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Combinatorial families enumerated by quasi-polynomials

We say that the sequence (a_n) is quasi-polynomial in n if there exist polynomials $P_0, \ldots, P_{s-1}$ such that $a_n = P_i(n)$ where $i \equiv n \pmod{s}$. We present several families of combinatorial structures with the following properties: Each family of structures depends on two or more parameters, and the number of isomorphism types of structures is quasi-polynomial in one of the parameters whenever the values of the remaining parameters are fixed to arbitrary constants. For each family we are able to translate the problem of counting isomorphism types of structures to the problem of counting integer points in a union of parameterized rational polytopes. The quasi-polynomiality of the counting sequence then follows from Ehrhart's result about the number of integer points in the sequence of integral dilates of a given rational polytope. The families of structures to which this approach is applicable include combinatorial designs, linear and unrestricted codes, and dissections of regular polygons.