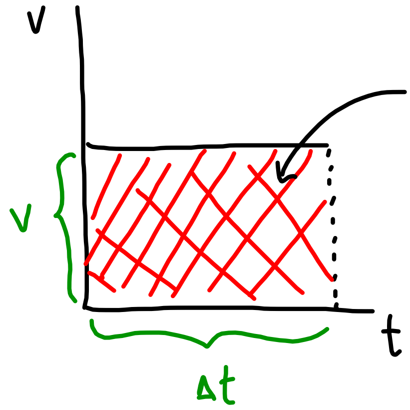
# Acceleration + Displacement

Consider constant velocity:




Area of rectangle $= l \times w$

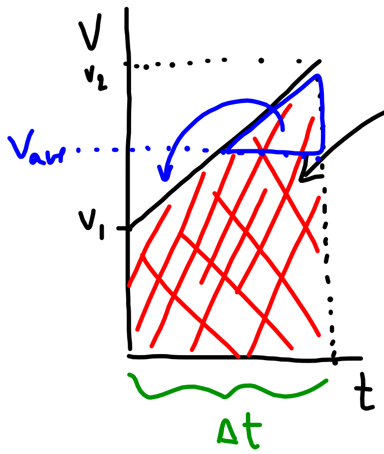
Area $= v\Delta t$

The area is the displacement

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

$\Delta d = v\Delta t$

Consider constant acceleration:




Area of Trapezoid $= \frac{1}{2}(h_1 + h_2)b$

Area $= \frac{1}{2}(v_1 + v_2)\Delta t$

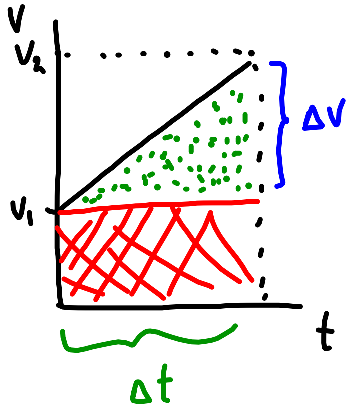
$\Delta d = \left(\frac{v_1 + v_2}{2}\right)\Delta t$

$\Delta d = v_{ave}\,\Delta t$

( really just $v_{ave} = \frac{\Delta d}{\Delta t}$ )

where $v_{ave} = \frac{v_1 + v_2}{2}$

we can find $v_{ave}$ this way ONLY because there is constant acceleration




Area = ▭ + ◺

$$Area = v_1 \Delta t + \frac{1}{2}(\Delta v)\Delta t$$

$$Area = v_1 \Delta t + \frac{1}{2}(a\Delta t)(\Delta t)$$

Recall

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

$\Delta v = a\Delta t$

Maybe Useful

$$\Delta d = v_1 \Delta t + \frac{1}{2}a(\Delta t)^2$$

$$\Delta d = v_2 \Delta t - \frac{1}{2}a(\Delta t)^2$$

$$v_2^2 = v_1^2 + 2a\Delta d$$

# Summary of Kinematics Equations

Constant Velocity: $v = \frac{\Delta d}{\Delta t}$

Constant Acceleration: $v_{ave} = \frac{\Delta d}{\Delta t}$ where $v_{ave} = \frac{v_1 + v_2}{2}$

$a = \frac{\Delta v}{\Delta t}$ where $\Delta v = v_2 - v_1$

Maybe Useful:

Will be given

$$\Delta d = v_1 t + \frac{1}{2} a t^2$$

$$\Delta d = v_2 t - \frac{1}{2} a t^2$$

$$v_2^2 = v_1^2 + 2a\Delta d$$

There are 5 kinematics variables:

$v_1, v_2, t, \Delta d, a$

If you know any 3, you can find the other 2.