Ethiopian TVET-System

Furniture Making L-I

Based on Sept. 2012G.C. Occupational standard

Module Title:- Using and Maintaining Hand and Power Tools

TTLM Code:- IND FMK1 TTLM 2019v1

This module includes the following Learning Guides

LG17: Select hand tools

LG Code:- IND FMK1 M06 - LO1 -LG- 17

LG18: Use hand tools

LG Code:- IND FMK1 M06 – LO2 -LG- 18

LG19: Maintain hand tools

LG Code:- IND FMK1 M06 – LO3 -LG- 19

Instruction Sheet

LG17: Select hand tools

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics –

- Select hand tools
- Use hand tools
- Maintain hand tools

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, **you will be able to –**

- Select appropriate Hand tools to the requirements of task.
- Identify Unsafe or defective tools and marked for repair according to procedure.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 3 to 7
3. Read the information written in the "Information Sheets 1". Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the "Self-check 1" **in page** 5
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 1).
6. If you earned a satisfactory evaluation proceed to "Information Sheet 2". However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.
7. Submit your accomplished Self-check. This will form part of your training portfolio.

Information Sheet-1	safety rules and regulations on wood work shop

1.1 safety rules and regulations on wood work shop

What is safety & care?

Safety is the first essential requirement and every personnel must learn the safety measures even before he starts working on a hand tools. Safety is an attitude, a form of mind of worker. If the attitude of worker towards safety is good and he is safety conscious, then he himself will develop the safe working habits. Before you can use tools or attempt practical work in a workshop you must understand basic safety rules. These rules will help keep you and others safe in the workshop.

SAFETY EQUIPMENT

Safety equipment is for you. It will protect you from injury and may possibly save your life. Some of the more common types of safety equipment for your personal protection follow.

Safety Shoes

Protect feet and prevent injury or loss of toes.

Eye Eye protection is necessary because of hazards caused by infrared and ultraviolet radiation, or by flying objects such as sparks, globules of molten metal, or chipped concrete and wood, etc. These hazards are always present during welding, cutting, soldering, chipping, grinding, and a variety of other operations. It is absolutely necessary for you to use eye protection devices such as helmets, hand shields, and goggles during eye-hazard operations. Appropriate use of goggles will limit eye hazards Protection

Helmets

also known as hard hats, come in a variety of shapes. They may be made of tough polyethylene or polycarbonate, one of the toughest hat materials yet developed. When falling objects strike the hats, the shock absorbing suspension capabilities minimize injuries.

Gloves

Use gloves whenever you are required to handle rough, scaly, or splintery objects.

Hearing protection is a must when working with or around certain types of power tools. Some tools are capable of producing dangerously high noise levels which, if ignored, can result in serious hearing loss or injury. Use the hearing protection regular earing protection

- Safety is a precaution to avoid accident.
- Care is a technique of properly handling tools, equipment's & materials.

Safety rule of hand tools

1, there is a tool for every purpose especially designed for a particular purpose. Select the correct tools for the correct job.

2. Place heavy tools in the center bench where they will not push off fall.

3, do not carry sharp tools in your pocket. Cary only a few tools at a time.

4, hold the tool in the correct way when you are using it. The cutting movement should be away from you.

5, never put nail in your mouth,

6, do not use tools that are not sharp, they may slip & hurt you or another student.

7, when same one asks for a tool always give it in your hand do not throw.

8. When you use a chisel, cut away from your body & keep both hands behind the tools,

9, be sure that the handle of hammers, mallet files is not loosening.

10, when you want to see if a tool is sharp, try it on a piece of paper or wood, do not use your finger,

11. WEAR proper clothing and protective equipment.

12. THINK safety, and ACT safely at all times.

Self-Check -1	Written Test

Directions: Answer all the questions listed below.

A. Your immediate supervisor

B. B. The executive officer C. The safety officer D. You

2. Before starting work, what action should you accomplish first?

A. Notify the supervisor B. Inspect your tools C. Insert hearing protection D. Operate the tool on a test item

3. Who should you notify for an unsafe condition?

A. Supervisor B. Safety officer C. Division officer D. Commanding officer

4. What equipment can you operate?

A. Any tool in the shop B. Any tool in the portable toolbox C. The tool type you are authorized to operate D. The tools needed for maintenance only

5. What tool habit states a tool is useless if you cannot find it?

A. Keep your tool set complete B. Keep each tool in its proper place C. Keep your tools within easy reach D. Keep your tools in good condition

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet-2	Hand Tools

Introduction:

Hand tools are non-powered instruments used for construction. Unlike power tools, they are not driven by electrical, fuel, or pneumatic (air) power. They are driven by muscle and controlled by the hand. Proper use of these tools will help prevent accidents.

1.1 hand tools

Tools used in bench and Machine shop are classified as under.

1. Measuring and testing tools

2. Measuring tool that is used for setting out and checking distance on a work piece.

- Try square,
- Miter square
- Combination squire
- Tap measure caliper
- Folding rule
- Sprit level (water level)
- Verne caliper

3. Marking tools

- Marking gauge
- Mortise gauge
- Cutting gauge
- Trammel point
- Scratch awl
- Marking knife
- Caliper
- Compas

4. Hand saw

- Rip saw
- Crosscut saw
- Backsaw:
- Dovetail saw
- Compass saw:
- Keyhole saw

- Coping saw
- Hack saw
- Miter box saw
- Bow saw

5. Chiseling tools

- Pairing chisel
- Firmer chisel
- Mortise chisel

6. Boring tools

- Hand drill
- Forester bit
- Hand brace
- Twist drill bit
- Center bit
- Auger bit
- Counter sink bit

7. Smoothing & shaping tools

- Try/ Jointer plane,
- Spoke-shave plane,
- Jack plane,
- Scrapers
- Smooth plane
- All types Files
- Rabbet plane
- Draw knife
- Block plane
- Hand scraper
- Router plane,
- Cabinet scraper

8. Striking & fastening tools

- Types of hammers
- Mallet

9. Holding & supporting tools

- The work bench & Bench vice
- All type of clamp

10.tightening tools

- Wrench
- Screw drive

Self-Check 2	Written Test

1. List down Smoothing tools
2. Boring tools

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet-3	Punches

There are two basic types of punches; solid (1) which are the most common, and hollow (2) which are usually designed for punching holes in leather, paper, and other similar materials. Solid punches are used to mark metal, drive pins, align holes and to do other similar jobs.

DRIFT PUNCH

The drift punch has a narrow, tapered flat point. The points range in size from 1/8 to 1/2 inch in diameter with an overall length from 7 to 9 inches. Drift punches may be used to remove shafts, pins, rivets (after heads have been removed), and to align small parts.

ALIGNMENT PUNCH

The alignment punch has a narrow, tapered flat point. The points range in size from 1/8 to 1/2 inch in diameter with an overall length of 12 to 15 inches. Alignment punches are used to line up mating parts for assembly. Make sure the punch is large enough for the job. A punch that is too small may bend or break.

PRICK PUNCH

The prick punch has a long, conical-shaped point and ranges from 4 to 5 inches in length overall. It is used to mark soft metal.

CENTER PUNCHES

There are two types of center punches, both used for starting drill holes.

1. The hand-held type has a narrow, cone-shaped point terminating in a sharp, conical tip. Hand-held types; range from 1/8 to 5/8 inches in diameter and from 3 to 6 inches long. The hand-held punch must be struck with a hammer.
2. The automatic type has an adjustable regulator for determining the impact of the punch and also has interchangeable points. The automatic punch contains a tension spring for marking without the use of a hammer.

Self-Check 3	Written Test

List types of center punches

What is the use of punches?

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Rubbing the tool on an abrasive stone, which has been lubricated with light oil, completes the sharpening process. Abrasive stones are called oilstones. The success of the sharpening depends on:

1. Quality of the oilstone.
2. The sharpening technique.

There are two types of oil stones:

1. Natural oil stones
2. Artificial oil stones

Natural Oil Stones are stones cut from natural abrasive rocks:

1. Washita
2. Arkansas

Natural stones are available in hard and soft grades. Hard grade producing the finest cutting edge. The dimensions of a natural stone after it is cut is approximately 200 mm x 50 mm x 25 mm. They are expensive compared with the cost of artificial stones.

Artificial Stones

Cementing together abrasive material such as carborundum makes artificial Stones. The most common types are:

1. Silicone Carbide
2. Aluminum Oxide

Coarse, medium and fine grade stones are available. Also, combination stones, which have, fine grade on one side and a coarse grade on the other

Oil Stone Slips

Oil stone slips are small stones of various shapes that are used to sharpen cutting tools such as gouges, auger bits and molding plane cutters. They are available in natural and artificial stone and in a range of Grades.

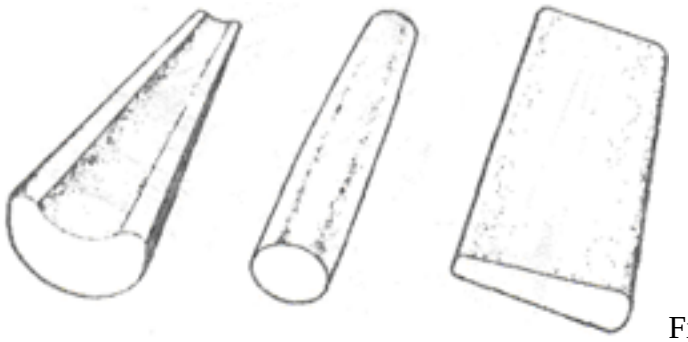


Figure 8 – Samples of oilstone slips

Lubrication of Stones

Sharpening stones must be lubricated either with oil or water. Oil lubricates better than water. But water does not stain clothes and wood.

An oilstone must be kept will oiled when in use and never use dry. Three types oils are used:

1. Neat's foot oil
2. Light machine oil
3. Combination of 50% oil and 50% kerosene

Sharpening Stones Sharpening stones usually have one coarse face and one fine face. This design could combine coarse artificial stone with fine natural stone. The coarse edge is used to remove nicks and reshape the tool being sharpened. The fine edge is used to complete the sharpening process and put a keen edge on the tool. Sharpening stones are available in various shapes and sizes,

The following steps describe how to use a sharpening stone properly:

1. Hold the handle of the blade to be sharpened in one hand and extend the blade across the stone.

2. Press down on the blade with the fingers of the other hand With a circular or arch motion, stroke the blade against the sharpening stone.

3. . After several strokes, reverse the blade and stroke the other side in a similar manner. Use light, even pressure. 5. Repeat stroking action until the desired edge is obtained

Self-Check 4	Written Test

- **Oil Stone uses**
- Three types oils are used

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

Answers

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet-5	Identify Unsafe or defective tools

One of the main dangers to persons health and safety, whether in the home or in place of work ,is the risk from using damaged or fully equipment.
There are many obvious examples ,including risk of electric shock ,fire and explosion which can have detrimental effects ranging from minor injuries right up to causing death, not only for the person using the equipment but also those nearby.
Broken equipment can also take the form of damaged or defective safety protection
Which is designed to protect the wear from harm when it isn't in adequate state .

Defective tools can cause serious and painful injuries. If a tool is defective in some way, do not use it.
If tools and equipment are defective, attach an Out of Service tag with signature and date. Upon proof of repairs (a receipt), the tag will be removed and attached to the invoice for continuous monitoring of repairs dates completed.
HAND TOOLS
Watch for problems like:
 Chisels and wedges with mushroomed heads. Split or cracked handles. Chipped or broken drill bits. Wrenches with worn out jaws. Tools that is not complete, such as files without handles.

To ensure safe use of hand tools, do not use a defective tool, inspect tools prior to use and verify that tools are repaired.
AIR, GAS OR ELECTRIC POWER TOOLS
Watch for problems like:

- Broken or inoperative guards
- Insufficient or improper grounding due to damage on double insulated tools.
- No ground wire (on plug) or cords of standard tools.
- The on / off switch not in good working order.
- Tool blade is cracked.
- The wrong grinder wheel is being used. The guard has been wedged back on a power saw.

Self-Check 5	Written Test

1. Why identify defective tools?
2. When we see damage tools we reports for

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Instruction Sheet	LG18: Use hand tools and Power Tools

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics –

- Hand tools
- power tools

This guide will also assist you to attain the learning outcome stated in the cover page.

Specifically, upon completion of this Learning Guide, **you will be able to –**

- ☞ produce Hand tools the desired outcomes to job specifications.
- ☞ Grinding machine and sharpening blades
- ☞ Use Oil stone or grinding stone for sharpen blades finely.
- ☞ Perform sefty accordance with company or industry procedure.

Learning Instructions:

8. Read the specific objectives of this Learning Guide.
9. Follow the instructions described in number 3 to 7.
10. Read the information written in the "Information Sheets 1". Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
11. Accomplish the "Self-check 1" **in page -.** 32
12. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 1).
13. If you earned a satisfactory evaluation proceed to "Information Sheet 2". However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.
14. Submit your accomplished Self-check. This will form part of your training portfolio.
15.

Information Sheet-1	Hand tools

What are hand tools?

Hand tools are non-powered. They include anything from axes to wrenches. The greatest hazards posed by hand tools result from misuse and improper maintenance

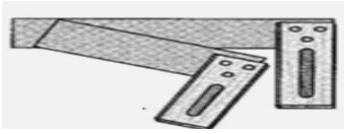
1.1.1 Measuring and testing tools

.1 Uses of hand tools

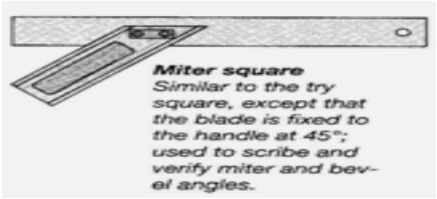
Try-square

Try-square:- it is used for testing the squares of surfaces and edges of -pieces, outside and inside corners of joints, and for marking lines at right-angles to a given surface or edge.

Try-square Is an L-shaped tool used as a guide to lay out 90 degree cuts with pencil markings. It is also used to check that the edges and ends of boards are square, and whether a board is the same depth along its entire length. A try square has broad blades 6 to 12 inches long set at right angles

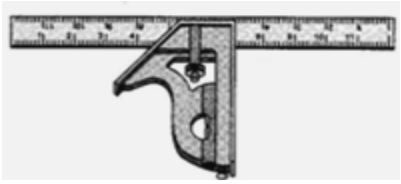


1- Miter square: - that is used for checking of 450.



2- Combination squire

- Is used for squaring measuring, marking & checking squares 450& 900 Angles vertical & horizontal levelness & also depth
- Using a Combination Square to Mark 90-Degree and 45-Degree Angles



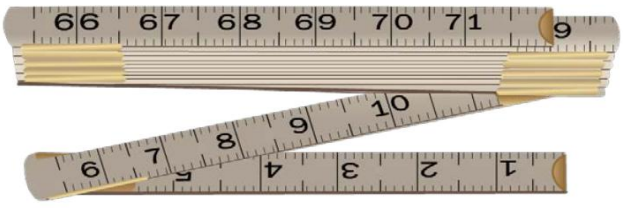
Sliding T-Bevel The sliding T-bevel is made up of a slotted blade and a solid stock. The blade is adjustable so it can be set to measure any angle. The T-bevel is used for testing bevels and laying out angles.

- . designed to measure long distances.
- Measuring tool that is used for setting out and checking distance on a work piece.
- A measuring tape can come in any length from 6 to 50 feet..
- The most common are 10, 16, and 25 feet.

.

1. **Zigzag rule** (folding rule):

Folding Rules a folding rule is made up of hardwood, steel, or aluminum sections, each measuring 6 to 8 inch. The sections are connected by spring joints that unfold for measuring distances. These folding rules are usually from 2 to 6 feet long.



The folding rules cannot be relied on for extremely accurate measurements because a certain amount of play develops at the joints after continued use.

A chalk line used to mark long, straight lines on floors, ceilings and walls.

5, Sprit level (water level):- LEVELS

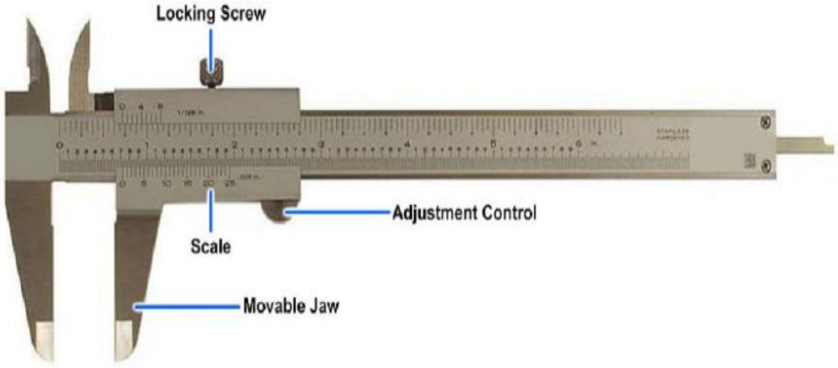
- Levels are tools designed to prove whether a plane or surface is in the true vertical or true horizontal.
- used to test horizontal & vertical levelness.

CALIPERS

- Types and Uses Simple calipers are used in conjunction with a scale or rule to determine the thickness or the diameter of a surface, or the distance between surfaces. A caliper is usually used in one of two ways. Either the caliper is set to the dimension of the work and the dimension transferred to a scale, or the caliper is set on a scale and the work machined until it checks with the dimension setup on the caliper. To adjust a caliper to a scale dimension, hold one leg of the caliper firmly against one end of the scale and adjust the other leg to the desired dimension. To adjust a caliper to the work, open the legs wider than the work and then bring them down to the work.
- Simple Calipers
  - Used for inside diameters have straight legs with feet turned outward.
- Transfer Calipers
  - Used for measuring chamfered grooves or flanges.
- Hermaphrodite Caliper
  - Used chiefly for locating the center of a shaft, or for locating a shoulder.
- Spring-Joint Calipers
  - . For measuring chamfered cavities (grooves)
- Slide Calipers
  - Used for measuring outside and inside dimensions.
- Trammels
  - Measures distances beyond the range of calipers.

- also be used as a divider by changing the points.

- Venire Calipers
  - Most venire calipers read outside on one side and inside on the other side.



Self-Check 1	Written Test

1. What is the simplest, most common measuring tool?

   Digital measuring device B. Flat steel rule C. Measuring tape D. Wooden folding rule

2. What minimum distance will the folding rule section measure, in inches?

   A. 4 B. 6 C. 8 D. 10

3. Which of the following is a rule for caring of measuring tapes?

   A. Keep the case intact

   B. Always oil the steel tape after each use

   C. Retract the tape quickly to prevent kinks

   D. Apply oil to the spring joints

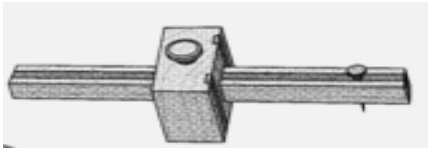
4. What is a combination square used for?

   A. Lay out angles for rafters B. Measure and cut drywall C. Measure the accuracy of a right angle D. Measure extended exterior lengths

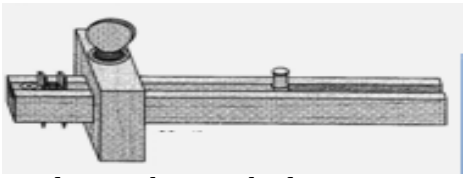
Information Sheet-2	Marking tools

Are putting/placing lines, circles, points and arcs after measurement .

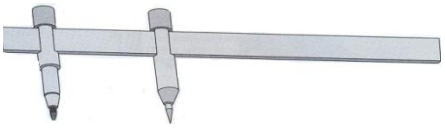
- **Marking gauge**; - used for marking line parallel to a face or an edge of a work piece. It has one pine.



- Mortise gauge:- is similar to the marking gauge and has similar parts but two pines instead of one. It is used for making two lines parallel to a face or edge of work piece.

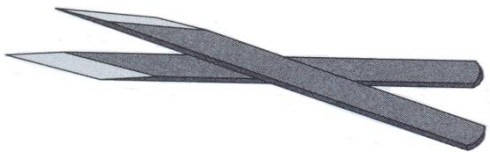


- Cutting gauge:- Used for scribing large arcs and circles can be attached to any point on a straight edge; distance between points equals circle radius.

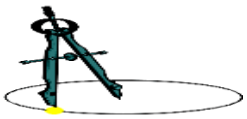


- **Scratch awl** :- used to lay out the position for drilling or boring holes

Marking knife: - use is used for marking a cut line across the shoulders of joints.



- A compass;-Uses for small circles arcs and large circles and arcs



Self-Check 2	Written Test

List down at list 5 Marking **tools**

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet-3	Hands saw

Is used to cut the wood across, along and at different angle and to make curved shapes

- Crosscut saw used to cut across the grain
- Rip saw Used to cut along the grain

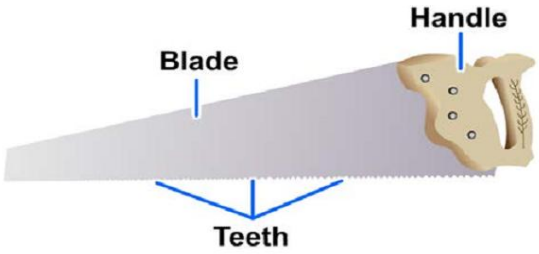
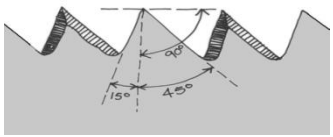
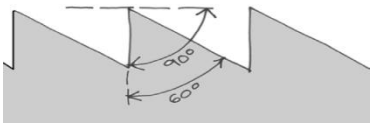


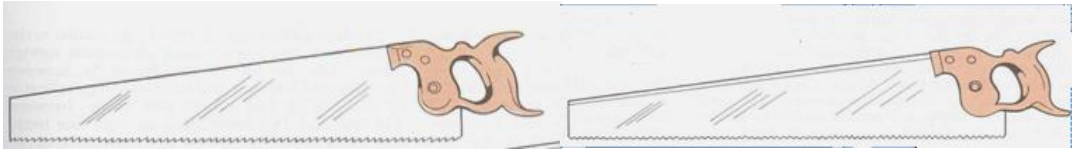
Figure 6-1 — Parts of a saw.

- Most commonly used crosscut saws are 10- to 12-point for fine work and 7- or 8point for faster cutting. Ten teeth per inch is considered general purpose.
  - Knife shaped teethes
  - 5-8 points per-inch
- Rip saw

  A rip saw has large, chisel-shaped teeth, usually 5-1/2 teeth per inch, and is made to cut with the wood grain. Blade lengths measure from 24" to 28". Teeth are cross-filed to ensure that the chisel point is set square to the direction of cutting for best performance. This saw is best held at a 60º angle to the surface of the board being cut.
  - 3-5 points per-inch
  - Wider gullet







- **Backsaw:** - A backsaw is a thick-bladed saw with a stiff, reinforced back to provide the rigidity necessary in precision cutting. It varies in length from 10" to 30" and is found in tooth counts from seven to 14 teeth per inch. They are used with miter boxes to cut miters.
- is a fine teeth crosscut saw.

- It gets this name b/s of the heavy metal band along the back that supports the thin blade

- **Dovetail saw:-** is similar to backsaw but has a thinner blade and fine teeth

- Its handle is similar to the handle of the chisel

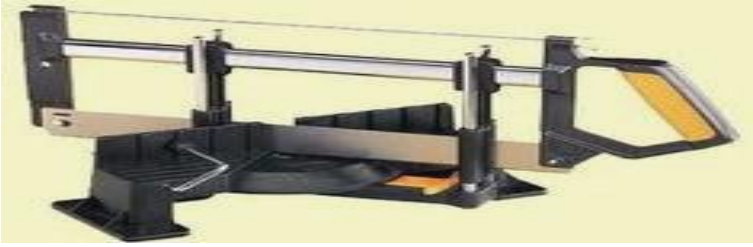
Compass saw: - - is used to cut curves or circles where turning & coping Saws can't be used b/s of their frame.

- **Keyhole saw**: - Has a narrower blade than compass saw. the type with a shorter blade has a round handle and is known as a pad saw while that with the larger blade a shaped handle, similar to the compass saw, and is referred to as a keyhole saw, both are mainly used for cutting internal curves.

- **Coping saw: -**
- Coping saws cut irregular shapes, curves and intricate decorative patterns. They consist of a thin blade and a C-shaped steel tension frame. The removable blade is typically 6-1/2" long.

- It has a steel frame similar to “c” which holds the blade under tension.

- **Miter box saw**:-is used for accurate angle Sawing.
- Miter boxes are used to help cut exact angles for wood trim and rafters. Better models provide a mechanism for a backsaw. They are made of plastic, hardwood or aluminum.



- **Hacksaw**:- used for cutting metal, plastic, and so forth but not wood. There are several different blade types available for cutting different types and thicknesses of metal and other materials

- **Bow saw:-** It is mainly used for cutting external and internal curves in fairly thick boards. Fairly thick boards.

Self-Check 3	Written Test

1. Saws have what type of blade?

   A. Thick and flat B. Thick and round C. Thin and flat D. Thin and round

2. What two categories of handsaws are available?

   A. Crosscut and metal B. Metal and wood C. Ripsaw and crosscut D. Ripsaw and metal

3. What type of saw is used for cutting down trees and sawing heavy timbers?

   A. Backsaw B. Dovetail C. Nest-of-saws D. One-man crosscut

4. What type of saw is used for cutting intricate decorative patterns?

   A. Backsaw B. Coping C. Dovetail D. Keyhole

5. What type of saw is similar to the backsaw?

   A. Coping B. Dovetail C. Hacksaw D. Keyhole

Information Sheet-4	chiseling tools

In use, the chisel is forced into the material to cut the material. The driving force may be manually applied or applied using a mallet or hammer. In industrial use, a hydraulic ram or falling weight ('trip hammer') drives the chisel into the material to be cut

Chisels are cutting and joint making tools

Chisels are tools that can remove thick or thin shavings of wood.

- ❖ It used for cutting precise grooves for making joints. Similar to the iron in a plane, a chisel has a blade with a flat side and a beveled edge. The blade of a chisel is attached to a wood or plastic handle

Figure 6-16 — Socket-type chisel.

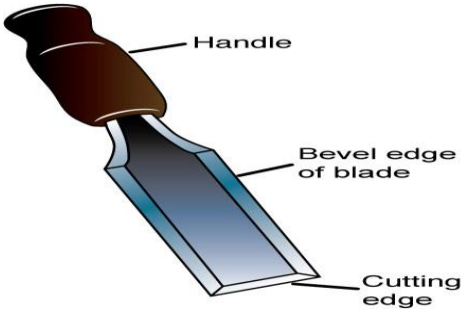


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Figure 6-17 — Tang-type chisel.

1**, butt chisel**: short chisel with beveled sides and straight edge for creating joints.

Carving chisels: used for intricate designs and sculpting; cutting edges are many; such as gouge, skew, parting, straight, paring, and V-groove.

Corner chisel: resembles a punch and has an L-shaped cutting edge. Cleans out square holes, mortises and corners with 90 degree angles.

Flooring chisel: cuts and lifts flooring materials for removal and repair; ideal for tongue-and-groove flooring.

framing chisel: usually used with mallet; similar to a butt chisel, except it has a longer, slightly flexible blade.

Mortise chisel: thick, rigid blade with straight cutting edge and square sides to make mortises and similar joints.

mortise chisel

- Is a firmer chisel w/h is a thick and extra strong blade with a higher bevel angle.
- The handles usually feature a ferrule at both top and bottom of the handle.
  Its width is from 1/8-2 in.
- Through mortise can be made in two ways to prevent the work piece from being split;
- By using a piece of waste wood under the work piece.
- By cutting the hole half way down and turning the work piece upside down to meet both holes.

Bevel-edged chisel:-is generally used for paring and lighter chiseling and is also suitable for cleaning out corners of joints

Pairing is peeling waste wood from a piece of timber using a chisel without mallet.

- Its long, thin and bevel-sided blade helps it to use with hand pressure to pair long cuts. Its width is from 1/4-2 in.
- When pairing thin slivers wood, use both hands: one on the tool handle to exert pressure and the other on the blade to guide the cut.

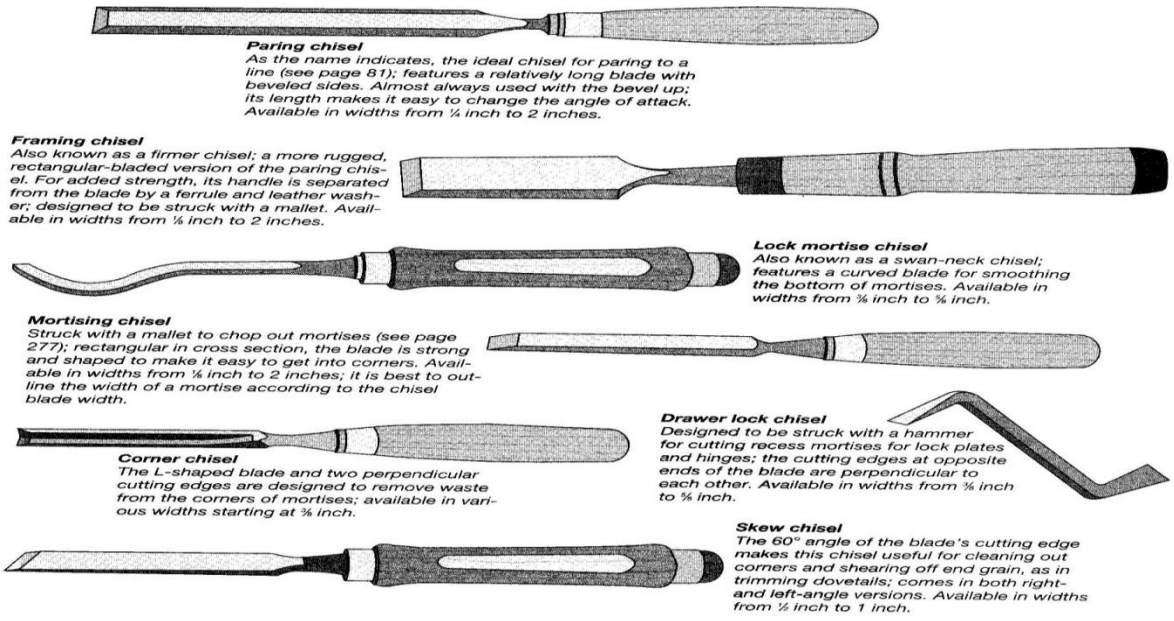
2, **Firmer chisel**; is square-edged sides and bevel tip for heavy-duty stock removal.

- It consists metal ferrule and leather washer at the base of the handle which allows it to be struck with a mallet

It has a width from 1/8-2 in

Skew chisel: has a 60 degree cutting angle and is used for trimming and finishing

Self-Check4	Written Test



List down uses of **butt chisel** , **Carving chisel s**and **Corner chisel**

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet-5	Boring tools

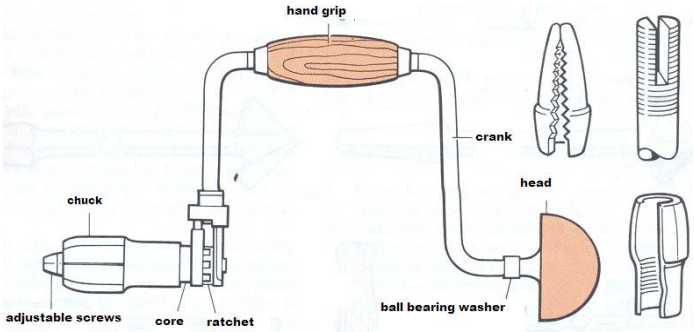
Boring means cutting larger holes with brace and auger bits. One must bore the holes in exactly the right place and in the correct direction. When the hole goes right through the stock, take care to prevent pieces from splitting off when the bit comes through.

Drilling and Boring tools

The hand drill is used for drilling holes $^{1}/_{4}$in, (6mm) or less across.

- A straight-shank drill should be used in place of the hand drill.

- Holes less than 6mm in diameter are usually drilled with a hand drill where it is difficult to use a brace. Another reason for using a hand drill is that the bits do not break so easily in a hand drill as they do in brace.
- Hand drill is used to hold the twist drill for drilling.



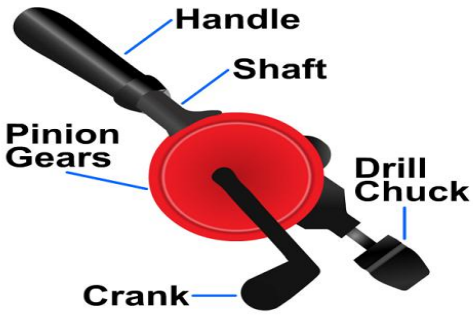
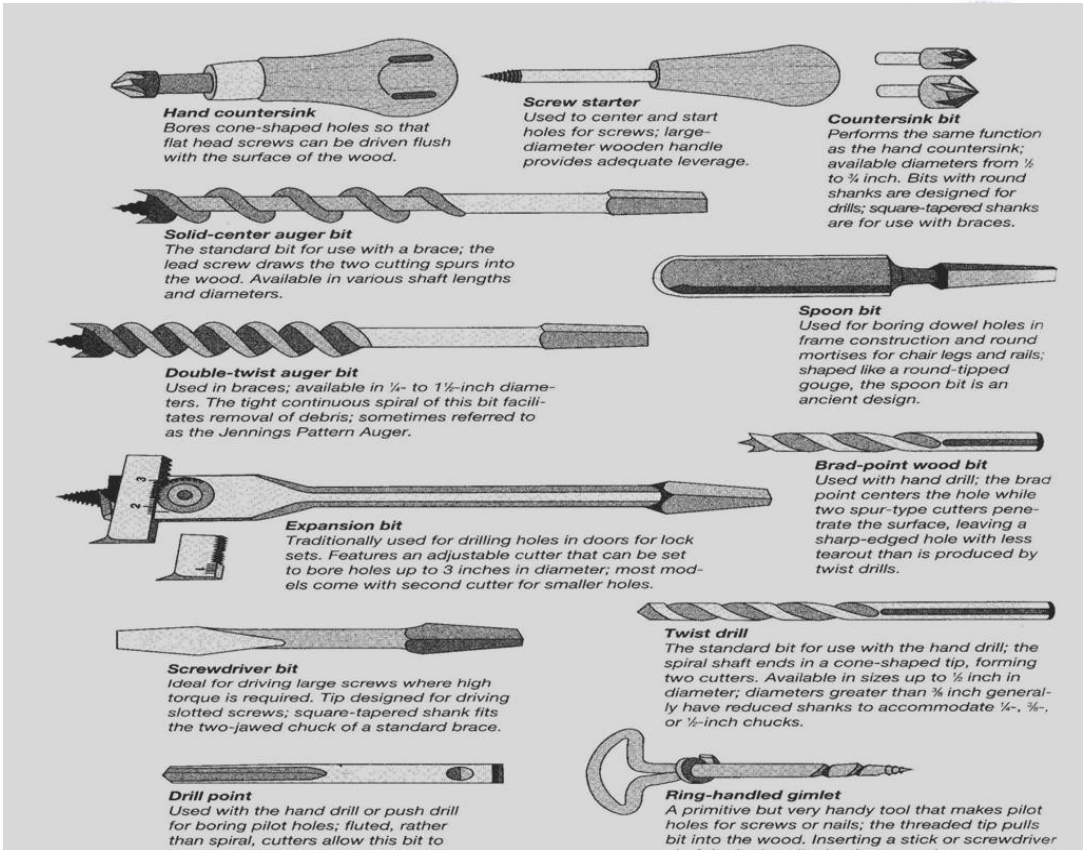


Figure 7-3 — Parts of a hand drill.

Types of drilling bits

- auger bit
- Twist drill bit
- Expensive bit
- Forester bit
- Drill point bit
- Counter sink bit
- spade bit


Hand countersink
Bores cone-shaped holes so that flat head screws can be driven flush with the surface of the wood.
Screw starter
Used to center and start holes for screws; large-diameter wooden handle provides adequate leverage.
Countersink bit
Performs the same function as the hand countersink; available diameters from ½ to ¾ inch. Bits with round shanks are designed for drills; square-tapered shanks are for use with braces.
Solid-center auger bit
The standard bit for use with a brace; the lead screw draws the two cutting spurs into the wood. Available in various shaft lengths and diameters.
Spoon bit
Used for boring dowel holes in frame construction and round mortises for chair legs and rails; shaped like a round-tipped gouge, the spoon bit is an ancient design.
Double-twist auger bit
Used in braces; available in ¼- to 1½-inch diameters. The tight continuous spiral of this bit facilitates removal of debris; sometimes referred to as the Jennings Pattern Auger.
Brad-point wood bit
Used with hand drill; the brad point centers the hole while two spur-type cutters penetrate the surface, leaving a sharp-edged hole with less tearout than is produced by twist drills.
Expansion bit
Traditionally used for drilling holes in doors for lock sets. Features an adjustable cutter that can be set to bore holes up to 3 inches in diameter; most models come with second cutter for smaller holes.
Twist drill
The standard bit for use with the hand drill; the spiral shaft ends in a cone-shaped tip, forming two cutters. Available in sizes up to ½ inch in diameter; diameters greater than ¾ inch generally have reduced shanks to accommodate ¼-, ⅜-, or ½-inch chucks.
Screwdriver bit
Ideal for driving large screws where high torque is required. Tip designed for driving slotted screws; square-tapered shank fits the two-jawed chuck of a standard brace.
Drill point
Used with the hand drill or push drill for boring pilot holes; fluted, rather than spiral, cutters allow this bit to
Ring-handled gimlet
A primitive but very handy tool that makes pilot holes for screws or nails; the threaded tip pulls bit into the wood. Inserting a stick or screwdriver

Self-Check 5	Written Test

1. The auger drill is also known as what type of drill?
   A. Bit brace B. Hand C. Ratchet handle D. Speed handle
2. . The auger can drill holes and perform which other functions?
   A. Remove and install nails B. Remove and install screws C. Rip and crosscut wood D. Torque and loosen nuts
3. You should use which type of drill when you want total control of the drill?
   A Auger B. Cordless C. Hand D. Push
4. When using a hand drill, which of the following statements is true concerning the work piece?
   A. Apply a light coat of oil to the surface of the work piece
   B. Make sure the work piece is clamped securely
   C. Remove the wood shavings with an air hose
   D. Ensure the work piece is half the thickness of the drill diameter
5. Before using a manual drill, which of the following items should be placed under the work piece?
   A Dye pack B. Rag C. Water hose D. Piece of scrap material

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

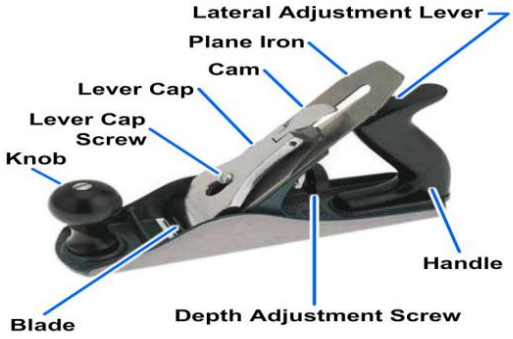
Information Sheet-6	Smoothing & shaping tools

Jointer plane

The is used to straighten the edges of boards in an operation known as jointing. It is also used to flatten the face of a board. The jointer plane is usually 20 to 24 inches long. A similar, but shorter, plane about 18 inches long is known as a fore plane

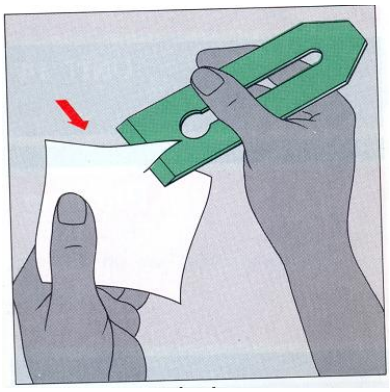
- ☞ Is used to plane large work piece, particularly when long edges have to be joined together.
- ☞ Its extra length enables it to bridge depressions in the wood and to remove shavings from high spots.
- ☞ It has a sole having 18-36 in long and the width of 2 in.

A jointer plane

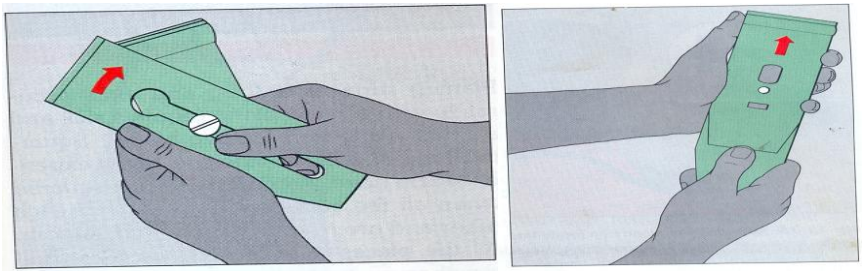


Assembling plane

2 Test the plane iron for sharpness. It should cut paper easily with a shearing (side ways) cut.



3 Place the plane-iron cap on the flat side of the plane iron with the screw in the slot.



Assembling the plane-iron cap and the plane iron Lining up the plane iron-cap and the plane iron

4 Pull the plane-iron cap back, and turn it straight with the plane iron.

5 Slide the cap toward the cutting edge of the plane iron. Never push the cap over the edge of the blade.

6 Adjust and tighten the cap with a screw driver. The cap should be about $^{1}/_{16}$ in. (1.6mm) from the cutting edge of the blade.

7 Place the blade and plane-iron cap in the plane. Put the plane iron with its bevel (slanted) side down on the frog. Be sure that the plane iron is properly placed on the lateral adjusting lever.

8 Lay the lever cap over the plane iron assembly so that the screw slides in the slot.

9 Tighten the lever cap to hold the entire assembly.

Adjusting plane

1. Move the plane iron with the lateral adjusting lever until the cutting edge is parallel to the bottom of the plane.

2. Set the cutting depth with the adjustment nut near the handle. Move the nut right or left until you get the correct depth.

Curve cutting planes

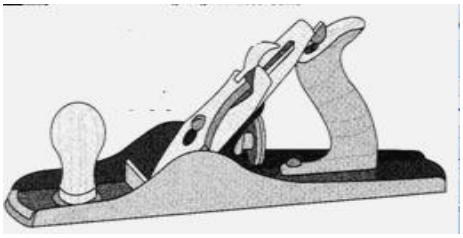
- This class of planes comprises those used for producing smooth curved surfaces and edges. The two that are commonly used are the spoke shaves and the compass plane.

3. Jack plane

This plane is used for general smoothing of edges and sizing of wood. The name comes from the saying, “Jack of all trades,” since this plane performs the work of both smooth planes and jointer planes. It is usually about 15 inches long with a blade that has a moderately curved edge. When stock is prepared, the jack plane is used after the scrub plane and before the smooth plane.

the name Jack plane is derived from the fact that this plane is used for a wide variety of work.

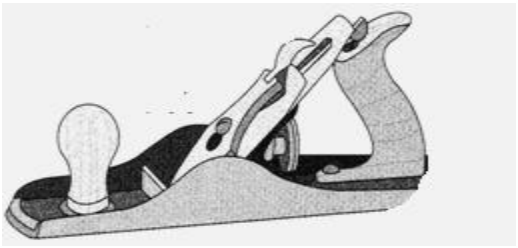
- Is used to bring the timber down to size
- Remove marks left on the timber by the saw.
- make the surfaces of the timber flat and square
- Its body length is ~400 mm and the width of the blade is 50 mm.



Scrub Plane The scrub plane is used to remove large amounts of wood from the surface of lumber in the first stages of preparing rough stock, or when the thickness of the board needs to be reduced significantly

3. **Smooth plane**

- Is used to remove any slight irregularity by taking thin shavings from the surface.
  To clean up surfaces in preparation for glass papering, staining, polishing, etc.
- Its body length is ~230 mm & the width of the blade is 50 mm.
- Special Purpose Plane
- The smooth plane is 9 to 10 inches long and is meant to be used with two hands.



1. **Rabbet plane**

Figure 8-6 — Rabbet plane.

Is used for cutting recesses (rebates) along the edges of timber. The plane is fitted with in adjustable depth stop and on adjustable fence. The depth stop determines the depth of the rebate and the fence determines the breadth of the rebate.

2. **Block plane:-**

Is the smallest hand plane. The block plane's plane iron is set at a much lower angle than that of other planes. It is used to plane across the grain at the ends of boards, otherwise known as blocking in. It is also used to shave thin pieces of wood from small surfaces in awkward areas. This plane is small enough to use with one hand, sometimes at an angle of as much as 45 degrees. A toe knob is provided when additional pressure is needed. it is used for end grain of wood.

Figure 8-5 — Block plane.

3. Spoke-shave plane

Small plane like a narrow knife used to shave and dress wood. There are two types of spoken shaves these are flat bottom and round bottom spoke shave ,

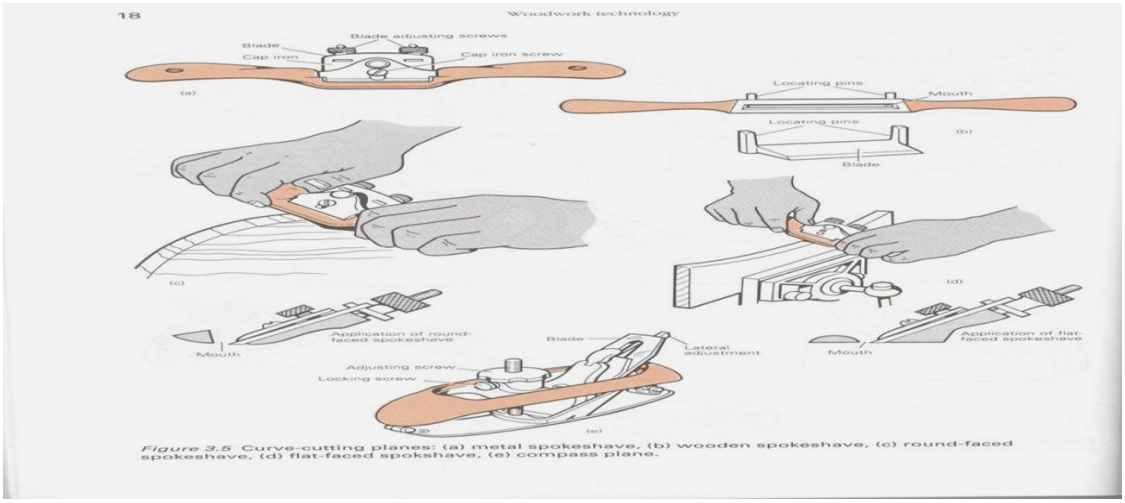
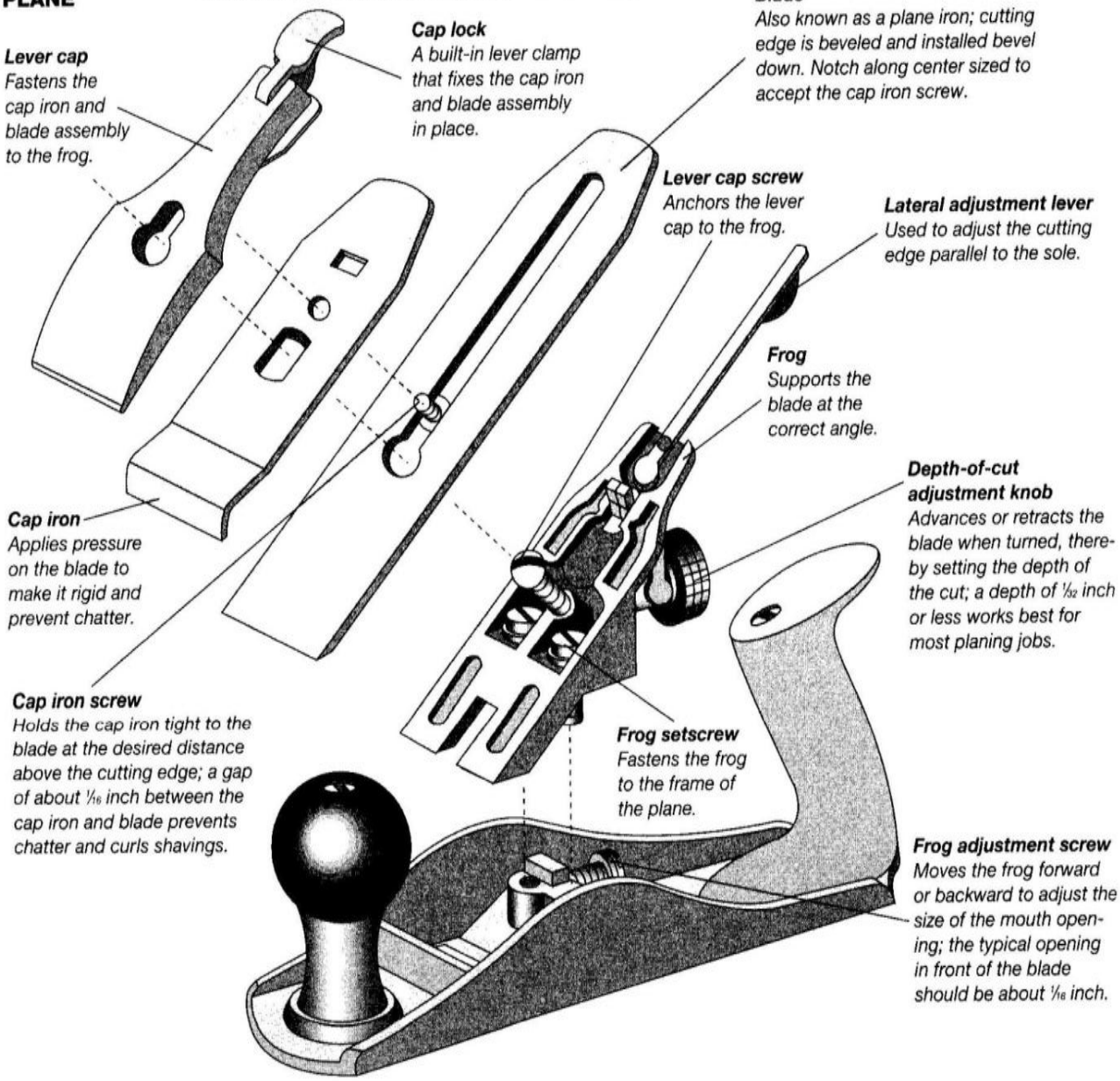


Figure 3.5 Curve-cutting planes: (a) metal spokeshave, (b) wooden spokeshave, (c) round-faced spokeshave, (d) flat-faced spokeshave, (e) compass plane.

ANATOMY OF A BENCH PLANE

STEEL-BODIED SMOOTHING PLANE
A general purpose plane for smoothing faces and edges; the sole is 2 to 2½ inches wide and 8 to 10 inches long.



Blade
Also known as a plane iron; cutting edge is beveled and installed bevel down. Notch along center sized to accept the cap iron screw.

Cap lock
A built-in lever clamp that fixes the cap iron and blade assembly in place.

Lever cap
Fastens the cap iron and blade assembly to the frog.

Lever cap screw
Anchors the lever cap to the frog.

Lateral adjustment lever
Used to adjust the cutting edge parallel to the sole.

Frog
Supports the blade at the correct angle.

Depth-of-cut adjustment knob
Advances or retracts the blade when turned, thereby setting the depth of the cut; a depth of 1/32 inch or less works best for most planing jobs.

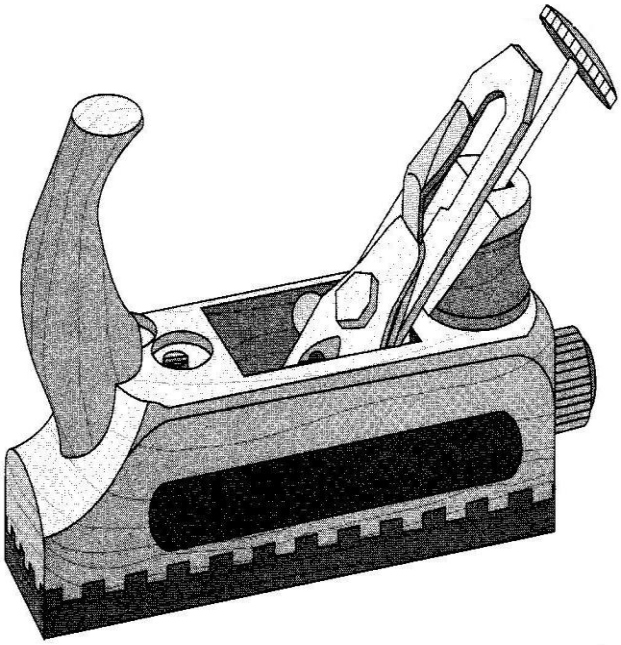
Cap iron
Applies pressure on the blade to make it rigid and prevent chatter.

Cap iron screw
Holds the cap iron tight to the blade at the desired distance above the cutting edge; a gap of about 1/16 inch between the cap iron and blade prevents chatter and curls shavings.

Frog setscrew
Fastens the frog to the frame of the plane.

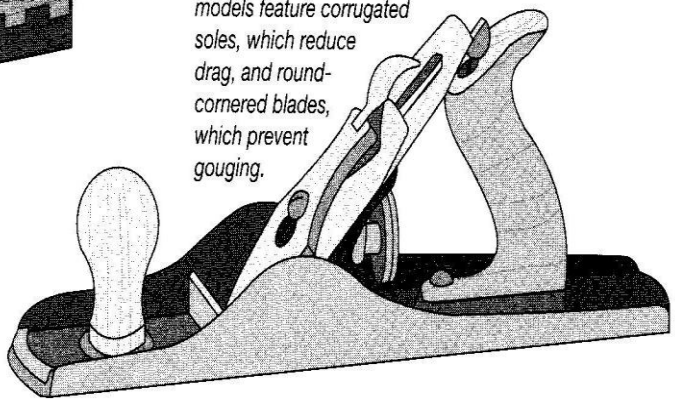
Frog adjustment screw
Moves the frog forward or backward to adjust the size of the mouth opening; the typical opening in front of the blade should be about 1/16 inch.

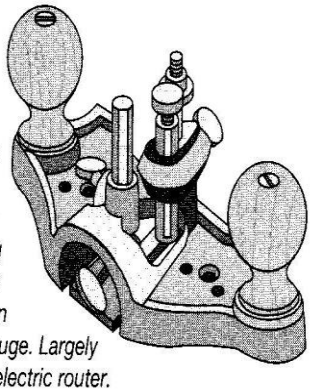
PLANES AND SCRAPERS FOR WOODWORKING



Wooden smoothing plane
The traditional wood-bodied version of the steel smoothing plane. Features a self-lubricating lignum vitae sole to reduce surface friction; capable of very fine blade adjustment.

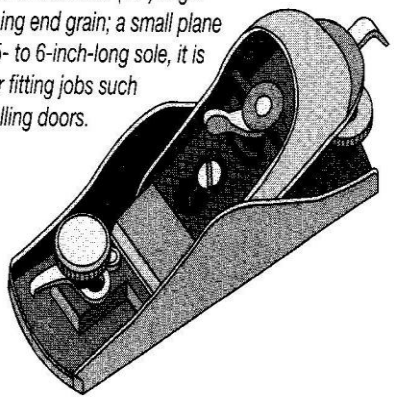
Jack plane
A rugged general-purpose plane for flattening rough surfaces. Some models feature corrugated soles, which reduce drag, and round-cornered blades, which prevent gouging.



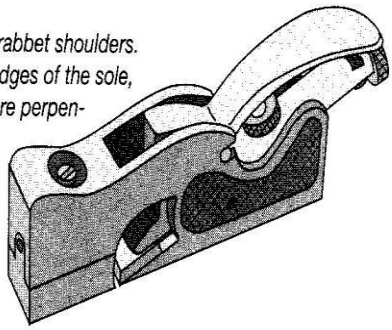


Router plane
Sometimes called a granny's tooth, this specialized plane is designed for routing dadoes and shallow mortises; features an adjustable depth gauge. Largely superseded by the electric router.

Block plane
Blade cuts bevel-side up and is mounted at a shallow (14°) angle for planing end grain; a small plane with a 5- to 6-inch-long sole, it is ideal for fitting jobs such as installing doors.



Shoulder plane
Used to trim tenon and rabbet shoulders. Blade extends to both edges of the sole, and sides of the frame are perpendicular to the sole; low blade angle is designed for cutting end grain.



Self-Check 6	Written Test

1. Planes are used to perform what action to wood?

B. Make decorative designs B. Remove knots C. Rip cut D. True edges

2.What type of plane is used to straighten the edges of boards?

A. Block B. Jointer C. Scrub D. Smooth

3.What type of plane is used to remove large amounts of wood from the surface of lumber?

A. Block B. Jointer C. Scrub D. Smooth

4.The jack plane is used for what purpose?

A. Final finishing B. General smoothing C. Making a rabbet D. Truing the edges

5.At what time frame is the smooth plane used?

A. After the rabbet is made B. Before the jack plane is used C. First plane used D. Last plane used

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet-7	Striking & fastening tools

- Used for striking other tools or objects into the work piece.

Parts of a hammer are as follows:

1 Claw
1 Eye
2 Handle
3 Neck
4 Striking face

And there are two types of striking faces

FLAT FACE AND BELL FAC

Hammers come in 7, 13, 16 and 20 ounce sizes. Your selection should be based upon the following: flat face for rough work, or bell face for finishing work where you don't want dents in the finish. The straight claw is generally used for ripping and framing. The curved claw is preferred for general use.

The carpenter's hammer is used for driving and pulling nails and tapping wood chisels. There are two types of claws,

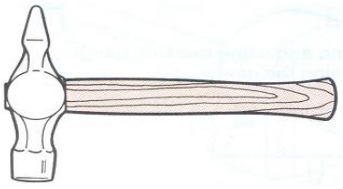
CURVED CLAW STRAIGHT CLAW

Claw Hammers

- The common wood work hammers are the Warrington hammer, claw hammer, cross pin hammer and pin hammer.
- All have two main parts: the head made of forged tool steel, and the handle made of wood.

Warrington hammer

- Is a light cross pin hammer.
- It is generally used for light hammering particularly ion cabinet work.
- The cross pin end is used for starting small nails and also for pressing down when gluing small in lays and veneers in to the position.

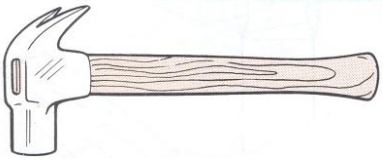


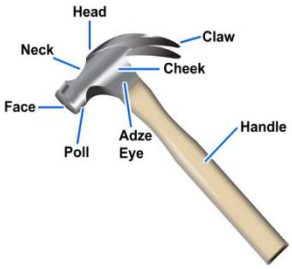
Pin hammer

- Pin hammer is light but accurate for inserting panel and veneer pins.

Claw hammer

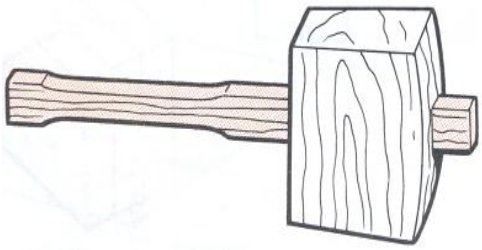
- Claw hammer is a heavier than Warrington hammer and pin hammer and the head have a claw end instead of a pin end.
- It is mainly used for heavy hammering, for driving in large nails. The claw end is used for removing nails.

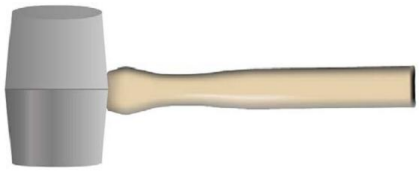




Wooden mallets

- It can be made of wood or plastic.
- Wooden mallet is also known as wooden hammer. It has a wood head (100-175mm) long and a wooden handle.
- Plastic mallet has plastic head and wooden handle.
- The general use of a mallet is for driving chisels.
- It may be used also when assembling work.





Self-Check 7	Written Test

1. What type of hammer is used for projects that need great force?

A. Ball peen B. Jeweler's C. Rubber mallet D. Sledgehammer

2. What type of hammer has a lightweight head?

A. Ball peen B. Jeweler's C. Rubber mallet D. Sledgehammer

3. What type of hammer is used for setting or splitting bricks or for chipping excess mortar?

A. Drywall B. Napping C. Masonry D. Tile

4. . What type of hammer has a sharp surface for scoring tile?

A. Drywall B. Masonry C. Napping D. Tile

5. . When working with a hammer, you should wear what personal protective equipment?

A. Eye protection B. Fire-retardant coveralls C. Hardhat D. Steel-toe boots

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

Score = _____

Rating: _____

Information Sheet-8	**Holding & supporting tools**

Name: _____ Date: _____

These tools and devices are those you will require to hold or fasten the work piece securely so that you can work and it safety. They include: work beach, bench vice, bench stop bench hook, bench holding fast, 'G' cramp, sash cramp, saw cramp or vice, miter cramp, shooting boards, miter board.

1. **The work bench:** - is an essential piece of apparatus in the workshop. You need it to support the work piece from the time of setting out the job through to the end of the necessary bench-work operations. It is in the form of a heavy table with a well (a little lower) at the center of the top surface to accommodate some of the tools required.
2. **Bench vice**:- is made of cast iron, often with a quiche release device that permits quiche movement of the job and provides instantaneous grip. The vice is fitted to the side of the work bench so that the top of the jaw is level with the top of the work bench.

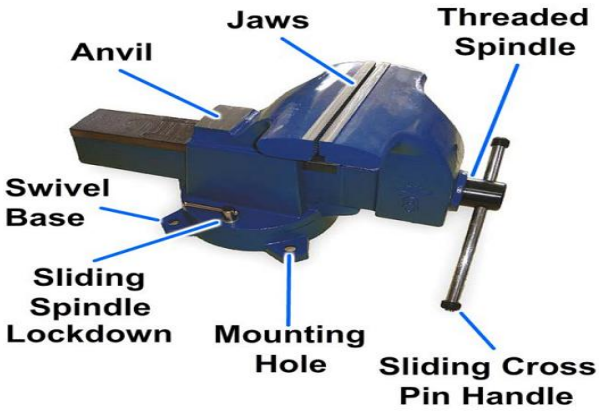


Figure 7-13 — Machinist bench vise.

3. **Bar clamp:** - is used clamp face to face & edge to edge
4. Sash clamp; the largest of all even it has extension apices to increase its length used for edge to edge clamp.
5. "**C" cramp:-** is a metal cramp is from of the letter 'G' used for holding a piece of wood(job) to the work-bench to enable such operations as sawing or chiseling to performed and also use it to hold small parts of a job together when gluing a job. The size is determined according to the opening of the jaws (50-300mm).

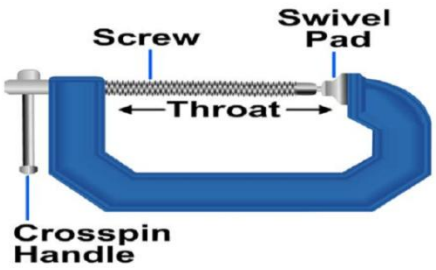
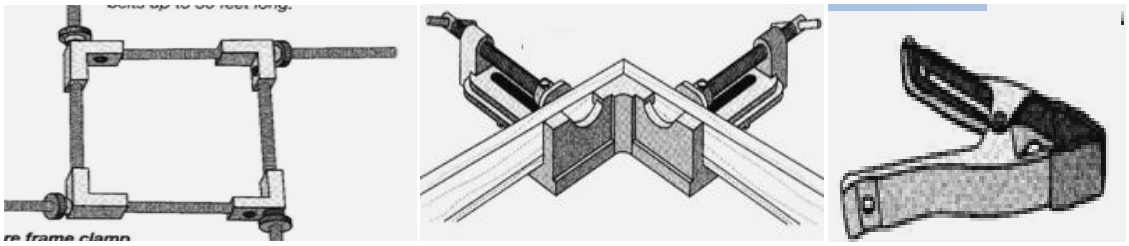


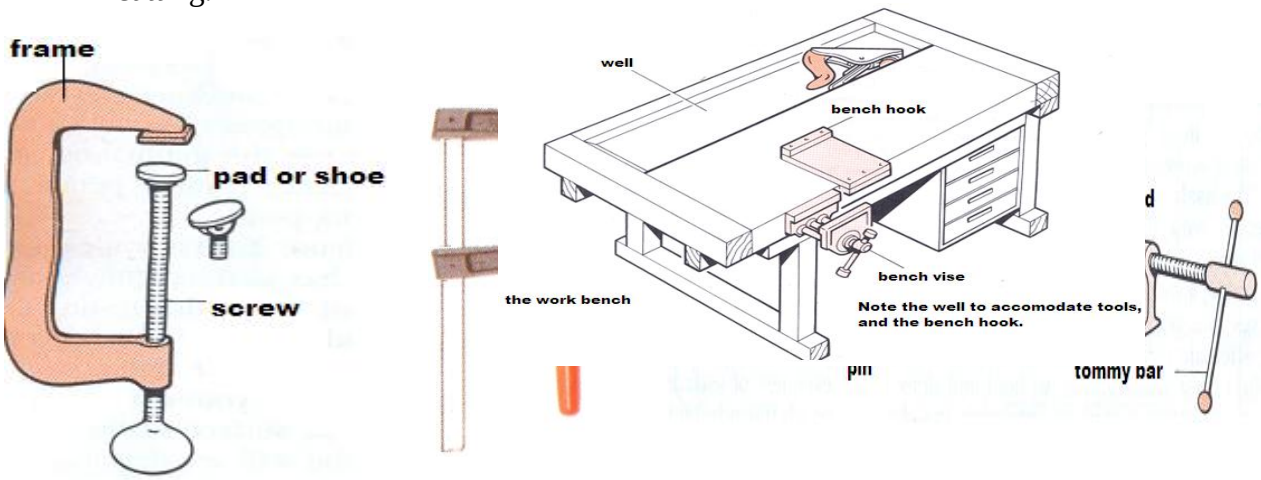
Figure 7-23 — C-clamp.

6. **Sash cramp:-** is a long metal cramp with opening ranging frame 45cm 195cm. it is used while gluing to hold and draw the parts being assembled together while the glue is setting. For example you might use this cramp when giving sashes, door frames, carcasses etc.

7. **Frame clamp:-** used to frame such as picture frame (photo frame)



8. Miter box:- is advice made of either metal or wood used for holding a work piece when cutting a miter (at an angle of 450). A ten on saw or a panel saw may be used for the cutting.



Self-Check 8	Written Test

List types of **supporting tools**

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 9	Tightening tools.

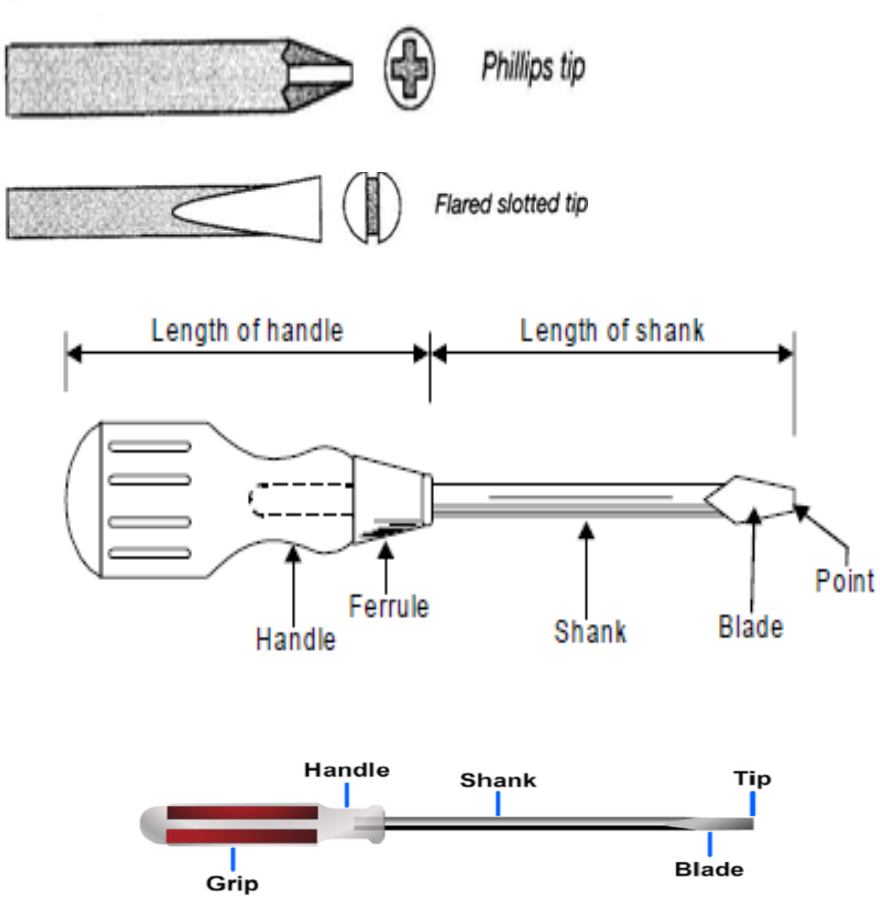
Screw drivers/Tightening Tools

- Screw drivers
- Wrenches
- Based on their tip screw drivers are classified into;
- Flat screw driver
- Philips

- Before driving a screw into any dense wood, pre-drill a hole to prevent the screw head from breaking off or the work piece from splitting.
- A long and thicker handled screwdriver will provide extra twisting power.
- Screwdrivers often feature flat, square, or hex-shaped shanks that enable a wrench to be used when additional torque is required.

- ☞ The tightening tools include pinchers, screw driver and wrenches, which are discussed as under. Screw driver
- ☞ Screw driver is a screw tightening tool.. It is generally used by hand for tightening the screws. It is also of various types depending upon the kind of work.

Standard screw driver with its part



WRENCHES A wrench is a tool used to provide a mechanical advantage when torque is applied to hold and turn bolts, nuts, screws, and pipes. Wrenches are forged from steel alloy to prevent breakage. Wrenches are divided into two categories: nonadjustable and adjustable. Nonadjustable wrenches are made to work on a particular size of bolt, nut, screw, or pipe. Adjustable wrenches are made to tighten or loosen a particular size of bolt, nut, screw, or pipe.

- Open-end wrench
- Engineer's wrench

- Combination wrench
- Pipe wrench

Figure 5-87 — Combination wrench.

Self-Check 9	Written Test

1. The most common Phillips® screwdriver has what maximum numbered size?

A.2 B. 4 C. 6 D. 8

2 . What type of screwdriver will tighten and loosen six-point star head screws?

A. Allen B. Jeweler's C. Ratchet D. Torx

3. What type of screwdriver will tighten and loosen hexagonal slot head screws?

B. Allen B. Jeweler's C. Ratchet D. Torx

4. If a screwdriver is exposed to excessive heat, the blade will undergo what change?

C. Increase in rust B. Melting C. Reduction of hardness D. Tempering of the tip

5 On a screwdriver, what action, if any, can be done to restore a worn straightedge?

A. File the blade tip B. Heat the tip and reshape it C. Remove the handle and use the other end D. Nothing; the screwdriver has to be replaced

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

PLIERS

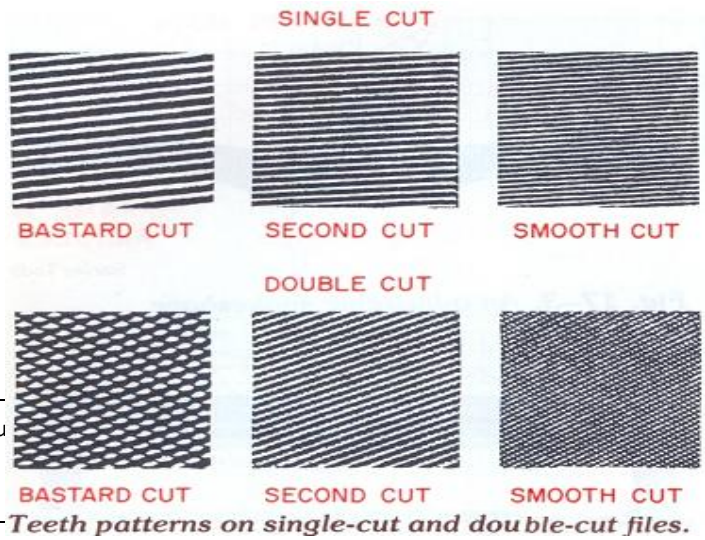
- . Pliers are made of hardened steel and come with different head styles that determine their use. Pliers are used to hold, cut, and bend wire and soft metals.

Types of Pliers

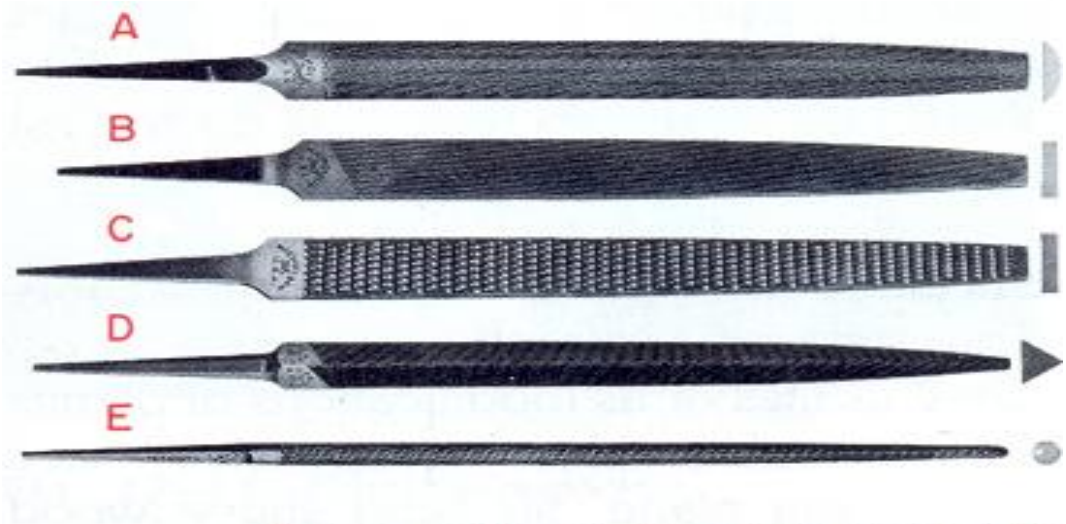
- Slip-Joint Pliers
- Diagonal Cutting Pliers
- Lineman's Pliers
- Parallel Jaw Pliers
- Long Nose Pliers (Needle Nose Pliers)
- Flat Nose Plier

FILES: - Files are used for cutting, smoothing off, or removing small amounts of metal, wood, plastic, or other material. Files are made in various lengths, shapes, and cuts. Every file has five parts the point, edge, face or cutting teeth, heel or shoulder, and tang.

- A file is used for smoothing edges and shapes where other cutting tools cannot easily be used.
- There are different shapes and those commonly used in wood work are
  1. Round file
     - Used for smoothing concave curves and enlarging holes.
  2. Square file
     - Used for producing slots.
  3. Half-round file
     - Used for smoothing concave edges and enlarging holes.
  4. Triangular files
     - Used to form sharp corners and grooves and also used for sharpening hand saws.
     - It is also called saw file.



Teeth patterns on single-cut and double-cut files.

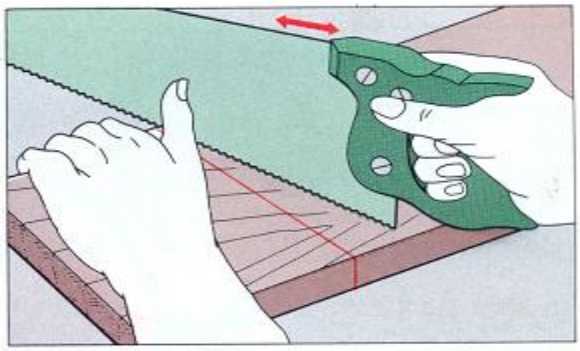


Some common files for wood: (A) half-round, (B) flat double-cut, (C) flat rasp, (D) triangular, and (E) round.

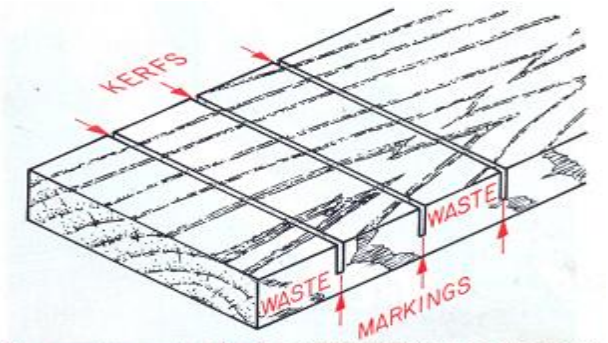
Operation Sheet 1	***cross cutting***

Procedure for cutting across the grain (cross cutting)

1. Layout and mark the board to be cut.
2. Fasten the board in a bench vice, if it can be held this way. Wider or longer boards that can not be firmly held in a vice should be laid across sawhorses.
3. Place the heel of the cross cut saw near the cutting line on the waste side of the wood. This is the part of the wood that will be cut off and thrown away. Pull the saw while you guide it with the left thumb.
4. Make several short strokes. Test these cuts with a try square. Do this to see that the saw blade is cutting at right angles to the surface of the board.
5. Continue cutting. Use long strokes. Cut at about a 45-degree angle to the board.
6. Finish sawing. Use short, easy strokes. With your left hand, hold the end of the lumber to be cut off. This keeps the wood from splitting or breaking from its own weight.



Starting the cut across the grain of the wood.



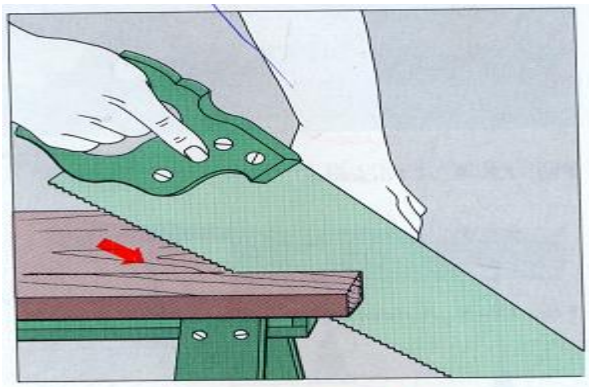
The waste parts of a board in relation to the kerfs

Operation Sheet 2	***ripping***

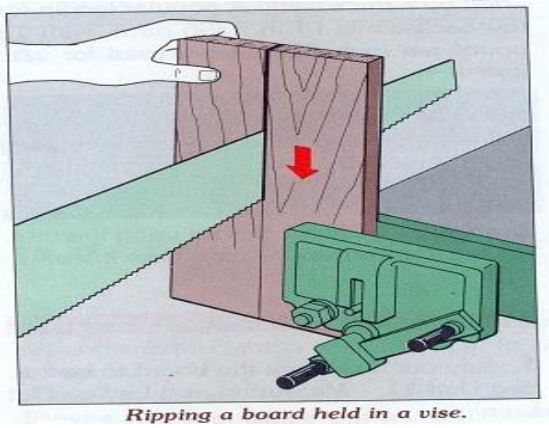
Procedure for cutting along the grain (ripping)

1. Mark the lumber to be sawed or ripped.
2. Hold the board on a sawhorse if possible. Ripping in a vise is also satisfactory.
3. Start ripping in much the same manner as in step 3 under 'cross cutting'. Begin the cut by pulling the rip saw back. Hold the cutting edge at an angle of about 60º to the surface. Be sure that the cut is on the waste side of the board.
4. Continue ripping the board with short, easy strokes.

Checking a saw with a try square



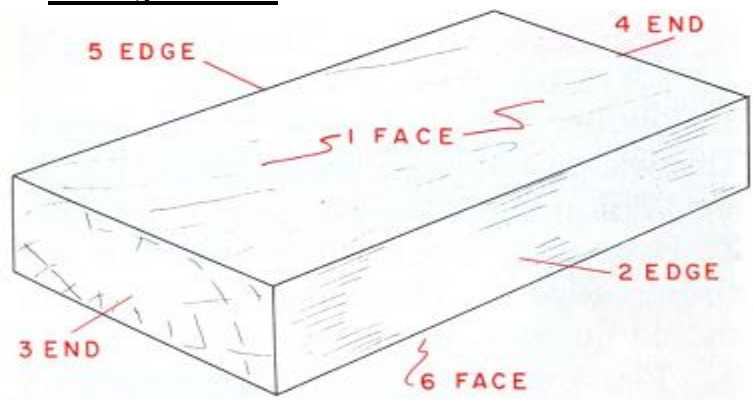
Ripping a board on a sawhorse.



Ripping a board held in a vise.

Operation Sheet 3	CONTENT-

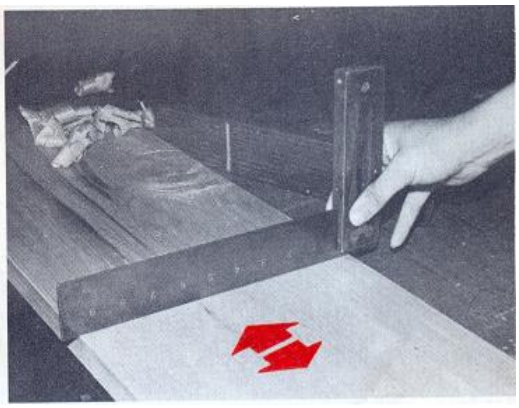
Planing the stock



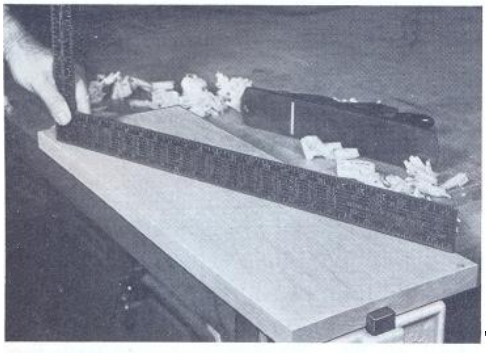
The steps in planing a board.

Planning the first face

1. Select best face (board surface) of the board.
2. Put the board on the bench, and fasten it between the vise dog and a bench or board stop. Place the board so that you can plane in the direction of the grain (fibres) of the wood.
3. Adjust the cutting depth of the plane iron so that it will cut evenly and not too deeply.
4. Plane the surface until it is clean and smooth.
5. Test the surface for flatness with a try square or a framing square. The entire blade should touch the surface through out the board.
6. Test the surface diagonally across the board to defect a wind (twist).



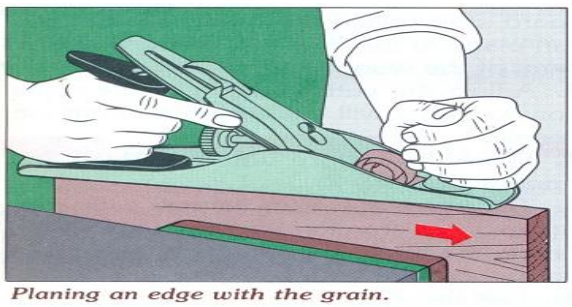
Planing surface Checking flatness



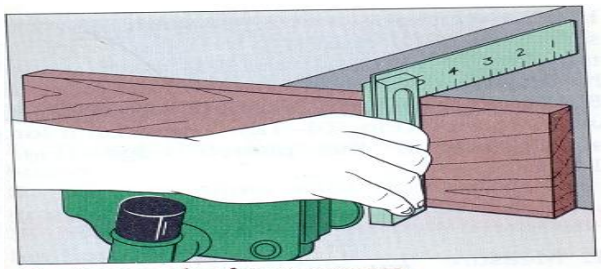
Testing diagonally for a wind

Planing the first edge

1. Choose the best edge of the board. This will probably be the one needing the least amount of planing.
2. Fasten the board in a vise with the chosen edge up. The direction of the grain should be away from you.
3. Plane the edge until it is square with the working face (planed surface).
   Note where to put pressure on the plane for starting and finishing the stroke.
4. Test the edge with the face for squareness.



Planing an edge with the grain.

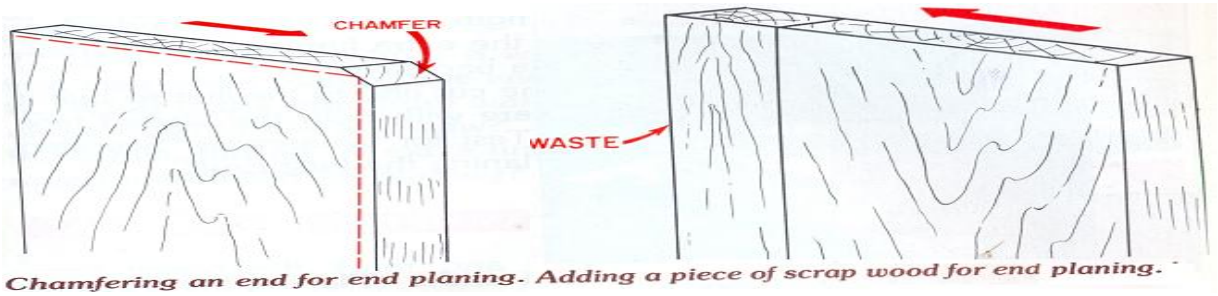


Testing an edge for squareness.

Planning the first end

1. Choose the best end of the board.
2. Fasten the board in a vise with the chosen end up.
3. Decide how you will plane the end.
   Follow one of these three steps:

A. Cut the end to make a chamfer ‘’shaping a chamfer and a bevel’’, for details about a chamfer. This should be cut from the unfinished edge. You can then plane in the direction of the arrow with out splitting the edge.

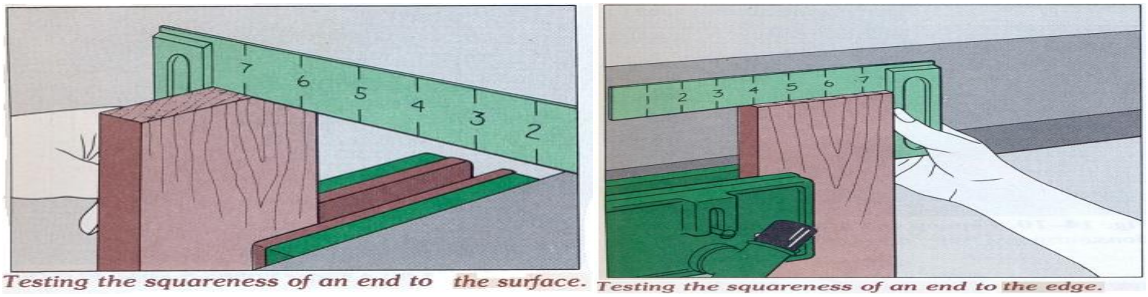


Chamfering an end for end planing. Adding a piece of scrap wood for end planing.

B. Clamp a narrow piece of scrap wood against the unfinished edge. Plane in the direction of the arrow. This keeps the outer edge from splitting.

C. Plane two-thirds of the distance across the end from out side, and then reverse the direction. The opposite edge will not split off if the plane is lifted before the blade goes all the way across. Use a block plane on very narrow boards.

4. Plane the end until it is square with the planed surface and edge. Hold a wide board in a vise with a hand screw clamp. Fasten it to the board so that the clamp rests flat on the bench top while holding the board, as shown.



Testing the squareness of an end to the surface. *Testing the squareness of an end to the edge.*

Planning the opposite end

1. Measure the board for the length needed, and mark it. Allow an extra $^{1}/_{16}$in. (1.6mm) for sawing and planing.
2. Mark the length square with the planed edge.
3. Cut off the extra lumber with a cross cut saw or a back saw.
4. Plane the cut and to the line so that it will be square with both the planed face and edge. Test for queerness.

Planning *the opposite edge*

1. Measure and mark the board very carefully for width. Allow an extra $^{1}/_{16}$in. (1.6mm) for sawing and planing.
2. If necessary, cut off the extra lumber with a rip saw. Do this only when the waste is about $^{3}/_{8}$in (10mm) or more. Allow $^{1}/_{16}$in. (1.6mm) for planing to the line.

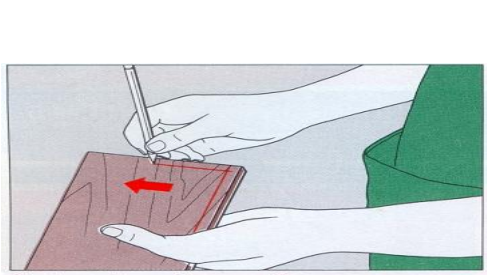
3. Plane this edge to the line so that it will be square with the working face and also square with both ends.

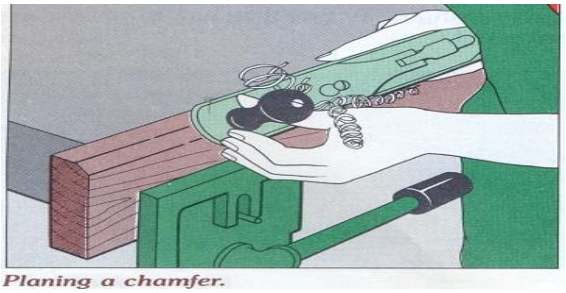
Planning the last surface

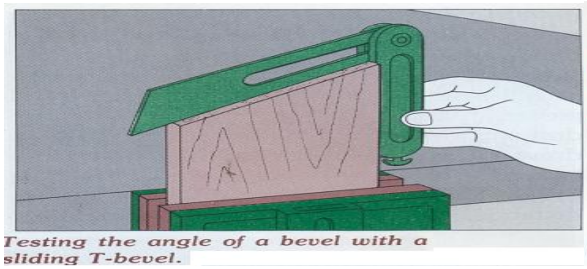
1. Mark the board for thickness with a marking gauge. Put the gauge line on both edges and ends.
2. Plane this last surface to the gauge line. Test if for squareness and smoothness.

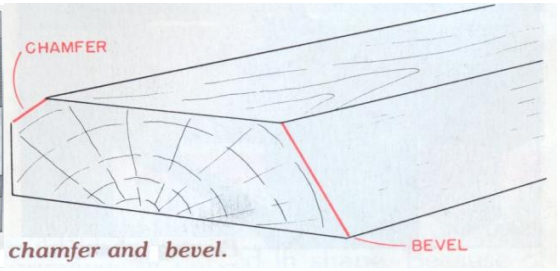
Laying out a chamfer and bevel

1. Gauge (mark) a line or lines lightly with a marking gauge or a sharp pencil so as to out line the chafer or bevel. Gauging with a pencil is better because sometimes the spur point of the marking gauge cuts and damages the surface grain.
2. Set the sliding T-bevel to the angle you want and check the out lined chamfer or bevel.


Gaging a line with a pencil.


Planing a chamfer.

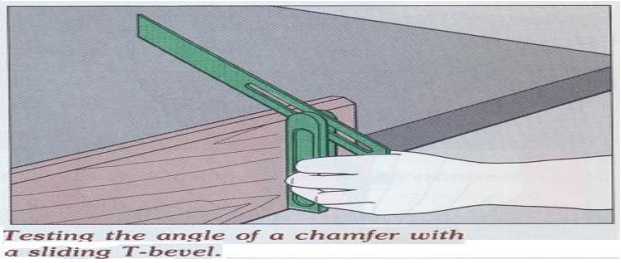

Testing the angle of a bevel with a sliding T-bevel.



chamfer and bevel.

Planning and testing

1. Fasten the board in a vise.


Testing the angle of a chamfer with a sliding T-bevel.

2. Plane the chamfer or bevel. If the board or block is small; fasten it in a hand-screw clamp that is held in a vise. It can then be planted with a small block plane.
3. Test the angle of the chamfer or bevel with a sliding T-bevel.

Portable hand tools

Portable hand tools are designed for a wide variety of uses, including construction, tree cutting, bridging, or tree clearing. Portable electric hand tools increase production and reduce time and manpower.

1. Portable jig saw
2. Portable circular saw
3. Portable drill
4. Portable router
5. Portable plane
6. Portable sander

Information Sheet-10	**Portable jig saw**

is a power-driven jigsaw that cuts smooth and decorative curves in wood and light metal. Most saber saws are light-duty machines and are not designed for extremely fast cutting.

Safety rules for jig saw

- ☞ Always secure permission from your teacher / instructor to use the portable jigsaw.
- ☞ Disconnect the plug from the electric power outlet before you inspect parts, make adjustments, or insert the saw blade.
- ☞ Fasten the jigsaw blade firmly in the blade guard before using the portable jigsaw.
- ☞ Inspect wood before making saw cuts, and remove any nails, dirt, or other things that will injure the jigsaw blade.
- ☞ Protect your clothing and keep the electric cable out of the path of the portable jigsaw.
- ☞ Hold or clamp the board to be cut so that it will not vibrate or move.
- ☞ Allow the blade to come to full speed before starting to cut.
- ☞ Always hold the portable jigsaw firmly.
- ☞ Switch off the saw and wait until the saw blade has completely stopped moving before you put it down.
- ☞ While working pay full attention. Do not talk to others.
- ☞ Disconnect the plug from the electric-power outlet when the portable jigsaw is not in use.

Self-Check -10	Written Test

1. Unless a jig is used, powder-actuated fasteners should NOT be driven into materials within what minimum distance of an unsupported edge or corner?

A. 3 centimeters B. 3 inches C . 30 centimeters D. 13 inches

2. What type of saw cuts smooth and decorative curves in wood and light metal?

A. Circular B. Electric chain C. Reciprocating D. Saber

3.Uses of jigsaw ?

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

Score = _____

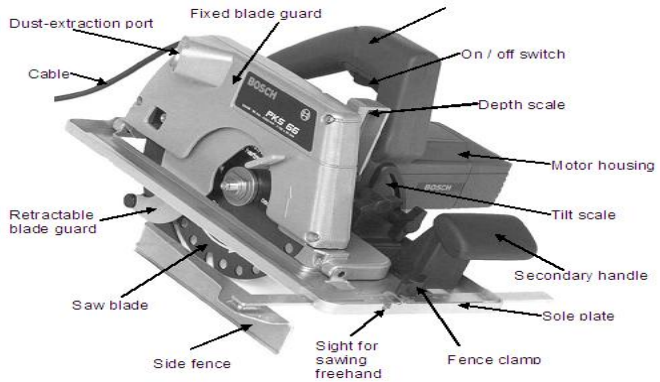
Rating: _____

Name: _____ Date: _____

Information Sheet-11	Portable circular saw

It is a handy piece of equipment suitable for construction work. It is principally used for cutting boards to length and width and for making angular cuts.

circular blade that revolves at an arbor speed of 3200 to 4600 revolutions per minute (rpm).



Before operating this saw, be sure you are using a blade that is right for the job. The manufacturer's instruction manual shows the proper saw blade to use for a particular material. The blade must be pushed securely into the opening provided. Rock it slightly to ensure a correct fit, and then tighten the setscrew.

Safety rules for portable electrical saw

- Always secure permission from your teacher / instructor to use the portable circular saw.
- Disconnect the plug from the electric power outlet before you inspect parts, make adjustments, or change the saw blade.
- Keep saw blades sharp. Dull saw blades may cause the saw to stall or bind.
- Replace dull saw blades. They make the user force the portable circular saw through the work – increasing the risk that it will be thrown back when the saw blades meet tough or irregular grain.
- Keeps the retractable safety guard operating freely. Use it at all times.
- Always hold the portable circular saw firmly.
- Inspect wood before making saw cuts, and remove any nails, dirt, or other things that will injure the saw blade.
- Protect your clothing and keep the electric cable out of the path of the portable circular saw.
- Allow the blade to come to full speed before starting a saw cut.
- Hold or clamp the board to be cut so that it will not vibrate or move.
- By sawing long boards or lumber use an additional guide (wood), hold it by bar clamp in position.
- Do not attempt to make adjustments while the portable circular saw is in operation.
- While working pay full attention. Do not talk to others.
- Disconnect the plug from the electric-power outlet when the portable circular saw is not in use.

Self-Check -11	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next

1. Before making any adjustments to a circular saw, what action should you take first?
   A. Clean the saw B. Clean the shop C. Disconnect the power source D. Inspect the blade
7. What personal protective equipment should you wear while operating a circular saw?
   A. Apron B. Back brace C. Dust mask D. Goggle

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

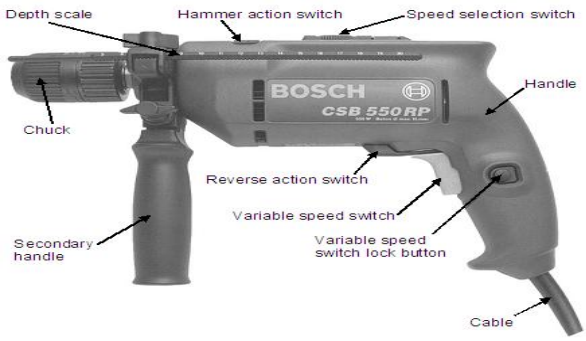
Information Sheet-12	Portable drill

The portable power drill is a motorized rotary driving tool that is operated by a small, high-speed electric motor having a gear reduction driving unit.

The size of the power drill is determined by maximum opening of the chuck ,i.e., the largest drill size that the chuck can accommodate.

The portable power drill is supplied with the following standard attachments: friction clutch used for drilling screws; flexible unit used for drilling in close quarters and at an angle; drill stand used for supporting the portable electric drill to enable it to be used as a drill press; drill fixture, attached to the portable power drill for drilling holes at 900 or at predetermined angles

Offset right-angle attachment, used for drilling holes in closes quarters.



Safety rules for portable drill

- Always secure permission from your teacher / instructor to use the portable drill.
- Disconnect the plug from the electric power outlet before you insert or change the bit.
- Be careful not to use larger bits than those recommended by the manufacturer.
- Fasten the bit firmly in the chuck before using it.
- Make sure the bit is inserted at least 2 cm into the chuck.
- Be sure the drill bits are always sharp
- Keep the air vents on the drill housing free of dirt.
- Hold or clamp the piece of wood to be drilled so that it will not move.

- Always hold the portable drill firmly.
- Switch off the portable drill and wait until the bit has completely stopped rotating before you put down the portable drill.
- While working pay full attention. Do not talk to others.
- Disconnect the plug from the electric-power outlet when the portable drill is not in use

Self-Check -12	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next

1. Portable power drills have replaced hand drills because of an increase in which of the following characteristics?

A. Speed and leverage B. Speed and accuracy C. Leverage and versatility D. Accuracy and leverage

2. A heavy-duty construction drill has what handle design?

A. Hook-and-knob B. Knob-and-tooth C. Pistol-grip D. Spade

3. What type of drill is used in plumbing and electrical work?

A. Brace B. Hammer C. Impact wrench D. Right angle

4. What type of drill is used in beveling, pounding, digging, and breaking operations?

A. Brace B. Hammer C. Impact wrench D. Right angle

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

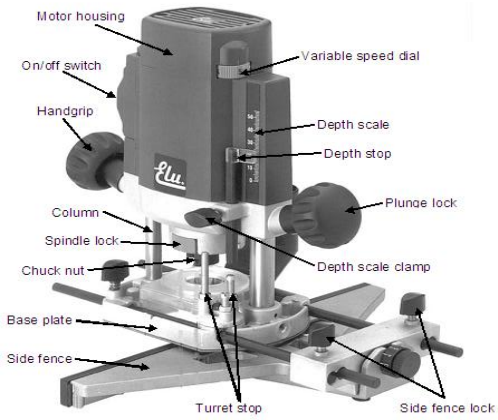
Information Sheet-13	Portable router

Is a versatile portable power tool that can be used free hand or with jigs and attachments. It consists of a motor containing a chuck into which the router bits are attached. The motor slides into the base in a vertical position. By means of the depth adjustment ring, easy regulation of the depth of a cut is possible. Routers vary in size from 1/4 to 2 1/2 horsepower, and the motor speed varies from 18,000 to 27,000 revolutions per minute.

The power hand router is a power driven shaping tool having bit that revolve at a spindle speed of between 5000 and 27000 rpm, used for cutting moldings, grooves for inlaying, beading, decorative edges, etc.

Portable hand routers are classified by the horsepower of the motor and the diameter of the cutter shaft.

The capacity is determined by the depth and diameter of the bit that may be used.



Safety rules for portable router

- Inspect wood before shaping, and remove any nails, dirt, or other things that will injure the bits or cutters.
- Replace dull bits or cutters. They make the user force the portable router through the work

- increasing the risk that it will be thrown back when the bits or cutters meet tough or irregular grain.
- Be careful not to use larger bits and cutters than those recommended by the manufacturer.
- Make sure the bit is inserted at least 2 cm into the chuck. Turn it by hand to make sure it clears the router base.
- Fasten the bit and cutter firmly in the chuck before using it.
- Be sure the bits and cutters are always sharp.

Self-Check 13	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next

1. The router is a versatile tool that can be used in which manner?

   A. As a saber saw B. As a scraper C. Free hand D. Hands free with a pattern

2. The router speed varies from 18,000 to what number of revolutions per minute?

   A. 2,700 B. 7,200 C. 27,000 D. 72,000

3. What router accessory is one of the most practical?

   A. Depth adjusting ring B. Edge guide C. Interchangeable chucks D. Screw type bits

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

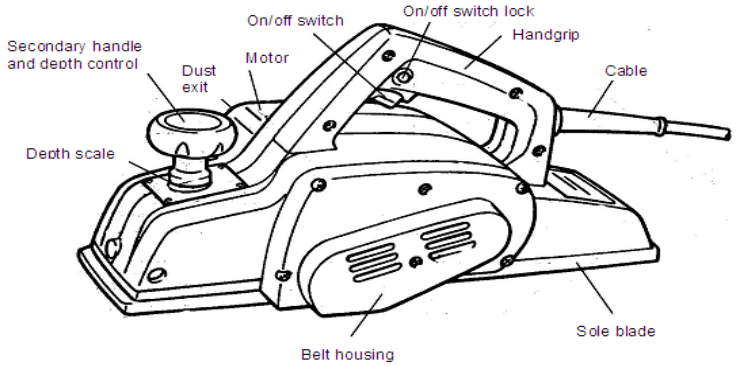
Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet-14	Portable plane

The portable electric plane is power- driven rotary cutting-edge tool. The cutting is done by a continuous-motion shearing at speeds varying between 20,000 and 25,000 revolution per minute. It is used for planning wooden surfaces and edges smooth and true in a similar manner to the hand plane, but with less effort and time.



Safety rules for planner

⇒ Replace dull cutters. They make the user force the portable planer through the work – increasing the risk that it will be thrown back when the cutters meet tough or irregular grain.

⇒ Inspect wood before planning, and remove any nails, dirt, or other things that will injure the cutting blade.

⇒ Protect your clothing and keep the electric cable out of the path of the portable planer.

⇒ Check that the on/off switch is not locked before plugging it in.

⇒ Allow the cutter head to come to full speed before planning

⇒ Hold or clamp the board to be planed so that it will not vibrate or move.

⇒ Do not touch the sole of the portable planer while working. Keep both hands on the handle.

⇒ Hold the portable planer in both hands.

⇒ Switch off the portable planer and wait until the cutter head has completely stopped moving before you put the portable planer aside.

⇒ While working pay full attention. Do not talk to others.

⇒ Disconnect the plug from the electric-power outlet when the portable planer is not in use.

Self-Check -14	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the

1. The power plane is widely used for trimming panels, doors, and what other item?

   A. Frames B. Sheet metal C. Tree limbs D. Windows

2. The portable power plane has what maximum safe cutting depth, in inches?

   A. 1/32 B. 1/16 C. 3/32 D. 3/16

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet-15	Portable sanders

The portable sanders are power driven abrading tools used for sanding (smoothening) wooden surfaces.

Belt sander.

1) The belt sander: -employs a coated-abrasive belt that revolves over a pad area by an idler and driving drums. It is basically used for flush or regular sanding. The belts are made in various grades (grit numbers) and in a variety of widths (75-100mm) and lengths (525-675mm) to fit a particular make of machine.
2) The disc sander has a coated-abrasive disc that rotates on a motor spindle. It is principally used where a scratch-free surface does not matter much. The disc for can be fitted with a pad to enable it to be used for polishing.

3, The finishing sander uses a coated-abrasive strip fitted over a pressure pad that is driven either in an orbital or an in-line oscillating motion

It is power driven abrading tools used for sanding (smoothening) wooden surfaces.

- The belt sander :-basically used for flush or regular sanding
- The disc sander :-used where a scratch-free surface does not matter much.
- The finishing sander:- uses a coated-abrasive strip fitted over a pressure pad that is driven either in an orbital or an in-line oscillating motion

Safety rule Portable sanders

- Select correct abrasive belt
- Check to be sure belt is not tool fight
- Don not allow your attention to be distained
- Be sure stock is firmly against stop to prevent belt throwing it
- Do not hold small pieces in hand
- Grip the machine with both hand
- Work should be held firm, especially when using a belt sand
- Do not apply additional preserve to the sandy
- Disconnect the power before changing the sand paper
- Wear a dust mask or connect a dust extraction system to the base plate
- Wear safety glasses
- If using a sander for long period, change use ear protection

Self-Check -15	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the

1. Portable sanders are available in which of the following types?

A. Belt, disk, and cloth B. Belt, disk, and finish C. Cloth, flap, and finish D. Cloth, flap, and high-speed

2. On a heavy-duty belt sander, the belt is usually what minimum width, in inches?

A. 1 B. 2 C. 3 D. 4

3. What type of sander is used for removing old finish, paint, and varnish from siding, wood flooring, and concrete?

A. Belt B. Disk C. Orbital finish D. Oscillating finish

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet-16	Grinding machine

Bench Grinder Bench grinders are used for reshaping and sharpening chisels, drills, hatchets, and other similar small hand tools.

The bench grinder consists of a tool rest, an abrasive wheel, and an encased motor assembly. The clamp is used for fastening the grinder to a working surface. The rest supports tools that are being ground. It is adjustable and may be moved from side to side. The abrasive wheel may be changed, depending upon the type of metal being ground

The following steps describe how to use a bench grinder properly:

1. Before using, inspect the grinder and abrasive wheel, checking for cracks or breaks on exposed surfaces.

2. Loosen the wing nut on the rest, adjust the rest and tighten the wing nut.

3. Support the tool to be ground on the rest.

4. Move the tool back and forth across the abrasive wheel face to be sure of an evenly ground surface

5. Stop grinding occasionally to check for the desired edge. When the desired edge is obtained, you are finished. Store grinder in its designated storage area.

1.. The portable grinder comes equipped with which of the following items?

A. Grinding wheel and wire brush
B. Grinding wheel and paint brush
C. Paint brush and flap brush
D. Wire brush and sanding pad

Self-Check -16	Written Test

1. Uses of Grinding machine ?

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Grinding plan iron

1. clean the surface of the oil stone with same oil and a rage ,
2. put a little oil on the oil stone ,
3. Place the bevel flat on the stone.
4. make the plane iron on the stone back and ward avoiding a rocking motion ,
5. Put oil on the oil stone from time to remove steel practice.
6. turn the plane iron on its back and put it flat on the oil stone .move it back ward and for ward
7. pull the sharpened edge of the plane iron across a pieces of wood to remove the bull from the adage

Operation Sheet 2	Ripping circular saw

TITLE; ripping with portable circular saw

PURPOSE; ripping cutting with portable circular saw for construction purpose.

CONDITIONS: The trainee should perform this activity with complete protective equipment's

EQUIPMENT TOOLS AND MATERIALS: (Tape rule, Try square, Pencil, work piece, clamp.

Procedure for ripping **cutting**

- Make a lien showing the location of the cut.
- Place the work over the saw horses so that the cut can be made.

- Whenever possible, use the rip guide & adjust for the correct width of cut.
- Start the cut & the slowly walk along the saw.
-

PRECAUTIONS: Disconnect the plug from the electric power out let when the tool is not in use.

- Keep the blade is sharp.
- Always hold the electric saw firmly.
- Allow the blade to come full speed before starting.
- Adjusting only 3-6mm below the thickness of the board to be cut.
- Do not use it without the saw guard of the blade

QUALITY CRITERIA: 1. Select the wood with good quality.

1. Cut the wood to the correct degree

Instruction Sheet	LG19:- Maintain hand tool

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics –

- Maintenance
- Routine maintenance
- Handling of hand and power tools

This guide will also assist you to attain the learning outcome stated in the cover page.

Specifically, upon completion of this Learning Guide, **you will be able to –**

- Routine maintenance of hand tools.
- Operate a blade by its angle.
- Fix jigs according to working procedure.
- Store Hand tools in designate location.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 3 to 7.
3. Read the information written in the "Information Sheets 1". Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the "Self-check 1" **in page** 10
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 1).
6. If you earned a satisfactory evaluation proceed to "Information Sheet 2". However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.
7. Submit your accomplished Self-check. This will form part of your training portfolio.

Information Sheet-1	Maintenance

Introduction

Maintenance can be defined as working on something to keep it in a functioning and safe state and preserving it from failure or decline. Preventive – or proactive – maintenance is carried out to keep something functional. This type of activity is usually planned and scheduled. Corrective – or reactive – maintenance is repairing something to get it working again. This is an unscheduled, unplanned task, usually associated with greater hazards and higher risk levels.

The maintenance objectives are the following:-

- Optimising resources utilisation.
- Reducing downtime.
- Improving spares stock control
- Maximising production or increasing facilities availability at the lowest cost and at the highest quality and safety standards.
- Reducing breakdowns and emergency shutdowns.
- To achieve all the above objectives as economically as possible.

Importance of maintenance

The main purpose of regular maintenance is to ensure that all equipment required for production is operating at 100% efficiency at all times.

- Equipment breaks down leads to inevitable loss of production.
- an improperly maintained machine will require expensive and frequent repairs, because with passage of time all machines will wear and need to be maintained
- Maintenance may be considered as the health care of our manufacturing machines and equipment. It is required to effectively reduce waste and run an efficient, continuous manufacturing operation, business, or service operation. The cost of regular maintenance is very small when it is compared to the cost of a major breakdown at which time there is no production.

The benefits of performing maintenance inspections at recommended service intervals are:

- Reduced risk of costly in-season downtime
- Reduced repair costs due to preventative maintenance;
- Ensures optimum performance at all times
- Higher resale value for well-maintained equipment
- Use of proven Genuine John Deere Parts
- Proper maintenance will help to minimize problems.

- Hand and power tools maintenance creates problems such as
  - loss in production time
  - rescheduling of production
  - spoilt materials (Damage of in process material)
  - need for over time

Types of maintenance

Maintenance can be classified as:-

A) preventive maintenance and
B) Corrective maintenance

A) Preventive: - It represents the actions to retain the desired or required state of technical means of a system, to take influence on the decrease of the wear potential in such a way as to utilize if for the aims of the enterprise in the most effective way.

Preventive Maintenance is a step taken to keep every equipment in a better condition and not wait till it is in dire need of maintenance.

- preventive maintenance can be divided in to:-
  - Direct and
  - Indirect maintenance
- In the previous definition of preventive maintenance it represents the action that is taken to prevent the occurrence of failure before they develop to a break down or disturbances in production. Actions that are taken to prevent the occurrence of failure is called direct preventive. Because condition of the equipment will be improved directly.
- some of the jobs done for direct preventive maintenance are:-

- programmed replacements of parts
- over hauls
- lubrication
- oil change and
- cleaning

- In direct preventive maintenances can be done by measuring the condition the tools or inspect it find to out the condition level.
- Indirect preventive maintenance is also called condition monitoring.
- The condition monitoring can be done in two different ways:-

Subjective condition monitoring: - when the monitoring is done by the senses such as Listen, look, touch, taste and smells to estimate the condition of equipment it is known as Subjective. The results achieved are very much dependent on the deer or worker.

***Objective condition monitoring*: -** this is when the condition of equipment is measured in Some other way than using the senses.

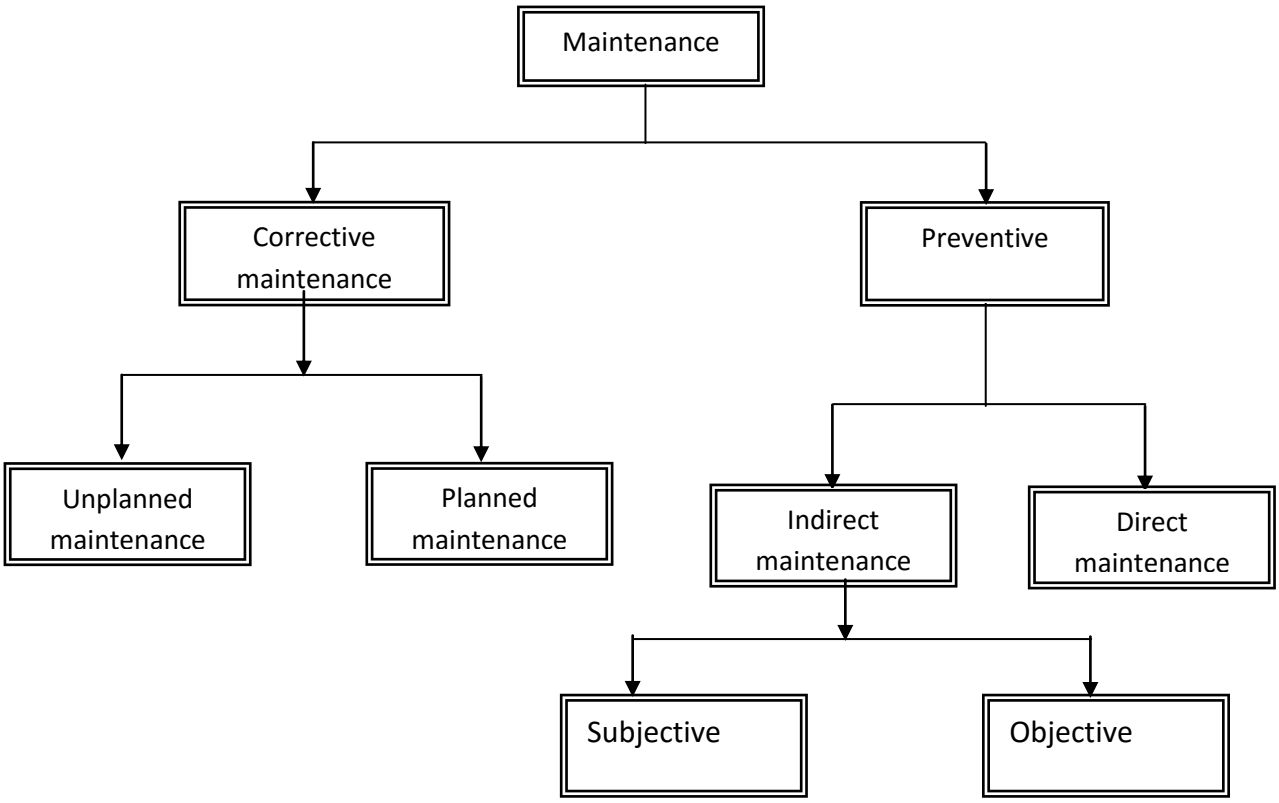
The benefits of *preventive Maintenance* are many. Here is a list of few such benefits:

- The first benefit is that Preventive Maintenance is that it increases the efficiency and speed of your equipment. .
- It is better because it saves you from spending too much when the tools breaks down completely and requires a big time repair or a replacement. It helps to truncate the problem at the bud.
- It also saves your time since you need not face the break down when you need the tools the most and then spend time to get the tools back in shape.
- It also helps to save money since preventive maintenance would cost lesser than repairs and replacement.
- If it is a computer or a system that stores data for your project then Preventive maintenance is a must since if the computer breaks down it would result in loss of data that might be important.
- It also ensures the safety of the person who is working with the tools since if the tools is not in a proper condition it might also lead to a major accident which is not desirable at all.

B) Corrective maintenance: - it implies that repairs are made after the tools are out of order.

- Corrective maintenance represents the actions to establish the required state of plants, to establish the wear potential required for future utilization thus including the improvement of components and the elimination of weak points.
- Corrective maintenance is classified as **planned** and **unplanned** corrective maintenance.
- Corrective maintenance is performed in order **to correct a fault in equipment**. This maintenance can be done through planned and unplanned

Summary



Directions: Answer all the questions listed below. Illustrations may be necessary to aid Some explanations/answers.

1.What are the 2 classification of **Maintenance**
2.What is the purpose of **Maintenance**
3.What are the 2 classification of **Preventive** Maintenance

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet-2	Routine maintenance

Routine Maintenance, also known as preventive, preventative or cyclical maintenance, is an essential part of the on-going care and upkeep of any tools.

However, each individual organization, big or small simple or complex, or using highly advanced or simple technology must chose that maintenance system which best meets its individual needs in implementing its policies .Therefore, it becomes necessary for the policy makers to get acquainted with various kinds of maintenance systems that need to be evaluated before a judicious choice can be made.

As mentioned earlier maintenance policy and strategy of TVET schools should be developed in accordance with principles of total productivity maintenance. Therefore changing the attitude and improving the skill of instructors, students and other operators who are using facilities is very important in order to implement the polices.

Based on complexities, purposes and sizes of facilities, there are different maintenance policies and strategies to follow. With respect to TVET institutions based on facilities they are utilizing maintenance systems to be implemented are:

- Preventive Maintenance
- Corrective Maintenance
- Contract Maintenance
- Improvement Maintenance

Preventive Maintenance (PM)

Preventive maintenance system refers to those critical systems which have to reduce the likelihood of failures to the absolute minimum. It is maintenance strategy primarily based on essential care, condition monitoring and fixed time maintenance to keep servicing facilities in satisfactory operating conditions by utilizing systematic inspection, detection and correction of incipient failures either before they occur or before they develop in to major defects.

Preventive Maintenance can also be classified as.

I) Direct, it is fixed time maintenance; some of activities which fall under this category are; programmed replacement of parts, overhauls, lubrication, oil change and cleaning. Activities of fixed time maintenance are governed by time, running hours and instruction from manufacturer of equipment.

II) Indirect, it is condition based maintenance which involves inspection and detection of failures before break down. It is carried out in order to find the failures in an early stage of their development. It can be done by measuring the condition of body temperature, vibration, abnormal noise and other measurable factors.

Self-Check -2	Written Test

Explain the equation below

Maintenance systems to be implemented?

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

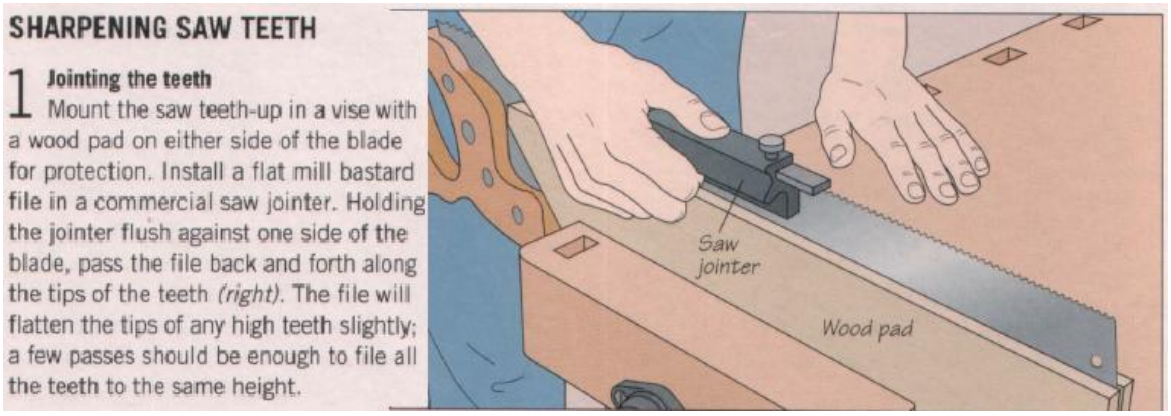
Score = _____

Rating: _____

Name: _____ Date: _____

Operation Sheet 1	CONTENT-

Short Answer Questions



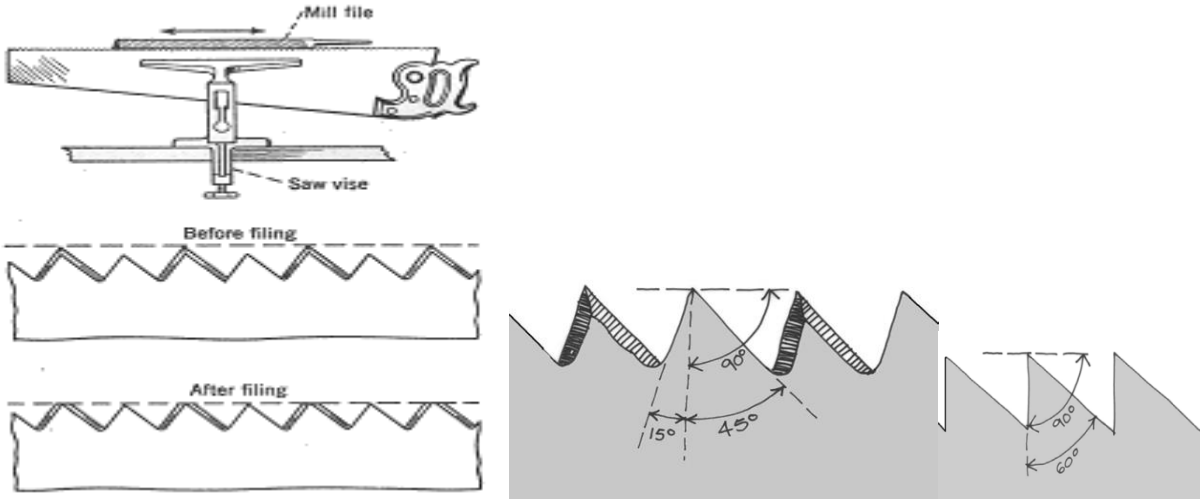


Fig.3.1.1 Jointing of hand saw Rip saw Cross cut saw

3.1.2 Sharpening of hand saw:-Sharpening of hand saw is performed by using triangular file which fits into the gullet of the teeth perfectly

- ***Note*:-**the procedures described for jointing, dressing, rejoining &setting the teeth for a rip saws are the same for performing similar operation on a cross cut saw. However, the shaping &sharpening operations differ.
- Cross cut saw teeth sharpening in the directions of bevel side
- sharpening of rip saw teeth is performed at an angle

***3.1.3 Setting*:-**setting is bending the saw teeth alternatively to the right & left by using **saw setter.**

Fig. 3.1.3 setting of hand saw

1.2. Plane Iron& chisel

sharpening plane iron & chisels bench girder are used. After Sharpening on the girder honing is follows. For the purpose of honing oil stone or water stone can be used & honing guide to hone the plan iron chisel to the proper angle. This is to avoid the burrs & keep the chisel & plan iron to sharp enough.

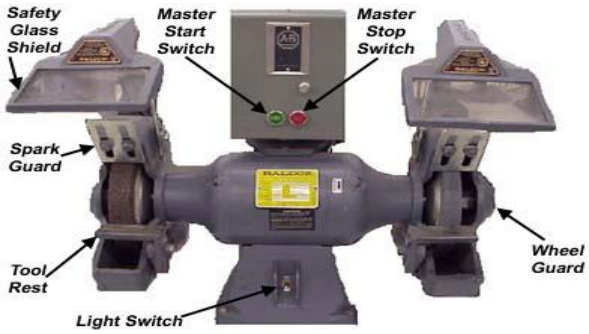


Fig 3.2 ***bench girder***

SETTING UP

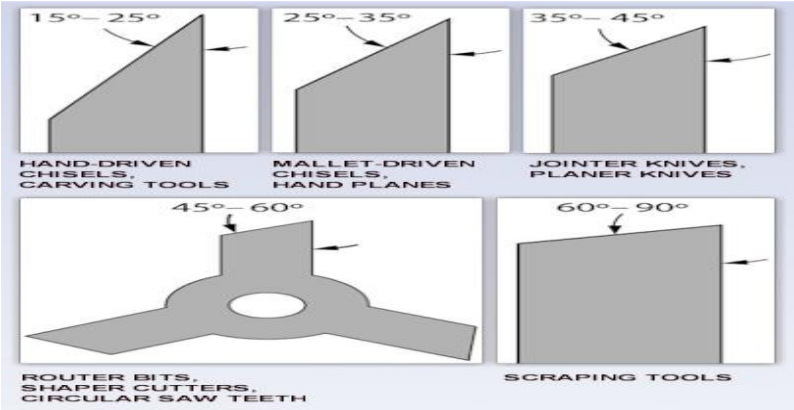
A plane must be sharp and properly adjusted to shear off shavings of wood—often as thin as paper—with no tearout. Before using a new plane you will have to sharpen the blade and adjust the tool for top performance. The procedure involves two steps: creating a bevel on the blade's cutting edge and honing another bevel on part of the first one, called a microbevel; then removing, or "lapping," the burr that results from the honing process.

If the cutting edge is damaged in any way, or if you are trying to restore an old blade, you first need to square its end. As shown in the photo at right, a grinder is the best tool to use for this purpose.

Whether you work with steel-bodied or wooden planes, setting them up requires very little in the way of specialized equipment. Honing can be accomplished with a combination sharpening stone and a commercial honing guide. Adjusting a plane's depth of cut requires only a screwdriver. The sole of a wooden plane becomes naturally slick with use; however, rubbing a little paste wax on the bottom of a steel-bodied plane will reduce friction.

Hone your blades frequently to maintain a keen edge and always retract them into the plane after use. Store the plane upright to prevent the sole from being harmed by other tools.

A nicked or out-of-square plane blade can be salvaged by squaring its end on a grinder. The guide helps keep the blade perpendicular to the grinding wheel.



Note: *- Keep a pot of water near the grinder. It may need to dip the metal that is grinding into the water occasionally to prevent it from getting too hot.*

When handling materials, employees shall:

- Prevent creating hazards when storing materials by being aware of the material's height and weight; how accessible the stored materials are to the user – consider the need for availability of the material; and the condition of the storage containers. All materials stored in tiers must be stacked, racked, blocked, inter-locked, or otherwise secured to prevent sliding or collapse.
- Keep storage areas free from accumulated handling of hand and power tools materials that may cause slips, trips, falls, or fires or that may contribute to harboring pests.
- If possible, place bound materials on racks and secure it by stacking, blocking, or inter-locking to prevent it from sliding, falling, or collapsing.
- Stack lumber no more than 16 feet high if handled manually and no more than 20 feet if using a forklift.
    - Remove all nails from used lumber before stacking it.
    - Stack and level lumber on supported bracing.
- Ensure stacks are stable and self-supporting. Observe height limitations when stacking materials.
- Stack bags and bundles in interlocking rows and limit the height of the stack to keep them secure.
- Block the bottom tiers of drums/barrels/kegs to keep them from rolling if stored on their side.
    - Stack drums/barrels/kegs symmetrically.
    - Place planks, pallets, etc. between each tier of drums/barrels/kegs to make a firm, flat stacking surface when stacking on end.
    - Chock the bottom tier on each side to prevent shifting in either direction when stacking two or more tiers high.
- Materials must not be stored on scaffolds or runways in quantities exceeding those needed for immediate operations.
        - Additional safe material storage practices include:
- Ensuring shelves and racks are sturdy and in good condition.
- Stacking all materials on a flat base.
- Placing heavier objects closer to the floor and lighter/smaller objects higher.
- Not stacking items so high that they could block sprinklers (18" of clearance) or come in contact with overhead lights or pipes.
- Using material-handling equipment or a ladder to place or remove items above your head.

- Never standing on a shelf, rack, boxes, or a chair.

All hand and power tools has their own handle when we uses this tools we have to use the correct handles

more tools are very sharp so give more attention on working area /workshop/some tools may need high pressure others also need small amount of pressure so identify which tools need more power .

Self-Check -3	Written Test

Explain the equation below

1. What is the use of material handling?
2. Handling of materials used for the tools?
3. When placed heavy tools in the center of the bench?

Note: **Satisfactory rating - 3 points** **Unsatisfactory - below 3 points**

Answer Sheet

Name: _____ Date: _____

Score = _____

Rating: _____

References

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- ✓ 3080 Hand and Power Tools
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