

2012 AP[®] STATISTICS FREE-RESPONSE QUESTIONS

5. A recent report stated that less than 35 percent of the adult residents in a certain city will be able to pass a physical fitness test. Consequently, the city's Recreation Department is trying to convince the City Council to fund more physical fitness programs. The council is facing budget constraints and is skeptical of the report. The council will fund more physical fitness programs only if the Recreation Department can provide convincing evidence that the report is true.

The Recreation Department plans to collect data from a sample of 185 adult residents in the city. A test of significance will be conducted at a significance level of $\alpha = 0.05$ for the following hypotheses.

$$H_0 : p = 0.35$$

$$H_a : p < 0.35,$$

where p is the proportion of adult residents in the city who are able to pass the physical fitness test.

- (a) Describe what a Type II error would be in the context of the study, and also describe a consequence of making this type of error.
- (b) The Recreation Department recruits 185 adult residents who volunteer to take the physical fitness test. The test is passed by 77 of the 185 volunteers, resulting in a p -value of 0.97 for the hypotheses stated above. If it was reasonable to conduct a test of significance for the hypotheses stated above using the data collected from the 185 volunteers, what would the p -value of 0.97 lead you to conclude?
- (c) Describe the primary flaw in the study described in part (b), and explain why it is a concern.

4. Some boxes of a certain brand of breakfast cereal include a voucher for a free video rental inside the box. The company that makes the cereal claims that a voucher can be found in 20 percent of the boxes. However, based on their experiences eating this cereal at home, a group of students believes that the proportion of boxes with vouchers is less than 0.2. This group of students purchased 65 boxes of the cereal to investigate the company's claim. The students found a total of 11 vouchers for free video rentals in the 65 boxes.

Suppose it is reasonable to assume that the 65 boxes purchased by the students are a random sample of all boxes of this cereal. Based on this sample, is there support for the students' belief that the proportion of boxes with vouchers is less than 0.2 ? Provide statistical evidence to support your answer.

2003 AP[®] STATISTICS FREE-RESPONSE QUESTIONS

2. When a law firm represents a group of people in a class action lawsuit and wins that lawsuit, the firm receives a percentage of the group's monetary settlement. That settlement amount is based on the total number of people in the group—the larger the group and the larger the settlement, the more money the firm will receive.

A law firm is trying to decide whether to represent car owners in a class action lawsuit against the manufacturer of a certain make and model for a particular defect. If 5 percent or less of the cars of this make and model have the defect, the firm will not recover its expenses. Therefore, the firm will handle the lawsuit only if it is convinced that more than 5 percent of cars of this make and model have the defect. The firm plans to take a random sample of 1,000 people who bought this car and ask them if they experienced this defect in their cars.

- (a) Define the parameter of interest and state the null and alternative hypotheses that the law firm should test.
- (b) In the context of this situation, describe Type I and Type II errors and describe the consequences of each of these for the law firm.