

Suppose that $2n$ points on an $n \times n$ grid are marked. Show that for some $k > 1$ one can select $2k$ distinct marked points, say a_1, \dots, a_{2k} , such that a_1 and a_2 are in the same row, a_2 and a_3 are in the same column, \dots , a_{2k-1} and a_{2k} are in the same row, and a_{2k} and a_1 are in the same column.