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Derivation of new formulae to make calculation part easier

Vikas Saini[1],Bhupendra Chouhan[2],Manish Kumar Pandey[3],Yogesh Kumar[4]

[1,3,4] Department of E &T Shri Shankaracharya Group of Institution,Bhilai, Chhattisgrath, India
[2] Department of Mechanical Shri Shankaracharya Institution of technology & management, Bhilai, Chhattisgrath, India.

Abstract - *Mathematics is backbone of Science and technology. It is all about derivation of formulae and with the help of those formulae to create many sub formulae and to make calculation part easy. In this paper, multiplication of three 2 digit numbers in a single line by using just 4 steps, and to find the approximate value of (1/n) power of any particular number. Multiplication of three two 2 numbers is all about algorithm. Whereas to find the value of (1/n) is nothing but using application of differential formula in calculus.*

Key Words: Multiplication, Addition, Operation,Carry, Differential Application, power.

1. INTRODUCTION

In [2] multiplication of Three two digit number can be done in a single line with rapid approach. This is just a 4 step formula. Formula can be remembered so easily and calculation can be done within few seconds. In [3] with the help of formula of differential application approximate value of any number's power of(1/n) can be find so easily.

2. To Multiplication of 3 to 2 Digit in single line.

Formula :-

$$\begin{array}{cc} & A \quad B \\ & C \quad D \\ x & E \quad F \end{array}$$

= A.C.E / (A.D + B.C).E+ A.C.F /(A.D + B.C).F+ B.D.E / B.D.F.

This operation has to be done from right to left side.

Step 1 :- Multiplication of B, D and F.
Step 2 :- (a) multiplication of B,D,E.
(b) Multiplication of A,D and B,C
(c) Addition of both (A.D) + (B.C)
(d) Operation (c) will be multiplied with F.
(e) Addition of operation (a) and (d)
Step 3 :- (f) multiplication of A,C,F
(g) Operation (c) will be multiplied with E
(h) Addition of operation (g) and (f)
Step 4 :- Multiplication of A,C,E.
Remark :- All carry will be added in further step by step.

Example- (A)

$$\begin{array}{cc} & 1 \quad 6 \\ & 2 \quad 7 \\ x & 3 \quad 2. \\ = & 13824. \end{array}$$

Here -

A= 1, B = 6.
C= 2, D = 7.
E = 3, F= 2.

Step 1 :- Multiplication of B, D and F.
6 x 7 x 2 = 84.
Placed – 4, Carry – 8.

Step 2 :- (a) multiplication of B,D,E
6 x 7 x 3 = 126.
(b) Multiplication of A,D and B,C
A x D = 1 x 7= 7.
B x C = 2 x 6 = 12.
(c) Addition of 7 + 12 = 19.
(d) Operation (c) will be multiplied with F
19 x 2 = 38.
(e) Addition of 126 + 38 = 164.
Carry = 8.
Total = 164 + 8 = 172.
Placed :- 2, Carry :- 17

Step 3 :- (f) multiplication of A,C,F
1 x 2 x 2 = 4.
(g) 19 x 3 = 57.
(h) Addition of 57 + 4 = 61.
Carry was 17.
Total – 61 + 17 = 78.
Placed – 8, Carry – 7.

Step 4:- Multiplication of A,C,E.
1 x 2 x 3 = 6.
Carry is 7.
Total – 6 + 7 = 13.

In nutshell,

Step 1 – placed 4, Carry – 8.

Step 2 – placed 2, carry – 17.

Step 3 – 8, Carry – 7.

Step 4 - 13

Answer – 13824.

Example- (B)

8 7

1 4

x 5 3

= 64554

Here-

A = 8, B = 7

C= 1, D= 4

E = 5, F= 3

Step 1:-Multiplication of B, D and F.

7 x 4 x 3 = 84.

Placed – 4, Carry – 8

Step 2 :-(a)Multiplication of B,D,E.

7 x 4 x 5 = 140.

(b)Multiplication of A, D and B,C

A x D = 8 x 4 = 32.

B x C = 7 x 1 = 7.

(c) Addition of both 32 + 7 = 39.

(d) 39 will be multiplied with 3

39 x 3 = 117.

(e) Addition of 117 + 140 = 257.

Carry – 8.

Total – 257 + 8 = 265.

Placed – 5, Carry – 26.

Step 3 :-(f) Multiplication of A, C, F

8 x 1 x 3 = 24.

(g) 39 will be multiplied with 5.

39 x 5 = 195.

(h) Addition of 24 + 195 = 219.

Carry – 26.

Total – 219 + 26 = 245.

Placed – 5, Carry – 24.

Step 4 :-Multiplication of A,C,E.

8 x 1 x 5 = 40.

Total – 40 + 24 = 64.

Answer :- 64554.

3. Find the Approximate value of any number's power of (1/n)

Application of Differentiation formula :-

let suppose-

$f(x) = x^2$.

$F(x+h) = (x+h)^2$.

f' (x) = lim h tense to 0.

$f'(x) = [f(x+h) - f(x)] / h$.

$= [(x+h)^2 - x^2] / h$.

$= (x^2 + h^2 + 2hx - x^2) / h$

$= h^2 + 2hx / h$

= h + 2x (h tense to zero.)

= 2x.

As same as if $f(x) = x^n$

$f'(x) = n.x^{(n-1)}$.

Formula:- (A) $X^{(1/n)} = (x-k)^{1/n} + [k/\{n.(x-k)^{(n-1)/n}\}]$

Here the main point is the value of k must not be greater than x-k.
x - k is the value which can be written as form of any power of a number.

Example- (a) $54^{1/5}$ = ?

Here 54 lies between 2^5=32 and 3^5=243.

So,

x =54

X - k=32

k=22

n=5

$x^{1/n}$ = $(x-k)^{1/n} + [k/\{n.(x-k)^{n-1/n}\}]$

$54^{1/5} = 32^{1/5} + [22/5.(32)^{4/5}$

$= 2 + [22/5.16]$

$=2+(22/80)$

$=2+0.275$

$=2.275$

Hence - $54^{1/5}$ = 2.275

Example- (b) $83^{1/2}$=?

Here 83 lies between 9^2=81 and 10^2=100.

So,

x=83

X - k=81

k=2

n=2

$83^{1/2} = 81^{1/2} + [2/2.(81)^{1/2}]$

$=9 + 1/9$

$=9+0.111$

$=9.111$

Hence -$83^{1/2}$ = 9.111

Example- (c) $270^{1/4}$=?

Here 270 lies between 4^4=256 and 5^4=625.

So,

x =270

X – k =256

k=14

n=4

$270^{(1/4)} = 256^{1/4} + 14/4.(256)^{3/4}$

$= 4 + [14/4.64]$

$= 4 + (7/128)$

$=4 + 0.054$

Hence - $270^{1/4} = 4.0547$

Formula:- (B) $X^{1/n} = (x+k)^{1/n} -[k/n.(x+k)^{(n-1)/n}]$

Example- (a) $60^{1/3}$=?

Here 60 lies between 3^3=27 and 4^3=64.

So,

x =60

x+k =64

k=4

n=3

$60^{1/3} = (64)^{1/3} – [4/3.(64)^{2/3}]$

$= (64)^{1/3} –[4/3.16]$

$= 3.916$

Hence – $60^{1/3} = 3.916$

Example- (b) $1000^{1/10}$=?

Here 1000 lies between 1^{10}=1 and 2^{10}=1024.

So,

x=1000

x + k=1024

k=24

n=10

$1000^{1/10} = 1024^{1/10} – [24/10.(1024)^{9/10}]$

$= 2 – 0.005$

$= 1.995$

Hence - $1000^{1/10} = 1.995$.

REFERENCE :-

[1] Dickson.L.E., “History of the Theory of Numbers”, Chelsea Publishing Company, New York, Vol II, 1952.

[2] M.A. Gopalan and S. Vidyalakshmi, “Integral solutions of x2+y2 =w2+Dz2”, Advances in Theoretical and Applied Mathematics, Vol.l, No.2,pp.115-118(2006).

[3] Vedic Mathematics, Swami Bharti Krishan Tirth Ji Maharaj.

BIOGRAPHIES

Vikas Saini received his BE degree in Electronics & Telecommunication from CSVTU Bhilai in the year 2017,Maths Enthusiast author at MBAtious, Quant-99.02%ile in CAT17,99.60%ile in Elitmus.

Bhupendra chouhan received his BE (Hons) degree in Mechanical Engineering from CSVTU Bhilai in the year 2017.

Manish Kumar Pandey received his BE degree in Electronics & Telecommunication from CSVTU Bhilai in the year 2017, Political Expert, and fond of mathematics.

Yogesh Kumar received his BE degree in electronics & Telecommunication from CSVTU Bhilai in the year 2017,science Enthusiast, published paper presentation in PRSU.