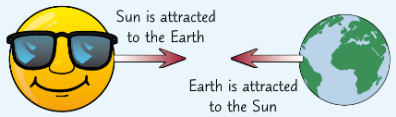
Physics Crib Sheet: Topic 5

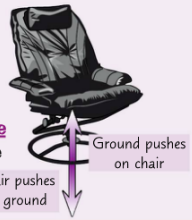
Resultant force: the overall force on a point or object

Forces can be **contact** or **non-contact**

The Sun and the Earth are attracted to each other by the gravitational force. This is a non-contact force. An equal but opposite force of attraction is felt by both the Sun and the Earth.



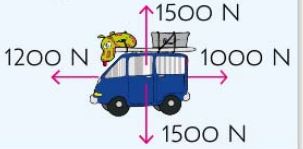
A chair exerts a force on the ground, whilst the ground pushes back at the chair with the same force (the normal contact force). Equal but opposite forces are felt by both the chair and the ground.



EXAMPLE: For the free body force diagram given, calculate the resultant force acting on the van.

1) Consider the horizontal and vertical directions separately.
2) State the size and direction of the resultant force.

Vertical: 1500 – 1500 = 0 N
Horizontal: 1200 – 1000 N = 200 N
The resultant force is 200 N to the left.



If a resultant force moves an object, work is done:

$W = Fs$ — W: Work done (J); F: Force (N); s: Distance (moved along the line of action of the force) (m)

Terminal velocity: the frictional force is equal to the accelerating force

Vectors have magnitude and direction:
Force, velocity, displacement, acceleration, momentum.

Scalar quantities have magnitude only:
Speed, distance, mass, temperature, time.

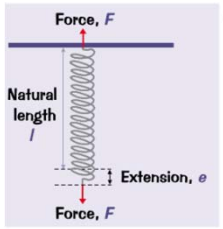
GRAVITATIONAL FORCE: the force of attraction between masses.
1.) makes things fall towards the ground
2.) gives everything weight

MASS v WEIGHT

Mass: the amount of 'stuff' in an object
Weight: the force acting on an object due to gravity

Weight (N) = Mass (kg) x Gravitational Field Strength (N/kg)

Forces and elasticity: extension is directly proportional to force



This is the equation:

$F = ke$ — F: Force (N); k: Spring constant (N/m); e: Extension (m)

$E_e = \frac{1}{2}ke^2$ — E_e: Elastic potential energy (J); k: Spring constant (N/m); e: Extension (m)

Newton's First and Second Laws of motion

Inertia and Newton's Third Law

Equations

$s = vt$ — distance travelled (m) = speed (m/s) × time (s)

$v^2 - u^2 = 2as$ — v: Final velocity (m/s); u: Initial velocity (m/s); a: Acceleration (m/s²); s: Distance (m)

$F = ma$ — Resultant force (N); m: Mass (kg); a: Acceleration (m/s²)

Stopping Distance = Thinking Distance + Braking Distance

$a = \frac{\Delta v}{t}$ — Acceleration (m/s²); Δv: Change in velocity (m/s); t: Time (s)

$p = mv$ — momentum (kg m/s) = mass (kg) × velocity (m/s)