

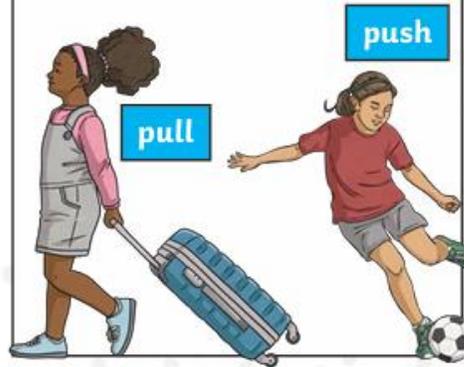


Key Vocabulary

force	A force is a push or pull that can cause an object to start or stop moving or change its speed, direction or shape.
gravity	Gravity is a pulling force exerted by the Earth (or any object with mass).
newton (N)	The newton (N) is a unit of measurement used to measure force , named after Sir Isaac Newton.
friction	Friction is a contact force that occurs between two touching surfaces that are either trying to move or are already moving across each other.
air resistance	Air resistance is a form of friction that occurs between air and an object moving through it. It can also be referred to as 'drag'.
water resistance	Water resistance is a type of friction that happens when water (or any liquid) pushes against an object moving through it.

Forces

Forces can be categorised as pushes or pulls.



Mass is the measure of the amount of matter within an object and is typically measured in grams (g) or kilograms (kg).

Weight is the measure of the gravitational **force** acting on an object and is measured in **newtons (N)**.



Sir Isaac Newton	Galileo Galilei	Ibn al-Haytham
Newton theorised that a force must pull objects downwards after observing an apple fall from a tree. This sparked his curiosity about why objects fall downwards rather than sideways or upwards.	Galileo suggested that, if he were to drop two balls of different masses from the top of the Leaning Tower of Pisa with no air resistance to slow their fall, both balls would hit the ground at the same time.	Al-Haytham described gravity as the attraction between two masses and explored how the force of gravity causes objects to accelerate.



Key Vocabulary

streamlined	Streamlined objects have a shape that allows them to move more efficiently through air or water by reducing resistance.
mechanism	A mechanism is the smaller moving parts of a machine.
lever	A lever is a mechanism that uses a small force to move a heavier load by pivoting on a fixed point.
pulley	A pulley is a wheel (or set of wheels) over which a rope is looped, used to lift heavy objects with less effort.
gear	Gears are wheels with teeth that lock together and turn each other to transfer motion.



Streamlined shapes have a pointed front and a low, curved back to allow them to cut through air or water more efficiently, enabling faster movement.



Forces can be both helpful and unhelpful. For example, **air resistance** helps a plane stay in the air but it also opposes the driving **force**, slowing the plane down.

Forces in Action



Levers	Pulleys	Gears
A lever has three main parts: the pivot point (where the lever rotates); the force applied to one end; and the load (object or resistance) being moved at the other end. The distance between the pivot and where the force is applied affects how easy it is to lift the load.	A pulley with a single wheel allows you to change the direction of the force applied when lifting. The more wheels added to a pulley system, the less force is needed to lift the load. For example, adding a second wheel halves the amount of force required.	When gears are connected, they always rotate in opposite directions, allowing them to change the direction of motion. If the first gear is larger than the second, the second gear will rotate faster, increasing the speed of motion.



As a Scientist...

In year 3:

- Compare how things move on different surfaces.
- Know how a simple pulley works and use making lifting an object simpler •

Notice that some forces need contact between two objects, but magnetic forces can act at a distance. • Observe how magnets attract and repel each other and attract some materials and not others.

- Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials.
- Describe magnets as having two poles.
- Predict whether two magnets will attract or repel each other, depending on which poles are facing.

In year 5:

- Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object and the impact of gravity on our lives.
- Identify the effects of air resistance, water resistance and friction, which act between moving surfaces.
- Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect. Pupils should explore falling objects and raise questions about the effects of air resistance. They should explore the effects of air resistance by observing how different objects such as parachutes and sycamore seeds fall. They should experience forces that make things begin to move, get faster or slow down.