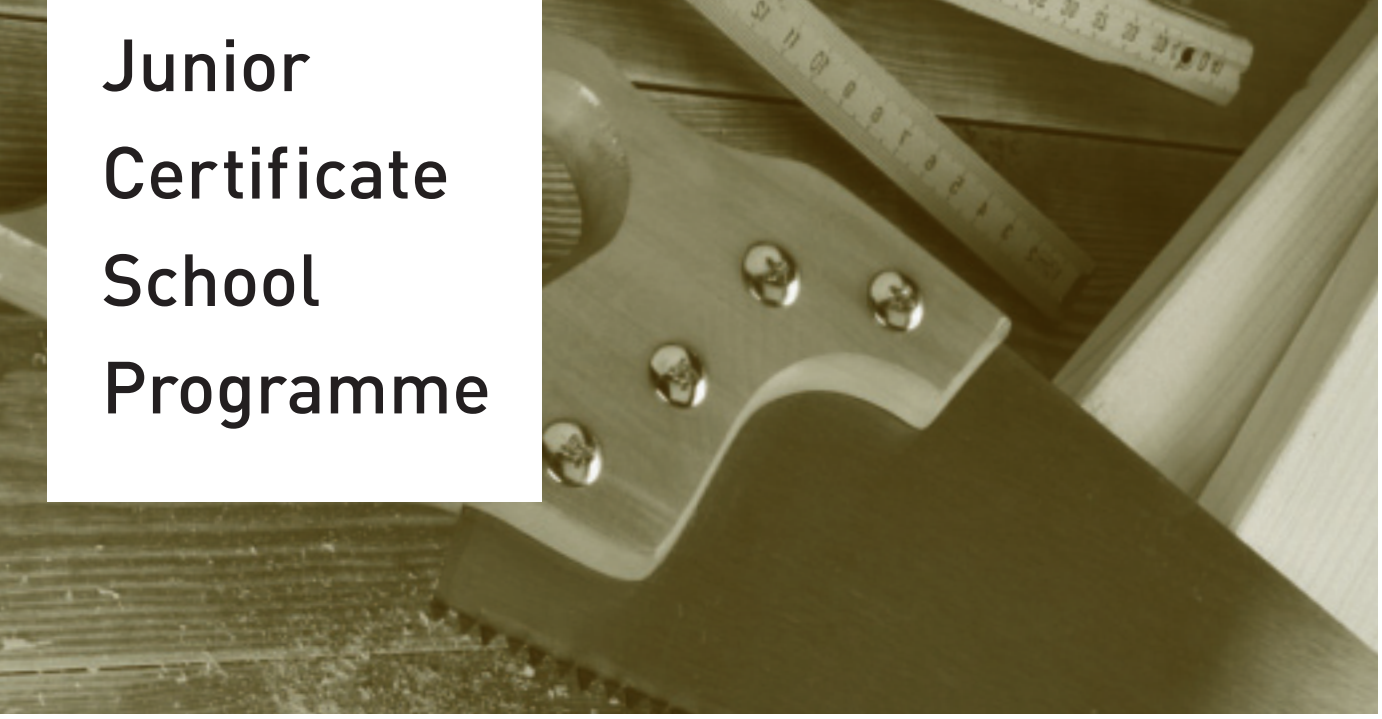
Junior Certificate School Programme



# Materials Technology Wood

Tom Ronayne & Liam O'Brien

Student Workbook 1

Statement code MTW2 Theory 1

An Roinn Oideachais agus Scileanna
Department of Education and Skills

PDST Professional Development Service for Teachers | An tSeirbhís um Fhorbairt Ghairmiúil do Mhúinteoirí

Junior Certificate School Programme

**Materials Technology Wood**
**Student Workbook 1**

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Written by Tom Ronayne and Liam O'Brien

Edited by Mary Clare Higgins

## LEARNING TARGETS

At Junior Certificate Level the student can:

### Display basic background knowledge of woodwork theory

# Theory 1

MTW

## Statement Code no: 2

Student: Name Surname

Class: Class

At Junior Certificate level the student can:

# Display basic background knowledge of woodwork theory

Date Commenced: D D / M M / Y Y

Date Awarded: D D / M M / Y Y

## Learning Targets - This has been demonstrated by your ability to:

| | | |
|---|---|---|
| 1 | List safety procedures in a workshop | ☐☐☐ |
| 2 | Label a simple diagram for hardwood (deciduous) or softwood (coniferous) trees | ☐☐☐ |
| 3 | Recognise at least three trees by their leaves | ☐☐☐ |
| 4 | Have a basic knowledge of the growth of trees | ☐☐☐ |
| 5 | Recognise four different manufactured boards | ☐☐☐ |
| 6 | Identify at least three common wood defects | ☐☐☐ |
| 7 | Identify and label the common hand tools and state their uses | ☐☐☐ |
| 8 | Identify and label four given power tools and describe their safe usage | ☐☐☐ |
| 9 | Identify other relevant materials and understand their safe usage (e.g. fabrics, metals, ceramics etc.) | ☐☐☐ |
| 10 | Identify four different methods of fixing and fastening | ☐☐☐ |
| 11 | Identify four common joints and state where they would be used | ☐☐☐ |
| 12 | Identify four different applied finishes and explain their use | ☐☐☐ |

**Refer also to:** English, Art, Maths, Materials Technology: Metal, Technical Graphics, Science

Work begun ☐☐☐ | Work in progress ☐☐☐ | Work completed ☐☐☐

# SAFETY

| Keywords | Safety | Rules | Procedures |
|---|---|---|---|

**Think Safety** for both yourself and others when you enter the Woodwork room. There are many potentially dangerous hand/power tools and harmful substances in this room. Follow the teacher's instructions at all times.

| | SAFETY PROCEDURES FOR OUR WOODWORK ROOM |
|---|---|
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| 11 | |
| 12 | |
| 13 | |

Target 2

# Label a simple diagram for hardwood (deciduous) or softwood (coniferous) trees

## PARTS OF A TREE

| Keywords | Crown | Trunk | Roots |
|---|---|---|---|

All trees have three main parts: **Crown, Trunk, Roots.**

### Crown

The tree's crown is made up of: **Branches, Leaves, Flowers & Fruit**

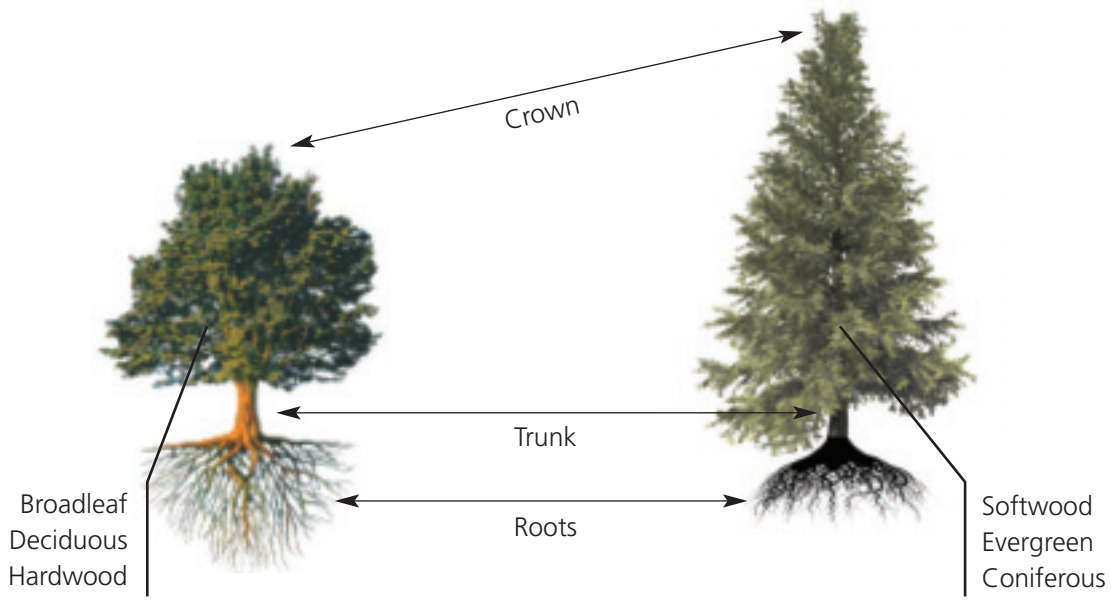
The branches support and spread the leaves allowing them to gather sunlight, which the tree needs to make its food.

### Trunk

The trunk of the tree supports its crown. It also allows minerals and water to be transported inside the tree. Timber is produced from the trunk.

### Roots

The roots anchor the tree in the ground. They also absorb water and minerals, which the tree needs to grow.



# TYPES OF TREES

| Keywords | | | | |
|---|---|---|---|---|
| | **Carbon Dioxide** | **Oxygen** | **Timber** | **Softwood** |
| | **Coniferous** | **Broadleaf** | **Evergreen** | **Hardwood** |
| | **Deciduous** | | | |

Trees are the largest type of plant, some reaching a height of 400 feet. Some live for centuries. Trees take **carbon dioxide** out of the air and produce **oxygen**. Trees also produce **timber** and fruits

Trees can be divided into two main types: **Coniferous** and **Broadleaf**.

## Coniferous Trees

Most **coniferous** trees have needle-like or scaly leaves and produce woody cones that contain their seeds. Many are pyramid shaped and almost all are **evergreen** - this means they keep their leaves all year round.
*EXCEPTION: The Larch Tree*

The wood from these types of trees is usually called **softwood**. Coniferous trees are also known as **evergreen** and **softwood** trees.

Softwood
Evergreen
Coniferous

Needle-like leaves and seed bearing cones

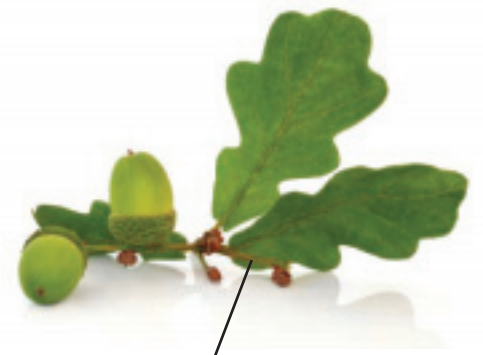
Target 2

# Label a simple diagram for hardwood (deciduous) or softwood (coniferous) trees

## Broadleaf Trees

Most broadleaved trees have flat wide leaves.
They produce flowers and fruits containing seeds.
They have an irregular shape and almost all are **deciduous**.
This means they lose their leaves in winter
*EXCEPTION: The Holly Tree*

The wood from these types of trees is usually called **hardwood**.
Broadleaf trees are also known as deciduous and hardwood trees.



Broadleaf & Seed-bearing fruits

Broadleaf Deciduous
Hardwood Winter

Broadleaf Deciduous
Hardwood summer

# Recognise at least three trees by their leaves

## BROADLEAF TREES

Oak

| Where from | Wood | Used for |
|---|---|---|
| Europe | Hard & heavy, very strong & durable | For superior joinery, external woodwork, furniture, flooring, boat building |

Beech

| Where from | Wood | Used for |
|---|---|---|
| Europe | Hard & heavy, liable to insect attack, not durable if exposed | Furniture, tools, bent work, turning |

# Recognise at least three trees by their leaves

## Horse Chestnut

*(The tree with conkers)*

| Where from | Wood | Used for |
|---|---|---|
| Europe | Light & soft, not durable | Turning, packing cases & pallets |

## Ash

| Where from | Wood | Used for |
|---|---|---|
| Europe | Very tough, elastic, liable to insect attack, not durable if exposed | Sports equipment, hurleys, tool handles, furniture, veneer |

# Recognise at least three trees by their leaves

## CONIFEROUS TREES

### Scots Pine (Red Deal)

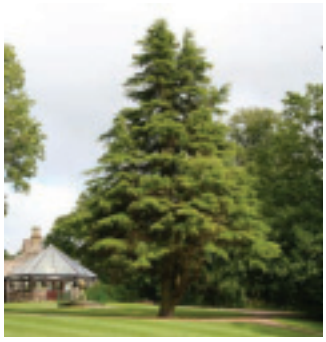
| Where from | Wood | Used for |
|---|---|---|
| Northern Europe | Soft, Fairly strong, durable, easily treated | Furniture, door frames, roof frames, flooring, |

### Larch

*(Only conifer that **does** lose its leaves in winter)*

| Where from | Wood | Used for |
|---|---|---|
| Europe | Fairly hard, heavy, strong, durable, tough | Doors, windows, floors, furniture, fencing |

# Recognise at least three trees by their leaves



## Yew

| Where from | Wood | Used for |
|---|---|---|
| Europe, Asia | Hard, heavy, strong, durable, tough, elastic, finishes well and acquires a natural polish. | Brushes, wood ware, parquet floors, bows, small furniture |

## Sitka Spruce (White Deal)

*(Most planted tree in Ireland)*

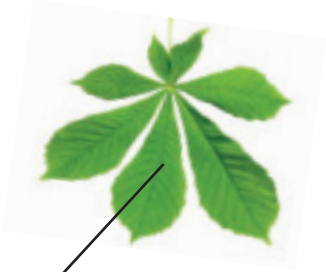
| Where from | Wood | Used for |
|---|---|---|
| Canada, USA | Soft,(easily damaged), light, strong, not durable outdoors, decays easily | Musical instruments, paper, boats, roofing, floor & ceiling joists, pallets |

Recognise at least three trees by their leaves

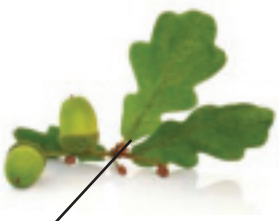
**Match the tree to the correct leaf:**

| Name | Number | Hardwood | Softwood |
|---|---|---|---|
| Ash | | | |
| Scots Pine | | | |
| Horse Chestnut | | | |
| Larch | | | |
| Yew | | | |
| Oak | | | |
| Beech | | | |
| Sitka Spruce | | | |

1.



2.



3.

4.

5.

6.

7.

8.

## TREE QUIZ

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D | O | W | P | O | R | S | X | T | V | B | M | S |
| E | B | E | B | L | A | R | C | H | Q | E | N | C |
| C | S | Y | O | C | M | P | O | S | R | E | O | O |
| I | F | H | A | Z | W | T | N | O | P | C | R | T |
| D | A | A | U | A | Q | B | I | R | C | H | I | S |
| U | D | D | C | S | P | I | F | T | G | F | L | P |
| O | A | K | I | H | R | S | E | U | H | E | M | I |
| U | U | K | D | F | F | I | R | V | B | D | Z | N |
| S | O | Y | X | T | L | K | I | P | O | R | U | E |
| X | Z | I | P | V | I | J | J | U | C | X | V | W |
| H | O | R | S | E | C | H | E | S | T | N | U | T |

## Find the following trees:

| | | | |
|---|---|---|---|
| **Scots pine** | **Birch** | **Horse Chestnut** | **Fir** |
| **Yew** | **Oak** | **Beech** | **Ash** |
| **Deciduous** | **Larch** | **Conifer** | |

**Make a list of the Broadleaf trees from the box above in the tree quiz:**

**Make a list of the Coniferous trees from the box above in the tree quiz:**

Target 3

## Recognise at least three trees by their leaves

**These types of trees have three names. What are they?**

1. _____
2. _____
3. _____

**These types of trees have three names. What are they?**

1. _____
2. _____
3. _____

## HOW A TREE GROWS

| Keywords | | | | |
|---|---|---|---|---|
| | **Germinates** | **Sapling** | **Carbon Dioxide** | **Cells** |
| | **Seedling** | **Photosynthesis** | **Oxygen** | |

When the **seed** of a tree **germinates** in soil it grows into a **seedling**, then a **sapling** or young tree.

The **sapling** needs food to grow - like all living things.

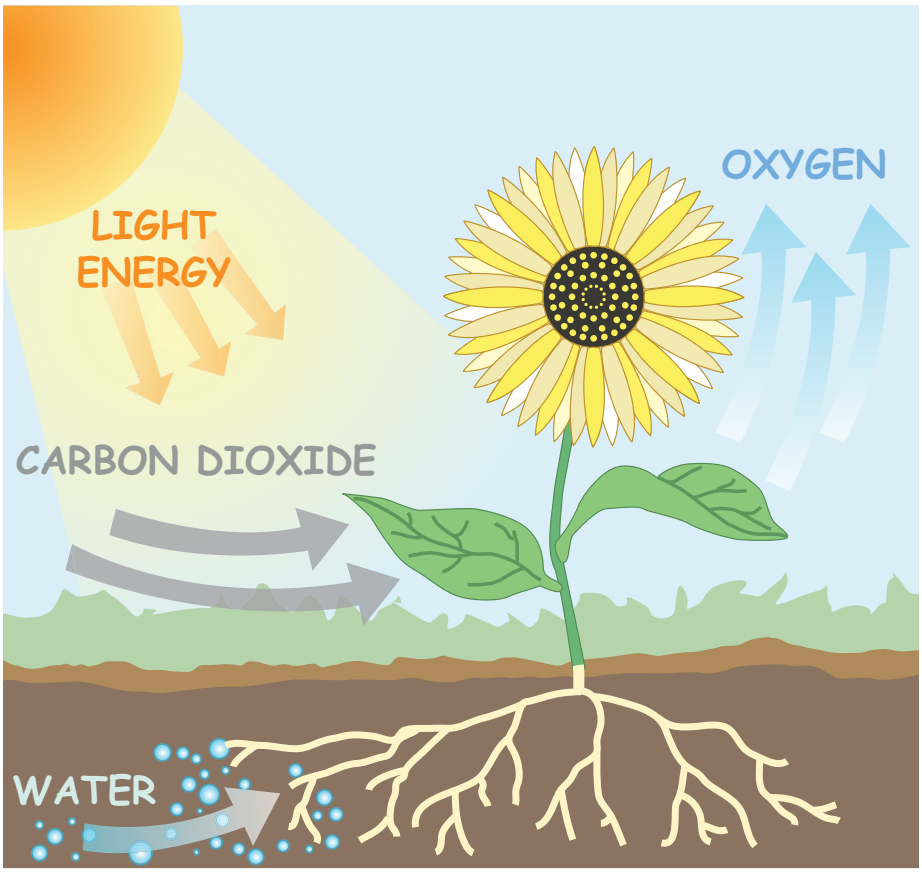
The roots of the tree draw water and minerals (as sap) from the ground up to the leaves.

**Sunlight** and **carbon dioxide** react with the water and minerals in the leaves to form glucose. The tree needs glucose to grow. This chemical reaction is called **photosynthesis**.

This takes place when sunlight and **carbon dioxide** are absorbed by the **green leaves**.

The food or glucose then travels through the branches to the growing **cells** just below the bark. **Oxygen** is also made during the process and it is needed by animals and humans to live.

We breathe in oxygen and breathe out carbon dioxide. This process also helps to reduce the greenhouse effect.



## STRUCTURE OF A TREE

| Keywords | | | | |
|---|---|---|---|---|
| | **Pith** | **Bark** | **Sapwood** | **Annual Rings** |
| | **Cambium Layer** | **Bast** | **Heartwood** | |

### Pith

The pith is the dead centre of the tree around which all growth takes place. It is the very first part of the tree to grow, during the sapling stage.

### Bark

This outer layer protects the tree from external damage.

### Bast (Phloem vessels) ↓

A thin layer under the bark in which the food the tree has made is carried down from the leaves to all growing parts of the tree.

### Cambium Layer (Xylem cells) ↑

This is where the growth takes place. These cells carry water and minerals from the ground up the trunk to the leaves.

### Sapwood

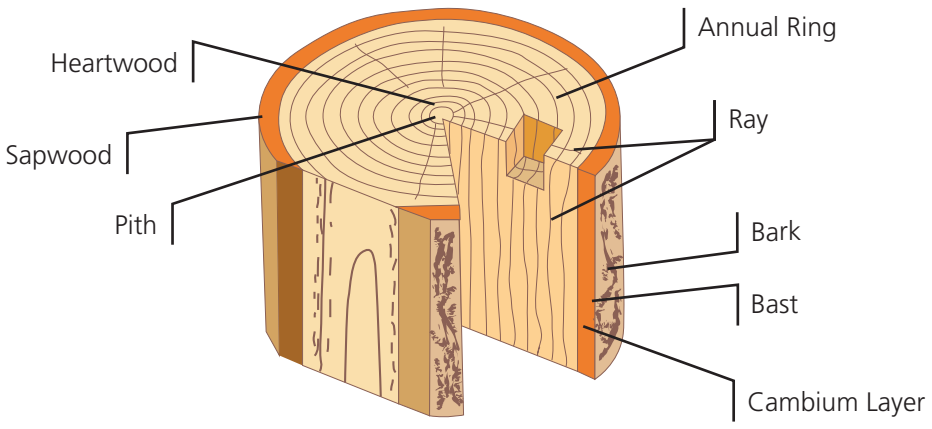
This is the new layer or ring of growth that is formed each year just under the bark. It is the living part of the tree. Mature sapwood becomes heartwood as the tree expands and grows.

### Heartwood

The heartwood is the inner and older part of the tree. It contains no living cells. It gives the tree rigidity and strength; it is also the main supply of timber.

### Annual Rings

These are formed as the tree grows and expands during its lifetime. Annual rings are made up of two bands, one from spring growth and the other from autumn growth. Counting the annual rings will give the age of the tree.




Horizontal Section of a Tree

## STRUCTURE OF A TREE

### Match the meanings in the table below:

| | |
|---|---|
| **1. Pith** | **A.** This is the new layer of growth. |
| **2. Bark** 2 B | **B.** This gives the tree rigidity and strength; it is also the main supply of timber. |
| **3. Bast** | **C.** This outer layer protects the tree from external damage. |
| **4. Cambium Layer** | **D.** These are formed as the tree grows and expands during its lifetime. |
| **5. Sapwood** | **E.** The dead centre of the tree around which all growth takes place. |
| **6. Heartwood** | **F.** A thin layer under the bark in which the food is transported. |
| **7. Annual Rings** | **G.** This is where the growth takes place. |

| Write each word and its meaning below. Match the numbers and letters | |
|---|---|
| 1. | |
| 2. | |
| 3. | |
| 4. | |
| 5. | |
| 6. | |
| 7. | |

## Write down the meanings of the tree parts:

Annual Rings

Sapwood

Pith

Cambium Layer

Bast

Bark

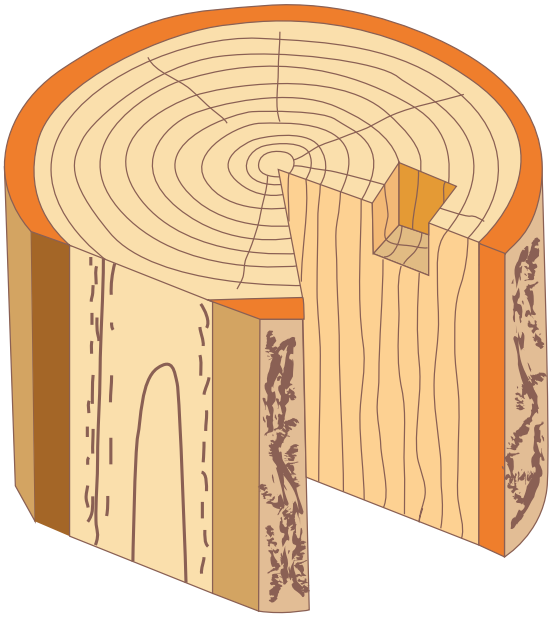
Heartwood

# Recognise four different manufactured boards

## Label the diagram using the words below:

Annual Rings  Sapwood  Pith  Cambium Layer

Bast  Bark  Heartwood



## Sketch the diagram in the box below and label it:

# Recognise four different manufactured boards

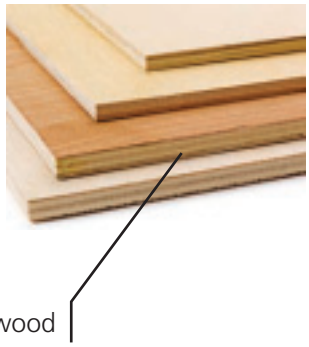
| Keywords | | | |
|---|---|---|---|
| | **Plywood** | **Exterior** | **Medium Density Fibreboard (MDF)** |
| | **Chipboard** | **Grain Direction** | **Hardboard** |

## DEFINITION OF A MANUFACTURED BOARD

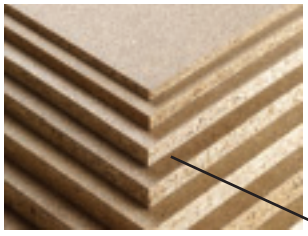
Manufactured boards are man-made from wood products. They are made in factories, not cut directly from trees.

There are many different types of man-made boards but we are only going to look at four. These are: **Plywood, Chipboard, Medium Density Fibreboard (MDF)** and **Hardboard**.

Man-made boards (sheets) come in lots of different sizes and thicknesses but the most common is 2440mm x 1220mm (8ft x 4ft)

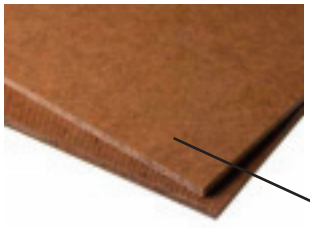


Plywood



Chipboard

Medium Density Fibreboard (MDF)



Hardboard

## PLYWOOD

| Keywords | | | | |
|---|---|---|---|---|
| | Shrink | Veneer | Softwoods | Boards |
| | Surface | Grain | Exterior | Warping |
| | Finishes | Hardwoods | Plywood | |

Plywood is made by gluing very thin pieces of wood together. These thin pieces of wood are called Veneers or Plys. They are glued one on top of the next, with the grain direction running at right angles to each other. There are always odd numbers (3,5,7,9, etc.) of veneers to stop the board from warping. The greater the number of plys the stronger the board.

Plywood is used in the making of furniture, in the building industry, in ship and boat building, in the making of musical instruments and in the toy making industry.

**Advantages of plywood**

- Plywood can be bought in large sheets, usually 2440mm x 1220mm (8ft x 4ft)
- It comes in a range of thicknesses from 3mm up to 25mm
- It does not warp or shrink easily.
- The surface of plywood is usually flat and smooth.
- It can be bought with many different surface finishes.
- It can be used instead of hardwoods and softwoods.
- There is an exterior grade of plywood for outdoor use.

**Disadvantages of plywood**

- The edges of plywood often need to be hidden.
- Surface veneers are often very plain.
- Surface veneers get damaged easily and are difficult to repair.

## CHIPBOARD

| Keywords | | | |
|---|---|---|---|
| | **Chipboard** | **Sheets** | **Solid** |
| | **Wood chips** | **Veneer** | **Timber** |
| | **Glue** | **Edges** | **Joints** |

Chipboard is a man-made board that is made by mixing wood chips and glue together. This mixture is then heated and pressed into sheets and dried.

The most usual size of a sheet of chipboard is 2440mm x 1220mm (8ft x 4ft)
Chipboard is often used in the furniture and the building industry. It can be used to make: Worktops; Kitchen presses; Bedroom units; Flooring; Furniture

**Advantages of chipboard**

- **Chipboard** can be bought in large sheets.
- The surfaces of chipboard can be decorated with **veneers** or other surface finishes
- It is cheap to buy
- It is available in many thicknesses

**Disadvantages of chipboard**

- **Edges** often need to be covered with **solid timber** or **veneer**
- Edges are easily split by **screws** or **nails**
- **Hinges** or other **fittings** may not hold when fitted to the edge of chipboard
- **Surfaces** and **edges** are often rough
- Chipboard is not strong. It breaks easily
- Chipboard is not suitable for use outdoors

## MEDIUM DENSITY FIBREBOARD (MDF)

| Keywords | | | |
|---|---|---|---|
| | **Medium Density Fibreboard (MDF)** | **Bond** | **Pressure** |
| | **Fibres** | **Glues** | |

**Medium Density Fibreboard** (MDF) is made from wood **fibres** mixed with **glues**. The mixture is put under pressure and heated.

MDF gets its strength from the special **glues** used to bond the **fibres** together under huge pressure. MDF is used in the making kitchen and bedroom cabinets; Cabinet doors and wall panels; In the making of shop fronts (exterior grade) and furniture.

**Advantages of MDF**

- MDF can be worked like solid wood
- It is quite strong
- It has a very smooth finish on each of its surfaces
- The surfaces take paint and other finishes easily
- Its edges are easily moulded by machine
- There is an exterior grade of MDF
- It is available in many thicknesses

**Disadvantages of MDF**

- Edges can be easily split by nails or screws
- Machining and cutting MDF for long periods may cause breathing problems. (Always wear a mask when cutting MDF)
- MDF edges need to be treated when finishing

## HARDBOARD

| Keywords | Hardboard | Pulp | Pressure | Water-resistant |
|---|---|---|---|---|

Hardboard is made by "cooking" softwood chips in special chemicals, at great heat, to turn them into wood pulp. The chemicals are then drained off and the pulp is then dried under huge pressure which produces hardboard. It is 3-4mm thick.

There are many types of hardboard. Standard hardboard is the most usual. It smooth on one surface only.

Hardboard is used on the backs of cabinets, drawer bottoms, under floor coverings, as wall panels and as panels in interior doors.

**Advantages of chipboard**

- It is easily cut
- It can be bought in water resistant sheets
- It can be bought in different colours
- There are lots of different types of hardboard
- No adhesive is used in the manufacture of hardboard

**Disadvantages of chipboard**

- It has little strength
- It breaks easily

# Identify at least three common wood defects

## WOOD DEFECTS

| Keywords | | | | |
|---|---|---|---|---|
| | Natural | Defects | Knots | Warping |
| | Artificial | Shakes | Cupping | |

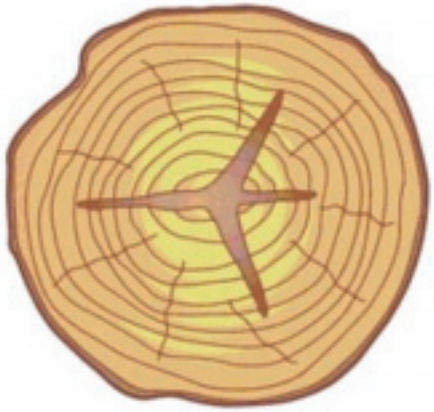
All trees are different: their shape, size and rate of growth will affect the quality of timber they produce. How and when the tree is cut down and stored also affects the timber quality. These factors can produce a number of **defects** in the timber.

Defects can be divided into two groups **NATURAL** and **ARTIFICIAL**. However, defects can occur on their own or in combinations.

## NATURAL DEFECTS

### Heart Shakes

These splits or cracks occur along the heart (middle) of the tree and occur due to the release of the internal tensions which develop in the growing tree before it is felled (cut down).



### Knots

Knots are formed as branches grow from the tree trunk. A knot is often seen as a defect because it can weaken the timber and is difficult to work. However, in some cases a knot can be decorative.

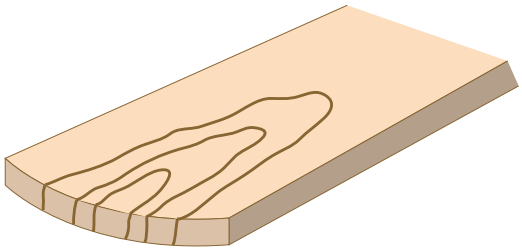
Interior door made from Scots Pine (Red Deal) showing many knots

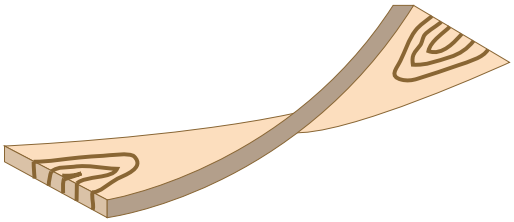
## ARTIFICAL DEFECTS

These types of defects can occur after the  tree has been cut into planks and left to dry.
As the timber dries it shrinks. This shrinkage is not even throughout the plank and causes the plank to change shape.

### Cupping

This is where the timber has shrunk across its width and the sides of the board turn up away from the pith during seasoning.





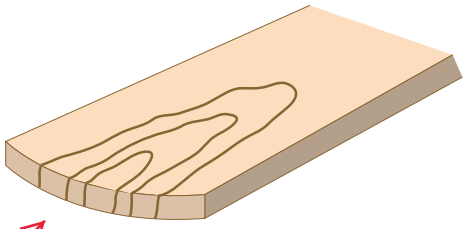
### Warping/Twisting

This is where a board warps or twists along the length of the board during seasoning.

## Draw an arrow to show which is which:

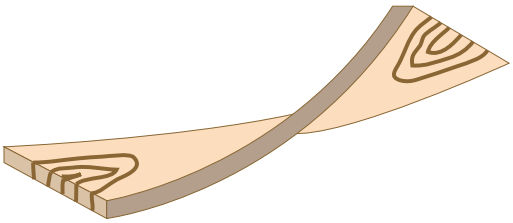
Warping

Heart Shake



Natural

Cupping



Artificial

Knots

# Identify at least three common wood defects

## Fill in the blanks:

A heart shake happens when

A knot is made by

Cupping means that the timber has

Warping means that the timber

A natural defect is

An artificial defect is

# Identify and label the common hand tools and state their uses

## HAND TOOLS

| Keywords | Steel Rule | Measuring Tape | Pencil |
|---|---|---|---|

### Measuring

The two most common tools used in the woodwork room for **measuring** are the **STEEL RULE** and the **MEASURING TAPE**.

In order to make good accurate work pieces it is very important to mark out your work piece correctly. The tools used for **measuring** are important pieces of equipment and must be looked after properly. They should not be used for anything else.

### The Steel Ruler

The steel rule is usually 300mm long in the woodwork room. The markings on the rule are either in millimetres (mm) or centimetres (cm). All measurements start at the square end of the rule.

**Measure and mark the following sizes on the lines below:**

(a)10mm (b) 12mm (c) 17mm (d) 29mm (e) 71mm

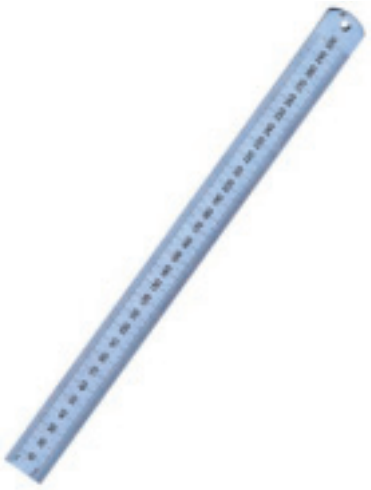
(a)

(b)

(c)

(d)

(e)



### The Measuring Tape

USE: The **measuring tape** is mostly used for long measurements. It is used for checking the overall sizes of large work pieces and for marking out on boards. It comes in different lengths.

*REMEMBER: MEASURE TWICE, CUT ONCE*

## Marking a work piece

| Keywords | | | |
|---|---|---|---|
| | **Marking** | **Face Edge** | **Waste** |
| | **Face Side** | **Measurements** | **Try Square** |

The two tools most used in the woodwork room for marking a work piece are the: **Pencil** and the **Try square**.

### The Pencil

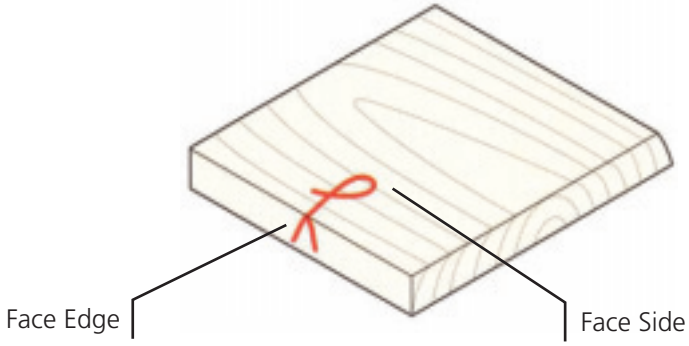
The pencil is the tool most often used in the woodwork room for marking a work piece.

There are lots of different types of **pencil** and the HB or H pencil are the best.

Remember always keep a nice sharp point on your pencil; it helps to mark out your sizes accurately.

Biros, ink pens and markers should not be used. Can you think of any reasons for not using them?

Marking a work piece involves selecting the **face side** and **face edge**. The face side and face edge are used for marking our measurements on.



## The Try Square

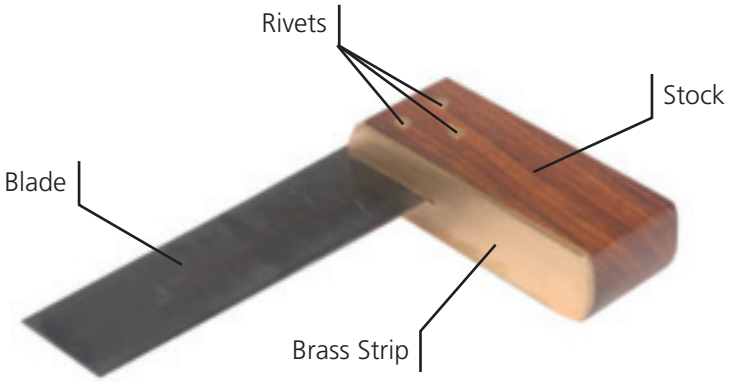
| Keywords | | | |
|---|---|---|---|
| | **Blade** | **Square** | **Brass Strip** |
| | **Stock** | **Right Angles** | **Rivets** |

The try square has three main uses:

1. It is used to check how **square** the piece of work is before and after shaping.
2. It is used as a straight edge to mark a line at a right angle to the face side and edge of the work piece.
3. It is used to check if timbers are square to each other where they meet.

Note: A Right Angle = 90 Degrees (90°)

*It is very important when using the try square that all of the stock edge is in contact with the work piece.*



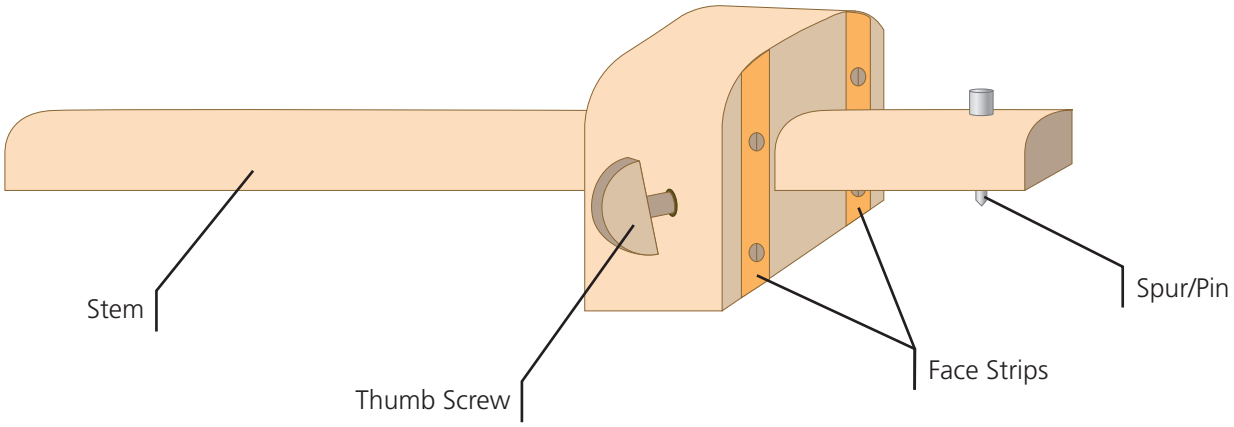

Checking timbers are square to each other

Marking a line at 90 degrees (90°) to an edge

## Marking Gauge

| Keywords | | | |
|---|---|---|---|
| | **Stem** | **Parallel** | **Spur/Pin** |
| | **Stock** | **Marking Gauge** | **Thumb Screw** |

USE: The **marking gauge** is used to mark a single line **parallel** to the edge of your work piece.




Using a marking gauge

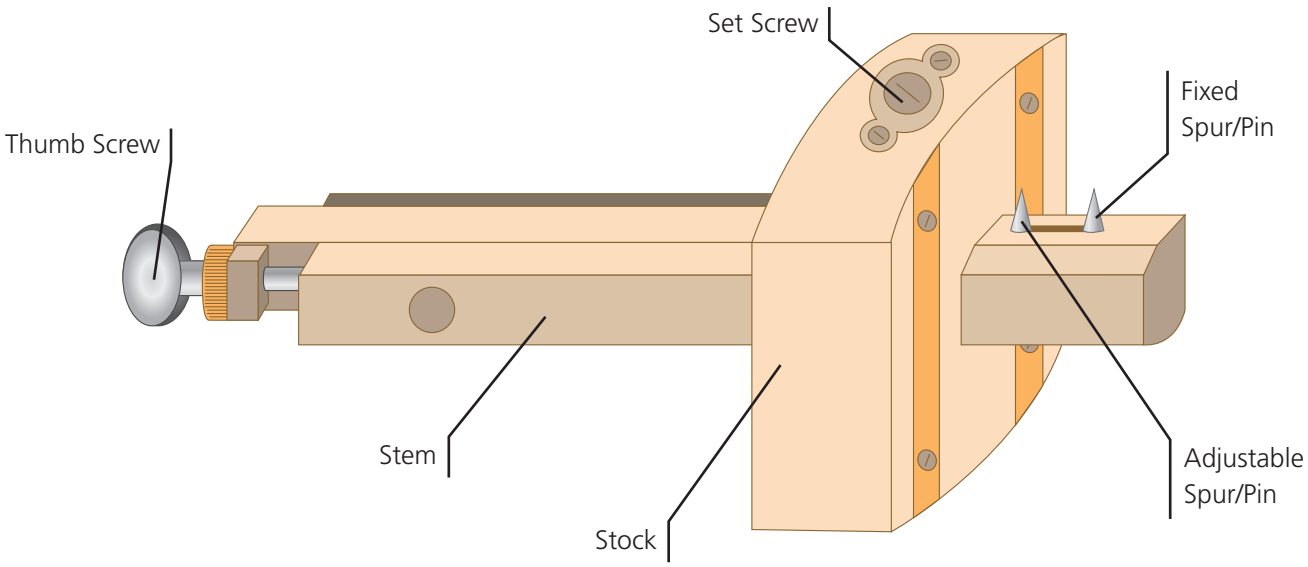
## The Mortise Gauge

| Keywords | | | |
|---|---|---|---|
| | **Stem** | **Parallel** | **Spur/Pin** |
| | **Stock** | **Mortise Gauge** | **Set Screw** |
| | | **Thumb Screw** | |

USE: The mortise gauge is most commonly used for marking mortise and tenon joints.

The **mortise gauge** has two **spurs / pins**. One is fixed (it does not move) and the other can be moved using a thumb screw, which slides the pin along the stem. The fixed spur is the closest spur to the end of the **stem**.

The mortise gauge is used to mark two parallel lines in line with the edge of a work piece. It is used in the same way as a marking gauge.




Note: Some mortise gauges have a third pin which allows it to be used as a marking gauge as well as a mortise gauge

**Sketch a Try Square here:**

Label the **stock, blade, rivets and brass strip**

A **try square** is used to check how s_____ a piece of work is.

## Sketch a Marking Gauge here:

Label the **stock, stem and spur/pin** and **thumb screw**

The **marking gauge** is used to mark lines _____ to the edge of your work piece.

**Sketch a Mortise Gauge here:**

Label the **stock, stem, fixed and adjustable spur/pin, thumb screw, set screw**

The **mortice gauge** is most commonly used for marking _____ and _____ joints.

## WOODWORKING HANDSAWS

| Keywords | Handsaw | Blade | Teeth | Kerf | Set |
|---|---|---|---|---|---|

**USE:** Handsaws are used for cutting wood metal or plastic.

A handsaw is a tool which has a metal blade with a lot of sharp V-shaped teeth. A handsaw blade can vary from flat and wide to narrow and thin. The size and shape of handsaw teeth differ a lot and depend on what the saw is to be used for.

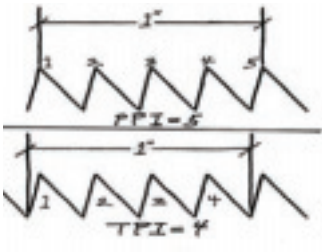
### Saw Care

You must take great care of saws because the teeth can be easily damaged. Blunt or damaged saw teeth will not cut properly and could cause you to have an accident.

### Saw Teeth

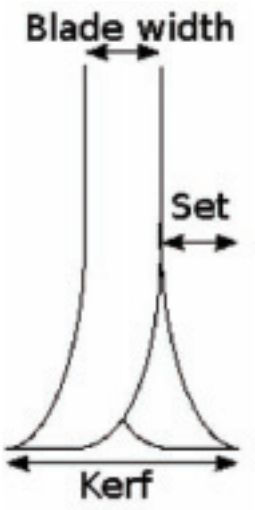
The number of teeth on a saw blade is very important when choosing a saw. The more teeth a saw blade has, the smoother but slower the cut.

The less teeth a saw blade has the rougher but faster the cut.




Saw teeth are measured in:
**Points Per Inch (25mm) (PPI)** or
**Teeth Per Inch (25mm) (TPI)**

A coarse tooth blade (2, 3 TPI) should be used for sawing wood up to 200mm wide or thick.




A fine toothed blade (18 to 32 TPI) should be used for thinner wood or plastics under 5mm.

On most saws the teeth are wider than the saw blade because the teeth are flared out sideways **(Set)**. This allows the blade to move through the cut easily without getting stuck. The width of a saw cut is called the **Kerf**.

## The Coping Saw

| Keywords | Coping Saw | Pull Stroke | Frame | Blade |
|---|---|---|---|---|
| | Teeth | Sighting Pin | Handle | |

**USE:** The **coping saw** is used to cut shapes and/or curves in thin pieces of wood. Its blade is very thin and is easily broken.

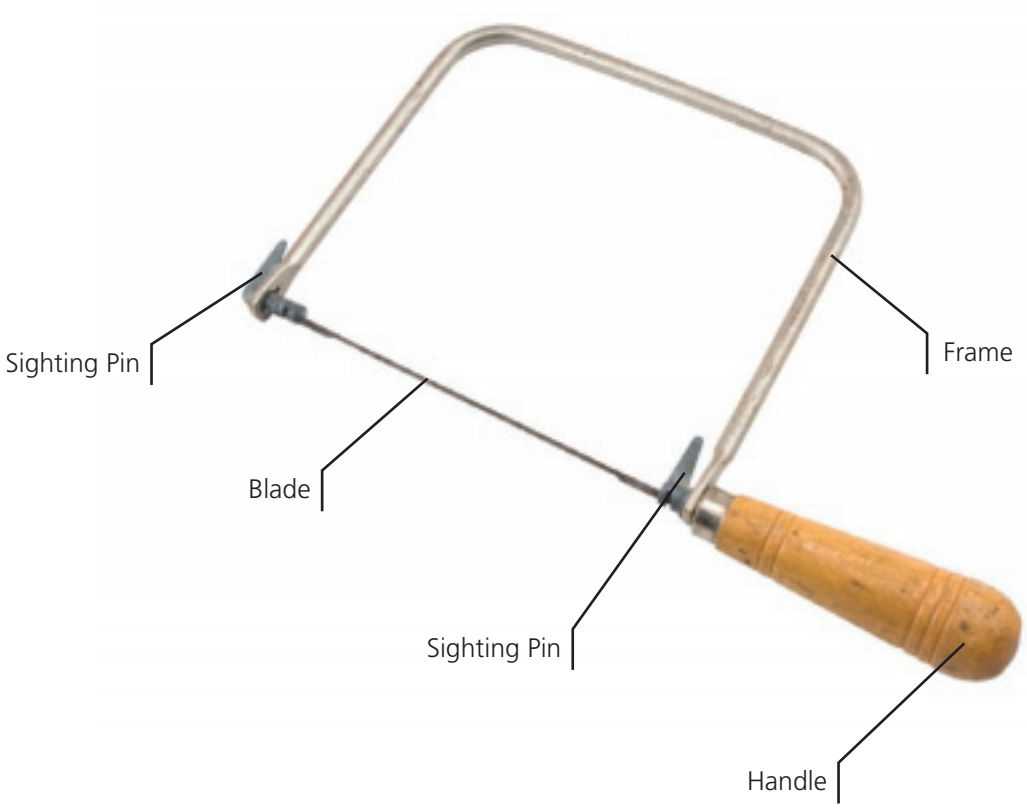
One difference between the **coping saw** and other saws is that it cuts on the **pull stroke**.

For the saw to cut on the pull stroke the **teeth** of the blade must point towards the handle. This helps to cut straight.

There are two **sighting pins**, one at each end of the blade. These sighting pins, must be kept in line with each other.

If the sighting pins are not in line this means that the blade will not cut straight and may snap.

A coping saw blade has from 14 to 17 TPI.



## The Tenon Saw

| Keywords | Bench Work | Handle | Tenon Saw |
|---|---|---|---|
| | Blade | Stiffening Rib | |

**USE:** The **tenon saw** is used for light **bench** work and cutting wood to length.

This saw has a **stiffening rib** along the length of the blade to help stop the blade from bending.

This also helps to make it easier to cut straight.

**Tenon saws** come with different lengths of **blade**.

A tenon saw blade has from 10 to 15 TPI

## The Panel Saw

| Keywords | Panel Saw | Manufactured Board |
|---|---|---|

**USE:** The **panel saw** is used to cut thin sheet material such as manufactured boards like plywood and chipboard.

It is also used to cut across the **grain** of larger / thicker timber.

A panel saw has from 10 to 12 TPI.

## CHISELS

| Keywords | | | | |
|---|---|---|---|---|
| | **Chisel** | **Paring** | **Bench** | **Mallet** |
| | **Chopping** | **Shaping** | **Vice** | |

There are many different types of **Chisels**. We will look at:

**The Bevel Edged Chisel**
**The Mortise Chisel**
**The Firmer Chisel**

A **chisel** is most often used for **chopping or paring** wood. Great care must be taken when using the chisel.

When **chopping**, the chisel is held in one hand while its handle is struck with a **mallet** held in the other hand. The handle of a **chisel** can be made from plastic or wood.

**Paring** is removing small amounts of waste wood from the work piece.

**Chisels** come in many different sizes and can be bought with blades from 3mm to 40mm wide. The most common in the woodwork room are 6mm, 10mm, 12mm, 18mm and 25mm.

### SAFETY:

Both hands must be kept behind the **cutting edge** of the **chisel**. The work piece should be held in a **vice** or clamped to the **bench**. Always work with the chisel facing away from your body.

# Identify and label the common hand tools and state their uses

| Keywords | Bevel edged | Firmer | Mortise | Chisel |
|---|---|---|---|---|

## The Bevel Edged Chisel

**USE:** This **chisel** is used for removing waste wood from **trenches** and for **paring**. The **bevel** (sloping side) on this **chisel** allows it to get into difficult corners.

## The Firmer Chisel

**USE:** It is used for general paring of timber, making housings and for light chopping.

This **chisel** does not have **sloping sides**.

## The Mortise Chisel

**USE:** This chisel is used for chopping out mortises and for heavy duty work.

The blade of this chisel is thicker and stronger than the blade of other chisels. This helps to prevent the chisel breaking at the neck, while chopping out a mortise.

The handle often has a metal ring/ferrule at the top and bottom. This helps to prevent the handle from splitting when hit with a mallet. A leather washer acts as a shock absorber and also to prevent the handle from splitting.

## Mallet

| Keywords | Assemble | Joints | Mallet | Beech |
|---|---|---|---|---|

**USE:** The **mallet** is used to strike the **chisel** handle when chopping out waste timber from the work piece.

It is also used to tap pieces together or take apart pieces which are tightly jointed. When using the **mallet** to **assemble** or take apart **joints** always put a **scrap** piece of wood on top of the work piece for the mallet to strike so that you protect your work piece.

The **mallet** is usually made of wood (Beech) but can also be made from soft metals, rubber, plastic, and rawhide. It should not be used to strike metal objects, as this will damage it.

## HAMMERS

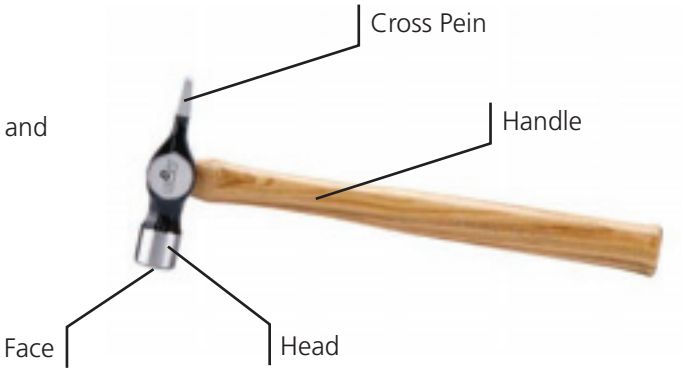
| Keywords | | | |
|---|---|---|---|
| | **Claw** | **Wedge** | **Cross Pein** |
| | **Driving** | **Handle** | **Hammer** |

There are many different types of hammers. We will look at the **Warrington hammer** and the **claw hammer**.

**USE:** The **hammer** is used for **driving** or hammering nails, pins and wooden wedges home.

### The Warrington Hammer

As the lighter of the hammers it is used to drive panel pins and tacks. The **cross pein** is used for striking short pins.




### The Claw Hammer

**USE:** The **claw hammer** can be used to pull nails out of timber as well as **driving** them in.

The head of the claw hammer is held in place by steel **wedges**, which will help stop the head from coming off the **handle** when pulling nails. The **handle** can be made of wood or steel. The claw is used to pull nails out of timber


## WOOD PLANES

| Keywords | | | | |
|---|---|---|---|---|
| | **Shavings** | **Plane** | **Try Plane** | **Smoothing plane** |
| | **Finish** | **Bench Plane** | **Jack Plane** | |

**USE:** A **plane** is used to remove unwanted timber in the form of **shavings** from the work piece in order to get an even surface or **finish**.

There are many different types of plane and each is designed to do a particular job.

Planes can be divided into two main groups: **Bench Planes** and **Special Planes**.

### Bench Planes

We will look at the **jack plane** and the **smoothing plane**

*Bench planes must always be kept on their sides when not being used. This prevents the blade from being damaged.*

### *Jack Plane*

A **jack plane** is a large, hand-held woodworking tool designed to allow its user to plane the surface of wood and to remove large quantities of wood in a single pass.

It varies in size from 355mm to 380m in length.

**USE:** It is used mostly for rough shaping of boards and can remove heavy shavings in each pass. Its blade width is from 45mm to 50mm.

### *Smoothing Plane*

The **smoothing plane** is smaller in length than the jack plane – typically 240mm -250mm long, with a blade width of around 50mm, and is usually the last plane to be used to finish the surface of your wood.

**USE:** Many craftsmen will use the smoothing plane as the tool which gives the final finish on their work. Indeed, some people use such a fine cut on their final pass with their smoothing plane that it is more of a polish than a cut!

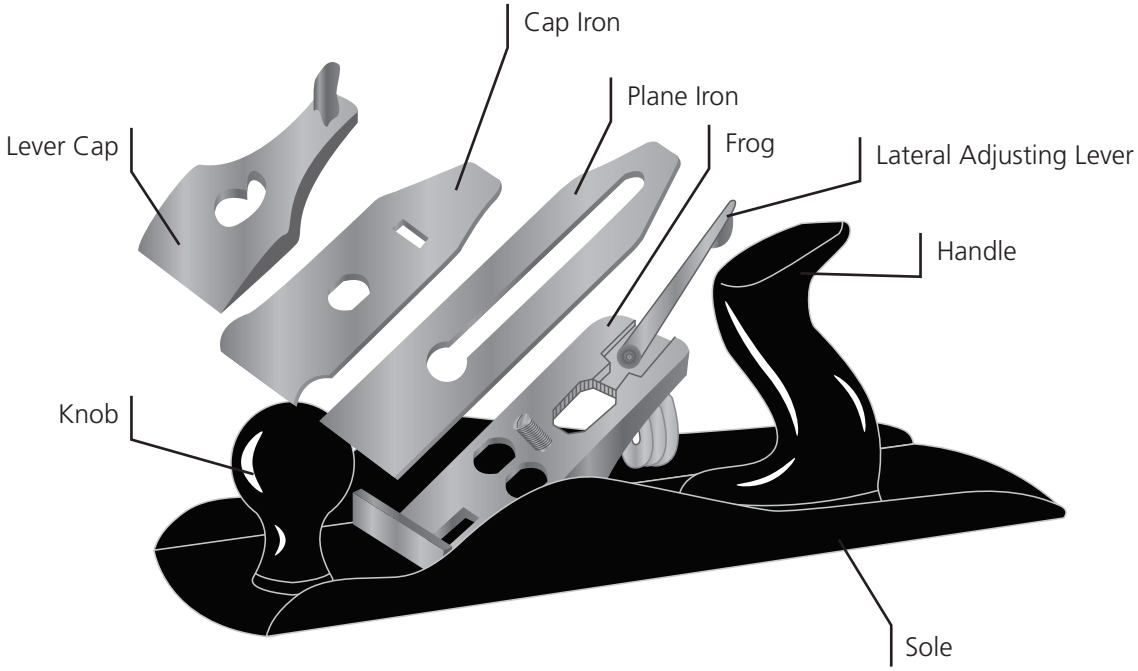
355mm to 380mm

240mm to 250mm

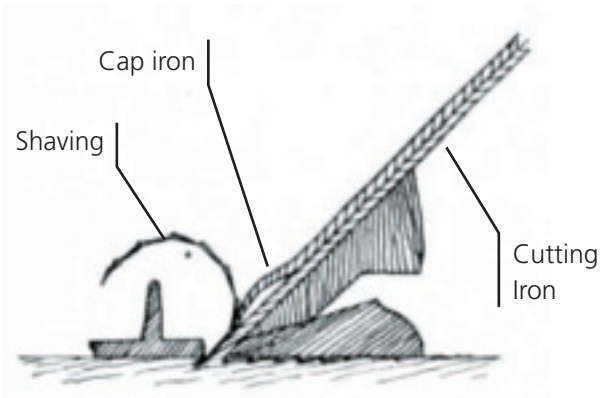
# Identify and label the common hand tools and state their uses

*Parts of a Bench Plane*

| Keywords | Lever Cap | Cutting Iron | Sole |
|---|---|---|---|
| | Cap Iron | Handle | |




The cutting assembly of a bench plane is made up of the **Cap Iron** and the **Cutting Iron**. These are held together by the **Lever Cap**.




**Cutting Iron:** This is the part of the plane that has the blade. The blade must be razor sharp to give a smooth finish.

**Cap Iron:** The cap iron is attached to the cutting iron with a screw, which must always be kept tight to stop shavings entering between them. The closer the cap iron is to the edge of the blade the finer the shavings will be. The cap iron has a curved front edge and it is this that makes the shavings curl as you plane the wood.

**Lever Cap:** This is a quick release metal plate that keeps the cap iron and cutting iron in place.

## Special planes

There are many special planes. These planes have been designed for a specific purpose and most of the work they do can be done by a router (see page 50). The special planes we will look at are: **Block Plane, Rebate Plane, Plough Plane, and Spokeshave**

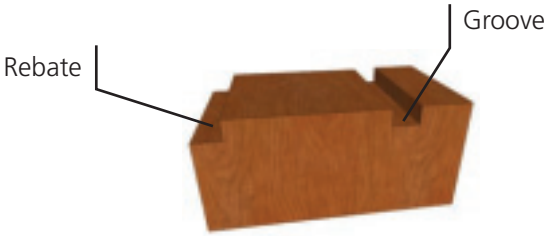
### *The Block Plane*

A **block plane** is similar to a bench plane but much smaller. It has the cutting iron set at a low angle, with the bevel up. It is typically small enough to be used with one hand.

**USE:** A block plane is most often used for planing end grain. It is also used for very light planing, for planing small work and for finishing wood joints.

### *The Rebate Plane*

**USE:** The **Rebate Plane** is a plane that is used to plane a rebate or step on the edge or end of a piece of timber. The height and width of the rebate are set by adjusting the side fence and/or the depth stop.

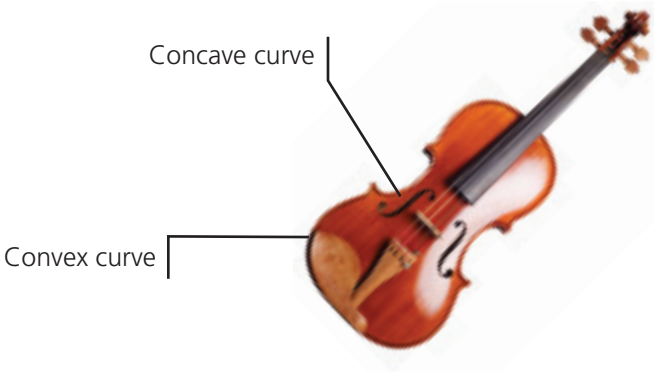



### *The Plough Plane*

**USE:** The **Plough Plane** is a plane that is used to cut or plough a groove along the grain in timber. A wide range of blades can be used for cutting grooves of different sizes.

### *The Spokeshave*

**USE:** A **Spokeshave** is a plane that is used to plane or smoothen curved wooden surfaces. There are two main types of Spokeshave which are used to shape **Concave** (internal) and **Convex** (external) curves



## WOODWORK BENCH AND BENCH EQUIPMENT

### Woodwork Bench

Most work in a woodwork room is carried out on the woodwork **bench**. Some benches have storage lockers for tools. Benches are usually made of pine and have two woodwork vices, one on each side.

Always keep your bench clean and tidy. *It is your workspace.*

### Bench Vice

The **bench vice** is usually made of metal and is fixed to the bench.
**USE:** It is used to hold wood steady while working it.

### Bench Hook

**USE:** The **bench hook** is used by the woodworker to hold wood steady while cutting it.

It is held tightly in the vice to stop it from moving while the timber is cut. It also protects the top of the bench from being damaged by saw cuts.

## HOLDING TOOLS

### G Cramp

The **G cramp** is a holding tool that gets its name from its shape.

**USE:** It is used to press pieces of timber together while being worked or when pieces of timber are being glued together. Always protect your work piece from being damaged with a piece of scrap wood.

### Sash Cramp

**USE:** The **sash cramp** is used to cramp wood when gluing up frames or panels

### Other Cramps

There are hundreds of other types of cramps and they are all used to hold or squeeze wood together.

# POWER TOOLS

**Power tools** allow us to get jobs done more quickly. **Power tools** are defined as tools that use a form of power such as electricity, battery or air to drive the tool.

Most of the **power tools** that we will use in the woodwork room use mains electricity or battery (cordless power tools).

**Cordless power tools** have a number of advantages over corded (plugged into the mains) power tools.

- They can be used anywhere once the batteries have been charged.
- There are no trailing leads, so there is no danger of being electrocuted.

Great care must be taken when using all power tools.

*ALWAYS FOLLOW THE GIVEN INSTRUCTIONS FOR THE POWER TOOL THAT YOU ARE USING*

## The Power Drill

| Keywords | | | |
|---|---|---|---|
| | **Hammer Action** | **Variable Speed** | **Cordless** |
| | **Reverse Drive** | **Chuck** | |

The power drill is the most common of all the **power tools**. The **drill** is available as a **corded** and/or **cordless power tool**.

**USE:** The **drill** is used to bore holes in wood, brick, metal and other materials. The cordless drill is often also used as a power screwdriver.

Other features some drills will have are:

- Hammer action
- Variable speed
- Reverse drive

All drill bits and screw driver bits are held in the chuck.

**SAFETY:** Always follow the makers instructions when using these machines


## The Orbital Sander

| Keywords | Orbital Sander | Sander | Abrasive Paper | Jigsaw |
|---|---|---|---|---|

**USE:** The **orbital sander** is a power tool that is used to sand timber.

Abrasive-paper is fixed onto the rubber pad. This pad will vibrate when the **sander** is switched on.

The **abrasive paper** can be changed, depending on the finish required. Some sanders are fitted with dust bags.

## The Jigsaw

**USE:** The **jigsaw** is a power tool that can be used for cutting wood, light metals, plastic etc. The blade is held **vertically** in the tool, it has an up and down **motion** when the tool is switched on. The blade is replaceable.

The advantages of the **jigsaw** are that it can be used to make straight cuts and to cut **irregular shapes** from sheet material. This power tool is also available as a cordless power tool.

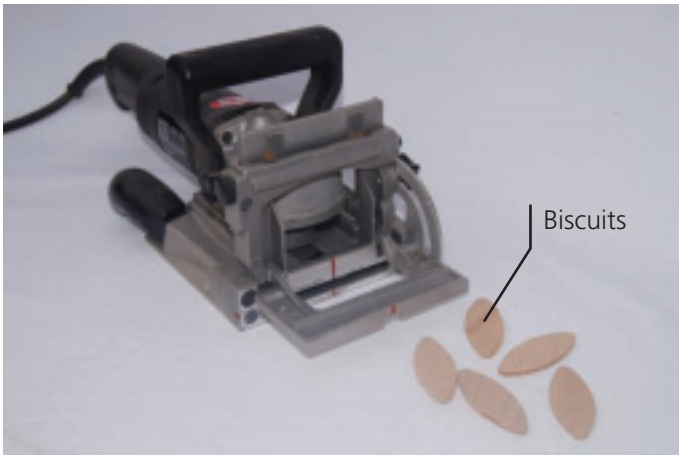
The blade in a jigsaw should be replaced when worn or damaged. There are many different types of blades available:- Blades that are coarse or fine, blades that cut wood or metal.

## Biscuit Joiner

| Keywords | | | | |
|---|---|---|---|---|
| | **Biscuit Joiner** | **Oval** | **Rotary** | **RPM** |
| | **Biscuit** | **Router** | **Cutter** | |

A **biscuit joiner**, is a woodworking power tool used in joining pieces of wood together. A biscuit joiner is ideal for joining wood together at corners as well as for joining wood edge to edge such as for a table top.

**USE:** A biscuit joiner is used to cut slots into the wood to be joined and then a plywood biscuit is inserted between the glue-coated slots to create a secure joint. The plywood biscuits are oval in shape and fit into the slots cut by the biscuit joiner. They hold the joint together with the help of woodwork glue. The joint must be clamped while the glue sets.




## Router

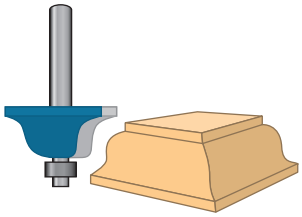
**USE:** A **router** is a high speed rotary cutting tool. It is most commonly used to cut grooves, create decorative edges on wood, or to hollow out areas.

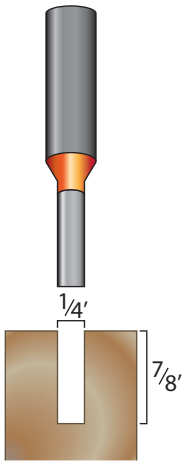
The router uses the edge of its cutting bit, which rotates at speeds of approximate 25,000 to 30,000 RPM to produce a smooth cut.

Variable speed routers can typically be adjusted to rotate at speeds of 10,000 RPM to 30,000 RPM.

Router bits come in various sizes and shapes depending on the hardness of wood or other material to be cut, and the type of cut desired.

The router bit can be raised or lowered to suit the depth of cut required.





# PROPERTIES OF MATERIALS

Wood is the main material used in the woodwork room but there are many other materials that are used either along with or instead of wood. They include **metals**, **plastics**, **ceramics**, **leather**, **fabrics**, **rubber**, **glass** etc.

It is important to know about the properties of any materials that you might want to use. Some of the words used to describe properties of materials are: **hardness, strength, toughness, absorbency, elasticity, waterproof, insulation, thermal insulation, electrical insulation.** There are many more properties of materials.

| | |
|---|---|
| **Hardness** | A materials resistance to scratching and pressure. Hardwood does not mark as easily as softwood. |
| **Strength** | The ability of a material to resist breaking when a force such as pushing or pulling down on it is applied. |
| **Toughness** | Toughness measures the energy required to crack or break a material. It is important for things which suffer impact such as a mallet. |
| **Elasticity** | A material's ability to return to its original shape when a force is removed e.g. rubber band. |
| **Plasticity** | A material's ability to be easily shaped or moulded. e.g. Plasticene, pottery clay and acrylic. |
| **Absorbency** | Ability of a material to soak up a liquid. |
| **Waterproof** | Resistance to liquids. Repels water. |
| **Insulation** | Insulation stops the flow of heat or electricity. |
| **Thermal insulation** | A material's ability to reduce the rate of heat transfer. e.g. Attic insulation. |
| **Electrical Insulation** | The ability of a material to resist the flow of electric current e.g. Plastic coating on electric cables. |

## Fabrics

| Keywords | | | | |
|---|---|---|---|---|
| | **Fabric** | **Man-made** | **Wool** | **Plant Cotton** |
| | **Fibres** | **Synthetic** | **Silk** | **Linen** |
| | **Natural** | **Animal** | **Leather** | **Regenerated** |

**Fabric** refers to any material made through weaving or knitting of fibres that may be used in the production of further goods (garments, etc.). **Fibres** are long thin pieces of a natural or artificial substance, similar to a thread or hair in shape. There are two types of fibres. **Natural** or **Man-made**.

**Natural fibres** come from both animals and plants.

**Animal fibres** include: *Wool* - Fibres from animal coats: Sheep, goats, rabbits.
*Leather* - Animal hide or skin.
*Silk* - Fibres from the cocoon of the silkworm

**Plant fibres** include: *Cotton* - Fibres from the cotton plant's seed pod.
*Linen* is a textile made from the fibres of the flax plant.

**Man-made fibres** are made by man from chemicals. They do not exist in nature.
There are two types of man-made fibres:
*Synthetic fibres* are made from coal, oil and/or chemicals.
*Regenerated fibres* are made from plant materials but they have chemicals added.

| | Fabric | Properties | Uses |
|---|---|---|---|
| **Natural Fibres** *Animal Fabric* | Wool | Wool is hard wearing, elastic, comfortable, absorbs water. | Coats, blankets, toys, clothing, insulation, carpets. |
| | Leather | Flexible, extremely durable, does not tear easily, is lightweight. | Sporting goods, coats, bags, belts and shoes |
| | Silk | Is the strongest natural fibre, very comfortable, absorbs moisture, cool to wear in summer. | Blouses, dresses, scarves, pants, ties |
| **Natural Fibres** *Plant* | Cotton | Natural resource that is fully renewable, strong and durable, soft and comfortable. | Blouses, shirts, shorts, jackets, pants. |
| | Linen | Two to three times as strong as cotton, quite stiff and wrinkles easily, absorbs moisture and dries quickly. | Dresses, Suits, Coats, Shirts, Children's wear, Bed sheets |
| **Man-Made Fibres** *Synthetic* | Polyester | Inexpensive; superior strength and resilience; lightweight; has an unusually high melting point. | All types of clothing, bedspreads, sheets, pillows. |
| | Acrylic | Quick drying to move moisture from body surface, Easily washed, retains shape, Resistant to moths, oil, and chemicals. | Sweaters, socks, sportswear, children's wear, Blankets. |
| | Nylon | Exceptionally strong, Elastic, Easy to wash, Can be pre-coloured or dyed in wide range of colours. | Clothes, raincoats, cyclewear, windbreakers, swimwear |
| **Man-Made Fibres** *Regenerated* | Acetate | Luxurious feel and appearance, Wide range of colours, soft, fast drying, Shrink, moth and mildew resistant | Blouses, dresses, wedding clothing, home furnishings |
| | Viscose | Greater elasticity than cotton & linen, Creases easily, Good conductor of heat, One of the most absorbent of all textiles, dyes easily. | Extremely thin continuous threads, clothing |

## Ceramics

Ceramics is anything made with clay. It is usually fired (in a kiln) to produce a hard and durable finish, such as bricks, wall and floor tiles, hand basins, and china.

Ceramic items are made by:

- Moulding wet clay into shape
- Placing the item in a kiln and fired to 1000° C
- Brushing on a ceramics glaze in the colour of your choice, allowing the piece to fully dry overnight at room temperature and fire the piece in the kiln again

### Properties of ceramics

- Hard but brittle (They break easily)
- Wear-resistant  (Very tough when glazed)
- Thermal insulators (High resistance to heat)
- Electrical insulators (Do not conduct electricity)

# JOINING WOOD TO WOOD

A wood joint is the intersection of two pieces of wood that are connected together. The connection may be made by fasteners, like screws or nails, by glue, by wood joints, or by any combination of these.

## NAILS

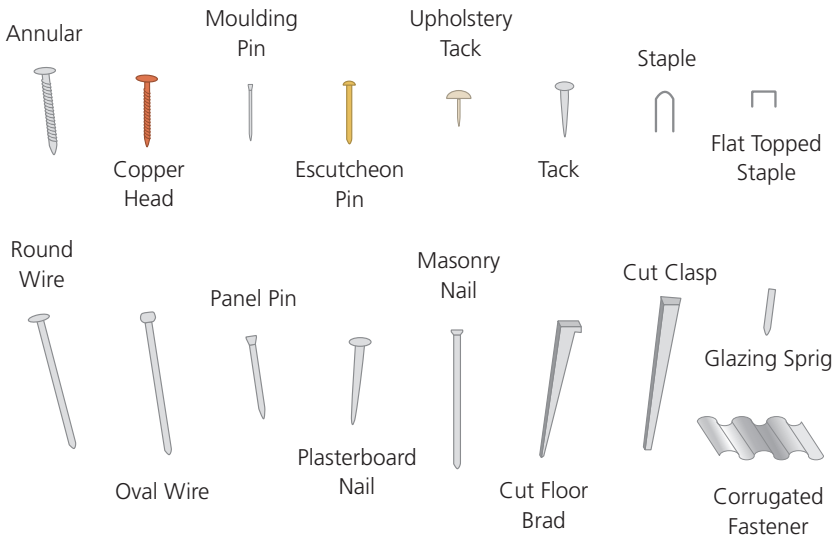
| Keywords | | | |
|---|---|---|---|
| | **Wire** | **Shank** | **Mouldings** |
| | **Oval Wire Nails** | **Nail Punch** | **Hammer** |
| | **Panel Pins** | **Nail** | |

Using **nails** is an easy and quick way to join pieces of wood together.

There are many different types and sizes of nails.

It is very important that you use the right type of nail for the job that you are doing.

Nails hold by friction. A nail driven into wood forces the fibres apart, and because of the very tight fit, the friction between the nail and the wood holds the nail in place. If the wood splits, which often happens particularly near the end of a board, there is little friction and therefore little holding power.




We will look at three types of nail: **Round Wire Nail; Oval Wire Nails; Panel Pins.**

### Round Wire Nail

These are used where strength is needed and where you don't mind how they look. They are often used when putting frames, floors or roofs together and in general carpentry work.

They have a big round head and can be bought in different lengths from 20mm to 150mm.

## Oval Wire Nails

This type of nail is oval in shape. There is a right way and a wrong way to nail them into wood.

These nails are less likely to split the wood when hammered in correctly. The head can be punched below the surface with a nail punch.

Oval wire nails can be used closer to the end or edge of a piece of wood than a round wire nail.

They are sold in lengths from 12mm to 150mm.

## Panel Pins

Panel pins have small heads and narrow shanks. They are used for pinning thin pieces of wood like hardboard and mouldings.

Their small heads allow them to be punched below the surface of the wood with a nail punch. They are sold in lengths from 5mm to 40mm.

## Nail Punch

A **nail punch** is used to drive the head of a nail or panel pin flush with or below a surface. It is usually struck by a hammer. Each nail punch has a shaped tip at one end whose diameter has to suit the **nail** or **pin** to be driven.

## SCREWS

| Keywords | Screws | Slot | Steel | Countersunk | Brass |
|---|---|---|---|---|---|

In woodwork, **screws** are mostly used to join wood to wood and also to join fittings such as hinges, locks, handles, etc. to wood.

Screws give about seven times the holding power of nails because they are threaded.

Screws are made from many different metals. Screws used in woodwork are mostly made from steel or brass.

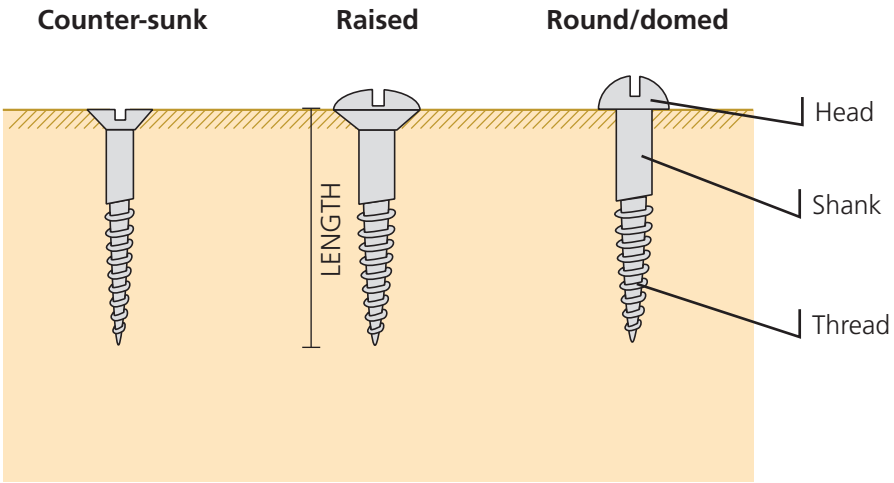

Screws used in woodwork have either a cross shaped slot in the head (use a **crosshead screwdriver** or a single slot in the head (use a **flathead** screwdriver).

Wood screws are classified by the type of drive used to screw tem in, the shape of the head and their length.

**Types of drive**. The two basic **drive** designs are single **slot** and **crosshead**. Crossheads are normally either '**Philips**' or '**Pozidrive**', these require specific types of screwdriver although a Philips driver can be used on Pozidrive screws. It is always important to use the correct size of screwdriver to ensure that the work piece and screw are not damaged.

### The Parts of a Screw

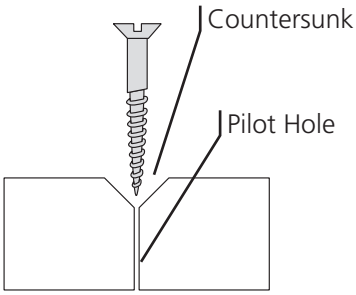
There are many different types of screws used in woodwork. **Countersunk**, **Raised Head**, **Round Head**, etc.



## The Countersunk Screw

The countersunk screw can have a slotted or crosshead head.

It is made in such a way that its head can be level with the wood surface when it is screwed in. (The screw hole must be countersunk with a countersink bit in a drill for this screw).





Countersink Bit

The countersunk screw is used for joining pieces of wood together and also for attaching fittings such as hinges, locks, handles, etc. when you don't want the head of the screw raised above the surface.

The size of a screw is determined by the thickness (**gauge**) of the shank. The gauge is always given as a number, from 0 to 20.

The smaller the gauge the thinner the screw, the bigger the gauge the thicker the screw.

There are six things that you need to know when you are buying screws:

1. How long the screw needs to be. (Length)
2. How thick the shank has to be. (Gauge)
3. The type of **head** you want. (Countersunk, etc.)
4. What the screw is to be made of. (Steel, etc.)
5. The type of drive required. (Crosshead, etc.)
6. The type of thread on the screw. (Chipboard, etc.)

If you go into a shop to buy a box of screws you might have to ask for a box of:
**25mm, number 6, countersunk, steel, crosshead, chipboard screws**

| 25mm | number 6 | countersunk | steel | crosshead | chipboard |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |
| Length | Shank | Head | Made of | Drive | Thread |

This is the type of screw you would get.

## FITTINGS

The main ways of joining wood to wood are by using metal or plastic **fittings** or by using **woodworking joints**.

| Keywords | | | | |
|---|---|---|---|---|
| | **Fittings** | **Butt Hinge** | **Catch** | **Concealed Hinge** |
| | **Hinge** | **Lock** | **Piano Hinge** | |

The fittings we will look at are; **Hinges; Knock-Down (KD) fittings; Locks; Catches**

### Hinges

Hinges are fittings that allow doors, gates or lids, etc. to be opened or closed while staying attached. The hinges we will look at are the **butt hinge** the **piano hinge** and the **concealed hinge**.

### Butt Hinge

The **butt hinge** is a very commonly used hinge in cabinet making and carpentry. They are usually the hinges fitted to doors in houses.

This hinge contains two leaves. One leaf is recessed into the door and the other into the door frame.

**Butt hinges** are mostly made from steel or brass and countersunk screws are used to fit them.

Butt hinges come in a range of sizes from 13mm to 150mm in length.

### Piano Hinge

The **piano hinge** is a long type of butt hinge. It is sold in 1830mm and in 2440mm lengths and is cut to the length required.

It is often used to hold the lids on **cabinets** and also to hold small doors on lockers etc.

It is fitted along the full length of the door or lid to which it is being fitted with countersunk screws.

Piano hinges are usually made from brass or brass coated steel.

# Identify four different methods of fixing and fastening

| Keywords | | | | |
|---|---|---|---|---|
| | **Cabinet** | **Adjustments** | **Surface** | **Knock-Down (KD) Fitting** |
| | **Secure** | **Lock** | **Mortice** | |

## Concealed Hinge

The **concealed hinge** is mostly used on doors in kitchen and bedroom units. They are hidden from view when the cabinet door is closed.

They are made of 2 parts: One part is the hinge cup and the arm which is fitted to the door; the other part is the mounting plate which is fitted to the frame of the unit.

An exact hole must be drilled into the door to fit the hinge cup.

This hinge allows for a lot of adjustments to be made to a door after it has been fitted.

The concealed hinge is very suitable for chipboard or MDF.

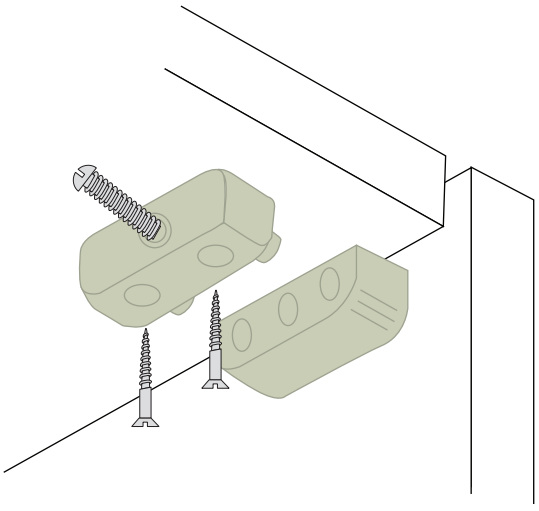
## Knock Down (KD) Fittings

Knockdown (KD) fittings are mainly used to assemble flat pack furniture or for assembly by the user. They are used within kitchen units or self-assembly furniture. Knockdown (KD) fittings are often fittings which can be joined together with one screw or bolt.

Most KD fittings are cheap and are quick and easy to use.

They are usually made from plastic or metal.

There are many types of Knockdown (KD) fittings.



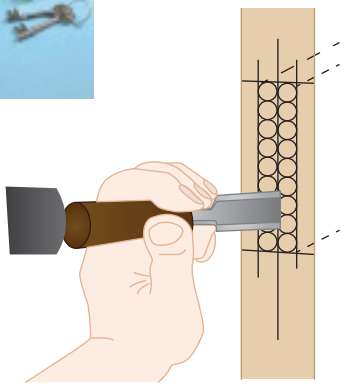
# Identify four different methods of fixing and fastening

## Locks

A **lock** is a fitting that can be used to keep doors, drawers, etc. closed and **secure**.

They can be fitted onto the surface (**surface mounted lock**) or fitted into the edge (**mortice lock**) of a door or drawer.

The **mortice lock** fits into a mortice that has been 'cut out' of a timber door edge. The locking action is achieved by a bolt that shoots out of the lock into the striker plate on the door frame when the key is turned.

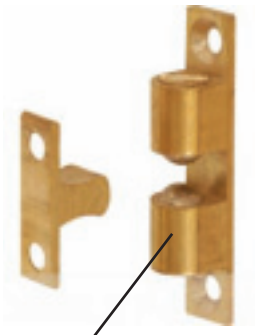


## Catches

A catch or bolt is a fitting that is used to keep doors, drawers, etc. closed but not secure.

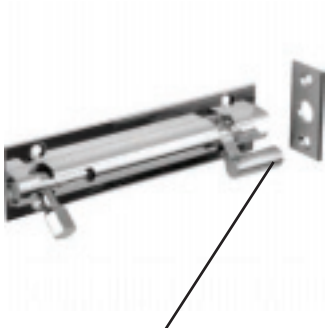
There are many types of catches and bolts. The ones most commonly used in the woodwork room are; **the twin roller catch; the twin ball catch; the magnetic catch and the furniture bolt.**

Twin Roller Catch



Twin Ball Catch

Magnetic Catch



Furniture Bolt

# WOOD JOINTS

| Keywords | | | |
|---|---|---|---|
| | **Butt Joint** | **Dovetail Halving Joint** | **Bridle Joint** |
| | **Cross Halving Joint** | **Finger (Box) Joint** | **Tee Halving Joint** |
| | | **Mortice and Tenon Joint** | |

In order to make a successful woodwork project it is essential to know the right joint to use, and to know how to make that joint in the right way.

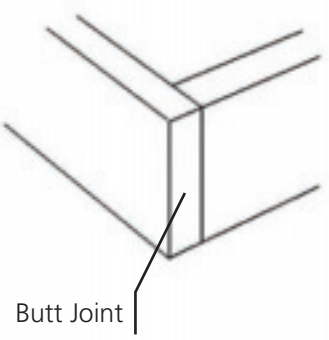
Always consider how strong the joint needs to be, how much of a gluing surface there will be and how the finished joint will look.

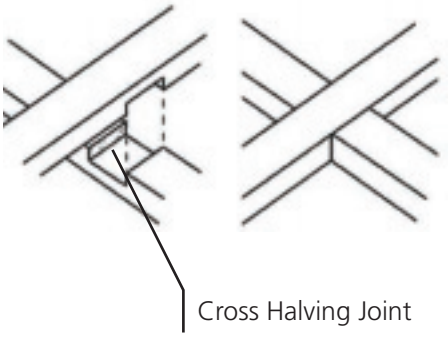
The direction of force on the joint should also be considered.

## Butt Joint

Butt Joints are the most basic method for joining two pieces of wood, and while it isn't the strongest of joints, it is very useful in some situations.

The joint can easily separate under pressure or stress. It is usually strengthened by screws or nails.



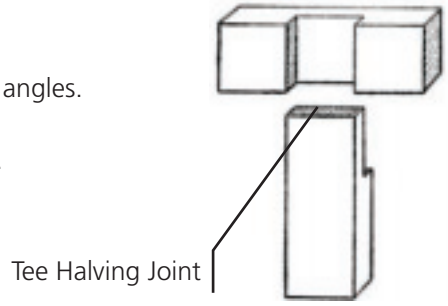

## Cross Halving Joint

**Cross halving joints** are used whenever it is necessary to join two pieces of wood that cross over each other. Sometimes these joints can be seen on the strengthening rails of tables and chairs.

## Tee Halving Joint

**Tee halving joints** are used where two pieces of wood meet at right angles.

It is a relatively strong joint, but relies on glue for a lot of its strength.

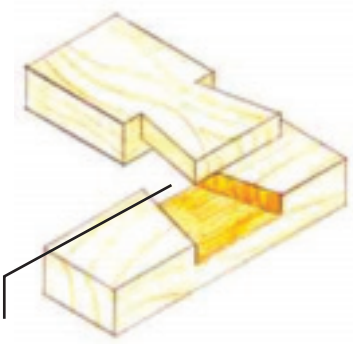


# Identify four common joints and state where they would be used

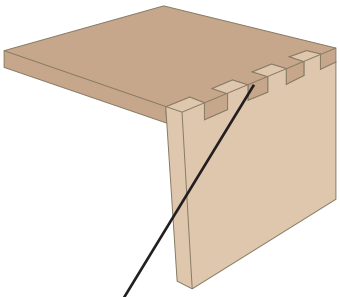
## Dovetail Halving Joints

**Dovetail halving joints** are similar to the tee halving joint but the dovetail halving joint is used where greater strength is required. A joint such as this is very difficult to pull apart because of the dovetail shape of one of the pieces.

This joint is usually used in frame construction.



Dovetail Halving Joint

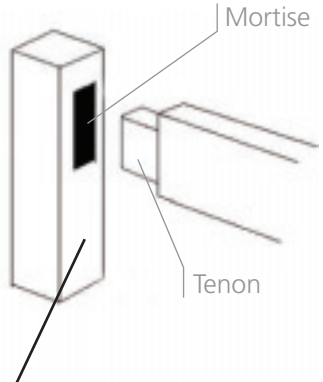


Finger Joint

## Finger or Box Joint

The **finger or box joint** 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 good quality glue such as PVA.

They are used for a wide range of products including jewellery boxes, cabinet construction, kitchen cupboards and many others.

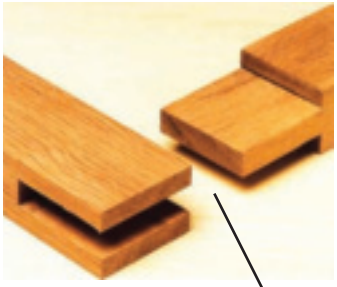



Mortise and Tenon Joint

## Mortice and Tenon Joint

The **mortise and tenon joints** are used in the making of tables, chairs, doors and many different types of frames. A tenon is cut to fit the mortise exactly and usually has shoulders that seat when the joint fully enters the mortise. The joint may be glued, pinned, or wedged to lock it in place.

The mortise and tenon is a very strong joint and there are many different types of mortise and tenon.



Bridle Joint

## Bridle Joint

The **bridle joint** is similar to a mortise and tenon joint in that it has a mortice and a tenon. The difference is that the mortice is open on one side in a bridle joint.

# FINISHING

| Keywords | Abrasive Paper | Filler | Plane | Surface |
|---|---|---|---|---|

If you're going to spend a lot of time making a woodwork project, it makes sense that you would want the finish to be able to show off your handiwork and protect it for years to come. The difference between a good woodwork project and a great one is often how well the project is finished.

A surface finish is applied to seal or protect the timber from moisture, dirt, heat, insect and fungal attack. Before any finish can be applied to wood, it must first be prepared. This means it must be – clean, smooth and free of marks.

The process of finishing starts with surface preparation, either by sanding by hand (usually with a sanding block or power sander), scraping, or planing.

## Removing Marks

Common marks which should be removed are – dents/humps, glue stains, holes/cracks, scratches and pencil marks.

**Dents** can be removed in two ways:

a. By using a plane to remove the surrounding timber
b. By applying heat and moisture to the dent, which makes the wood swell to its original size.

**Humps** (large) can also be removed by planing the wood. Smaller bumps can be removed by scraping or sanding.

**Glue stains** can be removed by scraping or sanding.

**Holes** and **cracks** need to be filled with suitable filler.

**Scratches** can be removed by using abrasive paper.

## Sanding

Before any finish is applied the surface must be prepared first. Any finish is only as good as the preparation that has gone before it. Preparation usually means sanding the surface with abrasive paper.

## Abrasive Paper (Sandpaper)

The term 'sandpaper' is generally used to cover all types of grit attached to a backing sheet. The modern term is **abrasive paper**.

The term sanding comes from using sandpaper (paper with sand glued to it) to smoothen timber. Modern abrasive paper can be made up of pieces of glass or other grits glued to either cloth or paper. The **grade** of the paper depends on the size of abrasives used in its making. This information is given on the back of the abrasive paper

| Abrasive Types | Grit Sizes |
|---|---|
| Super fine | 800-1200 |
| Extra fine | 400-600 |
| Fine | 180-360 |
| Medium | 100-150 |
| Coarse | 40-80 |

**Steps in Sanding**

1. When sanding you should sand in the direction of the grain. This means that you sand with the grain.

2. If using papers with different grits start with the roughest and finish with the smoothest, depending on how rough the timber is to start with.

   *START WITH GRADES* 50, 60, 80, 100, 120

   *FINISH WITH GRADES* 220, 240, 280, 320

3. On flat surfaces you should use a cork sanding block to hold the abrasive paper.

## APPLIED WOOD FINISHES

| Keywords | | | |
|---|---|---|---|
| | **Stains** | **Spirit Based** | **Externally** |
| | **Paint** | **Oil Based** | **Internally** |
| | **Varnish** | **Water Based** | **Application** |

There are many different types of finishes available but the most commonly used in the woodwork room are:

**STAINS VARNISH PAINT OILS**

The choice of finish you choose to use will depend on; What the item will be used for; Where it will be used – indoors/outdoors; Safety – food, children, etc.; Your own personal taste.

**NOTE:** Finishes can only be mixed within their own type. i.e. Water based with water based.

### STAINS

There are many reasons why wood might be stained:

1. To make it look better
2. To highlight the grain
3. To match the colour of different types of wood
4. To blend old wood with new

**Types of Stains**

Stains come in many different types, brands and colours but the main difference between them is what they are made of.

**The main types of stains are:**

1. Water based
2. Spirit based

**Method of applying stains:**

1. Ensure the surface is clean and properly prepared
2. Stain is applied to the wood by using a cloth or a brush. The wood soaks it up and holds the stain in. The oil or water which carried the stain then evaporates.
3. After the wood has dried finishing coats can be applied.

## VARNISH

Varnish is commonly found in the woodwork room. It is a clear finish, which is also available with a slight colour tint. They are hard wearing, waterproof and heat resistant.

**Types of Varnish**
Varnish is available in gloss and matt finishes. It is also available with stain mixed in. There are two types:

1. Water based
2. Spirit based

**Uses of Varnish**
Varnish can be used both internally and externally on a wide range of objects such as boats, furniture, toys, doors, windows and floors.

**Method of applying varnish:**

1. Ensure the surface is clean and properly prepared.
2. The first coat of varnish seals the timber.
3. Brush the varnish onto the timber, finishing off in the same direction as the grain.
4. Allow the varnish to dry and then sand lightly using fine abrasive paper.
5. Apply a second coat, which is full strength.
6. A third coat can be applied when dry.

**Properties of varnish:**

- Varnish is resistant to heat and alcohol.
- Varnish is resistant to wear and solvents.
- It is water and water vapour resistant (resistant to humidity).
- It has a long curing time (slow to dry).
- Its long curing time makes it easy to brush, but can cause problems with dust getting into the finish.
- It tends to yellow more over time than other finishes.

Varnish cures by being exposed to oxygen. When left in a can that has air in it, it will skin over in time. If the varnish hasn't begun to gel under the skin, it's still okay to use. Remove the skin and strain the remaining varnish into a smaller can (or glass jar), and seal.

## PAINT

| Keywords | White Spirits | Primer | Undercoat |
|---|---|---|---|

Paint is available in a wide range of colours and finishes. It is hardwearing and easily cleaned.

**Uses of paint**
Paint can be used both internally and externally on any article made from wood or wood products.

**Method of applying paint:**

1. Ensure the surface to be painted is clean and properly prepared.
2. Apply a **primer** paint, which seals the timber.
3. Apply an **undercoat**, which is right for the finishing coat.
4. Allow to dry and then sand lightly using fine sandpaper.
5. Apply the final coat of paint and leave to dry.

**Care of paint brushes:**

1. Wipe the brush in a cloth after use.
2. It can then be cleaned in a liquid like **white spirits**, if an oil / spirit finish was used. If the finish was water based the brush can be cleaned in water.
3. Dry the brush in a cloth for further use.

## OILS

| Keywords | Toxic | Non-toxic | Vegetable Oil |
|---|---|---|---|

Oil finishes have been used for centuries to treat and preserve wood. Oil finishes seep into the wood and penetrate the wood's fibres. Because of this, oil finishes cannot be built up to a thick coat like varnish can.

Oil finishes are probably the easiest finish to apply, but they offer less protection. Another advantage is that minor repairs can be accomplished by simply wiping on more oil.

**Applying Oil Finishes**
A good oil finish, when done well, produces a magnificent finish, but it is a time consuming procedure which needs a lot more effort than simply brushing or spraying on a topcoat such as varnish.

Oil finishes soak into the grain of wood rather than sit on the surface like varnish, which is the property that makes it such an attractive finish.

Oil finishes are simply wiped onto the surface of wood with a clean cotton rag.

Most oil finishes require 5-6 coats to achieve a decent finish. Allow the piece to dry for 48 hours (or more) before applying the next coat. Wet the piece with oil again, and keep it wet for a minimum of 20 minutes before allowing it to dry again.

Always sand lightly between coats.

**Vegetable Oil** can be used as a finish on wooden products which need to be non-toxic, such as salad bowls, wooden spoons, toys etc.

Some vegetable oils cause allergic reactions.

### IMPORTANT SAFETY NOTE

Any rags and cloths you use are very likely to spontaneously combust (Go on fire). This can occur when the solvents evaporating from your rags do not have sufficient air to evaporate into and heat builds up in the rag.

When you are finished with an oily rag always place it in water to prevent fire.

# SAFETY WHEN USING FINISHES

1. Always follow the manufacturer's instructions carefully.
2. All finishes should be applied in a well-ventilated area.
3. Wear safety goggles, a respirator or face mask, where necessary
4. Wear protective clothing and/or PVC gloves where necessary.
5. Do not smoke, eat or drink while using finishes.
6. Wash your hands after use.
7. Do not pour waste finishes into drains.
8. When you are finished with an oily rag always place it in water to prevent fire.

# NOTES