
CLEMENT LAM, Concordia University

A search for $\text{PBD}(30, K)$ where K does not contain a divisor of 6

Let K be a set of positive integers. A *pairwise balanced design* $\text{PBD}(v, K)$ consists of a finite set V of cardinality v (whose elements are called points) and a family of subsets of V (called blocks) that has the property that every pair of distinct points lies in precisely one block, and the size of each block lies in K . Suppose K contains no divisors of 6. In 1983 and 1984, Drake and Larson determine all positive integers v such that a proper $\text{PBD}(v, K)$ exists, with the possible exception of $v = 30$. Furthermore, they determined that for $v = 30$, the only possible block sizes are $\{4, 5, 7, 8\}$. Let b_i denote the number of blocks of size i . Drake and Larson shows that there are only 6 possible block distributions (b_8, b_7, b_5, b_4) , namely $(1, 1, 14, 41)$, $(0, 3, 24, 22)$, $(0, 3, 15, 37)$, $(0, 1, 27, 24)$, $(0, 1, 24, 29)$ and $(0, 1, 15, 44)$. In 2004, Grüttmüller and Streso eliminated the first of these. In this talk, we report the results of a computer search which eliminated the remaining five cases.

Joint work with Ronald Mullin and Narges Simjour.