1. Mark the following statement as correct or incorrect.

"Statistical significance is the same as practical significance."

a.) This statement is correct.  
b.) This statement is incorrect.

2. For the null hypothesis that there is no difference between men and women's voting habits, what would be the appropriate alternative hypothesis?

a.) $H_a: \hat{p}_m - \hat{p}_w > 0$  
b.) $H_a: \hat{p}_m - \hat{p}_w < 0$  
c.) $H_a: p_m - p_w > 0$  
d.) $H_a: p_m - p_w < 0$  
e.) $H_a: \mu_m - \mu_w < 0$

3. Is this an example of independent samples or dependent samples?

a.) Independent Samples  
b.) Dependent Samples
Questions 4 - 6 Is there a difference in the distance in how much younger and older people sway when they try to maintain their balance? Six elderly men and eight young men were asked to balance on a platform. The platform measured the amount of sway side to side the individuals had. Assume that these individuals were randomly selected.

4. Besides random sampling, what other assumption do you need to check?
   a.) That there are at least 15 successes and 15 failures in each group.
   b.) YN+NY is at least 30.
   c.) The boxplots for the data from the men and women have no outliers.
   d.) The boxplot of differences have no outliers.

5. If computing this problem by hand, what value of t would you use in the 95% confidence interval to compare the side to side sway for the two groups?
   a.) 2.306
   b.) 2.665
   c.) 2.447
   d.) 2.571
   e.) 1.96
   
   \[ df = 5 \]
   Take the smallest sample size and subtract one.

6. Here is a row of Minitab output from this analysis. At alpha = 0.10, what conclusion can you make?

T-Test of difference = 0 (vs neq): T-Value = 1.92 P-Value = 0.083 DF = 10

   a.) We have evidence that the sample mean sway distance from side to side is different for the young and the elderly. \[ x \]
   b.) We do not have evidence that the sample mean sway distance from side to side is different for the young and the elderly.
   c.) We have evidence that the population mean sway distance from side to side is different for the young men and the elderly men.
   d.) We do not have evidence that the population mean sway distance from side to side is different for the young men and the elderly men.

\[ p-value < \alpha \]
\[ 0.083 < 0.10 \]

Rej. Ho
Evidence for Ha
**Questions 7 – 10** In 2012, the General Social Survey included a question that asked randomly selected participants if they thought that there should be paid leave for childcare for employed parents. Out of 576 men (group 1), 458 said yes and out of 665 women (group 2), 579 said yes. Below is the Minitab output.

<table>
<thead>
<tr>
<th>Sample</th>
<th>X</th>
<th>N</th>
<th>Sample p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>458</td>
<td>576</td>
<td>0.795339</td>
</tr>
<tr>
<td>2</td>
<td>579</td>
<td>665</td>
<td>0.870677</td>
</tr>
</tbody>
</table>

Difference = \( p(1) - p(2) \)

Estimate for difference: \(-0.075378\)

95% CI for difference: \((-0.117213, -0.033828)\)

7. What is the population proportion of women that feel that there should be paid leave for childcare for employed parents?
   a.) 0.795
   b.) 0.871
   c.) 0.836
   d.) Almost 0
   e.) Unknown value
   
   We did not ask every American woman, so this value is unknown.

8. What would be the value of the pooled proportion?
   a.) 0.795
   b.) 0.871
   c.) 0.836
   d.) Almost 0
   e.) -0.0755

\[
p = \frac{458 + 579}{576 + 665} = 0.836
\]

9. Based on the confidence interval, what would be the correct conclusion?

   We are 95% confident that the population proportion for the men ...
   a.) is between 0.034 to 0.117 less than for women
   b.) is between 0.034 to 0.117 more than for women
   c.) is between 0.034 less to 0.117 more than for women
   d.) is 0.117 and the population proportion is 0.034 for women
   e.) is 0.034 and the population proportion is 0.117 for women

10. Besides random sampling, what other assumptions are needed?
    a.) Population is Normally Distributed.
    b.) At least 15 observed success and 15 observed failures in each group.
    c.) Each sample sizes needs to be larger than 30.
    d.) a and b
    e.) a and c
11. For the following hypothesis statements, what would be the description of a Type II error?  
   Ho: \( \mu = 9 \) versus Ho: \( \mu \neq 9 \)  
   a. Rejecting Ho that \( \mu = 9 \) when \( \mu = 9 \)  
   b. Rejecting Ho that \( \mu = 9 \) when \( \mu \neq 9 \)  
   c. Failing to Reject Ho that \( \mu = 9 \) when \( \mu \neq 9 \)  
   d. Failing to Reject Ho that \( \mu = 9 \) when \( \mu = 9 \)  

   The error that occurs when we fail to reject Ho when Ho is False

12. Which of the following is equal to the level of significance (\( \alpha \))?  
   a.) The probability that the parameter is in the confidence interval  
   b.) The amount of bias in a statistic  
   c.) The probability of making a Type I error  
   d.) The probability of making a Type II error  
   c. by definition

**Questions 13 – 15** Is there a difference in the population mean number of text messages sent for male and female students at UF? Students at UF were randomly given a survey asking about their texting habits. The data is below. (Males is group 1 and Females are group 2)

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Females</td>
<td>95.699</td>
<td>143.61</td>
<td>163</td>
</tr>
<tr>
<td>Males</td>
<td>61.63</td>
<td>65.31</td>
<td>57</td>
</tr>
</tbody>
</table>

13. What is the point estimate of difference between the population mean number of texts between male and female students at UF?  
   a.) -34.069  
   b.) 34.069  
   c.) 2.76  
   d.) -2.76  
   e.) Unknown value  

14. What would be the correct alternative hypothesis?  
   a.) \( H_a: \bar{x}_m - \bar{x}_f \neq 0 \)  
   b.) \( H_a: \bar{x}_m - \bar{x}_f > 0 \)  
   c.) \( H_a: p_m - p_f > 0 \)  
   d.) \( H_a: H_m - H_f \neq 0 \)  
   e.) \( H_a: H_m - H_f < 0 \)  

15. If the p-value equals 0.0173, what statement can you make about the confidence interval for the difference in the population mean number of text messages?  
   a.) The 95% confidence interval would include 0.  
   b.) The 99% confidence interval would not include 0.  
   c.) The 95% confidence interval would not include 0.  
   d.) The 90% confidence interval would include 0.  
   a. p-value < .05  
   .0173 < .05  
   Fail to reject Ho  
   95% CI includes 0
16. Suppose that a study found that 14 out of 100 smokers (group 1) suffered from emphysema and 2 out of 120 non-smokers (group 2) suffered from emphysema. What is the value of the sample relative risk?

\[ RR = \frac{\frac{14}{100}}{\frac{2}{120}} = 8.4 \]

a.) 8.4  
b.) 7  
c.) 0.123  
d.) 1

17. A recent article in BMC Medicine entitled “Dairy Consumption and risk of type 2 diabetes: 3 cohorts of US adults and an updated meta-analysis” by Chen, et al, found the following 95% confidence interval for relative risk for eating one serving a day of yogurt (group 1) versus no serving of yogurt per day (group 2) in the onset of type 2 diabetes (0.75, 0.92). What conclusion can be made here?

We are 95% confident that . . .

a.) eating yogurt doesn’t affect the risk of getting Type 2 diabetes.

b.) eating yogurt does lower the risk of Type 2 diabetes.

c.) eating yogurt increases the risk of Type 2 diabetes.

d.) the population proportion of Americans that get Type II diabetes who eat yogurt is 0.75 more to 0.92 more than Americans who don’t eat yogurt each day.

e.) the population proportion of Americans that get Type II diabetes who don’t eat yogurt is 0.75 more to 0.92 more than Americans who do eat yogurt each day.

18. Which of the following questions is answered by a test of significance?

a.) Is the sample or experiment properly designed?

b.) Is the observed effect due to chance?

c.) Is the observed effect practically important?

19. Does just downloading a fitness app onto your phone lead to weight loss? Five people were randomly selected from the database of Americans that had downloaded the app. There data is below.

<table>
<thead>
<tr>
<th>Student</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Weight</td>
<td>200</td>
<td>191</td>
<td>180</td>
<td>150</td>
<td>147</td>
</tr>
<tr>
<td>Later Weight</td>
<td>201</td>
<td>193</td>
<td>175</td>
<td>147</td>
<td>147</td>
</tr>
</tbody>
</table>

Find a **99% confidence interval** for the population mean weight difference.

\[ \bar{x} = 1 \]
\[ s_x = 2.92 \]
\[ n = 5 \]
\[ \bar{x} = 4 \]
\[ t = 4.604 \]

\[ 1 \pm 4.604(2.92/\sqrt{5}) \]

\[ (-5.0, 7.0) \]
Questions 20 - 24 Determine what type of statistical test should be used to answer each of the questions below. (Each response has a unique corresponding question.)

a) One proportion
b) Comparing means of dependent samples
c) Comparing two independent means
d) Comparing two independent proportions
e) Comparing proportions of dependent samples

20. What proportion of Americans have a pet?

21. Is there a difference in the proportion of people that have pets that live in a rural area versus an urban area?

22. Is there a difference in the price of taking care of a cat versus a dog? One hundred dog owners and one hundred cat owners are asked to estimate the average month cost of their pet.

23. Do people tend to develop allergies to pets during their teenage years? One hundred people were asked at age 12 and at age 18 if they were allergic to cats.

24. Does the cost of owning an animal increase as the animal gets older? Long term pet owners were asked to estimate the cost of her puppy when the puppy is 1 year old versus ten years old.

Questions 25 – 26 A fitness consultant wants to determine the effect of stretching hamstring muscles on back pain. In a study, she has eight randomly selected individuals rate their level of lower back pain on a scale of 1 to 10. On this scale, a “10” is extreme pain and “0” is no pain at all. She then has them complete several hamstring stretching exercises every day for three weeks. At the end of that time, she has them rate their pain again on the same scale. The consultant was specifically interested in determining if the stretching program reduced pain. The consultant found the difference in pain levels, by taking the “before pain level” – the “after pain level”.

25. What is the parameter being estimated?
   a.) The sample proportion difference in pain before and after the stretching program.
   b.) The sample mean difference in pain before and after the stretching program.
   c.) The population mean difference in pain before and after the stretching program.
   d.) The population proportion difference in pain before and after the stretching program.

26. Suppose that the test statistic was 1.43, what would be the p-value?
   a.) p-value < 0.001
   b.) p-value between 0.010 and 0.005
   c.) p-value between 0.025 and 0.050
   d.) p-value between 0.050 and 0.100
   e.) p-value greater than 0.100
Questions 27 – 29 A company is comparing two voice-to-speech software programs – Version A and Version B. The two programs cost about the same, so they want to determine if there is a significant difference between the two programs. They test the two software programs on the same set of 1000 words. Below is a table of the correct and incorrect conversion for the words.

<table>
<thead>
<tr>
<th>Program A</th>
<th>Correct</th>
<th>Incorrect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correct</td>
<td>746</td>
<td>64</td>
</tr>
<tr>
<td>Incorrect</td>
<td>56</td>
<td>134</td>
</tr>
</tbody>
</table>

27. What is the sample proportion of words that program A got correct?
   a.) 0.134
   b.) 0.746
   c.) 0.802
   d.) 0.810
   e.) 0.880

\[ P = \frac{746 + 64}{746 + 64 + 56 + 134} = 0.81 \]

28. What is the test statistic for McNemar's Test?
   a.) 0.73 or -0.73
   b.) 1.96 or -1.96
   c.) 10.95 or -10.95
   d.) 20.63 or -20.63

\[ T5 = \frac{Y_N - N_Y}{\sqrt{Y_N + N_Y}} = \frac{64 - 56}{\sqrt{64 + 56}} = 0.73 \]

29. Besides random sampling, what other assumptions need to be met?
   a.) The number of words that were detected by one program, but not the other must be at least 30.
   b.) The number of words that were detected by one program, but not the other must be larger than 15.
   c.) The number of observed successes and failures for each program must be more than 30.
   d.) The number of observed successes and failures for each program must be more than 15.

30. A study was done on the amount of weight lost by people using weight watchers. For the alternative hypothesis to see if the population mean weight loss was greater than 0, they found the test statistic of 8.23. What does this mean?
   a.) The observed \( \bar{x}_d \) was 8.23 standard errors away from the hypothesized value of the population mean difference, 0.
   b.) It is impossible to get such a large test statistic.
   c.) Since the test statistic is so large, the p-value must also be very large.
   d.) The chance of seeing this sample mean was 1 out of 8.23 under the null hypothesis.

\[ \text{Definition of Test Statistic} \]

\[ \text{similar to Quiz 8 Questions} \]
31. Old Faithful is a very famous geyser located at Yellowstone National Park. The geyser is famous for being very predictable. The website for Yellowstone National Park states that the interval between eruptions for Old Faithful is typically about 90 minutes. Is this still correct? A researcher has collected times for the eruptions from Old Faithful. Below are the results.

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Mean</th>
<th>StDev</th>
<th>SE Mean</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interval</td>
<td>270</td>
<td>71.107</td>
<td>13.499</td>
<td>0.822</td>
<td>(69.490, 72.725)</td>
</tr>
</tbody>
</table>

Based on the 95% confidence interval, we know that for the hypotheses statements

\[ H_0: \mu = 90 \text{ versus } H_a: \mu \neq 90, \]

the p-value would be . . .

- Greater than 0.05
- Less than 0.05
- Equal to 0.05

Reject \( H_0 \)

\( p\)-value < \( \alpha \)

Questions 32 -33 To make soda-lime glass (glass used for bottles and windowpanes) a glass furnace must reach the temperature of 1675 degrees C. A company is monitoring the temperature of their glass furnace. They want the average temperature to be 1675 degrees. If it is too hot or too cold, the glass will not have the desired properties. During eight randomly selected times, the temperature of the glass furnace was taken. Below are the eight pouring temperatures.

1656 1668 1646 1577 1620 1589 1627 1506

32. What is the correct alternative hypothesis for this problem?
   a) Ha: \( \mu > 0 \)
   b) Ha: \( \mu \neq 0 \)
   c) Ha: \( \mu \neq 1675 \)
   d) Ha: \( \mu > 1675 \)

33. What is the test statistic?
   a) 3.43
   b) -3.43
   c) 86.34
   d) -0.43
   e) 0.43

\[ \bar{X} = 1611.125 \]

\[ S_X = 52.78 \]

\[ n = 8 \]

\[ T_S = \frac{\bar{X} - \mu_0}{S_X / \sqrt{n}} = \frac{1611.125 - 1675}{52.78 / \sqrt{8}} \]

\[ = -3.43 \]