
ALEXANDER KOLPAKOV, Université de Neuchâtel

Space vectors forming rational angles

We classify all sets of nonzero vectors in \mathbb{R}^3 such that the angle formed by each pair is a rational multiple of π . The special case of four-element subsets lets us classify all tetrahedra whose dihedral angles are multiples of π , solving a 1976 problem of Conway and Jones: there are 2 one-parameter families and 59 sporadic tetrahedra, all but three of which are related to either the icosidodecahedron or the B_3 root lattice. The proof requires the solution in roots of unity of a $W(D_6)$ -symmetric polynomial equation with 105 monomials (the previous record was only 12 monomials). This is a joint work with Kiran Kedlaya, Bjorn Poonen, and Michael Rubinstein.