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ROLE OF MATH KNOWLEDGE IN THE PROCESS OF LABORATORY WORKS IN PHYSICS

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Abstract:

This article gives information about role of mathematical knowledge in conducting laboratory works in phyusics.

Key words: phyusic eksperiment, facultative lesson, demonstration eksperiment, physical quantity, function.

Introduction

Physical experiments in the form of lab sessions are often preferred over demonstration experiments in optional classes. The main advantages of the physical experiment are the students' independence and activity level, their ability to work with physical devices, the development of observations and measurements, and the observations of their individual plans and rates or the possibility of experimentation.

Laboratory practice plays an important role in the study of physics. Physical laws are defined and tested through experiment. Pupils study the basic physical phenomenas in the physical laboratories and learn the methods of their analysis.

In the laboratory, a physical experiment is performed to study the effects on a particular event. In order to fully understand the properties of the objects and the nature of the event, it is necessary to add specific physical quantities that characterize these features and measuere the various qualitative aspects by using them. It is then reflected by the relationship between the different properties of the event. Physical size is a quantitative description of quality. Any process can be mathematically expressed by using physical measure. This is why monitoring physical processes and measuring different physical sizes are of particular importance.

In the modern physics course it is common to use a number of concepts (point coordinates, vectors, etc.), terms (e.g., magnitude, value of measures, and other terms). Typically, advanced mathematical knowledge is used in the study of physics. The calculation of errors in laboratory is mainly done by mathematical methods. The concept of derivation is purely mathematical from the point of view of continuous functions only, in the field of functional continuity. In physics, optional physical measure can be considered as a function of one or more dimensions. For example, the way a body travels is a function of time, to clarify, the way of a moving object depends on the time of motion. This connection is written in the form $S = S(t)$ in an invisible form. In addition, speed and acceleration can be recorded

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as a function of time $v = v(t)$ and $a = a(t)$. Some physical quantities can be expressed as a function of coordinates, including also velocity and acceleration. The simplest example of such measures is the density of body. If we set the vertical axis of the coordinate system to the surface of the Earth by z, this connection will be written $\rho = \rho(z)$ as if it is functional. Depending on the size of the particles, it is determined by the general function $\rho = \rho(x, y, z)$

Now let us look at the meaning of the concept of derivation in physical examples by using the concept of density. According to the definition, the average density of a body is numerically equal to its mass per unit of volume $\rho = \frac{\Delta m}{\Delta V}$. From a mathematical point of view, the density of a body at a given point must be defined by the formula $\rho = \lim \frac{\Delta m}{\Delta V} = \frac{dm}{dV}$, that is, the mass derived from the mass of the body. If the ratio of the arbitrary magnitude $f(y)$ and the finite magnitude of the argument y to Δf Δy are sufficiently precise to represent the derivative, physicists call Δf and Δy measures as infinitely quantities.

As you know, the notion of differential has infinitely small incremental content. Since there is no infinitely small difference in the mathematical content of physical quantities, it is impossible to speak about their differentials in the mathematical content. But, physics also uses symbols and expressions like Δf and Δy that can be regarded as infinitely small in physical terms. Similarly, the argument for the proportions of functions and arguments that represent physical quantities are used as a derivation $f' = \frac{df}{dy}$, which are small enough to be a derivative in physics, since the threshold is zero in almost all cases. This is then used as a formula $\frac{df}{dy} = \lim_{\Delta y \to 0} \frac{df}{dy}$ for physical quantities

As the concepts of derivatives used in mathematics and physics differ in meaning, the concept of integral has different meanings in both cases. In mathematics, it is defined as the transition $\lim_{\Delta y \to 0} \sum_{i=0}^{\infty} f(y)\Delta y$ to an integral limit,to clarify $\lim_{\Delta y \to 0} \sum_{i=0}^{\infty} f(y)\Delta y = \int_a^b f(y)dy$

But physics cannot determine the magnitude $\Delta y \to 0$. In addition, the value $f(y)$ may not exist at all. For this reason, the physical limit $f(y)$ does not exist in many cases.

If the sum Δy is small enough, but the average value of the function $f(y)$ between these values of the argument is large enough, then $\sum_{i=0}^{\infty} f(y)\Delta y$ the sum will have some physical value. Therefore, physics is defined not as a sum of integral sums, but as a sum of many compounds that are small enough, that is

$$\int_a^b f(y)dy = \sum_{i=0}^{\infty} f(y)\Delta y$$

Specifically, if a function $f(y)$ represents a time-dependent velocity, then it becomes $f(y)=v(t)$, a function is represented by a time-traveling path $\Delta S=\upsilon\Delta t$.

Integration in physics is also used to calculate the mean values of physical quantities. Indeed, the average velocity is calculated by the formula $\upsilon_y=\dfrac{S}{t_2-t_1}$. However, if we write the expression of S with integral, then this formula will appear $\upsilon_y=\dfrac{S}{t_2-t_1}\int_{t_1}^{t_2}\upsilon(t)dt$

Thus, the forms of formulas do not change, but their content varies substantially while applying mathematical operations to physics. Such changes are naturally occurring in the nature of physical laws and phenomena to make the physical problem more comfortable.

In the following, we will determine the properties and complexes of the mathematical knowledge contained in the physical laboratory experiment as an example of a laboratory work called "Determination of gravity acceleration by using a mathematical oscillator."

In this laboratory, the functions of the mathematical analysis of the mathematical vibration equation, the derivation of functions of the course of mathematical analysis, the derivation of exact integers and the second order differentiation are used. The least squares method can be used to process the experimental results.

In this lab, the acceleration of gravity is defined by using a formula $T=2\pi\sqrt{\dfrac{\ell}{g}}$. To minimize the error, the calculation is performed by using the least squares method. From the above formula, we can say that $T^2=\dfrac{4\pi^2}{g}\ell$, the angle here is equal to $\dfrac{4\pi^2}{g}$, $\ell=\ell^1+\ell_0-r$, if we take $\ell^1-r=\ell$, then it appears as $T^2=\dfrac{4\pi^2}{g}\ell+\dfrac{4\pi^2}{g}\ell_0$. Measuring the length of the oscillator, ℓ^1 and r are constant, ℓ^1 does not change. Connection T^2 to ℓ_0 is represented by the angle $\dfrac{4\pi^2}{g}$ and a straight line crossing y-axis . If we state on the above equation $T^2=y$, $\ell_0=x$, $T^2=y$, $\ell_0=x$, then It appears as $y=a+bx$.

In this graph, a straight line is formed by plotting and connecting the points of T^2 to the one ℓ_0 found by the least squares method. This line represents the smallest line, which is the smallest deviation from the points on which the experiment results.

In physical education, the laboratory plays an important role in determining mathematical knowledge, including concepts, sizes, formulas and regularities, as well as in assessing students' knowledge and improving the effectiveness of learning.

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