Force Problems – Set 2

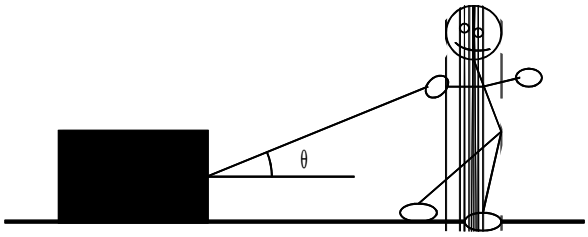
A block rests on an incline plane that makes an angle θ with the horizontal. The coefficient of static friction between the block and the plane is μ_s and the coefficient of kinetic friction is μ_k.

a) Find an expression for the maximum angle of the incline before the block slips.

*HINT: The equation for the force of static friction ($F = \mu_s N$) represents the **maximum** force that friction can provide.*

b) Assuming that the block is in motion, find an expression for the acceleration of the block in terms of θ and μ_k.

While standing on a rough surface, Stickman is pulling an ice block to the right with a tension *T*.

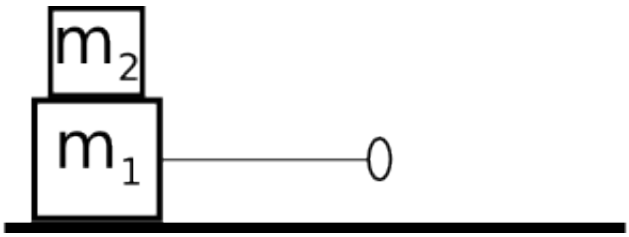


a. Draw a freebody diagram of Stickman. (He does not slide)

b. Draw a freebody diagram of the ice block. (It's frictionless)

c. Assume that the Box is frictionless and calculate the velocity of the box after it has traveled a distance *d* starting from rest. Your velocity should be in terms of m,F_p (Force of Stickman's pull), θ, and d.

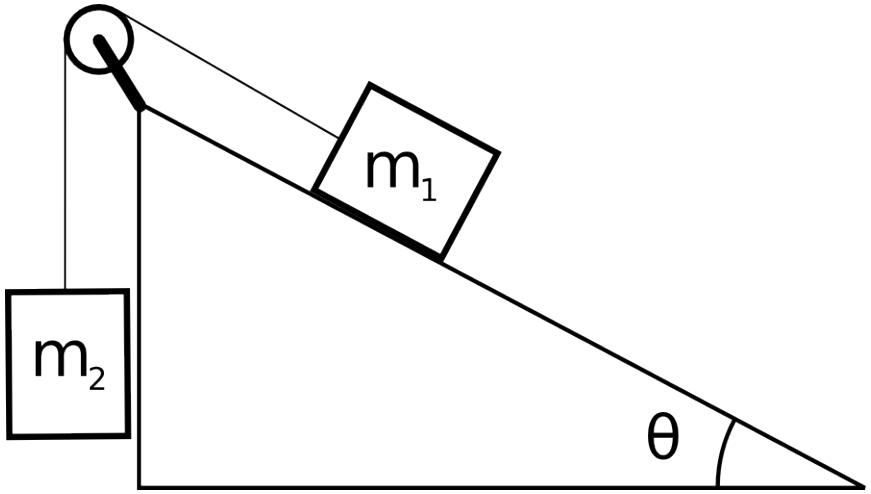
Two blocks with masses m_1 and m_2 are stacked up as shown in the picture below. A rope with a handle is attached to m_1 as shown. There is no friction between m_1 and the table. The coefficient of static friction between m_2 and m_1 is μ_s.



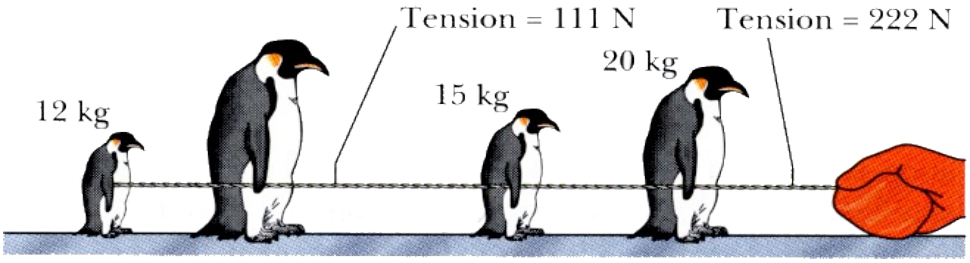
a) Draw free body diagrams for m_1 and m_2.
b) Find an expression for the maximum force that can be applied to to the rope on m_1 without m_2 slipping.
c) Find an expression for the reaction force of the floor acting on m_1 in terms of g, m_1, and m_2.

In the picture below, the coefficient of kinetic friction between the ramp and m_1 is μ_k. A rope connecting m_1 and m_2 passes over a massless frictionless pulley.

Calculate the acceleration of the system.



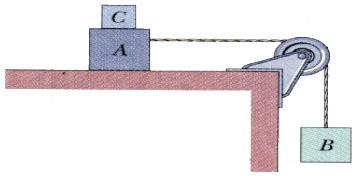
Four penguins are being playfully pulled along a very slippery (frictionless) ice by a zoo keeper. The masses of the first, second, and third penguins and two cord tensions are shown below. Find the mass of the third penguin.



A and B are blocks with weights of 44 N and 22 N respectively. The coefficient of friction between the table and the block is 0.20.

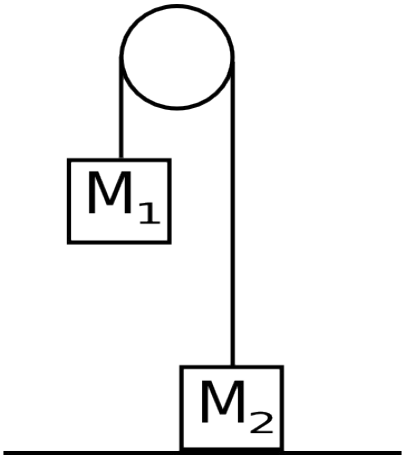
a) Determine the minimum weight of block C so that block A does not slide.

b) If block C is suddenly lifted off of A, what is the acceleration of A?



Force Problems – Set 2

One end of a rope is connected to a mass M_1=10kg. The rope passes over a massless frictionless pulley and the other end is connected to a mass M_2 = 5kg. M_2 is initially resting on the ground and M_1 is suspended 3m above the ground. The system is initially at rest.



If M_1 is released and allowed to hit the ground, what is the maximum height that M_2 will reach?

*HINT: When M_1 hits the ground, M_2 will still have an upward velocity. M_2 will **continue** upward until its velocity is zero.*