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EFFECTIVENESS OF VEDIC MATHEMATICS IN THE COMPETITIVE EXAMS

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doi: [10.48047/AFJBS.6.14.2024.9150-9161](https://doi.org/10.48047/AFJBS.6.14.2024.9150-9161)**Abstract:**

Mathematics is considered to be very dry and boring subject by a large number of people. Children dislike and bear mathematics for a variety of reasons like computation etc. Vedic mathematics is found to be very effective and sound for mental calculations in mathematics. Sutras and sub sutras have beautiful and striking tricks for fast and easy for mathematical calculations. In competitive exams like CET, GATE, JEE, UPSE, GPSE, NTSE, Olympiads & many other, mental and fast calculations is required. Vedic mathematics helps in faster mental calculations & helps to reduce time to solve difficult mathematical equations in competitive exams. In this paper some mathematical tricks are taught to a group of 30 students, whom are pursuing for competitive exams and told to solve questions without and with using Vedic methods techniques. The time taken to complete the calculations are taken in terms of minutes before and after adopting Vedic methods techniques and are analyzed using paired t-test. This paper could be able to find that Vedic mathematics provides more systematic, simplified, unified and faster techniques than the conventional system to improve the speed of calculations while performing mathematical operations.

Keywords: Vedic mathematics, Calculations, t-test

Introduction:

Veda is a Sanskrit word which means 'Knowledge'. **Vedic Mathematics** is a collection of Techniques/Sutras to solve mathematical arithmetic's in easy and faster way. It consists of 16 Sutras (Formulae) and 13 sub-sutras (Sub Formulae) which can be used for problems involved in arithmetic, algebra, geometry, calculus, conics. Vedic Mathematics is a system of mathematics which was discovered by Indian mathematician **Jagadguru Shri Bharathi Krishna Tirthaji** in the period between A.D. 1911 and 1918 and published his findings in a Vedic Mathematics Book by Tirthaji Maharaj. Using regular mathematical steps, solving problems sometimes are complex and time consuming, but using Vedic Mathematics' general techniques (applicable to all sets of given data) and specific techniques (applicable to specific sets of given data), numerical calculations can be done very fast.

The students who pursue for competitive examinations like Bank Probationary officers exam, IBPS exams, FDA, SDA, Bank Clerks exams, CET etc. in India find difficulty in order to solve aptitude or reasoning problem questions. The Vedic mathematics has mainly 16 formulas which can solve some basic mathematical operations like, multiplication, square, square root, cube, cube root, calendar problem, subtraction and division. These methods can be considered as shortcut methods and which will dramatically reduce the burden of competitive

examinations reasoning problems and also students can able to solve more no. of problems in a short duration of time.

In his recent address on the radio and television programme, Mann Ki Baat, Prime Minister Narendra Modi spoke to a boy, Usman, and suggested him to study Vedic mathematics to succeed in competitive exams. He told him that knowledge of Vedic mathematics can help solve mathematical calculations as fast as a computer can.

1. Significance:

- a) Increase speed of computation
- b) Improves mental calculations
- c) Keeps mind nourished and active
- d) Fun & Interesting
- e) Improves confidence

2. Research Methodology:

The research paper has been developed from Primary and descriptive secondary data.

The Primary data is collected from students, whom are pursuing for competitive exams belong to one of the competitive exam training Centre at Goregaon (W), Mumbai, Maharashtra.

Some mathematical tricks are taught to a group of 30 students and a set of mathematical questions are distributed to respondents. The time taken to complete the test are taken in terms of minutes before and after adopting Vedic methods techniques and are analyzed using paired t-test.

The secondary information is collected from books about Vedic mathematics, research journals, web links, related research papers etc.

3. Objective:

- a) To study the concept of Vedic mathematics
- b) To know whether a Vedic mathematics helps in improving the speed of calculation and save the execution time.
- c) To find the decrease time difference in terms of minutes before and after adopting Vedic methods techniques while solving some basic mathematical operations.

4. Vedic mathematics techniques used in this study: The present study focuses only on the multiplication, square and square roots techniques.

I. Design of Vedic multiplier

This section described the techniques used for multiplication of two numbers in Ancient Vedic mathematics. These techniques are: Nikhilam sutra and Urdhva tiryakbhyam Sutra.

A. Nikhilam Sutra

The formula simply means: “**all from 9 and the last from 10**”. The algorithm has its best case in multiplication of numbers, which are nearer to bases of 10, 100, 1000 i.e. increased powers of 10.

Case I: Integer less than base: consider 98 X 97

Here the nearest base = 100

$$(x) 98 \quad (100-98)$$

$$(y) 97 \quad (100-97)$$

Column 1	Column 2
(x) 98	2 (x ₁)
(y) 97	3 (y ₁)
95	06

Result 98 X 97 = **9506**

Case II: Integer more than base: consider 112 X 114

Here the nearest base = 100

$$(x) 112 \quad (100-112)$$

$$(y) 114 \quad (100-114)$$

Column 1	Column 2
(x) 112	-12 (x ₁)
(y) 114	-14 (y ₁)
126	168

(Carry 1 to the left because 2nd part of answer should be of 2 digit for base 100)

so result 112 X 114 = 129/95 = **12768**

Case III: Integer below and above the base: consider 995 X 1040

Here the nearest base = 1000

$$(x) 995 \quad (1000-995)$$

$$(y) 1040 \quad (1000-1040)$$

Column 1	Column 2
(x) 995	05 (x ₁)
(y) 1040	-40 (y ₁)
1035	-200

Here the 2nd part is negative i.e. -200 so we carry 1 (i.e. 1000, since the base is 1000)

from 1st part of answer and final answer is obtained as

$$1034 / (1000-200) = 1034 / 800$$

Result 995 X 1040 = **1034800**

The nikhilam sutra can also be modified for binary arithmetic.

B. Urdhva-Tiryakbhyam Sutra:“Urdhva-Tiryakbhyam Sutra” means “**Vertically and crosswise**” we can also call it “**Criss-Cross system of multiplication.**”

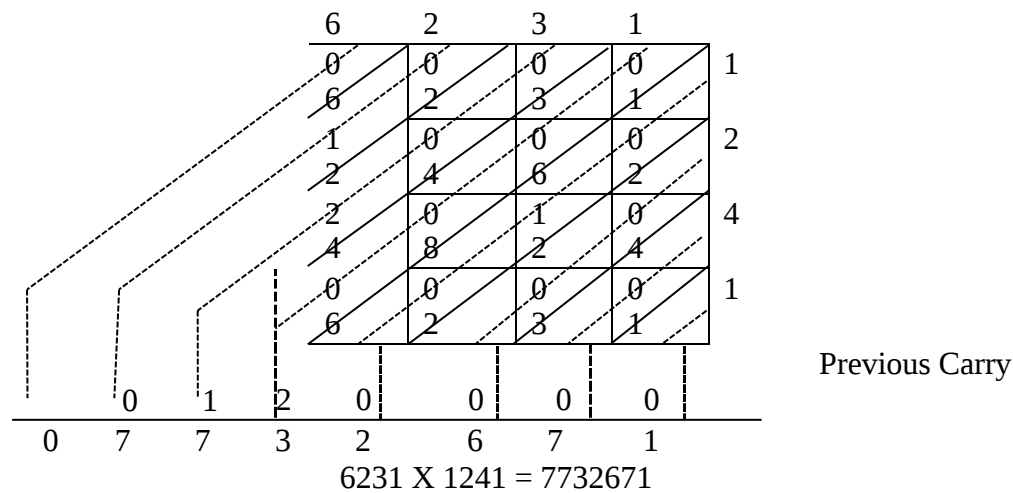


Fig 1. Multiplication of two large numbers by Urdhva- Tiryakbhyam Sutra

Alternative way of multiplication of two numbers using Urdhva-tiryakbhyam Sutra

Consider the product (416 X 535)

Step 1

$$\begin{array}{r} 416 \\ \times 535 \\ \hline \end{array}$$

Result = 30
Prev. Carry = 0

Carry = 3

Step 2

$$\begin{array}{r} 416 \\ \times 535 \\ \hline \end{array}$$

Result (5+18) = 23
Prev. Carry. = 3

Carry = 2

Step 3

$$\begin{array}{r} 416 \\ \times 535 \\ \hline \end{array}$$

Result (20 + 30 + 2) = 53
Prev. Carry = 2

Carry = 5

Step 4

$$\begin{array}{r} 416 \\ \times 535 \\ \hline \end{array}$$

Result (12 + 5) = 17
Prev. Carry = 5

Carry = 2

Step 5

$$\begin{array}{r} 416 \\ \times 535 \\ \hline \end{array}$$

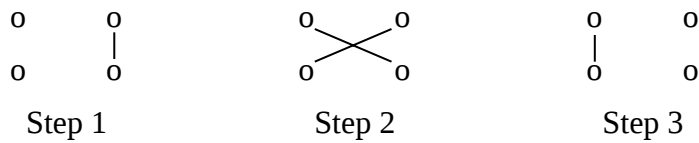
Result = 20
Prev. Carry = 2

Carry = 2

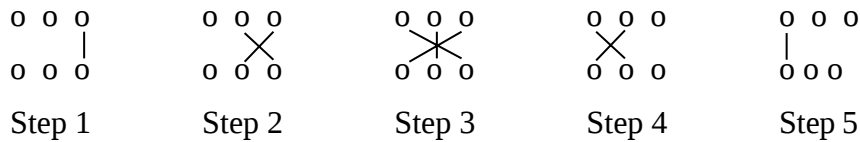
416 X 535 = 222560

Fig.2 Alternative method of multiplication by Urdhva-tiryakbhyamm sutra

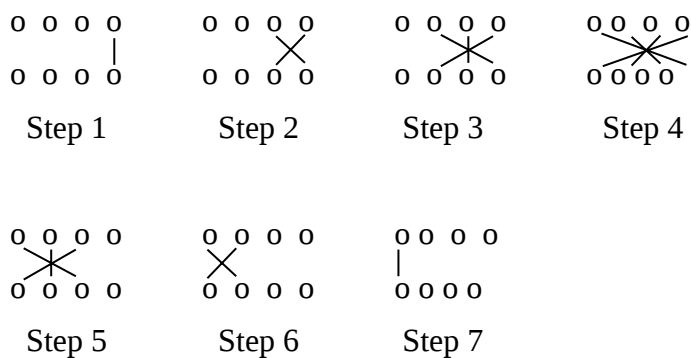
• **Algorithm for 2 by 2 multiplication**



• **Algorithm for 3 by 3 multiplication**



• **Algorithm for 4 by 4 multiplication**



C. Multiplication of numbers with a series of 9's in the multiplier:

Multiply 5462 by 9999

Step 1. Subtract 1 from 5462 (given number)

5462 -1 = 5461 (put it on left side of answer)

Step 2. Subtract each of the digit of 5461 from 9 (i.e. 9-5, 9-4, 9-6, and 9-1)

We get 4538(put it on right side of answer)

So result is 5462 X 9999 = **54614538**

D. Multiplication of numbers with a series of 1's in the multiplier: Multiply 32454 by 1111

We write down 4 in the unit place as it is 4	-----4
Add (4+5) = 9	-----9
Add (4+5+4) = 13 , 1 carry	-----3
Add (4+5+4+2) +1 carry = 16, 1 carry	-----6
Add (5+4+2+3) + 1carry =15, 1 carry	-----5
Add (4+2+3) + 1 carry = 10, 1 carry	-----0
Add (2+3) + 1 carry = 6	-----6
Write down 3 as it is = 3	-----3 t
Final Answer is (down to up) = 36056394	

II. Design of Vedic Square

Vedic maths provides a powerful method to compute the square of any number of any length with ease and get the answer in one line. It uses the concept of the “Dwanda” or “Duplex” (D), which is explained here

Sr. No.	Type	Duplex of	Required definition	Example	Result
1.	1 - digit no.	D (a)	a^2	4	16
2.	2 - digit no.	D (ab)	$2ab$	25	$(2 \times 2 \times 5) = 20$
3.	3 - digit no.	D (abc)	$2ac + b^2$	128	$(2 \times 1 \times 8 + 2^2) = 20$
4.	4 - digit no.	D (abcd)	$2(ad + bc)$	1543	$2(1 \times 3 + 5 \times 4) = 46$
5.	5 - digit no.	D (abcde)	$2(ae + bd) + c^2$	32513	$2(3 \times 3 + 2 \times 1) + 5^2 = 47$

Fig 3. Computation of duplex

Once the concept of ‘Duplex’ is clear, we can compute the square of any number very easily

A. Square of 2 digit number (ab):

$$(ab)^2 = D(a) / D(ab) / D(b)$$

$$\begin{aligned} \text{Consider } (54)^2 &= D(5) / D(54) / D(4) \\ &= 25 / 40 / 16 \\ &= 29 / 1 / 6 \end{aligned}$$

$$\text{Result } (54)^2 = \mathbf{2916}$$

B. Square of 3 digit number (abc):

$$(abc)^2 = D(a) / D(ab) / D(abc) / D(bc) / D(c)$$

$$\begin{aligned} \text{Consider } (215)^2 &= D(2) / D(21) / D(215) / D(15) / D(5) \\ &= 4 / 4 / 21 / 10 / 25 \\ &= 4 / 6 / 2 / 2 / 5 \end{aligned}$$

$$\text{Result } (215)^2 = \mathbf{46225}$$

C. Square of 4 digit number :

$$(abcd)^2 = D(a) / D(ab) / D(abc) / D(abcd) / D(bcd) / D(cd) / D(d)$$

$$\begin{aligned} \text{Consider } (2103)^2 &= D(2) / D(21) / D(210) / D(2103) / D(103) / D(03) / D(3) \\ &= 4 / 4 / 1 / 12 / 6 / 0 / 9 \end{aligned}$$

$$\text{Result } (2103)^2 = \mathbf{4422609}$$

III. Design of Vedic Square root.

Some tricks of square roots of a series

$$\text{A. For such type of problem } \sqrt{a} \sqrt{a} \sqrt{a} \sqrt{a} \sqrt{a} \dots n \text{ times}, \text{ result is } a^{\frac{2^n - 1}{2^n}},$$

where a= number inside the square root and n is no of repetition.

Example. Result for $\sqrt{6\sqrt{6\sqrt{6\sqrt{6\sqrt{6}}}}}$ is $6^{\frac{2^5-1}{2^5}} = 6^{\frac{31}{32}}$

B. For such type of problem $\sqrt{a\sqrt{a\sqrt{a\sqrt{a\sqrt{a}}}} \dots \infty$, result is a, where a= number inside the square root

Example. Result for $\sqrt{3\sqrt{3\sqrt{3\sqrt{3\sqrt{3}}}} \dots \infty$ is 3.

C. For such type of problem $\sqrt{a \pm \sqrt{a \pm \sqrt{a \pm \sqrt{a \pm \sqrt{a \pm \dots \infty}}}}}$, result is $\frac{\sqrt{4a+1} \pm 1}{2}$, where a= number inside the square root

Example. Result for a) $\sqrt{11 + \sqrt{11 + \sqrt{11 + \sqrt{11 + \sqrt{11 + \dots \infty}}}}}$ is

$$\frac{\sqrt{4 \times 11 + 1} + 1}{2} = \frac{\sqrt{45} + 1}{2}$$

b) $\sqrt{11 - \sqrt{11 - \sqrt{11 - \sqrt{11 - \sqrt{11 - \dots \infty}}}}}$ is $\frac{\sqrt{4 \times 11 + 1} - 1}{2} = \frac{\sqrt{45} - 1}{2}$

D. For such type of problem $\sqrt{a \pm \sqrt{a \pm \sqrt{a \pm \sqrt{a \pm \sqrt{a \pm \dots \infty}}}}}$, if factors of “a” are two consecutive numbers as x & x-1 then result of

$\sqrt{a + \sqrt{a + \sqrt{a + \sqrt{a + \sqrt{a + \dots \infty}}}}}$ is “x” & result of

$\sqrt{a - \sqrt{a - \sqrt{a - \sqrt{a - \sqrt{a - \dots \infty}}}}}$ Is “x-1”

Example. For $\sqrt{6 \pm \sqrt{6 \pm \sqrt{6 \pm \sqrt{6 \pm \sqrt{6 \pm \dots \infty}}}}}$, factors of “6” are 3 and

2 (consecutive numbers), so result of $\sqrt{6 + \sqrt{6 + \sqrt{6 + \sqrt{6 + \sqrt{6 + \dots \infty}}}}}$ is 3

&

result of $\sqrt{6 - \sqrt{6 - \sqrt{6 - \sqrt{6 - \sqrt{6 - \dots \infty}}}}}$ is 2

5. Hypothesis:

a) The following Null hypotheses are formed for the present study-

H_0 : There is no significant difference between before and after using Vedic Mathematics techniques while solving some mathematical problems ($\mu_x = \mu_y$; mean score before and after adopting Vedic mathematics techniques are same)

b) The following alternative hypotheses are formed for the present study-

H_1 : There is significant difference between before and after using Vedic Mathematics techniques while solving some mathematical problems ($\mu_x \neq \mu_y$; mean score before and after adopting Vedic mathematics techniques are different)

6. **Paired t- test:** This hypothesis testing is conducted when two groups belong to the same population or group. The groups are studied either at two different times or under two varied conditions. The formula used to obtain the t-value is:

$$t = \frac{\bar{d}}{s_d / \sqrt{n}}$$

where: $\bar{d}$ is the mean of the difference scores

s_d is the standard deviation of the difference scores

n is the number of pairs of observations

Table 1.

Sr. No.	Time taken by student(in min.) before implementation of Vedic mathematics techniques (t_1)	Time taken by student(in min.) before implementation of Vedic mathematics techniques (t_2)	Difference $d = t_1 - t_2$	d^2
1	15	12	03	09
2	19	17	02	04
3	12	10	02	04
4	18	14	04	16
5	17	12	05	25
6	11	08	03	09
7	16	11	05	25

8	08	05	03	09
9	16	11	05	25
10	14	10	04	16
11	13	10	03	09
12	12	08	04	16
13	08	06	02	04
14	10	08	02	04
15	14	10	04	16
16	15	12	03	09
17	11	07	04	16
18	10	07	03	09
19	17	15	02	04
20	16	13	03	09
21	18	15	03	09
22	09	07	02	04
23	10	09	01	01
24	12	09	03	09
25	15	11	04	16
26	11	07	04	16
27	17	15	02	04
28	16	12	04	16
29	13	10	03	09
30	14	10	04	16
Total	407	311	96	338

Table 2.Necessary values for calculation and t values

Group	N	Mean	S.D.	t value (calculated)	t value (tabulated)	df	Status of null hypothesis
1a(before implementation of Vedic mathematics techniques)	30	13.567	3.072	17.007	2.045	29	Rejected
1b (after implementation of Vedic mathematics techniques)	30	10.367	2.914				

The tabulated value of t for 29 degree of freedom (df) and at 5% level of significance is, $t_{0.05} = 2.045$. Since calculated t-value (17.007) is higher than the tabulated value, it is significant at 5% level of significance.

Hence null hypothesis is rejected and alternative hypothesis is accepted.

7. One tailed test:

If we take one tailed test (right tailed), $\mu_x > \mu_y$, there is a significant decrease in time before and after adopting Vedic mathematics techniques while solving some basic mathematical problems. The tabulated value of t for 29 degree of freedom (df) and at 5% level of significance is, $t_{0.05} = 2.045$. Since calculated t-value (17.007) is higher than the tabulated value, it is significant at 5% level of significance.

From both alternative hypothesis, we can conclude that Vedic mathematics techniques improve the speed of calculations while solving some mathematical problems.

Table: 3: Whether Vedic mathematics techniques improves thinking ability?

Particulars	No. of respondents (f)	% of respondents
YES	25	83
NO	05	17
TOTAL	30	100

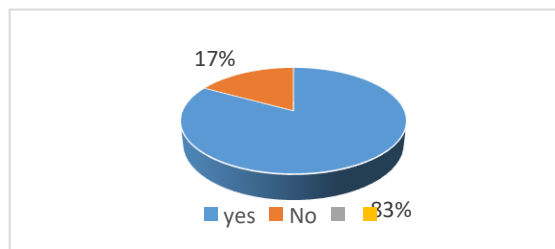


Table: 4: Whether Vedic mathematics techniques improves concentration?

Particulars	No. of respondents (f)	% of respondents
YES	27	90
NO	03	10
TOTAL	30	100

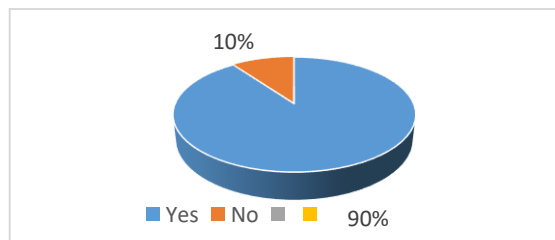


Table: 5: Whether Vedic mathematics techniques improves speed of basic mathematical operations?

Particulars	No. of respondents (f)	% of respondents
YES	30	100
NO	00	00
TOTAL	30	100

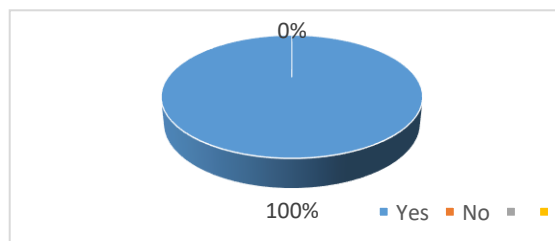
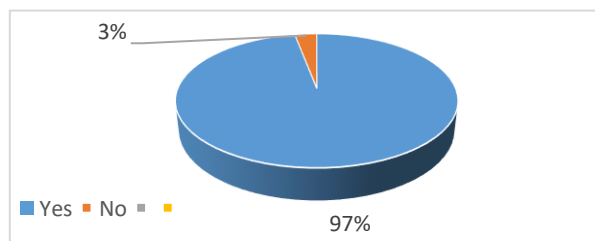


Table: 6: Whether Vedic mathematics techniques improve speed of basic mathematical operations?

Particulars	No. of respondents (f)	% of respondents
YES	29	97
NO	01	03
TOTAL	30	100



8. Suggestions :

Students can use the Vedic Mathematics Techniques as it helps to:

1. Eliminate the fear for Mathematics.
2. It helps to carry out tedious and cumbersome mathematical operations in a simple way and improves concentration.
3. Reduces errors as they have minimum steps to solve.
4. It sharpens the mind, increases mental ability, intelligence and develops Left & Right Sides of the brains by increasing visualization and concentration abilities.

5. Students are able to master the computational skills by using the mental methods and thereby reducing the dependency on devices like calculators, computers etc.
6. Saves a lot of time, as calculations are much easier and faster. Definitely these techniques would be handy for the students during exams and particularly for the competitive exams which are time bound and time management is important in such exams.

10. Conclusion:

One can learn Vedic Mathematics from an early age and basic knowledge of multiplication table helps a student to better grasp the subject. The beauty of Vedic maths lies in the fact that it reduces the otherwise cumbersome-looking calculation in conventional mathematics to a very simple one. This is so because the Vedic sutra are claimed to be based on the natural principles on which the human mind works. Since the students do calculations mentally without the use of pen or paper while using Vedic Mathematics tricks, they are actually concentrating which develops the concentration abilities. Thus, Vedic Mathematics is nothing but few 'tricks' that helps in solving mathematical calculations quite easily. It is a unique technique of calculations that is based on simple principles and rules, applying which, any kind of mathematical problems can be solved orally. More and more use of Vedic Math can without any doubts generate interest in a subject that is generally dreaded by children.

We all know everybody is not genius or we can say everybody is not born genius. By practicing the technique of Vedic maths one can reduce maths phobia. Vedic maths is very beneficial to the students for preparing competition exams as it increases the mental calculations and help to calculate much faster as compare to conventional method. So to create more awareness of Vedic maths is required and it should be part of school curriculum. We conclude that Vedic mathematics provides more systematics, simplified, unified and faster techniques than the conventional system to improve the speed of calculations while performing mathematical operations.

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