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

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

if n>1 and c_n belongs to A, then

$$(2) \qquad c_n = m!,$$

where m is a positive integer with m>n>1. Notice that c_n =12, 126, 12624, 12624120, 12624120720, 126241207205040 and 1262412072050404040320 for n=2,3,4,5,6,7 and 8, which are none factorial. We may assume that n≥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≥9, we see from (1) that

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

$$+1262412072050404040320*10^{d(n!)+\ldots+d(10!)+d(9!)}.$$

Since $3^2 \mid 1262412072050404040320$ and $3^3 \mid k!$ for k≥9, we get from (3) that

$$(4) \qquad 3^2 \mid c_n, \quad n\geq 9.$$

Hoever, since m>n≥9, we obtain frpm (2) that $3^3 \mid c_n$, 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.