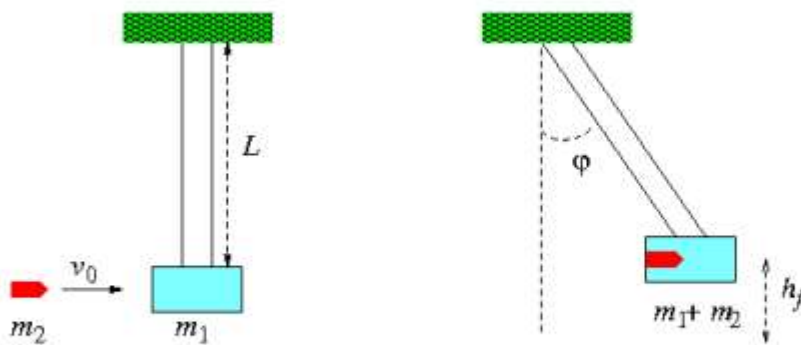


Momentum and Collisions Problem

A simple way to measure the speed of a bullet is with a *ballistic pendulum*, which consists of a wooden block of mass m_1 into which a bullet of mass m_2 is shot. The block is suspended from two cables, each of length L . Assume that the time the bullet takes to come to rest (that is, the bullet is moving at the same speed as the block) is negligibly small. The impact of the bullet causes the block and embedded bullet to swing through a maximum angle φ . The initial speed of the bullet is v_0 .



Find a relation for the initial speed of the bullet as a function of m_1 , m_2 , L , g , and φ .

The relation will assist in the development of the solution.

The mass will oscillate through its motion losing a percentage, P , of its energy after it reaches maximum angle on either the left or right side. The length of each cable changes over time based on a time varying equation provided to you. Additionally, a bullet is embedded in the block each time the block makes 3 full cycles (max height on right, back to center, max height on left, back to center represents a cycle).

Write your program to keep track of the vertical position, horizontal position, the angle, the velocity, acceleration, and Energies (potential and kinetic). Assume the bullet has the same initial velocity (firing speed) for each cycle. This process should continue until the change is minimal.