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One-norm spectrum of a lattice

In 1964, John Milnor gave the first example of isospectral non-isometric compact Riemannian spaces. To do this, he related the spectrum of the Laplace operator on a torus, and the (Euclidean) norm of the vectors of the (corresponding) dual lattice. Consequently, a pair of lattices with the same theta function induces a pair of isospectral tori.

In this talk, we will introduce a new relation between the spectrum of a lens space (a sphere over a cyclic group), and the one-norm (sum of the absolute values of the entries) of the vectors in an associated lattice. We associate to each lattice, the one-norm generating function defined as follows: the power series whose k -th term is the number of vectors in the lattice with one-norm equal to k .

We will show that two lens spaces are isospectral if and only if their corresponding lattices have the same one-norm generating function. Furthermore, we will prove that the generating function is a rational function, and consequently, a finite part of the spectrum determines the whole spectrum.

This is a joint work with Roberto Miatello and Juan Pablo Rossetti.