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"A STUDY ON MATHEMATICIANS OF ANCIENT INDIA AND THEIR CONTRIBUTIONS"

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Abstract:

Indian mathematics has its roots in Vedic literature. It is imperative to know about the ancient, medieval and modern time Indian mathematicians and their contribution in the field ofMathematics. Indian mathematicians made significant early contributions to the study of the concept of zero as a number, negative numbers, arithmetic, and algebra. In addition, trigonometry was further advanced in India, and, in particular, the modern definitions of sine and cosine were developed here. Ancient Indian mathematicians have contributed immensely to the field of mathematics. The invention of zero is attributed to Indians and this contributionoutweighs 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. The number system used today was invented by Indians and it is still called Indo-Arabic numerals because Indians invented them and the Arab merchants took them to the western world. It is also noticed that there is a distinct and inequitable neglect off the contributions of the sub-continent. Many of the developments of Indian mathematics remain almost completely ignored, or worse or attributed to the scholars of other nationalities, often European. However a few historians (mainly European) are reluctant to acknowledge the contributions of Indian mathematicians. They believe Indians borrowed the knowledge of mathematics from Greeks. Even after all those criticisms it is a great pleasure for us to have been born in such a country where so many great mathematicians **like Aryabhata, Brahmagupta, Srinivasa Ramanujan, P.C. Mahalanobis, Calyampudi Radhakrishna Rao, D.R. Kaprekar, Satyendra Bose, Bhaskara I, Mahavira, Bhaskara II** and many others born.

Keywords: Mathematicians, Contribution in the field of Mathematics, Ancient Indian Mathematicians

I. INTRODUCTION

Civilization has been shaped significantly by mathematics for many years.

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The mathematical concepts that originated on the Indian subcontinent have greatly influenced the rest of the world. Some of the world's greatest mathematical minds are from India who have made the nation proud. India has been a pioneer in every

field, from literature and science to art and theatre. The discipline of mathematics continues to be one of the utmost importance around the globe. There are two distinct types of people when it comes to mathematics: those who are utterly brilliant at it and those for whom it is nothing less than a nightmare. But if we look at our everyday lives, mathematics plays a significant role in them. Maths is used in everything, from slicing a cake into equal pieces to weighing people or calculating their height. Many famous Indian Mathematicians who changed the perspective of the world with the help of Mathematics keep inspiring the whole world with their discoveries and Inventions. They not only inspired the world to remain curious but helped the entire human race. The creation of zero is ascribed to Indians, and this contribution exceeds all others because it forms the foundation of the decimal number system, without which no mathematical growth would have been conceivable. The modern number system was established by Indians, and it is still known as Indo-Arabic numerals since Indians invented them and Arab traders brought them to the western world.

The oldest source of knowledge for Indian Mathematics is Sulba Sutras (800 BCE) followed by the Pingala's Chanda Sastra, laying foundations for combination techniques in Mathematics (3rd century BCE).

As we look forward to the next years of development, it's a fitting time to remember geniuses whose contributions to Mathematics had global impacts –

Aryabhatta (476 AD to 550 AD)

- At the time, he wrote Aryabhattiya, a mathematical compendium. It's broken into four sections.
- In the first section, he explains how to represent huge decimal numbers using alphabets.
- The second part of the book comprises difficult questions from contemporary fields of mathematics such as number theory, geometry, trigonometry, and algebra.
- He denied that our globe is 'Achala' (immovable) and said that 'the earth is round and revolves on its own axis.'

Varahamihira (6th Century)

- One of Varahamihira's most notable works was the Brihat Samhita, an encyclopaedic study of architecture, temples, planetary motions, eclipses, timekeeping, astrology, seasons, cloud formation, rainfall, agriculture, arithmetic, gemology, scents, and many other topics.
- While Varahamihira summarised previous works on astronomy, the Shilpa Sastra, and temple architecture in some lines, he argues that his explanation of numerous architectural principles and models is among the earliest books that have

remained.

- The discovery of trigonometric equations was one of Varahamihira's mathematical accomplishments.
- He improved the precision of Aryabhata's sine tables.

Brahmagupta (598 to 668 CE)

- The Brahmasphutasiddhanta is Brahmagupta's principal work, written in or about 628.
- This mathematical astronomy book covers a significant amount of mathematical content, such as a thorough comprehension of the function of zero.
- Brahmagupta offered the solution to the general linear equation in chapter eighteen of Brahmasphutasiddhanta.
- The current system, which is based on the Hindu-Arabic number system, originated in the Brahmasphutasiddhanta.

Bhaskaracharya (12th century AD)

- He gained a grasp of numerical systems and problem-solving that Europe would take generations to achieve.
- Bhaskara developed the first calculus about 500 years before Newton and Leibniz.
- Calculated derivatives for trigonometric formulae and functions.
- To show the Pythagorean Theorem, compute the same area using two alternative approaches.
- After learning about the derivative and differential coefficient, differential calculus was established.
- Lilavati explains how to solve indeterminate quadratic, cubic, and quadratic equations.

AIMS AND OBJECTIVES

Mathematics in India has a very rich, long and hallowed history. Unfortunately, most Indians are not aware of these remarkable contributions made by Indians to the development of mathematics. The series of talks to be delivered by eminent scholars from all over the world, aims to provide a glimpse of this rich mathematical heritage of India.

It is time we walk down the annals of history and celebrate achievements which we didn't know belong to India; claim our contribution which innately belongs to Bharat and take forward the continuum of India's contribution towards making the world a better place for humanity to thrive and coexist.

Azadi Ka Amrit Mahotsav is an initiative of the Government of India to celebrate and commemorate 75 years of progressive India and the glorious history of its people, culture and achievements.

After a prolonged struggle spread over more than 100 years on the back of several movements spearheaded by individuals and communities across the country, India successfully ousted the foreign rulers from the Indian subcontinent in 1947.

India's journey from the beginning of time is dotted with consequential events, each of which added to the idea of India in a very unique and inevitable manner. For long, these events have been stories limited to folklore or a part of a historian's collective.

Ministry of Culture is proud to announce Dhara: An ode to Indian Knowledge System, a series of programs powered by lecture demonstrations, celebrating and showcasing India's contribution and achievements across diverse fields. One of the most important event under this series is dedicated to 'India's Contribution to Mathematics Through Ages'

Starting from the most elementary thing in mathematics namely the representation of numbers, through the way of expressing recursive relations, to arriving at the solutions of indeterminate equations, to the development of sophisticated techniques in handling the infinites, Indian Mathematicians have made remarkable contributions.

Sulbasutras, the oldest extant texts, explicitly state and make use of the so-called Pythagorean Theorem besides giving various interesting approximations to surds. By the time of Aryabhata, the Indian mathematicians were fully conversant with most of the mathematics that we currently teach in our schools, which include the algorithms for extracting square root and cube root based on the decimal place-value system.

Among other things, Aryabhata also presented the differential equation of sine function in its finite-difference form and a method for solving the linear indeterminate equation.

Brahmagupta for the first time in the history of mathematics, fully discusses the arithmetic operations with zero. He also introduces the profound 'bhavana' law of composition for solving quadratic indeterminate equations. Apart from some of these important landmarks in the evolution of arithmetic, geometry, and algebra, significant contributions have also been made in the development of trigonometry.

The Kerala School of astronomy and mathematics pioneered by Madhava discovered the infinite series for pi (π)—the so-called Gregory-Leibniz series and other trigonometric functions. Much of their painstaking work was largely carried out voluntarily, with hardly any support from the institutions of higher learning.

LITERATURE REVIEW

MATHEMATICS has played a significant role in the development of Indian culture for millennia. Mathematical ideas that originated in the Indian subcontinent have had a profound impact on the world. Swami Vivekananda said: "you know how many

sciences had their origin in India. Mathematics began there. You are even today counting 1, 2, 3, etc. to zero, after Sanskrit figures, and you all know that algebra also originated in India."

In ancient time, mathematics was mainly used in an auxiliary or applied role. Thus, mathematical methods were used to solve problems in architecture and construction (as in the public works of the Harappan civilization) in astronomy and astrology (as in the words of the Jain mathematicians) and in the construction of Vedic altars (as in the case of the Shulba Sutras of Baudhayana and his successors). By the sixth or fifth century BCE, mathematics was being studied for its own sake, as well as for its applications in other fields of knowledge.

The aim of this article is to give a brief review of a few of the outstanding innovations introduced by Indian mathematics from ancient times to modern. As we shall see, there does not seem to have been a time in Indian history when mathematics was not being developed. Recent work has unearthed many manuscripts, and what were previously regarded as dormant periods in Indian mathematics are now known to have been very active. Even a small study on this subject leaves one with a sense of wonder at the depth and breadth of ancient Indian thought.

HISTORICAL ORIGIN OF THE DECIMAL NUMBER SYSTEM

The very first method of counting began with the usage of 10 fingers, which ultimately led to the ideation of the basic 10 digits – 1, 2, 3, 4, 5, 6, 7, 8, 9. This is called the decimal or denary system. This system is the most commonly used number system in the world, though not the only one!

Some ancient chronological milestones in the evolution of decimals includes:

- 3500-2500 BC, the earliest usage of a close relative of the decimal system by the Iranian Elamites
- 2900 BC, Egyptians start counting in powers of 10
- 2600 BC, Indus Valley civilization begins the usage of decimal points with reference to measuring weight
- 1400 BC, Chinese manuscripts shed light on the existence of a possible decimal system when making calendars
- 1200 BC, Yajur Veda makes ground breaking news by establishing the power of 10 up to 1055
- 400 BC, a concrete binary system is built with conversions to and from the decimal system
- 250 BC, Archimedes takes the power of 10 to 1080,000,000,000,000,000
- 100-200 CE, decimal logarithms come into existence

RESEARCH METHODOLOGY

A descriptive analysis method was used for the present study to achieve the above

mentioned objective. Procedure To achieve the above objective, first the investigator tried to view online all the available resources and websites during the years. The researcher also visited different libraries in search of text books to gather information. Participated in open discussions with others concerned persons on this topic.

After identifying the content covered in mathematics text books and web materials and compiling all those systematically researcher analysed and tabulated to know the content covered in the textbooks in which how much importance given about the contribution of mathematicians in the field of mathematics with special reference to Indian mathematicians in dealing with mathematical concepts at appropriate place.

CONCLUSION

Ancient Indian mathematicians contributed significantly to the study of mathematics such as Algebra, Trigonometry, Geometry, Calculus, Number Theory, Physics, Astronomy, Hydrology, Geology, Ecology, and Jyotish. India is home to some of the world's most brilliant brains. India has been a pioneer in all sectors, from literature and science to art and theatre, thanks to immensely gifted individuals who have made the country proud.

Mathematics, as a science, remains vital in the globe, and this blog examines some of the world's most notable Indian mathematicians and their contributions to the field.

It could be concluded initially by simply saying that the work of Indian mathematicians has been severely neglected by western historians, although the situation is improving somewhat now a days. What primarily wished to tackle was to answer two questions, firstly, why have Indian works been neglected, that is, what appears to have been the motivations and aims of scholars who have contributed to the Eurocentric view of mathematical history. This leads to the secondary question, why should this neglect be considered a great injustice.

This article attempted to answer this by providing a detailed investigation (and analysis) of many of the key contributions of the Indian subcontinent, and where possible, demonstrate how they pre-date European works (whether ancient Greek or later renaissance). Article have further developed this 'answer' by providing significant evidence that a number of Indian works conversely influenced later European works, by way of Arabic transmissions. It is also included a discussion of the Indian decimal place value system which is undoubtedly the single greatest Indian contribution to the development of mathematics, and its wider applications in science, economics (and so on). This article

offers a well-researched overview of ancient Indian mathematics. In every way possible, the scholars expanded and developed mathematics. Their contributions will undoubtedly inspire and be used for future generations.

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