

Acceleration - the rate of change of velocity

- speeding up or slowing down
- changing direction
- can be negative

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time}}$$

$$a = \frac{\Delta v}{\Delta t} \quad \text{or} \quad a = \frac{v_2 - v_1}{t}$$

symbol: a



MEASURED IN: $\frac{\text{m}}{\text{s}^2}$ Meters per second squared

Example

What is the rate of change of velocity when a car speeds up from $10 \frac{\text{m}}{\text{s}}$ to $25 \frac{\text{m}}{\text{s}}$ in 3s?

• "Rate of change of velocity" = acceleration

$$\bullet a = \frac{v_f - v_i}{t} = \frac{25 - 10}{3} = \frac{15 \frac{\text{m}}{\text{s}}}{3 \text{s}} = \boxed{5 \frac{\text{m}}{\text{s}^2}}$$

Also

- change in velocity = (acceleration ($\frac{\text{m}}{\text{s}^2}$)) \times (time (s))
- change in time = $\frac{\text{change in velocity}}{\text{acceleration}}$

$$\begin{aligned} \Delta v &= a(\Delta t) \\ \Delta t &= \frac{\Delta v}{a} \end{aligned}$$