BUS 310, Exam #1F, Part III, Spring 2019 Name KEY

Section _____

Instructions: This exam is in three parts: Part I is to be completed partly at home using the materials posted on Blackboard for Part I and you will answer questions about that work in class below; Part II is to be completed entirely in class using your computer. Part III is to be done entirely in class without your computer.

1. You may not use cell phones, and you may only access internet resources you are specifically directed to use: You may access your data file for Part I of the exam in Blackboard. You may access the data files posted to Blackboard for the Exam part II, but not for Part III.
2. It is a violation of the honor code to communicate with other students in or out of the class during the exam, by any means. Students whose exams show evidence of coordination will be reported.
3. Show all work to support your reasoning. Primarily, this can be done in Excel. Deletion of evidence of your logical process can result in loss of credit. A significant amount of credit goes toward process, reasoning and interpretation.
4. When rounding, do not over-round. In general, do not report dollar amounts beyond the penny. Means should be rounded to one digit more than the original data; standard deviations to two digits more. Do not report fractions rounded to single digit expressions: $\frac{131}{256} \neq \frac{1}{2}$, and do not round decimals or percents to a single digit: $0.57846 \ldots \neq 60\%$ *or* 0.6. Report a minimum of two digits, up to four, unless otherwise specified in the problem.
5. If a problem asks for an explanation, state the solution clearly, then interpret or explain in addition to stating the solution, not in place of. Explanations without solutions, just as solutions without explanations, will not be awarded full credit.

Part I: At Home

This part was completed at home. You can upload the Excel file for Part I to the Part I folder in Blackboard for use during the Exam period. However, this submission will not be graded in this location, it must be submitted to the "**to be graded** folder" to receive credit.

Part II: In Class (with computer)

Before completing Part III, complete Part II in class. Return the paper to your instructor and put away your computer. Then pick up Part III.

Part III: In Class (without computer)

1. You may use a handheld calculator for this portion of the exam. Any calculator is fine, as long as it is not on a device that connects to the Internet. That means, you may not use the calculator on your phone or smart watch. You may also not share calculators with another student taking the exam at the same time.
2. This is Exam F.
3. Answer the questions on the paper exam. Sign the honor code statement on the next page.
4. Turn in your paper copy of the exam to your instructor. Your instructor will attach this portion of the exam to the version of Part II that you submitted previously.

Honor Code Statement:

I, _____ (print your name), agree to abide by the George Mason Honor Code and Academic Integrity Pledge: *To promote a stronger sense of mutual responsibility, respect, trust, and fairness among all members of the George Mason University Community and with the desire for greater academic and personal achievement, I, a student member of the university community, pledge not to cheat, plagiarize, steal, or lie in matters related to academic work.* Furthermore, I have read and I agree to follow the guidelines laid out in the instructions for this exam above. I also agree not to participate in the efforts of other students to circumvent these guidelines, or to assist in their violations of the code, and will report such efforts in a timely manner.

_____ _____

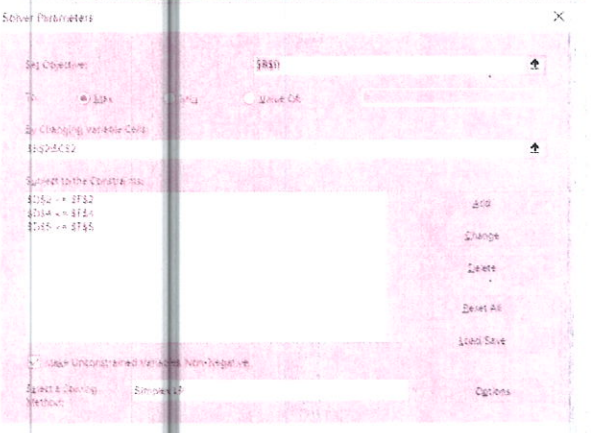
Student Signature and G# Today's Date

Part III:

Below you will find screenshots of the set-up for a linear programming problem on planting. Use this information to answer the questions that follow.

		Oats	Corn	Total	Inequality	Available/Goal
2	Acres	83.33333	16.66667	100	<=	100
4	Capital	18	36	2100	<=	2100
5	Labor	2	6	2133.333	<=	2400
7	Revenue	55	125	6666.667		
9	Profit	6933.333				

A farmer has 100 acres on which to plant oats or corn. Each acre of oats requires $18 capital and 2 hours of labor. Each acre of corn requires $36 capital and 6 hours of labor. Labor costs are $8 per hour. The farmer has $2100 available for capital and $2400 for labor. If the revenue is $55 from each acre of oats and $125 from each acre of corn, what planting combination will produce the greatest total profit? What is the maximum profit (revenue+leftover cash reserve +labor cash reserve)?



6 Variable Cells

Cell	Name	Final Value	Reduced Cost	Objective Coefficient	Allowable Increase	Allowable Decrease
B2	Acres Oats	83.33333333	0	22	20	0.5
C2	Acres Corn	16.66666667	0	41	1	20

12 Constraints

Cell	Name	Final Value	Shadow Price	Constraint R.H. Side	Allowable Increase	Allowable Decrease
D2	Acres Total	100	1	100	16.66666667	16.66666667
D4	Capital Total	2100	1.111111111	2100	150	300
D5	Labor Total	2133.333333	0	2400	1E+30	266.6666667

1. What is the final maximum profit for planting 83.3 acres of oats, and 16.7 acres of corn? (4 points)

$6933.33

2. What is the shadow price for the Labor constraint? What does it mean in the context of the problem? (6 points)

0

If you increase the value of the constraint there will be no change in profit (revenue).

3. What does it mean for a linear programming problem to be infeasible? (6 points)

all the constraints can't be satisfied at the same time

Below you will find a screenshot of the relevant Excel data for a difference of means problem. Use this information to answer the questions that follow.

	A	B	C	D
1	Pair	Male	Female	Difference: Male - Female
41	40	$29,752	$29,188	$564
42	41	$30,414	$30,095	$319
43	42	$25,795	$25,248	$547
44	43	$27,944	$27,673	$271
45	44	$26,661	$26,212	$449
46	45	$31,351	$30,783	$568
47	46	$29,303	$28,519	$784
48	47	$28,628	$28,644	-$16
49	48	$24,524	$24,114	$410
50	49	$27,217	$26,282	$935
51	50	$21,651	$21,153	$498
52	Mean	$27,241	$26,944	$297
53	St.Dev.	$2,536.45	$2,548.50	$ 297.87
54				
55	T-Score	Confidence Level		Standard Error
56	2.009575	95%		$ 42.13
57				

4. Is the data dependent or independent? Explain what leads you to this conclusion. (6 points)

dependent, paired data

5. Use the information provided to calculate the 95% confidence interval. (6 points)

mean ± t-score * st. error

(212.34, 381.66)

6. Does the interval you calculated support the claim that men make more than women? Why or why not? (6 points)

Yes, since the interval of differences does not contain zero

Use the data in the table below to answer the questions that follow.

Preference	Count	Proportion
R	181	45.25%
N	29	7.25%
L	190	47.50%

Z-Scores	Confidence Levels
1.150	75%
1.282	80%
1.645	90%
1.960	95%
2.576	99%

$n = 181 + 29 + 190 = 400$

$st.error = \sqrt{\frac{p(1-p)}{n}} =$

0.024969

7. Use the data provided to find the margin of error for the 80% confidence interval for those that prefer L. (5 points)

0.0320

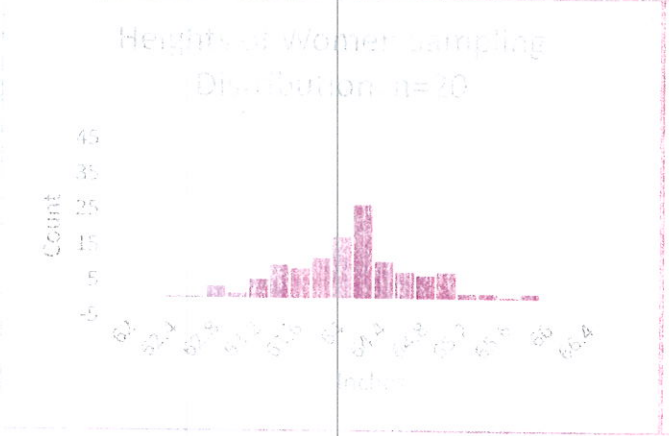
8. Use the data provided to find the margin of error for the 95% confidence interval for those that prefer L. (5 points)

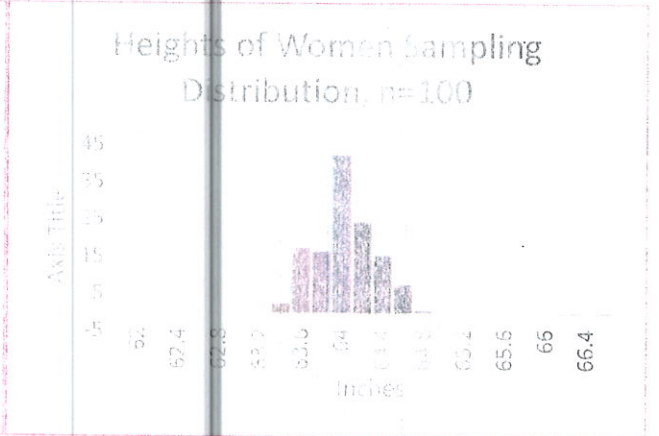
0.0489

9. What do you notice about the margin of error as the confidence level increases? (5 points)

it gets wider / larger

Use the information below to answer the questions that follow.





Sample Size	Standard Error	Mean
n=20	0.6658	64.05
n=100	0.2924	64.03
n=1	3.1	64

10. Explain how the information above supports the claims of the Central Limit Theorem. Be as thorough as possible. (6 points)

The mean centers on the true mean.
The standard error gets smaller as the sample size increases according to the formula $\approx \frac{\sigma}{\sqrt{n}}$

11. Describe a scenario is which a stratified sample would be a more appropriate choice than a simple random sample. (6 points)

in order to reduce the risk that the sample will not be representative in a particular variable

12. What is a response error? How does it produce excess bias in a sample? (6 points)

any response that is incorrect or missing
for instance, missing responses might tend to be of a particular kind and thus skew results

13. Why does asking poor questions lead to inaccurate responses? (5 points)

misunderstandings could lead people to answer the question inaccurately.

14. What conditions should be met to substitute a z-score in a confidence interval for means instead of a t-score? (6 points)

normally distributed
$n \geq 40$
Standard deviation of population is known

15. Write the Excel formula to find t-score for an 99.9% confidence interval. (5 points)

$1 - 0.999 = 0.001 =$ Alpha $\quad \alpha/2 = .0005$

Sample size.

$=$ T.INV.RT (.0005, N-1)

16. What assumptions are made when using a two-sample pooled t-confidence interval? (4 points)

independent or unpaired data
equal variances

Standard errors: $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$ $\quad \sigma_{\hat{p}} = \sqrt{\frac{p(1-p)}{n}}$ $\quad s_{pooled} = \sqrt{\frac{(n_1-1)s_1^2+(n_2-1)s_2^2}{n_1+n_2-2}}$

$$s_{x_1-x_2} = s_{pooled}\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}$$

Sample sizes: $n > \hat{p}(1-\hat{p})\left(\frac{z_{\alpha/2}}{E}\right)^2$ $\quad n > \left(\frac{z_{\alpha/2}\sigma}{E}\right)^2$ $\quad m = n = \frac{4z_{\alpha/2}^2(\sigma_1^2+\sigma_2^2)}{w^2}$

Confidence intervals:

One sample: $\bar{x} \pm t_{\alpha/2,n-1}\frac{s}{\sqrt{n}}$ $\quad \hat{p} \pm z_{\alpha/2}\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$

Two samples (independent): $(\bar{x}_1 - \bar{x}_2) \pm t_{\alpha/2,n-1}\sqrt{\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}}$ $\quad (\hat{p}_1 - \hat{p}_2) - z_{\alpha/2}\sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1}+\frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$