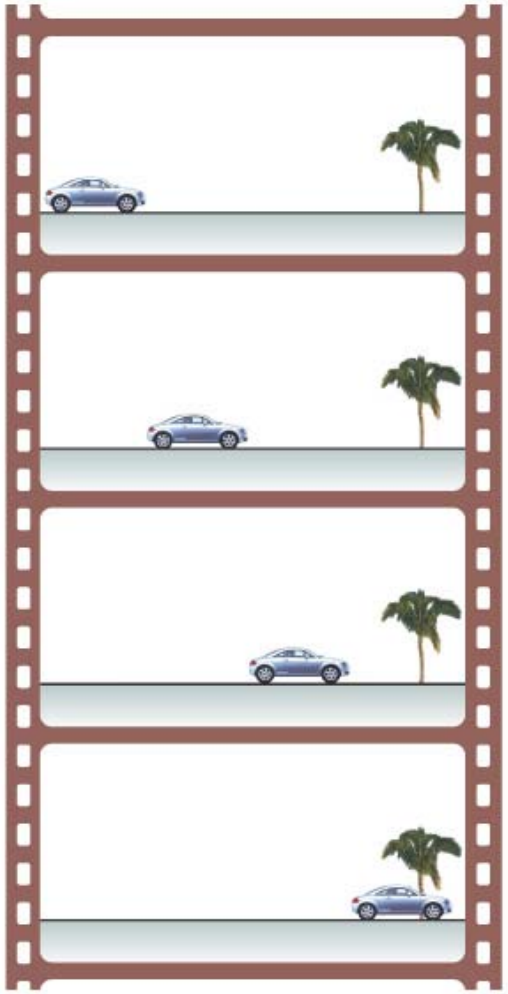
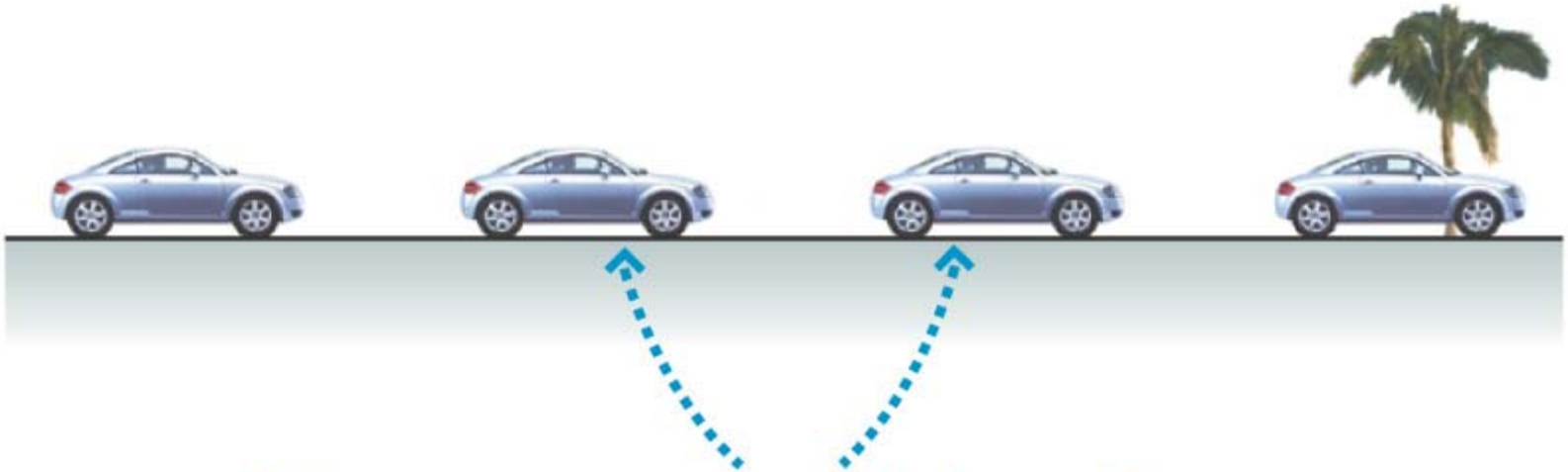
Dot Motion Diagrams

- Simple representation of motion
- Use dots for objects position with time
- Assumes small time intervals
- Like a filmstrip



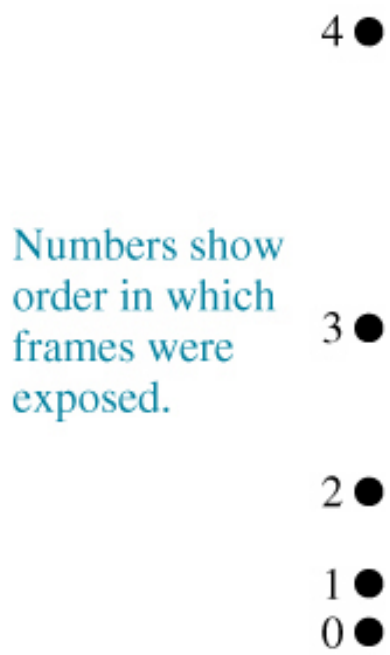


The same amount of time elapses between each image and the next.

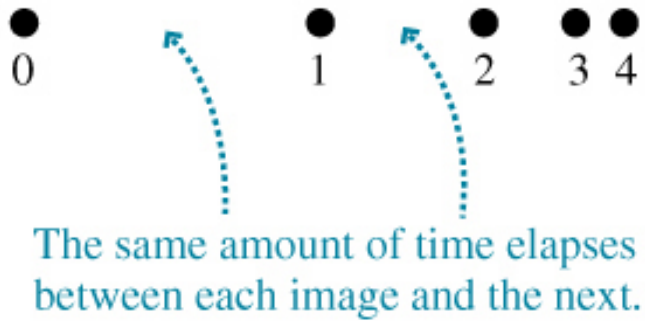
Start

0 1 2 3

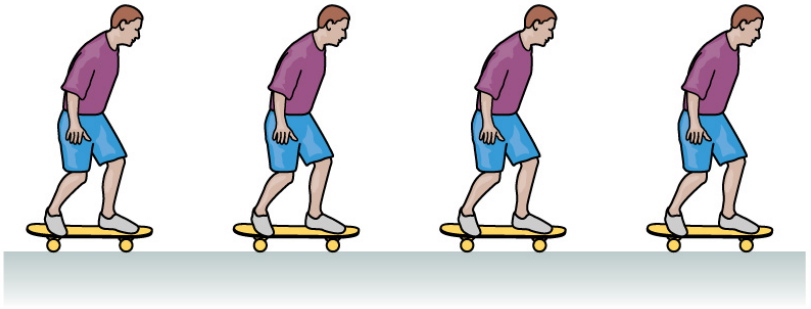
(a) Motion diagram of a rocket launch



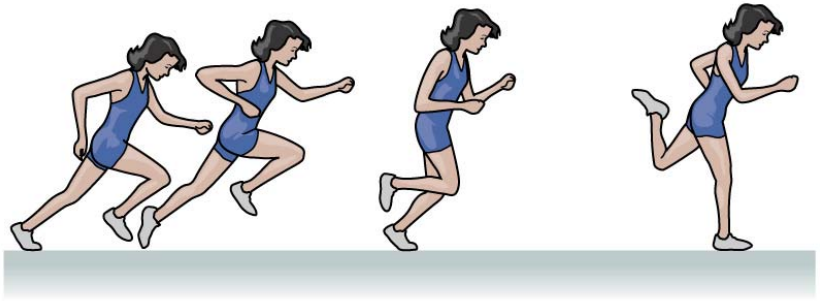
(**b**) Motion diagram of a car stopping



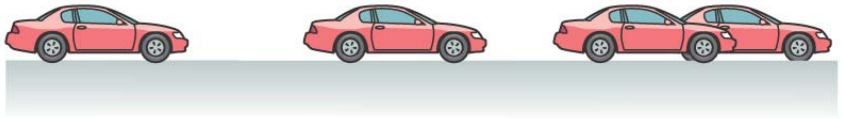
(A)



(B)

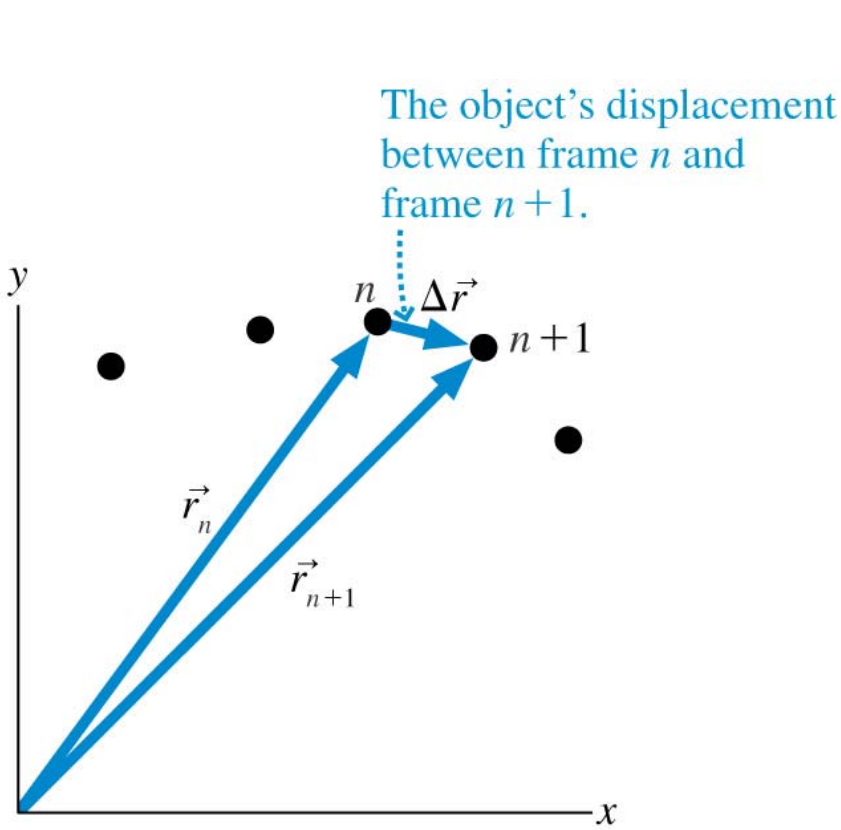


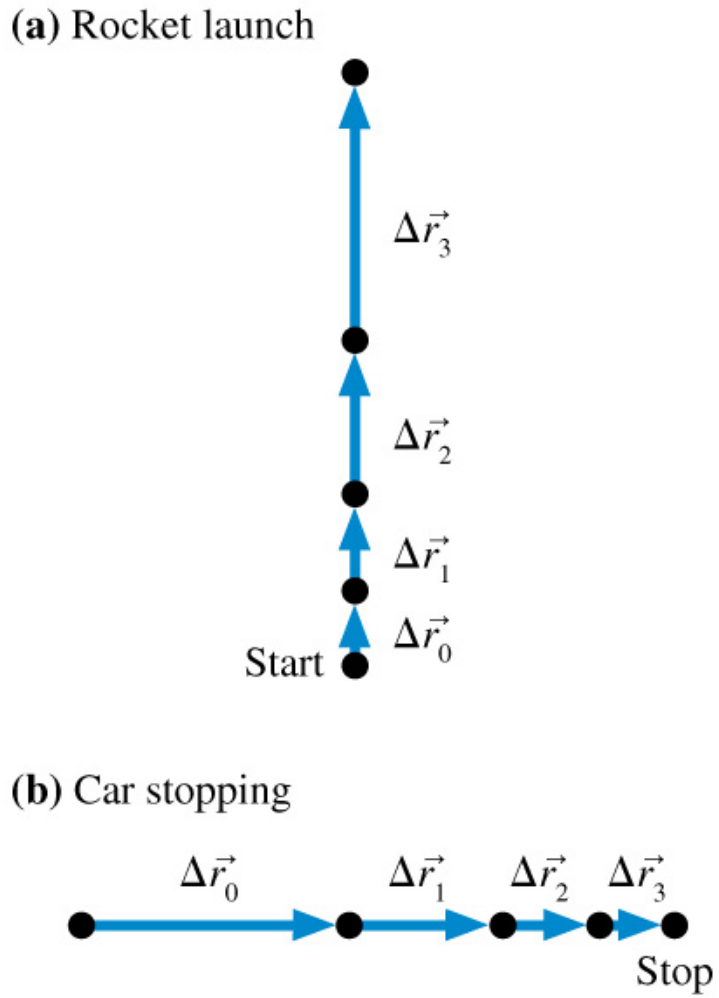
(C)



(D)

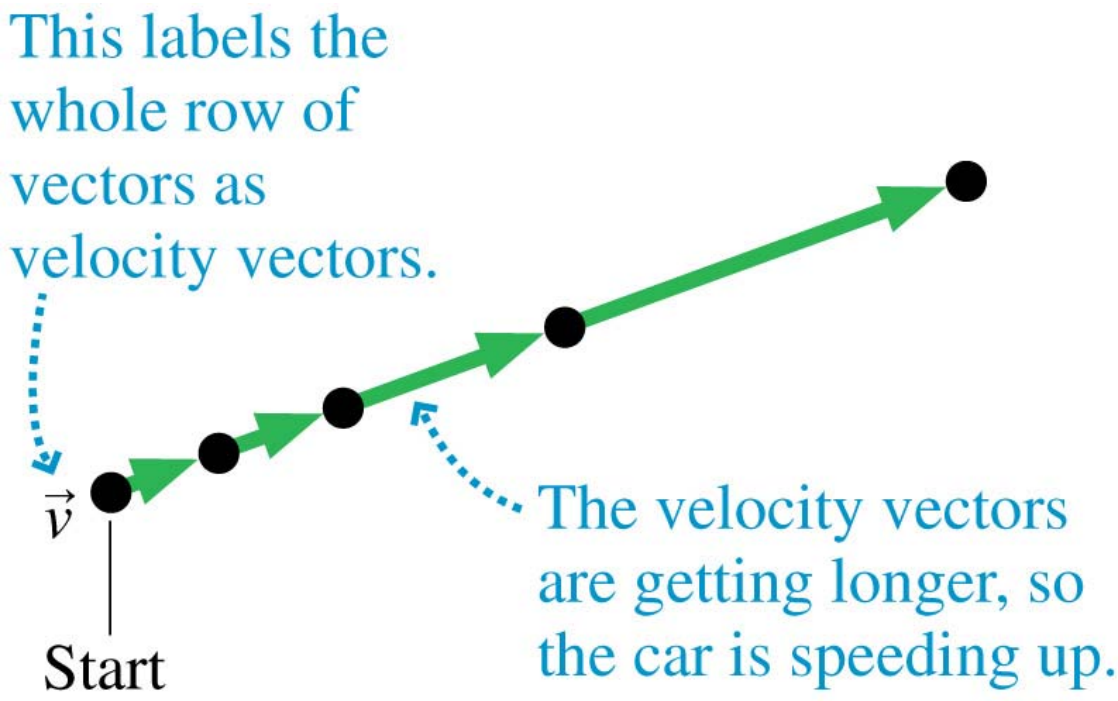
Displacement $\Delta\vec{r} = \vec{r}_2 - \vec{r}_1$

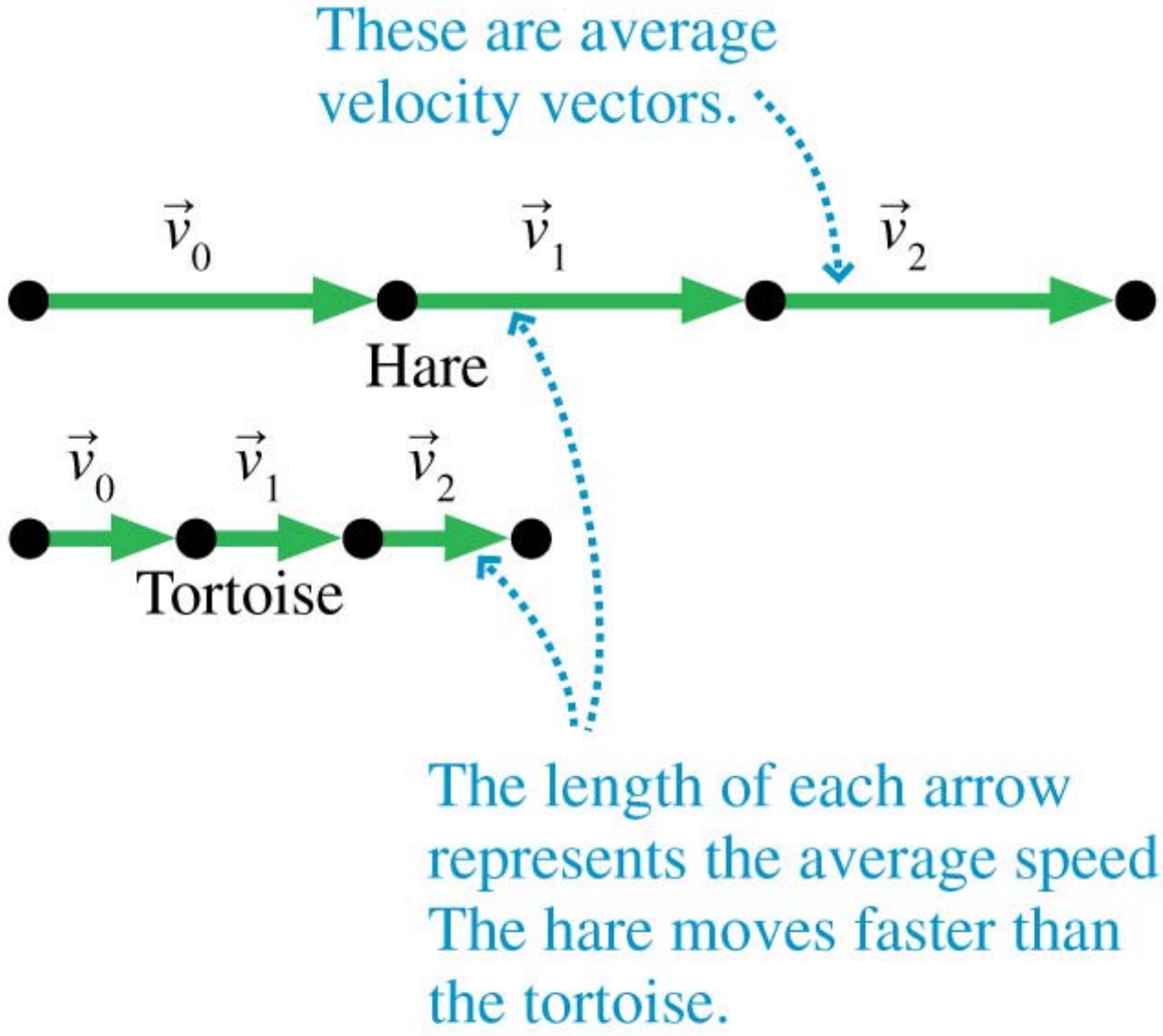




Average Velocity

$$\vec{v}_{average} = \frac{\Delta \vec{r}}{\Delta t}$$

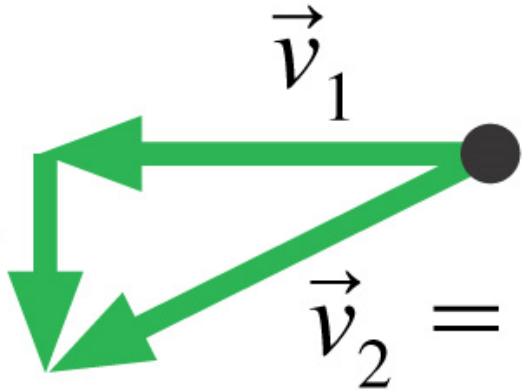




Acceleration

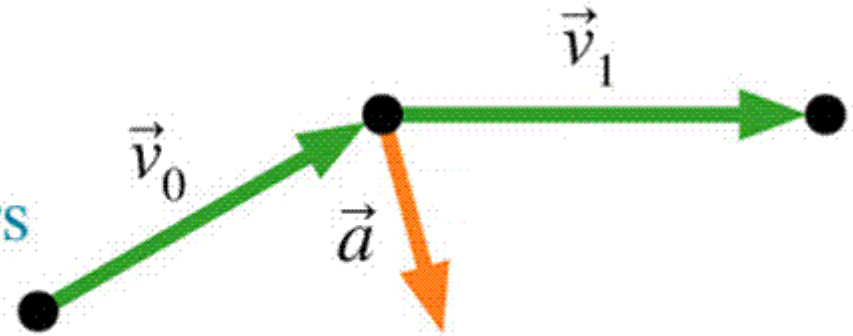
$$\vec{a}_{average} = \frac{\Delta\vec{v}}{\Delta t} = \frac{\vec{v}_2 - \vec{v}_1}{\Delta t} \qquad \vec{v}_2 - \vec{v}_1 = \vec{a}\Delta t \qquad \vec{v}_2 = \vec{v}_1 + \vec{a}\Delta t$$

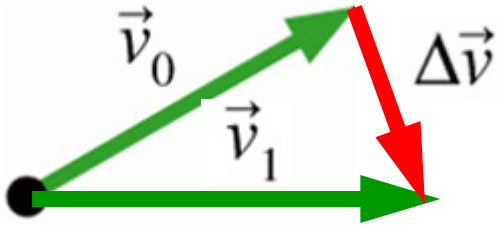
$$\Delta\vec{v} = \vec{a}\,\Delta t$$



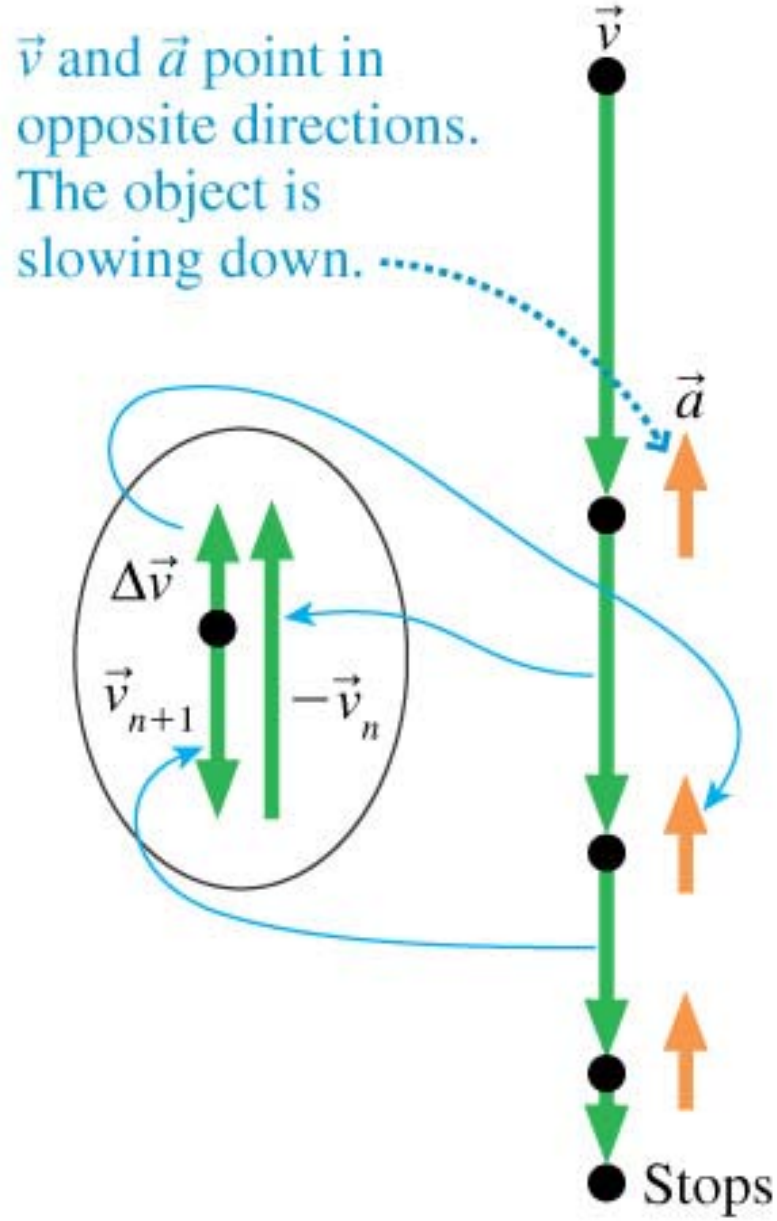
Dots show positions at equal time intervals.

Velocity vectors go dot to dot.





$\Delta\vec{v}$ and $\vec{a}$ are parallel. This is an average acceleration so it is the acceleration at the middle instant or dot.



OHQ

- Speeding up $\vec{a} \uparrow\uparrow \vec{v}$ *parallel*
- Slowing down $\vec{a} \uparrow\downarrow \vec{v}$ *antiparallel*
- Constant $\vec{a} = 0$
- Turning $\vec{a} \angle \vec{v}$