Integer programming-based constructions of Latin squares

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Integer programming models may be used to construct special types of Latin squares by appropriately defining the variables and constraints such that a feasible (or optimal) solution defines the desired Latin square. Recently Appa et al. [1, 2] used integer programming in order to solve certain problems concerning mutually orthogonal Latin squares, including a proof of the non-existence of a pair of mutually orthogonal Latin squares of order 6 by an attempted LP-based construction of such a pair. In this talk we consider the construction a various types of Latin squares by utilising integer programming as well as algebraic identities which define special types of Latin squares. These algebraic identities may be incorporated as constraints in an integer programming model in order to construct a quasi-group for which the multiplication table represents the desired Latin square. One such an example is a self-orthogonal Latin square (SOLS) (a Latin square orthogonal to its transpose), where the multiplication table of a quasi-group satisfying the identity $yx = x(xy)$ represents a SOLS.

References