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.
   \[ H_0: \mu \leq 110 \quad H_a: \mu > 110 \]

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

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)
   \[ \text{Type I Error: Rejecting } H_0: \mu = 52.5 \text{ when } H_0 \text{ is true} \]
   \[ \text{Type II Error: Retaining } H_0: \mu = 52.5 \text{ when } H_0 \text{ is false} \]

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)
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. 

\[ \text{Answer: B} \]

A) 0.0012  
B) 0.0384  
C) 0.0128  
D) 0.1321

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? 

\[ \text{Answer: A} \]

A) fail to reject $H_0$ (Retain $H_0$)  
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.

\[
\begin{array}{cccccccc}
0 & 3 & 6 & 3 & 3 & 5 & 4 & 1 & 3 & 5 \\
7 & 3 & 1 & 2 & 3 & 3 & 2 & 4 & 1 & 6 \\
2 & 5 & 2 & 8 & 3 & 1 & 2 & 5 & 4 & 1 \\
1 & 1 & 2 & 1 & 5 & 7 & 5 & 4 & 9 & 3 \\
\end{array}
\]

\[ P\text{-value } = 0.000001; \quad P\text{-value } < \alpha, \text{ Reject } H_0 \]

There is evidence to support the school districts claim

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.

\[ \text{Answer: B} \]

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 $s = 2.7$.

$H_0: \mu = 38 \quad H_a: \mu \neq 38$

Test statistic \[ t_{obs} = -1.972 \]

P-Value: 0.05679

\[ P\text{-value } < \alpha, \text{ Reject } H_0 \]

There is enough evidence to support the claim
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 $\alpha = 0.05$.

Ho: $\mu = 1000$  Ha: $\mu \neq 1000$

$n = 40$  $\bar{x} = 980$  $s = 80$  $\alpha = 0.05$

Test statistic $t_{obs} = -1.581$

$P$-Value: 0.1219

$P$-value $> \alpha$, Retain Ho  There is not enough evidence to reject the manufactures claim

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.

70 48 41 68 69 55 70 57 60 83
32 60 72 58 88 48 59 60 56 65
66 60 68 42 57 59 49 70 75 63
44

Ho: $\mu \leq 60$  Ha: $\mu > 60$

$n = 31$  $\bar{x} = 60.387$  $s = 12.187$  $\alpha = 0.01$

Test statistic $t_{obs} = 1.769$

$P$-Value: 0.043061

$P$-value $> \alpha$, Retain Ho  There is not enough evidence to say that the police issue at least 60 speeding tickets a day in their area.

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. Answer: A

A) 1.667  B) 1.452  C) 1.997  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: $\mu \geq 10$  Ha: $\mu < 10$

$n = 20$  $\bar{x} = 8.6$  $s = 2.1$  $\alpha = 0.01$

Test statistic $t_{obs} = -2.981$

$P$-Value: 0.00383

$P$-value $< \alpha$, Reject Ho  There is enough evidence to say that the mean wait time for a bus during rush hour is less than 10 minutes.
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>Day</th>
<th>Tickets</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>70</td>
</tr>
<tr>
<td>2</td>
<td>48</td>
</tr>
<tr>
<td>3</td>
<td>41</td>
</tr>
<tr>
<td>4</td>
<td>68</td>
</tr>
<tr>
<td>5</td>
<td>69</td>
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<tr>
<td>6</td>
<td>55</td>
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<td>7</td>
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</tr>
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<td>57</td>
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<tr>
<td>9</td>
<td>60</td>
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<tr>
<td>10</td>
<td>83</td>
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<tr>
<td>11</td>
<td>32</td>
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<tr>
<td>12</td>
<td>60</td>
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<tr>
<td>13</td>
<td>72</td>
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<tr>
<td>14</td>
<td>58</td>
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<tr>
<td>15</td>
<td>70</td>
</tr>
<tr>
<td>16</td>
<td>57</td>
</tr>
<tr>
<td>17</td>
<td>60</td>
</tr>
<tr>
<td>18</td>
<td>83</td>
</tr>
</tbody>
</table>

$H_0: \mu \leq 60 \quad H_a: \mu > 60$

$n = 14 \quad \bar{x} = 60.214 \quad s = 13.429 \quad \alpha = 0.01$

Test statistic $t_{obs} = 0.0597$

$P$-Value: 0.47665

$P$-value $> \alpha$, Retain $H_0$ 
There is not enough evidence to say that the police issue at least 60 speeding tickets a day in their area.