SOLVING DYNAMICS ISSUES

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ABSTRACT
In this article, two problems related to dynamics are solved, and it is stated that one problem is given as a task for independent solution.

Keywords: mass, acceleration, force, force of reaction, force of gravity, force of tension, acceleration of free fall.

INTRODUCTION, METHODS, RESULTS AND DISCUSSION

When solving a problem, the necessary formula, that is, to search for a pattern through understanding, to try to determine the purpose of the information in the problem, to look at the given problem from all sides, to be able to connect it with the laws of nature and other approach issues should be contrasted.

The first and most difficult stage of solving the problem is to express the physical essence of the given phenomenon in the most general way using the appropriate equations and formulas. The mathematical expression of the physical meaning of the problems should be clear and the most convenient.

Issue 1. An object with mass m is lying on the floor of an elevator. If the elevator accelerates: 1) upward straight acceleration and straight deceleration; 2) What force does the object exert on the floor of the elevator if it moves downward with uniform acceleration and uniform deceleration?

Solving . Elevator and we look at the body in it in the coordinate system connected to the earth's surface. We consider a downward trend positive.

In any of the above cases, the body $P = m \cdot g$ is affected by the force of gravity and the reaction force of the support (pressure force of the floor). R The pressure force of the object on the floor of the elevator R is equal to

1. The elevator is moving towards the snow. of the body to the top accelerative movement $mg - R = -ma$ formula with it is proved that $R = ma + mg$.

It was possible to see (know) the result obtained in advance.

resulting in a larger total compressive force. $ma + mg$

Accelerated upward motion of the body

$mg - R = ma$

is expressed by the formula, in which

$R = mg - ma$

will be

We explain the obtained result qualitatively. The elevator slows down, but the object lying in it tries to maintain its speed, while the floor slows down the movement of the objects and the object presses on the floor with less force. More precisely, the pressure on the floor decreases due to the manifestation of the induction property: the body does not accept the given acceleration at once, but gradually, trying to keep its speed unchanged at every moment of time.

2. The elevator is moving down.

The coordinate system is still related to the Earth's surface: Down is considered positive. The equation of motion of the body for the downward plane acceleration property is written in the following form

$mg - R = ma$

in this

$R = mg - ma$

will be

The obtained result is explained qualitatively, as before, by the manifestation of the property of inertia.

Two special points: g downward movement with acceleration (the elevator falls freely) and g greater than, for example, $2 \cdot g$ downward movement with acceleration i deserve special attention.

$a = g$ when there is a base reaction force $R = 0$, i.e., the bodies do not press on the base or do not stretch the suspension rope, and in the elevator there is a weightless state, just like when the satellite of the earth is orbiting outside the earth's atmosphere. In this regard, the state of weightlessness can be called the undeformed state of the body.

$a = 2 \cdot g$ the places of the floor and the ceiling in the elevator change, because now all objects mg are pressed against the ceiling with force. People would be able to walk and move around in such an elevator with their heads down compared to people on the stairs.

The downward planar acceleration motion $mg - R = -ma$ is written in the form of the equation where, that is $R = ma + mg$, the case of the upward acceleration motion of the elevator is similar.

Issue 2. A horizontal axis passing through the center of the stern, on which it can rotate. Loads of mass m_1 = 2 kg and m_2 = 8 kg are attached to the ends of the boom. a) What is the pressure exerted on the axle at the initial moment when the steering wheel is horizontal and is not pushed?

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Disregarding the mass of the stern and the friction on the axle, and considering the loads as material points; b) solving the problem for the case where the arrow does not pass through the middle of the boom, but passes through a distance equal to 1/3 of its length (calculated from the side of the small mass load).

Given:
$m_1 = 2$ kg
$m_2 = 8$ kg
$l_1 = \frac{1}{3} l_2$

Solving. a) the force exerted by the axle on the steering wheel and, according to Newton's third law, which is numerically F equal to the compressive force on the axle, can be replaced by two forces F' applied to each load and $\frac{F}{2}$ equal to

Sturgeon weightless that account received without, Newton's second the law using the following to write can:

$$m_1 a = \frac{F}{2} - m_1 g, \qquad m_2 a = m_2 g - \frac{F}{2},$$

from this

$$F = \frac{4 \cdot m_1 \cdot m_2}{m_1 + m_2} g$$

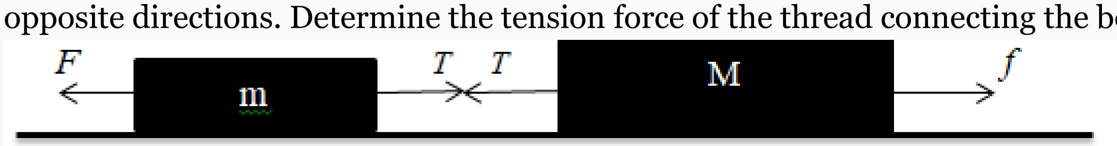
b) it is necessary to replace F' the forces m_1 and forces $F_2 = \frac{2}{3} F$ placed in accordance with the forces $F_1 = \frac{2}{3} F$ and loads m_2. The acceleration of loads is related to the following relation.

$$\frac{a_1}{l_1} = \frac{a_2}{l_2}, \text{ that is } a_1 = \frac{a_2}{2}.$$

Answers: a) $F \approx 64\, N$; b). $F = \frac{9 \cdot m_1 \cdot m_2}{3 \cdot m_2 + m_1} = 42{,}3\, N.$

A task to solve independently.

Issue 3. On a smooth table lie two objects connected by a string. Masses of bodies m and M ($M > m$). A force is applied to a body with a small mass F, and f a force ($F > f$) is applied to a body with a large mass. F and f the forces are directed in opposite directions. Determine the tension force of the thread connecting the bodies.



Answer: $T = \frac{m \cdot f + M \cdot F}{m + M}$.

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