A NEW AND IMPROVED SYSTEM OF CALCULATION

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DANIEL DOWLING

A NEW AND IMPROVED SYSTEM OF CALCULATION

Trieste

NEW AND IMPROVED

SYSTEM OF CALCULATION,

IN WHICH

A UNIVERSAL RULE OF PROPORTION

IS, BY NEW ARRANGEMENT, APPLIED TO

QUESTIONS RELATING TO MILITARY AFFAIRS, MENSURATION, NATURAL PHILOSOPHY, AND MERCANTILE OPERATIONS.

BY DANIEL DOWLING,

Author of the "Key to Dr. Hutton's Mathematics" and an "Improved System of Arithmetic;" and Master of the Preparatory School for the Universities, Military Colleges, and the higher departments of Commerce, 9, Upper Mall, Hammersmith.

DEDICATED, BY PERMISSION, TO

HIS GRACE THE DUKE DE GUICHE.

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1829.

DEDICATION

TO

HIS GRACE THE DUKE DE GUICHE.

MY LORD DUKE,

In bringing the following work before the public under the sanction of your distinguished name, I am not influenced so much by your elevated rank, as the heir of hereditary honours, transmitted to you through a long line of illustrious warriors and statesmen, nor by the rare combination of public spirit, private virtues, and military glory, which render the Duke de Guiche conspicuous among the Peers of France, as by my lively recollection of the conciliating, amiable, and kind disposition, the dignified deportment, and the

ardent love of science, which distinguished the COUNT DE GRAMMONT from the rest of my Pupils.

In testimony of my high admiration of your transcendent talents, of my unfeigned esteem for your private worth, and of my gratitude for your many condescending favours, this work is respectfully inscribed to your Grace, by,

My Lord Duke,

Your Grace's most devoted

and humble Servant,

DANIEL DOWLING.

9, UPPER MALL, HAMMERSMITH;
JANUARY, 1829.

PREFACE.

THE following sheets, containing an extended application of a general Rule of Proportion, published by the Author as an Appendix to the last edition of his Improved System of Arithmetic, were composed exclusively for the use of his Pupils. It was not, originally, his intention to publish them; but, finding by experience that they formed a system of arithmetical calculations more comprehensive, concise, and practically useful, than any hitherto offered to the public; and being informed that a gentleman, who had received some information on the subject from the Author's Pupils, had been lecturing on this system, *as his own*;* he considered it a duty he owed to himself and the public, to publish them, with appropriate explanations and illustrations.

* A Mr. Perry sent one of his *Travellers* to the Author, at the Mansion House, Highgate, to solicit the introducing of the "*Perrian System*," into his Establishment. The Author replied that he should previously ascertain whether the "*Perrian System*" was better than his own; but, if he could not produce six pupils, all under twelve years of age, who were superior to Mr. Perry in calculation, he would adopt his system. Mr. Perry accepted the challenge, and, after the pupils had solved questions which he could not even comprehend, he acknowledged, in their presence, *that he knew nothing of the system; that he had never seen it before; that he had no system to offer equal to it; and that he had never before seen any thing that approached it in excellence.* After that avowal, in the presence of his pupils, the Author permitted them to explain to him the principles upon which his system was founded, and made him a present of his "Improved System of Arithmetic," and the Appendix, in which the principles had been developed. Mr. Perry has, since that period, lectured on this system, *as his own*. Should he deny these *facts*, the Author pledges himself to bring forward the young gentlemen in whose presence he had made the above declaration.

Arithmetic is unquestionably one of the most useful branches of the Mathematics, and, when treated as a science, yields to none of them in clearness, precision, and in conducting to accurate and interesting results. Elementary works on this subject being considered by Mathematicians, *in this country*, as unworthy of their attention, have been committed to the care of men, who, being imperfectly acquainted with the first principles of the science, have crowded them with gross absurdities, unintelligible rules, and useless examples, that never could have been tolerated had not this branch of education been neglected by men of science.

The manner in which this branch of the Mathematics is generally taught is no less defective. On the Continent, men of the greatest eminence are practical teachers of Arithmetic; but, in this country, it is assigned to the writing-master, whose province is to examine the solutions, (which he generally does by the assistance of a Key,) and to see them set in a ciphering-book; but it forms no part of his duty to analyze the questions, and explain to the Pupils the principles upon which the operations are founded. Hence, in private schools, youth are uselessly employed the greatest part of the time they are at school in the acquisition of Arithmetic; and, in public grammar schools, it is entirely disregarded.

The object of the author has been to treat the subject as a science; to reduce it to a few simple principles; to substitute one general rule of proportion, easily understood and remembered, for the numerous rules that have perplexed and obscured the subject: how far he has succeeded, he leaves to others to determine.

If this system offered no other advantage than the removal of the distinction between the *Rule of Three direct, the Rule of Three inverse, the Rule of Three direct in Vulgar Fractions, the Rule of Three inverse*

in Vulgar Fractions, the Rule of Three direct in Decimals, the Rule of Three inverse in Decimals, and the Rule of Five or Compound Proportion, that would not be inconsiderable. But it is presumed that the arranging of Interest, Commission, Brokerage, Profit and Loss, Barter, Fellowship, the calculations of the Public Funds, Annuities, and Exchanges, under the general form, as applications of the Rule of Proportion, will be deemed an additional advantage.

The Author has not confined the application of his system to mercantile operations, he has extended it to the mensuration of solids and superficies, to mechanics, and other branches of Natural Philosophy.

In Fractions no distinction has been made between Compound Fractions and Multiplication, nor between Complex Fractions and Division; and questions involving Multiplication and Division of Fractions have been solved by one operation. Decimal Fractions should be taught with the first four operations of arithmetic, as the numerators only are used, the denominators being understood.

Many of the theorems and examples have been deduced from Hutton, Gregory, and Dalby's Mathematics, Kelly's Cambist and Merchants' Books; but the author has solved the questions by his own rule. He is indebted to Capt. Henry Kater for Theorem page 82. In the calculation in Mechanics, friction and other considerations have been disregarded.

THE AUTHOR RECOMMENDS THE FOLLOWING RULES TO TEACHERS.

I. Read the Question aloud to the Pupils, and point out to them the terms of the supposition and those of the demand.

II. Separate the supposition into first cause and first effect, and the demand into second cause and second effect.

III. Draw two lines at right angles to each other; place the first cause and first effect at each side of the vertical line, and the second cause and second effect in the vertical opposite angles, that is, the second cause vertically opposite the first cause, and the second effect vertically opposite the first effect, and put x instead of the quantity required.

IV. Do not permit the pupils to cancel until they can analyze the question, and arrange the terms in proportion.

V. Cancel the terms on one side of the vertical line with those on the other, that is, the terms of the first cause and second effect with those of the second cause and first effect; and divide the product of the terms that remain on the same side as x into the product of those that remain on the other side, for the result or value of x.

VI. Vary the question as often as it has conditions, by substituting the value for x, and x for another term; and make the Pupils write on their slates the questions that such alterations would produce.

Thus, Example 3, *page* 7,

Substituting 96 for x, and x for any other term as in the supposition, 4 feet long, it will be resolved into the following question.

If an iron bar, 6 feet long, 4 inches broad, and 2 inches thick, weigh 96 lb., how long must the bar be that is 3 inches broad, $1\frac{1}{2}$ inches thick, to weigh 36 lb. A great advantage will arise from this mode of investigation: every question being varied as often as it contains conditions, the Pupils will form different questions requiring different results. Frequently the variation produces questions more difficult than the original.