

Resources for excellence in IIT JEE, Olympiads & NTSE

BASICS OF SPEED MATHEMATICS

CHANDRAMOULI MAHADEVAN



astrarka

PRODUCTS FOR EXCELLENCE IN MATH & SCIENCE

<http://www.astrarka.com> - info@astrarka.com - [@astrarka](https://twitter.com/atrarka)

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Table of Contents

1	Introduction.....	11
2	Building Blocks for Speed Math.....	13
3	Speed Addition	47
4	Speed Subtraction.....	69
5	Multiplication without tables.....	85
6	Base Multiplication.....	117
7	Straight Multiplication.....	141
8	Multiplication using inside-outside pairs.....	149
9	Squares and Cubes	169
10	One subtle change to improve your accuracy.....	181
11	Basic Patterns in Division	191
12	Extension to the Speed Division	203
13	Argumental Division.....	223
14	Straight Division	233
15	Closing Thoughts	245

Foreword

Several books have been written on the subject of Speed Mathematics, Vedic Mathematics and other systems of numerical manipulation. This book is different – in that it brings together the techniques from Vedic Mathematics and Trachtenberg System together. We have not attempted to do a comparative study of these techniques and make a judgment on which one is better. Instead we have simply, presented the techniques in a sequence that makes most sense. There are inherent strengths in these two approaches. While Vedic System has very short and pithy statements, which encapsulate the essence of a technique [base multiplication is a fine example of this], the Trachtenberg System offers valuable insights into how very simple adjustments in the way we do things, go a long way in improving accuracy. The treatment of speed addition and preliminary treatment of conventional elementary school division is an excellent insight. All systems of knowledge rely on profound analogies. The argumental division is an excellent case in point. The section underscores an important point that a polynomial in x , is simply a decimal number when the value of x is equal to ten. This equivalence drives home a very useful insight. We can now draw several algebraic techniques into play while handling numbers, and similarly, we can use number manipulation techniques while we handle problems in Algebra. At the core of education, is the need of conceptual understanding. The good demonstration of our conceptual understanding of a subject is related to our ability to draw these analogies and make such meaningful connects.

We sincerely hope that the student is able to get a good grasp of the subject and the techniques after working with the content of this book.

Astrarka Educational Solutions Private Limited.
Bangalore, India.

Preface

In June 2009, we started to work on a video of Basics of Speed Mathematics. The motivation was very simple. We wanted to offer the student a bouquet of techniques for flawless computation of problems related addition, subtraction, multiplication and division. Once the student is familiar with the underlying principles of numerical manipulation, he would be able to make a decision on what works well for him given a certain problem in Arithmetic.

Furthermore, several schools and institutes openly focused on speed and speed alone. We beg to differ. Speed at the expense of accuracy is useless. There is really no point in racing through a highway at a blistering pace if there is no guarantee of safety. It is therefore very clear that any school of thought that does not focus on inherent error checking techniques is simply not comprehensive enough. So, we decided to spend a section of this work on error detection techniques using digital roots.

One other area of focus has been speed addition techniques. The method you will see appears very elaborate, but in fact, it is robust and complete. Most books on speed math that we have come across do not talk of these methods. The Trachtenberg system is a place where we looked for these techniques.

Multiplication is the crown jewel of speed mathematics. We have devoted a good chunk of material on this topic. We have presented several key techniques from the Vedic and Trachtenberg school of thought. Both these schools offer powerful insights into Speed Math. It would be unfortunate if we fall prey to the temptation of picking one over the other as the golden standard.

Several man months have been invested on working through the basic material in preparation of the speed mathematics video. The idea to convert this into a book was an afterthought based on feedback from parents, who believed that they really needed a workbook of sorts to help their children with these problem solving techniques.

The feedback from the parents and teachers, who championed our video products, laid the foundation stone for this book. It has been a humbling experience, although, we must add – that discovering the child in us and

going through the materials of elementary school Mathematics filled our work days with immense joy.

It would be impossible for us to acknowledge all the people that have contributed to this mammoth effort. This is the problem related to completeness in our enumeration. However, it would be unfair if we did not thank a few people whose contributions stood out during the design, production and review process of the video¹ and the book. Monica Ranjit helped us out with the content of the Trachtenberg System, and Santosh Govindarajan bore the brunt as he created and solved well over a 1000 problems in preparation of the video shoot. R Balasubramanian was always ready to help with smart little perl routines for generating random numbers while building the exercise problem set. Without their colossal effort, this book would have been an exercise in futility.

We would like to thank all the staff of Astrarka for their contributions, support and assistance throughout this project.

Chandramouli Mahadevan
Bangalore

¹ The 25 hour video on Basics of Speed Mathematics is a 6 DVD set produced by Astrarka. For additional details about the product and its features, please feel free to contact sales@astrarka.com or <http://www.astrarka.com>

1 Introduction

There was a time in ancient India when Mathematics, and perhaps even education was imparted using Sanskrit Sutras. Sutras are aphorisms. These are short sentences – usually a few words or sentences long, which contained a specific formula or way of solving problems. Our attempt in this book is very simple. We are not going to sing praises of the wisdom of our ancestors. We will understand and apply these aphorisms to our day-to-day Math problems. This will help us become better equipped to handle complex Math as we progress through our schooling phase. Therefore, this is not a comparative study of techniques for Speed Math. Our attempt is to teach you develop basic Math skills – thus help you understand and enjoy the language of numbers; identify patterns and handle the quirks and manipulation of numbers with ease. With practice, you will start experiencing the fact that the anxiety associated with learning Math gradually dissolves, making way for a sense of appreciation and even command over the subject. Constructive curiosity will thus lead you to become confident in dealing with the subject.

1.1 Review of learning objectives

Speed Mathematics deals with a collection of techniques. If you master these techniques, you will dramatically improve your speed and accuracy in Math. We will also emphasize on techniques to check for accuracy after a solution reached. This step will help you identify errors and give you an opportunity to correct you solutions. Therefore, we have three major learning objectives.

1. Techniques for handling multiplication, division, addition and subtraction.
2. Techniques for ensure that the techniques when applied do produce the desired results.
3. Techniques to check for accuracy of solutions.

For doing this, we will have to commence with an introduction of terms and phrases which we will frequently use. These terms and definitions form the basic building blocks of our language of speed math.

For some reason, most societies relate ability to solve problems to intelligence. People with an ability to solve problems fast have always been considered very intelligent. Those with an uncanny ability to solve problems not only quickly, but also accurately, are considered super intelligent. Is this ability a blessing or a skill? We think this is a skill and each and every kid can develop this skill if he or she is willing to invest time and effort to learn, understand and practice these techniques. To be good at anything takes practice. It takes of hours and hours of effort and practice, for someone to be an expert like say, Roger Federer or Raphael Nadal. These men have dedicated several hours every day to practice their art. To be good at Math requires a similar attitude. We must sacrifice boredom; practice the techniques by solving problems. Let us now capture these points into a basic expectation from each of you. Let us make a personal commitment to work towards becoming very good at number manipulation.

1.2 Basic Expectations

These are simple rules of thumb for getting better at the art of speed mathematics.

1. Always have a paper and pencil handy with you while going through this material / class. I would recommend that you set aside a notebook for taking notes, solving problems and practicing what you learnt in a certain section.
2. Practice by solving problems and then by solving even more problem. The more you practice the better you become.
3. Believe in yourself. You are good at Math; and if you don't think so – believe in your ability to become good at Math. Math is not hard; like Music, it takes practice and dedication.
4. Because you have learnt do things in a certain way at school, it will take a while for you to get used to doing this differently. Be reminded that all the methods, of computation, work. What we are going to learn here is a different way to look at the problem solving process.

At the end of the course, we will look at formal proofs for our techniques. We strongly recommend a bright beginner to keep away from this and invest his energy on the learning aspect of the course.

2 Building Blocks for Speed Math

This is a textbook and a workbook for students. We are going to deal with Speed Math techniques. Speaking of Speed Math there are multiple schools of thought that exist in this domain; there is a Trachtenberg System from Europe, there are Chinese speed math techniques based on Abacus, and there are many more. Perhaps it is safe to say that every civilization had a math technique; some of these techniques are available today. This course is not a comparative study of various methods for Speed Math; rather this is simply a way of exposing the techniques and giving you practice in using those techniques in day-to-day math problems. In doing so it is our hope that the anxiety and fear associated with conquering math will gradually vanish leading to greater self confidence in taking on challenges in math and education at large.

For some reason, most societies relate ability to solve problems to intelligence. People with an ability to solve problems fast have always been considered very intelligent. Those with an uncanny ability to solve problems not only quickly, but also accurately, are considered super intelligent. Is this ability a blessing or a skill? We believe that this is a skill. Therefore it can be developed. Each and every kid can develop this skill if he or she is willing to invest time and effort to learn, understand and practice these techniques.

It is safe to say that in Ancient India, mathematics and perhaps even education was handed out through aphorisms called Sutras. In the pre-printing press era, much of knowledge was captured as aphorisms the world over. Typically they were a couple of lines long and they had all the knowledge required to perform a certain step or an equation. This course is not about praising or analyzing the aphorisms in detail. We will simply extract, distill the essence of the aphorisms and offer those techniques in a form that is easy for us to grasp and internalize and use in our day-to-day problems. This will help us become better equipped to handle complex Math as we progress through our schooling phase. Therefore, this is not even a comparative study of techniques for Speed Math. Our attempt is to teach you develop basic Math skills – thus helping you understand and enjoy the language of numbers; identify patterns and handle the quirks and manipulation of numbers with ease. With practice, you will start experiencing the fact that the anxiety associated with learning Math gradually dissolves, making way for a sense of appreciation and even command over the sub-

End of Preview.

**Rest of the book can be read @
<http://kinige.com/kbook.php?id=851>**

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