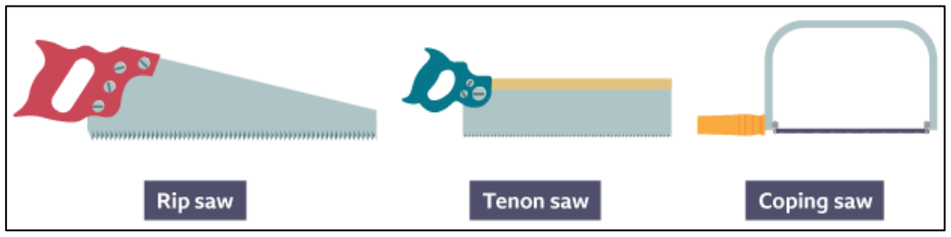
Year 8

Knowledge organiser 1: Resistant Materials

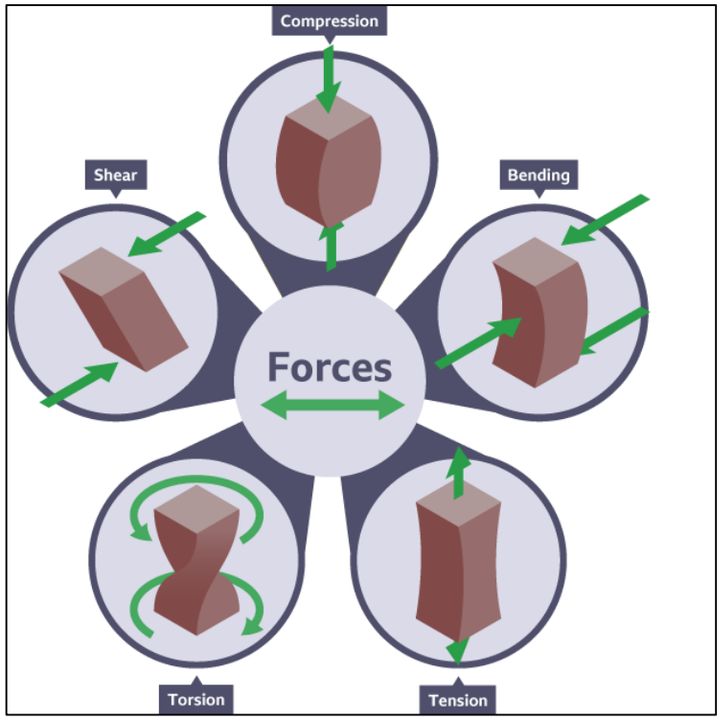
Batch production: Where one group of identical products is made at the same time, before moving onto producing the next group.

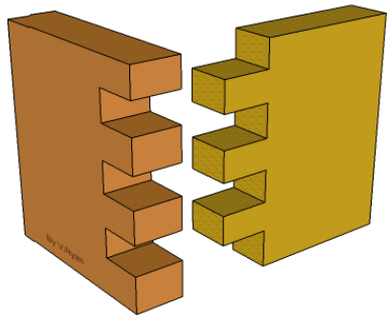


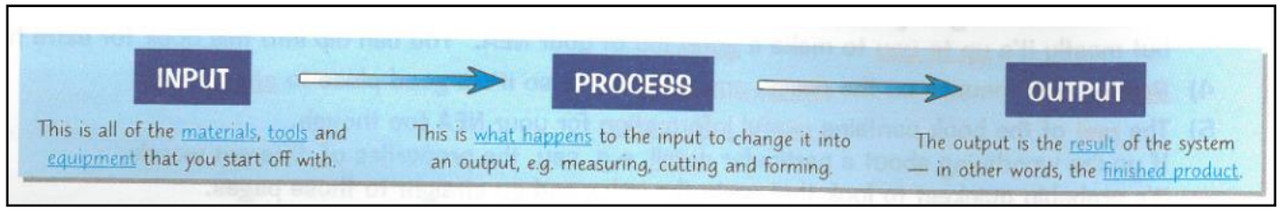
This a good example of a 'finger' or 'comb' joint. It is ideal for box constructions and is suitable for use with natural woods such as pine and mahogany or even manmade boards such as plywood and MDF. The joint is strong especially when used with a good quality glue such as PVA (woodworkers adhesive) or cascamite.

Forces act on materials all the time - even if a material appears stationary it still has a force acting on it. There are five terms used to describe what type of force can act on a material:

- **tension** - a pulling force
- **compression** - a pushing force
- **bending** - forces at an angle to the material
- **torsion** - a twisting force
- **shear** - forces acting across the material







Assembly line: A series of workers and machines in a factory by which a succession of similar items is progressively assembled.

Compressed: Made smaller by squeezing together.

Safety is Really Important

Power tools are hand-held motorised tools. You need to use them safely...

1) Before using power tools, do a visual check for any loose connections and run your hand along the lead to check for any cuts in the insulation (when it's not plugged in, of course). Check that the blade or drill bit or whatever is attached correctly and tightly.
2) You can use an RCD (Residual Current Device) to help prevent electric shocks. The power tool plugs into the RCD, which you plug into the socket. If you accidentally cut through the lead of the power tool, the RCD cuts off the electricity supply straight away.
3) Wear a mask or fit an extraction hose if the tool's going to produce a lot of dust. Always wear safety glasses and make sure clothing can't get caught.
4) Clamp your work down firmly so it can't slip or move.
5) Make sure you know where the stop buttons are before you start.
6) When you've finished, make sure the tool has stopped moving before you put it down.

To find out more:
https://www.bbc.co.uk/bitesize/guides/zh4g4qt/revision/1

Working property	Usage example
Strength - how a solid material behaves when stress and strain are applied, eg compressive, tensile and shear strength	Steel is used for cables in suspension bridges as it has high tensile strength to support the weight of the bridge and vehicles
Hardness - ability to withstand indentations (dents) or abrasions (scratches)	A tunnelling drill can be encrusted with synthetic diamonds to ensure it stays sharp while drilling through rocks
Durability - ability to maintain functionality without requiring excessive repair or maintenance	Most plastics are durable - eg acrylonitrile butadiene styrene (ABS) is used to make safety helmets for builders and toy building blocks
Strength to weight ratio - strength divided by its density	Carbon fibre is used to make the bodies of racing cars as it is both lightweight and able to withstand the aerodynamic forces on it in a race
Stiffness - ability to withstand deformation (change in shape) when a force is applied	When constructing a frame of a building, steel will be used for its stiffness, preventing the building from deflecting (moving under the load)
Elasticity - ability to return to original shape after a force is applied	Silicone rubber is often used in swimming caps as it is extremely flexible
Impact resistance (toughness) - ability to withstand a sudden high force or shock	Polycarbonate is used in motorcycle visors for its impact resistance as it will not shatter if hit by a stone when at high speed
Plasticity - ability to be shaped or moulded	When heated, thermoplastics like ABS can be injection moulded into a variety of products

Metals come from an **ore** that is mined from the ground. A huge amount of heat energy is needed to extract the metal from the ore - this energy often comes from **fossil fuels**. Metal ores are **non-renewable**, meaning they are a **finite resource** and therefore **recycling** metal is important.

Alloys are made by combining different metals to produce another that is more useful for a specific task. **Stainless steel** is an alloy of **iron** and **chromium** (from 10.5 per cent to 27 per cent). The chromium produces an oxide layer on the outer surface of the **steel** and prevents **corrosion**. Stainless steel is often used for kitchen utensils as it will not **rust** and can be wiped and cleaned with ease.

Drill bits
Timber can also be drilled by using a variety of different drill bits, which work by twisting into a piece of timber:
•twist drills - used to simply drill a hole of a fixed diameter into a piece of timber
•countersink bits - used to profile a hole so that the top of a screw can sit flush with a surface

Sand casting can be used to cast larger and more complex shapes as it uses a two-part mould:

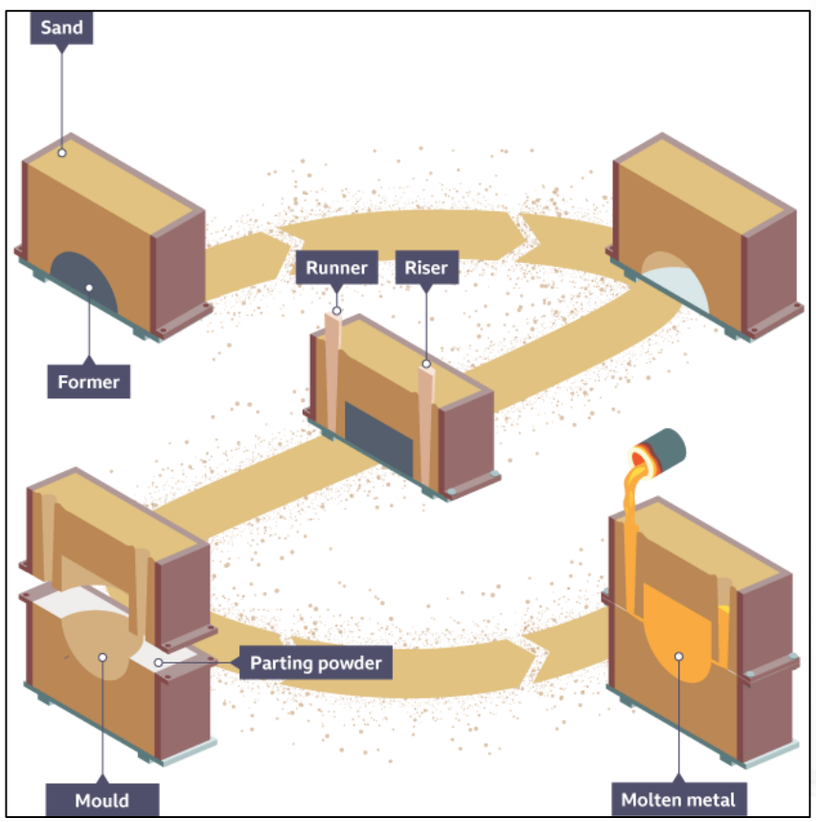
1.a **former** is made, usually by hand, and is placed in the **'green' sand**, which is packed tightly around the former before it is removed

2.this is repeated on the other part of the mould

3.two holes are made in the sand, one for the molten metal to be poured into (the runner) and one for the metal to come up and out the other side (the riser)

4.once they are both ready, parting powder is applied to the sand and the two moulds are placed together, one on top of the other

5.the molten metal, often **aluminium** in schools, is poured into the runner until it comes up to the riser when the cavity in the sand is full of metal



Iron Ore

Alloy: An alloy is a mixture of two or more elements, at least one of which is a metal.

Iron oxide: The common form of iron oxide is rust and is a chemical reaction with iron and oxygen.

Sand casting: A process of making a mould in sand so that a molten metal can be poured to take a form.

Iron: A chemical element - when alloyed with carbon it becomes steel.

Pewter: A soft alloy of tin and copper.