National Mathematical year –
A holistic review of Indian Mathematicians and its impact

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Abstract

Declaration and celebration of the year 2012 as National Mathematical Year was a great tribute to a great Indian Mathematician Ramanujan. In the competitive world, life is complex without Mathematics. It enables human being to be logical in thinking. It has a great influence on human life; for the development of Mathematics as a Science, Indian Mathematicians have contributed a lot. Their theories and work has become a base for many Mathematical formulae. In spite of this our students are unaware of contributions of Indian Mathematicians. It is very much essential to know the contribution of Mathematicians in the development of Mathematics. Indian Mathematicians like Aryabhatta, the first one to give formula for area of triangle, also known for Value number system and enormous contributions to the theory of numbers and indeterminate equations. His Aryabhatiya is used to solve astronomical problems whereas his Aryabhatsiddhanta is used in preparing Hindu Calendars. Brahmagupta is known for Geometry with a significant contribution of introducing “zero” to the number theory. He is a founder of “Numerical Analysis.” Shridhar, followed by Brahmagupta gave a book on Algebra which even Bhaskar referred it. Later Mahaviracharya wrote Ganit Sara Sangrah, which is the first text book on Arithmetic in present day form. Bhaskarachrya (Bhaskar II, a founder of differential calculus, known for its Arithmetic. He is the first one to recognize the certain types of quadratic equations could have two solutions. He introduced cyclic process “chakrwal” to solve algebraic equations which was later rediscovered an inverse cyclic by Europe Mathematicians like Galio, Euler and Lagrange. His basic idea on ‘differential coefficient’ is known as ‘Rolle's theorem’ which was later developed by Newton and Leibnitz. Ramanujan known for its Mathematical number theory, infinite series and continued fractions and notion of zero, his collaborative work of British Mathematician G. H. Hardy resulted into 'Reimann Hypothesis’ and found many applications in Crystallography and String Theory. To nurture the glorious tradition of Indian Mathematician and become knowledge power, the students need to know their contributions and the significance of Mathematics and its applications. The paper is review on a few of those Mathematicians to trigger thought process in the similar direction.

Key words:
Mathematics, Algebra, Aryabhatta, Brahmagupta, Bhaskara- I, Bhaskar-II, Mahaviracharya, Ramanujan

1.1 Introduction

Government of India has celebrated a year 2012 as a National Mathematical Year and 22nd December as National Mathematics Day. Prime Minister Manmohan Singh declared 22nd December as the 'National Mathematics Day' and 2012 as the ‘National Mathematical year’ to pay a tribute to a great Indian Mathematician Srinivasa Ramanujan and mark his 125th birth anniversary on 22nd December. Celebration of 2012 as National mathematical year is for two reasons; one is to know the emptiness of mathematical awareness in Indian Students, a tribute to Ramanujan and to raise a voice on inadequate number of competent mathematicians. This paper attempts to know the relevance of National Mathematical year, to know the contributions of Indian Mathematicians and to know the importance of Mathematics.
1.2 Importance of Mathematics

Mathematics being the universal language, have forced today to make ourselves to know its importance. It is a subject which fosters logical and rigorous thinking and having a tremendous influence on human life which is a necessary part of our life. The world today has recognized the significance of Mathematics, without which higher technology cannot be mastered and go to see; the world is progressing in every sector with the help of technology. Since Ancient times Mathematics has been used, as a branch of knowledge, it has so many developments over the centuries, but the world has understood the application of Mathematics and realized that without the application of Mathematics the progress of Society and country is just impossible. It was mentioned by Napoleon that, “the progress and the improvement of Mathematics are linked to the prosperity of the state”. Without Mathematics, higher technology cannot be mastered, so is the advancement of Science, which leads to increase the production of goods and services which promotes the human welfare. Dr. Mangal (1971) says, today’s societal set up is totally governed by the scientific and technological knowledge which can only be attained by the study of Mathematics. He says ignorance about Mathematics is the bottleneck for the progress of nation or society. Mathematics is responsible for giving us a system, organization and essential abilities for leading a successful life. Hence learning and researches in Mathematics is inevitable. Indians gave special importance to the development of Mathematics and their significant contributions in Mathematics were in developing arithmetic, algebra, geometry, infinite series expansions and calculus. The world also recognizes the Indians’ knowledge of Mathematics. The contributions of Indian Mathematicians are recognized all over the world, but unfortunately the students are unaware of their contributions, the significance of Mathematics and its application.

Since ancient times, Indian Mathematicians have contributed in the development of Mathematics, and the evidence for Indians’ Mathematical knowledge is Indus valley civilization. The excavations of Mohan-Jo-Daro and Harappa are the indicators of Indians’ knowledge on numbers. The pottery and archeology exhibits the knowledge of geometry and measurement. The Indian Mathematicians like Aryabhat, known for Value number system, Brahmagupta known for Geometry, Bhaskarachrya known for its Arithmetic and Ramanujan- known for its Mathematical analysis number theory, infinite series and continued fractions and notion of zero. It is the need of the hour to carry forward the legacy of great Mathematicians so as to encourage and nurture the glorious tradition of the country in Mathematics. The country needs to produce more Mathematicians of the caliber of Ramanujan to become a knowledge superpower in the world.

Kim Plofker from Netherlands says that “Indian Mathematical Science is extremely important and has a significant effect on the world’s knowledge as it is today. The lack of available resources has kept us under informed about the developments that have taken place in India.”

G. Krishnakumar during the International congress on Mathematical Education in Seoul shows concern on the status of Mathematics Education. He mentions that to understand the depth of some areas where Mathematics is used, there is the need of awareness of history of Mathematics and students should understand the relationship of Mathematics with other disciplines and society.

1.3 Mathematical Contributions by Indian mathematicians

History reveals that animals, birds and insects had a great sense of numbers than human beings. Numbers were used by them but to name these numbers, it took long time. since the acquaintance of numbers to the world, man was trying to find the methods of computation with great speed and accuracy. Way back 3000B.C, Egyptians, Sumerians, Babylonians, Greeks, Romans, Chinese and Indians were trying to develop notion system to express the place value of the numbers. Then the invention of zero and place value system made it possible to write any numbers with the help of any
ten symbols 0,1,2,3,4,5,6,7,8,9. And these two miracles on inventions are given by Indian Mathematicians for which French Mathematician Laplace appreciated these Indian Mathematical inventions by mentioning “this Indian invention picks up its new height when we recall that the most talented great Mathematicians like Archimedes and Apollonius failed to discover such simple but essential system”. Let us discuss the significant contribution by some of Indian Mathematicians and how their basic theories have helped in further mathematical developments.

1.3.1 Aryabhata I

A Mathematician, born on 21st March A.D. 476 in Kerala and lived in Kusumapura, a city near Pataliputra(Patna) in Bihar. He contributed the establishment of alphabetic system, decimal numbers, extraction of square and cube roots, construction of trigonometrically sine tables, tables of astronomical constants, areas of triangles, trapezium, volume of pyramids and sphere, epicycle models of a planetary notion, rotatory and revolutionary processes of planets, movementary directions of planets, determination of days and nights and of weeks and months.

He is an author of ‘Aryabhatiya’ and he gave mathematical rules at the age of 23. It was marked as the start of new scientific tradition in India. It was later studied and analyzed over the centuries by famous Indian Mathematicians & astronomers like Bhaskara of 7th century, Paramesvara of 15th century and Nilakantha of 15th-16th century. His work on Astronomy is known by Aryabhata-Siddhanta.

Aryabhatiya is a small work written in traditional Indian form of distinctly metrical verses made up into four parts of the treatise
1. Dasagitika or tengiti stanzaz
2. Ganitapada or Mathematics
3. Kalakriya or the reckoning of time
4. Gola or the sphere

Though the sources of rules or proofs are not mentioned anywhere nevertheless Aryabhatiya treats the diverse problems of arithmetic, algebra, geometry, theory of numbers, trigonometry and astronomy.

Though he cited only the Rule of Three ( teaches to find a number x forming with the three given numbers a, b, c with rule of proportion a/b = c/x) but later it became the fundamental rule for the Rule of Five, Seven etc., only in India this rule was translated into problem solving methods. Aryabhata formulated the rule of solving the linear equations whereas introduced a formula to calculate the time of meeting of two planets moving in opposite direction or same direction. If “s” is the distance between two bodies with velocities v₁ and v₂, the time of meeting is

\[ t = \frac{s}{v_1 + v_2} \] when the bodies move in the opposite direction

\[ t = \frac{s}{v_1 - v_2} \] when the bodies move in the same direction

Aryabhata formulates the solution in such a way as to avoid introducing negative numbers, which are later adopted by Bramagupta and used it regularly. Several problems in Aryabhatiya lead to quadratic equation to find the number of terms in an Arithmetic Progression and calculation of interest. The rules of summation of natural squares and cubes and other series which were previously known to Babylonians and Greeks were stated by Aryabhata.

His enormous contributions were to the theory of numbers and indeterminate equation. In fact Greek Mathematician Diophantus was concerned with rational solution of indeterminate equations whereas Aryabhata tried to solve these equations in positive integers whereas other Indians also tried
for positive integers. In fact he was the first in the world literature to formulate very elegant methods of integer solution of indeterminate equation of the first degree, Aryabhata’s geometrical rules include

1. Area of triangle $A = \frac{1}{2}bh$

2. Volume of pyramid = base area * $\frac{1}{3}$ height which was refined by Sridhara and gave a formula as volume of pyramid = base area * $\frac{1}{3}$ height.

3. Aryabhata calculated volume of sphere by formula as $V = \frac{4}{3}\pi r^3$ which was later refined by Bhaskara II and stated that volume of sphere = $\frac{4}{3}\pi r^3$.

4. Aryabhata gave the value of constant $\pi$ = $\frac{62832}{20000}$ upto four decimals i.e. 3.1416.

5. Zij- al-arjabhar is the translation of treatise in Arabic during 8th century. His contribution given in Aryabhatiyam are accepted and adopted to solve many astronomical problems.

The first Indian built satellite launched by a Soviet Rocket in 1975 was in honour of Aryabhata. His some Mathematical and astronomical innovations were carried out by Brahmagupta whereas his ideas were inherited by West European Scientists. Aryabhatidsiddhanta is used in preparing Hindu Calenders (panchangs). Aryabhat was the first one in Indian Mathematics to give the formula for the area of a triangle. Aryabhat introduced the concept of infinitesimal in terms of basic differential equation, which was elaborated by Manjula in 10th century and Bhaskaracharya in 12th century and derived the differentials of the sine function and again it was used by Mathematicians in deriving the areas of curved surfaces and volumes.

1.3.2 Brahmagupta-

Born in Ujjain about 598 A.D., gave Brahmasphutasiddhanta in his 30th year, Khandha- Khadyaka in his 67th years. One of his most contributions to Mathematics was ‘Introduction of zero’ to the number system and concept of negative numbers.

Brahma-Sphuta-Siddhanta had many rules of arithmetic which is part of the mathematical solutions now. These are ‘a positive number multiplied by a positive number is positive’, a positive number multiplied by a negative number is negative’, ‘a negative number multiplied by a negative number is negative’. He gave $\sqrt{10}$ as the value of $\pi$ and 3 as its practical value. In his arithmetic, he explained how to find cube and cube roots of an integer and gave rules facilitating the computation of squares and square roots. He also gave the rules for dealing with five types of combinations of fractions.

$$\sum n^2 = \frac{n(n+1)(2n+1)}{6}$$

$$\sum n^3 = \left[\frac{n(n+1)}{2}\right]^2$$

It introduces the study of solar and lunar eclipses, planetary conjunctions and positions of the planets and calculation of length of the year as 365 days 6 hours 19 seconds, algorithm for computing square roots, solution of indeterminate equations of the form $ax+c = by$, $ax^2+c = y^2$, $ax^2-c = y^2$ etc., he gave a beautiful method to generate infinitely many integer solutions of the single equation $Nx^2+1 = y^2$, where $N$ is a non square integer, starting with one trial solution. He pointed that he could not mention how the first trial solution can be found. For small values of $N$, it can be guessed easily. Later these equations were explored by European Mathematicians and there is a rich and interesting theory created by number theorist. He gave method of finding the area of a cyclic quadrilateral with sides $a$, $b$, $c$, $d$ as

$$\sqrt{(s-a)(s-b)(s-c)(s-d)}$$

and length of diagonals in terms of sides as

$$\sqrt{\frac{(ab+cd)(ac+bd)}{ad+bc}}$$

Brahmagupta in his khand- khadyaka which consists of study of the topics covering the longitudes of the planets, lunar eclipses, solar eclipses, rising and setting, the moon’s crescent and conjunction of the
planets. He introduces interpolation formula for computing values of sines. He is recognized as Indian Mathematician and Astronomer. He thought 1÷0=0, which was proved wrong by Bhaskara-I and he proved that it is infinity whereas Modern view says that a number divided by zero is undefined. He is a founder of branch of higher Mathematics known as “Numerical Analysis”. A translation of Brahmagupta that the Arabs became aware of Indian astronomy and Mathematics.

1.3.3 Bhaskara I

An Indian Mathematician, who was considered as the follower of Aryabhata. He was the first person to write numbers in Hindu Arabic decimal system with a circle for zero. Born about 600 A.D in Saurashtra, India. He expanded on the trigonometric equations provided by Aryabhat whereas he did pioneering work in indeterminate equations. He primarily developed Aryabhatta’s principles of astronomy. His work is in three forms, the Mahabhaskariya, Laghubhaskariya and Aryabhatiyabhasya. In Mahabhaskariya, he discusses topics such as the longitudes of the planets, conjuction of the planets with each other and with bright stars, eclipses of the sun and the moon, rising and settings and lunar crescent. Parts of it were later translated into Arabic. Gave an approximation to trigonometric sine function by giving the formula \[ \sin X = \frac{16x(\pi - x)}{5\pi^2 - 4(x(\pi - x))} \] with leads to a maximum error of less than 1%.

Aryabhatiyabhasya is the commentaries on Aryabhata’s work, he found a method to solve intermediate equation of the first degree with two remainders and also considers problems relating to trigonometric formulas.

He is the one who expressed his idea on how one particular rectangle can be treated as a cyclic quadrilateral. He is the first person to open discussion on quadrilaterals with all the four sides unequal and none of the opposite sides are parallel. He criticized the approximation of \( \pi \) as \( \sqrt{10} \) and believed that \( \pi \) was not rational. His algorithm method to solve linear indeterminant equations was later suggested by Euclid and formulated certain tables for solving equations that occurred in astronomy. Brahmagupta and he contributed the study of fractions to Mathematics. His assertion that if \( p \) is a prime number, then \( 1+ (p-1)! \) Is divisible by \( p \), is now known as Wilson’s theorem.

1.3.4 Mahaviracharya:

Jain Mathematician of 9th century from Malkhed near Gulbarga from Karnataka, wrote Ganita- sara Sangraha in A.D. 850, which consists mostly Pure Mathematics, giving operations with numbers, squaring and cubing, square roots and cube roots, summation of arithmetic and geometric series, fractions, rules of three, mensuration and algebra. He is the first person to find out that real square roots of negative numbers can not exit. Special features of Mahaviracharya’s Mathematics consists of garland product, finding cube of a number using Arithmetic progression and finding areas bounded by circles. the currently used methods of calculating least common multiple of the given numbers were described by him and derived formulae to calculate the area of ellipse.

1. In the garland product of two numbers, the numbers equidistant from the beginning and end are equal. E.g.: \[ 14287143 \times 7 = 100010001, \quad 11011011 \times 91 = 1002002001, \quad 27994681 \times 441 = 12345654231 \]

2. The sum of \( n \) terms of an Arithmetical progression with \( a=n, d=2n \) and \( n=n \) gives the cube of a number \( n \), \( S_n = n+3n+5n+\ldots\ \to \ n \ terms = n^3 \),\n\[ S_n = 5+15+25+35+45=125=5^3 \]

3. If three equal circles touch each other, then the area \( A \) of the region bounded by the arcs of these circles is given by \( A= \) area of the equilateral triangle -1/2 area of one of the circles where the equilateral triangle is formed by the centers of the three circles and each side of the triangle is equal to the diameter \( d \) of each of the circles.

\[ A = \frac{\sqrt{3}}{4} \times \left( \frac{d}{2} \right)^2 - \frac{\pi}{4} \times \left( \frac{d}{2} \right)^2 \]
\[ A = \frac{\sqrt[3]{3}}{4} d^2 - \frac{1}{2} \left( \pi d^2 \right) \]

He also gave techniques for least common denominator, for combinations, for solving linear, quadratic as well as high order equations, for calculating areas and volumes.

### 1.3.5 Bhaskaracharya

He is known as Bhaskar or Bhaskar II. He was the first to recognize the certain types of quadratic equations could have two solutions

Born in Bijjada Bida (present Bijapur) in Karnataka. Most prominent Mathematician and astronomer of 12th century born on 1185 A.D. his treatise were named as Siddhantshiromani of which two treatise Lilavati (arithmetic) and Bijaganita (Algebra) were exclusively mathematical whereas other treatise like Goladhaya (sphere) and Grahaganita (Mathematics of planets) deals with astronomy. He was known in the discovery of the principles of differential calculus and its application to astronomical problems and computations. He was first to conceive the differential coefficient. His work on calculus predates Newton and Leibniz by over half a millennium whereas there is a strong evidence that Bhaskara was pioneer in some of the principles of differential calculus. Gives the solutions of a cubic and a biquadratic equations in his Bijaganita

1. Gave the formula \[
\pm \sqrt{a \pm \sqrt{b}} = \frac{a + \sqrt{a^2 - b}}{2} \pm \frac{a - \sqrt{a^2 - b}}{2}
\]
2. Introduces the method of solving the equation \( NX^2 + k = y^2 \), when \( K = -4, -2, -1, 1, 2, 4 \). He referred this method as chakravala or the cyclic process. This method was rediscovered as inverse cyclic by European Mathematicians like Galois, Euler and Lagrange.
3. Introduces the concept of instantaneous motion of a planet and distinguishes between average velocity and accurate velocity in terms of differentials if \( y \) and \( y' \) are the means anomalies of a planet at the ends of consecutive intervals then Bhaskaracharya introduces the formula \( siny' - siny = (y' - y) \cos y \) which is equivalent to the result \( d (siny) = \cos y \). Dy, where \( d \) is modern notation for differential operator.
4. The concept of infinity was brought first time by him. He described a wheel that could run forever, which is a great contribution to engineering field.
5. Concepts of permutation and combinations were explained by him with examples, which have become the foundation for decision making disciplines.
6. Introduced the formulae like area of sphere = \( 4 \times \text{area of circle} \)
7. Volume of sphere = \( \text{area of sphere} \times \frac{1}{6} \text{of its diameter} \)
8. \( \sin (a \pm b) = \sin a \cos b \pm \cos a \sin b \)

Bhaskara originated fundamentals of Rolle’s theorem was later developed by Newton & Leibnitz. The famous French Mathematician Fermat, in 1657 A. D. proposed equation \( NX^2 + k = y^2 \) with \( N = 61 \) for solution as a challenge to his contemporaries, none of them throughout the western world succeeded in solving the equations in integers till 1767 A. D., whereas Euler by Lagrange’s method of continued fractions, had a complete solution to such types of equations, wrongly called Pell’s equation by Euler. But the very same equation, though coincidentally, was completely solved by Bhaskara II five hundred years earlier.

### 1.3.6 Ramanjuan (1887-1920)

A wonderful young Mathematician of 20th century from Tanjore district of Madras state. He tried to generalize that any number divided by itself was unity. In his short span of life his Mathematical contributions are significant. His independent work in Mathematics especially on some properties of Bernoulli’s numbers was published in the form of articles in Journal of Indian Mathematical Society. Some of his achievements are:
1. Divergent series. He sent 120 theorems on divisibility properties of the partition function.
2. Hyper geometric series and continued fractions give insight into algebraic formulae, transformation of infinite series.
3. Definite integrals
4. Elliptic functions
5. Fractional differentiation in which he gave meaning to Eulerian Second integral for all values of all values of n. He proved that the integral of $x^{n-1} \ e^{-x} = \text{Gamma}(\gamma)$ is true for all values of $\gamma$
6. The theory of numbers, he tried to discover the Riemann’s series concerning prime numbers by himself. He showed remarkable powers to solve the unsolved problems like Goldbach’s theorem, which states that even number is the sum of two prime numbers.
7. One of his greatest inventions was “interesting number”, which is supposed to be the smallest number expressible in the form of sum of two cubes in two different ways, $1729 = 1^3 + 12^3 = 9^3 + 10^3$.
8. His contributions are there in finding solution to Fermat Theorem (which states that a prime number of the form 4m+1 is the sum of two squares) through papers.
9. Highly composite numbers, its structure, the distribution and its special forms are studied by him.

All the concepts above mentioned and its analysis given by Ramanujan and his extraordinary mastery over the algebra of inequalities were also appreciated by Prof. G.H. Hardy, a leading Mathematician of that time.

Ono, a number theorist along with his two colleagues and former students Amanda Folson from Yale and Rob Rhoades from Stanford, presented a formula for mock modular forms that may be useful to physicists who study black holes during Ramanujan’s 13th conference at University of Florida. Jaccobi discovered originally modular form. Ono says “no one was talking about black holes in 1920’s when Ramanujan came up with mock modular forms and yet, his work may unlock secrets about them” he also says that new formula based on Ramanujan’s vision may allow Physicist to compute their entropy.

G. H. Hardy, the British Mathematician known for his achievements in number theory and Mathematical Analysis was a friend of Ramanujan. He brought Ramanujan to Cambridge University. The self taught and obsessive Indian genius Ramanujan had managed to prove all of Riemann’s results and more with almost no knowledge of developments in the western world and no formal tuition. Hardy and Ramanujan collaborated on many Mathematical problems and their joint efforts resulted into Riemann Hypothesis and have found many applications in fields like Crystallography and string theory.

Ramanujan proved more than 3000 theorems, identities and equations including properties and equations of highly composite numbers, the partition function. Ramanujan identified converging infinite series for the calculation of the value of $\pi$, some of which could compute eight additional decimal places of $\pi$ with each term in the series and it has become the basis for the fastest algorithm used by modern computers to compute $\pi$, to ever increasing levels of accuracy. His prime and the theta function inspired for further research. Ramanujan had left behind several notebooks. With theorems which were not published, later other Mathematicians continued to study it. English mathematician G. N. Watson published 14 papers under the general title theorems stated by Ramanujan and published 30 papers which were inspired by Ramanujan’s work.

In fact for a long time it was thought that Bhaskara II represented the end of mathematical developments in the Indian subcontinent until modern times. However Mahendra Suri wrote first Indian treatise and Narayana wrote an important commentary on Bhaskara II resulting into contributions to algebra and magic squares. However during this period, Madhava invented Taylor series.
In fact Charles Whish in 1835 was the first person in modern times to realize that the mathematicians of Kerala had anticipated some of the results of the Europeans on the calculus by nearly 300 years. Newton- Gauss interpolation formula, formula for circum radius of a cyclic quadrilateral are based on some of the remarkable discoveries of the Kerala mathematicians. Another Kerala mathematician Madhava, gave a series for π, translated into the language of modern mathematics, reads \[ \pi R = 4R - 4R/3 + 4R/5 - \ldots \] was rediscovered by European mathematicians several centuries later. One of these formula leads to the approximation 3.14159265359. He also developed the world’s most consistent system of trigonometry. Varahmira, a Mathematician compiled Aryabhat’s written texts on astronomy and made important additions to Aryabhat’s trigonometric formulas. His works on permutation and combinations complemented the method of calculation of \( ^nC_r \), which closely resembles the recent Pascal’s triangle. Sridhar wrote a book on algebra, ‘Patagonia’ in 750 A.D whereas in 850 A.D. Mahavirachrya wrote Ganita Sara Sangrah, in present day it is the first book on Arithmetic.

Conclusion

In today’s scenario, one cannot digest the progress of Science and Technology without zero. There is always an argument that “inventing zero is not rocket science” but there is no rocket science without zero. No doubt, the whole world has recognized outstanding contributions in the field of Mathematics. It is even true that all the outstanding contributions made by Indian Mathematicians are over many hundreds of years and it all started with Aryabhat 500 AD. His work was the summary of Jain Mathematic and the beginning of new era of Astronomy and Mathematics. He introduced trigonometry to make astronomical calculations and also solved indeterminate equations. Aryabhata formulates the solution in such a way as to avoid introducing negative numbers, which are later adopted by Brahmagupta and used it regularly. The rules of summation of natural squares and cubes and other series which were previously known to Babylonians and Greeks were stated by Aryabhata. The rule of three (rule of proportions) given by him became the base for Rule of Five and seven etc. Then was Brahmagupta, founder of numerical analysis, in seventh century to introduce major contributions on negative numbers and zero. The progress of Mathematics from ninth century saw developments in sine tables, solving equations, algebraic notations, indeterminate equations, quadratics and number systems followed by his thought 1÷0=0, which was proved wrong by Bhaskara-I and stated it as infinity whereas Modern view says that a number divided by zero is undefined. A follower of Aryabhat, Bhaskara I, introduced Hindu Arabic decimal system and the concept of cyclic quadrilateral whereas he was the believer of π as irrational number. His theorem on prime number is known by Wilson’s theorem now. Mahaviracharyya contributions include garland product, finding cube of a number using Arithmetic progression and finding areas bounded by circles. Bhaskaracharya or Bhaskar II came up with infinity, known for discovery of the principles of differential calculus and its application to astronomical problems and computations and originated fundamentals of Rolle’s Theorem. One among the genius Indian Mathematicians was Ramanujan, whose vision and work in Mathematics has become the foundation for many theories. He proved more than 3000 theorems, identities and equations including properties and equations of highly composite numbers, the partition function. Ramanujan identified converging infinite series for the calculation of the value of π upto eight additional decimal places of π and it has become the basis for the fastest algorithm used by modern computers to compute π. His collaborative work with British mathematician, G.H. Hardy resulted into Riemann Hypothesis and has found many applications in fields like Crystallography and string theory. His interesting invention was about number 1729. Many research papers in mathematics are inspired by Ramanujan’s work. Some of the other contributions by Mathematicians like Varahmira was additions to Aryabhat’s trigonometric formulas and method of calculation of \( ^nC_r \), which resembles Pascal’s triangle. Madhava invented Taylor series.

In spite of all 2012 year was declared as National mathematical year to pay tribute to a Ramanujan to awake the students to think about their growth and progress by understanding the contributions of Indian Mathematicians. To encourage and nurture the glorious tradition of the country in Mathematics,
the country needs to produce more Mathematicians of the caliber of Ramanujan to become a knowledge superpower in the world.

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