

ADM 2304 -- ASSIGNMENT 1

Due Date: Sunday, February 3, 2019, at 11:30 pm

Instructions:

1. Your assignment should be uploaded to Brightspace in pdf format.
2. You may use Minitab or other software for any calculations. However, you must show your manual calculations when asked. You may paste your output onto your assignment to show your use of Minitab; however, this output does not replace any of the steps outlined below. This means that answers that are exclusively computer output may receive only one mark.
3. If you are performing a hypothesis test, make sure you state the hypotheses, the level of significance, the rejection region, the test statistic (and p-value, if requested), your decision (whether to reject or not to reject the null hypothesis), and a conclusion that answers the question posed or interprets the decision taken. These steps must be completed in addition to any computer output.
4. The data in the Minitab data files can be found in the file **Assign1Data.xlsx**.
5. Remember to include your integrity statement.

1. [10 marks]

The file **medinc.mtw** contains data on the median incomes (**medinc**) of census dissemination areas in Toronto.

- (a) Treating this set of data as the population, use Minitab to calculate the population mean and the population standard deviation for the **medinc** variable. Set aside all population information until parts (d) and (e).
- (b) Use Minitab (Calc Menu – Random Data – Sample from Columns) to draw twenty samples of size $n = 40$ from the Toronto **medinc** population. This procedure must be replicated twenty times (note that if you open up the same sampling dialog box each time from the menu, then you only have to replace the last destination column with the next one. In Minitab Express, you must specify the sample size each time but you do not need to specify the destination column). For each sample, use Minitab to calculate the sample mean. Note that when you can use the Descriptive Statistics function, you can specify the calculation of only the sample means of all your samples at once.
- (c) Copy the sample means into a new column and calculate the mean and standard deviation of your sample means.
- (d) The sampling distribution of the sample mean has an average equal to the population mean. Explain why the mean in part (c) may be different from the population mean in part (a).
- (e) How would you use the sample standard deviation in part (c) to estimate the population standard deviation in part (a)? How close is your estimate to the true value?

2. [10 marks]

A survey of 848 Americans found that 441 do not believe President Trump's assertion that there is a crisis on the Mexican-US border.

<https://www.independent.co.uk/news/world/americas/us-politics/trump-shutdown-latest-border-wall-poll-support-tweets-republicans-democrats-graham-pelosi-a8726206.html>

- (a) As a Democrat, you believe that a majority of Americans do not believe Trump's assertion of a crisis at the US-Mexican border and want to confirm your belief. Perform a test at the 0.05

- level of significance using a manual calculation of the appropriate (1-sided) confidence interval for the proportion of Americans who do not believe Trump. What is your conclusion?
- (b) Suppose you wanted to take a large enough sample size to enable you to conclude with the same level of significance that more than 50% of Americans do not believe Trump's assertion of a crisis. What sample size would be required?
 - (c) To test whether the proportion of college students who do not believe Trump exceeds 50%, you found 13 out of a small sample of 15 randomly selected college students who do not believe Trump. Perform the test, using the 0.05 level of significance and show how you would calculate the p-value for this test.

3. [10 marks]

The file **salaries.mtw** contains the starting salaries of a sample of new commerce graduates.

- (a) Test at the 0.05 level of significance whether there is sufficient evidence to conclude that the average starting salary of all new commerce grads exceeds \$50,000. Use the critical value approach and show **manually** how the t-statistic is calculated.
- (b) Now show how you would calculate the p-value for the result in part (a).
- (c) Calculate **manually** a 95% 1-sided confidence interval for the average salary.
- (d) Explain why the p-value and confidence interval do or do not support your conclusion in part (a).
- (e) Show a boxplot of the data and explain whether the assumptions of the test and confidence interval are reasonable.