Force and Motion		
KS 1	Lower KS2	Upper KS2
Forces and motion **There are different types of forces** **Pushes and Pulls.** Children need to experience seeing and feeling the effects of the wind on the out side environment (playground) e.g. trees, paper and leaves being blown. Children need to experience push and pull forces from the wind by opening their coats and running in the wind. Holding different shaped large card in front of them, as they run. Children need to observe what happens to wind socks, weather vanes and windmills. They need to hold materials to feel the effects of wind such as ribbons and kites blowing in the wind. Through these experiences children should be encouraged to develop a force vocabulary, focusing on push, pulls and comparative vocabulary. Possible opportunity for Modelled Investigation Which part of the school grounds does the ribbon get blown the most? Children to bring in their skateboards, scooters, bikes etc to use as part of their investigation. Can they use these words and experiment with their mode of transport? Stop, start, change direction, speed up, slow down. Along side these experiences there needs to be a focus on children developing a force vocabulary, focusing on push, pulls and comparative vocabulary. **Notice that some forces need contact between two objects.** Challenge the children to find out how they could move a big sack of potatoes. Children are to use their ideas to get the heavy load across a set space within the class room. Children need to experience the amount of force (pull) of moving the bag of potatoes before they work out their method.	**Forces and motion** **There are different types of forces (push, pull, friction, air resistance, water resistance, magnetic forces, gravity).** **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.** **Magnetism.** Pupils to explore magnets starting with bar magnets. Pupils need to experience the attraction and repulsion forces between the magnets. Establish the concepts of like poles repel and unlike (opposite) poles attract. Also discuss that some forces need a contact but magnetic force can act at a distance. Possible opportunity for modelled investigation. Pupils need to measure the strength of the magnets and compare the size of magnet and the size of the magnetism. Mark on paper where the magnets attract each other/ object and measure the distance. Repeat the investigation with other types of magnets. Possible opportunity for intermediate investigation. Pupils need to explore what magnetic force can work through. Pupils to sort out materials that a magnet attracts through. Paper, card, thin iwb, ruler, table, sand, water. Discuss with the Pupils what would make this a fair test. In simple ways Pupils are to draw the forces, using arrows, between the magnets, including the hand force.	**Forces and motion** **There are different types of forces (push, pull, friction, air resistance, water resistance, gravity).** **Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.** **Friction, air resistance and water resistance are forces which slow down moving objects.** **Gravity can act without direct contact between the Earth and an object.** **The effects of friction, air resistance and water resistance can be reduced or increased for a preferred effect.** **Gravity and Air resistance** Pupils to explore how different objects fall, e.g. tissue paper, cotton wool, A4 paper, grease proof paper, weights, paper clips, tin foil (the paper to be crumpled and uncrumpled) Pupils to observe and compare how quickly objects fall to the ground. Pupils need to look at the patterns in movement, focusing on why do some fall slowly or quickly. Show the children how to draw a simple force diagram. Then ask pupils to draw simple force diagrams for what they have observed. Use the observation of objects falling to re-establish the key concepts of gravity and air resistance. Possible opportunity for intermediate investigation. Pupils need to explore making paper helicopters. Pupils then to make a standard and investigate what would make the helicopter come down more slowly? Pupils then to make a second helicopter changing a variable to compare. Draw together the pupils ideas and discuss variables and how they affected the speed of the helicopter.

Children need to explore forces needed to make simple toys move, e.g. push/ pull cars, windmills, blow football, jack in the box, toys with springs, jump up toys, string puppets. Ask children how do you use force (pull/ push) to start the toy? How can they make the toy go faster? Go slower? Stop it? Children to explore their ideas. **Compare how some things move on different surfaces** Children need to explore cars moving down a ramp. Ask questions about how they would make them speed up? Slow down? Change direction? Stop? <u>Possible opportunity for intermediate investigation</u> Which surface affects how far a car travels? (Use ramps to propel the car) Children to explore how different surfaces affect how far toy cars travel. Children can also try making slopes steeper/ more shallow and see the effects on how far the car travels Children to fill cola bottles of the same size and type, with different materials. Children to explore the force needed to lift them. Children are to discuss which ones take the most force to lift? Children to discuss the comparison between each bottle and place them in order. Children to make drawings of the force they see. <u>Possible opportunity for Independent investigation</u> Children to design their own skittle game using soft balls to knock their bottles down. They could focus on the type of ball they use to knock the bottles down, the distance from the thrower to the bottles. Children are to find out which bottles take the most force to knock down.	**Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.** **Friction, air resistance and water resistance are forces which slow down moving objects.** **Friction, air resistance and water resistance can be useful or unwanted.** **The effects of friction, air resistance and water resistance can be reduced or increased for a preferred effect.** **<u>Gravity and Friction</u>** Pupils to explore cars moving down ramps as a brief introduction. Use the opportunity to re-establish force vocabulary. <u>Possible opportunity for independent investigation.</u> Pupils to explore the question of how can you slow a toy car down? Children to focus on type/ size of car, ramp length. Through discussion unwrap the ideas behind the question. Focus on friction and air resistance. **<u>Air resistance</u>** Pupils to explore parachutes. Pupils to use a standard parachute, exploring amount of weight, size of parachute, type of material to make parachute, height dropped from etc. **<u>Force meters</u>** Introduce force meter as a way of measuring force. Make simple Newton meters (rubber band) link to force as a pull (gravity) Introduce force meter (range of). Measure the force needed to lift different classroom objects up. Use a cradle to lift a range of objects around 10. reinforce the idea of force being measure in Newtons. Pupils are then to choose objects, the correct meter, estimate the force needed and then accurately measure the force. **<u>Floating and sinking</u>**	**Friction, air resistance and water resistance are forces which slow down moving objects.** **Friction, air resistance and water resistance can be useful or unwanted.** **The effects of friction, air resistance and water resistance can be reduced or increased for a preferred effect.** **More than one force can act on an object simultaneously (either reinforcing or opposing each other).** **<u>Movement and friction</u>** Briefly measure forces in the classroom, recap using a range of force meters. <u>Possible opportunity for intermediate investigation.</u> Pupils to explore shoes gripping different surfaces, carpet, wood, vinyl, playground, grass, doormat etc. Pupils to answer the question does their shoe grip the surface well? What makes it do that? Is it slippery? Why? Children to try and explain their findings. Children to focus on the shoe print that goes with the shoes with the most grip. Pupils to test the same shoe on different surfaces. Pupils to use force meters to measure the force needed to move the shoe. Pupils to draw a simple force diagram. Pupils to discuss the affect of different surfaces and the friction caused. **<u>Water resistance</u>** Discuss pupils experiences of being in water. Pupils need to explore moving objects in water. What does it feel like to move in water? What force is needed to move? <u>Possible opportunity for intermediate investigation</u> Pupils explore different rafts moving through water. Does the shape of the correx affect how quickly the raft move through the water? Stress the movement of weight on the pulley transfers through the pulley inot movement of the raft. Pupils to draw together results, why did the results happen? Children to use simple force diagrams to explain their ideas.

	Pupils to observe what happens to a range of challenging objects (shape, materials, size). Pupils to predict what will happen when they are placed on water. Pupils to choose examples that will float/ sink. Pupils to focus on some floating and sinking objects and discuss gravity and up thrust and why things sink or float. Pupils to draw interpretations of what happens and the related forces.	**Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.** **<u>Transferring force and motion through gears, pulleys, levers and springs.</u>** Cycling- how are gears used? Pupils to bring in their own bikes to explore how gears transfer force into movement. See resulting motion and make connections with how the pedals turning, the gear ratio and the wheel turning. Ask how are bikes moved? Which gear would you use to go up hill? Slow down? Start off? Explore force and motion. Hold an exploration work shop with the ideas in the table above what is causing the movement? How can you make the objects move faster, easier

Gears	Pulleys	Levers	Springs
Teaching clock Push bike **Gear ratios**	Window blinds Lifting pulley Roller blind **Size of pulley**	Seesaw Balance Garden spade **Pivot point**	Pin ball Jumping frogs **Size of springs and amount pulled of compressed**