

1062-05-118

Kari Ragnarsson* (kragnars@math.depaul.edu), Department of Mathematical Sciences, 2320 N Kenmore Avenue, Chicago, IL 60614, and **Bridget Eileen Tenner**. *The boolean complex of a Coxeter system.*

In any Coxeter group, the set of elements whose principal order ideals are boolean forms a simplicial poset under the Bruhat order. This simplicial poset defines a cell complex, called the boolean complex. We show that for a Coxeter system of rank n , the boolean complex is homotopy equivalent to a wedge of $(n-1)$ -dimensional spheres. The number of such spheres can be computed recursively from the unlabeled Coxeter graph, and defines a new graph invariant called the boolean number. Explicit computation of boolean numbers of certain families of graphs indicate interesting enumerative properties related to derangements. We uncover this relationship and determine the combinatorial significance of the spheres by constructing and analyzing an explicit basis for the homology of the boolean complex. More precisely, to a given finite simple graph we assign a class of derangements of its vertex set, and to each derangement we associate a homology class in the maximal dimension of the boolean complex. Combining these steps we obtain a basis for the homology of the boolean complex, whose elements are indexed by derangement and represent the spheres in the complex. (Received August 02, 2010)