OUTLINES OF NUMBER SCIENCE

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NATHAN NEWBY

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—OF—

NUMBER SCIENCE

—BY—

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SECOND EDITION.

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1884.

EXPLANATORY.

This little book is prepared to meet the author's convenience in giving Arithmetical instruction in the Normal School, and at the solicitation of a large number of pupil-teachers, who have received in the class-room and have afterwards used in their own schools, much of the matter herein contained. The work is but an elaboration of a series of articles written by the same hand in 1873, and published in an educational paper in this State. An examination of the order of procedure will show that the book is not made for *children*, but for the mature mind already conversant with most of the facts of number as presented in the text books on Arithmetic. "The aim of the Normal School is not so much to teach the facts of the common school branches as to make a thorough study of the relations of those facts to one another. The study of these relations opens up new lines of thought that make the common school branches intensely interesting studies to most students."

The province of the school as thus stated, being kept in view, the attempt has been made so to present the topics of number science that the lines which unify parts that are kindred, may be readily seen.

The discussion begins with a general definition of Mathematics, together with a brief consideration of the

realms of *Space* and *Time*. These are defined as conditions:—Space as the condition of extension, and hence preliminary to Geometry in its various phases; and Time as the condition of succession, and hence preliminary to the idea of Number.

Starting with Time as the conditioning factor, it is sought to show the genesis of number in general. From this idea the mind readily passes to that of number in particular. The term *Integral unit* or *Unit one* (from Davies), is fixed upon to designate the primary idea of number in particular. It must be borne in mind that the elements which enter into a science are *mental* and not *material* objects. A pencil, a horse or a box, is not an element of number science—is not a *unit;* it is the *idea one* which the mind forms upon viewing the object as an entirety that constitutes the unit, or fundamental element in the science of numbers.

The student is next asked to re-think the nine general classes of numbers, to find the basis of each classification, and to give, by definition, the mark of each class.

The classification of numbers is discussed thus early not because of its logical relation to that which precedes or succeeds it, but because of the basal character which Number classification sustains in all computation.

Number Representation is next discussed. Under the Arabic Notation it is observed that the characters are used to represent numerical values thought in

three systems of numbers. Each of these systems, together with its notation, is discussed.

Number Reduction is next considered. The kinds of reduction are determined, and applied to numbers thought in the decimal, the fractional and the compound systems. Attention is called to the fact that reduction descending is effected by *multiplication*, and that reduction ascending is effected by *division*, whether the number to be reduced be an abstract integer, a fraction or a denominate number.

Under Number Processes, the phases of synthesis and analysis are treated. The terms used, the mental acts involved, and the principles which guide the mind in computing are discussed.

In formulating definitions and principles it is sought in the main, to "bring before the mind the act or process by which the concept to be defined is supposed to be constructed." It has been a special aim to make every definition sufficiently inclusive to embrace all that the term covers wherever found in the work: e. g. The definitions of multiplication and division as given in most text books on Arithmetic are but partial since they do not include multiplication and division by a *fraction*. The definitions in this book are believed to be ample.

Both common and decimal fractions are treated together, the principles of the one being the principles of the other.

The suggestions given for the treatment of Com-

pound Numbers, will, it is hoped, enable the teacher to proceed more systematically and satisfactorily than by the methods usually presented.

Most of the definitions and discussions under the applications of Percentage are omitted, not because they are unimportant, but because they are so well given in text books on Arithmetic that their repetition here is deemed unnecessary.

Methods of solving representative problems have been freely inserted under these applications.

Involution and Evolution are treated Arithmetically instead of Geometrically and in a manner at once simple and exhaustive.

"Results in teaching depend upon the clearness with which distinctions are made;" and the pupil can be brought to make clear distinctions only by being held to rigidly logical modes of thinking. As an aid to this end, forms of solution are given for nearly all classes of arithmetical exercises. These forms or others equally logical should be *strictly adhered to in order to secure to the pupil the maximum culture which the subject can give.*

A number of errors, typographical and otherwise, were observed after the work was in print. Some of these have been corrected with the pen. Others still remain, but they are of such a character as not to mislead the attentive reader.

TERRE HAUTE, APRIL, 1884.

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