## Spring Term Overview - YEAR 5/6 – Forces

<table>
<tr><th colspan="3">Year 5/6 Forces</th></tr>
<tr><th colspan="2">Unit Title: Science - Forces</th><th>Guide Time: 3 hours</th></tr>
<tr><td>Assessment:</td><td>Mini-quiz, teacher assessment during lessons, especially as all children are starting from the same baseline and the NC. Assessment statements for the end of this unit are located in the Science planning folder on Trust Shared.</td><td rowspan="4">Very Important Points (VIPs):<ul><li>A force is a push or pull. Forces need to be equal and opposite for an object to stay still.</li><li>Gravity is a force that pulls objects towards the centre of a body.</li><li>Mass is how much matter an object contains. Weight a force and relies on the pull of gravity.</li><li>More friction is created between rough surfaces. Less friction is created between smooth surfaces.</li><li>A newton meter is used to measure the pull of gravity in N (newtons).<br>Friction acts between the surfaces of two moving objects resulting in a reduction in speed.</li><li>Levers, gears and pulleys are all part of simple mechanisms.</li><li>Levers and pulleys are used to lift heavy objects.</li></ul>Fat Question:<br>How do forces impact and effect our everyday lives?</td></tr>
<tr><td>Links to prior learning:</td><td>As stated above, all children will be starting from a similar baseline, with little prior knowledge.<br>KS1 national curriculum objectives that children will have knowledge of include:<ul><li>To compare how things move on different surfaces</li><li>To notice that some forces need contact between 2 objects, but magnetic forces can act at a distance.</li></ul></td></tr>
<tr><td>Links to other learning - cross-fertilisation:</td><td>Links to maths through the calculating the distance travelled / time taken aspect of the unit, alongside measurement blocks based around converting units of measure as well as understanding weight and mass, for example.<br><br>History – children can explore the history of forces and improtant scientists who were prominent in it's discovery / creation. Children can also apply their understanding to that of forces created by a range of aircrafts during WWII.</td></tr>
<tr><td>Links to future learning:</td><td>Children will use the knowledge gained in this unit to support their understanding of the following units across the academic year:<ul><li>Space (The world beyond us)</li><li>PE</li></ul>Children will also build on this learning when moving into KS3 and beyond in physics.</td></tr>
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| **Character/Wider Development ('50 things', cultural capital, skills)** | March 6th – 15th March<br>British Science Week- a ten-day celebration of the innovation that led the United Kingdom to excel in science and technology.<br><br>11th February<br>International Day of Women and Girls in Science.<br><br>Thematic questions:<br>Culture<br>Why were engineers allowed to avoid serving in the army in WW2?<br>World Around Us<br>How could the weather in different countries impact friction?<br>World Beyond Us<br>Why are rockets and spacecraft shaped the way that they are?<br>Modern Britain<br>What evidence is there of WW2 in Britain today?<br>Healthy Body Healthy Mind<br>How are forces used within play equipment?<br>Technology in Action<br>Are there any modern machines that use levers and pulleys? | |

## OVERVIEW OF TEACHING SEQUENCE

| Sequence | Learning Focus or Key Question | Learning Outcomes | Key Words | Depth of Learning | Misconceptions | Activities |
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| Lesson 1 | LO: To explore the effect that forces have on objects. | To identify forces as pushes and pulls.<br><br>To identify and explain the different forces acting on objects | forces, gravity, earth's gravitational pull, weight, mass. | **SEND**: Add the name of the forces to each picture. The first letter of each word is provided.<br><br>**GD**: Describe each force using scientific vocabulary accurately. | The differences between weight and mass.<br><br>All objects exert a gravitational pull.<br><br>The strength of an object's gravitational pull depends on its mass. | Y5- Describe the forces acting on a range of objects.<br>You can use labelled diagrams to support your answers.<br>Use the word mat for support and to ensure that you are spelling unfamiliar words correctly.<br><br>Y6 - Describe the forces acting on a range of objects. You can use labelled diagrams to support your answers. You should use scientific vocabulary such as; forces, gravity, earth's gravitational pull, weight, mass, friction, air |

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| | | | | | | resistance, water resistance, buoyancy streamlined |
| Lesson 2 | L.O: To explore the effect that gravity has on objects and how the first theory of gravity was developed. | To explain the effect of gravity on unsupported objects.<br><br>To explain Isaac Newton's role in developing a theory of gravity.<br><br>To accurately measure the force of gravity pulling on objects. | forces, gravity, earth's gravitational pull, weight, mass, friction, air resistance, water resistance, buoyancy streamlined | SEND<br>Planning proforma provided with sentence stems.<br><br>GD<br>Independently plan, carryout and write a conclusion. | Mass is a measure of the amount of 'stuff' inside an object and is measured in kilograms (kg).<br><br>Weight is actually a measure of the strength of gravity acting on an object. It is measured in newtons (N). | Y5 - Find an object's weight by placing the object in a bag and hanging the bag from the newton<br>meter to measure how strongly gravity is acting on the object.<br>Record the results on the table provided.<br><br>Y6 - measure the weight and mass of different objects. The children will need to plan their experiment. |
| Lesson 3 | LO: To investigate how air resistance affects moving objects. | To explain how air resistance affects moving objects.<br><br>To plan and conduct an investigation into the effects of air resistance. | Parachute, forces, gravity, earth's gravitational pull, weight, mass, friction, air resistance, surface area, decent, opposing. | SEND<br>Planning proforma provided with sentence stems.<br><br>GD<br>Independently plan, carryout and write a conclusion. Build on previous points for improvement. | The mass of the object does not affect how fast it falls. | Y5 - Investigate the following question: What effect does surface area have on the amount of air resistance?<br>Questions provided to support with planning the investigation.<br><br>Y6 - Create an experiment to investigate how different factors could have an impact on the amount of air resistance. Choose to investigate one of the following; the height of the<br>drop, the size of the parachute, the shape of the parachute, the distanced dropped, the length of string or the object attached to the parachute. Plan independently. |
| Lesson 4 | LO: To identify streamlined shapes and minimise the effects of water resistance. | To identify forces as pushes and pulls.<br><br>To identify and explain the different forces acting on objects | Buoyancy, drag, streamline, forces, gravity, earth's gravitational pull, friction, water resistance, | SEND<br>Table to record results is provided.<br><br>GD<br>Independently plan, carry out and write a conclusion. Build on | The more streamlined an object is the less water resistance will occur. | Y5- Investigate the following question: How does the shape of an object effect the time taken to travel through water? Questions and frame to support planning the investigation will be provided. |

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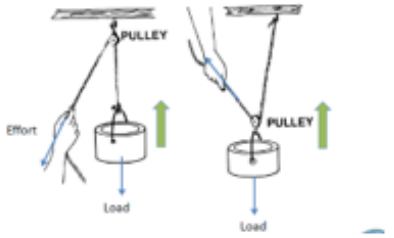
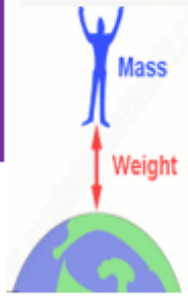
| | | | surface area, decent, opposing. | previous points for improvement. | | Y6- Create an experiment to investigate how different factors could have an impact on the amount of water resistance. |
| Lesson 5 | LO: To be able to investigate the effects of friction; recognising and controlling variables. | To explain the effects of friction on a moving vehicle.<br><br>To investigate the effects of friction created by different materials.<br><br>To recognise and control variables in an investigation. | Friction, surface, opposing, lubrication, engine, moving parts, reducing friction, applied force, aquaplaning, disperse water. | SEND<br>Planning pro-forma provided with sentence stems. | Friction is always a useful force – sometimes we try to reduce friction – How? | Y5 – Investigate the following question: How does the texture of a surface effect the speed of a moving object?<br><br>Y6 - Investigate the following question: How does the texture of a surface effect the speed of a moving object. |
| Lesson 6 | To explain and investigate simple mechanisms. | To explain how different mechanisms work.<br><br>To investigate a simple mechanism.<br><br>To design my own mechanism for a given purpose. | Pulley, wheel, gears, cogs, teeth, levers, pivot. | SEND<br>Simple 5 step instructions.<br><br>GD<br>Create more than one, each with up to 7 instructions. | Levers and pulleys are used to lift large loads, cogs are not. | Y5/6<br>Select a mechanism to recreate.<br>Follow the instructions independently. |
| Lesson 7 | To complete a review of learning. | | | | | |
| Context (big picture learning).<br><br>**Intent:** To enhance children's knowledge and understanding of forces. Working scientifically to investigate gravity, friction, air resistance and water resistance, including their effects on objects. They will also investigate how friction impacts moving objects and the functions of simple mechanisms. | | | | | | |

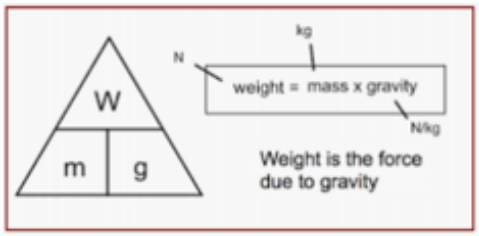
# Forces

**Intent:** To enhance children's knowledge and understanding of forces. Working scientifically to investigate gravity, friction, air resistance and water resistance, including their effects on objects. They will also investigate how friction impacts moving objects and the functions of simple mechanisms.

## How do forces impact and effect our everyday lives?


### Very Important Points (VIPs)

A force is a push or pull. Forces need to be equal and opposite for an object to stay still.

Gravity is a force that pulls objects towards the centre of the Earth.
Mass is how much matter. Weight is the measure of gravity acting on an object.

More friction is created between rough surfaces. Less friction is created between smooth surfaces.

A newton meter is used to measure the pull of gravity in N (newtons).

Friction acts between the surfaces of two moving objects resulting in the movement slowing down.

Levers, gears and pulleys are all part of simple mechanisms.

Levers and pulleys are used to lift heavy objects. Gears are used to alter the speed of a moving object.

### Air and Water Resistance

**Air resistance** occurs between the surface of a falling object and the air that surrounds it and it also works to slow the rate at which the object falls. Air resistance works with surface area, so the more surface area, the more air resistance. Think about when you drop two pieces of paper: one crumpled and one flat.

**Water resistance** occurs between the surface of an object and the water that surrounds it. Streamlined objects are shaped strategically to limit the surface area to more efficiently move through air and water, this reduces the amount of water resistance.

### Important People

#### Sir Isaac Newton

Isaac Newton was born in 1643 and became famous for his work on **gravity and his three laws of motion**. The famous story of an **apple falling to the ground from a tree** illustrates how Newton's work on gravity was inspired by things he observed in the world around him.

#### Archimedes

The idea of a simple machine originated with the Greek philosopher Archimedes around the 3rd century BC, who studied the Archimedean **simple machines**: lever, pulley, and screw. He discovered the **principle of mechanical advantage** in the lever.

### Key vocabulary

**Forces**- Pushes or pulls.

**Gravity**- A pulling force exerted by the Earth (or anything else which has mass)

**Earth's gravitational pull**- The pull that Earth exerts on an object, pulling it towards Earth's centre.

**Weight**- The measure of the force of gravity on an object.

**Mass**- A measure of how much matter (or 'stuff') is inside an object.

**Friction**- A force that acts between two surfaces or objects that are moving, or trying to move, across each other.

**Air resistance**- A type of friction caused by air pushing against any moving object.

**Water resistance**- A type of friction caused by water pushing against any moving object.

**Buoyancy** – An upward force that a liquid applies to an object.

**Streamlined**- When an object is shaped to minimise the effects of air or water resistance.

**Levers**- A rigid bar resting on a pivot, used to move a heavy or firmly fixed load with one end when pressure is applied to the other.

**Gears**- A toothed wheel that works with others to alter the speed of a driving mechanism.

**Pulleys**- A wheel with a grooved rim around which a cord passes, which acts to change the direction of a force applied to the cord and is used to raise heavy weights.