

Poster Presentation

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The structure of the full icosahedral group

D. Lee¹, J. Lee²

¹Seoul Women's University, Department of Mathematics, Seoul, South Korea, ²Kwandong University, Department of Mathematics Education, Gangneung, South Korea

We consider the full icosahedral group, which is the Coxeter group of type H_3 . The Coxeter groups appear naturally in geometry and algebra. In 1935, the finite Coxeter groups were classified by Coxeter in terms of Coxeter-Dynkin diagrams. We remark that the affine extensions of the Coxeter groups of types H are related to quasicrystals with tenfold symmetry. Our approach to understanding the structure of Coxeter groups is the noncommutative Groebner basis theory, which is called the Groebner-Shirshov basis theory. By completing the relations coming from a presentation of the Coxeter group, we find a Groebner-Shirshov basis to obtain a set of standard monomials. Especially, for the Coxeter group of type H_3 , its Groebner-Shirshov basis and the corresponding standard monomials are constructed. Thus, we understand the algebra structure of the group algebra $C[H_3]$, which is not commutative.

[1] J. E. Humphreys, *Reflection Groups and Coxeter Groups*, Cambridge Studies in Advanced Math. 29, Cambridge Univ. Press, 1990., [2] A. I. Shirshov, *Some algorithmic problems for Lie algebras*, *Sibirsk. Math. Z.* 3 (1962), 292-296., [3] B. Buchberger, *An algorithm for finding the basis elements of the residue class ring of a zero dimensional polynomial ideal*, Ph.D. thesis, University of Innsbruck, 1965.

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