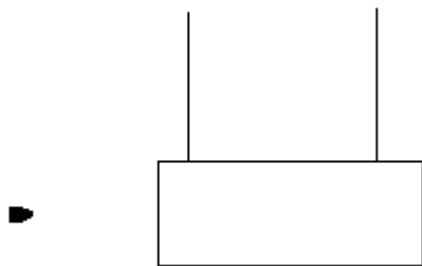


**Part 1**

A ballistic pendulum is used to measure the speed of a bullet. It consists of a block that is suspended in a manner that allows it to swing freely. A bullet is shot horizontally into the block (perfectly inelastic collision) and the block swings upward. Derive a formula for  $v$ , the speed of the bullet in terms of  $m_1$  the mass of the bullet,  $m_2$  the mass of the block and  $\Delta y$  the maximum height that the block rises after the collision.

**Part 2**

Now consult the video of the ballistic pendulum in Logger Pro.

- Determine the distance  $\Delta y$  by using the angular displacement and the value  $R = 20.9$  cm as the radius of the pendulum motion.
- Determine the distance  $\Delta y$  by using the video analysis tools in Logger Pro.
- Calculate a percent difference between these two values.
- Using your equation from part 1 and the values  $m = 16.283$  g for the ball and  $M = 76.475$  g for the pendulum, calculate the speed of the ball as it leaves the launcher.