Prime numbers and Twin prime

Algorithm

For the first time a method that generates all prime numbers.

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Abstract: This article develops an old and well-known expression to obtain prime numbers, composite numbers and twin prime numbers. The conditioning (n) will be the key to make the formula work and the conditioning of the letter (z) will be important for the formula to be efficient.

Keywords: Prime numbers, twin prime numbers, composite numbers.

Introduction

The study of the prime numbers is wonderful and exciting, in the absence of an expression that involves all of them I have investigated and I have discovered a brilliant expression that contains all the prime numbers greater than 3. This expression comes from investigating first how they are distributed the composite numbers, this allowed me to explore its order and understand its mechanism. The expression of the prime numbers is its result.
The expression to obtain the prime numbers is similar to how we use the sieve of Eratosthenes although all that infinite procedure expressed in symbols in a formula.
From here it was very easy to get to the Twin prime numbers.

Methods

The prime numbers greater than three can be expressed under the expressions $(6\,n\,+\,1)$ and $(6\,n - 1)$, for some values of (n). This paper demonstrates in chapter 1, 2 and 3 how to obtain the correct (n) values to obtain all the prime numbers.

Also, Twin prime numbers greater than 3 are expressed under the same expression, so once the values of (n) are obtained for obtaining the prime numbers, combining both expressions we obtain all the twin prime numbers in chapter 6 and 7.

The algorithm presented in this paper does not calculate prime numbers or twin prime numbers only generates the mechanisms to obtain them.

Index

Chapter 1

A) Sequence of: $\boldsymbol{\beta} = \mathbf{6n \pm 1}$

The $\boldsymbol{\beta}$ sequence will be fundamental since this will allow us to obtain all the composite values and once excluded these will only be the prime numbers.
All prime numbers greater than 3 are within this sequence, the problem is that there are also composite numbers that are products of prime numbers greater than 3.
The formula enunciated in the following point is intended to separate the composite numbers from the prime numbers and does it marvellously.

$P = \ prime\ number > 3$
$P_{(a)} = prime\ number\ > 3\ contained\ in\ the\ sequence\ \beta_{(a)}$
$P_{(b)} = prime\ number\ > 3\ contained\ in\ the\ sequence\ \beta_{(b)}$

$\beta_{(a)} = 6\mathrm{n} + 1 = \{7; 13; 19; 25; 31; \ldots.\}$	$\beta_{(b)} = 6\mathrm{n} - 1 = \{5; 11; 17; 23; 29; 35; \ldots..\}$
$\mathrm{P}_{(a)} \subseteq \beta_{(a)}$	$\mathrm{P}_{(b)} \subseteq \beta_{(b)}$

$$\boldsymbol{\beta} = \mathbf{6n \pm 1} = \{\mathbf{5; 7; 11; 13; 17; 19; 23; 25; 29; 31; 35;}\ \ldots..\}$$

$$\mathrm{P} \subseteq \beta$$

B) Formula to obtain Prime numbers

The formula stated in the next bullet is meant to separate composite numbers from prime numbers and it does it wonderfully.

$$(\exists\, n)\ n > 0 \in \mathbb{N} /\ 6n \pm 1 = P$$

$$P\ = 6n_{n \neq B \pm \left(\frac{B \pm 1}{6}\right) + B * z_{<\left(\frac{B \pm 1}{6}\right)}} \pm 1$$

This algorithm allows us to obtain all prime numbers greater than three. This formula allows obtaining the correct values of (n), for which we can establish how the prime numbers are located and distributed.
$\beta = 6n \pm 1$
$Z \geq 0$

The formula is divided into two main variables:

Two for the way $B_{(a)} = 6n - 1$	Two for the way $B_{(b)} = 6n + 1$
$\boldsymbol{P_{(a)} \subseteq \beta_{(a)}}$	$\boldsymbol{P_{(b)} \subseteq \beta_{(b)}}$
$P_{(a)}\ = 6n_{\substack{n \neq B_{(b)} - \left(\frac{B_{(b)}+1}{6}\right) + B_{(b)} * z_{<\left(\frac{B_{(b)}+1}{6}\right)} \\ n \neq B_{(a)} + \left(\frac{B_{(a)}-1}{6}\right) + B_{(a)} * z_{<\left(\frac{B_{(a)}-1}{6}\right)}}} + 1$	$P_{(b)} = 6n_{\substack{n \neq B_{(b)} + \left(\frac{B_{(b)}+1}{6}\right) + B_{(b)} * z_{<\left(\frac{B_{(b)}+1}{6}\right)} \\ n \neq B_{(a)} - \left(\frac{B_{(a)}-1}{6}\right) + B_{(a)} * z_{<\left(\frac{B_{(a)}-1}{6}\right)}}} - 1$

Chapter 2

Prime numbers in the sequence$\beta_{(a)}$

A) Example and demonstration of the formula

With this formula we obtain prime numbers larger than 3 that are within the sequence $\beta_{(a)}$

$$P_{(a)} = 6n_{\substack{n \neq B_{(b)} - \left(\frac{B_{(b)}+1}{6}\right) + B_{(b)} * z_{<\left(\frac{B_{(b)}+1}{6}\right)} \\ n \neq B_{(a)} + \left(\frac{B_{(a)}-1}{6}\right) + B_{(a)} * z_{<\left(\frac{B_{(a)}-1}{6}\right)}}} + 1$$

$P_{(a)}$ = $prime\ numbers\ in\ B_{(a)} > 3$

$Z \geq 0$

$$\beta_{(a)} = 6n + 1 = \{7; 13; 19; 25; 31; 37; 43; 49; 55 \ldots\}$$

$$\beta_{(b)} = 6n - 1 = \{5; 11; 17; 23; 29; 35; 41; 47; 53; 59; 65 \ \ldots..\}$$

B) Example and demonstration of how to obtain: $P_{(b)} < x$ / $x \in \mathbb{N}$

In this example I will calculate all prime numbers greater than 3 and less than 190.

$P_{(a)} = prime\ numbers\ in\ \beta_{(a)}$

$x < 190$

We use this simple formula to get a value that will be important for the final formula.

	Formula to determine expansión
$x > 7$	$\boldsymbol{n = \frac{x-1}{6}}$

$$n = \frac{190 - 1}{6} = 31{,}5$$

I search in the sequence $\boldsymbol{\beta_{(b)}}$ the next value of natural numbers of the 31,5

$$\beta_{(b)} = 6n - 1 = \{5; 11; 17; 23; 29; \mathbf{35}; 41; 47; 53; 59; 65 \ \ldots..\}$$

The result is 35.

This value helps us determine how far we should expand the formula.

Formula to obtain prime numbers $P_{(a)} > 3 \wedge < 190$

$$P_{(a)} = 6n_{\substack{n\neq 5-\left(\frac{5+1}{6}\right)+5*z_{<\left(\frac{5+1}{6}\right)} \\ n\neq 7+\left(\frac{7-1}{6}\right)+7*z_{<\left(\frac{7-1}{6}\right)} \\ n\neq 11-\left(\frac{11+1}{6}\right)+11*z_{<\left(\frac{11+1}{6}\right)} \\ n\neq 13+\left(\frac{13-1}{6}\right)+13*z_{<\left(\frac{13-1}{6}\right)} \\ n\neq 17-\left(\frac{17+1}{6}\right)+17*z_{<\left(\frac{17+1}{6}\right)} \\ n\neq 19+\left(\frac{19-1}{6}\right)+19*z_{<\left(\frac{19-1}{6}\right)} \\ n\neq 23-\left(\frac{23+1}{6}\right)+23*z_{<\left(\frac{23+1}{6}\right)} \\ n\neq 25+\left(\frac{25-1}{6}\right)+25*z_{<\left(\frac{25-1}{6}\right)} \\ n\neq 29-\left(\frac{29+1}{6}\right)+29*z_{<\left(\frac{29+1}{6}\right)} \\ n\neq 31+\left(\frac{31-1}{6}\right)+31*z_{<\left(\frac{31-1}{6}\right)} \\ n\neq 35-\left(\frac{35+1}{6}\right)+35*z_{<\left(\frac{35+1}{6}\right)}}} + 1$$

We expanded the formula to $\beta_{(b)} = 35$

Therefore solving the operations we obtain:

$$P_{(a)} = 6n_{\substack{n\neq 4+5*z_{<1} \\ n\neq 8+7*z_{<1} \\ n\neq 9+11*z_{<2} \\ n\neq 15+13*z_{<2} \\ n\neq 14+17*z_{<3} \\ n\neq 22+19*z_{<3} \\ n\neq 19+23*z_{<4} \\ n\neq 29+25*z_{<4} \\ n\neq 24+29*z_{<5} \\ n\neq 36+31*z_{<5} \\ n\neq 29+35*z_{<6}}} + 1 = \quad 6n_{\substack{n\neq 4 \\ n\neq 8 \\ n\neq 9,20 \\ n\neq 15,28 \\ n\neq 14,31,45 \\ n\neq 22,41,60 \\ n\neq 19,42,65,88 \\ n\neq 29,54,79,104 \\ n\neq 24,53,82,111,140 \\ n\neq 36,67,98,129,160 \\ n\neq 29,64,99,134,169,204}} + 1$$

We take the values ℕ: $n > 0 \wedge < 31{,}5$

$$\boldsymbol{n} \neq [\mathbf{4; 8; 9; 14; 15; 19; 20; 22; 24; 28; 29; 31}]$$

By replacing these values in 6n + 1, composite numbers Nc <190 are formed, for that same reason, these values are not valid to obtain the prime numbers. So we exclude them to achieve the goal of finding prime numbers.

Using the missing natural numbers in the previous set we obtain:

$\boldsymbol{n}_{(p)} = values\ of\ (n)\ that\ generate\ prime\ numbers$

$$\boldsymbol{n}_{(\boldsymbol{p})} = [1; 2; 3; 5; 6; 7; 10; 11; 12; 13; 16; 17; 18\ ; 21; 23; 25; 26; 27; 30]$$

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We obtain the Prime numbers:

$$\mathbf{P}_{(\mathbf{a})<190} = \mathbf{6}\ \boldsymbol{n}_{(\boldsymbol{p})} + \mathbf{1}$$

$\mathbf{P}_{(\mathbf{a})<190} = [7; 13; 19; 31; 37; 43; 61; 67; 73; 79; 97; 103; 109; 127; 139; 151; 157; 163; 181]$
$\mathbf{P}_{(\mathbf{a})} = prime\ numbers\ in\ \beta_{(a)}$

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Formula analysis

The formula of prime numbers works with great accuracy, it excludes composite numbers in a scheme of 2 triangles of integrated numbers. So I separate these triangles for a more in-depth analysis.

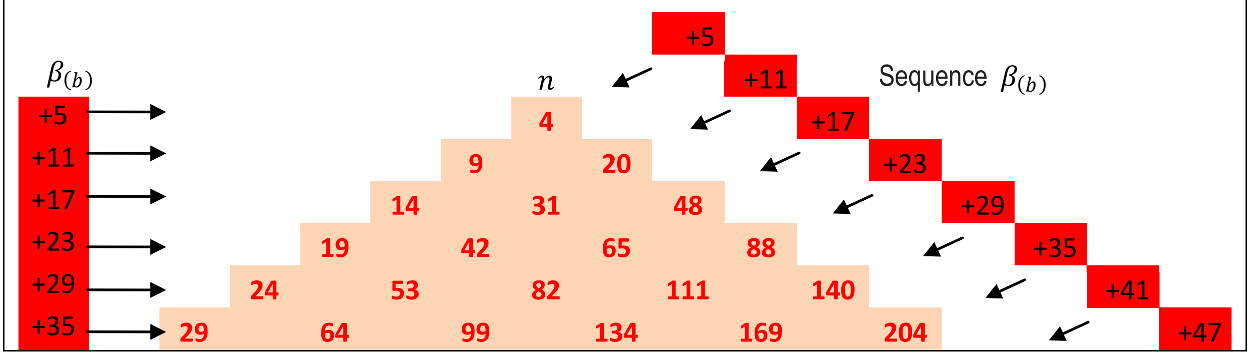
Original	Triangle 1	Triangle 2
$n \neq 4$		
$n \neq 8$	$n \neq 4$	$n \neq 8$
$n \neq 9{,}20$	$n \neq 9{,}20$	$n \neq 15{,}28$
$n \neq 15{,}28$	$n \neq 14{,}31{,}45$	$n \neq 22{,}41{,}60$
$n \neq 14{,}31{,}45$	$n \neq 19{,}42{,}65{,}88$	$n \neq 29{,}54{,}79{,}104$
$n \neq 22{,}41{,}60$	$n \neq 24{,}53{,}82{,}111{,}140$	$n \neq 36{,}67{,}98{,}129{,}160$
$n \neq 19{,}42{,}65{,}88$	$n \neq 29{,}64{,}99{,}134{,}169{,}204$	
$n \neq 29{,}54{,}79{,}104$		
$n \neq 24{,}53{,}82{,}111{,}140$		
$n \neq 36{,}67{,}98{,}129{,}160$		
$n \neq 29{,}64{,}99{,}134{,}169{,}204$		

C) Triangles of values for (n), composite numbers within the sequence $\beta a = 6n + 1$

The triangle is armed with the following formula:

$(\,triangle\ 1), n = \left(\dfrac{\beta_{(b)} * \beta_{(b)} - 1}{6}\right)$	$(\,triangle\ 2), n = \left(\dfrac{\beta_{(a)} * \beta_{(a)} - 1}{6}\right)$

triangle **1** values of n for $\beta a = 6n + 1$



$$(\,triangle\ 1), n = \left(\frac{\beta_{(b)} * \beta_{(b)} - 1}{6}\right)$$

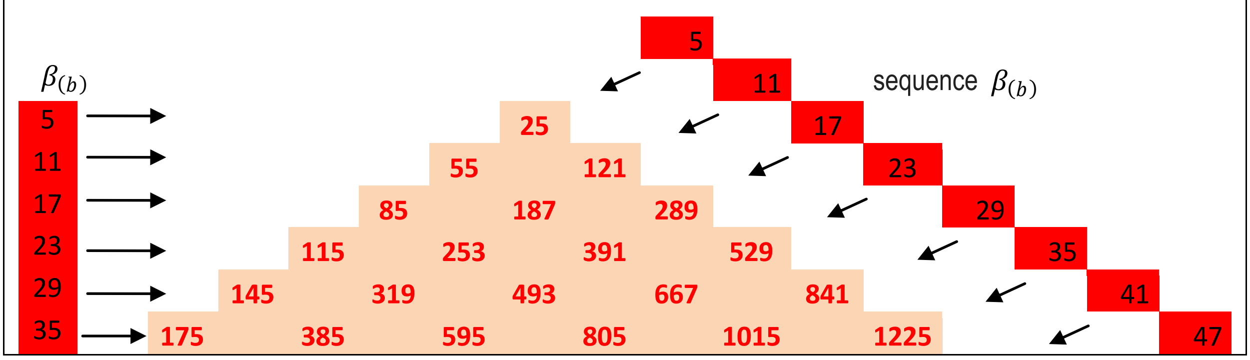
The values of (n) that form diagonals are spaced according to the sequence $\beta_{(b)}$

Example of the first diagonal: 4,9,14,19,24……(n+5)

Values of (n) that are horizontal are spaced according to the sequence $\beta_{(b)}$

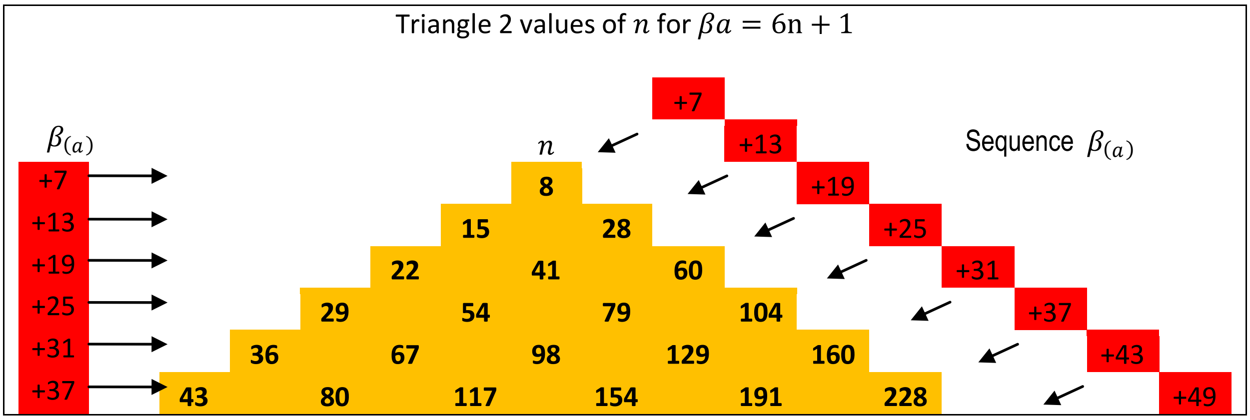
Example of row 4: 19,42,65,88……(n+23)

Triangle 1 of composite numbers



$Nc1 =$ *composite numbers of the triangle* 1

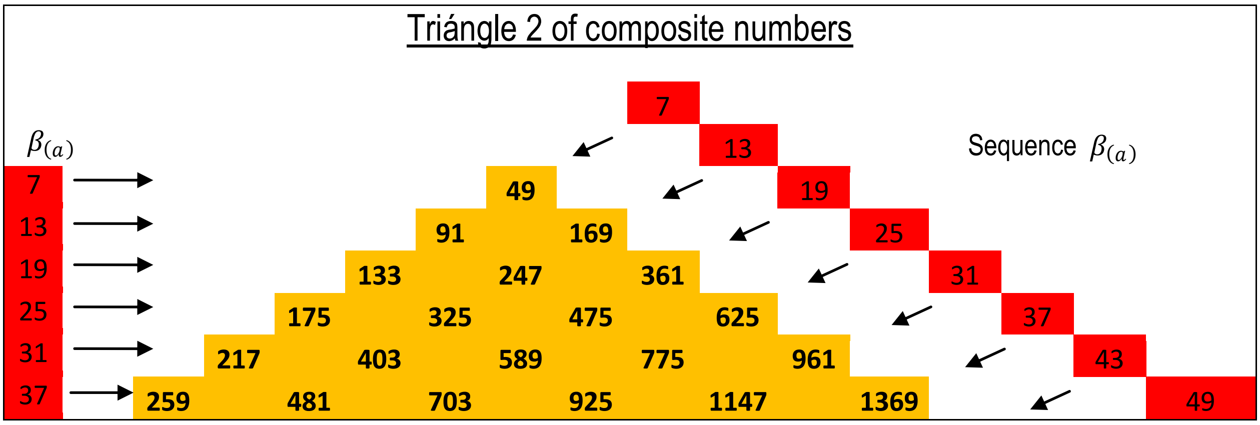
$$\boldsymbol{Nc1 = B_{(b)} * B_{(b)}}$$



$$(\,Triangle\ 2), n = \left(\frac{\beta_{(a)} * \beta_{(a)} - 1}{6}\right)$$

The values of (n) that form diagonals are spaced according to the sequence $\beta_{(a)}$
Example of the first diagonal: 8,15,22,29,36……(n+7)

Values of (n) that are horizontal are spaced according to the sequence $\beta_{(a)}$
Example of row 4: 29,54,79,104……(n+25)



$Nc2 =$ *composite numbers of the triangle* 2

$$\boldsymbol{Nc2 = B_{(a)} * B_{(a)}}$$

Chapter 3

Prime numbers in the sequence $\boldsymbol{\beta_{(b)}}$

A) Demonstration of how to get: $P_{(b)} < x$ / x ∈ ℕ
In this example I will calculate all prime numbers greater than 3 and less than 190.

$P_{(b)}: Prime\ numbers\ in\ \beta_{(b)}$
$x < 190$

We use this simple formula to get a value that will be important for the final formula.

Formula to determine expansión
$x > 7$ $$\boldsymbol{n = \frac{x-1}{6}}$$

$$n = \frac{190-1}{6} = 31{,}5$$

I search in the sequence $\boldsymbol{\beta_{(a)}}$. the next value of natural numbers of 31,5

$$\beta_{(a)} = 6n + 1 = \{7; 13; 19; 25; 31; \mathbf{37}; 43; 49; 55 \ldots\}$$

The value is 37
This result helps us determine to what extent we should expand the formula

B) Formula to obtain the $P > 3$ that are contained in $\beta_{(b)}$

$$P_{(b)} = 6n_{\substack{n \neq \beta_{(b)} + \left(\frac{\beta_{(b)}+1}{6}\right) + \beta_{(b)} * z_{<\left(\frac{\beta_{(b)}+1}{6}\right)} \\ n \neq \beta_{(a)} - \left(\frac{\beta_{(a)}-1}{6}\right) + \beta_{(a)} * z_{<\left(\frac{\beta_{(a)}-1}{6}\right)}}} - 1$$

$P_{(b)}$ = $prime\ numbers\ in\ \beta_{(b)}$
$Z \geq 0$

$$\beta_{(a)} = 6n + 1 = \{7; 13; 19; 25; 31; 37; 43; 49; 55 \ldots\}$$

$$\beta_{(b)} = 6n - 1 = \{5; 11; 17; 23; 29; 35; 41; 47; 53; 59; 65 \ \ldots..\}$$

Formula to obtain prime numbers $P_{(b)} > 3 \wedge < 190$

$$P_{(b)} = 6\mathrm{n}_{\begin{array}{c} n\neq 5+\left(\frac{5+1}{6}\right)+5*z_{<\left(\frac{5+1}{6}\right)} \\ n\neq 7-\left(\frac{7-1}{6}\right)+7*z_{<\left(\frac{7-1}{6}\right)} \\ n\neq 11+\left(\frac{11+1}{6}\right)+11*z_{<\left(\frac{11+1}{6}\right)} \\ n\neq 13-\left(\frac{13-1}{6}\right)+13*z_{<\left(\frac{13-1}{6}\right)} \\ n\neq 17+\left(\frac{17+1}{6}\right)+17*z_{<\left(\frac{17+1}{6}\right)} \\ n\neq 19-\left(\frac{19-1}{6}\right)+19*z_{<\left(\frac{19-1}{6}\right)} \\ n\neq 23+\left(\frac{23+1}{6}\right)+23*z_{<\left(\frac{23+1}{6}\right)} \\ n\neq 25-\left(\frac{25-1}{6}\right)+25*z_{<\left(\frac{25-1}{6}\right)} \\ n\neq 29+\left(\frac{29+1}{6}\right)+29*z_{<\left(\frac{29+1}{6}\right)} \\ n\neq 31-\left(\frac{31-1}{6}\right)+31*z_{<\left(\frac{31-1}{6}\right)} \\ n\neq 35+\left(\frac{35+1}{6}\right)+35*z_{<\left(\frac{35+1}{6}\right)} \\ n\neq 37-\left(\frac{37-1}{6}\right)+37*z_{<\left(\frac{37-1}{6}\right)} \end{array}} - 1$$

We expand up to $\beta_{(a)} = 37$

Therefore solving the operations we obtain:

$$P_{(b)} = 6n_{\begin{array}{c} n\neq 6+5*z_{<1} \\ n\neq 6+7*z_{<1} \\ n\neq 13+11*z_{<2} \\ n\neq 11+13*z_{<2} \\ n\neq 20+17*z_{<3} \\ n\neq 16+19*z_{<3} \\ n\neq 27+23*z_{<4} \\ n\neq 21+25*z_{<4} \\ n\neq 34+29*z_{<5} \\ n\neq 26+31*z_{<5} \\ n\neq 41+35*z_{<6} \\ n\neq 31+37*z_{<6} \end{array}} - 1 = 6n_{\begin{array}{c} n\neq 6 \\ n\neq 6 \\ n\neq 13,24 \\ n\neq 11,24 \\ n\neq 20,37,54 \\ n\neq 16,35,54 \\ n\neq 27,50,73,96 \\ n\neq 21,46,71,96 \\ n\neq 34,63,92,121,150 \\ n\neq 26,57,88,119,150 \\ n\neq 41,76,111,146,181,216 \\ n\neq 31,68,105,142,179,216 \end{array}} - 1$$

We take the values $\mathbb{N}$: $n > 0 \wedge n < 31{,}5$

$$n \neq [6; 11; 13; 16; 20; 21; 24; 26; 27; 31]$$

By replacing these values in 6n - 1; composite numbers $NC < 190$ are formed; for the same reason, these values are not valid to obtain the prime numbers. So we exclude them from the set of Naturals under 31.5.

Using the missing natural numbers in the previous set we obtain:

$\boldsymbol{n}_{(p)} = values\ of\ (n)\ that\ generate\ prime\ numbers$

$\boldsymbol{n}_{(\boldsymbol{p})} = [1; 2; 3; 4; 5; 7; 8; 9; 10; 12; 14; 15\ ; 17; 18; 19; 22; 23; 25; 28; 29; 30]$

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Replacing we obtain the following prime numbers:

$$\mathbf{P}_{(\mathbf{b})<190} = \mathbf{6}\ \boldsymbol{n}_{(\boldsymbol{p})} - \mathbf{1}$$

$P_{(b)<190} = [5; 11; 17; 23; 29; 41; 47; 53; 59; 71; 83; 89; 101; 107; 113; 131; 137; 149; 167; 173; 179]$

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Formula analysis

The prime number formula works with great accuracy; it excludes composite numbers in a 2-triangle integrated number scheme. So I separate these triangles for a more in-depth analysis.

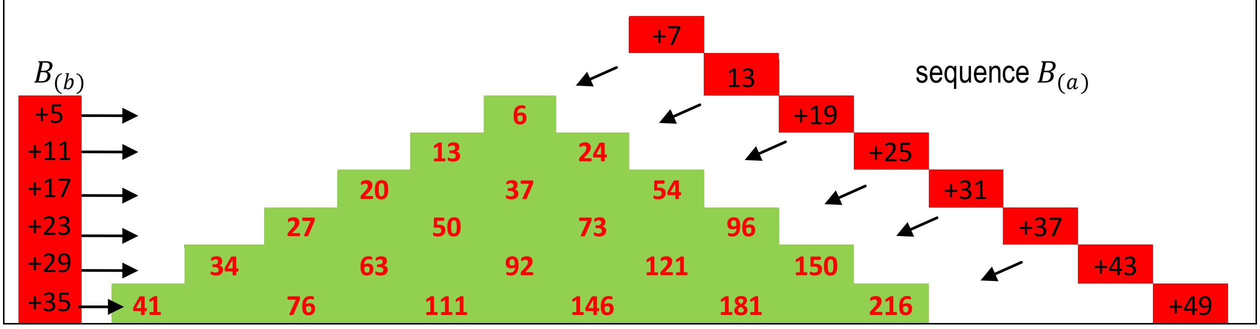
Original	Triangle 3	Triangle 4
$n \neq 6$ $n \neq 6$ $n \neq 13,24$ $n \neq 11,24$ $n \neq 20,37,54$ $n \neq 16,35,54$ $n \neq 27,50,73,96$ $n \neq 21,46,71,96$ $n \neq 34,63,92,121,150$ $n \neq 26,57,88,119,150$ $n \neq 41,76,111,146,181,216$ $n \neq 31,68,105,142,179,216$	$n \neq 6$ $n \neq 13,24$ $n \neq 20,37,54$ $n \neq 27,50,73,96$ $n \neq 34,63,92,121,150$ $n \neq 41,76,111,146,181,216$	$n \neq 6$ $n \neq 11,24$ $n \neq 16,35,54$ $n \neq 21,46,71,96$ $n \neq 26,57,88,119,150$ $n \neq 31,68,105,142,179,216$

C) Triangles of values for (n), composite numbers within the sequence $\beta b = 6\text{n} - 1$

The triangle is armed with the following formulas:

$(Triangle\ 3), n = \left(\frac{\beta_{(b)} * \beta_{(a)} + 1}{6}\right)$	$(Triangle\ 4), n = \left(\frac{\beta_{(a)} * \beta_{(b)} + 1}{6}\right)$

Triangle 3 with the values of n for $\beta b = 6\text{n} - 1$

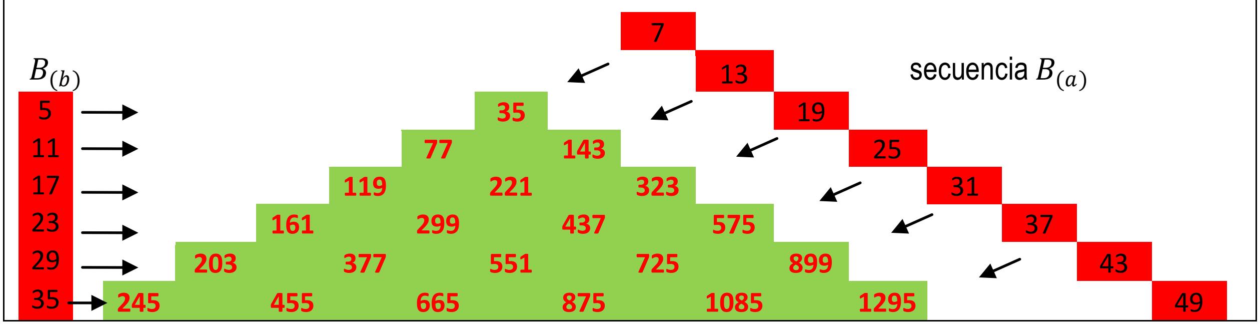


$$(Triangle3), n = \left(\frac{\beta_{(b)} * \beta_{(a)} + 1}{6}\right)$$

The values of (n) that form diagonals are spaced according to the sequence $\beta_{(a)}$
Example of the first diagonal: 6,13,20,27,34……(n+7)

Values of (n) that are horizontal are spaced according to the sequence $\beta_{(a)}$
Example of row 4: 27,50,73,96……(n+23)

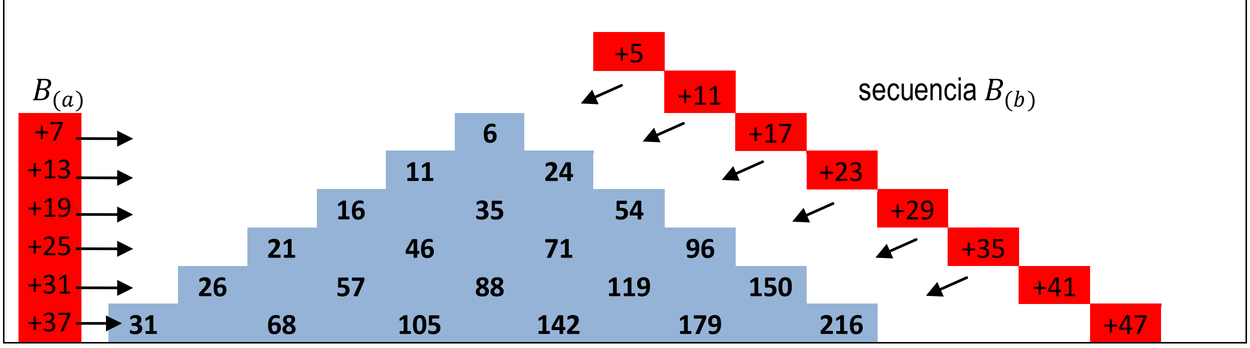
Triangle 3 of composite numbers



$Nc3 =$ *composite numbers of the triangle3*

$$\boldsymbol{Nc3 = B_{(b)} * B_{(a)}}$$

Triangle 4 with the values of n for $\beta b = 6n - 1$

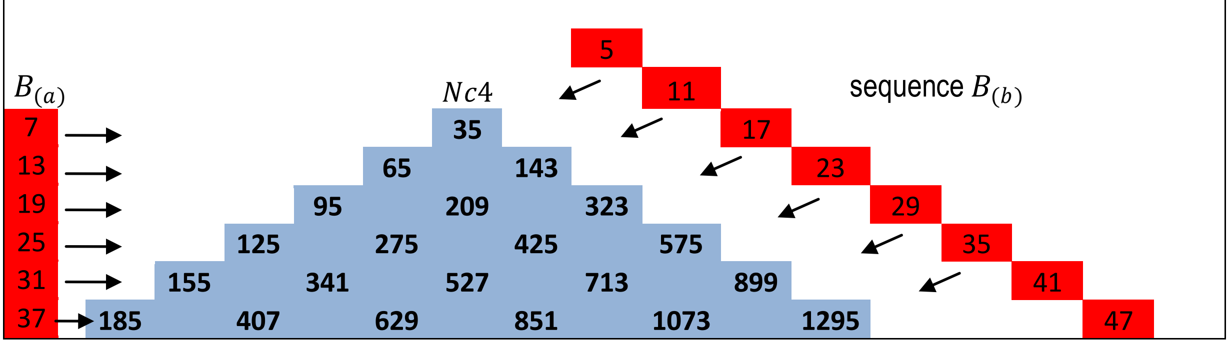


$$(\,Triangle\ 4), n = \left(\frac{\beta_{(a)} * \beta_{(b)} + 1}{6}\right)$$

The values of (n) that form diagonals are spaced according to the sequence $\beta_{(a)}$
Example of the first diagonal: 6,11,16,21,26……(n+5)

Values of (n) that are horizontal are spaced according to the sequence $\beta_{(a)}$
Example of row 4: 21,46,71,96……(n+25)

<u>Triangle 4 of composite numbers</u>



$$Nc4 = \ composite\ numbers\ of\ triangle\ 4$$

$$\boldsymbol{Nc4 = B_{(a)} * B_{(b)}}$$

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<u>The 4 triangles of composite numbers.</u>

These are obtained by forming a binary combination.

Horizontal Location	Diagonal location	Result
$B_{(a)}$	$B_{(a)}$ $B_{(b)}$	$B_{(a)}*B_{(a)}$ $Triangle\ 2$ $B_{(a)}*B_{(b)}$ $Triangle\ 4$
$B_{(b)}$	$B_{(a)}$ $B_{(b)}$	$B_{(b)}*B_{(a)}$ $Triangle\ 3$ $B_{(b)}*B_{(b)}$ $Triangle\ 1$

Chapter 4

Graphic table

The graphs in Table 1 and Table 2 show the behavior of (n) with respect to prime numbers and composite numbers. The side columns of the central column (yellow) mark the position of the multiples of Beta, forming composite numbers for (n).

Red color: Values of (n) that form composite numbers (central column)
Yellow color: Values of (n) that form prime numbers (central column)

Table1 $B_{(a)} = 6n + 1$

7	6	5	4	3	2	1		1	2	3	4	5	6	7
43	37	31	25	19	13	7	N	5	11	17	23	29	35	41
							1							
							2							
							3							
							4							
							5	1						
							6	2						
							7	3						
							8	4						
						1	9	5						
						2	10	1	1					
						3	11	2	2					
						4	12	3	3					
						5	13	4	4					
						6	14	5	5					
						7	15	1	6	1				
					1	1	16	2	7	2				
					2	2	17	3	8	3				
					3	3	18	4	9	4				
					4	4	19	5	10	5				
					5	5	20	1	11	6	1			
					6	6	21	2	1	7	2			
					7	7	22	3	2	8	3			
				1	8	1	23	4	3	9	4			
				2	9	2	24	5	4	10	5			
				3	10	3	25	1	5	11	6	1		
				4	11	4	26	2	6	12	7	2		
				5	12	5	27	3	7	13	8	3		
				6	13	6	28	4	8	14	9	4		
				7	1	7	29	5	9	15	10	5		
			1	8	2	1	30	1	10	16	11	6	1	
			2	9	3	2	31	2	11	17	12	7	2	
			3	10	4	3	32	3	1	1	13	8	3	
			4	11	5	4	33	4	2	2	14	9	4	
			5	12	6	5	34	5	3	3	15	10	5	
			6	13	7	6	35	1	4	4	16	11	6	1
			7	14	8	7	36	2	5	5	17	12	7	2
		1	8	15	9	1	37	3	6	6	18	13	8	3
		2	9	16	10	2	38	4	7	7	19	14	9	4
		3	10	17	11	3	39	5	8	8	20	15	10	5
		4	11	18	12	4	40	1	9	9	21	16	11	6
		5	12	19	13	5	41	2	10	10	22	17	12	7
		6	13	1	1	6	42	3	11	11	23	18	13	8
		7	14	2	2	7	43	4	1	12	1	19	14	9

Table 2 $B_{(b)} = 6n - 1$

7	6	5	4	3	2	1		1	2	3	4	5	6	7
43	37	31	25	19	13	7	N	5	11	17	23	29	35	41
							1							
							2							
							3							
							4							
							5							
							6							
						1	7	1						
						2	8	2						
						3	9	3						
						4	10	4						
						5	11	5						
					1	6	12	1						
					2	7	13	2						
					3	1	14	3	1					
					4	2	15	4	2					
					5	3	16	5	3					
				1	6	4	17	1	4					
				2	7	5	18	2	5					
				3	8	6	19	3	6					
				4	9	7	20	4	7					
				5	10	1	21	5	8	1				
			1	6	11	2	22	1	9	2				
			2	7	12	3	23	2	10	3				
			3	8	13	4	24	3	11	4				
			4	9	1	5	25	4	1	5				
			5	10	2	6	26	5	2	6				
		1	6	11	3	7	27	1	3	7				
		2	7	12	4	1	28	2	4	8	1			
		3	8	13	5	2	29	3	5	9	2			
		4	9	14	6	3	30	4	6	10	3			
		5	10	15	7	4	31	5	7	11	4			
	1	6	11	16	8	5	32	1	8	12	5			
	2	7	12	17	9	6	33	2	9	13	6			
	3	8	13	18	10	7	34	3	10	14	7			
	4	9	14	19	11	1	35	4	11	15	8	1		
	5	10	15	1	12	2	36	5	1	16	9	2		
1	6	11	16	2	13	3	37	1	2	17	10	3		
2	7	12	17	3	1	4	38	2	3	1	11	4		
3	8	13	18	4	2	5	39	3	4	2	12	5		
4	9	14	19	5	3	6	40	4	5	3	13	6		
5	10	15	20	6	4	7	41	5	6	4	14	7		
6	11	16	21	7	5	1	42	1	7	5	15	8	1	
7	12	17	22	8	6	2	43	2	8	6	16	9	2	

Table 3

Red color: Values of (n) that form composite numbers (central column)
Yellow color: Values of (n) that form prime numbers (central column)

$$\beta_{(a)} = 6\text{n} + 1 \qquad \beta_{(b)} = 6\text{n} - 1$$

Prime numbers					
β (a)				β (b)	
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36
37	38	39	40	41	42
43	44	45	46	47	48
49	50	51	52	53	54
55	56	57	58	59	60
61	62	63	64	65	66
67	68	69	70	71	72
73	74	75	76	77	78
79	80	81	82	83	84
85	86	87	88	89	90
91	92	93	94	95	96
97	98	99	100	101	102
103	104	105	106	107	108
109	110	111	112	113	114
115	116	117	118	119	120
121	122	123	124	125	126
127	128	129	130	131	132
133	134	135	136	137	138
139	140	141	142	143	144
145	146	147	148	149	150

Capítulo 5

Fórmula para obtener números primos gemelos.

In mathematics, and more specifically in number theory, two primes are twin primes if, with $q > p, q - p = 2$ is satisfied.

Then two prime numbers are called twins if one of them is equal to the other plus two units. Thus, the prime numbers 5 and 7 form a pair of twin primes. Other examples of twin prime pairs are 11 and 13 or 41 and 43.

There is no formula capable of obtaining these numbers, but thanks to this document I demonstrate for the first time a formula that allows obtaining all twin prime numbers greater than three

This formula is armed with the combination of the two main variables of the prime numbers that we develop in this document. Both formulas are put together to condition (n) and get the correct values for (n).
This formula is not intended to prove the infinity of twin prime numbers, it only shows a way to obtain them.

$Tp = Twin\ prime\ number > 3$

$$(\exists\ n)\ n > 0 \in \mathbb{N} /\ 6n \pm 1 = Tp$$

$$Tp = 6n_{\substack{n \neq \beta_{(b)} \mp \left(\frac{\beta_{(b)}+1}{6}\right) + \beta_{(b)} * Z_{<\left(\frac{\beta_{(b)}+1}{6}\right)} \\ n \neq \beta_{(a)} \mp \left(\frac{\beta_{(a)}-1}{6}\right) + \beta_{(a)} * Z_{\left(\frac{\beta_{(a)}-1}{6}\right)}}} \pm 1$$

$\beta = 6\text{n} \pm 1 = \{5; 7; 11; 13; 17; 19; 23; 25; 29; 31; 35; \ldots \ldots \ldots\}$

$Z \geq 0$

Formula Development

$$Tp = 6n_{\substack{n \neq \beta_{(b)} - \left(\frac{\beta_{(b)}+1}{6}\right) + \beta_{(b)} * Z_{<\left(\frac{\beta_{(b)}+1}{6}\right)} \\ n \neq \beta_{(b)} + \left(\frac{\beta_{(b)}+1}{6}\right) + \beta_{(b)} * Z_{<\left(\frac{\beta_{(b)}+1}{6}\right)} \\ n \neq \beta_{(a)} - \left(\frac{\beta_{(a)}-1}{6}\right) + \beta_{(a)} * Z_{<\left(\frac{\beta_{(a)}-1}{6}\right)} \\ n \neq \beta_{(a)} + \left(\frac{\beta_{(a)}-1}{6}\right) + \beta_{(a)} * Z_{<\left(\frac{\beta_{(a)}-1}{6}\right)}}} \pm 1$$

This formula allows you to exclude composite numbers and non-twin prime numbers.

Chapter 6

Application of the formula.

$Tp = Twin\ prime\ number\ > 3.$

A) Demonstration of Finding Twin Prime Numbers

Example: $Tp < 100\ en\ \beta_{(a,b)}$

Formula $x > 7$ $n = \frac{x-1}{6}$	I replace the number 100 in the value of x $n = \frac{100-1}{6} = 16{,}5$

I search in succession $\beta_{(a)}$ the next natural number a 16,5

$$\beta_{(a)} = \{7; 13; \mathbf{19}; 25; 31; 37 \ldots\ldots\}$$

The value is 19.
This result helps us determine to what extent we should expand the formula

Aplicación de la formula

Reemplazo con el primer valor de $\beta_{(b)}$ dos veces, luego reemplazo con el primer valor de $\beta_{(a)}$ también 2 veces, luego repita el mismo procedimiento con los siguientes valores $\beta_{(b)}$ y $\beta_{(a)}$ tantas veces como sea necesario. En este ejemplo la formula se expande hasta el número 19.

Application of the formula

Replacement with the first value of $\beta_{(b)}$ twice, then replacement with the first value of $\beta_{(a)}$ also 2 times, then repeat the same procedure with the following values $\beta_{(b)}$ and $\beta_{(a)}$ as many times as necessary. In this example the formula expands to the number 19.

With the following example it will be much clearer.

B) Twin prime numbers $Tp > 3 \wedge < 100$

Formula Expansion up to $\beta_{(a)} = 19$ $Z \geq 0$ $\beta_{(a)} = 6n + 1 = \{\mathbf{7}; \mathbf{13}; \mathbf{19}\}$ $\beta_{(b)} = 6n - 1 = \{\mathbf{5}; \mathbf{11}; \mathbf{17}\}$ $Tp = 6n \pm 1$ $n \neq \beta_{(b)} - \left(\frac{\beta_{(b)}+1}{6}\right) + \beta_{(b)} * Z_{<\left(\frac{\beta_{(b)}+1}{6}\right)}$ $n \neq \beta_{(b)} + \left(\frac{\beta_{(b)}+1}{6}\right) + \beta_{(b)} * Z_{<\left(\frac{\beta_{(b)}+1}{6}\right)}$ $n \neq \beta_{(a)} - \left(\frac{\beta_{(a)}-1}{6}\right) + \beta_{(a)} * Z_{<\left(\frac{\beta_{(a)}-1}{6}\right)}$ $n \neq \beta_{(a)} + \left(\frac{\beta_{(a)}-1}{6}\right) + \beta_{(a)} * Z_{<\left(\frac{\beta_{(a)}-1}{6}\right)}$	$Tp = 6n \pm 1$ $n \neq 5 - \left(\frac{5+1}{6}\right) + 5 * z_{<\left(\frac{5+1}{6}\right)}$ $n \neq 5 + \left(\frac{5+1}{6}\right) + 5 * z_{<\left(\frac{5+1}{6}\right)}$ $n \neq 7 - \left(\frac{7-1}{6}\right) + 7 * z_{<\left(\frac{7-1}{6}\right)}$ $n \neq 7 + \left(\frac{7-1}{6}\right) + 7 * z_{<\left(\frac{7-1}{6}\right)}$ $n \neq 11 - \left(\frac{11+1}{6}\right) + 11 * z_{<\left(\frac{11+1}{6}\right)}$ $n \neq 11 + \left(\frac{11+1}{6}\right) + 11 * z_{<\left(\frac{11+1}{6}\right)}$ $n \neq 13 - \left(\frac{13-1}{6}\right) + 13 * z_{<\left(\frac{13-1}{6}\right)}$ $n \neq 13 + \left(\frac{13-1}{6}\right) + 13 * z_{<\left(\frac{13-1}{6}\right)}$ $n \neq 17 - \left(\frac{17+1}{6}\right) + 17 * z_{<\left(\frac{17+1}{6}\right)}$ $n \neq 17 + \left(\frac{17+1}{6}\right) + 17 * z_{<\left(\frac{17+1}{6}\right)}$ $n \neq 19 - \left(\frac{19-1}{6}\right) + 19 * z_{<\left(\frac{19-1}{6}\right)}$ $n \neq 19 + \left(\frac{19-1}{6}\right) + 19 * z_{<\left(\frac{19-1}{6}\right)}$ We expanded the formula to $\beta_{(a)} = 19$

$Tp = 6n \pm 1$ $n \neq 4 + 5 * Z_{<1}$ $n \neq 6 + 5 * Z_{<1}$ $n \neq 6 + 7 * Z_{<1}$ $n \neq 8 + 7 * Z_{<1}$ $n \neq 9 + 11 * Z_{<2}$ $n \neq 13 + 11 * Z_{<2}$ $n \neq 11 + 13 * Z_{<2}$ $n \neq 15 + 13 * Z_{<2}$ $n \neq 14 + 17 * Z_{<3}$ $n \neq 20 + 17 * Z_{<3}$ $n \neq 16 + 19 * Z_{<3}$ $n \neq 22 + 19 * Z_{<3}$	$Tp = 6n \pm 1$ $n \neq 4$ $n \neq 6$ $n \neq 6$ $n \neq 8$ $n \neq 9, 20$ $n \neq 13, 24$ $n \neq 11, 24$ $n \neq 15, 28$ $n \neq 14, 31, 48$ $n \neq 20, 37, 54$ $n \neq 16, 35, 54$ $n \neq 22, 41, 60$

We take the values ℕ: $n > 0 \wedge < 16{,}5$

$$\boldsymbol{n} \neq [\mathbf{4}; \mathbf{6}; \mathbf{8}; \mathbf{9}; \mathbf{11}; \mathbf{13}; \mathbf{14}; \mathbf{15}; \mathbf{16}]$$

Using the natural numbers that are missing in the previous sequence we obtain:

$n_t = values\ of\ (n)\ that\ yield\ twin\ prime\ numbers$

$n_t = [\mathbf{1};\ \mathbf{2};\ \mathbf{3};\ \mathbf{5};\ \mathbf{7};\ \mathbf{10};\ \mathbf{12}]$

A002822 https://oeis.org/

Replacing we finally obtain the twin prime numbers less than 100.

$\boldsymbol{Tp}_{(\boldsymbol{a})}$ =Twin prime numbers in $\beta_{(a)}$ $\boldsymbol{Tp}_{(\boldsymbol{a})} = \mathbf{6}\boldsymbol{n}_{\boldsymbol{t}} + \mathbf{1}$ $n_t = [\mathbf{1};\ \mathbf{2};\ \mathbf{3};\ \mathbf{5};\ \mathbf{7};\ \mathbf{10};\ \mathbf{12}]$ $Tp_{(a)} = [7; 13; 19; 31; 43; 61; 73]$ Reference A006512 https://oeis.org/	$\boldsymbol{Tp}_{(\boldsymbol{b})}$ =Twin prime numbers in $\beta_{(b)}$ $\boldsymbol{Tp}_{(\boldsymbol{b})} = \mathbf{6}\boldsymbol{n}_{\boldsymbol{t}} - \mathbf{1}$ $n_t = [\mathbf{1};\ \mathbf{2};\ \mathbf{3};\ \mathbf{5};\ \mathbf{7};\ \mathbf{10};\ \mathbf{12}]$ $Tp_{(b)} = [5; 11; 17; 29; 41; 59; 71]$ Reference A002822 https://oeis.org/

Twin prime number

We order the results of the previous exercise by forming the pairs of twin primes.
Twin prime number $= Tp > 3 \wedge < 100$

$$Tp = (Tp_{(b)}; Tp_{(a)})$$

$Tp_{(a)}$= Twin prime number in $\beta_{(a)}$ $\quad Tp_{(a)} = [7; 13; 19; 31; 43; 61; 73]$

$Tp_{(b)}$ = Twin prime number in $\beta_{(b)}$ $\quad Tp_{(b)} = [5; 11; 17; 29; 41; 59; 71]$

$$\boldsymbol{Tp} = [\,(\mathbf{5}; \mathbf{7});\ (\mathbf{11}; \mathbf{13});\ (\mathbf{17}; \mathbf{19});\ (\mathbf{29}; \mathbf{31});\ (\mathbf{41}; \mathbf{43});\ (\mathbf{59}; \mathbf{61});\ (\mathbf{71}; \mathbf{73})\,]$$

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E) Graphic table

Twin prime numbers in light blue, prime numbers in yellow, and composite numbers in red.

Table 4

$Tp > 3$					
β(a)				β(b)	
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36
37	38	39	40	41	42
43	44	45	46	47	48
49	50	51	52	53	54
55	56	57	58	59	60
61	62	63	64	65	66
67	68	69	70	71	72
73	74	75	76	77	78
79	80	81	82	83	84
85	86	87	88	89	90
91	92	93	94	95	96
97	98	99	100	101	102
103	104	105	106	107	108
109	110	111	112	113	114
115	116	117	118	119	120
121	122	123	124	125	126
127	128	129	130	131	132
133	134	135	136	137	138
139	140	141	142	143	144
145	146	147	148	149	150

Conclution

- These formulas are amazing, they accurately calculate prime numbers and twin prime numbers.
- The two formulas are fully polarized with respect to each other. This shows that both columns of prime and composite numbers β(a) and β(b) are incredibly connected. These columns are complementary opposites.
- These wonderful formulas generate what has been sought throughout history. For the first time we can find an expression that generates absolutely all prime numbers greater than three, composite numbers, and also all twin primes greater than three.
- These formulas are simple and easy yet extensive and infinite. Understanding the behavior of (n) is equivalent to understanding how prime numbers and composite numbers are distributed.
- The use of triangles is a smarter and more efficient method for finding prime numbers than the Eratosthenes sieve and the Sundaram sieve.

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