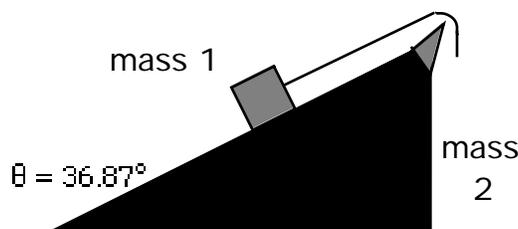
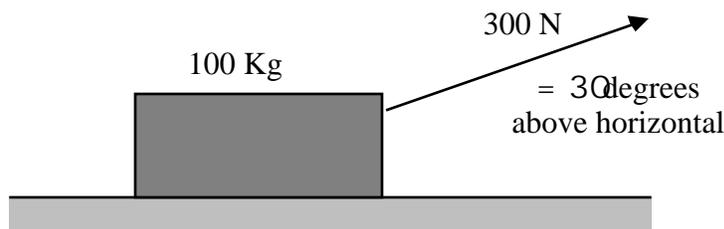


1. a. - c.) State Newton's Laws clearly and completely in prose form.
 d. True/False
 _____ (T/F) If \vec{A} and \vec{B} are in opposite directions, then $\vec{A} \cdot \vec{B}$ is always zero.
 _____ (T/F) The kinetic energy needed for a skier to be able to coast up a 100 m incline depends on the choice for the reference height $h = 0$.
 _____ (T/F) Only conservative forces can do work.

2. a.) Find the normal force.
 Find the acceleration of the box if b.) it starts at rest.
 c.) it is moving to the right.
 $\mu_s = 0.35$; $\mu_k = 0.25$

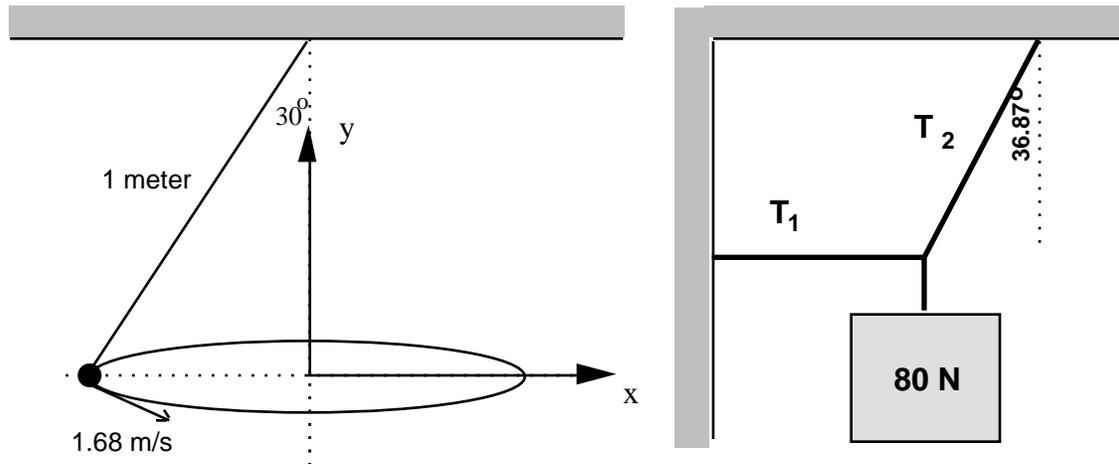


3. A mass m_1 is on an incline which makes a 36.87° ($=\tan^{-1}(3/4)$) angle w.r.t. the horizontal. A string runs from the mass and up over a massless, frictionless pulley to suspend a second mass m_2 where $m_1 = 100 \text{ kg}$ and $m_2 = 100 \text{ kg}$. (a.) Assuming that the incline is frictionless, find the accelerations of the two masses. (b.) Find the tension in the string. (c.) Next given that $\mu_k = 0.375$ ($= 3/8$), find the accelerations of the masses assuming that m_1 is moving up the incline..
4. A child is swinging in a tire suspended by a rope of length ℓ ($= 4 \text{ m}$) which will break when the tension is twice the weight of (the child plus the tire). Model the child/swing as a point mass at the end of the rope. (a) Suppose the swing's supporting rope reaches a greatest angle θ_0 ($= 57.261^\circ$) with respect to the vertical. What will be the speed of the swing as it passes through the low point of its arc? (b) At what speed will the rope break as the child passes through the low point?



EXTRA CREDIT (Value is only + 4% relative to 100 %)

- a. Find the magnitude and direction of the mass's acceleration at the instant illustrated for the conical pendulum below. The mass travels in a horizontal path at a speed of 1.682 m/s .



- b. Find the tension in each of the two cords that are suspending the 80 N mass as illustrated. The first cord is horizontal and the second makes an angle of 36.87° with respect to the vertical.