HYPOTHESIS TESTING You can use the following procedure to test a hypothesis about a statistical measure for a population.

KEY CONCEPT *For Your Notebook*

Hypothesis Testing

STEP 1 **State** the hypothesis you are testing. The hypothesis should make a statement about some statistical measure of a population (such as the percent of the population that has a certain characteristic).

STEP 2 **Collect** data from a random sample of the population and compute the statistical measure of the sample.

STEP 3 **Assume** that the hypothesis is true and calculate the resulting probability p of obtaining the sample statistical measure *or a more extreme* sample statistical measure. If this probability is small (typically $p < 0.05$), you should reject the hypothesis.

CHOOSE CRITERION
In Step 3, some statisticians use $p < 0.1$ or $p < 0.01$ as a condition for rejecting a hypothesis.

EXAMPLE 2 Test a hypothesis

FIREFIGHTING A recent Harris Poll claimed that 48% of adults consider firefighting to be a prestigious occupation. To test this finding, you survey 40 adults and find that 15 of them do consider firefighting a prestigious occupation. Should you reject the Harris Poll's findings? *Explain.*

Solution

STEP 1 **State** the hypothesis.

48% of adults consider firefighting a prestigious occupation.

STEP 2 **Collect** data and calculate a statistical measure.

In your survey, 15 out of 40 people, or 37.5%, consider firefighting to be a prestigious occupation.

STEP 3 **Assume** that the hypothesis in Step 1 is true. Find the resulting probability that you could randomly select 15 *or fewer* adults out of 40 who consider firefighting a prestigious occupation. This probability is

$$P(x \le 15) = P(x = 0) + P(x = 1) + P(x = 2) + \cdots + P(x = 15)$$

where each term in the sum is a binomial probability with $n = 40$ and $p = 0.48$.

You can approximate the binomial distribution with a normal distribution having the following mean and standard deviation:

$$\overline{x} = np = 40(0.48) = 19.2$$

$$\sigma = \sqrt{np(1 - p)} = \sqrt{40(0.48)(0.52)} \approx 3.16$$

Using a z-score and the standard normal table on page 759 gives:

$$P(x \le 15) \approx P\left(z \le \frac{15 - 19.2}{3.16}\right) \approx P(z \le -1.3) = 0.0968$$

▶ So, if it is true that *48% of adults consider firefighting a prestigious occupation*, then there is about a 10% probability of finding 15 or fewer adults who consider firefighting prestigious in a random sample of 40 adults. With a probability this large, you should *not* reject the hypothesis.