



SHRIPATI (1019 – 1066 CE): An Indian Mathematician and Astronomer

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1. Introduction:

Shripati was one of the prominent mathematicians and astronomers of the early India, he summarized his works on mathematics in the treatise, *Ganitatilaka*, and it is a treatise of arithmetic which described the rules of signs for addition, subtraction, multiplication, division, square, square root, cube, cube roots, of positive and negative quantities. Other works on astronomy and astrology are as the following:

- (i). *Siddhantsekhara*, is a work on mathematical astronomy and contained the rules of arithmetic, algebra, and formulae of sphere etc.
- (ii). *Dhikotidakarana*, is a description of solar and lunar eclipses.
- (iii). *Dhruvamanasa*, is an astronomical work on finding planetary longitudes, eclipses, and planetary transit etc.
- (iv). *Jyotisharatnamala*, it is a treatise based on Lallacharya's astrological work *Jyotisharatnakosa*.
- (v). *Daivajna – vallabha*, is an astrological work however, some historians of mathematics believed that this was a work of Varahamihira a sixth century Indian mathematician and astronomer, but it is still uncertain.
- (vi). *Jatakapaddhati*, is a text on the computation of strength of the planet stand astrological places in astrology [1 p. 108].

About the place of birth and time of Shripati is not known certainly, but a little information is inferred from his works. In his astronomical and astrological works two dates had mentioned one corresponding to 1039 CE and another to 1056 CE and he was a member of the *Kāśyapa gotra* and lived in a place known as, *Rohinikhanda*, in modern Maharashtra state at 250 kilometres in the south of Ujjain [2 p. 325]. In the *Dhruvamanasa*, a mention was found that, his father was Nagadeva, who was the son of Bhatt Kesava and in his other work *Siddhantsekhara*, a statement indicates that he belonged to a *Brahmin* family. It is inferred from his text *Ganittilaka*, that he was a follower of the *Shaiva* sect i.e., devotee to Lord *Shiva* and from the

work *Jatakapaddhati*, a mention implies that he was a teacher and some of his students requested him to author the treatises [1 p. 108].

2. Some Works of Shripati on Mathematics

(a). Shripati worked on solving the quadratic equations and an identity was given by him as the following [1 p. 108]:

$$\sqrt{(a + \sqrt{b})} = \sqrt{[a + \sqrt{(a^2 - b)}]/2} + \sqrt{[a - (a^2 - b)]/2}$$

He also mentioned the rules for the solution of first-degree indeterminate equations but these rules like that of Brahmgupta's rules [4 p. 52].

(b). A number series, starting from one and in increasing order expressed in the powers of ten with an individual name of each number as the following [1 p. 109]:

Eka (1), *Dash* (10), *Sata* (10^2), *Sahasra* (10^3), *Ayut* (10^4), *Laksh* (10^5), *Prayuta* (10^6), *Koti* (10^7), *Arbuda* (10^8), *Padma* (10^9), *Kharva* (10^{10}), *Nikharva* (10^{11}), *Mahasarosa* (10^{12}), *Sanku* (10^{13}), *Antya* (10^{14}), *Madhya* (10^{15}) and *Parardha* (10^{16}). However, a similar series of word numerals were also mentioned in the works of earlier Indian mathematicians.

(c). He defined the different operations with zero as the following:

(i). $a + 0 = a$

(ii). $a - 0 = a$

(iii). $a \div 0 = 0$, it was wrongly defined.

(iv). $a \times 0 = 0$

(v). $0 \times a = 0$

(vi). $0^2 = 0$

(vii). $0^3 = 0$

(viii). $0 \div 0 = 0$, it was also wrongly defined.

Shripati also explained that the square root and cube root of zero are zero for both operations [1 p. 114].

In his arithmetical text *Ganitatilaka*, he described in detail the arithmetic operations like addition, subtraction, multiplication, division, squaring and cubing of a number, fractions, proportion etc. At the end of the text a description of dealings like trading of gold, measurement of length, measurement of area and measurement of weights was given by him [1 p. 115].

Conclusion: In his book Ganitatilaka he dealt with Parikramastakam that is eight basic processes (Addition, Subtraction, Multiplication, Division, Square, Square Root, Cube and Cube Root) of whole numbers. He had also included Fraction and Proportions.

References:

1. Rawal, Bachubahi, B.: Shripati – The creator of “Ganittilaka”, Ancient Indian Mathematicians (Editor, K. V. Krishna Murty and Co-editor, M. S. Rao), Institute of Scientific Research on Vedas, 2010.
2. Plofker, Kim: Mathematics in India, Hindustan Book Agency, New Delhi, 2012.
3. Rao, S. B., Venugopal, P. and Uma, S. K.: Bhāskarācārya – II The Most Popular Indian Astronomer, Ancient Indian Mathematicians (Editor, K. V. Krishna Murty and Co-editor, M. S. Rao), Institute of Scientific Research on Vedas, 2010.
4. Mohan, M., Chander, S.: Some Indian Savants of Mathematics, Gaṇita Bhāratī, 25 (1-4): 45-60, 2003.

