

Block exercise

I encourage you to refer to the supplemental material on the website to help you with the following exercise. Minitab treats Block quite differently from the book and we want to explore the differences in this exercise. Basically, the book treats block as just another factor when setting up the design. In the analysis, however, it may ignore certain block-treatment interactions while still plotting the block in the effects plot. Minitab first selects the optimal fractional factorial design for the factors at hand, and *then* blocks; analysis then essentially ignores the block effect.

1. *Minitab Approach.* Four factors are examined in 8 runs with the 8 runs being subdivided into two blocks. Remember that Minitab uses $D=ABC$ as the default design generator and $\text{Block}=AB$ as the default block generator. First, we set up Minitab's default design by selecting 4 factors in 8 runs with 2 blocks. Look at the output in the Session window to verify the block and design generators. Enter the data below and analyze the design.

A	B	C	D	Block	Response
1	-1	-1	1	1	6.1
-1	1	-1	1	1	4.8
1	-1	1	-1	1	3.9
-1	1	1	-1	1	6.5
-1	-1	-1	-1	2	5.4
1	1	-1	-1	2	26.1
-1	-1	1	1	2	4.4
1	1	1	1	2	24.7

2. *Book Analysis Approach.* This time, we will analyze *Minitab's* design using the text's approach. Copy factor levels, block levels and the response column into a new Worksheet; don't forget to label the factor and block columns. Select the four factors as well as the block as factors under Define Custom Design, verify the Low/High levels for the factors. Analyze the data. Does the presence of Block as a factor complicate the analysis? Look at the alias table in the output. What is Block confounded with? If you eliminate every effect containing Block from the alias table, is the alias table the same as the table Minitab produced in Part 1?
3. *Book Design Approach.* In this section, we will replicate the book's design approach, but no new data will be analyzed. Under Create Factorial Design, select 5 factors in 8 runs. Label Factor E as Block and create the design. Look at the alias table; if Block (identified as E in the alias table) is crossed out from the alias table wherever it appears, what is the resolution of the design? What was the resolution of the design in Part 1 and Part 2? Which design approach do you think you prefer?