HOMEWORK #2

Read:

R tutorial on "One and Two-sample t-tests"
ANOVA chapter posted on Courseworks

R Assignment:

For each of the four problems hand-in the relevant R code and graphs. Use the output to answer all questions.

1. The mean waiting time at the drive-through of a fast-food restaurant from the time the food is ordered to when it is received is 85 seconds. A manager devises a new system that he believes will decrease the wait time. He implements the new system and measures the wait time for 10 randomly sampled orders. They are provided below:

   109 67 58 76 65 80 96 86 71 72

   (a) Use R to make a histogram of the wait times. Does the data appear to be normally distributed?
   (b) Calculate the mean and standard deviation of the wait times for the 10 orders.
   (c) Determine whether the new system is effective, i.e. test whether the mean wait time is less than 85 seconds.

2. An educator believes that a new reading curriculum will help elementary school students improve some aspects of their reading ability. She arranges for a third-grade class of 21 students to take part in the new curriculum for an eight-week period. A control classroom of 23 third-graders follows the standard curriculum. At the end of the eight weeks, all students are given a Degree of Reading Power (DRP) test, which measures aspects of reading that the treatment is designed to improve. The data can be found at:

   www.stat.columbia.edu/~martin/W2024/Data/DRPscores.txt

   (a) Use the read.table function to read the data into R.
   (b) Test the hypothesis that the treatment group performed better than the control group on the test. State your conclusions.

3. A drug company was concerned about the length of time a particular drug retained its potency. A random sample (Sample 1) of 10 bottles of the product was drawn from current production and analyzed for potency. A second sample (Sample 2) was obtained, stored for 1 year, and then analyzed. The measurements obtained are as follows:

Sample 1	10.6	10.2	10.5	10.3	10.8	9.8	10.6	10.7	10.2	10.0
Sample 2	9.9	9.8	9.6	10.1	10.2	10.1	9.7	9.5	9.6	9.8

(a) Make box plots and histograms for the data from both samples. Comment on whether the data appear to be normally distributed.
(b) Perform a two-sample t-test to determine whether the potency level is significantly different for the drug after being stored for a year.

4. Having done poorly on their Math finals in June, eight students repeat the course in summer school and take another exam in August.

June	54	49	68	66	58	60	62	62
August	50	65	74	64	56	65	68	72

If we consider these students to be representative of all students who might attend this summer school in other years, do these results provide evidence that the program is worthwhile? Use R to perform a paired t-test.