


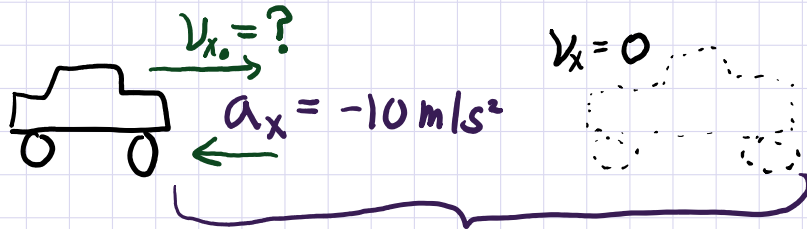
Example 2

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Example 2



2) In coming to a stop, a car leaves skid marks on the highway 320 m long. Assuming a deceleration of 10 m/s^2 (roughly the maximum for rubber tires on dry pavement), estimate the speed of the car just before braking?



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

$\Delta x = 320\text{ m}$

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

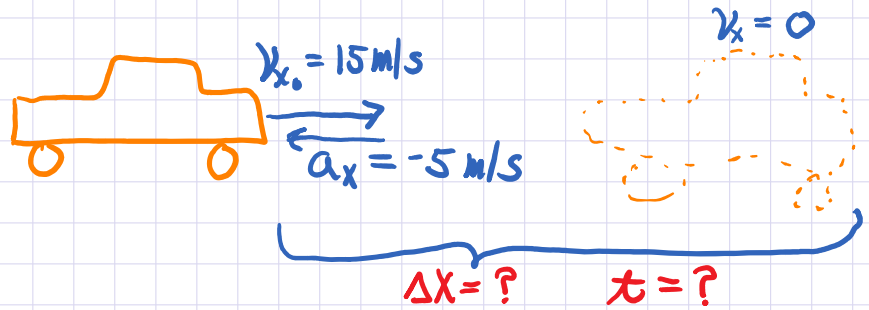
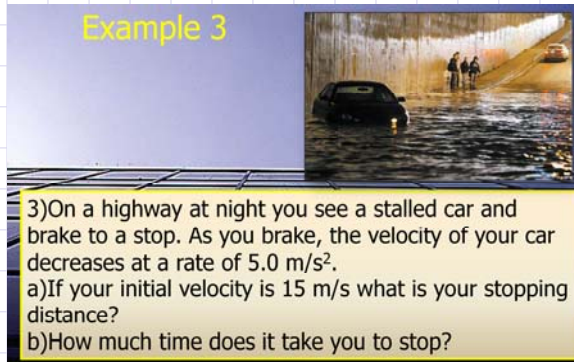
$$v_{x_0} = \sqrt{2 a_x \Delta x}$$

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

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

Example 3

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b) $t = ?$

$$v_x = v_{x_0} + a_x t$$
$$t = -\frac{v_{x_0}}{a_x}$$
$$t = \frac{-(15 \text{ m/s})}{-5 \text{ m/s}^2}$$
$$t = 3 \text{ s}$$

a) $\Delta x = ?$

$$\Delta x = v_{x_0} t + \frac{1}{2} a_x t^2$$
$$\Delta x = (15 \text{ m/s})(3 \text{ s}) + \frac{1}{2} (-5 \text{ m/s}^2)(3 \text{ s})^2$$
$$\Delta x = 45 \text{ m} - 22.5 \text{ m}$$
$$\Delta x = 22.5 \text{ m}$$

Example 4

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Example 4

- 4) A student throws a set of keys vertically upward to her sorority sister, who is in a window 4.00 m above. The keys are caught 1.50 s later by the sister's outstretched hand.
- With what initial velocity were the keys thrown?
 - What was the velocity of the keys just before they were caught?

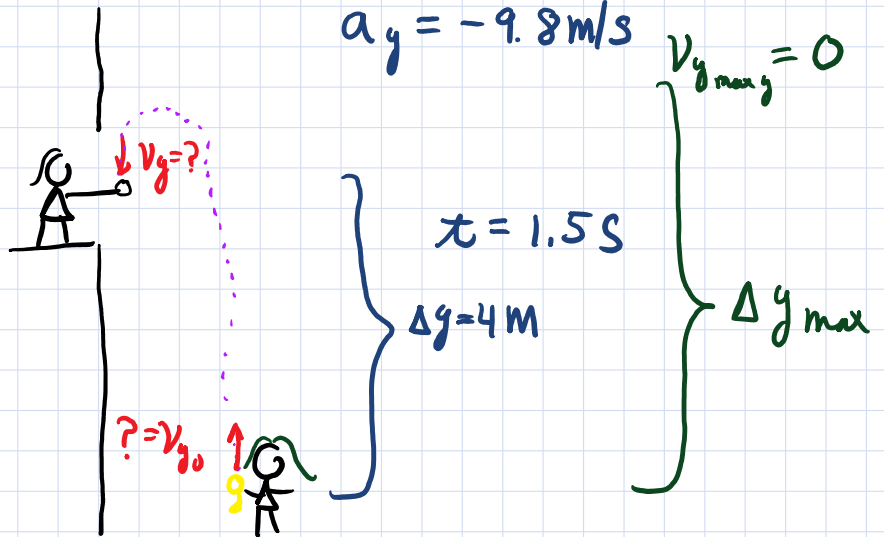
$$\Delta y = v_{y0}t + \frac{1}{2}a_y t^2$$

$$v_{y0}t = \Delta y - \frac{1}{2}a_y t^2$$

$$v_{y0} = \frac{\Delta y}{t} - \frac{1}{2}a_y t$$

$$v_{y0} = \frac{4\text{m}}{1.5\text{s}} + \frac{1}{2}(+9.8\text{m/s}^2)(1.5\text{s})$$

$$v_{y0} = 10.02\text{ m/s}$$



$$v_y = v_{y0} + a_y t$$

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

$$v_y = -4.68\text{ m/s}$$

$$v_{y,max}^2 = v_{y0}^2 + 2a_y \Delta y_{max}$$

$$\Delta y_{max} = \frac{-v_{y0}^2}{2a_y}$$

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

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

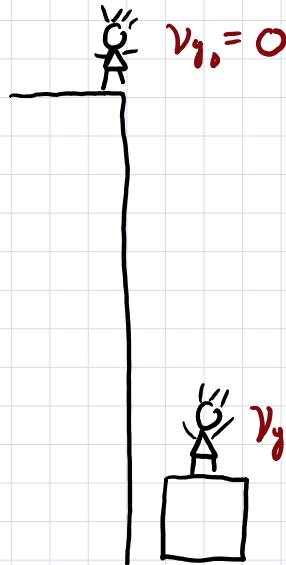
Example 5

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5) A woman is reported to have fallen 144 ft from the 17th floor of a building, landing on a metal ventilator box, which she crushed to a depth of 18.0 in. She suffered only minor injuries. Calculate:

- the speed of the woman just before she collided with the ventilator box,
- her average acceleration while in contact with the box, and
- the time it took to crush the box.



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

$$\Delta y = -144 \text{ ft} \left(\frac{1 \text{ m}}{3.28 \text{ ft}} \right) = -43.9 \text{ m}$$

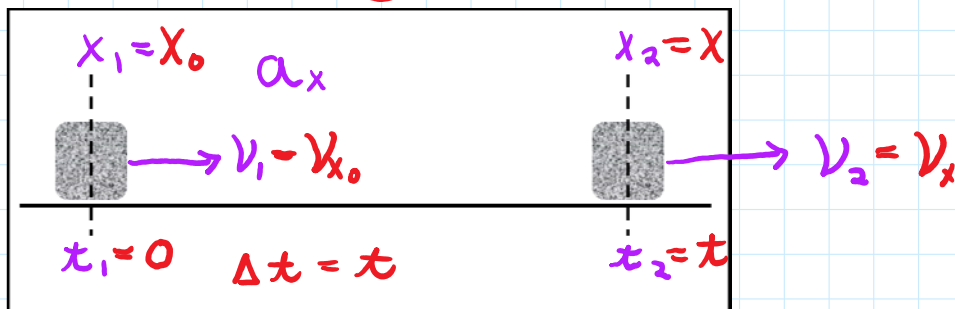
$$a) v_y^2 = v_{y_0}^2 + 2a_y \Delta y$$

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

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

$$v_y = 29.33 \text{ m/s}$$

$$\Delta X = X - X_0$$



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

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

$$\textcircled{1} \quad \Delta X = \left(\frac{v_x + v_{x_0}}{2} \right) t$$

No a_x

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

$$\Delta X = \frac{1}{2} (2v_{x_0} + a_x t) t$$

$$\textcircled{3} \quad \Delta X = v_{x_0} t + \frac{1}{2} a_x t^2$$

No v_x

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

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

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

$$\textcircled{2} \quad v_x = v_{x_0} + a_x t$$

No ΔX

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

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

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

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

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

$$\textcircled{4} \quad v_x^2 = v_{x_0}^2 + 2 a_x \Delta X$$

No t