STAT 614 HOMEWORK 7 CHAPTER 6 SIGNIFICANCE TESTS

**1**) **SAT Verbal Scores** Do students who learned English as well as another language simultaneously score worse on the SAT Critical Reading exam than the general population of test takers? The mean score among all test takers on the SAT Critical Reasoning exam is 501. A random sample of 100 test takers who learned English as well as another language simultaneously had a mean SAT Critical Reading score of 485 with a standard deviation of 116. Do these results suggest that students who learn English as well as another language simultaneously score worse on the SAT Critical Reading Exam?

The assumptions for performing the t test are satisfied

a) State the appropriate null and alternative hypotheses

b) Find the t-statistic and the degrees of freedom. DO NOT USE R (Use the step by step method illustrated in the notes)

c) Find the p value

d) Use your p value to make a decision to reject or fail to reject the null hypothesis. Let α = .05

**2**) Using the R embedded dataframe **mtcars** we will explore and apply methods of significance testing to the variable **qsec**

library(tidyverse) mtcars ?mtcars

**a)** We will consider the values given for **qsec** in the **mtcars** data frame to be a random sample taken from the population of vehicles foreign and domestic.What does the variable **qsec** represent?

**b)** Use R to produce a quartile plot of **qsec** (as demonstrated in class) to investigatenormality.

**c**) Use R to produce a histogram of **qsec** to investigate normality.

**d**) Comment on why the quartile plot and the histogram support a claim the assumption for normality has been satisfied.

**e)** It is believed that the **qsec** indicator for the population of vehicles is equal to 16. An investigative organization argues that the qsec indicator for vehicles is in fact greater than 16. Given the statistics of the sample data , is their evidence that the true mean of the population is greater than 16? Perform a hypothesis test at the significance level of .05 :

* State the appropriate null and alternative hypothesis
* Use and show R code to execute a t test.
* What are the t statistic, the p value, and the 95% confidence interval.
* Use the p value to determine if you should reject the null hypothesis. Justify your answer.
* Use the confidence interval to determine if you should reject the null hypothesis. Justify your answer.

**3**) For a test of Ho : π = 0.45, n = 150, x = 75

Use R code for the following.

a) Find the p value for Ha : π > 0.45

b) Find the p value for Ha : π < 0.45

c) Find the p value for Ha :π ≠ 0.45

d) Do any of the p values in a, b, or c give strong evidence against the null

hypothesis Ho?

**4**) In August 2003, 65% of employed adults in the United States reported that basic mathematical skills were critical or very important to their job. The supervisor of the job placement office at a 4-year college thinks this percentage has increased due to increased usage of technology in the workplace. He takes a random sample of 480 employed adults and finds that 297 of them feel that basic mathematical skills are critical or very important to their job. Is there sufficient evidence to conclude that the percentage of employed adults who feel that basic mathematical skills are critical or very important to their job has increased at the significance level of .05? (Hint change your percent values to decimals; creating proportions)

* State the appropriate null and alternative hypotheses
* Use R code to execute the proportion test
* Identify the p value, the 95% confidence interval, and the z statistic.
* Should your null hypothesis be rejected? Why or Why not.

**5**) According to a union agreement, the mean income for all managers in a large manufacturing company equals $2000 per month. A representative of a graduate group decides to analyze whether the mean income µ for graduate managers matches this norm. For a random sample of 10 graduate employees, y(bar) = $1500 and s = 100.

DO NOT USE R (Use the step by step method illustrated in the notes)

The level of significance or testing is α = .05

a) Test whether the mean income of graduate employees differs from $2000 per month. Include assumptions hypotheses, test statistic, and the p value. Interpret the result.

b) Report the p value for Ha: µ < 2000. Interpret

c) Report and interpret the p value for Ha: µ > 2000

(Hint: The p values for the two possible one-sided tests must sum to 1.)