



OPEN ACCESS

SUBMITTED 08 January 2025

ACCEPTED 20 February 2025

PUBLISHED 11 March 2025

VOLUME Vol.05 Issue03 2025

COPYRIGHT

© 2025 Original content from this work may be used under the terms of the creative commons attributes 4.0 License.

Uzbekistan mathematicians and their discoveries

Jorayeva Mohinur Yunus kizi

1st year student of Mathematics Education, Termez State Pedagogical, Institute, Termez, Uzbekistan

Turayev Ruziboy Norovich

PhD, Senior Lecturer, Department of Mathematics and Informatics, Termez State Pedagogical Institute, Uzbekistan

Abstract: Mathematics is one of the most important foundations of human development and one of the sciences that has played an important role in the development of civilization. The importance of mathematics in the development of all sciences and technologies is incomparable. Initially, this science began with simple calculations, and later branched out into such branches as complex algebra, geometry, analysis, and number theory. Uzbekistan is one of the countries that has produced great mathematicians in the history of science. Scientists such as Muhammad ibn Musa al-Khwarizmi, Abu Rayhan Beruni, Mirza Ulugbek, Qazizoda Rumi, and Jamshid al-Koshi made a great contribution to science not only in the East, but also in the whole world with their discoveries. In this article, we will talk about the lives, scientific works, scientific achievements of great mathematicians, how their discoveries are used today, and their significance today.

The purpose of this article is to highlight the contribution of Uzbek mathematicians to science, analyze their important discoveries and developments, and show their place in the development of mathematics. Through the article, readers will gain information about the scientific heritage of Uzbek mathematicians and their significance today.

Keywords: Uzbek mathematicians, Muhammad al-Khwarizmi, Ulugbek, Qazizoda Rumi, algebra, algorithm, trigonometry, scientific heritage, mathematical analysis, number theory, Central Asian scientists, modern mathematics.

Introduction: Qazizoda Rumi (1364–1436) was a famous Uzbek mathematician and astronomer who made a

significant contribution to the scientific and cultural development of Transoxiana. His scientific activities were mainly associated with Samarkand, and he was one of the main scientific collaborators of Mirzo Ulugbek.

Life: Qazizada Rumi, whose full name was Sadriddin Musa ibn Mahmud Rumi, was born in 1364 in what is now Turkey. The nickname "Rumi" refers to his origin from the Anatolian (Rumiya) region. He later moved to Transoxiana and pursued his scholarly activities in that region.

Scientific activity: He had a deep knowledge in the fields of mathematics, astronomy and philosophy, and made important discoveries in trigonometry and astronomy in particular. Qazizoda Rumi Mirzo was one of the main scientific leaders at the Ulugbek Observatory. Among his students was the famous mathematician and astronomer Ali Kushchi

Works: Sharh al-Mulakhas: "Sharh al-Mulakhas" is an important scientific work on astronomy and mathematics written by Qazizada Rumi, as a commentary on the book "Al-Mulakhas fi al-Hay'a" (Summary of Astronomy) written by Nasir al-Din Tusi (13th century). This work is of great importance in the scientific heritage of the Middle East and served as one of the main guides for later astronomers and mathematicians.

Content and significance of the work:

1. AstronomyThe work

"Sharh al-Mulakhas" includes astronomical knowledge of that time, and it covers the following topics in detail:

- The movement of celestial bodies - A detailed explanation of the stars, planets and the laws of their movement is given.
- The shape and movement of the Earth - Based on the geocentric model adopted at that time, there are scientific analyses of the position of the Earth and the structure of the universe.
- Solar and lunar eclipses - The mechanism of occurrence of these phenomena and methods for calculating them are described.

2. Trigonometry and mathematical aspects

The work also provides insights into trigonometric methods necessary for accurate astronomical calculations. In particular, the astronomical application of the sine, cosine and tangent functions, calculation methods used in Eastern mathematics, Geometric models and their role in explaining the motion of celestial bodies

Scientific significance of the work:

1. Influence on Eastern and European astronomy -

Through this work, Qazizoda Rumi further improved the work of Nasir al-Din Tusi and later had a great influence on the activities of the Mirzo Ulugbek Observatory.

2. Accurate development of astronomical tables - This commentary was an important source in the composition of "Zizhi Kuragoniy" by Ulugbek and his team.

3. Being a source for the next generation of scientists - Ali Kushchi and other famous astronomers used this work of Qazizoda Rumi.

Sharh Ashkal at-Ta'sis: "Sharh Ashkal at-Ta'sis" is an important mathematical work written by Qazizada Rumi, which is a commentary on the book "Ashkal at-Ta'sis" written by the famous scholar Mahmud Zamakhshari (1075–1144). This work, by explaining concepts in the fields of algebra, geometry, and mathematical logic, had a great influence on the development of medieval Islamic mathematics.

Content and significance of the work:

1. Origin of the workIn his work "Ashkal at-Ta'sis", Mahmud Zamakhshari outlined the basic principles of algebra and geometry. This work is one of the important parts of Islamic mathematics of the 9th–12th centuries, in which: mathematical formulas, algebraic and geometric problems, and solutions based on logical arguments are presented.

However, since this work is short and concise in some places, Qazizadeh Rumi wrote a commentary on it to make it more understandable and comprehensive.

2. Content of the work

Qazizoda Rumi's "Sharh Ashkal at-Ta'sis" is based on mathematical thought and theoretical principles, and pays close attention to the issues of algebra, geometry, and mathematical logic. This work made a great contribution to the development of the Eastern school of mathematics and served as a theoretical basis for the scientific works of scientists such as Ali Qushchi and Mirzo Ulugbek in later periods. The main content of the work is discussed in more detail below.

1) Algebra and equations

Algebra is one of the main branches of mathematics, and Qazizoda Rumi considered various algebraic problems in this field and provided a theoretical basis for their solutions.

a) Algebraic equations and their solution methods

Equations with one and two unknowns – Determining the unknowns was important in medieval mathematics. Qazizoda Rumi described methods for solving these equations using various algebraic and geometric methods.

Quadratic and higher-order equations – He revised Al-

Khwarizmi's method for quadratic equations and presented new proofs based on it.

b) Properties of numbers and mathematical proofs

Prime numbers and their properties – Eastern mathematicians paid special attention to the study of prime numbers, as they play an important role in algebraic structures.

Number theory – Qazizoda Rumi studied issues such as the division of numbers, their even and odd types, and the properties of complex numbers.

c) Mathematical ratios and proportions

Proportions – Qazizoda Rumi explained mathematical ratios and their importance in physical and astronomical calculations.

Useful Relative Relationships – For example, the golden ratio and other special proportions have been used in art and architecture since ancient times.

2) Geometry and Shapes

Geometry is one of the most developed areas of Eastern mathematics, and Qazizoda Rumi presented his deep knowledge in this field as a commentary.

a) In-depth analysis of triangles, rectangles, and circles
Euclidean Geometry – The principles of Euclidean geometry are widely used to explain the basic properties of triangles and other shapes.

Parallelograms and their properties – Qazizoda Rumi compared and analyzed the properties of shapes such as squares, rhombuses, and rectangles.

Circles and their lengths – Determination of the number Pi (π) and calculations on the length of a circle.

b) Pythagorean Theorem and its Proofs

Proof of the Pythagorean Theorem by Islamic Mathematicians – Qazizoda Rumi gave several proofs of this theorem and explained how it is used in various mathematical contexts.

Pythagorean Triples – with sets of numbers such as (3,4,5), (5,12,13) operation and their properties.

c) Trigonometric calculations of Eastern mathematicians

Sine, cosine and tangent - Qazizoda Rumi gave explanations about these trigonometric functions and expressed his opinion on their application in astronomy and geography.

Spherical geometry - Special geometric rules used in the study of the motion of terrestrial and celestial bodies.

3) Mathematical logic and proofs

The concept of mathematical logic was of great importance in Qazizoda Rumi's work. He tried to

improve the methods of proving mathematical theories.

a) Mathematical axioms and postulates

Euclidean axioms - Qazizoda Rumi revised the five basic postulates of Euclid and analyzed their reliability.

Alternative axioms - He expressed his opinion on alternative geometric axioms put forward by some schools of mathematics.

b) Logical proofs and their structure

Various methods of proofs – Ways to prove mathematical theorems using induction, deduction and contrapositive hypothesis methods.

The rigor of mathematical proofs – Necessary conditions for proofs to be correct and clear.

c) Methodological approaches to solving mathematical problems

Geometric constructions – Problems solved using a circle and a ruler.

Solving geometry problems with algebraic methods – Methods for solving problems based on the relationship between algebra and geometry.

3. Scientific significance of the work:

1. Impact on the development of mathematics – "Sharh Ashkal at-Ta'sis" contributed to the in-depth study of algebra and geometry in the Middle Ages.

2. Impact on subsequent mathematicians – This work was later studied by scientists from the Mirzo Ulugbek Observatory, including Ali Kushchi, and served as the basis for his work.

3. The connection between mathematics and astronomy – Geometry and algebra were widely used in astronomical calculations, so this work was also important in the field of astronomy.

Collaboration with Ulugbek: Qazizoda Rumi Mirzo was one of Ulugbek's scientific advisors and actively participated in compiling the astronomical tables "Ziji Kuragoniy". This table was one of the most accurate astronomical calculations of that time, and was later used by many European scientists.

Scientific legacy:

Qazizoda Rumi's work had a great influence on scientific development in the Middle East and Central Asia. His astronomical tables and trigonometric calculations later played an important role in the development of science.

Conclusion: Qazizoda Rumi did important work on mathematical theories.

These great scientists left us an invaluable scientific heritage. Their scientific works also serve as the basis for today's technologies and modern mathematical models.

"Sharh al-Mulaxhas" is one of the important scientific

works that shows the rise of medieval Eastern science to a high level. It made a great contribution to the development of astronomy and mathematics at that time, and was later studied in Europe.

The work "Sharh Ashkal at-Ta'sis" written by Qazizoda Rumi was created to make the basic concepts of mathematics easier to understand and develop. It clearly expressed the theoretical aspects of algebra and geometry, serving as an important guide for the next generation of scientists.

Mathematics is an eternal science, and Uzbek scientists left an indelible mark on its development.

REFERENCES

Berdikulov O. Great scholars in the history of science of Uzbekistan - Tashkent: Science, 2000.

Karimov R. Eastern scholars and their scientific heritage - Samarkand: Ma'naviyat, 2012.

Nasr S.H. Science and Civilization in Islam – Harvard University Press, 1968.

Al-Khwarizmiy M. Algebra and its methods – Tashkent: Fan, 1985.

Qori-Niyoziy M. Mirzo Ulug'bek and his scientific school – Tashkent: Uzbekistan, 1963.

Scientific heritage in Uzbekistan: Qazizoda Rumi and his works // Uzbekistan National Encyclopedia, 2005.

Rosen, E. Three Scientific Treatises by Qāḏīzāda al-Rūmī // Journal of Near Eastern Studies, 1956.

Sayili, A. The Observatory in Islam and Its Place in the General History of the Observatory – Ankara: Turk Tarih Kurumu Basimevi, 1960.

Samkharov A. History and development of mathematics – Tashkent: University Press, 1998.

Sarton G. Introduction to the History of Science – Baltimore: Williams & Wilkins, 1927.