

# **FIRST YEAR IN ALGEBRA**

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649584321

First Year in Algebra by Frederick H. Somerville

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**FREDERICK H. SOMERVILLE**

**FIRST YEAR  
IN ALGEBRA**



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BY

FREDERICK H. SOMERVILLE

THE WILLIAM PENN CHARTER SCHOOL, PHILADELPHIA



NEW YORK · CINCINNATI · CHICAGO  
AMERICAN BOOK COMPANY

## PREFACE

THE aim of this little book is to provide an introductory course as a foundation to elementary algebra. A minimum number of definitions, an early introduction of the literal symbol in its simplest form, a clear conception of the opposition of positive and negative quantity, and a gradual introduction to the early processes are believed to be the first essentials to successful later work. New elements are introduced as the result of some natural process, the exponent, for example, not being mentioned or used until, in multiplication, the pupil meets the operation that produces it.

Certain important topics are given a more extended treatment than is customary in most books prepared for beginners. The application of the equation to the problem is made in a form that experience has shown to give excellent results, and the reasoning powers developed by the limited classifications have been equal to the demands of the general problem. Substitution has a much more important position than is usual in elementary teaching, and its constant applications are designed to meet an actual need felt by teachers in higher grades of work.

The importance of factoring is emphasized by an unusual amount of practice, and the arrangement of the type-forms is one that has been given extended trial in the class room.

Reviews are constant and consist of both classified groups for topical review and miscellaneous exercises in which the power of discrimination is first developed. The frequent grouping of principles recently passed over serves to keep them clearly in mind. The exercises have been carefully graded throughout and are free from difficult and discouraging questions.

FREDERICK H. SOMERVILLE.

PHILADELPHIA, PA.

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## CHAPTER I

### SYMBOLS. POSITIVE AND NEGATIVE QUANTITY

1. In arithmetic we represent quantity by the use of *numbers*, and, in most cases, we work with *units of a particular kind*.

Thus, 4 pounds, 3 yards, and 7 dollars are units of a particular kind.

2. In algebra we represent quantity by the use of the *letters of the alphabet*, and we do not, as a rule, assign a particular value to these literal symbols.

Thus,  $4a$ ,  $3m$ ,  $6x$ , and  $7y$  represent what we call *general units*, and our operations with them are accomplished without reference to any particular value.

#### ILLUSTRATIONS OF OPERATIONS WITH LITERAL SYMBOLS

At first the student may wonder that operations with these new symbols of quantity are possible, but a comparison of an arithmetical addition with particular units and an algebraic addition with general units will serve to convince.

8 SYMBOLS. POSITIVE AND NEGATIVE QUANTITY

BY ARITHMETIC	BY ALGEBRA
7 apples	$7a$
5 apples	$5a$
<u>3 apples</u>	<u><math>3a</math></u>
15 apples	$15a$

No matter what the "a" of the algebraic illustration stands for, it is true that the sum of seven a's, five a's, and three a's is fifteen a's.

The principle is the same when units of different kinds are considered together.

BY ARITHMETIC	BY ALGEBRA
4 pounds + 3 ounces	$4a + 3b$
6 pounds + 2 ounces	$6a + 2b$
<u>10 pounds + 4 ounces</u>	<u><math>10a + 4b</math></u>
20 pounds + 9 ounces	$20a + 9b$

Note that in both additions, units of the same kind are added together, pounds added to pounds, ounces to ounces, a's together, and b's together.

SYMBOLS OF OPERATION

The principal signs of operation in algebra are identical with those of arithmetic.

**3. Addition** is indicated by the "plus" sign, +.

Thus,  $a + b$  is the *indicated sum* of the quantity  $a$  and the quantity  $b$ . Read "a plus b."

**4. Subtraction** is indicated by the "minus" sign, -.

Thus,  $a - b$  is the *indicated difference* between the quantity  $b$  and the quantity  $a$ . Read "a minus b."