

MENTAL ARITHMETIC,

By J. A. McLELLAN, M.A., LL.D.,

Inspector of High Schools, Ontario.

PART I.

FUNDAMENTAL RULES, FRACTIONS, ANALYSIS.

PRICE, 30 CENTS.

(FROM THE PREFACE.)

Mental Arithmetic is not intended to supersede written arithmetic, but should rather be its constant auxiliary. Without proper mental training, the pupil becomes accustomed to depend almost entirely on rules and formulae—not capable of interpreting the latter, and entirely in the dark as to the reasons of the former. The long and barren reign of rule and routine is due to the fact that rational methods in teaching the Logic of THE PUBLIC SCHOOL have been too generally ignored—that Mental Arithmetic, which, by easy steps, leads the pupil into an intelligent possession of principles, and renders him expert and logical in their application, has hitherto held an utterly insignificant place in school-room work. Given a slate, a pencil, a rule, and a salutary dread of coming trouble, and a pupil was supposed to be seized of all the elements necessary to make him a first-rate arithmetician. But better methods have begun to prevail, and the improvement in teaching written arithmetic which has taken place during the past few years has only to be supplemented by systematic mental training in order to reach the highest results of the study of the science. This is recognized by the various educational authorities throughout the Dominion. Most of them have, it is believed, made it imperative that their teachers shall have a thorough training in Mental Arithmetic, and prove by actual examination, their knowledge of rational methods as well as their ability to teach them. In a very short time the wisdom of this course will be seen, not only in increased proficiency in mathematical science, but in consequently increased intelligence and power in mastering other subjects.

It is hoped that this work, undertaken at urgent request of many teachers and inspectors, will be found useful in suggesting the methods and affording the materials for thorough and systematic mental training. No formal rules nor definitions have been given—these can be given by the teacher when the pupil has been led by easy inductions to a clear comprehension of the ideas and principles they involve. A great variety of type questions on the fundamental rules, fractions, and analysis, has been given, and the teacher can multiply at pleasure questions corresponding to the various types.

The SECOND PART, most of which is already written, will contain illustrations of concise methods of computation, ratio, and proportional parts, a full treatment of all the rules that come under the general head of percentage, and a large collection of examination paper: for mental solution, affording examples of every variety of question likely to be met with in ordinary written arithmetic.

HINTS TO TEACHERS.

From MENTAL ARITHMETIC, PART I

1. Use material objects (numeral frame, etc.) to give first notions of numbers. First, teach carefully the ANALYSIS of elementary numbers (with their notation) up to nine inclusive—so as to give clear notions of addition, subtraction, multiplication and division.
2. In addition, etc., let the pupil have plenty of drill in *small numbers*, till he thoroughly comprehends the elementary processes. *Types of easy questions* are given in the book—let similarly easy questions be framed by the teacher, and by the pupils for mutual drill.
3. Give many *practical questions*, so that ultimately when a problem is prepared the pupil will be able to know in an instant which of the fundamental rules, or what combination of them, is to be applied in the solution.
4. Always proceed from the known to the unknown. The pupil learns subtraction from his knowledge of addition, etc., etc.: knowing that $4 + 3 = 7$, he knows that $7 - 3 = 4$, and that $7 - 4 = 3$; knowing that $4 \times 3 = 12$ he knows that 12 contains 4, 3 times, and 3, 4 times, etc.
5. In the "simple rules," prepare the way for fractions; make young scholars familiar with *factors, multiples, measures*. The pupil having become thoroughly familiar by proper training in the simple rules, with the notion of *division into equal parts*, and with the language expressing such division, will find but little difficulty in the whole subject of fractions.
6. In general, pupils should not be permitted to use a text-book during recitation—young pupils need no book, those who have advanced to division, analysis, etc., will do better to prepare assigned lessons, and at the same time, should have additional questions proposed corresponding to the given types.
7. In addition to daily oral work, there should be frequent WRITTEN examinations, the pupils are furnished with pencils and small slips of paper, they are directed to turn to certain questions, to write down on their slips the numbers of these questions, and are then allowed a given time to solve them mentally, using the pencil only to write, opposite its number, the answer they have found for any question.
8. The pupil should commence mental arithmetic when he enters school, and should continue it so long as it is thought necessary that arithmetic should be one of his studies.

OPINIONS OF THE TEACHING PROFESSION.

T. CARSCADDEN, B.A., Head Master High School, Richmond Hill

"Dr. McLellan's Mental Arithmetic will supply a long felt need. The study of mental arithmetic has been neglected in nearly all our schools for the want of a good text-book on the subject. When taken up it has generally been pursued in a desultory manner, without any system whatever. In this book the subject is treated in a systematic and logical manner. There is a unity of plan running through the whole book. I am of opinion that it will do more for the intelligent comprehension of the principles of arithmetic than any book that has yet been published on this subject. The appearance and style of the book are inviting and highly creditable to the publishers."

N. M. CAMPBELL, Head Master Model School, County of Elgin.

"I examined the Mental Arithmetic issued by you, and prepared by Dr. McLellan. It is just what was wanted for our Canadian schools, and cannot fail to be a great help to the teacher."

J. S. ATKINSON, M.D., Head Master Model School, Prescott.

"I think it will fully meet a want that has long been felt among teachers. Each rule is taken up thoroughly and illustrated by many admirable examples bearing upon it. I think the introduction of this book into our schools cannot fail to be attended with the most satisfactory results."

C. CLARKSON, B.A., Head Master Model School, Brockville.

"I received the Mental Arithmetic; it is excellent for the variety of questions the neatness of their construction, and the careful gradation in their difficulty. I have used Greenleaf's for a long time, and it is decidedly superior in several important parts.

W. MACKINTOSH, Insp. Public Schools, Madoc.

"I have for some months been anxiously looking for its publication, and a some what careful examination has more than fulfilled all my expectations. We have been much in need of a Canadian Mental Arithmetic, and I feel satisfied that the one you have published will rapidly supersede the American works now in use."

JAMES DUNCAN, Principal Essex Model School, Windsor.

"I have carefully examined Mental Arithmetic by Dr. McLellan and pronounce it the best published on the subject. I feel confident that its merits will bring it into general use in this country. It is just what I would expect from the well known ability of its author."

J. MILLAR, B.A., Head Master High School, St. Thomas.

"McLellan's Mental Arithmetic is undoubtedly superior to any other work of the kind that has appeared in this country. It possesses all the advantages of other books of the kind that I have seen, and has, besides, features of a decidedly improved character."

F. L. MICHELL, M.A., Head Master High School, Perth.

MENTAL ARITHMETIC. Intelligent and painstaking teachers have heretofore been compelled to use inferior American works on this subject. We have now, thanks to Dr. McLellan, a work which I hope to see in the hands of every teacher in the land."

A. KENNEDY, Head Master Model School, Martintown.

"I consider it a very suitable book for the purpose intended. It supplies a want that has long been felt by the teachers of Ontario. I am certain that it will be of great use, especially to young and inexperienced teachers."