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

Determine whether the given value is a statistic or a parameter.
1) After inspecting all of 55,000 kg of meat stored at the Wurst Sausage Company, it was found that 45,000 kg of the meat was spoiled.  
A) Parameter  B) Statistic

Determine whether the given value is from a discrete or continuous data set.
2) The temperature of a cup of coffee is 67.3°F.  
A) Continuous  B) Discrete

Identify which of these types of sampling is used: random, stratified, systematic, cluster, convenience.
3) A sample consists of every 49th student from a group of 496 students.  
A) Stratified  B) Random  C) Cluster  D) Convenience  E) Systematic

Estimate the probability of the event.
4) Of 1232 people who came into a blood bank to give blood, 397 people had high blood pressure. Estimate the probability that the next person who comes in to give blood will have high blood pressure.  
A) 0.29  B) 0.373  C) 0.322  D) 0.241

Find the indicated probability.
5) The table below describes the smoking habits of a group of asthma sufferers.  

<table>
<thead>
<tr>
<th></th>
<th>Nonsmoker</th>
<th>Occasional smoker</th>
<th>Regular smoker</th>
<th>Heavy smoker</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>334</td>
<td>50</td>
<td>68</td>
<td>32</td>
<td>484</td>
</tr>
<tr>
<td>Women</td>
<td>357</td>
<td>30</td>
<td>89</td>
<td>37</td>
<td>513</td>
</tr>
<tr>
<td>Total</td>
<td>691</td>
<td>80</td>
<td>157</td>
<td>69</td>
<td>997</td>
</tr>
</tbody>
</table>

If one of the 997 people is randomly selected, find the probability of getting a regular or heavy smoker.  
A) 0.157  B) 0.442  C) 0.227  D) 0.100

Find the indicated probability. Round to the nearest thousandth.
6) An unprepared student makes random guesses for the ten true-false questions on a quiz. Find the probability that there is at least one correct answer.  
A) 0.900  B) 0.999  C) 0.100  D) 0.001

Use the given degree of confidence and sample data to construct a confidence interval for the population proportion p.
7) A survey of 300 union members in New York State reveals that 112 favor the Republican candidate for governor. Construct the 98% confidence interval for the true population proportion of all New York State union members who favor the Republican candidate.  
A) 0.316 < p < 0.430  B) 0.304 < p < 0.442  C) 0.308 < p < 0.438  D) 0.301 < p < 0.445

Use the given data to find the minimum sample size required to estimate the population proportion.
8) Margin of error: 0.04; confidence level: 99%; from a prior study, \( \hat{p} \) is estimated by 0.12.  
A) 438  B) 18  C) 526  D) 254
Use the given degree of confidence and sample data to construct a confidence interval for the population mean \( \mu \). Assume that the population has a normal distribution.

9) Thirty randomly selected students took the calculus final. If the sample mean was 95 and the standard deviation was 6.6, construct a 99% confidence interval for the mean score of all students.

A) \( 91.68 < \mu < 98.32 \)  
B) \( 91.69 < \mu < 98.31 \)  
C) \( 92.95 < \mu < 97.05 \)  
D) \( 92.03 < \mu < 97.97 \)

10) \( r = 0.806, n = 9 \)

A) Critical values: \( r = -0.666, \) no significant linear correlation  
B) Critical values: \( r = 0.666, \) no significant linear correlation  
C) Critical values: \( r = \pm 0.666, \) significant linear correlation  
D) Critical values: \( r = \pm 0.666, \) no significant linear correlation

11) Find the value of the linear correlation coefficient \( r \).

\[
\begin{array}{c|cccc}
   x & 47.0 & 46.6 & 27.4 & 33.2 & 40.9 \\
   y & 8 & 10 & 5 & 10 & \\
   & 0.156 & -0.175 & 0 & 0.175 & \\
\end{array}
\]

12) The regression equation relating dexterity scores \( x \) and productivity scores \( y \) for the employees of a company is \( y = 5.50 + 1.91x \). Ten pairs of data were used to obtain the equation. The same data yield \( r = 0.986 \) and \( y = 56.3 \). What is the best predicted productivity score for a person whose dexterity score is 33?

A) 183.41  
B) 56.30  
C) 68.53  
D) 58.20

13) The frequency distribution below summarizes employee years of service for Alpha Corporation. Determine the width of each class.

<table>
<thead>
<tr>
<th>Years of service</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-5</td>
<td>5</td>
</tr>
<tr>
<td>6-10</td>
<td>20</td>
</tr>
<tr>
<td>11-15</td>
<td>25</td>
</tr>
<tr>
<td>16-20</td>
<td>10</td>
</tr>
<tr>
<td>21-25</td>
<td>5</td>
</tr>
<tr>
<td>26-30</td>
<td>3</td>
</tr>
</tbody>
</table>

A) 10  
B) 5  
C) 6  
D) 4
14) The frequency distribution for the weekly incomes of students with part-time jobs is given below. Construct the corresponding relative frequency distribution. Round relative frequencies to the nearest hundredth of a percent if necessary.

<table>
<thead>
<tr>
<th>Income ($)</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>200-300</td>
<td>55</td>
</tr>
<tr>
<td>301-400</td>
<td>70</td>
</tr>
<tr>
<td>401-500</td>
<td>73</td>
</tr>
<tr>
<td>501-600</td>
<td>68</td>
</tr>
<tr>
<td>More than 600</td>
<td>10</td>
</tr>
</tbody>
</table>

A) | Relative Frequency | B) | Relative Frequency |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>201-300</td>
<td>15.5%</td>
<td>200-300</td>
<td>12.5%</td>
</tr>
<tr>
<td>301-400</td>
<td>22.1%</td>
<td>301-400</td>
<td>20.1%</td>
</tr>
<tr>
<td>401-500</td>
<td>31.3%</td>
<td>401-500</td>
<td>37.3%</td>
</tr>
<tr>
<td>501-600</td>
<td>16.2%</td>
<td>501-600</td>
<td>15.2%</td>
</tr>
<tr>
<td>More than 600</td>
<td>14.9%</td>
<td>More than 600</td>
<td>14.9%</td>
</tr>
</tbody>
</table>

C) | Relative Frequency | D) | Relative Frequency |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>200-300</td>
<td>25.98%</td>
<td>200-300</td>
<td>19.93%</td>
</tr>
<tr>
<td>301-400</td>
<td>24.91%</td>
<td>301-400</td>
<td>25.36%</td>
</tr>
<tr>
<td>401-500</td>
<td>3.65%</td>
<td>401-500</td>
<td>26.45%</td>
</tr>
<tr>
<td>501-600</td>
<td>19.64%</td>
<td>501-600</td>
<td>24.64%</td>
</tr>
<tr>
<td>More than 600</td>
<td>26.07%</td>
<td>More than 600</td>
<td>3.62%</td>
</tr>
</tbody>
</table>
Construct the cumulative frequency distribution that corresponds to the given frequency distribution.

<table>
<thead>
<tr>
<th>Weight (oz)</th>
<th>Number of Stones</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2-1.6</td>
<td>5</td>
</tr>
<tr>
<td>1.7-2.1</td>
<td>2</td>
</tr>
<tr>
<td>2.2-2.6</td>
<td>5</td>
</tr>
<tr>
<td>2.7-3.1</td>
<td>5</td>
</tr>
<tr>
<td>3.2-3.6</td>
<td>13</td>
</tr>
</tbody>
</table>

A) | Cumulative Frequency |
---|----------------------|
Less than 1.7 | 5 |
Less than 2.2 | 7 |
Less than 2.7 | 12 |
Less than 3.2 | 17 |
Less than 3.7 | 28 |

B) | Cumulative Frequency |
---|----------------------|
Less than 2.2 | 7 |
Less than 3.2 | 17 |
Less than 3.7 | 30 |

C) | Cumulative Frequency |
---|----------------------|
1.2-1.6 | 5 |
1.7-2.1 | 7 |
2.2-2.6 | 12 |
2.7-3.1 | 17 |
3.2-3.6 | 30 |

D) | Cumulative Frequency |
---|----------------------|
Less than 1.7 | 5 |
Less than 2.2 | 7 |
Less than 2.7 | 12 |
Less than 3.2 | 17 |
Less than 3.7 | 30 |

Provide an appropriate response.

16) A contractor is considering a sale that promises a profit of $26,000 with a probability of 0.7 or a loss (due to bad weather, strikes, and such) of $8000 with a probability of 0.3. What is the expected profit?
A) $18,000  B) $18,200  C) $23,800  D) $15,800

Find the indicated probability. Round to three decimal places.

17) An airline estimates that 94% of people booked on their flights actually show up. If the airline books 73 people on a flight for which the maximum number is 71, what is the probability that the number of people who show up will exceed the capacity of the plane?
A) 0.062  B) 0.051  C) 0.011  D) 0.179

Determine whether the given procedure results in a binomial distribution. If not, state the reason why.

18) Choosing 4 marbles from a box of 40 marbles (20 purple, 12 red, and 8 green) one at a time without replacement, keeping track of the number of red marbles chosen.
A) Procedure results in a binomial distribution.
B) Not binomial: the trials are not independent.
C) Not binomial: there are more than two outcomes for each trial.
D) Not binomial: there are too many trials.
Express the null hypothesis and the alternative hypothesis in symbolic form. Use the correct symbol (μ, p, σ) for the indicated parameter.

19) A psychologist claims that more than 5.8 percent of the population suffers from professional problems due to extreme shyness. Use p, the true percentage of the population that suffers from extreme shyness.
   A) H₀: p < 5.8%  B) H₀: p = 5.8%  C) H₀: p = 5.8%  D) H₀: p > 5.8%
   H₁: p ≥ 5.8%  H₁: p < 5.8%  H₁: p > 5.8%  H₁: p ≤ 5.8%

Formulate the indicated conclusion in nontechnical terms. Be sure to address the original claim.

20) The principal of a middle school claims that test scores of the seventh-graders at his school vary less than the test scores of the seventh-graders at a neighboring school, which have variation described by σ = 14.7. Assuming that a hypothesis test of the claim has been conducted and that the conclusion is to reject the null hypothesis, state the conclusion in nontechnical terms.
   A) There is sufficient evidence to support the claim that the standard deviation is less than 14.7.
   B) There is not sufficient evidence to support the claim that the standard deviation is greater than 14.7.
   C) There is not sufficient evidence to support the claim that the standard deviation is less than 14.7.
   D) There is sufficient evidence to support the claim that the standard deviation is greater than 14.7.

Find the P-value for the indicated hypothesis test.

21) In a sample of 47 adults selected randomly from one town, it is found that 9 of them have been exposed to a particular strain of the flu. Find the P-value for a test of the claim that the proportion of all adults in the town that have been exposed to this strain of the flu is 8%.
   A) 0.0524  B) 0.0024  C) 0.0048  D) 0.0262

Provide an appropriate answer.

22) In a χ² test for independence, the statistic based on a contingency table with 6 rows and 5 columns will have ____ degrees of freedom.
   A) 25  B) 30  C) 24  D) 20

Use a χ² test to test the claim that in the given contingency table, the row variable and the column variable are independent.

Formulate the indicated conclusion in nontechnical terms. Be sure to address the original claim.

23) Responses to a survey question are broken down according to gender and the sample results are given below. At the 0.05 significance level, test the claim that response and gender are independent.

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Undecided</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>25</td>
<td>50</td>
<td>15</td>
</tr>
<tr>
<td>Female</td>
<td>20</td>
<td>30</td>
<td>10</td>
</tr>
</tbody>
</table>

A) Reject the null hypothesis. There is sufficient evidence to warrant rejection of the claim that response and gender are not independent.
B) Fail to Reject the null hypothesis. There is not sufficient evidence to support the claim that response and gender are independent.
C) Reject the null hypothesis. There is sufficient evidence to warrant rejection of the claim that response and gender are independent.
D) Fail to Reject the null hypothesis. There is not sufficient evidence to warrant rejection of the claim that response and gender are independent.
Use a $\chi^2$ test and 5 percent level of significance level to test the claim that in the given contingency table, the row variable and the column variable are independent.

24) Use the sample data below to test whether car color affects the likelihood of being in an accident.  
Use a significance level of 0.01.

<table>
<thead>
<tr>
<th>Car has been in accident</th>
<th>Red</th>
<th>Blue</th>
<th>White</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car has not been in accident</td>
<td>28</td>
<td>33</td>
<td>36</td>
</tr>
<tr>
<td>Car has been in accident</td>
<td>23</td>
<td>22</td>
<td>30</td>
</tr>
</tbody>
</table>

Calculate the test statistic and formulate the decision whether to Reject or fail to reject the null hypothesis.
A) Test statistic $\chi^2 = 0.4287$, Reject the null hypothesis
B) Test statistic $\chi^2 = 0.4287$, Fail to reject the null hypothesis
C) Test statistic $\chi^2 = 9.210$, Reject the null hypothesis
D) Test statistic $\chi^2 = 9.210$, Fail to reject the null hypothesis

Find the median for the given sample data.

25) The distances (in miles) driven in the past week by each of a company’s sales representatives are listed below.

| 78 | 126 | 238 | 284 | 310 | 356 |

Find the median distance driven.
A) 198.50 mi  
B) 238 mi  
C) 284 mi  
D) 261 mi

Find the range, variance, and standard deviation for each of the two samples, then compare the two sets of results.

26) When investigating times required for drive-through service, the following results (in seconds) were obtained.

<table>
<thead>
<tr>
<th>Restaurant A</th>
<th>120</th>
<th>67</th>
<th>89</th>
<th>97</th>
<th>124</th>
<th>68</th>
<th>96</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restaurant B</td>
<td>115</td>
<td>126</td>
<td>49</td>
<td>56</td>
<td>98</td>
<td>76</td>
<td>78</td>
</tr>
</tbody>
</table>

A) Restaurant A: 57 sec; 793.98 sec$^2$; 28.18 sec  
   Restaurant B: 77 sec; 727.98 sec$^2$; 26.98 sec  
   There is more variation in the times for restaurant A.

B) Restaurant A: 75 sec; 493.98 sec$^2$; 22.23 sec  
   Restaurant B: 70 sec; 727.98 sec$^2$; 26.98 sec  
   There is more variation in the times for restaurant B.

C) Restaurant A: 75 sec; 493.98 sec$^2$; 22.23 sec  
   Restaurant B: 77 sec; 727.98 sec$^2$; 26.98 sec  
   There is more variation in the times for restaurant B.

D) Restaurant A: 75 sec; 493.98 sec$^2$; 22.23 sec  
   Restaurant B: 56 sec; 727.98 sec$^2$; 32.89 sec  
   There is more variation in the times for restaurant B.

Use the empirical rule to solve the problem.

27) At one college, GPA’s are normally distributed with a mean of 3 and a standard deviation of 0.6.  
What percentage of students at the college have a GPA between 2.4 and 3.6?
A) 95%  
B) 84.13%  
C) 99.7%  
D) 68%
Find the indicated z score. The graph depicts the standard normal distribution with mean 0 and standard deviation 1.

28) Shaded area is 0.0694.

![Graph]

A) 1.45  B) 1.48  C) 1.39  D) 1.26

Provide an appropriate response.

29) Find the area of the shaded region. The graph depicts IQ scores of adults, and those scores are normally distributed with a mean of 100 and a standard deviation of 15 (as on the Wechsler test).

![Graph]

A) 0.6293  B) 0.4400  C) 0.7486  D) 0.8051

Solve the problem.

30) The amount of snowfall falling in a certain mountain range is normally distributed with a mean of 70 inches, and a standard deviation of 10 inches. What is the probability that the mean annual snowfall during 25 randomly picked years will exceed 72.8 inches?

A) 0.0808  B) 0.4192  C) 0.5808  D) 0.0026

Determine whether the samples are independent or dependent.

31) The effectiveness of a headache medicine is tested by measuring the intensity of a headache in patients before and after drug treatment. The data consist of before and after intensities for each patient.

A) Independent samples  B) Dependent samples
State what the given confidence interval suggests about the two population means.

32) A researcher was interested in comparing the amount of time spent watching television by women and by men. Independent simple random samples of 14 women and 17 men were selected, and each person was asked how many hours he or she had watched television during the previous week. The summary statistics are as follows.

<table>
<thead>
<tr>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\bar{x}_1 = 12.9$ hrs</td>
<td>$\bar{x}_2 = 13.7$ hrs</td>
</tr>
<tr>
<td>$s_1 = 3.9$ hrs</td>
<td>$s_2 = 5.2$ hrs</td>
</tr>
<tr>
<td>$n_1 = 14$</td>
<td>$n_2 = 17$</td>
</tr>
</tbody>
</table>

The following 99% confidence interval was obtained for $\mu_1 - \mu_2$, the difference between the mean amount of time spent watching television for women and the mean amount of time spent watching television for men: $\text{CI} = (-5.73, 4.13)$ hrs.

What does the confidence interval suggest about the population means?

A) The confidence interval limits include 0 which suggests that the two population means might be equal. There does not appear to be a significant difference between the mean amount of time spent watching television for women and the mean amount of time spent watching television for men.

B) The confidence interval includes only positive values which suggests that the mean amount of time spent watching television for women is larger than the mean amount of time spent watching television for men.

C) The confidence interval limits include 0 which suggests that the two population means are unlikely to be equal. There appears to be a significant difference between the mean amount of time spent watching television for women and the mean amount of time spent watching television for men.

D) The confidence interval includes only negative values which suggests that the mean amount of time spent watching television for women is smaller than the mean amount of time spent watching television for men.

Assume that you want to test the claim that the paired sample data come from a population for which the mean difference is $\mu_d = 0$. Compute the value of the t test statistic. Round intermediate calculations to four decimal places as needed and final answers to three decimal places as needed.

33) A farmer has decided to use a new additive to grow his crops. He divided his farm into 10 plots and kept records of the corn yield (in bushels) before and after using the additive. The results are shown below.

<table>
<thead>
<tr>
<th>Plot</th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>6</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>8</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>9</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>10</td>
<td>11</td>
<td>12</td>
</tr>
</tbody>
</table>

You wish to test the following hypothesis at the 5 percent level of significance.

$H_0: \mu_d = 0$ against $H_1: \mu_d \neq 0$.

What is the value of the appropriate test statistic?

A) 2.536  
B) 2.033  
C) 1.584  
D) 5.014
Given below are the analysis of variance results from a Minitab display. Assume that you want to use a 0.05 significance level in testing the null hypothesis that the different samples come from populations with the same mean.

34) Identify the value of the test statistic.  

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor</td>
<td>3</td>
<td>13.500</td>
<td>4.500</td>
<td>5.17</td>
<td>0.011</td>
</tr>
<tr>
<td>Error</td>
<td>16</td>
<td>13.925</td>
<td>0.870</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>27.425</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A) 4.500  B) 13.500  C) 5.17  D) 0.011

35) Identify the p-value.  

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor</td>
<td>3</td>
<td>13.500</td>
<td>4.500</td>
<td>5.17</td>
<td>0.011</td>
</tr>
<tr>
<td>Error</td>
<td>16</td>
<td>13.925</td>
<td>0.870</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>27.425</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A) 5.17  B) 0.870  C) 0.011  D) 4.500

36) What can you conclude about the equality of the population means?  

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor</td>
<td>3</td>
<td>13.500</td>
<td>4.500</td>
<td>5.17</td>
<td>0.011</td>
</tr>
<tr>
<td>Error</td>
<td>16</td>
<td>13.925</td>
<td>0.870</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>27.425</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A) Accept the null hypothesis since the p-value is less than the significance level.
B) Accept the null hypothesis since the p-value is greater than the significance level.
C) Reject the null hypothesis since the p-value is less than the significance level.
D) Reject the null hypothesis since the p-value is greater than the significance level.