



Vedic Mathematics – A controversial origin but a wonderful discovery

KEYWORDS

Sutras, Vedas, Atharvaveda, Algebra, Linear and non linear differential equations

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ABSTRACT Vedic Mathematics is the name given to the system of mathematics, which is claimed to be discovered from Vedas by Sri Bharti Krishna Tirtha. It is based on book authored by Bharti Krishna Tirtha and published in 1965. Vedic Mathematics is based on sixteen Sutras and thirteen subsutras in Sanskrit which are claimed to have ability to solve all modern mathematica problems. These sutras help in speedy calculations in high school mathematics. Differential equations and recurring decimals can be solved with the help of these sutas. Although the application of these sutras in different fields has not been objected to but the critics of Vedic Mathematics object to its origin and name.

Vedic Mathematics is the name given to the system of mathematics, which is claimed to be discovered from Vedas between 1911 and 1918 by Sri Bharti Krishna Tirtha [1]. It is based on book authored by Bharti Krishna Tirtha and published in 1965 and has been reprinted 15 times. Vedic Mathematics is based on sixteen Sutras and thirteen subsutras in Sanskrit which are claimed to have ability to solve all modern mathematica problems. The sutras are

S. No	Sutras	Subsutras
1	Ekadhikena Purvena	Anurupyena
2	Nikhilam Navatascaramam Dasatah	Sisyate Sesamjnah
3	Urdhva triyagbhyam	Adyama dyenantyaman-tyena
4	Paravartya Yojayet	Kevalaih Saptakam Gunyat
5	Sunyam Samyasamuccaye	Vestanam
6	Anurupye Sunyamanyat	Yavadunam Tavadunikrtya
7	Sankalana vyavakalanabhyam	Yavadunam Tavadunikrtya Varganka yojayet
8	Puranapuranaabhyam	Antyayordasake pi
9	Calanakalanabhyam	Antyayoreva
10	Yavadunam	Samuccayagunitah
11	Vyastisamastih	Lopanasthapanabhyam
12	Sesanyankena caramena	Vilokanam
13	Sopantyadvayamantyam	Gunitasamuccayah Samuccayagunitah
14	Ekanyunena Purvena	
15	Gunitah samuccayah	
16	Gunakasamuccayah	

These sutras are helpful in quick calculations. For example first sutra "Ekadhikena Purvena" which means "one more than the previous one" is helpful in evaluating value of fractions with numerator 1 and denominator a two digit number ending with 9, like 1/19, 1/29, 1/39 etc. The method is as follows. We start from right hand side with digit 1. We multiply it with one more than 1 that is 2 and we get second digit 2.

2 1

2

Now multiply 2 with second digit to get third digit 4 and similarly fourth digit is third digit multiplied with 2 is 8.

8421

2

When we multiply fourth digit number 8 with 2 we get 16 which is two digit number, we write 6 to the left of 8 and 1 is carried forward to be added to next digit.

1 68421

2

Now multiply 6 with 2 and add the carried forward digit 1 to get 13, we write 3 to the left of 6. Again 1 is carried forward. Repeat the process till the digits start repeating. Then stop and put dots on first and last digit to show that its recurring decimal and put a decimal to the left of last non repeating digit. Hence

...

.052631578947368421 = 1/19

Second sutra "Nikhilam Navatascaramam Dasatah" helps in finding product of numbers close to powers of 10. Suppose we want to multiply 997 and 994. The base here is a power of 10 which is close to the given digit. In this case it is 1000. Write the numbers on left hand side and its difference from 1000 on right hand side with a '-' sign in between, one below the other.

997-003

994-006

Multiply vertically the two numbers on the left hand side and write their product as a three digit number below them.

997-003

994-006

018

Now write the difference of digits cross wise either 997-006 or 994-003, which is 991 in both the cases and write it to the left of already written number i.e. 018

997-003

994-006

991 018

Hence the product of 997 and 994 is 991018.

The first corollary of Nikhilam sutra says " Whatever extent of its deficiency lessen it further and also set up the square of that deficiency." It helps in finding squares of numbers close to a power of 10. For example square of 998 which is 002 less than 1000 is obtained by further subtracting 0002 from 998 to get 996, which is right hand side of the answer and left hand side is square of 002 i.e. 004. Hence $998^2 = 996004$.

The third sutra "Urdhva Tiryagbhyam" is applicable to multiplication. This sutra means "vertically and crosswise". If we want to multiply 31 and 34, we write the numbers one below the other. First multiply vertically the right hand digits .

31

34

4

The middle digit is obtained by multiplying crosswise and adding them . $(3 \times 4) + (3 \times 1)$ is 15. As it is two digit number we write 5 to the left of 4 and 1 carried over to be added to the next number.

31

34

54

Now multiply the left hand digits vertically and add the carried over number. $(3 \times 3) + 1$ is 10

31

34

1054

Hence $31 \times 34 = 1054$.

These examples show that these sutras help in quick high school level mathematical calculations. The sutras help in speed and accuracy in solving numericals, there by prepare school children to overcome the fear of mathematics. The sutras are systematic, coherent and unified than the conventional method. It is a mental tool for calculations [2]. Linear, non linear, partial and ordinary differential equations can be solved using these sutras [3]. Recurring decimals can also be solved by these sutras [4].

Some sutras are used in designing software which help in increasing speed of computers and lowers the consumption of power. A design has been presented of a low power, high speed algorithm for ALU (Arithmetic Logic Unit) using "Urdhva Tiryagbhyam" sutra [5]. Employing this sutra in the computation algorithm of the coprocessor reduces the complexity, execution time, area and power. A novel binary division algorithm is designed extending "Paravartya Sutra" to "Radix 2" binary number system for division and application to polynomial division [6].

The application of these sutras in different fields has not been objected to but the critics of Vedic Mathematics object to its origin and name. Dani[7] argues that the origin of sutras mentioned in the book are not "vedic" at all, as they are not found in Atharvaveda as claimed by the author in [1]. Prof.S.C.Shukla, a renowned scholar of ancient Indian mathematics met Bharti Krishna Tirtha, in 1950 when he visited Lucknow to give a blackboard demonstration of his 'Vedic Mathematics' and requested him to point out the sutras in question in the parishishta (appendix) of Atharvaveda of which he even carried a copy (standard version) edited by G.M. Bolling and J.Von Negelein [8]. The author of 'Vedic Mathematics' is said to have told him that the sixteen sutras mentioned by him were not in those parishishtas and that 'they occur in his own parishishtas and not any other' [9]. This implies that the sutras are not from Vedas. Moreover the style of language of sixteen sutras and subsutras point to their discovery by the author himself. Further the branches of mathematics like algebra and calculus which he mentions did not exist in the vedic times. Bharti Krishna Tirtha did his M.A. in mathematics, Sanskrit, Philosophy and English from Bombay Centre of the American college of Sciences, Rochester New York. Hence he had good knowledge of Vedas and mathematics. Hence the conclusion that these sutras are created by the author himself and so the title "Vedic mathematics" is not acceptable[10].

Dr. J.N. Kapoor [11] has observed that vedic mathematics is not concerned with those aspects of mathematics which do not depend on computation. However most of the applicable parts of mathematics do require computation. For non computational, thinking and logical part of mathematics vedic mathematics does not provide any help. The book deals with only a small aspect of mathematics and its claim to give one line answers to all mathematical problems is questionable. Vedic mathematics has nothing to do with mathematics in the Vedas except that it was written by a person who knew Vedas and mathematics. Dr.T.M. Karade [12] concludes that one would never find a special and separate chapter on mathematics in the Vedas. It may be scattered here and there and to discover it is a herculean task. Bharti Krishna Tirtha's work on mathematics is usually referred to as Vedic Mathematics. But it does not mean that there cannot be Vedic Mathematics other than Bharti Krishna's mathematics [12]. Dutta and Singh [13] have noticed seven distinct modes of multiplication employed by Hindus viz Door junction method, gelosia method, cross multiplication method, multiplication by separation of places, zigzag method, parts multiplication method and Al-gennair method [14]. Out of these the cross multiplication method is algebraic and has been compared to Tirtakgunana or Vajrabhaya used in algebra. This method was known to the Hindu Scholors of eighth century. Bharti Krishna Tirtha's mathematical method ' Urdhvatiyaka Sutra' is a simplified version of this method.

We may conclude that the Vedic Mathematics discovered by Bharti Krishna Tirtha can be used in High school mathematics for speedy calculations and this branch need further intensive research to give it a shape of systematic branch of knowledge.

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