

**Homework #7 – Due Thursday, Nov. 9**  
COR1-GB.1305 – Statistics and Data Analysis

**Problem 1**

Consider (again) the time it takes for a call center to answer its calls. The call center claims that the mean time to answer a call is 3 minutes. In a random sample of 7 calls, the average time for the call center to answer was 191 seconds, with a sample standard deviation of 11.4 seconds.

- (a) What is the interpretation of the population mean,  $\mu$ ?
- (b) Provide the null and alternative hypotheses for testing the call center's claim.
- (c) Compute the test statistic.
- (d) Compute the  $p$ -value.
- (e) Test the call center's claim, at the 1% level of significance.

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**Problem 2**

Recall the study of 80 students who used a private tutor to help them improve their SAT scores. Their score on the mathematical section improved by an average of 11 points, with a sample standard deviation of 65 points.

- (a) Is there evidence, at the 5% level of significance, that tutoring affects the math score?
- (b) Compute the  $p$ -value corresponding to the hypothesis test. Interpret the  $p$ -value. What does it tell us about whether tutoring affects the math score?

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**Problem 3**

Use the data in `Market.CSV` to test whether IBM has a different mean return than the market. To do this, first use Calculator to create a variable called `IBMedge`, defined as `IBMRet - MarketReturn`.

- (a) What is the sample?
- (b) What is the population?
- (c) What is the interpretation of the population mean,  $\mu$ ?
- (d) Formulate the null and alternative hypotheses.
- (e) Run descriptive statistics for `IBMedge`. Use the information provided to compute the  $t$ -statistic and the  $p$ -value.

- (f) What is the result of the test, at the 5% level of significance?
- (g) Interpret the  $p$ -value in the context of the question as to whether IBM beats the market.
- (h) Now, let Minitab do the hypothesis test using *Stat*  $\Rightarrow$  *Basic Statistics*  $\Rightarrow$  *1-Sample T*, with options *One or more samples, each in a column: IBMedge*, and specifying *perform hypothesis test*. (You need to specify the null hypothesis, and you may need to use options to set the confidence level [100(1 – significance level)], and the alternative hypothesis.) Get the  $p$ -value from Minitab. Compare with your answer in (e).
- (i) Does the fact that stock returns are not normally distributed have any impact on the validity of the  $t$ -test and corresponding  $p$ -value? Explain.

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#### Problem 4

Recall the data set `NormTemp.CSV`. The first column (`Temp`) contains the body temperatures of 130 randomly selected subjects. Use Minitab’s one-sample  $t$  to get the  $p$ -value corresponding to the null hypothesis that the mean temperature is 98.6 degrees Fahrenheit. Interpret the  $p$ -value. In the end, does the 98.6 “normal temperature” seem to be folklore or fact?

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