

Finding group divisible designs with and without automorphisms

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A k -GDD, or *group divisible design* with block size k , is a triple $(X, \mathcal{G}, \mathcal{B})$ where X is a set of *points*, \mathcal{G} is a partition of X into subsets (called *groups*) and \mathcal{B} is a collection of k -element subsets of X (called *blocks*) such that any two points from distinct groups appear together in exactly one block and no two distinct points from any group appear together in any block. There are a number of known necessary conditions for the existence of a GDD. However, these conditions are not sufficient.

Most work done on GDDs has been on existence but very little work has been done on the enumeration of such structures. Also, most GDDs that are constructed directly are done so using methods that involve assuming automorphisms. This talk will focus on 4-GDDs. We will present some recent work done on the enumeration of some small 4-GDDs and discuss how this has led to some insights on the diversity of GDDs both with and without automorphisms.

Joint work with R. Julian R. Abel and Diana Combe.