Reminders 9-13-10:

-3rd Webassign Due 9/16

-Exam 1 Monday Sept 20 Homework 1-3.

-Quiz Today on Kinematics

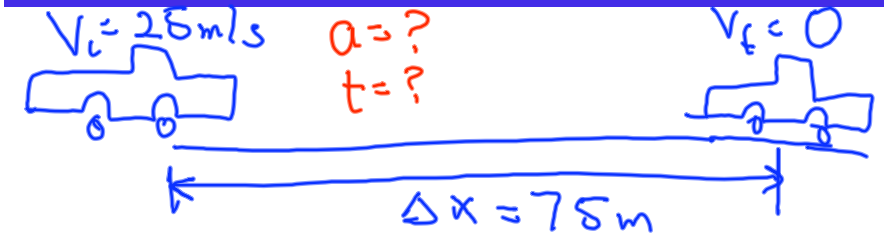
-Conceptual Questions on Kinematics Due Today

Objectives:

-More Kinematics Examples

-Newton's 2nd and 3rd Laws + Examples

- **An object is traveling at the rate of 25 m/s. It reaches a surface that slows it down. It comes to a complete stop after traveling 75 m.**
  - **What is the acceleration of the object?**
  - **How long does it take to come to a complete stop?**
- **Discuss alternative ways to solve the problem.**



$$V^2 = V_i^2 + 2a\Delta x$$

$$a = \frac{V^2 - V_i^2}{2\Delta x} = \frac{0 - (25\,m/s)^2}{2(75\,m)}$$

$$= -4.2\,m/s^2$$

$$V = V_i + at \qquad t = \frac{V - V_i}{a}$$

$$t = \frac{0 - 25\,m/s}{-4.2\,m/s^2} = 6.0\,s$$

A rock is thrown upward from a cliff. The initial velocity of the rock is 22 m/s. The cliff is 32 m above the surface of the ocean.

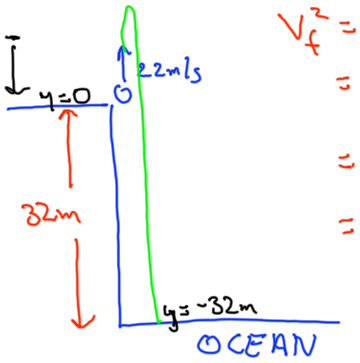
What is the *velocity* of the rock when it is 32 m above the ground while it's on the way down? Do you actually need to do a calculation? $-22\ m/s$

What are the acceleration and velocity of the rock at its highest point? $V = 0 \quad a = -9.80\ m/s^2$

What is the *speed* of the rock when it hits the water?

How long does the rock take to hit the water?

Discuss alternative methods to solve the latter 2 questions.



$$v_f^2 = v_i^2 + 2a\Delta x$$

$$= \sqrt{v_i^2 + 2a\Delta x}$$

$$= \sqrt{(22)^2 + 2(-9.80)(-32)}$$

$$= 33\ m/s$$

$$v = v_i + at$$

$$t = \frac{v - v_i}{a} = \frac{-33\ m/s - 22\ m/s}{-9.80\ m/s^2}$$

$$= 5.65\ s$$

$$x - x_i = v_i t + \frac{1}{2} a t^2$$

$$-32\ m = \left(22\ \frac{m}{s}\right) t + \frac{1}{2}\left(-9.80\ \frac{m}{s^2}\right) t^2$$

$$\left(4.9\ \frac{m}{s^2}\right) t^2 - \left(22\ \frac{m}{s}\right) t + 32 = 0$$

$$t = \frac{22 \pm \sqrt{(22)^2 - 4(4.9)(32)}}{9.8}$$

$$= 5.65\ s$$

A motorist drives along a straight road at a constant speed of 9.00m/s. When she is 22.0m in front of a parked motorcycle police officer, the officer starts to accelerate at 2.00m/s² to overtake her. Assuming the officer maintains this acceleration, determine the total displacement of the officer as he overtakes her.

- *Answer: 121m*

Want $x_p = x_m$

$x_m = 22 + 9t$

$x_p = t^2$

$x_p = x_m$

$t^2 = 22 + 9t$

$t^2 - 9t - 22 = 0$

$(t - 11)(t + 2) = 0$

$t = 11s$

$x_p = \frac{1}{2}(2)(11)^2 = 121m$