Problems to look over Ch9

Name___________________________________

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

Provide an appropriate response.

1) The mean IQ of statistics teachers is greater than 110. Write the null and alternative hypotheses.
   \[ H_0: \mu = 110 \]
   \[ H_a: \mu > 110 \]

2) The mean age of bus drivers in Chicago is 48.5 years. Write the null and alternative hypotheses.
   \[ H_0: \mu = 48.5 \]
   \[ H_a: \mu \neq 48.5 \]

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

3) 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.
   \[ \text{Answer: B} \]
   A) left- tailed  
   B) two- tailed  
   C) right- tailed

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

4) 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. (Statements not values)
   \[ \text{Type I: Rejecting } H_0 \text{ (average age of bus drivers in Chicago is 52.5 yrs) when } H_0 \text{ is true.} \]
   \[ \text{Type II: Retaining } H_0 \text{ (average age of bus drivers in Chicago is 52.5 yrs) when } H_0 \text{ is false.} \]

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

5) The mean score for all NBA games during a particular season was less than 100 points per game. If a hypothesis test is performed, how should you interpret a decision that fails to reject the null hypothesis?
   \[ \text{Answer: C} \]
   A) There is sufficient evidence to reject the claim \( \mu < 100 \).
   B) There is sufficient evidence to support the claim \( \mu < 100 \).
   C) There is not sufficient evidence to support the claim \( \mu < 100 \).
   D) There is not sufficient evidence to reject the claim \( \mu < 100 \).

6) Given \( H_0: \mu \leq 12 \), for which confidence interval should you reject \( H_0 \)?
   \[ \text{Answer: B} \]
   A) (11.5, 12.5)  
   B) (13, 16)  
   C) (10, 13)
SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

7) 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.

$P$-Value: 0.04166

Sample results like those obtained show evidence in favor of $H_a$ therefore reject $H_0$ in favor of $H_a$

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

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 0.01 level of significance?  
   Answer: A
   A) fail to reject $H_0$
   B) not sufficient information to decide
   C) reject $H_0$

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

9) A local school district claims that the number of school days missed by its teachers due to illness is below the national average of 5. A random sample of 40 teachers provided the data below. At $\alpha = 0.05$, test the district’s claim using $P$-values.

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<tr>
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$Ho: \mu = 5$

$Ha: \mu < 5$

$\alpha = 0.05$

$C = 95%$

Left tailed

$n = 40$

$Tobs = Equation = -4.7155$

$P$-value $= Equation = 0.0000153$

Reject $H_0$ in favor of $H_a$

The sample results show strong evidence that the average number of days missed by teachers for illness if less than 5 days, on average
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

10) You wish to test the claim that \( \mu > 32 \) at a level of significance of \( \alpha = 0.05 \) and are given sample statistics \( n = 50, \bar{x} = 32.3, \) and \( s = 1.2. \) Compute the value of the standardized test statistic. Round your answer to two decimal places. 

Answer: B

A) 2.31  
B) 1.77  
C) 3.11  
D) 0.98

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

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

\( H_0: \mu = 38 \)

\( H_a: \mu \neq 38 \)

\( \alpha = 0.05 \)

\( C = 95\% \)

Two tailed

\( n = 35 \)

\( T_{obs} = \text{Equation} = -1.97 \)

\( P-value = \text{Equation} = 0.0568 \)

Retain \( H_0 \)

The sample results show no evidence that \( \mu \) is different than 38, on average.

12) A manufacturer claims that the mean lifetime of its fluorescent bulbs is 1000 hours. A homeowner selects 40 bulbs and finds the mean lifetime to be 980 hours with a standard deviation of 80 hours. Test the manufacturer’s claim. Use \( \alpha = 0.05. \)

\( H_0: \mu = 1000 \)

\( H_a: \mu \neq 1000 \)

\( \alpha = 0.05 \)

\( C = 95\% \)

Two tailed

\( n = 40 \)

\( T_{obs} = \text{Equation} = -1.58 \)

\( P-value = \text{Equation} = 0.123 \)

Retain \( H_0 \)

The sample results show no evidence that the mean lifetime of fluorescent bulbs is different from 1000 hours, on average.
13) A local group claims that the police issue at least 60 speeding tickets a day in their area. To prove their point, they randomly select one month. Their research yields the number of tickets issued for each day. The data are listed below. At \( \alpha = 0.01 \), test the group's claim.

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<thead>
<tr>
<th>70</th>
<th>48</th>
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\[ H_0: \mu = 60 \]
\[ H_a: \mu > 60 \]
\[ \alpha = 0.01 \]
\[ C = 90\% \]

Right tailed

\[ n = 31 \]

\[ T_{obs} = \text{Equation} = 0.177 \]

\[ P\text{-value} = \text{Equation} = 0.430 \]

Retain \( H_0 \)

The sample results show no evidence that the average number of tickets issued is more than 60, on average.

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

14) Find the standardized test statistic \( t \) for a sample with \( n = 25, \bar{x} = 36, s = 3 \), and \( \alpha = 0.005 \) if \( H_a: \mu > 35 \). Round your answer to three decimal places.

\[ A) 1.667 \quad B) 1.452 \quad C) 1.997 \quad D) 1.239 \]
15) The Metropolitan Bus Company claims that the mean waiting time for a bus during rush hour is less than 10 minutes. A random sample of 20 waiting times has a mean of 8.6 minutes with a standard deviation of 2.1 minutes. At $\alpha = 0.01$, test the bus company’s claim. Assume the distribution is normally distributed.

$Ho: \mu = 10$

$Ha: \mu < 10$

$\alpha = 0.01$

$C = 90\%$

Left tailed

$n = 20$

$Tobs = Equation = -2.98$

$P-value = Equation = 0.0038$

Reject $Ho$ in favor of $Ha$

The sample results show strong evidence that the average waiting time for a bus during rush hour is less than 10 minutes, on average.

16) A local group claims that the police issue more than 60 speeding tickets a day in their area. To prove their point, they randomly select two weeks. Their research yields the number of tickets issued for each day. The data are listed below. At $\alpha = 0.01$, test the group’s claim.

<table>
<thead>
<tr>
<th>70</th>
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</table>

$Ho: \mu = 60$

$Ha: \mu > 60$

$\alpha = 0.01$

$C = 90\%$

Right tailed

$n = 14$

$Tobs = Equation = 0.0597$

$P-value = Equation = 0.4766$

Retain $Ho$

The sample results show no evidence that the average number of tickets is more than 60, on average.
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

17) Determine the standardized test statistic, \( z \), to test the claim about the population proportion \( p = 0.250 \) given \( n = 48 \) and \( \hat{p} = 0.231 \). Use \( \alpha = 0.01 \).

\[ Z = \frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}} \]

\[ = \frac{0.231 - 0.250}{\sqrt{\frac{0.250(1-0.250)}{48}}} \]

Answer: C

A) - 2.87  
B) - 0.23  
C) - 0.304  
D) - 1.18

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

18) A telephone company claims that 20% of its customers have at least two telephone lines. The company selects a random sample of 500 customers and finds that 88 have two or more telephone lines. If \( \alpha = 0.05 \), test the company's claim using critical values and rejection regions.

\[ p = 0.2 \]
\[ q = 0.8 \]
\[ H_0: p = 0.2 \]
\[ H_a: p > 0.2 \]
\[ \alpha = 0.05 \]
\[ C = 95\% \]
\[ Right tailed \]
\[ n = 500 \]

\[ Z_{obs} = \frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}} \]

\[ = \frac{0.176 - 0.2}{\sqrt{\frac{0.2(1-0.2)}{500}}} \]

\[ = -1.34 \]

\[ P-value = \Phi(-1.34) = 0.9101 \]

Retain \( H_0 \)

The sample results show no evidence that the customers have at least two phone lines, on average.
19) An airline claims that the no-show rate for passengers is less than 5%. In a sample of 420 randomly selected reservations, 19 were no-shows. At $\alpha = 0.01$, test the airline's claim.

$H_0: p = 0.05$

$H_a: p < 0.05$

$\alpha = 0.05$

$C = 95\%$

left tailed

$n = 420 \quad r = 19$

$Z_{obs} = \text{Equation} = -0.448$

$P$-value $= \text{Equation} = 0.327$

Retain $H_0$

The sample results show no evidence that the average no-show rate for passengers is less than 5%, on average.