Statistics 506
Test 1

1. An experimenter provided an analyst with the following data table. Answer the questions using the table provided.

(A,B,C)	Response
(-1,-1,-1)	14.5
(1,-1,-1)	9.5
(-1,1,-1)	15.2
(1,1,-1)	20.3
(-1,-1,1)	15.1
(1,-1,1)	12.8
(1,1,1)	21.8
(-1,1,1)	18.1

(a) Compute effects and construct an effects plot for the experiment. Which effects are significant? If interactions are significant, construct interaction plots and interpret them.

(b) Recompute the effects by adding 4 to each of the first 4 observations and create an effects plot. Which effects changed, and which didn't? If effects didn't change, explain why.

(c) Suppose that 4 was added to only the 2nd observation. Compare the effects (and effects plot) to the effects (and effects plot) from your first analysis. Explain any differences.

2. A researcher is studying factors that affect the performance of *textitpervious* concrete, a building material used to minimized storm water run-off. Factors included Aggregate Size (Small, Large), Cement Type (A, B), and Water/Cement Ratio (.275, .30). The response variable was the amount of time for 2 liters of water to percolate through a 6-inch diameter slug; the researcher's goal is to minimize the response. The experiment was replicated 3 times; results appear below. Analyze the data using only the averages.

   (a) Compute the factor effects and construct a normal plot. Which effects are important? If any two-way effects are important, construct an interaction plot and interpret the plot.

   (b) Which combination of significant effects minimizes the response? Compute the EMR.

   (c) Which combination of significant effects minimizes the response when the smaller Aggregate Size is used? Compute the EMR.

   (d) In order to moderate the effect of Aggregate Size, which Cement Type would you use? Construct EMR for this recommendation.

Aggregate Size	Cement Type	Water/Cement Ratio	Average Time (sec)
Small	A	.275	8.1
Large	A	.275	7.2
Small	B	.275	7.8
Large	B	.275	4.3
Small	A	.30	6.9
Large	A	.30	6.0
Small	B	.30	6.2
Large	B	.30	3.1