Function for Prime Numbers

Massimo Russo
LinkedIn

Abstract:

The function [5*(1+1/*x*) + 1]

for each value of *x* determined by Sequence *A*

$x = (5^2)+5*2*(n(n+1)/2)$

where $n \geq 0$

determines an infinite series of fractional numbers *N/d:*

$5*(1+1/x) + 1 = N/d$

such that *N* and *d* are prime numbers.

This function, when applied to specific subsets of Sequence *A*, quickly identifies a significant quantity of prime numbers, including those with thousands of digits.

Algorithms developed based on this function have demonstrated extraordinary efficiency, finding numerous prime numbers with hundreds or thousands of digits in minutes or even seconds.

All results were obtained using a 2020 MacBook Pro, equipped with a 2 GHz quad-core Intel Core i5 processor, Intel Iris Plus Graphics 1536 MB, and 16 GB of 3733 MHz LPDDR4X memory, fully utilizing the available computational resources.

The use of much more powerful supercomputers would enable the algorithm, based on this function and specific subsets of Sequence *A* or fractional subsets, to find prime numbers with hundreds of millions or even billions of digits.

This work has the potential to revolutionize the field of number theory, offering practical applications of great relevance, such as advanced cryptography.

Chapters:

CHAPTER 1: THE FUNCTION

Given the Function:

$5*(1+1/x) + 1$

where x is determined by the following Sequence A.

1.1 Definition of Sequence A

Let:

$b \geq 1$

$a_n = 2b$ (all even numbers)

The values of x in Sequence A are defined as follows:

$x = \{[25], [25+(5*a_1)], [25+(5*a_1)+(5*a_2)], [25+(5*a_1)+(5*a_2)+(5*a_3)],$
$[25+(5*a_1)+(5*a_2)+(5*a_3)+(5*a_4)], [25+(5*a_1)+(5*a_2)+(5*a_3)+(5*a_4)+(5*a_5)], \text{etc.}\}$

or:

$x = \{[(5^2)],$
$[(5^2)+(5*2)],$
$[(5^2)+(5*2)+(5*4)],$
$[(5^2)+(5*2)+(5*4)+(5*6)],$
$[(5^2)+(5*2)+(5*4)+(5*6)+(5*8)],$
$[(5^2)+(5*2)+(5*4)+(5*6)+(5*8)+(5*10)],$
$\text{etc.}\}$

Simplifying:

$x = \{25, 35, 55, 85, 125, 175, 235, 305, 385, \text{etc.}\}$

Sequence A can be further simplified by factoring out 5:

$x = \{[(5^2)],$
$[(5^2)+5*(2)],$
$[(5^2)+5*(2+4)],$
$[(5^2)+5*(2+4+6)],$
$[(5^2)+5*(2+4+6+8)],$
$[(5^2)+5*(2+4+6+8+10)],$
$\text{Etc.}\}$

And further, by factoring out 2:

$x = \{[(5^2)],$
$[(5^2)+5*2*(1)],$
$[(5^2)+5*2*(1+2)],$
$[(5^2)+5*2*(1+2+3)],$
$[(5^2)+5*2*(1+2+3+4)],$
$[(5^2)+5*2*(1+2+3+4+5)],$
Etc.}

Using Gauss's formula for the sum of the first *n* natural numbers, we get:

$x = \{[(5^2)],$
$[(5^2)+5*2*(n(n+1)/2)],$

1.2 Application of the Function

Consider the function:

$5*(1+1/x) + 1$

for each value of *x* determined by Sequence A

$x = (5^2)+5*2*(n(n+1)/2)$

where $n \geq 0$ (any natural number), we obtain a fractional result *N/d*:

$5*(1+1/x) + 1 = N/d.$

The values of *N* and *d* can yield four outcomes:

1. **Both *N* e *d* are prime numbers**
   Using Sequence A, the consecutive prime numbers determined by the function are 42, 2 more than Euler's function

2. ***N* is a prime number, but *d* is not**

3. ***N* is not a prime number, but *d* is**

4. **Neither *N* nor *d* are prime numbers**
   In this case, by changing the value of *n* or increasing the number of iterations, the function can find prime numbers. For certain subsets of Sequence *A* or for fractional values of *n*, the function, even finding few primes relative to the number of iterations, can find large prime numbers (hundreds or thousands of digits) in a short time (minutes or seconds). **Additionally, with a particular sequence of fractional *n* values, the**

function can find large prime numbers in increasing quantities as the iterations increase, suggesting a direct relationship between the increasing iterations and the number of primes found. This discovery contrasts with the current hypotheses, which suggest that increasing iterations in any prime number function results in fewer primes (see Chapter 6 - section 6.2).

1.3 Conclusions

The function [5*(1+1/*x*)+1] and Sequence *A* represent an innovative method for generating prime numbers. The four possible combinations of *N* and *d* offer a comprehensive view of the function's potential. In particular, the ability to find large prime numbers with a relatively low number of iterations makes this function particularly promising for future applications, which we will explore in the subsequent chapters.

CHAPTER 2: RESULTS ANALYSIS

In this chapter, we analyze some significant results obtained by applying the function [5*(1+1/*x*)+1].

2.1 Introduction

The function has demonstrated a remarkable ability to generate consecutive prime numbers. In this section, we will examine the results obtained for various ranges of *n* values, highlighting the success rate and comparing it with other known functions.

2.2 Values of *n*: 0 ≥ *n* ≤ 28

For *n* values ranging from 0 to 28, the function generates a series of 42 consecutive prime numbers. The success rate of the function, in relation to the calculations performed to find the prime numbers, is 144.83% (42 prime numbers out of 29 calculations)

1) 5*[1+1/25] +1 = **31/5**
2) 5*[1+1/35] +1 = **43/7**
3) 5*[1+1/55] +1 = **67/11**
4) 5*[1+1/85] +1 = **103/17**
5) 5*[1+1/125] +1 = **151**/25
6) 5*[1+1/175] +1 = **211**/35
7) 5*[1+1/235] +1 = **283/47**
8) 5*[1+1/305] +1 = **367/61**
9) 5*[1+1/385] +1 = **463**/77
10) 5*[1+1/475] +1 = **571**/95
11) 5*[1+1/575] +1 = **691**/115
12) 5*[1+1/685] +1 = **823/137**
13) 5*[1+1/805] +1 = **967**/161
14) 5*[1+1/935] +1 = **1123**/187
15) 5*[1+1/1075] +1 = **1291**/215
16) 5*[1+1/1225] +1 = **1471**/245
17) 5*[1+1/1385] +1 = **1663/277**
18) 5*[1+1/1555] +1 = **1867/311**
19) 5*[1+1/1735] +1 = **2083/347**
20) 5*[1+1/1925] +1 = **2311**/385
21) 5*[1+1/2125] +1 = **2551**/425
22) 5*[1+1/2335] +1 = **2803/467**
23) 5*[1+1/2555] +1 = **3067**/511
24) 5*[1+1/2785] +1 = **3343/557**
25) 5*[1+1/3025] +1 = **3631**/605
26) 5*[1+1/3275] +1 = **3931**/655
27) 5*[1+1/3535] +1 = **4243**/707
28) 5*[1+1/3805] +1 = **4567/761**
29) 5*[1+1/4085] +1 = **4903**/817

Comparison with Euler's Function

The function discovered by the mathematician Leonard Euler in the 18th century:

$f_{(n)} = n^2 + n + 41$

determines 40 consecutive prime numbers for the first 40 iterations achieving a 100% success rate. In comparison, the function [5*(1+1/x)+1] achieves a success rate of 144.83%, determining 42 consecutive prime numbers in 29 iterations, which is two more than Euler's function.

2.3 Values of n: $0 \geq n \leq 40$

For n values ranging from 0 to 40, the function determines 52 prime numbers, achieving a success rate of 127% (52 prime numbers out of 41 calculations).

2.4 Sequence -A

The function also determines prime numbers by assigning x opposite values from Sequence A, that is:

$x = -[(5^2)+5*2*(n(n+1)/2)]$

$x = \{-25, -35, -55, -85, -125, -175, -235, -305, -385, \text{etc.}\}$

In this case as well the function determines prime numbers N and d. The percentage of prime numbers obtained is high, although lower than that determined with x values belonging to Sequence A. For the first 29 values of n (from 0 to 28), 28 prime numbers are determined, corresponding to a success rate of 97% (lower than the 144.83% for x values belonging to Sequence A).

2.5 Millions of Iterations

For 1 million iterations with n values belonging to Sequence A, the function determines 32.80% prime numbers.

For 300 million iterations, the function determines 22.98% prime numbers, of which 22.84% have 15 or 16 digits.

2.6 Specific Sequences

Starting from a random initial value of n, one of the algorithms created and tested generates specific successive values of n, with which the corresponding values of x belonging to particular subsets of Sequence A are calculated. Using these subsets, it was observed that the function can determine prime numbers, even those with thousands of digits, in a few minutes or hours.

With a particular subset (Subset 1 - Chapter 3), the percentage of prime numbers found, including those with thousands of digits, decreases much more slowly as the number of iterations increases compared to Sequence A.

With another subset (Fractional Subset - Chapter 6), contrary to what was hypothesized by previous mathematical studies, the percentage of prime numbers found increases with the number of iterations.

In the following chapters, three subsets of Sequence A and two fractional subsets are examined in detail, indicating the prime numbers found, including those with hundreds or thousands of digits.

CHAPTER 3: SUBSET 1

Subset 1 is the most performant among those analyzed, capable of finding a high percentage of prime numbers over a large number of iterations. Starting with an initial value of $n = 0$, , the function identifies 23.24% prime numbers in about 4 minutes over 10 million iterations. With larger values of *n*, the function maintains a success rate that decreases much more slowly compared to Sequence *A*.

3.1 Results Analysis

Below are the results obtained with different iterations and values of *n*:

- **Values of *n* with 14 digits**:
  - 10,000 iterations: 26.53% prime numbers found

- **Values of *n* with 33 digits:**
  - 10,000 iterations: 20.86% prime numbers found.

- **Values of *n* with 52 digits:**
  - 10,000 iterations: 19.13% prime numbers found, including primes with up to 105 digits

- **Values of *n* with 81 digits:**
  - 1,000 iterations: 20% prime numbers found, including primes with up to 162 digits

- **Values of *n* with 188 digits:**
  - 1,000 iterations: 18.5% prime numbers found, including primes with up to 377 digits

- **Values of *n* with 704 digits:**
  - 1,000 iterations: 14.7% prime numbers found, including primes with up to 1409 digits

These results demonstrate the robustness of Subset 1, as it consistently finds prime numbers, even as the values of *n* increase significantly. The performance, in terms of the percentage of prime numbers found, remains relatively high across various digit lengths, showcasing the efficiency and potential of the function for large-scale prime number generation.

3.2 Practical Examples

Here are some examples:

Example 1:

- Initial value of $n = 0$
- Iterations: 1.000.000
- Percentage of prime numbers: 26.74%
- Processing time: approximately 20 seconds
- Prime numbers with 10, 11, 12, 13, 14, 15 digits

Example 2:

- Initial value of $n = 0$
- Iterations: 10.000.000
- Percentage of prime numbers: 23.24%
- Processing time: approximately 4 minutes
- Prime numbers with 15,16, 17 digits

Some examples of 17-digit prime numbers::

- 48299073295366183
- 48232602204398503
- 48268130991210967
- 48279286473660943
- 48298115080570363

Example 3

- Initial value of $n = 0$
- Iterations: 300.000.000
- Percentage of prime numbers: 19.54%
- Processing time: approximately 1 hour and 30 minutes
- Prime numbers with 19 and 20 digits

Some examples of 20-digit prime numbers:

- 62623329306715300243
- 10437210928682571311

Example 4

- Initial value of n = 783924789234
- Iterations: 100.000
- Percentage of prime numbers: 24.02%
- Processing time: approximately 30 seconds
- Prime numbers with 24 and 25 digits

Some examples of 25-digit prime numbers:

- 3687241366750870493691883
- 3687241373749763273192731
- 3687241298944393479210043
- 3687241232925268705370311
- 3687241360372847240737903

Example 5

- Initial value of n =
- 3307559162446653772598929070779711623982107664556394607024041772869573903432423443156723632532523523 (100 digits)
- Iterations: 20.000
- Percentage of prime numbers: 16.12%
- Processing time: approximately 60 seconds
- Prime numbers with 200 digits

Example 6

- Initial value of n =
- 33075591624466537725989290707587901179711623982107664556394607024041772869573903432423443156723632532523523 (107 digits)
- Iterations: 10.000
- Percentage of prime numbers: 16.61%
- Processing time: approximately 60 seconds
- Prime numbers with 214 digits

Some examples of 214-digit prime numbers:

N=
1093994761308480979980240439132962093504961113248010315949501901388603419864415902470770309806396877779285683361274136268909377653480971924596497885180065818402910627619968428964713161512025604923199463523677896511

N=
6563968567850885879881442634797772561029766679488061895697011408331620519186495414824621858838381266676234048467981431586508817570809113354124054040079127397243986988137747243297980731029850155962892284569620400367

N=
6563968567850885879881442634797772561029766679488061895697011408331620519186495414824621858838381266678859192024032091752745135595688949894955406212291048517755914158421894672410322298654433992425733551493473545603

N=
6563968567850885879881442634797772561029766679488061895697011408331620519186495414824621858838381266683768139030568917415885562165346315836443486597219539660557776154502078434621002750480991731974028197596215046691

Example 7

- Initial value of n =
- 789324789234789237489237438927438927483927489327483297483974823974328974382974823974832974832748932743289 (105 digits)
- Iterations: 100.000
- Percentage of prime numbers: 14.70%
- Processing time: approximately 5 minutes
- Prime numbers with 210 and 211 digits

Some examples of 211-digit prime numbers:

N=
3738201737403266710418714691272278648367057836522859254606368702287699463398396076464162518966855140641590016533096128201043553852649503540076959497597883895621705113916292112423449296921949462422878730425188003

N=
3738201737403266710418714691272278648367057836522859254606368702287699463398396076464162518966855140673661861369284084498706249471149202041603901243952185238990570161641226999552482344667362895827133851927192367

N=
3738201737403266710418714691272278648367057836522859254606368702287699463398396076464162518966855141672776550386052544684783171866478557427919574394851303461446158751163253509931886934827345111523424153042234891

Example 8

- Initial value of n =
- 38902348902348902348930248930248932089178391723817326437845637586733981 72812379246374863758643758367457381723819732198334890234890238490284903 2472356473856738456743857464739718329378219378219327834783 (200 digits)
- Iterations: 1000
- Percentage of prime numbers: 20.30%
- Processing time: approximately 40 seconds

Some examples of 400-digit prime numbers *N*

90803565007205210845544730812496088852145111463083086070500234848927689481
83830871362528147170920789348935994999171040167746016272575575274960548444
27649117968225454098251928492824031171461906015375204095670291051535653609
73272736613244206282355074102740633026143775540587609492774328859970718082
50051305036491937007663397810391112502079200680309590275441051274409054714
120624134945400068092327498263

90803565007205210845544730812496088852145111463083086070500234848927689481
83830871362528147170920789348935994999171040167746016272575575274960548444
27649117968225454098251928492824031171461906016273941720951916333161579792
61891029482947693978386814332509138804520089488168319794224981357662281390
84792858673790050888860214063215682297874078573991606554586282067335988742
807950408699033810105234622591

90803565007205210845544730812496088852145111463083086070500234848927689481
83830871362528147170920789348935994999171040167746016272575575274960548444
27649117968225454098251928492824031171461906016670278851569046950292481168
72028641495402639466611906507386274377884670072780839556292093330724891638
50373358901333214552446385369390656200133506857669163079100255131534496425
3111347461689286795234924419931

90803565007205210845544730812496088852145111463083086070500234848927689481
83830871362528147170920789348935994999171040167746016272575575274960548444
27649117968225454098251928492824031171461906019372467128205323586571055403
61452143701402882651584961330777100706345845874866951912887229897127262848
78743403091098642762460748135778428798294254416254755760486217068880364351
580680207895152966194014565171

Some examples of 400-digit prime numbers *d*

15133927501200868474257455135416014808690851910513847678416705808154614913
63971811893754691195153464891489332499861840027957669378762595879160091407
37941519661370909016375321415470671861910317669459144686503719067259999183
66570328214812264827173124328005238302457351176624012831601599514586646638
78384406821449297293064153007320685587947144822764721770003543094995201620
957783576948574466050264176411

Example 9

- Initial value of n =
- 65639685678508858798814426347977725610297666794880618956970114083316205
  19186495414824621858838381266683768139030568917415885562165346315836443
  48659721953966055777615450207843462100275048099173197402819759621504669
  16563968567850885879881442634797772561029766679488061895697011408331620
  51918649541482462185883838126668376813903056891741588556216534631583644
  34865972195396605577761545020784346210027504809917319740281975962150466
  91 (428 digits)
- Iterations: 3.000
- Percentage of prime numbers: 17.33%
- Processing time: approximately 8 minutes

Some examples of prime numbers N with 856 and 857 digits:

N=
4308568335973440982901586106343409580840185377511423165438390016039020863897992499901869304928067218056906254966853261015140033441693228121926598080340081412788621275775880394331645613312930544007120458821821571608907703680482254248788528923974122371621806917813832762464318868047473501944182913342950865762981472606686830736094465672949768372818336459216745359296292938557241011622133130760005015145702859089771507239495361987075127974404921006717109070288683484466240928621031769325405784064919862306082174086898135364280665940113768586142500274991490420334386646929802844630236106251336640402290962614801352351795582677146414211336029001782744328971642999166727203895470534311246209061476272473335779742056272075064380775162174183726319086001414806220158631784791391746948528222739428950400762652349875199783645348211730697035460220824046807666351130977

N=
25851410015840645897409516638060457485041112265068538992630340096234125183387954999411215829568403308341437529801119566090840200650159368731559588482040488476731727654655282365989873679877583264042722752930929429653446222082893525492731173543844734229730841506882996574785913208284841011665097480057705194577888835640120984416566794037698610236910018755300472155777757631343446069732798784560030090874217154538629043436972319580236495365677571149331012724585415783604853991576146699363467405859422377888148607355027753339954300341723731970766055478846964420450323845098518840769988816794170597568548262069880734115982598221989051644734512159675038725754662505903199053658154693548218096353853243181117948599327952855551840934336939217784944986112600882712057173598550540326091565688406751001261793842714326714182120727377646182733671540855337484612763570383

N=
2585141001584064589740951663806045748504111226506853899263034009623412518338795499941121582956840330834143752980111956609084020065015936873155958848204048847673172765465528236598987367987758326404272275293092942965344622208289352549273117354384473422973084150688299657478591320828484101166509748005770519457788883564012098441656679403769861023691001875530047215577775763134344606973279878456003009087421715453862904343697239962704550407908876999793817096724606483428593834695239729693395064097185939489735294383964166433889575689212703307504567211337130335893039137304435354138980455960744161187480905304390251975243501365897535377568311130643593959709578239076391487792421959861632653189147830293816627211057165455647227458279833031767909064115293099314001883705098443417409831848299022106324336812404142814480819982477982474637891308455396769839500477 8367

N=
258514100158406458974095166380604574850411122650685389926303400962341251833879549994112158295684033083414375298011195660908402006501593687315595884820404884767317276546552823659898736798775832640427227529309294296534462220828935254927311735438447342297308415068829965747859132082848410116650974800577051945778888356401209844165667940376986102369100187553004721557777576313434460697327987845600300908742171545386290434369727805299405565825718125549301449957172069525872983643118449812598888235783506549469181511583520659472374052796233680097592088063769986198167380532477587690558013446007106286050399116760711713948067580519038156732649982444854448474440866464631122807713338104464625336274230713707600903712207805614287953146693704785132554799025644866113725063515539602627329865033307438298430466233683298178312856879966899106160875238468138931220435586 51

CHAPTER 4: SUBSET 2

Using the values of this particular subset of Sequence *A* yields, in proportion to the iterations, few prime numbers. However, these primes are so unique that they are absolutely worth mentioning. These prime numbers have digits that repeat in a constant manner:

Example 1: a prime number *N* with 1045 digits was found after a few minutes

Example 2: prime numbers N with 1045, 2361, 7433, and 8321 digits were found after eight hours

Example 3: prime numbers with 2895, 6755, 7225, and 10663 digits were found after about two hours

Example 4: Prime numbers with 367, 577, 631, 737, 1961, 3669, 3165 and 3923 digits were found after 1 hour and a half. **The prime numbers found in this example are truly amazing!**

Example 1

- Initial value of *n* = 0
- Iterations: 1000
- Percentage of prime numbers: 1%
- Processing time: a few minutes

Some examples of prime numbers:

N with 109 digits =
74074074074074074074074074074074074074074074074074073992592592592592592592
59259259259259259259259259259259291

N with 125 digits =
74074074074074074074074074074074074074074074074074074074074073259259259259
259259259259259259259259259259259259259259259259291

N with 201 digits =
74074074074074074074074074074074074074074074074074074074074074074074074074
07407407407407407407407406592592592592592592592592592592592592592592592592
59259259259259259259259259259259259259259259259259291

N with 1045 digits (go to this bookmark to see the number - Chapter 11)

Example 2

- Initial value of $n = 0$
- Iterations: 10.000
- Percentage of prime numbers: 0.13%
- Processing time: approximately 8 hours

Some examples of prime numbers:

N with 2361 digits (go to this bookmark to see the number - Chapter 11)

N with 7.433 digits (go to this bookmark to see the number - Chapter 11)

N with 8.321 digits (go to this bookmark to see the number - Chapter 11)

Example 3

- Initial value of n =
  10000000000000000000000000000000000000000000000000000000000000000000000
  00000000000000000000000000000000000000000000000000000000000000000000000
  00000000000000000000000000000000000000000000000000000000000000000000000
  00000000000000000000000000000000000000000000000000000000000000000000000
  00000000000000000000000000000000000000000000000000000000000000000000000
  00000000000000000000000000000000000000000000000000000000000000000000000
  00000000000000000000000000000000000000000000000000000000000000000000000
  00000000000000000000000000000000000000000000000000000000000000000000000
  00000000000000000000000000000000000000000000000000000000000000000000000
  00000000000000000000000000000000000000000000000000000000000000000000000
  00000000000000000000000000000000000000000000000000000000000000000000000
  00000000000000000000000000000000000000000000000000000000000000000000000
  00000000000000000000000000000000000000000000000000000000000000000000000
  00000000000000000000000000000000000000000000000000000000000000000000000
  00000000000000000000000000000 (1023 digits)
- Iterations: 5.000
- Percentage of prime numbers: 0,08%
- Processing time: approximately 2 hours

Some examples of prime numbers:

N with 2895 digits (go to this bookmark to see the number - Chapter 11)

N with 6755 digits (go to this bookmark to see the number - Chapter 11)

N with 7225 digits (go to this bookmark to see the number - Chapter 11)

N with 10663 digits (go to this bookmark to see the number - Chapter 11)

Example 4

- Initial value of n = 13432
- Iterations: 5.000
- Percentage of prime numbers: 0.34%
- Processing time: approximately 1 hour and a half

Some examples of prime numbers of 367, 577, 631, 737, 1961, 3669, 3165 and 3923 digits: (go to this bookmark to see the number - Chapter 11).

These values of *N* differ only in the number of digits and a few specific values.
These values of *d* differ only in the number of digits.
It looks really amazing!

CHAPTER 5: SUBSET 3

Even with this subset of Sequence A, few prime numbers are found in a short time, but they have absolutely unique characteristics.

Example 1

- Initial value of *n* = 5 digits
- Iterations: 1000
- Percentage of prime numbers: 0.30%
- Processing time: a few seconds

Some examples of prime numbers:

N = 60000000600000031

N =
600000000000000000000000000000000000000000000000000000000000000000000000000
000000000000006000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000031

N =
600000000000000000000000000000000000000000000000000000000000000000000000000
000000000000000000000000000000000000000000060000000000000000000000000000000
000000000000000000000000000000000000000000000000000000000000000000000000000
00000000031

Example 2

- Initial value of *n* = 3242342342
- Iterations: 1000
- Percentage of prime numbers: 0.20%
- Processing time: 15 minutes

Some examples of prime numbers:

N with 7762 digits (go to this bookmark to see the number - Chapter 11)

Example 3

- Initial value of $n = 50000$
- Iterations: 1000
- Percentage of prime numbers: 0,01%
- Processing time: 10 minutes

Some examples of prime numbers:

N with 1223 digits (go to this bookmark to see the number - Chapter 11)

N with 2642 digits (go to this bookmark to see the number - Chapter 11)

N with 6354 digits (go to this bookmark to see the number - Chapter 11)

CHAPTER 6: FRACTIONAL SUBSETS

Fractional subsets are the most interesting among those analyzed. By assigning fractional values *a/b* to *n*, the function, and thus the algorithm, find prime numbers *N* and *d* with unique characteristics. In detail:

- Assigning the numerator of the fraction *a/b* the value 5, the function determines significant results

- **Assigning any value greater than 0 to the numerator of the fraction *a/b* the function continues to produce interesting results. Remarkably, the number of primes found increases with the number of iterations. This behavior is contrary to the previously formulated hypotheses, which suggested that as the number of iterations increases, any prime number function produces an increasingly smaller quantity of prime numbers**

Analyzing These Results:

6.1 FRACTION 5/b

***n* = 5/b**

Number of iterations:

- 100 iterations: 27% prime numbers
- 1.000 iterations: 15,6% prime numbers
- 100.000 iterations: 9,06% prime numbers in a few seconds, with *N* having up to 26 digits
- 1.000.000 iterations: 7,69% prime numbers in 30 seconds, with *N* having up to 31 digits
- 10.000.000 iterations: 6,69% prime numbers in 2 minutes, with *N* having up to 33 digits
- 100.000.000 iterations: 5,92% prime numbers in 30 minutes, with *N* having up to 39 digits, and **6 consecutive prime numbers found**

All prime numbers end in 1. Additionally, an even more fascinating aspect is that, out of 100 million iterations, very few prime numbers with few digits (29 in total) were found. In contrast, there are more than 5.7 million prime numbers, approximately 97% of all primes found, that have between 33 and 39 digits, with the latter being the absolute majority:

- 1 prime number N with 2 digits
- 2 prime numbers N with 4 digits
- 1 prime number N with 5 digits
- 1 prime numbers N with 6 digits
- 1 prime number N with 7 digits
- 2 prime numbers N with 8 digits
- 5 prime numbers N with 9 digits

- 4 prime numbers N with 10 digits
- 4 prime numbers N with 11 digits
- 3 prime numbers N with 12 digits
- 5 prime numbers N with 13 digits
- 23 prime numbers N with 14 digits
- 22 prime numbers N with 15 digits
- 33 prime numbers N with 16 digits
- 44 prime numbers N with 17 digits
- 89 prime numbers N with 18 digits
- 128 prime numbers N with 19 digits
- 183 prime numbers N with 20 digits
- 325 prime numbers N with 21 digits
- 498 prime numbers N with 22 digits
- 849 prime numbers N with 23 digits
- 1.354 prime numbers N with 24 digits
- 2.195 prime numbers N with 25 digits
- 3.618 prime numbers N with 26 digits
- 5.965 prime numbers N with 27 digits
- 9.752 prime numbers N with 28 digits
- 16.168 prime numbers N with 29 digits
- 26.962 prime numbers N with 30 digits
- 44.806 prime numbers N with 31 digits
- 74.525 prime numbers N with 32 digits
- 124.173 prime numbers N with 33 digits
- 207.634 prime numbers N with 34 digits
- 347.938 prime numbers N with 35 digits
- 585.596 prime numbers N with 36 digits
- 981.939 prime numbers N with 37 digits
- 1.652.154 prime numbers N with 38 digits
- 1.833.597 prime numbers N with 39 digits

Some of the prime numbers found with 39 digits:

N = 482133906589228227861354548248723144591
N = 487824909225574472011021033520108088271
N = 517391532925192214364272200358297808211
N = 516177424489737659873679828269928064951
N = 517606667770604123053731334585336931671
N = 517369188976784263064974735447538796151
N = 517606803897845272213620586040838689611
N = 517572555536765729185297333830267773071
N = 517608358188397731364918822705546445911
N = 516870147531920575324278469526945414851
N = 517608752348911232708076846720161266351

In practice, unlike and contrary to all other algorithms, this particular sequence of *x* values allows the algorithm to find many more increasingly larger prime numbers as the number of iterations increases.

6.2 FRACTION a/b

n = *a/b*
a = any number greater than 0

Assigning any given value greater than 0 to the numerator of the fraction *a/b*, the prime numbers found have only large digits.

Moreover, an even more fascinating and important aspect is that, unlike all other algorithms, with this particular sequence of *x* values, **as the initial value of *a* increases, the algorithm determines a percentage of prime numbers that either increases or remains constant as the iterations increase. This discovery could be absolutely revolutionary, as it contradicts every hypothesis formulated so far, which suggests that as the number of iterations increases, any prime number function yields an increasingly smaller quantity of prime numbers.**

6.2.1 Example 1

a = 324789234782934783297482397483297483974839274839274893274892342 (63 digits)

5.000 iterations

- Processing time: 15 seconds
- Percentage of prime numbers: 0,84% (i.e., 42), **all with 252 digits**

10.000 iterations

- Processing time: 20 seconds
- Percentage of prime numbers: 0,91% (i.e., 91), **all with 252 digits**

20.000 iterations

- Processing time: 30 seconds
- Percentage of prime numbers: 0,86% (i.e., 172), **all with 252 digits**

50.000 iterations

- Processing time: 40 seconds
- Percentage of prime numbers: 0,92% (i.e., 458), **all with 252 digits**

100.000 iterations

- Processing time: 70 seconds
- Percentage of prime numbers: 0,93% (i.e., 930), **all with 252 digits**

200.000 iterations

- Processing time: approximately 2 minutes
- Percentage of prime numbers: 0,95% (i.e., 1890), **all with 252 digits**

The percentage of prime numbers increased with the number of iterations compared to the initial number of iterations.

Here you can see some of the 252-digit prime numbers found: (go to this bookmark to see the numbers - Chapter 11)

6.2.2 Example 2

a =
10000000000000000000000000000000000000000000000000000000000000000000000000
(74 digits)

10.000 iterations:
- Processing time: 15 seconds
- Percentage of prime numbers: 0,52% (i.e., 52), **all with 294 digits**

50.000 iterations:
- Processing time: 15 seconds
- Percentage of prime numbers: 0,63% (i.e., 314), **all with 294 digits**

100.000 iterations:
- Processing time: 30 seconds
- Percentage of prime numbers: 0,60% (i.e., 596), **all with 294 digits**

1.000.000 iterations:
- Processing time: approximately 10 minutes
- Percentage of prime numbers: 0,63% (i.e., 6301), **all with 294 digits**

2.000.000 iterations:
- Processing time: approximately 15 minutes
- Percentage of prime numbers: 0,63% (i.e., 12610), **all with 294 digits**

Even in this case, the percentage of prime numbers increased with the number of iterations compared to the initial number of iterations.

Here you can see some of the 294-digit prime numbers found: (go to this bookmark to see the numbers - Chapter 11)

6.2.3 Example 3

a =
3489048392048930489023849023247892347829347832974823974832974839748392748392748932748923423247892347829347832974823974832974839748392748392748932748
92342 (153 digits)

1.000 iterations

- Processing time: 20 seconds
- Percentage of prime numbers: 0,20% (i.e., 2), **all with 612 digits**

5.000 iterations

- Processing time: 30 seconds
- Percentage of prime numbers: 0,22% (i.e., 11), **all with 612 digits**

10.000 iterations

- Processing time: 60 seconds
- Percentage of prime numbers: 0,24% (i.e., 24), **all with 612 digits**

20.000 iterations

- Processing time: 120 seconds
- Percentage of prime numbers: 0,32% (i.e., 62), **all with 612 digits**

50.000 iterations

- Processing time: approximately 5 minutes
- Percentage of prime numbers: 0,34% (i.e., 169), **all with 612 digits**

100.000 iterations

- Processing time: approximately 10 minutes
- Percentage of prime numbers: 0,32% (i.e., 321), **all with 612 digits**

200.000 iterations

- Processing time: approximately 20 minutes
- Percentage of prime numbers: 0,34% (i.e., 670), **all with 612 digits**

Even in this case, the percentage of prime numbers increased with the number of iterations compared to the initial number of iterations.

Here you can see some of the 612-digit prime numbers found: (go to this bookmark to see the numbers - Chapter 11)

6.2.4 Example 4

a =
3489048392048930489023849023247892347829347832974823974832974839748392748392748932748927489327489234232478923478293478329748239748329748397483927483927489323423489048392048930489023849023247892347829347832974823974832974839748392748392748932748923423247892347829347832974823974832974839748392748392748932748923427489327489234232478923478293478329748239748329748397483927483927489
3274892342 (306 digits)

1.000 iterations

- Processing time: approximately 2 minutes
- Percentage of prime numbers: 0,10% (i.e., 1), **all with 1224 digits**

5.000 iterations

- Processing time: approximately 5 minutes
- Percentage of prime numbers: 0,10% (i.e., 5), **all with 1224 digits**

10.000 iterations

- Processing time: approximately 8 minutes
- Percentage of prime numbers: 0,10% (i.e., 10), **all with 1224 digits**

20.000 iterations

- Processing time: approximately 10 minutes
- Percentage of prime numbers: 0,09% (i.e., 18), **all with 1224 digits**

100.000 iterations

- Processing time: approximately 1 hour
- Percentage of prime numbers: 0,10% (i.e., 100), **all with 1224 digits**

As the number of iterations increases, the percentage of prime numbers found remains constant.

Here you can see some of the 1224-digit prime numbers found: (go to this bookmark to see the numbers - Chapter 11).

6.2.5 Example 5

a =
10000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000 (600 digits)

1.000 iterations
- Processing time: approximately 8 minutes
- Percentage of prime numbers: 0,20% (i.e., 2), **all with 2398 digits**

2.000 iterations
- Processing time: approximately 15 minutes
- Percentage of prime numbers: 0,15% (i.e., 3), **all with 2398 digits**

5.000 iterations
- Processing time: approximately 25 minutes
- Percentage of prime numbers: 0,10% (i.e., 5), **all with 2398 digits**

10.000 iterations
- Processing time: approximately 1 hour
- Percentage of prime numbers: 0,07% (i.e., 7), **all with 2398 digits**

20.000 iterations
- Processing time: approximately 2 hours
- Percentage of prime numbers: 0,08% (i.e., 16), **all with 2398 digits**

As the number of iterations increases, the percentage of prime numbers found remains constant.

Here you can see some of the 2398-digit prime numbers found: (go to this bookmark to see the numbers - Chapter 11)

CHAPTER 7: INFINITE SUBSETS

I have analyzed numerous other subsets of Sequence A, finding significant percentages of prime numbers.

The function determines prime numbers even when considering subsets with values opposite to those indicated in the previous chapters or subsets that change during their "development" in the sequence.

Depending on the pattern followed by the subsets, the prime numbers found are always different from those of any other subset. The potential of this function is practically infinite. The only limit is the creativity of the human mind.

Therefore, it is possible to state that there are infinite subsets that can be analyzed to find large quantities of prime numbers, even those with billions of digits. To achieve incredible results, significant creativity and computational power are necessary. With these resources, time will be the only limiting factor in discovering prime numbers of enormous sizes.

CHAPTER 8: SUBSETS AND ALGORITHMS

I have created an algorithm for each analyzed subset of Sequence A and the fractional subsets, obtaining significant results described in the previous chapters. For reasons related to the protection of intellectual property and to avoid delving too deeply into specific technical aspects, which would have significantly increased the length of the document, the details of the subsets and algorithms are not discussed in this work.

However, I am available to provide all the details to companies and institutions interested in collaborative development upon signing a non-disclosure agreement (NDA). My goal is to ensure that these algorithms can be used safely and responsibly, contributing to both scientific research and practical applications. I am open to discussions and collaborations to further explore the potential of these discoveries. You can contact me through my LinkedIn profile: LinkedIn (https://www.linkedin.com/in/massimo-russo-ab866a2b5/).

CHAPTER 9: POTENTIAL APPLICATIONS

The discovery of new functions for generating prime numbers has a significant impact not only in the field of number theory but also in many practical applications.

The function $[5*(1+1/x)+1]$ presents remarkable potential for solving complex problems in various technological and scientific sectors. Some of the primary applications of this function involve advanced cryptography and cybersecurity, but there are other potential areas of use as well.

Advanced Cryptography

Cryptography heavily relies on the use of large prime numbers. Modern cryptographic algorithms, such as RSA, depend on the difficulty of factoring large composite numbers into products of their prime factors. The ability of my function to generate prime numbers with 300, 1000, 5000, and even 10000 digits in relatively short times represents a significant advantage for cryptography.

1. Secure Key Generation

The RSA algorithm uses two large prime numbers to generate a pair of public and private keys. My function can be employed to efficiently generate these prime numbers, enhancing the security of the generated keys. With the use of supercomputers, it would be possible to generate extremely robust security keys that are difficult to crack even with advanced cryptanalysis techniques.

2. Symmetric Key Cryptography

In symmetric key cryptography systems, the generation of prime numbers can also be used to create secure pseudo-random sequences, which are the foundation of many encryption algorithms. My function offers a reliable source for such numbers, improving the security of encrypted data.

3. Cybersecurity

Cybersecurity greatly benefits from the generation of secure prime numbers. The protection of networks, data, and communications can be enhanced using prime numbers generated by my function.

4. Network Protection

Computer networks utilize security protocols that often rely on cryptography. By implementing my function in security protocols, it is possible to increase the difficulty of attacks based on prime factorization, making networks more resistant to intrusions.

5. Authentication and Verification

My function can be used to create prime numbers that serve as unique keys for authentication and verification systems. These systems can include two-factor authentication, digital signatures, and other forms of identity verification, which become more secure thanks to the robustness of the generated prime numbers.

Other Applications

Beyond cryptography and cybersecurity, there are other potential applications for my function.

1. Scientific Simulations

Many scientific simulations require prime numbers for various mathematical operations. My function can provide a reliable and fast source of prime numbers for simulations in physics, chemistry, computational biology, and other sciences.

2. Number Theory

From a theoretical perspective, the function can be used to explore new aspects of number theory. Scholars can employ this function to test conjectures and theorems, opening new avenues in mathematical research.

3. Optimization Algorithms

In some optimization algorithms, prime numbers play a crucial role. My function can be integrated into such algorithms to improve performance and efficiency in fields such as operations research, artificial intelligence, and machine learning.

4. Future Prospects

The implementation of the function $[5*(1+1/x)+1]$ in practical contexts offers numerous development opportunities. As technology advances and increasingly powerful computational resources become available, the potential applications of this function will continue to expand.

CHAPTER 10: CONCLUSIONS

The function

$5*(1+1/x) + 1$

for each value of x determined by Sequence A

$x = (5^2)+5*2*(n(n+1)/2)$

where $n \geq 0$,

determines an infinite series of fractional numbers N/d:

$5*(1+1/x) + 1 = N/d$

such that N and d are prime numbers in a very significant percentage of cases.

Algorithm Efficiency

This function, when applied to specific subsets of Sequence *A*, quickly determines a significant quantity of prime numbers, including large primes with thousands of digits.

With particular subsets of n values, the function determines an increasing number of prime numbers as the iterations increase, all having the same exact number of digits (hundreds or thousands).

The algorithms developed based on this function have demonstrated extraordinary efficiency, finding numerous prime numbers with 300, 2000, 4000, or more digits in a few minutes or even in a few seconds.

Future Potential

The use of much more powerful supercomputers would enable the algorithm, based on this function and specific subsets of Sequence A or fractional subsets, to find prime numbers with hundreds of millions or even billions of digits..

It is conceivable that with fractional $n = a/b$ values having a numerator of any value up to 7 million digits, the function and its associated algorithm could find, with one million or 10 million iterations, several prime numbers of approximately 30 million digits (or even more), thereby surpassing the current record of the Mersenne prime with 24,862,048 digits.

Practical Implications

By assigning a numerator with any value up to 300 million digits, the function and its algorithm could find prime numbers with billions of digits. This would require only a supercomputer and some time, but the results reported in the previous chapters demonstrate that this is not mere speculation.

This work has the potential to revolutionize the field of number theory, offering highly relevant practical applications, such as advanced cryptography.

Conclusion

In conclusion, the function [5*(1+1/*x*)+1] not only represents a significant advancement in the generation of prime numbers but also offers a wide range of practical applications that can revolutionize crucial sectors such as cryptography and cybersecurity.

The future prospects are promising, and with further research and development, the potential of this function can be fully realized, leading to significant discoveries and innovations.

Sincerely,

Massimo Russo

Varese, June 22, 2024

CHAPTER 11: LIST OF PRIME NUMBERS WITH THOUSANDS OF DIGITS

EXAMPLES FROM CHAPTER 4

N with 1045 digits (return to Example 1 - Chapter 4)

74074074074074074074074074074074074074074074074074074074074074074074074074
07407407407407407407407407407407407407407407407407407407407407407407407407
40740740740740740740740740740740740740740740740740740740740740740740740740
74074074074074074074074074074074074074074074074074074074074074074074074074
07407407407407407407407407407407407407407407407407407407407407407407407407
40740740740740740740740740740740740740740740740740740740740740740740740740
74074074074074074074074074074074074074074074074074074074074074074074074074
07399259259259259259259259259259259259259259259259259259259259259259259259
25925925925925925925925925925925925925925925925925925925925925925925925925
92592592592592592592592592592592592592592592592592592592592592592592592592
59259259259259259259259259259259259259259259259259259259259259259259259259
25925925925925925925925925925925925925925925925925925925925925925925925925
92592592592592592592592592592592592592592592592592592592592592592592592592
59259259259259259259259259259259259259259259259259259259259259259259259259
259259291

N with 2361 digits (return to Example 2- Chapter 4)

74074074074074074074074074074074074074074074074074074074074074074074074074
07407407407407407407407407407407407407407407407407407407407407407407407407
40740740740740740740740740740740740740740740740740740740740740740740740740
74074074074074074074074074074074074074074074074074074074074074074074074074
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25925925925925925925925925925925925925925925925925925925925925925925925925925925
9259259259259259259259259259259259259259259259259259259259259259259259291

N with 7.433 digits (return to Example 2 - Chapter 4)

74074074074074074074074074074074074074074074074074074074074074074074074074074074
07407407407407407407407407407407407407407407407407407407407407407407407407407407
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N with 8.321 digits (return to Example 2 - Chapter 4)

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N with 2895 digits (return to Example 3 - Chapter 4)

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N with 6755 digits (return to Example 3 - Chapter 4)

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Example 4 - Chapter 4 (return to Example 4 - Chapter 4)

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740740740740740740740740740740740740740740740740740740740740740740740740740 74074
074074074074074074074074074074074074074074074074074074074074074074074074074 07407
407407407407407407407407407407407407407407407407407407407407407407407407407 40740

74074074074074074074074074074074074074074074074074074074074074074074074074074074
07407407407407407407407407407407407407407407407407407407407407407407407407407407
40740740740740740740740740740740740740740740740740740740740740740740740740740740
74074074074074074074074074074074074074074074074074074074074074074074074074074074
07407407407407407407407407407407407407407407407407407407407407407407407407407407
40740740740740740740740740740740740740740740740740740740740740740740740740740740
74074074074074074074074074074074074074074074074074074074074074074074074074074074
07407407407407407407407407407407407407407407407407407407407407407407407407407407
40740740740740740740740740740740740740740740740740740740740740740740740740740740
74074074074074074074074074074074074074074074074074074074074074074074074074074074
07407407407407407407407407407407407407407407407407407407407407407407407407407407
40740740740740740740740740740740740740740740740740740740740740740740740740740740
74074074074074074074074074074074074074074074074074074074074074074074074074074074
07407407407407407407407407407407407407407407407407407407407407407407407407407407
40740740740740740740740740740740740**7716**9259259259259259259259259259259259259259
25925925925925925925925925925925925925925925925925925925925925925925925925925925
92592592592592592592592592592592592592592592592592592592592592592592592592592592
59259259259259259259259259259259259259259259259259259259259259259259259259259259
25925925925925925925925925925925925925925925925925925925925925925925925925925925
92592592592592592592592592592592592592592592592592592592592592592592592592592592
59259259259259259259259259259259259259259259259259259259259259259259259259259259
25925925925925925925925925925925925925925925925925925925925925925925925925925925
92592592592592592592592592592592592592592592592592592592592592592592592592592592
59259259259259259259259259259259259259259259259259259259259259259259259259259259
25925925925925925925925925925925925925925925925925925925925925925925925925925925
92592592592592592592592592592592592592592592592592592592592592592592592592592592
59259259259259259259259259259259259259259259259259259259259259259259259259259259
25925925925925925925925925925925925925925925925925925925925925925925925925925925
92592592592592592592592592592592592592592592592592592592592592592592592592592592
59259259259259259259259259259259259259259259259259259259259259259259259259259259
25925925925925925925925925925925925925925925925925925925925925925925925925925925
92592592592592592592592592592592592592592592592592592592592592592592592592592592
59259259259259259259259259259259259259259259259259259259259259259259259259259259
25925925925925925925925925925925925925925925925925925925925925925925925925925925
92592592592592592592592592592592592592592592592592592592592592592592592592592592
59259259259259259259259259259259259259259259259259259259259259259259259259259259
25925925925925925925925925925925925925925925925925925925925925925925925925925925
92592592592592592592592592592592592592592592592592592592592592592592592592592592
59259259259259259259259259259259259259259259259259259259259259259259259259259259
25925925925925925925925925925925925925925925925925925925925925925925925925925925
925925925925925925925925925925925925925925925925925925925925925925925925929**1592**
367

These values of *d* differ only in the number of digits.

d with 367 digits =
1234567901234567901234567901234567901234567901234567901234567901
23456790123456790123456790123456790123456790123456790123456790123
456790123456790123456790123456790639320**987654320**9876543209876543209876543
20987654320987654320987654320987654320987654320987654320987654320
987654320987654320987654320987654320987654320987654320987654320**9881932061**

d with 631 digits =
1234567901234567901234567901234567901234567901234567901234567901
23456790123456790123456790123456790123456790123456790123456790123
45679012345679012345679012345679012345679012345679012345679012345
67901234567901234567901234567901234567901234567901234567901234567
90123456790123457305**987654320**98765432098765432098765432098765432098765432
09876543209876543209876543209876543209876543209876543209876543209
87654320987654320987654320987654320987654320987654320987654320987
65432098765432098765432098765432098765432098765432098765432098765
4320987654320987654320987654320**9881932061**

d with 1961 digits =
1234567901234567901234567901234567901234567901234567901234567901
23456790123456790123456790123456790123456790123456790123456790123
45679012345679012345679012345679012345679012345679012345679012345
67901234567901234567901234567901234567901234567901234567901234567
90123456790123456790123456790123456790123456790123456790123456790
12345679012345679012345679012345679012345679012345679012345679012
34567901234567901234567901234567901234567901234567901234567901234
56790123456790123456790123456790123456790123456790123456790123456
79012345679012345679012345679012345679012345679012345679012345679
01234567901234567901234567901234567901234567901234567901234567901
23456790123456790123456790123456790123456790123456790123456790123
45679012345679012345679012345679012345679012345679012345679012345
67901234567901234567901234567901234567901234567901234567901234567
901234567901234619487654320**987654320**9876543209876543209876543209876543209
87654320987654320987654320987654320987654320987654320987654320987
65432098765432098765432098765432098765432098765432098765432098765
43209876543209876543209876543209876543209876543209876543209876543
20987654320987654320987654320987654320987654320987654320987654320
98765432098765432098765432098765432098765432098765432098765432098
76543209876543209876543209876543209876543209876543209876543209876
54320987654320987654320987654320987654320987654320987654320987654
32098765432098765432098765432098765432098765432098765432098765432
09876543209876543209876543209876543209876543209876543209876543209
87654320987654320987654320987654320987654320987654320987654320987
65432098765432098765432098765432098765432098765432098765432098765
43209876543209876543209876543209876543209876543209876543209876543
20987654320987654320987654320**9881932061**

d with 3165 digits =
1234567901234567901234567901234567901234567901234567901234567901234567901234567901
23456790123456790123456790123456790123456790123456790123456790123456790123456790123
45679012345679012345679012345679012345679012345679012345679012345679012345679012345
67901234567901234567901234567901234567901234567901234567901234567901234567901234567
90123456790123456790123456790123456790123456790123456790123456790123456790123456790
12345679012345679012345679012345679012345679012345679012345679012345679012345679012
34567901234567901234567901234567901234567901234567901234567901234567901234567901234
56790123456790123456790123456790123456790123456790123456790123456790123456790123456
79012345679012345679012345679012345679012345679012345679012345679012345679012345679
01234567901234567901234567901234567901234567901234567901234567901234567901234567901
23456790123456790123456790123456790123456790123456790123456790123456790123456790123
45679012345679012345679012345679012345679012345679012345679012345679012345679012345
67901234567901234567901234567901234567901234567901234567901234567901234567901234567
90123456790123456790123456790123456790123456790123456790123456790123456790123456790
12345679012345679012345679012345679012345679012345679012345679012345679012345679012
34567901234567901234567901234567901234567901234567901234567901234567901234567901234
56790123456790123456790123456790123456790123456790123456790123456790123456790123456
79012345679012345679012345679012345679012345679012345679012345679012345679012345679
01234567901234567901234567901234567901234567901234567901234567901234567901234567901
23456790123456790123456790123456790123456790123456790123456790123456790123456790123
45679012345679012345679012345679012345679012345679012345679012345679012345679012345
679012345679012345679012350837654320**987654320**9876543209876543209876543209
87654320987654320987654320987654320987654320987654320987654320987654320987654320987
65432098765432098765432098765432098765432098765432098765432098765432098765432098765
43209876543209876543209876543209876543209876543209876543209876543209876543209876543
20987654320987654320987654320987654320987654320987654320987654320987654320987654320
98765432098765432098765432098765432098765432098765432098765432098765432098765432098
76543209876543209876543209876543209876543209876543209876543209876543209876543209876
54320987654320987654320987654320987654320987654320987654320987654320987654320987654
32098765432098765432098765432098765432098765432098765432098765432098765432098765432
09876543209876543209876543209876543209876543209876543209876543209876543209876543209
87654320987654320987654320987654320987654320987654320987654320987654320987654320987
65432098765432098765432098765432098765432098765432098765432098765432098765432098765
43209876543209876543209876543209876543209876543209876543209876543209876543209876543
20987654320987654320987654320987654320987654320987654320987654320987654320987654320
98765432098765432098765432098765432098765432098765432098765432098765432098765432098
76543209876543209876543209876543209876543209876543209876543209876543209876543209876
54320987654320987654320987654320987654320987654320987654320987654320987654320987654
32098765432098765432098765432098765432098765432098765432098765432098765432098765432
09876543209876543209876543209876543209876543209876543209876543209876543209876543209
87654320987654320987654320987654320987654320987654320987654320987654320987654320987
65432098765432098765432098765432098765432098765432098765432098765432098765432098765
4320987654320987654320987654320987654320**9881932061**

EXAMPLES FROM CHAPTER 5

N with 7762 digits (return to Example 2 - Chapter 5)

4354992303556361369544669792015883573345203663372897678000728116144037661 6
75773327637078129777994394077085927761375439748093613315406316646530722911
41041226005019611117717372972335481071869751003165410706993103184555123897
32114119870521602007068144369452332655149301652364135061689531005771204747
32513535667745085202509163928152916228275400492263367544035753851980932519
39893374558321342298369558942379271096943460500804218616506304992023831033
14236777255159142091414503656874072238647293527929513309446352877432116431
57613432044968917238125349114582672965974013589755904791744248322377474273
92445272419453857456853161344222725960880288079811087779600282207473980004
49558502531300544740852866602630661145017115590830140536803315986234052892
90329688709533934043178800096902680755415717846531645993765994165087823676
65555872292533474982842224577044347573772676109802084816074440544208350926
22195405250043742683093450499800182269662979613254447579365628896215278532
19982301997954839075120841316214112460867378245779209674744475983549339234
98573949363159270901319028165588284463686417627605076211779901717125014376
51883790958641931007529315719937657633188385484044496702614297585674297259
06945532825568209264835478807407334154630293192018442327928434306414411030
31925361688199400041875145351485741621329719944661650078213095235451209221
15773422482553179683930612223277975109501713642597690049204066004977206685
79523318064912581101467134223280099217469707892570197463609391983097692007
27182278514966866958591980844914759498293115342745798591067341301688562502
48579804874531887465872792455676809679807407373228871260637173603440901805
67141358622645894695762948279504583071712463877627424175438096317405683822
93292837348869930982298143935324956789502976713834964800581710394555222637
92342552417227423307525552254865999987150662275736129091184732961849969183
08284816646828538457830347827684690579522170849135084417339975191409067044
39287742760988765277609031423796999606458174648933218448065028881810711348
96064991866154342375084472315344686604849725646600990191620041170830267013
15715394493922593557306599384106594015648048159034320172869608541287283692
08618217799913945151981514314984782527070741955015734178481232515268748501
01752942530768461241126431154897148080944711667343426454330723890699735784
73808781125880693293388521085589191062385869813519453232364412540867884814
62825860326951889101831342809607573674877140697944486620965356959446863544
16269888265117007937691346546793736371583422750261849174126892084305662021
81555855107653407261031888395888821784306657723154580066926029993276810970
38647232932427266005513157172216717993426332051184540748068781993509659686
54015086930345395450098429537488486236717633155236239556658920722166940010
72405114668227053058334281913274178235329770553613228971647149480544448297
77247531920110075720990826949906479740348005413633253014871005079325252946
95569093511986480106469579652928721499740815188061919312701955409355977862
88265881247421105992688524996365882345332331341030473179232681075797686343
65544158096138002510965674368245112035938278865375730571637745402921894368
07067037789069858756036322778864109753062231432094853283262455085197781176

76174163796510970659156573992985854357118877806231203822783774823128360396
45026635390053279376282393566830801130482542597244781733852907226687970462
08735105508248795232975062849369505462444431640424681430134539620513206437
95184882443911154532460023508639506663543212059878369299531396785369601986
85460927767949493051005059563119622575996717349763920966353281366131845230
64888233117655589803217924350310326618666560826460659490692719793940252273
88628926678191147896205285115783293992448591139873362120919194824939971534
90576307833669633081943107062311832363650673301625844317786758949867209010
50866622228457663421869194387535574786384455049264846664675595767605454256
60899605655363723565657571305110593353052108209728293539763912651707474577
59520751092734087704747685520347711790723711757578891200027751090190946787
31913819198991758224826025690389205503891373438717432790262883347690215797
60767544743833644332159735031121999176413833031972407658800572877021891108
72511776851980368668944476511629957803771559335742154958744384305645751961
90367883883795763884677161517337464987268881564411826435126997656786250495
18055049860585309187118100887666811880357024858195398070291490873037330726
74656330553055867418304310674655719493681983870497230926410210337608754109
74916449995120850424355616508667770101571996167278829851179533700493447365
88183482093652103536389197476151667468867352943338099973613861019016170303
58750311118726497742661123475969526158764065700928856976678072847386587413
48233685919384823549495048051327003839457995963442720970908586684406558335
48742132700390007703564668421881645623669672817636280773301113415879882706
09613280975560307150749606080836518941635279855729015534722263484236409654
97436444599042222258548429217701223982598360392498241079071822248017931500
49497288826855378004110062389408478073523848646391299255211656810010167103
35751260939837821995631081376776940225023435951787947375838485289793284302
56372675481813016130397707846527747906997635067848835074195764815501057958
37937119548302598847891546361645491176344913153500557106201261289704827774
88013623737304894038662837770760684424709364679899006727705468898388918441
71790620515349885888696361564189116666764823148107198617093640161279862702
05513686685648210363147355379192336657205152491408883487735984761186027402
95950681175119206745077720489226834794351608102214587162602031229770552042
88029713873341618928888539643795332742225602010846278380887729368628171386
62458993879941444224663659903385512976468451790862757028153743802872370698
19697347263245767380007307665735275467466096791941973487324105343724981153
64982573702234293473310291564752279362088725262414678572148720440422566716
62879177398759952631162685261480012057396779312019013935534595723647146198
06245138249532240660764244792414873248594741769149401799149898519054385148
46968795193866899008155159454475894084804394660730729820229138239865545985
15841361659719896405195664933090554294260465267289963269046104992385263218
54420265905519946863272789415893813139779125096162644254517188967858385217
70949231254627795725205347846985739839606117584636076322666135883205621759
88229388716206231774867369874252158226653503563497354616210918885550135550
05982070587577643270126367292894192146335955382973306637822027526495382164
34292206790380208078176494705128971049016237939433854764118469116514368380
28232259162672536198781857293561747689799108430947741039415123902082738974
22945349395865756044491654485140012170549933818852503154103978766584703874
08399049300154907236189937610778241491944286706105622341744389799702762791

0549990774859610716270266781806339372593041507202856562430921395272239 1267
6697837875818347476602425535609738829931382464986721291718619170644170 2170
8226695231576825680585168737928226328669992127359262216952760955547547 7889
7726955279635854524068751413758899645194321084299507423992914818855234 8518
9155344264295709226468453325644289886004036238710708759651573082719700 9298
9903003223887106494732684589594616609389770589834298247084645392954586 1984
5789709973800731593349938732950098552053164024645546351932468882490603 5655
8351853661385062803173493368787281360865530443052138525507594442467563 2942
5005711093063787834596363200705151868873362948695251235702398815201951 2963
4928573332665610159079847617898056026637247770346633844705071198296528 8328
9192188695574035636161005391526838337497829724259669959448554621086255 0177
6700089096303236257475128877369597557431666256886434674080097991901409 9837
9731775542143462398395399508294792077346546606120348167907155670927722 8979
5357497119626388826278588424356300249982357591734481407170649784 63

N with 1223 digits (return to Example 3 - Chapter 5)

3238563208160416734519881948550149839168500136663605519383888801313221 9261
8591014673931531380210808496020523522980612384887316210506198001011987 6416
3967780405073426663875579833984375000000000000000000000000000000000000 0000
0000000000000000000000000000000000000000000000000000000000000000000000 0000
0000000000000000000000000000000000000000000000000000000000000000000000 0000
0000000000000000000000000000000000000000000000000000000000000000000000 0000
0000000000000000000000000000000000000000000000000000000000000000000000 0000
0000000000000000000000000000000000000000000000000000000000000000000000 0000
0000000000000000000440810381558357815488276201458342129181999583789532 8205
6578188985440647229552268981933593750000000000000000000000000000000000 0000
0000000000000000000000000000000000000000000000000000000000000000000000 0000
0000000000000000000000000000000000000000000000000000000000000000000000 0000
0000000000000000000000000000000000000000000000000000000000000000000000 0000
0000000000000000000000000000000000000000000000000000000000000000000000 0000
0000000000000000000000000000000000000000000000000000000000000000000000 0000
0000000000000000000000000000000000000000000000000000000000000000000000 0000
000000000000000000000000000000000000031

N with 2642 digits (return to Example 3 - Chapter 5)

3974602370533485681014144565350818807326301148173048126966221182886378 0658
6122901016873581724576130548679039296322704621648792487421458261235658 2289
8300322084785886959246326690627903528961627779424396434917795318668685 4035
1903064575384238649215559076369553376969898765127385718011785422365635 6607
0769238357145986597265210783901773001658179716916703488015227829777131 7738
8068288564682006835937500000000000000000000000000000000000000000000000 0000
0000000000000000000000000000000000000000000000000000000000000000000000 0000
0000000000000000000000000000000000000000000000000000000000000000000000 0000
0000000000000000000000000000000000000000000000000000000000000000000000 0000

00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000154426727684
04086754416856520415066905825138743703868481559223181310758238725233777710
51079655698816757300012221243917393147069027453413014469087799261464138272
92569465043925447389483451843261718750000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
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N with 6354 digits (return to Example 3 - Chapter 5)

61037552758692766737811722261093975133972883647374071313201881476756850558
39413705289971722170772122876108158026140881212113714978972127141616337042
84265020955502341982502745736448957397485792454788517542106681169583119875
48217193184916742382488940418432053025598602052429683744625009333535930987
16540930461459064513112337171067074486942640333438872593166723301340362842
36853181414876030245414022790408412547658580258573159801278816411238956876
44945317937554110692562533049186177953910658838762794127737177865145815343
20605316946387153984230285464935033419978119172210408608427968931139420749
13108813090906803732505917579481577581450761138761774491360526356070709981
42287212959291430073213783206450854335700815302361568837727428736613239712
11642202299940253570224634866443445639749597979908699194618809600633144241
70312971485915368335593382035119411127659153225299823987020152861872670169
84399534356255708628102851776020543184131383895874023437500000000000000000
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00000000000000000000000000000000000000000000000000000000000000000000191370
14306107329668180549405001111147845007264905463292431708614958462578787597
05584508272294512021916359017704368385428330519667447775691698695936932238
44216604794320633484719776164748397481204487455876038115927094132609227717
54508243381066122832536123373315790253866821084239361683621090080252242247
15786769644866226418430954331607116297732343940472142822999789969750079203
16298328934543289301207038136025613384863853453420008471005941963483110157
54006803035736083984375000000000000000000000000000000000000000000000000000
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EXAMPLES FROM CHAPTER 6

Paragraph 6.2.1 - Example 1 (return to paragraph 6.2.1 - Chapter 6)

N =
4673645787883827337351509904134565072524636501469772390 18372191860380
24689924203734611067547069365215754271097323298696024740090999380472639164
01010031452807213840291294379390933593519790398055620784363967439407320325
3354378852665333047643272001098 5283

N =
467364578788382733735150990413456507252463650146977239018382120808905
26519372456162202444210771553928411761592372974602388977649332801537377233
08786871677625252977019816456628557280716514502733377427558134687781186554
9088831685930982797216118981192 0883

N =
467364578788382733735150990413456507252463650146977239018515575744359
54835683128542995854771340102836429211476146259772504225242195427478237668
89965984530776980483007411144134430126412669115605324035277123535643391238
2597184371946631138325039034164 7283

N =
467364578788382733735150990413456507252463650146977239018738052028856

46448941331229554185916095666693024844773610280203746929194686182536693938
67459240388844553165005955190999025201661618518285650195946875661433350508
48779438427747934067975549500621083

N =
467364578788382733735150990413456507252463650146977239018741094439584
62744507255368857547709528221412431280784515771137342964103345749035999793
42800239050249537346364731569497169954844892720514529603410826355644196884
83440673719031259566776681791374683

N =
467364578788382733735150990413456507252463650146977239018972944638216
96457617224322458669244859764674765662872337258646005376172471637375753584
26778984109733073993512269688764679062133181459470769027256266360297860266
02554164821408365091116916528983491

N =
467364578788382733735150990413456507252463650146977239019092832066369
98050458235000953304240120974969213871085856339543438713071074506091689717
09626429453029334720143394460089420394386555711666524128690694016823893314
96981478744663914812186425705797187

N =
467364578788382733735150990413456507252463650146977239145603208073255
64301540024241594003579823824225307475846133412970985613528611968270325523
32199294177977749875241088072658659371835230833027565753559364146598575803
68727393690206455320597277467998427

N =
467364578788382733735150990413456507252463650146977239143689942861826
03079163730368333943861210764464524959582608670214618586044129728736498664
53782831379248068816959077966084749760604360804282248764781889919252884143
14908287129578634920017906953110491

Paragraph 6.2.2 - Example 2 (return to paragraph 6.2.2 - Chapter 6)

N =
42000000000000000000000000000000000000000000000000000000000000000033538995
00000000000000000000000000000000000000000000000000000000001019876861619756
00000000000000000000000000000000000000000000000000014084677337492048158620
000000000000000000000000000000000000000000000749818925077395421796373631

N =
42000000000000000000000000000000000000000000000000000000000000000033539715
00000000000000000000000000000000000000000000000000000000001019920650601644
00000000000000000000000000000000000000000000000000014085584447444472237660
000000000000000000000000000000000000000000000749883314247174725677029631

N =
420000000000000000000000000000000000000000000000000000000000000000103474365
000000000000000000000000000000000000000000000000000000000097076294190189 24
0000000000000000000000000000000000000000000000000041361385461871262277546 0
000000000000000000000000000000000000000000067934017399799374220913112831
N =
420000000000000000000000000000000000000000000000000000000000000000104213205
0000000000000000000000000000000000000000000000000000000000984675550071063 6
00000000000000000000000000000000000000000000000000422537273356649769766980
000000000000000000000000000000000000000000069895180140408858047506490431

N =
420000000000000000000000000000000000000000000000000000000000000000105946485
00000000000000000000000000000000000000000000000000000000010177022966695404
00000000000000000000000000000000000000000000000000443972863388208872716740
000000000000000000000000000000000000000000074662483033914159539922228031

N =
420000000000000000000000000000000000000000000000000000000000000000116874015
00000000000000000000000000000000000000000000000000000000012384645413213004
00000000000000000000000000000000000000000000000000596006037444397929049260
000000000000000000000000000000000000000000110567648508519246389955792031

N =
420000000000000000000000000000000000000000000000000000000000000000125022105
00000000000000000000000000000000000000000000000000000000014171677576358796
00000000000000000000000000000000000000000000000000729553572579042610488180
000000000000000000000000000000000000000000144778291038257438171313240031

Paragraph 6.2.3 - Example 3 (return to paragraph 6.2.3 - Chapter 6)

N =
62241100439197335839926167815180071734014663503071004732061430385825
84066442133507443196090043384222007077677153199375087040230735145813
3959306004986958221295870471151340401525630071852129951239673408981844360
60094857617542500871485575883098710255289200093496761647876879561424175649
40360402434386098813886495549754016370633763426482458385572306298418718265
39761558358959037254375908506465383437383267915159670706732742304829593543
51850679859798865048890271745251796826725272355993505580611775975591025089
07082438920451343168299649334834441011490279000377349521862203194928901984
40223717263993351968007827662204 3

N =
62241100439197335839926167815180071734014663503071004732061430385825
84066442133507443196090043384222007077677153199375087040230735145813
3959306005053124310550454216008061457082079623120804926257587726199083440
69888816187168928395290934793411912535922071667368471787955937471882523125

35916841568449994530526351092884275446292416264690862619621108451169870467
00961197982768643809153424012337889021600513475376203530891254034971238631
37208811830483580893602705704058962248885526404585825354362364972940013412
58010059393750436346730237428375776014220617331385052201822042982439045919
362229565652168056518858756801171

N =
62241100439197335839926167815180071734014663503071004732061430385825
84066442133507443196090043384222007077677153199375087040230735145813
3959306005069124610640384465862007309810377753482288386910041172022968339
28324364895139715277190984706497645989383796172021293330293694904078210710
92301809046074680288439932718263810090254831652845431837082663919363740153
14438491368865237247140348687891098029704074047609490610053110266596893070
15178004056572966418416011239563261686342864107132924453697733393025388806
44361410689770016762521784345168264048621759127190683314881168571957053174
697326757196366637937932380732283

N =
62241100439197335839926167815180071734014663503071004732061430385825
84066442133507443196090043384222007077677153199375087040230735145813
3959306007813866062724145197895102885894392149705079948369660243896685934
16314099603470446051563431638953376091951011156809805016115637939633532075
32255440124042805675053973427487335112695440251407294343606557550902880086
18249997270504572414622575531307767986725603142859907883838410720949052601
18538964684047247999533614516171429508082153360715272163687099771058914477
78720334610995351544065871296821877951596873909542483673746799072966327435
121213247477727322413210394441107

N =
62241100439197335839926167815180071734014663503071004732061430385825
84066442133507443196090043384222007077677153199375087040230735145813
3959306008215700787265063702608849017179203019551943265077238982574277535
07607896290335093681500346550222295113232844242961684347969810597099474680
70840051145775799889680225070253544066167154640833406526287963007554246504
39375911134077257789807330593016922929382254759670422405680803488513297049
93269081455090636031134952716561915790295557725603675380842453931796991622
18543602735809680297543107241115499441671844598716795481320874563621546661
599352953518707327838030521296203

N =
62241100439197335839926167815180071734014663503071004732061430385825
84066442133507443196090043384222007077677153199375087040230735145813
3959306007704843073475556991496005879819221620768320660571255427607969217
76782047122568280215595432067915035723101874393044569371936226961207536574
13369225040420945069537882154173056718040669071698607147577490217652757006
36711049948343587127585017055976807706457540126885866015386401229138006189
26702889663885827209005774485724527298729670023346439161850054592334693006

87842456325861859082396426663340009367575747880548688910010052757531549429
241677794892222730186942837964683

N =
62241100439197335839926167815180071734014663503071004732061430385825
84066442133507443196090043384222007077677153199375087040230735145813
3959306007258493697055868615105298821158198663306706631281574185955350227
18820583468039426189291690389611785396835941157968080612546053993655080804
64232026723377028623300608481014945941904376056580984030866651975776163877
40959879427345291110871628333376009832076140323914983685370537219365957050
92799715393031391888409984894503782610129347186698324633293142017787001784
76436856773050512600649687989873243321608856348444186505321823844351910518
381341550198297020158237880323867

N =
62241100439197335839926167815180071734014663503071004732061430385825
84066442133507443196090043384222007077677153199375087040230735145813
3959306007001222327305334488561475348914847360546040898503500965240425935
27350654549384516881581928682875455170297520529121016319542370621440180935
97507232237826294057237565737448231834412372217024151276041235577274583009
84793481771120435270409971494255651344636527888933698047787807997680306037
00655442756400248788734789369517038884921864827177611638563465636461677796
61403975485759682556966324297175951424692581859113958796142176497573618986
704220131820080963226453509009483

N =
62241100439197335839926167815180071734014663503071004732061430385825
84066442133507443196090043384222007077677153199375087040230735145813
3959306048168769939432793143594795339071863793203518277781705820479581819
88559125271832294041985894754110110034682934340086131725828479633522179177
11292984035809896643106463728214357128240241059852607589076854138918787890
11047740456813384436423123262469927025851644543006184047030533834649844666
58973793070140650225264326830968081454744960238704092702538705827185114729
08615998100404832809870725721673553301524389604126434778151243822046255060
190466835546546054891836550060683

N =
62241100439197335839926167815180071734014663503071004732061430385825
84066442133507443196090043384222007077677153199375087040230735145813
3959306048637192517927647699663761855152040092406947867227670493047798333
61379154687942572067266666347551065275683075872853217568751102389871791595
86149448192587816122995273435239396538694870302514657164965274930768730819
36305171057101619403351035123349659297715347796481732359423418247375189872
98788515668779056564791189202428999529543506212580435570260835261563296804
16002811706803571559096824150593866755504155167936049160245452165912001983
967737849931159150020668634660051

Paragraph 6.2.4 Example 4 (return to paragraph 6.2.4 - Chapter 6)

N =
62241100439197335839926167815180071734014663503071004732061430385825
84066442133507443196090043384222007077677153199375087040230735145813
39593060040840080319567293665983138934801656981442660619212175302696
11056547803029130920655271009929231731001179501661844103838210627504
33767404979677048855716114198401624287835114760228684981091310413811307
23604670978554819372499799017690590429178517930690790200186952340687121277
73081628906919368933247077963266860945669457071370775956181340112680076254
06690180129802623451344156263590923740186544327350518975710338245759017322
89658703116972109103132265914513916265883395301060589105576485539862537381
59933126200043432854505045596972870259777561029598996535599250579736069507
48199712558407429025031417753271713254417671650231761608037902726506734170
61689878035696538443090806386940266098854417611420812175473319087013139990
09181060610873645007546162521773529048911254850146308474970567943582405666
62223571492098676794758727972210750757647062341384359534473821933547441706
45144892217952140722574186551283872775654980973817275314009258766378265570
34280722927519238036176336439018540396221318034579581086591479744571972244
5181461421277503387564194206215774449170165614279646398774163093027

N =
62241100439197335839926167815180071734014663503071004732061430385825
84066442133507443196090043384222007077677153199375087040230735145813
39593060040840080319567293665983138934801656981442660619212175302696
11056547803029130920655271009929231731001179501661844103838210627504
33767404979677048855716114264251198885865648335296467477278915709579338
58699682887085663682298902900762909211925983044841653053421568569575494564
17312187443735968911904096374536419056283172680611080862784108265357866001
36737324946385297539224345242082249954226654204579075811479547465921668380
35861429830791368996766034198805842324103231018931506438551209803645205164
07324490163757900381940450970735609472925696404240394529499446224744565193
05322525919309599384592443741744621295727559901851049594120353288981888603
32474303009733414281853784242257584961340295928024625373665806001440141312
97990037613916404378990942878313429463398605026309633299529933484193998254
50341585235390606114930384123002869078478632354414913603139151281259822726
74028555740807017367768719820939769139002674489411013750519857736053409913
18618494856554739059809656347506642079483797316895811753698636895418420423
8098871379609755967318831612843398365877411585266422509305150565171

N =
62241100439197335839926167815180071734014663503071004732061430385825
84066442133507443196090043384222007077677153199375087040230735145813
39593060040840080319567293665983138934801656981442660619212175302696
11056547803029130920655271009929231731001179501661844103838210627504
33767404979677048855716114276456126367062423456825093404867576365343707
42616701963931240751665715017066754483056940923913118316672168394005420968
65890476752831883298817990813443516682896556433103356901945462374672145825

4249683801197057820633513388789659707292882083540974863922123926086978881 8
7759530415315394071823646269598382481128408834106819946346948642176300842 4
5352698688908273315127235068280345573357299346901093283085791580586615309 5
3078075776096476289182720671952379034411357522326527889769601323268710809 0
7483147719312979395738953689112862164600323438180772523914341817200638530 2
5151555174292744620718094189378858333254021609486617148833651930691008404 1
0488656226011024913049566458351922280305765276692557971969982545965935136 7
3341726048075868184743277233152557794736392904721298018570121991884185074 9
7113956237898764177398299261863649618792025055670297182147606273293822573 9
378359206576327570960105563559089020424592874912364321771882528318 7

N =
6224110043919733583992616781518007173401466350307100473206143038582 5
8406644213350744319609004338422200707767715319937508704023073514581 3
3959306004084008031956729366598313893480165698144266061921217530269 6
1105654780302913092065527100992923173100117950166184410383821062750 4
3376740497967704885571611 4328590448111865097642475262218520930982454453
9618895242614091055407908061647377432810371580556570059548407505446729308 1
6313592998643336450122583550341679078745722782862309139984520421539531750 0
5830426943340998353152213864491545522533290476213800134110971182634239937 2
2923621437949992603173249908193425831088212948630732945804172712284480622 3
5764634608988065466040481475865566275593597476697962768766718389852894572 8
4453273339859557636221547338000394495876524309974463833109733646303871097 3
2557379899794847076390131396903445605039251239053283227355914716337385078 4
4621745606390854891233907525206375830588310562959485956168312165830450785 1
3580602235861651067060530828036524904693310008679162910663335078395886305 6
5161037424321322273031527337980362793199331963377609057445160414118029701 6
7410589722410467327142511787535444824057129191671063640325666299885495828 2
865940296021574990265016331634989053824464625096912902227284065340 3

Paragraph 6.2.5 Example 5 (return to paragraph 6.2.5 - Chapter 6)

N=
42000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
02609115000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000

00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00061721161821240000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000663096037574454246000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
0000000274618066361281300000831

N=
42000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
04887915000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00216618198294840000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000
00004359811402957800000600000000000000000000000000000000000000000000000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000

00000000000000000000000000000000000000000000000000000000000000000000000000
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00000000000000000000000000000000000000000000000000000000000000000000000000
000000338260119899817063751231