Latin Squares Instructor: Padraic Bartlett

Homework 3: Partial Latin Squares, continued

Week 2 *Mathcamp 2012*

Attempt all of the problems that seem interesting, and let me know if you see any typos! (+) problems are harder than the others. (++) problems are currently open.

1. Construct a set of four distinct 5×5 MOLS .
2. Construct a set of three distinct 9×9 MOLS, as well as a set of three distinct 8×8 MOLS.
3. Given a latin square of order n, must it have an orthogonal mate? (For $n = 2, 6$, this is trivially true because there are no pairs of MOLS of order 2 or 6. For other values of n, can we always make an orthogonal mate? Or for any n, can you find a Latin square with no orthogonal mate?)
4. (+) Show that there is no pair of 6×6 MOLS. (The fastest way to do this is probably to use Mathematica or your favorite programming language to just check cases.)
5. Even though we cannot construct a pair of MOLS pf order 6, it turns out that we **can** come pretty close, in the following sense: create a pair of 6×6 Latin squares such that when you superimpose these two squares on top of each other, you get 34 distinct pairs of symbols (out of a possible 36 distinct pairs.)
6. (++) Find the size of the largest set of 10×10 MOLS.
7. Given a pair of MOLS of order m and another pair of MOLS of order n, create a pair of MOLS of order mn.