



Thus, using the normal approximation and continuity correction, the probability that the restaurant will have no more than 20 no-shows is 0.8790. Notice that the continuity correction has a significant impact on the accuracy of the approximation. Using the binomial distribution, the exact probability is 0.8775.

## 9.6 EXERCISES

### ✓ CONCEPT CHECK

1. Why would you want to use the normal distribution to approximate a binomial distribution?
2. What are the parameters of a normal distribution used to approximate a binomial distribution?
3. What is continuity correction? How does it improve the normal approximation to the binomial?

### 💡 PRACTICE

4. Consider the probability that fewer than 15 out of the 123 people watching a movie have already read the book. Assume that the probability of a given person having read the book is 40%. Verify that a normal distribution can be used to approximate the binomial probability, or show how the conditions have not been met.
5. Consider the probability that at most 2 out of 30 television sets on an assembly line are defective. Assume that the probability of a given television set being defective is 5%. Verify that a normal distribution can be used to approximate the binomial probability, or show how the conditions have not been met.

 APPLICATIONS

Solve each problem. Use a normal distribution to approximate each probability.

6. Management at a small engineering company is considering the addition of a company cafeteria area. A random sample of 50 persons out of the total number of persons employed by the firm will be surveyed to see if they are in favor of the addition. Assume that the true percentage of persons that favor the addition is 90%.
  - a. Find the expected number of employees in the sample who will favor the addition of the cafeteria area.
  - b. Find the standard deviation of the number of employees in the sample who will favor the addition of the cafeteria area.
  - c. What is the probability that between 35 and 37 employees (inclusive) in the sample will favor the cafeteria?
  - d. What is the probability that more than 40 of the employees in the sample will favor the cafeteria?
  - e. What is the probability that at most 38 of the employees in the sample will favor the cafeteria?
  
7. The accounting department of a large corporation checks the addition of expense reports submitted by executives before paying them. Historically, they have found that 15% of the reports contain addition errors. An auditor randomly selects 60 expense reports and audits them for addition errors.
  - a. Find the expected number of reports in the sample that will have addition errors.
  - b. Find the standard deviation of the number of reports sampled that will have addition errors.
  - c. Find the probability that fewer than 10 of the sampled expense reports will have addition errors.
  - d. Find the probability that at least 30 of the sampled expense reports will have addition errors.
  - e. Find the probability that between 5 and 15 (inclusive) of the sampled expense reports will have addition errors.
  
8. A local electronics store purchased a market research study which suggests that 60 percent of all homes have gaming systems. A sample of 200 homes is selected to confirm the study's findings. If the marketing study is correct, answer the following questions.
  - a. Find the expected number of homes sampled which will have gaming systems.
  - b. Find the standard deviation of the number of homes in the sample which will have gaming systems.
  - c. What is the probability that at most 80 of the sampled homes will have gaming systems?
  - d. What is the probability that between 100 and 120 (inclusive) homes sampled will have gaming systems?
  - e. What is the probability that at least 130 of the sampled homes will have gaming systems?

9. Suppose a virus is believed to infect two percent of the population. If a sample of 3000 randomly selected subjects are tested, answer the following questions.
- Find the expected number of subjects sampled that will be infected.
  - Find the standard deviation of the number of subjects sampled that will be infected.
  - What is the probability that fewer than 30 of the subjects in the sample will be infected?
  - What is the probability that between 40 and 80 (inclusive) of the subjects in the sample will be infected?
  - Find the probability that at least 70 of the subjects in the sample will be infected.