



Year 5

Topic: Forces

National Curriculum links:

- 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.

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**

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.

**Key vocabulary**

Force, gravity, Earth, air resistance, water resistance, friction, mechanisms, simple machines, levers, pulleys, gears

**Possible evidence**

- 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

**Common misconceptions**

Some children may think:

- 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.

**Apply knowledge in familiar related contexts, including a range of enquiries**

**Activities**

**Possible evidence**

- Investigate the effect of friction in a range of contexts e.g. trainers, bathmats, mats for a helter-skelter.
- 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.
- Investigate the effects of air resistance in a range of contexts e.g. parachutes, spinners, sails on boats.
- Explore how levers, pulleys and gears work.
- Make a product that involves a lever, pulley or gear.
- Create a timer that uses gravity to move a ball.
- Research how the work of scientists such as Galileo Galilei and Isaac Newton helped to develop the theory of gravitation.

- 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
- Can demonstrate clearly the effects of using levers, pulleys and gears

**Lesson 1**

**LO: to identify forces acting on objects**

**Key Assessment Questions**

- Can children identify forces as pushes and pulls?
- Can children identify and explain the different forces acting on objects?

**Lesson 2**

**LO: to explore the effect that gravity has on objects.**

**LO: to understand how the first theory of gravity was developed.**

**Key Assessment Questions**

- Can children explain the effect of gravity on unsupported objects?
- Can children explain Isaac Newton's role in developing a theory of gravity?
- Can children accurately measure the force of gravity pulling on objects?

<b>Lesson 3</b> <u>LO: to investigate the effects of air resistance</u>	<b>Key Assessment Questions</b> Can children explain how air resistance affects moving objects? Can children plan and conduct an investigation into the effects of air resistance?
<b>Lesson 4</b> <u>LO: to explore the effects of water resistance</u>	<b>Key Assessment Questions</b> Can children explain the effects of water resistance? Can children minimise the effects of water resistance on an object? Can children identify streamlined shapes?
<b>Lesson 5</b> <u>LO: to investigate the effects of friction</u>	<b>Key Assessment Questions</b> Can children explain what friction is? Can children explain the effects of friction on a moving vehicle? Can children investigate the effect of friction created by different materials? Can children recognise and control variables in an investigation?
<b>Lesson 6</b> <u>LO: to explore and design a mechanism</u>	<b>Key Assessment Questions</b> Can children explain how different mechanisms work? Can children investigate a simple mechanism? Can children design their own mechanism for a given purpose?

If completing topic over a term, objectives can be covered over more than one lesson ensuring scientific enquiry skills (working scientifically) are being developed