



	<b>Year</b>	5	<b>Topic</b>	Forces
	<ul style="list-style-type: none"> <li>• Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.</li> <li>• Identify the effects of air resistance, water resistance and friction that act between moving surfaces.</li> <li>• Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.</li> </ul>			

Prior learning	Future learning
<ul style="list-style-type: none"> <li>• Compare how things move on different surfaces. (Y3 - Forces and magnets)</li> <li>• Notice that some forces need contact between two objects, but magnetic forces can act at a distance. (Y3 - Forces and magnets)</li> <li>• Observe how magnets attract or repel each other and attract some materials and not others. (Y3 - Forces and magnets)</li> <li>• 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 - Forces and magnets)</li> <li>• Describe magnets as having two poles. (Y3 - Forces and magnets)</li> <li>• Predict whether two magnets will attract or repel each other, depending on which poles are facing. (Y3 - Forces and magnets)</li> </ul>	<ul style="list-style-type: none"> <li>• Forces as pushes or pulls, arising from the interaction between two objects. (KS3)</li> <li>• Using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces. (KS3)</li> <li>• Moment as the turning effect of a force. (KS3)</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. (KS3)</li> <li>• Forces measured in Newtons, measurements of stretch or compression as force is changed. (KS3)</li> </ul>

WHAT PUPILS NEED TO KNOW OR DO TO BE SECURE	
Show understanding of a concept using scientific vocabulary correctly	
Key learning	Possible evidence

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

- Can demonstrate the effect of gravity acting on an unsupported object
- Can give examples of friction, water resistance and air resistance
- Can give examples of when it is beneficial to have high or low friction, water resistance and air resistance
- Can demonstrate how pulleys, levers and gears work

<p>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.</p>	
<p><b>Key vocabulary</b></p>	
<p>Force, gravity, Earth, air resistance, water resistance, friction, mechanisms, simple machines, levers, pulleys, gears</p>	
<p><b>Common misconceptions</b></p>	
<p>Some children may think:</p> <ul style="list-style-type: none"> <li>• the heavier the object the faster it falls, because it has more gravity acting on it</li> <li>• forces always act in pairs which are equal and opposite</li> <li>• smooth surfaces have no friction</li> <li>• objects always travel better on smooth surfaces</li> <li>• a moving object has a force which is pushing it forwards and it stops when the pushing force wears out</li> <li>• a non-moving object has no forces acting on it</li> <li>• heavy objects sink and light objects float.</li> </ul>	
<p><b>Apply knowledge in familiar related contexts, including a range of enquiries</b></p>	
<p><b>Activities</b></p>	<p><b>Possible evidence</b></p>
<ul style="list-style-type: none"> <li>• Investigate the effect of friction in a range of contexts e.g. trainers, bathmats, mats for a helter-skelter.</li> <li>• Investigate the effects of water resistance in a range of contexts e.g. dropping shapes through water and pulling shapes, such as boats, along the surface of water.</li> <li>• Investigate the effects of air resistance in a range of contexts e.g. parachutes, spinners, sails on boats.</li> <li>• Explore how levers, pulleys and gears work.</li> <li>• Make a product that involves a lever, pulley or gear.</li> <li>• Create a timer that uses gravity to move a ball.</li> <li>• Research how the work of scientists such as Galileo Galilei and Isaac Newton helped to develop the theory of gravitation.</li> </ul>	<ul style="list-style-type: none"> <li>• Can explain the results of their investigations in terms of the force, showing a good understanding that as the object tries to move through the water or air or across the surface the particles in the water, air or on the surface slow it down</li> <li>• Can demonstrate clearly the effects of using levers, pulleys and gears</li> </ul>

## Year 5: Forces: Working scientifically

### Classifying

- Not relevant

### Observing over time

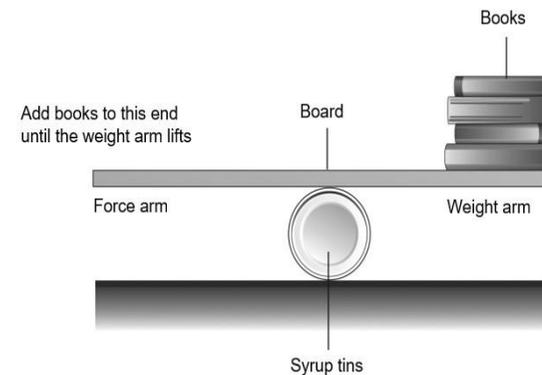
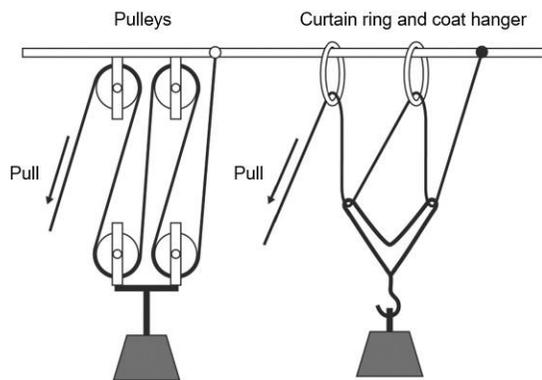
- Not relevant

### Pattern seeking

- Not relevant

**Comparative/Fair testing:** Children use the scientific knowledge gained from enquiry work to make predictions they can investigate using comparative and fair tests.

- Compare friction e.g. trainers or weighted match box pulled with forcemeter, balloon rockets, CD hovercraft, balloon cars.
- Compare water resistance e.g. boats in a gutter of water, plasticine in a cylinder of liquid (easier with a more viscous liquid e.g. bubble bath).
- Compare air resistance e.g. spinners, parachutes, sailing boats, straw rockets.
- Compare levers, pulleys and gears – see illustrations below.



**Researching:** Children independently ask scientific questions. This may be stimulated by a scientific experience or involve asking further questions based on their developed understanding following an enquiry.

- Given a wide range of resources the children decide for themselves how to gather evidence to answer a scientific question. They choose a type of

enquiry to carry out and justify their choice. They recognise how secondary sources can be used to answer questions that cannot be answered through practical work.

The children select from a range of practical resources to gather evidence to answer their questions. They carry out fair tests, recognising and controlling variables. They decide what observations or measurements to make over time and for how long. They look for patterns and relationships using a suitable sample.

- Research Heath Robinson and Rube Goldberg machines. (Children present what they've learned in different ways: create a model, write a song, write a story, create a PPT, etc. This could be cross-curricular with D&T and English biography writing.)