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

Provide an appropriate response.

1) Find the critical value $z_c$ that corresponds to a 94% confidence level.

2) Find the margin of error for the given values of $c$, $\sigma$, and $n$.
   
   $c = 0.90$, $\sigma = 11.5$, $n = 120$

3) Find the margin of error for the given values of $c$, $\sigma$, and $n$.
   
   $c = 0.95$, $\sigma = 677$, $n = 40$

4) A random sample of 40 students has a test score with $\bar{x} = 81.5$. Assume the population standard deviation is 10.2. Construct the confidence interval for the population mean, $\mu$ if $c = 0.90$.

5) A group of 49 randomly selected students has a mean age of 22.4 years. Assume the population standard deviation is 3.8. Construct a 98% confidence interval for the population mean.

6) In a sample of 10 randomly selected women, it was found that their mean height was 63.4 inches. From previous studies, it is assumed that the standard deviation $\sigma$ is 2.4 and that the population of height measurements is normally distributed. Construct the 95% confidence interval for the population mean.

7) The number of wins in a season for 32 randomly selected professional football teams are listed below. Construct a 90% confidence interval for the true mean number of wins in a season. Assume that $\sigma$ is 2.6.

   9 9 9 8 10 9 7 2
   11 10 6 4 11 9 8 8
   12 10 7 5 12 6 4 3
   12 9 9 7 10 7 7 5

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 95% confident that the true mean is within 3 ounces of the sample mean? The standard deviation of the birth weights is known to be 6 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 value of $E$, the margin of error, for $c = 0.90$, $n = 10$ and $s = 3.1$.  

12) Use the confidence interval to find the margin of error and the sample mean.  (12, 20)  

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.  

14) In a survey of 2480 golfers, 15% said they were left-handed. The survey’s margin of error was 3%. Construct a confidence interval for the proportion of left-handed golfers.  

15) A survey of 280 homeless persons showed that 63 were veterans. Construct a 90% confidence interval for the proportion of homeless persons who are veterans.  

16) A pollster wishes to estimate the proportion of United States voters who favor capital punishment. How large a sample is needed in order to be 98% confident that the sample proportion will not differ from the true proportion by more than 3%?  

17) A private opinion poll is conducted for a politician to determine what proportion of the population favors decriminalizing marijuana possession. 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%?  

18) Find the critical values, $X^2_R$ and $X^2_L$, for $c = 0.95$ and $n = 12$.  

19) Find the critical values, $X^2_R$ and $X^2_L$, for $c = 0.99$ and $n = 10$.  

Assume the sample is taken from a normally distributed population and construct the indicated confidence interval.  

20) Construct a 95% confidence interval for the population standard deviation $\sigma$ of a random sample of 15 men who have a mean weight of 165.2 pounds with a standard deviation of 10.5 pounds. Assume the population is normally distributed.  

21) The heights (in inches) of 20 randomly selected adult males are listed below. Construct a 99% confidence interval for the variance, $\sigma^2$.  

<table>
<thead>
<tr>
<th>Height</th>
<th>70</th>
<th>72</th>
<th>71</th>
<th>70</th>
<th>69</th>
<th>73</th>
<th>69</th>
<th>68</th>
<th>70</th>
<th>71</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>67</td>
<td>71</td>
<td>70</td>
<td>74</td>
<td>69</td>
<td>68</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td>72</td>
</tr>
</tbody>
</table>

Provide an appropriate response.  

22) The statement represents a claim. Write its complement and state which is $H_0$ and which is $H_A$.  

$\mu = 8.3$
23) Given $H_0: p \geq 80\%$ and $H_a: p < 80\%$, determine whether the hypothesis test is left-tailed, right-tailed, or two-tailed.

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

25) A researcher claims that 71% of voters favor gun control. Determine whether the hypothesis test for this claim is left-tailed, right-tailed, or two-tailed.

26) The mean age of bus drivers in Chicago is 51.5 years. If a hypothesis test is performed, how should you interpret a decision that rejects the null hypothesis?

27) The mean age of bus drivers in Chicago is greater than 54.1 years. If a hypothesis test is performed, how should you interpret a decision that rejects the null hypothesis?

28) The $P$-value for a hypothesis test is $P = 0.066$. Do you reject or fail to reject $H_0$ when the level of significance is $\alpha = 0.05$?

29) The $P$-value for a hypothesis test is $P = 0.006$. Do you reject or fail to reject $H_0$ when the level of significance is $\alpha = 0.01$?

30) Find the critical value and rejection region for the type of $z$-test with level of significance $\alpha$.

   Right-tailed test, $\alpha = 0.01$

31) Find the critical value and rejection region for the type of $z$-test with level of significance $\alpha$.

   Two-tailed test, $\alpha = 0.06$

32) Find the critical value and rejection region for the type of $z$-test with level of significance $\alpha$.

   Two-tailed test, $\alpha = 0.10$

33) Test the claim about the population mean $\mu$ at the level of significance $\alpha$. Assume the population is normally distributed.

   Claim: $\mu \neq 35$; $\alpha = 0.05$; $\sigma = 2.7$
   Sample statistics: $\bar{x} = 34.1$, $n = 35$

34) Test the claim about the population mean $\mu$ at the level of significance $\alpha$. Assume the population is normally distributed.

   Claim: $\mu = 1400$; $\alpha = 0.01$; $\sigma = 82$
   Sample statistics: $\bar{x} = 1370$, $n = 35$
35) You wish to test the claim that $\mu \neq 14$ at a level of significance of $\alpha = 0.05$ and are given sample statistics $n = 35, \overline{x} = 13.1$. Assume the population standard deviation is 2.7. Compute the value of the standardized test statistic. Round your answer to two decimal places.

36) You wish to test the claim that $\mu = 1430$ at a level of significance of $\alpha = 0.01$ and are given sample statistics $n = 35, \overline{x} = 1400$. Assume the population standard deviation is 82. Compute the value of the standardized test statistic. Round your answer to two decimal places.

37) Find the critical value and rejection region for the type of $t$-test with level of significance $\alpha$ and sample size $n$.

Left-tailed test, $\alpha = 0.1$, $n = 22$

38) Find the critical value and rejection region for the type of $t$-test with level of significance $\alpha$ and sample size $n$.

Right-tailed test, $\alpha = 0.1$, $n = 35$

39) Find the standardized test statistic $t$ for a sample with $n = 10, \overline{x} = 16.5, s = 1.3$, and $\alpha = 0.05$ if $H_0: \mu \geq 17.4$. Round your answer to three decimal places.

40) Find the standardized test statistic $t$ for a sample with $n = 12, \overline{x} = 21.7, s = 2.1$, and $\alpha = 0.01$ if $H_a: \mu < 22.2$. Round your answer to three decimal places.

41) Determine the critical value, $z_0$, to test the claim about the population proportion $p \neq 0.325$ given $n = 42$ and $\hat{p} = 0.247$. Use $\alpha = 0.05$.

42) Determine the standardized test statistic, $z$, to test the claim about the population proportion $p \geq 0.132$ given $n = 48$ and $\hat{p} = 0.11$. Use $\alpha = 0.05$.

43) Compute the standardized test statistic, $X^2$, to test the claim $\sigma^2 = 25.8$ if $n = 12, s^2 = 21.6$, and $\alpha = 0.05$.

44) Test the claim that $\sigma = 6.21$ if $n = 12, s = 5.7$, and $\alpha = 0.05$. Assume that the population is normally distributed.

45) Test the claim that $\sigma^2 \neq 47.6$ if $n = 10, s^2 = 52.5$, and $\alpha = 0.01$. Assume that the population is normally distributed.

46) Classify the two given samples as independent or dependent.

Sample 1: The scores of 22 students who took the ACT
Sample 2: The scores of 22 different students who took the SAT
47) As part of a marketing experiment, a department store regularly mailed discount coupons to 25 of its credit card holders. Their total credit card purchases over the next three months were compared to their prior credit card purchases during the previous three months. Determine whether the samples are dependent or independent.

48) Find the standardized test statistic to test the claim that \( \mu_1 = \mu_2 \). Assume the two samples are random and independent.

Population statistics: \( \sigma_1 = 1.5 \) and \( \sigma_2 = 1.9 \)
Sample statistics: \( \bar{x}_1 = 24, n_1 = 50 \) and \( \bar{x}_2 = 22, n_2 = 60 \)

49) Suppose you want to test the claim that \( \mu_1 \neq \mu_2 \). Assume the two samples are random and independent. At a level of significance of \( \alpha = 0.05 \), when should you reject \( H_0 \)?

Population statistics: \( \sigma_1 = 1.5 \) and \( \sigma_2 = 1.9 \)
Sample statistics: \( \bar{x}_1 = 19, n_1 = 50 \) and \( \bar{x}_2 = 17, n_2 = 60 \)

50) Two samples are random and independent. Find the P-value used to test the claim that \( \mu_1 = \mu_2 \). Use \( \alpha = 0.05 \).

Population statistics: \( \sigma_1 = 2.5 \) and \( \sigma_2 = 2.8 \)
Sample statistics: \( \bar{x}_1 = 12, n_1 = 40 \) and \( \bar{x}_2 = 13, n_2 = 35 \)

51) Construct a 95% confidence interval for \( \mu_1 - \mu_2 \). Assume the two samples are random and independent. The sample statistics are given below.

Population statistics: \( \sigma_1 = 1.5 \) and \( \sigma_2 = 1.9 \)
Sample statistics: \( \bar{x}_1 = 25, n_1 = 50 \) and \( \bar{x}_2 = 23, n_2 = 60 \)

52) Construct a 95% confidence interval for \( \mu_1 - \mu_2 \). Assume the two samples are random and independent. The sample statistics are given below.

Population statistics: \( \sigma_1 = 2.5 \) and \( \sigma_2 = 2.8 \)
Sample statistics: \( \bar{x}_1 = 12, n_1 = 40 \) and \( \bar{x}_2 = 13, n_2 = 35 \)

53) Find the standardized test statistic, \( t \), to test the claim that \( \mu_1 = \mu_2 \). Two samples are random, independent, and come from populations that are normally distributed. The sample statistics are given below. Assume that \( \sigma_1^2 = \sigma_2^2 \). 

\[
\begin{align*}
n_1 &= 14 & n_2 &= 12 \\
\bar{x}_1 &= 14 & \bar{x}_2 &= 15 \\
s_1 &= 2.5 & s_2 &= 2.8
\end{align*}
\]
54) Suppose you want to test the claim that $\mu_1 \neq \mu_2$. Two samples are random, independent, and come from populations that are normally distributed. The sample statistics are given below. Assume that $\sigma_1^2 \neq \sigma_2^2$. At a level of significance of $\alpha = 0.20$, when should you reject $H_0$?

- $n_1 = 11$
- $n_2 = 18$
- $\bar{x}_1 = 2.9$
- $\bar{x}_2 = 3.3$
- $s_1 = 0.76$
- $s_2 = 0.51$

55) Construct a 90% confidence interval for $\mu_1 - \mu_2$. Two samples are random, independent, and come from populations that are normally distributed. The sample statistics are given below. Assume that $\sigma_1^2 = \sigma_2^2$.

- $n_1 = 10$
- $n_2 = 12$
- $\bar{x}_1 = 25$
- $\bar{x}_2 = 23$
- $s_1 = 1.5$
- $s_2 = 1.9$

56) Construct a 95% confidence interval for $\mu_1 - \mu_2$. Two samples are random, independent, and come from populations that are normally distributed. The sample statistics are given below. Assume that $\sigma_1^2 = \sigma_2^2$.

- $n_1 = 11$
- $n_2 = 18$
- $\bar{x}_1 = 4.8$
- $\bar{x}_2 = 5.2$
- $s_1 = 0.76$
- $s_2 = 0.51$

57) Find $\bar{d}$. Assume the samples are random and dependent, and the populations are normally distributed.

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<tr>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>13</td>
<td>11</td>
<td>30</td>
<td>26</td>
</tr>
<tr>
<td>B</td>
<td>11</td>
<td>17</td>
<td>18</td>
<td>5</td>
</tr>
</tbody>
</table>

58) Find the critical value, $t_0$, to test the claim that $\mu_d = 0$. Assume the samples are random and dependent, and the populations are normally distributed. Use $\alpha = 0.01$.

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<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>8.2</td>
<td>9.2</td>
<td>11.1</td>
<td>8.1</td>
</tr>
<tr>
<td>B</td>
<td>10.6</td>
<td>9.5</td>
<td>9.4</td>
<td>9.3</td>
</tr>
</tbody>
</table>

59) Nine students took the SAT. Their scores are listed below. Later on, they took a test preparation course and retook the SAT. Their new scores are listed below. Test the claim that the test preparation had no effect on their scores. Assume the samples are random and dependent, and the populations are normally distributed. Use $\alpha = 0.05$.

<table>
<thead>
<tr>
<th>Student</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scores before course</td>
<td>720</td>
<td>860</td>
<td>850</td>
<td>880</td>
<td>860</td>
<td>710</td>
<td>850</td>
<td>1200</td>
<td>850</td>
</tr>
<tr>
<td>Scores after course</td>
<td>740</td>
<td>860</td>
<td>840</td>
<td>920</td>
<td>890</td>
<td>720</td>
<td>840</td>
<td>1240</td>
<td>970</td>
</tr>
</tbody>
</table>
60) Construct a 95% confidence interval for data sets A and B. Data sets A and B are random and dependent, and the populations are normally distributed. Round to the nearest tenth.

<table>
<thead>
<tr>
<th></th>
<th>30</th>
<th>28</th>
<th>47</th>
<th>43</th>
<th>31</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>28</td>
<td>24</td>
<td>25</td>
<td>35</td>
<td>22</td>
</tr>
</tbody>
</table>

61) Find the weighted estimate, \( \hat{p} \) to test the claim that \( p_1 \neq p_2 \). Use \( \alpha = 0.02 \). Assume the samples are random and independent.

Sample statistics: \( n_1 = 1000, \ x_1 = 250 \), and \( n_2 = 1200, \ x_2 = 195 \)

62) Find the standardized test statistic, \( z \) to test the claim that \( p_1 = p_2 \). Assume the samples are random and independent.

Sample statistics: \( n_1 = 50, \ x_1 = 35 \), and \( n_2 = 60, \ x_2 = 40 \)

63) In a recent survey of gun control laws, a random sample of 1000 women showed that 65% were in favor of stricter gun control laws. In a random sample of 1000 men, 60% favored stricter gun control laws. Construct a 95% confidence interval for \( p_1 - p_2 \).

64) A random sample of 100 students at a high school was asked whether they would ask their father or mother for help with a homework assignment in science. A second random sample of 100 different students was asked the same question for an assignment in history. Forty-three students in the first sample and 47 students in the second sample replied that they turned to their mother rather than their father for help. Construct a 98% confidence interval for \( p_1 - p_2 \).
**Answer Key**
**Testname: MATH 13 CH 6-8 REVIEW**

1) ±1.88  
2) 1.73  
3) $210  
4) (78.8, 84.2)  
5) (21.1, 23.7)  
6) (61.9, 64.9)  
7) (7.2, 8.8)  
8) 16  
9) 27  
10) 2.131  
11) 1.80  
12) $E = 4, \bar{x} = 16$  
13) Use normal distribution.  
14) (0.12, 0.18)  
15) (0.184, 0.266)  
16) 1509  
17) 601  
18) 3.816 and 21.920  
19) 1.735 and 23.587  
20) (7.7, 16.6)  
21) (1.47, 8.27)  
22) $H_0: \mu = 8.3$ (claim); $H_3: \mu \neq 8.3$  
23) left-tailed  
24) right-tailed  
25) two-tailed  
26) There is sufficient evidence to reject the claim $\mu = 51.5$.  
27) There is sufficient evidence to support the claim $\mu > 54.1$.  
28) fail to reject $H_0$  
29) reject $H_0$  
30) $z_0 = 2.33; z > 2.33$  
31) $-z_0 = -1.88, z_0 = 1.88; z < 1.88, z > 1.88$  
32) $-z_0 = -1.645, z_0 = 1.645; z < -1.645, z > 1.645$  
33) Reject $H_0$. There is enough evidence at the 5% level of significance to support the claim.  
34) Fail to reject $H_0$. There is enough evidence at the 1% level of significance to support the claim.  
35) -1.97  
36) -2.16  
37) $t_0 = -1.323; t < -1.323$  
38) $t_0 = 1.307; t > 1.307$  
39) -2.189  
40) -0.825  
41) ±1.96  
42) -0.45  
43) 9.209  
44) critical values $X_L^2 = 3.816$ and $X_R^2 = 21.920$; standardized test statistic $X^2 = 9.267$; fail to reject $H_0$; There is not sufficient evidence to reject the claim.
45) critical values $X^2_L = 1.735$ and $X^2_R = 23.589$; standardized test statistic $X^2 = 9.926$; fail to reject $H_0$; There is not sufficient evidence to support the claim.

46) independent

47) dependent

48) 6.2

49) Reject $H_0$ if the standardized test statistic is less than $-1.96$ or greater than $1.96$.

50) 0.1052

51) (1.364, 2.636)

52) (-2.209, 0.209)

53) -0.962

54) Reject $H_0$ if the standardized test statistic is less than $-1.372$ or greater than $1.372$.

55) (0.721, 3.279)

56) (-0.883, 0.083)

57) 9.0

58) ±4.604

59) claim: $\mu_d = 0$; critical values $t_0 = ±2.306$; standardized test statistic $t = -2.401$; reject $H_0$; There is sufficient evidence to reject the claim.

60) (-0.7, 18.7)

61) 0.202

62) 0.374

63) (0.008, 0.092)

64) (-0.204, 0.124)