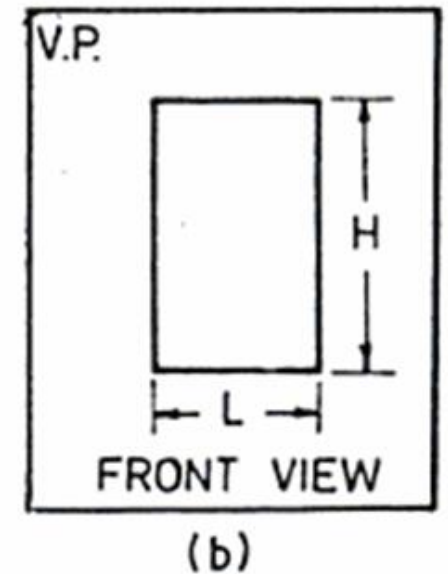
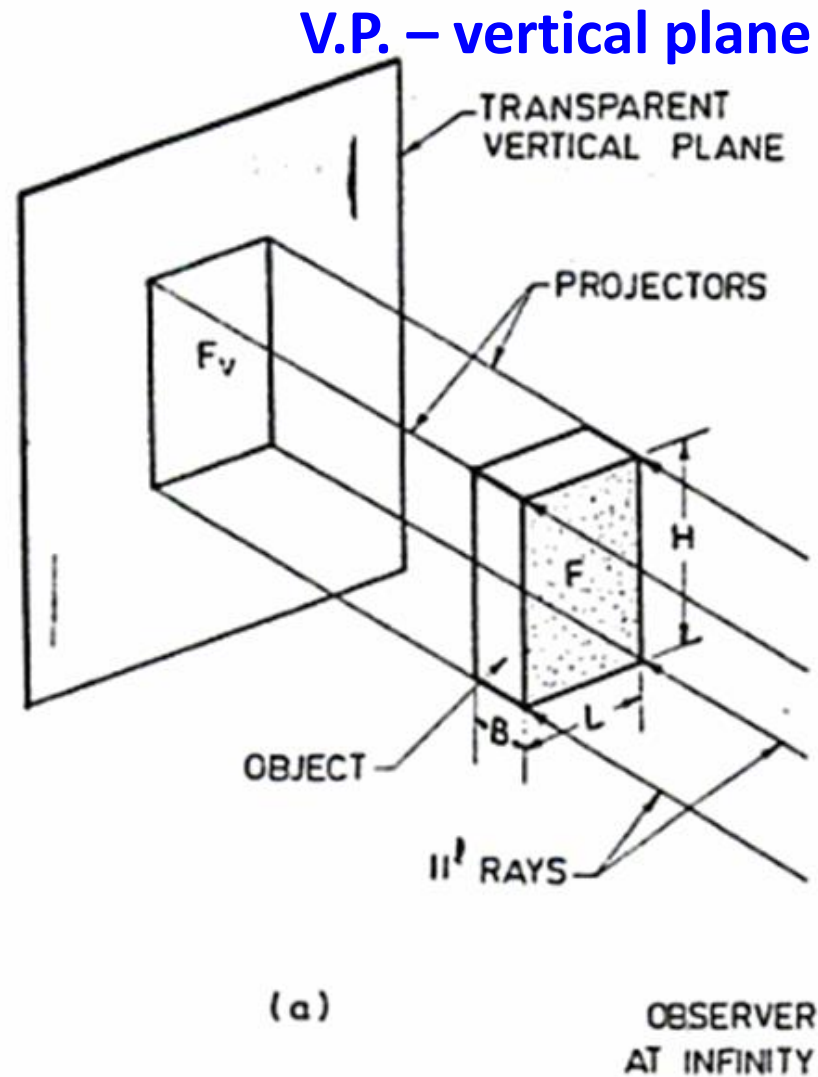


# ORTHOGRAPHIC PROJECTIONS

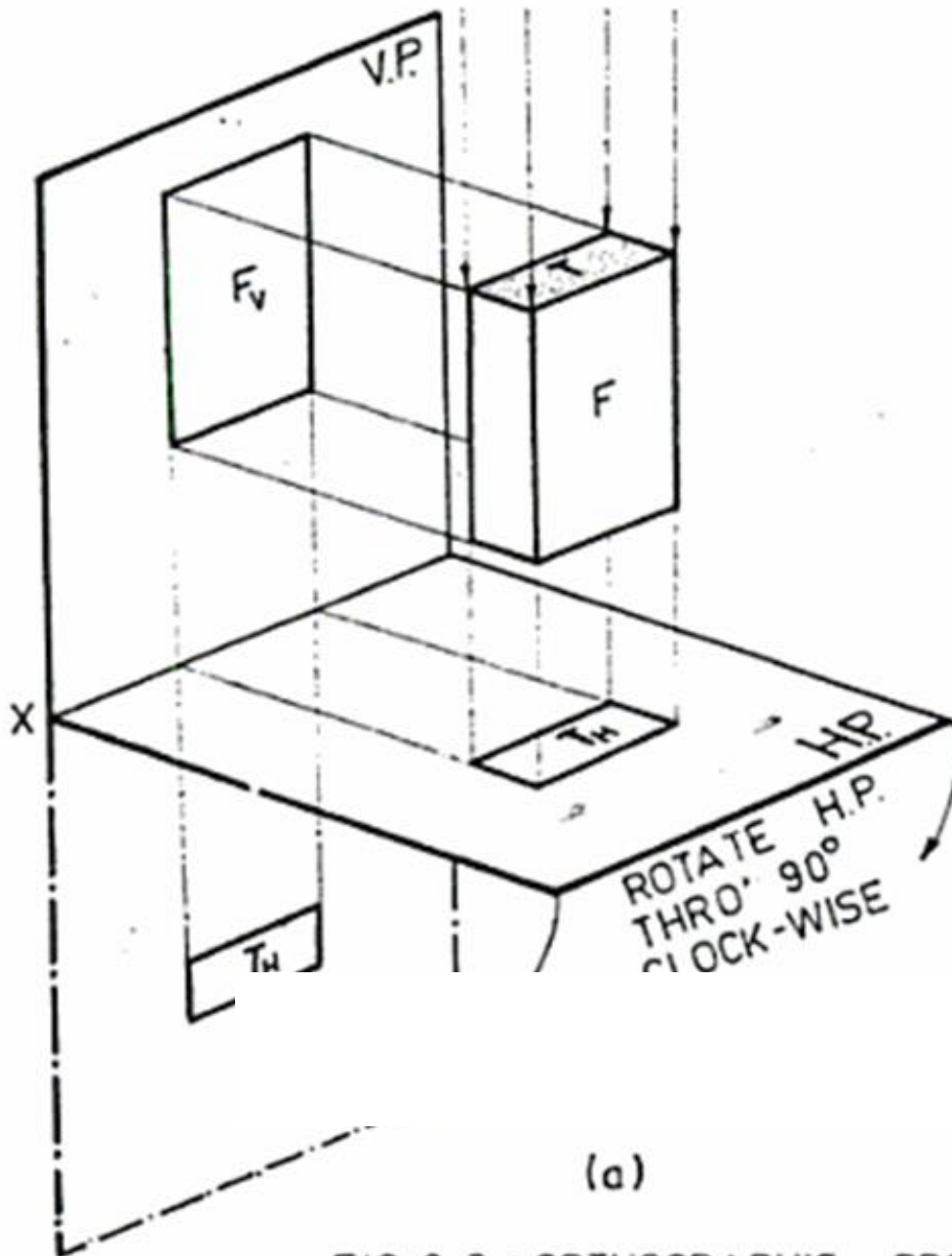
**Ortho** – right angle

**Orthographic** – right angled drawing

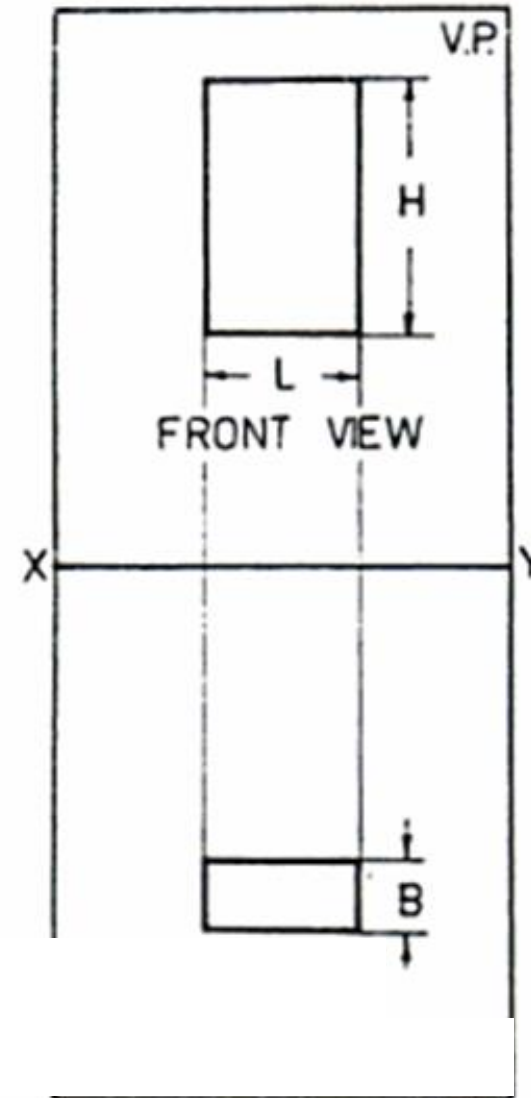
When the projectors are perpendicular to the plane on which the projection is obtained, it is known as orthographic projection



# FIRST ANGLE PROJECTION – FIRST QUADRANT



(a)



(b)

V.P – Vertical Plane  
H.P – Horizontal Plane  
V.P. and H.P – Principal planes of projection  
Projection on **VP**  
– **FRONT VIEW**  
Projection on **HP**  
– **TOP VIEW**

## FOUR QUADRANTS -

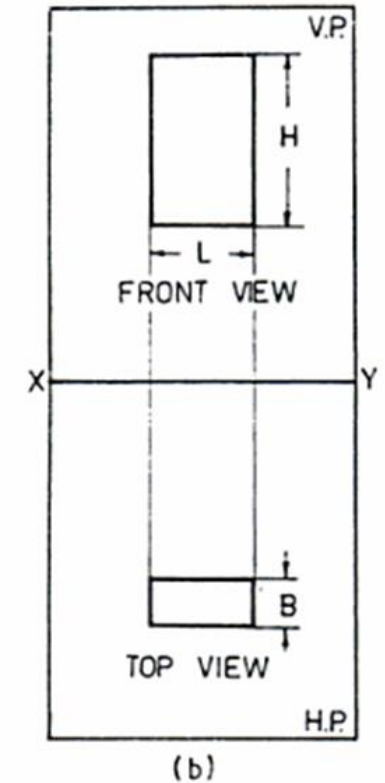
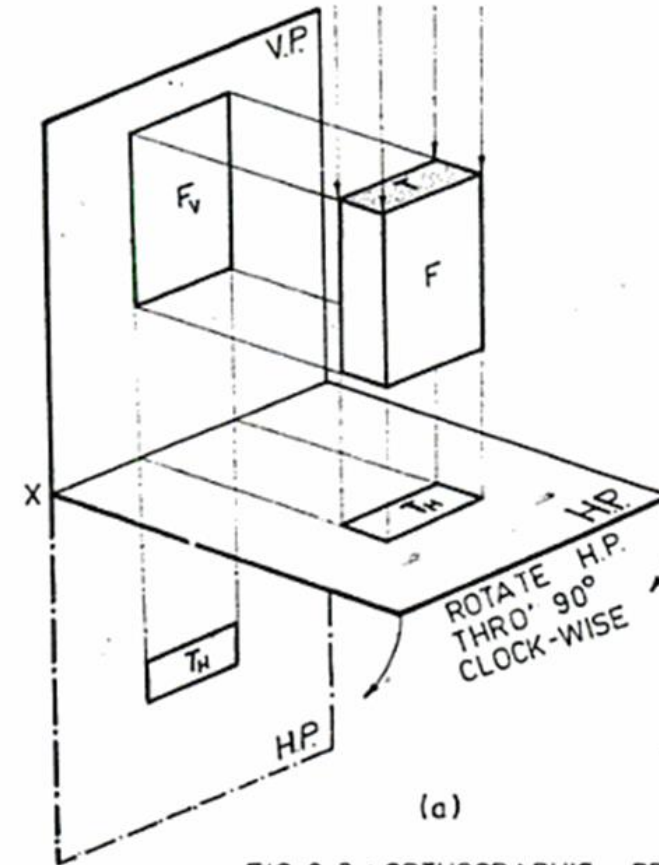
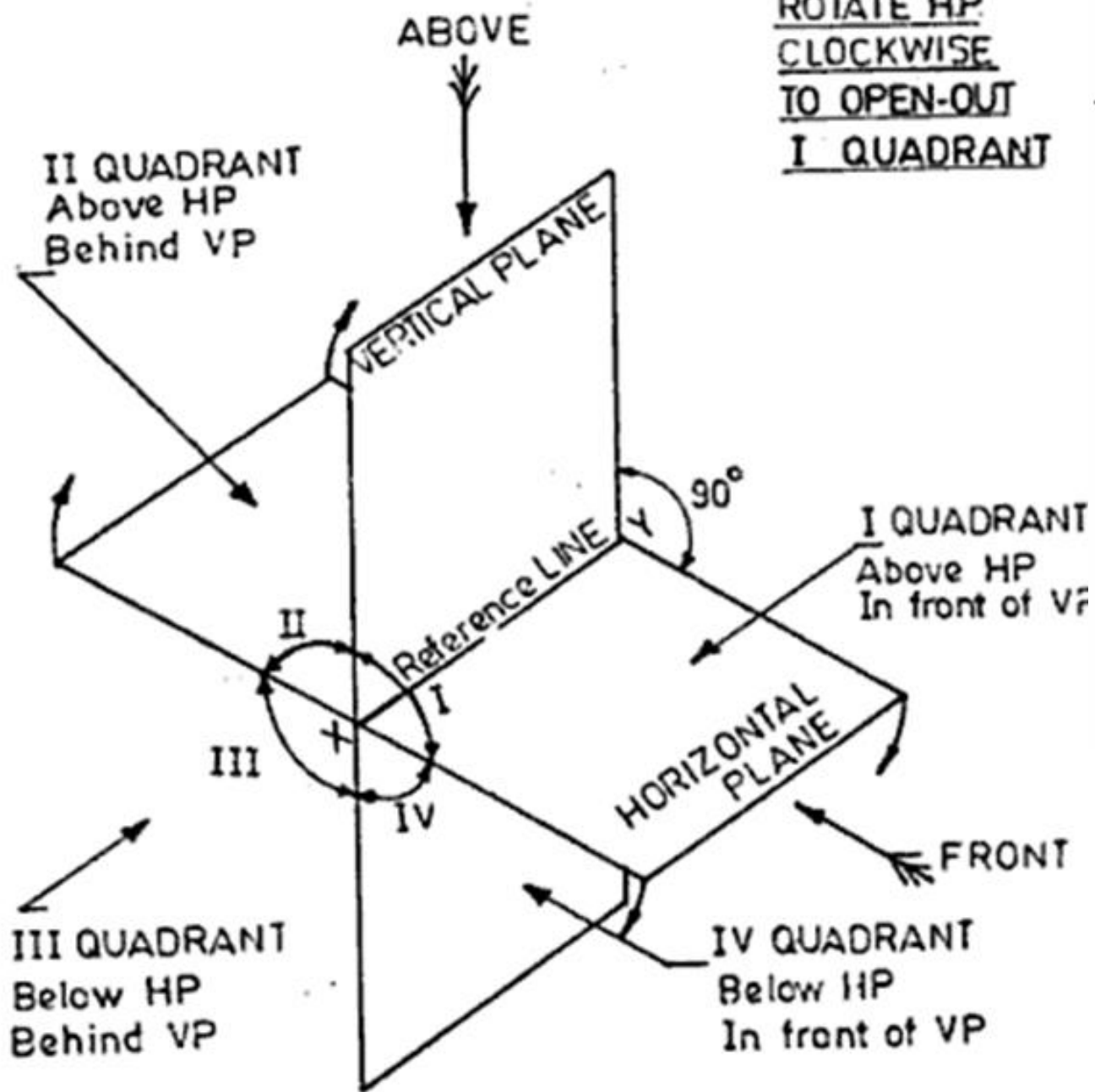
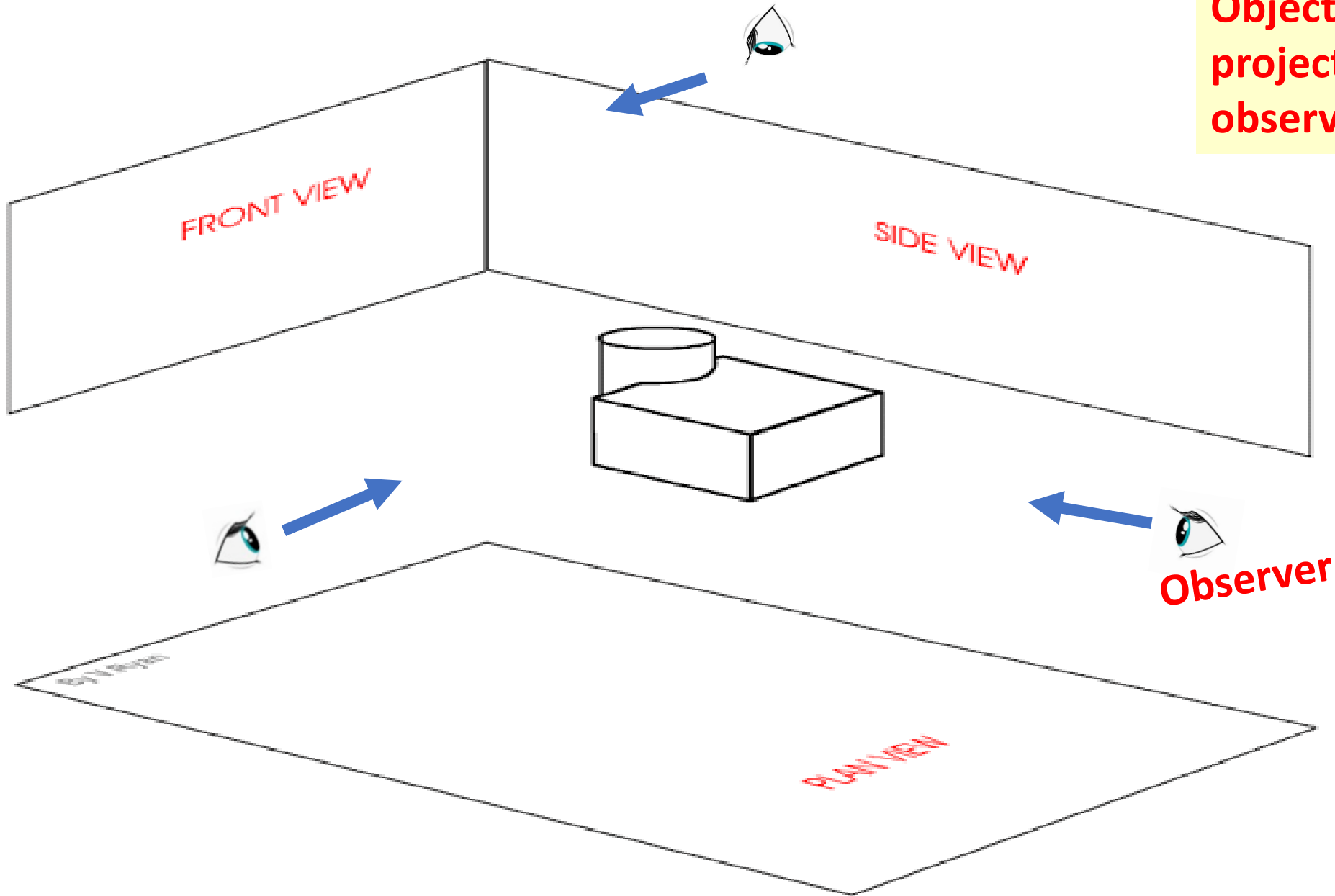


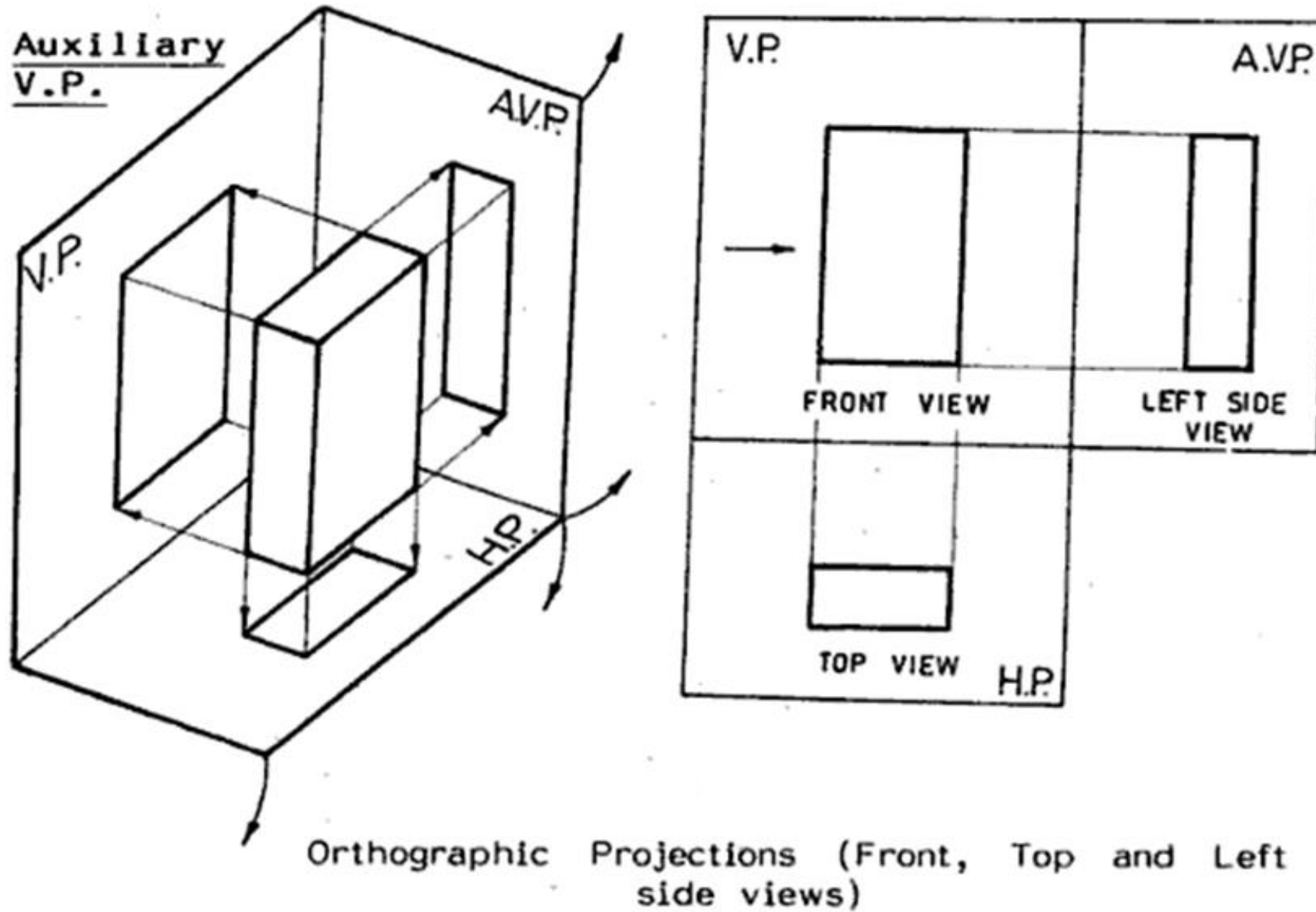
FIG. 2. ORTHOGRAPHIC PROJECTIONS (FRONT & TOP VIEWS)

**OBJECT IS IN BETWEEN THE  
OBSERVER AND THE PROJECTION  
PLANE**

# FIRST ANGLE PROJECTION

Object lies between projection plane and observer



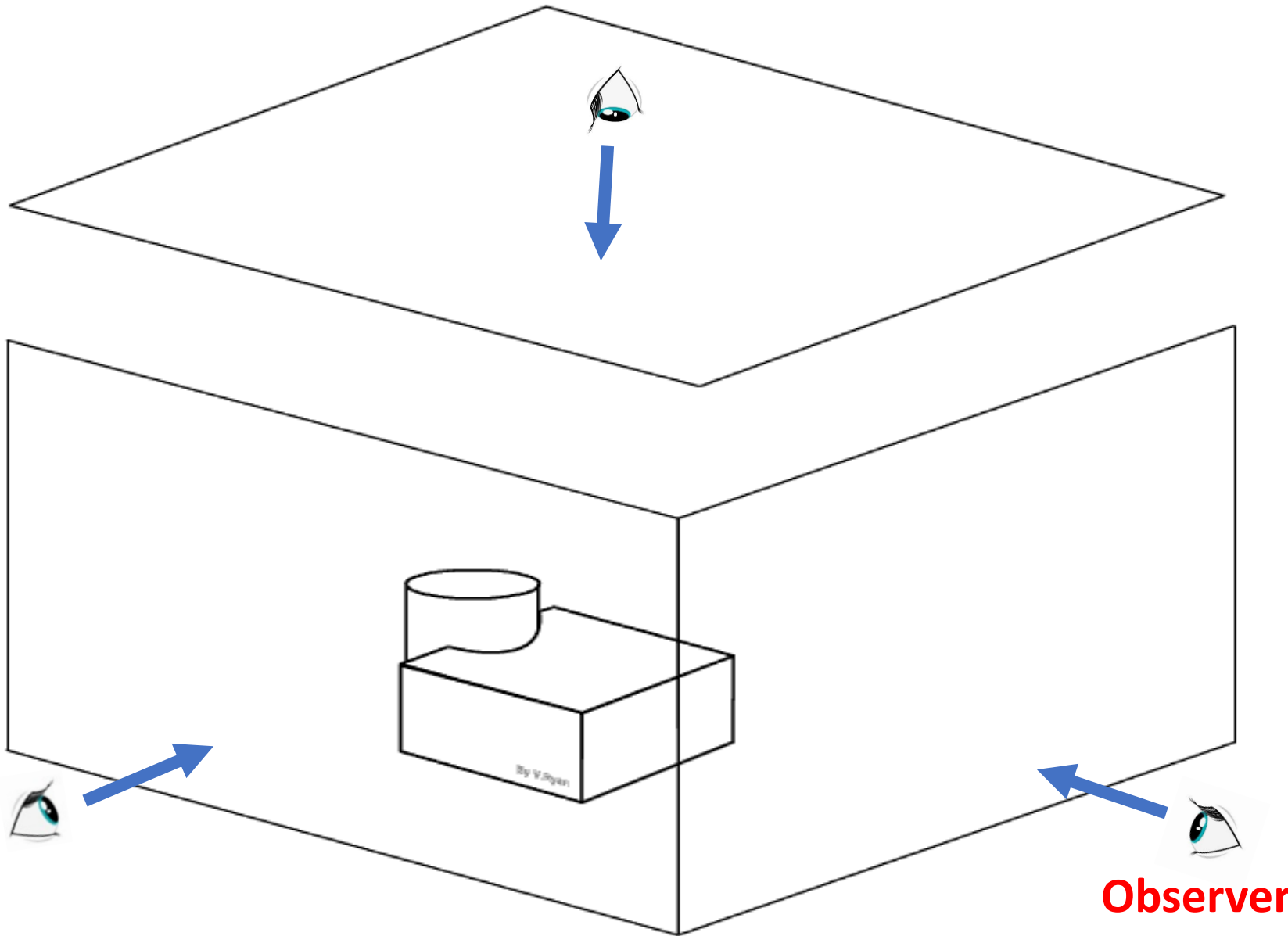


**AVP** is positioned on the **right side** of the **VP** to obtain the **left side view**

**AVP** is positioned on the **left side** of the **VP** to obtain the **right side view**

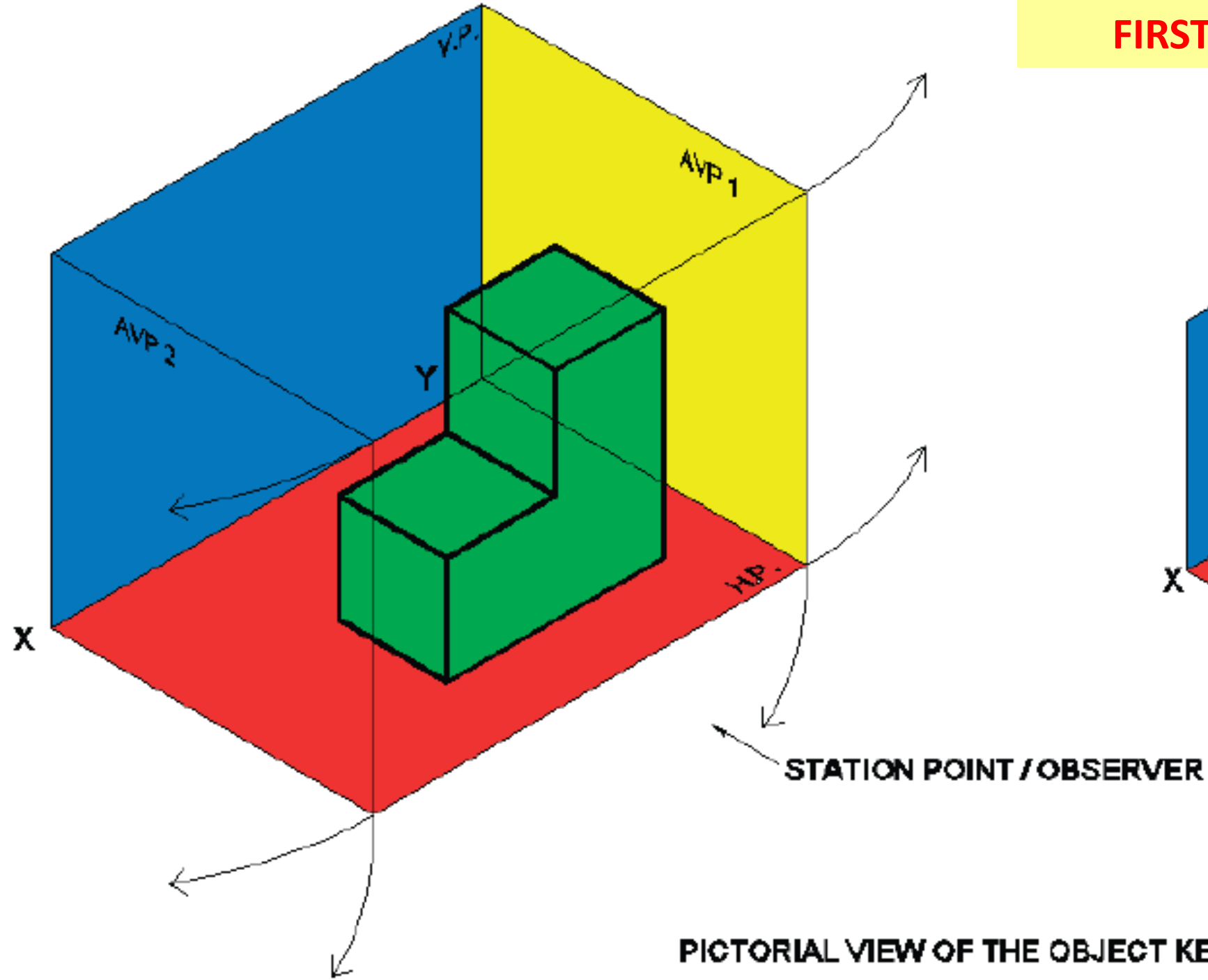
# THIRD ANGLE PROJECTION

Projection plane lies between object and observer

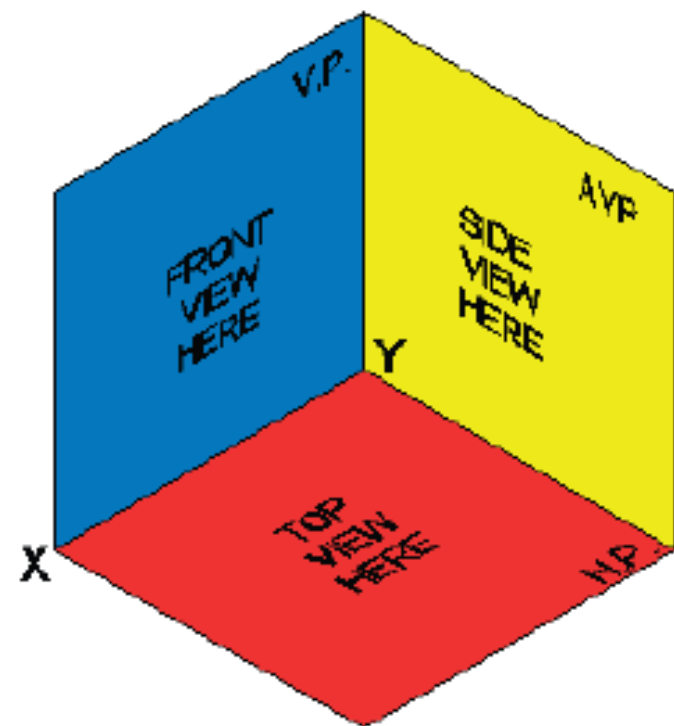


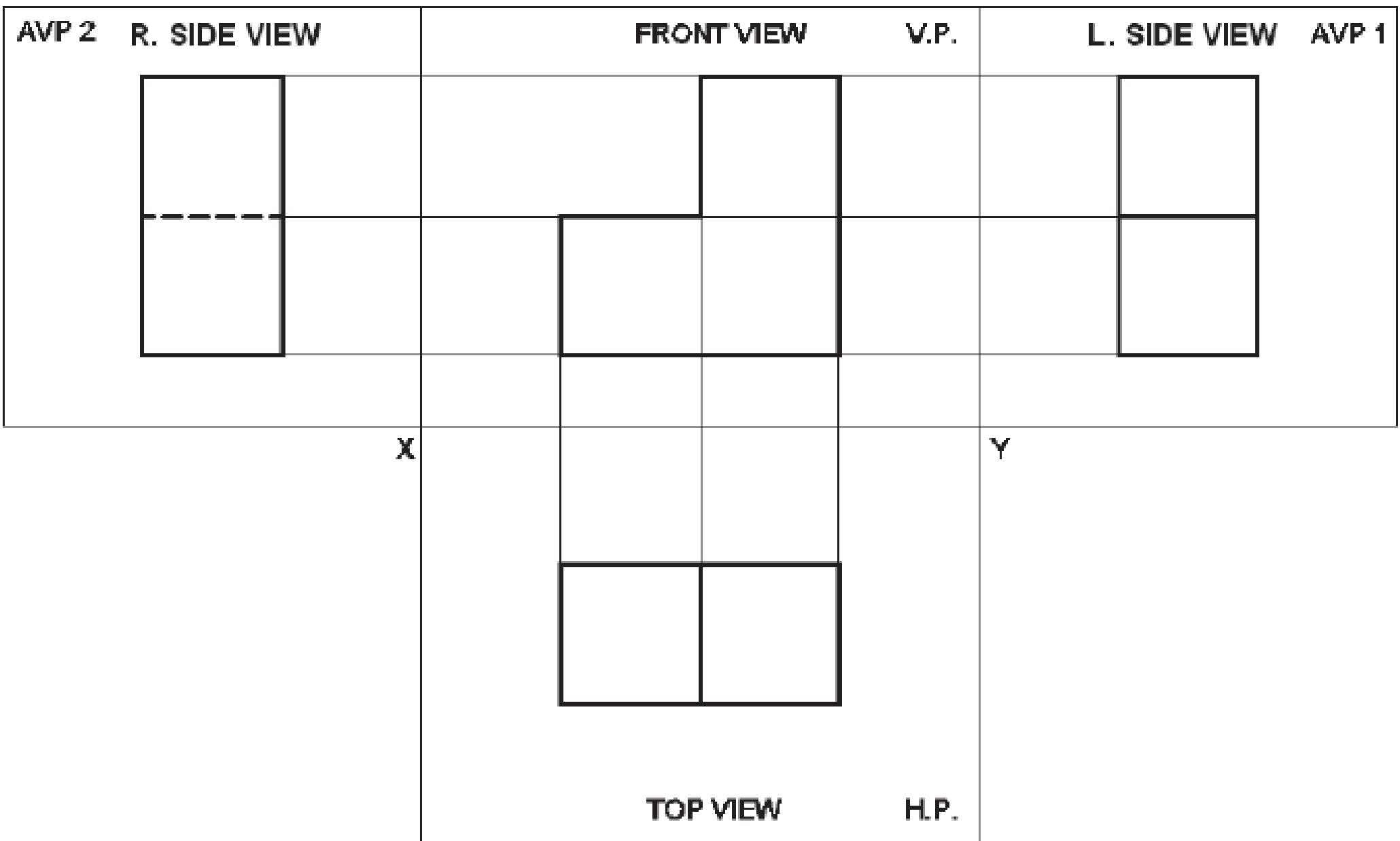
Observer

## FIRST ANGLE PROJECTION



PICTORIAL VIEW OF THE OBJECT KEPT IN I QUADRANT



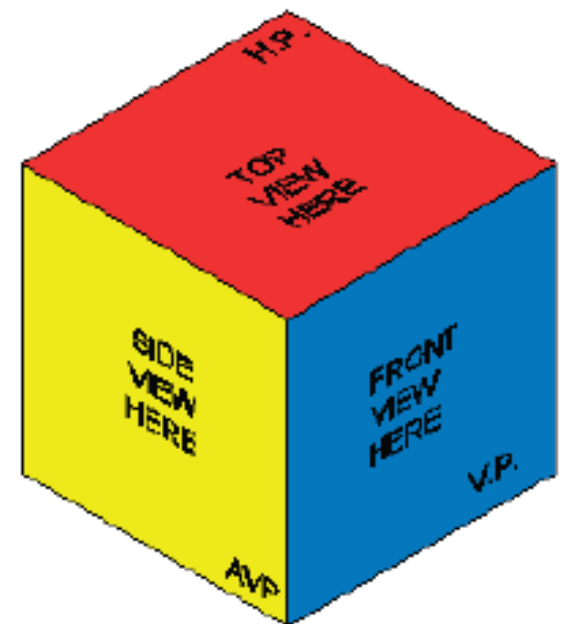
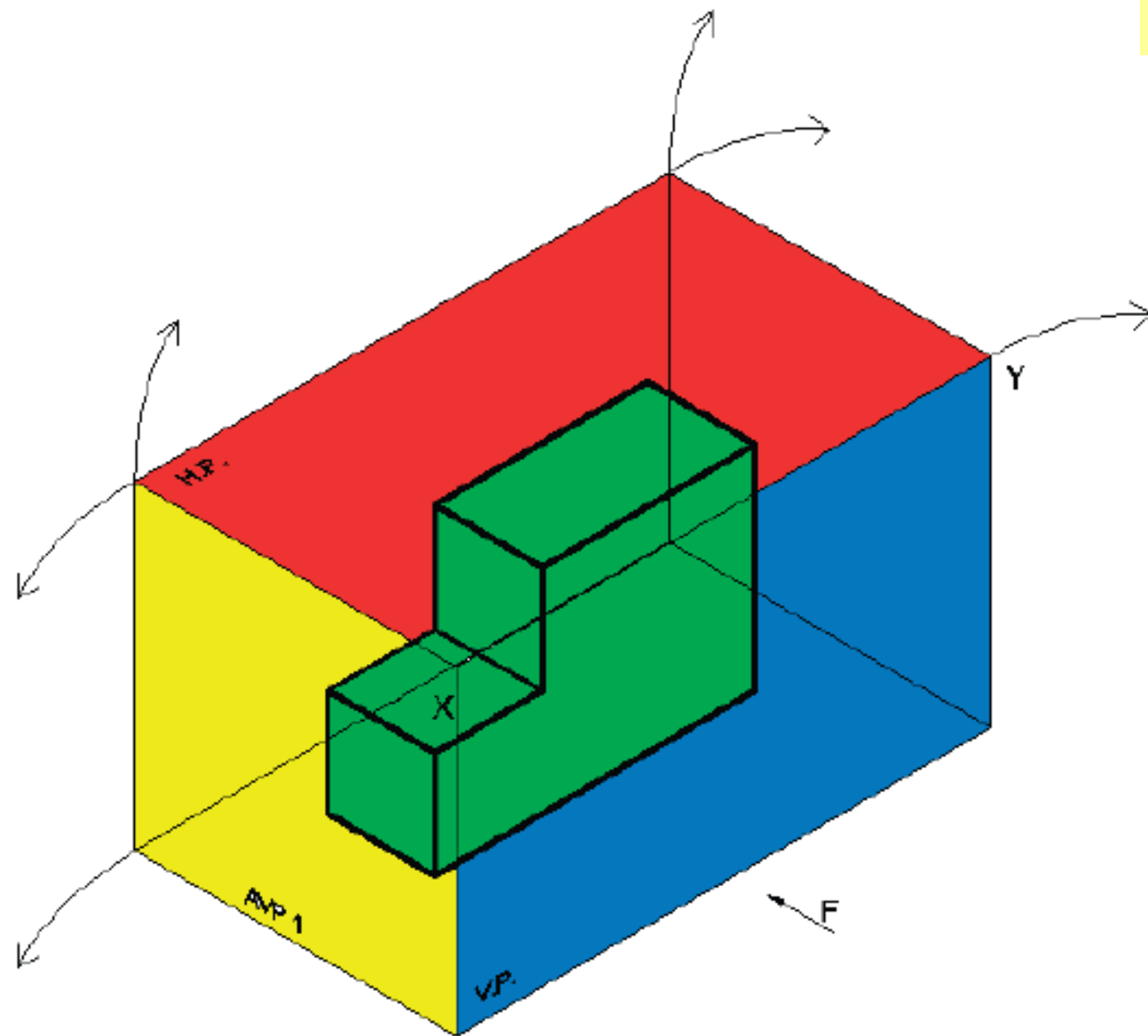


**FIRST ANGLE PROJECTION**

**I ANGLE PROJECTION**

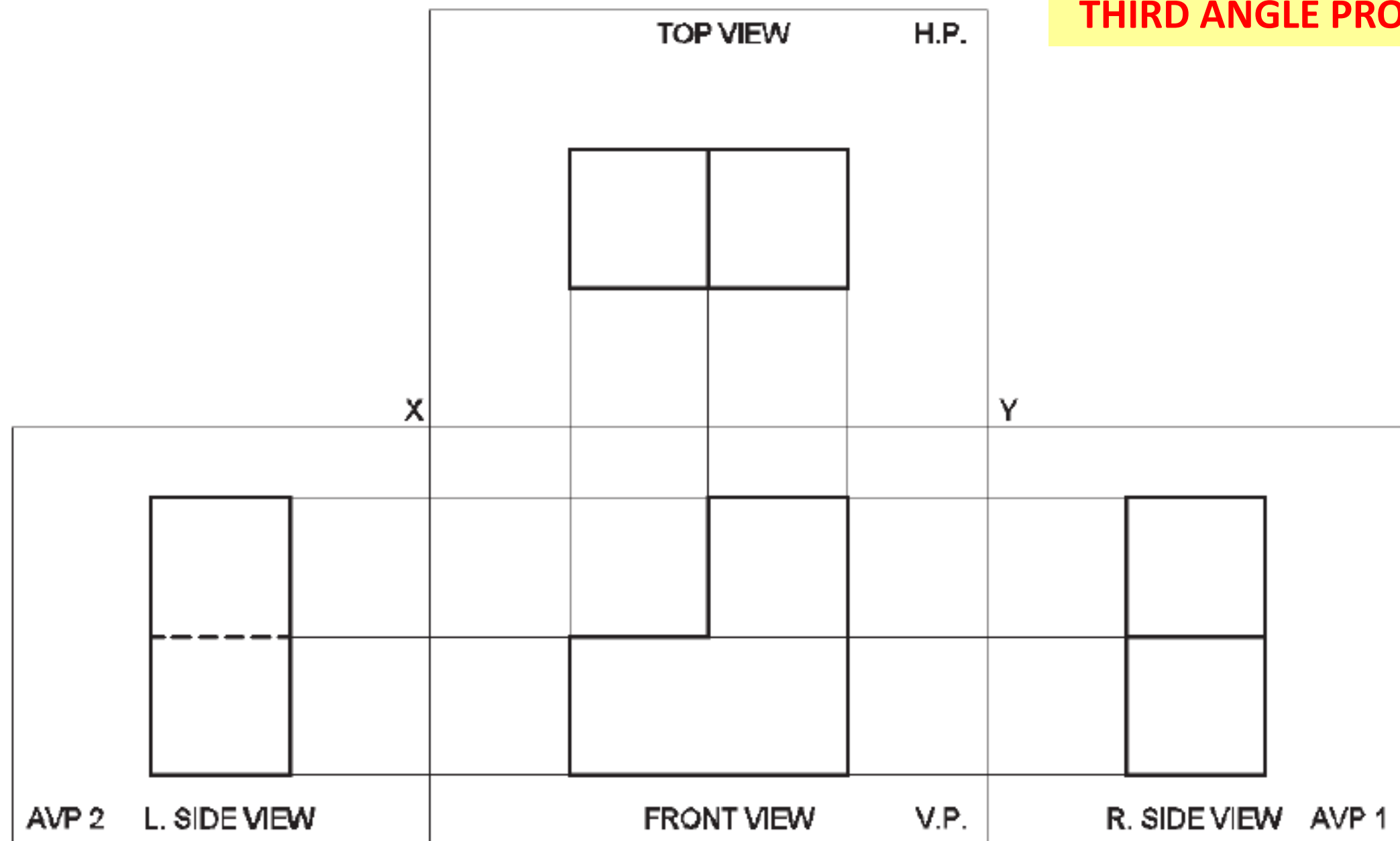


# THIRD ANGLE PROJECTION



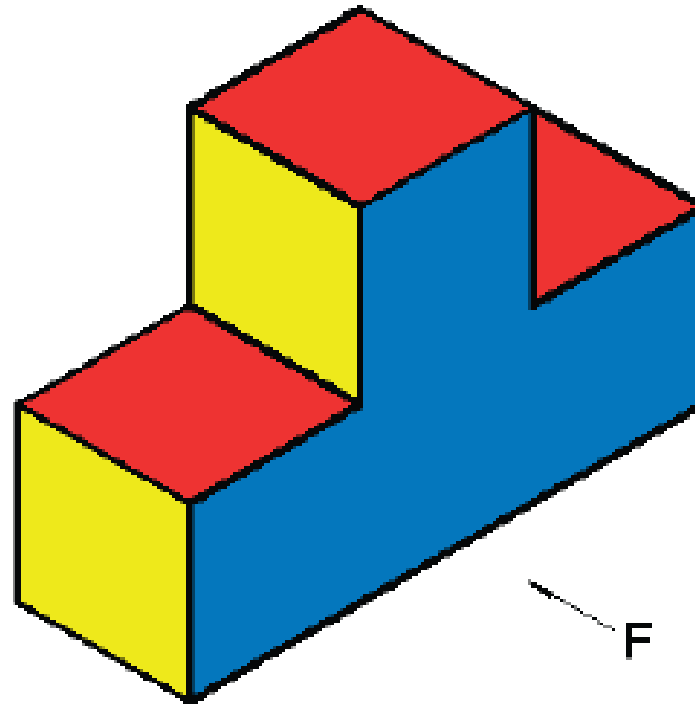
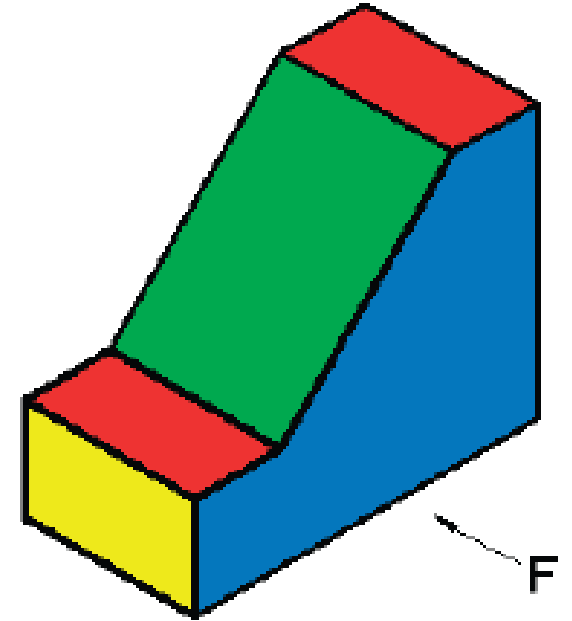
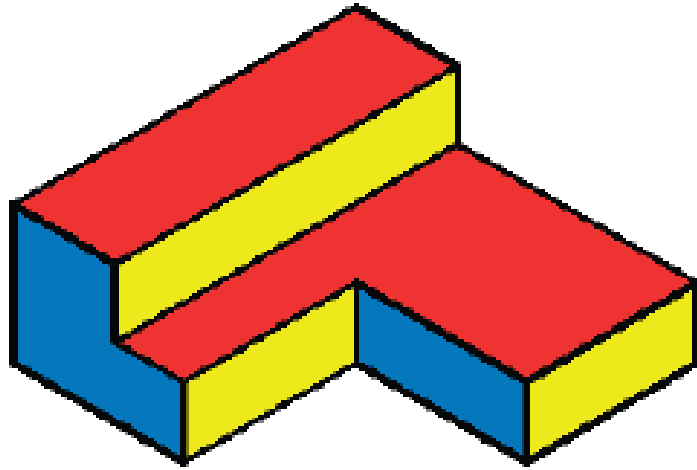
PICTORIAL VIEW OF THE OBJECT KEPT IN III QUADRANT

# THIRD ANGLE PROJECTION

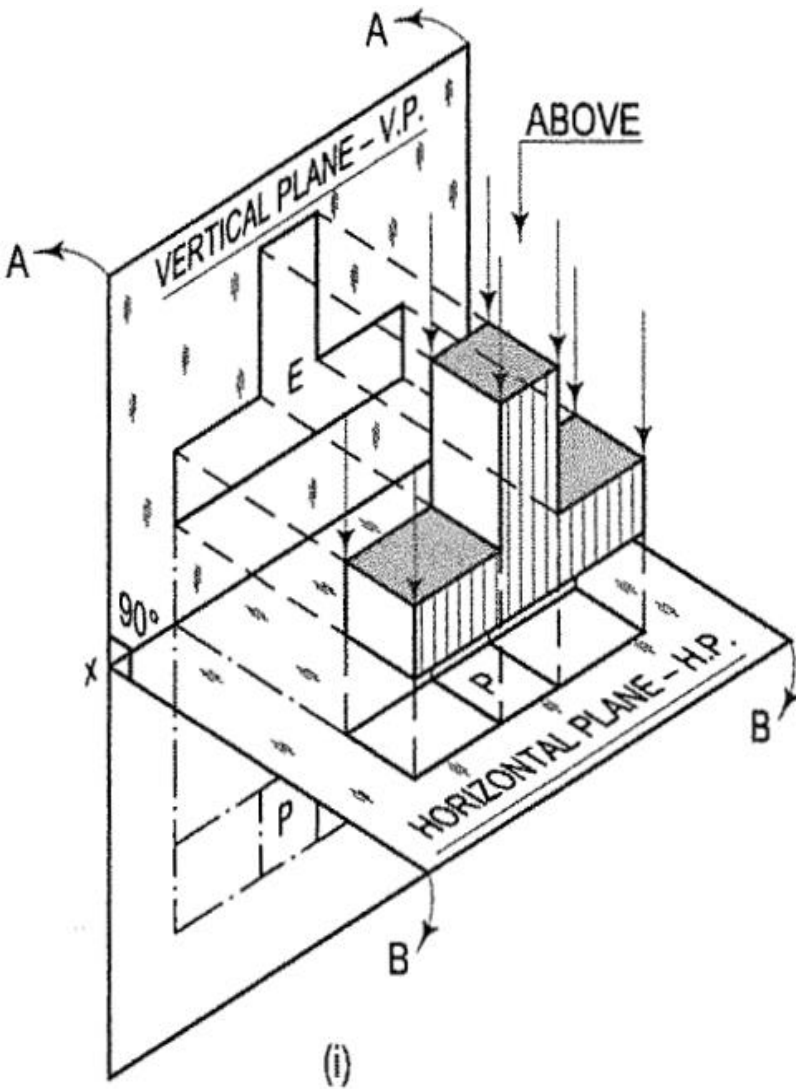


## III ANGLE PROJECTION

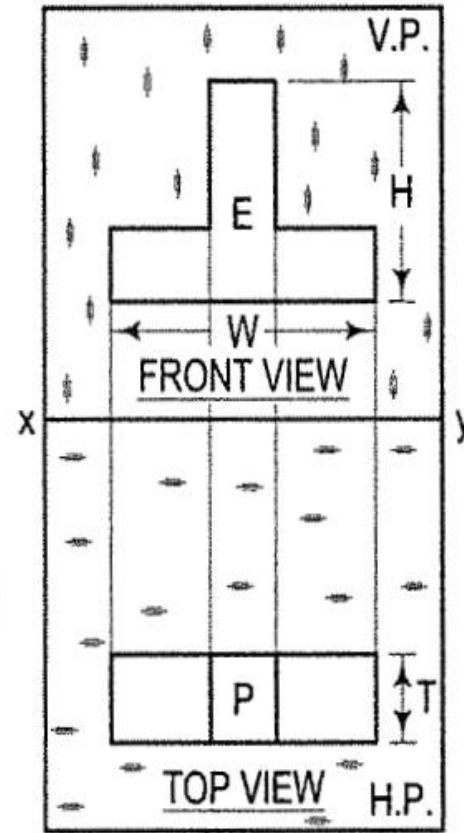
Sketch looking from the direction of arrow  
Front View, Top View and side view



# FIRST ANGLE PROJECTION

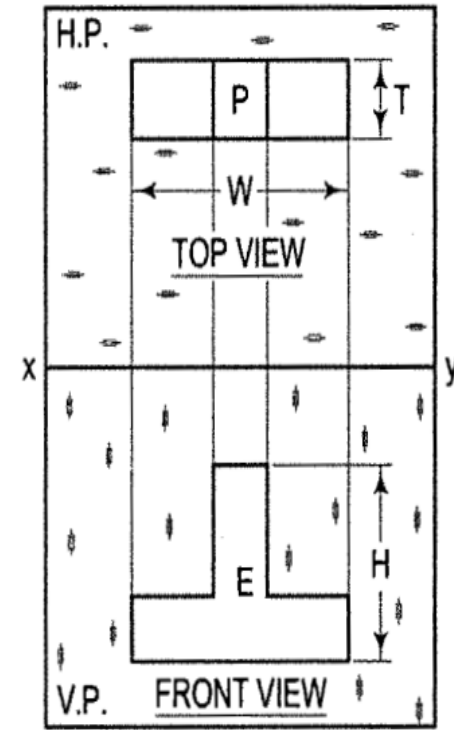
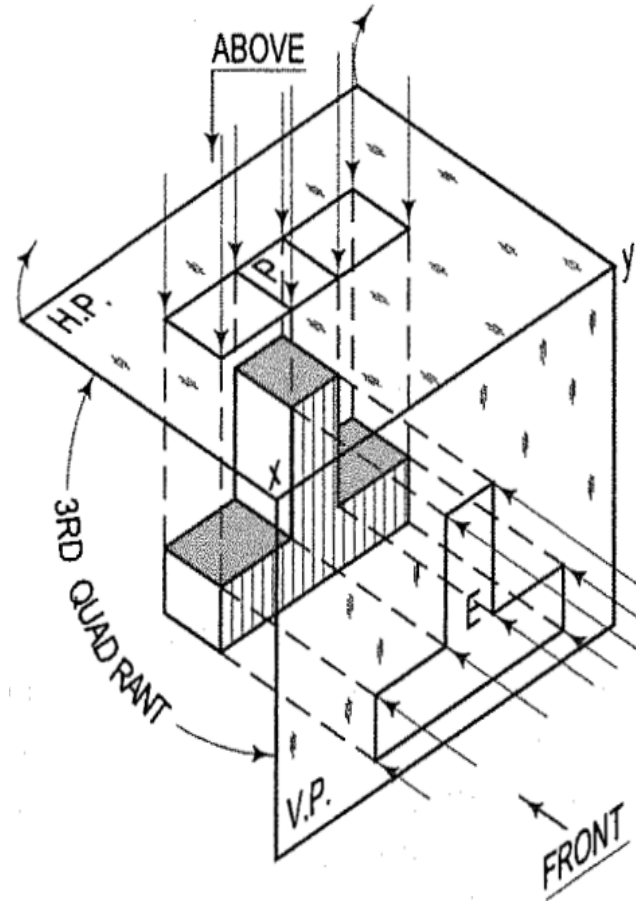


(i)



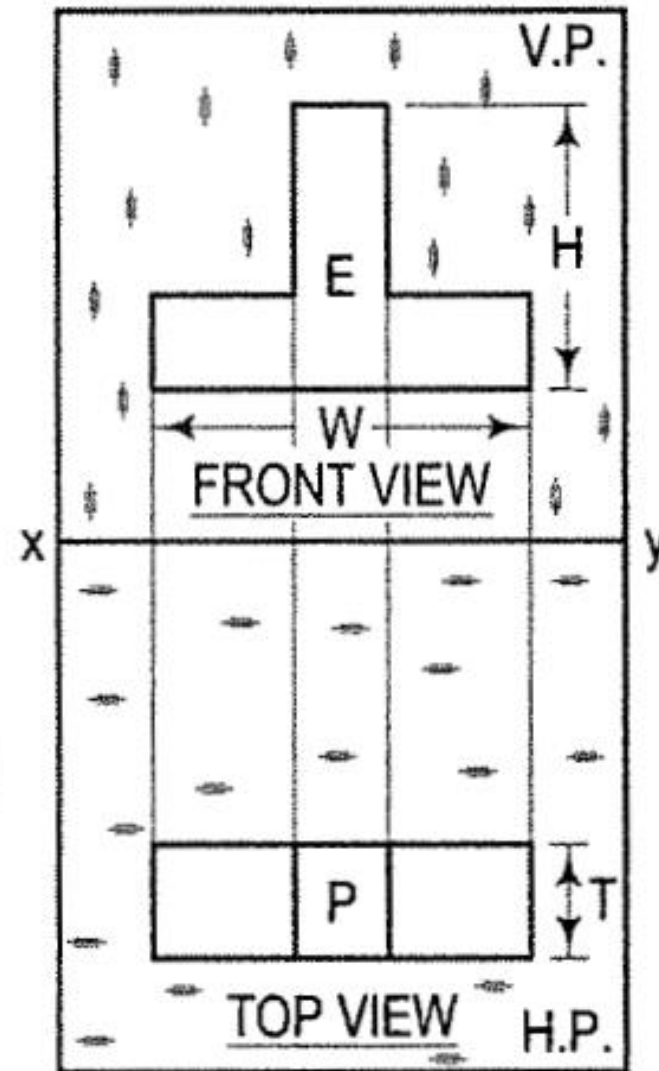
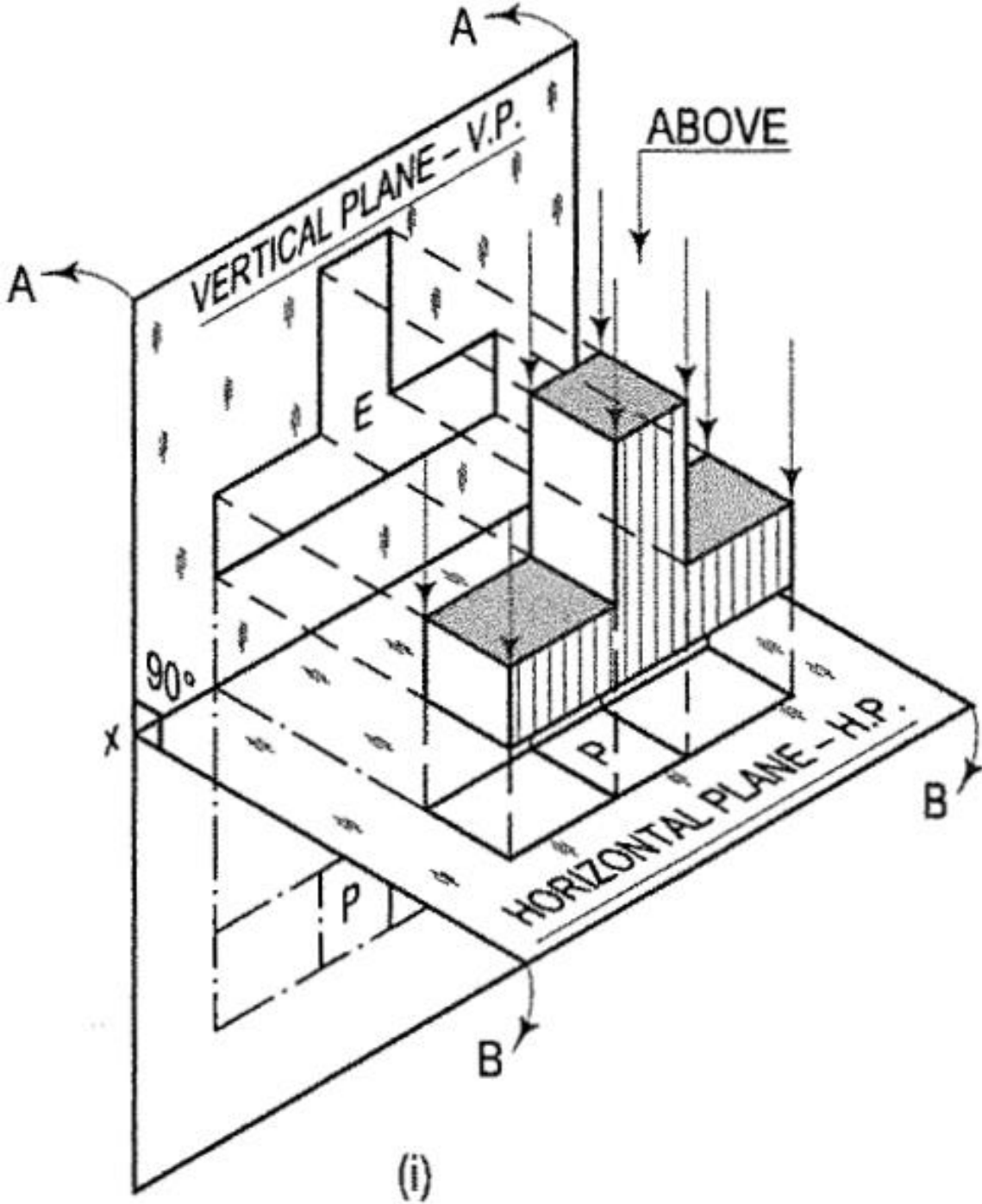
(ii)

## THIRD ANGLE PROJECTION

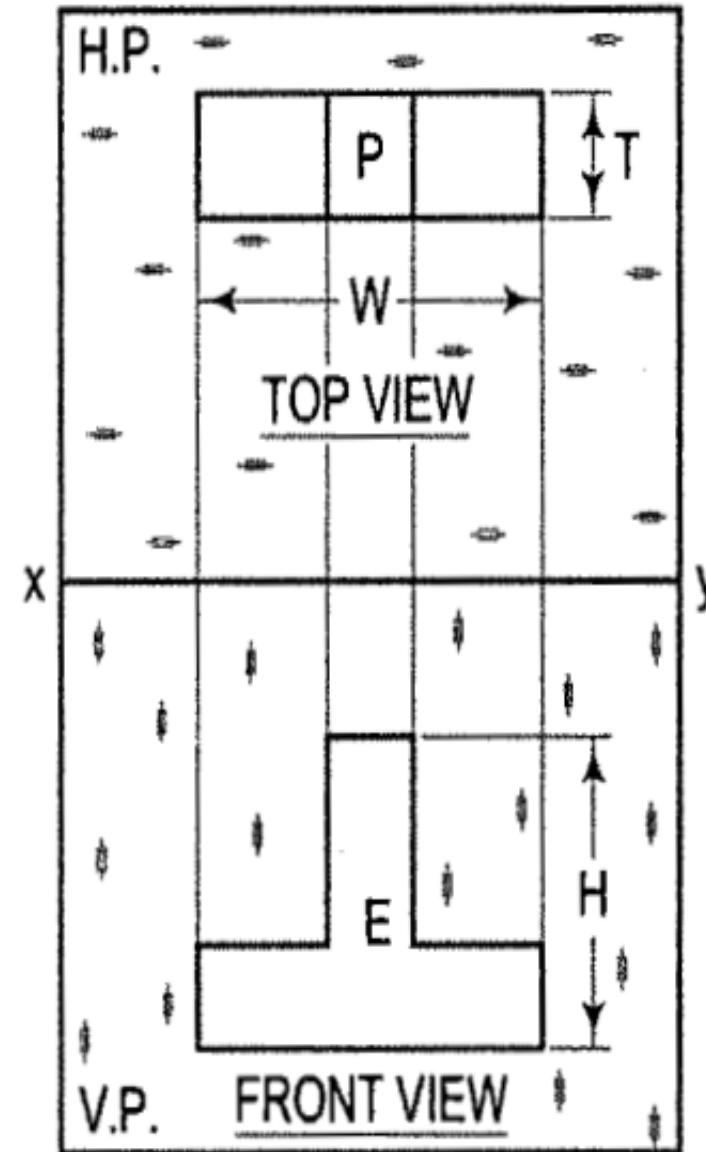
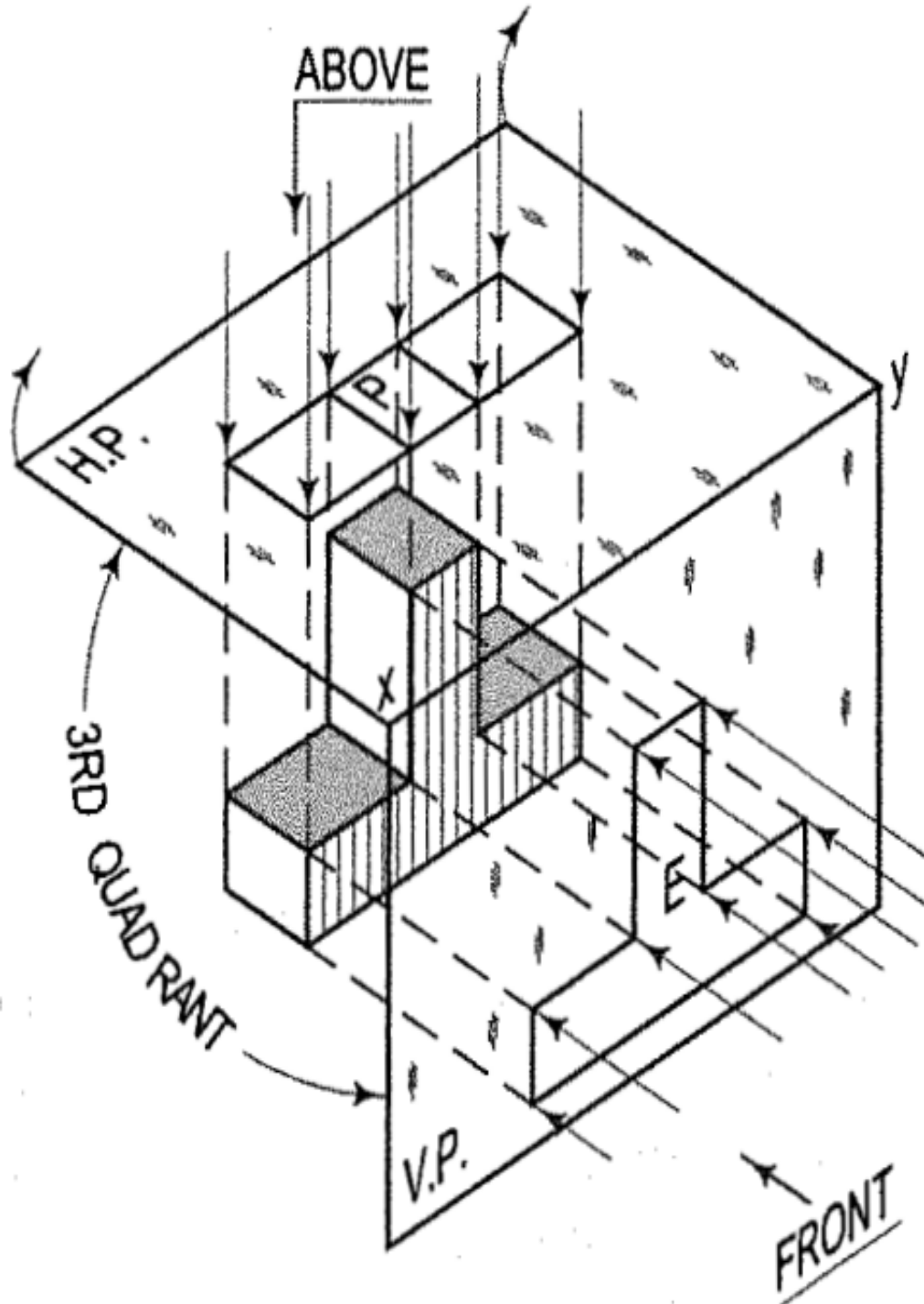


Hy

# FIRST ANGLE PROJECTION



(ii)

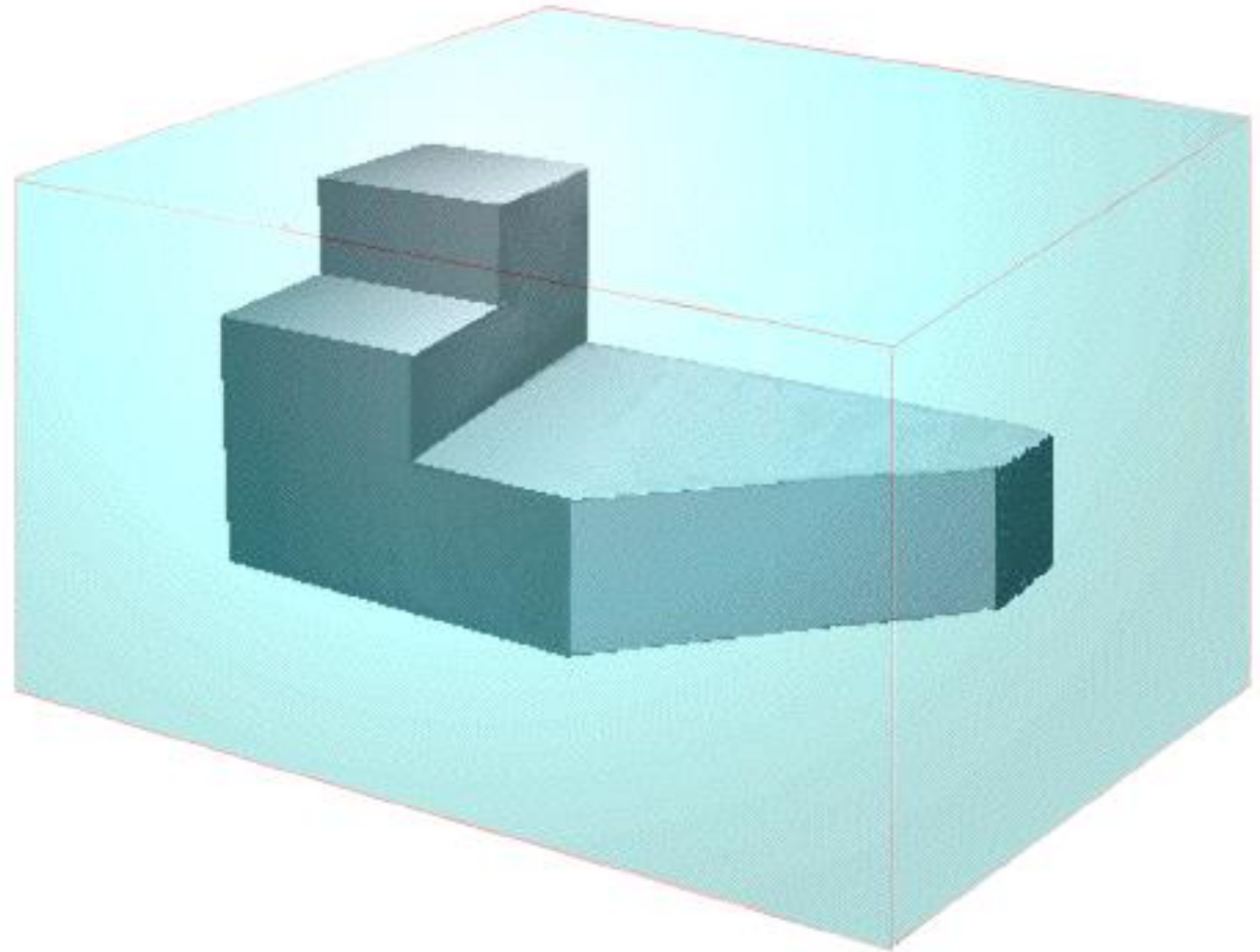


**THIRD ANGLE  
PROJECTION –  
THIRD  
QUADRANT**



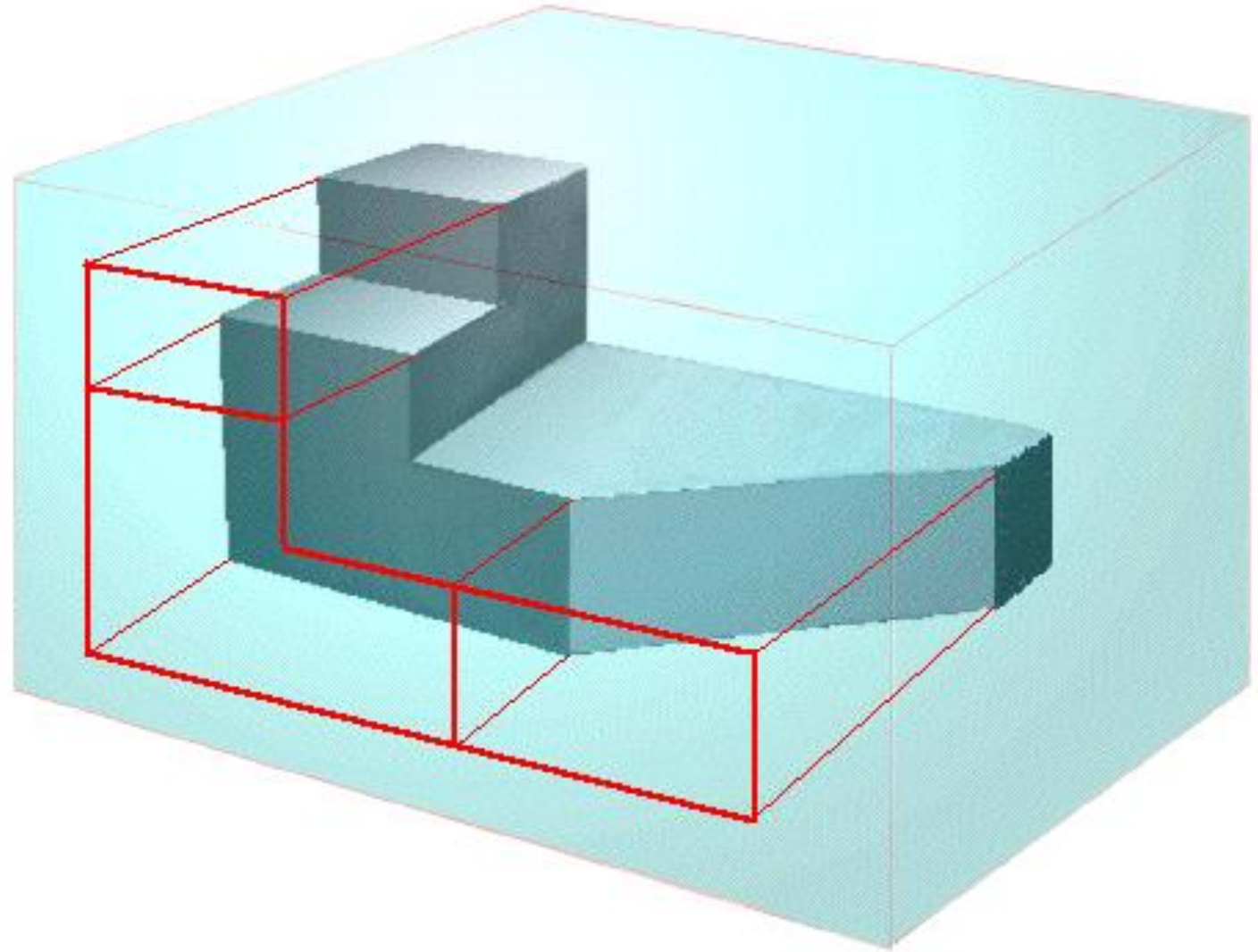
# Glass Box Approach

Projection of points to the three views



# Glass Box Approach

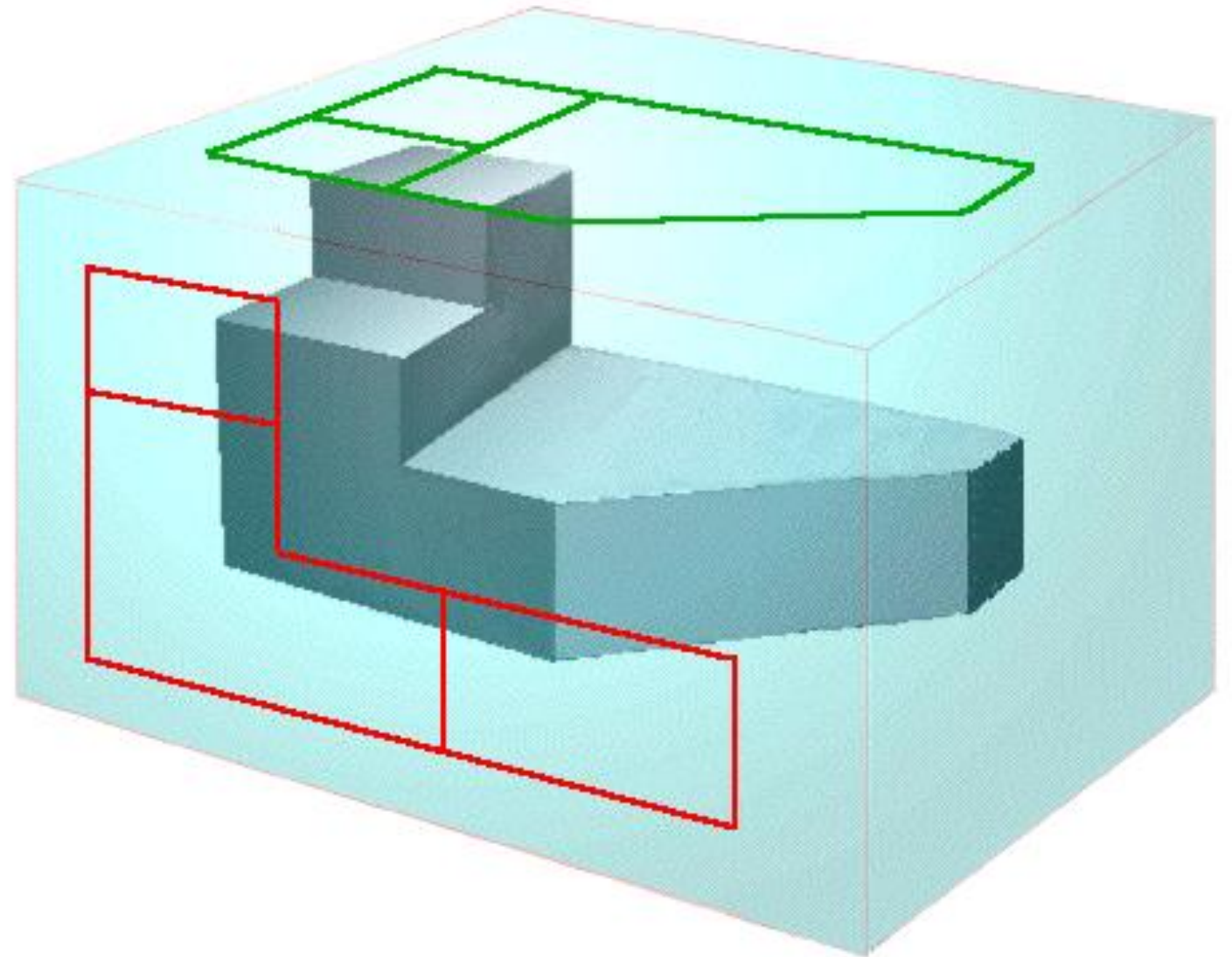
**Projection of points to FRONT VIEW**





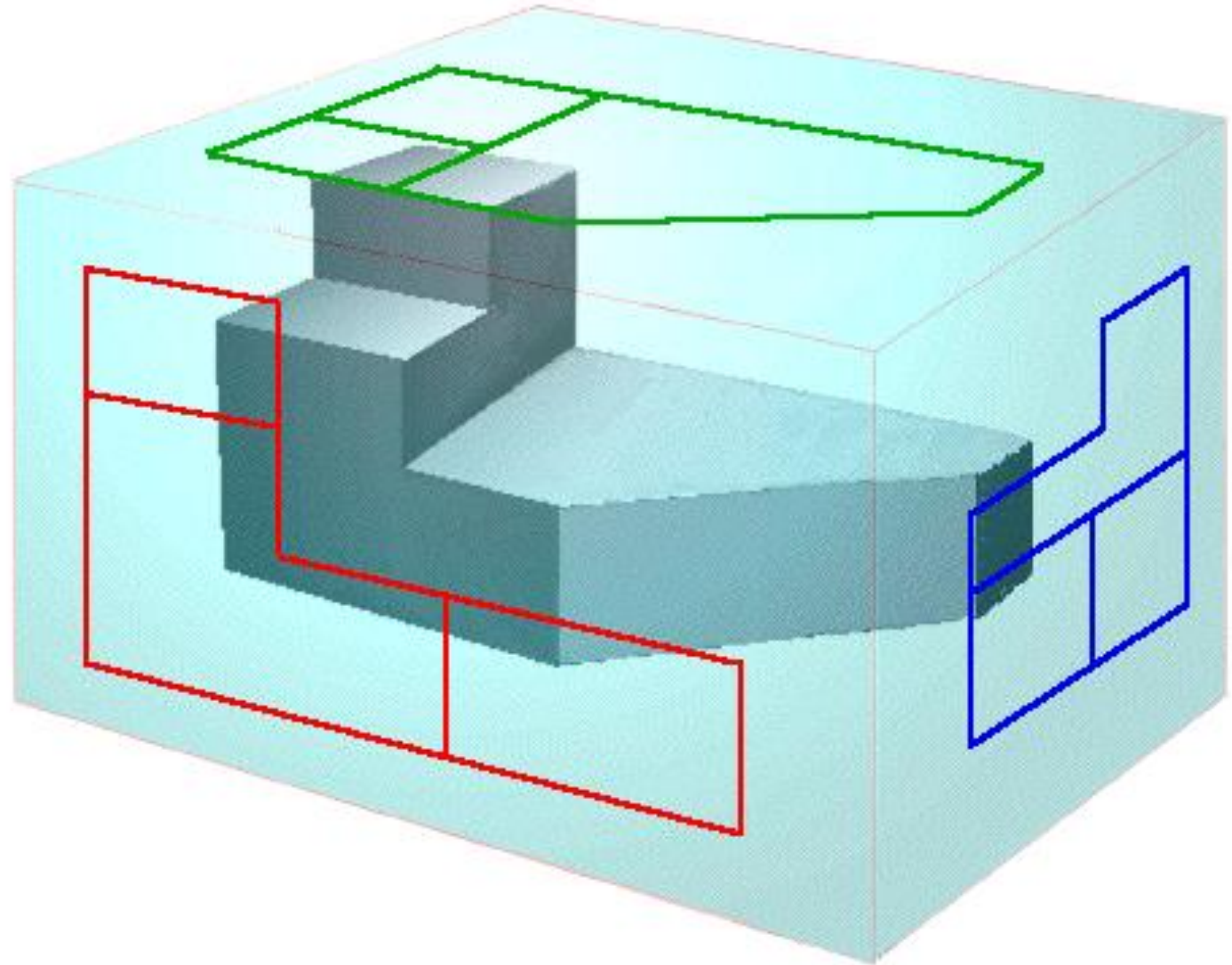
# Glass Box Approach

Projection of points to TOP VIEW



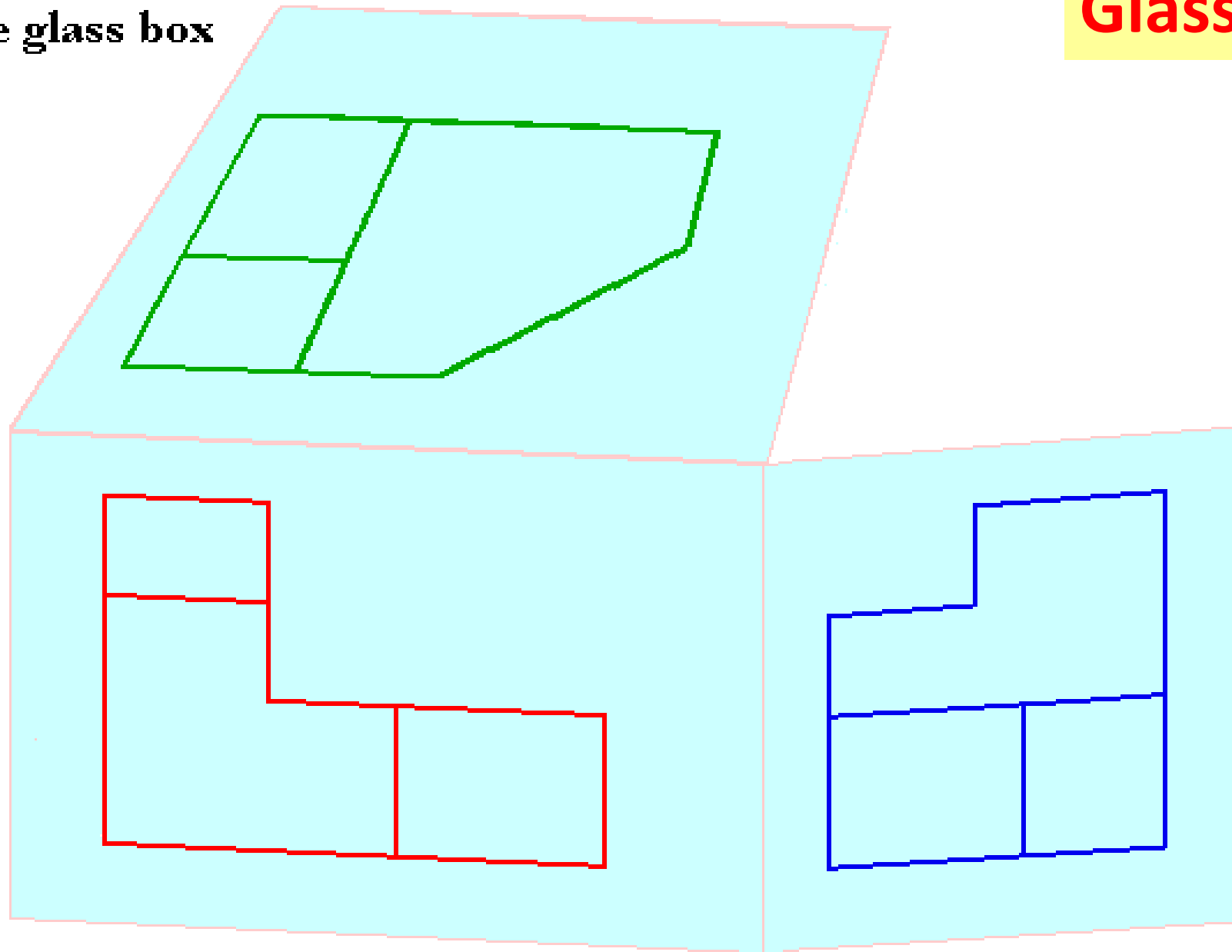
# Glass Box Approach

Projection of points to RIGHT SIDE VIEW

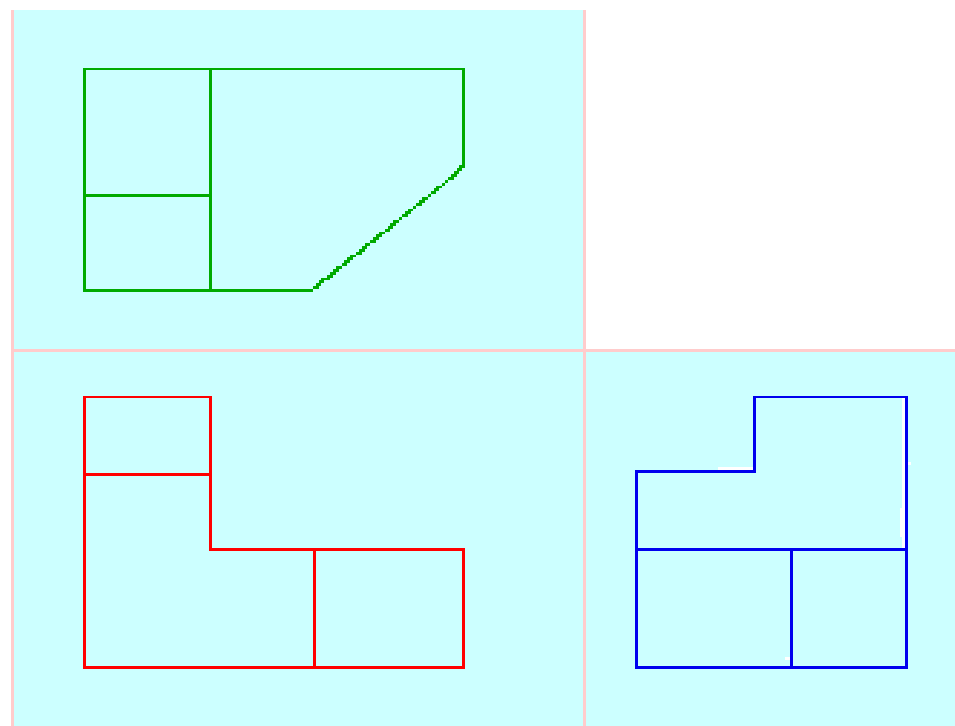


**Unfold the glass box**

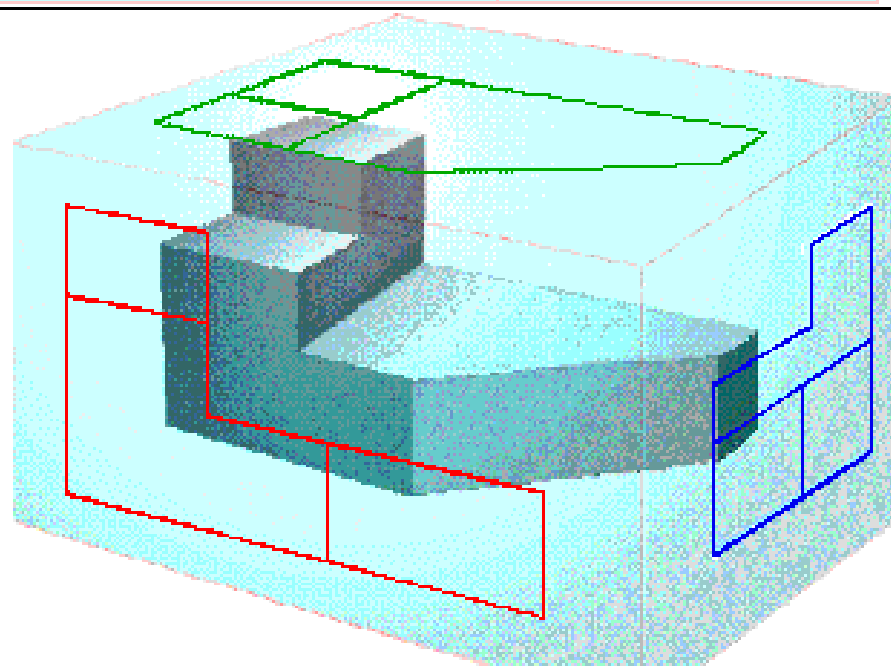
# Glass Box Approach

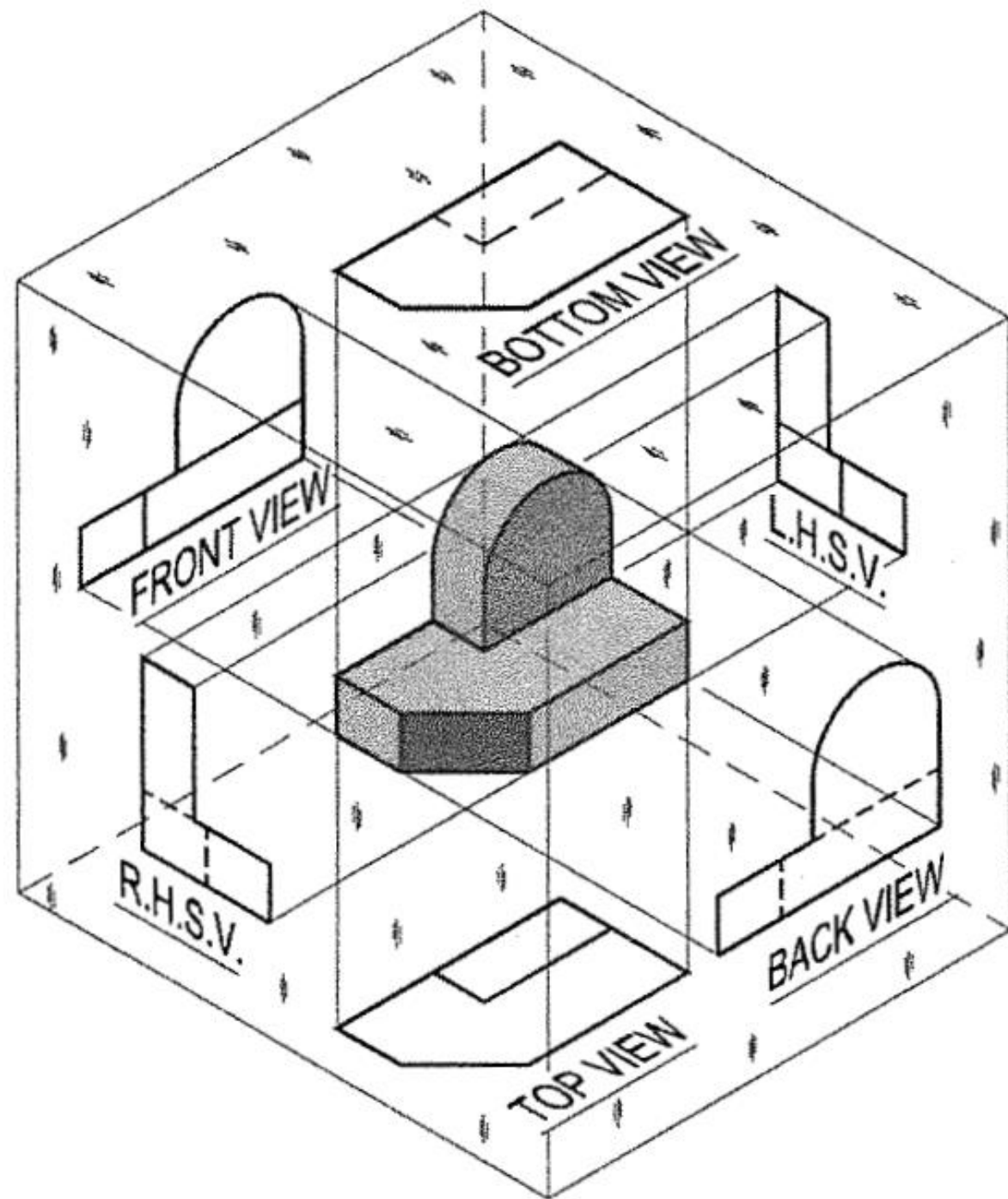


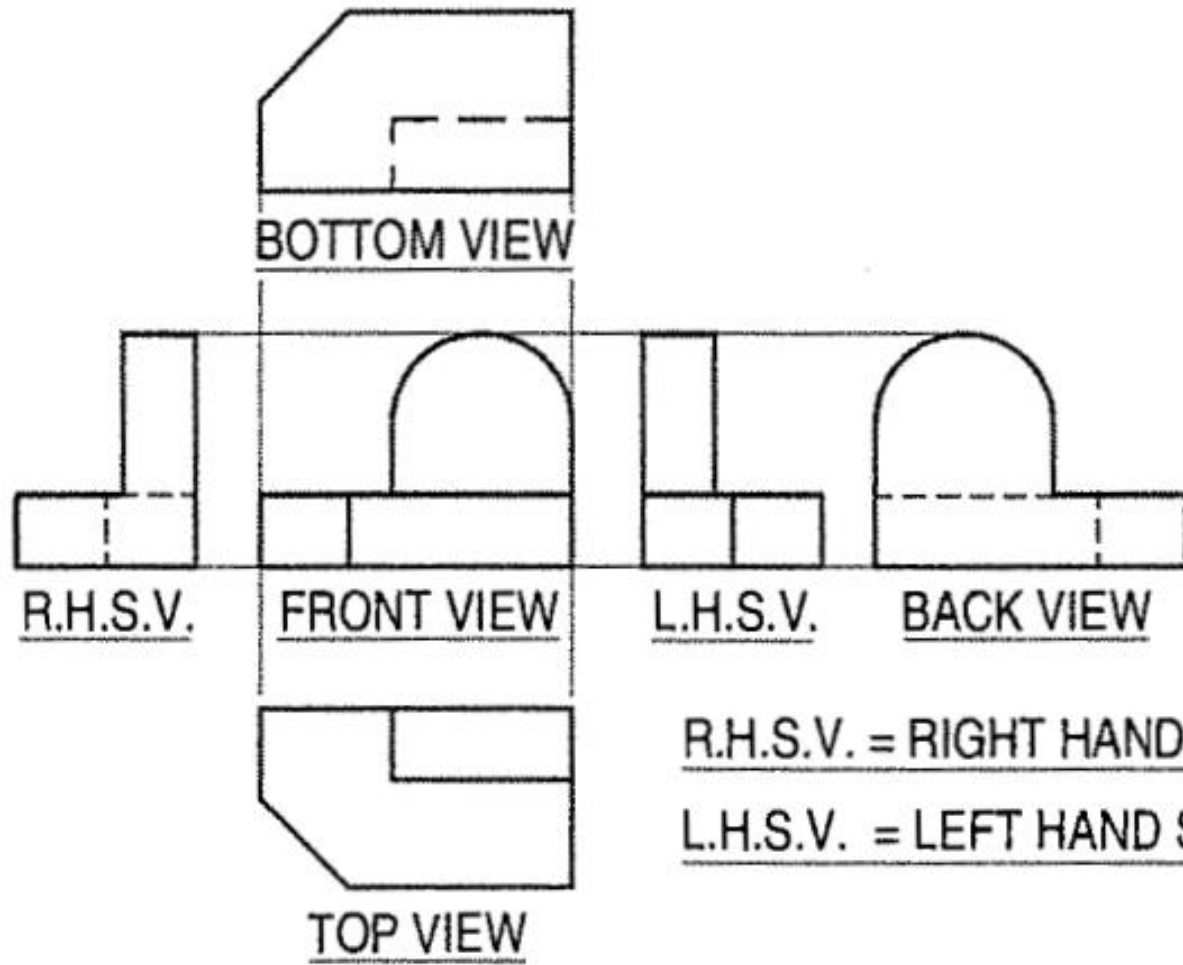
**Unfolded  
glass-box**



**Object in the  
glass-box**

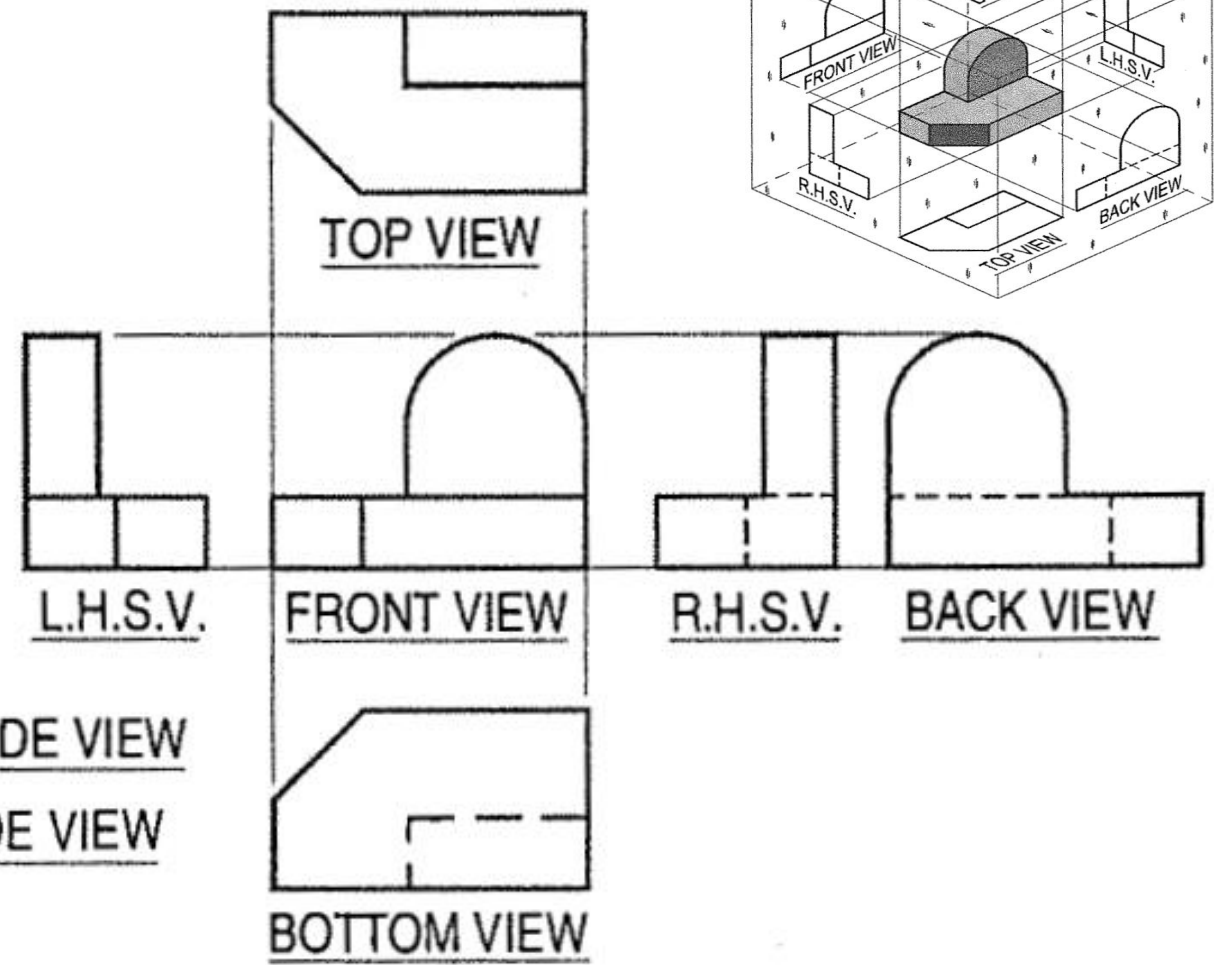




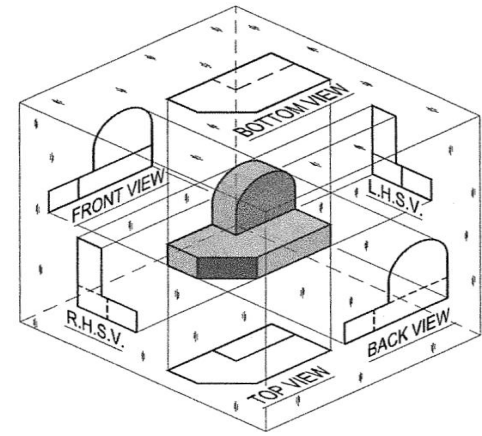


FIRST ANGLE PROJECTION

R.H.S.V. = RIGHT HAND SIDE VIEW  
L.H.S.V. = LEFT HAND SIDE VIEW

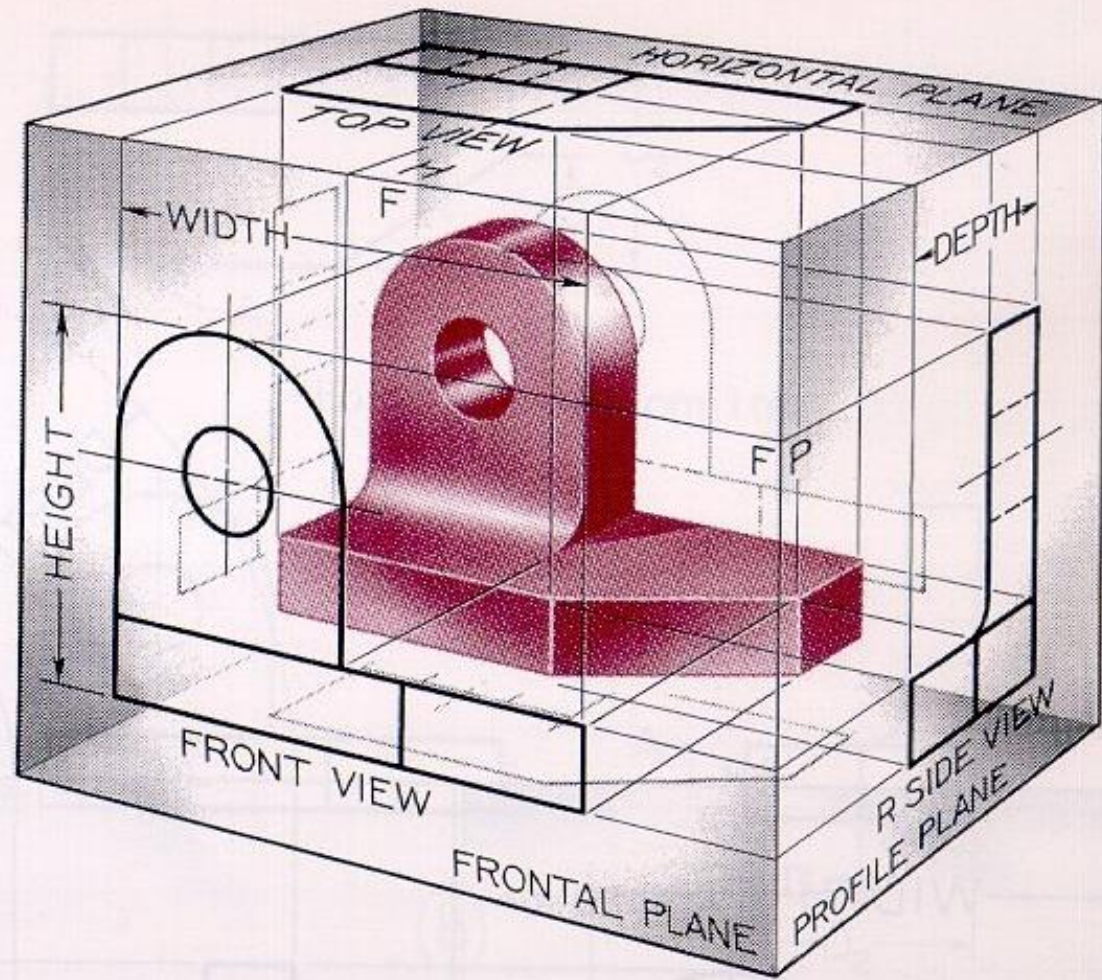


THIRD ANGLE PROJECTION

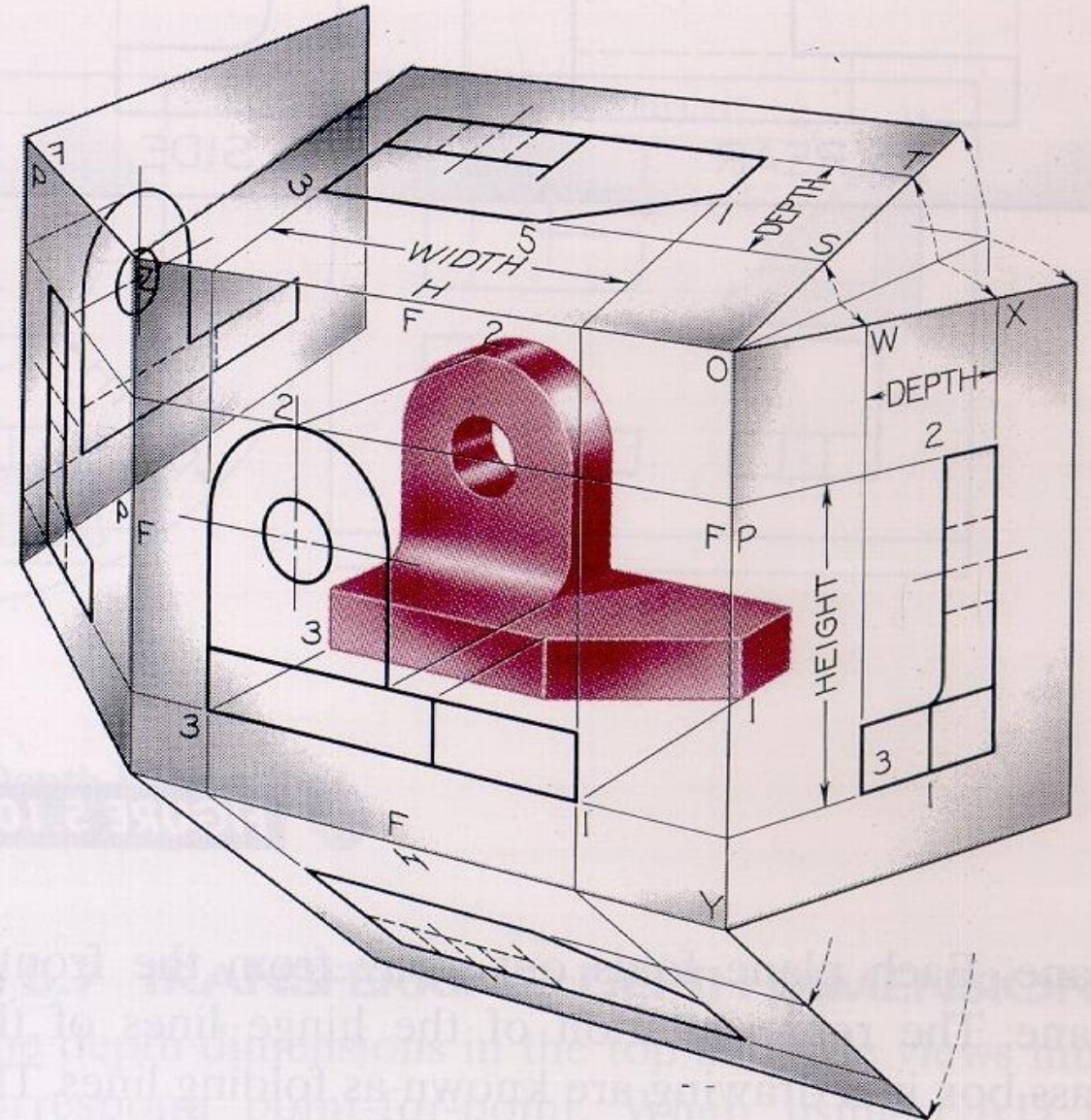




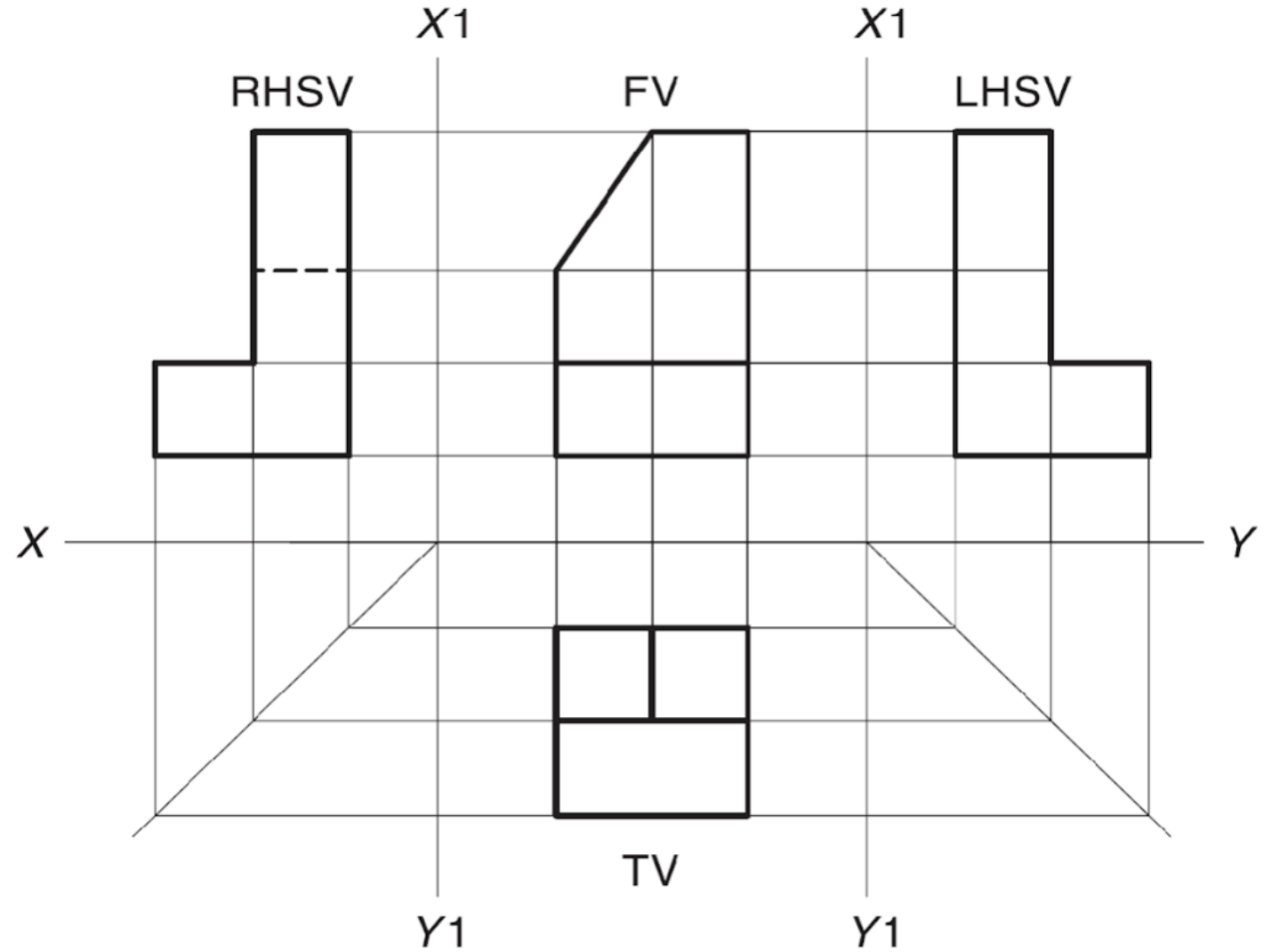
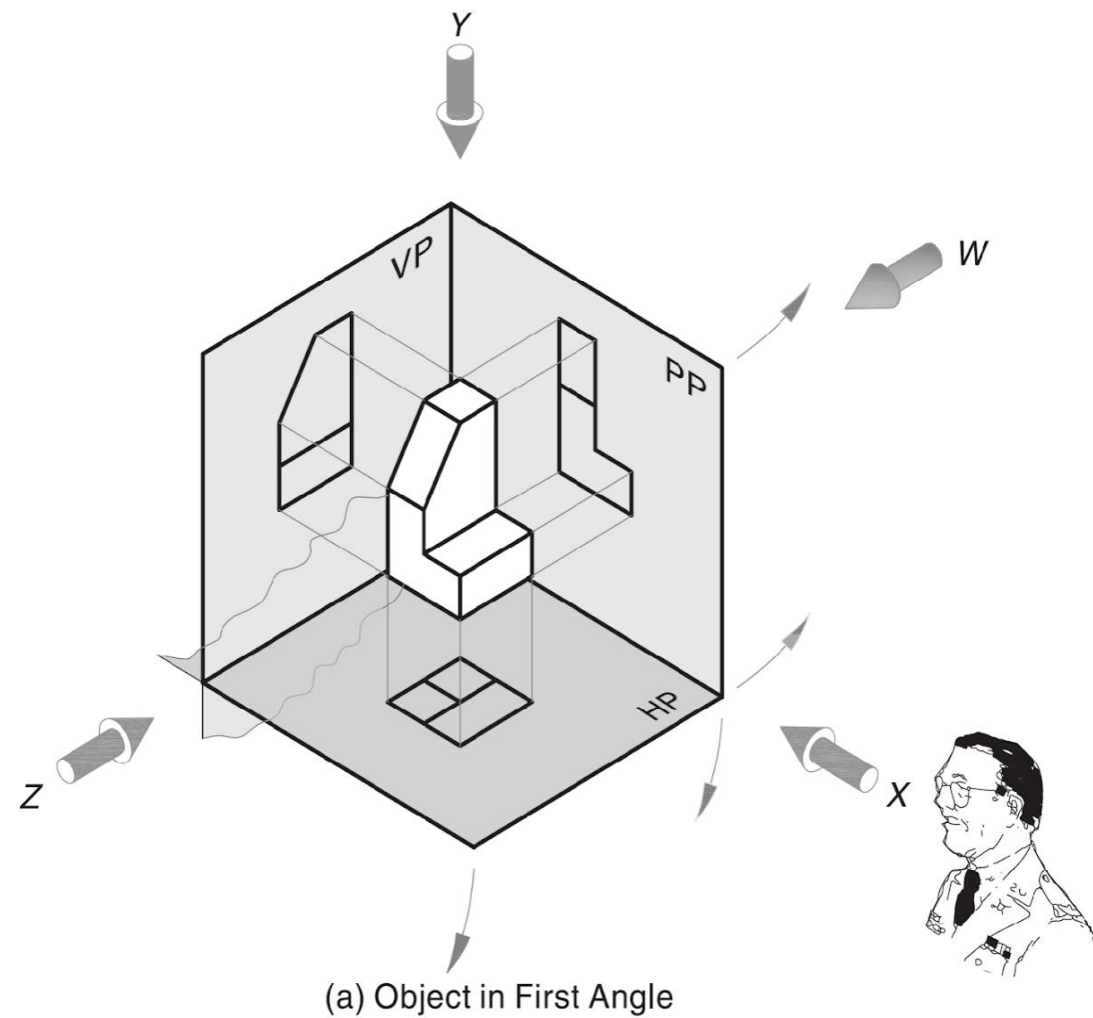
## Unfolding the Glass Box



## Glass Box Approach



Object lies between projection plane and observer

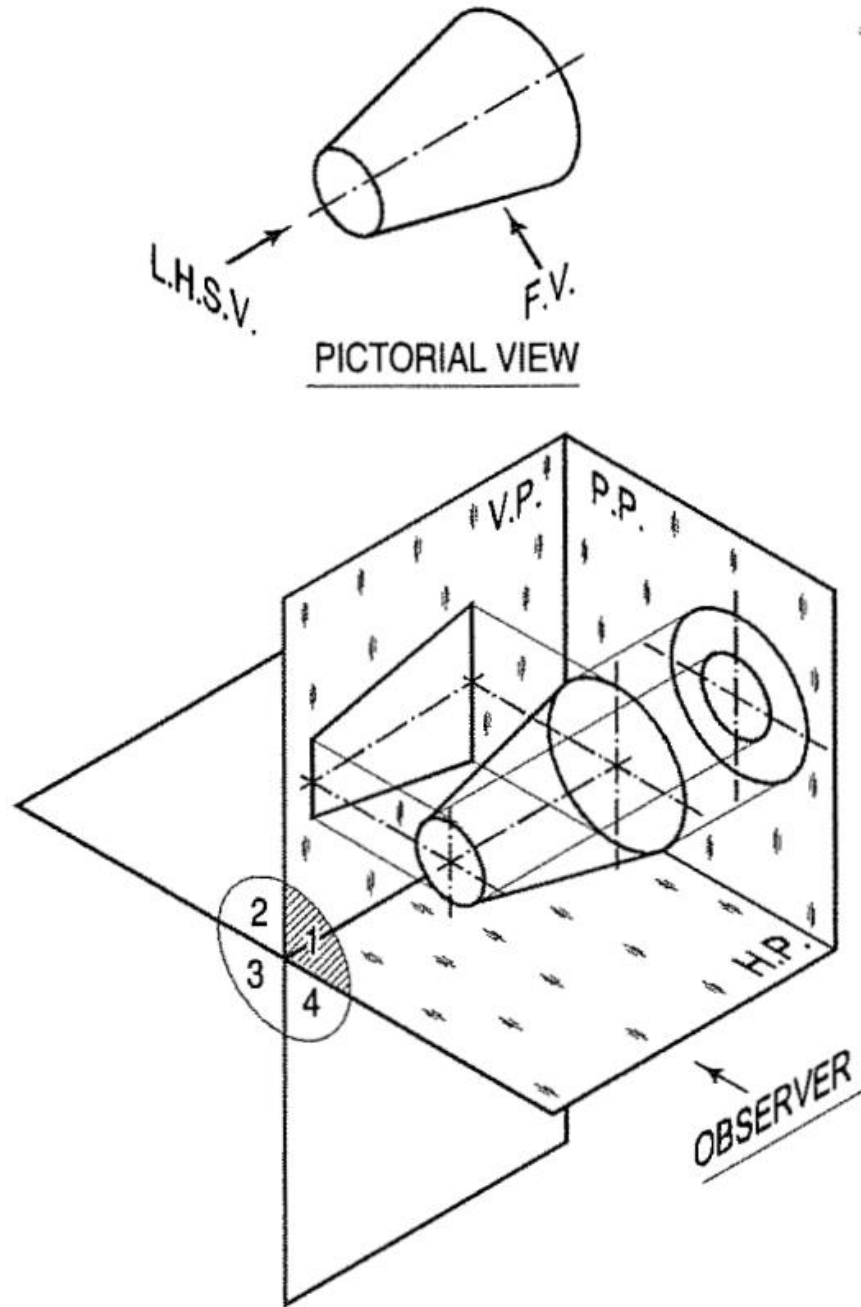


(b) Location of the Principal Views

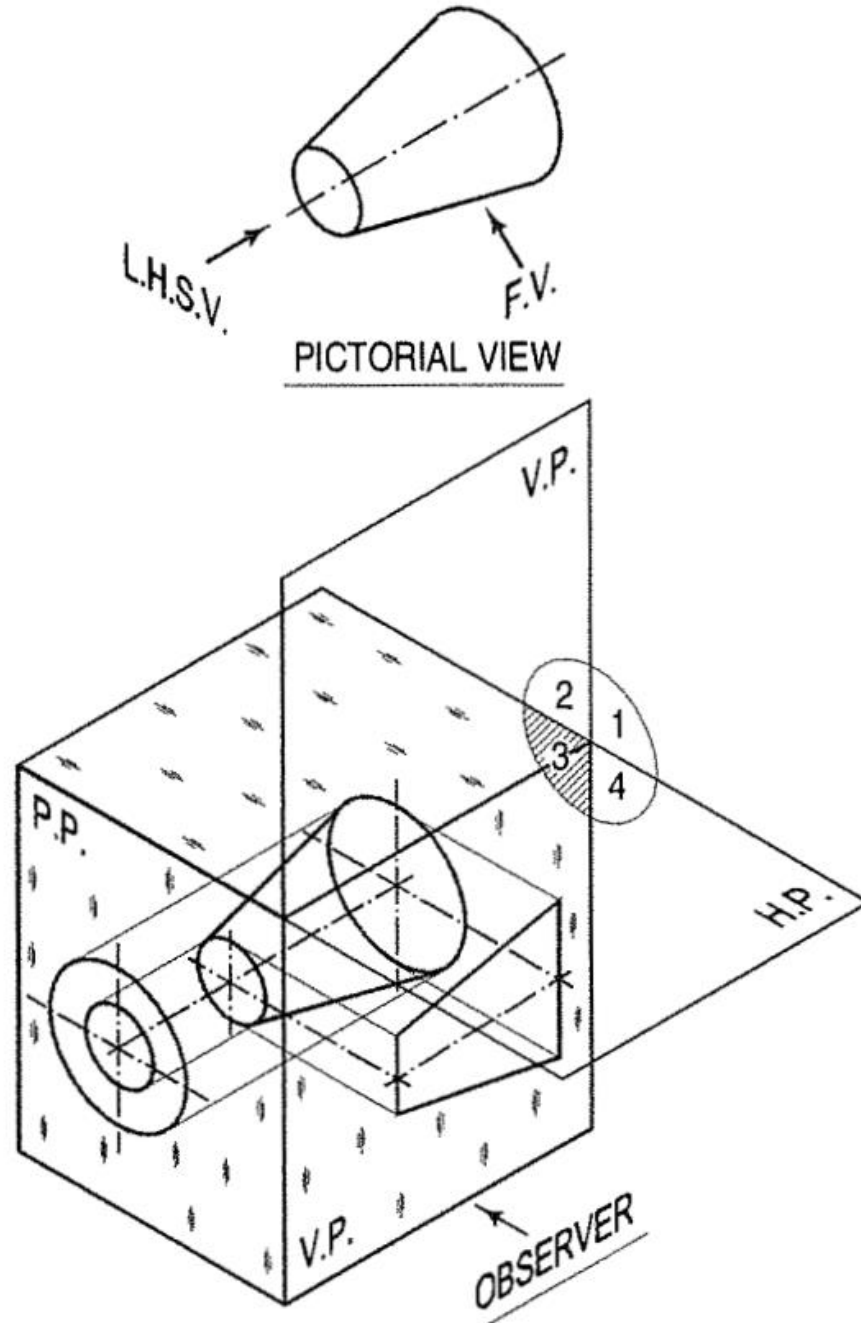
**FIRST ANGLE PROJECTION**

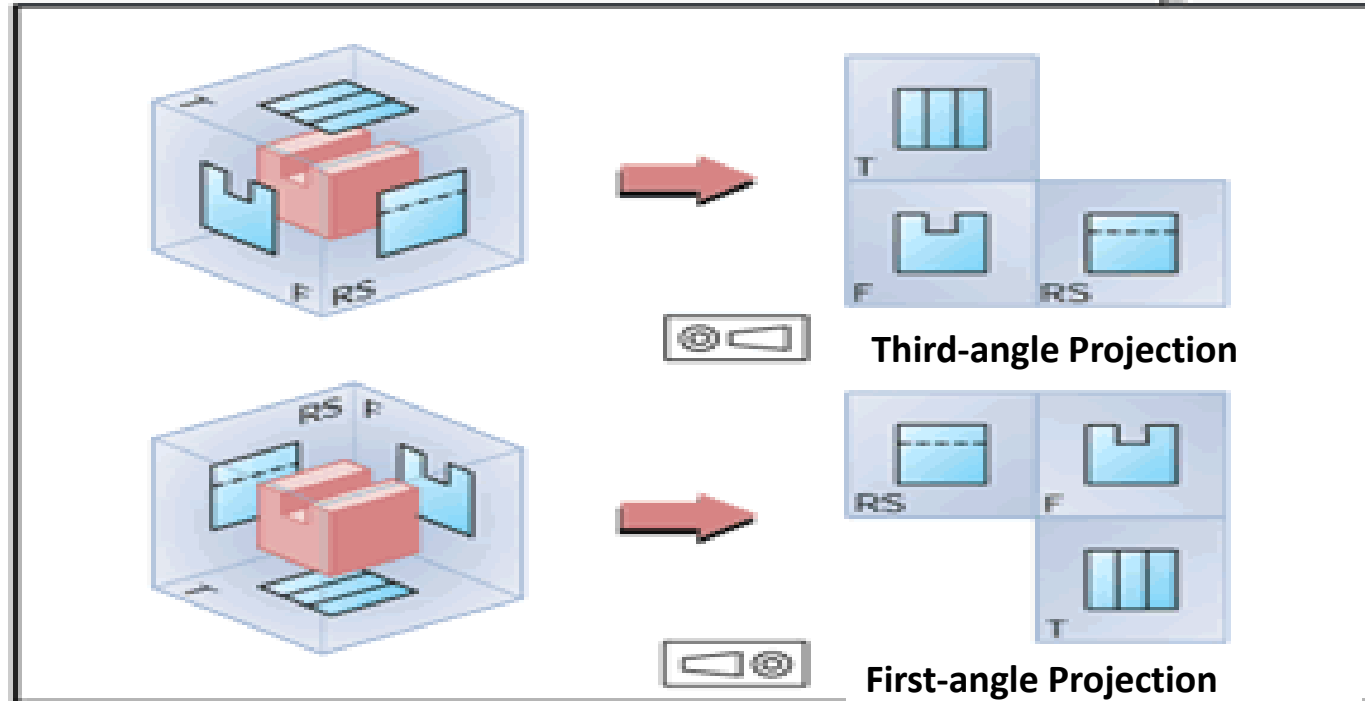


### FIRST ANGLE PROJECTION METHOD



### THIRD ANGLE PROJECTION METHOD



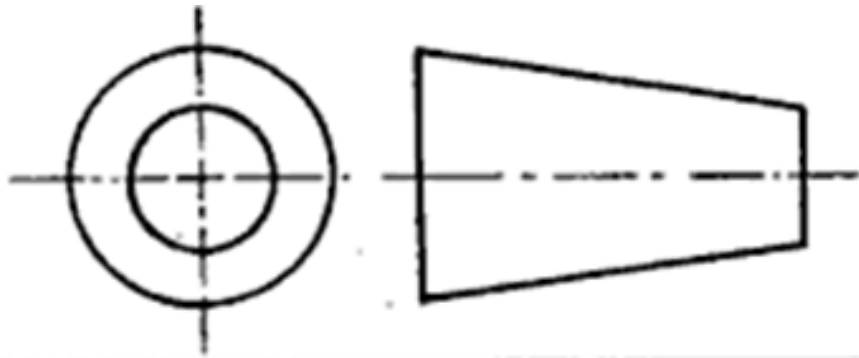


## FIRST ANGLE PROJECTION

Object lies between the observer and the planes of projection

Front view comes above the top view

Object is situated on or above the horizontal plane

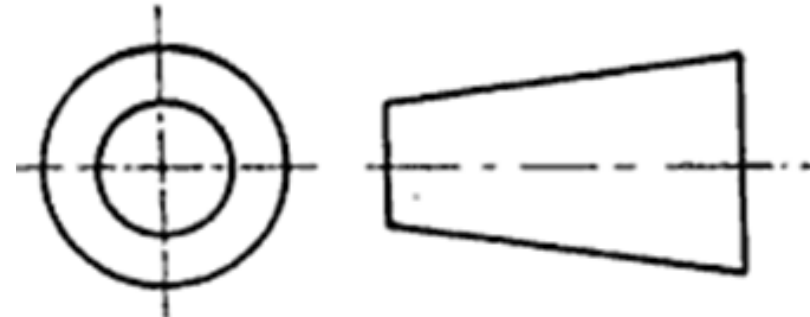


## THIRD ANGLE PROJECTION

Planes of projection lie between the object and observer

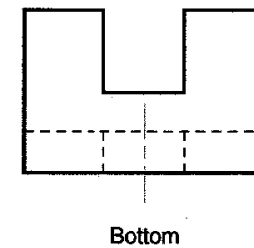
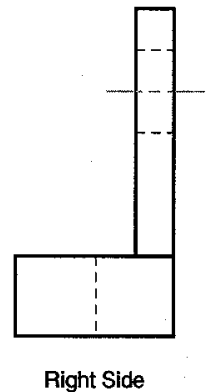
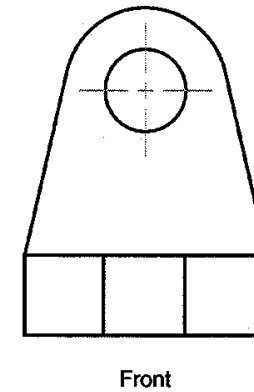
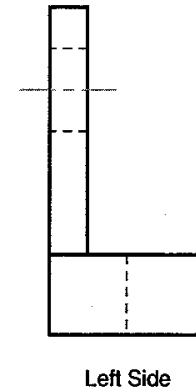
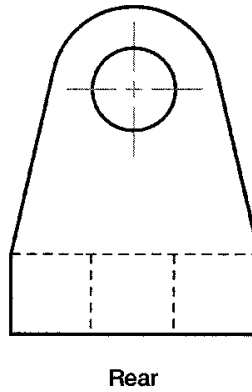
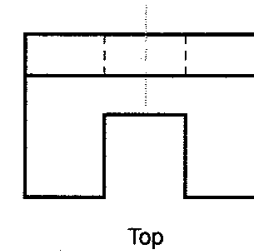
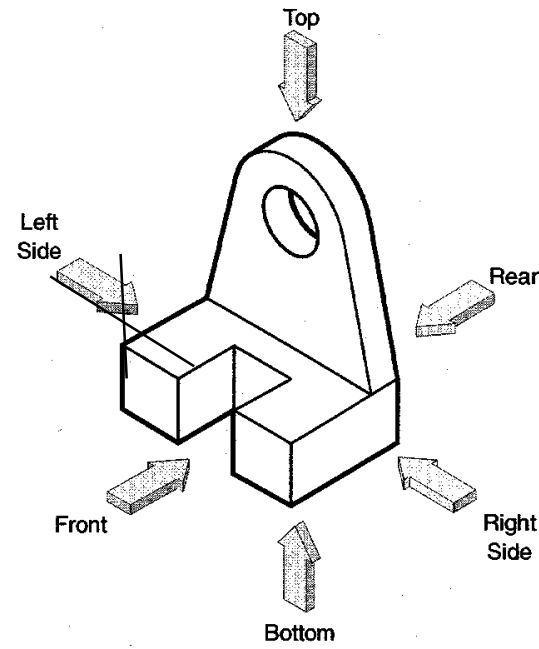
Top view comes above the front view

Object is situated on or above the ground plane



# Orthographic Projection Fundamentals

## Defining Six Principal Views or Orthographic Views


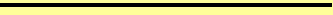


**LINES** on an engineering drawing signify more than just the geometry of the object and it is important that the appropriate line type is used.

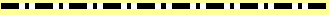

## **Line Thickness**

For most engineering drawings you will require two thickness', a thick and thin line. The general recommendation are that thick lines are twice as thick as thin lines.

### **LINE STYLES**

	A thick continuous line is used for visible edges and outlines.
	A thin line is used for hatching, leader lines, short centre lines, dimensions and projections.

**Other line styles used to clarify important features on drawings are:**

	Thin chain lines are a common feature on engineering drawings used to indicate centre lines. Centre lines are used to identify the centre of a circle, cylindrical features, or a line of symmetry.
	Dashed lines are used to show important hidden detail for example wall thickness and holes

# Precedence of Lines

- Visible lines takes precedence over all other lines

 0.6 mm

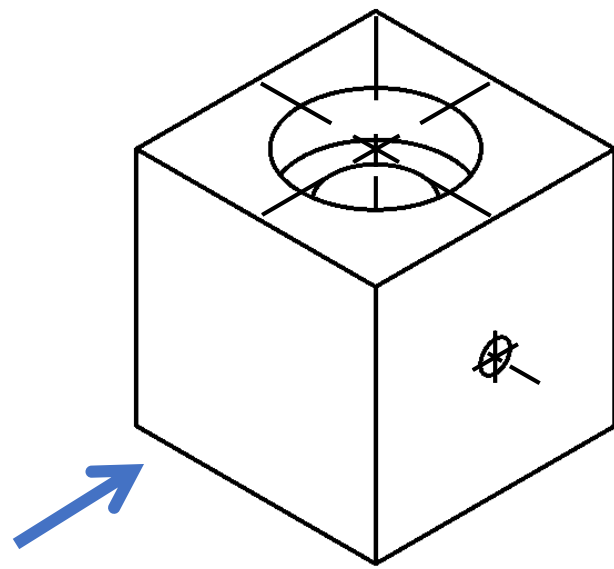
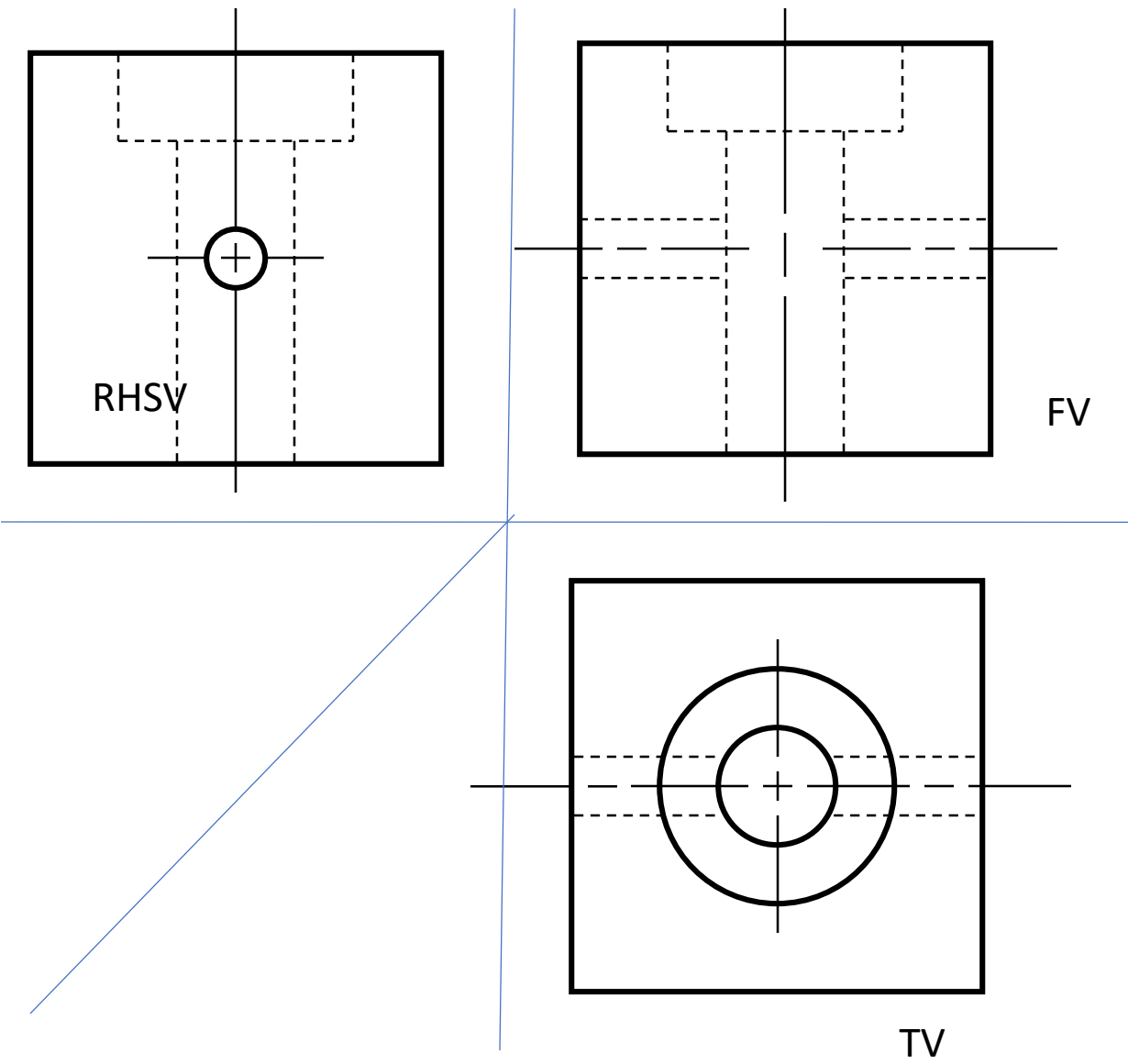
- Hidden lines and cutting plane lines

 0.3 mm

- Center lines



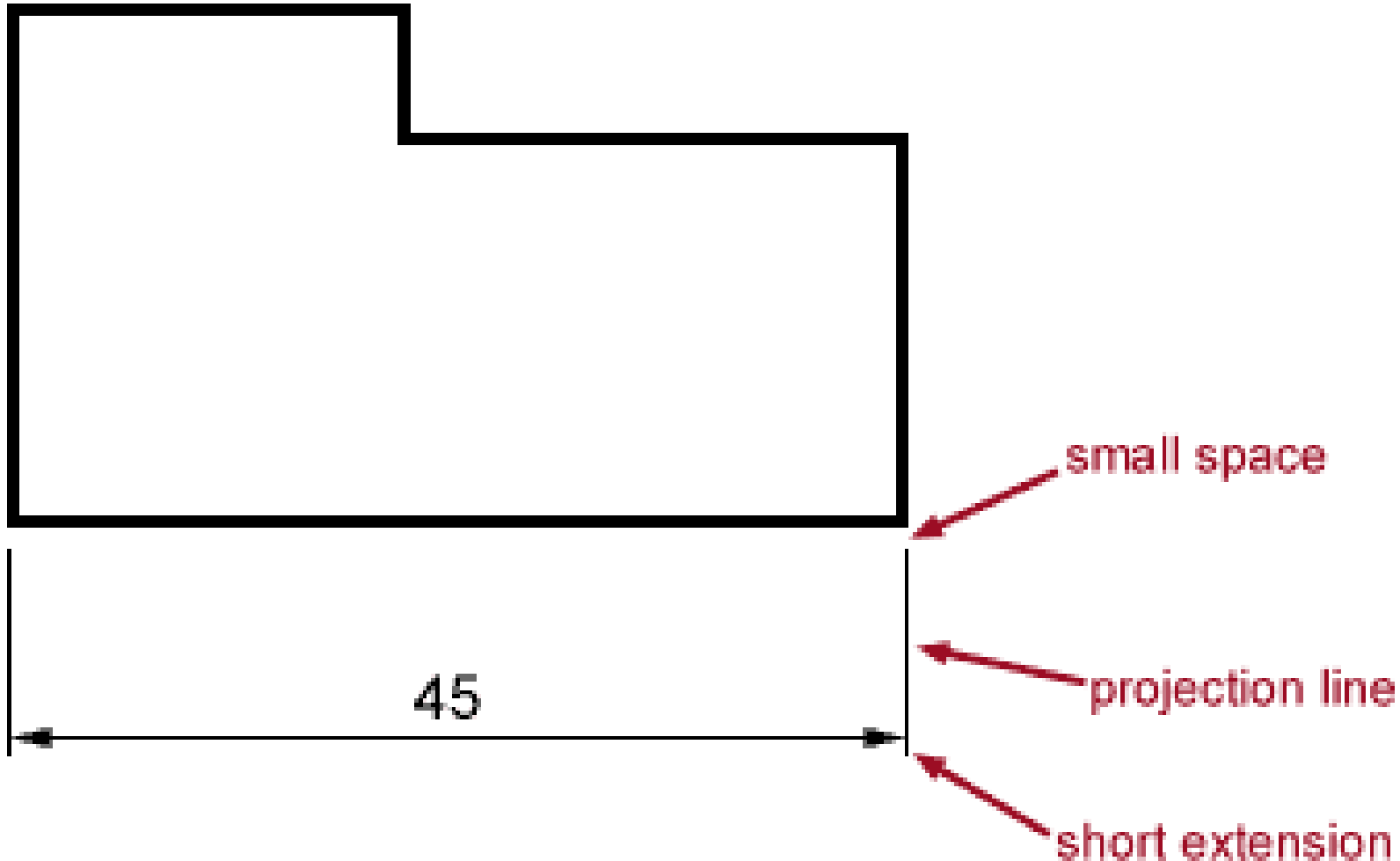
**For Example:**



- 1. Visible**
- 2. Hidden**
- 3. Center**

# DIMENSIONING

A dimensioned drawing should provide all the information necessary for a finished product or part to be manufactured.

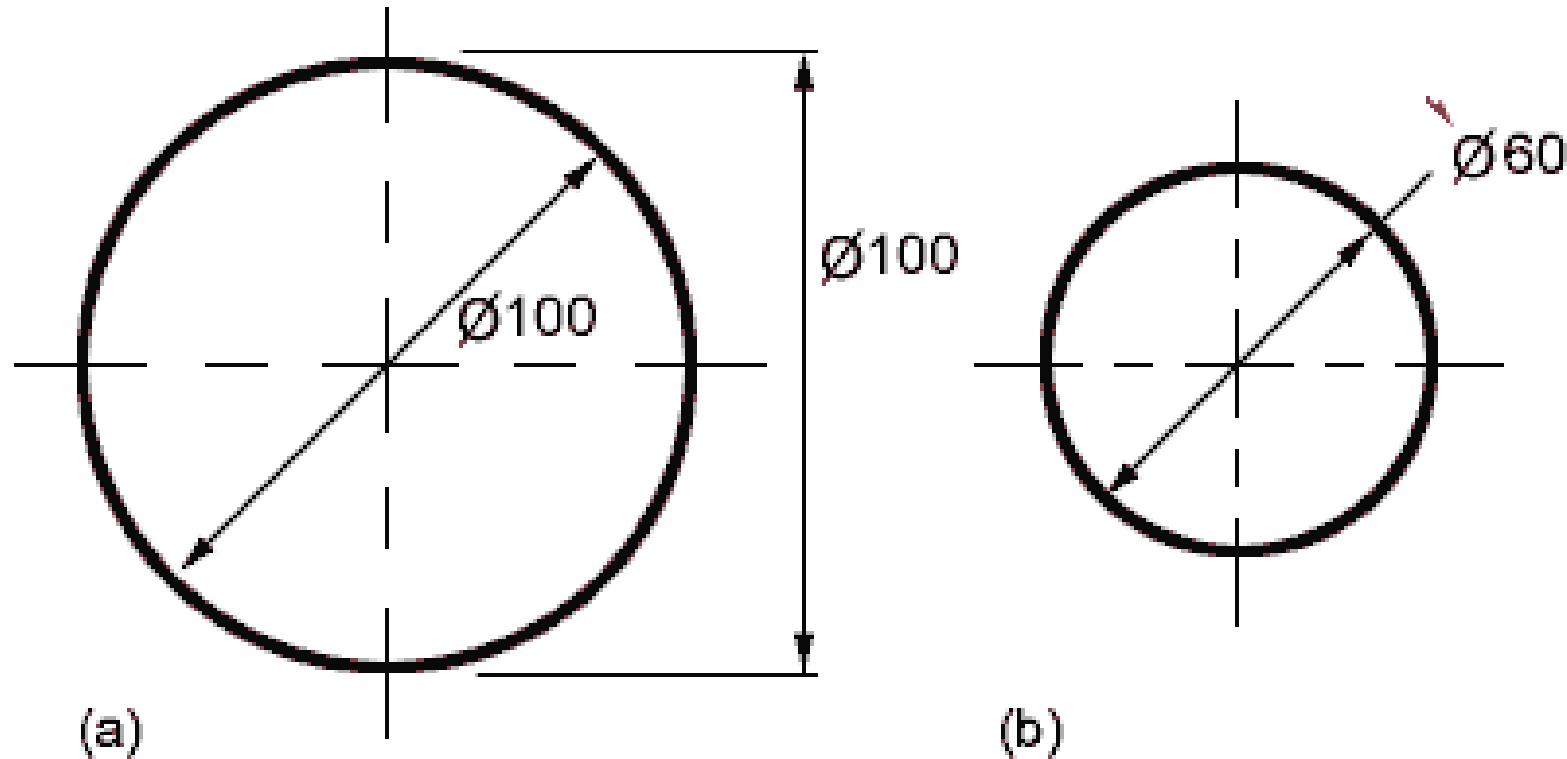


Dimensions are always drawn using continuous thin lines. Two projection lines indicate where the dimension starts and finishes.

Projection lines do not touch the object and are drawn perpendicular to the element you are dimensioning.

All dimensions less than 1 should have a leading zero. i.e. .35 should be written as 0.35

# Dimensioning of circles



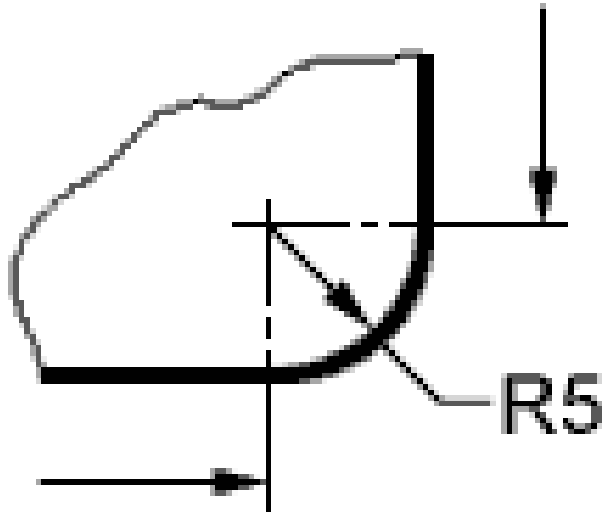
(a) shows two common methods of dimensioning a circle. One method dimensions the circle between two lines projected from two diametrically opposite points. The second method dimensions the circle internally.

(b) is used when the circle is too small for the dimension to be easily read if it was placed inside the circle.

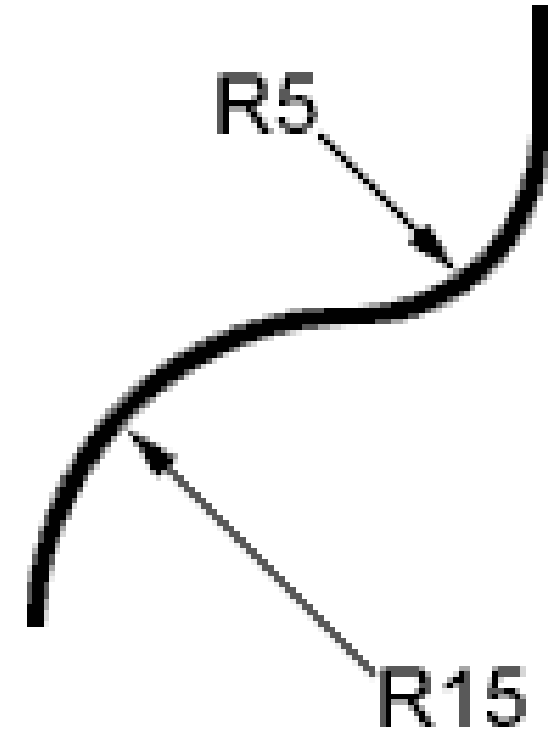


## DIMENSIONING RADII

All radial dimensions are preceded by the capital R.



(a)

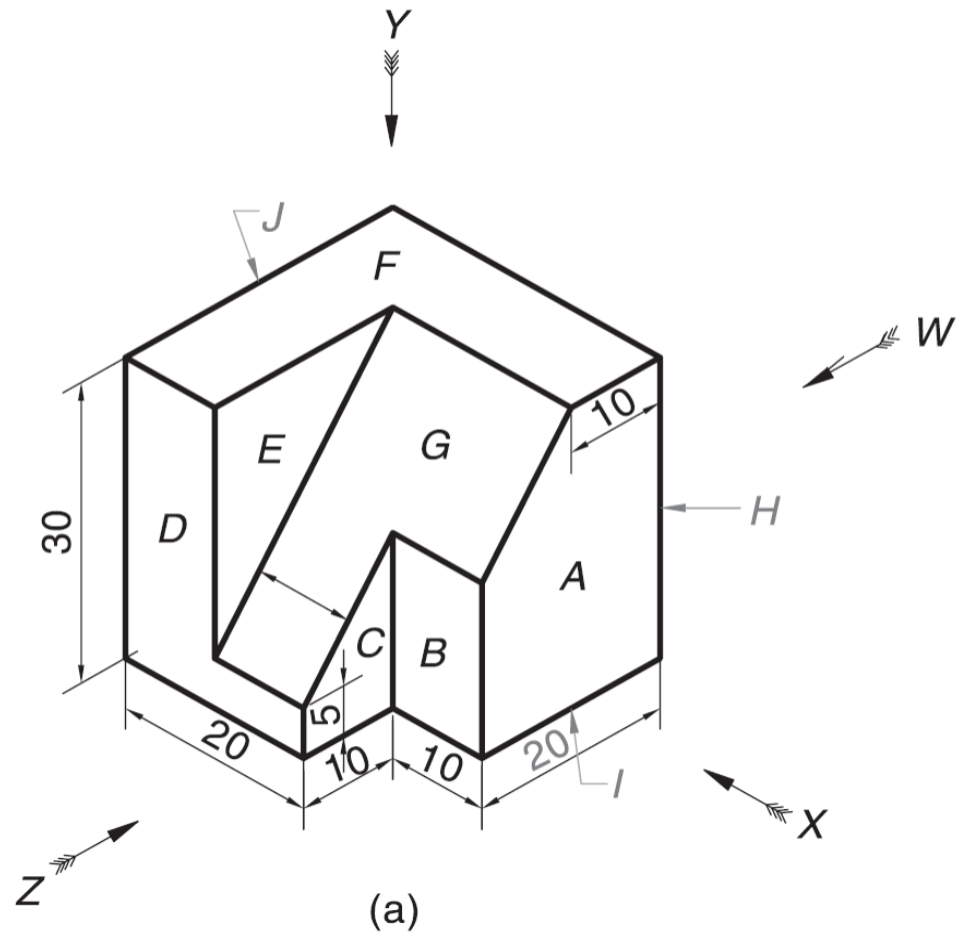


(b)

(a) shows a radius dimensioned with the centre of the radius located on the drawing.

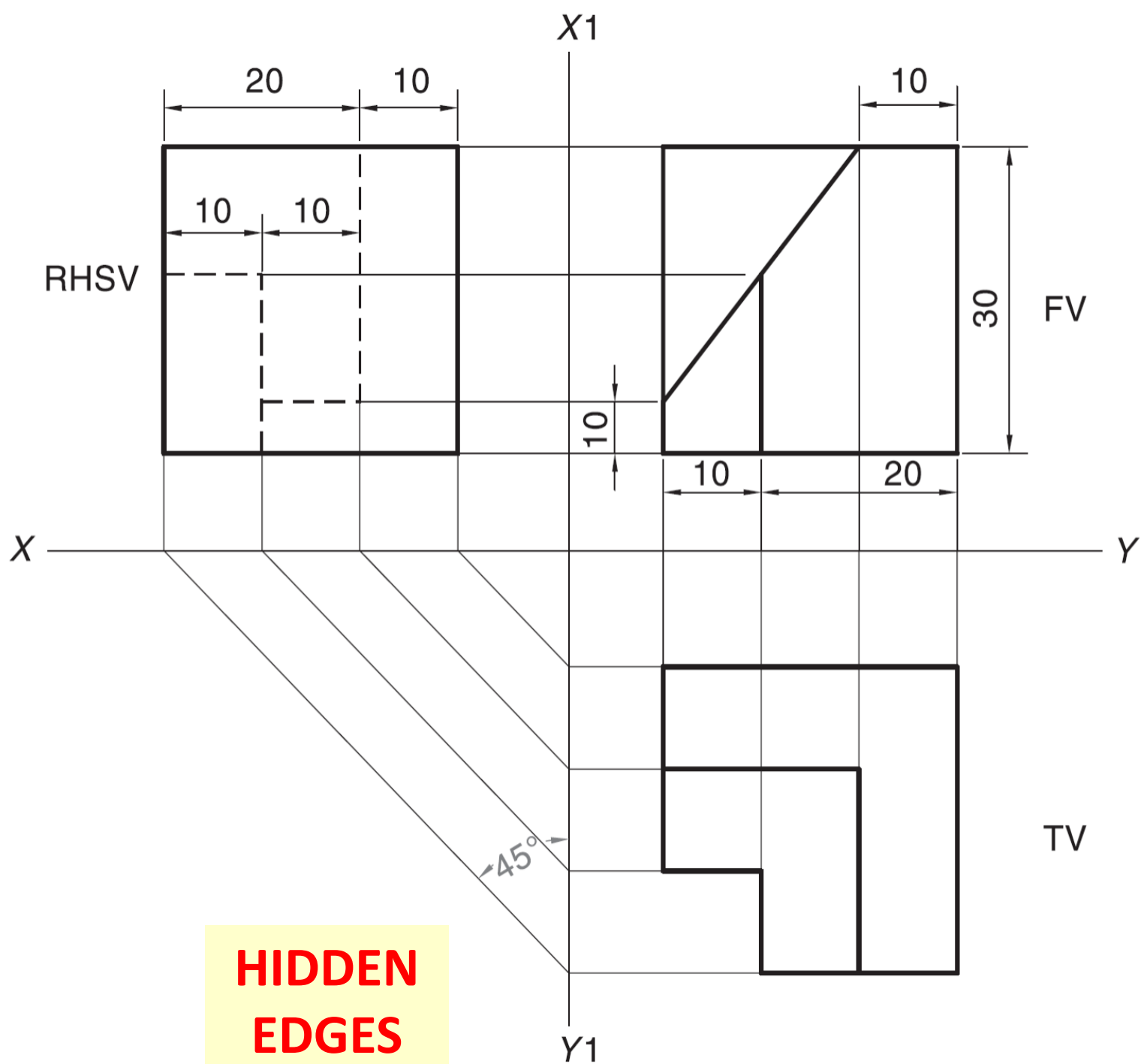
(b) shows how to dimension radii which do not need their centres locating.



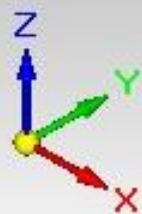
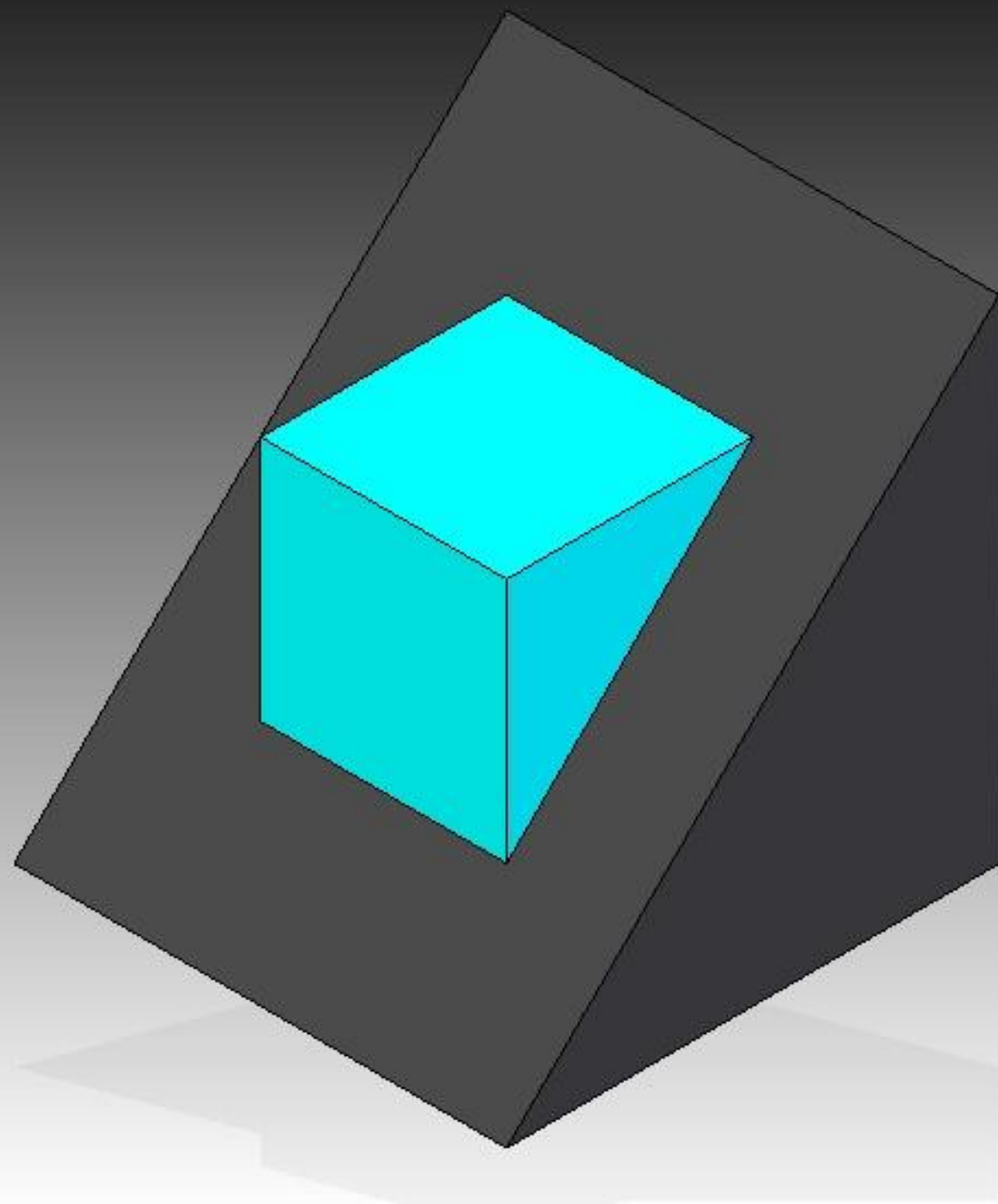


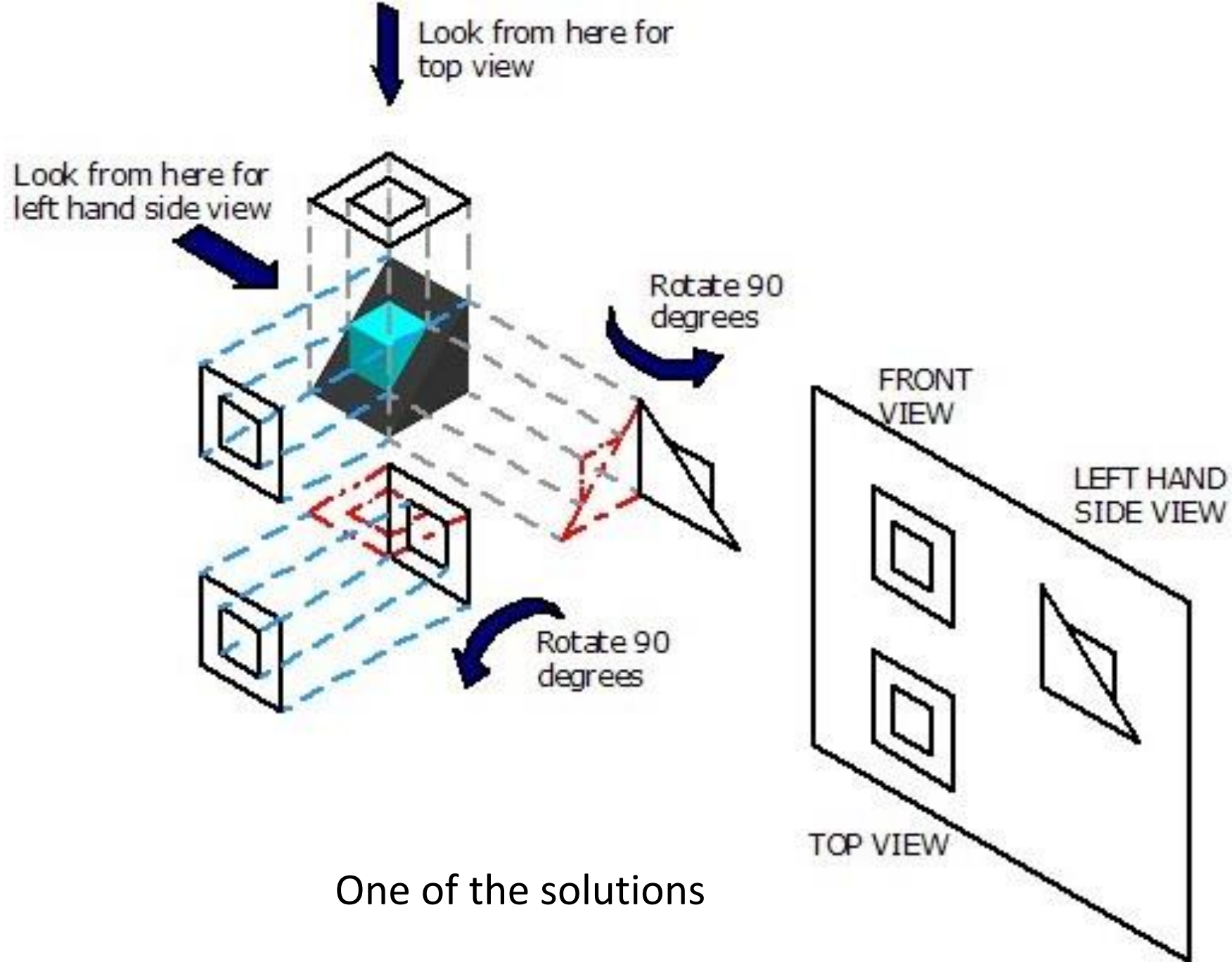
(a)

**Note the  
method of dimensioning**



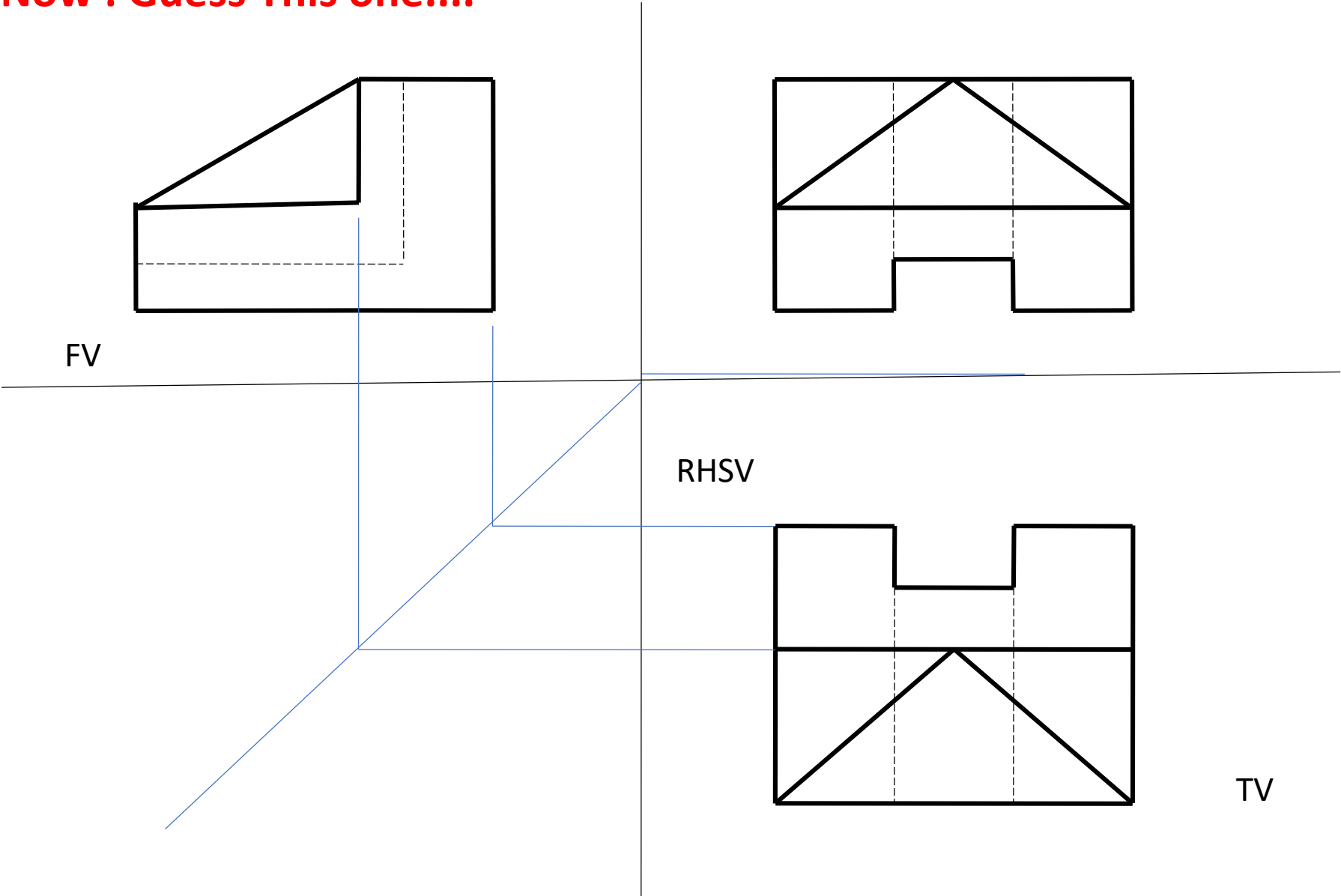
**HIDDEN  
EDGES**



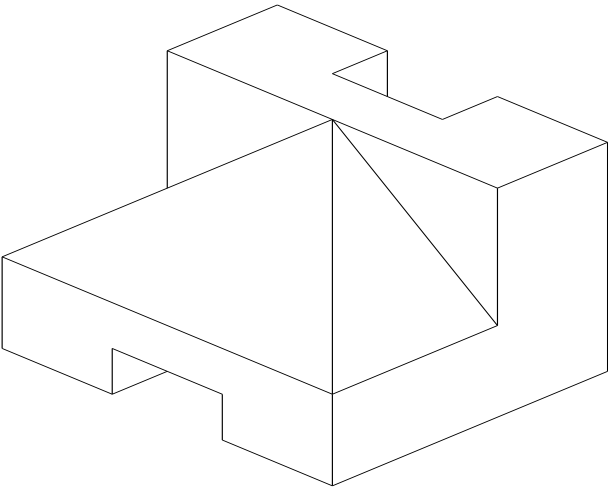
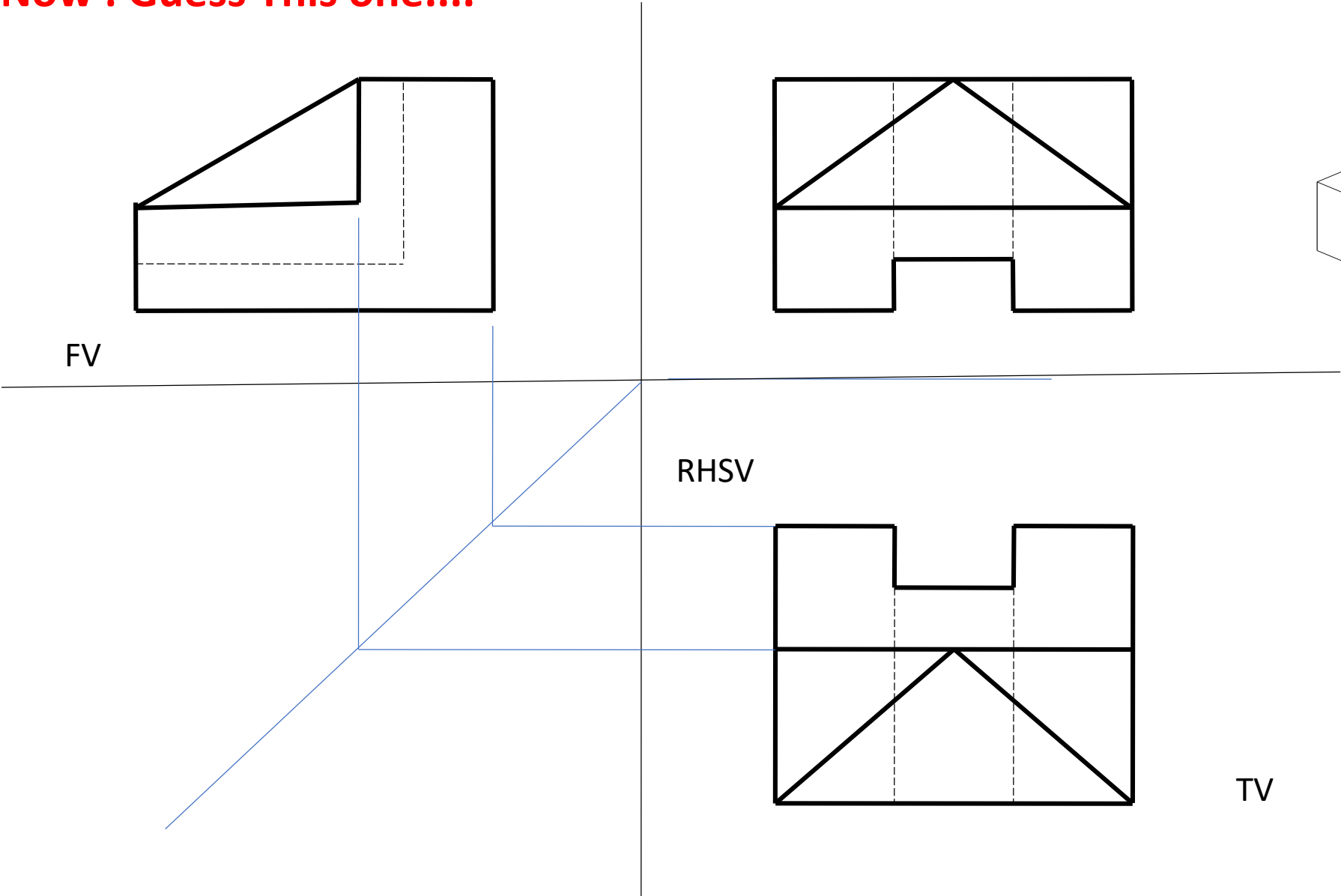


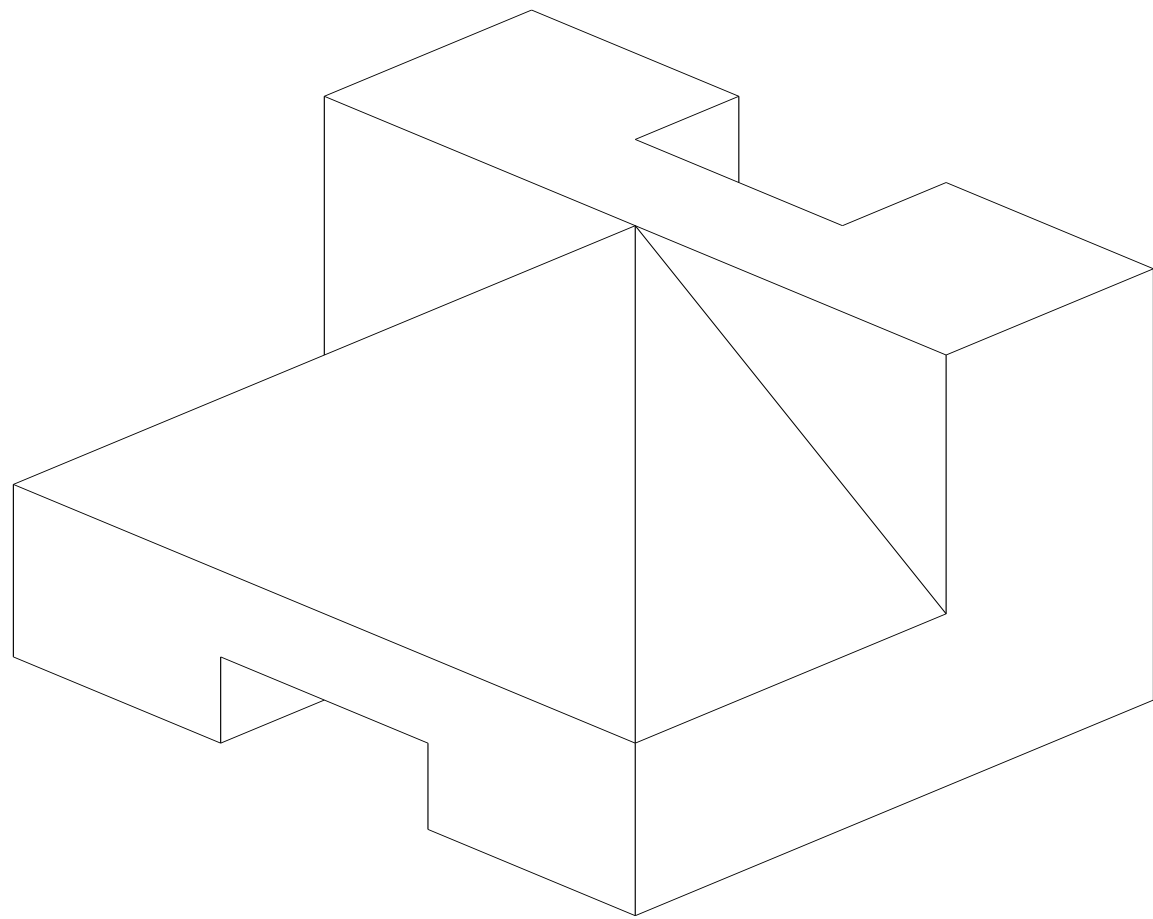
One of the solutions

Now : Guess This one....



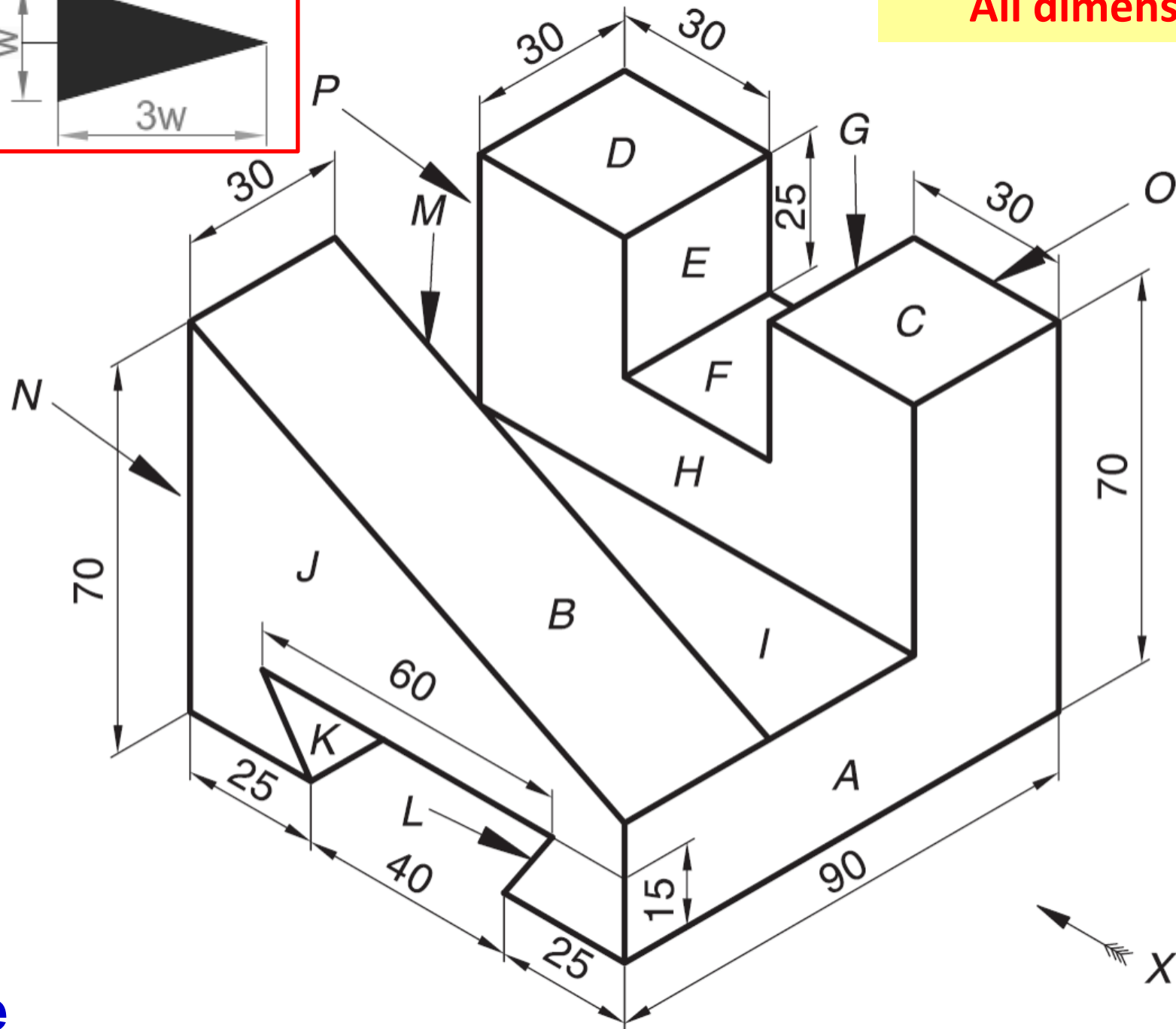
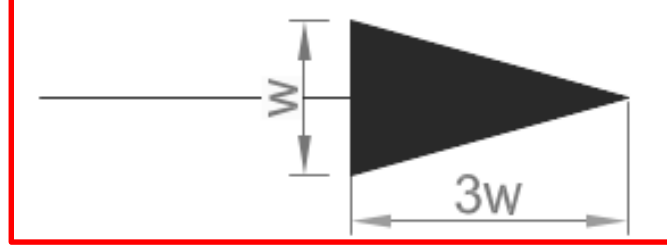
Now : Guess This one....



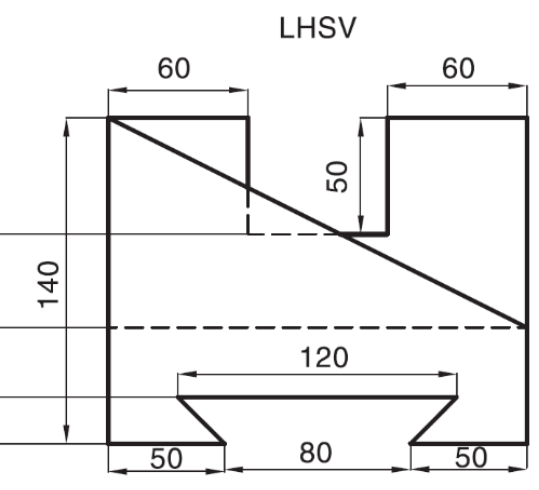
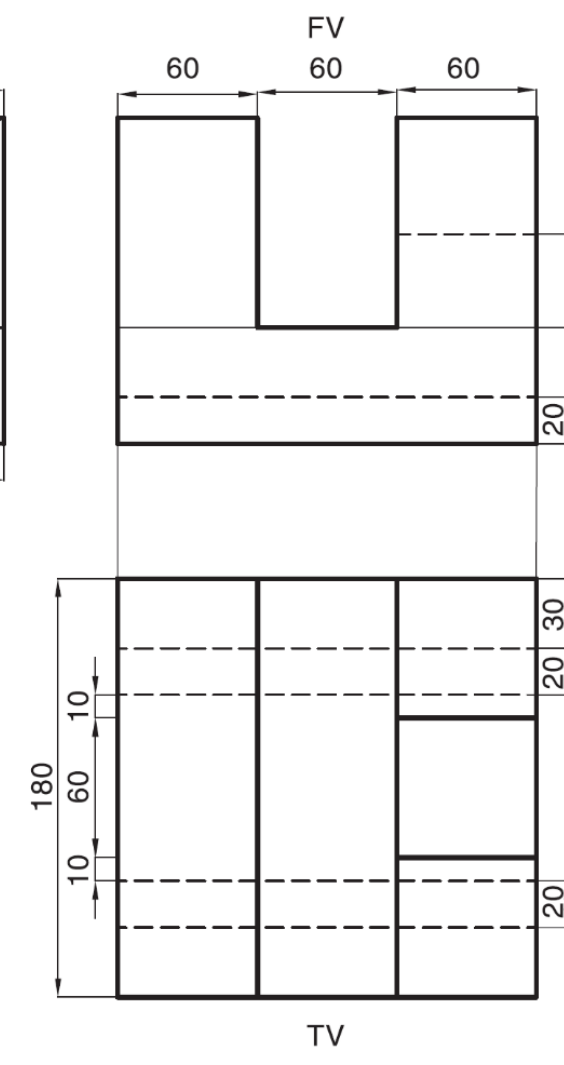
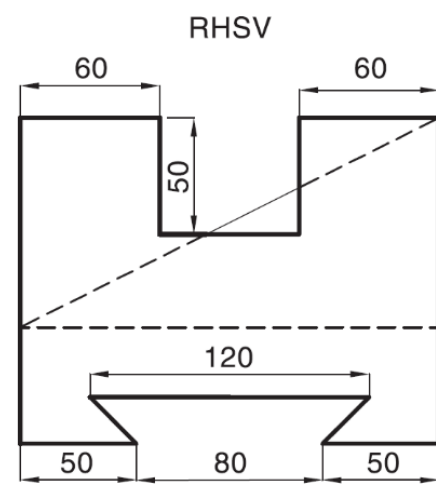
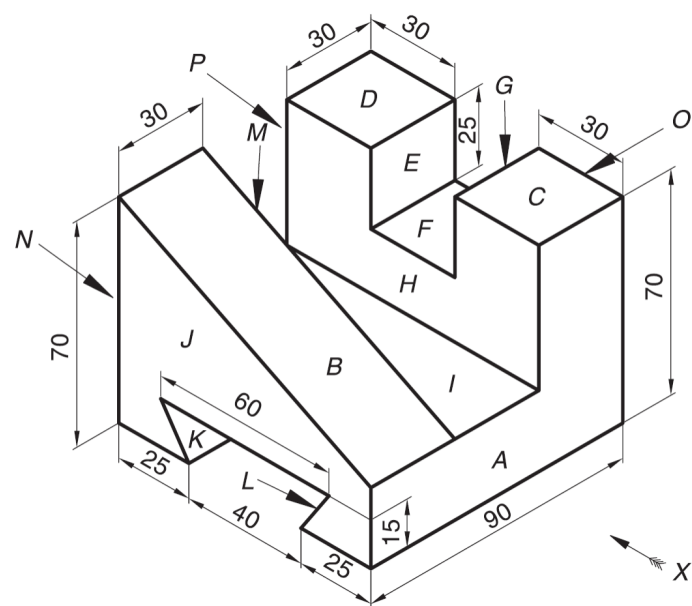


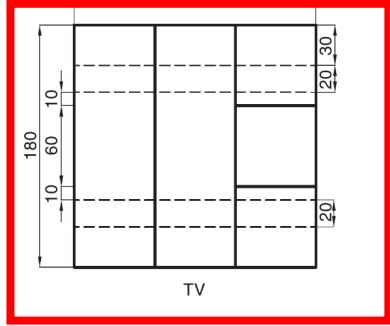


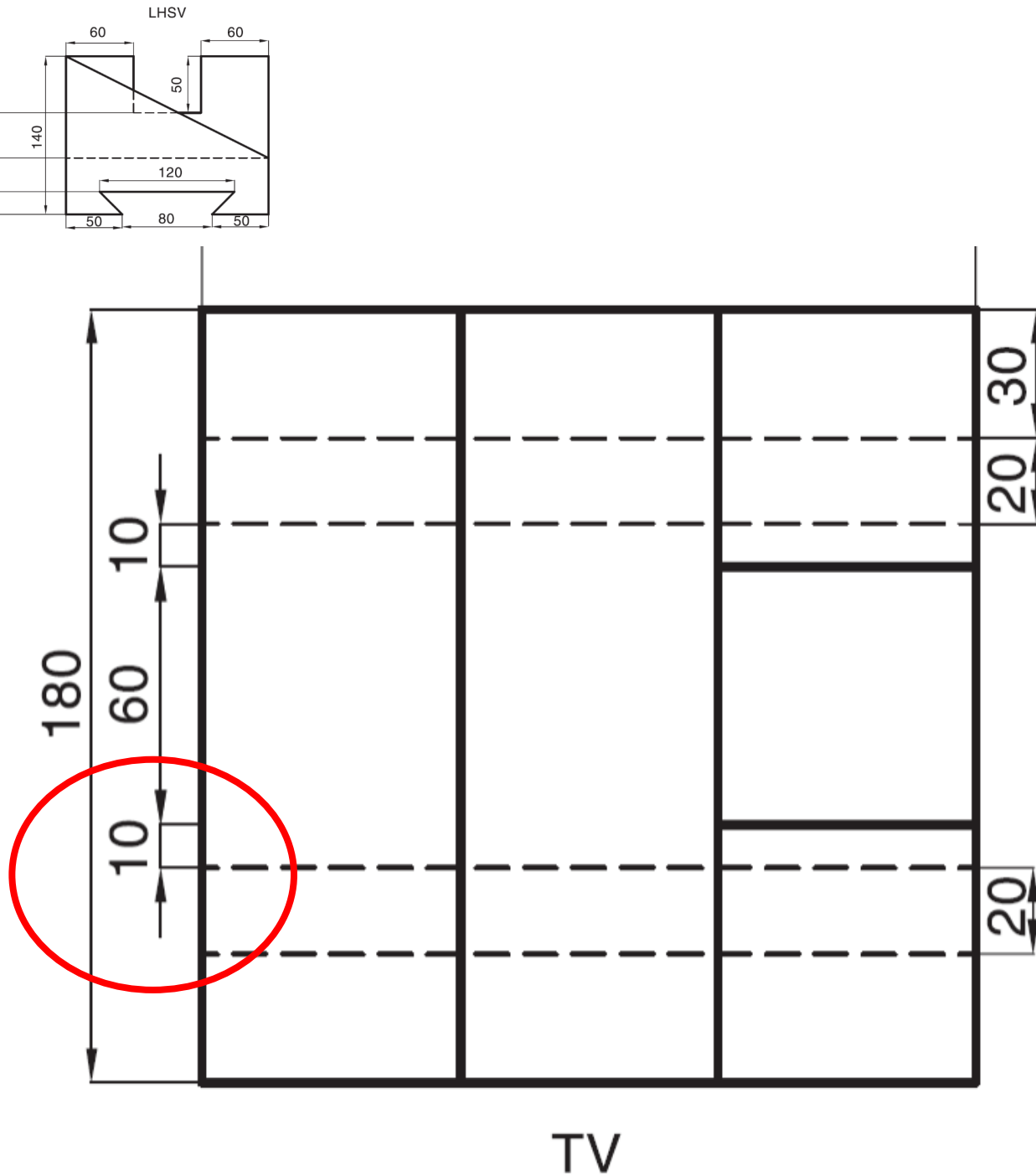
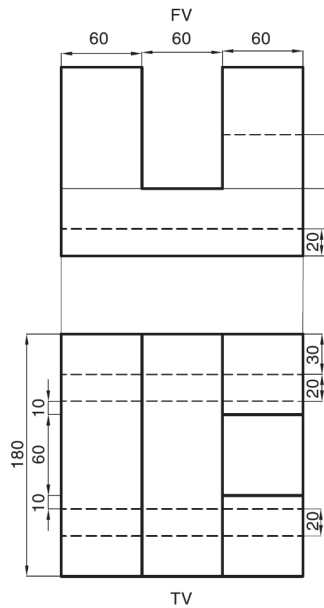
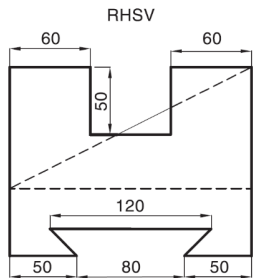
All dimensions in mm



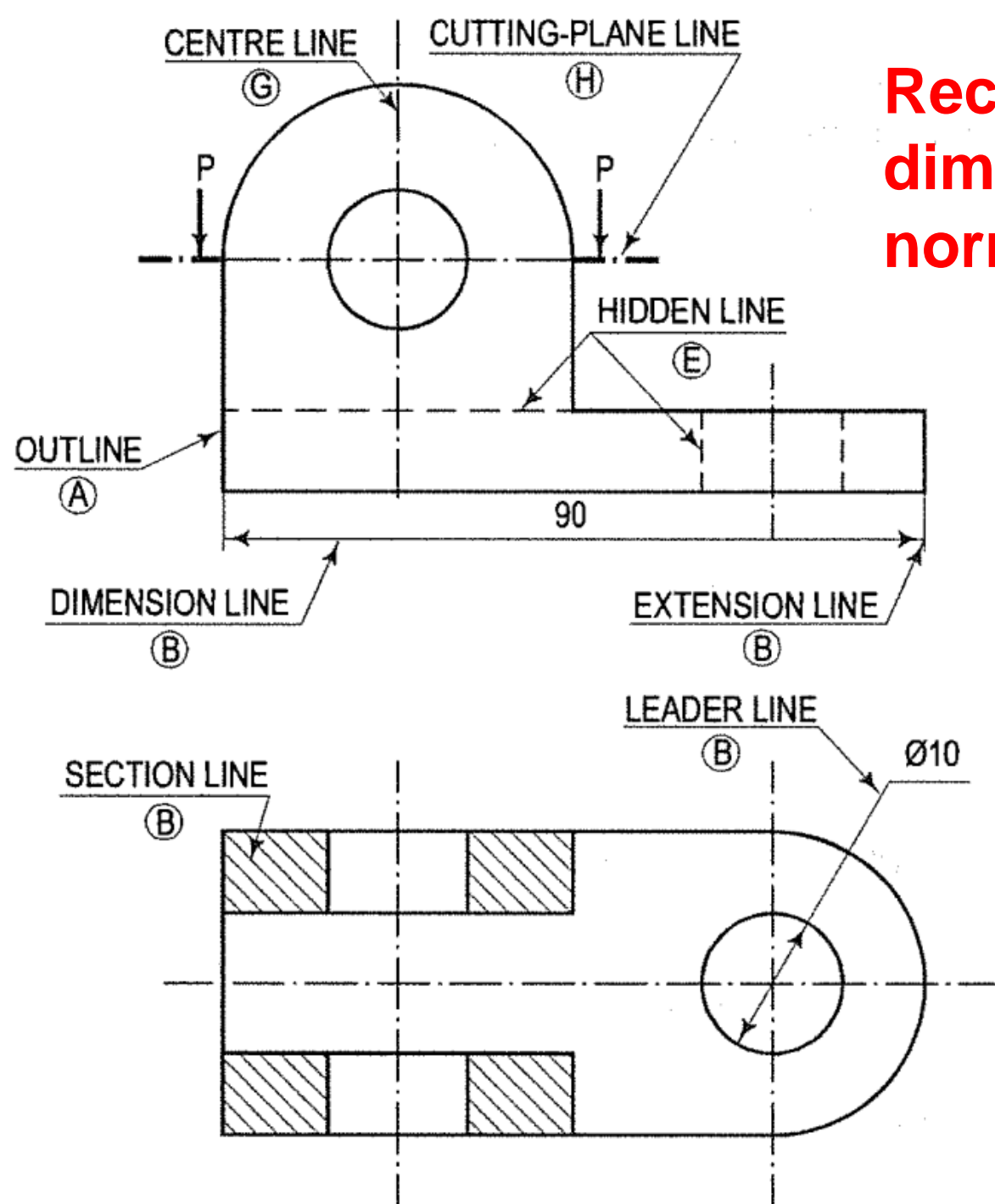
Note the  
method of  
dimensioning  
and arrow style

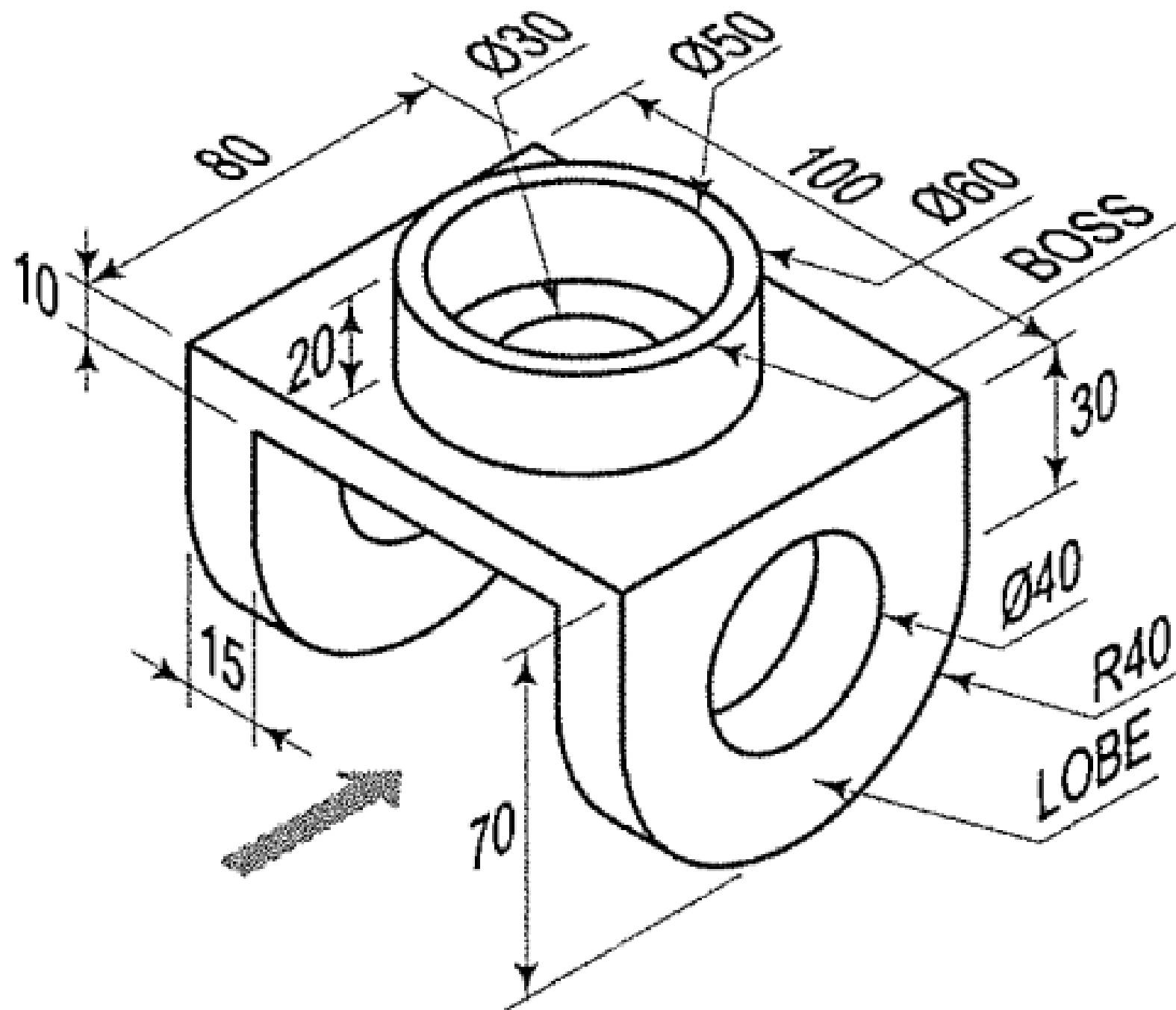


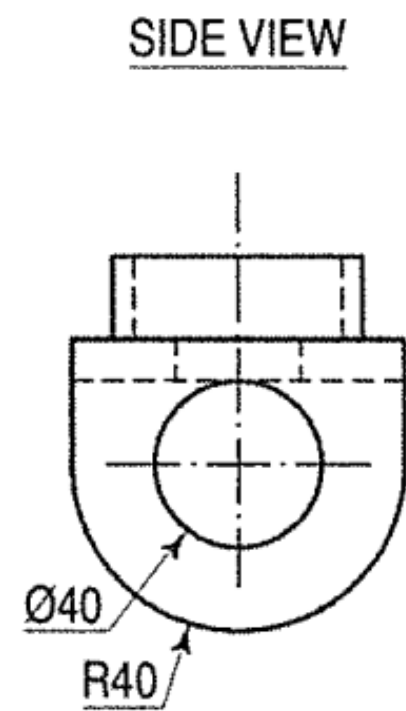
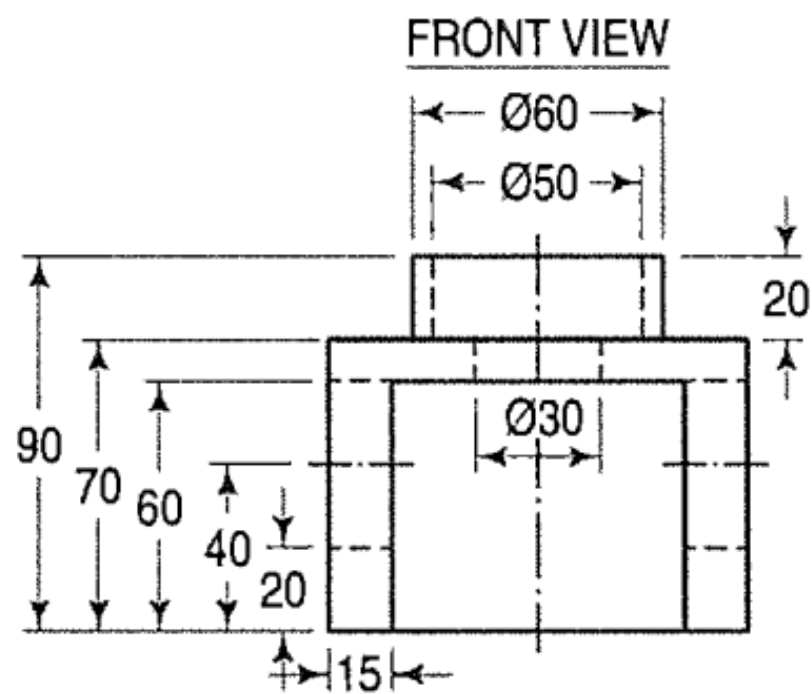




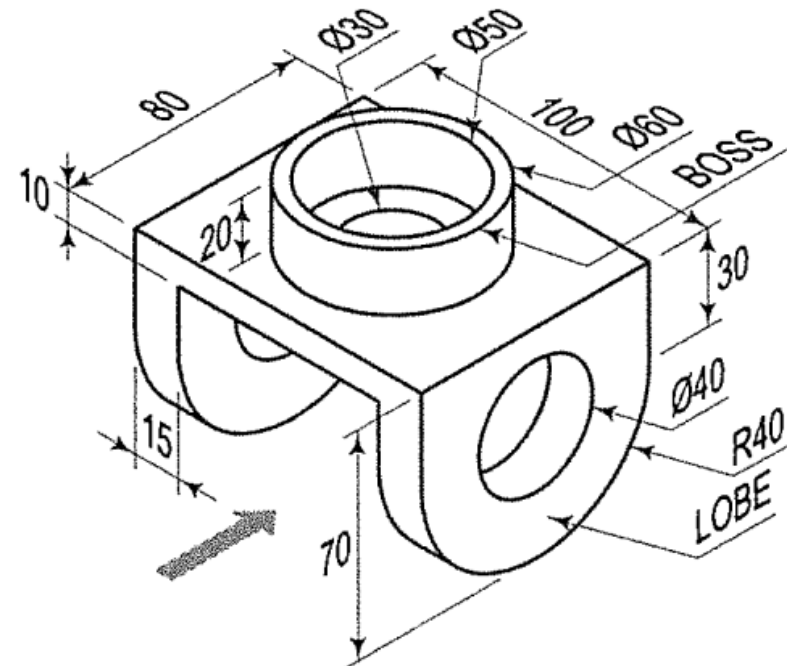
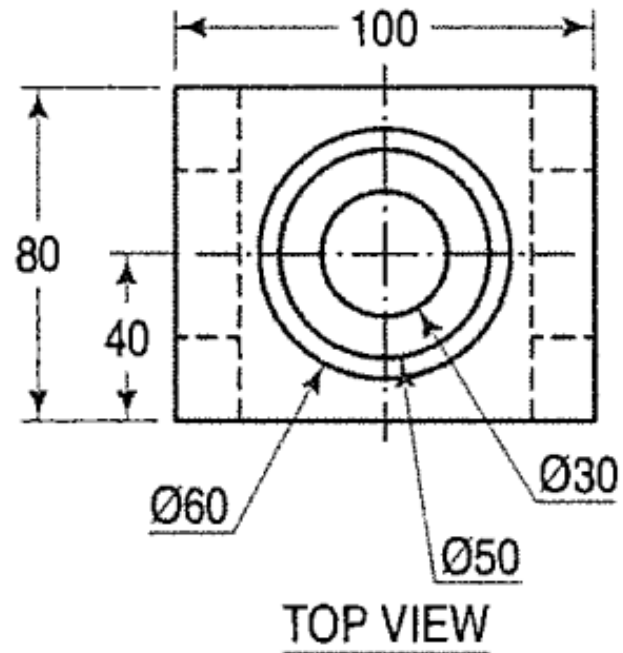
**Recall  
dimensioning  
norms**







**Note the  
different  
method of  
dimensioning**





**DO NOT USE A  
MIXTURE OF STYLES  
WHILE DIMENSIONING**