Abstract

Constructing, Counting, Classifying, and Characterizing Combinatorial Structures—Some Recent Results

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Contemporary, sophisticated techniques for counting and classifying combinatorial structures together with an ever increasing amount of computing resources available have made it possible to settle open problems that were far beyond reach 20 years ago. A few recent results of this kind will be addressed in this talk.

The main classes of Latin squares of order 11 can be *counted* using a variety of constructive and nonconstructive techniques. It turns out that their number is 2036029552582883134196099, which is far too large for any constructive approach.

Several types of codes have been *classified* lately, including the binary perfect one-error-correcting codes of length 15—there are 5983 equivalence classes—and short binary constant weight codes.

Classifications of combinatorial structures are good starting points for trying to understand (*characterize*) the given structures; the concept of switching is one way of approaching this issue. It turns out that the equivalence classes of binary perfect one-error-correcting codes of length 15 are partitioned into just nine switching classes and all 11084874829 isomorphism classes of Steiner triple systems of order 19 are connected via cycle switches.

This is joint work with Alexander Hulpke, Petteri Kaski, Veli Mäkinen, Kevin Phelps, and Olli Pottonen.