International Journal on Integrated Education
https://journals.researchparks.org/index.php/IJIE
e-ISSN : 2620 - 3502
p-ISSN : 2615 - 3785

In teaching the subject of complex numbers and operations on them use of historical data

Ummatova Makhbubakhan Akhmedovna
Senior teacher of the mathematics department of Kokand SPI

Tokhtabayeva Manzurakhan Mukhtarjonovna
Kokand SPI, listener

Abstract

This article analyzes the knowledge, rule, evidence, law, theorem, definition, hypothesis necessary for the use of historical data in teaching the topic of complex numbers and operations on them. Examples of turns in the stages of development of mathematics are given. In the process of teaching, regular teaching of historical knowledge to students enables them to think independently, freely, to research, to approach each issue creatively, to feel responsibility, to carry out scientific research, to analyze, to make effective use of scientific literature. based on increasing their interests .

Key words: number systems, natural, whole, real and complex number systems and their introduction

In our republic education system reform do , state and non-state education institutions and education and personnel preparation in the field competition environment formation basically education system consistent development , education and personnel preparation system in society done being increased update , advanced democratic legal state to build processes adaptation , personnel preparation system and content of the country social and economic progress perspectives , society needs , science , culture , technology and of technology modern achievements come came out without improvement according to certain affairs done increased At the same time, tasks such as creative-intellectual and spiritual-ethical education of students, development of their creative abilities, development of effective forms and methods of this and creation of a normative, material-technical and informational base ensuring their implementation were defined. .

Today, attention is paid to educating young people as worthy heirs of prospects, creative people, and the future of our country is related to the development of the potential and talent of creatively thinking young people, the search for modified educational content, new technologies and innovations.

In particular, in the decision of the President of the Republic of Uzbekistan dated 05.07.2020 No. PQ-4708 "On measures to increase the quality of education in the field of mathematics and to develop scientific research", a number of issues that have not been resolved in the field of the quality of education in the field of mathematics and the need to implement measures aimed at increasing the efficiency of scientific research is indicated.

In order to further improve the system of teaching mathematics at all stages of education, to support the effective work of pedagogues, to expand the scope and increase the practical importance of scientific and research work, a number of priority directions have been defined.

e-ISSN : 26203502
p-ISSN : 26153785

In the teaching of mathematics , it is important to learn about numbers , their place in the development of science and technology, and in human life in general . Therefore, it is very necessary to study the construction of numbers and their properties on a theoretical basis.

It can be said that numerical systems are the basis of general secondary education mathematics. Because some operations on intuitively formed natural numbers, their comparison is studied in elementary school, and then the system of natural numbers is expanded with negative numbers.

First, natural, whole and rational numbers, operations between them, properties of these operations are studied. Then, the concepts of the approximate value of the number and the square root, which are the basis for introducing the concept of irrational number, are studied. In the upper class, complex numbers are partially studied.

Studying complex numbers, conducting research on specific aspects of teaching complex numbers in the educational system is one of the urgent issues. Familiarity with its history will increase interest in the student.

Ancient Greek mathematicians considered only natural numbers to be "real," but Ancient Egypt and Ancient Babylon began using fractions in practical calculations two thousand years before the new era. The next important stage in the development of the concept of number was negative numbers. They were introduced by Chinese mathematicians two centuries before the new era.

In the 3rd century AD, the ancient Greek mathematician Diophantus used negative numbers. He also knew the rules of actions on these numbers. Hing scholars studied negative numbers in detail in the 8th century BC, they interpreted these numbers as "debt". By using negative numbers, it was possible to describe the change of quantities in a unique way. Already in the 8th century AD, the square root of a positive number has two values - positive and negative, and it is impossible to extract a square root from negative numbers, for example. found that it is impossible to find a number *x such that* x^2=-9 .

In the 16th century, in connection with the study of cubic equations, there was a need to extract square roots from negative numbers. Cube and square roots are involved in the formula for solving a cubic equation. This formula works fine when the equation has one real root (for example, for the equation $x^3 +3x – 4=0$ *), but when the equation has three real roots (for example,* $x^3 -7x + 4=0$) a negative number will be formed under the square root. As a result, the way to find these three roots of the equation passed through the forbidden operation - the operation of extracting the square root from a negative number. To explain the resulting paradox, the Italian algebraist J. Cardano in 1545 proposed introducing new natural numbers. He showed that the system of equations $x = 5 \pm \sqrt{-15}$ *x+y=10, xy=40* , $y = 5 \pm \sqrt{-15}$ which does not have a solution in the set of real numbers , has solutions of the form, only $\sqrt{-a} \cdot \sqrt{-a} = -a$ by agreeing to work with such expressions by the rules of ordinary algebra) is needed. Cardano called such quantities "pure negative" and even "irrationally negative", considered them useless and tried not to apply them.

However, as early as 1572, Italian algebraist R. Bombelli published a book containing the basic rules of arithmetic operations on such numbers. The book also contained a rule for extracting cube roots from such numbers. The name "abstract numbers" was introduced by the French mathematician and philosopher R. Descartes in 1637, and in 1777 by the XVIII century. L. Euler, one of the great mathematicians, suggested using the first letter of the French word " *imagineire" ("abstract") to designate the number -1 ("abstract" unit);* this symbol became widespread thanks to K. Gauss (1831). During the 17th century, the discussion of the arithmetical nature of abstraction and the possibility of giving them a geometric interpretation continued.

e-ISSN : 26203502
p-ISSN : 26153785

The technique of performing operations on complex numbers gradually developed. At the border of the XVII and XVIII centuries, first, the general theory of roots of *the nth* degree from negative numbers, and then the theory of roots of $(Cos\varphi + iSin\varphi)^n = Cosn\varphi + iSinn\varphi$ *the nth degree* from arbitrary complex numbers was created based on the formula of the English mathematician A. Muavr (1707). Using this formula, it is possible to create equations for cosines and sines of multiple arcs. At the end of the 18th century, the French mathematician J. Lagrange said that abstract quantities no longer make mathematical analysis difficult.

Mathematicians have learned to express solutions of differential equations with constant coefficients using complex numbers. Such equations are found, for example, in the theory of vibrations of a material point in a resistive medium. Earlier, the Swiss mathematician Ya. Bernoulli applied complex numbers to the calculation of integrals.

Although many problems, including cartography and hydrodynamics, were solved with the help of complex numbers during the 18th century, the theory of these numbers was still not strictly logically based. That is why the French mathematician P. Laplace believed that the results obtained with the help of abstract numbers are only a guide, and only after they are directly confirmed by rigorous proofs, they take on the character of real truth.

The geometric interpretation of complex numbers allows to define many concepts related to functions of complex variable, expands their field of application.

It became clear that complex numbers can be used in many problems dealing with magnitudes described by vectors in the plane: in the study of fluid flow, in the problems of the theory of elasticity.

In the development of the theory of functions of a complex variable , NI Muskhelishvili dealt with their application to the theory of elasticity, MV Keldish, MA Lavrentyev to aero- and hydrodynamics, NN Bogolyubov and VS Vladimirov to the problems of the quantum field theory. Uzbek mathematician IS Arjanikh applied complex numbers to field theory.

Regularly teaching pupils and students historical information on the subject in the course of teaching enables them to think independently, freely, to research, to approach each issue creatively, to feel responsibility, to carry out scientific research, to analyze, from scientific literature. to productive use, and most importantly, to increase their interest in study, science, pedagogue and their chosen profession.

BOOKS

1. Ummatova, Mahbuba Akhmedovna, and Olimakhon Okhunjonovna Rahmonova. "ANTISYMMETRICAL MULTIFLICTS IN ELEMENTARY MATHEMATICS." INTERNATIONAL CONFERENCE DEDICATED TO THE ROLE AND IMPORTANCE OF INNOVATIVE EDUCATION IN THE 21ST CENTURY. Vol. 1. No. 10. 2022.

2. Akhmedovna, Ummatova Mahbuba, and Ilhomjonova Shahnozakhan Ilhomjonovna. "ON THE RELATIONSHIP OF BIOLOGICAL AND MATHEMATICAL SCIENCES IN EDUCATION." ONLINE SCIENTIFIC JOURNAL OF SUSTAINABILITY AND LEADERSHIP RESEARCH 2.12 (2022): 816-817.

3. Ummatova, Mahbuba Akhmedovna, and Abdurahim Tursunboyevich Mamatkulov. "ON THE PRACTICAL SIGNIFICANCE OF AL-KHORAZMI'S WORKS." INTERNATIONAL CONFERENCE DEDICATED TO THE ROLE AND IMPORTANCE OF INNOVATIVE EDUCATION IN THE 21ST CENTURY. Vol. 1. No. 10. 2022.

4. Ahmedovna, Ummatova Mahbuba, and Esonov Munavvarjon Mukimjonovich. "METHODOLOGY OF PERFORMING PRACTICAL INDEPENDENT WORK." Open Access Repository 8.12 (2022): 171-176.

e-ISSN : 26203502
p-ISSN : 26153785

5. Nosirovich, Nosirov Sobirzhon, and Ummatova Makhbuba Ahmedovna. "AUTOMORPHISM OF NUMERICAL SYSTEMS." Open Access Repository 8.12 (2022): 197-201.
6. Ummatova, MA "DIDACTICAL AND PRACTICAL FUNCTIONS OF MATH CLASS." Galaxy International Journal of Interdisciplinary Research 10.12 (2022): 259-262.
7. Akhmedovna , Ummatova Makhbuba . "ROL ZADACH TEORIII CHISEL PRI POVYSHENII MATEMATIChESKIH ZNANIY UchAshchIXSYa." Uchenyy XXI veka 1-2 (2017).
8. Ummatova, M., G. Akhmedova, and O. Makhmudova. "Practicheskaya napravlennost v obuchenii mathematike." Theory and practice of contemporary humanitarian and aesthetic science. 2014.
9. Ummatova , M. , and M. Yakubzhanova . "About the history of complex numbers."
10. D. A. Gusev "Udivitelnaya logika" M. Prosveshchenie 1999.