

saving thelma and louise

Purpose

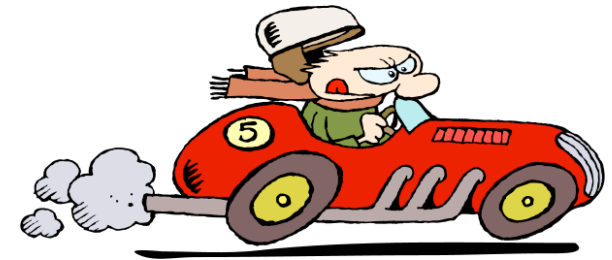


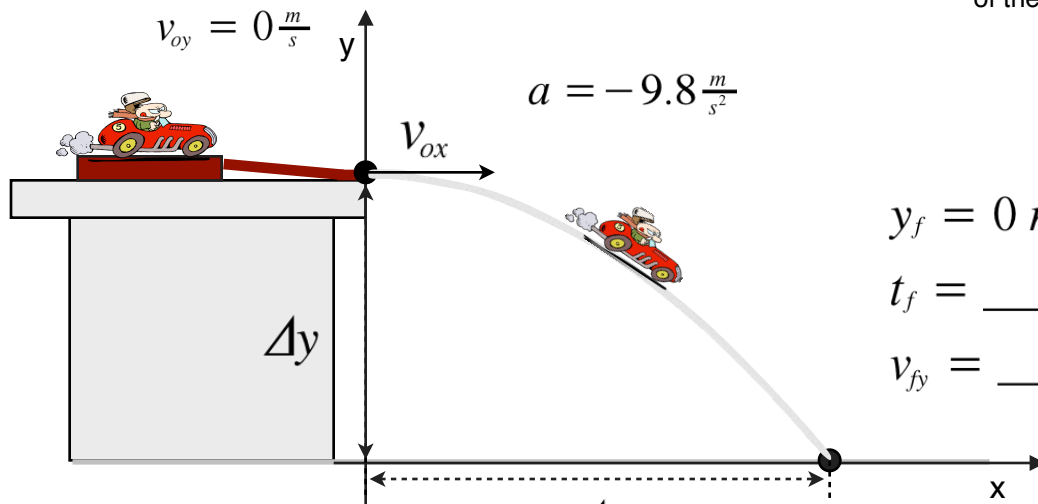
Diagram of the Problem

Part 1 - Calibrating

$$y_o = \text{___} m$$

$$t_o = 0 s$$

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



$$y_f = 0 m$$

$$t_f = \text{___} s$$

$$v_{fy} = \text{___} \frac{m}{s}$$

$$x_o = 0 m$$

$$t_o = 0 s$$

$$v_{ox} = \text{___} \frac{m}{s}$$

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

$$x_f = \text{___} m$$

$$t_f = \text{___} s$$

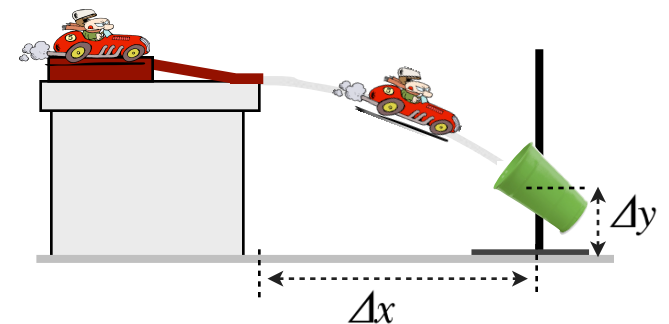
$$v_{fx} = \text{___} \frac{m}{s}$$

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)				Initial Velocity v _{ox} (m/s)
	Launcher Height (m)	Trial 1 (m)	Trial 2 (m)	Trial 3 (m)	Average Range (m)	
Calibrating Trials	1.					
	2.					
Average						

Motion Equations

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

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

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

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

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

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

Plug in your values

Height off the floor

$$y_f =$$

$$y_f =$$

Launcher height y _o (m)	Catcher height from floor y _f = Δy + y _o	Object Range x _f (m)	from the Table above v _{ox} (m/s)	Success Yes/No?
Test 1				
Test 2				

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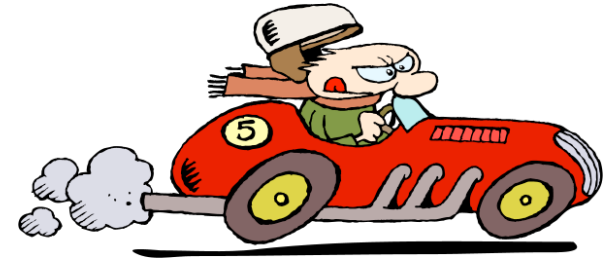
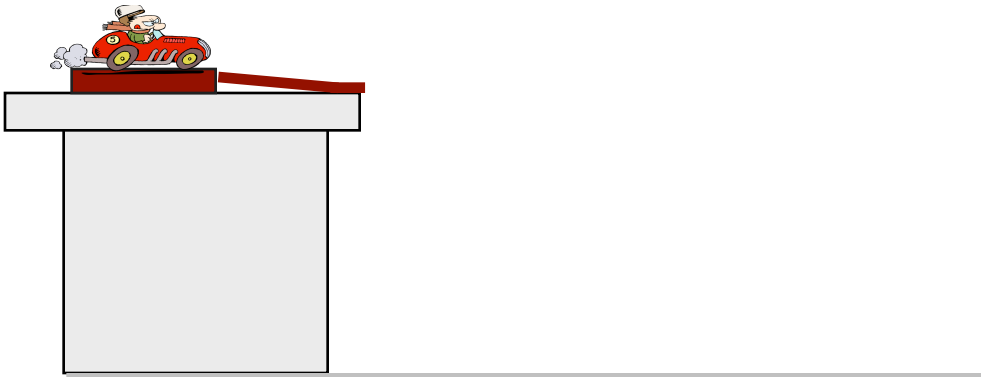


Diagram of the Problem

Part 1 - Calibrating

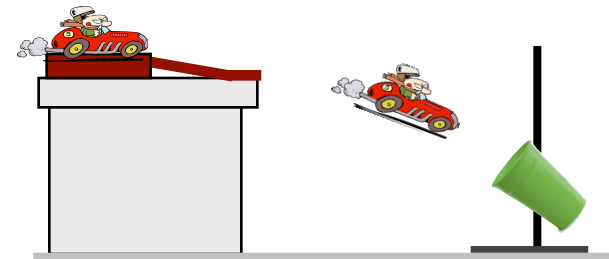


Procedure

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)				Initial Velocity (m/s)
	Launcher Height (m)	Trial 1 (m)	Trial 2 (m)	Trial 3 (m)	Average Range (m)	
Calibrating Trials	1.					
	2.					
Average						

Motion Equations

- 1.
- 2.

Data Analysis

Part 1 - Calibrating

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

2. To find the initial velocity, solve equation 2 for V_{0x} 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_{0x} for x_f

2. Solve your equation for V_{0x} for y_f

Launcher height y_0 (m)	Catcher height from floor $y_f = \Delta y + y_0$	Object Range x_f (m)	from the Table above v_{0x} (m/s)	Success Yes/No?
Test 1				
Test 2				