AN ANALYSIS OF MATHEMATICS AND COMPUTATION SPEED BOOSTUP CALCULATIONS IN TERMS OF VEDIC MATHS

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ABSTRACT

The Vedic mathematics is a method of mathematical formulas established by Indians in the year of 1957 with 16-word formulae and some sub-formulae. In tests, majority of students find it challenging to solve the aptitude questions with restricted or short time span. There is a shortage of decisiveness among students. We provided some simple mathematical formulas such as subtraction, multiplication, square, square root and cube, cube root to a community of 30 school students and asked them to solve some questions using Vedic methods. Accomplished using Vedic method of minute measurements, before and after adopting Vedic method. It may be observed that the Vedic methods considerably increases the tempo of arithmetic operations. After reading this paper we wish that it will contribute to study of Vedic Mathematics and to improving the pace of mental calculations particularly in all examinations.

KEYWORDS: Vedic Mathematics, T-test, Vedic sutras.

INTRODUCTION:

The term of the ancient Hindu mathematical sutras is Vedic Mathematics. The method includes 16 Vedic formulas which are used to solve complex or intricate mathematical problems. Vedic mathematics was rediscovered from Indian scriptures in the years 1911-1918 and was thoroughly established in 1957 by Jagadgúru Sri Bharathi Krishna Thirthaji Maharaja.

We try to establish and try to solve several rational thinking query problems in solving this test. The Vedic mathematical methodology comprises of 16 Vedic sutras for conducting a broad range of useful mathematical calculations. These strategies can be known as fast curing methods and which will greatly decrease the amount of competition examinations queries.

An observational research is performed to determine if a Vedic mathematics methodology increases the pace of fundamental mathematical operations. These suggested mathematical problems would be tested by school students before and after utilizing Vedic mathematics. Basic arithmetic operations of addition, subtraction, multiplication, square, square root, cube, cube root, aggregation, multiplication and division with multiplication laws, among others, before and after accepting Vedic views students are registered. Initially hypothesis is generated and is tested by t-test. This study finds that the Vedic structure greatly boost the calculating ability.

Interconnected Research:

There is not much evidence of the role of Vedic mathematics in improving simple mathematical operations or calculations. This Vedic mathematical method has expanded around the globe. Then in 1981, a community of British mathematicians together with K. Williams, A. Nicholas and J. Pickles started to teach Hartleys theorem separately. The Vedic mathematics methods aid in quick or swift calculations under circumstances. Teaching critical reasoning is important as students study for competitive exams. Vedic mathematics techniques are particularly helpful or effective methods which assist in attaining a proficiency at rapid calculation.

Methods Used:

This work reflects on some Vedic mathematics method which consist of “Nikhilam Navatas Charamam Dasatah” means all from 9 last from 10, subtraction using the rule all from 9 and last from 10, Multiplication using “Urdhva Tiryakbhyam Sutra” (Vertical and Crosswise), Multiplication of numbers with a series of 9’s in the multiplier, multiplication of numbers with series 1’s in the multiplier and multiplication of numbers with similar digits in the multiplier, square, square root of perfect square, cube and cube root of perfect cubing.

- 'Nikhilam Navatas Charamam Dashatah" means all from 9 and last from 10. This method can be very easily used in multiplication of numbers, which are near to base 10, 100, 1000... (i,e. power of 10) etc.
    1. Find the Base and Difference. (deficiency from the base)
    2. Number of Digits on right hand side is same as Number of zeros in the base.
    3. Multiply the difference on right hand side.
    4. Put the cross answer on the left hand side. (cross subtract to get first figure)

For example: 96 x 98

9 6 | - 4 (96 is 4 below 100)

9 8 | - 2 (98 is 2 below 100)

9 4 | 0 8

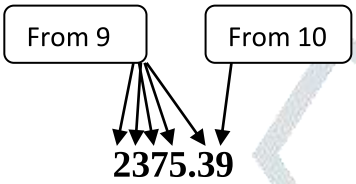
96 x 98 = **9408**

Here Base is 100 so we are allowed to have two digits on right hand side

- Subtraction using the rule 'Nikhilam Navatas Charamam Dasatah'(all from 9 and last from 10)

For example: subtract 2375.39 from 10000.

Just apply 'All from 9 and Last from 10' to 2375.39, difference of 2 from 9 is 7, 3 from 9 is 6, 7 from 9 is 2, 5 from 9 is 4, 3 from 9 is 6 and 9 from 10 is 1 so we get **7624.61**.



Start from Left & subtract all from 9 and the last from 10

10000.00
- 2375.39
7624.61

- Urdhva Tiryakbhyam Sutra (Vertical and Crosswise):
  This is the universal formula which is appropriate to all belongings of multiplication [3,8]. The rule of multiplication for 3 digit number(283 x 161) is as follows.

Multiplication: (283 x 161)

Step-1 : 2 8 3 / 1 6 1 ⟶ 3 x 1 = **3**

Step-2 : 2 8 3 / 1 6 1 ⟶ (8 x 1) + (3 x 6) = 8 + 18 = **26**

Step-3 : 2 8 3 / 1 6 1 ⟶ (2 x 1) + (3 x 1) + (8 x 6) = 2 + 3 + 48 = **53**

Step-4 : 2 8 3 / 1 6 1 ⟶ (2 x 6) + (8 x 1) = 12 + 8 = **20**

Step 5 : 2 8 3 / 1 6 1 ⟶ 2 x 1 = **2**

> Note: We Can Solve this form both the sides.
> Left to Right and Right to Left
>
> For Right to Left Follow Step 1 → 5
> For Left to Right Follow Step 5 → 1

283 x 161 = $2_{2}0_{5}3_{2}63$ = **45563**

- **Multiplication of numbers with a series of 9’s in the multiplier :**

This is in comparison with everything from 9 and last from 10 in the formula : ' By One Less Than the One Before.

For example: Multiply 45973 by 99999

The number being multiplied by 9's is first reduced by 1: 45973–1 = 45972.

So the amount is decreased by 1: 45973–1 = 45972.

There is the first part of the answer to this query. Then all from 9 and the Last from 10 is applied to 45972 to get 54027, which is the second part of the response.

45973 x 99999 = <u>45972</u> <u>54027</u>

- **Multiplication of numbers with series of 1's in the multiplier: Multiply 45132 by 1111**

We write down 2 in the unit place as it is 2 → 2

Add (2 + 3) = → 5

Add (2 + 3 + 1) = 6 → 6

Add (2 + 3 + 1 + 5) = 11 (1 carry) → 1

Add (3 + 1 + 5 + 4) + 1 carry = 14 (1 carry) → 4

Add (1 + 5 + 4) + 1 carry = 11 (1 carry) → 1

Add (5 + 4) + 1 carry = 10 (1 carry) → 0

Write down 4 as it is + 1 carry = 5 → 5

Final answer is = **50141652**

We can slove this both sides.

Right to Left ⇩

Left to Right ⇧

Example: Multiplication of numbers with similar digits in the multiplier: multiply 888 by 333

888 x 3 x 111

888 x 3 = 2664 x 111

We write down 4 in the unit place as it is 4 → 4

Add (6 + 4)= 10 (1 carry) → 0

Add (4 + 6 + 6) + 1 carry = 17 (1 carry) → 7

Add (2 + 6 + 6) + 1 carry = 15 (1 carry) → 5

Add (2 + 6) + 1 carry = 9 → 9

Write down 2 as it is = → 2

Final Answer is = **295704**

- **Square of any number:**

Using the formula vertically and crosswise, we can give a simple method for squaring numbers while the numbers being multiplied are the same.

The square of any number is only the sum of its Duplexes.

Duplex $D(a) = a^2, D(ab) = 2ab,\ D(abc) = 2ac + b^2, D(abcd) = 2ad + 2bc$

For Example: Square of 67

This is a building of three duplex houses located 67: D(6), D(67) and D(7).

D(6) = 36, D(67) = 84, D(7) = 49, By adding these three, we arrive at the normal equation.

67^2 = D(6) / D(67) / D(7)

= 36 / 84 / 49

= 368449

= **4489**

- **Square root of perfect square:**

  A ideal square trimmings with 0, 1, 4, 5, 6, 9. If a number ends with 2, 3, 7 and 8 it won't be a perfect square.

  Compare last digit of the square and Square Root.

Perfect square end with	Square root end with
1	1 or 9
4	2 or 8
9	3 or 7
6	4 or 6
5	5
0	0

For example : Discover the Square root of 5184

Step - 1: The Number 5184 ends with 4. so, square root ends with __2 or __8.

Step - 2 : Take complete Number 5184

Step - 3: 5184 deception between 4900 (which one is square of 70) & 6400 (which one is square of 80)

Step - 4 : From Step 1 we know that square root ends with 2 or 8. Of all the numbers between 70 & 80 (71, 72, 73, 74, 75, 76, 77, 78, 79). Thus out of 72 & 78 one is the correct answer.

Step -5 : Observe the Number 5184 is either closer to 4900 or 6400. It is closer to 4900.

Therefore, Answer is 72.

72 x 72 = 5184

- **Cube of any number :**

  Finding a cube of any number using the Algebraic Expression

$$(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$$

1^3	= 1
2^3	= 8
3^3	= 27
4^3	= 64
5^3	= 125
6^3	= 216
7^3	= 343
8^3	= 512
9^3	= 729
10^3	= 1000

Method of finding cube of (ab)

$(ab)^3 = a^3 \quad a^2b \quad ab^2 \quad b^3$

$2a^2b \quad 2ab^2$

a^3 / $3a^2b$ / $3ab^2$ / b^3

For example : Cube of 21

$(21)^3$ = 8 4 2 1

8 4

8 / 12 / 6/ 1

$(21)^3 = 8_1261$

$= \mathbf{9261}$

- **Cube root of perfect cube:**

Compare last digit of the Cube and Cube Root.

Perfect cube end with	Cube roots end with
0	0
1	1
2	**8**
3	**7**
4	4
5	5
6	6
7	**3**
8	**2**
9	9

Note: The cube roots 3 and 7 finish in the same number as their respective cubes while, cube roots 8 and 2 end in the same number.

The method can be explained with an example, discover the cube root of 438976.

Step : 1 We can represent the number as

438 | 976 (3 digit on RHS, immaterial even though there is no digit is on LHS)

Step - 2: Cube root ends with 6, thus answer at this stage____6

Step - 3: To get the result form LHS we take from the left of the slash is 438.

Step - 4: To find out two ideal cubes in which the number 438 is placed on the number side.

$(343 \leq 438 \leq 512)$ i.e, $(7^3 \leq 438 \leq 8^3)$

Step - 5: Out of the above two numbers, take smallest one viz. 6, we write answer as 76.

Thus 76 cube root of 438976

Objective and Methodology of the study:

To test the capability of a corresponding Vedic mathematics methodology. For sub goal, we can complete problem by adding Vedic mathematics.

This analysis is focused on primary and secondary sources. The primary data has been obtained from students of various school of different region of Gujarat State. It is supplementary evidence that was collected through polls and focus groups come across. Primary knowledge comes from newspaper, articles, magazines, online sites, and associated scholarly study reports. Based on evidence checking, an idea is established and its relevance is checked using the paired t-test.

Total 30 students from School of Gujarat State of India have been interviewed. This exam is packed with mathematical questions like subtraction, square root, multiplication, and other calculations. Before and after accepting Vedic views students are registered. A theory is established through statistics as given in figure 1.

V. Hypothesis and paired t-Test:

The average score of 30 Children was reported in Table-1 shows time required for completion of mathematical operations before and after implementing Vedic mathematical methods.

Table 1: Paired t-test both before and after embracing Vedic Mathematics.

Sr. No.	Before accepting Vedic mathematics methods (x)	After accepting Vedic mathematics methods (y)	Difference (D= x - y)	D^2
1	12	8	4	16
2	14	9	5	25
3	10	6	4	16
4	13	8	5	25
5	19	12	7	49
6	15	9	6	36
7	10	7	3	09
8	18	15	3	09
9	15	12	3	09
10	9	4	5	25
11	16	14	2	04
12	19	15	4	16
13	17	12	5	25
14	10	5	5	25
15	12	8	4	16
16	18	15	3	09
17	13	9	4	16
18	19	14	5	25
19	8	4	4	16
20	15	9	6	36
21	11	8	3	09
22	12	8	4	16
23	19	11	8	64
24	17	13	4	16
25	14	9	5	25
26	13	7	6	36
27	18	16	2	04
28	9	8	1	01
29	14	10	4	16
30	10	4	6	36

Null Hypothesis (H_0): $\mu_x = \mu_y$, mean The scores remain the same before and after following the Vedic mathematical methods. In other terms, there would be little realistic distinction between solving problems with Vedic mathematics and those without.

Alternative Hypothesis (H_1): $\mu_x \neq \mu_y$, (Two tailed)

After following Vedic Mathematics methods, you will have a much greater comprehension and results while solving any simple mathematics problems as shown in table 2.

Table 2. t-Test for Individual Findings

	Variable 1	Variable 2
signify value	13.96666667	9.633333333
discrepancy	11.96436782	12.3091954
Observations	30	30
Pearson association	0.905385423	
conjecture Mean Difference	0	
Degree of freedom	29	
t- test	15.65407295	
P(T <= t) one-tail	5.55713E-16	
t Critical one-tail	1.699126996	
P(T <= t) two-tail	1.11143E-15	
t Critical two-tail	2.045229611	

The tabulated value of t is 2.045. Because 't' calculated (15.65407295) is greater than 't' tabulated(15.65407295), it is statistically important at the 5 percent stage of significance. Consequently, alternate explanation is considered as the null hypothesis was dismissed.

In the other hand, t- measure was added (right tailed) there is a substantial decrease in time needed to learn Vedic strategies in order to solve simple mathematical problems. The average amongst the 29 degrees of freedom and at 5 percent significance level is 2.045. If the estimated value of "t" (15.65407295) is greater than the tabulated "t", then this is important.

Through analysing all alternate hypotheses we have concluded that Vedic mathematics methods are beneficial in solving mathematical problems. As a result a significant number of respondents replied that Vedic mathematics enhances the calculation pace. Focusing on user interface, only 2 percent responded that there will be no change in speed and all the respondents decided that preparation should be continuous in order to enhance memorization of Vedic mathematics methods.

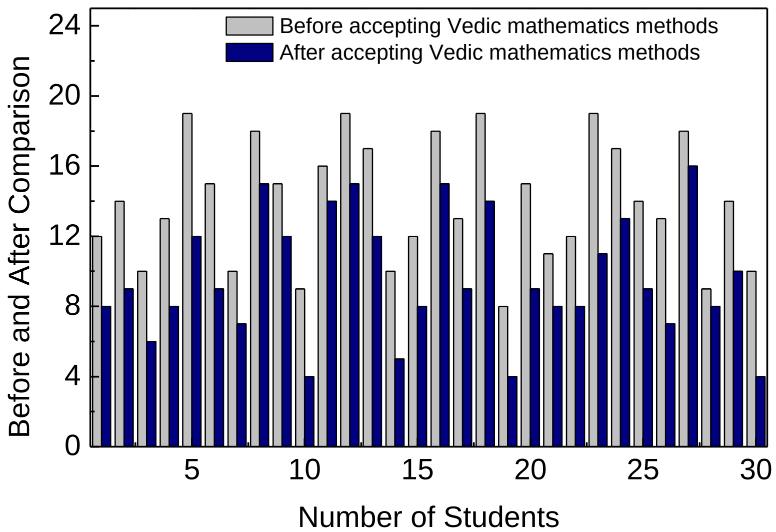


Figure 1. Graph shows Before and after comparison of students to accepting Vedic mathematics methods.

This research focuses on a significant number of just 30 participants. The longitudinal analysis requires further participants to validate its inference. This is just one mathematical procedure. The potential analysis includes operations with fewer complex mathematical techniques. The analysis calculated time by minutes.

CONCLUSION:

Indian Vedic Mathematics is an ancient method of mathematics focused on 16 sutras and sub sutras. Learning the Vedic methods of mathematics requires thorough preparation and inspiration. According to this paper on Vedic mathematics, it may greatly reduce the time to do certain simple mathematical computations. Vedic mathematics strategies are useful in mathematical problems that are rated and counted. It is one of the very popular way to solve math operations.

In this analysis, such numerical mathematical operations are used such as subtraction, square, square root, cube and cube root, and the multiplication of numbers close to a base. The paper statistical showed that Vedic mathematics strategies massively reduce the time required to solve mathematical problems. Both respondents accepted that at least one minute can be spared if we follow Vedic mathematics strategies for solving problems of simple mathematical operations and choose alternate hypothesis from a set of paired t-test. This paper has significance to the Vedic universe because of being capable of improving the pace of calculations.

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