Physics

Newton's first law

An object will not start moving, stop moving or change speed unless of force acts on it

If the total force is zero

- **A still objects stays still**
- **A moving objects keep moving with the same speed and same direction**

Example

If a train car or bus is moving at constant velocity that means driving forces and resistive forces are balanced

The velocity will change only if there is a non zero resultant force

Acceleration

A non zero resultant force always causes acceleration

Acceleration can mean five things

- **Starting**
- **Stopping**
- **speeding up**
- **slowing down**
- **changing direction**

In a free body diagram unequal arrows are acceleration

Newton second law

- The bigger the force the bigger the acceleration
- Also the bigger the mass the smaller the acceleration
- Formulae
- F = ma

F is the force (N)
m is the mass (kg)
A is the acceleration (m/s2)

A car accelarates. from rest to 25m/s in 10s. Find force.

rest → 0

25m/s

V = 25m/s

t = 10s.

F = ?

m = 1000kg

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

$a = \frac{vf - vi}{t}$

$a = \frac{25 - 0}{10}$

$a = \frac{25}{10} = 2.5\ m/s^2$

F = ma.

F = (1000kg) (2.5)

F = 2500N Answer.

What force is needed for an 80kg man on a 10kg bike to accelarate at 0.25m/s²?

F = ma.

Total mass = 80 + 10 = 90

F = 90 x 0.25

F = 22.5 N

Experiment how mass and force affect the acceleration

To investigate the effect of mass

- Add mass to the trolley makes total mass bigger
- Do not add match to the hook that would change the force
- record the total acceleration
- more mass, Smaller acceleration
- Less mess. big acceleration

To investigate the effect of force

- Keep total mass the same
- Move message from the trolley
- Record acceleration each time
- if you apply more force there is bigger acceleration
- If you apply less force then there is less acceleration

Stopping distance

Stopping distance = Thinking distance + Braking distance

Thinking distance

- **Distance travelled while driver is reacting**
- **before touching breaks**

It is affected by

- **Speed**
- **reaction time such as tiredness, alcohol drugs and distractions**

Let suppose your driving a car and child come in front of your car so first of all you will think then you will apply brake so thinking time is basically called thinking distance

Braking distance

Distance after breaks are applied

It is affected by

- **Speed**
- **road condition such as ice rain tyres**
- **Brakes quality**

Reaction time ruler drop test

- **Arm on table Someone holds ruler at zero mark**

- Without warning drop the ruler
- Catch it as fast as possible
- Distance where you catch it is basically the distance Fallen
- Use equation to find reaction time

$v^2 = u^2 + 2as.$

and $t = \frac{v}{a}$.

Caugth at 20cm (0.29m)

Find time =?

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

v is not given.

$v = \sqrt{2gh}$.

$= \sqrt{(2)(9.8)(0.20m)}$