Ethiopian TVET-System

Furniture Making L-II

Based on Sept. 2012G.C. Occupational standard

Module Title: Setting-up and Operating Woodworking Machines

TTLM Code: IND FMK2 M02 TTLM 0919V1

This module includes the following Learning Guides

LG04: Prepare for work
LG Code: IND FMK2 M02LO1-LG-04

LG05:Set-up machines
LG Code: IND FMK2 M02LO2-LG-05

LG06:Operate machines
LG Code: IND FMK2 M02LO3-LG-06

LG07:Clean up work area
LG Code: IND FMK2 M02LO4-LG-07

Instruction Sheet	LG04: Prepare for work

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

1.1 Determining work instructions according to job requirements

1.1.1. Design
1.1.2. Quality
1.1.3. Materials
1.1.4. Quantities
1.1.5. Equipment's

1.2. Cutting list

1.3. Job specifications.

1.4. Workplace health and safety

1.5. Characteristics of materials and uses

1.6. Select tools and equipment

1.7. Procedures for minimizing waste material

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**:

- Perform work instructions to determine job requirements
- Read and interpret cutting list and job specifications
- Observe workplace health and safety requirements
- Select and inspect quality material for machining
- Identify and check Joining machines, cutting tools and jigs
- Determine procedures to minimize waste material Check Safety equipment

Learning Instructions:

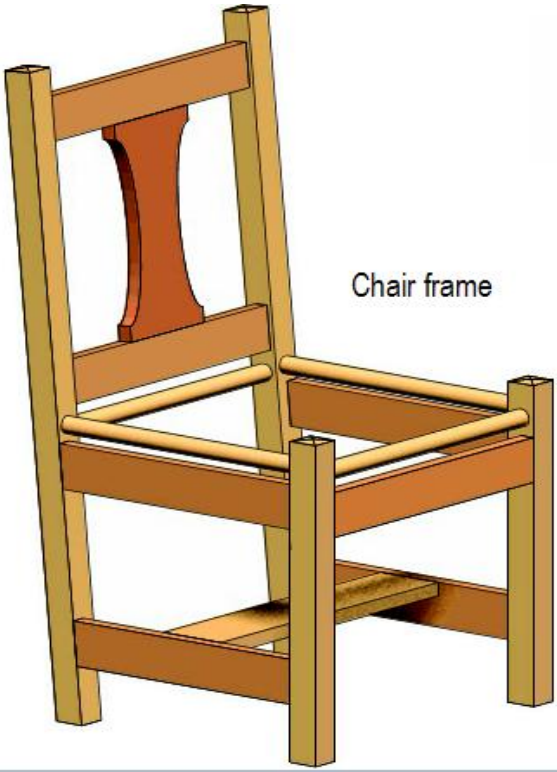
1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information "Sheet 1, Sheet 2, Sheet 3Sheet 4 and Sheet 5".
4. Accomplish the "Self-check 1, Self-check t 2, Self-check 3 and Self-check 4" **in page -7, 10, 15 and 19** respectively.

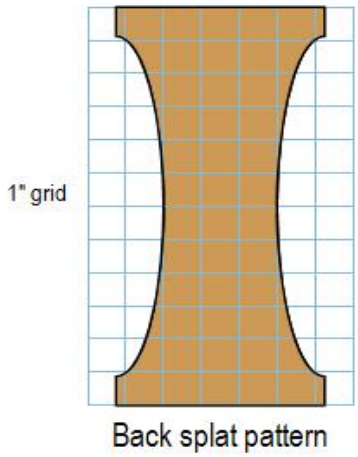
1. Do the "LAP test" **in page – 10 and 21** (if you are ready).

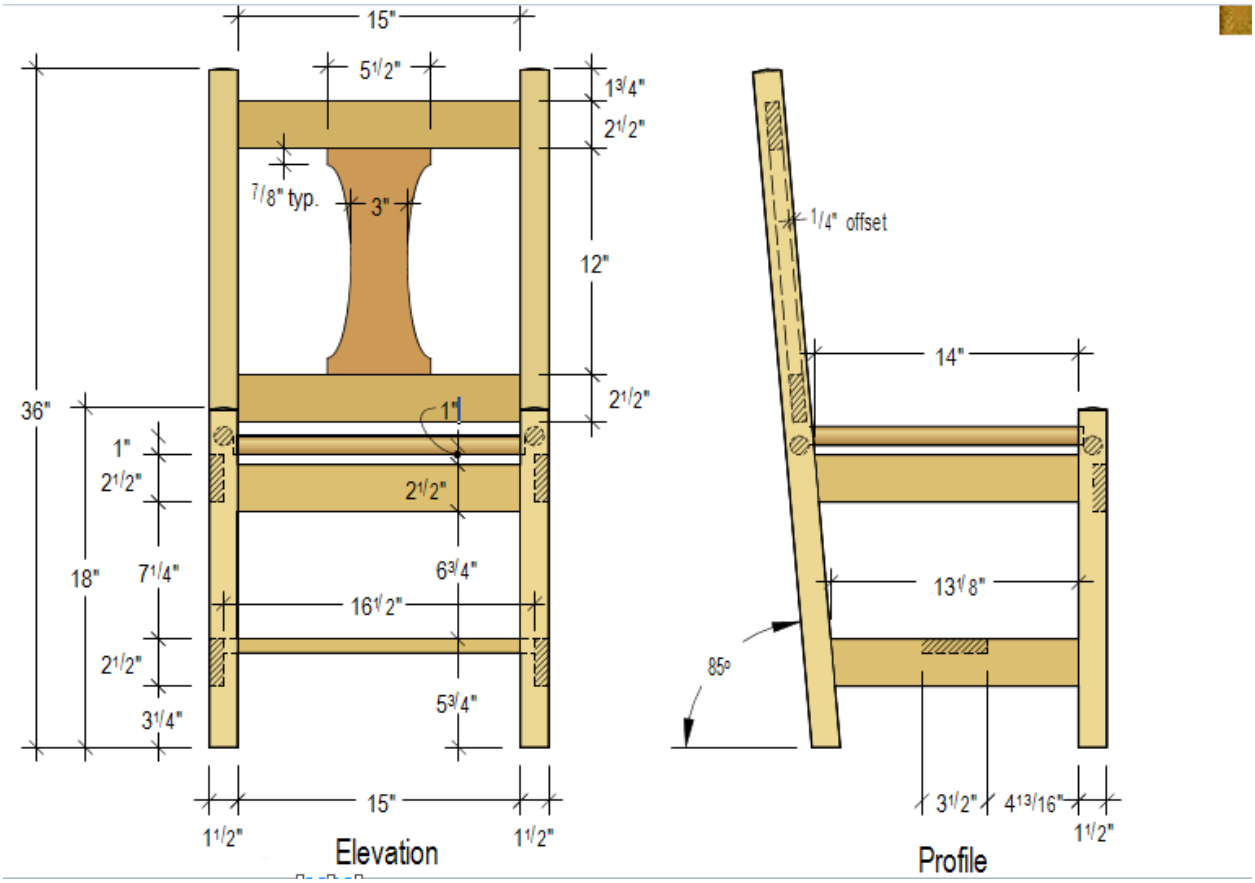
Information Sheet-1	Determining work instructions according to job requirements

1.1.1. Design

- People are not likely to have the same ideas, likes or dislikes for a particular furniture design.
- It is almost impossible to give specific rules that will insure good design in a piece of furniture. However, furniture must be well designed and beautiful if it is to be *useful*, *attractive* and *convenient*.
- The taste or feeling for good design can be acquired by observing quality in all manufactured products and by adhering to certain fundamentals.
- There are many things to consider when designing a product. The end result must, of course, satisfy the customer.
- To do this the designer must consider the purpose, strength, size, shape, proportion, appearance, time (the time spent in designing is well worth the effort. This helps to avoid mistakes and saves time in the long run), and cost of the product.






15"
5 1/2"
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3"
12"
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36"
1"
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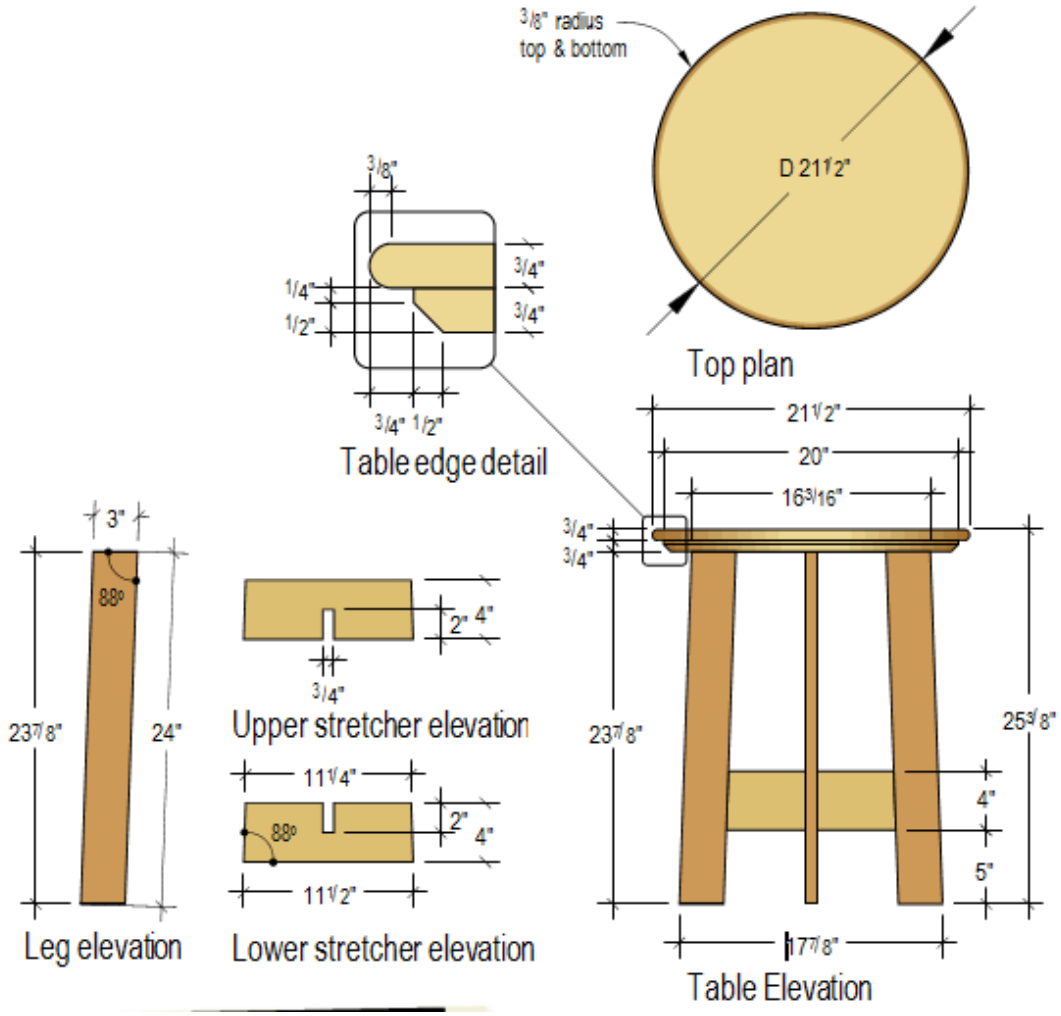
1"
2 1/2"
18"
7 1/4"
6 3/4"
16 1/2"
2 1/2"
3 1/4"
5 3/4"
15"
1 1/2"
1 1/2"
Elevation
1/4" offset
14"
13 1/8"
85°
3 1/2"
4 13/16"
1 1/2"
Profile



1.1.2. Quality

- Quality is ultimately measured by how will the product meets the requirements and expectations of the consumer.
- Quality may be specified by the designer or the person that uses it.
- The standards or specification requirements, address lumber grades, plywood grades, wood and manufactured panel casework, plastics covered casework, countertops, doors, finishing, and assembly.
- Quality also involves productivity. when work falls short of the goals, corrective action must be taken. reports and schedules are made to assist in monitoring work activities.

1.1.3. Materials

- There are many materials available for producing cabinets and fine furniture.
- These should be considered carefully throughout the design and production process.
- Materials you might consider include lumber, veneer, plastic, manufactured panel products, plywood, particleboard, plastic laminates, and glass.

- To assemble these materials, you will also choose among adhesives, mechanical fasteners, or joinery.
- Finishing materials are coating that provide color and protection to the wood.
- What material(s) will be suitable or available for realization?
- What properties should the material (s) used possess?
- Will the material(s) need any special treatment?
- What type of finish will be required

1.1.4. Quantities

- The manufacturing organization should produce the products in right number.
- If they are produced in excess of demand the capital will block up in the form of inventory and if the quantity is produced in short of demand, leads to shortage of products

Bill of Materials

- listing of all of the raw materials, parts, subassemblies, and assemblies needed to produce one unit of a product
- Basically, a bill of material (BOM) is a complete list of the components making up an object or assembly.

Self-Check -1	Written Test

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

Match column A with column B. Select the letter of the correct answer from column B & write your answer on the provided space **in front of the number in column A**

If you wish to change your answer place an x mark on your previous answer and write your preferred answer

Column A	Column B
---------- Ultimately measured by how will the product meets the requirements and expectations of the consumer. (**2 points**)	Quantities
----------The manufacturing organization should produce the products in right number(**2 points**)	Bill of material
---------- listing of all of the raw materials, parts, subassemblies, and assemblies(**2points**)	Design
---------- *Useful*, *attractive* and *convenient*. (**2points**)	Quality

Note: **Satisfactory rating –8 points** **Unsatisfactory - below 8 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet-2	Reading and interpreting cutting lists

- What is cutting list? A cutting list shows how to cut a given set of parts from set of available stock.
- Now that we have designed the cabinet, we have to figure out how much wood we will need to make it.
- Each parts of your project require a certain amount of wood which has thickness, width and length.
- When you designed the project, you figure out what all of the parts were and what their dimensions have to be.
- So you basically create a list all of these parts, listing where they go in final assemble as well as their names, thickness, width, length and what kind of wood you want to use to make them.
- From the cut list you can determine know how much wood you need to buy, you can estimate how much the material will cost and once you know what it will cost.

Operation Sheet 1	Cutting list

Developing a Cutting Schedule:

Once you have completed your working drawings, you will need to determine the final cut-size of each piece. First, create a table with six columns labeled as follows:

Key	Parts	Pcs.	Size	Material	Cut from

Step-1Key: Begin by assigning each piece of your project a letter (A, B, C, etc.). Use the letter to label each part on your rough layout as shown on the illustration to the right.

Step-2Parts: Next, name the piece (Back, front, top, leg, etc.)

Step-3Pieces: If the part to be cut is duplicated, number the amount of pieces you will need to cut. For instance, if you are making a dining room table, you will need 4 legs. If you are making a nightstand, you will need two sides. Since these parts are the exact same size, you need only write the part once and label the amount of pieces.

Step-4 Size: Determine the exact size of your final piece after you cut it. Record the dimension. This will tell you the size to cut your wood.

Step-5 Material: List the type of material you will use (oak, pine, redwood, etc.). This is particularly important if you are using more than one type of lumber.

Step-6 Cut from: List the lumber in its store-bought size from which you will cut the part (1x4x8; ¾" plywood; 2x6x4; etc.). This will tell you from which piece of store bought lumber to cut.

A cutting list is a tabulated list showing information about the materials required for the job. It shows you things like:

When finished, your cutting schedule will look something like this:

Key	Parts	Pcs.	Size	Material	Cut From (buy) *see Notes
A	Top	1	3/4 x 26-3/4 x 47-7/8" (OA)	Pine	4/8, 1 x 4
B	Edging, ends top	2	3/4 x 1 x 27-3/4"	Pine	All edging from 1/5, 1 x 6
C	Edging, front top	1	3/4 x 1 x 49-7/8"	Pine	"
D	Legs	4	2 x 2 x 28-1/2"	Pine	1/5, 8/4 x 6
E	Top rails, front and rear	2	3/4 x 1-1/2 x 47-1/8"	Pine	All rails from 1/7, 1 x 4
F	Top rails, ends	2	3/4 x 1-1/2 x 24-3/4"	Pine	"
G	Rear stretcher	1	1-3/4 x 1-5/8 x 47-1/8"	Pine	All stretchers cut from 1/7, 8/4 x 8" board
H	End stretchers	2	1-3/4 x 1-5/8 x 24-3/4"	Pine	"
I	Dividers	3	3/4 x 4-1/4 x 26-1/2"	Pine	1/8, 1 x 6
J	Cleat	1	3/4 x 1-1/2 x 22-3/4"	Pine	Scrap box
K	Drawer shelf	1	3/4 x 12-1/4 x 26-1/4"	Pine	1/5, 1 x 8
Drawer					
L	Drawer sides	2	1/2 x 2-5/8 x 12-1/2"	Pine	1/5, 1 x 4
M	Drawer back	1	1/2 x 1-7/8 x 10-5/8"	Pine	1/1, 1 x 4
N	Drawer front	1	3/4 x 4-3/16 x 12-1/4"	Pine	1/18, 1 x 6
O	Drawer bottom	1	1/4 x 10-1/16 x 11-15/16"	Plywood	1 sq. ft.
Keyboard Platform					
P	Keyboard platform	1	3/4 x 14-5/8 x 30-7/8"	Pine	1/5, 1 x 4
Q**	Hand rest	1	3/4 x 2 x 30-7/8"	Pine	1/1, 1 x 4
R	Stop blocks	2	3/4 x 3/4 x 3-1/2"	Pine	1/18, 1 x 6

Specification

Having considered all this factors and having decided what to do, a statement is then made embodying the major conclusions regarding functions, limitations, etc. This statement is referred to as a design specification. For example; the container must be:

- Able to hold reasonable amount of rubbish safely.
- Very stable and raged.
- Easy to move about.
- Easy to operate by foot (i.e. the lid).
- Easy to construct with available materials.
- Attractive and inexpensive.

Self-Check -2	Written Test

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

1. Define what is cutting list? (2.5 points)
2. Develop chart for cut list? (5 points)
3. What are difference between a bill of materials and cutting list? (2.5points)

Note: **Satisfactory rating –10 points** **Unsatisfactory - below 10 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

LAP Test	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

tructions: Given necessary templates, tools and materials you are required to perform the following tasks within ½ hour.

Task 1: Using Job specifications, set-out rods and plans for determine the job requirements, including cutting list, dimension, design, quality materials and processes

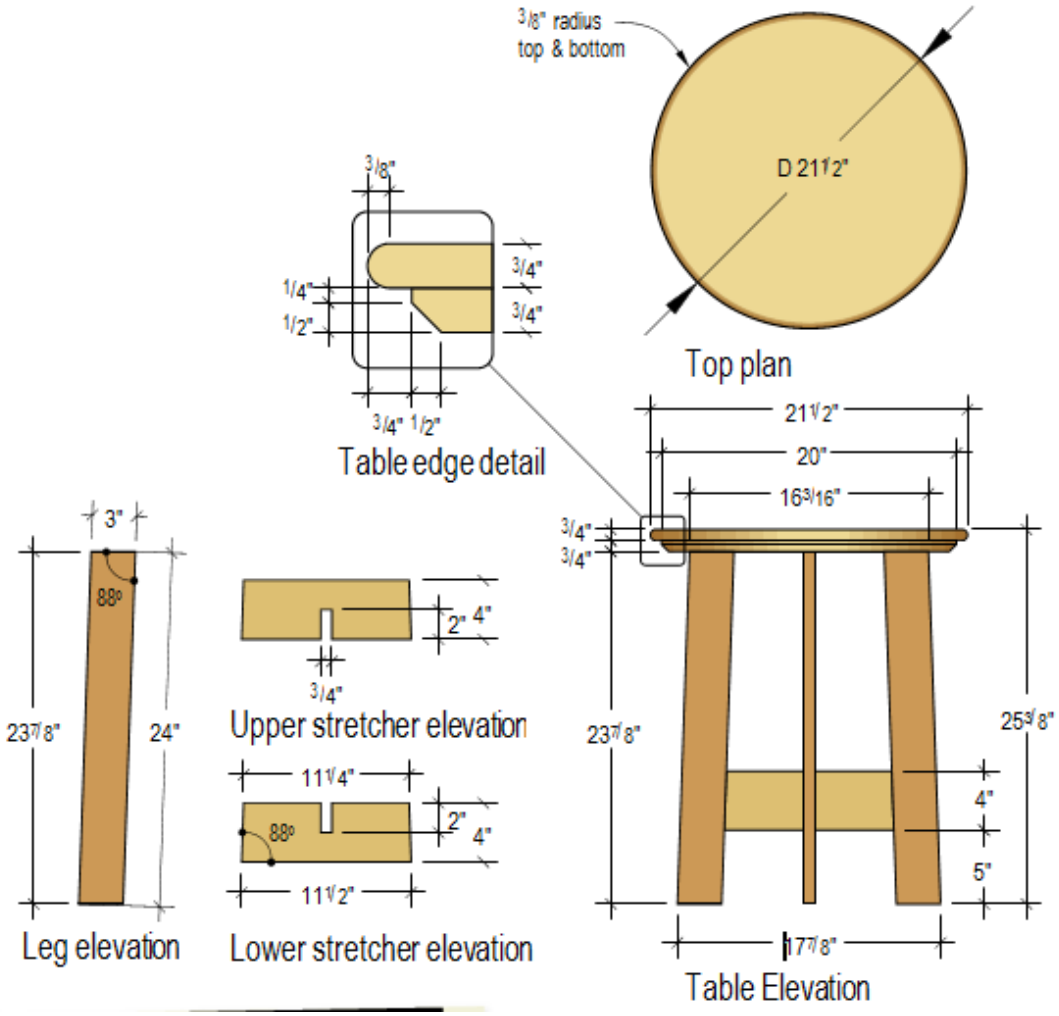
Task 2: Check Cutting list and set out in accordance with workplace procedures and the plans and specification

Task 3: Identify Components and described using common workplace terminology

Task 4: Establish Sizes and tolerance of components and documents in accordance with workplace procedures

Task 5: Identify Dimensional allowances for further processing and documented

Task 6: Interpret Cutting list and accordance with job requirements



Information Sheet-3	Observing workplace health and safety requirements

- **Safety** is the first essential requirement and every personnel must learn the safety measures even before he starts working on a machine or on equipment's.
- **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 equipment and 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 is a precaution to avoid accident.

Care is a technique of properly handling tools, equipment's& materials.

To protect ourselves from the accidents of hand tools & machines in the workshop it's better to consider the following three safety care.

Personal protective equipment

When working on or with the machine, the following must be strictly observed:
Personswithlonghairwhoarenotwearingahairnetarenotpermittedtoworkonorwiththemachine!

It is prohibited to wear gloves while working on or with the machine!

When working on or with the machine, the following must always be worn by personnel:

Protective clothes
Sturdy, tight-fitting clothing (tear-resistant, no wide sleeves)

Protective footwear that protect the feet from heavy falling objects and prevent sliding on slippery floors

Hearing protection
To protect against loss of hearing

General Safety Rules:

General safety rule is very important to reduce the accident while you working in workshop. Some of them are listed below,

- ***Always dress properly***: - Dress properly for your work. While you must wear your aprons are provided so that you can work on the machines. Remove any jeweler, neckties, chains, bracelets, and rings. Roll up your sleeves and tie any hair back in a ponytail before beginning any work
- ***Follow directions*:-**understanding the procedures of using by hand tools & machines.

- ***Keep the shop clean: -*** Put your tools back where they belong when you are finished. Keep the floor clear of debris and sawdust the floor should be clear of scrap blocks, excessive material, and sawdust. Keep projects, sawhorses, and other equipment and materials you are using out of travel lanes. Wipe up any spilled liquids immediately.
- ***Learn to use the tools correctly***
  - -Understanding using of hand tools in proper ways.
- ***Avoid house play***
- ***Report all accidents***
- ***Practice lending a cheerful helping hand when requested by someone.***

Be thoughtful and helpful toward other students in the class. Caution them if they are violating a safety rule. This is one of the most important rules in that all of you have responsibility for each other's safety and well-being in the class.

House Keeping

Keeping of work shop clean & store the tools in proper place is to ensure our body & tools from the accidents of machine while working & breakage of tools respectively. The workshop is kept in different ways .Some of themes are:

- Work benches should be free &clean of clutter.
- Tools & equipment's should be safely stored.
- Keep the floor clean &clear.
- Immediately wipe of spilled liquids which can create a slippery surface.

Fire prevention

- When using power tools it is the responsibility of the student to be aware of a tool gettinghot. If t his happens immediately turn it off, unplug it, and report it to the teacher.
- If a tool emits a "burning smell" inform the instructor immediately.
- Any finishing materials should not be used near an open flame.
- This would also includethinners and paints.
- Rags that have absorbed any amount of linseed oil, solvents, stains, paints, or any otherfinishin g products must be disposed in an approved covered metal container as aprecaution against sp ontaneous combustion.
- Report to the instructor any odor of gas. Gas can not only cause a fire or an explosion, itcan al so make people ill.
- When unplugging an electrical cord, always do so by the plug itself and not by the cord.This caus es damage to the wires and can eventually be the cause of a fire.

The Ten Commandments of Machine Safety

1. **Pay Attention**: Not paying attention is the number one cause of accidents. Think. Think. Think. Keep your mind on your work. Give your work your undivided attention. Do not look around, talk to others, or use a machine without rehearsing the cut in your mind first.
2. **Keep Machine Guards In Place** at all times. Guards are there to protect you. If a guard has been removed tell the teacher so that he/she may put it back on before you begin.
3. **Do Not Over Reach**: Never reach across or over a moving blade.
4. **Know The Fly Zone**: Know where the wood is going to go, kick back, or fly if you lose control of it, and do not stand in that area. For example: A drill press will spin the wood clockwise, so the long side of the material should be to the left. A table saw will throw the wood backward, so stand to the side.
5. **Proper Tool Use**: Only use a tool for what it is made for. Understand grain direction, rip-cuts, cross-cuts, blade direction, and proper blade installation. Turn off a tool when you are finished and wait for it to come to a complete stop before leaving. Blades are often felt before they are heard.
6. **Proper Wood Size**: Many accidents occur simply because a person attempts to cut a piece of wood that is too small or too big. Smaller pieces of lumber are easily grabbed by the blade and the hand holding the wood quickly follows. Because lumber that is too large must be forced into the blade, the extra force required can cause slipping, thrusting, or sudden release. Body parts then lunge forward into the blade. Oversized lumber is under control of the blade, not your hands.
7. **Special Set-Up Approval**: A special cut requires guards to be removed, and if not done correctly will cause serious injury. Always inform the teacher of any special set-up you are thinking on attempting.
8. **Proper Hand Placement**: Always hold the wood firmly. Never cross your arms. Do not push wood hard towards the blade. Do not force wood. You may slip and fall into the blade.
9. **Keep Fingers Clear**: Keep your fingers clear of blades, rotating parts, pinch points, and electrical plugs by maintaining a clearance of 2 to 4 inches. To assure your safety and the safety of others, only cut wood that is a minimum of 12” long and 3” wide (the 12/3 rule). You must inform the instructor before cutting any piece smaller than the 12/3 rule.
10. **Keep Work against the Fence and On the Table**: Wood should be firmly against the fence and the table before cutting. The blades and cutters are designed to drive/throw/press the wood against the fence and table. In other words, if you don’t have wood there, the blade will put it there for you, along with your hand.

Self-Check -3	Written Test

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

1. Define safety? (2 points)
2. List personal protective equipment's? (2 points)
3. List Ten Commandments of machine safety(6 points)

Note: **Satisfactory rating –10 points** **Unsatisfactory - below 10points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet-4	Characteristics of materials and uses

Wood selection:

a. Only material furnished or approved by the instructor is to be used.

b. All material is to be inspected for knots and nails before using. These may fly off during cutting and cause bodily injury or damage the machine.

c. Do not use green lumber in any milling process. Green lumber is wood that has not been thoroughly dried. It is wet on the inside and contains tree sap. This type of wood will change over time (warp, bow, twist, etc.) as well as grow mold.

Plywood

Plywood layers (called veneers) are glued together. Each layer is called a ply. When gluing the plies together, the grain pattern of each alternating layer is placed at a right angle to the layer before it. This adds to the strength.

There are usually an odd number of plies so that the sheet is balanced—this reduces warping.

Advantages:

1. Allows you to keep the wood look of a project.
2. Can be stainedIs strong and resistant to distortions
4. Cheaper than wood planks

Disadvantages:

1. Splinters when router
2. Exposed edges show veneers
3. Feathers, sheaves, or splits when screw fasteners are used or when hinges are applied

MDF

MDF is an engineered wood product formed by breaking down hardwood or softwood “left-overs” (the wood material left behind after milling) into wood fibers. These left-overs are combined with wax and a resin binder, which are then formed in panels by applying high temperature and pressure. MDF is more condensed and more compressed than plywood. Edges, therefore, may be routered cleanly and sanded with little effort. Entire projects can be made from MDF, the tops, the shelves, the face frames, the drawer fronts, and more.

Advantages:

1. Edges are easily routered and sanded.
2. Easily painted
3. Minimal sanding
4. Can use for the entire project
5. Cheaper than wood

Disadvantages:

1. Cannot be stained
2. Does not look like wood

Particleboard, sometimes called pressboard or chipboard, is an engineered wood product manufactured from wood particles, such as wood chips, sawmill shavings, or even saw dust. These materials are combined with a synthetic resin or some other suitable binder and pressed together, forming what we call a composite material.

Advantages:

1. Cheap.
2. Good underlayment for vinyl or tile backer board
3. Holds screws in place
4. Good for shelves spanning 30” or more

Disadvantages:

1. Chips when routering
2. Prone to expansion and discoloration due to moisture
3. Does not look like wood

Ethiopian Timber

Local Name	Uses of Wood
Eucalyptus	Housing construction, caulking material
Wanza	Simple furniture
Eucalyptus	Building construction, poles, piles, flooring, bridge
Zigba	Furniture, construction, door, window
Pine	Furniture and cabinet making, frames in building construction
Tid	Construction, poles, flooring
Tikur inchet	Construction, Framing
Kerero	Furniture, flooring, construction
Girar	Construction

	Structure/ Material	Types	Use	Width
Plywood	3 or more layers of veneer, glued at 90 degrees to one another (cross banding) Bonding: Interior/ exterior Marine Structural	Decorative plywood	Paneling	3 – 30 mm
		Three-ply board	Drawer bottom, cabinet box	
		Multi-ply	Veneered furniture	
		Four/ six ply	Structural work	
		Drawer side plywood	Drawer sides	12 mm
Blockboard	Outside layers of veneer Core is constructed from strips of solid wood	3 layer	Shelving, worktops Not good to veneer	12 – 44 mm
Laminboard	Blockboard structure, strips of solid wood only 5 – 8 mm wide	3 layer	Furniture applications, good for veneering	12 – 44 mm
		5 layer		
Particle Board	Consists of wooden particles, glued together Different particle sizes and glues Relatively brittle, lower tensile strength	Chipboards:	Furniture applications Can be veneered, not painted	6-40 mm
		Single layer chipboard		
		3-layer chipboard		
		Graded density chipboard		
		Decorative chipboard	With surface ready	
		Oriented strand board	Greater tensile strength Structural work	
		Flake or wafer board		
Fibre Boards	Wood reduced to basic fibre elements Various density and adhesives Homogeneous and sable	Hardboards:	Cabinet backs, furniture	1.5 – 12 mm
		Standard	Mesh pattern at back	
		Tempered	Water resistant glue	
		Duo faced	No mesh pattern at back	
		Decorative	Perforated, lacquered	
		Medium boards:	Pinboards and wall paneling	6 – 12 mm
		Low density		
		High density		
		Medium density fibreboard (MDF)	Synthetic resin adhesive Smooth surface, edges Can be veneered, painted, moulded	6 – 32 mm

Self-Check -4	Written Test

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

Match column A with column B. Select the letter of the correct answer from column B & write your answer on the provided space **in front of the number in column A**

If you wish to change your answer place an x mark on your previous answer and write your preferred answer

Column A	Column B
---------- pressboard or chipboard, is an engineered wood product manufactured from wood particles(**2 points**)	Plywood
---------- engineered wood product formed by breaking down hardwood or softwood “left-overs” (the wood material left behind after milling) into wood fibers.(**2 points**)	MDF
---------- layers (called veneers) are glued together(**2points**)	Particleboard

Note: **Satisfactory rating –6points** **Unsatisfactory - below 6points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information sheet-5	Select tools and equipment

Tools

- Tools can be divided into two main groups: hand tools and power tools.
- Hand tools are operated by the physical strength of the user.
- Power tools require an external source of power such as electricity or compressed air to operate.
- Each of these groups can also be divided into sub groups.

Operation Sheet 1	Use hand and power tool safely

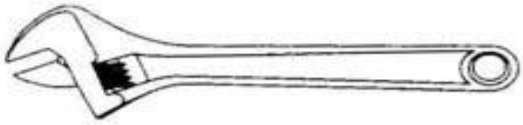
Steps 1- select the right tool and equipment for the job

Steps 2- keep tools in good condition

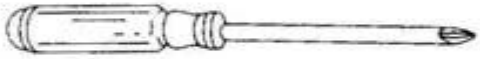
Steps 3- use tools and Equipment the correct way

Steps 4- keep tools in a safe place

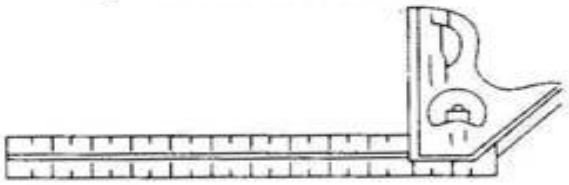
Medium screwdriver

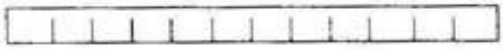


Adjustable wrench



#2 Phillips screwdriver





Straight edge

Combination square

13mm Wrench

- Combination wrench
- Hex key
- Framing square
- Medium size flat blade screw driver

Waste Disposal and Recycling

1. Be responsible for cleaning up workstations, tools and the shops.
2. Sort waste by category as required using approved containers.
3. Sort recyclable liquids and solids into proper approved storage container.

LAP Test	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 3 hours.

Task 1: Interpret work order and locate and apply relevant information

Task 2: Apply safe handling requirements for equipment, products and materials, including use of personal protective equipment

Task 3: Read and interpret cutting lists and job specifications

Task 4: Identified materials used in the work process

Instruction Sheet	LG05&LG06:Set-up machines &Operate machines

This learning guide is developed to provide you the necessary information regarding the following Learning out come and content coverage and topics; –

LO2.Set-up machines

2.1. Equipment Safety

2.2. Machine settings and adjustments.

2.3. Checking machine operations, accuracy and quality of finished work

LO3. Operate machines

3.1 Characteristics of machines and operating procedures
3.2 Feeding materials in to machine
3.3 Operating and monitoring machines
3.4 Methods of minimizing wastes

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 :–

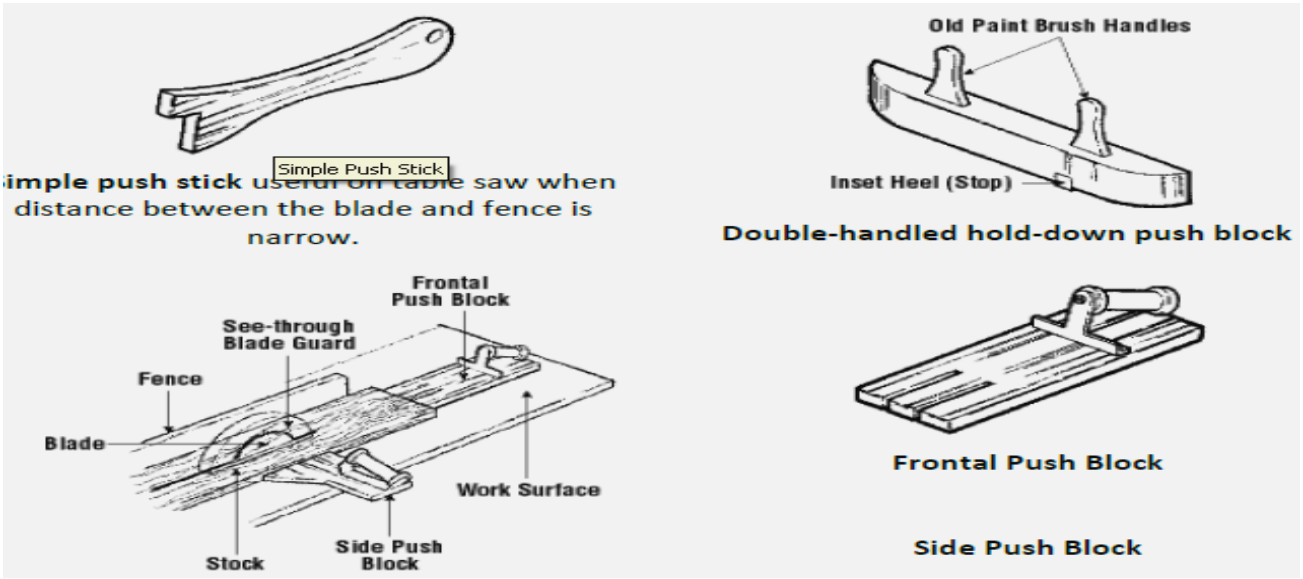
- Check Safety equipment, including emergency stops, gauges, guards and controls
- Make settings and adjustments for machines
- Conduct trial runs to check machine operation, accuracy and quality of finished work
- Feed material into machine with job requirements
- Operate machine with its designed capacity and purpose
- Monitor machine operation to ensure product quality

Learning Instructions:

2. Read the specific objectives of this Learning Guide.
3. Follow the instructions described below.
4. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3, Sheet 4, Sheet 5, Sheet 6, Sheet 7, Sheet 8, Sheet 9 and Sheet 10”.
5. Accomplish the “Self-check 1, Self-check t 2, Self-check 3, Self-check 4, Self-check 5 Self-check 6 Self-check 7and Self-check 8” **in page -5, 12, 23, 30, 45, 56, 65, and 76** respectively.
6. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1-Operation Sheet 25**.**
7. Do the “LAP test” **in page – 13, 37, 47, and 75** (if you are ready).

Information sheet-1	Equipment Safety

Checking safety equipment's



Woodworking Machines - General Safety

What should you do before using woodworking machines?

Woodworking tools can be dangerous if not used properly.

- Only use woodworking machines that you have been trained to use properly and safely.
- Read the owner's manual carefully.
- Make sure you understand instructions before attempting to use any tool or machine. Ask questions if you have any doubts about doing the work safely.

What safety procedures should you follow when using woodworking machines?

- Always wear safety glasses or goggles, or a face shield (with safety glasses or goggles).
- Wear dust masks when required.
- Wear hearing protection that is suitable for the level and frequency of the noise you are exposed to in the woodworking area. If you have trouble hearing someone speak from three feet away, the noise level from the machine is too high. Damage to hearing may occur.
- Use gloves to protect hands from splinters when handling wood but do not wear them near rotating blades and other machinery parts where the gloves can catch.
- Wear protective footwear when required.
- Make sure the guard is in position, is in good working condition, and guards the machine adequately before operating any equipment or machine. Check and adjust all other safety devices.
- Make sure the equipment is properly grounded before use.

- Check that keys and adjusting wrenches are removed from the machine before turning on the power.
- Inspect stock for nails, staples, loose knots or other defects before cutting, planing, routing or carrying out similar activities.
- Make sure that all machines have start and stop buttons within easy and convenient reach of an operator. Start buttons should be protected so that accidental contact will not start the machine. A collar around the button 3 to 6 mm (1/8 to 1/4 inch) above the button is recommended.
- Ensure that all cutting tools and blades are clean, sharp, and in good working order so that they will cut freely, not forced.
- Turn the power off and unplug the power cord (or lock out the power source) before inspecting, changing, cleaning, adjusting or repairing a blade or a machine. Also turn the power off when discussing the work.
- Use a "push stick" to push material into the cutting area. Jigs are also useful in keeping hands safe during cutting procedures. Keep hands out of the line of the cutting blade.
- Clamp down and secure all work pieces when drilling, sanding, cutting or milling.
- Use good lighting so that the work piece, cutting blades, and machine controls can be seen clearly. Position or shade lighting sources so they do not shine in the operator's eyes or cause any glare and reflections.
- Ensure that the floor space around the equipment is sufficient to enable you to machine the size of work piece being processed safely without bumping into other workers or equipment.
- Use extension tables or roller supports for large workpieces. Supports should be placed on both sides (infeed and outfeed).
- Woodworking machines should be fitted with efficient and well-maintained local exhaust ventilation systems to remove sawdust or chips that are produced.
- Electric power cords should be above head level or in the floor in such a way that they are not tripping hazards.
- Keep work area free of clutter, clean, well swept, and well lit. Spills should be cleaned up immediately. Floor areas should be level and non-slip. Good housekeeping practices and workplace design will reduce the number of injuries and accidents from slips, trips, and falls.
- Keep the area free from water and moisture. Do not use electrical equipment outdoors in the rain.
- Always keep your attention on the work. For example, if you must talk to another person, turn off the equipment first.

What should you avoid when working with woodworking machines?

- Do not wear loose clothing, work gloves, neckties, rings, bracelets or other jewellery that can become entangled with moving parts.
- Avoid awkward operations and hand positions where a sudden slip could cause your hand to move into the cutting tool or blade.
- Do not stand directly behind stock that is being cut, planed, or jointed to avoid injury from kick-back.
- Do not remove sawdust or cuttings from the cutting head by hand while a machine is running. Use a stick or brush when the machine has stopped moving.
- Do not use compressed air to remove sawdust, turnings, etc. from machines or clothing.
- Do not leave machines running unattended (unless they are designed and intended to be operated while unattended). Do not leave a machine until the power off is turned off and the machine comes to a complete stop.
- Do not try to free a stalled blade before turning the power off.
- Do not distract or startle an operator while he or she is using woodworking equipment.
- Horse play should be prohibited. It can lead to injuries.

Self-Check -1	Written Test

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

1. What should you do before using woodworking machines? (2 points)
2. List out safety procedures should you follow when using woodworking machines at least five points? (5 points)
3. What should you avoid when working with woodworking machines? (3 points)

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

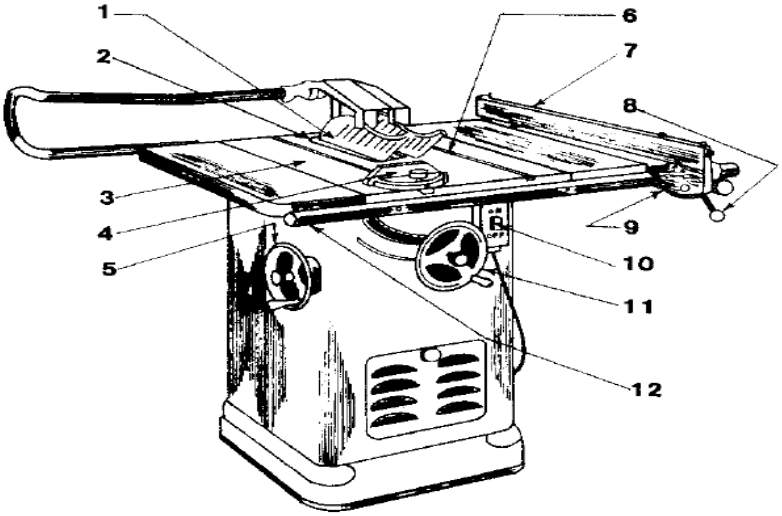
Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information sheet-2	Table Saw

1. Blade guard
2. Table insert
3. Table
4. Miter head
5. Blade tilt handwheel
6. Table slot
7. Fence
8. Fence lock
9. Fence carriage
10. Off-On switch
11. Blade lowering and raising handwheel
12. Front rail



Common Uses of Table Saw

- Cross Cutting
- Miter Cutting
- Ripping

Table Saw Blade

- Cross cutting circular saw blade
- Combination

Table Saw

- Basically table saw is used in ripping and cross cutting.

PROCESS	TYPE OF BLADE
Cross Cutting	**Cross cut, Combination**
Miter Cutting	**Cross cut, Combination**
Ripping	**Rip Saw Blade**
Dadoing	**Cross cut, Combination**

➢ Table saw is one of the most useful machines in the wood lab; it is also one of the most dangerous.

➢ It can be used to accurately rip and crosscut lumber and sheet goods.

➢ The table saw can also be used for special operations including cutting dadoes and rabbets and for re sawing. With the use of special jigs, joinery like tenons and box joints can be made. In addition, the blade can be tilted for cutting bevels and miters.

1. The number one cause of injuries on the table saw is **kickback.** Kickback occurs when the operator loses control of the material being cut and it is thrown from the machine with great force.
2. When cutting, the saw blade should project ¼ - ⅜” above the stock or enough to clear the common gullets.

3. The fence is used to guide ripping operations. The miter gauge or sled is used to guide crosscut operations. Always hold the work firmly against the fence, sled, or miter gauge.
4. During a rip cut, once the material has moved away from your left hand, move your left off the table. Do not drag your hand across the table and never reach over the blade.
5. You **must** use a push stick when ripping pieces that are 6" or less in width.
6. Cutting work pieces shorter than 10" in length is a **special setup**; get permission from the instructor or aide prior to cutting.
7. Performing on-edge resawing is a **special setup**. You must get specific instruction and special permission from your instructor.
8. When ripping stock, the piece between the fence and blade must be controlled and pushed past the blade all the way onto the outfeed table. Failure to do so may result in a kickback.
9. When you are ripping stock, the scrap must fall to the outside (non-bound side) of the blade (not between the blade and fence).
10. Lowering stock directly down over the saw blade is dangerous and is **never** allowed.
11. Procedures involving raising the blade into the work are **special setups.** Permission and instructions must be obtained from your instructor prior to performing this type of work.
12. The riving knife must always be in place behind the blade except when the instructor has authorized its removal for **special set-ups**.
13. The over-arm saw guard is available if deemed necessary for a particular operation. The over-arm guards are stored near or on each saw.
14. Make adjustments or measurements at the blade only when the power switch is off and the blade is at a complete stop.
15. The main power switch should be left in the off position when you leave the saw.
16. Freehand cutting, ripping, or crosscutting without using the fence, sled, or miter gauge is **ABSOLUTELY FORBIDDEN** in all circumstances.
17. Do not reach over the saw blade or pass wood over the saw blade at any time the blade is spinning.
18. When helping someone to tail-off (supporting the work hanging off the back of the saw table), your only purpose is to support the stock from below. Only the operator pushes the stock through the saw.
19. Make sure the blade is stopped and completely lowered when clearing scraps from the table.
20. The instructor must inspect all **special setups** and dado blade installations before the power is turned on.
21. Use a **special setup** with V-block or sled when cutting cylindrical stock to help keep it from spinning.
22. If a mistake forces you to stop the saw in the middle of a cut, stop what you are doing **without moving your hands** and turn off the saw by gently bumping the red START/STOP PADDLE with your knee.
23. Backing the stock away from the blade while the saw is running is forbidden. If it is necessary to remove a work piece, always stop the saw first.
24. The piece between the blade and the fence or a stop must always be under the operator's control. If free, it can bind and cause a serious kickback.
25. If the fence is used at the same time as the miter gauge, the miter gauge must be between the fence and the blade. This is a **special setup.**
26. When you are crosscutting a number of pieces to the same length using the miter gauge, clamp a clearance block to the rip fence well ahead of the saw blade to prevent the cut piece from being pinched between the blade and fence.
27. Stock edges or faces that contact the table, miter gauge or fence, must be straight and flat.
28. Seek assistance and direction from your instructor before milling materials with defects such as splits, warps and knots.
29. Changing the saw blade for non-standard operations is a **special setup**. After installing any blade, the brake cartridge must be installed properly and adjusted approximately 3/32 - 1/8" away from the blade, and checked by the instructor.

30. Using the dado set is a **special setup**. The dado blades and dado brake cartridge must be installed and properly adjusted. If the dado stack is over ½" thick, the arbor washer should not be used.

Safe Work Procedure
Circular Bench Saw

DO NOT use this equipment unless you have been instructed in its safe use and operation and have been given permission

PERSONAL PROTECTIVE EQUIPMENT


Safety glasses must be worn at all times in work areas.


Long and loose hair must be contained.


Hearing protection must be worn.


Sturdy footwear must be worn at all times in work areas.


Close fitting/protective clothing must be worn.


Rings and jewellery must not be worn.

PRE-OPERATIONAL SAFETY CHECKS

- ✓ Locate and ensure you are familiar with all machine operations and controls.
- ✓ Check workspaces and walkways to ensure no slip/trip hazards are present.
- ✓ Ensure all guards are fitted, secure and functional. Do not operate if guards are missing or faulty.
- ✓ Ensure all locks are securely tightened.
- ✓ Ensure table and work area is clear of all tools, off-cut timber and sawdust.
- ✓ Start the dust extraction unit before using the machine.

OPERATIONAL SAFETY CHECKS

- ✓ Allow the saw blade to obtain maximum speed before making a cut.
- ✓ Use a push stick (at least 400 mm long) to guide timber through saw.
- ✓ Always stand to one side of the line of cut.
- ✓ Before making adjustments, switch off and bring the machine to a complete standstill.
- ✓ Remove the rip fence when using the mitre gauge.
- ✓ Make sure someone "tails out" when cutting long material.

ENDING OPERATIONS AND CLEANING UP

- ✓ Switch off the machine when work completed.
- ✓ Leave the machine in a safe, clean and tidy state.

POTENTIAL HAZARDS AND INJURIES

- ⓘ Kickback: wood may catch or jam and be flung back violently.
- ⓘ Airborne dust.
- ⓘ Eye injuries.
- ⓘ Contact with blade at point of operation.

DON'T

- ✘ Do not use faulty equipment. Immediately report suspect equipment.
- ✘ Do not cut irregular stock, branches or wood with embedded nails or screws.
- ✘ Do not cut freehand.
- ✘ Do not cut pieces with shattered ends.
- ✘ Never remove off cuts or sawdust from the saw table while the saw is running.
- ✘ Never leave the machine running unattended.

Operation Sheet 1	*Operation of Circular Saw – Table Type*

Operate a circular saw

Step -1 Inspect, clean, and lubricate a table saw.
Step-2 Select appropriate blade for the job; remove and replace table saw blades.
Step-3 Make a crosscut to fixed size.
Step-4 Make a rip cut to fixed size.
Step-5 Layout and cut a miter.
Step-6 Install dado head to fixed size.
Step-7 Cut a dado to fixed size.
Step-8 Cut a groove to predetermined size.
Step-9 Set up and adjust molding head to cut molding pattern.
Step-10 Make a rabbit to fixed size, using supplementary rabbet fence.
Step-11 Make a series of duplicate crosscuts.
Step-12 Set up saw for tanning and make a tendon of predetermined size.

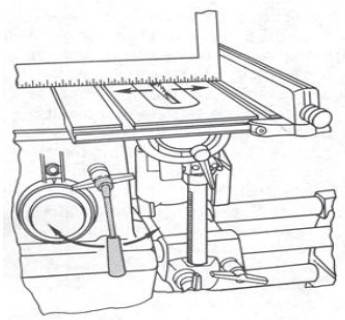
Care and maintenance

- **Safety measures.**
- **Selecting the right saw blade for the job**
- **The right way to clean**
- **Keeping your blade sharp**

Operation Sheet 2	Ripping

Step-1 Select a ripping or combination blade.

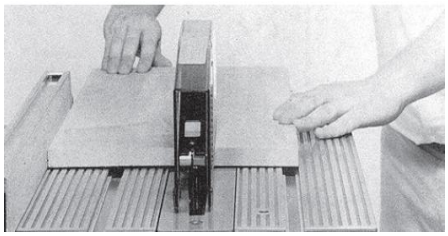
Step-2 Be sure blade guards are in place.



Step-3 Adjust the depth of cut by turning the elevating hand wheel. The teeth of the blade should be 1/16” above the surface of the stock.

Step-4 Adjust the saw blade to form a right angle with the fence and perpendicular to the table.

Step-5 Place material to be cut on the saw table with the straightest edge against the fence. Align the cutoff mark with the saw blade.

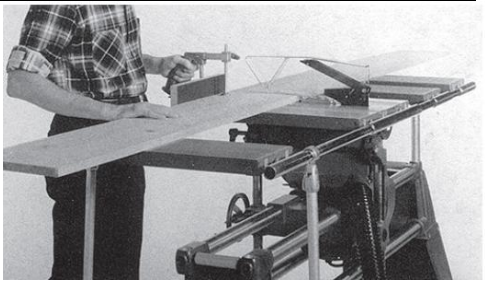


Step-6 Be sure the saw blade is not engaging the material, then start the saw.

Step-7 Push the stock (material) in to the blade to make the cu until the cut is made. (Make sure that the straighter edge of the stock is placed against the guide fence.

Step-8 Remove the stock from the table.

Operation Sheet 3	Cross cutting



Step-1 Select a crosscut or combination blade.

Step-2 Be sure blade guards are in place.

Step-3 Adjust the depth of cut by turning the elevating hand wheel. The teeth of the blade should be 1/16” above the surface of the stock.

Step-4 Adjust the saw blade to form a right angle with the fence and perpendicular to the table.

Step-5 Place material to be cut on the saw table with the straightest edge against the fence. Align the cutoff mark with the saw blade.

Step-6 Be sure the saw blade is not engaging the material, then start the saw.

Step-7 Push the sliding guide fence in to the blade to make the cu until the cut s made. (Make sure that the stock is placed firmly against the guide fence.

Step-8 Pull back the guide fence in to its original position

Step-9 Remove the stock from the table.

Operation Sheet 4	Miter Cutting

Step-1 Select a crosscut or combination blade.

Step-2 Set the angle of the miter cut.

Step-3 Make the cut in the same manner as described for crosscutting.

Operation Sheet 5	Dadoing

Step-1 Select and install a dado head of desired width.

Step-2 Place the lumber on the table, and adjust the dado head until the teeth just touch the bottom of the board to be dadoed.

Step-3 Push the stock and the guide fence to the rear of the table, and adjust the dado head to the desired depth of cut.

Step-4 Make the cut in the same manner as described for crosscutting.

Self-Check -2	Written Test

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

Multiple Choice – Place the letter of the most correct answer on the answer sheet.

1. What should be done with articles of clothing such as ties, coats and long sleeves when operating the table saw?
   a. Keep them away from the saw blade
   b. Remove or fasten them out of the way
   c. Do not get close to the saw
   d. Have a student hold them out of the way

2. Which of the following items should NOT be worn when operating the table saw?
   a. Rings
   b. Gloves
   c. Bracelets
   d. All of these

3. Personal protective equipment which should be worn when operating the table saw is/are _____.

a. gloves
b. ear protectors
c. safety glasses
d. both b and c

4. When sawing with the table saw, which of the following would not be a safe practice?

a. Use the blade guard
b. Secure a helper to support the material being sawed
c. Push the material through the saw with the right hand and a push stick
d. Stand in line with the saw blade

Note: **Satisfactory rating - 12 points** **Unsatisfactory - below 12 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

LAP Test	Practical Demonstration

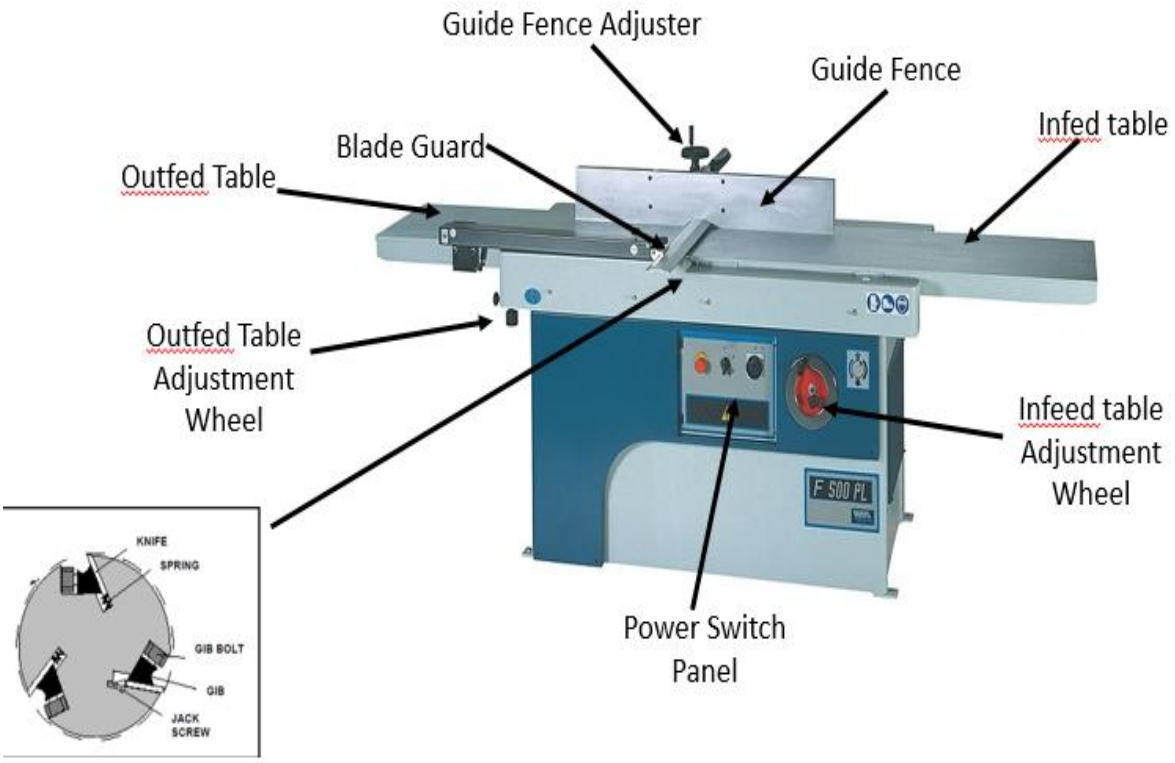
Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 3 hours.

Task 1: Safety glasses and ear protectors are used all times.
Task 2: Loose clothing and jewelry are not worn.
Task 3: The saw blade height is adjusted properly for ripping, crosscutting and dadoing.
Task 4: The saw guard is in place.
Task 5: The saw splitter and anti-kickback devices are in place (when applicable).
Task 6: The saw table top is clear of tools and materials.
Task 7: Other students are outside the operator safety zone.
Task 8: The fence is adjusted and locked in place for ripping cuts.
Task 9: The miter head is properly adjusted and the ripping fence is out of the way for crosscutting.
Task 10: The material is on the correct side of the blade when making bevel cuts.
Task 11: The dado blade is properly installed and adjusted when making dado cuts.
Task 12: The correct table insert is in place for ripping, crosscutting and dadoing.
Task 13: A push stick is used for all ripping cuts less than 6 inches in width.
Task 14: A helper or support stand is used for cutting long and wide stock.
Task 15: Correct procedures are used in cutting stock.
Task 16: All work procedures are safe and acceptable.

Information sheet-3	Jointer



- The jointer is primarily used for flattening the face of a board and straightening and squaring the edges of a board. In special circumstances, it may also be used for rabbeting, beveling and tapering.
- The stock is placed on the infeed table and pushed, with the aid of a push block, over the cutter head and onto the outfeed table.
- The fence is used to help guide the stock. The length of the cutter head, which defines the size of a jointer, indicates the widest board that can be surfaced.

1. Ensure that the guard is over the knives at all times while the jointer is being operated.

2. Adjust the depth of cut before turning on the power. For most cuts, the jointer should be set for 1/32”.

3. The maximum depth of cut is 1/16”.

4. The minimum length of stock for jointing is 14”.

5. Keep all body parts at least 6” from the cutter head. Never place your hand directly on the piece being jointed within 6” of the cutter head.

6. Use a push stick or push block when face-jointing flat pieces of stock or for edge-jointing any piece lower than the height of the fence.

7. Never joint the face of stock less than ¼" thick.

8. Push the stock clear of the cutter head and make sure the guard has returned over the throat and knives before picking up stock.

9. To avoid rocking of the stock during cutting, always place the concave or most stable side of the stock on the table.

10. The out feed table must be at the same level as the knives and is **NEVER** to be adjusted by a student.

11. **Never joint end grain**. It is a dangerous practice, especially on narrow pieces, and the jointer tends to splinter the work at the end of the cut.
12. Examine stock for loose knots and splits and avoid cutting these if possible.

13. Operations involving "stop cuts" or "drop cuts" require that the stock be held in place by a stop or clamp. The instructor must approve these **special setups.**

14. Never attempt to run a piece of wood across the jointer until the machine is running at full speed.

15. Your instructor must check **special setups** on the jointer for special operations such as rabbeting, beveling, chamfering, or tapering.

16. Use only clean, dry lumber on the jointer.

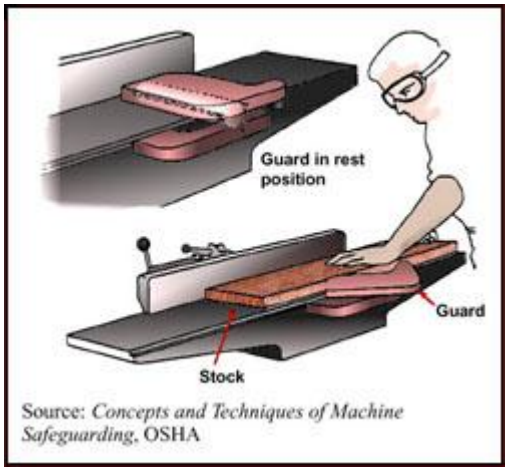
17. on stock that is severely warped, band saw the stock into shorter and/or narrower pieces before jointing, if possible. This eliminates much of the warp. Then joint the faces as usual.

18. Material must be pushed through the jointer and never pulled.

Engineering Controls

For hand-fed jointers, horizontal head:

- Enclose cutter head with an automatic (spring-loaded, self-enclosing) guard that exposes the cutter head only when the stock is being fed. The guard must automatically adjust to cover the unused portion of the head, and it must remain in contact with the material at all times. The figure at the right shows the appropriate use of a self-adjusting guard.



Source: *Concepts and Techniques of Machine Safeguarding*, OSHA

- Adjust the cylindrical cutter head so that the knife projects no more than 1/8 inch beyond the cylindrical body of the head.

- Adjust the cutter head so that the clearance

between the path of the knife projection and the rear table is no more than 1/8 inch.

- Keep the clearance between the table and the head as small as possible.

Fig 1 - Jointer with self-adjusting guard

Fig 2 - Jointer Blade

For vertical head jointers:

- Completely enclose cutter head, except for slot to the material for jointing. This guard can be part of the exhaust system.

apply local

Work Practices

- Use hold-down push blocks when jointing wood narrower than 3 inches.
- As a general rule, never joint pieces of material that less than four times the width of the bed opening.

are

- Kickbacks - Stock may be thrown back at the operator after being caught by the knives. This also may expose the operator's hands to the knives.

  Possible Solution:

  Work Practices

  - Avoid deep cuts. They increase the likelihood of kickbacks and require a larger table opening.

Flying chips - The cutting action of the knives may throw wood chips and splinters.

Possible Solutions:

Work Practices

- Check knives regularly for proper setting and adjustment, but be sure to shut off the power first.

Adjusting the jointer

1. Adjusting the out feed table

The out feed table of jointers must be adjusted such that its horizontal plane is tangent to the cutting circle of the knives. This mean that it's top must be exactly the same height a the cutting knives at their highest point of revolution.

2. Adjusting the in feed table

In order to make a cut on jointers, the in feed (front) table must be lower than the out feed table. The difference in height between the two tables determines the depth of cut. The amount of waste wood to be cut away. The in feed table is adjusted in height by loosening the lock on the right side and then turning the handle beneath the table to raise or lower it.

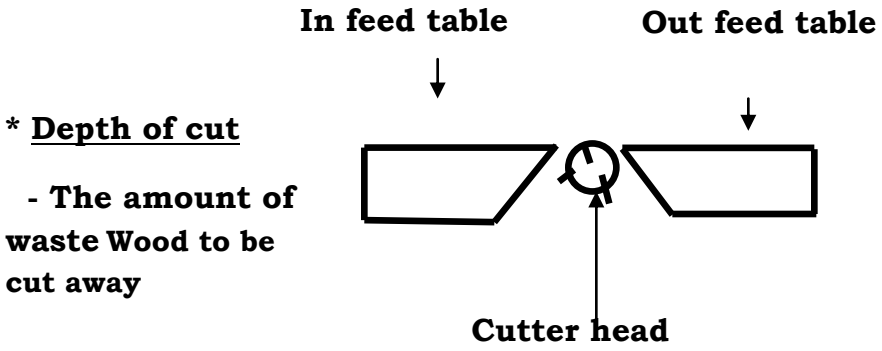


Figure 2. Adjustment of in feed table

3. **Adjusting the fence**

The adjust the fence at 90^0 angles to the table:

STEPS

- loosen the knob or lever that holds the fence in position;
- set the fence at 90^0 angle to the table;
- Check the angle by holding a square against the fence and the table
- Lock the fence to that position.

To adjust the fence at any angle other than 90^0:

STEPS

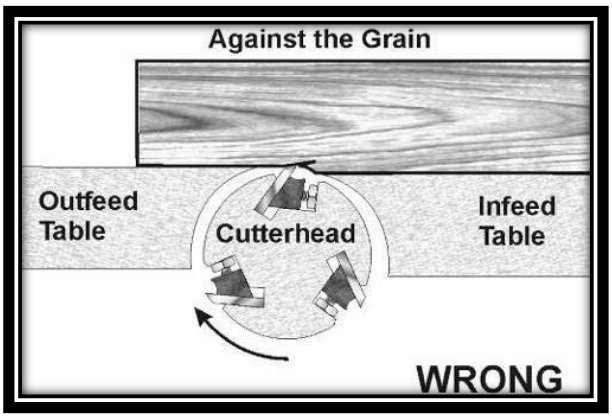
- ✓ loosen the fence control handle or lever;
- ✓ Set the fence to the required angle by using a protractor or sliding T-bevel;
- ✓ Lock the fence to that position.

Operation

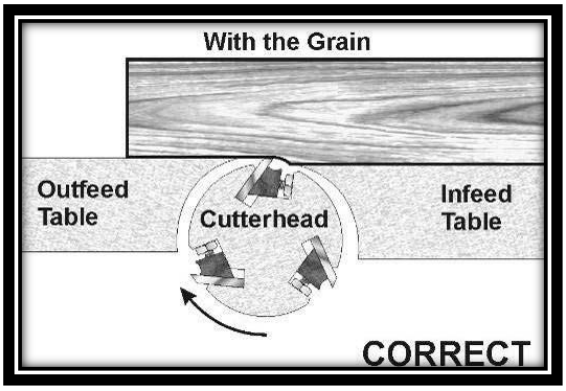
- In operation, the board to be jointed is held with its face against the fence and the edge to be jointed resting on the infeed table.
- The board is fed across the cutter head and onto the outfeed table.
- The knives in the revolving cutter head remove an amount of material and the relationship of the two tables and the fence keeps the board oriented in such a way that the result is an edge which is flat along its length and perpendicular to the board's face.
- A jointer may also be used to flatten the face of a board, in which case the sole focus is to produce a flat surface on the face of the board and the fence is not used. This procedure is often performed prior to edge jointing so that the board has a flat reference face for subsequent operations.

Direction of Grain feed

○ Avoid feeding work into the jointer against the grain (Figure 18).



This may result in chipped and splintered edges. Feed with the grain to obtain a smooth surface, as shown in Figure 19.



Note:

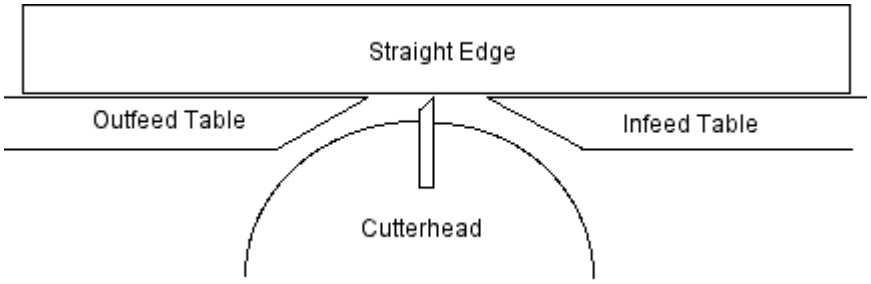
- **Jointing (or edging)** is the process of creating a finished, flat edge surface that is suitable for joinery or finishing. It is also a necessary step prior to ripping stock to width on a table saw.
- Never edge a board that is less than 3 inches wide, less than 1/4 inch thick, or 12 inches long, without using a push block.
- When edging wood wider than 3 inches lap the fingers over the top of the wood, extending them back over the fence such that they will act as a stop for the hands in the event of a kickback.
- Position the fence (move forward) to expose only the amount of cutterhead required.

Determining Correct Table Height

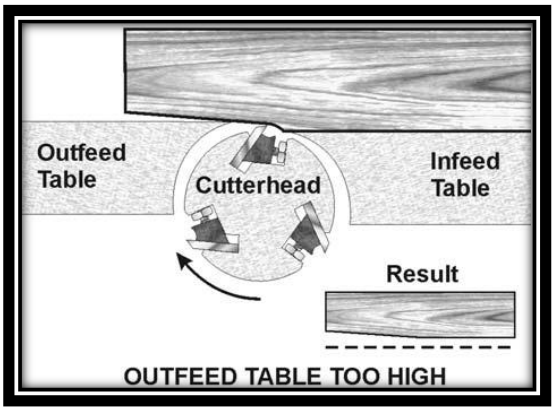
The table consists of two parts on either side of the cutter head. The stock is started on the infeed table and fed past the cutter head onto the outfeed table. The surface of the outfeed table must be exactly level with the highest point reached by the knife edges.

The surface of the infeed table is depressed below the surface of the outfeed table an amount equal to the desired depth of cut. The level of the outfeed table must be frequently checked to ensure the surface is exactly even with the highest point reached by the knife edges. The height and parallelism of the knives with the out feed table should be checked, and any needed adjustments made, before putting the jointer into operation.

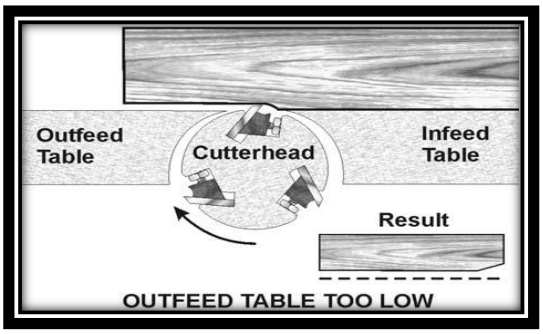
The out feed table and cutter head knives are correctly adjusted when all three blades are parallel to the out feed table and all three blades are set at the same height in the cutter head

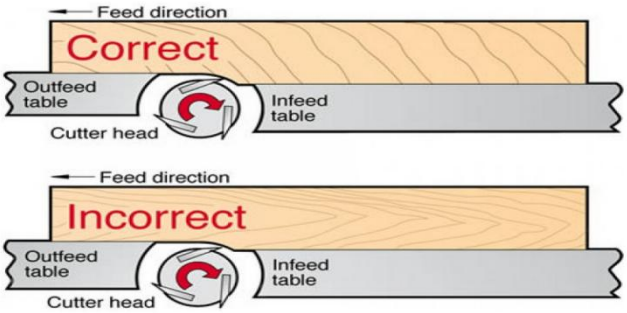


Out feed table too high: If the out feed table is too high, a curved finished surface results.

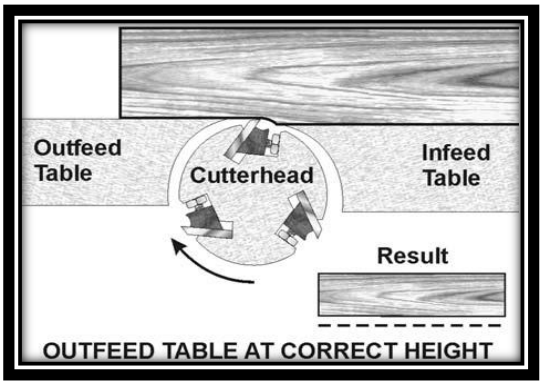


Out feed table too low: If the out feed table is too low, the work will have a gouge, or snipe, at the end of the cut.

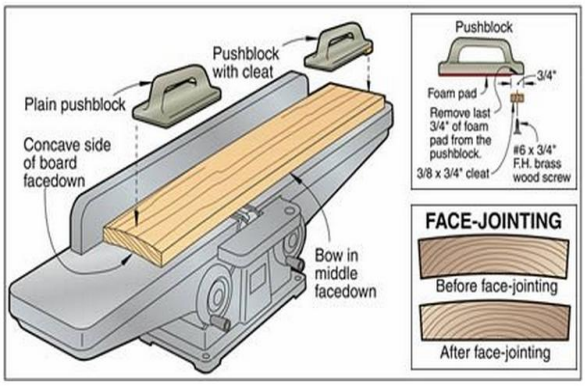




Out feed table at correct setting: The work piece will rest firmly on both tables with no open space under the finished cut.



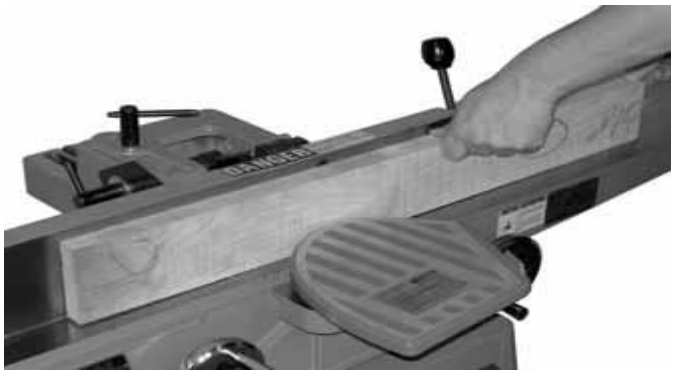
Operation Sheet 6	Surface Planing



Step-1 Inspect the stock before starting & remove any foreign objects or debris.
Step-2 Set the depth of cut as required (1/32" is recommended for face planing - Less for hard wood or wider stock.)
Step-3 Set & lock the fence at 90°.
Step-4 If your work piece is cupped, place the cupped side face down on the in-feed (right) table.
Step-5 Set the position of the fence so that the length of blade remaining exposed is roughly 1/4" longer than the width of the board to be jointed.
Step-6 Turn on the machine & using push blocks press the stock against the table and tight to the fence, feeding the stock over the cutter head.
Step-7 Inspect the board & repeat the step if needed until the surface is flat.

Operation Sheet 7	Edge Jointing

Step-1 Inspect the stock before starting & remove any foreign objects or debris.
Step-2 Set the depth of cut as required (1/16" - 1/8" is recommended for edge jointing - Less for hard wood or wider stock.)
Step-3 Set & lock the fence at 90°
Step-4 If your work piece is cupped, place the cupped side face down on the in-feed (right) table.



Step-5 Set the position of the fence so that the length of blade remaining exposed is roughly 1/4" longer than the width of the board to be jointed.
Step-6 Turn on the machine; press the stock against the table and tight to the fence, feeding the stock over the cutter head.
Step-7 Inspect the board & repeat the step if needed until the surface is flat.

Operation Sheet 8	Rabbeting

Step-1 Remove the cutter guard & move the fence forward leaving only the width of the desired rabbet on the tables uncovered by the fence & lock the fence in position.
Step-2 Inspect the stock before starting & remove any foreign objects or debris.
Step-3 Set the depth of cut as required (1/16" - 1/8" is recommended for rabbeting - Less for hard wood or wider stock.)
Step-4 Turn on the machine & using push blocks press the stock against the tables rabbeting arm and tight to the fence, feeding the stock over the cutter head.
Step-5 Repeat the steps until the rabbet are cut to desired depth.

Self-Check -3	Written Test

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

Match column A with column B. Select the letter of the correct answer from column B & write your answer on the provided space **in front of the number in column A**
If you wish to change your answer place an x mark on your previous answer and write your preferred answer

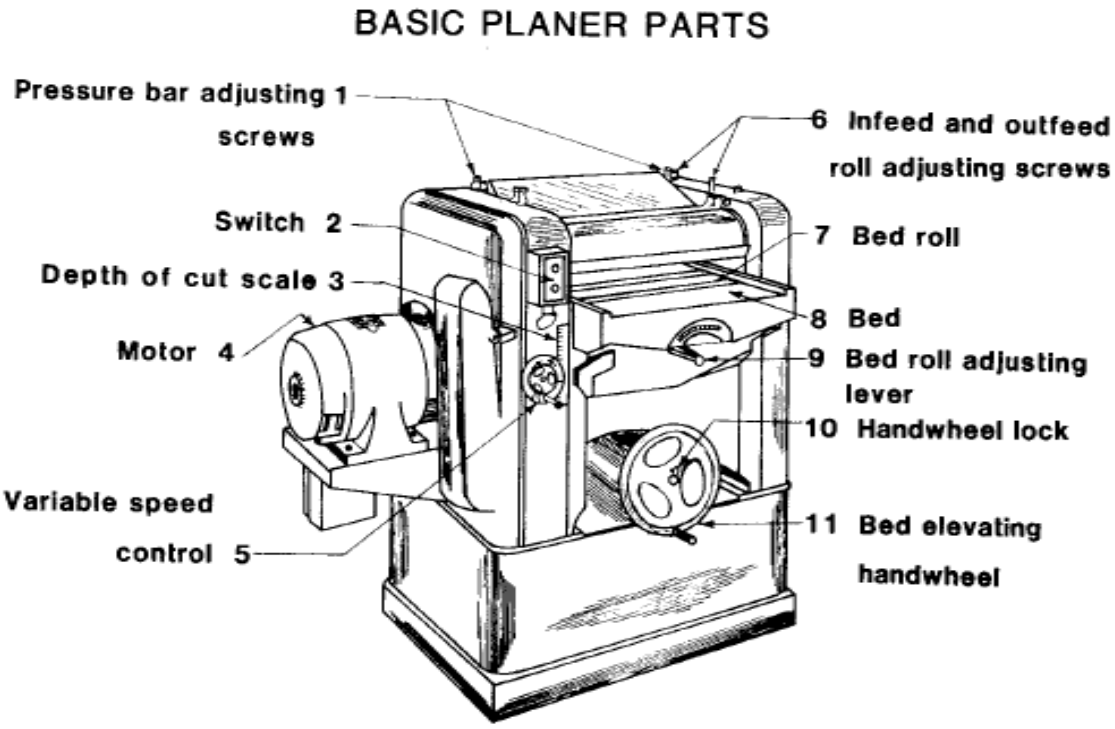
Column A	Column B
---------- Jointers must be adjusted such that its horizontal plane is tangent to the cutting circle of the knives. This means (**2 points**)	1/16"
----------jointer table must be lower than the out feed table (**2 points**)	out feed table
----------The maximum depth of cut jointer (**2points**)	In feed table
----------The minimum length of stock for jointing (**2points**)	¼"
--------Never joint the face of stock less than ----- thick (**2points**)	1/32"
--------Adjust the depth of cut before turning on the power. For most cuts, the jointer should be set for-----" (**2points**)	14"

Note: **Satisfactory rating – 12 points** **Unsatisfactory - below 12 points**

You can ask you teacher for the copy of the correct answers.

Name: _____ Date: _____

Information sheet-4	Planer/Thicknesser



- The planer is used to smooth lumber to an even thickness. After flattening one side of a board on the jointer, the board is run through the planer with the flat side down on the table, which supports the board and acts as a reference surface.
- The cutter head, located above the work piece, then smoothest the opposite face and makes it parallel to the jointed face.
- The width of the cutter head, which defines the size of a planer, indicates the widest board that can be surfaced.

1. Do not remove more than 1/32” of wood at one time.
2. Adjust the initial depth of cut to the thickest part of the board.

3. The stock must be longer than the distance between the in feed and out feed rollers. The minimum length of stock for planing is clearly marked on each planer.

4. Do not plane stock to less than 1/4" thick. To plane thinner stock, run it through the planer with a backer board. For this **special setup**, obtain the instructor's permission.

5. Never put your hands into the planer.

6. If a board needs to be realigned on the table after being gripped by the cutter head, use cares to keep your fingers clear of the table and feed rollers.

7. Never change depth of cut after stock has been started through the planer.

8. Do not plane stock with large cracks or loose knots.

9. Always plane wood with the grain, never across or perpendicular to the grain; the planer will shred the wood.

10. Always ensure that the machine has reached full speed before inserting the wood in the machine.

11. Plane pieces of varying thickness in progressive order, starting with the thickest first.

12. Because of the possibility of flying particles, do not look into the planer while the machine is running. Stand in an upright position and to one side while you are operating this machine.

13. The maximum length of stock which can be surfaced or planed is limited only by the location of walls and other equipment surrounding the planer.

14. A planer will produce two flat, parallel faces only when the surface which was put on the table was flat and smooth to begin with. Planing a warped board will only produce a warped board of even thickness.

15. Kickbacks are infrequent but possible on a planer.

16. Only the instructor may adjust the speed of the planer's feed rollers.

17. If the stock gets stuck in the planer, do the following, in this order:

a) Gently push the stock into the planer; do not overly force the material.
b) If that doesn't work, shift the stock at a slight angle while keeping your fingers clear of the table.
c) If that doesn't work, lower the table 1/8 turn of the adjustment wheel and repeat steps a and b until the stock starts feeding again. If the stock still will not proceed through the planer repeat steps a, b, and c until the stock starts feeding again. Do not turn the wheel more than 1/8 turn at a time; the feed rollers could lose contact with the stock and a kickback could occur.
d) Note: Do not turn the power off while stock is in the planer; you could damage the cutter head.

Safe Work Procedure
Thicknesser

DO NOT use this machine unless you have been instructed in its safe use and operation and have been given permission

PERSONAL PROTECTIVE EQUIPMENT


Safety glasses must be worn at all times in work areas.


Long and loose hair must be contained.


Hearing protection must be worn.


Sturdy footwear must be worn at all times in work areas.


Close fitting/protective clothing must be worn.


Rings and jewellery must not be worn.

PRE-OPERATIONAL SAFETY CHECKS

- ✓ Locate and ensure you are familiar with all machine operations and controls.
- ✓ Ensure all guards are fitted, secure and functional. Do not operate if guards are missing or faulty.
- ✓ Check workspaces and walkways to ensure no slip/trip hazards are present.
- ✓ Check material to be planed for defects, splits, dead knots or nails.
- ✓ Ensure in-feed table is clear of debris and free from gum or resin residue.
- ✓ Do not exceed maximum 2mm depth of cut.
- ✓ Ensure all locks are securely tightened before operating the machine.
- ✓ Start the dust extraction unit before using the machine.

OPERATIONAL SAFETY CHECKS

- ✓ Feed timber to machine with the grain.
- ✓ Feed only one piece of timber at a time.
- ✓ Stand to one side of material being fed through machine to avoid possible kickback.

ENDING OPERATIONS AND CLEANING UP

- ✓ Switch off the machine when work completed.
- ✓ Before making adjustments or before clearing the in-feed or out-feed tables, switch off and bring the machine to a complete standstill.
- ✓ Leave the machine in a safe, clean and tidy state.

POTENTIAL HAZARDS AND INJURIES

- ⓘ Wood may catch and be flung back violently.
- ⓘ Flying chips and debris.
- ⓘ Eye injuries.

- Point of operation - Contact with the cutter head may occur during blade adjustment or other maintenance activities.

Possible Solutions:

Engineering Controls

- Completely enclose belts and pulleys of line shaft with heavy mesh guards; guards must be used regardless of the line shaft. sheet metal or location of the
- Cover cutting heads with a metal guard or cage. The system may be integrated with the guard. exhaust
- Provide barriers at the loading and unloading ends to keep point of operation. hands out of

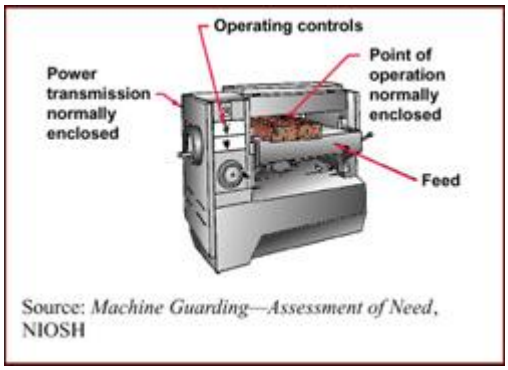


Fig 1 - Planer

- In-running rolls - Clothing, hair, or hands may be caught by and pulled into the automatic feed mechanism.

Possible Solutions: *Engineering Controls*

- Guard feed rolls with a wide metal strip or bar that will allow boards to pass but that will keep the operators' fingers out.

- Kickbacks - Stock may be thrown back at the operator after being caught by the cutter head.

Possible Solutions: *Engineering Controls*

- Install anti-kickback fingers on the in-feed side across the width of the machine.

Work Practices

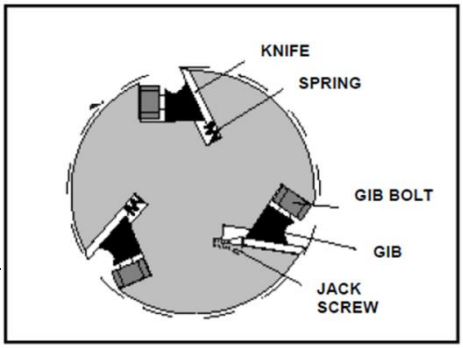
- Stand back after putting the boards through to avoid injuries from kickback and flying splinters.
- Do not feed boards of different thickness. Thinner boards will be kicked back
- **Flying objects** - The work piece as well as wood chips and splinters may be thrown by the cutting action.

Possible Solutions: *Engineering Controls*

- Use a barrier or guardrail when the machine is running.

Cutter head

- Cutter head of thickness planer is a heavy steel cylinder



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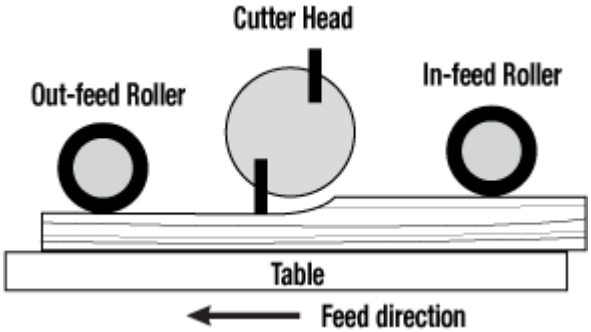
TYPICAL CUTTER HEAD SIDE VIEW

- Mounted between the in feed and out feed tables.
- It is the operative unit of thickness planer on which two, three or four cutter knives are mounted, and rotate together with it during operation.
- The planing capacity of thickness planer, i.e. their size is determined by the length of the cutter head and that of the knives mounted on it.



SAFE USE OF THE THICKNESS PLANER

What should you do before using Thickness Planer?

Planers can be dangerous if not used properly.

- Read the owner's manual carefully.
- Make sure you understand instructions before attempting to use any tool or machine.
- Learn the applications and limitations before use.
- Refer to Woodworking Machines - General Safety Tips for general safety precautions.

What should you check before starting your machine?

- Are the knives set for the proper clearance and depth of cut? Are they sharp, balanced, and fastened securely?
- Is the fence anchored in the proper position?
- Can the guard (swing or overhead) move freely and return over the cutting head?
- Is the equipment properly lubricated?
- Are the parts or accessories in proper working condition?

The basic use of a thickness planer is to have the stock a parallel surface and uniform thickness and width.

Operation Sheet 9	Planning to uniform thickness and wide

Step-1 Make sure all safety instructions and procedures been read and understood before attempting to operate a Surface Planer.

Segregate the materials to be planed according to thickness and/ or width

have

Work on the width first then on the thickness

Step-2 Adjust the depth of cut. (Depth of cut is affected by the hardness and width of the material. The recommended maximum depth of cut is 2 mm.

Step-3 Adjust the fence to allow the whole of the face to be planed.

Step- 4 Advance the material to the cutting head by sliding the material and push until the material reaches the infed roller

Feed the boards that have the widest width (when working with the width and boards which are thickest when working with the

For materials with different width or thickness on both ends. feed first the end with smaller dimension

Step-5 Adjust the depth of cut by turning the adjustment wheel as after the materials are all through unto the planer

passed

Step-6 Repeat Steps 4 and 5 until the desired width and thickness is reached.

Do not feed materials wherein the grain is parallel to the blade

Self-Check -4	Written Test

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

Match column A with column B. Select the letter of the correct answer from column B & write your answer on the provided space **in front of the number in column A**

If you wish to change your answer place an x mark on your previous answer and write your preferred answer

Column A	Column B
---------- Do not remove more than ----- of wood at one time from planer. (**2 points**)	Kickbacks
---------- Do not plane stock to less than ----thick in planer (**2 points**)	Cutter head
---------- Stock may be thrown back at the operator after being caught by the cutter head. (**2points**)	cutter head and that of the knives mounted
---------- of thickness planer is a heavy steel cylinder (**2points**)	¼”
-------- The planing capacity of thickness planer, i.e. their size is determined by the length of the ----------on it (**2points**)	1/32”
---------- Mounted between the in feed and out feed tables. (**2points**)	Anti-kickback

Note: **Satisfactory rating – 12 points** **Unsatisfactory - below 12 points**

You can ask you teacher for the copy of the correct answers.

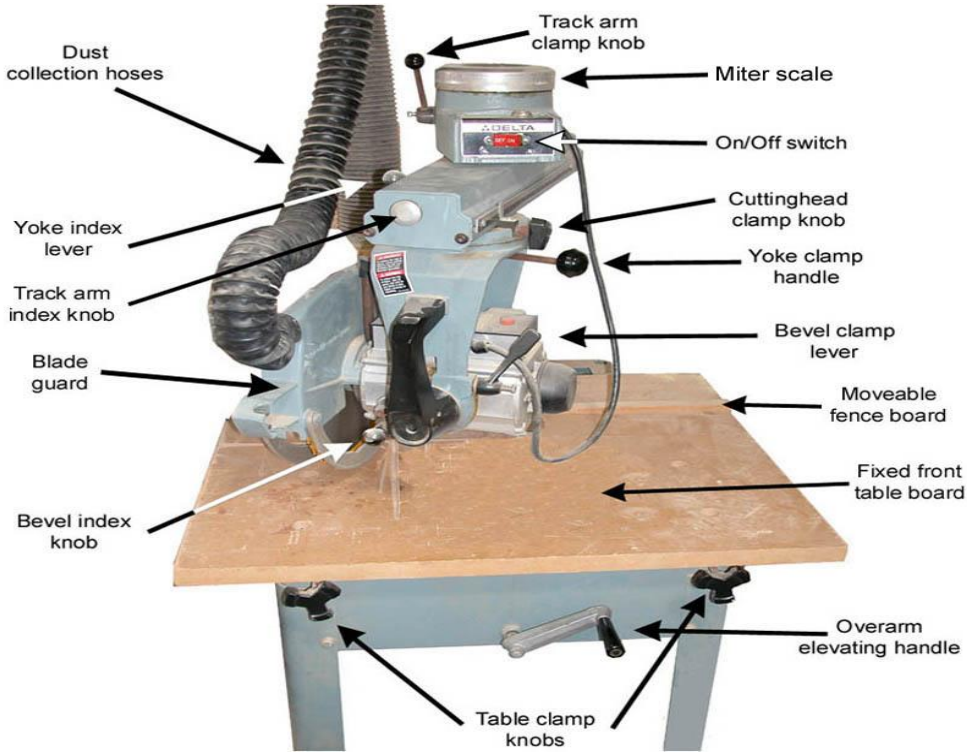
Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information sheet-5	Radial Arm Saw



The radial arm saw is used to cut lumber to rough length. It consists of a trunnion assembly, which includes the motor, bracket, and blade, and a cantilevered support arm. The trunnion assembly rolls on bearings along the support arm. The wood remains stationary on the table against a fence and the trunnion assembly is pulled towards the operator. Due to the nature of the machine, it is typically not very accurate, but does an excellent job for rough work. It is possible to raise, lower, and rotate the support arm and to rotate the trunnion assembly for certain operations, but those operations are **forbidden** in the WMT lab.

1. When making a cut on the saw, hold the stock firmly against the fence.

2. Maintain a minimum safe distance of 6” between the line of the blade and your fingers and hands.

3. Never hold the stock being cut with your thumb sticking out along the edge of the board.

4. Make sure there is no gap between the stock and the fence at the cut line. A gap can usually be avoided by turning the board over.

5. Use your upper body to control the speed of the cut by keeping your arm relatively straight and rotating at the waist. Using only your arm makes it difficult to control the saw.

6. Do not force the saw into the material any faster than it can cut with ease. Because of the direction of rotation of the saw blade, it has a tendency to “climb” into the wood. **Control the rate of cut.**

7. When cutting thicker stock, make sure the blade clears the back, upper corner of the stock prior to cutting. A spacer block between the stock and fence may be necessary to ensure this. This is a **special setup.**

8. Because it is hard to hold two or more pieces securely at the same time, cut only one piece at a time.

9. Use the saw for crosscutting only and never for ripping.

10. Do not use the saw for cutting short lengths of stock; your hands could be drawn into the blade.

11. Use extreme care in cutting warped stock since there is a tendency for the kerf to close and pinch the blade in this type of defect. To avoid this difficulty, make a partial cut, back the saw out of the cut, and start again. This process should be repeated as long as a tendency to bind is observed.

12. Let the blade reach full speed before making a cut.

13. Always return the saw to the rear of the support arm after completing a cut. Never remove stock from the table until the saw has been returned.

14. Any unusual noise or vibration should be brought to the immediate attention of your instructor. A noise or vibration could be caused by a blade with the wrong size arbor hole and/or a blade which is out of round.

Safe Work Procedure
Radial Arm Saw

DO NOT use this machine unless you have been instructed in its safe use and operation and have been given permission

PERSONAL PROTECTIVE EQUIPMENT


Safety glasses must be worn at all times in work areas.


Long and loose hair must be contained.


Hearing protection must be worn.


Sturdy footwear must be worn at all times in work areas.


Close fitting/protective clothing must be worn.


Rings and jewellery must not be worn.

PRE-OPERATIONAL SAFETY CHECKS

- ✓ Locate and ensure you are familiar with all machine operations and controls.
- ✓ Ensure all guards are fitted, secure and functional. Do not operate if guards are missing or faulty.
- ✓ Check workspaces and walkways to ensure no slip/trip hazards are present.
- ✓ Keep table and work area clear of all tools, off-cut timber and sawdust.
- ✓ Start the dust extraction unit before using the machine.

OPERATIONAL SAFETY CHECKS

- ✓ Keep hands away from the blade and cutting area.
- ✓ The work piece must be held against a fence.
- ✓ Allow the saw blade to obtain maximum speed before making a cut.

- ✓ Operate the saw with the left hand where possible.
- ✓ Avoid reaching over the saw line. Do not cross arms when cutting.
- ✓ When pulling the saw across, with your right hand, keep the left hand, especially the thumb, well clear of the line of cut.
- ✓ Return the cutting head to the rear of the table after each cross cut.
- ✓ When cutting bowed timber, place the bow against the table to avoid the saw binding.
- ✓ Before making adjustments, switch off and bring the machine to a complete standstill.

ENDING OPERATIONS AND CLEANING UP

- ✓ Switch off the machine.
- ✓ Reset all guards to a fully closed position.
- ✓ Leave the machine in a safe, clean and tidy state.

POTENTIAL HAZARDS

- ⓘ Saw may grab and 'kick-back' toward operator.
- ⓘ Flying chips and airborne dust.
- ⓘ Contact with rotating blade.
- ⓘ Eye injuries.
- ⓘ Noise.

DON'T

- ✘ Do not use faulty equipment. Immediately report suspect equipment.
- ✘ Do not cut branches, dowel or wood with embedded nails or screws.
- ✘ Do not rip solid timber along the grain.
- ✘ Do not cut short lengths of timber.
- ✘ Do not exceed the maximum cut for the machine

Proper Setup and Use

Prior to use:

- Evaluate the work piece material type and appropriateness of the saw and saw blade. Inspect the material for nails, screws, or other foreign objects. Ensure the material is flat and straight so that it will lay flat on the table.
- Determine the location and angle(s) of cuts required.

- Determine the required fixturing/tooling/clamping/supports needed.
- Obtain personal protective equipment (safety glasses /shields) hearing protection and remove all loose clothing, jewelry and securely tie back all long hair/beards.

At the radial saw:

- Turn on the dust collection system if available.
- With the tool off inspect the tool. Look for damage, missing guards, and blade condition.
- Inspect the work area and remove any obstructions and trip hazards.
- Set the blade height and angle.
- Set up fixturing/supports and stops to make required cuts. Ensure the work piece will have adequate support.
- With saw blade stationary move saw through entire range of motion to ensure that there is no interference with blade, machine parts, table or guards/fences.
- Ensure that if stops and clamps are used together that they are both on the same side of the blade cut so that the potential for jamming and kickback are minimized.

Cutting process:

- Locate work piece on saw. Ensure that it is placed firmly against the back fence of the saw.
- Ensure that work piece is either clamped in place or hand held without crossing hands. Keep holding hand at least 6” away from the line of the blade cut.
- Be sure that any clamping of the work piece is on the same side of the cut as the stop so that potential for jamming /kickback against stop is minimized.
- With the cutting head at the rear of the track, tighten the lock to keep the saw from running forward when it is turned on.
- Turn on the saw and let the blade reach full speed before attempting the cut. Proceed with firm hand on saw- controlling rate of cut by sound of motor speed.
- It is usually good practice on the first setup to make a sacrificial cut in the work piece material to ensure that fixturing and angle setup is performing as expected and that the saw is capable of cutting thru the entire work piece.
- If trial cut is satisfactory – setup and make required cuts to work piece(s).
- Allow blade to come to a complete stop and is returned the back of the track before releasing the handle and prior to adjusting/advancing work piece.

Operation Sheet 10	Operate a Radial Arm Saw

Step-1 Inspect, clean, and lubricate a radial arm saw.
Step-2 Remove and replace radial arm saw blades.
Step-3 Make a crosscut to predetermined size.
Step-4 Crosscut duplicates lengths.
Step-5 Cut a miter and compound miter to predetermined size.
Step-6 Install dado head to predetermined size.
Step-7 Cut a dado to predetermined size
Step-8 Cut a groove to predetermined size.

Operation Sheet 11	Cross cutting

Step-1 Select a crosscut or combination blade.
Step-2 Be sure blade guards are in place.
Step-3 Adjust the depth of cut by turning the elevating hand wheel. The teeth of the blade should be 1/16” below the surface of the stock.
Step-4 Push the saw to the rear of the table; tighten the lock to keep the saw from running forward when it is turned on.

Step-5 By using a tri-square check the saw blade form a right angle with the fence and perpendicular to the table. Adjust as necessary
Step-6 Place material to be cut on the saw table with the straightest edge against the fence. Align the cutoff mark with the saw blade.
Step-7 Be sure the saw blade is not engaging the material, then start the saw and release the lock.
Step-8 Always pull the saw by the yolk handle. Do not cross your arms to pull the saw. If you hold the material on the right of the saw blade, pull the yolk with the left hand. Most accidents happen when the arms are crossed.

Step-9 Pull saw slowly toward the operator; keep the arm stiff to prevent the saw from grabbing and lunging forward.
Step-10 Return the saw to the rear of the table (some radial saws will do this automatically). Tighten the saw lock and turn the switch off.
Step-11 Apply blade brake slowly if one is available on your machine.

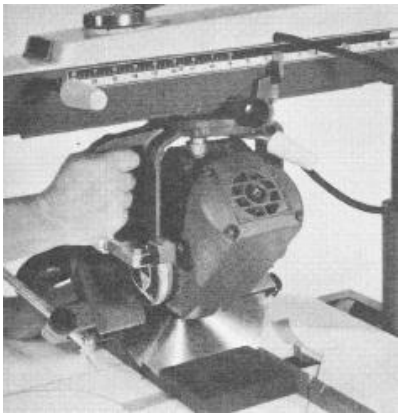
Operation Sheet 12	Miter Cutting

Step-1 Select a crosscut or combination blade.

Step-2 Set the angle of the miter cut.

Step-3 Make the cut in the same manner as described for crosscutting.

Operation Sheet 13	Bevel Cutting



Step-1 Select a quality crosscut or combination blade.
Step-2 Lock the overarm and yoke in the same position as for crosscutting.
Step-3 Raise the saw using the elevating handle until the motor can be tilted to the desired bevel. Release the bevel latch and bevel clamp handle.
Step-4 Tilt the saw to the desired bevel as indicated on the bevel scale.
Step-5 Re-engage the bevel latch and tighten the bevel clamp.

Step-6 Make the cut in the same manner as described for crosscutting.

Step-7 A compound angle cut is a combination bevel and miter cut.

Operation Sheet 14	Dadoing

Step-1 Select and install a dado head of desired width.

Step-2 Set the overarm and the motor yoke in the same position as for crosscutting.

Step-3 Place the lumber on the table, and lower the dado head until the teeth just touch the top of the board to be dadoed.

Step-4 Push the saw to the rear of the table, and lower the dado head to the desired depth of cut.
Step-5 Make the cut in the same manner as described for crosscutting.

LAP Test	Practical Demonstration

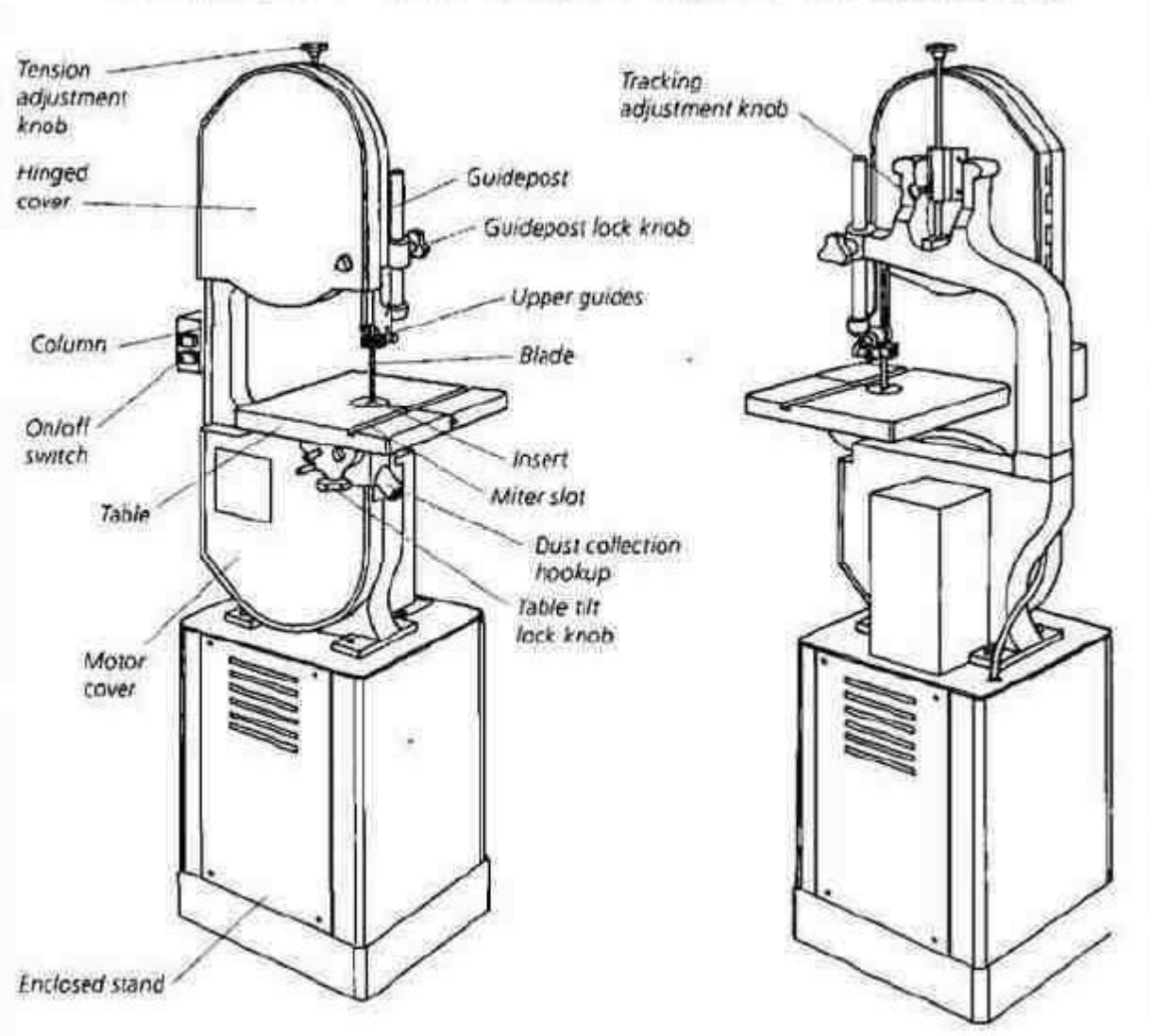
Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 3 hours.

- Identify and describe all controls, adjustments, and functions of the radial arm saw.
- Dress appropriately and wear appropriate personal protective equipment for the cutting operation.
- Correctly setup and adjust the saw for all types of required cuts.
- Apply good judgment in selecting clamping/securing method for work piece and accurately position work piece for cutting operation.
- Students must be able to reset all saw functions to square, perpendicular cuts and clean up saw in preparation for next user.

Information sheet-6	Band Saw



The band saw is almost indispensable for making curved cuts and resawing (cutting wood to make it thinner). The blade is a thin loop of steel, typically ¼ to ½ inch wide. The blade runs over wheels above and below a table, allowing wood to be cut where blade is traveling downward through the table. The size of a band saw is determined by the diameter of the wheels, which roughly indicates the largest piece that can fit between the blade and the body of the saw. The band saw is the fastest cutting saw in the woodworking lab. It is a rough cutting and shaping tool not intended for finish cuts.

1) Adjust the upper guide and guard to about ¼" above the stock with the machine at a full stop.
2) Allow the saw to reach full speed before starting to feed your work.
3) Plan cuts carefully; lay out and make relief cuts before cutting long curves and curves of small radii. Turning holes should be made where required. Plan work so that all cuts will be made in the forward direction.

4) If the stock binds or pinches the blade, do not attempt to back the stock out. Shut the power off and remove the stock after the machine stops. Backing up while the machine is running could pull the blade off the wheels.
5) When removing scrap material from the band saw table, always be aware of the blade. Use a piece of scrap stock to remove scrap pieces; do not use your hands.
6) Keep the floor areas surrounding the saw clear of scraps.
7) If the blade breaks, stand clear and shut off the power if possible. Keep others clear until the machine stops completely and notify the instructor.
8) Never make adjustments to the saw while it is running.
9) Do not place your fingers close to the saw blade when cutting stock. Always maintain a 4" margin of safety.
10) If it is necessary to back the saw out of a long cut, turn the power off and wait for the blade to stop. Then seek assistance from the instructor.
11) To stop the band saw make sure the powers is off then apply gentle pressure on the brake pedal until the blade stops. Leave the machine only after the blade has stopped moving completely.
12) Your instructor should approve all re-sawing and other **special setups**.
13) Use a push stick when re-sawing.
14) When re-sawing, the edge of the stock on the table and the face of the stock against the resaw fence must be surfaced.
15) Keep upper and lower doors closed and all guards in place.
16) Use a push stick or guide for cuts that would place your hands near the saw blade.
17) Cutting cylindrical or irregular stock on the band saw may be done only with a special jig, such as a V-block **(special setup).**
18) Never stand or allow others to stand to the right of the band saw when it is running.
19) If you hear a clicking noise, turn off the saw at once. This indicates a crack or kink in the blade as it passes through the guide.

Safe Work Procedure Band saw

DO NOT use this machine unless you have been instructed in its safe use and operation and have been given permission

Personal Protective Equipment


Safety glasses must be worn at all times in work areas.


Long and loose hair must be contained.


Hearing protection must be worn.


Sturdy footwear must be worn at all times in work areas.


Close fitting/protective clothing must be worn.


Rings and jewellery must not be worn.

PRE-OPERATIONAL SAFETY CHECKS

- ✓ Locate and ensure you are familiar with all machine operations and controls
- ✓ Ensure all guards are fitted, secure and functional. Do not operate if guards are missing or faulty.
- ✓ Check workspaces and walkways to ensure no slip/trip hazards are present.
- ✓ Ensure push stick is available.
- ✓ Lower the blade guide and guard to full effect.
- ✓ Start the dust extraction unit before using the machine.

OPERATIONAL SAFETY CHECKS

- ✓ Keep hands away from the blade and cutting area.
- ✓ Feed the work piece forward evenly and hold it firmly on the table to ensure effective control during cutting, while keeping hands in a safe position.
- ✓ Use a push stick when feeding material past the blade.
- ✓ Before making adjustments, switch off the saw and bring the machine to a complete standstill.
- ✓ Stop the machine before attempting to back the work away from the blade.
- ✓ Stop the saw immediately if the blade develops a 'click'. Report it to your supervisor.

ENDING OPERATIONS AND CLEANING UP

- ✓ Switch off the machine when work completed.
- ✓ Reset all guards to a fully closed position.
- ✓ Leave the machine in a safe, clean and tidy state.

DON'T

- ✘ Do not use faulty equipment. Immediately report suspect machinery.
- ✘ Attempt to cut very small items.
- ✘ Cut cylindrical or irregular stock.
- ✘ Never leave the machine running unattended.
- ✘ Do not force a wide blade on a cut of small radius. Use relief cuts when cutting sharp curves.

General Rules for Correct Operations:
Correct working position:

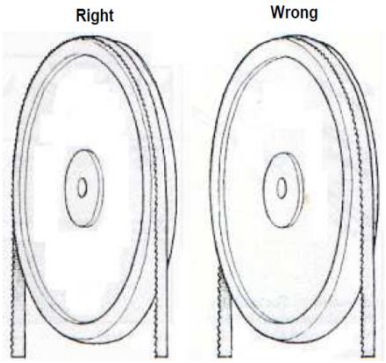
- Stand in front of the machine facing towards cutting direction.
- Make sure that nobody is standing in the dangerous area.
- Keep the area in front and behind the machine clean in order to insure that you stand safely and firmly on the floor.

Work piece handling:

- Lay hand flat on the work piece.
- Keep your fingers close together and thumbs close to the fingers.

- Push work-piece steadily forward and do not pull back.
- When cutting long boards, ask a helper to support the end.
- Always mind the position of your fingers.
- Use a push stick for narrow and short pieces.

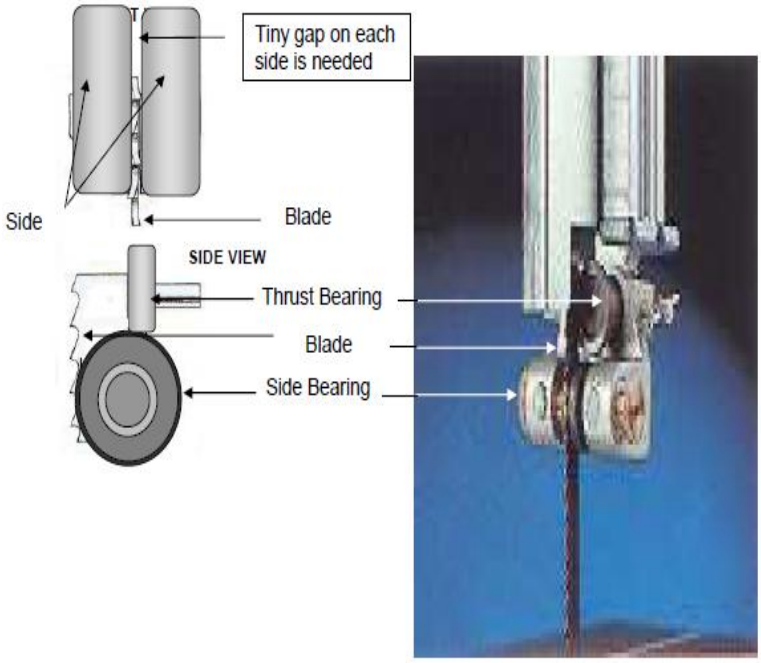
Correct Position of Saw Blade On Wheel.

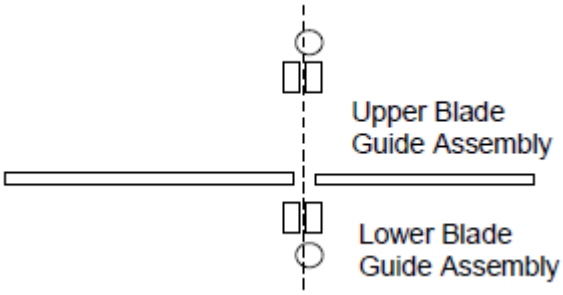


- The saw blade should not run in the middle of the rubber bandage because if it does, the setting of the teeth might be changed or affected as tension is applied.
- If the blade runs on the rear part of the rubber, the upper wheel must be tilted until the blade slips to the front part of the brim on the wheel.
- This adjustment is done carefully and making sure the machine is OFF.
- The position of the saw blade on the wheel should be closely observed during the adjustments.

Correct Adjustment of Side Bearings

- A pair of saw blade ***side bearings*** guides the saw blade. One bearing is fixed above the working table, the other below. Extra care must be observed when making some adjustments on the guides.
- If adjustment is necessary, the guides have to be set simultaneously.
- The **Side Bearing (1)** is adjusted to allow slight clearance for the blade of 1/10 mm on both sides.
- The distance from the side bearing to the tooth ground of the saw blade should be about 2 mm.
- The **Thrust Bearing (2)** keeps the saw blade from the back. Adjustments should be made to allow 0.5 to 1-mm space between the saw back.





Operation Sheet 15	Setting Up a Band Saw

Step 1- Ensure that the machine is isolated.
Step 2- Open the guard doors and slacken off the blade tension.
Step 3- Remove blade.
Step 4- Install the new blade and position it on center of the pulleys, apply tension by using hand-wheel adjustment.
Step 5- Correct tension can be achieved by pre-setting the tension indicator, if fitted, or by manually checking the blade for a side-to-side movement of approximately 50 mm.
Step 6- Rotate the top pulley by hand and note any backward or forward movement of the blade on the wheel. Adjust tracking control if necessary.
Step 7- Replace the frontal guard, check positioning of guides and the thrust wheel.
Step 8- Close guard doors.
Step 9- Set the height of the top guard and guides to just above the work-piece and secure it.
Step 10- Switch on for trial run and trial cut.

Causes of Band saw Breakage, or Blade Run-Off

1. Badly brazed or butt-welded joint.
2. Cracked saw blade.
3. Twisting of blade in the cut.
4. Incorrect setting of guides and thrust wheel.
5. Off-cuts wedged between the blade and the work-piece.
6. Incorrect tracking of the blades.
7. Violent or sudden braking action.

Operation Sheet 16	How to Adjust The Blade Guides

Step 1 Adjust side bearings to allow 1 cm of space.
Step 2 Push the thrust bearing or the blade support backwards.
Step 3 put the new saw blade onto the wheels.
Step 4 Adjust the side bearing to the saw blade, leaving 1/10-mm allowance on both sides.
Step 5 Make sure that the front edge or the rollers are just 2 mm behind the tooth ground.
Step 6 Adjust the thrust bearing leaving 1 mm. Clearance between supports and saw blade back.
Step 7 Tight / check all adjustments screws.
Step 8 If the machine is equipped without thrust bearing, make sure that it is adjusted also.

Operation Sheet 17	Replacing a Band Saw Blade

Step 1 Open upper and lower wheel guards, throat plate, and table aligning pin.
Step 2 Release the tension on the blade by lowering the upper wheel.
Step 3 Remove the saw blade by slipping it off the wheels and out of the table slot.
Step 4 Coil the blade, which was removed.

a. With the blade almost touching your body, grasp it arms' length in front of your body, with the back of the blade resting in the palm of each hand, teeth pointing up.
b. Twist the wrist up and in, and bring them together. This will automatically form three loops.
c. Place the loose loop flat on the bench top and release the hands. The blade is coiled.

Step 5 Select the proper blade for the job.

Note: Be guided with proper selection of blades for cutting the arc shape.
For straight ripping, the width of the blade ranges from 19 mm – 38 mm.

Step 6 Insert the selected blade in the slot of the table.

- Position on the upper and lower guide block.
- Replace throat plate and aligning pin.

Note: See to it that the teeth are pointing downward.

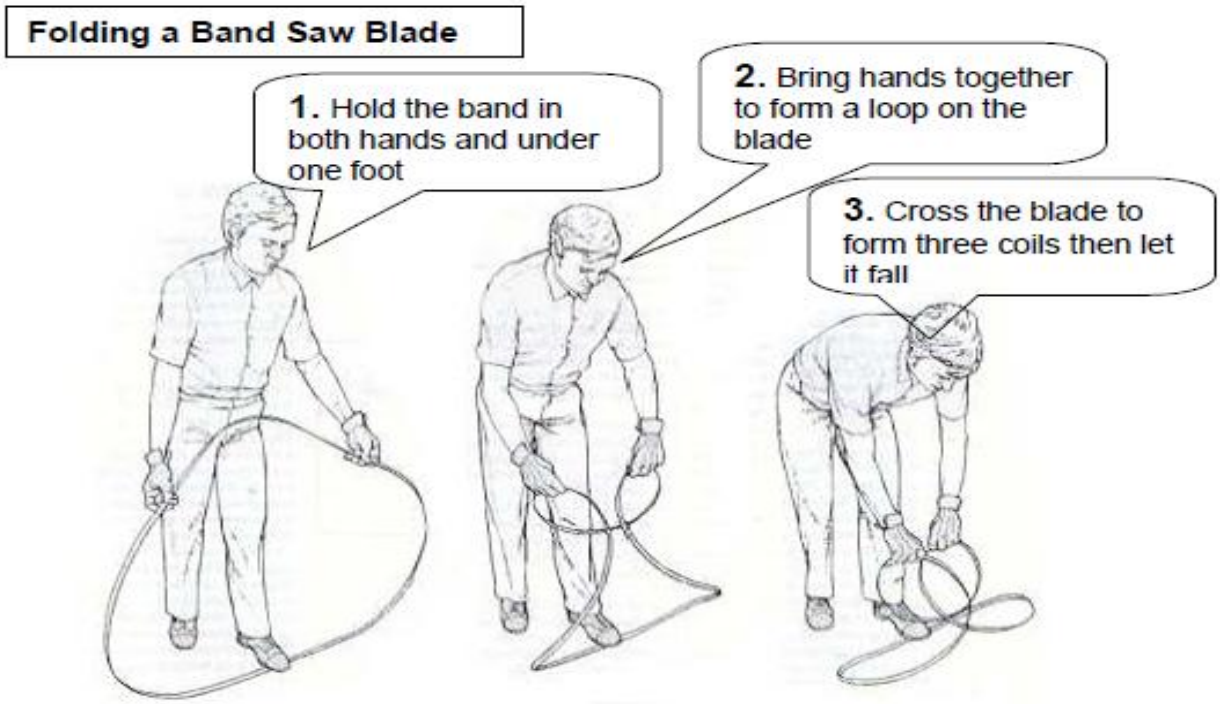
Step 7 Apply tension by raising the upper wheel.

Note: Rotate the upper wheel by hand and note
Whether the blade is tracking the wheel.

Step 8 Adjust the guide blocks so that they are behind the set of the teeth and close to the blade (but not
too close to cause friction).

Step 9 Adjust the thrust wheel behind the blade, so that it is free when the saw is not cutting (but be sure to make contact when the saw is cutting.)

Step 10 Adjust the table to job requirements.



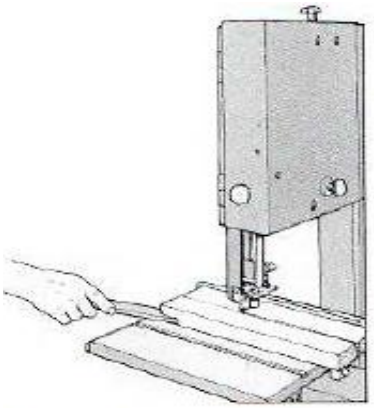
Setting and Operating Band Saws

Rip-sawing On a Band Saw

- Making a rip cut parallel to another edge is a straightforward procedure – but unless the blade is sharp and set perfectly, it will tend to drift off line even when you are ripping against a fence. Also, make sure the blade guides are adjusted correctly and the tracking is true.

Ripping against the fence

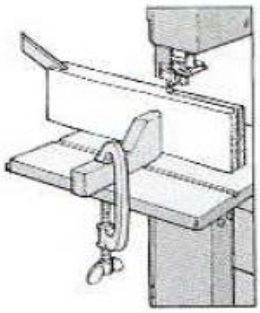
- With the work pressed against it, adjust the rip fence sideways until the blade is just on the waste side of the marked line. Switch on and feed the work at a steady rate, without forcing it. Keep the work-piece pressed against the fence throughout the cut.
- Finish cutting a narrow work-piece by feeding it with a push stick, pressing diagonally towards the fence.



Ripping against the fence

Ripping against a block

- The blade persists in wandering when you are using the rip fence, employ a rounded guide block similar to that used for cutting parallel curves.
- Clamp it to the saw table, leaving the required clearance between blade and block, and make the rip cut freehand so that you can compensate for the sideways drift by slightly changing the direction of feed.



Ripping against a rounded block

Re-sawing timber

When re-sawing a piece of timber into thinner planks, fit a wide blade and use either the rip fence or a guide block. Hold the work against the fence with a block of scrap wood and feed with a push stick.

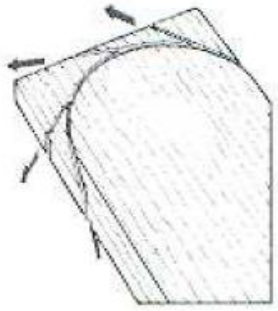
Making Curved Cuts On a Band Saw

- Sawing freehand by following a line marked on a work-piece is not difficult to provide the blade is sharp and accurately set. If the blade is blunt or damaged, it is much more likely to wander and you will find yourself constantly correcting the line of cut, which inevitably puts a strain on the blade.
- Select the width of blade to suit the minimum radius you wish to cut, and plan the procedure to ensure that the bulk of the work-piece is able to pass through the throat of the saw.

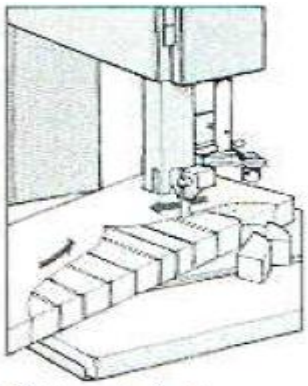
1. Freehand Cutting, guide the workpiece with both hands.

Following a curve freehand

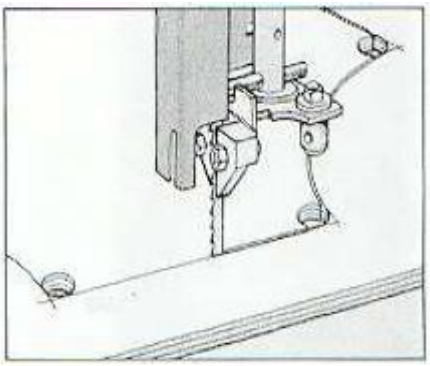
- Feed the work into the blade, cutting at a steady rate on the waste side of the line, and follow the curve without twisting the blade in the kerf.
- As the blade approaches the end of the cut, keep your hands away from the cutting edge and, if need be, pass one hand behind the blade to guide the work **(1)** If the blade begins to bind as you negotiate a tight curve, do not withdraw it. Instead, run it out to the side of the work through the waste and start the cut again. It may be necessary to perform a similar procedure several times to complete a curve **(2)**.
- If you suspect in advance that it will be impossible to complete a cut in one flowing movement, make short straight cuts through the waste so that it will fall away in sections as the curved cut progresses **(3)**.



2. Cutting a tight curve
Remove waste in sections.



3. Cut waste first
Waste falls away as curve is cut.

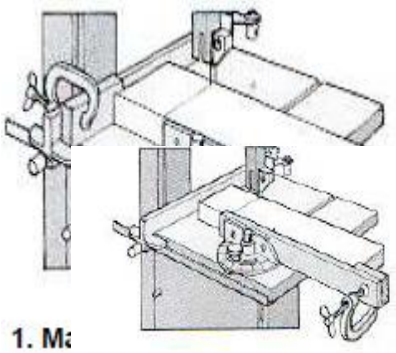


4. Drill holes at strategic points to change direction

- Alternatively, drill clearance holes at strategic points so that you can turn the blade in another direction **(4)**. If there's no escape route for a binding blade, switch off and slowly back out the kerf.

Crosscutting on a Band Saw

- Reasonably accurate crosscutting is possible on a band saw but the finish will not be as good as on a table saw. If appearance is important, you will need to plane or sand the end grain.
- Hold the work firmly against the miter fence and feed it past the blade by sliding the fence along its groove machined in the table. Don't forces the pace or you will distort the blade.
- Clamp a block to the rip fence to serve as an end stop when you want to saw several identical offcuts **(1)**.



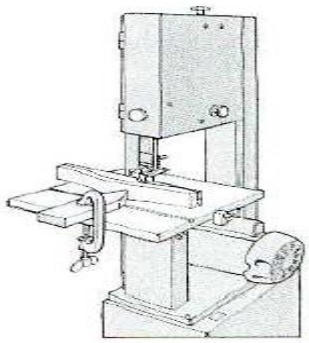
1. Ma

2. Cutting identical components to length

☛ To cut a number of work-pieces to the same length, extend the saw's mitre fence with wooden facing and clamp an end stop to it. But the squared end of each workpiece against the end stops and cut it to length **(2)**. Cut a miter by adjusting the angle of the fence. To make a compound-angle miter, tilt the saw table at the same time.

Cutting parallel curves

Curves components often have parallel sides. To help cut one curve parallel to another, round over the end of a block of timber and clamp it to the saw table, leaving a clearance between it and the blade equal to the width of the finished work-piece. Run one of the curves against the rounded end of the block while following the other marked line with the saw blade.

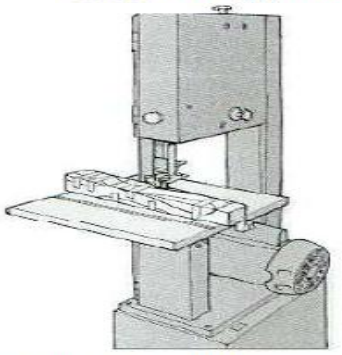


Cutting identical components

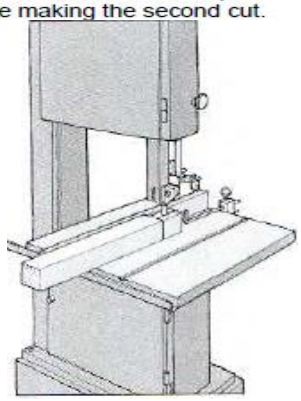
- To make identical components, cut several blanks and pin them together through the waste.
- Following the outline of the work-piece marked on the top blank, cut all the components in a single pass.

Cutting three-dimensional curves with a band saw

- To cut a component that has three-dimensional curves (a cabriole leg, for example) mark out its shape on two adjacent sides of a square-section blank.
- Cut one side freehand, then replace the waste and tape it in position. Turn the work-piece through 90 degrees in order to cut the second curve



Cutting a cabriole leg
Tape waste onto the workpiece before making the second cut.



Cutting Joints on a Band Saw

- Any joint that incorporates a tongue – a tenon, lap joint, barefaced housing, corner halving joint and so on – can be cut in a similar way. The procedure for cutting a tenon demonstrates the principle.
- To avoid having to back out of a deep cut, always saw the shoulders first. Do so when you cut alongside the tongue to get rid of the waste
- Using an end stop clamped to the rip fence as a guide, crosscut the shoulder line of the tenon.
- Adjust the rip fence to saw alongside the tenon, with the waste facing away from the fence. Set the depth stop to complete the cut on the shoulder line. If your saw is not fitted with a depth stop, clamp a block to the fence ahead of the work.
- To ensure that the tenon is centered on the rail, cut one side, then turn the work over and cut the other.

Cutting a Tenon

- Adjust the saw's depth stop to complete the cut on the tenon's shoulder line.

LAP Test	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 4 hours.

- Identify and describe all controls, adjustments, and functions of the band saw.
- Dress appropriately and wear appropriate personal protective equipment for the cutting operation.
- Correctly setup and adjust the band saw for all types of required cuts.
- Apply good judgment in selecting clamping/securing method for work piece and accurately position work piece for cutting operation.
- Demonstrates proper application and use of miter cuts, relief cuts, and push blocks.
- Students must be able to reset all saw functions and clean up saw in preparation for next user.

Self-Check -5	Written Test

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

Match column A with column B. Select the letter of the correct answer from column B & write your answer on the provided space **in front of the number in column A**

If you wish to change your answer place an x mark on your previous answer and write your preferred answer

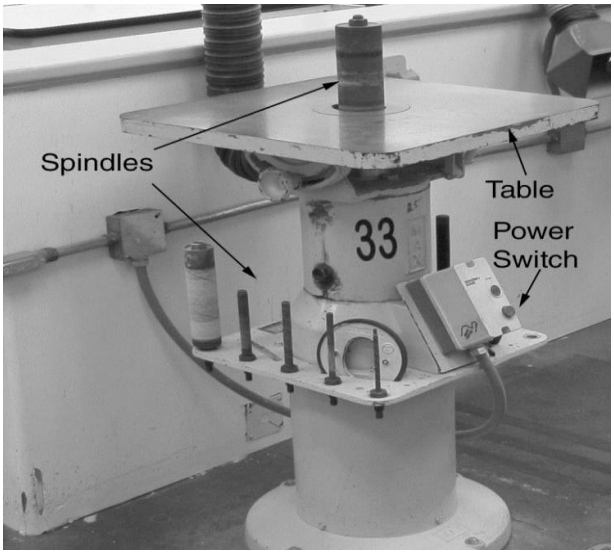
Column A	Column B
---------- Cuts made perpendicular to the long axis of the work piece. (**2 points**)	Rip cuts
---------- Cuts made parallel to the long axis of the work piece. (**2 points**)	Cross cuts or “cutoffs”
----------the narrow ribbon like nature of the blade allows the operator to turn the work piece about the blade while advancing the cut thru the material. The minimum radius is about three times the blade width. (**2points**)	Radius or curved cuts

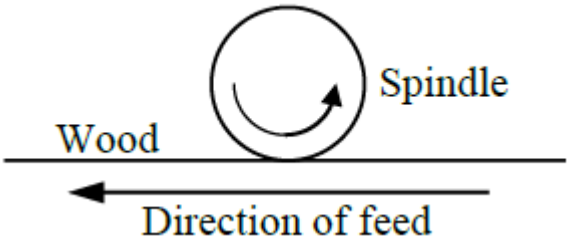
Note: **Satisfactory rating – 6 points** **Unsatisfactory - below 6 points**

You can ask you teacher for the copy of the correct answers.

Name: _____ Date: _____

Information sheet-7	Oscillating Spindle Sander





Safety Precautions

Hazards
Abrasions
Flying debris (potential eye and face damage)
Electrical shock
Entanglement of hair, jewelry or clothing
Fire risk
Training
Shop Safety Fundamentals
Site Specific Training
Protective Equipment
Safety Glasses
Hearing protection
Tie back long hair
Avoid loose fitting clothing

The spindle sander is used to sand inside (concave) curves. The spindle rotates while simultaneously oscillating up and down. This helps keep the abrasive from loading up and overheating, which would happen if the spindle did not move up and down. Various spindle sizes can be used on the machine to accommodate different work radii.

1) Always use the largest spindle possible for the radius being sanded. Using a smaller spindle makes it more difficult to get a smooth curve, takes longer, and results in excessive abrasive wear.
2) Always feed against or into the direction of the spindle rotation.
3) Avoid excessive pressure on the spindle. Too much pressure generates heat and will quickly damage the abrasive.
4) Use the throat plate that leaves the smallest opening around the spindle.

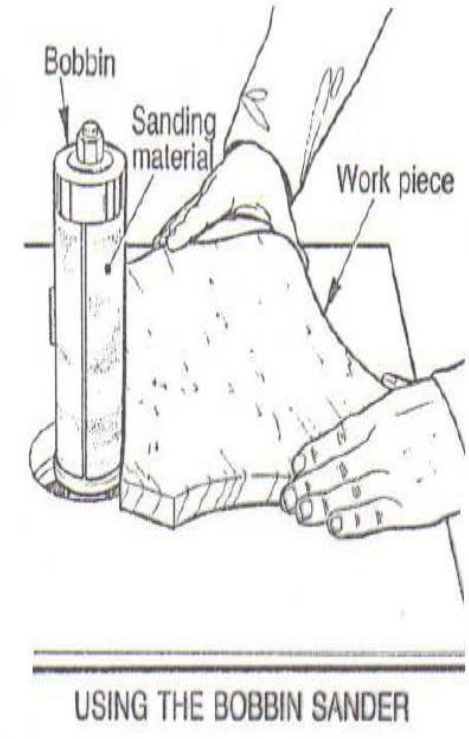
5) Hand-tighten the spindles only. Do not use wrenches to tighten spindles; this can result in the spindle becoming stuck in the collet.
6) Every component of the spindle sander has a home on the tool rack. Do not leave spindles, throat plates, or wrenches lying around; return them to their proper location in the tool rack.
7) Notify the instructor if the spindle abrasives are excessively worn.

Operation Sheet 18	Operation Startup

Step 1 Put on PPE listed above
Step 2 Ensure work area is clean and free of obstacles
Step 3 Ensure all guards are present and function properly
Step 4 Make necessary adjustments for safe operation
Step 5 Inspect machine for damage or obstructions to operation
Step 6 Turn on sander using power switch located at front of the machine
Step 7 Begin work
Step 8 Slowly press work piece against the spindle, avoid feeding material to quickly
Step 9 Keep hands clear of sanding surfaces

Shutdown

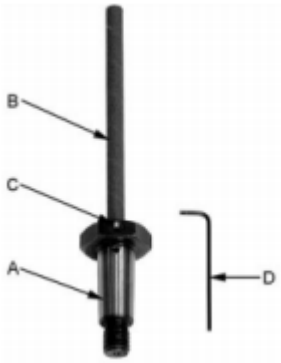
1. Remove work piece
2. Turn off tool using power switch
3. Allow sander to stop on its own



USING THE BOBBIN SANDER

Operation Sheet 19	Mounting Sanding Sleeves

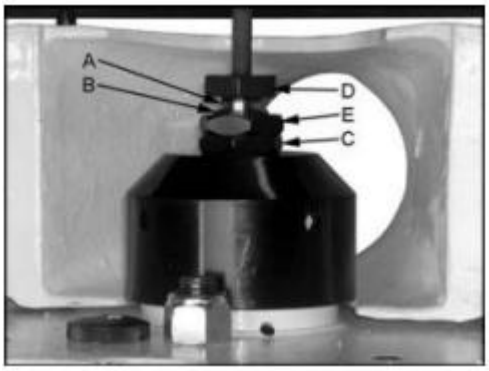
1. Thoroughly clean the arbors (A) on all of the spindle assemblies. Also clean the arbor housing on the sander
2. Slip the sanding sleeve over the spindle (B) and hold in place by tightening the set screw (C) with a 2mm hex wrench (D)
3. Repeat for all of the steel spindle assemblies
4. Place sanding assemblies in the holders found on the sides of the sander



Operation Sheet 20	Installing Sanding Assemblies

WARNING: Disconnect the sander from the power source when installing or removing sanding assemblies. Failure to comply may cause serious injury

1. Thoroughly clean the arbor and arbor housing before installing the sanding assemblies
2. Thread the arbor (A) into the arbor housing (B)
3. Use the provided wrenches to hold the lower arbor housing nut (C) while turning the arbor nut (D) clockwise



Operation Sheet 21	Removing Sanding Assemblies and Replacing Sanding Sleeve

1. Disconnect the sander from the power source
2. Use the provided wrenches to hold the upper housing nut (E) while turning the arbor nut (D) counterclockwise

Replacing Sanding Sleeve

1. Loosen hex nut (A) with a 26 mm wrench or large adjustable wrench
2. Slide the sanding sleeve (B) off the drum and replace with a new sanding sleeve
3. If you are replacing the sanding sleeve on the steel spindles, loosen the set screw found on the arbor nut
4. Remove sanding sleeve from the spindle and replace with new sanding sleeve
5. Tighten the set screw

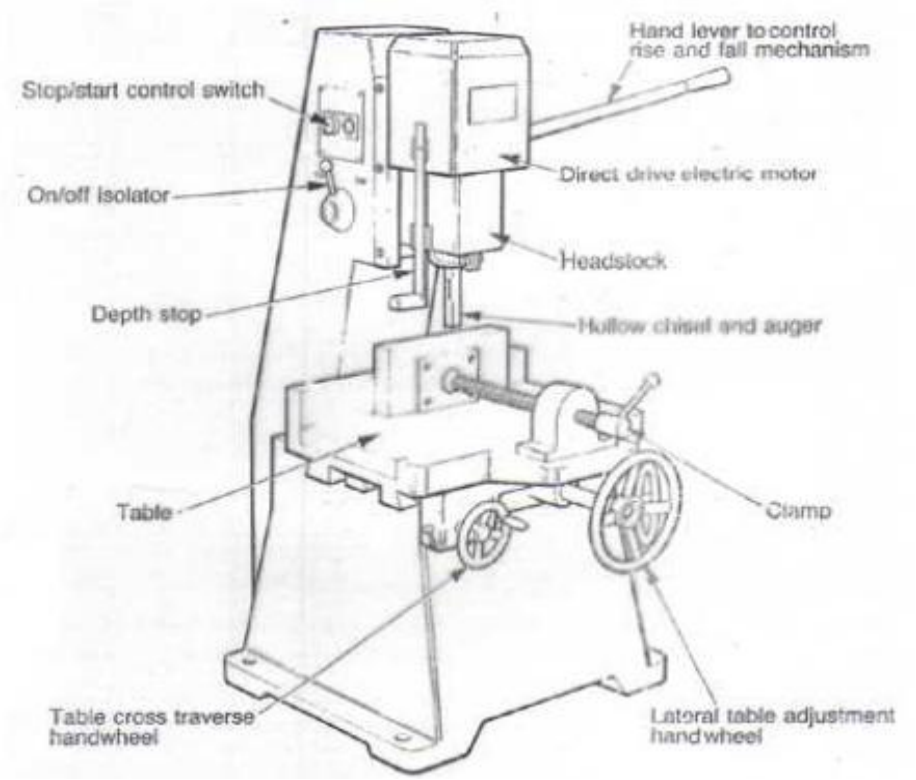
Adjusting Sanding Table

1. Loosen the lock knobs on the sides of the table
2. Using the scale on the side of the table, adjust the table to the desired angle
3. Tighten the lock knobs once the desired angle is met (0º to 45º)

Maintenance

- Wipe the machine down after each use
- Keep exposed metal surfaces clean and rust free
- Make periodic inspection of the operation of the machine
- Replace gear lube at 800 hours of use

Information sheet-8	Hollow Chisel Mortiser



- The hollow chisel mortiser is uniquely capable of making a square hole. It does so by forcing a hollow, four-sided chisel into the wood, and removing the encircled waste with a special drill bit. Due to the forces involved, a lot of heat is generated.
- Setup of this machine is critical; improper positioning of the chisel and bit can ruin the tool or the work piece.

1. You must be checked out on this machine before using it. Check with the instructor or aide for detailed instructions prior to using the hollow chisel mortiser.

2. Ensure the chisel and drill bit are sharp prior to installation.

3. The bit should be positioned about .020” below the chisel. This is approximately the thickness of a non-flexible 6” scale, or a dime. The spacing can be accomplished by installing the chisel with a .020” spacer between the chisel shoulder and the upper bushing. Then, install the drill bit with the bit tight against the mouth of the chisel; tighten the chuck. Remove the .020” spacer, slide the chisel up tight against the bushing, and tighten with the appropriate wrench. Ensure the chisel is square to the fence when it is tightened.

4. When the machine is turned on, some squeaking is normal. It is caused by the bit rubbing against the chisel. If the noise is excessive, check your setup.

5. If using the depth stop or other stops, make sure lock bolts are securely tightened.

6. Ensure the work is securely clamped in place.

7. Always use a backer board to prevent damage to the bit and minimize tearout on through mortises.

8. Do not cut more than about 1/2" deep at a time. Deeper cuts may result in the chisel getting stuck in the work piece. If a deeper cut is desired, make a 1/2" cut, move the work piece over and make an overlapping cut of greater depth. Continue this back-and-forth process until the desired depth is achieved.

9. Harder woods will require shallower cuts and greater care in drilling.

10. Do not apply excessive force. If excessive force is required, check your setup and/or have the instructor check it.

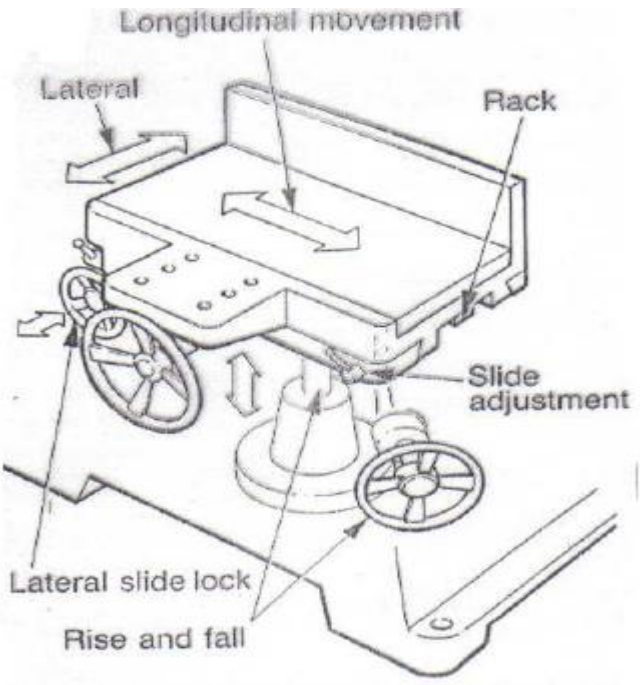


Figure 2- The table. Longitudinal movement is effected by control of the large hand-wheel at the front of the machine. Lateral movement is effected by control of the small wheel to the left of the large hand-wheel. The table also has a rise and fall hand-wheel control as illustrated
.

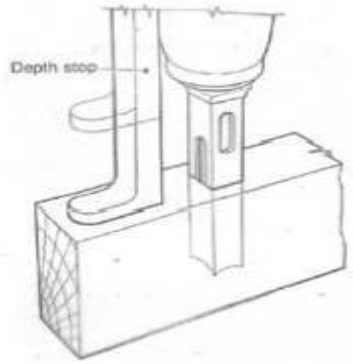


Figure 1- Depth stop.
Pre-set to determine the depth of the cut.
The depth stop moves with the chisel.

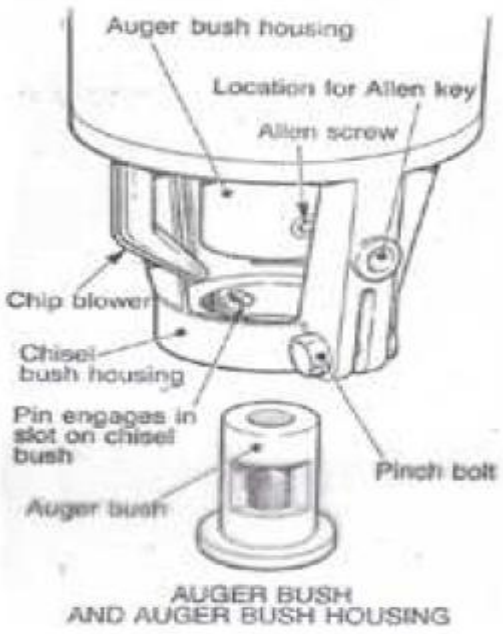


Figure 3 – Headstock, chisel, and auger.
The auger bush fits into the auger bush housing section and is secured with an Allen Key.
This enables tightening of the auger shank when the chisel section is entered.

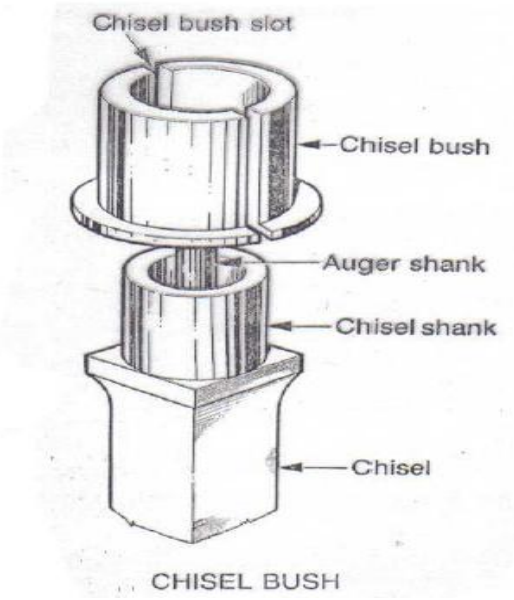
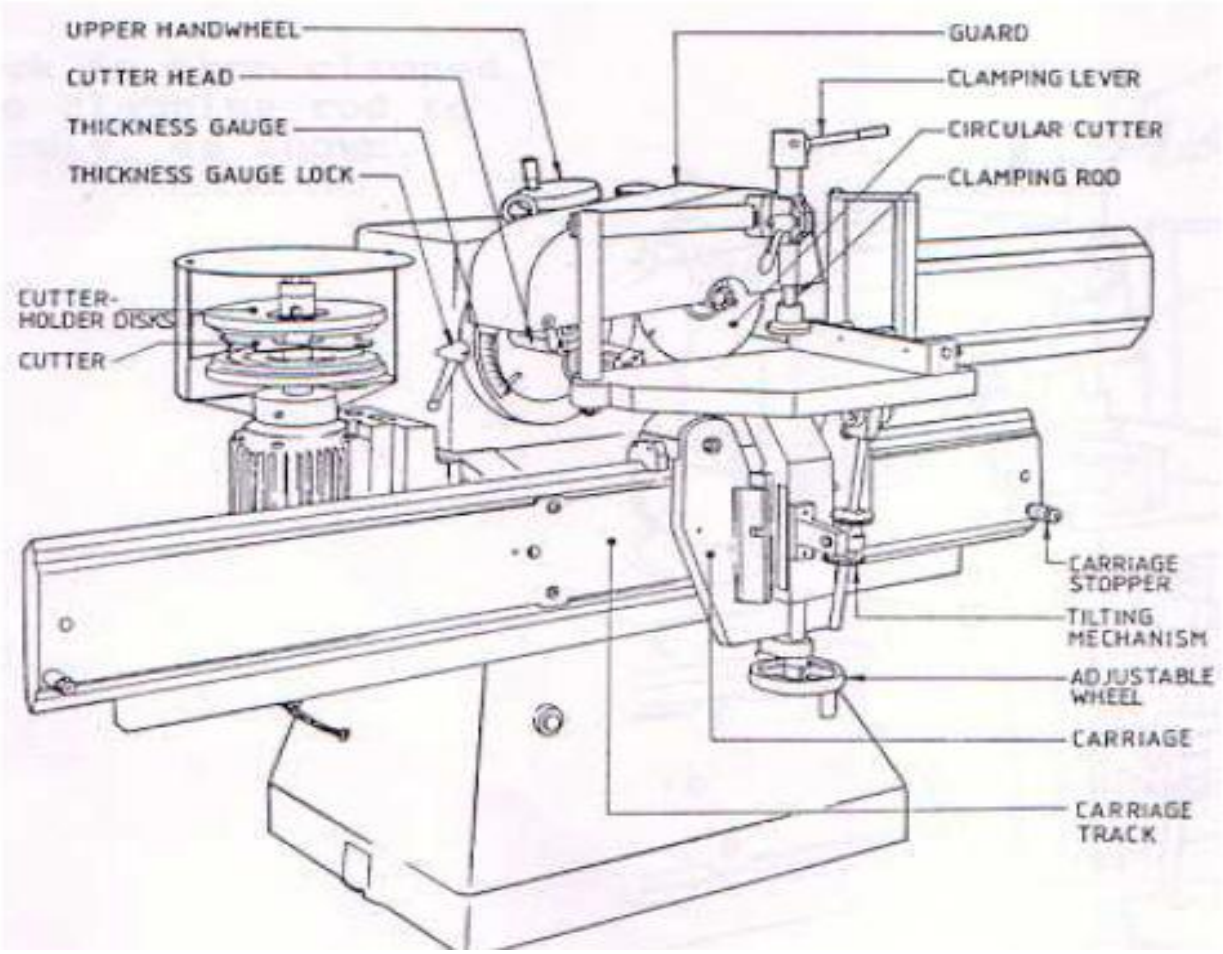


Figure 4 – The chisel bush is entered into the chisel bush housing with the slot engaging the pin incorporated in the housing. The securing pinch bolt completes fixing after the chisel is squared.

Tenoner Machine



- As the furniture industry grows the need for more fast and specialized machines grows along with it.

- Such need is very well noted in small shops when making wood joints. Tenons in a small company are done by using a spindle moulder or even a circular saw. But for larger companies whose demand for such joint are high, a TENONER machine is more practical for the need.

Principle of Operation

- The tenoner has cutter blocks, which unlike the spindle moulder, its cutter block revolves around the stationary work-piece.
- The work-piece is placed on top of the table and securely fastened by a hold down clamp.
- It also has a circular blade that has a parallel cutting circle with the cutter block to cut the final length of the work-piece.

Self-Check -6	Written Test

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

Match column A with column B. Select the letter of the correct answer from column B & write your answer on the provided space **in front of the number in column A**

If you wish to change your answer place an x mark on your previous answer and write your preferred answer

Column A	Column B
---------- The bit should be positioned about ------- below the chisel. (1 points)	Depth stop
---------- Do not cut more than about ------ deep at a time. (2 points)	020”
--------- Pre-set to determine the depth of the cut. The depth stop moves with the chisel.	1/2"

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

You can ask you teacher for the copy of the correct answers.

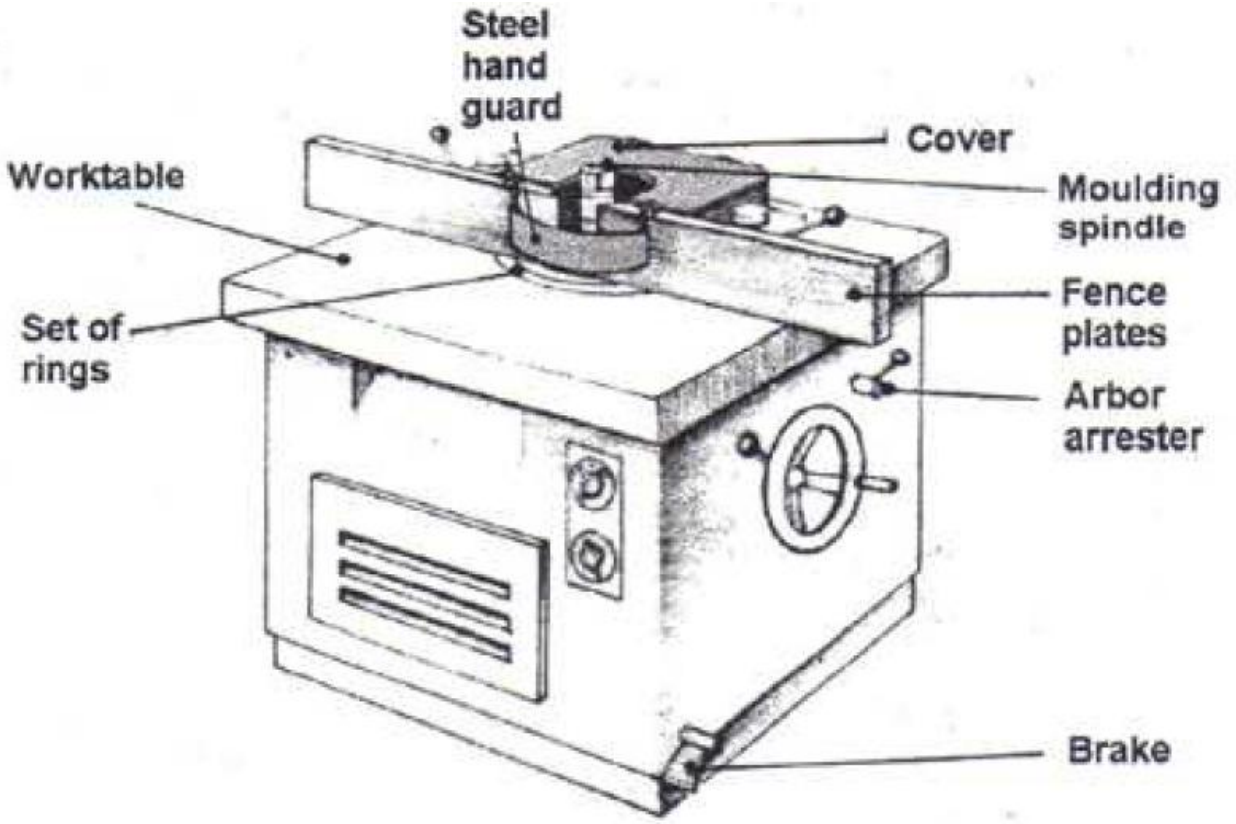
Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information sheet-9	Spindle Moulder



Description of the Spindle Moulder

The Vertical Spindle Moulder or " Spindle" is the most universal and the most interesting of the basic woodworking machines. For the expert wood machinist there is no limit to the operations that can be performed on this machine.

The most common operations done on the spindle moulder are:

- Grooving
- Rebating
- Profiling curved or straights /edges
- Shaping

Apart from this, complete wood joints can be made, such as:

- Half lap
- Mortise and tenon joints
- Tongue and groove joints
- Dovetail joints
- Mitre joints
- Housing joints, etc.

Work Table

- The “Table” (1) is fixed onto the base. It must be of reasonable size (not smaller than 110x80cm).
- It has a circular opening through which the spindle (3) is inserted into the arbor head.
- This opening can be closed up by inserting sets of rings (2) of different diameter.
  1. Wooden fence plates with borings
  2. Steel hand guard
  3. Cover
  4. Screw for adjusting the whole fence
  5. Screw for adjusting the wooden fence plates

  Fence
- The fence rests on the worktable. It can be set at any distance and angle from the spindle to allow for cuts of different depth.
- The “fence plates” (1) should be made of hard wood (Beech wood, Oak,etc.)
- This allows for easy fixing of safety devices and implements with nails or screws.
- Furthermore, wooden fence plates are easily replaced if worn out and will not destroy rotating tools if these are accidentally brought too near to the fence.
- Each fence plate should be adjustable individually in depth and lengthwise.

- **DO NOT use this machine unless you have been instructed in its safe use and operation and have been given permission**

- **PERSONAL PROTECTIVE EQUIPMENT**

.


Safety glasses must be worn at all times in work areas.


Long and loose hair must be contained.


Hearing protection must be worn.


Sturdy footwear must be worn at all times in work areas.


Close fitting/protective clothing must be worn.


Rings and jewellery must not be worn.

PRE-OPERATIONAL SAFETY CHECKS

- ✓ Locate and ensure you are familiar with all machine operations and controls.
- ✓ Ensure all guards are fitted, secure and functional. Do not operate if guards are missing or faulty.
- ✓ Check workspaces and walkways to ensure no slip/trip hazards are present.
- ✓ Ensure cutter is in good condition and securely mounted.

OPERATIONAL SAFETY CHECKS

- ✓ Keep clear of moving machine parts.
- ✓ Follow correct clamping procedures. Keep overhangs as small as possible and check work piece is secure.
- ✓ Ensure you have selected correct speed and rate.
- ✓ Ensure you have set the correct depth of cut.

ENDING OPERATIONS AND CLEANING UP

- ✓ Switch off the machine when work completed.
- ✓ Before making adjustments and measurements or before cleaning swarf accumulations, switch off and bring the machine to a complete standstill.
- ✓ Leave the machine and work area in a safe, clean and tidy state.

POTENTIAL HAZARDS AND INJURIES

- ⓘ Sharp cutters.
- ⓘ Skin irritation.
- ⓘ Moving machine parts.
- ⓘ Eye injuries.
- ⓘ Metal splinters and burrs.
- ⓘ Hair/clothing getting caught in moving machine parts.

DON'T

- ✘ Do not use faulty equipment. Immediately report suspect machinery.
- ✘ Never leave the machine running unattended.
- ✘ Do not leave equipment on top of the machine.

General Rules for Correct Operation

1. Check spindle, spindle collars, locking nut, ensure that all parts are free of dust and dirt.
2. Clean parts as necessary and place them on piece of wood on spindle table.
3. Place small collar on bottom of spindle shaft.
4. Place cutting head on spindle, ensuring that cutters are pointing in cutting direction.
5. Put on other collars.
6. Fasten locking nut gently but firmly. Never run spindle without collars and locking nut securely fastened. Danger of breakage!
7. Use flexible steel hand guard or ring fence.
8. Check all screws and levers for tightness.
9. Release arbor arrester and turn spindle by hand it ensure free run.
10. Check correct speed
11. Make sure that nobody is standing in the dangerous area.
12. Keep the area in front and behind the machine clean in order to assure that you stand safely and firm on the floor
13. Switch on motor; allow coming to full speed before you start to work.
14. Place your hands firmly on work piece.
15. Feed work piece into the cutter head slowly but steadily.

Operation Sheet 22	Set up for Rebating

Step 1- Adjustment of height and depth of cutting head only with machine switched off.
Step 2- Close the opening of the working table as much as possible by using rings.
Step 3- Bring wooden fence plates as near as possible to cutting head.
Step 4- Use special rulers for adjusting the correct height and depth.
Step 5- Close the cover at the back
Step 6- Use flexible steel hand guard
Step 7- Check all screws and levers for tightness
Step 8- Always use a sample piece to test the correct set-up

General Notes on Spindle Tools

- Cutter heads with self-locking knife holders are always to be preferred over other systems
- Do not allow cutters to project too far over the cutter head body! Cutters must be placed well inside the tool
- Do not use cutters with more than one cutting edge.
- Try to use cutters in pairs
- Do not use universal cutter head knives on slotted collars.
- Old planer strip knives are totally unsuitable as material for making profiling knives! When a new cutter is required, use only special cutter blanks. The maximum speeds for spindle tools used in training workshops are listed again hereunder:
- Slotted collar n max=4500 rpm
- Adjustable wobbling saw, 250 mm n max=3500 rpm
- Universal cutter head n max=6000 rpm
- Do not exceed these maximum speeds!

Operation Sheet 23	Rebating along the Grain

Rebate Cutter Head with two pre-Cutters
Flexible Steel Hand Guard

Step 1 Check spindle, spindle collars, locking nut, ensure that all parts are free of dust and dirt.
Step 2 Clean parts as necessary and place them on piece of wood on spindle table
Step 3 Inspect rebate cutter head for sharpness; check fixing of cutters and spurs.
Step 4 Place small collar on bottom of spindle shaft.
Step 5 Place rebate cutter head on spindle, ensuring that cutters are pointing in cutting direction.
Step 6 Put on other collars. The largest collar is placed on the top directly under the locking nut.
Step 7 Fasten locking nut gently but firmly.
Step 8 Adjust height and depth of cut.
Step 9 Close wooden fence plates to leave only little space between fence plates and cutter head.
Step 10 Check all screws and levers for tightness.
Step 11Release arbor arrester and turn spindle by hand it ensure free run.
Step 12 Place flexible steel hand guard in holes in wooden fence plates; ensure sufficient allowance between guard and cutter head.

Step 13 Check correct speeds (6000 rpm)
Step 14 Switch on motor; allow coming full speed
Step 15 Place your hands firmly on work piece
Step 16 Feed work pieces into the cutter head slowly but steadily, from right to left

Rebating along the Grain with Feed Installation

Procedure:

As mentioned above, additional:

1. Adjust the feed installation slight inclined to the feeding direction so that the item is proper pressed against the fence.
2. Use the feed installation also for every test molding

Rebating along the Grain Short Items

Procedure:

As mentioned above, additional:

1. Use a jig for the feeding of work piece
2. Make sure that the jig is big enough to place your hands on it.
3. Cut-out of the jig must have the same size than the work piece so that we have a proper pressure against the fence and the working table
4. For every new work piece is a need of a matching jig.

Operation Sheet 24	**Rebating Across the Grain**

Rebate Cutter Head with 2 Pre Cutters
Flexible Steel Hand Guard
Cut Through Board
Push Block

Step 1 Set up the machine according to steps 1 to 7.
Step 2 Adjust height of cut
Step 3 Fix cut through board to wooden fence plates with two clamps.
Step 4 Release arbor arrester and turn spindle by hand to ensure free run.
Step 5 Check all screws and levers for tightness
Step 6 Check correct speed (6000 rpm)
Step 7 Place flexible steel hand guard in holes on fence plates.
Step 8 Turn on the motor
Step 9 Open right fence fastening screw and cut haft way through board.
Step 10 Close right fence fastening screw and open left one. Complete cut until cutter head projects out of cut through board as desired.
Step 11 Switch off motor and check correct cutting depth
Step 12 Switch on motor.
Step 13 Placed closed left hand flat on work piece and press short end well against fence keeping it well out of reach of the rotating cutter head.
Step 14Take push block in right hand and place behind work piece.
Step 15 Push work piece forward into the cutter head using the push block for safe and easy guidance and to prevent splitting.

Safety with Rebating Across the Grain

Use only soft wood for cutting through boards. Plywood's is unsuitable as it damages the cutter heads. Use small pieces of packing wood on back of fence plates to prevent slipping of clamps.

Moulding of Frame

As mentioned above, additional:

1. Use a special jig to cover the opening in the wooden frame plates.
2. Use a pressure board to press the frame properly against working table.
3. Use a push block to avoid splitting.
4. For large frames use table extension.

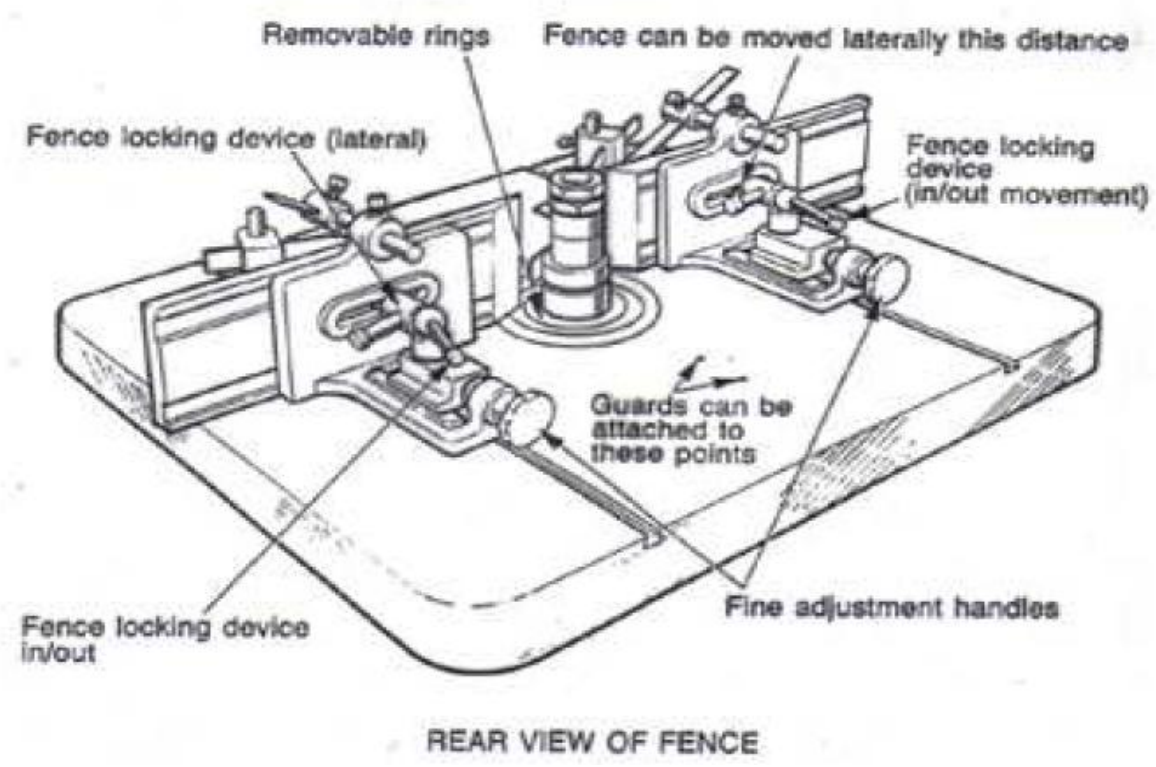


Figure. Illustration of a spindle moulder showing the rear view of the fence

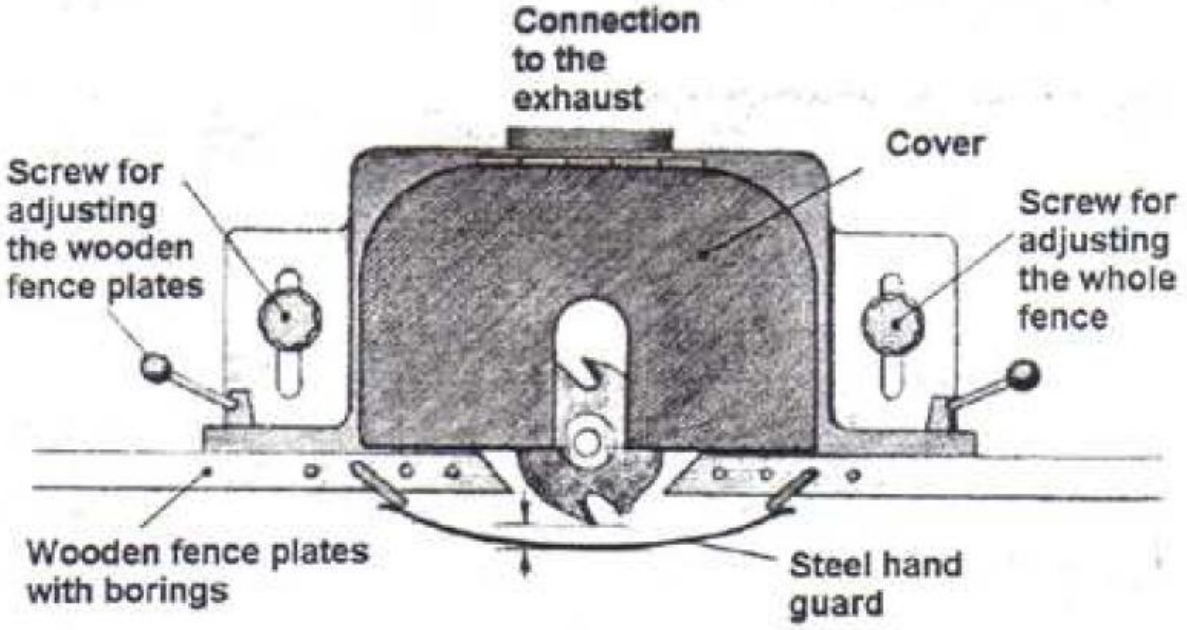


Figure – Illustration showing the top view of the spindle moulder

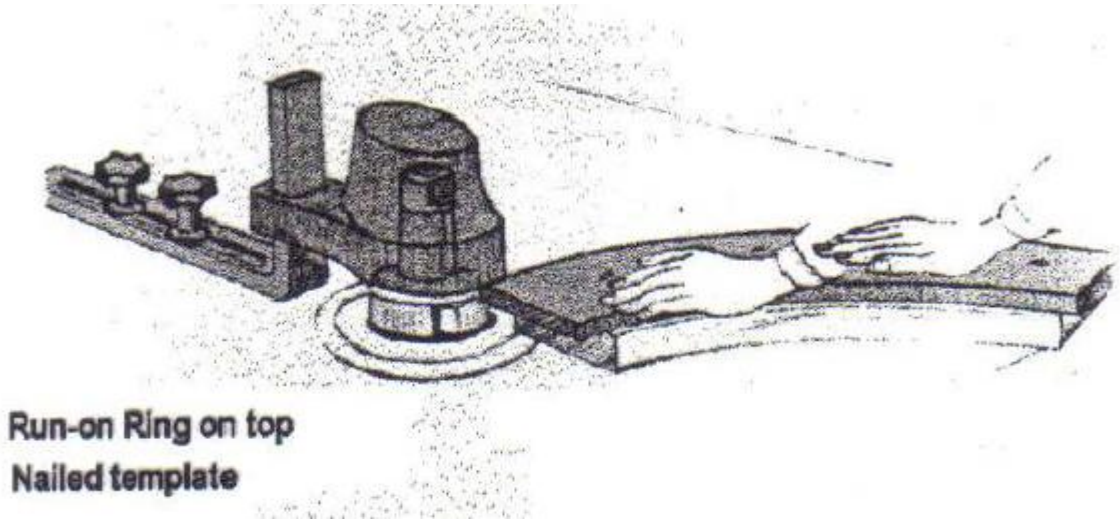
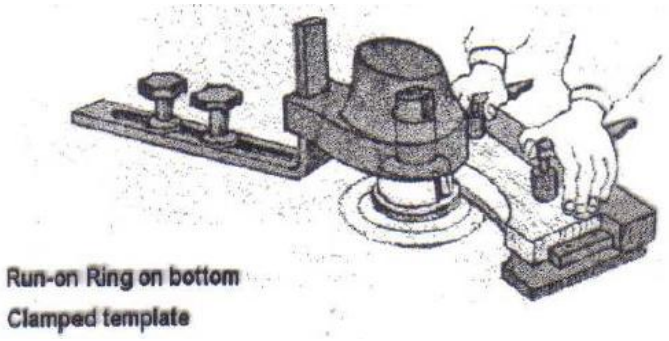


Figure – Illustration of timber shaped with the use of a nailed template, run-on ring on top

Figure – Illustration of run-on ring on bottom, clamped template



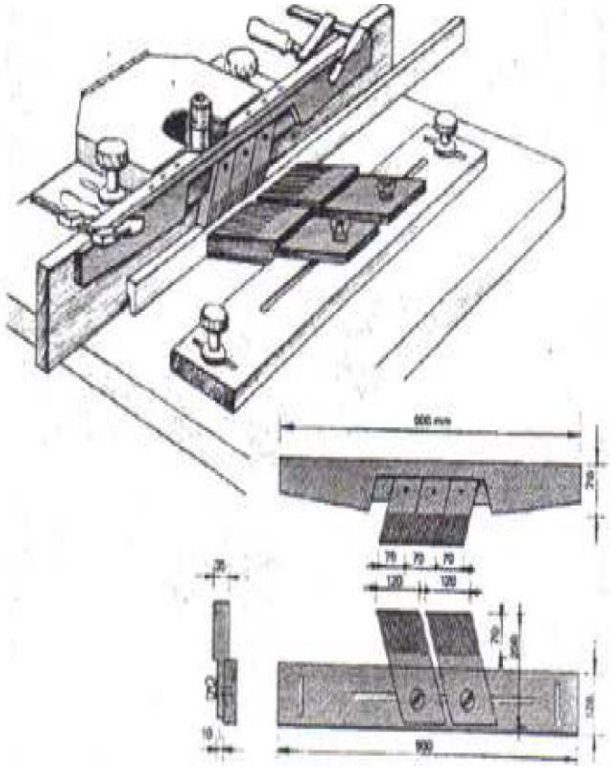


Figure – Illustration showing a featherboar

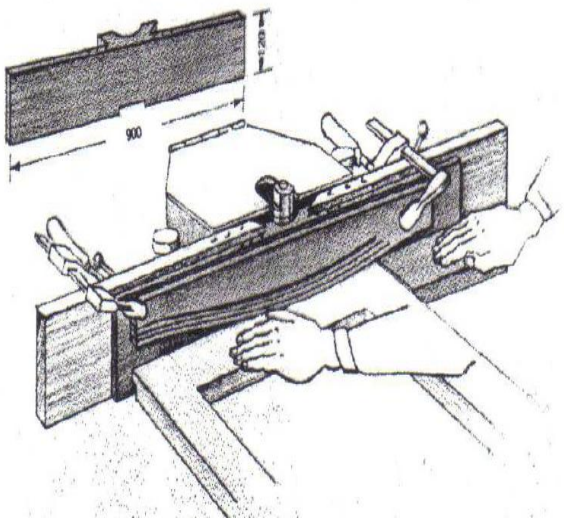
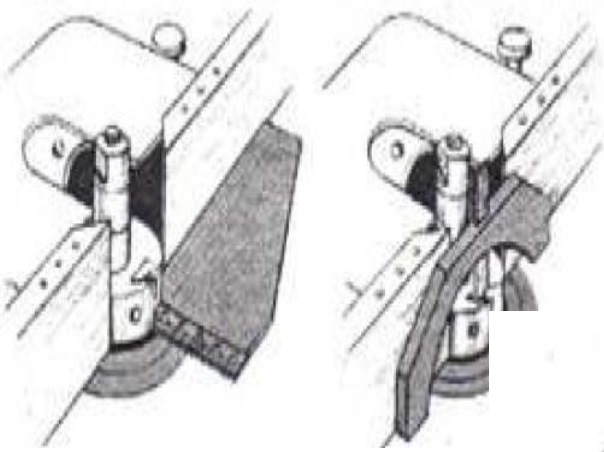


Figure – Illustration showing a frame being moulded



Adjusting of height and depth of with a rebate cutter block

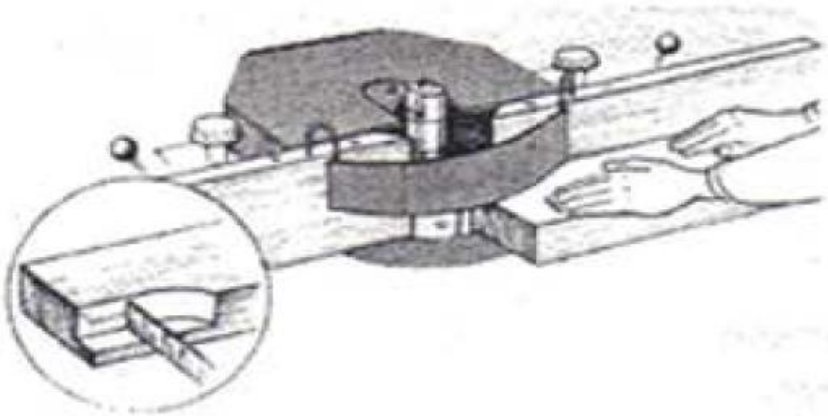


Figure – Proper position for the hand during a cutting operation. Use always a steel hand guard and check your machine set-up with a piece of scrapwood

Self-Check -7	Written Test

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

1) What are the most common operations done on the spindle moulder?

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

You can ask you teacher for the copy of the correct answers.

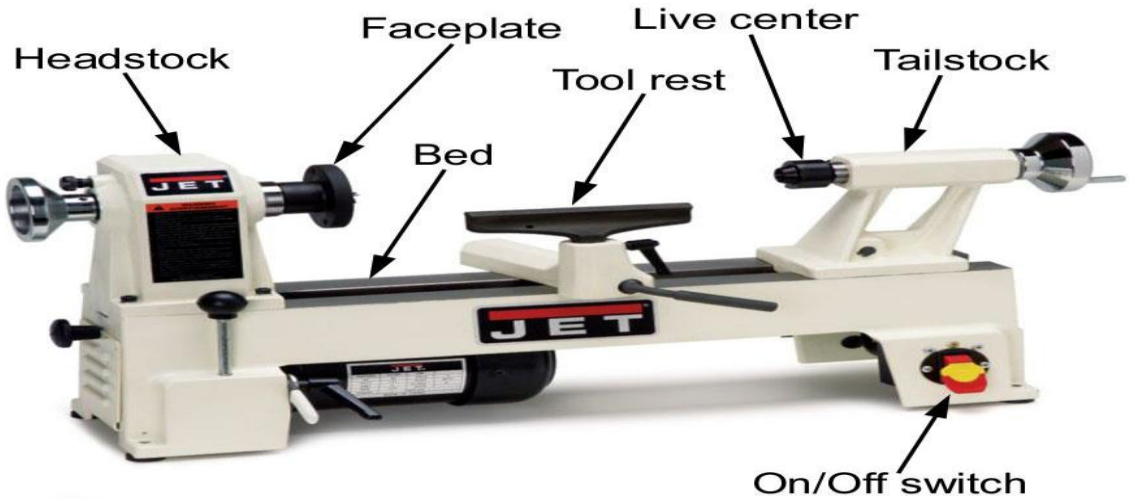
Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information sheet-10	Wood Lathe



The lathe is used to make round or cylindrical shapes. Its primary components are the bed, headstock, tailstock, and tool rest. The work is rotated using a motor in the headstock; various tools are used at the tool rest to shape the work. The tailstock is used to support longer work at the opposite end of the bed. The lathe can be used to make a variety of turned objects, including table or chair legs, spindles, goblets, and bowls.

1. Always wear a face shield and eye protection when operating the lathe.

2. Remove or fasten any loose clothing and roll sleeves above your elbows. Tie long hair up and back.

3. Be sure belt covers are in place and closed.

4. Keep the floor where you are standing clear of chips to provide good footing.

5. Make sure the stock is free from checks, loose knots, or other defects.

6. Make sure the stock is correctly mounted on the lathe.

7. For faceplate turning, carefully select the screws used to secure the work. The screws must be properly sized for the design; they must not contact the cutting tools while you are working. Use a screw in every hole provided in the faceplate.

8. Make sure all screws are tight and check them occasionally.

9. Clamp the tool rest holder and tool rest firmly.

10. Make adjustments to the tool rest only when the lathe is at a complete stop.

11. Keep the tool rest as close as reasonably possible to the stock by frequently stopping the lathe and adjusting the tool rest.

12. Adjust the tool rest height so the cutting edge of the tool is at or just below the center of the work piece.

13. Before turning on the lathe, rotate the stock at least one full revolution by hand to make sure it clears the tool rest and all parts of the lathe.

14. Always hold the turning tool firmly against the tool rest.

15. Remove the tool rest when sanding, polishing, or finishing the workpiece.

16. Use a tailstock with a bearing center (live center) whenever possible.

17. Adjust the tailstock center so that the point is firmly embedded in the stock without impeding free rotation.

18. Run the lathe at slow speed when beginning any turning operation. When the stock is balanced and does not vibrate the speed may be increased.

19. If the lathe vibrates, it is running too fast or the stock is not properly secured. Stop the lathe and correct the problem.

20. The speed selector on a variable speed lathe must be operated only while the lathe is turning. A variable speed lathe does not have a belt which is moved between different sized pulleys to change the speed; it typically has a knob or handle on the front that can be rotated.

21. Stand to the side when starting the lathe.

22. Keep your hands away from the stock while it is rotating.

23. Keep your tools sharp since dull tools are harder to control and leave a rough surface on the work.

24. Stop the lathe to make measurements with calipers.

25. When polishing use a small rag folded in a pad, not wrapped around your finger.

26. Sand and polish only on the underside of the work.

27. A dust mask is recommended when sanding, especially with exotic or splatted woods.

28. Cut faceplate stock round on the band saw before mounting on the faceplate.

29. Allow glued stock or mounting blocks to cure at least 24 hours before using.

30. On faceplate turnings keep an accurate check on cutting depth to avoid striking the mounting screws.

DO NOT use this machine unless you have been instructed in its safe use and operation and have been given permission

PERSONAL PROTECTIVE EQUIPMENT


Safety glasses must be worn at all times in work areas.


Long and loose hair must be contained.


Hearing protection may be required.


Sturdy footwear must be worn at all times in work areas.


Close fitting/protective clothing must be worn.


Rings and jewellery must not be worn.

PRE-OPERATIONAL SAFETY CHECKS

✓ Locate and ensure you are familiar with all machine operations and controls.

✓ Ensure all guards are fitted, secure and functional. Do not operate if guards are missing or faulty.

- ✓ Check workspaces and walkways to ensure no slip/trip hazards are present.
- ✓ Ensure the work-piece has been suitably prepared for the lathe operation.
- ✓ Work-piece must be securely fastened to face plate, chuck or between centres.
- ✓ Adjust speed to suit the diameter of the work and turning operation.
- ✓ Rotate the work-piece by hand to check clearance between tool rest and bed.
- ✓ Ensure the cutting tools are sharp and in good condition.
- ✓ Start the dust extraction unit before using the machine.

OPERATIONAL SAFETY CHECKS

- ✓ Only one person may operate this machine at any one time.
- ✓ Before making adjustments, switch off and bring the machine to a complete standstill.
- ✓ Keep the tool rest adjusted close to the work and at the correct height.
- ✓ Adjust speed to suit the diameter of the work and turning operation.
- ✓ Stop the lathe and remove all tool rests before sanding.

ENDING OPERATIONS AND CLEANING UP

- ✓ Switch off the machine when work completed.
- ✓ Return all chisels and other tools to racks.
- ✓ Remove all tool-rests and place in rack.
- ✓ Leave the machine in a safe, clean and tidy state.

POTENTIAL HAZARDS AND INJURIES

- ⓘ Eye injuries from flying debris or defective timber.
- ⓘ Hair/clothing getting caught in moving machine parts.
- ⓘ Airborne dust.

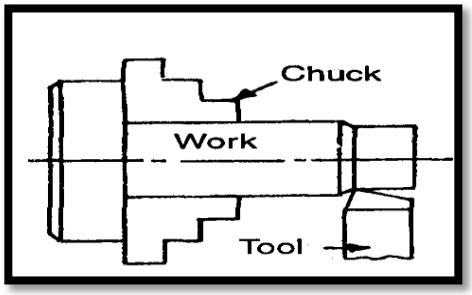
DON'T

- ✘ Do not use faulty equipment. Immediately report suspect equipment.
- ✘ Never leave the machine running unattended.

Lathe Operation

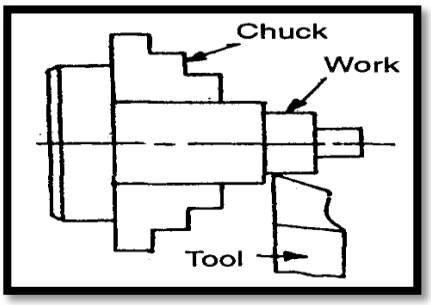
1. Plain turning.

- It is an operation of removing excess material from the surface of the cylindrical work piece.
- In this operation, the work is held either in the chuck or between centers and the longitudinal feed is given to the tool either by hand or power.



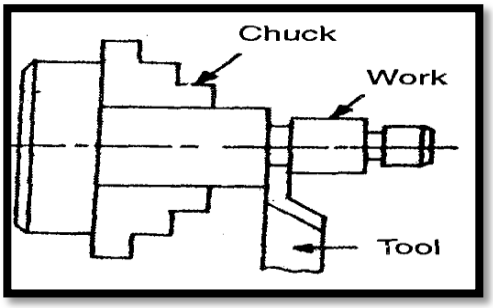
2. Step turning.

- In this type of lathe operation various steps of different diameters in the work peice are produced.
- It is carried out in the similar way as plain turning.



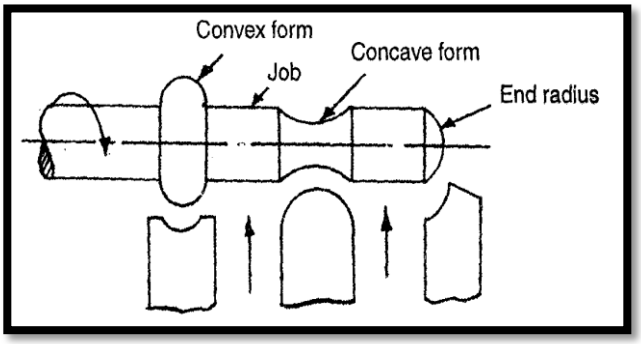
3. Undercutting or grooving.

- It is the process of reducing, the diameter of a work piece over a very narrow surface.
- The work is revolved at half the speed of turning and a grooving tool of required shape is fed straight into the work by rotating the cross-slide screw.



4. Forming.

- It is an operation of turning a convex, concave or any irregular shape.
- Form turning may be accomplished by the following methods (i) Using a forming tool, (ii)



Combining cross land longitudinal feed, (iii) Tracing or copying a template.

5. Spindle Turning

- Spindle turning refers to the process of shaping a piece of wood held between the head stock and the tail stock, where the grain of wood runs parallel to the axis of the lathe.
- It is also known as turning between centers. Scraping tools may be used but you need to sand off to remove the rough surface.

Examples of spindle turned items are;

- table and chair legs,
- furniture legs,
- lamp columns,
- tool and drawers handle, and etc.

6. Face Turning

Face turning is the term used to describe the process of producing circular edges and surfaces, and hollow ends of the work piece mounted on the face plate. Work piece that are face turned usually have their grains running at right angle to the axis of the lathe. Always select a speed appropriate to the diameter of the work or the type of wood you want to turn.

Examples of items that are face turned are;

- ✓ bowls
- ✓ bases for stand
- ✓ Circular tools, etc.

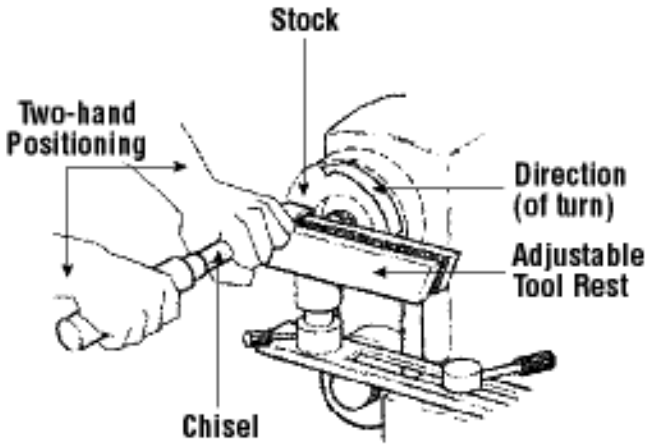
7. Cup chuck turning

Is process of shaping a work piece mounted in a cup chuck. The work piece is first spindle turned and one end slightly tapered to be driven in to the tapered mouth of the cup chuck.

Examples of cup chuck turned items are:-

- egg cups
- salt and pepper shakers, etc

9.4 Turning Tools



Tools used to cut and shape the wood as it turns in the lathe are called turning chisels. Most common shapes are the gouge, skew, round nose, and parting tool. Other types also available such as spear point chisel, facing chisel, etc.

- The gouge is used primarily to rough down the stock to its approximate diameter. It also used to make cove cuts.

Fig - Gouge

- The skew is used often on the wood lathe. It produce finishing cuts to smooth a cylinder and makes bead and v-grooves. The skew also used to scrape faceplate turning.

- The round nose is usually used to scrape faceplate turnings for straight and curved cuts.

☞ The parting tool is a narrow chisel used in a scraping fashion to make narrow grooves for measuring diameters with calipers.

☞ The facing chisel it ranges in size from 12mm to 25mm is slightly beveled along one or both edges for side scraping. It is used for surfacing and rounding convex surfaces and beads when face tuning and also for forming round, beads, and cylinders when center turning.

☞ The spear point chisel is ground to a point of about 60 degree. It is generally used for scraping v-grooves, rounds, and beads, square shoulders and also for flat surfacing. The useful size ranges from 12mm to 18mm.

Factors which determine the best speed

(i) Cutting speed. It is the peripheral speed of the work past the cuttin, tool or the speed, at which the metal is removed by the tool from the work. It is expressed in metres / mm.

(ii) Feed. It is the distance the tool advances for each revolution of-Ihe workpiece. It is expressed in mm / revolution,

(iii) Depth of cut. It is the perpendicular distance measured from the machined surface to the uncut surface of work. It is expressed in mm.

Operation Sheet 25	Procedures of using lathes

Step-1 Learn the components of your lathe. A basic wood lathe consists of a bed, headstock, tailstock, and tool rest. Here are the functions of each of these parts.

- The headstock consists of the drive train, including the motor, pulleys, belts, and spindle, and for a right handed turner, will be located on the left end of the lathe. Mounted on the end of the headstock facing the tailstock is the spindle and the spur center or for face turning such as bowls and plates, or other flat or face work, the face plate assembly.
- This is the tailstock, the crank on the end forces the cup center into the end of the work piece.
- The tail stock is the free spinning end of the lathe, and has the tailstock spindle and the cup center, as well as a hand-wheel or other feature for clamping or securing the work piece between the lathe centers.
- the tool rest is a pretty massive steel assembly, to support the tool while cutting.

The tool rest is similar to a mechanical arm with a metal guide bar to support the chisel or knife used for turning the work piece. It usually can be adjusted by sliding the length of the bed at its base, with an intermediate arm that can swing from a parallel to a perpendicular position in relation to the lathe bed, and the upper arm, which holds the actual tool rest bar. This assembly

has as many as three swivel joints, all of which tighten with a setscrew or clamp to keep it secure while turning is in progress.

Step- 2 Choose the lathe operation you are going to begin with. A simple task might be to turn a square or irregularly shaped piece of wood to a true cylindrical shape, often the first step to forming a spindle or other round item.

Step-3 Select a suitable piece of wood for your project. For a beginner, using a softwood like southern yellow pine, lodge-pole pine, or balsam fir may be a good idea. Look for a piece with fairly straight grain, and few, tight, knots. Never turn a split piece of stock, or one with loose knots, these may separate during turning, and become projectiles traveling at a significant speed.

Step- 4 Square the stock. For example, if you are going to begin with a piece of 2X4 lumber, rip it to a nominally square shape, such as 2X2. You can then chamfer, or bevel the square corners, effectively creating an octagonal piece, which will reduce the amount of wood that must be removed to reach your desired cylindrical shape.

Step-5 Cut the stock to the desired length. For a beginner, starting with a relatively short length, less than 2 foot long for an intermediate, or medium sized lathe, is a good choice. Longer work pieces are difficult to true, and maintaining a uniform diameter along the length of a longer piece can take a lot of work.

Step-6 Mark the center of each end of your stock, and position it between the lathe centers. Assuming the tailstock is not locked in position, slide this until it pushes the cup center into the tail end of your work piece. Using the hand crank, tighten the tailstock spindle so that it pushes the stock into the spur center, mounted on the headstock spindle. Make sure the work piece is securely held, and all clamps are tightened, otherwise, the work piece may fly off the lathe while you are turning.

Step-7 Position the tool rest parallel to the length of the work piece, keeping it far enough back to allow the work piece to rotate without hitting it, but as close as possible. A good working distance is about 3/4 of an inch. Remember, the closer the tool rest is to the turning work piece, the more leverage and better control you will have with your knife (chisel).

Step-8 Free spin, or hand turn the work piece to make sure it doesn't hit the tool rest. It is a good practice to always turn a work piece by hand before turning the lathe on, making sure it has sufficient clearance.

Step-9 Choose the knife you will use for the turning operation. A roughing gouge is a good choice for beginning to turn an irregular or square work piece down to a round shape. Practice holding the knife on the tool rest, using your left (again, for right handed persons) hand on the metal blade behind the tool rest, and your right near the end of the handle. Keeping your elbows in, and braced against your body will give you better control of the tool.

Step-10 Turn the lathe on, making sure it is at the lowest speed setting. Place the cutting edge of the tool on the rest, keeping clear of the rotating work piece, check your grip, and slowly begin easing it toward the work piece. You want to move in toward it perpendicular to the work piece, until the cutting edge just touches the wood. Forcing it or moving too quickly will cause the tool to jam into the wood, and it will either break off, or you will lose your grip on the tool if the lathe doesn't stall out. This is one of the most dangerous steps in beginning turning.

Step-11 Begin moving the cutting edge parallel to the rotation of the work piece, continuing to make a light cut along its length. When using a roughing gouge or similar tool, you can cant, or pitch the tool edge so chips are thrown at an angle from the work piece, so you do not become covered with them while you turn. Twist the tool slightly and observe the flight path of the chips to adjust it so they fly away from you to your right or left.

Step-12 Continue pushing the tool into the stock gradually, in passes, so that you remove a roughly equal amount of wood with each pass. This will eventually cut away the angular corners, leaving your work piece round, and with practice, cylindrical in shape.

Step-13 Stop the lathe frequently when you are just beginning, to check your progress, look for stress cracks in the wood, and clear debris which may begin to accumulate on the lathe bed. You may want to use a pair of calipers to check the diameter of your work piece along its length so you finish with the desired diameter.

Step-14 Smooth the finished round work piece by increasing your lathe speed, and holding your cutting tool so it barely contacts the wood, then moving it slowly along the work piece’s length. The slower your tool movement, and finer, or lighter the cut, the smoother the finished cut will be.

Step-15 Sand the work piece when you are finished cutting if desired. You can sand the stock by hand while it is turning if you use caution. Turn the lathe off, and swing the tool rest out of the way, then select a suitable grit and type of sandpaper for this process. Turn the lathe back on, and hold the paper lightly against the wood, moving it back and forth to prevent removing too much wood from one area of the work piece.

LAP Test	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 3 hours.

Task 1: Interpret work order and locate and apply relevant information

Task 2: Apply safe handling requirements for equipment, products and materials, including use of personal protective equipment

Task 3: Read and interpret cutting lists and job specifications

Task 4: Identified materials used in the work process

Self-Check -8	Written Test

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

Match column A with column B. Select the letter of the correct answer from column B & write your answer on the provided space **in front of the number in column A**

If you wish to change your answer place an x mark on your previous answer and write your preferred answer

Column A	Column B
---------- is an operation of removing excess material from the surface of the cylindrical work piece. (2 points)	Undercutting or grooving
---------- In this type of lathe operation various steps of different diameters in the work piece are produced. (2 points)	Plain turning
----------– t is the process of reducing, the diameter of a work piece over a very narrow surface. (2points)	Step turning
----------refers to the process of shaping a piece of wood held between the head stock and the tail stock, where the grain of wood runs parallel to the axis of the lathe.	Face turning
is the term used to describe the process of producing circular edges and surfaces, and hollow ends of the work piece mounted on the face plate.	Spindle turning

Note: **Satisfactory rating – 6 points** **Unsatisfactory - below 6 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Instruction Sheet	L07.Cleanup work area

This learning guide is developed to provide you the necessary information regarding the following Learning out come and content coverage and topics; –

4.1. Collect and store material

4.2. Remove waste and scrap

4.3. Clean and inspect equipment and work area

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 :–

- Check and minimize waste quantities
- Recycle or discard items that do not meet quality requirements
- Identify and report problems with required work
- Collect and store material for reused
- Remove waste and scrap with workplace procedures
- Clean and inspect equipment and work area for serviceable condition

Learning Instructions:

8. Read the specific objectives of this Learning Guide.
9. Follow the instructions described below.
10. Read the information written in the information “Sheet 1, Sheet 2, and Sheet 3”.
11. Accomplish the “Self-check 1, Self-check 2, and Self-check 3” **in page -4, 6, and 12** respectively.
12. Do the “LAP test” **in page – 12** (if you are ready).

Information Sheet-1	Collect and store material

Collecting, storing and reusing materials

- It is every student's responsibility to clean the shop at the end of class.
- Keep the floor clean and free of scrap material, sawdust, oil, wax, and grease.
- Such mes es cause slips, trips, and falls. If you see it, it is up to you to clean it! No "step-overs."
- Keep work areas clean. Messy work areas are unsafe areas. Always use a hand brush to clean up scrap material, shavings, and sawdust. Never use your hand.
- Always wait for moving parts (blades, drill bits, sanding discs, etc.) to come to a complete stop before removing scrap material or saw dust. Moving parts, no matter how slow, are still a danger.
- Put away leftover wood immediately. Do not leave scrap material behind for someone else to move out of their way. Put away your own material.
- Place electrical cords and vacuums out of the path of travel. To avoid tripping accidents, make certain electrical cords are flat on the floor and not suspended in the air.
- Clean paint brushes immediately after using. Put used rags in the proper container.
- Keep your behavior clean: Absolutely no vulgar, crude, or rude behavior will be tolerated.
- That means no cussing (including the misuse of religious names of God, prophets, or priests), no coarse joking, and no inappropriate touching or show of affection.
- Report all breakage or damage to tools or machinery to the instructor immediately. Moreover, if a machine is running poorly, making an unusual sound, or is out of adjustment, the student shall turn it off immediately, unplug it so that others don't use it, and inform the instructor directly. If conditions of the shop are such that a hazard is beyond the control of the teacher then it will be reported to the principal.

Carrying, moving, storing

- When lifting, keep your back straight and lift with your legs. Do not strain yourself.
- If something is too heavy, ask for help or use a hand-truck, a lever, dolly, jack, wheels, or rollers. If you must strain to lift or carry something then it is too heavy for you.
- Always carry long objects with the front end high enough to avoid hitting someone. If the front end is low, it may not only hit someone, but also strike the ground and put a sudden stop to your movement causing injury to someone following you.
- Any left-over wood should be returned to the proper area immediately, do not leave it behind for someone else. Small specialty wood (oak, maple, walnut, etc.) goes in marked bins. Long specialty wood should be returned to their marked shelves. Other "common
  - Woods" shall be placed in the upright bins. Plywood is stored in plywood racks.

Storage: - Develop a system of racks, bins and tool panels to make it easy to find the right tool or materials quickly. Don't store tools, supplies or spare parts in the aisle or on the floor where they become tripping hazards. Keep other flammable materials away from heaters

and welding areas to prevent fire. Grease, oil, paint and solvents should be stored in a closed metal container, preferably in metal cabinets. Gasoline or other fuels should never be stored inside the shop. Supplies and equipment should be stored in an area designed specifically for them

Self-Check -1	Written Test

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

1. What are methods collecting, storing and reusing materials? (2 points)

Note: **Satisfactory rating – 2 points** **Unsatisfactory - below 2 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet-2	Remove waste and scrap

- **Keep the work area clean.**
  - Safe systems of work are in place and being followed.
  - Keep the floor free of scraps and oil.
  - Cluttered work areas invite accidents.
- Keeping workshop and storage spaces clean and dry can help prevent many accidents.
  - Sparks can ignite scraps, sawdust and solvents.
  - Water can conduct electricity.
  - Do not stand in water, on damp floors or in the rain when working with electrical tools.
  - Keep hands and tools dry.
- Keep wastage of the wood in the garbage cabinet.
- **Housekeeping: -** Each user is expected to clean up after him/her self. Good housekeeping helps ensure long tool life and a safer work area for everyone

Clean tool and equipment

- **Keep tools clean and in good repair.** Always clean up power tools before putting them away. Avoid using tools that are or appear to be in disrepair. Use power tools only, for their intended functions.
- **Repairing and Cleaning Power Tools**:-Always turn off and unplug a power tool before
  (1) Adjusting, oiling, cleaning or repairing it;
  (2) Attaching an accessory;
  (3) Changing bits, blades or grinding wheels. Unplug or lockout tools when not in use. Unplug tools by pulling directly on the plug. Jerking on the cord can cause damage to the tool.
- Do not leave tools, hardware and other materials out when not in use. Before making adjustments or changing bits or cutters, disconnect the power cord to avoid accidentally touching the switch and possible injury when the tool starts.

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Self-Check -2	Written Test

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

1. List the benefit of keep the work area clean? (2 points)

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

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet-3	Clean and inspect equipment and work area

Clean hand tools keep your hand tools in good, clean condition with two sets of rags. One rag should be lint-free to clean or handle precision instruments or components.
The other should be oily to prevent rust and corrosion.

1. **Clean floor jacks**
   Wipe off any oil or grease on the floor jack and check for fluid leaks. If you find any, top up the hydraulic fluid.
   Occasionally, apply a few drops of lubricating oil to the wheels and a few drops to the posts of the safety stands.
2. **Clean electrical power tools**
   Keep power tools clean by brushing off any dust and wiping off excess oil or grease with a clean rag.
   Inspect any electrical cables for dirt, oil or grease, and for any chafing or exposed wires.
   With drills, inspect the chuck and lubricate it occasionally with machine oil.
3. **Clean air powered tools**
   Apply a few drops of oil into the inlet of your air tools every day. Although these tools have no motor, they do need regular lubrication of the internal parts to prevent wear.
4. **Clean hoists and heavy machinery**
   locate the checklist or maintenance record for each hoist or other major piece of equipment before carrying out cleaning activities.
   You should clean operating mechanisms and attachments of excess oil or grease.

A Clean and Safe Workplace

- Poor housekeeping on the job site is a frequent cause of workplace incidents and worker injuries
- These types of incidents can be easily be prevented by keeping the workplace clean.
- Good housekeeping makes jobs more efficient and safe. Housekeeping on the job means cleaning up scrap and debris, putting it in containers, and making sure the containers are emptied regularly.
- It also means proper storage of materials and equipment.
- Good on-the-job housekeeping is one of the easiest ways to improve your safety and that of your co-workers. Poor workplace housekeeping creates incidents waiting to happen.
- We all know how fast rubbish accumulates on site scrap lumber, broken bricks, pieces of drywall, garbage from coffee breaks and lunches.
- Construction rubbish is often irregular in shape, hard to handle, and full of sharp objects. One of the biggest problems is packaging. Too often it gets removed from material and left where it falls. This creates tripping and slipping hazards. It also makes other hazards difficult to see.

- Even worse, it invites more mess. When the site is not cleaned up, no one cares about leaving garbage where it drops.
- People often do not recognize housekeeping as a safety issue until after an incident has occurred. That is when bad housekeeping is revealed.
- Day-to-day housekeeping and cleanliness should not be left for employees to do
- During the last few minutes of the work day. Housekeeping should be an ongoing effort. Whether employees or employers fill out work orders, pick up after each task or clean the workplace themselves, each one plays a role in keeping the job site clean and safe.

All students are responsible for end of class clean up. All machines are shut down seven minutes prior to the end of class to ensure the shop is clean and ready for the next class. This included but not limited to:

- ✓ Projects put away in the appropriate location
- ✓ Wood is either recycles or places in the storage bins
- ✓ Saw dust is cleaned up, floors are swept
- ✓ Machines are swept down
- ✓ Work stations/tables are cleaned
- ✓ Tools put away in their proper places
- ✓ Report any problems that may be associated with the equipment (e.g., funny noises, dull blades, etc.)

What is housekeeping?

When we think of "housekeeping" we tend to think of the common phrase: "A place for everything and everything in its place." But housekeeping means more than this. Good housekeeping means having no unnecessary items about and keeping all necessary items in their proper places.

What's so important about housekeeping?

Think about what could happen if a bunch of oily rags suddenly caught fire one night, or if, in an emergency, employees couldn't get out of the work area safely because aisles were cluttered. Imagine those same employees unable to get out altogether because of a blocked exit.

Experience has shown that good housekeeping is an essential part of your company's health and safety program.

What are the benefits of good housekeeping at work?

Good housekeeping at work benefits both employers and employees alike. Good housekeeping can:

- eliminate clutter which is a common cause of accidents, such as slips, trips, and falls, and fires and explosions;
- reduce the chances of harmful materials entering the body (e.g., dusts, vapours);
- improve productivity (the right tools and materials for the job will be easy to find);
- improve your company's image (good housekeeping reflects a well-run business. An orderly workplace will impress all who enter it – employees, visitors, customers, etc.
- help your company to keep it's inventory to a minimum (good housekeeping makes it easier to keep an accurate count of inventories);
- help your company to make the best use of its space;
- make the workplace neat, comfortable and pleasant – not a dangerous eyesore.

Keeping work areas organized and clean can help make work safer, healthier and easier

What are some signs of poor housekeeping?

There are many signs of poor housekeeping. You may recognize some of these in your own workplace:

- cluttered and poorly arranged work areas;
- untidy or dangerous storage of materials (for example, materials stuffed in corners; overcrowded shelves);
- dusty, dirty floors and work surfaces;
- items that are in excess or no longer needed;
- blocked or cluttered aisles and exits;
- tools and equipment left in work areas instead of being returned to roper storage places;
- broken containers and damaged materials;
- overflowing waste bins and containers;
- spills and leaks.

How to improve housekeeping in your workplace

Good housekeeping requires effort and teamwork, but it's worth it. Here are some general pointers:

- Set housekeeping standards. Make sure they are clear, objective and attainable. Standards should make work easier, safer and healthier. It is best to involve employees when setting standards.
- Measure how well the standards are met. (Remember: what gets measured gets done.)
- Use checklists to help you to systematically measure housekeeping. (See page 3 for a sample checklist.)
- Provide positive feedback. Let employees know how well they are doing and how to improve.
- Encourage housekeeping as a way of life – not just a special activity when visitors are coming.

Whether your workplace is an office, plant, store, or warehouse, here are some recommended housekeeping practices:

- Follow safe work procedures and the requirements of the law.
- Keep work areas clean.
- Keep aisles clear.
- Keep exits and entrances clear.
- Keep floors clean, dry and in good condition.
- Vacuum or wet sweep dusty areas frequently.
- Stack and store items safety.
- Store all work materials (for example, paper products, flammable liquids, etc.) in approved, clearly labelled containers in designated storage areas only.
- Use proper waste containers.
- Keep sprinklers, fire alarms and fire extinguishers clear.
- Clean up spills and leaks of any type quickly and properly.
- Clean and store tools, items and equipment properly.
- Fix or report broken or damaged tools, equipment, etc.
- Keep lighting sources clean and clear.
- Follow maintenance requirements.

Inspection

- A critical appraisal involving examination, measurement, testing, gauging and comparison of material or item
- It determines if the material, equipment, facility etc… are in accordance with standards

Procedures in Conducting a Maintenance Inspection Activity

1. Prepare a **Standard Checklist**. Checklist should be very detailed and stringent based on the set of standard values for inspection.
2. Implement a **periodic clean-up schedule**; and an **award and sanction scheme**
3. Evaluate **workstations** according to the Standard Checklist

Tips in preparing a checklist

- ✓ Keep it simple – one page per checklist.
- ✓ Follow a logical sequence
- ✓ Use bullet or enumerated points, as possible
- ✓ Avoid making assumptions

Sample Checklist

WORK AREA

Y	N	Criteria
☐	☐	1. Is flooring clear of obstacles and spilled substances?
☐	☐	2. Are aisles, exits and traffic areas clear?
☐	☐	3. Are walls clear and clean?
☐	☐	4. Is ceiling free from cobwebs?
☐	☐	5. Are equipment arranged for the purpose of safety and ease in maintenance?
☐	☐	6. Is work area organized and kept clear of trash and other hazards?
☐	☐	7. Are trash and waste materials properly thrown out?
☐	☐	8. Are there appropriate and sufficient cleaning supplies for the work area?

LAP Test	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 6 hours.

Task 1: Reuse material that can be collect and store.

Task 2: Remove Waste and scrap following workplace procedures.

Task 3: Cleaned and Inspected equipment and work area for serviceable condition in accordance with work place procedures.

Self-Check -3	Written Test

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

2. What are some signs of poor housekeeping? (2 points)
3. How to improve housekeeping in your workplace? (2 points)
4. List procedures in conducting a maintenance inspection activity? (2 points)

Note: **Satisfactory rating – 6 points** **Unsatisfactory - below 6 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Reference:

1. *Yale Environmental Health & Safety*

2. *OCTE toolSAFE* ***TCJ Construction Technology***

3. *UC Davis Shop Safety Manual*

4. ***ERNEST JOYCE*** *The Technique of* ***FURNITURE MAKING*** *Fourth Edition • Revised by* ***ALAN PETERS*** *First published 1970 Reprinted, 2000*

5. *The complete Book of stationary poma tool techniques 1988 R.J.ED cristofore.*

6. *Wood machining complete guide to effective and safe working practice 1987, N.S Voisey*

7. *operation of modern woodworking machines NERMAN HJORTH,WILLIAM F.*