1. Suppose that you plan to run a $p \times p$ Latin square and want to know the power of detecting a difference of size $D$ between any two of the $p$ treatments assuming a variance of $\sigma^2$. In a CRD, the value $\Phi^2 = \frac{nD^2}{2a\sigma^2}$ and degrees of freedom $a - 1$ and $N - a$ are used to compute the power. In a standard RCBD, the value $\Phi^2 = \frac{bD^2}{2a\sigma^2}$ and degrees of freedom $a - 1$ and $(a - 1)(b - 1)$ are used to compute the power. What is the form of $\Phi^2$ as well as the degrees of freedom in order to compute the power in this situation?

2. Now suppose that you plan to replicate this $p \times p$ Latin square using the same rows but different columns. In other words, the design is a Latin rectangle. Under this design, answer the same question posed in the previous exercise.

3. In HW #6 Problem #5 each patient had his or her serum amylase determined using each of the four methods.

   (a) Explain why this experiment, as designed, is not a crossover experiment.

   (b) Explain why this experiment, as designed, could be considered a repeated measures study.

4. For Montgomery Problem 4-23, investigate whether there may be an issue with residual effects. SAS code for this analysis are on Slides 27 and 32 of the Replicated Latin Squares and Crossover Design notes.

5. Because Japanese beetles ate the Roma beans in the Oehlerts’ garden last year, they ran an experiment this year to determine the best insecticide. They have six garden beds with beans, and the garden store has three different sprays that claim to keep the beetles off the beans. Sprays drift on the wind, so they cannot spray very small areas. Because of this, they divide each garden bed into two plots and use a different spray on the plants in the middle of each plot. After month, they scored the sprayed plant in terms of insect damage using a 0-100 scale, where the higher the score the more damage.

   Bed

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>51 A</td>
<td>25 A</td>
<td>33 B</td>
<td>25 A</td>
<td>35 A</td>
<td>40 B</td>
</tr>
<tr>
<td>2</td>
<td>39 B</td>
<td>43 C</td>
<td>47 C</td>
<td>26 B</td>
<td>32 C</td>
<td>43 C</td>
</tr>
</tbody>
</table>

Analyze these data to determine the effects of sprays. Which one should they use?

6. Montgomery Problem 4-42. Analyze the data assuming day is a fixed effect (using OLS) and then analyze the data assuming day is a random effect (Using REML). Summarize the differences and similarities of the two analyses as it pertains to the comparison of hardwood concentrations.