STAT511 HW#7

Reading: Read Chapters 8 and 9 of Ott & Longnecker
See Canvas Calendar for Due Date.

40 points total, 2 points per problem part unless otherwise noted.

1. Read Problem 8.23 which concerns power plant reliability. This data is available from the Ott&Longnecker companion site.
    - Note that the data is in "wide" format. In order to "transpose" the data to "long" format you can use the following code (assumes the original data is called InData after importing):

```
library(tidyverse)
Reliability <- gather(InData, key = "Plant", value = "EDG")
Reliability$Plant <- as.factor(Reliability$Plant)
str(Reliability)
```

    - **Note** for parts C and D: plots do NOT need to be included in your assignment, just discuss. However, p-values from Levene's test and Shapiro-Wilk test should be included in your assignment.

A. Create side-by-side boxplots and include then in your assignment.
B. Run the one-way ANOVA on the original scale. Include the ANOVA table in your assignment.
C. Do the assumptions for one-way ANOVA appear to be satisfied for these data? In order to justify your response, consider residual diagnostic plots, Levene's test (using default center = "median") and Shapiro-Wilk test results. (**4 pts**)
D. Because the data are counts of the number of successes for the EDGs, a square root transform may be an alternative to analysis on the original scale. Run the one-way ANOVA after square root transforming EDG. Include the ANOVA table in your assignment.
E. Do the assumptions for one-way ANOVA appear to be satisfied for after square root transform? In order to justify your response, consider residual diagnostic plots, Levene's test (using default center = "median") and Shapiro-Wilk test results. (**4 pts**)
F. Now run the Kruskal-Wallis test on the original scale (not square root transformed). Include the p-value and conclusion in your assignment.
G. Use Dunn's test to run pairwise comparisons after Kruskal-Wallis. Include the pairwise comparisons in your assignment. Which plants show evidence of a difference from plant G at the alpha = 0.05 level? (**4pts**)

2. Read Problem 9.13 which concerns a weight loss study.
    - Use the following code to (1) transpose from wide to long and (2) reorder the levels of Trt so that S (standard) is first (for convenience for Dunnett's comparisons). Assumes the original data is called InData after importing

```
library(tidyverse)
WtLoss <- InData %>%
        gather(key = "Trt", value = "Loss") %>%
        mutate(Trt = as_factor(Trt)) %>%
        mutate(Trt = fct_relevel(Trt, "S"))
 str(WtLoss)
```

A. Calculate a table of summary statistics including sample size, mean, sd and se by Trt group. (**4 pts**)
B. Run the one-way ANOVA and include the ANOVA table in your assignment.

Note: I will not formally ask you to evaluate assumptions for this group of questions but based on the residual diagnostic plots, I think the data looks OK. There does seem to be an outlier for one of the groups.

C. Calculate unadjusted p-values for pairwise comparisons of means.
D. Calculate Tukey adjusted p-value for pairwise comparisons of means.
E. Comparing unadjusted and Tukey adjusted results, how many comparisons yield p-values less than 0.05? Just count the number of p-values less than 0.05.
F. Calculate the Tukey $HSD_{0.05}$ value (95% Tukey ME). In R, use `qtukey(0.95, 5, 45)` to find the exact table value.
G. Create a "cld" display with Tukey adjustment.
H. Calculate Dunnett adjusted p-values to compare each of the "A" treatments versus "S" (standard). Summarize your conclusions from the Dunnett adjusted pairwise comparisons. Which Trts show evidence of differences as compared to the standard at the alpha = 0.05 level? (**4pts**)