Change all times to minutes.)

2:30	2:00	1:30	3:20
1:00	2:15	1:50	2:10
1:30	2:30		

Source: *World Almanac.*

12. **Chocolate Chip Cookie Calories** The average 1-ounce chocolate chip cookie contains 110 calories. A random sample of 15 different brands of 1-ounce chocolate chip cookies resulted in the following calorie amounts. At the $\alpha = 0.01$ level, is there sufficient evidence that the average calorie content is greater than 110 calories?

100	125	150	160	185	125	155	145	160
100	150	140	135	120	110			

Source: *The Doctor's Pocket Calorie, Fat, and Carbohydrate Counter.*

13. **Cost of Making a Movie** During a recent year the average cost of making a movie was \$54.8 million. This year, a random sample of 15 recent action movies had an average production cost of \$62.3 million with a variance of \$90.25 million. At the 0.05 level of significance, can it be concluded that it costs more than average to produce an action movie?

Source: *New York Times Almanac.*

Section 8.3

14. **Internet Visits** A U.S. Web Usage Snapshot indicated a monthly average of 36 Internet visits per user from home. A random sample of 24 Internet users yielded a sample mean of 42.1 visits with a standard deviation of 5.3. At the 0.01 level of significance, can it be concluded that this differs from the national average?

Source: *New York Times Almanac.*

15. **Cell Phone Bills** The average monthly cell phone bill was reported to be $50.07 by the U.S. Wireless Industry. Random sampling of a large cell phone company found the following monthly cell phone charges (in dollars):

55.83	49.88	62.98	70.42
60.47	52.45	49.20	50.02
58.60	51.29		

At the 0.05 level of significance, can it be concluded that the average phone bill has increased?

Source: *World Almanac.*

16. **Teaching Assistants' Stipends** A random sample of stipends of teaching assistants in economics is listed. Is there sufficient evidence at the $\alpha = 0.05$ level to conclude that the average stipend differs from $15,000? The stipends listed (in dollars) are for the academic year.

14,000	18,000	12,000	14,356	13,185
13,419	14,000	11,981	17,604	12,283
16,338	15,000			

Source: *Chronicle of Higher Education.*

17. **Cost of a Movie Ticket** The average movie ticket in 2010 cost $7.89. A random sample of 15 movie tickets from the suburbs of a large U.S. city indicated that the mean cost was $11.09 with a standard deviation of $4.86. At the 0.01 level of significance, can it be concluded that the mean is higher than the national average?

18. **Cell Phone Call Lengths** The average local cell phone call length was reported to be 2.27 minutes. A random sample of 20 phone calls showed an average of 2.98 minutes in length with a standard deviation of 0.98 minute. At $\alpha = 0.05$, can it be concluded that the average differs from the population average?

Source: *World Almanac.*

19. **Commute Time to Work** A survey of 15 large U.S. cities finds that the average commute time one way is 25.4 minutes. A chamber of commerce executive feels that the commute in his city is less and wants to publicize this. He randomly selects 25 commuters and finds the average is 22.1 minutes with a standard deviation of 5.3 minutes. At $\alpha = 0.10$, is he correct?

Source: *New York Times Almanac.*

20. **Average Family Size** The average family size was reported as 3.18. A random sample of families in a particular school district resulted in the following family sizes:

5	4	5	4	4	3	6	4	3	3	5
6	3	3	2	7	4	5	2	2	2	3
5	2									

At $\alpha = 0.05$, does the average family size differ from the national average?

Source: *New York Times Almanac.*

21. **Doctor Visits** A report by the Gallup Poll stated that on average a woman visits her physician 5.8 times a year. A researcher randomly selects 20 women and obtained these data.

3	2	1	3	7	2	9	4	6	6
8	0	5	6	4	2	1	3	4	1

At $\alpha = 0.05$, can it be concluded that the average is still 5.8 visits per year? Use the *P*-value method.

22. **Number of Jobs** The U.S. Bureau of Labor and Statistics reported that a person between the ages of 18 and 34 has had an average of 9.2 jobs. To see if this average is correct, a researcher selected a random sample of 8 workers between the ages of 18 and 34 and asked how many different places they had worked. The results were as follows:

8	12	15	6	1	9	13	2

At $\alpha = 0.05$, can it be concluded that the mean is 9.2? Use the *P*-value method. Give one reason why the respondents might not have given the exact number of jobs that they have worked.

23. **Water Consumption** The *Old Farmer's Almanac* stated that the average consumption of water per person per day was 123 gallons. To test the hypothesis that this figure may no longer be true, a researcher randomly selected 16 people and found that they used on average 119 gallons per day and $s = 5.3$. At $\alpha = 0.05$, is there enough evidence to say that the *Old Farmer's Almanac* figure might no longer be correct? Use the *P*-value method.

Technology Step by Step

TI-84 Plus Step by Step

Hypothesis Test for the Mean and the *t* Distribution (Data)

1. Enter the data values into L_1.
2. Press **STAT** and move the cursor to TESTS.
3. Press **2** for T-Test.
4. Move the cursor to Data and press **ENTER.**
5. Type in the appropriate values.

Section 8.4

households indicated that 171 owned some type of stock. At what level of significance would you conclude that this was a significant difference?

Source: www.census.gov

7. **Fans of Professional Baseball** According to a professional polling company, an unbelievably low percentage—36%—of Americans said that they were fans of professional baseball. A random sample of 200 people in southwestern Pennsylvania indicated that 88 were baseball fans. At $\alpha = 0.02$, is the proportion greater than 36%?

8. **Female Physicians** The percentage of physicians who are women is 27.9%. In a survey of physicians employed by a large university health system, 45 of 120 randomly selected physicians were women. Is there sufficient evidence at the 0.05 level of significance to conclude that the proportion of women physicians at the university health system exceeds 27.9%?

Source: *New York Times Almanac*.

9. **Burglaries** About 30% of all burglaries are through an open or unlocked door or window. A random sample of 130 burglaries indicated that 85 were not via an open or unlocked door or window. At the 0.05 level of significance, can it be concluded that this differs from the stated proportion?

Source: *polling report.com*

10. **Undergraduate Enrollment** It has been found that 85.6% of all enrolled college and university students in the United States are undergraduates. A random sample of 500 enrolled college students in a particular state revealed that 420 of them were undergraduates. Is there sufficient evidence to conclude that the proportion differs from the national percentage? Use $\alpha = 0.05$.

Source: *Time Almanac*.

11. **Moviegoers** The largest group of moviegoers by age is the 40- to 59-year-old age group. This group constitutes 32% of the movie-going population. A theater complex randomly surveyed the customers over a three-week period and found that out of 423 surveyed, 170 were 40 to 59 years of age. At the 0.01 level of significance, does this differ from the stated proportion?

Source: *MPAA Study*.

12. **Television Set Ownership** According to Nielsen Media Research, of all the U.S. households that owned at least one television set, 83% had two or more sets. A local cable company canvassing the town to promote a new cable service found that of the 300 randomly selected households visited, 240 had two or more television sets. At $\alpha = 0.05$, is there sufficient evidence to conclude that the proportion is less than the one in the report?

Source: *World Almanac*.

13. **After-School Snacks** In the *Journal of the American Dietetic Association*, it was reported that 54% of kids said that they had a snack after school. A random sample of 60 kids was selected, and 36 said that they had a snack after school. Use $\alpha = 0.01$ and the P-value method to test the claim. On the basis of the results, should parents be concerned about their children eating a healthy snack?

14. **Natural Gas Heat** The Energy Information Administration reported that 51.7% of homes in the United States were heated by natural gas. A random sample of 200 homes found that 115 were heated by natural gas. Does the evidence support the claim, or has the percentage changed? Use $\alpha = 0.05$ and the P-value method. What could be different if the sample were taken in a different geographic area?

15. **Youth Smoking** Researchers suspect that 18% of all high school students smoke at least one pack of cigarettes a day. At Wilson High School, a randomly selected sample of 300 students found that 50 students smoked at least one pack of cigarettes a day. At $\alpha = 0.05$, test the claim that less than 18% of all high school students smoke at least one pack of cigarettes a day. Use the P-value method.

16. **Exercise to Reduce Stress** A survey by *Men's Health* magazine stated that 14% of men said they used exercise to reduce stress. Use $\alpha = 0.10$. A random sample of 100 men was selected, and 10 said that they used exercise to relieve stress. Use the P-value method to test the claim. Could the results be generalized to all adult Americans?

17. **Borrowing Library Books** For Americans using library services, the American Library Association (ALA) claims that 67% borrow books. A library director feels that this is not true so he randomly selects 100 borrowers and finds that 82 borrowed books. Can he show that the ALA claim is incorrect? Use $\alpha = 0.05$.

Source: American Library Association; *USA TODAY*.

18. **Doctoral Students' Salaries** Nationally, at least 60% of Ph.D. students have paid assistantships. A college dean feels that this is not true in his state, so he randomly selects 50 Ph.D. students and finds that 26 have assistantships. At $\alpha = 0.05$, is the dean correct?

Source: U.S. Department of Education, *Chronicle of Higher Education*.

19. **Football Injuries** A report by the NCAA states that 57.6% of football injuries occur during practices. A head trainer claims that this is too high for his conference, so he randomly selects 36 injuries and finds that 17 occurred during practices. Is his claim correct, at $\alpha = 0.05$?

Source: *NCAA Sports Medicine Handbook*.

20. **Recycling** Approximately 70% of the U.S. population recycles. According to a green survey of a random sample of 250 college students, 204 said that they recycled. At $\alpha = 0.01$, is there sufficient evidence to conclude that the proportion of college students who recycle is greater than 70%?

Section 8.5

is the standard deviation of the potassium content greater than 100?

781	467	508	530
707	535	498	400

Source: www.drugs.com

10. Exam Grades A statistics professor is used to having a variance in his class grades of no more than 100. He feels that his current group of students is different, and so he examines a random sample of midterm grades as shown. At $\alpha = 0.05$, can it be concluded that the variance in grades exceeds 100?

92.3	89.4	76.9	65.2	49.1
96.7	69.5	72.8	67.5	52.8
88.5	79.2	72.9	68.7	75.8

11. Tornado Deaths A researcher claims that the standard deviation of the number of deaths annually from tornadoes in the United States is less than 35. If a random sample of 11 years had a standard deviation of 32, is the claim believable? Use $\alpha = 0.05$.

Source: National Oceanic and Atmospheric Administration.

12. Interstate Speeds It has been reported that the standard deviation of the speeds of drivers on Interstate 75 near Findlay, Ohio, is 8 miles per hour for all vehicles. A driver feels from experience that this is very low. A survey is conducted, and for 50 randomly selected drivers the standard deviation is 10.5 miles per hour. At $\alpha = 0.05$, is the driver correct?

13. Sodium Amounts in Food Healthier diets generally involve lower sodium amounts. The American Heart Association recommends less than 2300 mg of sodium daily. (One teaspoon of table salt contains 2400 mg of sodium!) A random sample of prepared foods has the sodium amounts listed below. Is there sufficient evidence to conclude at $\alpha = 0.05$ that the standard deviation in sodium amounts in prepared foods exceeds 150 mg?

640	580	450	480	570	900	900
600	540	500	350	500	700	

14. Vitamin C in Fruits and Vegetables The amounts of vitamin C (in milligrams) for 100 g (3.57 ounces) of various randomly selected fruits and vegetables are listed. Is there sufficient evidence to conclude that the standard deviation differs from 12 mg? Use $\alpha = 0.10$.

7.9	16.3	12.8	13.0	32.2	28.1	34.4
46.4	53.0	15.4	18.2	25.0	5.2	

Source: *Time Almanac 2012*.

15. Manufactured Machine Parts A manufacturing process produces machine parts with measurements the standard deviation of which must be no more than 0.52 mm. A random sample of 20 parts in a given lot revealed a standard deviation in measurement of 0.568 mm. Is there sufficient evidence at $\alpha = 0.05$ to conclude that the standard deviation of the parts is outside the required guidelines?

16. Golf Scores A random sample of second-round golf scores from a major tournament is listed below. At $\alpha = 0.10$, is there sufficient evidence to conclude that the population variance exceeds 9?

75	67	69	72	70
66	74	69	74	71

17. Calories in Pancake Syrup A nutritionist claims that the standard deviation of the number of calories in 1 tablespoon of the major brands of pancake syrup is 60. A random sample of major brands of syrup is selected, and the number of calories is shown. At $\alpha = 0.10$, can the claim be rejected?

53	210	100	200	100	220
210	100	240	200	100	210
100	210	100	210	100	60

Source: Based on information from *The Complete Book of Food Counts* by Corrine T. Netzer, Dell Publishers, New York.

18. High Temperatures in January Daily weather observations for southwestern Pennsylvania for the first three weeks of January for randomly selected years show daily high temperatures as follows: 55, 44, 51, 59, 62, 60, 46, 51, 37, 30, 46, 51, 53, 57, 57, 39, 28, 37, 35, and 28 degrees Fahrenheit. The normal standard deviation in high temperatures for this time period is usually no more than 8 degrees. A meteorologist believes that with the unusual trend in temperatures the standard deviation is greater. At $\alpha = 0.05$, can we conclude that the standard deviation is greater than 8 degrees?

Source: www.wunderground.com

19. College Room and Board Costs Room and board fees for a random sample of independent religious colleges are shown.

7460	7959	7650	8120	7220
8768	7650	8400	7860	6782
8754	7443	9500	9100	

Estimate the standard deviation in costs based on $s \approx R/4$. Is there sufficient evidence to conclude that the sample standard deviation differs from this estimated amount? Use $\alpha = 0.05$.

Source: *World Almanac*.

20. Heights of Volcanoes A random sample of heights (in feet) of active volcanoes in North America, outside of Alaska, is shown. Is there sufficient evidence that the standard deviation in heights of volcanoes outside Alaska is less than the standard deviation in heights of Alaskan volcanoes, which is 2385.9 feet? Use $\alpha = 0.05$.

10,777	8159	11,240	10,456
14,163	8363		

Source: *Time Almanac*.