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Arithmetics in numeration systems with negative quadratic base

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We consider positional numeration system with negative base $-\beta$, as introduced by Ito and Sadahiro. In particular, we focus on arithmetical properties of such systems when β is a quadratic Pisot number. We study a class of roots $\beta>1$ of polynomials x^2-mx-n, $m\geq n\geq 1$, and show that in this case the set ${\rm Fin}(-\beta)$ of finite $(-\beta)$-expansions is closed under addition, although it is not closed under subtraction. A particular example is $\beta=\tau=\frac12(1+\sqrt5)$, the golden ratio. For such β, we determine the exact bound on the number of fractional digits appearing in arithmetical operations. We also show that the set of $(-\tau)$-integers coincides on the positive half-line with the set of (τ^2)-integers.

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