STAT 610 Final Exam: Section 660 - Fall 2018

NAME (Same as Learn) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

UNIVERSITY EMAIL \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

SIGNATURE \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

You have a maximum of 3 hours for this test. You will receive a penalty if you continue to work after the instructor says stop working. The 6 questions are worth 16 points each. In each question, parts (a), (b), (c), and (d) are equally valued at 4 points each. I will also give you 4 free points so that you may receive a 100% on the exam. Part (e) on each of the first five questions are optional, difficult, and worth 1 extra point on the exam (no partial credit). Do not do them unless you have finished the remainder of the test first. Thus, the maximum score on the exam is 105%.

GOOD LUCK!

1) A local charity is running a raffle where 12 tickets are to be sold – one per person. There are 3 prizes to be given out. If there are 7 males and 5 females that each buy one ticket, what is the probability that the males win:

1. all of the prizes?
2. exactly two of the prizes?
3. exactly one of the prizes?
4. none of the prizes?
5. What is the probability that the females win: (answer for parts a-d)

2) Chapter 8: A sample of n=64 randomly selected voters from Philadelphia were polled (asked) about a new city tax. 32 of 64 said they would vote “yes” on the new city tax. In order for the tax to be created, 2/3 of the voters need to vote yes in the upcoming election. Assume that z=2 is the cutoff value and α=.05.

1. Estimate p, the fraction of voters in the population favoring the new city tax.
2. Find the margin of error.
3. Find the 95% two-sided confidence interval.
4. Assume a 95% confidence level and a two-sided test, is it statistically possible that the vote is exactly 66.6% ?
5. If you could change your answer to part (a), what is the largest possible margin of error?

3) The LeBow website says “The average starting salary of a starting graduate student from LeBow is $60,000.” To support these claims, you are provided 25 salaries from the recent graduates of the masters program. The average salary of the 25 graduates’ salaries was $50,000 and the standard deviation of the 25 graduates’ salaries was $15,000. Is the LeBow website statistically correct?

1. Write the null and alternative hypothesis.
2. Calculate the standard error of the average salary.
3. Calculate the test-statistic or confidence interval. Use z=2 or a 95% confidence interval.
4. Reject or fail to reject the null hypothesis and explain why you came to your conclusion
5. Assuming the average salary and standard deviation are always the same, what is the closest sample size (the number closest to 25) that would change your conclusion in part (d).

4) Regression Math. Consider the output from a regression model with Yi=alpha+beta\*Xi+errori  where i=1,2,…,n is the observation i. Assume that zα=2.

|  |  |  |  |
| --- | --- | --- | --- |
| Coefficient | Estimate | Standard Error |  |
| alpha (intercept) | 0 | 2 |  |
| beta | -3 | 3 |  |
|  |  |  |  |
| R^2 | 0.09 |  |  |

1. Construct a 95% confidence interval for the coefficient Beta.
2. Is there evidence to support a linear relationship between Y and X? Use zα=2.
3. Predict Y when X=2
4. If the standard deviation of Y is 10, what is the standard deviation of X?
5. Perform the hypothesis test (in part b) using the test-statistic approach and a cutoff value of zα=2

5) Regression Explanation: The Y variable is the daily revenue of a product (in $1000s of dollars) and the X variables are daily Ad Spend ($1000s of dollars spent on ads), Summer Months (1 if June-July-August, 0 otherwise), and Price (in dollars). Running a regression gives the table below:

|  |  |  |  |
| --- | --- | --- | --- |
| Variable Name | Estimate | Standard Error | p-value |
| Intercept | 10 | 4 | 0.010 |
| Ad Spend | 0.9 | 0.10 | 0.000 |
| Summer Months | 20 | 5 | 0.010 |
| Price | -0.4 | 0.001 | 0.000 |
|  |  |  |  |
| R^2 = 80% | N=200 |  |  |

1. Write out the least-squares regression equation that predicts the daily revenue of the product and predict the daily revenue for a product sold in July at a price of $5 and with $10,000 spent on ads.
2. Using a sentence, interpret “-.4” in the table.
3. Interpret R^2 – write a sentence.
4. Interpret “10” in the table. Is 10 directly meaningful to a business person? Why or why not?
5. How much money should the company spend on advertising in July? Why?

6) ANOVA: Consider the following data on 3 marketing campaigns:

|  |  |  |
| --- | --- | --- |
| Marketing Campaign A | Marketing Campaign B | Marketing Campaign C |
| 1 | 0 | 2 |
| 0 | 2 | 2 |
| -1 |  | 2 |

Are the all the means of campaigns A, B, and C equal? Assume that the number in the table represent “engagement” as measured on social media for each campaign. Show all your work and assume a Fα = 5 is the cutoff value. I strongly suggest you follow the 6 step process we did in class.