

Finite groups with large irreducible character

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Let G be a finite group and Θ be an ordinary irreducible character of G . We study finite groups having an ordinary irreducible character Θ such that $|G| \leq 2\Theta(1)^2$. Groups with a character of large degree were investigated by N.Snyder in [1].

Theorem *Let G be a finite group with an ordinary irreducible character Θ such that $\Theta(1) = pq$, where p and q are different primes. If $2\Theta(1)^2 \geq |G|$, then G has an abelian normal subgroup of index pq .*

Note that some sporadic simple groups G have an irreducible character Θ such that $|G| < 3\Theta(1)^2$. For instance, the sporadic group $Th = F_{3|3}$ of Thompson has an irreducible character Θ of degree $\Theta(1) = 190373976$, so that $|Th| < 2,51\Theta(1)^2$.

It is easy to see that the Frobenius group of order $n(n+1)$ with $n = pq$ and $n+1 = 2^m$ is an example of the group with an irreducible character Θ with degree pq .

References

- [1] N. Snyder, Groups with a character of large degree. *Proc.Amer.Math.Soc.* **136** (2008) 1893-1903.