Stat 514 Fall 2016

Exam II

Name: _____

1. I am doing a behavioral experiment with SHR rats to see how Y=time to task completion in a maze, is affected by combinations of Omega Fatty acids (three levels: 0%, 1% and 2%) and AFC (Artificial Food Coloring, two levels: present or not present). Twenty four rats will be randomly assigned to one of the six treatment groups (four per group). At Time 1, before any treatment is applied, I observe the time each rat takes to complete the task. I then give each rat its treatment and measure the task completion time at Time 2.

   a. Draw the layout.

AFC

	Y						~					
Conc.	0			1			2			0		
Rat	1	2	3	4	5	6	7	8	9	10	11	12
Pre	X	X	X	X	X	X	X	X	X	X	X	X
Post	X	X	X	X	X	X	X	X	X	X	X	X

Test

	1			2		
13	14	15	16	17	18	
X	X	X	X	X	X	
X	X	X	X	X	X	

25

   b. Write out the model with Source, df and EMS (use the algorithm).

Source	df	EMS
A_i	1	usual als.
C_j	2	
AC_ij	2	
S(ij)k	18	
T_l	1	
AT_il	1	
CT_jl	2	
ACT_ijl	2	
TS(ij)kl	18	

Bet.

Within

   c. Which are the Between and Within terms in the model?

Above.

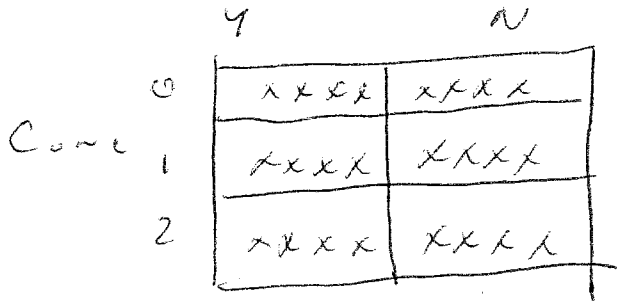
   d. How could you check if randomization did its job using the data of Time 1?

1 way ANOVA on pre scores.

2. Joe Blow was given the data from the experiment of problem 2, but Joe only used the Time 2 data (post-treatment).

   a. Draw Joe's layout.

A F C



   b. What is Joe's ANOVA table with source and df?

A: 1
C: 2
AC: 2
E(ij)k 18

   c. Which terms are Joe's Between and Within terms?

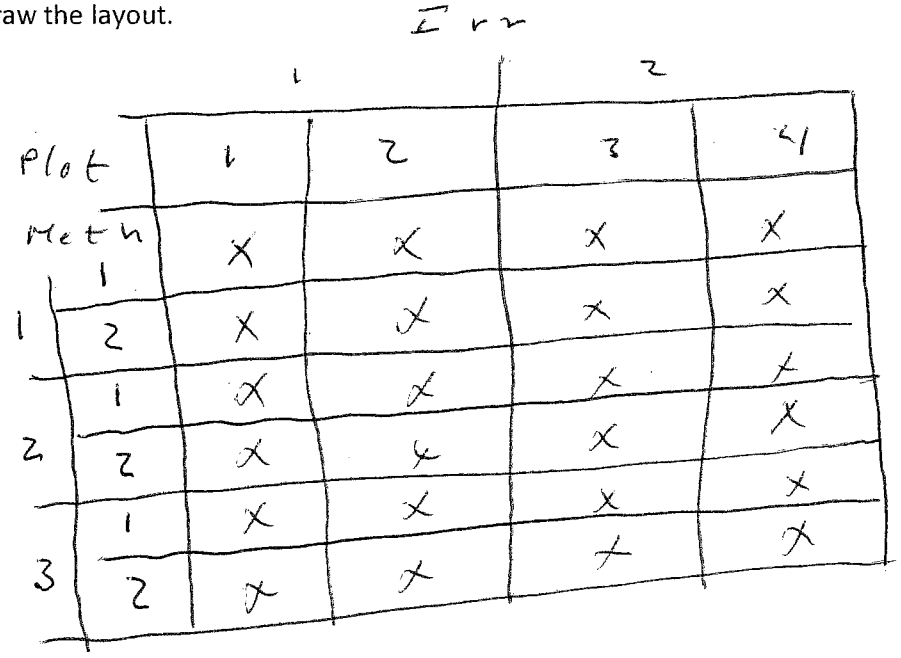
All Between.

   d. Will Joe's analysis be as good at analyzing treatment effects as the model in problem 1? If not why not?

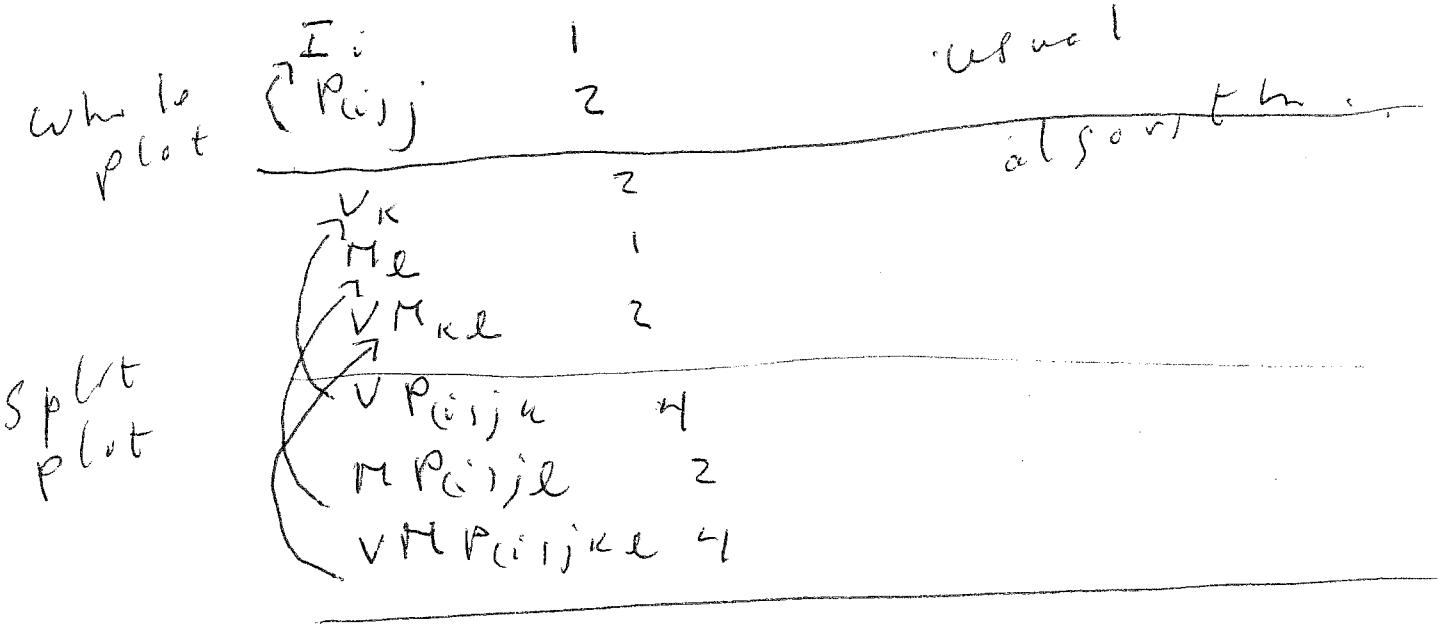
No baseline comparison to control for nat.

3. I have a large farm to run an experiment on. There are three factors of interest: Irrigation method with two levels (hard to change factor) is one. Seed variety with three levels and planting method with two levels (easy to change factors) are the others. Four whole plots are randomly assigned to the two irrigation methods (2 plots to each method). Each whole plot is then divided into six split plots and these are randomly assigned to the six variety-planting method combinations.

a. Draw the layout.



b. Write out the ANOVA table with source df and EMS.

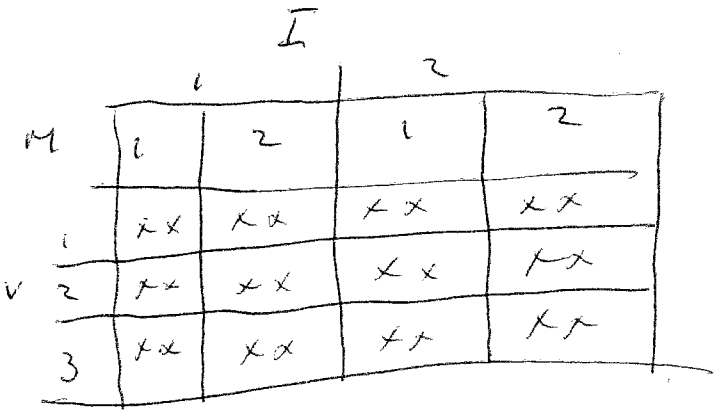


c. Which are the whole plot and split-plot terms in the model?

See above.

4. Joe Blow wants to run the experiment of question 3 as a Completely Randomized Design.

a. Suppose that Joe ran his experiment by assigning whole plots (same total number of data points) to the factor combinations. What is Joe's ANOVA table with Source and df?



I_i	1
M_j	1
V_{ik}	2
IM_{ij}	1
IV_{ik}	2
MV_{jk}	2
IMV_{ijk}	2
error	18

b. Is Joe's design better or worse at detecting significance for any factors than the design of question 3? Why?

Maybe better for I_i df ↑

worse for others since no control for plot to plot variation

5. For a 2^3 design, given the following treatment combinations, fill in the coefficients for the contrasts of the main effects and the interactions listed on the left.

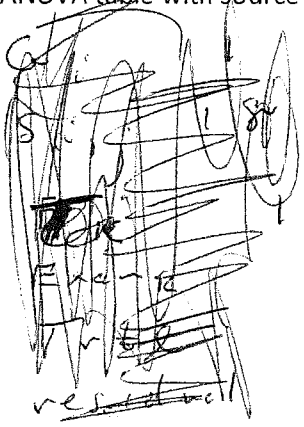
	(1)	a	b	ab	c	ac	bc	abc
A	-1	1	-1	1	-1	1	-1	1
B	-1	-1	1	1	-1	-1	1	1
C	-1	-1	-1	-1	1	1	1	1
AC	1	-1	-1	1	1	-1	-1	1
ABC	-1	1	1	-1	1	-1	-1	1

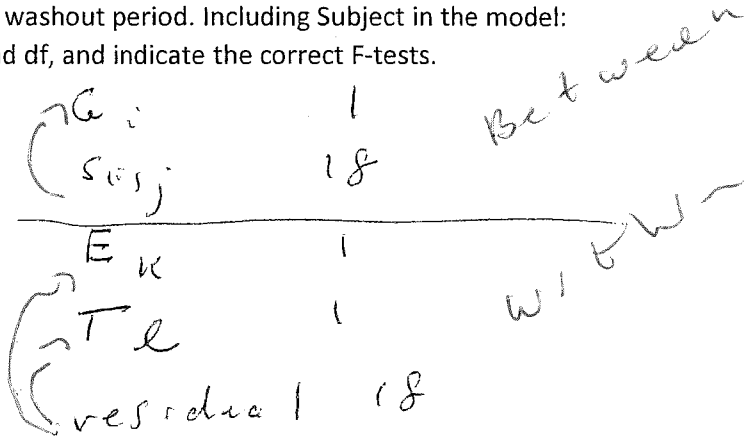
6. It is desired to compare two treatments for alleviating test anxiety. The treatments are a meditation training course vs. a 10mg dose of propanalol given one hour prior to the exam. Twenty students with test anxiety volunteered for the study and were randomly divided into two groups of 10 each. The response variable is heart rate variability (HRV) during an exam. Joe Blow suggests a crossover design for this study:

	Exam I	Exam II
Group 1	Meditation	Propanalol
Group 2	Propanalol	Meditation

We may assume that there is enough time before each exam for the meditation training and may assume that the propanalol has an effective washout period. Including Subject in the model:

a. What is Joe's ANOVA table with source and df, and indicate the correct F-tests.





b. You are most interested in the main effect for Treatment, but the way Joe set up his design there is a real problem when comparing the mean HRV for propanalol to the mean HRV for meditation. What is it?

Washout effect,

(confounding with 2way

not real problem)