

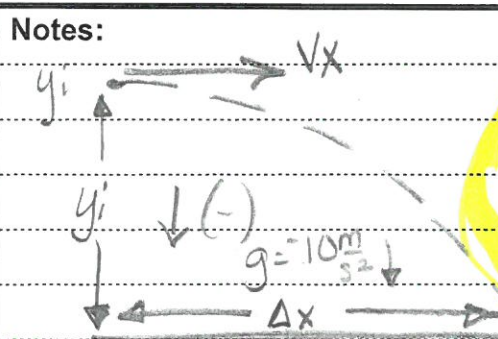


Topic/Objective: **HORIZONTALLY LAUNCHED (H.L.) PROJECTILES**

Name: **KEY**
 Class/Period:
 Date:

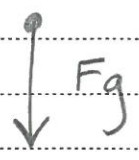
Essential Question:
 How do initial variables influence the range and the time in the air for **H.L.** Projectiles?

Questions:
 What variables effect **H.L.** Projectiles?



For a projectile to be **horizontally launched** or **launched straight out**, the initial vertical velocity **MUST BE 0**.

Force diagram



Projectile Variables

- projectile mass, m
- initial velocity horizontally, v_x
- initial height y

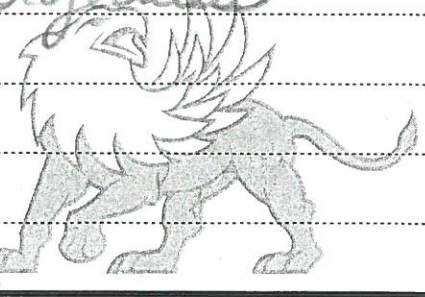
Constants

- initial vertical velocity $v_{yi} = 0$
- accel. due to gravity $g = 10 \frac{m}{s^2}$

NOTE:
 FOR OUR STUDY OF PROJECTILES, WE ASSUME AIR RESISTANCE (FRICTION) IS \emptyset .

These variables will effect
 - RANGE, Δx
 - TIME IN THE AIR, t

Summary: **Horizontally launched H.L.** projectiles are unique b/c $v_{yi} = 0$. Gravity will affect downward motion but the horizontal motion will be at constant velocity.





Topic/Objective:

H.L. CONTINUED

Name:

Class/Period:

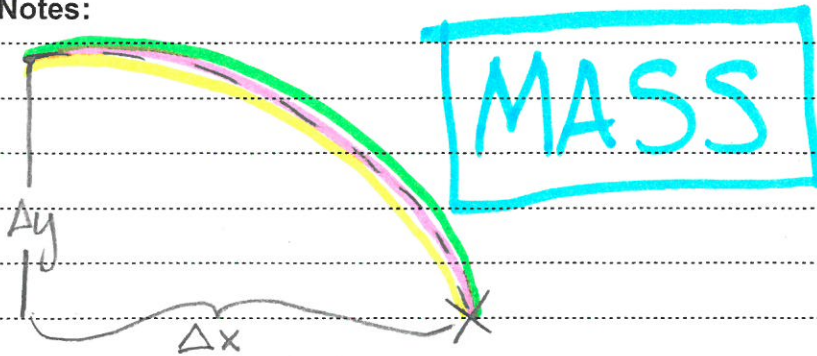
Date:

Essential Question:

Questions:

What happens when ONLY mass is altered?

Notes:



Assume mass increases $m_A < m_B < m_C$

m_A

Effect on Range

$$\Delta x_A = \Delta x_B = \Delta x_C$$

When mass changes, range is not affected.

m_B

m_C

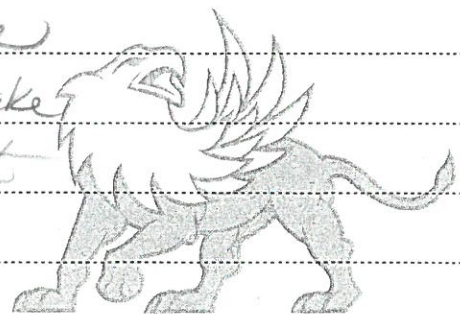
Effect on Time

$$t_A = t_B = t_C$$

When mass changes, time in the air stays the same.

Summary:

While mass does influence how much FORCE is needed to make a mass move, the mass does not change an object's motion.





Topic/Objective:
H.L. CONTINUED

Name:
Class/Period:
Date:

Essential Question:

Questions:
What happens when ONLY HORIZONTAL VELOCITY is altered?

Notes:

HORIZONTAL VELOCITY

Δy

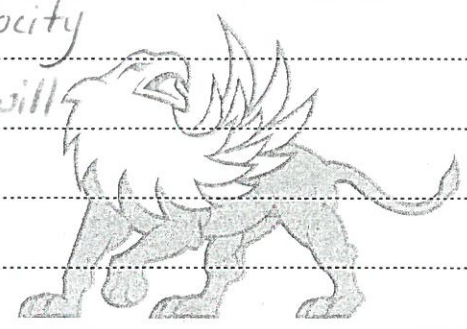
VA
VB
VC

Assume v_x increases $v_A < v_B < v_C$

Effect on Range (Δx)
 $\Delta x_A < \Delta x_B < \Delta x_C$
 When v_x increases, Δx increases

Effect on Time (t)
 $t_A = t_B = t_C$
 When v_x increases, t remains constant.

Summary: A faster starting horizontal velocity will increase range but the air time will be the same since the release height was the same.





Topic/Objective:

H.L. CONTINUED

Name:

Class/Period:

Date:

Essential Question:

Questions:

What happens when only INITIAL HEIGHT is altered?

Notes:



$y_A < y_B < y_C$ When height increases

Effect on Range
 $\Delta x_A < \Delta x_B < \Delta x_C$

When height increases, Δx increases.

Effect on TIME

$t_A < t_B < t_C$

When height increases, time increases.

Summary:

A higher release height will increase the time in the air. Even though horizontal velocity is constant, the projectile moves forward longer so it goes forward farther.

