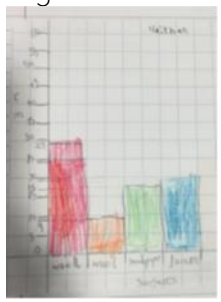
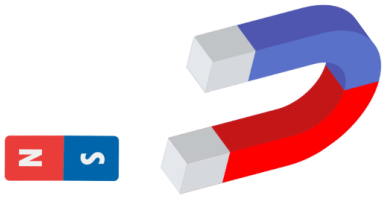
Hartford Primary School

YEAR GROUP	3	SUBJECT	Science	TERM	Autumn
National Curriculum Statements	• compare how things move on different surfaces • notice that some forces need contact between two objects, but magnetic forces can act at a distance • observe how magnets attract or repel each other and attract some materials and not others • 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 • describe magnets as having two poles • predict whether two magnets will attract or repel each other, depending on which poles are facing.				
Prior Learning (What should they already know)	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)				
Misconceptions	• the biggest magnet will be the strongest • all metals are magnetic • smooth surfaces produce no friction				
RETRIEVAL VOCABULARY	materials, metal		NEW VOCABULARY	**Force, push, pull, twist, contact force, non-contact force, magnetic force, magnet, strength, bar magnet, ring magnet, button magnet, horseshoe magnet, attract, repel, magnetic material, metal, iron, steel, poles, north pole, south pole**	

	Essential Learning for this lesson	Suggested teaching tasks/approaches	New Knowledge – What I'm leaving the lesson with
LESSON 1	A force is a push or a pull. Working scientifically focus: • asking relevant questions • making systematic and careful observations	Hook lesson – carousel different games that use different forces and children to try and answer the question 'What is a force?' Record vocabulary children are using already during to describe their observations for a whole class mindmap/display on what the children already know about forces. Class discussion trying to answer the question 'what is a force?' – introduce definition 'a force is a push or pull' to children'. Extension – Can the children group which carousel activities used a pull and which used a push? May need another go to check.	**A force is a push or a pull.**

	• reporting on findings from enquiries, including oral and written explanations		
LESSON 2	Compare how things move on different surfaces.	RAMP experiment The children were given a ramp and four surfaces. A range of measuring equipment was left out for them to choose from. They were also given a table to record their results which prompted them to try each surface three times. The children then presented their results in a bar chart and the teacher asked them to talk to each other about their graph. Illustrative fair test – How does the type of surface on the table affect the speed of the tub travelling on it? Show the children how a tub on a table can be moved by attaching it to string which itself is attached to a mass that can fall to the ground. Ask them to discuss all the variables that they can think of that might affect how well the tub moves on the surface. They could write all of these on separate post-its of the same colour. Ask them to discuss how they could measure or observe how well the tub travels. These also could also be written on separate post-its of a different colour. In front of the children, take the post-it with 'material of the surface' written on it, and the post-it with 'speed' written on it. Combine these two variables to make the following questions for the children to investigate: 'How does the type of material of the surface affect the speed the tub travels?' Show children different types of materials that can be used to cover the table top. Ask them to talk about what they think we happen to the way the tub travels on the different materials. Discuss with the children what they need to do in order to keep the investigation fair. Children can perform the investigation in small groups Recording The children could draw the way in which they have set up the investigation. They could use a table to record their results. This data could then be transferred to a bar chart.	Different surfaces create different amounts of friction, which affects how fast or far an object moves. Forces act on moving objects.

		Developing an explanation The teacher could ask the children to watch them demonstrating the same investigation. This is an opportunity for children to share their results and their reasoning as to why things happened. The teacher could also use a digital microscope to show the children the surface of the various materials when magnified. 	
LESSON 3	Some forces need contact between two objects, but magnetic forces can act at a distance. Observe how magnets attract some materials and not others. 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. WS: To be able to use results to draw simple conclusions.	Recap observations from previous lesson – 'A force is a push or a pull.' Pose the question 'Can a force make something move without touching it?' May want to use a short clip for a hook such as Magneto from X-Men or the force in Star Wars. Introduce a selection of different magnets – what are they? What do they do? What are they used for? Add to working wall children's thoughts as appropriate. Children explore which objects around the classroom are magnetic or not and record in a table. Ensure there are some examples of non-magnetic metal objects to test and highlight to children that not all metals are magnetic. Draw children's attention throughout to the fact that magnets do not need contact with the object to act. - From NC: Pupils should observe that magnetic forces can act without direct contact, unlike most forces, where direct contact is necessary (for example, opening a door, pushing a swing). Model to children writing a conclusion based on the findings they have recorded – children have their own go in books 'What happens when we put a magnet near different materials?'	A magnet attracts magnetic material. Iron and nickel and other materials containing these, e.g. stainless steel, are magnetic. 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.

		Whole class discussion - 'Can a force make something move without touching it?' conclude with yes.	
LESSON 4	Observe how magnets attract or repel each other. Describe magnets as having 2 poles. Predict whether 2 magnets will attract or repel each other, depending on which poles are facing. Magnets have magnetic fields.	What happens when we put two magnets near each other? Drawn coloured diagrams of poles, two norths together, two souths together and a north and a south together, using rectangular magnets of all the same size. Children form predictions orally and then explore and observe for themselves what happens. Encourage children to explore once again if contact is needed for the force to act. Provide children with a wordbank (magnetic fields, repel, attract, force, north pole, south pole, strongest, weakest, same, opposite) they write out their observations next to their coloured diagrams. Towards the end of the lesson introduce to the children the idea of different shaped and sized magnets. Explain that the poles still work the same way so a north pole with still repel a north pole and attract a south pole etc. However, the strength of the force might change – do they think it will? Will some magnets have a bigger force than others? Next week we will explore this. e.g.  Extension – Discuss how we could test this next week. We want to do a comparative test because we want to compare the strength of different magnets, we will also need a magnetic material for the magnetic force to act upon. See what ideas the children come up with!	**The strongest parts of a magnet are the poles. Magnets have two poles – a north pole and a south pole. If two like poles, e.g. two north poles, are brought together they will push away from each other – repel. If two unlike poles, e.g. a north and south, are brought together they will pull together – attract.**
LESSON 5	WS: Explore the strengths of different magnets and find a fair way to compare them. WS: Making systematic and careful observations and, where appropriate, taking accurate measurements	Show the children a selection of magnetics (could be a photo on board) – remind the children that in the previous lesson we asked 'Which magnet is the strongest?' Pose the question 'Does the shape and size of a magnet affect how strong it is?' to the children. Show the children the variety of magnets (different sizes and shapes) that we have to use and a collection of paperclips. Explain that the children can test the strength of the magnetic force by seeing how far away from the magnetic	Magnets can have different strengths and we can test this by measuring the distance between a magnet and a magnetic material. The stronger a magnet is, the further it can be away from a magnetic material and still attract it.

	using standard units, using a range of equipment. WS: Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions. WS: Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables.	material it will act at. The stronger the force the further away the magnet can be whilst still attracting a magnet. Children use teacher made template to place the magnet and paper clip and measure in centimetres how far away the magnet is when it starts to attract the paperclip. Teacher to model this first and how to move the magnet slowly along the ruler. Children record findings in a teacher made table. Provide children with a bar chart template (this could be pre-labelled and with axis numbers already printed to save time and get the children used to the format especially if it is new to them). Model to children how to use their recorded results to complete their own bar chart. Discuss findings – tallest bar shows the strongest magnet as it was the furthest away when the paperclip was attracted. Shortest shows the weakest as it had to be closer for the force to act. Ask the children to discuss whether their strongest magnet was also their biggest? Was the weakest the smallest? Did size/shape seem to make a difference? Be wary of common misconception that bigger magnets are always stronger as this is not true.	New learning of recording results in a bar chart.
LESSON 6	NC: (non-statutory guidance) looking for patterns in the way that magnets behave in relation to each other and what might affect this, for example, the strength of the magnet or which pole faces another; identifying how these properties make magnets useful in everyday items and suggesting creative uses for different magnets.	How are magnets used in everyday life? Watch the three clips (http://www.bbc.co.uk/learningzone/clips/mice-using-magnets-animation/2188.html The video above is a funny little animation that shows two mice using magnets to reach some cheese and then escape from the cat! http://www.bbc.co.uk/learningzone/clips/super-powerful-magnets-the-los-alamos-magnetic-man/2187.html The video above shows how magnets have been used to climb tall metal structures. http://www.bbc.co.uk/learningzone/clips/using-magnets-to-sort-scrap-metal/2186.html The video above shows how magnets can be used to separate materials in a scrap yard.). Recap findings from last lesson that some magnets are stronger/weaker than others.	Children should be able to list common uses of magnets in everyday life and be able to discuss the properties of different sized/shaped/strength magnets that make them suitable for that specific objective. Children should be able to suggest creative uses for different magnets.

		Which magnet would be used for which task? Show children an objective that requires a magnet, e.g. 'retrieving a dropped key' and a selection of 2-3 different magnets, which would they select and why? Oral discussion of a few more examples. Children to create a poster of different ways magnets can be used in everyday life and the kind of magnet that may work best for this (could draw size/strength required or develop a rating system e.g. 10 being very strong and 1 being very weak) or children to create a poster starting with magnets first and then suggesting creative uses for them.	
LESSON 7 (extra lesson if time)	Recapping magnetic fields and how magnetic force does not need direct contact to work.	Problem-solving – making a compass Begin by asking children to rub a magnet on a metal paperclip. Then ask them to place the paperclip near other ones. They should find that for a few moments they have created their own magnet. Now ask them to push this magnetised paperclip into a cork. Place the cork in a bowl of water. Try it several times. Can the children explain what is happening? Discuss with them the fact that the Earth has its own magnetic field. The paperclip is lining up with magnetic North. The children can write the compass direction on small post-its and place them around their bowls.	

Helpful resources to reference	