

# WOW sheet

## What is weight?

Here is what 'weight' means in physical science:

---

Weight is the force of gravity exerted on an object.

---

In other words, weight is just another word used to describe the force of **gravity** on an object.

**Gravity** is a special force that attracts matter to other matter. The more matter something has, the greater the force of its gravity. The force of gravity is often written as  $F_g$  or just as  $g$ .

On planet Earth, weight is a force that acts on all objects all the time. That's because the Earth always pulls on all objects downwards towards the centre of the Earth with the force of gravity.

## Weight is NOT the same as mass

Mass is the amount of matter an object has. That amount of matter will be the same wherever in the universe that object is. The weight of the object, however, depends on how much gravitational acceleration there is on the object.

### Here's an example

The moon has less mass than the Earth. So, the pull of gravity isn't as strong on objects on the moon. That's why the same person can jump a lot higher if they are on the moon compared to how high they can jump on Earth. They would also weigh less on the moon because weight is a force caused by gravity.

Have you ever seen a video of astronauts floating in space? You may have heard that floating described as being 'weightless'. With only very little gravity, the astronauts can float because they have virtually no weight. (But they are still made of matter, so they still have mass!)

## Calculating weight

Weight is the force on an object caused by gravity. To calculate an object's weight ( $W$ ), you multiply the object's mass ( $m$ ) by the local gravitational acceleration ( $g$ ).

Formulaically, it can be written as:

$$W = mg$$

In other words, this is really just a simple multiplication formula:  
Weight = mass  $\times$  gravity.

Near the surface of the Earth, the local gravitational acceleration ( $g$ ) is 9.8 meters per second squared ( $9.8 \frac{m}{s^2}$ ).

## Unit of measure

The international unit of measure for weight ( $W$ ) is the newton (N). This is because weight is a force and the unit that force ( $F$ ) is measured in is newtons (N).

Like all units of measurement, understanding what a newton is can be a little confusing. This is because a unit of measure is just a way for people to talk about the size of something.

### Here's an example

Defining units of measure can sometimes feel like talking in a big circle! Here's the definition of a centimetre and a metre:

- A **centimetre** is a unit of length, equal to one hundredth ( $1/100$ ) of a **metre**.
- A **metre** is a unit of length, equal to one hundred (100) **centimetres**.

Keep in mind a unit of measure is just a way to talk about the size of something. Don't worry too much about understanding 'exactly' what that size 'looks like'.

One newton is equal to 1-kilogram meter per second squared. In other words, 1 newton of force is the amount of force required to accelerate an object with a mass of 1 kilogram so that it travels 1 meter per second every second.

Formulaically, it can be written as:

$$1 \text{ N} = 1 \frac{\text{kg} \cdot \text{m}}{\text{s}^2}$$

