

## Subject 5. Probabilities and triangles

In the last year Math.en.Jeans workshop, our team struggled to solve the following two problems:

1. Assume a stick is randomly broken into three pieces. What is the probability that the obtained pieces can form a triangle?
2. Let be the set  $A_n = \{1, 2, 3, 4, \dots, n\}$ . We randomly choose 3 of its elements. What is the probability that the chosen numbers be the lengths of the sides of a triangle?

Our new problems are:

- 1'. Assume a stick is randomly broken into four pieces. What is the probability that the obtained pieces can form a quadrilateral?

- 2'. Let be the set  $B_n = \{1^2, 2^2, \dots, n^2\}$ . We randomly choose 3 of its elements. What is the probability that the chosen numbers be the lengths of the sides of a triangle?

Solve the same problem for the set  $C_n = \{1^3, 2^3, \dots, n^3\}$ , or more general, for the set  $X_{nk} = \{1^k, 2^k, \dots, n^k\}$ .

3. What is the probability that four randomly chosen numbers of the above sets of number (i. e.  $A_n, B_n, C_n, X_{nk}$ ) be the lengths of the sides of a quadrilateral?