

# Forces

## 2. Gravity

### CONCEPT 2

## UNDERSTANDING GRAVITATIONAL FIELDS, MASS AND WEIGHT

### NOTES

The region around the Earth affected by its gravity is its **gravitational field**. A **field** is an area in which an object feels a force.

Within the Earth's gravitational field objects are pulled towards the Earth. This pull is a **non-contact** force because it acts on objects at a distance away from the Earth - objects do not have to be on a planet's surface to be affected.

All objects are made from matter and will have a mass in kilograms (kg). This is a measure of the amount of *stuff* that makes it up. This doesn't change unless it is physically altered in some way to change the amount of *stuff*.

Objects will feel the pull of gravity within a gravitational field and this pull is called the object's **weight**. An object's weight is a force and is measured in newtons. This pull is always in the direction of the centre of the Earth. There is no sense of up and down - it is away and towards the centre of the Earth!

The Earth's **gravitational field strength** gets weaker the further you move from the Earth's surface. It also varies slightly across the surface of the Earth: how far south towards the equator you are because of the bulge of the Earth; depending on the density of the rock underfoot; and even on the weather as heavy rainfall can increase its strength.

Gravitational field strength **increases with the mass of the object**. This is linked to the density of an object. For example, Saturn is over 764 times bigger than Earth but its mass is only 95 times bigger than Earth because it is mostly gas. Saturn's gravitational field strength is only slightly more than Earth's. Gravitational field strength **decreases with distance from the object**.

Earth's gravitational field strength is 10 N/kg on and near the surface. This means that for every kilogram of mass there is a pulling force of 10 N.

Even though the Moon is over 350 000 km from the Earth, they are affected by each other's gravitational fields.