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TWO NEW CONCEPTS IN FINITE GROUP THEORY

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Abstract

Let G be a group acted on by a group A by automorphisms. The nature of this action is very restrictive and hence informative about the structure of G . We have been carrying on research in this area, especially on length type problems, in several collaborated works over the years.

The action is said to be coprime if G and A have coprime orders. The existence of nice conditions which are valid in this case made it almost traditional to assume that the action is coprime. After many attacks to a longstanding noncoprime conjecture we have recently introduced the concept of a good action of A on G in a joint work with Güloğlu and Jabara. We say the action is “good” if $H = [H, B]C_H(B)$ for every subgroup B of A and for every B -invariant subgroup H of G . It can be regarded as a generalization of the coprime action due to the fact that every coprime action is good. However there are noncoprime actions which are good. It is expected that this concept may help to understand the real difficulties in studying a noncoprime action.

On the other hand Khukhro, Makarenko and Shumyatsky studied the case where A is a Frobenius group and obtained very nice results showing the dependence of certain invariants of the group G on the corresponding invariants of $C_G(H)$ where H is a Frobenius complement of A . During some efforts to understand the real relation between this assumption on A and its conclusions, in a joint work with Güloğlu we have defined the concept of a Frobenius-like group. A finite group A is said to be Frobenius-like if it contains a nontrivial nilpotent normal subgroup F , which is called the kernel of A ; and a nontrivial complement H to F in A , which is called the complement in A such that $[F, h] = F$ for all nonidentity elements $h \in H$. Every Frobenius group is a Frobenius-like group and Frobenius-like groups seem to be a very significant generalization, because they are much more probable to be encountered in practice.

With this talk I aim to present a survey of our results extending several coprime results to good action case, and studying the action of Frobenius-like groups.

Date : Monday, December 13, 2021

Time: 14:00

Place: Zoom