Title: New square potentiation algorithm.
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Comments: 7 pages
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Abstract: This document develops and demonstrates the discovery of a new square potentiation algorithm that works absolutely with all the numbers using the formula of the square of a binomial.

1) Binomial Theorem squared

$$(x+y)^2$$

Binomial squared

A binomial squared (sum) is equal to the square of the first term, plus the double product of the first by the second plus the second square. Your result will always be a perfect square trinomial.

$$\mathbf{(x+y)^2 = (x+y)*(x+y) = x^2 + 2\,x\,y + y^2}$$

2) Application of the Binomial to the square

Demonstration

The square of a binomial is always applied to two terms, in this case I try to show that it can be applied to a single term or rather to any number, the method consists in discovering the two terms that form that number. With the following examples and demonstrations it will be very easy to find the solutions.

The ideal is to divide the digits into two groups, the first will be the letter X and the second will be the letter Y.

Example
1845
I can group it in several ways in two terms I can choose any of them to solve the exercise.
184**5**, 18**45**, **1845**

In the cases of numbers of a single digit like the number 9, we add the 0 in front.

09

0 corresponds to **x**
9 corresponds to **y**

In cases where we have decimal numbers, the following happens, the whole number represents the first letter and the decimal part represents the second. But I can group them in different ways too.

47,745

47 corresponds to **x**
745 corresponds to **y**

The number of digits corresponding to the letter Y will be multiplied by two and that will be the value that orders the numbers to be added in columns.
If you have a digit in Y multiply by 100, 10 and 1
If you have two digits in Y multiply by 10.000, 100 and 1.
If you have three digits in Y multiply by 1.000.000, 1.000 and 1.
And so on.

Example nº1

We will use the number 17.
The number 1 is replaced by the letter **x**, the number 7 is replaced by the letter **y**

$$17^2 = 1^2 + 2 * 1 * 7 + 7^2$$
$$17^2 = 1 + 14 + 49$$

Now we add using the following method.

$17^2 = 289$

	1			1***100**=100
	1	4		14***10**=140
+		4	9	49***1**=49
	2	**8**	**9**	Result

The letter Y has only one digit.
We multiply the first term by 100, the second term by 10, and the third term by 1. In all cases when we use the square of a whole number.

Example nº2

We will use the number 35
The number 3 is replaced by the letter **x**, the number 5 is replaced by the letter **y**

$$35^2 = 3^2 + 2 * 3 * 5 + 5^2$$
$$35^2 = 9 + 30 + 25$$

Now we add using the following method.

$35^2 = 1.225$

		9			9*100=900
		3	0		30*10=300
+			2	5	25*1=25
	1	**2**	**2**	**5**	Result

The letter Y has only one digit.
We multiply the first term by 100, the second term by 10, and the third term by 1. In all cases when we use the square of a whole number.

Example nº3

We will use the number 174
The number 17 is replaced by the letter **x**, the number 4 is replaced by the letter **y**

$$174^2 = 17^2 + 2 * 17 * 4 + 4^2$$
$$174^2 = 289 + 136 + 16$$

Now we add using the following method.

$174^2 = 30.276$

	2	8	9			289*100=28.900
		1	3	6		136*10=1.360
+				1	6	16*1=16
	3	**0**	**2**	**7**	**6**	Result

The letter Y has only one digit so we multiply by 100, 10 and 1

Example nº4

We will use the number 1846
The number 184 is replaced by the letter **x**, the number 6 is replaced by the letter **y**

$$1846^2 = 184^2 + 2 * 184 * 6 + 6^2$$
$$1846^2 = 33.856 + 2.208 + 36$$

Now we add using the following method.

$1846^2 = 3.407.716$

	3	3	8	5	6		33856*100=3.385.600
			2	2	0	8	2.208136*10=22.080
+						3	6	36*1=36
	3	**4**	**0**	**7**	**7**	**1**	**6**	Result

The letter Y has only one digit so we multiply by 100, 10 and 1.

Example nº5

We will use the number 1846
The number 18 is replaced by the letter **x**, the number 46 is replaced by the letter **y**

$$1846^2 = 18^2 + 2 * 18 * 46 + 46^2$$
$$1846^2 = 324 + 1.656 + 2.116$$

Now we add using the following method.
$1846^2 = 3.407.716$

	3	2	4					324*10.000	=3.240.000
		1	6	5	6			1.656*100	=165.600
+				2	1	1	6	2.116*1	=2.116
	3	**4**	**0**	**7**	**7**	**1**	**6**	Result	

The letter Y has two digits so we multiply by 10.000, 100 and 1.

3) Binomial application squared to a decimal number

Example nº6

We will use the number 2,8
The number 2 is replaced by the letter **x**, the number 8 is replaced by the letter **y**

$$2{,}8^2 = 2^2 + 2 * 2 * 8 + 8^2$$
$$2{,}8^2 = 4 + 32 + 64$$

Now we add using the following method.
$2{,}8^2 = 7{,}84$

	4			4***100**=400
	3	2		3,2***10**=320
+		6	4	0,64***1**=64
	7,	**8**	**4**	Result

The letter Y has only one digit so we multiply by 100, 10, and 1.
The comma is located at two places, since we have raised a square decimal number, so if there were 2 decimal numbers the comma runs 4 places, if there were 3 decimal numbers, 6 places are run, etc. A ladder is formed on the right side of 1 base step.

Example nº7

We will use the number 4.31
The number 4 is replaced by the letter **x**, the number 31 is replaced by the letter **y**

$$4{,}31^2 = 4^2 + 2 * 4 * 31 + 31^2$$
$$4{,}31^2 = 16 + 248 + 961$$

Now we add using the following method.

$$4{,}31^2 = 18{,}5761$$

By having two decimal numbers we are forced to multiply by 10.000 in the first term, by 100 in the second term and the last term by 1 to achieve the final sum.

	1	6					16*10.000=160.000
		2	4	8			248*100=24.800
+				9	6	1	961*1=961
	1	**8,**	**5**	**7**	**6**	**1**	Result

The letter Y has two digits so we multiply by 10.000, 100 and 1.
The comma is located at 4 places, since we have raised 2 square decimal numbers. A staircase is formed on the right side of two base steps.

Example nº8

We will use the number 124,826
The number 124 is replaced by the letter **x**, the number 826 is replaced by the letter **y**

$$124{,}826^2 = 124^2 + 2 * 124 * 826 + 826^2$$
$$124{,}826^2 = 15.376 + 204.848 + 682.276$$

Now we add using the following method.

$$124{,}826^2 = 15.581{,}530276$$

The letter Y has three digits so we multiply by 1.000.000 in the first term, by 1.000 in the second term and the last term by 1 to achieve the final sum.

	1	5	3	7	6						15.376*__1.000.000__=15.376.000.000
			2	0	4	8	4	8			204848*__1.000__=204.848.000
+						6	8	2	2	7	6	682276*__1__=682.276
	1	**5**	**5**	**8**	**1,**	**5**	**3**	**0**	**2**	**7**	**6**	Result

The comma is located at 6 places, since we have raised 3 square decimal numbers. A ladder is formed on the right side of three base steps.

4) Application of the Binomial squared to a fraction.

Example nº9

We will use the fraction $\frac{24}{13}$

$$\left(\frac{24}{13}\right)^2 = \frac{24^2}{13^2}$$

We will start in the numerator with the number 24, the number 2 is x, the number 4 is y.
Then in the denominator with the number 13, the number 1 is x, the number 3 is y.

$$\left(\frac{24}{13}\right)^2 = \frac{2^2+2*2*4+4^2}{1^2+2*1*3+3^2}$$

$$\left(\frac{24}{13}\right)^2 = \frac{4+16+16}{1+6+9}$$

Now we add using the following method.

$$\left(\frac{24}{13}\right)^2 = \frac{576}{169}$$

		4				1			*100
		1	6				6		*10
+			1	6	+			9	*1
		5	**7**	**6**			**1**	**6**	**9**

The method is very simple and is solved as in the cases of whole numbers.

Conclusion

This new algorithm of square potentiation presents a surprising accuracy, which transforms it into a reliable system or method to perform squared power operations.

This is simply different, it is a novel and interesting alternative.

This method opens the door so we can also use powers to the cube, to the fourth, etc.

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1/04/19

Reference

Zeolla Gabriel Martin, New multiplication algorithm, http://vixra.org/abs/1811.0320
Zeolla Gabriel Martin, Algoritmo de multiplicación distributivo, http://vixra.org/abs/1903.0167
Zeolla Gabriel Martin, New cubic potentiation algorithm, Vixra