Four Variables and Finite Groups

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We consider the strength of the infinitary logic $\mathcal{L}^4_{\infty\omega}$ with four variables on finite groups. A simple game-theoretic argument shows that $\mathcal{L}^4_{\infty\omega}$ cannot distinguish elementary abelian groups of different dimensions. In contrast, every completely reducible centreless group can be characterized by a single sentence of $\mathcal{L}^4_{\infty\omega}$, and, consequently, by a single sentence of the first order logic $\mathcal{L}^4_{\omega\omega}$ with four variables, by the result of Dawar, Lindell and Weinstein.

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