



Rings & Wings

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Title: Extending Fisher's Inequality to Infinite Set Systems

Abstract: A well-known inequality in finite combinatorics, so-called *Fisher's Inequality*, is the following: if X is a set and $\mathcal{B}$ is a collection of nonempty subsets of X , such that there is a natural number n satisfying $|A \cap B| = n$ for all distinct $A, B \in \mathcal{B}$, then $|\mathcal{B}| \leq |X|$. We motivate this result and present a linear-algebraic proof. We then extend Fisher's Inequality to infinite set systems $(X, \mathcal{B})$ (that is, X is infinite and $\mathcal{B}$ is a collection of subsets of X). Natural generalizations will also be discussed.