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

1) A researcher claims that 62% of voters favor gun control. Determine the null and alternative hypotheses.
   A) Ho: \( p \neq 0.62 \) vs. Ha: \( p = 0.62 \)  
   B) Ho: \( p \geq 0.62 \) vs. Ha: \( p < 0.62 \)  
   C) Ho: \( p = 0.62 \) vs. Ha: \( p \geq 0.62 \)  
   D) Ho: \( p < 0.62 \) vs. Ha: \( p \geq 0.62 \)  
   E) Ho: \( p = 0.62 \) vs. Ha: \( p \neq 0.62 \)

2) In a sample of 150 children selected randomly from one town, it is found that 24 of them suffer from asthma. Find the P-value for a test of the claim that the proportion of all children in the town who suffer from asthma is equal to 11%. (the alternative is right-tailed).
   A) 0.05  
   B) 0.95  
   C) 0.01  
   D) 0.025  
   E) 0.975

3) Test the claim that for the population of female college students, the mean weight is given by \( \mu = 132 \) lb. Sample data are summarized as \( n = 20, \bar{x} = 137 \) lb, and \( s = 14.2 \) lb. Find the test statistic.
   A) 1.729  
   B) 20  
   C) 1.57  
   D) 14.2  
   E) -1.57

4) Failing to reject a false Ho:
   A) is a Type I error.  
   B) has probability 1 - \( \beta \) of occurring.  
   C) has probability \( \alpha \) of occurring.  
   D) is a correct decision

5) At one school, the average amount of time that ninth-graders spend watching television each week is 21.6 hours. The principal introduces a campaign to encourage the students to watch less television. One year later, the principal wants to perform a significance test to determine whether the average amount of time spent watching television per week has decreased from the previous mean of 21.6 hours. Which type of the significance test should be used?
   A) Left-tailed  
   B) Right-tailed  
   C) Middle-tailed  
   D) Two-tailed  
   E) Neither

6) 410 people were asked if they were satisfied with their jobs. 37% said they were. It is wished to test the following null hypothesis: Ho: \( p = 0.3 \). Find the test statistic.
   A) 4.125  
   B) 0.037  
   C) 0.153  
   D) 2.612  
   E) 3.093

7) Given Ha: \( p \neq p_0 \). What is the P-value if the test statistics is calculated to be \( z = 1.08 \)?
   A) 0.28  
   B) 0.58  
   C) 0.11  
   D) 0.05  
   E) 0.22

8) An article in a journal reports that 34% of American fathers take no responsibility for child care. A researcher claims that the figure is higher for fathers in the town of Cheraw. A random sample of 233 fathers from Cheraw yielded 96 who did not help with child care. Do the data provide sufficient evidence to conclude that in Littleton the proportion is higher than 0.34? Use a 0.05 significance level.
   Ho: \( p = 0.34 \), Ha: \( p > 0.34 \); \( \alpha = 0.05 \). Test statistic: \( z = 2.32 \). P-Value = 0.0102. State your conclusion in terms of the null hypothesis.
   A) Do not reject Ho.  
   B) Do not reject Ha.  
   C) Reject \( H_{0.34} \).  
   D) Reject Ho.  
   E) Accept Ho.
9) From the statistics given below, find the value of the point estimate for the difference in proportions
\[ n_1 = 216, \ x_1 = 76, \ n_2 = 186, \ x_2 = 99 \]
A) 0.392  B) 0.180  C) 0.435  D) 0.308  E) 0.218

10) The U.S. Department of Labor and Statistics wanted to compare the results of an unemployment program for the past two months in the U.S. Suppose the proportion of the unemployed two months ago is \( p_2 \) and the proportion of the unemployed one month ago is \( p_1 \). A study found a 99% confidence interval for \( p_2 - p_1 \) is (-0.0012, 0.003). Give an interpretation of this confidence interval.
A) We are 99% confident that the proportion of the unemployed one month ago is between 0.12% less and 0.3% more than the proportion of the unemployed two months ago.
B) We are 99% confident that the proportion of the unemployed two months ago is between 0.12% less and 0.3% more than the proportion of the unemployed one month ago.
C) We know that 99% of the unemployed two months ago is between 0.12% less and 0.3% more than the unemployed one month ago.
D) We know that 99% of all random samples done on the population will show that the proportion of the unemployed two months ago is between 0.12% less and 0.3% more than the proportion of the unemployed one month ago.
E) We know that 99% of the unemployed one month ago is between 0.12% less and 0.3% more than the unemployed two months ago.

11) A two-sided significance test for two population proportions is to be performed using the P-value approach. Ho: \( p_1 - p_2 = 0 \), Ha: \( p_1 - p_2 \neq 0 \). Use the given sample data to find the P-value for the significance test. Give an interpretation of the P-value. \( n_1 = 200, \ \hat{p}_1 = 0.10, \ n_2 = 200, \ \hat{p}_2 = 0.08 \).
A) P-value = 0.2119; If there is no difference in the proportions, there is about a 21.19% chance of seeing the observed difference or larger by natural sampling variation.
B) P-value = 0.4238; There is about a 42.38% chance that the two proportions are equal.
C) P-value = 0.484; If there is a difference in the proportions, there is a 48.4% chance of seeing the observed difference by natural sampling variation.
D) P-value = 0.484; If there is no difference in the proportions, there is about a 48.4% chance of seeing the observed difference or larger by natural sampling variation.
E) P-value = 0.2119; There is about a 21.19% chance that the two proportions are equal.

12) A researcher is interested in the academic performance differences between individuals using an optimistic versus a pessimistic approach to their studies. If the researcher fails to find a significant difference, when in fact one exists in the population:
A) the null hypothesis was correctly accepted.
B) the null hypothesis was correctly rejected.
C) the research hypothesis was correctly accepted.
D) a Type 2 error has been made.
E) a Type 1 error has been made.

13) A researcher wishes to determine whether people with high blood pressure can reduce their blood pressure by following a particular diet. Use the sample data below to construct a 99% confidence interval for \( \mu_1 - \mu_2 \) where \( \mu_1 \) and \( \mu_2 \) represent the means for the treatment group and the control group respectively.
Treatment Group: \( n = 85, \ \bar{x} = 189.1, \ s = 38.7 \)
Control Group: \( n = 75, \ \bar{x} = 203.7, \ s = 39.2 \)
A) (-30.5, 1.3)  B) (-29.0, -0.2)  C) (-1.3, 30.5)  D) (-1.5, 30.7)  E) (-26.8, -2.4)
14) Refer to **Problem 13**. Assume that the assumptions and conditions for inference with a two-sample t-test are met. Test the claim that the treatment population mean $\mu_1$ is smaller than the control population mean $\mu_2$. Test the claim using a significance level of 0.01. State your conclusion.

- A) Reject $H_0$.
- B) Reject $H_a$.
- C) Do not reject $H_0$.
- D) Do not reject $H_a$.
- E) The control group should be changed.

15) One hundred sixty students who were majoring in either math or English were asked a test question. The researcher recorded whether they answered the question correctly. The response and the major are independent. The results are shown in the table.

<table>
<thead>
<tr>
<th></th>
<th>Accuracy</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Correct</td>
<td>Incorrect</td>
</tr>
<tr>
<td>Math</td>
<td>27</td>
<td>53</td>
</tr>
<tr>
<td>English</td>
<td>43</td>
<td>37</td>
</tr>
</tbody>
</table>

Calculate the 98% confidence interval for $(p_{\text{math}} - p_{\text{English}})$

- A) $(.352, .463)$
- B) $(-.703, -.352)$
- C) $(-.409, -.703)$
- D) $(.503, .708)$
- E) $(-.323, -.077)$

16) The central limit theorem states that the sampling distribution of $\bar{x}_1 - \bar{x}_2$ is (approximately) normal.

- A) when at least one of the sample sizes is greater than or equal to 30.
- B) when the total number sampled is greater than or equal to 30.
- C) when either one of the sample sizes is greater than or equal to 30.
- D) regardless of both of the sample sizes.
- E) when both of the sample sizes are greater than or equal to 30.

17) Doctors estimate that 53% of college students go to bed before midnight. If they survey 5 students at random, find the probability that at most 4 of them are going to bed before midnight.

- A) $0.958$
- B) $0.0418$
- C) $0.460$
- D) $0.185$
- E) $0.975$

18) In a poll of 278 voters in a certain city, 67% said that they backed a bill which would limit growth and development in their city. The margin of error in the poll was reported as 5.5 percentage points (rounded, 95% confidence level, z=1.96). Which statement is correct?

- A) The reported margin of error is consistent with the sample size.
- B) There is not enough information to determine the margin of error.
- C) For the given sample size, the margin of error should be much larger than stated.
- D) The sample size is too small to achieve a margin of error less than 10%.
- E) For the given sample size, the margin of error should be much smaller than stated.

19) 350 randomly selected students took the statistics final. If the margin of error for a 99% confidence interval is 4.45, and the sample mean is 86 (with the standard deviation 12.2), identify the correct lower limit of a 98% confidence interval for the mean score of all students.

- A) 84.32
- B) 89.2
- C) **84.48**
- D) 73.86
- E) 83.98

20) Assume that the weights of newborn babies are normally distributed with a mean of 6 pounds and a standard deviation of 1.2 pounds. If 20 newborn babies are randomly selected from this population, find the z-score of an average weight of $\bar{x} = 6.7$ pounds.

- A) $-1.667$
- B) **2.608**
- C) 2.61
- D) 0.58
- E) -2.33
TRUE/FALSE.

21) If the p-value of the test statistic is smaller than $\alpha$, conclude ‘Reject Ho’. **TRUE**

22) For a given level of significance, increasing the sample size will always decrease the probability of committing a Type I error. **TRUE**

23) The actual P-value is less informative than reporting the result of the test as “Reject Ho” versus “Do Not Reject Ho”. **FALSE**

24) If the P-value of the test statistic was found to be 0.9 for testing $H_0: p = 0.8$ against $H_a: p < 0.8$, then the correct conclusion is ‘there is strong evidence that $p < 0.8’$. **FALSE**

25) The goal of the hypothesis test is to prove the null hypothesis. **FALSE**

26) A hypothesis test is significant when the P-value is greater than $\beta$ (=P(type II error). **FALSE**

27) When the confidence intervals for $\mu_1 - \mu_2$ contains zero, it is possible to predict which population mean is equal to zero. **FALSE**

28) However small the difference between two population proportions, for sufficiently large sample sizes, the null hypothesis of equal population proportions is likely to be rejected. **TRUE**

29) If a test rejects $H_0: \mu_1 = \mu_2$, then the confidence interval for $(\mu_1 - \mu_2)$ having the same error probability does not contain zero. **TRUE**

30) For two estimates from independent samples, the standard error is $se(\text{estimate 1} - \text{estimate 2}) = \sqrt{[se(\text{estimate 1})]^2 - [se(\text{estimate 2})]^2}$. **FALSE**