Provide an appropriate response.

1) Find the critical value \( z_c \) that corresponds to a 95% confidence level.

2) Find the critical value \( z_c \) that corresponds to a 99% confidence level.

3) A random sample of 120 students has a test score average with a standard deviation of 9.2. Find the margin of error if \( c = 0.98 \).

4) A random sample of 150 students has a grade point average with a standard deviation of 0.78. Find the margin of error if \( c = 0.98 \).

5) A random sample of 40 students has a mean annual earnings of $3120 and a standard deviation of $677. Construct the confidence interval for the population mean, \( \mu \) if \( c = 0.95 \).

6) A random sample of 56 fluorescent light bulbs has a mean life of 645 hours with a standard deviation of 31 hours. Construct a 95% confidence interval for the population mean.

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

7) A group of 49 randomly selected students has a mean age of 22.4 years with a standard deviation of 3.8. Construct a 98% confidence interval for the population mean.
   A) (18.8, 26.3)  
   B) (20.3, 24.5)  
   C) (21.1, 23.7)  
   D) (19.8, 25.1)

8) A nurse at a local hospital is interested in estimating the birth weight of infants. How large a sample must she select if she desires to be 99% confident that the true mean is within 2 ounces of the sample mean? The standard deviation of the birth weights is known to be 7 ounces.

9) In order to fairly set flat rates for auto mechanics, a shop foreman needs to estimate the average time it takes to replace a fuel pump in a car. How large a sample must he select if he wants to be 99% confident that the true average time is within 15 minutes of the sample average? Assume the standard deviation of all times is 30 minutes.

10) Find the critical value, \( t_c \), for \( c = 0.95 \) and \( n = 16 \).

11) Find the critical value, \( t_c \), for \( c = 0.99 \) and \( n = 10 \).

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

12) In a random sample of 28 families, the average weekly food expense was $95.60 with a standard deviation of $22.50. Determine whether a normal distribution or a \( t \)-distribution should be used or whether neither of these can be used to construct a confidence interval. Assume the distribution of weekly food expenses is normally shaped.
   A) Use normal distribution.
   B) Use the \( t \)-distribution.
   C) Cannot use normal distribution or \( t \)-distribution.
13) For a sample of 20 IQ scores the mean score is 105.8. The standard deviation, \( \sigma \), is 15. Determine whether a normal distribution or a t-distribution should be used or whether neither of these can be used to construct a confidence interval. Assume that IQ scores are normally distributed.
   A) Cannot use normal distribution or t-distribution.
   B) Use normal distribution.
   C) Use the t-distribution.

14) A random sample of 15 statistics textbooks has a mean price of $105 with a standard deviation of $30.25. Determine whether a normal distribution or a t-distribution should be used or whether neither of these can be used to construct a confidence interval. Assume the distribution of statistics textbook prices is not normally distributed.
   A) Use normal distribution.
   B) Cannot use normal distribution or t-distribution.
   C) Use the t-distribution.

15) Find the value of \( E \), the margin of error, for \( c = 0.99 \), \( n = 10 \) and \( s = 3.2 \).
   A) 1.04   B) 3.21   C) 2.85   D) 3.29

16) Construct a 95% confidence interval for the population mean, \( \mu \). Assume the population has a normal distribution. A sample of 20 college students had mean annual earnings of $3120 with a standard deviation of $677.

17) Construct a 90% confidence interval for the population mean, \( \mu \). Assume the population has a normal distribution. A sample of 15 randomly selected students has a grade point average of 2.86 with a standard deviation of 0.78.

18) When 435 college students were surveyed, 120 said they own their car. Find a point estimate for \( p \), the population proportion of students who own their cars.

19) A survey of 300 fatal accidents showed that 123 were alcohol related. Construct a 98% confidence interval for the proportion of fatal accidents that were alcohol related.

20) When 495 college students were surveyed, 150 said they own their car. Construct a 95% confidence interval for the proportion of college students who say they own their cars.

21) A researcher at a major hospital wishes to estimate the proportion of the adult population of the United States that has high blood pressure. How large a sample is needed in order to be 95% confident that the sample proportion will not differ from the true proportion by more than 4%?

22) The mean age of bus drivers in Chicago is 48.5 years. Write the null and alternative hypotheses.

23) The mean IQ of statistics teachers is greater than 110. Write the null and alternative hypotheses.

24) A candidate for governor of a particular state claims to be favored by at least half of the voters. Write the null and alternative hypotheses.
25) The mean score for all NBA games during a particular season was less than 101 points per game. Write the null and alternative hypotheses.

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

26) Given $H_0: p \geq 80\%$ and $H_a: p < 80\%$, determine whether the hypothesis test is left-tailed, right-tailed, or two-tailed.
   A) two-tailed  B) right-tailed  C) left-tailed

27) Given $H_0: \mu \leq 25$ and $H_a: \mu > 25$, determine whether the hypothesis test is left-tailed, right-tailed, or two-tailed.
   A) two-tailed  B) left-tailed  C) right-tailed

28) A researcher claims that 62\% of voters favor gun control. Determine whether the hypothesis test for this claim is left-tailed, right-tailed, or two-tailed.
   A) right-tailed  B) two-tailed  C) left-tailed

29) The mean age of bus drivers in Chicago is 52.5 years. Identify the type I and type II errors for the hypothesis test of this claim.

30) The mean IQ of statistics teachers is greater than 120. Identify the type I and type II errors for the hypothesis test of this claim.

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

31) The mean age of bus drivers in Chicago is 50.2 years. If a hypothesis test is performed, how should you interpret a decision that rejects the null hypothesis?
   A) There is not sufficient evidence to support the claim $\mu = 50.2$.
   B) There is sufficient evidence to reject the claim $\mu = 50.2$.
   C) There is not sufficient evidence to reject the claim $\mu = 50.2$.
   D) There is sufficient evidence to support the claim $\mu = 50.2$.

32) The mean age of bus drivers in Chicago is greater than 57.8 years. If a hypothesis test is performed, how should you interpret a decision that rejects the null hypothesis?
   A) There is sufficient evidence to support the claim $\mu > 57.8$.
   B) There is not sufficient evidence to reject the claim $\mu > 57.8$.
   C) There is sufficient evidence to reject the claim $\mu > 57.8$.
   D) There is not sufficient evidence to support the claim $\mu > 57.8$.

33) The mean age of bus drivers in Chicago is greater than 47.6 years. If a hypothesis test is performed, how should you interpret a decision that fails to reject the null hypothesis?
   A) There is sufficient evidence to support the claim $\mu > 47.6$.
   B) There is sufficient evidence to reject the claim $\mu > 47.6$.
   C) There is not sufficient evidence to reject the claim $\mu > 47.6$.
   D) There is not sufficient evidence to support the claim $\mu > 47.6$. 
34) A candidate for governor of a certain state claims to be favored by at least half of the voters. If a hypothesis test is performed, how should you interpret a decision that fails to reject the null hypothesis?

A) There is sufficient evidence to support the claim $\rho \geq 0.5$.
B) There is not sufficient evidence to reject the claim $\rho = 0.5$.
C) There is sufficient evidence to reject the claim $\rho \geq 0.5$.
D) There is not sufficient evidence to support the claim $\rho = 0.5$.

35) Suppose you are using $\alpha = 0.05$ to test the claim that $\mu > 14$ using a P-value. You are given the sample statistics $n = 50$, $\bar{x} = 14.3$, and $s = 1.2$. Find the P-value.

36) Suppose you are using $\alpha = 0.05$ to test the claim that $\mu \neq 14$ using a P-value. You are given the sample statistics $n = 35$, $\bar{x} = 13.1$, and $s = 2.7$. Find the P-value.

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

37) Given $H_a: \mu > 85$ and $P = 0.007$. Do you reject or fail to reject $H_0$ at the 0.01 level of significance?

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

38) 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 0.01 level of significance?

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

39) Find the critical value for a right-tailed test with $\alpha = 0.01$ and $n = 75$.

40) Find the critical value for a two-tailed test with $\alpha = 0.01$ and $n = 30$.

41) Find the critical value for a left-tailed test with $\alpha = 0.05$ and $n = 48$.

42) Test the claim that $\mu > 19$, given that $\alpha = 0.05$ and the sample statistics are $n = 50$, $\bar{x} = 19.3$, and $s = 1.2$.

43) Test the claim that $\mu \neq 38$, given that $\alpha = 0.05$ and the sample statistics are $n = 35$, $\bar{x} = 37.1$ and $s = 2.7$.

44) A trucking firm suspects that the mean lifetime of a certain tire it uses is less than 34,000 miles. To check the claim, the firm randomly selects and tests 54 of these tires and gets a mean lifetime of 33,390 miles with a standard deviation of 1200 miles. At $\alpha = 0.05$, test the trucking firm's claim.
Answer Key
Testname: 2023EXAM3REVIESPRING2013

1) ±1.96
2) ±2.575
3) 1.96
4) 0.15
5) (2910, 3330)
6) (636.9, 653.1)
7) C
8) 82
9) 27
10) 2.131
11) 3.250
12) B
13) B
14) B
15) D
16) (2803, 3437)
17) (2.51, 3.21)
18) 0.276
19) (0.344, 0.476)
20) (0.263, 0.344)
21) 601
22) H₀: μ = 48.5, Hₐ: μ ≠ 48.5
23) H₀: μ ≤ 110, Hₐ: μ > 110
24) H₀: p ≥ 0.5, Hₐ: p < 0.5
25) H₀: μ ≥ 101, Hₐ: μ < 101
26) C
27) C
28) B
29) type I: rejecting H₀: μ = 52.5 when μ = 52.5
    type II: failing to reject H₀: μ = 52.5 when μ ≠ 52.5
30) type I: rejecting H₀: μ ≤ 120 when μ ≤ 120
    type II: failing to reject H₀: μ ≤ 120 when μ > 120
31) B
32) A
33) D
34) B
35) 0.0384
36) 0.0488
37) A
38) B
39) 2.33
40) ±2.575
41) ±1.645
42) standardized test statistic ≈ 1.77; critical value = 1.645; reject H₀; There is enough evidence to support the claim.
43) standardized test statistic ≈ -1.97; critical value = ±1.96; reject H₀; There is enough evidence to support the claim.
44) standardized test statistic ≈ -3.74; critical value z₀ = -1.645; reject H₀; There is sufficient evidence to support the trucking firm's claim.