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IMPROVING THE SOLUTION OF NON-STANDARD PROBLEMS IN SCHOOL PHYSICS LESSONS

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ABSTRACT
The article reveals methods for developing students' physical knowledge by solving non-standard problems in teaching physics and how to implement them.

KEY WORDS. *Logical thinking, creative skills, training, development, method, technique, physical activity, physical process.*

INTRODUCTION

It is planned to create conditions for the implementation of the paradigm in modern general secondary schools, which in many respects are ready for the formation of subjects, their individual characteristics and self-development in accordance with personal experience. At the same time, given the current system of school education, including the lack of attention to non-standard issues in general secondary school textbooks, we will try to propose to improve the level of knowledge of students by strengthening this method.

To do this, the formation and development of the subject of educational activity takes place in the process of its implementation: the need for this activity creates a desire to learn, and the essence of educational activity forms the ability to learn. The desire and ability to learn characterizes the topic of the learning activity.

THE MAIN RESULTS AND FINDINGS

In the process of solving problems in physics, students' logical thinking expands, their creative abilities develop. They have a broader understanding of

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the essence of physical phenomena, a deeper understanding of the practical application of the laws of physics. Get acquainted with the function, structure, principles of operation of many physical measuring instruments, have the skills and abilities to work with them. The issues also instill in students diligence, courage, will and character. By analyzing the literature on many problem-solving methods and based on experience, there are general aspects of problem-solving for all sections of the physics course and specific aspects of problem-solving methods for each major topic. The following is a brief overview of the general aspects of problem-solving techniques in physics:

1. It is known that in the content of each physical problem lies a special view of the phenomena and laws of physics. Therefore, in order to solve a simple or complex problem of any branch of physics, it is necessary to study in depth the theory that applies to it. It is impossible to solve a problem without knowing the theoretical conclusions, the formulas that represent the actions.

2. There are a few solutions to the issue carefully read and understand the contents of the study. As soon as you read the terms of the problem, you should not focus on the size you are looking for and try to find it quickly. On the contrary, for example, reflect the physical phenomenon and understand this situation need to remember the underlying physical laws and formulas. If it is necessary to find a physical quantity, as well as to calculate the chain or to create an image, it is necessary to determine what quantities and conditions are given in the problem. The details of the case shall be recorded in the order given in its terms. If the quantities in the problem are given in the system of different units, they must be reduced to the SI system.

3. If there is a drawing or chain in the case, they should be carefully studied and copied correctly. If the subject matter design or not, the chain

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according to the physical condition of the process to envision, and reflecting the full contents of the issue should have drawn or chain.

Problem 1 (problem for 7th grade). The object was thrown from the tower in a horizontal direction at a speed of 15 m / s. Determine the radius of curvature of the trajectory of the body 2 s after the start of the motion. Ignore weather resistance.

Solution: Based on the above recommendations to the reader, we will create a problem-solving model as follows.

Given :

$\vartheta_0 = 15 m/s$

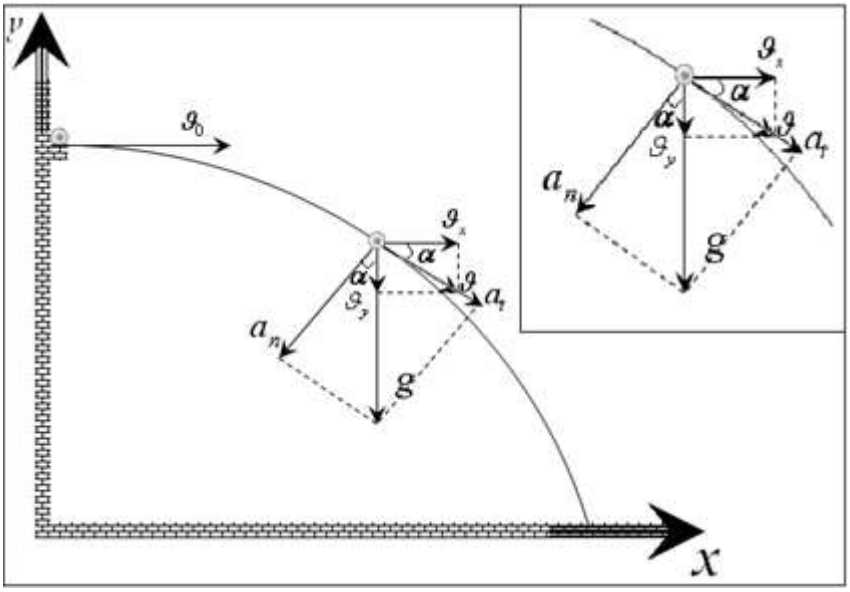
$t = 2s$

R=?

The x and y components of the instantaneous velocity of a body:

$$\begin{cases} \vartheta_x = \vartheta_0 \\ \vartheta_y = gt \end{cases}$$

So, depending on the problem, the student will need to explain the diagram in Figure 1 below.



1- picture

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The diagram describes the situation at time t = 2s. According to it:

$$\begin{cases} \cos\alpha = \dfrac{a_n}{g} \\ \cos\alpha = \dfrac{\vartheta_x}{\vartheta} \end{cases} => \frac{a_n}{g} = \frac{\vartheta_x}{\vartheta} => \frac{a_n}{g} = \frac{\vartheta_0}{\vartheta} \quad (1)$$

To solve the problem, you need to use the following formulas to solve the problem.

Here: a_n - acceleration of aspiration to the center $a_n = \dfrac{\vartheta^2}{R}$ (2)

ϑ - the instantaneous speed of the object $\vartheta = \sqrt{\vartheta_x^2 + \vartheta_y^2} = \sqrt{\vartheta_0^2 + (gt)^2}$ (3)

We express (1) by (2): $\dfrac{\frac{\vartheta^2}{R}}{g} = \dfrac{\vartheta_0}{\vartheta}$ => $R = \dfrac{\vartheta^3}{\vartheta_0 g}$

(3) considered: $R = \dfrac{(\sqrt{\vartheta_0^2 + (gt)^2})^3}{\vartheta_0 g}$

Calculation: $R = \dfrac{(\sqrt{15^2 + (9{,}81 \cdot 2)^2})^3}{15 \cdot 9{,}81} \approx 104m$

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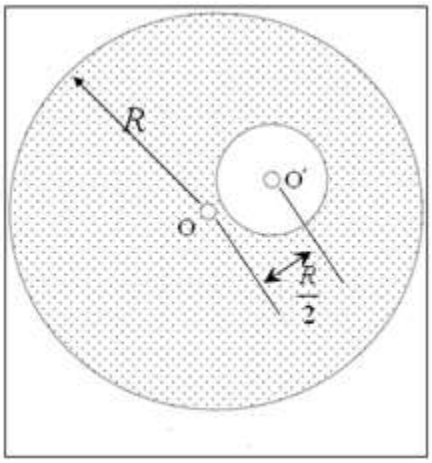

Figure 2

answer: $R = \frac{(\sqrt{\vartheta_0^2 + (gt)^2})^3}{\vartheta_0 g} \approx 104m$

2 - (7-designed class issue). In a smooth horizontal plane lies a pallet of mass M. The pallet can move in this plane without friction. A body of mass m is placed on the pallet. The coefficient of friction between the pallet and the body is k. How is the power pallet horizontal direction F slides on the value of the object palette? If the length of the pallet is l, how long will it take for the body to fall off the pallet?

To solve the problem, *we encourage students to solve this problem using the methods we have suggested above.*

Given : M, m k, *l*	The equations of motion of a board and a body are as follows: $ma = f$ (1)
F=? t=?	$Mb = F - f$ (2)

In this case - the friction force, a and b -

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accelerations.

No friction as one, then a = b. The acceleration and friction force of the equation of motion can be determined.

Friction force: is equal to $f = m\frac{F}{M+m}$.

In order to avoid friction and friction force $f \le kmg$, that is $\frac{F}{M+m} \le kg$ must satisfy the inequality.

if $F > k(M+m)g$ sliding friction occurs. In this case, equations (1) and (2) take the form From these equations we find a and b:

$$\begin{cases} a = kg \\ b = \dfrac{F - kmg}{M} \end{cases}$$

From this $b>a$ turns out that

The acceleration of an object relative to a board is opposite to the direction of motion.

in terms of size $\frac{F - kmg}{M} - kg$ is equal..

Time of body movement on the board: $t = \sqrt{\frac{2lM}{F - kg(M+m)}}$

Answer: $F > k(M+m)g$, $t = \sqrt{\frac{2lM}{F - kg(M+m)}}$

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To achieve the goal you need to perform the following tasks:

- Analysis of educational activities, describing the purpose, composition, content, conditions of formation and development of educational subjects.
- Summarize information on the development of ideas about the role of tasks in school physics education; to determine the level of development in didactics and methods of applying non-standard physical problems in the formation of the topic of educational activities in the lower grades of school.
- The formation of criteria for assessing the quality of non-standard physics problems and the identification of their methodological capabilities are used as a means of educating the characteristics of the personality of a general secondary school student, which characterizes the subject of study.
- Preparation of a set of non-standard physics problems for general secondary school and the development of guidelines for teachers describing the methods of working with exercises of the specified genre.
- Conduct an experimental test of the effectiveness of the proposed teaching methodology.

CONCLUSION

In conclusion, it is difficult for students to have a broad understanding of physical processes in solving simple physical problems. In solving a non-standard problem, one not only understands the physical content of the problem but also helps to develop the ability to think logically.

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