International Journal of Humanities & Social Science Studies (IJHSSS)
A Peer-Reviewed Bi-monthly Bi-lingual Research Journal
ISSN: 2349-6959 (Online), ISSN: 2349-6711 (Print)
ISJN: A4372-3142 (Online) ISJN: A4372-3143 (Print)
Volume-IX, Special Issue, June 2023, Page No. 104-110
Published by Scholar Publications, Karimganj, Assam, India, 788711
Website: http://www.ijhsss.com
DOI: 10.29032/ijhsss.v9.iSpecial.2023.104-110

Some Glimpses of Indian Mathematicians

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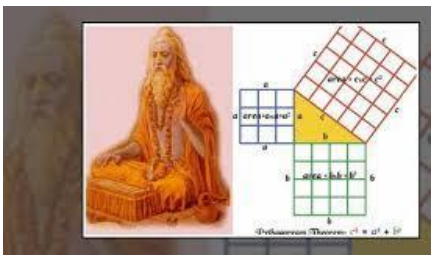
Abstract:
The practice of mathematics has attracted attention in India since ancient times. Many new formulas and theories of mathematics have been discovered in India. Many theories and formulas which were discovered much later at the international level were practiced in India long before that. Some of which are internationally recognized and many are not. Indian mathematicians continued their relentless efforts without any hope of recognition. Now we will highlight some of the shining stars of mathematics who have enriched the practice of mathematics in India.

Keywords: Indian, Mathematician, Ancient.

"An equation means nothing to me unless it expresses a thought of God" ... Srinivasa Ramanujan.
"Mathematics is the gateway and key to all Sciences"..... Roger Bacon.

The practice of mathematics has attracted attention in India since ancient times. Many new formulas and theories of mathematics have been discovered in India. Many theories and formulas which were discovered much later at the international level were practiced in India long before that. Some of which are internationally recognized and many are not. Indian mathematicians continued their relentless efforts without any hope of recognition. Now we will highlight some of the shining stars of mathematics who have enriched the practice of mathematics in India.

Baudhayana (approx 800BC-740BC) , who was also a priest. He is noted as the author of the earliest 'SulbaSutra'(Baudhayana Sulbasutra), which contained several important mathematical results. The value of pi (π) was first calculated by him. What is known as Pythagoras theorem today is already found in Baudhayan's SulvaSutra, which was written several years before the age of Pythagoras. Baudhayana gives the length of the diagonal of a square in terms of its sides, which is equivalent to a formula for the square root of 2. Some theorems about diagonal of rectangle, rhombus are found in his writings.

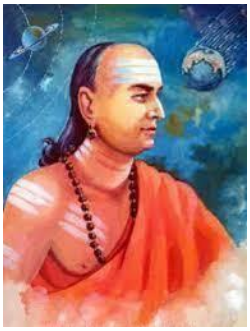


Acharya Pingala (approx 3rd-2nd century BCE) was an ancient Indian poet, mathematician and the author of the Chandahsastra (Pingala-sutras) .

The Chandahsastra presents the first description of a binary number system. Pingola's work also includes material related to the Fibonacci numbers. The concepts of Permutation-Combination, Pascal's triangle are found in his writings.
Names like Panini, Bharatmuni etc. are heard in ancient Indian mathematics practice.

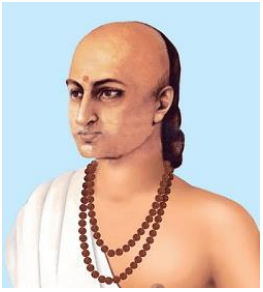
Aryabhata (Born:- 476 AD, Patliputra , Patna ; Died:- 550 Ad, Patliputra, Patna) :- He was the most notable mathematician and astronomer of the classical era. He flourished extensively during the Gupta period.

The First unmanned Earth satellite built by India was named after "Aryabhata", in his memory. The works for which he is noted are: Explanation of Solar eclipse & lunar eclipse, reflection of light by moon, rotation of Earth on its axis, value of pi(π) correct to four decimal places, diameter of earth, solution of single variable quadratic equation. He did most of his work at Nalanda University. Many researchers say that Aryabhata served as the head of Nalanda University.



Varahamihira (possibly 505CE- 587CE) :- Varahmihira was a famous philosopher, astronomer, mathematician and poet contemporary to the Gupta Empire. He wrote a great anthology called " Panchasiddhantika", which contains the essence of Greek, Egyptian, Roman and Indian astronomy during his life time. Apart from astronomy, he was proficient in mathematics, archaeology, meteorology and architecture.

He was one of the reformers of Indian calendar. He is the one who introduced the practice of taking Baisakh as the first month while counting the year. Varahamihira constructed a type of table to solve the problem (Combination) of selecting 'R' number of objects from 'N' number of objects in a different way. This table was rediscovered many centuries later in Europe under the name " Pascal's Triangle".

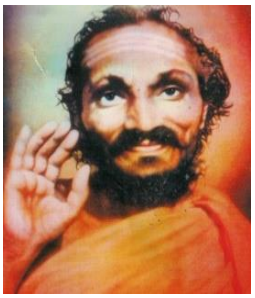


Brahmagupta (Born:- 598AD, Bhinmal, Rajasthan ; Died:- 668AD, Ujjain, Chalukya Empire) was an Indian mathematician and astronomer, author of " Brahmasphutasiddhanta" & " Khandakhadyaka".

The works for which he is noted are : Brahamagupta's theorem, Brahmagupta's identity , modern number system, rules for computing with zero, Brahmagupta-Fibonacci identity, Brahmagupta's interpolation formula etc. He described gravity as an attractive force.

Bhaskar-I (Born:- 600CE, possibly Saurastra or Asmaka; Died:- 680CE, possibly Asmaka, Telangana & Maharashtra):- Bhaskara was a famous Indian mathematician and astronomer of the 7th century. He wrote the first number in the Hindu-Arabic decimal system with a circle for zero.

He gives a unique and remarkably reasonable estimate of the sine function found in Aryabhata's work. He is particularly known for the sine approximation formula of Bhaskar-I. On 7june 1979, the Indian Space Research Organization launched the Bhaskara-I satellite in his memory.



Sridhara Acharya (Born:- 870 AD Bhurisresti village, Hugli, WB ; Died:- 930 AD):- He was the first person to give an algorithm for solving quadratic equations, which is equally used today.

He gave special explanation on the concept of zero. He separated algebra from arithmetic. He wrote on the practical applications of algebra. Two famous books written by him were "Trisatika" and "Patiganita" . In Trisatika he wrote three hundred verses. " Ganitapancavimsi" is another mathematical treatise which according to some historians was written by Sridhara Acharya.

Brahmadeva (1060-1130) Was the author of " Karanaprakasa" , a commentary on Aryabhatiya by Aryabhata. Its content deals with some trigonometric and astronomical applications.

Notable among his works were mean longitudes of the planets, solar eclipses, lunar eclipse, lunar crescent, planetary conjunctions and latitudes.

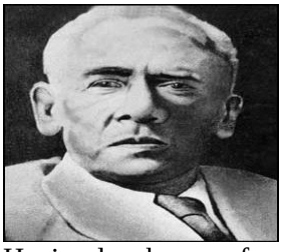
Bhaskara-II / Bhaskaracharya (Born:- 1114 AD, Vijjadavida, Maharashtra ; Died:- 1185AD, Ujjain) :- "Siddhanta-siromani" was his main work. The first section Lilavati (Patiganita) of Siddhanta-siromani , named after his daughter, contains of 277 verses.

It covers calculations, progressions, measurement, permutations and other topics. The second section Bijaganita (Algebra) has 213 verses. It discusses zero, infinity, positive and negative numbers and indeterminate equations. In the third section Grahaganita, while treating the motion of planets, he considered their instantaneous speeds. He wrote another treatise called " Karna-kautuhala" . His contributions to mathematics were proved of the Pythagorean theorem, preliminary concept on differential calculus & integral calculus; solution of quadratic, cubic and quadratic indeterminate equations . He developed spherical trigonometry along with a number of other trigonometric results. His mathematical astronomy text Siddhanta-siromani was written in two parts: 1- Mathematical astronomy, 2- Sphere.

Ashutosh Mukherjee (Banglar Bagh) (28 June 1864- 25may 1924) was an eminent judge, mathematician and educationist from Calcutta. His contribution in making Calcutta University a great institution is immeasurable.

At the age of seventeen, he wrote an article, "New Demonstration of proposition in Euclid" in messenger of mathematics of the Cambridge University(1881) . It was so well received that he was accepted as a member of the London Mathematical Society. Some of his articles on mathematical problems become popular as Mookharjee's theorems and were included in the curriculum of the Cambridge University. In 1908, he established the Calcutta Mathematical Society.

Syamadas Mukhopadhyaya (Born:- June 22, 1866, Horipal, Hooghly, WB ; Died:- 8 May 1937) introduced the four-vertex theorem and Mukhopadhyaya's theorem in plane geometry.

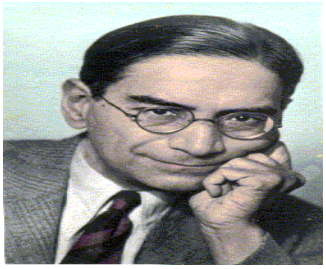


He is also known for non-Euclidean geometry and differential geometry. He was awarded the Griffith prize and worked in various institutions (Rajabazar Science College, Bangabasi College, Bethune College) . He was the president of the Calcutta Mathematical Society.

Srinivasa Ramanujan (Born:- 22 December 1887, Erode, Mysore state ; Died:- 26 April 1920, Kumbakonam, Madras):- He is most famously known for his contribution in analytical theory of numbers, continued fractions, infinite series , elliptic functions.

The works for which he is world famous are: Ramanujan's sum, Ramanujan prime, Hardy-Ramanujan asymptotic formula, Mock theta functions, Ramanujan conjecture, Landau-Ramanujan constant, Ramanujan-Soldner constant, Rogers-Ramanujan identities, Ramanujan's Master theorem, Ramanujan-Sato series. National Mathematics Day has been celebrated every year on 22nd December to make the birth anniversary of Srinivasa Ramanujan.

Prasanta Chandra Mahalanobis (29 June 1893, Calcutta - 28 June 1972) :- His areas of work were mathematics and statistics. He is remarkable for the Mahalanobis distance, a statistical measure . He was the member of the first planning commission of free India.



Mahalanobis has been considered the father of modern Statistics in India. He was awarded the Padma Vibhushan in 1968. Mahalanobis was a Fellow of the Royal Society and was awarded the Weldon Memorial Prize (1944).

Satyendra Nath Bose (1 January 1894, Calcutta – 4 February 1974) was an Indian mathematician and physicist noted for his collaboration with Albert Einstein in developing theory regarding the gaslike qualities of electromagnetic radiation. He received a B.Sc. degree in mixed Mathematics from Presidency College (1913) . Then he joined Sir Ashutosh Mukherjee's newly formed Science college where he topped the M.Sc. mixed Mathematics examination and then started research in the theory of relativity.

He became known throughout the world for his work on quantum mechanics in the early 1920s in developing the foundations for Bose statistics and the theory of Bose condensate. He was awarded the Padma Vibhushan in 1954. Some of his own independent work and some of his work with Einstein have had worldwide influence.

Subbayya-Sivasankaranarayana Pillai (Born: 5 April 1901, Vallam, Tamil Nadu ; Died: 31 August 1950, He died in a plane crash in Egypt on his way to a conference of the International Congress of Mathematics at Harvard University.) : Pillai was a famous Indian mathematician, specialized in number theory.

According to KS Chandrasekharan his contribution to Waring's problem was definitely his best work and one of the greatest achievements of Indian mathematics after Ramanujan. The works for which he is famous are: Pillai prime, Pillai sequence , Pillai's conjecture, Pillai's arithmetical function.

Raj Chandra Bose (Born: 19 June 1901 , Narmadapuram, Madhya Pradesh ; Died:- 31 October 1987, Fort Collins, Colorado) :- Notable among his works were design theory, finite geometry and the theory of error-correcting codes.

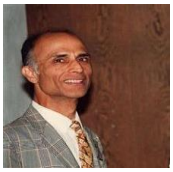
He also invented the notions of partial geometry, association scheme and strongly regular graph and started a systematic study of difference sets to construct symmetric block designs. He was remarkable for his work in disproof of the famous conjecture made by Euler.

C.R. Rao (10 September 1920, Karnataka) :- Calyampudi Radhakrishna Rao, is an Indian-American mathematician and statistician. He is currently research professor at the university at Buffalo. The

American Statistical Association has described him as "living legend".

Row has been honoured by numerous colloquia, honorary degrees, and festschrifts and was awarded the US National Medal of Science in 2002. He has been awarded the Padma Vibhushan in 2001. He has been awarded the 2023 International Prize in Statistics, which is statistics' equivalent of the Nobel Prize. The works for which he is world famous are: Cramer-Rao bound, Rao-Blackwell theorem, orthogonal array, Score test etc.

Harish-Chandra Mehrotra (11Oct 1923, Kanpur - 16 Oct 1983) , who did fundamental work in representation theory, especially harmonic analysis on Semisimple Lie groups.



Awards: Fellow of the Royal Society, Cole prize in Algebra(1954) , Srinivasa Ramanujan Medal.

Shakuntala Devi (4 Nov. 1929-21 April 2013) : Shakuntala Devi, sometimes known as the 'Human Computer' was an Indian writer, Mathematician and mental calculator.

She was included in the 'Guinness Book of World Records' in 1982 for her extraordinary calculation ability. As an author , she has written several books including novels, books on mathematics, puzzles and astronomy.

There are also many other Indian mathematicians whose contributions are worldwide. The English equivalent of *mathematics* comes from Greek word *mathema* , meaning "that which is learnt", "what one gets to know", hence also "study" and "science".

The practice of mathematics , where it originated and when it started is a historical debate. Some historians believe that Egypt is the birthplace of practice of mathematics . Some historians say that Babylonian civilization is the birth place of this practice. Again, many researchers identify India as the origin of the practice of mathematics. The practice of mathematics in India has been advanced and more advanced since ancient times.

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