ON SMARANDACHE CONCATENETED SEQUENCES I: FACTORIAL SEQUENCE

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Abstract. let $A=\{n!\}_{n=1}^{\infty}$, and let $C(A)=\{c_n\}_{n=1}^{\infty}$ denote the Smarandache concatenated sequence of A. In this paper we prove that if $n>1$, then c_n does not belong to A.

Let $A=\{n!\}_{n=1}^{\infty}$, and let $C(A)=\{c_n\}_{n=1}^{\infty}$ denote the Smarandache concatenated sequence of A . In this part we prove the following result.

Theorem. If $n>1$, then c_n does not belong to A.

Proof. By the definition of the Smarandache concatenated sequence of A (see[1]), we have

(1) $c_n = \overline{1!2!...n!}$

if $n>1$ and c_n belongs to A, then

(2) $c_n = m!,$

where m is a positive integer with $m>n>1$. Notice that c_n =12, 126, 12624, 12624120, 12624120720, 126241207205040 and 12624120720504040320 for n=2,3,4,5,6,7 and 8, which are none factorial. We may assume that $n \geq 9$. Then we have $m>9$.
For any positive integer a, let d(a) denote the figure number of a in the decimal system. Since $n \geq 9$, we see from (1) that

(3) $c_n = n! + (n-1)!10^{d(n!)} + ... + 9!10^{d(n!)+...+d(10!)}$

$+12624120720504040320*10^{d(n!)+...+d(10!)+d(9!)}$.

Since $3^2 | 12624120720504040320$ and $3^4 | k!$ for $k \geq 9$, we get from (3) that

(4) $3^2 | c_n$, $n \geq 9$.

Hoever, since $m>n \geq 9$, we obtain frpm (2) that $3^4 | c_n$, which contradicts (4). Thus, if $n>1$, then c_n does not belong to A. The Theorem is proved.

Reference

1.M.-H.Le, On Smarandache concatenated sequences I:Prime power sequence, Smarandache Notions J.