

## Horizontal Projectile Motion Lab

Name \_\_\_\_\_ 0

**Purpose:** To find relationships among the variables ( $v$ ,  $t$ ,  $\Delta x$ ,  $\Delta y$ ) in a horizontal projectile motion problem. To compare the actual range to the predicted range.

### PART A: Setup

1. Set up a pair of photogates 10 cm apart at the edge of the lab table. RECORD the photogate spacing in meters as  $\Delta x_{\text{gates}}$ .
2. Measure the height of the lab table at the edge by the photogates. RECORD this as  $\Delta y$ .
3. Open the Data Studio file named "Flat Projectile".

### PART B: Procedure

4. Tape a piece of paper on the floor where the ball will hit. Lay a piece of carbon paper over it.
5. With a piece of tape, mark the location on the floor directly under the edge of the table.
6. Using a ramp, roll the yellow plastic ball straight through the photogate pair and, using Data Studio, measure the time for the ball to break both beams. (It will be called 'elapsed time' in Data Studio.) RECORD this time as  $t_{\text{gates}}$ .
7. Measure the perpendicular distance from the tape to the mark left by the ball. RECORD this as  $\Delta x$ .

### PART C: Calculations

8. Calculate the velocity of the ball through the gates for each run and RECORD it as  $v_{\text{gates}}$ .
9. Calculate the time the ball should have taken to fall to the floor and RECORD this as  $t_{\text{fall}}$ . This value will be the same for all trials.
10. Calculate the range predicted and record this as  $\Delta x_{\text{calc}}$  and RECORD it.
11. Calculate the %error between  $\Delta x_{\text{calc}}$  and  $\Delta x$  as found in part B. Use the measured value as the accepted value.
12. Show a sample of each calculation in the space to the right of the data and results tables.

# Horizontal Projectile Data and Calculations

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**DATA:**

**Part A**

<b><math>Dx_{\text{gates}}</math> (m)</b>	<b><math>Dy</math> (m)</b>

**Part B**

<b>trial</b>	<b><math>t_{\text{gates}}</math> (s)</b>	<b><math>Dx</math> (m)</b>
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

**RESULTS:**

<b>trial</b>	<b><math>v_{\text{gates}}</math> (m/s)</b>	<b><math>t_{\text{fall}}</math> (s) (all same)</b>	<b><math>Dx_{\text{calc}}</math>(m)</b>	<b>% error</b>
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				