Physics Lab

Period _____

Name _____

Date _____

saving thelma and louise

Purpose

_____

_____

_____

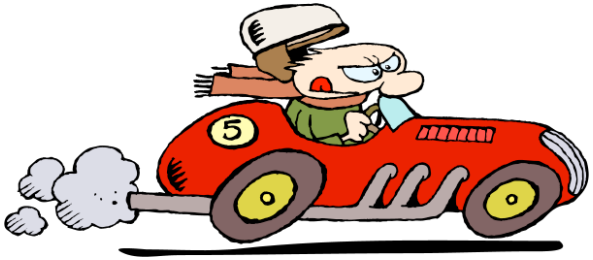


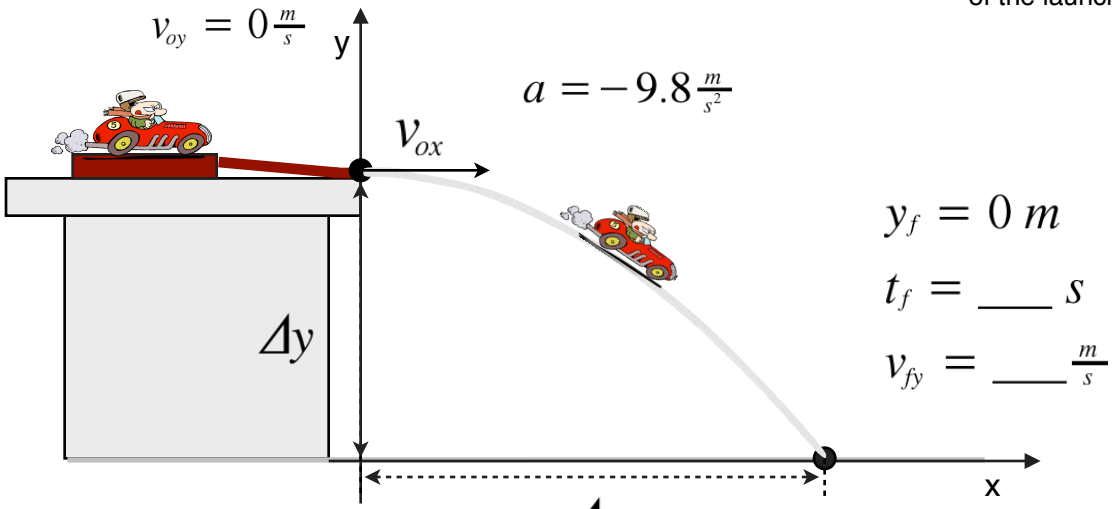
Diagram of the Problem

Part 1 - Calibrating

$y_o = \_\_\_ \; m$

$t_o = 0 \; s$

$v_{oy} = 0 \frac{m}{s}$



$y_f = 0 \; m$

$t_f = \_\_\_ \; s$

$v_{fy} = \_\_\_ \frac{m}{s}$

$x_o = 0 \; m$

$t_o = 0 \; s$

$v_{ox} = \_\_\_ \frac{m}{s}$

$a = 0 \frac{m}{s^2}$

$x_f = \_\_\_ \; m$

$t_f = \_\_\_ \; s$

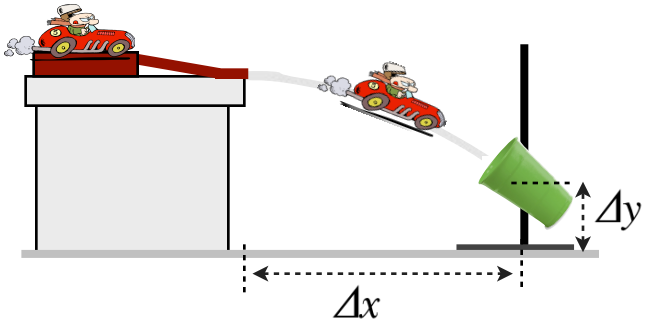
$v_{fx} = \_\_\_ \frac{m}{s}$

Procedure

1. Launch the projectile over the edge of your lab table. Record the distance the object lands from the lab table (range) and the height of the launching platform.

Part 2 - The Test

2. Given a random range or height from your teacher, calculate the other variable. Now, using your equations set the height and the range of the cup in order for the object to land in the cup.



Data Acquisition

Launcher #	(Δy)	Object Range (Δx)				
	Launcher Height (m)	Trial 1 (m)	Trial 2 (m)	Trial 3 (m)	Average Range (m)	Initial Velocity v_{ox} (m/s)
Calibrating Trials	1.					
	2.					
					Average	

Motion Equations

1. $\Delta y = v_{oy}\, t - \frac{1}{2} g t^2$
2. $\Delta x = v_{ox}\, t$

Data Analysis

Part 1 - Calibrating

1. With the initial velocity $v_{oy} = 0$, solve equation 1 for t

$$t = \sqrt{\frac{2\Delta y}{g}}$$

2. To find the initial velocity, solve equation 2 for V_{ox} and plug in the time from equation 1.

$$v_{ox} = \frac{\Delta x}{t} = \frac{\Delta x}{\sqrt{\frac{2\Delta y}{g}}} = \Delta x \sqrt{\frac{g}{2\Delta y}}$$

Part 2 - The Test

1. Solve your equation for V_{ox} for x_f

$$v_{ox} = x_f \sqrt{\frac{g}{2\Delta y}}$$

with $x_o = 0$

$$x_f = v_{ox} \sqrt{\frac{2\Delta y}{g}}$$

plug in your values

$$x_f =$$

2. Solve your equation for V_{ox} for y_f

$$v_{ox} = x_f \sqrt{\frac{g}{2\Delta y}}$$

$$v_{ox}^2 = x_f^2 \frac{g}{2(y_f - y_0)}$$

$$(y_f - y_0) = x_f^2 \frac{g}{2v_{ox}^2}$$

$$y_f = x_f^2 \frac{g}{2v_{ox}^2} + y_0$$

Launcher height y_o (m)		Catcher height from floor $y_f = \Delta y + y_o$	Object Range x_f (m)	from the Table above v_{ox} (m/s)	Success Yes/No?
	Test 1				
	Test 2				

Plug in your values

Height off the floor

$$y_f =$$

$$y_f =$$

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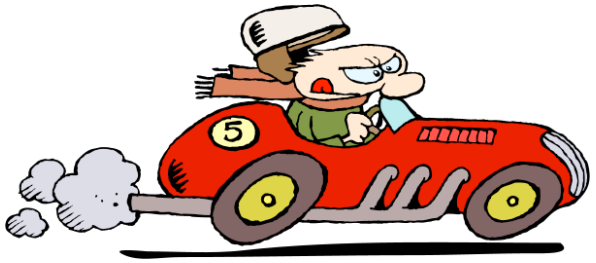
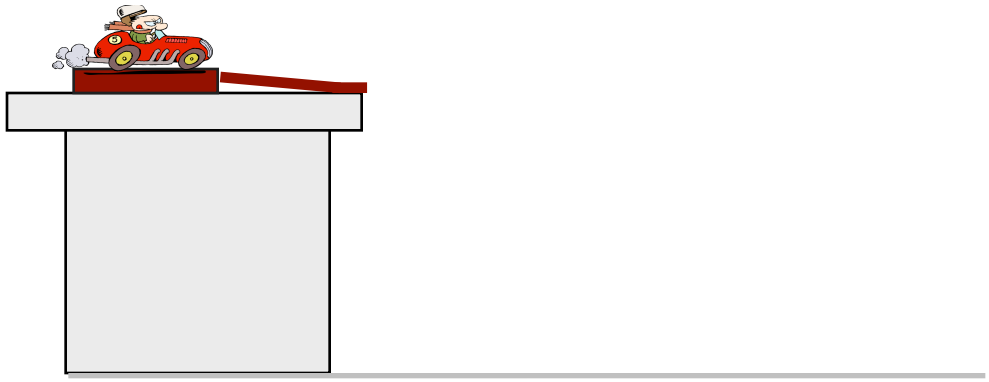


Diagram of the Problem

Part 1 - Calibrating

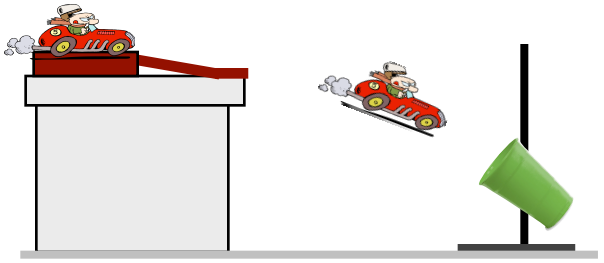


Procedure

1. Launch the projectile over the edge of your lab table. Record the distance the object lands from the lab table (range) and the height of the launching platform.

Part 2 - The Test

2. Given a random range or height from your teacher, calculate the other variable. Now, using your equations set the height and the range of the cup in order for the object to land in the cup.



Data Acquisition

Launcher #	(Δy)	Object Range (Δx)				
	Launcher Height (m)	**Trial 1 (m)**	**Trial 2 (m)**	**Trial 3 (m)**	**Average Range (m)**	**Initial Velocity (m/s)**
Calibrating Trials	1.					
	2.					
					Average	

Motion Equations

1.

2.

Data Analysis

Part 1 - Calibrating

1. With the initial velocity $v_{oy} = 0$, solve equation 1 for t

2. To find the initial velocity, solve equation 2 for V_{ox} and plug in the time from equation 1.

Part 2 - The Test

You will need these equations for the test.

1. Solve your equation for V_{ox} for x_f

2. Solve your equation for V_{ox} for y_f

Launcher height y_o (m)		Catcher height from floor $y_f = \Delta y + y_o$	Object Range x_f (m)	from the Table above v_{ox} (m/s)	Success Yes/No?
	Test 1				
	Test 2				