Year 5
Unit: Forces

Intent:
To explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.
To identify the effects of air resistance, water resistance, and friction that act between moving surfaces.
To recognise that some mechanisms, including levers, pulleys, and gears, allow a smaller force to have a greater effect.

Prior learning
Year 3 – Compare how things move on different surfaces.
Year 3 – Notice that some forces need contact between two objects, but magnetic forces can act at a distance.
Year 3 – Observe how magnets attract or repel each other and attract some materials and not others.

Later learning (not in Year 5)
KS3 – Forces as pushes or pulls, arising from the interaction between two objects.
KS3 – Using force arrows in diagrams.
KS3 – Forces measured in Newtons, measurements of stretch or compression as force is changed.

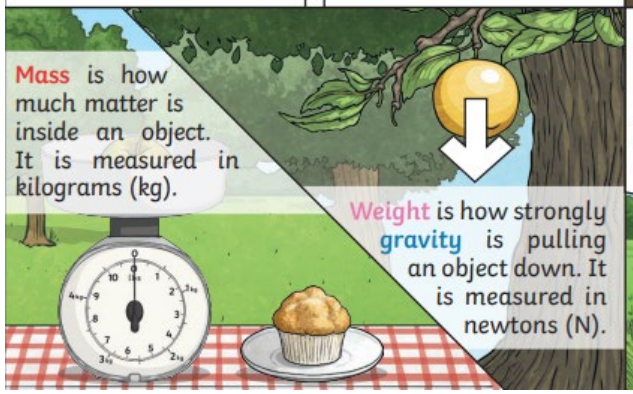
Key Questions:
Forces are thought of as what?
Which type of force is gravity?
What is the measure of how much matter is inside an object?
What is friction?
Which word describes an object that is shaped to minimise the effect of air or water resistance?
What type of force is buoyancy?
Which type of mechanism uses a cog?

Forces

Forces can make an object...
- start to move.
- stop moving.
- change direction.
- move faster.
- change its shape.
- move more slowly.

Isaac Newton

Isaac Newton is famously thought to have developed his theory of gravity when he saw an apple fall to the ground from an apple tree.



Mass is how much matter is inside an object. It is measured in kilograms (kg).

Weight is how strongly gravity is pulling an object down. It is measured in newtons (N).

The Moon has a smaller mass than Earth so the gravitational pull on the Moon is smaller than it is on Earth.

Jupiter has a greater mass than Earth so the gravitational pull on Jupiter is stronger than on Earth.

It has a pointed nose to cut through the water, and a smooth, low, curved back to allow the water to flow over and around it.

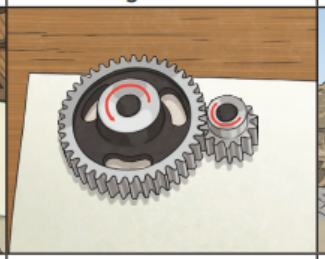
This shark is **streamlined**.

It does not create much water resistance so it can move through the water quickly.

Pulleys

Pulleys can be used to make a small force lift a heavier load. The more wheels in a pulley, the less force is needed to lift a weight.

Gears/Cogs



Gears or cogs can be used to change the speed, force or direction of a motion. When two gears are connected, they always turn in the opposite direction to each other.

Levers

Levers can be used to make a small force lift a heavier load. A lever always rests on a pivot.

Examples of forces in action:

Water resistance and air resistance are forms of friction. Friction is sometimes helpful and sometimes unhelpful. For example, air resistance is helpful as it stops the skydiver hitting the ground at high speed. Friction on a bike chain can make the bike harder to pedal so it is unhelpful.

Vocabulary	
Air resistance	A type of friction caused by air pushing against any moving object.
Buoyancy	An object is buoyant if it floats. This is because the weight of the object is equal to the upthrust.
Forces	Pushes or pulls.
Friction	A force that acts between two surfaces or objects that are moving, or trying to move, across each other.
Gravitational pull	The pull that Earth exerts on an object, pulling it towards Earth's centre. It is the Earth's gravitational pull which keeps us on the ground.
Gravity	A pulling force exerted by the Earth (or anything else which has mass).
Mass	A measure of how much matter (or 'stuff') is inside an object.
Mechanism	Parts which work together in a machine. Examples of mechanisms are pulleys, gears and levers.
Streamlined	When an object is shaped to minimise the effects of air or water resistance.
Upthrust	A force that pushed objects up, usually in water.
Water resistance	A type of friction caused by water pushing against any moving object.
Weight	The measure of the force of gravity on an object.