

Name _____

Student Number _____

STA 441s 2020 Quiz 9

$$\mu = \begin{pmatrix} \mu_1 \\ \mu_2 \\ \vdots \\ \mu_k \end{pmatrix} = \begin{pmatrix} E[y_1 | \mathbf{X}=\mathbf{x}] \\ E[y_2 | \mathbf{X}=\mathbf{x}] \\ \vdots \\ E[y_k | \mathbf{X}=\mathbf{x}] \end{pmatrix} = \begin{pmatrix} \beta_{0,1} + \beta_{1,1}x_1 + \cdots + \beta_{p-1,1}x_{p-1} \\ \beta_{0,2} + \beta_{1,2}x_1 + \cdots + \beta_{p-1,2}x_{p-1} \\ \vdots \\ \beta_{0,k} + \beta_{1,k}x_1 + \cdots + \beta_{p-1,k}x_{p-1} \end{pmatrix}$$

One mark each

1. (6 points) In a taste test, a sample of female coffee drinkers and a sample of male coffee drinkers rate the flavour of three coffees. Denote the ratings for participant i by y_{i1} , y_{i2} and y_{i3} .

- (a) This is a factorial experiment. What are the factors? (Let's say that case is not a factor.)

Gender and coffee

- (b) Classify each factor as between-cases or within-cases.

Gender is between, coffee is within

- (c) Make a 2 by 3 table. Draw an oval or ovals on the table, indicating the crossing or nesting of cases within experimental conditions.

	<i>Coffee</i>		
	1	2	3
<i>Female</i>			
<i>Male</i>			

- (d) Give a formula (or formulas) for the one or more response variables you would use to test for the interaction. These are linear combinations of the y_{ij} values.

$$L_{i,1} = y_{i,1} - y_{i,2}$$

$$L_{i,2} = y_{i,2} - y_{i,3}$$

- (e) Write the regression model you would use to test for the interaction. Just write the expected value(s). Don't bother with the error terms. *Say how the dummy variable is defined.*

$$E(L_1 | x) = \beta_{0,1} + \beta_{1,1}x$$

$$E(L_2 | x) = \beta_{0,2} + \beta_{1,2}x$$

$$x = \begin{cases} 1 & \text{for Female} \\ -1 & \text{for Male} \end{cases}$$

- (f) In terms of the β_{ij} parameters in your model, state the null hypothesis you would use to test the interaction.

$$H_0: \beta_{1,1} = \beta_{1,2} = 0$$

2. (4 points) For the data from the study of perception and attention, you tested the interaction of handedness (left or right) and ear (left ear, right ear, or both) using the compound symmetry covariance structure in `proc mixed`.

2 pts (a) Fill in the table below. On your printout, circle the F statistic and write "Question 2" beside it.
all or nothing

F Statistic (a number)	p -value (a number)	Reject Null Hypothesis? (Yes or No)	Statistically Significant? (Yes or No)
1.13	0.3291	No	No

2 pts (b) In plain, non-statistical language, what do you conclude? You have a lot more room than you need.

There is no evidence that the effect of presentation (To left ear, right ear, or both) is different for left versus right-handed subjects.

(No marks for this unless (a) is right)

Attach your log file and your results file to the quiz paper. Make sure your name and student number appear on both printouts.