

VEDIC MATHEMATICS—MATHEMATICAL CALCULATIONS BASED  
ON THE VEDIC SŪTRAS AND ON THE LĪLĀVATĪ

B.B. LAL  
Chief Archaeological Chemist (Retd)  
47, Subhash Road  
Dehra Dun-248001

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Śrī Jagadguru Svāmī Śrī Bhāratī Kṛṣṇa Tīrthajī Mahārāja, Śaṅkarācārya of GovardhanaMath, Puri has derived from the *Atharvaveda* sixteen *sūtras* with a number of corollaries giving abbreviated forms of methods of a variety of mathematical calculations.<sup>1</sup> Reviewing this original and important work, Bag<sup>2</sup> has observed that the derivation of the *sūtras* demonstrates great power of insight or intuition. A simple mathematical problem of multiplication ( $3465 \times 2571$ ) has been cited to illustrate the remarkably simple and short process based on the *Sūtras*.

The mathematical process cited here is no doubt simple and short, but involves quite a bit of mental calculation. While scanning through the relevant literature on the developments of scientific thoughts in early India, the present author's attention was drawn to a more ingenious and easier method, which had been developed about eight hundred years earlier by Bhāskarācārya. This method is discussed below.

*Multiplication of 3465 by 2571 :*

Write the multiplicand in the horizontal line and the multiplier in a vertical line as shown in the Figure. Let there be as many vertical columns and rows as there are the digits in the multiplicand and the multiplier, respectively. Draw diagonals as shown. Now multiply each digit of the multiplicand by each digit of the multiplier, and write the digits of each product in the unit's place in the lower part of each square below the diagonal, and the digits in the ten's place in the upper part of each square above the diagonal. Starting with the lowest half-square to the right, add all the digits in each diagonal belt adding the digits in the ten's place of each sum to the sum of the digits in the

next higher diagonal belt. The result of the multiplication is found straight away.

		Multiplicand					
		3	4	6	5		
Multiplier	2	6	8	1	2	1	0
	5	1	5	2	0	3	0
	7	2	1	2	8	4	2
	1	3	4	6	1	5	5
		8	9	0	8	5	1
		Product					

It is thus seen that this method, involving very little mental calculation, is much simpler than the one based on the *sūtras* and is discussed in the *Līlāvati*, the first part of Bhāskarācārya's larger work called *Siddhānta Śiromaṇi*, datable to 1150 A.D.

REFERENCES

- <sup>1</sup> Jagadguru Svāmī Śrī Bhārati Kṛṣṇa Tīrthajī Mahārāja, Śaṅkarācārya of Govardhana Matha, Puri. *Vedic Mathematics or Sixteen Simple Mathematical Formulae from the Vedas*, Banaras Hindu University, Varanasi.
- <sup>2</sup> Bag, A.K., *Indian Journal of History of Sciences*, 3(1), 59-60, 1968.