works and learn the associated terminology. Only then will results from technology make sense.

The basic idea underlying the hypothesis-testing procedure is based on the rare event rule first presented in Section 4-1. Let's review that rule before proceeding.

Rare Event Rule for Inferential Statistics

If, under a given assumption, the probability of a particular observed event is extremely small, we conclude that the assumption is probably not correct.

Following this rule, we test a claim by analyzing sample data in an attempt to choose between the following two explanations:

1. The sample results could easily occur by chance.
   Example: In testing the XSORT gender-selection method that is supposed to make babies more likely to be girls, the result of 52 girls in 100 births is greater than 50%, but 52 girls could easily occur by chance, so there is not sufficient evidence to conclude that the XSORT method is effective.
2. The sample results are not likely to occur by chance.
   Example: In testing the XSORT gender-selection method that is supposed to make babies more likely to be girls, the result of 95 girls in 100 births is greater than 50%, and 95 girls is so extreme that it could *not* easily occur by chance, so there is sufficient evidence to conclude that the XSORT method is effective.

Figures 8-1 and 8-2 summarize the procedures used in two slightly different methods for conducting a formal hypothesis test. We will proceed to conduct a formal test of the claim from Example 1 that $p > 0.5$. In testing that claim, we will use the sample data consisting of 58 girls in 100 births.

Steps 1, 2, 3: Use the Claim to Create a Null Hypothesis and an Alternative Hypothesis

Objective

Identify the *null hypothesis* and *alternative hypothesis* so that the formal hypothesis test includes these standard components that are used often in many different disciplines.

Null Hypothesis (denoted by H_0)

Statement that the value of a population parameter (such as proportion, mean, or standard deviation) is *equal to* some claimed value. (The term *null* is used to indicate *no* change or no effect or no difference.) We test the null hypothesis directly in the sense that we assume (or pretend) it is true and reach a conclusion to either reject it or fail to reject it.

Example: Here is an example of a null hypothesis involving a proportion: $H_0: p = 0.5$.

Alternative Hypothesis (denoted by H_1 or H_a or H_A)

Statement that the parameter has a value that somehow differs from the null hypothesis. For the methods of this chapter, the symbolic form of the alternative hypothesis must use one of these symbols: $<, >, \neq$.

Example: Here are different examples of alternative hypotheses involving proportions:

$$H_1: p > 0.5 \quad H_1: p < 0.5 \quad H_1: p \neq 0.5$$

The *original claim* could become the null hypothesis (as in a claim that $p = 0.5$), it could become the alternative hypothesis (as in the claim that $p > 0.5$), or it might not be either the null hypothesis or the alternative hypothesis (as in the claim that $p \geq 0.5$).