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Cyclotomic Polytopes and Growth Series of Cyclotomic Lattices

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The coordination sequence of a lattice L encodes the word-length function with respect to M , a set that generates L as a monoid. We investigate the coordination sequence of the cyclotomic lattice $L = \mathbb{Z}[\zeta_m]$, where ζ_m is a primitive m -th root of unity and where M is the set of all m -th roots of unity. We prove several conjectures by Parker regarding the structure of the rational generating function of the coordination sequence; this structure depends on the prime factorization of m . Our methods are based on unimodular triangulations of the m -th cyclotomic polytope, the convex hull of the m roots of unity in $\mathbb{R}^\varphi(m)$, and combine results from commutative algebra, number theory, and discrete geometry.

This is joint work with Serkan Hosten (SF State).

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