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SOLVING KINEMATICS PROBLEMS

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ABSTRACT
In this article, two problems related to the "kinematics" section of physics are solved, and one problem is given as a task for independent solution.

Key words: knowledge, time, distance, speed, acceleration, height, point, vertical, horizontal, movement, height of rise.

INTRODUCTION, METHODS, RESULTS AND DISCUSSION

Students' acquisition of theoretical knowledge of physics and their ability to apply it in practical exercises is one of the factors that improve the quality of training of physics teachers for general education schools. Problem solving helps develop practical skills. Skills acquired in solving the following problems will be useful for future pedagogical activities of students.

Issue 1. The body jumped straight up. Prove that the initial speed gi of the body when it jumps up is equal to the final speed when it falls down, and the time it takes to go up is equal to the time it takes to come down. Ignore air resistance.

Solving. The surface of the earth from which the object is thrown y is chosen to be the positive direction of the object's axis. We enter designations: t_1 – ascent time, t_2 -descent time, v_0 -initial velocity v_{oxir} when the horse is standing up, -final velocity h during descent, -height of ascent.

Now we express the condition of the problem mathematically.

The object is flying up. This is the law of motion of a body

$$y = v_0 t - \frac{g \cdot t^2}{2}$$

in form be expressed means that in this y- vertical shot of the body speed time pass with

$$v = v_0 - g \cdot t$$

t varies depending on the meaning.

The body reaches the highest point of elevation. Both $t - t_1$ to the equation the value let's put As a result,

$$\begin{cases} h = v_0 \cdot t_1 - \dfrac{g \cdot t_1^2}{2} \\ v = g \cdot t_1 \end{cases} \quad (1)$$

the system of equations is derived, because h the speed of the object at the highest point of the ascent v_0 is equal to

Then the body h starts to fall down from height - this is the equation of motion

$$y = h - \frac{g \cdot t^2}{2}, \quad v = g \cdot t$$

will have the appearance.

Body husband to the surface reached arrived: $y = 0, \quad t = t_2$; therefore,

$$\begin{cases} h = \dfrac{g \cdot t_2^2}{2} \\ v_{oxir} = g \cdot t_2 \end{cases} \quad (2)$$

Thus, the sequential expression of the meaning of the problem in mathematical language showed us the right way to solve the problem. In fact, from the system (1), v_0 the speed h can be expressed by and. g

$$v_0 = \sqrt{2 \cdot g \cdot h}$$

From the system (2), v_{oxir} it is very easy to express the value of -velocity through its quantities.

$$v_{oxir} = \sqrt{2 \cdot g \cdot h}$$

If the right sides of the equations are equal, then their left sides are also equal, i.e

$$v_0 = v_{oxir}.$$

Now $t_1 = t_2$ the system of equations (1) and (2) written for the equality of times and for the last ones is automatically derived.

The indicated method is often used in solving problems, in particular, in solving problems related to plane variable motions.

Issue 2 . Two bodies are successively thrown vertically upwards from the same point and with the same initial speed with an interval of t = 0.5 s. $v_0 = 24{,}5\frac{m}{s}$ How much time and at what height will they meet each other after the first object is launched?

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Given:	Solving.
$v_0 = 24.5$ m/s $t = 0.5$ s $g = 9.8$ m/s^2 t – ? h – ?	**Solving.** We count the time from the moment the first object is thrown. Let the h- axis be directed vertically upwards. In that case, v_0 should be considered positive, and g should be considered negative. the height of the rise of the first object at time t $$h_1 = v_0 \cdot t - \frac{g \cdot t^2}{2}.$$

The rise height of the second body is also expressed by a similar formula, but for the same instant of time, since it was thrown t c later

$$h_2 = v_0(t-\tau) - \frac{g(t-\tau)^2}{2}.$$

When the rise heights are equal, that is:

$$h_1 = h_2 = h$$

bodies meet each other . Therefore

$$v_0 \cdot t - \frac{g \cdot t^2}{2} - v_0 \cdot t - v_0 \cdot \tau - \frac{g \cdot t^2}{2} - \frac{g \cdot \tau^2}{2} + g \cdot t \cdot \tau \text{ being}$$

from this

$$t = \frac{v_0}{g} + \frac{\tau}{2};$$

$$h = v_0\left(\frac{v_0}{g} + \frac{\tau}{2}\right) - \frac{g \cdot \left(\frac{v_0}{g} + \frac{\tau}{2}\right)^2}{2} = \frac{v_0^2}{2g} - \frac{g \cdot \tau^2}{8}.$$

A task to solve independently

Issue 3. A body, with constant acceleration, successively traverses two identical path sections, each equal to s. If the body t_1 traverses the first cross section a at time t 2 and the second cross section at time t_2, the acceleration of the body is n and the velocity at the beginning of the first cross section Find v_0 .

Answers:

$$\begin{cases} a = \dfrac{2 \cdot s \cdot (t_1 - t_2)}{t_1 \cdot t_2 (t_1 + t_2)}; \\ v_0 = \dfrac{s}{t_1 \cdot t_2} \dfrac{t_2^2 + 2t_1t_2 - t_1^2}{t_1 + t_2}. \end{cases}$$

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