Physics

name _____ period ____

Inv-2 Expan II: Air Rockets & Launch Velocity

sheet # _____ due date _____

Introduction:

We are going to use our Blue free fall kinematics equations to determine a quantity not easily measured. How fast does a rocket lift off the launch pad.

In other words, what is v_{launch}?

Equipment:

air rocket, launch caps, launch pad, altitude gun, stop watch, 100 ft tape measure, air pump

General Instructions and data collection:

The air rockets will be launched from about the middle of the West Lawn. Three of four students will determine τ (total time of flight). Three or four students move 100. ft from the launch pad and determine Θ_{apex}. I need one data recorder for the time and one for the apex angle. One student will launch the rocket. The rest of you are on the recovery team.

Collected Data	Launch #1 total time	Launch #1 apex angle	Launch #2 total time	Launch #2 apex angle	Launch #3 total time	Launch #3 apex angle
1						
2						
3						
4						
avg.						

How many sources of error were there for each method of determining the launch vel.?

Apex time method:

Apex angle method:

Which method do you think resulted in the most reliable data? _____

Launch Equation Derivations:

Let's do the easy derivation first. *Starting with a blue free fall equation*, show the steps to the right required to isolate the v_{launch} if all you have is a stop watch.

Trig Drawing

Now the harder one. Suppose we have no *stopwatch, but we do have a tape measure and altitude angle gun. Draw the set up in the right box and show the right triangle trig. Starting with a blue free fall equation*, show the steps to the right required to isolate the v_{launch}.

Use these equations and data from the front table to determine each V_{launch}

How many significant figures should your final answers contain? _____

Using τ_1	Using Θ_1	Using τ_2	Using Θ_2	Using τ_3	Using Θ_3

What is the percent difference between each method for each launch?

A couple of practice problems:

Will and Nate go out to the West Lawn, catch the skunk who lives under Mr. Askey's room and duct tape it to one of Mr. Babb's big rockets. The Rocket is launched . . .

1.) Will determines the total time of flight to be 12.50 seconds. What is his version of the V_{launch} in km/hr?

2.) Nate steps off 50 meters and uses an altitude gun to measure an apex angle of 74°. What V_{launch} (km/hr) will he determine?

3.) What is the percent difference between their two methods?