

Assignment 4

Due: Thursday March 13

[20 points]

1. (Data from Montgomery) Three brands of batteries are under study. It is suspected that the lives (in weeks) of the three brands are different. Five randomly selected batteries of each brand are tested with the following results:

Weeks of Life		
Brand 1	Brand 2	Brand 3
100	76	108
96	80	100
92	75	96
96	84	98
92	82	100

- (a) Construct an ANOVA table for the data.
- (b) Conduct a randomization test using the F-statistic as the test statistic. Make sure to state:
- The null and alternative hypotheses.
 - Your conclusions for the test.
 - What assumptions are you making. Be specific to the problem.
- (c) Now conduct the following test, assuming the data are draws from a population of similar batteries:

$$H_0 : \mu_i = \mu \quad \text{for all } i$$
$$H_1 : \mu_i \neq \mu \quad \text{for at least one } i$$

- What assumptions are you making?
 - Conduct the test.
 - State the conclusions of the test.
 - Write out the formula and provide a 95% confidence intervals for μ_1, μ_2 and μ_3 . Put this into a table like the one on page 75 of the notes.
 - Use the Bonferroni method to create all $\binom{t}{2}$ treatment comparison 95% confidence intervals (ex. $\mu_1 - \mu_2$). Which intervals contain zero? Why are we interested in those intervals?
 - Use residual plots to check the normality assumption and model fit.
- (d) Suppose the quality engineering department wishes to be able to detect a treatment variation or average squared treatment effect size is $\sum \tau_i^2 / t = 9$. Thus the average treatment effect size is 3 weeks. Also from previous studies they believe $\sigma^2 = 20$. Set the α level at 0.05.
- What sample size would they need to achieve a power of 0.80?

2. Get together in your groups for the project to discuss the following:
 - (a) What is flight length? How will you measure it?
 - (b) Determine some potential design factors which may influence the flight length of your respective crafts. How many levels for each factor will you consider?

Individually write up the results of this meeting.