Homework 6

1. A chemist wishes to test the effects of four chemical agents on the strength of a particular type of cloth. Because there might be variability from one bolt to another, the chemist decides to use a randomized complete block design, with the bolts of cloth considered as blocks. He/She selects five bolts and applies all four chemicals in random order to each bolt. The resulting tensile strengths follow.

	Bolt				
Chemical	1	2	3	4	5
1	73	68	74	71	67
2	73	67	75	72	70
3	75	68	78	73	68
4	73	71	75	75	69

a) Use ANOVA to analyze the data from the experiment (use $\alpha = 5\%$) and draw conclusions.
b) Use appropriate plots to check assumptions.
c) Perform Tukey and Bonferroni pairwise comparisons for the treatments (use $\alpha = 5\%$).

2. A clay tile company is interested in studying the effect of cooling temperature on strength. The company has five ovens which produce the tiles. Four tiles are baked in each oven and then randomly assigned to one of the four cooling temperatures. The data are shown below.

Cooling	Oven					
Temp	1	2	3	4	5	Mean
5	3	10	7	4	3	5.40
10	3	8	12	2	4	5.80
15	9	13	15	3	10	10
20	7	12	9	8	13	9.80
Mean	5.50	10.75	10.75	4.25	7.50	7.75

a) Use ANOVA to determine if there exists difference between the four cooling temperatures (use $\alpha = 5\%$).
b) If there exists difference between the four temperatures, perform pairwise comparisons using Tukey's method.
c) Suppose the company believes that the first two temperatures 5° and 10° are not different from each other, the last two temperatures 15° and 20° are not different from each other either, but there exists difference between these two groups of temperatures. Find a set of orthogonal contrasts that would allow you to test this belief.
d) Use contrast sum of squares to test the contrasts you find above and draw your conclusions.