cookies, then compare the result to the actual number of reduced fat Chips Ahoy cookies with 18 chocolate chips.

b. Find the probability that a cookie will have 21 chocolate chips, then find the expected number of cookies with 21 chocolate chips among 40 different reduced fat Chips Ahoy cookies, then compare the result to the actual number of reduced fat Chips Ahoy cookies with 21 chocolate chips.

5-5 Beyond the Basics

17. Poisson Approximation to Binomial Distribution An experiment consists of rolling a single die 12 times and the variable x is the number of times that the outcome is 6.

a. Can the Poisson distribution be used to find the probability that the outcome of 6 occurs exactly 3 times? Why or why not?

b. If the Poisson distribution is used, is the result OK? Why or why not?

Chapter 5 Review

This chapter introduced the important concept of a probability distribution, which describes the probability for each value of a random variable. This chapter includes only discrete probability distributions, but the following chapters will include continuous probability distributions.

In Section 5-2 we introduced probability distributions and the following definitions.

- A *random variable* has values that are determined by chance.
- A *probability distribution* consists of all values of a random variable, along with their corresponding probabilities. A probability distribution must satisfy three requirements: there is a numerical random variable x and its values are associated with corresponding probabilities, the sum of all of the probabilities for values of the random variable must be 1, and each probability value must be between 0 and 1 inclusive. The second and third requirements are expressed as $\sum P(x) = 1$ and, for each value of x, $0 \le P(x) \le 1$.
- Important characteristics of a *probability distribution* can be explored by constructing a probability histogram and by computing its mean and standard deviation using these formulas:

$$\mu = \sum [x \cdot P(x)]$$

$$\sigma = \sqrt{\sum [x^2 \cdot P(x)] - \mu^2}$$

- In Section 5-3, we introduced *binomial distributions,* which have two categories of outcomes and a fixed number of independent trials with a constant probability. The probability of x successes among n trials can be found by using the binomial probability formula, or Table A-1 (the Binomial Probability table), or computer software (such as STATDISK, Minitab, Excel, or StatCrunch), or a TI-83/84 Plus calculator.
- In Section 5-4 we noted that for a binomial distribution, the parameters of the mean and standard deviation are described by $\mu = np$ and $\sigma = \sqrt{npq}$.
- In Section 5-5 we introduced *Poisson probability distributions,* which apply to occurrences of some event over a specific interval. Probabilities for a Poisson distribution can be computed with Formula 5-9.
- *Unusual Outcomes:* In this chapter, we saw that we could determine when an outcome has an unusually low or unusually high number of successes. We used two different criteria: (1) the range rule of thumb, and (2) the use of probabilities, described as follows.