(1)

Scalar

- Speed
- distance
- Force
- Time
- mass
- Impulse.

* no direction.

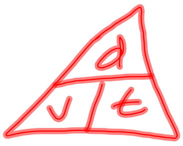
Vecter

- velocity
- displacement
- momentum

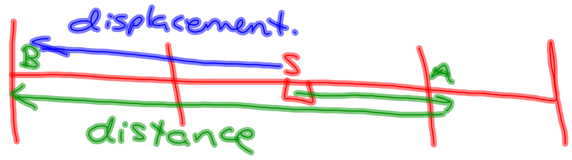
* direction

(2) Velocity

- $V = \frac{d}{t}$
- $d = vt$
- $t = d/v$



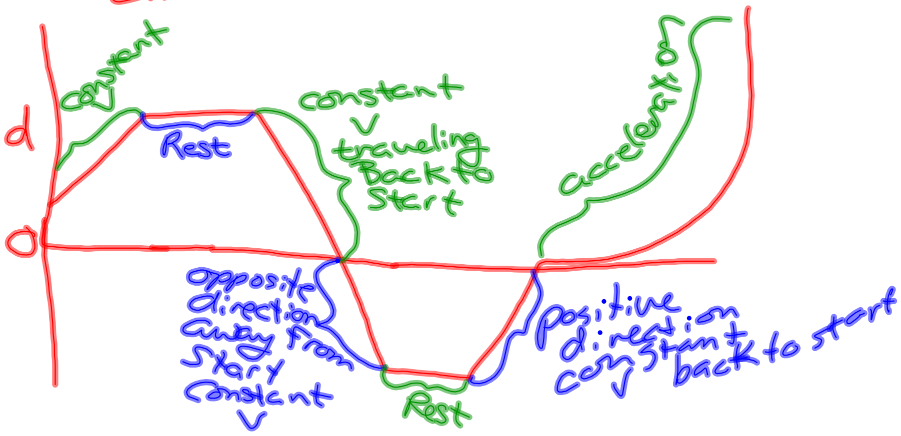
*note velocity is a vector. It deals with displacement S to F not including points in between.



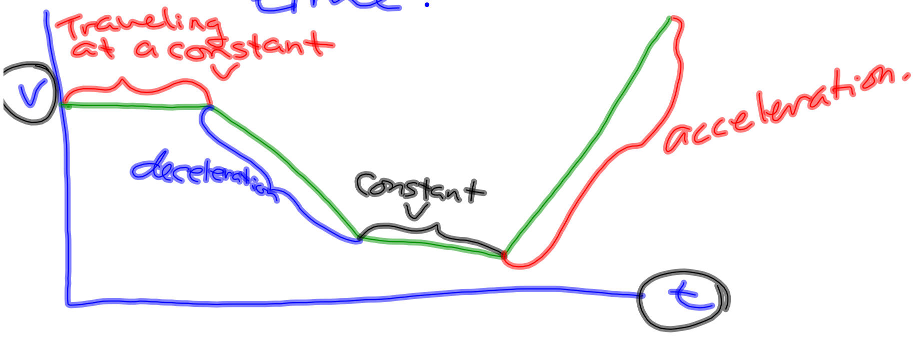
Speed : Scalar quantity.
$\frac{\text{distance}}{\text{time}}$

Velocity : Vector quantity.
$\frac{\text{displacement}}{\text{time}}$

displacement vs time.

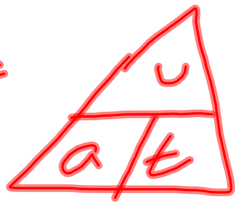


Velocity vs time.



acceleration

- $a = v/t$
- $v = at$
- $t = v/a$



NOTE:
V is a change in velocity.

ie: if a car is traveling at 20 m/s then accelerates at a rate of 5 m/s² for 3 seconds. What is its final velocity

- Calculate change in velocity.
- add it to the origional v.

$a = v/t$ $a = 5\ m/s^2$

$v = a\ t$ $V_f = ?$

$5\ m/s^2 \times 3\ s$ $V_i = 20\ m/s$.

$= 15\ m/s$ $t = 3\ s$

$V_f = 20\ m/s + 15\ m/s = 35\ m/s$

(5) displacement

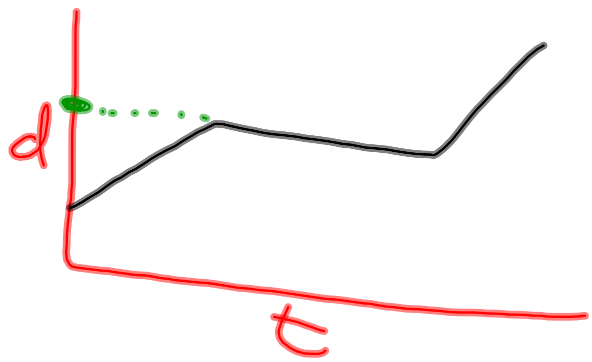
Velocity

$d = v \times t$

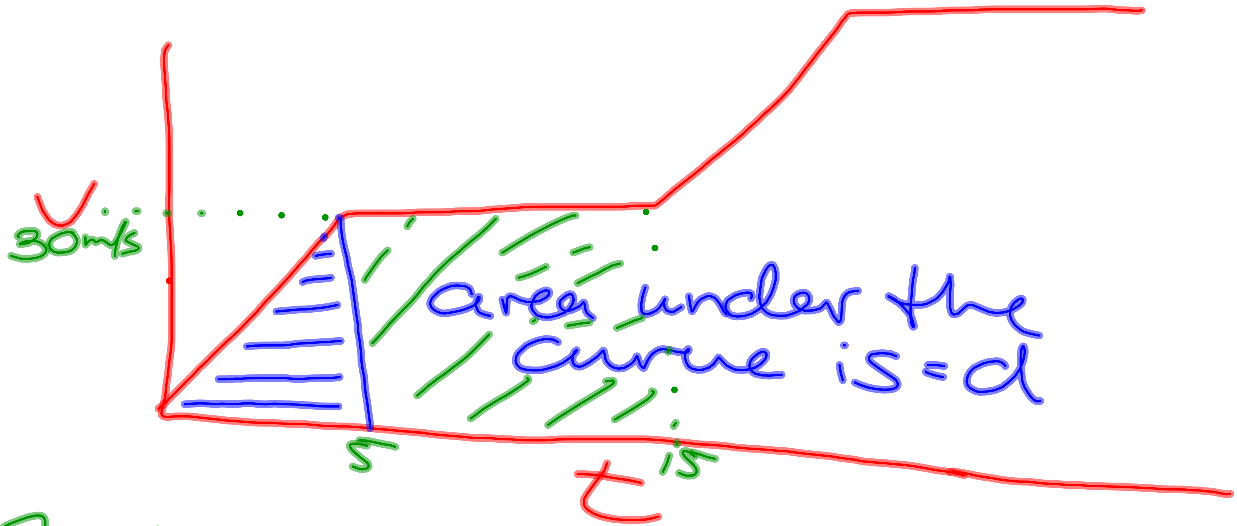
acceleration

★ $d = \frac{v_f \times t}{2}$

d vs t



v vs t

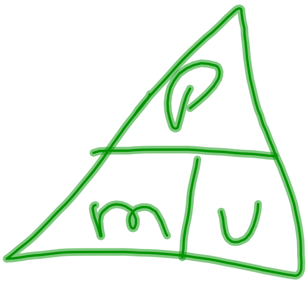


What was the displacement at 15 seconds?

$\left(\frac{5s \times 30m/s}{2}\right) + \left(30m/s \times 10s\right)$

Blue area green area.

④ <u>momentum</u>



$p = mv$

$m = p/v$

$v = p/m$

* → p = momentum.

v = velocity.

m = mass.

$\vec{v}$ must be in m/s

conversions

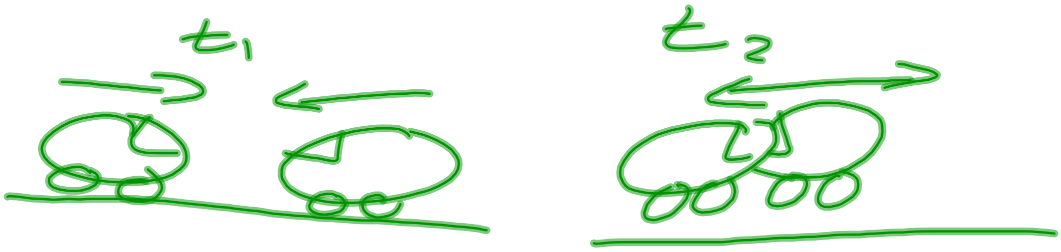
km/h ÷ 3.6 = m/s

m/s × 3.6 = km/h

100 km/h ~ 28 m/s

(5) Conservation of p

→ hit + stick.



- hit + rebound

- explosions

$$\sum p_{before} = \sum p_{after}.$$

Sum of the momentum before is the sum of the momentum after!

Joey is driving a 1600kg car 18m/s to the Right. David is driving an 1800kg truck 10m/s to the left. If they crash and do not stick together and Joey travels 12m/s to the left after the collision how fast will David go?

L(−) R(+)

m_J 1600kg	m_D 1800kg	m_J 1600kg	m_d 1800kg
V_J +18m/s	V_D −10m/s	V_J' −12m/s	V_D' = ?
p_J = 28800 kgm/s	p_D −18000 kgm/s	p_J' = −19200 kgm/s	p_D' = +30000

28800 + (−18000)
= 10800 kgm/s − (−19200)
= +30 000

$p = m \times v$

$v = p/m$

$= \frac{+30000}{+1800\text{kg}}$

$V_D' = +16.6$ m/s.

a 4kg ball is traveling North at 3m/s. It hits a 6kg ball going South. They stick together and travel South at 1.6 m/s. How fast was the 6kg ball traveling?

S(-) N(+)

4kg → ← 6kg

$v_1 = +3$ m/s

$v_2 = ?$

$p_1 = 4 \times +3$
$= +12$ m/s

$p_2 = -28$ kgm/s

$v = \frac{p}{m}$

$= \frac{-28 \text{ kgm/s}}{6\text{kg}}$ p_2

$= -4.6$ m/s

(p / m v)

← [4kg 6kg]

$v'_{1 and 2} = 1.6$ m/s

$p_{1 and 2} = 10\text{kg} \times 1.6$ m/s
$= -16$ kgm/s

-16 kgm/s $- (+12$ m/s$)$

$= -28$ kgm/s

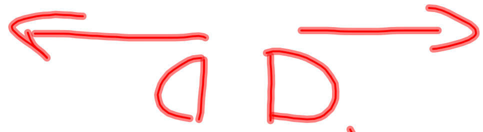
Amphy throws a 1 kg hand grenade at a velocity of 2.6 m/s (N). It breaks into 2 pieces: a 0.8 kg piece that travels 15.8 m/s (N) and another piece that travels South. How fast does the South piece travel?

S(−) N(+)

$m_{1and2} = 1\,kg$

$v_{1and2} = +2.6\,m/s$

$p_{1and2} = 1\,kg \times +2.6\,m/s = +2.6\,kg\,m/s$



$m_1' = 0.2\,kg$ (1 kg − 0.8 kg) $m_2' = 0.8\,kg$

$v_1' = ?$ $v_2' = +15.8\,m/s$

$p_2' = 0.8\,kg \times +15.8\,m/s = +12.64\,kg\,m/s$

$p_{1and2} - p_2' = +2.6\,kg\,m/s - (+12.64\,kg\,m/s)$

$p_1' = -10.04\,kg\,m/s$

$v_1' = \frac{p_1'}{m_1} = \frac{-10.04\,kg\,m/s}{0.2\,kg}$

$= -50.2\,m/s$

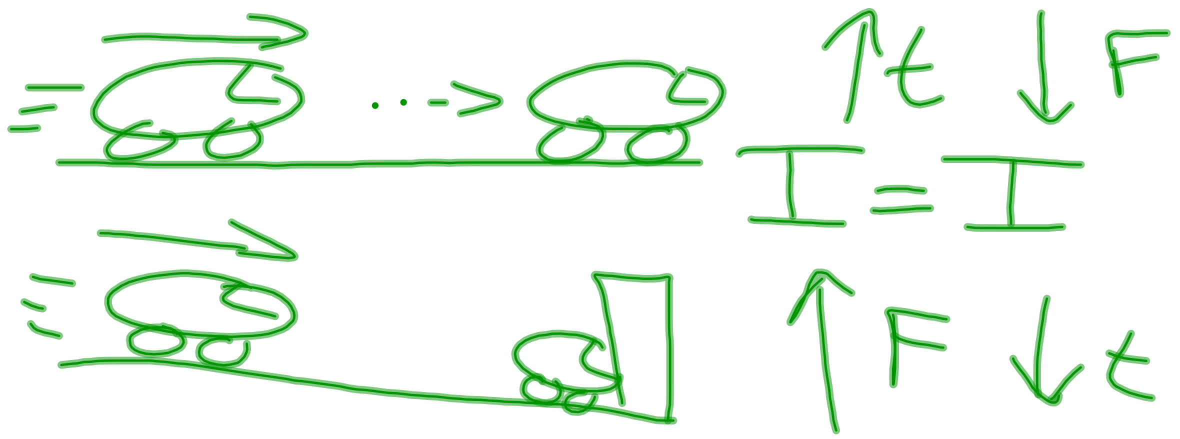
SOUTH

(6)
change in momentum is
Impulse.

Change in $p = Ft$

$I = Ft$

The larger the mass the more force is needed <u>or</u> a longer time



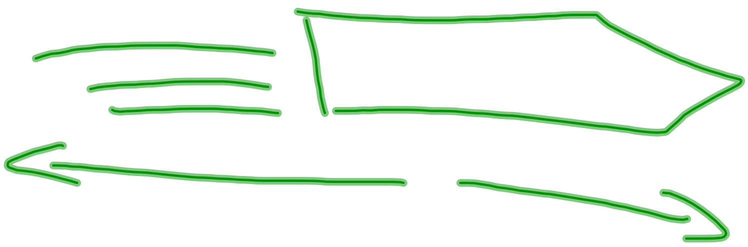
So long as initial + final momentum are equal so will impulse be. the same.

(7) Law of inirtia

Something traveling will Continue to do so until a force acts upon it.

(8)

For every action there is an equal but oposite reaction



acceleration occurs
when a force acts on
a mass.