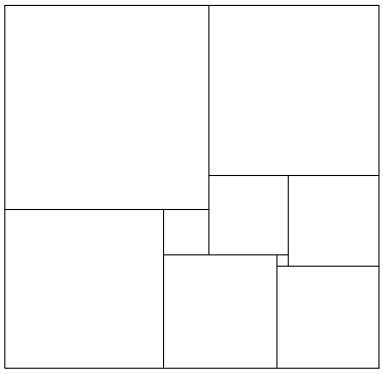
BRITISH COLUMBIA SECONDARY SCHOOL MATHEMATICS CONTEST, 2025

Senior Final, Part B

May 2, 2025

1. For some integers x and y, the number $3x + 2y$ is divisible by 23. Prove that the number $17x + 19y$ is also divisible by 23.

2. The diagram shown is a rectangle that has been divided into 9 squares. If the smallest square has sides of length 1, what are the lengths of the sides of the rectangle?



3. In a six-digit number, the first digit is the same as the fourth digit, the second digit is the same as the fifth digit and the third digit is the same as the sixth digit. Prove that the number is divisible by 7, 11 and 13.

4. A highly composite number is a positive integer that has more divisors than any smaller positive integer. For example, 6 is a highly composite number because it has more divisors than 1,2,3,4 or 5. What is the smallest highly composite number that is larger than 70?

5. Find the dimensions of all rectangles with the following properties:

    1. Not a square
    2. Integer side lengths
    3. Using piecewise straight cuts, it can be decomposed into two pieces which can be reassembled into a 12 by 12 square.