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Vedic Mathematics: Need Of An Hour

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Abstract- In today's age of competition, the mathematical skills are highly required. The fast calculations are the pillars to clear any competitive exams. Vedic mathematics not only makes someone calculations speedy but also saves the time. Vedic mathematics should be implemented from school level to increase the interest of students in the subject. Vedic mathematics depends upon sixteen sutras of Sanskrit

Keywords: Vedic, sutras, mathematics, calculations.

1. INTRODUCTION

In the 19th century German mathematician Karl Friedrich Gauss called mathematics as the Queen of the Sciences. However, one must know that Acharya Lagadh Muni in his book Vedang Jyotish (1350 BC) about more than 3,000 years before Carl Friedrich Gauss stated the importance of mathematics saying Just as on the top of the peacock is the crest and on the head of the serpent is the Cobra Pearl, in the same way among all the Vedang Shastras (sciences) mathematics is at the top. The so-called Vedic mathematics is a case in point. A book **Vedic Mathematics** written by Jagadguru Swami Shri Bharati Krishna Tirtha ji Maharaja in 1965 is at the centre of this pursuit which has now acquired wide following. Tirthaji was the Shankaracharya of Govardhan Math, Puri from 1925 until he passed away in 1960. The book was published posthumously but he had been carrying out a campaign on the theme for a long time apparently for several decades by means of lectures, blackboard demonstrations, classes and so on. It has been known from the beginning that there is no evidence of the contents of the book being of Vedic origin, the foreword to the book by Manjula Trivedi a disciple of the Swamiji make this doubt clear even before one gets to the text of the book. No one has come up with any positive evidence subsequently.

At the school level Vedic mathematics deals only with a small part and more importantly there too, it concerns itself with only one particular aspect that of faster computation. One of the main aims of mathematics education even at the elementary level consists of developing familiarity with a variety of concepts and their significance. Not only does the approach of Vedic mathematics contribute anything towards this crucial objective but in fact might work to its objective because of the undue emphasis laid on faster computation. The Swamiji's assertion 8 months (or 12 months) at an average rate of 2 or 3 hours per day should suffice for completing the whole course of mathematical studies on these Vedic lines.

2. THE SIXTEEN SUTRAS

There are sixteen sutras which must be known to everyone. Let us discuss one by one

2.1 EKADHIKENA PURVENA (by one more than the previous)

Ekadhikena purvena is very useful in finding the product of numbers, if the sum of unit digits of the two numbers totals to 10 e.g. $24 \times 26 = ?$ (1)

. Equation (1) equals to (first digit multiplied with one more than first digit) (product of unit digits of both the number) as $(2 \times 3)(4 \times 6) = 624$. So, $24 \times 26 = 624$. The answer has come without doing any elaborate calculation

2.2 NIKHILAM NAVATASHCARAMAM DASHATAH (all from 9 and last from 10)

This sutra is very commonly used in the subtraction of a number from the powers of 10. For example $10000 - 7688 = 2312$. (2)

The last number is 8 and this is subtracted from 10 and the next 8 is subtracted from 9, all other numbers are subtracted by 9 and the result comes out almost orally.

2.3 URDHVA-TRIBHAGYAM (vertically and crosswise)

This is used for multiplications and the formula used is explained below

$$ab \times cd = (ac)(ad+bc)(bd) \quad (3)$$

Using above method, we find $24 \times 12 = (2 \times 1)(2 \times 2 + 4 \times 1)(4 \times 2)$ and the answer is 288.

2.4 PARAVARTYA YOJAYET (Transpose and apply)

This is used to solve division problems when the divisor is a little greater than the nearest power of 10 and starts with 1. Let us apply the formula to the problem $1589/112$. Here, the divisor is 112 which is near to 100 and having the difference 12. Let us take its complement as -1 and -2 . First of all let us take the first digit of the dividend as 1. Then multiply 1 with -1 and write below 5. Then multiply 1 with -2 and write it below 8. Now $5 - 1 = 4$. Then multiply 4 with -1 and write it below 8 and -2 . Again multiply 4 with -2 and write below 9. In last, we get quotient as 14 and remainder is 21.

2.5 SHUNYAM SAAMYASAMUCCAYE (When the sum is the same. That sum is zero)

This is used to solve equations in the form 1. $ax + b = cx + d$, (4)

then $x = d - b / a - c$.

$$2. (x + a)(x + b) = (x + c)(x + d) \text{ then } x = cd - ab / a + b - c - d. \quad (5)$$

Some applications are as follows: 1. A term which occurs as a common factor in all the terms is equated to zero e.g. : $14x + 9x = 4x + 12x$. Here x occurs as a common factor with all terms and hence the value of x according to this sutra is zero.

2. If the product is of the form $(x+8)(x+3) = (x+12)(x+2)$, then value of x in this equation would be 0.

2.6 ANURUPYE SHUNYAMANAT (This is used to solve the linear equation)

Let us suppose the equations $2x + 4y = 8, 4x + 6y = 16$, (6)

the ratio of terms of $x = 1/2$ and the ratio of the R.H.S term is also $8/16 = 1/2$. Therefore, the value of other variable in this case is $y = 0$. Substituting this value of y in any other of the two equations, we can get value of x as 4.

2.7 SANKALANA-VYAVAKALANABHYAM (By addition and subtraction)

This sutra is used to solve equations (if the coefficient of one variable is same in both the equation irrespective of the sign) means the coefficient of the one variable in first equation should be equal to the coefficient of the second variable in the second equation and the coefficient of the second variable in the first equation should be equal to the coefficient of first variable in the second equation. Then the two equations can be added and subtracted and solved for the variables.

This formula can be used to solve addition problems when the unit digits of the numbers add up to 10 for e.g. number 22 and 18, the unit digits add up to 10. Let us try to add the following $295+46+28+15+44+22=?$. Now, we need to check and make pair of numbers in such a way that their unit places add up to 10. So rearrange to put the paired number together as $(295+15)+(46+44)+(28+22) = 310+90+50 = 450$. This happened in easy steps instead of long calculations.

The application of this sutra can be found in calculus to find roots of a quadratic equation and the second application is in differential calculus for factorizing 3rd, 4th, and 5 degrees expression. This sutra finds very specialized applications in the area of higher mathematics.

This is used to find squares of numbers that are close to the powers of 10. Compare the number with the closed base to it and find the deficiency or excess. Square the difference and this is one part of the answer, reduce the given number or increase it by the difference it has to the power of base 10. Let us understand this with an example. Let us try to find the square of 12 using above technique. As 12 is near to 10 and it is 2 excess than 10. Following steps are involved :

- Let us understand the same in case of more digits number i.e whose base is closer to 100 and 2 more than 100. So, $(102)^2 = (102+2)/(2)^2 = 104/004 = 10404$.

This helps in the factorization of quadratic equations.

This sutra gives you the process of converting fractions to decimals. Let us understand with the help of an example. i.e $10/7$. The consecutive remainders are 3,2,6, 4,5,1 respectively. Multiply each remainder with 7 i.e 21,14,42,28,35,7. Then $10/7=0.142857$.

This sutra is used to find solution of equations in the following form

Where a, b, c and d are in arithmetic progression. Solution for such equations is $2c+d = 0$. Let us take an example

Now according to the above sutra, the solution would be

$$\mathbf{x} = -10/3 \quad (12)$$

2.14 GUNITA SAMUCHAYA

It is used to find the correctness of the answers in factorization problems and it states that the sum of the coefficients in the product is equal to the sum of coefficients of the factors and if this condition is satisfied then the equation can be considered to be balanced. For e.g. let us consider a quadratic equation

$$8x^2 + 11x + 3 = (x+1)(8x+3) \quad (13)$$

In above equation, the sum of coefficients is $8+11+3 = 22$. Product of the sum of coefficients of the factors is $(1 + 1)(8 + 3) = 22$. Since both the totals tally, therefore the equation is balanced and correct.

2.15 GUNAKASAMUCHYA (The factor of the sum is equal to the sum of the factors.)

This sutra holds good for a perfect number. Let us find the factors of number 28. The factors are 1,2,4,7,14,28 $1 \times 28 = 28$ $2 \times 14 = 28$ $4 \times 7 = 28$ So, in this case, the sum of factors is $1+2+4+7+14 = 28$ The sum of factors equals the factor of the sums, so 28 is said to be a perfect number.

3. CONCLUSION

In today's age of competition, the mathematical skills are highly required. The fast calculations are the pillars to clear any competitive exams. Vedic mathematics not only makes someone calculations speedy but also saves the time. Vedic mathematics should be implemented from school level to increase the interest of students in the subject. Vedic mathematics depends upon sixteen sutras of Sanskrit.

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