# SOME RESULTS CONCERNING THE SMARANDACHE DECONSTRUCTIVE SEQUENCE

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## ABSTRACT

In this note some new primes which were found in the Smarandache Deconstructive Sequence (SDS(n)) are reported, unusual sequences involving SDS(n) are given, along with a list of factorizations for SDS(n). All computations were done with PARI/GP [3], except where noted.

## I INTRODUCTION

The Smarandache Deconstructive Sequence, SDS(n) (A007923) [4] is:

1,23,456,7891,23456,789123,4567891,23456789,123456789,...

in which the lengths of the terms increase by 1, and the digits sequentially repeat 1-9. Smarandache first defined this sequence in [5].

## II PRIMES IN SDS(n)

In [1] Ashbacher listed eight primes that arise in the Smarandache Deconstructive Sequence:

23, 4567891, 23456789, 1234567891, 23456789123456789,
23456789123456789123, 4567891234567891234567891,
1234567891234567891234567891

The author has found five more.

The values of n for which SDS(n) is prime are:

2,7,8,10,17,20,25,28,31,38,61,62,355,

with no more terms being found for n <= 500.

For example, SDS(28) = 1234567891234567891234567891
which is the last prime in Ashbacher's list.

The largest prime the author found, SDS(355)=

789123456789123456789123456789123456789123456\

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7891234567891234567891234567891234567891

has been proven prime with Primo [2].

## III SOME UNUSUAL SEQUENCES INVOLVING SDS(n)

If we sum the squares of the individual digits of SDS(n) we get the following sequence:

(a) 1,13,77,195,90,208,272,284,285,286,298,362,480,375,493,557,

For example, 1^2 = 1; 2^2 + 3^2 = 13; 4^2 + 5^2 + 6^2 = 77; 7^2 + 8^2 + 9^2 + 1^2 = 195, etc.

Are there any squares in sequence (a) above?

Yes. For the following values of n the sum of the squares of the digits of SDS(n) is a square:

1,100,280,346,568,721,1021,1153,1657,2548,2565,
2584,3673,4537,4801,5545,6004,6826,7156,

Is this sequence infinite?

Another question one might ask concerning sequence (a) is, will any primes occur?

For the following values of n the sum of the squares of the digits of SDS(n) is prime:

2,16,17,19,21,33,38,39,52,53,56,57,69,70,73,74,
75,88,91,93,105,106,110,125,128,141,142,145,147,
177,181,196,197,199,213,214,217,219,231,235,237,
254,268,272,273,285,290,303,304,305,309,322,323,...

We conjecture that this sequence is infinite.

If we sum the individual digits of SDS(n) after raising the digit to its own power we get the following sequence:

(b) 1,31,50037,405021249,50068,405021280,405071286,405071316,...

For example, 1^1 = 1; 2^2 + 3^3 = 31; 4^4 + 5^5 + 6^6 = 50037, etc.

After searching for primes in sequence (b), these values of n such that the sum of the digits of SDS(n) when raised to their own power is prime were found:

2,21,32,33,69,92,93,94,107,123,140,163,164,248,269,

272,291,307,326,345,364,377,392,393,433,434,448,453,
454,485,487,502,519,538,573,580,626,627,685,718,755,
757,809,865,866,878,917,955,973,986,988,1024,1028,1048,

We conjecture that this sequence is infinite.

## IV FACTORS OF SDS(n)

In closing, we provide a list of factors for the first fifty values of SDS(n).

SDS1:
0
SDS2:
23
SDS3:
2^3.3.19
SDS4:
13.607
SDS5:
2^5.733
SDS6:
3.17.15473
SDS7:
4567891
SDS8:
23456789
SDS9:
3^2.3607.3803
SDS10:
1234567891
SDS11:
59.397572697
SDS12:
2^7.3.23.467.110749
SDS13:
37.353.604183031
SDS14:
2^7.13.23.47.13040359
SDS15:
3.19.13844271171739
SDS16:
739.1231.4621.1086619
SDS17:
23456789123456789
SDS18:
3^2.7.11.13.19.3607.3803.52579
SDS19:
31.241.1019.162166841159
SDS20:
23456789123456789123
SDS21:
2^7.3.19.83.67247.11217082711
SDS22:
13.1171.5009.103488876927413
SDS23:

2^7.37139.4934332239074993
SDS24:
3.29.53.19447.5949239.1479230321
SDS25:
4567891234567891234567891
SDS26:
31.120817.6262948234815488507
SDS27:
3^3.757.3607.3803.440334654777631
SDS28:
1234567891234567891234567891
SDS29:
20393.16338731.70399426574704481
SDS30:
2^7.3.43.2766406997679197695353 6163
SDS31:
7891234567891234567891234567891
SDS32:
2^7.13.67.439.166657.2875758147251799619
SDS33:
3.19.43.191.1685653375348716426865246703
SDS34:
3671.14074661.8840837878285862569056 1
SDS35:
11083.590819.9973889.119776913.2998604101
SDS36:
3^2.7.11.13.19.101.3607.3803.9901.52579.999999000001
SDS37:
5077076293.2431651249631059840436 72887
SDS38:
234567891234567891234567891234567891 23
SDS39:
2^7.3.19.626081583685292110001081583685 29211
SDS40:
13.1794115880987.3016274343701.112170916993561
SDS41:
2^7.3547.19141.1822695439.148087593391540944 9259
SDS42:
3.36677.77890601.6953106199727.13242377845224779
SDS43:
17.26869948438634654320987595497458183 7327523
SDS44:
17.911.98981.9659394263.240869841259.6576837459611
SDS45:
3^2.31.41.271.3607.3803.238681.2906161.4185502830133110721
SDS46:
47.15667.62788723633.2670235844266703105846 7275423
SDS47:
857.2737081577999625335292507482317011566 3310139
SDS48:
2^7.3.157089311.7572475819198513188475662796700757119
SDS49:
17.593.138599.31074683.1398187430503.12998975969380 7375161
SDS50:
2^7.13^2.461.66173.3920187843941.90674101777271797005 76871

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