for the CEOs of all industrial firms, find the probabilities that ... randomly chosen CEOs:

(1) Exactly five saw their pay decrease in 1995.

(2) At least five got raises in 1995.

(3) Fewer than four got raises in 1995.

(b) Compute the mean and standard deviation for these thirty-nine changes in salaries.

(c) Assume that the 1995 percent changes in salary for the CEOs of all industrial firms are normally distributed with mean and standard deviation as calculated in (b). Find the probabilities that a randomly chosen CEO had a pay change in 1995 of:

(1) At least a 25 percent increase.

(2) Less than a 5 percent increase.

(3) Between a 15 percent decrease and a 15 percent increase.

Chapter Concepts Test

Circle the correct answer or fill in the blank. *Answers are in the back of the book.*

T F 1. The expected value of an experiment is obtained by computing the arithmetic average value over all possible outcomes of the experiment.

T F 2. The value of z for some point x lying in a normal distribution is the area between x and the mean of the distribution.

T F 3. The right and left tails of the normal distribution extend indefinitely, never touching the horizontal axis.

T F 4. For a normal distribution, the mean always lies between the mode and the median.

T F 5. All but about three-tenths of 1 percent of the area in a normal distribution lies within 3 standard deviations from the mean.

T F 6. Developing a conditional loss table is cumbersome when there are many possible actions and outcomes, because the loss resulting from every action/outcome pair must be included in the table.

T F 7. The area under the curve of a normal distribution between the mean and a point 1.8 standard deviations above the mean is greater for a distribution having a mean of 100 than it is for a distribution having a mean of 0.

T F 8. The normal distribution may be used to approximate the binomial distribution when the number of trials, n, is greater than or equal to 60.

T F 9. The two types of losses we consider in solving an inventory-stocking problem are opportunity losses and activity losses.

T F 10. When the probability of success in a Bernoulli process is 50 percent ($p = 0.5$), its binomial distribution is symmetrical.

T F 11. A frequency distribution lists observed frequencies for an experiment that has already been performed; a probability distribution lists outcomes that could result *if* the experiment were performed.

T F 12. The value a random variable will take on can usually be predicted in advance of a particular occurrence.

T F 13. Once the value of p has been decided for a Bernoulli process, the value of q is calculated as $1 - p$.

T F 14. If the expected number of arrivals in an office is calculated as five per hour, one can be reasonably confident that five people will arrive within the next hour.

T F 15. The binomial distribution is not really necessary because its values can always be approximated by another distribution.

T F 16. The height of adult humans can be described by a Poisson distribution.

T F 17. Any action that minimizes expected loss will also minimize expected gain.

T F 18. After 20 trials of an experiment, a correctly shaped distribution curve is created.

T F 19. An example of an opportunity loss could be loss of sales due to the excess age of fruit on a grocery shelf.

T F 20. A distribution where the mean and median have different values can never be a normal distribution.

T F 21. The mean of a binomial distribution is given by np.

A B C D E 22. If the expected daily profit of a lemonade stand is \$13.45, then:

(a) Tomorrow's profit will be \$13.45.

(b) Tomorrow's profit will be less than \$13.45.

(c) Tomorrow's profit will be more than \$13.45.

(d) Tomorrow's loss will be \$13.45.

(e) None of the above.

A B C D E 23. For a given binomial distribution with n fixed, if $p < 0.5$, then:

(a) The Poisson distribution will provide a good approximation.

(b) The Poisson distribution will provide a bad approximation.

(c) The binomial distribution will be skewed left.

(d) The binomial distribution will be skewed right.

(e) The binomial distribution will be symmetric.

A B C D 24. Suppose we have a Poisson distribution with $\lambda = 2$. Then the probability of having exactly 10 occurrences is:

(a) $\frac{2^{-10}e^{10}}{10!}$.

(b) $\frac{2^{10}e^{-2}}{2!}$.

(c) $\frac{10^2e^{-10}}{10!}$.

(d) $\frac{2^{10}e^{-2}}{10!}$.

A B C D E 25. Which of the following is a characteristic of the probability distribution for any random variable?

(a) A probability is provided for every possible value.

(b) The sum of all probabilities is 1.

(c) No given probability occurs more than once.

(d) All of these.

(e) (a) and (b) but not (c).

A B C D 26. Which of the following could never be described by a binomial distribution?

(a) The number of defective widgets produced by an assembly process.

(b) The amount of water used daily by a single household.

(c) The number of people in your class who can answer this question correctly.

(d) All of these could always be described by a binomial distribution.

A B C D E 27. If $p = 0.4$ for a particular Bernoulli process, the calculation $\left(\frac{7!}{3! \times 4!}\right)(0.4)^3(0.6)^4$ gives the probability of getting:

(a) Exactly three successes in seven trials.

(b) Exactly four successes in seven trials.

(c) Three or more successes in seven trials.

(d) Four or more successes in seven trials.

(e) None of these.

A B C D E 28. For binomial distributions with $p = 0.2$:

(a) A distribution for $n = 2{,}000$ would more closely approximate the normal distribution than one for $n = 50$.

(b) No matter what the value of n, the distribution is skewed to the right.

(c) The graph of this distribution with $p = 0.2$ and $n = 100$ would be the exact reverse of the graph for the binomial distribution with $n = 100$ and $p = 0.8$.

(d) All of these.

(e) (a) and (b) but not (c).

A B C D E 29. Which of the following is a necessary condition for use of a Poisson distribution?

(a) Probability of one arrival per second is constant.

(b) The number of arrivals in any 1-second interval is independent of arrivals in other intervals.

(c) The probability of two or more arrivals in the same second is zero.

(d) All of these.

(e) (b) and (c) but not (a).

A B C D E F 30. In what case would the Poisson distribution be a good approximation of the binomial?

(a) $n = 40, p = 0.32$.
(b) $n = 40, q = 0.79$.
(c) $n = 200, q = 0.98$.
(d) $n = 10, p = 0.03$.
(e) (a) and (c).
(f) All of these.

A B C D E 31. For a normal curve with $\mu = 55$ and $\sigma = 10$, how much area will be found under the curve to the right of the value 55?

(a) 1.0.
(b) 0.68.
(c) 0.5.
(d) 0.32.
(e) Cannot be determined from the information given.

A B C D E F 32. Suppose you are using a normal distribution to approximate a binomial distribution with $\mu = 5, \sigma = 2$, and wish to determine the probability of getting more than seven successes. From the normal table, you would determine the probability that z is greater than:

(a) 0.
(b) 0.5.
(c) 0.75.
(d) 1.0.
(e) 1.25.
(f) 1.5.

A B C D E F 33. For a normal curve with a mean of 120 and a standard deviation of 35, what proportion (in percent) of the area under the curve will lie between the values of 40 and 82?

(a) 12.7.
(b) 85.1.
(c) 13.8.
(d) 48.9.
(e) 12.1.
(f) 19.4.

A B C D E F 34. Which of the following normal curves looks most like the curve for $\mu = 10, \sigma = 5$?

(a) Curve for $\mu = 10, \sigma = 10$.
(b) Curve for $\mu = 20, \sigma = 10$.
(c) Curve for $\mu = 20, \sigma = 5$.
(d) Curve for $\mu = 12, \sigma = 3$.
(e) (a), (c), and (d).
(f) None of these.

A B C D E 35. A binomial distribution may be approximated by a Poisson distribution if:

(a) n is large and p is large.
(b) n is small and p is large.
(c) n is small and p is small.
(d) None of these.
(e) (a) and (b) but not (c).

A B C D E F 36. The standard deviation of a binomial distribution depends on:
(a) Probability of success.
(b) Probability of failure.
(c) Number of trials.
(d) (a) and (b) but not (c).
(e) (b) and (c) but not (a).
(f) (a), (b), and (c).

37. The weighted average of the outcomes of an experiment is referred to as the _____.

38. The distribution that deals only in successes and failures is referred to as the _____ distribution. It is usually used to describe a _____ process.

39. When approximating a binomial distribution by a normal distribution, a _____ correction factor should be used.

40. The mean of a binomial distribution, μ, can be calculated as _____ once n and p are known. The standard deviation, σ, is calculated as _____.

41. For a Poisson distribution, the symbol that represents the mean number of occurrences per interval of time is _____.

42. A list of the probabilities of outcomes that could result if an experiment were performed is called a _____.

43. The two parameters that are necessary to describe a normal distribution are the _____ and the _____.

44. A _____ variable is a variable that assumes different values according to the results of an experiment.

45. _____ distributions can take on only a limited number of values, which can be listed, while _____ distributions can take on any value within a range.