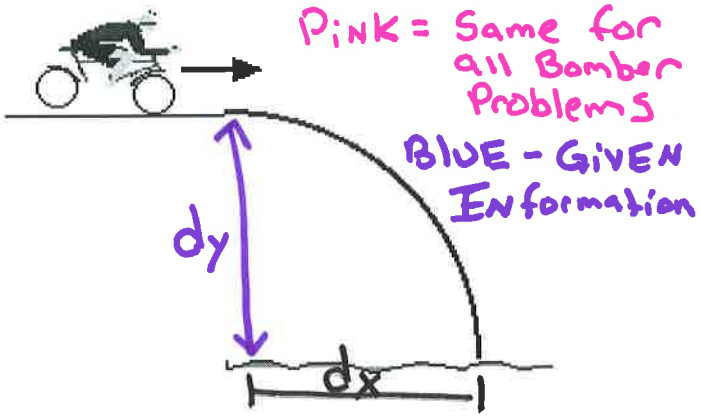
Physics First Honors
2012-13

Projectiles

Example Bomber Problem

A not-so-fortunate mountain biker is peddling towards a cliff at 15.0 m/s. Suddenly her brakes go out she goes flying off the 18.0 meter high cliff into the water below. How far from the base of the cliff will the person land, and how fast will they be going?



PINK = Same for all Bomber Problems
BLUE - GIVEN Information

	CONST. V		Free Fall
	X		Y
V_i =	15	V_i =	0
V_f =	15	V_f =	-18.8
d =	28.7	d =	18
a =	0	a =	-9.8
t =	1.92	t =	1.92

Black - Calculated

1. Find how long it takes for her to hit the water. (time)

$d_y = \frac{1}{2} a_y t^2$

$18 = \frac{1}{2}(9.8) t^2$

$4.9 t^2 = 18$

$t^2 = \frac{18}{4.9} = 3.673$

$t = \sqrt{3.673}$

$t = 1.92$

2. Find how far from the base of the cliff she lands. (horizontal distance)

$dx = V_x \cdot t$

$dx = 15(1.92) = 28.7\ m$

3. Find how fast she is moving horizontally as she hits the water. (horizontal velocity)

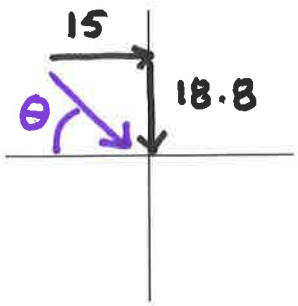
$V_x = 15\ m/s \Rightarrow$ CONST. Velocity

4. Find how fast she is moving vertically as she hits the water. (Vertical velocity)

$V_f = V_i + at$

$V_f = 0 - 9.8(1.92) = -18.8\ m/s$

5. Find her actual (resultant) velocity as she hits the water. (remember what you need for a vector)



$V^2 = 15^2 + 18.8^2 = 579$

$V = \sqrt{579} = 24.1\ m/s$

$\theta = \tan^{-1}\left(\frac{V_y}{V_x}\right) = \tan^{-1}\left(\frac{18.8}{15}\right) = 51^\circ$

$\vec{V} = 24.1\ m/s$ @ 51° above Horizontal