

Module 04

Forces and Newtons Laws

QUESTIONS

Question 1 (LV1): A mother pushes a stroller on a frictionless surface. Are there any forces acting on the stroller? Qualitatively describe what happens to the stroller as a result of the forces acting on it.

Question 2 (LV2): A 2-kg book is attached to a vertical spring with a spring constant of 200 N/m. Find the vertical stretch of the spring.

Question 3 (LV3): A rightward force is applied to a book in order to move it across a desk with a rightward acceleration. Draw a free-body diagram for this situation, including friction forces but ignoring air resistance.

Question 4 (LV4): A 10-kg bag of sand is supported by 4 separate vertical ropes. What is the magnitude of the tension force on each rope?

Question 5 (LV5): The maximum forward acceleration of a loaded truck is 4 m/s^2 . After unloading the truck's cargo, its mass is halved. What is the maximum acceleration of the unloaded truck when affected by the original driving force?

PROBLEMS

Problem 1 (LV3, LV5): A student pushes a 75-kg sled for a distance of 2.5 m over the surface of a frozen lake. The student exerts a horizontal force of 175 N and the coefficient of kinetic friction between the sled and the ice is 0.2. If the sled starts from rest, what is its final velocity ?

Problem 2 (LV2, LV4): A box is pulled up an inclined plane by a light string, as shown in Fig. 1. The plane is inclined at an angle of 30° and the coefficient of kinetic friction between the box and the plane is 0.3. (a) Make a free body diagram for the box. (b) Find the tension force acting on the box if the box is moving at a constant speed.

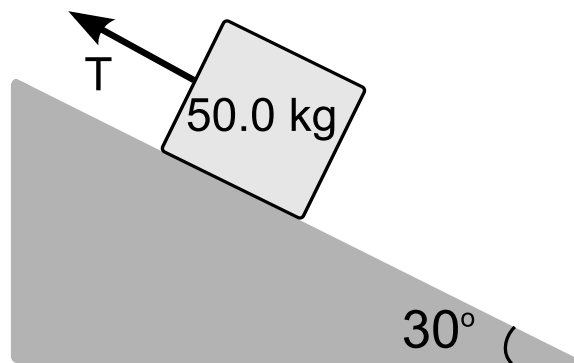


FIG. 1: Box moving on inclined plane.