1023-05-724 **D. Raghavarao**, **S. S. Shrikhande** and **M. S. Shrikhande*** (shrik1m@cmich.edu), Department of Mathematics, Central Michigan University, Mt. Pleasant, MI 48859. *Incidence Matrices and Inequalities for Combinatorial Designs.*

In this paper we use incidence matrices of block designs and row-column designs to obtain proofs of some well known combinatorial inequalities. We introduce the concept of *nearly orthogonal* Latin squares by modifying the usual definition of orthogonal Latin squares: Let $v = 2m$ and L_1 and L_2 be Latin squares on symbols $\{0, 1, 2, \ldots, 2m-1\}$. Then L_1 and L_2 are said to be *nearly orthogonal* if on superimposition of L_2 and L_1, the identical pairs do not occur together and symbols l and l' $(l \neq l')$ occur 2 times or 1 time according as $|l - l'| = m$ or not.

Theorem: Let $L_1, L_2, \ldots, L_t$ be t Latin squares of order $v = 2m$ on symbols $\{0, 1, 2, \ldots, 2m-1\}$ such that each pair of squares is nearly orthogonal. Then

$t \leq \frac{v}{2} + 1$, if $v \equiv 2 \pmod 4$,

$t \leq \frac{v}{2}$, if $v \equiv 0 \pmod 4$.

The concept of nearly orthogonal latin squares opens up interesting combinatorial problems and is expected to be useful in planning experiments by statisticians. (Received September 21, 2006)