8.4 Expecting the Unexpected

▶ Find the probability of independent events.

▶ Find the probability that an event does not occur.

▶ Find counterintuitive probabilities.

Finding the Probability of Independent Events

Two events are **independent** if the occurrence of one does not affect the occurrence of the other. For instance, the event "consumer likes chocolate" should be independent of the event "consumer has more than one cell phone."

Probability of Independent Events

The probability that two independent events occur is the product of their individual probabilities.

$$\text{Probability that both events occur} = \left(\begin{array}{c}\text{probability}\\\text{of event 1}\end{array}\right)\left(\begin{array}{c}\text{probability}\\\text{of event 2}\end{array}\right)$$

This principle can be applied to three or more independent events.

EXAMPLE 1   **Finding the Probability of Independent Events**

In the game of *Yahtzee*, rolling five dice with the same number is called a YAHTZEE. What is the probability of rolling five 6s?

SOLUTION

Rolling one die has no effect on any of the other dice. So, the events are independent. For each die, the probability of rolling a 6 is one-sixth. So, the probability of rolling five 6s is

$$\text{Probability of rolling five 6s} = \left(\frac{1}{6}\right)\left(\frac{1}{6}\right)\left(\frac{1}{6}\right)\left(\frac{1}{6}\right)\left(\frac{1}{6}\right)$$

$$= \left(\frac{1}{6}\right)^5$$

$$= \frac{1}{7776}.$$

So, you have a 1 in 7776 chance of rolling five 6s on any given roll.

Yahtzee was first marketed by Edwin Lowe in 1956.

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In the game of *Yahtzee*, you are allowed three rolls of the dice, and you are allowed to keep any of the dice you want. With 3 rolls, it can be shown that the probability of rolling any YAHTZEE is about 1 out of 22. Visit *Math.andYou.com* to play a dice game simulator. How many times do you play the game before you roll a YAHTZEE?