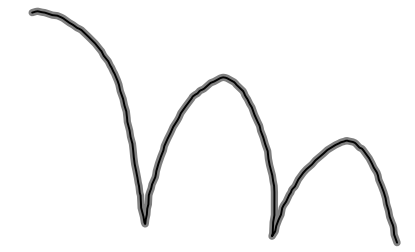
MC #11



1s

xs?

H_1

$H_2 = \frac{1}{2} H_1$

$H_3 = \frac{1}{2} H_2$

$\Delta y_2 = \frac{1}{2} \Delta y_1$

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

$t = \sqrt{\frac{2\Delta y}{g}}$

$t_2 = \sqrt{\frac{2 \frac{1}{2} \Delta y_1}{g}}$

Oct 27-7:52 AM

$\frac{t_2}{t_1} = \frac{\sqrt{\frac{\Delta y_1}{g}}}{\sqrt{\frac{2\Delta y_1}{g}}}$

$\boxed{\frac{t_2}{t_1} = \frac{1}{\sqrt{2}}}$

Oct 27-8:05 AM

HANDOUT #1

KNOWN

a) $\Delta y_1 = v_{0y} t_1 + \frac{1}{2} g t_1^2$

$t_2 = \sqrt{\frac{2 \cdot 2\Delta y}{g}}$

$t_1 = \sqrt{\frac{2\Delta y_1}{g}}$

Oct 27-8:06 AM

$\frac{t_2}{t_1} = \sqrt{\frac{2(2\Delta y_1)}{g}} \left(\sqrt{\frac{g}{2 \cdot \Delta y_1}} \right)$

$\frac{t_2}{t_1} = \frac{\sqrt{2}}{1}$

Oct 27-8:11 AM

b) $\Delta x = v_{0x}t + \frac{1}{2}at^2$ ($a = 0$)

$\Delta x_1 = v_0 t_1$

$\Delta x_2 = v_0 \sqrt{2}\, t_1$

$\frac{\Delta x_2}{\Delta x_1} = \sqrt{2}$

Δy_1

$\Delta y_2 = 2\Delta y_1$

IT AFFECTS TIME IN THE AIR, SO:

$t_2 = \sqrt{2}\, t_1$

Oct 27-8:16 AM

c) $\Delta x_1 = v_{0x} \cdot t_1$ $\quad v_{0x} = v_0$

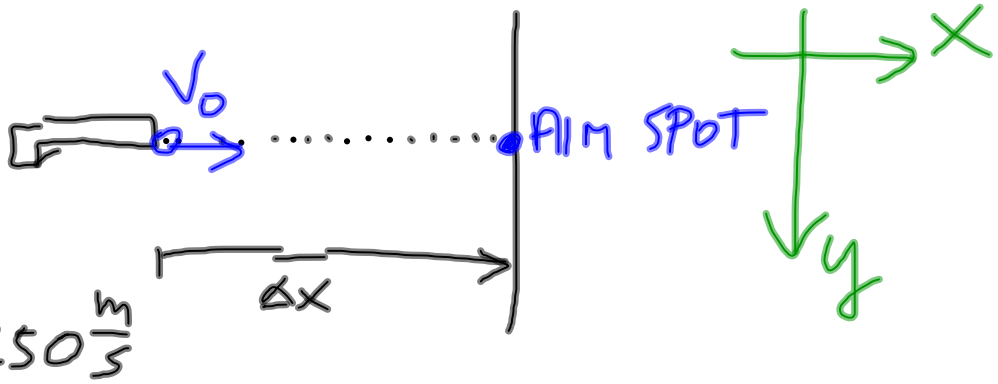
$\Delta x_1 = v_{0_1} \cdot t_1$ $\quad v_{0_2} = 2v_{0_1}$

$\Delta x_2 = 2v_{0_1} \cdot t_1$

$\frac{\Delta x_2}{\Delta x_1} = 2$

Oct 27-8:36 AM

(1)



$V_0 = 250 \frac{m}{s}$

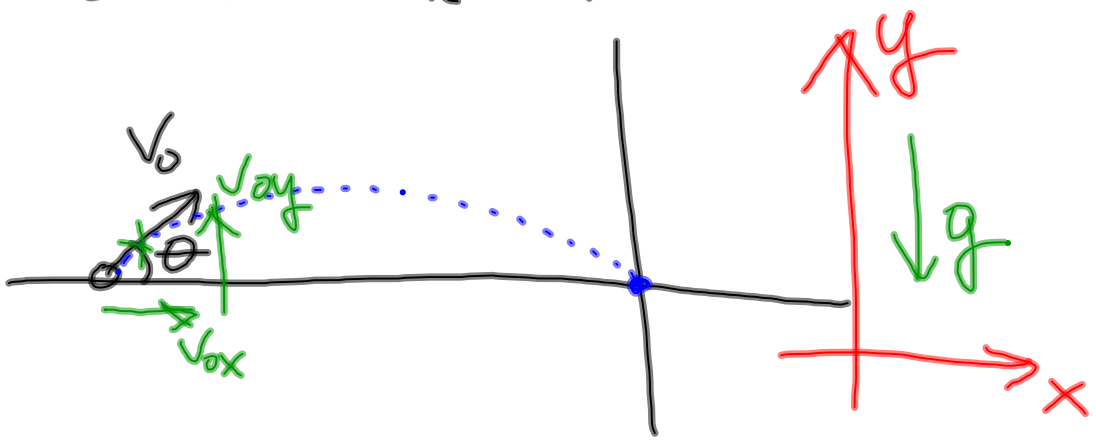
$\Delta x = 150\,m$

HOW FAR BELOW THE INTENDED TARGET DID THE BULLET HIT?

Oct 27-8:39 AM

$\Delta y = 1.76\,m$ ← t FROM (1)

(2) HOW TO AIM THE GUN TO GET THE HORIZONTAL TARGET?



Oct 27-8:51 AM

$V_{0x} = V_0 \cos\theta$

$V_{0y} = V_0 \sin\theta$

$V_{0x} = 250 \cos\theta$

$V_{0y} = 250 \sin\theta$

(x)

$V_{0x} = 250 \cos\theta$

$V_x = V_{0x}$

$\Delta x = 150\ m$

$t = ?$

(y)

$V_{0y} = 250 \sin\theta$

$V_y = -V_{0y}$ (because $\Delta y = 0$)

$g = -9.8\ m/s^2$

$\Delta y = 0$

$t = ?$

Oct 27-9:00 AM

(x) $\Delta x = V_{0x} t$

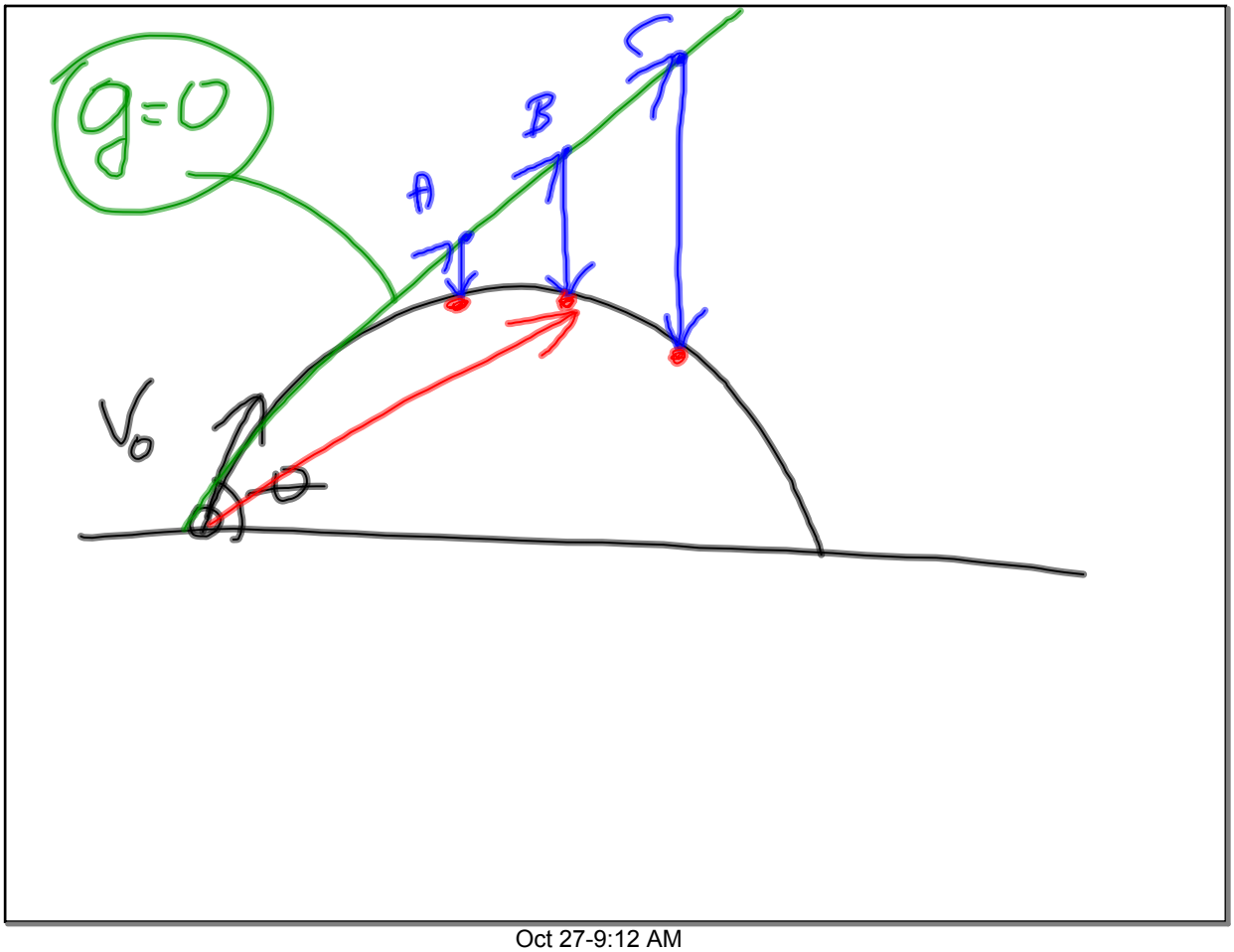
(y) $\Delta y = V_{0y} t + \frac{1}{2} g t^2$

(x) $150 = 250 \cos\theta\ (t)$

(y) $0 = 250 \sin\theta\ (t) - 4.9 t^2$

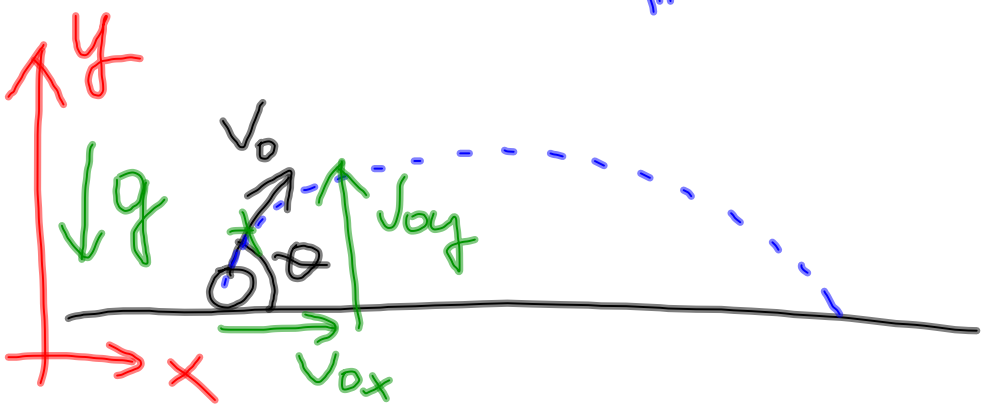
Need t to solve for θ.

Oct 27-9:05 AM



Oct 27-9:12 AM

10/28/14 ANS. $V_0 = 20\frac{m}{s}$ $\theta = 35^\circ$ (E 35° N)



Oct 28-7:53 AM

(x)

$V_{0x} = V_0 \cdot \cos\theta$

$V_x = V_{0x}$

$\Delta x = 38.24\ m$

$t = 7.34\ s$

(y)

$V_{0y} = V_0 \cdot \sin\theta$

$V_y = ?$

$\Delta y = 0$

$t = 7.34\ s$

Oct 28-8:01 AM

(x) $\Delta x = V_{0x} \cdot t$

$\Delta x = V_0 \cos\theta \cdot t$

$38.34 = (7.34) V_0 \cos\theta$

$38.34 = (7.34) V_0 \cos\theta$

(y) $\Delta y = V_{0y} t + \frac{1}{2} g t^2$

$\Delta y = V_0 \cdot \sin\theta \cdot t - 4.9 t^2$

$0 = -4.9(7.34)^2 + V_0 \cdot \sin\theta \cdot t$

$76.83 = (7.34) V_0 \sin\theta$

Oct 28-8:02 AM

$$\begin{cases} 26.83 = (7.34) V_0 \cdot \sin\theta \\ 38.34 = (7.34) V_0 \cos\theta \end{cases} \div$$

$$0.70 = \tan\theta$$

$$\theta = \tan^{-1}(0.70)$$

$$\boxed{\theta = 35^\circ} \text{ E of N}$$

Oct 28-8:09 AM

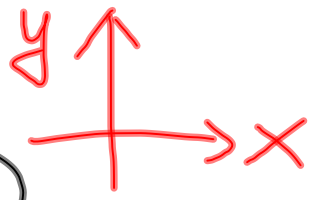
$$\Delta x = V_0 \cdot \cos\theta \cdot t$$

$$38.34 = V_0 \cdot \cos(35^\circ)(7.34)$$

$$\boxed{V_0 = 20.0 \ \frac{m}{s}}$$

Oct 28-8:15 AM

SUMMARY HANDOUT



38

x	y
$V_{0x} = V_0 \cdot \cos 50^\circ$	$V_{0y} = V_0 \cdot \sin 50^\circ$
$V_x = V_{0x}$	$V_y = ?$
$\Delta x = 1.06\ m$	$g = -9.8\ \frac{m}{s^2}$
$t = ?$	$\Delta y = ?$
	$t = ?$

Oct 28-8:20 AM