

Learning Journey

Forces

KNOW IT



- I know about [static friction](#) and [balanced forces](#)
- [I know about dynamic friction as well as balanced and unbalanced forces](#)
- [I can define weight and know the difference between mass and weight](#)
- [I can use a Newton meter to confidently measure forces](#)
- I know what a zero error is and how to correct this.
- I know how to [identify and control variables](#) in an investigation.
- I know the difference [between weight and mass](#).
- I know how gravity can effect weight.



LINK IT

This topic links with the forces topic that you will cover in year KS4.



PROVE IT

- DIRT task -
- End of unit test



SAY IT

VOCABULARY	DEFINITION
Force	Something that can change the shape, speed or direction of an object. Measured in newton's.
Newton meter	A measuring device used to measure forces.
Zero error	When a measuring device is not set to zero before use. Therefore all measurements will be incorrect by the amount displayed.
weight	A force which is the result of the interaction between the mass of an object and gravity. The units for this are N.
mass	A measurement of the amount of matter (particles) and object is made up from. This does not change if gravity changes. The units for this are Kg.
gravity	This is a force exerted between two objects with mass. The larger the mass, the larger the force. The units for this are N/Kg.
Static friction	A frictional force that resists an equal and opposite force, preventing an object from moving.
Dynamic friction	A frictional force that is caused by two objects sliding over each other.

FORCES



Static friction acts **between surfaces that are in contact and at rest with respect to each other**. It is the force that makes it difficult to start moving an object. The force of static friction must be overcome in order to move an object.

Dynamic friction or sliding friction, occurs **when two objects are moving relative to each other and rub together** (like a sled on the ground).

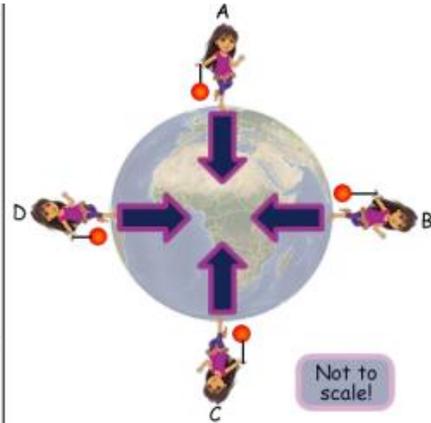
Weight: The force of gravity on an object (N).

Non-contact force: A force that acts on an object without direct contact.

Mass: The amount of stuff in an object (kg).

Gravitational field strength, g: The force from gravity on 1 kg (N/kg).

Field: The area where other objects feel a gravitational force.



Gravity is a force of attraction between any two objects that have mass.

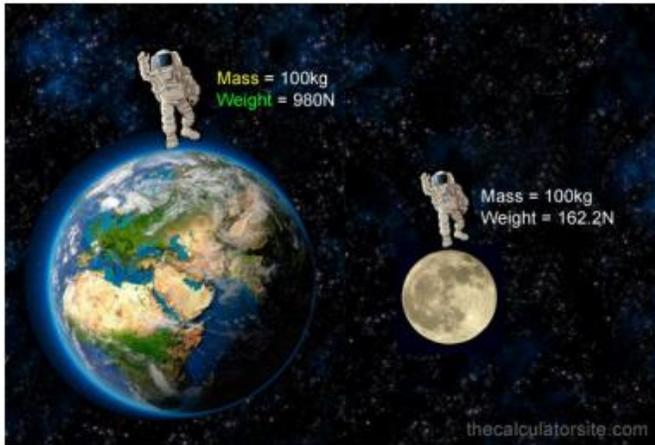
The bigger the mass the bigger the force of gravity, this is why we notice that we are pulled to the centre of the Earth but don't notice that you are also being attracted to and attract the person you sit next to in class!

When astronauts leave Earth, they experience less gravity the further they travel from Earth.

The strength of gravity is dependent on:-

- the mass of the object,
- The distance between the objects.

Mass and Weight



Imagine the same astronaut on Earth and on the moon. You can see from the picture their mass doesn't change, mass describes the amount of stuff they are made of and is measured in kilograms (kg).

Their weight however has changed, this is because weight is a force that is affected by mass and gravity.

$$\text{Weight (N)} = \text{Mass (kg)} \times \text{Gravity (N/kg)}$$

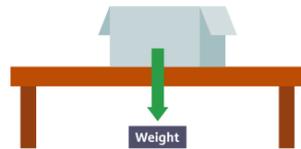
Gravity on the Moon is less than gravity on Earth, even though their mass is the same they weigh less on the Moon because the strength of gravity is less.

Weight versus mass

The terms weight and mass are often used incorrectly. Phrases like 'a bag of sugar weighs 1 kg' are not scientifically correct.

Mass is a measure of the amount of **matter** an object is made out of. Mass is measured in kilograms (kg). Very small masses are sometimes measured in grams (g). There are 1000 g in one kg.

Weight is the force that acts on mass due to gravity and is therefore measured in newtons (N).



The driving force pushes the bicycle, making it move.



Friction pushes on the bicycle, slowing it down.

A **variable** is anything that can change and be measured. Two important types of variables are:

- **Independent variables** – the variable that is **being changed** during the experiment
- **Dependent variables** – the variable **being tested or measured** during the experiment

In an experiment, the effect of changing **just one variable** on another is tested - testing how the independent variable affects the dependent variable. For this reason, other variables must be controlled so that they don't affect the independent variable. These variables are **control variables**.

Calculating weight and mass

The following equation can be used to calculate the weight of an object:

$$W = m \times g$$

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

The **gravitational field strength** on Earth is 10 N/kg.

This means that a 1 kg mass would be attracted to Earth by a force of 10 N.