Given current trends for [illegible] later, the firm suspects that today's new parents are better educated, on average, and, as a result, more likely to use a vitamin supplement for their infants. A sample of 1,500 new parents redeemed 295 coupons. Does this support, at a significance level of 2 percent, the firm's belief about today's new parents?

■ 8-80 An innovator in the motor-drive industry felt that its new electric motor drive would capture 48 percent of the regional market within 1 year, because of the product's low price and superior performance. There are 5,000 users of motor drives in the region. After sampling 10 percent of these users a year later, the company found that 43 percent of them were using the new drives. At $\alpha = 0.01$, should we conclude that the company failed to reach its market-share goal?

■ 8-81 According to machine specifications, the one-armed bandits in gambling casinos should pay off once in 11.6 turns, with a standard deviation of 2.7 turns. A lawyer believes that the machines at Casino World have been tampered with and observes a payoff once in 12.4 turns, over 36 machines. At $\alpha = 0.01$, is the lawyer right in concluding that the machines have a lower payoff frequency?

Chapter Concepts Test

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

T F 1. In hypothesis testing, we assume that some population parameter takes on a particular value before we sample. This assumption to be tested is called an alternative hypothesis.

T F 2. Assuming that a given hypothesis about a population mean is correct, the percentage of sample means that could fall outside certain limits from this hypothesized mean is called the significance level.

T F 3. In hypothesis testing, the appropriate probability distribution to use is always the normal distribution.

T F 4. If we were to make a Type I error, we would be rejecting a null hypothesis when it is really true.

T F 5. Testing on the raw scale or the standardized scale will lead to the same conclusion.

T F 6. If 1.96 is the critical value of z, then the significance level of the test is 0.05.

T F 7. If our null and alternative hypotheses are H_0: $\mu = 80$ and H_1: $\mu < 80$, it is appropriate to use a left-tailed test.

T F 8. If the standardized sample mean is between zero and the critical value, then you should not reject H_0.

T F 9. The value $1 - \beta$ is known as the power of the test.

T F 10. After performing a one-tailed test and rejecting H_0, you realize you should have done a two-tailed test, at the same significance level. You will also reject H_0 for that test.

T F 11. It is often, but not always, possible to set the value of α so that we obtain a risk-free trade-off in hypothesis testing.

T F 12. You are performing a two-tailed hypothesis test on a population mean and have set $\alpha = 0.05$. If the sample statistic falls within the 0.95 of area around μ_{H_0}, you have proved that the null hypothesis is true.

T F 13. If hypothesis tests were done with a significance level of 0.60, the null hypothesis would usually be accepted when it was not true.

T F 14. If $\mu_{H_0} = 50$ and $\alpha = 0.05$, then $1 - \beta$ must be equal to 0.95 when $\mu = 50$.

T F 15. For a given level of significance, the critical values of t get closer to zero as the sample size increases.

T F 16. Selecting the appropriate significance level is easier than selecting the proper test to use.

T F 17. Mathematical methods exist that guarantee that the significance level chosen will always be appropriate.

T F 18. Hypothesis testing helps us draw conclusions about estimated parameters.

T F 19. A hypothesis test will be useful in determining whether a population mean is 45 or 60 (i.e., H_0: $\mu = 45$; H_1: $\mu = 60$).

T F 20. Hypothesis testing cannot unequivocally prove the "truth" about the value of a population parameter.

T F 21. The power of a hypothesis test is appropriate only for use with one-tailed tests.

A B C D 22. A major automobile manufacturer has had to recall several models from its 1993 line due to quality-control problems that were not discovered with its random final inspection procedures. This is an example of:

(a) Type I error.

(b) Type II error.

(c) Both Type I and Type II error.

(d) Neither type of error.

A B C D 23. If $n = 24$ and $\alpha = 0.05$, then the critical value of t for testing the hypotheses H_0: $\mu = 38$ and H_1: $\mu < 38$ is:

(a) 2.069.

(b) 1.714.

(c) -1.714.

(d) -2.069.

A B C D E 24. To test hypotheses about the mean of a normal population with a known standard deviation, we can compare:

(a) The observed value of $\bar{x}$ with the critical value of $\bar{x}$.

(b) The observed value of $\bar{x}$ with the critical value of z.

(c) The observed value of z with the critical value of $\bar{x}$.

(d) The observed value of z with the critical value of z.

(e) Either (a) or (d).

A B C D E 25. If we say that $\alpha = 0.10$ for a particular hypothesis test, we are saying that:

(a) Ten percent is our minimum standard for acceptable probability.

(b) Ten percent is the risk we take of rejecting a hypothesis that is true.

(c) Ten percent is the risk we take of accepting a hypothesis that is false.

(d) (a) and (b) only.

(e) (a) and (c) only.

A B C D 26. Suppose we wish to test whether a population mean is significantly larger or smaller than 10. We take a sample and find $\bar{x} = 8$. What should our alternative hypothesis be?

(a) $\mu < 10$.
(b) $\mu \neq 10$.
(c) $\mu > 10$.
(d) Cannot be determined from the information given.

A B C D E 27. Suppose that a hypothesis test is being performed for a process in which a Type I error will be very costly, but a Type II error will be relatively inexpensive and unimportant. Which of the following would be the best choice for α in this test?

(a) 0.01.
(b) 0.10.
(c) 0.25.
(d) 0.50.
(e) None of these.

A B C D 28. You are performing a right-tailed test of a population mean and σ is not known. A sample of size 26 is taken, and $\bar{x}$ and s are computed. At a significance level of 0.01, where would you look for the critical value for the test?

(a) The z table, where 0.99 of the area is to the left of the z value.
(b) The z table, where 0.98 of the area is to the left of the z value.
(c) The t table, where, with 25 degrees of freedom, the column heading is 0.02.
(d) The t table, where, with 25 degrees of freedom, the column heading is 0.01.

A B C D E 29. When using the sample proportion, $\bar{p}$, to test the hypotheses H_0: $p = p_{H_0}$ and H_1: $p \neq p_{H_0}$, the standard error of $\bar{p}$ is:

(a) $\sqrt{pq/n}$.
(b) pq/n.
(c) $\sqrt{p_{H_0}q_{H_0}/n}$.
(d) $p_{H_0}q_{H_0}/n$.
(e) None of these.

A B C D E F 30. For a particular hypothesis test, $\alpha = 0.05$ and $\beta = 0.10$. The power of this test is:

(a) 0.15.
(b) 0.90.
(c) 0.85.
(d) 0.95.
(e) 0.25.
(f) None of these.

A B C D 31. For a two-tailed test of hypotheses at $\alpha = 0.10$, the acceptance region is the entire region:

(a) To the right of the negative critical value.
(b) Between the two critical values.
(c) Outside of the two critical values.
(d) To the left of the positive critical value.

A B C D 32. The normal distribution is the appropriate distribution to use in testing hypotheses about:

(a) A proportion, when $np_{H_0} > 5$ and $nq_{H_0} > 5$.
(b) A mean, when σ is known and the population is normal.
(c) A mean, when σ is unknown but n is large.
(d) All of the above.

A B C D E 33. When a null hypothesis is accepted, it is possible that:
(a) A correct decision has been made.
(b) A Type I error has been made.
(c) Both (a) and (b) have occurred.
(d) Neither (a) nor (b) has occurred.
(e) None of these.

A B C D E 34. When the null hypothesis is H_0: $\mu = 42$, the alternative hypothesis can be:
(a) H_1: $\mu \geq 42$.
(b) H_1: $\mu < 42$.
(c) H_1: $\mu = 40$.
(d) H_1: $\mu \neq 40$.
(e) None of these.

A B C D 35. With a lower significance level, the probability of rejecting a null hypothesis that is actually true:
(a) Decreases.
(b) Remains the same.
(c) Increases.
(d) All of these.

A B C D E F 36. Decision makers make decisions on the appropriate significance level by examining the cost of:
(a) Performing the test.
(b) A Type I error.
(c) A Type II error.
(d) (a) and (b).
(e) (a) and (c).
(f) (b) and (c).

37. Observed $\bar{x}$ values and critical z values cannot be compared directly because they are on two different _____.

38. In order to use the t distribution to test hypotheses about a population mean, we must assume the population is _____ distributed and that its standard deviation is _____.

39. To be assured that a hypothesis test is working correctly, we would like the value of $1 - \beta$ to be as close to _____ as possible.

40. The power of a test refers to the test's ability to _____ the _____ hypothesis when it is _____.

41. An assumption or speculation made about the value of a population parameter is a _____.

42. Accepting a null hypothesis when it is false is a Type _____ error. Its probability is denoted by _____.

43. The assumption about a population parameter that we wish to test is the _____ hypothesis. The conclusion we accept when the data fail to support this assumption is the _____ hypothesis.

44. A hypothesis test involving two rejection regions is called a two-_____ test.

45. If the null hypothesis is $\mu = 10$ and the alternative hypothesis is $\mu > 10$, the appropriate test to use is a _____ test.