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On \((mn, n, mn, m)\) relative difference sets with \(\gcd(m, n) = 1\). (English) Zbl 1401.05050


Summary: There has been much research on \((p^a, p^b, p^a, p^a-b)\) relative difference sets with \(p\) a prime, while there are only a few results on \((mn, n, mn, m)\) relative difference sets with \(\gcd(m, n) = 1\). The non-existence results on \((mn, n, mn, m)\) relative difference sets with \(\gcd(m, n) = 1\) have only been obtained for the following five cases: (1) \(m = p\), \(n = q\), \(p > q\); (2) \(m = pq\), \(n = 3\), \(p, q > 3\); (3) \(m = 4\), \(n = p\); (4) \(m = 2\) and (5) \(n = p\), where \(p\), \(q\) are distinct odd primes. For the existence results, there are only four constructions of semi-regular relative difference sets in groups of size not a prime power with the forbidden subgroup having size larger than 2. In this paper, we present some more non-existence results on \((mn, n, mn, m)\) relative difference sets with \(\gcd(m, n) = 1\). In particular, our result is a generalization of the main result of Hiramine’s work [Y. Hiramine, J. Comb. Theory, Ser. A 117, No. 7, 996–1003 (2010; Zbl 1227.05086)]. Meanwhile, we give a construction of non-abelian \((16q, q, 16q, 16)\) relative difference sets, where \(q\) is a prime power with \(q \equiv 1 \pmod{4}\) and \(q > 4.2 \times 10^8\). This is the third known infinite classes of non-abelian semi-regular relative difference sets.

MSC:

05B10 Combinatorial aspects of difference sets (number-theoretic, group-theoretic, etc.)

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relative difference set; semi-regular relative difference set; self-conjugate

Software:

Magma

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References:


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