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

Determine whether the study depicts an observational study or an experiment.

1) The personnel director at a large company would like to determine whether the company cafeteria is widely used by employees. She calls each employee and asks them whether they usually bring their own lunch, eat at the company cafeteria, or go out for lunch.

   A) experiment
   B) observational study

Determine the sampling technique which is used.

2) A market researcher randomly selects 100 homeowners under 55 years of age and 500 homeowners over 55 years of age. What sampling technique was used?

   A) convenience
   B) stratified
   C) systematic
   D) random
   E) cluster

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

Construct the specified histogram.

3) For the data below, construct a frequency histogram and a relative frequency histogram.

   Weight (in pounds) | Frequency
   -------------------|----------
   135 – 139          | 6        
   140 – 144          | 4        
   145 – 149          | 11       
   150 – 154          | 15       
   155 – 159          | 8        

Construct a stem-and-leaf plot for the data.

4) The number of home runs that Mark McGwire hit in the first 13 years of his major league baseball career are listed below. (Source: Major League Handbook) Construct a stem-and-leaf plot for this data.

   3 49 32 33 39 22 42 9 9 39 52 58 70
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Describe the shape of the distribution.

5) _______

A) skewed to the left  
B) bell shaped  
C) skewed to the right  
D) uniform

Explain what is misleading about the graphic.

6) _______

A) The length of a side has doubled, but the area has been unchanged.  
B) The length of a side has doubled, but the area has been multiplied by 8.  
C) The graphic is not misleading.  
D) The length of a side has doubled, but the area has been multiplied by 4.

Provide an appropriate response.

7) At a tennis tournament a statistician keeps track of every serve. The statistician reported that the mean serve speed of a particular player was 103 miles per hour (mph) and the standard deviation of the serve speeds was 9 mph. Assume that the statistician also gave us the information that the distribution of the serve speeds was bell shaped. What proportion of the player's serves are expected to be between 112 mph and 130 mph?

A) 0.1585  
B) 0.317  
C) 0.68  
D) 0.997

8) At a tennis tournament a statistician keeps track of every serve. The statistician reported that the mean serve speed of a particular player was 99 miles per hour (mph) and the standard deviation of the serve speeds was 15 mph. If nothing is known about the shape of the distribution, give an interval that will contain the speeds of at least eight-ninths of the player's serves.

A) 39 mph to 159 mph  
B) 69 mph to 129 mph  
C) 144 mph to 189 mph  
D) 54 mph to 144 mph
9) For the following data set, approximate the sample standard deviation of unused vacation days.

<table>
<thead>
<tr>
<th>Days</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2</td>
<td>9</td>
</tr>
<tr>
<td>3-4</td>
<td>22</td>
</tr>
<tr>
<td>5-6</td>
<td>28</td>
</tr>
<tr>
<td>7-8</td>
<td>15</td>
</tr>
<tr>
<td>9-10</td>
<td>14</td>
</tr>
</tbody>
</table>

A) 5.5 days  B) 2.4 days  C) 3.5 days  D) 5.9 days

10) The data below are the final exam scores of 10 randomly selected history students and the number of hours they slept the night before the exam. Find the equation of the regression line for the given data. What would be the predicted score for a history student who slept 15 hours the previous night? Is this a reasonable question? Round your predicted score to the nearest whole number.

<table>
<thead>
<tr>
<th>Hours, x</th>
<th>Scores, y</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>65</td>
</tr>
<tr>
<td>5</td>
<td>80</td>
</tr>
<tr>
<td>2</td>
<td>60</td>
</tr>
<tr>
<td>8</td>
<td>88</td>
</tr>
<tr>
<td>2</td>
<td>78</td>
</tr>
<tr>
<td>4</td>
<td>85</td>
</tr>
<tr>
<td>4</td>
<td>90</td>
</tr>
<tr>
<td>5</td>
<td>90</td>
</tr>
<tr>
<td>6</td>
<td>71</td>
</tr>
</tbody>
</table>

A) \( y = 5.044x + 56.11 \); 132; No, it is not reasonable. 15 hours is well outside the scope of the model.
B) \( y = -5.044x + 56.11 \); -20; No, it is not reasonable.
C) \( y = 5.044x + 56.11 \); 132; Yes, it is reasonable.
D) \( y = -5.044x + 56.11 \); -20; Yes, it is reasonable.

11) The following data represent the living situation of newlyweds in a large metropolitan area and their annual household income. What percent of people who own their own home make between $35,000 and $50,000 per year?

<table>
<thead>
<tr>
<th></th>
<th>&lt; $20,000</th>
<th>$20–35,000</th>
<th>$35–50,000</th>
<th>$50–75,000</th>
<th>&gt; $75,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Own home</td>
<td>31</td>
<td>52</td>
<td>202</td>
<td>355</td>
<td>524</td>
</tr>
<tr>
<td>Rent home</td>
<td>67</td>
<td>66</td>
<td>52</td>
<td>23</td>
<td>11</td>
</tr>
<tr>
<td>Live w/family</td>
<td>89</td>
<td>69</td>
<td>30</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

A) 71.1%  B) 4.5%  C) 17.4%  D) 30.5%

12) A card is drawn from a standard deck of 52 playing cards. Find the probability that the card is a queen or a club.

A) \( \frac{4}{13} \)  B) \( \frac{3}{13} \)  C) \( \frac{2}{13} \)  D) \( \frac{7}{52} \)

13) How many ways can five people, A, B, C, D, and E, sit in a row at a concert hall if A and B must sit together?

A) 12  B) 24  C) 120  D) 48
14) From 8 names on a ballot, a committee of 5 will be elected to attend a political national convention. How many different committees are possible?

A) 3360  B) 56  C) 336  D) 6720

15) Mamma Temte bakes six pies a day that cost $2 each to produce. On 31% of the days she sells only two pies. On 39% of the days, she sells 4 pies, and on the remaining 30% of the days, she sells all six pies. If Mama Temte sells her pies for $5 each, what is her expected profit for a day's worth of pies? [Assume that any leftover pies are given away.]

A) $7.90  B) -$7.00  C) $19.90  D) -$8.02

16) A recent survey found that 70% of all adults over 50 wear sunglasses for driving. In a random sample of 10 adults over 50, what is the probability that at least six wear sunglasses?

A) 0.006  B) 0.200  C) 0.850  D) 0.700

17) A help desk receives an average of four calls per hour on its toll-free number. For any given hour, find the probability that it will receive exactly seven calls. Use the Poisson distribution.

A) 0.0030  B) 0.0596  C) 0.0087  D) 522.0448

18) A physical fitness association is including the mile run in its secondary-school fitness test. The time for this event for boys in secondary school is known to possess a normal distribution with a mean of 440 seconds and a standard deviation of 60 seconds. Between what times do we expect most (approximately 95%) of the boys to run the mile?

A) between 341.3 and 538.736 sec  B) between 322.4 and 557.6 sec
C) between 345 and 535 sec  D) between 0 and 538.736 sec

Suppose that prices of a certain model of new homes are normally distributed with a mean of $150,000. Find the percentage of buyers who paid:

19) between $150,000 and $156,300 if the standard deviation is $2100.

A) 47.5%  B) 49.85%  C) 34%  D) 99.7%

Provide an appropriate response.

20) Suppose a population has a mean of 7 for some characteristic of interest and a standard deviation of 9.6. A sample is drawn from this population of size 64. What is the standard error of the mean?

A) 0.15  B) 0.7  C) 3.3  D) 1.2
21) In a sample of 10 randomly selected employees, it was found that their mean height was 63.4 inches. From previous studies, it is assumed that the standard deviation, σ, is 2.4. Compute the 95% confidence interval for μ.

A) (59.7, 66.5)  B) (60.8, 65.4)  C) (58.1, 67.3)  D) (61.9, 64.9)

22) How much money does the average professional hockey fan spend on food at a single hockey game? That question was posed to 10 randomly selected hockey fans. The sampled results show that sample mean and standard deviation were $19.00 and $3.35, respectively. Use this information to create a 98% confidence interval for the mean.

A) 19 ± 2.718(3.35/√10)  B) 19 ± 2.262(3.35/√10)
C) 19 ± 2.821(3.35/√10)  D) 19 ± 2.764(3.35/√10)

23) A researcher at a major clinic wishes to estimate the proportion of the adult population of the United States that has sleep deprivation. How large a sample is needed in order to be 99% confident that the sample proportion will not differ from the true proportion by more than 4%?

A) 849  B) 2073  C) 1037  D) 17

24) Find the critical values, $\chi^2_{1-\alpha/2}$ and $\chi^2_{\alpha/2}$, for 90% confidence and n = 15.

A) 6.571 and 23.685  B) 4.660 and 29.131
C) 4.075 and 31.319  D) 5.629 and 26.119

25) Find the standardized test statistic t for a sample with n = 10, $\bar{x}$ = 8.8, s = 1.3, and α = 0.05 if H₀: μ ≥ 9.7. Round your answer to three decimal places.

A) -2.617  B) -2.189  C) -3.010  D) -3.186

26) The business college computing center wants to determine the proportion of business students who have personal computers (PC’s) at home. If the proportion exceeds 35%, then the lab will scale back a proposed enlargement of its facilities. Suppose 300 business students were randomly sampled and 85 have PC’s at home. Find the rejection region for this test using α = 0.10.

A) Reject H₀ if z > 1.645 or z < -1.645.  B) Reject H₀ if z > 1.28.
C) Reject H₀ if z = 1.28.  D) Reject H₀ if z < -1.28.

27) Test the claim that σ < 21.33 if n = 28, s = 16.83 and α = 0.10. Assume that the population is normally distributed.
28) Data sets A and B are dependent. Test the claim that \( \mu_d = 0 \). Use \( \alpha = 0.01 \).

<table>
<thead>
<tr>
<th>A</th>
<th>7.1</th>
<th>8.1</th>
<th>10.0</th>
<th>7.0</th>
<th>7.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>9.5</td>
<td>8.4</td>
<td>8.3</td>
<td>8.2</td>
<td>9.6</td>
</tr>
</tbody>
</table>

Assume that the paired data came from a population that is normally distributed.

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

29) Nine students took the SAT. Their scores are listed below. Later on, they read a book on test preparation and retook the SAT. Their new scores are listed below. Construct a 95% confidence interval for \( \mu_d \). Assume that the distribution is normally distributed.

<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 reading book</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>950</td>
</tr>
<tr>
<td>Scores after reading book</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>

A) (-20.341, 4.852)  
B) (-30.503, -0.617)  
C) (-10.321, 15.436)  
D) (1.651, 30.590)

30) Find the standardized test statistic, \( t \), to test the hypothesis that \( \mu_1 \neq \mu_2 \). Two samples are randomly selected and come from populations that are normal. The sample statistics are given below.

\[
\begin{align*}
n_1 &= 11 & n_2 &= 18 \\
n &= 5.1 & x_2 &= 5.5 \\
s_1 &= 0.76 & s_2 &= 0.51
\end{align*}
\]

A) -1.546  
B) -2.123  
C) -1.326  
D) -1.821

31) Find the standardized test statistic estimate, \( z \), to test the hypothesis that \( p_1 > p_2 \). Use \( \alpha = 0.01 \). The sample statistics listed below are from independent samples.

Sample statistics: \( n_1 = 100 \), \( x_1 = 38 \), and \( n_2 = 140 \), \( x_2 = 50 \)

A) 2.116  
B) 1.324  
C) 0.638  
D) 0.362

32) In a recent survey of drinking laws, a random sample of 1000 women showed that 65% were in favor of increasing the legal drinking age. In a random sample of 1000 men, 60% favored increasing the legal drinking age. Construct a 95% confidence interval for \( p_1 - p_2 \).

A) (-1.423, 1.432)  
B) (-2.153, 1.679)  
C) (0.587, 0.912)  
D) (0.008, 0.092)

Test the indicated hypothesis. Assume that the populations are normally distributed.

33) Test the hypothesis that \( \sigma_1 > \sigma_2 \) at the \( \alpha = 0.01 \) level of significance for the given sample data.

\[
\begin{array}{c|cc}
\text{Population 1} & \text{Population 2} \\
\hline
n & 25 & 17 \\
s & 5.76 & 2.21 \\
\end{array}
\]

A) Test statistic: \( F = 6.79 \). Critical value: \( F = 3.18 \). Reject \( H_0 \).
B) Test statistic: \( F = 2.61 \). Critical value = 3.18. Do not reject \( H_0 \).
C) Test statistic: \( F = 6.79 \). Critical value: \( F = 3.18 \). Do not reject \( H_0 \).
D) Test statistic: \( F = 2.61 \). Critical value = 1.87. Reject \( H_0 \).
SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Provide an appropriate response.

34) Many track hurdlers believe that they have a better chance of winning if they start in the inside lane that is closest to the field. For the data below, the lane closest to the field is Lane 1, the next lane is Lane 2, and so on until the outermost lane, Lane 6. The data lists the number of wins for track hurdlers in the different starting positions. Test the claim that the probabilities of winning are the same in the different positions. Use $\alpha = 0.05$. The results are based on 240 wins.

<table>
<thead>
<tr>
<th>Starting Position</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Wins</td>
<td>36</td>
<td>33</td>
<td>32</td>
<td>45</td>
<td>44</td>
<td>50</td>
</tr>
</tbody>
</table>

35) The contingency table below shows the results of a random sample of 200 registered voters that was conducted to see whether their opinions on a bill are related to their party affiliation.

<table>
<thead>
<tr>
<th>Party</th>
<th>Opinion</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Approve</td>
<td>Disapprove</td>
<td>No Opinion</td>
<td></td>
</tr>
<tr>
<td>Republican</td>
<td>42</td>
<td>20</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Democrat</td>
<td>50</td>
<td>24</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Independent</td>
<td>10</td>
<td>16</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

Test the claim of independence.
Answer Key
Testname: DEPARTMENT REVIEWS 2011

1) B
2) B
3) Frequency Histogram: Relative Frequency Histogram:

4)
0 | 3 9 9
1 |
2 | 2
3 | 2 3 9 9
4 | 2 9
5 | 2 8
6 |
7 | 0
5) C
6) D
7) A
8) D
9) B
10) A
11) C
12) A
13) D
14) B
15) A
16) C
17) B
18) B
19) B
20) D
21) D
22) C
23) C
24) A
25) B
26) B

27) critical value $\chi^2_0 = 18.114$; standardized test statistic $\chi^2 \approx 16.809$; reject $H_0$; There is sufficient evidence to support the claim.
28) critical values $t_0 = \pm 4.604$; standardized test statistic $t = -1.215$; fail to reject $H_0$; There is not sufficient evidence to reject the claim.
29) B
30) A
31) D
32) D
33) A
34) critical value $\chi^2_0 = 11.070$; chi-square test statistic $\chi^2 = 6.750$; fail to reject $H_0$; There is not sufficient evidence to reject the claim. It seems that the probability of winning in different lanes is the same.
35) critical value $\chi^2_0 = 9.488$; chi-square test statistic $\chi^2 = 8.030$; fail to reject $H_0$; There is not sufficient evidence to reject the claim of independence.