Γ-magic squares

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A *magic square of side* n is an $n \times n$ array whose entries are all elements of $[n^2]$, each of them present once, such that the sum of every row, column, main and backward main diagonal is equal to the same number $\mu = n(n^2+1)/2$. Magic squares are some of the oldest known math structures and have been studied for thousands of years. They are known to exist for any $n \neq 2$.

When we fill the entries with elements of a group Γ of order n^2 instead, we speak about a Γ-*magic square of side* n.

Until recently, the only result in this direction was a construction of $Z_n \oplus Z_n$-magic squares. We proved that a Γ-magic square of side n exists for any Abelian group of order n^2 if and only if $n \neq 2$.

We also found Γ-semimagic squares of side $n \equiv 0 \pmod 4$ for dihedral groups D_{2n^2}. (A *semimagic square* only requires the row and column sums to be all equal, not necessarily the diagonals.)

I will present some of our constructions for the Abelian or dihedral case or both.

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