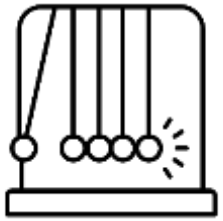
Forces

Science Capitol:

Could become a physicist

National Curriculum Objectives:

Foundation 1	Foundation 2	Year 1 and 2	Year 3 and 4	Year 5 and 6
			Year 3 • compare how things move on different surfaces • notice that some forces need contact between two objects, but magnetic forces can act at a distance	**Year 5** • 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



Year 3

SP3.1 know about, and describe, how objects move on different surfaces
SP3.2 know that some forces need contact between two objects, but magnetic forces can act at a distance

Key scientist

Coming soon…

Prior Learning	Future learning
• Explore how things work. (Nursery – Forces) • Explore and talk about different forces they can feel. (Nursery – Forces) • Talk about the differences between materials and changes they notice. (Nursery – Forces) • Explore the natural world around them. (Reception – Forces) • Describe what they see, hear and feel whilst outside. (Reception – Forces) • Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Y2 - Uses of everyday materials)	• Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. (Y5 - Forces) • Identify the effects of air resistance, water resistance and friction, that act between moving surfaces. (Y5 - Forces) • Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect. (Y5 - Forces)

Linked texts

Coming soon…

What pupils need to know or do to be secure

Show understanding of a concept using scientific vocabulary correctly

Key Learning

A force is a push or a pull.

When an object moves on a surface, the texture of the surface and the object affect how it moves. It may help the object to move better or it may hinder its movement e.g. ice skater compared to walking on ice in normal shoes.

For some forces to act, there must be contact e.g. a hand opening a door, the wind pushing the trees.

Some forces can act at a distance e.g. magnetism. The magnet does not need to touch the object that it attracts. Do not cover any more detail on magnets in this unit.

Possible Evidence to support teacher assessment

- Can give examples of forces in everyday life
- Can give examples of objects moving differently on different surfaces

Key Vocabulary

Force, push, pull, twist, contact force,

Common misconceptions

Some children may think:

- Forces will start a motion but not stop it
- An object stops moving because it's run out of force

Apply knowledge in familiar related contexts

Line of Enquiry – Classification

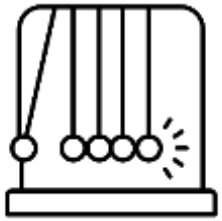
Carry out investigations to explore how objects move on different surfaces e.g. spinning tops/coins, rolling balls/cars, clockwork toys, soles of shoes etc.

Equipment

Coming soon…

Possible Evidence to support teacher assessment

- Can use their results to describe how objects move on different surfaces
- Can use their results to make predictions for further tests e.g. it will spin for longer on this surface than that, but not as long as it spun on that surface



Year 5

SP5.1 know that unsupported objects fall towards the earth because of the force of gravity acting between the earth and the falling object
SP5.2 know the effects of air resistance, water resistance and friction, that act between moving surfaces
SP5.3 know that some mechanisms, including levers, pulleys and gears allow a smaller force to have a greater effect

Key scientist

Coming soon…

Prior Learning	Future learning
Compare how things move on different surfaces. (Y3 – Forces) • Notice that some forces need contact between two objects, but magnetic forces can act at a distance. (Y3 - Properties of materials) • Observe how magnets attract or repel each other and attract some materials and not others. (Y3 - Properties of materials) • 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 - Properties of materials) • Describe magnets as having two poles. (Y3 - Properties of materials) • Predict whether two magnets will attract or repel each other, depending on which poles are facing. (Y3 - Properties of materials)	• Forces as pushes or pulls, arising from the interaction between two objects. (KS3) • Using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces. (KS3) • Moment as the turning effect of a force. (KS3) • 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) • Forces measured in Newtons, measurements of stretch or compression as force is changed. (KS3)

Linked texts

Coming soon…

What pupils need to know or do to be secure

Show understanding of a concept using scientific vocabulary correctly

Key Learning	Possible Evidence to support teacher assessment
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.	• 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
Key Vocabulary	**Common misconceptions**
Force, gravity, Earth, air resistance, water resistance, friction, mechanisms, simple machines, levers, pulleys, gears	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	
Line of Enquiry – Fair test	**Possible Evidence to support teacher assessment**
• 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.	• 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

• 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.	
Equipment **Coming soon…**	