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Eulerian Enumeration and Other Illustrations of the Peak Phenomenon

Abstract for the Combinatorics and Number Theory Seminar 2003 April 14

The peak algebra, introduced by John Stembridge in connection with the combinatorial study of shifted tableux and Schur Q-functions, has recently emerged as a natural algebraic setting to study flag enumeration in Eulerian posets, in particular face-lattices of convex polytopes.

I will discuss the peak algebra and Eulerian enumeration in the broader context of the following peak phenomenon:

Given a statement regarding the algebra of quasisymmetric functions (these include the symmetric functions), there is an analagous statement that holds for the peak subalgebra (these include Schur's Q-functions).

I will give some examples of this phenomenon, and explain what implications it might have for the study of flag f-vectors, the cd-index, and related invariants on posets.