

## **THE DEVELOPMENT OF MATHEMATICS IN THE PHILOSOPHICAL HERITAGE OF CENTRAL ASIA.**

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**Annotation:** Since ancient times, Central Asia has been one of the centers of science, culture, spirituality and enlightenment, which has raised thousands of world-famous great figures. Our great ancestors directly participated in the creation of a universal civilization and made a huge contribution to the development of spirituality and enlightenment alongside with mathematics, medicine in the region. The article discusses contributions of great scientists to the development of science in Central Asia.

**Key words:** mathematics, Kharazmi, abjad, Giyasiddin Koshin, zero

The opinions of our ancestors about the fields of science, especially mathematics, were reflected in their scientific works. In the Middle Ages, a madrasah was considered a higher religious educational institution, where the educational process was directed in a certain direction, but there was no specific curriculum. Education in madrasahs was not limited to a specific period, that is, the learner who did not complete a certain task continued to work again, and thus studies in madrasahs sometimes lasted very long.

Madrasa educated persons were considered valuable, they were respected in the society, therefore its successful completion was considered a very important achievement. In this regard, the Iranian scholar Syed Nafisi quotes the following poem in his book about Bahavaddin Muhammad Amuli:

«Эй дил, ки зи Мадраса ба дайр афтодй, Ва -  
андар сафи аҳди зухд гайр афтодй. Аламд, ки  
корро рарақамдй ба цой, Садр шукр, ки окибат ба  
хайр афтодй»,

Translated as: "O heart, from the madrasa I came into the world and then joined the ranks of the nobles. Praise be to you, you have done the job, honors to you, you have brought the end to the best."

Mudarris-teachers were widely educated people. They taught them based on their own knowledge and worldview. Madrasa students studied Arabic morphology and syntax (sarfu nakhv) as well as "mathematical science". This subject included arithmetic, algebra, calculus, geometry and trigonometry. Natural science, geography and astronomy were also taught.

Mathematics is studied in two parts:

First part: whole numbers and operations with them, simple complex numbers, finding the greatest common divisor, finding the least common multiple, finding sequences and their sum, operations with fractional numbers, etc.

Part Two: Ratios, Solving Linear and Quadratic Equations in One Unknown, Solving Equations in One Unknown with Highest Degrees.

Students have mastered six basic operations: addition, subtraction, multiplication, division, exponentiation, square and cube roots. And in the teaching of geometry, the focus was on solving the problems of land measurement. Concepts of straight line, plane, angle, area, volume, circle and circle, triangle, rectangle are given. The teaching of numeracy was completed by al-Kharazmi's Kitab-ul-Wasaya (Book of Wills), which also served as a guide for the distribution of inheritance. "Faroizkhan" rank was assigned to the students who learned the "Division of Inheritance" well. "Abjad" and chronogram (material history) were also studied in the madrasa. In the madrasa, mathematics lessons were conducted based on the books "Majmui ilmi hisab" (Everything about the science of calculation) by Bahovaddin Amul and "Daftari mashki fariz" (Mathematical exercise book) by Giyasiddin Koshin, which corresponded to the psychology of students and were closely related to the life of the people.

Computing science has attracted people's attention since ancient times. People wanted to know the distance between the sky and the earth, the planets and stars, how

many hours in a day. Ancient people learned to count with their fingers. The result is a decimal number (1, 2, 3, 4, 5, 6, 7, 8, 9, 0). Later, using zero (0), they learned to add, subtract, multiply, and divide. Thus, the science of computing found its further development

*Он набинй, ки якй дахй гардад, Чун зи оход расад бар ашарот*

(As you can see, one is a product of ten, after converting it to ten, you add a zero at the end)

During the development of mathematics, the appearance of numbers has changed several times. The numbers we are using now are Arabic. Central Asian scientists spread them throughout Europe. Al-Kharizmi gave the following definition of zero: "A group of numbers can be determined by a small circle similar to (0)".

The first sign of zero was introduced to science by al-Kharizmi. Positive and negative numbers were first used by Muhammad Abdulwafa (940-998). Ali Kushchi made a great contribution to the development of positive and negative numbers. He fully developed the theory of positive and negative numbers. He used the terms "positive" and "negative" for the first time. Thanks to the services of Koshin and Bahavuddin Amuli, numbers were divided into 3 (three) main categories: units, tens and hundreds. In Eastern medieval mathematics, zero and one-digit numbers were considered simple, and two-digit and multi-digit numbers were considered complex.

In calculation techniques, the medieval mathematicians of Central Asia followed the Indian models, and during addition and subtraction, the first adder or subtractor was placed in a row, and the second adder or subtractor was placed under it in a group. The movements are usually written on a board covered with sand or dust, from right to left, with a pointed stick. The result is grouped in the top row, with cross-row calculations turned off. The use of blackboards and erasing of intermediate results was widespread in India and later spread to the countries of Central and Near Central Asia. The widespread use of this technique was undoubtedly due to the lack of paper in the 13th century, and then to its high cost.

In the works of Eastern medieval scientists, two ways of solving equations are reflected: poetic and prose. They did not use formulas until the 18th century. In the Middle Ages, the well-known scholar of Central Asia, al-Kharazmi, in his monograph *Risolai jabru mukobala* (Treatise on Algebra), divided equations into six groups and showed different methods of solving them. He described the types of equations for the first time.

A root is anything that can be multiplied by one or more numbers or a smaller decimal number.

A square is the product of the root when multiplied by itself.

In these works of medieval Central Asian mathematicians, the rules for obtaining square and cube roots are given a large place. These rules were also known to Chinese and Indian mathematicians.

In the medieval mathematics of Central Asia, the rules of root extraction are found for the first time in Al-Kharazmi. However, he only described extracting the square root.

Most importantly, all explanations are directed towards one goal: to develop the mathematical thinking of every researcher of this discipline. Although in most cases modern mathematical science considers the contributions of Western mathematicians more important, the evidence shows that the contributions of our ancestors to mathematics as a science are equally important. We believe that particular mathematical discoveries spread from Central Asia to the West. In the Middle Ages, Arabic was considered a scientific language, so all Central Asian scientists wrote their works in this language, and as a result, all scientific discoveries of Central Asian scientists in the West were considered Arabic. Mathematical operations are studied according to the method typical of Western didactics. The geographical features and national color characteristic of the peoples of Central Asia are not taken into account. Therefore, today's classical mathematical researches carried out by oriental scientists are close to our people and should be used in the educational process of today's school, which helps to educate the

national pride of the young generation, arouse interest in their history, culture and their roots.

### **Conclusion**

Medieval encyclopedists-scientists left a significant mark on the history of world science and culture. Their works, written mainly in Arabic - the language of science and science of medieval Muslims in Central Asia, as well as in Persian - clearly show the picture of social, political and scientific life of this period. Studying the history of science of this period allows us to distinguish two important moments. First, the gap between the ancient traditions and science of this region did not exist at all. Secondly, the greatest natural scientists of the Middle East were born in Central Asia.