

THE LATTICE OF N-RUN ORTHOGONAL ARRAYS

by

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ABSTRACT

If the number of runs in a (mixed-level) orthogonal array of strength 2 is specified, what numbers of levels and factors are possible? If there are 12 runs, for example, 23 different parameter sets occur, four of which – $OA(12,2^{11})$, $OA(12,2^4 3^1)$, $OA(12,2^2 6^1)$ and $OA(12,3^1 4^1)$ – dominate, in the sense that any other 12-run array can be obtained from one of these four by the “expansive replacement” method. This paper discusses the properties of the lattice of parameters of N-run orthogonal arrays. It will be shown that the height of this lattice is at most $\lfloor c(N-1) \rfloor$, where $c = 1.4039\dots$, and that there is an infinite sequence of values of N for which this bound is attained. On the other hand, the number of nodes in the lattice is bounded above by a subexponential function of N (and subexponential growth does occur for certain sequences of values of N). Using a new construction based on “mixed spreads”, all parameter sets with 64 runs are determined. Four of these 64-run orthogonal arrays appear to be new.