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РАЗРАБОТКА ELECTRONIC MANUAL DEVELOPMENT FOR THE ELECTIVE COURSE "COMPLEX NUMBERS" IN THE RUSSIAN AND ENGLISH LANGUAGES

ЭЛЕКТРОННОГО ПОСОБИЯ К ЭЛЕКТИВНОМУ КУРСУ «КОМПЛЕКСНЫЕ ЧИСЛА» НА РУССКОМ И АНГЛИЙСКОМ ЯЗЫКАХ

©*Eremeeva G.,*
ORCID: 0000-0001-6673-542X,
Ph.D., Kazan Federal University,
Kazan, Russia, guzeliksanova@rambler.ru
©*Еремеева Г. Р.,*
ORCID: 0000-0001-6673-542X,
канд. пед. наук,
Казанский (Приволжский) федеральный университет,
г. Казань, Россия, guzeliksanova@rambler.ru
©*Nurkaeva L.,*
Kazan Federal University,
Kazan, Russia, nurkaeva.liana@yandex.ru
©*Нуркаева Л. И.,*
Казанский (Приволжский) федеральный университет,
г. Казань, Россия, nurkaeva.liana@yandex.ru

Abstract. The article deals with the development of electronic manual for the elective course "Complex numbers" in the Russian and English languages. In the modern world you must have a complete understanding of the numbers to master mathematical culture, but currently methodological developments in the study of the theory of complex numbers in schools is relatively small and designed electronic manual for the elective course "Complex number" allows not only to improve the mathematical culture of students, but also to develop communicative competence. The aim of the research is to develop the electronic manuals for the elective course "Complex numbers" in two languages. The following methods were used: analysis of psychological, pedagogical and methodical literature, analysis and synthesis of personal experience of the authors. The electronic manuals, presented in the form of a website, for the elective course "Complex numbers" in two languages became the result of the research. Materials of the article can be useful to enrich pedagogical knowledge, notably a deficiency in the study of complex numbers in the school mathematics course is made up. New ways of thinking at possibility of studying complex numbers in two languages opens up prospects for the development of both mathematical and communication skills. The results of the research can be used by teachers in the educational process in preparing students, pupils of 11 grades, as well as in improving mathematical and communicative culture of the general public.

Аннотация. Статья посвящена разработке электронного пособия к элективному курсу «Комплексные числа» на русском и английском языках. В современном мире для овладения математической культурой в полной мере, необходимо иметь законченное представление о числе, но в настоящее время методических разработок по изучению теории комплексных чисел в школе сравнительно мало и разработанное электронное пособие к элективному курсу «Комплексные числа» позволяет не только повысить математическую культуру учащихся, но и развивать коммуникативные компетенции. Целью работы является разработка электронного пособия к элективному курсу «Комплексные числа» на двух языках. Были использованы

следующие методы: анализ психолого–педагогической и учебно–методической литературы, анализ и обобщение личного опыта авторов. Результатом исследования стало электронное пособие, представленное в виде сайта, к элективному курсу «Комплексные числа» на двух языках. Материалы статьи могут быть полезными для обогащения педагогического знания: восполняется определенный пробел в изучении комплексных чисел в школьном курсе математики. Новый взгляд на возможности изучения комплексных чисел на двух языках открывает перспективы для развития как математических, так и коммуникационных навыков. Результаты исследования могут найти применение учителями в учебном процессе при подготовке учащихся, учащимися 11 классов, а также для повышения математической и коммуникационной культуры широкой общественности.

Keywords: elective course, complex numbers, electronic manual, English, students.

Ключевые слова: элективный курс, комплексные числа, электронное пособие, английский язык, учащиеся.

In the modern world school graduates must have a large number of different competencies, which involve not only general culture, but also scientific, in particular mathematical culture, as the society makes the high demands to the graduates

The main idea of the course of algebra in school is the idea of numbers. According to basic education programs, developed by the new state educational standard of secondary general education, the content of subjects "Mathematics" and "Basic algebra and mathematical analysis for beginners", both basic and intermediate level, included the subject "Complex numbers". It completes the main theme of serial extensions of sets of numbers. Thus knowledge of the number in algebraic culture of students becomes full and complete. The subject "Complex numbers" gives an opportunity to solve the equations, identically to convert polynomials and trigonometric expressions. This subject is closely linked with geometry, vector and coordinate method, the geometric place of points, transformations of the plane.

Complex numbers, as an area of mathematics, find application in natural sciences, electrical engineering for the calculation of alternating current circuits, quantum mechanics, aerodynamics, the study of the motion of liquids and gases, aircraft, etc.

In the modern world you must have a complete understanding of the numbers to master mathematical culture. But currently methodological developments in the study of the theory of complex numbers in schools is relatively small and designed electronic manual for the elective course "Complex number" allows not only to improve the mathematical culture of students, but also to develop communicative competence. It can be used both by teachers in the educational process and students in the self-study topics.

The program of elective course "Complex numbers" is intended for 11 grades pupils of mathematical profile and is made in accordance with the requirements for the elective course. In the development of the elective course we took into account psycho-pedagogical features of students and also methodical recommendations of teaching the subject "Complex numbers". We used textbooks and methodological literature of A. G. Mordkovich, M. L. Galickij, Yu. A. Glazkov, Yu. P. Baharev, A. H. Shahmejster [1-5].

The elective course "Complex numbers" was developed in the framework of the concept of profile training at the senior stage of General education. It meets the State standard of secondary education in mathematics, according to which the elective course as a component of education should be aimed at meeting the cognitive needs and interests of the students, the formation of new types of cognitive and practical activities, which are not typical of traditional training courses.

The course "Complex numbers" was created in two languages and it is intended for students with good level of English. The number of teaching hours is 20. The main content of the course corresponds to the modern trends in the development of a school course of algebra. The elective

course gives students the opportunity to meet with the new extension of the concept of number, promotes the formation and development of such qualities as intellectual receptivity and ability to assimilate new information, flexibility and independence of logical thinking and also to develop their communicative skills and to practice the English language.

The course structure consists of five logically complete and meaningful interrelated topics, the study of which will provide a systematic and practical approach of the knowledge and skills of students:

1. The algebraic form of a complex number: the history of complex numbers; the concept of a complex number; algebraic form of complex numbers and operations with complex numbers given in algebraic form; conjugate complex numbers; properties of conjugate numbers.

2. The trigonometric form of a complex number: image of complex numbers points on the plane; the module of a complex number; the argument of a complex number, properties of modulus and argument of complex numbers, trigonometric form of a complex number; operations with complex numbers given in trigonometric form

3. The degree and the roots: exponentiation of a complex number; theorem de Moivre; extraction of roots of complex numbers; exponential form of complex numbers.

4. Complex numbers and quadratic equations: quadratic equations with real coefficients and negative discriminant: quadratic equations with complex coefficients, the solution of equations of the 3rd degree (Cardano formulas), the solution of equations of the 4th degree (Ferrari method).

5. Complex numbers in plane geometry: the distance between two points, the equation of the circle, the division of the line segment in given ratio, the scalar product of vectors, collinearity of vectors, parallelism of straight lines, the angle between the vectors, the area of a triangle and quadrilateral.
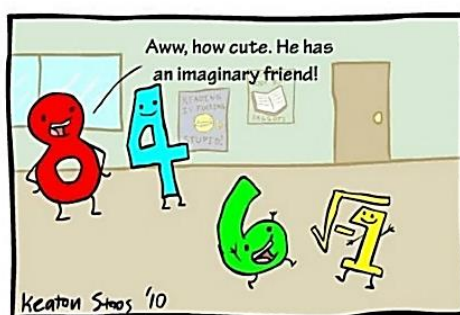
Figure. The main page of the electronic manual

All lessons are aimed at expanding and deepening of the basic course.

This elective course is presented as an electronic manual, which is a website http://complex-number.jimdo.com/ created with the website constructor named jimdo.

The job of the website involves the presence of historical information about the origin and development of complex numbers and theoretical materials.

The main type of a lesson is a workshop. There are various forms of work with students for the most successful learning planning: lectures and seminars, group and individual forms. For current control at each session we recommend students a series of tasks of different complexity.

In the electronic manual all problems are presented with solutions.

The study of the course concludes with conducting the final testing in on-line mode, which is done on the website http://onlinetestpad.com. The test results can be tracked in the personal cabinet of the developer.

The designed electronic manual for the elective course "Complex numbers" can be used by teachers in the educational process at training of students and pupils in the self-study of themes.

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