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TOOLS AIMED AT DEVELOPING STUDENTS' PROFESSIONAL COMPETENCE ON THE BASIS OF AN INTEGRATIVE APPROACH

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Abstract:
This article discusses the development of students' professional competencies based on an integrative approach and the use of tasks with an integrative content. It provides an explanation of how to use the integrative approach in the teaching of mathematics, and provides examples of integrative content tasks designed to be used in the teaching of mathematics. In addition, the article shows how to use software tools based on the integration of disciplines in finding solutions to integrative tasks in the teaching of mathematics. Guidelines for teachers on the use of an integrative approach are also recommended.

Keywords: Professional competence, integrative approach, practical issues on integrative content, software tools, Kramer method, Electric circuit.

INTRODUCTION

The lectures form the specific features of the individual work of students and the implementation of work methods, they develop problem-solving algorithms, concept study plans, rules, laws, and ways to create theories. In general lectures, the science of mathematics is based on showing different connections with the sciences of specialization [1; p.37-38]. The generalization of lectures shows students the results of systematizing their knowledge, achievements, problems. The texts of the lectures are realized through the formation and introduction of the problem-solving nature of the study material and the quality of the acquired knowledge. The lecture should be designed to facilitate students' understanding of the basic ideas of science, to strengthen self-confidence, to increase interest in open and transparent learning. Lecture textbooks can be represented by inductance and deductivity. Organizing a lecture in an inductive way takes more time, but the inductive approach is more understandable to students, providing a higher quality of knowledge of shortcomings, but this method is much more difficult to understand.

LITERATURE REVIEW

Experience in improving the quality of data shows that the presentation of a generalized mathematical description begins with the presentation of various reports and processes (in the form of experiments or examples). The inductive principle allows students to learn the basics of generalized models, which slightly increases the presentation time but allows for understanding. Further expansion of the theory creates conditions for the intellectual development of students. Providing students with access to professional guides for the introduction of mathematical concepts and methods in the process of developing an effective way of thinking includes the following steps:

- forming a professional composition of students for several practical problems;
- construct a generalized mathematical model and study mathematical methods for solving practical problems of this type.

With this approach, conditions are created for the problematic presentation of learning material, which allows to increase the interest of learners and their activity in the lecture. Students' independent work theoretically consists of several stages, from the exam to the exam:

1. Preparation to the plan and the text of the lecture recommended by the teacher.
2. Study the text of the report in preparation for the practical training, followed by monitoring the performance of this work in the practical training.
3. Each stage should be provided with the opportunity to receive individual counseling from the teacher [2; p.11-12].

This approach encourages students to develop their scientific and professional skills, increase their professional knowledge, and gain experience by independently searching for necessary information.

MAIN PART

The report on "Definite integrals and their applications" was presented to the first-year students of "Physics and Astronomy" as an experiment. As a result of this lecture, students will get acquainted with the concepts that make up the topic, connect the basic concepts of higher mathematics with a clear integral, to create mathematical models of the simplest real processes and events, broaden their horizons about the practical aspects of mathematics, they learn the culture of mathematical thinking, get acquainted with solving problems whose content requires the calculation of definite integrals. In some cases, the problem of finding the exact value of an integral can be very complex [3; p.135]. In such cases, the value of the definite integral is calculated using approximate calculation methods. The methods of straight rectangles and trapezoids are examples of this. In geometry, definite integral is used to solve problems such as calculating the surfaces of curved trapezoids of different shapes, finding the length of the arc of a curved line, determining the size of objects. As an example of the application of definite integrals in mechanics can be cited etc calculating the work done by the force, determining the distance traveled in an uneven motion, finding the mass of the wire. In economic theory, such issues as finding the volume of products produced using the definite integral, calculating the Gini coefficient, which is an economic indicator, and determining the success of the consumer and the producer are solved. The advantages of this lecture are:

- students will have the knowledge necessary to understand the nature of career-oriented tasks;
- a problematic situation is created, evidence is introduced;
- visual possibilities of a culture of discussion, ways of communicating, collaborative search and decision-making processes are developed.

The purpose of the lecture is to study career-oriented tasks. The lecture plan was developed using the data dissemination method (see Table 1).

Table 1.

Comments on the lecture process and its main stages

Teacher activity	Student activities	Ideas and feedback
Motivational and indicative part of the course		
1. Gives examples needed to apply a definite integral. 2. Offers general and special schemes for calculating quantities using definite integrals. 3. Shows the geometric meaning of a definite integral. 4. Knowing the definite integral implies the types of tasks required. 5. Forms the overall purpose of the lecture. Solves career-oriented problems using definite integral.	Defines the basic ways to apply a definite integral. Constructs curved trapezoids in a graphical image and uses a definite integral to calculate their faces. Understands the need for more knowledge on the application of definite integrals. Defines the general purpose of the course: solves career-oriented problems using certain integrals.	Directions are required to implement students' knowledge: for example, the length of a curve described as a way for students to get to the workplace can be calculated using a definite integral (which is in line with the logic of developing the integration of mathematics and sciences). It is necessary to use a definite integral concept to create problem situations, to solve practical problems from other specialties. Defining the purpose of the lecture in the form of a learning task, students should be taught to solve tasks using formulas.
The main part of the lesson		
The teacher demonstrates the solution of practical problems using a definite integral	Students, together with the teacher, analyze the basic properties of the definite integral. Writes the text of the report, asks questions	At this stage, professionally important qualities of students are formed. The basic skills required for professional activity are developed
The last part of the lesson		
At the end of the lesson, the teacher gives a homework assignment and conclusion on the topic	Students analyze the content of the lesson, systematize their knowledge, record homework	The formation of basic mental activity continues. Motivation to study mathematics increases

As a result of the lecture, students develop the following characteristics:

- understands the need to study the calculation of definite integrals;
- explores various aspects of the application of definite integrals in professional activities;
- distinguishes theoretical aspects of problem solving using definite integrals;
- selects methods for calculating definite integrals;
- substantiates the exchange of ideas in the process of solving practical problems related to the profession together with the teacher.

THEORETICAL BACKGROUND

The following practical tasks can be used to determine how well students have mastered the topic:

Task 1. Determine the path traversed at speed $v(t) = t^2 - 3tsint$. Where t is in the time interval [0;5].

Task 2. If $F(x) = x^3 + \frac{1}{x}$, determine what work needs to be done to raise the spring to 2 cm.

Task 3. If the function is given graphically, calculate the definite integral.

Task 4. Calculate the face of the shape bounded by the lines $y = x^3, y = 4x$. Draw the shape.

These tasks take very little time, are easily checked, and allow students to identify gaps in their knowledge. In addition, such quick tasks to be solved during the lecture are a good incentive for students to more actively understand the topic.

Now let's look at the following task 5 on the profession of economics, which shows the need for economists to study mathematics:

Task 5. The company that produces technical products produces 4 different parts, such as M_1, M_2 , M_3 and M_4. 3 different raw materials C_1, C_2 and C_3 are used to produce these parts. In this case, using a_{ij} (i=1,2,3,4; j=1,2,3) to determine how many units of raw material C_j are used to produce a unit of technical detail M_i the norm of consumption of raw materials for the production of a unit of technical parts is given by $A_{4x3}=(a_{ij})$ is expressed by the matrix:

$$A = \begin{pmatrix} 4 & 3 & 2 \\ 1 & 0 & 5 \\ 3 & 2 & 4 \\ 5 & 3 & 1 \end{pmatrix}.$$

In this case, the row C representing the plan of production of details M_i (i=1,2,3,4) and the column matrices B indicating the unit price of raw materials C_j (j=1,2,3) should be as follows:

$$C = \begin{pmatrix} 90 & 110 & 80 & 100 \end{pmatrix}, \quad B = \begin{pmatrix} 7 \\ 4 \\ 5 \end{pmatrix}.$$

In this case, there is a set of CA matrices, and it consists of the following D–row matrix, which represents the amount of raw materials C_1, C_2 and C_3 used to produce the planned parts:

$$D = C \cdot A = \begin{pmatrix} 90 & 110 & 80 & 100 \end{pmatrix} \begin{pmatrix} 4 & 3 & 2 \\ 1 & 0 & 5 \\ 3 & 2 & 4 \\ 5 & 3 & 1 \end{pmatrix} = \begin{pmatrix} 1210 & 730 & 1150 \end{pmatrix}.$$

This means that we need to have 1210, 730 and 1150 units of raw materials C_1, C_2 and C_3 respectively to fulfill the parts production plan. There is also a multiplication DB of the found D matrix representing the amount of raw material to the B matrix showing the unit price of the raw material, and it shows us the amount of our cost to purchase the required amount of raw material:

$$DB = \begin{pmatrix} 1210 & 730 & 1150 \end{pmatrix} \begin{pmatrix} 7 \\ 4 \\ 5 \end{pmatrix} = 1210 \cdot 7 + 730 \cdot 4 + 1150 \cdot 5 = 17140.$$

In the process of teaching mathematics, lessons, lectures and practical classes predominate. Organizational formations such as laboratory work are not sufficiently involved in the teaching of mathematics and there are almost no laboratories in the practice of natural mathematics teachers. We see the urgency of teaching students to use software tools that can solve arbitrary types of problems in the process of teaching mathematics. There are many software tools that can be used in the teaching of mathematics today, and their role in solving and explaining problems is unique (see Table 2) [4; p.35-36]:

Table 2.

The most used software tools

№	**Title**	**The main functions of the application**	**Pedagogical purposes of using software**
1.	MathLAB, MathCAD, Mathematica,	Draw graphs of various functions (with pre-	1. Forming the ability to express functional dependence. 2. Conduct trainings to "independently" determine

	MapleV, Advanced Grapher, AutoCAD, Derive, 3D Studio, C ++ and others	rendering tables of values of x and y)	legitimacy in graphs construction. 3. Forming the ability to develop, interpret and use formulas and mathematical expressions. 4. Conduct trainings on the use of software to solve practical problems.
2.	Teachers' use of programs	Research, creating on-screen images of the objects being studied for the purpose of study	1. Develop the ability to enter events and hypotheses, develop methods to verify them. 2. Develop the ability to emphasize general statements, on the basis of which generalizations are created. 3. Use a computer to create and edit graphic images and solve problems.
3.	Spreadsheets	Diagrams depicting the dynamics of process learning	1. Develop the ability to find the optimal solution. 2. Representation of the solution of the equation in digital and graphical forms. 3. Learn to find complete solutions. 4. Teach dynamic representation of graphical data.
4.	Calculators	Automation of computing and information retrieval	1. Creating and studing function tables and graphs. 2. Learning to perform approximate calculations. 3. Preliminary determination of digital analysis results.

Frequent practical classes in mathematics provide great opportunities to develop students 'research skills. In practical classes, students take a creative approach to any work, build a mathematical model, take into account their advantages and disadvantages, evaluate different options, choose the best option, develop the ability to solve certain problems rationally [5; p.80-81]. Let's look at a few practical exercises as an example. In the practical session, students learn to conduct research, obtain results, and explore processes (see Table 3).

Table 3.

Career-oriented tasks in the organization of practical training

№	**Topics**	**Practical training plan**	**Examples of practical problems solved in the course of practical training**
1.	Finding solutions to physical problems using the derivative	1. Determining the steps to solve practical problems using the derivative. 2. Creating a table of relationships between physical quantities using the derivative. 3. Making a plan to solve physical problems using the derivative.	**Task 6.** Arrows fired from a weapon move according to the law $x(t) = -4t^2 + 13t$ (м). Indicate the speed of the arrow in the third second. **Task 7.** The amount of electrical energy passing through the conductor from time $t = 0$ seconds is given by the formula $q(t) = 2t^2 + 3t + 1$ (cooling), find the power of electricity in the fifth second. **Task 8.** The amount of temperature Q(J) required to heat 1 kg of water from 0° to S is determined by the formula $Q(t) = t + 0.00002t^2 + 0.0000003t^3$. If $t = 100°$, calculate the heat capacity of the water. **Task 9.** The body moves in the correct direction according to the law $x(t) = 3 + 2t + t^2\ (m)$. Determine its speed and acceleration between the times of 1 and 3 seconds. **Task 10.** Find the magnitude of the force *F* acting on the point of mass *m* moving according to the law $x(t) = t^2 - 4t^4\ (m)$ for $t = 3$ seconds. **Task 11.** An object of mass $m = 0{,}5$ kg moves in the right direction according to the law $x\ (t) = 2t^2 + t - 3\ (m)$. Find the kinetic energy of this body 7 seconds after the motion begins. **Task 12.** The electrical energy passing through a conductor is given by the formula $q = 3t^2 + t + 2$, starting from $t = 0$. Find the current strength at time $t = 8$.
2.	Complete function	1. Creating an algorithm	**Task 13.** Find the increase and decrease

	check using the derivative	to solve problems in determining the largest and smallest values of a function. 2. Classifying tasks on the largest and smallest values of a function. 3. Creating a plan to solve tasks that apply to the largest and smallest values.	intervals and extremum points of the given functions: a) $y = x\sqrt{1-x^2}$; b) $y = x - 2sinx$. **Task 14.** Determine the rectangle with the largest surface included in the circle of radius R. **Task 15.** The two light sources are located at a distance of 30 m from each other. Find the least illuminated point on the line connecting them, if the light sources are in a ratio of $27:8$. **Task 16.** Two capacitors connected in parallel form a C battery. If C_1:C_2 = 4:1, what is the value of the capacitor capacitance? **Task 17.** A light source with an electromagnetic power of $E = 220V$ and an internal resistance of $r = 50$ Ohm is connected to a device with a resistance of R. What should be the consumer's R resistance for power consumption to be maximum?
3.	Using integrals to solve practical problems	1. Defining the steps of solving practical problems using integrals. 2. Creating a table of relationships between integrations of physical quantities. 3. Creating a plan to solve practical problems using integrals.	**Task 18.** The train consumes a current of $1680\ A$ at a speed of $v = 58\ km/h$ in the zone of a one-way power supply with a length of $l = 9\ km$. Find the average voltage across the current collector of the train. **Task 19.** In the interval $(0;T)$, the conductor passed through an alternating current according to the law $I(t) = atdt$. How much electricity passed through the intersection of the conductor during this time? In this case $I(t)$ current $I(t)dt = dqt$ and $q(t)$ are related to the amount of electrical energy. **Task 20.** The elastic force of a 5 cm elongated spring is 3N. What should be done to lengthen spring 5 cm?
4.	Differential equations	1. Giving examples of problems that lead to differential equations. 2. Creating a table of relationships between basic concepts and other concepts.	**Task 21.** The motion of the material point *m* of the mass *v* slows down under the influence of a resistance force proportional to the square of the velocity. Find that speed depends on time. If $v(0) = 100\ m/s$ and $v(1) = 50\ m/s$, find the velocity of the point in the third second after the decrease begins. **Task 22.** Assuming that the decay rate of radium at each minute of time is directly proportional to its quantity (k coefficient $k > 0$), construct a differential equation for the time function ("radioactive decay") as the mass of radium changes. **Task 23.** The body moves in proportion to the distance traveled. How many paths does the body travel in 5 seconds from the start of the movement, if it is known that it walks 8 m in 1 second and 40 m in 3 seconds? **Task 24.** Establish a relationship between the variable mass of the pilot rocket and the flight speed. In this case, m is the decrease in the mass of the rocket, dv is the rate of acceptance after increasing the waste, from which this mdv equation is formed. $-v_0dm$ – the amount of gases emitted as a result of the action (v_0 is the velocity of the emitted part of the gas; the sign "minus" is set because the mass (m) decreases).

5.	Multiple integrals	1. Defining steps for solving practical problems using double integrals. 2. Creating a table of relationships between integrations between physical quantities. 3. Creating a plan to solve life problems using double integrals.	**Task 25.** If the surface density of the plate material at point $M(x;y)$ is $\rho(x,y)=k\sqrt{x^2+y^2}$, then determine the mass of the round plate at the center of radius R, where $k>0$. **Task 26.** D denotes the ABC triangle with the ends $A(1;1)$, $B(2;2)$ and $C(3;1)$ of the flat plate. The mass distribution density at each point is equal to the coordinate of that point. Identify the following: a) the mass of the plate; b) the coordinates of the center of gravity of the plate.

RESULTS

In the teaching of mathematics, goals such as demonstrating the connection between the teaching materials and the surrounding reality, clearly confirming the conclusions of the science and solving the form of practical work (tasks) are achieved. Such work is of great practical importance and will be more meaningful than the teacher simply explaining such results. Occupational orientation has a special place in the educational process due to the use of information technology [6; p.38-39]. At the same time, the teacher not only teaches students certain knowledge, but also puts into practice the task of teaching them the rational use of new opportunities both in the learning process and in future professional activities.

The potential of personal computers is to create graphs of functions representing one or more processes on a computer monitor on a two-dimensional and three-dimensional surface during the research process, allowing to observe the immediate execution of calculations. We explain to students of physics and astronomy the topic of mathematics "Solution of a system of linear equations by the Kramer method" in accordance with their professional problems and the theoretical and practical content of the subject on the principle of interdisciplinary interdependence. We show that this topic can be applied to solving problems in the sciences of physics and astronomy, and that it is possible to facilitate the mathematical calculations of such problems through modern advanced programs [7; p.27-28]. Teaching students the application of mathematics topics in higher education institutions increases their interest in scientific and theoretical knowledge, constantly strives to be creative, search for problems and tasks, find ways to analyze the needs of society and partially solve them.

First, the solution of the system of linear equations by the Kramer method is theoretically explained to the students. Suppose we are given a system of two first-order, two unknown algebraic equations:

$$\begin{cases} a_{11}x_1 + a_{12}x_2 = b_1 \\ a_{21}x_1 + a_{22}x_2 = b_2 \end{cases} \quad (1)$$

Multiplying the first equation of (1) system by a_{22} and the second equation by a_{12}, and adding the results, we get the following expression:

$$(a_{11}a_{22}-a_{12}a_{21})x_1 = \text{б}_1a_{22}-\text{б}_2a_{12} \Rightarrow x_1 = \frac{b_1a_{22}-b_2a_{12}}{a_{11}a_{22}-a_{12}a_{21}} \quad (2)$$

If we multiply the first equation of (1) system by a_{21} and the second equation by a_{11}, and add the results,

$$(a_{11}a_{22}-a_{12}a_{21})x_2 = \text{б}_2a_{11}-\text{б}_1a_{21} \Rightarrow x_2 = \frac{b_2a_{11}-b_1a_{21}}{a_{11}a_{22}-a_{12}a_{21}} \quad (3)$$

(3) equality arises. If we look at (2) and (3), according to the definition of the second-order determinant,

$$x_1 = \frac{\begin{vmatrix} b_1 & a_{12} \\ b_2 & a_{22} \end{vmatrix}}{\begin{vmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{vmatrix}} = \frac{\Delta_1}{\Delta};\ x_2 = \frac{\begin{vmatrix} a_{11} & b_1 \\ a_{21} & b_2 \end{vmatrix}}{\begin{vmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{vmatrix}} = \frac{\Delta_2}{\Delta} \quad (4)$$

is formed. Equation (4) is called the Kramer formula.

It is necessary and sufficient that $\Delta \neq 0$ for (1) system to have a unique solution. Considering (4), Δ is a second-order determinant composed of coefficients in front of the unknowns in the given system (1). Δ_1, Δ_2 are the determinants formed by replacing the first and second columns of Δ with free terms, respectively.

If three unknown systems of three algebraic equations

$$\begin{cases} a_{11}x_1 + a_{12}x_2 + a_{13}x_3 = b_1 \\ a_{21}x_1 + a_{22}x_2 + a_{23}x_3 = b_2 \\ a_{31}x_1 + a_{32}x_2 + a_{33}x_3 = b_3 \end{cases}$$

are given and $\Delta = \begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix} \neq 0$, the solution of the given system is determined by Kramer formulas

$$x_1 = \frac{\Delta_1}{\Delta}\ ;\ x_2 = \frac{\Delta_2}{\Delta}\ ;\ x_3 = \frac{\Delta_3}{\Delta} \quad (5).$$

Here, too, Δ_1, Δ_2, Δ_3 are formed by replacing the column elements of Δ with successively free terms, respectively. If a system of n first-order n unknown algebraic equations

$$\begin{cases} a_{11}x_1 + a_{12}x_2 + \ldots + a_{1n}x_n = b_1 \\ a_{21}x_1 + a_{22}x_2 + \ldots + a_{2n}x_n = b_2 \\ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \\ a_{n1}x_1 + a_{n2}x_2 + \ldots + a_{nn}x_n = b_n \end{cases}$$

is given and $\Delta = \begin{vmatrix} a_{11} & a_{12} & \ldots. & a_{1n} \\ a_{21} & a_{22} & \ldots. & a_{2n} \\ \ldots. & \ldots. & \ldots. & \ldots. \\ a_{31} & a_{32} & \ldots. & a_{nn} \end{vmatrix} \neq 0$, the solution of the given system is determined according to Kramer's formula as follows:

$$x_1 = \frac{\Delta_1}{\Delta},\ x_2 = \frac{\Delta_2}{\Delta},\ \ldots,\ x_n = \frac{\Delta_n}{\Delta} \quad (6)$$

Δ_1, Δ_2, …, Δ_n are formed by replacing the column elements of Δ with successively free terms, respectively.

Then the practical application of Kramer's method of solving a system of linear equations is considered in relation to physical problems [8; p.112-114].

Below is the electrical circuit. Using Kirchhoff's laws, it is necessary to determine the currents in the electric network networks (see Figure 1):

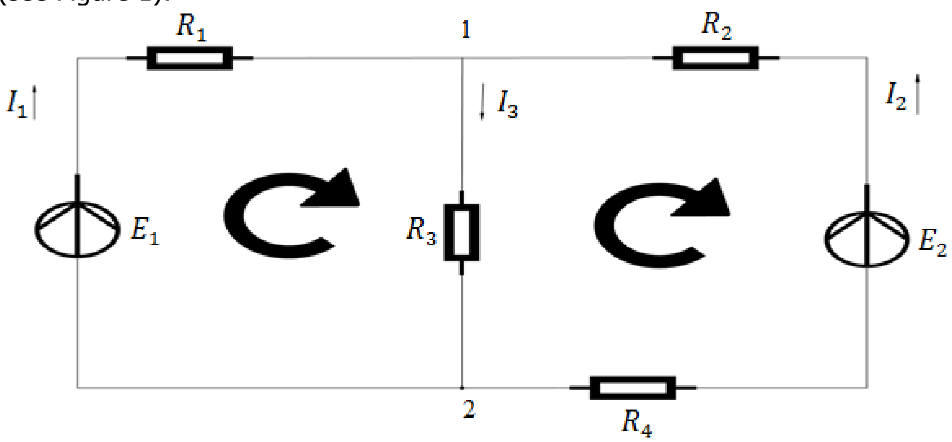

Figure 1. **Electric circuit.**

The parameters of the electric circuit elements are as follows:
$R_1 = 45$ Ohm, $R_2 = 15$ Ohm, $R_3 = 45$ Ohm, $R_4 = 75$ Ohm,
$E_1 = 60$ V, $E_2 = 450$ V.

Solution: We select the positive directions of the indulged currents and mark them according to the scheme. For the first node, we construct the equations using the first Kirchhoff's law. Selecting the directions of bypassing the contours, we write the equations according to the second Kirchhoff's law. As a result, we have a system consisting of three unknown three-line equations:

$$\begin{cases} I_1 + I_2 - I_3 = 0 \\ I_1R_1 + I_3R_3 = E_1 \\ -I_2(R_2 + R_4) - I_3R_3 = -E_2 \end{cases}$$

We calculate this system of equations by the Kramer method. We generate the following determinants:

$$\Delta=\begin{vmatrix}1 & 1 & -1\\ 45 & 0 & 45\\ 0 & -90 & -45\end{vmatrix}=10125,\quad \Delta_1=\begin{vmatrix}0 & 1 & -1\\ 60 & 0 & 45\\ -450 & -90 & -45\end{vmatrix}=-12150,$$

$$\Delta_2=\begin{vmatrix}1 & 0 & -1\\ 45 & 60 & 45\\ 0 & -450 & -45\end{vmatrix}=37800,\quad \Delta_3=\begin{vmatrix}1 & 1 & 0\\ 45 & 0 & 60\\ 0 & -90 & -450\end{vmatrix}=25650.$$

We find the values of the currents according to Kramer's formula:

$$I_1=\frac{\Delta_1}{\Delta}=-\frac{12150}{10125}=-1{,}2\ (A),\qquad I_2=\frac{\Delta_2}{\Delta}=\frac{37800}{10125}=3{,}73\ (A),$$

$$I_3=\frac{\Delta_3}{\Delta}=\frac{25650}{10125}=2{,}53\ (A).$$

When calculating a system of equations of this kind, if the coefficients of the unknowns in the system are given by large numbers or decimal fractions, students will have to spend a lot of time for the calculation [9; p.98-99]. Therefore, in today's era of modern technology, software is developed to solve each problem. In particular, in finding a solution to the above problem, its code is entered into the C ++ program and a schematic is generated (see Figure 2). The coefficients in the scheme are replaced by the coefficients in the problem and the result is obtained [10; p.24-25].

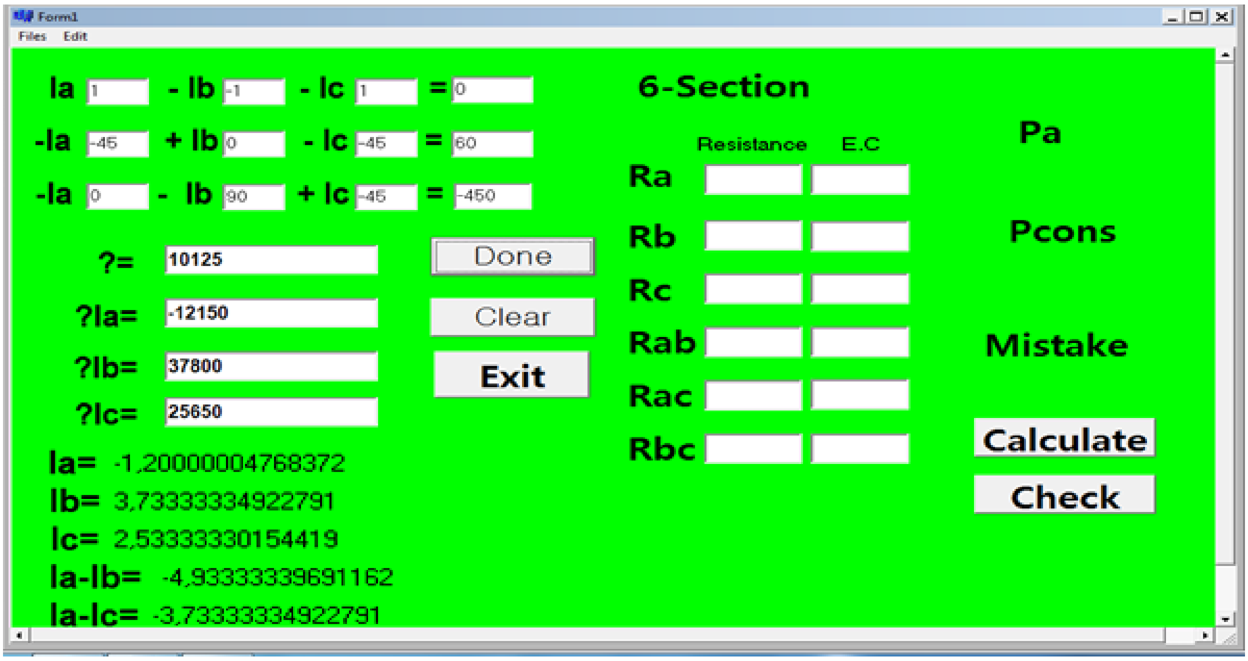

***Figure 2.* The case where the solution is found in C ++.**

Integration of mathematics with the specialized sciences allows the development of its information-specialized ontology using electronic programs **(MathLAB, MathCAD, MapleV, AutoCAD and S ++)**. **Ontology** is the use of different knowledge and data integration by professionals in finding solutions to tasks throughout their practice. That is, it is a way of demonstrating knowledge using an infinite set of concepts and the relationships between them. Ontology is used to formally describe a field of knowledge. The advantage of using ontology as a tool of knowledge is that it is a systematic approach to the study of the field of science. Ontology is used in the programming process as a form of presenting knowledge about the real world or part of it.

CONCLUSION

Various applications of Matcad, Matlab, and Maple can be used to create graphical models. Students are invited to draw a graph of a given function in an expression that has parameters. Changing the value of the coefficient will result in the emergence of new graphs. Changing the values of the coefficients is necessary when certain conditions are met, that is, when students observe changes in the function graph and draw conclusions about the nature of the changes in the function graph. In this case, Matcad, Matlab, and Maple are used to recalculate all results in the workflow so that students can immediately see that their decisions are correct.

The development of ready-made software products should be organized on a number of tasks that demonstrate the advantages and disadvantages of each solution method in mastering the capabilities of independent programming. Thus, in solving a number of problems in an Excel spreadsheet, it is interesting to compare the methods of mathematical editors Matcad, Matlab and high-level programming languages, in particular, Pascal, Basic, Delphi, C ++. Such comparisons include, for example, finding solutions to equations and a system of equations. Approximation and interpolation, integration and differentiation are among them. Forming such tasks is also important for other tasks and software tools. They allow you to individualize the performance of multifunctional tasks. The use of software in the teaching of mathematics shapes students' ability to solve practical problems, increases their interest in the topic, as a result of which students study the material in depth and spend less time on it. Modern software tools are not only a tool for learning new information technologies, but also a tool for learning how to identify and solve tasks on a computer [11; p.11-12]. This can be achieved by creating complex disciplines of mathematics and computer science that have a specific discipline when applying career-oriented tasks to acquire knowledge and acquire professional skills. Thus, software can serve as a tool to develop students' professional competencies in solving career-oriented tasks.

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