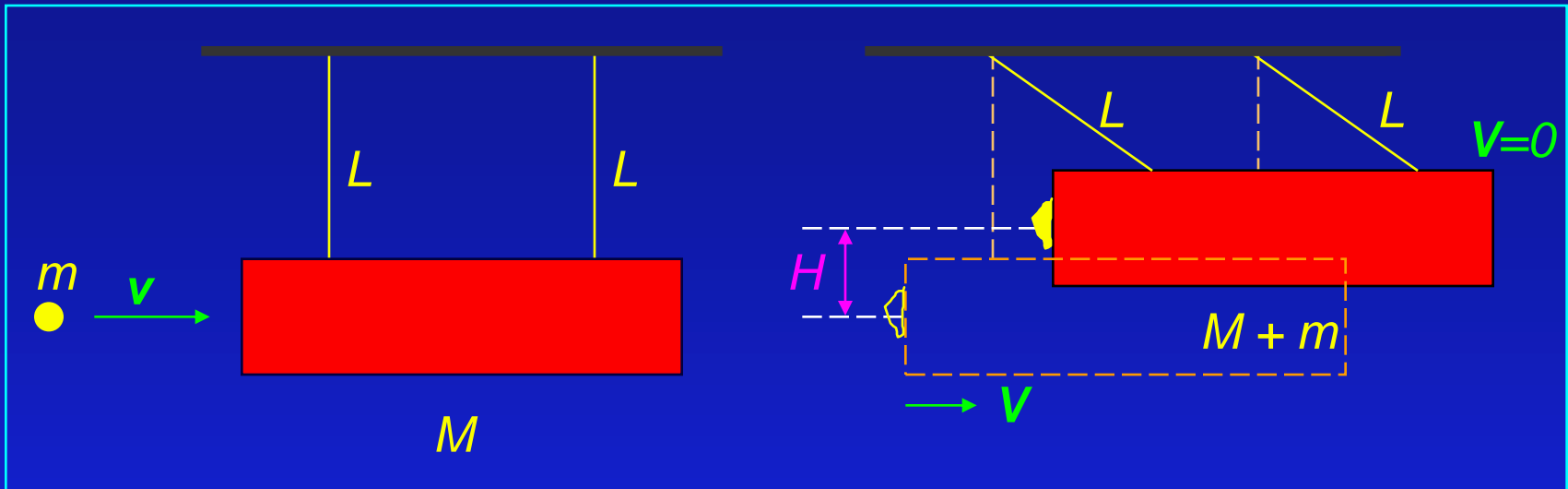# Ballistic Pendulum

A projectile of mass m moving horizontally with speed v strikes a stationary mass M suspended by strings of length L. Subsequently, $m + M$ rise to a height of H.

Given H, M and m what is the initial speed v of the projectile?

Collision Conserves Momentum

$0 + m\,v = (M+m)\,V$

After, Conserve Energy

$\frac{1}{2}(M+m)\,V^2 + 0 = 0 + (M+m)\,g\,H$

$V = \text{sqrt}(2\,g\,H)$

Combine: $v = \dfrac{M+m}{m}\sqrt{2gH}$

See I.E. 1 in homework

demo