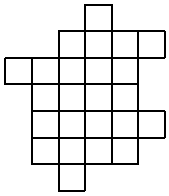
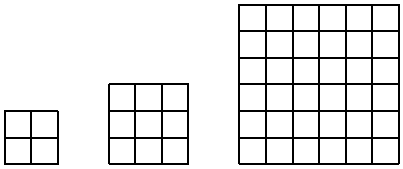
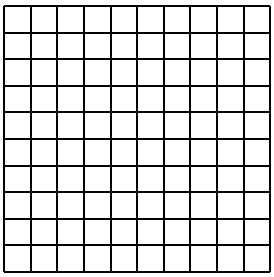
1. A 7×7 board is made from 16 rectangular triominoes and 1 monominoe. Show that the monominoe lies either in the center of the board or on the boundary.

2. The shape in the figure below is to be divided into several congruent parts along the grid lines. What shapes can the congruent parts have?



3. What is the fewest number of cuts along grid lines required to produce pieces which can be reassembled to form a 7×7 grid of squares starting with the three squares shown.



4. A large town is laid off in perfect square blocks. The town council wants to place emergency telephones so that there is exactly one phone within one block of each intersection, with exceptions only at intersections on the boundary of the town at which places the telephone is allowed to be two blocks away. Is this possible? What if the town covers the entire plane?