

Homework Set 7

This homework will not be collected.

1. Reading: Sections 8.1-8.4 and 15.1-15.2.
2. Exercise 8.6 a b c d (p. 438).
3. Researchers conducted an experiment to compare the starch content of tomato plants grown in sandy soil supplemented by one of three different nutrients, A, B, or C. Those seedlings assigned to nutrient A served as the control group (receiving distilled water only). Plants assigned to nutrient B were fed a weak concentration of Hoagland nutrient, while those assigned to nutrient C received the Hoagland nutrient at full strength. Although six plants were allocated to each of the nutrient groups, only five survived in group B and four in group C. The data for the stem starch contents, in micrograms per milligram, are given here.

Nutrient A	22	20	21	18	16	14
Nutrient B	12	14	15	10	9	
Nutrient C	7	9	7	6		

- a. Write an appropriate model for this experimental situation. Define all terms.
 - b. Assuming that nutrients B and C did not cause the plants to die, perform an analysis of variance to compare the treatment means. Use $\alpha = .05$. [Hint: The equal variance assumption may be violated here, but use an F-test anyway.]
4. A researcher wanted to determine whether attending a Head Start program improves the academic performance of first graders from a low-income community. The researcher obtained a random sample of six children who attended a Head Start program and six who did not. There were large differences in the type of support the students received at home from their parents. Thus, after assessing the home environment of the twelve students, the researcher paired the students based on the similarities in their home environment. After completing the first grade, the students were given an overall aptitude examination. The results are shown here.

Attended Head Start Program?	Pair					
	1	2	3	4	5	6
Yes	58	73	85	76	88	90
No	47	67	69	62	77	77

What is the study design? What is treatment here and what is the blocking variable? Explain why this design is better than a completely randomized design without considering the blocking variable.

5. For the data in problem 4, estimate the overall mean μ , the treatment effects α_i , and the block effects β_j .
6. Refer to problem 4.
 - a. Do the students who attended a Head Start program appear to have higher mean aptitude scores than the students who did not attend such a program? Use $\alpha = .05$.
 - b. Give the efficiency of the randomized complete block design relative to a completely randomized design. Interpret your findings.
7. Ex. 15.6 (pp. 991-992).