On finite matroids satisfying an extremal condition

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Abstract

It is well known that the flats of a simple matroid of rank $d+1$ are the subspaces of a d-dimensional linear space, and viceversa, hence the theory of d-dimensional linear spaces is a useful tool to approach the theory of simple matroids. In this paper we prove that in any finite simple matroid of rank $d+1$, $d \geq 3$, for every $i \leq d-2$, the number of $(i+1)$-flats missing a point p is greater than or equal to the number of lines passing through p. Moreover, the equality holds for a certain point q and a certain $i \leq d-2$ if, and only if, $i = d-2$ and the matroid is the sum of q and a generalized projective space of dimension $d-1$.