

FORCE

CONTACT FORCES

Objects exerting forces by touching

AIR RESISTANCE
air particles oppose the direction of a moving object to slow it down

THRUST
force that propels an object in one direction

FRICTION
force between two surfaces that causes moving objects to slow down and stop

NORMAL REACTION FORCE
force that opposes gravity and prevents objects falling through each other or to the centre of the Earth

UPTHRUST
upward force that acts on an object when it is in a fluid causing it to float

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NON-CONTACT FORCES

Objects exerting forces by not touching

MAGNETIC FORCE
the force experienced by a magnetic object when placed within a magnetic field

opposite poles attract
same poles repel

ELECTROSTATIC FORCE
the force experienced between charged particles such as protons and electrons, or ions

same charges repel
opposite charges attract

GRAVITATIONAL FORCE
gravity always pulls two objects towards each other
objects in orbit, like planets and moons, are constantly falling towards each other but at speeds so fast they never collide

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WEIGHT and MASS

Weight is a measure of mass under the force of gravity

MASS
how much matter there is in an object, which stays constant as the number of particles do not change
an apple has around 1,000,000,000,000,000,000,000,000 atoms!

weight = mass X gravitational force
Newtons **N** kilograms **kg** Newtons per kilogram **N/kg**

If we take an apple to the moon or Jupiter, it would have the same **MASS** as on Earth, but different **WEIGHT** as each celestial body has a different **GRAVITATIONAL FORCE**

$g=1.7$ $g=9.8$ $g=24.7$

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FREE BODY DIAGRAMS

Where two or more forces are shown interacting with one another in scenarios and simplified

SCENARIOS

upthrust and weight are **BALANCED** so the plane maintains the same altitude

thrust and air resistance are **BALANCED** so the plane maintains a constant speed

FREE BODY DIAGRAMS

friction and weight are **UNBALANCED** so the ball rolls down the slope

weight and normal reaction force are **BALANCED** so the ball does not go through the slope

"normal" refers to how the force acts 90° to the surface the object is interacting with

FORCE

PRESSURE

A measure of how concentrated a force is

LOW PRESSURE
High surface area of the mallet makes it useless for ice climbing...

HIGH PRESSURE
Low surface area at the point means the ice axe can slice through ice easily

...but great for driving spiky pegs into the ground

Pa pressure = $\frac{\text{force}}{\text{area}}$
Pascals or N/m^2

force divided by area
Newtons **N**
metres squared m^2

FORCE

MOTION

When an object changes position over time

3,000 m
2 minutes = 120 seconds
 $3,000 / 120 = 25 \text{ m/s}$

m/s speed = $\frac{\text{distance}}{\text{time}}$
metres per second
distance divided by time
metres **m**
seconds **s**

30 m/s
20 m/s
the red balloon is gaining on the purple balloon at a speed of 10 m/s
relative motion = fastest speed - slowest speed