MULTIPLE CHOICE

1. The absolute value of the difference between the point estimate and the population parameter it estimates is
   a. the standard error
   b. the sampling error
   c. precision
   d. the error of confidence

   ANS: B

2. A population has a standard deviation of 50. A random sample of 100 items from this population is selected. The sample mean is determined to be 600. At 95% confidence, the margin of error is
   a. 5
   b. 9.8
   c. 650
   d. 609.8

   ANS: B

3. The value added and subtracted from a point estimate in order to develop an interval estimate of the population parameter is known as the
   a. confidence level
   b. margin of error
   c. parameter estimate
   d. interval estimate

   ANS: B

4. If an interval estimate is said to be constructed at the 95% confidence level, the confidence coefficient would be
   a. 0.1
   b. 0.95
   c. 0.9
   d. 0.05

   ANS: B

5. In general, higher confidence levels provide
   a. wider confidence intervals
   b. narrower confidence intervals
   c. a smaller standard error
   d. unbiased estimates

   ANS: A
6. A random sample of 900 observations has a mean of 20, a median of 21, and a mode of 22. The population standard deviation is known to equal 4.8. The 95% confidence interval for the population mean is ....

7. When the level of confidence decreases, the margin of error
   a. stays the same
   b. becomes smaller
   c. becomes larger
   d. becomes smaller or larger, depending on the sample size
   
   ANS: B

8. In a sample of 400 voters, 360 indicated they favor the incumbent governor. The 95% confidence interval of voters not favoring the incumbent is
   a. 0.871 to 0.929
   b. 0.120 to 0.280
   c. 0.765 to 0.835
   d. 0.071 to 0.129
   
   ANS: D

9. What type of error occurs if you fail to reject $H_0$ when, in fact, it is not true?
   a. Type II
   b. Type I
   c. either Type I or Type II, depending on the level of significance
   d. either Type I or Type II, depending on whether the test is one tail or two tail
   
   ANS: A

10. An assumption made about the value of a population parameter is called a
    a. hypothesis
    b. conclusion
    c. confidence
    d. significance
    
    ANS: A

11. A weatherman stated that the average temperature during July in Chattanooga is less than 80 degrees. A sample of 32 Julys is taken. The correct set of hypotheses is
    a. $H_0: \mu \geq 80$  $H_a: \mu < 80$
    b. $H_0: \mu \leq 80$  $H_a: \mu > 80$
    c. $H_0: \mu \neq 80$  $H_a: \mu = 80$
    d. $H_0: \mu < 80$  $H_a: \mu > 80$
    
    ANS: A

13. It is said that more males register to vote in a national election than females. A research organization selected a random sample of 300 registered voters and reported that 165 of the registered voters were male.
    a. Formulate the hypotheses for this problem.
    b. Compute the standard error of $p$.
    c. Compute the test statistic.
    d. Using the $p$-value approach, can you conclude that more males registered to vote than females?
       Let $\alpha = .05$. 
ANS:
  a. \( H_0: P \leq 0.5 \)
     \( H_a: P > 0.5 \)
  b. 0.0289
  c. \( Z = 1.73 \)
  d. \( p \)-value = 0.0418 < .05; (or use confidence interval) reject \( H_0 \); yes, more males than females registered to vote.

14. If we are interested in testing whether the mean of population 1 is significantly larger than the mean of population 2, the
  a. null hypothesis should state \( \mu_1 - \mu_2 > 0 \)
  b. null hypothesis should state \( \mu_1 - \mu_2 \geq 0 \)
  c. alternative hypothesis should state \( \mu_1 - \mu_2 > 0 \)
  d. alternative hypothesis should state \( \mu_1 - \mu_2 < 0 \)
ANS: C

15. The daily production rates for a sample of factory workers before and after a training program are shown below. Let \( d = \text{After} - \text{Before} \).

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

We want to determine if the training program was effective.
  a. Give the hypotheses for this problem.
  b. Compute the test statistic.
  c. At 95% confidence, test the hypotheses. That is, did the training program actually increase the production rates?

ANS:
  a. \( H_0: \mu_d \leq 0 \)
     \( H_a: \mu_d > 0 \)
  b. test statistic \( t = 5.88 \)
  c. \( p \)-value (0.0042) is less than 0.005, reject \( H_0 \)

16. When developing an interval estimate for the difference between two population proportions, with sample sizes of \( n_1 \) and \( n_2 \),
  a. \( n_1 \) must be equal to \( n_2 \)
  b. \( n_1 \) must be smaller than \( n_2 \)
  c. \( n_1 \) must be larger than \( n_2 \)
  d. \( n_1 \) and \( n_2 \) can be of different sizes,

ANS: D
17. If we are interested in testing whether the proportion of items in population 1 is significantly less than the proportion of items in population 2, the
a. null hypothesis should state \( P_1 - P_2 > 0 \)
b. null hypothesis should state \( P_1 - P_2 < 0 \)
c. alternative hypothesis should state \( P_1 - P_2 > 0 \)
d. alternative hypothesis should state \( P_1 - P_2 < 0 \)
ANS: D

Problem 3
An insurance company selected samples of clients under 18 years of age and over 18 and recorded the number of accidents they had in the previous year. The results are shown below.

<table>
<thead>
<tr>
<th>Under Age of 18</th>
<th>Over Age of 18</th>
</tr>
</thead>
<tbody>
<tr>
<td>( n_1 = 500 )</td>
<td>( n_2 = 600 )</td>
</tr>
<tr>
<td>Number of accidents = 180</td>
<td>Number of accidents = 150</td>
</tr>
</tbody>
</table>

We are interested in determining if the accident proportions differ between the two age groups.

18. Refer to the Problem 3 and let \( p_u \) represent the proportion under and \( p_o \) the proportion over the age of 18. The null hypothesis is
a. \( p_u - p_o \leq 0 \)
b. \( p_u - p_o \geq 0 \)
c. \( p_u - p_o \neq 0 \)
d. \( p_u - p_o = 0 \)
ANS: D

19. Refer to the Problem 3. The pooled proportion is
a. 0.305 
b. 0.300 
c. 0.027 
d. 0.450 
ANS: B

20. In a regression analysis, the error term \( \varepsilon \) is a random variable with a mean or expected value of
a. zero 
b. one 
c. any positive value 
d. any value 
ANS: A

21. If the coefficient of determination is a positive value, then the coefficient of correlation
a. must also be positive 
b. must be zero 
c. can be either negative or positive 
d. must be larger than 1 
ANS: C
22. In regression analysis, the model in the form \( y = \beta_0 + \beta_1 x + \epsilon \) is called
   a. regression equation
   b. correlation equation
   c. estimated regression equation
   d. regression model
   ANS: D

23. A multiple regression model has the form
   \[ \hat{Y} = \beta_0 + \beta_1 x + \beta_2 w + \epsilon \]
   As \( x \) increases by 1 unit (holding \( w \) constant), \( Y \) is expected to
   a. increase by 11 units
   b. decrease by 11 units
   c. increase by 6 units
   d. decrease by 6 units
   ANS: C

**Problem 4**
A regression model between sales (\( Y \) in $1,000), unit price (\( X_1 \) in dollars) and television advertisement (\( X_2 \) in dollars) resulted in the following function:
\[ \hat{Y} = 7 - 3X_1 + 5X_2 \]
For this model SSR = 3500, SSE = 1500, and the sample size is 18.

24. Refer to the Problem 4. The coefficient of the unit price indicates that if the unit price is
   a. increased by $1 (holding advertising constant), sales are expected to increase by $3
   b. decreased by $1 (holding advertising constant), sales are expected to decrease by $3
   c. increased by $1 (holding advertising constant), sales are expected to increase by $4,000
   d. increased by $1 (holding advertising constant), sales are expected to decrease by $3,000
   ANS: D

25. Refer to the Problem 4. The coefficient of \( X_2 \) indicates that if television advertising is increased by $1 (holding the unit price constant), sales are expected to
   a. increase by $5
   b. increase by $12,000
   c. increase by $5,000
   d. decrease by $2,000
   ANS: C

**Problem 5**
Below you are given a partial computer output based on a sample of 25 observations.

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>145.321</td>
<td>48.682</td>
</tr>
<tr>
<td>( X_1 )</td>
<td>25.625</td>
<td>9.150</td>
</tr>
<tr>
<td>( X_2 )</td>
<td>-5.720</td>
<td>3.575</td>
</tr>
<tr>
<td>( X_3 )</td>
<td>0.823</td>
<td>0.183</td>
</tr>
</tbody>
</table>
26. Refer to the Problem 5. The estimated regression equation is
   a. \[ Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon \]
   b. \[ E(Y) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \]
   c. \[ \hat{Y} = 145.321 + 25.625 X_1 - 5.720 X_2 + 0.823 X_3 \]
   d. \[ \hat{Y} = 48.682 + 9.15 X_1 + 3.575 X_2 + 1.183 X_3 \]
   ANS: C

27. Refer to the Problem 5. The interpretation of the coefficient on \( X_1 \) is that
   a. a one unit change in \( X_1 \) will lead to a 25.625 unit change in \( Y \)
   b. a one unit change in \( X_1 \) will lead to a 25.625 unit increase in \( Y \) when all other variables are held constant
   c. a one unit change in \( X_1 \) will lead to a 25.625 unit increase in \( X_2 \) when all other variables are held constant
   d. It is impossible to interpret the coefficient.
   ANS: B

28. Refer to Exhibit 13-5. We want to test whether the parameter \( \beta_1 \) is significant. The test statistic equals
   a. 0.357
   b. 2.8
   c. 14
   d. 1.96
   ANS: B