

Stomping on Dots

Activity

A Stomp puzzle consists of a rectangular board made up of unit squares, a smaller "Stomp piece" also made up of unit squares, and some initial configuration of dots appearing on the Stomp board with at most one dot per unit square. You are allowed to place the Stomp piece anywhere within the grid on each move, as long as it lines up with the grid and stays within the boundary. All the squares that are covered then change state, so that dots that are covered disappear, while empty squares that are covered sprout new dots. The goal is to obliterate all the dots in as few moves as possible, or to prove that it is impossible to do so.

Questions

1. Find a way to clear the top left Stomp board in as few moves as possible, using the short L-triomino to the right of the board as your Stomp piece.
2. Find a way to clear the top right Stomp board in as few moves as possible, using the long L-tetromino pictured next to the board.
3. Is it possible to clear the top middle Stomp board using the T-tetromino shown to the right of the board? If so, do it in as few moves as possible; if not, explain why it is impossible.
4. Is it possible to clear the bottom left Stomp board using the domino shown to the right of the board? If so, do it in as few moves as possible; if not, explain why it is impossible.
5. Prove that it is impossible to clear the bottom right Stomp board with the I-triomino shown next to the board.
6. Suppose that you are given a rectangular board whose length and width are each at least four, with any initial arrangement of dots. Explain why it is always possible to clear the board using an L-triomino (the top left board Stomp piece).
7. Once again imagine that you are playing Stomp on a rectangular board whose length and width are each at least four. Prove that if two dots are initially placed in any two squares, then it is possible to clear the board using the T-tetromino (the top middle board Stomp piece).

