# Lab 9: Ballistic Pendulum

Experiment for Physics 225 Lab at CSU Fullerton.

## What You Need to Know

## What You Need to Do

### Part 1: Determining the initial launch velocity $v\_{0}$ of the projectile

#### Theoretical Analysis for Determination of $v\_{0}.$

Show the steps in deriving the following equation for the initial velocity of the ball $v\_{0}$ in relation to the height that the ball swings up to, $h$, the mass of the ball $m$, the mass of the catcher $M$, and the local gravitational constant $g.$

$$v\_{0}=\frac{\left(m+M\right)}{m}\sqrt{2gh}$$

### Part 2: Determining the horizontal range *D* of the projectile from the initial velocity $v\_{0}$.

#### Theoretical Analysis for Determination of $D$, the range of the projectile.

1.

Show the steps in deriving the following equation for the distance the ball will travel $D,$ in relation to the initial velocity of the ball $v\_{0}$, and the height from the bottom of the ball to the floor $H,$ and the local gravitational constant $g.$

$$D=v\_{0}\sqrt{{2H}/{g}}$$

#### Experimental procedure for Measuring D, the range of the projectile

1. *Prepare to submit your graph paper with measurements.*
	1. *Since this is primary data, make sure to include your graph paper with the labeled average predicted line, and the average measured line drawn on it in your lab report*.
	2. If your instructor requires electronic submission of your lab report, include a good quality photo of the graph paper with the black impressions from the impact of the steel ball on it pasted in your Word document. (use your phone camera).
2.

Do the predicted and measured average values overlap within the uncertainty values? Answer with specific examples from your data.

## Conclusion

Follow the lab report guide to write a conclusion on this lab.

Submit the excel sheet with your collected data and hand in your physical graph paper with from your data collection with all lab group names on it.

Conclusion