Lab 8 (100 points + 10 points BONUS): One-Way ANOVA
Objectives: Analyze data via the one-way ANOVA method.

A. (10 points) Online Prelab

B. (90 points) Average Test Score (TestScore) across the regions in the United States (Region). We are interested in comparing the Average Test Score for the college entrance exam across the four regions of the United States. A more complete analysis might consider different tests taken by high schoolers, but those data were not available to the researchers.

1. (10 points) Code.
2. (15 points) Make side-by-side boxplots and an effects plot of the data. Also, make a table containing the sample size, mean, and standard deviation for each region. From this information, do you think that the population mean of the Average Test Scores are different across each group? Please explain your answer. Be sure to comment on each of the plots.
3. (15 points) Examine the assumptions necessary for ANOVA. Is it appropriate to continue the analysis? Be sure to state each of the assumptions. One of the assumptions can be assumed true, but please state it nonetheless. For the other assumptions, check them using the appropriate plots/data. You will need to explain all of your answers. Please show all of your work. Remember, you need to generate the normal probability plots and histograms for *each* treatment group.
4. (15 points) Report the results of the ANOVA significance test (four steps) using a significance level of 0.001. Are your results in this part consistent with what you stated in part 2? Please explain your answer. Note that part 2 is a subjective procedure whereas part 4 is objective.
5. (15 points) Use an appropriate multiple-comparison method to compare the mean Average Test Score for each pair of regions at a 0.001 significance level. Explain why you chose this multiple-comparison method. Present a visual representation of the results. Write a short statement for your conclusion in complete English sentences.
6. (20 points) Write a short paragraph to describe and explain the difference between the mean Average Test Scores for the different regions studied. What are the practical conclusions to the inference performed in the lab? Be sure to discuss whether this data can be generalized to other college entrance exams with an explanation of your conclusion. Remember that the Average Test Score is for **a** college admission exam.[1] This paragraph should be written in complete English sentences and should be understandable to someone who has not taken a course in Statistics.

[1] An important consideration is the preference of the college entrance exams, which may not be common knowledge for everyone in STAT 350. See the map at https://en.wikipedia.org/wiki/SAT#/media/File:SAT-ACT-Preference-Map.svg

7. (10 points) BONUS. Assuming that the North Central region is the control (this is where Purdue is), perform the Dunnett multiple-comparison test at a 0.1% significance level.
    a. (5 points) Code (Please copy it here even if you included it in part 1.) R users: Make sure that your categorical variables are explicitly defined.
    b. (5 points) Present the output and state which of the treatment levels are different from the control and how they are different. Be sure to use complete English sentences.