VEDIC MATH – AN INTRODUCTION

by

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"The Vedic Math Guy"

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Vedic Math is a relatively new term that has been introduced into the lexicon only in the last fifty years. Re-discovered during the period 1911-1918 by a brilliant mathematician, philosopher and educator Swamiji Bharathi Krishna Thirtha, it consists of a set of sixteen aphorisms or formulae (sutras) and thirteen sub-aphorisms. This has been highlighted in a book published posthumously in 1965 under the title "Vedic Mathematics". This approach according to the author's own account, he distilled the sutras from the `mathematical formulae' from ancient Indian philosophical and religious texts from *Atharva Veda* (one of the four treatises – *Rig, Yajur and Sama* being the others) that deals primarily with worldly aspects.

According to one interpretation, the portions of knowledge encompassing intra-disciplinary science that deals with all branches of mathematics, science, architecture, and engineering, is tied to Atharva Veda. Naturally, the `mathematical formulae' can be expected to fall under this treatise. Ancient Hindus in the process of constructing sacrificial altars of precise shapes and sizes had to master geometry, arithmetic and algebra that had been encoded into these sutras. S*utra* is the root of the word '*suture'* - the thread that physicians use to tie up a wound.

There is strong evidence that the Vedic Math sutras of Swamiji are from the Vedas, however there are some who do not believe so. It is best to leave the controversy of the origins of the sutras to experts in that area, and concentrate on whether the Vedic Math (VM henceforth) approach is relevant to us in the modern world. It is my intent here in a series of columns to make a case that these sutras in totality cover arithmetic, algebra, plane and solid geometry, conics, and calculus.

The bottom line is: Does VM work? Why should I learn it? Will I get confused with what I have learned or learning at school?

I will answer these questions in succession. But first let us start by speaking the basic lingo of VM. Since 'seeing is believing', let us start with an example of a special case of squaring a multi-digit number that ends with '5'.

Suppose you want to find the area of a square with side 35 ft. That is we want to find Area= 35 x 35 = $(35)^2$ sq.ft. One's immediate reaction is to reach for the calculator. But Vedic Math has a very simple formula called the "One more than previous" (*Ekadhikena Purvena*) for you. Let us apply this.

Step 1. First recognize that the square of the second digit '5' (or 5 x 5) is 25; this will form the last two digits of the answer.

Step 2. Next, start with the digit previous to '5', i.e., '3'. Use the sutra "One more than previous" now. Since the previous digit is '3', one more than the previous is '4'. Now multiply these digits: 3 x 4 = 12, to get the other digits of the answer.

Step 3. Finally, assemble the answer as: 1225 where '12' is from Step 2, and '25' is from Step 1.

Now, learning the above sutra was not so bad, was it? Try this trick on your friend, parent or even your teacher. *Remember this formula works for the special case of squaring numbers ending with 5 only*. A quick check using basic algebra will reveal that the proof is not difficult (e-mail vedicmath@hotmail.com to get a copy of the proof).

Though we dealt with a special case of squaring a number ending with '5', relevant formulae exist for squaring a general number.

This I will discuss in a future column. Alternately in VM, this could be done using the general multiplication formula.

I have already illustrated a few characteristics of VM. First, sutras are easy to remember. In fact they even rhyme. Application of the sutras is easy to learn. Proof can be found algebraically. There is more than one method to doing the arithmetic i.e., multiple ways of 'skinning the cat' - in this case through squaring, general multiplication, etc. Learning this sutra did not confuse you, did it?

Now some basic questions have been answered and I have piqued your interest, I will pose some deeper questions.

To begin with: How different is VM as opposed to conventional mathematics? Is VM well grounded in theory or is it a bag of tricks? Can VM be the basis of a complete math curriculum? Why should one learn VM in the age of calculators and computers? Is VM limited to a decimal base or can it be used for other bases (such as binary, octal or hexadecimal used in theoretical computer science)?

First of all VM is more coherent than conventional mathematics. For example, the technique for division is the opposite of multiplication; reversing the technique to find the square will get us the square root, and so on. VM allows for a smooth transition from arithmetic to algebra to geometry. Conventional mathematics, at the level of arithmetic and algebra is a hodge-podge of techniques. We do not usually think about this since this is the only way we have been taught from grade school.

VM works with any base (decimal or base 10 is the most commonly used one) easily. In conventional mathematics we have numbers with either all positive or all negative digits (such as 1947 or –1947). VM allows a mixture of digits in the same number using a technique called Viniculum or complement (e.g. $2\overline{1}5\overline{3}$). Incidentally, Viniculums have strong relationship through discrete mathematics approaches used in microprocessor technology for all arithmetic operations. Using VM one can sum a mixed set of three or more multi-digit positive and negative numbers in a single operation in exactly the same way as is implemented in a modern digital computer. In conventional mathematics this takes three operations. Arithmetic operations in VM can be carried out from right to left (we usually do this) or from left to right.

Use of VM or any mental math technique for that matter (Tractenberg techniques developed in a Nazi concentration camp by an inmate comes to mind) increases the mental agility of the students and ability to retain complex ideas in mind. Overuse of concepts as compared to a 'concept and drill' approach (ignore what the Chicago Math Curriculum crowd would like you to believe) is one of the main reasons why North American students consistently score lower in proficiency tests than students from any developed country. Students learn to develop their own strategies to solve problems and to handle contingencies by extrapolation in VM. This enhances personal growth in other learning situations and in subjects that require logic.

Finally, VM-based curriculum has been developed and used in some schools in Britain successfully. James Glover, Head of Mathematics at St. James School, Twickenham, London, Britain has been using a curriculum he had developed for the last twenty years. Maharshi Schools the world over are teaching a VM curriculum developed by Kenneth Williams and Mark Gaskell at their school in Skelmersdale, Lancashire, England for nearly fifteen years. Some schools in India have started to offer VM curriculum. VM training centers exist in Singapore and Australia also.

Future columns will discuss each technique at a time.

Homework For Fun: Try the "One more than the previous" sutra to square the following numbers: 45, 65, 75, and 125. Send answers to vedicmath@hotmail.com. All correct answers will be acknowledged.

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