

ELEMENTARY ALGEBRA

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Elementary Algebra by B. Sestini

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B. SESTINI

**ELEMENTARY
ALGEBRA**

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A L G E B R A.

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PREFACE.

To render the Science of Algebra intelligible to pupils whose minds are yet unaccustomed to such studies, is not an easy task. For should the instructor subject every principle, as it is announced, to a rigorous demonstration, he will very probably not be comprehended; while, on the other hand, inconclusive reasoning is worse than none at all.

To obviate this difficulty has been the main object of the present treatise. The beginner will here be furnished with such proofs as are suited to his capacity; examples will afford new light to what might be otherwise obscure; with regard to the operations founded on higher principles he will, for the present, content himself with merely practical rules, exemplified in the same manner.

With a mind thus gradually led on to strict mathematical discussion, he may then resume his course with profit, by the aid of a treatise now in preparation, which is intended as a sequel to this, and by more exact and thorough investigation, complete his study of Algebra.

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ALGEBRA.

PRELIMINARY ARTICLE.

§ 1. A NUMBER, for example 7 or 8, is used to signify or represent seven or eight different beings; for instance, seven or eight lamps, seven or eight boats. But the figure 7 cannot express more than seven, and the figure 8 no more than eight.

Different signification of numbers and algebraic symbols.

Algebraic *symbols* have a general signification, and the same symbol may be used to represent five, or seven, or a hundred different objects.

The letters a , b , &c. of the Latin, and α , β , &c. of the Greek alphabet, are employed as algebraic symbols; and therefore a , for instance, may be used equally well to represent seven stones, or nine rods, or fifty rings, &c. The same symbol is frequently used to represent different quantities of the same order; and then, to distinguish the different significations of the symbol, we add to it one or more accents, as follows:

$$a', a'', a''', \dots a^{(n)}$$

and read—*a prime, a second, &c.*

or else, instead of the accents, numbers may be used, as follows:

$$a_1, a_2, a_3, \dots a_n$$

and read—*a one, a two, &c.*

§ 2. Algebraical operations are the same as with numbers, but on account of the more general signification of algebraic symbols, algebraic computation is also more general than the arithmetical.

Algebraic operations the same as arithmetical ones, but more general.

Simple and compound symbols.

§ 3. Algebraic symbols are either simple or compound. A simple symbol is, for example, a or b ; but if a or b are connected with some other symbol, or with numbers, this union causes them to become compound symbols. Symbols can be connected together in many ways, and so likewise symbols and numbers. A symbol, for example, can be added to itself several times, or multiplied by itself several times.

Coefficient and exponent.

§ 4. When a symbol, for example b , is added to itself two or three times, instead of taking it as many times as it is to be added, we write the symbol only once, placing before it the number which indicates the number of times that symbol is taken; so in our case we should have $2b$ or $3b$. The number placed before the symbol is called *coefficient*. The coefficient may be a fraction as well as a whole number, and also another algebraic symbol. When a symbol is multiplied by itself three or four, or more times, we express it likewise by a number placed, not before the symbol, like the coefficient, but above it. The expression, for example, c^4 , signifies that c is multiplied by itself four times; and if the same *exponential* expression would be multiplied again by c or by c^2 , it would become equivalent to c^5 or c^6 , &c. The number 4 is called *exponent*. The exponent, like the coefficient, can be a whole number, or a fraction, or an algebraic symbol.

Signs, plus and minus.

§ 5. When a symbol is to be added to another, or when several symbols are to be added together, we write them in succession, placing between them the sign $+$, termed *plus*. So, for instance, if a , b , c are to be added together, we write $a+b+c$, and read a plus b plus c .

When a symbol is to be taken or subtracted from another, for example, the number 7, represented by b , from the number 15, represented by a , we write first the symbol a and then b , placing between them the sign $-$, termed *minus*. So if a