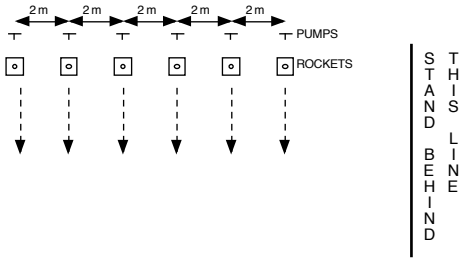
ROCKET PROJECTILE LAB

Background

In this lab you will launch an air-powered rocket. The rocket will be launched and land at the same height. You will launch the rocket twice. The first time you will launch it straight up. You will then predict the range of the rocket at a pre-assigned angle. You will measure the actual range.

Non-negotiable rule

You are not to launch the rocket without the teacher's permission. If you launch without permission, you will receive a zero for the lab. If the individual responsible cannot be determined, then the whole group will receive the zero.



Procedure/Calculations

STEP 1 Follow the launch sheet's instructions and launch the rocket straight up. Using 2 stopwatches, measure the time the rocket is in the air. When you are completely ready to launch, stand behind the "line" to the right. Record your data on the math sheet.

STEP 2 Using this data, calculate the initial velocity of the rocket. Show all your steps on the math sheet.

STEP 3 Record your assigned angle on the math sheet.

STEP 4 Calculate the rocket's range using the calculated initial velocity and the your pre-assigned angle. Show your work on the math sheet.

STEP 5 Setup your rocket to launch according to the second sheet of launch instructions.

STEP 6 When you are completely ready to launch, stand behind the "line" to the right.

STEP 7 When you have the teacher's permission. You may launch and measure your rocket's range. Write the measured range on your math sheet.

STEP 8 Pretend the first thing you did was to launch the rocket at an angle. Calculate the Vo from this horizontal launch. Use this new Vo to find how long it is in the air if it is launched straight up. Show your work on the math sheet.

STEP 9 Calculate the percent error in the measured time in step one compared to the calculated time in step 8. Show your work and answer on the math sheet.

$$\text{Percent Error} = \frac{\left|\text{Calculated Time from range measurement - Measureed Time from Step 1}\right|}{\text{Calculated Time from range measurement}} \text{x100}$$

STEP 10 You may work together on the math calculations but everyone is to turn in their own paper. You may work with 1 partner on the bonus formula derivation.

MATH SHEET

ROCKET PROJECTILE LAB

Show all your work for all the credit.
Be neat and label what you are solving for in each step or your work.

Names:

STEP 1

Time #1_____ **Time #2** _____ **Average Time** _____

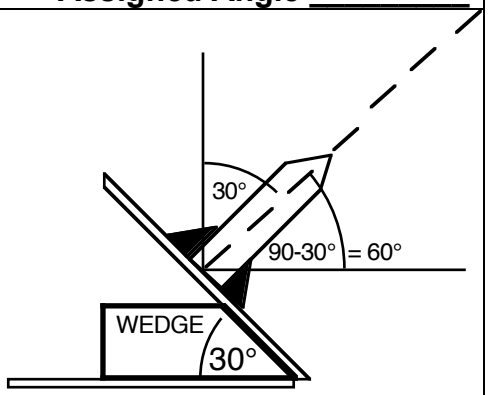
STEP 2 (From the vertical launch)

v_O= _____

STEP 3

Assigned Angle _____

STEP 4 (Calculated for the angled launch.)



Range: _____

STEP 7 (Convert from the feet to meters if needed.)

Measured Range from the launch: _____

MATH SHEET

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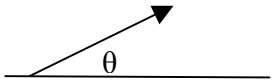
STEP 8

For a rocket launched at an angle.



$\upsilon_o = \sqrt{\frac{Rg}{2\tan\theta(\cos\theta)^2}}$ where R = range, θ is the angle with the ground and "g" is positive.

[Bonus points if you can derive the formula above. You may work with one partner. Turn it in on a separate sheet of paper.]

Calculated Air time for Step 1: _____

STEP 9

Percent Error: _____