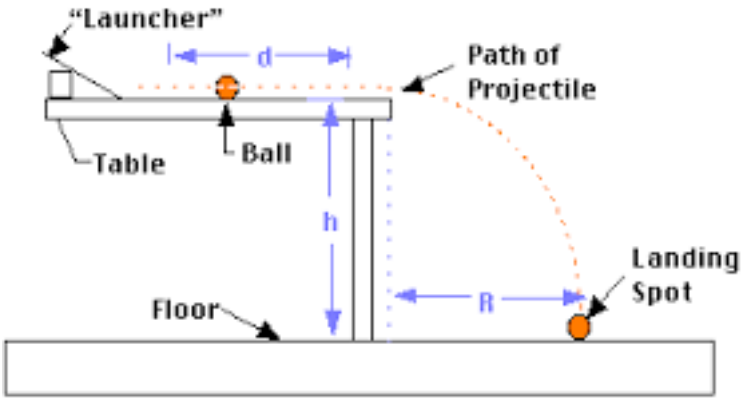
Anne Serkey 4U 11/12/13

Horizontal Launch Lab

Purpose
The propose of the lab was to find the range of the horizontally launch ball bearing.

Hypothesis
We calculated that the rage of the ball bearing should be 0.43m from the edge of the table to the middle of the target.

Picture of the Set-up



Procedure

I. Finding the horizontal velocity

1. Measure the time it takes the ball bearing to travel 1m from the end of the ruler ramp, to the end of the table.
2. Record time.
3. Repeat 4 additional times.

Data

	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5
Time					

4. Calculate the average time

$$\frac{sum\ of\ the\ time\ trials}{5} = 0.44s$$

5. Calculate the Horizontal velocity

$x = v_i(t) + ½\ (a)\ (t^2)$
$x = v_i(t) + ½\ (0)\ (t^2)$
$1m = v_i(0.44)$
$2.27\ m/s = v_i$ in the horizontal plane

II. Finding the time to land

1. Measure the distance from the top of the table to the ground
2. Calculate the time it would take for the projectile to fall vertically to the ground.
3. Record data

Data

Distance = 97cm = 0.97m

Formula: $x = v_i(t) + ½\ (a)\ (t^2)$
$0.97 = 0 + ½\ (a)\ (t^2)$
$0.97 = 0 + ½\ (9.8)\ (t^2)$
$0.97 = 0 + 4.9\ (t^2)$
$0.198 = t^2$
$0.44s = t$

III. Finding the range of the projectile

1. Use the horizontal velocity and the time to land in the vertical plane, calculate the range (horizontal distance) of the projectile.

Formula: $x = v_i(t) + ½\ (a)\ (t^2)$
$x = 2.27(0.44) + \cancel{½\ (0)\ (t^2)}$
$x = 0.99m$

Percent Error

$$\% \text{ Error} = \left| \frac{\text{Theoretical Value} - \text{Experimental Value}}{\text{Theoretical Value}} \right| \text{ X } 100$$

This is the distance we calculated mathematically (theoretical value)

The 0.93m is the distance that the ball really went (experimental value)

$\% \text{ Error} = \frac{0.99-0.93}{0.99} = \frac{0.06}{0.99} = 6\%$ error

Conclusion

Claim (What did you do)
Though collecting time and distance data, we were able to calculate the horizontal distance a ball bearing would travel horizontally when projected off of a table. We calculated the range of the projectile to be 0.99m.

Evidence (what data was collected)
When the projectile was launched from the table the actual distance was 0.93m. This is slightly smaller than our calculated distance.

Reasoning (ties the two together)
When calculating the range factors such as friction across table, air resistances were neglected. This may account for the 6% error in the results.