Chapter 6-2: Population Proportion

A hypothesis test about a population proportion involves three following forms:

1.	H_0: $p \geq p_0$	&	H_a: $p < p_0$
2.	H_0: $p \leq p_0$	&	H_a: $p > p_0$
3.	H_0: $p = p_0$	&	H_a: $p \neq p_0$

Test Statistic for Hypothesis Test about a Population Proportion

$$z = \frac{\bar{p} - p}{\sqrt{\frac{p_0(1 - p_0)}{n}}}$$

Exercises

1. Consider the following hypothesis test: H_0: $p \geq 0.75$ & H_a: $p < 0.75$

A sample of 300 items was selected. Compute the p-value and state your conclusion for each of the following sample results. Use $\alpha = .05$.

a) $\bar{p} = 0.68$
b) $\bar{p} = 0.77$

2. A study by Consumer Reports showed that 64% of supermarket shoppers believe supermarket brands to be as good as national name brands. To investigate whether this result applies to its own product, the manufacturer of national name-brand ketchup asked a sample of shoppers whether they believed that supermarket ketchup was as good as the national brand ketchup.

a) Formulate the hypotheses that could be used to determine whether the percentage of supermarket shoppers who believe that the supermarket ketchup was as good as the national brand ketchup differed from 64%.
b) If a sample of 100 shoppers showed 52 stating that the supermarket brand was as good as the national brand, what is the p-value?
c) At $\alpha = .05$, what is your conclusion?
d) Should the national brand ketchup manufacturer be pleased with this conclusion? Explain.

3. Before the 2003 Super Bowl, ABC predicted that 22% of the Super Bowl audience would express an interest in seeing one of its forthcoming new television shows, including "8 Simple Rules," "Are You Hot?," and "Dragnet." ABC ran commercials for these television shows during the Super Bowl. The day after the Super Bowl, Intermediate Advertising Group of New York sampled 1532 viewers who saw the commercials and found that 414 said that they would watch one of the ABC advertised television shows (*The Wall Street Journal*, January 30, 2003)

a) What is the point estimate of the proportion of the audience that said they would watch the television shows after seeing the television commercials?
b) At $\alpha = .05$, determine whether the intent to watch the ABC television shows significantly increased after seeing the television commercials. Formulate the appropriate hypotheses, compute the p-value, and state your conclusion.
c) Why are such studies valuable to companies and advertising firms?

4. According to the Census Bureau's American Housing Survey, the primary reason people who move chose their new neighborhood is because the location is convenient to work (USA Today, December 24, 2002). Based on 1990 Census Bureau data, we know that 24% of the population of people who moved selected "location convenient to work" as the reason for selecting their new neighborhood. Assume a sample of 300 people who moved during 2003 found 93 did so to be closer to work. Do the sample data support the research conclusion that in 2003 more people are choosing where to live based on how close they will be to their work? What is the point estimate of the proportion of people who moved during 2003 the chose their now neighborhood because the location is convenient to work? What is your research conclusion? Use $\alpha = .05$.

5. In a cover story, *Business Week* published information about sleep habit of Americans (*Business Week*, January 26, 2004). The article noted that sleep deprivation causes a number of problems. They note that lack of sleep causes highway deaths. Fifty-one percent of adult drivers admit to driving while drowsy. A researcher hypothesized that this issue was an even bigger problem for people working night shifts.

a) Formulate the hypotheses that can be used to help determine whether more than 51% of population of night shift workers admit to driving while drowsy.
b) A sample of 500 night shift workers found that 232 admitted to driving while drowsy. What is the sample proportion? What is the p-value?
c) At $\alpha = .01$, what is your conclusion?