

# Lower bounds for sumsets of multisets in $\mathbb{Z}_p^2$

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The classical Cauchy-Davenport theorem implies the lower bound  $n+1$  for the number of distinct subsums that can be formed from a sequence of  $n$  elements of the cyclic group  $\mathbb{Z}_p$  (when  $p$  is prime and  $n < p$ ). We generalize this theorem to a conjecture for the minimum number of distinct subsums that can be formed from elements of a multiset in  $(\mathbb{Z}_p)^m$ ; the conjecture is expected to be valid for multisets that are not "wasteful" by having too many elements in nontrivial subgroups. We prove this conjecture in  $(\mathbb{Z}_p)^2$  for multisets of size  $p+k$ , when  $k$  is not too large in terms of  $p$ .

Comments: 13 pages. The quantitative bound in Theorem 1.8 has been improved, and a new coauthor has been added. These statements are not unrelated

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