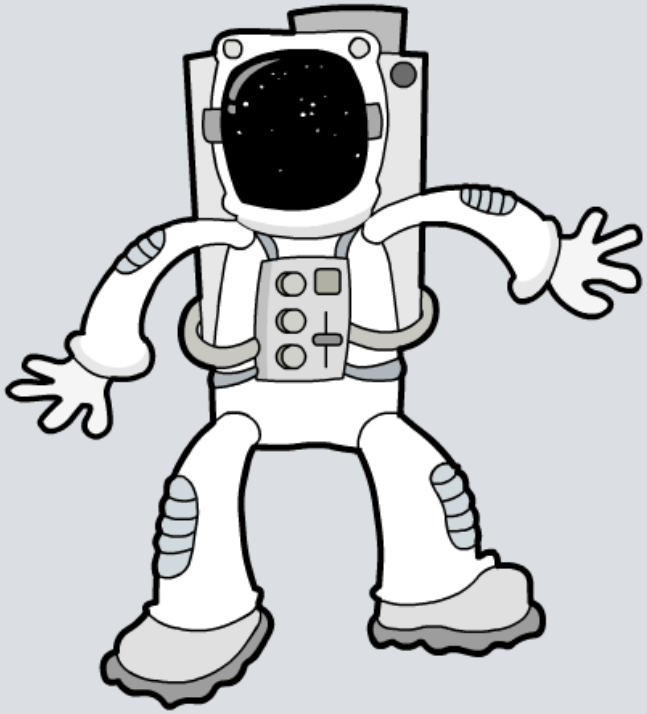
Mass and Weight



Confused about weight and mass?

WARNING: This class may alter your weight!

Have you ever heard anyone saying that the scales don't tell the truth about their weight? You may be surprised to hear that they are right!

Scales give a reading in pounds or kilograms, which are units of **mass**, not units of **weight**.

The confusion arises because most people use the word 'weight' when scientists would use the word 'mass'.

What are mass and weight?

Mass and weight are not the same!

Mass is the **amount of matter** in an object and is measured in **kilograms**.

Mass is not a force and has the same value anywhere in the Universe, including outer space.

Weight is a **force** and is caused by the pull of gravity acting on a mass. Like other forces, weight is measured in **newtons** and has both magnitude and direction.

Weight has different values depending on where the object is in the Universe.

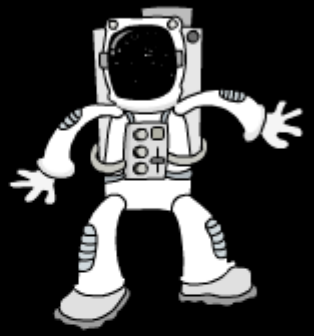
Weight and mass on different planets

How do mass and weight compare on different planets?

This astronaut has a mass of 80 kg and a weight of 800 N on Earth.

Will his mass and weight be any different throughout the Solar System?

Click each planet below to find out more.



Mercury	Venus	Earth	Mars	Jupiter
Saturn	Uranus	Neptune	Pluto	summary

Why does weight vary?

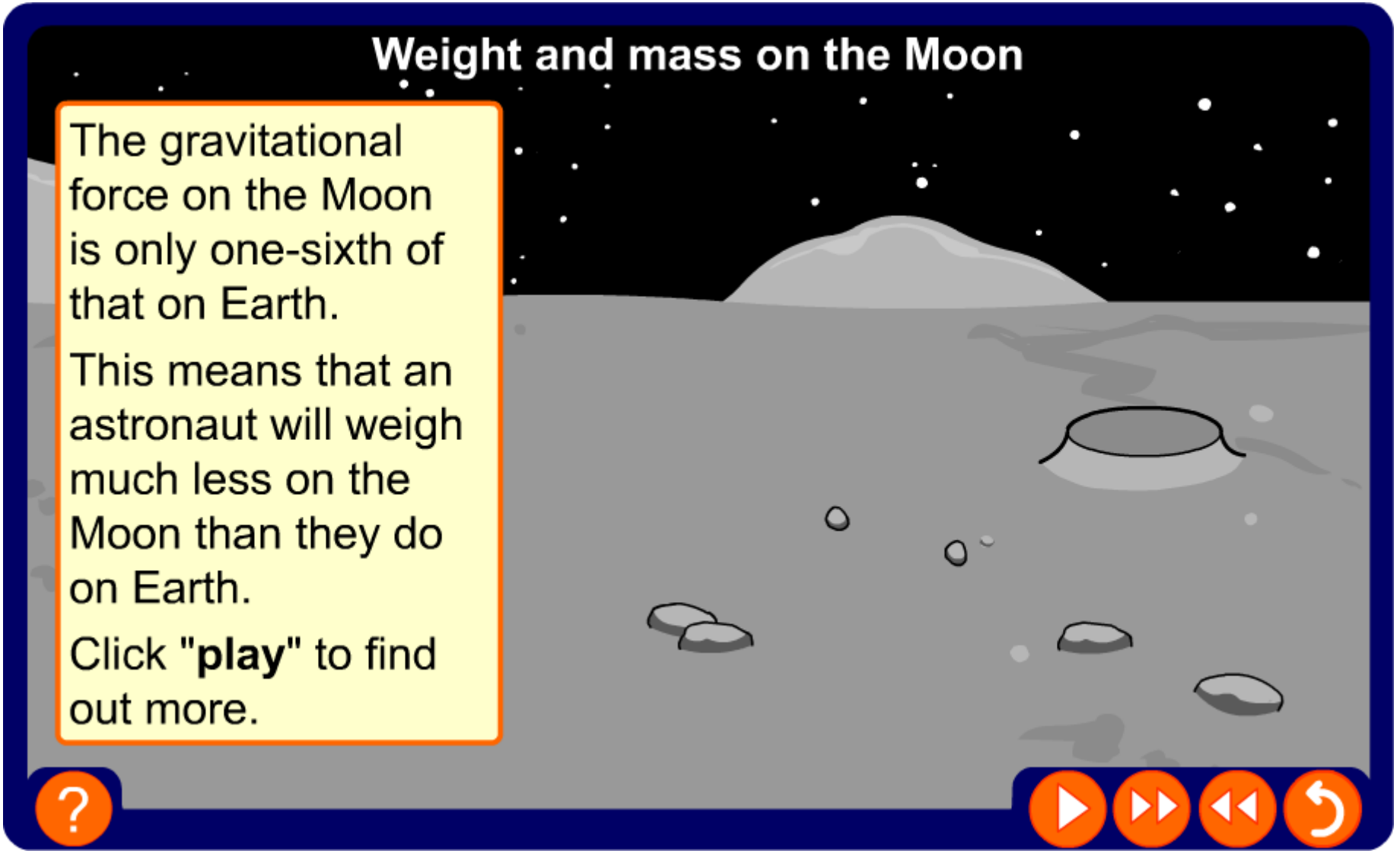
Gravity is the force that attracts objects with mass towards each other.

The bigger the mass of the object, the stronger the force of gravity.

For example, an apple will have the same mass on Earth as on the Moon, but its weight will be different.

The Earth has a bigger mass than the Moon, and so exerts a stronger gravitational pull on the apple.

Weight and mass on the Moon



How do we calculate an objects weight?

The weight of an object depends on its mass and the gravitational field strength:

weight = mass × gravitational field strength

The units for these quantities are as follows:

- Weight is measured in newtons (N).
- Mass is measured in kilograms (kg).
- Gravitational field strength is measured in newtons per kilogram (N/kg).

The gravitational field strength depends on the force of gravity. On Earth it is 10 N/kg, but it varies on different planets depending on their size.

Calculating the weight of a car

A car has a mass of 10,000 kg.

What is the weight of the car?

(Use 10 N/kg as the value of the gravitational field strength.)

weight = mass × gravitational field strength

weight = 10,000 kg × 10 N/kg

weight = 100,000 N

Calculating the weight of an astronaut

An astronaut and his equipment have a mass of 150 kg.

What is the weight when he is standing on the Moon?

(Use 1.6 N/kg as the value of the gravitational field strength.)

weight = mass × gravitational field strength

weight = 150 kg × 1.6 N/kg

weight = 240 N

Calculating weight and mass

You will need this equation to answer the following questions about mass and weight:

weight = mass x gravitational field strength

Click "**start**" to begin.

start