

Name \_\_\_\_\_

Student Number \_\_\_\_\_

## STA 441s 2024 Quiz 10

1. (5 points) In the Tooth Growth data, guinea pigs were randomly assigned to a combination of Supplement Type (Vitamin C or orange juice), and Dosage Level (Low, Medium, High). The response variable was tooth length after a certain length of time.

- (a) Write  $E(y|\mathbf{x})$  for a regression model with *effect coding*. That's the model with an intercept, and zeros, ones and minus ones. You don't have to say how the dummy variables are defined. That will become clear in the next part. In spite of the notation, your dummy variables do not have to be called  $x$ .

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

- (b) Make a table with six rows, one for each treatment combination. Make columns showing how your dummy variables are defined. **You are *not* being asked for the expected values.** They are too messy.

- (c) Suppose you want to test whether, averaging over Dosage Level, Supplement Type has an effect on average tooth growth. Give the null hypothesis in terms of  $\beta$  values from your regression equation.

- (d) Suppose you want to test whether the effect of Dosage Level depends on Supplement Type. Give the null hypothesis in terms of  $\beta$  values from your regression equation.

- (e) Suppose you want to test whether, averaging over Supplement Type, Dosage Level has an effect on average tooth growth. Give the null hypothesis in terms of  $\beta$  values from your regression equation.

2. For the bunny study, you tested the effect of drug on force required to extract the tooth, conditional on healing time. You followed up this test of conditional independence with Bonferroni-corrected tests for drug, separately for each healing time.
- (a) (2 points) We want to know if the drug had an effect at 12 days of healing time. Fill in the table below. On your printout, circle the *uncorrected*  $p$ -value and write “Question 2” beside it.

Bonferroni-corrected $p$ -value (a number)	Reject Null Hypothesis? (Yes or No)	Statistically Significant? (Yes or No)

- (b) (3 points) The reason for doing the bunny study was to find out if the drug helped dental implants become more firmly attached to the bone. Based on the results of your statistical analysis (and only on the results of your statistical analysis), would you recommend proceeding to clinical trials with humans? *Answer Yes or No and briefly explain.* You can get full marks for the word Yes or No, and a single sentence with no numbers and no statistical terminology. You have a lot more room than you need.

**Attach your log file and your results file to the quiz paper. Make sure your name and student number are written clearly on both printouts.**