BUS 310, Exam #1B, 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 B.
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. Write the constraints for your mining model. Label each one for what it represents. (6 points)

$2x + 10y \geq 80$ Anthracite
$4x + 5y \geq 60$ Ordinary } Coal Type
$7x + 5y \geq 75$ Bituminous

2. What is objective function for your model, and what is the minimum cost for filling the order? Write the equation and explain the meaning of all variables in the model. (6 points)

$150x + 200y = \text{Cost} = \$2333.33$

x: days at Mine #1
y: Days at Mine #2

3. How many days must each mine be run to fill the given order? (6 points)

Mine #1: $x = 6.67$ days
Mine #2: $y = 6.67$ days

4. State the shadow price for the regular coal constraint. (4 points)

36.67

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

5. Report the mean and standard deviation of your simple random sample and systematic sample of weight (2A). Label each value. (10 points)

Simple random
mean = 13.49
st.dev = 2.046

Systematic
mean = 14.27
st.dev = 2.659

answers will vary but should be in the same ballpark

6. State the 95% confidence interval for the cluster sample, and state the final sample size. Interpret the meaning in the context of the problem. (2B) (8 points)

answers will vary

(34.7, 58.4)

We are 95% confident that the true mean age is between 34.7 and 58.4.

7. Report your stratified sample confidence interval for debt, and the simple random sample. Do both intervals contain the true mean of the data set? Explain. (2C) (9 points)

Stratified (2,700.06, 4,181.78)
Simple random (3,169.87, 4,479.60)

answers will vary

true mean $ 3797.48 yes, in interval

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

8. Report the 99% confidence interval for the difference of means. Explain why the data is independent. (10 points)

(−$16.47, $35.04)

independent because data is not paired.

Calculations in Excel: (1) 25 points, (2) 30 points, (3) 20 points.

Part II:

9. A 95% confidence interval is calculated from a sample size of 83, and it is found to be (56.9, 73.2), for the mean speed in miles per hour on a certain road in the US. What is the point estimate at the center of this interval? What is the standard deviation of the sample from which it was drawn? [Hint: use the confidence interval formula at the end of the exam to solve for σ.] (10 points)

mean = 65.05

St. dev = 37.3

10. Calculate the probabilities associated with the following z and t values. Round each value to 4 decimal places. (4 points each)
    a. $P(z < -0.98)$ 0.1635
    b. $P(z \geq 1.72)$ 0.0427
    c. $P(t > 2.9, df = 25)$ 0.0038
    d. $P(t \leq -1.3 \text{ or } t \geq 1.3, df = 310)$ 0.1946

Column Labels				
Row Labels	East	South	West	Grand Total
Hourly	137	92	146	375
Salaried	140	115	226	481
Grand Total	**277**	**207**	**372**	**856**

11. Using the data in the table above, calculate the proportion of people in the sample who receive an hourly wage. Use that proportion to determine the sample size needed to calculate a 95% confidence interval that has only a 3.5% margin of error. [Hint: Sample size formula is at the end of the exam.] (8 points)

772

12. Using the same table, calculate the following: (4 points each)
    a. The proportion of the sample that live in the south neighborhood.

207/856 = 0.242

    b. The standard error (sampling distribution standard deviation) for this situation.

0.01464

c. The 92% confidence interval for the proportion of the sample that lives in the south neighborhood.

(21.62%, 26.74%)

d. Interpret the interval in the context of the problem.

We are 92% confident that the true proportion of the population living in the South neighborhood is between 21.62% and 26.74%.

e. What are the conditions that need to be met to use the proportion confidence interval formula? [Hint: it assumes the normal approximation to the binomial distribution.] (4 points)

$npq \geq 10$

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

Upload your completed Excel **files (plural!)** to the Exam #1 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.