1077-VJ-946 **Geoffrey S Iyer***, geoff.iyer@gmail.com, and **Oleg Lazarev** and **Liyang Zhang**. *Constructing Generalized Sum-Dominant Sets.*

Many of the biggest problems in additive number theory (such as Goldbach's conjecture and Fermat's last theorem) can be recast as understanding the behavior of sums of a set with itself. A sum-dominant set is a finite set $A \subset \mathbb{Z}$ such that $|A + A| > |A - A|$. It was initially believed that the percentage of subsets of $\{0, \ldots, n\}$ that are sum-dominant tends to zero, however, in 2006 Martin and O'Bryant proved a positive percentage are sum-dominant.

We generalize their result to deal with many different ways of taking sums and differences of a set. We first prove that $|\epsilon_1 A + \cdots + \epsilon_k A| > |\delta_1 A + \cdots + \delta_k A|$ a positive percent of the time for all nontrivial choices of $\epsilon_j, \delta_j \in \{-1, 1\}$. Previous approaches proved the existence of many such sets given the existence of one; however, no method existed to construct such a set.

Extending this result, we find sets that exhibit different behavior as more sums/differences are taken. For example, we say A is k-generational if A, $A + A$, $\ldots$, kA are all sum-dominant. Numerical searches were unable to find even a 2-generational set, however, we prove that for any k a positive percentage of sets are k-generational, and no set can be k-generational for all k. (Received September 14, 2011)