

# Computer Aided Vedic Mathematics Solutions for Improving Computational Skills

\*Mrs. Sharayu G. Karandikar

## Abstract

*In today's technology oriented world e-learning is an emerging trend in teaching-learning process. It provides a facility of anytime / anywhere learning without a classroom and a teacher. This research paper reviews togetherness of computer science technique of e-learning and ancient methodology of Vedic Mathematics. It aims at enhancing global technology trends in revealing alternatives methodology in computational science and generating awareness about Vedic Mathematics through e-learning. To achieve these objectives, case based study is conducted of Vedic Mathematical sutras. The case study has examined working of Vedic sutras in performing arithmetic operations. These Vedic sutras with a handful of examples are presented to people in form of a web-site. The web-site has provided prominent feature of user input for enabling people to practice with their own data. Also a feature of working with conventional method is provided for enabling people to check correctness of result as well as to perform comparative analysis between two methodologies. The web-site is demonstrated to the audience and feedback is collected with the help of feed-back form. Answers to questions generated in the feedback form were analyzed and presented in form of a spread sheet with consolidated results. The response of audience was positively significant and the views expressed were valuable and motivating. The study makes contributions to the enhancement of e-learning and to the awareness of alternative computational method with Vedic Mathematics.*

## Introduction

Mathematics is a main stream of science. It is of great importance and value. Mathematics although important and interesting is also tedious. It is difficult to grasp, remember, practice and reproduce mathematical skills. Even basic arithmetic operations of multiplication and division become lengthy and complicated with bigger numbers. These basic skills in mathematics are essential for every one for performing day to day activities.

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\*Assistant Professor, YMT College of Management, MCA Department, Kharghar.

It also improves analytical and reasoning ability. It helps to bring clarity in thinking. Moreover basic educational skill-sets mainly include arithmetic computational skills. For better development of these skills an alternative method of Vedic Mathematics can be adopted. This stream is originated from Vedas, an ancient knowledge resource. The Vedic Mathematical sutras are reconstructed and demonstrated by Swamiji “Jagadguru Swami Sri Bharati Krsna Tirthaji Maharaj” in his book Vedic Mathematics. This methodology is easier and faster as compared to conventional methodology. With practice it helps to boost the confidence and develops interest in mathematics. Vedic mathematics in collaboration with computer aided teaching-learning technology doubles the benefits. It enables learning facility without an expert teacher anytime and anywhere. The technique can be used as per convenience, depending on the grasping capacity of an individual. It provides facility of repetition of learning process as needed. Ultimately Vedic Sutras with E-Learning facility together provides greater benefits.

This work is an effort to make available the basic source of authentic information about Vedic Mathematics at ease. On-line learning in Vedic Mathematics provides greater advantages to conventional methodology of learning. It generates liking about the subject because it is fun learning Vedic Mathematics on computer. It releases the tension of time bound learning. It generates interest in subject because it is easy and faster. It helps to boost confidence in the subject with repetitive practice and demo examples. It removes fear of big and complex calculations because it requires only basic arithmetic computational skills. It provides a demonstration of each Mathematical Vedic Sutra with detailed and step by step explanation and working example. It provides a facility of walk through the page navigation which makes it much easier to use for very basic learners and primary users of computers. It provides a facility of user input for practicing the learned sutras or lessons. It provides the facility of selection of Mathematical Vedic Sutra for performing arithmetic operation as per requirement and interest. Overall it offers an easy and interesting way of learning Vedic Mathematics.

In today's automated or computerized world, learning a new subject has become easy, faster and convenient through computerized application. Moreover learning Vedic Mathematics is just learning and practicing a new methodology adopted to learn easier and faster way of performing arithmetic operations. With the help of computerized application a learner can learn and practice various arithmetic operations at his/her own convenient time, speed and place. Vedic Mathematics is so interesting and easy to learn; moreover a computerized application with detailed explanation, examples and tutorials makes it easier and complete so that other guidance or teaching is not required.

The dissertation sets the focus on performing arithmetic operations using Vedic Mathematical sutras through a computerized application. It throws light on importance and advantages of ancient methodology which are helpful in practicing complex and big arithmetic calculations as mental arithmetic. It demonstrates that the arithmetic operations can be performed easily, faster and with minimum steps as compared to conventional methodology.

## **Literature Survey**

The main source of information about Vedic Mathematics is found in the revolutionary work of research by His holiness Jagadguru "SANKARACHARYA SRI BHARATI KRISHNA TIRTHAJI MAHARAJ". The work of Swamiji on reconstruction of Vedic Sutras is the primary literature available on Vedic Mathematics. All other sources of information on the subject are primarily based on Swamiji's literature.

Mathematics is a well-known branch of knowledge which is essential to master from childhood for performing various tasks from simple calculations to complex research oriented computations. Particularly arithmetic computations in mathematics are necessity for every human being even for carrying out day to day tasks. Arithmetic problems basically include addition, subtraction, multiplication and division. As far as we can perform the operation as mental arithmetic or counting on fingers it's easy and interesting. As it becomes complex

and involves big numbers it becomes lengthy. Either we have to take help of tools like calculator or develop a habit of performing these operations as mental sums. Some complex calculations involve large number of steps. Performing such operations becomes tedious and time consuming. Moreover, it is further difficult to cross check or validate the accuracy of the answer.

To make mathematical calculations easy, faster and accurate “sixteen simple mathematical formulae” are given in a book “VEDIC MATHEMATICS” by His holiness Jagadguru “SANKARACHARYA SRI BHARATI KRISHNA TIRTHAJI MAHARAJ” of Govardhana Matha, Puri 1884 - 1960.

The reconstruction of Vedic sutras by his holiness Jagadguru “SANKARACHARYA SRI BHARATI KRISHNA TIRTHAJI MAHARAJ” is the original resource of knowledge in the field of Vedic Mathematics. This monumental work is of great importance in mathematical horizon. The literature provides overview of contribution of Vedic sutras in different areas of mathematics starting from basic arithmetic computation, ranging to fields of algebra, geometry, conics and calculus. It provides wide variety of examples to clarify concept of each sutras in details. It provides step by step solution for every computation with explanation. It provides ways of general implementation of the sutras as well as special case studies wherever applicable.

## **Vedic Mathematics**

### **SANKARACHARYA SRI BHARATI KRISHNA TIRTHAJI MAHARAJ**

Many individuals, institutions and organizations have done a remarkable work in promotion of the subject. Every step ahead in the subject is primarily based on the reconstruction work done by Swamiji which is presented in the book “Vedic Mathematics”. Earlier efforts have provided detailed information about the subject, history of Vedic mathematics, introduction to Swamiji’s great reconstruction work, list of 16 sutras, detailed working of sutras. The previous work also includes a set of ready made examples with stepwise working of sutras. Facility of tutorial is also provided for exercise and reference.

The present work is a step ahead of the earlier efforts done by individual, institutions and companies to promote and campaign about the subject of Vedic Mathematics. This is a small effort taken up to create awareness and generate interest in the subject with the help of computerized application presented in form of web site with prominent feature of user input. The work is inspired by Swamiji's great work of reconstruction of Vedic sutras. This work is originally and primarily based on Swamiji's monumental work.

This research work emphasizes on the understanding of the sutras for arithmetic operations. These sutras are described in details and presented in step by step manner. Every sutra's working is explained with numerous examples. These examples are verified manually according to the steps given and presented as case study report. This research work has a strong support of web site which is developed as a part of research. The web site provides information about Vedic Mathematics. It lists and describes sutras for arithmetic operations. It explains the sutra's working with steps. It demonstrates examples with stepwise computation. It provides facility of user input for practice. It facilitates comparative analysis by provision of demonstration by conventional method.

## **Research Methodology**

Initially a thorough study of the topic is undertaken to enhance the understanding about Vedic Mathematics, its importance and usage. An extensive literature review is carried out to acquire technical and educational benefits of Vedic Mathematics. A supporting document is prepared in the form of case studies, where multiple sample cases are studied to check the applicability of Vedic Mathematical sutras. Numerous examples are illustrated to demonstrate working of Vedic Mathematical sutras and corollaries if any. An integrated approach is used to provide usability interpretations of computer aided teaching-learning methodology based on e-learning technology for Vedic Mathematics. To seek the applicability and advantages the system is evaluated with the help of demonstration to variety of audience. The responses are collected and evaluated by the way of questionnaire. This is followed by analytical testing, conducted to

provide educational excellence of computerized learning of Vedic Sutras for basic arithmetic operations. It primarily investigates the usability value in comparative analysis among conventional methodology and Vedic Methodology. Moreover this work aims to promote authentic and ancient resource of mathematical miracles proposed in Vedas based on magic and logic.

The case study data is used to act upon as the prototype to develop and enrich the usability and advantages of Vedic Mathematics in the form of the web site. The basic but valuable information is provided along with step wise explanation of each sutra in the web site. The Vedic Mathematical sutras are elaborated and demonstrated with the help of example section in the thesis. In addition to this, a prominent feature of user input for practice is provided in the web site. In combination with the web site, experimentation is carried out in the form of demonstration and response collection. Variety of audience participated in this process. The data collection and evaluation is performed in the form of questionnaire. The samples are selected on random basis from the educational zone. The samples are collected in and around the city of Mumbai. The collected responses are processed, tabulated and analyzed. This data is presented in form of work sheet and mathematical and statistical formulae are applied to the data. The over all process will be used for interpretation of data for the purpose of drawing conclusions. It is expected that the developed web site will provide opportunities for the people to remove fear about Vedic Mathematics, develop interest and liking about the subject. It will motivate the audience to practice and enrich their knowledge. It will extend help for using and promoting ancient, authentic methodology with latest technological features in educational zone.

### **Data Generation and Analysis**

The data generation and analysis provides the means of producing evidence and supporting documents based on practical observation. The data processed during this research work is primarily based on Swamiji's book in which Swamiji has reconstructed the Vedic Mathematical sutras with detailed step by step explanation and rich set of examples and case study. The main theme as well as

required examples and related data are also collected from this book. The data is also gathered using secondary sources like other books and web sites where the information about the topic is presented. The examples with their working steps and answers are collected and analyzed as text for reference and understanding of Vedic Mathematical sutras. The examples are analyzed using various combination of input. Approximately 15 different sutras and upasutras are considered with various cases ranging from 4 to 8 are studied.

### A case study of “Urdhva Tiryak Sutra”

This is a general sutra applicable to all cases of multiplication. It is very simple, systematic and easy way to perform multiplication of big numbers. The formula is short and means “vertically and cross wise”. The steps are as follows:

- Represent the digit wise terms

For each place of power of 10 do the multiplication of digits of both the numbers that gives same power of 10. For this, use vertical and crosswise digit multiplication.

- Perform summation

Add all the terms contributing for each power of 10. Represent all such terms from left to right.

- Arrange all the terms with single digit.

Terms with more than single digit should carry over the extra digits to previous term. This is done from right to left.

- Formulate the answer

Attach each term from left to right to get final answer.

### Example of “Urdhva Tiryak Sutra”

532 X 472

Step 1 : represent the digit wise terms.

$$5 \times 4 : 5 \times 7 + 3 \times 4 : 5 \times 2 + 4 \times 2 + 3 \times 7 : 3 \times 2 + 7 \times 2 : 2 \times 2$$

Step 2 : Perform Summation.

$$20:35+12:10+8+21:6+14:4$$

Step 3 : Arrange all the terms with single digit.

$$20 : 47: 39: 20: 4$$

$$5 \quad 4 \quad 2$$

$$25:1:1:0:4$$

Note : if one of the terms contains more than one digit, the right most digits is put down and left digits is carried over to left term.

Step 4 : Formulate the answer.

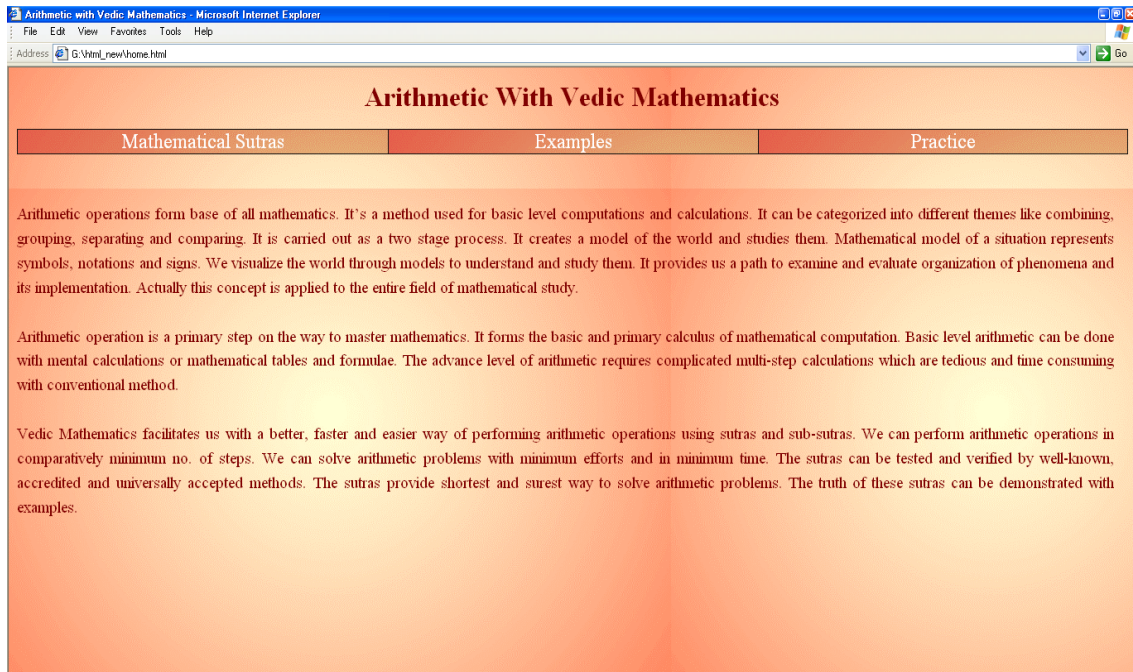
$$251104 \Rightarrow \text{Answer} \Rightarrow 532 \times 472 = 251104$$

### **The Outcome**

The hypothesis presented in this research work is strongly supported by case studies that are provided in form of readymade examples and user defined practice section on the web site. A set of cases are studied thoroughly. A handful of cases are evaluated successfully. This case study report is documented and presented in the thesis as well as on the web site.

The research idea, process and outcome are presented in the form of web site. The web site provides information about Vedic Mathematics. It provides the sutras and their working steps in detail. It provides readily available examples with step by step execution of an operation. It provides a special practice section for user. The practice section provides a prime facility of user input. This facility helps to get the practice of sutra as per user requirement and to crosscheck the accuracy of answer for user specific arithmetic operation. The web site also facilitates with the choice of demonstration by conventional method for a particular operation. This facility provides additional benefit of comparative analysis between working of Vedic Mathematical method and conventional method.





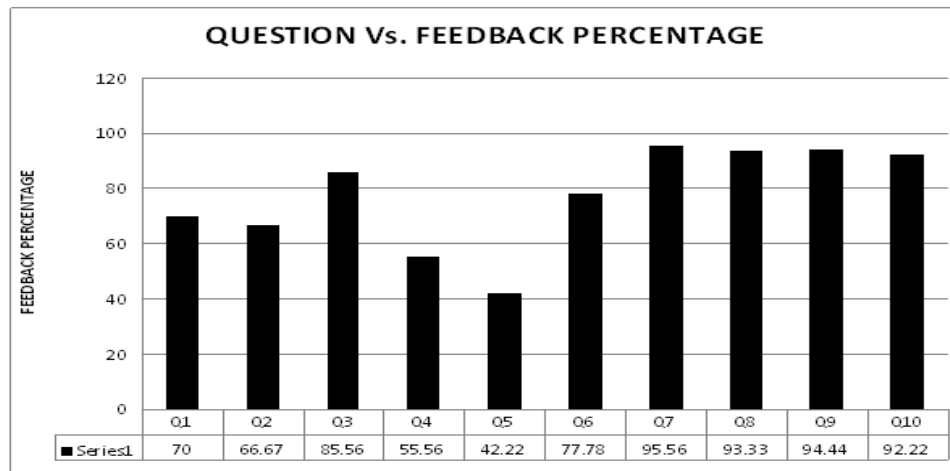
### Operational features of the web site

- It provides information about Swamiji's work
- It lists sutras for arithmetic operations
- Every sutra is explained with suitable example.
- Complete step by step working of sutra is given in detail.
- Every example is diagrammatically represented with appropriate supporting information.
- Comparative analysis between conventional method and Vedic method is presented for every sutra in practice section.
- Tutorial facility is provided for practice and exercise.
- The system provides the facility of user input for particular operation.
- User can interact with the system.
- User can give input as per his requirement and choice.
- The system lists applicable sutras for the given input.
- User can get access to all different ways of performing the operation.
- The system gives choice to select any of the sutras applicable to perform the operation.

- User can decide to use a particular way as per his requirement and choice.
- The system presents answer using all possible ways simultaneously to perform the operation.
- User can get to know the working of multiple applicable sutras simultaneously.
- User can perform Comparative analysis between different sutras.
- The system produces step by step working of operation by conventional method as well as Vedic sutra.
- The user can obtain steps and answer with conventional method simultaneously for comparison.
- The system facilitates the user with detail explanation of each step of working of the sutra.
- The user can systematically evaluate each step thoroughly.

## **Testing of Hypothesis**

The usefulness of the work to the people is verified with the help of demonstration of web site. Fortunately a variety of audience has extended the help in testing process. Many people showed interest and enthusiasm about the work. The audience was co-operative during the demonstration and training sessions. It's their support and positive attitude towards a new web based learning strategy that has kept the work motivated for the entire tenure of testing. People who were aware and interested in learning "Vedic Mathematics" and also people who were eager to understand an easy and faster alternative learning methodology participated in the process of testing. The students, the parents, the teachers and the general people were approached for the testing. The response of the people was recorded in the form of feedback. The feedback is documented in the form of excel sheet that is presented in the thesis report. The size of audience was around 100. The comments and views expressed by the audience were really valuable and motivating. The general response was positive which will take this project long way in future and the work may be presented on large scale in schools and coaching classes for promotion of the subject.



## Interpretation and Conclusion

The effort put in this dissertation provides new dimension of computerized learning to the work done by Swamiji in the field of Vedic Mathematics. His reconstruction work of Vedic Mathematical sutras has opened a new horizon in the branch of mathematics. The sixteen mathematical formulae demonstrated in this research are based on logical and magical methodology relating to calculus of shorthand formulae. This reveals the ancient techniques disseminated in Vedas in the field of mathematics.

This research mainly throws the light on understanding and adopting new methodology of performing arithmetic operations using Vedic Mathematical sutras. This methodology basically applies to arithmetic operations involving large numbers. It reduces the number of steps to be carried out in an operation as well as the complexity in terms of getting accurate answer for intermediate steps and final result. It provides an easy, less time consuming, short and simple solution to a lengthy and complex calculation. It mainly emphasizes on performing such big numbered arithmetic operations as mental calculations with no external resources. The reduction in numbers of steps is remarkable and this can be achieved with very basic mathematical knowledge of multiplication table only up to 9.

This new technology can be learned easily and this knowledge can be integrated with any complex mathematical operation applicable in almost any field. This can be also considered as a better alternative to understand and practice arithmetic operations. It can be used for improving mathematical skills there by developing liking for the subject and removing its fear and frustration.

## **Bibliography**

- *Vedic Mathematics*
- *sankaracharya sri bharati krishna tirthaji maharaj*
- *Researching Information Systems and Computing*
- *Briony J. Oates*