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ARYABHATT: A BEACON OF MATHEMATICS

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Abstract: Aryabhata was the greatest mathematician and astronomer of ancient times. His work in the field of science and mathematics continues to inspire scientists even today. He was one of the first Indian to use algebra. Reader will be surprised to know that he wrote his famous composition 'Aryabhatiya' in the form of poetry. It is one of the famous creations of ancient India. Most of the information given in this book is related to spherical trigonometry and astronomy. In 'Aryabhatiya' 33 rules of arithmetic, algebra and trigonometry are also given.

By declaring 2012 as the National Year of Mathematics, Prime Minister of India has in a way honored India's first mathematician and astronomer Aryabhata. It is because of Aryabhata, who gave the world the understanding of zero, that for hundreds of years, India led the world in the field of mathematics. Aryabhata's contribution is considered to be the most important in all the achievements the world has achieved in astronomy today. It is because of them that today mathematics and astronomy is doing new research.

Keywords: Aryabhatiya, Decimal System, Bhashya, Sine, Pi, Ptolemy, Verses.

Introduction: The relation between India and mathematics is not new but it is centuries old. It goes back to the Golden Age of 1200 BC and 400 A D to 1200 AD when the great mathematicians of India made major contributions in this field. The decimal system, zero, algebra, advanced trigonometry, negative numbers and many more has given by India to the world. Trigonometry was elaborated on by a mathematician from a school in Kerala in the 15th century. This developed two centuries before the invention of computation in Europe. The Vedas of the Vedic period also have evidence of the use of numbers. The mathematics of the Vedic period, which is found in most of the Vedic texts, is traditional. Sanskrit is the main language in which mathematical work of ancient and medieval period was done in India. Not only this time but the use of mathematics can also be seen in prehistoric times. Evidence of practical use of mathematics is also found in the excavations of Indus Valley Civilization such as Harappa and Mohenjo-daro. For weight ratios such as 0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50, 100, 200 and 500 the decimal system was used in civilization. They used the most stable dimension of BRICS in the form 4:2:1. India had many famous mathematicians in the Vedic period, the classical period from 400 to 1200 and in modern India.

Life Journey of Aryabhata: Information about Aryabhata's birth time comes from his book Aryabhatiyam. In this book, he has said that "3600 years have passed since Kali Yuga and I am 23 years old, while I am writing this book." According to the tradition of Indian astrology, Kali Yuga started in 3101 BC. Accordingly, Aryabhatiyam was composed in 499 AD. In this sense, Aryabhata is believed to have been born in 476 AD. But there is difference of opinion about his birthplace. Some scholars say that he was born at some place between the Narmada and the Godavari, which is written in Sanskrit literature as Ashmak Desh. While Ashmaka is identified by Kautilya's "Arthashastra" as modern Maharashtra, according to ancient Buddhist sources, Ashmaka or Asak was located in the Dakkan. Some other sources consider this country to be in the far north, because Ashmaka fought with the Greek invader Alexander (Alexander, 4 BC). Aryabhata in his book 'Aryabhatiya' has written his birthplace Kusumpur and birth time Shaka Samvat 398 (476). From this information, the year of his birth is undisputed, but there is a dispute about the actual place of birth. According to some trusted sources, Aryabhata was born in the Ashmak region of Maharashtra and it is also certain that at some point of his life, he had gone to Kusumpur for further education and lived there for some year. Along with the Hindu and Buddhist traditions, the seventh-century Indian mathematician Bhaskar has identified Kusumpura as Pataliputra (modern Patna). A great center of study, Nalanda University was established here and Aryabhata may have been associated with it. It is possible that Aryabhata used to live there during the last days of the Gupta Empire and this period is known as the Golden Age of India. There is evidence that he has described many astronomical instruments in the Aryabhata-siddhanta.

Aryabhata was one of the great mathematician and astrologer of ancient India. He composed the book 'Aryabhatiya', in which many principles of mathematics and astrology are presented. Famous scholars like Aryabhata, Varahmihira, Brahmagupta, Aryabhata II, Bhaskaracharya, Kamalakar have made invaluable contributions in this field among the astrologers of ancient times. Aryabhata is the most famous of all these. He was a prominent astrologer and mathematician of the Gupta period. He received his education at Nalanda University. When he was 23 year old he wrote 'Aryabhatiya Granth'. This Granth 'Aryabhatiya' was accepted from all around, due to which King Buddhagupta made Aryabhata the head of Nalanda University.



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Work of Aryabhata

Aryabhata wrote many treatises on mathematics and astronomy, some of which are found. His great creation, 'the Aryabhattiyam', is the collection of mathematics and astronomy, which is cited extensively in the Indian mathematical literature, and which continues to exist in modern times. The mathematical part of Aryabhattiyam includes arithmetic, algebra, simple trigonometry and spherical trigonometry. It includes continuous fractions, quadratic equations, sums of power series and a table of chords. The information of three texts written by Aryabhata is available even today. Dasgeetika, Aryabhattiyam and Tantra but according to the experts, he wrote another book 'Aryabhata Siddhanta'. At present only 34 verses of it exist. This book of his was widely used in the seventh decade. But there is no definite information about how such a useful book got lost.

Aryabhata did many other works in mathematics and astronomy. With the work done by him, he gave new avenues to many big scientists. In India, many institutes have been opened in his name, in which many types of research work are done. He was the greatest mathematicians and astronomers of ancient india. His work in the field of science and mathematics continues to inspire scientists even today. It is surprising that he wrote his famous composition 'Aryabhatiya' in the form of poetry. It is one of the well-known books of ancient India. Many of the information given in this book is related to spherical trigonometry and astronomy. In 'Aryabhatiya' 33 rules of arithmetic, algebra and trigonometry are also given. Today we all know that the earth is round and rotates on its axis and that is why there are night and day. This theory was propounded by 'Nicholas Copernicus' in the medieval period, but very few people will be aware of this reality that Aryabhata had discovered that the earth is round and its circumference is approximately 24835 Miles. Aryabhata proved the Hindu religion's belief of solar and lunar eclipses wrong. This great scientist and mathematician also knew that the moon and other planets are illuminated by the rays of the sun. Aryabhata proved from his sources that there are not 366 days in a year but 365.2951 days. Aryabhatiya gives a direct account of the work done by him. It is believed that Aryabhata himself may not have given this name but later commentators may have used the name Aryabhatiya. This is also mentioned by Aryabhata's disciple Bhaskara I in his writings. This is sometimes also known as Arya-Sata-Ashta. Square root, cube root, parallel series and different types of equations are given in 'Aryabhatiya'. This book is a collection of mathematical and astronomical fact. The mathematical part of Aryabhatiya involves algebra, arithmetic, spherical trigonometry, simple trigonometry, Sum of Power Series, Continuous Fractions, Quadratic Equations and a table of Sines. The Aryabhatiya has a total of 108 verses, plus 13 additional introductory ones. All these are divided into four verses or chapters: Aryabhata had a profound influence on the mathematics and astrology theory of India and the world. Aryabhata, who holds the most important position among Indian mathematicians, has presented the theory of astrology and related mathematics in the form of his famous treatise 'Aryabhatiya' in 120 Aryachandas. He denoted the value of 'pi' more precisely than the great Archimedes in the field of mathematics and was the first in the field of astronomy to declare that the earth rotates on its own axis. The place-value system was clearly present in the works of Aryabhata. Although he did not use a symbol to represent zero, mathematicians believe that the knowledge of zero as a place holder for the powers of ten, along with empty coefficients, was rooted in Aryabhata's place-value numeral system. It is surprising and surprising that he had discovered astrology about one and a half thousand years ago without the advanced tools of today. Aryabhata had searched the theory propounded by Copernicus (1473 to 1543 AD) thousand years ago. Aryabhata proved first time in "Golpad" that the earth rotates on its axis. According to this great mathematics, the relation of diameter and circumference of a circle comes to 20,000: 62,832 which is pure up to four decimal places. Aryabhata calculated and found that the circumference of the Earth is 39,968.05820 km, which is only 0.2% less than its original value of 40,075.01670 km. The earth is round and rotates on its axis, which causes night and day, this theory is known to all, but many people will be familiar with the fact that Aryabhata had find out long before 'Nicholas Copernicus' that The Earth is round and its circumference is approximately 24835 miles. A planet named Rahu swallows up the Sun and the Moon, causing eclipses of the Sun and the Moon, this belief of Hindu religion was proved wrong by Aryabhata. In a lunar eclipse, a lunar eclipse occurs when the Earth comes between the Moon and the Sun and its shadow falls on the Moon, he searched the reason. Aryabhata also knew that the moon and other planets are not themselves luminous, but that the sun's rays are reflected in it and also that the earth and other planets revolve around the sun. He also told that the 'moon' is black and it is illuminated only by the light of the sun. Aryabhata's 'Bollis Siddhanta' (theory of solar eclipses), 'Romaka Siddhanta' and Surya Siddhanta are particularly important. 'Varshaman' as decided by Aryabhata is more scientific than 'Ptolemy'. Aryabhata's name is also well-known in the history of world mathematics. Apart from being an astronomer, his contribution in the field of mathematics is also valuable. Aryabhata's oldest text is also in algebra. He first fixed the price of 'Pi' (π) and he was the first to give the 'parentheses' of 'SINE'. He invented the equations to solve complex mathematical problems easily and which became famous all over the world. He invented a new method for speaking numbers like eleven, zero one after the other. In algebra, he made many amendments and promoted the 'Arya Siddhanta' of mathematical astrology. In old age, Aryabhata composed a treatise called 'Aryabhata Siddhanta'. His 'Dashgeeti Sutra' texts were received by Prof. Karne published under the name 'Aryabhatiya'. Aryabhatiya is the complete text. In this book, apart from many things of mathematics like geometry, square root, cube root, calculations of astronomy and things related to space are also included. Even today, the help of this book is taken in preparing the 'Hindu Panchang'. Aryabhata was followed by



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another astronomer of the same name whose name was 'Little Aryabhata'. India's first satellite was named Aryabhata to commemorate his important contribution in both the fields of astronomy and mathematics.

Aryabhata became immortal in history because of his great contribution to zero (0). Without which it is difficult to even imagine mathematics. Aryabhata was the first to explain the place value system. He was the first to tell with the example that our earth revolves around the sun on its axis and the moon is the satellite of the earth which revolves around the earth. He believed that the orbits of all the planets are ellipsoidal. He said that the light of the moon is the reflection of the sun itself.

Conclusion: With time people's thinking has changed and here along with the interest of the people of the world has also started to know and understand Indian culture. Perhaps it is the result of this that the attention of the people towards the great works of ancient sages and mathematicians. The biggest example of this is the theorem of Pythagoras, which is now known as the Bodhayana-Pythagoras theorem. The aim of the Indians from the very beginning has been "Vasudhaiva-Kutumbakam". Everything discovered by them was dedicated to the welfare of the people. We forgot our great tradition and got lost in the depths of ignorance. Today there is a need to re-research on the beliefs established by our sages so that their discovery can be planned in the direction of public welfare.

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