

# BA SANGAM COLLEGE

YEAR 13

## APPLIED TECHNOLOGY

### WORKSHEET 4

#### Previous Knowledge

Students have some prior knowledge on topic which was done last year in Year/Level 12/ 2019.

#### **Learning Outcomes**

##### **STRAND OUTCOME**

After completing this strand students will be able to know different types of machines used in woodwork.

All of the pictures and information about machinery shown below is a rough guide to show some of the most common and useful machines used in woodwork.

#### **Band Saw:**

A band saw is a piece of machinery that is used to cut angled or curved shapes on a piece of wood. The band saw has the same function as a jigsaw only it is much larger and instead of moving the saw to cut the wood like on a jigsaw you move the wood around the blade.

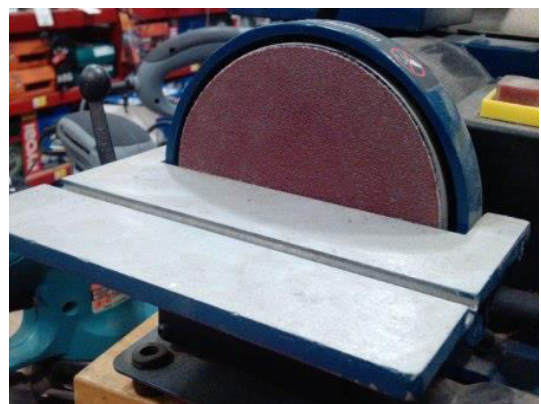
#### **Parts it consists of:**

A band saw actually has a continuous metal blade inside its casing that is rotated around with wheels. Because of this when the blade is damaged a new band needs to be bought and installed which is a bit more difficult than installing separate blades.

A band saw has a base which supports the timber when cutting and the user can either free cut or run their timber along a rail which is used to cut timber at the same width.

#### **Disc Sander:**

A disc sander is machinery that is used to sand the end grain of a piece of timber. It uses a circular sanding motion to sand the wood which is why it is only good



for end grain because it makes deep scratches on faces or edges that are sanded with the machine.

### **Parts it consists of:**

Disc sanders use a large sanding disc to sand the end grain of timber and it spins at high speeds in a circular clockwise motion which prevents the timber from flying out of your hands.

If a piece of timber is sanded on the wrong side of the sanding disc it will be very hard to hold and will probably come loose from your grip.

### **Drop Saw:**

Drop saws are one of the most common machines that people buy for cutting timber because they are versatile and easy to use.

The drop saw replaces the hand saw because it is much quicker and can cut or trim large piece of timber and the blade can also be turned at an angle for cutting things like mitre joints.

Drop saws come in a range of sizes and prices but usually the more expensive models are the larger and more advanced ones.

### **Parts it consists of:**

The drop saw cuts with a circular blade like on a table saw and they can be a range of different sizes. A drop saw is used by placing a piece of timber on its base and pulling the handle down while pressing the trigger to cut.

Almost all drop saw machinery now come with the feature of being able to turn the blade on an angle for angled cuts with another handle or button at the base of the machine. The drop saw also has a retractable plastic guard to prevent accidents when cutting.

### **Linisher:**

A linisher is the machine version of a portable belt sander and it works exactly the same way as one. This machine is the opposite to a disc sander which is only for end grain where the linisher is for the edges and faces of a piece of timber.

Because the linisher is used to sand the edges and faces of timber you have to make sure you are sanding with the grain or the linisher will leave deep scratches on your timber.



**Parts it consists of:**

The finisher works like a portable belt sander which is with some drums that are turned at high speed causing a sanding belt that is mounted on the drums to turn at high speed as well.

**Mortising Machine:**

A mortising machine is a special type of machine that has a special drill bit which can bore out square holes.

Mortising machinery is designed specifically to make mortises for mortise and tenon joints and they are much more quick and easy to use than making the joint with a mallet and chisel.

**Parts it consists of:**

A mortising machine is really just a bench mounted pedestal drill that can only make square holes. There are only a few different sized mortising drill bits and the machine is operated the same way as a pedestal drill.

## ACTIVITY

(e) Study the diagram given below and answer the questions that follow.



(i) Name the portable machine shown in the diagram above.

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(ii) State **one** advantage of using this machine.

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(iii) State **one** safety precaution that needs to be followed while using the machine.

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(iv) Name the **portable machines** that can be used for the following operations:

I. Boring holes for a dowel joint.

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II. Cutting and grinding metal.

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## LESSON PLAN

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| <b>Subject:</b> Applied Technology           | <b>Year/Level:</b> 13 |              |
| <b>Week:</b> 4                               | <b>Lesson 2</b>       | <b>Date:</b> |
| <b>Topic:</b> Motorized Machines and Engines |                       |              |

### Previous Knowledge

Students have some prior knowledge on topic which was done last year in Year/Level 12/ 2019.

## Learning Outcomes

### STRAND OUTCOME

After completing this strand students will be able to know different types of machines used in woodwork.

#### **Pedestal Drill:**

Pedestal drills are like a much larger version of a cordless drill only they are either bench mounted or they stand on the floor.

Pedestal drills are much more accurate than any other drilling method because the user has the ability to clamp down what they are drilling and they can drill holes in larger materials.

#### **Parts it consists of:**

Pedestal drills also use a motor to rotate a drill bit at high speed and they can take any sized drill bit.

Instead of a trigger operation pedestal drills work with a button and the user then pulls the handle down to lower the drill bit so it is a good idea to secure the object down with a vice or clamp



### **Scroll Saw:**

This machinery is very similar to jigsaws and band saws only they are used for cutting much smaller and thin pieces of timber that are too hard or difficult to cut with a band saw or jigsaw.

The scroll saw sounds a bit like a waste of money but it is used to cut more intricate curves and shapes that cannot be achieved with a band saw or jigsaw and take too long with a coping saw.

### **Parts it consists of:**

The scroll saw also has a base like a band saw where the wood is fed to the blade only it is more compact than a band saw and the blade isn't as long.

The scroll saw also does not have a continuous blade like a band saw it uses individual blades like a jigsaw which means they are easier to change and are usually cheaper.



### **Table Saw:**

Table saws are one of the most versatile and useful pieces of machinery used in woodwork because they can cut large pieces of timber or manufactured boards with ease. Table saws can also cut angles and they are able to trim or square off the ends of timber.

### **Parts it consists of:**

A table saw has a height adjustable circular blade that comes out of the base of the machine. Most table saws have two runners and one slides up and down the base to give the user extra support and stability when cutting.

Table saws are usually more expensive machinery because they are very versatile, quite large and contain mostly all metal components.



## **Thicknesser:**

A thicknesser is used to smooth rough timber or reduce its thickness and it is the machine equivalent for a hand planer or electric planer only it can plane much larger pieces of timber much quicker than the other two planers.

A thicknesser can be easily adjusted to suit different thicknesses and it has an almost limitless choice of thicknesses.

### **Parts it consists of:**

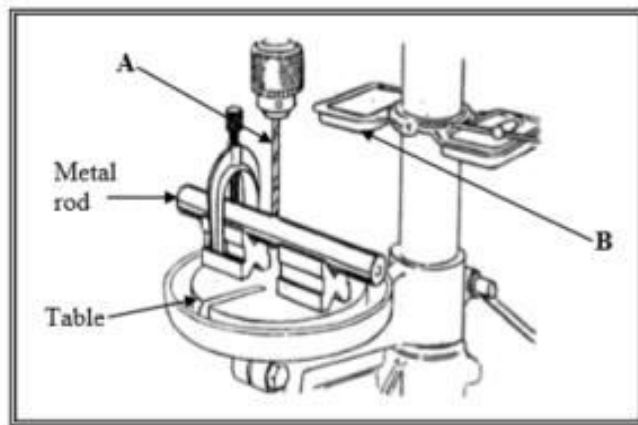
A thicknesser works with two rollers that feed the timber into the blades and then push it out after it has been thicknessed.

In the middle of this machinery is a height adjustable set of blades which are used to remove certain amounts of timber depending on the adjustment settings of the machine.



## ACTIVITY

Study the diagram of a drilling process given below and answer the questions that follow.



- (i) Name the best material for the part labelled A. Give a reason for your choice.

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- (ii) Explain why copper is the most suitable material for the part labelled B.

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- (iii) State one property of mild steel.

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## LESSON PLAN

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| <b>Subject:</b> Applied Technology  | <b>Year/Level:</b> 13 |              |
| <b>Week:</b> 4  | <b>Lesson 3</b>       | <b>Date:</b> |
| <b>Topic:</b> APPLIED ENGINEERING [ <b>Motorized Machines and Engines</b> ] |                       |              |

### Previous Knowledge

Students have some prior knowledge on topic which was done last year in Year/Level 12/ 2019.

## **Learning Outcomes**

### **STRAND OUTCOME**

After completing this strand students will be able to know different types of machines used in woodwork.

### **Woodworking lathes]**

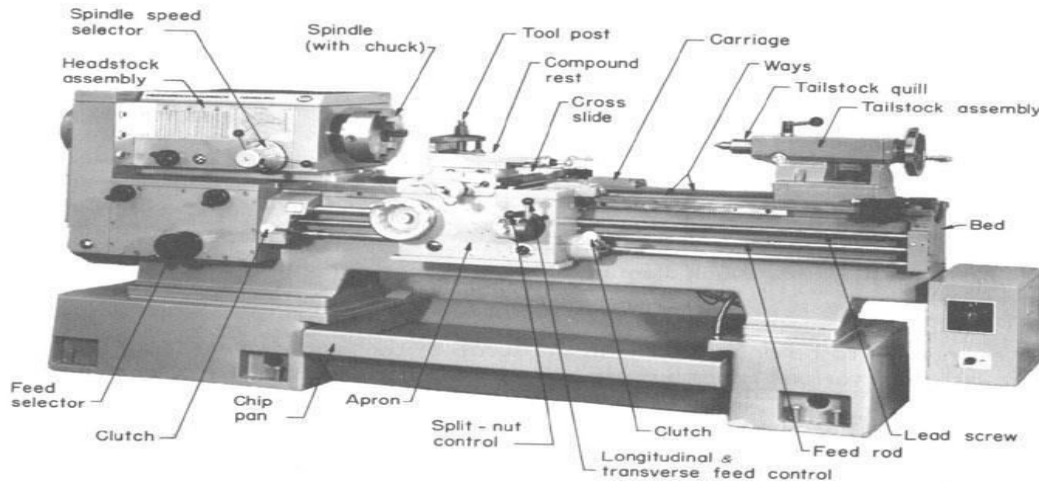
Woodworking lathes are the oldest variety. All other varieties are descended from these simple lathes. An adjustable horizontal metal rail –the tool rest –between the material and the operator accommodates the positioning of shaping tools, which are usually hand-held. After shaping, it is common practice to press and slide sandpaper against the still-spinning object to smooth the surface made with the metal shaping tools. The tool rest is usually removed during sanding, as it may be unsafe to have the operators hands between it and the spinning wood.



Many woodworking lathes can also be used for making bowls and plates. The bowl or plate needs only to be held at the bottom by one side of the lathe. It is usually attached to a metal face plate attached to the spindle. With many lathes, this operation happens on the left side of the headstock, where are no rails and therefore more clearance. In this configuration, the piece can be shaped inside and out. A specific curved tool rest may be used to support tools while shaping the inside.

# Metal lathe

In a [metalworking lathe](#), metal is removed from the work piece using a hardened [cutting tool](#), which is usually fixed to a solid moveable mounting, either a tool-post or a turret, which is then moved against the work piece using hand wheels and/or computer-controlled motors. These cutting tools come in a wide range of sizes and shapes, depending upon their application. Some common styles are diamond, round, square and triangular.



Explanation of the standard components of most lathes:

**Bed:** Usually made of cast iron. Provides a heavy rigid frame on which all the main components are mounted. **Ways:** Inner and outer guide rails that are precision machined parallel to assure accuracy of movement. **Headstock:** mounted in a fixed position on the inner ways, usually at the left end. Using a chuck, it rotates the work.

**Gearbox:** inside the headstock, providing multiple speeds with a geometric ratio by moving levers.

**Spindle:** Hole through the headstock to which bar stock can be fed, which allows shafts that are up to 2 times the length between lathe centers to be worked on one end at a time.

**Chuck:** 3-jaw (self-centering) or 4-jaw (independent) to clamp part being machined. **Chuck:** allows the mounting of difficult work pieces that are not round, square or triangular.

**Tailstock:** Fits on the inner ways of the bed and can slide towards any position the headstock to fit the length of the work piece. An optional taper turning attachment would be mounted to it.

**Tailstock Quill:** Has a Morse taper to hold a lathe center, drill bit or other tool.

**Carriage:** Moves on the outer ways. Used for mounting and moving most the cutting tools.

**Cross Slide:** Mounted on the traverse slide of the carriage, and uses a hand wheel to feed tools into the work piece.

**Tool Post:** To mount tool holders in which the cutting bits are clamped. **Compound Rest:** Mounted to the cross slide, it pivots around the tool post.

**Apron:** Attached to the front of the carriage, it has the mechanism and controls for moving the carriage and cross slide.

**Feed Rod:** Has a keyway, with two reversing pinion gears, either of which can be meshed with the mating bevel gear to forward or reverse the carriage using a clutch.

**Lead Screw:** For cutting threads.

**Split Nut:** When closed around the lead screw, the carriage is driven along by direct drive without using a clutch.

**Quick Change Gearbox:** Controls the movement of the carriage using levers.

**Steady Rest:** Clamped to the lathe ways, it uses adjustable fingers to contact the work piece and align it. Can be used in place of tailstock or in the middle to support long or unstable parts being machined.

**Follow Rest:** Bolted to the lathe carriage, it uses adjustable fingers to bear against the work piece opposite the cutting tool to prevent defl

## LESSON PLAN

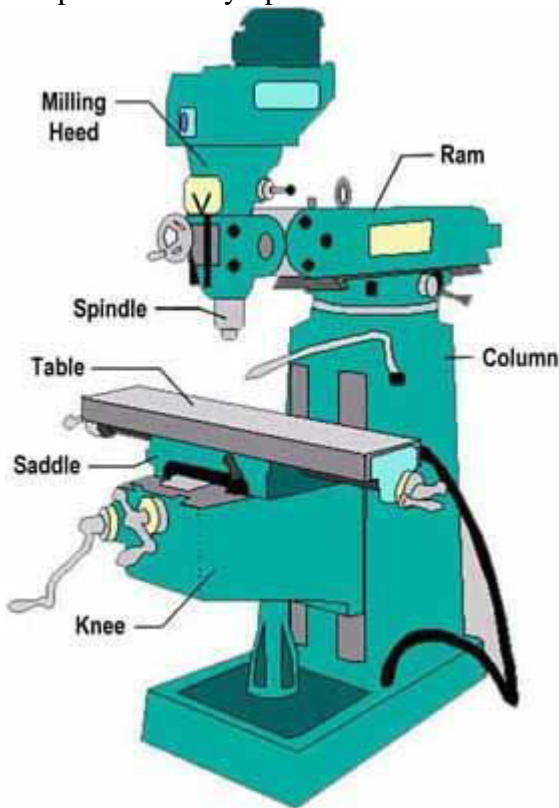
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| <b>Subject:</b> Applied Technology                                 | <b>Year/Level:</b> 13 |              |
| <b>Week:</b> 6   | <b>Lesson 4</b>       | <b>Date:</b> |
| <b>Topic:</b> APPLIED ENGINEERING [Motorized Machines and Engines] |                       |              |

### STRAND OUTCOME

After completing this strand students will be able to know different types of machines used in woodwork.

### Vertical Milling Machines

Milling is a process performed with a machine in which the cutters rotate to remove the material from the work piece present in the direction of the angle with the tool axis. With the help of the milling machines one can perform many operations and functions starting from small objects to large ones.



Milling machining is one of the very common manufacturing processes used in machinery shops and industries to manufacture high precision products and parts in different shapes and sizes.

## **Milling Machine**

The milling machines are also known as the multi-tasking machines (MTMs) which are multi-purpose machines capable of milling and turning the materials as well. The milling machine has got the cutter installed up on it which helps in removing the material from the surface of the work piece. When the material gets cooled down then it is removed from the milling machine.

### **Milling Process**

The milling machine involves the following processes or phases of cutting:

### **Milling Cutters**

There are a lot of cutting tools used in the milling process. The milling cutters named end mills have special cutting surfaces on their end surfaces so that they can be placed onto the work piece by drilling. These also have extended cutting surfaces on each side for the purpose of peripheral milling. The milling cutters have small cutters at the end corners. The cutters are made from highly resistant materials that are durable and produce less friction.

### **Surface Finish**

Any material put through the cutting area of the milling machine gets regular intervals. The side cutters have got regular ridges on them. The distance between the ridges depends on the feed rate, the diameter of the cutter and the quantity of cutting surfaces. These can be the significant variations in the height of the surfaces.

### **Gang Milling**

This means that more than two milling cutters are involved in a setup like the horizontal milling. All the cutters perform a uniform operation or it may also be possible that the cutter may perform distinct operations. This is an important operation for producing duplicate parts.

### **Types of Milling Machines**

The two main configurations of the milling machining operations are the types of milling machines. These are the vertical mill and the horizontal mill. They are further discussed below:

#### **Vertical Milling Machines**

The vertical mill has a vertically arranged spindle axis and rotate by staying at the same axis. The spindle can also be extended and performing functions such as drilling and cutting. Vertical mill has got two further categories as well: turret mill and bed mill.

The turret mill has got a table that moves perpendicularly and parallel to the spindle axis in order to cut the material. The spindle is, however, stationary. Two cutting methods can be performed with this by moving the knee and by lowering or raising the quill.

The other is the bed mill in which the table moves perpendicular to the axis of the spindle and the spindle moves parallel to its axis.

## ACTIVITY

The Drill Press is one of the safest workshop machines used for drilling holes and other operations using special attachments.

- (i) Name two other operations other than drilling that can be carried out on the Drill Press.

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- (ii) Use a sketch to show the method of holding a cylindrical metal piece while drilling holes using a Drill Press.

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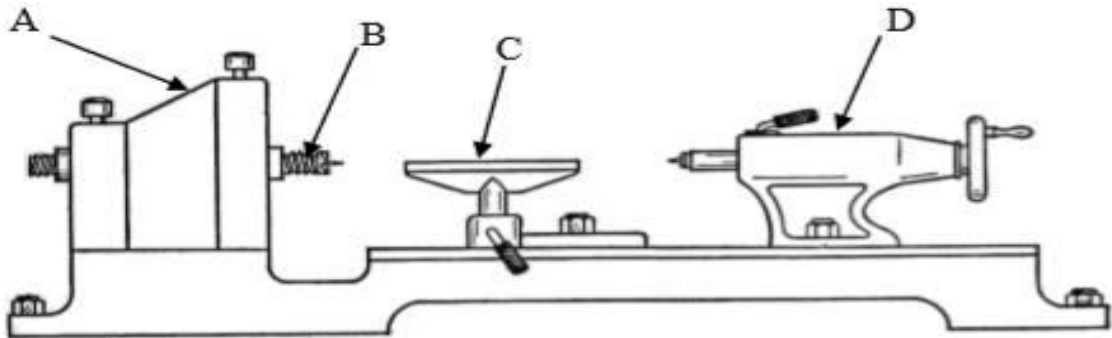
- (iii) State a limitation of a Drill Press.

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(b) Study the diagram of a Wood working lathe given below and answer the questions that follow.



- (i) Name the parts labeled A and D.

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- (ii) Explain the functions of the parts labeled B and C.

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(c) A Band Saw is a versatile machine used to cut curves and straight lines in thin and thick material such as woods, plastics and metals.

(i) State one adjustment that needs to be made before starting the machine.

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(ii) Give a reason for the breakage of Band Saw blades.

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## LESSON PLAN

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| <b>Subject:</b> Applied Technology                                 | <b>Year/Level:</b> 13 |              |
| <b>Week:</b> 4   | <b>Lesson</b> 5       | <b>Date:</b> |
| <b>Topic:</b> APPLIED ENGINEERING [Motorized Machines and Engines] |                       |              |

### STRAND OUTCOME

After completing this strand students will be able to know different types of machines used in woodwork.

### Horizontal Milling Machines

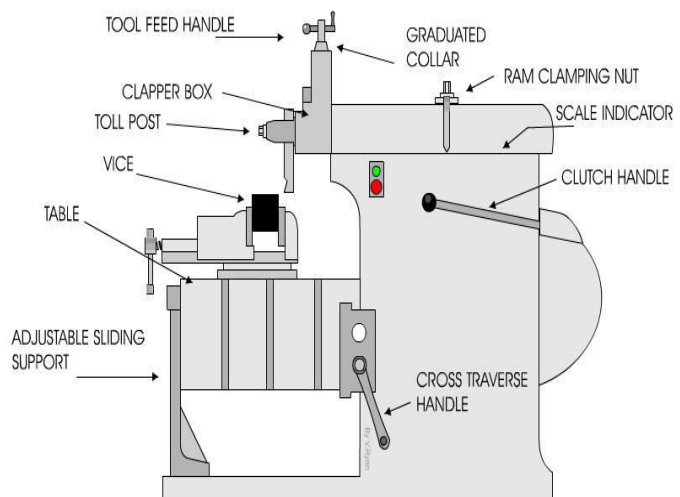
The horizontal mill is also the similar cutter but their cutters are placed on a horizontal arbor. A lot of horizontal mills have got rotary tables that help in milling in various angles. These tables are called the universal tables. Apart from this all the tools that are used in a vertical mill can also be used in the horizontal mill.

### Shaping Machine

A shaping machine is used to machine surfaces. It can cut curves, angles and many other shapes. It is a popular machine in a workshop because its movement is very simple although it can produce a variety of work.

### The main parts are indicated below:

The tool feed handle can be turned to slowly feed the cutting tool into the material as the 'ram' moves forwards and backwards. The strong machine vice holds the material securely. A small vice would not be suitable as the work could quite easily be pulled out of position and be damaged. The vice rests on a steel table which can be adjusted so that it can be moved up and down and then locked in position. Pulling back on the clutch handle starts the 'ram' moving forwards and backwards



## Hydraulic Press

A hydraulic press is a device (see machine press) using a hydraulic cylinder to generate a compressive force.

The hydraulic press depends on Pascal's principle: the pressure throughout a closed system is constant. One part of the system is a piston acting as a pump, with a modest mechanical force acting on a small cross-sectional area; the other part is a piston with a larger area which generates a correspondingly large mechanical force. Only small-diameter tubing (which more easily resists pressure) is needed if the pump is separated from the press cylinder.



Pascal's law: Pressure on a confined fluid is transmitted undiminished and acts with equal force on equal areas and at 90 degrees to the container wall.

The distance the large piston will move is the distance that the small piston is moved divided by the ratio of the areas of the heads of the pistons. This is how energy, in the form of work in this case, is conserved and the law of conservation of energy is satisfied. Work is force applied over a distance, and since the force is increased on the larger piston, the distance the force is applied over must be decreased.

### Application

Hydraulic presses are commonly used for forging, clinching, moulding, blanking, punching, deep drawing, and metal forming operations.



**ACTIVITY**

1. State the function of Hydraulic Press?

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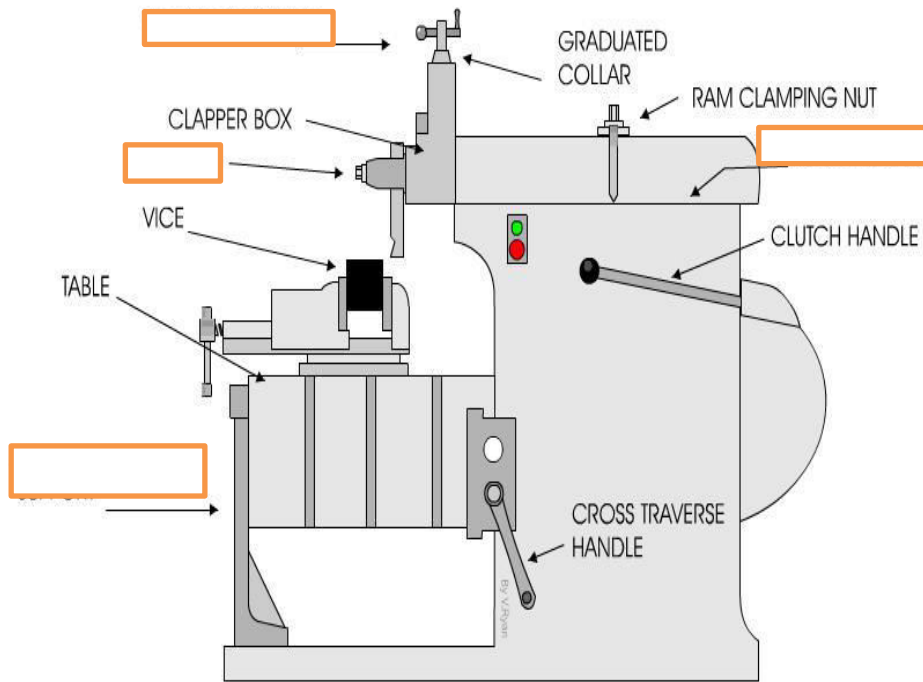


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2. Label the missing machine parts



b.

