

# On a problem concerning the Smarandache Left-Rigth sequences

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## Abstract

*In this paper a problem posed in [1] and concerning the number of primes in the Smarandache Left-Right Natural number sequence (SLRNN) and in the Smarandache Left-Right prime (SLRP) sequence is analysed.*

## Introduction

In [1] the author defined the SLRNN and SLRP sequences in the following way:

*SLRNN* - Starting with 1 append alternatively on the left and on the right the next natural numbers:

1, 21, 213, 4213, 42135, 642135, 6421357, 86421357, 864213579, 86421357910, .....

*SLRP* - Starting with the first prime 2 append alternatively on the left and on the right the next primes:

2, 32, 325, 7325, 732511, 13732511, 1373251117, 191373251117, 19137325111723, .....

In the section dedicated to those two sequences the following open question is reported:

*How many terms are prime numbers?*

Moreover by defining as additive primes those prime numbers which sum of digits is prime too, this second question is also reported:

*How many terms are additive prime?*

## Results

In the table 3 and 4 the first 40 terms for the SLRP and SLRNN sequences respectively are reported.

By looking at the tables 5 and 6 regarding the prime factors of the first 25 terms of both the sequences, we can see clearly the for the SLRNN sequence a clear pattern emerge. In fact all the terms  $a(n)$  with  $n=3 \cdot k+2$  and  $n=3 \cdot k+3$  (where  $k=0,1,2,3,\dots$ ) are divisible by 3 while those with  $n=10 \cdot k+5$  and  $n=10 \cdot k+6$  are divisible by 5.

On the contrary for the SLRP sequence any pattern is visible.

According to those considerations and thanks to an Ubasic code the first 575 and 717 terms of the SLRP and SLRNN sequence respectively have been tested for primality.

The last term tested for both the sequences has 2103 and 2043 digits respectively.

Here a summary table for both the sequences.

Start/end prime	# digits	Prime
2	1	2
19/17	12	191373251117
37/31	20	37291913732511172331
139/149	76	1391311131071018979716153433729191373251117233141475967738397103109127137149
311/307	163	311293281271263251239229223199193181173.....161197211227233241257269277283307

Table 1. Prime in the SLRP sequence

Start/end numb.	# digits	Prime
120/121	255	120118116114112110108106104102100.....101103105107109111113115117119121

Table 2. Primes in the SLRNN sequence

According to those results the percentage of the primes inside the two sequences is 0.87% and 0.14% for the SLRP and SLRNN respectively.

Actually the percentage is so low that this seems to point out that the number of primes is finite.

**Open question:** Is the number of primes in the SLRP and SLRNN finite?

Let's now check if those primes are also additive. For the primes of the sequence SLRP we have that 4 out of 5 are additive being the sum of digits equal to 2, 41, 71 and 631. The only prime that is not additive is that starting with 139 and ending with 149 which sum of digits is 296 that is composite. About the SLRNN sequence the only prime found is not additive because the sum of the digits is equal to 1027 that is a composite number.

According to those results the following two conjecture can be posed:

**Conjecture 1:** The number of additive primes inside the sequence SLRP is finite

**Conjecture 2:** The number of additive primes inside the sequence SLRNN is null.

1	2
2	32
3	325
4	7325
5	732511
6	13732511
7	1373251117
8	191373251117
9	19137325111723
10	2919137325111723
11	291913732511172331
12	37291913732511172331
13	3729191373251117233141
14	433729191373251117233141
15	43372919137325111723314147
16	5343372919137325111723314147
17	534337291913732511172331414759
18	61534337291913732511172331414759
19	6153433729191373251117233141475967
20	716153433729191373251117233141475967
21	71615343372919137325111723314147596773
22	7971615343372919137325111723314147596773
23	797161534337291913732511172331414759677383
24	89797161534337291913732511172331414759677383
25	8979716153433729191373251117233141475967738397
26	1018979716153433729191373251117233141475967738397
27	1018979716153433729191373251117233141475967738397103
28	1071018979716153433729191373251117233141475967738397103
29	1071018979716153433729191373251117233141475967738397103109
30	1131071018979716153433729191373251117233141475967738397103109
31	1131071018979716153433729191373251117233141475967738397103109127
32	1311131071018979716153433729191373251117233141475967738397103109127
33	1311131071018979716153433729191373251117233141475967738397103109127137
34	1391311131071018979716153433729191373251117233141475967738397103109127137
35	1391311131071018979716153433729191373251117233141475967738397103109127137149
36	1511391311131071018979716153433729191373251117233141475967738397103109127137149
37	1511391311131071018979716153433729191373251117233141475967738397103109127137149157
38	1631511391311131071018979716153433729191373251117233141475967738397103109127137149157
39	1631511391311131071018979716153433729191373251117233141475967738397103109127137149157167
40	1731631511391311131071018979716153433729191373251117233141475967738397103109127137149157167

Table 3. First 40 terms of sequence SLRP

1	1
2	21
3	213
4	4213
5	42135
6	642135
7	6421357
8	86421357
9	864213579
10	10864213579
11	1086421357911
12	121086421357911
13	12108642135791113
14	1412108642135791113
15	141210864213579111315
16	16141210864213579111315
17	1614121086421357911131517
18	181614121086421357911131517
19	18161412108642135791113151719
20	2018161412108642135791113151719
21	201816141210864213579111315171921
22	22201816141210864213579111315171921
23	2220181614121086421357911131517192123
24	242220181614121086421357911131517192123
25	24222018161412108642135791113151719212325
26	2624222018161412108642135791113151719212325
27	262422201816141210864213579111315171921232527
28	28262422201816141210864213579111315171921232527
29	2826242220181614121086421357911131517192123252729
30	302826242220181614121086421357911131517192123252729
31	30282624222018161412108642135791113151719212325272931
32	3230282624222018161412108642135791113151719212325272931
33	323028262422201816141210864213579111315171921232527293133
34	34323028262422201816141210864213579111315171921232527293133
35	3432302826242220181614121086421357911131517192123252729313335
36	363432302826242220181614121086421357911131517192123252729313335
37	36343230282624222018161412108642135791113151719212325272931333537
38	3836343230282624222018161412108642135791113151719212325272931333537
39	383634323028262422201816141210864213579111315171921232527293133353739
40	40383634323028262422201816141210864213579111315171921232527293133353739

Table 4. First 40 terms of sequence SLRNN

1	Prime
2	2x2x2x2x2
3	5x5x13
4	5x5x293
5	13x29x29x67
6	13x1056347
7	7x7x28025533
8	Prime
9	7x13x 210300275953
10	3x 973045775037241
11	7x6763xC
12	Prime
13	11x38393xC
14	7xC
15	137xC
16	3x11x157x2179xC
17	4519xC
18	3x239x593x144725040140349010212526739
19	11x5197xC
20	3x3x3x83x89xC
21	43x53x113xC
22	???
23	127x3343x42841xC
24	3x3x3x7x7x7xC
25	19xC

Table 5. Prime factors for the sequence SLRP (here C indicates a composite number)

1	1
2	3x7
3	3x71
4	11x383
5	3x5x53x53
6	3x5x13x37x89
7	79x81283
8	3x3x3x11x43x67x101
9	3x3x96023731
10	17x41x113x271x509
11	3x19x37x53x419x23197
12	3x10477x12433x309857
13	11x29x179x2683x79037111
14	3x107xC
15	3x5x7x13x103451182574050631
16	5xC
17	3x3x3x3x3x3xC
18	3x3xC
19	17x1068318359331890340653714807
20	3x 672720470702880711930371050573
21	3xC
22	281x54601xC
23	3x13x35381xC
24	3x35153x2296818494525086397759867921481497
25	5x5x17x37x127x593xC

Table 6. Prime factors for the sequence SLRNN (here C indicates a composite number)

## References

- [1] Felice Russo, A set of New Smarandache functions, sequences and conjectures, American Research press, 2000, pag. 68-69