Automorphisms of extremal codes

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Extremal codes are self-dual binary codes with largest possible minimum distance. In 1973 Neil Sloane published a short note asking whether there is an extremal code of length 72. Since then many mathematicians search for such a code, developing new tools to narrow down the structure of its automorphism group. We now know that, if such a code exists, then its automorphism group has order ≤ 5.

The methods for studying this question involve explicit and constructive applications of well known classical theorems in algebra and group theory, like Burnside's orbit counting theorem and quadratic reciprocity, as well as basic representation theoretic methods and tools from the theory of quadratic forms.