

Year 8 Future Engineers Knowledge organiser

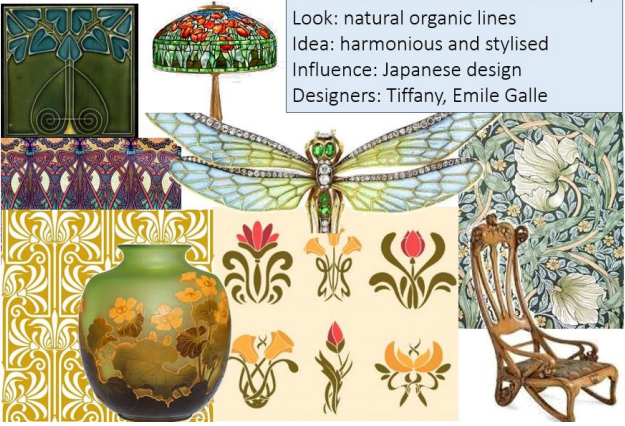
USB Lamp

Knowledge organiser for design movements

There are many different **Design Movements** which have influenced artists and designers across the generations. Below are just some key examples. You can also **check the DT resources** on **Firefly** to quiz yourself on others.

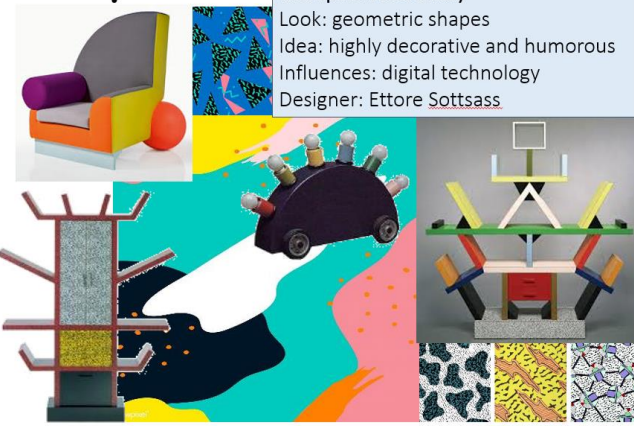
Art Nouveau

When and where: 1890-1905 Europe
Look: natural organic lines
Idea: harmonious and stylised
Influence: Japanese design
Designers: Tiffany, Emile Galle



Memphis

Memphis 1980's Italy
Look: geometric shapes
Idea: highly decorative and humorous
Influences: digital technology
Designer: Ettore Sottsass



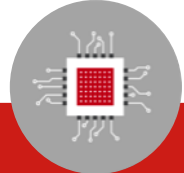
Art Deco

When and where: 1925-1939 Europe & USA
Look: geometric shapes
Idea: glamorous
Influence: Hollywood and Tutankhamen
Designers: Cloris Cliff, Eileen Gray



De Stijl

When and where: mid 1920's Holland
Look: rectangles primary colours
Idea: abstraction
Influence: modern art
Designer: Gerrit Rietveld, Piet Mondrian



Knowledge organiser for CAD/CAM

Computer Aided Design

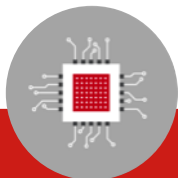
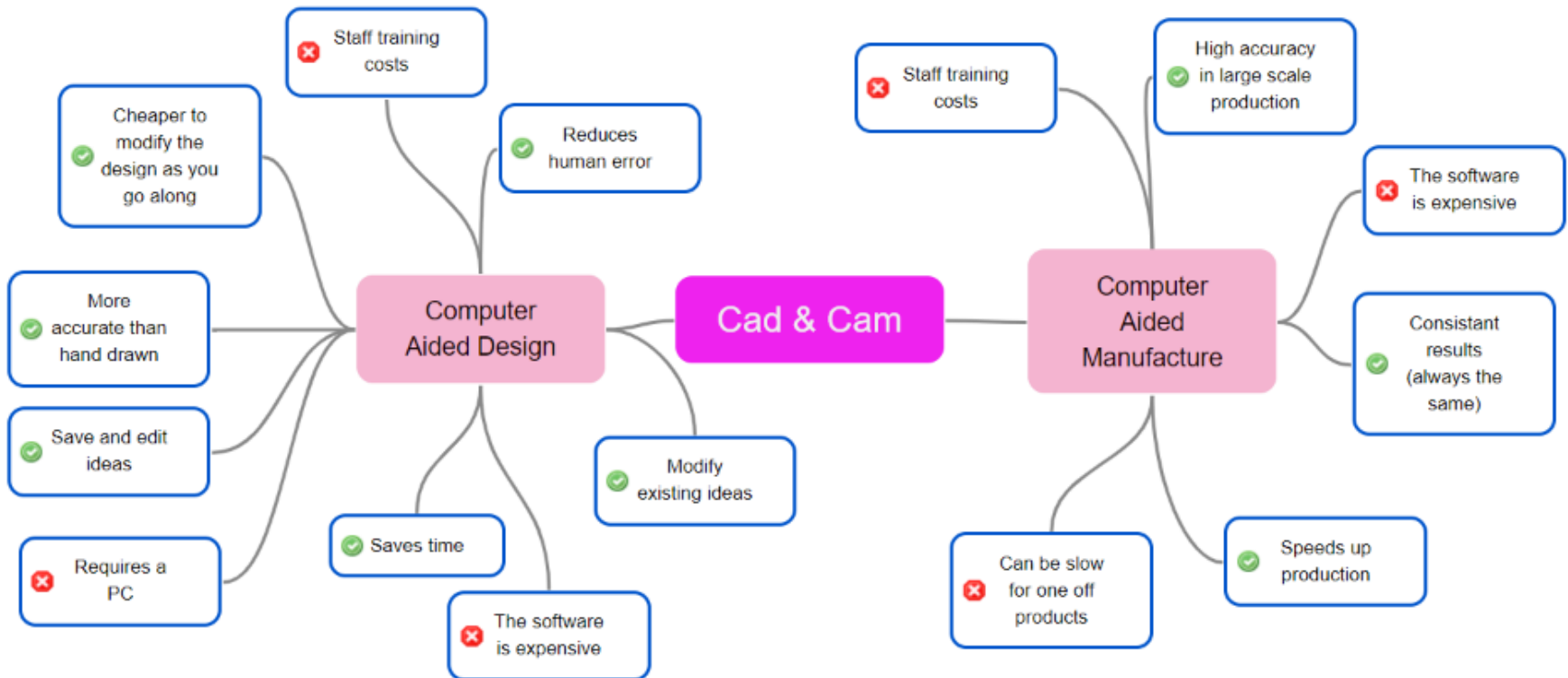
CAD can be created using both 2D drawing or 3D modelling tools. Some examples include:

Techsoft 2D Design, Google SketchUp, ProDesktop

Computer Aided Manufacture

CAM allows for the manufacture of prototypes from CAD drawings in a range of different materials. Some examples include:

Laser cutter, vinyl cutter, 3D printer



Knowledge organiser for electronics

The **green board** is referred to as a **Printed Circuit Board**. This is where all of the components are soldered in place. **PCB's** have silver tracks on them to allow the electricity to flow from one place to another.



Components used in your circuit

Fixed resistor: It **limits current** in a circuit and protects some components. Resistance is measured in **Ohms**.



Light Emitting Diode (LED) : They **produce light** when a current is passed through them.

The LED is a **Polarised Component** which means the current will only flow from positive to negative and must be placed in the circuit correctly.



Latching switch: These switches **stay on** when moved. Momentary switches return back to their original state.



Soldering



A good soldered joint.

Connection to the copper track and to the component.



Bad soldered joints

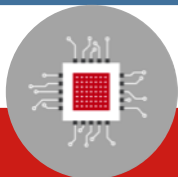
Not enough solder or too much solder causing a dry joint. This makes a bad connection.



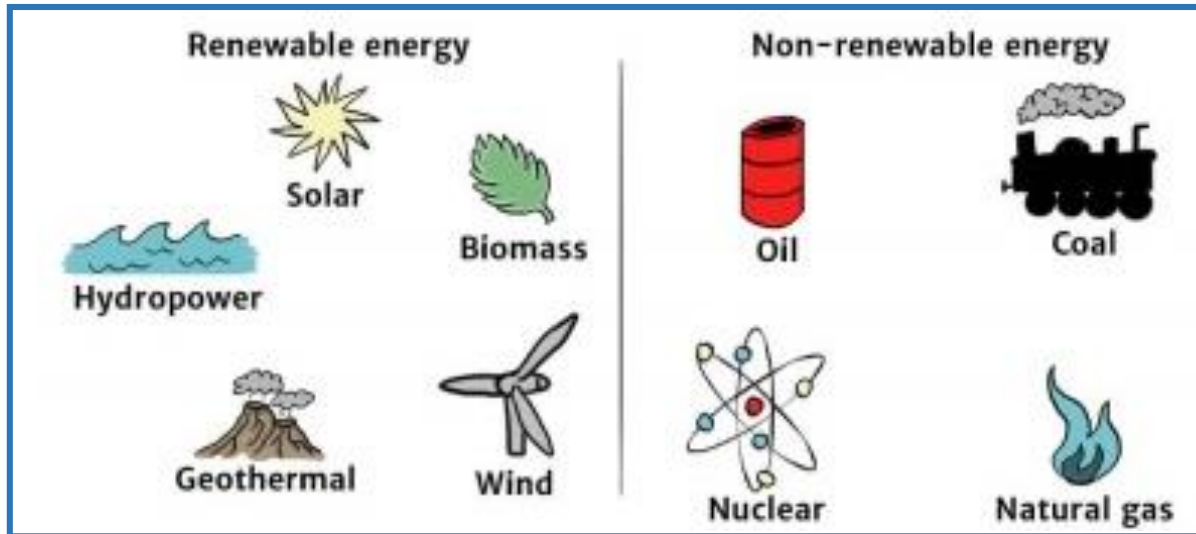
Soldering health and safety :

- Wear **apron** and **goggles**
- Use the **soldering iron stand, circuit board holder** and **soldering board** at all times.
- Only hold the soldering iron by the **yellow handle**.
- Check the **flex** of the soldering iron before starting.
- Think you have a problem? **Ask!**
- **Only solder the joints** on your circuit board
- If you **burn yourself** run it under **cold water** and **tell the teacher**

Future Engineers



Knowledge organiser for energy and electrical power sources

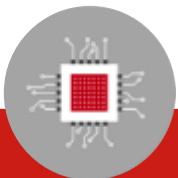


A single **AA battery** produces **1.5 volts**. Power is produced using a chemical reaction. The chemicals used are harmful and can leak into soil and water when disposed of incorrectly.

A **USB port** produces a low voltage power supply, about **5 volts** which will power or charge small electronic products.

A **mains socket** produces a high voltage power supply about **240 volts**. A step-down transformer is needed to reduce the voltage for small electronic products. There is energy loss through heat.

A single **solar cell** produces a very low voltage power supply, about **0.45 volts** so several cells are needed to provide enough power even for small electronic products. The advantage of solar cells is that are a **renewable** form of energy.



Knowledge organiser for Tools and Equipment



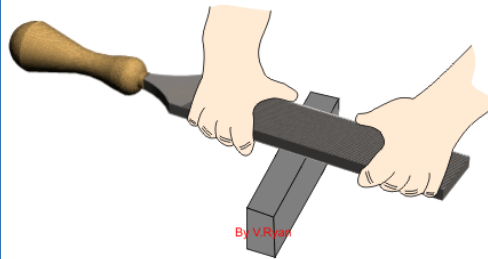
Coping Saw

Use Bench Vice to hold material
Use masking tape on acrylic
Cut slowly
Use full length of blade
Do not twist



Fret Saw

Wear goggles
Use masking tape on acrylic
Cut slowly
Hold carefully
Make sure extraction is on



Draw filing

A technique used for producing smooth edges on pieces of metal or **acrylic**. The process works by moving any type of single-cut file forwards and backwards along the length of the material's edge.



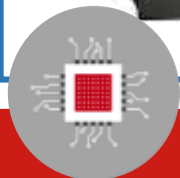
Wet and Dry Paper

Abrasive paper for metal/acrylic comes in a range of grades (smooth – rough)



Sand Paper / Glass Paper

Abrasive paper for wood comes in a range of grades (smooth – rough)



Knowledge organiser for shaping polymers using heat

Plastics Oven

You could use a **former** to help you create the shape you want.



 **Wear gloves**

Strip Heater

You could use a **jig** to help you bend the acrylic accurately.

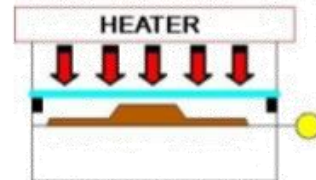


 **Wear gloves**

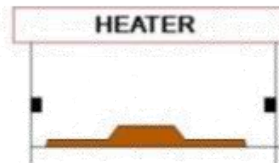
Vacuum Former



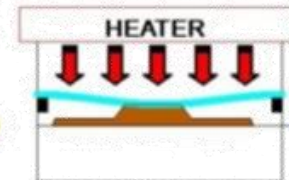
1. Mould is made from MDF or Expanded Polystyrene



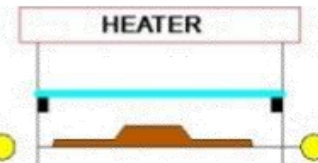
4. The electric element (heater) is turned on and begins to warm the plastic sheet



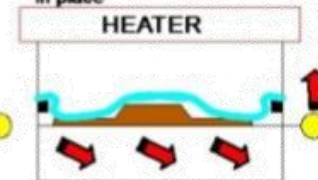
2. The mould is placed in the bottom of the vacuum former



5. The Thermoplastic becomes flexible as it is heated. The mould is moved up to the plastic using the handle

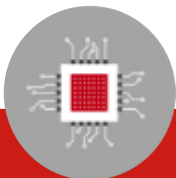


3. The sheet of plastic is placed above the mould and clamped in place



6. The pump is turned on and the air is removed from under the plastic, sucking the plastic over the mould

[Vacuum forming video](#)



Knowledge organiser for adhesives

WARNING!

These chemicals are irritants and flammable. Wash skin with soap and water if in contact and keep away from heat and flames. Wear latex gloves and goggles when handling the liquid and make sure the lid is secure when not being used.

Dichloromethane (liquid solvent cement)

Used to join acrylic to acrylic



Staff only!



PVA

Used to glue wood to wood



WARNING!

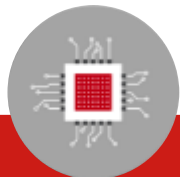
The melted glue and the nozzle of the glue gun are very hot.

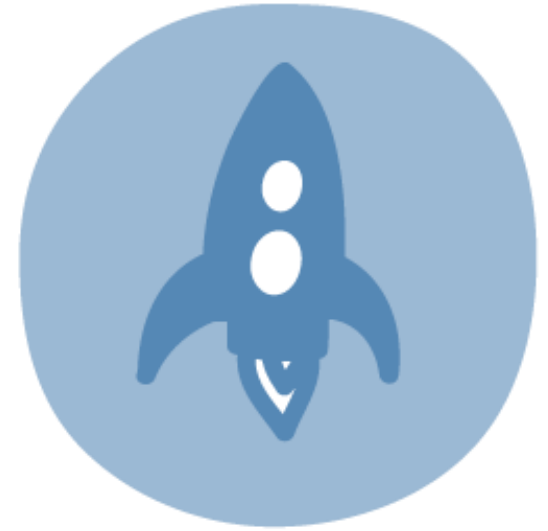
Glue gun

Used to join dissimilar materials



Wear goggles





Year 8 Innovate Knowledge Organiser

Stand or store

Tools and their uses



Try square

Used to mark lines at 90 degrees to edge of timber



Marking gauge

Set up to a measurement and used to mark lines for joints on timber to save time measuring each line



Tenon saw

Used to cut joints in timber as the blade does not flex due to it having a back on it



Coping saw

Used to cut different shapes out in timber and the blade can be taken off to cut out middle sections of timber



G Clamp

Used to hold/clamp work together when gluing or to hold work when cutting



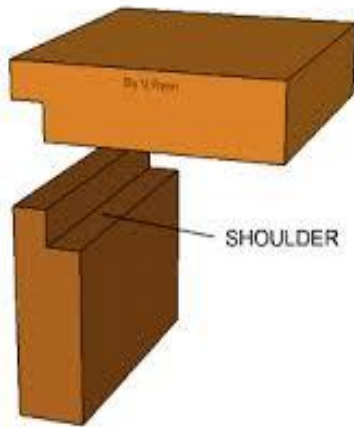
Glasspaper

Comes in different grits the higher the grit the finer the finish and used to smooth timber



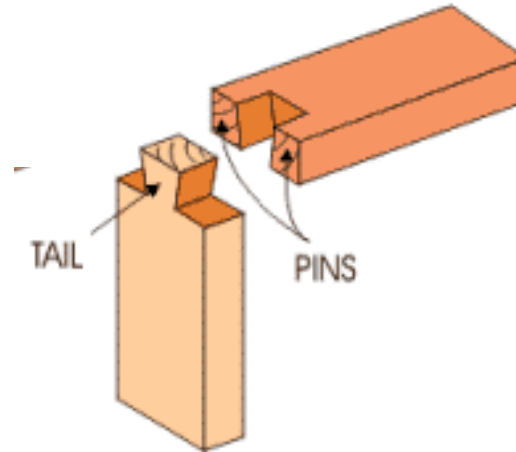
Wood joints

Joinery is a part of woodworking that involves joining together pieces of **wood**, to produce more complex items. Some **wood joints** use fasteners like screws or nails, some adhesives like PVA, while others use only **wood** elements. Different types of wooden joint have different properties making them suitable for making different types of products.



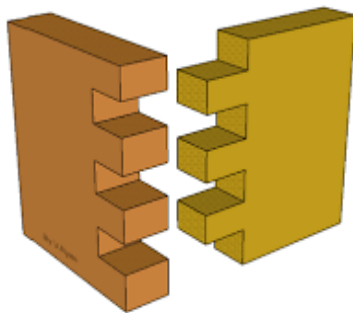
Lap joint

Quick and easy to make and high strength.



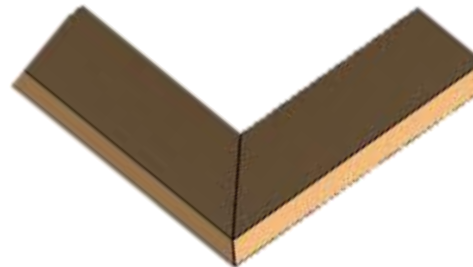
Dovetail

The strongest joint, it is interlocking, resists being pulled apart, looks attractive, and holds together even without glue.



Finger joint

Attractive and strong.



Mitre joint

No end grain shows, making for a more attractive joint.

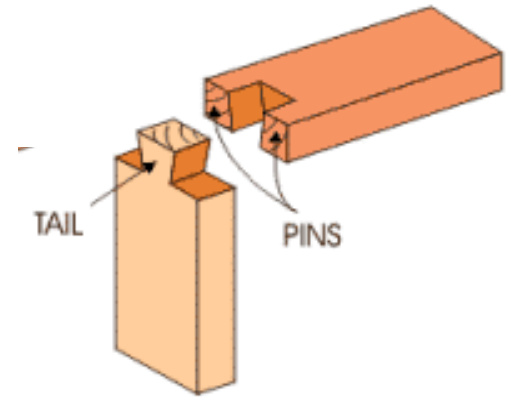


Why are dovetails used to joint timber

- Dovetail joints are noted for their **resilience to pull apart**, these finger-like joints between two pieces of wood enable a tight, strong, and long lasting fit.
- Dovetail joints require **no mechanical fasteners** to join them.
- There are two parts to a dovetail joint **tails** and **pins**. The tails look like the tail of a dove (hence the name). The pins are on the opposite board and fit in between the tails to create a joint that is impossible to pull apart in at least one direction.

- The **advantages** of using dovetail joints are:
- They are strong as they have a **large gluing area**, is **interlocking** and this resists being pulled apart and they can hold together even without glue.

- The **disadvantages** using dovetail joints are:
- They can be **fairly difficult to mark out** and cut, and if they are made badly these joints lose the advantages listed above.



Properties and uses of oak

Type of timber

- Oak is a **hardwood**

Properties

- It is **light in colour** but darkens with age
- It is **close grained** which makes it very strong but harder to work with as it blunts tools.
- It is very **durable** and **tough** making it resistant to knocks
- It is **long lasting** and is **resistant** to fungal attacks making it a good timber to use outdoors

Uses

- To make **high quality furniture**
- To make **timber framed buildings**
- Used in **boat building**
- To make **window frames** and **doors**



Properties and uses of teak

Type of timber

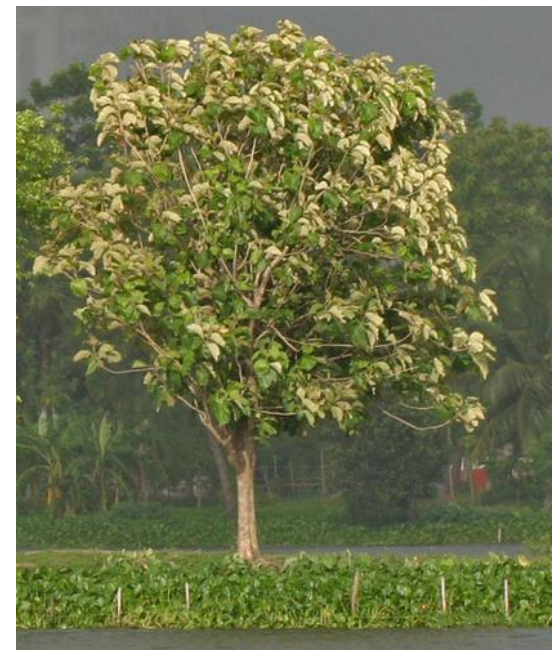
- Teak is a **hardwood**

Properties

- It is **darker in colour**
- It is **close grained** which make it good for carving and cutting joints accurately
- It is **Resistant** to rotting and to the effects of hot sun, rain, frost or snow, making it most suitable for outside.
- It is **very hard** so is not damaged easily
- It is has **good resistance to acid**

Uses

- To make **exterior furniture**
- For the **decks** on boats
- Used for the **tops of science benches**
- To make **window frames** and **doors**



Properties and uses of pine

Type of timber

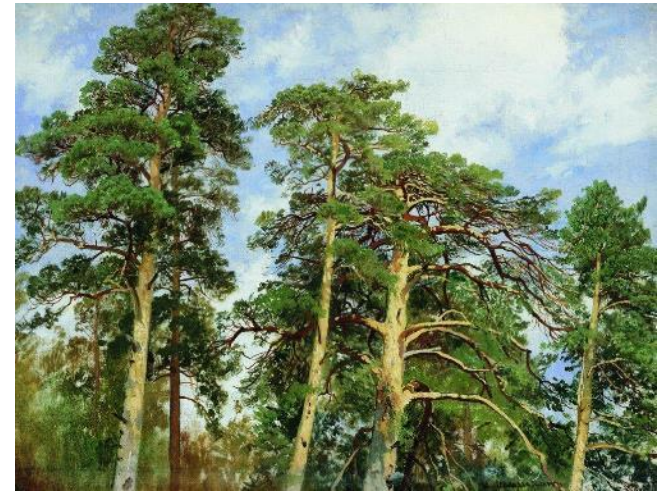
- Pine is a softwood

Properties

- It is **light and pale in colour**
- It is **more open grained** which make it easier to cut and work with
- It is **lightweight**
- It is **fairly strong** so can be used for furniture and joinery
- It is **does not last well outdoors** unless it is painted or treated

Uses

- To make **interior furniture**
- For **general building and construction work**
- Used for **decorative mouldings**
- To make **interior doors**



Laminated pine board

Pine laminated boards are made by **gluing sections of thin strips of pine together** to form a board

The boards come in **different widths** and **thicknesses**



Advantages of using laminated pine board

It is **more stable** the board is made up of sections of pine it is less likely to cup, warp or twist

You are **not limited** to the diameter of the tree

It has a **good quality surface finish** making it easy to paint or apply a finish to.

Disadvantages of using laminated pine boards

It only comes in **set thicknesses** so you are restricted to the thicknesses it is produced in

It is **harder to plane or chisel** as the grain may run in different directions

Uses

Used for **interior furniture** such a cabinets

Used for **shelving**

Used for **worktops**

