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Title: Criteria for laws between infinite subsets of infinite groups

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A theorem of B. H. Neumman shows that infinite group in which every two infinite subsets there exist two commuting elements, is abelian.

In this paper, we prove that if in an infinite group G, every two infinite subsets X and Y, there exist $a \in X$ and $b \in Y$ such that $[a^{n_1}, b^{n_2}] = 1$, then G satisfies the law $[x^{n_1}, y^{n_2}] = 1$, where $n_2 \equiv 0[n_1]$ and $n_2 \in \{3, 6, 2^k/k \in \mathbb{N}^*\}$.

Moreover, and using this result, we also prove that an infinite group satisfies the law $(x_1^{n_1} x_2^{n_2} \dots x_r^{n_r})^2 = 1$ if and only if in any r infinite subsets $X_1, \dots, X_r$, of G there exist $a_i \in X_i (i = 1, \dots, r)$ such that $(a_1^{n_1} \dots a_r^{n_r})^2 = 1$, where $n_1, \dots, n_r \in \{2^k/k \in \mathbb{N}^*\}$ and $r \geq 2$.

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