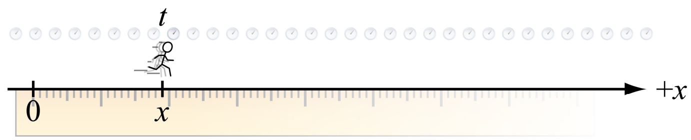
Describe 1-dimensional motion by labeling snapshots with times and positions

Frame of reference – placed meter stick(s) and fleet of synchronized clocks

Time	t	$[t] = \mathrm{s}$
x-position	x	$[x] = \mathrm{m}$



x-displacement

$$\Delta x := x_f - x_i$$

Distance

$$|\Delta x|$$

Until-now traveled path length

$$\ell := \int_{t'=0}^{t'=t} |v_x|\, \mathrm{d}t' = \Sigma_{\substack{\text{SEGMENTS}\\ \text{THUS FAR}}} |\Delta x|$$

Average x-velocity

$$v_{x,\mathrm{AVG}} := \frac{\Delta x}{\Delta t} = \frac{x_f - x_i}{t_f - t_i} \qquad [v] = \frac{\mathrm{m}}{\mathrm{s}}$$

Average speed

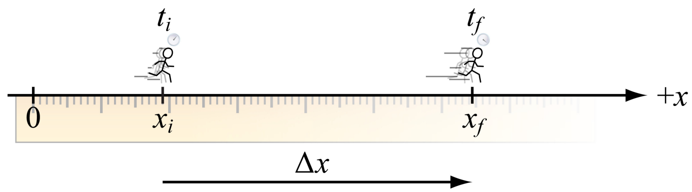
$$v_{\mathrm{AVG}} := \frac{\Delta \ell}{\Delta t}$$

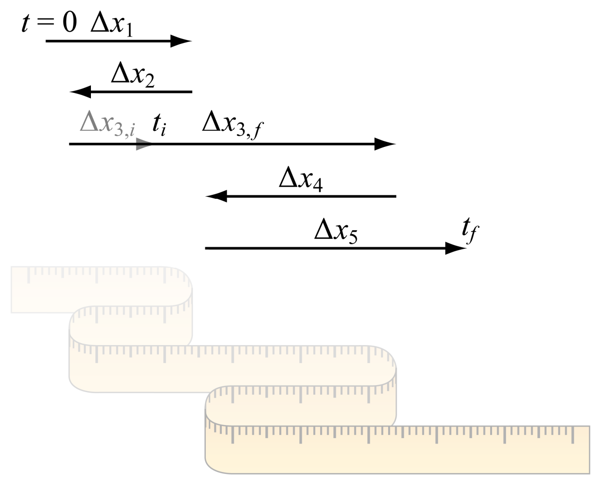
Instantaneous x-velocity

$$v_x := \lim_{\Delta t \to 0} \frac{\Delta x}{\Delta t} = \frac{\mathrm{d}x}{\mathrm{d}t}$$

Instantaneous speed

$$v := |v_x|$$





UAM/Relationships	**Unmentioned**
$x_i + v_{x,\mathrm{AVG}}\,\Delta t = x_f$	a
$v_{x,i} + a_{x,\mathrm{AVG}}\,\Delta t = v_{x,f}$	x
$v_{x,\mathrm{AVG}} = \dfrac{v_{x,i} + v_{x,f}}{2}$	t, x, a
$x_i + v_{x,i}\Delta t + \dfrac{1}{2} a_x \Delta t^2 = x_f$	
$v_{x,i}^2 + 2a_x \Delta x = v_{x,f}^2$	t

Average x-acceleration

$$a_{x,\mathrm{AVG}} := \frac{\Delta v_x}{\Delta t} = \frac{v_{x,f} - v_{x,i}}{t_f - t_i} \qquad [a] = \frac{\mathrm{m}}{\mathrm{s}^2}$$

Instantaneous x-acceleration

$$a_x := \lim_{\Delta t \to 0} \frac{\Delta v_x}{\Delta t} = \frac{\mathrm{d}v_x}{\mathrm{d}t}$$