

# Forces Knowledge organiser

A force is a push or a pull that is applied by one object on another.

Force is measured in **newtons (N)**. The size of a force can be measured using a **newtonmeter**.



## Contact and non-contact forces

**Contact forces** – the objects are physically touching

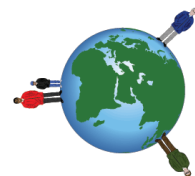
**Non-contact forces** – the objects are physically separated

Contact forces	Non-contact forces
Friction	Gravity
Air resistance	Magnetic
Water resistance	Electrostatic
Upthrust	
Tension	
Normal contact force	
Driving force	
Thrust	

## Gravity, Mass and Weight

**Gravity** is a force of attraction between two masses, measured in **newtons (N)**.

The force of gravity of the Earth pulls us towards it's centre.



**mass** → kg



**Mass** is the amount of matter in an object, measured in **kilograms (kg)** or **grams (g)**.

**Weight** is the downward pulling force on an object due to gravity, measured in newtons (N).

$$\text{Weight (N)} = \text{mass (kg)} \times \text{gravitational field strength (N/kg)}$$

On Earth the gravitational field strength is 9.8 N/kg.

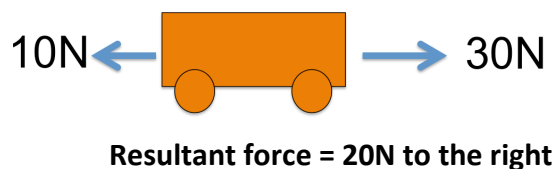
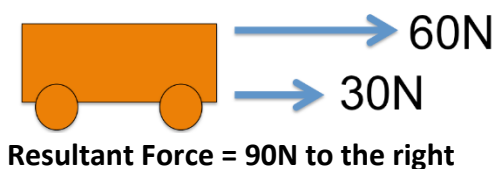
## Force diagrams

Forces have a **direction as well as size**. The size and direction of a force can be represented by arrows.

The longer the arrow, the larger the force.

## Resultant forces

When there are several forces acting on an object we can work out what their combined effect is. The combined force is called the resultant force.



## Newton's Laws of motion

### Newton's First Law of Motion – (Balanced forces)

When the forces on an object are balanced (or there is no resultant force acting), the motion of the object does not change.



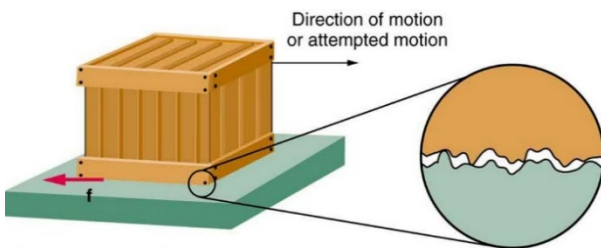
### Newton's Second Law of Motion – (Unbalanced forces)

If there unbalanced forces (or a resultant force) acts on an object it will cause it to:

- Change speed
- Change direction
- Change shape



## Friction



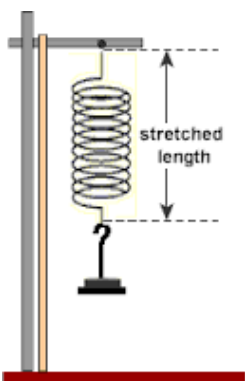
Friction is a force that opposes motion (it slows objects down) and is caused by the contact of two objects.

Friction can be caused by the surfaces of two objects moving over one another, or by an object moving through a fluid such as air (air resistance) or water (water resistance).

Some objects are designed to reduce the amount of air resistance acting on them – we call these **aerodynamic**.



## Hooke's Law - Springs and extension



Springs are made from coils of wire. They can be stretched (made longer) or compressed (made shorter).

A spring is stretched by applying **two forces**.

**Elastic** materials will stretch with a force and then return to their original shape when the force is taken away. Springs are elastic.

**Hooke's Law** states that the extension of a spring is **directly proportional** to the force on it.

If the spring is stretched too far, the extension stops being proportional to the force. If it is stretched even further, it goes beyond its **elastic limit**. The spring will no longer return to its original length when the force is removed.

