Ramanujan's Infinite Summation formula: Key Fundamental Scientific Issues

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Abstract

The author tries to Look at the famous Ramanujan's Infinite Summation Result from a Relativistic Time reference frame and resolving the fundamental issues. Mathematics unlike conventional views ,when looked at Relativistic Time, Observer's perspective, many contradictions.conflicts seem to get resolved. In fact at deeper foundational level, there is critical role of relativity, time and observer even in mathematics like physics that must be incorporated to make mathematics consistent.

The Legendary Ramanujan has brilliantly shown that the

$$Sum\ 1 + 2 + 3 + 4 + 5 + 6 + \cdots .. upto\ infinity = -1/12$$

$$\zeta(-1) = 1 + 2 + 3 + 4 + \ldots\ldots = \frac{-1}{12}$$

This type of Sum is linked to Riemann Zeta Function.

This equation does not have a fancy name, since it has proven by many mathematicians over the years while simultaneously being labeled a paradoxical equation. Nevertheless, it sparked a debate amongst academics at the time, and even helped extend Euler's research in the Basel Problem and lead towards important mathematical functions like the Riemann Zeta function

This is also liked to the Riemann Zeta function

Now, why this is important. Well for starters, it is used in string theory. Not the Stephen Hawking version unfortunately, but actually in the original version of string theory (called Bosonic String Theory). Now unfortunately Bosonic string theory has been somewhat outmoded by the current area of interest, called supersymmetric string theory, but the original theory still has its uses in understanding superstrings, which are integral parts of the aforementioned updated string theory.

The Ramanujan Summation also has had a big impact in the area of general physics, specifically in the solution to the phenomenon know as the Casimir Effect. Hendrik Casimir predicted that given two uncharged conductive plates placed in a vacuum, there exists an attractive force between these plates due to the presence of virtual particles bred by quantum fluctuations. In Casimir's solution, he uses the very sum we just proved to model the amount of energy between the plates. And there is the reason why this value is so

important.So the Ramanujan summation, that was discovered in the early 1900's, which is still making an impact almost 100 years on in many different branches of physics, and can still win a bet against people who are none the wiser.

Technical Issues with the Ramanujan's Infinite Summation Result

Two equally crazy claims:

1. $1-1+1-1+1-1 \cdots = 1/2$
2. $1-2+3-4+5-6\cdots = 1/4$

A, which is equal to $1-1+1-1+1-1$ repeated an infinite number of times. I'll write it as such:

$A = 1-1+1-1+1-1\cdots$

Take away **A** from 1

1-A=1-(1−1+1−1+1−1⋯) **THIS IS WHERE THE FUNDAMENTAL OBEJCTION IS : IT CAN NOT BE REARRANGED LIKE THIS !!**

So

1-A=1−1+1−1+1−1+1⋯

Look familiar? we started off with. Substitute **A** for that right side, do a bit of high school algebra and boom!

1-A =A

1-A+A=A+A

1 = 2A

1/2 = A

At any moment in time, 1-A will have lesser element than A ..if time is ignored, they are assumed to be the same infinite terms...

So, at any moment in time if one term is taken out from infinity, it will not remain the same rather one less element…but without time, it is assumed to be the same

1-A will have Relatively lesser number of elements than A.. Relative Order of Infinity…But assuming absolute they are equated which is fundamentally not correct and objectionable

This little beauty is Grandi's series, called such after the Italian mathematician, philosopher, and priest Guido Grandi. That's really everything this series has, and while it is my personal favourite, there isn't a cool history or discovery story behind this. **However**, it does open the door to proving a lot of interesting things, including a very important equation for quantum mechanics and even string theory. **#2: 1−2+3−4+5−6⋯ = 1/4**.

We start the same way as above, letting the series B =1−2+3−4+5−6⋯. This time, instead of subtracting **B** from 1, we are going to subtract it from **A**. Mathematically, we get this:

A-B = (1−1+1−1+1−1⋯) — (1−2+3−4+5−6⋯)

A-B = (1−1+1−1+1−1⋯) — 1+2−3+4−5+6⋯

Then to shuffle the terms around a little bit, and we see another interesting pattern emerge. ! **THIS IS WHERE THE FUNDAMENTAL OBEJCTION IS : IT CAN NOT BE REARRANGED LIKE THIS !!(THIS IS WHERE IT VIOLATES THE FUNDAMENTAL ASPECTS).**

This is because assuming the absolute existence of infinite terms independent of observer(mathematician's brain here) and time and also the order of infinity, one thinks that two series A & B simultaneously exist and are of the same order absolutely.

Can a mathematician write the two series A & B absolutely at the same time ? the mathematician assumes the orders of the same are the same and the same number of terms because he thinks they exist absolutely indepdendently of the observer's role and time. But at any moment in time, for any observer(here mathematician) there can't be the same order of the two series A & B hence they can't be rearranged like this one by one. Also, one can't separate a particular finite element from the entire series like done before by taking 1 out of the series A.

Similarly for the series B & C as well or any other such type of infinite series.

It fundamentally violates the assumption of Euclidean type Space assumed by the learned mathematicians while developing those rules centuries ago when their contemporary understanding of the physical world was initial classical. Lets be extremely practical and true to self. As a mathematician, do you not consider day to day life experiences of space when you develop the basic mathematical rules like addition and subtraction etc...1+1 =2 etc.

One has to understand that INFINITY (AT ANY MOMENT IN TIME FOR ANY OBSERVER'S BRAIN) = FINITE . The MOMENT ONE UNDERSTANDS THIS, MANY FUNDAMNETAL ISSUES WOULD BE AUTOMATICALLY RESOLVED !

$A\text{-}B = (1-1) + (-1+2) + (1-3) + (-1+4) + (1-5) + (-1+6)\cdots$

$A\text{-}B = 0+1-2+3-4+5\cdots$

We know that **A = 1/2**, so some more basic algebra

$A\text{-}B = B$

$A = 2B$

1/2 = 2B

1/4 = B

If one notices the number of elements of A & B may not be the same relatively if one takes all the elements in the infinite set...so, this rearranging may not be complete if all the elements are taken.. By assuming absoluteness of infinity one assumes that they will have the same number of elements always hence Compelte rearrangement

One of the major mistakes is the assumption of same number of elements assuming the Absoluteness of Infinity for all

This equation does not have a fancy name, since it has proven by many mathematicians over the years while simultaneously being labeled a paradoxical equation. Nevertheless, it sparked a debate amongst academics at the time, and even helped extend Euler's research in the Basel Problem and lead towards important mathematical functions like the Riemann Zeta Function.

Once again we start by letting the series **C** = 1+2+3+4+5+6⋯, to Subtracting **C** from **B**.

B-C = (1−2+3−4+5−6⋯)-(1+2+3+4+5+6⋯)

Then some rearrangement of the order is done ! **THIS IS WHERE AGAIN THE FUNDAMENTAL OBEJCTION IS : IT CAN NOT BE REARRANGED LIKE THIS !!(THIS IS WHERE IT AGAIN VIOLATES THE FUNDAMENTAL ASPECTS)**

B-C = (1-2+3-4+5-6⋯)-1-2-3-4-5-6⋯

B-C = (1-1) + (-2-2) + (3-3) + (-4-4) + (5-5) + (-6-6) ⋯

B-C = 0-4+0-8+0-12⋯

B-C = -4-8-12⋯

B-C = -4(1+2+3)⋯

B-C = -4C

B = -3C

And since we have a value for **B=1/4**, we simply put that value in and we get our magical result:

1/4 = -3C

1/-12 = C **or** C = -1/12 PROVED AS USUAL TRADITONALLY

B-C will not have the same number of elements in the Infinity as C infact less element than C at any moment in time relatively. The Absolute assumption that both have same number of elements is objectionable and hence this can't be assumed to be B-C can't be taken equal to 4C.

So the relative order of infinity..number of elements in B-C and C are different not the same as considered in absolute terms

So, what does this fundamental statement mean ?! **THIS IS WHERE THE FUNDAMENTAL OBEJCTION IS : IT CAN NOT BE REARRANGED LIKE THIS !!(THIS IS WHERE IT VIOLATES THE FUNDAMENTAL ASPECTS)**

First let's look at the fundamental assumptions while performing these arithmetical & algebraic operators : How does it violate the fundamental assumption when the mathematical system was developed

The Mathematician who performs this assumes

ALL THE INFINITE TERMS EXIST SIMULTANEOUSLY EXISTS INDEPENDENT OF TIME & OBSERVER(MATHEMATICIAN'S BRAIN) !

& THE ORDERS OF ALL THE TYPES OF INIFNITIES ARE THE SAME DUE TO THEIR ABSOLUTE EXISTENCE AND HENCE ONE CAN ADD?SUBTRACT INDIVIDUAL TERM OUT OF THE WHOLE !

Just because the mathematician assumes that Infinity is absolutely infinite irrespective of their orders(even if considers absolute), he/she can add ,rearrange/group the individual terms as he wishes to….

To be Precise, one can't separate 1 out of the series 1-1+1-1+1…….to show that

1-A =A .

Can one separate something from any Inifinity ? This because of Absoluteness of Infinity assumed by the Mathematician… But in Reality, Practicality, the Observer/Mathematician can't realize the

absoluteness of Infinity and the Simultaneous existence of infinite terms..It's impossible. **Infact Relativity Aspect is Ignored as explained above** . Let's forget all the theoretical philosophies and talk practically in the physical world… Can a mathematician's individual brain figure out /write all the infinite terms at the same time absolutely. He/she assumes/thinks/imagines in his subconscious mid that he/she can. But that's illusion and true ! This is because the mathematician's brain ignores the role of Time and Relativity and Self consciousness and role as in Quantum Physics.

When the Mathematicians developed the rule 1+1 =2 for example what presumptions the mathematican's brain assumed ? It assumes the independent absolute existence of Euclidean type Space in day to day normal life experiences without Time but that's not the Physical Reality. It's even possible that in Quantum or some other Space-Time where the fundamental nature/ characteristics of Space itself changes, One can't find 1+ 1=2 rather it could be 1+1 =1 or something else. One may not clearly separate 1 from another 1 in that space as in the day to day Euclidean type Space.

Further,

Like Quantum Physics in normal day to day Mathematics might appear independent and absolute for all the observers simultaneously but at the scale of Inifnity & Infinitesimals etc, one can realize the role of time, observer and relativity in the evolution of mathematical rules(here algebraic and arithmetical).

Just because the mathematician assumes so, he/she manipulates the infinite terms in the disguise of infinity to come up with different weird results…

The key Issue : One needs to look at this very fundamentally.

Infinity is not an Absolute Phenomenon in Mathematics Independent of Time . This is extremely fundamental concept. In physics there is role of Relativity & Time dimension along with Space..But in Mathematics, one treats like Platonic system all the integers exist Absolutely independently of Observer /Mathematician's Brain ", Simulationeously...This is blunder. Like Classical Physics where traditionally it is said that Role of Observer is not important but in Quantum scale this is quite important..similarly , in mathematics,in daily life it might not make much difference but at the level of Infinity etc, the role of Observer ,Relativity, Time dimension are quite important. Otherwise the Mathematics would be Fundamentally incompatible for Physics application.

How can Absolute Mathematics become Compatible with Relative Physics ? It's like an unbounded function is trying to model the bounded Function ? Relativity in Mathematics is often fundamentally ignored !!

This is extremely deep and could requires deep Imagination for mathematicians at large to realize in Real World. It has to be realized that like Physics, Mathematics at some level requires Human Brain Observers Role too..say like the Scale of Infinity.

Physics might not agree that the Universe is absolutely Infinite independent of Human observer but Conventional Mathematics does that...

So, the point is there is important role of Mathematician Observer's mind and time as well at the scale of Infinity and infinitesimal both. So, Infinity or the setof all Integers for example doesn't exist simultaneously independent of mathematicians brain. ... Mathematician creates the Integer when he writes or thinks of this...It's like Quantum Mechanics like Superposition where the observer sees that's why it exists like in Schrodinger's Cat.

Set in Conventional archaic Mathematics assumes Simultaneity but Physics doesn't believe in Simultaneity at deeper level. Similarly, Mathematical tools can't rely on Simultaneity at Infinity and Infinitesimal level though in day to day normal life it's ok like one says that Quantum wave is not pronounced at Classical level size...

Similar aspects exist for Mathematics as well.

So, the Set of Infinite series doesn't exist at the same time rather they come into existence when an observer mathematician creates it or observes it.

So, the Mathematical Operations (which are mostly Classical Absolute Euclidean space type) may not be valid at Quantum Scale or Relativistic Classical Aspects.

So, one possible big mistake is in the Physics domain as well where such type of Mathematical tools are applied everywhere even in finance and economics(which itself tries to understand the crucial role of Human Observer's Consciousness in the Universe). Will separately deal in another paper about this.

Like Normal Addition, Subtraction etc could not be Valid in Quantum Space or for Infinite and Infinitesimal scale...

Now coming to Ramanujan's Infinite Sum result, the way one applies Classical Absolute Mathematical Operations on Infinity assuming Absoluteness of the Set Independent of Time and Mathematician's brain(Observer), it is not fundamentally not allowed and incompatible at that scale. So, with highest respect for our legend Ramanujan's, I very humbly imagine that his genius discovery (at that time when physics was not much developed influencing Classical mathematical rules and tools)should be looked from Relativistic Time & Role of Observer(Mathematician's Brain) Perspective.

This foundational issue is causing the problem which leads to weird results in infinite series..

And this absolute classical rules of mathematics can't be applied normally on Infinite series here..It's like the role of Observer(Physicist) is not visible at Classical scale but at Quantum scale. Similar for Mathematics.

One one hand Ramanujan's Summation (Based on Absolute Classical Euclidean World Rules is applied for Quantum phenomenon of Energy. Can Energy be added like Addition Rule of Euclidean Mathematics ??

The fundamental concept of Space separation (from which Pythagoras or Addition or Subtraction , Multiplication or Division originated Classically) may not be valid in Quantum Space Time. Always ..!!

THIS ALSO REQUIRES TO REVISIT THEFOUNDATION ASSUMPTION OF MATHEMATICS OF INFINITY ,FINITENESS & INFINITESIMAL ,SUCH SERIES etc. BEFORE PRODUCING WEIRD RESULTS AGAIN AND

AGAIN. MATHEMTICS IS NOT WRONG BUT THE MATHEMATICIAN'S VIOLATION OF ASSUMPTIONS AND MANIPULATION IS WTONG THAT NEEDS TO BE FUNDAMENTALLY REALIZED/IMAGINED/UNDERSTOOD.

Relativity ,Time,Observer's role are extremely important in Mathematics as well at those scales though not pronounced in day to day normal life appearing nonsensical.

Hence, Mathematical tools need to be developed from Quantum / Physics perspective as the part of evolution... Ramanujan's Infinite Summation results need to be seen from that perspective and then this weird results can be deeply validated...

So, I humbly think Normal mathematical classical absolute tools when applied in fundamentally Objectionable ways, it leads to the weird results . It needs to be checked before applying to Infinity, Infinitesimals etc. Infinite Series etc.