All of the AQA science revision sheets at www.tes.com/teaching-resources/shop/teachsci1

**Third Law:** When two objects interact, the forces they exert on each other are **equal** and **opposite**.

If you push on a wall, there is a **normal contact force** pushing back with the same force. This is an **equilibrium** situation – neither object moves.

If two people on roller-skates push against each other, they will both feel the **same size force** and so accelerate away from each other. If one person has a smaller mass they will accelerate away more quickly.

**Inertia**Objects at rest, stay at rest and objects moving at a steady speed, keep moving until acted on by a force.
This tendency to remain in the **same state of motion** is called inertia.

**Inertial mass** is a ratio of force over acceleration: *m = F ÷ a*
 (*F = ma* rearranged)

**Investigating Motion**The acceleration of a trolley can be investigated as the mass is changed.

Required Practical

see practical sheet for detail

A moving object crashes into a stationary object causing both objects to move.

The total **momentum before** the collision is **equal** to the **momentum after** the collision (30 kg m/s in this example).

If the two objects lock together and continue to move after a collision then the mass of the moving object will increase, therefore the velocity will decrease to maintain momentum.

**After**

**Before**

20 kg m/s

10 kg m/s

0 kg m/s

30 kg m/s

**Momentum**All moving objects have momentum.
It is a vector quantity (has size and direction).

The greater the mass, the greater an objects its momentum.
The greater the velocity, the greater an objects momentum.

Velocity (m/s)

Momentum
(kg m/s)

$$p=mv$$

Mass (kg)

Acceleration (m/s2)

Mass (kg)

Force (N)

$$F=ma$$

**Acceleration and Resultant Force**The larger the resultant force, the larger the acceleration. Force and acceleration are directly proportional.

Acceleration is inversely proportional to mass – a larger mass will accelerate more slowly for a given force.

Larger acceleration

Moving object with balanced forces (no resultant force).
Object stays stationary

Stationary object, no force.
Object stays stationary

**First Law:** For a **stationary** object, if the resultant force is zero the object will **stay stationary**.
**Second Law:** For a **moving** object, if the resultant force is zero it will carry on **moving** at the **same velocity**.

**Newton’s First, Second and Third Laws**