Math 3770 Test 3 Fall 2000 Name_____
Table #_____

You may use your three 8.5x11 crib sheets (in your hand only), your calculator, and the tables I supply. Use no other outside source of information in solving the problems on this exam. **Show your work neatly and completely**.

1. In a study to compare the compressive strengths of two different concrete formulas the following data was obtained.

Formula	1	2
	5800	2122
	4598	1372
	6508	1160
		2869

Assuming the data represents two independent random samples from two normal populations, does the data present significant evidence at $\alpha = 0.01$ that the mean compressive strength for formula 1 exceeds that of formula 2 ? Perform all necessary auxiliary tests at $\alpha = 0.10$. An output of the procedure TTEST of SAS for this data can be found in the printout titled "COMPRESSIVE STRENGTHS."

2. A manufacturer of plumbing supplies has a standard for variance in the weight of galvanized elbows of 0.10. A random sample of 14 elbows yields the data found in the printout "WEIGHTS OF GALVANIZED ELBOWS." Does the data present significant evidence at $\alpha = .05$ that the variance of weights exceeds the company standard ?

3. In the SAS printout Corn Yield per Acre can be found figures for the mean yield per acre in the state of Georgia for the years 1966 to 1987. With Y_i the observed yield in the year x_i, it is assumed that the data satisfies the following model.

$Y_i = \alpha + \beta x_i + \varepsilon_i$, ε_i iid $N(0,\sigma^2)$.

a) How many pairs (x_i, y_i) were analyzed ?

b) Give a point estimate of σ^2.

c) Give a 95% confidence interval for σ^2.

d) The least squares equation is $\hat{y} = a + b x$ where
a = _____ and b = _____.

e) The value of the statistic $t = \frac{b\sqrt{S_{xx}}}{\sqrt{MSE}}$ for this data is _____.

f) Evaluate S_{xx} and explain how you arrived at this value.

g) Is there significant evidence at $\alpha = .01$ that mean yield increases with increasing years ?

TTEST PROCEDURE

Variable: S

T	N	Mean	Std Dev	Std Error	Min	Max	Variances	T	DF	Prob>|T|
1	3	5635.333	965.588	557.482	4598.000	6508.000	Unequal	5.5245	3.8	0.0064
2	4	1880.750	777.420	388.710	1160.000	2869.000	Equal	5.7318	5.0	0.0023

For H0: Variances are equal, F' = 1.54 DF = (2,3) Prob>F' = 0.6923

```
title'COMPRESSIVE STRENGTHS';
data cncr;
input t s @@;
cards;
1 5800 1 4598 1 6508 2 2122 2 1372
2 1160 2 2869
;
proc ttest;
class t;
var s;
```

WEIGHTS OF GALVANIZED ELBOWS

Weights x of galvanized elbows.

x
9.9742038
10.354773
9.2446485
8.8312453
9.7701952
9.9874024
10.325970
9.4431663
10.842134
9.3081078
10.624455
8.6691716
10.074091
10.648412

Summary statistics for x
NumNumeric = 14
Mean = 9.8641
Standard Deviation = 0.68213

Model: MODEL1
Dependent Variable: YLD

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Prob>F
Model	1	1267.69085	1267.69085	8.821	0.0076
Error	20	2874.17278	143.70864		
C Total	21	4141.86364			

Root MSE	11.98785	R-square	0.3061
Dep Mean	53.22727	Adj R-sq	0.2714
C.V.	22.52201		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	T for H0: Parameter=0	Prob > |T|
INTERCEP	1	-38.304912	30.92409162	-1.239	0.2298
YR	1	1.196499	0.40285351	2.970	0.0076

```
options ls=79;
options pagesize=55;
TITLE'CORN YIELD PER ACRE';
DATA CRN;
INPUT YR YLD @@;
CARDS;
66 43.0 67 58.0 68 40.0 69 35.0
70 31.0 71 54.0 72 52.0 73 48.0
74 56.0 75 55.0 76 62.0 77 24.0
78 50.0 79 65.0 80 42.0 81 50.0 82 85.0
83 60.0 84 72.0 85 64.0 86 57.0 87 68.0
;
PROC REG;
MODEL YLD=YR;
```