Name Jenny

Student Number

STA 441s 2016 Quiz 5

1. 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 a sample of 100 eggs for 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.

   (a) (1 point) Write a regression equation that allows for the possibility that the lines relating age and expected egg weight could have *different slopes*. You need not say how your dummy variables are defined. You will do that in the next part.

   $E(Y|\mathbf{X}) = \beta_0 + \beta_1 x + \beta_2 f_1 + \beta_3 f_2 + \beta_4 x f_1 + \beta_5 x f_2$ (x: Age)

   (b) (2 points) 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, because they are all either zero or one.

Feed	f_1	f_2	$E(Y\|x)$
A	1	0	$(\beta_0+\beta_2)+(\beta_1+\beta_4)x$
B	0	1	$(\beta_0+\beta_3)+(\beta_1+\beta_5)x$
C	0	0	$\beta_0 + \beta_1 x$

   (c) (2 points) Does the effect of feed type depend on the hen's age? Give the null hypothesis, using symbols from your regression equation.

   $H_0: \beta_4 = \beta_5 = 0$

   (d) (1 point) Is the slope of the line relating hen's age to expected egg weight different for feed types A and B? Give the null hypothesis, using symbols from your regression equation.

   $H_0: \beta_4 = \beta_5$

$$F = \left(\frac{n-p}{s}\right)\left(\frac{a}{1-a}\right) \qquad a = \frac{sF}{n-p+sF}$$

2. (4 points) In your analysis of the telephone sales data, you tested whether the lines relating sales last quarter to sales this quarter had the same slope for the three software packages.

   (a) Give the value of the test statistic (t, chi-square or F.) The answer is a number from your printout. Write the number in the space below. Also, circle the number on your printout and write "Question 2a" beside it.

$F = 10.3$

   (b) You also tested for pairwise differences between slopes, with a Bonferroni correction. Don't give any numbers. Just state your conclusions (if any) in plain, non-statistical language.

The slope of the lines for software One and three is greater than the slope for two.

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