A CENSUS OF PRIME-ORDER UNIFORM STEP MAGIC SQUARES

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Abstract. A magic square is a square array of order greater than two whose entries are taken from a set of consecutive whole numbers – beginning from 1 – with the property that the numbers in any row, column or diagonal of the array add up to the same sum. A magic square p by p magic square $\{m_{ij}\}$ is said to be of the uniform step kind if

$$m_{ij} = u + p(v-1), \quad u, v = 1, 2, \ldots, p$$

with $i = 1 + [(\varepsilon + (u-1)\alpha + (v-1)\beta) \bmod p]$ and $j = 1 + [(\rho + (u-1)\gamma + (v-1)\delta) \bmod p]$, where the $\bmod p$ operator designates the remainder when an integer is divided by p, and ε, α, β, ρ, γ, δ are elements of the set $Z_p = \{0, 1, \ldots, p-1\}$ satisfying appropriate compatibility conditions.

In this paper we show that if p is an odd prime number then there exist $(p-1)^3[(p-2)^3 - 2(p-3)]$ uniform step magic squares of order p. A more general result – with a more difficult proof – can be found in [8, Uko].

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