Lesson 1

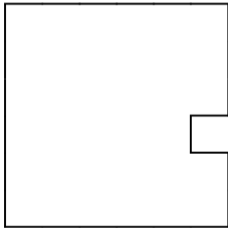## Konstantin Miagkov

Problem 1.
A small square was cut out of a larger square, as shown on the picture. As a result, the perimeter of the square increased by 10%. By how many percent did the area decrease?
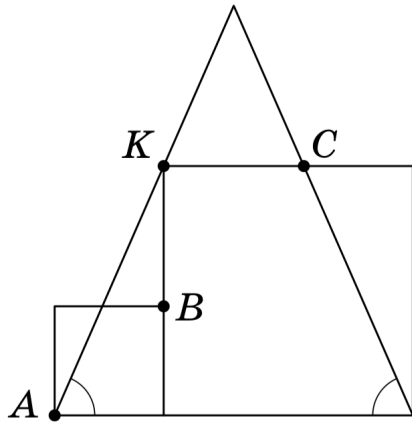

Problem 2.
30 sharks were put in a pond. The sharks immediately started eating each other. A shark is considered full if it ate at least 3 other sharks. What is the biggest possible number of sharks that could get full? A shark that got full and then got eaten still counts.
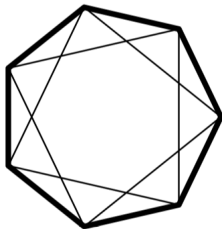
Problem 3.
Two squares an an isosceles triangle are positioned as shown on the picture (point K is on the side of the triangle). Show that points A, B, C are collinear (lie on one line).

Problem 4.
A heptagon has several diagonal drawn inside of it, as shown on the picture. An integer is placed in each vertex of the heptagon. For every side of the heptagon, one of the two integers it connects is divisible by the other. Is it possible that for every diagonal drawn in the heptagon, neither of the integers it connects is divisible by the other?

Problem 5.
100 liars and knights are sitting at a round table. Knights always tell the truth, and liars always lie. It is known that there is at least one liar and one knight at the table. Every person only sees 10 people to the left of them, and 10 people to the right (it's a really big table!). Each person is asked – *do you see more knights than liars?*. Prove that at least one person answered "No!". (A person does not see themselves).