

**FINAL EXAM**  
**STAT 302**  
**Fall 1994**

Name \_\_\_\_\_

Instructions: Show all work for partial credit. If you can't finish a problem, indicate the procedure that you would use to solve it. Mark your answers clearly.

1. A study in quality in certain plant yielded the following results

<b>Defects</b>	<b>Shift</b>		
	<b>1</b>	<b>2</b>	<b>3</b>
Yes	424	533	432
No	12	20	22

a) Compute the expected counts if there were not differences between the shifts. (5 pts)

b) Test the hypothesis that the shifts have the same defect rate. Use  $\alpha = .05$ . (5 pts)

2. Real estate appraisers rely heavily on multiple regression models in their evaluation of property. Typically, the sale price of a house is modeled as a function of variables such as size, condition, location, etc. The following are data on ten house sales.

SALE PRICE in thousands	HOUSE SIZE in hundreds of sq. ft.	CONDITION RATING 1 = poor, 10 = excellent
63.0	23	5
32.7	11	2
57.7	17	9
45.5	14	3
47.0	18	8
55.3	21	4
64.5	24	4
42.6	20	2
54.5	19	7
57.5	21	5

The data was feed into JMP and the results appear below.

Response: Price

Summary of Fit

RSquare	0.792178
RSquare Adj	0.732801
Root Mean Square Error	5.126516
Mean of Response	52.03
Observations (or Sum Wgts)	10

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	9.0260097	8.52009	1.06	0.3246
Size	1.9359026	0.43249	4.48	0.0029
Condition	1.3487797	0.71257	1.89	0.1003

Effect Test

Source	Nparm	DF	Sum of Squares	F Ratio	Prob>F
Size	1	1	526.56515	20.0358	0.0029
Condition	1	1	94.16041	3.5828	0.1003

a) Test the utility of the overall model. (5 pts)

b) Which of the two regressors are contributing to the model? Justify your answer. (5 pts)

c) Interpret **in practical terms** the value of the coefficients of each regressor. (5 pts)

d) Suppose that a new regressor is added to the model and the regression coefficient is 0.54 with a standard deviation of 0.24. Should this regressor be kept in the model? Use  $\alpha = .05$ . (5 pts)

3. The following model was proposed for testing salary discrimination against women in a state university system:

$$E(y) = \beta_0 + \beta_1 x_1 + \beta_2 x_2,$$

where  $y$  = annual salary (in thousands of dollars)

$x_1$  = 0 if female , and 1 if male

$x_2$  = experience (years)

Based on a sample of 140 employees, the estimated model was:

$$\hat{y} = -120.4 + 205.3x_1 + 124.9x_2$$

the overall p-value was .002 and the standard deviations of the coefficients of the regressors were 41.5 and 23.6, respectively.

a) Is there evidence of salary discrimination? Justify your answer. (5 pts)

b) Interpret the coefficient of  $x_1$ . (5 pts)

c) The following comment was made : "The model suggests that if the difference in experience between two employees is one year, then the difference in salary is expected to be \$124.9." Do you agree? Explain. (5 pts)

d) Explain what it would mean if there were interaction between gender and experience. [Hint: You can use pictures] (5 pts)

4. A weight reduction program claims that it reduces at least ten pounds in the first 10 days. A sample of 10 people that followed the program yielded the following results:

Client	Weight	
	Before	After
1	140	131
2	163	150
3	157	159
4	196	183
5	187	185
6	154	150
7	203	187
8	148	145
9	160	153
10	141	131

Do the data provide evidence to refute the claim? Use  $\alpha = 0.05$ . (10 pts)