# Latin Squares

The effect of five different ingredients (A, B, C, D, E) on the reaction time of a chemical process is being studied. Each batch of new material is only large enough to permit five runs to be made. Furthermore, each run requires approximately 1.5 hours, so only five runs can be made in one day. The experimenter decides to run the experiment as a Latin square so that day and batch effects may be systematically controlled. She obtains the data that follow.

|  | **Day** | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **Batch** | **1** | **2** | **3** | **4** | **5** |  |
| 1 | A=8 | B=7 | D=1 | C=7 | E=3 |  |
| 2 | C=11 | E=2 | A=7 | D=3 | B=8 |  |
| 3 | B=4 | A=9 | C=10 | E=1 | D=5 |  |
| 4 | D=6 | C=8 | E=6 | B=6 | A=10 |  |
| 5 | E=4 | D=2 | B=3 | A=8 | C=8 |  |

Upload an RMarkdown file that answers the following …

1. Is this a valid Latin Square? (explain)
2. Write the model equation
3. Analyze the data from this experiment (use α=0.05) and draw conclusions about the factor of interest. (Note: Use aov() instead of gad() for Latin Square Designs, be sure all blocks are recognized as factors)