

# **TSINGHUA MATHCAMP 2018 COURSE: ALGEBRAIC COMBINATORICS I**

IVAN LOSEU, LECTURER

Algebraic Combinatorics is a subject at the intersection of Algebra and Combinatorics. Combinatorics is about counting objects, while Algebra is concerned with the study of algebraic operations such as addition, multiplication and generalizations of those. So at the first glance, those are very different subjects. But this is not so. In this course we will study algebraic structures behind classical objects of combinatorics, such as permutations, partitions, binomial coefficients, rectangular paths, increasing subsequences of a given sequence and others. We will encounter algebraic structures such as groups and their actions, rings of polynomials and power series, symmetric polynomials. We will investigate how Algebra interacts with Combinatorics, how using algebraic techniques helps to solve purely combinatorial questions and how Combinatorics gives rise to objects of interest to Algebra.