Acceleration

N4 N5

Acceleration

Acceleration is the **change in speed (or velocity)** every **second** and is measured in metres per second per second (ms^{-2}).

It can be calculated using the formula:

$$\text{acceleration} = \frac{\text{final velocity} - \text{initial velocity}}{\text{time}}$$

In symbol form: $$\mathbf{a = \frac{v - u}{t}}$$

Quantity	Symbol	SI Unit
acceleration	a	ms^{-2}
final velocity	v	ms^{-1}
Initial velocity	u	ms^{-1}
time	t	s

A common form of the equation worth remembering is **$v = u + at$**

Example:

1. Calculate the acceleration of a vehicle travelling from rest to 12 ms^{-1} in 5 s.

a = ?
v = 12 ms^{-1}
u = 0 (at rest)
t = 5 s

$a = \frac{v - u}{t}$

$a = \frac{12 - 0}{5}$

$a = 2.4\ ms^{-2}$

2. A car accelerates at 4 ms^{-2} for 10 s from rest. Calculate the sped of the car after 10 s. N5

a = 4 ms^{-2}
v = ?
u = 0 (at rest)
t = 10 s

$a = \frac{v - u}{t}$

$v = u + at$

$v = 0 + (4 \times 10)$

$v = 40\ ms^{-1}$

3. Calculate the deceleration of a train which travels from 30 ms^{-1} to 16 ms^{-1} in a time of 1 minute. N5

a = ?
v = 16 ms^{-1}
u = 30 ms^{-1}
t = 1 minute = 60 s

$a = \frac{v - u}{t}$

$a = \frac{16 - 30}{60}$

$a = -0.47\ ms^{-2}$