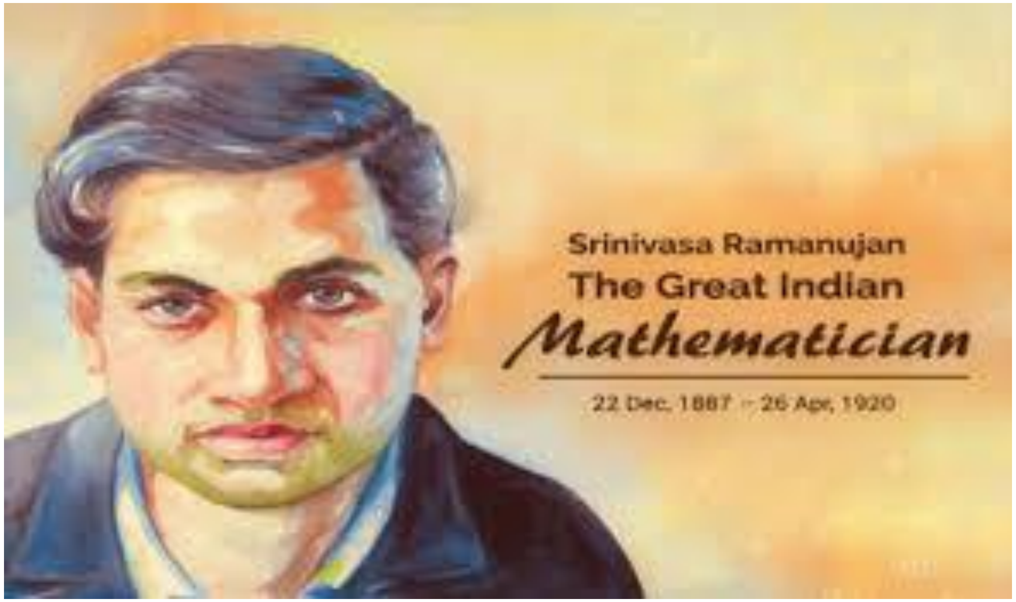
NATIONAL MATHEMATICS DAY



P.ANURADHA
ASSISTANT PROFESSOR OF MATHEMATICS
SR & BGNR ARTS AND SCIENCE COLLEGE
KHAMMAM

Mathematics is the Queen of Sciences

- ***Yatha sikha mayuranam***
  Naganam manayo yatha
  Tadvadvedangasastranam
  Ganitam murdhani sthitam

- "Like the crowning crest of a peacock and the shining gem in the cobra's hood, mathematics is the supreme *Vedanga Sastra"* .
- There are six *VedangaSastras*

  viz. *Siksa* (phonetics), *Niruktam* (etymology), *Vyakaranam* (grammar), *Chandas* (prosody), *Kalpam* (ritualistics) and *Ganitam* (maths).

  - Vedic maths

SRINIVASA RAMANUJAN :

- Born22 December 1887
  Erode, Madras Presidency, British India
- Died26 April 1920 (aged 32)
  Kumbakonam, Madras Presidency, British India
- Other names Srinivasa Ramanujan Aiyangar
- Citizenship British Raj
- Education Government Arts College (no degree)

  Pachaiyappa's College (no degree)

  Trinity College, Cambridge (Bachelor of Arts by Research, 1916)

Time line :

- 22 Dec 1887, Erode. Srinivasa Iyyengar/ Komalthammal . Birth Star- Uthrattathi
- **1903- George Carr 's book.**
- 1904- Matriculate of Univ. of Madras.
- **1907- Failed in FA.**
- **1909- Married Janaki.**
- **1911- First research paper. JIMS**
- 1912- Accountant in Madras Port Trust

House of ramanujan:

- The visit to the **house** of the greatest mathematician and Noble laureate from India was quite inspiring.
- The **house** in the heart of **Kumbakonam** the temple town of Tamil Nadu is **now** being maintained by the SASTRA college.

House:

KNOWN FOR :

- Landau– Ramanujan constant
- Mock theta functions
- Ramanujan conjecture
- Ramanujan prime
- Ramanujan – Soldner constant
- Ramanujan theta function
- Ramanujan's sum
- Rogers– Ramanujan identities
- Ramanujan's master theorem
- Ramanujan–Sato series

GOLDBACH'S CONJECTURE:

- Goldbach's conjecture is one of the important illustrations of ramanujan contribution towards the proof of the conjecture.
- The statement is every even integer greater that two(>2) is the sum of two primes,

  that is, 6=3+3

Ramanujan shown that every large integer could be written as the sum of at most four primes.

Example: 43=2+5+17+19.

Partition of whole numbers

- Partition of whole numbers is another similar problem that captured ramanujan
- Subsequently ramanujan developed a formula for the partition of any number, which can be made to yield the required result by a series of successive approximation.

  Example : 3 = 3 + 0

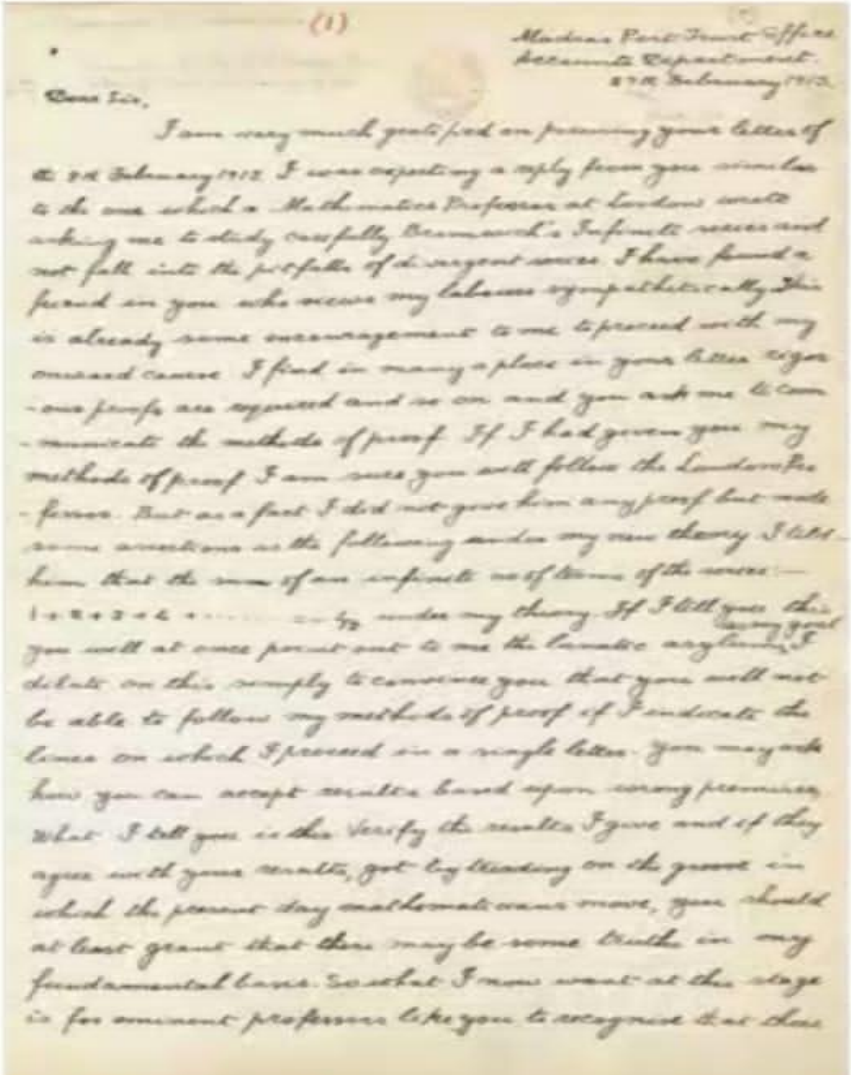
  = 1 + 2

  = 1+1+1

  4 = 3+1 = 2+2 = 2+1+1 = 1+1+1+1,

  so the partition number of 4 is 5.
- The partition number of 10 is 42,
- While 100 has more than 190 million partitions

This is Ramanujan's Research Paper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Madras Port Trust Office
Accounts Department
27th February 1913

Dear Sir,

I am very much gratified on perusing your letter of the 8th February 1913. I was expecting a reply from you similar to the one which a Mathematics Professor at London wrote asking me to study carefully Bromwich's Infinite Series and not fall into the pitfalls of divergent series. I have found a friend in you who views my labours sympathetically. This is already some encouragement to me to proceed with my onward course. I find in many a place in your letter rigorous proofs are required and so on and you ask me to communicate the methods of proof. If I had given you my methods of proof I am sure you will follow the London Professor. But as a fact I did not give him any proof but made some assertions as the following under my new theory. I told him that the sum of an infinite no of terms of the series:—
$1+2+3+4+\cdots = -\frac{1}{12}$ under my theory. If I tell you this you will at once point out to me the lunatic asylum as my goal. I dilate on this simply to convince you that you will not be able to follow my methods of proof if I indicate the lines on which I proceed in a single letter. You may ask how you can accept results based upon wrong premises. What I tell you is this. Verify the results I give and if they agree with your results, got by treading on the groove in which the present day mathematicians move, you should at least grant that there may be some truths in my fundamental basis. So what I now want at this stage is for eminent professors like you to recognise that there

- **Fermat Theorem:** He also did considerable work on the unresolved Fermat theorem

  which states that a prime number of the form 4m+1 is the sum of two squares.

  Ex: 4(4)+1 = 17

  we can write 17 =

- **Euler's constant :** By 1904 Ramanujam had began to undertake deep research. He investigated the series (1/n) and calculated*Euler's constant* to 15 decimal places.

Taxi Numbers:

$$
\begin{aligned}
\mathrm{Ta}(1) &= 2 = 1^3 + 1^3 \\
\mathrm{Ta}(2) &= 1729 = 1^3 + 12^3 \\
&= 9^3 + 10^3 \\
\mathrm{Ta}(3) &= 87539319 = 167^3 + 436^3 \\
&= 228^3 + 423^3 \\
&= 255^3 + 414^3 \\
\mathrm{Ta}(4) &= 6963472309248 = 2421^3 + 19083^3 \\
&= 5436^3 + 18948^3 \\
&= 10200^3 + 18072^3 \\
&= 13322^3 + 16630^3 \\
\mathrm{Ta}(5) &= 48988659276962496 = 38787^3 + 365757^3 \\
&= 107839^3 + 362753^3 \\
&= 205292^3 + 342952^3 \\
&= 221424^3 + 336588^3 \\
&= 231518^3 + 331954^3
\end{aligned}
$$

Magic Square:

RAMANUJAN'S MAGIC SQUARE

It is 22nd Dec 1887

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

a	b	c	d
(d+1)	(c-1)	(b-3)	(a+3)
(b-2)	(a+2)	(d+2)	(c-2)
(c+1)	(d-1)	(a+1)	(b-1)

Janaki Ammal (1897-1994) :

Wedding - 14 July 1909.

S. Janaki Ammal

INDIA

Date 17.3.1984

Dear Sir,

I understand from Mr. Richard Askey, Wisconsin, U.S.A., that you have contributed for the sculpture in memory of my late husband Mr. Srinivasa Ramanujan. I am happy over this event.

I thank you very much for your good gesture and wish you success in all your endeavours.

Yours faithfully,

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Mock – theta function: LAST letter to Hardy (12 Jan. 1920)

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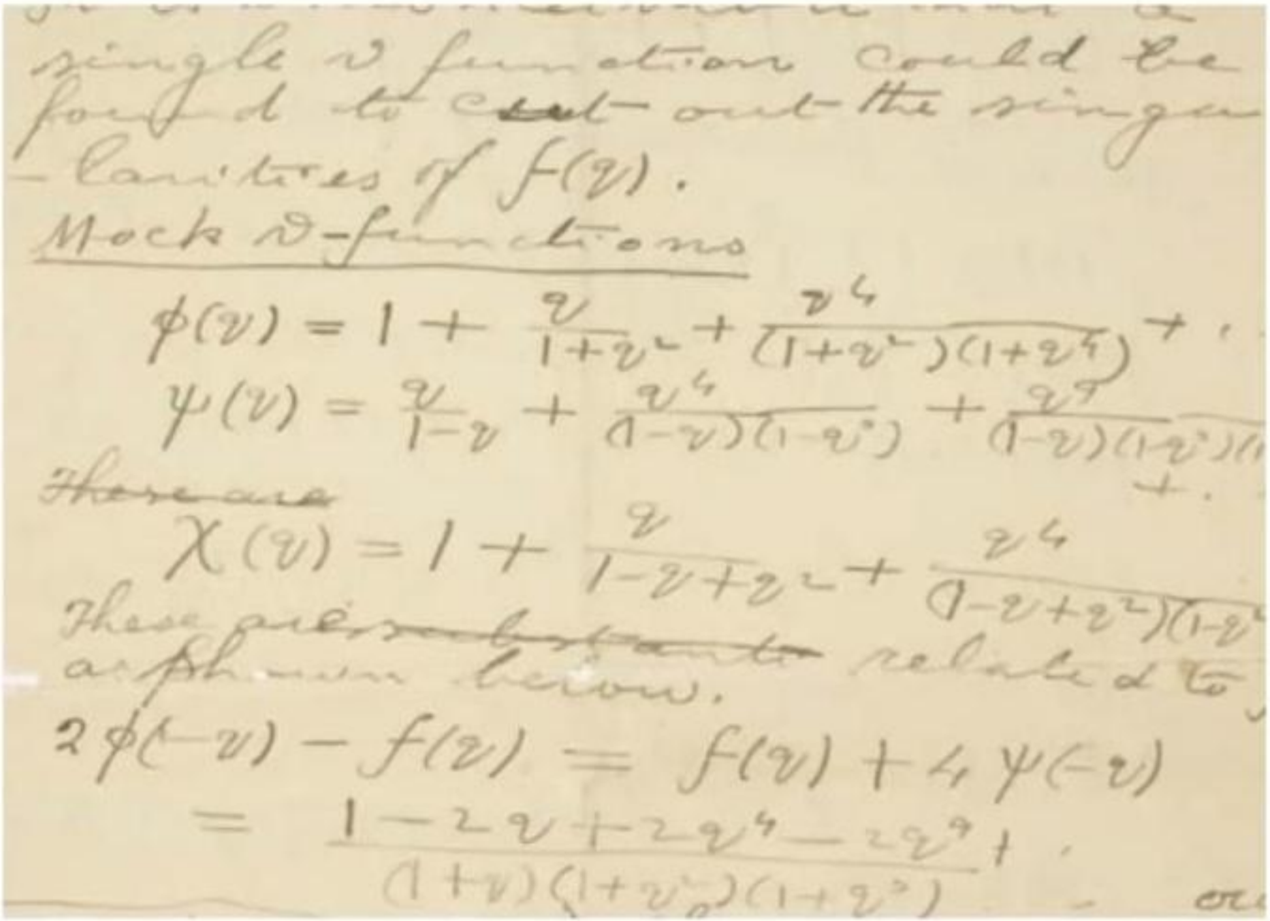

single ϑ function could be found to cut out the singularities of $f(q)$.

Mock ϑ-functions

$$\phi(q) = 1 + \frac{q}{1+q^2} + \frac{q^4}{(1+q^2)(1+q^4)} + \cdots$$

$$\psi(q) = \frac{q}{1-q} + \frac{q^4}{(1-q)(1-q^3)} + \frac{q^9}{(1-q)(1-q^3)(1 \ldots} + \cdots$$

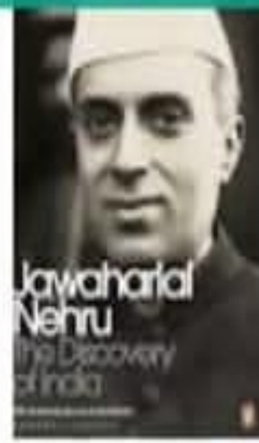
~~There are~~

$$\chi(q) = 1 + \frac{q}{1-q+q^2} + \frac{q^4}{(1-q+q^2)(1-q^2 \ldots}$$

These are ~~not~~ related to f(q) as shown below.

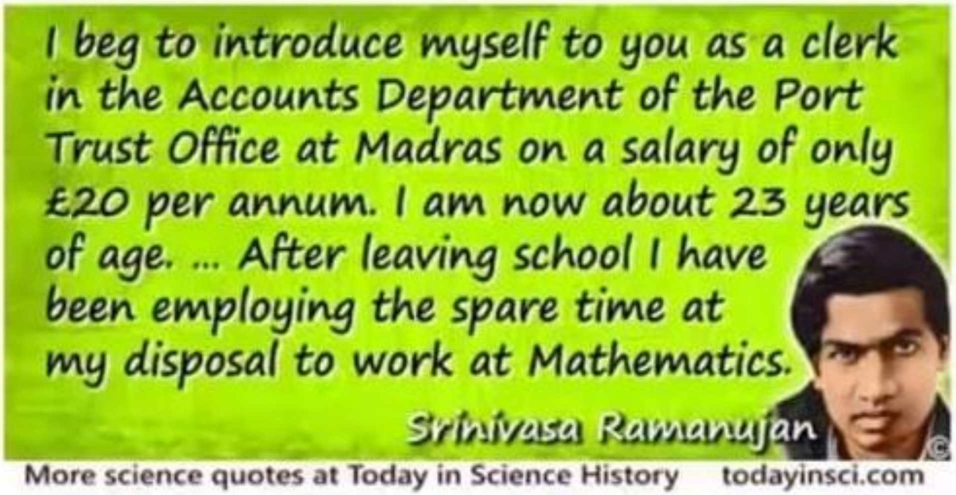
$$2\phi(-q) - f(q) = f(q) + 4\psi(-q)$$

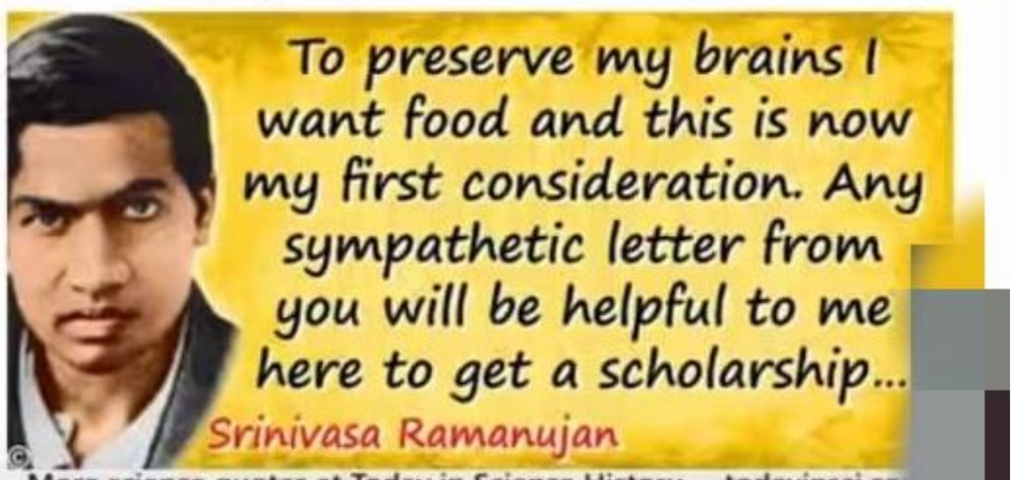
$$= \frac{1-2q+2q^4-2q^9+\cdots}{(1+q)(1+q^2)(1+q^3)\cdots}$$



- Jawaharlal Nehru(1889-1964) in his **Discovery of India** has written "Ramanujan's brief life and death are symbolic of the conditions in India; of our millions how few get any education at all; how many live on the verge of starvation."

I beg to introduce myself….





Ramanujan's 'Lost Notebook'

- The manuscript in which Ramanujan recorded the mathematical discoveries of the last year (1919–1920) of his life. Its whereabouts were unknown until it was rediscovered by George Andrews in 1976, in a box of effects of G. N. Watson stored at the Wren Library at Trinity College, Cambridge.

is using the webcam

Note book is NOT A BOOK.

- The "notebook" is not a book, but consists of loose and unordered sheets of paper — "more than one hundred pages written on 138 sides in Ramanujan's distinctive handwriting.
- The sheets contained over six hundred mathematical formulas listed consecutively without proofs.“
- After Ramanujan passed away his wife gave his notebooks to the University of Madras

Microsoft Teams
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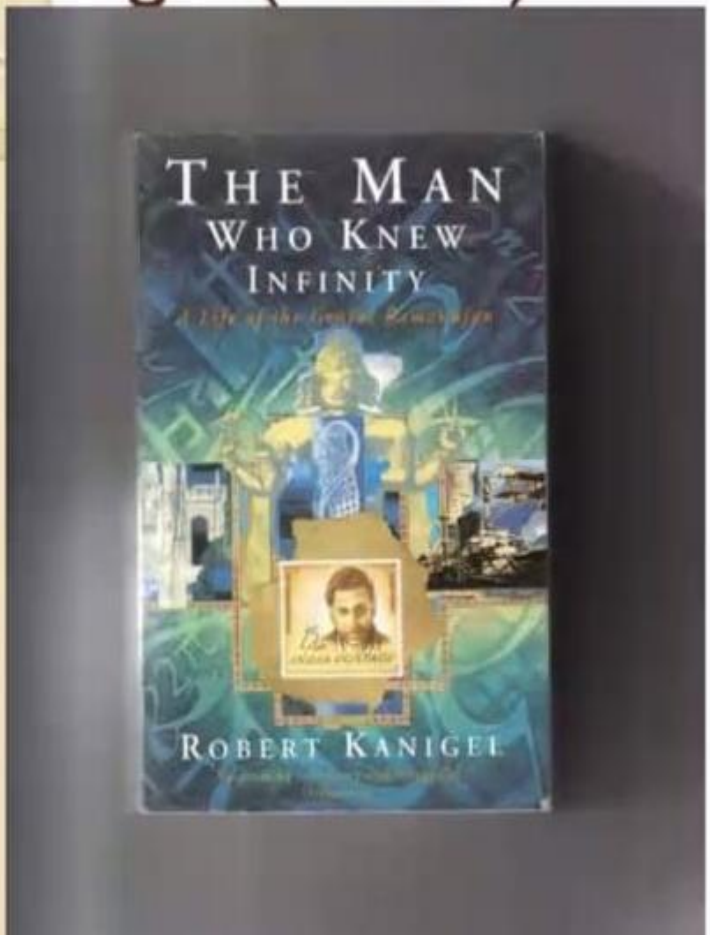
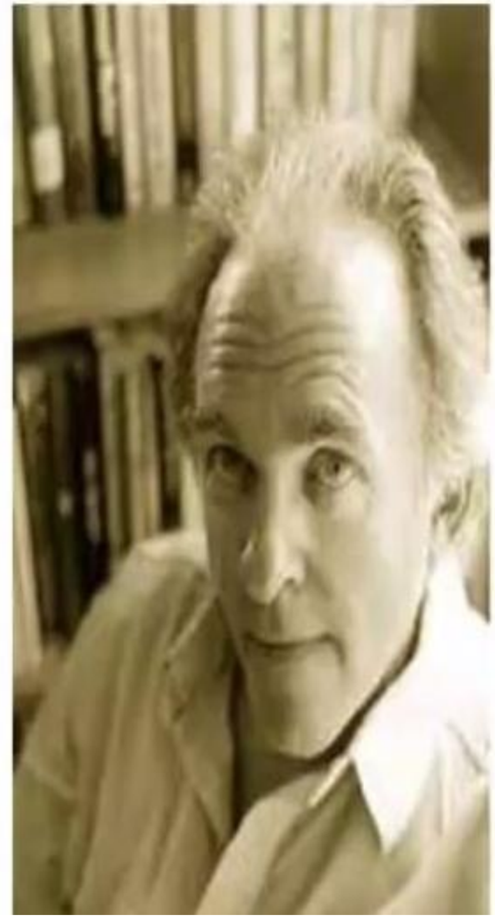
"The Man who knew Infinity"-Robert Kanigel (1946)





George Andrews on SR

- One of the most amazing and wonderful mathematicians of all time is Srinivasa Ramanujan. He provides a shining example for each of us in at least two important ways.
- First, **his magical genius** has provided mathematicians for the last one hundred years with wonderful research directions that have greatly enriched our understanding of many areas of mathematics.

National mathematics day, year :

- In 2011, on the 125th anniversary of his birth, the Indian government declared that 22 December will be celebrated every year as *National Mathematics Day*.
- Then Indian Prime Minister Manmohan Singh also declared that 2012 would be celebrated as National Mathematics Year.

Year of Mathematics - 2012

PAUCITY OF GOOD MATHEMATICIANS: PM

2012 declared year of math

DC CORRESPONDENT
CHENNAI, DEC. 26

Prime Minister Manmohan Singh said on Monday that the country did not have adequate number of competent mathematicians.

Declaring 2012 as Year of Mathematics while commemorating eminent mathematician Srinivasa Ramanujan's 125th birth centenary, Dr Singh said that students had failed to pursue mathematics at advanced levels over more than three decades, which in turn had adversely affected the quality of mathematics teachers in schools and colleges.

"There is a general perception in our society that the pursuit of mathematics does not lead to attractive career possibilities. This perception must change. This might have been valid some years ago, but today there are many new career opportunities available for mathematicians and the teaching profession itself has become much more attractive in recent years", he said.

Union HRD Minister Kapil Sibal said that the country's education system was socially stratified with graduates of elite universities becoming the managerial class.

"Thus far we have had an education system that is socially stratified... graduates of a few elite universities such as the IITs and IIMs become the managerial class that run the Indian state and the industry. This is changing and must change", he said.

The minister also raised concern over the decline in the number of students joining streams like Humanities and Social Science.

"This is accentuated by the basic changes taking place in the balance in power in India with the unprecedented rise of the corporate sector."

"Jobs in the state sector have seen stagnation while those in corporate and informal sectors have grown exponentially," he said.

> There is a general perception in our society that the pursuit of mathematics does not lead to attractive career possibilities. This perception must change
>
> **Dr. Manmohan Singh**

Indian mathematical Society:

- The Society was founded in April 1907 by V. **Ramaswamy** Aiyer with its headquarters at Pune

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S.Narayana Iyer, E.H.Neville, G H Hardy, V.Ramaswamy Iyer, Ramachandra Rao, PV Seshu Iyer, SIR Francis Spring

$$x + n + a = \sqrt{(ax + (n+a)^2 + x\sqrt{(a(x+n) + (n+a)^2 + (x+n)\sqrt{\text{etc.}}) \ldots})}$$

12. S Narayana Iyer, Treasurer, Port Trust

13. E H Neville, Trinity College

14. G H Hardy, Mentor of Ramanujan

15. V Ramaswamy Iyer, Founder of IMS & JIMS

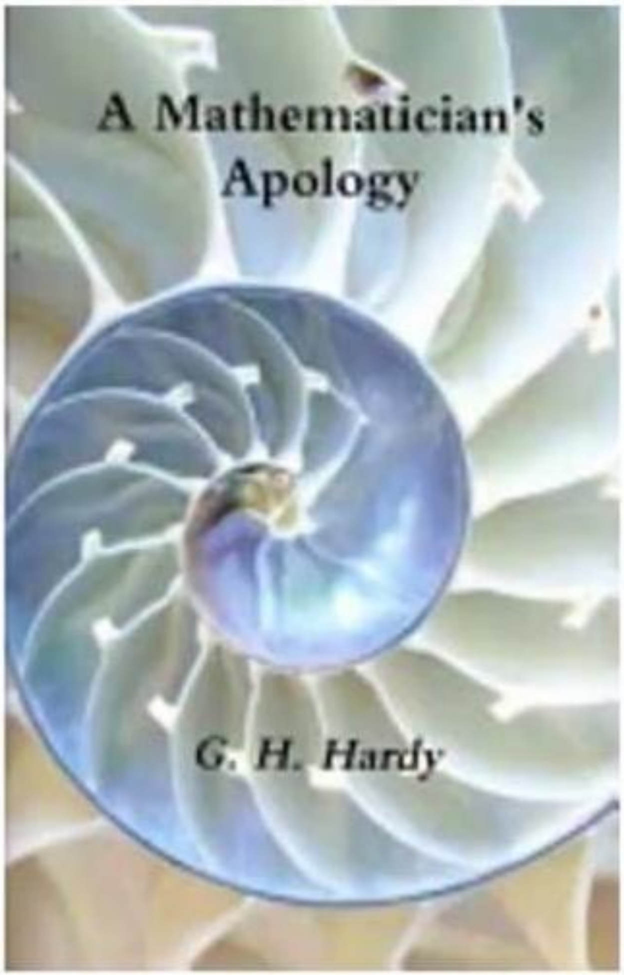
9. Dewan Bahadur Ramachandra Rao, Collector of Nellore

10. Professor PV Seshu Iyer, Maths Professor at Kumbakonam

11. Sir Francis Spring Chairman, Madras Port Trust

YAKUMAR (Gu...

G H Hardy (1877-1947),FRS



CONTRIBUTIONS OF KAPREKAR :

- **Dattatreya Ramchandra Kaprekar** (1905–1986) was an Indian recreational mathematician
- KAPREKAR NUMBER
- KAPREKAR CONSTANT
- DELMO NUMBER
- PERFECT NUMBER
- POLITE NUMBER

Kaprekar's constant:

- In 1949, Kaprekar discovered an interesting property of the number 6174,
- which was subsequently named the Kaprekar constant.[
- Ex: 1234
- 4321 − 1234 = 3087, then

  8730 − 0378 = 8352, and

  8532 − 2358 = 6174

  7641 − 1467 = 6174.
- A similar constant for 3 digits is 495.

Kaprekar number:

- Another class of numbers Kaprekar described are the Kaprekar numbers.
- A Kaprekar number is a positive integer with the property that if it is squared, then its representation can be partitioned into two positive integer parts whose sum is equal to the original number

Ex: 45

$45^2=2025$, and $20+25=45$,

also 9, 55, 99

Devlali or self number:

- In 1963, Kaprekar defined the property which has come to be known as self numbers, as the integers that cannot be generated by taking some other number and adding its own digits to it.
- For example, 21 is not a self number,

  since it can be generated from 15

  $$15 + 1 + 5 = 21.$$
- But 20 is a self number, since it cannot be generated from any other integer.

Harshad number:

- Kaprekar also described the harshad numbers
- which he named harshad, meaning "giving joy”
- these are defined by the property that they are divisible by the sum of their digits.
- Thus 12, which is divisible by 1 + 2 = 3, is a harshad number.

  Ex: 18 which is divisible by 1+8 = 9

Demlo number:

- Kaprekar also studied the Demlo numbers
- Demlo is a train station 30 miles from Bombay on the then G. I. P. Railway where he had the idea of studying them.
- The best known of these are the Wonderful Demlo numbers 1, 121, 12321, 1234321, ..., which are the squares of the repunits 1, 11, 111,1111, ...[11]

POLITE NUMBER:

- In number theory, a **polite number** is a positive integer that can be written as the sum of two or more consecutive positive integers.

  Ex: $10 = 1 + 2 + 3 + 4$

  $13 = 6 + 7$

- The first few polite numbers are

  3, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, .

Perfect number:

- **Perfect number**, a positive integer that is equal to the sum of its proper divisors.
- The smallest perfect number is 6, which is the sum of 1, 2, and 3.

  factors of 6 are 1 , 2, 3 (other than self)

  $$6 = 1 + 2 + 3$$

- Other perfect numbers are 28, 496, and 8,128.

  factors of 28 are 1 , 2, 4, 7, 14

  $$28 = 1+2+4+7+14$$

ABUNDANT NUMBER:

- In number theory, an **abundant number** or **excessive number** is a number that is smaller than the sum of its proper divisors.
- The integer 12 is the first abundant number.
- Its proper divisors are 1, 2, 3, 4 and 6

  $12 < 1+2+3+4+6$

- The amount by which the sum exceeds the number is the **abundance**.
- The number 12 has an abundance of 4

  abudance of 12 is $16 - 12 = 4$

Thank you 😊