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USE OF COORDINATE AXES IN SOLVING PROBLEMS OF SOME TYPES OF STATIC PROBLEMS

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Abstract
In this article, the equilibrium conditions of objects are studied. It is known the method of solving type problems is explained with using coordinate axes.

Key words: rod that can move freely around the base, loads of mass m_1 and m_2, coordinates, length, negative moment, positive moment.

We may face various difficulties in solving static problems. To overcome the difficulties let's look at a common way to solve problems on same types.

Issue 1. Loads with a mass of m_1 and m_2 are hung on the weightless rod ends that can move freely l long around the base as shown in the figure below. What are the distances from the base to the loads so that the loads are in balance ? (m_1>m_2).

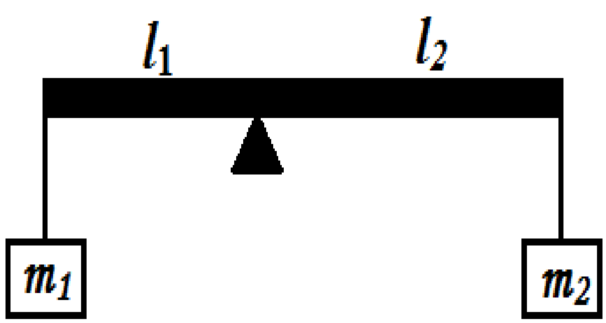

Figure 1

We use coordinate axes to solve this problem. We draw an OX coordinate axis along the axis and set the distance from the origin to the stem as an arbitrary x_o. We determine the direction of all the forces in the system.

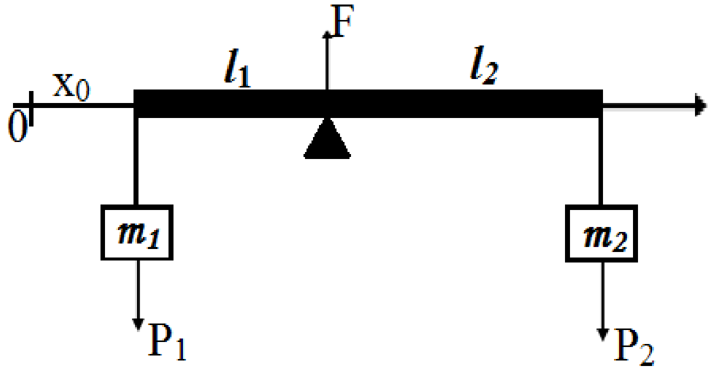

Figure 2

Assuming that the axis of rotation is the coordinate head, we assume that the base is absent. The forces P_1 and P_2 that move the system clockwise are the reaction of the base force F, which moves it counterclockwise, as a force it is equal to P_1+P_2.

We determine the moments of the driving forces in the direction of the clockwise direction and in the opposite direction to it.

$$M_1 = P_1 x_0 + P_2(x_0 + l_1 + l_2) \quad (1)$$

$$M_2 = F(x_0 + l_1) \quad (2)$$

Positive and negative moments for the system to be in equilibrium we equal

$$P_1 x_0 + P_2(x_0 + l_1 + l_2) = F(x_0 + l_1) \quad (3)$$

Here we can put an arbitrary number instead of x_0 , we put a zero to simplify the problem. In this case, expression (3) looks like this:

$$P_2(l_1 + l_2) = Fl_1 \quad (4)$$

Given that $l_1 + l_2 = l$, $P_1+P_2 = F$, we find l_1 va l_2

$$P_2 l = Fl_1 , \qquad l_1 = \frac{P_2 l}{F}, \qquad l_2 = l - \frac{P_2 l}{F}, \quad (5)$$

Issue 2. M is a wheelchair of mass l length of bridge piers l_1 and l_2 at a distance. Determine pressure forces on the bridge supports of the trolley. ($l_1 > l_2$).

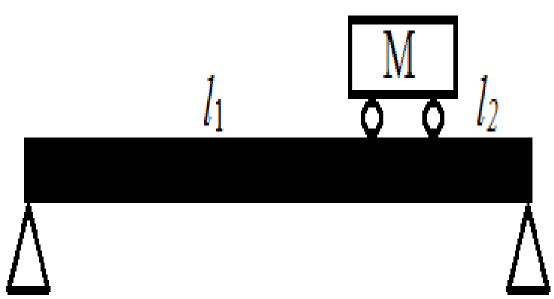

Figure 3

In solving this problem we also pass the OX axis along the bridge and we define all the forces in the system

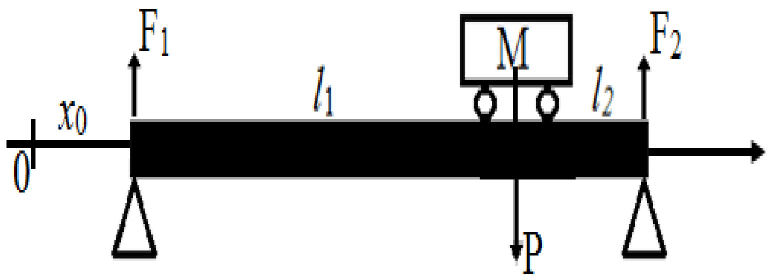

Figure 4

As the axis of rotation define the coordinate head. In that case the clock hand torque M_1 in the direction and opposite to it, we determine the moment of inertia M_2.

$$M_1 = P(x_0 + l_1) \quad (6)$$

$$M_2 = F_1 x_0 + F_2(x_0 + l_1 + l_2) \quad (7)$$

We equate the moments $M_1$and M_2 and take x_0=0

$$Pl_1 = F_2(l_1 + l_2) \quad (8)$$

Here we find F_2

$$F_2 = \frac{Pl_1}{l_1+l_2} \quad (9)$$

Now we determine F_1 given that $F_1+F_2 = P$

$$F_1 = \frac{Pl_2}{l_1+l_2} \quad (10)$$

Issue 3. A rod with an unknown mass and a system of loads suspended from it are located as shown in the figure. If the system is in equilibrium, determine the mass of the stem.

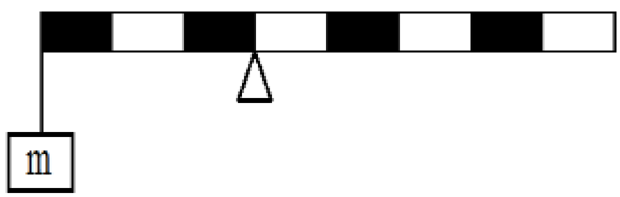

Figure 5

In this case we also hold the OX coordinate axis and define the forces directions.

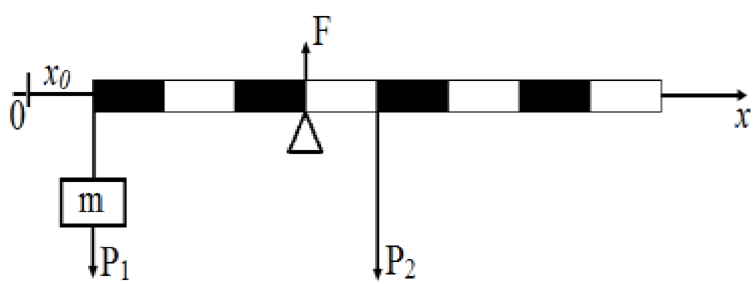

Figure 6

Here the x_0 coordinate was from the beginning to the left end of the stem arbitrary distance , gravity of a body of mass P_1- m, weight of rod P_2 and F is the sum of the forces $P_1$and P_2. Find the moments of positive and negative force with respect to the coordinate head.

$$M_1 = P_1 x_0 + P_2(x_0 + l_2) \quad (11)$$
$$M_2 = F(x_0 + l_1) \quad (12)$$

Here the distance from the left end of the isthmus to the force P_2, l, is the distance from the left end of the rod to the force F, and x_0 is an arbitrary number since it zero, we equate the moments and derive the formula for finding the mass of the stem.

$$P_2 l_2 = F l_1 \quad (13)$$
$$P_2 l_2 = (P_1 + P_2) l_1 \quad (14)$$

Given that $P_2 = m_2 g$ the mass of the stem is derived.

$$m_2 = \frac{l_1}{l_2 - l_1} m_1 \quad (15)$$

In general,solving arbitrary problems of this type using coordinate axes makes the problems look simple and does not cause difficulties for the learner.

Bibliography:

1. M. Usmonov. Fizikadan savol va masalalar toʻplami. - «Navroʻz» Toshkent – 2016.
2. A. G. Gʻaniyev, A. K. Avliyoqulov, G. A. Almardonova “ Fizika 1-qism. Akademik litsey va kasb hunar kollejlari uchun darslik” Toshkent – 2008.
3. A. P. Rimkevich “Fizikadan masalalar toʻplami. Oʻrta maktabning 8-10 sinflari uchun” Toshkent – 1987.