Section 8.3

Here is the test statistic for a proportion:

$$z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}}.$$

Exercise 1. Find the value of the test statistic z using

$$z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}}.$$

(a) The claim is that 25% of restaurant workers do not feel that stress exerted a negative impact on their personal lives. A random sample of 100 workers were asked whether or not work stress had a negative impact on their personal lives. Thirty-two of them responded, "No".

(b) The claim is that 73% of first-year college students responding to a national survey identified "being very well-off financially" as an important personal goal. A state university finds that 132 of an SRS of 200 of its first-year students say that this goal is important.

Class Exercise 1. Find the value of the test statistic z using

$$z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}}.$$

(a) The claim is that 20% of U.S. adults are smokers. In a random sample of 200 U.S. adults, 18.5% say they are smokers. **Answer: -0.530**
(b) The claim is 40% of U.S. adults eat breakfast every day. In a random sample of 250 U.S. adults, 41.6% say they eat breakfast every day. **Answer: 0.516**
(c) The claim is that 44% of home buyers find their real estate agent through a friend. In a random sample of 1762 home buyers, 722 found their real estate agent through a friend. **Answer: -2.557**
(d) The claim is that 24% of adults in the United States are afraid to fly. In a random sample of 1075 adults in the United States, 292 are afraid to fly. **Answer: 2.428**

Requirements

Consider a binomial experiment with n trials, where p represents the population probability of success and $q = 1 - p$ represents the population probability of failure. Let r be a random variable that represents the number of successes out of the n binomial trials. The number of trials n should be sufficiently large so that both $np > 5$ and $nq > 5$ (use p from the null hypothesis). In this case, the sample test statistic $\hat{p} = r/n$ can be approximated by the normal distribution.

Exercise 2. In 2001, a national vital statistics report indicated that about 3% of all births produced twins. Is the rate of twin births the same among very young mothers? Data from a large city hospital found only 7 sets of twins were born to 469 teenage girls. Test an appropriate hypothesis and state your conclusion. Be sure the appropriate assumptions and conditions are satisfied before you proceed.

Class Exercise 2. A company with a fleet of 150 cars found that the emissions systems of 14 out of the 44 they tested failed to meet pollution control guidelines. Is this strong evidence that more than 20% of the fleet might be out of compliance? **Answer:** p**-value** $= \mathbf{0.025}$

Class Exercise 3. In a presidential election, 308 out of 611 voters surveyed said that they voted for the candidate who won (based on data from ICR Survey Research Group). Use a 0.01 significance level to test the claim that among all voters, the percentage who believe that they voted for the winning candidate is equal to 43%, which is the actual percentage of votes for the winning candidate. What does the result suggest about voter perceptions?
Answer: p**-value** $= \mathbf{2.163} \cdot 10^{-4}$

Class Exercise 4. The company Drug Test Success provides a "1-Panel-THC" test for marijuana usage. Among 300 tested subjects, results from 27 subjects were wrong (either a false positive or a false negative). Use a 0.05 significance level to test the claim that less than 10% of the test results are wrong. **Answer:** p**-value** $= \mathbf{0.282}$

Homework

C problems: 5-21 ODD
B problems: 1
A problems: 3