UW Math Circle
March 3, 2016

1. (a) Find a partner and play the following game on an 8×8 chessboard. Start with a queen on square b1. On your turn, you can move the queen any number of squares vertically, horizontally, or diagonally, but she must always move up and/or to the right. The winning player is the one who can move the queen to square h8. Who wins?

   (b) What if the Queen starts on $c1$ instead?
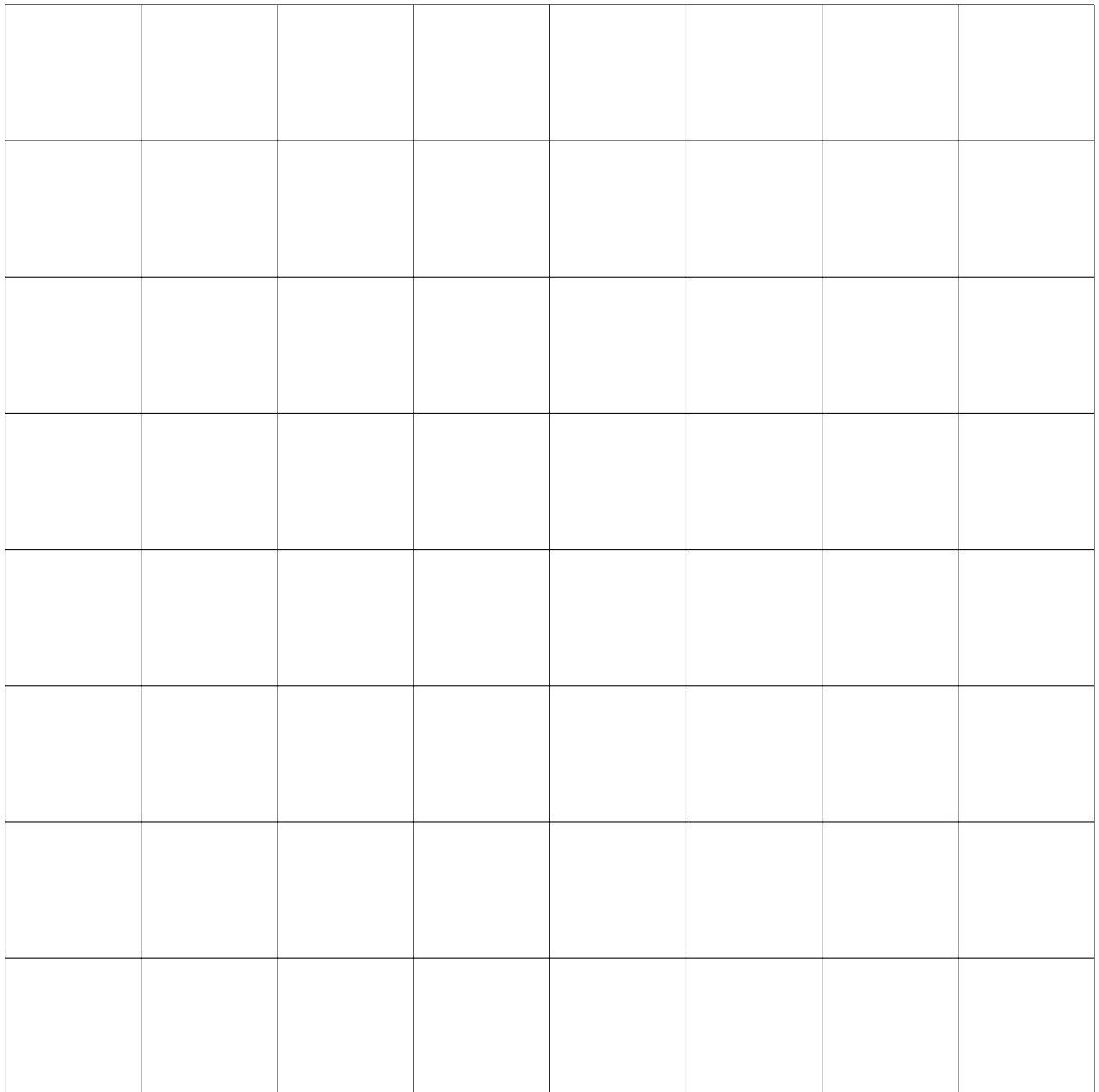
2. Gillian and Harold are playing a game on a 2×15 grid. They take turns tiling it with 1×2 dominoes, and the first person who can't place a domino loses. If Gillian goes first, who wins? What if they used a 2×14 board instead?
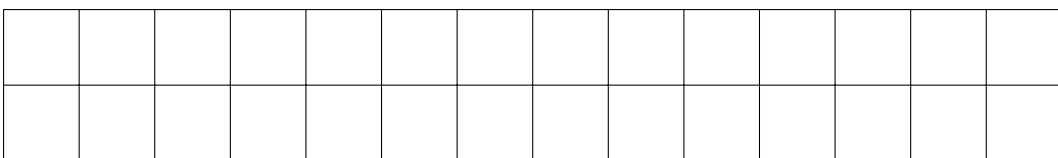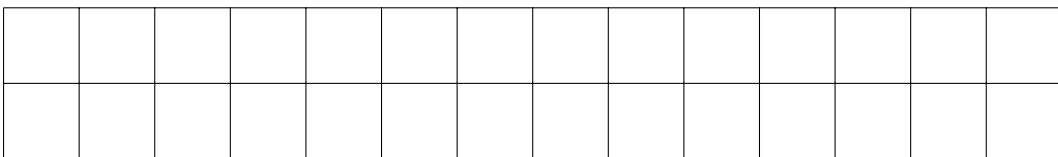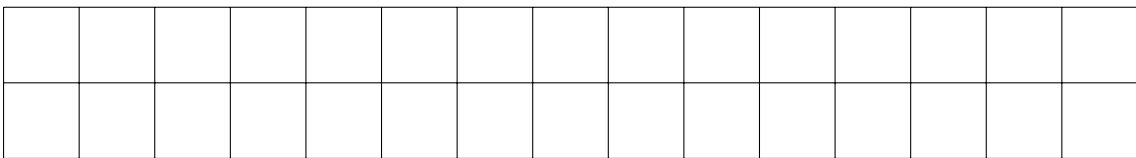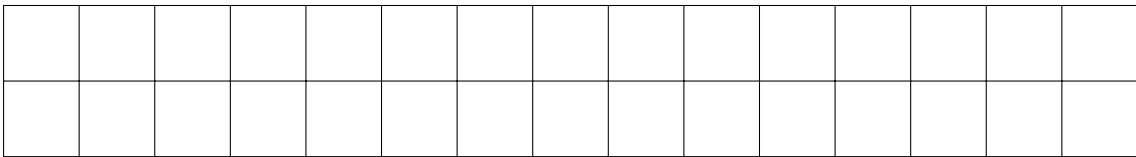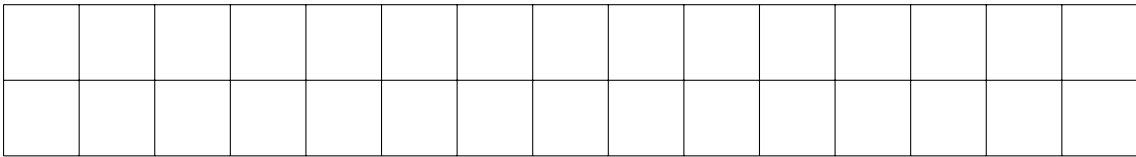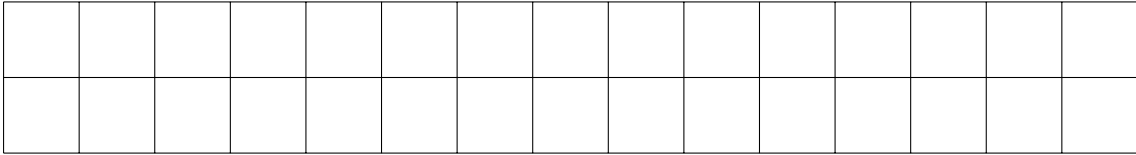
3. Ten ones and ten twos are written on the blackboard. Alice and Bob play a game in which they take turns erasing numbers from the board two at a time. If a person erases two different numbers from the board, they replace them with a 1. If they erase two of the same number from the board, they replace it with a 2. Alice wins the game if the last number remaining on the board is a 1. Bob wins if the last number left on the board is a 2. If Alice goes first, who wins the game?

4. (a) Find a partner and play this game. Start with two piles of 20 stones each. On your turn, you can take as many stones as you want from one pile. The person who wins the game is the one who takes the last stone. Which player wins?

   (b) Who wins the game is if you start with two piles of stones – one with 20 stones, and one with 30 stones?

   (c) Who wins the game if you start with three piles of stones– one with 3 stones, one with 4 stones, and one with 5 stones?

   (d) What about piles of 10, 20, and 30 stones?