

## ADM 2304 -- ASSIGNMENT 1

Due Date: Tuesday, February 9, 2016 at midnight.

### Instructions:

1. 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 Minitab output may receive only one mark.
2. If you are performing a hypothesis test, make sure you state the hypotheses, the level of significance, the decision rule in terms of the critical value, the test statistic or p-value, your decision (whether to reject or not to reject the null hypothesis), and your conclusion in managerial terms. These steps must be completed in addition to any Minitab output.
3. The data in the Minitab data files can be found in the file **Assign1Data.xls**.
4. Remember to include your integrity statement. Your assignment should be uploaded to Blackboard in pdf format.

1. [ 10 marks ]

In the 2015 federal election, 39.47% of the electorate voted for the Liberal party, 31.89% for the Conservative party, 19.71% for the NDP, 4.66% for the Bloc Quebecois, and 3.45% for the Green party.

- (a) A recent poll of 1500 respondents found that 28% support the Conservative party. Test whether this is sufficient evidence to conclude that the level of support has dropped since the election. Use the 5% level of significance and show your manual calculations.
- (b) Suppose you want to estimate the national level of support for the Conservatives using a 95% 2-sided confidence interval with a margin of error of  $\pm 1\%$ . What sample size would be required?
- (c) Suppose that, in a random sample of 17 University of Ottawa students, only 2 indicated a preference for the Conservatives. Test whether this is sufficient evidence to indicate that the level of support for the Conservatives among U of O students is lower than the 31.89% share of the popular vote in 2015. Use the .05 level of significance and show what probability you need to find to calculate the p-value for the result.

2. [ 10 marks ]

The file **bmisamples.mtw** contain the BMI of two samples of men and women. Two of the columns, **OWmale** and **OWfemale** code the BMI values as:

0 - if  $BMI \leq 25.4$  (these are considered “not overweight”);

1 - if  $BMI \geq 25.5$  (these are considered “overweight”).

- a. Test whether there is sufficient evidence to show that the proportion of overweight males (proportion of males who are overweight) is different than the proportion of overweight females in the population. Use the critical value approach and the 0.05 level of significance. Perform the test manually after using Minitab to summarize the data (*if you use descriptive statistics, the mean coded value in each sample is the sample proportion*).
- b. Explain how to find the p-value manually (indicate what probability needs to be found).
- c. Finally calculate manually the 95% 2-sided confidence interval for the true difference between the proportions of overweight males and overweight females.
- d. Explain how the results in parts b and c are consistent with your conclusion in part a.

3. [10 marks]

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

- (a) Treating this set of data as the population, use Minitab to calculate the population mean for the **medinc** variable. Set aside all population information until part e.
- (b) Examine a boxplot and histogram of the population data. Explain if the mean of a random sample of size 31 would have a normal distribution.
- (c) Now use Minitab (Calc Menu – Random Data – Sample from Columns) to draw twenty samples of size  $n = 31$  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). Using each sample, use Minitab to calculate a 95% confidence interval estimate for the population mean, assuming you do not know the population standard deviation (this interval estimation can be done in one operation on all twenty columns, but not in Minitab Express).
- (d) For the first sample, confirm the Minitab generated interval by calculating the interval manually. Display the sample data graphically and comment on whether the relevant assumption regarding the population distribution is warranted given your sample (state clearly the assumption needed to justify the interval estimation).
- (e) Count the number of intervals out of your twenty, that contain the true value of the population mean from part a.

4. [ 5 marks ]

The file above also contains a random sample of size 40 (**sampleA**) from the same population of median incomes. Suppose an earlier census found that the population mean of the Toronto median incomes was \$24000. Test at the 0.05 level of significance whether the sample constitutes sufficient evidence to show that the population mean of median incomes now exceeds \$24000. Show your manual calculations (you may use Minitab to summarize the sample data).

Explain whether your test satisfies the underlying assumptions, with reference to graphical evidence.