Let g and h be two distinct elements of a group G, and let n be a positive integer. Consider a sequence $w = (w_1, w_2, \ldots)$ which is not eventually periodic and where each w_i is either g or h. Denote by H the subgroup of G generated by all elements of the form $w_k w_{k+1} \ldots w_{k+n-1}$ with $k \geq 1$. Prove that H does not depend on the choice of the sequence w (but may depend on n).