Example 2

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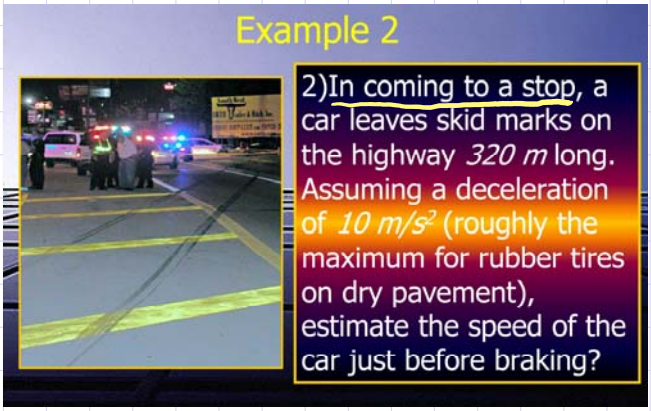

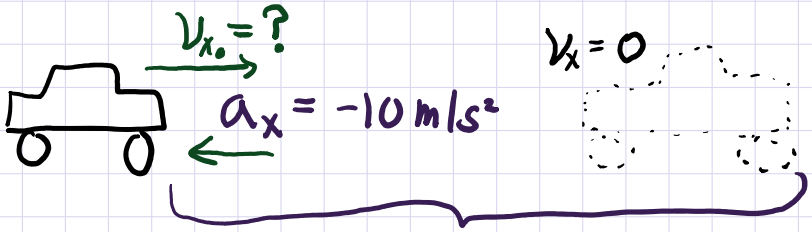

$\Delta x = 320\ m$

$v_x^2 = v_{x_0}^2 + 2a_x \Delta x$ ($v_x \to 0$)

$v_{x_0}^2 = -2a_x \Delta x$

$v_{x_0} = \sqrt{-2a_x \Delta x}$

$v_{x_0} = \sqrt{-2(-10\ m/s^2)(320\ m)}$

$v_{x_0} = 80\ m/s$

Example 3

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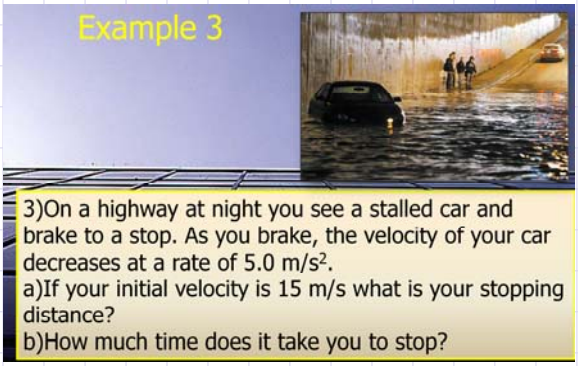

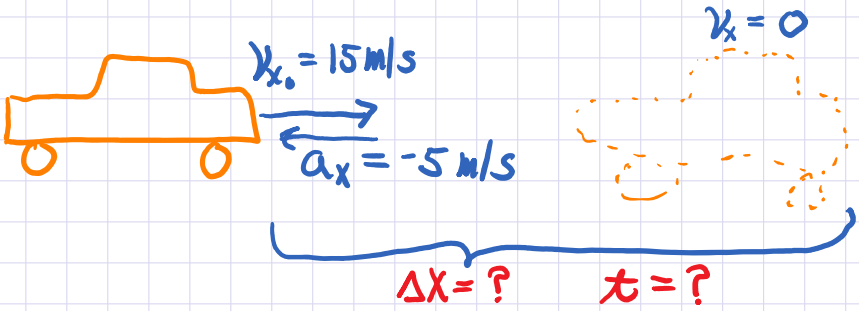

b) $t = ?$

$v_x = v_{x_0} + a_x t$

$t = \dfrac{-v_{x_0}}{a_x}$

$t = \dfrac{-(15\ m/s)}{-5\ m/s^2}$

$\boxed{t = 3\ s}$

a) $\Delta x = ?$

$\Delta x = v_{x_0} t + \frac{1}{2} a_x t^2$

$\Delta x = (15\ m/s)(3s) + \frac{1}{2}(-5\ m/s^2)(3s)^2$

$\Delta x = 45\ m - 22.5\ m$

$\boxed{\Delta x = 22.5\ m}$

Example 4

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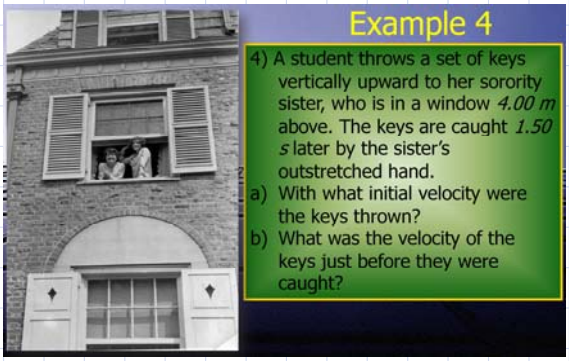

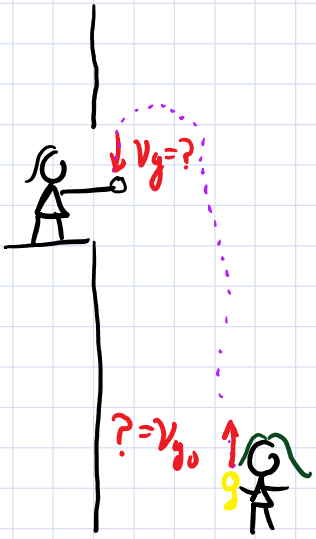

$a_y = -9.8\ m/s$

$v_{y_{max}} = 0$

$t = 1.5\ s$

$\Delta y = 4\ m$

Δy_{max}

$$\Delta y = v_{y_0} t + \tfrac{1}{2} a_y t^2$$

$$v_{y_0} t = \Delta y - \tfrac{1}{2} a_y t^2$$

$$v_{y_0} = \frac{\Delta y}{t} - \tfrac{1}{2} a_y t$$

$$v_{y_0} = \frac{4\ m}{1.5\ s} + \tfrac{1}{2}(+9.8\ m/s^2)(1.5\ s)$$

$$v_{y_0} = 10.02\ m/s$$

$$v_y = v_{y_0} + a_y t$$

$$v_y = 10.02\ m/s + (-9.8\ m/s^2)(1.5\ s)$$

$$v_y = -4.68\ m/s$$

$$\cancel{v_{y_{max}}^2}^{\,0} = v_{y_0}^2 + 2 a_y \Delta y_{max}$$

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

$$\Delta y_{max} = \frac{+(10.02\ m/s)^2}{2(+9.8\ m/s^2)}$$

$$\Delta y_{max} = 5.12\ m$$

Example 5

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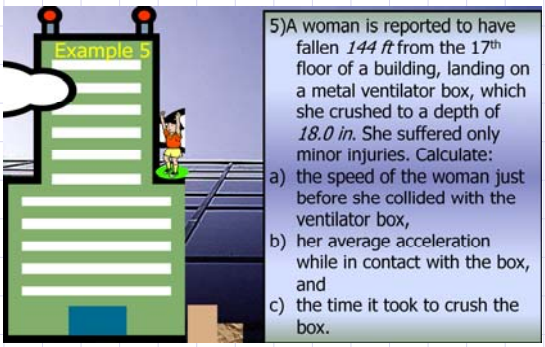
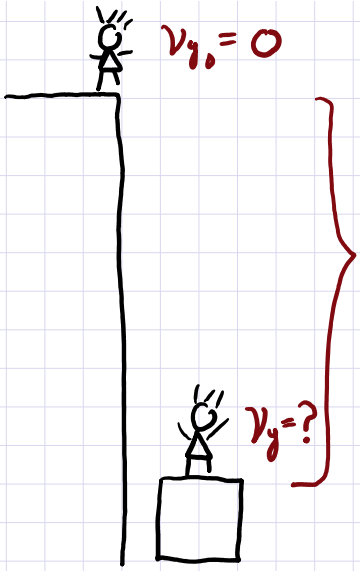




$a_y = -9.8\ m/s^2$

$\Delta y = -144\ \cancel{ft}\left(\frac{1\ m}{3.28\ \cancel{ft}}\right)$

$= -43.9\ m$

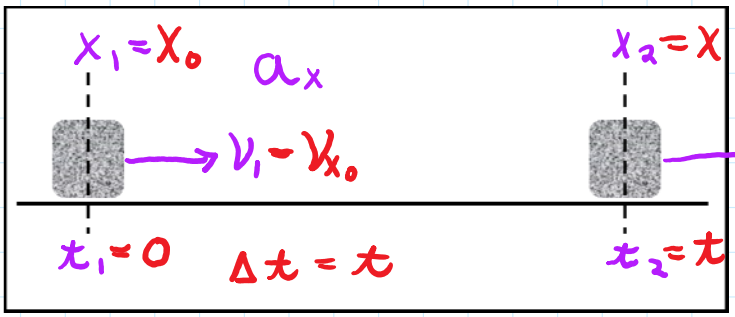
a) $v_y^2 = \cancel{v_{y_0}^2}^{0} + 2a_y\Delta y$

$v_y = \sqrt{2a_y\Delta y}$

$v_y = \sqrt{2\,(+9.8\ m/s^2)(+43.9\ m)}$

$v_y = 29.33\ m/s$

$\Delta x = x - x_0$



$$v_{ave} = \frac{\Delta x}{t}$$

$$\left(\frac{v_x + v_{x_0}}{2}\right) = \frac{\Delta x}{t}$$

① $\boxed{\Delta x = \left(\frac{v_x + v_{x_0}}{2}\right) t}$

No a_x

$$\Delta x = \left(\frac{v_{x_0} + a_x t + v_{x_0}}{2}\right) t$$

$$\Delta x = \tfrac{1}{2}(2v_{x_0} + a_x t) t$$

③ $\boxed{\Delta x = v_{x_0} t + \tfrac{1}{2} a_x t^2}$

No v_x

$$a_x = \frac{\Delta v}{t}$$

$$a_x = \frac{v_x - v_{x_0}}{t}$$

$$v_x - v_{x_0} = a_x t$$

② $\boxed{v_x = v_{x_0} + a_x t}$

No Δx

$$v_x = v_{x_0} + a_x t$$

$$t = \frac{v_x - v_{x_0}}{a_x}$$

$$\Delta x = \left(\frac{v_x + v_{x_0}}{2}\right)\left(\frac{v_x - v_{x_0}}{a_x}\right)$$

$$2 a_x \Delta x = (v_x + v_{x_0})(v_x - v_{x_0})$$

$$2 a_x \Delta x = v_x^2 - v_{x_0}^2$$

④ $\boxed{v_x^2 = v_{x_0}^2 + 2 a_x \Delta x}$

No t