

# FORCES & MAGNETS

## YEAR 3/4 KNOWLEDGE ORGANISER

### What I will have learnt by the end of the unit

- I can compare how things move on different surfaces.
- I can notice that some forces need contact between two objects, but magnetic forces can act at a distance.
- I can observe how magnets attract or repel each other and attract some materials and not others.
- I can 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.
- I can describe magnets as having two poles.
- I can predict whether two magnets will attract or repel each other, depending on which poles are facing.

### Key Knowledge

- ~ Different surfaces create a different amount of friction.
- ~ The amount of friction created by an object moving over a surface depends on the roughest of the surface and the object, and the force between them.
- ~ A magnetic field is invisible.
- ~ The needle in a compass is a magnet. A compass always points North-South on Earth.

### What I should already know

- The shape of some materials can be changed when they are stretched, twisted, bent and squashed.
  - Know how different toys move.
- Know what a force is and be able to explain that a push and pull are types of forces.
- That when forces are applied to an object they allow them to move or stop moving.
- The strength of the force determines how far and fast an object moves.

### Recall & Remember

Add information to your knowledge mind map regularly, to help you reflect on, and remember what you have learnt throughout the unit.

At the end of the unit, work in a small group to create a fun quiz on purple mash about forces for your friends to complete.

### Key Concepts

Biology  
Chemistry  
Physics  
Scientific enquiry  
Science for the future  
Vocabulary

### What I will have learnt at the end of the key stage

- I will be able to explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object
- I will be able to identify the effects of air resistance, water resistance and friction, that act between moving surfaces
- I will be able to recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect

### Key Skills I will learn/use

- Ask relevant questions and using different types of scientific enquiries to answer them
- Set up simple practical enquiries, comparative and fair tests
- Make systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers
- Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions
- Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables
- reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions
- Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions
- Identifying differences, similarities or changes related to simple scientific ideas and processes
- Using straightforward scientific evidence to answer questions or to support their findings.

### Opportunities for teaching diversity, equality (including protected characteristics and expanding cultural capital)

**Get to meet a scientist! Explore people who use science in their jobs.** I'm a Scientist, Get me out of here! - A super-curricular science outreach education & engagement activity ([imascientist.org.uk](http://imascientist.org.uk)) Science for Everyone ([science4everyone.org](http://science4everyone.org))

### Skills I may use for other subjects

**Literacy-** I can use my literacy knowledge to write about my findings.

**Mathematics-** I can use my knowledge carry out simple tests and record my findings using diagrams and graphs.



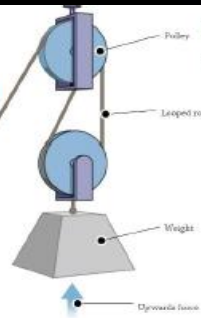
# FORCES & MAGNETS

Term	Definition
1 Force	A push or pull on an object which can cause it to move, change speed, direction or shape. Measured in Newtons (N).
2 Magnet	A material or object that produces a magnetic field. It attracts or repels magnetic objects, including iron.
3 Contact force	A force that requires physical contact to occur e.g. kicking a ball.
4 Attract	To pull towards. Opposite of repel.
5 Repel	To push away. Opposite of attract.
6 Propel	The act of driving or pushing forward.
7 Friction	The resistance of motion when one object rubs against another. Friction causes objects to slow down and the energy becomes heat.
8 Weight	The force due to gravity on objects. This force pulls on all objects near the earth. Measured in Newtons (N).
9 Mass	The amount of matter contained in an object. Measured in units such as g, kg.
11 Gravity	The area around a large object when a weight can be felt. The sun's gravity keeps the planets orbiting around it.
12 Air resistance	The frictional force of air against a moving object. The faster an object moves, the greater the air resistance.
13 Water resistance	The frictional force of water against a moving object. The faster an object moves, the greater the water resistance.
14 Acceleration	Increase in the rate or speed of something.
15 Balanced force	Two forces of equal size acting in opposite directions on an object so that it will stay still or continue to move in the same way.
16 Unbalanced force	Two forces of unequal size acting in opposite directions causing an object to move, change speed, direction or shape.

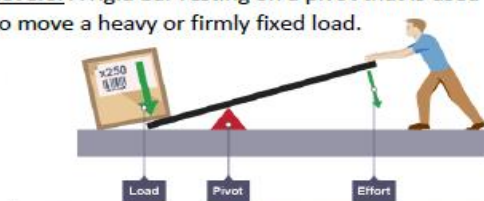
## Newton's Three Laws of Motion

<b>First law</b>	An object will continue in the state it is in (rest or motion) unless a force acts on it.
<b>Second law</b>	Acceleration depends on the magnitude of the force applied and the mass of the object.
<b>Third law</b>	"For every action, there is an equal and opposite re-action."

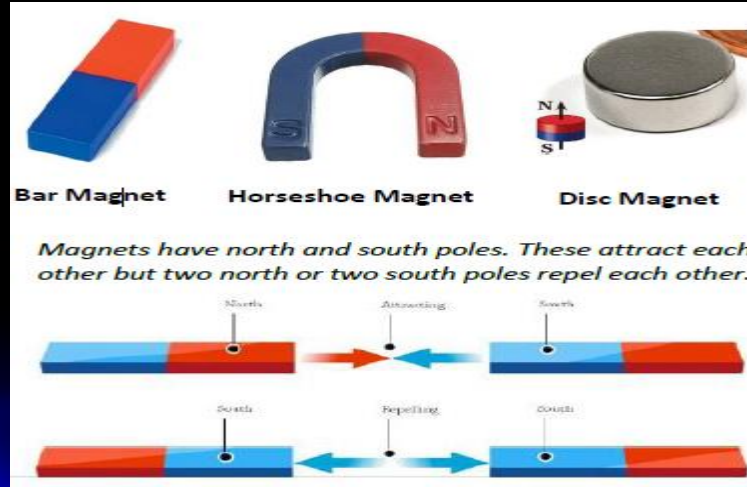
**Pulleys:** A wheel with a grooved rim that a rope can be looped around so that less force is needed to lift heavy objects. The more wheels that are used, the less force is needed (but the more rope!).



**Levers:** A rigid bar resting on a pivot that is used to move a heavy or firmly fixed load.



**Gears:** A wheel with teeth that works with other gears transmit power from one part of a machine to another. Bigger gears have more teeth so smaller gears have to go faster to keep up.



Magnetic ✓	Non-magnetic X
These objects contain iron, nickel or cobalt. Not all metals are magnetic.	These objects do not contain iron, nickel or cobalt.

## How do different surfaces affect the motion of an object?

Forces act in opposite directions to each other.

When an object moves across a surface, friction acts as an opposite force. Friction is a force that holds back the motion of an object.

Some surfaces create more friction than others which means that objects move across them slower.

On a ramp, the force that causes the object to move downwards is gravity.

Objects move differently depending on the surface of the object itself and the surface of the ramp.



grass



gravel



carpet



sand



wood

## How do magnets work?

Magnets produce an area of force around them called a magnetic field. When objects enter this magnetic field, they will be attracted to or repelled from the magnet if they are magnetic. When magnets repel, they push each other away. When magnets attract, they pull together.