

Soln:

? x-dir

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

2 unknowns

\therefore look @ y-direction

y-dir

$$\Delta y = v_{y0} t + \frac{1}{2} g \Delta t^2 \quad v_{y0} = 0$$

$$\Delta y = -\frac{1}{2} g \Delta t^2$$

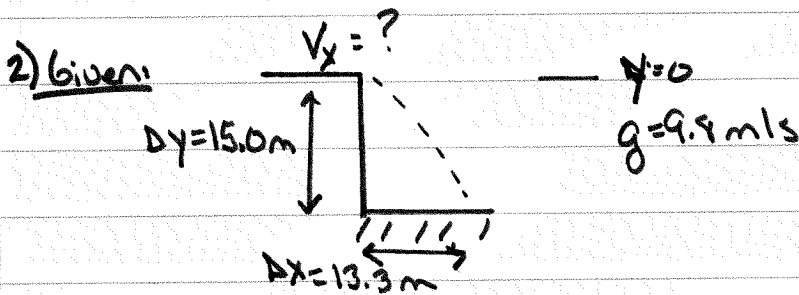
$$2 \frac{\Delta y}{-g} = \Delta t^2$$

$$\Delta t = \sqrt{\frac{-2(-0.75 \text{ m})}{9.8 \text{ m/s}^2}}$$

$$V_x = \frac{1.35 \text{ m}}{0.39 \text{ s}}$$

$$\Delta t = 0.39 \text{ Sec}$$

$V_x = 3.5 \text{ m/s}$ down, ← But did Ask for speed so dont need direction



x-direction

$$V_x = \frac{\Delta x}{\Delta t} ? \quad 2 \text{ unknowns}$$

$$V_x = \frac{13.3 \text{ m}}{1.75 \text{ s}}$$

y-direction

$$\Delta y = v_{y0} t - \frac{1}{2} g t^2 \quad v_{y0} = 0$$

$$\Delta y = -\frac{1}{2} g \Delta t^2$$

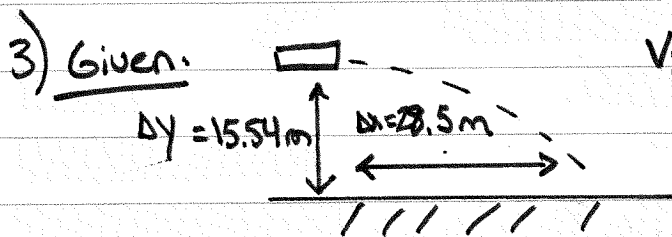
$$\Delta t^2 = \frac{-2 \Delta y}{g} = \frac{-2(-15.0 \text{ m})}{9.8 \text{ m/s}^2}$$

$$\Delta t = 1.75 \text{ s}$$

$$V_x = 7.6 \text{ m/s}$$

AP Physics
 Worst - Projectile motion # 1

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$V_x = ?$ Just Horizontal Speed
 $g = 9.8 \text{ m/s}^2$

Soln:

X-direction

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

$$\Delta x = V_x \Delta t$$

$$=$$

$$\frac{28.5 \text{ m}}{1.78 \text{ s}} \quad \Delta V_x = \frac{28.5 \text{ m}}{1.06 \text{ s}} = 8.02 \text{ m/s}$$

$$V_x = 16.0 \text{ m/s}$$

Y-direction

$$\Delta y = V_{y0} t - \frac{1}{2} g t^2 \quad V_y = 0$$

$$t^2 = -\frac{2\Delta y}{g}$$

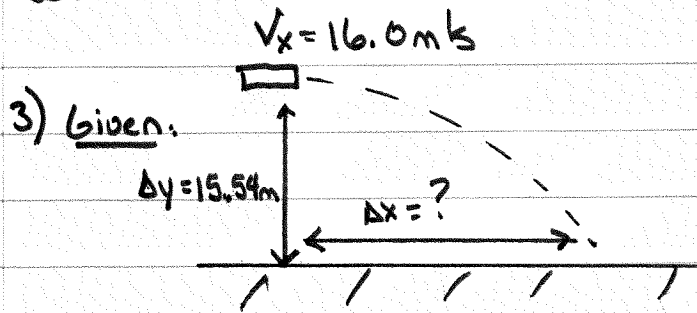
$$\Delta t = -\frac{2(-15.54 \text{ m})}{9.8 \text{ m/s}^2}$$

$$= 1.06 \text{ s}$$

$\Delta t = 1.78 \text{ s}$

AP Physics
wkst - Projectile motion #1

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$\Delta t = 1.78 \text{ s}$ to fall
 $g = 9.8 \text{ m/s}^2$

Soln. x-dir

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

$$\Delta x = V_x \Delta t \quad 2 \text{ unknowns}$$

y-direction

$$\Delta y = v_{y0} t - \frac{1}{2} g \Delta t^2 \quad v_{y0} = 0$$

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

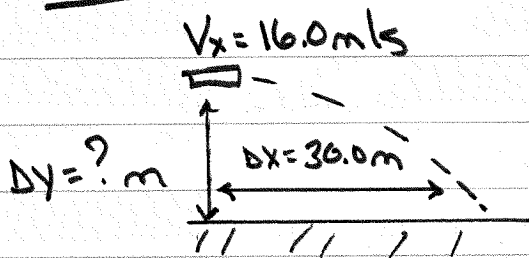
$$= \frac{-2(-15.54 \text{ m})}{9.8 \text{ m/s}^2}$$

$$\Delta x = (16.0 \text{ m/s})(1.78 \text{ s})$$

$$\boxed{\Delta x = 28.5 \text{ m}}$$

$$\Delta t = 1.78 \text{ s}$$

4) Given:



$g = 9.8 \text{ m/s}^2$

Soln. x-dir

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

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

$$= \frac{30.0 \text{ m}}{16.0 \text{ m/s}}$$

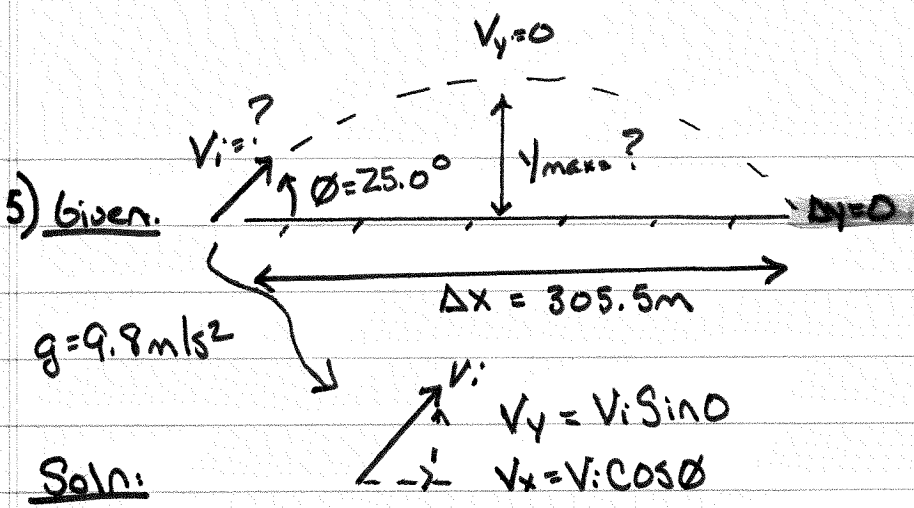
y-direction

$$\Delta y = v_{y0} t - \frac{1}{2} g \Delta t^2 \quad v_{y0} = 0$$

$$\Delta y = -\frac{1}{2} (9.8 \text{ m/s}^2) (1.88 \text{ s})^2$$

$$\boxed{\Delta y = -17.3 \text{ m}}$$

$$\Delta t = 1.88 \text{ s}$$



Things I know:
 $y_{\text{max}} @ \frac{\Delta t}{2}$
 $@ V_{y0} = 0$
 $\Delta y = 0 @ \Delta x = 305.05$

Soln:

x-dir

① $V_x = \frac{\Delta x}{\Delta t}$
 $v_x = v_i \cos \theta$

$v_i \cos \theta = \frac{\Delta x}{\Delta t}$ solve for Δt
 $\Delta t = \frac{\Delta x}{v_i \cos \theta}$

y-dir

② $\Delta y = v_{y0} \Delta t - \frac{1}{2} g \Delta t^2$
 $v_y = v_i \sin \theta$
 $@ y = y_{\text{max}} @ t = \frac{\Delta t}{2}$

$y_{\text{max}} = v_i \sin \theta \frac{\Delta t}{2} - \frac{1}{2} g \left(\frac{\Delta t}{2}\right)^2$
 ? ? ? ? 3 unknowns

But $\Delta y = 0 @ 305.5 \text{ m} \neq \Delta y_{\text{total}}$

③ $\Delta y = v_{y0} \Delta t - \frac{1}{2} g \Delta t^2$
 $0 = v_i \sin \theta \Delta t - \frac{1}{2} g \Delta t^2$
 $v_i \sin \theta \Delta t = \frac{1}{2} g \Delta t^2$
 $v_i = \frac{g \Delta t}{2 \sin \theta}$

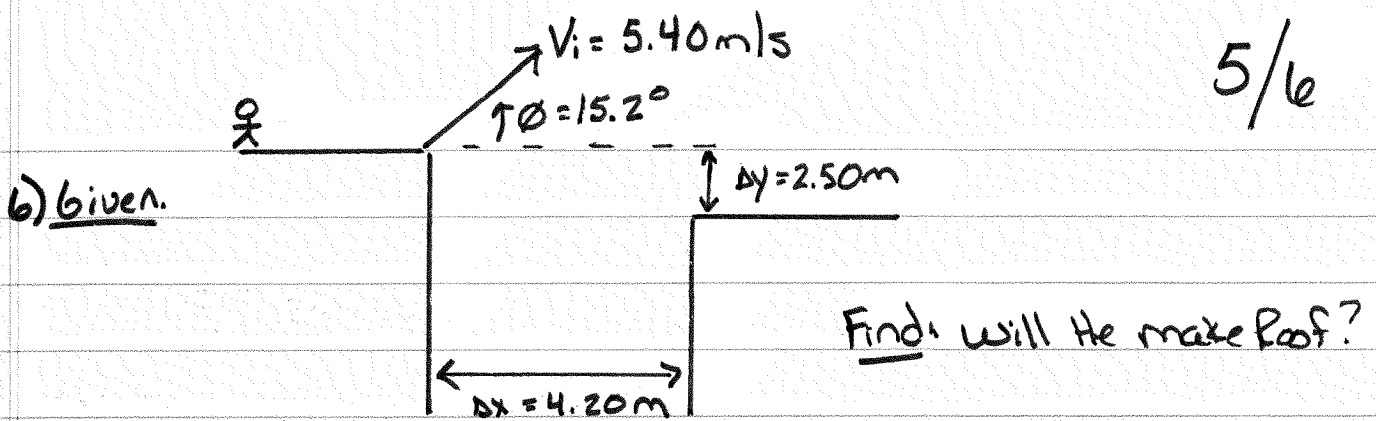
④ $\Delta t = \frac{\Delta x}{v_i \cos \theta}$
 $= \frac{305.5 \text{ m}}{(62.5 \text{ m/s}) \cos(25.0)}$

$\Delta t = 5.39 \text{ sec in Air Total}$

⑤ $y_{\text{max}} = v_i \sin \theta \frac{\Delta t}{2} - \frac{1}{2} g \left(\frac{\Delta t}{2}\right)^2$
 $= (62.5 \frac{\text{m}}{\text{s}}) \sin 25.0 \frac{5.39}{2} - \frac{1}{2} (9.8) \left(\frac{5.39}{2}\right)^2$
 $= 71.2 \text{ m} - 35.6 \text{ m}$

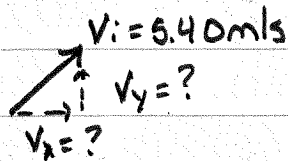
$y_{\text{max}} = 35.6 \text{ m}$

Sub in Δt from x-dir into
 $v_i = \frac{g \Delta x}{2 \sin \theta v_i \cos \theta}$
 $v_i^2 = \frac{g \Delta x}{2 \sin \theta \cos \theta} = \frac{(9.8 \text{ m/s}^2)(305.5 \text{ m})}{2 \sin(25.0) \cos(25.0)}$
 $v_i^2 = 3908.25 \text{ m}^2/\text{s}^2$
 $v_i = 62.5 \text{ m/s}$



Soln:

- Will he fall 2.50m Vertical before Traveling 4.20m Horizontally?
- Only common Variable Btw x & $y \Rightarrow$ Time
- 1st solve How long, Δt_x to go 4.20m?
- 2nd How far will fall in Δt_x ?



$$V_x = V_i \cos \theta$$

$$= 5.40\text{m/s} \cos(15.2)$$

$$V_x = 5.21\text{m/s}$$

$$V_y = V_i \sin \theta$$

$$= (5.40\text{m/s}) \sin(15.2)$$

$$V_y = 1.42\text{m/s}$$

x-dir

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

$$\Delta t = \frac{\Delta x}{V_x} = \frac{4.20\text{m}}{5.21\text{m/s}}$$

$$\Delta t = 0.806\text{s to Travel } 4.20\text{m}$$

y-direction . How far fall in 0.806s

$$\Delta y = V_{yi} \Delta t - \frac{1}{2} g t^2$$

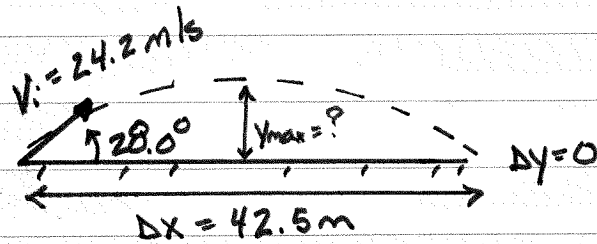
$$= (1.42\text{m/s})(0.806\text{s}) - \frac{1}{2} (9.8\text{m/s}^2)(0.806\text{s})^2$$

$$= 1.14\text{m} - 3.18\text{m}$$

$$\Delta y = -2.04\text{m} \quad \text{will fall in } 0.806\text{s}$$

Less than 2.50m

• He will make it

7) Given: $\Delta t = ?$ Total timeSoln:

$$\text{x-dir}$$

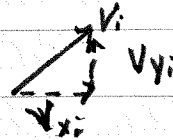
$$V_x = \frac{\Delta x}{\Delta t}$$

$$V_i \cos \theta = \frac{\Delta x}{\Delta t}$$

$$\Delta t = \frac{\Delta x}{V_i \cos \theta}$$

$$= \frac{42.5 \text{ m}}{(24.2 \text{ m/s}) \cos 28.0^\circ}$$

$$\Delta t = 1.99 \text{ s}$$



$$V_{xi} = V_i \cos \theta$$

$$V_{yi} = V_i \sin \theta$$

y-dir

$$\Delta y = V_{yi} t - \frac{1}{2} g t^2$$

$$y_{\max} @ \frac{\Delta t}{2} \quad V_{yi} = V_i \sin \theta$$

$$y_{\max} = V_{yi} \sin \theta \frac{\Delta t}{2} - \frac{1}{2} g \left(\frac{\Delta t}{2} \right)^2$$

$$= (24.2 \text{ m/s}) \sin 28.0^\circ \frac{1.99 \text{ s}}{2} - \frac{1}{2} (9.8 \frac{\text{m}}{\text{s}^2}) \left(\frac{1.99 \text{ s}}{2} \right)^2$$

$$= 11.3 \text{ m} - 4.85 \text{ m}$$

$$y_{\max} = 6.5 \text{ m}$$