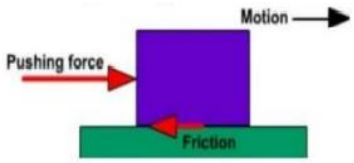
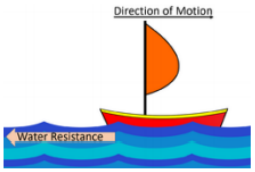
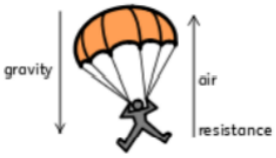
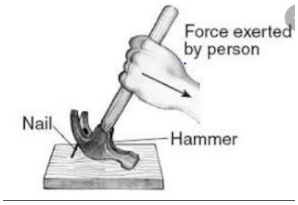
Year 3/4

D.T. Knowledge Organiser – Mechanics: Gears

Key Enquiry Questions:	
What is a force?	In physics, a force is an interaction that causes an affected object to be pushed or pulled in a certain direction. This results in an alteration to the state of the object's momentum. Forces causes objects to accelerate, decelerate, stop moving, or add to the object's overall pressure, change direction, or change shape.
What is friction?	Friction is a force - it is the resistance of motion when one object rubs against another. 
What is water resistance?	This is a force (friction) that creates resistance of motion of an object that is moving in water. Some objects can move through water with less resistance if they are streamlined. 
What is air resistance?	This is a force (friction) that creates resistance of motion of an object through the air. Air resistance pushes up on the parachute, opposing the force of gravity. This makes the parachute land more slowly. 
What happens when objects are dropped?	Explain that objects fall to the floor because of a force called gravity. Gravity pulls objects to the centre of the earth.
Can any objects move upwards?	Explain that objects fall to the floor because of a force called gravity, so for an object to move upwards, a force greater than the weight of an object needs to be exerted on the object.
pulleys	A flag being raised/ lowered on a flagpole is a prime example of a pulley mechanism in action. The rope or belt pulled by the user fits into a groove in wheels at the top and bottom of the flagpole. This switches the direction of the force needed to lift/ lower the flag up and down the post. 
gears	 A can opener is an example of a gear mechanism in action. When you turn the handle, it turns a small, round, metal traction gear. The notches in the gear allow it to grip onto the lip of the can. As the wheel moves around the rim of the can, the cutting wheel on the other side of the lip opens the can.
bicycle gears	Bicycle gears are an example of a multiple gear and pulley mechanism in action. The size of the gears (and number of teeth) determines how many times the rear wheel turns for every pedal stroke. A lower, easier gear (small chain ring, big cog) helps the user to accelerate faster, whilst a higher, harder gear (big chain ring, small cog). 
lever	 A basic tool used to lift or pry things open. The long bar rotates on a fixed point (pivot) and the motion of the activity results in something changing position or moving from one place to another at one end when force is applied to the other end.

Key Vocabulary	
push	A push is the force that moves an object away from something, a push and a pull are opposite forces, meaning they move objects in different directions.
pull	A pull is the force of bringing an object closer.
force	In physics, a force is an interaction that causes an affected object to be pushed or pulled in a certain direction. This results in an alteration to the state of the object's momentum. Forces causes objects to accelerate, add to the object's overall pressure, change direction, or change shape.
direction	A course along which someone or something moves.
movement	Movement, or motion, is the state of changing something's position—that is, changing where something is.
turn	A change of direction when moving.
speed	The rate at which someone or something moves or operates or is able to move or operate.
mechanism	A system of parts working together in a machine.
pulley	A grooved wheel over which a drive belt can run
drive belt	The belt which connects and transfers movement between two pulleys.
gear / cog	A wheel with teeth around its circumference.
driver	The gear or pulley that provides the input movement to the system.
follower	The gear or pulley that provides the output movement to the system.
motor spindle	The rod on the end of the motor onto which a gear or pulley is attached.
gearing up or down	Changing the rotational speed of a product by the use of pulleys or gears. When a small pulley or gear is used to drive a larger one the rotational speed is reduced and the product has been geared down.
fulcrum	The point at which a lever pivots (like the middle of a seesaw).

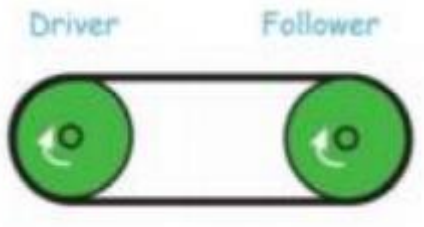
Important Facts

Isaac Newton (1643-1727) was an English mathematician, physicist, astronomer and author who is widely recognised as one of the most influential scientists of all time. Lots of fairground rides are based around Newton's three laws of motion.

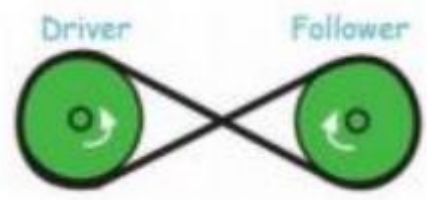
Newton's Laws of Motion Rap | 1st 2nd & 3rd | Physics Rap (video.link)
https://video.link/w/rhzEb

Pulleys

Pulleys do not touch but the wheels are joined by a drive belt. They can be used to change the speed, direction or force of a movement.



The pulleys rotate in the same direction.



The pulleys rotate in different directions.

Pulleys explained: https://video.link/w/9Q9Bb

Gears

Gears are toothed wheels that lock together and turn one another.

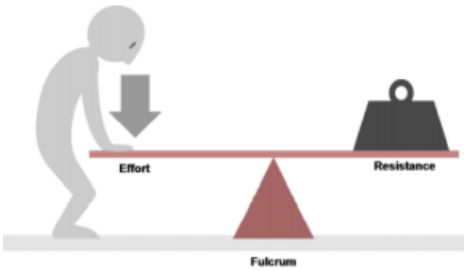
The wheels are usually different sizes so that one gear speeds up to slow down the next gear. Gears are also used to change the direction of movement.

If the first gear wheel is smaller (and has fewer teeth) than the second one, then the second (bigger) gear doesn't have to move as quickly to keep up with the smaller gear. So, the second gear wheel turns more slowly than the first.

Gears explained: https://video.link/w/qT9Bb

Levers

A **lever** can be described as a long rigid body with a fulcrum along its length. A lever amplifies an input force to provide a greater output force, which is said to provide leverage.



Load: The object you're lifting. (resistance in diagram)

Fulcrum: Point at which the **lever** pivots.

Effort: The force applied to make the object move.

Levers explained: https://video.link/w/BeDEb or

What is a Lever? - Simple Machines | Science for Kids | Educational Videos by Mocomi - YouTube

Health and Safety
• Remove any jewellery and tie back long hair. • Wear goggles if using tools. • Do not get too close to someone who is using tools. • Use tools correctly and safely. • Walk safely and calmly around the classroom / workshop. • Wear an apron and roll up your sleeves. • Follow the teacher's instructions carefully. • Make sure that you are using the correct equipment for tasks. • If you need to move around with tools, hold them safely. • Report any accidents & clean up properly after yourself.