



## Forces (Physics)

### Year 5

#### End Points:

- A force is either a push or pull
- A force can cause an object to increase speed, decrease speed, change direction or change shape
- Gravity is a force that pulls objects towards the centre of the earth
- Friction occurs when two objects move against each other
- Air resistance is a kind of friction that slows down objects moving through the air
- Water resistance is a kind of friction that slows down objects moving through water
- Upthrust is the force that can keep objects afloat
- Changing the shape of an object affects the forces that act upon them
- Increasing the surface area of something increases the amount of air resistance acting upon it
- In a fair test, specific variables are controlled
- Simple machines can allow a smaller force to have a great effect
- A lever uses a long pole and a pivot point to increase a force
- Pulleys use a rope running over a pulley wheel to increase a force
- Gears use cogs with teeth to increase the force

This unit builds on learning from Year 3 Forces and Magnets, giving children the opportunity to build on their knowledge of forces as pushes and pulls. Pupils will learn that forces can make things increase their speed, reduce their speed, change direction or change shape. They will study gravity, friction air resistance and water resistance, looking at ways in which all of these forces act upon objects such as parachutes, boats and footballs.

Pupils will work scientifically to plan and undertake an investigation see how water and air resistance act in opposition to gravity. They will use two identical pieces of paper and drop them from a height, recording the time it takes for the paper to reach the ground using a stopwatch. Since both pieces of paper have the same mass, the force of gravity will be the same. If we fold or crumple one piece of paper, the force of gravity pulling on it remains the same as the mass is the same. However, the force of air resistance slowing down the paper falling will differ as this depends on surface area. In this investigation the variable is the surface area of the paper.

Pupils will have the opportunity to research scientists who worked on developing our understanding of forces such as Isaac Newton. They will consider how understanding forces is vital to many different roles today.

Knowledge from this unit will help prepare children for Physics in KS3.

### **Lesson Sequencing:**

In lesson one, children will learn that a force is either a push or a pull. They will learn that forces can have one of four effects on something: increase speed, decrease speed, change direction or change shape. Lesson two will explore friction, looking at it in the form of both air and water resistance. In lessons three and four, children will explore the effects of air and water resistance through two different investigations. In lesson five, children will explore the effect of forces when using simple machines such as levers, pulleys and gears. In the assessment lesson, children will apply the knowledge learnt to draw diagrams of forces and to answer questions.

### **Misconceptions:**

- Heavier objects fall at greater speeds than lighter objects
- Forces always act in pairs that are equal
- If an object is moving, more force is being applied in the direction it is moving
- An object at rest has no forces acting on it
- There is no gravity on the moon
- Gravity is stronger the further off the ground something is
- Smooth surfaces have no friction
- Objects always travel better on smooth surfaces.
- The heavier an object is, the faster it falls because more gravity is acting on it
- The best place to put the fulcrum is in the centre of the lever

### **Working Scientifically criteria met in this unit:**

- planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
- taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
- recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- using test results to make predictions to set up further comparative and fair tests
- reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations
- identifying scientific evidence that has been used to support or refute ideas or arguments