



Classical Mathematics in India: A Journey through Ancient Mathematical Achievements

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Abstract

Classical mathematics in India stands as a testament to the profound mathematical achievements of ancient Indian scholars. With a rich history dating back to the Vedic period, Indian mathematicians made groundbreaking contributions that continue to inspire and influence the world of mathematics today. This article delves into the historical development of classical mathematics in India, highlighting the remarkable discoveries and methodologies employed by mathematicians of that era. From the concept of zero and the decimal system to ingenious algorithms and geometric advancements, Indian mathematicians played a pivotal role in shaping the course of mathematics as a discipline. By exploring the key mathematical treatises and the impact of Indian mathematics on neighbouring civilizations, this article aims to shed light on the remarkable legacy of classical mathematics in India.

Keywords: Classical Mathematics, Ancient India, Indian Mathematicians, Vedic Mathematics, Zero, Decimal System, Algorithms, Geometric Advancements

Introduction

The rich legacy of mathematics in India dates back thousands of years, with scholars and mathematicians making significant contributions to various branches of the subject. From the Vedic period to the classical era, Indian mathematicians developed sophisticated mathematical concepts, methods, and theories that laid the foundation for many modern mathematical principles. This article explores the fascinating world of classical mathematics in India and the groundbreaking discoveries made by Indian scholars.

1. The Vedic Period and Sulba Sutras

The roots of Indian mathematics can be traced back to the Vedic period, which spanned from around 1500 BCE to 500 BCE. During this time, the ancient Indian scriptures known as the Vedas contained mathematical knowledge used in rituals, astronomy, and daily life. The Sulba Sutras, a group of texts associated with the Vedas, are particularly noteworthy for their mathematical content. The Sulba Sutras provide detailed instructions for constructing various altars used in Vedic rituals. These instructions involve geometric principles and methods to create perfect rectangular shapes, squares, and circles. Remarkably, these texts demonstrate a deep understanding of geometry and advanced calculations.

2. Aryabhata and the Beginning of Classical Mathematics

Around the 5th century CE, Aryabhata, an Indian mathematician and astronomer, made significant contributions to the field of mathematics. His magnum opus, the



"Aryabhatiya," is a pioneering work that covers various mathematical topics. Aryabhata introduced the concept of zero as a number and the decimal system, which revolutionized arithmetic operations. He also developed algorithms for addition, subtraction, multiplication, division, and square roots using the decimal place-value system.

3. Brahmagupta and the Rules of Arithmetic

Brahmagupta, another influential mathematician and astronomer, lived during the 7th century CE. His most notable work, the "Brahmasphutasiddhanta," contained groundbreaking contributions to arithmetic and algebra. Brahmagupta made significant advancements in understanding negative numbers and rules for performing arithmetic operations with them. He presented solutions to linear and quadratic equations and also explored methods for solving problems related to indeterminate equations.

4. Bhaskara II and the Concept of Infinity

Bhaskara II, also known as Bhaskaracharya, was an eminent mathematician and astronomer who lived in the 12th century CE. He is renowned for his remarkable treatise, the "Lilavati," which covers various mathematical topics. Bhaskara II made notable contributions to algebra, including solving quadratic, cubic, and quartic equations. He also worked on indeterminate equations and introduced the concept of "infinity" in his mathematical work.

5. Kerala School of Mathematics

The Kerala School of Mathematics, which flourished between the 14th and 16th centuries CE, made significant contributions to calculus and infinite series. The scholars of this school made advancements in trigonometry, including trigonometric functions and their applications in astronomy. The renowned mathematician Madhava of Sangamagrama, often referred to as the "Founder of Calculus," was a prominent figure in the Kerala School. He developed the concept of infinite series expansions for trigonometric functions, such as sine, cosine, and arctangent, which predated similar European discoveries by several centuries.

Conclusion

Classical mathematics in India holds a profound significance in the history of the subject. The ancient mathematicians of India made groundbreaking discoveries, ranging from geometric principles in Vedic texts to the invention of the decimal system and the concept of zero by Aryabhata. Brahmagupta's work on negative numbers and Bhaskara II's exploration of infinity further enhanced India's mathematical legacy. The Kerala School's contributions to calculus and infinite series demonstrate India's pioneering efforts in the field, rivalling European developments. The discoveries and achievements of Indian mathematicians have left an enduring impact on the world of mathematics and continue to inspire scholars and enthusiasts alike. The classical era of Indian mathematics stands as a testament to the brilliance of ancient Indian scholars and their enduring quest for knowledge and understanding.

References

- [1] Hayashi, T. (2010). The Bakhshali Manuscript: A Study in Indian Mathematics. Hindustan Book Agency. ISBN-13: 978-9380250064.



- [2] Neugebauer, O. (2013). The Exact Sciences in Antiquity. Dover Publications. ISBN-13: 978-0486223322.
- [3] Gupta, R. C. (1994). Encyclopaedia of Indian Mathematics. Munshiram Manoharlal Publishers. ISBN-13: 978-8185636991.
- [4] Kak, S. (2018). The Astronomical Code of the R̥gveda . Aditya Prakashan. ISBN-13: 978-8177421738.
- [5] Bourbaki, N. (2013). Elements of the History of Mathematics. Springer. ISBN-13: 978-9401757267.
- [6] Bag, A. K. (2019). Indian Mathematics: An Overview. Springer. ISBN-13: 978-9811387856.
- [7] Pingree, D. (1981). Census of the Exact Sciences in Sanskrit. American Philosophical Society.
- [8] Ifrah, G. (2000). The Universal History of Numbers: From Prehistory to the Invention of the Computer. John Wiley & Sons. ISBN-13: 978-0471393407.
- [9] O'Connor, J. J., & Robertson, E. F. (2000). Indian Mathematics - The story of mathematics. mathshistory.st-andrews.ac.uk/HistTopics/Indian_mathematics/ Accessed on 10 March 2023.
- [10] George Gheverghese Joseph. (2009). The Crest of the Peacock: Non-European Roots of Mathematics. Princeton University Press. ISBN-13: 978-0691135267.
- [11] Cajori, F. (1991). A History of Mathematics (Vol. 1). AMS Bookstore. ISBN-13: 978-0821819312.
- [12] Plofker, K. (2009). Mathematics in India. Princeton University Press. ISBN-13: 978-0691120676.
- [13] Filliozat, P. (2004). Ancient Indian Mathematics: With Special Reference to Vedic Mathematics and Astronomy. Munshiram Manoharlal Publishers. ISBN-13: 978-8121508250.
- [14] Bhargava, H. P. (1976). The Positional Decimal System in Indian Mathematics and Its Diffusion. Indian Journal of History of Science, 11(1), 1-18.
- [15] Singh, A. N. (2018). History of Mathematics in India. Taylor & Francis. ISBN-13: 978-0367445829.

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