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A generalization of Kneser's addition theorem

Two important topics in the study of additive abelian groups are sumsets and subsequence sums. In joint work with B. Mohar and L. Goddyn, we have studied a unification of these two problems.

Let $A_1, A_2, \ldots, A_n$ be a sequence of finite subsets of an (additive abelian) group. Define a group element g to be a k-sum if g can be expressed as a sum of group elements from k distinct terms of this sequence. Our main problem of interest will be finding a (natural) lower bound on the number of (distinct) k-sums.

The study of sumsets is the special case when $n = k = 2$ and here M. Kneser proved an important lower bound. The study of subsequence sums is the special case when every set A_i has size one. Here there have been a number of interesting lower bounds, due to Hamidoune, Bollobas–Leader, Grynkiewicz, and others. We prove a general lower bound on the number of distinct k-sums which generalizes all of these results.