

# Stat 141 (Experimental Designs 1)

1st Semester AY 2025-2026

## Laboratory Exercise 4

Instruction: Answer the following as indicated.

1. An experiment station conducted a randomized complete block experiment in order to make comparisons among three varieties of sweet potato. Six blocks were used. The yields (kg) are shown in the following table.
  - a. Test if there exist significant differences in the mean yield among the three varieties.
  - b. Test if blocking is effective.
  - c. Compute and discuss the relative efficiency of the above experiment relative to a CRD experiment with 6 replications.
  - d. How many replications are required for a CRD experiment to be equally efficient as the above RCBD experiment?

Block	Variety			Total
	A	B	C	
1	45	40	30	115
2	40	42	37	119
3	43	48	35	126
4	45	45	27	117
5	38	42	25	105
6	46	38	26	110
Total	257	255	180	692

2. An experiment was conducted to determine the effect of a complete fertilizer (NPK) on the yield of corn. A field was divided into 5 blocks each containing six plots. Each of six levels of NPK was randomly assigned to each plot within each block. Two corn plants were sampled from each plot and the weight of the mature ears was measured. The data is given below.
  - a. Perform the necessary sequential tests to determine if the six NPK levels have significant effect on the mean weight of corn ears.

- b. Test if blocking is effective.

NPK (kg)	Samples	Blocks				
		1	2	3	4	5
50	1	16.5	16.4	15.7	16.6	16.0
	2	16.4	15.8	15.3	16.1	16.8
100	1	16.0	14.4	15.5	15.6	16.4
	2	16.6	13.9	16.6	16.2	16.2
150	1	15.1	15.0	15.9	16.1	15.0
	2	15.6	14.3	16.2	15.2	14.5
200	1	15.6	14.7	15.6	15.4	15.6
	2	15.5	15.2	15.5	14.6	15.2
250	1	13.5	14.2	14.5	15.4	14.9
	2	14.3	13.3	15.1	15.1	13.3
300	1	14.2	12.5	15.1	14.0	14.3
	2	13.0	12.6	14.3	14.8	14.6

3. A petroleum company was interested in comparing the miles per gallon achieved by four different gasoline blends (A, B, C, and D). Because there can be considerable variability due to differences in driving characteristics and car models, these two extraneous sources of variability were included as “blocking” variables in the study. The researcher selected four different brands of cars and four different drivers. The drivers and brands of cars were assigned to blends in the manner displayed in the following table. The mileage (in mpg) obtained over each test run was recorded as follows:
- Test if there are significant differences in the mean mileage among the four blends of gasoline.
  - Test if using drivers and car models as row and column blocks, respectively, is effective.
  - Compute and interpret the efficiency of the design used in this experiment relative to
    - CRD;
    - RCBD with drivers as blocks; and
    - RCBD with car models as blocks.
  - If future studies were to be conducted, would you recommend using both car model and driver as blocking variables? Explain.

Driver	Car Model			
	1	2	3	4
1	A(15.5)	B(33.8)	C(13.7)	D(29.2)
2	B(16.3)	C(26.4)	D(19.1)	A(22.5)
3	C(10.5)	D(31.5)	A(17.5)	B(30.1)
4	D(14.0)	A(34.5)	B(19.7)	C(21.6)