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Transition Matrices for Young's Representations of S_n . Preliminary report.

The irreducible representations of the symmetric group S_n are indexed by integer partitions $\lambda \vdash n$. The corresponding simple modules are denoted $\{S_n^\lambda \mid \lambda \vdash n\}$, and the dimension of S_n^λ equals the number f_λ of standard Young tableaux of shape λ . In the 1920s, A. Young defined two bases of S_n^λ — the natural and seminormal bases — by describing the action of $\sigma \in S_n$ on vectors indexed by standard Young tableaux of shape λ . We give a formula for the entries in the transition matrix between the seminormal and natural bases, answering an open question in the representation theory of the symmetric group. Our method is to use a graph Γ_λ , which has vertices labeled by the standard tableaux of shape λ and colored edges corresponding to adjacent transpositions in S_n . This graph is the Hasse diagram of weak Bruhat order on standard tableaux. The entries in the transition matrix are calculated using weights on walks on Γ_λ . We generalize our method to the wreath product group $S_n \wr \mathbb{Z}_r$ and the Iwahori-Hecke algebra $H_n(q)$ of S_n . (Received September 20, 2018)