ST511 Additional Practice Problems for Exam 2
Note: this does not include every concept we've covered!

1. Do car dealers charge women more than men for the same car? A producer for a consumer advocacy news magazine plans to explore this question. He will use information from the county tax collector's records for each auto purchase to randomly select 8 transactions in which a man had purchased a car. He will then searched the records for 8 women who purchased the same make and model of car and calculate the difference (female – male) in price paid.
    a. He plans to conduct a hypothesis test. What are the appropriate null and alternative hypotheses? Write a sentence that clearly communicates about the parameter of interest.
    b. He produced the following output from PROC POWER in SAS. Based on this output, interpret α, β, and power.

Fixed Scenario Elements	
Distribution	Normal
Method	Exact
Number of Sides	1
Null Mean	0
Alpha	0.01
Mean	500
Standard Deviation	600
Total Sample Size	8

Computed Power
Power
0.340

    c. If the standard deviation turns out to be much larger than what was hypothesized (as shown in the output), would the power of the test be larger or smaller than what is shown? Explain your reasoning.
    d. After collecting data, the producer finds a sample mean difference in price of 527.20 dollars with a standard deviation of 596 dollars. Conduct the appropriate hypothesis test at the 1% level. Be sure to include all relevant steps (besides Steps 1 & 2, which you addressed in part a). The p-value is 0.02; include both a well-labeled picture of the p-value as well as a sentence defining the p-value in the context of this problem.
    e. Use the sample data to calculate the 95% confidence interval. Note: the value of the multiplier is 2.365.
    f. Write a sentence interpreting the confidence interval in the context of this problem.
    g. Write a sentence interpreting the confidence level in the context of this problem.

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2. Many office "coffee stations" collect voluntary payments for the food consumed. Researchers performed an experiment to see whether the image of eyes watching would make employees more likely to pay. Each week on the cupboard behind the "honest box," they alternated pictures of flowers with pictures of eyes looking at the viewer. They measured the consumption of milk to approximate the amount of food consumed and recorded the contributions (in British pounds) each week per liter of milk. The table below summarizes their results.

	n	Mean	Standard Deviation
Flowers	5	0.181	0.067
Eyes	5	0.417	0.151
Difference (Flowers – Eyes)	5	-0.236	0.972

   a. Use this data to conduct the appropriate hypothesis test at the 10% level. Be sure to include all relevant steps. The p-value is 0.017; include both a well-labeled picture of the p-value as well as a sentence interpreting the p-value in the context of this problem.
   b. Suppose that $\beta = 0.15$. Write sentences interpreting α, β, and power in the context of this problem.
   c. Use the data to calculate the 90% confidence interval.
   d. Write a sentence interpreting the confidence interval in the context of this problem.
   e. Write a sentence interpreting the confidence level in the context of this problem.
   f. Based on the confidence interval and hypothesis test is there evidence to support the hypothesis from part (a)? Explain your reasoning.

3. There is a growing body of literature demonstrating that early exposure to frightening movies is associated with ongoing fright symptoms. As part of a class on media effects, college students were asked to write narrative accounts of their exposure to frightening movies before the age of 13, including if they had ongoing fright symptoms. The following table breaks down the results by sex:

Ongoing fright symptoms	Men	Women	Total
Yes	7	29	36
No	31	50	81
Total	38	79	117

   a. What is the observed value of the test statistic for this test?
   b. What is the appropriate null distribution for this test?
   c. What is the expected value of the test statistic under the null hypothesis? [Hint: use what we've learned about distributions in general and the Chi-square distribution specifically to help answer this question.]
   d. The p-value for this test is 0.0447. Would it be reasonable to conduct a multiple comparisons procedure? Explain your reasoning and conduct the procedure if appropriate.