# Flow Free on a Torus

**Brian Kronenthal and Wing Hong Tony Wong**

These puzzles are motivated by the smartphone game Flow Free. The objective is to build pipes connecting pairs of dots of the same color and shape. The rules are

1.  pipes can run horizontally or vertically,
2.  only one color pipe can enter each square,
3.  a pipe cannot cross itself, and
4.  pipes must pass through every square on the board.

In this variation, we play the game on a torus. Imagine the opposite edges of the board are glued together—blue glued to blue and yellow glued to yellow.

The resulting shape would be a doughnut. So a path can go off one edge of the board and reenter at the corresponding square on the opposite edge.

We give the solution to the first puzzle below. The solutions to the rest can be found at *maa.org/mathhorizons/supplemental.htm.* ■

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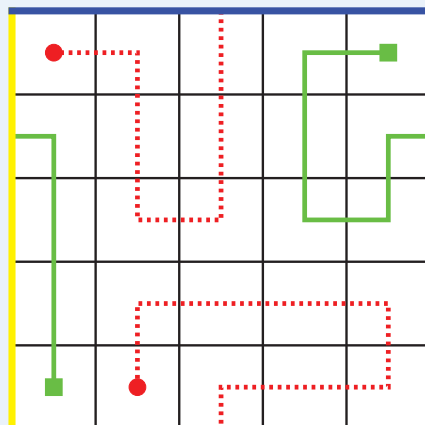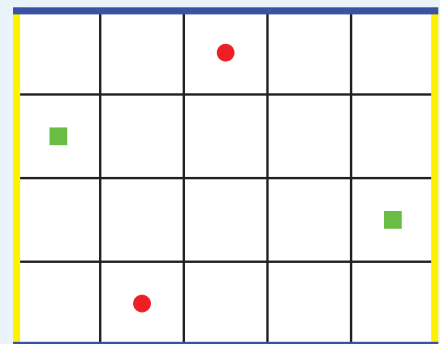**Email:** kronenthal@kutztown.edu
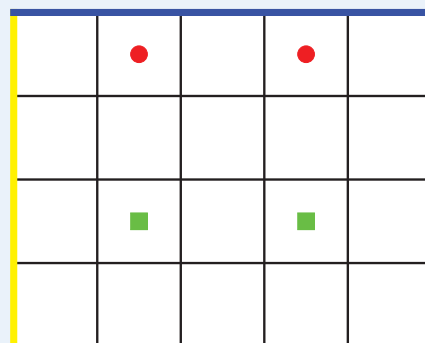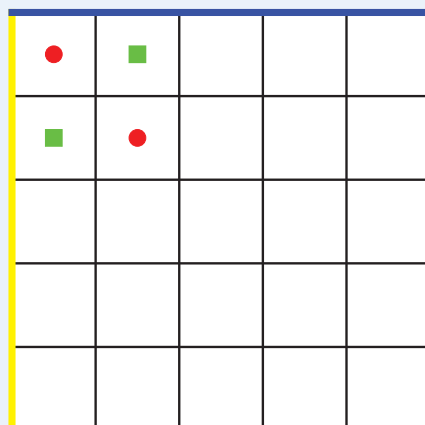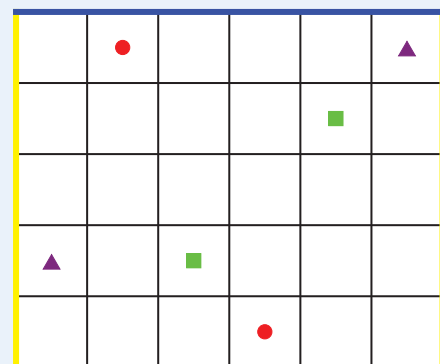**Email:** wong@kutztown.edu
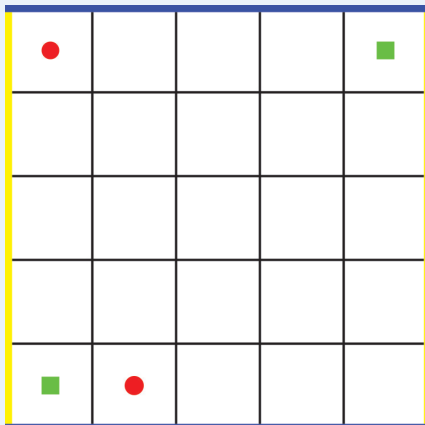
Puzzle #1.



Solution to puzzle #1.



Puzzle #2.



Puzzle #3.



Puzzle #4.



Puzzle #5.