Calculate Square Root of Any Two Natural Numbers at a Same Time Using a Single Binomial Expansion

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Abstract: This short mathematical note describe an appropriate mathematical process for finding square root of any positive natural number using binomial expansion. This paper will be meaningful to those with a background in binomial theorem.

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1. Introduction

In this note I do not refer to any article over on the calculation and laws of binomial theorem. A polynomial with two terms is called a binomial. Bi1nomial theorem tells us that the expanded expression of the form

(a-b)n is
$^{n}C_{0}xa^{n-0}xb^{0-}$
$^{n}C_{1}xa^{n-1}xb^{1+n}C_{2}xa^{n-2}xb^{2-}$
$^{-n}C_{n}xa^{n-n}xb^{n}$

So we can say the formula is

$(a+b)^{n}=n_{x=0}\ \Sigma^{n}C_{x}\ a^{n-x}b^{x}$

2. Mathematical Note

Considering n=O.5 and x= 0, 0.1, 0.2, 0.3, 0.4, 0.5 we can calculate (1-2)½ in this way -

$(1-2)^{0.5}=(^{0.5}C_{0}x1^{0.5}x2^{0})-$
$(^{0.5}C_{0.5}x1^{0.4}x2^{0.1})+$
$(^{0.5}C_{0.2}x1^{0.3}x2^{0.2})-^{0.5}C_{0.3}x1^{0.2}x20.3)+$
$(^{0.5}C_{0.4}x1^{0.1}x2^{0.4})-(^{0.5}C_{0.5}x1^{0}x2^{0.5})$
$= 1-\{(2^{0.1}x0.5!)\%(0.1!0.4!)\}+$
$\{(2^{0.2}x0.5!)\%(0.2!\ 0.3!)\}-\{(2^{0.3}x0.5!)\%(0.3!0.2!)\}+$
$\{(2^{0.4}x0.5!)\%(0.4!0.1!)\}-2^{0.5}$
$=1-\{(2^{0.1}x0.5x0.4!)\%(0.1x0!x0.4!)\}+$
$\{(2^{0.2}x0.5x0.4x03!)\%(0.2x0.1x0!x0.3!)\}-(2^{0.3}x10)+(2^{0.4}x5)-$
$2^{0.5}$
$= 1-(5x2^{0.1})+(10x2^{0.2})-(10x2^{0.3})+(5x2^{0.4})-2^{0.5}$
= 0 ……………………… (1)

In this same way,

$(7-2)^{0.5} = 7^{0.5}-(5x7^{0.4}x2^{0.1})$
$+(10x7^{0.3}x2^{0.2})-(10x7^{0.2}x2^{0.3})$
$+(5x7^{0.1}x2^{0.4})-2^{0.5}$
= 0

So we get,

(a-b) ½ = 0, where a and b can be any natural number (2)

From (1) adding the first five terms we get –

$1-5x2^{0.1}+10x2^{0.2}-10x2^{0.3}+5x2^{0.4} = 1.414$

which is equal to √2 ………………….. (3)

And adding the last five terms, we get

(-5x20.1+10x0.2-10x20.3+5x20.4-20.5)=(-1) … (4)

From (3) we can say

b½= expansion till fifth term of (a-b)½ ,where a and b are any natural numbers.

From (4) we can say

a½= mod of expansion from second to last term of (a-b)½ ,where a and b are any natural numbers.

3. Conclusion

Without using non terminating binomial series we can also calculate root of any natural number in this way. Even we can find root of two different natural numbers with a single binomial expansion.

4. Acknowledgments

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Reference

[1] Ganit - Chhaya 11 by Sourendranath Dey.