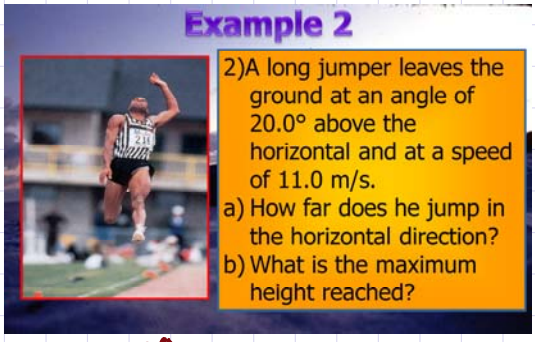
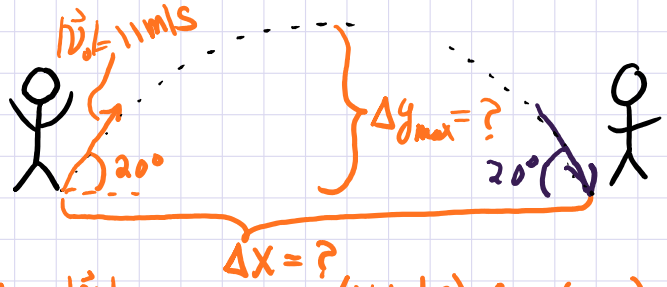
Example 2

Wednesday, September 9, 2015 7:08 AM





$a_y = -9.8 m/s^2$

$a_x = 0$

$\Delta y = 0$

$V_x = |\vec{V}_0| \cos(20^\circ) = (11 m/s)\cos(20^\circ) = 10.34 m/s$

$V_{y_0} = |\vec{V}_0| \sin(20^\circ) = (11 m/s)\sin(20^\circ) = 3.76 m/s$

$\Delta y = V_{y_0} t + \frac{1}{2} a_y t^2$

$0 = V_{y_0} t + \frac{1}{2} a_y t^2$

$0 = (V_{y_0} + \frac{1}{2} a_y t) t$

$t = 0 \qquad V_{y_0} + \frac{1}{2} a_y t = 0$

$\frac{1}{2} a_y t = -V_{y_0}$

$t = \frac{-2V_{y_0}}{a_y}$

$t = \frac{+2(3.76 m/s)}{+9.8 m/s^2}$

$t = .77 s$

$\Delta X = V_x t$

$\Delta X = (10.34 m/s)(.77 s)$

$\boxed{\Delta X = 7.96 m}$

$V_x = 10.34 m/s$

$V_y = -3.7 m/s$

b) Δy_{max}

$V_y^2 = V_{y_0}^2 + 2 a_y \Delta y_{max}$

$\Delta y_{max} = \frac{-V_{y_0}^2}{2 a_y}$

$\Delta y_{max} = \frac{-(3.76 m/s)^2}{2(-9.8 m/s^2)}$

$\Delta y_{max} = .698 m$

Example 3

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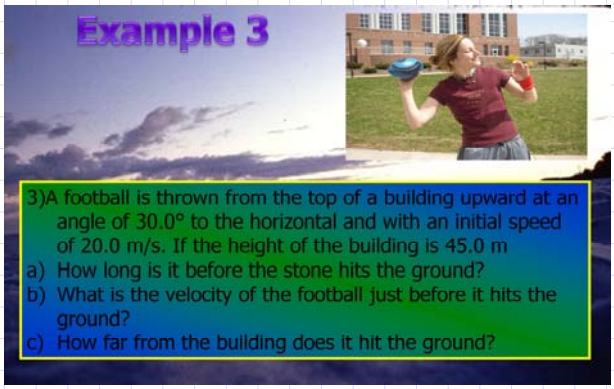

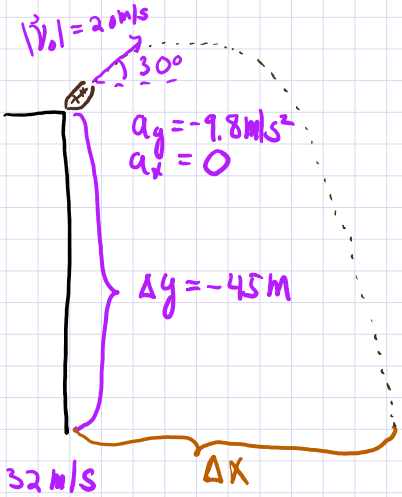

$v_x = |\vec{v}_0| \cos(30) = (20 m/s)\cos(30°) = 17.32 m/s$

$v_{y_0} = |\vec{v}_0| \sin(30) = (20 m/s)\sin(30°) = 10 m/s$

a) $\Delta y = v_{y_0} t + \frac{1}{2} a_y t^2$

$\frac{1}{2} a_y t^2 + v_{y_0} t - \Delta y = 0$

$t^2 + \frac{2v_{y_0}}{a_y} t - \frac{2\Delta y}{a_y} = 0$

$t^2 + \frac{2(10 m/s)}{-9.8 m/s^2} t - \frac{2(-45 m)}{-9.8 m/s^2} = 0$

$1t^2 - 2.04s\, t - 9.18 s^2 = 0$

a b c

$t = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$t = \frac{2.04s \pm \sqrt{(-2.04s)^2 - 4(1)(-9.18s^2)}}{2}$

$t = \frac{2.04s \pm \sqrt{40.88s^2}}{2} = \frac{2.04s \pm 6.39s}{2}$

$t = \frac{2.04s + 6.39s}{2}$ or $\frac{2.04s - 6.39s}{2}$

$t = 4.22s$ $-2.2s$

b) $v_x = 17.32 m/s$ ~ $|\vec{v}| = ?$, $\theta = ?$

$v_y = v_{y_0} + a_y t$

$v_y = (10 m/s) + (-9.8 m/s^2)(4.22s)$

$v_y = -31.356 m/s$

c) $\Delta x = v_x t$

$\Delta x = (17.32 m/s)(4.22s) = 73.1 m$