BUS 310, Exam #1B, Spring 2018

Name KEY

Section _____

**Instructions**: This exam is in two 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. 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. Be sure you are using the data file that matches the exam version you are given.

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.
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 correct 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. Enjoy your break!

Part I:

1. State the number of sheets the metalworking shop needs to cut of each type to achieve their minimum waste goal? (9 points)

0 for Pattern 1, 26 for Pattern 2, 27 for Pattern 3

2. What is objective function for your model, and what is the minimum waste solution? Write the equation and explain the meaning of all variables in the model. (12 points)

$0.34x_1 + 0.22x_2 + 0.27x_3 = 13.01$ (Waste)

$x_i$ is units of Pattern i That should be cut

3. Report your 98% confidence interval for the mean proportion of shipments with defectives as calculated from your stratified sample. Interpret the interval in the context of the problem. (12 points)

(41.86%, 58.34%)

We are 98% confident that the true mean proportion of defective shipments is between 41.86% and 58.34%

4. What do you notice about the intervals as the confidence level increases? (6 points)

they get wider

5. Report your 99% confidence interval for the cluster sample. (6 points)

(43.12%, 56.33%)

6. Report the 92% confidence interval for the difference of mean proportions of shipments with defectives. What can you say about what this interval means for how the proportion of defectives differs from the two months? (12 points)

(-5.09%, 15.52%)

they are not meaningfully different

Calculations in Excel: (1) 25 points, (2) 40 points, (3) 20 points.

Part II:

7. Explain the procedure for producing a systematic sample. Describe a situation where this would produce a representative sample, and one where it would not. (8 points)

initial random seed in first k individuals then add k to the seed until sampling frame is exhausted. If the data are pre-sorted, this would be a poor method; if sampling frame is pretty random. Then its okay.

8. Describe a situation where someone responding to a survey might be inclined to provide an untruthful response? What are some steps a researcher can take to reducing the number of untruthful responses? (12 points)

where information is sensitive and might get out or one answer may be more culturally preferred such as sex, drugs & religion as question topics. Ensure confidentiality and anonymity.

9. A 95% confidence interval is calculated from a sample size of 57, and it is found to be $(88.1, 99.8)$, for the mean speed in kilometers per hour on a certain road in Canada. What is the point estimate at the center of this interval? What is the standard deviation of the sample from which it was drawn? (12 points)

$\bar{x} = 93.95$

$S = 22.53$

10. Calculate the following $z$ and $t$ values: (4 points each)
    a. $P(z < -0.75)$

    0.2266

    b. $P(z \geq 1.82)$

    0.03438

    c. $P(t > 1.13, df = 5)$

    0.154876

    d. $P(t \leq -1.6, df = 48)$

    0.05808

11. Using the data in **310exam1data.xlsx** file, calculate the proportion of homeowners in the sample. Use that proportion to determine the sample size needed to calculate a 95% confidence interval that has only a 3% margin of error. (10 points)

1050

12. Using the data in the same data file, calculate the following: (5 points each)
    a. The proportion of users that prefer Chrome.

47.50%

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

1.77%

    c. The 95% confidence interval for the proportion of internet users that prefer Chrome.

(44.04%, 50.96%)

13. Using the same data file, you will find salaries from a sample of 76 graduates from Mid-West business schools, and 76 graduates from East Coast business schools, in thousands of dollars, five years out of school. The graduates are matched for major, GPA, industry and experience. Is the data dependent or independent? (8 points)

dependent

14. Use the data from the previous problem to calculate a confidence interval for the difference of means. Report the interval and explain whether it indicates there is (or is not) a difference in earning power between the two groups. (12 points)

(-2.45, 1.70)

there is no meaningful difference

15. Test the data graphically or by means of calculations to determine if the data meets the requirements for apply various two sample tests, i.e. are the standard deviations of the two groups similar enough to justify a pooled sample? Is the data approximately normal? Etc. Explain the tests you conducted and your conclusions. (10 points)

Answers will vary

See version A for more complete explanation

**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 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.