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Effectiveness of Vinculum in Fast Multiplication

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ABSTRACT

'Vinculum' is an important term in Vedic mathematics. Calculations are made simpler by converting digits larger than five into their complementary values below five. By decreasing the possibility of carry-overs, this reduction speeds up and improves the efficiency of mathematical operations. Long multiplication, also known as column multiplication, is a method for multiplying numbers especially those with multiple digits by breaking down the process into small manageable steps. This paper includes action research on the group of 20 students of class 7 & class 8. This study is based on the use of vinculum method to do long multiplication problems. Vedic method based on vinculum and Nikhilaṃ Navataś charamaṃ Daśataḥ sutra (all from 9 last from 10) and Ekādhikena Pūrveṇa sutra (One more than the previous one) is used by these students for enhancing the mental capability and reducing the time duration during the session.The main components of the paper are accuracy and fast calculation.

Keywords: Vinculum, Devinculum, Nikhilaṃ Navataś charamaṃ Daśataḥ Ekādhikena Pūrveṇa,Urdhva Tiryagbhyam

INTRODUCTION

The ancient Indian mathematical theory that Jagadguru Shankaracharya Swami Bharati Krishna Tirtha Ji Maharaj unearthed from the Vedic writings between 1911 and 1918 is known as Vedic Mathematics. The Atharva Veda, one of the four Vedas of ancient Indian literature, is said to be the source of the mathematical methods and ideas that form the foundation of this amazing system. He was an Indian monk and Shankaracharya of Goverdhana Matha in Puri Odisha from 1925 to until his death in 1960. Swamiji childhood name is Venkatraman. Vedic Mathematics the book entitled as written by Swamiji has 16 sutras and 13 subsutras which can be used for all branches of mathematics.

What is Vinculum? Vinculum is a key concept in Vedic Mathematics that simplifies computations by removing numbers greater than 5. Digits larger than five frequently result in carry-overs in classical arithmetic, which can make calculations more difficult. By transforming such digits into their complements (less than 5) and expressing them as negative numbers, the vinculum approach deftly solves this problem. This is accomplished by placing a horizontal bar above the numeral to show that it is negative. A vinculum number is one that has both positive and negative numbers in this manner. The procedure minimises the incidence of carry numbers and speeds up and improves the efficiency of calculations by lowering all digits to values fewer than five**.**

Advantages of using vinculum:

In Vedic mathematics, the vinculum method has various benefits that improve the effectiveness and mental manageability of mathematical computations. Flexibility is one of its main advantages; it may be applied selectively anytime it makes the process easier. This technique simplifies computations by converting higher numbers, like 6, 7, 8, and 9, into their smaller complementary equivalents. To further reduce complexity, this

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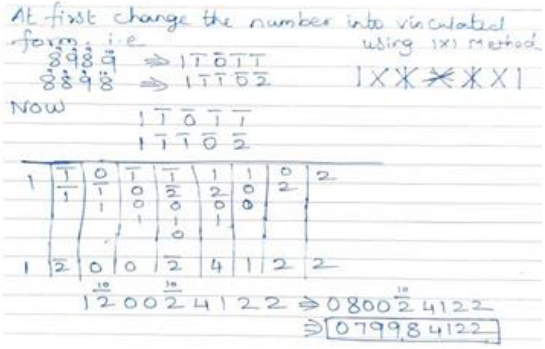
frequently leads to figures that cancel each other out or may be modified to do so. Additionally, because they are easier to work with, the digits 0 and 1 are more common in vinculum numbers, which streamlines processes. The fact that borrowing is frequently avoided in subtraction, which simplifies the procedure, is another noteworthy benefit. In comparison to traditional methods, the vinculum methodology efficiently transforms high-pressure zone numbers into low-pressure zone numbers, resulting in faster and more seamless computations.

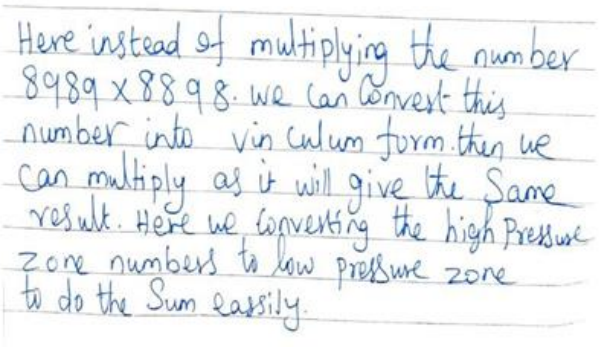
Sutras: Nikhilaṃ Navataścharamaṃ Daśataḥ (All from 9 and last from 10);Ekādhikena Pūrveṇa (One more than the previous one). & Urdhva Tiryagbhyam (Vertically Crosswise Multiplication)

High pressure zone numbers	Vinculated form low pressure zone numbers [To be converted into vinculum]
9	$1\bar{1}$
8	$1\bar{2}$
7	$1\bar{3}$
6	$1\bar{4}$

To understand better, let us try a few Examples:

Example: 8989 x 8898





Working process in figure

Step to convert positive number to vinculum form:

I. Find out the digits that are to be converted.

II. Apply subtraction “all from 9 and last from 10” on those digits and put bar on them.

III. To end the conversions “add one to the previous digit”.

IV. Repeat this as many times in the same number as necessary.

V. In case the units digit of subtrahend is zero, apply subtraction all from 9 & last from 10 till tens place, leaving zero.

METHODOLOGY

In this study, a group of students participated in a learning session on the Vedic method of multiplication. Students were given a set of activities to practise the sutra that was covered throughout the session after the introduction and explanation of pertinent instances based on Vedic multiplication techniques. The simplified

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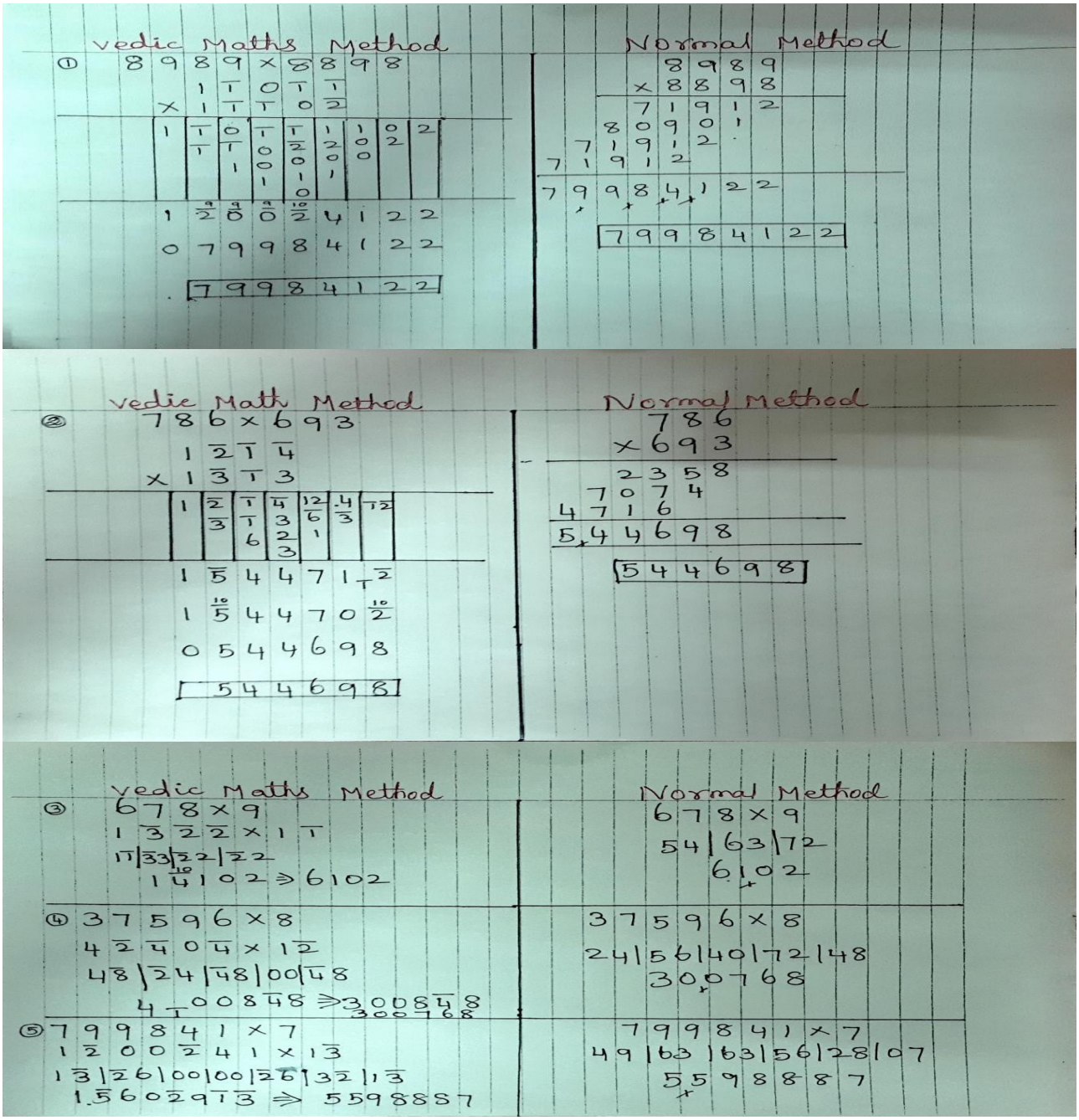
Vedic methods used to solve these multiplication problems stand in stark contrast to the more intricate and time-consuming steps of the contemporary mathematical system. Students were able to complete even the most difficult multiplication problems more quickly and accurately by using certain Vedic approaches. Making mathematics simpler and more interesting for pupils was the main goal of this study. This two-day action research project involved gathering and analysing the students' answers to the exercises in a single session. The fact that each student used significantly less time to solve a problem throughout the session was a noteworthy finding. The efficacy of the Vedic approach was amply proved when students were asked to answer an example using both the modern and Vedic methods in order to highlight the differences in approaches.



Sample of 20 students work which are shown as tabulated below:

S.No.	NAME OF STUDENT	MODERN METHOD	VEDIC METHOD
		TIME (in Min)	TIME (in Min)
1	AADYANT TANWAR	1.33	0.4
2	AARADHYA KUMAR	2.36	0.41
3	ANSH YADAV	1	0.58
4	ATHARV SOOD	2	0.58

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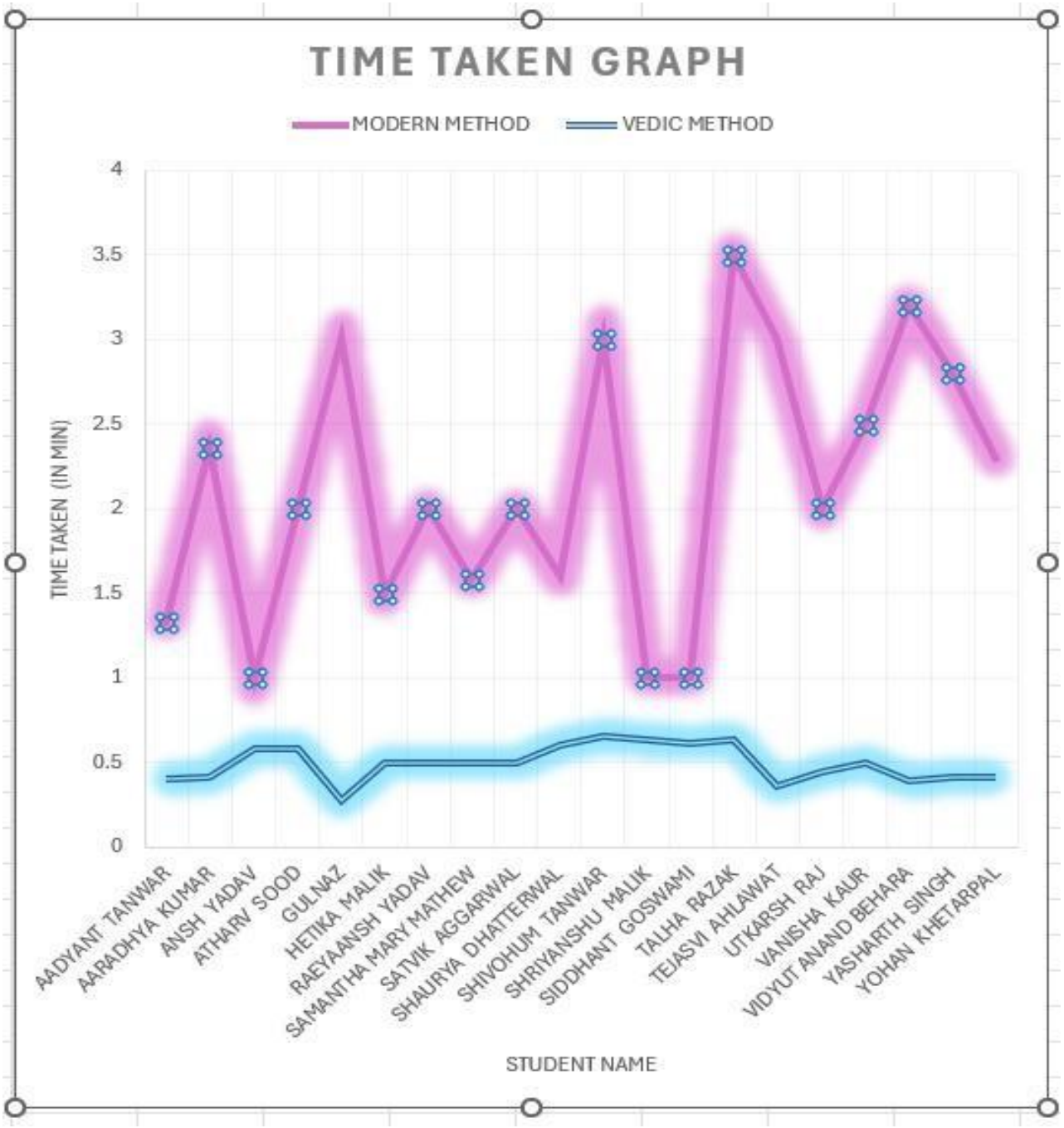
5	GULNAZ	3	0.28
6	HETIKA MALIK	1.5	0.5
7	RAEYAANSH YADAV	2	0.5
8	SAMANTHA MARY MATHEW	1.58	0.5
9	SATVIK AGGARWAL	2	0.5
10	SHAURYA DHATTERWAL	1.6	0.6
11	SHIVOHUM TANWAR	3	0.66
12	SHRIYANSHU MALIK	1	0.63
13	SIDDHANT GOSWAMI	1	0.61
14	TALHA RAZAK	3.5	0.63
15	TEJASVI AHLAWAT	3	0.36
16	UTKARSH RAJ	2	0.45
17	VANISHA KAUR	2.5	0.5
18	VIDYUT ANAND BEHARA	3.2	0.39
19	YASHARTH SINGH	2.8	0.41
20	YOHAN KHETARPAL	2.3	0.41



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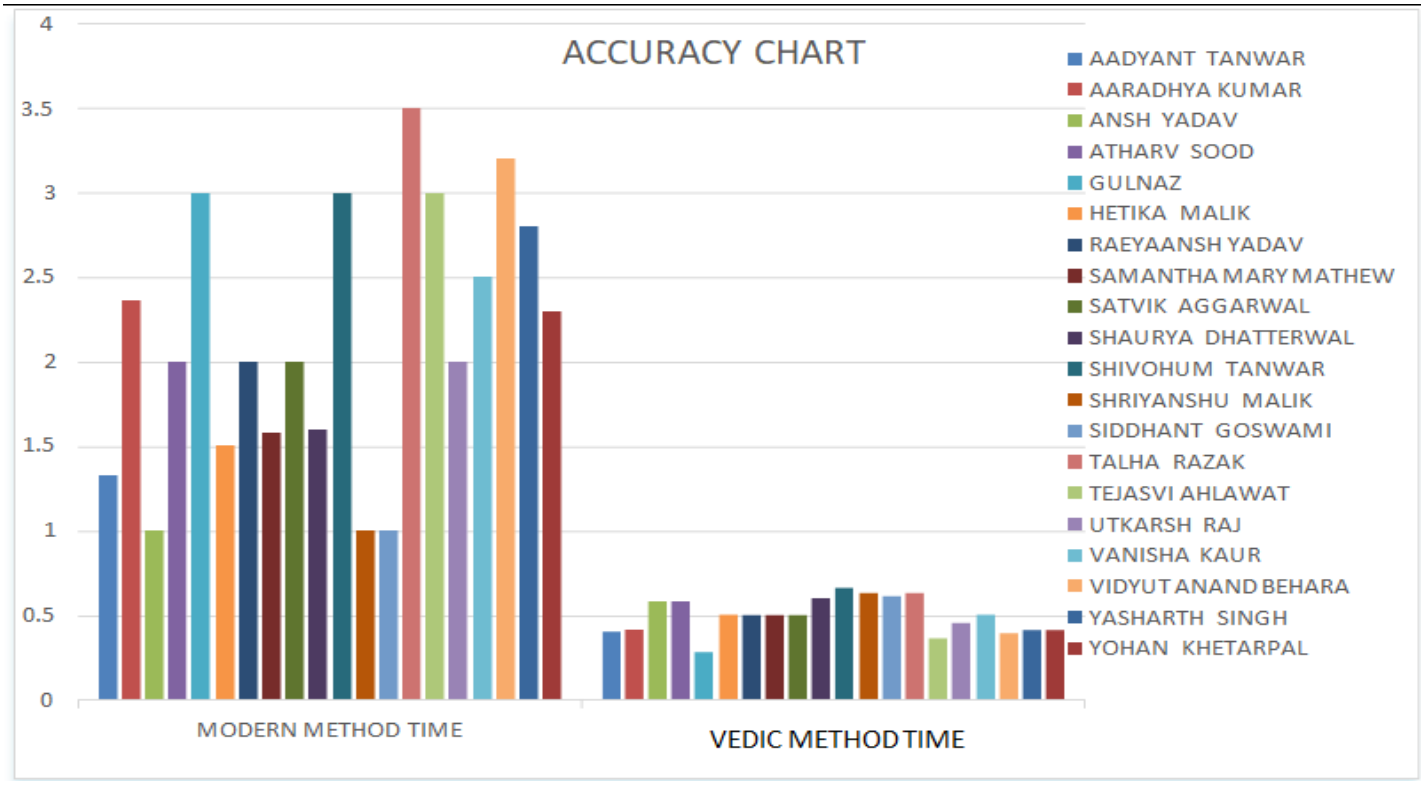
Accuracy in Calculation:

S. No.	NAME OF STUDENT	MODERN METHOD TIME (in Min)	ACCURACY IN MODERN METHOD	VEDIC METHOD TIME (in Min)	ACCURACY IN VEDIC METHOD
1	AADYANT TANWAR	1.33	YES	0.4	YES
2	AARADHYA KUMAR	2.36	NO	0.41	YES
3	ANSH YADAV	1	NO	0.58	YES
4	ATHARV SOOD	2	YES	0.58	YES
5	GULNAZ	3	NO	0.28	YES
6	HETIKA MALIK	1.5	YES	0.5	YES
7	RAEYAANSH YADAV	2	YES	0.5	YES
8	SAMANTHA MARY MATHEW	1.58	YES	0.5	YES
9	SATVIK AGGARWAL	2	NO	0.5	YES
10	SHAURYA DHATTERWAL	1.6	NO	0.6	YES
11	SHIVOHUM TANWAR	3	YES	0.66	YES
12	SHRIYANSHU MALIK	1	NO	0.63	YES
13	SIDDHANT GOSWAMI	1	NO	0.61	YES
14	TALHA RAZAK	3.5	NO	0.63	YES
15	TEJASVI AHLAWAT	3	NO	0.36	YES
16	UTKARSH RAJ	2	NO	0.45	YES
17	VANISHA KAUR	2.5	NO	0.5	YES
18	VIDYUT ANAND BEHARA	3.2	NO	0.39	YES
19	YASHARTH SINGH	2.8	NO	0.41	YES
20	YOHAN KHETARPAL	2.3	YES	0.41	YES



CONCLUSION

We observed that the students are very electrified about the Vedic Mathematics method, they are impatient to acquire the knowledge of Vedic Mathematics techniques. At the end of this session, students showed better results based on multiplication problems in the comparison of modern method. They are pleased to do long multiplication problems by Vedic Method. This study helps us to boost a positive attitude and drive away from

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phobia of mathematics from the students. Our country has a rich environment of Vedic mathematics in history so we need to continue Vedic mathematics in present era to make students' life much easier in comparison of complex calculations.

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