

Name _____

Student Number _____

STA 441s 2024 Quiz 6

1. (2 points) In your analysis of the Diet Data, you fit a model in which the explanatory variables were Diet, and weight before starting the diet. There were no interactions. You want to know whether, controlling for weight before, there is any difference in the results for Diet 2 and Diet 3.

(a) Fill in the table below. Do not correct for multiple testing.

t , χ^2 or F Statistic (a number)	p -value (a number or range)	Reject H_0 ? (Yes or No)	Statistically Significant? (Yes or No)

On your printout, circle the test statistic and write “Question 1” beside it.

(b) In plain, non-statistical language, what do you conclude?

2. (2 points) It is quite possible that which diet is more effective (or more exactly, the relative effectiveness of the diets) might depend on the initial weight of the person. You tested this hypothesis.

(a) Please fill in the table below.

t , χ^2 or F Statistic (a number)	p -value (a number or range)	Reject H_0 ? (Yes or No)	Statistically Significant? (Yes or No)

On your printout, circle the test statistic and write “Question 2” beside it.

(b) In plain, non-statistical language, what do you conclude?

$$y = \beta_0 + \beta_1 x_1 + \cdots + \beta_{p-1} x_{p-1} + \epsilon \quad SST = SSR + SSE \quad R^2 = \frac{SSR}{SST}$$

$$a = \frac{R_F^2 - R_R^2}{1 - R_R^2} \quad F = \left(\frac{n-p}{s} \right) \left(\frac{a}{1-a} \right) \quad a = \frac{sF}{n-p+sF}$$

3. (2 points) Based on your model the Diet Data with equal slopes (Question 1), what proportion of the *remaining* variation in weight after 6 weeks is explained by weight before the experiment, once you allow for Diet? Hint: $F = t^2$. Please show some work below. You'll need a calculator. **Circle your final answer.**

4. (4 points) Hens (female chickens) are randomly assigned to one of three different feed types: A , B or C . The response variable is the mean weight of the eggs they lay, based on 100 eggs from each chicken. Hen's age is a covariate. Assume that the relationship between age and expected egg weight can be approximated by a straight line over the range of the data.

- (a) Write a regression equation that assumes the lines relating age and expected egg weight have the *same slope* for each feed type. Use *cell means coding*. That's indicator dummy variables with no intercept.

$$E(Y|\mathbf{x}) =$$

- (b) Make a table with three rows, one for each feed type. Make columns showing how your dummy variables are defined. Add another, wider column showing expected egg weight for each feed type. The *symbols* for the dummy variables for feed type will not appear in this last column.

- (c) Controlling for hen's age, is egg weight related to the type of feed? Give the null hypothesis, using symbols from your regression equation.