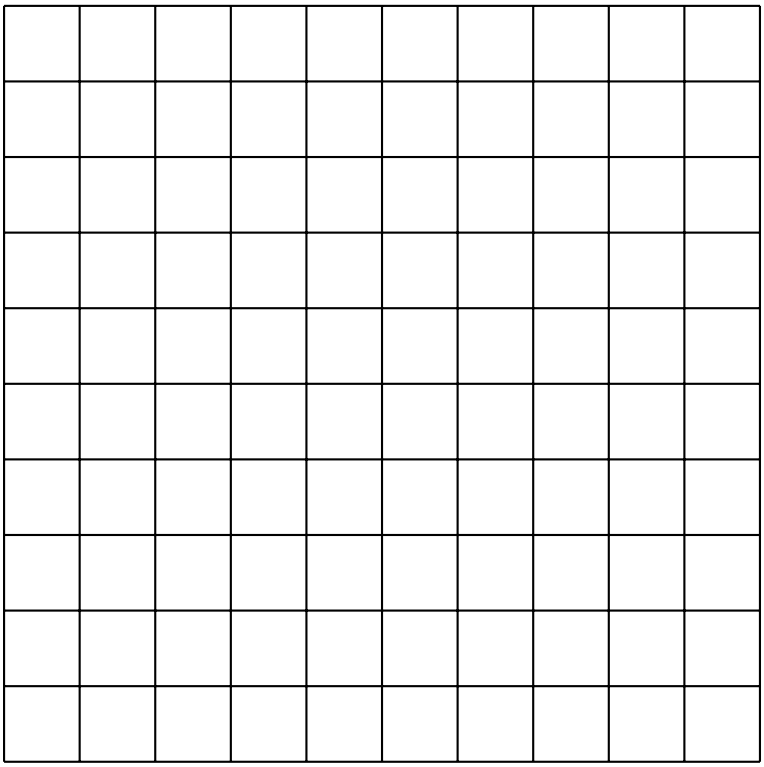
UW Math Circle
Halloween Auction
October 27, 2016

1. Find the **tallest** rectangular grid of letters so that each row is a word and where the letters in each column are in alphabetical order. For example,
   C A L L
   K N O T
   is a solution of height 2.

2. Create a list of **as many** primes as possible such that the average of any two of the primes in your list is also prime.

3. Draw 7 dots with lines connecting each dot to every other dot (they don't have to be straight lines). How **few** crossings can you get in your drawing?

4. You have a 10×10 grid, and each grid can contain a graveyard or a ghost. A grid with a ghost must share an edge with a graveyard. Find a configuration with **as many** ghosts as possible.



5. Given any number, reverse its digits, and add the two together. Repeat this process with the sum until the number is a palindrome (meaning it is the same when read forwards or backwards). Find a number that takes the **largest** number of steps to become a palindrome.

   For example, the number 57 takes two steps to become a palindrome: $57 + 75 = 132$, then $132 + 231 = 363$.

6. **Lazy spider**

A spider wants to build a web connecting a set of dots. The spider builds the web out of straight line segments. A strand of web can connect to another strand or to one of the dots. Here are two examples.

For each of the three sets of dots given, construct a web with the shortest total length possible. Your score will be the sum of those three lengths.