Step 7: Because the test statistic does not fall within the critical region, we fail to reject the null hypothesis.

Step 8: Because we fail to reject H_0: $p = 0.93$, we fail to reject the claim that 93% of computers have antivirus programs. We conclude that there is not sufficient sample evidence to warrant rejection of the claim that 93% of computers have antivirus programs. (See Table 8-3 for help with wording this final conclusion.)

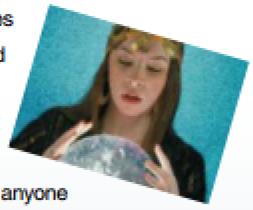
Confidence Interval Method

The claim of $p = 0.93$ can be tested with a 0.05 significance level by constructing a 95% confidence interval (as shown in Table 8-1 in Section 8-2). (In general, for *two-tailed* hypothesis tests construct a confidence interval with a confidence level corresponding to the significance level, as in Table 8-1.)

The 95% confidence interval estimate of the population proportion p is found using the sample data consisting of $n = 400$ and $\hat{p} = 380/400$. Using the methods of Section 7-2 we get: $0.929 < p < 0.971$. That interval contains the claimed value of 0.93. Because we are 95% confident that the limits of 0.929 and 0.971 contain the true value of p, we do not have sufficient evidence to warrant rejection of the claim that that 93% of computers have antivirus programs. In this case, the conclusion is the same as with the P-value method and the critical value method.

CAUTION When testing claims about a population proportion, the critical value method and the *P*-value method are equivalent in the sense that they always yield the same results, but the confidence interval method is not equivalent to them and may result in a different conclusion. (Both the critical value method and *P*-value method use the same standard deviation based on the *claimed proportion p*, but the confidence interval uses an estimated standard deviation based on the *sample proportion*.) Here is a good strategy: Use a confidence interval to *estimate* a population proportion, but use the *P*-value method or critical value method for *testing a claim* about a proportion. See Exercise 36.

Win $1,000,000 for ESP



Magician James Randi instituted an educational foundation that offers a prize of $1 million to anyone who can demonstrate paranormal, supernatural, or occult powers. Anyone possessing power such as fortune telling, ESP (extrasensory perception), or the ability to contact the dead, can win the prize by passing testing procedures. A preliminary test is followed by a formal test, but so far, no one has passed the preliminary test. The formal test would be designed with sound statistical methods, and it would likely involve analysis with a formal hypothesis test. According to the foundation, "We consult competent statisticians when an evaluation of the results, or experiment design, is required."

Finding the Number of Successes x

Computer software and calculators designed for hypothesis tests of proportions usually require input consisting of the sample size n and the number of successes x, but the sample proportion is often given instead of x. The number of successes x can be found as illustrated in Example 2. Note that in Example 2, the result of 462.6 people must be rounded to the nearest whole number.

Example 2 Finding the Number of Successes x

A Harris Interactive survey conducted for Gillette showed that among 514 human resource professionals polled, 90% said that appearance of a job applicant is most important for a good first impression. What is the actual number of respondents who said that appearance of a job applicant is most important for a good first impression?

Solution

The number of respondents who said that appearance of a job applicant is most important for a good first impression is 90% of 514, or $0.90 \times 514 = 462.6$, but the result must be a whole number, so we round the product to the nearest whole number of 463.