

Homework 4, STAT 514, Due Oct. 9

1. Problem 19 on page 65.
2. In a completely randomized design, there are two factors, A with two levels and B with three levels. Suppose the 6 treatment means are

$$\begin{aligned}\mu_{11} &= 6, \mu_{12} = 10, \mu_{13} = 8, \\ \mu_{21} &= 5, \mu_{22} = 5, \mu_{23} = 5.\end{aligned}$$

- a. Are there interaction effects? Why?
  - b. Find  $\mu, \alpha_i, \beta_j$  and  $(\alpha\beta)_{ij}, i = 1, 2, j = 1, 2, 3$ , such that
3. In a completely randomized design, there are two factors, A with two levels and B with three levels. Suppose the 6 treatment means are

$$\begin{aligned}\mu_{11} &= 6, \mu_{12} = 5, \mu_{13} = 10, \\ \mu_{21} &= 8, \mu_{22} = 10, \mu_{23} = 3.\end{aligned}$$

- a. Are there interaction effects? Why?
  - b. Find  $\mu, \alpha_i, \beta_j$  and  $(\alpha\beta)_{ij}, i = 1, 2, j = 1, 2, 3$ , such that
- $$\mu_{ij} = \mu + \alpha_i + \beta_j + (\alpha\beta)_{ij}.$$
4. Consider the reaction time experiment described in Exercise 4 of Chapter 4.
    - a. Write down the two-way complete model for the experiment. Remember to explain each term in the model.
    - b. Find the sums of squares that are accounted for by the factors and their interactions, i.e., ssA, ssB and ssAB.
    - c. Generate the interaction plots. Do you see an obvious interaction between the two factors? Carry out a formal hypothesis testing for the interaction.
    - d. Test the hypothesis that the levels of factor cue have the same effects on the reaction time.
    - e. Find a 95% confidence interval for the difference between the average reaction time from the auditory cue and the average reaction time from the visual cue.
    - f. Find an appropriate confidence interval for the difference between auditory cue and the visual cue, when the elapse time is 5 seconds.
    - g. Is it necessary to do multiple comparisons for levels of factor elapse time? Why?