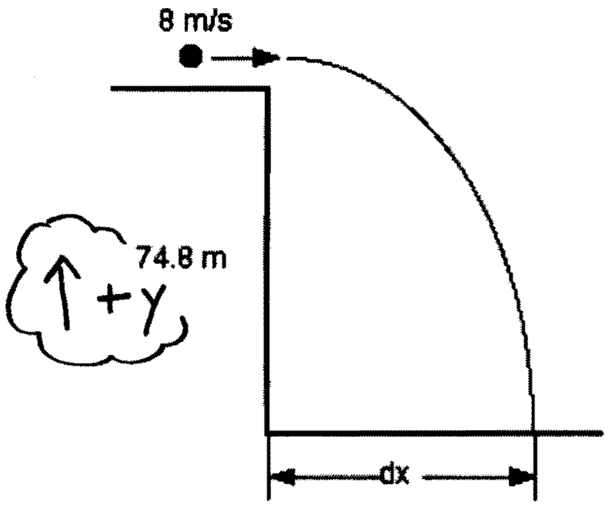
Bomber Problems

1. A stone is thrown horizontally off a cliff 74.8 m high
   a. How long is the stone in the air?
   b. How far from the base of the cliff does the stone land?
   c. What is the stones horizontal velocity as it hits the ground?
   d. What is the vertical velocity of the stone as it hits the ground



	X	Y
V_i	8.0 m/s	0
V_f	8.0 m/s	V_{yf}
d	dx	-74.8 m
a	0	-9.8 m/s²
t	t	t

A) Using "y" data Find time

$d = \frac{1}{2} a t^2$

$-74.8 = \frac{1}{2}(-9.8) t^2 \Rightarrow t^2 = \frac{2(74.8)}{9.8}$

$t = \sqrt{15.26} = \boxed{3.91 \text{ sec}}$

B) Using t = 3.91 Find "dx"

$V_x = \frac{dx}{t} \Rightarrow dx = (V_x)t = 8.0(3.91) = \boxed{31.2 m}$

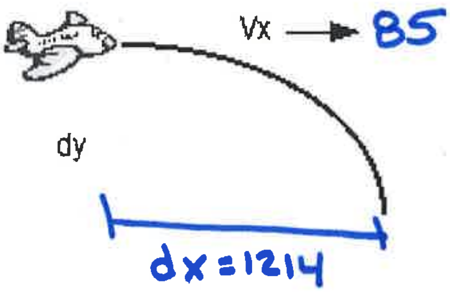
c) $V_{xf} = 8.0$ m/s

d) Find V_{yf} using $V_f = V_i + at$ w/ $V_i = 0$

$V_f = at = -9.8(3.91) = \boxed{-38.3 \text{ m/s}}$

PROJECTILES

2. An airplane traveling at 85 m/s and drops a load of relief supplies when it is directly over a camp. The supplies land 1214 meters away from the camp, what was the altitude of the airplane when it dropped the supplies?



	X	Y
V_i	85	0
V_f	85	*
d	1214	?
a	0	-9.8
t	14.28	14.28

-1000

Find time using the "x" data

$d = V_{avg} \cdot t$

~~1210~~ 1214 $= 85 \cdot t$

$t = \frac{1214}{85} = 14.28$ Sec

Given Time We can Find dy

$dy = \cancel{V_i t} + \frac{1}{2} a t^2$ (0)

$dy = \frac{1}{2}(-9.8)(14.28)^2 = -4.9(203.99) \approx -1000$ m

The Supplies land 1000 m Below the Plane so the Altitude must Be 1000 m

Bomber Problems

3. A pigeon is flying 20.0 m above the ground with a horizontal velocity of 5.00 m/s. The pigeon wants to ruin your car's new paint job.

Determine the following:

a. The horizontal distance, before the car the pigeon must drop its "load"

b. What the "load's" horizontal velocity is just before it hits the car.

c. What is the "load's" horizontal acceleration just before it hits the car.

d. What the "load's vertical velocity is just before it hits the car.

e. What is the "load's" vertical acceleration just before it hits the car.

f. What is the "load's" actual (resultant) velocity just before it hits the car.

	X	Y
V_i	5.0 m/s	0
V_f	5.0 m/s	V_f
d	d	-20
a	0	-9.8
t	t	t

a) Find $t = \sqrt{\frac{2d}{g}} = \sqrt{\frac{2(20)}{9.8}} = 2.0\,s$

Find $d_x = V_x \cdot t$

$d_x = (5.0)(2.0) = $ **10. m**

b) $V_x = 5.0\,m/s$

c) $a_x = 0.0$

d) $V_{yf} = V_{yi} + a_y(t)$

$V_{yf} = 0 - 9.8 \times 2.0 = -19.6\,m/s$

E) $a_y = g = -9.8\,m/s^2$

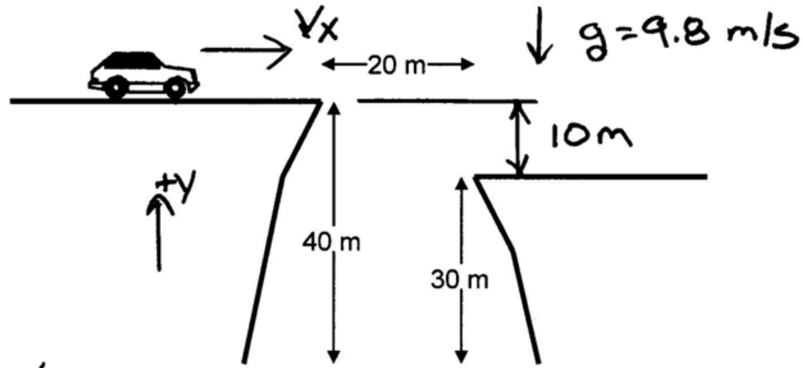
F) 

$\theta = \tan^{-1}\left(\frac{19.6}{5.0}\right) = 75.7^\circ$

$V = \sqrt{5.0^2 + 19.6^2} = 20.2\,m/s$

V = 20.2 m/s @ 76° Below Horizontal

4. Determine how fast you would have to drive in order for your car to just barely make it to the other cliff.



	X	Y
v_i	V_x	$V_{y_i} = 0$
v_f	V_x	
d	20m	-10m
a	0	$-9.8\ m/s^2$
t	t	t

$$t = \sqrt{\frac{2d}{g}} = \sqrt{\frac{2(-10)}{-9.8}} = \underline{1.43\ sec}$$

$$V_x = \frac{d_x}{t} = \frac{20}{1.43} = \underline{14.0\ m/s}$$