



FIGURE 6.2 Effects of changing n for a fixed value of p

number of successes will be small and the distribution skews to the right. When p is large, it is more likely that the number of successes will be large and the distribution is skewed to the left. You can also see that when p is equal to 0.50, the distribution is symmetric. From the binomial distributions for $n = 10$, you will notice, not surprisingly, that the probability distributions for $p = 0.20$ and $p = 0.80$ are mirror images of each other.

Where does the mean fit into the picture? The mean is the value that you expect to occur; that is, it is the most likely outcome. In Figure 6.1 you see that in the first probability histogram the highest bar is for $X = 2$ and the mean of a binomial random variable with $n = 10$ and $p = 0.20$ is $\mu = (10)(0.20) = 2$.

Figure 6.2 shows the effects of changing the value of the parameter n for a fixed value of p . The y -axis scale for each histogram is approximately the same. You can see that, for the most part, the shape of the distribution remains the same as n varies, but the number of possible values and the probability of each value of X (bars in the histogram) change. In fact, as n gets larger, the individual probabilities get smaller. This makes sense because we know that the probabilities must sum to 1, and if there are more values of X , then each value gets a smaller share of the total.

The binomial distribution is not the only discrete probability distribution that deals with the number of successes. The Poisson distribution is used when we are interested in the number of successes in a time interval or region. To find out more about this, refer to the extended discussion of this topic in Appendix D of the text.

6.3.5 EXERCISES—LEARNING IT!

6.6 The board of realtors of a small city reports that 80% of the homes that are sold have been on the market for more than 6 months. The board takes a random sample of 15 homes that have recently been sold and counts the number that were on the market longer than 6 months. What is the probability that of the 15 houses in the sample:

- Less than 12 have been on the market longer than 6 months?
- Between 8 and 13 have been on the market longer than 6 months?
- At least 10 have been on the market longer than 6 months?
- At most 4 have been on the market for less than 6 months?

6.7 The Department of Transportation for a city has found that 25% of all parking tickets issued are not paid within 1 month of issue. The department takes a random sample of 20 parking tickets that were issued 1 month ago and counts the number that have not been paid. What is the probability that: