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THE ROLE OF MATHEMATICS IN THE EFFECTIVE STUDY OF COMPUTER SCIENCE

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Annotation: Without knowledge of mathematics, it is impossible to understand the basics of modern technology, nor how scientists study natural and social phenomena.

The article reveals the methodology of designing mathematical activities of students, which is necessary when using information technology.

Keywords: computer science, number systems, mathematics and programming, activity approach.

INTRODUCTION

As practice shows, interdisciplinary connections in education are a concrete expression of the integration processes taking place today in science and society. In our opinion, these connections play an important role in improving the practical and scientific-theoretical training of students, an essential feature of which is their mastery of the generalized nature of cognitive activity and the formation of general and professional competencies. Generality also makes it possible to apply knowledge and skills in specific situations, when considering particular issues, both in educational and industrial activities. With the help of interdisciplinary connections, not only the tasks of teaching, developing and educating students are solved at a qualitatively new level, but also the foundation is laid for a comprehensive vision, approach and solution of complex problems of reality.

Despite the fact that mathematics and computer science are completely different disciplines, they are inextricably linked. Mathematics is an independent science that has been established for centuries, whereas computer science does not carry a qualitatively new discipline, it only generalizes elements of other sciences.

Any program can be called an algorithm, with a clear execution of a given sequence of actions. However, the program begins its life cycle after launch and can be modified, changed, correct errors or, conversely, get rid of them, whereas the algorithm cannot afford it.

MATERIAL AND METHODS

The purpose of studying mathematics is to increase the general outlook, the culture of

thinking, and the formation of a scientific worldview. Mathematics is becoming more and more present in various fields of other sciences, playing a leading role in modern education. With the development of mathematics, various areas of study appear, which become the basis for other scientific disciplines, including educational ones such as computer science and other special disciplines.

Computer science has received a number of results and theories from mathematics that have found wide application, especially in the theory of languages and translation, as well as program verification.

Computer science in its theoretical part has "grown" out of mathematics and actively uses the mathematical apparatus. Many topics of the computer science course can be called mathematical:

- elements of mathematical logic;
- number systems;
- elements of probability theory and mathematical statistics;
- graph theory;
- theory of algorithms and some others.

Experience shows that studying these topics in computer science and mathematical disciplines makes it easier for students to learn new concepts, proofs of certain statements, and theorems.

The study of computer science by students made it possible to remove many cognitive difficulties arising in the process of teaching mathematics, arouse students' interest in mathematical problems, show the possibility of solving them with new, non-standard methods: algorithmization of solving complex problems on a computer, the ability to simulate and visually see mathematical processes on the display screen and control these processes, etc.

Students are very interested in generalizing classes in mathematics and computer science on the topics "Graphical method for solving systems of equations in Microsoft Excel", "Solving inequalities with one variable", "Solving equations", "Solving quadratic equations", "Graphs of functions and their properties", "Cyclic algorithms. Plotting trigonometric functions". Such integrated classes are used in cases where knowledge of the material of some subjects is necessary to understand the essence of the process, phenomenon in the study of another subject. Integration in learning allows you to perform a developmental function necessary for the comprehensive and holistic development of the student's personality, the development of interests, motives, and cognitive needs.

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Computer boards are an electrical circuit. The presence of current in the circuit means 1, absence - 0. The number system is binary. The number system is a set of techniques and rules by which numbers are written and read. A computer uses a binary number system to represent information, because it has a number of advantages over other number systems:

The machine performs the translation of numbers from decimal to binary and vice versa, but programmers often use octal and hexadecimal number systems at the stages of debugging programs and viewing the contents of files in machine code mode. Numbers in these number systems are counted almost as easily as decimal ones, and require three- and four-times fewer digits, respectively, than in the binary number system.

Converting octal and hexadecimal numbers to binary is very simple; it is enough to replace each digit with an equivalent binary triad for octal a number system or a notebook for the hexadecimal number system.

To convert a number from binary to octal or hexadecimal, it must be divided to the left and right of the comma into triads or tetrads and each such group replaced with the corresponding octal or hexadecimal digit.

The description of the processes occurring in electrical circuits is based on mathematical analysis (differential and integral calculus). The main methods of mathematical research are mathematical proofs - rigorous logical reasoning. For mathematics, as for computer science, when working with certain models, the vital aspect is not important, but a certain pattern is fundamental. So, the same differential equation can describe both population growth and radioactive decay.

Mathcad has a number of built-in functions designed to solve ordinary differential equations (ODES). When solving an ODE, the desired value is a function. When using any numerical integration methods, it is necessary that at least the following values are specified:

- initial conditions;
- a set of points where you need to find a solution;
- the differential equation itself, written in some special form.

RESULTS AND DISCUSSION

Example

First-order differential equations

A first-order differential equation is an equation that does not contain derivatives above the first order of unknown function. Figure 1 shows an example of how to solve a relatively simple differential equation:

The logical unit of the processor functions according to the rules of Boolean algebra. Boolean algebra, or the algebra of statements, was developed in order to determine the truth or falsity of compound statements without delving into their content. The true statement corresponds to the value of the logical variable 1, and the false one corresponds to the value 0. In the algebra of statements, as in mathematics, certain operations can be performed on statements, as a result of which new, composite statements are obtained.

Various life situations can be described using game theory, which is well implemented in a computer. Game theory is a branch of applied mathematics that has become an integral part of economic theory. Wherever there is an interaction of independent rational (or partially rational) subjects, a game arises. The main question of game theory is to predict the behavior of the participants in the game. John von Neumann presented a mathematical justification for a common strategy for playing two participants in terms of minimization and maximization. One of the founders of game theory was the French mathematician E. Borel. But the first systematic presentation of ideas and methods in this field was the work of von Neumann and O. Morgenstern, published in1944, "Game Theory and Economic Behavior", which extended game theory to an arbitrary number of participants and applied this theory to economic behavior.

Example

The matrix game is defined by the following payment matrix:

Strategies "In"

Strategies "A" B1 B2 B3 B4

1.45 2.12 0.75 4.01

A2 3.52 1.87 0.18 12.7

A3 6.08 4.43 11.0 6.01

To find a solution to the matrix game, namely:

- the top price of the game;
- the lower price of the game;
- the net price of the game;
- specify the optimal strategies of the players;
- provide a graphical solution (geometric interpretation), if necessary.

Step 1:

Let's determine the lower price of the game - and

The lower price of game a is the maximum gain that we can guarantee ourselves in a game against a reasonable opponent if we use one and only one strategy throughout the game (such a

strategy is called "pure").

We will find the minimum element in each row of the payment matrix and write it in an additional column.

Then we will find the maximum element of the additional column (marked with an asterisk), this will be the lower price of the game.

Step 2:

Let's determine the top price of the game - R.

The top price of the game p is the minimum loss that player "B" can guarantee himself in a game against a reasonable opponent if he uses one and only one strategy throughout the game.

We will find the maximum element in each column of the payment matrix and write it in an additional row from the bottom (highlighted in color - see Table 2).

Then we will find the minimum element of the additional row (marked with a plus), this will be the top price of the game.

Space modeling in computer games is carried out using vector algebra and analytical geometry. Vector graphics is a way of representing objects and images in computer graphics based on the mathematical description of elementary geometric objects, commonly called primitives, such as points, lines, splines, Bezier curves, circles and circles, polygons. Vector graphics objects are graphical representations of mathematical objects.

The term "vector graphics" is used to distinguish from raster graphics, in which the image is represented as a graphic matrix consisting of pixels of a fixed size. A color attribute is assigned to each pixel of the graphic matrix in the bitmap image. A collection of multicolored pixels of a raster matrix forms an image.

When output to matrix display devices (monitors), vector graphics are pre-converted into raster graphics, the conversion is performed programmatically or appa-rately by means of modern video cards.

CONSULSION

Thus, I would like to emphasize that, despite the lack of clear relationships in programs and textbooks, each of us has ample opportunities to implement the links between mathematics and computer science in the learning process. And this should be dictated primarily by concern for the formation of the dialectical worldview of students. To do this, it is necessary that the content of education and teaching methods are organically interconnected and interdependent.

We see the implementation of interdisciplinary connections between mathematics and

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computer science for effective student learning through integrated classes; the study of topics related to mathematics, filling computer science classes with mathematical problems. For example, solving problems using the MoEhoe! tabular processor, such as plotting functions and diagrams; calculating geometric parameters of objects; determining the minimum and maximum area of shapes; solving percentage problems; using MoEhoe! for calculations, etc.

Preparation of abstracts, development and implementation of projects, research papers on related sections and topics of these academic disciplines. This is the main task of interdisciplinary communication. At the same time, the effectiveness of teaching and upbringing increases, and the possibility of end-to-end application of knowledge, skills, and skills acquired in the classroom in these subjects is provided.

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