

1021-05-38

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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 $L = \mathbf{Z}[\zeta_m]$, 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 $\mathbf{R}^{\phi(m)}$, and combine results from commutative algebra, number theory, and discrete geometry. (Received August 02, 2006)