

# Summation of Infinite Number Series and Calculations of Dimensions in String Theory

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- Rishi Raj

In this research paper I shall discuss how many results one can derive from Ramanujan Summation which will also help us to increase our understanding of the dimensions of string theory which I have shown at the end of the paper.

Ramanujan summation says that,

$$S=1+2+3+4+\dots=-1/12$$

It is proved in the following way,

$$4S=4+8+12+16+\dots$$

$$S-4S= -3S$$

$$-3S=1-2+3-4+5-6+\dots$$

Using the formula of integration  $1/(1+x)^2$  when  $x = 1$ , we get

$$-3S=1-2+3-4+5-6+\dots=1/4$$

$$\therefore S = 1 + 2 + 3 + 4 + \dots = -\frac{1}{12}$$

This is just one of the infinite results which we can get using the above mentioned process. Let us suppose that the sum of infinite numbers is equal to  $-1/8$  or  $-1/16$ . Now I will use the same process mentioned above to derive these results.

$$S = 1 + 2 + 3 + 4 + \dots = -\frac{1}{8}$$

$$3S=3+6+9+12+\dots$$

$$S-3S=-2S$$

Using the formula of integration  $1/(1+x)^2$  when  $x = 1$ , we get

$$-2S=1+2-3+4-5+6-\dots=-1/4$$

$$\therefore S = 1 + 2 + 3 + 4 + 5 + 6 + \dots = -\frac{1}{8}$$

The same is with the result  $-1/16$

$$S = 1 + 2 + 3 + 4 + \dots = -\frac{1}{16}$$

$$5S=5+10+15+20+\dots$$

$$S-5S=4S$$

Using the formula of integration  $1/(1+x)^2$  when  $x = 1$ , we get

$$4S=1-2+3-4+5-6+\dots=1/4$$

$$\therefore S = 1 + 2 + 3 + 4 + 5 + \dots = -\frac{1}{16}$$

Now as I have shown that there are infinite numbers of results we can obtain from Ramanujan summation I would further like to improve the string theory formula for the calculation of dimensions which is

$$\sum_{n=1}^{\infty} n \rightarrow -\frac{1}{12}$$

Now to correct the above formula with my results I improve the formula as

$$\sum_{n=1}^{\infty} n \rightarrow -\frac{1}{4n}$$

There are 2 main points upon which it stands or two limits of the summation of infinite numbers. They are:-

1. The value of  $-1/4n$  i.e. 4 multiplied with any number, must not be less than or equal to  $-1/4$ .
2. The formula of integration  $1/(1+x)^2$  in which  $x$  should always be equal to 1 i.e.  $x=1$ .

So that's what I have obtained from my calculations. One of the things which I expect is that being a formula of math and physics it must stand at all levels.

## References

1. Quora, What is Ramanujan summation?, anonymous

2. The world as I see it, Albert Einstein, Mass Publishers, 1935

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