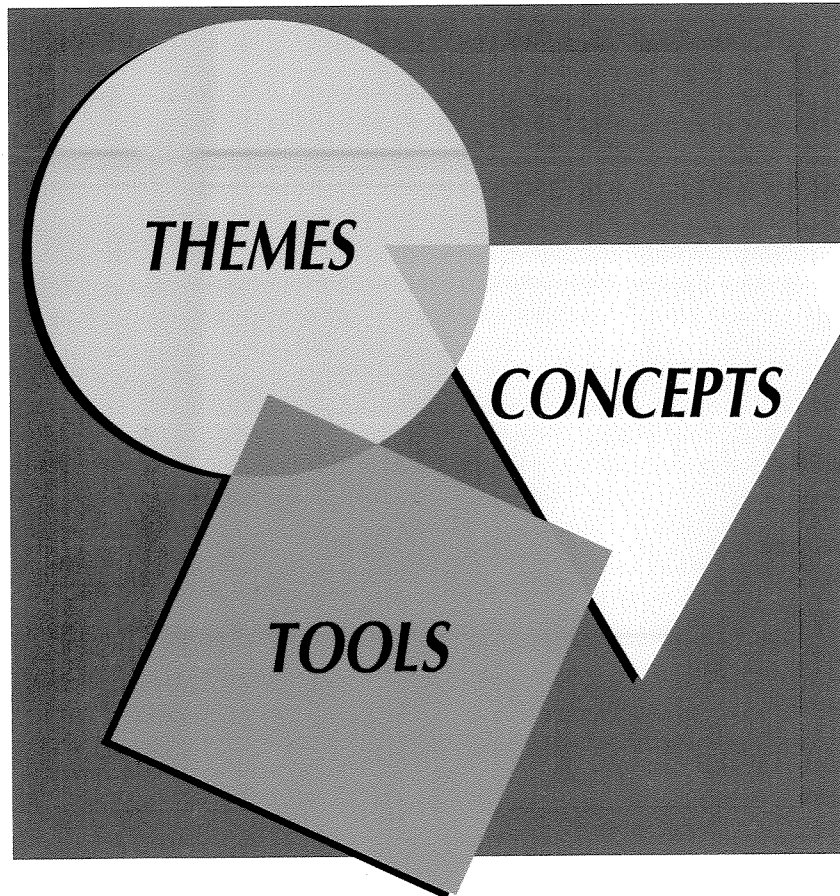


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Anita Wah
Henri Picciotto

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A U T H O R S



Anita Wah received her Bachelor's Degree in Mathematics from Oberlin College and a Master's Degree in Biostatistics from Harvard. She attended and taught as a master teacher at the Woodrow Wilson Algebra Institute and has over ten years of teaching experience at the high school and college levels. She has been involved as a curriculum consultant and staff development trainer for the State of California.

Henri Picciotto has been teaching mathematics for over twenty years at every level from counting to calculus. He has developed curriculum for the Lawrence Hall of Science at the University of California and has consulted for many schools, districts, and university departments of education across the country. He received his Bachelor's Degree, as well as his Master's Degree in Mathematics from the University of California at Berkeley. He is currently the mathematics coordinator for The Urban School of San Francisco, California.

A Word From the Authors

We would like to acknowledge the many people without whom this book would not have been possible.

These math teachers and authors had a significant influence on our teaching or on the ideas that led to this book: Abraham Arcavi, Richard Brown, G.D. Chakerian, Calvin Crabill, Zoltan Dienes, Lew Douglas, Martin Flashman, Paul Foerster, Donna Gaarder, Martin Gardner, Harold Jacobs, Mary Laycock, Sidney Rachlin, Peter Rasmussen, Sherman Stein, Daniel Teague, Joel Teller, Zalman Usiskin.

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And of course, our spouses: Alan Fishman and Irva Hertz-Picciotto.

Heartfelt thanks to all!

DEDICATION



This book is dedicated to our students and colleagues at The Urban School of San Francisco, a great place for involvement, collaboration, and challenge. ■



Dear Student,

In arithmetic you have learned to work with numbers. Algebra is an extension of arithmetic, where you learn to work with symbols. It is the language of all of mathematics and science, and a tool for solving problems in business and engineering.

In the future more and more algebra will be done by computer. But what good would it do you to have a computer ready to do the algebra for you if you didn't understand what algebra is? It would be as useful as a calculator to someone who didn't know the meaning of numbers.

Algebra is difficult to learn, but it is the key to so many possibilities in your life that it is worth the effort. You cannot learn algebra just by listening to your teacher. You need to be much more involved: do your homework every day, read the book carefully, and if necessary, get help from your teacher. Good work habits are essential if you want to succeed in this class.

Most importantly, be ready to discuss difficult problems with your classmates, sometimes to help them, and sometimes to get help from them. Talking is the best way to sort out what you understand from what you don't understand, and explaining is the best way to improve your understanding. While learning math and problem solving, you will also be improving your ability to communicate with other people.

You may be surprised at how much writing will be expected from you. Almost every lesson requires you to explain something, and you will have to write reports on a regular basis. This is difficult at first, but it will help you in the long run, by making you not only a better mathematician, but also a better thinker, and a better writer.

Good work habits, communicating, thinking, and writing will help you no matter what you do in the future. But of course, as math teachers, we would like you to stick with it, and take many more math classes. To convince you of this, we have tried to write a book that you will find interesting and that puts you, the student, in the center of the action.

Sincerely,

Anita Wah and Henri Picciotto



Dear Parent,

This book is different from the book you used if you took algebra. It certainly is different from the books we used. We have taught from many algebra textbooks over the years, and are well acquainted with the traditional algebra course. The course had many problems: there were many Ds and Fs, and even students who got good grades often did not really understand what they were doing. In addition, the development of calculator and computer technology has made it imperative to change the emphasis of the course. Moreover, as a profession, math teachers now have a better understanding of how students learn.

This book is based on three big ideas, which have been guiding principles in our teaching:

- In order to learn to reason flexibly and independently about the abstract concepts of algebra, students need tools to think with. These tools should be designed to support students' work with the main ideas of algebra: variables, operations, equations, functions, and so on. We use manipulative, electronic, and old-fashioned pencil-and-paper tools.
- Learning mathematics should be based on solving interesting problems. Students' skills develop best if they are given an interesting context to practice them in. Look through the book at the wide variety of problems we address: air travel, get-rich-quick schemes, telephone billing plans, children's growth rates, making cranberry-apple juice, car and bicycle trips, and on and on.
- Most students will not remember concepts if they are explained once or twice by a teacher and practiced in isolation over a short period of time. Students must be involved in their own learning, and have experience with ideas in many forms and formats over an extended period of time. They must experiment, conjecture, discover, and write about what they are thinking. In this book, important ideas are returned to over and over, and much work is expected of the student — hard work, but work that is more varied and interesting than the traditional drill and practice.

After using this book, your child will be exceptionally well prepared for future courses, because we have made a point of giving extra emphasis to the areas that are most important to the rest of secondary school math and science: square roots, proportions, scientific notation, functions, and symbol sense. In addition, the emphasis on thinking, communication, and writing skill will help across the whole curriculum.

If you have any questions about this course, we are sure your student's teacher will be glad to help answer them. The biggest help you can provide is to make sure that your student does algebra homework every day.

Sincerely,

Anita Wah and Henri Picciotto