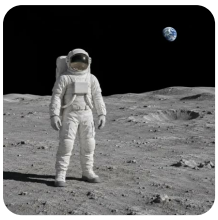
KS3 SCIENCE · PHYSICS

Gravity and space revision sheet

Name _____



1. Mass and weight

- **Mass** is the amount of matter in an object. It is measured in **kilograms (kg)**.
- **Weight** is the force of gravity on an object. It is a force, so it is measured in **newtons (N)**, with a newton meter.
- Mass stays the same wherever you go. Weight depends on where you are: everything weighs less on the Moon, because the Moon's gravity is weaker.
- On the Earth, weight pulls towards the centre of the Earth. That direction is what we call down.



2. Calculating weight

weight (N) = mass (kg) × gravitational field strength, g (N/kg)

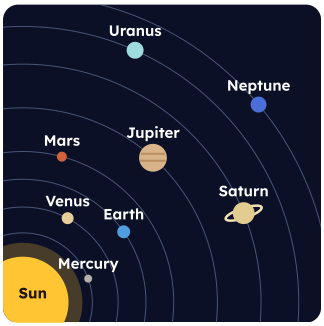
- **g** is the force of gravity on each kilogram. On the Earth, g is about **10 N/kg**. On the Moon, g is **1.6 N/kg**.
- On the Moon you would weigh about a sixth of your weight on the Earth. Your mass would not change.

PLACE	G IN N/KG	WEIGHT OF A 50 KG PERSON
The Moon	1.6	50 × 1.6 = 80 N
Mars	3.7	50 × 3.7 = 185 N
The Earth	10	50 × 10 = 500 N
Jupiter (top of its clouds)	25	50 × 25 = 1250 N



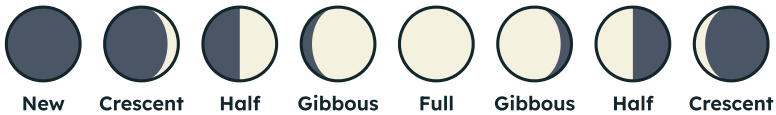
3. Gravity and orbits

- **Gravity** pulls every object towards every other object. **More mass, more pull:** the Earth has far more mass than the Moon, so its gravity is stronger.
- **More distance, less pull.** The further an object is from the centre of the Earth, the weaker the Earth's pull on it.
- **Gravity holds things in orbit.** The Sun's gravity keeps the planets and the comets moving round it. The Earth's gravity does the same for the Moon and for satellites. With no gravity, they would move away in a straight line.
- The Moon is a **natural satellite**. An **artificial satellite** is a machine that people have put into orbit, to watch the weather, take pictures of the Earth or carry phone and TV signals.



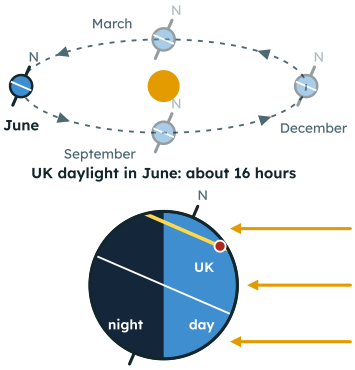
4. The Sun, stars and galaxies

- The Sun is a **star**: a huge ball of hot gas that gives out its own light. Planets and moons do not give out light. We see them because they **reflect** light from the Sun.
- In order of size: **planet → solar system → galaxy → universe**.
- A **galaxy** is a huge collection of stars, gas and dust, held together by gravity. Ours is the Milky Way. Many stars have planets of their own, called **exoplanets**.

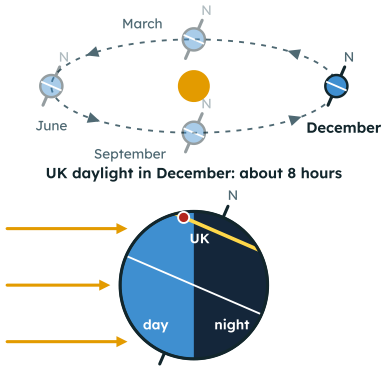


The Moon over one month, seen from the UK. The Sun always lights half of the Moon. The shape we see depends on how much of the lit half faces the Earth.

5. Days, years and seasons



June: summer in the UK. The yellow line is the path the UK takes in one day.



December: winter in the UK. Most of the yellow line is in the dark.

- **One day is one spin.** The Earth turns once on its axis every 24 hours. The half that faces the Sun has day, and the other half has night.
- **One year is one orbit.** The Earth takes about 365 days to travel once round the Sun.
- The Earth's **axis is tilted**, and it always leans the same way. In June the north leans towards the Sun, and the UK has summer. In December the north leans away from the Sun, and the UK has winter.
- Summer is warmer for two reasons. The Sun is higher in the sky, so its light is more concentrated. The days are also longer.



6. Light years

- A **light year** is the distance that light travels in one year: more than 9 million million km. It is a distance, not a time.
- The stars are so far away that kilometres give numbers too long to use easily. The nearest star beyond the Sun is about 40 000 000 000 000 km away. That is about 4 light years.
- Light takes about 8 minutes to reach us from the Sun, about 4 years from the nearest star beyond the Sun, and millions or billions of years from other galaxies.

Watch out

- Kilograms measure **mass**. Weight is a force, so give it in **newtons**.
- There **is** gravity on the Moon. It is weaker than the Earth's, not missing.
- The seasons come from the **tilt** of the axis, not from the distance to the Sun: the Earth is closest to the Sun in January.

Key words

Mass: the amount of matter in an object, measured in kilograms
Gravity: a force that pulls any two objects towards each other
Orbit: the path of a planet, moon or satellite around a larger body
Artificial satellite: a machine that people have put into orbit
Planet: a large ball of rock or gas that orbits a star
Galaxy: a huge collection of stars, gas and dust, held together by gravity
Universe: everything that exists, including all the galaxies
Axis: the imaginary line through the poles that the Earth spins around
Year: the time the Earth takes to orbit the Sun once

Weight: the force of gravity on an object, measured in newtons
Gravitational field strength: the force of gravity on each kilogram, in N/kg
Natural satellite: a moon: a body, not made by people, that orbits a planet
Star: a huge ball of hot gas that gives out its own light
Solar system: the Sun and everything that orbits it
Milky Way: the galaxy that our solar system is in
Exoplanet: a planet that orbits a star outside our solar system
Day: the time the Earth takes to spin once on its axis
Light year: the distance that light travels in one year

Pictures are illustrations made for this sheet, not real photographs.