Orthographic Projection

Projection

- Engineering drawing often requires the description of 3D objects of 2D sheets
- A valid systematic approach is needed to describe 3D objects on 2D sheets with all the details and correct pattern
- If straight lines are drawn from various points on the contour of an object to meet a plane, the object is said to be projected
- The points where the lines and planes meet, when connected in correct order, gives the projection of the object
- The straight lines used to form the projection are called the projectors

Methods of Projection

1. Orthographic projection
2. Oblique projection
3. Isometric projection
4. Perspective projection

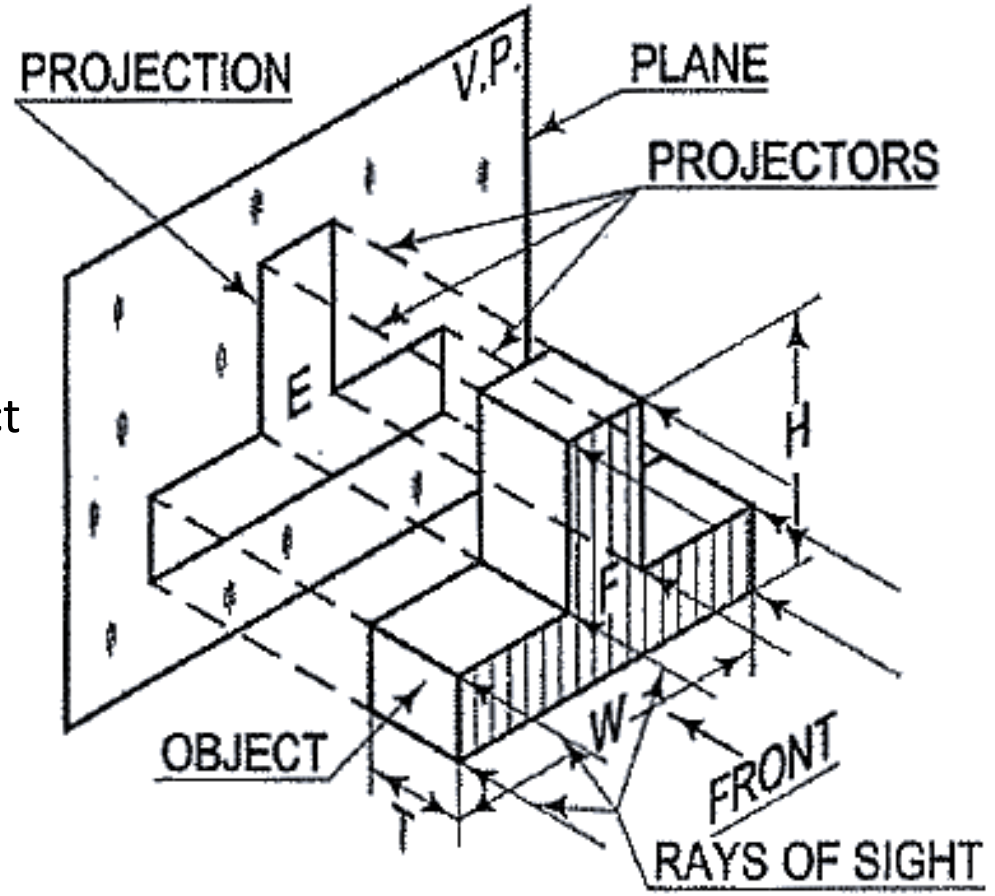
- Methods 2, 3 and 4 are 2D plots of 3D objects are presented from one view, as seen by an eye
- Orthographic projection method presents two or three views on mutually perpendicular projection planes
- Each projection view represents two dimensions of the object
- At least 2 or 3 views are required for the complete description of a 3D object

Orthographic Projection

- When the projectors are parallel to each other and perpendicular to the plane of projection, the projection is called orthographic projection
- Step 1: Look from the front side
- Step 2: Consider the rays of sight

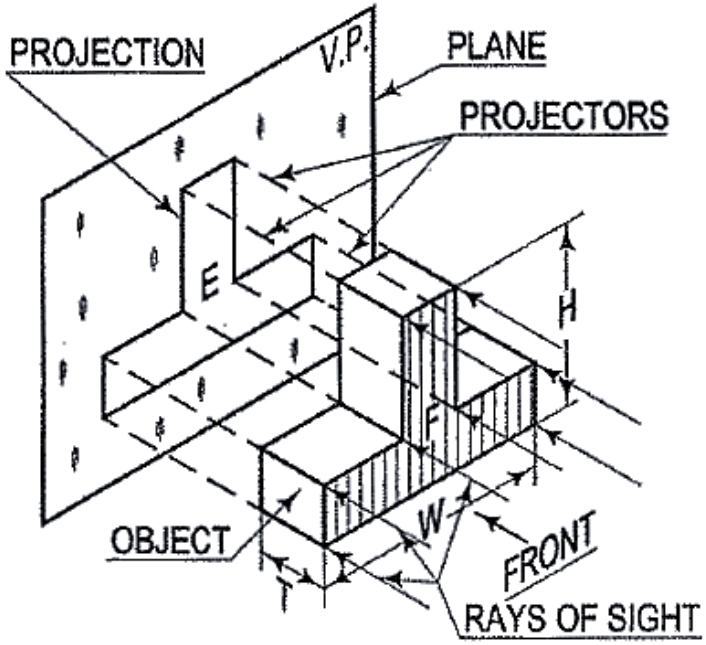
Being parallel to each other and striking

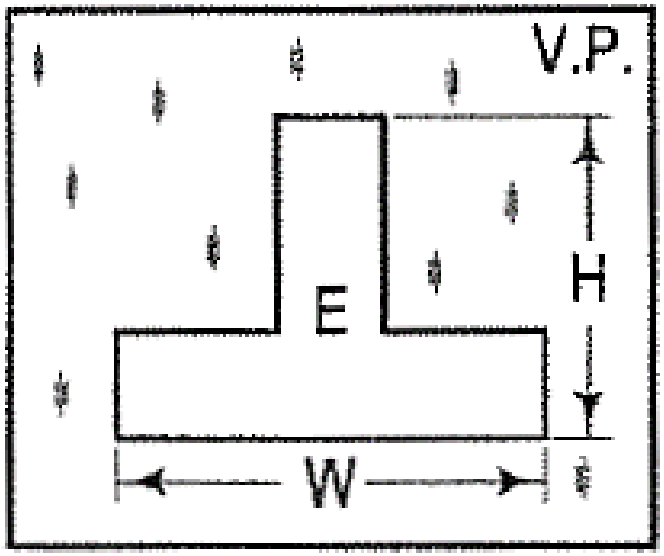
The vertical plane (VP) behind the object



Methods of Projection

- Step 3: the points at which the rays of sight meet the plane are joined in the correct sequence to get the ***front view*** or ***elevation***.



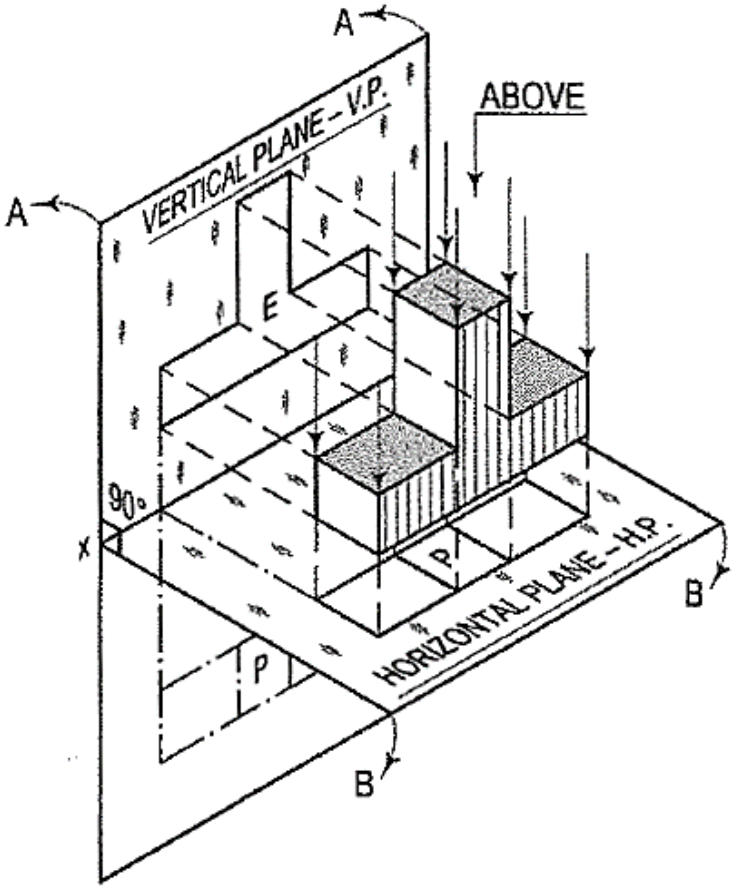


(V.P : Vertical Plane)

- Elevation shows the height (H) and width (W) of the object, not the thickness (T)

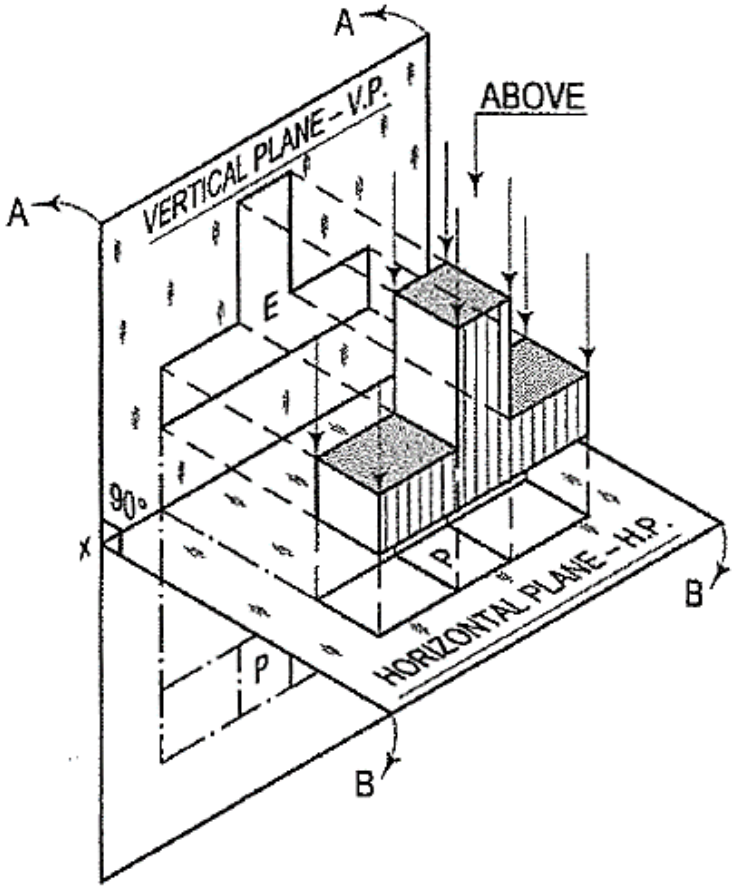
Orthographic Projection

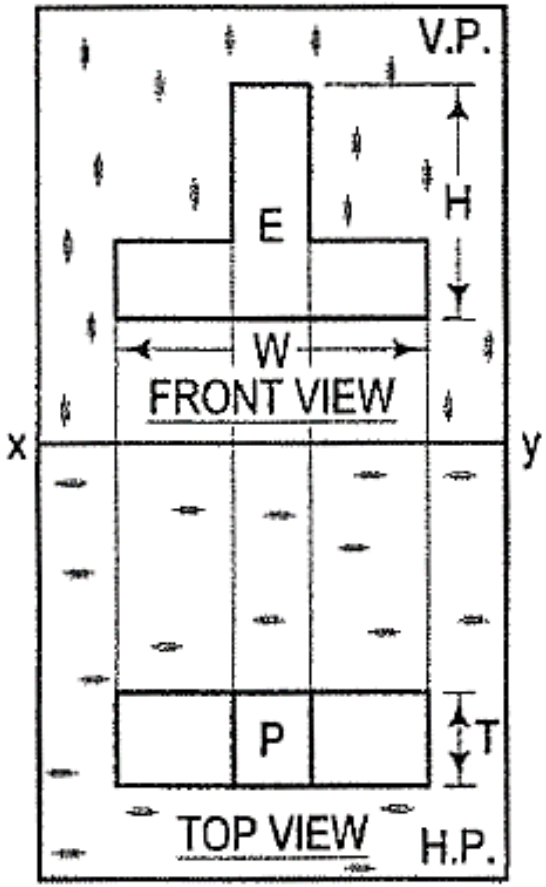
- Consider a Horizontal Plane (H.P) perpendicular to the V.P, the projection on the H.P shows the ***top view*** or ***plan*** of the object.
- This view shows the width and thickness of the object



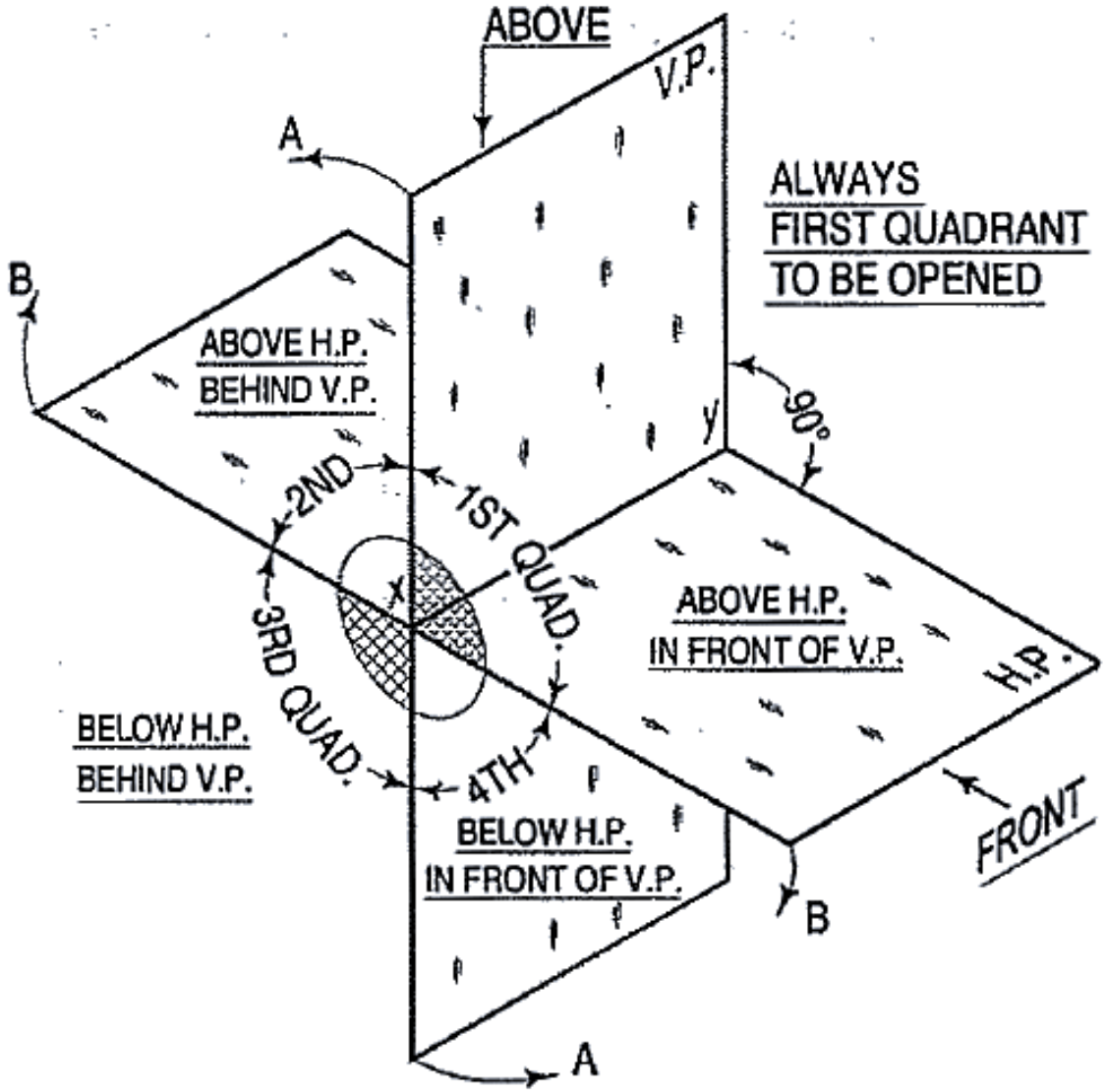
Orthographic Projection

- One of the planes is now rotated, i.e either V.P is rotated in direction A or H.P is rotated in direction B to get a planer plot of the two projections.
- Dashed lines are used to connect the two plots to show the respective points





Four Quadrants

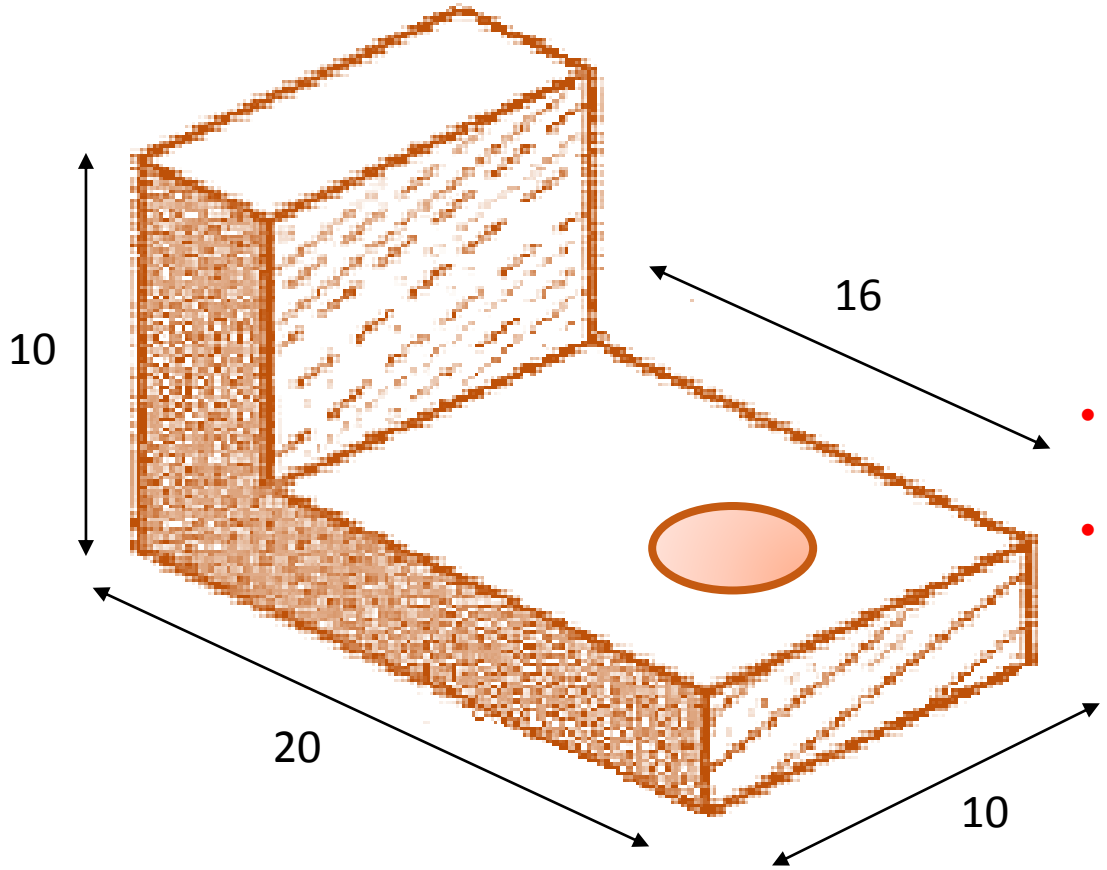


First Angle Projection

- It is assumed that the object is placed in front of V.P and above H.P in the first quadrant and then projected on these planes
- The object is assumed to be placed between the observer and the plane
- Front view (elevation) and top view (plan) when drawn, the front view appears above the top view of the object
- Each projection shows the view of the surface as seen by the observer

Practice Drawing

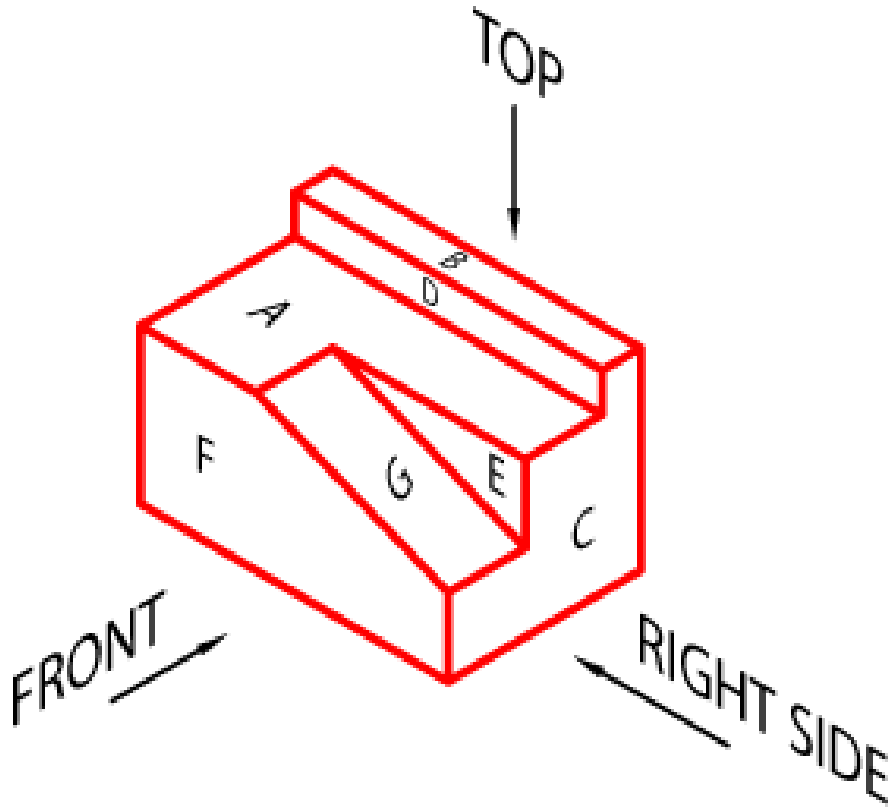
- Use the first angle projection method to draw the plan and elevation of the following object
- Show the proper use of various line types and dimensioning



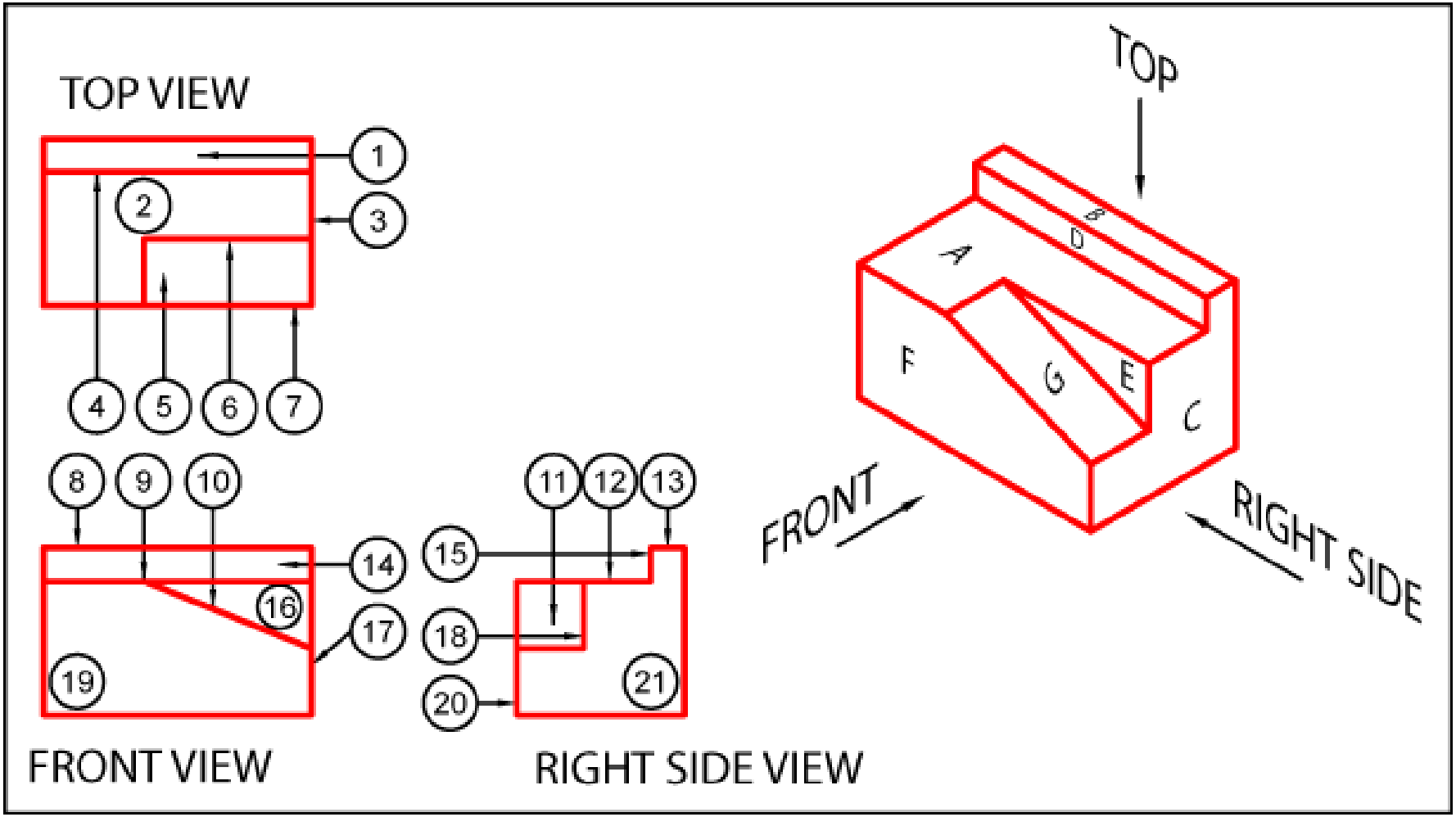
- Diameter of the hole is 4 cm
- All the dimensions are in cm

Practice Drawing

- Use the first angle projection method to draw the plan and elevation of the following object
- Show the proper use of various line types and dimensioning



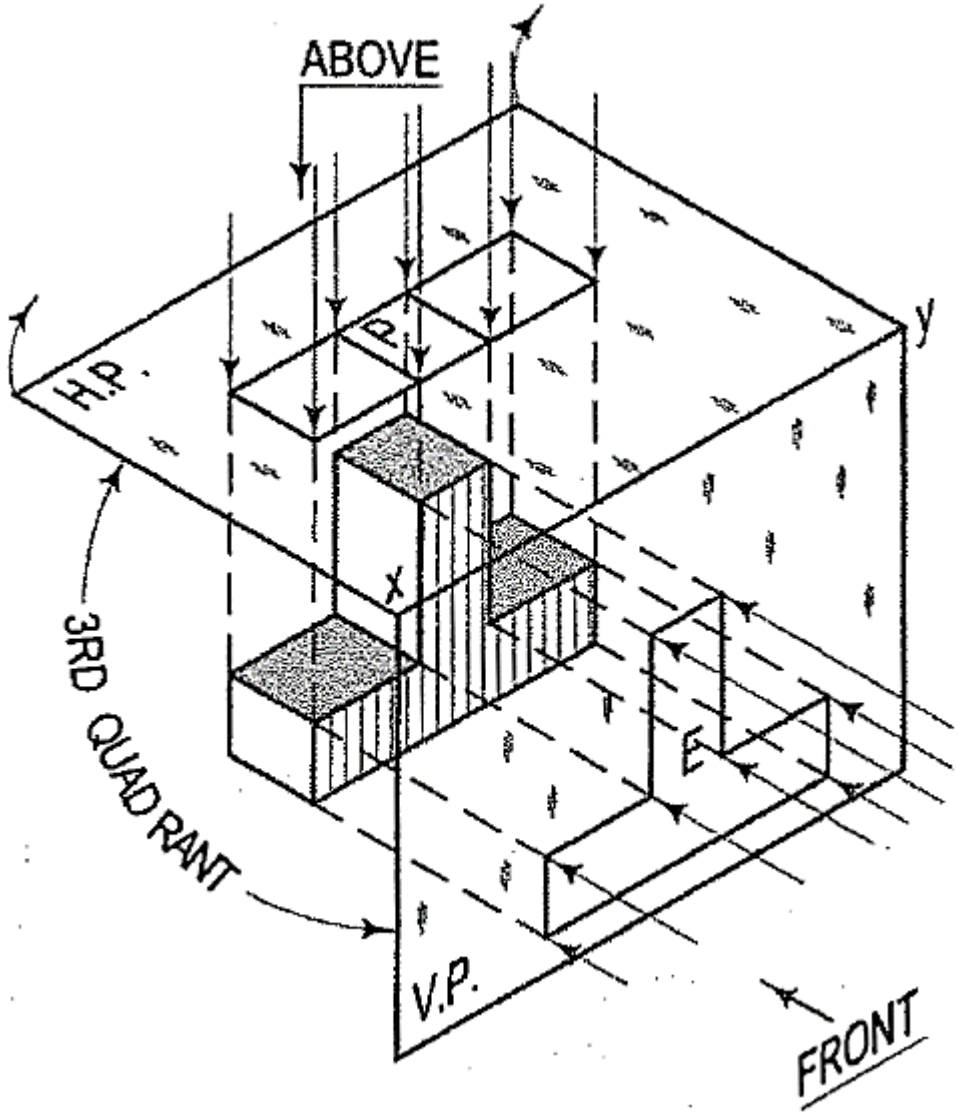
Practice Drawing

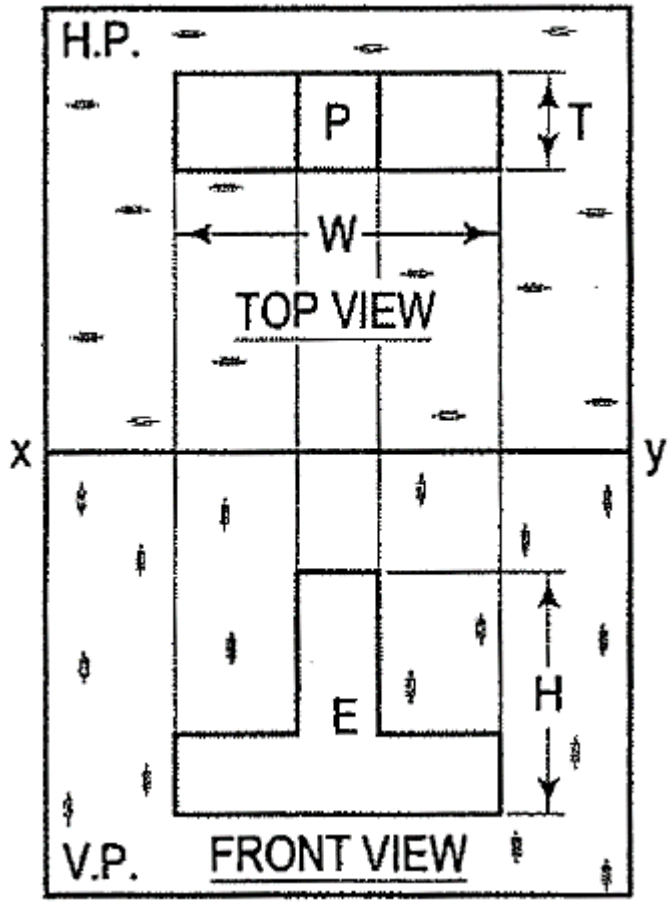


Third Angle Projection

- It is assumed that the object is placed in behind V.P and below H.P in the third quadrant and then projected on these planes
- The plane is assumed to be placed between the observer and the object
- Front view (elevation) and top view (plan) when drawn, the front view appears below the top view of the object
- Each projection shows the view of the surface as seen by the observer

Third Angle Projection

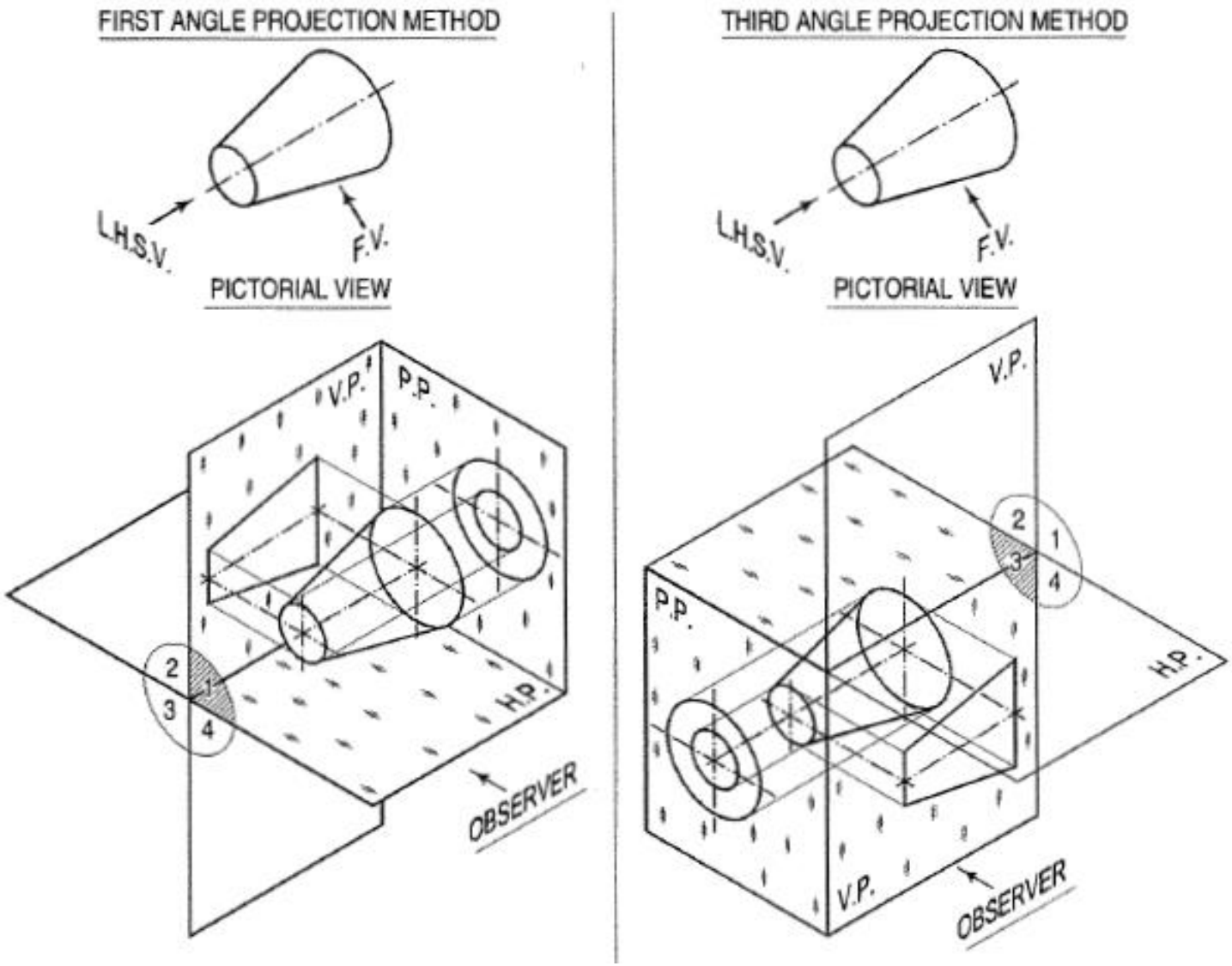




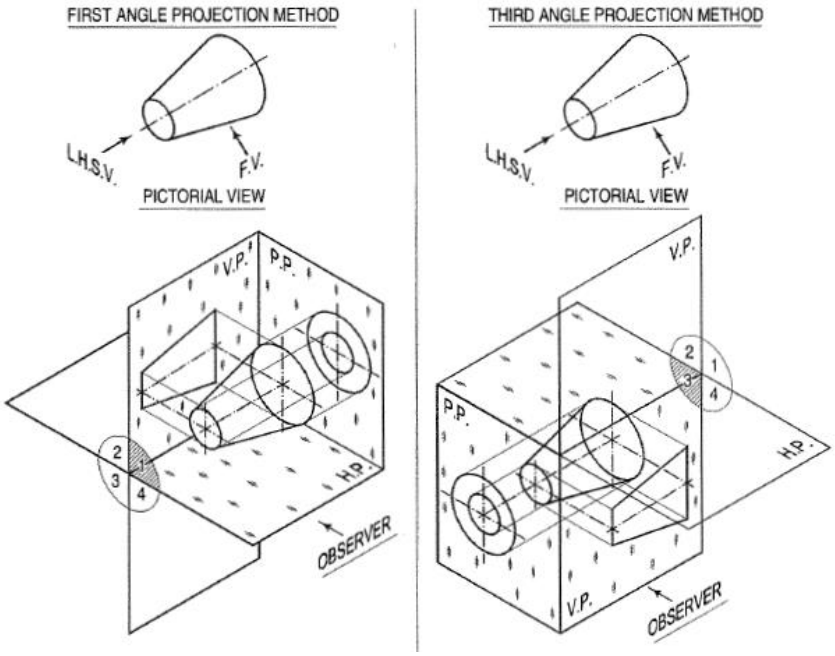
Difference between First and Third Angle Projection

First angle projection	Third-angle projection
Object is kept in the first quadrant.	Object is assumed to be kept in the third quadrant.
Object lies between observer and the plane of projection.	Plane of projection lies between the observer and the object.
The plane of projection is assumed to be non-transparent.	The plane of projection is assumed to be transparent.
Front (elevation) view is drawn above the XY line	Front (elevation) view is drawn below the XY line
Top (plan) view is drawn below the XY line	Top (plan) view is drawn above the XY line
Left view is projected on the right plane and vice versa	Left view is projected on the left plane itself.
Followed in India, European countries	Followed in USA

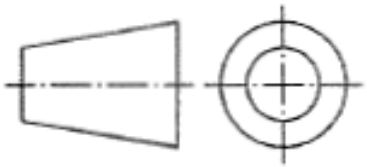
Difference between First and Third Angle Projection



Difference between First and Third Angle Projection

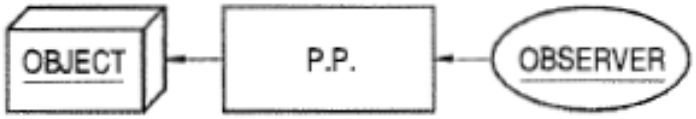


RELATION BETWEEN OBSERVER, OBJECT AND P.P.

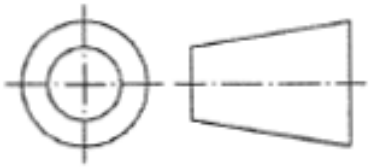


F.V. L.H.S.V.

IDENTIFYING GRAPHICAL SYMBOL OF FIRST ANGLE PROJECTION



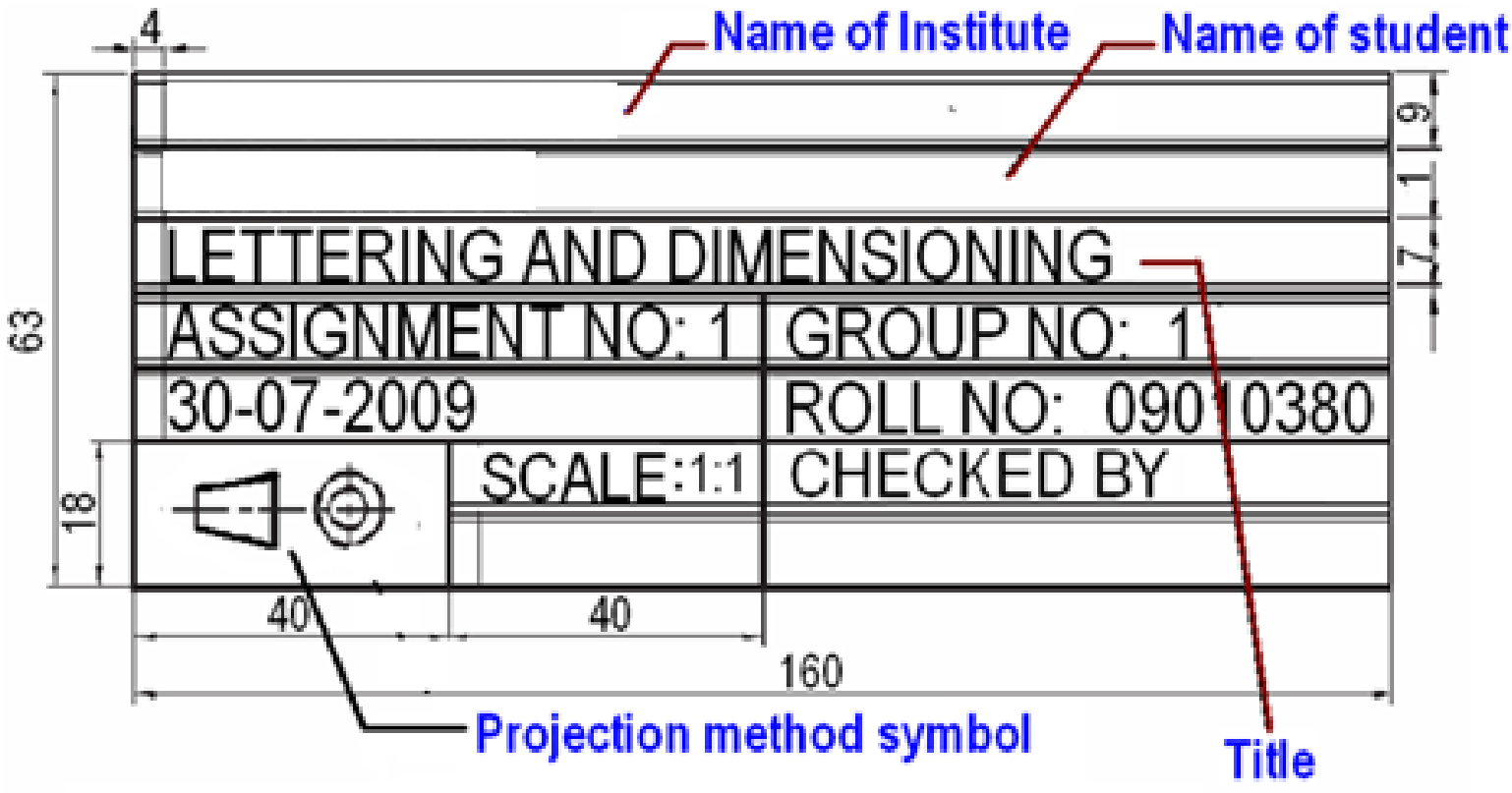
RELATION BETWEEN OBSERVER, OBJECT AND P.P.



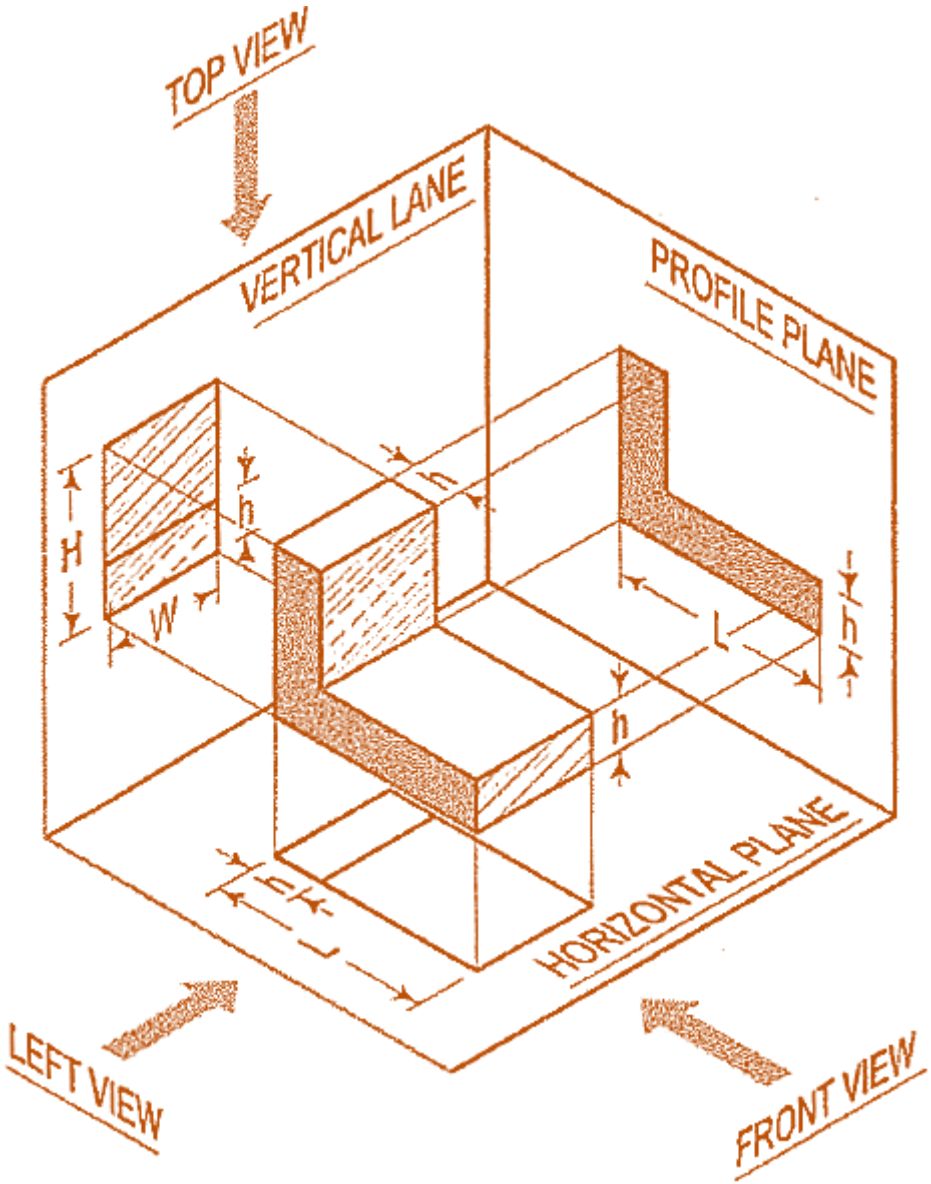
L.H.S.V. F.V.

IDENTIFYING GRAPHICAL SYMBOL OF THIRD ANGLE PROJECTION

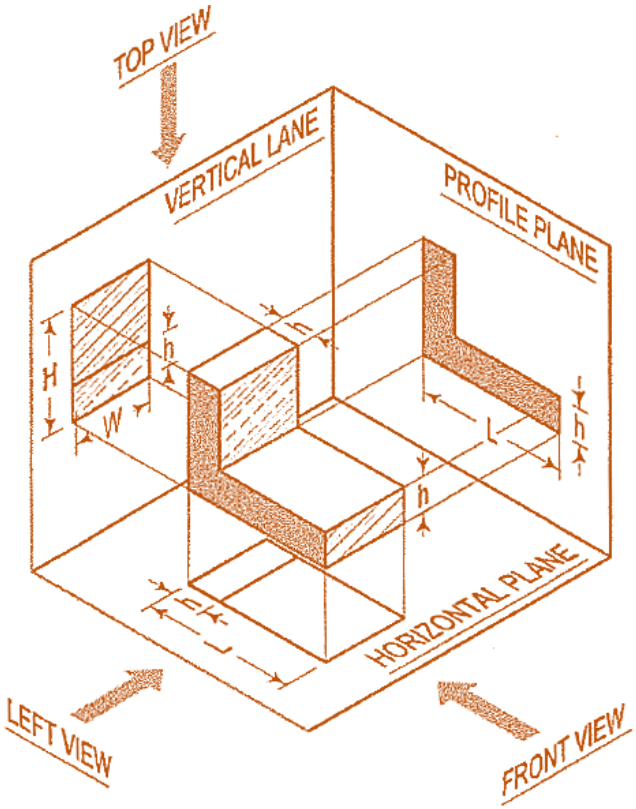
Projection Symbol in Sheet Layout

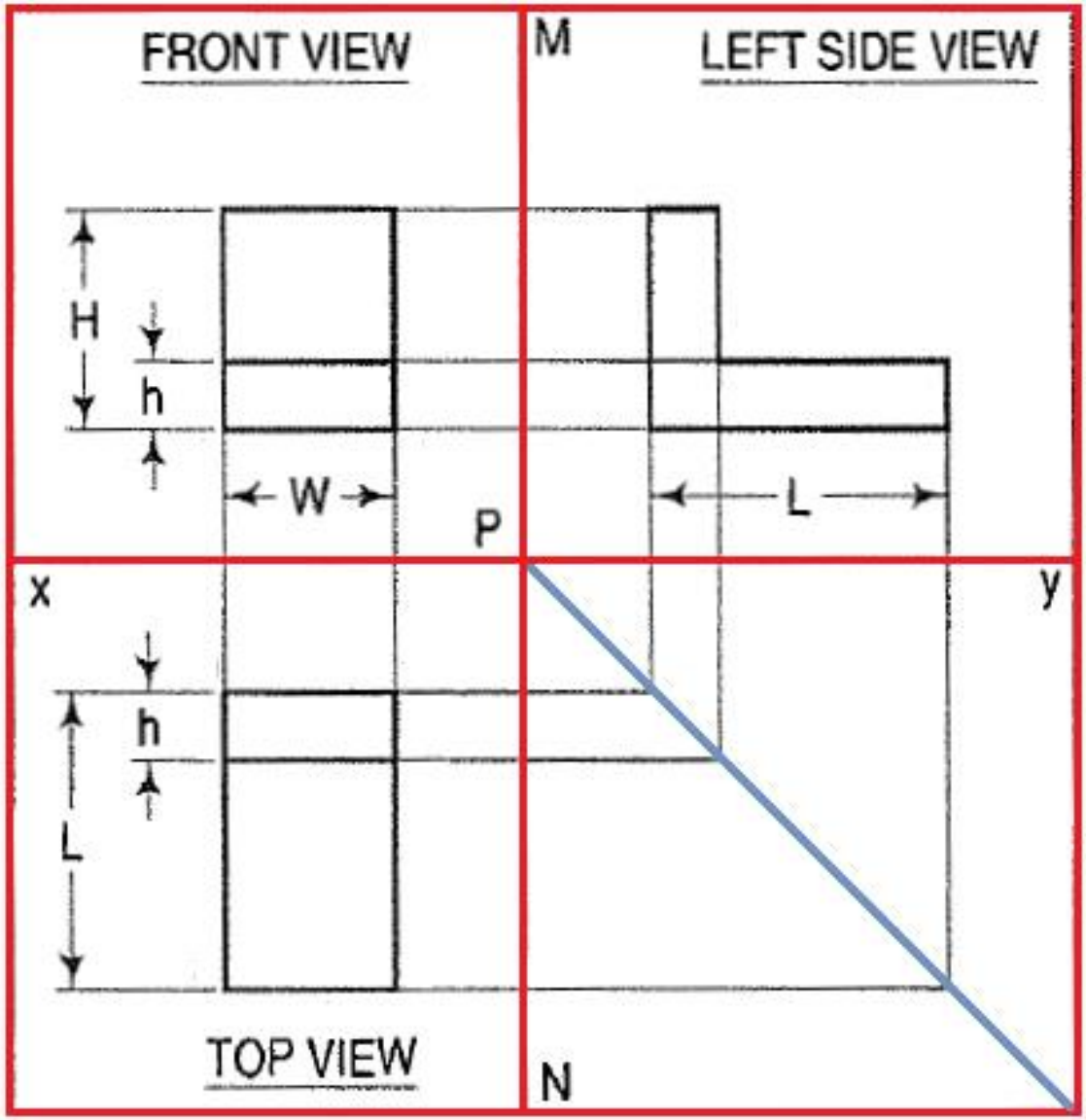


3 Side View of 3D Object

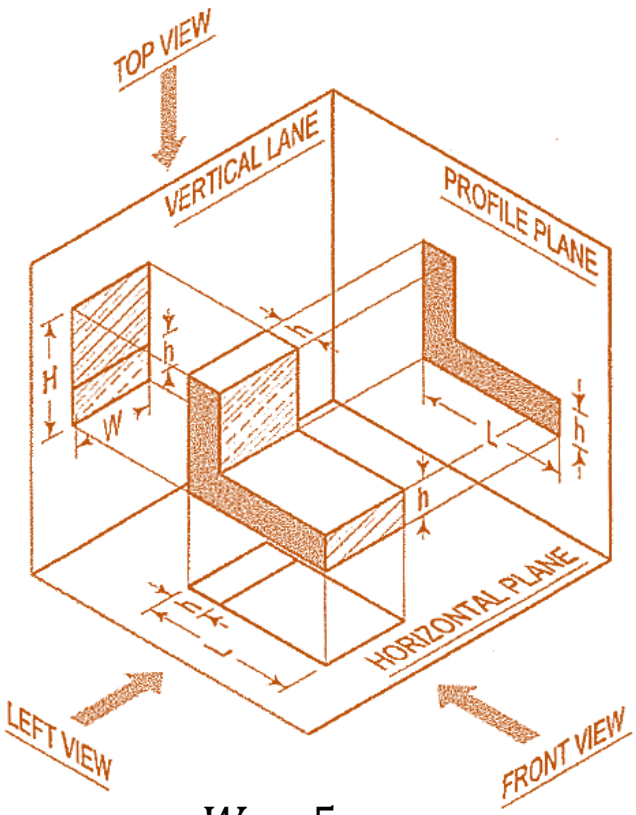


3 Side View of 3D Object

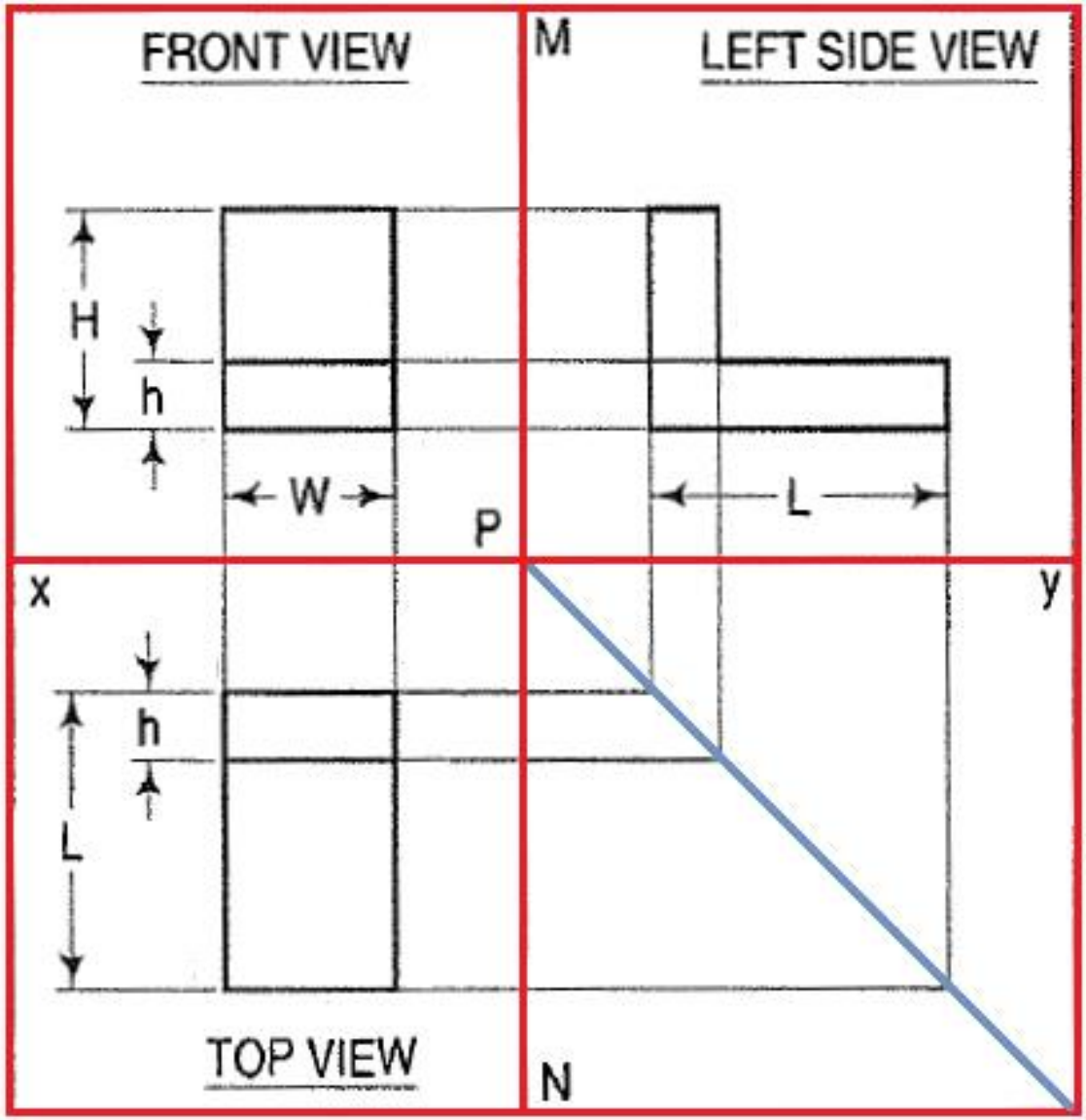




Practice Drawing

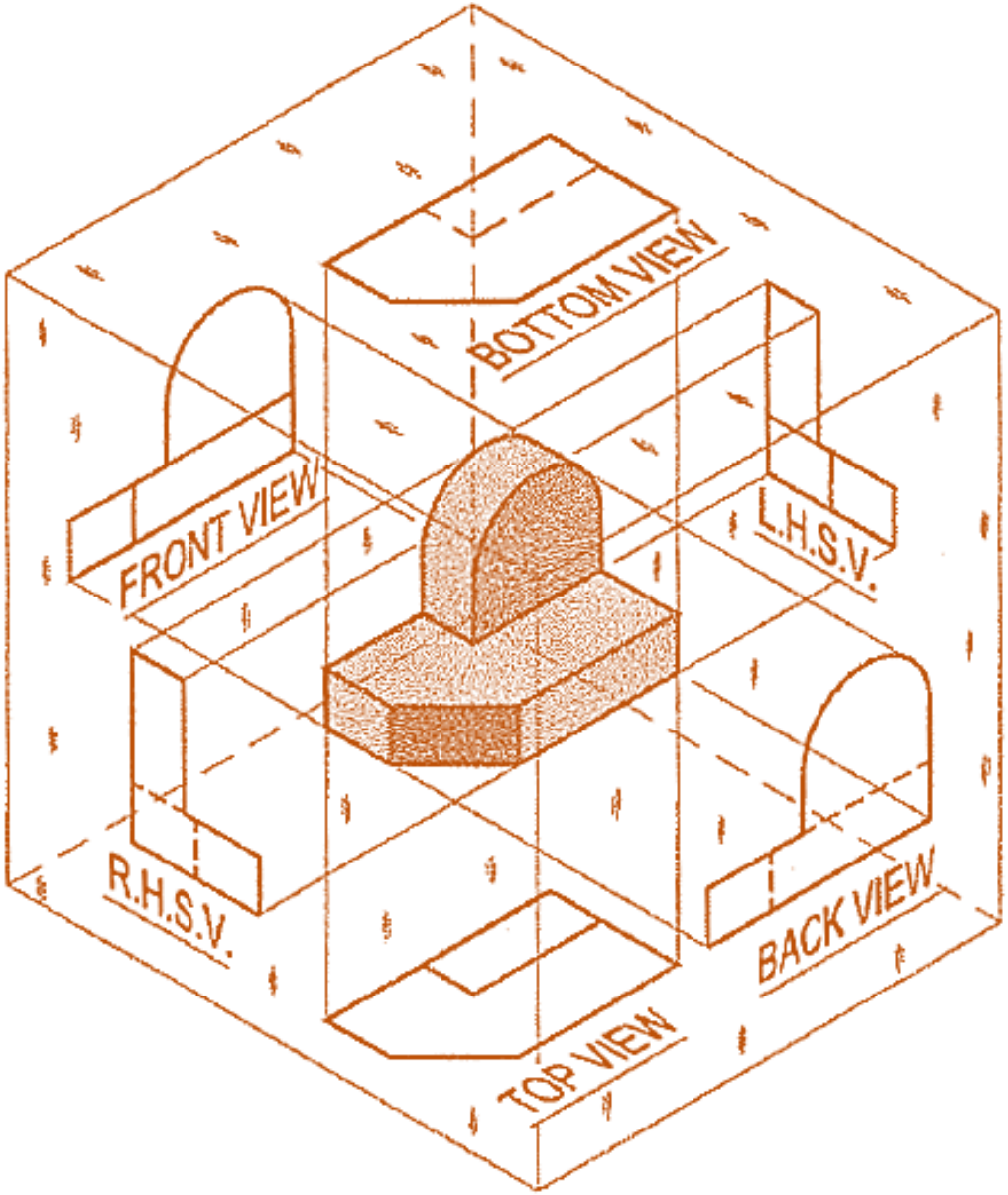


$W = 5cm$
$h = 3cm$
$L = 15cm$
$H = 10cm$

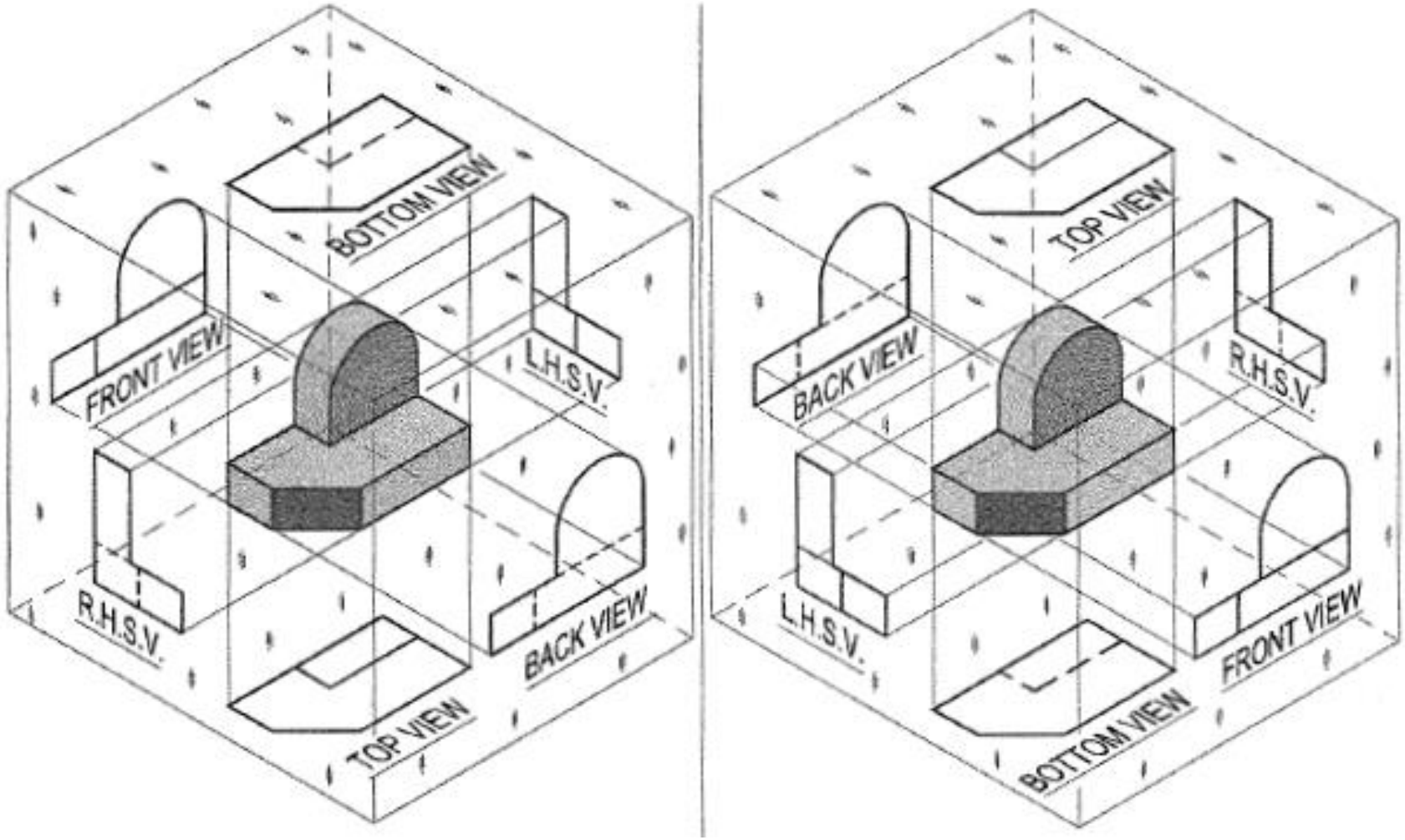


Six Views of an Object

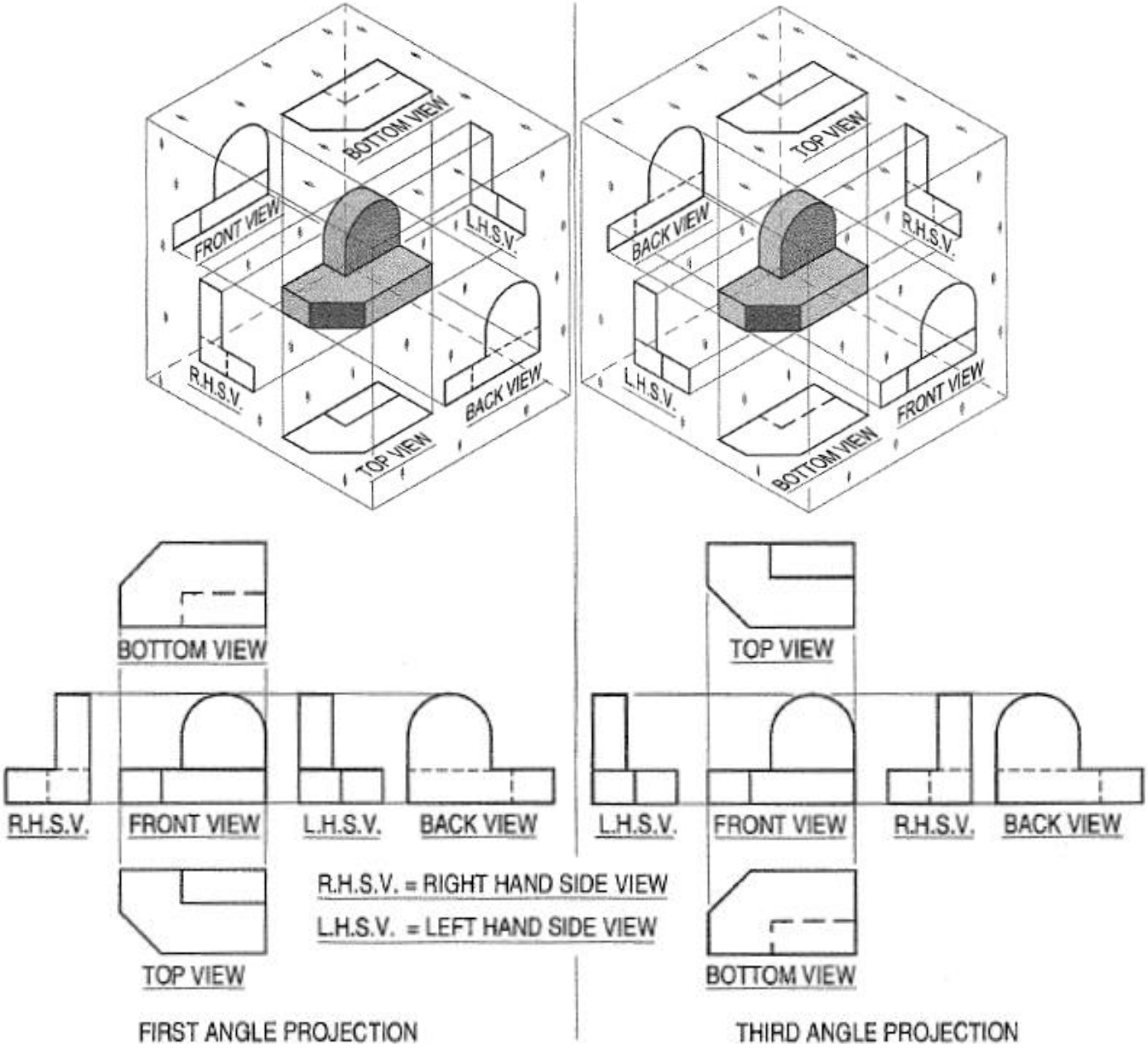
- Observer
- Plane of Projection
- object



Six Views of an Object

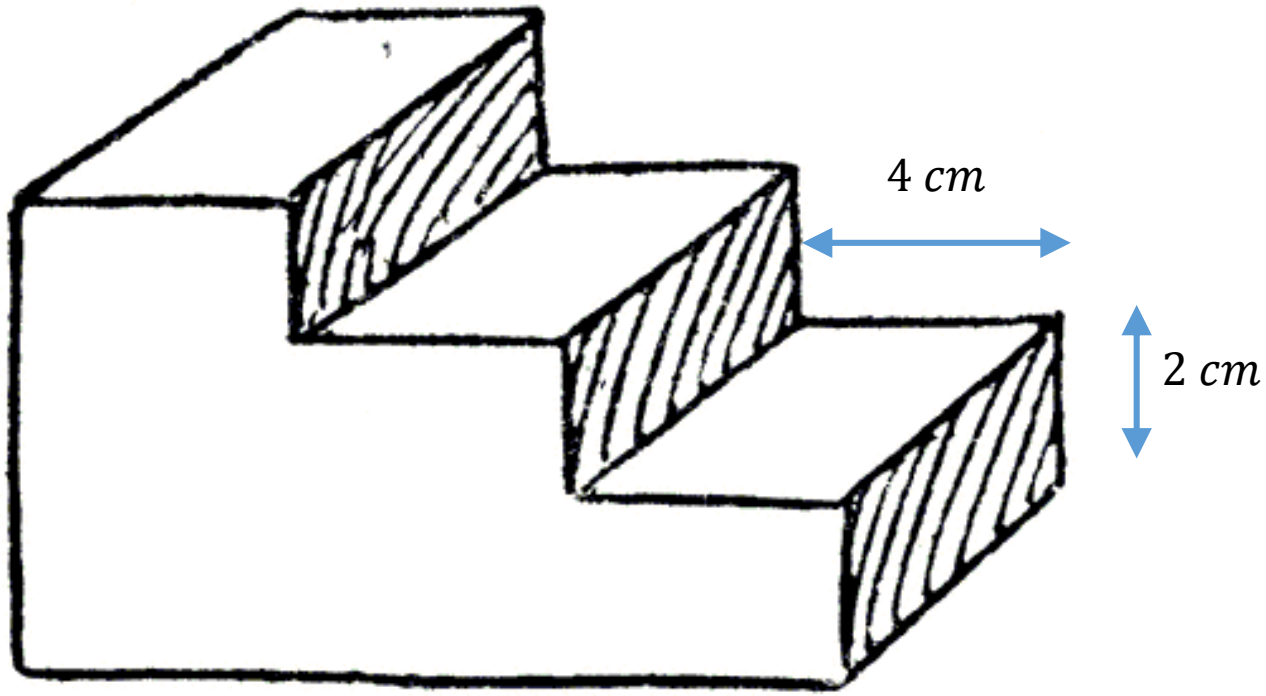


Six Views of an Object



Practice Drawing

- Draw front, top, left and right side views of the following object using first angle projection



Conclusion