Resources for excellence in IIT JEE, Olympiads & NTSE

ELEMENTARY ALGEBRA

CHANDRAMOULI MAHADEVAN

astrarka
PRODUCTS FOR EXCELLENCE IN MATH & SCIENCE
http://www.astrarka.com - info@astrarka.com - @astrarka

Dedicated to my team

Copyright © 2011
Chandramouli Mahadevan, on behalf of
Astrarka Educational Solutions Private Limited

All rights reserved.
No part of this book may be reproduced, stored, or transmitted by any means, whether auditory, graphic, mechanical, or electronic, without written permission of both publisher and author, except in the case of brief excerpts used in critical articles and reviews. Unauthorized reproduction of any part of this work is illegal and is punishable by law.

ISBN: 1937591131
EAN-13: 978-1-937591-13-7

First e-Edition 2011

Contents

1	Good Habits	3
2	Fundamentals	5
3	Addition, Subtraction and Simple Brackets	13
4	Multiplication	21
5	Division	29
6	Elementary Rules	33
7	Simple Equations	35
8	Symbolic Expressions	41
9	HCF, LCM and Elementary Fractions	45
10	Simultaneous Equations	51
11	Involution	55
12	Evolution	59
13	Factorization	63

14 Quadratic Equations **69**

15 Ratio and Proportion **73**

16 Closing Thoughts **77**

17 Solutions **79**

Foreword

Algebra is amongst the oldest of branches in Mathematics. Apart from the music of variables, equations and polynomials, series and progressions – Algebra offers a great deal of insight into solving day to day problems. The origins of the subject can be traced to our ancestors and their endeavours to determine a numerical value of an unknown (which was later formalized as a variable), given a set of inputs and assumptions. Several texts in ancient Greece, Egypt and India, enumerate problems in Algebra which in current day curriculum is covered under the concept of unitary method.

Most students have a blend of emotions while dealing with Algebra. Talking about x and y, unknowns and equations, is exciting, and equally confusing. This is not just our premise, but this is based on feedback and direct inputs we have received from the student, teacher and parent community.

We started a project to address this conceptual gap. We started stringing together a set of concepts followed by a problem set using the preceding texts. This effort left us with a skeletal structure of concepts in Algebra which progresses from

basics to through to advanced topics. This formed the basis of our work on “Elementary Algebra”.

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

Astrarka Educational Solutions Private Limited.
Bangalore, India

Preface

We learnt an important lesson from our "Basics of Speed Mathematics" video effort. The book followed the video and our customers wondered why. For this book, we pro-actively worked on the video and paperback simultaneously. We believe that the nature of treatment of the subject, structure and presentation of content is unique. It lends itself to easy reading and a journey through a maze of concepts establishing opportunities for small victories along the way.

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. At the same time, we know that without their colossal effort, this book would have been an exercise in futility. This is a 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 de-

sign, production and review process of the video [1] and the book. R Balasubramanian spent long hours in getting the type setting right. Without his tireless efforts to ensure the accuracy of the content, we would not have been able to complete this project.

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

Chandramouli Mahadevan,
Bangalore.

[1] The 10 hour video on Elementary Algebra is a 3 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 Good Habits **3**

2 Fundamentals **5**

3 Addition, Subtraction and Simple Brackets **13**

4 Multiplication **21**

5 Division **29**

6 Elementary Rules **33**

7 Simple Equations **35**

8 Symbolic Expressions **41**

9 HCF, LCM and Elementary Fractions **45**

10 Simultaneous Equations **51**

11 Involution **55**

12 Evolution **59**

13 Factorization **63**

14 Quadratic Equations **69**

15 Ratio and Proportion **73**

16 Closing Thoughts **77**

17 Solutions **79**

1 Good Habits

Concept 0:
There are five fundamental principles, or **good habits** that we would like to emphasize before we commence our discussion on Elementary Algebra.

1. Neatness is conducive to accuracy. Refrain from the temptation to write down something quickly and then scratch the same to make the necessary corrections.

2. One of the weaknesses we find in students while solving word problems is the usage of the = sign. This sign has a specific meaning in the world of mathematics. It cannot be used as a way to begin every new line of step in the problem solving process. Use appropriate mathematical signs and symbols. Never use them to mean something vague. = sign is never a good space filler.

3. Spend a second or two to explain how you arrived at a certain step. Several books and references use a statement, such as "it follows from the above statement". We have

oftentimes wondered how the expression or equation below follows from the one above. A good explanation is an excellent demonstration of your understanding of the underlying principles.

4. When you are faced with several conclusions during a problem solving process, it is a good idea to number the statements or equations. In subsequent steps, you can refer to these conclusions by using the label or the assigned equation number.

5. The easiest of problems attracts the silliest of mistakes. If the problem is easy, motivate yourself to get it right. Do not let overconfidence or carelessness take control of the situation.

2 Fundamentals

Concept 1:
Algebra is similar to Arithmetic. In both cases, we manipulate quantities. Arithmetic deals with manipulation of numbers. Algebra is slightly different. In Algebra, we deal with a greater generality. We employ letters or symbols to denote quantities on which we perform the mathematical operations or manipulations.

The term **manipulation** means the same in both the worlds. A set of inputs or information about a problem is given. We will derive the result using the inputs. Thus, from a problem-solving standpoint, both Arithmetic and Algebra are very similar.

Each number represents a unique point in the number line. An algebraic symbol stands for one or more numerical values. In several cases, we can have a symbol that can stand for an infinitely large number of numeric values. It is possible for us to apply the mathematical operations without assigning any specific value to a symbol. This may confuse the beginner. This will become clearer as we make progress.

End of Preview.

Rest of the book can be read @
http://kinige.com/kbook.php?id=858

* * *

Read other books of Chandramouli Mahadevan @
http://kinige.com/kbrowse.php?via=author&id=272