



Orthographic Projection and Projection of Points

Indian Institute of Technology Mandi

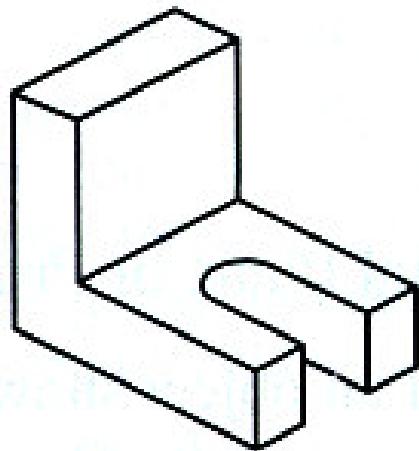
Graphics for Design



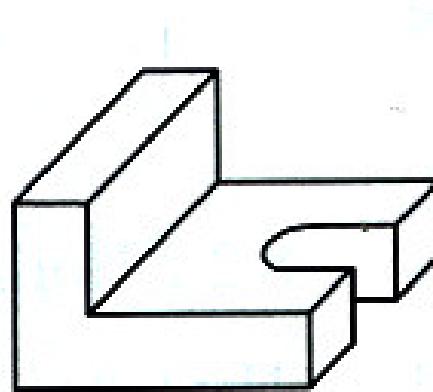
Orthographic Projection

A parallel projection technique in which the plane of projection is perpendicular to the parallel line of sight.

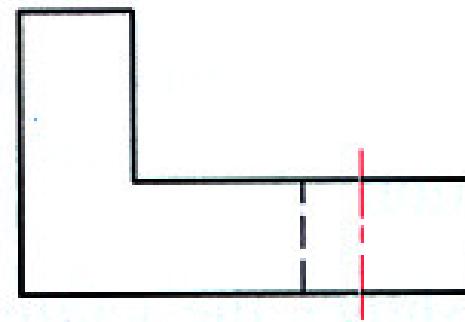
Orthographic projection technique can produce either pictorial drawings that show all three dimensions of an object in one view, or multi-views that show only two dimensions of an object in a single view.



Isometric



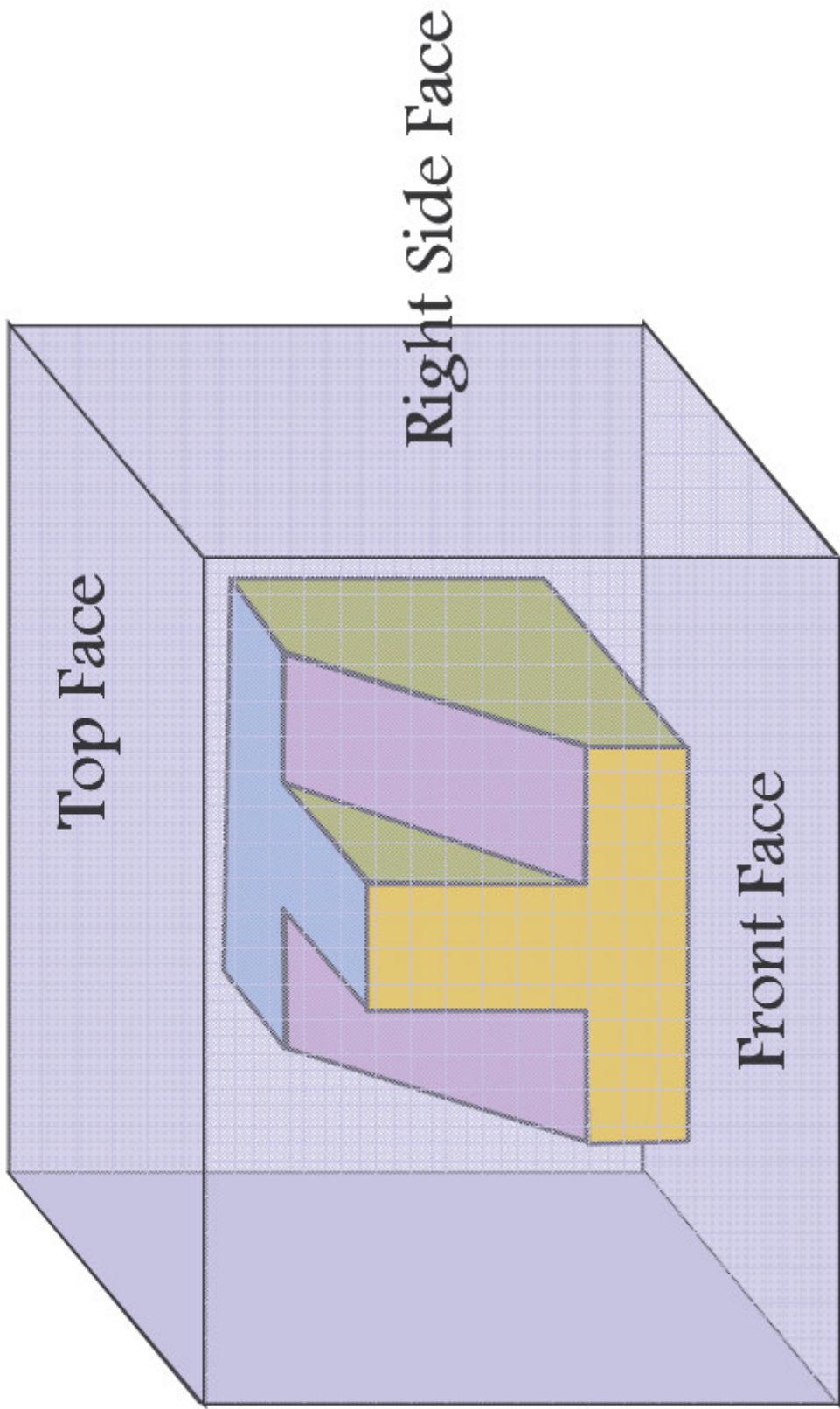
Oblique



Multiview

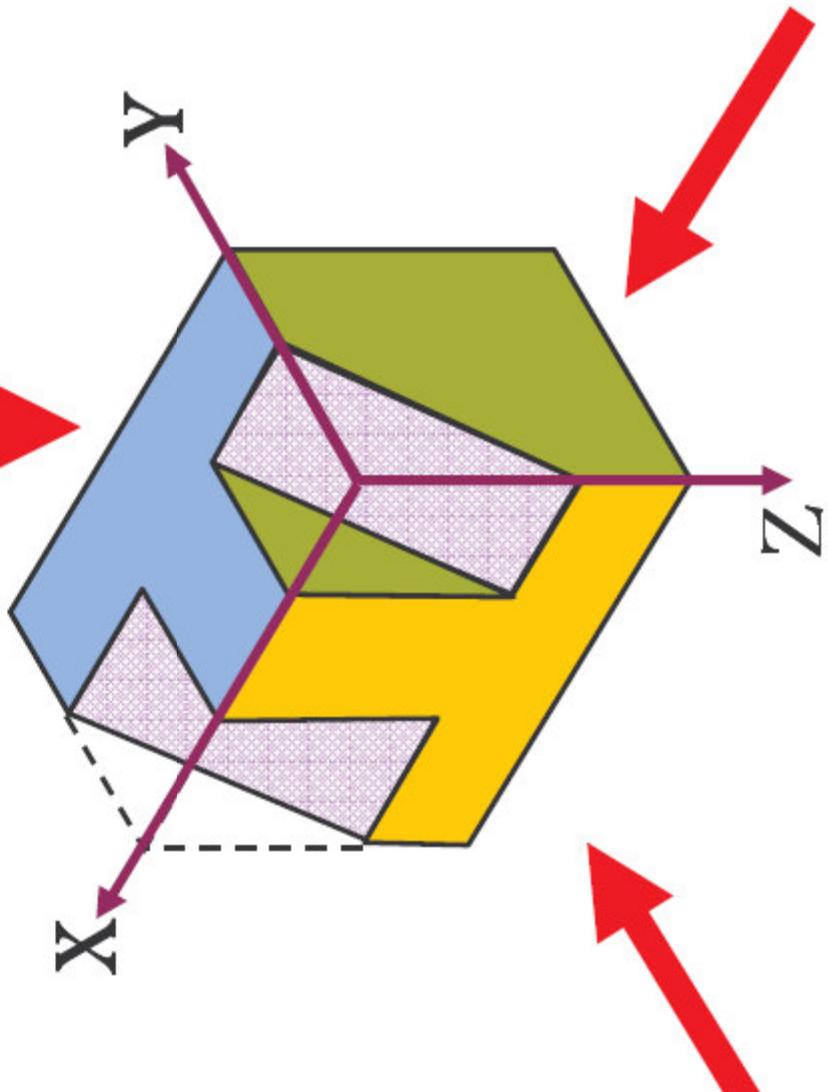
Transparent Viewing Box

- Viewing faces



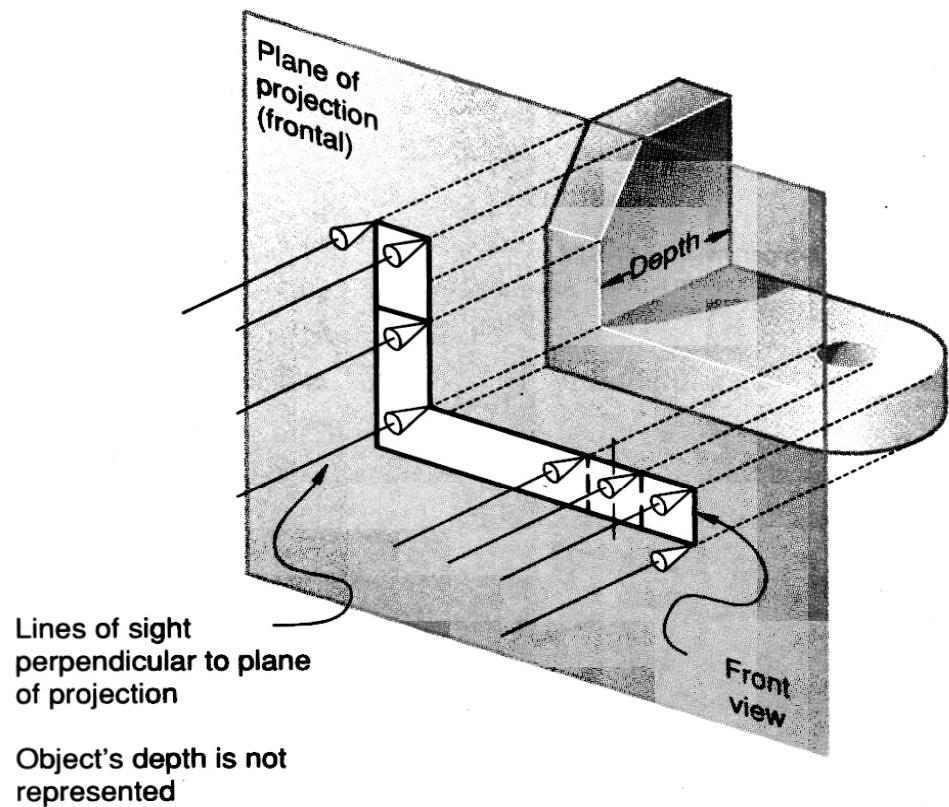
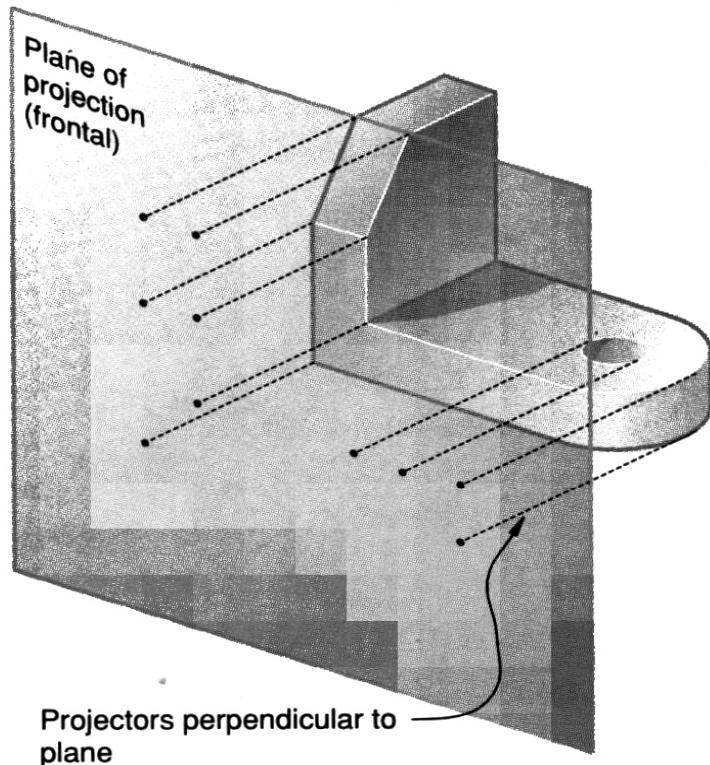
Orthographic projections

- When the viewing planes are parallel to these principal planes
 - Orthographic views

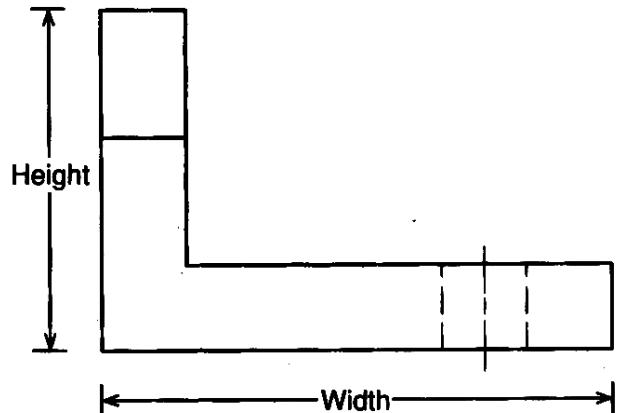
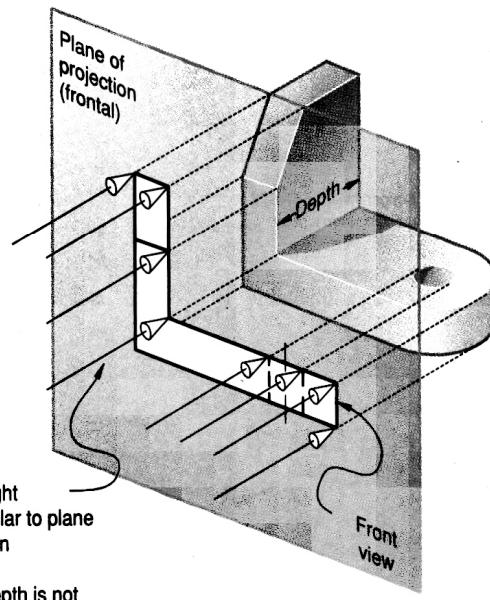
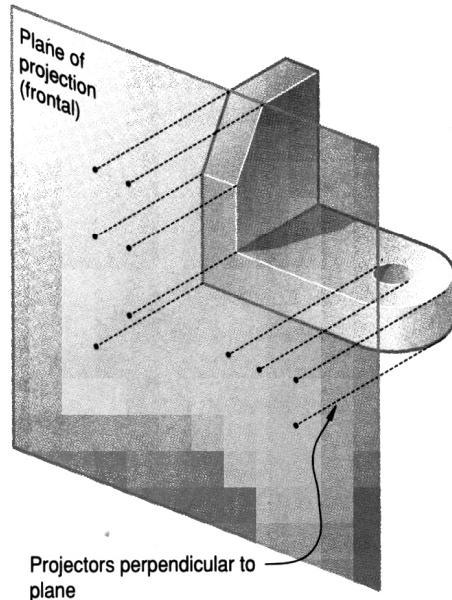


Multi-view Projection

In an orthographic projection, the object is oriented in such a way that only two of its dimensions are shown. The dimensions obtained are the true dimensions of the object



Frontal plane of projection



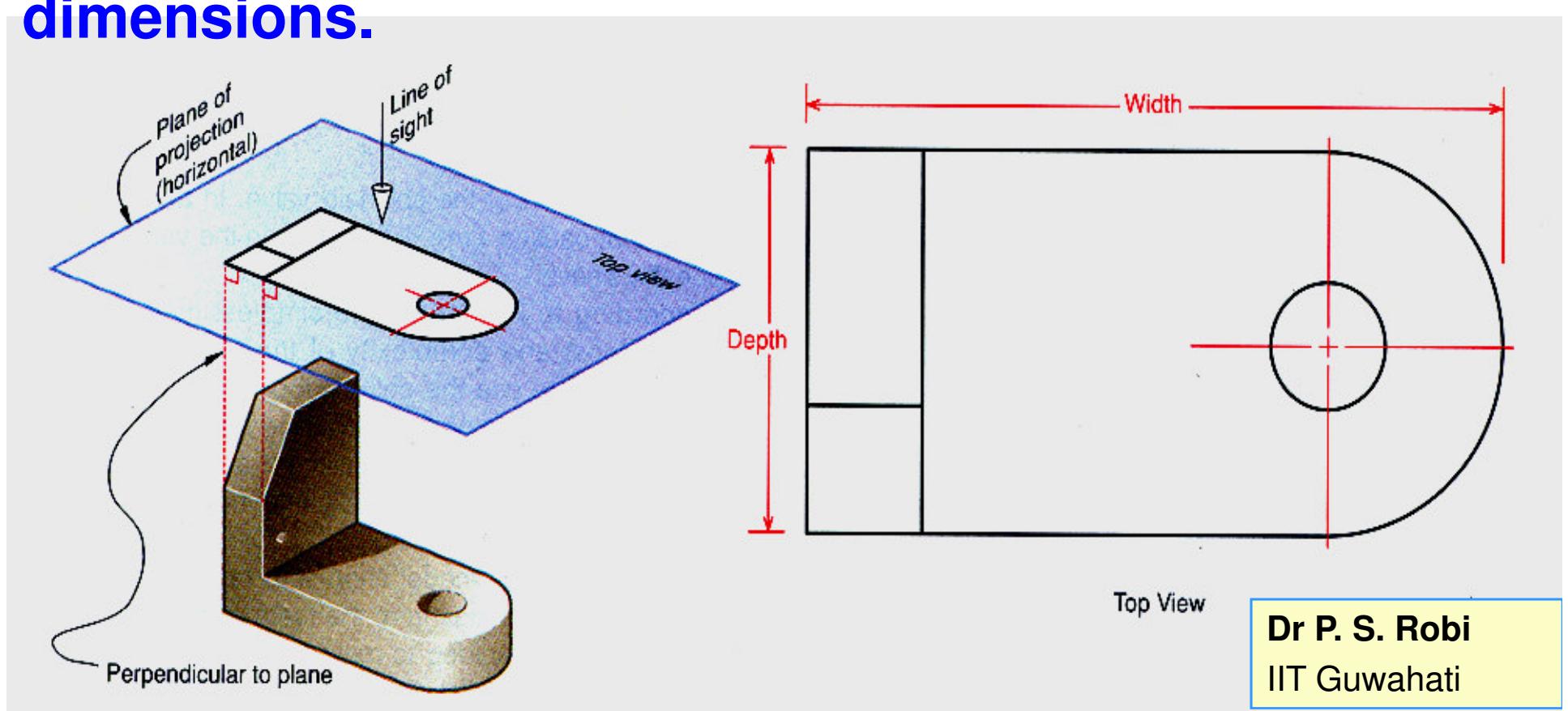
Frontal plane of projection is the plane onto which the Front View (FV) of the multi-view drawing is projected.

Front view of an object shows the width and height dimensions.

Horizontal plane of projection

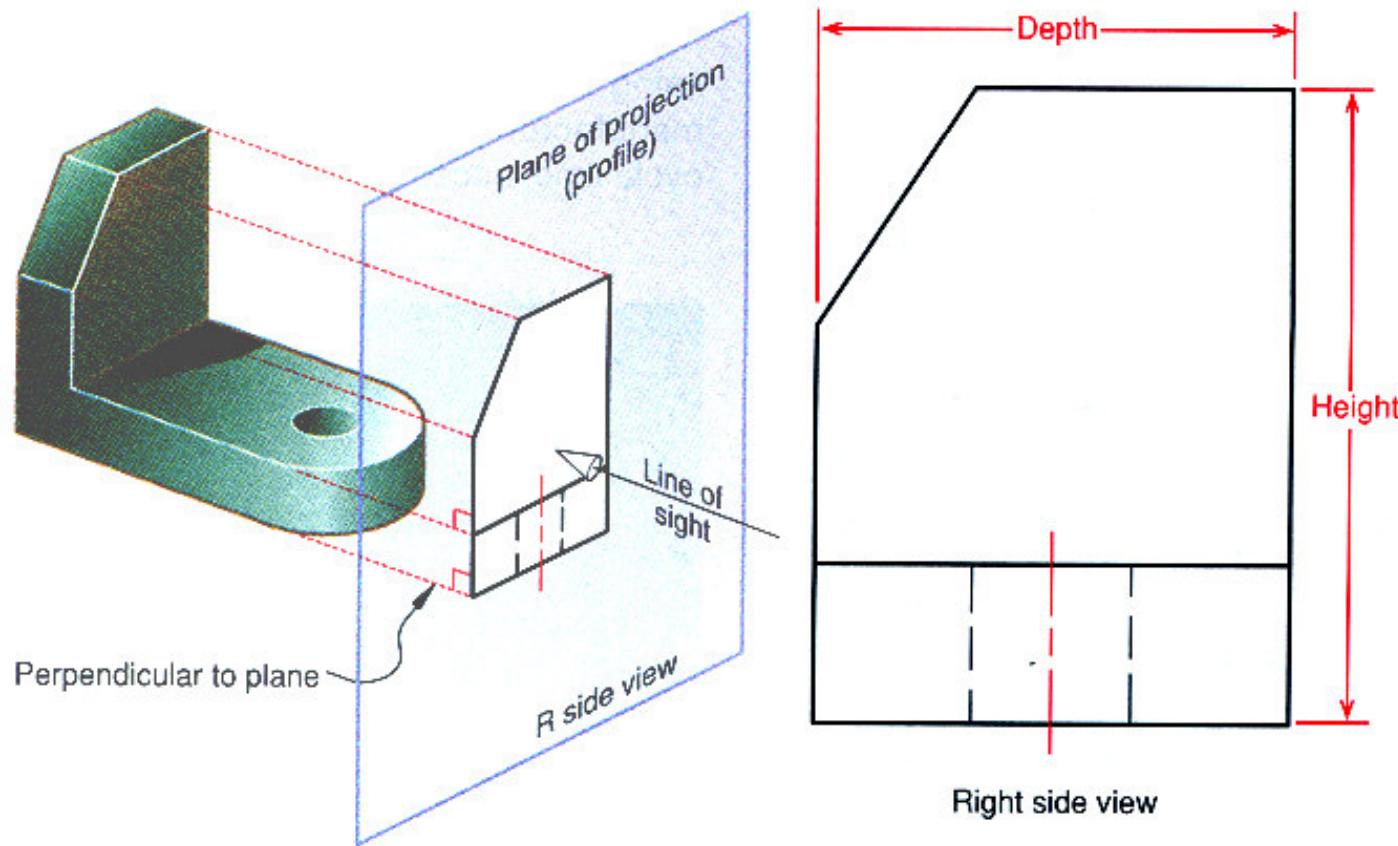
Horizontal plane of projection is the plane onto which the Top View of the multi-view drawing is projected.

Top view of an object shows the width and depth dimensions.



Profile plane of projection

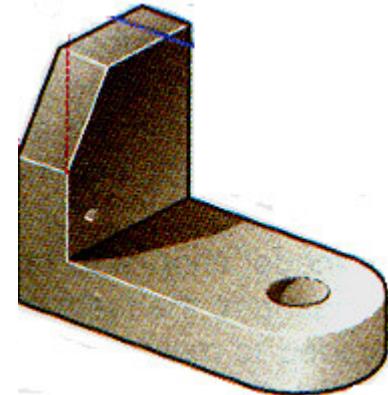
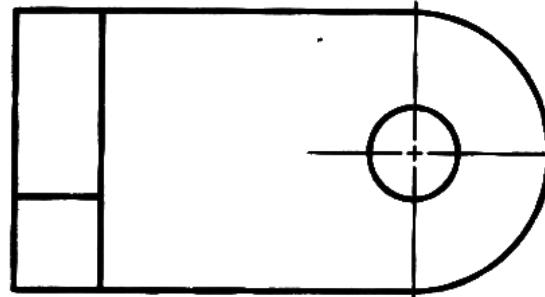
In multi-view drawings, the **right side view is the standard side view used**. The right side view of an object shows the depth and the height dimensions. The right side view is projected onto the profile plane of projection, which is a plane that is parallel to the right side of the object.



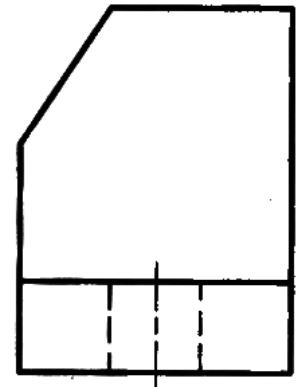
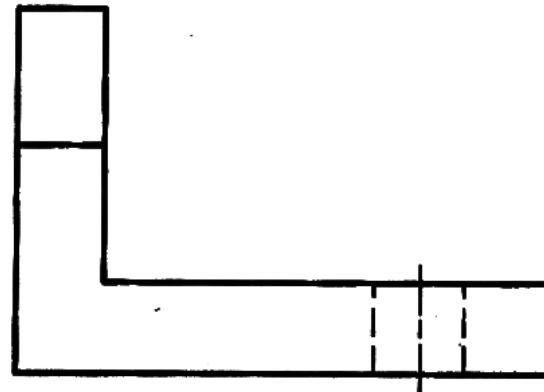
Orientation of views from projection planes

Top view is always positioned and aligned with the front view, and side view is always positioned to the side of and aligned with the front view.

Top view



Front view



Right side view

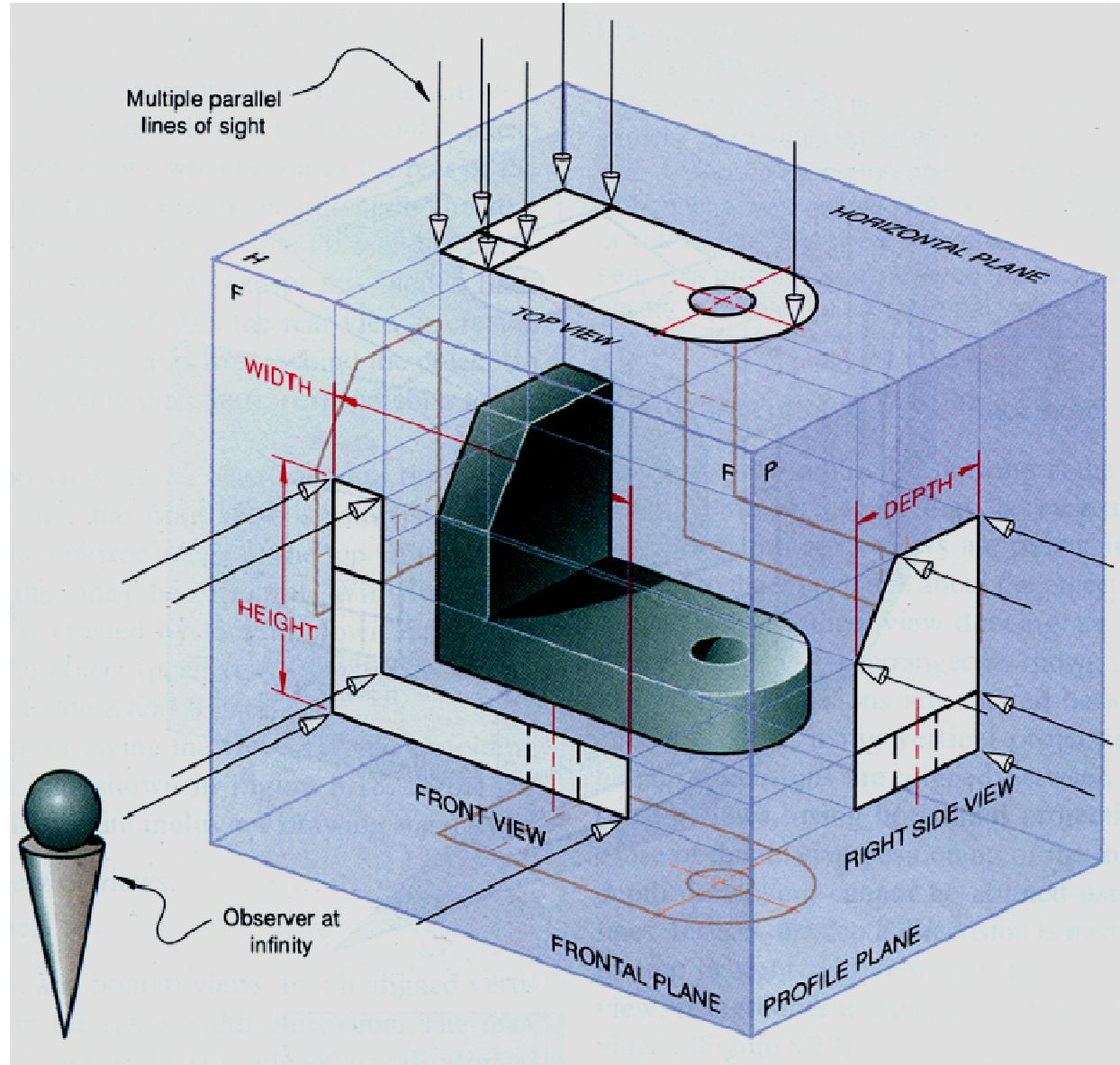
Six Principal views

The plane of projection can be oriented to produce an infinite number of views of an object. However, some views are more important than others.

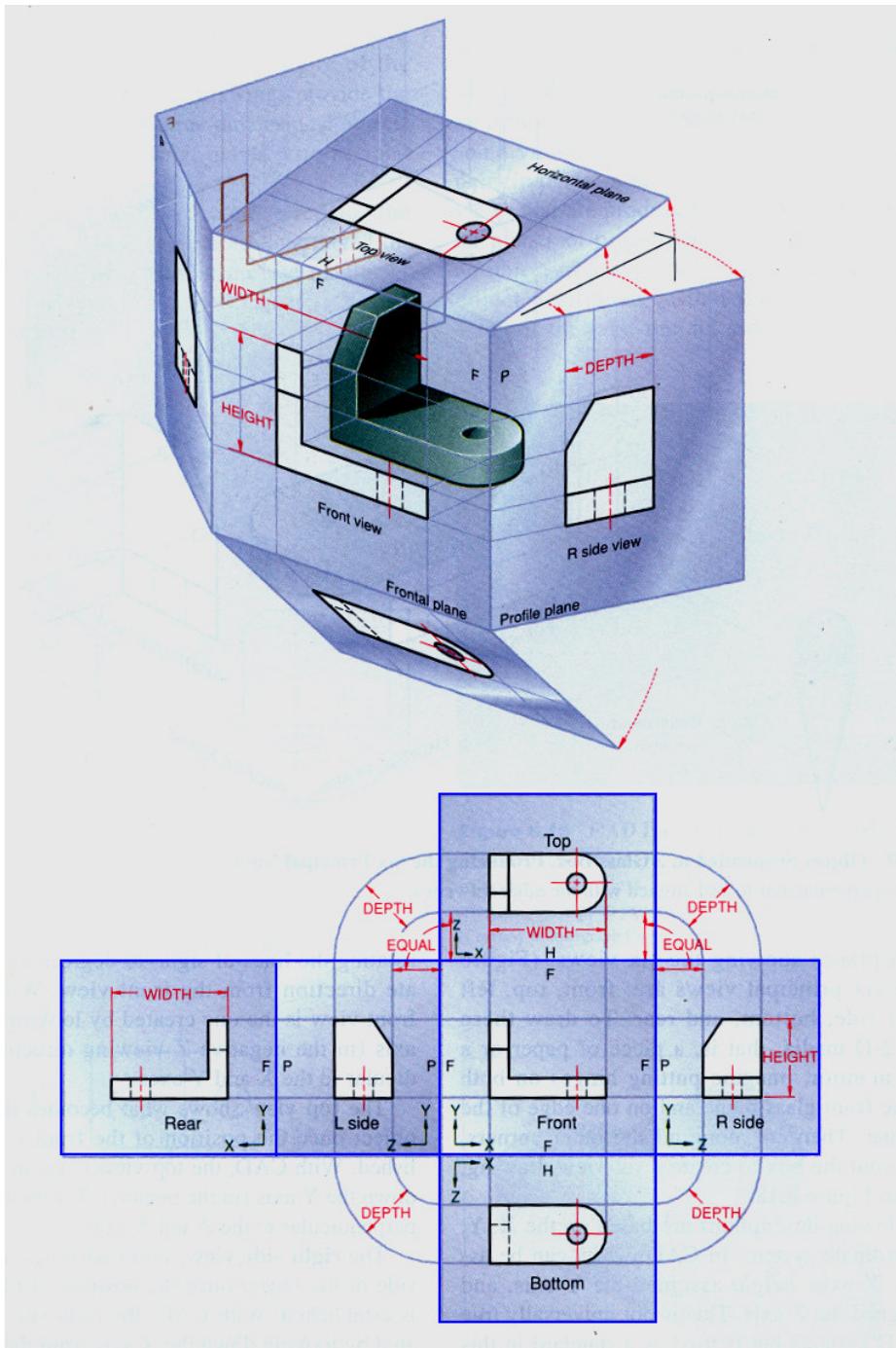
These **principal views** are six mutually perpendicular views that are produced by six mutually perpendicular planes of projection.

Imagine suspending an object in a glass box with major surfaces of the object positioned so that they are parallel to the sides of the box, six sides of the box become projection planes, showing the six views – front, top, left, right, bottom and rear.

Six Principal Views



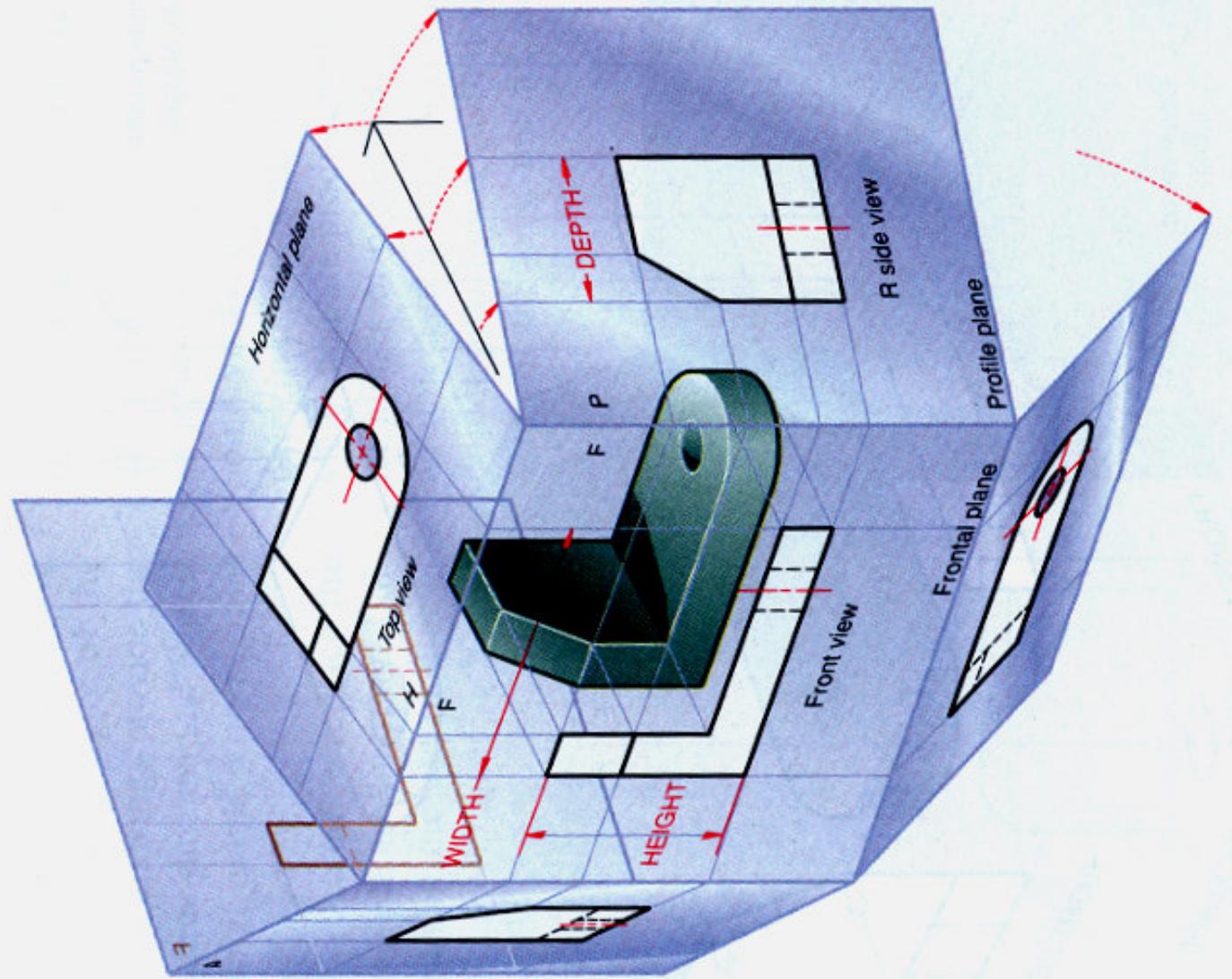
Object is suspended in a box producing six principal views: each view is perpendicular to and aligned with the adjacent views.

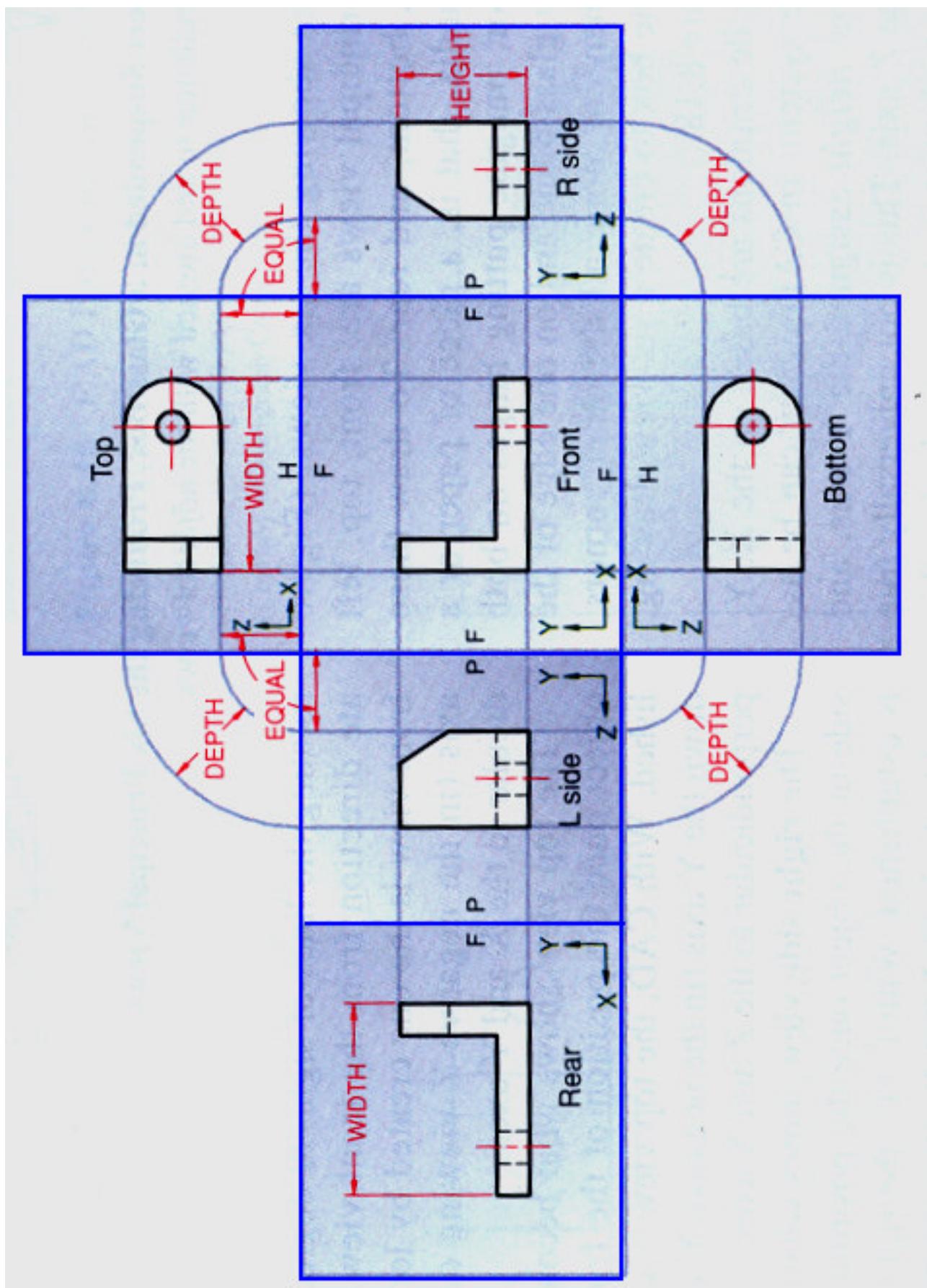


Unfolding the glass box to produce six-view drawing

Top, front and bottom views are all aligned vertically and share the same width dimension.

Rear, left side, front and right side views are all aligned horizontally and share the same height dimension.

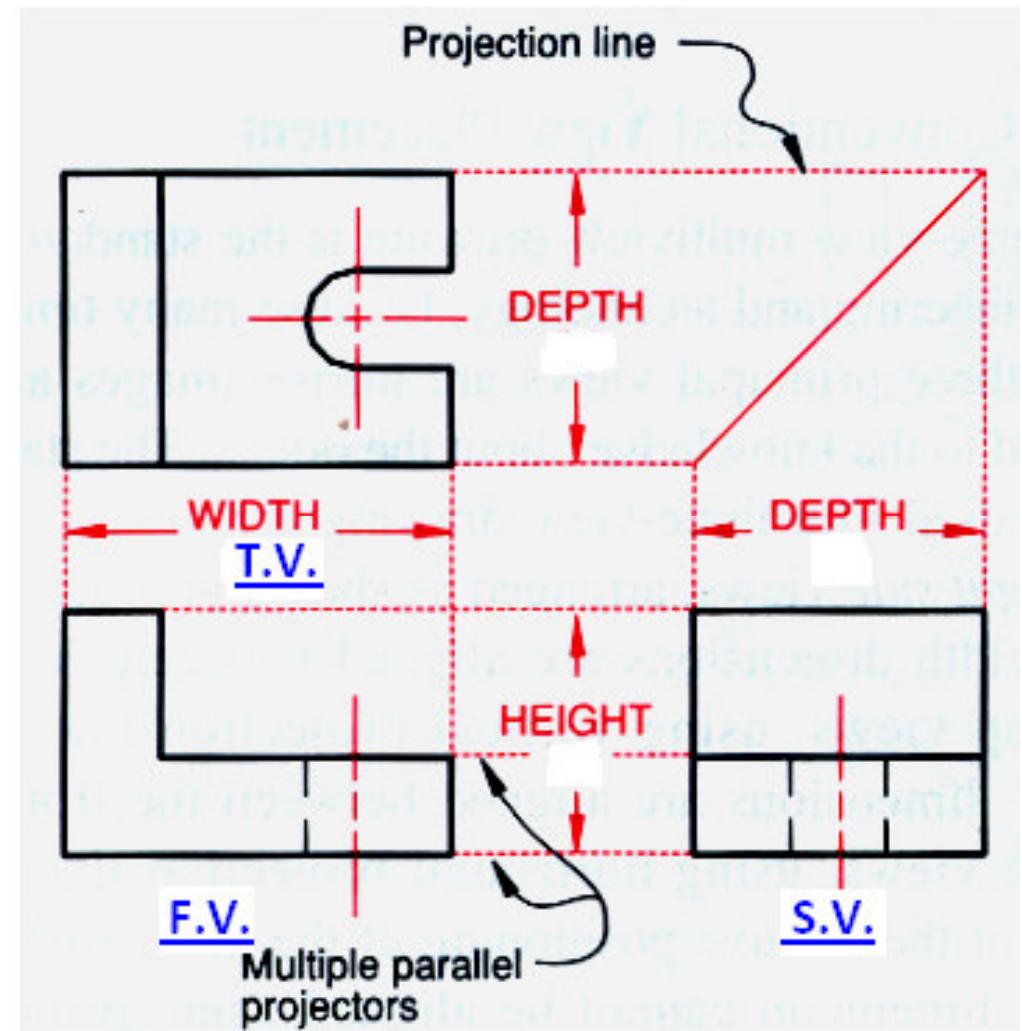




Conventional view placement

The three-view multiview drawing is the standard used in engineering and technology, because many times the other three principal views are mirror images and do not add to the knowledge about the object.

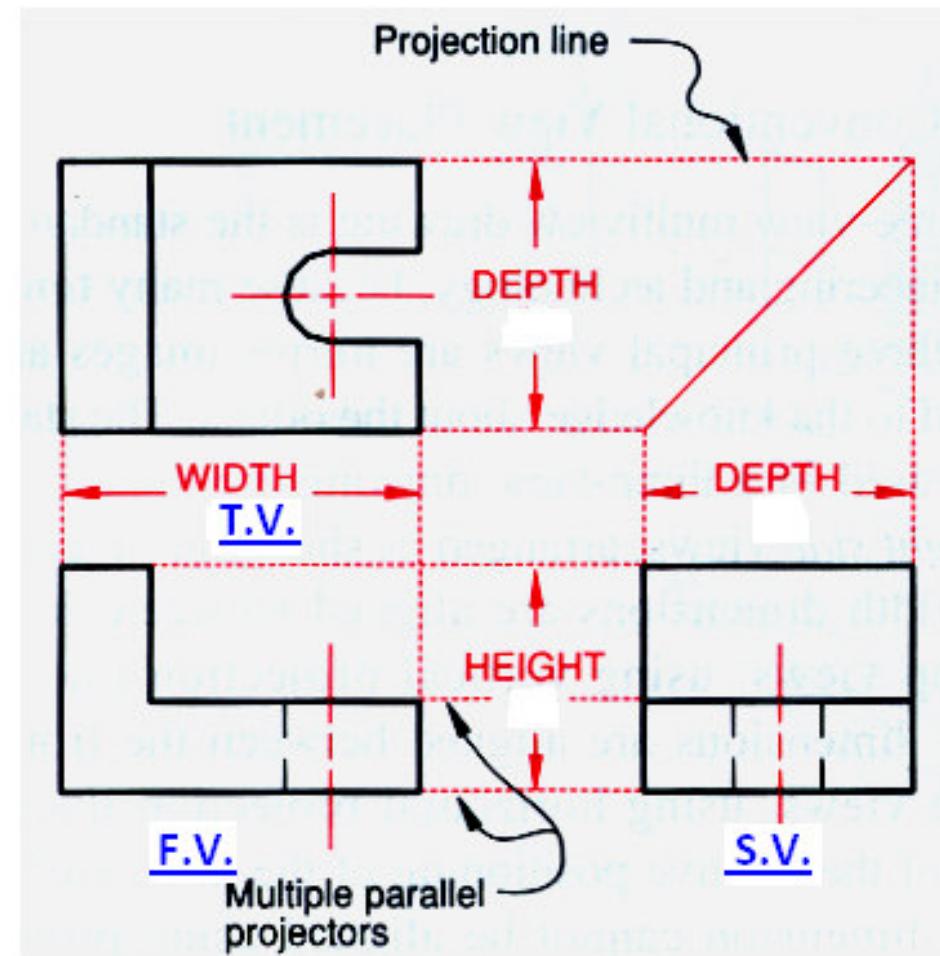
The standard views used in a three-view drawing are the top, front and the right side views



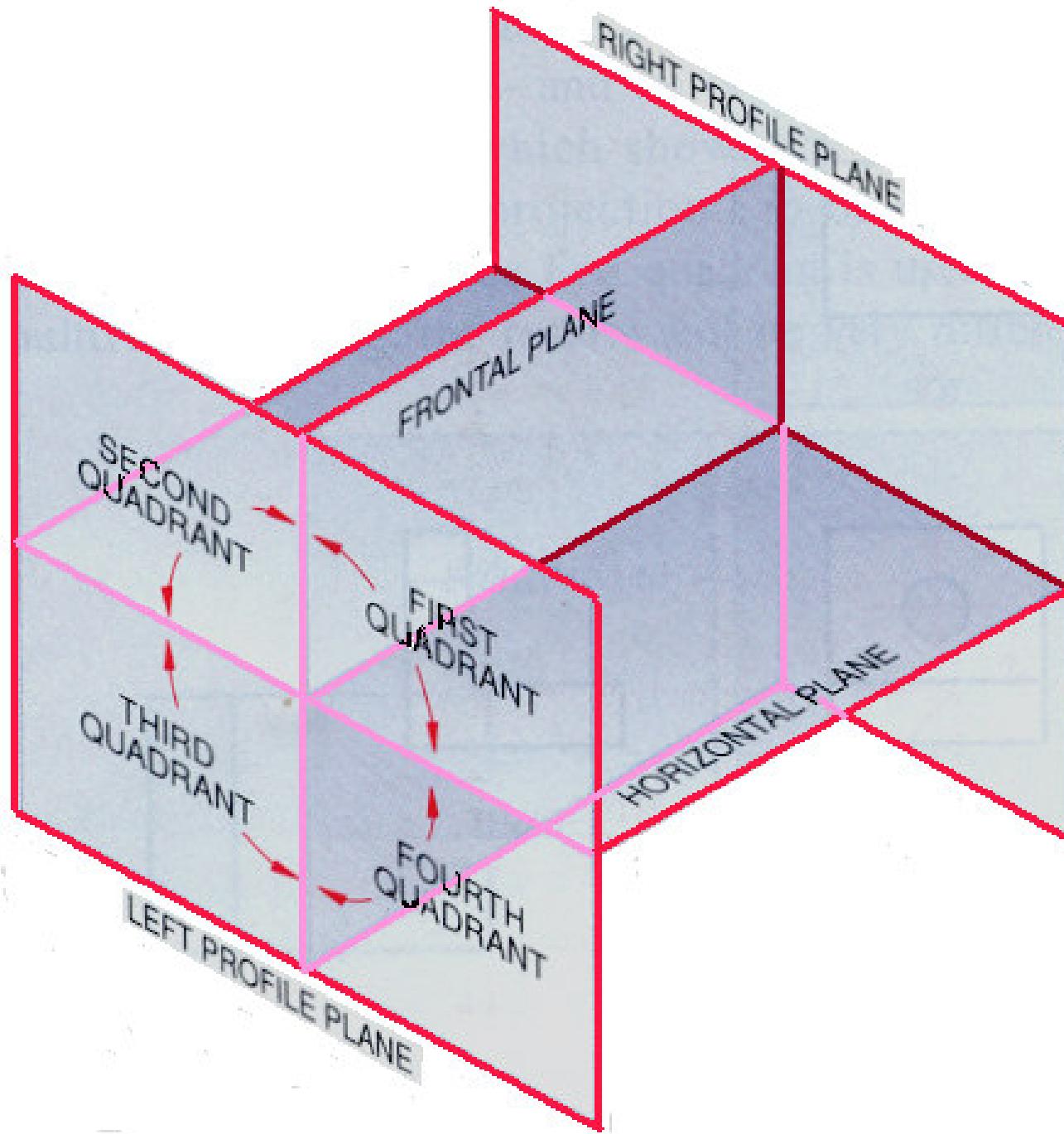
The width dimensions are aligned between the front and top views, using vertical projection lines.

The height dimensions are aligned between the front and the profile views, using horizontal projection lines.

Because of the relative positioning of the three views, the depth dimension cannot be aligned using projection lines. Instead, the depth dimension is measured in either the top or right side view.



The principal projection planes and quadrants used to create first- and third-angle projection drawings





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Graphics for Design



Lines

- Five types of line styles used

- Visible lines



- Hidden lines



- Centerlines



- Dimension lines

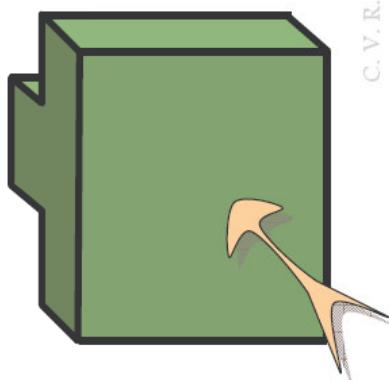
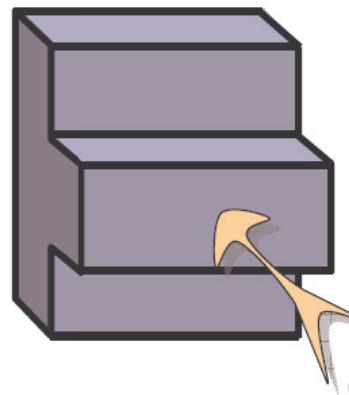
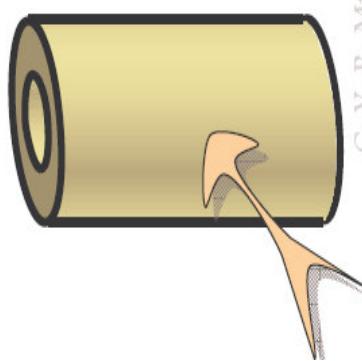
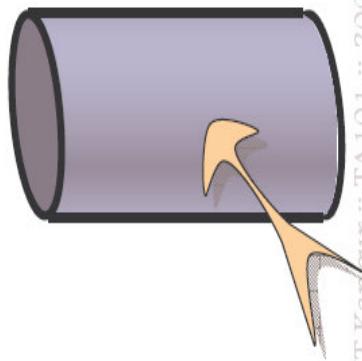
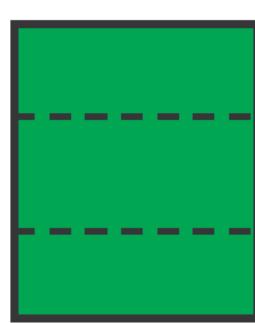
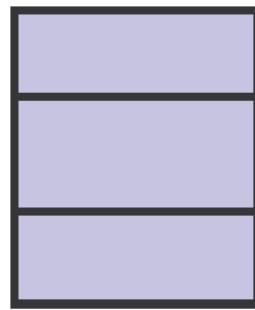
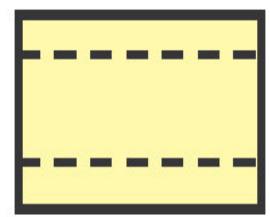


- Construction lines

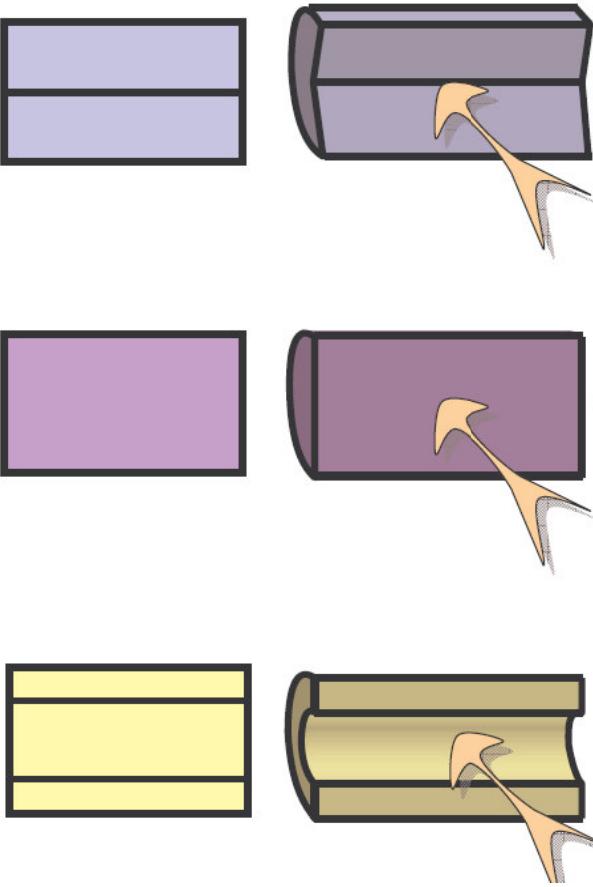


Visible & Hidden lines

– Boundaries

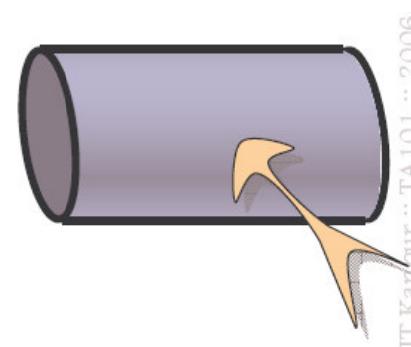
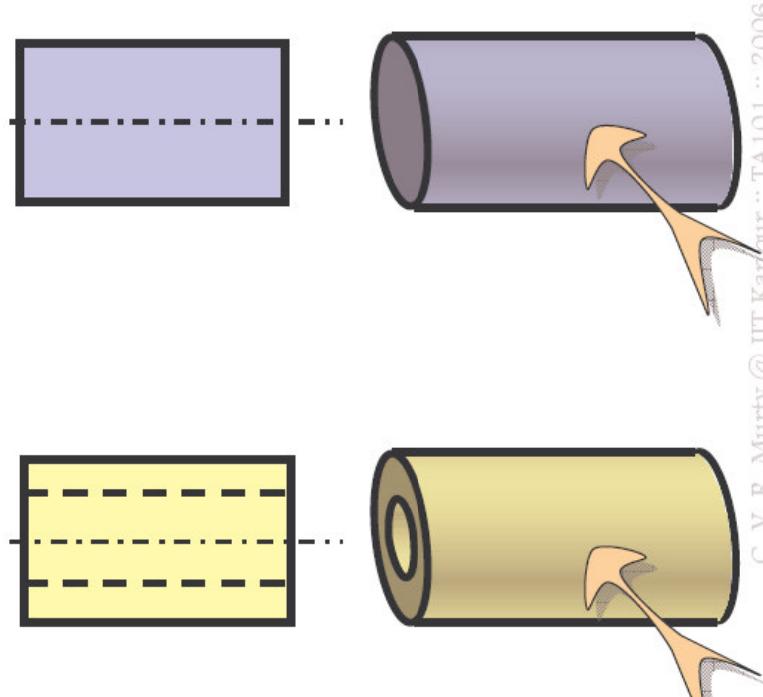


- Surfaces meet

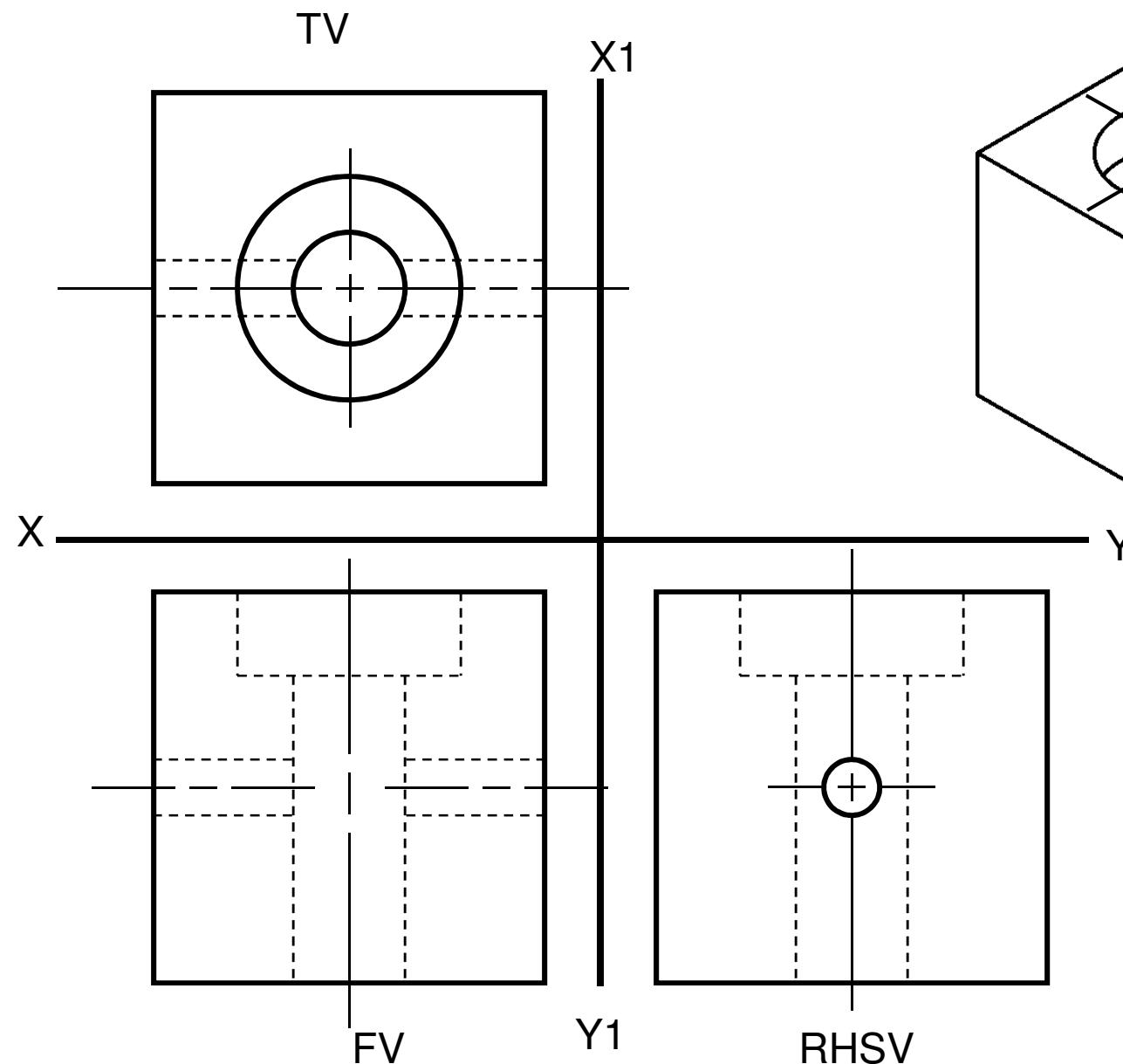


- Centerlines

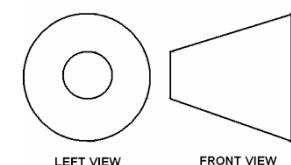
- Axial Symmetry



Example

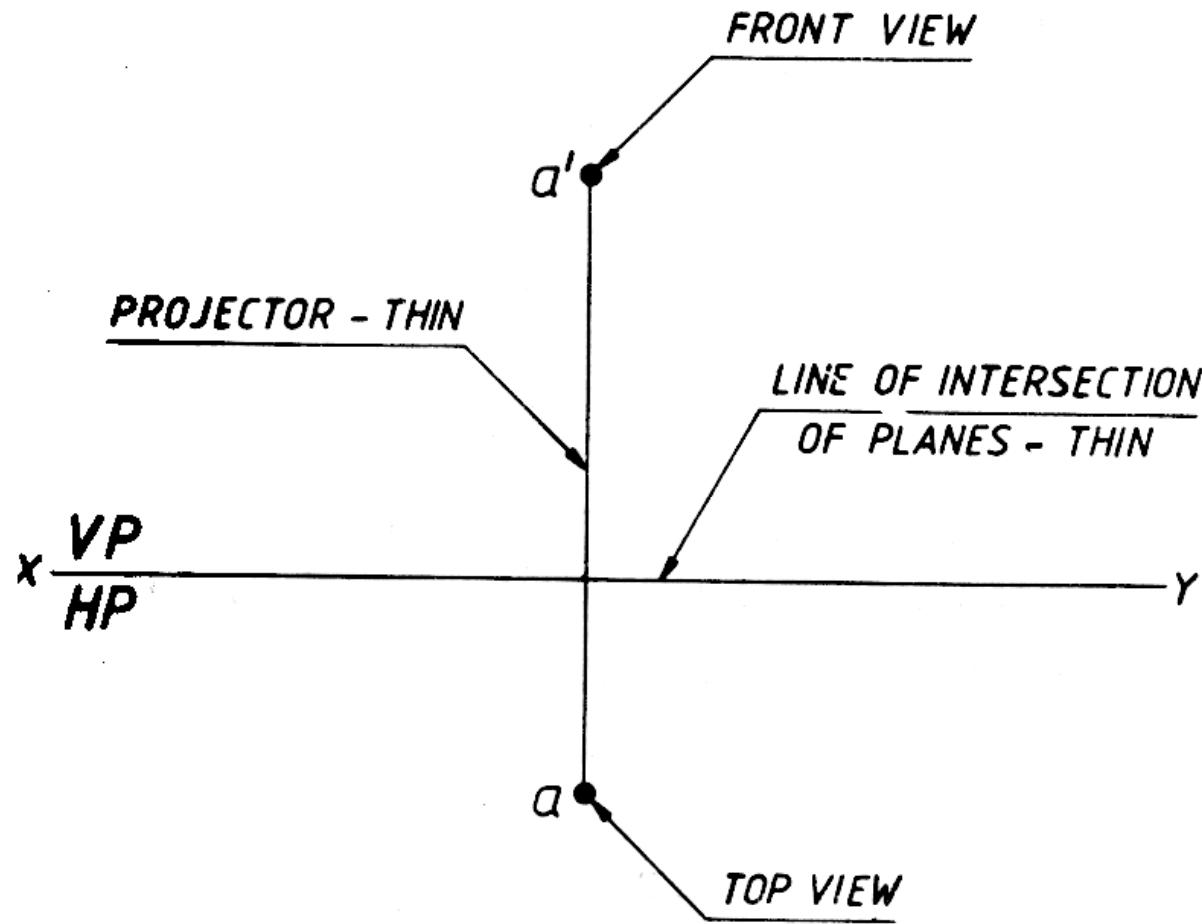


1. Visible
2. Hidden
3. Center



Conventions

Convention



- Projectors and the lines of the intersection of planes of projections are shown as thin lines.

Precedence of Lines

- *Visible lines* take precedence over all other lines



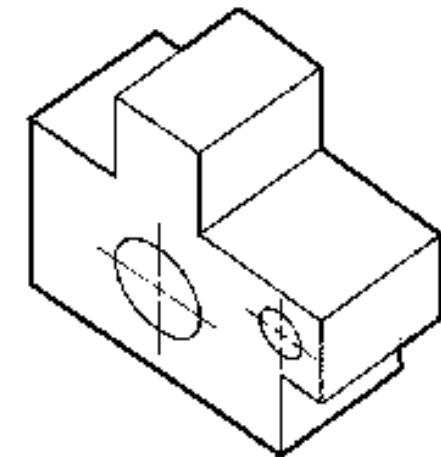
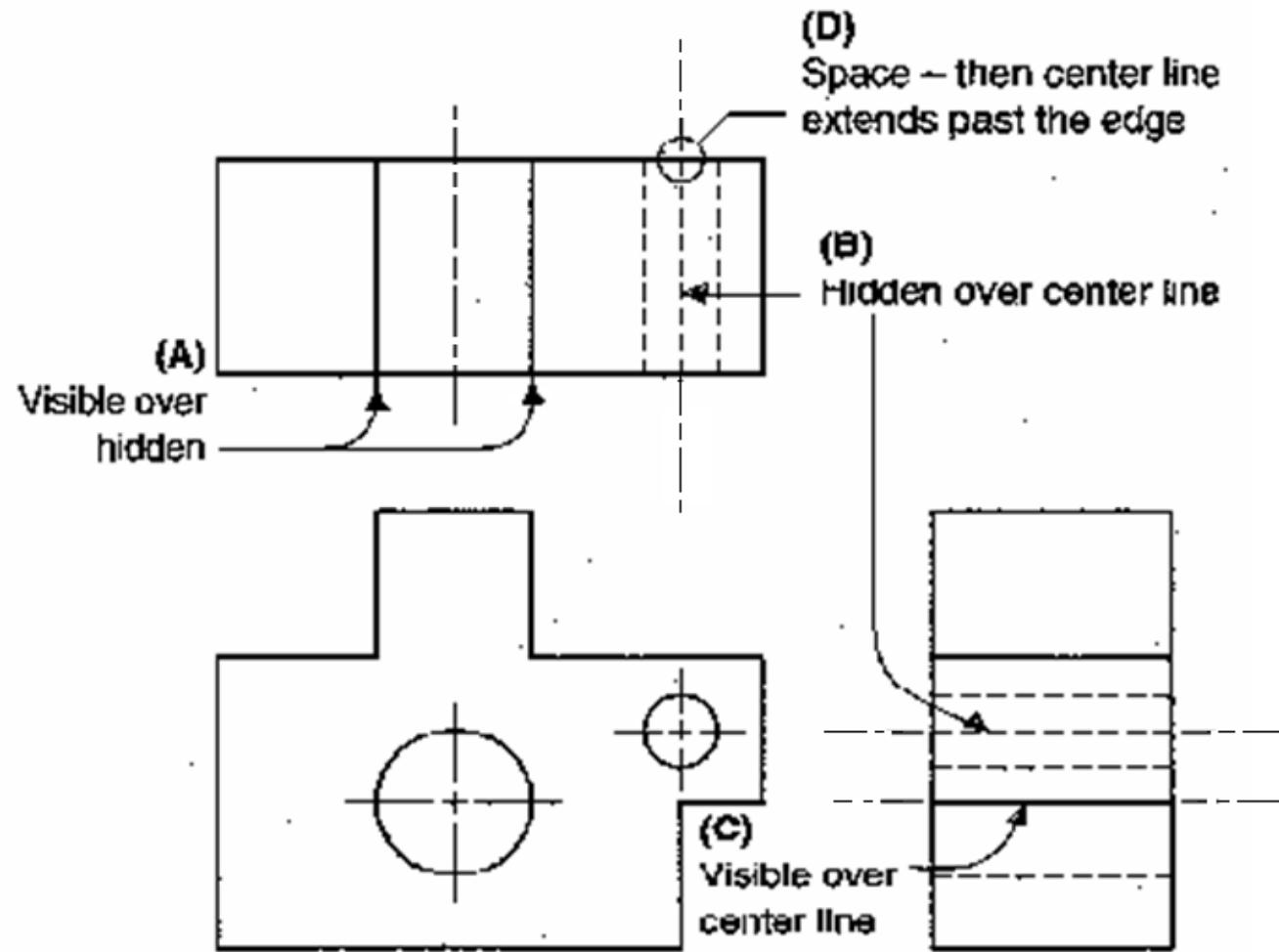
- *Hidden lines* take precedence over center lines



- *Center lines* have lowest precedence



Example: Application of Precedence

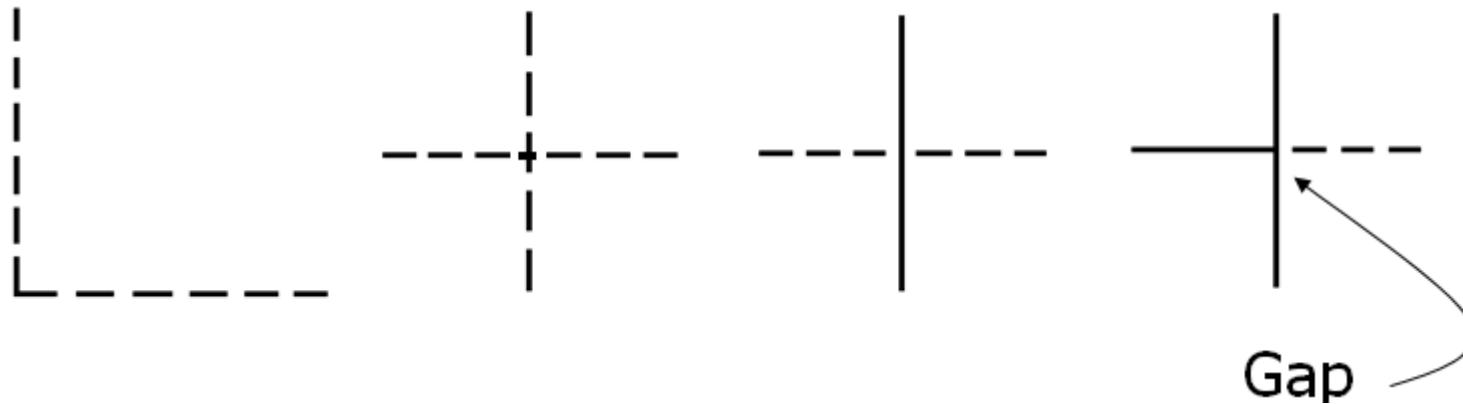


Intersecting Lines in Orthographic Projections

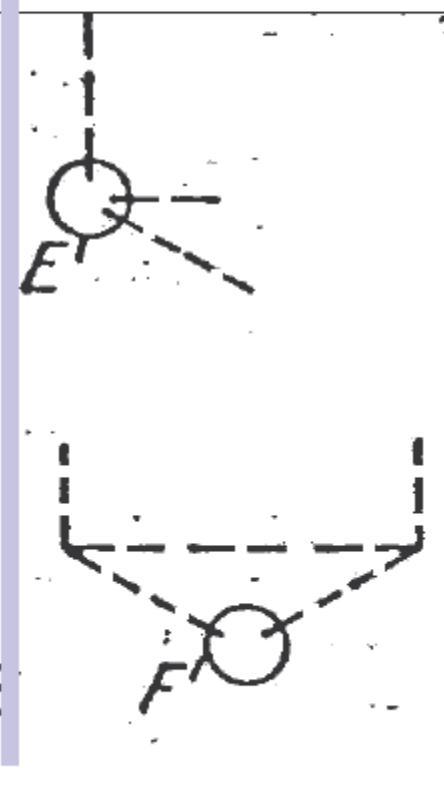
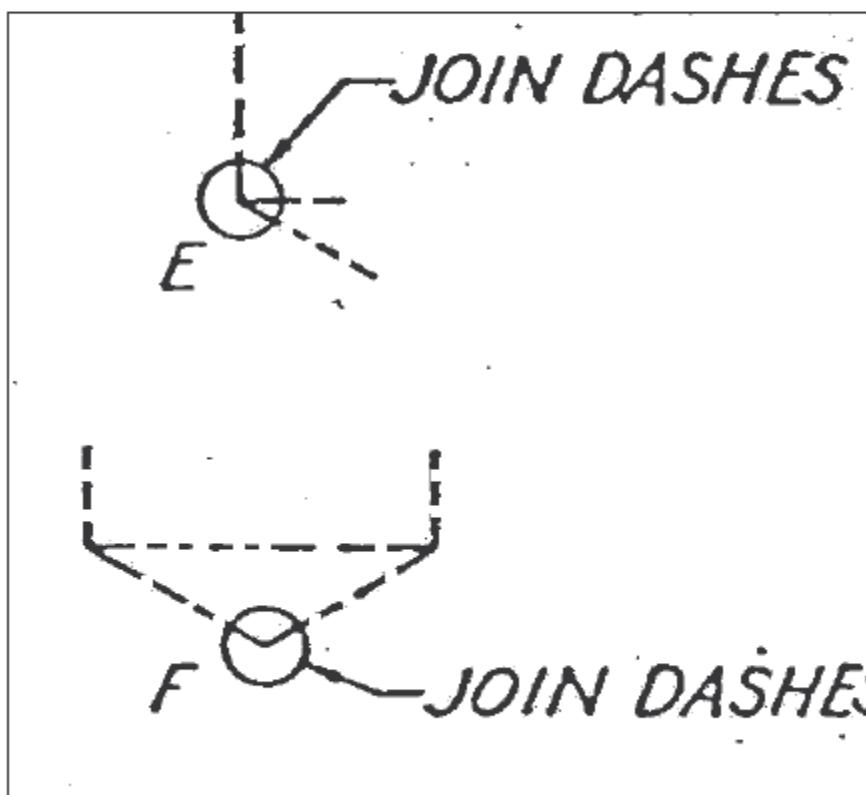
Solid Line Intersections

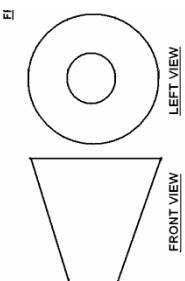
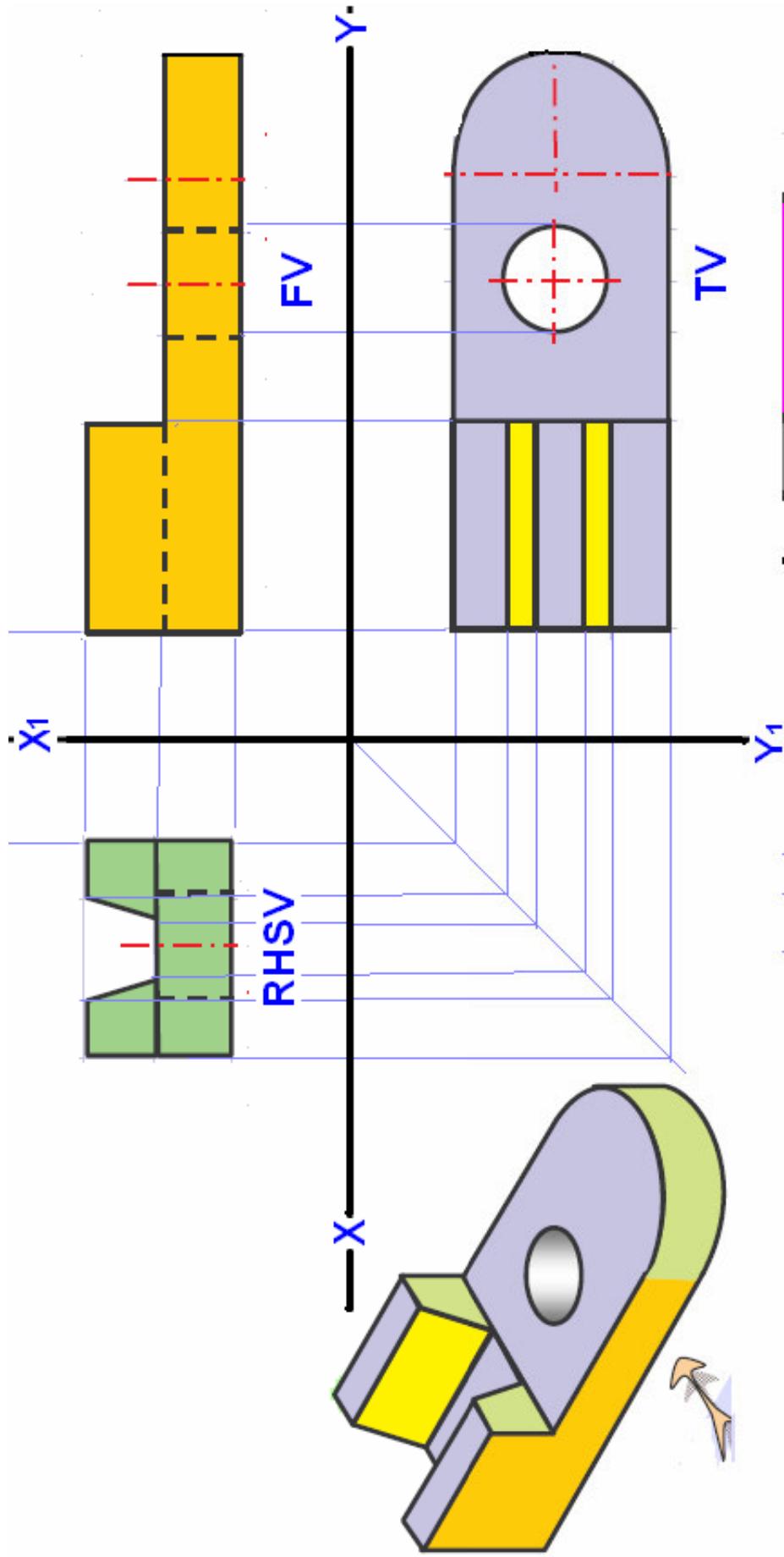


Dashed Line Special Case Intersections



Intersection of hidden line





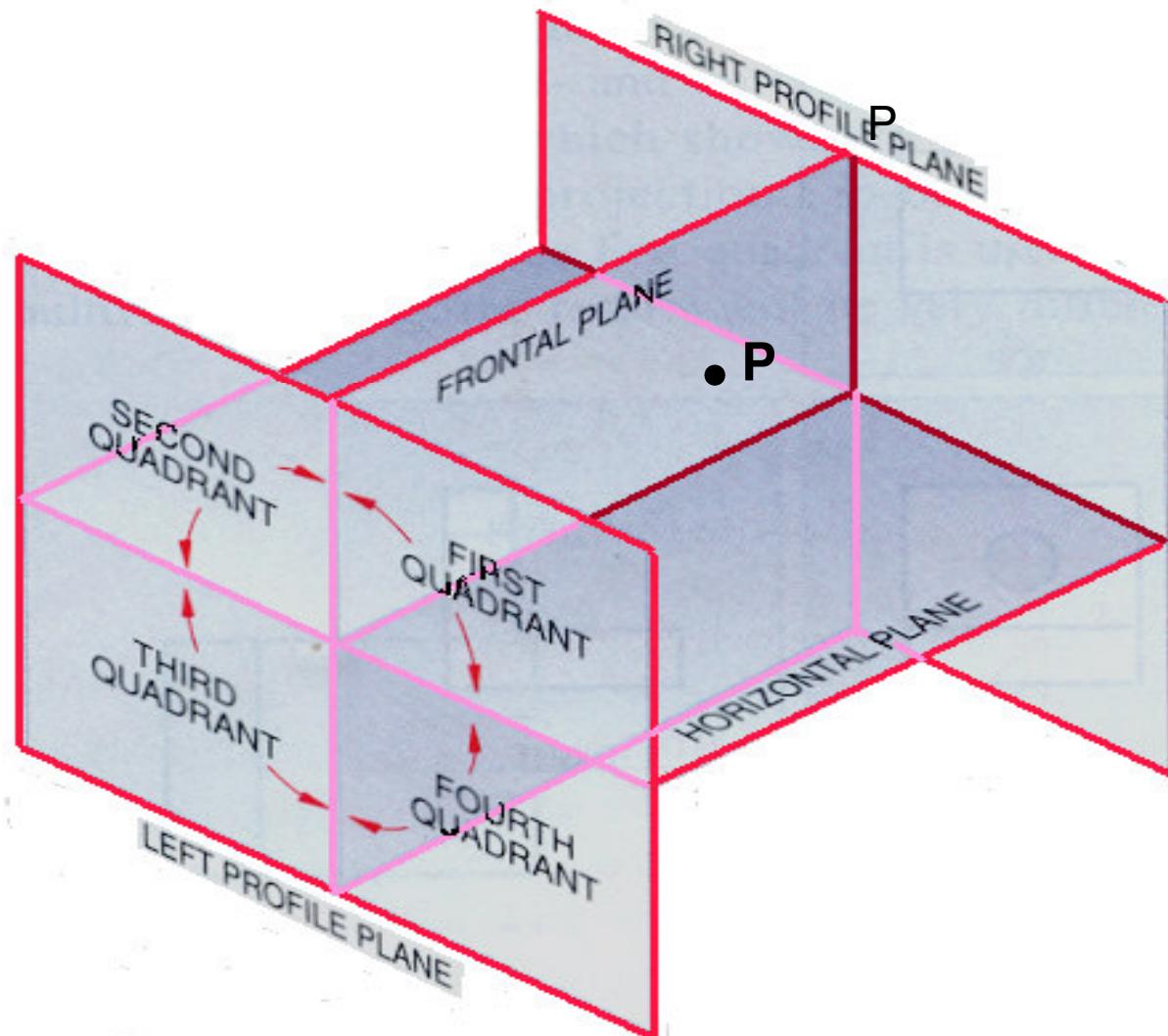
Projection of Points

(Orthographic)

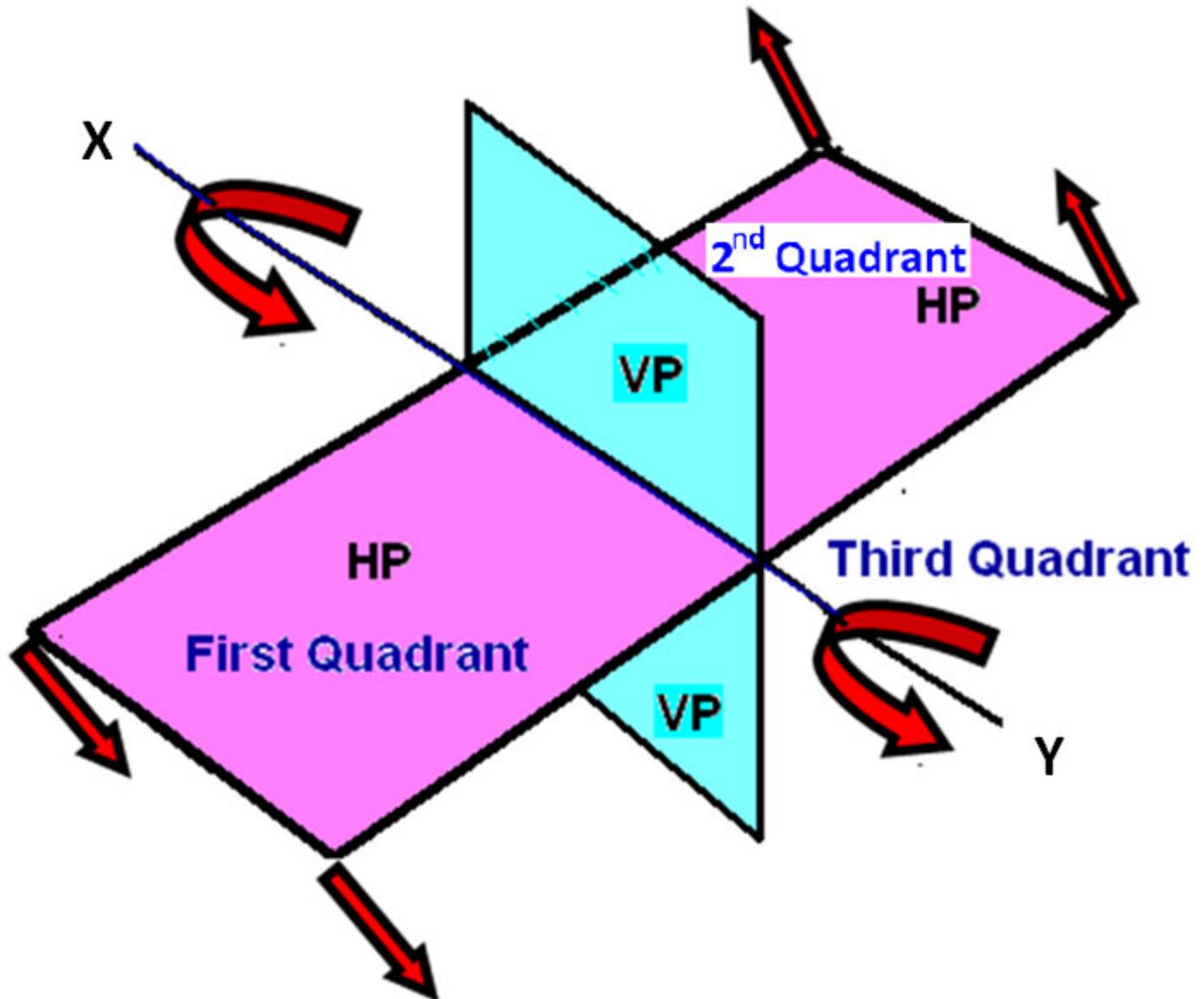
A POINT

Define its position with respect to the coordinates.

With respect to the VP, HP, & PP



Direction of rotation of the HP

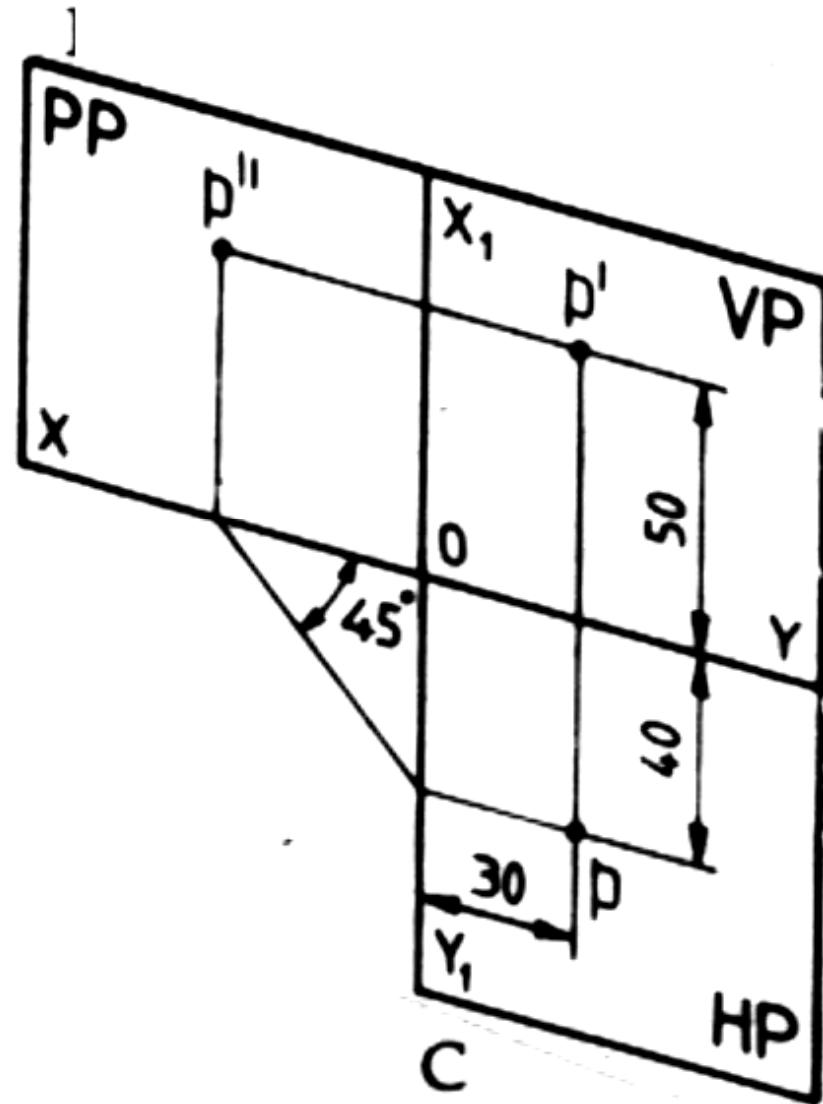


Convention

- Top views are represented by only small letters eg. a .
- Their front views are conventionally represented by small letters with dashes eg. a'
- Profile or side views are represented by small letters with double dashes eg. a''

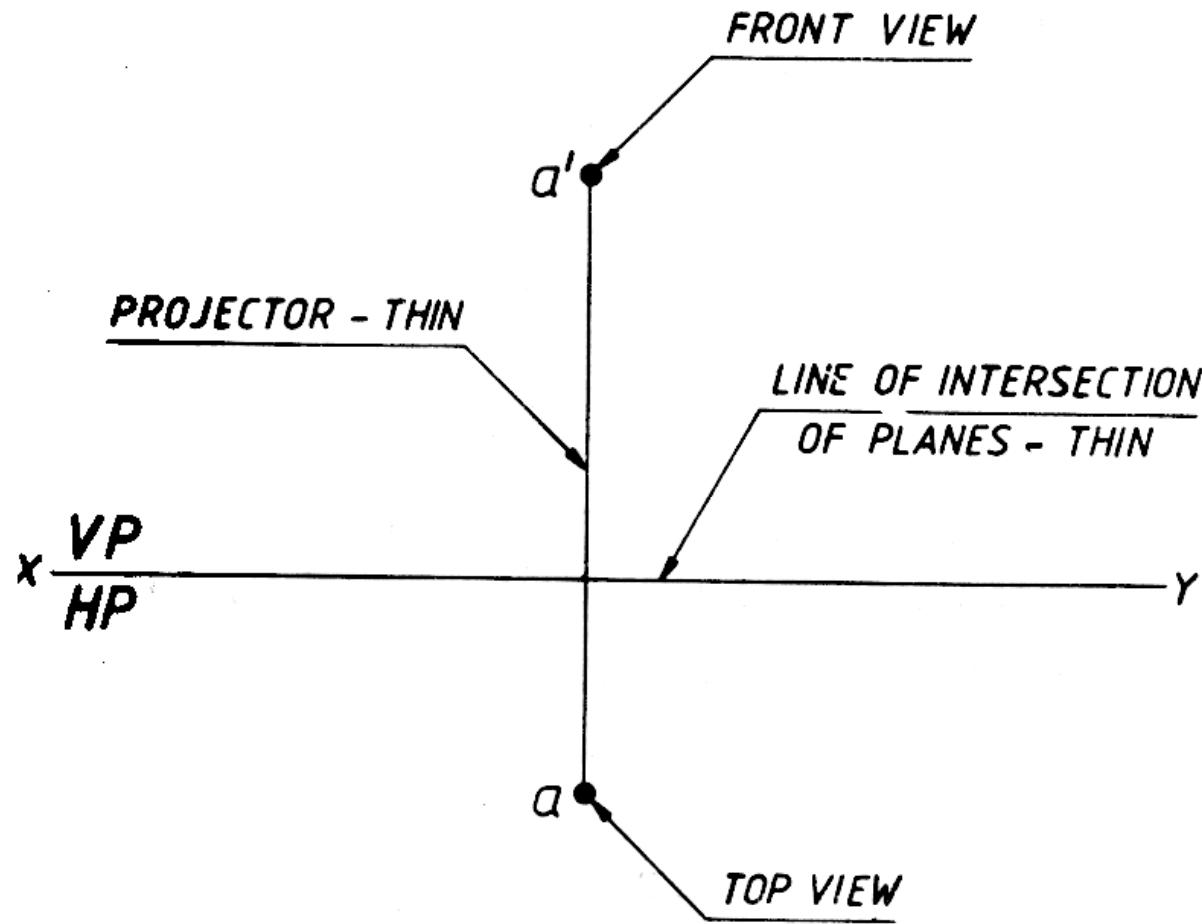
Convention

- The line of intersection of HP and VP is denoted as XY.
- The line of intersection of VP and PP is denoted as X_1Y_1



HP & PP Completely rotated

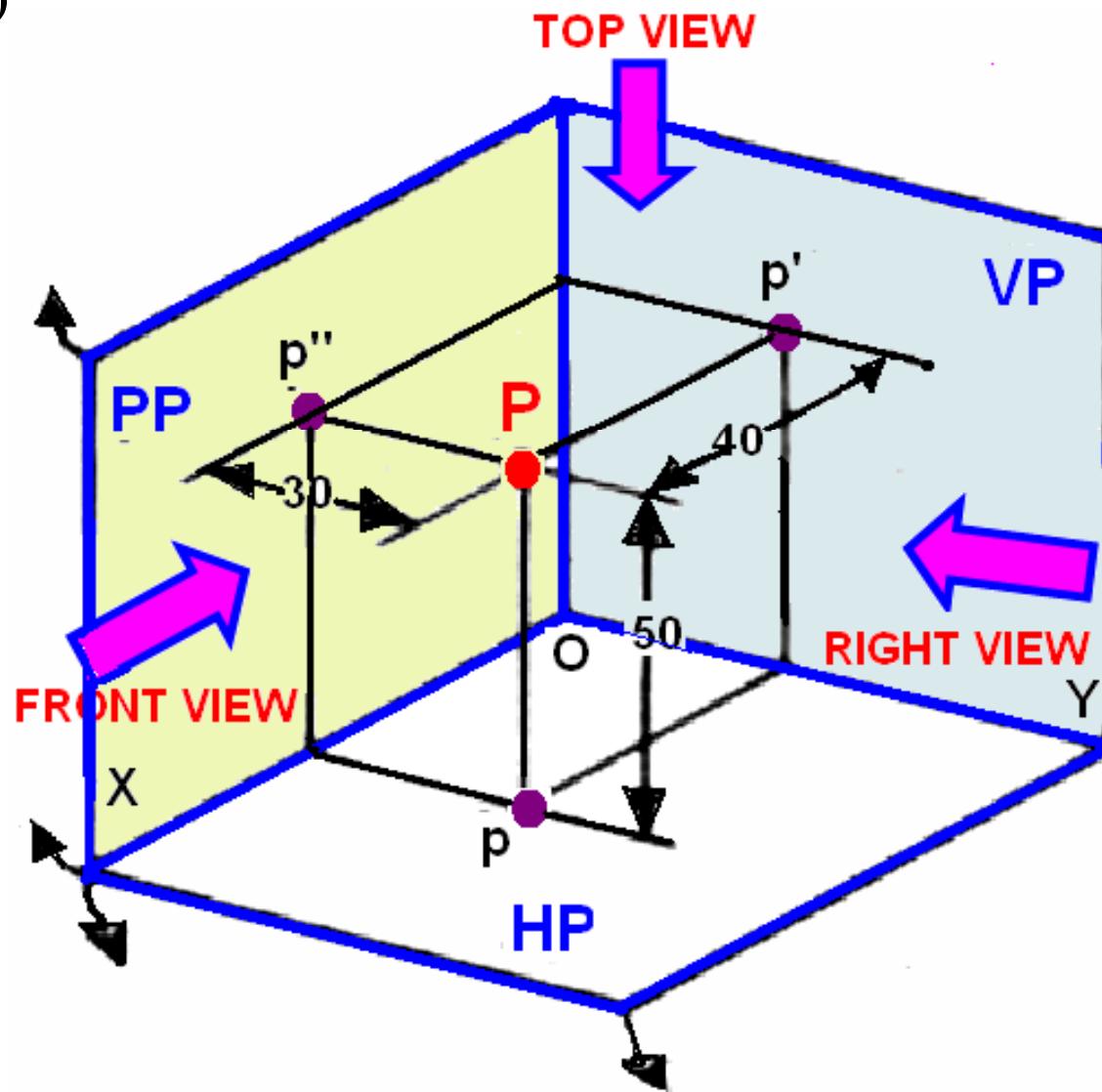
Convention



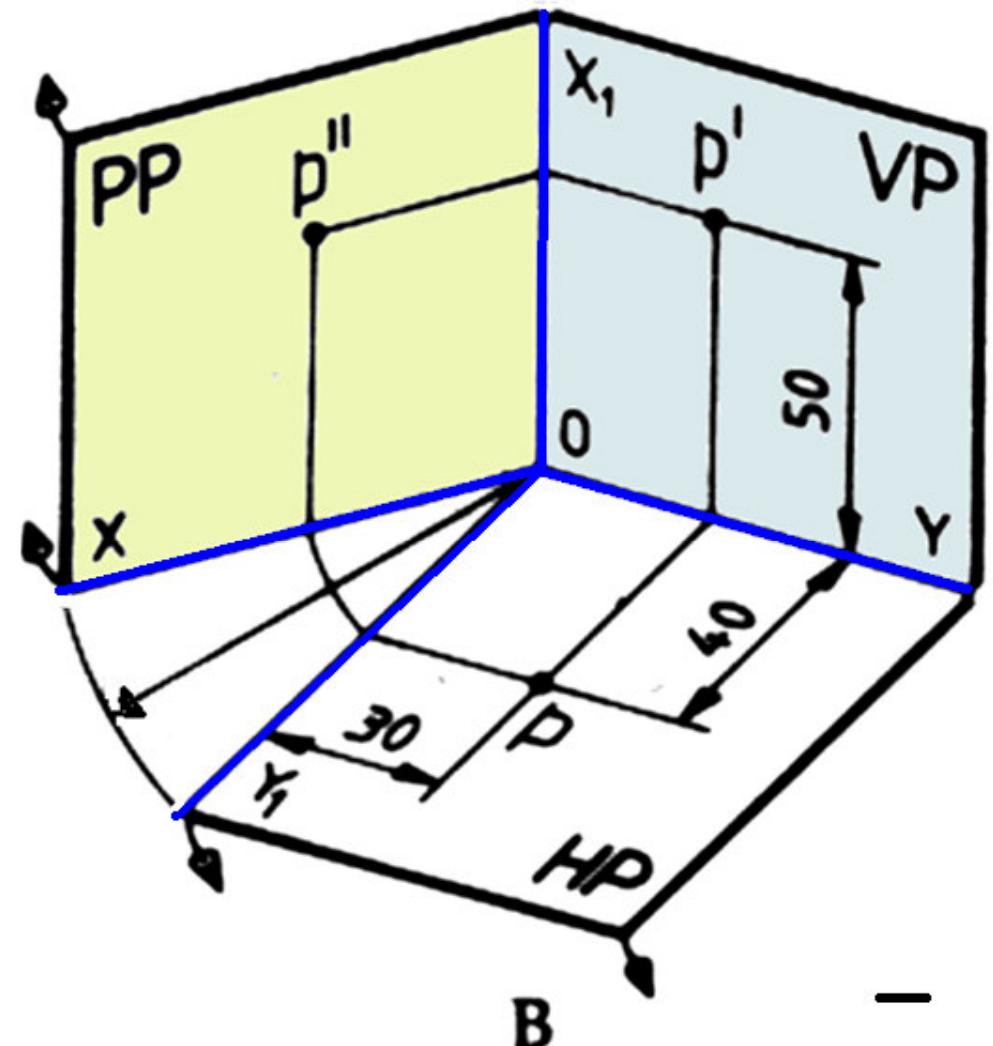
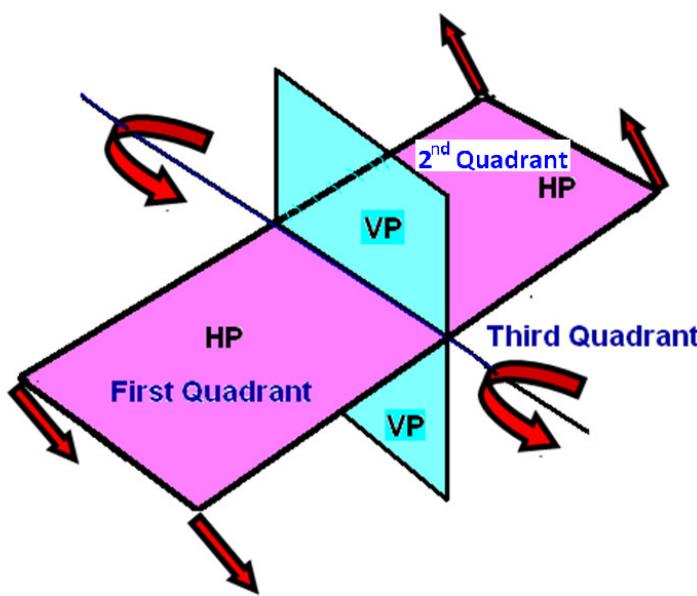
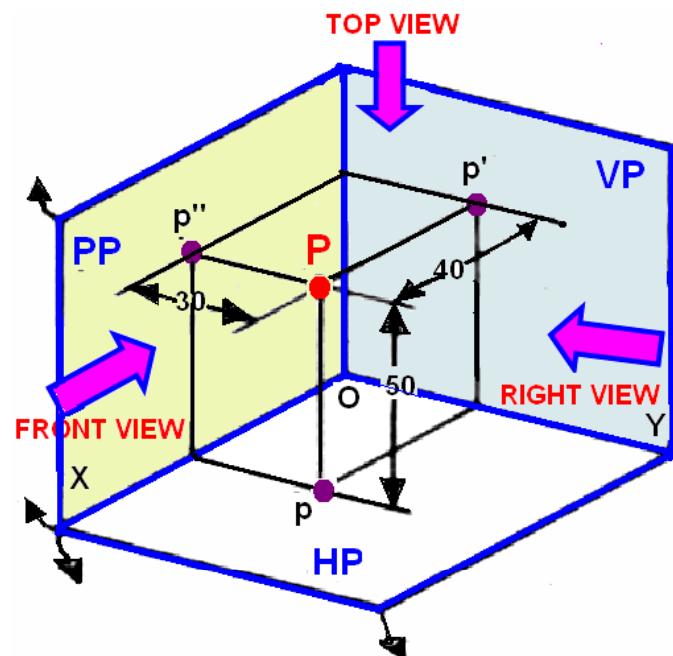
- Projectors and the lines of the intersection of planes of projections are shown as thin lines.

Point in the First quadrant

Point P is 40 mm in front of VP, 50 mm above HP, 30 mm in front of left profile plane (PP)

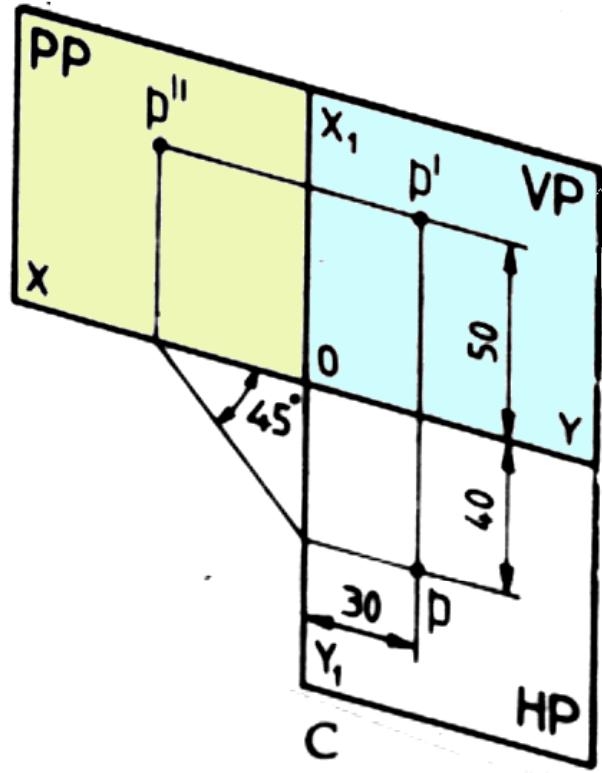


Point in the First quadrant

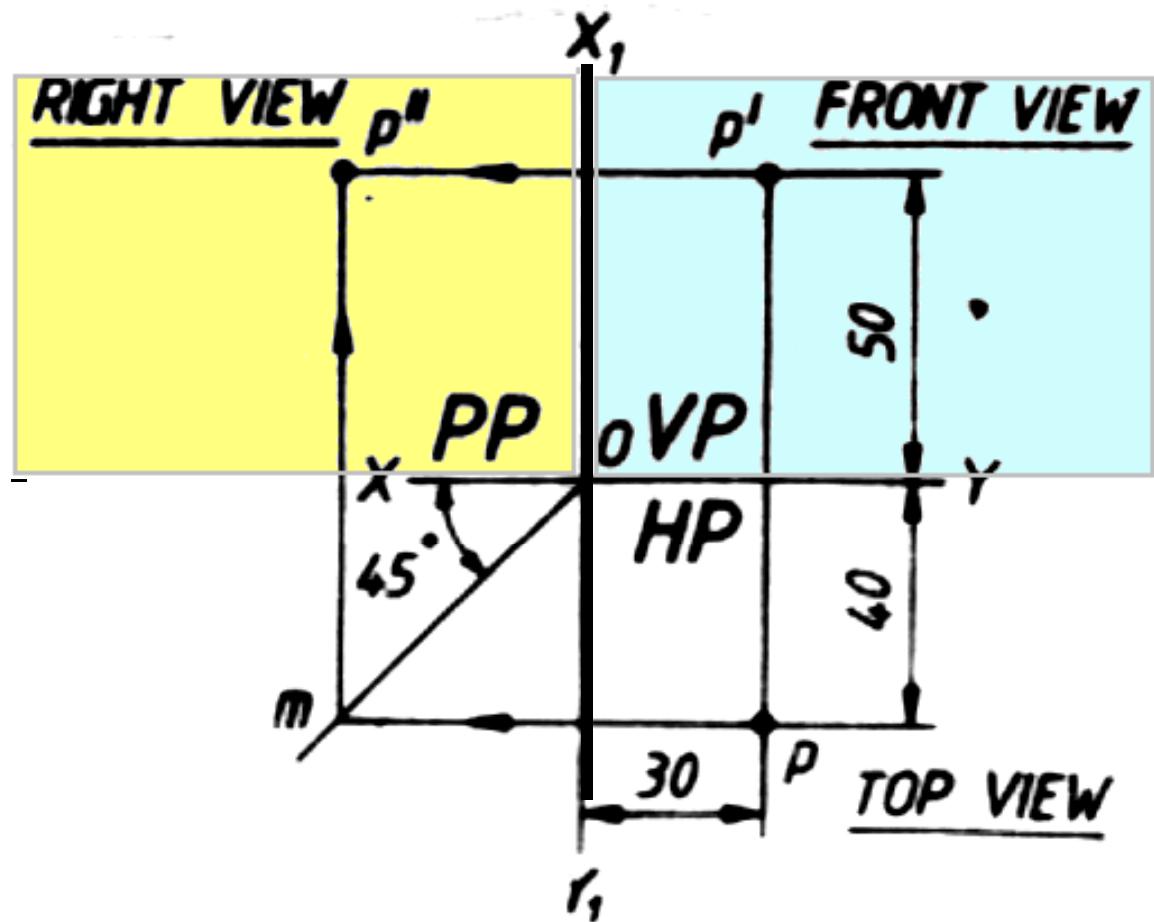


HP & PP Partly rotated

Point in the First quadrant



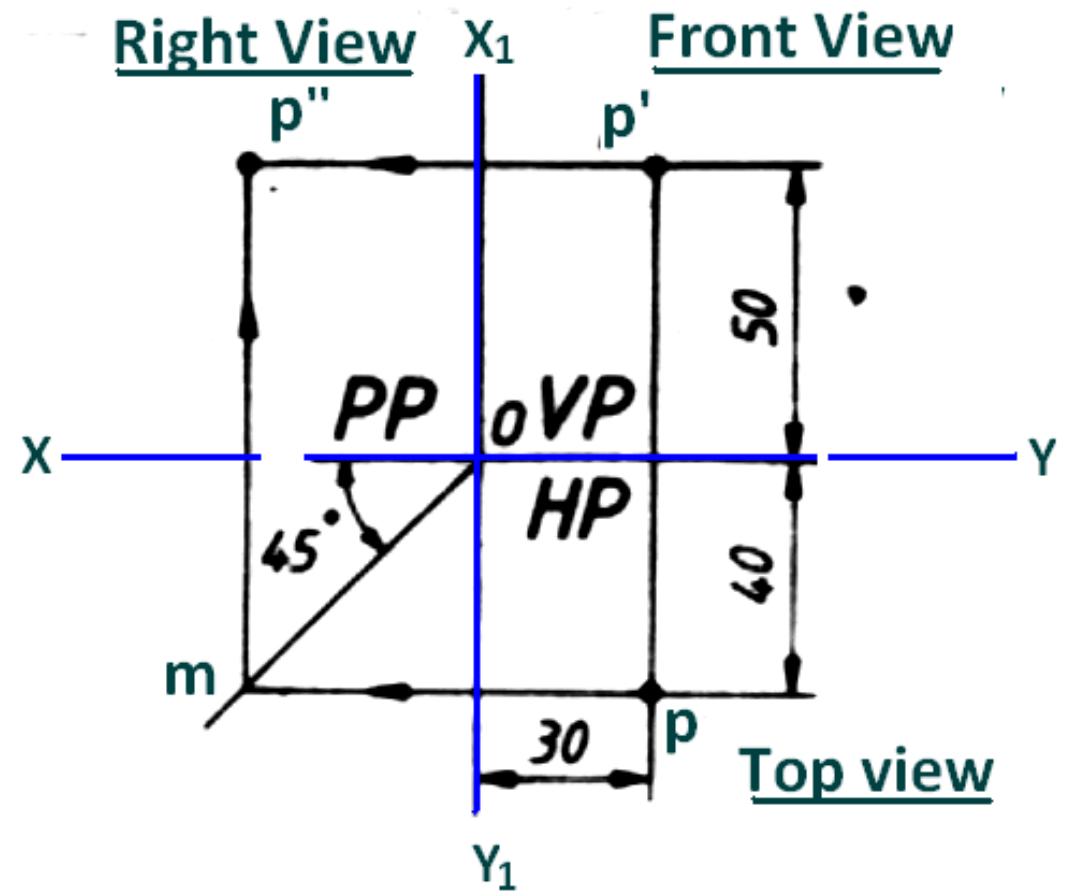
HP & PP Completely rotated



Point in the First quadrant

Procedure

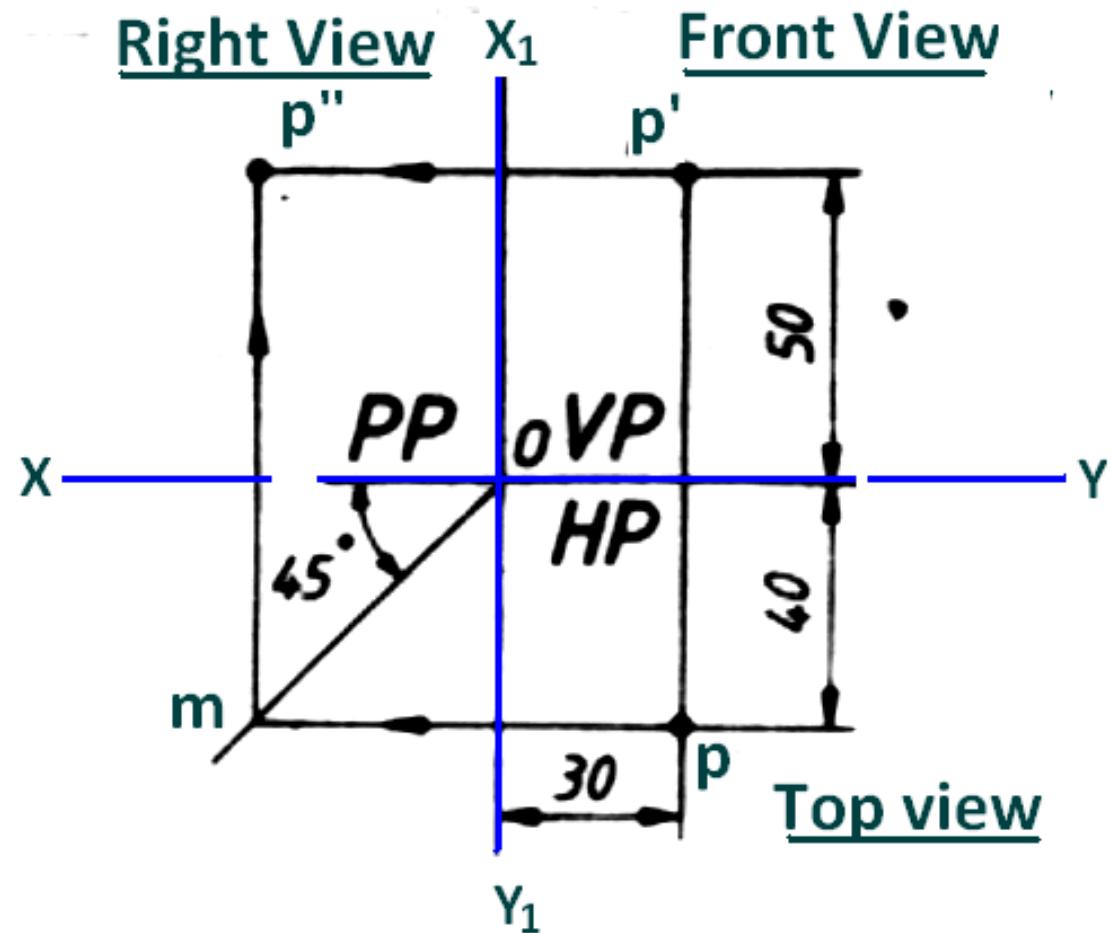
- Draw a thin horizontal line, XY, to represent the line of intersection of HP and VP.
- Draw X₁Y₁ line to represent the line of intersection of VP and PP.
- **Draw the Top View (p).**
- Draw the projector line
- **Draw the Front View (p')**



Point in the First quadrant

Procedure

- To project the right view on the left PP, draw a horizontal projector through p' to intersect the 45 degree line at m .
- through m draw a vertical projector to intersect the horizontal projector drawn through p' at p'' .
- p'' is the right view of point P





Thank you