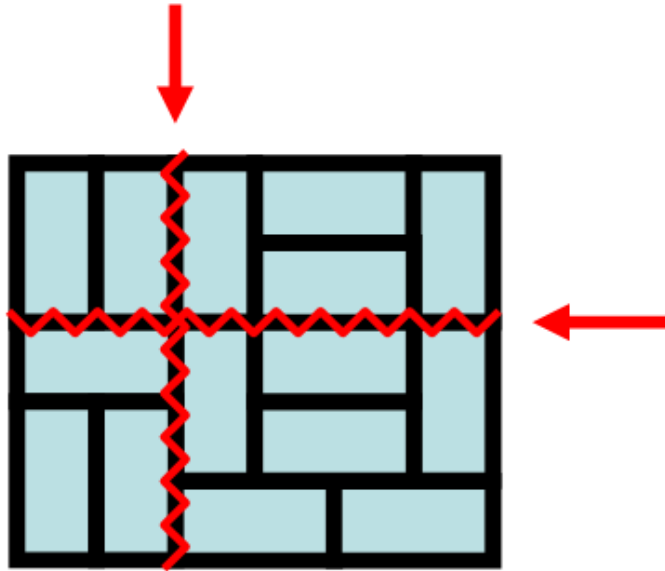


Karate Bricks

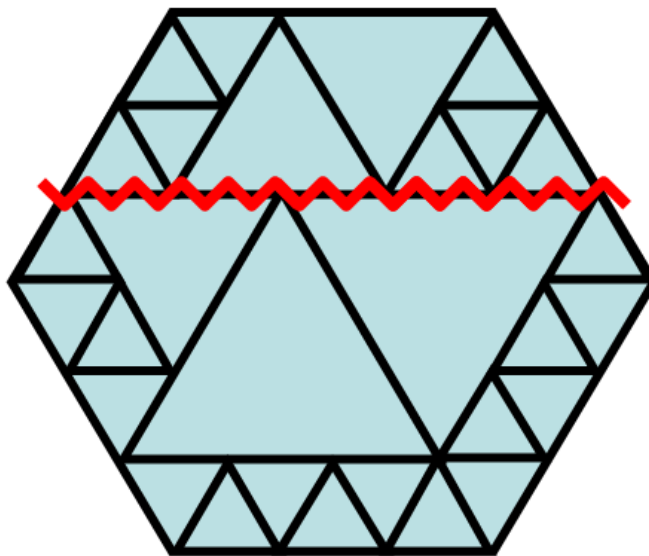
A fake karate brick looks like a regular brick, but when it is hit with a karate chop, it disintegrates. Sometimes people use these fake bricks to convince other people that they have a black belt in karate. The difference between real and fake karate bricks is that the real bricks do not have a fault line.



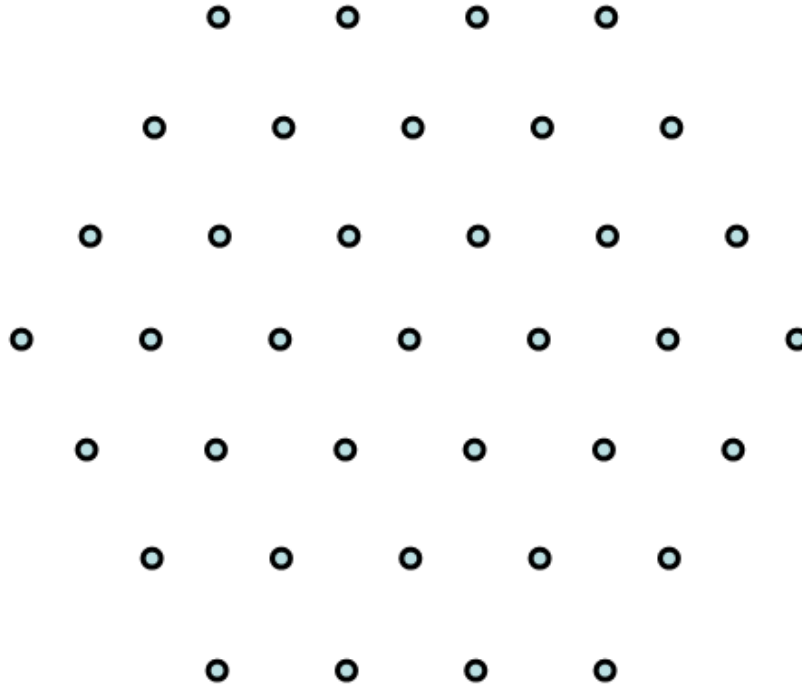
This is a fake karate brick because it has fault lines.

Can you make a real karate brick the same dimensions as the brick above, using the same fifteen 5cm x 10cm dominoes?

There are also fake solid metal pipes that look difficult to bend, but are actually easy. Fake solid metal pipes have a cross-section with a fault line (see below).



Using equilateral triangles on the grid below, make a pipe cross-section without a fault line. Can you do it using less than 20 triangles? Can you do it using exactly 36 triangles?



Extensions:

- Prove that there is no real rectangular karate brick made of 5cm x 10cm dominos that is 20cm wide.
- Prove that there is no real square karate brick made of the same dominos that has a 30cm side.
- What is the smallest cube that can be constructed of smaller cubes so that there are no fault planes?
- Can you find other fake and real constructions like the pipes and bricks and email them to Galileo.
- How many ways are there to create a fake rectangular karate brick that is 15cm wide and
 - 10cm long
 - 20cm long
 - 30cm long
 - 40cm long
 - 50cm long
 - 60cm long
 - Do you recognize a pattern?

The Math in This Problem:

This puzzle challenges students to observe and analyze shapes, along with their respective dimensions and measurements. Using patterns found in real-life objects, particularly those used to form bricks and solid metal pipes, students will simulate constructing such items using triangles and rectangles.

Credits: The initial problem and last extension are found in “Polyominoes : A Guide to Puzzles and Problems in Tiling” by George Martin, ISBN: 0883855011

