



Medium Term Plan: Forces

Key Stage Two
(Year 5/6)

During this unit of work, children will consolidate and extend their knowledge of forces by naming individual forces (e.g. gravity, friction, upthrust). They will extend their knowledge of frictional forces (air resistance and water resistance) and plan fair test investigations to discover which shoe has the greatest friction and which shapes offer the most water resistance. They will learn how forces can be helpful and unhelpful in various scenarios and identify the forces involved in each scenario. They will learn what a mechanism is and how pulleys, levers and gears are used to allow a smaller force to have a greater effect.

Are there different types of forces?

Scientific Knowledge and Conceptual Understanding*

biology	chemistry	physics
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Working Scientifically*


plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary;	take measurements, using a range of scientific equipment taking repeat readings when appropriate;	record data and results using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
use test results to make predictions to set up further comparative and fair tests	report and present findings from enquiries, including conclusions, causal relationships and explanations of and a degree of trust in results, in oral and written forms	identify scientific evidence that has been used to support or refute ideas or arguments.

Upper Key Stage 2 Scientific Knowledge and Conceptual Understanding Areas*

Forces	Animals, including humans	Properties and Changes of Materials	Earth and Space
Evolution and Inheritance	Light	Electricity	Electricity

*Shaded boxes indicate coverage for this unit

Why has this science unit been chosen for pupils at Applegarth Primary School?	In this science unit, our Applegarth children will: consolidate and extend their knowledge of forces by naming individual forces (e.g. gravity, friction, upthrust). They will extend their knowledge of frictional forces (air resistance and water resistance) and plan fair test investigations to discover which shoe has the greatest friction and which shapes offer the most water resistance. They will learn how forces can be helpful and unhelpful in various scenarios and identify the forces involved in each scenario. They will learn what a mechanism is and how pulleys, levers and gears are used to allow a smaller force to have a greater effect.
What specifically do we want the children to know, understand and be able to do by the end of this unit?	Children will know that: A force causes an object to start moving, stop moving, speed up, slow down or change direction. Gravity is a force that acts at a distance. Everything is pulled to the Earth by gravity. This causes unsupported objects to fall. Air resistance, water resistance and friction are contact forces that act between moving surfaces. The object may be moving through the air or water, or the air and water may be moving over a stationary object. A mechanism is a device that allows a small force to be increased to a larger force. The pay back is that it requires a greater movement. The small force moves a long distance and the resulting large force moves a small distance, e.g. a crowbar or bottle top remover. Pulleys, levers and gears are all mechanisms, also known as simple machines. Children will be able to: Explain that objects fall to earth due to the force of gravity. Describe and demonstrate how simple levers, gears and pulleys assist the movement of objects. Compare and describe, using a range of toys, models and natural objects, the effects of water resistance, air resistance and friction

KS2 National Curriculum PoS	Knowledge Focus (from progression document)	Possible Misconceptions
<p>Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object</p> <p>Identify the effects of air resistance, water resistance and friction, that act between moving surfaces</p> <p>Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.</p> <p>For more details, working scientifically and non-statutory guidance, click this link.</p>	<p>A force causes an object to start moving, stop moving, speed up, slow down or change direction. Gravity is a force that acts at a distance. Everything is pulled to the Earth by gravity. This causes unsupported objects to fall.</p> <p>Air resistance, water resistance and friction are contact forces that act between moving surfaces. The object may be moving through the air or water, or the air and water may be moving over a stationary object.</p> <p>A mechanism is a device that allows a small force to be increased to a larger force. The pay back is that it requires a greater movement. The small force moves a long distance and the resulting large force moves a small distance, e.g. a crowbar or bottle top remover.</p> <p>Pulleys, levers and gears are all mechanisms, also known as simple machines.</p>	<p>Some children may think:</p> <ul style="list-style-type: none"> • the heavier the object the faster it falls, because it has more gravity acting on it • forces always act in pairs which are equal and opposite • smooth surfaces have no friction • objects always travel better on smooth surfaces • a moving object has a force which is pushing it forwards and it stops when the pushing force wears out • a non-moving object has no forces acting on it • heavy objects sink and light objects float
Prior Learning	Subsequent Learning	
<p>In Y3/4, children will have learned to:</p> <p>Compare how things move on different surfaces</p> <p>Notice that some forces need contact between two objects, but magnetic forces can act at a distance</p> <p>Observe how magnets attract or repel each other and attract some materials and not others</p> <p>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</p> <p>Describe magnets as having two poles</p> <p>Predict whether two magnets will attract or repel each other, depending on which poles are facing.</p>	<p>In KS3:</p> <p>Forces as pushes or pulls, arising from the interaction between two objects.</p> <p>Using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces.</p> <p>Moment as the turning effect of a force.</p> <p>Forces: associated with deforming objects; stretching and squashing – springs; with rubbing and friction between surfaces, with pushing things out of the way; resistance to motion of air and water.</p> <p>Forces measured in Newtons, measurements of stretch or compression as force is changed.</p>	
Exploring how scientific ideas have changed over time	Cross-curricular links	
<p>How have our ideas about gravity changed over time?</p>	<p>Vikings – Boats/ long boats – sinking etc</p> <p>What surfaces are best for pulling across water? How does the weight of the object effect how hard it is to pull it across the water?</p> <p>Vikings played games to show their strength and might. Tug of war – how is this effected by force?</p> <p>Describe the balance and imbalance of a Viking show of strength of lifting heavy logs over their heads and holding them there.</p>	
Local Context	Cultural Capital	
Previously Learned Vocabulary	New Vocabulary	
<p>Force, push, pull, twist, contact force, non-contact force, magnetic force, magnet, strength, bar magnet, ring magnet, button magnet, horseshoe magnet, attract, repel, magnetic material, metal, iron, steel, poles, north pole, south pole</p>	<p>Air resistance, water resistance, friction, gravity, newton, gears, pulleys, force, push, pull, opposing, streamline, brake, mechanism, lever, cog, machine, pulley</p>	
Significant People / Events		
<p>Historical Figures see https://www.primary-science.co.uk/product-page/scientists-across-the-curriculum</p> <p>Archimedes (Mathematician who developed theories about how levers and pulleys can lift and move heavy objects)</p> <p>Galileo Galilei - links to free resources requiring a login (Astronomer, Mathematician & Physicist who was the first person to use the scientific method to test theories about gravity and the Solar System)</p> <p>Isaac Newton - links to free resources requiring a login (Mathematician & Physicist who developed theories about gravity)</p> <p>George Cayley (Aeronautical Engineer who designed the first successful glider to carry a human being)</p> <p>Under-represented groups</p> <p>Brahmagupta - search document for information (Mathematician & Astronomer who was the first scientist to talk about gravity)</p>		
Recommended Reads (Reading for pleasure and writing opportunities)**	Recommended Reads – Curriculum Enhancement**	
<p>The Enormous Turnip (Katie Daynes)</p> <p>Leonardo's Dream (Hans de Beer)</p> <p>The Aerodynamics of Biscuits (Clare Helen Welsh)</p> <p>The Tin Snail (Cameron McAllister)</p> <p>Clockwork (Phillip Pullman)</p> 	<p>Pull, Lift Lower (Michael Dahl)</p> <p>Pulleys (Sally Walker)</p> <p>How Machines Work (David Macaulay)</p> 