

## LIST OF EXPERIMENTS

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CARPENTRY

(Carpentry deals with the processing of wood to obtain desired shapes and sizes. The process dealing with the technique of making wooden pattern is called pattern making.)

(Wood obtained from tree is the chief product of forest. It has been universally acceptable as raw material for manufacturing wooden products or appliances. From the prehistoric times, wood has been utilized an important source of getting heat by firing it. It has been utilized as a major construction material for making shelter for the basic need of human being. As the civilization advanced, it gained tremendous importance as special material for boatbuilding, for piling to support docks and railroad tracks. But in modern times, with the advance of wood chemistry, the uses of wood have recognized its importance in manufacturing cheap useful products used in day today life such as paper, furniture, textiles, plastics and hundreds of chemicals and extractives.) The wooden products as plywood have superseded in some products in comparison metallic and ceramic materials. Compressed wood has also replaced some metals for gears and die casts. In war-time, in Europe, wood has been used as a source of wood gas for propelling automobiles. Similarly clothing has been made from wood cotton and wood wool. The useful work on wood is being generally carried out in a most common shop known as carpentry shop. (The work performed in carpentry shops comprises of cutting, shaping and fastening wood and other materials together to produce the products of woods. Therefore, carpentry shop deals with the timber, various types of tools and the art of joinery. In wood, there are two types of cells namely radiating outward from the center of wood cross-section and running parallel to the length of wood. Trees are generally classified into exogenous and endogenous types according to manner of growth.)

**CLASSIFICATION OF CARPENTRY TOOLS:**

1. Marking and Measuring Tools
2. Cutting and planning tools
3. Drilling and boring tools
4. Striking tools
5. Holding tools

**1. MARKING AND MEASURING TOOLS:** Steel rule, marking knife, Steel tape, marking gauge, Folding rule, Mortise gauge, Try square, Wing compass, Bevel square, Divider, Mitre square, Trammel.

**2. CUTTING AND PLANNING TOOLS:**

- i) **SAWS:** Cross cut saw (Hand saw), Rip saw, Tenon saw.
- ii) **CHISELS:** Firmer chisel, Dovetail chisel, Mortise chisel, outside chisel, inside chisel .
- iii) **PLANNING TOOLS:** Wooden jack plane, metal jack plane, Smooth plane.

**3. DRILLING AND BORING TOOLS:**

Gimlet, Ratchet brace, Hand Drill, Auger

**4. STRIKING TOOLS:**

Wooden hammer, Claw hammer, Mallet, Straight peen hammer

**5. HOLDING TOOLS:**

Bench vice, Sash cramp, G-Cramp, C-Cramp

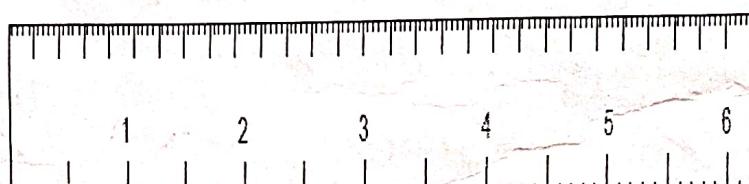
**6. MISCELLANEOUS TOOLS:**

Screw driver, Wood rasp file, Pincer

**1. MARKING AND MEASURING TOOLS:**

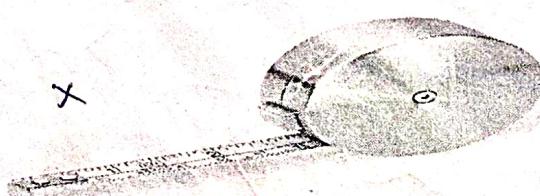
Marking is one of the most important features of wood work and success of completing job accurately depends on accuracy of marking and measuring.

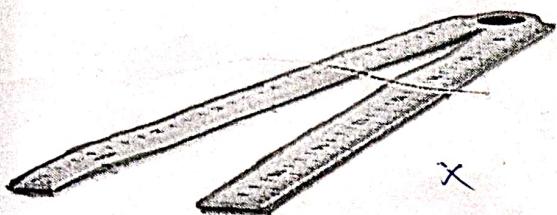
**STEEL RULE:** Used for making and measuring linear dimensions. It is specified by its length.



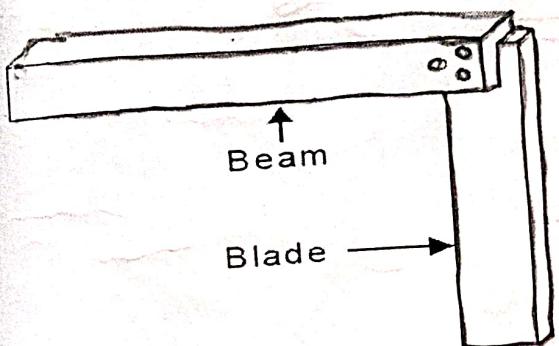
Steel rule

**STEEL TAPE:** The steel tape is used for measuring longer dimensions. They are available in different sizes, ranging from 0.6 to 2.5 m. It is flexible can be coiled and presses in a case.



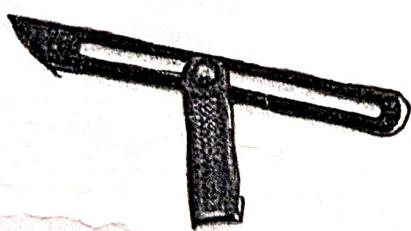


**FOLDING RULE:** Four-fold box wood rule is made of four pieces of each of 15 cm length. They are hinged in such a way that they can be folded. It is adapted to carpentry up to 60 cm length.



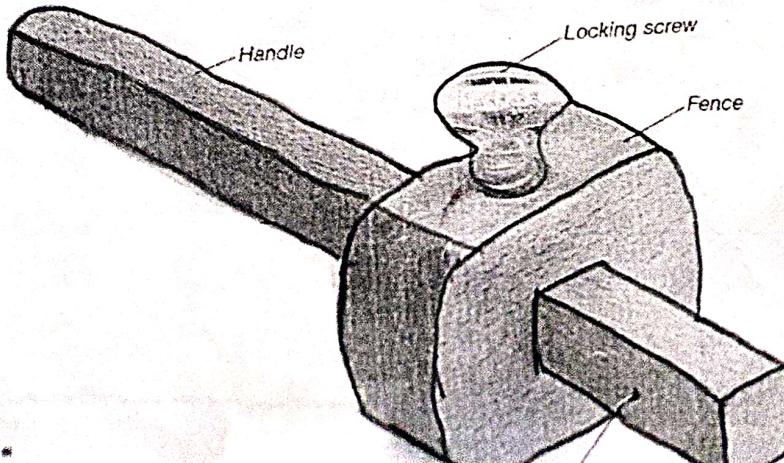
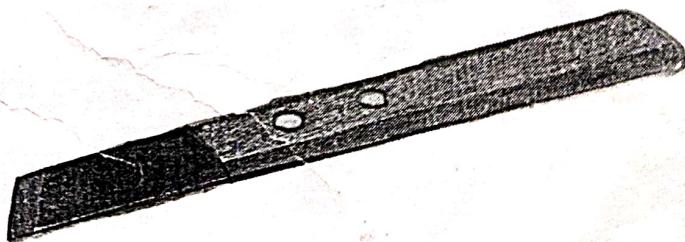
**TRY SQUARE:** The try square is used for testing flatness of surface marking parallel lines and also for marking and testing of right angles. It has a steel blade fitted at right angles in wooden or cast iron stock. It is available in various sizes ranging from 100 to 300 mm.

**BEVEL SQUARE:** It is used for marking and testing of any angle between 0 degrees to 180 degrees. It has a slotted blade and stock. The blade can be fixed at any position by means of a screw.



and generally used with a try square.

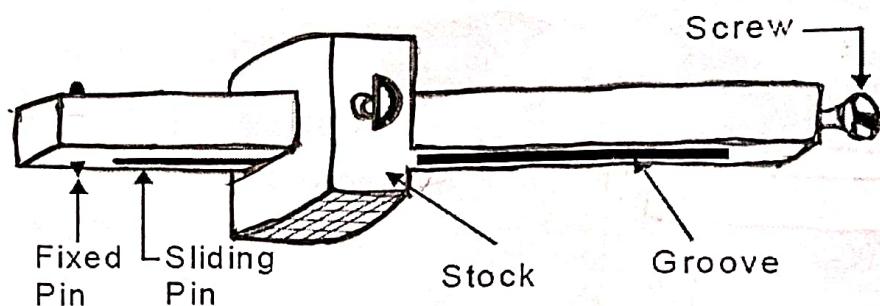
**MARKING KNIFE:** All dimensional lines marked with pencil, are cut with marking knife. It has a chisel edge and sharp point at other end. It is made of steel



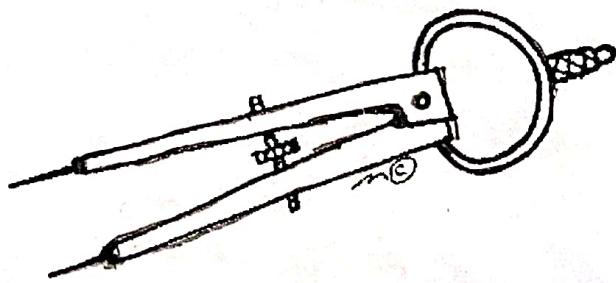
**MARKING GAUGE:** The marking gauge is commonly used when absolute accuracy is required. It has a stem with a sharp pin at one end. It is used to cut line along the grains and parallel to an edge. The distance can be adjusted by sliding the stock

(head) on a stem. This can be achieved by thumbscrew.

**MORTISE GAUGE:** It has two sharp pins, one is fixed to the stem and other to a brass slide, which can be secured at any position by a screw. It is used to cut two parallel lines in a single stroke. It is particularly adopted for marking in Mortise and Tenon joints.



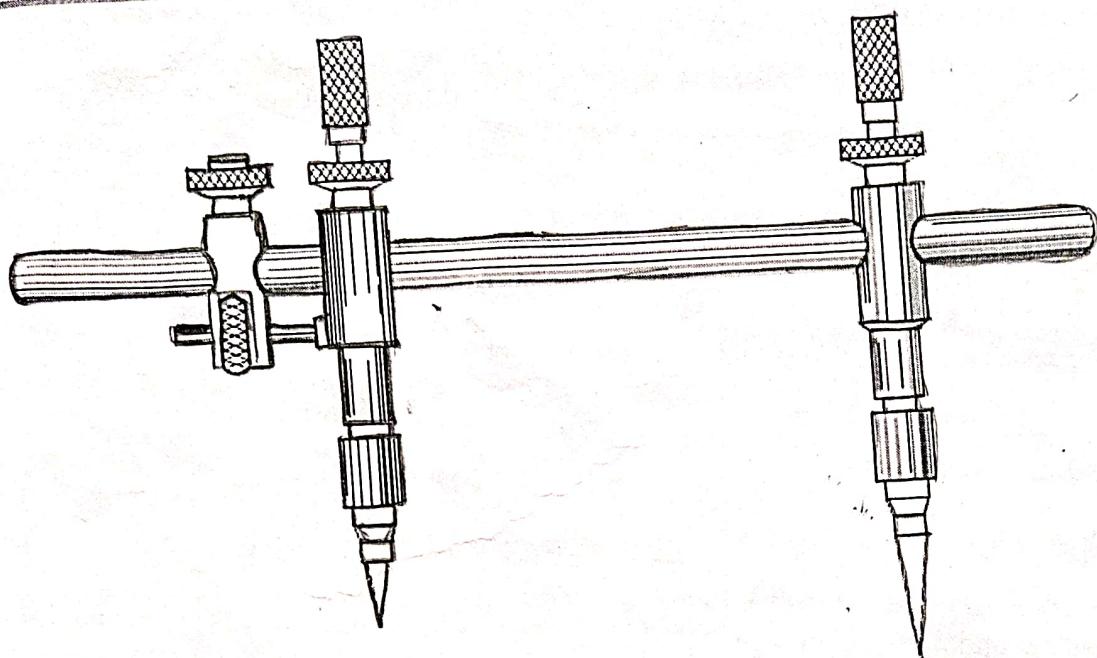
Mortise gauge



**Divider:** It consists of two pointed legs. The points are hardened and tempered to prevent wear. It is used for transferring the sizes and scribing curves in circles on wooden surface.

**TRAMMEL:** It is used for drawing very large circles and arcs which are beyond the scope of a compass. It consists of a wooden beam on which the two pins are located and distance between them can be adjusted by means of thumb screws.

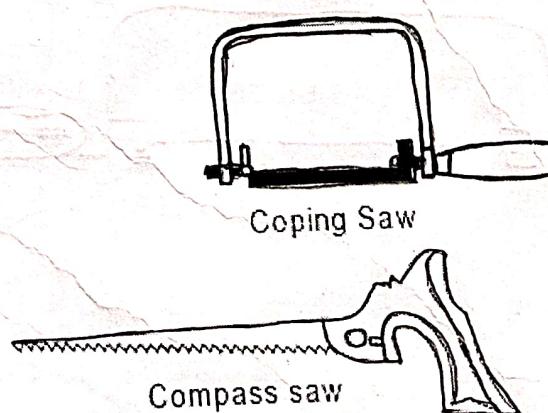
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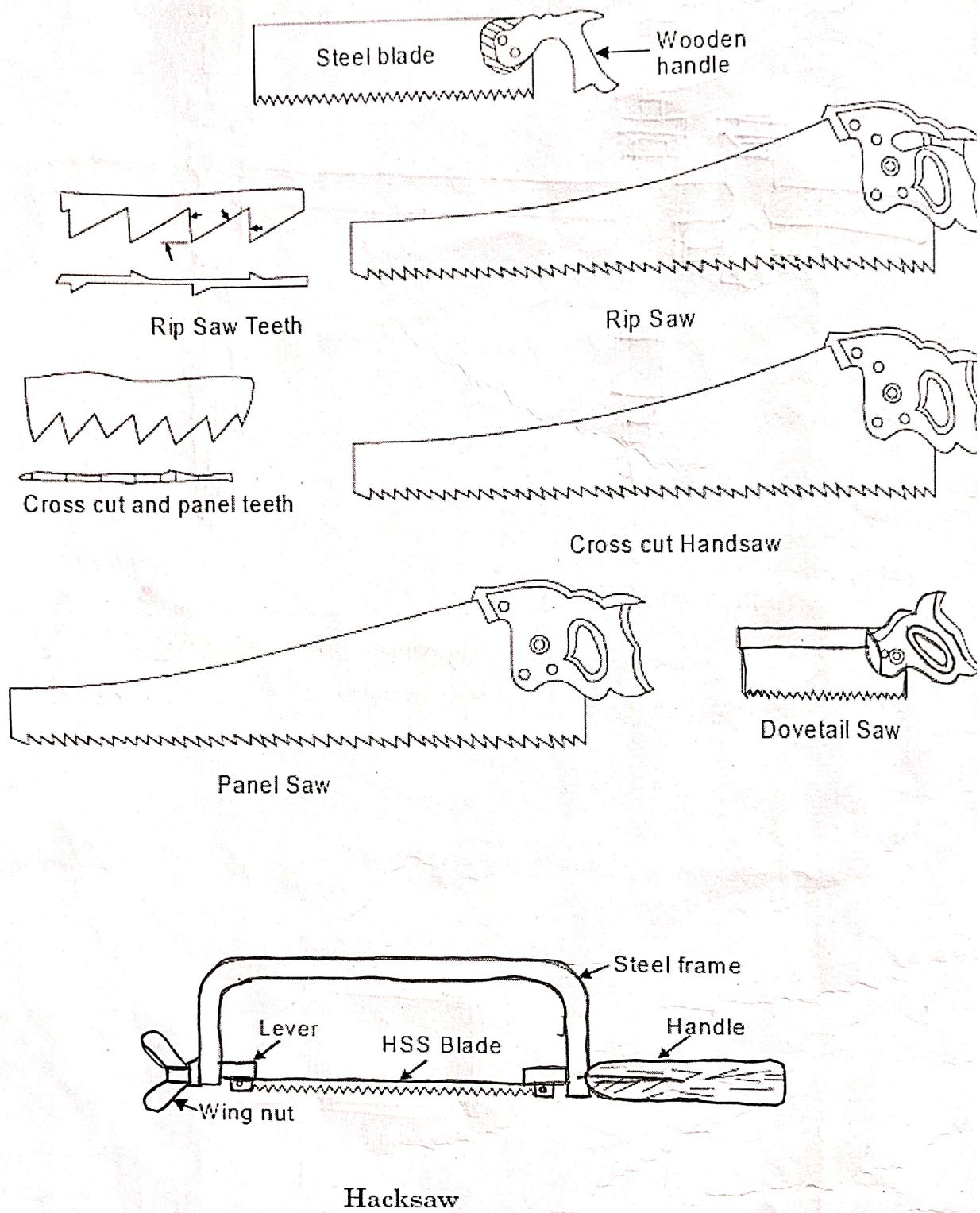


## 2. CUTTING AND PLANNING TOOLS:

Cutting tools are used for cutting timber to approximate size, cutting excess wood to obtain desired shape and accuracy. Planning tools are intended to make smooth and accurate surface.

### SAWS:-





**CROSS CUT SAW:** It is used for cutting the wood across the grains. (Hand saw) Its teeth are pointed. The pitch of the teeth is about 2.5 to 3.0 mm and the blade length is about 600 mm. its teeth have less 'set' than the rip saw.

**RIPSAW:** It is used for cutting the wood along the grains. Its teeth have chisel edge the pitch of the teeth is about 5 to 8 mm and the length of the blade is about 700 mm. The process of

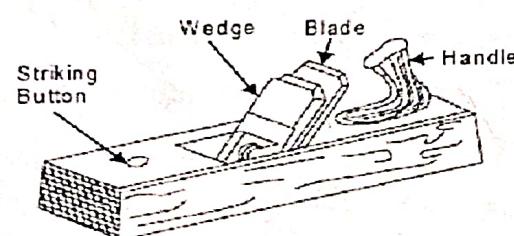
cutting the wood along the grains is called ripping. Because of high flexibility of the blade and less number of cutting points per cm. (i.e. high pitch) it is not suitable for cutting across the grains.

**TENON SAW:** Tenon saw or back saw is used for cutting small work. It is mostly adapted in joint work. It has a brass or steel back which strengthens the blade, but it restricts the depth of cut. Its fine teeth (6 to 8 teeth/cm) and stiff back permits the smooth, accurate cutting for marking joints. The saw is available in different length ranging from 250 to 400 mm.

### 3) PLANNING TOOLS:

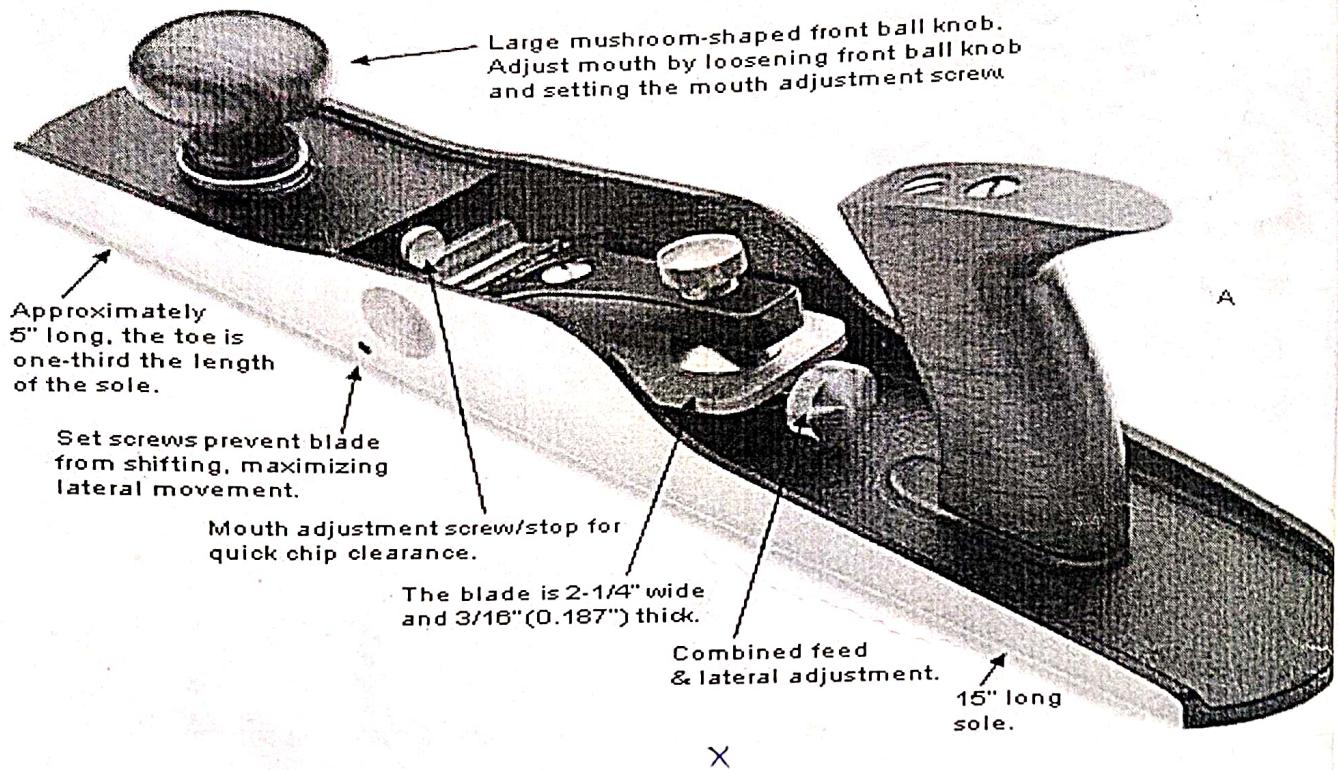
Planning tools are for reducing to its final and for smoothing the surface. Wooden jack plane: It consists of a wooden body or stock in which blade or cutter is fastened at an angle of 45° to the sole. The plane iron (blade or cutter) and the cap iron (back iron) are assembled and assembly is inserted in the mouth of plane along with the wedge. The back iron supports the cutting edge and also breaks the shaving so that they curl away from the blade. The blade can be set for taking deeper or shallower cuts. The length of the jack plane is about 350 to 425 mm. the blade is made of high carbon steel and has a width of 50 to 75 mm. its cutting edge is tempered and ground to an angle of 25 to 30° and it is slightly curved (convex).

#### WOODEN JACK PLANE:

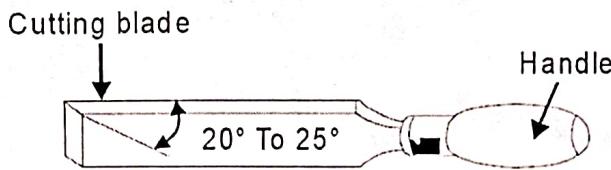


Jack plane

**METAL JACK PLANE:** Its body is made of gray cast iron, and is provided with a wooden handle at the back and a wooden knob at the front for holding with both the hands. A fine screw is used for adjusting the depth of cut i.e. the thickness of shaving removed, and a lever is used for lateral adjustment of the blade. It is very durable and gives better finish.



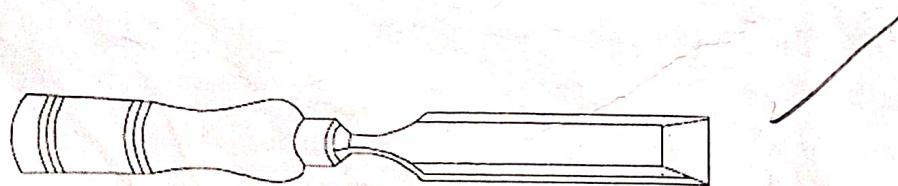
**3) CHISELS:** Chisels are used for cutting excess wood in shaping and joint making.



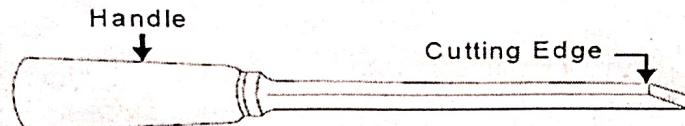
**FIRMER CHISEL:** The firmer chisel is capable of doing heavy work and is used for joining and shaping the wood,

with or without mallet. The chisel blade is made of rectangular section with beveled edge length of the blade is about 125 mm and the width of the edge varies from 3 to 50 mm.

**Dovetail chisel:** It is similar to firmer chisel but sides are beveled so that it can cut sharp corners. It is used for cutting sockets where the angles is less than a right-angle.



**Mortise chisel:** These chisels are robust, and can withstand heavy blows. It has a thick stock and narrow cutting edge. It is used for cutting mortises, and its width is ground to exact size of mortise to be cut.



Mortise chisel

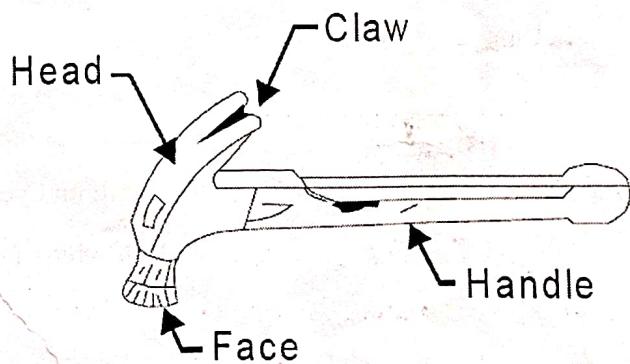
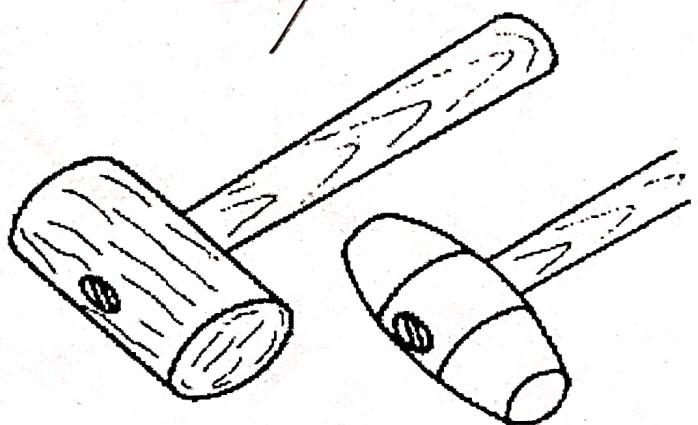
#### 4) STRIKING TOOLS:

Striking tools are used to drive in nails and to operate chisels.

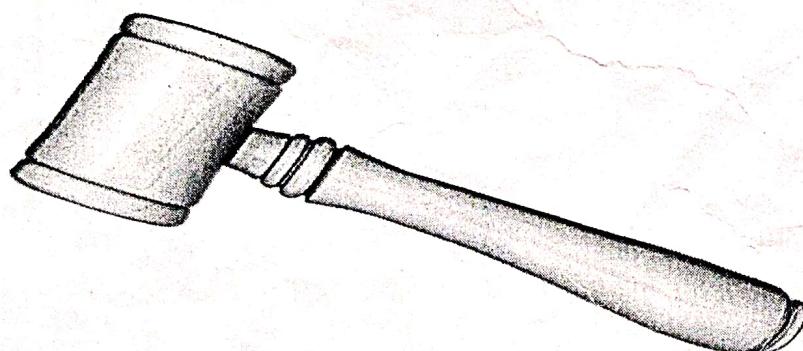
**Wooden Hammer:** It is mostly used for bench work and light work. It is made of cast steel with tempered face and peen. The wooden handle fits in the eye and steel wedge is driven into from a rigid joint.

**Claw hammer:** It is a dual purpose hammer. It has a hammer face which is used to drive in nails, and claw at other end for pulling out nails from the wood. It is designated by its weigh and it varies from 375 to 675 grams.

**Mallet:** It is used for operating the chisels and gauges. It is made of hard wood and is provided with handle. The striking faces are made flat, and may be round or rectangular in cross-section.



Claw hammer

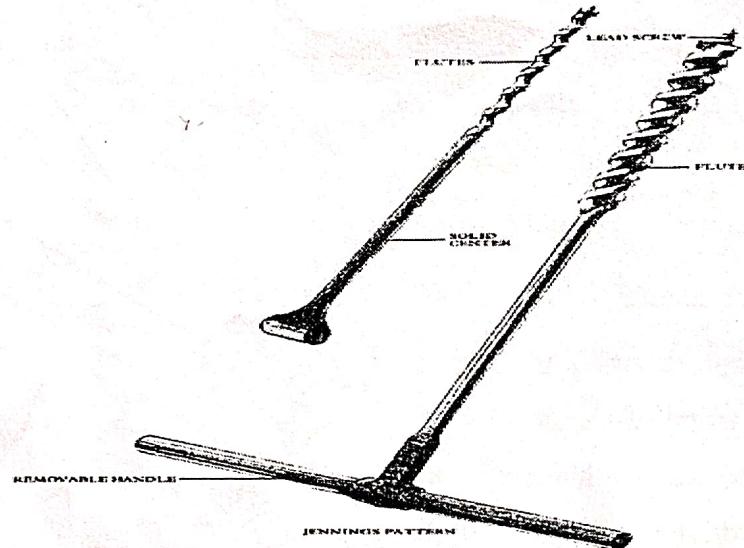


## 5) DRILLING TOOLS:

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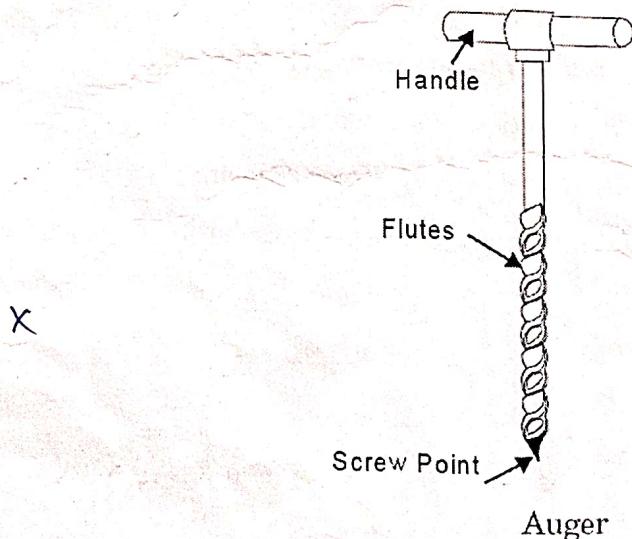
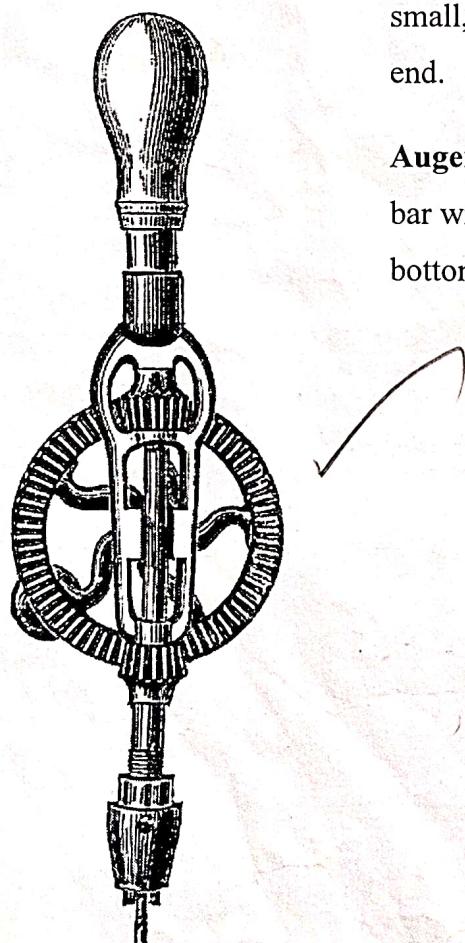
These tools are used for drilling and marking holes in wooden jobs.

**Gimlet:** It is hand operated tool used for making small holes for screw. It has a spiral flutes with screw like point.



**Hand drill:** It is used for drilling small holes. A straight shank drill is used with this tool. It is small, light in weight. The bit is clamped in the chuck at its end.

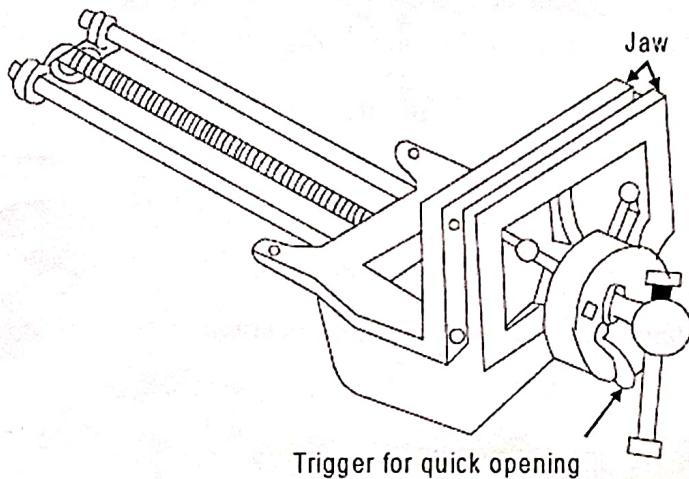
**Auger:** It is used for producing long deep holes. It is a steel bar with an eye at the top in which a handle is fitted. The bottom end is provided with a screw point.



## 6) WORK HOLDING TOOLS:

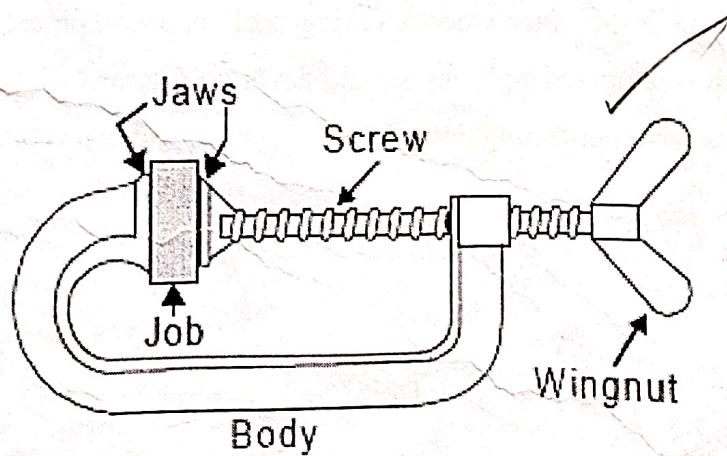
The vice and cramp are used to hold work while some operations are carried out.

**CARPENTRY BENCH VICE:** It is made of gray cast iron or steel, and it has two jaws one of which is fixed to the side of a bench and the other is movable. The faces of jaws are lined with hard wood to prevent damage of work surface. It is used for holding the work for planning sawing and chiseling on the bench.



Carpenter vice

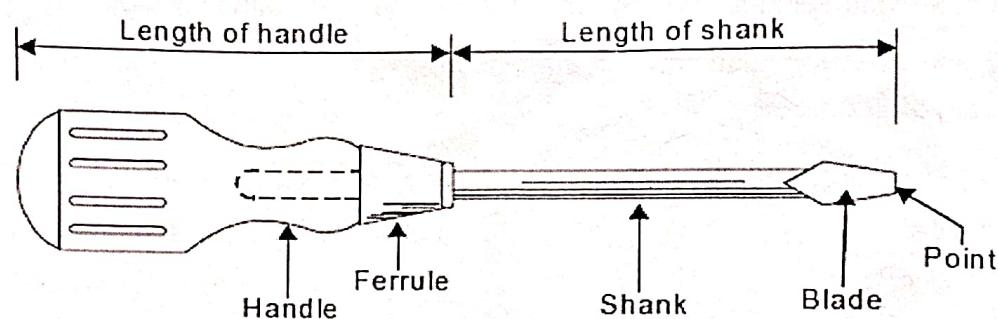
## G or C – CLAMP:



G or C-clamp

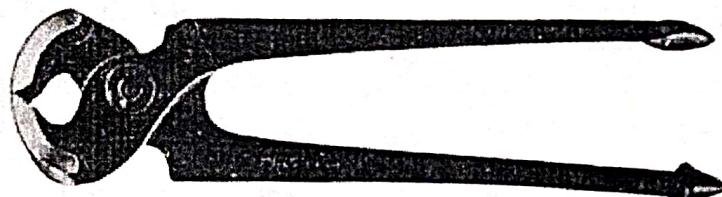
## 7) MISCELLANEOUS TOOLS:

**SCREW DRIVER:** These are used for driving the screws on wood or unscrewing them from wood. The size is specified by length of the blade.



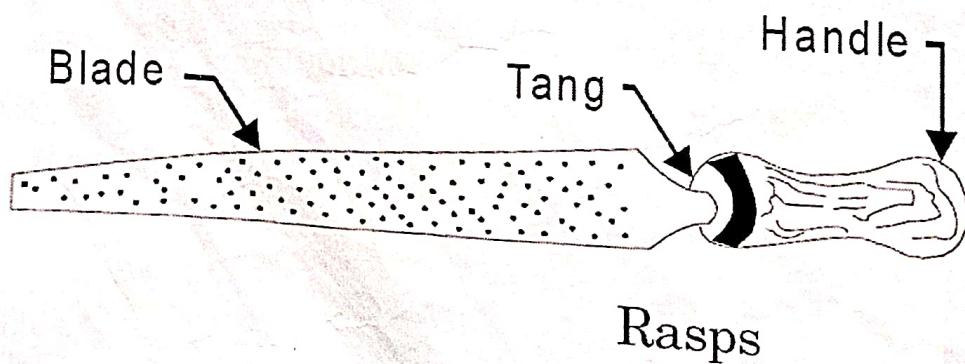
Standard screw driver with its parts

**PINCER:** It is used for pulling out the nails and is more efficient than the claw hammer.



### WOODRASP FILE AND RASPS:

They are used for maintaining other wood working tools and equipment. They are made of hardened tool steel which is tempered and they should never be dropped as they are very brittle to break. They are of various types depending upon their size, shape, cuts.



**EXPERIMENT NO. C1:**

**AIM:** To prepare half lap joint as per dimensions.

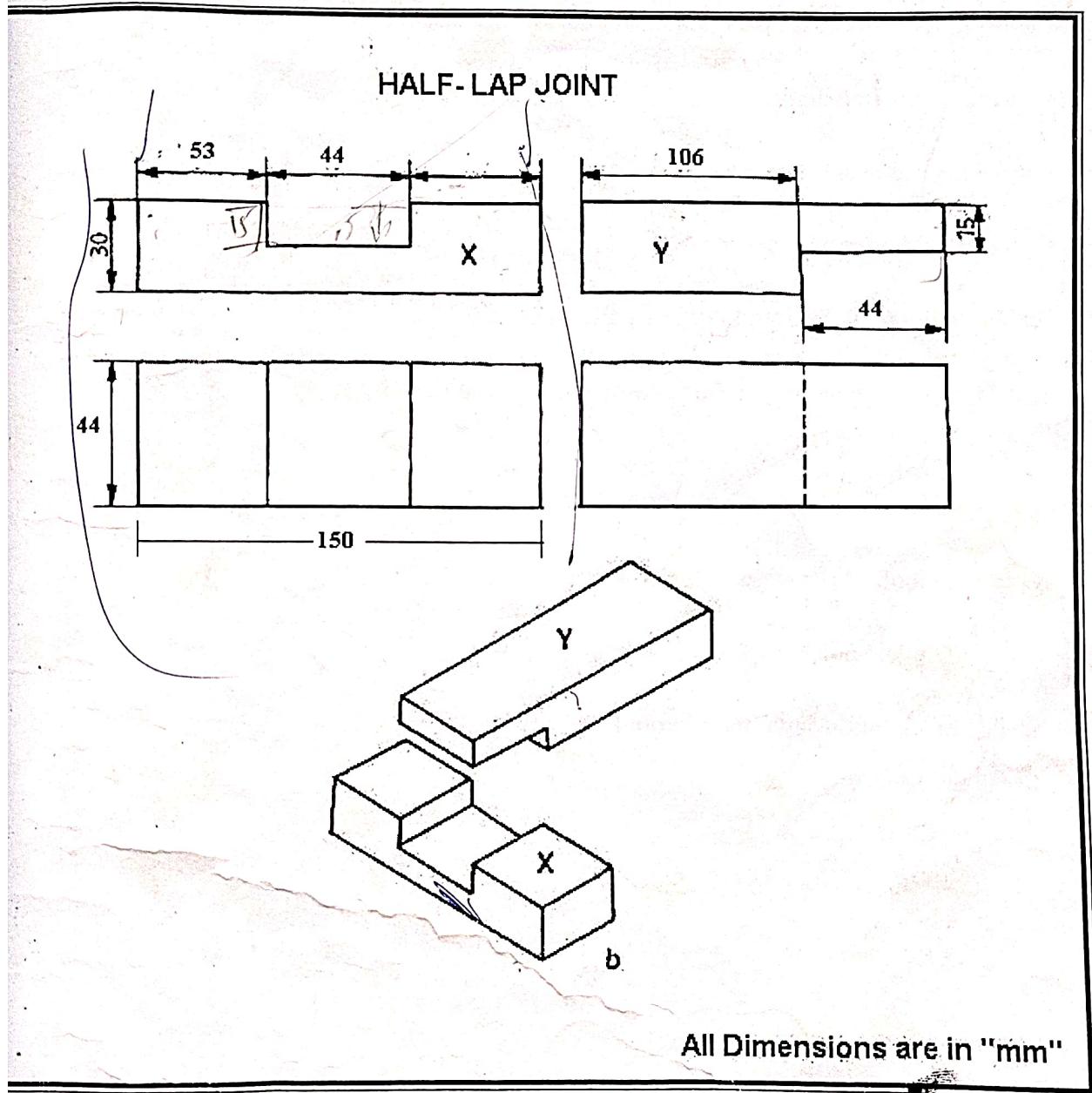
**MATERIAL REQUIRED:** Teak wood 50 mm x 25 mm x 300 mm.

**TOOLS REQUIRED:**

1. Carpenters vice (6")
2. Steel rule (12")
3. Marking gauge (6")
4. Metal jack plane (45 mm)
5. Firmer chisel (30 mm)
6. Mallet (1 kg)
7. Wood rasp file (100 mm)
8. Try square (9")
9. Cross cut saw (300 mm)

**SEQUENCEING OPERATIONS:**

1. Initial measuring
2. Rough planning
3. Smooth planning
4. Marking
5. Cutting
6. Hammering
7. Chiseling
8. Filing
9. Final Finishing

**EXPERIMENT DIAGRAM:**

**WORKING PROCEDURE:**

1. The given wood is checked for dimensions.
2. One side is planed with metal jackplane and checked for trueness by try square.
3. The four sides are also planned.
4. The excess material is cut by cross cut saw.
5. Now the portions for lapping are marked.
6. After sawing remove the waste material by firmer chisel.
7. If the material is still remained in 2 or 3 mm, and then removes by filing with wood rasp file.

**SAFETY PRECAUTIONS:**

1. Do not keep the tools at the edge of the workbench.
2. Do not keep the plane horizontal in idle mode.
3. Care must be taken while sawing operation.

**RESULT:**

**EXPERIMENT NO. C2:**

**AIM:** To prepare Dovetail lap joint as per dimensions.

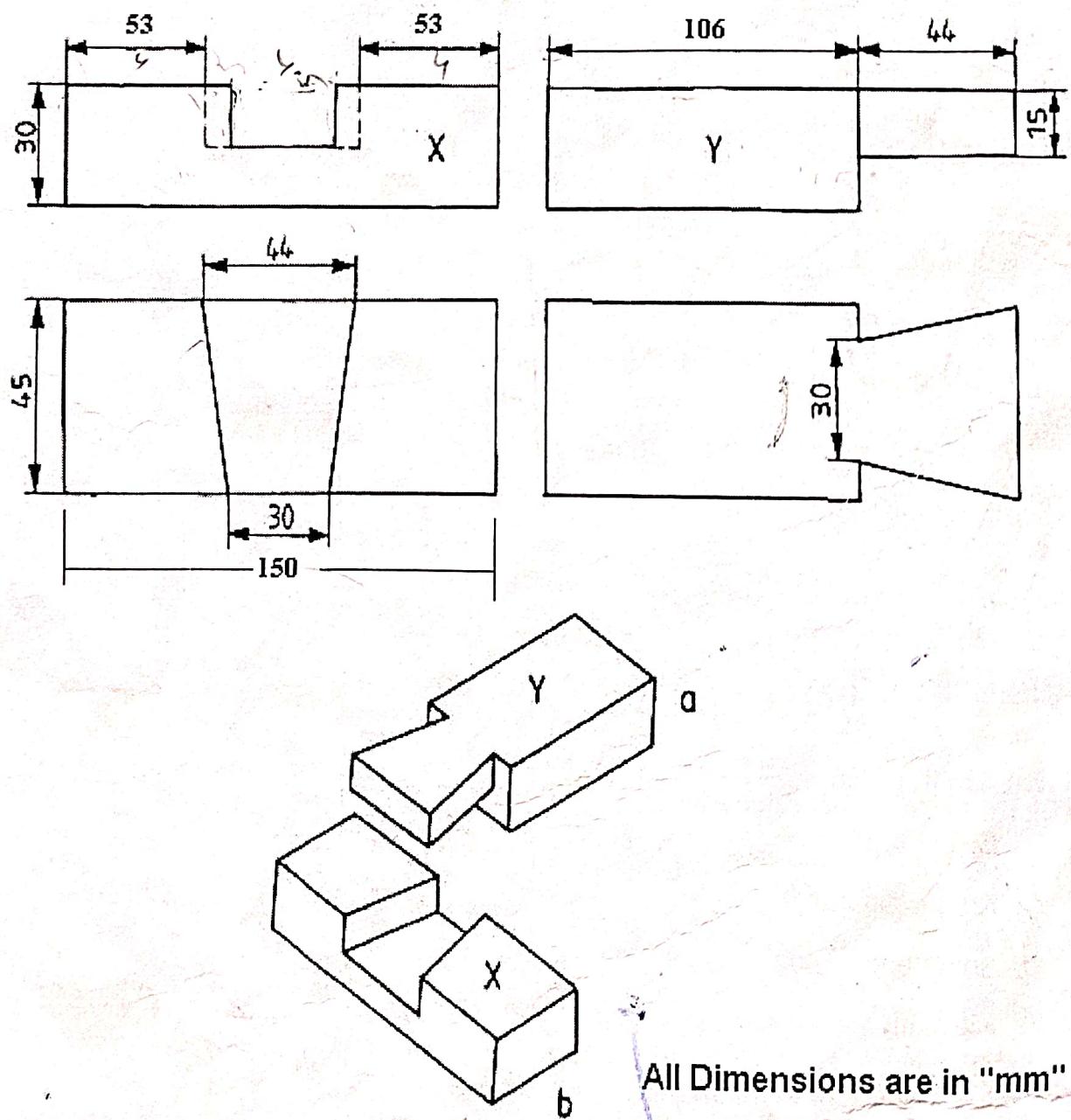
**MATERIAL REQUIRED:** Wood 50 mm x 50 mm x 300 mm.

**TOOLS REQUIRED:**

1. Carpenters vice
2. Steel rule
3. Marking gauge
4. Metal-jack plane
5. Firmer chisel
6. Mallet
7. Wood rasp file
8. Try square
9. Cross cut saw

**SEQUENCEING OPERATIONS:**

1. Initial measuring
2. Edge Preparation
3. Rough planning
4. Smooth planning
5. Marking
6. Cutting
7. Hammering
8. Chiseling
9. Filing
10. Final Finishing

**EXPERIMENT DIAGRAM:****DOVETAIL JOINT**

**WORKING PROCEDURE:**

1. The given wood is checked for dimensions.
2. One side is planed with metal jackplane and checked for trueness by try square.
3. The four sides are also planned.
4. The excess material is cut by cross cut saw.
5. Now the portions for lapping are marked.
6. After sawing remove the waste material by firmer chisel.
7. If the material is still remained in 2 or 3 mm, then remove by filing with wood rasp file.

**SAFETY PRECAUTIONS:**

1. Do not keep the tools at the edge of the workbench.
2. Do not keep the plane horizontal in idle mode.
3. Care must be taken while sawing operation.

**RESULT:**