Coefficients of Ehrhart quasi-polynomials

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Given a quasi-polynomial, how can we determine whether it is the Ehrhart quasi-polynomial of a rational polytope? Characterizing the Ehrhart quasi-polynomials of rational polytopes is an active area of research with many open questions. Even in dimension 2, the problem has only been solved for those polygons whose vertices are integer lattice points. When the vertices are allowed to be non-integral, many unsolved questions arise. We will discuss several techniques for exploring the set of Ehrhart quasi-polynomials, with an eye towards proving theorems and finding counterexamples. Our focus will be on the connection between the phenomenon of quasi-period collapse and the group SL_2(Q) of 2-by-2 matrices with rational entries and determinant 1.