Acceleration

-defined as the rate of change of speed
-calculated as the change in speed with respect to the change in time

Formula

$$a = \frac{\Delta v}{\Delta t} = \frac{(v_f - v_i)}{\Delta t}$$

Since this equation contains several variables, it can be manipulated to solve for any one of them

Example

Myriam Bedard accelerates at an average 2.5m/s^2 for 1.5s. What is her change in speed at the end of 1.5s

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

$a = 2.5 \, m/s^2$
$\Delta t = 1.5 \, s$
$\Delta v = ?$

$$\Delta v = a \cdot \Delta t$$
$$= (2.5)(1.5) = \boxed{3.75 \, m/s}$$

A skateboarder rolls down a hill and changes his speed from rest to 1.9m/s. If the average acceleration down the hill was 0.4m/s^2, ~~how long was the hill?~~ how long did this take?

$v_i = 0$

$v_f = 1.9\text{m/s}$

$a = 0.4\text{m/s}^2$

$\Delta t = ?$

$$a = \frac{v_f - v_i}{\Delta t}$$

$$a\Delta t = v_f - v_i$$

$$\Delta t = \frac{v_f - v_i}{a}$$

$$= \frac{1.9 - 0}{0.4}$$

$$= 4.75\text{s}$$

$$a = \frac{v_f - v_i}{\Delta t}$$

$$0.4 = \frac{1.9 - 0}{\Delta t}$$

$$0.4 = \frac{1.9}{\Delta t}$$

$$\Delta t = \frac{1.9}{0.4} = 4.75\text{s}$$

Kerrin-Lee Gartner is moving at 1.8m/s near the top of a ski hill. 4.2s later she is travelling at 8.3m/s. What was her average acceleration?

A bus with an initial speed of 12m/s accelerates at 0.62m/s^2 for 15 s. What is the final speed of the bus?

A snowmobile reaches a top speed of 22.5 m/s after accelerating at 1.2m/s^2 for 17s. What was the initial speed of the snowmobile?

In a race, a car travelling at 100 km/h comes to a stop in 5.0s.
What was the average acceleration?