

## THE ROLE OF MATHEMATICS IN THE WORK OF A MODERN PROGRAMMER

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### Introduction

One of the most popular questions asked by amateurs or people far from programming, and one of the biggest stereotypes of our time is whether a programmer needs mathematics. Undoubtedly, he does. The work of any programmer is closely connected with this science.

### The aim of the paper

To analyze the role of mathematics in the professional activity of a programmer of the XXI century.

### Objectives

1. To study the nature of mathematics;
2. To define the specificity of It-sphere;
3. To identify the connection of mathematics and the IT;
4. To provide readers with examples and research.

### The nature of mathematics

«Mathematics is the queen of all sciences»— this famous phrase belongs to the German scientist Karl Friedrich Gauss. This part of the paper is devoted to mathematics and its meaning for science.

This concept refers to formal science which studies various properties and the relationship between abstract objects such as numbers, geometric shapes and symbols. The word «mathematics» has ancient Greek roots; it means «knowledge» or «field of study».

To carry out its activities, mathematics uses the laws of logical reasoning and its own language. The whole mathematical foundation is based on axioms, from which theorems are already derived. A mathematical language is a collection of symbols and the relationships between them. With the help of it, you can reflect all the processes taking place in reality at a primitive level. Each mathematical symbol carries certain information that has a specific meaning, which distinguishes it from a word in a natural language [1].

### The role of IT in modern world

The sphere of information technology is a branch of the economy that, using modern achievements in the field of computer technology, the latest means of communication, collects, stores and transmits information. With the beginning of mass production of computers in the second half of the last century, the first IT specialists were ordinary engineers. However, with the rapid development of information technology in the 90s, a specialist was no longer able to cope with processing of large amounts of information, and there was also a lack of knowledge. All this was the impetus for the emergence of IT specialists. Currently, it is impossible to name any industry where IT specialists would not work, since the use of information technology makes life much easier for a person. Industry, agriculture, medicine can be just a small list of applications of information technologies [3].

### The connection of mathematics and the IT

Types of mathematics that can be useful in programming are:

- Discrete mathematics;
- Logic;
- Combinatorics;
- Theory of probability;
- Graph theory;
- Number theory and Cryptography;
- Discrete optimization.

Studying separate areas of mathematics will not make you a programmer in the broad sense of the word. However, for some spheres of programming, basic school knowledge in this area and self-education are quite enough.

Programming covers different areas - from web programming to the creation of neural networks. In order to write a program with a simple algorithm, it is not necessary to be an expert in mathematics. But mathematics helps a programmer think in the right direction and write the correct code. There are many applied tasks in coding where math is not needed.

For a simple task tester, there is no need to know mathematics, but without mathematics, it is difficult to do, in terms of more complex tasks, in particular.

For example, for a search engine, you need to write complex algorithms that help you find relevant answers to your query. This selection is given to the users, based on specific formulas [2].

### Examples and research

Yandex performed a survey among IT developers about programmer math knowledge.

The opinion in the survey was divided. Out of 15 respondents, 8 employees answered that mathematics must be known at a basic level, regardless of the field in programming, 7 answered that mathematics is not needed in some areas of programming [3].

### Conclusion

Answering the question whether a programmer needs mathematics, it is necessary to give the answer: «Yes». Whatever the programmer is and whatever he does, the more knowledge in the exact areas he knows, the better for him as a specialist. This science cannot be neglected and it certainly cannot be said that it will be enough to know only simple mathematical operations.

References

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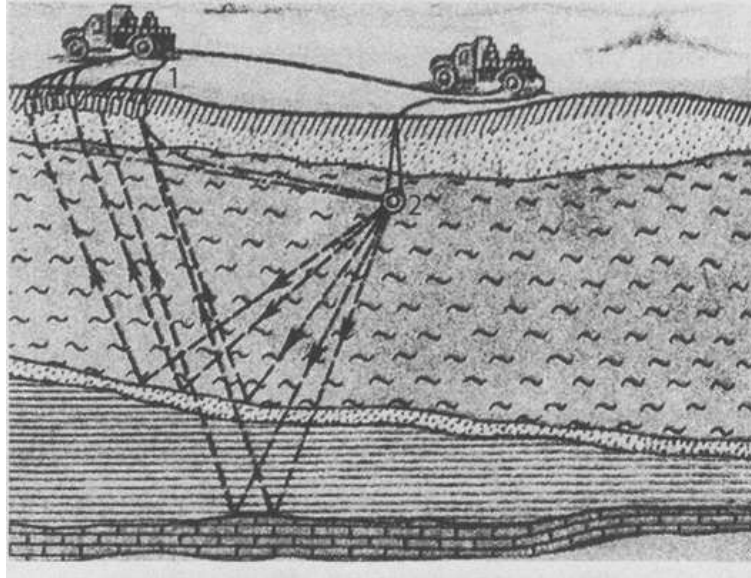
**PHYSICS AND GEOLOGY. SEISMOLOGICAL METHOD OF STUDYING THE EARTH'S CRUST**  
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How can physics help a geologist? Physics and geology seem to be sciences that are very far from each other, but if physics did not help geologists, many deposits of iron, oil, copper and other minerals would not be found. What the eye cannot see underground will be "seen" with the help of sophisticated geophysical instruments. To illustrate it, in this paper some global problems of geology that are closely related to physics are presented:

- The origin of the Earth and other planets;
- The structure and composition of various geospheres;
- Dating the age and stages of the Earth's development;
- The thermal history of the Earth;
- Development of the theory of rock destruction;
- Prediction of geodynamic processes (earthquakes, mountain impacts, sudden gas emissions, etc.).

The purpose of this paper is to present one of the methods of rock research in order to clearly illustrate how this science is closely related to geology. Seismic exploration is based on the study of the features of the propagation of Earth's crust elastic vibrations. Seismic waves are caused artificially. They spread in rocks at a speed of 2-8 km/sec - depending on the density of the rock.



*Fig. The scheme of seismic exploration.*

*1 - reception system; 2 - transmission system.*

If we take a look at the picture, we can see that the transmitting system (number 2) creates vibrations, and the receiving system (number 1) receives reflected waves.

At the interface between two media of different densities, part of the elastic vibrations is reflected back to the Earth's surface. The other part overcomes the interface, it is refracted and goes deep into the bowels to the new interface until they finally disappear. Reflected seismic waves reaching the Earth's surface are captured by special receivers and recorded on a special recording tool. Having deciphered the graph, seismic explorers establish the boundary of certain rocks occurrence. According to this data, maps of the underground relief are built.

Previously, explosions were most often used as a source of elastic vibration. Now they have been replaced with a seismic vibrator. It can be installed on trucks and explore a fairly large area in a short period of time. In addition, vibrators allow you to work in densely populated areas.

*From the point of view of physics*

When a blow is applied to a rock layer, there is not an impulse, but a long process of vibrational harmonic attenuation. In fact, if a harmonic attenuation process occurs as a result of the impact, it means that the object of the impact