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Chromatic numbers of Steiner quadruple systems

A Steiner quadruple system of order v, SQS(v), is a pair (X, B), where B is a set of 4-subsets of X such that each 3-subset of X is in a unique member of B. Hanani showed that an SQS(v) exists if and only if $v = 0, 1$ or $v \equiv 2, 4 \pmod{6}$. An SQS(v) is commonly described as a S(3,4,v) design, and as a 4-uniform hypergraph each SQS(v) has a chromatic number.

For a given $k \geq 2$, a basic problem is to determine all v for which a k-chromatic SQS(v) exists. We survey recent progress on this problem and point out avenues for future research.