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Q-bonacci Words and Numbers,
Fibonacci Quart. **60** (2022), no. 5, 187–195.

Abstract

We present a quite curious generalization of multi-step Fibonacci numbers. For any positive rational q , we enumerate binary words of length n whose maximal factors of the form 0^a1^b satisfy $a = 0$ or $aq > b$. When q is an integer we rediscover classical multi-step Fibonacci numbers: Fibonacci, Tribonacci, Tetranacci, etc. When q is not an integer, obtained recurrence relations are connected to certain restricted integer compositions. We also discuss Gray codes for these words, and a possibly novel generalization of the golden ratio.