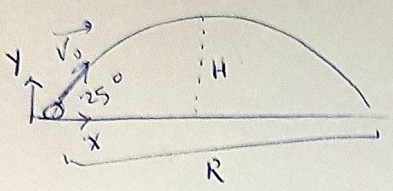
(1)



$H = ?$

$H = \frac{V_0^2 \sin^2\alpha_0}{2g}$ $\quad \begin{cases} \alpha_0 = 25^\circ \\ V_0 = 20\ m/s \\ g = 9.8\ m/s^2 \end{cases}$ $\quad H = \frac{(20)^2(\sin^2 25^\circ)}{2(9.8)} = 3.65\ m$

total flight time $= ?$

$V_y = 0 \longrightarrow -gt + V_0 \sin\alpha_0 = 0 \longrightarrow t = \frac{V_0 \sin\alpha_0}{g}$ (رفت)

زمان کل پرواز $t = 2t_{رفت} = \frac{2V_0 \sin\alpha_0}{g} = \frac{2(20)\sin 25^\circ}{9.8} = 1.72\ s$

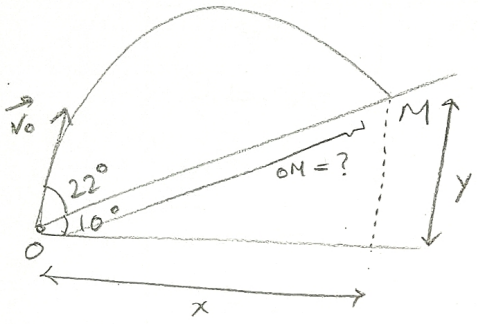
برد $R = ?$

$R = \frac{V_0^2 \sin 2\alpha_0}{g} = \frac{(20)^2 \sin 50^\circ}{9.8} = 31.27\ m$

سرعت برخورد به زمین $= ?$ $\quad \begin{cases} V_x = V_0 \cos\alpha_0 \longrightarrow V_x = 20\cos 25^\circ = 18.13\ m/s \\ V_y = -gt + V_0 \sin\alpha_0 t \quad t = 1.72\ s \longrightarrow V_y = -9.8(1.72) + 20\sin(25^\circ) = -8.4\ m/s \end{cases}$

$|\vec{V}| = \sqrt{V_x^2 + V_y^2} = \sqrt{18.13^2 + (-8.4)^2} = \sqrt{399.12} \simeq 19.98\ m/s$

(2)



$\theta = 22^\circ + 10^\circ = 32^\circ$

$|\vec{V_0}| = 15\ m/s$

معادله مسیر $\begin{cases} y = \frac{-gx^2}{2V_0^2 \cos^2\alpha_0} + x\tan\alpha_0 \quad (1) \\ \tan 10^\circ = \frac{y}{x} \quad (2) \end{cases}$

(1) $\longrightarrow y = \frac{-9.8x^2}{2(15)^2\cos^2(32^\circ)} + x\tan(32^\circ) \longrightarrow y = -0.03x^2 + 0.62x$

(2) $\longrightarrow \frac{y}{x} = 0.18 \longrightarrow y = 0.18x$

(2) $\longrightarrow 0.18x = -0.03x^2 + 0.62x$

$\longrightarrow 0.03x^2 + (0.18 - 0.62)x = 0$ $\quad (0.18 - 0.62 = -0.44)$

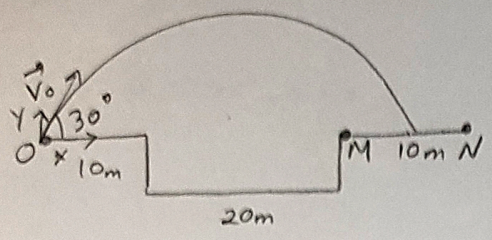
$\longrightarrow x(0.03x - 0.44) = 0 \begin{cases} x = 0 \\ x = 14.67\ m \end{cases}$

(2) $x = 14.67 \longrightarrow y = 2.65\ m$

$x = V_0 \cos\alpha_0 t \longrightarrow 14.67 = 15\cos(32^\circ)t$

$\longrightarrow t = 1.15\ s$

میانگین $OM = \sqrt{x^2 + y^2} = \sqrt{14.67^2 + 2.65^2} = \sqrt{222.18} \simeq 14.91\ m$



$OM = 10+20 = 30_m$

$ON = 10+20+10 = 40_m$

(3)

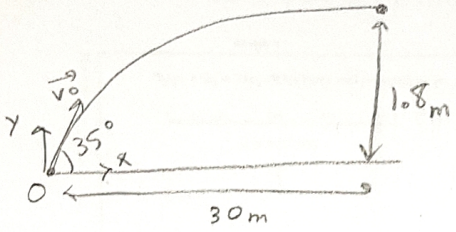
$\therefore R = \frac{V_0^2 \sin 2\alpha_0}{g} \longrightarrow 30_m < \frac{V_0^2 \sin 2\alpha_0}{g} < 40_m$

$\longrightarrow 30g < V_0^2 \sin 2\alpha_0 < 40g \longrightarrow \frac{30g}{\sin 2\alpha_0} < V_0^2 < \frac{40g}{\sin 2\alpha_0} \longrightarrow \sqrt{\frac{30g}{\sin 2\alpha_0}} < V_0 < \sqrt{\frac{40g}{\sin 2\alpha_0}}$

عند $\alpha_0 = 30°$

$\longrightarrow \sqrt{\frac{30(9.8)}{\sin(60°)}} < V_0 < \sqrt{\frac{40(9.8)}{\sin(60°)}}$

$\longrightarrow 18.43 \frac{m}{s} < V_0 < 21.28 \ m/s$



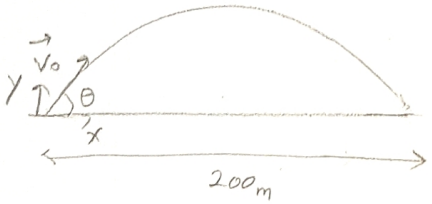
معادلة المسار $\longrightarrow y = \frac{-gx^2}{2V_0^2 \cos^2\alpha_0} + x\tan\alpha_0$

$1.8 = \frac{-9.8(30)^2}{2V_0^2 \cos^2(35°)} + (30)\tan(35°)$

(4)

$\longrightarrow V_0^2 = 342.19 \ m^2/s^2 \longrightarrow V_0 = 18.5 \ m/s$

$x = V_0 \cos\alpha_0 t \longrightarrow 30 = 18.5\cos(35°)t \longrightarrow t = 1.98 \ s$



زمن التحليق $= t = \frac{2V_0 \sin\theta}{g}$

(5)

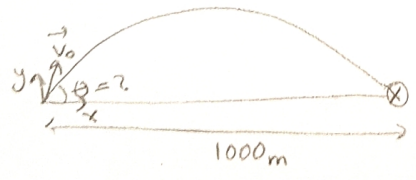
$x = V_0 \cos\theta \ t = V_0 \cos\theta \times \frac{2V_0 \sin\theta}{g}$

$\longrightarrow 200 = \frac{V_0^2 \times \sin 2\theta}{g} \longrightarrow \sin 2\theta = \frac{200g}{V_0^2} = \frac{200(9.8)}{3600} = 0.54$

$t' = \frac{2 \times 60 \sin(16.49°)}{9.8} = 3.48 \ s$

$\longrightarrow 2\theta = \sin^{-1}(0.54) = 32.99°$

$\longrightarrow \theta = 16.49°$



$X = V_0 \cos\theta t \longrightarrow V_0 \cos\theta = \frac{x}{t} = \frac{1000}{40} = 25 \ m/s$ ①

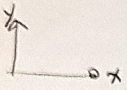
(6)

$t' = 2t = \frac{2V_0 \sin\theta}{g} = 40 \longrightarrow V_0 \sin\theta = 20g \ m/s$ ②

$\frac{V_0 \sin\theta}{V_0 \cos\theta} = \frac{20g}{25} \longrightarrow \tan\theta = \frac{20(9.8)}{25} = 7.84 \longrightarrow \theta = 82.73°$

$V_0 \cos\theta = 25 \ m/s \longrightarrow V_0 = \frac{25}{\cos(82.73°)} = 197.56 \ m/s$

$y = -0.025x^2 + 0.5x$



$\leftarrow$ compare $\rightarrow y = \dfrac{-gx^2}{2v_0^2 C_y^2 \alpha_0} + x\tan\alpha_0$

$\dfrac{-g}{2v_0^2 C_y^2 \alpha_0} = -0.025$

$\tan\alpha_0 = 0.5$

$\alpha_0 = 26.57°$

$0.05 v_0^2 C_y^2 (26.57°) = g$

$v_0 = \sqrt{\dfrac{g}{0.05(C_y^2(26.57))}} = \sqrt{\dfrac{9.8}{0.04}} = 15.65 \text{ m/s}$

(7)

0.8

$63.0123778\ \mu F = 63012.3778\ nF$

$0.00783981\ PA = 0.0000078348\ nA$

(8)