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NO-THREE-IN-LINE FOR SEVENTEEN AND NINETEEN

On the seventieth birthday of Professor Richard K. Guy

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Examples are presented where 34 points of a 17 by 17 square, and 38 points of a 19 by 19 square of lattice points are selected with no three of them in a straight line.

It is an old problem to ask for the maximum number $D(n)$ of lattice points which can be selected from n by n points of the unit lattice such that no three are in a straight line [1, 2]. For large n it is conjectured $D(n) < cn$ with $c = 1.87\ldots$. *Examples proving* $D(n) = 2n$ are known for $n \leq 16$, and for $n = 18, 20, 22, 24, 26$ [2]. As result of a computer search here solutions of $D(n) = 2n$ are presented for $n = 17$ and for $n = 19$. Now the minimum n with $D(n) < 2n$ is at least 21.

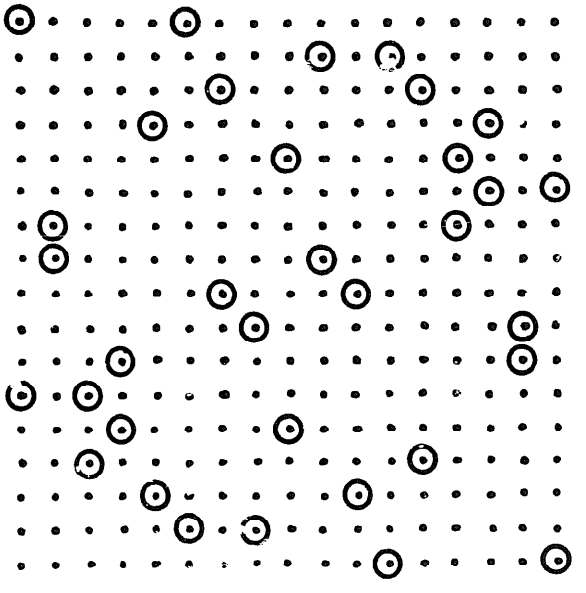

Fig. 1. $2n$ lattice points, no three in line, for $n = 17$.

References

[1] R.K. Guy, Unsolved Problems in Number Theory (Springer-Verlag, New York, Heidelberg, Berlin, 1981) 133–135.
[2] W. Moser and J. Pach, Research Problems in Discrete Geometry (1986) Problem 23.

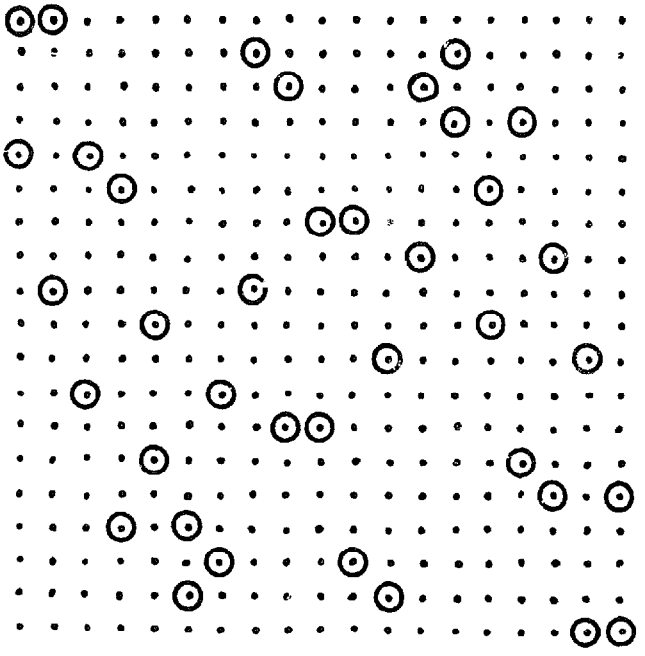

Fig. 2. $2n$ lattice points, no three in line, for $n = 19$.