ISSN: 0973-0583

History of Mathematics with Special Reference to Indian Mathematicians

Dr. Abhishekh Kumar Pandey
Principal, Vidya College of Professional Studies, Rasulpur, Varuna, Chipura, Patna

ABSTRACT

The aim of this article "History of Mathematics with Special Reference To Indian Mathematicians" is to provide an overview of Indian mathematicians as well as a discussion of the beginning to present sources and directions for forthcoming study survey. For this purpose of paper, it would be utilised to split the stuff generally into the following clusters: A.) History of Indian Mathematics, and (ii) Professional Mathematics today.

Keyword : History, India, Mathematics, Periods & Mathematicians

Introducation:

It is a very difficult task to prove the question of when mathematics was first used, yet it can be said that the word mathematics has a very deep connection with humans. In ancient times in India, students were given education in Gurukul. They were taught to write on sand. A device was used to teach counting, which was called Gintara. After some time, Patiya or Pati started being used. That's why mathematics also got the name Pati mathematics. Slate was invented much later and paper in the modern era.

Mathematics was one of the major subjects in the Indian education system. According to Kautilya's Arthashastra, after Chudakarma, the student should have the knowledge to learn script and numbers. It is known from the inscription of Hathi Gumpha that Kalinga King 'Kharavel' had spent nine years of his life in learning script, drawing, geometry and arithmetic. Prince Gautam also learned mathematics at the age of 8. Sources for the study of mathematics are also found in Jain texts.

In ancient India, the purpose of teaching mathematics was to find out the prices of things and to keep accounts. At that time, more emphasis was given on results rather than methodology. Students were taught tricks and tricks. Mathematics was taught in schools at that time because it was related to religious books, mathematics-astrology, resultant astrology etc.

Definitions of Mathematics:

"Mathematics is the music of reason."
(Paul Lockhart)

"Mathematics is the poetry of the universe." (Jonathan David Farley)

"Mathematics is the queen of the sciences."
(Carl Friedrich Gauss)

"Mathematics is the discipline dealing with nontrivial and interesting things." (Jody Azzouni)

"Pure mathematics is, in its way, the poetry of logical ideas." (Albert Einstein)

"As far as the laws of mathematics refer to reality, they are not certain; and as far as they are certain, they do not refer to reality." (Albert Einstein)

"The true spirit of delight, the exaltation, the sense of being more than Man, which is the touchstone of the highest excellence, is to be found in mathematics as surely as in poetry." (Bertrand Russell)

"Mathematics takes us still further from what is human, into the region of absolute necessity, to which not only the actual world, but every possible world, must conform." (Bertrand Russell)

"Mathematics is, I believe, the chief source of the belief in eternal and exact truth, as well as a sensible intelligible world." (Bertrand Russell)

"Mathematics is the most beautiful and most powerful creation of the human spirit." (Stefan Banach)

Nature of Mathematics:

Mathematics subject has its own unique nature on the basis of which we can compare it with any other subject. The basis of comparison of any two or more subjects is the nature of those subjects on the basis of which we get information about that subject.

The nature of mathematics can be understood well through the following points.

1. **Mathematics has its own language.** Language means mathematical terms, mathematical concepts, formulas, principles, and symbols which are of special type and give rise to the language of mathematics.
2. In mathematics, knowledge of numbers, place, direction and measurement or weight is acquired.
3. The rules, principles and formulas of mathematics are the same everywhere, so that their correctness can be checked at any time and at any place.
4. The basis of knowledge of mathematics is our senses. The basis of its knowledge is definite so that it can be trusted.
5. The knowledge of mathematics is accurate, systematic, logical and more clear, due to which it cannot be easily forgotten once acquired.
6. In mathematics, abstract ideas are converted into concrete forms, as well as explained.
7. In this, interrelationships and numerical conclusions are drawn between the objects found in the entire environment.
8. By studying it, every knowledge and information becomes clear and a possible answer is determined.
9. There is no possibility of doubt in its various rules, principles, formulas etc.
10. Study of mathematics develops the ability of induction, deduction and generalization.

On the basis of the above points, we can understand the nature of mathematics and conclude that in fact the structure of mathematics, which is the foundation of its nature, is stronger than other subjects.

History of Mathematics:

यथा शिखा मयूराणां, नागानां मण्यो यथा।
मद्वेदांगशास्त्राणां, गणितं मर्धि वर्तते ।।

That is, just like the crests of peacocks and the beads of snakes on the body, for the convenience of knowing or understanding the most important history of Indian mathematics, it can be divided into mainly five periods.

1. Ancient period (up to 500 BC):

There are two main divisions of the ancient period in which Indian mathematics has a very important place in the history. Arithmetic, algebra and geometry were developed during this period.

(a) Vedic period (up to 100 BC): There is clear mention of numbers and decimal system in the Vedas. The invention of "zero" and "decimal place scale" system during this period is an unprecedented contribution of India in the field of mathematics. It is not known when and who invented zero, but it has been in use since the Vedic period. The importance of the zero and decimal place value system is reflected in the fact that today this system is prevalent all over the world and its invention has taken mathematics and science to advanced heights of progress. The decimal space system went from India to Arabia and from Arabia to Western countries. This is the period that the Arabs called 1 to 9 Hindi Arabic Numerals.

(b) Later Vedic period (1000 BC to 500 BC):

1. Shulva and Vedanga Astrological Period: Shulva was the rope which was used for measuring the sacrificial altar. Development and expansion of geometry formulas is available in Shulva Sutras. The names of three sutra writers of this period are especially noteworthy - Bodhayana, Apastamba and Katyayana. Apart from these, Maitrayan, Varaha, Manav and Badhul are famous sutra writers of this period. His works are found in the form of his Shulva-Sutras. The theorem mentioned in the Baudhayana Shulva Sutra (1000 BC) is today known as the Pythagorean Theorem. Apart from this, Baudhayan has given the method of making a square equal to the sum and difference of two squares and has also told how to calculate the value of the causal number up to five decimal places.

1. Surya Pragyapti period: A detailed description of the mathematics of that time is available in Jain literature. The main works of this period are Surya Prajnapti and Chandra Prajnapti (500 BC), which are famous texts of Jainism. Therefore, Indians had knowledge of the long circle even before Minmax (350 BC). It is noteworthy that in Bhagwati Sutra (300 BC) also, the word 'parimandal' has been used for the long circle, two types of which have been described - (a) Para circle (b) Cubic circle, in the

development of mathematics and astrology. Jainacharyas have made a commendable contribution. He has thrown light on the subjects like different spatial behavior and mixing ratios, writing method, algebraic equations, various categories, permutation, set theory, rules of exponentials and logarithms etc.

2. Middle Eastern period (from 500 BC to 400 AD): Except for a few pages of the books Vakshali Mathematics, Surya Siddhant and Mathematics Anuyoga written during this period, the rest of the works have become obsolete. But from these pages and from the available literature of medieval Aryabhatta, Brahmagupta etc. it comes to the conclusion that mathematics had developed substantially even during this period. Anuyogadwar, Sthananga Sutra and Bhagwati Sutra are the main texts of this era. Apart from these, the work Tatvarthadhigam Sutra Bhashya by Jainacharya Umaswati (135 BC) and the work Tiloyapannati by Acharya Yativrisham (around 176 AD) are also famous Jain texts of this period.

3. Medieval period or Golden Age (400 AD to 1200 AD): In the history of mathematics, the medieval period is called the golden age of Indian mathematics because in this period, people like Aryabhatta (first and third), Brahmagupta, Shridharacharya, Bhaskar, Mahaviracharya etc. There were many great and excellent mathematicians. The principles, rules and methods in the Vedas in the form of sutras came before the common people in this era**.**

Aryabhata: Aryabhata (476–550 AD) was one of the greatest astronomers and mathematicians of ancient times. He wrote his famous work 'Aryabhatiya' in the form of a poem. 33 rules of arithmetic, algebra and trigonometry are also given in 'Aryabhatiya'. His two major contributions are the introduction of zero and the calculation of the approximate value of pi (À) up to 4 decimal places. In algebra, he explained the essence of a series of squares and cubes and solved equations of the type ax–by=c. Aryabhata proved from his sources that there are not 366 days in a year but 365.2951 days.

Brahmagupta: Brahmagupta (598-668 AD) was a famous Indian mathematician and a great master of mathematics and astrology. After Aryabhata, the first mathematician of India was 'Bhaskaracharya Pratham'. After him came Brahmagupta. Brahmagupta was also an astronomer and discovered the rules for the use of 'zero' (0). The most famous among his books are 'Brahmasphoot Siddhant' and 'Khand-Khadyak'. 'Brahmasphuta Siddhanta' is considered to be the first text in which zero has been mentioned as a different number.

4. **Late Medieval period (1200 AD to 1800 AD):** The main contribution of this period in the history of mathematics is 'Discussions on ancient texts'. Neelkanth, a mathematician from Kerala, determined the value of sine in 1500 AD. According to him, this formula has also been mentioned in the Malayalam text 'Muktibhasa', which we know as the Gregorian series. In this period, mathematicians named Narayan Pandit (1356 AD), Nilakantha (1587 AD), Kamalakar (1608 AD) and Samrat Jagannath (1731 AD) have made important contributions.

5. Present period (after 1800 AD): In this era, important research and theories were presented in the field of mathematics, which gave a new direction to mathematics.

Srinivasa Ramanujan Iyengar: Srinivasa Ramanujan (22 December 1887 – 26 April 1920) was a great Indian mathematician of modern times. he made profound contributions in the fields of analysis and number theory. Ramanujan's works are known for his contributions to number theory, mathematical analysis, string theory and crystallography. At the young age of 32, he compiled 3,884 theorems of mathematics which can surprise anyone. Most of these theorems have been proven correct. Although some of his discoveries have not yet been adopted in mainstream mathematics.

Nrisingh Bapu Dev Shastri: Nrisingh Bapu Dev Shastri (1831 AD) created books on Indian and Western mathematics. Geometry, Trigonometry, Sionism and Arithmetic are the main ones in his books.

Swami Bharati Krishnatirtha Ji Maharaj: A great mathematician and philosopher, Swami Bharati Krishnatirtha Ji Maharaj (1884-1960 AD) is the leader of Vedic mathematics in the modern era. In his book "Vedic Mathematics", he has propounded the Vedic formulas and presented the principles and methods contained in them in simple, understandable and clear language. His book Vedic Mathematics is an authentic

book. Through this unique work of his, Swamiji has shocked not only the common students of mathematics but also the conscience of the official scholars by introducing them to the amazing potential hidden in Vedic mathematics.

Sudhakar Dwivedi: Sudhakar Dwivedi has written many books on Large Circle Characteristics, Spherical Geometry, Equations, Theory of Movements and Functions etc. He also wrote commentaries on the books of Brahma Gupta and Bhaskar and made them accessible to the general public.

Mathematician Leelawati: Most of us have not heard the name of mathematician Lilavati. It is said about her that she could even count the leaves of a tree. Hardly anyone knows that the mathematics book from which hundreds of countries of the world including Europe are teaching mathematics today, is authored by "Lilavati", the daughter of a great mathematician of India, Maharishi Bhaskaracharya. Let us know about the great mathematician Lilavati, by whose name mathematics was known. It is a matter of the tenth century, in South India there was a great scholar of mathematics and astrology named Bhaskaracharya. His daughter's name was Lilavati. She was his only child. From astrological calculations, he came to know that 'she will become a widow within a few days of marriage.' After thinking a lot, he found such an ascendant in which the girl would not become a widow after marriage.

Conclusion:

The credit for the invention of zero goes to Indians and it is greater than all other contributions of other countries, as zero is the basis of the decimal number system, without which no further progress in mathematics could have been possible. The number system that is being used today is still known as Indo-Arabic numerals because it was invented by Indians and was carried to the western parts by Arab traders. Studies show that mathematics was first used in India during the Indus Valley Civilization period. It was mostly related to weights and measures and fundamental knowledge of geometry. It is essential to know about the ancient, medieval and modern time Indian mathematicians and their contribution to Science and Mathematics. Ancient Indian mathematicians have contributed immensely to the field of mathematics. The invention of zero is attributed to Indians and this contribution outweighs all other made by any other nation since it is the basis of the decimal number system, without which no advancement in mathematics would have been possible.

References:

1. Biography in Encyclopaedia Britannica. http://www.britannica.com/biography/Srinivasa Ramanujan.
2. Raju CK. Cultural foundations of mathematics: the nature of mathematical proof and the transmission of the calculus from India to Europe in the 16th c. CE. Delhi: Pearson Longman.
3. Rajagopal CT, Rangachari MS. On an untapped source of medieval Keralese Mathematics, Archive for History of Exact Sciences 1978; 18(2):89-102.
4. Walter C. The Aryabhatiya of Aryabhata: An Ancient Indian Work on Mathematics and Astronomy, University of Chicago Press, Chicago, Illinois, U. S. A 1930.
5. Seshadri CS. Editor, Studies in the History of Indian Mathematics, Hindustan Book Agency, New Delhi, India.
6. Almeida DF, John JK, Zadorozhnyy A. Keralese mathematics,: it,s possible transmission to Europe and the consequential educational implications, Journal of Natural Geometry 2001; 20(1): 77-104.
7. Kaprekar D. On Kaprekar Numbers, Journal of Recreational Mathematics 1980-81;13(2):81-82.
8. Deutsch D, Goldman B. Kaprekar's Constant. Mathematics Teacher 2004;98:234-242.
9. Kaprekar DR. An Interesting Property of the Number 6174, Scripta Mathematica 15:244-245.
10. Kaprekar DR. On Wonderful Demlo numbers, Math. Stud 1938; 6:68.
11. Kaprekar DR. Demlo Numbers, Khareswada, Devlali, India 1948.
12. Studies in Indian Mathematics and Astronomy Selected Articles of Kripa Shankar Shukla, Springer.

❖❖❖