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Research Paper

A New Concept of Finding Cubes and Also Higher Power on Two Digit Numbers

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ABSTRACT

In this article, we learn about a new concept of finding cubes and also higher power on two digit numbers. We firstly find the formulas in Algebraic form and thereafter, we apply these formulas to find our result. The new formulas are mainly based on two steps, namely, step1 and step2. And after adding this two steps we find the result. Therefore, these formulas are also be named as two step method.

Key words: - Two step method, Algebraic formulas, finding cubes and higher power, block symbol, omitting block symbol.

INTRODUCTION

We are generally familiar with the general algebraic formulas .The new formulas are also similar in respect of the terms of the general formulas but application of these terms are differ from the earlier . The new formulas are unique one. In new algebraic formulas, we apply unknown symbolic digit only as a digit of a number.

Procedure:-

Let us learn how we find the new formulas - the new formulas are mainly the multiplication of symbolic multi digit by symbolic same digits number. We apply a unique vertical and cross wise technique of multiplication. The product or result of vertical multiplication is step 1 and the product or result of crosswise multiplication is always step 2.

To find our new formulas, we multiply the formulas of preceding power by the same symbolic same digit number i.e. to find formula of cubes, we multiply the formulas of squares and to find 4^{th} power, we multiply the formula of cube and thus, we find the higher power or the n^{th} power formulas on two digit numbers.

Here, we discuss how we find our two steps – To understand this; we must follow the given instructions for-

Step 1:-

We multiply vertically the digits of step 1 of the formulas of preceding power by the symbolic same digits and write down our result directly in their respective places viz. a^2b^2 x ab = a^3b^3 or a^3b^3 x ab =a^4b^4 or $a^2b^2c^2$xabc = $a^3b^3c^3$ and so on.

[Note:- Step 2 of this part is to be added with the result of step 2].

Step 2:-

We apply digit wise multiplication with the term of the result of step 2 of the formulas of the preceding power by the symbolic same digits .We write the products using block symbol and add them respecting their place value. We also add the terms of the result of step 2 which is obtained by cross multiplication after finding above step 1 with our present result of step 2 keeping their exact place value. We generally put ‘0’ zero on last block just to align our digit of step 1 and step 2.

RESULT

Step 1 and Step 2.

Now, we find our various formulas of two digits numbers – If a, b are the digit of a number, then -

We know ,

$(ab)^2 = ab \text{ x } ab$

$= a^2b^2 + 2.a.b/0$ (putted '0')

Applying the above formula, we find

$(ab)^3 = (ab)^2 \text{ x } ab$

$=(a^2b^2 + 2.a.b) \text{ x } ab$

$=(a^2b^2 \text{ x } ab) + (2.a.b \text{ x } ab)$

$= a^3b^3 + (a^2.b/a.b^2+2.a^2.b/2.a.b^2)$

$= a^3b^3 + 3.a^2.b/3.a.b^2/0$

(Putted '0')

Applying the above formula, we find

$(ab)^4 = (ab)^3 \text{ x } ab$

$=(a^3b^3 + 3.a^2.b/3.ab^2) \text{ x } ab$

$=(a^3b^3 \text{ x } ab) + (3.a^2.b/3.a.b^2 \text{ x } ab)$

$= a^4b^4 + (a^3.b/a.b^3+3.a^3.b/6.a^2.b^2/3ab^3)$

$=a^4b^4+4.a^3.b/6.a^2.b^2/4.a.b^3/0$

(Putted '0')

Applying the above formula, we find

$(ab)^5 = (ab)^4 \text{ x } ab$

$= (a^4 b^4+4.a^3.b/6.a^2.b2/4.a.b^3) \text{ x } ab$

$=(a^4b^4 \text{ x } ab) + (4.a^3.b/6.a^2b^2/4.a.b^3 \text{ x } ab)$

$=a^5b^5+(a^4b/a.b^4+4.a^4.b/10.a^3.b^2/10.a^2.b^3/4.a.b^4)$

$=a^5b^5+5.a^4.b/10.a^3.b^2/10.a^2.b^3/5.a.b^4/0$

(Putted '0')

Applying the above formula, we find

$(ab)^6 = (ab)^5 \text{ x } ab$

$=(a^5b^5+5.a^4.b/10.a^3.b^2/10.a^2.b^3/5.a.b^4) \text{ x } ab$

$=(a^5b^5 \text{ X } ab) +(5.a^4.b/10.a^3.b^2/10.a^2.b^3/5.a.b^4) \text{ x } ab$

$=a^6b^6+(a^5.b/a.b^5+5.a^5.b/15.a^4.b^2/20.a^3.b^3/15.a^2.b^4/5.a.b^5)$

$=a^6b^6+6.a^5.b/15.a^4.b^2/20.a^3.b^3/15.a^2.b^4/6.a.b^5/0$ (Putted '0')

And thus we find the formulas of the following :–

$(ab)^7 = a^7b^7+7.a^6.b/21.a^5b^2/35.a^4.b^3/35.a^3.b^4/21.a^2.b^5/7.a.b^6/0$ (Putted '0')

$(ab)^n = a^nb^n+na^{n-1}.b/\frac{\underline{n(n-1)}}{2}.a^{n-2}.b^2/\frac{\underline{n(n-1)(n-2)}}{3.2}.a^{n-3}.b^3/....../n.a.b^{n-1}/0$ (Putted '0')

Where, $n \neq 0$

Here, we find the formula of the cube of 3 digit number – If a,b,c are the digit of a number, then

We know,

$(abc)^2 = a^2b^2c^2+2.a.b/2.a.c/2.b.c/0$ (Putted '0')

Applying the above formula, we find

$(abc)^3 = (abc)^2 \text{ x } abc$

$= (a^2b^2c^2 + 2.a.b/2.a.c/2.b.c) \text{ x } abc$

$= (a^2b^2c^2 \text{x } abc)+(2.a.b/2.a.c/2.b.c)\text{x } abc$

$=a^3b^3c^3+\{(a^2.b/a^2.c+ab^2/b^2.c+a.c^2/b.c^2)+(2.a^2.b/2.a^2.c+ 2ab^2/6abc/2b^2c+2ac^2/2bc^2)\}$

$= a^3b^3c^3+3ab^2/3ab^2+3a^2c/6abc/3ac^2+3b^2c/3bc^2/0$ (Putted '0')

We find the formula of the cube of a 4digit number – If a,b,c,d are the digit of a number, then we know,

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

Applying the above formula, we find

$(abcd)^3 = (a^2b^2c^2d^2+2ab/2ac/2ad+2bc/2bd/2cd) \text{ x } abcd$
$= (a^2b^2c^2d^2 \text{ x } abcd) + (2ab/2ac/2ad+2bc/2bd/2cd) \text{ x } abcd$
$= (a^3b^3c^3d^3+a^2b/ab^2+a^2c/a^2d/ac^2+b^2c/bc^2+b^2d/ad^2/bd^2+c^2d/cd^2)+2a^2b/2a^2c+2ab^2/$
$2a^2d+6abc/2ac^2+2b^2c+6abd/2bc^2+2b^2d+6acd/2ad^2+6bcd/2bd^2+2c^2d/2cd^2$
$=a^3b^3c^3d^3+3a^2b/3ab^2+3a^2c/3a^2d+6abc/3ac^2+3b^2c+6abd/3bc^2+3b^2d+6acd/3ad^2+$
$6bcd/3bd^2+3c^2d/3cd^2/0$ (Putted '0')

Application of the formulas - When we apply the new formulas, we must remember that always write down the digits according to our formulas and must follow the instructions for –

Step 1:-

We must obey the rule 1 digit x 1 digit = 2 digits and 2 digits x 1 digit = 3 digits and so on . In case of finding cube , we must write a^3=3 digit number and b^3= 3 digit number, c^3=3 digit number, d^3=3 digit number i.e. 2^3=008, 3^3=027 or 0^3=000. In case of finding fourth power of a number, we must write a^4=4 digit number ,b^4=4 digit number i.e.0^4=0000, 1^4=0001 or 3^4=0081 and so on ,in their respective places.

Step 2:-

We generally write the products in each block at least as per power of the formula i.e. in case of cube, it is at least 3 digits number and in fourth power it is at least 4 digit number and so on. After final calculation (multiplication) of each block, we should keep only one digit of one's place in each block starting from 2nd right most (tens place) block and other digit or digits forward as carry over number. We add the carry over number with the product of next block and keep the ones place forwarding the carry over number. Thus, we repeat the process as long as necessary. Thereafter final calculation, we put down all the digits in their respective places omitting block symbol and find the answer.

Explaining with examples – It will be better to study our new formulas with the help of examples.

Example 1:- We want to find cube of the number 57.

We know the formula,

$(ab)^3=a^3b^3+3.a^2.b/3.a.b^2/0$

Using this formula, we find, where a=5, b=7.

$(57)^3 \quad =5^37^3+3.5^2.7+3.5.7^2/0$
$=125343+3.25.7/3.5.49/0$
$=125343+527/735/0$
$=125343+59850$
$=185193.$

Example 2 :- We want to find cube of the number 70.

We know the formula,

$(ab)^3=a^3b^3+3.a^2.b/3.a.b^2/0$

Using this formula, we find, where a=7, b=0

$(70)^3 \quad =7^30^3+3.7^2.0/3.7.0^2/0$
$=343000+3.49.0/3.7.00/0$
$=343000+0/0/0$
$=343000+0$
$=343000$

Example 3 :- We want to find 4th power of the number 23.

We know,

$(ab)^4 = a^4b^4+4.a^3.b/6.a^2.b^2/4.a.b^3/0$ (putted '0' Zero)

Using this formula, we find where a=2, b=3

$(23)^4 \quad =2^43^4+4.2^3.3/6.2^2.3^2/4.2.3^3/0$
$=00160081+4.008.3/6.04.09/4.2.027/0$
$=00160081+0096/0216/0216/0$
$=00160081+119760$
$=00279841.$

Example 4 :- We want to find 5th power of the number 76.

We know,

$(ab)^5=a^5b^5+5.a^4.b/10.a^3.b^2/10.a^2.b^3/5.a.b^4/0$

Using this formula, we find where a=7,b=6.

$(76)^5 \quad = 7^56^5+5.7^4.6/10.7^3.6^2/10.7^2.6^3/5.7.6^4/0$
$= 1680707776+5.2401.6/10.343.36/10.49.216/5.7.1296/0$
$= 1680707776+72030/123480/105840/45360/0$

= 1680707776+854817600

= 2535525376.

Example 5:- We want to find the cube of the 3digit number 234.

We know :-

$(abc)^3 = a^3b^3c^3+3.a^2.b/3.ab^2+3.a^2c/6.abc/3.ac^2+3.b^2c/3.bc^2/0$

Using this formula, We find, Where a = 2, b = 3, c = 4

$(234)^3 = 2^33^34^3+3.2^2.3/3.2.3^2+3.2^2.4/6.2.3.4/3.2.4^2+3.3^2.4/3.3.4^2/0$

= 008027064+3.04.3/3.2.09+3.04.4/144/3.2.16+3.09.4/3.3.16/0

= 008027064+036/102/144/204/144/0

= 008027064+04785840

= 012812904

Example 6:- We want to find the cube of the 4 digit number 2345.

We know:-

$(abcd)^3=a^3b^3c^3d^3+3.a^2b/3.a.b^2+3.a^2c/3.a^2d+6.abc/3.ac^2+3.b^2c+6abd/3bc^2+3.b^2d+6.acd/3.ad^2+6.bcd/3.bd^2+3.c^2d/3.cd^2/0$

Using this formula, We find, Where a = 2, b = 3, c = 4, d = 5

$(2345)^3 = 2^33^34^35^3+3.2^2.3/3.2.3^2+3.2^24/3.2^2.5+6.2.3.4/3.2.4^2+3.3^2.4+6.2.3.5/3.3.4^2+3.3^2.5+6.2.4.5/3.2.5^2+6.3.4.5/3.3.5^2+3.4^2.5/3.4.5^2/0$

= 008027064125+3.04.3/3.2.09+3.04.4/3.04.5+6.2.3.5/3.2.16+3.09.4+6.2.3.5 /3.3.16+3.09.5+6.2.4.5/3.2.25+6.3.4.5/3.3.25+3.16.5/3.4.25/0

= 008027064125+036/054+048/060+144/096+108+180/ 144+135+240/150+360/225+240/300/0

= 008027064125+036/102/204/384/519/510/465/300/0

= 008027064125+04868149500

= 012895213625

CONCLUSION

From the above study, it clearly tells us that in case of multiplication, we find the sum of the digits of multiplier and multiplicand is equal to the total digits of the product. The new formulas will be very useful for the students, teachers in the field of multiplication.

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