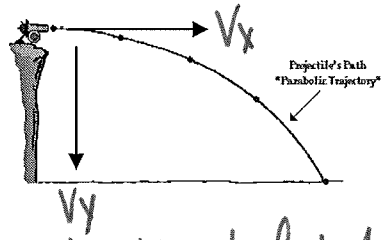
Name Key-notes Hour _____

Horizontally Shot Projectiles

A projectile is any object once in air that can't control own motion

Ex: football, softball, bullet, arrow

This means shooting or throwing something in the x direction and then it falls in the y direction.



Will a ball dropped and one shot from same height land at the same time?
DEMO: YES!

V_x = horizontal velocity V_y = vertical velocity

V_{iy} = 0 m/s! (initial vert. velocity)

The horizontal speed is constant because: we neglect air resistance

The acceleration (a) becomes a_y since gravity in y-direction $a_y = -9.8\ m/s^2$

EQUATIONS:

Horizontal (**only x**)

$V_x = \frac{\Delta x}{\Delta t}$

Vertical (**only y**)

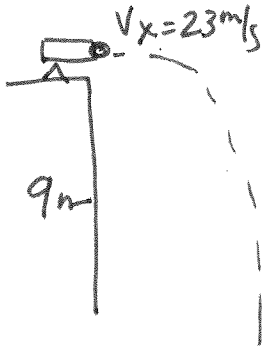
$\Delta y = V_{iy}\Delta t + \frac{1}{2}a_y\Delta t^2$

ΔX and Δy are NO LONGER INTERCHANGEABLE!

Ex. A cannon ball is shot off a cliff that is 9 meters high. How far away from the base of a cliff will the cannon ball land if it is shot horizontally at 23 m/s?

	Horizontal	Vertical
G:	$V_x = 23\ m/s$	$a_y = -9.8\ m/s^2$ $\Delta y = -9\ m$ $V_{iy} = 0$
U:	Δx	
E:	$V_x = \frac{\Delta x}{\Delta t}$	

Sketch:



Remember, you cannot interchange Δy and Δx when it is in 2 dimensions!

Need Δt, so this is a 2-step problem...

(1) $\Delta y = v_{iy}\Delta t^0 + \frac{1}{2}a_y\Delta t^2$

$-9 = 0 + \frac{1}{2}(-9.8)\Delta t^2$

$\Delta t = 1.35\ sec$

(2) $V_x = \frac{\Delta x}{\Delta t}$

$23\frac{m}{s} = \frac{\Delta x}{1.35\ sec}$

$\Delta x = 31\ m$