STA 4211 – Homework #1 – Due 1/31/18

**Part 1: Comparing 2 Treatments (CRD and RBD) Children Eating and Cats Drinking**

Complete the following parts for the Children participating in cooking experiment.

**Example:** Experiment was conducted to test effect of participation in meal preparation on caloric intake in children on subsequent meal. A sample of 47 randomized so that 25 participated and 22 did not participate in meal preparation. Response was total calories consumed in subsequent meal. Treatment Conditions and summary data (sample size, mean, standard deviation) are given below.



* Does the assumption of equal population variances seem reasonable?
* Compute the pooled (sample) variance sp2.
* Conduct the test of H0: = 0 vs HA: ≠ 0 at  = 0.05 significance level
* Obtain a 95% Confidence Interval for 
* Using the R Program on the class website, conduct the test, and obtain the 95% Confidence Interval using both direct computations and the **t.test** function. Confirm your calculations agree with the computer outputs.



* Give the population means for treatments 1 and 2 in terms of 
* Interpret the parameters  in terms of 
* Using the R program on the class website, use the regression approach to test:

 H0: = 0 vs HA: ≠ 0 and obtain a 95% Confidence Interval for 

Complete the following parts for the Cat drinking water experiment.

**Example:** A small pilot-study was conducted to compare the daily amount of water drank by cats under two conditions: flowing water (Trt 1) and still water (Trt 2). Each cat (block) was observed under each condition, and an average daily water amount *y* was observed for each condition.



* Conduct the test of H0: = 0 vs HA: ≠ 0 at  = 0.05 significance level
* Obtain a 95% Confidence Interval for 
* Using the R Program on the class website, conduct the test, and obtain the 95% Confidence Interval using both direct computations and the **t.test** function. Confirm your calculations agree with the computer outputs.



* Using the R program on the class website, use the regression approach to test:

 H0: = 0 vs HA: ≠ 0 and obtain a 95% Confidence Interval for 

## **Part 2: 1-Way ANOVA: Polyphenols in Italian Craft Beers**

* A study was conducted among 8 brands of Italian craft beers (actually one brand was Czech). The amount of polyphenols (gallic acid equivalents (mg/L)) in samples of each brand was determined, with 3 replicates per brand.
* The dataset **beer\_phenols.csv** provides the results of the experiment. Complete the following parts.
* Plot the polyphenol measurements versus the brand. Briefly describe the between and within brand variation pattern. (Do this before you declare brand as a factor variable).
* Obtain the Analysis of Variance. List all sources of variation, degrees of freedom, sums of squares, mean squares, and *F*-statistic
* Test whether the true mean rating scores differ among the 8 brands of beer at the **=0.05 significance level. Fully state all aspects of the test, as well as the observed significance level (*P*-value).
* Use Levene’s test to determine whether the assumption of equal variances is appropriate (**=0.05).
* Use Welch’s test to test whether the beer brands differ under the unequal variance case.
* Conduct the test using the Kruskal-Wallis Test based on ranks. Test whether the true median polyphenol levels differ among the 8 brands of beer at the **=0.05 significance level. Fully state all aspects of the test, as well as the observed significance level (*P*-value).
* Brands 3, 4, 7, and 8 are high alcohol content brands. Brands 1, 2, 5, and 6 are lower alcohol content brands. Devise a contrast that compares the polyphenol levels between these two types of beers. Test whether the population contrast is equal to 0 at the 0.05 level.
* Use Tukey’s and Bonferroni’s procedures to compare all pairs of craft beer brands (use an experimentwise error rate of 0.05).