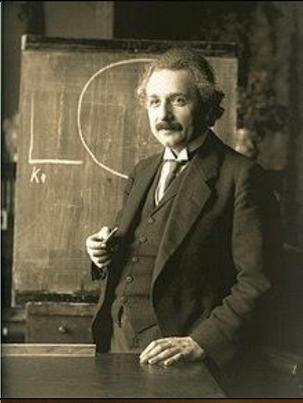


Vocabulary	
accelerate	Speed up
attract	To draw closer by an unseen force
decelerate	Slow down
drag	A force acting in the opposite directions – causing the object to slow down.
force	A pull or pull upon an object resulting from its interaction with another object
friction	The resistance that one surface or object encounters when moving
gravity	The force that attracts a body towards the centre of the Earth
magnet	Piece of metal (usually iron) that attracts iron and a few other metals.
Newtons	The unit of measurement we use to measure a force.
poles	Magnets, like the Earth, have a north and south pole.
reaction	Something that happens or is experienced as a results of an action.
repel	To force or push away
resistance	Acts against the act
streamlined	Designed with a shape that gives little resistance to the flow of air or water.

Diagrams and Symbols	What? (Key Knowledge)
<p>Diagrams of forces in action</p>	<p>Forces</p>
<p>What is a force?</p>	<p>A force is either:</p> <ul style="list-style-type: none"> • A push or • A pull
<p>Forces can make things...</p>	<ul style="list-style-type: none"> • Speed up • Slow down • Change shape • Change direction
<p>A force that speeds something up</p>	<p>The child is pushing the car to speed it up.</p>
<p>A force that slows something down</p>	<p>The girls is pulling the dog to slow it down.</p>
<p>A force that changes the shape of something</p>	<p>The can is being squeezed so that it changes shape and becomes smaller.</p>
<p>A force that changes the direction of something</p>	<p>When the ball is hit with the racket, it will change direction.</p>

Types of force	
gravity	Gravity is the force that pulls objects down towards the Earth. When something like a ball is thrown up, gravity pulls it back down.
air resistance	Air resistance slows down objects moving through the air, pushing in the opposite direction to cause drag . Streamlined objects move better and quicker through the air.
water resistance	Water resistance slows down objects moving through the air, pushing in the opposite direction to cause drag . Streamlined objects move better and quicker through the air.
friction	Friction happens when two surfaces come into contact with each other. Friction creates drag with causes objects to decelerate . Friction also generates heat. Friction is useful because it gives us grip. Smooth surfaces cause less friction than rougher surfaces.
magnetism	<div style="text-align: center;"> </div> <p>Magnets attract or repel each other or other objects.</p> <p>All magnets have a north and south pole. North and south attract but north and north or south and south will repel.</p>

Significant People	
Sir Isaac Newton	 <p>Isaac Newton was the first person to come up with a theory to explain gravity(he did not invent gravity). He is said to have seen an apple fall from a tree and remarked “whatever goes up must come down”.</p> <p>His discovery and theory allowed scientists to understand how the planets and sun moved around. He was also one of the first people to use maths to explain science.</p>
Albert Einstein	 <p>Albert Einstein is known for many of his theories which still underpin modern science understanding. He built on Newtons work, including on electromagnetism and developed his famous theories of relativity ($E=MC^2$ – probably the most famous equation in science).</p>
Emilie du Chatelet	 <p>Emilie du Chatelet is a forgotten figure today. She was a French mathematician and was one of the first people to translate Newton’s work into French. This made her unpopular with the church in Europe who often fought against modern scientific ideas. She also worked on the complex maths around Newton’s theory, adding her own notes to the translation.</p>

Gears

Gears are wheels with sets of **teeth** (cogs) that lock together and turn one another. When one gear is turned the others turn as well.

The wheels are usually different sizes so that the different wheels spin at different speeds and need different amounts of effort to turn them

In this example the large gear has four times as many teeth as the small one, so each time it rotates once, the small gear rotates four times.



It takes four times as much force to turn the large wheel once as it does to turn the small wheel once.

It takes only a quarter of the force needed to turn the large gear, to turn the small gear

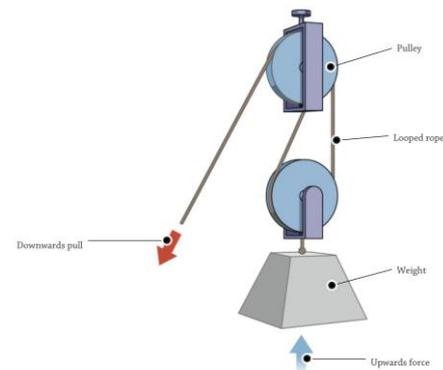
This is known as a 4:1 ratio

Think about how this works on your bike - it's the same principal although the gears are connected by a chain not directly to each other.

You can also connect smooth wheels (without teeth) by a **drive belt** to change the speed and amount of force needed.

Pulleys

Pulleys are made by looping a rope over one or more wheels. They are often used to lift heavy objects: pulling down on the rope creates an upward pull at the other end. Looping the rope over more wheels increases the upward force. Using two wheels means you can lift something twice as heavy using the same force.



Levers



A **lever** is a rigid arm that is braced against a turning point, or **fulcrum**. Pushing at one end of the arm creates a force at the other end.

In a seesaw the **fulcrum (pivot)** is in the centre so the force on each side is equal.

In the picture the girl is further away from the fulcrum than the weight so she needs less force to lift it.

Counterbalance

In crane designs, a **counterweight** is used to exert an opposite force so that the whole crane doesn't topple over when lifting a load. This balances the lever, which is the arm of the crane.

