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The minimum size of critical sets in latin squares. (English) Zbl 0891.62051

Summary: A critical set $C$ of order $n$ is a partial latin square of order $n$ which is uniquely completable to a latin square, and omitting any entry of the partial latin square destroys this property. The size $s(C)$ of a critical set $C$ is the number of filled cells in the partial latin square. The size of a minimum critical set of order $n$ is $s(n)$. It is likely that $s(n)$ is approximately $4^{-1}n^2$, though to date the best-known lower bound is that $s(n) \geq n + 1$.

We obtain some conditions on $C$ which force $s(C) \geq \lfloor (n - 1)/2 \rfloor^2$. For $n > 20$, this is used to show that in general $s(n) \geq \lfloor (7n - 3)/6 \rfloor$, thus improving the best-known result.

MSC:
62K05 Optimal statistical designs
05B15 Orthogonal arrays, Latin squares, Room squares

Keywords:
critical set $C$; design construction; partial latin square

Full Text: DOI

References:

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