ON \( r \)-CROSS INTERSECTING FAMILIES OF SETS

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Abstract

Let \([n] = \{1, \ldots, n\}\) and \(\binom{n}{k}\) denote the family of all \(k\)-subsets of \([n]\).

For \(i = 1, 2, \ldots, r\), let \(\mathcal{F}_i \subseteq \binom{n}{k_i}\). Suppose that \(\mathcal{F}_1 \cap \cdots \cap \mathcal{F}_r \neq \emptyset\)
holds for all \(\mathcal{F}_i \in \mathcal{F}_i\) for all \(1 \leq i \leq r\). We show that if \(k_i \leq n/2\) for
all \(i\), then

\[
\prod_{i=1}^{r} |\mathcal{F}_i| \leq \prod_{i=1}^{r} \binom{n-1}{k_i-1}.
\]

Moreover, equality holds if and only if there is an element \(x \in [n]\)
such that

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