Horizontal Projectile Motion

Vx does not change

Vy accelerates downward due to gravity

Free Fall

- D = Vi x t + ½ (-9.8) x t^2
- = 0 + - 4.9 x t^2

- So, t = sq root (D/4.9)

- This “t” for free fall = TOF for the horizontal projectile.

- Vx does NOT change in horizontal projectiles.
- Vy is accelerated downward by gravity so that (1 s yields – 9.8 m/s; 2 s yields – 19.6 m/s; 3s yields – 29.4 m/s; 4 s yields – 39.2 m/s)

Example

- You are at the top of The Empire State Building which is 380 meters tall. You throw a stone horizontally 4 m/s east. After how many seconds does it strike the ground? How far away from the base of the building does it travel?
- Free Fall t = sq root (380/4.9) = 8.8 s
- Range = Vx x TOF = 4 x 8.8 = 35.2 m

Example

- An object is thrown outward from a cliff with a horizontal velocity of 13 m/s. The object takes 11 seconds to reach the bottom of the cliff. Calculate the height of the cliff and the horizontal distance that was traveled.
- - D = Vi x t + ½ (-9.8) x t^2 = 0 + - 592.9 m
- D = height of cliff = 592.9 m
- Range = Vx x TOF = 13 x 11 = 143 m