BUS 310, Exam #1B, Fall 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:

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

1. State the amount of money to be invested in each fund? (6 points)

Aggressive 54 shares * 162 = $8748
Mid Cap 0 shares * 12 = $0

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

$19.4x + 13.7y = 1047.6$ min risk

3. State the shadow price for the ~~midcap fund~~ average annual return and explain its meaning. (8 points)

0.647 for each dollar earned risk increases by 0.647

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

4. Report your 90% confidence interval for the previous income of Other Business majors. Interpret the interval in the context of the problem. (10 points)

($43,895, $60,985)

The true mean previous salary of other business majors is between $43,895 and $60,985 w/ 90% certainty.

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

they get wider

6. Describe your comparative boxplot and how it relates to your complete set of confidence intervals. Do they appear to agree (qualitatively)? Explain. (8 points)

Finance appears to have the highest upper bound as well as the biggest spread

answers will vary

7. Report your 99% confidence interval for the cluster sample for salary. Which ages did you use and how do you think that affected your data? Do you think this is a representative sample? Why or why not? (9 points)

($54,976, $57,472) 29, 32, 35

reasonably so. in middle of age range.

large clusters answers will vary

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

8. Report the 97% confidence interval for the difference of mean monthly expenses. What can you say about what this interval means for how the mean monthly expenses differs from the two marital states? (10 points)

($-413.44, $-327.67)

unmarried people have fewer expenses on average

Calculations in Excel: (1) 35 points, (2) 40 points, (3) 25 points.

Part II:

9. Explain the procedure for producing a systematic sample. Describe a situation where this would produce a representative sample, and one where it would not. (6 points)

A systematic sample of size N divides the dataset size K $\Rightarrow (K/N)$ to determine the step size. then an initial random value between 1 & (K/N) is selected and then add (K/N) until sampling frame is exhausted. - more representative when not sorted

10. Describe a situation where someone receiving a survey might not return it, and commit a nonresponse error? What are some steps a researcher can take to reducing the number of nonresponses? (6 points)

less likely if they have to use own stamp, if survey too long, busy - answers will vary.

keep short, postage paid, call rather than write

11. Describe what a voluntary response bias is. How can we manage voluntary response biases? Are they accounted for when we build confidence errors? (6 points)

when someone of a strong opinion is motivated to respond, but weaker opinions do not.

randomized samples. call rather than write. answers will vary

- no, such errors are <u>not</u> accounted for in confidence intervals

12. A 95% confidence interval is calculated from a sample size of 104, and it is found to be $(83.7, 119.3)$, 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? [Hint: use the confidence interval formula at the end of the exam to solve for σ.] (10 points)

point estimate 101.5
standard deviation 91.5

13. Calculate the probabilities associated with the following z and t values. Round each value to 4 decimal places. (4 points each)
    a. $P(z < -0.53)$

    0.2981

    b. $P(z \geq 0.72)$

    0.2358

    c. $P(t > 1.16, df = 2)$

    0.1829

    d. $P(t \leq -2.3, df = 130)$

    0.0115

14. Using the data in **310exam1data.xlsx** file, calculate the proportion of families in the sample with just one ~~child.~~ Use that proportion to determine the sample size needed to calculate a 95% confidence interval that has only a 1.5% margin of error. [Hint: Sample size formula is at the end of the exam.] (8 points)

mall trip

proportion 6.7%
Sample size 1062

15. Using the data in the same data file, calculate the following: (4 points each)
    a. Create a pivot table displaying Married and Rent/Own. Copy it below.

	Own	Rent	Total
No	147	429	576
Yes	231	193	424
Totals	378	622	1000

    b. The proportion of the sample that own their own home.

37.8%

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

0.0153

    d. The 95% confidence interval for the proportion of the sample that own their home.

(34.8%, 40.8%)

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

We are 95% confident that the true proportion is between 34.8% and 40.8% w/respect to homeownership

16. Using the data on sheet #16-17, you will find salaries from a sample of 50 pairs of graduates from East Coast business schools five years out of school. The graduates are matched for major, GPA, industry and experience. Is the data dependent or independent? (8 points)

dependent

"pairs" & "matched"

17. 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. Test your answer with a graph and describe your test. (10 points)

($1149, $4487)

there is a statistically significant diff in salaries.

box plot confirms men are a bit higher

18. 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.] (-2 points)

$npq \geq 10$

or

$np \geq 5$ & $nq \geq 5$

19. What conditions need to be satisfied to use a Student-t confidence interval? (8 points)

approximately normal
generally for small samples
Standard deviation of population unknown

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.