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Frobenius semirational groups

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Abstract

In this talk, we give a survey of some recent advances on the problem of studying semi-rational finite groups.

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1 Introduction

For a finite group G, an element x of G is called *rational* if all generators of the group $\langle x\rangle$ are conjugate in G. If all elements of G are rational, then G itself is called *rational*. The notion of rational elements and rational groups has been generalised by Chillag and Dolfi [3]. An element $x \in G$ is called *k-semi-rational* if the generators of $\langle x\rangle$ belongs to at most k conjugacy classes of G. The group G is said to be *k-semi-rational* if all its elements are k-semi-rational in G. In particular, a 2-semi-rational group is called *semi-rational* and its elements are called *semi-rational*.

It was proved by Gow [6] that if G is a rational solvable group then $\pi(|G|) \subseteq \{2, 3, 5\}$. Chillag and Dolfi extended Gow's result to semi-rational groups and proved that $\pi(G) \subseteq \{2, 3, 5, 7, 13, 17\}$ when G is a semi-rational solvable group. They also posed the following problem:

Problem 1. [3, Problem 2] Let G be a solvable group, and let k be a positive integer. If G is a k-semi-rational, then is $\pi(|G|)$ bounded in terms of k?

This talk is based on the results in [1]. Indeed, we generalise the results of [4] to semi-rational Frobenius groups:

Theorem 1.1. *Let $G = HK$ be a Frobenius group with complement H and kernel K. Then G is semi-rational if and only if the following two properties hold:*

(a) H is itself semi-rational;

(b) Each element of K is semi-rational in G, that is, for every $x \in K$, the generators of $\langle x\rangle$ belong to at most two conjugacy classes of G.

We moreover give more details on the structure of semi-rational Frobenius groups:

*Speaker