

What should I already know?

- Know what a **force** is and be able to explain that a push and pull are types of forces.
- That when forces are applied to an object they allow them to move or stop moving.
- The strength of the force determines how far and fast an object moves.
- **Friction** is the **resistance of motion** when there is contact between two surfaces.
- The force that causes objects to move downwards towards the ground is gravity.
- That magnets have poles, and that opposite poles **attract**, while similar poles **repel**.

What is friction?

Friction is a force between two surfaces that are sliding, or trying to slide, across each other. Friction always works in the direction opposite to the direction in which the object is moving, or trying to move. Friction always slows a moving object down.

The amount of friction depends on the materials from which the two surfaces are made. The rougher the surface, the more friction is produced. Friction also produces heat. If you rub your hands together quickly, you will feel them get warmer.

Friction can be a useful force because it prevents our shoes slipping on the pavement when we walk and stops car tyres skidding on the road. Sometimes we want to reduce friction. For example, we use oil to reduce the friction between the moving parts inside a car engine.

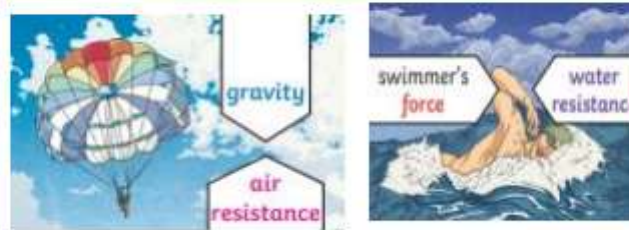


What are forces?

Forces are just pushes and pulls in a particular direction. Forces are shown by arrows in diagrams. The direction of the arrow shows the direction in which the force is acting. The bigger the arrow, the bigger the force.



Forces change the **motion** of an object. They will make it start to move or speed up, slow it down or even make it stop.
For example, when a cyclist pushes down on the pedals of a bike, it begins to move. The harder the cyclist pedals, the faster the bike moves. When the cyclist pulls the brakes, the bike slows down and eventually stops.



Water **resistance** and air resistance are forms of **friction**. Friction can sometimes be helpful and sometimes unhelpful. *For example air resistance is helpful as it stops the skydiver hitting the ground at high speed. Water resistance makes it harder to move through water so the swimmer has to work hard.*

Key Vocab

Forces	The pulling or pushing effect that something has on something else
Gravity	A pulling force exerted by the Earth (or anything else which has a mass)
Attract	If one object attracts another object, it causes the second object to move towards it
Friction	The resistance of motion when one object rubs against another
Motion	The activity of changing position or moving from one place to another
Repel	When a magnetic pole repels another magnetic pole, it gives out a force that pushes the other pole away
Resistance	A force which slows down a moving object or vehicle
Lever	A basic tool used to lift or pry things open
Pulley	A simple machine that makes lifting something easier. A pulley has a wheel or set of wheels with grooves that a rope or chain can be pulled over
Gear	A part of a machine that causes another part to move because of teeth which connect the two moving parts
Spring	A spiral of wire which returns to its original shape after it is pressed or pulled

What is gravity?

The force that pulls things to the ground on Earth (and other planets) is called **gravity**. Gravity also holds Earth and the other planets in their orbits around the Sun. The force of gravity also exists on the Moon but it is not as strong as it is on Earth. This is because the Moon is much smaller than our planet.

Isaac Newton

Isaac Newton is considered one of the most important scientists in history. He was born in 1643 in England.



When most people think of Isaac Newton, they think of him sitting under an apple tree watching an apple fall. Some people even believe the apple fell onto his head. Newton understood that what makes things like apples fall to the ground is a specific kind of force — the force we call gravity. Newton thought that gravity was the force of **attraction** between two objects, such as an apple and the earth. He also thought that an object with more matter exerted the same force on smaller objects as they exerted on it. That meant that the large mass of the earth pulled objects toward it. That is why the apple fell down instead of up, and why people do not float in the air.



What are examples of mechanisms?

Levers allow us to do heavy work with less effort. For example, trying to pick up a large heavy box is difficult, however if a lever is used it becomes much easier to move it.



Inclined Plane



Pulley



Pulleys also allow us to do heavy work – objects are attached to ropes and pulley wheels, and so instead of lifting heavy object upwards, we can pull on the pulley rope downwards.

Gears are toothed wheels. Their 'teeth' can fit into each other so that when the first wheel turns, so does the next one. This allows forces to move across a surface.



Gears

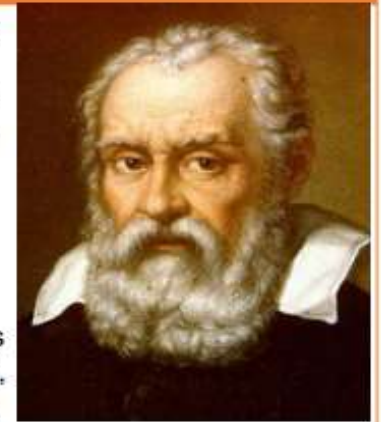
Springs can be stretched by pulling them or squashed by pushing them. The greater the force pulling or pushing the spring, the greater the force the spring uses to move back to its normal shape.



Springs

Galileo Galilei

Galileo Galilei was an Italian scientist who was born in 1564. He is important because **he changed the way that people thought about the world**. He created powerful telescopes, spotted distant moons and most significantly, he was able to prove that the Earth orbited the Sun, rather than the other way around.



Galileo conducted a famous experiment in which he dropped two objects from the Leaning tower of Pisa in 1589. He wanted to prove that the pull of gravity on an object is the same, regardless of their different weights.

Fun Fact!

Galileo was a great inventor and even carried on inventing after he had gone blind.