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Summary: Let \((W, S)\) be an arbitrary Coxeter system. For each word \(\omega\) in the generators we define a partial order – called the \(\omega\)-sorting order – on the set of group elements \(W_\omega \subseteq W\) that occur as subwords of \(\omega\). We show that the \(\omega\)-sorting order is a supersolvable join-distributive lattice and that it is strictly between the weak and Bruhat orders on the group. Moreover, the \(\omega\)-sorting order is a “maximal lattice” in the sense that the addition of any collection of Bruhat covers results in a nonlattice.

Along the way we define a class of structures called supersolvable antimatroids and we show that these are equivalent to the class of supersolvable join-distributive lattices.

MSC:

20F55 Reflection and Coxeter groups (group-theoretic aspects)
06A07 Combinatorics of partially ordered sets
05E15 Combinatorial aspects of groups and algebras (MSC2010)
06D75 Other generalizations of distributive lattices

Keywords:
Coxeter groups; partial orders; antimatroids; supersolvable lattices; join-distributive lattices; Catalan numbers; sorting algorithms; weak order; Bruhat order

Full Text: DOI arXiv

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