Lab 7: There's *Still* No Such Thing as a Free Launch (Part 2)

Wow! Working for the circus is a *lot* more fun than being a college student! After receiving *rave reviews* for The Human Cannon (a clown survival rate of nearly 90% ain't bad!), you have been asked to design a new game booth. People will use a catapult to toss a marble at a plate. If it lands on the plate, they win a prize. Now if the game is too hard, people are going to stop playing it and you won't make any money off of it. If it's too easy, too many people will win and you will lose money. So you want to make your plate large enough to catch a small fraction of pennies, but not large enough to catch them all.

Design a method for launching an object horizontally from the table onto the floor. The goal is to launch the object onto a paper target on the floor so that in 10 launches it hits the target **at least 3 times but less than 8**. As in last week's lab, you may take measurements on the floor or on the table. However, you may only launch your marble off the table once, with TA in attendance.

Question:

> Where will you place your target and how big should it be?
> How did you determine the size of your target?

Bonus Points:

After your group's presentation, you will get a chance to test out your game. Someone from another group will come over and launch the marble ten times. You have he opportunity to win the following extra credit points:

> The launcher's group receives two points if they can get eight or more marbles within the target.
> The designer's group receives two points if the launcher gets *at least three* but *less than eight* marbles in the target.

I. Introduction	**5 min**	**Whole class**	
II. Brainstorm and plan	**15 min**	**Groups of 4**	
III. Carry out the measurements and analysis	**40 min**	**Groups of 4**	
Write the lab report as you go.			
IV. Group presentations	**35 min**	**Whole Class**	
V. Evaluate your game design	**15 min**	**Groups of 4**	
Turn in your lab report.			

MAJOR GOALS:
- *Determine the uncertainty in a calculated result based on the uncertainty in experimental data.*
- *Identify the kind of uncertainty that can be minimized with experimental design or technique, and minimize it.*
- *Improve your visual representations for comparing data sets.*
- *Refine your assessment of the characteristics necessary to allow an outlier to be discarded.*