

STATISTICS 402 - Assignment 2

Due February 2, 2009

Farmer Jones wants to make an informed decision about which variety of corn to use. She decides to run an experiment, a field trial, to compare two corn varieties, A and B. She has a field with 36 plots available for the experiment. On 18 plots she will plant variety A and on the other 18 plots she will plant variety B. She wishes to see if the two varieties have equal yields, on average, or if the two varieties differ significantly.

How should she assign varieties to plots?

- **Convenience Assignment**

It is easiest to plant one variety on 18 plots on one side of the field and the other variety on the 18 plots on the other side. On the back is a picture of such an assignment and the yields, in bushels per acre, for each plot. The summary of those yields is given below

Variety	n	mean	std. dev.
A	18	144.9	8.29
B	18	141.8	7.65

Based on this assignment, by convenience, is there a significant difference in mean yield between the two corn varieties? Perform the appropriate test of hypothesis.

Do you think that the result gives a fair comparison between the two varieties?

- **Systematic Assignment**

Many people think that an alternating sequence is a random, or at least an unbiased, sequence. On the back is a picture of an alternating pattern, like a checkerboard, and the yields, in bushels per acre, for each plot. The summary of those yields is given below. those yields is given below

Variety	n	mean	std. dev.
A	18	142.3	5.75
B	18	144.5	5.37

Based on this assignment, alternating, is there a significant difference in mean yield between the two corn varieties? Perform the appropriate test of hypothesis.

Think about the results of the two tests of significance, the convenience assignment and the alternating assignment. Some may find it a bit disturbing that B has a higher sample mean in one study and A has a higher sample mean in the other. Of course, this could be due to chance variation. It could also be due to a poor assignment of treatments. For example, the right side/left side assignment is vulnerable to bias due to soil fertility, or drainage that is different from one side of the field to the other.

- **Random Assignment**

How, physically, would you randomly assign varieties to plots? Come up with a randomization scheme to assign variety A to 18 plots and variety B to the remaining 18 plots. Describe how your randomization scheme completely. Record your assignments in the grid.

Once you have completed your random assignment, consult “The Truth” – this sheet gives the yield for each plot using either variety. “The Truth” was used to fill in the yields for the plots in the convenience and alternating patterns you looked at earlier. In general, “The Truth” is not available since it requires knowing what would happen to the same plot of land using each of the treatments.

Write down the yields for your random assignment – if you have an A in the row 1, column 1 plot then you would put down 130 whereas if you have a B in the row 1, column 1 plot you would put down 118 for the yield. Repeat for all plots.

Based on this assignment, at random, is there a significant difference in mean yield between the two corn varieties? Perform a test of hypothesis.

Examine “The Truth” more closely. What is the relationship between the yields for the two varieties?

Convenience Assignment

A	A	A	B	B	B
130	149	139	155	137	145
A	A	A	B	B	B
149	133	152	131	147	136
A	A	A	B	B	B
141	156	137	146	132	148
A	A	A	B	B	B
150	142	155	136	152	133
A	A	A	B	B	B
139	155	139	147	137	153
A	A	A	B	B	B
155	138	150	137	145	136

Systematic Assignment

A	B	A	B	A	B
130	137	139	155	149	145
B	A	B	A	B	A
137	133	140	143	147	148
A	B	A	B	A	B
141	144	137	146	144	148
B	A	B	A	B	A
138	142	143	148	152	145
A	B	A	B	A	B
139	143	139	147	149	153
B	A	B	A	B	A
143	138	138	149	145	148

Randomized Assignment

	1	2	3	4	5	6
1						
2						
3						
4						
5						
6						