Year 5 – Forces	**Main Outcomes:** • 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.	**Focus:** Science – physics

What should I already know?

- A **force** is a push or a pull.
- Things move differently on different surfaces.
- **Gravity** and magnetism can act without contact.
- Some materials are magnetic and others are non-magnetic.
- Magnets have two poles which can attract or repel.

What I will do

I will have weekly or blocked science lessons. In lessons, I will be taught a skill and I will gain knowledge and understanding through the process of scientific enquiry (observing over time; pattern seeking; identifying, classifying and grouping; comparative and fair testing (controlled investigations); and researching using secondary sources).

Possible lines of enquiry

- Explore falling objects, such as paper cones, cupcake cases, parachutes and sycamore seeds, and raise questions about the effects of air resistance.
- Design and make a variety of parachutes and carry out fair tests to determine which designs are the most effective.
- Experience forces that make things begin to move, get faster or slow down, for example, by driving the goblin car.
- Explore the effects of friction on movement and find out how it slows or stops moving objects, for example, by observing the effects of a brake on a bicycle wheel.
- Explore the effects of levers, pulleys, gears and/or springs and simple machines on movement, for example, by designing and making products that use these things.
- Explore resistance in water by making and testing boats of different shapes.
- Find out how scientists, for example, Galileo Galilei and Isaac Newton helped to develop the theory of gravitation.

Vocabulary	Meaning
accuracy	the closeness of the measured value to a standard or true value
air resistance	a type of **friction** between air and another material
balancing force	two **forces** of the same size acting in opposite directions. If two balanced **forces** are acting on an object, that object will not change its **motion**
causal relationship	when one thing is responsible for causing the other thing
diagram	a drawing, image, or sketch that is used to help the reader visualise what the author is describing in the text
effort	the **force** applied to make the object move
fall	a **motion** towards a place where an object will have a lower energy
force	a **push** or a **pull**
friction	a **force** between two surfaces that are sliding, or trying to slide, across each other
fulcrum	the place where the **lever** pivots
gear	a rotating part in a machine it has teeth cut around its circumference (edge)
gravity	a **force** that **pulls** everything down toward the centre of the Earth.
lever	a simple machine used to increase **force**
mechanisms	complex machines that change the input **forces** and **motion** into a desired output **force** and **motion**
motion	the process of an object moving or being moved
newtons	the amount of **force** required to make a mass of 1kg accelerate (move) at a rate of 1 metre per second squared
precision	how precise or exact something is
pulleys	simple machines that make it easier (reduce the effort required) to lift or move a heavy object
ratio	a way of splitting up amounts and keeping them in proportion
resistance force	a **force** that acts in the opposite direction of moving objects
support/refute	to prove right (support) or wrong (refute) by argument or evidence
transfers	to move to a different place or thing
upthrust	any **force** that is causing something to be pushed upwards
variable	any one of the elements of the test which could be changed
weight	the **gravitational force** upon an object

Resources

Hamilton Science planning: forces https://www.hamilton-trust.org.uk/science/year-5-science/forces-may-forces-be-you/ (all planning also saved on SharePoint).

Knowledge and Skills Map – Science at Estcots School

Knowledge to understand

Friction is the **force** between surfaces that are touching.	It acts against movement. **Friction** gives us grip: without grip, starting and stopping is hard. **Friction** produces heat.
Air and water slow you down as you move through them. This is called **resistance**.	Streamlined objects have a shape that moves easily through the air or water. A parachute has a large surface area so it moves slowly through the air. It is difficult to run in water because it pushes against you.
Gravity acts between objects and the Earth.	It pulls objects towards the centre of the Earth. Unsupported objects **fall** towards the Earth. Things on the ground are pulled down by **gravity** too (which is why you can't fall off the Earth).
Levers are simple machines used to increase **force**.	**Levers** have a long arm and a **fulcrum**, which is where the arm pivots (a turning point). The object being lifted is called the load, and the **force** applied to that load through the arm to make the object move is called the **effort**. So, a lever is the name of the structure that connects these other three parts.
Pulleys are simple machines that make it easier (reduce the **effort** required) to lift or move a heavy object.	**Pulleys** includes at least one wheel and a length of rope. With a fixed **pulley**, the wheel is secured to a single spot. The same amount of **force** is required to pull the object up as if it were being lifted, but the **pulley** changes the direction of the **force**. This means that although the object feels as heavy to lift, it can be pulled from a much more convenient angle.
A **gear** is a rotating part (wheel) in a machine, that can increase the power of a turning **force**.	**Gears** are wheels with teeth cut around their circumference (edge) that slot together. When one **gear** is turned, the other one turns as well. If the **gears** are of different sizes, they can be used to increase the power of a turning **force**. The smaller wheel turns more quickly but with less **force**, while the bigger one turns more slowly with more **force**.

Skills to learn

- 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 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

Cross-curricular (maths)

- use all four operations to solve problems involving measure using decimal notation, including scaling and problems involving simple ratios
- scale weights and lengths using appropriate calculations

Equipment to become familiar with

Cameras

Gear construction kits (see red boxes in resources room) or Lego™ technic (Wojciech from PrepareRobo ltd office@preparerobo.com runs an excellent Lego™ robot building workshop (can involve coding) for approx. £4 per child + travel expenses – prices as of Feb 2023).

Force meters (Newton meters)

Evidence of Learning

Science books
Photos
Videos
Pupil conferencing
Teaching and learning observations
Learning walks
Data analysis

How will I know what I've learnt?

See KS2 teacher assessment exemplification for science

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/763065/2018_key_stage_2_teacher_assessment_exemplification_science.pdf

See also Hamilton Science_Assessment_Y5 (saved in planning folder on Sharepoint).

KS2 quizzes:

https://gcequiz.com/quiz/ks2-science-quizzes

https://churchfieldsjunior.com/test-your-skills-science/