

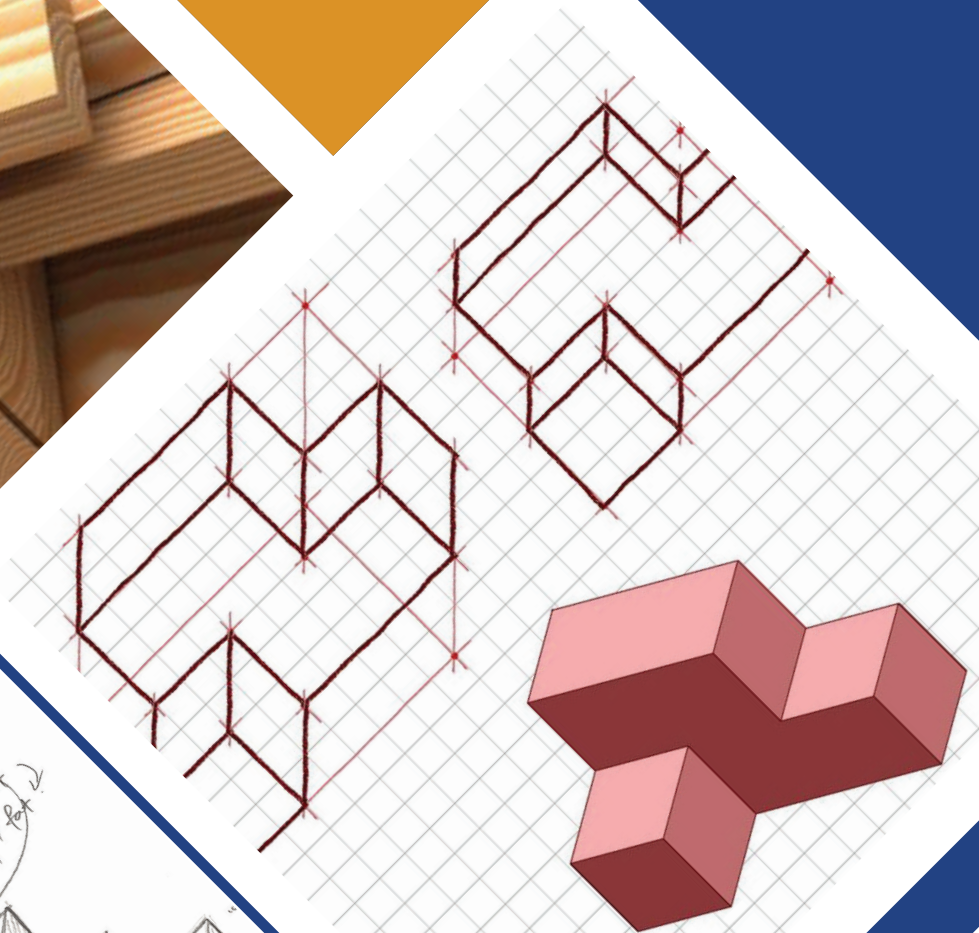
GRADE
7

DESIGN & REALISATION

WOOD TECHNOLOGY

FOUNDATION PROGRAMME

IN NUMERACY AND LITERACY SKILLS



Mauritius Institute of Education

under aegis of

Ministry of Education and Human Resources

GRADE

7

DESIGN & REALISATION

WOOD TECHNOLOGY

FOUNDATION PROGRAMME

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ICONS

Icons are included throughout the units to guide you through the textbook.



Activities to be done by the student



Case study



Research work to be carried out



Key terms or important words



Notes to educators

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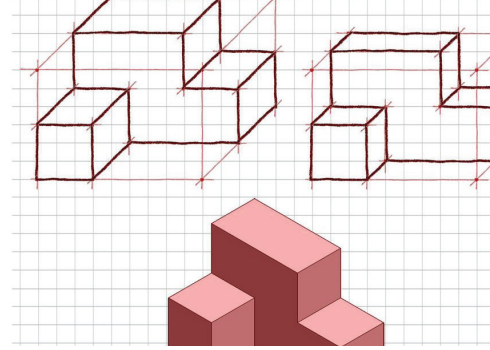
UNIT
01

**PICTORIAL
PROJECTION**
OBLIQUE

NOTE TO EDUCATORS



1. Educators should ensure that students know how to count the squares on the square grid and use them as units of measurement. Students should be able to count the height, width and depth of simple cuboid, as explained in Case study 1.
2. Students should become familiar with the concepts of depth and direction of depth (indicated by an arrow). Educators should demonstrate how to draw lines of depth at an angle of 45° . To ensure good understanding on the visualization of simple cuboids in three-dimensional space, educators may use simple objects such as card models, Lego blocks or any other teaching aid available in the DT studio/workshop to demonstrate to students.
3. Educators are encouraged to put emphasis on
 - (a) Quality of lines – construction, outline and avoid large dots
 - (b) Accuracy – drawing exactly on lines of the grid
 - (c) Stepwise explanation and demonstration
 - (d) Allowing students to repeat construction stepwise
4. Students should be able to use colour to enhance their work. For example:
 - (a) Front face of cuboid – Red Colour
 - (b) TOP face of cuboid – Yellow Colour
 - (c) SIDE face of cuboid – Blue Colour
5. Do not skip activities. Make sure that students tackle ALL the given activities in the correct order one after the other, starting from Activity 1 to Further Activity 3. This will ensure the implementation of differentiated instructions in the classroom, from low to high order performance.
6. Educators are encouraged to carry out demonstration sessions to show students how to place their ruler on the given grid lines, how to hold their pencil to draw faint lines at first and how to finally outline in dark so as to ensure precise and neat drawings.



Learning Outcomes

At the end of this unit you will be able to:

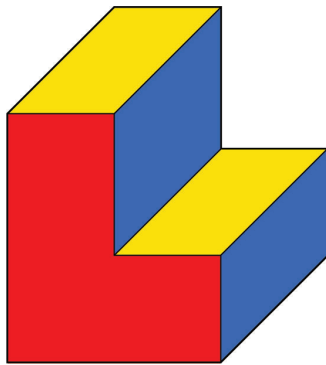
- Identify Oblique Projection
- Draw cubes and cuboids in oblique projection
- Apply simple colouring techniques to enhance the cubes and cuboids drawn in oblique projection

1.1 Pictorial Projection

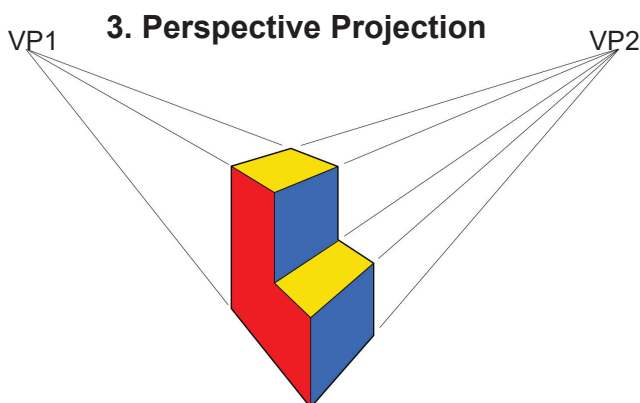
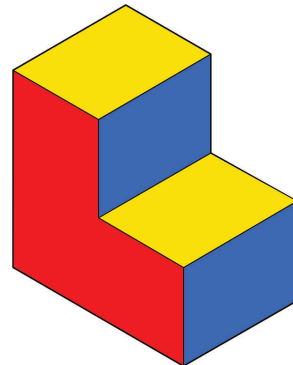
Pictorial projection is a method of drawing objects in 3-dimension (3D) such that they look like pictures.

There are several types of pictorial projection. The most common ones are:

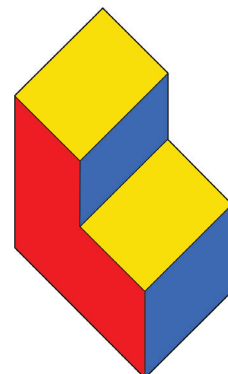
1. Oblique Projection



2. Isometric Projection



4. Planometric Projection



For this year, you are going to learn how to draw in oblique projection only.



NOTE TO EDUCATORS

You are encouraged to use pictures or products drawn to illustrate the concept of pictorial projection – drawing in picture form.

1.2 Introduction to Oblique Projection

Some examples of objects drawn in oblique projection are shown in Fig.1.1

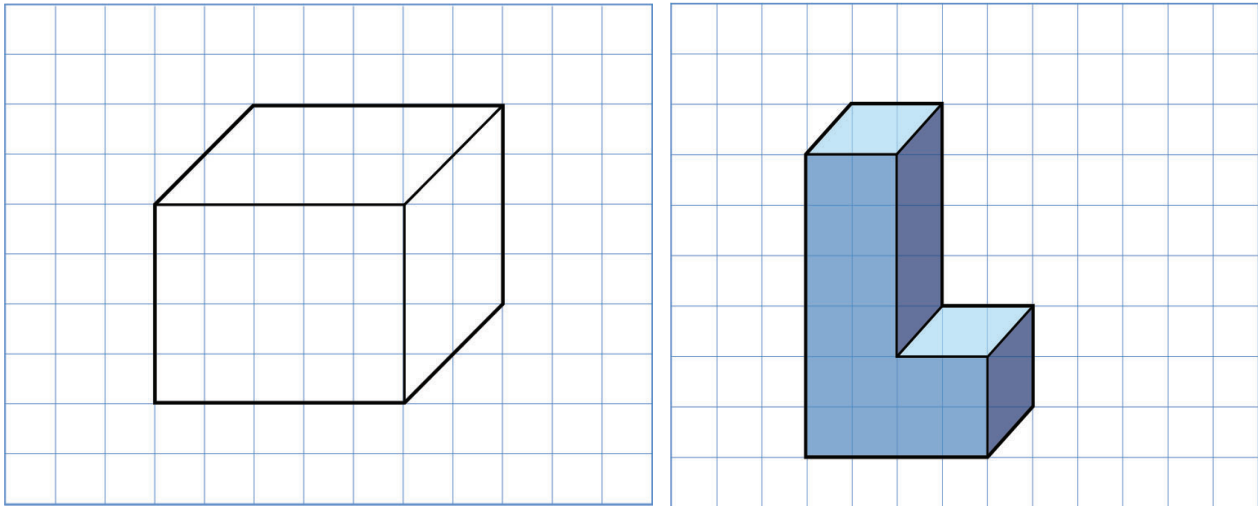


Fig. 1.1

1.3 Material and equipment used for drawing in oblique projection

To draw in oblique projection you will need:

- (1). Square grid paper (as shown in Fig. 1.2 below)
- (2). An HB Pencil
- (3). A Ruler



Fig. 1.2



Activity 1.1

Complete Table 1.1 by Matching Column A to Column B.

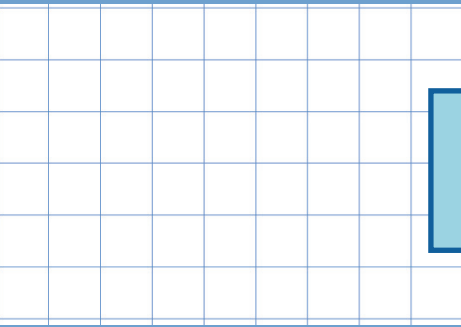
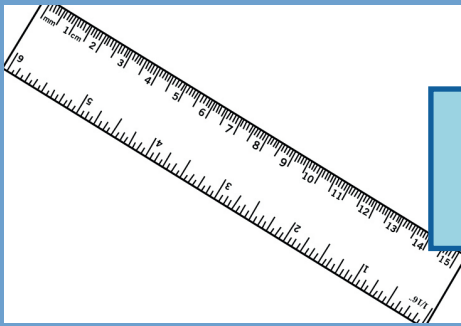
COLUMN A	COLUMN B
 A	1 RULER
 B	2 PENCIL
 C	3 ERASER
 D	4 SQUARE GRID

Table 1.1



Case study 1.1

Study Figure 1.3 which shows a cuboid drawn in Oblique Projection.

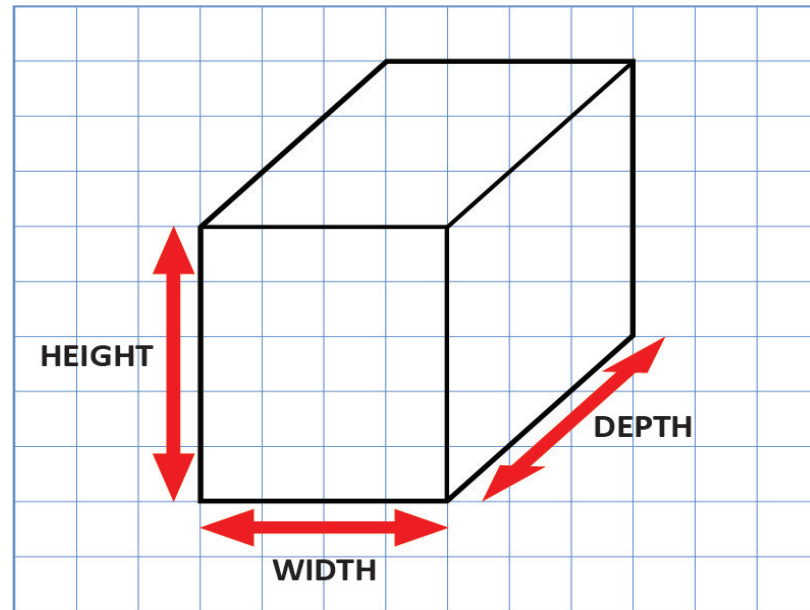


Fig. 1.3

From our observation, we can conclude that:

1. The Height is drawn on the vertical axis.
2. The Width is drawn on the horizontal axis.
3. The Depth is drawn on an axis inclined at 45° .

1.4 Using the squares on the grid as the unit of measure

When using the square grid to draw in oblique projection, each square in the grid is used as the unit of measure.

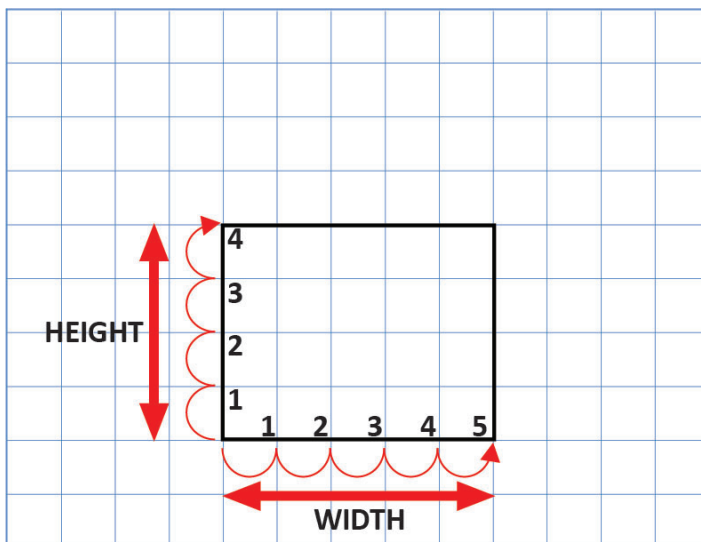


Fig. 1.4



Note to Educators

Illustrate clearly the counting of squares on board and on square grid paper.

Observations

From figure 1.4 we can retrieve the following dimensions:

Height = 4 squares

Width = 5 squares



Activity 1.2

Count and write down the value for the height and the width of each shape.

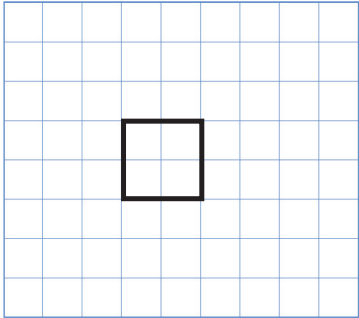
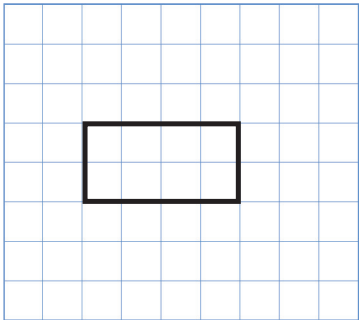
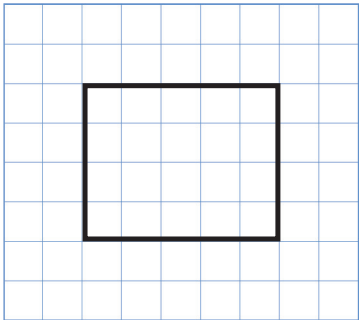
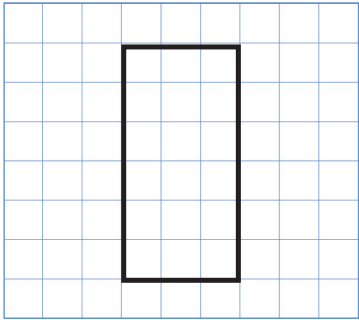
No	Square Unit(s)	Height (Number of units on the Vertical axis)	Width (Number of units on the Horizontal axis)
1			
2			
3			
4			

Table 1.2

1.5 Drawing cuboids in Oblique Projection

A cuboid is a box-shaped solid object. It has six flat surfaces and all angles are at right angle. Let us consider the drawing of the cuboid in Oblique projection shown in Fig. 1.5.

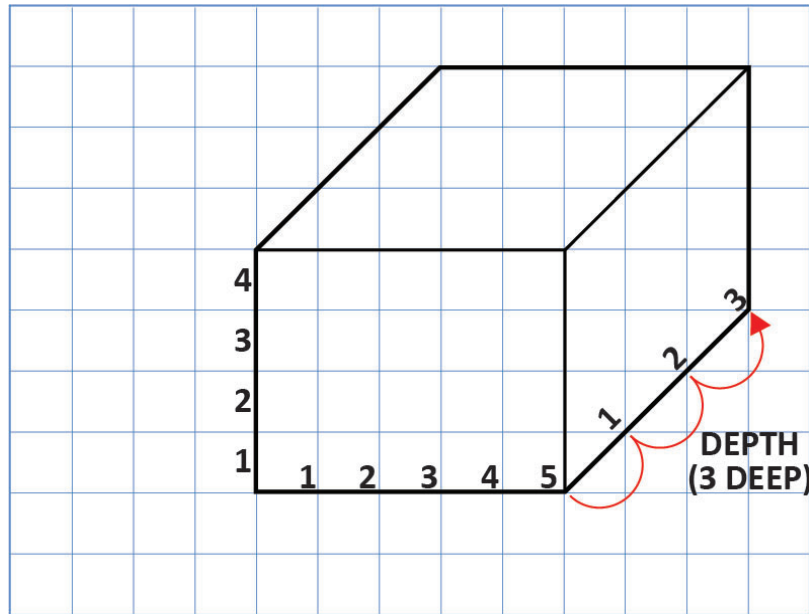


Fig. 1.5

From Fig.5, the following dimensions can be identified:

Height = 4 units

Width = 5 units

Depth = 3 units



NOTE TO EDUCATORS

- Use a model of a cuboid to explain its characteristics.
- Consider a session of practice on drawing of lines on the square grid before tackling Oblique projection.

Step 1: Drawing the given front face

Start by drawing the front view of the cuboid as shown in Fig. 1.6 on the square grid provided.

Count the exact number of squares in the shape below and draw the shape on the grid on the right.

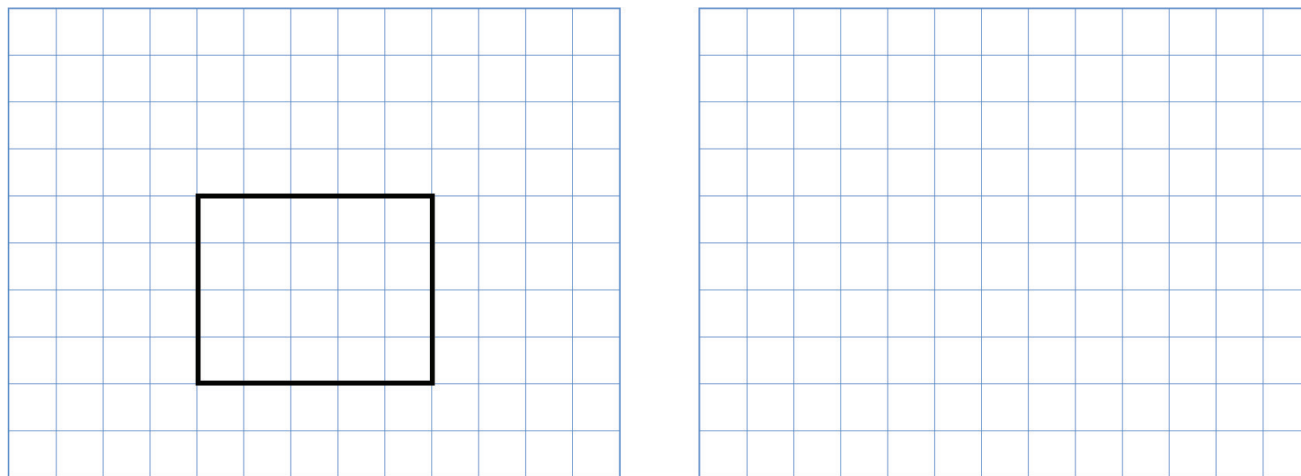


Fig. 1.6



NOTE TO EDUCATORS

You are encouraged to put emphasis on:

- *Quality of lines – construction, outline and avoid large dots*
- *Accuracy – drawing exactly on lines of the grid*
- *Stepwise explanation and demonstration*
- *Allowing students to repeat construction stepwise*

Step 2: Drawing the depth of 3 units

The depth of the object is represented by drawing a diagonal line at an angle of 45° on each corner of the rectangle.

The depth lines can be drawn either to the right or to the left of the front face depending on the direction you look at the object.

The direction of the depth lines is determined by an arrow next to the shape, that is, if the arrow is found on the right, the depth lines go the right, as shown in Fig. 1.7.

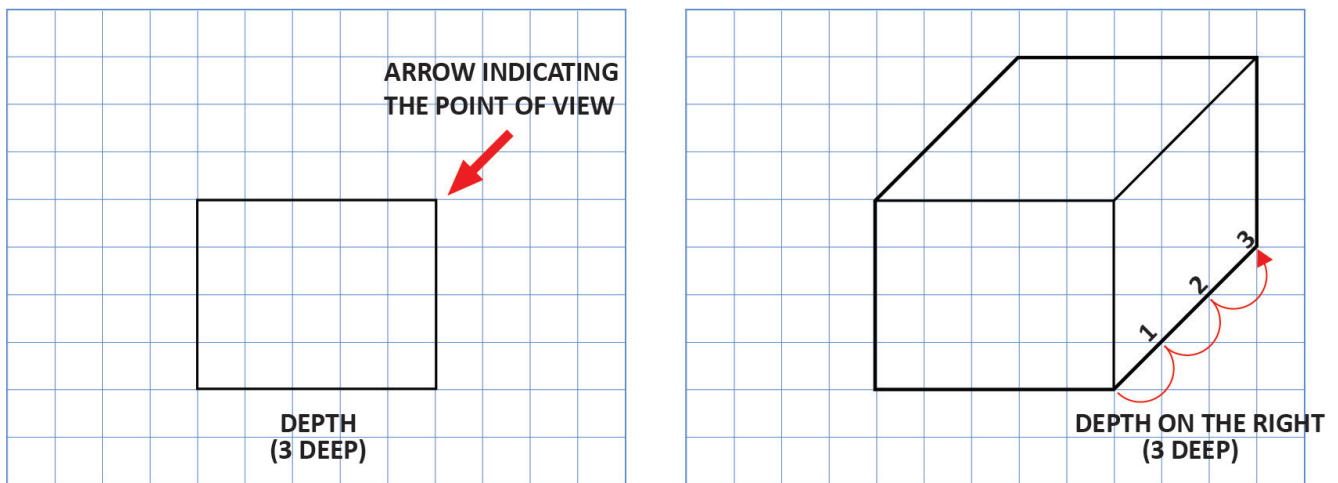


Fig. 1.7

If the arrow is found on the left, the depth lines go the left, as shown in Fig. 1.8.

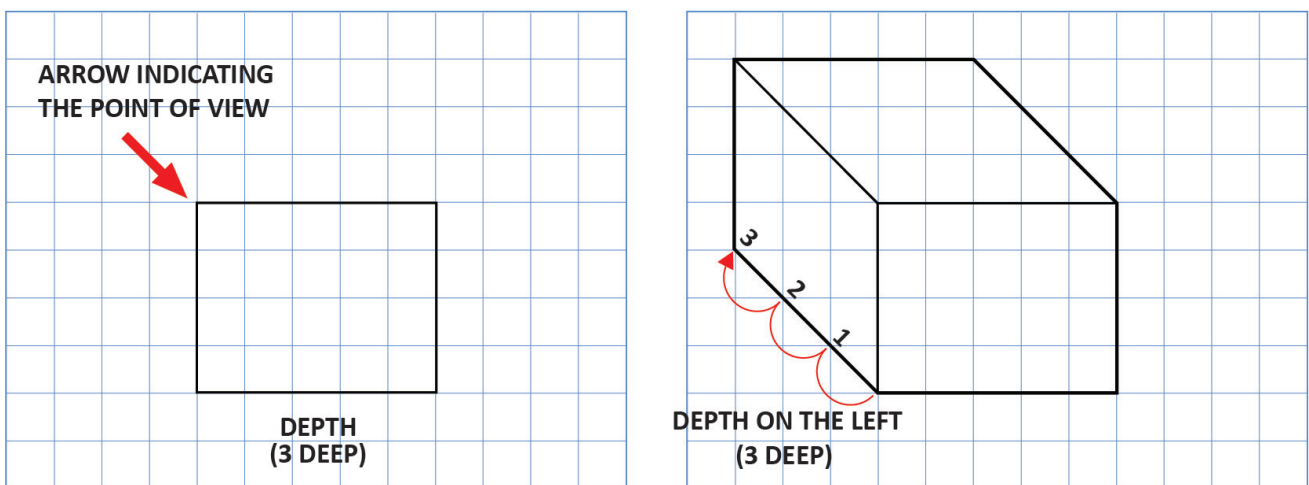


Fig. 1.8

For our cuboid, we will assume that the arrow is on the right, as shown below. So, we project the depth lines at 45° from each corner of the square using thin lines as shown in Fig.1.9.

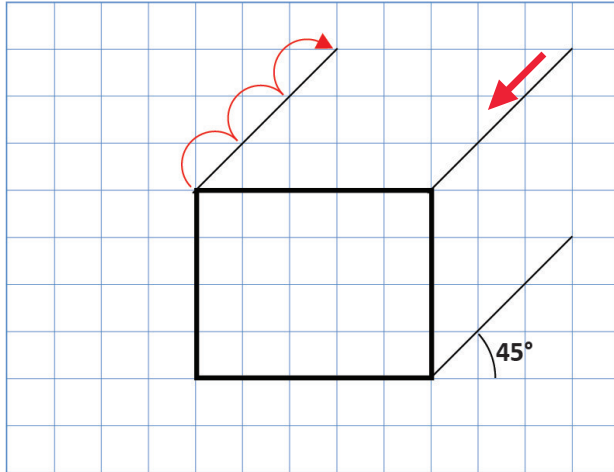


Fig. 1.9

Step 3: Finishing the cuboid with a proper outline

Join the edges to complete the drawing of the cuboid in oblique projection as shown in Fig. 1.10.

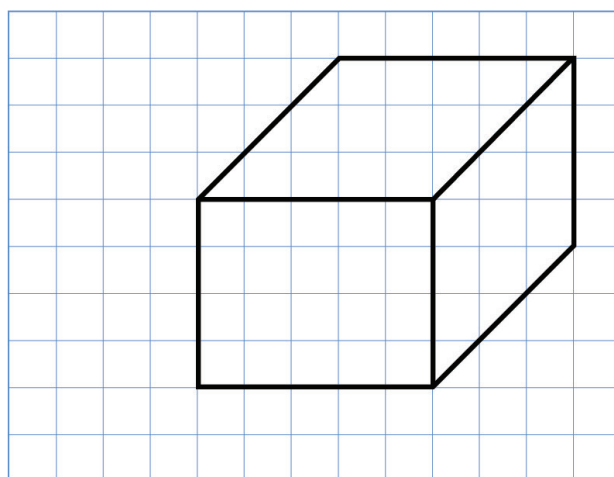


Fig. 1.10

Step 4: Using colour to enhance your work

A variety of colouring media can be used to enhance the three faces; the front, the top and the side as shown in Fig. 1.11.

In this exercise make use of coloured pencils to colour the front red, the top yellow and the side blue as shown in Fig. 1.11.

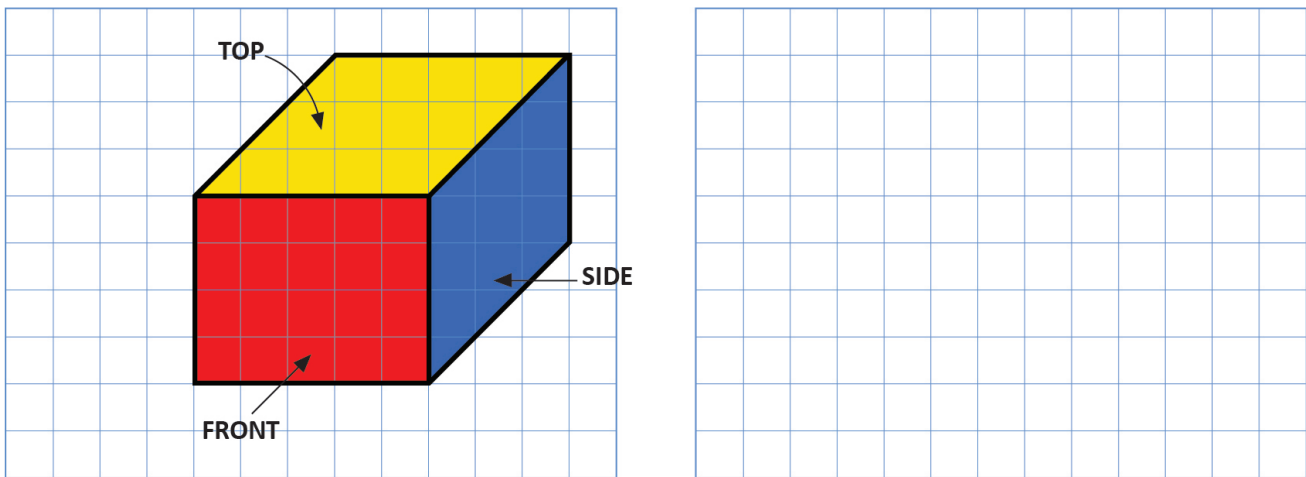


Fig. 1.11



Key terms

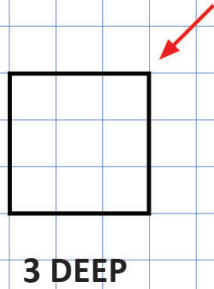
- Students are encouraged to draw the **front face** first.
- The depth in Oblique projection is drawn as a **diagonal line** on the square grid.
- The **direction of the depth** is indicated by an arrow.



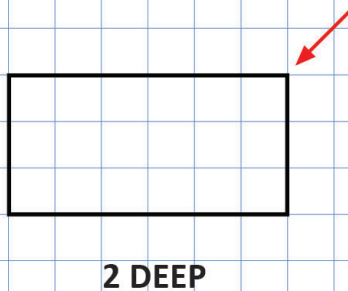
Activity 1.3

The following figures show the front faces of cubes and cuboids. Draw them in oblique projection and apply colour to enhance the drawings.

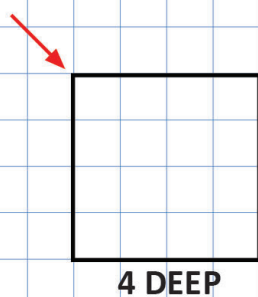
1.



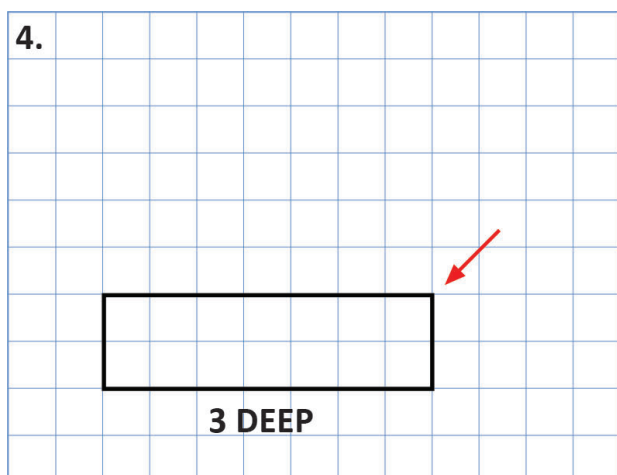
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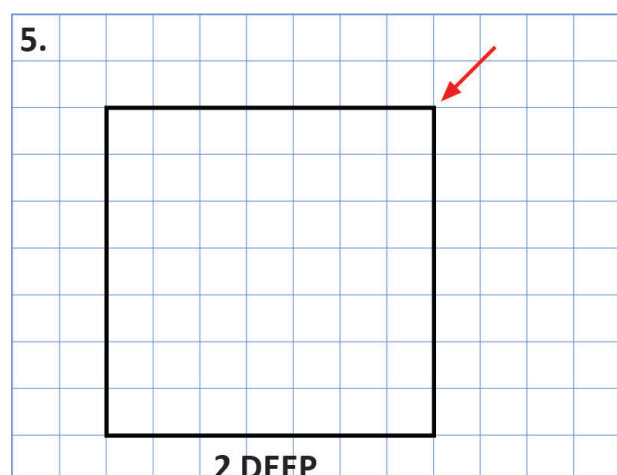
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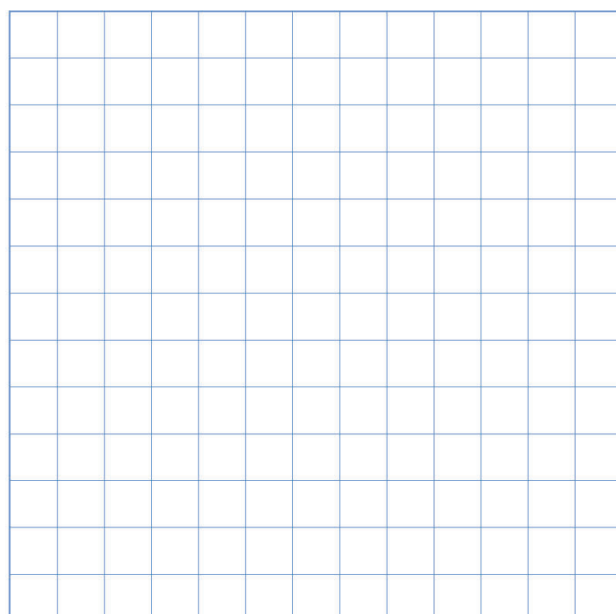
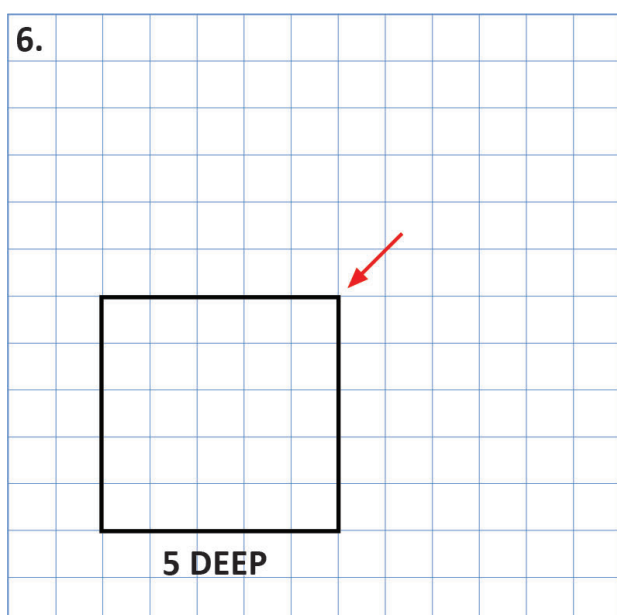
4.



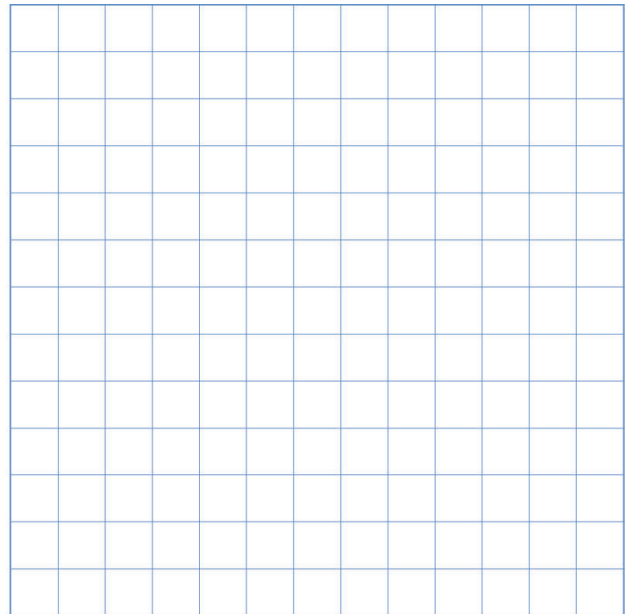
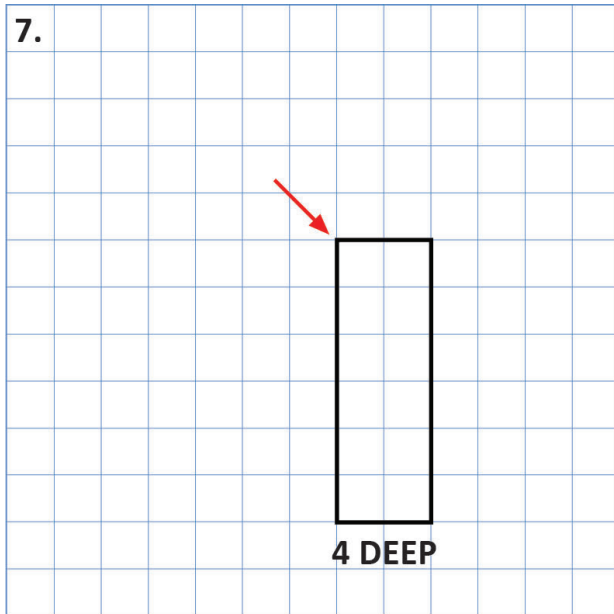
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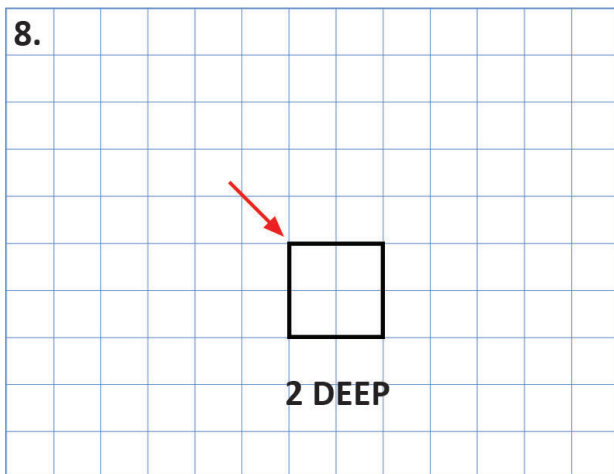
6.



7.



8.

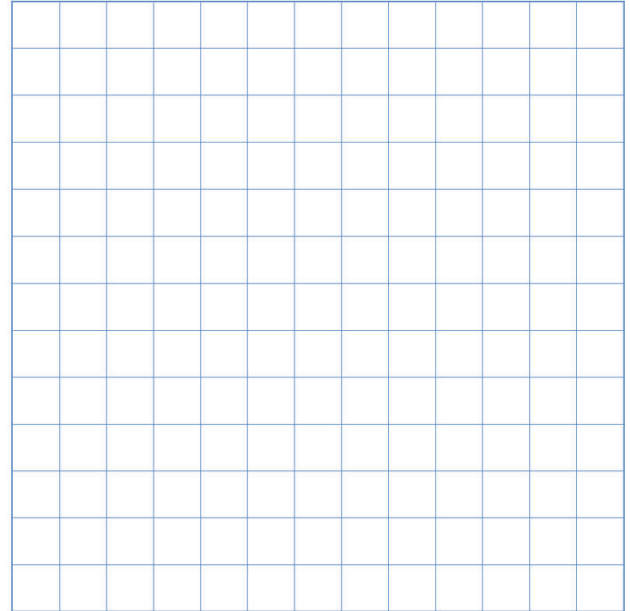
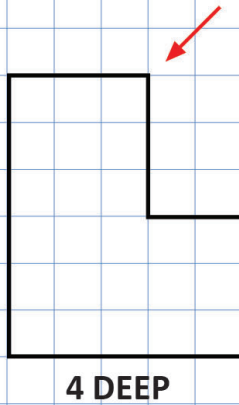




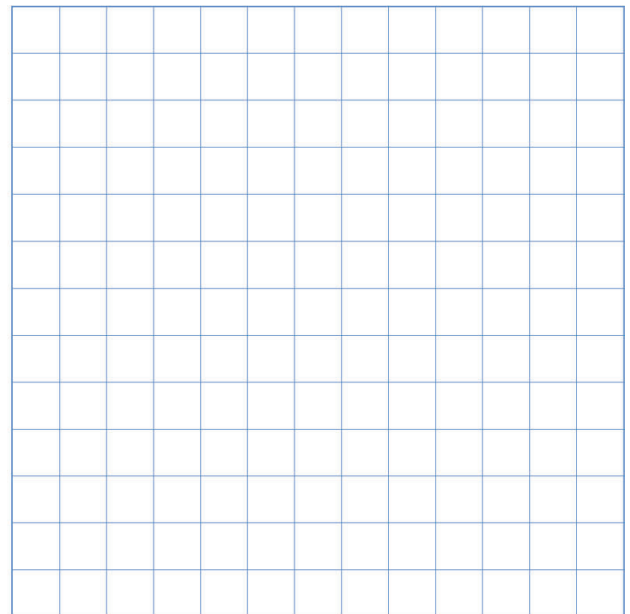
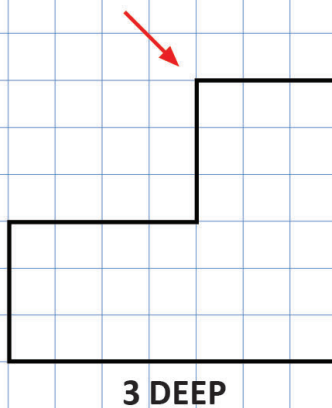
Further Activity 1.3

The following figures show the front faces of cubes and cuboids. Draw them in oblique projection and apply colour to enhance the drawings.

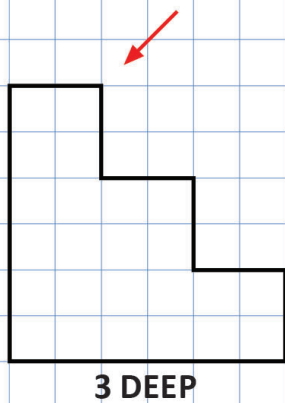
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2.

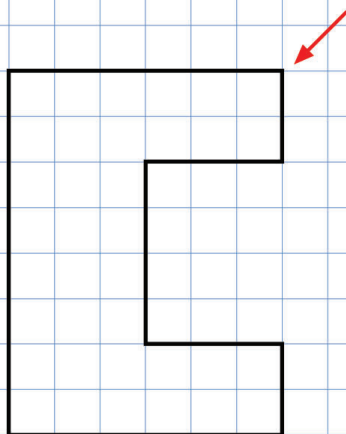


3.



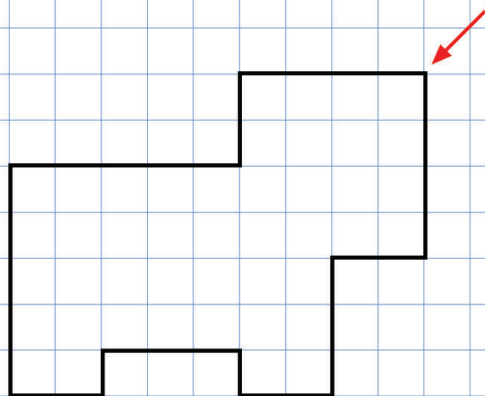
3 DEEP

4.



3 DEEP

5.



2 DEEP

UNIT 02 PROPERTIES OF WOOD

NOTE TO EDUCATORS



1. Educators are encouraged to visit the workshop to show the different uses of softwood and hardwood.
2. Educators are encouraged to show different wood samples to students.

UNIT
2

PROPERTIES OF WOOD



Learning Outcomes

At the end of this unit you will be able to:

- Differentiate between softwood and hardwood
- List some names of softwood and hardwood
- State some properties and uses of softwood and hardwood

2.1 Introduction

Wood is one of the most widely used material in our society. Wood is a natural material that comes from trees. It is a good material mainly for furniture construction and for making other objects used at home and at work.

There are two main types of wood namely:

1. **Softwood**
2. **Hardwood.**

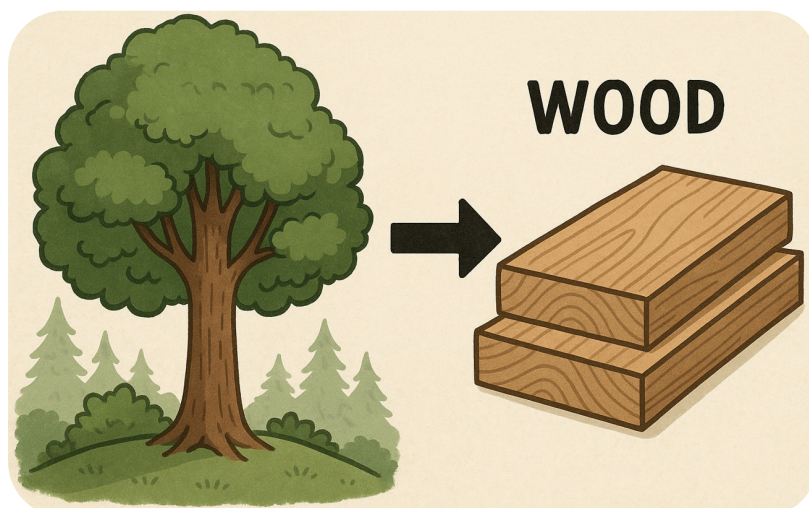


Fig. 2.1 Wood is a natural material coming from trees

2.2 Characteristics of softwood and hardwood

Table 2.1 below shows the main differences between hardwood and softwood.

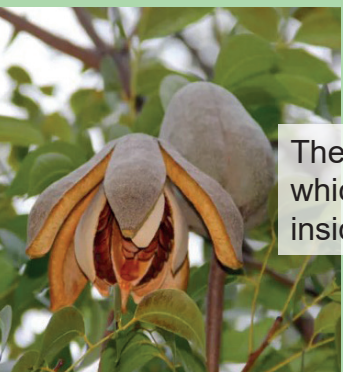
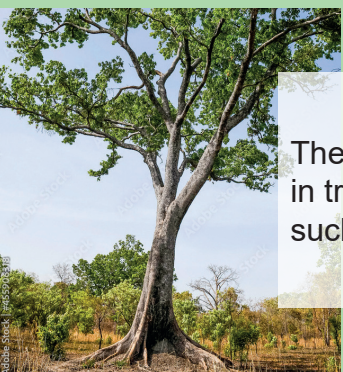
SOFTWOOD	HARDWOOD
 Example: Pine	 Example: Mahogany
 LEAVES Their leaves are like needles	 LEAVES Their leaves are large
 SEEDS They produce cones	 SEEDS They produce seeds which are found inside the fruits
 CLIMATE They generally grow in cold climate such as Canada and Russia	 CLIMATE They generally grow in tropical regions such as Malaysia

Table 2.1. Characteristics of hardwood and softwood

2.3 Properties and uses of common softwood

Softwood are known to have the following properties:

- i) It is cheap.
- ii) It is light in color.
- iii) It is fairly soft.
- iv) It is easy to work with.

Table 2.2 below shows the different properties and uses of some common softwood.

SOFTWOOD	PROPERTIES	USES
 Pine	• It is light in weight and quite soft • It has moderate strength • It is cheap	Indoor furniture Flush doors Window frames Structural work 
 Red Cedar	• It is light in weight • It keeps some bugs away • It is durable	Indoor furniture Music instruments 

Table 2.2. Properties and uses of common softwood

2.4 Properties and uses of common hardwood

Hardwood have the following properties:

- i) Hardwood is expensive.
- ii) Hardwood is strong
- iii) Hardwood has a wide range of colours and patterns.
- iv) Hardwood resist wear and tear over time.

Table 2.3 below shows the different properties and uses of some common hardwood.

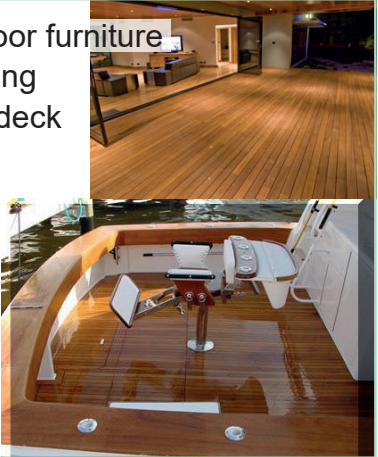
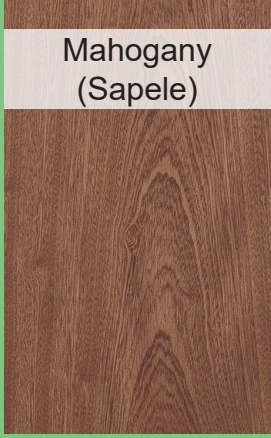
SOFTWOOD	PROPERTIES	USES
 Teak	• It is strong • It is very durable • It is resistant to decay • It is expensive	Outdoor furniture Flooring Ship deck 
 Mahogany (Sapele)	• It is strong • It can be difficult to work with • It is suitable for high class furniture	High class furniture Parquetry Boat building Musical instruments 
 Meranti	• It is moderately strong • It is suitable for low cost furniture • It is relatively cheap	Indoor furniture Flush doors Window frames Structural work 

Table 2.3. Properties and uses of common hardwood



Activity 2.1

1. Choose the correct answer out of four options (A, B, C, D).

a) Where does wood come from?

A. Rocks

B. Plastic

C. Trees

D. Water

b) Which type of wood is usually cheaper?

A. Hardwood

B. Plastic

C. Metal

D. Softwood

c) Which of these is a type of softwood?

A. Teak

B. Pine

C. Mahogany

D. Sapele

d) What kind of leaves do hardwood trees have?

A. Needle-like leaves

B. Large leaves

C. Small leaves

D. No leaves

e) What is a common use of hardwood?

A. Making paper

B. Flooring

C. Plastic bottles

D. Glass windows

2. Fill in the blanks by choosing the answer from the given list below:

softwood, needle, fruits, expensive, trees

- a) Wood is a natural material that comes from
- b) Softwood trees have-like leaves.
- c) Hardwood is usually more than softwood.
- d) Pine and cedar are types of
- e) Hardwood trees produce seeds inside

3. Match each item in column A to its corresponding option in column B.

COLUMN A

Pine	A
Mahogany	B
Easy to work with	C
Used for flooring	D
Grows in cold climate	E

COLUMN B

1	Hardwood
2	Softwood
3	Hardwood
4	Softwood
5	Hardwood

UNIT
03

**SAFETY
AWARENESS**

NOTE TO EDUCATORS



1. Educators are encouraged to illustrate clearly the importance of each safety measure by explanation and demonstration.
2. A visit to the school workshop can be useful to illustrate each safety measure.
3. Show the tools and equipment to the students and demonstrate their uses during practical work.

UNIT
3

SAFETY AWARENESS



Learning Outcomes

At the end of this unit you will be able to:

- List the safety rules and safety practices to be observed in the school workshop
- Use appropriate safety equipment when working in the school workshop

3.1 Introduction

When activities are carried out in the school workshop, you are exposed to tools, materials and equipment. You should be very careful and follow all workshop safety rules to prevent the risk of injuries.



Fig. 3.1 Students working in a school workshop

3.2 General safety rules to be observed in the workshop



Case study 3.1

Study figure 2.2 below which shows some important safety rules which have to be observed when entering the school workshop.

Always listen to instructions given by your Educator

Always wear an apron

Do not run in the workshop



Understand clearly all the safety signs in the workshop

Locate the emergency exits

Make sure you know the location of the emergency switches

Always leave the exit ways clear - these will be used in case of emergency

Fig. 3.2



Activity 3.1

Put a tick (✓) next to the correct safety practices and a cross (✗) next to the incorrect safety practices in the table below.

		Tick or Cross here
1		
2		
3		
4		

3.3 Safe practices when using tools and equipment

When working in the school workshop, you will use various tools and equipment.

Now, let's consider the safety precautions that need to be considered when working with these tools and equipment.

Tools and equipment should be kept in proper way



Choose the right tool for the right job



Clean up your working area after use



Wear correct safety equipment when working



Use safety guards on all equipment



Always hold your workpiece securely



Switch off all equipment after use



Fig. 3.3 Examples of safe practices

3.4 Safety equipment in the school workshop

Before doing any activities in the school workshop, you should dress up in the appropriate manner.

You must:

- wear an apron
- roll up long shirt sleeves
- not wear jewellery
- tie up long hair
- wear gloves, goggles, ear protector or respiratory mask when necessary



Fig. 3.4 Examples of safe practices



Activity 3.3

1. Match the protective equipment in column A with its use in column B to describe the use of the safety equipment.

COLUMN A



COLUMN B

A pair of gloves is used when handling sharp materials.

Safety glasses(goggles) are used during cutting or drilling process.

An apron is used to protect our body.

Ear muffs protect our ears from loud repetitive sounds

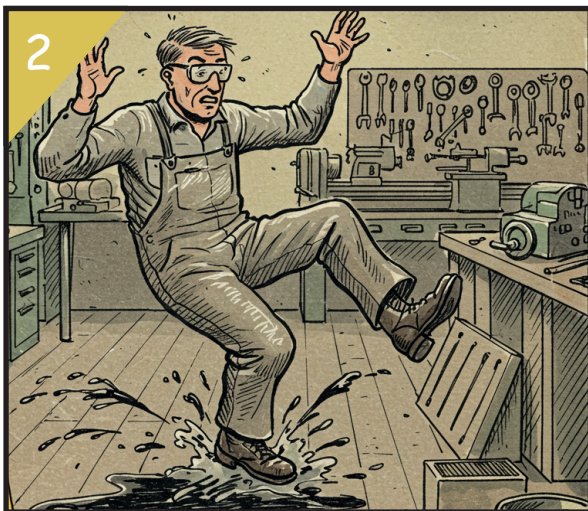
A respiratory mask is used when sanding or gluing materials.

2. The pictures below show accidents that can happen in the workshop.
Next to each picture write down what should have been done to avoid the accidents.

Accident

How to avoid the accident







3. Study the pictures given in table 3.1 and write down the name of the safety equipment that is being used.

Accident	Name of safety equipment
	1 _____
	1 _____ 2 _____
	1 _____ 2 _____
	1 _____ 2 _____ 3 _____ 4 _____

Table 3.1

3.5 Safety signs in the school workshop

Many accidents and injuries can be avoided if safe practices and clear instructions are observed in the workplace. By respecting the safety signs in the school workshop, you will make sure to stay safe while working.

While working in the workshop, you will come across different signs and symbols. Just like on the roads, signs are used to inform, warn and guide you.

There are 4 main types of signs commonly used in the workshop:

PROHIBITION SIGNS

To inform people that they are not allowed to do something.

Generally red in colour, with a circle shape.



No mobile phone allowed

MANDATORY SIGNS

To inform people that they are obliged to do something.

Generally blue in colour, with a circle shape.



Wear gloves

WARNING SIGNS

To inform people about potential dangers and hazards.

Generally yellow in colour, with a triangle shape.



Danger : Inflammable

INFORMTATIVE SIGNS

To inform or give instructions and directions to people.

Generally green in colour, with a square / rectangular shape.



Emergency exit



Case study 3.2

Some examples of safety signs have been given in figure 3.4 below. Observe the signs given carefully and, with the help of your educator, try to find their meaning.



Fig. 3.4 Examples of safety signs

UNIT
04

**WOODWORKING
TOOLS**

NOTE TO EDUCATORS



1. Educators are expected to make sure that students know the name of the tools shown in this unit, their properties (one or two) and how to use them.
2. A visit to the school workshop can be useful to illustrate each woodworking tool mentioned in this unit. A small demonstration could also be useful for the students to get a better understanding.
3. Remind the students of the importance of safety measures and safety equipment during practical work.

UNIT
4WOODWORKING
TOOLS

Learning Outcomes

At the end of this unit you will be able to:

- Identify and describe some woodworking tools
- Use the appropriate tools safely when working in the school workshop

4.1 Introduction

Woodworking tools are very useful for any artisan and will enable the transformation of ordinary wood into objects of beauty, utility, and lasting value. You will be introduced to the essential categories of woodworking tools, with a special attention to their use and importance.



Fig. 4.1 Woodwork in a school workshop

4.2 Tools for measuring and marking out

One of the very first step when working with wood is the measuring and marking out process. This process ensures that your work is accurate and precise, aligns or fits well in its intended use and, of course, remains safe.

NAME	TOOL	USE
Steel rule		Used to measure short lengths accurately Helps mark straight lines
Marking knife		Makes fine, sharp lines on wood to guide saws and chisels
Marking gauge		Marks lines parallel to the edge of the wood for cutting or joining
Try square		Checks and marks right angles (90°) on wood

Table 4.1. Measuring and marking out tools

4.3 Tools for cutting

Cutting involves removing waste parts to make your work piece to the right dimension. A large variety of cutting tools can be used for this process, as shown below.

NAME	TOOL	USE
Tenon saw		A hand saw with a stiff back used for straight, fine cuts
Bevel edge chisel		Used to remove fine waste known as paring
Firmer chisel		A strong chisel for chopping wood

Table 4.2. Cutting tools

4.4 Tools for drilling

Drilling is a process that basically involves making holes. However drilling can be very important for simple assembly of parts or more complicated design involving moving parts.

NAME	TOOL	USE
Pillar drill		Used to drill holes more accurately. A hand vice is used to hold the workpiece securely
Power drill		Used to drill holes while being held in hands
Hand drill		Used to drill holes manually. No electric power is involved

Table 4.3. Drilling tools

4.5 Tools for holding the workpiece

Holding tools are used to clamp the workpiece firmly while cutting, smoothing or even applying finish to it. Some common holding tools are described below.

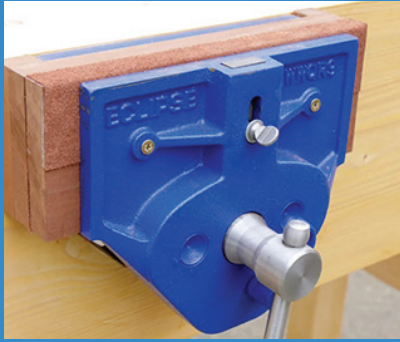
NAME	TOOL	USE
Bench vice		Holds wood tightly to a bench while working on it
G-clamp		Holds pieces of wood together during gluing or drilling

Table 4.4. Drilling tools

4.6 Driving tool

At this current level, you will be introduced to the wooden mallet which will be used to push (drive) another object into the workpiece.

NAME	TOOL	USE
Wooden mallet		Used to push wooden parts together Used to strike on chisels

Table 4.5. Driving tool: wooden mallet

4.7 Tools for planing and smoothing

Planing involves the removal of long chips from a piece of wood's surface to make it more even with clearly defined edges.

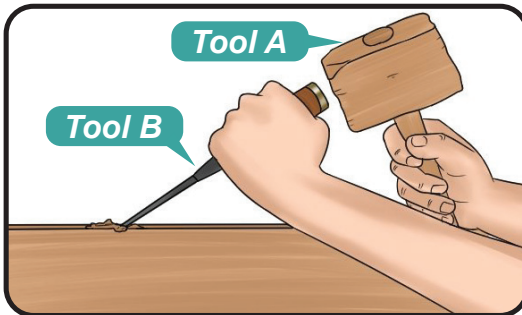
NAME	TOOL	USE
Jack plane		To plane or smoothen wood surface for a more even finish
Rasp		Used for shaping wood Removes material quickly but leaves a rough surface
Sand paper		Used to smoothen wood surfaces before painting and finishing

Table 4.6. Planing and smoothing tools



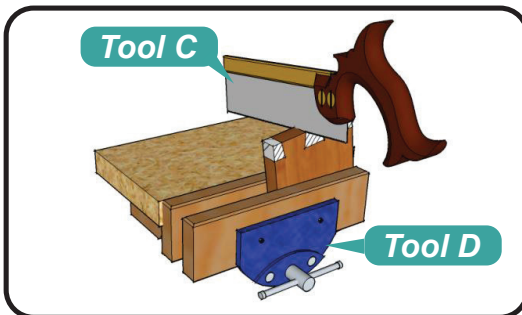
Activity 4.1

1. Study each picture given below and write down the name of the tool in the space provided.



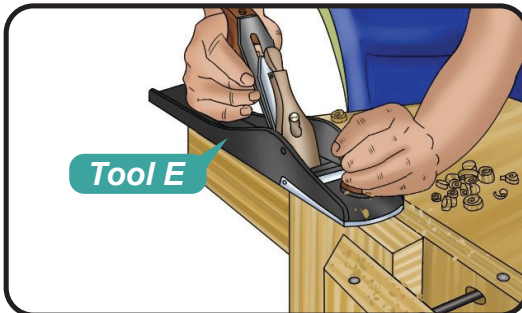
Tool A:

Tool B:

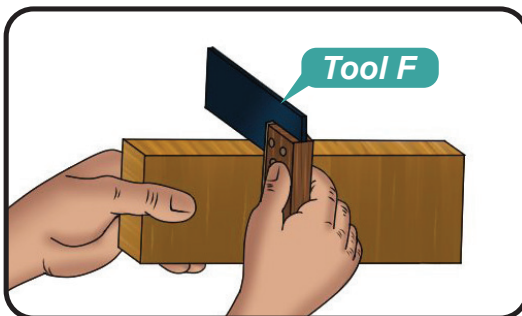


Tool C:

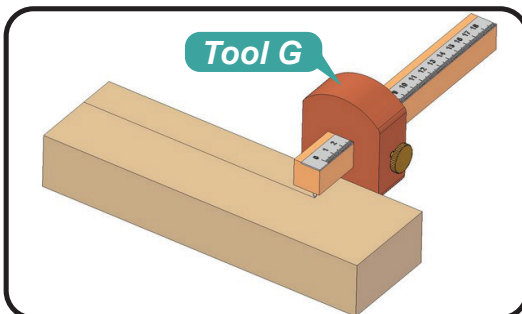
Tool D:



Tool E:



Tool F:



Tool G:

UNIT
05

DESIGNING AND
REALISING
A PEN HOLDER

UNIT
5**DESIGNING AND REALISING
A PEN HOLDER****Learning Outcomes**

At the end of this unit, you will be able to:

- Use appropriate woodworking tools and equipment to design and realise a wooden pen holder in your school workshop.

5.1 Introduction

Using the appropriate woodworking tools and equipment, you will now be guided into the designing and realisation of a wooden pen holder. As mentioned earlier, you should be very careful and follow all the workshop safety rules to prevent the risk of injuries while working.



Fig. 5.1 The wooden pen holder

5.2 Working drawing of the pen holder

The front, top, and side views of the pen holder have been given for you in figure 5.2 below. You have also been provided with the dimensions in millimetres (mm), which will enable you to mark your workpiece accurately.

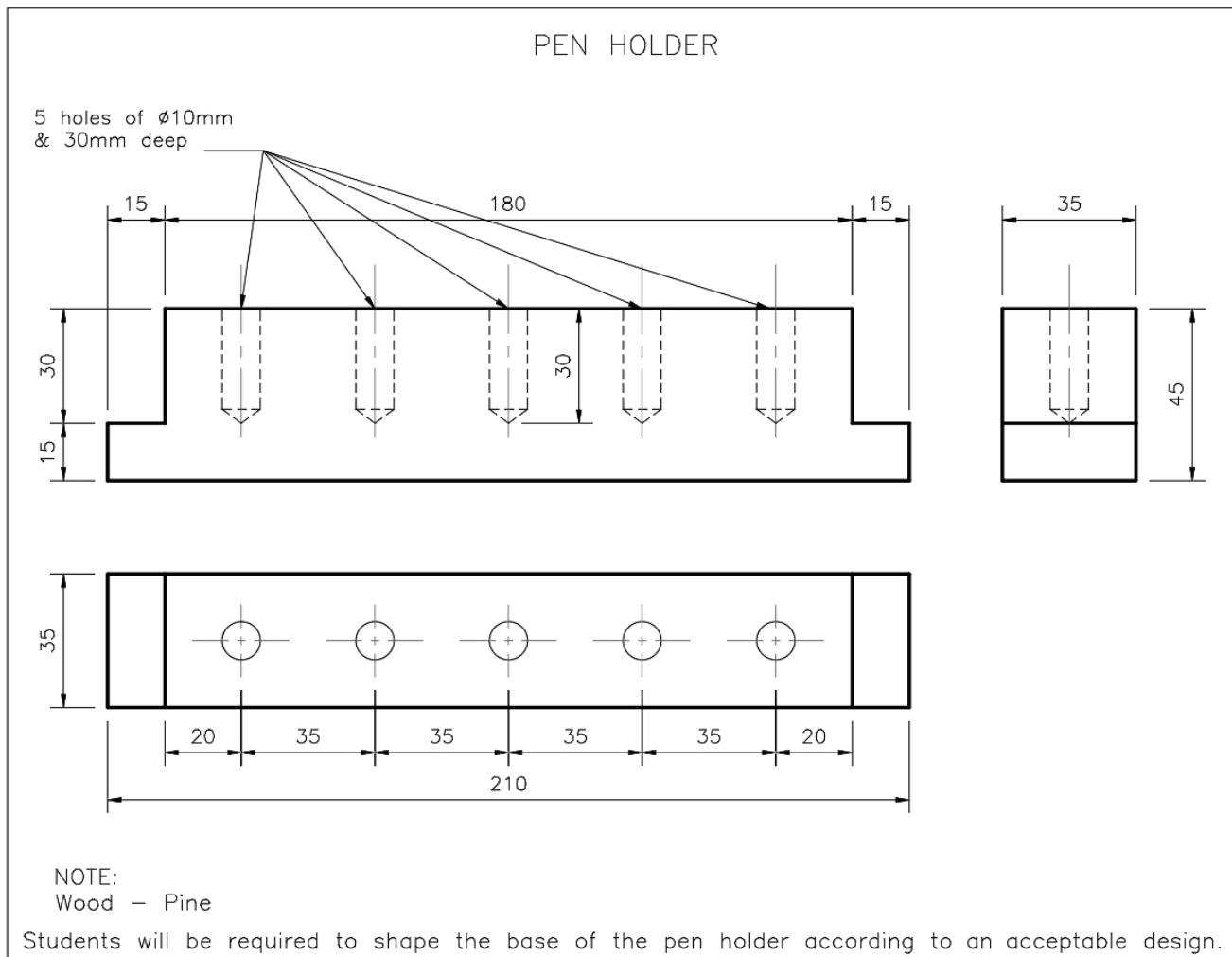


Fig. 5.2 Front, top, and side views of the pen holder with dimensions

5.3 Tools and materials required

Description	Tools and material
Pine wood block finished size (210 mm x 45 mm x 34 mm)	
Bench drill / Portable drilling machine	
Try square	
Steel rule / Measuring tape and pencil	
Marking gauge	
Clamps	
Tenon Saw	
10mm drill bit	
Sandpaper (120-grit and 240-grit)	
Paintbrush and wood sealer	

5.4 Step-by-step instructions

The instructions given below will guide you throughout the process of realising the wooden pen holder.

1



The workpiece: a pine wood block
(210 mm x 45 mm x 34 mm)

2



By using a try square, the surface
of the workpiece is checked for the
squareness as shown.

3



Mark the face side and face edge.



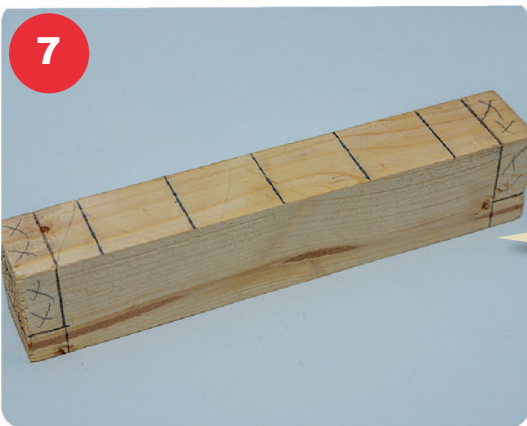
Using a marking gauge, mark the position of the 2 rebates.



Continue marking the position of the 2 rebates.



A view of how the marking out of the 2 rebates should look like.



A try square and a pencil will be used to mark the 5 lines for positioning the holes, as per the dimensions in the plan.



8

Use a marking gauge and adjust it to half the the thickness that is 17 mm.



9

Mark position of the hole along each line to **locate the centre of the hole.**



10

A view of how the marking out of the 5 holes should look like.

11



- Install the 10 mm drill bit into the chuck and tighten it securely.
- Adjust the table height so that the bit will comfortably reach the wood.

12



Mark the position of the hole along each line to **locate the centre of the hole.**

13



Use a bench vice or clamp to hold the workpiece firmly.



Start drilling slowly and increase speed gradually.



You may use tape on the drill bit as a visual guide for 30mm depth.

Alternative method to drill the holes using a portable power drilling machine.

14



Cut along the lines on the waste side with a tenon saw.

15



Turn the workpiece over to cut the remaining part.

16



This is what your workpiece should look like.

17



Use sandpaper to smoothen the surface of the workpiece. Start with 120-grit sandpaper to remove the rough edges. Finish with 240-grit sandpaper for a smooth finish. Sand inside the holes using rolled sandpaper for a polished look.

18



Use a paintbrush to apply a thin layer of wood sealer evenly.

19



Once you have applied the sealer, allow it to dry completely.

20



The final product



NOTE TO EDUCATORS

Tick the level achieved by the student for each step undertaken in the school workshop throughout the realisation of the wooden pen holder.

PROJECT-BASED SKILLS ASSESSMENT

Wooden pen holder



NAME OF STUDENT: DATE: / /

PERFORMANCE LEVELS



BASIC



INTERMEDIATE



PROFICIENT

CRITERIA	BASIC	INTERMEDIATE	PROFICIENT
Measuring and marking out			
Drilling work			
Shaping and smoothing edges			
Sanding and surface preparation			
Application of sealer			
Designing, creativity, and neatness			
Overall assessment			

