

# Introduction to Representation Theory

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**Abstract:** Abstract: Linear algebra might be the only thing mathematicians can actually do. This is the starting point of representation theory: let's understand groups through how they act on vector spaces. The most classical case (the group is finite and the vector space is complex) gives a remarkably pretty theory with many nice, interesting results. I'll try to present the most important aspects here, our northern star being the problem "in how many ways can we write an  $n$ -cycle in  $S_n$  as a composition of  $k$  transpositions?", which becomes much easier with the machinery of representation theory.

**Prerequisites:** linear algebra, group theory