BIA 654 Homework 2

1. (a) A utility company serves 50,000 households. As part of a survey of customer attitudes, they take a simple random sample (meaning drawing at random without replacement) of 750 of these households. The average number of television sets in the sample households turns out to be 1.86 and the standard deviation is 0.80. If possible, find a 95% confidence interval for the average number of television sets in all 50,000 households. If this isn't possible, explain why not.

   (b) Now, due to a budget constraint, the survey was conducted for only 18 households. The average number of television sets in the sample households turns out to be 1.86 and the standard deviation is 0.80. If possible, find a 95% confidence interval for the average number of television sets in all 50,000 households. If this isn't possible, explain why not.

2. (a) A cleaning business operates in the city of New York and works for the companies that lease office space in the city. The business contracts to clean office space in increments of 100 square feet. The business determines its margins by determining how long it takes a crew to clean 100 square feet of office space, and bases its rates on this information.

   Because the company is relatively new, it has to estimate the time it takes to clean a 100 square feet of office space. The company estimates that it should take 5.7 hours to clean 100 square feet. The company starts its business with this expectation and works for a week straight, collecting data as it proceeds in order to be certain that it is neither over- nor under-charging its clients.

   The data collected by the company can be seen in the data file attached (see Canvas Assignments folder). After collecting this data, the company wants to determine if the time originally estimated to clean 100 square feet of office space was reasonable. Check this by computing a 95 percent confidence interval.

   (*Hint*: Notice the sample size is relatively small. So, one has to justify the assumption of normal distribution, by examining (a) normal quantile plot and (b) a Goodness-of-fit test, e.g., Sharpiro-Wilk test. Perform these and present the result. Once this population normality assumption is met, then use a t-value with $n-1$ degrees of freedom.)

   (b) If the cleaning company from the previous question had a sample of 8 rather than a sample of 21 upon which to base its conclusions, what would be the boundaries of the 95 percent confidence interval for the estimate of the number of hours? Assume that the sample mean and standard deviation are equal to those calculated above. Assume also the number of hours are distributed according to a normal distribution.