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# GENERAL INSTRUCTIONS

1. The work to be done in the practical classes comprises of study of machines, measuring instruments and practice on jobs in different shops.
2. The manual gives the details of practical work to be done in each shop.
3. Observe safety precautions while working. Do not come wearing loose garments.
4. Do not meddle with equipments or operate machines, which you are not familiar.
5. It is in your own interest not to absent yourself because the schedule of work is tight and no extra turn is likely to be available.
6. When a student misses practical class due to some genuine reasons, he/she must complete the missed exercise after the regular classes are over, at the end of the session.
7. The students should not the leave the classes before time.
8. If the students spoils the practise job he/she will approach the workshop superiment for new job.
9. Always report for attendance first before proceeding for the practical work.
10. Each students will maintain a practical record book & bring it on each turn. Get it signed by the teacher. Students who do not bring their practical file are not allowed in workshop.



Teacher's Signature

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# Machine Shop...



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1.
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# SAFTEY MEASURES

1. Always wear proper dress and shoes in a work shop.
2. The students should not wear loose clothes, neck ties etc to guard against getting caught with moving machinery
3. Before switching on power, see that the tail slide, tool holder and job are properly clamped
4. Do not shift or change gears while the machine is running.
5. Do not try to measure work or adjust a cutting tool when the machine is running.
6. Do not take heavy cut on long slender work.
7. The machine should not be left running.
8. Oiling and Greasing must be checked frequently in order to avoid wear & tear.
9. Chips should be cleared using Brush
10. No attempt should be made to clean the revolving job with cotton waste.



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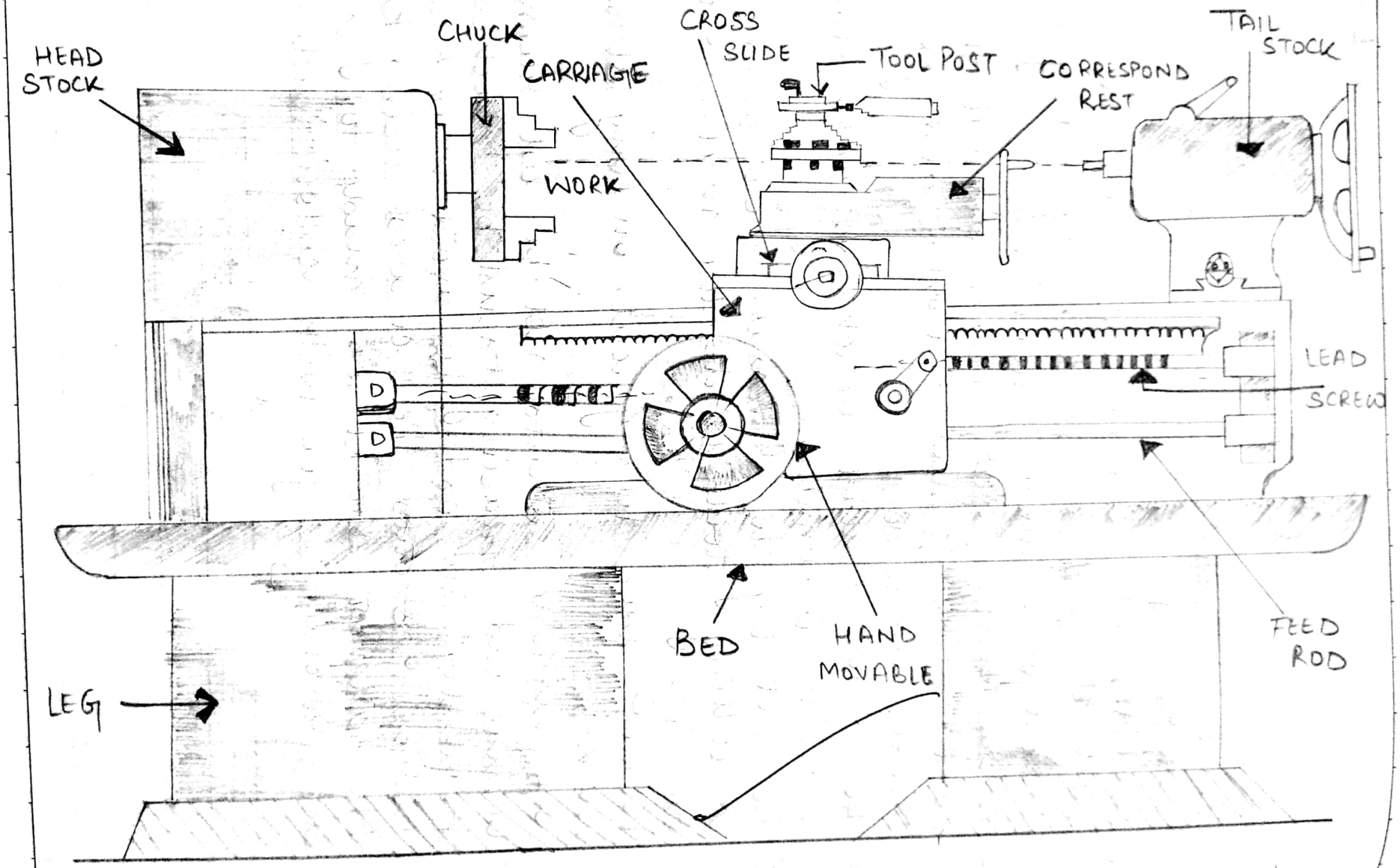
# LATHE MACHIINE...

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# Lathe Machine...

It is the mother of all Machines. A lathe is a tool that rotates the workpiece on its axis to perform various operations such as cutting, sanding, knurling, drilling or deformation, facing, turning, with tools that are applied to the workpiece to create an object with symmetry about an axis of rotation.

## PARTS OF LATHE MACHINE :

1. Head stock - It is used for gear assembly. the head stock is the part of the lathe which serves as a housing for the drawing pulleys and back gears, provides bearing for the machine spindle and keeps the latter in alignment with the bed. It is a fixed part which will be present on the left side of the lathe bed.

2. Chuck - A chuck is specialized type of clamp. It is used to hold an object with radial symmetry, especially a cylinder. In lathe it holds the rotating workpiece. On a lathe the chuck is mounted on the spindle which rotates within the head stock.



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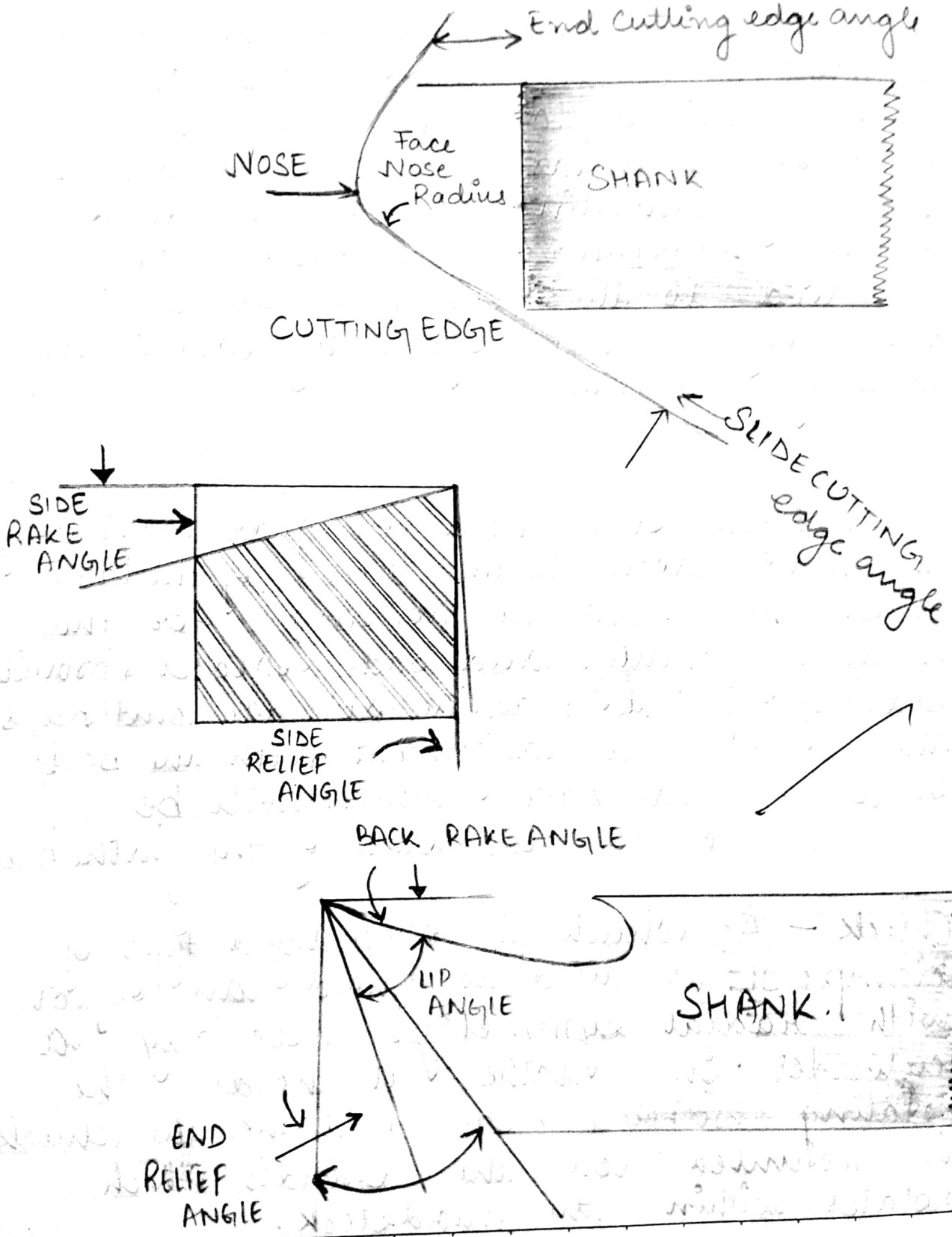
# Tool Signature :-



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chuck can be 3 jaw chuck, 4 jaw chuck etc.

| 3 jaw chuck | 4 jaw chuck |
|---|---|
| Contral | • Independent |
| Used for light work | • Used for heavy work |
| Only for circular work | • Used for every work. |
| Depth of cut is comparitively less | • The more depth of cut can be given |
| Less Gripping power | • More gripping power |
| Setting up of work is simple. | • Setting up of work is not easy. |

3. Bed — The bed of lathe acts as the base on which the different fixed and operation parts of the lathe are mounted. Lathe beds are usually made as single piece casting of semi steel (i.e. toughened cast iron). with the addition of small quantity of steel scrap to the "Cast iron". facilitating an easy sliding act. It holds the machine.

4. Carriage — The lathe carriage serves the purpose of supporting, guiding and feeding the total against the job during the operations of the lathe. It is used to move machines.



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5. Rack and Pinion - It is a type of linear valvator that comprises a pair of gears which convert rotational motion into linear motion. It gives smooth motion.

6. Compound Rest - It is a part of carriage. It is placed over the cross slide and it consists of a graduated circular base which is having swiveling machine. It moves the tool post.

7. Tool Post - It is also a part of carriage. It is the topmost part of carriage and is used for holding the tool or tool holder in position. It is used to cut and is adjusted accordingly. Tool post can be of types; 1 way tool post, 4 way tool post etc.

8. Cross Slide - It moves tool post to left and right. It is to provide cutting action to the tool and action of cutting tool will be perpendicular to centre line of lathe. It can either be operated by hand, by means of cross feed screw, or may be given power feed through the apron machanism.



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9. Aprones - It is also a part of Carriage. It houses the feed mechanism, clutch mechanism split half nut, gears, leaver. The aprone wheel can be rotated by hand for longitudnal motion of the carriage.

10. Lead Screw - It is a screw used as a linkage in a machine, to translate mechanism, used for precise linear movement of the carriage along the longitudinal axis of the lathe.

11. Feed Shaft - It is for autofeed. It is a power transmission mechanism, used for precise linear movement of the carriage

12. Tail stock - It is used for the supporting of longitudnal rotatory axis of workpiece bring
2. It is also used for drilling. It will drill only in centre.

13. Coolent Pump - It is a type of pump used to recirculate a coolent. generally liquid that is used to transfer heat away from engine. Cutting oil is mixed and is used to cool down the engine.



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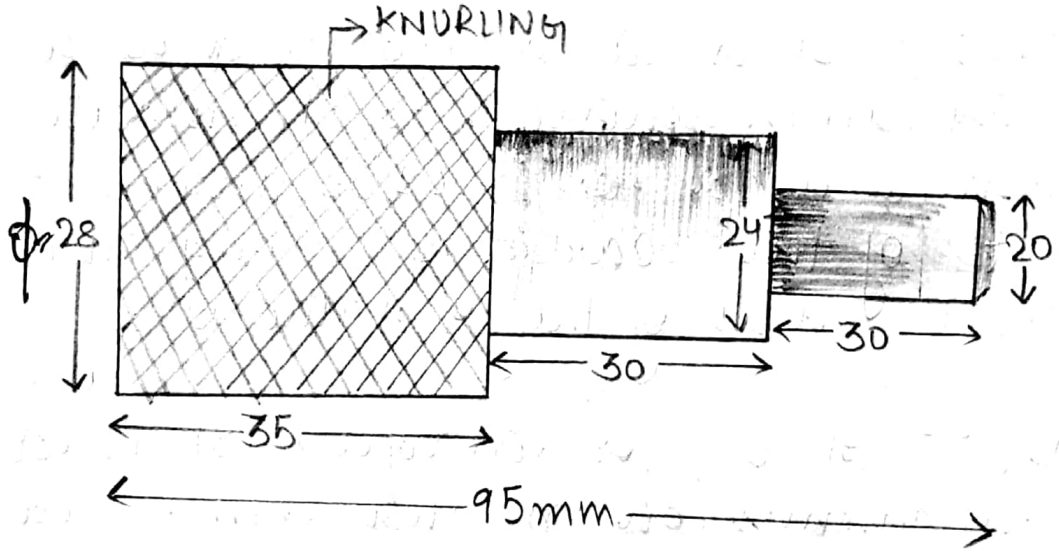
AIM: Practising in facing, Simple turning, step turning, Knurling and champfering

DIAGRAM:




NOTE:
All dimensions are in mm.

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# Job Performed

AIM : Practicing in facing, simple turning, step turning, knurling and champhering

TOOLS REQD : Vernier Calliper, Scale, chalk, jaw holder, cutter, toolbox holder, tool box holder, wrenches, Sandpaper.

CUTTING TOOL MATERIAL : High Speed steel

MATERIAL REQUIRED : Mild steel of diameter 32mm and length 95mm.

PROCEDURE :

1. The material on which the job is to be performed is taken and fitted in the jaws.
2. Then speed of jaw chuck is set and is rotated in forward direction.
3. Then the tool post is rotated in 45° dir$^n$, and facing is done.
4. The least count of the carrier is 0.2mm and in each step 1mm is done of 3 jaw chuck.
5. The turning is done by keeping the tool post in 90°. The material is brought in its length = 95mm



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6. For whole material the cutted diameter is 28mm by facing.
7. Then for 35mm, the diameter = 28 is maintained and for 30mm, 24 mm is kept and next 30mm, the diameter is 20mm.
8. Then for removing sharpness, chamfering is done.
9. Then knurling is performed on 35mm portion. It is done for better Grip.

PRECAUTIONS :

1. Always wear Apron while practising the job.
2. Always wear shoes.
3. Keep yourself away from chuck.

CONCLUSION :

The desired length of tool is obtained.

21/7/17



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# Operations :

1. Facing → It is the operation of watching the end of a piece of work to produce flat surface square with the axis. The operation involves feeding the tool perpendicular to the axis of rotation of the work.

2. Turning → In lathe is to remove excess material from the workspace to produce a cylindrical surface of required shape and size

3. Step Turning → It is the process of turning different surface having different diameters. The work is held between centres and the tool is moved parallel to the axis of the lathe.

4. Champhering → Operation of bevelling extreme ends of the workpiece. It smoothes the sharp edge of a job.

5. Knurling → Process of embossing different patterns on the surface of workpiece by pressing it against hardened steel rollers with edges of required pattern.

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# Fitting Shop...

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# SAFETY PRECAUTIONS

1. Loose clothing must be avoided
2. Do not take excessive cut than required.
3. The workpiece should be tightly firmed and vice-versa.
4. Avoid using blunt tools.
5. The hand hack saw and blade should be adjusted properly in the frame.
6. Don't wear wrist watch and bracelets while doing in the frame.
7. Antirust should be applied on the tools when not to be used for long time.
8. Get the first aid immediately in case of any injury.
9. Always chip the material away from yourself
10. Don't apply too much pressure while acting on the work shop (workpiece) or cutting with a handhack saw.



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# Introduction

Fitting means preparing matching parts to touch or join each other in a way that one will turn inside of another and one will slide upon another or the parts hold on another tightly. During the assembling of two matching parts, there may be either tightness or looseness between them. The degree of tightness or looseness between them is termed as fit. Manufactured parts are very frequently required to mate with each other. They may be designed to slide freely against one another or they may be designed to bind together to form a single unit. The most common fit found in the machine shop is that of a shaft in a hole.

## Types of fitting :-

CLEARANCE FIT : Also termed as the running fit, they are for the cases when it is desirable for the shaft to rotate or slide freely with the hole.

Transition fit : Also known as the push fit, it is for the cases when it is desirable that



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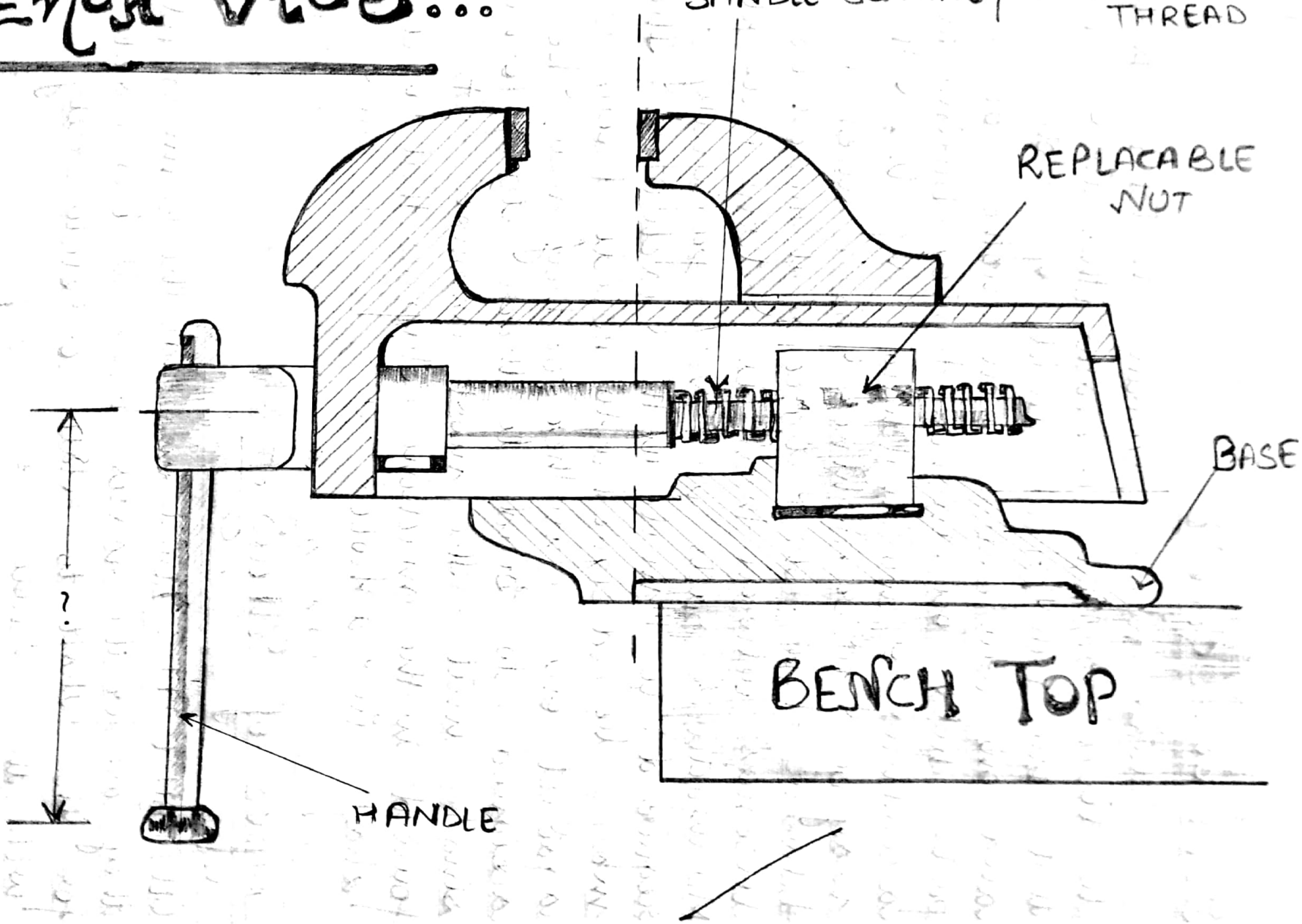
# Bench Vice...

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the shaft is held precisely, yet not so tightly that it can't be disassembled.

(iii) INTERFERENCE FIT : Also referred to as the force fit, it is used when it is desirable for the shaft to be securely held within the hole and it is acceptable that some force to be necessary for assembly.

## FITTING TOOLS :-

1. CLAMPING TOOLS —

The clamping tools that are used in a fitting shop are called vices and they are used for holding the jobs firmly during various fitting operations.

(i) Bench Vice : It consist of cast iron body and cast iron jaws. Two jaw plates are fitted with the jaws. Jaw plates are made up of high carbon steel and are wear resistant.

(ii) Hand Vice : It is used to grip very small objects. These are made in different shapes and sizes. It consist of the two steel legs hinged together at the bottom. A spring is provided between two legs. The jaws may be adjusted from a flange nut.

(iii) Pin Vice : It is used to hold wire or small diameter rods. It is also used for grinding



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small drills. It consist of a small chuck made up of tool steel and a mild steel handle.

Pipe Vice : It is used to hold pipes. It consist of a vertical screw with square threads. A handle is attached to the top of the screw. A movable jaw is mixed on the lower end of the screw.

## MEASURING TOOLS -

Steel foot tools : These are made up of stainless steel and are available in many sizes, ranging from 1/2 to 2 foot. These are marked in inches and millimeters.

Vernier Calliper : It is a precision instrument used for measuring lengths and diameters. It can be used for measuring internal and external dimensions.

Micrometer : It is used for measuring diameters or thickness of any job. It is of more precision that the vernier callipers. It consist of a hook type frame. A hard anvil is screwed on one end. On the second end, a spindle moves to and fro, carrying another small anvil on its end.

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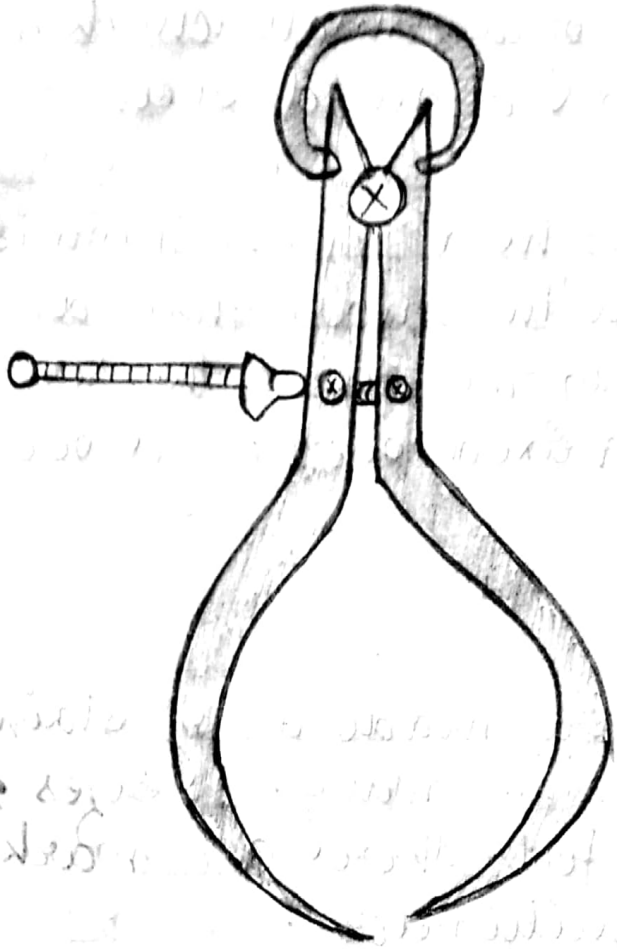
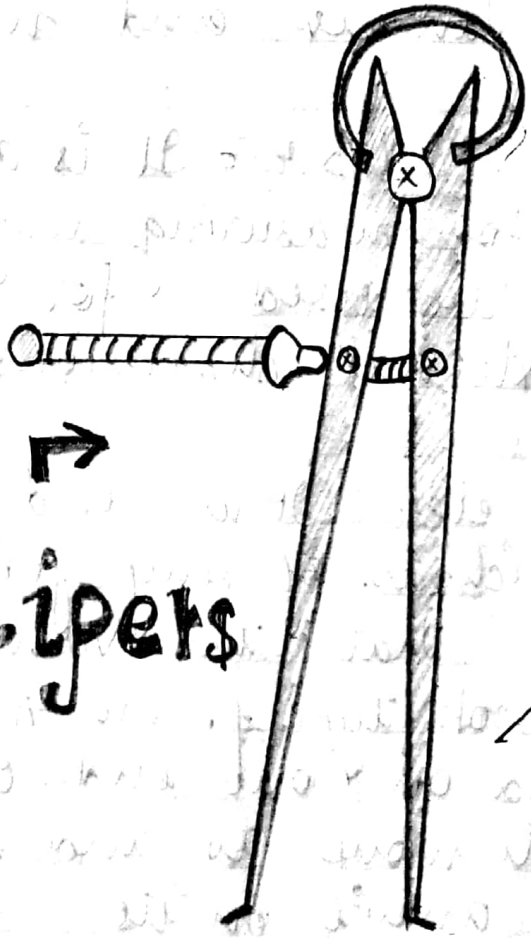


Outside Callipers



inside Callipers

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(iv) Vernier height gauge : It is used for measuring diameters or thickness of the workpiece. It consist of a vertical bar mounted on a heavy base. A sliding head with pointer is carried on to the rectangular bar.

(v) Angle plate : It consists of cast iron in which two ribs of metal are standing at right angles to one another. Holes are provided for clamping purpose. It is used for holding and supporting the jobs.

(vi) Callipers : Those are generally used to measure the inside and outside diameters. It is made in different sizes and shapes. It consists of two bent legs connected at one end by means of rivets or bolts. The edges are made to just join / touch the job, then the dimension is measured with the help of steel rules. Types include;

(a) Outside Callipers
(b) Inside Callipers.

3. MARKING TOOLS –

(i) Try Square : It is used for checking the squareness of two surface. It consist of a blade made up of steel, which is attached to a base at 90°. The base is made up of cast iron or steel.



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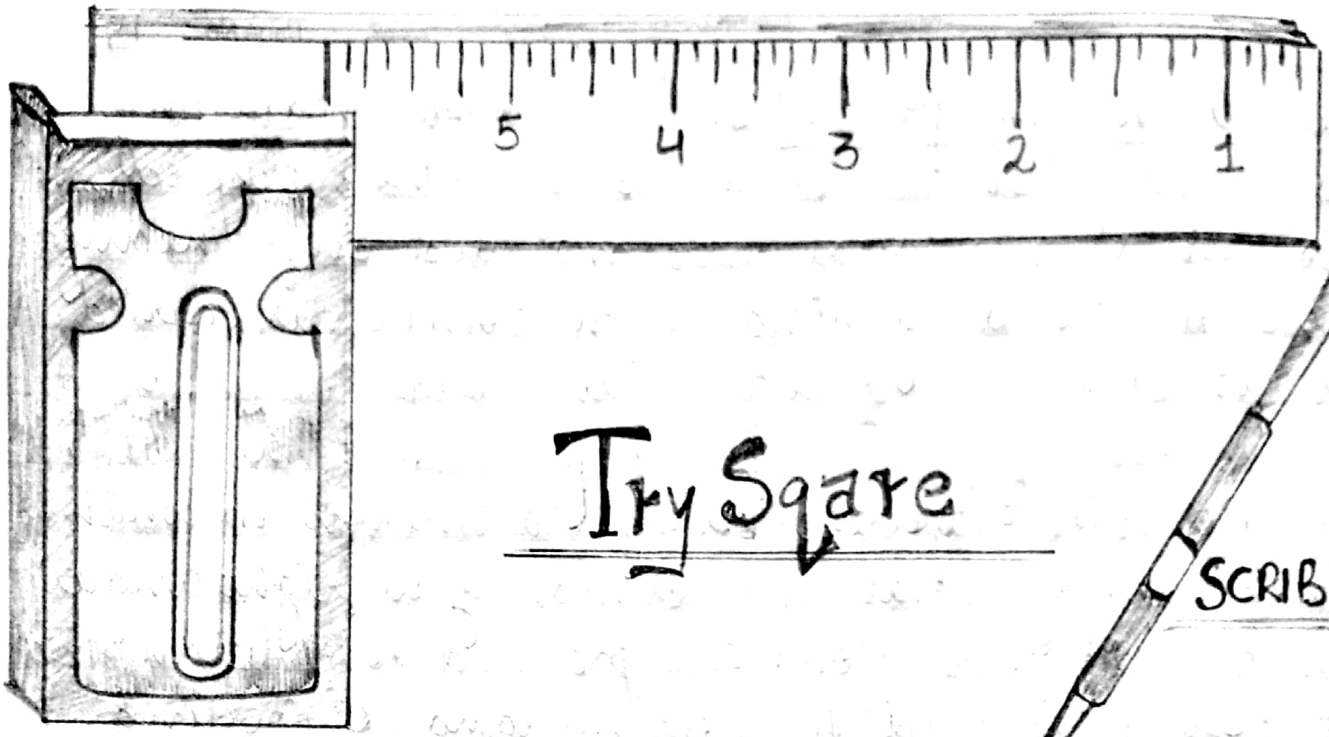
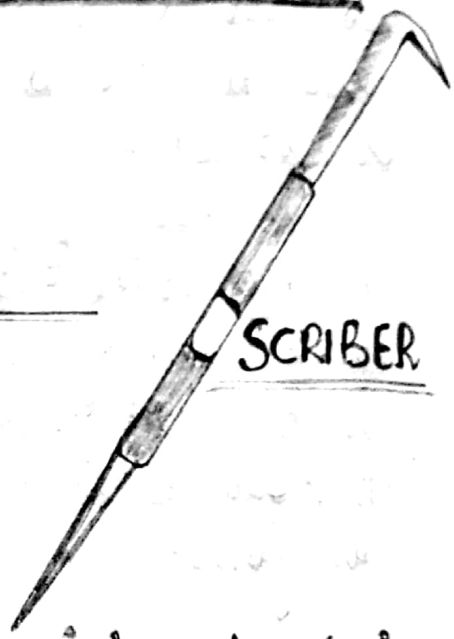



Try Square



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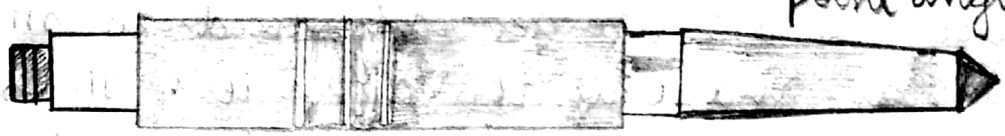
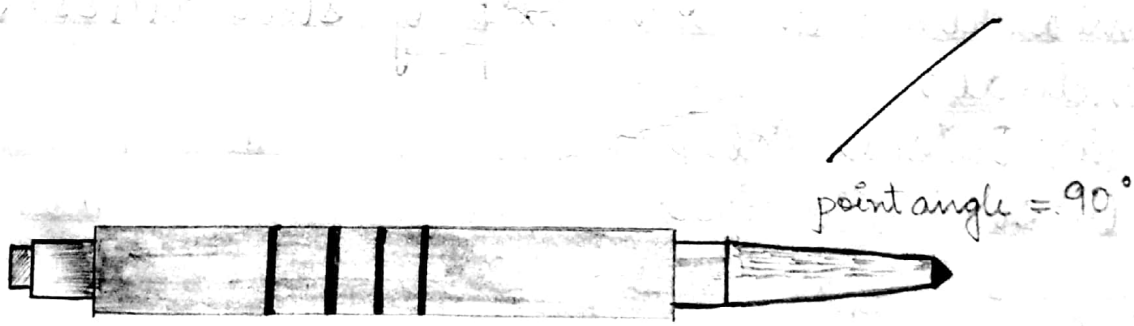



DOT PUNCH




CENTRE PUNCH

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(ii) Dot punch : It is used for marking dotted lines. It is made up of high carbon steel or high speed steel. One end is sharpened. Hammering is done on the second end while working. Angle of punching end is 60°

(iii) Centre punch : It is like a dotpunch except the fact that its punching end is 90°. It is used to mark the centre of the hole before drilling.

(iv) Scriber and Surface Gauge : Scriber is made up of high carbon steel and is hardened from the front edge. It is used for marking the lines. Scriber mounted on vertical bar is named surface gauge. A heavy base is provided at the bottom.

4. CUTTING TOOLS :—

(i) Hacksaw : It is used for cutting rods, flats, etc. The blade of the hacksaw is made up of high carbon steel or speed steel. The frame on the other hand, is made up of mild steel. The blade is placed inside the frame and is tightened with the help of flange nut. The teeth of saw blades are generally forward cut.



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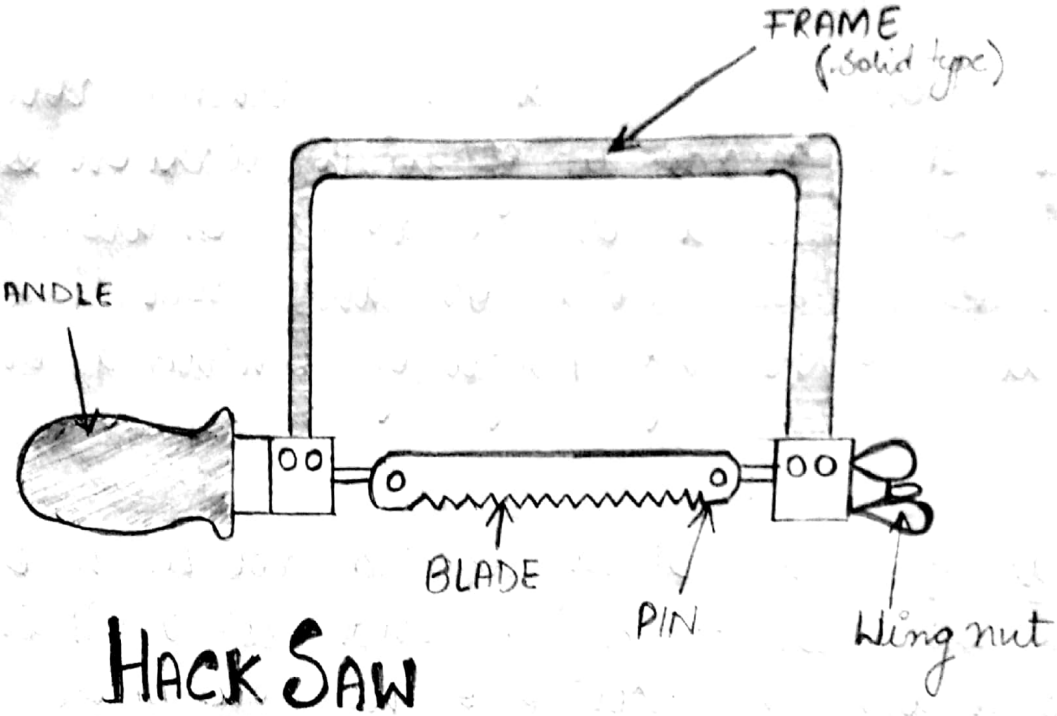
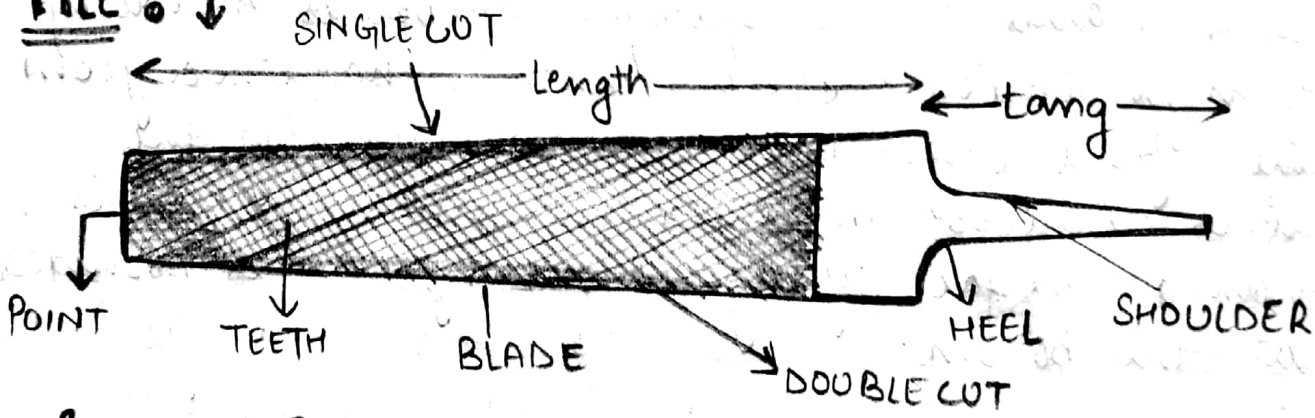
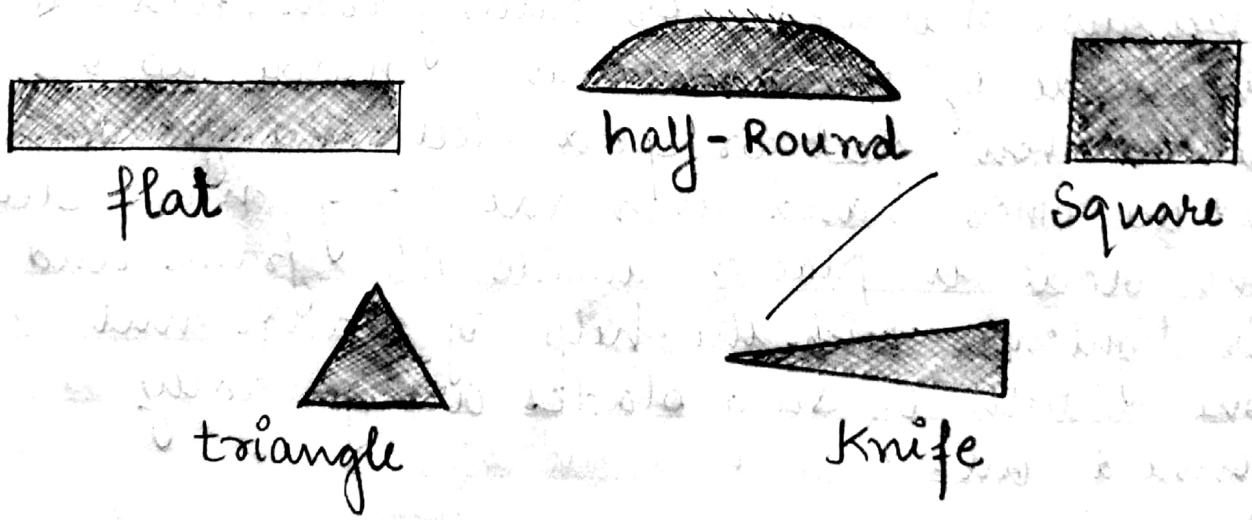



# HACK SAW

## FILE :-




## Types of files :



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The tightness and width of the blade are 1mm and 1/2" respectively. Blades are classified as-

(a) Depending upon the direction of cut – Forward
Backward

(b) Depending upon the pitch of the teeth – Coarse (8-14 TPI)
Medium (16-20 TPI)
Fine (24-32) TPI)

Types of hacksaw frames:
– Fixed frame
– Adjustable frame

In fixed frame, only one type of blade is used where as in adjustable frame, the length of the frame can be increased or decreased as per the requirements. And the blade from 8"-14" long can be used in it.

(ii) FILES: It is a multi tooth tool, which is used to remove material by rubbing it on the metal. Files are available in a no. of sizes, shapes and degree of coarseness.

Classification of files –
1. Rough file = 20-25 TPI
2. Second cut file = 30-35 TPI
3. Smooth file = 40-60 TPI
4. Dead Smooth file = 80-100 TPI



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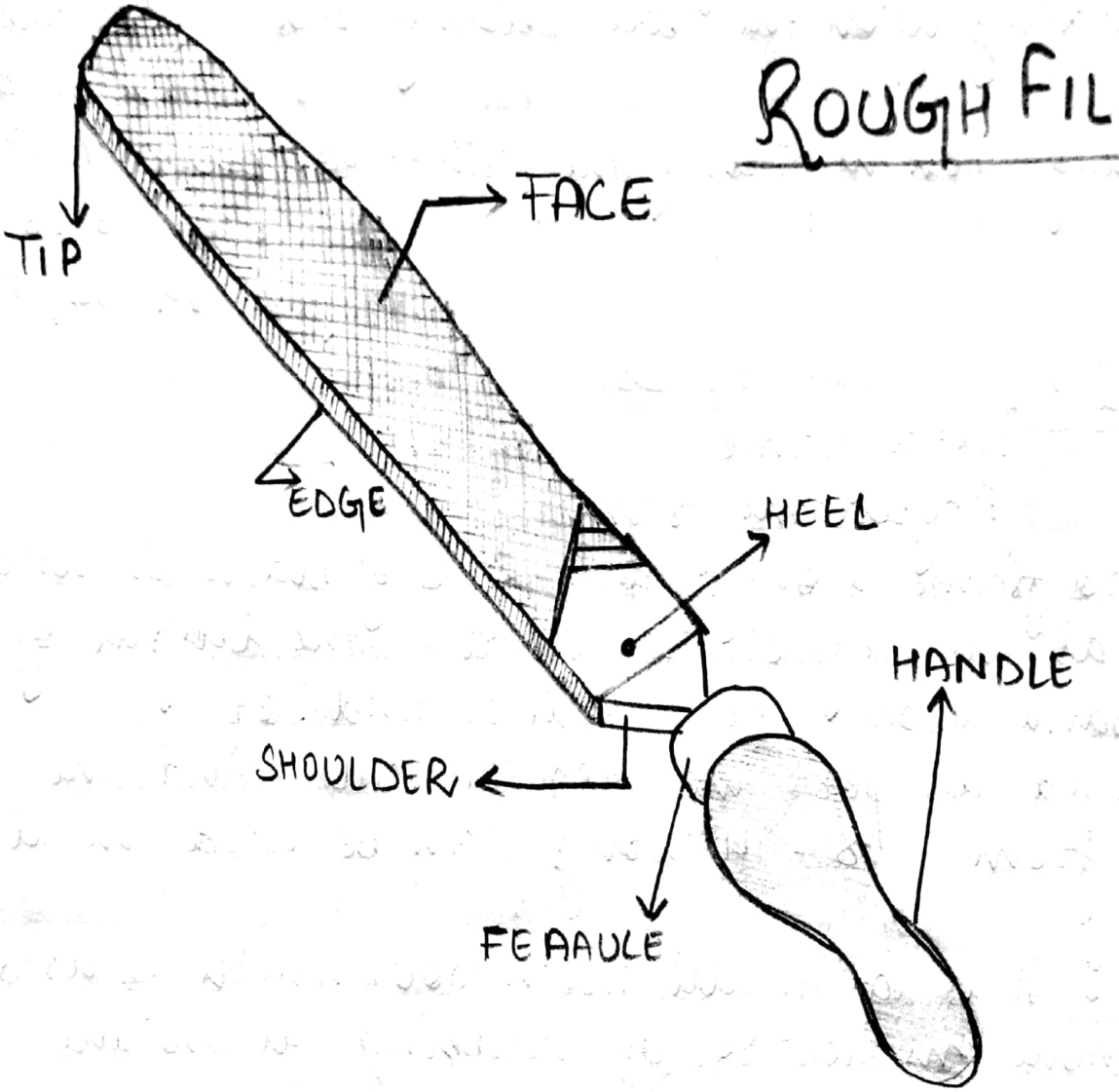
# ROUGH FILE...

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Classification on the basis of number of cuts:

1. Single cut files
2. Double cut files.

In single cut, the teeth are cut in parallel rows at an angle of 60° to the face. Another row of teeth is added in opposite direction in case of double cut files.

Classification on the basis of Shape and Size:

1. Flat file
2. Round file
3. Half Round file
4. Triangular file
5. Needle file
6. Knife edge file, etc.

SOFT EDGE FILE —

It is a file having only one edge with teeth. It is used in complex work pieces in order to avoid cutting with upper side of the file.

(iii) DRILL BIT —

It is a cutting tool used to remove material to create holes, almost always of circular cross section. Drill bits are available in many sizes and shapes and can help create different kinds of holes in a variety of materials. In order to create holes, drills bits are attached to a drill, which powers them to cut through the workpiece, typically by rotation. The drill will grasp the



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upper end of a bit called the shank in the chunk.

## 5. STRIKING TOOLS –

(i) Ball pein hammer: Also known as ball pein hammer, or the machinist's hammer, it is a type of peening hammer using in metal working. It is distinguished from a cross pein hammer by having a hemispherical head.

(ii) Double face Hammer: Literally or as the name suggests, a double faced hammer is a type of hammering device, that possesses two functional faces. Both the faces of a double faced hammer are alike and either of them can be easily used for striking the workpiece or job.

(iii) Sledge hammer: It is a tool with a large, flat, often metal head, attached to a lever (or handle). The size of its head allows a sledge hammer to apply more force than all other hammers of similar size. Along with the mallet, it shares the ability to distribute force over a wider area.



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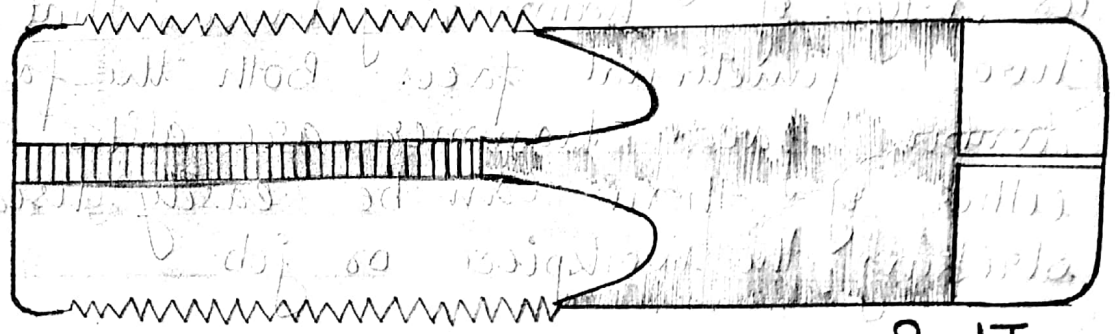

INTERMEDIATE TAP

2nd Tapper

# Tapers

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# 6. THREADING TOOLS :—

(i) **Die and die stock:** It is used for cutting external threads. Dies are made from tool steel and have internal threads. Before starting the operation, the job is held firmly in a vice or by any other job holding device. The proper die is selected for the desired threading and then starting point of the job is chamfered so that the die is properly adjusted on the job.

(ii) **Tapers:**
1. Taper tap (Front 6-8 teeth are missing)
2. Middle tap (Front 3 teeth are missing)
3. Plug tap (No teeth is missing)

Taps are used for making internal threads. It is inserted into the face of the hole at right angle. In the hand tapping, three taps are used. Taps have toothed bodies with a cylindrical shape. It also consists of a flute. Tap is held by a tap holder and before tapping, tap which be held at right angle to the plane of the work piece.



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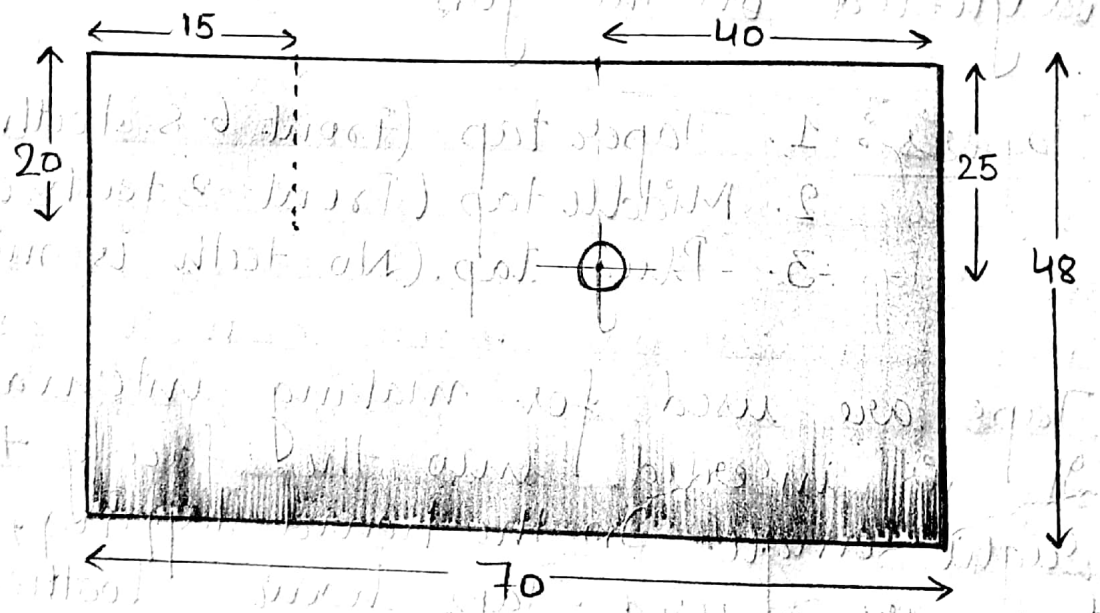
**AIM:** To practice in making fitting, chipping and drilling.

**TOOLS REQD:** Flat file, half-round file, hand hacksaw, vernier callipers, drill bit, dot punch, centre punch, ball pen hammer, try square, steel foot Rule.

**DIAGRAM:**




Note: Diameter 10mm hole

[- - -] Cutting

ALL DIMENSION IN 'MM'.

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Expt. No. / Name :

Date 9 / 2 / 17
Page No. 20

# Job Performed

**AIM :** To practice in making fitting, chipping and drilling.

**TOOLS REQUIRED :** Flat file, half-round file, hand hacksaw, Vernier Calliper, drill bit, dot punch, ball pein hammer, try square, steel foot tool, centre punch.

**MATERIAL REQUIRED :** Mild steel

**MACHINE REQUIRED :** Drilling machine.

**PROCEDURE :**

1. Study the drawing
2. File the job i.e. the mild steel slab to dimension $(70 \times 48)mm^2$
3. Mark the position to be removed.
4. Punch along the marked position.
5. Chips cutting along the punch marks.
6. File the cutting surface to the final position dimensions.
7. Mark the point for drilling, punch this position, and drill the respective hole.
8. File out burns (if any)

PTO

Teacher's Signature

NAVNEET

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Expt. No. / Name :

Date / /



PRECAUTIONS :

1. Proper use of tools to prevent injuries.
2. Don't test the sharpness of tools on your skin.

9/3/19

Teacher's Signature

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# Foundry Shop...

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# SAFETY PRECAUTIONS

1. Loose clothing should always be avoided possibly wear apron
2. Do not operate any or tool until you know about its operation.
3. There should not be any lumps in the green sand.
4. Always wear proper safety guards while doing the casting.
5. While pouring the molten metal make sure that the corners of the mould should not brought. Do not allow any other person to stand by you, when you are working on the machine.
6. Use ~~pop~~ proper fire fighting equipments in case of any accident.
7. Get the first-aid immediately in case of any injury.



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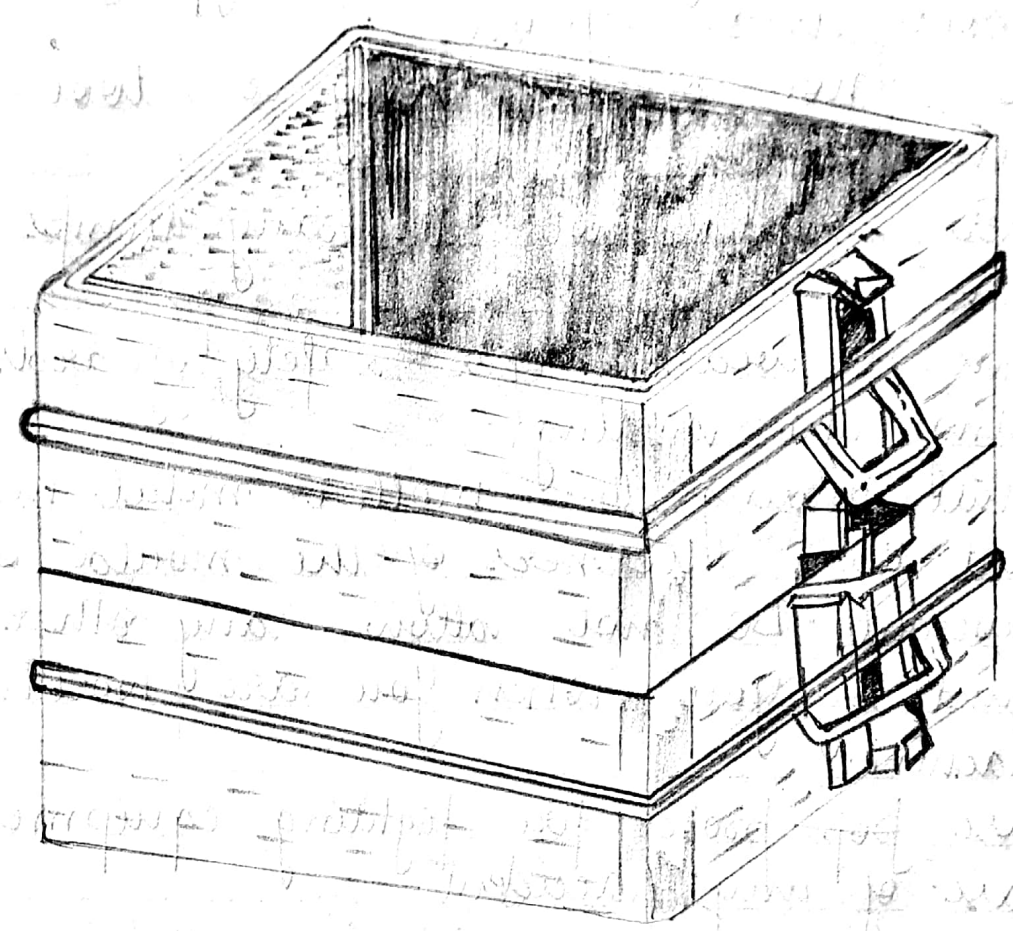

Moulding flask.

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# Introduction...

## PATTERN

A pattern is a model or the replica of the object (to be casted). It is embedded in moulding sand and suitable ramming of molding sand around the pattern is made. The pattern is then withdrawn for generating cavity (known as mold) in molding sand.

## Common Pattern Materials

The common materials used for making patterns are wood, metal, plastic, plaster, wax or Mercury.

## FOUNDARY

The place where jobs are prepared by meeting and pouring then molten metal into the moulds is known as foundary.

## MOULD

A mould is cavity so prepared that can be used to make canting by pouring molten metal into it.

## CASTING

The molten metal poured into mould, on cooling is known as casting.



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## FORGABILITY

The capacity of a metal to get forged is called forgability.

## Types of Patterns:

1. Solid Pattern
2. Split Pattern
3. Multi-piece pattern
4. Match-plate Pattern.

## Moulding and Casting Processes:

Acc. to this method used:

1. Floor moulding
2. Bench Moulding
3. Pit Moulding
4. Machine Moulding

## Types of Sand:

1. Green Sand
2. Dry Sand
3. Molasses Sand.

## Quality of Sand:

1. Good Refractoriness
2. Good Permeability
3. Good Flowability or Plasticity
4. Good Adhesiveness



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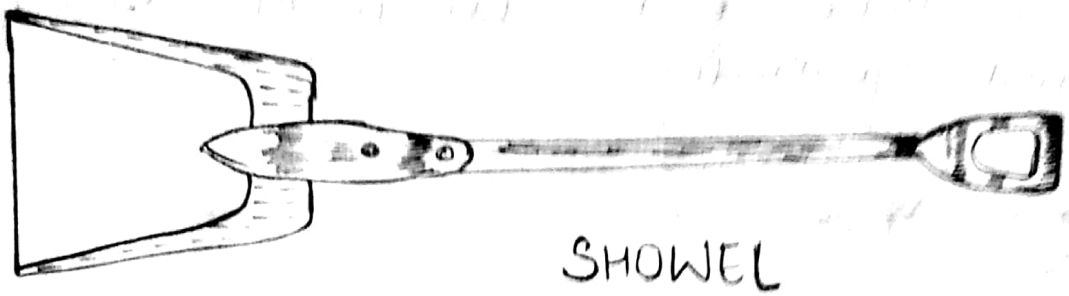
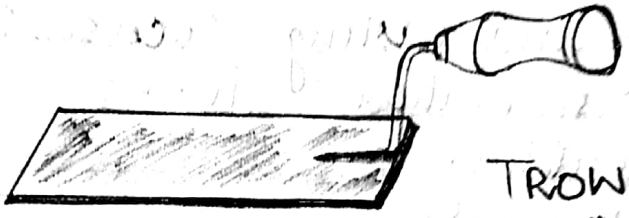
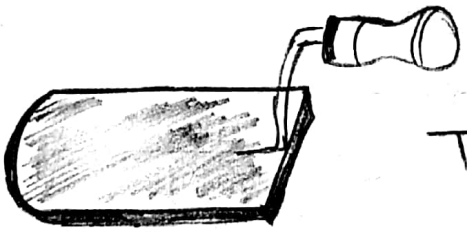


SHOWEL



TROWEL
(SQUARE NOSE)



TROWEL
(ROUND NOSE)

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Good Cohesiveness
Good Collapsibility.

## CORES :

A core can be defined as a body of sand which is used to form a cavity of desired shape and sand in casting. Cores are prepared separately in core boxes.

## MELTING FURNANCE :

A melting furnance is very necessary equipments in foundary shop. It is used to melt the metal to be casted.

## TOOLS USED IN FOUNDARY SHOP →

1. SNOVEL :

It consists of a steel pan fitted with a long wooden handle. It is used in mixing, tempering and conditioning of the foundry sand by hand. It is also used in moving and transforming the moulding sand to the container and moulding.

2. TROWELS :

These are used for finishing flat surface and corners inside a mould. Common shapes



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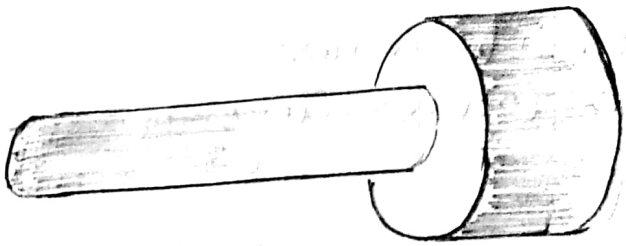
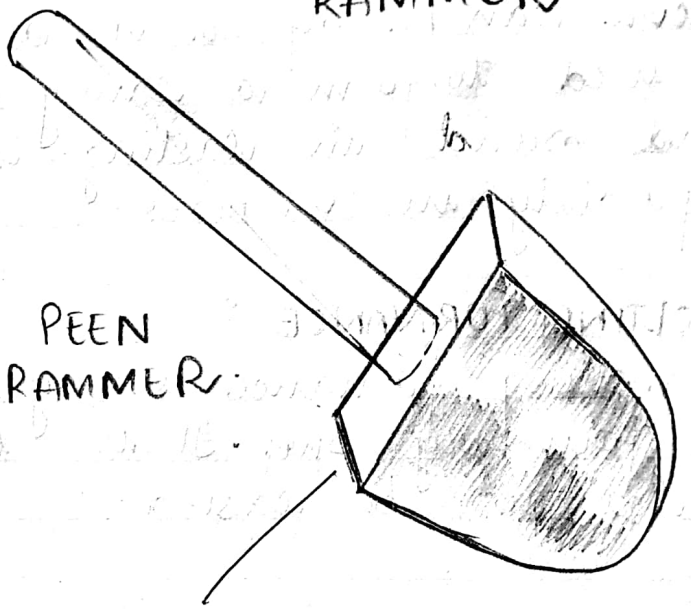
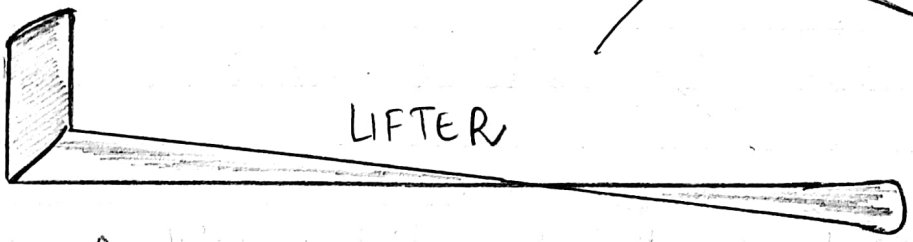
WOODEN RAMMER



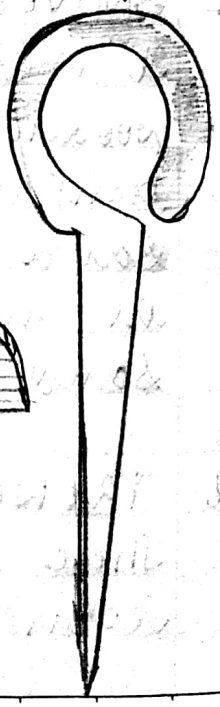
BOTT RAMMER



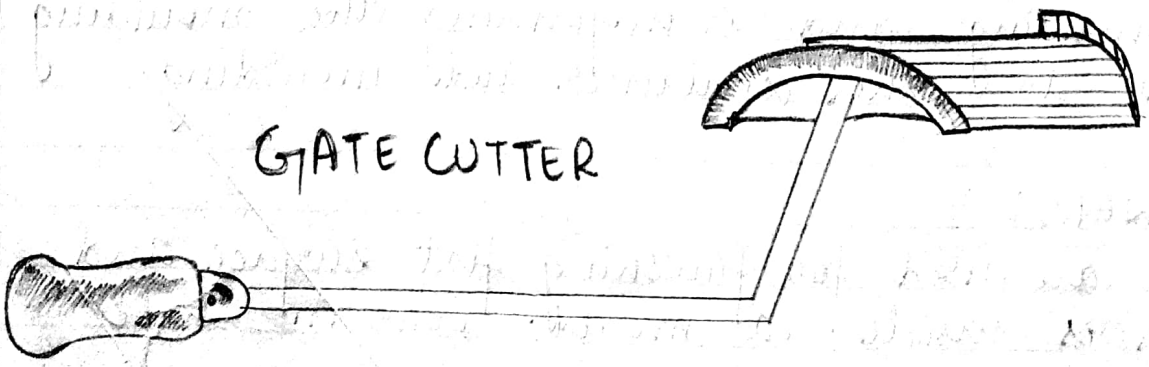
PEEN RAMMER



LIFTER



VENT WIRE



GATE CUTTER

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of trowels are made. They are made up of iron with wooden handle.

3. RAMMERS:

They are reqd. for striking the moulding sand mass in the molding box to pack or compact it uniformly all around the pattern.

4. LIFTER:

A lifter is a finishing tool used for repairing the mould and finishing the mould sand. Lifter is also used for removing loose sand from the mould.

5. VENT WIRE:

It is a thin steel rod or wire carrying a pointed edge at one end and a wooden handle or a bent loop at the other. After ramming and striking off the excess sand it is used to make small holes to allow the exist of gases and stream during casting.

6. GATE CUTTER:

It is a small shaped piece of sheet metal commonly used to cut runners and feeding gates for connecting sprue hole with the mold cavity.



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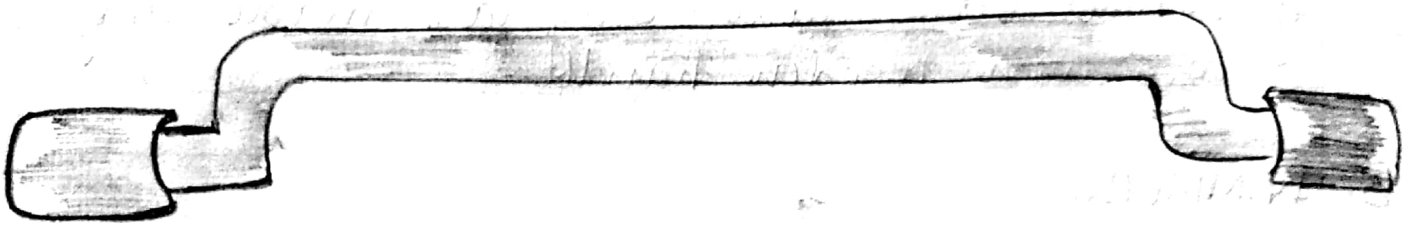
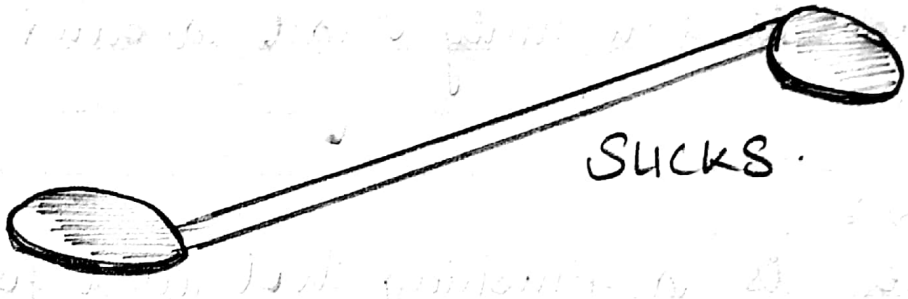
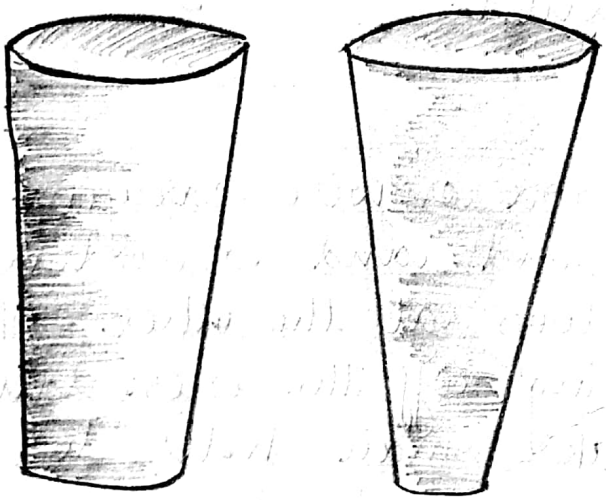
STRIKE OFF BAR





SLICKS.



SPRUE PINS

SWAB

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7. STRIKE OFF BAR :
It is a flat bar, made of wood or iron to strike off the excess sand from the top of a box after ramming.

8. SLICKS :
They are also recognized as small double ended mold finishing tool which are generally used for repairing and finishing the mold surfaces and their edges after the withdrawal of the pattern.

9. SPREE PINS :
It is a tapered rod of wood or iron which is placed or pushed in cope to form mold cavity while the moulding sand in the cope is being rammed.

10. SWAB :
It is small hemp fibre brush used for moistening the edge of sand mould, which are in contact with the pattern surface before withdrawing the pattern used for sweeping away the molding sand from the mold surface and pattern.



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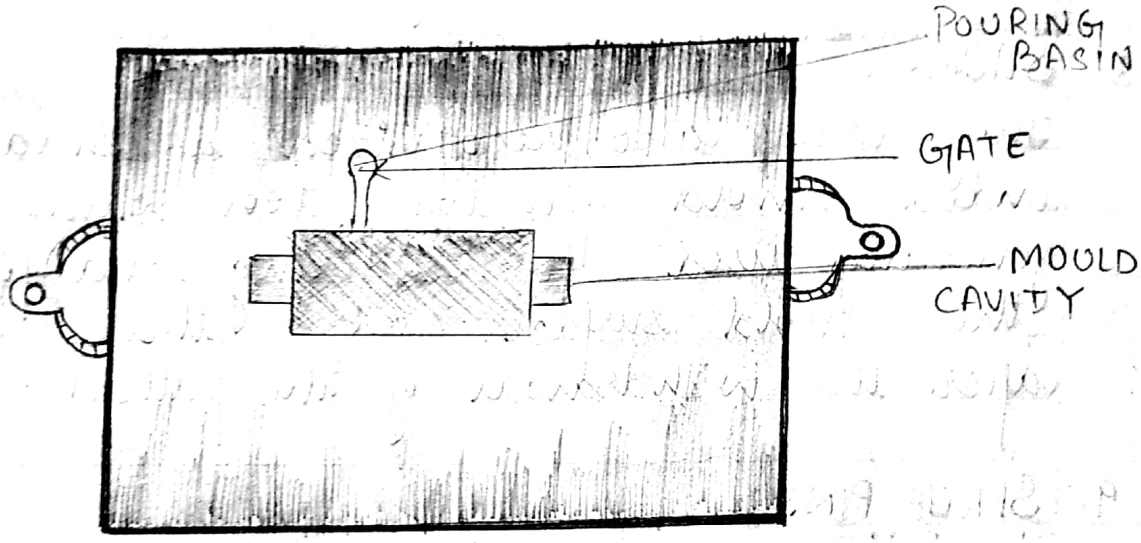
**AIM :** To prepare a mould by Solid piece pattern.

## Solid Pattern :

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# Job Performed.

**AIM :** To prepare a mould by solid piece pattern

**TOOLS REQD :**
Drag Box, Cope box, Bottom board, Butt hammer, Pin rammer, Vent-Wire, Swab, Runner-Riser pins, Bellow.

**MATERIAL REQUIRED :**
Moulding sand, pattern (single piece)

**PROCEDURE :**

1. Put water in the moulding sand and mix thoroughly
2. Place the pattern on the moulding board.
3. Place the drag box on the moulding board in the inverted position.
4. Sprinkle the parting sand over the pattern.
5. Fill the drag box without moulding sand and ram it.
6. Level the sand and make vent holes
7. Reverse the drag box and feed the Cope box over it.
8. Fill the Sand and place the runner riser pins in position.
9. Ram the Cope and level it.
10. Make vent holes over the pattern in the Cope box.



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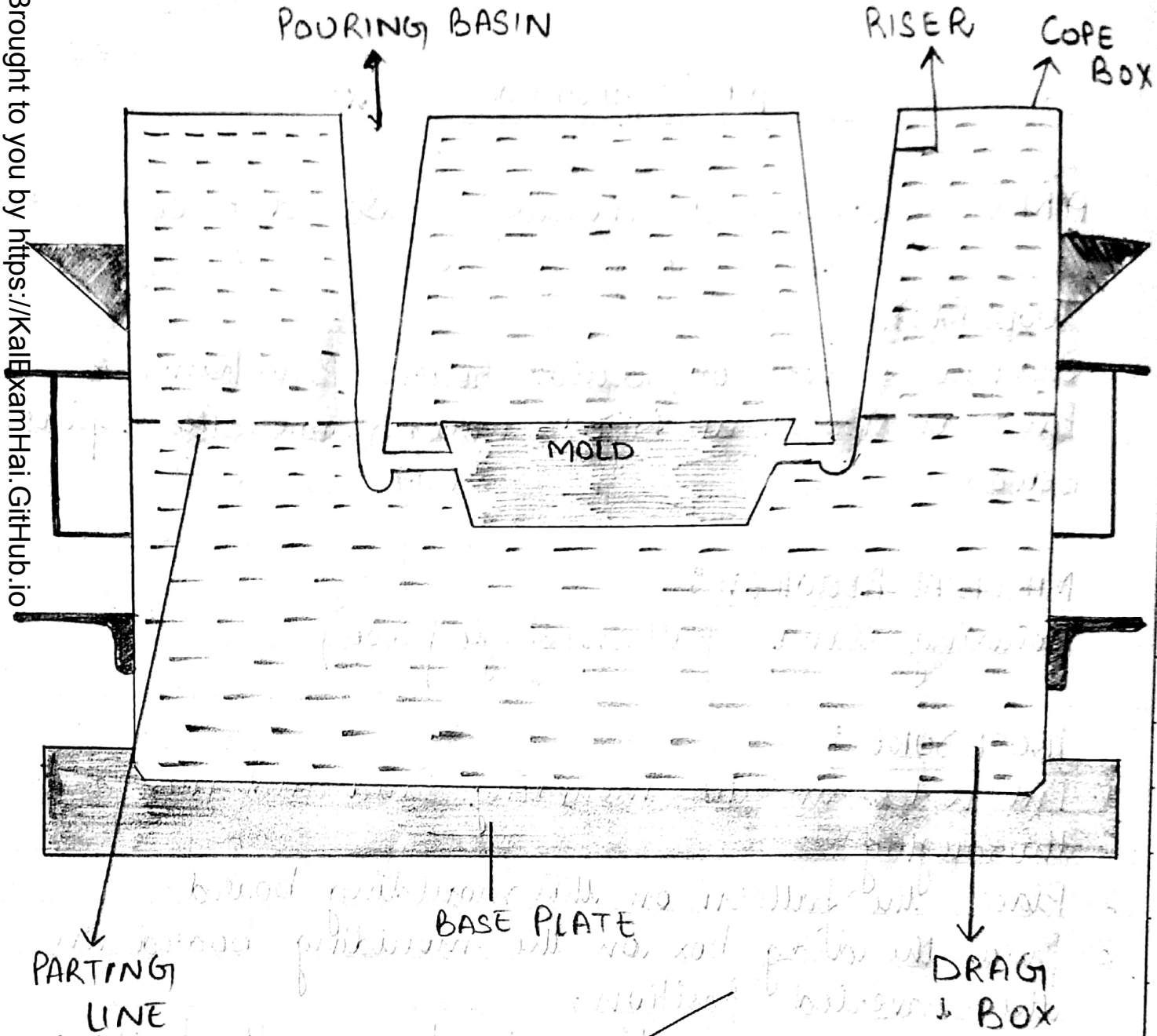


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11. Remove both the pins and make pockets around the runner and risers pins.
12. Lift the cope box, reverse and keep aside.
13. Put a little water with swab around the pattern.
14. Fix the draw screw to the pattern and remove it by slightly shaking.
15. Lift the pattern vertically up and make runner and Gate.

6/4/17



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# CARPENTRY Shop...

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Expt. No. / Name :

Date 16 / 3 / 17

Page No. 30

# SAFETY PRECAUTIONS

1. Loose clothing should always be avoided.
2. Don't take excessive cut than required
3. The workpiece should be tightened firmly in the vice
4. Avoid using blunt tools
5. Avoid taking a cut against the direction of grains
6. Don't wear rings, watches, bracelets, while doing the job.
7. Get the first aid immediately in case of any injury.
8. Always cut the material away from the body
9. Never check the sharpness of tool by finger tips.

Teacher's Signature

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# Introduction

Carpentry is the process of shaping, Timber, using hand Tools. The products produced are used in foundries, etc. It involves mainly of the joining together of wooden pieces and finishing the surface after shaping them. Hence, the term joining is also used commonly for carpentry.

## MATERIALS USED IN CARPENTRY:

Basic materials used in carpentry shop are timber and plywood. Auxiliary materials used are nails, screws, adhesives, paints, varnishes etc.

## CLASSIFICATION OF WOOD:

The timber used for commercial purpose can be divided into two classes as soft wood and hard wood

### I. SOFT WOOD –

A soft wood is light in weight and light colored. They may have distinct annual rings but the medullar rays (radial lines) are not visible and the colours of the 'sap wood' (outer layers) is not distinctive from the heart wood. (inner



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layers). These woods cannot resist stresses developed across their fibres; hence, not suitable for wood working.

II. HARD WOOD –

In this type of wood the annual rings are compact and thin and the medullar rays (radial lines) are visible in most cases. Hardwoods are nearly equally strong both along and across the fibre. Hardwood is the material used for wood working.

## SEASONING :-

Seasoning of wood is carried out for removing the sap and reducing the moisture content the pressure of sap and moisture will render the wood unsuitable for engineering works due to uneven shrinkage, cracks, warping and decay.

Different Methods of Seasoning –

1. Air seasoning or natural seasoning
2. Water seasoning
3. Electrical seasoning
4. Kiln seasoning.



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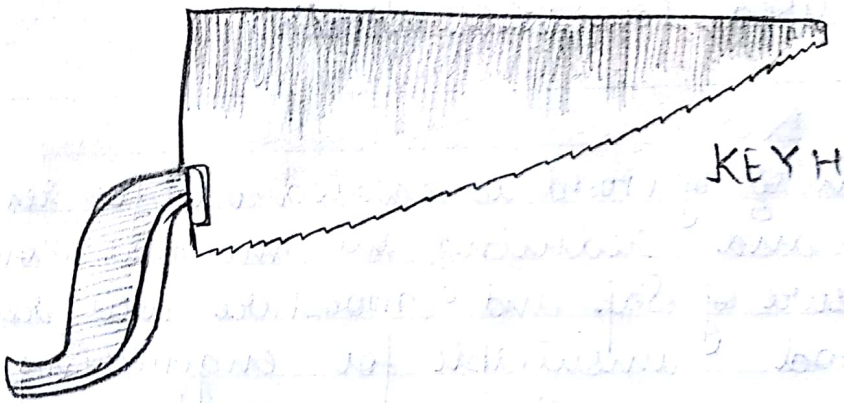
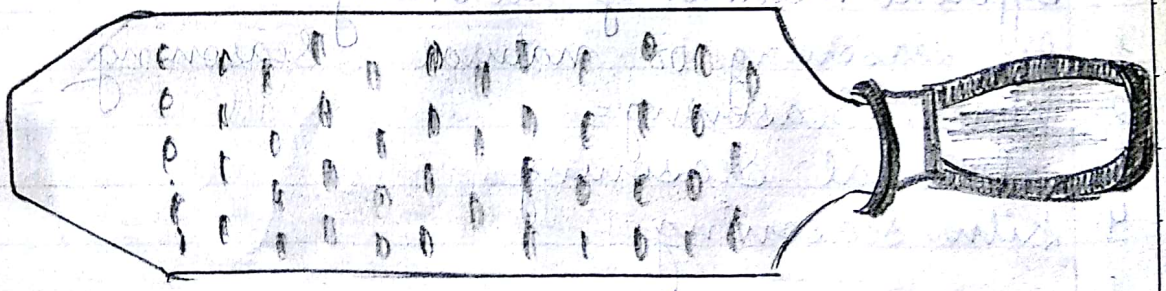
BALL PIN HAMMER



KEYHOLE SAW

RASP FILE





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# TOOLS USED IN CARPENTRY ARE :-

## 1. BALL-PEEN HAMMER —

It is also known as machinic's hammer and it is a type of peening hammer used in metal working. Its steel hand is harder than that of a claw hammer, so is less likely to chip on impact Ball-peen hammer are commonly used to drive old chisels, set reverts, bend and shape metal.

## 2. KEYHOLE - SAW —

A key hole saw is a long, narrow saw used for cutting small features in barior building materials. It has 8 to 13 teeth per inches of the Saw.

## 3. RASP FILE —

A rasp is coarse form of file used for coarsely shaping wood or other material. Typically, a hand tool, it consists of a generally tapered rectangular round, or half-round sectioned bar of case hardened steel.



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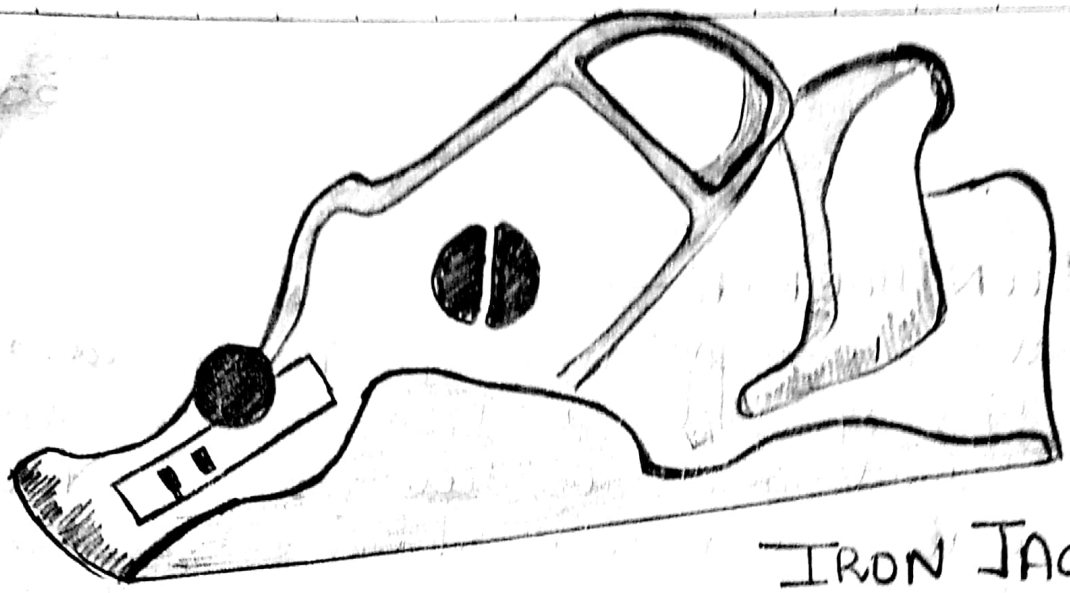
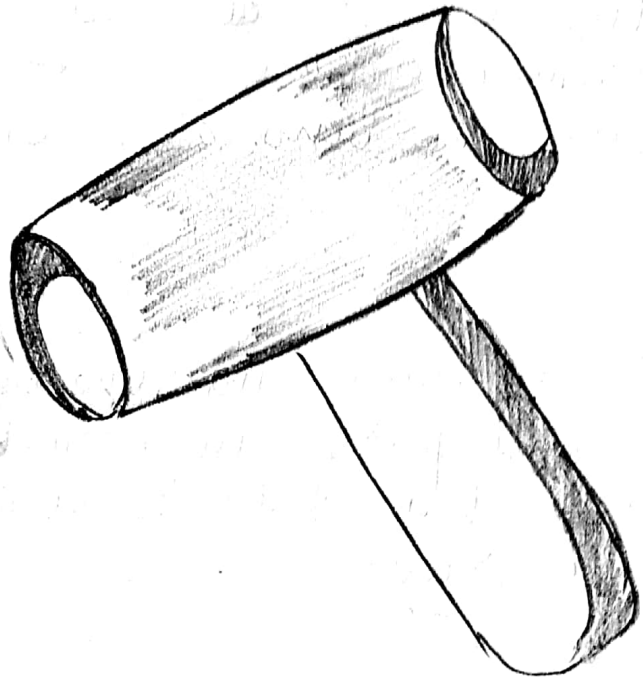
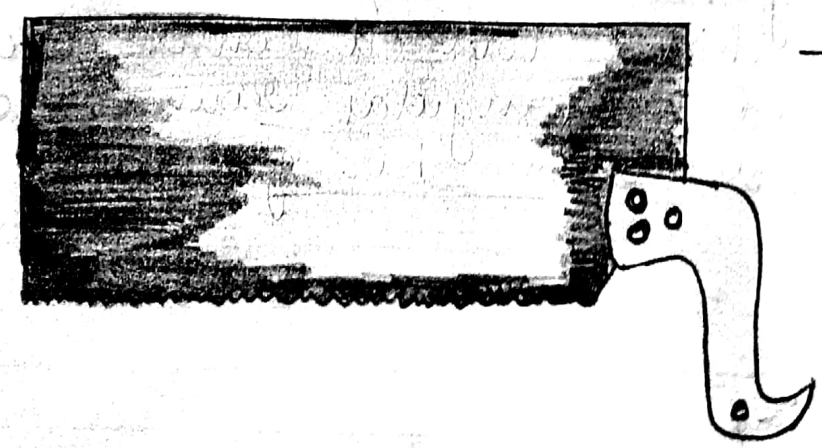


IRON JACK PLANE



MALLET



TENON-SAW

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4. IRON JACK PLANE –
A jack plane is general smoothing of the edges sizing of the timber but only marking it to correct size - wood edge jointing. They are about 12-15 inches long, and blade can have either a slightly curve edge for smoothing stock or straight edge for jointing stock.

5. RATCHET BRACE :
A carpenter's clamp used in confined spaces where a full turn of the brace cannot be achieved it is fitted with a pawl mechanism allowing the bit to be rotated while in the holes.

6. TENON - SAW –
It is used for straight cutting purpose. It has a strong brass or steel back for fines work. It is a back saw used for making deep, accurate cuts in furniture. Joinery.



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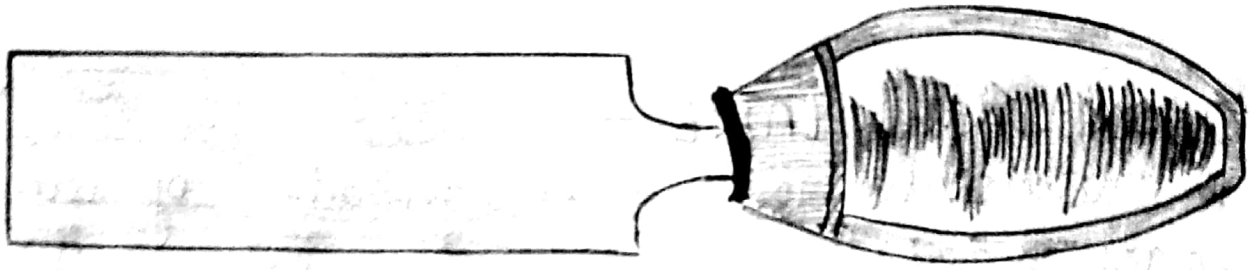
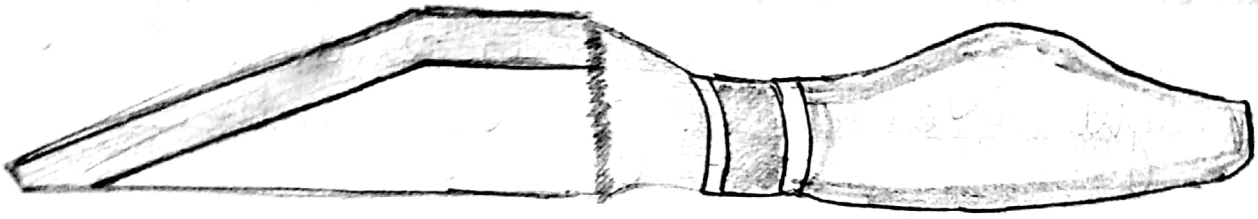
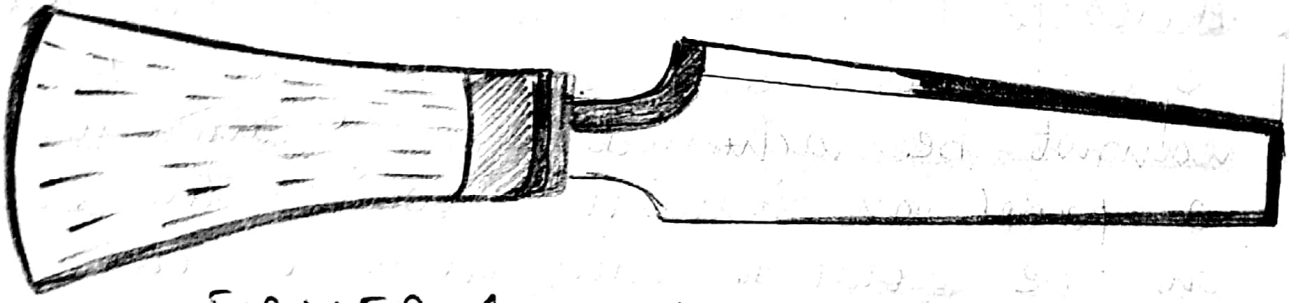


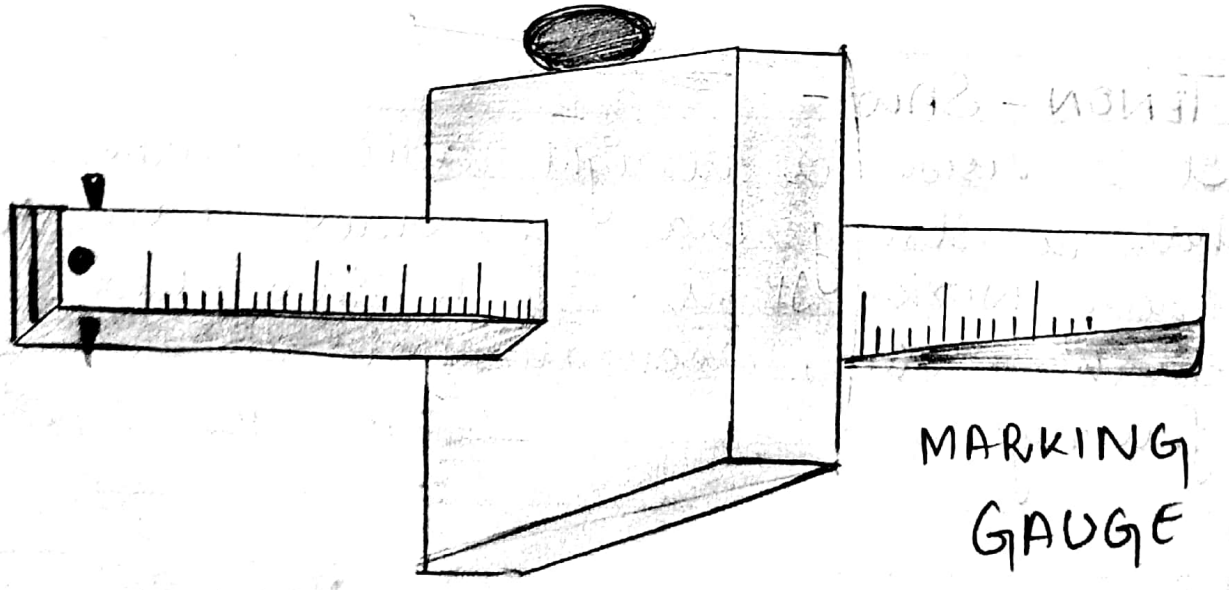
SMOOTH FILE



MORTISE CHISEL



FIRMER CHISEL



MARKING GAUGE

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7. SMOOTH FILE :
A type of file having teeth so fine as to make an almost smooth surfaces. Used for flushing metals. It is rectangular in shape, single cut on sides and edges. A file should not be used without a handle.

8. MORTISE CHISEL :
These are used for 'chopping out' joints. They are useful for cutting mortise joints as they are strong enough to withdraw heavy blows with a mallet.

9. FIRMER CHISEL :
Firmer chisel have a blade with a rectangular cross-section. This means they are stronger and can be used for heavier work. A paring chisel is longer thinner chisel which can be pushed into longer joints. It is used for cleaning the joint and make it accurate fit.

10. MARKING GAUGE :
It is also known as scratch gauge, used for woodworking and metalworking to mark out lines for cutting and other operation. The purpose of Gauge is to scribe a line.



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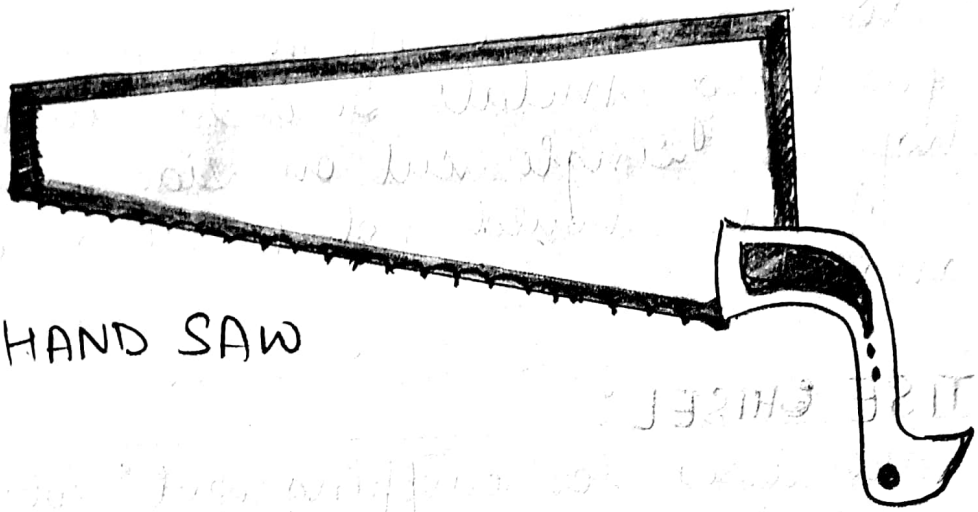
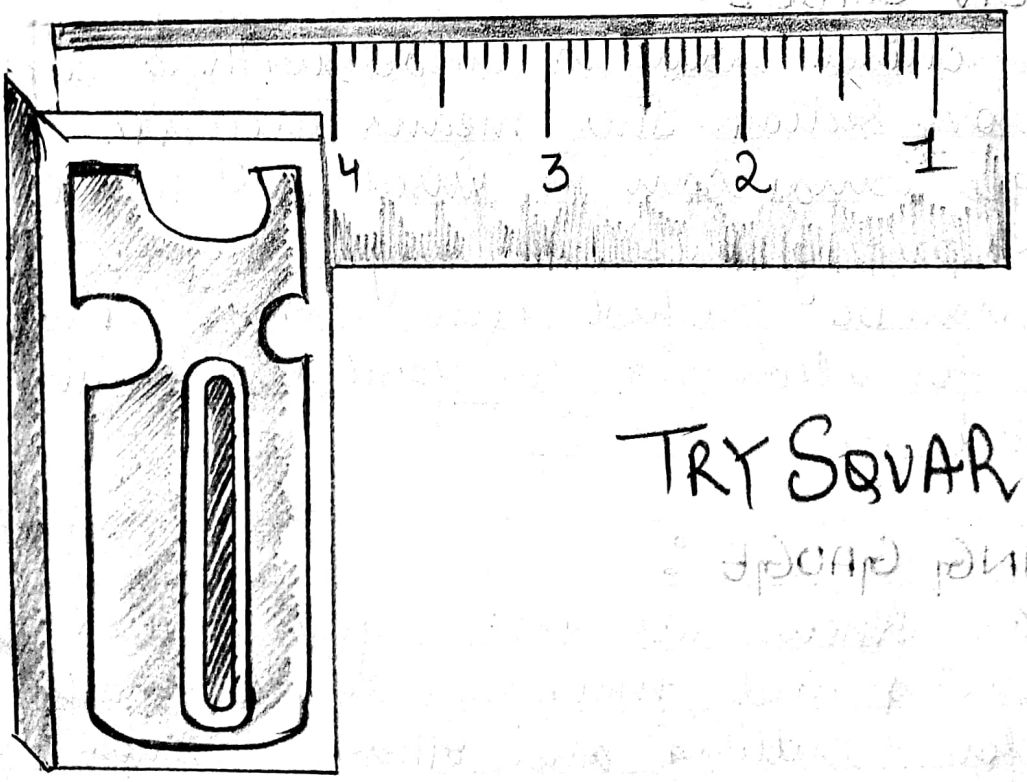


HAND SAW




TRY SQUARE

NAVNEET

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1. HAND SAW :

In carpentry, hand saw are used to cut pieces of wood into different shapes. They usually seperate by having a series of sharp points of some substances that is harder than the wood being cut at. It has 8 to 11 teeth per inch of the saw.

2. TRY SQUARE :

It is woodworking or a metalworking tool used for marking and measuring a piece of wood. The square refer to the tools primary used for marking. The accuracy of a rt. angle and to try a surface is to chuck is straighten or correspondence to an adjoining surface.



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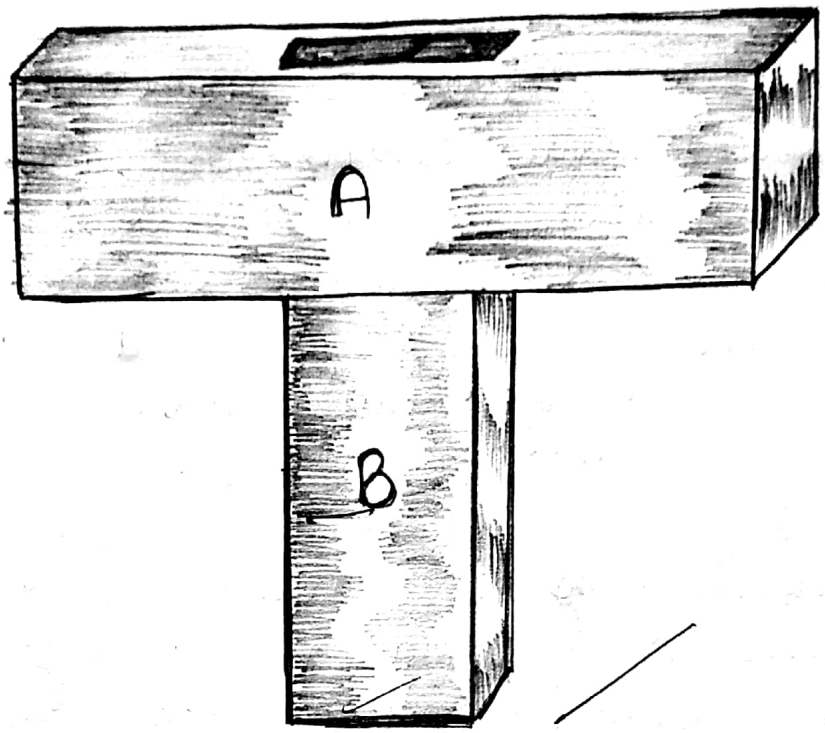
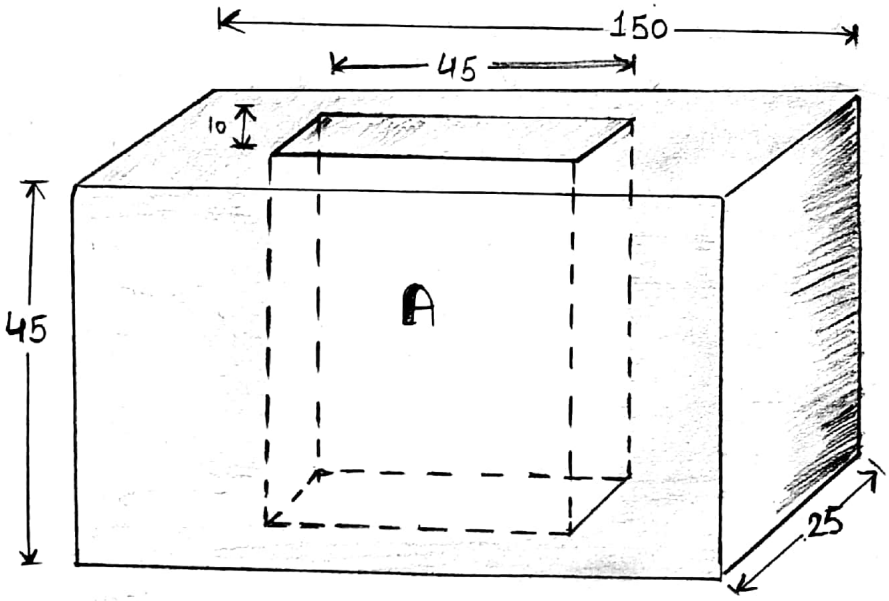
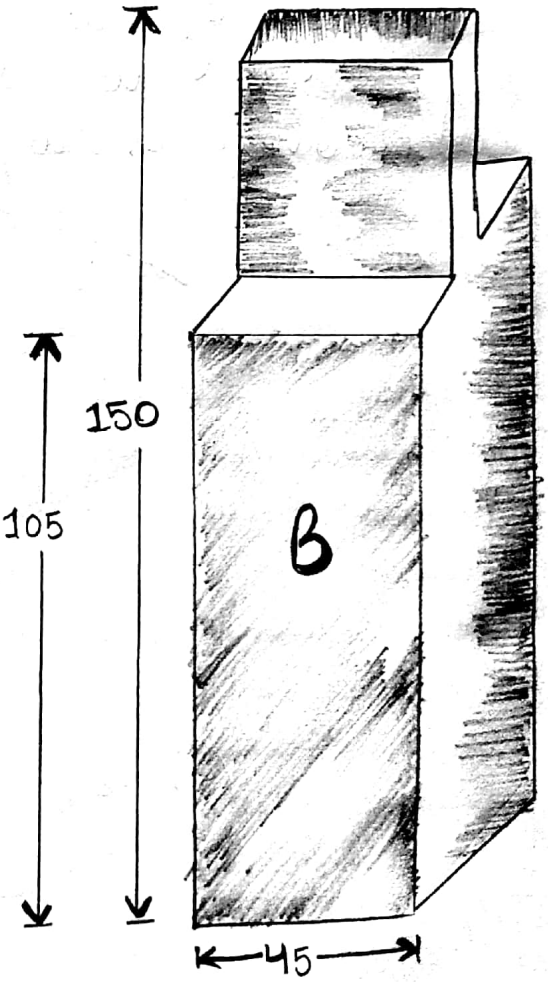
Aim: To design mortise and tenon join.

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# Job Performed.

**AIM:** To design mortise and tenon joint

**MATERIAL REQUIRED:** Soft wood, kail wood.

**TOOLS REQD.:**
Iron jack plane, hand saw, tenon saw, mortise chisel, firmer chisel, trisquare, scale, mortise gauge.

**MEASUREMENTS:** Initial Size: 305 x 50 x 35 mm
Complete Size: 300 x 45 x 25 mm

**PROCEDURE:**

1. Smooth the given planes wood to the cross-section of 45 x 25 mm.
2. Cut the given piece of wood in two equal parts.
3. Mark with the help of marking gauge the portion to be removed from pieces A.
4. Chisel out the marked portion leaving allowance for furnishing.
5. Mark lines with the help of marking gauge of required thickness on piece B.
6. Remove the unwanted material from piece B.
7. Finish the chisel surface.
8. Assemble the two parts.

6/11/17

Teacher's Signature :

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# Welding Shop...

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# SAFETY PRECAUTIONS

1. Always wear apron in the workshop.
2. Use goggles, gloves while working
3. Never weld with bare eyes.
4. To avoid exposure to skin use personal protective devices.
5. Keep clothing free from oil and grease.
6. Do not touch any wire/cable and don't allow them to lie horizontally around the work piece to avoid damage in work.

Teacher's Signature :

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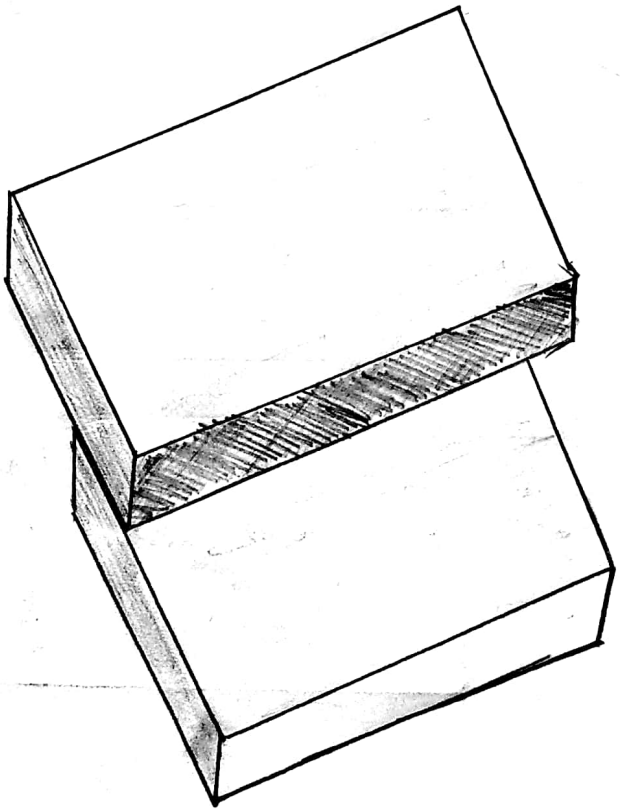

LAP JOINT

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# INTRODUCTION

Welding is a process of joining two similar metals, dissimilar metals of more than two by fusion or with help of heat and pressure. Welding has various applications in automobile, ships, bridges, railway tracks, machines, furniture, Gates etc.

## TYPES OF WELDING:

(A)
1. Electric Arc Welding
2. AC Arc Welding
3. DC Arc Welding
4. MIG (Metal Inert Gas) Welding
5. TIG (Tungsten Inert Gas) Welding.

(B) Gas Welding
1. LPG/
2. Oxyhydrogen
3. Oxyacetylene.

(C) Resistance Welding
1. Spot Welding
2. Seam Welding

## JOINTS PREPARED IN WELDING SHOP

1. **Butt joint:**
   a) Simple butt joint

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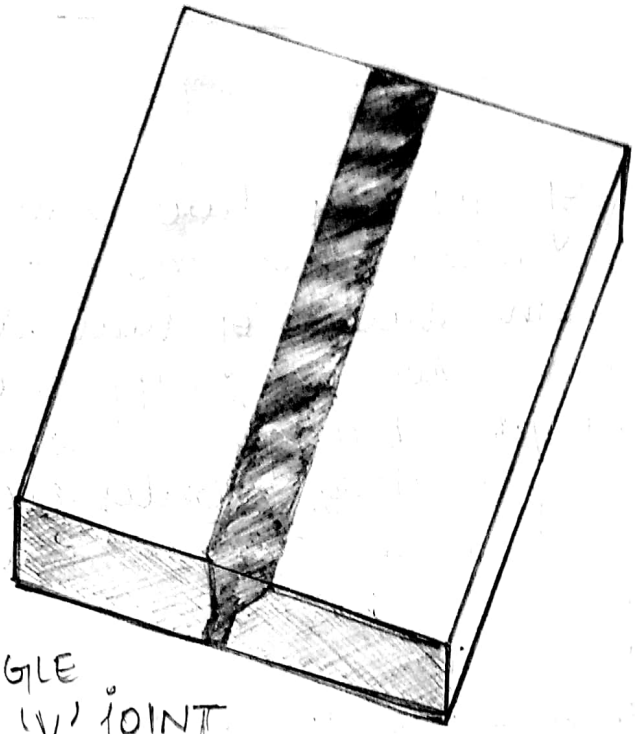
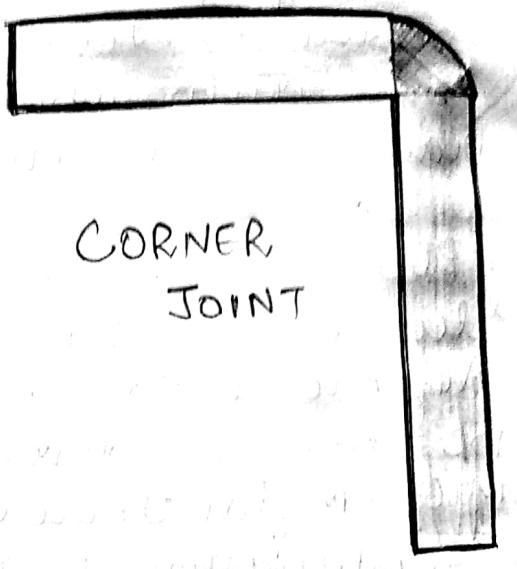
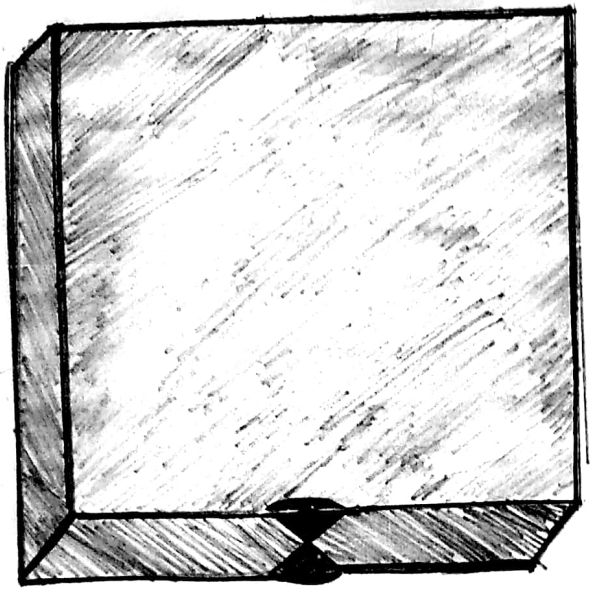


SINGLE 'V' JOINT



CORNER JOINT



DOUBLE 'V' JOINT

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Expt. No. / Name :

b) Single 'V' butt joint
c) Double 'V' butt joint

2. Lap joint
a) 'T' joint
b) Corner joint
c) Edge joint

BUTT JOINT :
The edges are cuddled in the same flame, 'V' or 'U' shape is given to the edge to make the joint stronger.

LAP JOINT :
Used to join two overlapped plates so that the corners of each plate join the surface of other.

T-JOINT :
Two surfaces are cuddled at right angles. Angle between surface is 90°.

CORNER JOINT :
Edges of the sheets are joined and their surfaces are kept at right angles.

EDGE PONT :
Two parallel plates are cuddled edge to edge.



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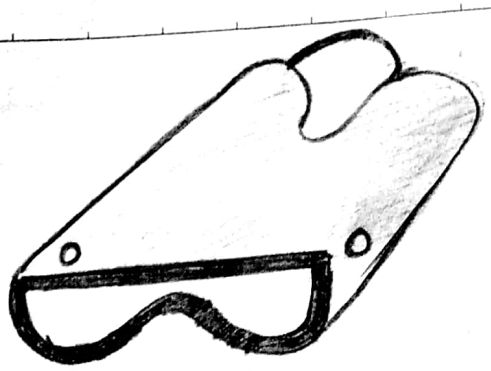
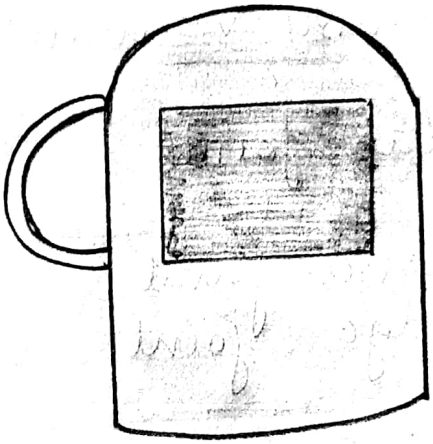
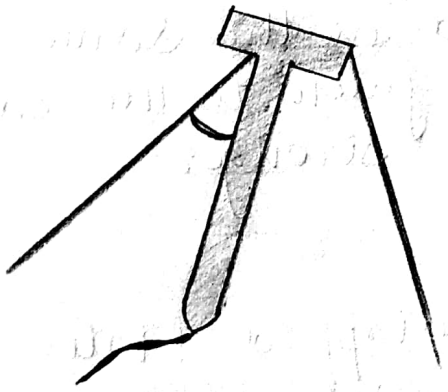
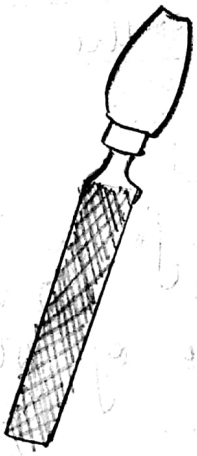


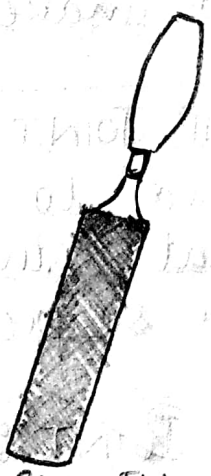
GOGGLES



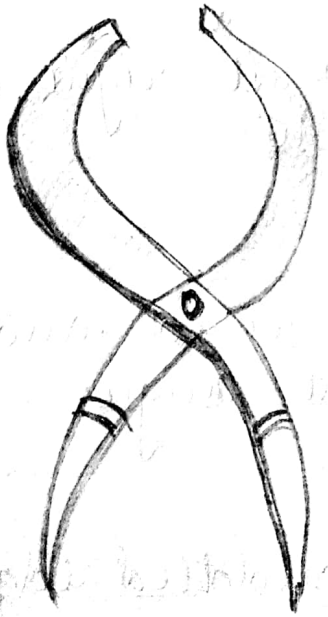




ROUGH FILE



SMOOTH FILE



TONG

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Expt. No. / Name :



# TOOLS USED IN WELDING :→

1. Files -
Rough files and smooth file is used to make metal plate smooth from all sides.

2. Goggles -
To protect eyes from heat & harmful rays and sparks.

3. Electric Holders -
Used to hold electrodes

4. Trysquare -
Used to check perpendicularity of metal oxide

5. Steel foot Rule - To measure the dimension of metal

6. Bench vise -
Used to tighten and grip the metal at a particular position to help with fitting and cutting.

7. Chipping Hammer -
Used to clean the chips and smooth the metal joints.



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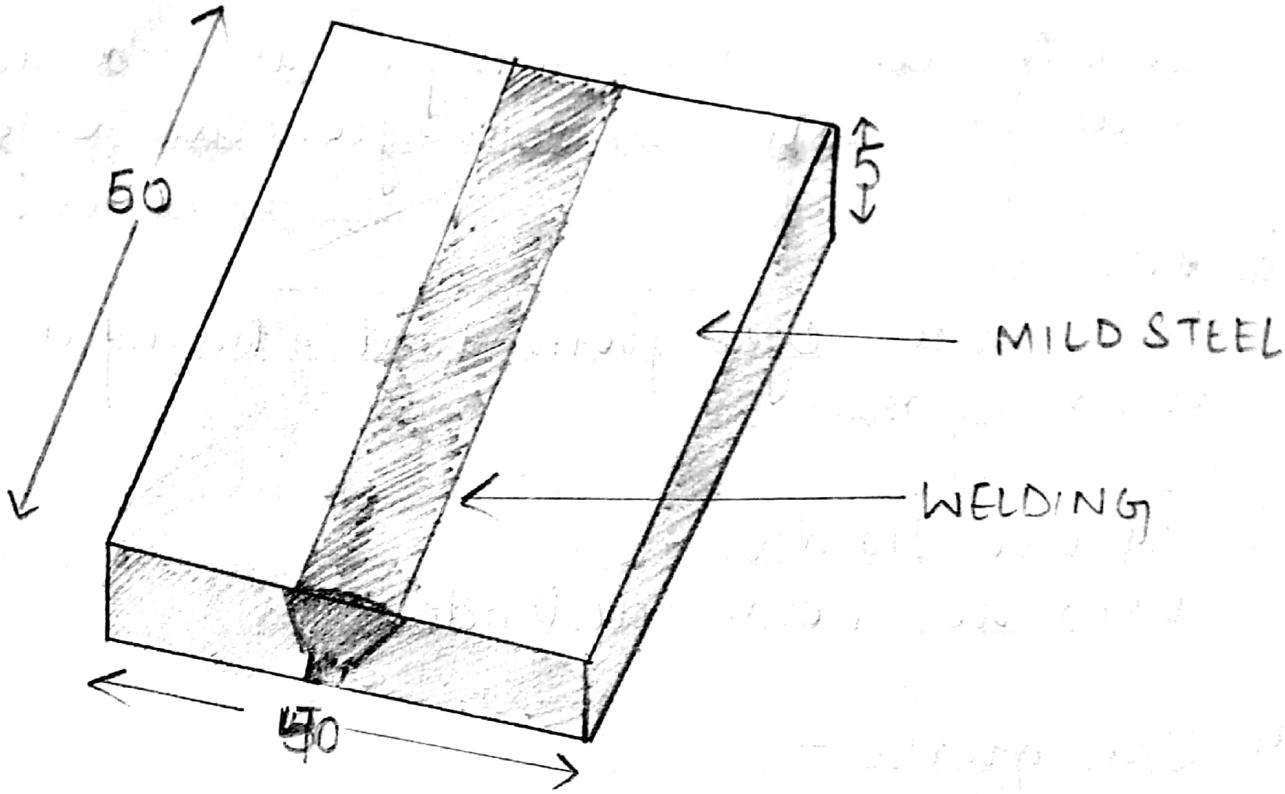
AIM : To prepare a 'V' Butt Joint by welding




NOTE : All dimension in mm

SINGLE 'V' BUTT JOINT.

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# Job Performed.

AIM : To prepare V- joint arc welding

TOOLS REQUIRED :
Electrode, Electrode holder, gloves, chipping hammer, tongs, welding screen and goggles, apron, steel foot Rule, Trisquare, wire, brush, file.

MATERIAL REQUIRED :
Mild steel plate, size (40 x 50x5) mm

PROCEDURE
1. Hold the given piece in bench vice.
2. File the plate to make it of reqd. dimensions.
3. Join the two plates as shown.
4. Start the welding job to join the two pieces in the given way.
5. Remove the slag using chipper and hammer.
6. Clean the joint with wire brush and let it cool.

PRECAUTIONS :
1. Do not touch any wire and do not allow them to lie horizontally around the workpiece to avoid damage on work.
2. Always Used eye protection.

20/4/17

Teacher's Signature

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# SHEET METAL SHOP...

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# SAFETY PRECAUTIONS

1. Hold the chisel in such a manner that the hammer blow may not miss the chisel to injure your hand.

2. Hammer with the loose hand should not be used it may cause hand injury.

3. Never middle the fingers in between the snip, while shearing.

4. Never manipulate tools or work piece during shearing and bending operations and machine.

5. Burns on cut piece are sharp, handle carefully such pieces.

6. Do not brush away the chips with your hand.

7. Hot working pieces should be clearly indicated same sign otherwise they may cause hand burns.

8. Place the scrap in the scrap box.

Teacher's Signature

YOUVA

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Expt. No. / Name :



# Introduction

It is regarded as working of this metallic sheet with hand tools and simple machines. It is important to know that for efficiency working in sheet Metal, one should know that for efficiency working in sheet metal, one should know about project Geometry i.e development of surfaces and the ~~proj~~ properties of metal.

## Widely Used Sheets:

1. Galvanised iron (G.I) sheet :-
It is soft sheet created with Zinc, has corrosion resistance due to Zn coating, welding is not easy.

2. Mild Steel Sheet :-
It is known as black iron sheet succuptable to rust and corrosion due to uncoating Used in fabrication, water tanks etc.

3. Aluminium Sheet :-
These sheets have silvery appearance. They are light weight and can be easily bent and crushed.

Teacher's Signature

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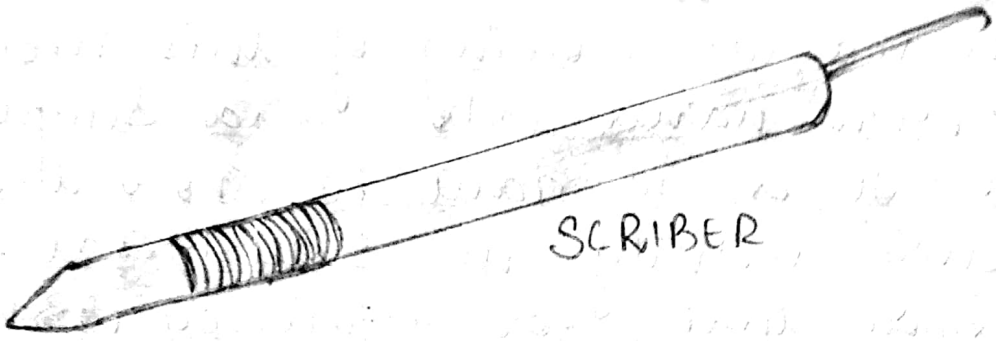


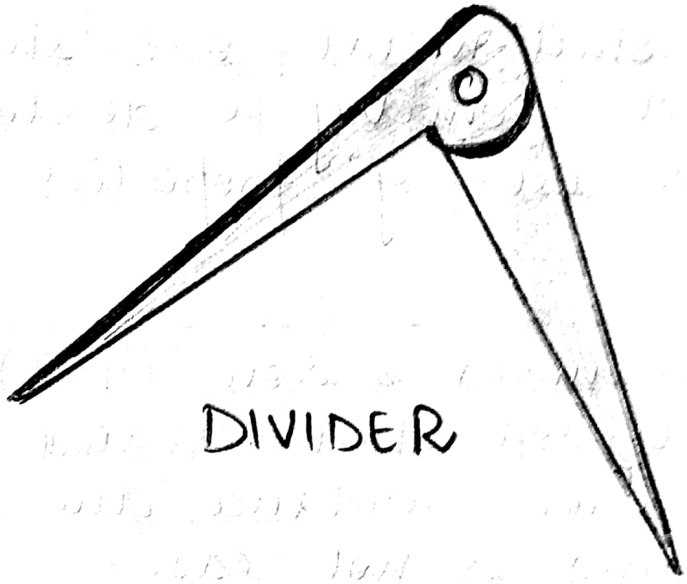


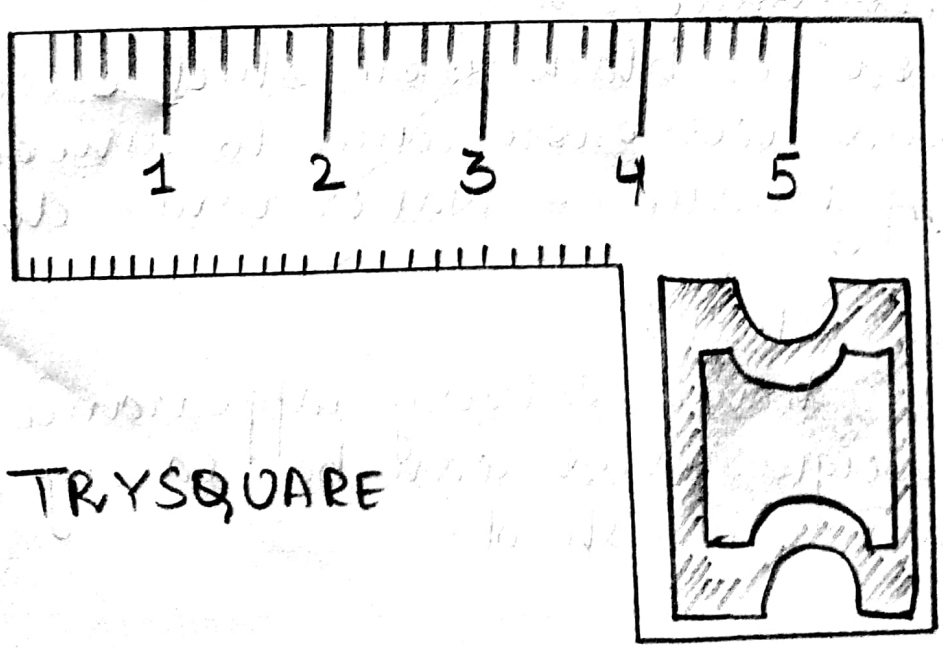


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# TOOLS USED IN SHEET METAL :-

1. Scriber :
It is steel wire of 200mm length with one end shop and hardness to make lines on metallic sheets

2. DIVIDER :
It is used to scribe arcs and circles on the metallic sheets

3. Try - Square :
It is used as marking tools. It can be drawn lines at right angles.

4. STEEL SQUARE :
It is a L shaped pieces of hardned steel. It is used to make square corners. It is also used for checking and making right angles.

## CUTTING TOOLS :

### Hand Shearing Machine :

(i) It is steel wire of 2nm. It is universal shearing machine. It is used for sheet cutting, flat shearing, around bar shearing etc.



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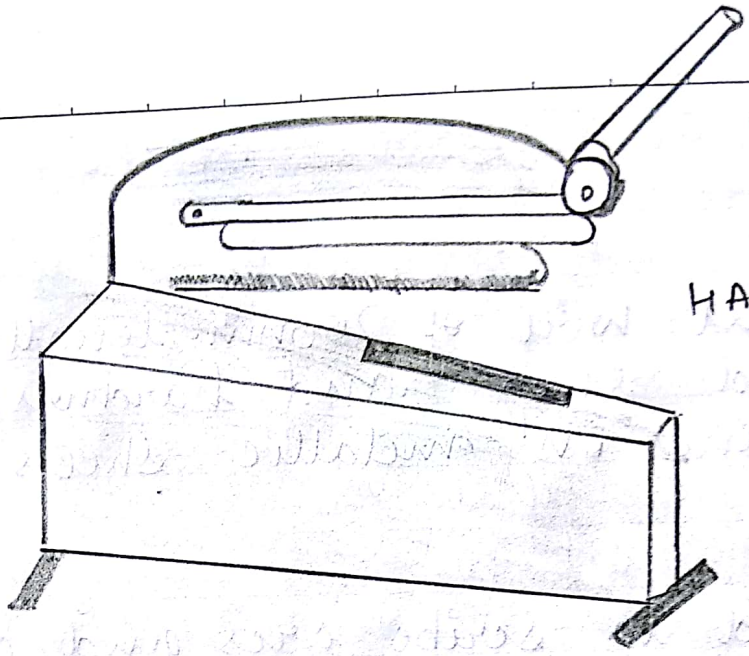
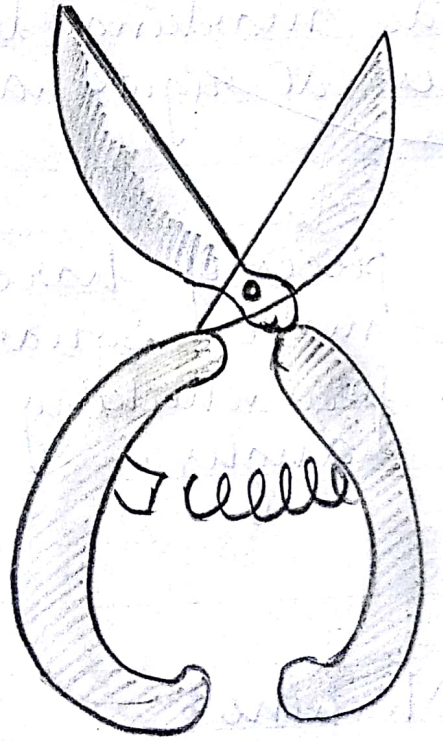


HAND SHEARING MACHINE



SNIP

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Snip :

(ii) It is used for cutting along straight line. It is used whose blades are straight. To cut sheets of greater thickness less shearing machine is used.

Standard Wire Gauze :

(iii) It is used to check the diameter of wire. It is made up of sheet disc.

| GAUGE | mm (thickness) |
|---|---|
| 1 | 7.62 |
| 12 | 2.64 |
| 20 | 0.91 |
| 28 | 0.38 |
| 32 | 0.27 |

STRIKING TOOLS

1. Mallet hammer –
It is made of good hammer wood. Used to give light force, smoothing of sheet.

2. PLASTIC HAMMER –
It is used for hammering sheets with low force. Some of its main uses are for striking of sheets, bending of sheets etc.



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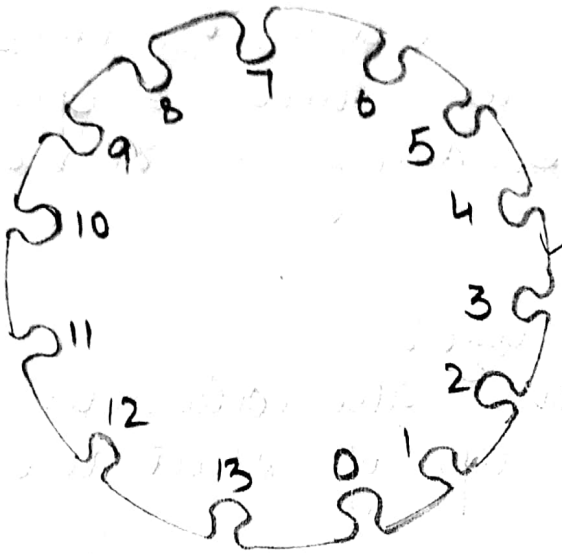
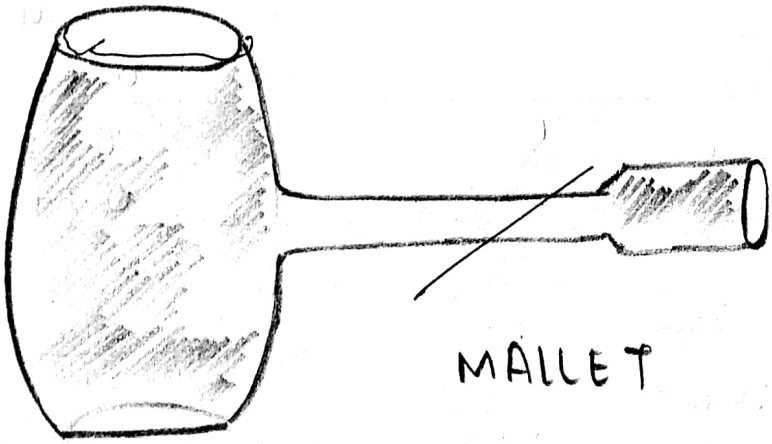
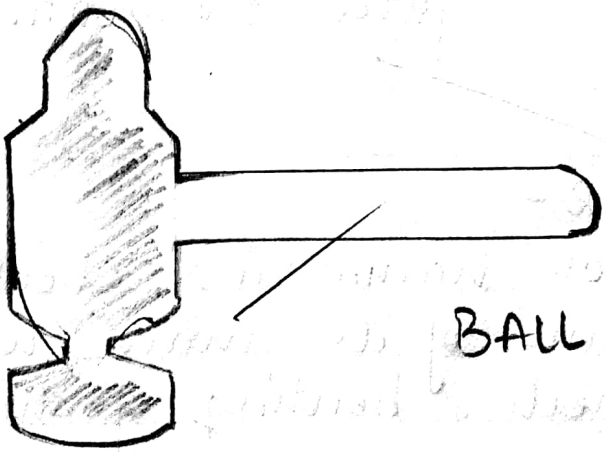



STANDARD WIRE GAUGE



MALLET



BALL PIN HAMMER

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3. RUBBER HAMMER :
Made of Rubber. They are used when light force in equipment. As they do not have marks and are less likely to dent the work piece.

4. BALL PEAN HAMMER:
It is a General purpose hammer. Its face is slightly curved and the head is round.

Email :-
It is evident that in order to carry out forgoing operations successfully, a proper advice is needed which should be capable of withstanding heavy rendered to the job.
Its body is made of steel (cast), mild steel provided with a hardened to about 20 to 25mm thick.



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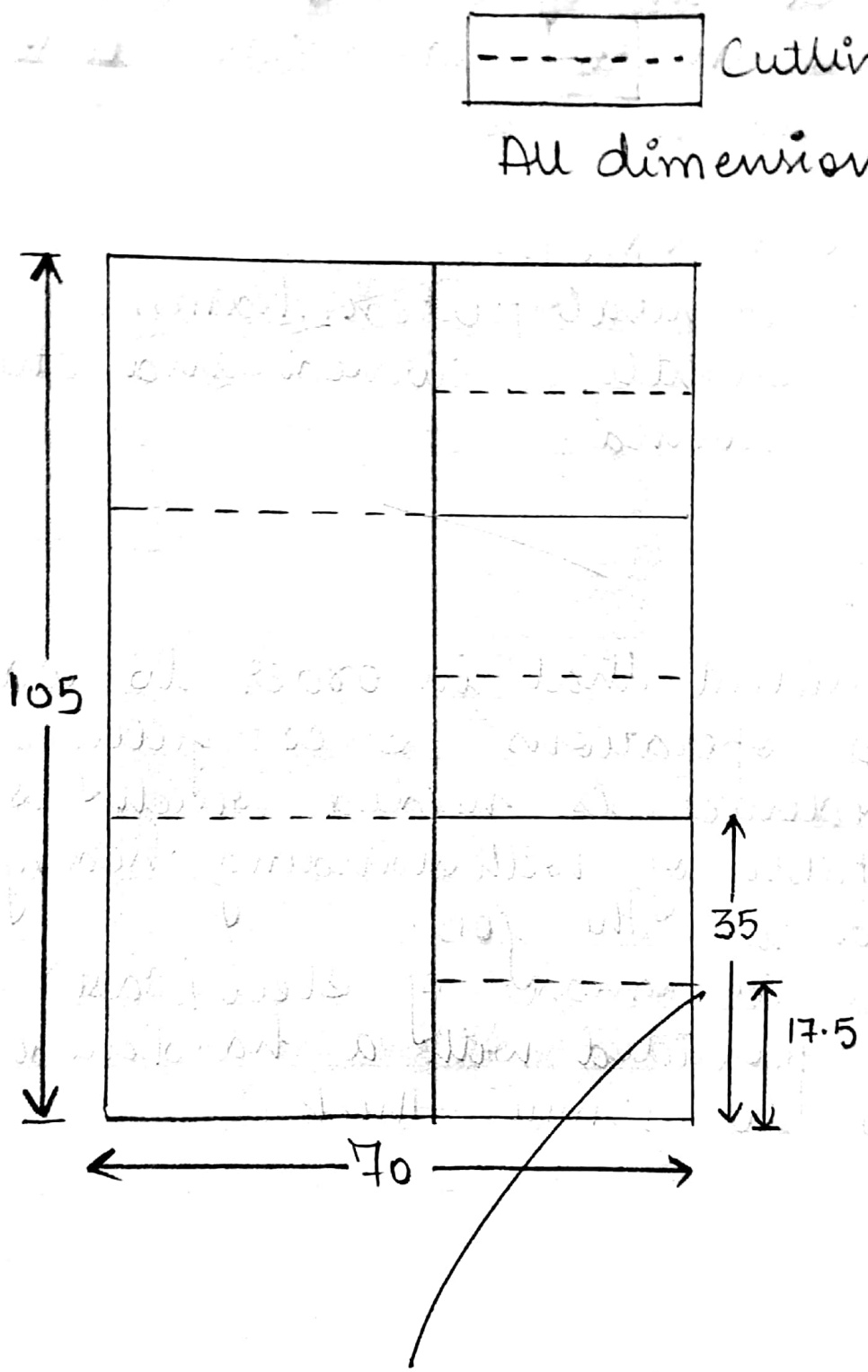
AIM : Practise in Marking And Cutting

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Expt. No. / Name :

# Job Performed 1.

AIM : Practise in making measuring and cutting

TOOLS REQUIRED : Snip, Steel foot Rule, Square, Sheet, mallet etc.

MATERIAL REQD. : Galvanised Iron (G.I) Sheet of size 100mm x 70mm.

PROCEDURE :

1. Study the drawing
2. Mark with the help of Scriber one Square as in figure.
3. Cut along the marking line (shown by doted line) with the help of ship and file.
4. Check all the dimension with steel foot Rule and give good finishing.

Teacher's Signature

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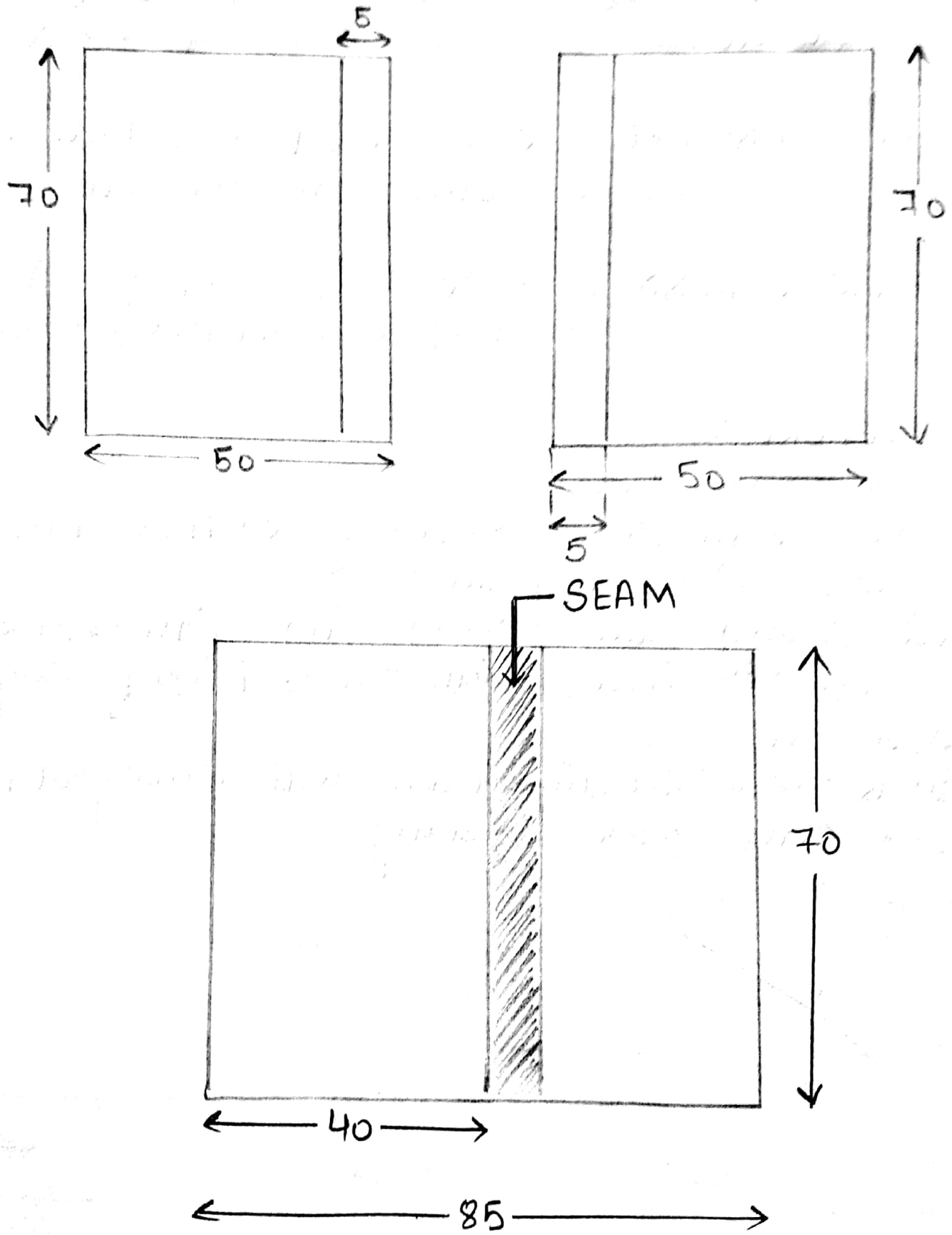
AIM : To prepare a Seam Joint.




NOTE : All dimension in 'mm'.

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# Job Performed 2.

AIM : To prepare a seam joint.

TOOLS REQD : Steel straight snip, try square, plastic hammer, steel foot Rule.

MATERIAL REQD : Galvanised iron sheet of size (100 x 70) mm

PROCEDURE :

1. Study the drawing.
2. Mark 5mm from one edge on both side
3. Cut it with the help of snip, bend the sheet along the mark.
4. Mark the middle along the length and cutting if so that we get 70x50 size of two sheets.
5. Remove the sharp edge with snip.

PRECAUTIONS :

1. Take accurate measurement.
2. Do not press hardly scriber on sheet with marking.
3. Be careful from sharp corners.

Teacher's Signature

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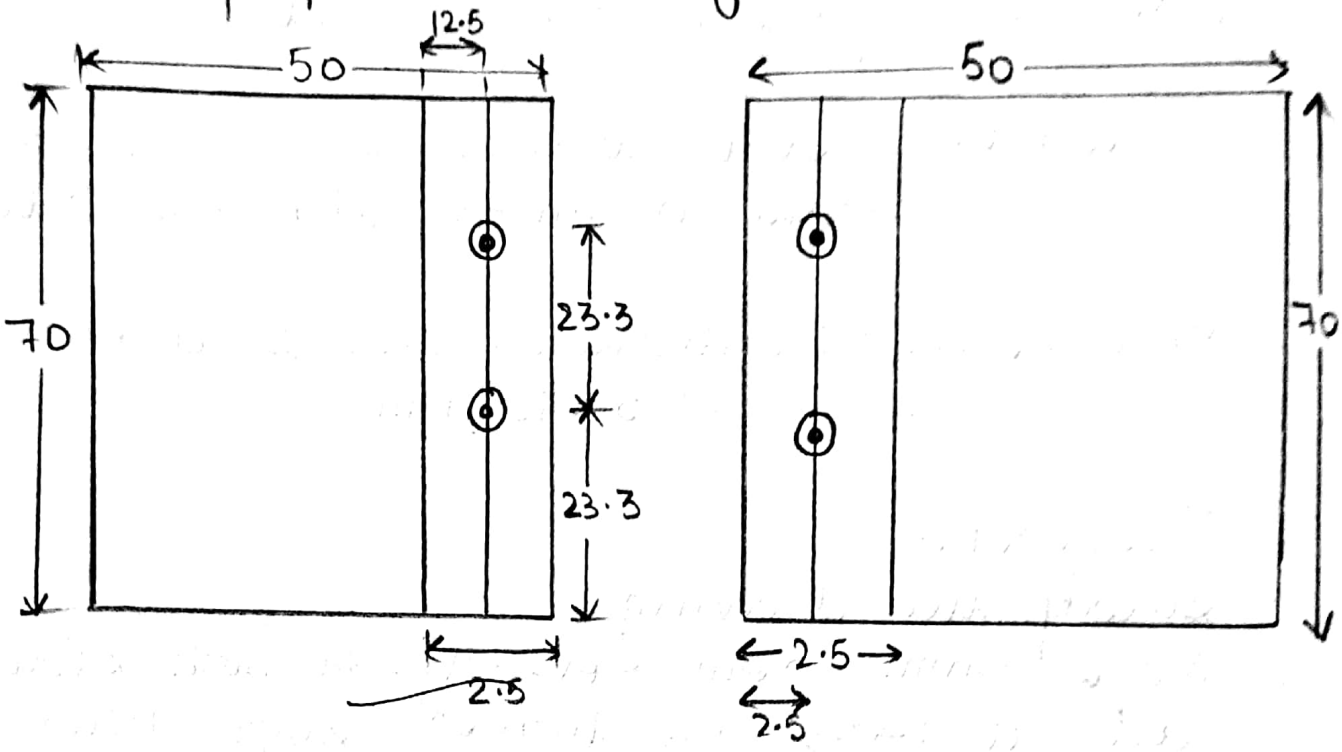
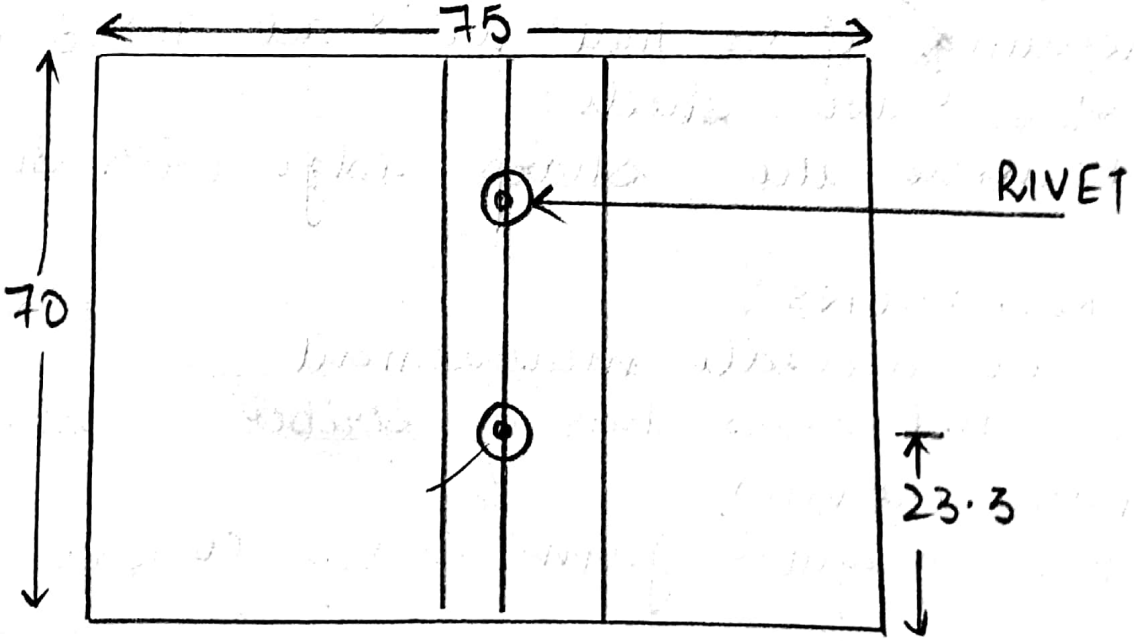
AIM : To prepare a rivet joint




NOTE : All dimension in 'mm'.

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Expt. No. / Name :

# Job performed 3.

AIM : To prepare rivet Joint.

TOOLS REQD : Steel foot Rul, Snip, try square, scriber, plastic hammer.

MATERIAL REQD : Galvanised iron sheet of Size 100mm x 70mm.

PROCEDURE :-

1. Study the operations.
2. Mark this sheet into two equal size pieces
3. Mark the sheets acc. to figure with scriber and position them.
4. Cut the sheet with snip and bend the help of mallet and rivet properly
5. join the two sheets
6. Remove the sharp edge with snip.

20/4/17

Teacher's Signature

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