THE IMPORTANT ROLE OF MATHEMATICS IN SOLVING PROBLEMS IN PHYSICS

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Abstract: This article is engaged in resolving the issues of the role and importance of mathematics in physics to learn. Mathematical methods, equations, graphics and technical computing solutions for the analysis and modeling of physical phenomena is an important tool that is shown. In the article the mathematical engaged in solving issues cited the example of to demonstrate the role of physical hardware.

Key words : Geometric progression, its properties and practical applications, Applications of GP in financial, biological, physical and technological fields, modeling various phenomena using GP.
After our country gained independence, our youth have achieved high results in various fields of sports and science in the world arenas, bringing honor to our country. Providing them with education at the level of world standards, strengthening the relationship between science and production, and helping them become qualified specialists in their field are the urgent tasks of today. We can clearly see this in the laws and resolutions on education that are being adopted. In particular, a lot of significant work is being done in the field of mathematics. As a vivid example, we can cite the Resolution of the President of the Republic of Uzbekistan No. PQ-4708 dated 07.05.2020 on measures to improve the quality of education and develop scientific research in the field of Mathematics and the Decree of the President of the Republic of Uzbekistan No. PF-5847 dated 08.10.2019 on approval of the Concept for the Development of the Higher Education System of the Republic of Uzbekistan until 2030.

The Law "On Education" provides for the implementation of a policy of further improving the education system, increasing the capacity of quality educational services, and training highly qualified personnel based on the modern needs of the labor market; implementation of targeted measures to strengthen the material and technical base of educational institutions by constructing, reconstructing and overhauling them, equipping them with modern educational and laboratory equipment, computer equipment and teaching aids;

Important tasks have been set to stimulate scientific research and innovation activities, create effective mechanisms for implementing scientific and innovative achievements in practice, and establish specialized scientific research and experimental laboratories, high-tech centers, and technoparks at universities and research institutes.

Today, geometric progression is widely used in modeling various processes. A geometric progression is a sequence of numbers in which each term is the result of multiplying the previous term by the same number. This concept is widely used not only in mathematics, but also in everyday life. The basic formulas and properties of GP play an important role in various fields, including calculating interest in finance, modeling bacterial growth in biology, analyzing radioactive decay in physics, and predicting the growth of computer memory in technology. Therefore, it is important to study the application of GP in life. A geometric progression (GP), also known as a geometric sequence, is a sequence of numbers where each term after the first is found by multiplying the previous term by a fixed, non-zero number called the *common ratio*.

If the first term is denoted by *a* and the common ratio by *r*, then the general form of a geometric progression is:

$a, ar, ar^2, ar^3, ar^4, \ldots$

Where:

- a = the first term
- r = the common ratio
- n = the position of the term in the sequence

Key Formulas:

1. The n-th term formula:

$a_n = a * r^{(n-1)}$

Where:

- a_n = the n-th term of the sequence
- a = the first term
- r = the common ratio
- n = the term number

Geometric progression (GP) is a mathematical concept widely used in various fields. Its main feature is that the ratio of each subsequent term to the previous term is constant, which allows you to model exponential growth or decrease. The study aims to identify how GP is used in various fields to model and solve problems. Examples and case studies from finance, population studies, engineering, and transportation are considered. Each case is analyzed to demonstrate the practical implementation of arithmetic progressions, emphasizing the consistent use of the formula to model processes involving the same variables. The study also includes the application of the GP formula to real-world numerical examples.

One of the most common applications of geometric progressions is in financial calculations, particularly in savings plans and installment payments.

Finance: Geometric progression plays an important role in financial calculations, especially in calculating compound interest. The growth of bank deposits, loans, and investments is based on the laws of GP. At the end of each period, interest is added to the principal amount, resulting in more interest being accrued in the next period. Annuities and debt repayment schedules are also analyzed using GP.

Biology: In biology, GP is used to model the growth of populations. The reproduction of bacteria, viruses, and other organisms often occurs in the form of a geometric progression, in which each generation increases exponentially over a certain period of time. This model shows the potential growth of a population without taking into account limited resources and other factors.

Physics: In physics, GP is used to analyze radioactive decay. Since the half-life of radioactive substances is constant, the amount of substance decreases in a geometric progression over time. In addition, the attenuation of vibrations and waves can also be modeled with GP in some cases.

Computer technology: In the field of computing, GP is used to analyze the efficiency of algorithms, especially those that work in the “divide and conquer” method. The growth of memory capacity, data transfer speed, and computer performance can also sometimes be modeled using GP.

Economics: In economics, GP is used to model economic growth, inflation, and asset obsolescence. A gross domestic product (GDP) that increases by a certain percentage each year or an asset value that decreases by a certain percentage can be expressed as a geometric progression.

Everyday life: GP is also found in everyday life. For example, according to legend, the multiplication of grains of wheat on a chessboard, pyramid schemes (financial fraud), and chain reactions can develop according to the laws of GP.
In each of these areas, geometric progressions serve as a useful tool for understanding phenomena, predicting events, and making decisions.
Geometric progression plays an important role in various areas of life, but its application is often limited to simplified models. In real life, many factors can stop or change geometric growth. For example, population growth can slow down due to limited resources, and financial investments can change depending on market conditions. Nevertheless, the basic concepts of GP serve as a useful tool for understanding and predicting various phenomena.

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Conclusion
As a mathematical concept, geometric progression is widely used in various areas of life. GP plays an important role in calculating interest in finance, modeling the reproduction of organisms in biology, analyzing radioactive decay in physics, and predicting the growth of data in technology. Understanding the practical significance of GP helps in solving problems and making decisions in various fields. In the future, it is advisable to conduct research on creating more complex models of GP and applying them to real-life situations.
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