

CHAPTER TWO

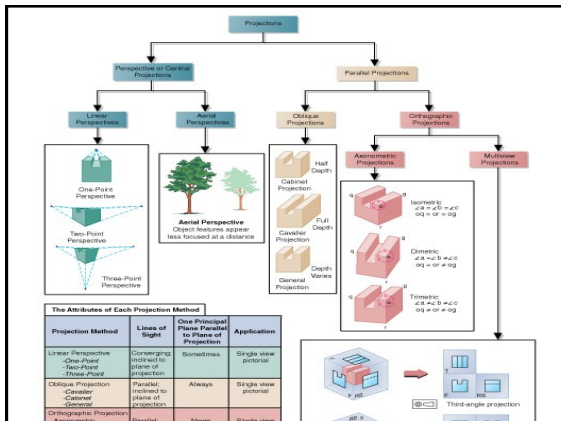
Theory of projection



PROJECTION

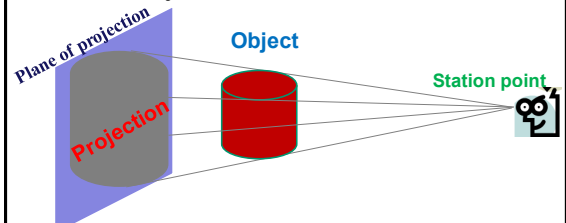
- The representation of an **object on a picture plane** as it would appear to the **observer stationed at a point** and viewing along the direction of projection.

Types of projections...

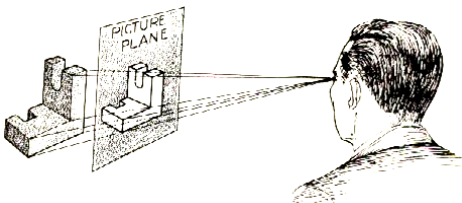


PERSPECTIVE PROJECTION

- Observer** is at **finite distance**.
- Rays or Projectors** are **converging at observer's eye**.
- It does not provide **exact size and shape of object**.
- The resulting view formed on the picture plane is of **different size and shape** as compared to the **actual size of the actual object**.



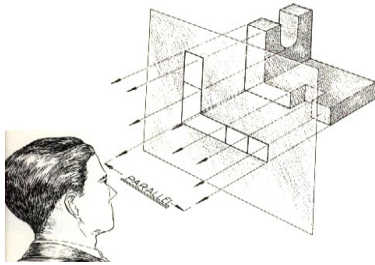
Perspective projection



PARALLEL PROJECTION

- The observer is placed at an **infinite distance** from the object.
- The view formed on the picture plane is of the **same size and shape** as that of the **object**.

PARALLEL PROJECTION



Orthographic Projection

Latin
Origin

* **ORTHO** means **Perpendicular**.

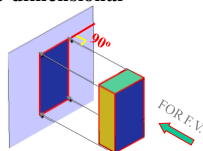
* Assume that observer is at infinite distance and rays or Projection lines are Parallel to each other and Perpendicular to the Plane of Projection.

* Since the projectors are perpendicular to the plane of projection, the view is called **Orthographic View** and the projection method is called **Orthographic projection**.

ORTHOGRAPHIC PROJECTION

* Orthographic projection is a two dimensional projection method.

* FV : Length and height of Object



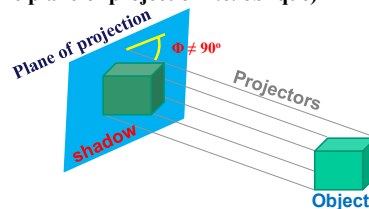
* As projectors are Parallel to each other, the size of **Orthographic View of an object** is equal to the actual size of an object.

OBLIQUE PROJECTION

* **Observer is at infinite distance.**

* **Rays or Projectors** are **Parallel to each other**.

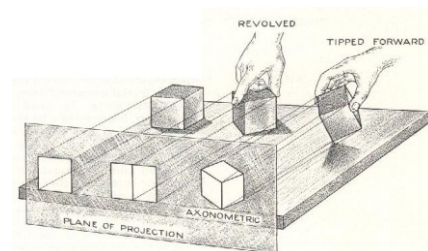
* **Rays or Projectors** are **not Perpendicular to the Plane of projection**. (i.e. projectors are inclined to the plane of projection i.e. oblique)



Axonometric projection

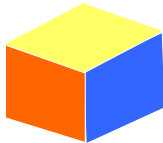
- If the object is **turned** and **tilted** so that the **three faces** are **inclined** to the **plane of projection** is a **special type of orthographic projection** known as **Axonometric projection**.
- Note that, the **projectors from the object** to the **plane** are **perpendicular to the plane**.

Axonometric projection

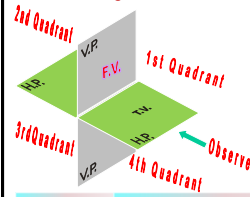


ISOMETRIC PROJECTION

- * **Observer** is at **infinite distance**.
- * **Rays** or **Projectors** are **parallel** to each other & **perpendicular** to the **plane of projection**.
- * **All faces** of the **object** are **equally inclined** to the **planes of projection**.
- * **All faces** of the **object** are **visible in a single view**.

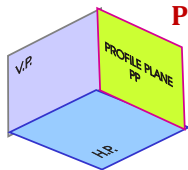


QUADRANT SYSTEM PROJECTION



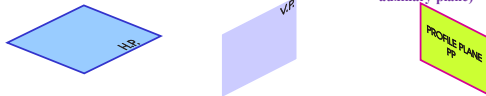
Quadrant	Observer; Object; Plane positions	Position of object w.r.t. planes of projection
First	Observer – Object – Plane	Above HP, In Front of VP
Third	Observer – Plane – Object	Below HP, Behind VP

PRINCIPAL PLANES



TYPES

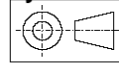
HORIZONTAL PLANE (H.P.) VERTICAL PLANE (V.P.) PROFILE PLANE (P.P.) (auxiliary plane)



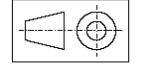
Brief rules

1 st angle projection	3 rd angle projection
View from above is placed underneath	View from above is placed above
View from below is placed above	View from below is placed below
View from left is placed on right	View from left is placed on left
View from right is placed on left	View from right is placed on right

Symbols



3rd angle projection



1st angle projection

Representation

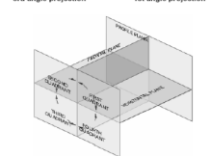
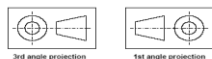
5.5 1st and 3rd angle projection

There are two standard arrangement of all six views of an object

- First-angle projection
- Third-angle projection

Each uses a different symbol

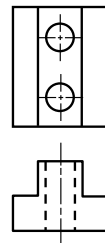
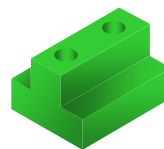
The names are derived from the method used to view the object being drawn



OBJECT REPRESENTATION

Axonometric projection

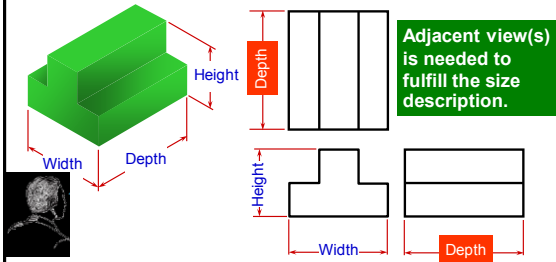
Multi-view projection



MULTIVIEW PROJECTION

Three principle dimensions
of an object ...

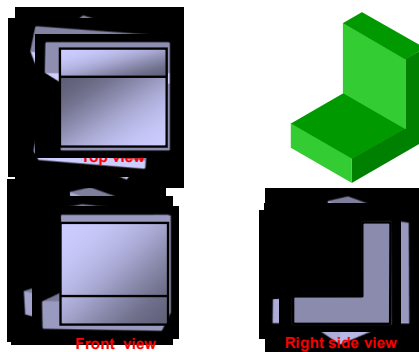
... can be presented only
two in each view.



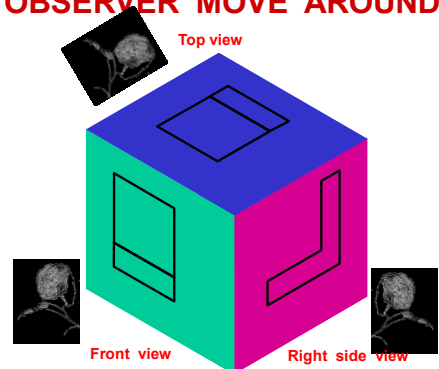
TO OBTAIN MULTIVIEW REPRESENTATION OF AN OBJECT

1. Revolve the **object** with respect to **observer**.
2. The **observer** move around the **object**.

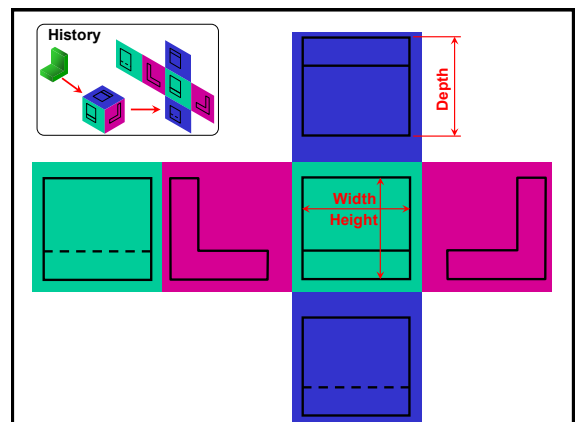
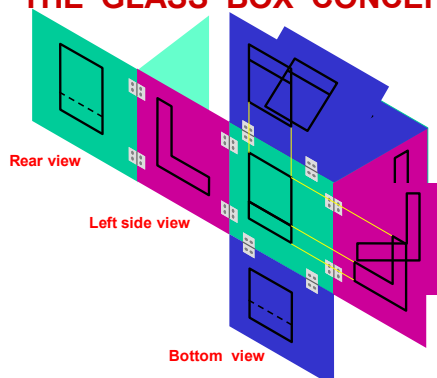
REVOLVE THE OBJECT



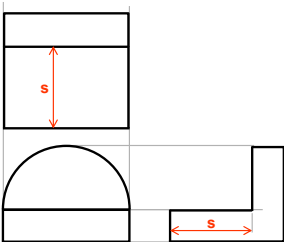
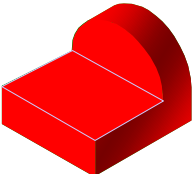
OBSERVER MOVE AROUND



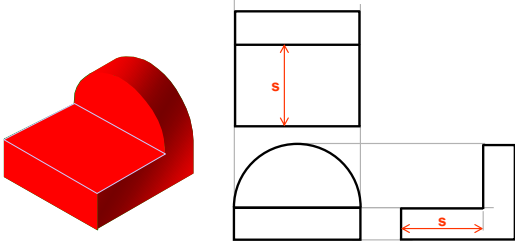
THE GLASS BOX CONCEPT



PROBLEM 1



The image shows a 3D isometric view of a red L-shaped block with a semi-circular top on the vertical face. To the right of the 3D view are three orthographic projections: a front view, a top view, and a side view. The front view shows a vertical rectangle of height $3s$ and a horizontal rectangle of width s , with a semi-circular top on the vertical face. The top view shows a rectangle of width s and depth s . The side view shows a vertical rectangle of height s and a horizontal rectangle of width s , with a semi-circular top on the vertical face. Red dimension lines indicate the height s and width s .



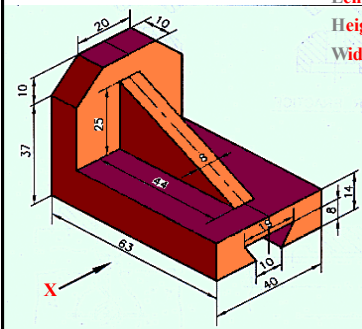
PROBLEM 3

Length = 63 mm
Height = 37 + 10 = 47 mm
Width = 40 mm

F.V. = L x H
= 63 x 47

T.V. = L x W
= 63 x 40

S.V. = W x H
= 40 x 47

$$\begin{aligned} \text{S.V.} &= W \times H \\ &= 40 \times 47 \end{aligned}$$


Orthographic Projection of Object Features

A row of four small images illustrating tools and techniques used in orthographic projection. From left to right: 1. A collection of various drafting tools, including compasses, dividers, and pencils, resting on a wooden surface. 2. A close-up of a pair of drafting compasses. 3. A close-up of a divider tool being used to draw a circle on a piece of paper with a grid. 4. A close-up of a hand using a compass to draw a circle on a piece of paper.

OBJECT FEATURES

Edges are lines that represent the boundary between two faces.

Corners Represent the intersection of two or more edges.

The diagram illustrates three types of 3D objects and their features:

- Rectangular Prism (Blue):** Labeled with "Edge" pointing to a red line on its top surface and "Corner" pointing to a yellow dot at the intersection of edges.
- Cylinder (Green):** Labeled with "Edge" pointing to the red circular base and "No corner" pointing to the side surface.
- Sphere (Green):** Labeled with "No edge" pointing to the curved surface and "No corner" pointing to the bottom.

OBJECT FEATURES

Surfaces are areas that are bounded by edges or limiting element.

Limiting element is a line that represents the last visible part of the curve surface.

The diagrams illustrate the concepts of surfaces and limiting elements for three different objects: a rectangular prism, a cylinder, and a sphere. Each object is shown in a 3D perspective view with a green body and a red limiting element. The rectangular prism has three red edges labeled 'Surface'. The cylinder has a red circular edge labeled 'Surface' and a red line along its length labeled 'Limit'. The sphere has a red circular edge labeled 'Surface' and a red line along its circumference labeled 'Limit'.

PROJECTION OF POINT(S)

Basic concepts for drawing projection of point

UV & TV of a point always lie in the same vertical line

UV of a point 'P' is represented by p' . It shows position of the point with respect to HP.

If the point lies above HP, p' lies above the XY line.

If the point lies in the HP, p' lies on the XY line.

If the point lies below the HP, p' lies below the XY line.

TV of a point 'P' is represented by p . It shows position of the point with respect to VP.

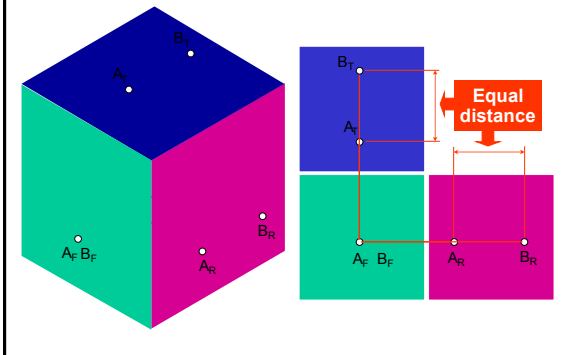
If the point lies in front of VP, p lies below the XY line.

If the point lies in the VP, p lies on the XY line.

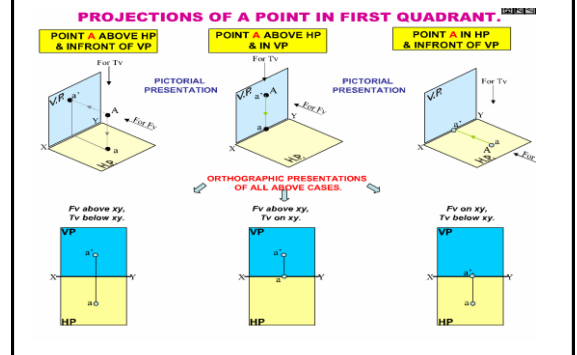
If the point lies behind the VP, p lies above the XY line.

If the point lies behind the VP, p lies above the XY line.

CONT...



CONT...

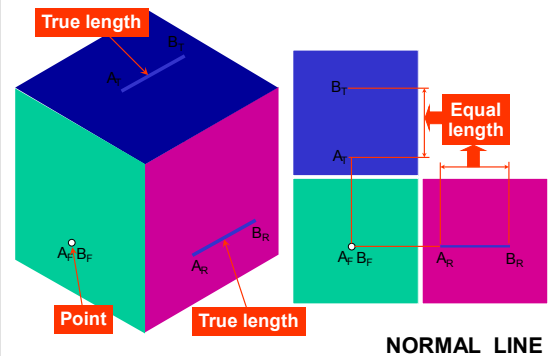


PROJECTION OF LINE

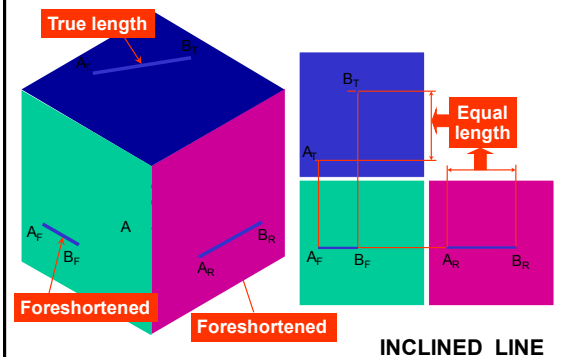
SIMPLE CASES OF THE LINE

1. A VERTICAL LINE (LINE PERPENDICULAR TO HP & // TO VP)
3. LINE PARALLEL TO BOTH HP & VP.
5. LINE INCLINED TO HP & PARALLEL TO VP.
7. LINE INCLINED TO VP & PARALLEL TO HP.
9. LINE INCLINED TO BOTH HP & VP.

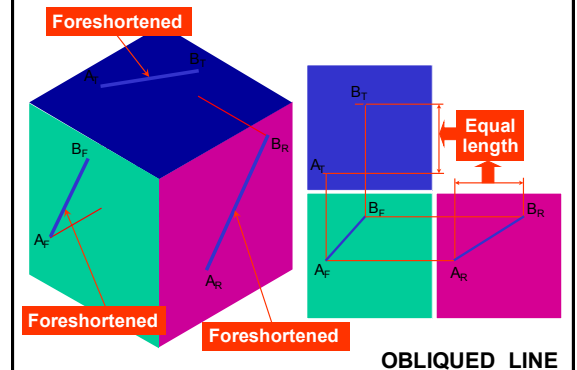
PROJECTION OF LINE

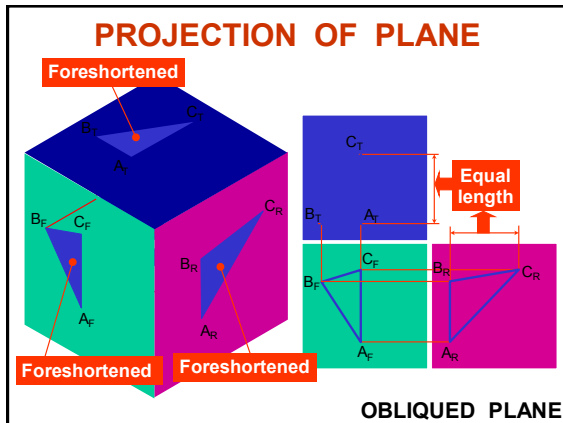
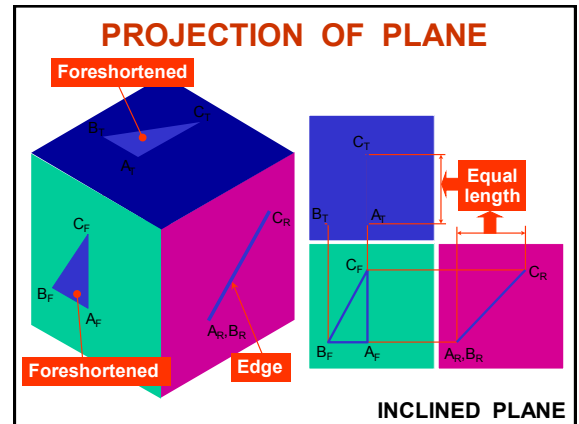
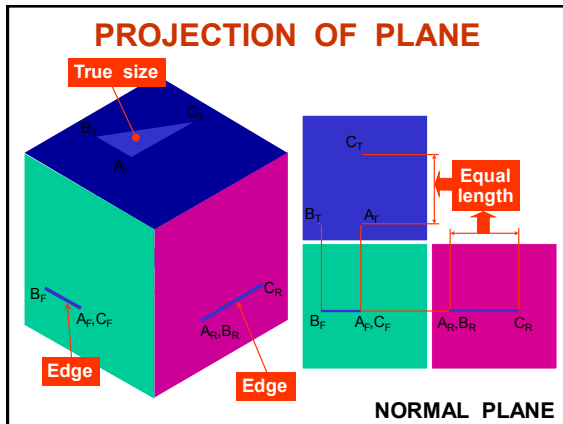


PROJECTION OF LINE



PROJECTION OF LINE





Conversion of Pictorial view into Orthographic Views

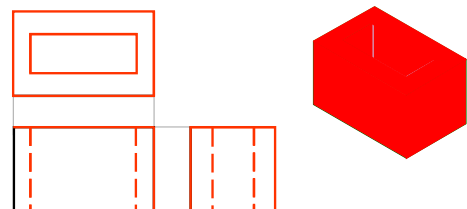
- Study of the object.
- Find the overall size of object i.e. Height, Width & Depth.
- Draw blocks for F.V. (W x H), T.V. (W x D) & S.V. (D x H) in their respective position according to the method of projection.
- Take suitable distance of above blocks from reference lines (X-Y & X1-Y1).

cont...

- Draw the view first which gives maximum visibility & which is simple to draw.
- In respective block, first draw the contour of the view followed by visible edges & at the end draw the hidden details.
- After drawing all views give all necessary dimensions (specify major dimension).

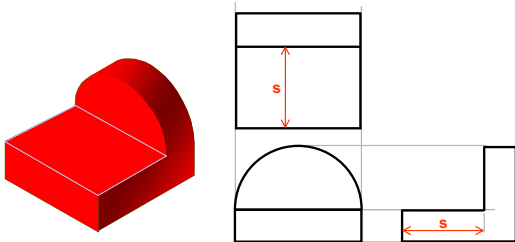
PROJECTION OF OBJECT

The views are obtained by projecting all object features to the picture plane.

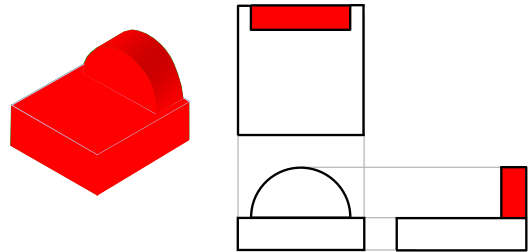


You have to project the remaining surfaces which are invisible too !

PROBLEM 1

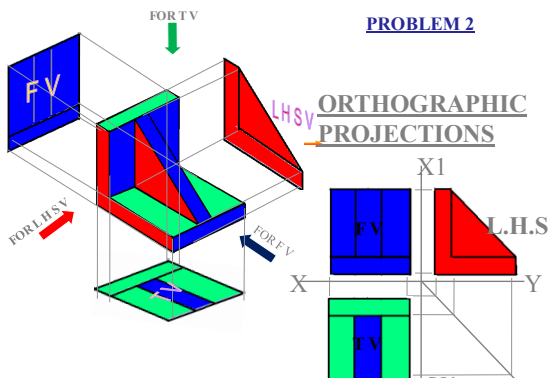


CONT...

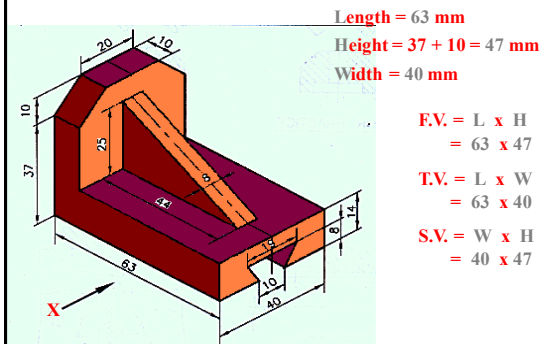


PROBLEM 2

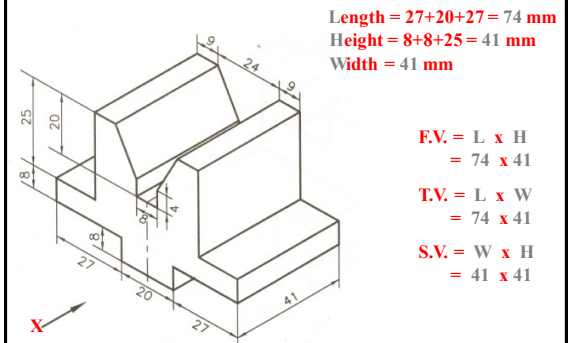
ORTHOGRAHIC PROJECTIONS

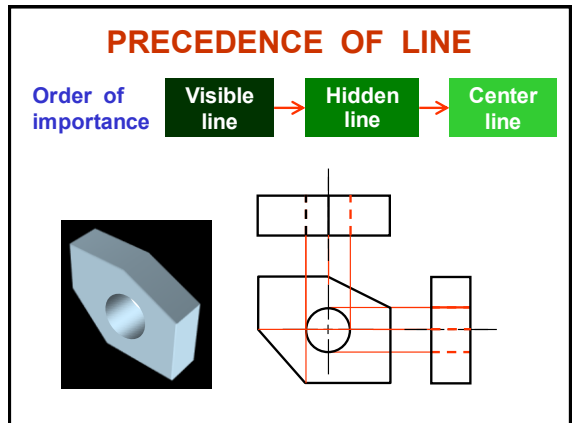
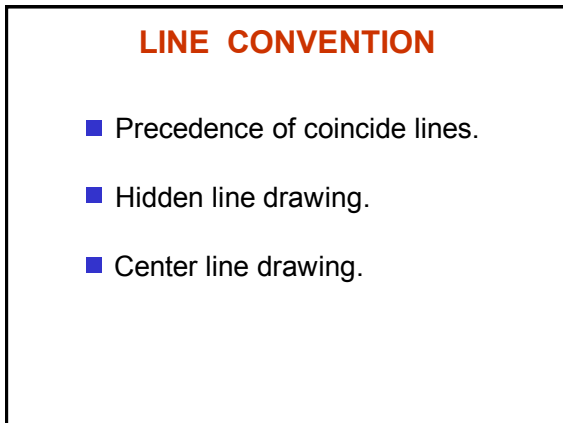
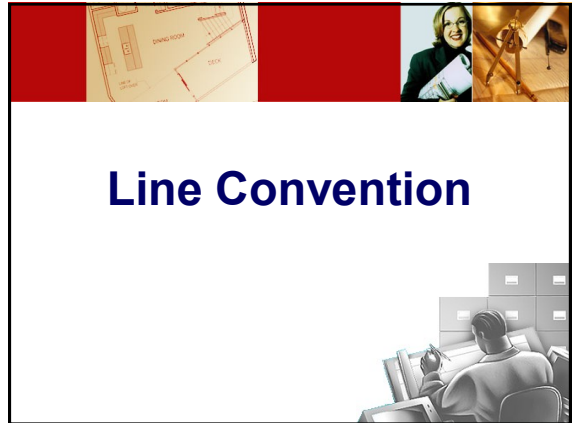
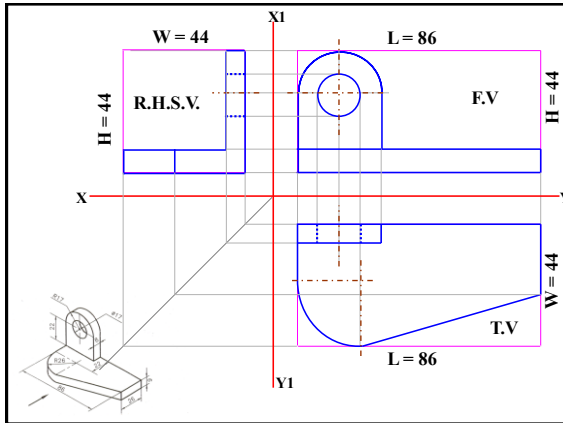
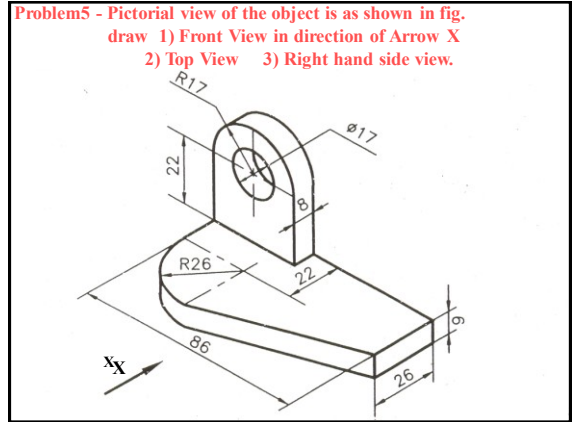
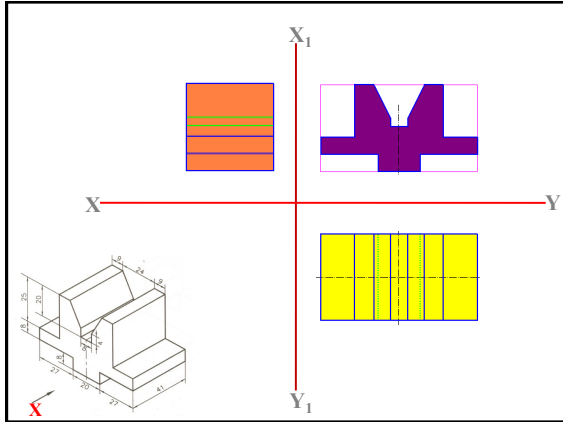


PROBLEM 3



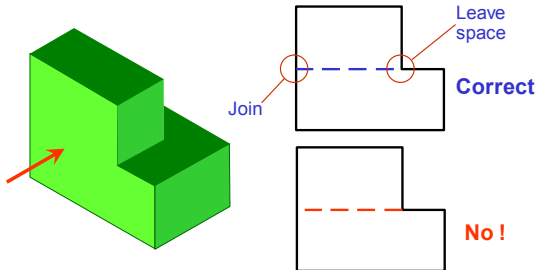
PROBLEM 4





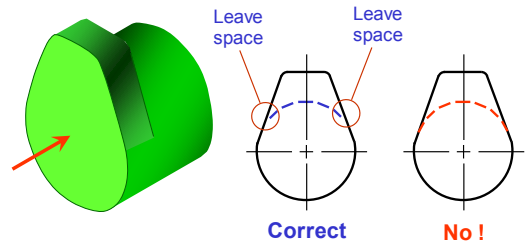
HIDDEN LINE PRACTICE

- Hidden line should join a visible line, **except** it extended from the visible line.



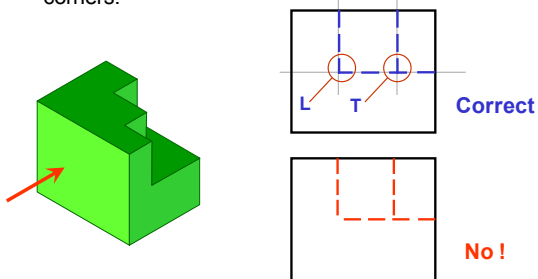
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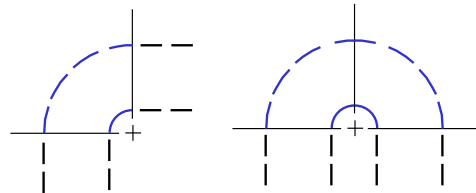
HIDDEN LINE PRACTICE

- Hidden line should intersect to form **L** and **T** corners.



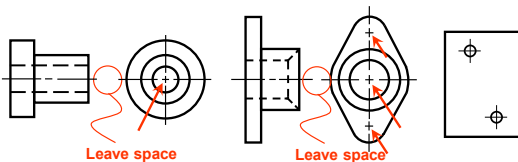
HIDDEN LINE PRACTICE

- Hidden arcs should start on a center line.



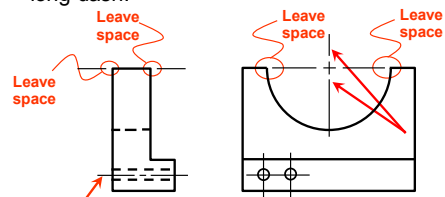
CENTER LINE PRACTICE

- In circular view, short dash should cross at the intersections of center line.
- For small hole, center line is presented as thin continuous line.
- Center line should not extend between views.

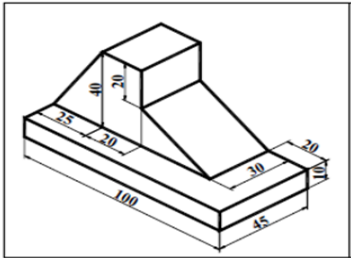


CENTER LINE PRACTICE

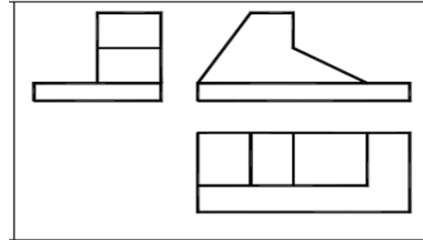
- Leave the gap when centerline forms a continuation with a visible or hidden line
- Center line should always start and end with long dash.



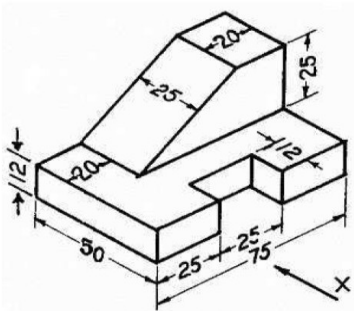
• EG1



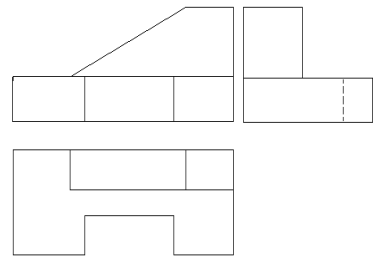
Ans



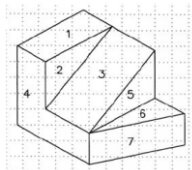
Eg2



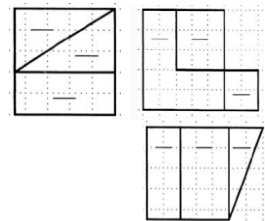
Ans



Eg3



Ans



YOUR MISTAKES

- Position
- Hidden line
- Lettering
- Alphabets of lines
- Paper
- Neatness
- Projection symbol
- Border line
- Projection of lines(45 degree)
- Joining Lines
- Dr by and Ch by

**“PRACTICE
MAKES MAN
PERFECT...”**