THE 2-DIVISIBILITY OF EVEN ELEMENTS OF THE SMARANDACHE DECONSTRUCTIVE SEQUENCE

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Abstract . In this paper we prove that if $n>5$ and $SDS(n)$ is even, then $SDS(n)$ is exactly divisible by 2^7.

Key words . Smarandache deconstructive sequence , 2-divisibility .

The Smarandache deconstructive sequence is constructed by sequentially repeating the digits $1,2,\cdots,9$ in the following way:

(1) $$1,23,456,7891,\cdots,$$

which first appeared in [3] . For any positive integer n , let $SDS(n)$ denote the n-th element of the Smarandache deconstructive sequence . In [1] , Ashbacher considered the values of the first thirty elements of this sequence . He showed that $SDS(3) = 456$ is divisible by 2^3, $SDS(5)=23456$ by 2^5 and all others by 2^7 . Therefore, Ashbacher proposed the following question.

Question . If we form a sequence from the elements $SDS(n)$ which the trailing digits are 6, do the powers of 2 that divide them form a monotonically increasing sequence ?

In this paper we completely solve the mentioned question. We prove the following result.

Theorem . If $n>5$ and $SDS(n)$ is even , them $SDS(n)$ is exactly divisible by 2^7.

Proof . By the result of [2], if $SDS(n)$ is even , then the trailing digit of it must be 6 . Moreover , if $n>5$, then $n \geqslant 12$. Therefore , by (1) , if $n>5$ and $SDS(n)$ is even , then we have

(2) $$SDS(n)=89123456 + k.\ 10^8,$$

where k is a positie integer . Notice that $2^8 \mid 10^8$ and $2^7 \parallel 89123456$. We see from (2) that $2^7 \parallel SDS(n)$. Thus , the theorem is proved .

References

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