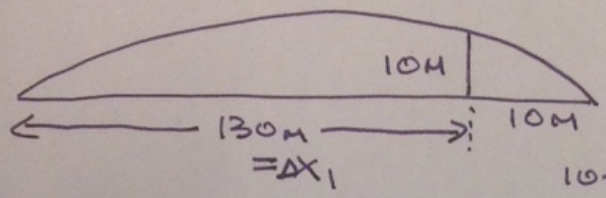
SI #3, prob # 7



$= \Delta X_1$

$10 + 130 = 140\ m = \Delta X_2$

$\Delta X_1 = V_{ox} t_1$

$130 = V_{ox} t_1$

$\frac{130}{V_{ox}} = t_1$

$\Delta Y_1 = V_{oy} t_1 + \frac{1}{2} a_y t_1^2$

$10 = V_{oy} t_1 - 4.9 t_1^2$

$10 = V_{oy} \frac{130}{V_{ox}} - 4.9\left(\frac{130}{V_{ox}}\right)^2$

$10 = \frac{V_{oy}}{V_{ox}} 130 - \frac{4.9(130)^2}{V_{ox}^2}$

Multiply both sides by V_{ox}^2

$10 V_{ox}^2 = V_{ox} V_{oy} (130) - 4.9(130)^2$

$10 V_{ox}^2 = 130 \boxed{V_o^2 \sin\theta \cos\theta} - 4.9(130)^2$

$10 V_{ox}^2 = 130 (4.9)(140) - 4.9(16900)$

$V_{ox}^2 = \frac{89180 - 82810}{10} = \frac{6370}{10}$

$V_{ox} = 25.24$

$V_{oy} = 27.18$

$V_o = \sqrt{25.24^2 + 27.18^2}$

$V_o = 37.1\ m/s$

$\theta = \tan^{-1} \frac{27.18}{25.24} = 47.2°$

$\Delta X_2 = V_{ox} t_2$

$140 = V_{ox} t_2$

$\Delta Y_2 = V_{oy} t_2 + \frac{1}{2} a_y t_2^2$

$0 = V_{oy} t_2 - 4.9 t_2^2$

$4.9 t_2^2 = V_{oy} t_2$

$4.9 t_2 = V_{oy}$

$t_2 = \frac{V_{oy}}{4.9}$

$140 = V_{ox} t_2 = V_{ox}\left(\frac{V_{oy}}{4.9}\right)$

$140 = \frac{V_{ox} V_{oy}}{4.9} = \frac{V_o^2 \sin\theta \cos\theta}{4.9}$

$\boxed{4.9(140) = V_o^2 \sin\theta \cos\theta}$