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Small Univoque Bases

For a positive number q, we say (ε_i) is a q-expansion for x provided, $x = \sum_{i=1}^{\infty} \frac{\varepsilon_i}{q^i}$. Working over the alphabet $\mathcal{A} = \{0, 1, \ldots, M\}$ we look at finding, given a fixed positive real number x, the smallest base $q_s(x)$ for which x has a unique $q_s(x)$-expansion.

We will first establish the result for $x = 1$. Then using relations between the representation of 1 under base $q_s(x)$ and the possible unique representation of real numbers we determine whether $q_s(x) \leq q_s(1)$ which will aid us in calculating the desired value.

This is a generalization of the work of D. Kong who established the results for $M = 1$. The study of such bases is important as most x have an infinite number of representations under an arbitrary base q.