Projectile Motion

Wait, I can move in 2 directions at once!

Quick Review

- Horizontal Direction:
 - Describe motion with the Kinematics Equations
 - $-v_i$, v_f , a, t, Δx



Quick Review

- Vertical Direction:
 - Describe motion with the Kinematic Equations
 - $-v_i$, v_f , g, t, Δy
 - Acceleration on Earth is approx. g = -9.8 m/s/s



What if you move in both at once?



Both in the Vertical and Horizontal

They combine to give the overall motion of the object.



horizontal velocity = v_x

Free Fall ($v_y = 0, v_x = 0$)



Horizontal Launch ($v_y = 0$)



What happens?

Both Fall in the SAME time!!





Horizontal and Vertical Motions are INDEPENDENT!

• What the projectile does horizontally does not affect what it does vertically.

However, both motions must occur in the same time!

$$\mathbf{t}_{\mathbf{x}} = \mathbf{t}_{\mathbf{y}}$$

Horizontal Launch ($v_y = 0$)



Does v_x change?

v_x constant ($a_x = 0$)

Demos

- https://youtu.be/qErh402eJgl
- Ball rolling off table https://youtu.be/V_In02jL8DY
- Boats racing across river
- Ballistic cart
- https://youtu.be/nAifrGXkE2k
- The Monkey and the Hunter https://youtu.be/z8S0_SHqoeY