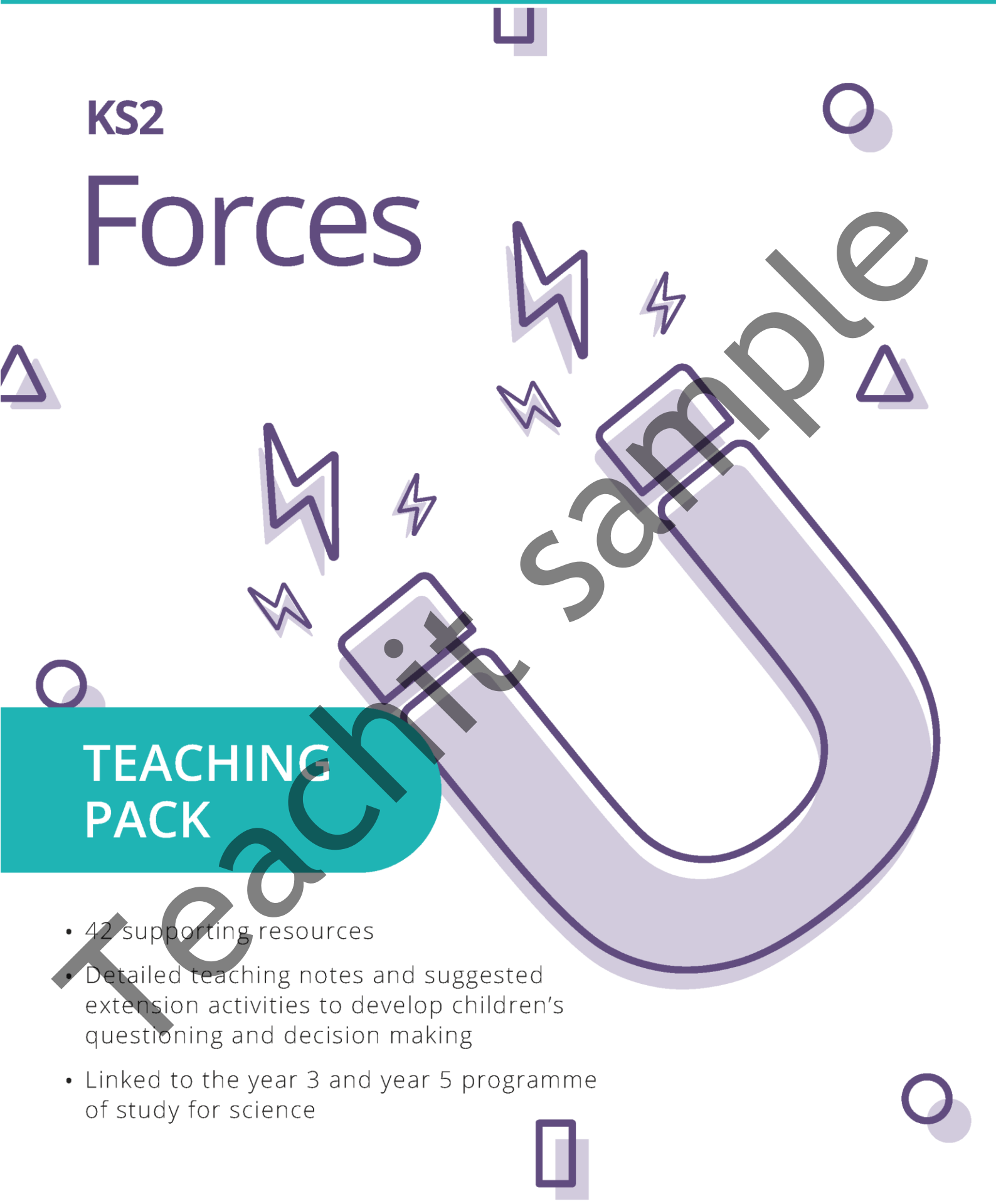
KS2

Forces



TEACHING PACK

- 42 supporting resources
- Detailed teaching notes and suggested extension activities to develop children's questioning and decision making
- Linked to the year 3 and year 5 programme of study for science

Contents

Session 7: Gravity investigation

Session 8: Air resistance

Session 9: Air resistance investigation

Session 10: Water resistance

Session 11: Friction investigation

Session 12: Levers and pulleys

Finding your way around the curriculum pack

The pack aims to provide creative teaching ideas within a structured sequence of lessons complete with supporting resources. The lessons cover 'Forces and magnets' at year 3 and 'Forces' at year 5. The pack contains twelve structured sessions made up of starter activities, main teaching activities, plenary sessions and extension opportunities. The first set of six sessions covers 'Forces and magnets' for year 3 and the second set of six sessions covers 'Forces' for Year 5. Where appropriate, cross-curricular learning opportunities are incorporated into each of the teaching sessions.

The pack lends itself to be used in different ways. It could form the basis of a whole week's mini project or form a teaching sequence for a term's work.

We've included links within the sessions to each separate resource included in this pack. Lots of the resources in this pack are Word documents, but we've also included links to PowerPoints. Please log in first in order to access any of these PowerPoints on Teachit Primary.

We hope you enjoy using this pack. If you have any questions, please get in touch: email support@teachitprimary.co.uk or call us on 01225 788851. Alternatively, you might like to give some feedback for other Teachit Primary members – you can do this by adding a comment on the Forces at KS2 Pack page on Teachit Primary (please log in to access this).

Curriculum coverage and mapping - Year 3

The activities in this pack match the requirements of the statutory guidance in the 2014 National Curriculum.

Year 3 Programme of Study: Forces and magnets:

Statutory requirements

Pupils should be taught to:

1. compare how things move on different surfaces
2. notice that some forces need contact between two objects, but magnetic forces can act at a distance
3. observe how magnets attract or repel each other and attract some materials and not others
4. 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
5. describe magnets as having two poles
6. predict whether two magnets will attract or repel each other, depending on which poles are facing.

Statutory requirements as set out above

Main teaching aspect	1	2	3	4	5	6
What is a force?						
Magic or magnets						
Is everything magnetic?						
Which magnet is the strongest?						
Are two magnets stronger than one?						
Magnetic gaming						

Working scientifically

Children should be taught to use the following practical scientific methods, processes and skills:

- asking relevant questions and using different types of scientific enquiries to answer them
- setting up simple practical enquiries, comparative and fair tests
- making 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.

Curriculum coverage and mapping: year 5

The activities in this pack match the requirements of the statutory guidance in the 2014 National Curriculum.

Year 5 Programme of Study: Forces

Statutory requirements

Pupils should be taught to:

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

Statutory requirements as set out above

Main teaching aspect	1	2	3
Gravity investigation			
Air resistance			
Air resistance investigation			
Water resistance			
Friction investigation			
Gears, levers and pulleys			

Working scientifically

Children should be taught to use the following practical scientific methods, processes and skills:

- 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

Non-Statutory

- describe and evaluate their own and other people's scientific ideas related to topics in the national curriculum (including ideas that have changed over time), using evidence from a range of sources.
- ask their own questions about the scientific phenomena they are studying, and select and plan the most appropriate ways to answer science questions, recognising and controlling variables where necessary, including: carrying out comparative and fair tests
- use a range of scientific equipment to take accurate and precise measurements or readings, with repeat readings where appropriate
- use appropriate scientific language and ideas from the national curriculum to explain, evaluate and communicate their methods and findings
- present findings and draw conclusions and raise further questions that could be investigated, based on their data and observations
- record data and results using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs

Session 4: Which magnet is the strongest?

(Statutory requirements covered: 3)

Purpose:

- To notice that magnetic forces can act at a distance
- To observe how magnets attract or repel each other and attract some materials and not others
- To predict whether two magnets will attract or repel each other, depending on which poles are facing.

Working Scientifically:

Children should be taught to use the following practical scientific methods, processes and skills:

- making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers
- 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.

Resources required for this teaching sequence:

- a range of magnets
- paper clips

Vocabulary introduced/used:

magnet, magnetic, non-magnetic, metal, force, attract, repel, poles, attraction, repulsion, pull towards, push away, strong, stronger, strongest, weak, weaker, weakest, like, unlike.

Getting started:

Show the children images of magnets and ask them in pairs to predict whether or not the magnets will attract or repel each other depending on which poles are facing each other. Recap 'like' and 'unlike' poles repelling and attracting to consolidate children's understanding. The teacher could either demonstrate the effect physically with the magnets or use resource 25179: Magnets – attract or repel? to show the effects.

Getting into the detail:

Show children some examples of different magnets and then display the following question to the children: *Which magnet is the strongest?* Discuss with the children what they think might make the strongest magnet (e.g. size, shape, material) and ask children to make a prediction about which magnet they think will be the strongest.

Next, ask children to think about how they would design a test to answer this question. This presents an assessment opportunity i.e. for planning and preparing a simple investigation. MA and LA groups could be asked to independently prepare the investigation by using the prompts from resource 25172: Which magnet is the strongest? – an investigation scaffold to help them design the experiment.

> The class teacher (CT) could work with the HA group to design the experiment using resource 25411:Which magnet is the strongest? – super scientist prompts.

Once the HA group have decided upon the method to follow, with the help of the CT, they can move away to begin the investigation, whilst the CT works with the MA and LA groups to assess and check the progress of their methods and ideas before they start their investigation.

Example method:

Variable to change: Type of magnet (bar, horseshoe, ring, stick etc).

What to measure: Number of paperclips each magnet can hold in a chain.

Variables to keep the same: Type/size of paperclip, pole that the paperclips are attached to.

Method:

1. Choose a magnet. If using a bar magnet, decide if you are using the North or South pole.
2. Take a paper clip and attach to the magnet, so that the paper clip is hanging from the magnet.
3. Next take another paper clip, and attach this to the bottom half of the first paper clip. (By attach, this means allowing the magnetic field to attract the second paper clip).
4. Keep repeating this process, until no more paper clips can be attached.
5. Record the number of paper clips held and then repeat the process with the remaining magnets.

Children could represent their findings visually in the style of a pictogram chart. For example, they can draw axes on a large sheet with the x axis along the bottom labelled with images of the magnets and the vertical y axis labelled with the number of paper clips. To complete the graph, children can stick on paper clips in columns to show how each magnet did.

Once children have finished the investigation, they can write a simple conclusion on their findings.

Rounding things up:

Discuss with children what they found out from the investigation. Ask the children to think about any questions they may have about magnets and then write these questions on to paper. Collect these together and stick them on a board to display to the whole class. Next, discuss with children how to sort the questions into those that could be investigated and those that could be answered by research or looking in books. This presents a good opportunity to assess children's ability to sort questions that can be answered by different forms of enquiry.

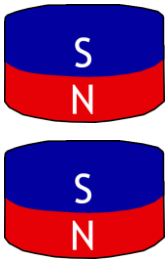
Taking things further:

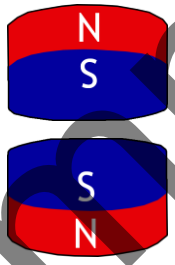
Use some of the children's questions to form the basis of further investigations they could carry out, allowing them time to plan and carry out the investigation for themselves. Research questions could be set as homework or as a report writing activity in a literacy lesson.

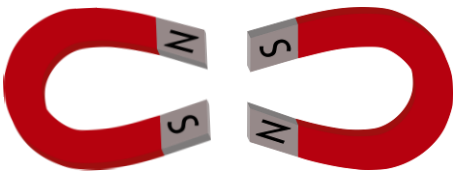
Resources contained within Session 4

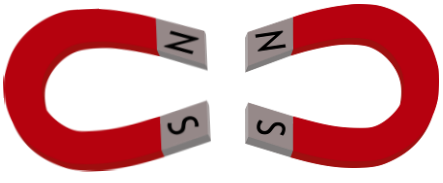
Name: ..... Date:.....

Look at the following magnets and decide whether they will attract or repel each other. Draw on arrows to show the direction of the forces that will make the magnets move.

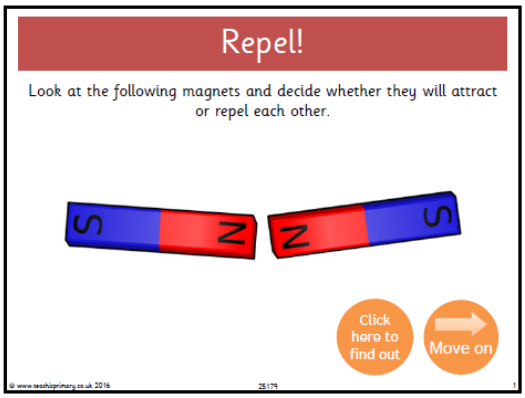


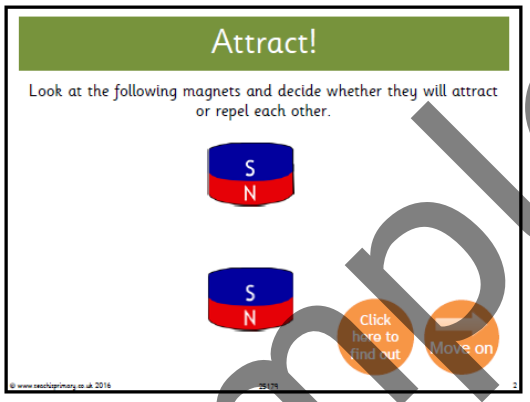


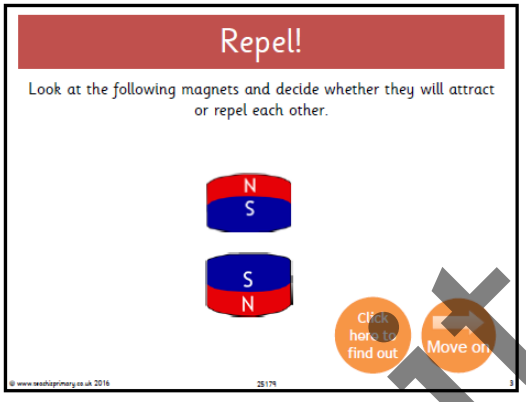


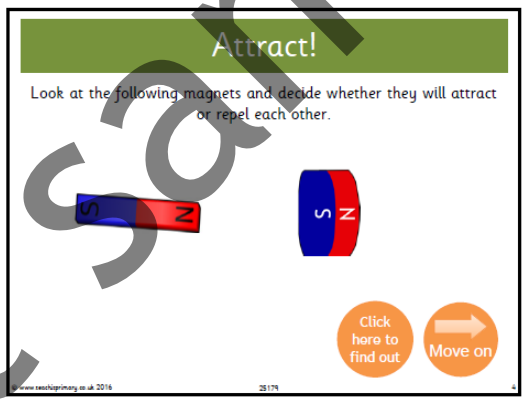


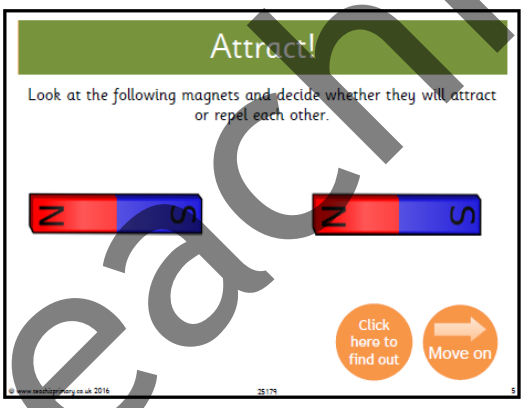
To access this resource please log in to the Teachit Primary website and type **25179** into the search bar.

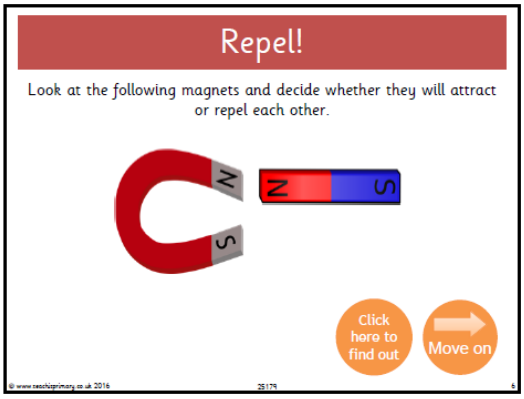


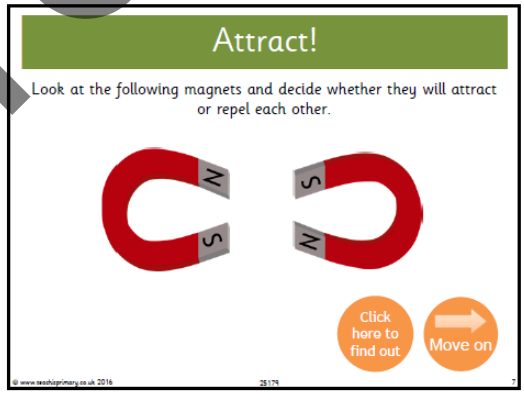


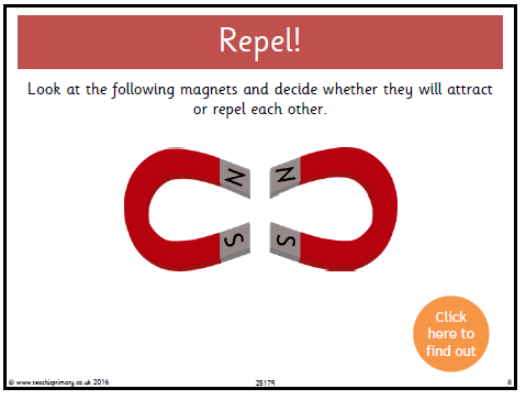






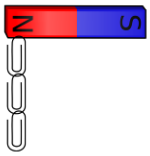
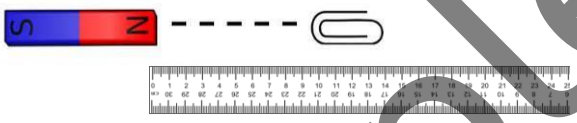






Name: ..... Date: .....

Choose which of the two options below you will use for your test.

Option 1: Attach paper clips to one of the poles of a magnet. Then add another paper clip to the bottom of the previous clip and continue until no more paper clips can be added. 	**Option 2:** Fix a ruler to the table. Place a magnet on the table at the end of the ruler next to the zero mark. Slide the paper clip along the table beside the ruler until the magnet no longer attracts the clip, recording the distance from the magnet. 

Draw and label your magnets here:

I predict that

.....

.....

Tick the options below that you will *change* for your chosen test.
The variables I will **change** are:

the type of metal objects the magnet will pick up	
the number of magnets I use together each time	
the type of magnet	
the pole of the magnet I use	
the distance between the object and the magnet	

Tick the options below that you will *keep the same* to make the test you chose fair.
The variables I will keep the **same** are:

the type of metal object to pick up	
the number of magnets I use each time	
the type of magnet	
the pole of the magnet I use	
the distance between the object and the magnet	

I will measure:

the total number of paper clips the magnet can hold	
the distance the paper clip is moved from the magnet so it is no longer attracted	

My results:

Conclusion:

I found out that:

.....

.....

.....

.....

.....

Further questions to investigate:

.....

.....

.....

.....

Name: ..... Date: .....

Super scientist prompts

Before you design your test to find out which magnet is the strongest, use the following prompts to help you.

1. Which of the following variables will you change?

- the distance between the magnet and objects ☐
- the type of objects (e.g. paper clip, washer, nail). All the same or change each time? ☐
- the number of objects ☐
- the type of magnet ☐
- the number of magnets to use at once ☐
- the length of time to test each magnet ☐
- any others? ☐

2. What things need to stay the same?

.....

.....

3. How will you carry out the experiment? All the magnets at once? One at a time?

.....

.....

4. How will you know which magnet is the strongest? What will you measure?

.....

.....

5. How have you made your test fair?

.....

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