

# **FIRST YEAR MATHEMATICS**

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First Year Mathematics by George W. Evans & John A. Marsh

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**GEORGE W. EVANS & JOHN A. MARSH**

**FIRST YEAR  
MATHEMATICS**



# FIRST YEAR MATHEMATICS

BY

GEORGE W. EVANS

HEADMASTER OF THE CHARLESTOWN HIGH SCHOOL, BOSTON

AND

JOHN A. MARSH

MASTER IN MATHEMATICS AT THE ENGLISH HIGH SCHOOL,  
BOSTON



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## PREFACE

THIS book is the result of twenty years of patient experiment in actual teaching. It is intended to be completed in the first year of the high school. It presents algebraic equations primarily as a device for the solution of problems stated in words, and gives a complete treatment of numerical equations such as are usually included in high-school algebra — one-letter and two-letter equations, integral and fractional, including one-letter quadratics and the linear-quadratic pair. So much of algebraic manipulation is included as is necessary for the treatment of these equations.

The arithmetic in the book is presented from a new point of view — that of approximate computation — and is utilized in the evaluation of formulas and in the solution of equations throughout the succeeding pages.

Geometrical facts are introduced as the basis of many algebraic and arithmetic problems, and wherever they are not intuitively accepted by the pupils they are accompanied by adequate logical demonstration. Proofs, and parts of proofs, are avoided when they seem to the pupils of an unnecessary and hair-splitting kind.

All problems are carefully graded, for it is by means of problems that each successive algebraic difficulty is introduced.

A great deal of pains has been taken to present new topics clearly and concretely, often dividing them into sub-topics each of which is separately illustrated and applied to practice. Definitions are generally prepared for by such advance work as will cause the student to feel the need of them; and where no need exists, they are omitted. To introduce definitions of concepts that are already familiar to the student,

such as angle and right angle, would increase the formalism of the exposition, and be on the whole repellant.

The book has been used in manuscript, and substantially in its present form, for four years in one of the largest high schools in Boston. It has been found workable. It gives the pupil who has but one year for mathematics a substantial knowledge of the meaning and purpose of algebra, and more than a hint of what geometry is about. Neither of these things can be said of the conventional first year mathematics. Pupils who go on with mathematics, after the course covered by this textbook, enter upon their second year with habits of self-reliance and of self-criticism, and complete the usual syllabuses of college preparation without duplication of work or loss of time. Teachers who have begun the text with some distrust have finished it with enthusiasm.

Other features of the book are:

1. The method of solution of equations: the logical explanation of each step is noted in writing, with a clear and systematic symbolization, by the pupil himself. Technical terms of manipulation, such as "transposing" and "clearing of fractions," are replaced by briefer statements of the actual thing done to each of the equal numbers.

2. Approximate computation is made not only a time-saver but a training in common sense.

3. The graphical method is used not merely as a preparation for examination questions but as a means of exhibiting the functional relation of the two letters of the equations used, and as a means of clarifying the study of elimination; it is made an integral part of the treatment of that subject.

4. The solution of quadratics is treated by the general methods of algebra, instead of using a method peculiar to high-school work. "Completing the square" is regarded as a method of factoring a quadratic expression; and the sign  $\pm$  for a square root is deduced from the solution of the equation  $x^2 = n$ , instead of the reverse. Problems are chosen, first, to show the answers distinct and of equal sig-



nificance, then successively to show them alike, apparently different but really alike, and so on. The algebraic negative appears here, with its interpretation. Meaningless answers are found, which are to be discarded; irrational answers are exemplified; imaginary answers are mentioned as an indication of some incongruity in the statement of the problem.

5. Two methods of elimination are given: "by combination" for linear pairs, and "by substitution" for linear-quadratic pairs.

6. Throughout the book, the pupil is required to check all his work, and so to rely upon himself for certitude of his accuracy.

7. The unusual arrangement of topics (see Table of Contents) and the introduction of material from arithmetic, geometry, and even from trigonometry, have been found to arouse an unusual interest in the pupil and to leave him at the end of the year with a feeling of achievement that pupils never get from the mere manipulation of algebraic expressions.

For all the foregoing reasons it is believed that this book will disarm many of the attacks now being made on the teaching of algebra in high schools.

We are greatly indebted to the wisdom and enthusiasm of Mr. Henry M. Wright and Mr. Bertram C. Richardson, who have given invaluable aid in working out the teaching system embodied in this book. Many other Boston teachers, notably Mr. Walter F. Downey and Mr. Peter F. Gartland, have generously coöperated in testing the various stages of the manuscript. In offering the book to a larger public, therefore, the authors feel warranted in claiming that it is representative of a considerable group of scholarly and progressive teachers.

GEORGE W. EVANS  
JOHN A. MARSH

BOSTON, *June 1, 1916.*

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