Ballistic Pendulum Prelab
Due start of class, week of Nov 4

Name:_____ Section:_____

Read sections 2.8 and 2.9 (pp. 20–25) in *Experimentation* by Baird.

In the ballistic pendulum experiment the prediction of the range depended on the height the pendulum arm swung up, h, and the height of the table, y. The lab write-up states that the range, x, is given by (eqn. 7)

$$x = \frac{(m+M)}{m} 2\sqrt{hy}$$

and the fractional uncertainty on the range is given by (eqn. 8)

$$\frac{\Delta x}{x} = \frac{\Delta y}{2y} + \frac{\Delta h}{2h}.$$

Let $y = 0.55$ m, $\Delta y = 0.005$ m, $h = 0.090$ m, $\Delta h = 0.002$ m, $m = 50$ g and $M = 200$ g. Calculate the relative uncertainties in y and h, and x (from eqn. 8) for these values.

Now use equation 7 to directly calculate the range. Set h to 0.09, change y by 0.005 (i.e., calculate $y \pm \Delta y$) and find the change in the range. Then keep y set to 0.55 and change h by 0.002 (i.e., calculate $h \pm \Delta h$) and find the change in range. In each case compare the fractional change in range, $\Delta x/x$, to $\Delta y/2y$ and $\Delta h/2h$. Comment on the contribution to the uncertainty of the range by each variable and why y has a larger absolute uncertainty but smaller contribution to the uncertainty of x.