THE ARITHMETICAL EXPOSITOR: OR, A TREATISE ON THE THEORY AND PRACTICE OF ARITHMETIC; IN TWO PARTS

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ENOCH LEWIS

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Trieste

THE

ARITHMETICAL EXPOSITOR;

OR,

A TREATISE

ON THE THEORY AND PRACTICE

OF

ARITHMETIC.

SUITED TO THE COMMERCE OF THE UNITED STATES.

IN TWO PARTS.

PART I.—CONTAINING ALL THE MOST USEFUL PRACTICAL RULES OF THE SCIENCE, ILLUSTRATED BY A SUFFICIENT COLLECTION OF EXAMPLES.

PART II.—CONTAINING THE LESS USEFUL PRACTICAL RULES, WITH THEIR EXEMPLIFICATIONS; A GENERAL VIEW OF THE THEORY; AND INDICATIONS OF THE MODES BY WHICH THE MORE DIFFICULT QUESTIONS IN THE WORK ARE SOLVED.

BY ENOCH LEWIS.

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THE

ARITHMETICAL

EXPOSITOR.

PART I.

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PREFACE.

The history of science, like the history of nations, is generally, in its early stages, involved in obscurity. It is the majestic river, not the streamlet that feeds it, that can be traced on the map of the world. Though we cannot now determine at what time, or by what people, the science of Arithmetic was first cultivated, it is obvious, that some knowledge of numbers must have been nearly coeval with the existence of man, and that some rude essays towards computation must have been blended with the early efforts of commercial adventure.

The foundations of science, as well as of art, were laid in our wants; and notwithstanding the advanced state in which the science of numbers is presented to us, we may still discover evident traces of its simple origin. The most natural mode of expressing small numbers, where language is wanting, is to exhibit a corresponding number of fingers; and as a number greater than *ten*, can be thus expressed, only by repeating the circuit, the number *ten* has been peculiarly marked in most languages, as well as in most systems of notation.

In most languages, numbers not exceeding ten, are designated by particular names; and the same terms, variously modified and combined, are, with a few exceptions, used to indicate all superior numbers. A process somewhat analagous, has been adopted in most systems of notation. The Hebrews, and after them the Greeks, appear to have used the first nine letters of their alphabet to denote the corresponding numbers; the second nine to indicate a number of *tens*; and to express hundreds, thousands, &c. other letters, differently marked, were used. In our present admirable

notation *ten* characters are capable of denoting all possible numbers.

Strabo, who lived during the reign of Augustus, informs us that the invention of Arithmetic was then ascribed to the Phœnicians. As these people were among the first who applied themselves to navigation, and rendered it subservient to commerce, it is probable that Arithmetic was *improved* by them; but the science appears to have been known at a much earlier period to the Chaldeans and Egyptians.

According to Josephus, the knowledge of Arithmetic was communicated to the Egyptians by the patriarch Abraham, who would appear to have borrowed it from his countrymen the Chaldeans.

In Greece, the time of Thales is an era in the history of science. That eminent philosopher travelled a long time in Egypt and India, enriching his mind with such scientific knowledge as those countries afforded, and returning to his native city, he established the celebrated Ionian school, which diffused a taste for science amongst the inhabitants of Greece. During his residence in Egypt, he measured the height of the Pyramids, by means of their shadows; which may be considered as the earliest instance on record, of the application of arithmetic to geometry.

Among the disciples of Thales was the celebrated Pythagoras, who, like his master, travelled into India and Egypt, and spent two-and-twenty years of persevering industry, in collecting the knowledge and wisdom of the east. Among the objects which claimed his attention, Arithmetic was one. The multiplication table is usually ascribed to him. To him we are likewise indebted for a knowledge of the property of right angled triangles, that the square of the longest side is equal to the sum of the squares of the other two.

How far the science of Arithmetic was advanced among the ancients, cannot be clearly ascertained; but from the mutilated remains of Grecian works on this subject, which have reached us, it appears that, be-

sides the fundamental rules of Arithmetic, they were acquainted with the methods of extracting the square and cube roots; and that they understood the theory of arithmetical and geometrical progressions.

Their modes of performing their calculations must, from the nature of their notation, have been exceedingly tedious and complicated: yet their knowledge of the combinations of numbers, and of the methods of reducing ratios to their simplest forms, appears to have been accurate and extensive.

The Alexandrian school was established by Lagus, one of the successors of Alexander; and it continued to flourish during upwards of ten centuries. This seminary produced a number of eminent mathematicians, one of whom was Euclid, the author of a well known treatise on geometry; the 7th, 8th and 9th books of which, form the oldest work on arithmetic extant.

About the second century of the Christian era, a new method of notation, called the sexagesimal, was introduced; of which Ptolemy the astronomer is supposed to have been the inventor. Every unit was divided into 60 parts, and each of these parts into 60 others, &c.—and the progression in whole numbers was also made sexagesimal. From one to fifty-nine, the numbers were expressed in the usual way; and sixty, called the *sexagesima prima*, was denoted thus I′ —twice sixty II′, and so on to fifty-nine times sixty— when the series was resumed as before, only sixty times sixty was expressed thus I″.—When a number less than sixty was joined to a sexagesimal, it was annexed in its proper character, thus I′V denoted sixty-five.

Fractions were expressed by placing the dash at the bottom, or on the left of the numerical letter, thus, I, or ′I, denoted $\frac{1}{60}$. Some traces of this notation are still visible in the divisions of the circle, and of time; in the former of which, the character, as well as the scale, is retained. Though the sexagesimal notation is commonly attributed to Ptolemy, there is reason to suppose it an eastern invention. The East Indians at