FREC 408
Assignment 7

Issued: November 19, 2003 **Due:** End of class, December 3, 2003

Be sure to:

- Put your name and the Assignment # on the front
- Answer as completely as you can. All I can go on is what you give me, so show your work.
- Be as neat as possible. You can write it out, but please be neat.
- Staple or place in a folder

1. ANOVA: Single Factor (hazardous materials). 40 pts

The Journal of Hazardous Materials (July 1995) published the results of a study of the chemical properties of three different types of hazardous organic solvents used to clean metal parts: aromatics, chloroalkanes, and esters. One variable studied was sorption rate, measured as mole percentage. Independent samples of solvents from each type were tested and their sorption rates were recorded.

I want you to run an ANOVA: Single Factor using Excel. The file is on the web site listed as SORPTION.xls

a. Run descriptive statistics in Excel on each solvent , print the table of descriptive statistics, and briefly describe the results.

b. Run the ANOVA Single factor and print out the results.

c. Conduct the formal test to see if there are significant differences in sorption rates across the three solvents using an alpha level = .01

2. Randomized Block Design. (Glaucoma treatment data) 60 pts

Two drugs, A and B, used for the treatment of glaucoma (an eye disease) were tested for effectiveness on 10 diseased dogs. Drug A was administered to one eye (chosen randomly) of each dog and drug B to the other eye. Pressure measurements were taken one hour later on the eyeballs of each dog. The 10 diseased dogs serve as blocks for comparing the two treatments, drug A and B. The data are given in an Excel file on the web, dogdrug.xls.

To run the ANOVA use:

Tools, Data Analysis, ANOVA: Two Factor Without Replication. When you identify the data for the test you will also include the dog column.

This is a Randomized Block Design. The output gives sums of squares for rows (which represent the blocks - dogs - and columns, which are the drugs.

a. Run descriptive statistics in Excel on the eye pressure for each drug. Are there big differences between each drug?

b. Conduct a difference of means test between the two drugs using alpha = .05. Is there a significant difference of mean eyeball pressure across the two drugs?

c. Run the ANOVA Two Factor Without Replication using an alpha level = .05 and print out the results. The output gives two separate F-tests. One is for the Rows which represent the Blocks (i.e., the dogs). This test tells you if it was important to control or account for the dogs in your experiment. The second test is for the Columns, which represent the Drugs.

d. Does the test for the Blocks show that it was important to account/control for the blocks? Show the test and explain why you reached your conclusion.

e. Does the test that there are differences between the two drugs show a significant difference? Show the test and explain why you reached your conclusion. Does this conclusion agree with the difference of means test conducted in b? Why or why not? (Note: the difference between the two tests is that in the ANOVA problem you accounted for the Blocks.)

Alternative Assignment 7, Problem 2

This file is on the web as: **flame.xls** or you can enter that data into Excel yourself.

a. Run descriptive statistics in Excel on the three materials. Are there big differences between each material?

b. Run the ANOVA: Single Factor on whether there is a difference in the mean charred length for the three materials (ignoring the laboratories) and print out the results. What is the conclusion of your test using an alpha level of .05?

c. Run the ANOVA Two Factor With Replication using an alpha level = .05 and print out the results. The output gives three separate F-tests - for the Sample (laboratories), the Columns (the materials) and an interaction between the laboratories and the materials. Does the conclusion change for a test of differences in the length of the charred portion for the three materials once we account for the laboratory? Why do you think it changes?

d. Does the test for the laboratories show there is a significant difference between the laboratories? Does the test for an Interaction between the laboratory and the materials show a significant interaction?

e. Calculate R Square for this model. Which factor - material or laboratory - contributes the most to R Square?

Flame Retardant Materials

Federal regulations require that certain materials, such as children's pajamas, be treated with a flame retardant. An evaluation of a flame retardant applied to three different materials was conducted at two different laboratories. Each lab tested three samples from each of the treated materials.
The data in the table below are the length of the charred portion of the material.
The analysis wants to examine the variability across the three materials and also if there is variability across the two laboratories. Test these hypotheses using alpha = .05.
You should use ANOVA: Two-Way with Replication

		Material		
Laboratory	**A**		**B**	**C**
	1	4.1	3.1	3.5
		3.9	2.8	3.2
		4.3	3.3	3.6
	2	2.7	1.9	2.7
		3.1	2.2	2.3
		2.6	2.3	2.5