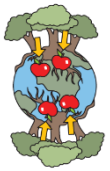
River Bank Primary Knowledge Organiser	Year Five Science	Autumn 2	Forces – Let's get moving

Key Vocabulary

Gravity	The force that attracts a body towards the centre of the Earth, or towards any other physical body having mass.
Weight	The name given to how much something is pulled down by gravity, measured in newtons (N).
Mass	The measure of the amount of matter in an object, measured in grams and kilograms.
Newton	The Standard International (SI) unit of force. 1N is the force required to cause a mass of 1kg to accelerate at 1m per second^2 where no other forces are acting upon it.
Non-contact	Push and pull forces that occur without any contact
Sir Isaac Newton	English mathematician and physicist best remembered for calculating the laws of gravitation and motion.
Galileo	(1564-1642) Italian astronomer and mathematician who was the first to use a telescope to study the stars. His findings on different weights descending at the same time strengthened Copernicus' theory that the Earth and other planet's revolve (orbit) the Sun.
Friction	The resistance that one surface or object encounters when moving over another.
Air resistance	The frictional force air exerts against an object moving through air.
Water resistance	The frictional force water exerts against an object moving through water.
Force Meter	An instrument to measure the magnitude of a force. Also known as a newton meter as the force is measured in newtons (N).
Reliable	Consistently good in quality or performance: able to be trusted.
Lever	A rigid bar resting on a pivot, used to move a heavy or firmly fixed load with one end when pressure is applied to the other.
Spring	An elastic device, typically made from a helical metal coil that can be pressed or pulled but returns to its former shape when released. These are used to exert constant tension or absorb movement.
Gear	A toothed wheel that works with others to alter speed of driving mechanisms (an engine) or the speed of the driven parts (wheels).
Pulley	A wheel on an axle or shaft designed to support movement and change of direction of a taut cable or belt. They can also transfer power between the shaft and cable/belt.
Axle	A rod or spindle (either fixed or rotating) passing through the centre of a wheel or group of wheels.
Shaft	A long, narrow part or section forming the handle of a tool, such as the body of an arrow.
Machine	An apparatus using mechanical power and having several parts, each with a definite function and together performing a particular task.
Rube Goldberg	A machine (or device, apparatus or contraption) that uses a series of chain reactions to accomplish a very simple task in a very complicated manner. https://www.youtube.com/watch?v=Av07QiqmsoA
Force	Strength or energy as an attribute of physical action or movement.

Gravity

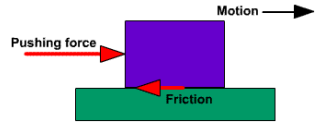


Unsupported objects, such as an apple falling from a tree, fall towards Earth because of the force of gravity acting between the Earth and the falling object. Newton's laws of motion explain that objects of different mass will accelerate at the same rate during free fall. Free fall is a special type of motion in which the only force acting upon an object is gravity. The force of gravity remains the consistent on Earth, regardless of where. All objects on Earth have a weight, which is the name given to how much something is pulled to the Earth's surface by gravity. The greater the mass (kg/g) the greater the gravitational pull (N).

Friction

Friction is a force holding back the movement of a sliding object. Friction is everywhere two surfaces are in contact with each other. The force of friction acts in the opposite direction to the object moving. Without friction, objects would not come to a stop.

If diagrams to represent forces, the size of the arrow indicates amount of force.



Above, the pushing force is greater than the friction, so there will be forward motion. If the amount of friction were greater, the pushing force would not be enough to move the box forwards.

Air resistance – frictional force caused by air.

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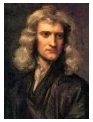
using friction against the parachute. This makes it more difficult for the object to fall at the rate determined by Earth's gravitational pull.

Water resistance - frictional force caused by water.

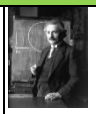
Submarines have teardrop shaped hulls to reduce the water resistance acting on them. This therefore increases the speed of the submarine in the water. Swimmers wearing swimming suits and caps helps them remained streamlined, reducing water resistance and therefore increasing their speed through the water.

Famous scientists

Galileo (born 1564) became famous for discovering celestial bodies using telescopes. His work on different weights descending at the same time strengthened the Copernicus' theory that the Earth and other planet's revolve (orbit) the Sun. Unfortunately, this got Galileo into lots of trouble and he was imprisoned for this work as it went against many religious beliefs held at the time. He died in 1642.



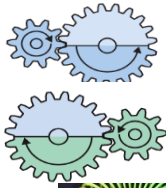
Sir Isaac Newton (born 1642) published a paper called *The Philosophiae Naturalis Principia Mathematica* in 1687 outlining the first theory of universal gravitation. This paper contains much of the work he is remembered for today. Newton spent the last 30 years of his life as Master of the Mint, making sure Britain's coins were made and used correctly. He died in 1727.



Albert Einstein (born 1879) published his theories of gravity being the product of the curvature of space and time acting on the universe. He supported Newton's theory of gravity but claimed there was more to this force and it affected more than just Earth. This was ground breaking science at the time (1905). He died in 1955.

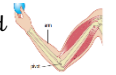
Gears, levers, pulleys and springs.

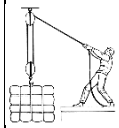
Gears are wheels with teeth that fit together. When one gear moves, the other moves in the opposite way. Gears are found in watches, some toys, bikes and cars.



Levers can change the direction of a force or magnify it (make it bigger).

Good examples our joints, scissors and bottle openers.





A pulley is a wheel fixed at one end with a rope passing through it. When the rope is pulled, it can lift an object more easily.

Springs come in many shapes and sizes. Springs work by storing energy or absorbing energy. They return to their original shape when this stored energy is released.

Images obtained from Rising Stars Switched on Science scheme.

Quiz	
Complete this sentence: **Unsupported objects fall towards Earth because of…** A. friction acting upon it. B. air resistance acting against it. C. water resistance acting against it. D. gravity acting upon it.	Complete this sentence: **Gravity is the force acting between…** A. weight and mass. B. the Earth and objects on the Earth. C. springs and forces. D. levers and pulleys.
Which of the following objects is used to slow down objects falling through the air? A. Submarine. B. Machine. C. Parachute. D. Gears.	Which of the following shapes is often used by modern submarines to reduce effects of water resistance on submarines? A. Teardrop. B. Circle. C. Rectangle. D. Rhombus.
Complete this sentence: **The force of friction acts …** A. in the opposite direction to the object moving. B. in the same direction to the object moving. C. against objects with a greater weight. D. against objects with a lower weight.	Which of the following objects cannot allow for a smaller force to have a greater effect? A. Levers B. Springs C. Gears D. Pulleys
The paper containing the work Sir Isaac Newton is best remembered for today outlined his theory on what? A. Friction B. Newton meters C. Universal gravitation D. Air resistance	Complete this sentence: **Without friction…** A. objects would come to a stop. B. objects would not come to a stop. C. objects would not move. D. objects would fall.

Images obtained from Rising Stars Switched on Science scheme.