CCS Discrete Math I | Professor: Padraic Bartlett

Homework 15: Finite Fields and Latin Squares

Due Monday, Week 9 | *UCSB 2014*

Solve **one** of the following **three** problems. As always, prove your claims/have fun! Also, this set is **extra-credit**, because of the holiday! Take care, and I'll see you all in a week! –Paddy

1. Given a Latin square of even order $2n$, must it have an orthogonal mate? In other words, for any even number $2n$, can you find a Latin square L that is not orthogonal to any other $2n \times 2n$ Latin square?

   (For $n = 2, 6$, this is trivially true because there are no pairs of MOLS of order 2 or 6. What about other values of $2n$?)

2. Given a pair of mutually orthogonal Latin squares (A, B) of order m and another pair of mutually orthogonal Latin squares (C, D) of order n, create a pair of mutually orthogonal Latin squares (X, Y) of order mn.

3. Write a computer program that, given inputs n, k, will try to find k mutually orthogonal Latin squares of order n. For what values of n, k does your program finish running in (say) under half a hour?