

Science Progression of Knowledge

Year 3

Topic: Forces

<u>National Curriculum Objectives:</u>	<u>Essential Vocabulary:</u>	<u>Substantive Knowledge:</u> - children MUST know this by the end of the unit	<u>Working Scientifically Objectives:</u>
<ul style="list-style-type: none"> compare how things move on different surfaces notice that some forces need contact between 2 objects, but magnetic forces can act at a distance observe how magnets attract or 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 2 poles predict whether 2 magnets will attract or repel each other, depending on which poles are facing 	<ul style="list-style-type: none"> <u>How things move:</u> move, movement, surface, distance, strength. <u>Types of forces:</u> push, pull, contact force, non-contact force, friction. <u>Magnets:</u> magnetic, magnetic field, magnetic force, bar magnet, horseshoe magnet, ring magnet, magnetic poles (north pole, south pole), attract, repel, compass. <u>Magnetic and non-magnetic materials:</u> e.g. iron, nickel, cobalt. <p>Previously introduced vocabulary: metal, names of materials.</p>	<ul style="list-style-type: none"> Objects move in different ways; they roll, slide, bounce etc. Forces change how things move. We can change the way an object moves by pushing or pulling them. Sometimes pushing and pulling slows things down, sometimes it speeds them up and sometimes it makes it change direction. Bigger pushes and pulls have bigger effects. Objects move differently on different surfaces Rough surfaces create friction and slow moving objects down. Forces change shapes. Sometimes when an object is pushed, pulled or twisted it changes shape. Magnets exert attractive forces on some materials. Magnets exert attractive and repulsive forces on each other. Magnets exert non-contact forces, which work through some materials. Magnetic forces are affected by the magnets strength. Magnetic forces are affected by the mass of the object being attracted. Magnetic forces are affected by the distance between magnet and object 	<ul style="list-style-type: none"> Carry out a fair test to explore whether objects need the same force to move them across different surfaces. Make predictions about the results of my investigation. Use my results to draw conclusions. Explore whether magnets attract or repel when north poles and south poles are put together. Draw diagrams to show the results of my findings. Predict which materials will be magnetic and which will not, then test my hypothesis. Carry out my own research to find out about uses for magnets and report my findings.
<u>Prior Knowledge:</u>	<u>Future Knowledge:</u>	<u>Working at Greater depth:</u>	<u>Science Enquiry/Key Questions:</u>
<p>In Year 2 children:</p> <ul style="list-style-type: none"> May have an awareness of how to make things stop and start, using simple pushes and pulls. They may know about floating and sinking. 	<p>In Year 5 children will learn:</p> <ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> Can they investigate the strengths of different magnets and find fair ways to compare them? 	<ul style="list-style-type: none"> What are magnetic materials? How can we find out? How far away does a magnet have to be before it attracts a magnetic material? Are bigger magnets stronger? Does the size and shape of a magnet affect how strong it is? How can we move magnets? Which surface is best to stop you slipping?

Science Progression of Knowledge

Year 5

Topic: Forces

<u>National Curriculum Objectives:</u>	<u>Essential Vocabulary:</u>	<u>Substantive Knowledge:</u> - children MUST know this by the end of the unit	<u>Working Scientifically Objectives:</u>
<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> <u>Types of forces:</u> air resistance, water resistance, buoyancy, upthrust, Earth's gravitational pull, gravity, opposing forces, driving force. <u>Mechanisms:</u> levers, pulleys, gears/cogs. <u>Measurements:</u> weight, mass, kilograms (kg), Newtons (N), scales, speed, fast, slow. <u>Other:</u> streamlined, Earth. <p>Previously introduced vocabulary: air, heat, moon.</p>	<ul style="list-style-type: none"> Air resistance and water resistance are forces against motion caused by objects having to move air and water out of the way. Friction is a force against motion caused by two surfaces rubbing against each other Some objects require large forces to make them move; gears, pulley and levers can reduce the force needed to make things move. 	<ul style="list-style-type: none"> Carry out an investigation to explore the effect of gravity on falling objects, taking careful measurements and observations to draw conclusions. Carry out independent research to find out about the roles Newton and Galileo played in helping our understanding of gravity, presenting my findings appropriately. Suggest ways to plan an experiment to find out which surface has the most friction when an object is moved across it. Carry out a fair test to explore the friction of different surfaces, recording my results accurately and using them to draw conclusions. Analyse a variety of statements, explaining which I agree with and why. Plan, set up and carry out an investigation to explore how the size of a parachute affects the speed at which it falls to the ground, recording my results appropriately and using them to draw conclusions. Make predictions about which shape of plasticine would fall quickest in a pot of water, giving scientific explanations for my choices. Carry out an experiment to test my predictions, recording my results using a stopwatch and using evidence to draw conclusions.
<u>Prior Knowledge:</u>	<u>Future Knowledge:</u>	<u>Working at Greater depth:</u>	<u>Science Enquiry/Key Questions:</u>
<p>In Year 3 children should:</p> <ul style="list-style-type: none"> compare how things move on different surfaces notice that some forces need contact between 2 objects, but magnetic forces can act at a distance observe how magnets attract or 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 2 poles predict whether 2 magnets will attract or repel each other, depending on which poles are facing 	<p>In KS3 children will learn about:</p> <ul style="list-style-type: none"> opposing forces and equilibrium: weight held by stretched spring or supported on a compressed surface forces being needed to cause objects to stop or start moving, or to change their speed or direction of motion (qualitative only) change depending on direction of force and its size. 	<ul style="list-style-type: none"> Can they describe and explain how motion is affected by forces? (including gravitational attractions, magnetic attraction and friction) Can they design very effective parachutes? Can they work out how water can cause resistance to floating objects? Can they explore how scientists, such as Galileo Galilei and Isaac Newton helped to develop the theory of gravitation? 	<ul style="list-style-type: none"> How can a force act on an object? How and why do objects move? How can we see forces? How can we measure forces? Do all objects fall through water in the same way? How does surface area of parachute affect the time it takes to fall? Can you label and name all the forces acting on the objects in each of these situations?

