

Instructions: This homework assignment covers **Chapter 9** of the course notes. On each part, there is opportunity for partial credit, so show all of your work and explain all of your reasoning. No work/no explanation means no credit even if your answer is correct. If you use R to answer any part or to check your work, please include all code and output as attachments. Do not just write out the code you used.

1. A balanced one-way classification experiment was run to compare the effects of various nitrogen sources on sugar beet yields (X , measured in kg/acre). The six nitrogen sources used in the experiment were as follows:

1. Control, no nitrogen
2. ORGANIC nitrogen: $\text{CO}(\text{NH}_2)_2$
3. INORGANIC nitrogen, AMMONIUM based: $(\text{NH}_4)_2\text{SO}_4$
4. INORGANIC nitrogen, AMMONIUM based: NH_4NO_3
5. INORGANIC nitrogen, NITRATE based: $\text{Ca}(\text{NO}_3)_2$
6. INORGANIC nitrogen, NITRATE based: NaNO_3 .

There were 10 acre-sized plots used per nitrogen source. The data from the experiment are in Table 1 (next page). Treat these as independent samples from the six experimental conditions. This is reasonable because the nitrogen sources were randomly applied to the plots and there were no known systematic sources of variation among the plots.

The experimenter's overall goal is to learn about the population mean sugar beet yields across the six experimental conditions. Are the population means different? How do the population means compare? Prepare a thorough analysis of the data using ANOVA and appropriate follow-up inference procedures if needed.

The experimenter has also asked you to advise him on what experimental condition(s) would maximize the population mean yield. What would you tell him? Defend your recommendations with solid statistical evidence.

Recall my idea of a thorough analysis includes

- a complete description of the statistical assumptions as well as checking these assumptions
- showing all calculations (carried out “by hand” or preferably using R)
- (if helpful/needed) well-constructed, informative graphs which are relevant to the problem at hand
- a well-written summary of the entire analysis (which should include the final main conclusions).

Nitrogen source	Observations											
	1	814.8	813.2	974.9	862.0	750.8	769.0	1026.0	849.4	946.3	997.9	
	2	1235.3	1185.9	1117.0	1171.8	1284.7	1211.5	1288.9	1001.4	1428.4	1373.6	
	3	1157.5	1236.1	1074.3	1171.5	1031.3	1015.9	950.1	1108.5	1275.8	999.4	
	4	955.0	1039.4	1318.6	926.9	1230.1	835.3	1013.8	1128.3	1023.7	1353.5	
	5	1070.0	1153.1	940.1	998.5	1264.3	1351.1	1117.5	1389.3	1037.1	1047.3	
	6	1077.2	1137.7	1187.4	1335.8	1262.6	1126.7	1081.6	1134.6	1272.0	1231.3	

Table 1: Sugar beet yield data. Yields (measured in kg/acre) for six nitrogen sources.