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Research Paper

A New Approach of Finding Squares

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ABSTRACT

In this paper, we discuss about a new approach of finding square firstly in Arithmetic form and thereafter write the method (formula) in Algebraic form. The new method is mainly based on two steps, namely steps 1 and steps 2. After adding this step we find the result. This method may be named as two steps method of finding square or squaring of any digit numbers.

Key Words: Two steps method of squaring. Vertical or direct multiplication, Horizontal multiplication, Doubling the partial product using block, omitting block.

INTRODUCTION

This method is also a formal method of finding square. It is a easiest and the shortest method comparing with other formal methods of finding square.

This new method is neither a Vedic method nor the alternative method of finding square. It is fully an independent new method of squaring the numbers.

PROCEDURE

Let us learn what is the new technique applied in this method. We can apply an independent vertical and crosswise technique in case of multiplication of any multi digit numbers but not the Vedic or Trachtenberg's method of multiplication. In this new method, we apply vertical and horizontal (in place of crosswise) multiplication technique firstly in Arithmetic form and thereafter find the formula in Algebraic form.

Now, we discuss how the new techniques are applied. To understand this, we must follow the given instructions for-

Step 1: We multiply vertical digits directly one by other means direct squaring the digits and always write down the two digits number direct result i.e. 0X0= 00 or 2X3=06, on their respective places.

Step 2: We write down the result atleast in two digits after by adding or doubling the various partial products of horizontal multiplication using blocks from left to right and we generally put down '0' zero for last blocks on the extreme right i.e. on ones places. Now, we keep the result of ones place in each block starting from second Last block for tens place and forward the other digit or digits as carry over number and add the carry number with the next partial product (block). Thus we repeat the process as long as necessary. After final calculation, we put down all the digits in their respective places omitting the block symbols.

RESULT

Step 1 + Step 2

Explaining with examples :-

Let us take examples for better understand the method to find the formulae (Formulas).

Example 1:- Find the square of **1** digit number.

Suppose, we want to find square of the number 3, we write and do it in his form.

3^2=3 X 3=09

In algebraic form (if ‘a’ is a digit)

a^2= a X a=(2 digit number)

Example 2:- Find the square of 2 digits number.

Suppose, we want to find square the number 12. We write and do it in this form.

$(12)^2$=$1^2 2^2$+2.1.2/0

= 0104+04/0

= 0104+040

= 0144.

Step 1:- Direct squaring or direct vertical multiplication.

$(12)^2$= 12 X 12 Or

1X 1=1^2 , 2 X 2=2^2

= $1^2 2^2$

Step 2:- Double or add the partial horizontal products and put down ‘0’ Zero on last block.

$(12)^2$= 2.1.2/0

(i) (ii)

In block (i) $(12)^2$=2 X (1X2) Or 1X2 + 1X2

In algebraic form (if a, b are digits of a number)

$(ab)^2$= $a^2 b^2$+ 2ab/0

Example 3:- Find the square of 3 digits number.

Suppose, we want to find square of the number 234, we write and do it in this form.-

$(234)^2$= $2^2 3^2 4^2$ + 2.2.3/2.2.4/2.3.4/0

= $2^2 3^2 4^2$ +12/16/24/0

= 040916 + 13840

= 054756

Step 1:- Direct squaring or direct vertical multiplication.

$(234)^2$= 234X234 Or

2X2=2^2, 3X3=3^2, 4X4= 4^2

= $2^2 3^2 4^2$

Step 2:- Double or add the partial horizontal products and put down ‘0’ Zero on Last block.

$(234)^2$= 2.2.3/2.2.4/2.3.4/0

(i) (ii) (iii) (iv)

In block (i) $(234)^2$= 2X (2X3) Or 2X3+ 2X3

(ii) $(234)^2$= 2X(2X4) Or 2X4+ 2X4

(iii) $(234)^2$= 2X(3X4) Or 3X4+ 3X4

In algebraic form (if a,b,c are digits of a number)

$(abc)^2$= $a^2 b^2 c^2$+2ab/2ac/2bc/0

Example 4:- Find the square of 4 digits number.

Suppose, we want to find square of the 2345, we write and do it in this form-

$(2345)^2$=$2^2 3^2 4^2 5^2$+2.2.3/2.2.4/2.2.5+2.3.4/2.3.5/2.4.5/0

= 04091625+12/16/20+24/30/40/0

= 04091625+12/16/44/30/40/0

= 04091625+1407400

= 05499025

Step 1:- Direct squaring or direct vertical multiplication

$(2345)^2$= 2345 X 2345 Or

2X2=2^2, 3X3=3^2, 4X4=4^2, 5X5=5^2

= $2^2 3^2 4^2 5^2$

Step 2:- Double or add the partial horizontal product and put down ‘0’ Zero on last block.

$(2345)^2$=2.2.3/2.2.4/2.2.5+2.3.4/2.3.5/2.4.5/0

(i) (ii) (iii) (iv) (v) (iv)

In block (i) $(2345)^2$= 2x (2x3)

Or 2x3+2x3

(ii) $(2345)^2$= 2x(2x4) Or 2x4+2x4

(iii) $(2345)^2$= 2x(2x5) + 2x(3x4) Or (2x5 + 2x5) + (3x5 + 3x5)

(iv) $(2345)^2$= 2x(3x5) Or 3x5 + 3x5

(v) $(2345)^2$= 2x (4x5) Or 4x5 +4x5

In algebraic form (if a,b,c,d are digits of a number)

$(abcd)^2$= $a^2 b^2 c^2 d^2$ + 2ab/2ac/2ad + 2bc/2bd/2cd/0

Example 5:- Find the square of 5 digits number.

Suppose, we want to find square of the number 34567.We write and do it in this form.

$(34567)^2$= $3^2 4^2 5^2 6^2 7^2$ + 2.3.4/2.3.5/2.3.6 +2.4.5/2.3.7+2.4.6/2.4.7+2.5.6/2.5.7/2.6.7/0

=0916253649+24/30/36+40/42+48/56+60/70/84/0
= 0916253649 + 278623840
= 1194877489

Step 1:- Direct squaring or direct vertical multiplication.

$(34567)^2$= 34567x34567 Or 3x3=3^2, 4x4=4^2, 5x5=5^2, 6x6=6^2, 7x7= 7^2
= $3^2 4^2 5^2 6^2 7^2$

Step 2:- Double or add the partial horizontal products and put down '0' Zero on last block.

$(34567)^2$=2.3.4/2.3.5/2.3.6+2.4.5/2.3.7+2.4.6/2.4.7+2.5.6/2.5.7/2.6.7/0
(i) (ii) (iii) (iv) (v) (iv) (vii)

In block (i) $(34567)^2$= 2x(3x4)
Or 3x4 + 3x4
(ii) $(34567)^2$= 2x(3x5)
Or 3x5 + 3x5
(iii) $(34567)^2$= 2x(3x6) + 2x(4x5)
Or (3x6+3x6) + (4x5+4x5)
(iv) $(34567)^2$= 2x(3x7) + 2x(4x6)
Or (3x7+3x7) +(4x6+4x6)
(v) $(34567)^2$ = 2x(4x7) + 2x(5x6)
Or (4x7 +4x7) +(5x6 +5x6)
(vi) $(34567)^2$ = 2x(5x7)
Or (5x7)+ (5x7)
(vii) $(34567)^2$= 2x(6x7)
Or ((6x7+6x7)

In algebraic form (if a,b,c,d,e are digits of a number)
$(abcde)^2$=$a^2b^2c^2d^2e^2$+2ab/2ac/2ad+2bc/2ae+2bd/2be+2cd/2ce/2de/0

Example 6:- Find the square of 6 digits number

Suppose, we want to find square of the number 452678. We can do it in this form
$(452678)^2$=$4^2 5^2 2^2 6^2 7^2 8^2$+2.4.5/2.4.2/2.4.6+2.5.2/2.4.7+2.5.6/2.4.8+2.5.7+2.2.6/2.5.8+2.2.7/2.2.8+2.6.7/2.6.8/2.7.8/0
=162504124964+40/16/48+20/56+60/64+70+24/80+28/32+84/96/112/0
= 162504124964+42413006720
= 204917371684

Step 1:- Direct squaring or direct vertical multiplication.

$(452678)^2$= 452678x452678
= $4^2 2^2 5^2 6^2 7^2 8^2$
Or, 4x4=4^2, 5x5= 5^2, 2x2=2^2, 6x6=6^2 ,7x7=7^2, 8x8=8^2

Step 2:- Double or add the horizontal products and put down '0' Zero on last block.

$(452678)^2$=
2.4.5/2.4.2/2.4.6+2.5.2/2.4.7+2.5.6/2.4.8+2.5.7+2.2.6/2.5.8+2.2.7/
2.2.8+2.6.7/2.6.8/2.7.8/0

In block (i) $(452678)^2$= 2x(4x5)
Or (4x5+4x5)
(ii) $(452678)^2$ = 2x(4x2)
Or (4x2+4x2)
(iii) $(452678)^2$ =2x(4x6)+2(5x2)
Or (4x6+4x6) +(5x2+5x2)
(iv) $(452678)^2$ = 2x(4x7)+2x(5x6)
Or (4x7+4x7)+(5x6+5x6)
(v) $(452678)^2$ = 2x(4x8)+2(5x7)+2(2.6) Or (4x8+4x8)+(5x7+5x7) +(2x6+2x6)
(vi) $(452678)^2$ = 2x(5x8)+2(2x7)
Or (5x8+5x8)+(2x6+2x6)
(vii) $(452678)^2$= 2x(2x8)+2(6x7)
Or (2.x8+2x8)+(6x7+6x7)
(viii) $(452678)^2$= 2x(6x8)
Or (6x8+6x8)
(ix) $(452678)^2$= 2x(7x8)
Or (7x8 + 7x8)

In algebraic form (if a,b,c,d,e,f are digits of a number)
$(abcdef)^2$=$a^2b^2c^2d^2e^2f^2$+2ab/2ac/2ad+2bc/2ae+2bd/2af+2be+2cd/2bf+2ce/2ef+2de/2df/2ef/0

CONCLUSION

It is clear to us from the above examples of finding square that if we write 1 digit x 1 digits=2 digits without neglecting '0' Zero before the result or product in case of any multiplication then we find the sum of the digits of multiplier and multiplicand are equal to the total digits of the product. We find the new method in the following algebraic form-

(i) a^2= a X a=(2 digit number)
(ii) $(ab)^2$= a^2b^2+2ab/0
(iii) $(abc)^2$=$a^2b^2c^2$+2ab/2ac/2bc/0
(iv)$(abcd)^2$=$a^2b^2c^2d^2$+2ab/2ac/2ad+2bc/2bd/2ad/0

(v)$(abcde)^2=a^2b^2c^2d^2e^2$+2ab/2ac/2ad+2bc/2ae+2bd/2be+2cd/2ce/2de/0
(vi)$(abcdef)^2=a^2b^2c^2d^2e^2f^2$+2ab/2ac/2ad+2bc/2ae+2bd/2af+2be+2cd/2bf+2ce/2cf+2de/2df/2ef/0
And so on.

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