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Hannah Alpert* (hcalpert@uchicago.edu). *Finite Phase Transitions in Countable Abelian Groups.*

Let A be an infinite set that generates a group G . The sphere $S_A(r)$ is the set of elements of G for which the word length with respect to A is exactly r . We say G admits all finite transitions if for every $r \geq 2$ and every finite symmetric subset $W \subset G \setminus \{e\}$, there exists an A with $S_A(r) = W$. We determine which countable abelian groups admit all finite transitions, and also show that \mathbb{R}^n and the finitary symmetric group on \mathbb{N} admit all finite transitions. (Received September 10, 2009)