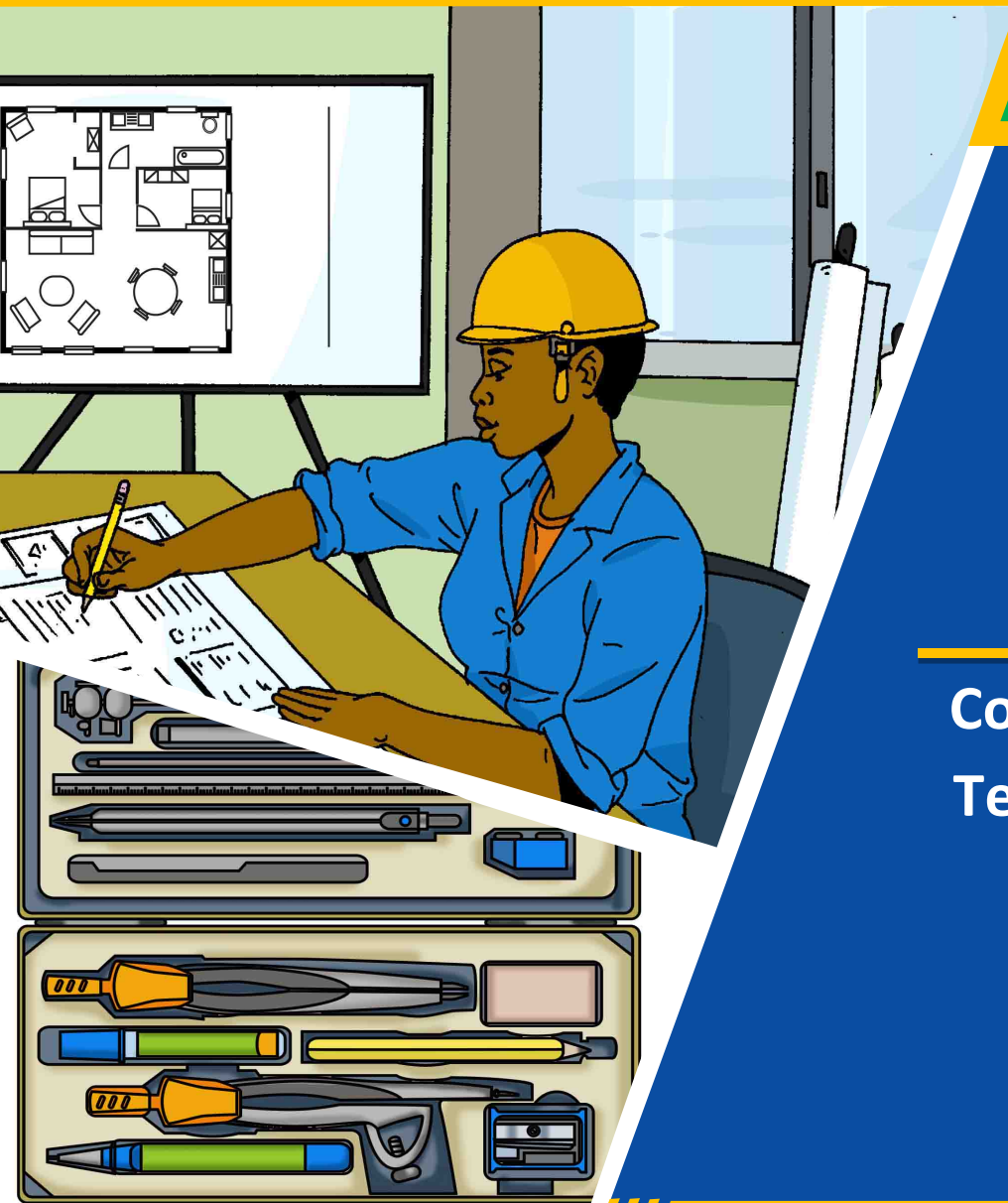




RQF LEVEL 3



BDCTD301

BUILDING CONSTRUCTION

Construction Basic Technical Drawing

TRAINEE'S MANUAL

December, 2023



CONSTRUCTION BASIC TECHNICAL DRAWING



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Under Rwanda TVET Board (RTB) guiding policies and directives



Under Swisscontact supervision and involvement

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LIST OF ABBREVIATIONS AND ACRONYMS

%: Percentages

CBET: Competence Based Education and Training

ISI: Indian Standard Institution

RQF: Rwanda Qualification Framework

RTB: Rwanda TVET Board

TSS: Technical Secondary Schools

TVET: Technical and Vocational Education and Training

INTRODUCTION

This trainee's manual encompasses all necessary skills, knowledge and attitudes required to realize Construction Basic Technical Drawing. Students undertaking this module shall be exposed to practical activities that will develop and nurture their competences. The writing process of this training manual embraced the competency-based education and training (CBET) philosophy by providing practical opportunities reflecting real life situations.

The trainee manual is subdivided into units, each unit has got various topics, you will start with a self-assessment exercise to help you rate yourself on the level of skills, knowledge, and attitudes about the unit.

A discovery activity is followed to help you discover what you already know about the unit.

After these activities, you will learn more about the topics by doing different activities by reading the required knowledge, techniques, steps, procedures, other requirements under the key facts section and you may also get assistance from the trainer. The activities in this training manual are prepared such that they give opportunities to students to work individually and in groups.

After going through all activities, you shall undertake progressive assessments known as formative and finally conclude with your own self-reflection to identify your strengths, weaknesses and areas for improvements.

Do not forget to read the point to remember section which provides the overall key points and takeaways of the unit.

Module Units:

Unit 1: Prepare and use materials, instruments and equipment.

Unit 2: Interpret lines and symbols

Unit 3: Apply drawing scales, dimensions and lettering

Unit 4: Perform angle projection

Unit 5: Perform construction drawing plans

UNIT 1: PREPARE AND USE MATERIALS, INSTRUMENTS AND EQUIPMENT



Unit summary:

This unit provides you with the knowledge, skills and attitudes required for preparing and using materials, instruments and equipment to realize construction basic technical drawing. It covers identification of various drawing instruments, materials and equipment; preparation of various drawing instruments, materials and equipment; use of drawing materials, instruments and equipment and handling of drawing tools and equipment as per Rwandan acceptable standards.

Self-Assessment: Unit 1

1. Study the unit illustration above and answer the following questions:
 - a. What does the illustration show?
 - b. What instruments, materials and equipment are shown in the illustration?
 - c. What do you think this unit is about based on the illustration?
2. Fill in and complete the self-assessment table below to assess your level of knowledge, skills and attitudes under this unit.
 - a. There is no right or wrong way to answer this assessment. It is for your own reference and self-reflection on the knowledge, skills and attitudes acquired during the learning process.
 - b. Think about yourself: do you think you have the knowledge, skills or attitudes to do the task? How well?
 - c. Read the statements across the top. Put a check in the column that best represents your level of knowledge, skills or attitudes.
3. At the end of this unit, you will assess yourself again.

My experience Knowledge, skills and attitudes	I don't have any experience doing this.	I know a little about this.	I have some experience doing this.	I have a lot of experience with this.	I am confident in my ability to do this.
Identify drawing instruments, materials and equipment					
Prepare drawing instruments, materials and equipment					
Describe the use of drawing instruments, materials and equipment					
Properly handle drawing instruments, materials and equipment					

My experience Knowledge, skills and attitudes	I don't have any experience doing this.	I know a little about this.	I have some experience doing this.	I have a lot of experience with this.	I am confident in my ability to do this.
Be attentive to details while selecting drawing instruments, materials and equipment					
Demonstrate endurance in your daily activities					
Comply with National and International Standards during basic construction technical drawing					



Key Competencies:

Knowledge	Skills	Attitudes
1. Identify drawing instruments, materials and equipment	1. Select drawing instruments, materials and equipment	1. Safe handling of drawing instruments, materials and equipment
2. Explain the use of drawing instruments, materials and equipment	2. Use different drawing instruments, materials and equipment	2. Avoiding wastage of materials
3. Describe the methods to handle drawing instruments, materials and equipment	3. Apply techniques to handle drawing instruments, materials and equipment	3. Taking care of drawing instruments, materials and equipment



Discovery activity



Task 1:

Read and answer the questions below:

1. Name the materials used in construction technical drawing
2. Name the instruments used in construction technical drawing
3. Name the equipment used in construction technical drawing
4. What are the necessary preparations of instruments, materials and equipment required before carrying out a construction technical drawing?
5. Describe how drawing instruments, materials and equipment should be maintained

Topic 1.1: Identification and preparation of various drawing instruments, materials and equipment

Activity 1: Problem Solving

Task 2:

1. You have applied for a job as a mason in your sector. The interviewer requires you to identify all the instruments, materials and equipment that will be used in construction technical drawing. Complete the table below by giving examples of instruments, materials and equipment under each section.

Drawing materials	Writing instruments
Tracing instruments	Measuring instruments
Sharpening instruments	Accessory instruments
Drawing equipment	Safety equipment

2. Describe the necessary preparation of instruments, materials and equipment required in construction technical drawing.

List of drawing materials¹

- ✓ Drawing sheet/ Drawing paper
- ✓ Pencil
- ✓ Ink
- ✓ Eraser/ Rubber
- ✓ Lead

• List of drawing instruments²

- ✓ Writing instruments
- **Mechanical Pencils**
- **Drawing pens/Ink pens**
- **Tracing instruments**
 - ✓ Ruler
 - ✓ Scale
 - ✓ Set squares
- **Measuring instruments**
 - ✓ Ruler
 - ✓ Scale
 - ✓ Set squares
 - ✓ Protractor
- **Sharpening instruments**
 - ✓ Pencil sharpener
- **Accessory instruments**
 - ✓ Instrument box
 - ✓ Knife
 - ✓ Templates
 - ✓ Scissors
- **List of drawing equipment**
 - ✓ Drawing table
 - ✓ Drawing board

¹ RTB Curricula

² 10 Essential Drawing Materials and Tools for Beginners (thevirtualinstructor.com)

✓ Drafter

✓ T-square

- **Preparation of various drawing instruments, materials and equipment before a construction technical drawing**

✓ First, fix the paper to your board, using clips or tape.

✓ Then sharpen your pencils, either to a point using a pencil sharpener, or to a chisel shape using the emery board

✓ Use this shape for drawing lines, drawing from the ends of each line to meet in the middle.

✓ Using the emery board to sharpen your compass leads to a chisel point too.

✓ Finally, draw a frame on your paper if required.

✓ Now you are ready to start drawing (Morling, 2010).



Activity 2: Guided Practice



Task 3:

Provided below is a list of the instruments, materials and equipment that are used in construction technical drawing.

Categorize the instruments, materials and equipment based on their purpose.

Drawing sheet/ Drawing paper; Pencil; Ink; Eraser/ Rubber; Lead; Mechanical Pencils

Drawing pens/Ink pens; Ruler; Scale; Set squares; Ruler; Scale; Set squares; Protractor

Pencil sharpener; Instrument box; Knife; Templates; Scissors; Drawing table; Drawing board Drafter; T-square



Activity 3: Application



Task 4:

1. You are given the assignment of drawing flush toilets for the new classroom block in your school. The Flush toilets are composed of:

- a. 6 similar, equal and aligned W.C
 - b. One toilet is 1.50m*1m
 - c. The height on the front is 3.10m and 2.60m on the back
 - d. Each W.C has a single wooden door of 0.75m*1.9m
 - e. The septic tanks and drainage system are not taken into consideration
2. Make a report of your assignment that should include all the required instruments, materials and equipment for the completion of the given task.

Topic 1.2: Use of drawing materials, instruments and equipment

Activity 1: Problem Solving

Task 5:

Imagine you are given a task of creating a room layout. The room measures 10m by 8m. Describe how you would use the following instruments, materials and equipment to create an accurate representation of the room.

Instruments, materials and equipment	Use of the instruments, materials and equipment
Drawing sheet/Drawing paper	
Drawing pencil	
A drafter	
Clinograph	
T-square	
Set-square	
Drawing board	
Protractors	
French curve	

Key Facts 1.2: Use of drawing materials, instruments and equipment

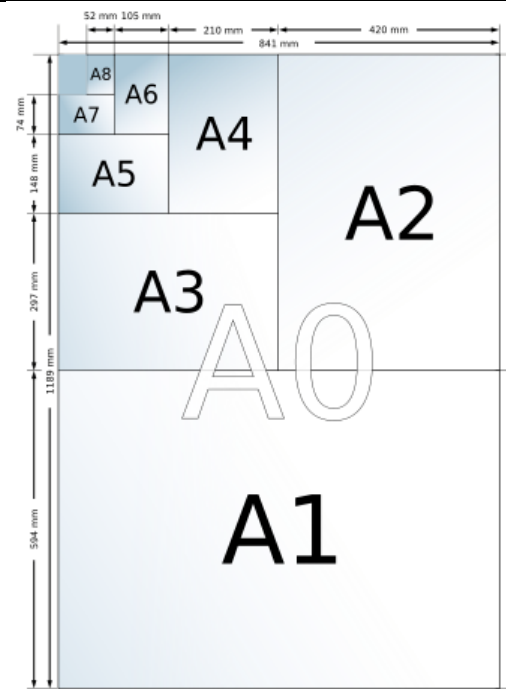
- **Drawing materials**

- ✓ **Drawing sheet/Drawing paper**

- ✚ Drawing sheet is the paper on which a drawing is to be made.
 - ✚ All A size sheets have their edge lengths in the same proportion which is in the ratio of short side to the long side and is equal to $1:\sqrt{2}$.
 - ✚ Each lower size in the A series is obtained by exactly dividing the A sheet along its middle as shown in the following figure:

Table of sheet sizes

Format	Measurements in mm
A0	841 x 1189
A1	594 x 841
A2	420 x 594
A3	297 x 420
A4	210 x 297
A5	148 x 210
A6	105 x 148



✓ Drawing pencil

- ✚ The pencils are used for producing the drawings on the sheets.
- ✚ The accuracy and appearance of drawing depend upon the quality of the pencil used.
- ✚ Pencils are of various grades easily recognized by the letters marked on the pencils.

✓ Different grades of drawing pencils according to Indian Standard Institution (I.S.I)³

Grade of pencil	Hardness
9H	: Hardest
6H, 5H, 4H	: Extremely Hard
3H	: Very Hard
2H	: Hard
H	: Moderately Hard
F	: Firm
HB	: Medium
B	: Moderately Soft & Black
2B	: Soft & Black
3B	: Very Soft & Black
4B, 5B and 6B	: Very Soft & Very Black
7B	: Softest

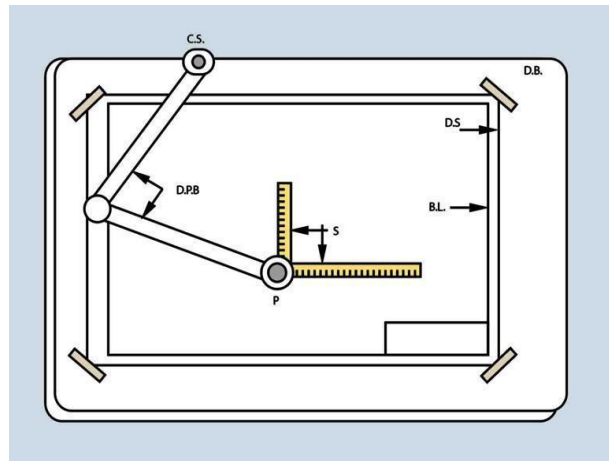
³ Indian Standard Institution (I.S.I)

- ✚ HB - (Soft grade): Used for drawing border lines, lettering and freehand sketching
- ✚ H - (Medium grade): Used for visible outline, visible edges and boundary lines
- ✚ 2H - (Hard grade): Used for construction lines, dimension lines, leader lines, extension lines, center line, hatching line and hidden lines
- ✓ **Rubber or eraser:** The rubber is used for erasing extra pencil lines
- ✓ **Erasing shield:** Erasing shield is used to protect the adjacent lines on the drawing when some part of a line is being erased.

● Drawing Instruments and Equipment

✓ A drafter

- ✚ It combines the functions of T-squares, scales, clinograph and protractor.
- ✚ It is used to draw horizontal, vertical and inclined lines and also for measuring lines and angles.



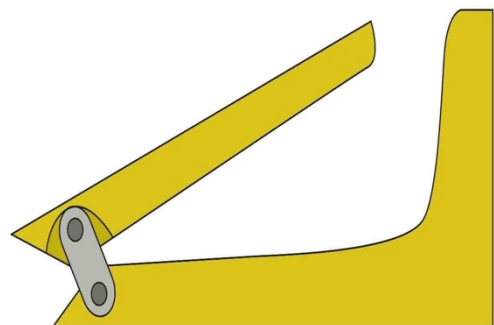
DPB=Double parallel bars; CS=

Clamping screw; P= Protractor

S=Scales; DS= Drawing sheet; BL= Border line; DB= Drawing board

✓ Clinograph

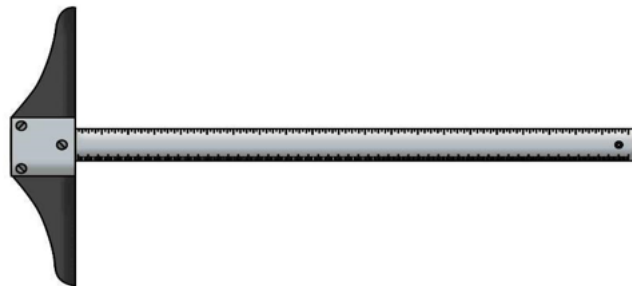
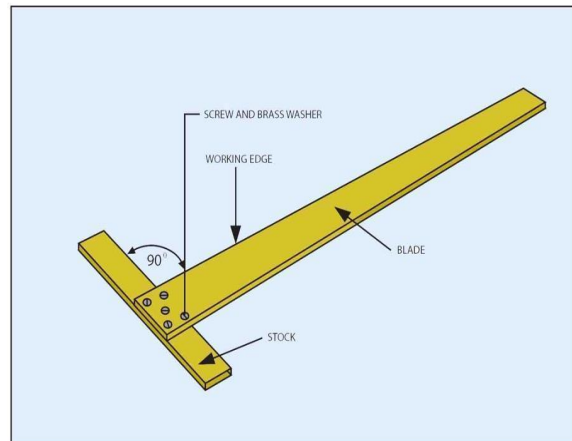
- ✚ Clinograph is an adjustable set square and is used to draw parallel lines at any inclination.
- ✚ The two sides of the clinograph are fixed at 90° and the third side can be adjusted at any desired angle.



✓ T-square

It consists of a straight edge or piece and a cross piece or head, also referred to as a stock

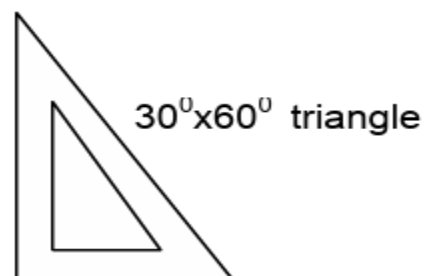
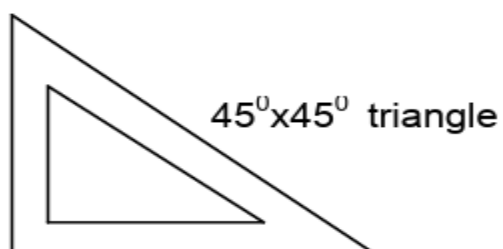
✚ The T-Square is used in conjunction with a Drawing Board to draw horizontal lines and as a guide for Set-Squares when drawing vertical and inclined lines.



✚ **Standard size of T- square according to Indian Standard Institution (I.S.I.)**

#	Designation	Length of working edge in mm
1.	T0	1500 + 10
2.	T1	1000 + 10
3.	T2	700 + 5
4.	T3	500 + 5

✓ Set-square

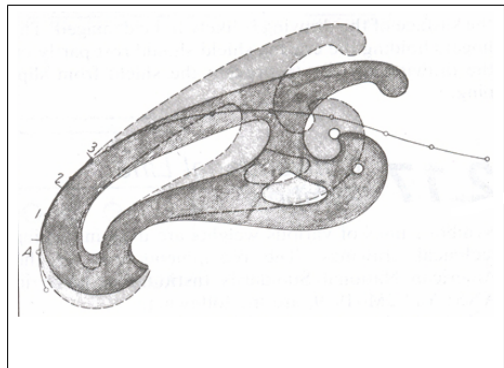


- ✚ The set-squares are used for drawing straight lines except the horizontal lines which are usually drawn with T-square.
- ✚ The perpendicular lines or the lines at 30°, 60° and 90° to the horizontal can be drawn by using the set squares
- ✚ The perpendicular lines or the lines inclined at 45° and 90° to the horizontal can be drawn by using the set-squares
- ✚ By using two set-squares, angle of 150°, 75° and 105° can be drawn

✓ French curve

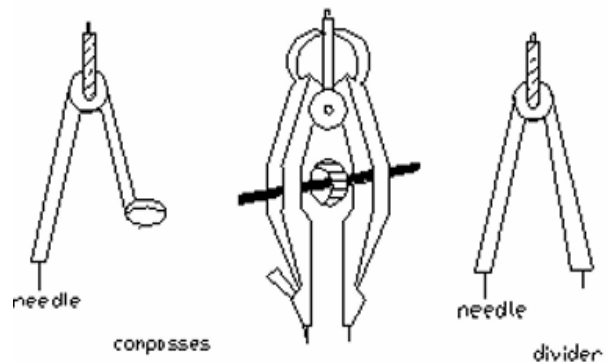
French Curves are also referred to as Irregular Curves

French Curves are used in drawing regular and smooth curves with varying radii of curvature that cannot otherwise be drawn using other drawing equipment.



✓ Compasses and dividers

- ✚ **Compasses:** are used to draw circles and arcs

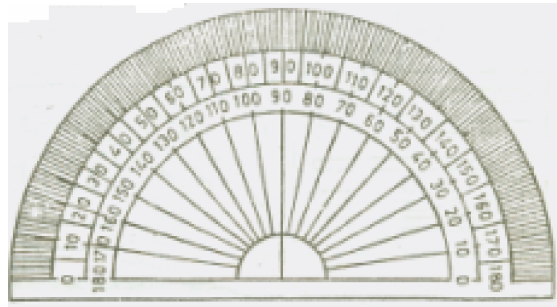


- ✚ **Dividers are used for:**

- Divide straight curved lines into a number of equal parts
- Setting-off dimensions from the-scale to the drawing
- Transferring dimensions from one part of the drawing to another part

✓ **Protractors**

Protractors are used for measuring or constructing angle which cannot be obtained by set squares



✓ **Drawing board**

The Drawing Board serves as the workstation in drawing and is made with a smooth level top surface onto which drawing paper is fixed using clamps, thumbnails (board pins), or using drawing tape.



Activity 2: Guided Practice



Task 6:

You are tasked to draw a perpendicular bisector of a line segment XY 10cm long.

- Which instruments, materials and equipment will you use to draw the bisector?
- Describe how you would use the instruments, materials and equipment identified above in(a)



Activity 3: Application



Task 7:

1. You are provided with the following instruments, materials and equipment used in construction technical drawing:

Clinograph, A Drafter, Erasing shield, Rubber or eraser, Drawing pencil, Drawing sheet/Drawing paper:

- a. Select the instruments, materials and equipment you will need to construct a floor plan for a standard 2-room house.
- b. Describe how you would use each of the instruments, materials and equipment selected above.

Topic 1.3: Handling of drawing tools and equipment

Activity 1: Problem Solving

Task 8:

Assume that you are a group representative in a given work of drawing a simple residential building floor plan and you are sent to the workshop to select the required materials to be used in the task. Describe briefly how you handle the instruments, materials and equipment by completing the table below.

Instrument	Proper care/Handling
Pencil	
T-square, triangles (set squares) and French curves	
Ruler or scale	
Speedball pens and lettering pens	
Dividers and compasses	
Ruling pen	
Drawing paper	
Masking tape or scotch tape, eraser and erasing shield	
Drawing board	

Key Facts 1.3: Handling of drawing instruments, materials and equipment

- **Handling of drawing instruments, materials and equipment**

The proper care and maintenance of drawing instruments, materials and equipment are the following⁴:

⁴ Proper Care of Drafting Instruments - HubPages

Instruments, materials and equipment	Proper care/Handling
Pencil	✓ Never sharpen the pencil over the drawing or close to any of your equipment. ✓ Always keep the lead sharp
T-square, triangles (set squares) and French curves	✓ Do not use the T-square for any rough purposes. ✓ Never cut paper along its working edge, since the plastics can easily be damaged. Even light scratches can ruin the T-square.
Ruler or scale	✓ Scales should not be pricked with needle points of either the divider or compass when measurements are taken. ✓ Do not use scale as a ruler.
Speedball pens and lettering pens	✓ After using, clean the speedball pen by wiping-off or scraping the ink on it with clean cloth, which is a little wet or you may use a blade for scraping. ✓ Lettering pens, like technical pens, should be clean at once with clean water and soap. Wipe it off with clean cloth.
Dividers and compasses	✓ Do not oil the joints of the legs of the dividers. ✓ The needlepoints must be sharp and of equal length.
Ruling pen	✓ Sharpen the nibs or blade of the ruling pen when it is no longer in a parabolic shape. ✓ Rub the dried ink on the nibs with the use of paper to avoid clogging at its end when in use.
Drawing paper	✓ It should be stored in rolled form. ✓ It should not be crumpled or wet or kept in a moist or cold place. ✓ Papers or bond papers must be kept in a large envelope.
Masking tape or scotch tape, eraser and erasing shield	✓ Should be kept together with other supplies to avoid losing it.
Drawing board	✓ It should always be in good (drawing) working condition. ✓ It must always be clean on or before using. ✓ The top surface must be smooth.

	✓ Do not use the divider as a substitute for thumbtacks in fastening the drawing paper on the drawing board or tabletop.
--	--



Activity 2: Guided Practice



Task 9:

Suppose that you are accepted in a company for the Industrial Attachment Program. The company assigns you to draft a kitchen layout for the bid they are competing for. You are visited by your school supervisor, under the help of your company supervisor, try to present to your school supervisor the methods of handling instruments, materials and equipment that you use in your task.



Activity 3: Application



Task 10:

Your school stakeholders visit the school in the launch of the newly built drawing workshop. As you are the one selected to present instruments, materials and equipment in the workshop, try to apply the methods of handling the instruments, materials and equipment in the workshop. Make a report of how you will handle each instruments, materials and equipment.



Formative Assessment

1. Answer by **True** or **False** to the following statement: “All the following are among the drawing instruments, materials and equipment.”
 - a. Pencil
 - b. Ruler
 - c. Eraser
 - d. drafter
 - e. Scale

- f. Clinograph
- g. Square
- h. Protractor
- i. Chalk
- j. T-square

2. State any ten drawing instruments and their uses.
3. Discuss the methods of handling the following drawing instruments and equipment:
 - a. Drawing board
 - b. Pencil
 - c. Erasing shield
 - d. Eraser



Points to Remember

- Make sure that each material, tool or equipment is in good working condition before use.
- Select the materials, tools and equipment relevant to the task.
- Remember to maintain the cleanliness of instruments before and after use.
- Materials and tools need to appropriately be stored in the instrument box.
- Take care of handling materials, tools and equipment.



Self-Reflection

1. Fill in and complete the self-assessment table below to assess your level of knowledge, skills and attitudes after covering this unit.
2. There are no right or wrong ways to answer this assessment. It is for your own reference and self-reflection on the knowledge, skills and attitudes acquisition during the learning process. Think about yourself:
 - a. Do you think you have the knowledge, skills or attitudes to do the task?

b. How well?

3. Read the statements across the top. Put a check in a column that best represents your level of knowledge, skills and attitudes.

My experience	I don't have any experience doing this.	I know a little about this.	I have some experience doing this.	I have a lot of experience with this.	I am confident in my ability to do this.
Knowledge, skills and attitudes					
Identify drawing instruments, materials and equipment					
Prepare drawing instruments, materials and equipment					
Describe the use of drawing instruments, materials and equipment					
Properly handle drawing instruments, materials and equipment					
Be attentive to details while selecting drawing instruments, materials and equipment					

My experience	I don't have any experience doing this.	I know a little about this.	I have some experience doing this.	I have a lot of experience with this.	I am confident in my ability to do this.
Knowledge, skills and attitudes					
Demonstrate endurance in your daily activities					
Comply with National and International Standards during basic construction technical drawing					

4. Fill in the table above and share results with the trainer for further guidance.

Areas of strength	Areas for improvement	Actions to be taken to improve
1.	1.	1.
2.	2.	2.
3.	3.	3.
4.	4.	4.

UNIT 2: INTERPRET LINES AND SYMBOLS.



Unit summary:

This unit provides you with the knowledge, skills, and attitudes required for interpreting lines and symbols for construction. It covers description of drawing lines, identification of the size of lines used in drawing and description of drawing symbols for construction and their functions.

Self-Assessment: Unit 2

1. Referring to the unit illustration above discuss the following:
 - a. What does the illustration show?
 - b. What activities are performed in the illustration above?
 - c. What do you think this unit is about based on the illustration?
2. Fill in and complete the self-assessment table below to assess your level of knowledge, skills and attitudes under this unit.
 - a. There is no right or wrong way to answer this assessment. It is for your own reference and self-reflection on the knowledge, skills and attitudes acquired during the learning process.
 - b. Think about yourself: do you think you have the knowledge, skills or attitudes to do this task? How well?
 - c. Read the statements across the top. Put a check in a column that best represents your level of knowledge, skills or attitudes.
3. At the end of this unit, you will assess yourself again.

My experience	I don't have any experience doing this.	I know a little about this.	I have some experience doing this.	I have a lot of experience with this.	I am confident in my ability to do this.
Knowledge, skills and attitudes					
Describe drawing lines used in construction drawing					
Identify the sizes of lines used in construction drawing					
Describe the symbols used in construction drawing					
Explain the functions of drawing symbols					

My experience	I don't have any experience doing this.	I know a little about this.	I have some experience doing this.	I have a lot of experience with this.	I am confident in my ability to do this.
Knowledge, skills and attitudes					
for construction drawing					
Draw correctly lines used in construction drawing					
Apply symbols used in drawing in drawing					
Take responsibility for tools and equipment maintenance					



Key Competencies:

Knowledge	Skills	Attitudes
1. Describe drawing lines used in construction drawing	1. Interpret all lines used in drawing	1. Demonstrate team spirit while working with others
2. Differentiate all line types used in drawing	2. Interpret symbols used in drawing	2. Be attentive to details while drawing the lines
3. Describe symbols used in construction drawing	3. Draw symbols in drawing	3. Properly maintain the cleanliness of the paper while you are drawing the lines
4. Differentiate symbols types used in drawing	4. Apply symbols used in drawing in drawing	4. Be attentive to details while drawing of symbols



Discovery activity



Task 11:

1. Read and answer the questions below:
 - a. Describe the different drawing lines used in construction drawing
 - b. Explain the different Identify the sizes of lines used in construction drawing
 - c. Describe the different symbols for construction drawing
 - d. Explain the functions of the various symbols for construction drawing
 - e. Describe the symbols used in construction drawing

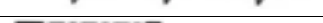
Topic 2.1: Interpretation of drawing lines

Activity 1: Problem Solving



Task 12:

Provided below are types of lines used in construction drawings. Analyze the lines and complete the table below by filling in the names of the lines and their applications.

Types of lines	Name of the line	Application of the line
		
		
		
		
		
		
		
		
		
		
		

Key Facts 2.1: Interpretation of lines

- Interpretation of lines

- ✓ Lines in drawing

-  Lines are defined as elements with no breadth but unlimited length (magnitude)

-  Lines used in any engineering drawing may be straight or curved.

- ✓ Types of lines and their applications and their size

Types of lines	Name of the line	Application of the line
	Continuous thick line	Dimension line
	A continuous thin line	Extension line Hatching Leaders for notes

	A continuous wavy line	Break line of part view and part sections when break lines are not centerlines
	A short thin dashed line	Non – visible outline(hidden)
	A thin chain line	Center lines and pitch circles
	A thin chain line with thick extremities	Cutting or viewing planes
	Continuous thin freehand	Boundaries of limits of partial or interrupted views
	Continuous thin Zigzag	Long break lines
	Chain thin and thick at the ends and changes of directions	Cutting planes
	Chain thick	Indication of line or surface to which special treatment required
	Chain thin double dash	Outlines of adjustment parts alternate and extreme positions of movable parts, centroid lines, initial outlines prior to forming



Activity 2: Guided Practice



Task 13:

Study and complete the table below by drawing the types of lines, giving the name of the line and the application of the line in the missing sections.

Types of lines	Name of the line	Application of the line
		
	A continuous thin line	
		Break line of part view and part sections when break lines are not centerlines

		
	A thin chain line	
		Cutting or viewing planes
		
	Continuous thin Zigzag	
		Cutting planes
		
	Chain thin double dash	

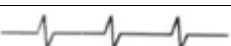
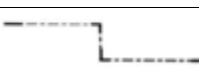
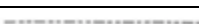


Activity 3: Application



Task 14:

Study and interpret the lines provided in the table below by giving the name and application of the line.

Types of lines	Name of the line	Application of the line
		
		
		
		
		
		
		
		
		
		
		

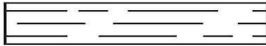
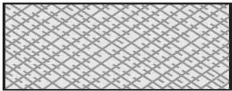
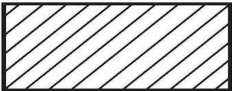
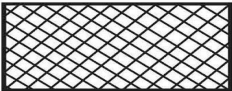
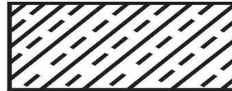
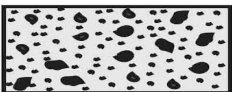
Topic 2.2: Interpretation of Symbols

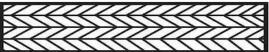
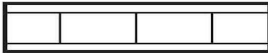
Activity 1: Problem Solving

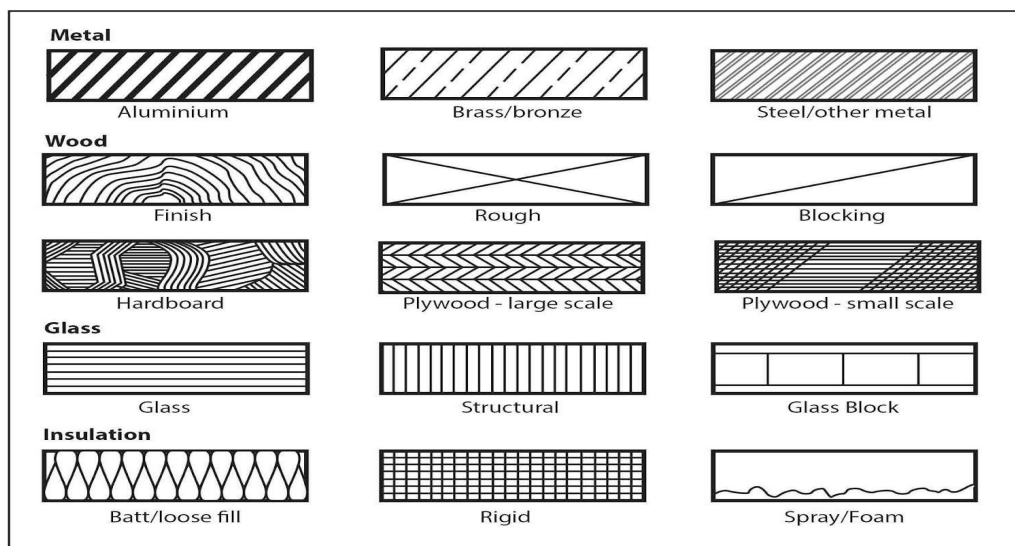
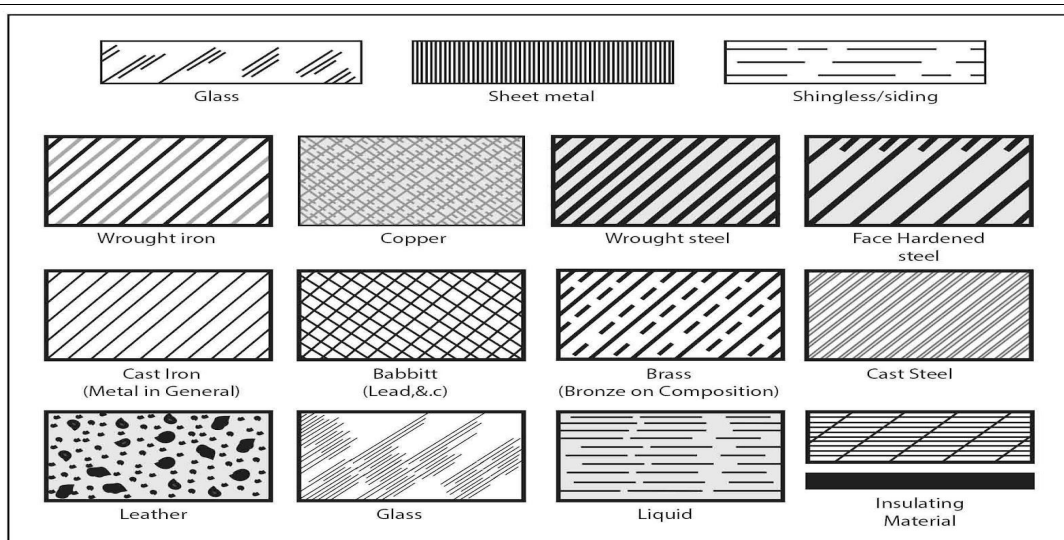
Task 15:

Provided below are symbols used in construction drawings. Analyze the symbols and complete the table below by filling in the category or type of the symbol.

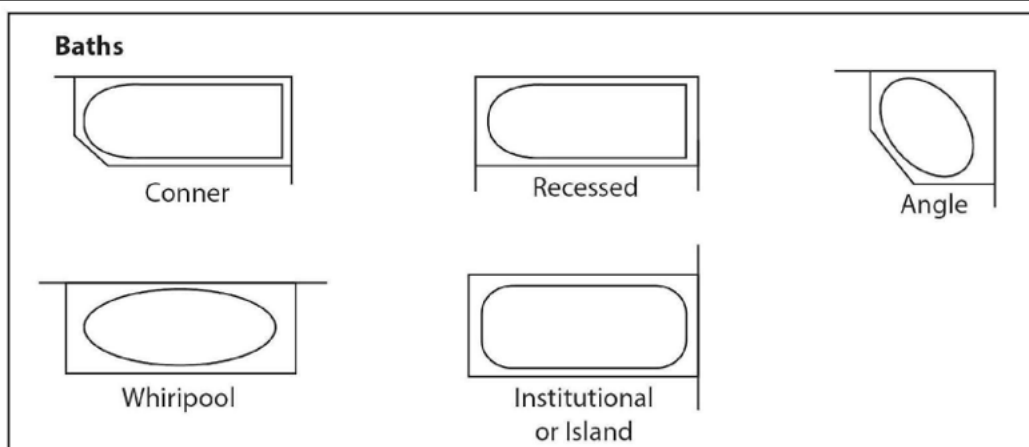
A.

			
Glass	Sheet metal	Shingless/siding	
			
Wrought iron	Copper	Wrought steel	Face Hardened steel
			
Cast Iron (Metal in General)	Babbitt (Lead,&c)	Brass (Bronze on Composition)	Cast Steel
			
Leather	Glass	Liquid	Insulating Material

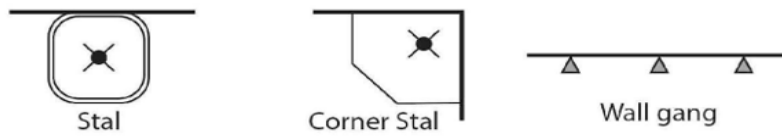
Metal		
		
Aluminium	Brass/bronze	Steel/other metal
Wood		
		
Finish	Rough	Blocking
		
Hardboard	Plywood - large scale	Plywood - small scale
Glass		
		
Glass	Structural	Glass Block
Insulation		
		
Batt/loose fill	Rigid	Spray/Foam



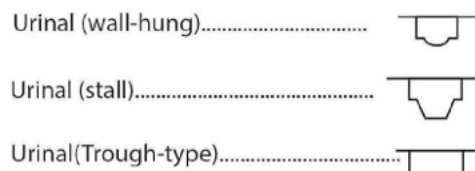
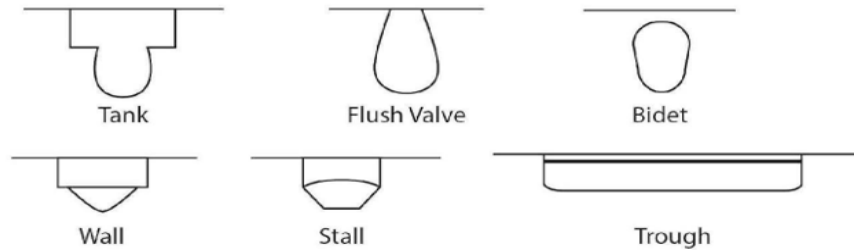
B.



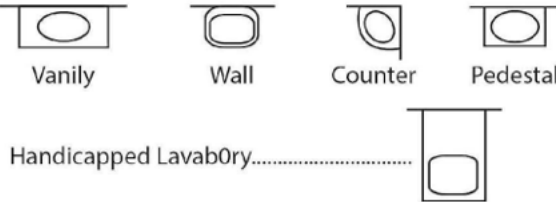
Showers



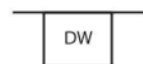
Water Closets



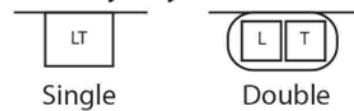
Lavatories



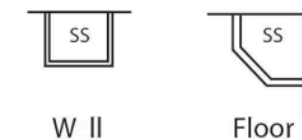
Dishwasher



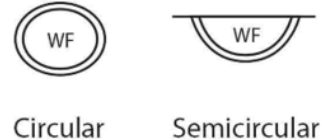
Laundry Trays



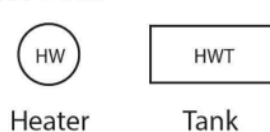
Service Sinks



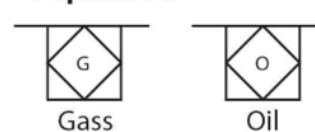
Wash Fountains



Hot water



Separators



C.

SINGLE CELL		CONNECTION, CHASSIS(GROUND)	
MULTICELL		CONNECTION, EARTH GROUND	
		CONNECTOR	
		DIODE SEMICONDUCTOR	
CAPACITOR FIXED		FUSE	
POLARIZED		DC GENERATOR	
CONTACTS CLOSED(BREAK)		HEATER	
OPEN(BREAK)		HOT WIRE	
CIRCUIT BREAK		INDUCTOR(COIL)	
CROSS NO CONNECTION		LAMP	
CONNECTION		MOTOR, DC,AC	

D.

	seen drawing no.5		Column line grid		mm
	Building section A-A can be seen on drawing noA-4		Partition type		Interior elevations 1, 2, 3 and be seen on drawing A-5. Direction of triangle indicates elevation
	Main object line		Window type		Double hung window
	Hidden or visible line		Door number		Casement window and double door
	Indicates centre line		Room number		Slide window
	Dimension lines		Ceiling height		External door(opening direction)
	Extension lines		Break in a continuous line		Internal door(opening direction)
	Symbol indicates centre line		Refer to note #3		
	Indicate wall section		Elevation marker		
	Indicates north direction				

Key Facts 2.2: Interpretation of Symbols

- **Introduction**

- ✓ Drawings contain symbols whose purpose is to identify specific features and concepts and reference those features to other drawings.
- ✓ Different construction disciplines (e.g., mechanical and electrical) have their own symbol sets. Symbols are generally used to communicate through its shape.
- ✓ Material symbols are used to represent materials or contents on floor plans, elevations, and detail drawings.
- ✓ Different symbols may be used to represent the same item on drawings. The outline of the drawing may be filled in with a material symbol to show what the object is made of.
- ✓ Various design layouts require symbols to highlight details like depth, direction, positioning, material types, and other key features that construction engineers and architects need to use.
- ✓ The combination of these symbols gives a holistic view to everyone involved in a particular construction project.

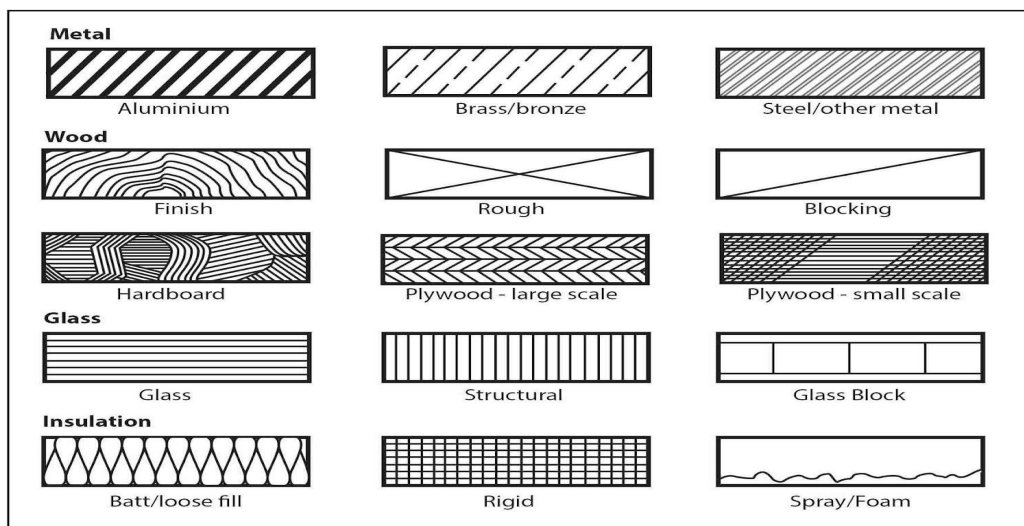
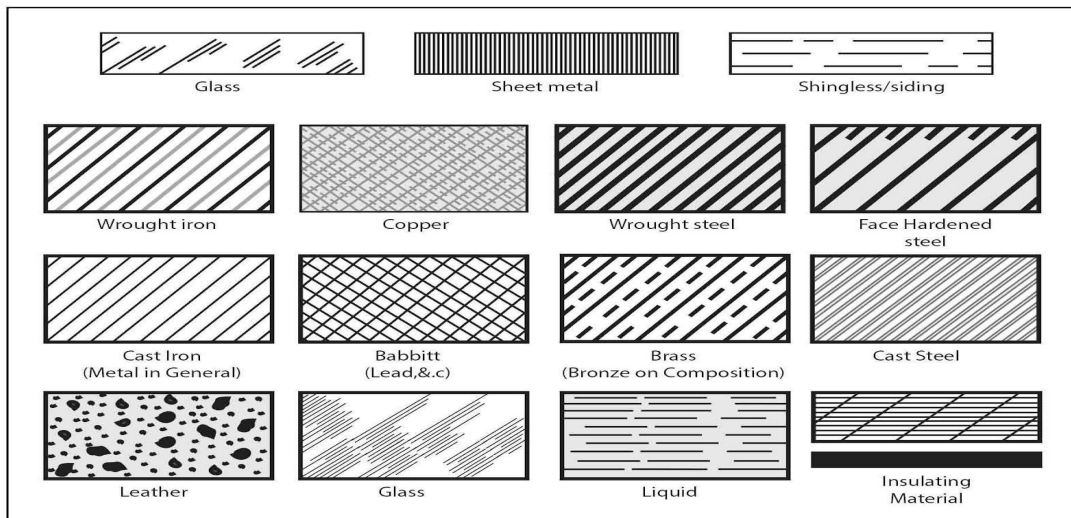
- **Rules of drawing symbols**

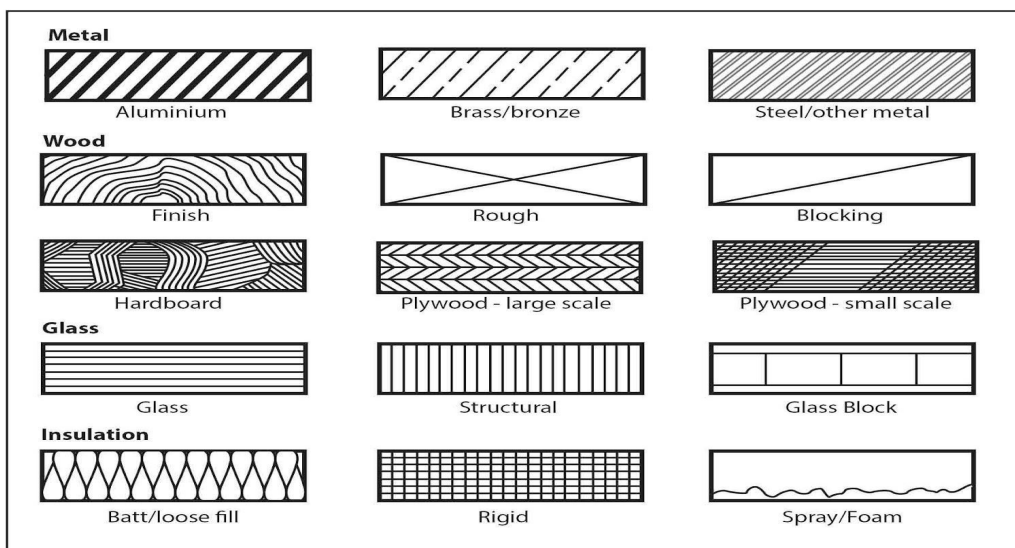
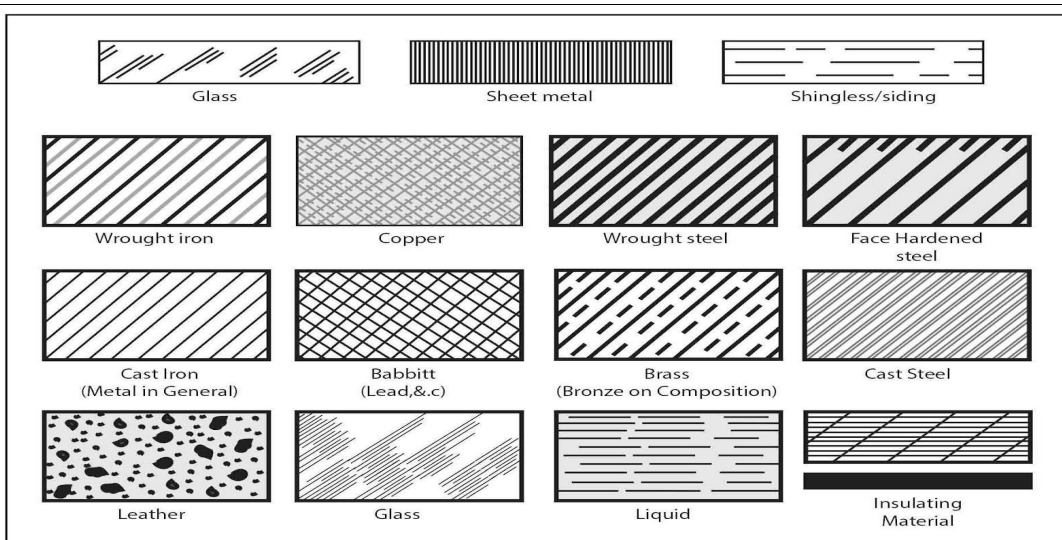
- ✓ Always use drawing instruments never draw the symbols freehand Use an architectural drawing template to increase the speed and clarity of symbols
- ✓ The location of the symbol on the working drawing is closely approximated

- **Types of symbols in construction drawings**

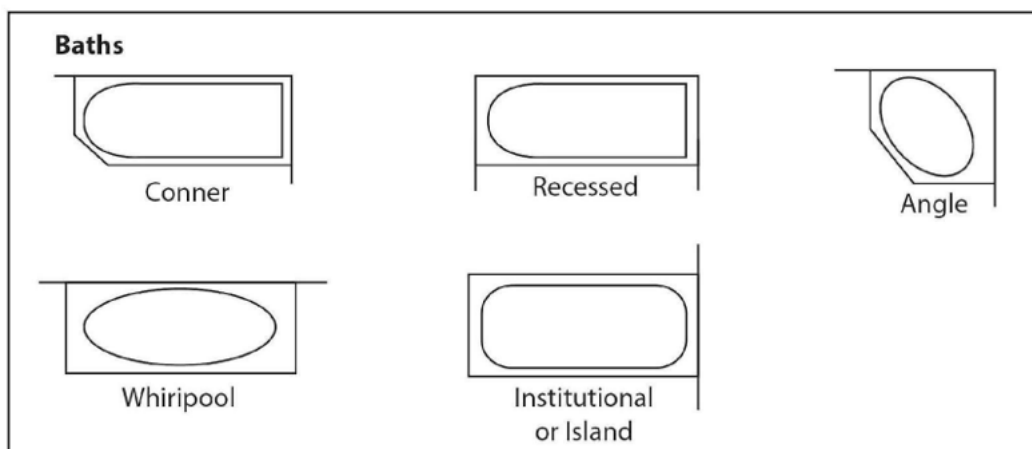
They are many types of symbols used in construction drawing and they can be divided into several categories.

✓ **Masonry symbols or Materials symbols**

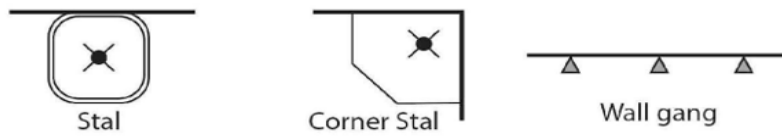




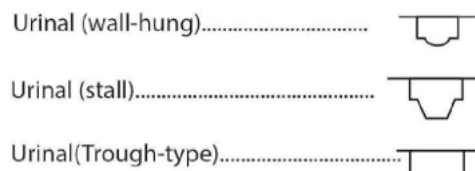
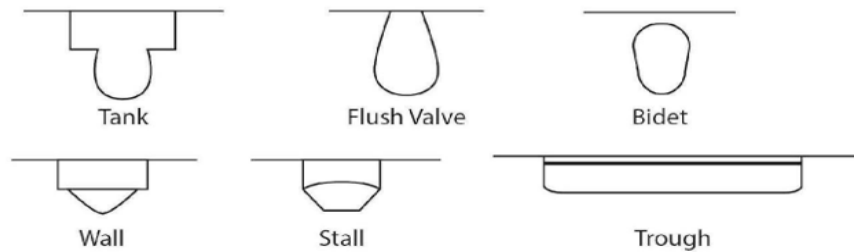
✓ Plumbing symbols



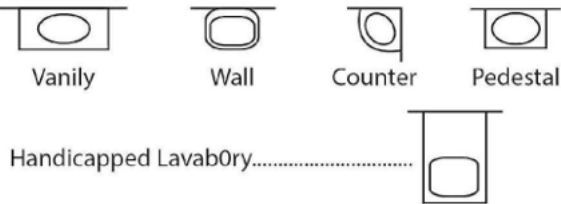
Showers



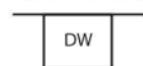
Water Closets



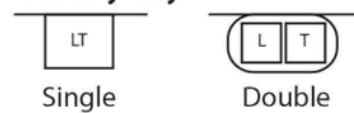
Lavatories



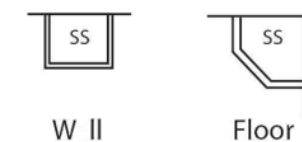
Dishwasher



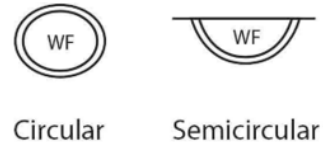
Laundry Trays



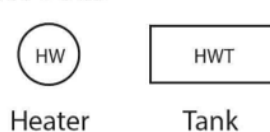
Service Sinks



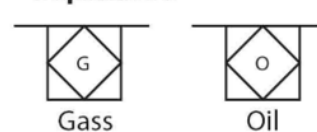
Wash Fountains



Hot water



Separators



✓ Electrical symbols

SINGLE CELL		CONNECTION, CHASSIS(GROUND)	
MULTICELL		CONNECTION, EARTH GROUND	
CAPACITOR FIXED		CONNECTOR	
POLARIZED		DIODE SEMICONDUCTOR	
CONTACTS CLOSED(BREAK)		FUSE	
OPEN(BREAK)		DC GENERATOR	
CIRCUIT BREAK		HEATER	
CROSS NO CONNECTION		HOT WIRE	
CONNECTION		INDUCTOR(COIL)	
		LAMP	
		MOTOR, DC,AC	

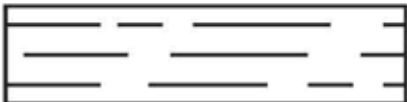
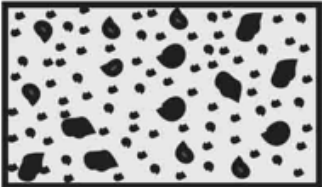
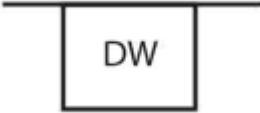
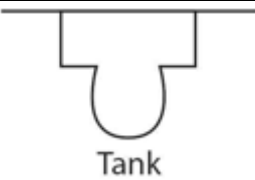
✓ Architectural symbols

	seen drawing no.5		Column line grid		Interior elevation and be seen on drawing no.5. Direction indicates elevation.
	Building section A-A can be seen on drawing no.6		Partition type		Double hung window
	Main object line		Window type		Casement window or double door
	Hidden or visible line		Door number		Slide window
	Indicates centre line		Room number		External door (direction)
	Dimension lines		Ceiling height		Internal door (direction)
	Extension lines		Break in a continuous line		
	Symbol indicates centre line		Refer to note #3		
	Indicate wall section		Elevation marker		
	Indicates north direction				



Task 16:

Analyze the symbols given below and complete the table by giving the meaning and type of the symbol.

Symbol	Meaning/interpretation	Type
		
		
		
		
		
		
		
		

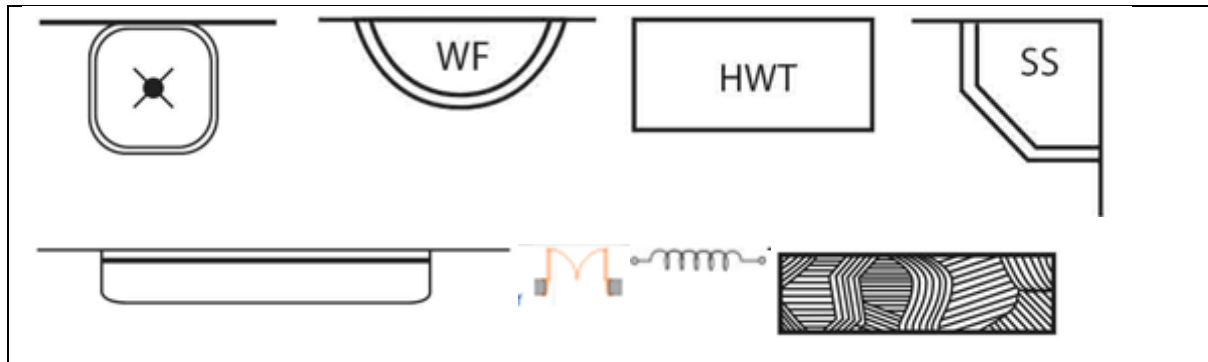


Activity 3: Application



Task 17:

You are hired to work on a building. You are provided with construction drawings that include some of the symbols below.



Describe where each symbol may be applied in the construction works. Make a report of your application which should include the name, type and application of the symbol



Formative Assessment

1. Answer true or False

a. This is Zig Zag line



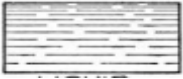
b. Dashed thick and thin lines are used to outline the hidden elements

c. The following is freehand line

d. _____

2. By using Allow match the following symbols used in drawing in column A with their meaning in column B

A. Symbols	B. Meanings
	Single door
	Kitchen sink

	Earth work
	Liquid
	Double door

Points to Remember

- Drawings contain symbols whose purpose is to identify specific features and concepts and reference those features to other drawings.
- Different construction disciplines (e.g., mechanical and electrical) have their own symbol sets. And symbols are generally used to communicate through its shape
- Material symbols are used to represent materials or contents on floor plans, elevations, and detail drawings.
- Different symbols may be used to represent the same item on these drawings. The outline of the drawing may be filled in with a material symbol to show what the object is made of.
- Various design layouts require symbols to highlight details like depth, direction, positioning, material types, and other key features that construction engineers and architects need to use.
- The combination of these symbols gives a holistic view to everyone involved in a particular construction project.

Self-Reflection

1. Fill in and complete the self-assessment table below to assess your level of knowledge, skills and attitudes after covering this unit.
2. There is no right or wrong way of answering this assessment. It is for your own reference and self-reflection on the knowledge, skills and attitudes acquisition during the learning process. Think about yourself:
 - a. Do you think you have the knowledge, skills or attitudes to do the task?
 - b. How well?
3. Read the statements across the top. Put a check in a column that best represents your level of knowledge, skills and attitudes.

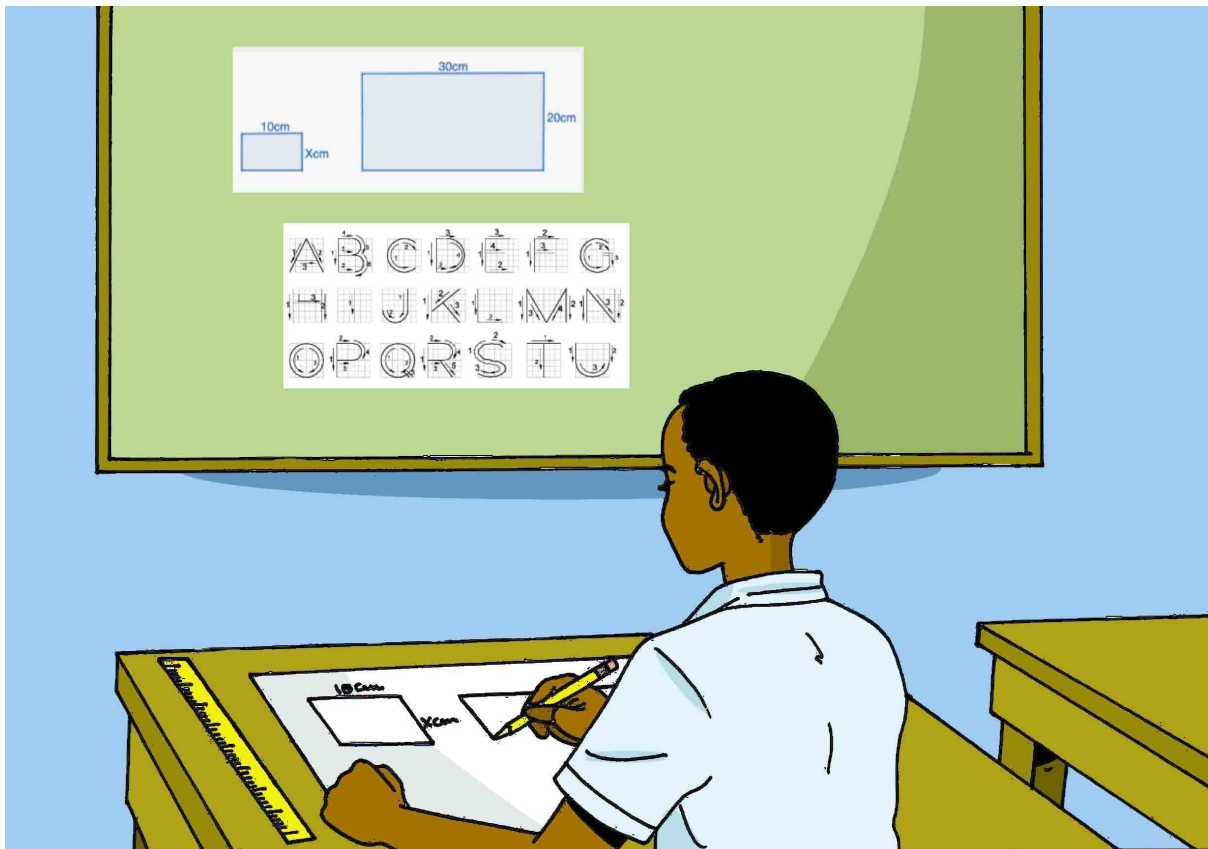
My experience	I don't have any experience doing this.	I know a little about this.	I have some experience doing this.	I have a lot of experience with this.	I am confident in my ability to do this.
Knowledge, skills and attitudes					
Describe drawing lines used in construction drawing					
Identify the sizes of lines used in construction drawing					
Describe symbols used in construction drawing					
Explain the functions of drawing symbols					

My experience	I don't have any experience doing this.	I know a little about this.	I have some experience doing this.	I have a lot of experience with this.	I am confident in my ability to do this.
Knowledge, skills and attitudes					
for construction drawing					
Draw correctly lines used in construction drawing					
Apply symbols used in drawing in drawing					
Take responsibility for tools and equipment maintenance					

4. Fill in the table above and share results with the trainer for further guidance.

Areas of strength	Areas for improvement	Actions to be taken to improve
1.	1.	1.
2.	2.	2.
3.	3.	3.
4.	4.	4.

UNIT 3: APPLY DRAWING SCALES, DIMENSIONS AND LETTERING



Unit summary:

This unit provides you with the knowledge, skills, and attitudes required for applying drawing scales, dimensions and lettering in construction technical drawing. It covers description of the scale; application of lettering; and application of dimensions in construction technical drawing.

Self-Assessment: Unit 3

1. Study the unit illustration above and answer the following questions.
 - a. What does the illustration show?
 - b. What activities are performed in the illustration above?
 - c. What do you think this unit is about based on the illustration?
2. Fill in and complete the self-assessment table below to assess your level of knowledge, skills and attitudes under this unit.

- a. There is no right or wrong way to answer this assessment. It is for your own reference and self-reflection on the knowledge, skills and attitudes acquired during the learning process.
 - b. Think about yourself: do you think you have the knowledge, skills or attitudes to do this? How well?
 - c. Read the statements across the top. Put a check in the column that best represents your level of knowledge, skills or attitudes.
3. At the end of this unit, you will assess yourself again.

My experience Knowledge, skills and attitudes	I don't have any experience doing this.	I know a little about this.	I have some experience doing this.	I have a lot of experience with this.	I am confident in my ability to do this.
Define correctly a scale					
Enumerate types of scale in drawing					
Describe the size of scale in drawing					
Apply different lettering in drawing					
Describe dimensioning in drawing					
Apply dimensioning in drawing					



Key Competencies:

Knowledge	Skills	Attitudes
1. Describe the scale	1. Use scale in construction drawing	1. Safe handling of tools and equipment
2. Describe lettering in drawing	2. Apply lettering in construction drawing	2. Avoiding wastage of materials
3. Describe dimensioning in construction drawing	3. Apply dimensioning in drawing	3. Taking care of tools and equipment



Discovery activity



Task 18:

Read and answer the questions below.

1. When do we use scales in construction technical drawing?
2. What is a Representative Fraction (RF)?
3. Briefly describe any types of scale you know

Topic 3.1: Description of the scale

Activity 1: Problem Solving

Task 19:

Using your experience working with measurements and drawings read and answer the following questions.

1. What do you understand by a scale in construction technical drawing?
2. As a mason, when would you use a scale in construction technical drawing?
3. What is meant by a Representative Fraction (RF)?
4. How is the Representative Fraction (RF) estimated?
5. If a storied building with a height of 20m is represented by a line of 10cm on the drawing, what is the representative fraction of the building?
6. Differentiate between the Architect's scale and Mechanical engineer's scale

Key Facts 3.1: Description of the scale

- **Meaning of Scale**

The proportion by which we either reduce or increase the actual size of the object on a drawing is known as drawing to scale or simple scale

- **Using A Scale**

A drawing is created to scale under the following conditions:

- ✓ When the object being drawn is too large for the drawing sheet.
- ✓ When the object being drawn is too small to be read easily.

- **Representative Fraction**

The ratio of the dimension of the object shown on the drawing to its actual size is called the Representative Fraction (RF)

$$RF = \frac{\text{Drawing size of an object (in same units)}}{\text{Its actual size}}$$

For example, if an actual length of 3 meters of an object is represented by a line of 15mm length on the drawing,

$$RF = \frac{\text{Drawing size of an object (in same units)}}{\text{Its actual size}} = \frac{15\text{mm}}{3\text{m}} = \frac{15\text{mm}}{3000\text{mm}} = \frac{1}{200} = 1:200$$

- **Scale types**

- ✓ **Architect's scale**

- ✚ Is used by architects primarily for producing drawings of buildings.

- ✚ It graduated in fractions of an inch.

- ✚ Is divided into proportional feet and inches.

- ✓ **Mechanical engineers scale**

- ✚ Is used for drawing parts of machines.

- ✚ Is used for applications where larger reductions in scale are not needed

- ✚ Has inches and fractions of an inch divided to represent inches.

It has divisions as below:

- Full size -1 inch divided into 32nds.
 - Half size -1/2 inch divided into 16ths.
 - Quarter size -1/4 inch divided into 8ths.
 - Eighth size -1/8 inch divided into 4ths.

- **Sizes of representative fraction scale**

- ✓ Full size scale.

- ✓ Reducing scale

- ✓ Enlarging scales



Activity 2: Guided Practice



Task 20:

Read and answer the questions below:

1. Which scale would you use to:
 - a. Produce drawings for a workshop?
 - b. Produce the drawings and electrical circuits?
 - c. Produce the drawings of the school basketball court?
 - d. Produce the drawings of a computer?
2. Which of the following situations may require a mason to use a scale for the drawing?
 - a. A picture of a building
 - b. Plan of classroom
 - c. Map of your school
 - d. Standard letters of the alphabet
3. If the road from Kayonza to Kigali of 67 km is represented by 6.7cm on a piece of paper, what is the scale of the drawing?
4. The scale of the drawing is 1:100. What is the actual size of the rectangular floor plan represented by 5 cm by 8cm?



Activity 3: Application



Task 21:

1. You are given the assignment of drawing flush toilets for the new classroom block in your school. The Flush toilets are composed of:
 - a. 6 similar, equal and aligned W.C
 - b. One toilet is 1.50m*1m
 - c. The height on the front is 3.10m and 2.60m on the back
 - d. Each W.C has a single wooden door of 0.75m*1.9m

Given that 10cm represent 1m, determine the drawing size of the flush toilets

Topic 3.2: Application of lettering in construction drawing



Activity 1: Problem Solving



Task 22:

Using your experience working with construction technical drawings read and answer the following questions.

1. What is lettering?
2. What is the recommended distance to be left between the two adjacent letters in all types of lettering?
3. What are the recommended heights of letters and numerals used in construction technical drawing?
4. What are the classifications of lettering used in construction technical drawing?
5. Explain the different styles of freehand lettering used in construction technical drawing below:
 - a. Lower case Italic freehand
 - b. Lower case vertical freehand lettering
 - c. Single stroke italic freehand
 - d. Single stroke vertical freehand lettering
6. Explain the different features of lettering used in construction technical drawing below:
 - a. Gothic lettering
 - b. Freehand lettering
 - c. Roman lettering

Key Facts 3.2: Application of lettering in construction drawing

- **Lettering**

- ✓ Technical lettering is the process of forming letters, numerals, and other characters in technical drawing.
- ✓ It is used to describe, or provide detailed specifications for an object

- ✓ Lettering used in engineering drawing is referred to as a Single Stroke, Commercial Gothic.

- **Feature of lettering**

- ✓ Uniformity
- ✓ Neatness
- ✓ Rapidity

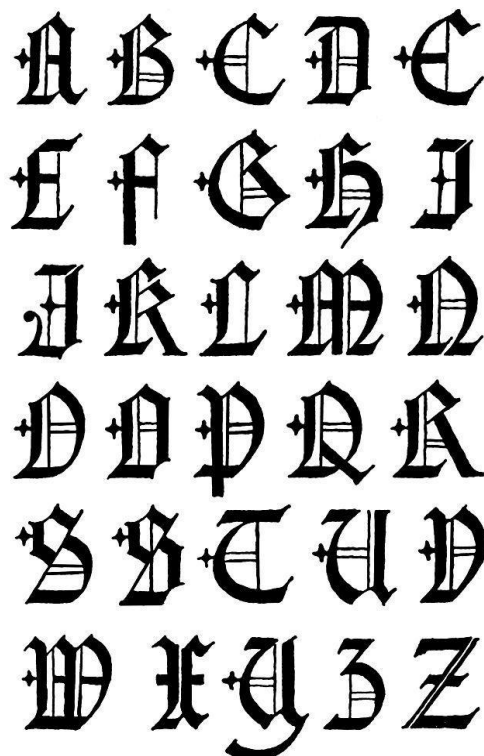
All lettering works are done either by freehand or by using drawing instruments. Skill and proficiency in freehand lettering can be achieved by the proper selection of appropriate sizes and style of lettering.

- **Height of letters and numerals**

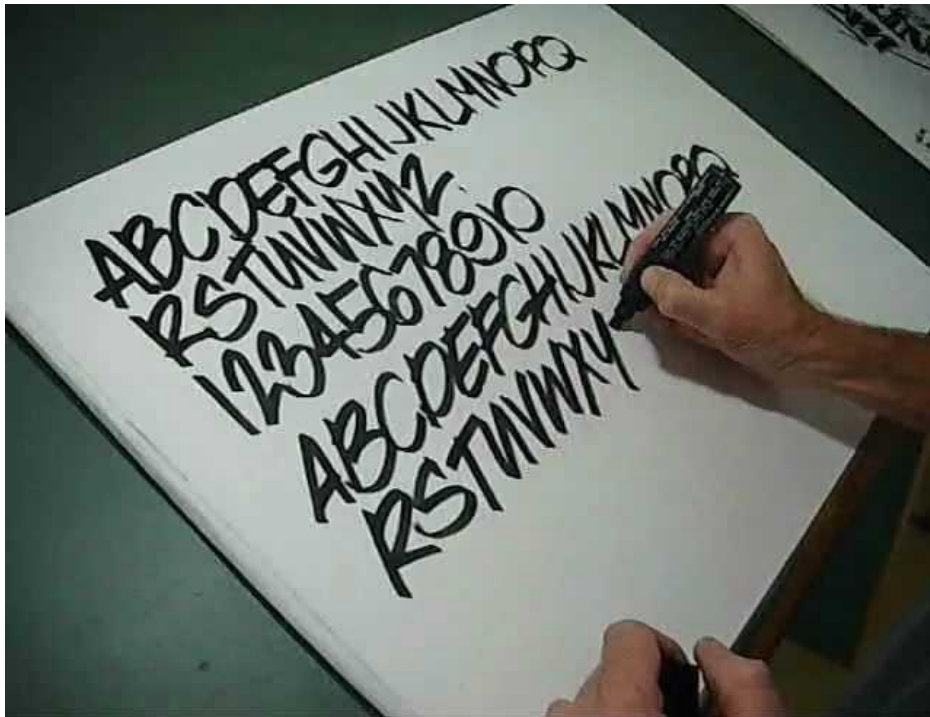
The height of letters and numerals recommended for use in engineering drawing are 2.5, 3.5, 5, 7, 10, 14 and 20mm. Height of the letters and numerals will be different for different purposes and may be selected suitably for their purpose.

- **Classification of lettering**

- ✓ **Gothic lettering.** The letter in which all the alphabets are of uniform width or thickness is known as gothic lettering.



- ✓ **Freehand lettering.** The art of writing alphabets without the use of instruments is called freehand lettering.



- ✓ **Roman lettering**



- **Style of freehand lettering**

- ✓ **Vertical or upright freehand lettering**



Single stroke vertical freehand lettering

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z , 1 2 3 4 5 6 7 8 9 0



Lower case vertical freehand lettering

a b c d e f g h i j k l m n o p q r s t u v w x y z

- ✓ **Inclined or Italic freehand lettering**



Single stroke italic freehand

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z , 1 2 3 4 5 6 7 8 9 0



Lower case Italic freehand

a b c d e f g h i j k l m n o p q r s t u v w x y z

- **Spacing of letters**

The spacing means the distance which is to be left between the two adjacent letters in all types of lettering.

Note:

- ✓ The space between each word should be kept equal to height of letter
- ✓ The space between the two lines should be left equal to twice the height of letter
- ✓ The space between the two lines should be kept not less than half or more than one and a half times the height of letter
- ✓ Lettering height (capital)
- ✓ Height of lowercase letters
- ✓ Spacing between characters
- ✓ Minimum spacing of base
- ✓ Minimum spacing between words



Activity 2: Guided Practice



Task 23:

1. Provided below are letters used in construction technical drawing. Analyze them and describe:

- a) The classification they belong
- b) Style of freehand lettering

A

b

C

d



Activity 3: Application



Task 24:

As a mason you are required to rewrite this statement by using inclined lettering style:

“All letters and numerals should neither touch each other nor the lines 1234 “

Topic 3.3: Application of dimensioning in construction drawing



Activity 1: Problem Solving



Task 25:

1. Using your experience working with construction technical drawings read and answer the following questions:
 - a. What is meant by a dimension line in construction drawing?
 - b. Explain the guidelines that dimensions should have?
 - c. Describe the steps involved in dimensioning
 - d. Describe where to put dimensions in construction technical drawing
 - e. Describe the dimension systems below:
 - i. Unidirectional dimension
 - ii. Angular dimensions system
 - iii. Chain dimensioning system
 - iv. A datum or Baseline dimension system
 - v. Describe the dimensioning principles in construction drawing

Key Facts 3.3: Application of dimensioning in construction drawing

● Introduction

- ✓ Dimension line is a thin line, broken in the middle to allow the placement of the dimension value, with arrowheads at each end
- ✓ The purpose of dimensioning is to provide a clear and complete description of an object.
- ✓ A complete set of dimensions will permit only one interpretation needed to construct the part.

● Dimensioning should follow these guidelines.

- ✓ **Accuracy:** correct values must be given.
- ✓ **Clearness:** dimensions must be placed in appropriate positions.

- ✓ **Completeness:** nothing must be left out, and nothing duplicated.
- ✓ **Readability:** the appropriate line quality must be used for legibility

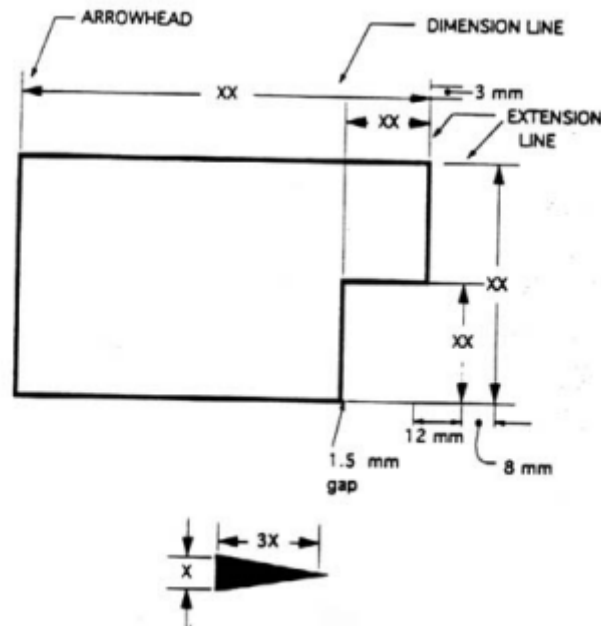


Fig 10. Dimensioning guidelines

- ✓ An arrowhead is approximately 3 mm long and 1mm wide. That is, the length is roughly three times the width.
- ✓ An extension line extends a line on the object to the dimension line. The first dimension line should be approximately 12 mm (0.6 in) from the object. Extension lines begin 1.5 mm from the object and extend 3 mm from the last dimension line.
- ✓ A leader is a thin line used to connect a dimension with a particular area

• Steps in Dimensioning

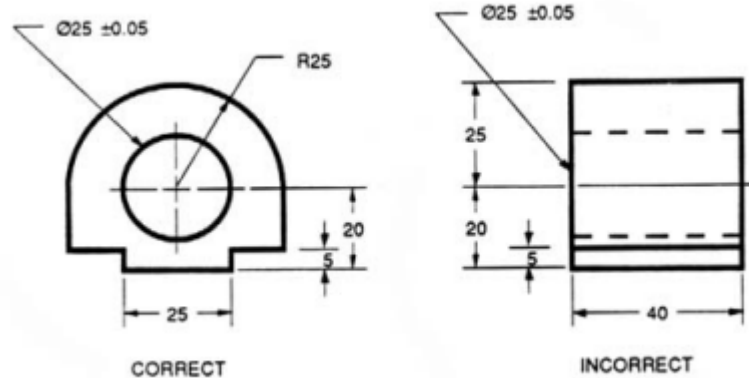
There are two basic steps in dimensioning objects, regardless of the type of object.

Step 1: Apply the size dimensions. These are dimensions, which indicate the overall sizes of the object and the various features, which make up the object.

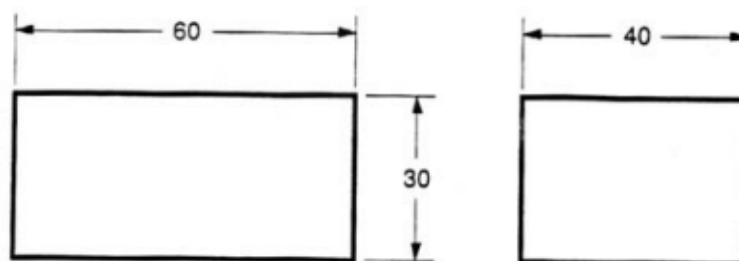
Step 2: Apply the location dimensions. Location dimensions are dimensions, which locate various features of an object from some specified datum or surface.

• Where to put dimensions

The dimensions should be placed on the face that describes the feature most clearly. Examples of appropriate and inappropriate placing of dimensions are shown



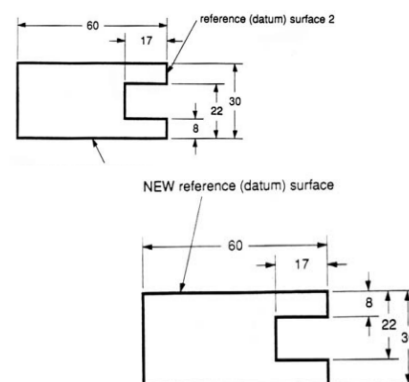
In order to get the feel of what dimensioning is all about, we can start with a simple rectangular block. With this simple object, only three dimensions are needed to describe it completely. There is little choice on where to put its dimensions.



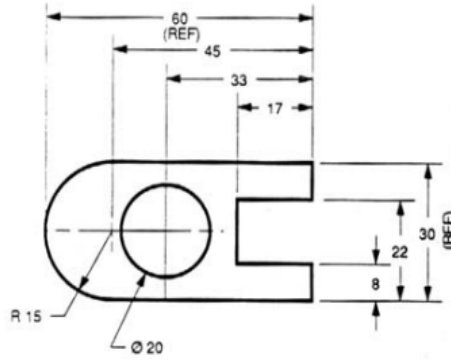
We have to make some choices when we dimension a block with a notch or cut-out. It is usually best to dimension from a common line or surface. This can be called the datum line surface.

This eliminates the addition of measurement or machining inaccuracies that would come from Chain or Series dimensioning. Notice how the dimensions originate on the datum surfaces.

We chose one datum surface in the following figure:



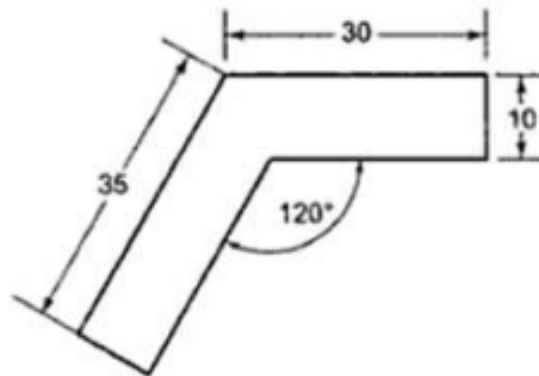
When the left side of the block is radiuses, we break our rule that we should not duplicate dimensions. The total length is known because the radius of the curve on the left side is given. Then, for clarity, we add the overall length of 60 and we note that it is a reference (REF) dimension. This means that it is not really required.



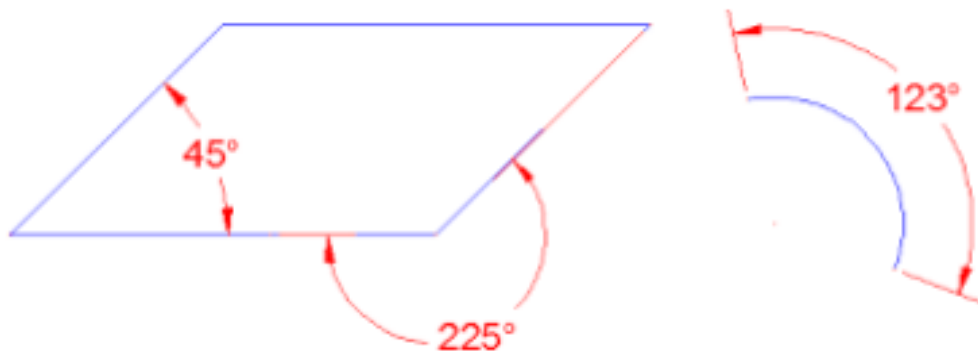
- **Dimension systems**

- ✓ **Unidirectional dimension**

- ✚ Place the numerals for the dimension values so that they can be read from the bottom of the drawing.
 - ✚ In the Unidirectional system, the dimension figures are written in the space left in the dimension line and they are so placed that they may be read from the bottom edge only. Hence, the dimension figures may not stand normal to the dimension line.

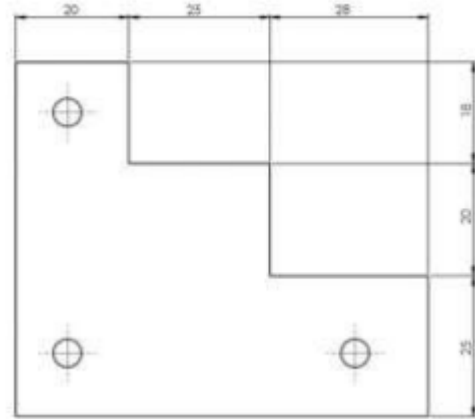


- ✓ **Angular dimensions system**



✓ Chain dimensioning system

It is when each single dimension is placed directly adjacent to the next dimension without any gap between dimensions. This method should only be used if tolerance accumulation is not going to affect the function of part or places dimensions in a line from one feature to the next.



● Dimensioning principles

All the dimensions, necessary to describe the size of the object completely in its finished form, should be given on the drawing.

- ✓ It should not be necessary to deduce any dimension from other dimensions during any stage of manufacture of the object.
- ✓ Each dimension should be given once.
- ✓ Dimensions should generally be placed outside the views, and that view shows the relevant features clearly.
- ✓ Care should be taken to avoid the crossing of the dimension lines and, if possible, crossing of extension lines also.
- ✓ Wherever possible, dimension should be taken from visible outlines and not from the hidden lines.
- ✓ Keep all dimension lines at least 10 mm (3/8") clear of object lines wherever possible.
- ✓ Try to group related dimensions rather than scattering them.
- ✓ Try to keep dimensions off the views themselves.
- ✓ Separate one line of dimensions from another line of dimensions or from a notation by a space of at least 10 mm (3/8").
- ✓ Leave a space of approximately 3 mm (1/8") between the object outline and the beginning of any extension line.
- ✓ Keep arrowheads slim and neat.

- ✓ Never dimension to a hidden line.
- ✓ Draw leader lines at an angle when intersecting object lines to avoid confusing them with extension lines.



Activity 2: Guided Practice



Task 26:

1. Provided below is the floor plan without dimensioning. As a person with knowledge on dimensioning, put on the floor plan the appropriate dimensioning. (*Use your own dimensions*)



Figure 11: Floor plan



Activity 3: Application



Task 27:

1. You will observe the administration block of your school. Draw its front view by respecting proper dimensioning.



Formative Assessment

1. Answer TRUE or FALSE for the following statements:
 - a. The scale in drawing is used for making the line
 - b. In lettering all letters must be uniform
 - c. Extension line and dimension line are the same in dimensioning.
2. Name the following scale
 - i. 1:10
 - ii. 1:2

- iii. 1:1
- iv. 1:100
- v. 1:1000
- vi. 5:1

3. What are the dimensioning principles to be followed while drawing construction technical drawings?



Points to Remember

- Drawing scale is the proportion by which we either reduce or increase the actual size of the object on a construction drawing
- Scale must remain the same for one object on construction drawing
- In lettering, all letters must be uniform
- All letters and numerals should neither touch each other
- All dimensioning should follow these guidelines: accuracy, clearness, completeness and readability
- All dimensions should generally be placed outside the views and that view shows the relevant features
- Dimensioning is used to provide a clear and complete description of an object.



Self-Reflection

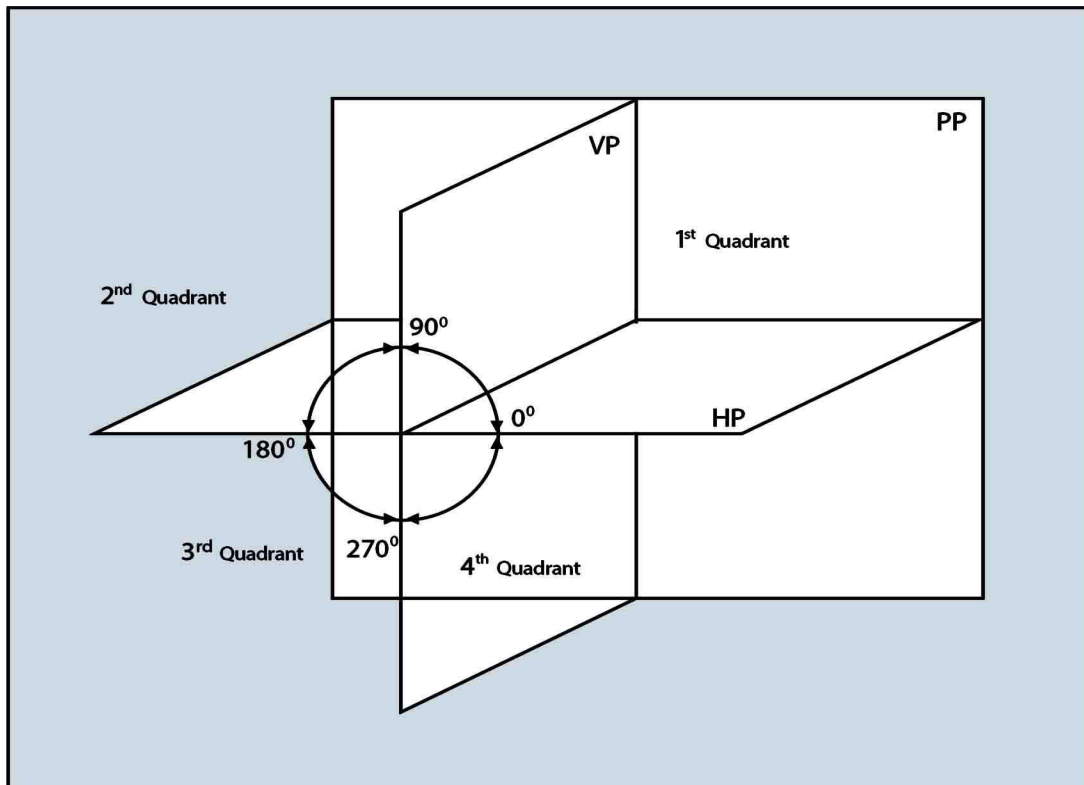
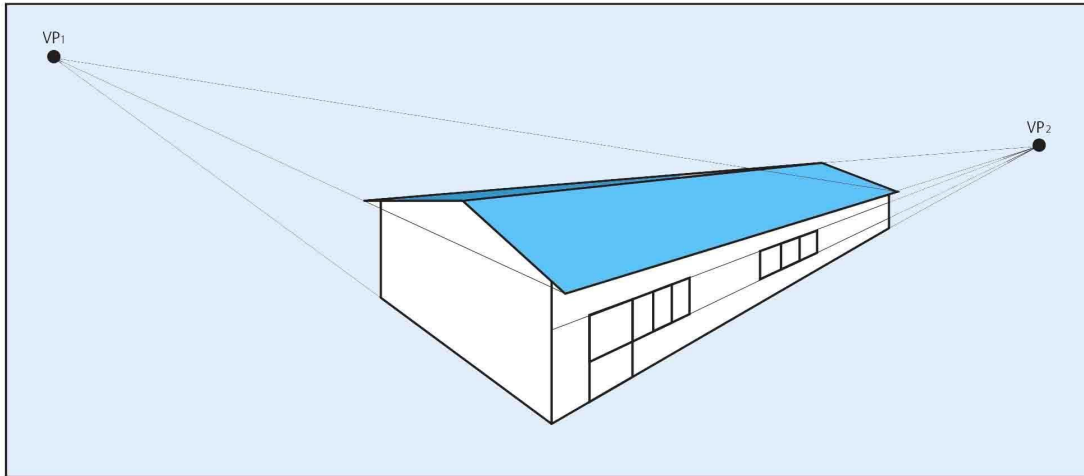
1. Fill in and complete the self-assessment table below to assess your level of knowledge, skills and attitudes after covering this unit.
2. There is no right or wrong way of answering this assessment. It is for your own reference and self-reflection on the knowledge, skills and attitudes acquired during the learning process. Think about yourself:
 - a. Do you think you have the knowledge, skills or attitudes to do the task?
 - b. How well?
3. Read the statements across the top. Put a check in a column that best represents your level of knowledge, skills and attitudes.

My experience	I don't have any experience doing this.	I know a little about this.	I have some experience doing this.	I have a lot of experience with this.	I am confident in my ability to do this.
Knowledge, skills and attitudes					
Define correctly a scale					
Enumerate types of scale in drawing					
Describe the size of scale in drawing					
Apply different lettering in drawing					
Describe dimensioning in drawing					
Apply dimensioning in drawing					

4. Fill in the table above and share results with the trainer for further guidance.

Areas of strength	Areas for improvement	Actions to be taken to improve
1.	1.	1.
2.	2.	2.
3.	3.	3.

UNIT 4: PERFORM ANGLE PROJECTION



Unit summary:

This unit provides you with the knowledge, skills, and attitudes required for performing angle projection. It covers the introduction to projection; drawing of geometrical figures and object; and application of projection in construction technical drawing.

Self-Assessment: Unit 1

1. Referring to the unit illustration above discuss the following:
 - a. What does the illustration show?
 - b. What is happening in the illustration?
 - c. What do you think this unit is about based on the illustration?
2. Fill in and complete the self-assessment table below to assess your level of knowledge, skills and attitudes under this unit.
 - a. There is no right or wrong way to answer this assessment. It is for your own reference and self-reflection on the knowledge, skills and attitudes acquired during the learning process.
 - b. Think about yourself: do you think you have the knowledge, skills or attitudes to do this? How well?
 - c. Read the statements across the top. Put a check in the column that best represents your level of knowledge, skills or attitudes.
3. At the end of this unit, you will assess yourself again.

My experience	I do not have any experience doing this.	I know a little about this.	I have some experience doing this.	I have a lot of experience with this.	I am confident in my ability to do this.
Knowledge, skills and attitudes					
Describe the types of planes of projection					
Describe the types of views					
Draw lines					
Draw triangles					
Draw circle					
Describe types of projection					
Apply projection of					

My experience	I do not have any experience doing this.	I know a little about this.	I have some experience doing this.	I have a lot of experience with this.	I am confident in my ability to do this.
Knowledge, skills and attitudes					
different objects					



Key Competencies:

Knowledge	Skills	Attitudes
1. Describe the types of planes of projection	1. Demonstrate the uses of planes of projection	1. Respect the given instructions
2. Describe the types of views	2. Draw lines, triangles, circles and solids	2. Avoid wastage of materials
3. Describe types of projection	3. Apply techniques of projection to various objects	3. Time management
4. Explain the methods of obtaining views	4. Draw projection views	5. Taking care of tools and equipment



Discovery activity



Task 29:

Read and answer the questions below.

1. What is meant by projection?
2. What is meant by planes of projection?
3. Explain the following type of plane
 - a. Reference plane
 - b. Vertical plane (V.P)
 - c. Horizontal plane (H.P)
 - d. Auxiliary plane (A.P)
 - e. Profile plane (P.P)

4. Describe the procedure of drawing of lines; triangle; a circle;
5. What do you understand about solids?
6. Describe the types of projection
7. Describe the types of views
8. What is meant by sections?

Topic 4.1: Introduction to projection



Activity 1: Problem Solving



Task 29:

Read and answer the questions below:

1. What do you understand by:
 - a. Projection
 - b. Plane of project
2. What do you understand about the following types of planes of projection?
 - a. Reference plane
 - b. Vertical plane (V.P)
 - c. Horizontal plane (H.P)
 - d. Auxiliary plane (A.P)
 - e. Profile plane (P.P)
3. What do you understand by the following types of views of projection?
 - a. Front view or elevation
 - b. Rear view
 - c. Top view or plan
 - d. Bottom view
 - e. Right view
 - f. left view or Side view or Side elevation or profile view
 - g. Auxiliary view

Key Facts 4.1: Introduction to projection

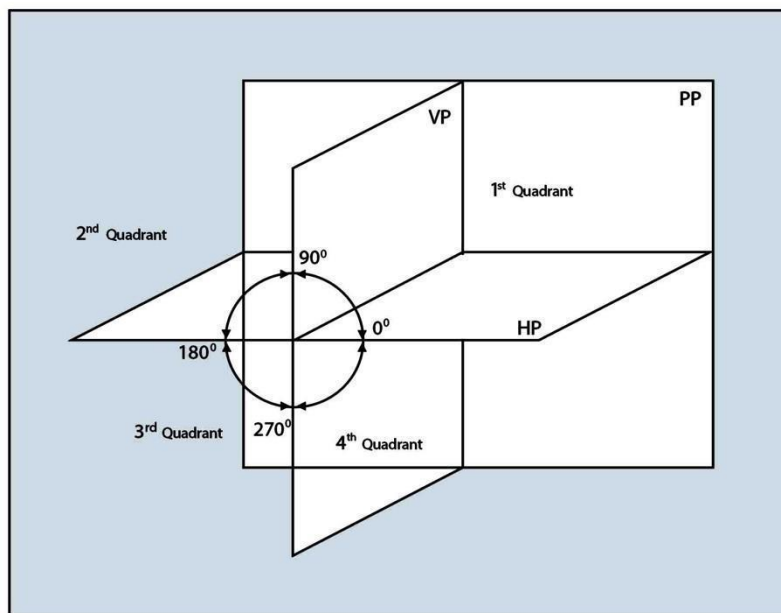
- **Definition**

- ✓ Any kind of representation of an object on a paper, screen or similar surface by drawing or by photography is called the projection of that object.
- ✓ A projection is the technique used to represent a three-dimensional (3D) drawing as a view conceived to be drawn or “projected” onto a plane known as the plane of projection (picture plane).

- **Plane of projection**

The plane which is used for the purpose of projection is called plane of projection

- ✓ **Types of projection planes**



- ✚ Reference plane: In general, two planes are employed for projection and are known as reference planes or principal planes of projection. These planes intersect at right angles to each other.
- ✚ Vertical plane (V.P): This is a plane which is vertical (V.P). Vertical plane is also known as frontal plane since front view is projected on this plane
- ✚ Horizontal plane (H.P): The plane which is horizontal but at right angle to the V.P

- ✚ Auxiliary plane (A.P): Any other plane, placed at any angles to the principal planes.
- ✚ Profile plane (P.P): The plane which is at right angles to the two principal plane is called auxiliary vertical plane (A.V.P).

✓ **Types of projection views**

- ✚ Front view or elevation shows the two dimensions, namely the length and the height of an object.
- ✚ Side view reveals the length and the other dimensions, that is to say the width of an object.
- ✚ Top view or plan shows the width and height/depth dimensions of an object.
- ✚ Bottom view
- ✚ Right view
- ✚ Left view or Side view or Side elevation or profile view
- ✚ Auxiliary view: The object is projected on an auxiliary plane

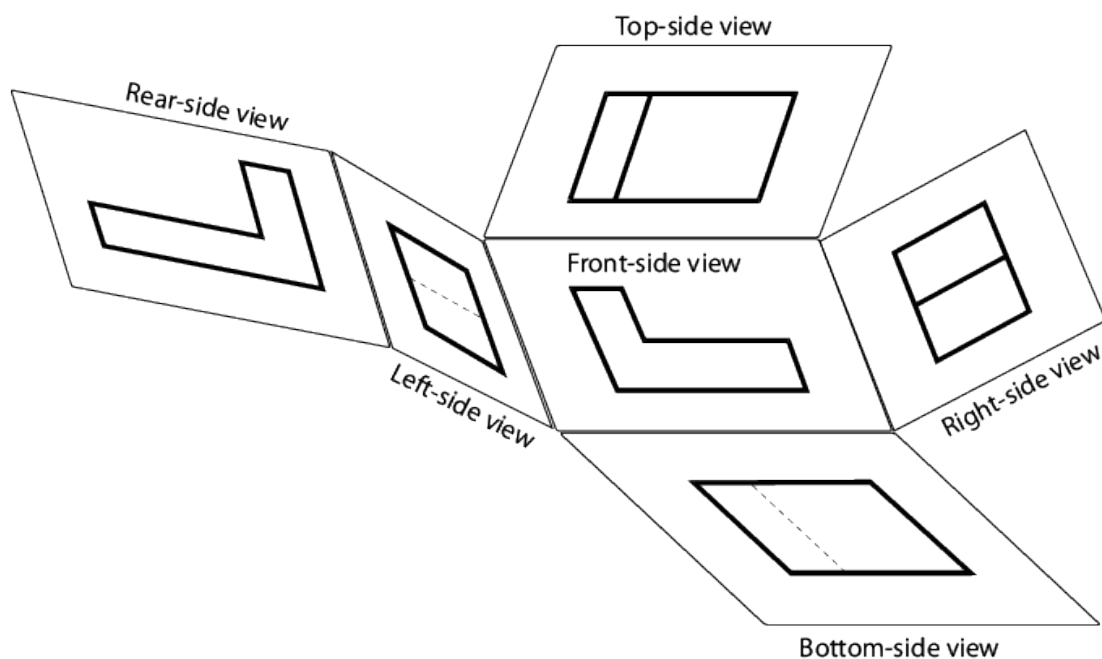
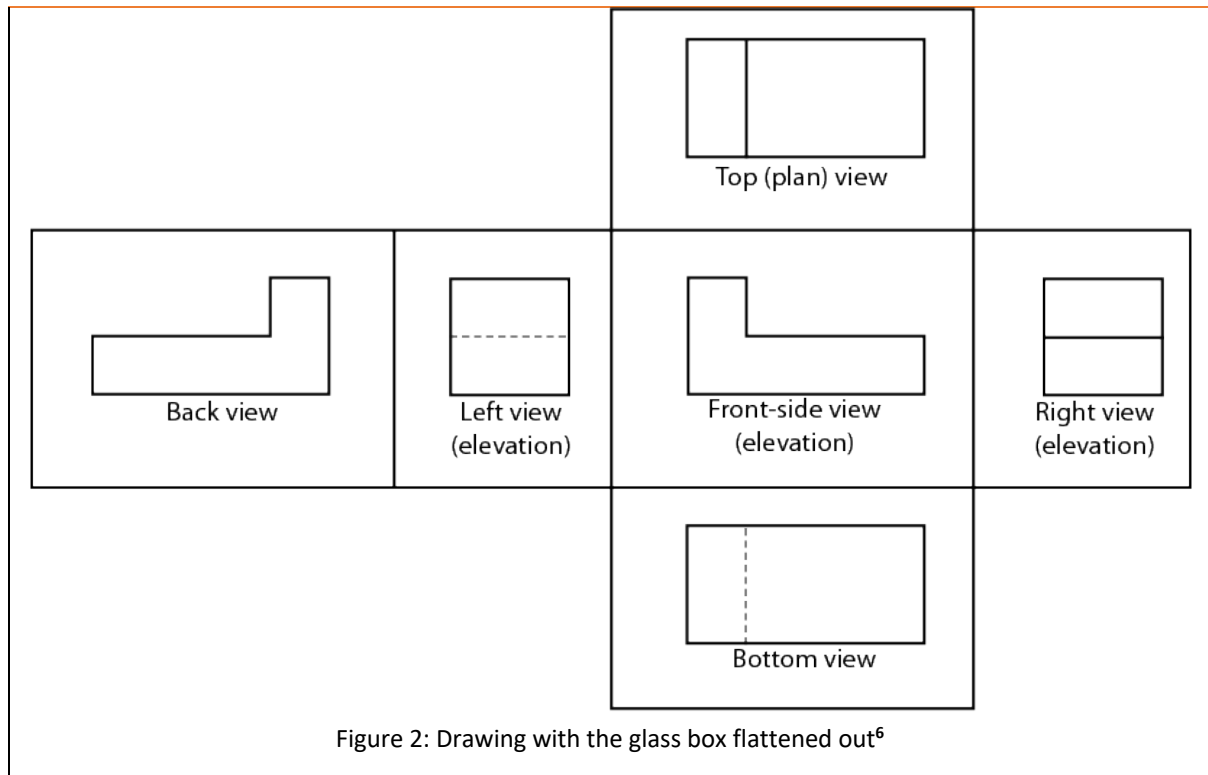


Figure 1: Box opened to produce orthographic views⁵

⁵ <https://caul-cbua.pressbooks.pub/lined/chapter/d3-21/>



Activity 2: Guided Practice



Task 30:

Choose your classroom or the workshop and observe its wall and floor sections. After which identify and name the:

- Reference plane
- Vertical plane (V.P)
- Horizontal plane (H.P)
- Auxiliary plane (A.P)
- Profile plane (P.P)

⁶ <https://caul-cbua.pressbooks.pub/lined/chapter/d3-21/>



Activity 3: Application



Task 31:

Choose any building or room at school and draw a representation of the room or building on a paper or screen. Your drawing should show the:

- a. Reference plane
- b. Vertical plane (V.P)
- c. Horizontal plane (H.P)
- d. Auxiliary plane (A.P)
- e. Profile plane (P.P)

Topic 4.2: Drawing of geometrical figures and object



Activity 1: Problem Solving



Task 31:

Based on your knowledge on geometrical figures, read and answer the following questions:

1. What do you understand about plane geometry?
2. Describe the common types of lines in geometry below:
 - a. Straight Line
 - b. Horizontal Line
 - c. Vertical Line
 - d. Parallel Lines
 - e. Perpendicular Lines
 - f. Intersecting Lines
 - g. Chord
 - h. Tangent Line
 - i. Secant Line
3. Describe the types of triangles below using their properties:
 - a. Right triangle
 - b. Equilateral triangle
 - c. Isosceles triangle
 - d. Obtuse triangle
 - e. Scalene triangle
 - f. Acute triangle
4. In drawing circles, what do the following mean?
 - a. Circumference
 - b. Radius
 - c. Diameter
 - d. Arc
 - e. Chord
 - f. Tangent

- a. Normal
 - b. Segment
 - c. A quadrant
 - d. Sector
5. Differentiate between the following quadrilaterals:
- a. Quadrilateral
 - b. Square
 - c. Rectangle
 - d. Parallelogram
 - e. Rhombus
 - f. Trapezium
 - g. Trapezoid
6. Differentiate between the following polygons:
- a. Pentagon
 - b. Hexagon
 - c. Heptagon
 - d. Octagon
 - e. Decagon
 - f. Nonagon
7. In drawing of solids, what do the following mean?
- a. Right solid
 - b. Right regular solid
 - c. Irregular solid
 - d. Polyhedron
 - e. Solid of revolution
 - f. Tetrahedron
 - g. Cube
 - h. Octahedron
 - i. Prisms
 - j. Pyramids
 - k. Cylinder

- g. Cone
- h. Sphere
- i. Conic sections
- j. Circle
- k. Ellipse
- l. Parabola
- m. Hyperbola
- n. Rectangular hyperbola

Key Facts 4.2: The Construction of Geometric Figures

- **Plane geometry**

- ✓ Plane geometry is the geometry of figures that are two-dimensional, that is, figures that have only length and breadth (Morling, 2010).
- ✓ There are an endless number of plane figures but we will concern ourselves only with the more common ones like the triangle, circle, the quadrilateral and the better-known polygons.
- ✓ In geometry, lines are fundamental elements that play a crucial role in defining shapes, angles, and relationships between points.

- **Common types of lines in geometry (Morling, 2010):**

- ✓ **Straight Line:** A straight line has no curves or bends. All points on a straight line lie in the same direction.
- ✓ **Horizontal Line:** A horizontal line is parallel to the horizon, running from left to right. It has a slope of zero degrees (0°).
- ✓ **Vertical Line:** A vertical line runs from top to bottom, perpendicular to the horizon.
- ✓ **Parallel Lines:** Parallel lines are two or more lines that are equidistant and never intersect, no matter how far they extend. They have the same slope but different y-intercepts.
- ✓ **Perpendicular Lines:** Perpendicular lines intersect at a right angle (90 degrees).

- ✓ **Intersecting Lines:** Intersecting lines cross at a single point. The angles formed at the intersection are not necessarily right angles.
- ✓ **Secant Line:** A secant line is a line that intersects a curve at two or more points. It can be thought of as a "cutting" line.
- ✓ **Tangent Line:** A tangent line is a line that touches a curve at exactly one point, known as the point of tangency. It is perpendicular to the radius at that point.
- ✓ **Chord:** A chord is a line segment that connects two points on a curve. If the curve is a circle, a chord that passes through the center is also a diameter.

• Surfaces

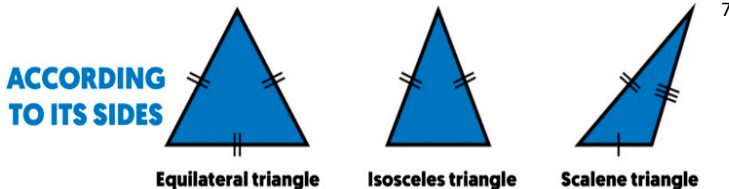
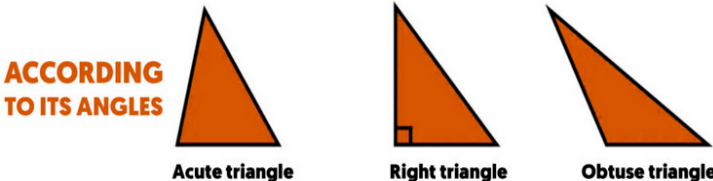
✓ Triangles

A triangle is a closed geometric figure having three sides and three angles.

✓ Types of triangles

Triangles are classified into the following groups, depending on various properties.

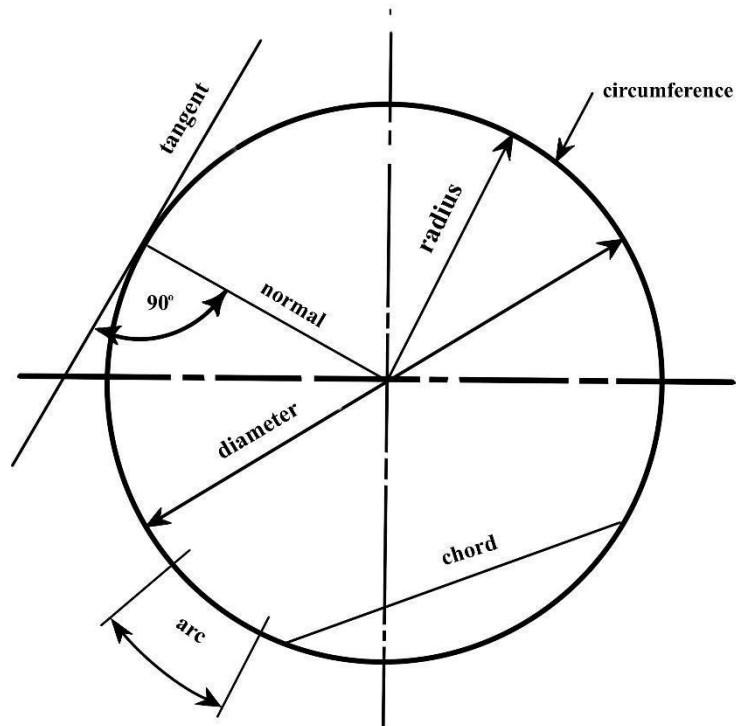
Note: A given triangle can be in more than one group.

Class of triangle	Description
ACCORDING TO ITS SIDES  ACCORDING TO ITS ANGLES 	Equilateral triangle: All sides are equal
	Isosceles triangle: 2 sides equal, 2 angles opposite to the equal sides are equal ⁸ .
	Scalene triangle: No equal sides
	Acute triangle: All angles are less than 90 degrees
	Right triangle: One angle equals 90 degrees
	Obtuse triangle: One angle is greater than 90 degrees

⁷ <https://www.worksheetsplanet.com/types-triangles/>

⁸ <https://byjus.com/maths/isosceles-triangle/>

- Circles

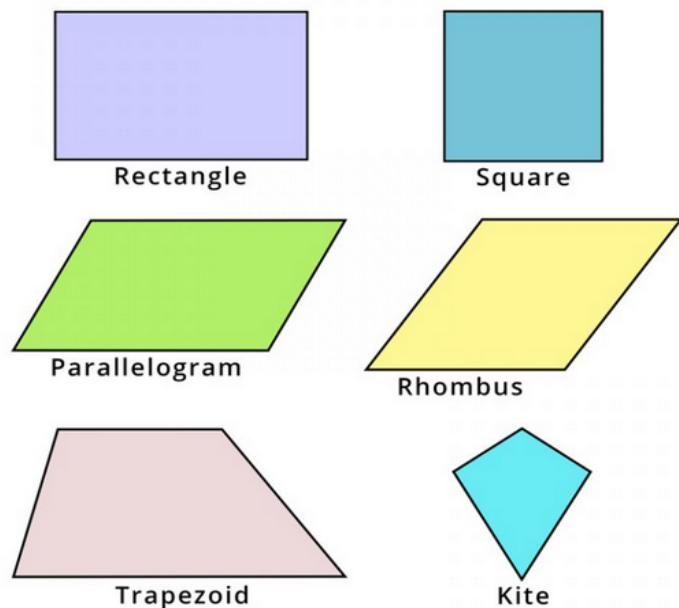


- ✓ A circle is a plane figure bounded by a line called the circumference, which is always equidistant from the center of the circle.
- ✓ The distance from the center to the circumference is called the radius;
- ✓ The distance from one edge of the circumference to the other through the center of the circle is called the diameter.
- ✓ An arc is any part of the circumference.
- ✓ A chord is any straight line drawn across the circle meeting the circumference at both ends.
- ✓ A tangent is a straight line that touches the circumference. It is always at right angles to the radius at the point of contact.
- ✓ The line drawn from the point of contact to the center of the circle is called the 'normal'.
- ✓ The region between a chord of a circle and its associated arc is known as a segment.

- ✓ A quarter of a circle made of two radii at right angles, one being horizontal and the other being vertical is known as a quadrant.
- ✓ The area enclosed by two radii of a circle and their intercepted arc is known as a sector.

• The Quadrilateral

- ✓ The quadrilateral is a plane figure bounded by four straight sides.
- ✓ A **square** is a quadrilateral with all four sides of equal length and one of its angles (and hence the other three) a right angle.
- ✓ A **rectangle** is a quadrilateral with its opposite sides of equal length and one of its angles (and hence the other three) a right angle.
- ✓ A **parallelogram** is a quadrilateral with opposite sides equal and therefore parallel.
- ✓ A **rhombus** is a quadrilateral with all four sides equal.
- ✓ A **trapezium** is a quadrilateral with one pair of opposite sides parallel.
- ✓ A **trapezoid** is a quadrilateral with all four sides and angles unequal.

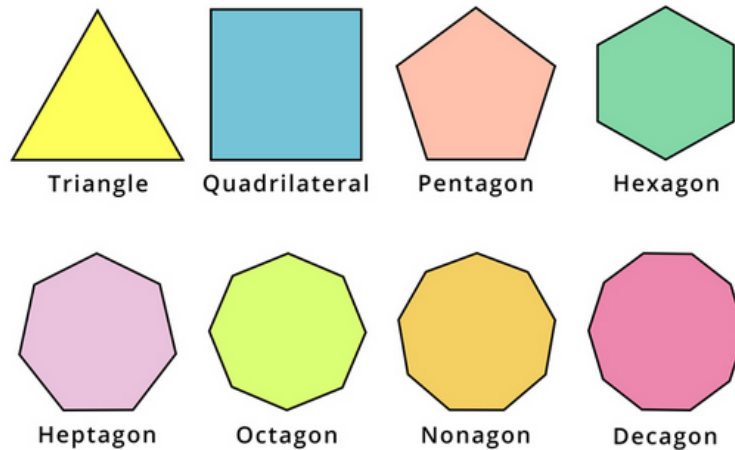


• Polygons

- ✓ A **polygon** is a plane figure bounded by more than four straight sides.
- ✓ A **pentagon** is a plane figure bounded by five sides.
- ✓ A **hexagon** is a plane figure bounded by six sides.

⁹ <https://mathmonks.com/quadrilateral>

- ✓ A **heptagon** is a plane figure bounded by seven sides.
- ✓ An **octagon** is a plane figure bounded by eight sides.
- ✓ A **nonagon** is a plane figure bounded by nine sides.
- ✓ A **decagon** is a plane figure bounded by ten sides.



- **Solid geometry (conic sections)¹⁰**

Solid geometry is the geometry of three-dimensional (3D) figures (objects that have the volume).

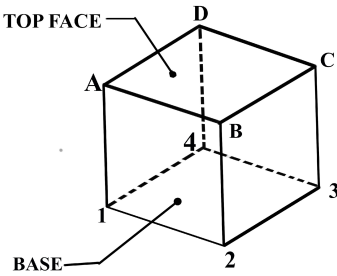
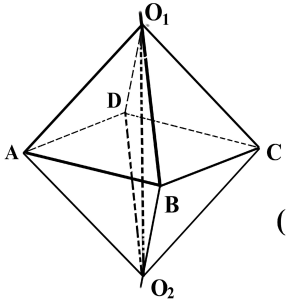
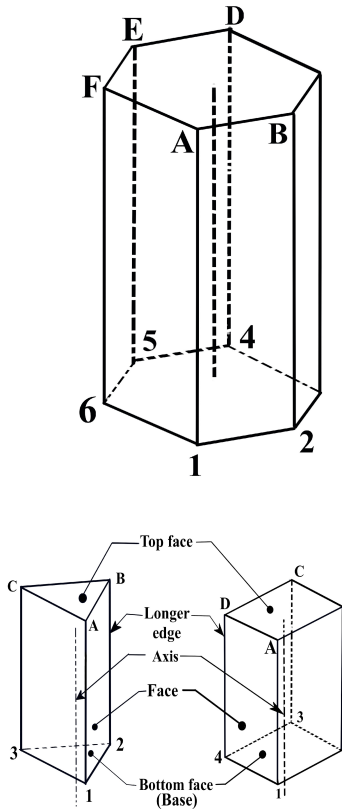
Types of solids

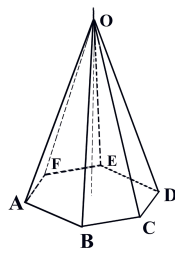
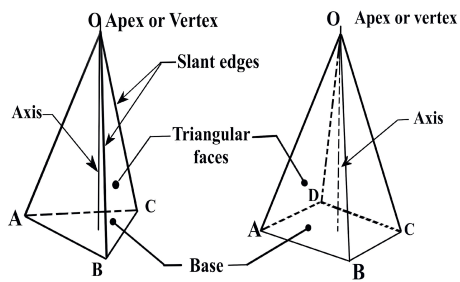
- ✓ When the axis of a solid is perpendicular to its base, it is a "**right solid**".
- ✓ If all edges of the base of a right solid are of equal length it is known as a "**right regular solid**", otherwise "**irregular solid**".

Solids are classified into two main groups: A **polyhedron** solid which is bounded by plane surfaces and **Solid of revolution** which is obtained by revolving a plane surface about one of its edges.

Solid	Description
Tetrahedron	▪ A tetrahedron has four equal equilateral triangular faces: ABC, OAB, OBC and OCA. ▪ Six Edges: AB, BC, CA, OA, OB and OC. ▪ O is the Apex

¹⁰ <https://mathmonks.com/polygon>

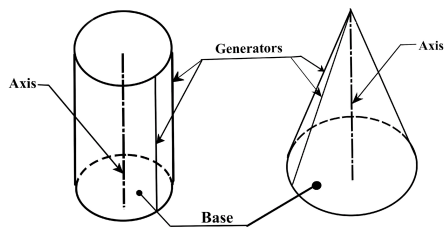
 Cube 	▪ A cube has six equal regular squares.
 Octahedron 	▪ An octahedron has eight equal equilateral triangular Faces: AO_1B, BO_1C, CO_1D, DO_1A, AO_2B, BO_2C, CO_2D and DO_2A.
 Prisms 	▪ A Prism is a polyhedron having two equal and similar faces (top and bottom base), parallel to each other and joined by other faces which may be Rectangles or Parallelograms. ▪ Axis: The imaginary line joining the centers of the faces. ▪ A prism is said to be a right regular prism when its axis is perpendicular to its base and all its faces (i.e. lateral surfaces) are equal rectangles. ▪ Prism is named according to the shape of its base as: ○ Triangular, ○ Square, ○ Rectangular, ○ Pentagonal ○ Hexagonal, etc.
 Pyramids	▪ A Pyramid is a polyhedron having a plane figure as its base and a number of



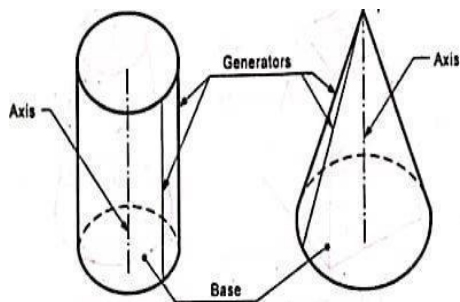
equal isosceles triangular faces meeting at a point called Apex or Vertex.

- Pyramid is said to be Right Regular when its axis is perpendicular to the base which is a regular plane figure.
- The line joining the apex and the corner of the base is called **slant Edge**.
- The pyramid is also named according to the shape of its base as:
 - Triangular
 - Square
 - Rectangular
 - Pentagonal
 - Hexagonal, etc.

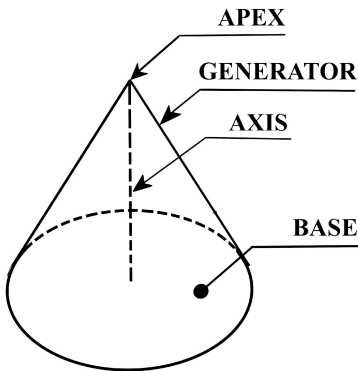
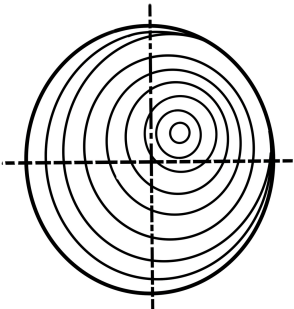
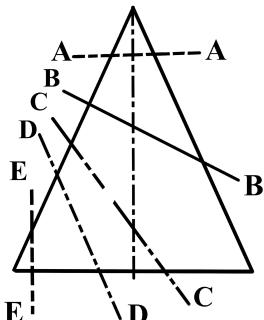
Cylinder

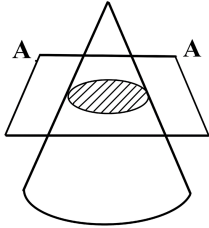
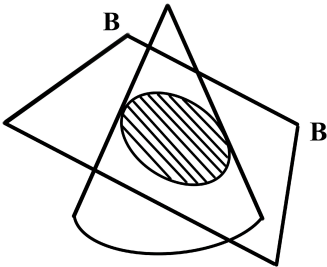
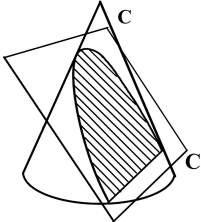
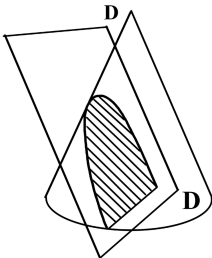
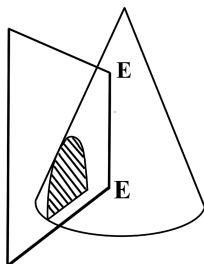


Here the cylinder needs to be drawn alone, and the cone as well to replace the two drawings below



- A Right Circular Cylinder is a solid generated by the revolution of a rectangle about one of its sides which is fixed. It has two circular faces, i.e., top face and bottom base.
- **Nomenclatures of a cylinder:** Axis, Top face, Bottom face (Base) and Generators.
- **Axis** is the line joining the centers of the top face and bottom base. It is perpendicular to base.

 Cone 	▪ A cone is a surface generated by the rotation of a straight line whose one end is in contact with a fixed point while the other end is in contact with a closed curve, not lying in the plane of the curve. ▪ Nomenclatures of a cone: Axis, Apex or Vertex, Base, Generators and Slant Height. ○ Axis is the line joining the apex with the center of the base. ○ Generators are straight lines drawn from the apex to the circumference of the base circle. ○ Base of the cone is the closed curve. ○ Apex or Vertex is the top point of the cone. ○ Slant Height: The length of the generator is the Slant Height of the cone.
 Sphere 	▪ A Sphere is a solid generated by the revolution of a semicircle about its diameter as its axis. ▪ The midpoint of the diameter is the center of the sphere. ▪ All points are at equal distance from its center.
 Conic sections 	▪ A right circular cone can be cut by section (cutting) planes in different positions relative to the axis of the cone to obtain cut sections of different shapes, namely, Circle, Ellipse, Parabola, Hyperbola and Rectangular Hyperbola.

	These cut sections seen on the cone are called Conic Sections or simply Conics.
 Circle 	When the cutting plane AA is perpendicular to the axis and cuts all the generators, the section obtained is a Circle.
 Ellipse 	- When the cutting plane BB is inclined to the axis of the cone and cuts all the generators on one side of the apex, the section obtained is an Ellipse. - Only when the cutting plane cuts all the generators of the cone, the elliptical section formed is a closed one.
 Parabola 	When the cutting plane CC is inclined to the axis of the cone and parallel to one of the generators, the section obtained is a Parabola.
 Hyperbola 	When the cutting plane DD makes a smaller angle with the axis than that of the angle made by the generator of the cone, the section obtained is a Hyperbola.
 Rectangular hyperbola or Equilateral Hyperbola 	When the cutting plane EE is parallel to the axis of the cone, but does not pass through the apex, the section obtained is a Rectangular or Equilateral Hyperbola.



Activity 2: Guided Practice



Task 32:

Using your knowledge on drawing geometric figures or objects, read and attempts the tasks below:

1. Draw the base AB, 50mm long. Set a compass to 70mm.
2. Draw any two chords AB and AC
3. Bisect AB and AC. The bisecting lines intersect at O, which is the center of the circle.
4. Draw a circle touching three given lines
5. Construct a tangent to a circle from a given point outside
6. Draw a line tangent to two given circles
7. Draw two circles of unequal radius
8. Draw two given circles of equal radii
9. Construct a regular polygon (pentagon) within a circle



Activity 3: Application



Task 33:

In your community, there are a number of constructions works taking place. Your role is to draw the diagrams representing those construction works. Help the leaders to draw:

- a. Water tank with radius 2m and height 10m
- b. Rubbish/garbage collection tank of a hexagonal shape with side 2m and height 2m
- c. A garbage burning structure of a cylindrical shape with base radius 2m, height 3m and top radius 1m.

Topic 4.3: Apply projection



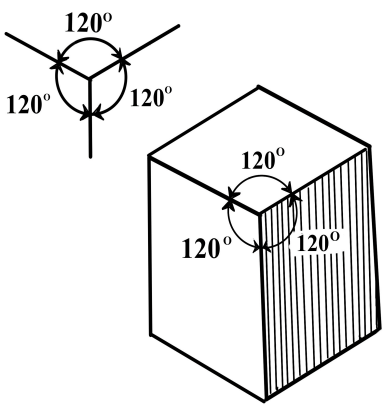
Activity 1: Problem Solving

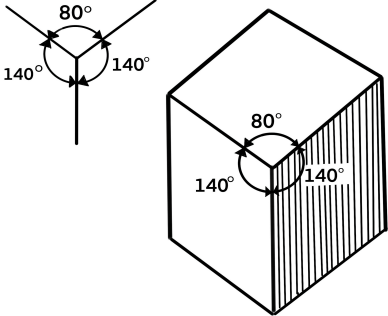
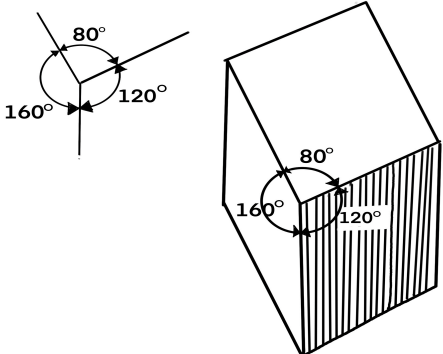
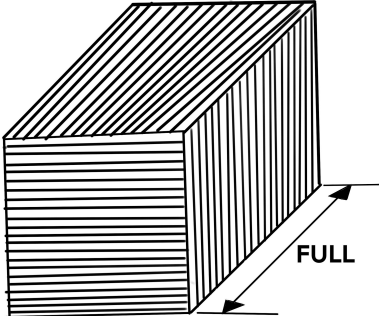
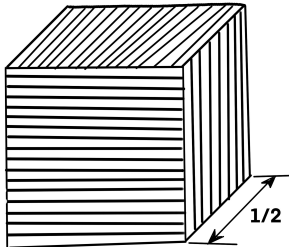


Task 34:

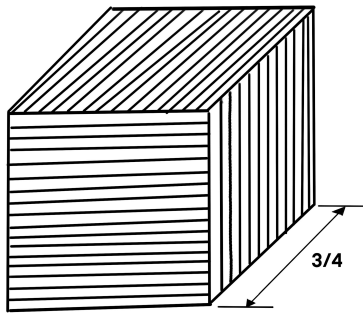
Using your knowledge on projections in construction technical drawings, read and answer the questions below.

1. Differentiate between pictorial and orthographic projections
2. With examples for each, differentiate between Axonometric; Oblique and Perspective pictorial projections
3. With examples for each, differentiate between top, front, back, left, right, bottom types of views under orthographic projections
4. Describe the types of sections under orthographic projection

Key Facts 4.3: Application of projection	
Types of projections	Description
 <i>Isometric projection</i>	Three sides of the object are shown on one projection plane and are equally inclined.

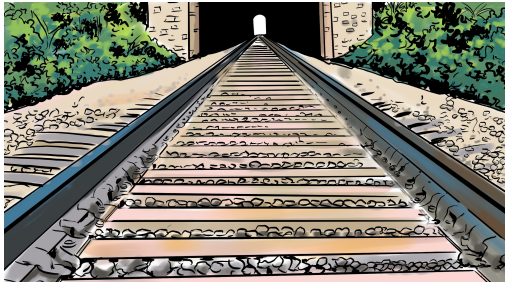
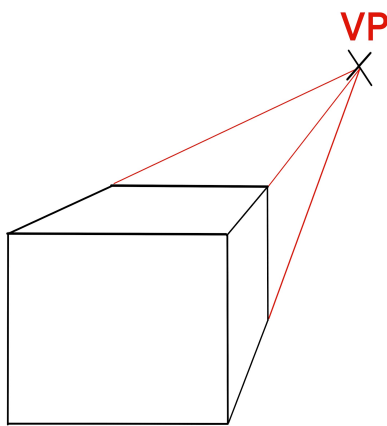
 <i>Dimetric projection</i>	Three sides of the object are shown on one projection plane and two of the three sides are equally inclined
 <i>Trimetric projection</i>	Three sides of the object are shown on one projection plane and are inclined differently.
 <i>Cavalier projection</i>	When the projection lines make an angle of 45° with the plane of projection, the projection is called a cavalier projection.
 <i>Cabinet projection</i>	When the angle that the projecting lines make with the plane of projection is such that the scale on the reading axis in the drawing is about one half as long as the two axes, the result is called a cabinet projection.

Clinographic projection



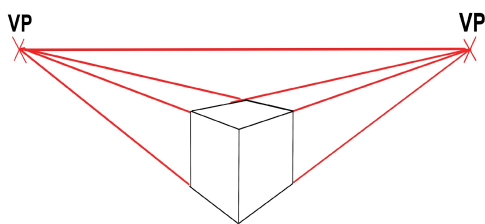
In cavalier and cabinet projections the principal face of the object is made parallel to the plane of projection. For some cases it may be desirable to turn the object at an angle with respect to the plane of projection and is known as clinograph projection

Parallel or one-point perspective

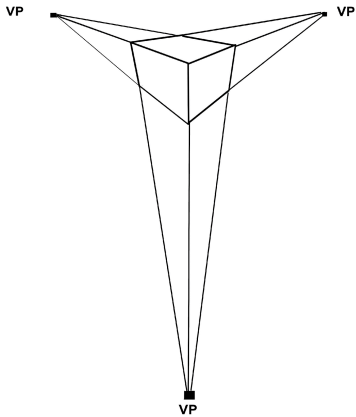
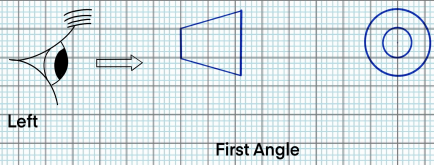
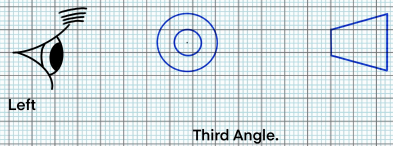
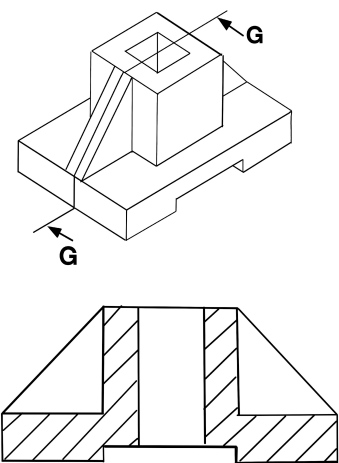


if the principal face of the object is parallel to the plane of projection and there is only one vanish point; the projection is known as parallel or one-point perspective.

Angular or two-point perspective



When the two faces of the object are at an angle with a plane of projection, where the third face is perpendicular to it, the two principal vanish points occur and the projection is known as angular or two points perspective.

Three-point perspective 	If the three principal faces of the object are inclined to the plane of projection, the projection obtained is known as an oblique or three points perspective.
First angle orthographic 	First angle projection is more common <i>in</i> Europe
Third angle orthographic 	Third angle projection is widely used in both the USA and UK
Longitudinal section  Section G-G	A sectional view represents that portion of an object which remains after a portion has been removed or assumed to have been removed. Longitudinal section is the portion remaining when the cut is along the length of the cut object.

Cross section	Cross section is the remaining portion when the object is cut across its width.
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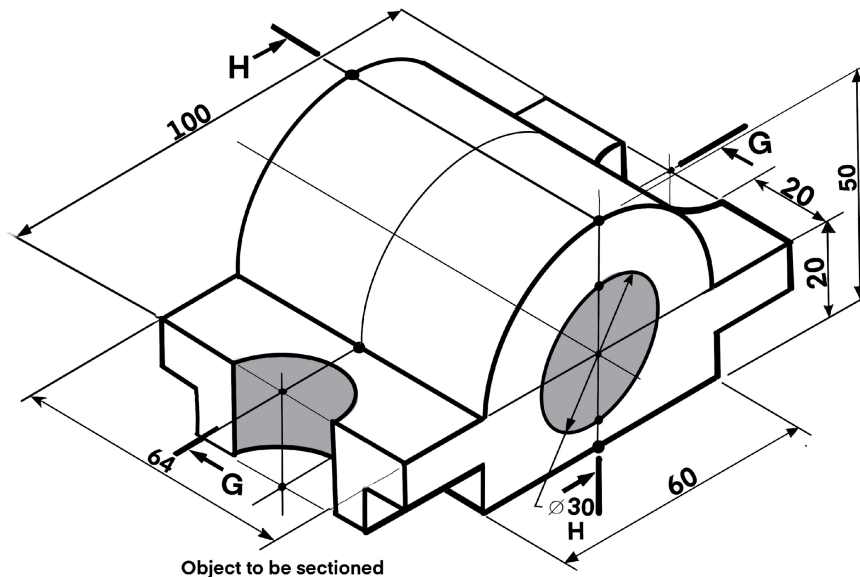


Activity 2: Guided Practice

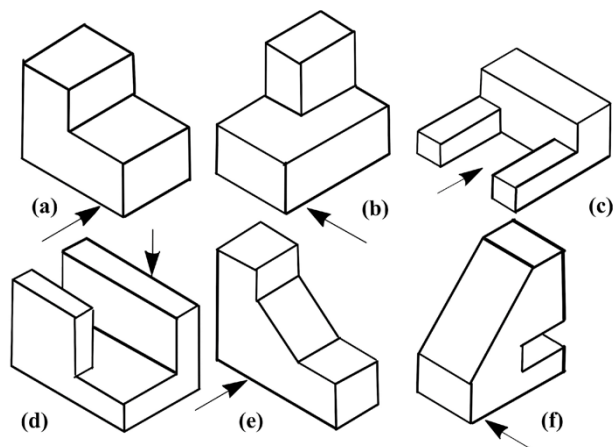


Task 35:

- In the following drawing there are two sections H-H and G-G. Represent them each apart.



- For each of the objects shown below, produce a freehand sketch Orthographic Projection showing the Front, Left, Right, Top and Bottom Side views in Third Angle. An arrow indicates the Front Side View. Indicate the Front, Left, Right, Top and Bottom Views by the letters F, L, R, T and B respectively.





Activity 3: Application



Task 36:

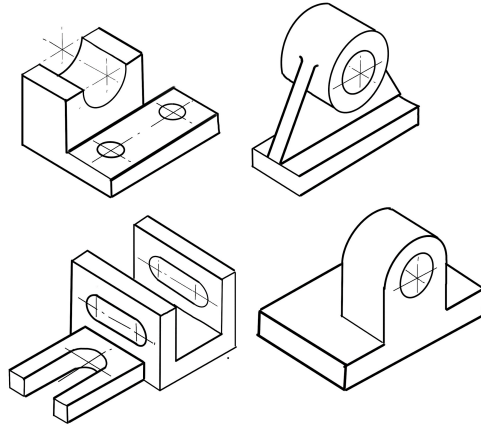
In your school there are different building blocks, choose any and:

- a. Draw the views of your classroom block
- b. Provide the three-dimensional representation of your drawing (at least four)
- c. Provide cross section and longitudinal section of your classroom block



Formative Assessment

1. Complete the following statements:
 - a. When the object is situated in the First Quadrant, that is, in front of V.P and above H.P, the projections obtained on these planes are called
 - b. V.P and H.P are called Principal planes of projection or reference planes. They are always transparent and at right angles to each other. The projection on VP is designated asand the projection on H.P as
 - c. The line of intersection of V.P and H.P is called the and is denoted as xy.
2. The following are the types of views except:
 - a. Top
 - b. Front
 - c. Base
 - d. Bottom
 - e. Real
3. For each of the objects shown below, produce a freehand sketch Orthographic Projection showing the Front, Left, Right, Top and Bottom Side views using both First and Third Angle methods. First, choose which side to view. Remember that the Front view is the one showing the object in its natural position and it should reveal most of the details. Indicate the Front, Left, Right, Top and Bottom Views by the letters F, L, R, T and B respectively.



Points to Remember

- Projection is the technique used to represent an object onto a plane.
- The Main projection planes are vertical and Horizontal planes and 90 degrees. These planes intersect at right angles to each other.
- Projection views top view, side views, bottom view are frequently used in engineering drawing.
- In geometry, lines are fundamental elements that define shapes, angles and relationship between points.
- Polyhedron solids are bounded by plane surfaces while solids of revolution are obtained by revolving a plane surface about one of its edges.
- Cross-section is the remaining portion when the object is cut across its width. A view or drawing that shows what the inside of something looks like after a cut is made across it. Arrangement



Self-Reflection

1. Fill in and complete the self-assessment table below to assess your level of knowledge, skills and attitudes after covering this unit.
2. There is no right or wrong way of answering this assessment. It is for your own reference and self-reflection on the knowledge, skills and attitudes acquired during the learning process. Think about yourself:
 - a) Do you think you have the knowledge, skills or attitudes to do the task?

b) How well?

- Read the statements across the top. Put a check in a column that best represents your level of knowledge, skills and attitudes.

My experience	I don't have any experience doing this.	I know a little about this.	I have some experience doing this.	I have a lot of experience with this.	I am confident in my ability to do this.
Knowledge, skills and attitudes					
Describe the types of planes of projection					
Describe the types of views					
Draw lines					
Draw triangles					
Draw circle					
Draw solids					
Describe types of projection					
Apply projection of different objects					

- Fill in the table above and share results with the trainer for further guidance.

Areas of strength	Areas for improvement	Actions to be taken to improve
1.	1.	1.
2.	2.	2.
3.	3.	3.

UNIT 5: PERFORM CONSTRUCTION DRAWING PLANS



Unit summary:

This unit provides you with the knowledge, skills, and attitudes required for performing construction drawing plans. It covers filling the title block and preparation of construction drawing plans.

Self-Assessment: Unit 5

1. Referring the unit illustration above discuss the following questions:
 - a. What does the illustration show?
 - b. What activities are performed in the illustration above?
 - c. What do you think this unit is about based on the illustration?
2. Fill in and complete the self-assessment table below to assess your level of knowledge, skills and attitudes under this unit.
 - a. There is no right or wrong way to answer this assessment. It is for your own reference and self-reflection on the knowledge, skills and attitudes acquired during the learning process.
 - b. Think about yourself: do you think you have the knowledge, skills or attitudes to do this? How well?
 - c. Read the statements across the top. Put a check in the column that best represents your level of knowledge, skills or attitudes.
3. At the end of this unit, you will assess yourself again.

My experience	I don't have any experience doing this.	I know a little about this.	I have some experience doing this.	I have a lot of experience with this.	I am confident in my ability to do this.
Knowledge, skills and attitudes					
Describe title block					
Enumerate element of title block					
Locate the title block on drawing sheet					
Make the dimension of title block					
Prepare construction drawing plans					



Key Competencies:

Knowledge	Skills	Attitudes
1. Describe the title block	1. Draw correctly title block	1. Safe handling of tools and equipment
2. Describe all drawing plans	2. Prepare drawing plans	2. Avoiding wastage of materials
3. Enumerate element of title block	3. Make the dimension of title block	3. Active participation in team



Discovery activity



Task 37:

Read and answer the questions below:

1. Describe the title block of a construction drawing plan
2. What elements make up the title block?
3. Where is the title block located on the drawing sheet?
4. What are the dimensions of the title block?
5. What are the procedures for preparing?
6. Site Location plan
7. Site plan
8. Foundation plan
9. Floor plan
10. Elevations
11. Roof plan
12. Sections
13. Details

Topic 5.1: Fill the Title block



Activity 1: Problem Solving



Task 38:

Using your experience and knowledge on construction drawings, read and answer the questions below:

1. What is meant by a title block on a construction drawing?
2. What are the elements of the title block on a construction drawing?
3. Where is the title block located on the drawing sheet?
4. What are the dimensions of the title block?

Key Facts 5.1: Fill the Title block

- **Fill the Title block**

A title block is a standardized block of text in a technical drawing that provides information about the drawing and its creator.

- **Elements of the title block**

- ✓ Title of the drawing (title of the project)
- ✓ Drawing number.
- ✓ Scale.
- ✓ Symbol denoting the method of projection.
- ✓ Name of the firm, and
- ✓ Initials of staff that have designed, checked and approved.
- ✓ Name of the owner
- ✓ Date
- ✓ Location of the project
- ✓ The name of sponsor

- **Location of title block**

The title block of a drawing, usually located on the bottom or lower right hand corner

- **Dimension of title block**

The size of the title block is 185 mm x 65 mm which is recommended by BIS (Bureau of Indian Standards).



Activity 2: Guided Practice



Task 39:

Draw a title block for any diagram of your choice and add all necessary information required



Activity 3: Application



Task 40:

1. You are given the assignment of drawing flush toilets for the new classroom block in your school. The Flush toilets are composed of:

- a. Six (6) similar, equal and aligned W.C
- b. One toilet is 1.50m*1m
- c. The height on the front is 3.10m and 2.60m on the back
- d. Each W.C has a single wooden door of 0.75m*1.9m
- e. The septic tanks and drainage system are not taken into consideration

On this drawing put on it the required title block

Topic 5.2: Preparation of Construction drawing plans



Activity 1: Problem Solving



Task 41:

Using your experience and knowledge on construction drawings, read and answer the questions below:

Describe how you would prepare the following construction drawing.

- a. Site plan
- b. Foundation plan
- c. Floor plan
- d. Elevations
- e. Roof plan
- f. Sections

Key Facts 5.2: Preparation of Construction drawing plans

- **Site plan**

- ✓ A site plan is a large-scale drawing that shows the full extent of the site for an existing or proposed development.
- ✓ Typically, depending on the size of the project, site plans are likely to be at a scale of 1: 500 or 1: 200.
- ✓ However, for very small projects, larger scales may be used, and for large projects smaller scales, or even several drawings, perhaps pulled together on one very small scale plan
- ✓ In preparing a site plan, the following should be included:

- **Title block, giving the project name, drawing type, author, revision number, status, scale used and so on.**

- ✓ Notes highlighting changes from previous revisions.

-  Directional orientation. This could be a compass or a north-pointing arrow.
-  Key dimensions.
-  Key materials.
-  Site boundaries and delineation of adjacent properties, including where necessary, adjoining or adjacent structures, and surrounding streets.
-  The location of the building or buildings in relation to their surroundings.
-  Trees, tree protection orders, and the main elements of the landscape.
-  Parking areas with dimensions or capacities, traffic flows, and signage

- **Foundation plan**

- ✓ A foundation plan is a sketch of the baseline of the entire structure.
- ✓ It represents the view of the structure that looks as if it was planned on a horizontal plane.
- ✓ It is used to show the design and how constructors anticipate building it.
- ✓ A foundation plan is a top view of the footings or foundation walls, showing their area and their location by distances between center lines and by distances from reference lines or boundary lines.
- ✓ Actually, it is a horizontal section view cut through the walls of the foundation showing beams, girders, piers or columns, and openings, along with dimensions and internal composition.
- ✓ The foundation plan is used primarily by the building crew who will construct the foundation of the proposed structure.

- **Floor plan**

- ✓ A floor plan is a drawing that shows a room as seen from above.
- ✓ Everything in a floor plan appears flat. Architects use floor plans to show what a room or building will look like.
- ✓ Floor plans usually show the measurements (called dimension lines) for how long things are in real life.

- ✓ Other dimension lines may show the length of windows, the distances from walls to windows, and so on.
- ✓ Floor plans may be drafted to scale, which means reducing the size of a drawing so the whole room can fit on a piece of paper
- ✓ Dimensions are usually drawn between the walls to specify room sizes and wall lengths.
- ✓ Floor plans may also include details of fixtures like sinks, water heaters, furnaces, etc.
- ✓ Floor plans may include notes for construction to specify finishes, construction methods, or symbols for electrical items.

- **Roof plan**

- ✓ A roof plan is used to show the shape of the roof.
- ✓ Materials such as the roofing material, vents and their location, and the type of underlayment are also typically specified on the roof plan.

- **Elevations**

- ✓ Elevation refers to an orthographic projection of the exterior (or sometimes the interior) faces of a building
- ✓ It is a two-dimensional drawing of the building's facades.
- ✓ As buildings are rarely simple rectangular shapes in plan, an elevation drawing is a first angle projection that shows all parts of the building as seen from a particular direction with the perspective flattened.
- ✓ Generally, elevations are produced for four directional views, for example, north, south, east, west.
- ✓ Simple elevation drawings might show:
 -  The outline of a building.
 -  Openings such as doors and windows.
 -  Roofs.
 -  Projections such as eaves and pipes.
 -  Level datum such as finished ground level and floor positions.
 -  Key dimensions such as wall lengths and heights.
 -  Exterior features such as decks, porches and steps.



Any portion of the foundation that may be visible.



Exterior wall and roof finishes.



Section of a house plan

- ✓ A 'section drawing', 'section' or 'sectional drawing' shows a view of a structure as though it had been sliced in half or cut along another imaginary plane.
- ✓ For buildings, this can be useful as it gives a view through the spaces and surrounding structures (typically across a vertical plane) that can reveal the relationships between the different parts of the buildings that might not be apparent on plan drawings.
- ✓ Plan drawings are in fact a type of section, but they cut through the building on a horizontal rather than vertical plane.
- ✓ The direction of the plane through which the section is cut is often represented on plan drawings and elevations by a line of long and short dashes, called a section plane.
- ✓ If there are a number of sections, the line may have letters at each end indicating the name of the section drawing and an arrow showing the direction that the view takes.
- ✓ The section line can take an indirect route through a building if this helps show the most important features or junctions in the building, as illustrated on the drawing below.



Activity 2: Guided Practice



Task 42:

1. Using the knowledge on preparation of construction drawing plan, prepare construction drawings for a simple residential house of 4 bedrooms, one living room, 1 dining room and 1 bathroom below.
 - a) Floor plan
 - b) Four elevations
 - c) One section

- d) Roof plan
- e) Foundation layout/plan



Activity 3: Application



Task 43:

1. You are given the assignment of preparing drawing plans of flush toilets for new classroom blocks in your school. The Flush toilets are composed of:

- a) 6 similar, equal and aligned W.C
- b) One toilet is 1.50m*1m
- c) The height on the front is 3.10m and 2.60m on the back
- d) Each W.C has a single wooden door of 0.75m*1.9m
- e) The septic tanks and drainage system are not taken into consideration



Formative Assessment

Read and answer the scenario provided

KINIHIRA TSS located in RULINDO District wants to extend their buildings by constructing additional toilets. As a person in charge of construction drawing at the school, prepare drawing plans of flush toilets.

Additional information:

- Are composed of 5 similar, equal and aligned W.C
- One toilet is 1.50m*0.90m
- The height on the front is 3m and 2.50m on the back
- Each W.C has a single wooden door of 0.8m*2m
- The septic tanks and drainage system are not taken into consideration
- All walls will be in bricks of 20 cm thick
- All foundation will be in stones 50cm depth
- All buildings are covered with iron sheets

- All buildings have R.C.C lintel of 20cm*20cm
- The overhang of all buildings is 50 cm
- The plans to be done are: floor plan, all sections, all views
- The scale to be used is 1/100



Points to Remember

Ask the students to keep in mind the following:

- A title block is a standardized block of text in a technical drawing that provides information about the drawing and its creator.
- Title block shows the drawing title (title of the project), drawing type, scale used, author and other information regarding the drawing
- Building construction drawings include site plan, foundation plan, floor plan, elevations, sections and roof plan.
- Site plan shows site boundaries and delineation of adjacent properties, including where necessary, adjoining or adjacent structures, and surrounding streets. It also illustrates the placement of the building within the site and car parking.
- Horizontal dimensions are provided on the floor plan while the vertical dimensions are provided on the section.



Self-Reflection

1. Fill in and complete the self-assessment table below to assess your level of knowledge, skills and attitudes after covering this unit.
2. There is no right or wrong ways to answer this assessment. It is for your own reference and self-reflection on the knowledge, skills and attitudes acquisition during the learning process. Think about yourself:
 - a. Do you think you have the knowledge, skills or attitudes to do the task?
 - b. How well?
3. Read the statements across the top. Put a check in a column that best represents your level of knowledge, skills and attitudes.

My experience Knowledge, skills and attitudes	I don't have any experience doing this.	I know a little about this.	I have some experience doing this.	I have a lot of experience with this.	I am confident in my ability to do this.
Describe title block					
Enumerate element of title block					
Locate the title block on drawing sheet					
Make the dimension of title block					
Prepare construction drawing plans					

4. Fill in the table above and share results with the trainer for further guidance.

Areas of strength	Areas for improvement	Actions to be taken to improve
1.	1.	1.
2.	2.	2.
3.	3.	3.

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