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Joints

KEYWORDS

bridle
butting
dovetail

dowel
flush
halving

haunch
housing
mortise

Joints are used when a strong connection is needed between pieces of wood. Joints are also a decorative element used in furniture. The best-made pieces use simple joints to give them added durability and strength. You should use joints in your projects also; it will show your skills and make your work sturdy.

JOINING WOOD

Wood is a natural material and there are many ways in which it can be joined together. Joints can be cut out of the wood itself, or you can use one of the many fastening systems available:

- Screws
- Nails
- Adhesives

Fastening systems are easy to use, but these methods are usually not as strong or durable as traditional joints.



Joints are strong and decorative

Advantages of wooden joints

- Strong, solid and long lasting
- Decorative (dovetailing, etc.)
- Resist forces well

Disadvantages of wooden joints

- Time-consuming to make
- Require skill
- Specific tools needed to make the joints

Butt joint

A butt joint is made by **butting** (placing) the end of one piece of wood against the side of another. The two pieces are glued together. This is a simple joint, but it requires screws, nails or pins to hold it together. A rebate on one piece will allow the glue greater grip and will make a better joint.

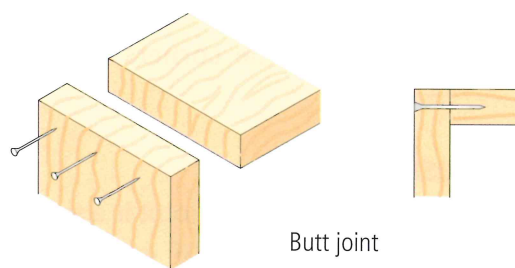
■ Use: Simple box construction

Edge joint

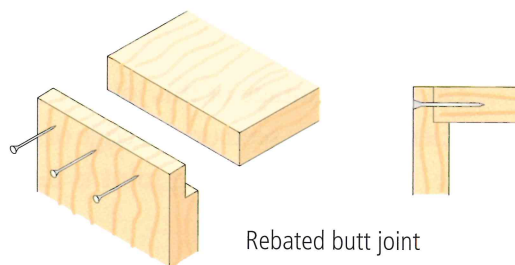
Wide boards are prone to warping and splitting. Sometimes it is necessary to have a wide board made from solid wood instead of manufactured board. To make a solid, wide board, narrow boards are joined together at the edges to create a wider board.

There are a number of edge joints. It is important that the edges are first planed perfectly flat. Allow the pieces to be a little thicker than necessary, so that slight inaccuracies in the joint line on the surfaces can be planed flat after the adhesive has set.

■ Use: Joining boards together



Butt joint

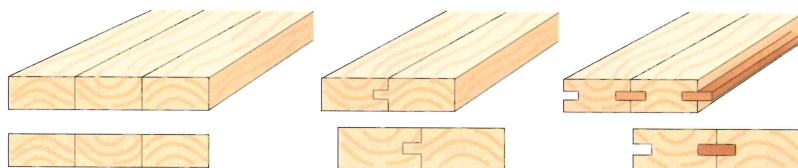


Rebated butt joint

Butt joints



Alternating grain helps to prevent warping of the board



Boards butt jointed with glue

Tongue and groove joint

Loose tongue or spline

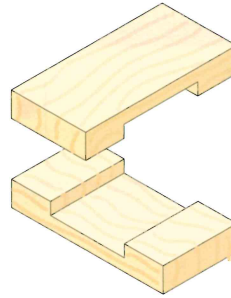
Edge joints



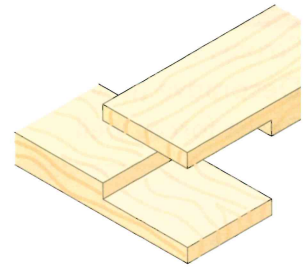
Halving joint

The halving joint is made by cutting out half the thickness of each piece. When the two halves are put together, they make up one full thickness. They are simple to construct and are glued together.

- Use: Joining the corners of small frames



Cross halving joint



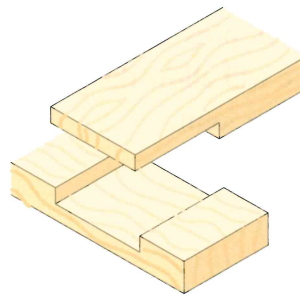
Corner halving

Housing joint

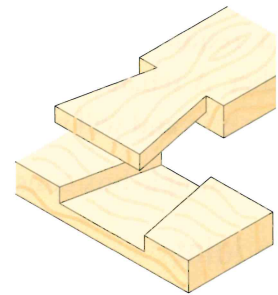
The housed or housing joint is a simple but effective method of joining two pieces of wood. The housing joint is glued and can be further strengthened with pins or screws.

One disadvantage of this joint is that the trench can be seen on the edge of the piece. A stopped housing joint is used to hide the joint.

- Uses: Fitting shelves in bookcases
- Securing divider pieces in boxes

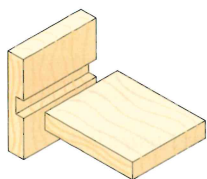


Tee halving

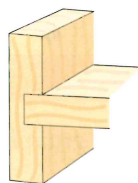


Dovetail halving

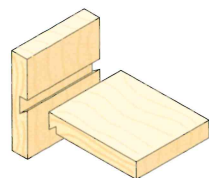
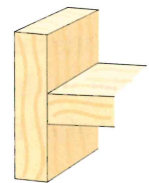
Types of halving joints



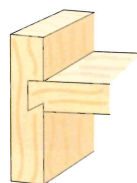
Housing joint



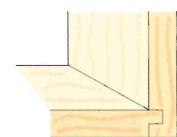
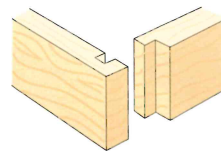
Stopped housing joint



Dovetail housing joint



Tongued and grooved joint



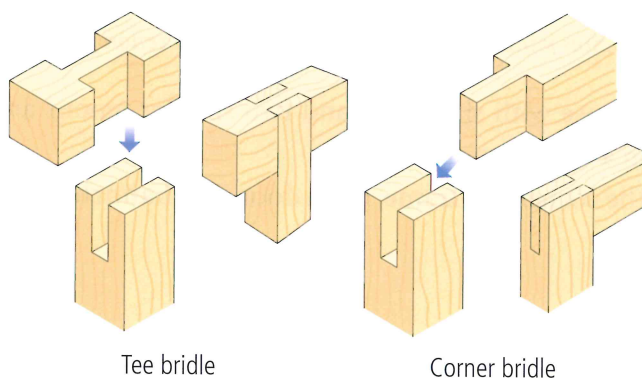
Corners of drawers

Types of housing joints

Bridle joint

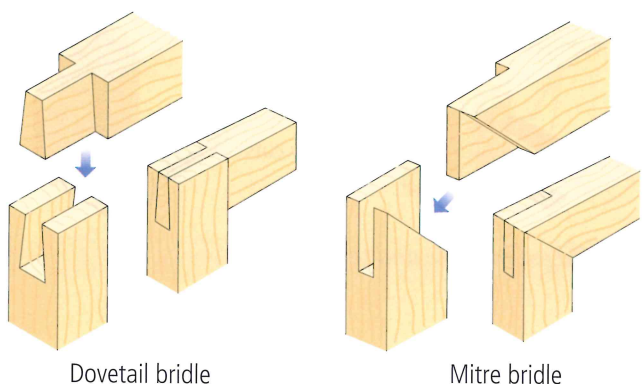
The **bridle joint** is very strong and has many uses. There is a large glue surface to give a strong bond. It is often used as an alternative to the **mortise and tenon joint**.

- Uses: Constructing frames
- Constructing tables
- Constructing chairs



Tee bridle

Corner bridle



Dovetail bridle

Mitre bridle

Types of bridle joint

Mortise and tenon joint

The **mortise and tenon joint** is a very strong joint and it is widely used. The joint is made by cutting out a hole, called a **mortise**, from one piece into which a **tenon**, cut from the other piece, fits exactly.

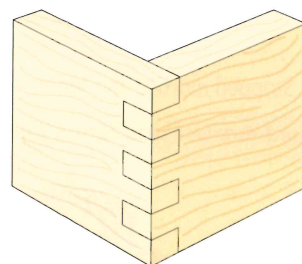
- There are a number of types
- The thickness of the tenon should be one-third the thickness of the piece

Finger joint

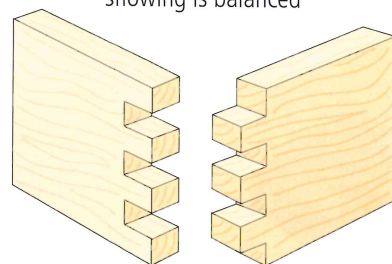
The **finger joint** is a strong joint. It is also called a **comb joint**. Because of the large glue surface area, it is very stable and is a popular joint in project work.

When marking out the joint it is important for there to be an odd number of fingers. This gives the joint a symmetrical (even) appearance.

- Use: Joining corners of frames and boxes



An odd number of fingers (7) is used so that the end grain showing is balanced



Finger joint

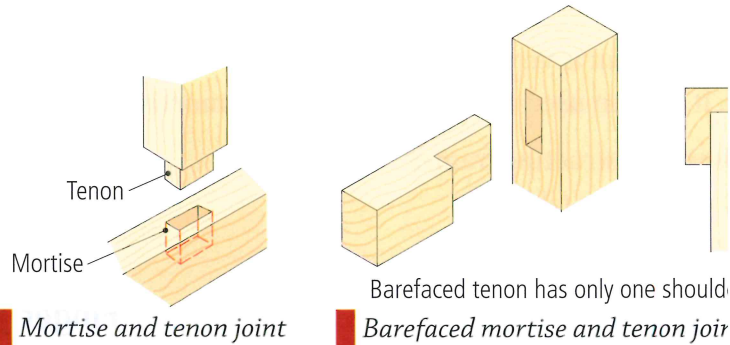


The stopped or stub mortise and tenon is used when you do not wish to see the tenon coming through to the other side of the piece. It is sometimes called a blind tenon.

When working with wider pieces of wood, twin tenons are used. A single, wide tenon will become loose with shrinkage and two smaller tenons are more secure. The twin tenon is stronger than a single tenon.

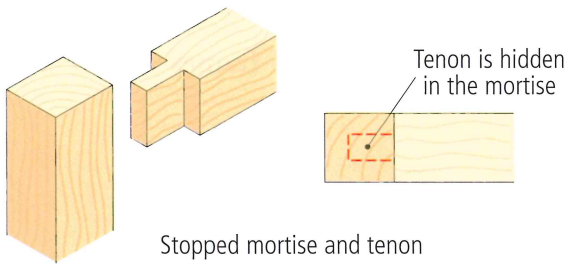
A haunched mortise and tenon is used at the corner of a frame, like a door. The haunch joint prevents the two pieces twisting.

- Uses: Constructing frames, e.g. doors
- Making tables and chairs



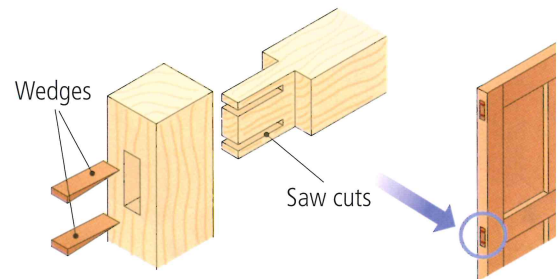
Mortise and tenon joint

Barefaced mortise and tenon joint

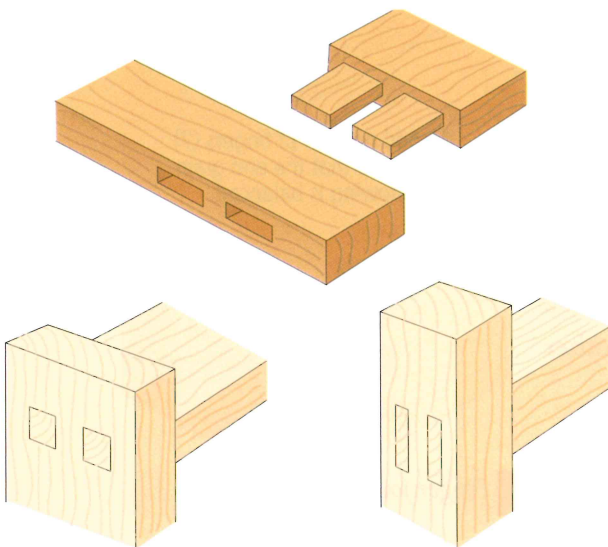


Stopped mortise and tenon

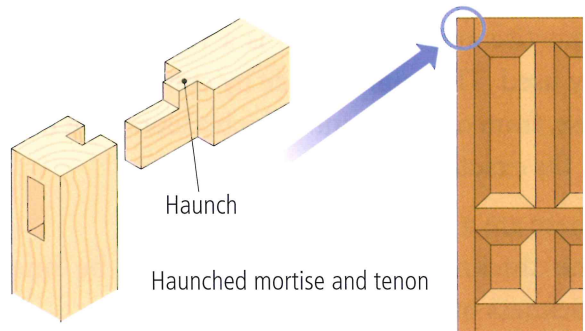
Stub or stopped mortise and tenon joint



Wedged mortise and tenon joint



Twin mortise and tenon joint



Haunched mortise and tenon joint

Dovetail joint

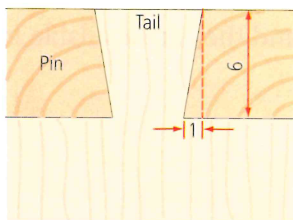
The dovetail joint is widely used in high-class work for joining the corners of carcasses and making drawers. It is strong and attractive. The shape of the joint ensures that it tightens when it is pulled against the slope.

The slope for softwood is greater than for hardwood, in order to give more grip on the piece. If too much slope is put on a dovetail joint, the tips of the tail can splinter and the end of the tail can be too narrow and weak. If the slope is small, the joint can be pulled apart. These slopes are given below.

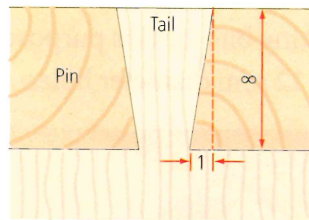


Dovetail joints are used in a cabinet. The dovetail joint tightens when a pulling force is applied.

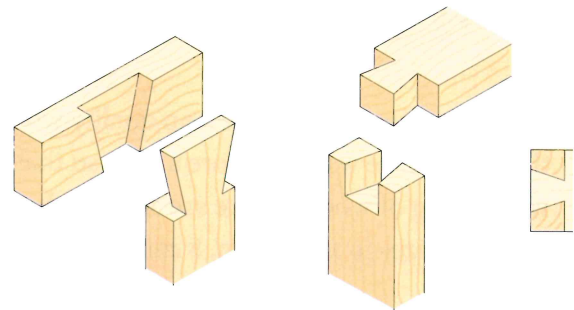
Slope	
Softwoods 1 in 6	Hardwoods 1 in 8



Softwood slope 1:6



Hardwood slope 1:8

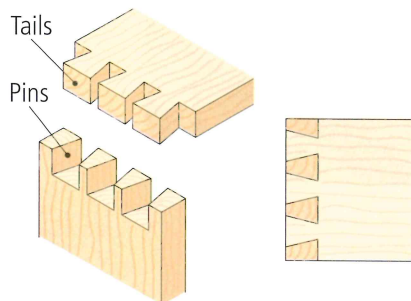


Tee dovetail halving joint

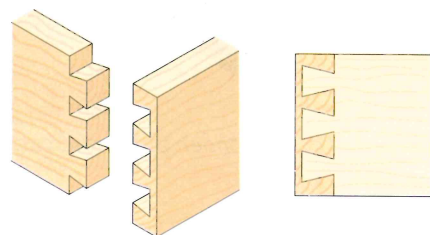
Single through dovetail – used for corners of where rails meet

Slope of dovetails

Tee dovetail halving joints and single through dovetail joint



Through dovetail joint – used in box carcasses, drawer carcasses, etc. (boxed dovetail)



Lapped dovetail – used where strength is needed but the front end grain of the tails has to be hidden, such as in drawer fronts

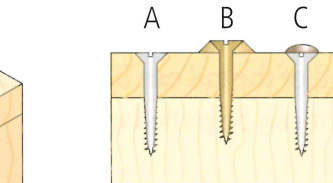
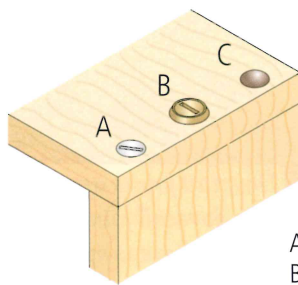
Through dovetail joint and lapped dovetail



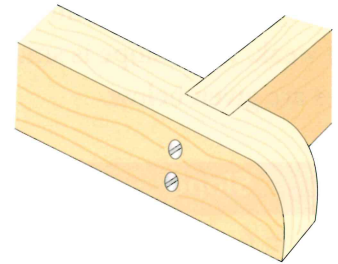


Screws

A simple screwed joint is a popular way to secure pieces together. Usually screws are countersunk into the wood. The screw then sits **flush** with the surface of the timber, giving a neat finish. A brass screw cap can be used to give a similar decorative effect. Screws are also used to give added strength to simple joints.



A: countersunk screw
B: brass screw and screw cap
C: plastic screw cover



Types of screw finish

Screw hold joint

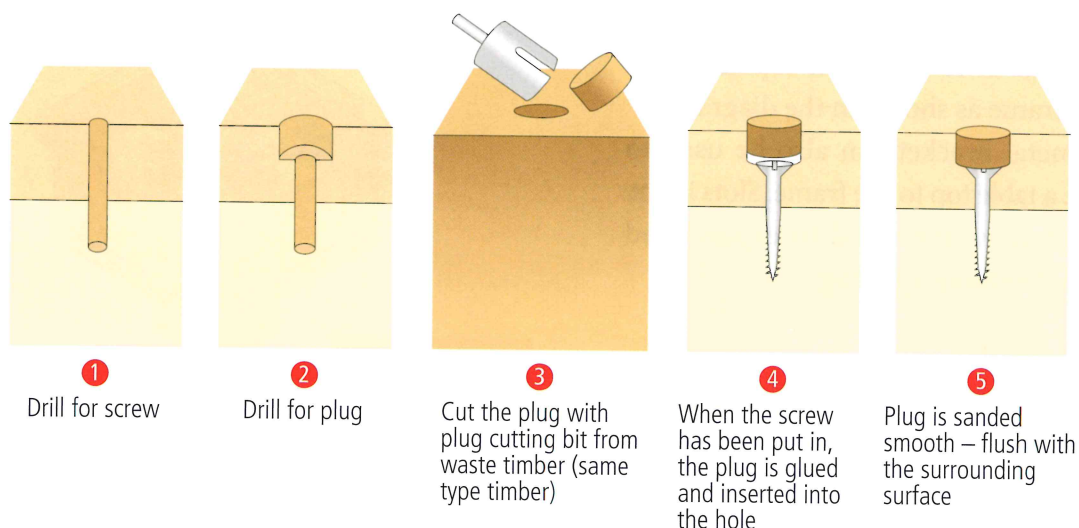
The appearance of screws on quality work can be unsightly. There are ways to hide the head of the screw. One way is to bore a hole so that the head finishes below the surface, then fill it with a plug of wood. There are special plug cutting bits for this purpose and they are available in different sizes to suit 6 mm, 8 mm, 10 mm and 12 mm diameter holes.



Wooden plugs and cutter

Method

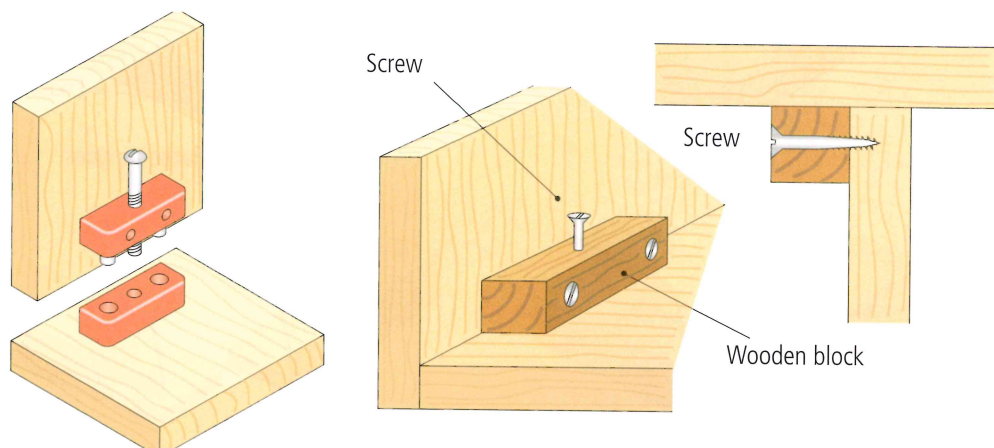
- Drill a pilot hole for the screw
- Drill a larger diameter hole to take the plug
- Use a plug cutting bit to cut a plug, the same size as the hole from a piece of similar wood
- When the screw is secured, apply glue to the plug and insert it in the hole
- Sand the excess material level (flush) and smooth with the timber



Wooden plugs are used to disguise the screw joint

Joint blocks

Simple butt joints can be strengthened using connector blocks. These can be made from wood or knock-down fittings can be bought; these are made from plastic and there are many types available. Plastic knock-down fittings are used in a lot of modern furniture:



Joint blocks and their use

Wooden blocks are used to secure boxes and table tops

- They are used on manufactured boards where it is difficult to use traditional joints
- There is a variety to choose from
- They allow the piece to be assembled and dismantled
- They are not very strong
- They are unattractive
- Use: Self-assembly furniture (needing only simple tools)

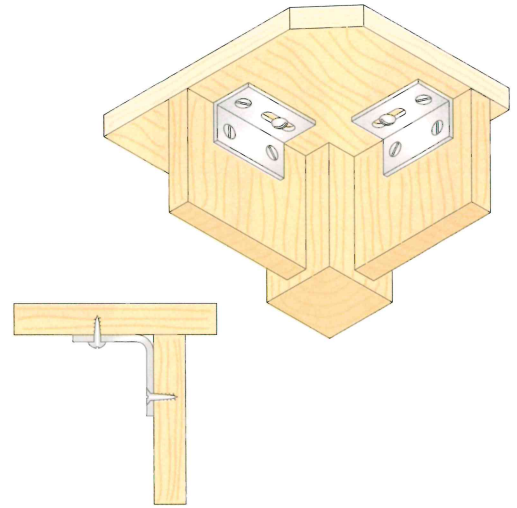


The wooden blocks can be used to hold up shelves or to attach the top of a table to the frame as shown in the diagram.

A metal bracket can also be used to secure a table top to the frame. Slots in the bracket allow the wood to expand and contract without splitting.

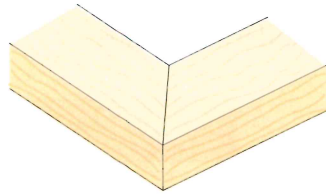
Mitre joint

The mitre joint is the simplest joint to have at a corner. Plain mitre joints can be weak, however, unless strengthened by nails, pins or biscuit joints (see p. 173). A mitre can also be incorporated into a bridle joint.

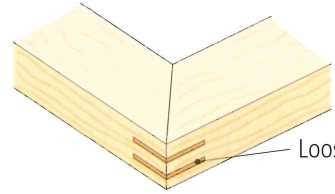


Slotted angle brackets are used to secure table top:

■ Use: Joining the corners of frames and boxes

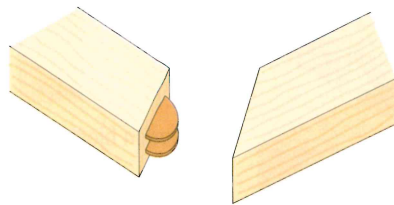


Mitre joint

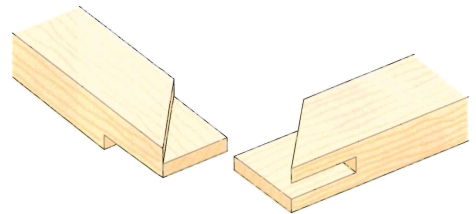


Loose tongues

Mitre joint with loose tongues



Mitre strengthened using biscuits



Mitre bridle joint

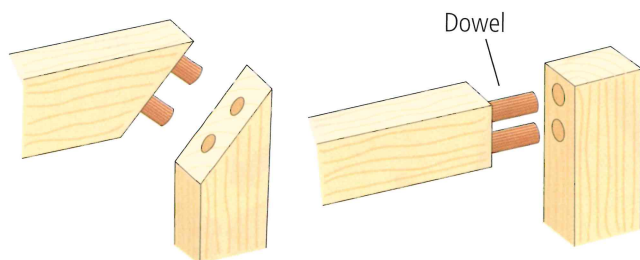
■ *Mitre joints*

Dowel joint

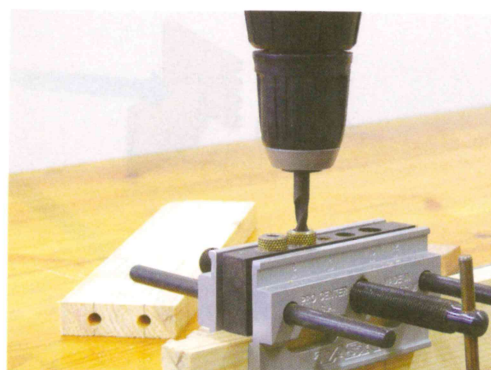
A **dowel** is a piece of wood in the shape of a cylinder. A dowel joint is similar to the mortise joint.

Method

- Accurately mark the centres of the holes for the dowels
- Drill corresponding holes in the two pieces using a dowelling jig
- Apply glue to the holes and insert the dowels
- Join the pieces and cramp them
- Uses: Making frames
- Making stools and tables
- For edge jointing boards



Dowel joints



Dowelling jig

Dowelling jigs will help to ensure that the joint is made accurately. Ready-made dowels are available with grooved sides to allow air and glue to escape from the holes. However, lengths of dowel can be cut and grooved with a saw cut to give the same effect.

Biscuit joint

In woodworking, a **biscuit** is an oval-shaped piece of compressed beech wood, used to join two pieces of wood. Biscuit joints are very popular. The joint is very strong and quick to make using a biscuit joiner. The power tool cuts slots for the biscuits, which are glued in place.

- Use: Joining two pieces of wood

Method

- Mark the centres for the biscuits on the pieces
- Adjust the biscuit joiner for the size of biscuit and the depth of cut
- Using the joiner, cut the slots into both pieces
- Insert the biscuit, glued on both sides, into the slots
- Fit the two pieces together and cramp them

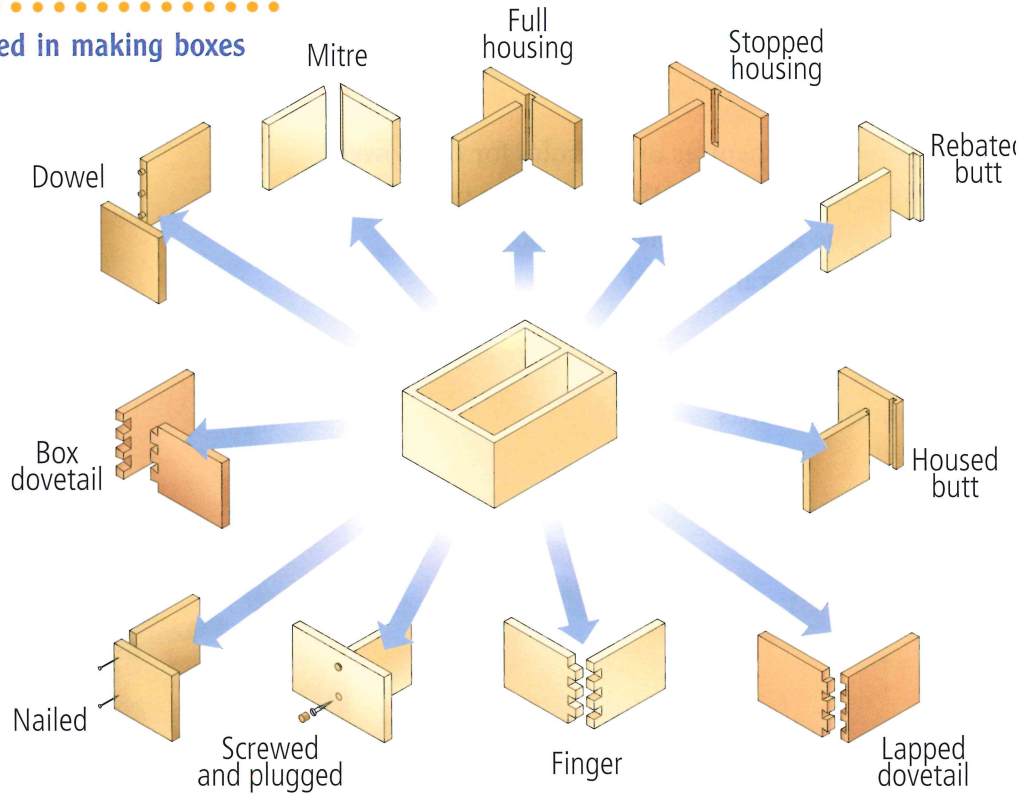


Biscuit joiner

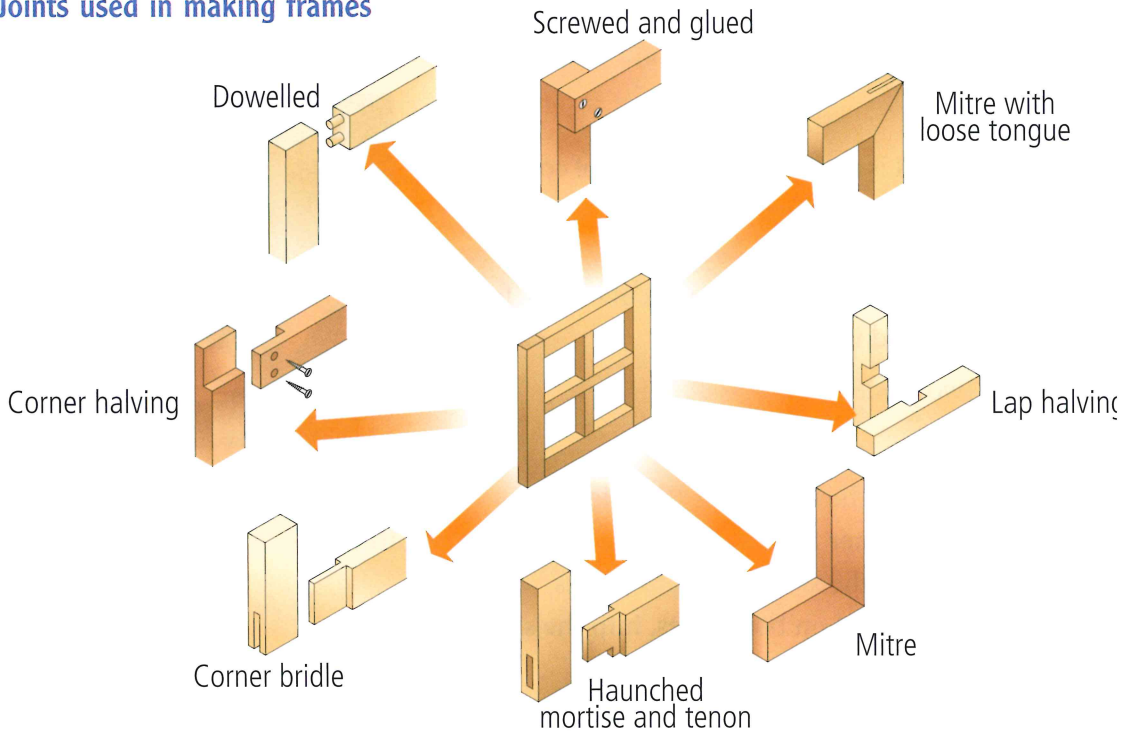


WHERE JOINTS ARE USED

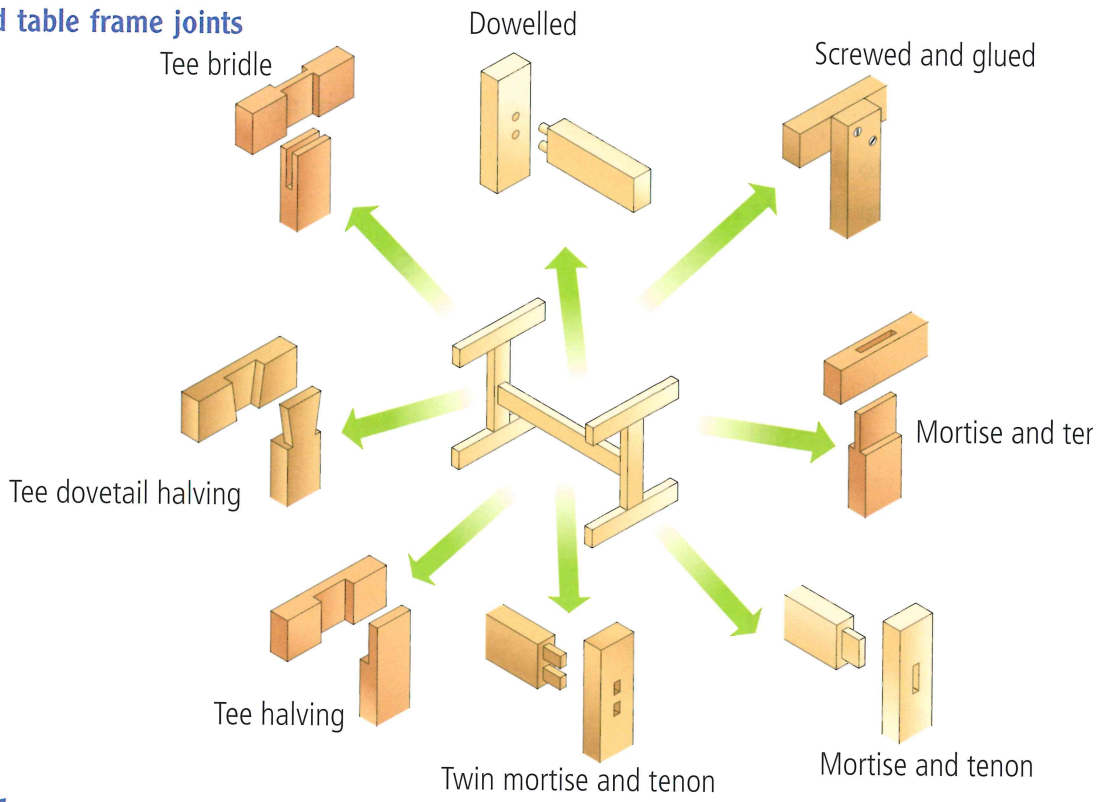
Joins used in making boxes



Joins used in making frames



Stool and table frame joints

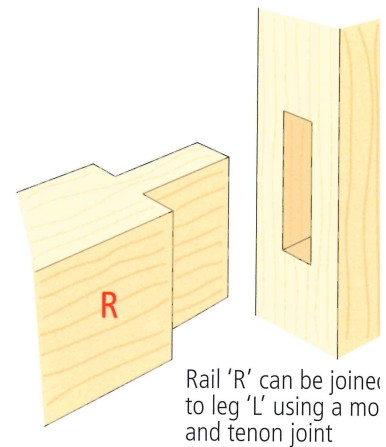
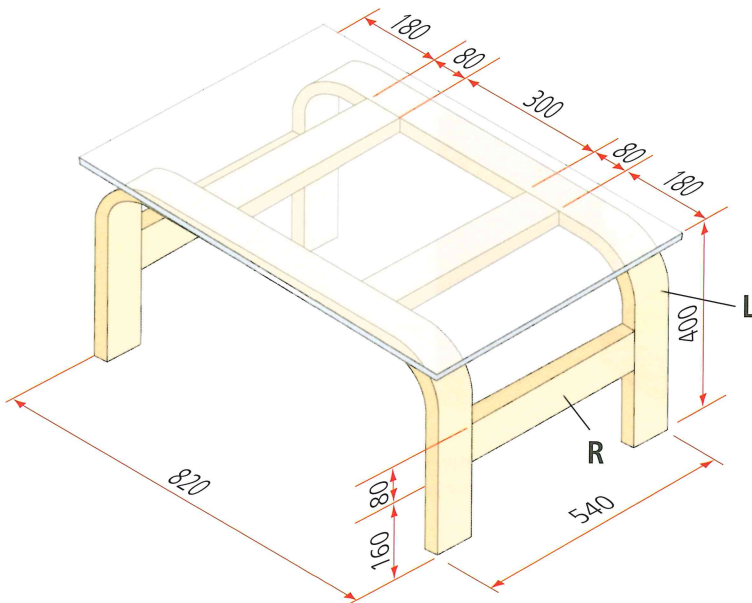


Example 1

The diagram shows a table made in solid ash. All frame material is 80 mm x 32 mm. With the aid of notes and neat freehand sketches, describe a suitable method of joining the members R and L.

Solution

The sketch of a suitable joint near the joint.



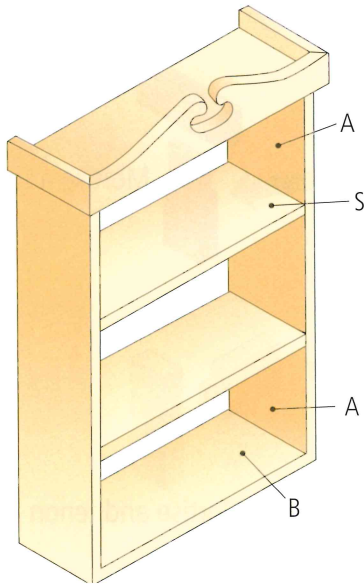


Example 2

The diagram shows a decorative shelf unit.

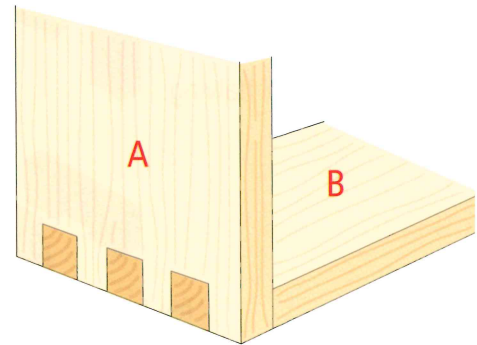
Describe, using notes and sketches, a suitable method of joining:

- The base B to the side A
- The shelf S to the side A



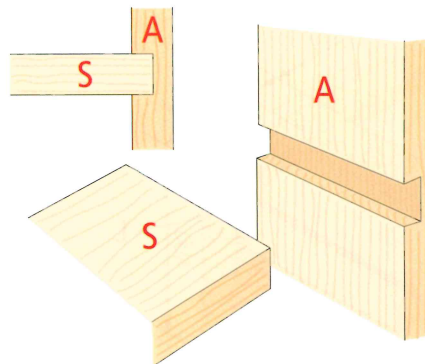
Solution A

Base B to the side A with finger joints.



Solution B

Shelf S to the side A using a housing joint.



A housing joint is used to join part 'S' to the side 'A'. It is joined using glue and sometimes held in place using panel pins