

# Representations of Symmetric Groups with Nontrivial Determinant

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A representation of a group is a realization of its elements in terms of matrices that takes the group operation into matrix multiplication. The groups of permutations (symmetric groups) were among the first families of groups for which the representations were classified in the work of Frobenius, Schur and Young around 1900. It was found that the irreducible representations of the  $n$ th permutation group are parametrized by integer partitions of  $n$ . Taking the determinant of the representing matrix results in either the trivial character, or in the sign character of the  $n$ th permutation group.

It has been a long-open problem to understand, for how many integer partitions of  $n$  the determinant gives rise to the non-trivial character. Recent work with Ayyer and Spallone has led to a closed formula for this number. Using this exact formula, one finds that most representations of large permutation groups have trivial determinant.