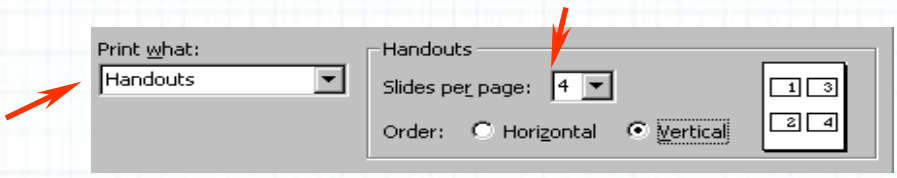
Chapter 5

Multiview Sketching & Projection

Print handouts

Select File, Print

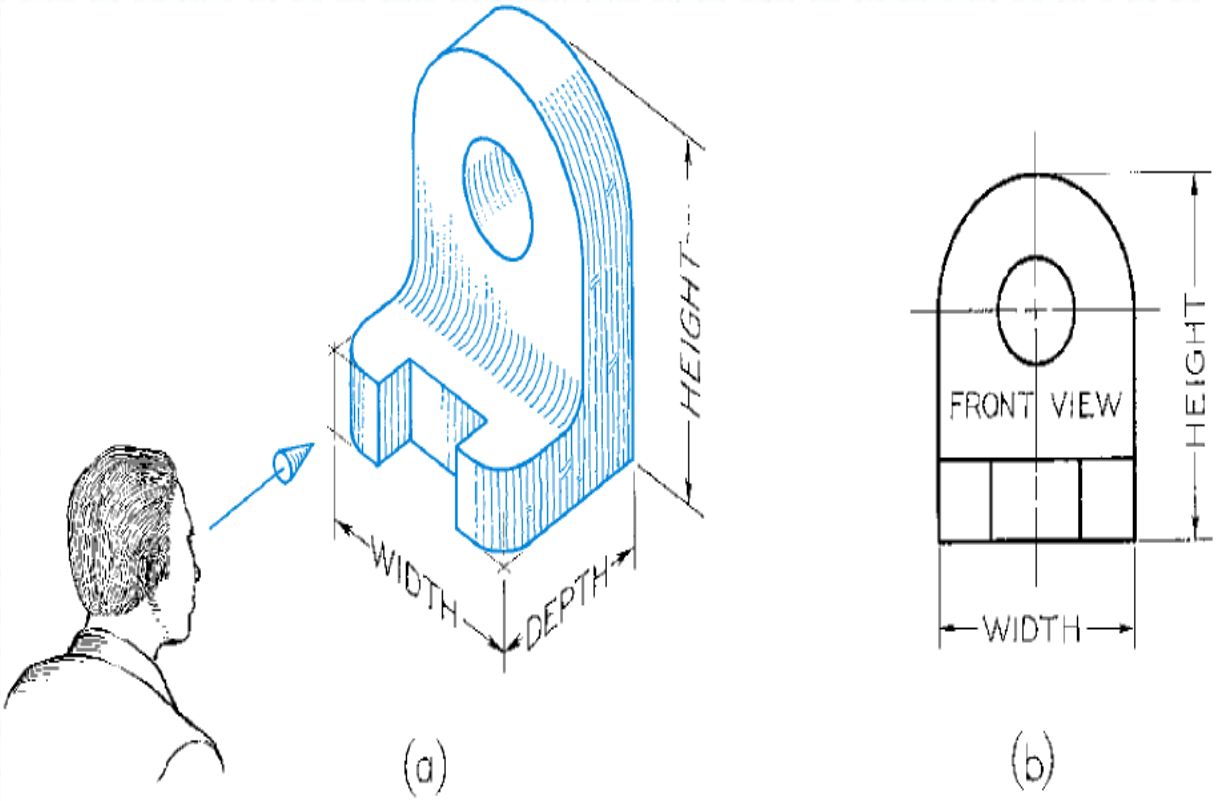
Edit the following selections to read:



Select the OK button

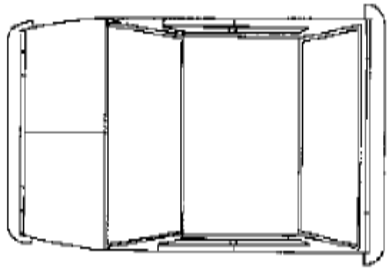
Orthographic Projection

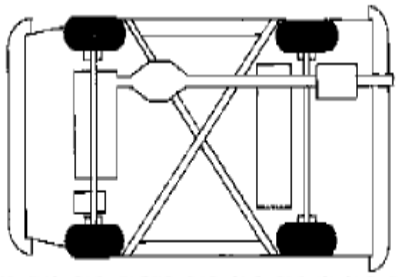
- A system of drawing views of an object using perpendicular projectors from the object to a plane of projection (I.e. paper)



Six Standard Views

- Top, front, right side, left side, back and bottom
  - Front
    - » Usually shows most detail
    - » If applicable – should show object in operating condition (I.e. car)

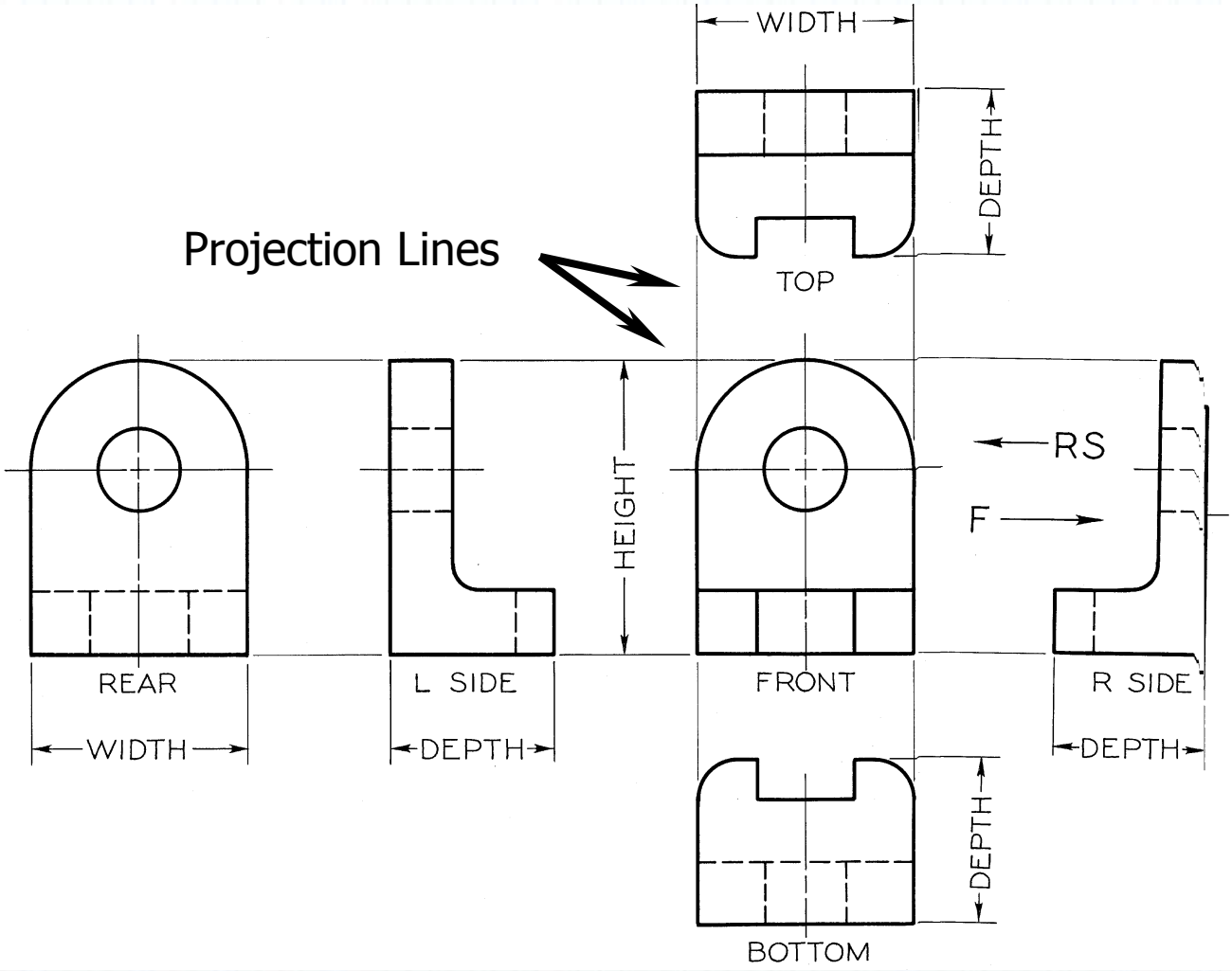




View Placement

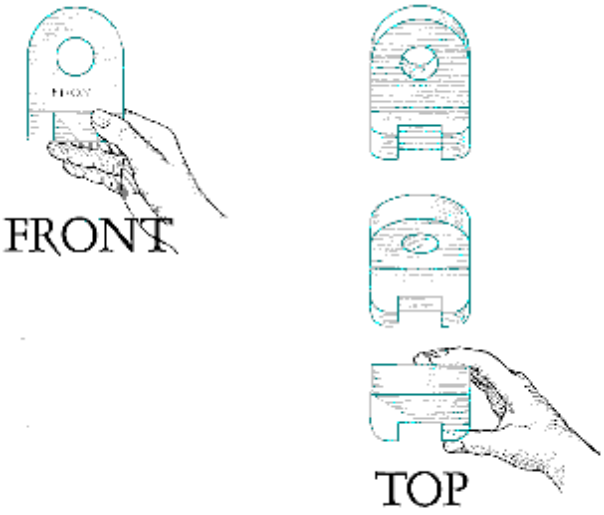
(3rd angle projection)

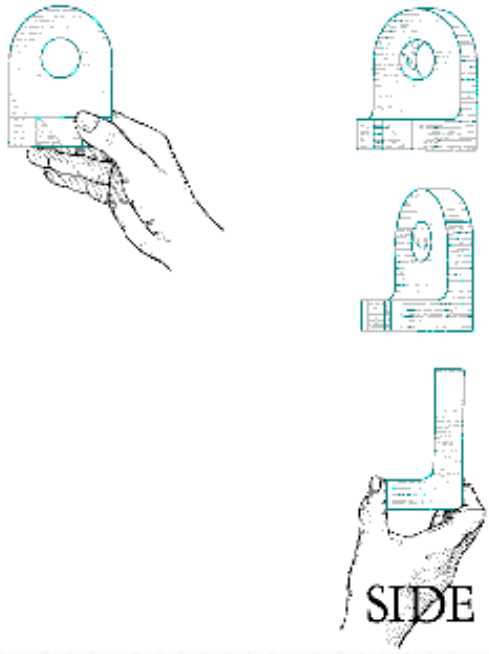
- Front view usually shows the most detail



- Why must views be arranged so that they align?
- **To make it possible for someone to interpret the drawing.**

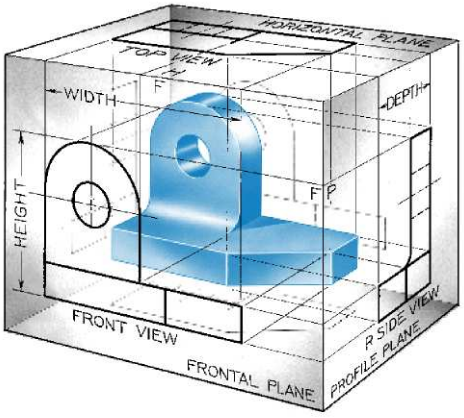
Revolving an Object to Produce the Six Basic Views



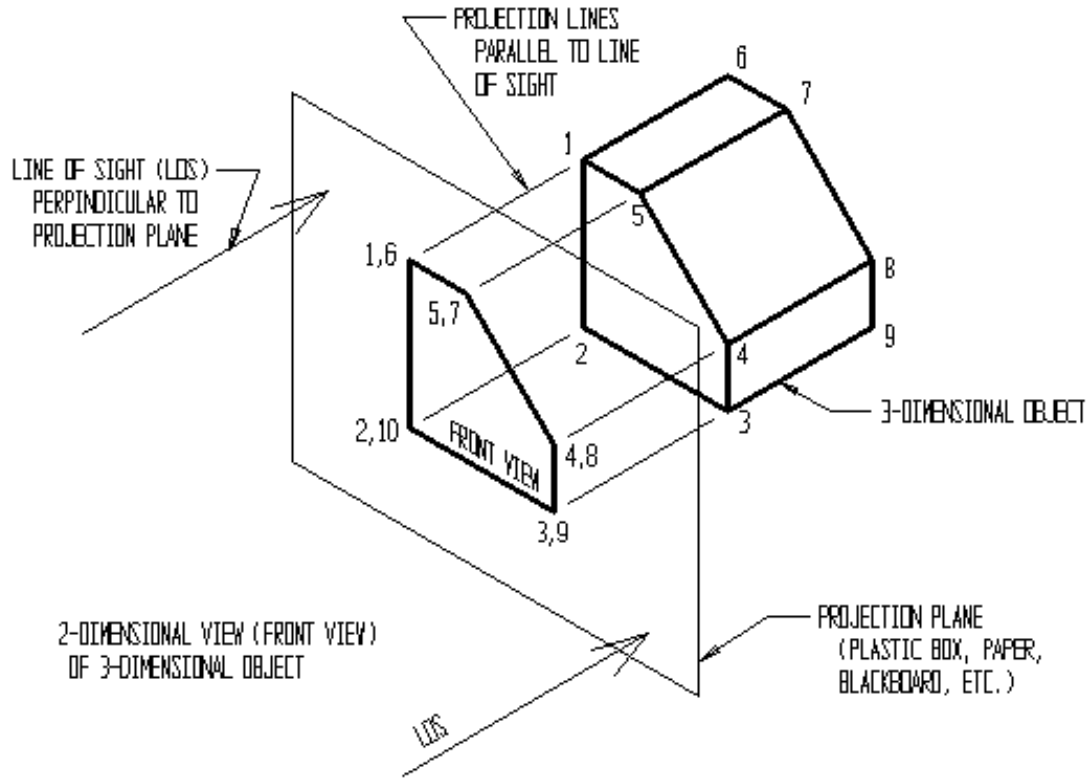


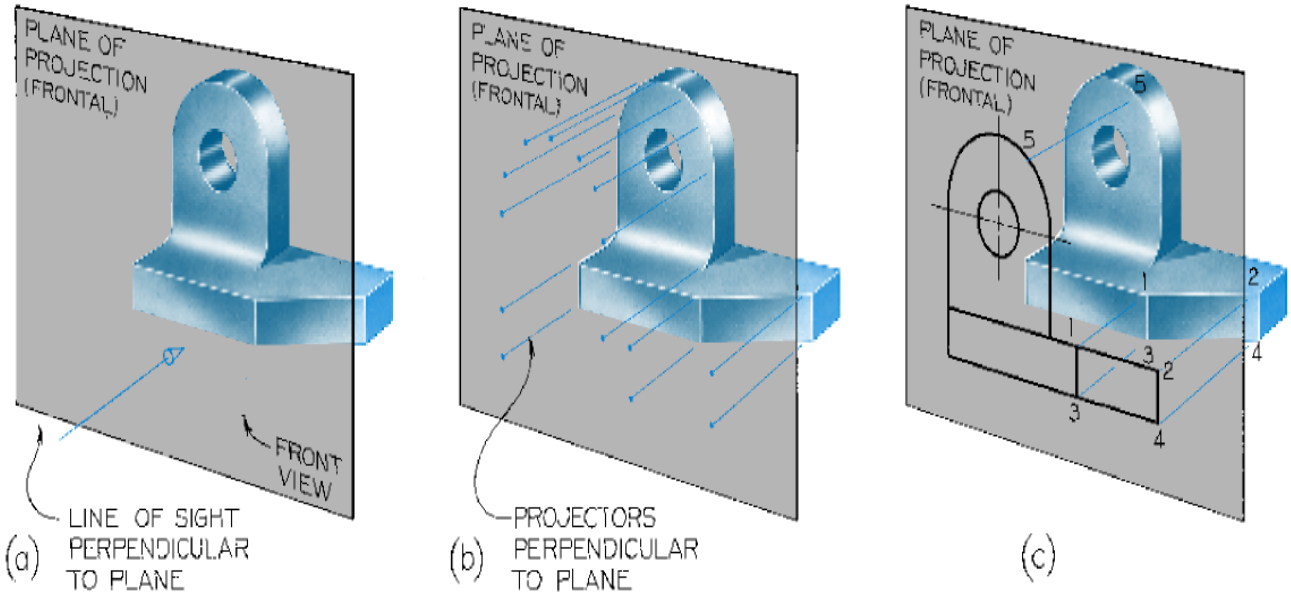
The Glass Box Metaphor

- Imagine that the object you are going to draw is positioned inside a glass box, so that the large flat surfaces of the object are parallel to the walls of the box.
  - 2 horizontal planes
  - 2 frontal planes
  - 2 profile planes
- From each point on the object, imagine a ray, or *projector* perpendicular to the wall of the box forming the view of the object on that wall or projection plane.
  - 2 horizontal planes (top and bottom views)
  - 2 frontal planes (front and back views)
  - 2 profile planes (right and left side views)

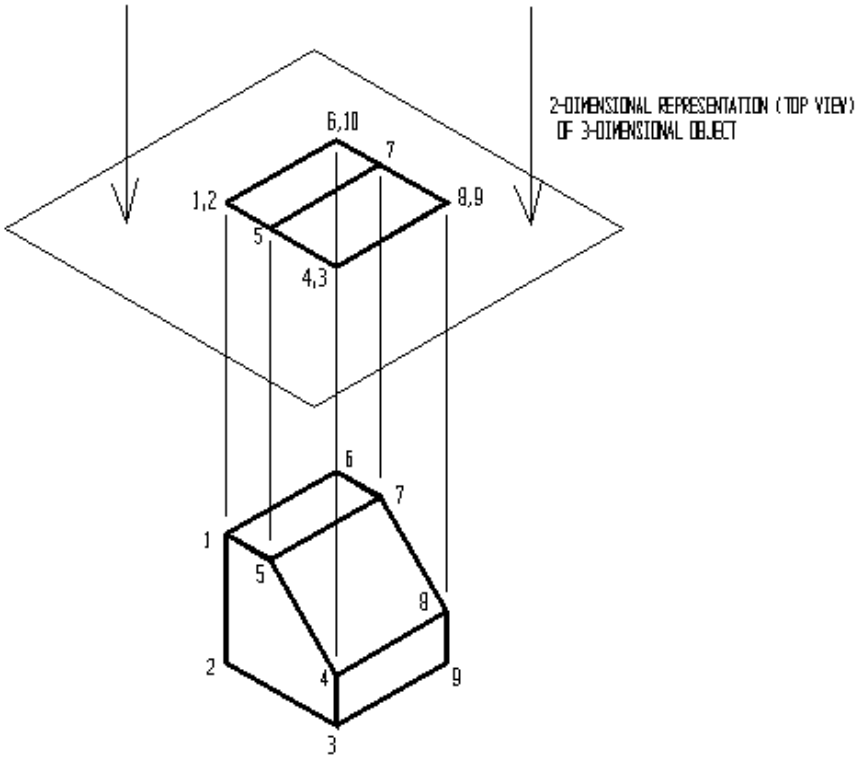


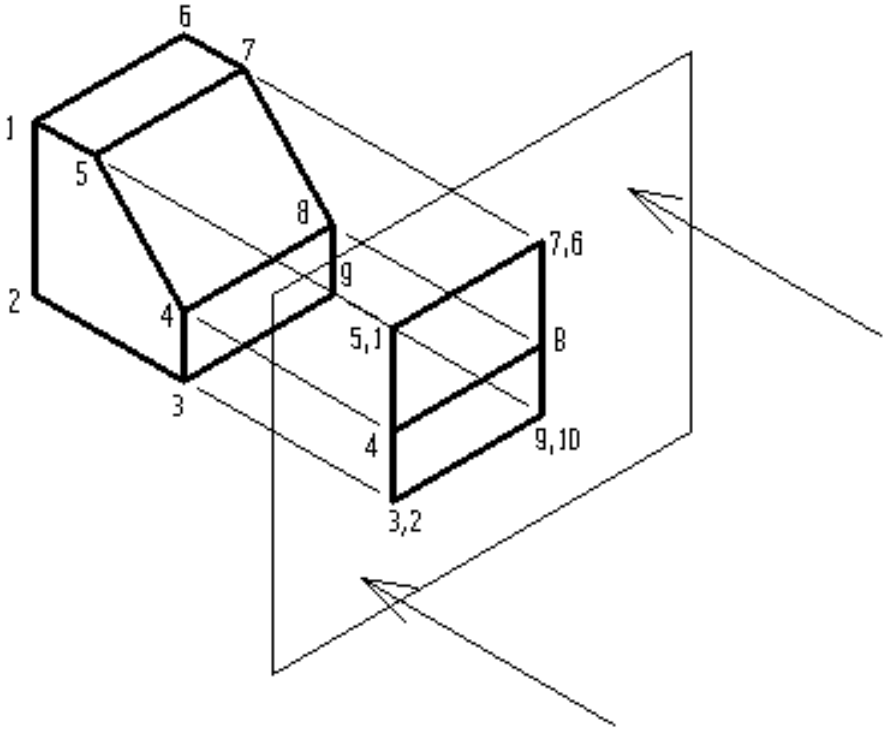
Projection of an Object





Projection of an Object

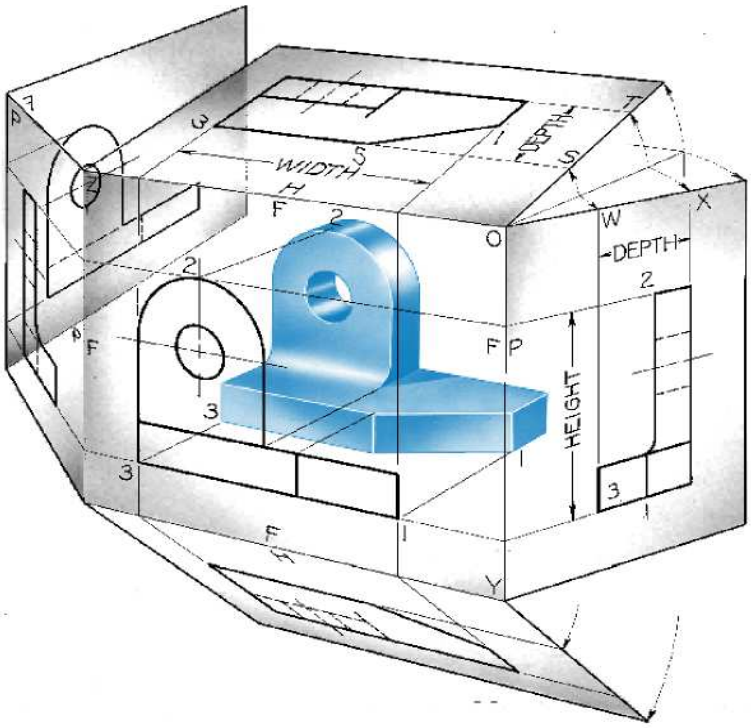




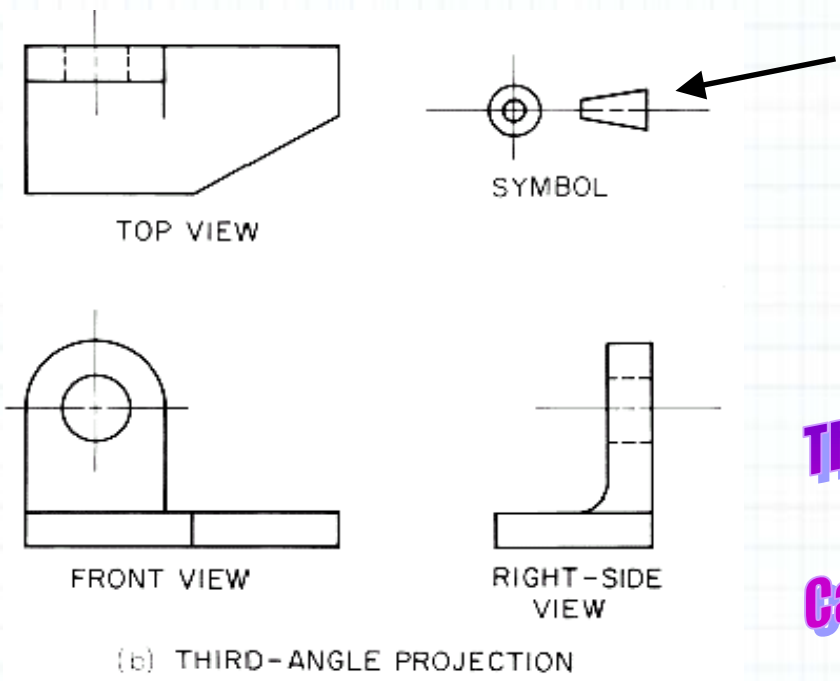
2-DIMENSIONAL REPRESENTATION (RIGHT SIDE VIEW)
OF 3-DIMENSIONAL OBJECT

Unfolding the Glass box

- For Third Angle Projection (the method in the U.S.)
- Imagine that the walls of the box are hinged and unfold the views outward around the front view.
- This will give you the standard arrangement of views for 3rd Angle Projection which is used in the US, Canada, and some other countries.



Third Angle Projection:

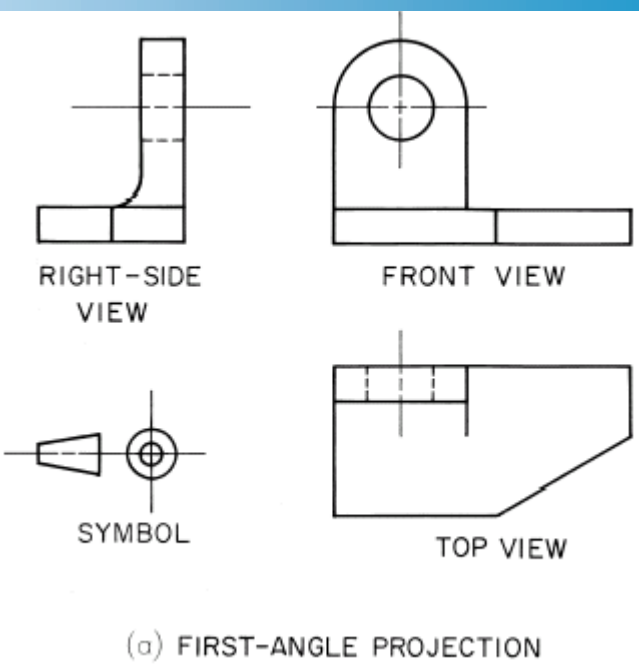


Symbol for third angle projection shown on dwg

Third angle projection Standard for USA, Canada and our class!

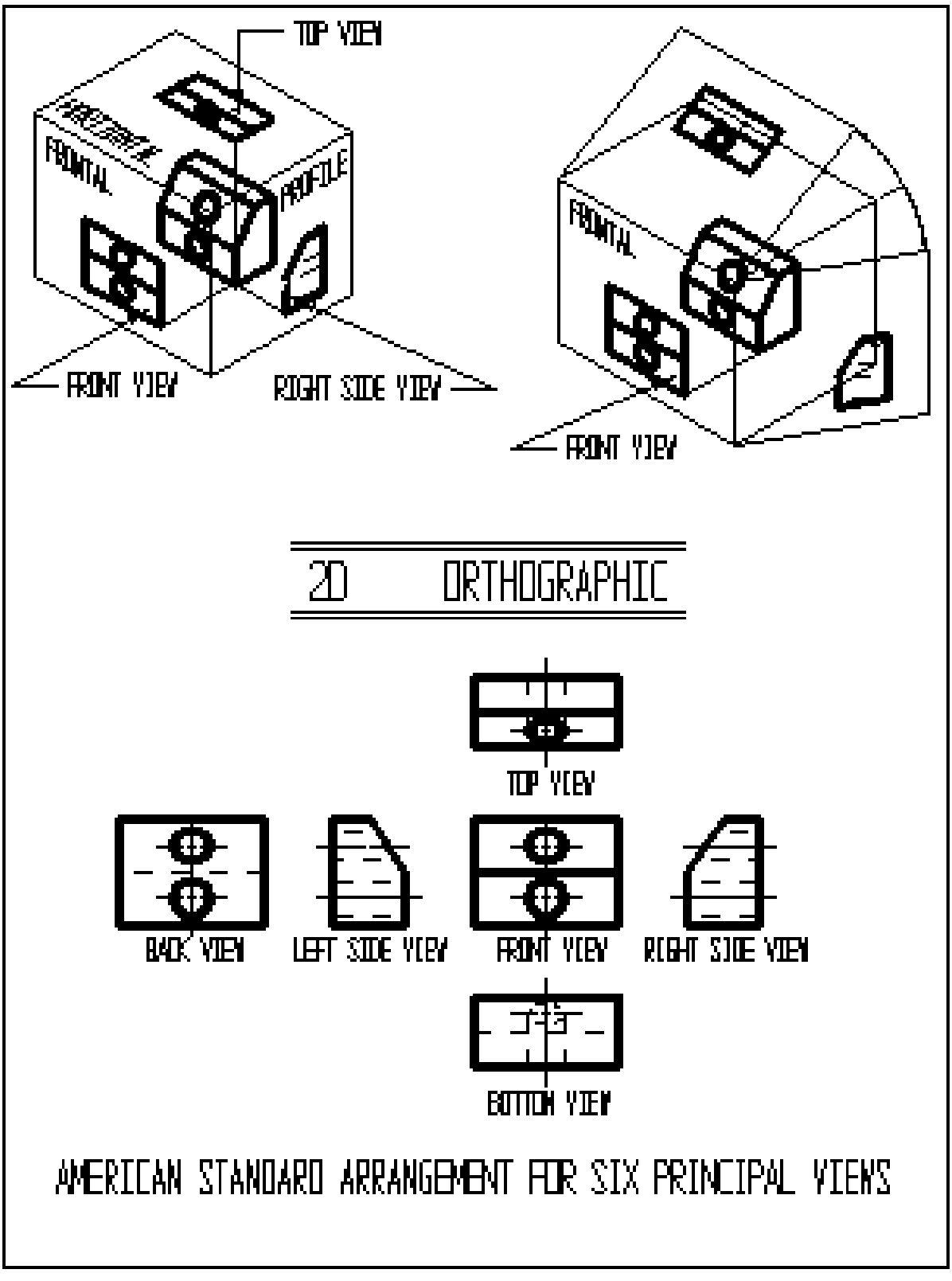
First Angle Projection:

First angle projection Primarily used in Europe and Asia!



Symbol for first angle projection

Glass Box Method



DEMO

- If a point, line or plane is in one view, it must be in all the views.

Example

- Do Hands-On 2 together
  - Need
    - » HB pencil
    - » Engineering Calculation Paper
    - » Model
    - » Access instructor's web page:
      - http://engr.bd.psu.edu/holidar or Angel
      - http://engr.bd.psu.edu/mjl19/
      - http://engr.bd.psu.edu/rxm61
  - Follow instructions
    - » Remember specs for the border & title block are included in the Penn State Erie Graphics Standards
- Label
  - Views – TOP, FRONT, etc.

Precedence of Lines

- When visible lines, hidden lines and center lines coincide remember:
  - Visible lines take precedence over hidden lines
  - Hidden lines take precedence over center lines, For example:

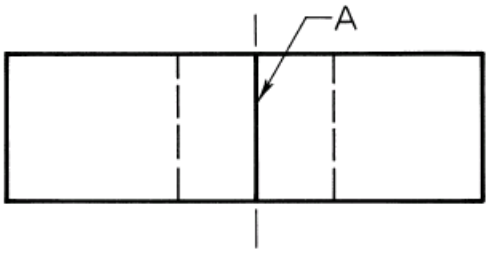
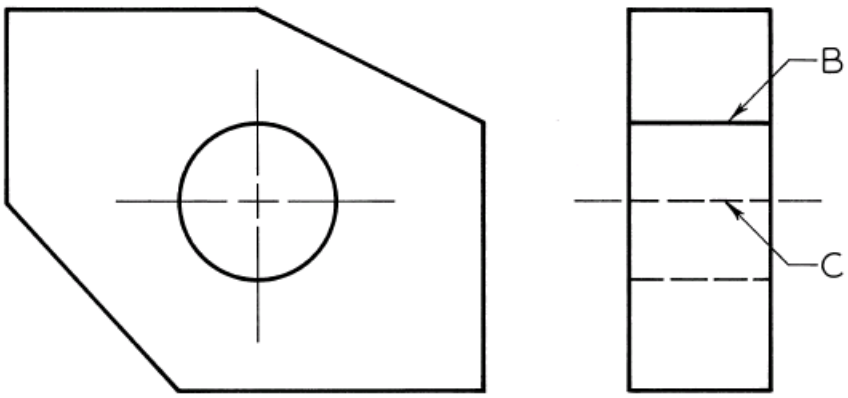


Figure 5.32



Hands-On 3

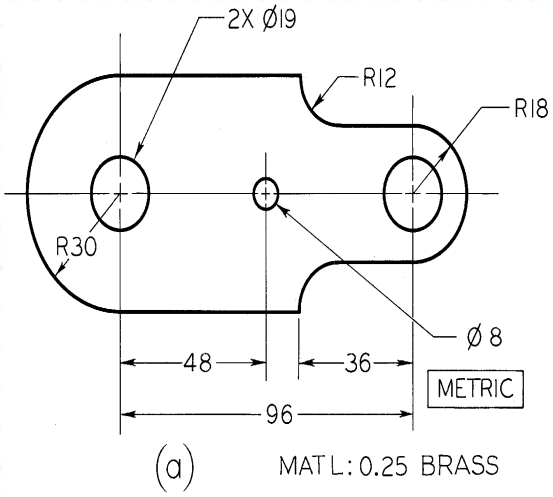
- Instructions on the web

Chapter 5

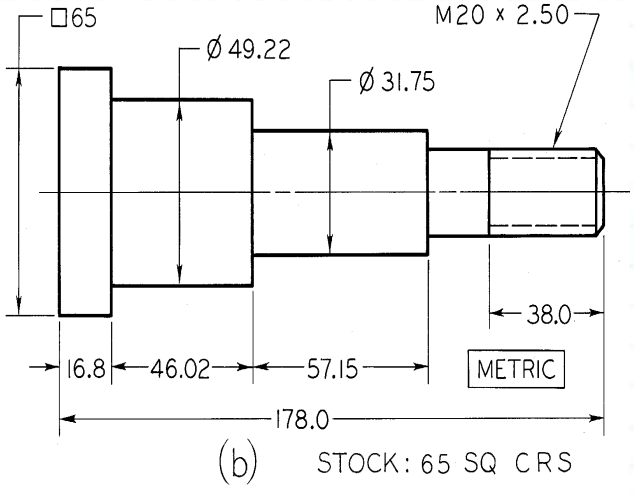
Multiview Sketching & Projection Part 2

Necessary Views

- A sketch or drawing should only contain the views needed to clearly and completely describe the object. Choose the views that show the shape most clearly, have the fewest hidden lines, and show the object in a usual, stable, or operating position.

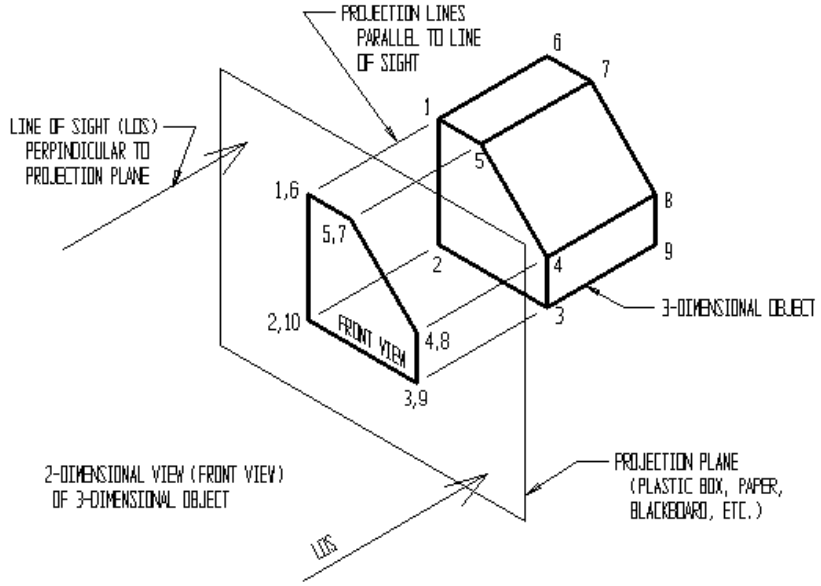


One view drawing of a shim



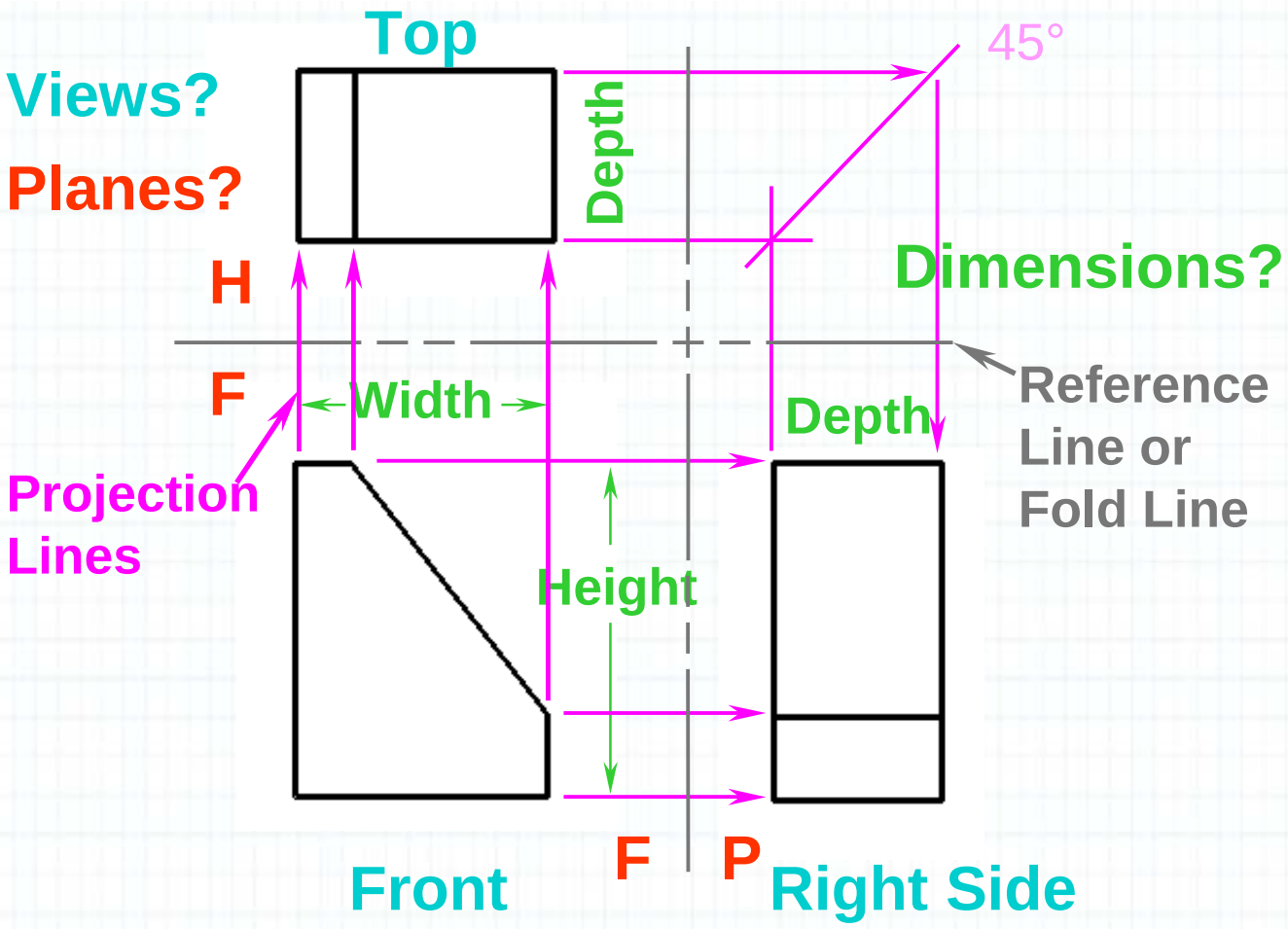
One view drawing of a connecting rod

3 Views - Most Common



Three views necessary?

Which view could be eliminated?

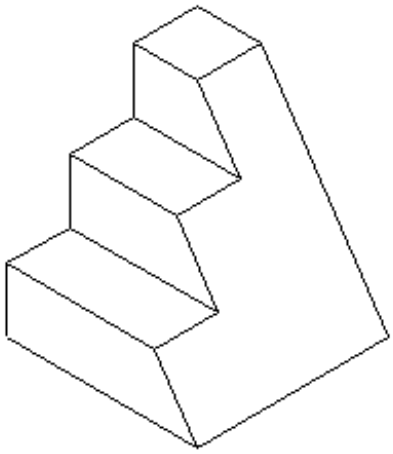


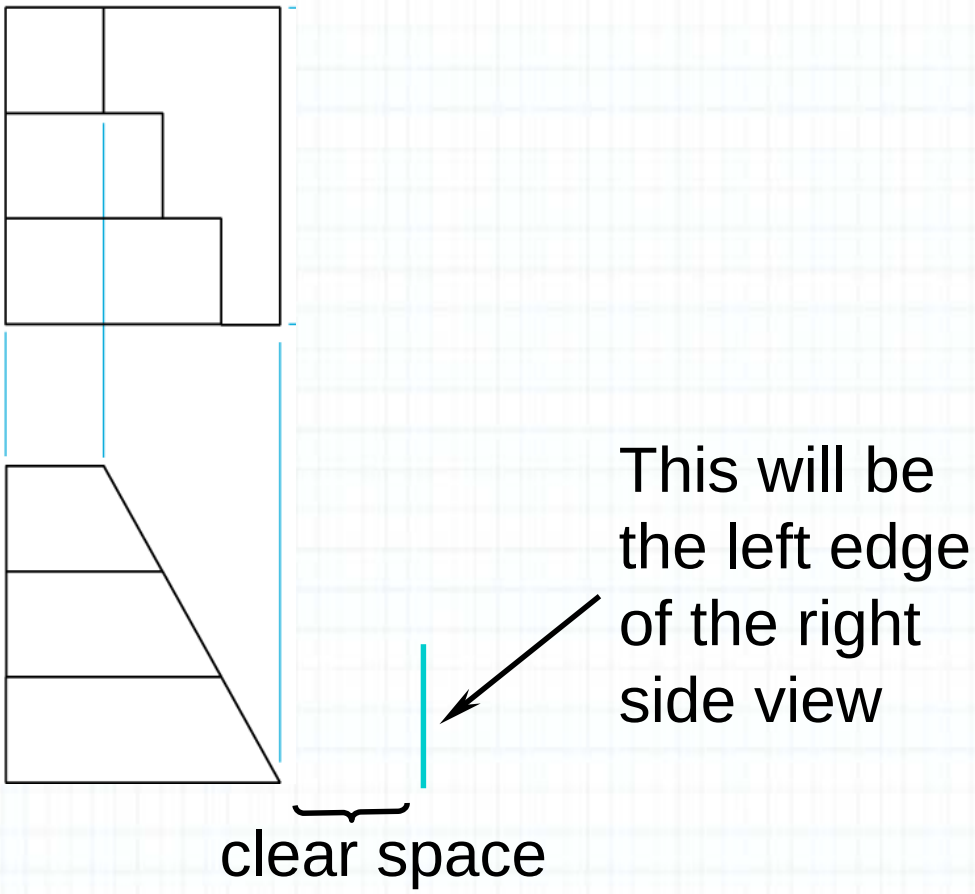
Transferring Dimensions

- Mitered System
- Dividers or Scale

Mitered System

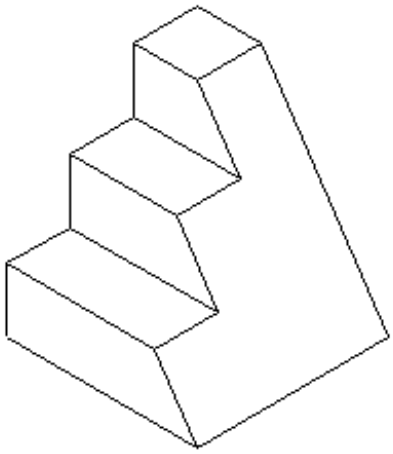
1. Determine spacing necessary between the front and right side views.
   a. For example, when dimensioning, more space is needed between the views.

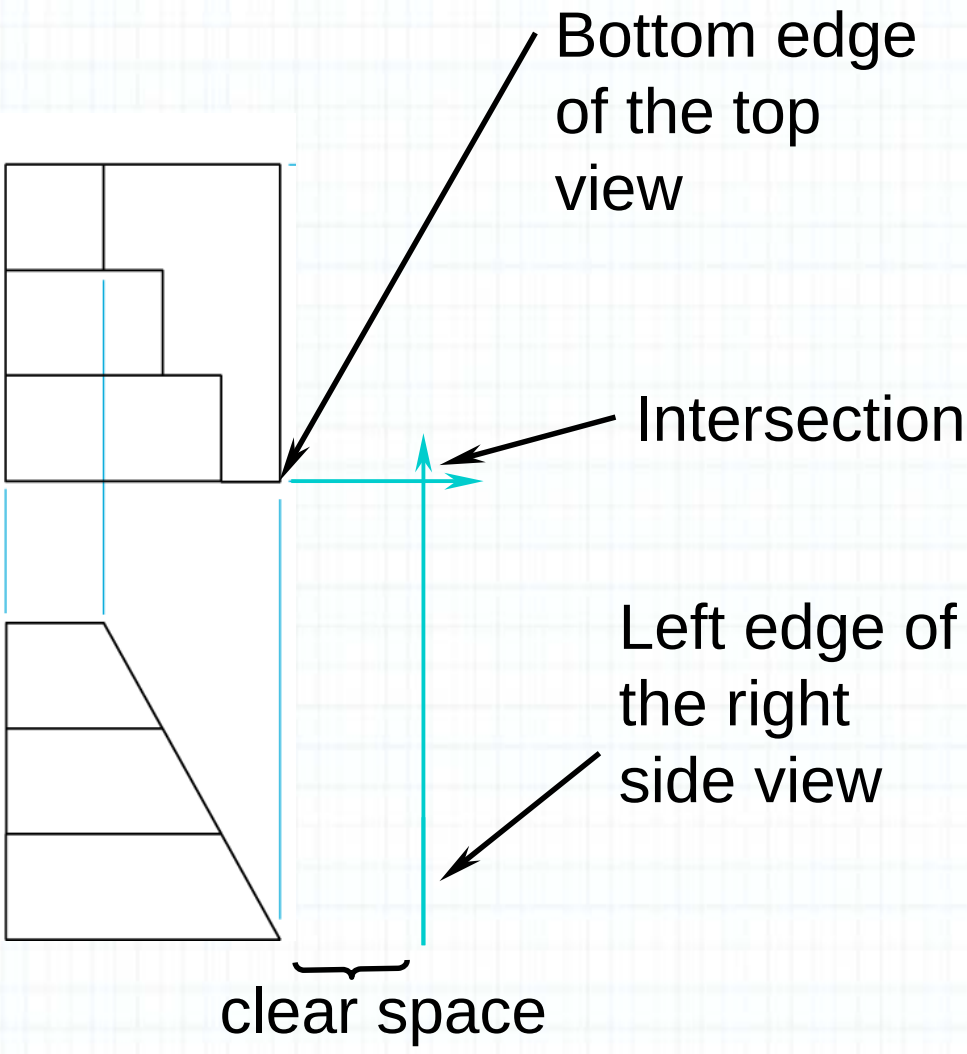




Mitered System

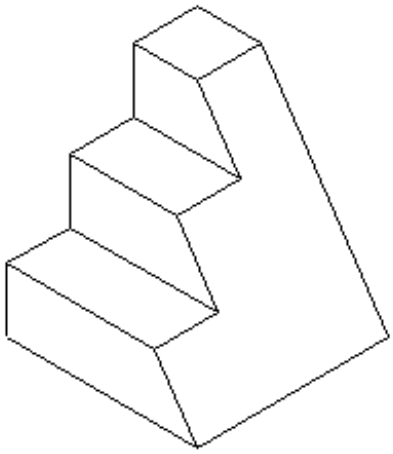
2. Extend a projection line from the bottom edge of the top view and one from the left side of the right side view until they intersect.

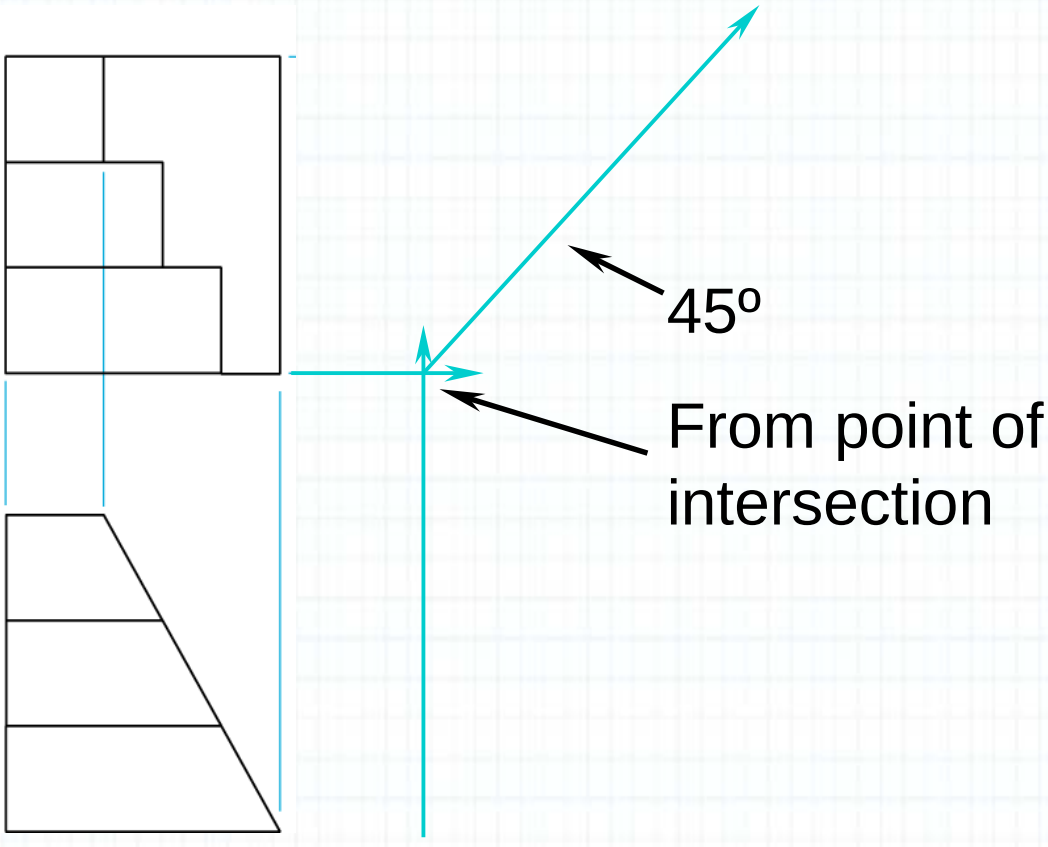




Mitered System

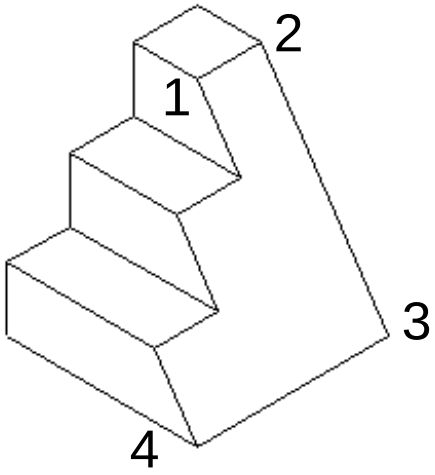
3. Extend a 45° angled line from the point of intersection.

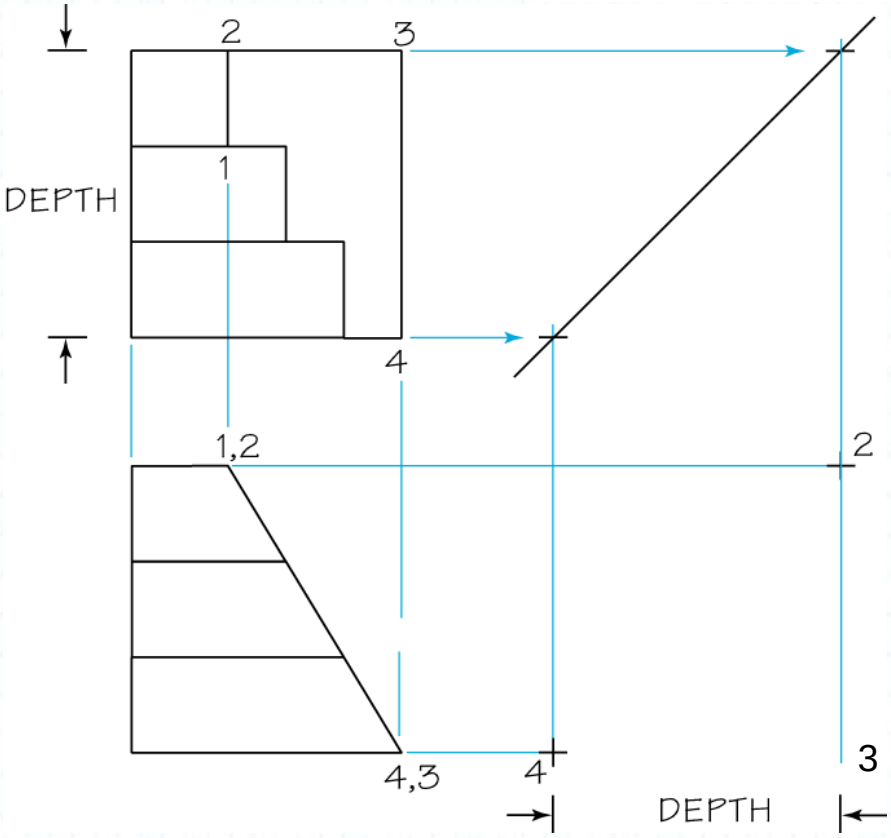




Mitered System cont'd.

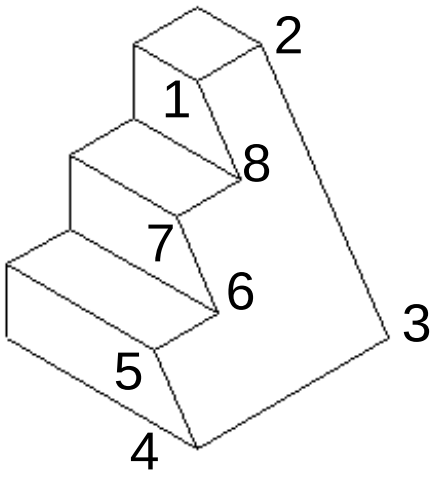
2. Project additional points, surface by surface.

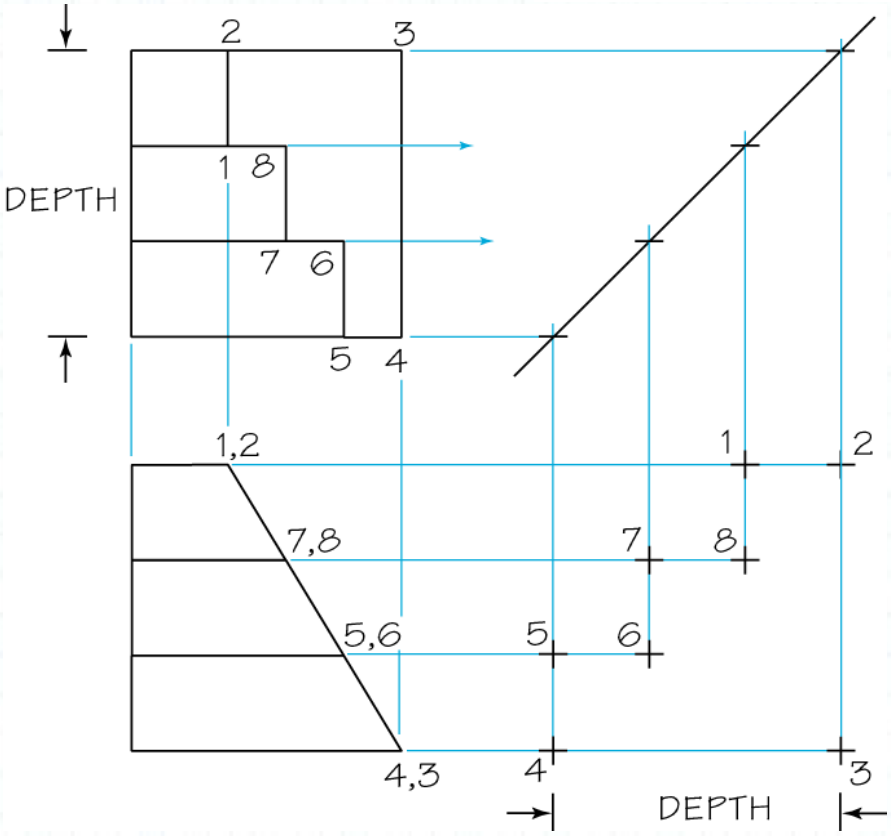




Mitered System cont'd.

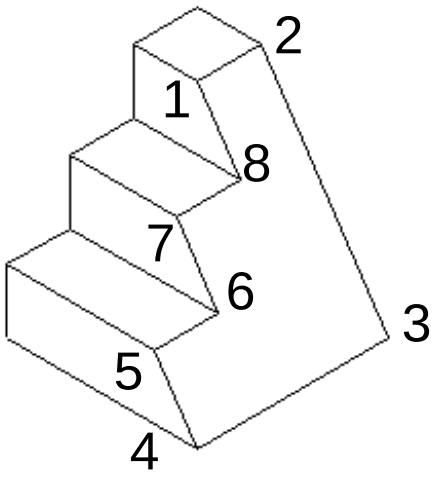
3. Project additional points, surface by surface.

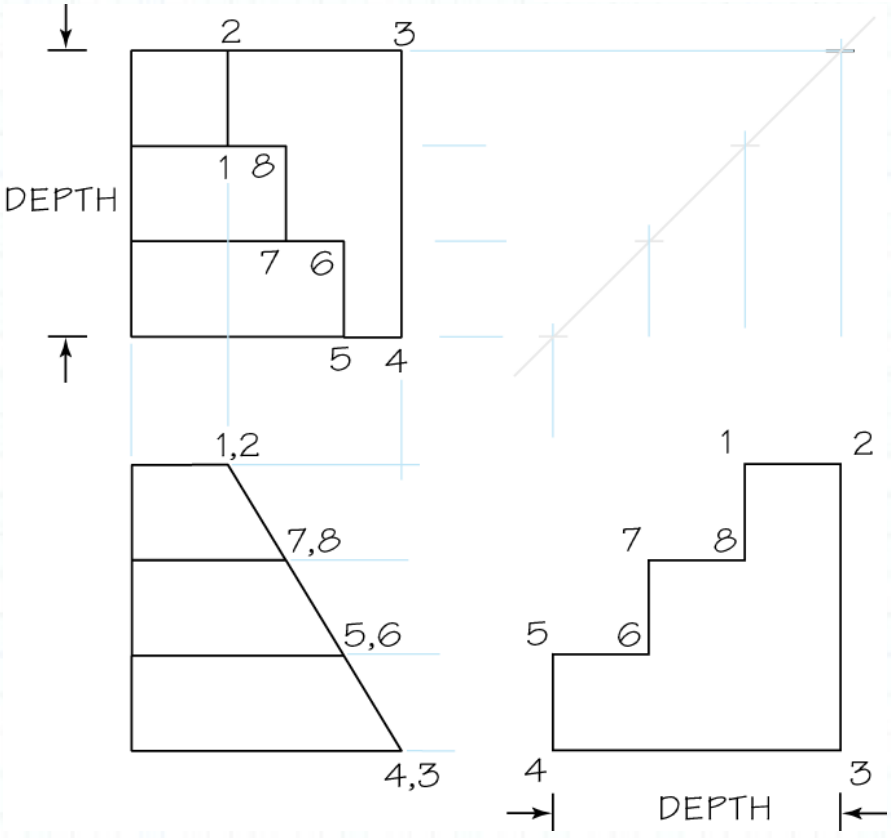




Mitered System cont'd.

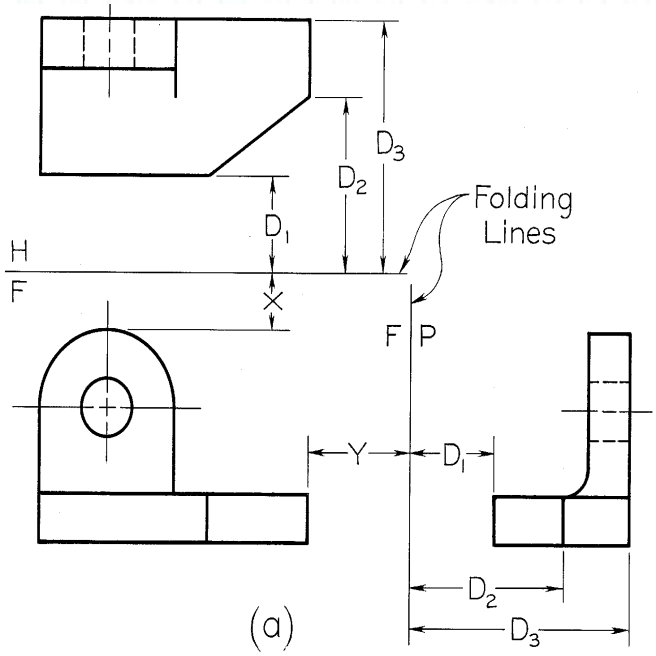
4. Draw the view locating each vertex of the surface on the projection and miter line.



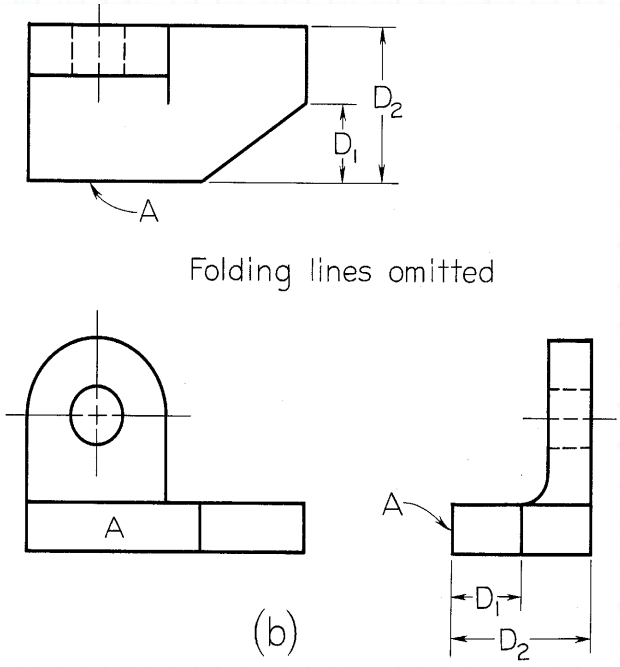


Dividers or Scale

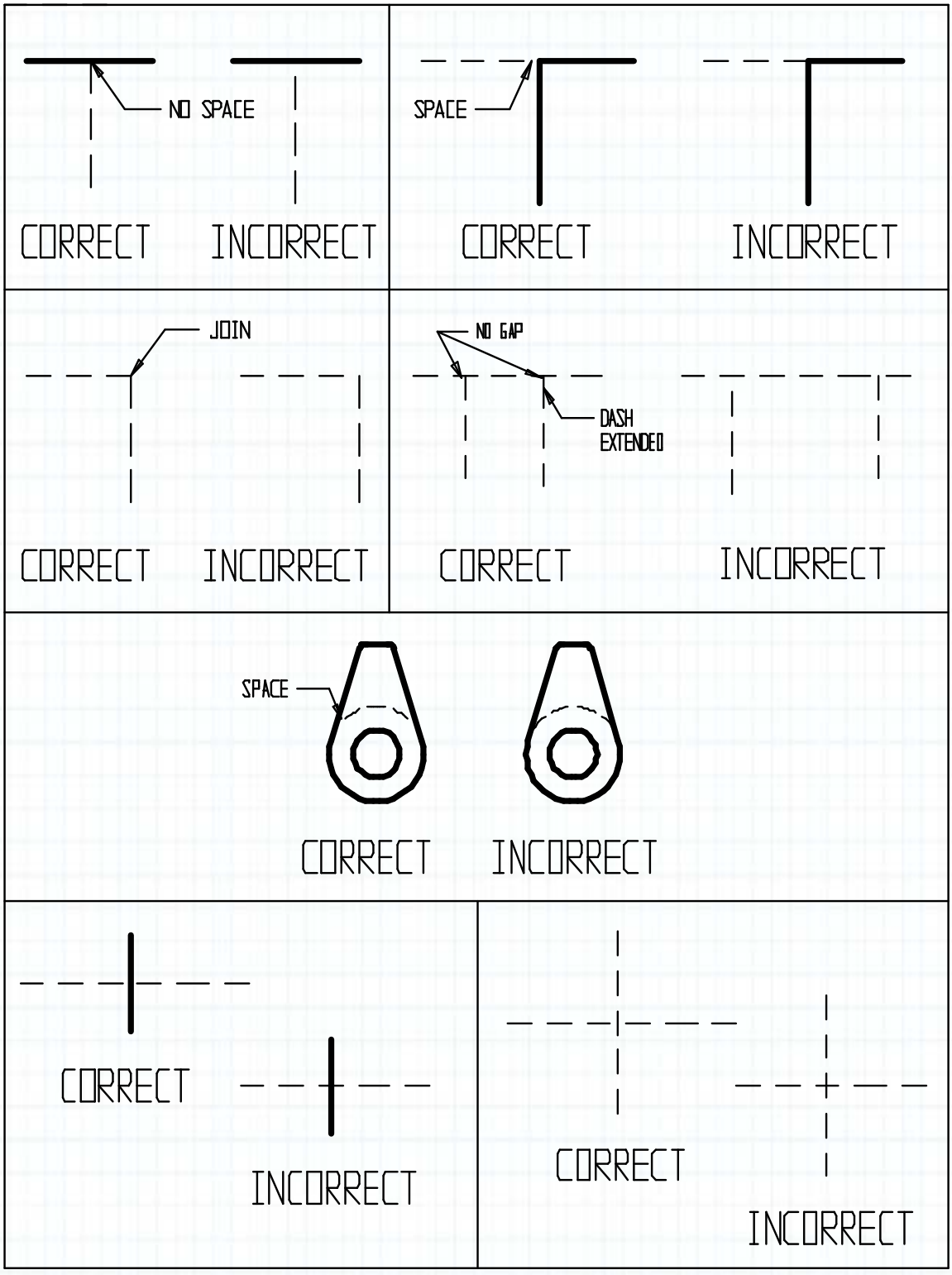
- With folding lines



- Without folding lines



Hidden Lines



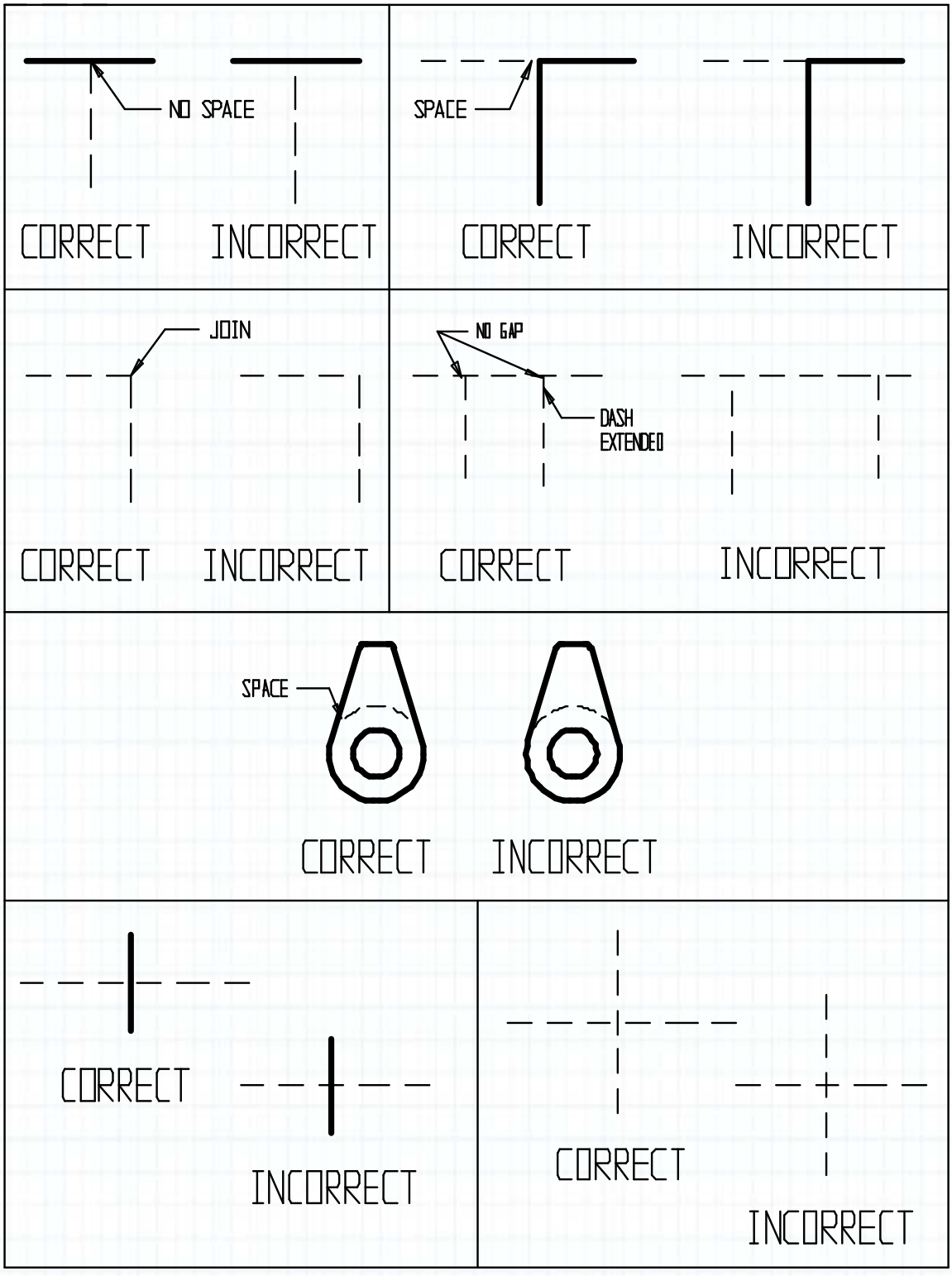
Also Review

- PENN STATE ERIE DRAFTING STANDARDS

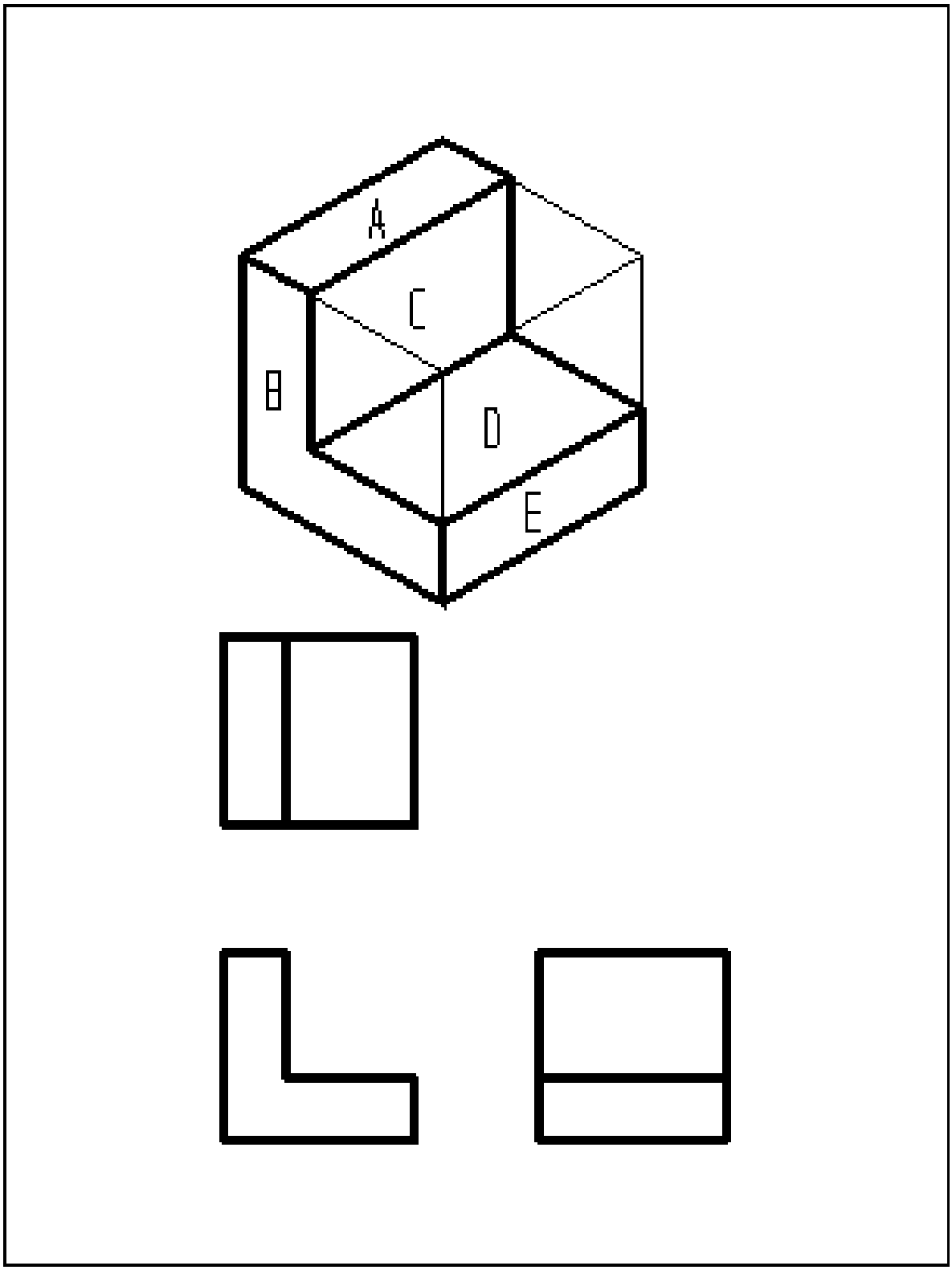
Chapter 5

Multiview Sketching & Projection Part 3

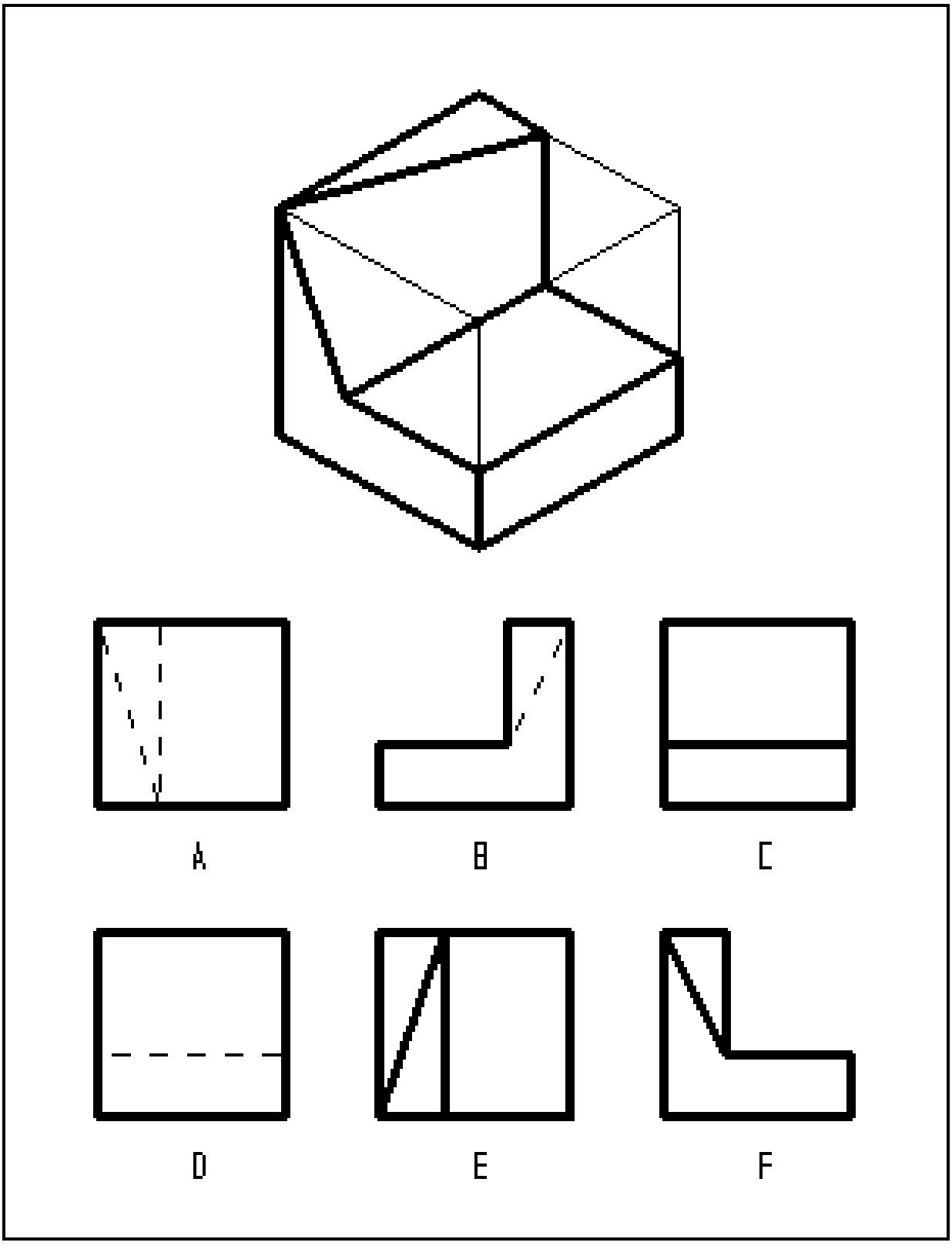
Review Hidden Lines



Surface Identification



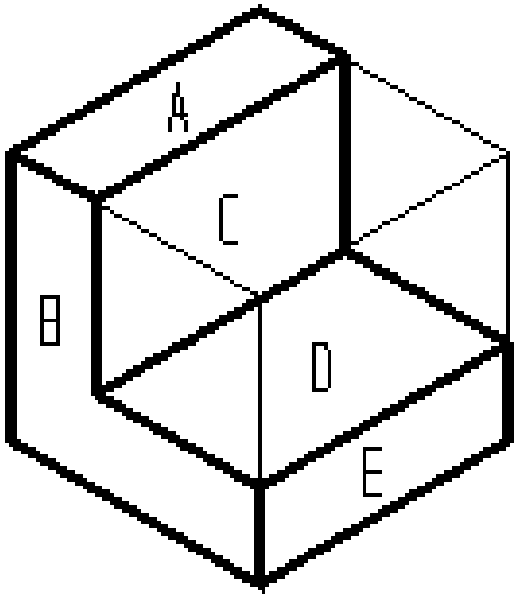
View Identification



Configuration Rule

NORMAL SURFACE

Plane is shown true shape and size. In other words, parallel to one of the principal planes.

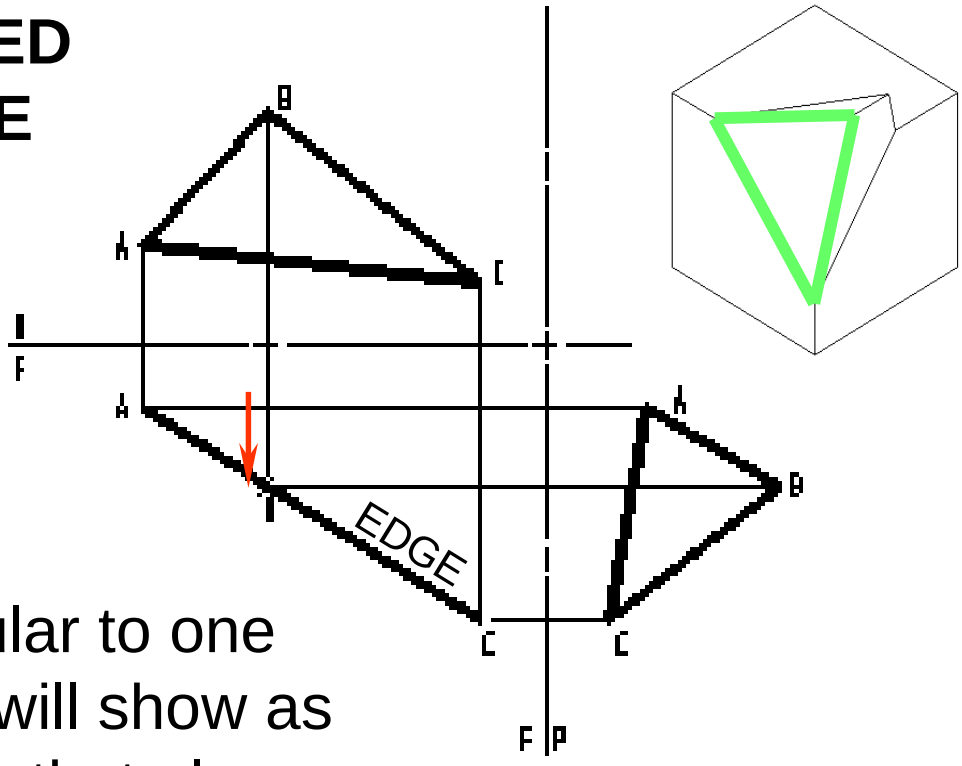


EDGE

SURFACE B

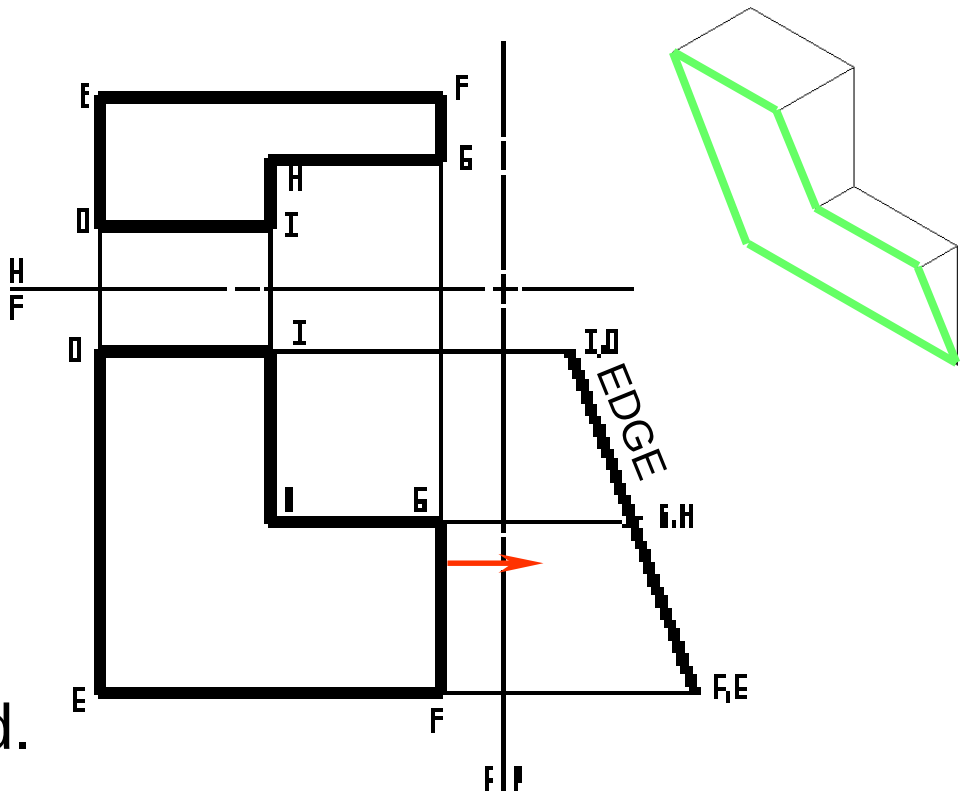
Configuration Rule

INCLINDED SURFACE



Surface is perpendicular to one plane and will show as an edge on that plane.

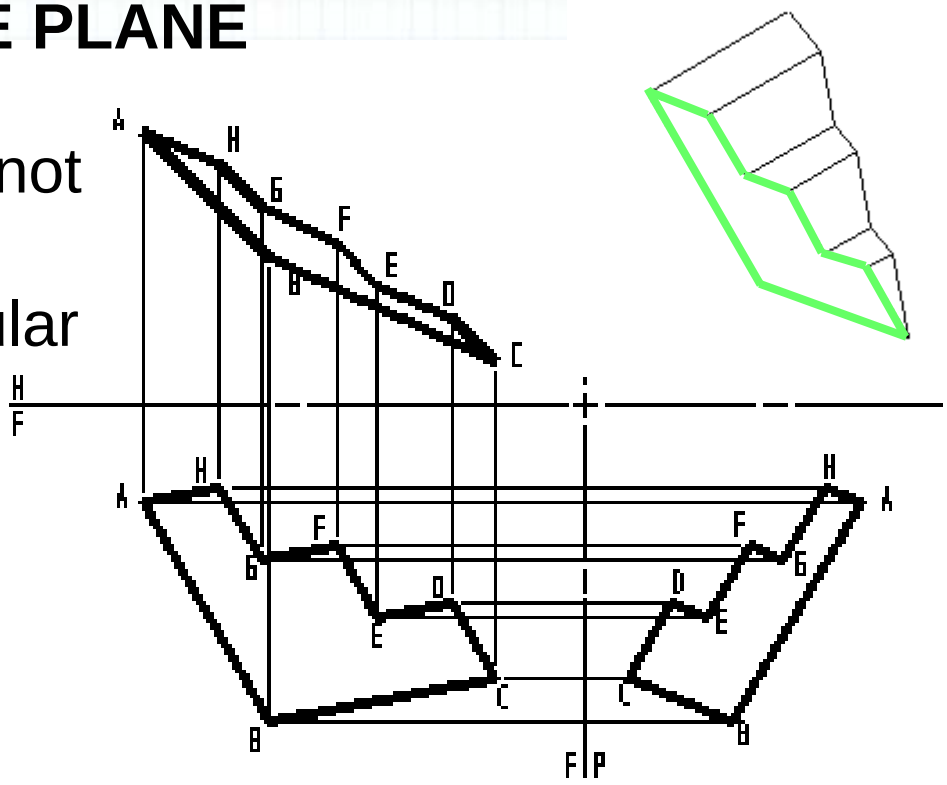
And the surface is tipped, or inclined, to adjacent planes. The surfaces in these views are foreshortened.



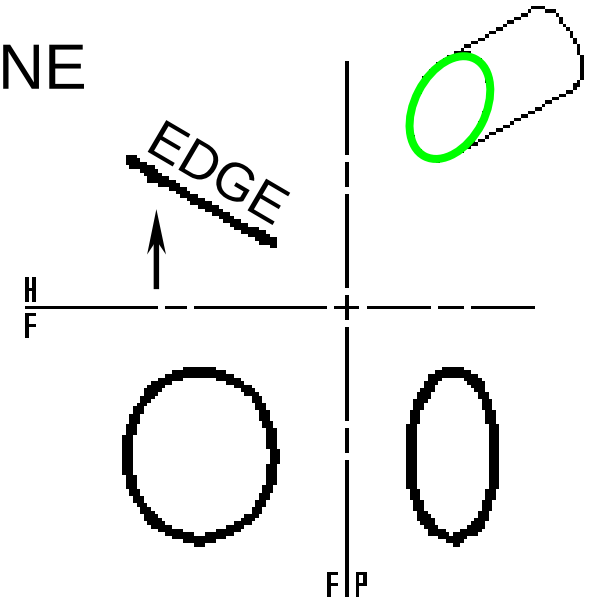
Configuration Rule

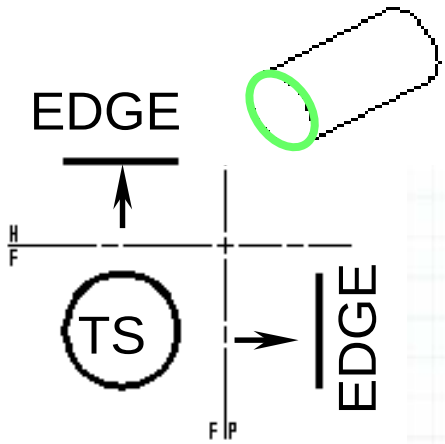
OBLIQUE PLANE

Surface is not parallel or perpendicular to any principal plane.



? PLANE

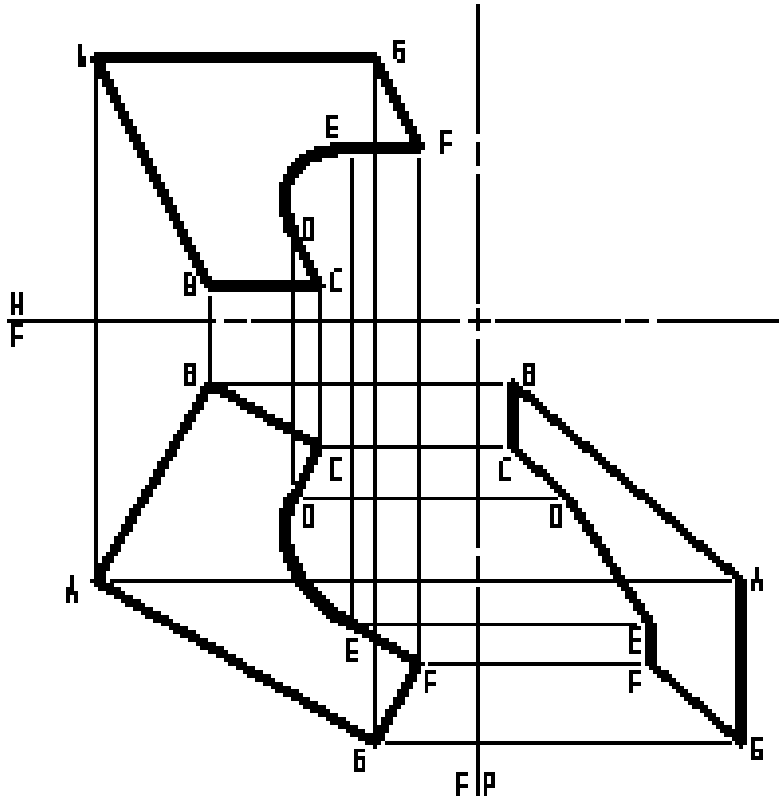




NORMAL PLANE

Configuration Rule

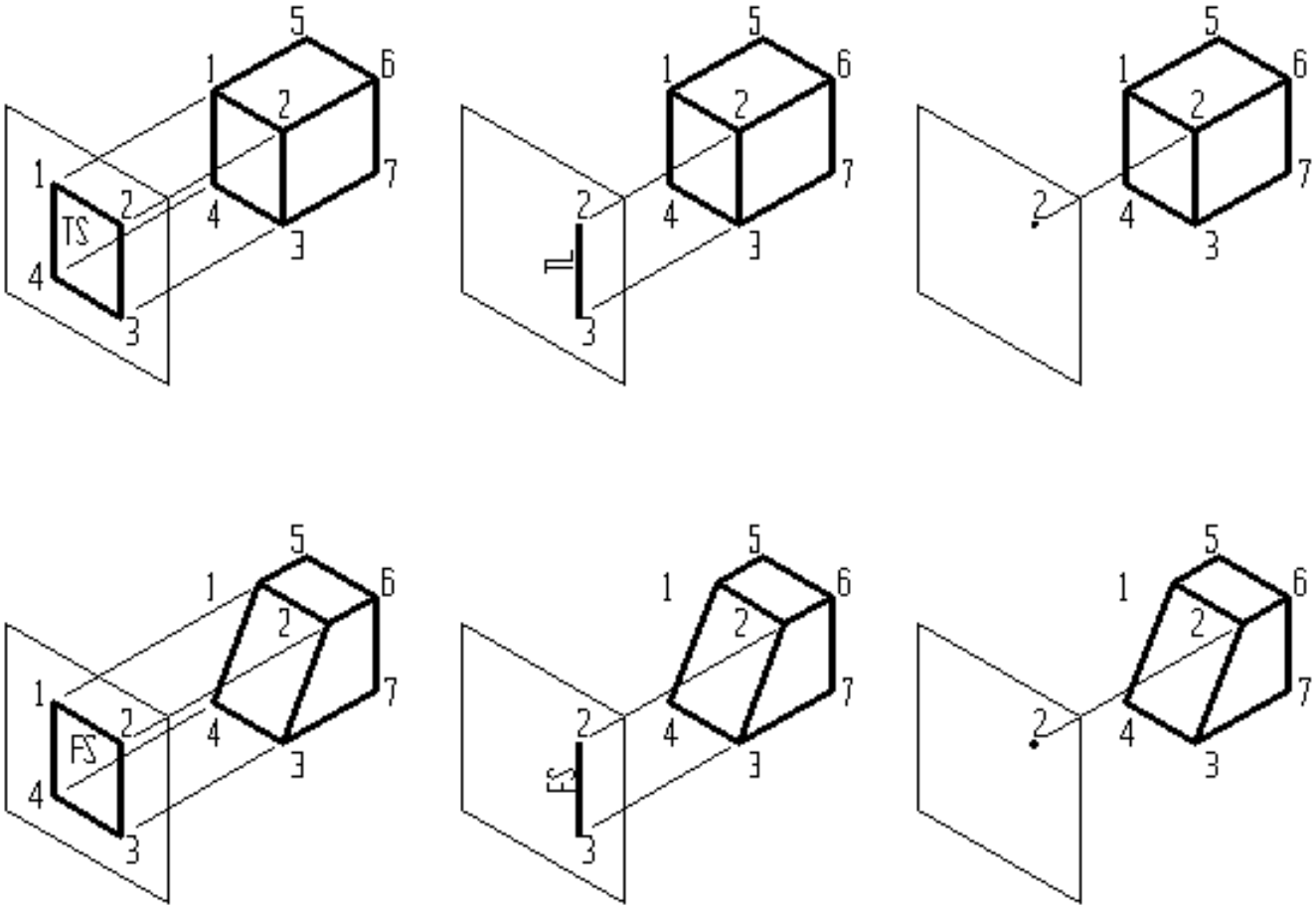
? PLANE



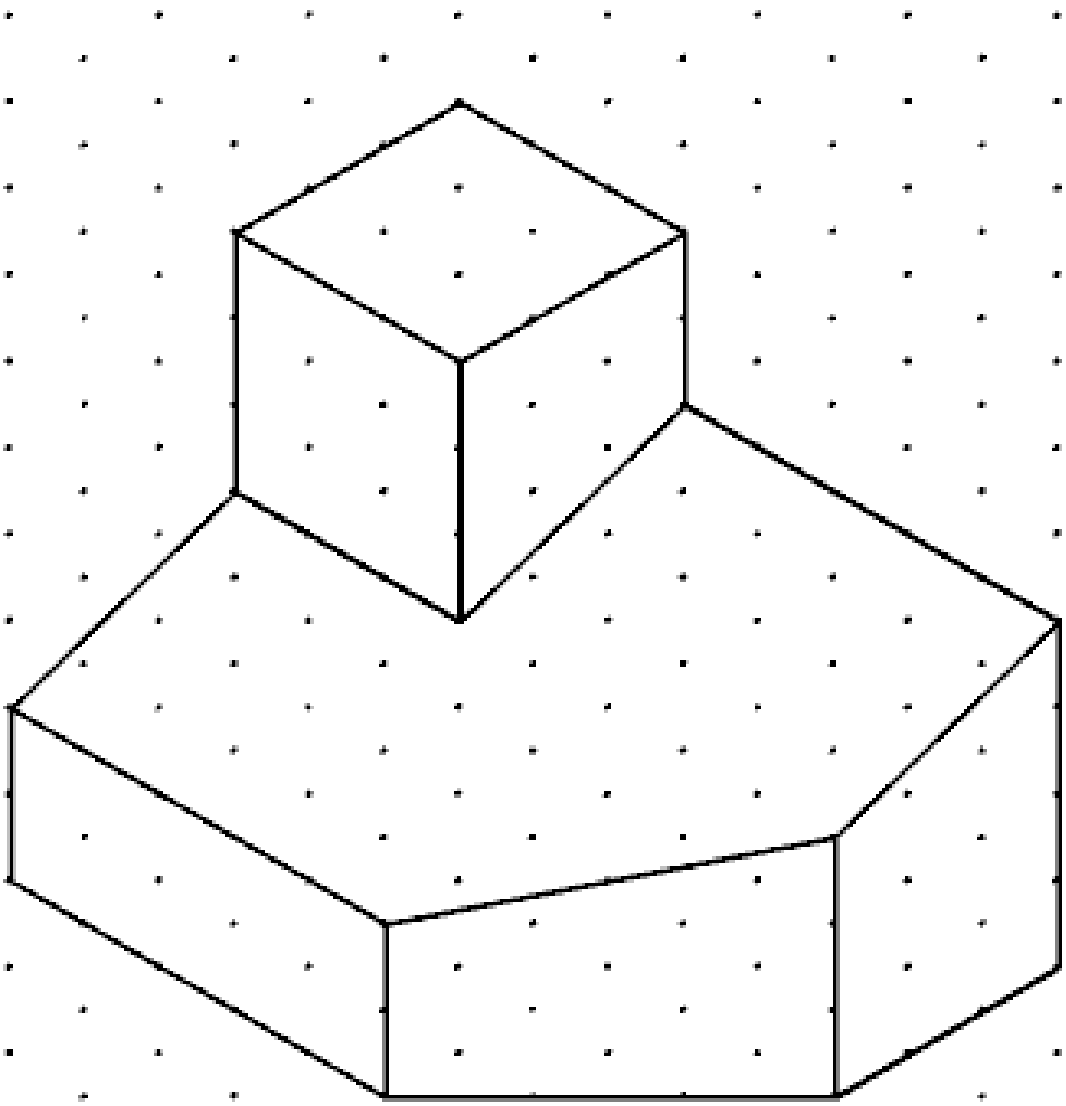
- Is this one correct?

Points, Lines & Planes

- If all else fails,
  - Break the object down to simpler shapes
  - Locate the height, width and depth of each point.



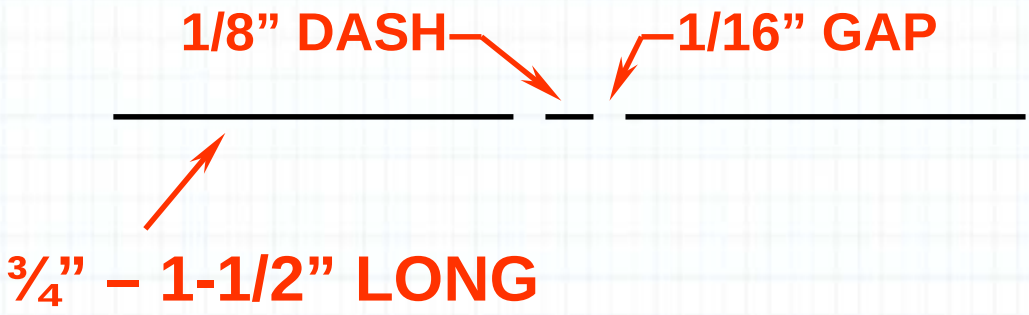
Exercise



Chapter 5

Multiview Sketching & Projection Part 4

Center Lines

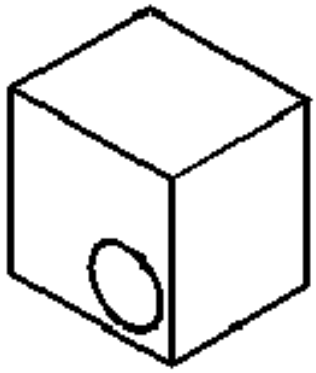


Thin dark line

Purpose of a center line?

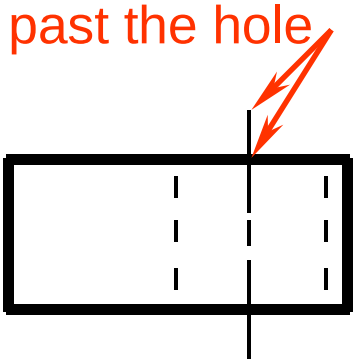
To show location of a hole, arc, cylinder, etc.

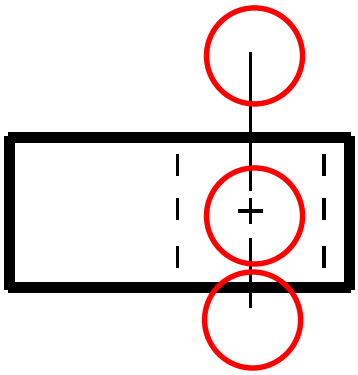
Center Lines

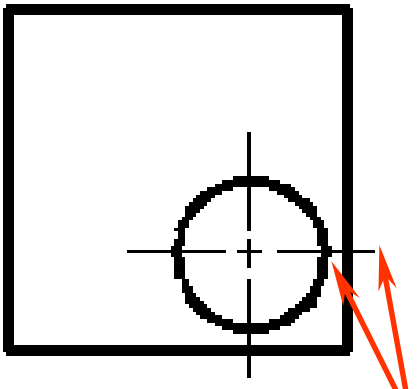


Extend center line

¼” past the hole

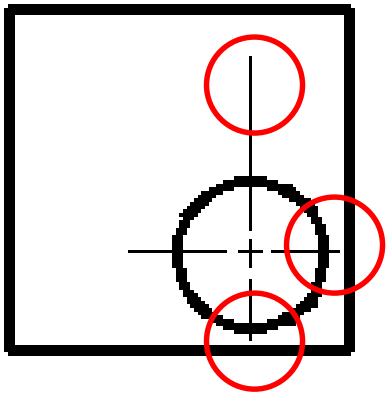






Extend center line

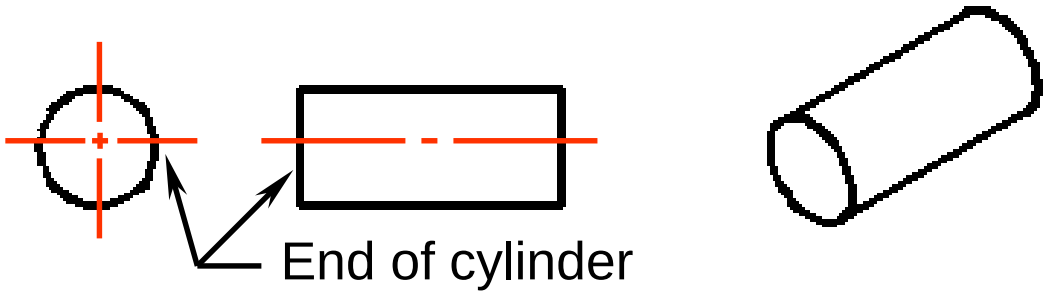
¼” past the hole

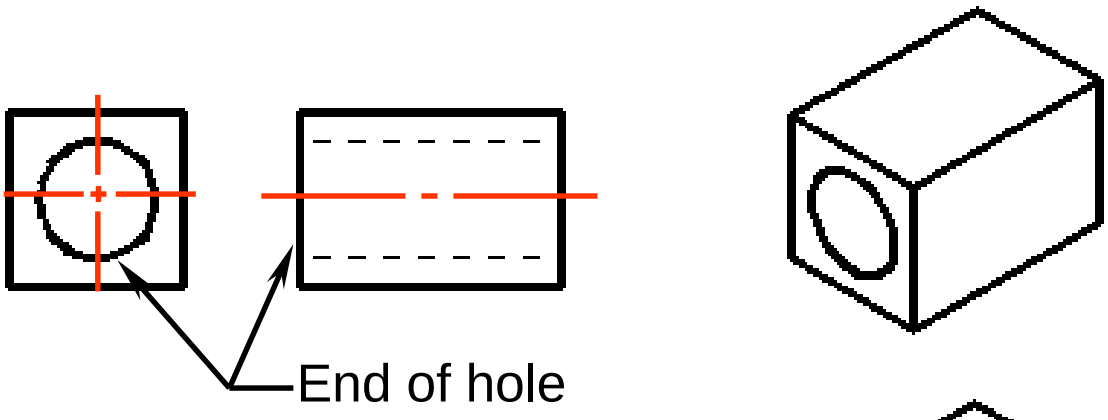


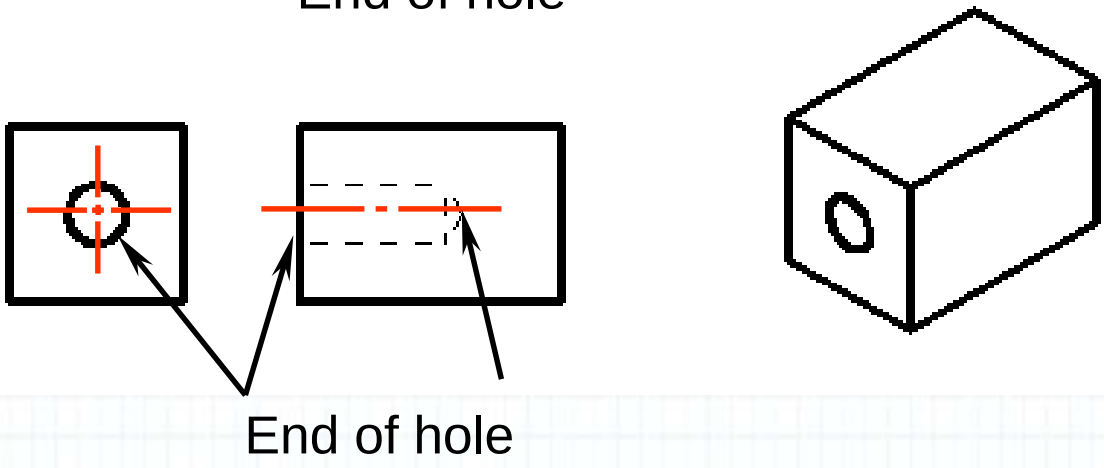
HOW MANY CENTER LINES MISTAKES?

Center Lines

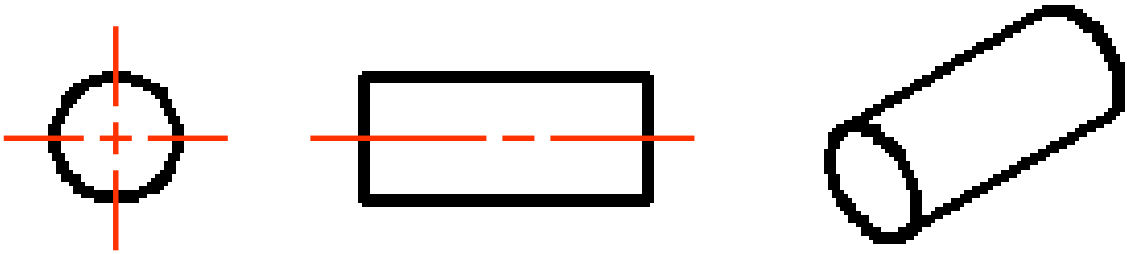
- ¼” past the end of the hole and/or cylinder

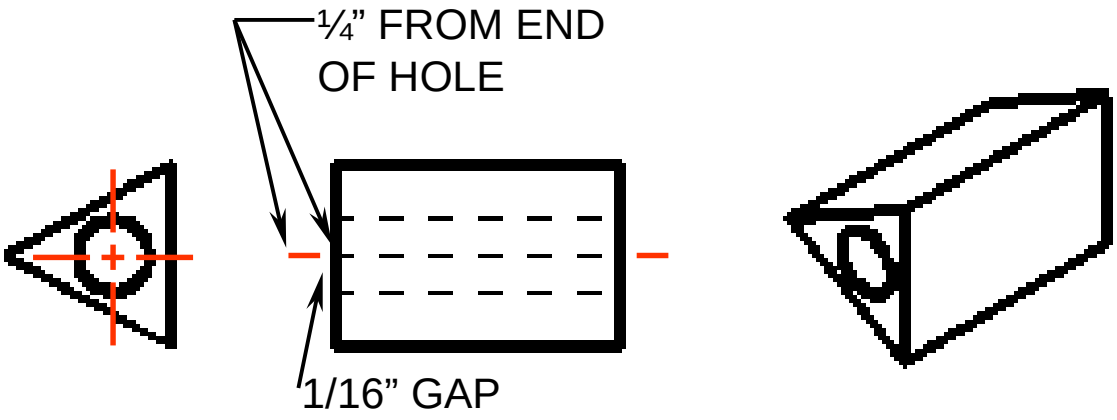




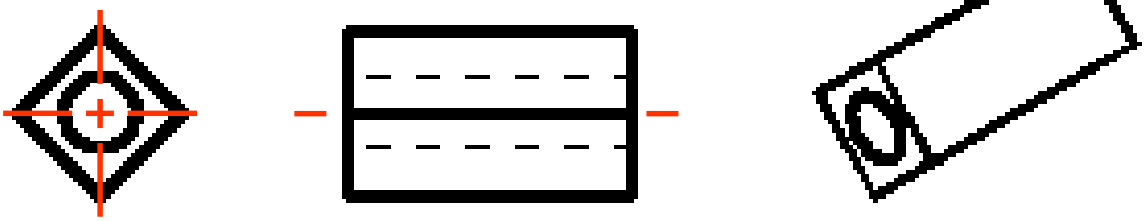


Precedence of Lines



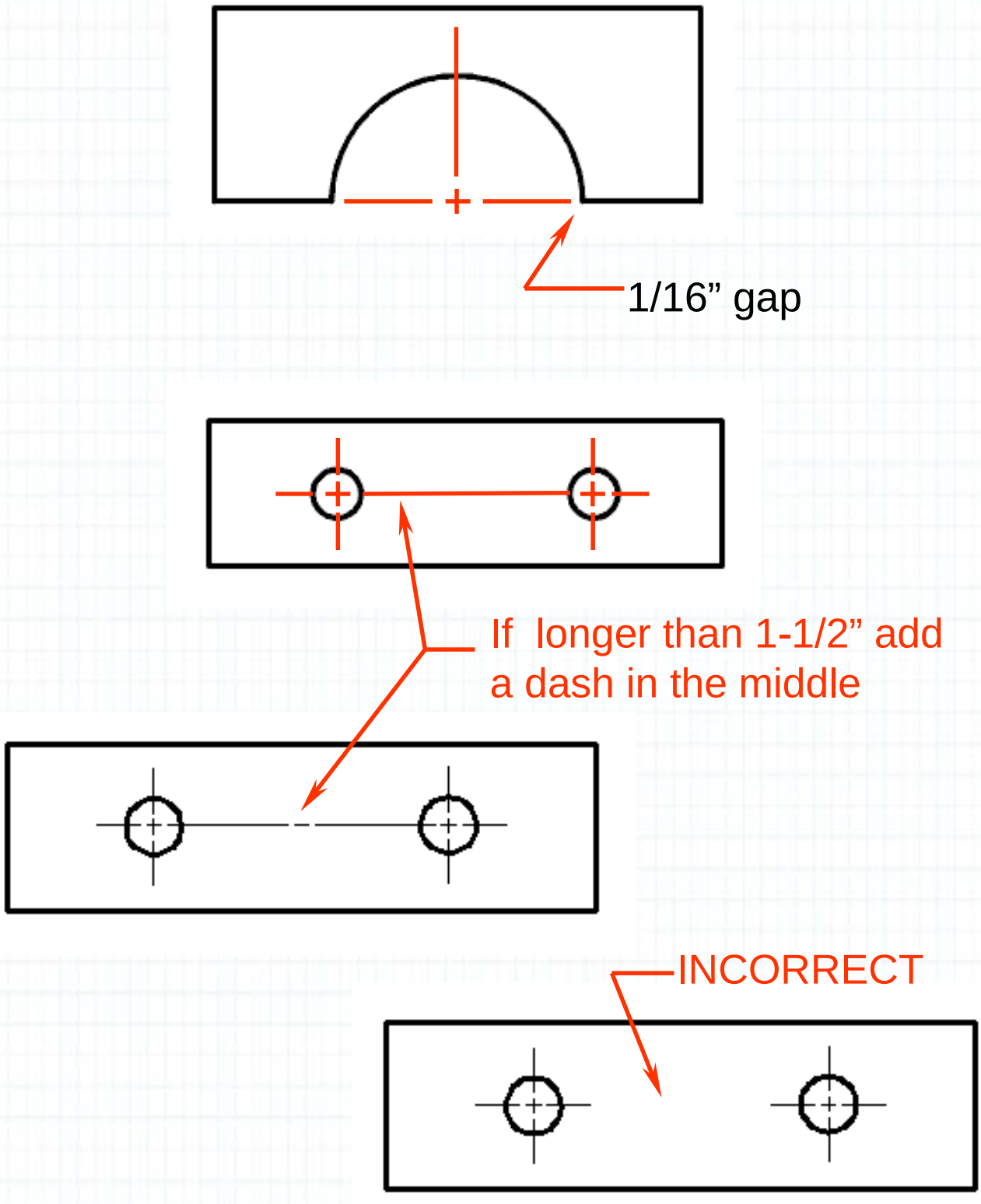


HIDDEN LINES TAKE PRECEDENCE OVER CENTER LINES

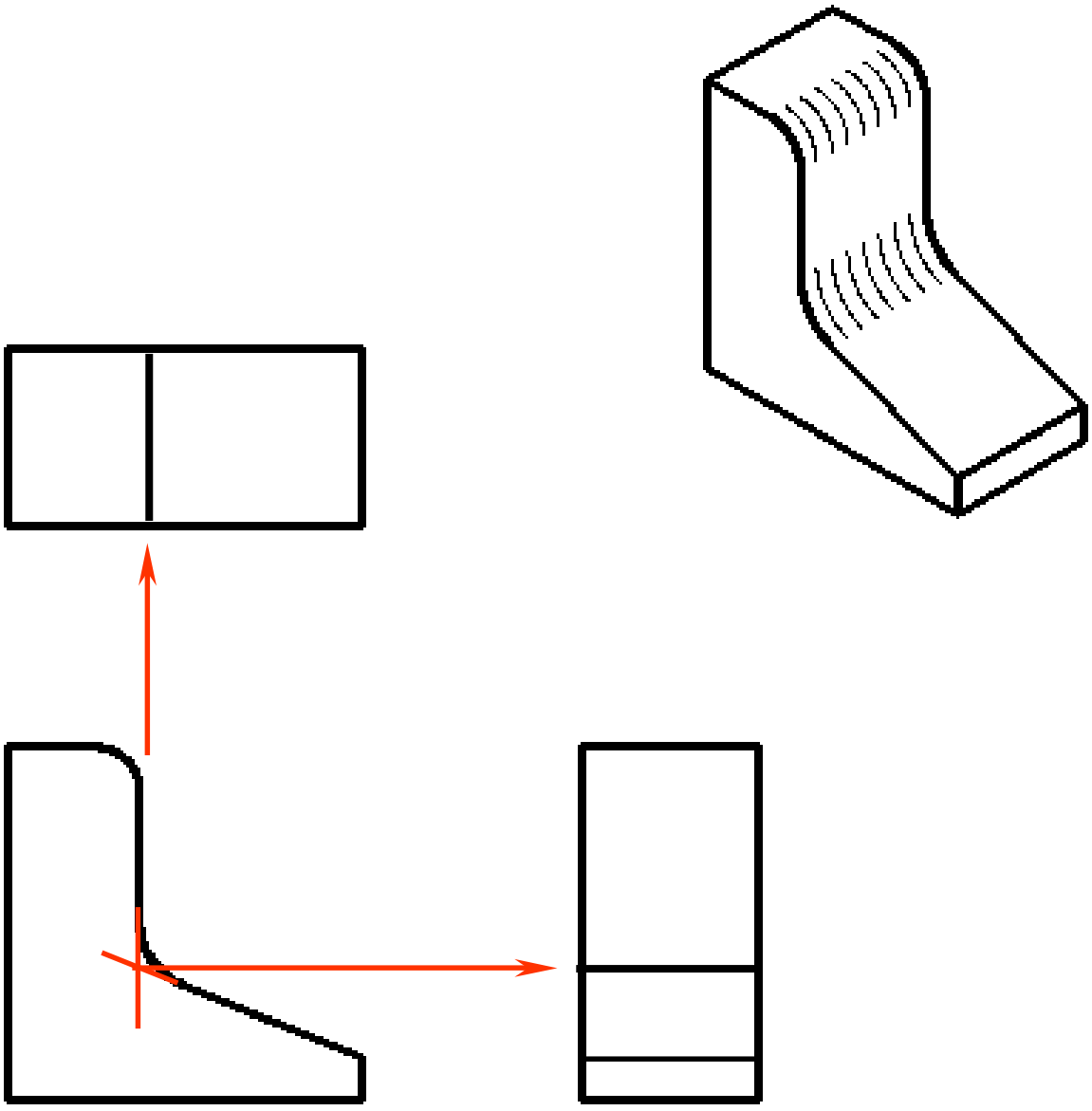


OBJECT LINES TAKE PRECEDENCE OVER HIDDEN LINES

Center Lines

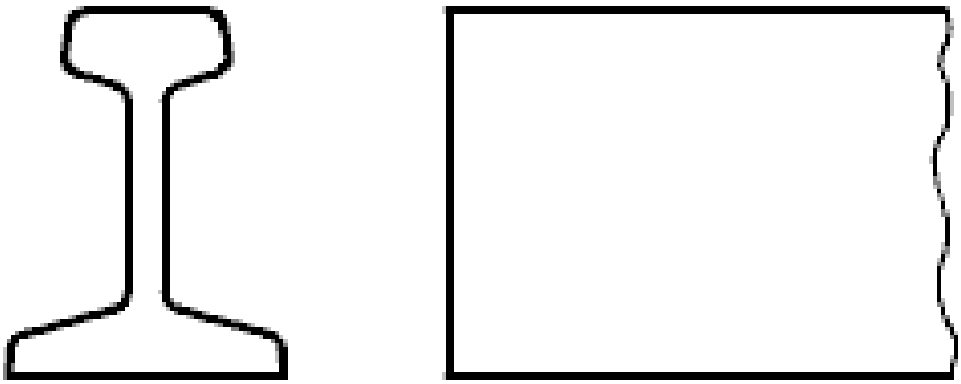


Projection of an Object



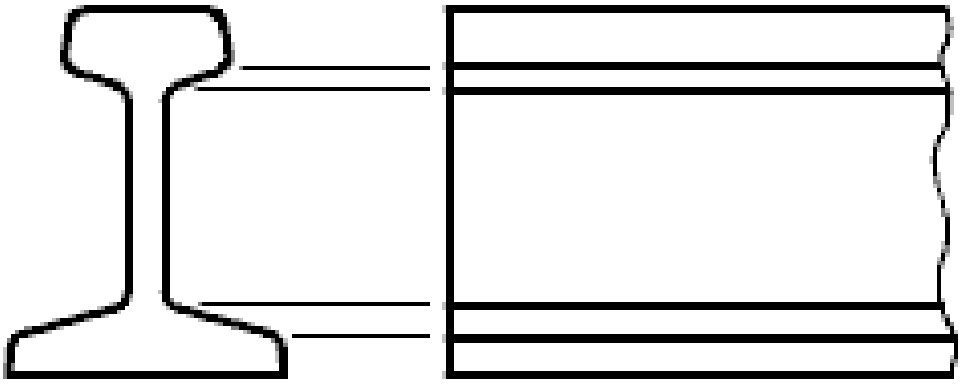
Fillets and Rounds: Self locating, so do NOT add center lines, but do draw where sharp corner would be.

Projection of an Object



Why?

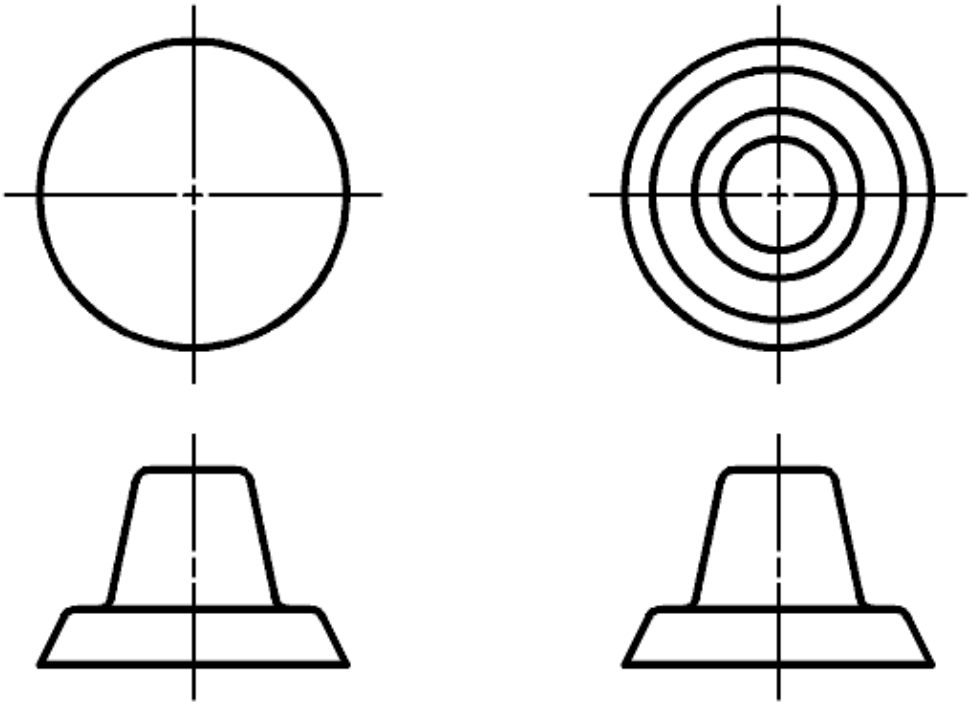
POOR PRACTICE



PREFFERED

Adds clarity

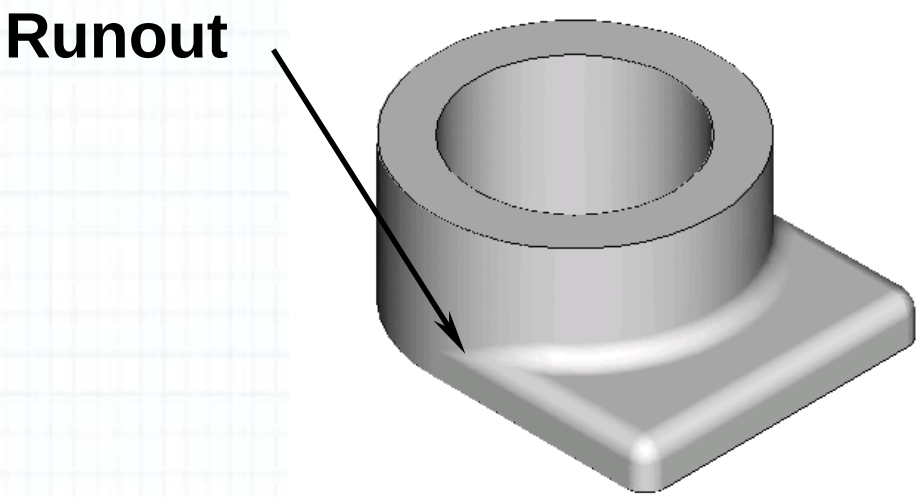
Projection of an Object

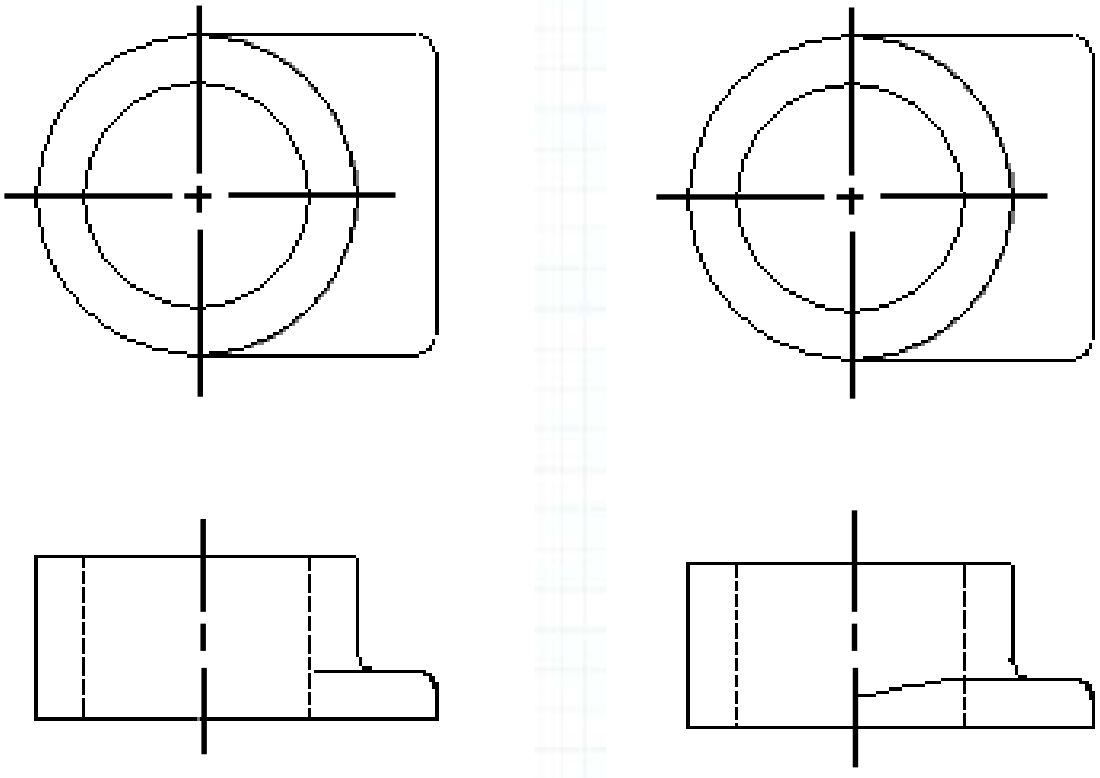


POOR PRACTICE

PREFFERED PRACTICE

Projection of an Object





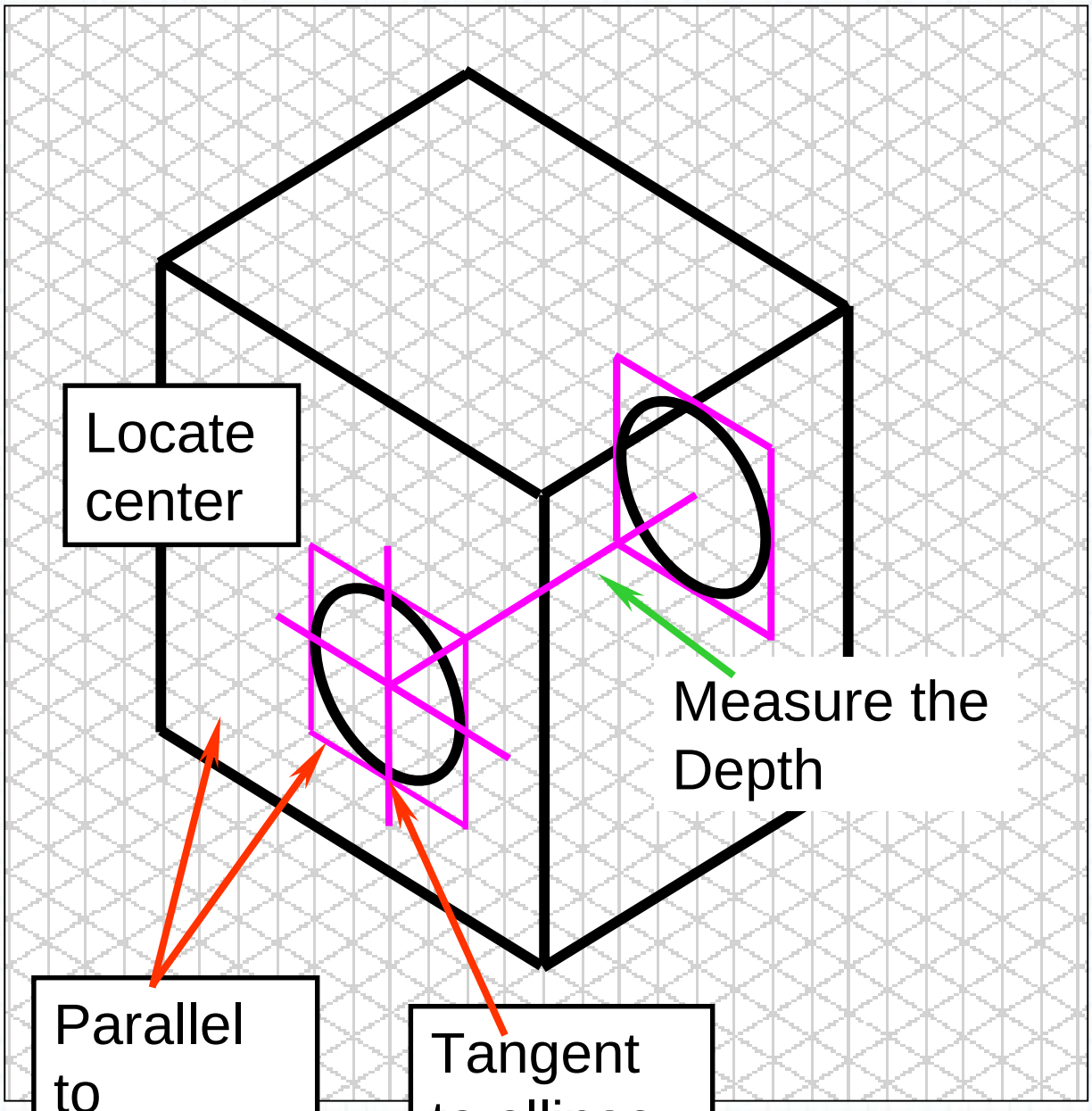
POOR PRACTICE

PREFFERED PRACTICE

Chapter 5

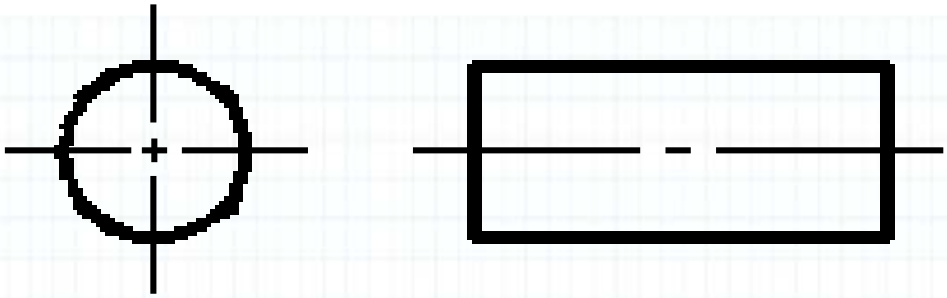
Multiview Sketching & Projection Part 5

Find Location & Size of a Thru Hole



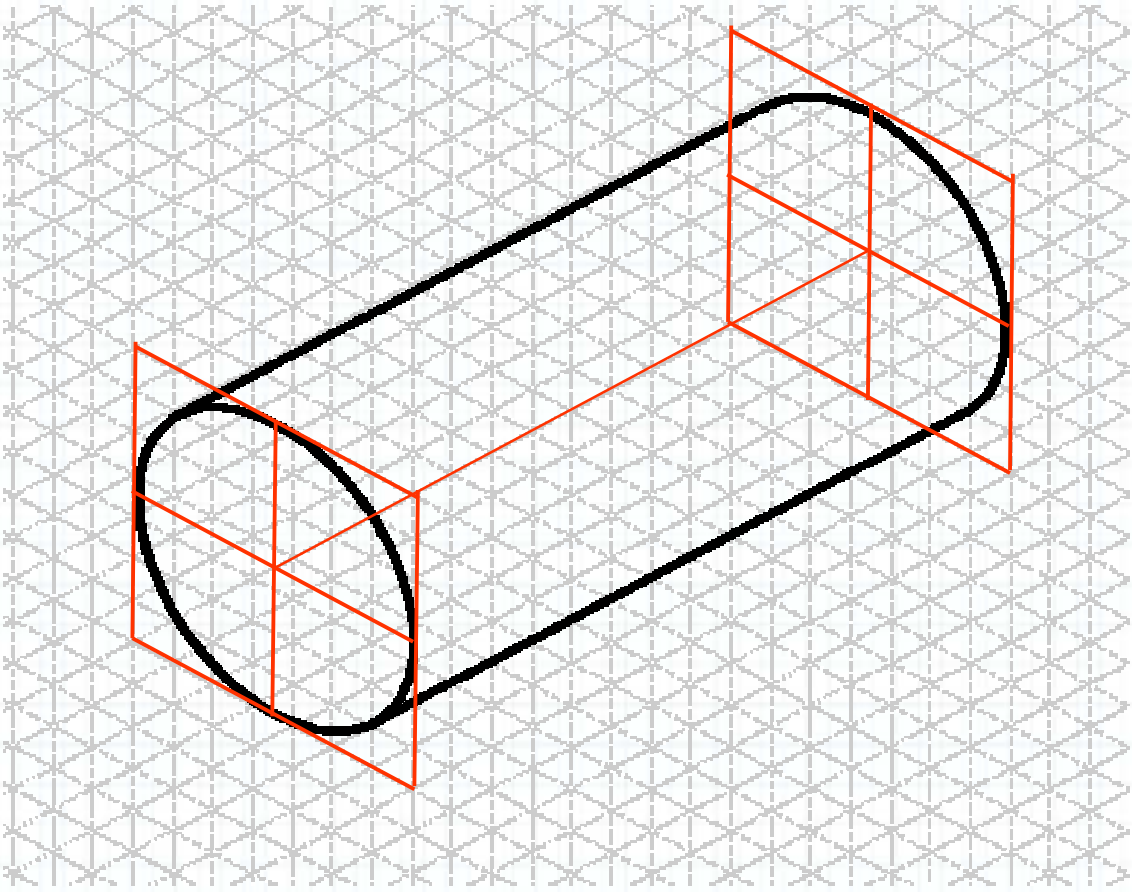
Enough information to determine diameter and location of hole on front surface

Find Location and Size



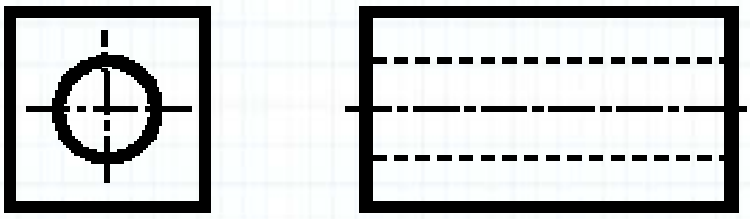
What is the diameter and length of the cylinder?

Ø1.5 X 3.75

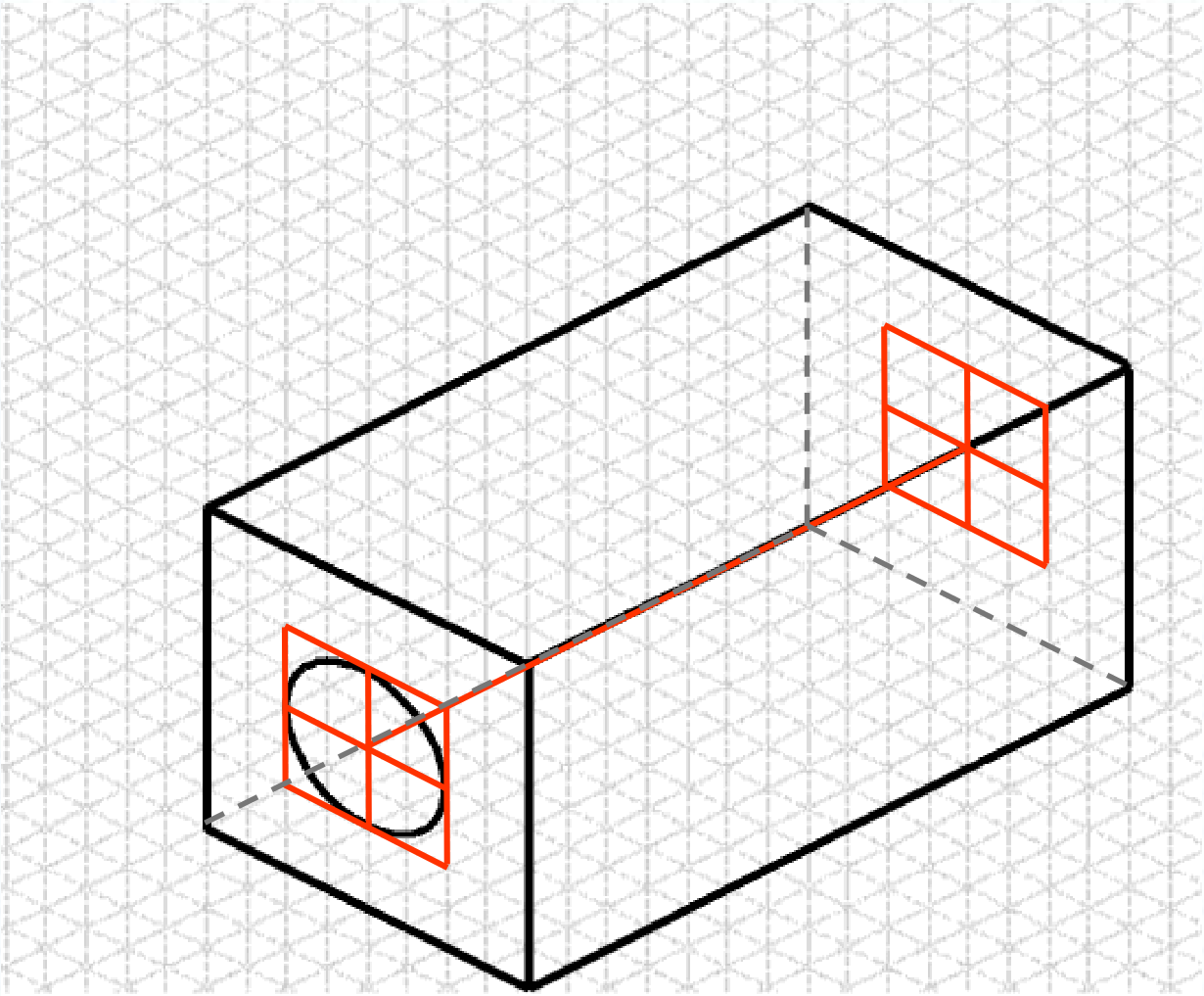


1 Grid = .25

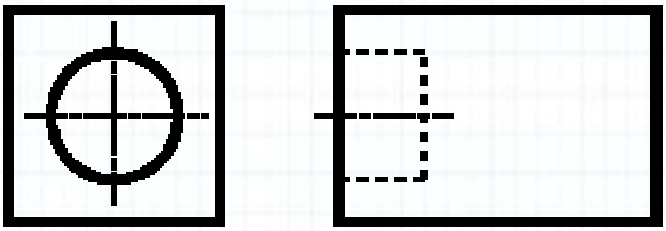
Find Location and Size



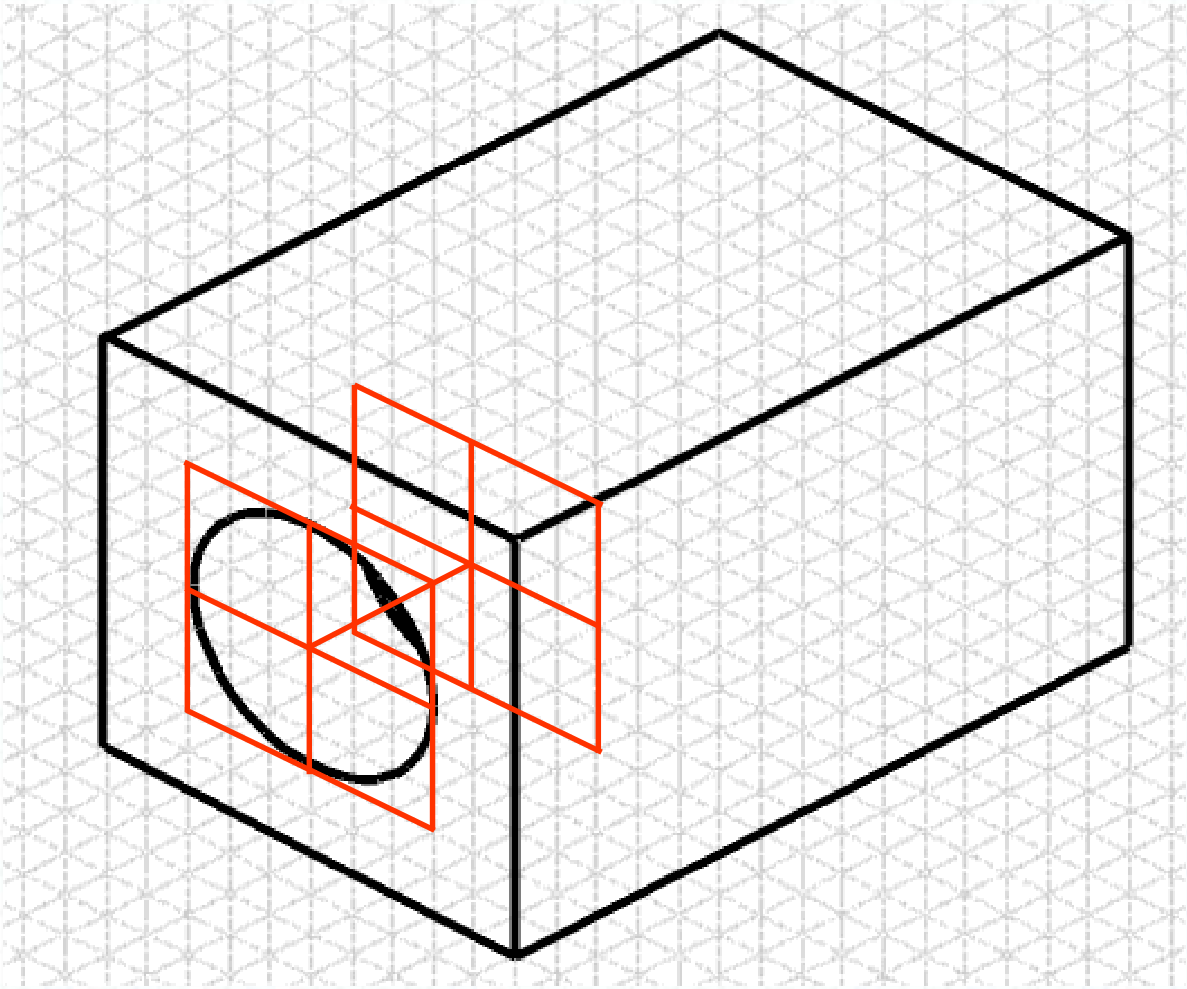
Size of hole? Ø1.0 X 1.75



Find Location and Size



Size of Hole? Ø1.5 ↧1.0



Cylinders, Holes & Arcs