Multiview Drawing

Definition:

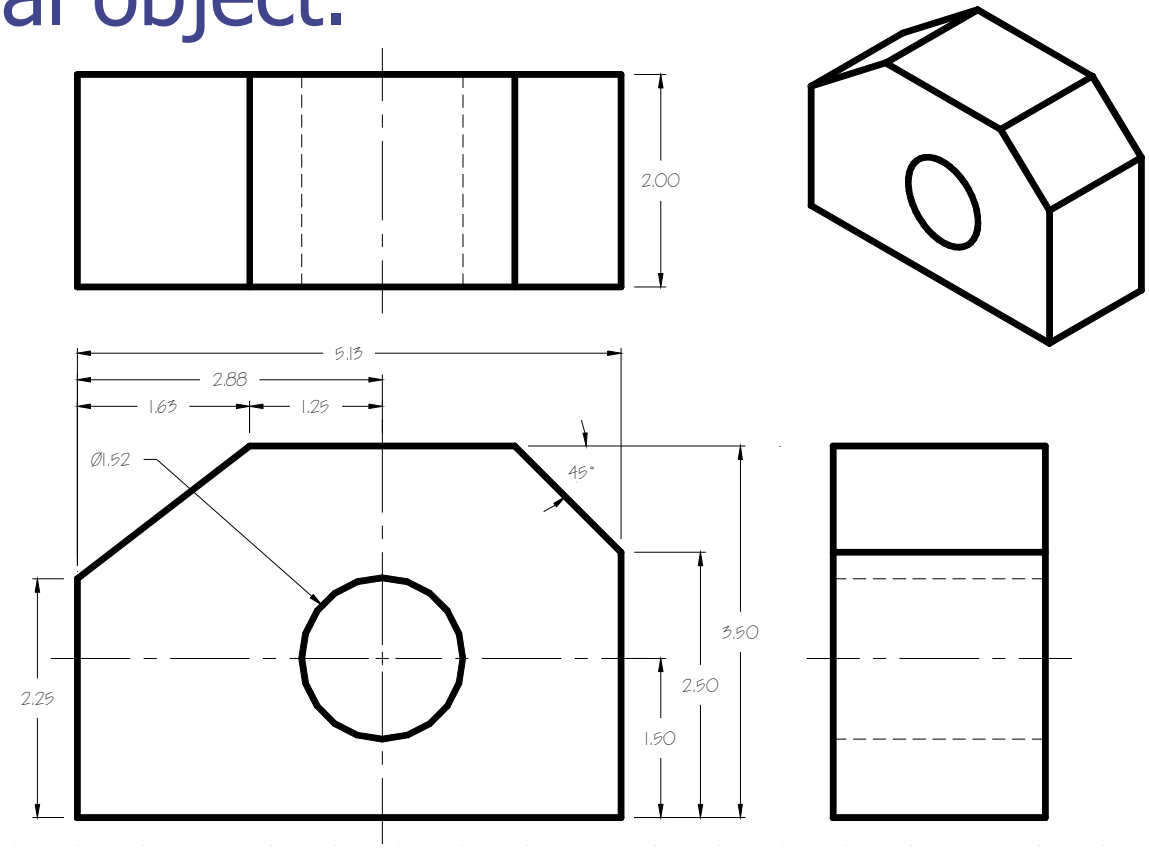
Graphical representation of a 3-dimensional object on one plane (sheet of paper) using two or more views.

Multiview Drawing

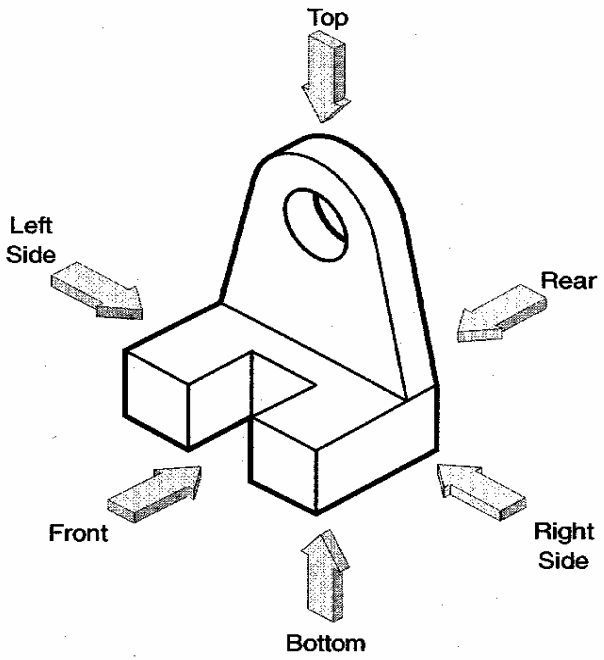
- Another name for multiview drawing is *orthographic projection*.
- Involves visualization and implementation
  - Ability to see clearly in the mind's eye an object
  - Process of drawing the object

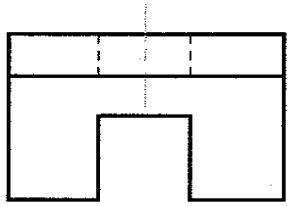
Orthographic Projection

- A system that allows you to make a two-dimensional drawing of a three-dimensional object.



Six Principal Orthographic Views

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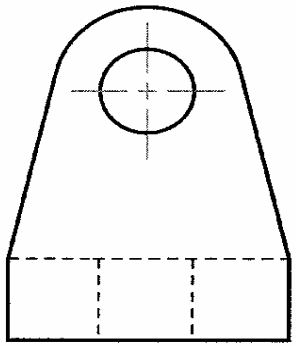
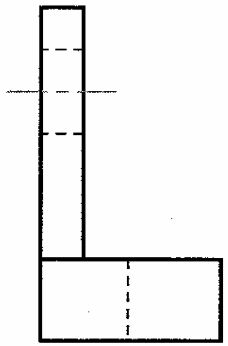
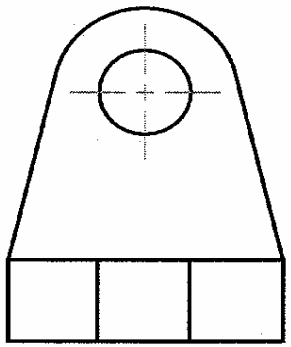
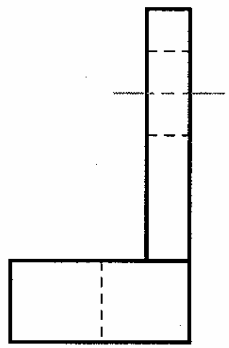

Rear


Left Side


Front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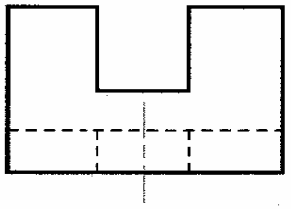
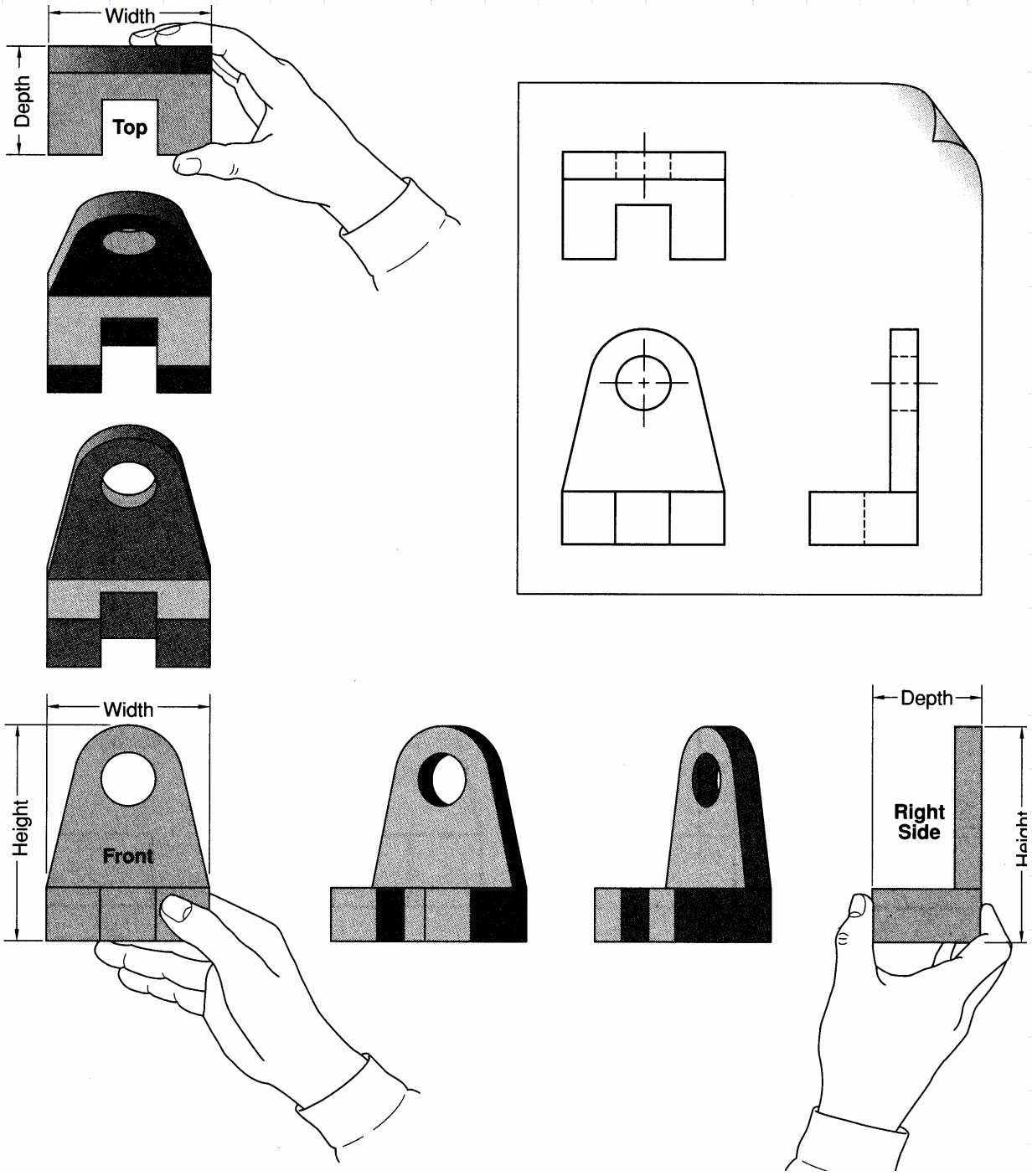
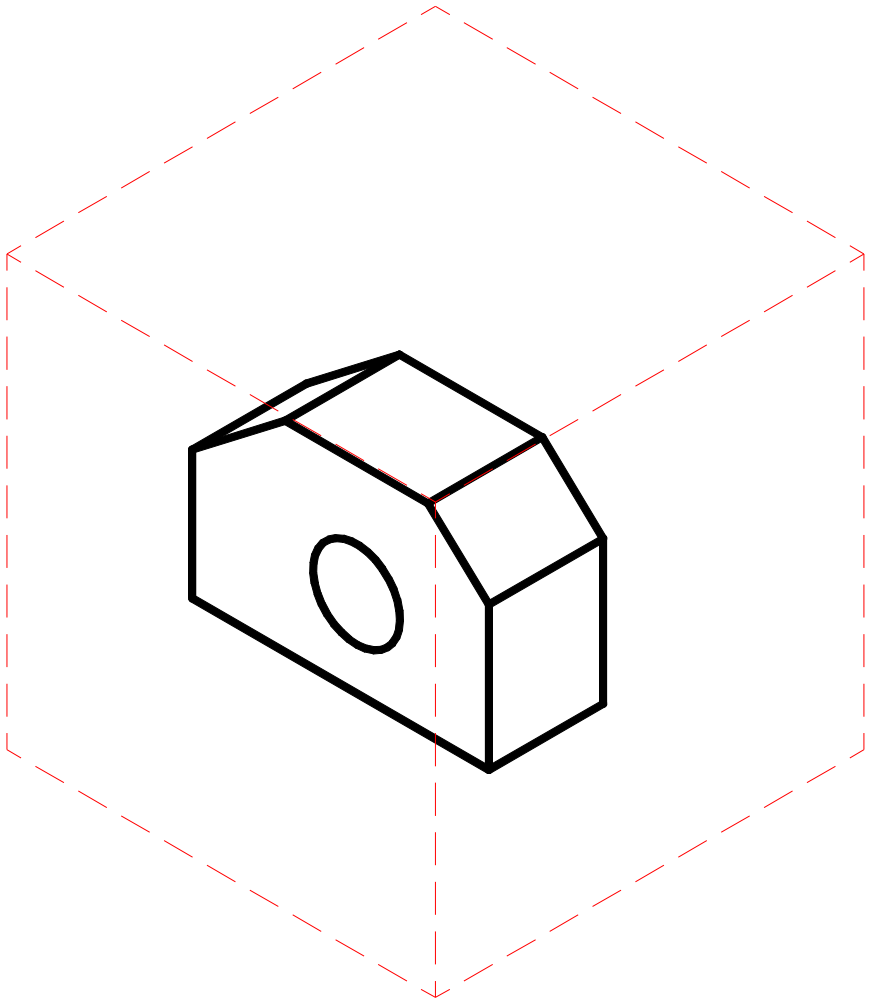

Bottom


Width
Depth
Top
Width
Height
Front
Depth
Right
Side
Height

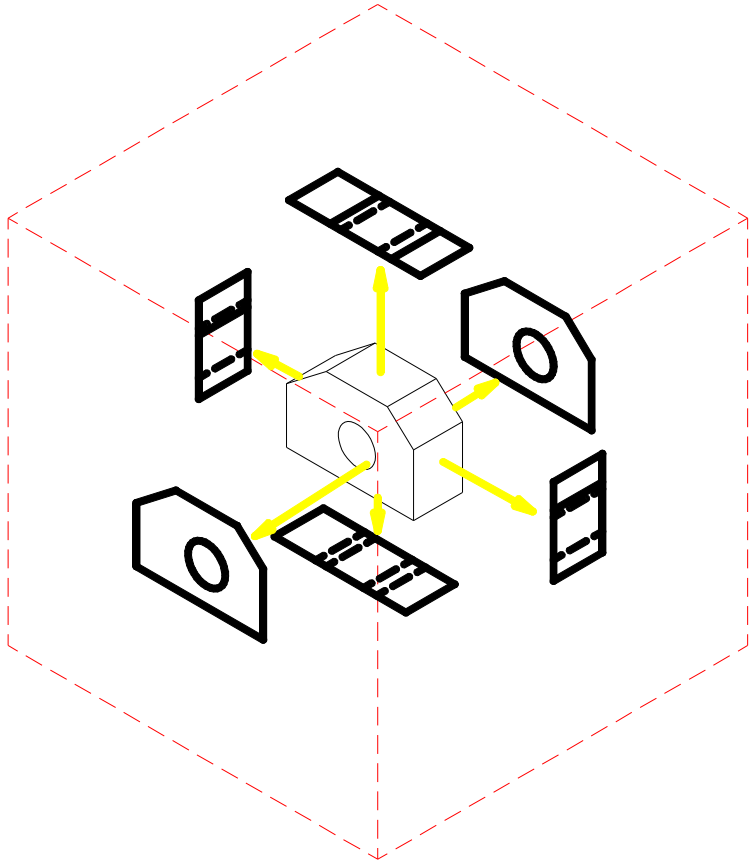
Viewing Objects

- Imagine a glass box is formed by six mutually perpendicular planes of projection that are located around the object.

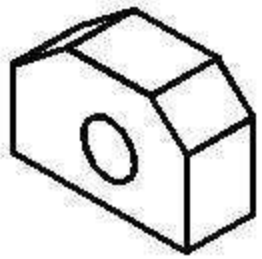


Viewing Objects

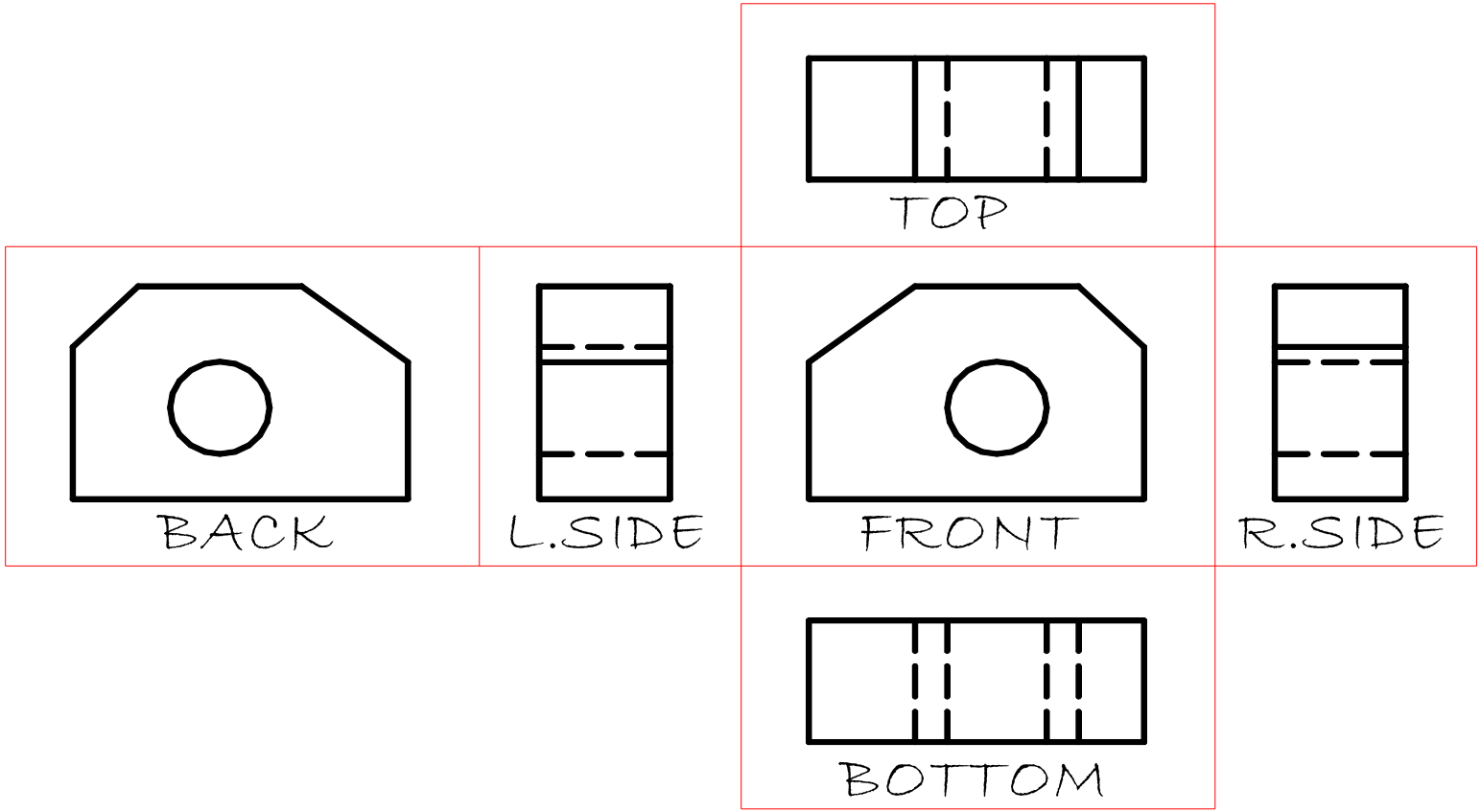
- Lines are formed on the planes by projecting the edges of the object onto the planes.
  - These images are called “views”.
  - There are six views formed by the planes of a box.



Viewing Objects

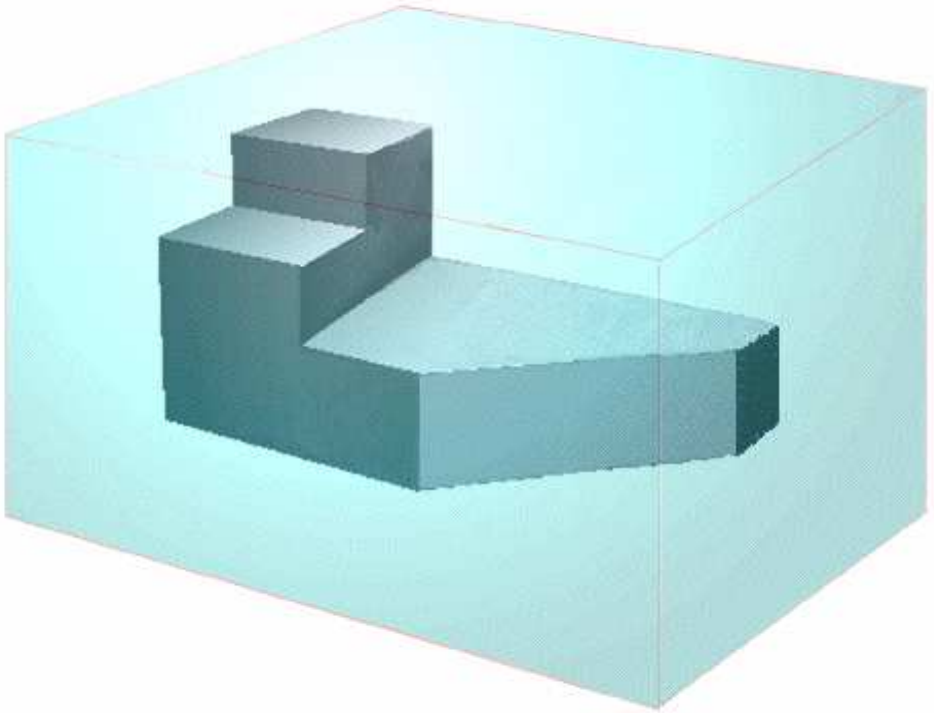


- Unfolding the box produces an arrangement of the six views.

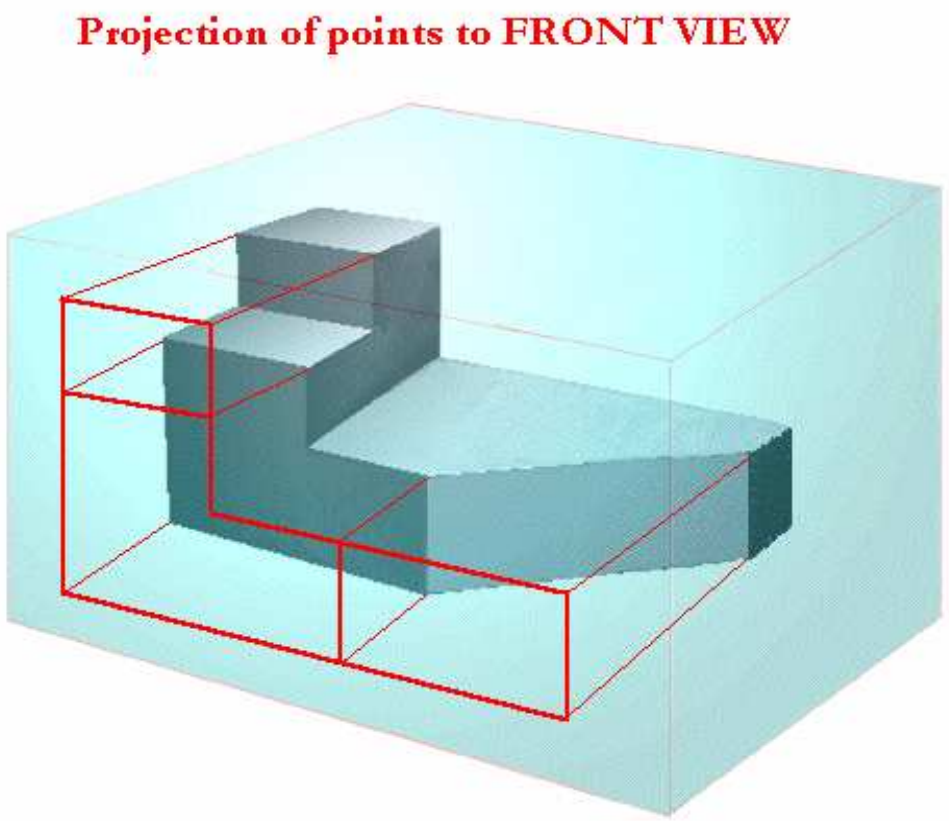


Glass Box Approach

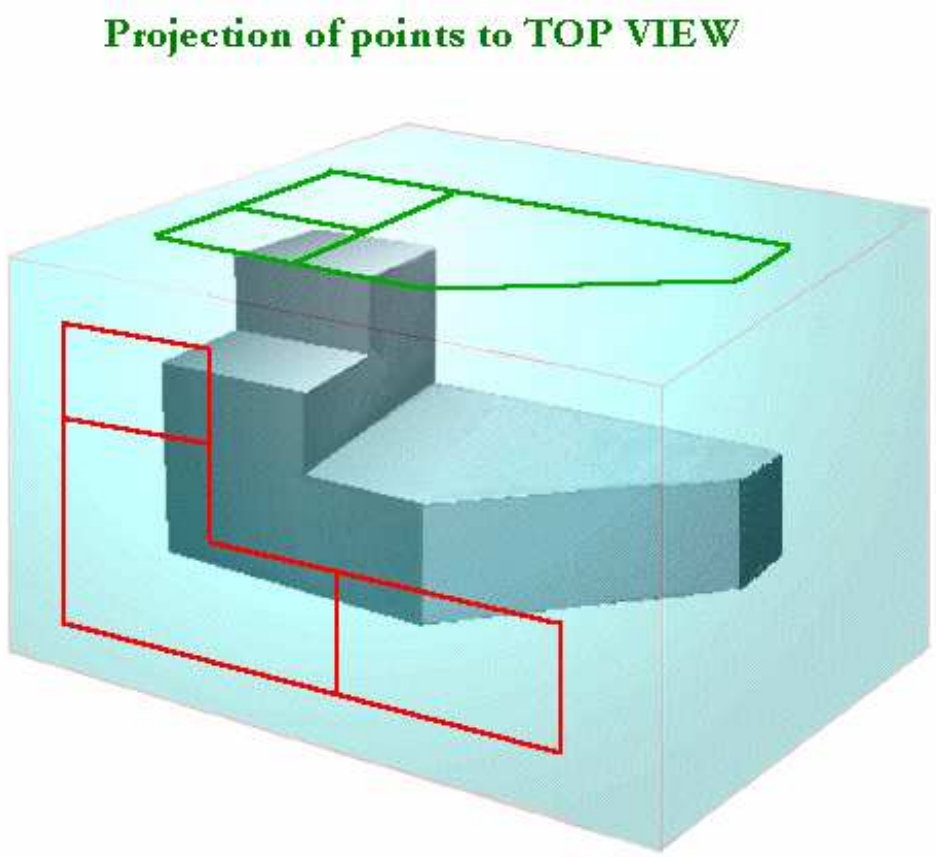
Projection of points to the three views



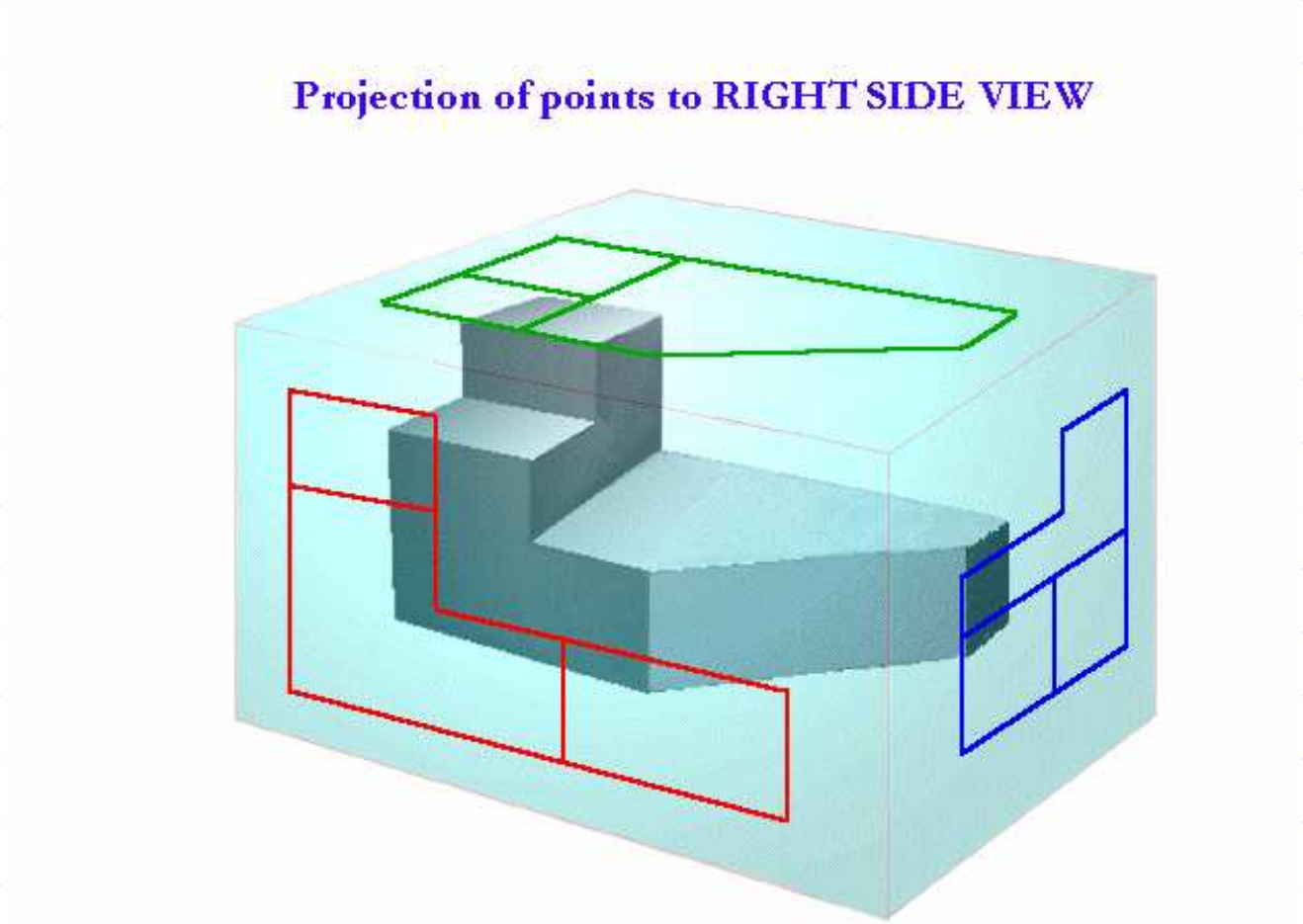
Glass Box Approach



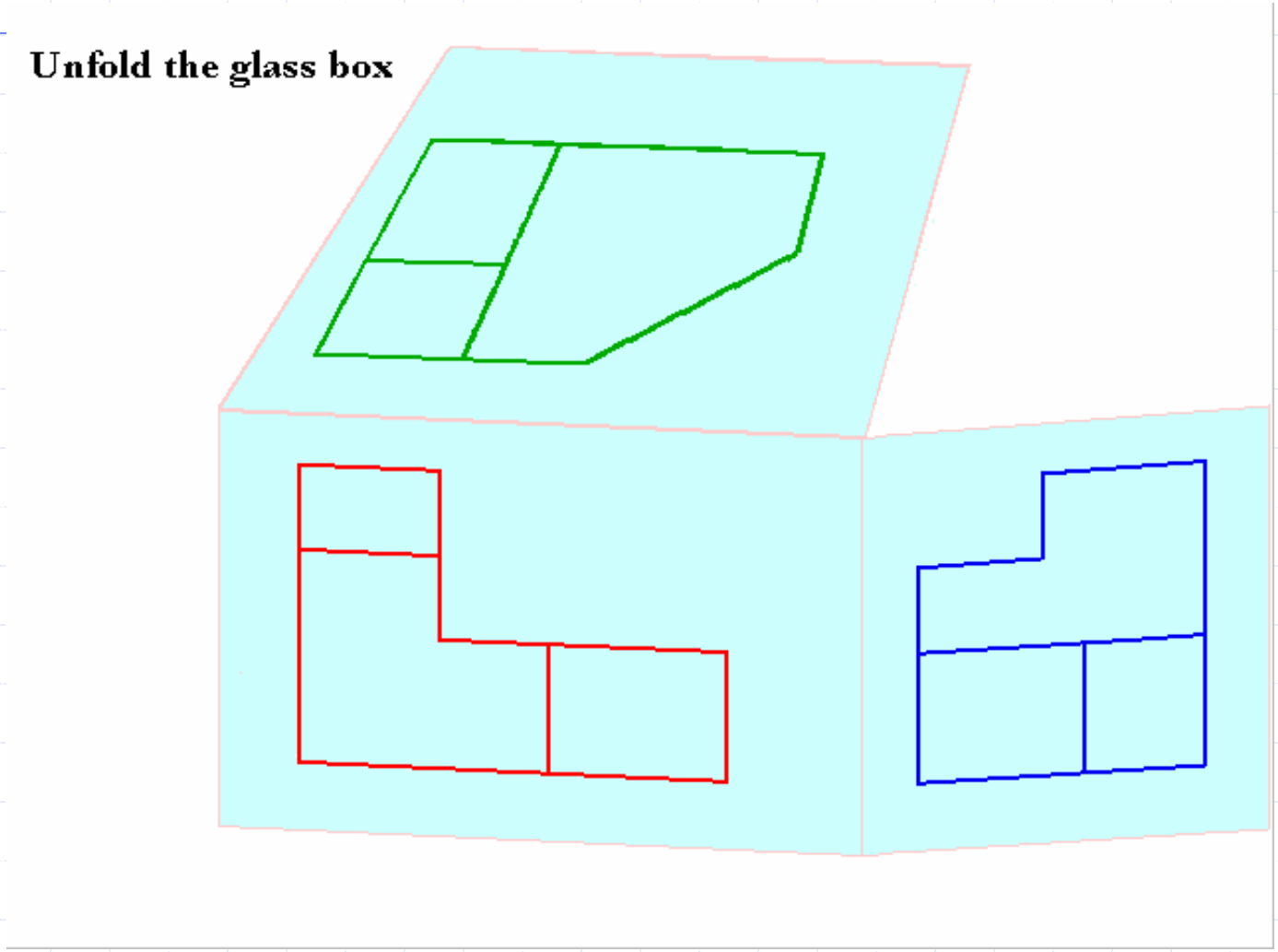
Glass Box Approach



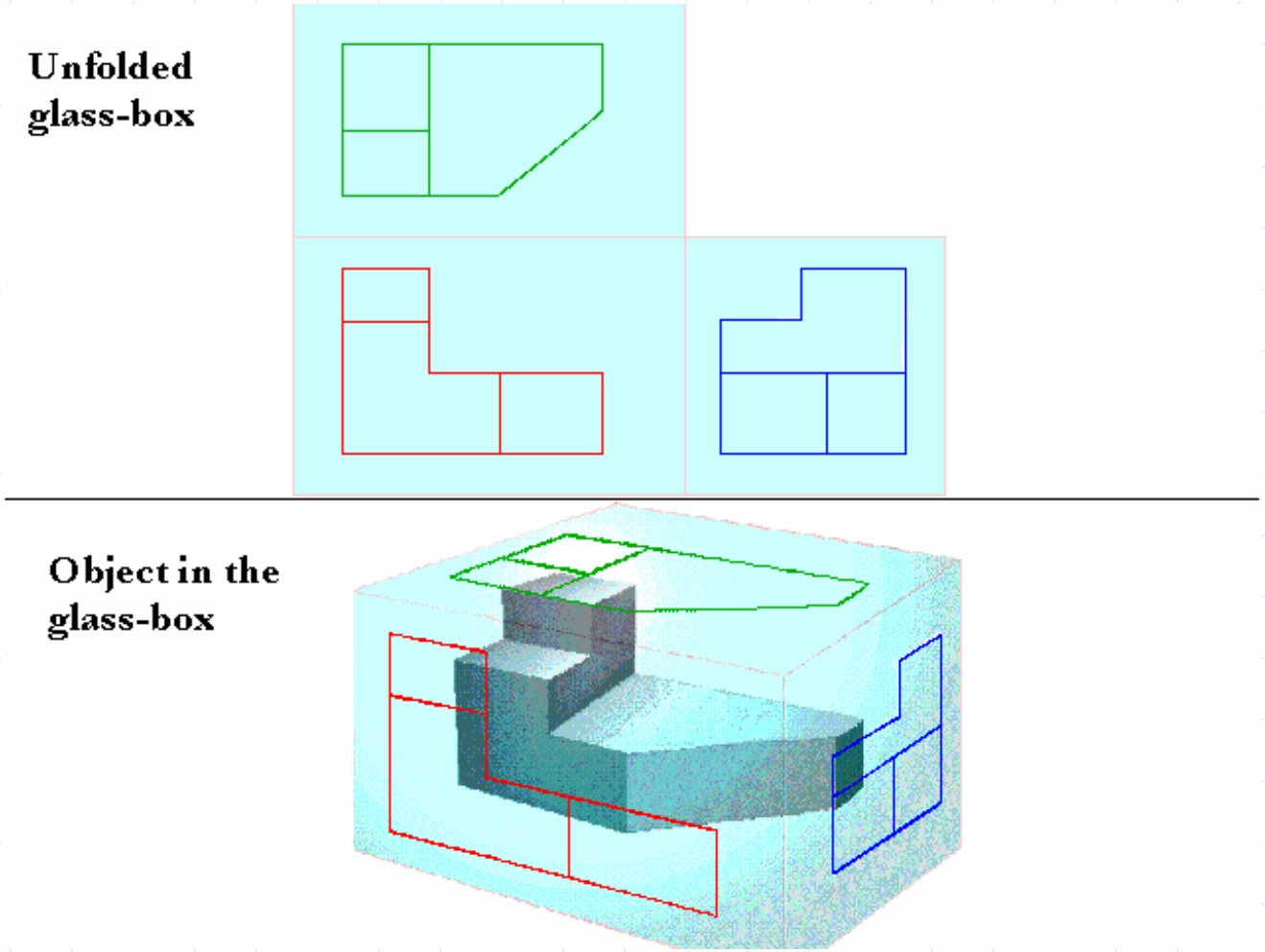
Glass Box Approach



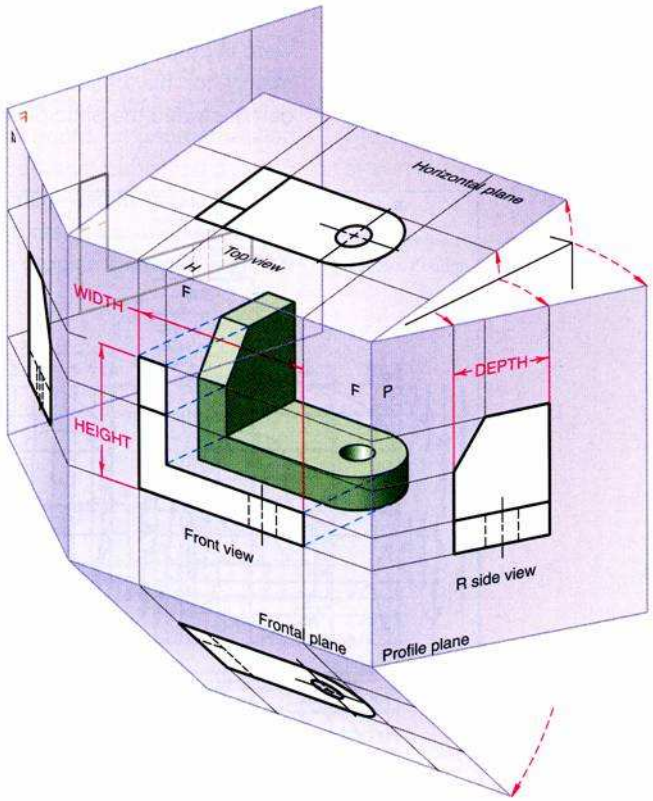
Glass Box Approach

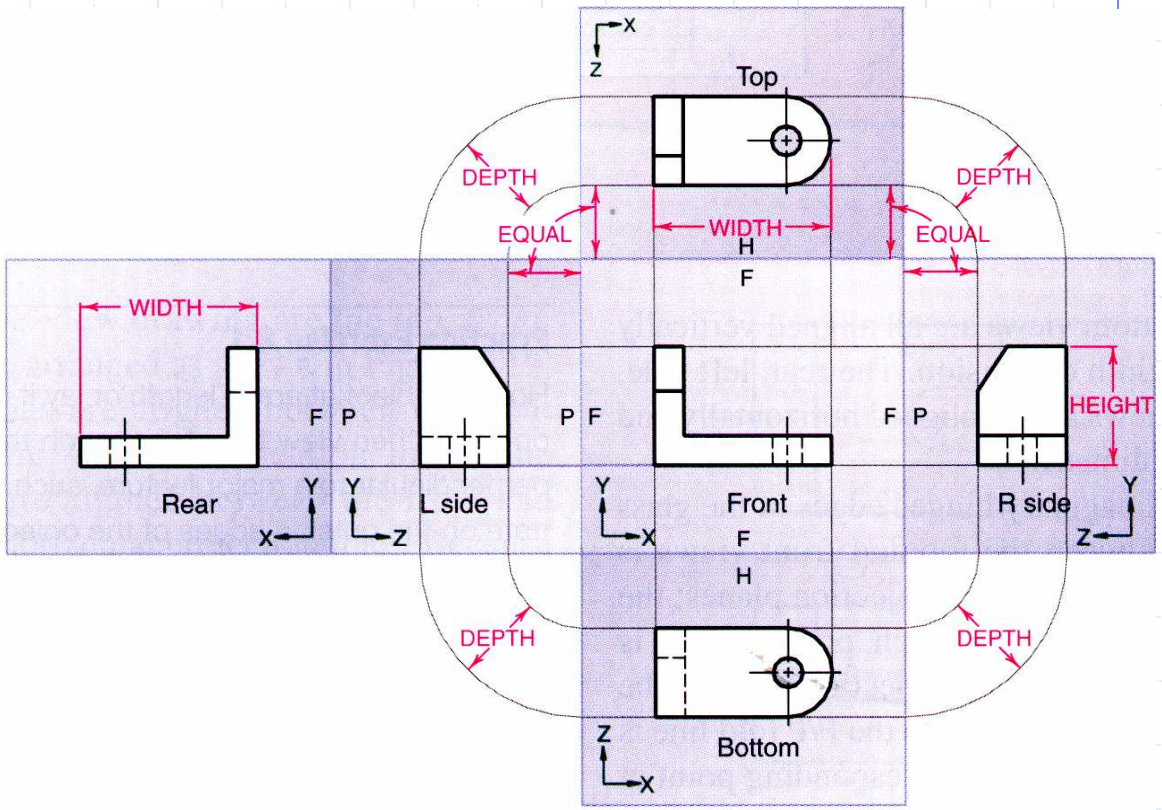


Glass Box Approach



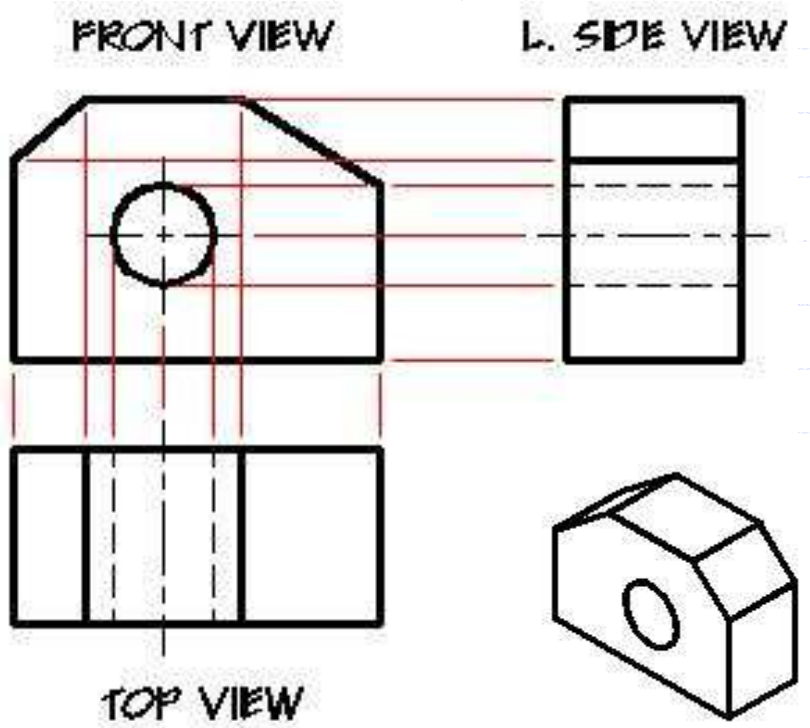
Standard 2D views



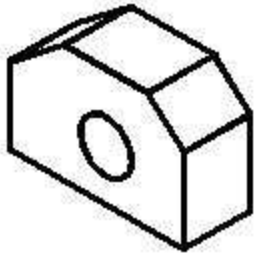


Angles of Projection

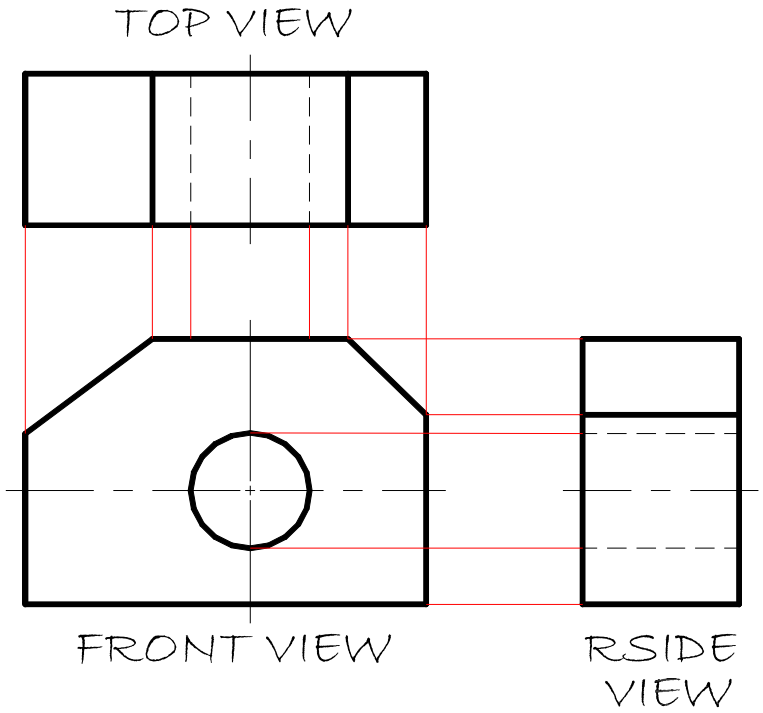
- First-angle projection
  - Used by many European countries



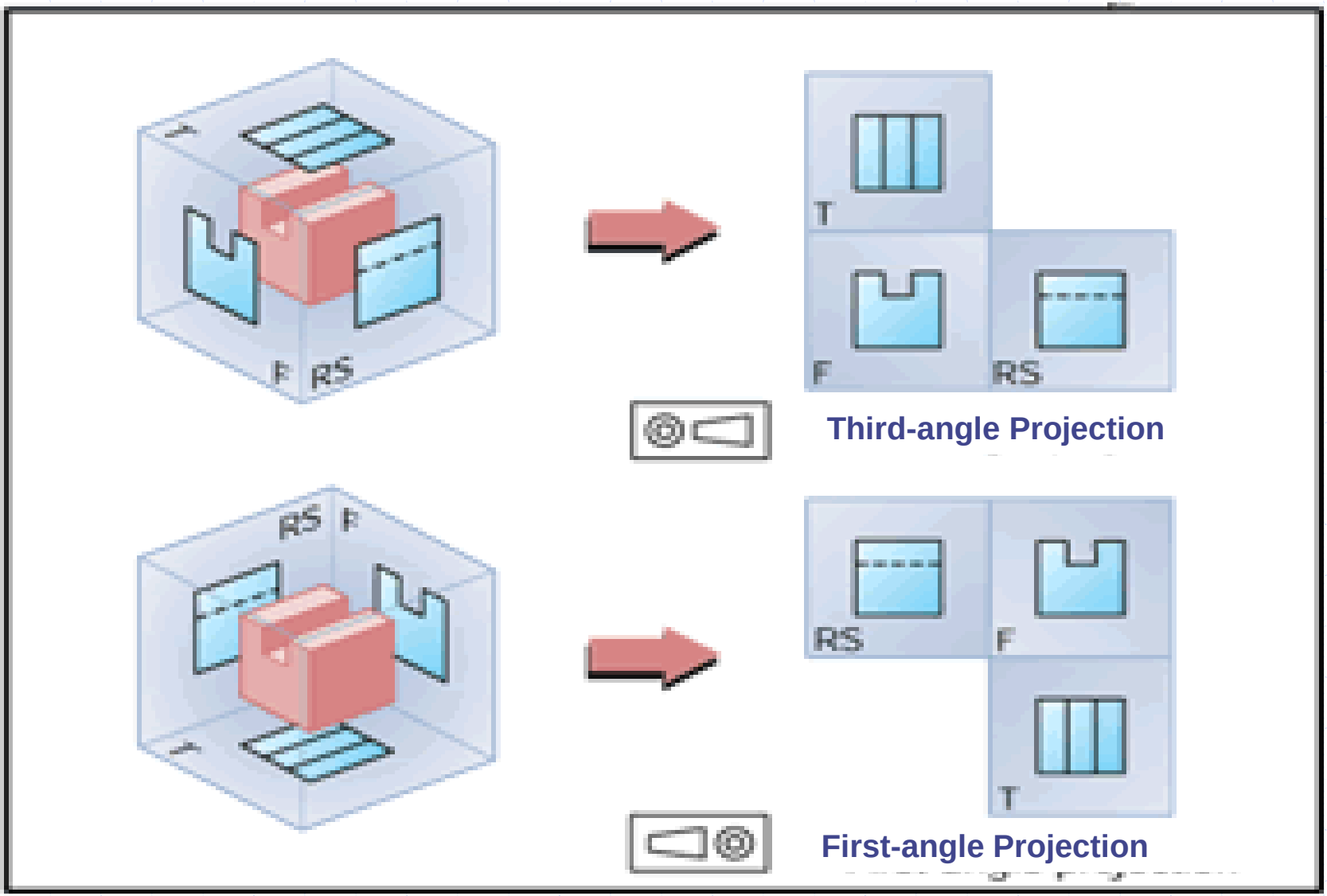
Angles of Projection



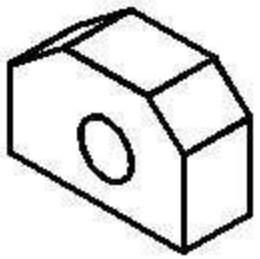
- Third-angle projection
  - Standard for the United States
    - Front view projected to ***vertical plane***
    - Top view projected to ***horizontal plane***
    - Right-side view projected to ***profile plane***



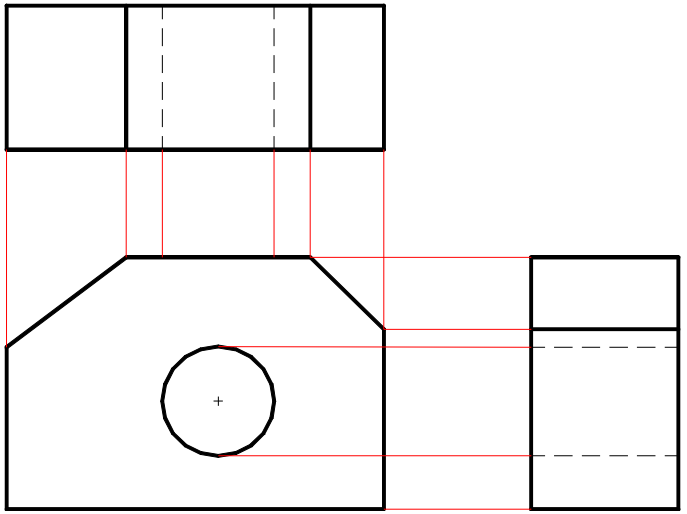
First and Third Angle Projections



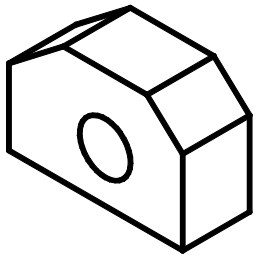
View Placement



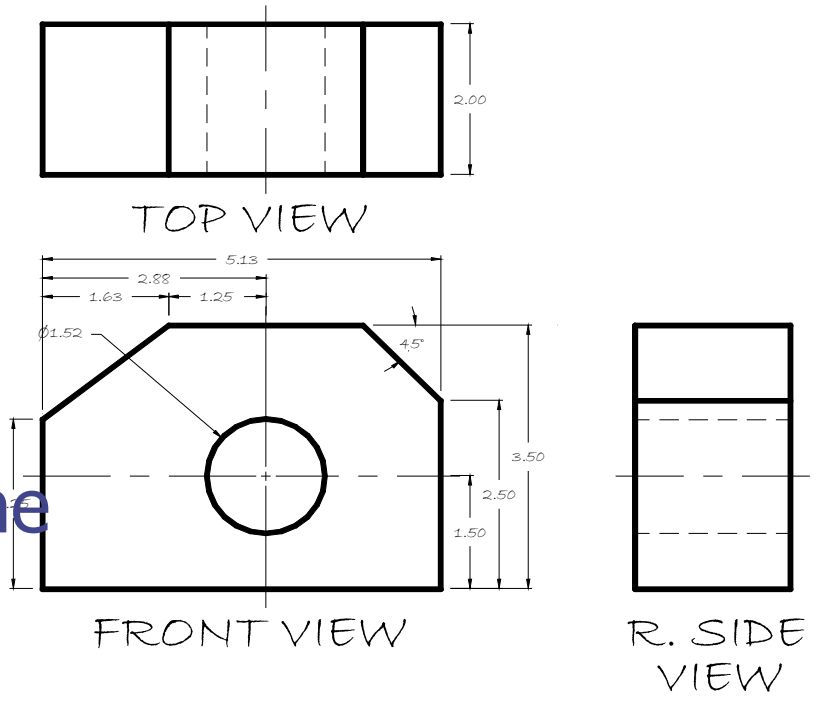
- Each view is placed in a constant location relative to the other views
- Each view must be placed in its correct position
- Views and features must be aligned



Choosing Views

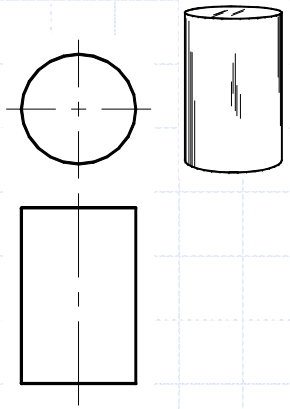


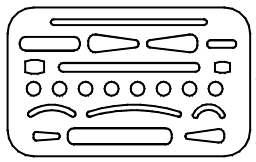
- Most commonly used views
  - Front View
  - Top View
  - Right Side View
- Most descriptive view is typically designated as the Front View
- Normally the longest dimension is chosen as the width (or depth)



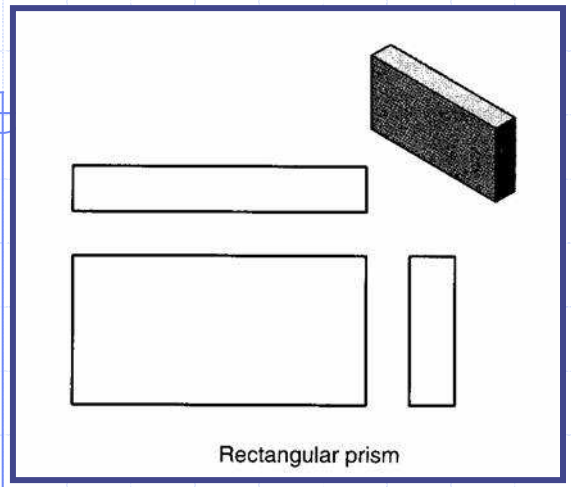
Choosing Views

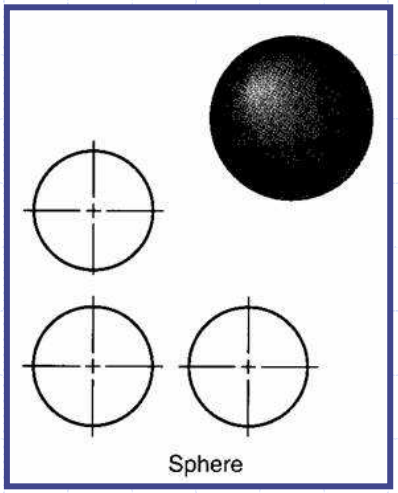
- Complex objects require three views to describe its shape
- Simple objects can be described with two views
  - Ex: Soda Can
- Thin objects can be described with only one view
  - Depth is given in a note
  - Ex: Erasing Shield

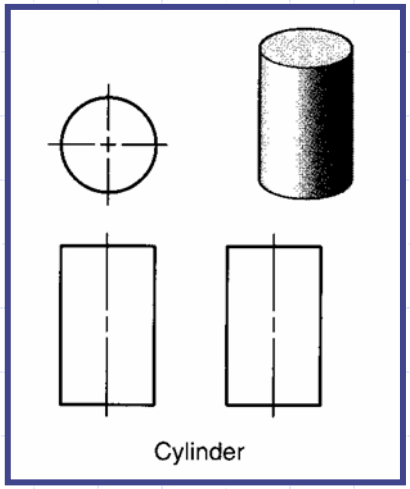


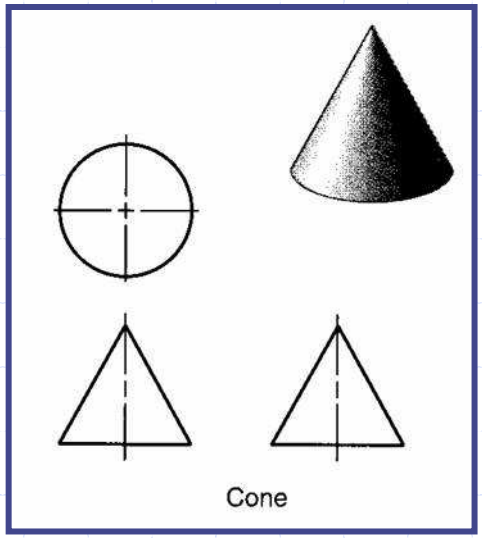


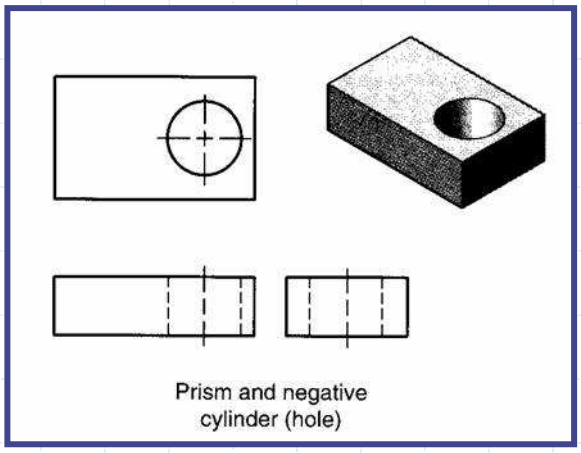
Standard Views of Primitive Solids





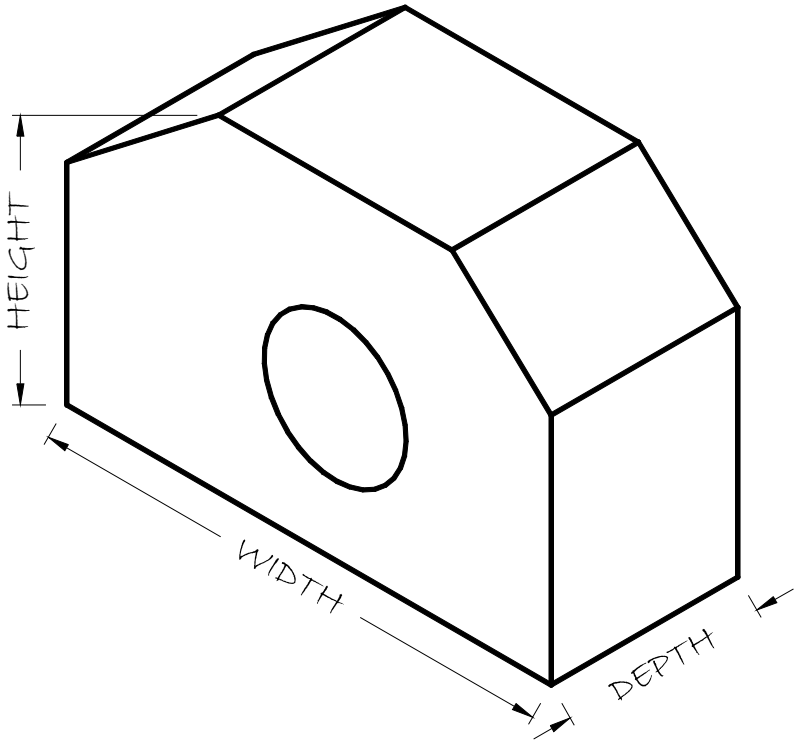




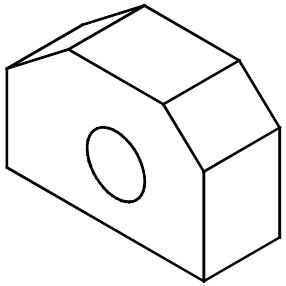


Object Dimensions

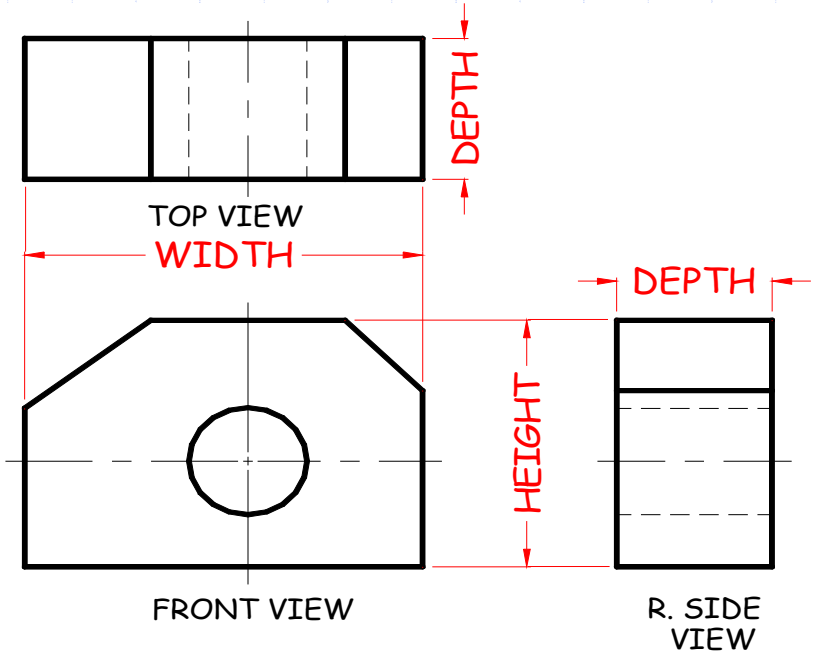
- All objects have 3 dimensions
  - ***Height***
    - Distance from top to bottom
  - ***Width***
    - Distance from side to side
  - ***Depth***
    - Distance from the front to back



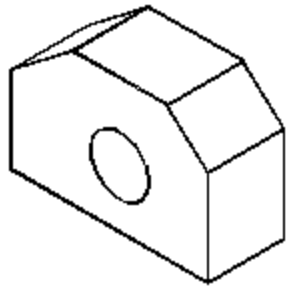
Object Dimensions



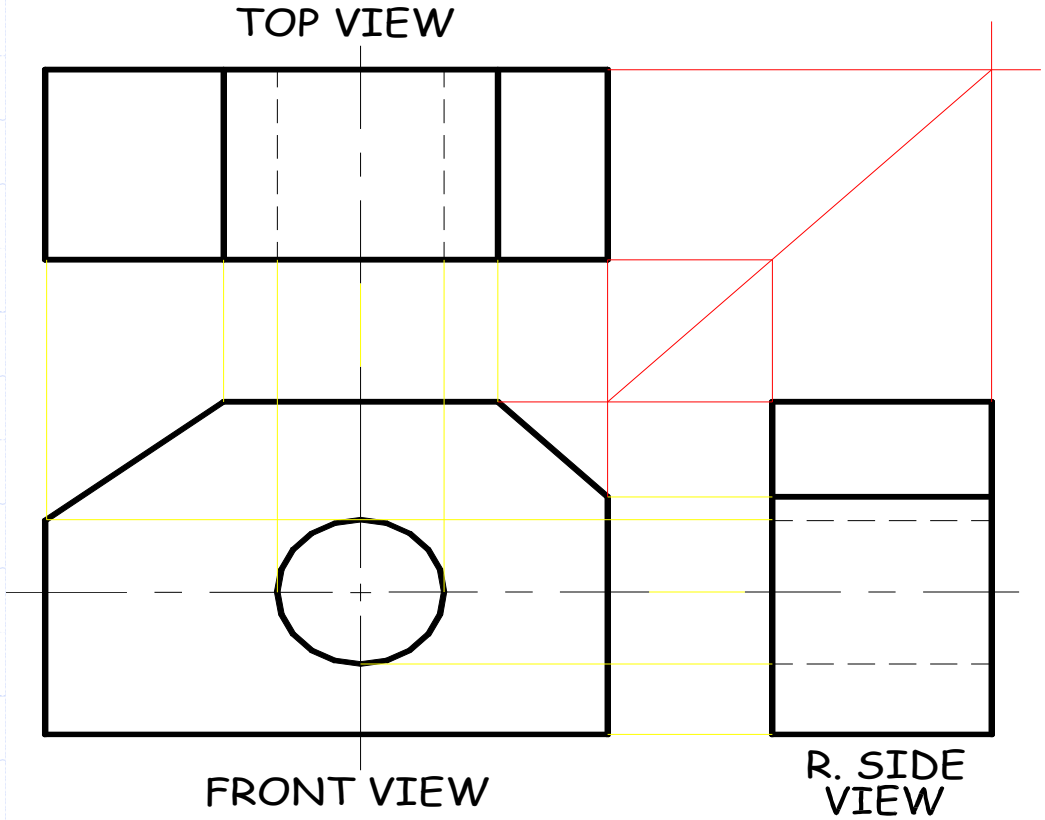
- Front View
  - Shows width & height
- Top View
  - Shows width & depth
- Side View
  - Shows height & depth



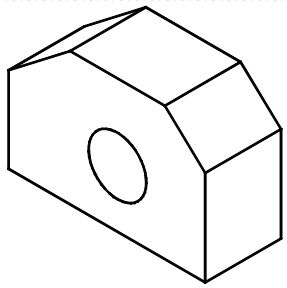
Drawing Views of Objects



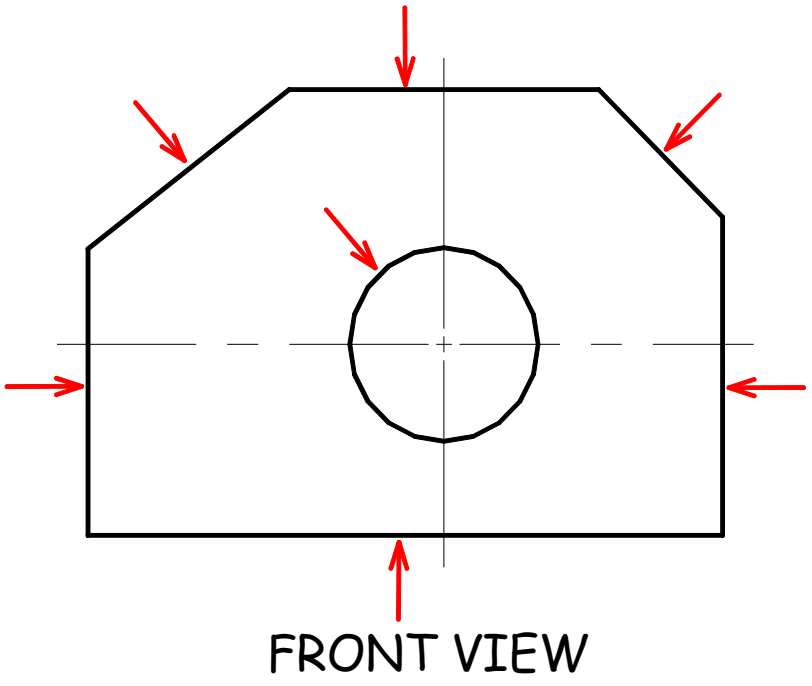
- Depth can be projected between views by using a 45° miter line



Line Types - Visible



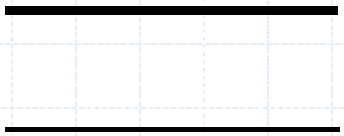
- Edges that can be seen in a given view are *Visible* or *Object* lines
- Visible lines are thick and dark
  - .028” or .7mm
  - F or HB lead



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.



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.

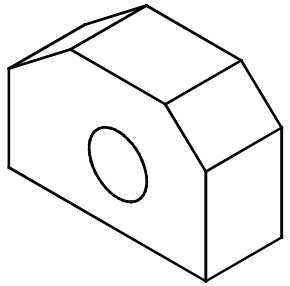
Line Styles

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

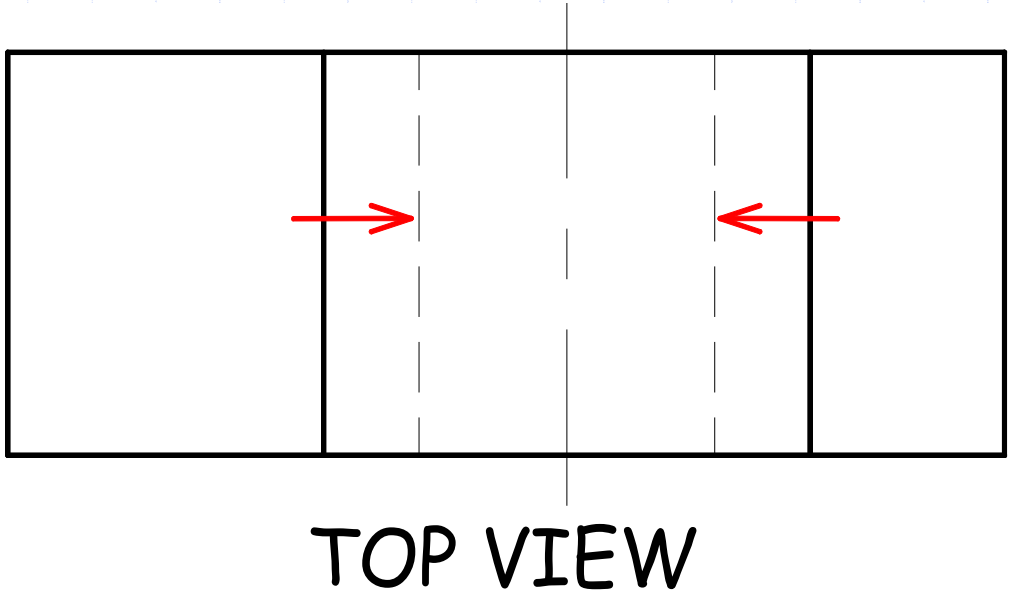
Thin chain lines are a common feature on engineering drawings used to indicate centre lines. Centre lines are used to identify the centre of a circle, cylindrical features, or a line of symmetry.

Dashed lines are used to show important hidden detail for example wall thickness and holes..

Line Types - Hidden

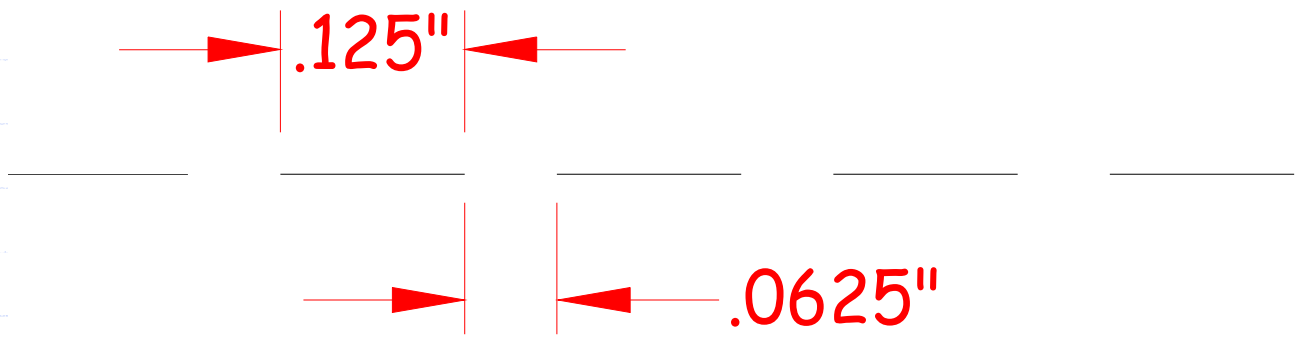


- Edges that cannot be seen from a given view are indicated by *Hidden* lines

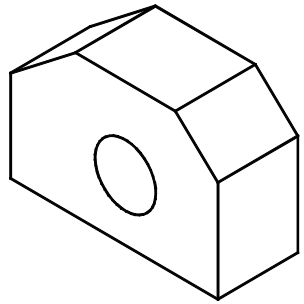


Line Types - Hidden

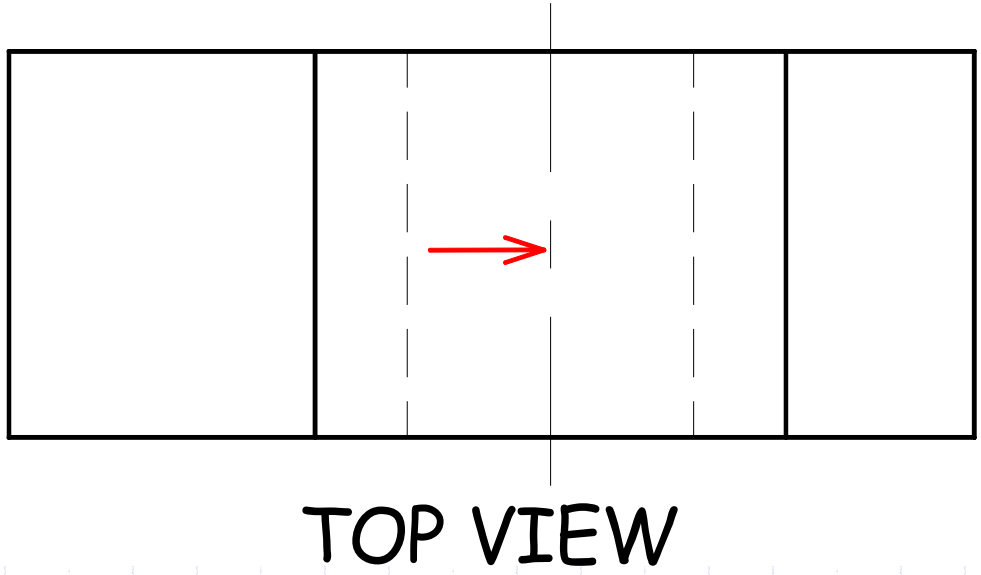
- Drawing hidden lines
  - .125” (3mm) dashes
  - .0625” (1mm) spaces between dashes
  - Thin: .020” (.5mm)
  - Dark: F or HB lead



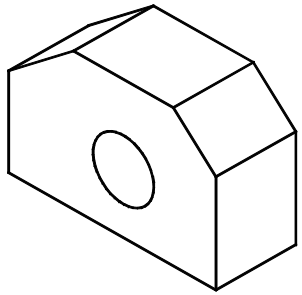
Line Types – Center



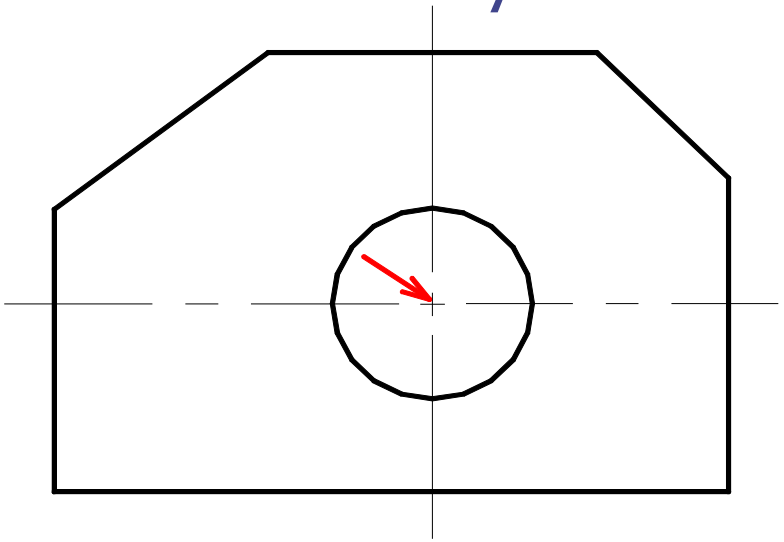
- *Center lines* indicate axes of symmetry

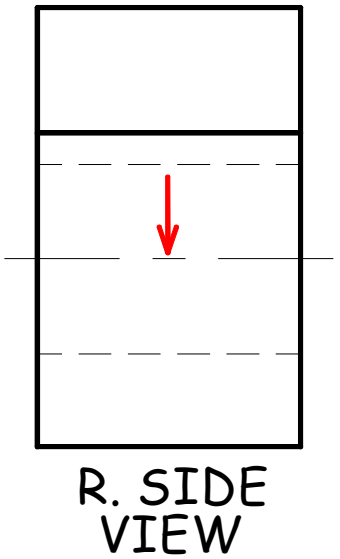


Line Types – Center



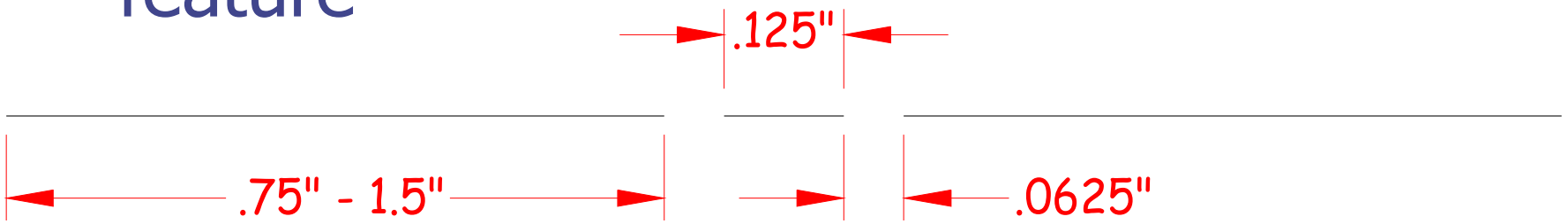
- Perpendicular lines for circular objects
  - Small dashes cross at the center point of feature
  - One center line drawn to indicate longitudinal axis of cylinder or hole





Line Types - Center

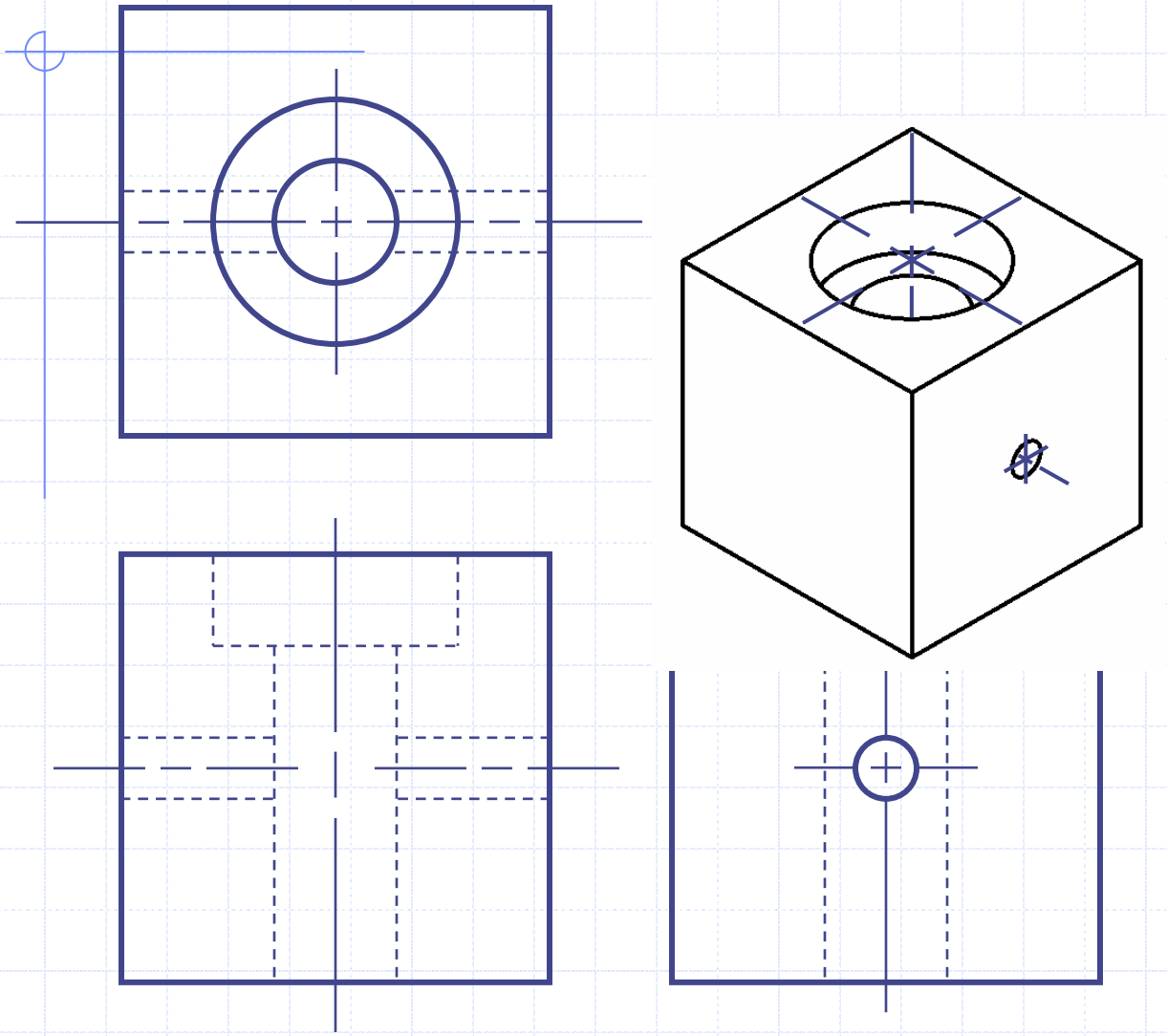
- Draw center lines using a series of long and short dashes
  - .125” (3mm) short dash @ the center
  - .75”- 1.5” (20mm-40mm) long dash
  - .0625” (1mm) spaces between dashes
  - Thin: .02” (5mm)
- Long dash extends .125” to .25” beyond feature



Precedence of Lines

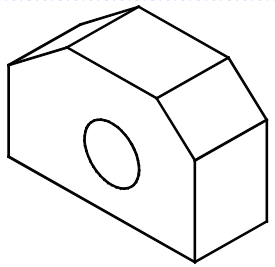
- Which line should be drawn when two lines coincide?
  - Visible line coincides with hidden or center line
    - Visible line is shown
  - Hidden line coincides with center line
    - Hidden line is shown

For Example:

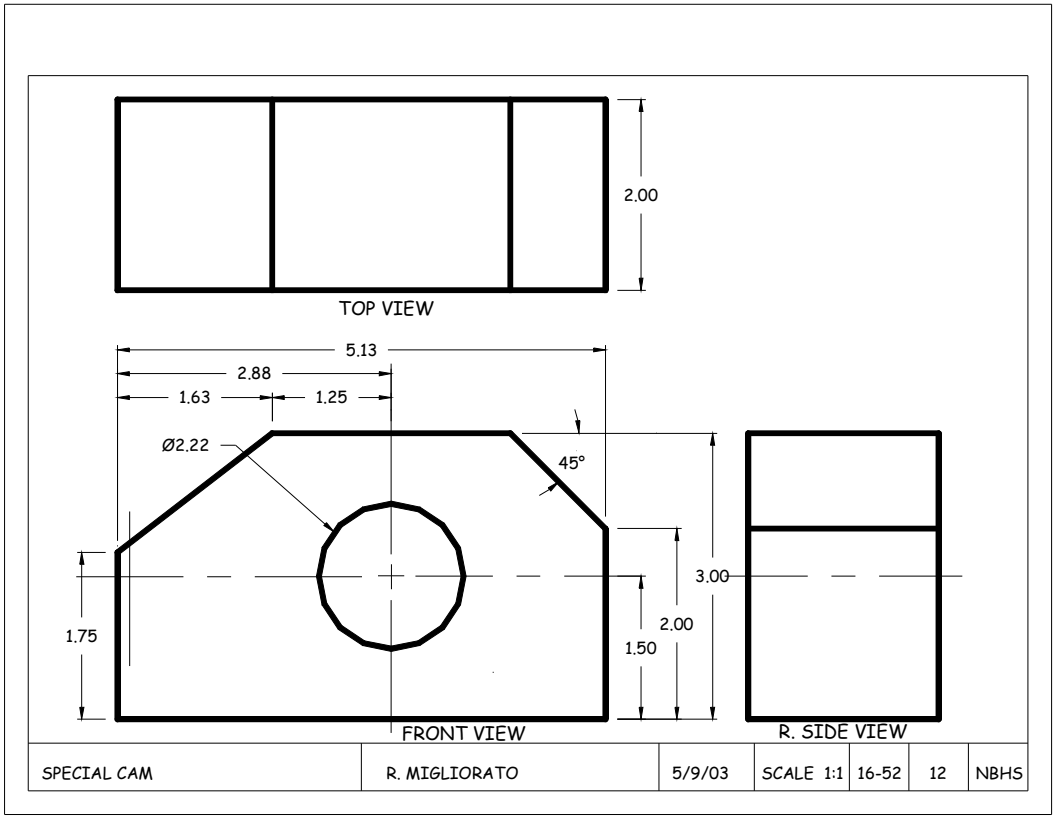


1. **Visible**
2. **Hidden**
3. **Center**

Placement of Views

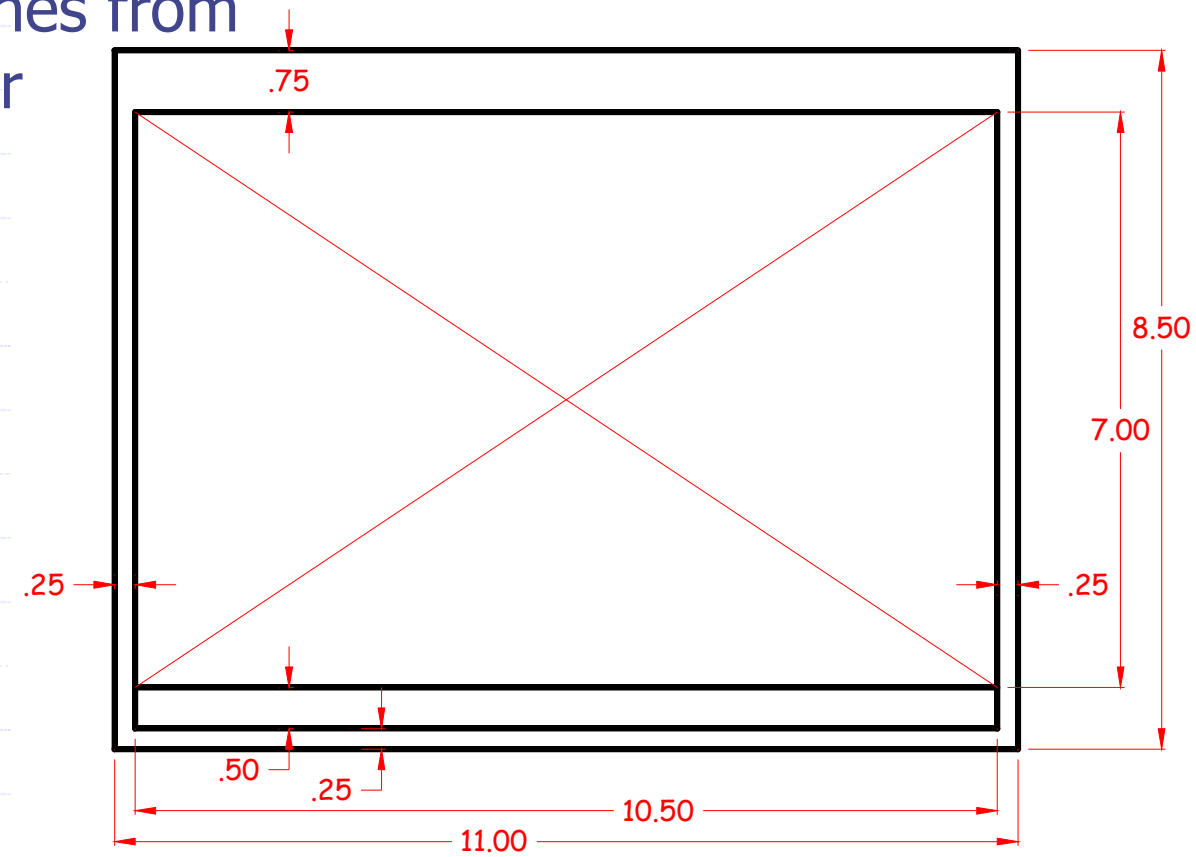


- Views should be visually balanced within the working space

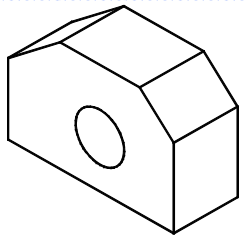


Steps for Centering a Drawing

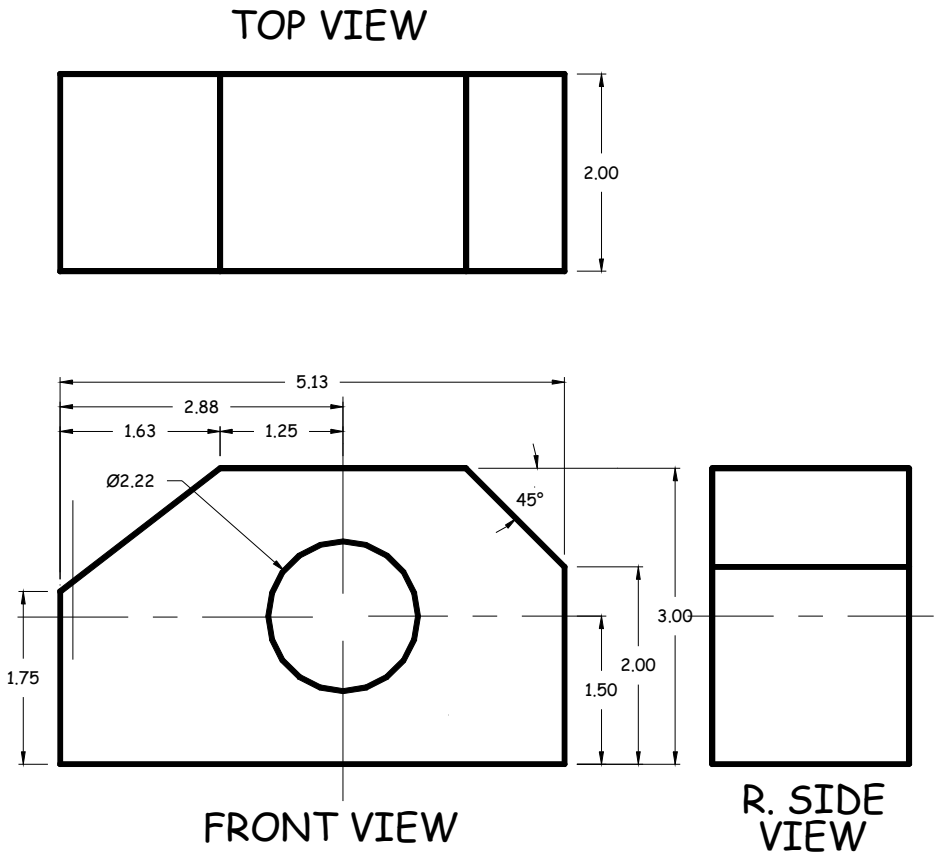
- Draw border and title block using light construction lines
- Draw diagonal lines from corners of border



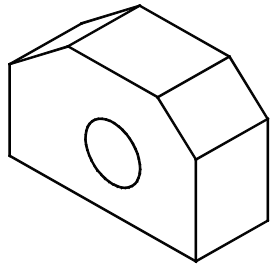
Steps for Centering a Drawing



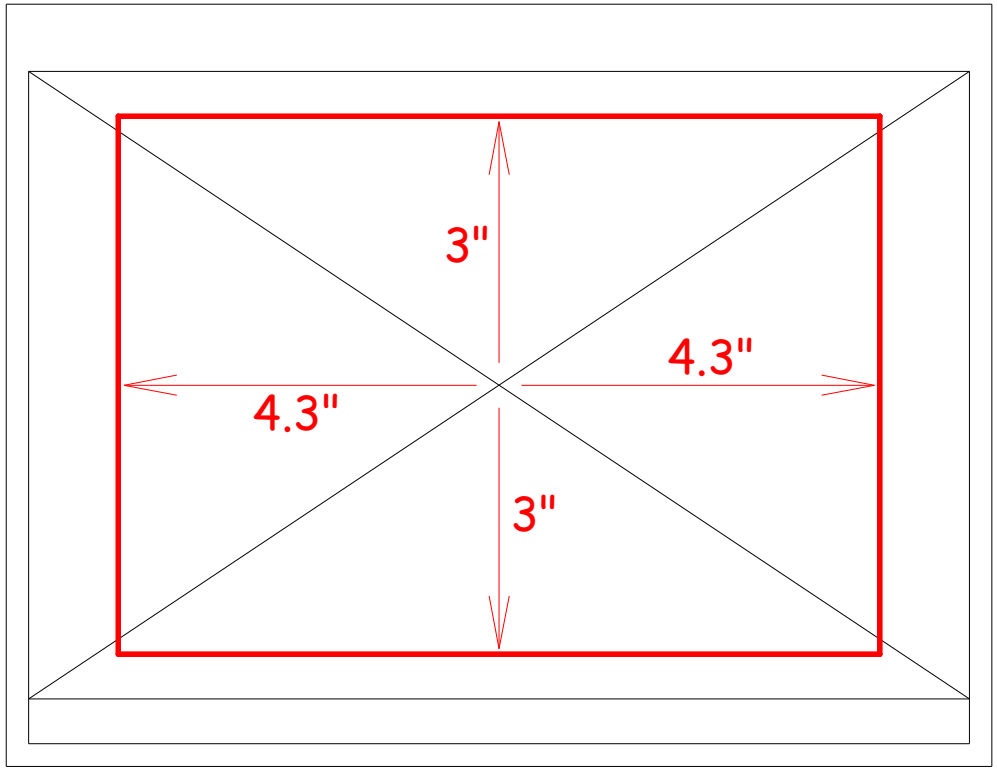
- Add:
  - Width 5.13
  - Space 1.50
  - Depth 2.00
  - ***Horizontal 8.63***
  - Height 3.00
  - Space 1.50
  - Depth 2.00
  - ***Vertical 6.50***



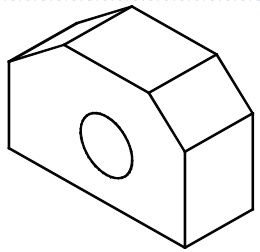
Steps for Centering a Drawing



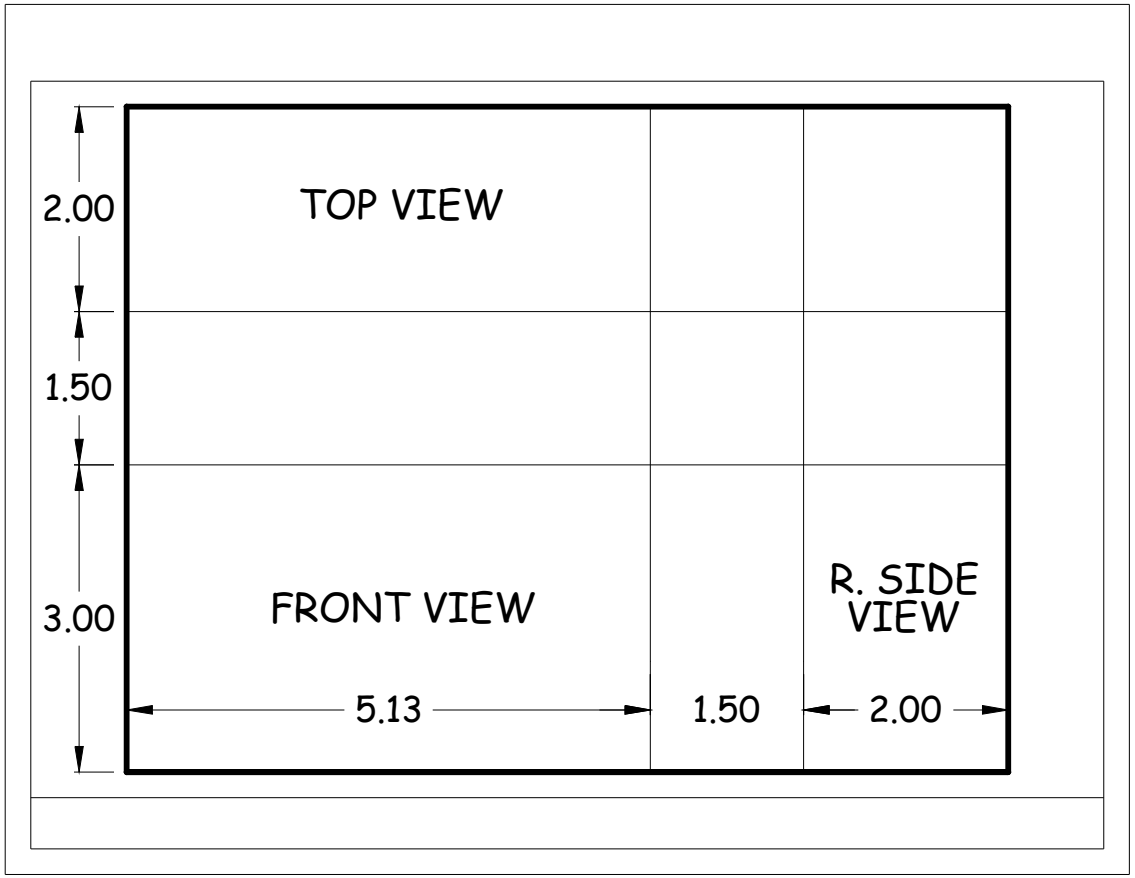
- Draw a box the size of all views
- Measure from the center:
  - Half the width
  - Half the height



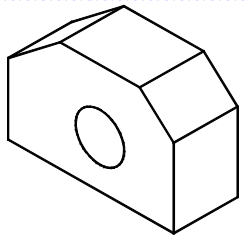
Steps for Centering a Drawing



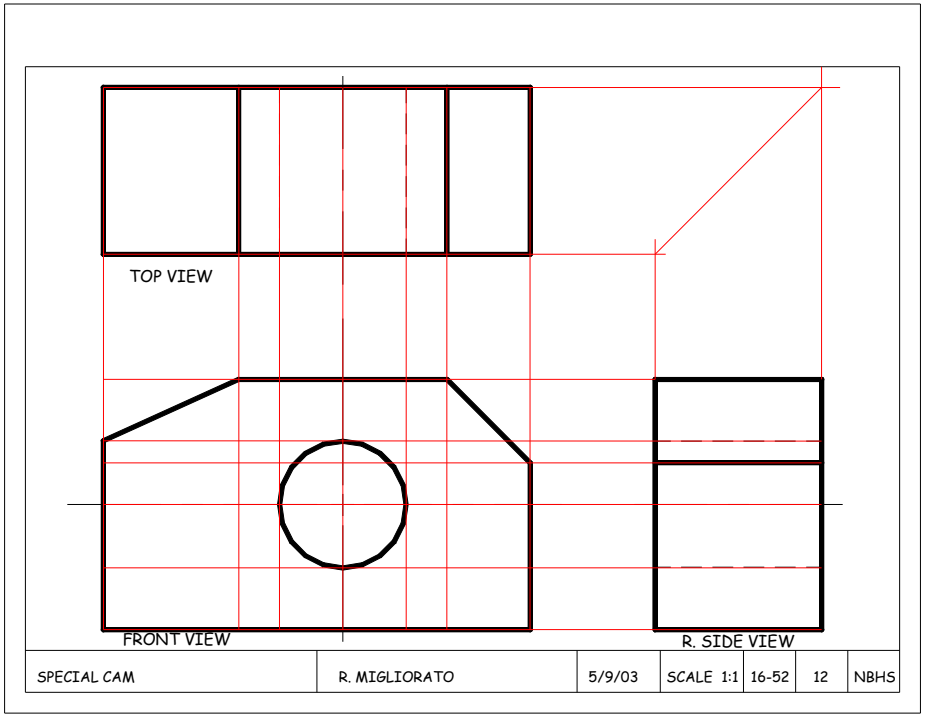
- Draw in views using light construction lines



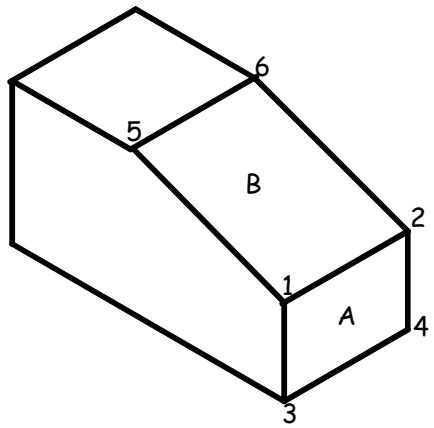
Adding Details



- Add holes and features
- Transfer horizontal and vertical features
- Use miter line to transfer depth

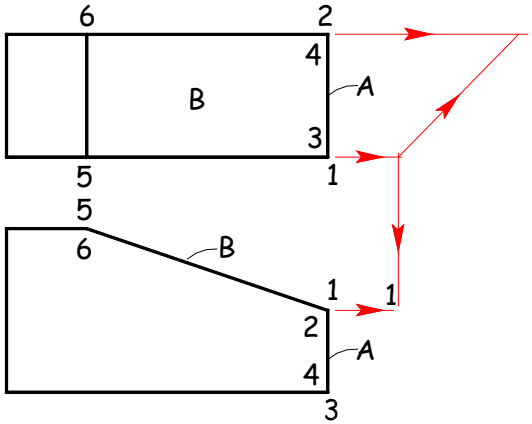


Straight Edges

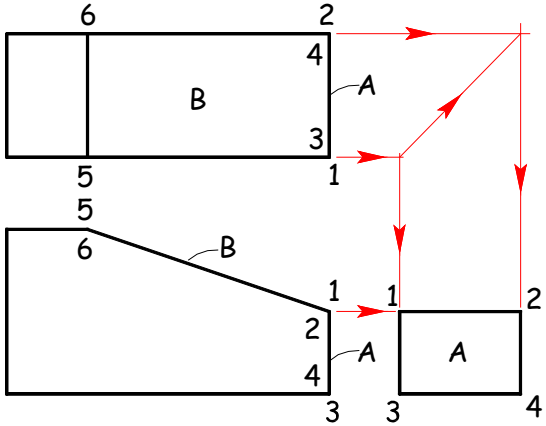


- Edges that are perpendicular to a plane of projection appear as a point

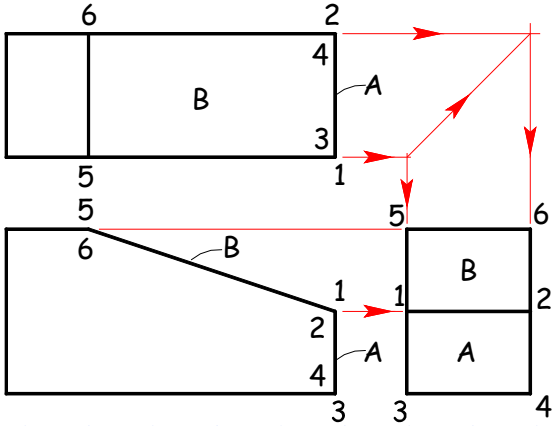
1



2

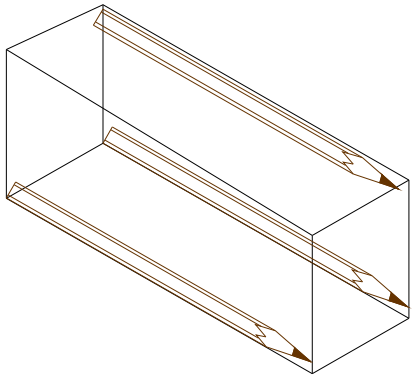


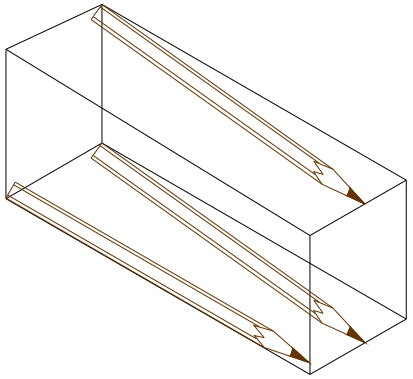
3

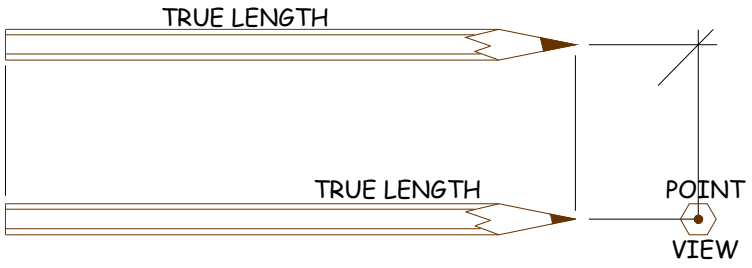


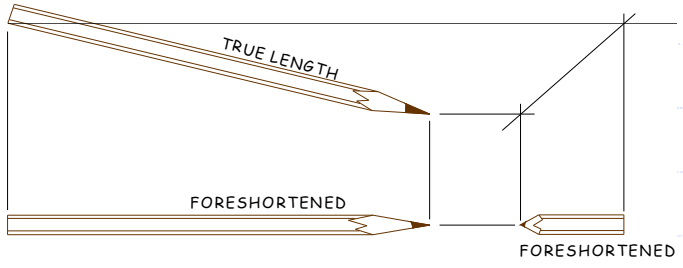
Straight Edges

- Edges that are parallel to a plane of projection appear as lines
- Edges that are inclined to a plane of projection appear as foreshortened lines



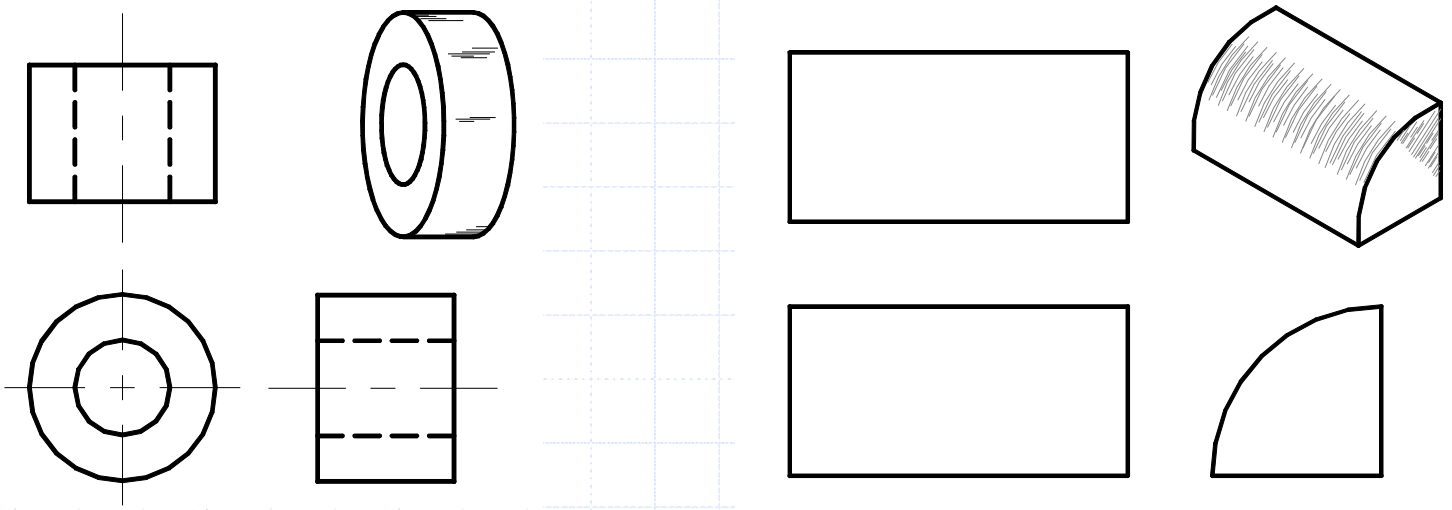






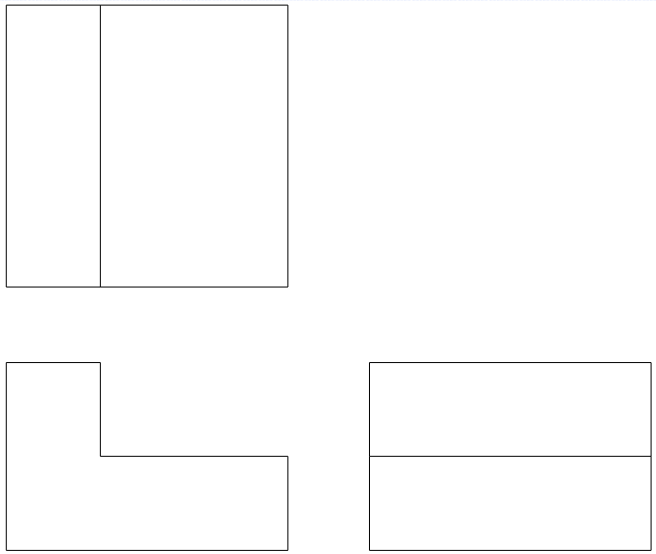
Curved Edges

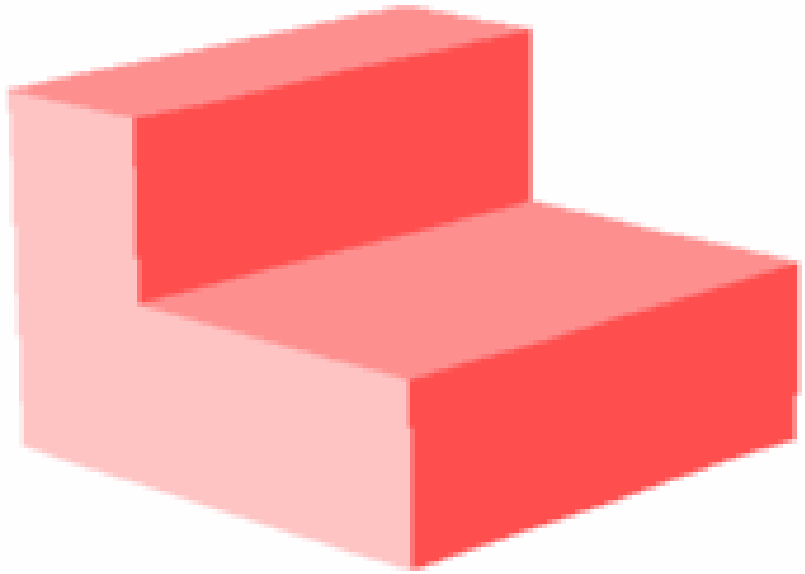
- Curved edges project as straight lines on the plane to which they are perpendicular
- Curved edges project as curved lines on the planes to which they are parallel or inclined



Normal Surfaces

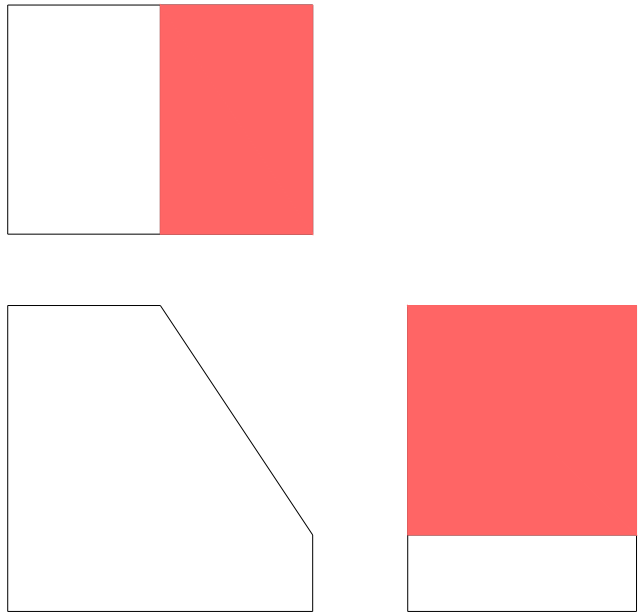
- Normal surfaces appear as an edge in two opposite principal views, and appear a surface in all other principal views.

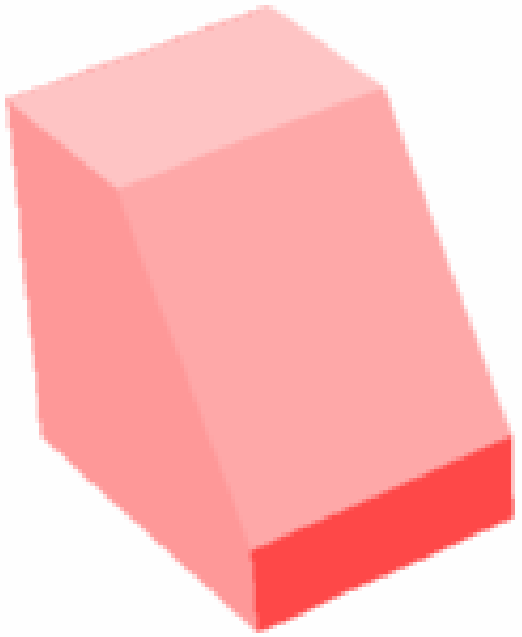




Inclined Surfaces

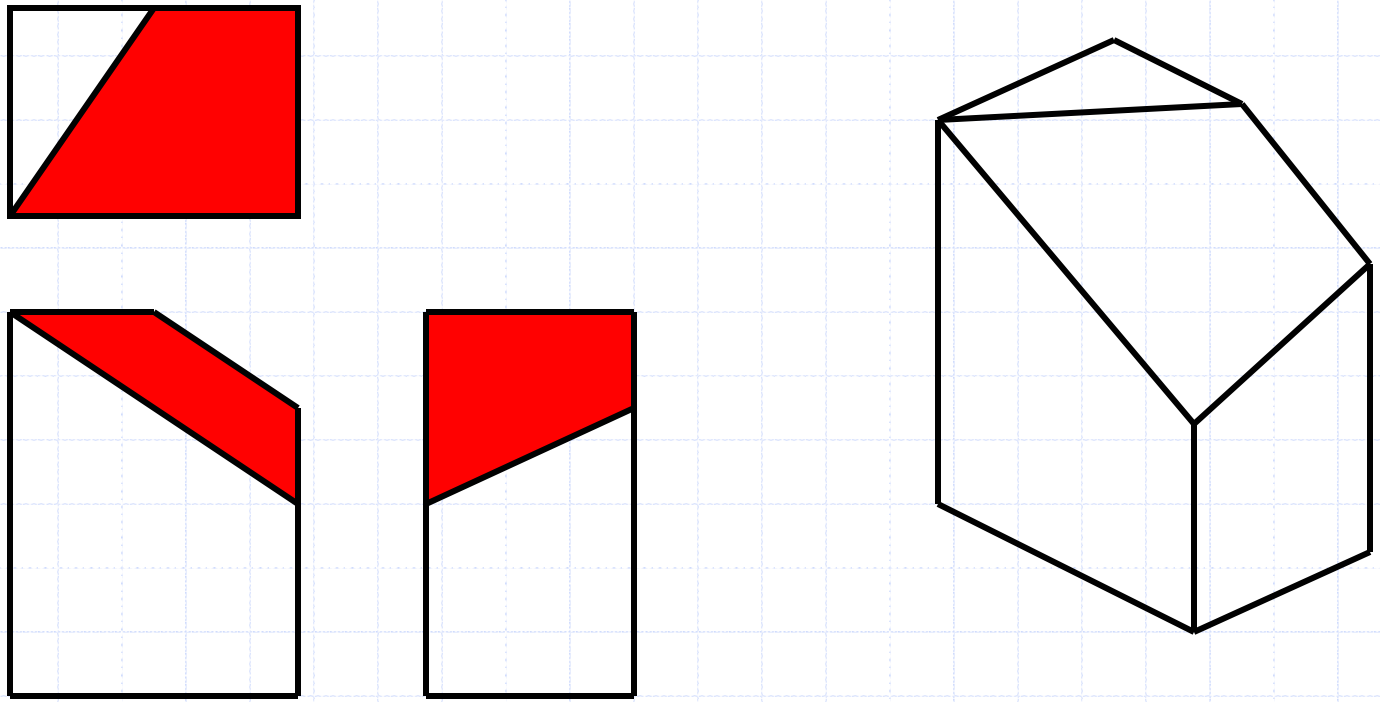
- Inclined surfaces appear as an edge in two opposite principal views, and appear foreshortened (not true size) in all other principal views.





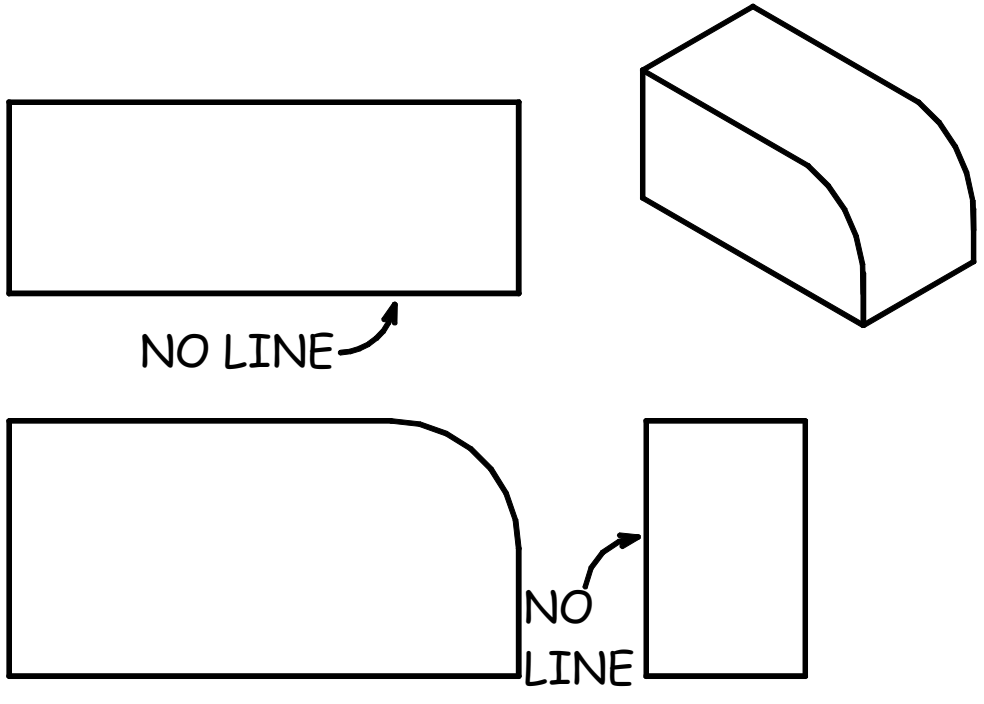
Oblique Surfaces

- Oblique surfaces do not appear either as an edge or true size in any principal view.



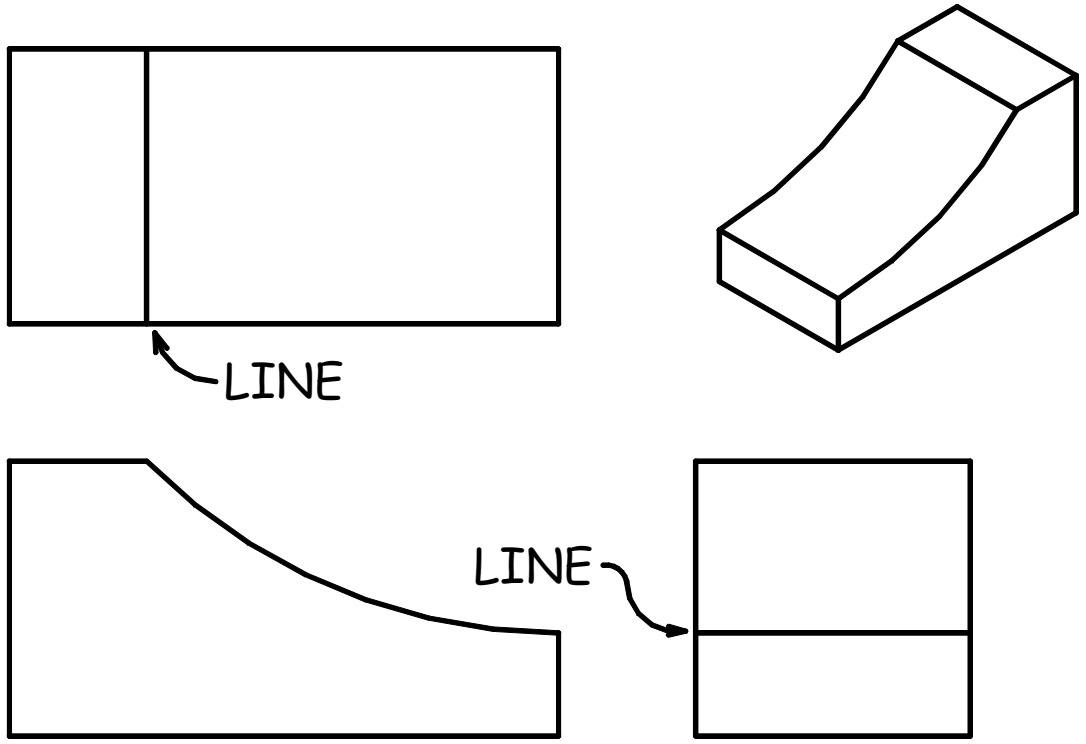
Intersections & Tangencies

- Where a curved surface is *tangent* to a plane surface, no line should be shown where they join



Intersections & Tangencies

- Where a plane surface intersects a curved surface, an edge is formed



Intersections & Tangencies

- Where the plane surface is horizontal or vertical, exceptions to these rules may occur