ALGEBRA MADE EASY

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CHIEFLY INTENDED

FOR THE USE OF SCHOOLS.

BY

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PREFACE.

THIS work is intended to lead the pupil, by an easy transition, from the *principles* of arithmetic to those of algebra. I have endeavoured, throughout the work, to illustrate abstract symbols and operations by a reference to natural objects; and the arrangement, which has been adopted, is that which nature and expediency seem to suggest. The subjects do not follow each other in the order of *rules*, but according to the peculiar nature of the principles discussed, and the progressive difficulty of the operations. After the expositions of an important principle various problems are given, in which the principle is exemplified. By this means the inventive powers of the pupil are exercised, and he is led, at an early stage of his progress, to see the utility of the subject.

Instead of attempting to teach a great many rules of arithmetic — which are to many pupils useless, because their practical application is never learned — the simple and beautiful doctrine of equations should be taught; and if this be done by rational means it will elevate the intelligence of the pupil, and thus place him above the slavish observance of conventional forms and technical formulæ. By this process an entire system of algebra may not be taught: but because we cannot teach the whole of a science, it is no reason why we should not illustrate some of its simple and useful departments; — because we cannot teach a boy the method of finding the greatest common measure of two quantities, it is no reason why we should not explain the nature and use of equations; — or because standard writers on algebra happen to introduce the rule of surds at an early part of their works, will this be deemed a sufficient reason for keeping a boy ignorant of the nature of a recurring decimal?

An enlightened system of education ought to cultivate all the susceptibilities of our nature: algebra, which is peculiarly called the analytic art, exercises in a way which no other subject can, those powers of analysis and abstraction, which would otherwise lie dormant and enfeebled. The philosopher, embracing within the comprehensive grasp of his intellect the known laws of the universe, was once a feeble-minded child; and in order that such a child may become a philosopher, its powers of analysis and induction should be cultivated, in a manner corresponding to its capabilities, at an early period of its intellectual development. While moral training, of a specific kind, should not be lost sight of, at the same time it is important to bear in mind, that the patient and reflective spirit which analysis engenders, gives a healthful tone to the character, and renders us more capable of appreciating and enjoying whatever is morally sublime or beautiful in nature or revelation.

We naturally acquire abstract ideas by a process of induction, — hence it is that a knowledge of the general symbols and operations of algebra is best communicated by an inductive method of instruction, whereby the mind of the pupil is led, by progressive steps, from the most simple particular cases, to those that are most complex and general. However, a judicious teacher will not fail, occasionally, to pursue a deductive process in elucidating certain abstract results, by showing the law of the formula in cases which come more within the range of our ordinary associations. In all algebraic investigations, each step should be thoroughly understood, before the next is attempted, or even presented to the eye of the pupil. By this means, thought is built upon thought — truth upon truth — until the pupil has, almost insensibly, acquired an accumulation of ideas. This plan has been appropriately called the constructive method of education, inasmuch as it is analogous to the way in which the most simple as well as the most gigantic of human contrivances are completed: — thus the ingenious mechanic lays stone upon stone, beam upon beam, until he has reared a vast and beautiful structure, exciting the wonder and admiration of the uninitiated observer. In this way too surprising results may be attained in education.

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DEFINITIONS AND NOTATION.

1. ALGEBRA teaches us a general method of computation, in which letters of the alphabet are used to represent numbers and quantities. Numbers that are unknown, but which may be found from certain things given in a question, are represented by x, or y, or any of the last letters of the alphabet; whereas numbers that are supposed to be known are represented by a, or b, or any of the first letters of the alphabet. When a figure is placed before any letter, it means, that the number for which the letter stands is to be multiplied by the figure. Thus $3x$ means, that the number for which x is put, is to be taken 3 times, that is, $3x = x+x+x$. In this example the 3, put before the x, is called the coefficient of x; and in the expression, $5\,x$, the coefficient is 5.

In like manner $a \times b$, or $a\,b$, means that the number for which a stands is to be multiplied by the number for which b stands; thus if $a=2$, and $b=4$, then $a\,b=2\times4=8$.

The *expression*, $c\,d+e$, means that the number c is to be multiplied by the number d, and then this product is to be added to the number e; thus if c stands for, or is equal to 5, and $d=3$, and $e=7$, then in this case $c\,d+e= 5\times3+7=22$.

The *quantity* $\frac{x}{4}$ means that the number, for which x is