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

1) A university dean is interested in determining the proportion of students who receive some sort of financial aid. Rather than examine the records for all students, the dean randomly selects 200 students and finds that 118 of them are receiving financial aid. Use a 95% confidence interval to estimate the true proportion of students who receive financial aid.

A) 0.59 ±0.057  B) 0.59 ±0.070  C) 0.45 ±0.033  D) 0.57 ±0.059

2) A university dean is interested in determining the proportion of students who receive some sort of financial aid. The dean randomly selects 200 students and finds that 118 of them are receiving financial aid. The 90% confidence interval for p is 0.59 ± 0.057. Interpret this interval.

A) We are 90% confident that between 53% and 65% of the sampled students receive some sort of financial aid.
B) We are 90% confident that 59% of the students are on some sort of financial aid.
C) 90% of the students get between 53% and 65% of their tuition paid for by financial aid.
D) We are 90% confident that the true proportion of all students receiving financial aid is between 0.53 and 0.65.

Question 3-6: The weight of apples is normally distributed with a mean of 7 ounces and a standard deviation of 2 ounces. A random sample of 30 apples is taken and put in a box.

3) What is the standard error for the sample mean (average weight of apples in a box)?
   A) 0.500  B) 0.365  C) 0.200  D) 0.067

4) What is the probability that the sample mean will be between 6.5 ounces and 7 ounces?
   A) 0.0853  B) 0.1370  C) 0.4147  D) 0.5000

5) What is the probability that the sample mean will be above 8 ounces?
   A) 0.9969  B) 0.0500  C) 0.2740  D) 0.0031

6) Below what value do 35.2% of the sample means fall?
   A) 6.4998  B) 6.8613  C) 7.5012  D) 7.1387

7) A major department store chain is interested in estimating the average amount its credit card customers spent on their first visit to the chain’s new store in the mall. Fifteen credit card accounts were randomly sampled and analyzed with the following results: $X = 50.50$ and $s^2 = 400$. Construct a 90% confidence interval for the mean.
   A) $50.50 \pm 13.55$  B) $50.50 \pm 9.10$  C) $50.50 \pm 6.92$  D) $50.50 \pm 11.08$

8) We have created a 95% confidence interval for $\mu$ with the result (0.56, 3.44). What conclusion will we make if we test $H_0: \mu = 0.1$ versus $H_1: \mu \neq 0.1$ at $\alpha = 0.05$?
   A) Reject $H_0$  B) Fail to reject $H_0$  C) None  D) Accept $H_0$

9) When testing $H_0: \mu_1 - \mu_2 = 0$ versus $H_1: \mu_1 - \mu_2 \neq 0$, the test statistic was found to be -1.82. Suppose $\alpha = 0.05$, which of the following is correct?
   A) with $p-value=0.0158$, we reject $H_0$  B) with $p-value=0.0688$, we fail to reject $H_0$
   C) with $p-value=0.9342$, we fail to reject $H_0$  D) with $p-value=0.0344$, we reject $H_0$
**Question 10-12:** A corporation randomly selects 100 salespeople and finds that 70 salespeople would like to take a self-improvement course. The firm did a similar study 10 years ago in which 61 salespeople out of a random sample of 120 salespeople wanted a self-improvement course. The groups are assumed to be independent random samples. Let $p_1$ and $p_2$ represent the true proportion of workers who would like to attend a self-improvement course in the recent study and the past study, respectively.

10) If the firm wanted to test if this proportion has changed from the previous study, which represents hypotheses?
   
   A) $H_0: p_1 - p_2 \neq 0$ versus $H_1: p_1 - p_2 = 0$ 
   
   B) $H_0: p_1 - p_2 \geq 0$ versus $H_1: p_1 - p_2 < 0$ 
   
   C) $H_0: p_1 - p_2 = 0$ versus $H_1: p_1 - p_2 \neq 0$ 
   
   D) $H_0: p_1 - p_2 \leq 0$ versus $H_1: p_1 - p_2 > 0$

11) What is the value of the test statistic?

   A) 2.884 
   
   B) 1.934 
   
   C) 1.267 
   
   D) 3.251

12) The company tests to determine at the 0.05 level whether the population proportion has changed from the previous study. Which of the following is most correct?

   A) Reject the null hypothesis and conclude that the proportion of employees who are interested in a self-improvement course has changed over the intervening 10 years.
   
   B) Fail to reject the null hypothesis, there is not enough evidence to conclude that the proportion of employees who are interested in a self-improvement course has not changed over the intervening 10 years.
   
   C) Reject the null hypothesis and conclude that the proportion of employees who are interested in a self-improvement course has not changed over the intervening 10 years.
   
   D) Fail to reject the null hypothesis, there is not enough evidence to conclude that the proportion of employees who are interested in a self-improvement course has changed over the intervening 10 years.

**Question 13-15:** The owner of a local nightclub has recently surveyed a random sample of 100 customers of the club with: $ar{X} = 21.73, s = 3.8$. She would like to determine whether or not the mean age of her customers is over 21.

13) Give the null and alternative hypotheses.

   A) $H_0: \mu = 21$ and $H_1: \mu \neq 21$ 
   
   B) $H_0: \bar{X} \leq 21.73$ and $H_1: \bar{X} > 21.73$ 
   
   C) $H_0: \mu \geq 21$ and $H_1: \mu < 21$ 
   
   D) $H_0: \mu \leq 21$ and $H_1: \mu > 21$

14) Using the sample information provided, calculate the value of the test statistic.

   A) $t = (21.73-21) / (3.8/102)$ 
   
   B) $t = (21.73-21) / 3.8$ 
   
   C) $t = (21-21.73) / (3.8/10)$ 
   
   D) $t = (21.73 - 21) / (3.8/10)$

15) Suppose $\alpha = 0.05$. Which of the following is correct?

   A) At $\alpha = 0.05$, we reject $H_0$. 
   
   B) At $\alpha = 0.05$, we accept $H_0$. 
   
   C) At $\alpha = 0.05$, we fail to reject $H_0$. 
   
   D) No decision should be made

16) A study in Yosemite National Forest is attempting to determine what factors aid a tree in reaching heights greater than 60 feet (adult pine trees). It is estimated that the forest contains 25,000 adult American pines. The study involves collecting heights from 250 randomly selected adult American pine trees and analyzing the results. Identify the population of the study.

   A) all the adult American pine trees taller than 60 feet 
   
   B) the 25,000 adult American pine trees in the forest 
   
   C) all American pine trees, of any age, in the forest 
   
   D) the 250 randomly selected adult American pine trees
17) Number of e-mail received in a week is an example of a __________ variable.
   A) parameter  B) continuous  C) discrete  D) categorical

18) According to the empirical rule, if the data form a "bell-shaped" normal distribution, ________ percent of the observations will be contained within 3 standard deviations around the mean.
   A) 99.70  B) 93.75  C) 68.26  D) 95.44

A survey was conducted to determine how people rated the quality of programming available on television. Respondents were asked to rate the overall quality from 0 (no quality at all) to 100 (extremely good quality). The stem-and-leaf display of the data is shown below.

<table>
<thead>
<tr>
<th>Stem</th>
<th>Leaves</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>24</td>
</tr>
<tr>
<td>4</td>
<td>03478999</td>
</tr>
<tr>
<td>5</td>
<td>0112345</td>
</tr>
<tr>
<td>6</td>
<td>12566</td>
</tr>
<tr>
<td>7</td>
<td>01</td>
</tr>
<tr>
<td>8</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>2</td>
</tr>
</tbody>
</table>

19) what percentage of the respondents rated overall television quality with a rating of 80 or above?
   A) 4  B) 100  C) 0  D) 96

The histogram below represents scores achieved by 200 job applicants on a personality profile.

20) Referring to the histogram, ________ percent of the job applicants scored between 10 and 20.
   A) 20%  B) 30%  C) 50%  D) 80%

Question 21-23: Given a data set: 7, 4, 9, 0, 7, 3

21) Find the mean of the data set
   A) 2  B) 1  C) 3  D) 7  E) 5
22) The five-number summary of the data set consists of __________, __________, __________, __________, and __________.
   A) 0, 3, 7, 7, 9  
   B) 0, 1.5, 4, 7, 9  
   C) 0, 3, 5.5, 7, 9  
   D) 0, 3, 4, 7, 9

23) Based on the five-number summary, what type of shape does the distribution of the sample appear to have?
   A) bell-shaped  
   B) Symmetrical  
   C) Right-skewed.  
   D) Left-skewed.

24) Suppose that past history shows that 50% of college students prefer Brand C cola. A sample of 8 students is to
    be selected. The average number that you would expect to prefer brand C is __________.
   A) 10  
   B) 3  
   C) 4  
   D) 7  
   E) None

25) Suppose that past history shows that 50% of college students prefer Brand C cola. A sample of 6 students is to
    be selected. The probability that at least 1 prefers brand C cola is __________.
   A) 0.016  
   B) 0.984  
   C) 0.094  
   D) 0.500

Questions 26-27: Mothers Against Drunk Driving is a very visible group whose main focus is to educate the public about the
harm caused by drunk drivers. A study was recently done that emphasized the problem we all face with drinking and

driving. Four hundred accidents that occurred on a Saturday night were analyzed. Two items noted were the number of
vehicles involved and whether alcohol played a role in the accident. The numbers are shown below:

<table>
<thead>
<tr>
<th>Number of Vehicles Involved</th>
<th>Did alcohol play a role?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>25</td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>75</td>
</tr>
</tbody>
</table>

26) What proportion of accidents involved alcohol or 2 vehicles?
   A) 170/400  
   B) 50/400  
   C) 345/400  
   D) 200/400

Question 27: The following table contains the number of employees of a company received over the last four year.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>76</td>
</tr>
<tr>
<td>2001</td>
<td>85</td>
</tr>
<tr>
<td>2002</td>
<td>68</td>
</tr>
<tr>
<td>2003</td>
<td>78</td>
</tr>
</tbody>
</table>

27) If a three-term moving average is used to smooth this series, how many terms would it have?
   A) 1  
   B) 2  
   C) 4  
   D) 3

Question 28-30: The following table contains the probability distribution for $X =$ the number of weekly sales of a particular
photocopying machine.

<table>
<thead>
<tr>
<th>$X$</th>
<th>$P(X)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.1</td>
</tr>
<tr>
<td>1</td>
<td>0.3</td>
</tr>
<tr>
<td>2</td>
<td>0.3</td>
</tr>
<tr>
<td>3</td>
<td>0.1</td>
</tr>
<tr>
<td>4</td>
<td>0.2</td>
</tr>
</tbody>
</table>

28) Referring to the table, the probability of at least two machine being sold is __________.
   A) 0.90  
   B) 0.60  
   C) 0.50  
   D) 0.10  
   E) None

29) Referring to the table, the mean or expected value for the number of sales for a given week is __________.
   A) None  
   B) 0.2  
   C) 2.0  
   D) 1.0  
   E) 1.5
30) Referring to the table, the standard deviation of the number of sales is ________.
   A) 1.60       B) 1.27       C) 0.8       D) 1.0       E) None

**Question 31-34:** The Sales of a firm is to be predicted using Market Value (Mkt_Val, X1) of the firm, the total Assets of the firm (Assets, X2), and the number of Employees (Employees, X3) of the firm. Fifteen observations are randomly selected and the multiple regression is applied to the data with the following Microsoft Excel output:

<table>
<thead>
<tr>
<th>Coefficients</th>
<th>Standard Error</th>
<th>t Stat</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>147.39</td>
<td>1.4640</td>
<td>0.17120</td>
</tr>
<tr>
<td>Mkt_val</td>
<td>0.0737</td>
<td>0.6281</td>
<td>0.5474</td>
</tr>
<tr>
<td>Assets</td>
<td>1.0166</td>
<td>6.2203</td>
<td>0.00006</td>
</tr>
<tr>
<td>Employees</td>
<td>0.0113</td>
<td>1.0718</td>
<td>0.30675</td>
</tr>
</tbody>
</table>

31) Which of the following equation is the correct multiple regression equation for the data?
   A) $\hat{Y}_i = 147.39 + 0.0737X_{1i} + 1.0166X_{2i} + 0.0113X_{3i}$
   B) $\hat{Y}_i = 147.39 + 0.0737X_{1i} + 1.0166X_{2i} + 0.0113X_{3i}$
   C) $\hat{Y}_i = 147.39 + 0.0737X_{1i} - 1.0166X_{2i} + 0.0113X_{3i}$
   D) $\hat{Y}_i = 147.39 + 0.0737X_{1i} + 1.0166X_{2i} + 0.0113X_{3i}$

32) What is the prediction for the sales of a company with Mkt-val=200, Assets=400, and Employees=5000?
   A) 924.79       B) 553.87       C) 625.27       D) 477.88

33) At the 0.01 level of significance, what conclusion should we draw regarding the inclusion of number of the Employees in the regression model?
   A) Employees is significant in explaining the Sales and should be included in the model because its $p$ value is more than 0.01.
   B) Employees is not significant in explaining the Sales and should not be included in the model because its $p$ value is less than 0.01.
   C) Employees is not significant in explaining the Sales and should not be included in the model because its $p$ value is more than 0.01.
   D) Employees is significant in explaining the Sales and should be included in the model because its $p$ value is less than 0.01.

34) The 95% confidence interval estimate for the slope of the Assets is ________ to ________.
   A) -0.119 to 0.0346       B) -0.450 to 1.265       C) -0.01846 to 0.3340       D) 0.6570 to 1.3762

**Question 35-39:** Management of a soft-drink bottling company wished to develop a method for allocating delivery costs to customers. Although one cost clearly relates to travel time within a particular route, another variable cost reflects the time required to unload the cases of soft drink at the delivery point. A sample of 15 customers was selected from routes within a territory and the delivery time (in minutes) and the number of cases delivered were measured. These data are partially presented in the table with the following results: $\text{SST}=2514.50$, $\text{SSR}=2442.55$, $\text{SSX}=24619.80$ and $\hat{Y}_1 = 24.84 + 0.14X_1$.

<table>
<thead>
<tr>
<th>Customer</th>
<th>Number of Cases (X)</th>
<th>Delivery Time(Y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>52</td>
<td>32.1</td>
</tr>
<tr>
<td>15</td>
<td>198</td>
<td>58.2</td>
</tr>
</tbody>
</table>

35) Which of the following statement is correct, when we interpret the meaning of the slope $b_1$.
   A) for each additional delivery, the estimated case increases by 0.14 minutes
   B) for each additional case, the estimated delivery time decreases by 0.14 minutes
   C) for each additional case, the estimated delivery time increases by 0.14 minutes
   D) for each additional delivery, the estimated case decrease by 0.14 minutes
36) Which of the following statement is correct for the coefficient of determination?
   A) 97.14% of the variation in the delivery time can be explained by the variation in the number of cases.
   B) 99% of the variation in the number of cases can be explained by the variation in the delivery time.
   C) 97.14% of the variation in the number of cases can be explained by the variation in the delivery time.
   D) 99% of the variation in the delivery time can be explained by the variation in the number of cases.

37) The standard error of the estimate $S_{YX}$ is __________.
   A) 1.765     B) 3.980     C) 4.705     D) 2.353

38) If the company wants to test if there is a linear relationship between X and Y. The value of the test statistic is __________.
   A) 2.353     B) 9.336     C) 4.668     D) 5.596

39) The 99% confidence interval estimate of the average delivery time for customers that receive 140 cases of soft drink (use $\bar{X} = 150.9$) is from __________ to __________.
   A) 42.55 to 46.34   B) 34.97 to 49.06   C) 21.86 to 68.65   D) 44.87 to 48.80

40) The Linear trend forecasting equation for an annual time series containing 40 observations (from 1961 to 2000) on net sales is $\hat{Y}_t = 1.2 + 0.5X_t$. What is the fitted trend value for this time series on net sales (in billions) for the 5th year?
   A) 6.2     B) 3.7     C) 21.2     D) 3.2

41) Which of the following terms describes the overall long-term tendency of a time series?
   A) Trend     B) Seasonal component     C) Cyclical component     D) Irregular component

Question 42–43: You’re manager of a hotel. You want to achieve the highest level of service. For 10 days, you collect data on the readiness of 100 rooms.

<table>
<thead>
<tr>
<th>Day</th>
<th>#Rooms</th>
<th>#Not Ready</th>
<th>% Not Ready</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100</td>
<td>12</td>
<td>0.12</td>
</tr>
<tr>
<td>2</td>
<td>100</td>
<td>14</td>
<td>0.14</td>
</tr>
<tr>
<td>3</td>
<td>100</td>
<td>10</td>
<td>0.10</td>
</tr>
<tr>
<td>4</td>
<td>100</td>
<td>18</td>
<td>0.18</td>
</tr>
<tr>
<td>5</td>
<td>100</td>
<td>22</td>
<td>0.22</td>
</tr>
<tr>
<td>6</td>
<td>100</td>
<td>14</td>
<td>0.14</td>
</tr>
<tr>
<td>7</td>
<td>100</td>
<td>15</td>
<td>0.15</td>
</tr>
<tr>
<td>8</td>
<td>100</td>
<td>13</td>
<td>0.13</td>
</tr>
<tr>
<td>9</td>
<td>100</td>
<td>14</td>
<td>0.14</td>
</tr>
<tr>
<td>10</td>
<td>100</td>
<td>16</td>
<td>0.16</td>
</tr>
<tr>
<td>Total:</td>
<td>1000</td>
<td>136</td>
<td></td>
</tr>
</tbody>
</table>

42) The $p$ control chart is to be made for these data. The center line of the control chart is __________.
   A) 0.136     B) 0.0950     C) 0.220     D) 0.120

43) The $p$ control chart is to be made for these data. The upper control limit is __________, and the lower control limit is __________.
   A) 0.1460; 0.0268   B) 0.0925; 0.0132   C) 0.2388; 0.03316   D) 0.0864; 0
Question 44-45:
The director of transportation of a large company is interested in the usage of her van pool. She considers her routes to be divided into local and non-local. She is particularly interested in learning if there is a difference in the proportion of males and females who use the local routes. She takes a sample of a day's riders and finds the following:

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>27</td>
<td>44</td>
<td>71</td>
</tr>
<tr>
<td>Non-Local</td>
<td>33</td>
<td>25</td>
<td>58</td>
</tr>
<tr>
<td>Total</td>
<td>60</td>
<td>69</td>
<td>129</td>
</tr>
</tbody>
</table>

She will use this information to perform a chi-square hypothesis test using a level of significance of 0.05.

44) Referring to the table, the value of the test statistic is __________.
   A) 2.65      B) 31.02      C) 7.41       D) 4.56

45) Referring to the table, what decision should you make?
   A) Reject H0, the proportions are the same.
   B) Reject H0, the proportions are different.
   C) Fail to reject H0, there is not enough evidence to show that the proportions are different.
   D) Fail to reject H0, there is not enough evidence to show that the proportions are the same.

Question 46-48: Recently, a university switched to a new type of computer-based registration. The registrar is concerned with the amount of time students are spending on the computer registering under the new system. She decides to randomly select 8 students on each of the 12 days of the registration and determine the time each spends on the computer registering. The range, mean, and standard deviation of the times required to register are in the table that follows.

<table>
<thead>
<tr>
<th>Day</th>
<th>Range</th>
<th>Mean</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
<td>5.250</td>
<td>3.4949</td>
</tr>
<tr>
<td>2</td>
<td>31</td>
<td>15.250</td>
<td>10.3060</td>
</tr>
<tr>
<td>3</td>
<td>13</td>
<td>20.375</td>
<td>4.9262</td>
</tr>
<tr>
<td>4</td>
<td>21</td>
<td>22.875</td>
<td>8.3911</td>
</tr>
<tr>
<td>5</td>
<td>35</td>
<td>8.500</td>
<td>11.3767</td>
</tr>
<tr>
<td>6</td>
<td>18</td>
<td>7.875</td>
<td>6.9372</td>
</tr>
<tr>
<td>7</td>
<td>25</td>
<td>11.250</td>
<td>8.5815</td>
</tr>
<tr>
<td>8</td>
<td>30</td>
<td>7.875</td>
<td>9.5235</td>
</tr>
<tr>
<td>9</td>
<td>17</td>
<td>10.250</td>
<td>6.3640</td>
</tr>
<tr>
<td>10</td>
<td>22</td>
<td>9.500</td>
<td>7.8740</td>
</tr>
<tr>
<td>11</td>
<td>27</td>
<td>7.875</td>
<td>8.7086</td>
</tr>
<tr>
<td>12</td>
<td>26</td>
<td>12.875</td>
<td>9.3723</td>
</tr>
<tr>
<td>total</td>
<td></td>
<td>275</td>
<td>139.75</td>
</tr>
</tbody>
</table>

46) An R chart is to be constructed for the time required to register. The upper control limit is __________; and the lower control limit is __________.
   A) 34.250; 2.871      B) 32.652; 1.098      C) 42.722; 3.117      D) 25.789; 3.765

47) An  \( \bar{X} \)  chart is to be used for the time required to register. The lower control limit for this data set is __________, while the upper control limit is __________.
   A) 3.101; 20.199      B) 2.562; 22.365      C) 1.987; 24.379      D) 0.373; 32.981
48) Which of the following statements is correct?

A) Since individual points are within the control limit without any pattern for the R chart, the process is out of control.
B) Since individual points are within the control limit without any pattern for the $\bar{X}$ chart, the process is in control.
C) Based on the $\bar{X}$ chart and R chart, the process is out of control.
D) Based on the $\bar{X}$ chart and R chart, the process is in control.
MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) B
2) D
3) B
4) C
5) D
6) B
7) B
8) A
9) B
10) C
11) A
12) A
13) D
14) D
15) A
16) B
17) C
18) A
19) A
20) A
21) E
22) C
23) D
24) C
25) B
26) C
27) B
28) B
29) C
30) B
31) D
32) C
33) C
34) D
35) C
36) A
37) D
38) B
39) A
40) D
41) A
42) A
43) C
44) D
45) B
46) C
47) A
48) C