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# AL-KHOREZMI'S CONTRIBUTION TO MATHEMATICS AND MATHEMATICS IN MODERN UZBEKISTAN

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**Abstract:**

This article reflects the contribution of the great mathematician, astronomer and geographer Muhammad al-Khwarizmi to the science of mathematics and his services as the founder of the science of Algebra. The article also analyzes information on state programs for the development of mathematics in modern Uzbekistan and the ongoing reforms.

**Keywords:** Math. astronomy, geodesy, geometry, algebra, scientists, academia, scientific research.

The great mathematician, astronomer and geographer Muhammad al-Khwarizmi (783-850) lived and worked in the late eighth and first half of the ninth centuries. At that time, Central Asia was part of the Arab Caliphate. The socio-economic demands of the existing system were one of the key factors in the development process during this period. There was a need to develop such sciences as astronomy, geodesy, geometry for the further development of construction, trade, handicrafts, agriculture and other fields. The advanced scholars of that time had a clear idea of the practical significance of these sciences, and Muhammad al-Khwarizmi was the leader and guide of these scholars.

Khorezmi made a great contribution to world science. He became the founder of the science of algebra. The word "algebra" itself is taken from his treatise "Al-kitab al-mukhtasar fi hisab al-jabr and al-muqabala." His treatise on arithmetic is based on Indian numbers, and the decimal positional system we use today has led to the spread of operations in this system to Europe. The name of the scientist "al-Khwarizmi" in the form of "algorithm" has remained in science forever. His work on geography has given rise to dozens of geographical works in Arabic. Khorezmi's work "Zij" showed the development of astronomy in both Europe and the East. J. As Sarton puts it, "Al-Khwarizmi was the greatest mathematician of his time and, if all conditions are taken into account, one of the greatest of all times." Information about the life of such an image is almost non-existent.

Of the more than 20 works by Khorezmi, only 10 have survived. These are "A Brief Book on Al-Jabr and Al-Muqabala Calculus" - an algebraic work, "A Book on Indian Calculus" or "A Book on Addition and Subtraction" - an arithmetic work, and "Kitab Surat-ul-Arz" - a work on geography. "Zij", "Book on working with Asturlob", "Book on making Asturlob", "On determining azimuth with the help of Asturlob", "Kitab ar-ruhoma", "Kitab at-Tarikh", "Booklet on determining the Jewish calendar and holidays" . Four of these works are in Arabic, one is in Fergani's work, two are in Latin translation, and the other three have not yet been found.

It is unknown when Khorezmi's arithmetic treatise was written. But in it the scientist remembers his algebraic treatise. Hence, it is known that Khorezmi wrote an arithmetic treatise after an algebraic treatise. This pamphlet was translated into Latin in the 12th century in Spain. The only manuscript of the translation, copied in the fourteenth century, is kept in the library of the University of Cambridge. The treatise begins with the phrase "Dixit Algorithm," meaning "Al-Khwarizmi said." Khorezmi then goes on to say the advantages of the nine Indian numbers in the representation of numbers, and that with their help any number can be written concisely and easily. In the Latin manuscript of the work, Indian numbers are often not written, their place is left blank, or occasionally Indian numbers corresponding to the numbers 1, 2, 3, 4, 5 are written. Often, however, Indian numbers were replaced by Roman numbers, which were common in Europe at the time.

Khorezmi describes in detail the writing of numbers in the decimal position system on the basis of Indian numbers. He emphasizes the convenience of such spelling of numbers, especially the use of zeros. Then Khorezmi goes on to describe arithmetic operations. At the same time, Khorezmi teaches to take into account the careers of numbers, that is, the discharges, and not to forget to write zero, otherwise the result will be wrong.

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Today, Uzbekistan pays great attention to mathematics, which has a deep historical basis and is one of the most important disciplines for modern development. It is safe to say that this science, which laid the foundation stone of our great ancestors, such as Muhammad Khorezmi, Ahmad Fergani, Abu Rayhon Beruni, Mirzo Ulugbek, has entered a new stage of development in recent years.

Our main goal is to develop mathematics in Uzbekistan and keep it at the level of world standards. We have enough scientific potential to make a worthy contribution to the scientific innovations taking place in the world of mathematics. In particular, the large number of young mathematicians in our ranks and their growing number help us to achieve these goals.

In today's rapidly changing world, it is necessary to build the future on a mathematical basis. Because today there are problems that are more dangerous than the atomic bomb. These include, for example, cyber threats, information security, optimization, and the risk of virus spread (including today's coronavirus pandemic).

This is to solve the problems of modern information technology, programming, mathematical modeling and chemical biology, the development of such areas is very important. And the basis of these fields is, of course, mathematics!

The application of mathematical science in biology, physics, chemistry, computer technology, cryptography, music, engineering, medicine, literature, economics and social fields is very wide. For example, today there is a growing interest in becoming a computer programmer. The basis of programming is mathematics. The program is a mathematical algorithm! Therefore, it is impossible to become a mature specialist in the field of programming without a thorough knowledge of mathematics.

Some theories of mathematics have brought unprecedented benefits to mankind. Here are some popular examples. GPS based on Lobachevsky geometry the navigator system accurately ensures optimal movement of traffic. The Google search engine, based on Markov chains, not only creates great opportunities for humanity, but also generates $ 37,000 per minute for das tour creators. Cryptography, based on the laws of mathematics, is used to encode information and keep it secret from strangers.

Laser treatment is developing in medicine. For example, a medical device that grinds a kidney stone with a laser is based on the geometric properties of an ellipse.

Today, like many sciences, mathematics is developing on the basis of global cooperation.

On February 17, 2017, the President of the Republic of Uzbekistan signed a decree "On the activities of the Academy of Sciences, scientific Research measures to improve the organization, management and financing - "On the resolution of the National Academy of Sciences of the Institute of Mathematics at the University of the structure.

At the same time, the President dated July 9, 2019, "state support for the development of mathematics and science education - the Academy of Sciences of the Republic of Uzbekistan, as well as support measures to improve the activities of the Institute of Mathematics named after V.I.Romanovskiy - " and dated May 7, 2020, "On the field of mathematics education Measures measures "were adopted. Through these decisions, a system of overcoming existing problems was created to develop mathematics science and education and bring it into line with international standards. For example, at international conferences on mathematics, international student competitions, seminars opportunities to participate in trainings. At the initiative of the President, a fund to support the development of mathematics and education was established. International scholarships for scientists and young researchers in the field of mathematics at the expense of the Foundation participation in practical activities is provided. Participation of students in international mathematics Olympiad - support for education, mathematics and scientific computing equipment procurement programs are underway.

The above-mentioned documents have created a number of opportunities for our scientists. In particular, in 2020, the Institute of Mathematics was granted independence in awarding academic degrees. In the Republic of Karakalpakstan, Bukhara, Namangan, Samarkand, Khorezm regions, regional branches of the institute were established. Currently, these units, 22 doctors, 22 candidates of science and physics - Mathematical Sciences, Doctor of Philosophy (PhD) in the country. The departments are located in the university buildings in the provinces, which is very convenient for working with young people and students and getting them interested in mathematics.

New, modern, innovative buildings were built for the Institute of Mathematics. It should be noted that the Institute of Mathematics has made a significant contribution to the development of this science, the training of highly qualified personnel for our country and has become one of the world-renowned centers of mathematical research.

May 7, 2020, the President of "Mathematics of measures to improve the quality of education and scientific research in the field of development - T

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adbirlari" On a solid foundation for the development of mathematics in our country gained an important document, I can say that. Based on this decision, schools specializing in mathematics will be established in each district. We have created a set of continuing education programs in mathematics in collaboration with relevant ministries and agencies. Now we need to change the approach and methodology in the textbooks. There is also an opportunity to solve this problem.

It should be noted that the fact that at the initiative of the President there are schools specializing in mathematics in our country, most of which are organized in the regions, is a practical manifestation of the country's interest in science and training of mature professionals who can meet modern requirements. The fact that these schools are equipped in accordance with modern requirements increases our confidence that in the near future our country will achieve great success in this area.

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