SELF-PROVING EXAMPLES IN THE FOUR FIRST RULES OF ARITHMETIC, SIMPLE & COMPOUND

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Self-proving examples in the four first rules of arithmetic, simple & compound by Alexander J. Ellis

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ALEXANDER J. ELLIS

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SELF-PROVING EXAMPLES

IN THE FOUR FIRST RULES OF

ARITHMETIC,

SIMPLE & COMPOUND,

ESPECIALLY ADAPTED

FOR SELF-PRACTICE AS WELL AS SCHOOL OR FAMILY USE:

ALLOWING THE TEACHER TO SET INNUMERABLE EXAMPLES SIMULTANEOUSLY, AND TO VERIFY THE RESULTS AT SIGHT, WITHOUT PERMITTING THE PUPILS TO FORESEE AND THEREFORE "FORCE THE ANSWER."

TO WHICH ARE ADDED, EXAMPLES IN

CONTRACTED DIVISION, SQUARE AND CUBE ROOT,

AS SELF-PRACTICE FOR ADVANCED COMPUTERS,

WITH AN EXPLANATION OF GUY'S AND HORNER'S RULES.

BY

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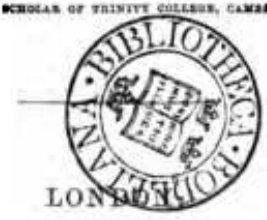

LONGMAN, BROWN, GREEN, AND LONGMANS,
PATERNOSTER ROW.
1855.

PREFACE.

COMPUTATION, or the transformation of sums, differences, products, and quotients, into ordinary numbers, is a series of operations which can only be performed correctly and rapidly—and they are rarely, if ever, performed correctly if they are not performed rapidly—without long and severe practice. The number of examples given in ordinary works on arithmetic is so small as to be nearly valueless, and the ordinary artificial modes of forming examples require such a previous knowledge of arithmetic, either to set or to verify, as make them totally unfitted for *self-practice*, and comparatively inapplicable to school or family use. Even Mr. Tate's ingenious mode of setting examples—which has been introduced below in an extended and corrected form (*see App.* 3 and 4)—can, as he left it, only be used by the master, and the time which would be wasted by a teacher who has himself to write or dictate every question to his pupils, renders all such methods inapplicable to school use, and quite unfit for self-practice, however well-adapted for private teaching.

Impressed with these views, the author has for some years endeavoured to devise simple methods of setting examples which should be applicable both to school or family use

and self-practice, the latter being at least as important as the former. After trying a great variety of different contrivances, he is induced to offer the following to the public as at once simple and complete. They turn upon the properties of arithmetical complements, complete or diminished by 1, and numbers divisible by 9 9, all of which can be rapidly formed. Although most of the properties are so easily verified that they have only to be stated in algebraical symbols to be understood, the author has thought it best to give the theory in an appendix for the use of teachers acquainted with elementary algebra. To prevent any confusion, the portions intended for self-practice and school or family use, have been kept entirely distinct. The examples for the use of teachers in schools are equally well adapted for teachers in private families. Governesses and parents have already successfully used some of the methods suggested, which are very simple in practice, and effect a great saving of time and labour to the teacher. Teachers and self-practisers must not suppose that because they may have some little difficulty in comprehending the rules laid down, there is any difficulty in their application. The verbal description of some of our simplest movements is often exceedingly complicated, and although the author has aimed at brevity and perspicuity, taking care in all cases to give a fully explained example, he cannot flatter himself with the hope that he has been always successful in so difficult an operation. The book is published with a hope that it will be found equally useful for the laborious adult or youth who wishes to qualify himself for business as a ready and certain computer, and for the teacher in schools and private families

who wishes to exercise pupils thoroughly in the acquisition of this indispensable art.

The *Preliminary Exercises* are an attempt to furnish examples for self-practice in Professor De Morgan's admirable rules given in the *Companion to the Almanack* for 1844. The person who has patience to work them all, and never leave one till he can perform it with perfect accuracy and the utmost rapidity, will in six months make himself a perfect computer. Of course it will not follow that he can work examples occurring in the business of life unless he knows the science of arithmetic as well as the art of computation. The writer therefore recommends a particular study of some such work as Professor De Morgan's *Arithmetic* to give him the requisite knowledge.

For the benefit of advanced computers, exercises in contracted division, and the extraction of square and cube roots, have been annexed. M. Guy's admirable rule for contracted division being little, if at all, known in this country, is given at length for its commonest case; and Horner's rule for the extraction of cube root being still but sparingly employed, notwithstanding its excellence and Professor De Morgan's efforts to make it known, is also fully explained. Although such explanations are, strictly speaking, beyond the scope of this little treatise, their general absence from books on arithmetic will excuse their insertion as an introduction to the examples. Cube roots, it may be urged, have very rarely to be extracted in actual practice. This is perfectly true. But it is also true that the ability to extract them readily can only be possessed by an accomplished

computer, and hence no one who wishes to become such will neglect to exercise himself diligently in working examples of the kind here proposed according to the methods recommended, not for the sake of the actual operations, but for the mass of subsidiary processes which they call into play. On the other hand, it has not been deemed necessary to add examples in Vulgar Fractions and Decimals, as they involve no new processes requiring especial exercise.

"Calculate like a machine, understand like its maker," should be the computer's motto.

A. J. E.

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