MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Solve the problem.

1) How many tissues should a package of tissues contain? Researchers have determined that a person uses an average of 42 tissues during a cold. Suppose a random sample of 10,000 people yielded the following data on the number of tissues used during a cold: \( \bar{x} = 37, s = 25 \). Identify the null and alternative hypothesis for a test to determine if the mean number of tissues used during a cold is less than 42.
   
   A) \( H_0: \mu = 42 \) vs. \( H_a: \mu < 42 \)  
   B) \( H_0: \mu = 42 \) vs. \( H_a: \mu \neq 42 \)  
   C) \( H_0: \mu = 42 \) vs. \( H_a: \mu > 42 \)  
   D) \( H_0: \mu > 42 \) vs. \( H_a: \mu \leq 42 \)

2) How many tissues should a package of tissues contain? Researchers have determined that a person uses an average of 58 tissues during a cold. Suppose a random sample of 10,000 people yielded the following data on the number of tissues used during a cold: \( \bar{x} = 49, s = 19 \). We want to test the alternative hypothesis \( H_a: \mu < 58 \). State the correct rejection region for \( \alpha = .05 \).
   
   A) Reject \( H_0 \) if \( z < -1.96 \).  
   B) Reject \( H_0 \) if \( z > 1.96 \) or \( z < -1.96 \).  
   C) Reject \( H_0 \) if \( z > 1.645 \).  
   D) Reject \( H_0 \) if \( z < -1.645 \).

3) How many tissues should a package of tissues contain? Researchers have determined that a person uses an average of 45 tissues during a cold. Suppose a random sample of 2500 people yielded the following data on the number of tissues used during a cold: \( \bar{x} = 34, s = 21 \). Suppose the corresponding test statistic falls in the rejection region at \( \alpha = .05 \). What is the correct conclusion?
   
   A) At \( \alpha = .05 \), reject \( H_0 \).  
   B) At \( \alpha = .10 \), reject \( H_a \).  
   C) At \( \alpha = .10 \), reject \( H_0 \).  
   D) At \( \alpha = .05 \), accept \( H_a \).

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

4) The hypotheses for \( H_0: \mu = 125.4 \) and \( H_a: \mu \neq 125.4 \) are tested at \( \alpha = .10 \). Sketch the appropriate rejection region.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

5) The owner of Get-A-Away Travel has recently surveyed a random sample of 381 customers to determine whether the mean age of the agency's customers is over 25. The appropriate hypotheses are \( H_0: \mu = 25, H_a: \mu > 25 \). If he concludes the mean age is over 25 when it is not, he makes a ______ error. If he concludes the mean age is not over 25 when it is, he makes a ______ error.
   
   A) Type II; Type I  
   B) Type I; Type I  
   C) Type I; Type II  
   D) Type II; Type II
6) A national organization has been working with utilities throughout the nation to find sites for large wind machines that generate electricity. Wind speeds must average more than 22 miles per hour (mph) for a site to be acceptable. Recently, the organization conducted wind speed tests at a particular site. Based on a sample of \( n = 33 \) wind speed recordings (taken at random intervals), the wind speed at the site averaged \( \bar{x} = 22.8 \) mph, with a standard deviation of \( s = 4.3 \) mph. To determine whether the site meets the organization’s requirements, consider the test, \( H_0: \mu = 22 \) vs. \( H_A: \mu > 22 \), where \( \mu \) is the true mean wind speed at the site and \( \alpha = .01 \). Suppose the value of the test statistic were computed to be 1.07. State the conclusion.

   A) At \( \alpha = .01 \), there is sufficient evidence to conclude the true mean wind speed at the site exceeds 22 mph.
   B) We are 99% confident that the site does not meet the organization’s requirements.
   C) We are 99% confident that the site meets the organization’s requirements.
   D) At \( \alpha = .01 \), there is insufficient evidence to conclude the true mean wind speed at the site exceeds 22 mph.

7) I want to test \( H_0: p = .6 \) vs. \( H_A: p \neq .6 \) using a test of hypothesis. If I concluded that \( p \) is .6 when, in fact, the true value of \( p \) is not .6, then I have made a __________.

   A) Type I and Type II error
   B) Type II error
   C) Type I error
   D) correct decision

8) Given \( H_0: \mu = 25 \), \( H_A: \mu \neq 25 \), and \( p = 0.034 \). Do you reject or fail to reject \( H_0 \) at the .01 level of significance?

   A) fail to reject \( H_0 \)
   B) reject \( H_0 \)
   C) not sufficient information to decide

9) If a hypothesis test were conducted using \( \alpha = 0.10 \), to which of the following \( p \)-values would cause the null hypothesis to be rejected.

   A) 0.150
   B) 0.110
   C) 0.090
   D) 0.105

   SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

10) In a test of \( H_0: \mu = 65 \) against \( H_A: \mu > 65 \), the sample data yielded the test statistic \( z = 1.38 \). Find and interpret the \( p \)-value for the test.

   MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

11) A bottling company produces bottles that hold 12 ounces of liquid. Periodically, the company gets complaints that their bottles are not holding enough liquid. To test this claim, the bottling company randomly samples 25 bottles and finds the average amount of liquid held by the bottles is 11.7 ounces with a standard deviation of .4 ounce. Calculate the appropriate test statistic.

   A) \( t = -18.750 \)
   B) \( t = -3.750 \)
   C) \( t = -2.372 \)
   D) \( t = -3.674 \)
12) According to an advertisement, a strain of soybeans planted on soil prepared with a specified fertilizer treatment has a mean yield of 96 bushels per acre. Fifteen farmers who belong to a cooperative plant the soybeans in soil prepared as specified. Each uses a 40-acre plot and records the mean yield per acre. The mean and variance for the sample of the 15 farms are $\bar{x} = 81$ and $s^2 = 10,125$. Find the rejection region used for determining if the mean yield for the soybeans is not equal to 96 bushels per acre. Use $\alpha = 0.05$.

13) A poll of 1,068 adult Americans reveals that 48% of the voters surveyed prefer the Democratic candidate for the presidency. At the 0.05 level of significance, do the data provide sufficient evidence that the percentage of all voters who prefer the Democrat is less than 50%?

14) In a sample of 157 children selected randomly from one town, it is found that 38 of them suffer from asthma. At the 0.05 significance level, do the data provide sufficient evidence to conclude the proportion of all children in the town who suffer from asthma is different from 11%?
Answer Key
Testname: PRACTICE-CH8

1) A
2) D
3) A
4)

10) \( p \)-value = \( P(z > 1.38) = .5 - .4162 = .0838 \); The probability of a test statistic even more contradictory to the null hypothesis than the one observed is .0838.

11) B

12) The rejection region requires \( \alpha/2 = .05/2 = .025 \) in both tails of the \( t \) distribution with \( df = n - 1 = 15 - 1 = 14 \). The rejection region is \( t > 2.145 \) or \( t < -2.145 \).

13) \( H_0: p = 0.5 \quad H_A: p < 0.5 \).
\( \alpha = 0.05 \)
Test statistic: \( z = -1.31 \). Critical value: \( z = 1.645 \).
Do not reject the null hypothesis. At the 5% level of significance, the data do not provide sufficient evidence to conclude that the percentage of voters who prefer the Democrat is less than 50%.

14) \( H_0: p = 0.11 \quad H_A: p \neq 0.11 \).
\( \alpha = 0.05 \)
Test statistic: \( z = 5.29 \). Critical values: \( z = \pm 1.96 \).
Reject \( H_0 \). At the 5% level of significance, the data provide sufficient evidence to conclude that the proportion of all children in the town who suffer from asthma is different from 11%.