

# Acceleration

11SCIE - Mechanics

Finn LeSueur

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## What is Acceleration?

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Acceleration is how quickly the velocity changes.

**e.g.** A supercar will accelerate to 50km/hr faster than a cyclist. That is to say, the supercar has a greater acceleration.

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## Calculating Acceleration

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

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

- **Velocity** has units meters per second ( $ms^{-1}$ )
- **Time** has units seconds ( $s$ )
- **Acceleration** has units meters per second per second ( $m/s^2$  or  $ms^{-2}$ )

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## Rearranging Equations

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

$$a \times \Delta t = \Delta V$$

v is divided by t

Undo the divide by multiplying

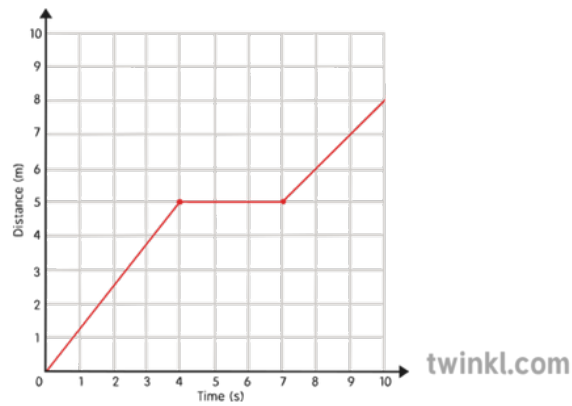


Figure 1: Distance-Time Graph

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

d is divided by t

$$v \times \Delta t = \Delta d$$

Undo the divide by multiplying

### Using Formula Triangles: Velocity

If you are having a hard time with maths, you can write your formula into triangles like this. Multiplication on the bottom and the product on the top. You will **not** be given formula in this form, you will have to remember the triangles if you want to use them.

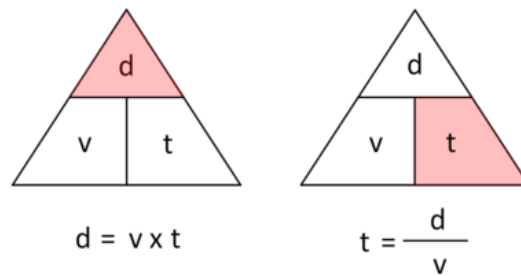


Figure 2: Velocity Triangle

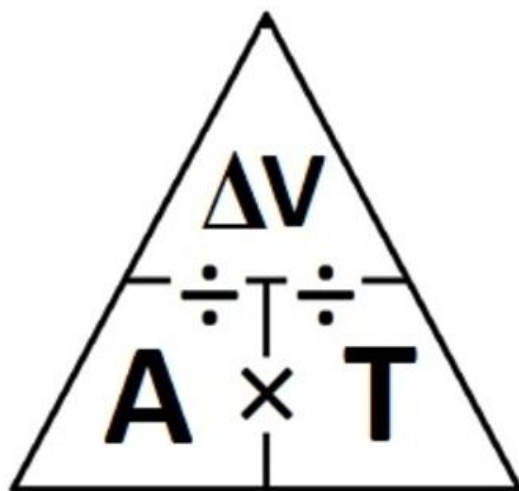


Figure 3: Acceleration Triangle

### Using Formula Triangles: Acceleration

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## Velocity-Time Graphs

Much like we can plot a distance-time graph, we can also plot velocity-time graphs.

Velocity-time graphs are useful for determining whether an object is accelerating and for calculating the distance travelled.

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### Calculating Acceleration

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

$$a = \frac{\text{rise}}{\text{run}}$$

using a velocity-time graph

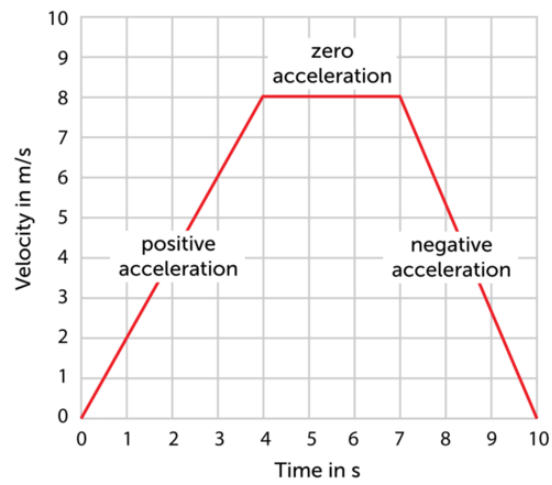


Figure 4: Velocity-Time Graph

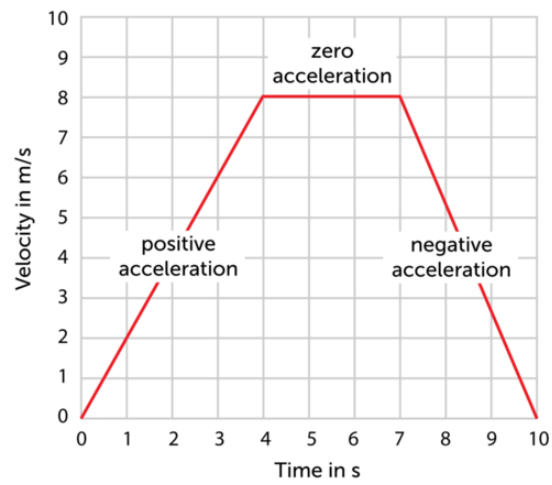


Figure 5: Velocity-Time Graph