Solution

a. Using the values $n = 945$, $p = 0.5$, and $q = 0.5$, Formulas 5-6 and 5-8 can be applied as follows:

$$\mu = np = (945)(0.5) = 472.5 \text{ girls}$$
$$\sigma = \sqrt{npq} = \sqrt{(945)(0.5)(0.5)} = 15.4 \text{ girls (rounded)}$$

b. With $\mu = 472.5$ girls and $\sigma = 15.4$ girls, we use the range rule of thumb as follows:

$$\text{minimum usual value: } \mu - 2\sigma = 472.5 - 2(15.4) = 441.7 \text{ girls}$$
$$\text{maximum usual value: } \mu + 2\sigma = 472.5 + 2(15.4) = 503.3 \text{ girls}$$

For groups of 945 births, the number of girls should usually fall between 441.7 girls and 503.3 girls (assuming that boys and girls are equally likely).

c. Because the result of 879 girls falls above the range of usual values (from 441.7 girls to 503.3 girls), we consider the result of 879 girls to be an unusually high number of girls.

Interpretation

The result of 879 girls in 945 births is unusually high, so it is not a result we expect to occur by chance. Because chance does not seem to be a reasonable explanation, because 879 girls is so much higher than we expect with chance, and because the 945 couples used the XSORT method of gender selection, it appears that the XSORT method is effective in increasing the likelihood that a baby is born a girl. (However, this does not *prove* that the XSORT method is the cause of the increased number of girls; such proof must be based on direct physical evidence.)

In this section we presented easy procedures for finding the parameters of μ (population mean) and σ (population standard deviation) from a binomial probability distribution. However, it is really important to be able to *interpret* those values by using such devices as the range rule of thumb for identifying a range of usual values.

5-4 Basic Skills and Concepts

Statistical Literacy and Critical Thinking

1. Notation In a clinical trial of the cholesterol drug Lipitor, 270 subjects were given a placebo, and 7% of them developed headaches. For such randomly selected groups of 270 subjects given a placebo, identify the values of n, p, and q that would be used for finding the mean and standard deviation for the number of subjects who develop headaches.

2. Standard Deviation For the binomial distribution described by the conditions in Exercise 1, find the standard deviation by evaluating $\sqrt{npq}$. Some books use the expression $\sqrt{np(1-p)}$ for the standard deviation. Will that expression always yield the same result?

3. Variance An Office Team survey of 150 executives found that 93.3% of them said that they would be concerned about gaps in a résumé of a job applicant. Based on these results, such randomly selected groups of 150 executives have a mean of 140.0 executives and a standard deviation of 3.1 executives. Find the variance, and express it with the appropriate units.