describes the use of probabilities to determine whether results could easily occur by chance.

Using Probabilities to Determine When Results Are Unusual

- **Unusually *high* number of successes:** x successes among n trials is an *unusually high* number of successes if the probability of x or more successes is unlikely with a probability of 0.05 or less. This criterion can be expressed as follows: $P(x \text{ or more}) \leq 0.05$.*
- **Unusually *low* number of successes:** x successes among n trials is an *unusually low* number of successes if the probability of x or fewer successes is unlikely with a probability of 0.05 or less. This criterion can be expressed as follows: $P(x \text{ or fewer}) \leq 0.05$.*

* The value 0.05 is not absolutely rigid. Other values, such as 0.01, could be used to distinguish between results that can easily occur by chance and events that are very unlikely to occur by chance.

6-7 Basic Skills and Concepts

Statistical Literacy and Critical Thinking

1. Exact Value and Approximation Refer to Figure 6-21 in Example 2, and refer to the Minitab display near the beginning of this section. Figure 6-21 shows the shaded region representing exactly 235 wins among 431 games. What is the shape of the corresponding region in the Minitab display? If we use technology without an approximation, the probability of exactly 235 wins is found to be 0.0066. If we use the normal approximation to the binomial distribution, the probability of exactly 235 wins is found from Table A-2 to be 0.0068. Which result is better? Is the approximation off by much?

2. Continuity Correction In a preliminary test of the MicroSort method of gender selection, 14 couples were treated and 13 of them had baby girls. If we plan to use the normal approximation to the binomial distribution for finding the probability of exactly 13 girls (assuming that the probability of a girl is 0.5), what is the continuity correction, and how would it be applied in finding that probability?

3. Notation The SAT test uses multiple-choice test questions, each with possible answers of a, b, c, d, e, and each question has only one correct answer. For people who make random guesses for answers to a block of 25 questions, identify the values of p, q, μ, and σ. What do μ and σ measure?

4. Checking Requirement The SAT test uses multiple-choice test questions, each with possible answers of a, b, c, d, e, and each question has only one correct answer. We want to find the probability of getting exactly 10 correct answers for someone who makes random guesses for answers to a block of 25 questions. If we plan to use the methods of this section with a normal distribution used to approximate a binomial distribution, are the necessary requirements satisfied? Explain.

Using Normal Approximation. ***In Exercises 5–8, do the following: If the requirements of $np \geq 5$ and $nq \geq 5$ are both satisfied, estimate the indicated probability by using the normal distribution as an approximation to the binomial distribution; if $np < 5$ or $nq < 5$, then state that the normal approximation should not be used.***

5. With $n = 13$ and $p = 0.4$, find P(fewer than 3).

6. With $n = 12$ and $p = 0.7$, find P(fewer than 8).

7. With $n = 20$ and $p = 0.8$, find P(more than 11).

8. With $n = 25$ and $p = 0.4$, find P(more than 9).