EXAM 3  Test Form Code A

Instructions: This exam has two Parts I and II.

Part I includes 3 content questions, each of these content questions is followed by a question about memory aid usage.

- The content questions are worth 3 points and are typical exam questions.
- The memory aid usage questions (2, 4, and 6) are worth 0.20 points. Please answer honestly and to the best of your ability. There is no wrong answer.
- Question 7 is a question about how confident you were in the answers for the questions 1, 3, and 5. This question is worth 0.20 points. There is no wrong answer.
- Please answer all of these questions regardless of your choice of participating in the study. If you chose not to participate in the study, your responses will be removed.
- The last question in this part asks how many questions are on the exam. It is worth 2.2 points. There are 36 questions.

Part II includes 29 content questions.

- Each is worth 3 points.

The total points for the exam equals 99 points. One point will be given for bringing your ID to the exam as well as filling in your name, UF ID#, and test code on your scantron correctly.

Please select the best answer among the alternatives given.

You may write whatever you want on this test, but only the answers bubbled in the scantron sheet will be graded. You must submit the scantron sheet for you to receive a grade on the exam. You must show the copy of the exam to the test room proctors before turning in your scantron.

There are 36 total questions on the exam.
PART I

1. (3 points) \( (\alpha = 0.05) \) A researcher conducts a hypothesis test where he compares the scores of a random sample of students' SAT scores to a national average (500). He hopes to show that the students' mean score will be higher than average. He finds a \( p \)-value for his sample of .03. What type(s) of error could be made?
   
   - a.) Type I error: \( H_0 : \mu = 500 \)  \( \rightarrow \) \( H_1 : \mu > 500 \)  
   - b.) Type II error: Failed to \( \text{Reject } H_0 \) when \( H_0 \) is false 
   - c.) Both Type I and Type II 
   - d.) Neither Type I nor Type II error 

2. (0.20 points) For the above question, which statement best describes your experience?
   
   - a.) I used a memory aid and it was very helpful. 
   - b.) I used a memory aid and it was somewhat helpful. 
   - c.) I remembered a memory aid, but I did not use it. 
   - d.) I did not remember a memory aid, but I would have used it had I remembered it. 
   - e.) I did not remember a memory aid, and I would not have used it even if I had remembered it. 

3. (3 points) A scientist takes \( 15 \) random samples of drinking water and determines the amount of dissolved fluoride. The EPA states that the maximum allowable amount of fluoride is 4.0 mg/L. For the scientist to determine if the amount of allowable fluoride exceeds the allowed amount, what degrees of freedom would she use in her significance test?

   \[ n = 15 \]

   - a.) 16 
   - b.) 15 
   - c.) 14 
   - d.) Not enough information to determine the degrees of freedom. 
   - e.) There is enough information to determine, but the degrees of freedom is not 14, 15 or 16.
4. (0.20 points) For the above question, which statement best describes your experience?
   a.) I used a memory aid and it was very helpful.
   b.) I used a memory aid and it was somewhat helpful.
   c.) I remembered a memory aid, but I did not use it.
   d.) I did not remember a memory aid, but I would have used it had I remembered it.
   e.) I did not remember a memory aid, and I would not have used it even if I had remembered it.

5. (3 points) For doing a hypothesis test $H_0: \mu_1 - \mu_2 = 0$ vs. $H_a: \mu_1 - \mu_2 \neq 0$, which of the following would support rejecting the null hypothesis?
   a.) test statistic close to 0 — this would result in a big $p$-value, $\Rightarrow$ fail to reject $H_0$
   b.) $p$-value far from 0 — big $p$-value $\Rightarrow$ fail to reject $H_0$
   c.) a sample mean difference close to 0 — this would support $H_0$ $\Rightarrow$ fail to reject $H_0$
   d.) test statistic far from 0 in either direction — this would result in a small $p$-value, so evidence to reject $H_0$

6. (0.2 points) For the above question, which statement best describes your experience?
   a.) I used a memory aid and it was very helpful.
   b.) I used a memory aid and it was somewhat helpful.
   c.) I remembered a memory aid, but I did not use it.
   d.) I did not remember a memory aid, but I would have used it had I remembered it.
   e.) I did not remember a memory aid, and I would not have used it even if I had remembered it.

7. (0.2 points) How confident are you in your answers to the preceding odd-numbered questions (1,3,5)?
   a.) 0 – 12%
   b.) 13 – 40%
   c.) 41 – 60%
   d.) 60 – 87%
   e.) 88 – 100%

8. (2.2 points) How many questions are on this exam? (Hint: Flip to the last page.)
   a.) 4
   b.) 7
   c.) 36
   d.) 50
Part Two (Each questions is worth 3 points)

Questions 9 – 13 Is there any difference in the population proportion of Democrats (group 1) and Republicans (group 2) that said that they are very happy? Use the summarized data below from the General Social Survey from 2014 to answer the following questions. The General Social Survey uses a random selection method.

<table>
<thead>
<tr>
<th></th>
<th>DEMOCRAT (i)</th>
<th>REPUBLICAN (z)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VERY HAPPY</td>
<td>248 x₁</td>
<td>221 x₂</td>
</tr>
<tr>
<td>SAMPLE SIZE</td>
<td>784 n₁</td>
<td>543 n₂</td>
</tr>
</tbody>
</table>

9. What is the population proportion of Democrats that said that they were very happy?
   a.) Unknown  b.) 0.316  c.) 0.353  d.) 0.407

10. What is the value of the pooled proportion for the significance test under Ho: \( p₁ - p₂ = 0 \)?
    a.) Unknown  b.) 0.316  c.) 0.353  d.) 0.407

11. The test statistic equals -3.397. What would be the p-value for \( H₀: p₁ - p₂ = 0 \) and \( Hₐ: p₁ - p₂ ≠ 0 \)?
    a.) p-value is almost 0
    b.) p-value is almost 1
    c.) p-value is equal to 0.05
    d.) Can not be determined from given information.

12. For the 95% confidence interval for \( p₁ - p₂ \) is (-0.1433, -0.0381), finish the following sentence.
    "We are 95% confident that the population proportion of Democrats that said that they were very happy in 2014 is . . .
    a.) between 0.0381 to 0.1433.
    b.) between 0.0381 to 0.1433 different from the population proportion of Republicans.
    c.) between 0.0381 to 0.1433 greater than the population proportion of Republicans.
    d.) between 0.0381 to 0.1433 less than the population proportion of Republicans.

13. Besides random sampling, what other assumption needs to be met?
    a.) The number of people who are very happy and not very happy for both groups is at least 30.
    b.) The number of people who are very happy and not very happy for both groups is at least 15.
    c.) The number of people who changed their minds must be more than 30.
    d.) The data must come from a Normal distribution.
    e.) Both b and d.
14. For Ho: μ = 80 versus Ha: μ ≠ 80, the test statistic equals 1.5. The sample size is 10. What is the p-value?
   a.) p-value is less than 0.05
   b.) p-value is greater than 0.20
   c.) p-value is between 0.05 and 0.10
   d.) p-value is between 0.10 and 0.20

Questions 15 – 16 Thirty five randomly selected undergraduate students were asked to run in place for a minute. Their pulse rate before and after running was recorded for each participant. Use the Minitab output below to answer the following questions. (Difference = Pulsebefore – Pulseafter)

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>StDev</th>
<th>SE Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulsebefore</td>
<td>35</td>
<td>73.60</td>
<td>11.44</td>
<td>1.93</td>
</tr>
<tr>
<td>Pulseafter</td>
<td>35</td>
<td>92.51</td>
<td>18.94</td>
<td>3.20</td>
</tr>
<tr>
<td>Difference</td>
<td>35</td>
<td>-18.91</td>
<td>15.05</td>
<td>2.54</td>
</tr>
</tbody>
</table>

95% CI for mean difference: (-24.08, -13.74)  

15. Based on the information given above, what would be a correct conclusion?
   a.) The population mean pulse rate after was between 13.74 beats and 24.08 beats per second
   b.) The population mean pulse rate before was between 13.74 beats and 24.08 beats per second
   c.) The population mean pulse rates increased between 13.74 beats and 24.08 beats per second
   d.) The population mean pulse rates decreased between 13.74 beats and 24.08 beats per second

16. What would be the correct alternative hypothesis to test to see if the pulse rate has increased?
   a.) Ha: \( \bar{x}_d < 0 \)
   b.) Ha: \( \bar{x}_d > 0 \)
   c.) Ha: \( \mu_d > 0 \)
   d.) Ha: \( \mu_d < 0 \)

\[ H_0: \mu_d = 0 \]
\[ H_a: \mu_d < 0 \]
(Pulsebefore < PulseAfter)
17. What value in a 95% confidence interval for the population relative risk would show that there was no statistically significant difference in risk?

a.) \( p_o \)
b.) \( \mu_o \)
c.) \( p_1-p_2 \)
d.) 0

e.) 1 \rightarrow \# \, p_1=p_2 \), \( RR=\frac{p_1}{p_2}=1 \)

Questions 18 – 22 Determine what type of statistical test should be used to answer each of the questions below. (You will only use each response one time.)

a.) One Mean
   - \( \) Comparing means of dependent samples
   - \( \) Comparing two independent means
   - \( \) Comparing two independent proportions
   - \( \) Comparing proportions of dependent samples

18. Is there a difference in the number of undergraduate and graduate students that volunteer for a nonprofit in a week?

19. Do students change their volunteer habits as they go through school? The same 100 students were asked as freshman and then again as seniors how many hours they spent volunteering each week.

20. Do students change the type of volunteer activity as they go through school? The same 100 students were asked as freshman and then again as seniors if they volunteered in a medically related area or a non-medical related area.

21. How many hours do UF undergraduates volunteer per week?

22. One hundred students who were planning on entering the medical field and two hundred other students who were not planning on entering the medical field were asked how many hours they volunteered that week. Is there a difference in the number of volunteer hours between the students planning or not planning on entering a medical field?
Questions 23 – 26 In the Beginning of Semester Survey, students were asked how many hours a week they spent studying. Is there a difference between in state and out of state students?

(in state – out of state)

<table>
<thead>
<tr>
<th></th>
<th>IN STATE (GROUP 1)</th>
<th>OUT OF STATE (GROUP 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEAN</td>
<td>16.25</td>
<td>19.62</td>
</tr>
<tr>
<td>STANDARD DEVIATION</td>
<td>10.99</td>
<td>26.83</td>
</tr>
<tr>
<td>SAMPLE SIZE</td>
<td>316</td>
<td>53</td>
</tr>
</tbody>
</table>

23. What is the point estimate of the population mean difference in study time?
   a.) Unknown
   b.) -3.37
   c.) 3.37
   d.) -15.84
   e.) 15.84

\[
\bar{x}_1 - \bar{x}_2 = 16.25 - 19.62 = -3.37
\]

24. What is the standard error for the test statistic?
   a.) 0.736
   b.) 1.44
   c.) 1.96
   d.) 3.737
   e.) 7.32

\[
\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}} = \sqrt{\frac{10.99^2}{316} + \frac{26.83^2}{53}} = 3.737
\]

25. For a p-value of 0.3711 and α = 0.05, what decision would you make?
   a.) Reject Ho
   b.) Fail to Reject Ho
   c.) Reject Ho
   d.) Fail to Reject Ho

\[
p-value = 0.3711
\]

\[
\alpha = 0.05
\]

Fail to Reject Ho

26. What is the symbol of the parameter that should be estimated here?
   a.) μ
   b.) p
   c.) μ0
   d.) μ1−μ2 Parameter for two independent means
   e.) p1−p2

\[
p-value \leq \alpha
\]

Reject Ho

\[
p-value > \alpha
\]

Fail to Reject Ho
Questions 27 – 30 Folgers coffee is interested in increasing their market share. They ask 574 people what was the last brand of coffee they purchased before and after an ad campaign. Did the ad campaign make a difference?

<table>
<thead>
<tr>
<th>Purchase after the ad</th>
<th>Folgers</th>
<th>Other Brand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before the ad</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purchase</td>
<td>86</td>
<td>19</td>
</tr>
<tr>
<td>Before the ad</td>
<td>16</td>
<td>453</td>
</tr>
</tbody>
</table>

27. What is the sample proportion that purchased Folgers before the ad campaign?
   a.) 0.1498
   b.) 0.1777
   c.) 0.1829
   d.) 0.2108
   e.) Unknown

\[
\hat{p} = \frac{86 + 19}{86 + 19 + 16 + 453} = .1829
\]

28. What would be the alternative hypothesis?
   a.) Ha: \( p_1 \neq p_2 \)
   b.) Ha: \( p \neq 0 \)
   c.) Ha: \( \hat{p}_1 - \hat{p}_2 \neq 0 \)
   d.) Ha: \( \bar{x}_1 - \bar{x}_2 \neq 0 \)

Hypothesis statements are not about statistics

29. What is the Test Statistic for McNemar’s Test?
   a.) 1.96 or -1.96
   b.) -1.04 or 1.04
   c.) -15.81 or 15.81
   d.) -0.51 or 0.51
   e.) -0.09 or 0.09

\[
T \text{S} = \frac{N_+ - N_-}{\sqrt{N_+ + N_-}} = \frac{19 - 16}{\sqrt{19 + 16}} = .516 \approx -.51
\]

30. Besides random sampling, what other assumptions need to be met?
   a.) The number of people who drink Folgers coffee needs to be bigger than 15 for both groups.
   b.) The number of people who drink Folgers coffee needs to be bigger than 30 for both groups.
   c.) The number of people who switched is greater than or equal to 15.
   d.) The number of people who switched is greater than or equal to 30.
Questions 31 – 33 A teacher gave a pre-test on fractions to 5 fourth graders. She then had them complete a hands on activity on fractions, and complete a post test on fractions. The data is below.

<table>
<thead>
<tr>
<th></th>
<th>Student 1</th>
<th>Student 2</th>
<th>Student 3</th>
<th>Student 4</th>
<th>Student 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Test Score</td>
<td>96</td>
<td>81</td>
<td>79</td>
<td>82</td>
<td>76</td>
</tr>
<tr>
<td>Post Test Score</td>
<td>98</td>
<td>85</td>
<td>86</td>
<td>86</td>
<td>82</td>
</tr>
</tbody>
</table>

Difference = Pre test score – Post test score

-2 -4 -7 -4 -6

df = 5 – 1 = 4

31. What would be the value for t for a 95% confidence interval for finding the population mean difference in the scores?
   a.) 1.68
   b.) 2.262
   c.) 2.228
   d.) 3.169
   e.) 4.604

32. Find the test statistic for determining if the hands on activity improve the scores.
   a.) -5.28
   b.) -1.12
   c.) 1.96
   d.) 0.0062
   e.) 0.2957

\[ t = \frac{\bar{x}_d - \mu_0}{\frac{s_d}{\sqrt{n}}} \]

33. Is the assumption of normality likely to be met in this case?
   a.) Yes, the population of differences is likely to be normal since there are no outliers in the data set.
   b.) No, the population of differences is not likely to be normal since there are outliers in the data set.
   c.) Yes, \( YN + NY \) is at least 30.
   d.) No, \( YN + NY \) is not at least 30.
   e.) Yes, the population is always normally distributed with large sample sizes.
34. A 95% confidence interval for the population mean SAT verbal score was found from students at a particular college. The confidence interval was (574, 624). SAT verbal scores range from 200 to 800.

a.) The population mean SAT score is practically and statistically different from 625.
b.) The population mean SAT score is not practically or statistically different from 625.
c.) The population mean is practically, but not statistically different from 625.
d.) The population mean SAT score is statistically significantly different from 625, but not practically different from 625.

625 is not in the interval, so
It is stat. sign. diff. from 625.
However, this is only 1 pt. This is pretty close, so it is probably not practically different.

35. A researcher was interested in trying to determine if there was a difference in the population proportion of men and women who have never contacted their work supervisor about work issues when they weren't on the clock. Is the proportion for men different than for women? Using the data from the 2014 General Social Survey, the test statistic is equal to -1.82. What is the p-value?

a.) 0.0287
b.) 0.0344
c.) 0.0574
d.) 0.0688
e.) 0.9312

36. Do Americans work longer than the 40 hour work week? A random sample of 150 Americans was taken. The p-value was 0.5177. What does this tell us? (Significance level is 0.05).

a.) We have evidence that the population mean work week is larger than 40 hrs.
b.) We do not have evidence that the population mean work week is larger than 40 hrs.
c.) We have evidence that the sample mean work week is larger than 40 hrs.
d.) We do not have evidence that the sample mean work week is larger than 40 hrs.