



## Forces and Magnets

EYFS

Year 1

Year 2

Year 3

**Key Concept:**

Friction is a force that is created when 2 things make contact.

Force makes things move, slow down or speed up or change direction or stop.

Direct contact is usually necessary to produce a force, whereas a magnetic force does not need direct contact.

Compare how things move on different surfaces.

Pupils will:

Feel the resistance caused by friction by comparing pulling an object tied to a rope across different surfaces.

Children need to know the direction of the movement of the object and the direction of the resistance/force and label these with arrows. This can be done with a moving bike, opening a door or drawer.

Notice that some forces need contact between two objects, but magnetic forces can act at a distance.

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|--------------------------|--------------------------|--------------------------|--|
|                          |                          |                          | <p>Make this explicit: that magnets have a magnetic force/energy.</p> <p>Observe how magnets attract or repel each other and attract some materials and not others.</p> <p>Observe and classify as magnetic or repellent.</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>Ensure that children do not generalise that all metals are magnetic.</p> <p>Describe magnets as having two poles.</p> <p>Discuss the need to store magnets carefully. The same poles should not touch. This will weaken the magnetic field over time.</p> <p>Predict whether two magnets will attract or repel each other, depending on which poles are facing.</p> <p>Explore how magnets are used in everyday life.</p> |
| <p><b>Scientist:</b></p> | <p><b>Scientist:</b></p> | <p><b>Scientist:</b></p> | <p><b>Scientist:</b><br/><b>Michael Faraday</b></p>  |

| Enrichment:                                      | Enrichment:   | Enrichment:                                      | Enrichment:  |
|--|---|--|--|
| <p style="text-align: center;"><u>Year 4</u></p> | <p style="text-align: center;"><u>Year 5</u></p> <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><b>Pupils will:</b><br/>Drop objects of different weights from a height. Predict which will hit ground first. Gravity <u>acts the same on all objects.</u> Air resistance will create a difference. Both will hit the ground at the same point.</p> <p>Identify the effects of air resistance, water resistance and friction, that act between moving surfaces.</p> <p>Run holding an open umbrella behind them to feel the resistance.</p> <p>Fair test:<br/>Design an experiment i.e to answer a question: How can we slow down <b>or</b> speed up the speed at which a parachute falls?</p> <p>Encourage children to think what it feels like to walk across a swimming pool.</p> <p>Use modelling clay to investigate how easily a boat could move through water.</p> | <p style="text-align: center;"><u>Year 6</u></p> | <p style="text-align: center;"><u>Year 7</u></p> <p>Forces are pushes or pulls, arising from an interaction between 2 objects.</p> <p>Use force arrows in diagrams, adding forces in one dimension, balanced and unbalanced.</p> <p><b>Pupils will:</b><br/>Know the difference between a balanced and an unbalanced force and how they influence the movement of an object.</p> <p>Forces are measured in Newtons, measurements of stretch or compression as force is changed.</p> <p><b><u>Balanced Forces</u></b><br/>Opposing forces and equilibrium: weight held by stretched spring or supported on a compressed surface.</p> <p><b><u>Describing Motion:</u></b><br/><b>Pupils will know:</b><br/>Speed and the quantitative relationship between average speed &lt; distance and time. (speed = distance ÷ time)</p> <p>The representation of a journey on a distance-time graph.</p> <p>Relative motion: trains and cars passing one another.</p> |

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|   | <p>Look at boats and their design to help embed the above.</p> <p>Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.<br/>Liaise with DT co-ordinator.</p> |                    | <p>Contact forces: weight = mass x gravitational field strength (g) on Earth <math>g=N/kg</math>. This is different on other planets and stars.</p> <p><b>Pupils will:</b><br/>Understand how Earth and space systems interact, how they affect us and how we affect them and how this is important for our survival.</p> |
| <b>Scientist:</b>   | <b>Scientist:</b><br>Galileo Galilei<br>Isaac Newton  | <b>Scientist:</b>  | <b>Scientist:</b>   |
| <b>Enrichment:</b>  | <b>Enrichment:</b><br>STEM Ambassadors  | <b>Enrichment:</b> | <b>Enrichment:</b>  |
| <p><b><u>Possible Careers:</u></b><br/>Engineer, Builder, Train driver, Aerodynamic designer, architect, ship designer, Car designer, Sports analyst, athlete, eco designer, Astrophysicist, meteorologist<br/>Teacher</p>  |   |                    |   |
| <p><b><u>Common misconceptions:</u></b><br/><b>Forces:</b></p> <ul style="list-style-type: none"> <li>• The term 'force' means someone makes you do something you do not want to do. It is also associated with the Armed Forces by some children in schools.</li> <li>• Movement stops when things 'run out of push' rather than because there are other forces acting on them. They may think that to keep an object moving you need to keep giving the object a force (push). This common misconception is because of the invisibility of the other forces at work. To help overcome this idea, the use of arrows to define size and direction of forces is needed in diagrams. This is particularly important as force is a 'vector quantity' and therefore should have both its size and its direction identified.</li> <li>• A stationary object has no forces acting on it. The reason the object is stationary is because the forces acting on it are balanced.</li> <li>• The best place to put the fulcrum is in the centre of the lever. The mechanism will in fact have a bigger effect when it is closer to the object being moved.</li> <li>• A greater force on a mechanism always has a greater effect on the object. In fact, a mechanism can allow a smaller force to have a greater effect.</li> </ul> |   |                    |   |

- Mass and weight are the same thing. Mass is a measure of the amount of matter in an object; weight is a measure of the force exerted by the object due to gravity. It is important to define these measurements and the difference must be clear when introducing pulleys.

| Year groups | Vocabulary/Statements   |
|-------------|---|
| Birth to 3  | • Repeat actions that have an effect.   |
| Nursery     | object, float, sink, water, up, down, top, bottom, push, pull, magnet, spring, squash, bend, twist, stretch, turn, spin, smooth, rough, fast, slow  |
| Reception   | float, sink, up, down, top, bottom, surface, move, roll, drop, fly, turn, spin, fall, fast, slow, faster, slower, fastest, slowest, further, furthest, wind, air, water, blow, bounce   |
| Year 1      |   |
| Year 2      | flexible, rigid, shape, push/pushing, pull/pulling, twist/twisting, squash/squashing, bend/bending, stretch/stretching (Y2 - Uses of everyday materials)  |
| Year 3      | 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  |
| Year 4      |   |
| Year 5      | force, gravity, Earth, air resistance, water resistance, friction, mechanisms, simple machines, levers, pulleys, gears  |
| Year 6      |   |
| KS3         | <ul style="list-style-type: none"> <li>• Magnetic fields by plotting with compass, representation by field lines</li> <li>• Earth's magnetism, compass and navigation</li> <li>• Forces as pushes or pulls, arising from the interaction between two objects • Using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces</li> <li>• Moment as the turning effect of a force</li> <li>• 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</li> <li>• Forces measured in Newtons, measurements of stretch or compression as force is changed</li> </ul> |