Homework 1 Due Date: See Canvas

1. In a discussion of SAT Mathematics (SATM) scores, someone comments: "Because only a minority of California high school students take the test, the scores overestimate the ability of typical high school seniors. I think that if all seniors took the test, the mean score would be no more than 450." You decided to test this claim (H_0) and gave the SAT to an SRS of 500 seniors from California These students had a mean SATM score of 460.56 and the sample standard deviation is 98.65. Is this good evidence against this claim?

   (a) Write down the null and alternative hypotheses clearly defining any notation (such as μ) use.

   (b) Compute the test statistics.

   (c) Determine the p-value using a software. Also determine bounds for the p-value using the t-table.

   (d) Provide a conclusion within the context provided by these data.

2. A cheese company suspects that a milk supplier is watering down milk to increase profits. The freezing point of natural milk is $-0.545°C$. Added water raises the freezing temperature. The freezing temperature of 15 lots of the suppliers milk is measured. The average of the 15 measurements is $\bar{X} = -0.538°C$. The standard deviation of the 15 measurements is $s = 0.008°C$. Is this sufficient statistical evidence that the supplier is adding water to the milk?

   (a) Write down the null and alternative hypotheses clearly defining any notation (such as μ) use.

   (b) Compute the test statistics.

   (c) Determine the p-value using a software. Also determine bounds for the p-value using the t-table.

   (d) Provide a conclusion within the context provided by these data.

3. While driving my Volkswagen, I noticed that the car was giving better mpg than advertised. So in addition to the computer computing mpg, I also recorded the mpg by dividing the miles driven by the number of gallons at each fill-up in 2016. The following data are the differences between the computer's and my calculations for that random sample of 20 records. I would like to determine if these calculations are different. The data is given in *mpg.txt*.

   (a) Report the sample mean and standard deviation remember to specify units).

   (b) Produce a boxplot of the differences.

   (c) Write down the null and alternative hypotheses clearly defining any notation (such as μ) use.

   (d) Use an appropriate test to test the above hypotheses.

   (e) Provide a conclusion within the context provided by these data.