Assignment 2

Due Thursday (09/15/05)

1.

An article in the *Journal of Strain Analysis* (vol. 18, no.2 , 1983) compares several procedures for predicting the shear strength for steel plate girders. Data for nine girders in the form of the ratio of predicted to observed load for two of these procedures, the Karlsruhe and Lehigh Methods, are given as follows:

Girder	Karlsruhe Method	Lehigh Method
S1/1	1.186	1.061
S2/1	1.151	0.992
S3/1	1.322	1.063
S4/1	1.339	1.062
S5/1	1.200	1.065
S2/2	1.402	1.178
S2/3	1.365	1.037
S2/4	1.537	1.086
S2/5	1.559	1.052

a) Is there any evidence to support a claim that there is a difference in mean performance between the two methods? Use $\alpha = 5\%$.

b) What is the P-value for the test in part a?

c) Construct a 95 percent confidence interval for the difference in mean predicted to observed load.

d) Investigate the normality assumption for both samples.

e) Investigate the normality assumption for the difference in ratios of the two methods.

f) Which design principles have been used in the experiment. Comment on their advantages and disadvantages.

(Hint: formulas needed for this problem can be found in Section 2.5 of Montgomery)

2.

A vendor submits lots of fabric to a textile manufacturer. The manufacturer wants to know if the lot average breaking strength exceeds 200 psi. if so, she wants to accept the lot. Past experience indicates that a reasonable value for the variance of breaking strength is 100 $(\text{psi})^2$. The hypotheses to be tested are

$$H_0 : \mu = 200 \text{ vs. } H_1 : \mu > 200.$$

The manufacturer decides to randomly select a number of specimens, measure their breaking strengths and test the hypotheses with $\alpha = 5\%$. Suppose she wants to guarantee that average breaking strength 210 or higher should be detected with probability at least 95%. What is the minimum number of specimens she should check? (Hint: because the distribution of the sample mean under $\mu = 210$ is normal, you do not need to generate the O.C. curves to determine the sample size).