

PULAT METHOD - AS A NEW METHOD OF ENSURING OBJECTIVITY OF STUDENTS' KNOWLEDGE CONTROL WHEN CARRYING OUT VERIFICATION WORKS IN MATHEMATICS AND COMPUTER SCIENCE

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Abstract. *Computer support for mathematics teachers during verification (control, written, independent) work is one of the relevant topics for science teaching methods of mathematics and computer science. For this, it is necessary to develop new computer programs in order to conduct the verification work that teachers need. This article discusses a method for developing such computer programs devoted to the topic "Prime numbers" using the Pulot method. A computer program generates numerical data and takes it for incoming data. Further they are reflected in the conditions of the tasks of the verification work. At the same time, each student is offered an individual option of work, each option will have different answers. Students cannot rewrite work results from each other. This is one of the novelty of this article. Programs are independent of any databases or data tables. Variants of the numerical data of the verification work are not stored anywhere and are not known in advance. If you look at computer testing programs that have databases, the options for verification work, tasks and their answers can be obtained in advance and used as a cheat sheet. In this developed method and a computer program, such an opportunity is not available, which is the other side of the novelty of this article. The programs developed by this method and their application facilitate the work of the teacher and ensure the objectivity of the control of student knowledge. Increases the level and quality of education.*

Keywords: *verification work, objectivity, number generation, program, students, primes, natural number, competency assessment, graphic form.*

Independent work of students in the process of teaching mathematics is a specific means of organizing and managing independent activities of students, a means of self-organization and self-discipline in mastering the necessary knowledge, skills and abilities. The purpose of conducting independent work is to identify existing gaps and shortcomings in teaching the topic covered, to seek and determine ways to eliminate them. The subject teacher in mathematics, after conducting the initial classes, should conclude how much the students have mastered the topic covered. To do this, the subject teacher at the next lesson plans to conduct independent work, calculated for about 5-6 minutes. However, by the traditional method, as practice shows, the subject teacher is not given the opportunity to conduct independent work in such a short period of time. On the other hand, the teacher needs a lot of work and a lot of time, especially when checking the solved problems by students. To facilitate the work of the teacher and with a small amount of time, independent work requires computer support for the teacher of mathematics. Another problem lies in the objectivity of the control of the acquired knowledge by the students. In this article, as an example, the method of conducting independent work on the topic "Decomposition of a natural number into prime factors" is considered. Of course, we believe that before that the

subject teacher had already conducted, although he solved the examples with the student for two lessons.

For computer support of the teacher of mathematics, to facilitate the work of the teacher and to ensure the objectivity of the control of the knowledge gained by students, it is necessary to develop computer programs. Let us consider a method for developing such programs using the modern high-level programming language PascalABC.Net. We define one variable of type date and time:

```
var rv := DateTime.Now;
```

Using the trigonometric functions of this programming language, whose arguments are the date value and time of the computer's system date, we find an arbitrary real number. To do this, enter the following line in the program:

```
var adad: double := cos(rv.Minute+rv.Second) + cos(rv.Second+ rv.DayOfYear) -  

    sin(Milliseconds) - sin(rv.Millisecond) + cos(rv.Day);
```

The resulting number of adad is, in fact, a small number. To turn it into a large number, we rewrite the program line in a different way and add several other lines in the program text:

```
var adad: double := 195 * abs(cos(rv.Minute+rv.Second) + cos(rv.Second+ rv.DayOfYear) -  

    sin(Milliseconds) - sin(rv.Millisecond) + cos(rv.Day))+36;  

while adad>89 do adad:=adad/1.76;
```

In the same way, we define another other number, for example, ad:

```
var ad: double := 91*abs(sin(rv.Minute)+sin(rv.Second) + cos(rv.Second+ rv.DayOfYear) -  

    cos(Milliseconds) - cos(rv.Millisecond) + cos(rv.Day))+11; while ad>32 do ad:=ad/1.13;
```

Using these two numbers, we define one natural number:

```
var adad1 : integer := round(ad)*round(adad);
```

The number adad1 is offered to students for decomposition into prime factors. Note that the number adad1 obtained by this method always has prime factors, that is, it is not simple. The program developed by this method offers each student individual options for the number. Students cannot copy answers from each other! This will make it possible to increase the level of independence of students in solving problems in mathematics and computer science, and ensure the objectivity of monitoring students' knowledge. The student must do the work himself on his own, without the direct participation of a teacher or another person, which requires the student to have independent mental operations, independent orientation in the educational material.

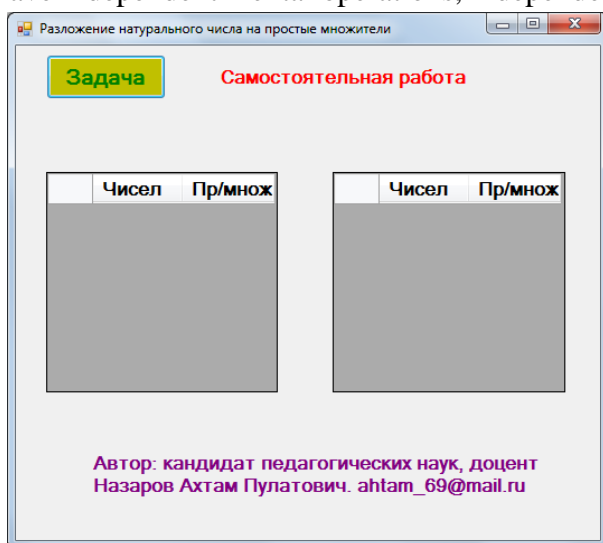


Figure 1.

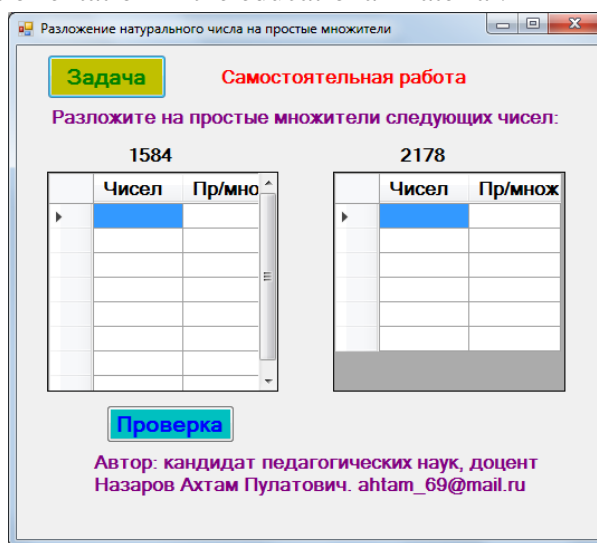


Figure 2.

The next step in developing a program by this method is the ability to input responses from students in the program. To do this, we will use the DataGridView tabular data control. It consists of two columns (columns). And the number of lines is equal to the number of prime factors of the proposed number, which is determined automatically by the program. The design of the visual form of the program after development is shown in Figure 1. From this figure it can be seen that the program for independent work offers the student two numbers. The numbers and conditions of the task appear after pressing the "Task" button (Figure 2).

After starting the program for execution (Figure 1) and pressing the "Task" button ("Задача"), the conditions of the task, numbers and a control element for entering answers from the student appear on the computer screen (Figure 2). Each student will write down his version in a notebook and solve problems in a notebook. The options are endless, and each time you press the Task button, different options appear. The student will enter the answers in the appropriate cells of the DataGridView control. From what date to start solving the problem, the student himself chooses. After the student has entered the answer, to check for correctness, press the "Check" button («Проверка»). The program checks the answer automatically if both the number and its prime factor are entered, that is, in the cells of one line. If both answers are correct, then the cells are filled with green, otherwise - red. Thus, the student can check the answers either step by step, or partially, or completely. That is, he entered only the answers in two cells of one line and pressed the "Check" button, or entered the answers of several lines and pressed the "Check" button, or entered the answers in all lines and pressed the "Check" button. The last cell of the second column is not available for input and editing. The program also gives students the opportunity to continue and correct mistakes if they made or did not solve correctly. To do this, you must click the "Continue" button («Продолжить»), which appears after clicking the "Check" button. The teacher, sitting at his workplace (from far away), observes by the colors of the fill in the cells who and how solves the problem of independent work. The teacher does not need to approach each student. This facilitates the work of the teacher, as well as the automatic verification of the entered answers. The teacher, at the end of the time allotted for independent work, will conclude how well the students have correctly mastered the topic and how many students have mastered it.

The developed program is very easy to implement and operate. It consists of only one program file and does not depend on any databases. On computers, the workplace is installed in a simple way - copy and paste. You can also use the local network and the Internet. With the network option, if during work, when the students launched the program, clicked on the "Task" button and perform certain tasks, the network connection accidentally disappears, then the students do not lose anything and continue to solve problems. Since the program has already been launched for execution and is located in the RAM of the computers of the students' workplaces. If they complete the option completely and get a green fill color in all cells, they will be able to click on the "Problem" button again to solve the next option. But if they close the program themselves, and then want to start the program again, then it will not open until the network connection is restored. In other words, in such situations, students have nothing to lose, since the described technology does not depend on any databases.

The above-mentioned method of carrying out independent and control work, developed by me, is known in the Republic of Tajikistan under the name "Pulat Method". With the application of the Pulat method, several programs have already been developed and implemented in the learning process. Copyright certificate received. They were published in works [1, 2, 3, 6, 8, 10]

and others, as well as in the previous conference [9]. This article is a logical continuation of these works. To get programs and moreover FREE OF CHARGE, you can go to donishju.net or contact my email address: ahtam_69@mail.ru.

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