

## BUSINESS DATA ANALYSIS - A15 - TEST 3

NAME: \_\_\_\_\_

STUDENT ID: \_\_\_\_\_

### Instructions:

- Please show all of your work on the test paper. Partial marks will be awarded in the event of an incorrect answer. Conversely, if the incorrect method has been implemented, or no work is shown, then no marks will be awarded even though the answer is correct.
- Round all decimals to at least two digits after the decimal point.
- All unauthorized materials must be put away such as cell phones, listening devices, etc. Programmable calculators and formula sheets are not allowed.
- **Cheating is a serious academic offense. Anyone caught cheating or aiding in the act of cheating will be given a mark of zero for this assessment, and a note will be placed in his or her file.**

### Formulas:

$$\hat{p} - z_{\alpha/2}SE(\hat{p}) \leq \mu \leq \hat{p} + z_{\alpha/2}SE(\hat{p}), \quad SE(\hat{p}) = \sqrt{\frac{\hat{p}\hat{q}}{n}}$$

$$n = \frac{0.25z_{\alpha/2}^2}{ME^2}, \quad n = \frac{\hat{p}\hat{q}z_{\alpha/2}^2}{ME^2}$$

$$z = \frac{\hat{p}-p_0}{\sigma(\hat{p})}, \quad \sigma(\hat{p}) = \sqrt{\frac{p_0q_0}{n}}$$

$$\bar{X} = \frac{\sum x_i}{n}, \quad s^2 = \frac{\sum(x_i-\bar{X})^2}{n-1}, \quad \sigma_{\bar{X}} = \frac{\sigma}{\sqrt{n}}$$

$$\bar{X} - t_{n-1}\frac{s}{\sqrt{n}} \leq \mu \leq \bar{X} + t_{n-1}\frac{s}{\sqrt{n}}$$

$$t = \frac{\bar{X}-\mu_0}{s/\sqrt{n}}$$

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- (1) (3 marks) A national paper claims that 11% of 16-20 year olds have been victims of crime at least once. You work for a government agency and you have sampled 580 young people in the 16-20 age group. 49 people in your sample have been a victim of crime. Test  $H_0 : p = 0.11$  against  $H_1 : p < 0.11$  at  $\alpha = 0.05$  level of significance.
- What is the  $p$ -value.
  - Is the paper claim correct?

- (2) (4 marks) Stephanie's parents claim that she spends more than 120 minutes a day talking on her cell phone and less than 75 minutes per day on school work. Stephanie collected data for 20 days which shows mean cell phone talking time of 128 minutes with standard deviation of 15 minutes and mean school work time of 68 minutes with standard deviation of 20 minutes.
- a) For the cell phone time, test  $H_0 : \mu = 120$  against  $H_1 : \mu > 120$  at 5% level of significance. Are the parents correct in their claim Stephanie talks on her cell phone more than 120 minutes per day?
- b) For the school work time, test  $H_0 : \mu = 75$  against  $H_1 : \mu < 75$  at 5% level of significance. Are the parents correct in their claim Stephanie spends less than 75 minutes per day on school work?

- (3) (4 marks) A police report claims that speeding is a serious problem in the Airport Tunnel on HW13. Working for Transport Quebec you are assigned to investigate. In a sample of 2240 cars and trucks you have observed 1157 exceeded the speed limit.
- Construct a 95% confidence interval for the proportion of motorists who are speeding in the Airport Tunnel.
  - How large a sample you would have to study to estimate this proportion with maximum error of 0.01 and 95% confidence?

- (4) (3 marks) You are a safety inspector at the water filtration plant in the glorious city of Laval. You test lead levels 60 times a day to make a determination if the concentration of lead is lower than the safety level of  $10\text{mg/L}$ . Today the average of the 60 daily measurements is  $9.2\text{mg/L}$  with standard deviation of  $3.2\text{mg/L}$ .
- Construct a 99% percent confidence interval for the average lead concentration based on your sample.
  - Is the water safe to drink today?

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- (5) (4 marks) You are a buyer for a large grocery chain. The prices of Premium Quality Cocoa from eight different suppliers are as follows (\$/kg):

3.5	3.1	2.8	3.0
2.9	3.2	4.0	3.9

- a) Determine the sample mean and the sample standard deviation.  
b) Based on this sample determine a 95% confidence interval for the mean price of Cocoa beans.

- (6) (2 marks) According to a Wikipedia article the height of Canadian females, ages 18-44, is normally distributed with a mean of 165.4 cm and standard deviation of 7.9 cm.
- What is the probability that a Canadian female in this age group is at least 175 cm tall?
  - What is the probability that a random sample of 10 Canadian females in this age group would have a sample average height of 175 cm or more?