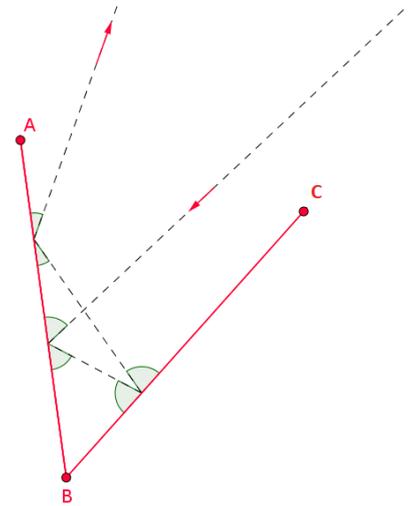


## LIGHT TRAP

Consider a plane figure  $f$  made of two sides AB and BC of a triangle. In the picture you see a ray of light that slides into  $f$  and then emerges after 3 reflections.

Problem 1: Determine points A, B, C and a ray of light so that we will obtain the maximum of reflections. Is it possible to obtain 4 / 5 / 6 / ... / n reflections? Is it possible that the ray never comes out, that is to say, the number of reflections is infinite?

Problem 2: Suppose  $|AB|=|BC|$ . Find the measure of the angle and the direction of the ray so that we will obtain the maximum of reflections. Is it possible to obtain 4 / 5 / 6 / ... / n reflections? Is it possible that the ray never comes out, that is to say, the number of reflections is infinite?



Task 3: Can we build another non-closed plane figure for which we can determine a ray of light that gets trapped?

## A „LEAKY CHOICE” GAME

Two players alternately pull stones out of a hat which contains 7 stones (our players know that there are 7 of them). With each move, each player has only two possibilities: he draws either 1 or 3 stones (he cannot pull out 2 stones – that is why the choice is “leaky”). The one who pulls out the last stone – wins.

Problem 1 (not difficult): Does any of these players have a winning strategy? If yes – please find it.

Problem 2: Let’s generalize the problem – instead of 7 stones, let’s introduce n of them. Therefore we analyze an analogous game, but with n stones in the hat. Please find the solution for every n natural.

If you manage to solve these problems, we may think about similar games for slightly different “leaky choices”.