

Year: 5

Subject: Science

Unit of Study: Let's Get Moving

Linked Literature: All About Physics (Big Questions) by Richard Hammond

Out of this World

Material World

Circle of Life

Let's Get Moving

Growing Up and Growing Old

Amazing Changes

Vocabulary	
air resistance	A type of friction caused by air pushing against any moving object
attract	To pull towards
buoyancy	An upward force that a liquid applies to objects
force	A push or pull that acts upon an object that can cause it to move, change shape or change direction
force meter	An instrument for measuring forces
friction	The force made when two moving objects rub against each other / are moving or trying to move across each other
gravity	The (pull) force that acts at a distance and attracts a body/objects towards the centre of the Earth
mass	A measure of how much matter is inside an object and is measured in kilograms (kg)
mechanism	Parts which work together in a machine. Examples and mechanisms are pulleys, gears and levers.
newton	The (measuring) unit of force
non-contact force	A force that does not need to touch an object to work eg: magnetic force
reliable	Something that can be depended on
repel	To push away
resistance	An opposing or slowing force
streamlined	When an object is shaped to minimise the effects of air or water resistance
water resistance	A type of friction caused by water pushing against any moving object
weight	The measure of the force or gravity on an object / force with which something is attracted to the Earth. It is measured in newtons (N)

I need to know:

A **force** is a **push** or a **pull** that acts upon an object. We can't see forces, but they are an important part of our everyday lives. We **push** and **pull** objects to do many different things. When we **push** or **pull** objects we can move the object, change the shape of the object, the speed of the object or make it change direction.

Gravity is a non-contact **force** which **acts at a distance**. It is a **pull force that pulls/ attracts objects towards the centre of the Earth**. The planets and the Sun do not touch, yet the planets stay in orbit around the Sun due to the force of gravity.

Forces in action



Friction is a **force** created between two surfaces when they rub together and always slows an object down but also creates heat. Rough surfaces create more friction than smooth surfaces. **Water resistance** and **air resistance** are types of **friction** that involve a liquid and a gas and are also known as 'drag' forces. **Water resistance** is the force responsible for making it difficult for us to move through the water. It acts between a moving object and the water molecules around it, slowing the object down. A shark is **streamlined** due to its pointed nose that cuts through the water, and a smooth, low, curved back to allow the water to flow over and around it. It does not create much **water resistance** so it can move through the water quickly.



Air resistance is a force that **acts in the opposite direction to gravity**. It acts between a moving object and the air molecules around it, slowing the object down. Parachutes are used to **increase air resistance** and **slow down the parachutist**, so they can land safely. Modern cars and planes are **streamlined** in design to reduce air resistance, allowing them to move faster.

Scientists

After dropping two balls of different masses from the leaning tower of Pisa (around 1590), Galileo discovered that everything falls at the same speed when the balls hit the ground at the same time. This contradicted the existing ideas (of Archimedes) that heavy objects fall faster than light objects. Isaac Newton was a scientist who developed the first description of the force of gravity. He is famously thought to have developed his theory of gravity when he saw an apple fall to the ground from an apple tree. Albert Einstein further developed the theory of gravity.



I need to do:

Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.

Identify the effects of air resistance, water resistance and friction, that act between moving surfaces.

Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.

Working scientifically skills:

Plan different types of scientific enquiries to answer questions, recognising controlling variables.

Use scientific equipment to take measurements.

Record data and results, using these findings to make predictions and set up further comparative and fair tests.

Report and present findings from enquiries.

Identify scientific evidence that has been used to support or refute ideas/arguments.

Prior knowledge:

Through their previous learning, children should be able to:

Compare how things move on different surfaces. (Y3)

Notice that some forces need contact between 2 objects, but magnetic forces can act at a distance. (Y3)

Observe how magnets attract or repel each other and attract some materials and not others. (Y3)

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. (Y3)

Describe magnets as having 2 pole and predict whether 2 magnets will attract or repel each other, depending on which poles are facing. (Y3)

A mechanism is a device which takes an input motion or force, and outputs a different motion or force. The purpose of a mechanism is to make the job easier to do, they do this by allowing a smaller force to have a greater effect. There are different types of mechanisms but the most commonly used systems are levers, pulleys, gears and cogs. These can be used to create simple machines.

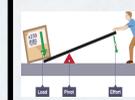


Pulleys

A pulley is a wheel with a grooved rim around which a cord passes. They pulley acts to change the direction of a force applied to the cord and is used to raise heavy weights. Pulleys can be used to make a small force lift a heavy load. The more wheels in a pulley, the less force is needed to lift a weight. Examples include blinds and flags on poles.

Gears and Cogs

Gears or cogs can be used to change the speed, force or direction of a motion. Gears are wheels with teeth which lock together and turn one another. When two gears are connected, they always turn in the opposite direction to each other. Watches, bikes and cars use cogs and gears.



Levers

Levers can be used to make a small force lift a heavier load. A lever always rests on a **pivot/fulcrum** (central point, pin or shaft on which a mechanism turns or oscillates—moves or swings back and forth in a regular rhythm.) A lever has a point where you push or pull, the point where it pivots and the point where the work is done. See-saws, bottle openers, scissors and crowbars are examples of levers.

What is gravity?

How do we measure force?

What are the effects of air resistance on moving objects?

What is water resistance and what are its effects on moving objects?

What is friction?
Investigation: whose shoe is safest?

What impact do gears, levers and pulleys have on forces?