

- c. If you win, what is your net profit? d. Find the expected value.
- e. If you bet \$1 in Maine's Pick 3 game, the expected value is $-50¢$. Which bet is better: A \$1 bet in the Maine Pick 3 game or a \$1 bet in the Maine Pick 4 game? Explain.

25. Expected Value in Roulette When playing roulette at the Venetian casino in Las Vegas, a gambler is trying to decide whether to bet \$5 on the number 27 or to bet \$5 that the outcome is any one of these five possibilities: 0, 00, 1, 2, 3. From Example 8, we know that the expected value of the \$5 bet for a single number is $-26¢$. For the \$5 bet that the outcome is 0, 00, 1, 2, or 3, there is a probability of $5/38$ of making a net profit of \$30 and a $33/38$ probability of losing \$5.

- a. Find the expected value for the \$5 bet that the outcome is 0, 00, 1, 2, or 3.
- b. Which bet is better: a \$5 bet on the number 27 or a \$5 bet that the outcome is 0, 00, 1, 2, or 3? Why?

26. Expected Value for Deal or No Deal The television game show *Deal or No Deal* begins with individual suitcases containing the amounts of 1¢, \$1, \$5, \$10, \$25, \$50, \$75, \$100, \$200, \$300, \$400, \$500, \$750, \$1000, \$5000, \$10,000, \$25,000, \$50,000, \$75,000, \$100,000, \$200,000, \$300,000, \$400,000, \$500,000, \$750,000, and \$1,000,000. If a player adopts the strategy of choosing the option of "no deal" until one suitcase remains, the payoff is one of the amounts listed, and they are all equally likely.

- a. Find the expected value for this strategy. b. Find the value of the standard deviation.
- c. Use the range rule of thumb to identify the range of usual outcomes.
- d. Based on the preceding results, is a result of \$750,000 or \$1,000,000 unusually high? Why or why not?



5-3

Binomial Probability Distributions

Key Concept Section 5-2 introduced the important concept of a discrete probability distribution. Among all of the different types of discrete probability distributions that exist, there are a few that are particularly important, and the focus of this section is the type that we call *binomial* probability distributions. We begin with a basic definition of a binomial probability distribution, along with notation and methods for finding probability values. As in other sections, we stress the importance of *interpreting* probability values to determine whether events are unlikely (with a low probability, such as 0.05 or less) or unusually high or low.

Binomial probability distributions allow us to deal with circumstances in which the outcomes belong to *two* relevant categories, such as acceptable/defective or survived/died. Other requirements are given in the following definition.

DEFINITION A **binomial probability distribution** results from a procedure that meets all the following requirements:

1. The procedure has a *fixed number of trials*. (A trial is a single observation.)
2. The trials must be *independent*. (The outcome of any individual trial doesn't affect the probabilities in the other trials.)
3. Each trial must have all outcomes classified into *two categories* (commonly referred to as *success* and *failure*).
4. The probability of a success remains the same in all trials.