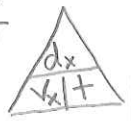
Topic 2C: Two Dimensional Projectiles

Skill 16: Projectiles launched horizontally

Remember that projectiles are objects experiencing only the force of gravity, which only acts on the vertical axis (up/down) or "y"

For a horizontal projectile the force that caused the launch is no longer present and the object moves forward at constant velocity (objects in motion, remain in motion) ie. equilibrium, zero acceleration, no net force use $v=d/t$



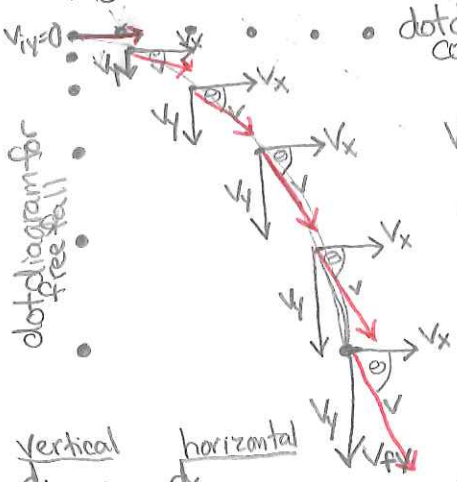
For "x" acceleration = 0 the equation $d_x = v_{ix}t + \frac{1}{2}at^{2^0}$ becomes $d_x = v_{ix}t$

(v_{ix} means initial horizontal velocity. Since horizontal velocity is constant it is ok to say $d_x = v_x t$)

For "y" acceleration = $g = 9.8\ m/s^2$ downward

- $v_{ix} = v_i \cos\theta$ $v_{ix} = v_i \cos 0^\circ$ $v_{ix} = v_i$
- as object begins to fall v_{ix} remains constant

v_i is horizontal



$v = \sqrt{(v_{ix})^2 + (v_{iy})^2}$

$\theta = \tan^{-1}\left(\frac{v_y}{v_x}\right)$

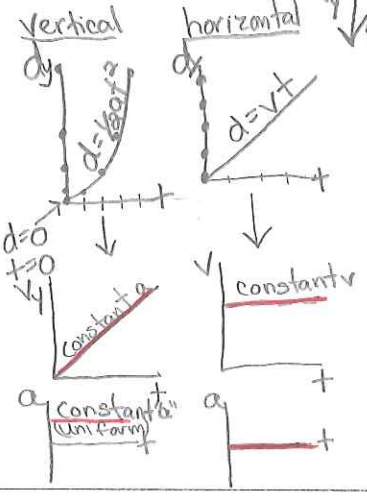
v_{iy} starts at zero & increases during fall

$v_{fy} = v_{iy}^{0} + at$; $v_{fy} = at$

$(v_{fy})^2 = (v_{iy}^{0})^2 + 2ad_y$; $v_{fy} = \sqrt{2a(dy)}$

$d_y = v_{iy}^{0}t + \frac{1}{2}at^2$

$\rightarrow t = \sqrt{\frac{2d_y}{a}}$



- The horizontal and vertical motions are independent of each other
- Vertical motion is a falling object (Skill 14)
- horizontal motion is in equilibrium (Skill 9)
- to find the resultant velocity; use vector equations (Skill 10)

Time is the same for both axes

	v_{iy}	v_{fy}	$\bar{v}_y$	d_y	a_y	t		v_x	d_x	t
Y	0						X			

Vertical – net force of gravity

horizontal – equilibrium