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Arithmetic Operations on Numbers

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ABSTRACT

This article describes in detail the general theoretical concepts of arithmetic and arithmetic operations on numbers.

KEYWORDS: arithmetic, theorem, mathematical properties, fractional numbers, natural numbers, etc.

Arithmetic operations on numbers have different properties. These properties can be described in words, for example: "The sum does not change by changing the position of the terms", can be written in letters: a + b = b + a, can be expressed in special terms. For example, this property of addition is called the commutative or commutative law. We often apply the laws of arithmetic out of habit, without realizing it. Often schoolchildren ask: "Why study these laws of transposition and combination, since it is so obvious how to add and multiply numbers?" In the 19th century, mathematics took an important step - it systematically represented not only numbers, but also vectors, functions, displacements, tables of numbers, matrices and many other things, even just letters, symbols, without worrying about their specific meaning. began to add and multiply. And here, most importantly, it became clear what laws these operations are subject to. The study of given operations on arbitrary objects (not necessarily on numbers) is already considered a branch of algebra, although this task is based on arithmetic and its laws. Arithmetic involves many rules for solving problems. In old books, you can find problems like "rule of three", "proportional division", "method of weights", "false rule", etc. Most of these rules are now obsolete, although problems have been solved with their help, they should not be considered obsolete. The famous problem about a pond filled with several pipes is at least two thousand years old, and it is still not easy for schoolchildren. But if earlier it was necessary to know a special rule for solving this problem, today it is already available for elementary school students to learn to solve such a problem by entering the letter x of the required value. Thus, arithmetical problems led to the need to solve equations, and this is again the function of algebra.

Among the important concepts introduced by arithmetic, ratios and percentages should be noted. Most concepts and methods of arithmetic are based on comparing various relationships between numbers. In the history of mathematics, the process of combining arithmetic and geometry took place over many centuries. The "geometrization" of arithmetic can be clearly observed: complex rules expressed by formulas become more precise when they succeed in their geometric representation. In mathematics itself and its application, the reverse process - the translation of visual, geometric data into the language of numbers - plays an important role (see Graphical calculations). This translation is based on the idea of the French philosopher and mathematician R. Descartes about defining points on a plane by coordinates. Of course, this idea was used even before that, for example, in maritime affairs, when it was necessary to determine the position of a ship, as well as in astronomy and geodesy. But the

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consistent use of coordinate language in mathematics comes from Descartes and his students. And in our time, when controlling complex processes (for example, the flight of a spaceship), it is preferred that all information processed by a computer be in the form of numbers. If necessary, the machine helps the person to translate the collected digital data into a written language.

A Brief History of Arithmetic. Since ancient times, working with numbers has been divided into two areas: one directly related to the properties of numbers, and the other related to computing techniques. In many countries, "arithmetic" usually refers to this last branch, which is the oldest branch of mathematics. Apparently, the greatest difficulty for ancient calculators came from dealing with fractions. This can be seen in the Ahmes Papyrus (also known as the Rhinda Papyrus), an ancient Egyptian work on mathematics from around 1650 BC. e. All fractions recorded in the papyrus, except for 2/3, have numerators equal to 1. The difficulty of working with fractions can also be felt in the study of ancient Babylonian cuneiform writing. Both the ancient Egyptians and Babylonians seem to have reckoned with some form of the abacus. The science of numbers was greatly developed by the ancient Greeks, beginning with Pythagoras, around 530 BC. e. As for the calculation technique itself, the Greeks did less in this area. The later Romans, on the other hand, made almost no contribution to the science of numbers, but, driven by the needs of rapidly developing production and trade, they improved the abacus as a counter. Very little is known about the origin of Indian arithmetic. Several later works on the theory and practice of operations with numbers have come down to us, written after the Indian positional system was improved by introducing zero into it. We don't know exactly when this happened, but it was then that our most common arithmetic algorithms were founded (see also: NUMBERS AND NUMBER SYSTEMS).

The Indian number system and the first arithmetic algorithms were taken from the Arabs. The oldest surviving Arabic arithmetic textbook was written by al-Khwarizmi around 825. It makes extensive use of Indian numerals and provides an explanation. This textbook was later translated into Latin and had a great influence in Western Europe. A distorted version of Al-Khwarizmi's name has reached us in the word "algorism", which later became the term "algorithm" by mixing with the Greek word arithmos. Indo-Arabic arithmetic became known in Western Europe mainly due to L. Fibonacci's work "The Book of the Abacus" (Liber abaci, 1202). The abacist method offered simplifications at least as similar to the use of our positional system for addition and multiplication. Abatsistov modified the algorithms that use the method of dividing and extracting zero and the Arabic square root. One of the first arithmetic textbooks, the author of which is unknown to us, was published in Treviso (Italy) in 1478, which was devoted to calculations in commercial transactions. This textbook was the forerunner of many arithmetic textbooks that appeared later. Until the beginning of the 17th century. More than three hundred such textbooks have been published in Europe. Arithmetic algorithms have improved significantly during this time. In the 16th and 17th centuries, symbols for arithmetic operations appeared, for example =, +, - Decimals were invented by S. Stevin in 1585, logarithms were invented by J. Napier in 1614, and the slide rule was invented by W. Outred in 1622. Accepted. Modern analog and digital computing devices were invented in the middle of the 20th century.

Arithmetic is the science of numbers. It is related to the meanings of numbers, their symbols and ways to work with them. No one "invented" arithmetic. It originates from human needs.

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At first, people worked only with the concept of quantity, but they still did not know how to count. For example, primitive man could say that he has gathered enough berries. The hunter knew at a glance that he had lost one of the spears. But time passed and man needed to determine the quantity, i.e. the numbers. Shepherds had to count the number of animals. Farmers had to calculate the time of seasonal work. Therefore, it is not known when both numbers and their names were invented so long ago. We call these numbers integers or natural numbers. Later, a person needed numbers less than one and numbers between whole numbers. This is how fractions were born.

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