

STAT423/523 HW5

- Present the solutions in the same sequence that the problems are listed in the homework sets. A one-point deduction will be enforced if they are not.
- Hand calculations in support of your final answers are required if and only if instructions explicitly ask for them.

1. An experiment investigated the effects of different bleaching chemicals on pulp brightness. Three chemicals were selected at random from a large population of potential bleaching chemicals. Summary statistics on pulp brightness are given below:

| Bleaching Chemical | Sample Size | Sample Mean | Sample SD |
|--------------------|-------------|-------------|-----------|
| 1 | 6 | 72.843 | 8.607 |
| 2 | 6 | 83.386 | 5.146 |
| 3 | 5 | 77.257 | 5.460 |

An ANOVA table for analyzing the data is given below:

Source DF SS MS F P-value

Chemical 2 336.0 168.02 3.781 0.0486

Error 14 622.1 44.44

Total 16 958.1

Refer to formula set 10K for all the problems below.

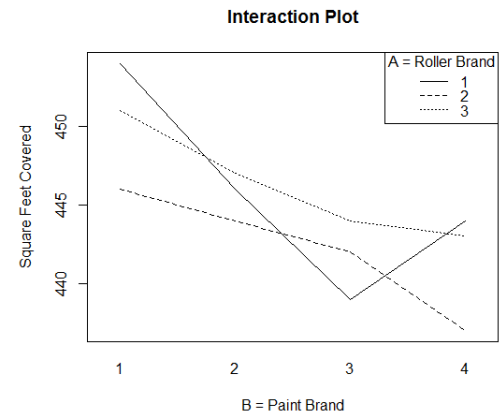
- a. Briefly explain why a **random-effects model** is appropriate here.
- b. Carry out the hypothesis test based on the ANOVA table at the $\alpha = 0.10$ level of significance. **Show all 4 steps in hypothesis testing that we follow in class.** Use the P-value provided above.
- c. Estimate σ_A^2 the variability due to bleaching chemicals. **Show some calculations.**
- d. What is an estimate of total variance in a single pulp brightness value?
- e. What proportion of total variation in a single pulp brightness value is attributed to differences among bleaching chemicals?

2. **Chapter 11: Section 11.1, Exercise 4. "In an experiment to see whether the amount of coverage of light-blue ..."**

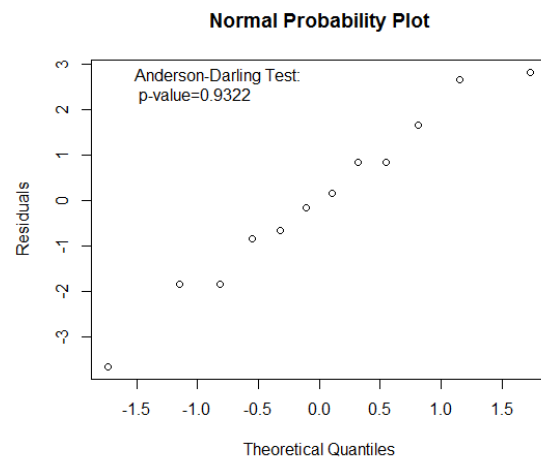
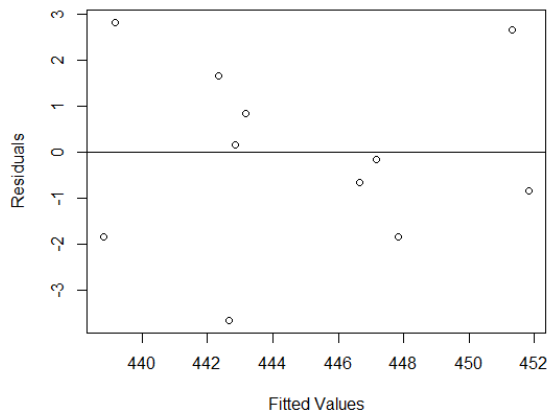
This is the two-way additive ANOVA table:

| | Df | Sum Sq | Mean Sq | F value | P-Value |
|----------------|----|--------|---------|---------|---------|
| A=Roller Brand | 2 | 38.00 | 19.00 | 2.803 | 0.1381 |
| B=Paint Brand | 3 | 159.58 | 53.19 | 7.848 | 0.0169 |
| Residuals | 6 | 40.67 | 6.78 | | |
| Total | 11 | 238.25 | | | |

a. An interaction plot of the data is given on the right. For the two-way additive model and ANOVA analysis above to be valid, the plot should show (roughly) parallel curves. Discuss what the plot tells you.



- Show by hand calculations that $SSA = SS(\text{Roller Brand}) = 38.00$.
- State and test hypotheses appropriate for deciding whether paint brand has any effect on coverage. Complete the 4-step procedure we follow in class. Use the given P-value in the ANOVA table.
- Repeat part (b) for brand of roller. Use the given P-value in the ANOVA table..
- Comment on each plot of residuals below.



3. Chapter 11: Section 11.1, Exercise 6. House assessor.

For part (a), follow the 4-step procedure we do in class.