Let $c \geq 1$ be a real number. Let G be an abelian group and let $A \subset G$ be a finite set satisfying $|A+A| \leq c|A|$, where $X+Y := \{x+y | x \in X, y \in Y\}$ and $|Z|$ denotes the cardinality of Z. Prove that

$$|\underbrace{A + A + \cdots + A}_{k \text{ times}}| \leq c^k |A|$$

for every positive integer k.