Gravity and space

Mass and weight

The **mass** of something is the amount of substance or 'matter' it contains. It is measured in **kilograms** (**kg**). Weight is the force of **gravity** pulling on a mass. It is a force, so it is measured in **newtons** (**N**).

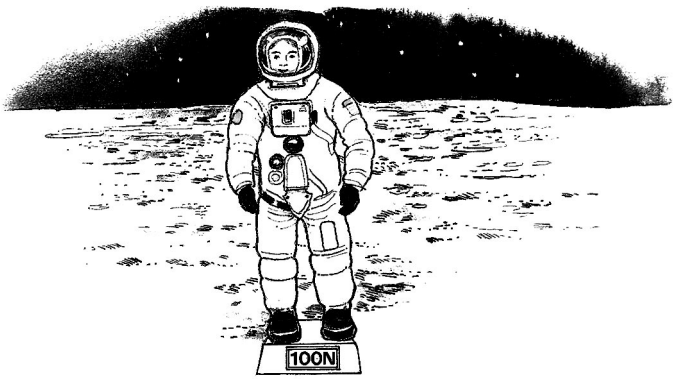
Gravity

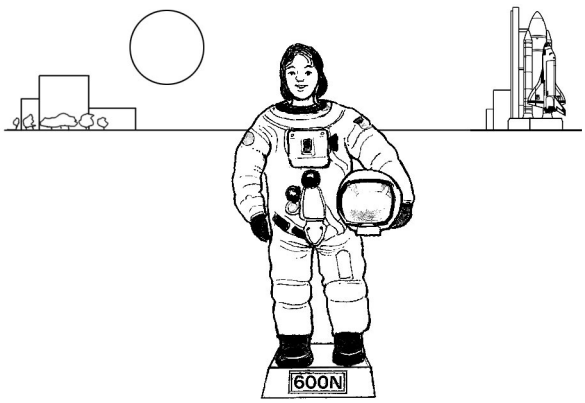
Gravity is the force of attraction between two masses. The force of gravity is stronger if:

- the objects have large masses
- the objects are close together.

On Earth, the gravity pulls on every kilogram of mass with a force of 10 N.

Gravity is not as strong on the Moon, because the Moon has a much smaller mass than the Earth. If you went to the Moon your mass would not change, but your weight would be less than on Earth because the Moon's gravity is weaker.





If a rocket travels away from the Earth, the force of gravity gets less and less as it gets further from Earth. If it is heading for the Moon, it will eventually reach a place where the Earth's gravity is cancelled out by the Moon's gravity. After that, the Moon's gravity will be pulling it towards the Moon.

The Sun's gravity keeps all the planets moving in **elliptical orbits** around it. If there was no gravity from the Sun, the planets would all fly off into space. The Earth's gravity keeps the Moon in orbit around the Earth.

Satellites

A **satellite** is anything that orbits around a planet. The Moon is the only **natural satellite** of the Earth.

Artificial satellites can be put into orbit around the Earth. They can be used for **communications** (transmitting telephone calls or television programmes), for navigation, or to take pictures of the Earth or the planets and stars.

Satellites can also be put into orbit around other planets. They can take pictures and take measurements, and send all the information back to Earth.

Changing ideas about the Solar System

People have known that the Earth is spherical for thousands of years, but they have only believed that the Sun is at the centre of the Solar System for about 500 years.

Early ideas had the Earth in the centre of the Solar System, with the Sun, the planets and the stars moving in circular orbits around the Earth. These ideas were used to make predictions about where the planets would be in the sky, but the predictions were not very accurate.

Copernicus suggested that the Sun was in the centre of the Solar System, but his model still had the planets moving in circular orbits. The predictions made using this model were a bit more accurate, but there were still errors.

Kepler suggested that the planets actually move in elliptical orbits around the Sun. His model could be used to make very accurate predictions. After Newton had worked out how Kepler's model could be explained using his ideas about gravity, most scientists accepted that this was the correct way of thinking about the Solar System.