

## **Report of department of “Algebra and mathematical logic” for 2021**

During the reporting period, 8 performers carried out 5 works on the following topics: 1. "Application of methods of algebra and mathematical logic" 2. Research of mathematical and logical works of Nasireddin Tusi. In 2021, 11 articles (2 in SCOPUS) and 1 thesis were published. In addition, 3 articles are in print.

### **1 Candidate of Physical and Mathematical Sciences, Doctor of Pedagogical Sciences:**

1. Aslanov Ramiz M.- Leading Researcher, (1 state).

### **3 doctors of philosophy in Mathematics:**

2. Babaev Ali E. - Head of Department, Leading Researcher , (1state)
3. Mammadov Eminaga M. – Leading Researcher, (1 state).
4. Shekhzamanova Leyla A. – Senior Researcher, (1 state).

### **3 researchers:**

5. Majlumbayova Valeriya F. – Senior Researcher, (1 state).
6. Babaeva Rena G. - Researcher (1 state).
7. Aliyev Ali S. - Researcher, (1 state).

### **1 dissertation:**

8. Mammadova Vafa M. - Junior Researcher, (1 state).

### **1 computer engineer:**

9. Karimova Matanat K. - Software programmer.

### **2 laboratory assistants:**

10. Gadjiyeva Aygun A. - senior laboratory assistant.
11. Shahbazova Sevinj T. - senior laboratory assistant.

### **Separate work**

#### **Theme 1. Application of the methods of algebra and mathematical logic.**

**Work 1. Compact weighted endomorphs of some regular functional algebras and structures of maximal ideals.**

*Ex: ph.d.m.s. l.r. Eminaga Mammadov, j.r. V.M.Mammadova.*

Until last year, our late colleague A. Shakhbazov and under his leadership V.Mammadova, a candidate for a degree, were engaged in this topic. The study of

many problems associated with the study of Banach algebras includes algebraic functions of algebraic functions defined on compact or local compact sets, algebraic-spectral properties and characteristics of subalgebras (regular algebras) - maximal ideals, functional capabilities, endomorphisms defined on them, etc. ... - makes the research relevant.

During the reporting period, in order to obtain the necessary information for research in this area, together with V. Mamedova, the corresponding chapters of the books Yu. Rudin "Functional Analysis", A. Helemsky "Banach Algebras", N. Burbaki "Spectral Theory", Gamelin "Uniform Algebras", L. Gillman "Rings of Continuous Functions" are studied and this work is still continuing.

In the near future, the research results will be presented in the form of a scientific article.

## **Work 2. Kripke-type models for non-negative logic.**

*Ex: head of dep. ph.d.m.s. docent Ali Babayev, s.r. Valeriya Majlumbayova.*

A formal deductive system of intuitionistic predicate calculus with the operator "meaningfulness" has been built. In this system, only "meaningful" predicates are provable.

## **Theme 2. Research of works of Nasireddin Tusi on mathematics and logic sciences.**

Tusi's treatises were studied on the second topic; «Asas -ul-iktibas». «Tajrid-al-mantig», «Sharh-al-isharat». «Comments on the book of Archimedes». On the ball and the cylinder ".

**Work 1.** Tusi's treatises were studied on the second topic: "Asas ul iktibas", "Tajrud al mantig" "Sharh al isharat", "Comments on the book of Archimedes" Ball and cylinder ".

*Ex: head of dep. ph.d.m.s. docent. Ali Babayev, s.r. Valeriya majlumbeyova.*

During the reporting period, syllogisms with mixed premises were studied in N. Tusi's treatise "Asas ul iktibas" ("Basics of acquiring knowledge"). In the indicated syllogisms of the premise, there can be categorical statements, as well as modal statements. The second section of the third chapter "Asas ul iktibas" N. Tusi is devoted to modal proposals. In this chapter, in addition to the modalities "necessary" and "possible", temporary modalities ("always") and ("sometime" - "" sometimes ") are considered. The fourth chapter of the work is devoted to the syllogisms, that Aristotle considered in the Second Analytics. However, Aristotle did not consider temporal modal proposals.

The famous researcher in the history of logic Nicola Risser noted the great role of Eastern scholars in the development of modalities. The first scholar of the East to draw attention to temporal (temporal) modalities was Abu Ali ibn Sina. N.

Tusi in the treatise "Asas ul Iktibas" significantly developed this theory and devoted most of his work to it.

**Work 2. Comparative research of bases of modal logics by Aristotle's, N.Tusi's and Ibn Sina's logical treaties**

*Ex: ph.d.m.s. l.r. Eminaga Mammadov , r. Rana Babayeva.*

In classical logic, only questions of alethic (necessary, accidental, etc.) and temporal (temporal) modality are usually considered.

During the reporting period, temporal modalities characterized by time were studied in the works of N. Tusi "Təcrid əl-məntiq" and Ibn Sina "İşarat və-tənbihat". The classification of modal proposals - general absolute, impermanent existence, special absolute, descriptive, general traditional, general conditional, temporary, published, temporary general absolute - was studied, issues related to time and their influence on four logical figures.

**Work 3. About the relation of regular polygons inscribed and described about the same circle in Tusi's comments to Archimedes' treatise "Ball and Cylinder".**

*Ex: r. Ali Aliyev, ph.d.m.s. s.r. Leyla Sheykhzamanova.*

During the reporting period, translation and research continued on Tusi's commentary on Archimedes' Two Books on the Ball and Cylinder (Heidarabad edition).

It is noted that Tusi's comments on the proof of Archimedes' theorems on calculating the lateral surfaces of a cone and a cylinder are accompanied by very clear explanations and corresponding figures. Here Tusi makes a very important point. He says: in the process of proving the conditions of the theorem itself may not be used. The theorems in this section are infinitesimal theorems. These theorems are versions of the corresponding integral theorems. At the present time, the translation and research of the sections concerning the theorems of the treatise continues.

**Head of Department:**

*ph.d.m.s. docent Ali Babayev*