Homework 9: Error-Correcting Codes and Latin Squares

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. Using MOLS, create a 4-ary length 5 code with distance 4, containing 16 elements.

2. A q-ary length n code C is called **linear** if the sum of any two codewords, thought of as elements in $(\mathbb{Z}/q\mathbb{Z})^n$. Find a linear code. Are any of the MOLS codes we've came up with linear? Are any *not* linear?

3. A q-ary length n code C is called **perfect** if there is some integer t such that for any element $\mathbf{x} \in (\mathbb{Z}/q\mathbb{Z})^n$, there is a unique word in C within Hamming distance t of $\mathbf{x}$. Consider the three codes (repeat three, the second code we studied on day 1, the MOLS code made out of 3×3 squares) we've studied in depth. Are any of them perfect? Can you find a perfect code? Can you find a code that is not perfect?