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EXPANSION OF POSITIVE INTEGER OR EXACT DECIMAL NUMBER UP TO INFINITY

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ABSTRACT

In this paper it is shown that a number, either positive integer or exact decimal number greater than 1, can be expended up to infinity in a defined manner by different positive integers or by different exact decimal numbers greater than 1.

Keywords: *Exact decimal number, Natural number, Positive integer.*

1. INTRODUCTION.

A series is an infinite addition of an ordered set of terms. The infinite series often contain an infinite number of terms of sequence. A number, either positive integer or exact decimal number greater than 1, can be represented by an infinite series, in a defined manner by different positive integer or by different exact decimal number greater than 1.

1.1 Definition.

Exact decimal number: These decimal numbers have a finite number of digits after the decimal point. The number of digits after the decimal point of these numbers is countable i.e. 1.10, 1.25, 1.01, ...

Natural number: Natural number are a part of the number system which includes all the positive integers from 1 till infinity and are used for counting purpose. It does not include zero (0). Therefore, they are also called counting numbers.

Natural numbers are part of real numbers, that include only the positive integers i.e. 1, 2, 3, 4, 5, 6,… excluding zero, fractions, decimals, and negative numbers.

Positive Integers: The positive integers or natural numbers are the counting numbers.

2. EXPANSION OF POSITIVE INTEGER OR EXACT DECIMAL NUMBER.

If a, b, c, d, e, f….. are Positive integers (1, 2, 3, 4 etc.) or exact decimal numbers greater than 1 (1.10, 2.25, 1.36 etc.) then a, in term of a, b, c, d, e, f…can be defined by an Infinite series.

$$a = 1 + \frac{(a-1)}{b} + \frac{(a-1)(b-1)}{bc} + \frac{(a-1)(b-1)(c-1)}{bcd} + \frac{(a-1)(b-1)(c-1)(d-1)}{bcde} + \ldots\infty$$

and

If a, b, c, d, e, f…are natural numbers in term of a= n, b = n+1, c = n+2, d = n+3, e = n+4,… then

$$\frac{2n}{(n+1)} + n(n-1)\sum_{n=N}^{\infty}\frac{1}{(n+1)(n+2)} = N$$

Or

$$\sum_{n=N}^{\infty}\frac{1}{(n+1)(n+2)} = \frac{1}{N+1}$$

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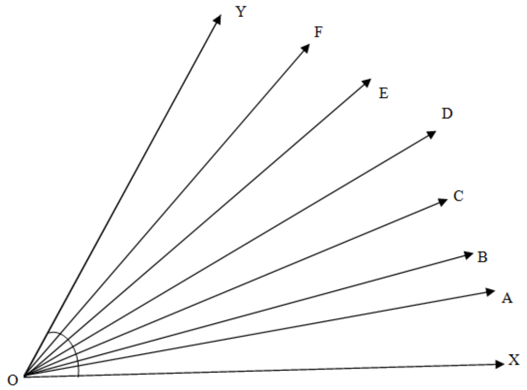
Proof:



Let angle XOY = θ
θ is divided into 'a' equal parts.
and remaining angle is divided into 'b' equal parts
and its remaining into 'c' equal part and onward remaining angles are divided into 'd' 'e' 'f' 'g'…equal parts

Now Angle XOA = θ /a (1)

Remaining angle AOY= $\angle XOY - \angle XOA = \left[\theta - \frac{\theta}{a}\right] = \frac{\theta(a-1)}{a}$

Angle AOY is divided into 'b' equal parts

Angle $AOB = \frac{\theta(a-1)}{ab}$ (2)

Remaining angle B0Y = $\angle AOY - \angle AOB = \frac{\theta(a-1)}{a} - \frac{\theta(a-1)}{ab}$

$$= \frac{\theta(a-1)(b-1)}{abc}$$

Angle BOY is divided into 'c' equal parts

Angle BOC $= \frac{\theta(a-1)(b-1)}{abc}$ (3)

Remaining Angle COY = $\angle BOY - \angle BOC = \frac{\theta(a-1)(b-1)}{ab} - \frac{\theta(a-1)(b-1)}{abc}$

$$= \frac{\theta(a-1)(b-1)(c-1)}{abc}$$

Angle COY is divided into'd' equal parts

Angle $COD = \frac{\theta(a-1)(b-1)(c-1)}{abcd}$ (4)

Like the same onward divided angle will be

$$DOE = \frac{\theta(a-1)(b-1)(c-1)(d-1)}{abcde} \quad (5)$$

$$EOF = \frac{\theta(a-1)(b-1)(c-1)(d-1)(e-1)}{abcdef} \quad (6)$$

$$FOG = \frac{\theta(a-1)(b-1)(c-1)(d-1)(e-1)(f-1)}{abcdefg} \quad (7)$$

And onward remaining angle can be divided in infinite division and their total sum will be θ.

Sum of equation (1) ,(2), (3), (4), (5), (6), (7) ………….. = θ

$$\frac{\theta}{a}+\frac{\theta(a-1)}{ab}+\frac{\theta(a-1)(b-1)}{abc}+\frac{\theta(a-1)(b-1)(c-1)}{abcd}+\frac{\theta(a-1)(b-1)(c-1)(d-1)}{abcde}+...\infty=\theta$$

$$\frac{\theta}{a}\left(1+\frac{(a-1)}{b}+\frac{(a-1)(b-1)}{bc}+\frac{(a-1)(b-1)(c-1)}{bcd}+\frac{(a-1)(b-1)(c-1)(d-1)}{bcde}+...\infty\right)=\theta$$

Or

$$1+\frac{(a-1)}{b}+\frac{(a-1)(b-1)}{bc}+\frac{(a-1)(b-1)(c-1)}{bcd}+\frac{(a-1)(b-1)(c-1)(d-1)}{bcde}+...\infty=a$$

If a, b, c, d, e….. are natural numbers, in term of, a = n, b = n+1, c = n+2 d = n+3,e = n+4,………

Above series can be written as

$$1+\frac{(n-1)}{(n+1)}+\frac{(n-1)(n)}{(n+1)(n+2)}+\frac{(n-1)(n)(n+1)}{(n+1)(n+2)(n+3)}+\frac{(n-1)(n)(n+1)(n+2)}{(n+1)(n+2)(n+3)(n+4)}+...\infty=n$$

$$\left(1+\frac{(n-1)}{(n+1)}\right)+\left(\frac{(n-1)(n)}{(n+1)(n+2)}+\frac{(n-1)(n)}{(n+2)(n+3)}+\frac{(n-1)(n)}{(n+3)(n+4)}+...\infty\right)=n$$

$$\frac{2n}{(n+1)}+\frac{(n-1)(n)}{(n+1)(n+2)}+\frac{(n-1)(n)}{(n+2)(n+3)}+\frac{(n-1)(n)}{(n+3)(n+4)}+...\infty=n$$

$$\frac{2n}{(n+1)}+(n-1)(n)\left(\frac{1}{(n+1)(n+2)}+\frac{1}{(n+1)(n+2)(n+3)}+\frac{1}{(n+1)(n+2)(n+3)(n+4)}+...\infty\right)=n$$

$$\frac{2n}{(n+1)}+n(n-1)\sum_{n=N}^{\infty}\frac{1}{(n+1)(n+2)}=N$$

Or

$$\frac{2n}{(n+1)}+(n-1)(n)\left(\frac{1}{(n+1)(n+2)}+\frac{1}{(n+2)(n+3)}+\frac{1}{(n+3)(n+4)}+...\infty\right)=n$$

$$(n-1)(n)\left(\frac{1}{(n+1)(n+2)}+\frac{1}{(n+2)(n+3)}+\frac{1}{(n+3)(n+4)}+...\infty\right)=n-\frac{2n}{n+1}$$

$$(n-1)(n)\left(\frac{1}{(n+1)(n+2)}+\frac{1}{(n+2)(n+3)}+\frac{1}{(n+3)(n+4)}+...\infty\right)=\frac{n^2+n-2n}{n+1}-\frac{2n}{n+1}$$

$$\frac{1}{(n+1)(n+2)}+\frac{1}{(n+2)(n+3)}+\frac{1}{(n+3)(n+4)}+...\infty=\frac{1}{n+1}$$

$$\sum_{n=N}^{\infty}\frac{1}{(n+1)(n+2)}=\frac{1}{N+1}$$

Or

Two example in which one use both High and Low value of a, b, c…and second only High value of a, b, c…

First

$a=10, b=100.c=2, d=3, e=1000. f=10000, g=100000$

$$a=1+\frac{(a-1)}{b}+\frac{(a-1)(b-1)}{bc}+\frac{(a-1)(b-1)(c-1)}{bcd}+\frac{(a-1)(b-1)(c-1)(d-1)}{bcde}+...\infty$$

$$10=1+\frac{(10-1)}{100}+\frac{(10-1)\times(100-1)}{100\times 2}+\frac{(10-1)\times(100-1)\times(2-1)}{100\times 2\times 3}+\frac{(10-1)\times(100-1)\times(2-1)\times(3-1)}{100\times 2\times 3\times 1000}+\frac{(10-1)\times(100-1)\times(2-1)\times(3-1)\times(1000-1)}{100\times 2\times 3\times 1000\times 10000}+...\infty$$

$$10=1+\frac{9}{100}+\frac{9\times 99}{100\times 2}+\frac{9\times 99\times 1}{100\times 2\times 3}+\frac{9\times 99\times 1\times 2}{100\times 2\times 3\times 1000}+\frac{9\times 99\times 1\times 2\times 999}{100\times 2\times 3\times 1000\times 10000}+...\infty$$

Second

$$a = 10, b = 100, c = 1000, d = 10000, e = 100000, f = 1000000, g = 10000000$$

………..

$$10 = 1 + \frac{(10-1)}{100} + \frac{(10-1)\times(100-1)}{100\times1000} + \frac{(10-1)\times(100-1)\times(1000-1)}{100\times1000\times100000} + \frac{(10-1)\times(100-1)\times(1000-1)\times(10000-1)}{100\times1000\times10000\times100000} + \frac{(10-1)\times(100-1)\times(1000-1)\times(10000-1)\times(100000-1)}{100\times1000\times10000\times100000\times1000000} + \ldots\infty$$

$$10 = 1 + \frac{9}{100} + \frac{9\times99}{100\times1000} + \frac{9\times99\times999}{100\times1000\times100000} + \frac{9\times99\times999\times9999}{100\times1000\times10000\times100000} + \frac{9\times99\times999\times9999\times99999}{100\times1000\times10000\times100000\times1000000} + \ldots\infty$$

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