**Part II: Short Questions.**

1. In a study with three treatment groups, A1, A2 and A3, and a control group, C, dummy vectors were constructed as follows: subjects in A1 were identified in D1, those in A2 were identified in D2, and those in A3 were identified in D3. A multiple regression analysis was done in which the dependent variable was regressed on the three coded vectors. The following regression equation was obtained:

y = 8 + 6D1 + 5D2 -2D3

1. Which group is used as the reference group?
2. What are the means of the four groups on the dependent variable?
3. The following regression equation was obtained from an analysis with effect coding for four groups with equal sample size:

y = 102.5+2.5E1-2.5E2-4.5E3

1. What is the grand mean of the four groups?
2. What are the means of the four groups, assuming that the fourth group was assigned -1’s?
3. What is the effect of each treatment?
4. To decide whether a company is discriminating against women, the following data were collected from the company’s records: Salary is the annual salary in thousands of dollars, Qualification is an index of employee qualification, and Sex (coded 1 for men and 0 for women). Two linear models were fit to the data and the regression outputs are shown in Table 1. Suppose that the usual regression assumptions hold.
5. Are men paid more than equally qualified women?
6. Are men less qualified than equally paid women?
7. Do you detect any inconsistency in the above results? Please explain.
8. Which model would you advocate if you were the defense lawyer? Please explain your choice.

**Table 1. Regression Outputs for the Salary Discriminating Data**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model 1: Dependent variable is Salary | | | | |
| Variable | Coefficient | s.e. | t-test | p-value |
| Constant | 20009.5 | 0.8244 | 24271 | <0.0001 |
| Qualification | 0.935253 | 0.0500 | 18.7 | <0.0001 |
| Sex | 0.224337 | 0.4681 | 0.479 | 0.6329 |
| Model 2: Dependent variable is Qualification | | | | |
| Variable | Coefficient | s.e. | t-test | p-value |
| Constant | -16744.4 | 896.4 | -18.7 | <0.0001 |
| Sex | 0.850979 | 0.4349 | 1.96 | 0.0532 |
| Salary | 0.836991 | 0.0448 | 18.7 | <0.0001 |

\*s.e.: standard error

**Part III: Data Analysis**

1. A researcher wished to determine whether the regression of achievement on students’ motivation is the same for males and females. She obtained measures of achievement and student motivation for 15 males and 15 females. The data set is named Achievement.sav”. Please report your results up to 3 decimal places.

Answer the following:

1. Correlation between student motivation and achievement in each of the groups
2. Proportion of variance accounted for by sex, motivation, and their cross product.
3. Is there evidence that student’s motivation and gender interact in their effects on achievement? What’s your conclusion?
4. Are the effects of motivation on school achievement statistically significant for both boys and girls? What are the regression lines for those two groups?
5. Please graphically present this interaction term. Is the interaction between motivation and gender ordinal or disordinal?