THE IMPACTS OF OLD INDIAN MATHEMATICIANS TO SCIENCE

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ABSTRACT

Over the course of many thousand years, ancient Indian mathematicians made substantial advancements in a variety of mathematical disciplines, including algebra, number theory, calculus, trigonometry, and measurement. This paper's goal is to introduce the mathematical achievements of ancient India's thinkers and scholars.

KEYWORDS: *Number Theory; Algebra; Mathematics; Pythagoras Theorem.*

INTRODUCTION: The following ancient Indian mathematicians made important contributions to the many subjects of algebra, trigonometry, astrology, number theory, and engineering: Baudhayana, Katyayana, Acharya Pingala, Aryabhata, Brahmagupta, Bhaskaracharya, Mahaviracharya, and Varahamihira [1-4, 13, 22, 24]. The fields of infinite expansion, mensuration, trigonometric nomenclature, and disparity equations may have seen the most significant advancements [7, 10]. Ancient India was unquestionably technologically proficient in the domains of mathematics, physics, astronomy, and geometry in the presence of the mathematicians mentioned above [6, 8, 19, 25]. The primary goal of this article is to examine the contributions made by ancient Indian mathematicians.

MATHEMATICIANS OF ANCIENT INDIA AND THEIR CONTRIBUTIONS: India's greatest mathematicians were Baudhayana, Katyayana, Acharya Pingala, Aryabhata, Brahmagupta, Bhaskaracharya, Mahaviracharya, and Varahamihira. This section of the paper discusses in depth these mathematicians' ideas and contributions.

BAUDHAYANA: Baudhayana was the first person to discover several mathematical concepts that were subsequently rediscovered by the West. Baudhayana first calculated the value of 'pi'. When calculating the area and circumference of a circle, 'pi' is beneficial. What is known as Pythagoras Theorem today is already present in Baudhayana's Sulvasutras, which was written several years before the age of Pythagoras [20].

ACHARYA PINGALA: By sheer happenstance, Acharya Pingala uncovered the vast potential of binary numerals. He was working with the Vedic meter, or Chandah. In Chandahsastra [22], he wrote. The term "Chandahsastra" refers to the Science of Meters as it applies to spoken poetry.

ARYABHATA: Aryabhata was a mathematician, astronomer, physicist, and astrologer who lived in the fifth century. He paved the way for further developments in mathematics. He wrote Aryabhatiya, a compendium of mathematics at the time, when he was 23 years old [9, 18]. This research paper is divided into four parts. He explains the process of using alphabets to represent large decimal values in the first segment. The second half contains challenging problems from subjects related to contemporary mathematics, including algebra (beejganita), geometry, trigonometry, and number theory. Sections two and three are devoted to Astronomy. Zero was shown by Aryabhata to be more than just a number; it was both a notion and a symbol. With the discovery of zero, Aryabhata was able to determine the precise distance between Earth and Moon. Additionally, the discovery of zero revealed a new aspect of negative numbers. The science of astronomy was highly developed in ancient India. The name of it was Khagol Shastra. Aryabhata studied at Khagol, the renowned astronomical observatory at Nalanda. The need for precise calendars, a better understanding of climate and rainfall patterns for timely crop selection and sowing, fixing the dates of seasons and festivals, navigation, time computation, and horoscope casting for astrological purposes all drove the development of the Science of Astronomy. Due to the need of traversing seas and deserts at night, knowledge of astronomy, in especially the tides and stars, was crucial for commerce. According to Aryabhata, the world is spherical and spins on its own axis, refuting the widely held belief that world is "Achala" (immovable). He provided instances to demonstrate why it is untrue that the Sun seems to be traveling from east to west. One such instance was the appearance of the trees on the shoreline moving in the other direction while someone is moving in a boat. He also said, very properly, that sunlight was reflected by the Moon and planets. Additionally, he provided a scientific explanation of solar and lunar eclipses, making it clear that these natural phenomena were not caused by Ketu, Rahu, or any other rakshasa (devil). Aryabhata's outstanding

KATYAYANA: Katyayana was born circa 200 BCE. He was a mathematician during the Vedic period and authored the Katyayana Sulba Sutra [21]. He was explained the computation of square root of 2 to five precise decimal places. His contribution to Geometry and Pythagorean theory is nothing short of extraordinary. Accomplishment is honored by the name of India's first satellite sent into space.

BRAHMAGUPTA: Brahmagupta advanced mathematics to unheard-of heights in the seventh century. He used place value in his multiplication strategies in a nearly identical manner to how it is applied now. He brought operations on zero and negative integers to mathematics. It was via his writing of Brahmasphutasiddhanta that the Arabs were introduced to our method of mathematics [14, 23]. There are 25 chapters and 1008 stanzas in this book. The planets' true and mean longitudes, the three issues with diurnal rotation, lunar and solar eclipses, the crescent moon, and conjunctions of the planets with fixed stars are all covered. The area of a cyclic quadrilateral was calculated by Brahmagupta [15]. He gave the following rules:

- A debt minus zero is a debt.
- A fortune minus zero is a fortune.
- Zero minus zero is a zero.
- A debt subtracted from zero is a fortune.

• A fortune subtracted from zero is a debt.

• The product of zero multiplied by zero is zero.

MAHAVIRACHARYA: In Jain literature (c. 500–100 BC), mathematics is described in detail. Quadratic equations might be solved by Jain gurus. Additionally, they have provided highly intriguing explanations of exponents, logarithms, set theory, series, fractions, and algebraic equations. The earliest textbook on mathematics in its current form was written around 850 BC by the Jain Guru Mahaviracharya and is called Ganitasnrasanngraha [17]. He also provided an explanation of the current approach to finding the Least Common Multiple (LCM) of a given integer. Indians were thus familiar with it long before John Napier made it known to the rest of the world. In addition to publishing several cyclic quadrilateral characteristics, he also provided universal formulae for number permutations and combinations, as well as solutions to n-degree equations. He provided the ellipse's area and circumference empirical formulas. Because he established vocabulary for ideas like equilateral and isosceles triangles, rhombus, circle, and semicircle, he is widely recognized among Indian mathematicians [11–12].

BHASKARACHARYA: In the 12th century, Bhaskaracharya was the dominating figure. In Bijapur, Karnataka, he was born. For his book Siddhanta Shiromani, he is well-known. Lilavati (Arithmetic) [5], Beej ganit (Algebra), Goladhyaya (Sphere), and Graha ganit (mathematics of planets) are its four divisions. To solve algebraic equations, Bhaskara devised the Chakrawat Method, also known as the Cyclic Method. Six centuries later, European mathematicians rediscovered this technique, which they named inverse cycle.

VARAHAMIHIRA: Varahamihira produced significant advances in the disciplines of ecology, geology, and hydrology. He was a Gupta era resident. He was among the first scientists to suggest that plants and termites may serve as signs of subterranean water. He listed thirty plants and six animals that may be signs of the existence of water. He provided crucial information on termites, also known as deemak or wood-destroying insects, stating that they would go extremely far below the water's surface in order to get water to maintain the moisture level in their homes, or bambis. The earthquake cloud idea presented by Varahamihira in his Brihat Samhita [16] is another theory that has drawn interest from the scientific community. This Samhita's 32nd chapter is dedicated to earthquake warning signals. He has attempted to connect the effect of planets, underwater activity, subterranean water, strange cloud formation, and aberrant animal behavior to earthquakes. It is worthwhile to acknowledge Varahamihira's work in Jyotish or Astrology. It was given by Aryabhata and Varahamihira in a methodical and scientific manner. One of the nine jewels, or academics, in Vikramaditya's court was Varahamihira. Because Varahamihira's prophecies were so precise, King Vikramaditya bestowed upon him the title "Varaha.".

CONCLUSION: The great mathematicians of ancient India and their contributions to a variety of subjects, including algebra, trigonometry, geometry, calculus, number theory, physics, astronomy, hydrology, geology, ecology, and jyotish, are a topic the author of this study well discusses.

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