International Journal of Engineering, Science and Mathematics
Vol.9Issue 05, May2020
ISSN: 2320-0294 Impact Factor: 6.765
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gage as well as in Cabell's Directories of Publishing Opportunities, U.S.A

SRINIVASA RAMANUJAN- A GREAT INDIAN MATHEMATICIAN

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DIO: 10.6084/m9.figshare.19897747

Abstract: The present paper is aimed at studying the contribution of SrinivasaRamanujan in the field of Mathematics. Without several formal exercise in pure mathematics, he has done strange work and appeared as one of the great arithmetician of India. His mathematical perception reconstructed and updated 20thepoch mathematics. His supremacy can be observed because he learned some outcomes that are believed to be true but have not been verified totill date. In his short life time he independently evaluated approximately 3900 results. Besides his published work, Ramanujan left behind several notebooks, which have been the object of much study. In 1918, he became the first Indian to be elected as a Fellow of the Royal Society. His findings have recently been applied to physics, where his theta function is crucial to string theory. The Ramanujan Journal was founded in 1997 to publish mathematical research.

Keywords: Number theory, composite number, theory of partition.

1. Introduction

On December 22, 1887, Ramanujan, one of India's most brilliant mathematicians, was born in Erode, Tamil Nadu. K. SrinivasaIyengar, his father, worked as a clerk at a sari business in Kumbakonam. He made historic contributions in the field of infinite series, number theories, analysis and fractions despite of no formal education in pure mathematics . He even provided solutions to mathematical problems that were deemed to be unsolvable by other geniuses. At the age of five years on 1st October 1892, heenrolled in a local school as a student. He showed bursts of brilliance that no ordinary child would have displayed at that age. He completed his primary education at the age of ten and then continued his study at Town High School.

In 1903, he borrowed a library copy of G. S. Carr's collection of 5,000 theorems, A Synopsis of Elementary Consequences in Aplied and Pure Mathematics, from a friend.He studied the contents of this book in detail.The book is generally acknowledged as a key

component in developing his genius.At the age of sixteen, he got scholarship. Due to his extreme love for mathematics, he failed in the other subjects and lost his scholarship. So, due to financial problems he left his studies and worked as an account clerk in the workplace of the Madras Port Trust. Mathematicians G. H. Hardy and J. E. Littlewood later acknowledged his work, and he moved to England in 1914. In 1916, Cambridge University gave him a B.A. (later called Ph.D.) for his research on extremely composite numbers. He had health problems when working with his colleagues Hardy and Littlewood, when he was at his finest. He was admitted to a Cambridge hospital and diagnosed with tuberculosis and vitamin deficiencies. After two years of struggle, he recovered and decided to return to India in 1919. However, the improvement was just temporary, as his condition deteriorated again following his arrival in Bombay, and he died on April 26, 1920.

In his short life, Ramanujan made ground-breaking contribution in the field of mathematics. His mathematical notion transformed and reconstructed mathematics of 20thcentury. A peer-reviewed scientific journal 'The Ramanujan Journal' launched in 1997 to publish work in the field of mathematics. In India, year 2012 was celebrated as National Mathematics Year in the memory of genius mathematician SrinivasaRamanujan.The Prime Minister likewisedeclared that December 22 would be renowned as National Mathematics Day from 2012 forwardsin the honour for his influence in the field of Arithmetic and to promote the magnificent tradition of Indian mathematics.Ramanujan was deeply religious and gave all praise of his considerable mathematical volumes to divinity: "An equation for me has no meaning unless it expresses a thought of God". In short, legendary Indian Mathematician Ramanujan did extraordinary and remarkable work which have applications in the field of science and technology.

2. Highly Composite Number

A natural number *n* is a highly combined number if $m \le n \Rightarrow d(m) \le d(n)$

where*d (n)* signifies the number of separate positive divisors of *n*. The following table depicts the first little highly compound numbers and the integer of their distinct positive divisors.

Table I

N	1	*2	3	4	*6	8	10	*12	18	20	24	30	36	48
d (n)	1	2	2	3	4	4	4	6	6	6	8	8	9	10
Prime Factorization		2	3	2^2	2.3	2^3	2.5	$2^2.3$	2.3^2	$2^2.5$	$2^3.3$	2.3.5	$2^2.3^2$	$2^4.3$

The asterisk-denoted numbers are superior extremely composite numbers. Superior very composite number is a natural number with more divisors than any other number scaled relative to some positive power of the number itself.

3. Hardy-Ramanujan Number

The Hardy-Ramanujan number is discoveredafter ansketch of G.H. Hardy, a British mathematician who had visited S. Ramanujan in hospital. The sketch is a part of Ramanujan'sprofile.'The Man Who Recognized Infinity' by Robert Kanigel.Ramanujan was wizard of mathematics and played with numbers.

$$1729 = 1^3 + 12^3 = 10^3 + 9^3$$

it is the minimum natural integer which can be conveyed as the sum of binary cubes in binaryvarious ways.Generalization of this idea developed the notion of “taxicab numbers”. Recently, application of this magic number used in formulation of theory of elliptical curves for solving several major Diophantine equations and an analogous problem involving fourth power.

4. Number Theory

The contribution of Ramanujan in number theory is remarkable. Theta function and modular equations formulated by him have applications in the field of number theory. He also worked on magic squares, theory of partitions, triangular number and Diophantine equations. Hardy-Ramanujan ‘circle method’ which has been described in one of his notebook has applications in number theory.Ramanujan ideas of number theory have application in Cryptography.

4.1 Magic squares

Ramanujan designed a super magic square. The top most row in this magic square is his birthdate (December 22, 1887). This is a fabulous magic square since not only ensure the

rows, columns, and diagonals add up to the equalinteger, then the four corners, the four internal squares (17, 9, 24, 89), the two middle numbers of first and last rows (12, 18, 86, 23), and the two middle numbers of first and last columns (88, 10, 25, 16) all add up to the sum of 139.

22	**12**	**18**	**87**
88	**17**	**9**	**25**
10	**24**	**89**	**16**
19	**86**	**23**	**11**

4.2 Theory of Partition

Ramanujan's fascination for magic squares led him to work on the theory of partitions. Three papers on the theory of partitions were published in the years 1919, 1920 and 1921. Suppose $p(n)$ denotespartition function, definite as the integer of ways of articulating$n$ as a sum of natural numbers $\leq n$.

For example,

$1 = 1$

$2 = 2 = 1 + 1$

$3 = 3 = 2 + 1 = 1 + 1 + 1$

$4 = 4 = 2 + 2 = 3 + 1 = 2 + 1 + 1 = 1 + 1 + 1 + 1$

$5 = 5 = 1 + 4 = 2 + 3 = 1 + 1 + 3 = 1 + 2 + 2 = 1 + 1 + 1 + 2 = 1 + 1 + 1 + 1 + 1$

and so on. As n increases, $p(n)$ becomes larger and larger. The following table describes the values of $p(n)$ for $n = 1, 2, \ldots\ldots, 10$.

Table II

n	1	2	3	4	5	6	7	8	9	10
***p* (*n*)**	1	2	3	5	7	11	15	22	30	42

About the dividers of a natural quantity, G. H. Hardy and E. M. Wright remarked as, "in spite of the definition of p (n), not very much is known about its arithmetic properties".

5. Recognition

- Stamp released by the Govt. in1962.
- 'The Ramanujan Journal' launched in 1997 to publish work in the field of mathematics.
- Year 2012 was declared as National Mathematics Year by Govt. of India.
- December 22nd has been celebrated as National Mathematics Day since 2012 onwards in the honour for Ramanujan's contribution in the field of Mathematics.
- Tamil Nadugovt. celebrated 22nd December 2017 as 'State ITDay'.
- SASTRA RamanujanPrize-Awarded to young Mathematician up to age of 32 every year.
- ICTP Ramanujan Prize- Awarded to ainvestigator from a emerging country less than 45 years of age who has showed outstanding study.

6. Some another contributions

Apart from the contributions described above, he operated in some another parts of mathematics such as hypergeometric series, continued fractions, analysis, congruence's, asymptotic expansions and their applications in the field of science and technology. He independently invented Bernoulli numbers and using these numbers formulated the value of Euler's continuous up to 15 decimal places.

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