

Stat 514 - Exam II  
Spring, 1988

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name

- 1) Consider the following experiment. In a field are three square plots  $P_1, P_2$  and  $P_3$ . Each plot is then subdivided into four equally sized and square subplots. There are four methods of tilling available,  $T_1, T_2, T_3$  and  $T_4$ . For each plot, we randomly assign one tilling method to each subplot. Each subplot is then divided in half, and to each half we randomly allocate one of two varieties of corn  $C_1$  or  $C_2$ , so that we have both varieties in each subplot.
- a) Why can't we regard this design as a completely randomized block design (with plots as blocks)?
- b) Write out a model, assuming  $y$  is total yield of corn in each half subplot, ~~including restrictions on randomization.~~

- 2) A pharmaceutical company wished to investigate the effects of three different drugs at low and high levels of a blood hormone in human subjects. For each drug, particular low and high levels were designated. Thirty subjects were randomly allocated to one of the six drug-level combinations (i.e. one drug/subject). After a three week administration of drug, two blood samples were obtained from each subject, and the level of hormone determined. Write out the correct model, indicating any nesting. Also indicate the correct F-tests as well as degrees of freedom for each term.

3) Suppose I ran a 2<sup>4</sup> experiment and then ran a complete replicate of the experiment (4 factors fixed).

a) What advantage would there be in pooling the rep X treatments interactions to use as an error term?

b) What do you need to assume for the F-tests as described in a) to be exact?

a) Set up a Graeco-Latin square with rows 1, 2, 3, columns 1, 2, 3, treatment 1 at levels A, B, C, and treatment 2 at levels  $\alpha, \delta, \gamma$ .

b) Even assuming that all 2 and higher order interactions are zero, what problem would you have in the analysis?

5) Could you run a  $2^3$  experiment in 4 blocks of two without confounding a main effect? Why?

6) For the investigation of the effects of a treatment A, subjects could be crossed with A or nested within A. Which case is analogous to the paired t-test and why?