Mathematical Playground

Ben Kang, Holden Mui, Mark Saengrungkongka

Name: _____

Date: _____

> In groups of three or four, work together on any problems that look interesting to you. Enjoy the problems!

Problem 1. Is it possible to split the numbers 1, 2, 3, 4, 5, 6, 7, 8, and 9 into two groups such that the two groups have the same sum? Explain why or why not.


Extension: find a way to split the numbers into three parts such that the three parts have the same sum.

Problem 2. You have 10 weights that are identical in appearance, and there is a scale that can weigh two weights at a time. Find a method that can always determine both the heaviest weight and the lightest weight in at most 17 weighings.

Extension: is there a way to determine both the heaviest weight and the lightest weight in less than 17 weighings?
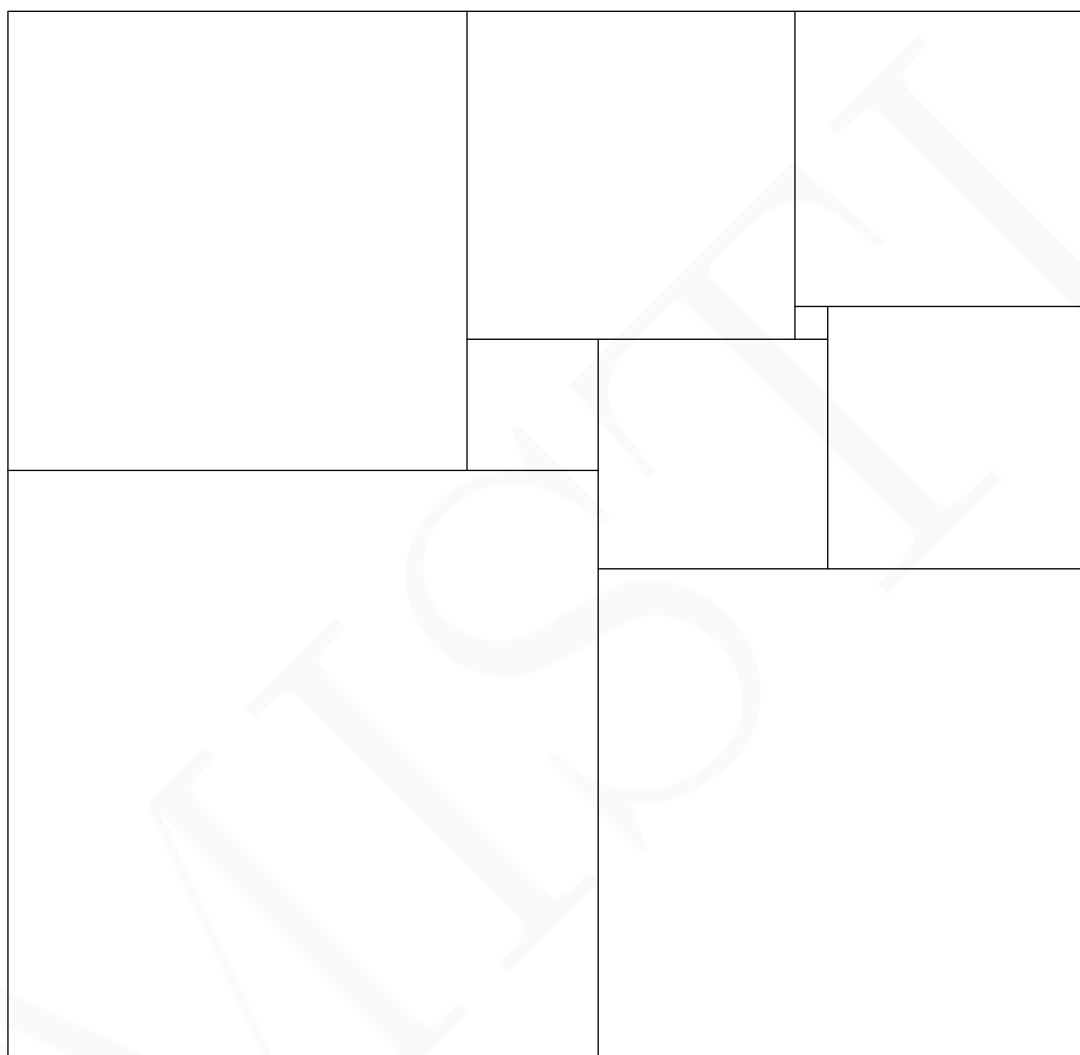
Problem 3. Divide each of the following shapes into four congruent pieces similar to itself.
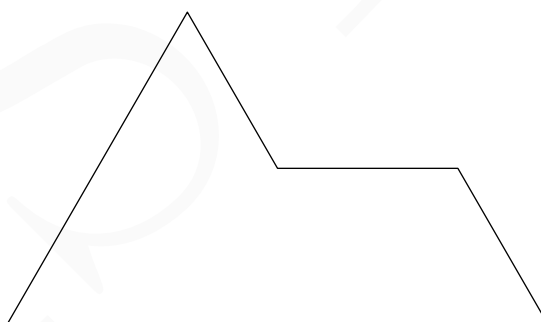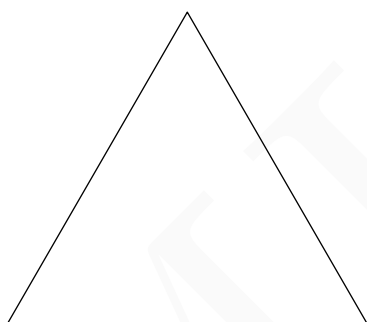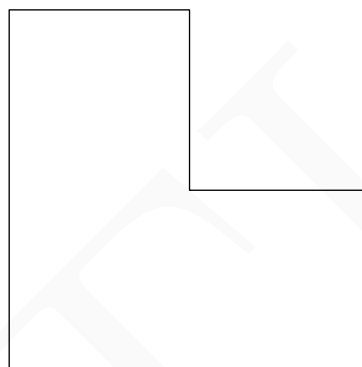
Extension: find a way to divide each shape into nine congruent pieces similar to itself.

Problem 4. The following rectangle has been dissected into squares of different sizes. If the side length of the smallest square is 1, find the side length of the largest square.

Extension: what is the area of the big rectangle?

Problem 5. 50 is the smallest number that is a sum of two positive square numbers in two ways; namely:

$$50 = 7^2 + 1^2 = 5^2 + 5^2.$$

What is the second-smallest number with this property?

Extension: what is the third-smallest number with this property?