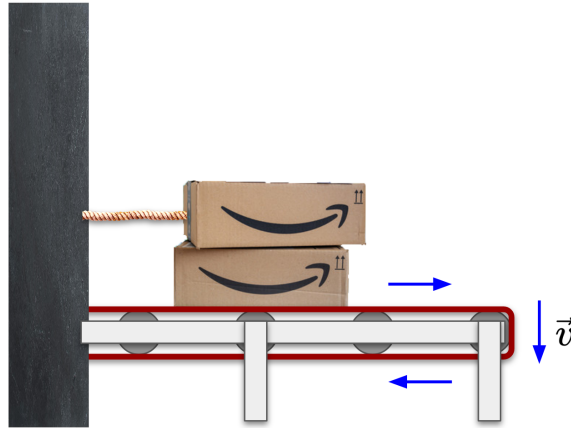


Physics 2211 – Summer GPS Week 5

Problem #1

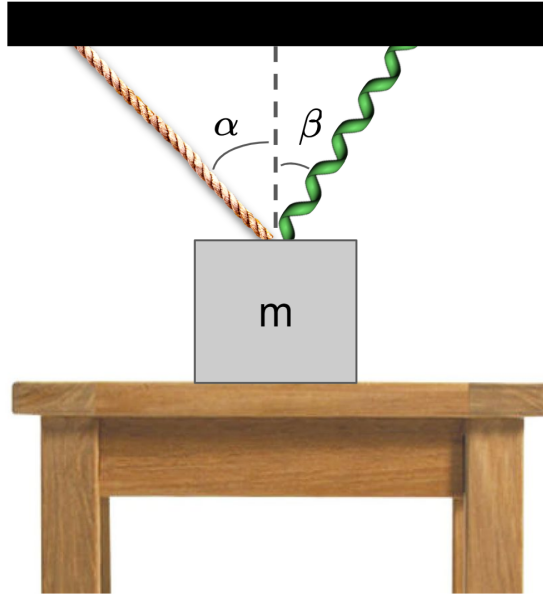
A conveyor belt rotates clockwise with speed v as indicated in the diagram. Two identical boxes, each with mass m , are stacked on top of each other and placed on the conveyor belt. The top box is attached to a rope that is connected to the wall. As a result, neither box is moving and tension in the rope is measured to be T . Your answers to the questions below may contain this measured value.



- A. Determine the coefficient of kinetic friction μ_k between the bottom box and the conveyor belt. Hint: treat the two boxes together as the system.
- B. The top box is just on the verge of sliding. Determine the coefficient of static friction μ_s between the top and bottom box. Hint: take the top box only to be the system.

Problem #2

A box of mass m hangs from a rope and a spring. The spring, which has spring stiffness k and relaxed length L_0 , is stretched to a length L . The rope and spring make angles α and β respectively with the vertical. A frictionless table located beneath the suspended box is in contact with the box. Given the information about the spring, the rope and the angles they make, you will ultimately answer the question: does the table help support the box?



- A. Calculate the tension in the rope. Give your answer in vector form. Your answer should only use variables given in the problem and fundamental physical constants (for example, g).

- B. Determine the magnitude of the normal component of the contact force on the box due to the table. Your answer should only use variables given in the problem and fundamental physical constants (for example, g).

C. Does the table help support the box? Use your result from the previous part to justify your answer.

Problem #3

Using your hand you pull a block of mass m up a wooden board at a constant speed. As indicated in the diagram, your hand is pulling a string at an angle θ with the wooden board which makes an angle θ with the ground. The coefficient of kinetic friction between the block and the board is μ . Determine the tension in the string.

