

COMPILATION: Unit 6 - Projectile motion paradigm lab

Date: Sun, 25 Feb 2001
From: John Koski <jkoski@SWBELL.NET>
Subject: Projectile Motion Lab Set-up

I recently completed the Projectile Motion Lab, and came up with a fairly easy set-up that yielded very good results. (The slope of my vertical velocity vs. time graph came out to be 9.804!) Thought you might want to pass it out to the other modelers.

I began by putting a 5-squares-per-inch graph on an overhead transparency. (I used the grid from the back of an Engineer's Computational pad because every fifth line was darker than the others.) I placed the transparency on an overhead projector, located so that the squares when projected on a screen were exactly five centimeters on a side. The video camera was located directly behind the projector to minimize parallax effects.

Next I mounted one of those horizontal ball launchers (the type where one drops vertically as another is launched horizontally) about four inches in front of the screen at its upper left corner in such a position that when the ball left the launcher it was exactly at an intersection of bold lines on the projected graph. We turned out all the lights in the room save for the projector. The lines came out beautifully on video, as did the ball image.

Each group filmed five trials and then took their videotape to a VCR with freeze-frame capabilities. Each frame represented a 1/30 second time interval. Each group viewed all of their trials and picked the one where the ball was closest to the zero-zero position as it left the launcher. (By the way, every group managed to have one that was just about exactly "on".) They then put clear plastic over the TV screen and marked the ball's location at each time interval. Images near the end of the run became blurred and elongated, but I had the students mark near the "head" of the blur. They then determined the vertical and horizontal positions of the ball at each time interval and recorded that information into their data tables. Knowing each square of the grid was five centimeters on a side, they were able to very accurately get readings to the nearest centimeter.

As I said, the results came out very good, and the set-up was fairly quick and easy. I had two VCRs in the room, and five groups of four students each were able to film the experiment and gather their data in about thirty minutes.