Constructing quasi-symmetric designs from orbits

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Abstract

Finding quasi-symmetric 2-(v, k, λ) designs with intersection numbers x and y, and with a prescribed automorphism group G is done in two steps:

1. compute the good orbits of G on k-element subsets of points,
2. select orbits comprising blocks of the design.

We will focus on the second step and explain methods for constructing quasi-symmetric designs from orbits. Depending on the number of the good orbits, we use one of the following three methods: the Kramer-Mesner method, a method based on clique search, and a method based on tactical decompositions.

Using these methods, we construct some new quasi-symmetric designs with parameters 2-$(56, 16, 6)$, $x = 4$, $y = 6$ and 2-$(56, 16, 18)$, $x = 4$, $y = 8$.