

proof that $\exp G$ divides $|G|^*$

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The following is a proof that $\exp G$ divides $|G|$ for every finite group G .

Proof. By the division algorithm, there exist $q, r \in \mathbb{Z}$ with $0 \leq r < \exp G$ such that $|G| = q(\exp G) + r$. Let $g \in G$. Then $e_G = g^{|G|} = g^{q(\exp G) + r} = g^{q(\exp G)} g^r = (g^{\exp G})^q g^r = (e_G)^q g^r = e_G g^r = g^r$. Thus, for every $g \in G$, $g^r = e_G$. By the definition of exponent, r cannot be positive. Thus, $r = 0$. It follows that $\exp G$ divides $|G|$. \square

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