

Section 10.1: 36,38

Section 10.2: 18,26,30

Section 10.3: 14,18

18. **Nexium** Nexium is a drug that can be used to reduce the acid produced by the body and heal damage to the esophagus due to acid reflux. The manufacturer of Nexium claims that more than 94% of patients taking Nexium are healed within 8 weeks. In clinical trials, 213 of 224 patients suffering from acid reflux disease were healed after 8 weeks. Test the manufacturer's claim at the $\alpha = 0.01$ level of significance.

36. Popcorn Consumption According to popcorn.org, the mean consumption of popcorn annually by Americans is 54 quarts. The marketing division of popcorn.org unleashes an aggressive campaign designed to get Americans to consume even more popcorn.

- (a) Determine the null and alternative hypotheses that would be used to test the effectiveness of the marketing campaign.
- (b) A sample of 800 Americans provides enough evidence to conclude that the marketing campaign was effective. Provide a statement that should be put out by the marketing department.
- (c) Suppose, in fact, that the mean annual consumption of popcorn after the marketing campaign is 53.4 quarts. Has a Type I or Type II error been made by the marketing department? If they tested the hypothesis at the $\alpha = 0.05$ level of significance, what is the probability of making a Type I error?

37. E-Cigs According to the Centers for Disease Control and Prevention, 2.8% of high school students currently use electronic cigarettes. A high school counselor is concerned the use of e-cigs at her school is higher.

- (a) Determine the null and alternative hypotheses.
- (b) If the sample data indicate that the null hypothesis should not be rejected, state the conclusion of the school counselor.
- (c) Suppose, in fact, that the proportion of students at the counselor's high school who use electronic cigarettes is 0.034. Was a Type I or Type II error committed?

38. Migraines According to the Centers for Disease Control, 15.2% of American adults experience migraine headaches. Stress is a major contributor to the frequency and intensity of headaches. A massage therapist feels that she has a technique that can reduce the frequency and intensity of migraine headaches.

- (a) Determine the null and alternative hypotheses that would be used to test the effectiveness of the massage therapist's techniques.
- (b) A sample of 500 American adults who participated in the massage therapist's program results in data that indicate that the null hypothesis should be rejected. Provide a statement that supports the massage therapist's program.
- (c) Suppose, in fact, that the percentage of patients in the program who experience migraine headaches is 15.3%. Was a Type I or Type II error committed?

26. Talk to the Animals In an American Animal Hospital Association survey, 37% of respondents stated that they talk to their pets on the telephone. A veterinarian found this result hard to believe, so he randomly selected 150 pet owners and discovered that 54 of them spoke to their pet on the telephone. Does the veterinarian have the right to be skeptical? Use a 0.05 level of significance.

30. Statistics in the Media A headline read, "More Than Half of Americans Say Federal Taxes Too High." The headline was based on a random sample of 1026 adult Americans in which 534 stated the amount of federal tax they have to pay is too high. Is this an accurate headline?

Source: Gallup Organization, April 14, 2014

14. SAT Verbal Scores Do students who learned English and another language simultaneously score worse on the SAT Critical Reading exam than the general population of test takers? The mean score among all test takers on the SAT Critical Reading exam is 501. A random sample of 100 test takers who learned English and another language simultaneously had a mean SAT Critical Reading score of 485 with a standard deviation of 116. Do these results suggest that students who learn English as well as another language simultaneously score worse on the SAT Critical Reading exam?

- (a) State the appropriate null and alternative hypotheses.
- (b) Verify that the requirements to perform the test using the t -distribution are satisfied.
- (c) Use the classical or P -value approach at the $\alpha = 0.1$ level of significance to test the hypotheses in part (a).
- (d) Write a conclusion based on your results to part (c).

18. TVaholics According to the American Time Use Survey, the typical American spends 154.8 minutes (2.58 hours) per day watching television. A survey of 50 Internet users results in a mean time watching television per day of 128.7 minutes, with a standard deviation of 46.5 minutes. Conduct the appropriate test to determine if Internet users spend less time watching television at the $\alpha = 0.05$ level of significance.

Source: Norman H. Nie and D. Sunshine Hillygus. "Where Does Internet Time Come From? A Reconnaissance." *IT & Society*, 1(2).