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Maximally non-associative quasigroups

A quasigroup $(Q, *)$ is an algebraic structure whose multiplication table is a Latin square. We say that $(x, y, z) \in Q^3$ is an associative triple if $(x * y) * z = x * (y * z)$. Let $a(Q)$ denote the number of associative triples in Q. One shows easily that $a(Q) \geq |Q|$, and it was conjectured that $a(Q) = |Q|$ never occurs for $|Q| > 1$. When q is an odd prime power, we give a non-constructive proof of existence of quasigroup Q with $a(Q) = |Q| = q^2$. Our main tools are Dickson nearfields and Weil bound for character sums. This is joint work with Aleš Drápal (Charles University, Prague).