Mihai Caragiu, Paul A. Vicol, and Mohammad Zaki
*On Conways Subprime Function, A Covering of* $\mathbb{N}$ *and an Unexpected Appearance of the Golden Ratio*,
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**Abstract**

The *subprime* function, introduced by Conway ($s(n) = n$ if $n$ is prime, otherwise $s(n) = n/p$ where $p$ is the least prime factor of $n$) was used to design interesting analogues of the Fibonacci sequence that are conjectured to be ultimately periodic. In the present article we prove that the binary operation $\circ$ on $\mathbb{N}$ defined by $x \circ y = s(x + y)$ induces a magma structure that is cyclic with generator 1, i.e., $\mathbb{N} = \langle 1 \rangle$. Moreover, if we consider, in this context, the sequence of subsets of natural numbers $\{C_n\}_{n \geq 0}$ defined by $C_0 = \{1\}$ and $C_{n+1} = C_n \cup (C_n \circ C_n)$ thereafter, we provide computational evidence to the effect that $\lim_{n \to \infty} \frac{|C_{n+1}|}{|C_n|} = \frac{1+\sqrt{5}}{2}$, thus providing an unexpected appearance of the Golden ratio $\varphi$.