3 Gravity

One of the most common forces is GRAVITY. It is the force that pulls us towards the centre of the Earth, and pulls the planets towards the Sun.

We take the biggest force in our lives completely for granted. This is the force of the Earth pulling us to its centre. We call it gravity. We measure gravity through weight as we saw on page 7. Gravity is a force created by the size of an object in space, and our closeness to it. In space, where we are not close to the Earth or another planet, there is little gravity (Picture 1). Here, apples would weigh almost nothing. On the Moon, which is a much smaller body, gravity is only a sixth as powerful as on Earth. Apples that weighed 1,200g on Earth would weigh just 200g (a sixth of 1,200, or 1,200 divided by six) on the Moon.

▲ (Picture 1) If gravity is taken away there will be no force pulling us and we would simply FLOAT about. This is called WEIGHTLESSNESS and it is what astronauts experience in space.

Weightlessness is not good for the body. Our muscles are always working against gravity, lifting our arms and legs and moving us around, and that is what keeps the muscles and bones of our bodies strong. In space, with such small forces to resist our movements, bones and muscles have little work to do and they are weakened.

The use of gravity

Gravity is very important to us. It pulls us towards the ground and stops us floating off into space. Gravity pulls your breakfast cereal to the bottom of its bowl, it pulls your computer down on the table, pulls the table on the floor and so on.

The problem with gravity

Gravity is not always useful. It stops athletes from being able to jump very high off the ground. It makes it very hard for planes to fly, and even harder for rockets to leave the Earth completely.

Gravity also makes things fall very quickly, so if brakes fail on a car when it is

on a slope, the car will quickly gain speed and may crash with unpleasant effects.

Gravity holds our Solar System together

Everything has a gravitational pull. The amount of the pull depends on its size. The Earth has a larger gravitational force than the Moon because it is bigger. However, the Earth is small compared to the Sun, and so the gravitational force of the Earth is tiny compared to that of the Sun.

The Sun's gravity is so strong that all of the planets are pulled towards it (Picture 2). What stops them all from colliding with the Sun? The fact that they are moving very fast. If the Sun stopped pulling on the planets they would all fly off into space. In this case, the force that tries to make planets fly into space is balanced by the gravity force that pulls them towards the Sun. Because the forces are in balance, all of the planets remain the same distance from the Sun, getting neither closer nor further away.

Summary

- **Gravity is a force.**
- **Weight is caused by gravity acting on things.**
- **Gravity depends on the size of objects in space: things weigh less on the Moon than on the Earth.**

▼ (Picture 2) All of the planets are held in their ORBITS by the force of gravity of the Sun, just as the Moon is being pulled towards the Earth by Earth's gravity. In fact, all the moons that orbit a planet are held in orbit by that planet's gravity.