BUS 310, Exam #2A, Part II, 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.
2. Be sure you are using the data file that matches the exam version you are given.
3. 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.
4. 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.
5. 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.
6. 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

1. Use the work done at home to answer the Part I questions.
2. Open the file from the in-class portion of the final posted on Blackboard that corresponds to the version of the exam you have. This is Exam A.
3. Answer the questions corresponding to the data file, and any additional calculation in Excel required. Be sure to sign the honor code statement on the next page.
4. When you have finished answering questions on the exam, and all your answers have been recorded on the paper test for grading, upload **both** the take home Excel file **and** the in-class Excel file to the same in-class Exam folder in Blackboard for grading. Only those files submitted to the Submission/To-Be-Graded Folder will be graded. (If in doubt, put all work in one Excel file.)
5. Turn in your paper copy of the exam to your instructor.

6. Put away your computer and pick up Part III. For this part of the exam, you will only be allowed to use a four-function or scientific calculator that is not connectable to the Internet. You may not use the calculator on your phone. You may not share a calculator with someone else taking this portion of the exam at the same time.

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 I:

The following questions refer to problem #1 from Part I:

1. State your hypotheses, test statistic and p-value for your two-sample t-test. Is there sufficient evidence that study hours and GPA affect each other? (10 points)

$H_0: \mu_1 = \mu_2$

$H_a: \mu_1 \neq \mu_2$

$t = -3.5107$

p-value = $0.000677 < 0.05$ reject null

There is sufficient evidence to think GPA class does affect # of hours studied.

2. Is there a positive or negative correlation in your regression model? Is this surprising or expected? (6 points)

negative

it suggests higher GPA students study less

it's not expected, but it can be explained

the relationship is also weak.

3. How does your p-value for your t-sample t-test compare to the p-value for your regression model? Why do you think this is the case? (6 points)

they are the same

assumptions like equal variance are similar

The following questions refer to problem #2 from Part I:

4. State the null and alternative hypotheses, the test statistic and p-value from your ANOVA test. Is there sufficient evidence to support the claim that heating type influences the cost of heating? (10 points)

H_0: all means the same $\mu_i = \mu_j \ \forall i, j$

H_a: at least one mean differs

$F = 1.579$

p-value = $0.215 > 0.05$

fail to reject null

There is not sufficient evidence to think heating type influences the cost of heating

5. Does your boxplot appear to support the assumption of approximately equal variances? Explain. (6 points)

they are somewhat similar but one is nearly twice the size of the other

The following questions refer to problem #3 from Part I:

6. After eliminating all unnecessary variables, state your final regression equation and R^2 value. (8 points)

$$Y = 394,299.4x_1 + 876,039.9x_2$$

x_1: Top10s; x_2: wins

$$R^2 = 0.979$$

7. Use the regression equation you found to predict the earning of someone whose age is 41, has played 20 events and 82 rounds, made 18 cuts, 6 Top-10s and one win. If the variable does not appear in your model, ignore it. (6 points)

3,241,836.47

8. Do any of the variables appear to have a negative correlation with earnings? Is this surprising? Did any survive in the final model? Explain. (6 points)

yes, but they appear to be weak relationships influenced by one extremely influential point none survived

9. Based on the scatterplots, does the model appear to have any outliers? Are they influential? Why or why not? (6 points)

based on the regression, there are no extreme outliers, but there does appear to be one value which is very influential

10. Do any of the scatterplots appear to be strongly nonlinear (curved)? Explain. (6 points)

no

Some of the graphs are just a mess

The following questions refer to problem #4 from Part I:

11. For your χ^2-test, state the null and alternative hypotheses, test statistic if available, and the p-value. Is there sufficient evidence to think that Dwell Type and Neighborhood are dependent? (10 points)

Ho: the variables neighborhood & dwell type are independent

Ha: The variables are dependent

$\chi^2 = 0.3149$

p-value = 0.9888 > 0.05

fail to reject null.

The variables are independent

Calculations in Excel: (1) 30 points, (2) 20 points, (3) 40 points, (4) 15 points.

Part II:

12. Using the data on sheet #12 to find the proportion of customers that live alone. The company believes that fewer than 20% of their customers live alone. Conduct a hypothesis test of proportions to determine if this data provides sufficient evidence to support that claim? State your null and alternative hypotheses, your test statistic and p-value. Summarize the conclusion so that a lay person can understand it. (10 points)

Ho: $p = 20\%$

Ha: $p < 20\%$

$Z = -2.2387$

p-value = 0.01258 < 0.05

reject null

There is sufficient evidence to support the claim that fewer than 20% live alone

13. Using the data on sheet #13, create a table of correlations to find the one variable that has the strongest relationship to Total Revenue. State the correlation and the variable. (8 points)

answers may vary
highest values are EBITDA, Current Liabilities, Total Liabilities, Total Assets, Current Assets
but some of these may be collinear

14. Using the same data as above, find the regression equation that best models Total Revenue from the variable you selected above. (8 points)

answers may vary
after starting w/ top 3 variables & eliminating high p-values, I ended up w/

$$Y = 2.689X$$

revenue Current Liabilities

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

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

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

Confidence intervals:

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

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

Test statistics:

One sample: $z \text{ or } t = \frac{\bar{x}-\mu_0}{s/\sqrt{n}}$ $z = \frac{\hat{p}-p_0}{\sqrt{p_0(1-p_0)/n}}$

Two samples: dependent: $z \text{ or } t = \frac{\bar{d}_0-\delta}{\frac{s_d}{\sqrt{n}}}$

Independent: $z \text{ or } t = \frac{(\bar{x}_1-\bar{x}_2)-(\mu_1-\mu_2)}{\sqrt{\frac{s_1^2}{n_1}+\frac{s_2^2}{n_2}}}$ $z = \frac{(\hat{p}_1-\hat{p}_2)-(p_1-p_2)}{\sqrt{\frac{p_1(1-p_1)}{n_1}+\frac{p_2(1-p_2)}{n_2}}}$

Degrees of freedom (two samples, unpooled) $\nu = \frac{\left(\frac{s_1^2}{m}+\frac{s_2^2}{n}\right)^2}{\frac{\left(\frac{s_1^2}{m}\right)^2}{m-1}+\frac{\left(\frac{s_2^2}{n}\right)^2}{n-1}}$

χ^2Tests: $\chi^2 = \sum_{all\ cells}\frac{(obs-\exp)^2}{exp}$

ANOVA: $MSE = \frac{\left(\sum_{j=1}^{J} n_j(\bar{Y}_j-\bar{\bar{Y}})^2\right)}{J-1}$ $MSS = \sum_{j=1}^{J}\frac{(n_j-1)s_j^2}{n-J}$ $F = \frac{MSE}{MSS}$

Upload your completed Excel **files (plural!)** to the Exam #2 submission box in Blackboard and submit your completed paper exam to your instructor. You may not modify anything once the exam is submitted. Put away your computer and pick up the final portion of the exam.