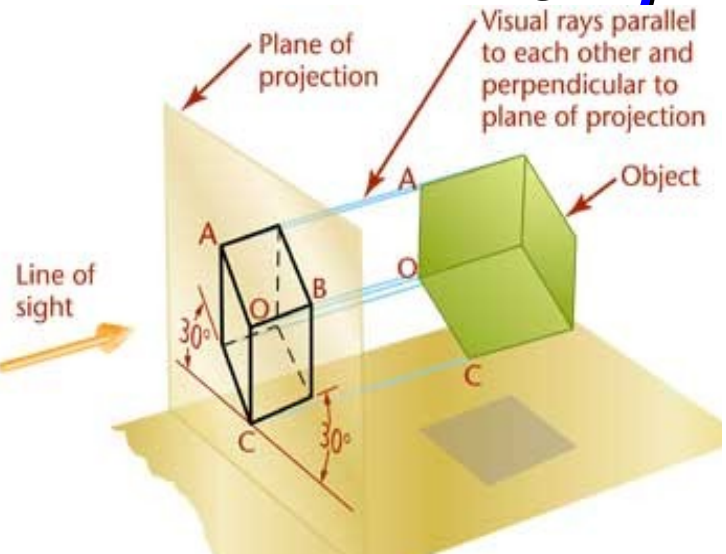


College of Electrical and Mechanical Engineering

Department of Mechanical Engineering

Engineering Drawing (MEng2001)

Chapter 4. Pictorial Drawing

By Tolina T.

April, 2022

Topics

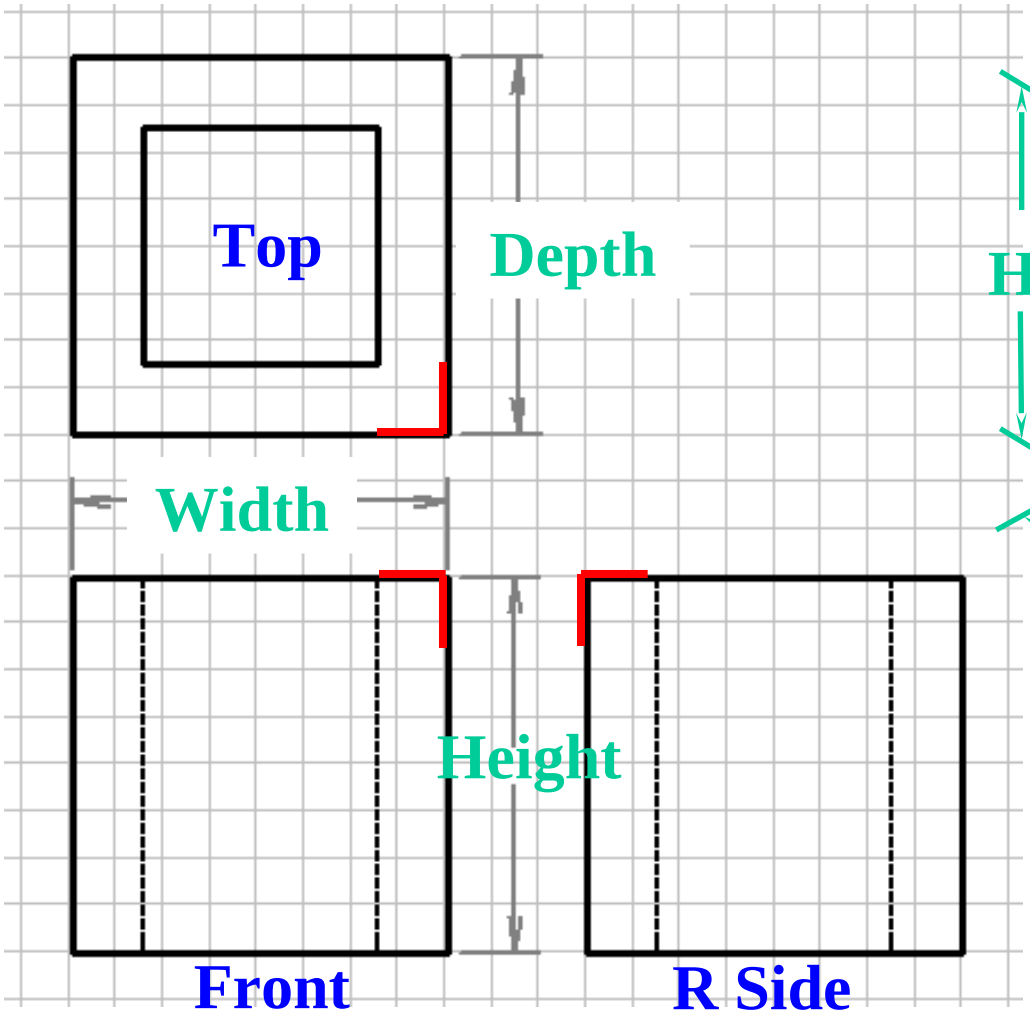
- Comparison between multi-view and pictorial drawing
- Types of pictorial projections
- Isometric drawings
- Oblique drawings

Objectives

- Be able to explain the difference between an **axonometric projection** and an **oblique projection**.
- Be able to explain the difference between an **isometric projection** and an **isometric drawing/sketch**.
- Be able to create an **isometric** and **oblique drawings** from an actual object and multiview drawing.

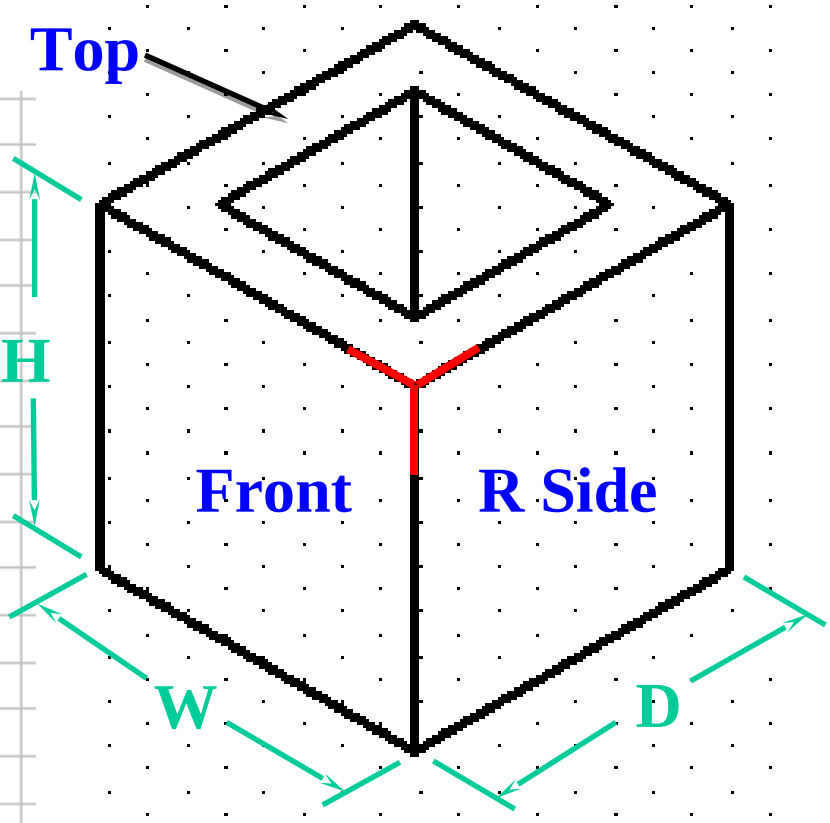
Comparison Between Multi-view and Pictorial Drawing

- *Pictorial projections are a type of technical illustration that shows several faces of an object at once.*
- *Pictorial projections are used by any industry that designs, sells, manufactures repairs, installs or maintains a product.*
- *Pictorial drawings distort dimensions and/or angles, making fabrication difficult*
- *Multiview drawings show the true size and shape of the two dimensions of an object.*



2D - Orthographic

3D - Isometric



Pictorial Distortion

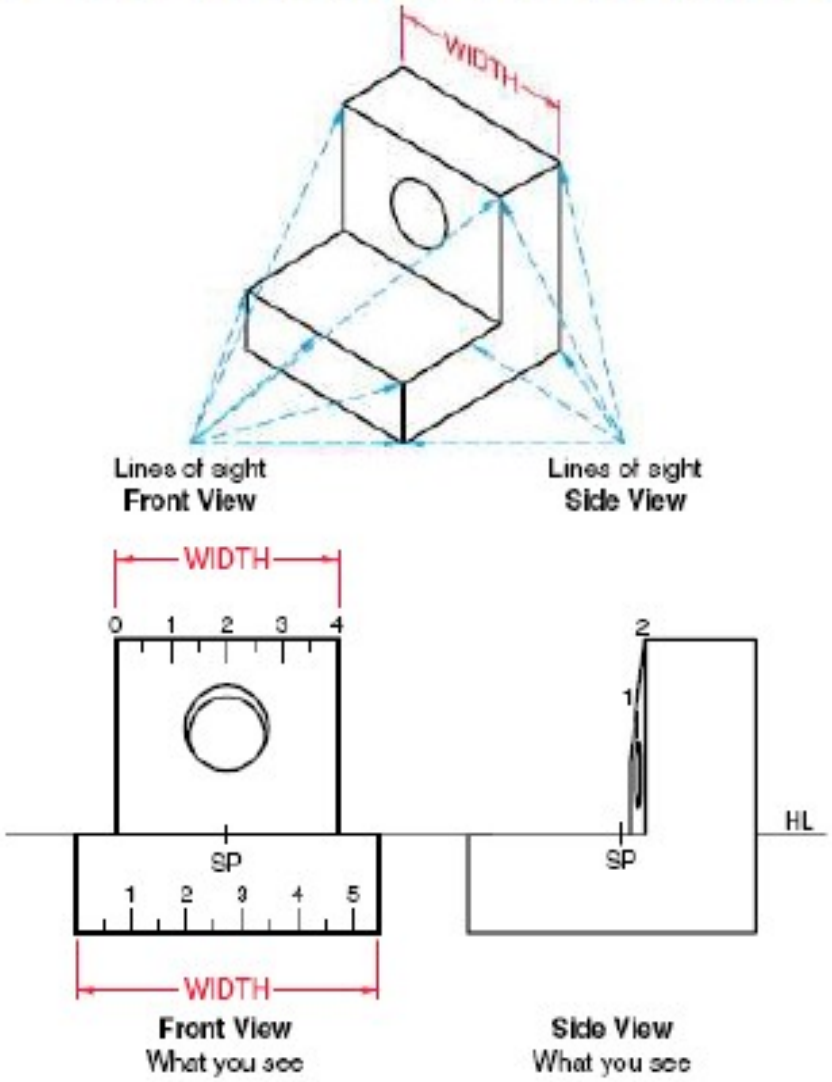


Figure 5.13 **Distorted dimensions**

Perspective drawings distort true dimensions.

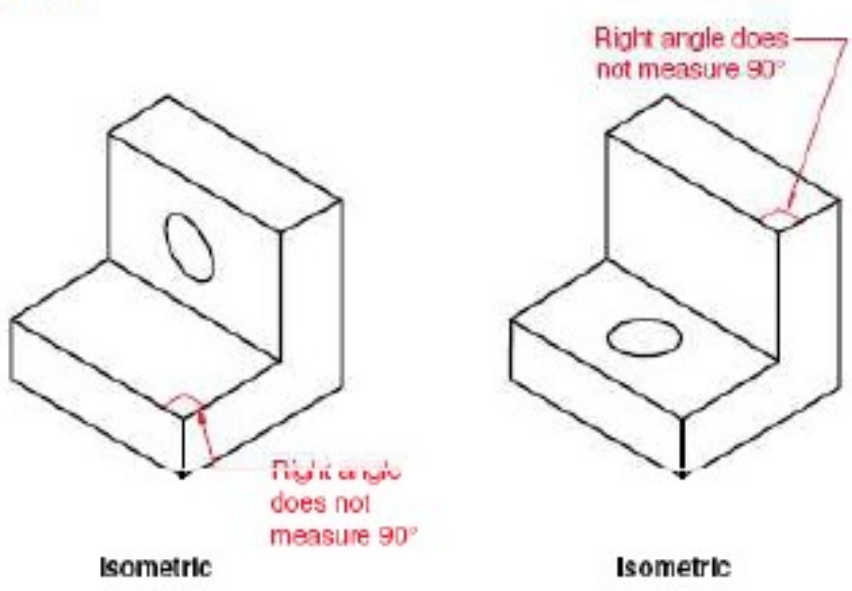


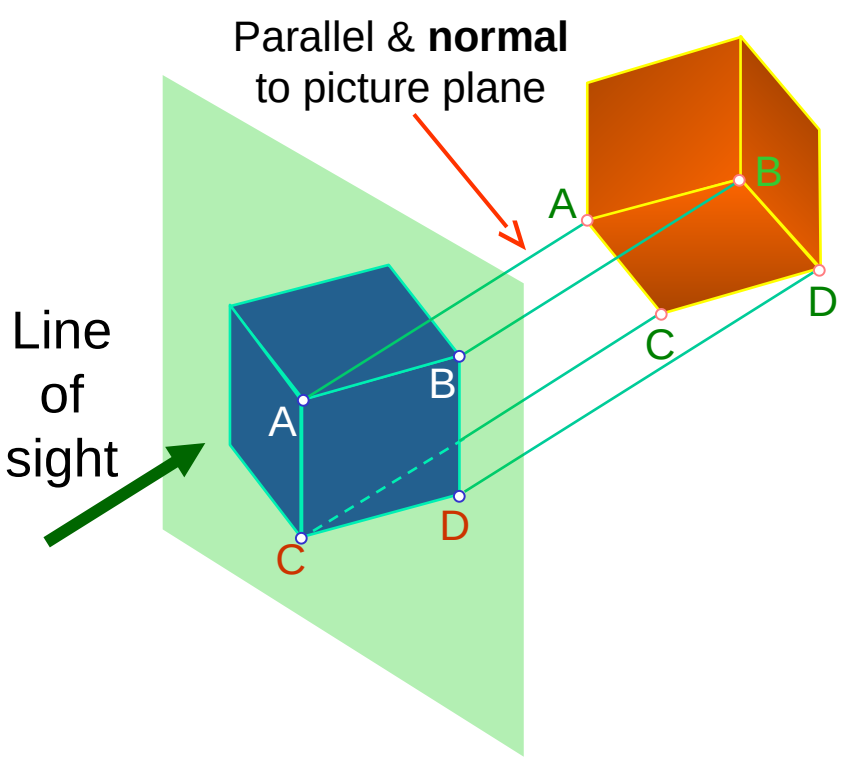
Figure 5.14 **Distorted angles**

Angular dimensions are distorted on pictorial drawings.

Types of Pictorial Projection

- *Three different types of pictorial projections are commonly used:*
  1. *Axonometric projection*
  2. *Oblique projection*
  3. *Perspective projection*

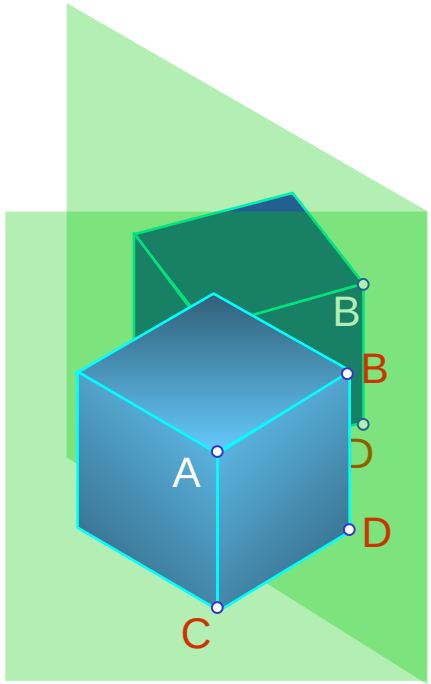
Axonometric Projection



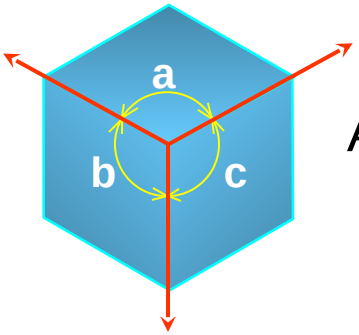
Axonometric projection is a parallel projection technique used to create pictorial drawings of objects by rotating the object on an axis relative to a projection plane to create a pictorial view.

Type of axonometric drawing

Axonometric drawings are classified by the angles between the lines comprising the axonometric axes:



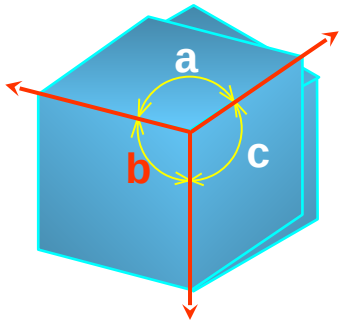
1. Isometric



Axonometric axis

All angles are equal.

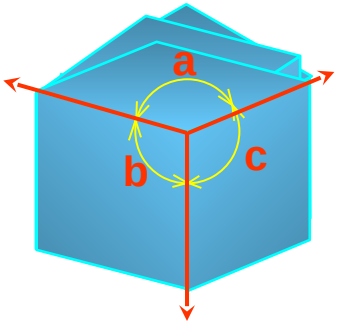
2. Dimetric



Axonometric axis

Two angles are equal.

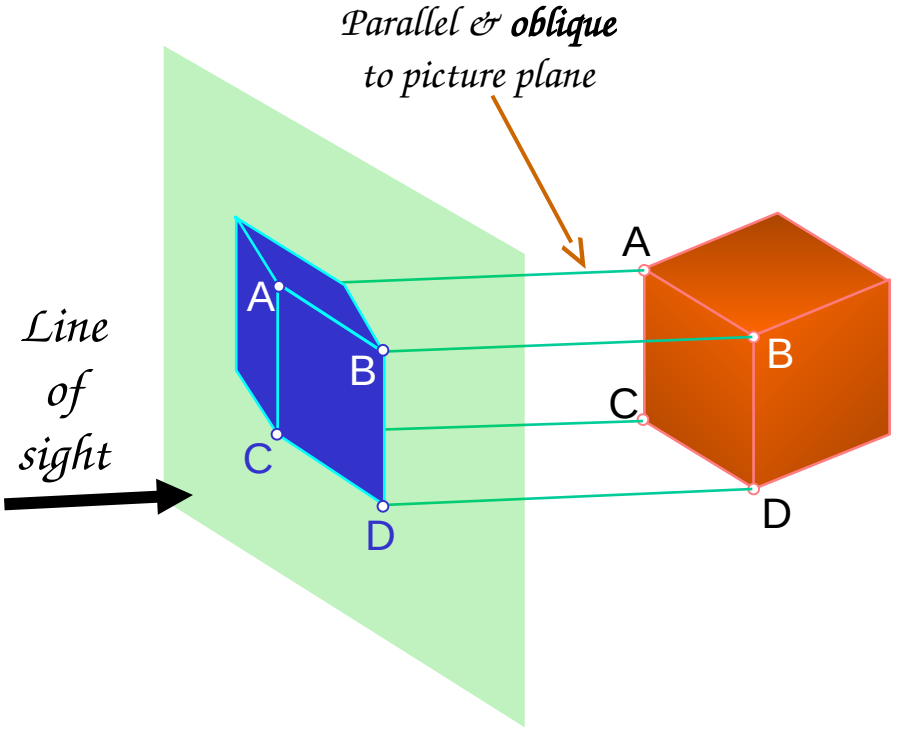
3. Trimetric



Axonometric axis

None of angles are equal.

Oblique Projection



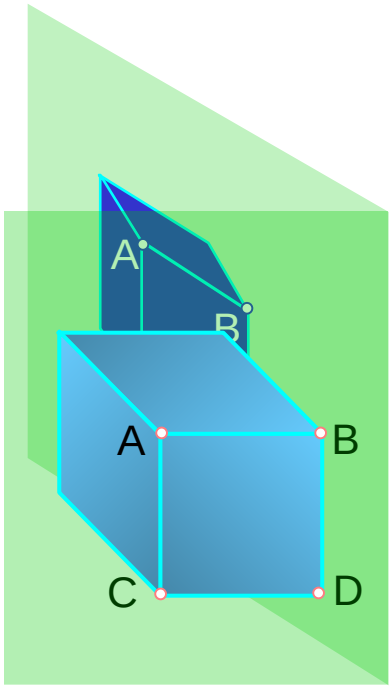
Oblique projections are a form of pictorial drawings in which the most descriptive or natural front view is placed parallel to the plane of projection.

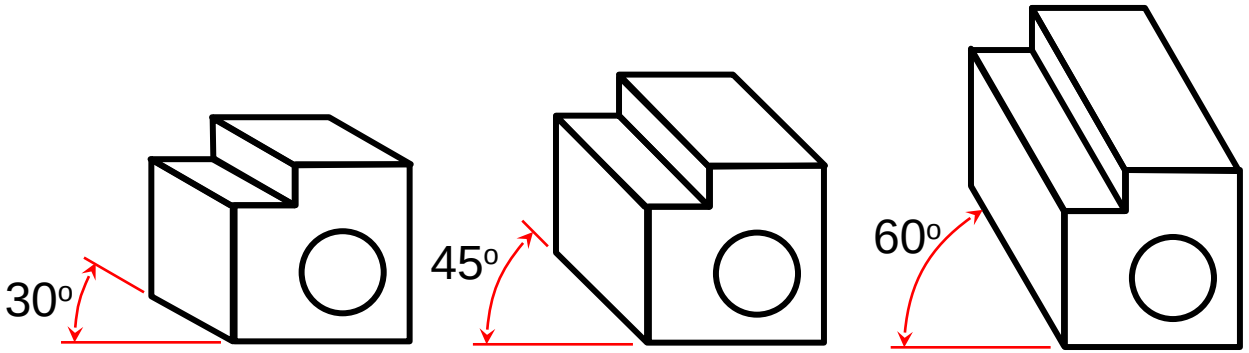
It is used in:

- ✓ Furniture manufacturing
- ✓ Cabinet making

Oblique Projection

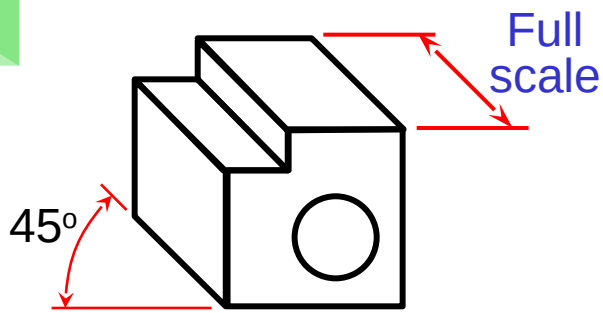
Oblique drawing angle



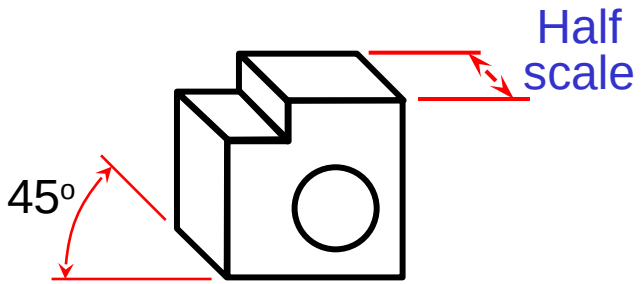


Type of Oblique drawing

1) Cavalier

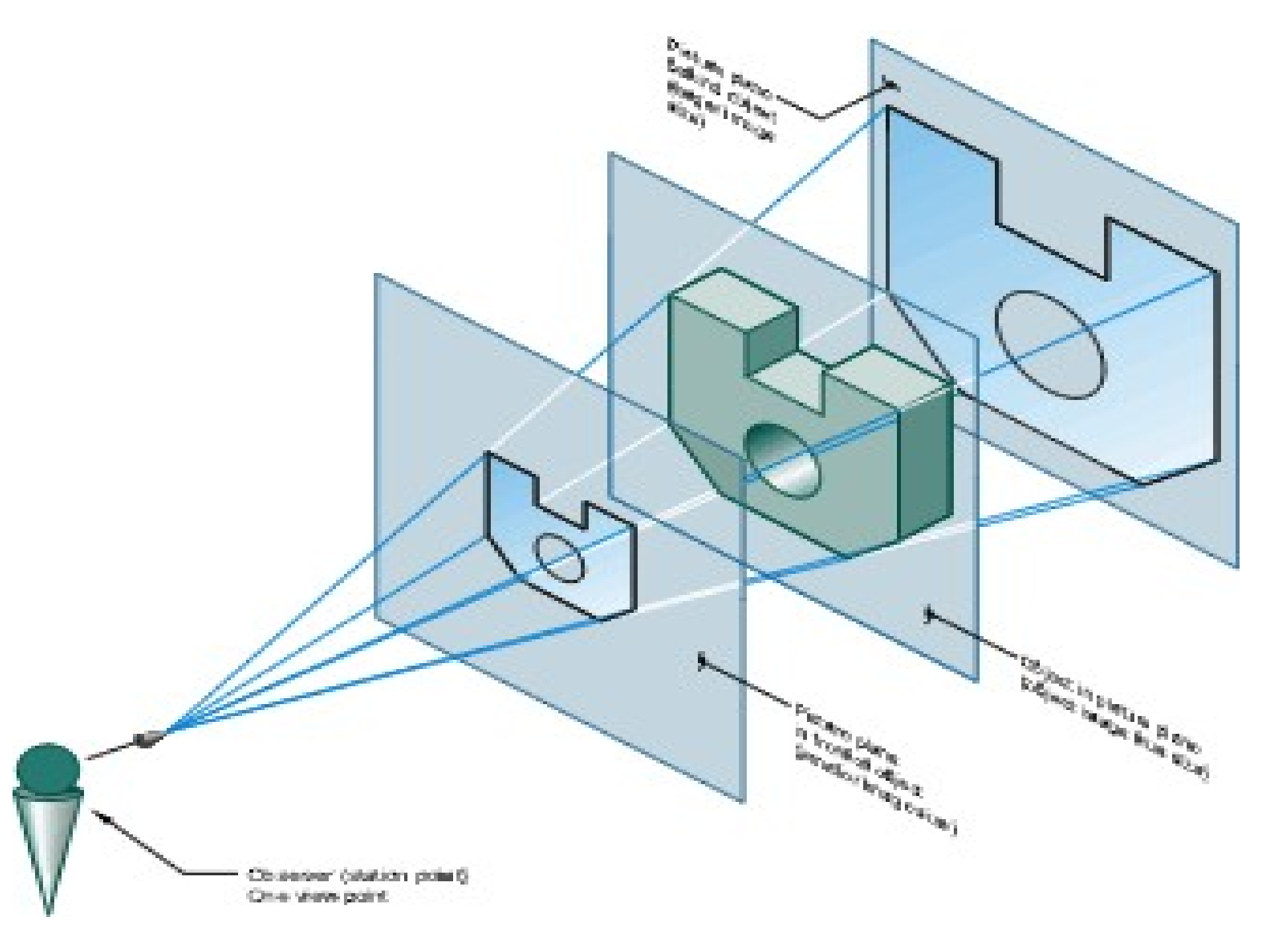


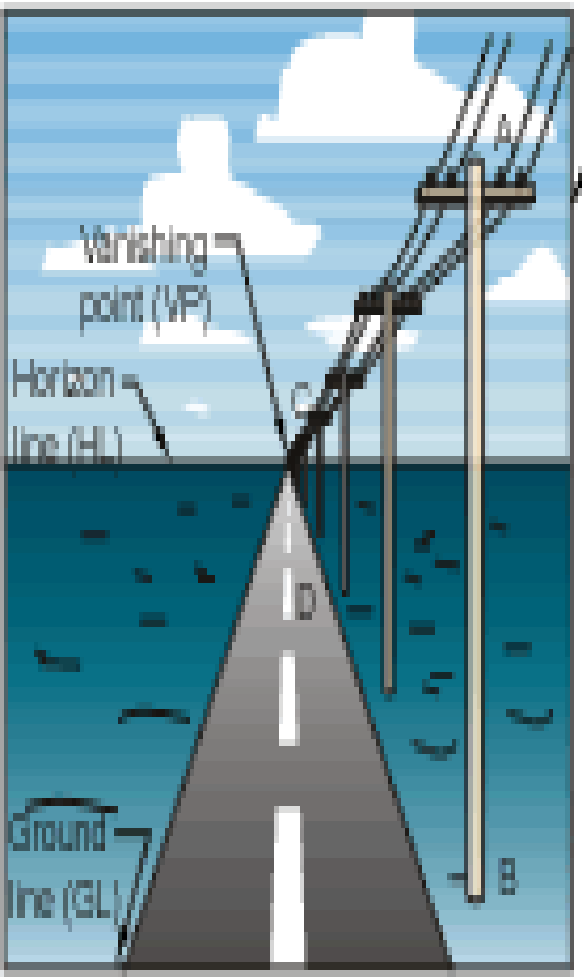
2) Cabinet



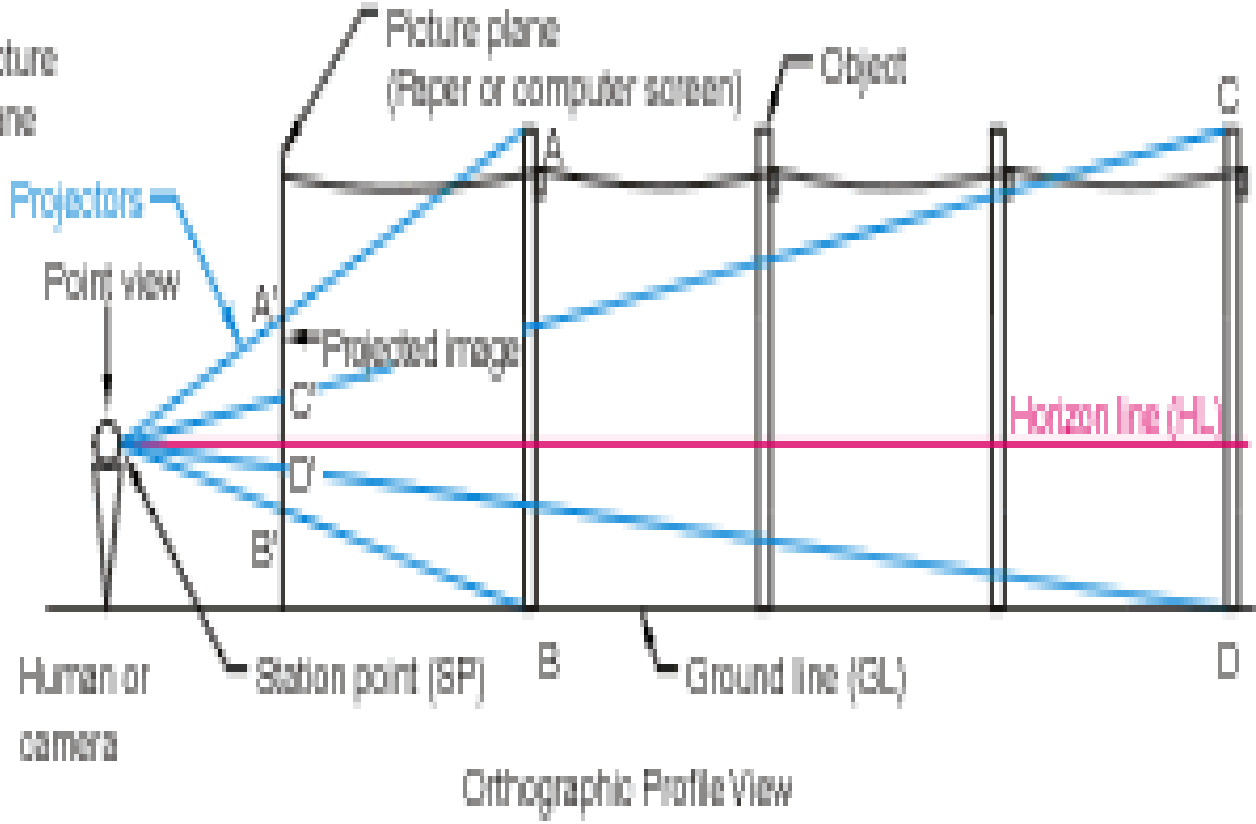
Perspective Projections

- *Perspective drawing techniques are used primarily because they come the closest to representing objects and scenes as we would view them in the real world.*
- *One of the most important features of perspective drawings is the convergence of parallel edges as they recede from the viewer.*





Perspective View



Orthographic Profile View

4 variables in perspective drawings:

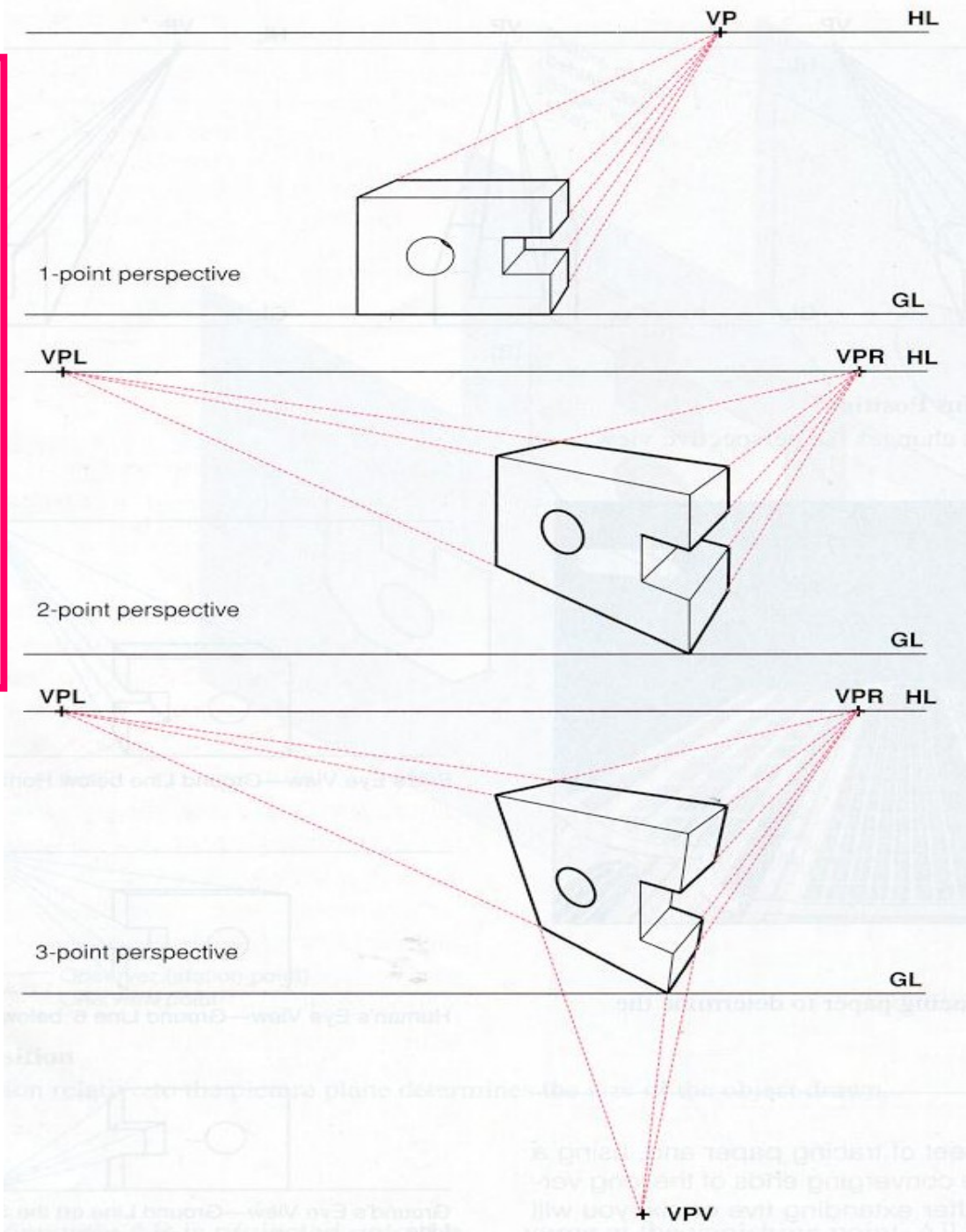
- *Distance of object from picture plane*
- *Position of station point*
- *Position of ground line*
- *Number of vanishing points*

Classifications

1-point perspective

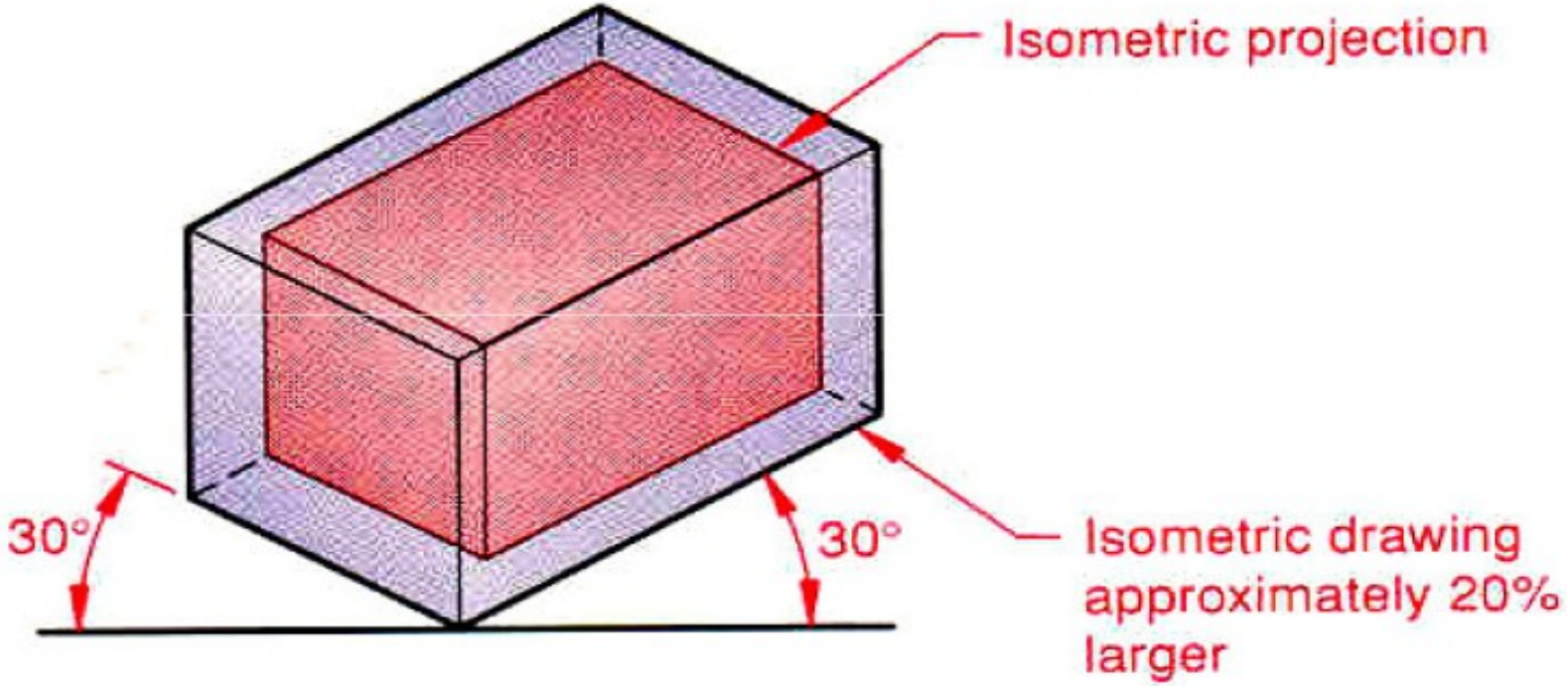
2-point perspective

3-point perspective



Isometric drawings

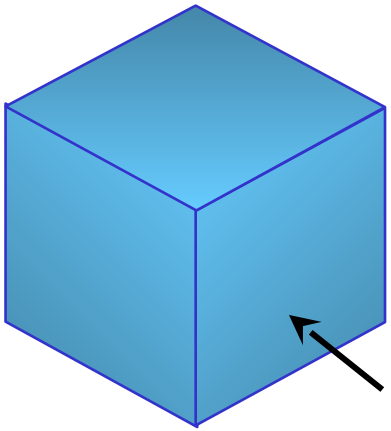
- *Isometric drawings are almost always preferred over isometric projection for engineering drawings, because they are easier to produce.*
- *An isometric drawing is an axonometric pictorial drawing for which the angle between each axis equals 120° and the scale used is full scale.*



Isometric Drawing / View

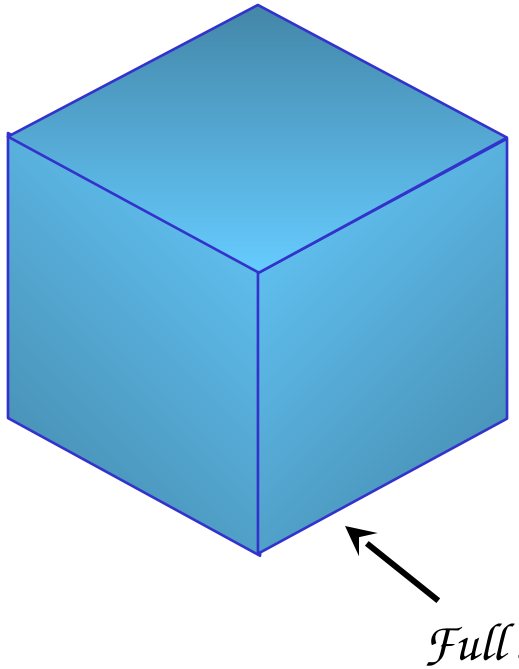
*Isometric drawing is a drawing drawn on an isometric axes using **full scale**.*

Isometric projection
(True projection)

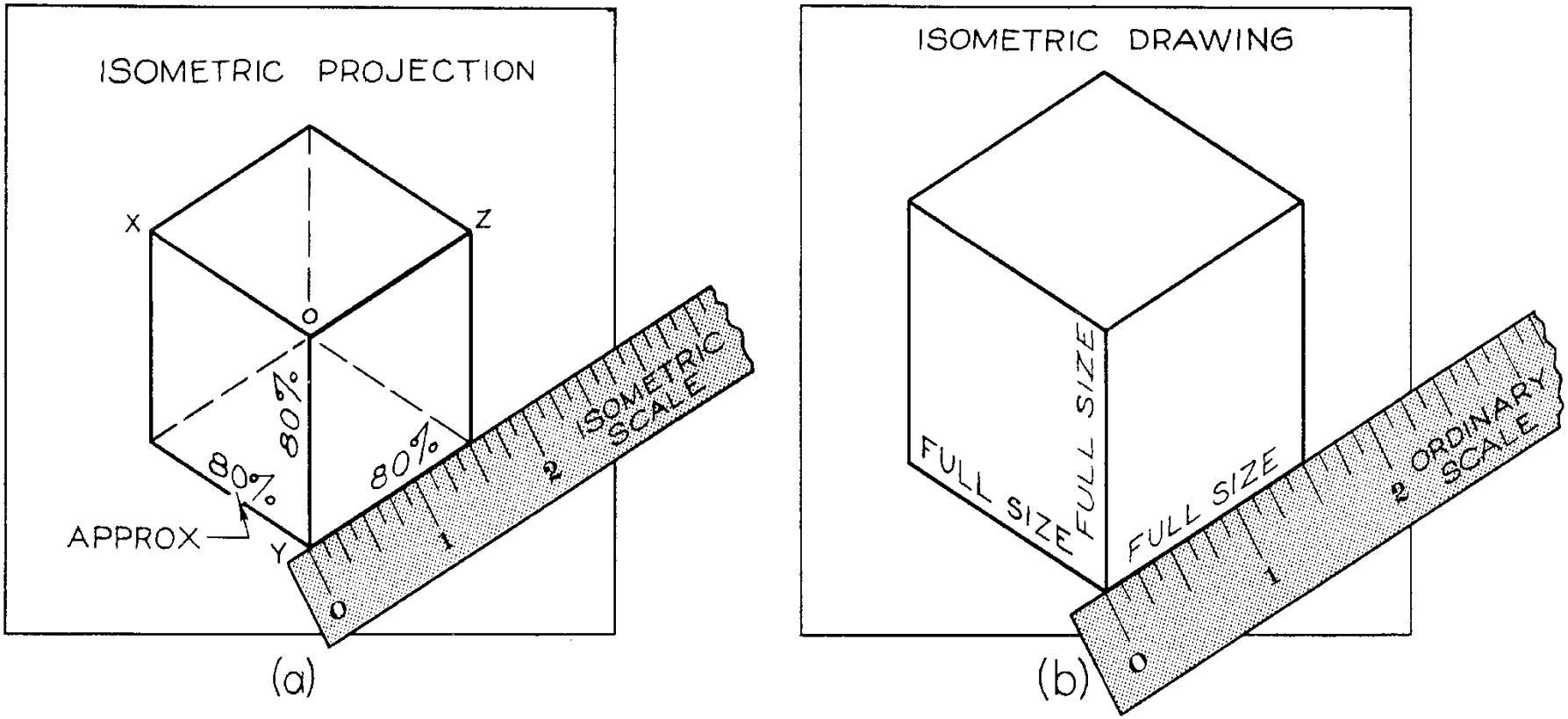


Foreshortened Length

Isometric drawing / View
(Full scale)



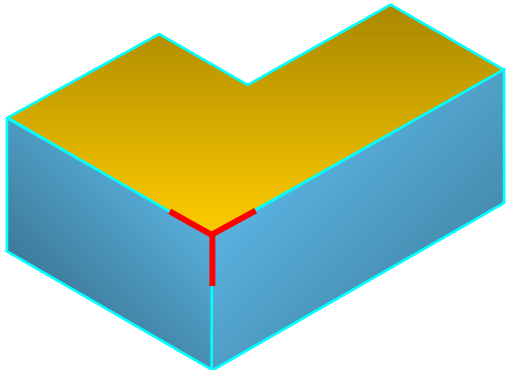
Full scale


ISOMETRIC PROJECTION
X
Z
O
80%
80%
80%
APPROX
Y
0
1
2
ISOMETRIC SCALE
(a)
ISOMETRIC DRAWING
FULL SIZE
FULL SIZE
FULL SIZE
0
1
2
ORDINARY SCALE
(b)

Positions of Isometric Axes

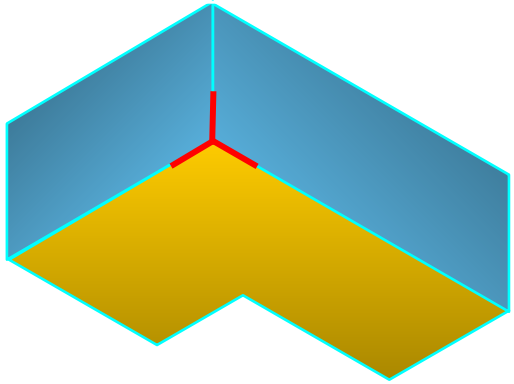
Isometric axes can be arbitrarily positioned to create different views of a single object.

Regular isometric



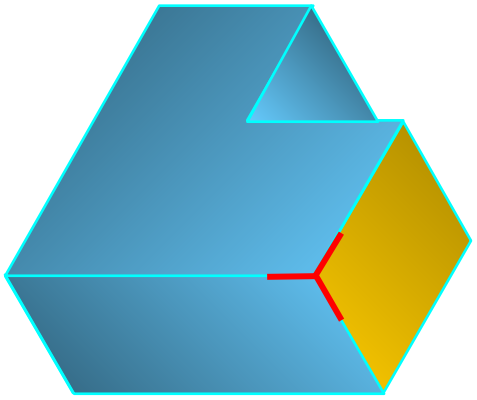
View point is looking down on the top of the object.

Reverse axis isometric



View point is looking up on the bottom of the object.

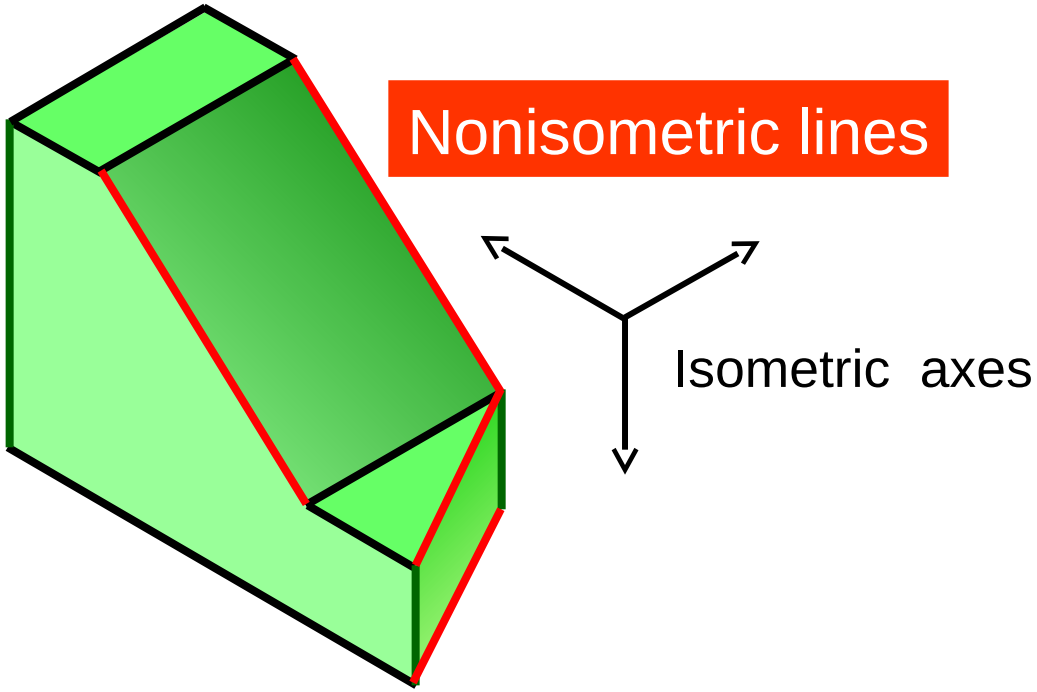
Long axis isometric



View point is looking from the right (or left) of the object.

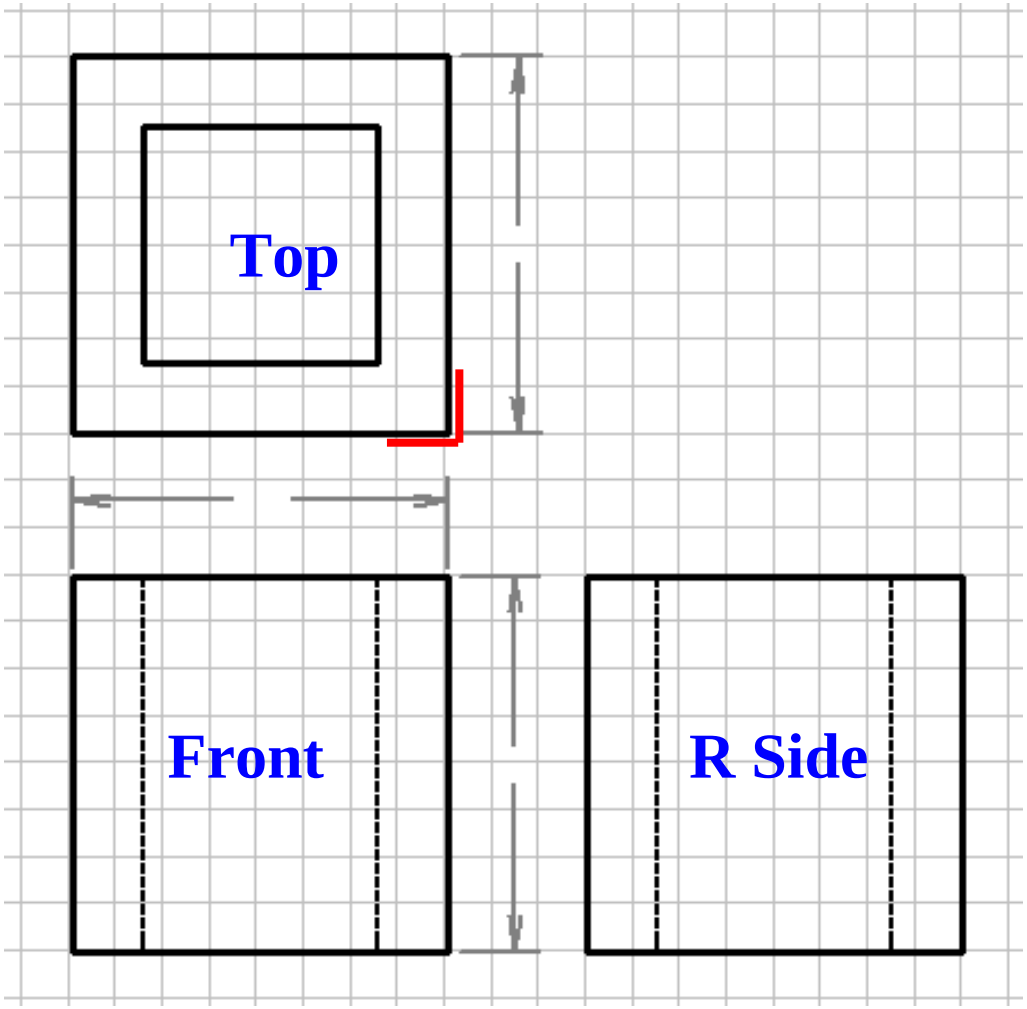
Distance in Isometric Drawing

- ***True-length distances*** *are shown along isometric lines.*
- ***Isometric line*** *is the line that run* ***parallel*** *to any of the isometric axes.*



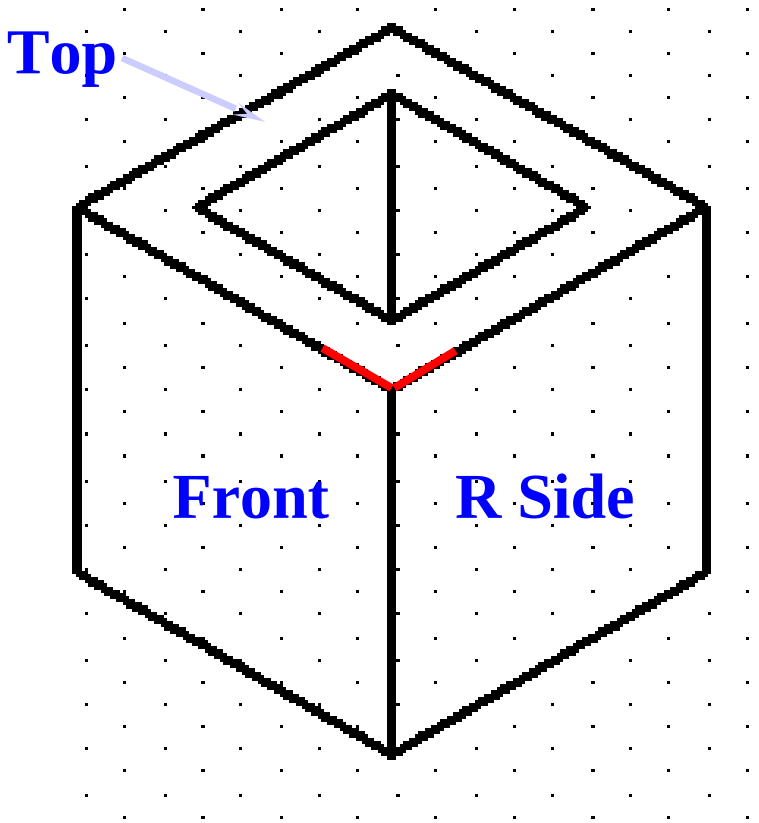
Axis, Views and Dimensions

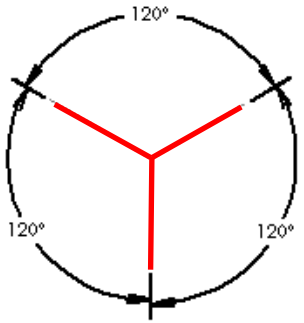
Views? **Axis?**



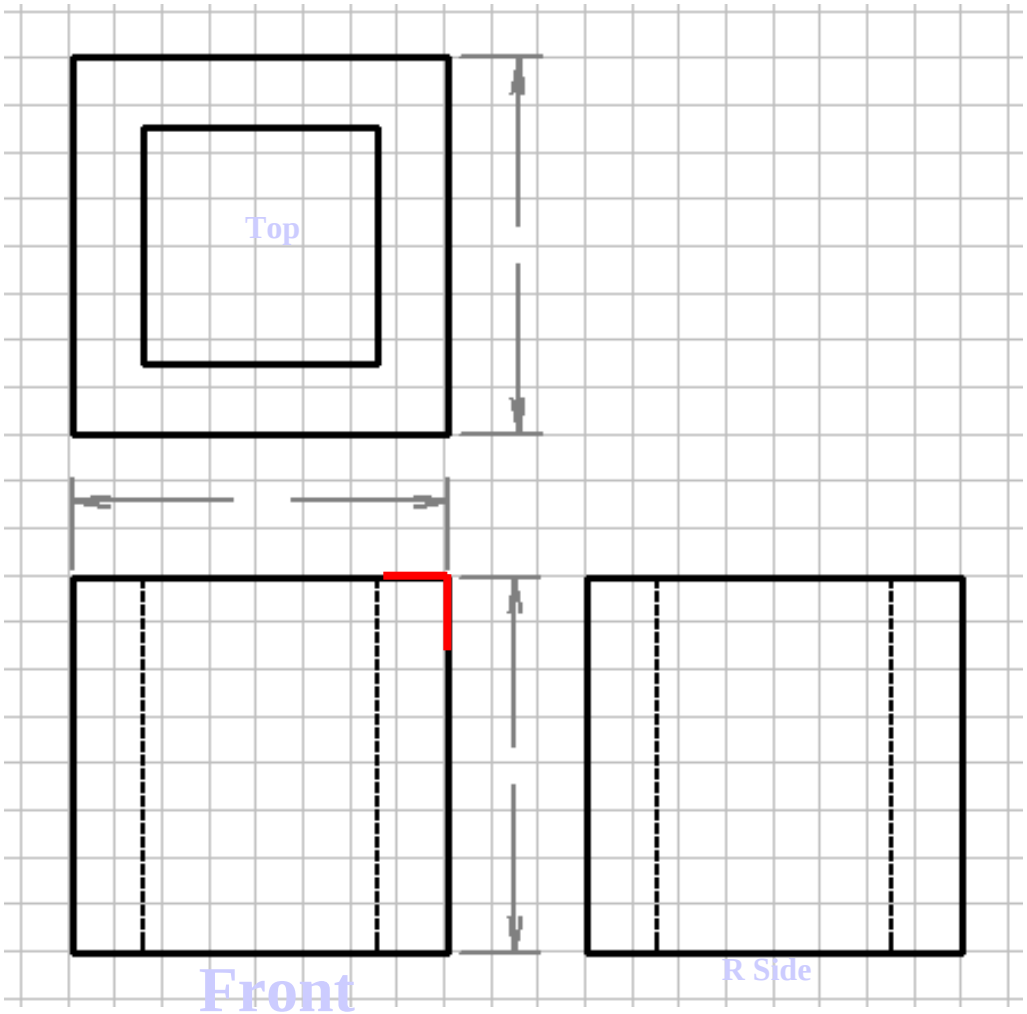
2D - Orthographic

3D - Isometric



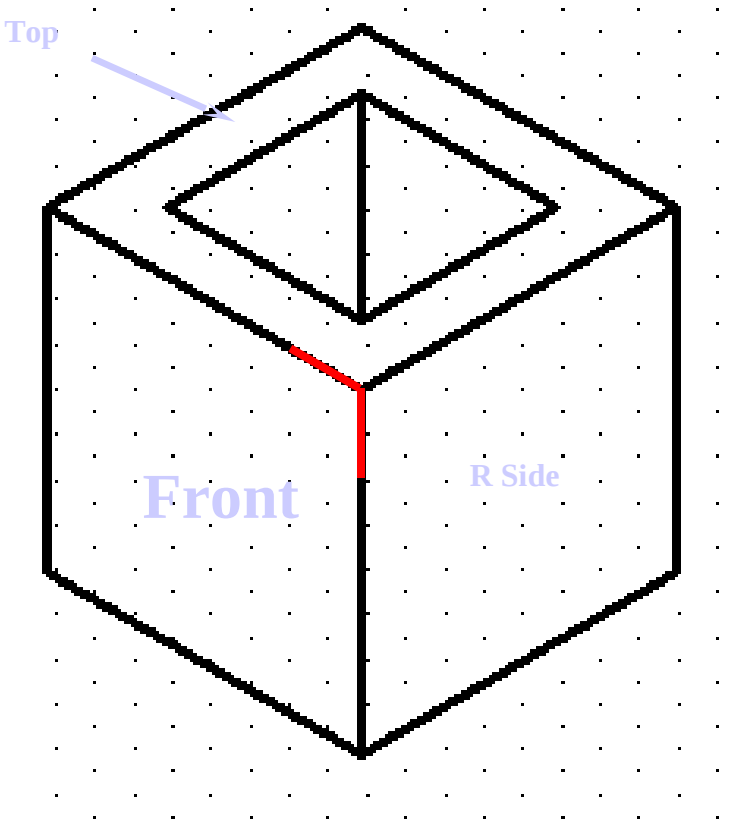


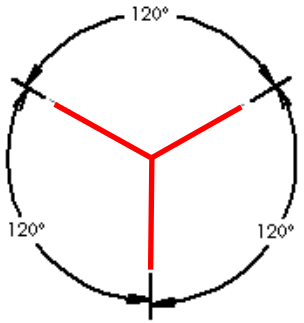
Axis, Views and Dimensions



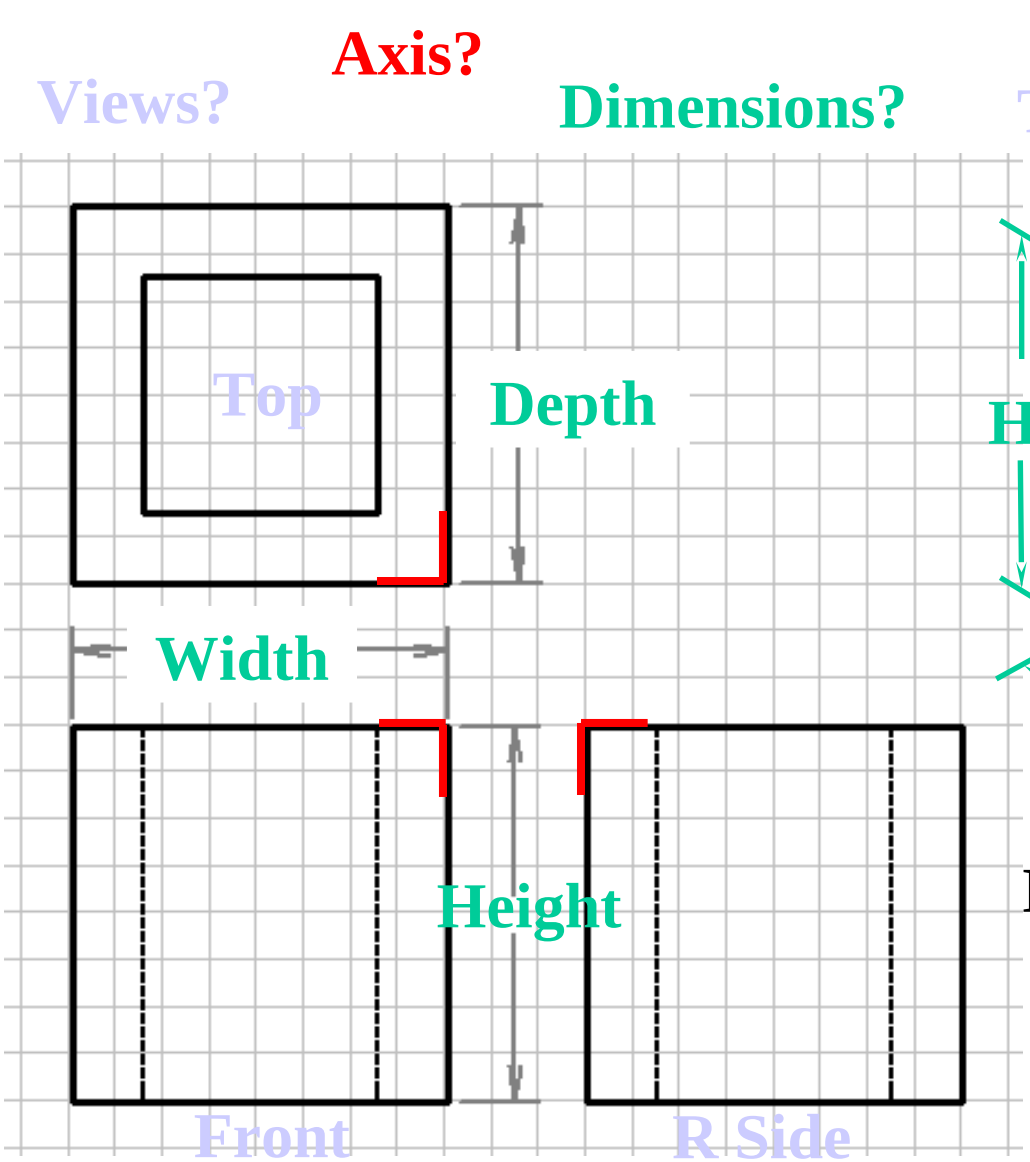
2D - Orthographic

3D - Isometric



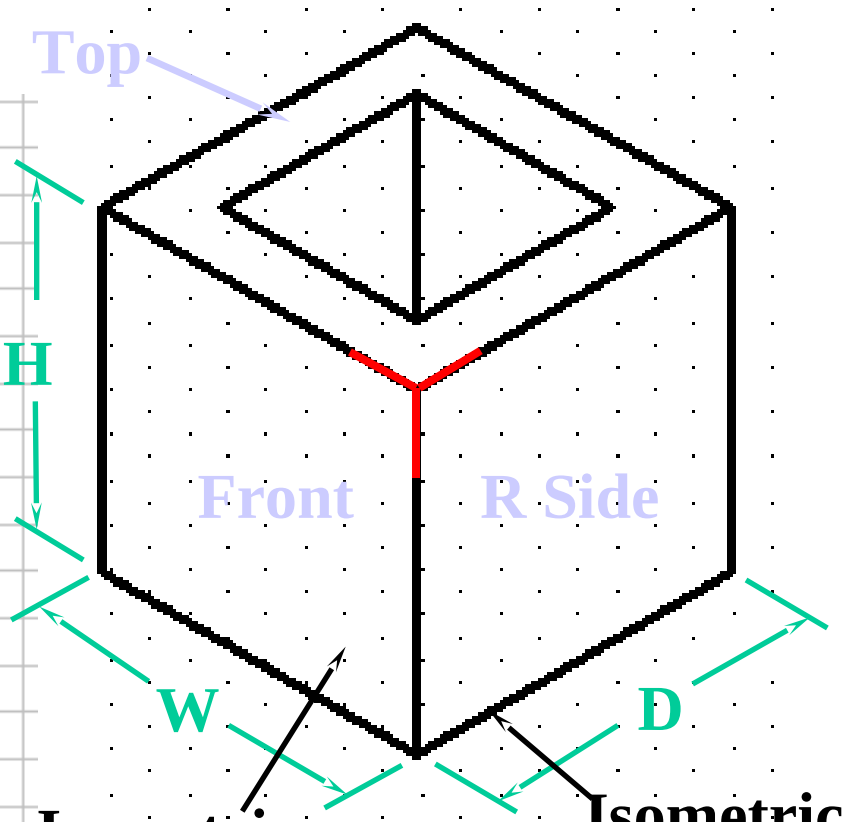


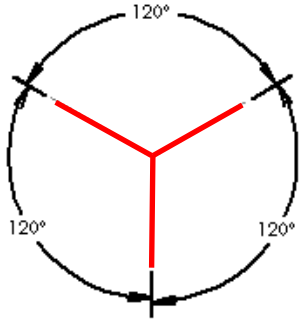
Axis, Views and Dimensions



2D - Orthographic

3D - Isometric





Sketch isometric from an actual object

1. *Place the object in the position which its shape and features are clearly seen.*

2. *Define an isometric axis.*

3. *Sketching the enclosing box.*

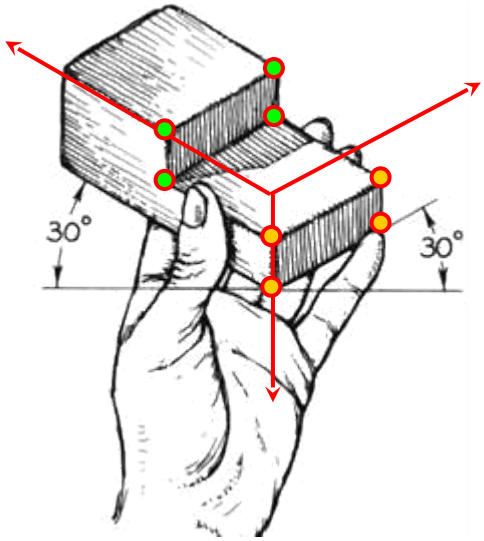
4. *Estimate the size and relationship of each details.*

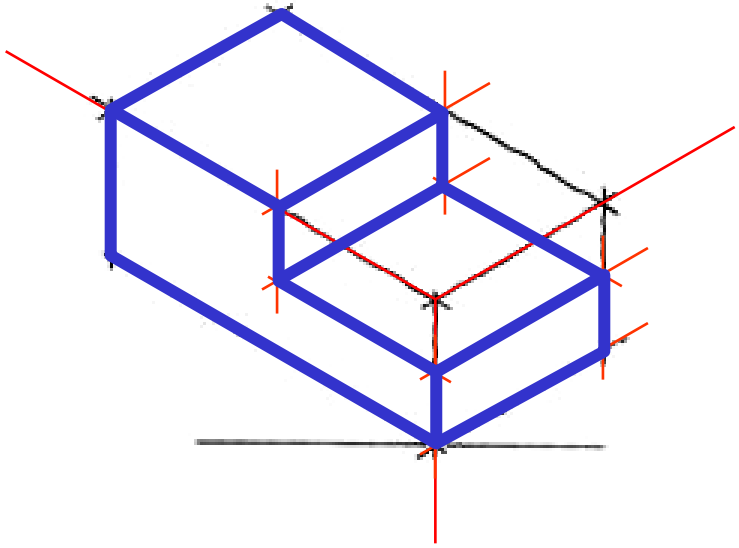
5. *Darken all visible lines.*

Sketch from an actual object

STEPS

1. Positioning object.
2. Select isometric axis.
3. Sketch enclosing box.
4. Add details.
5. Darken visible lines.

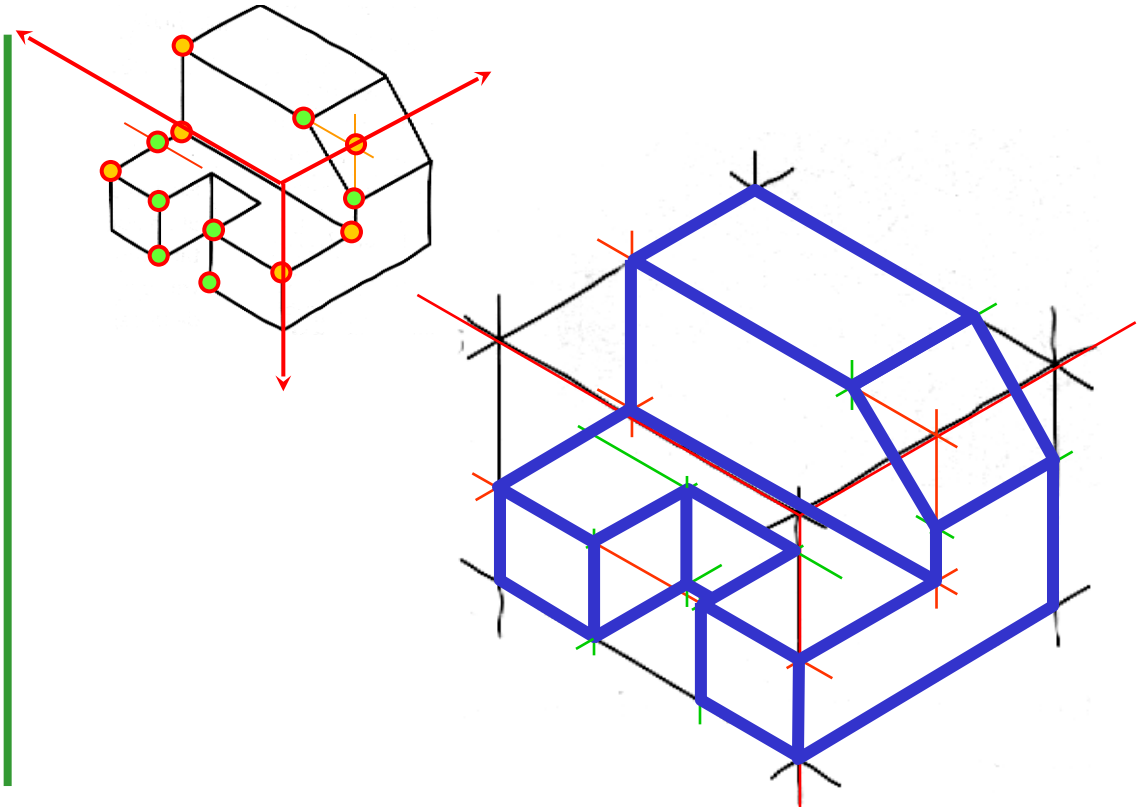




Sketch from an actual object

STEPS

1. Positioning object.
2. Select isometric axis.
3. Sketch enclosing box.
4. Add details.
5. Darken visible lines.



Note

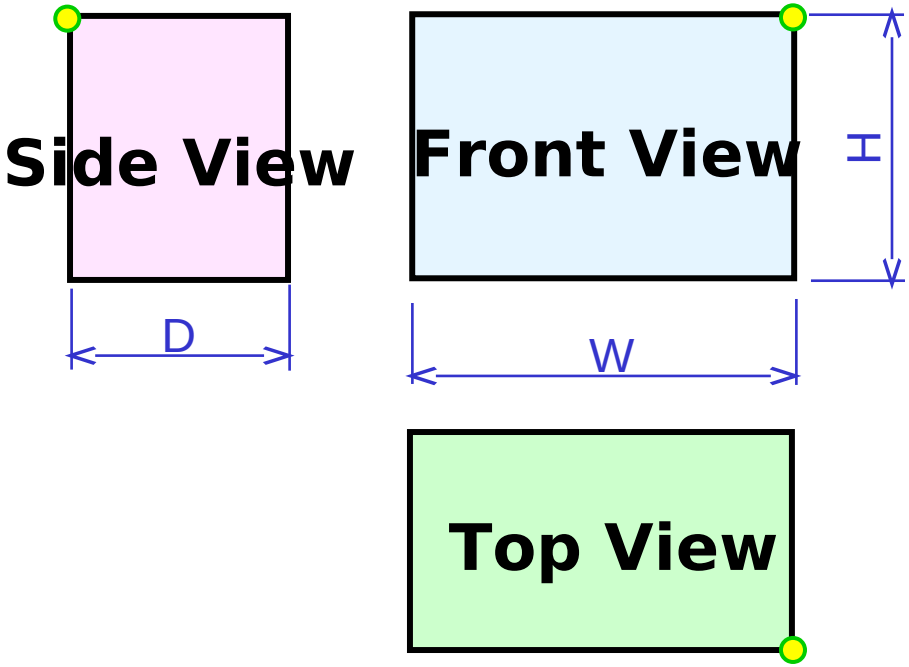
In isometric sketch/drawing), hidden lines are **omitted** unless they are absolutely necessary to completely describe the object.

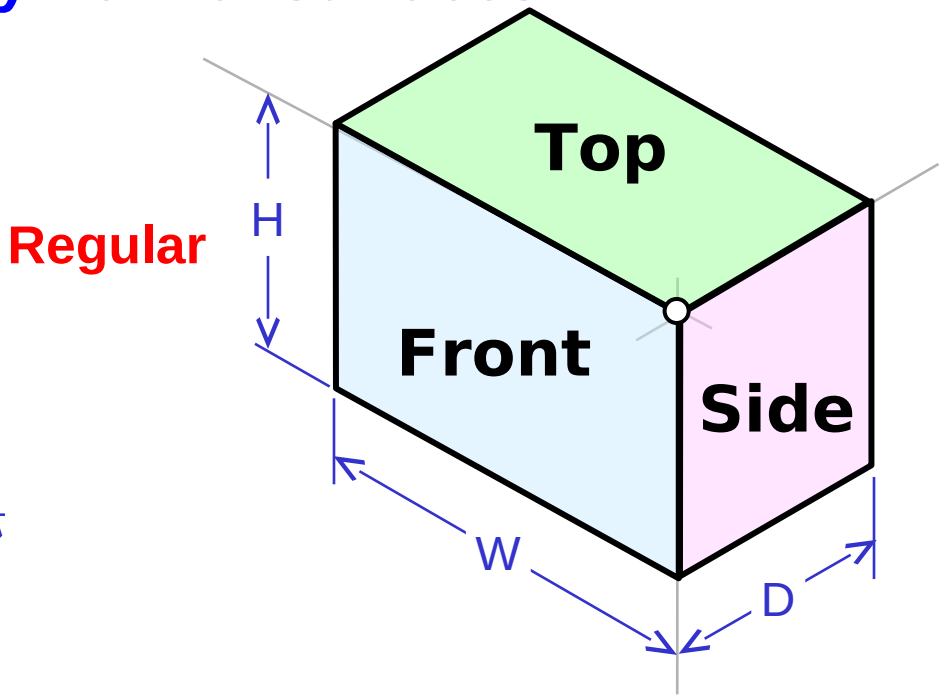
Sketch from multiview drawing

1. *Interprete the meaning of lines/areas in multiview drawing.*

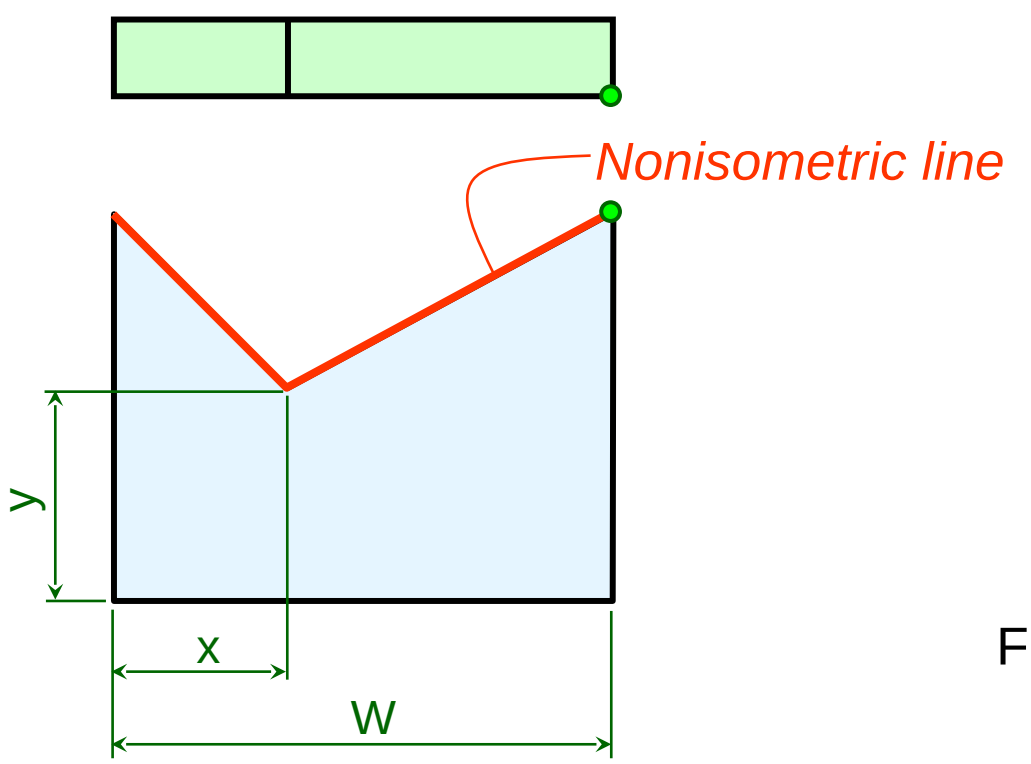
2. *Locate the lines or surfaces relative to isometric axis.*

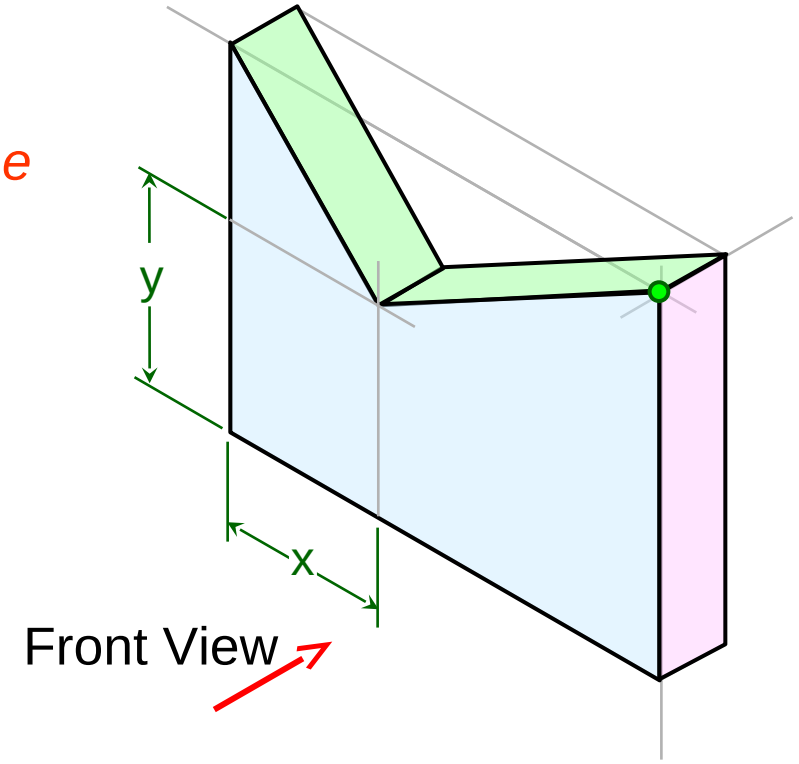
Example 1 : Object has only normal surfaces



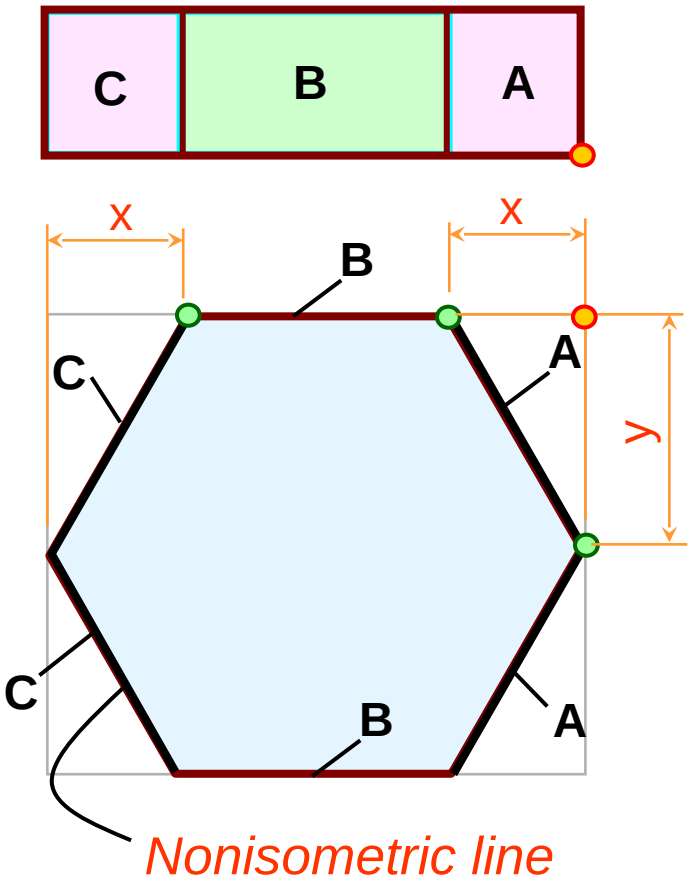


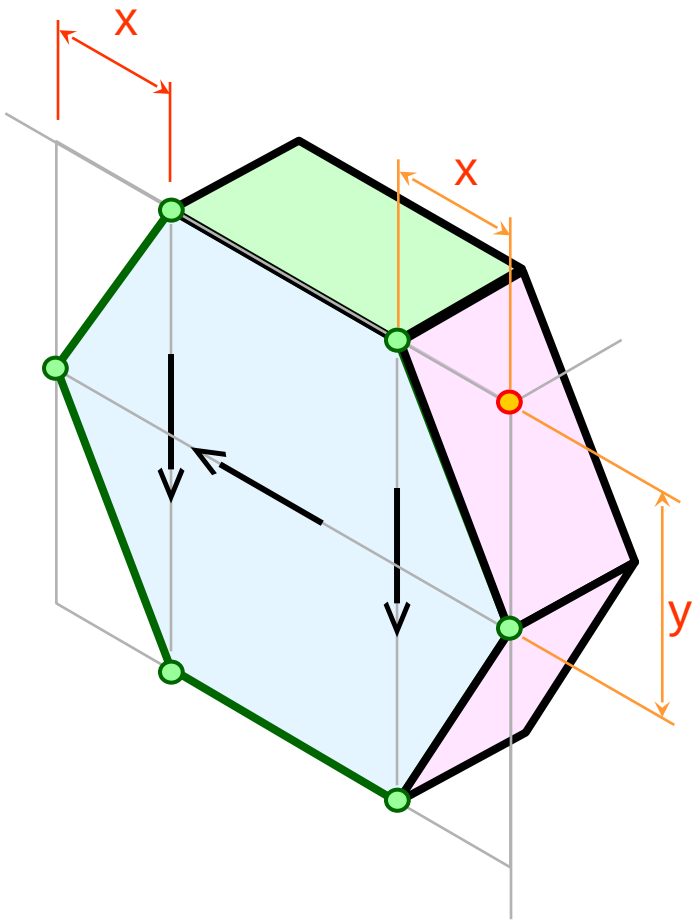
Example 2 : Object has inclined surfaces



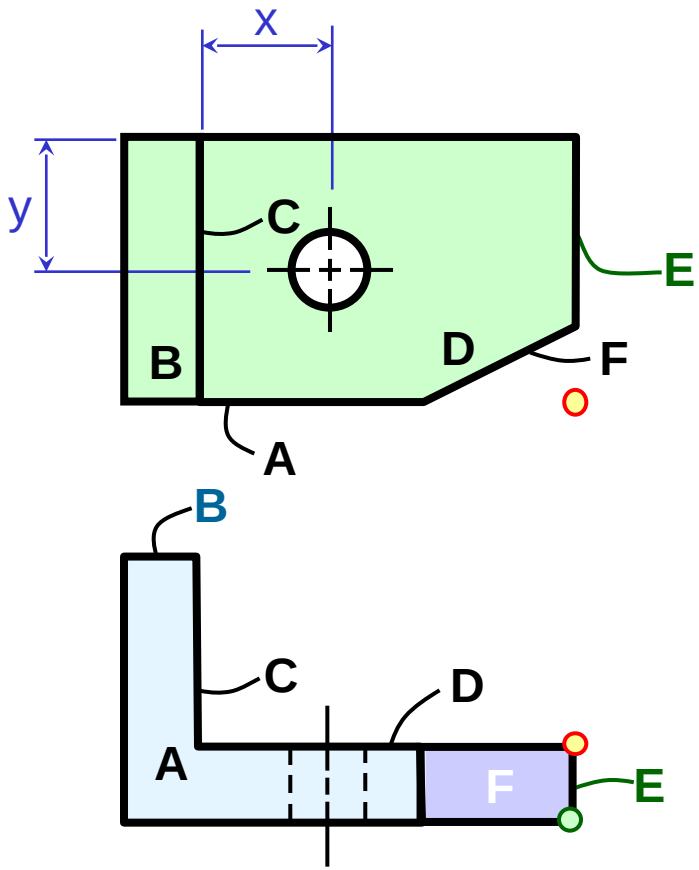


Example 3 : Object has inclined surfaces

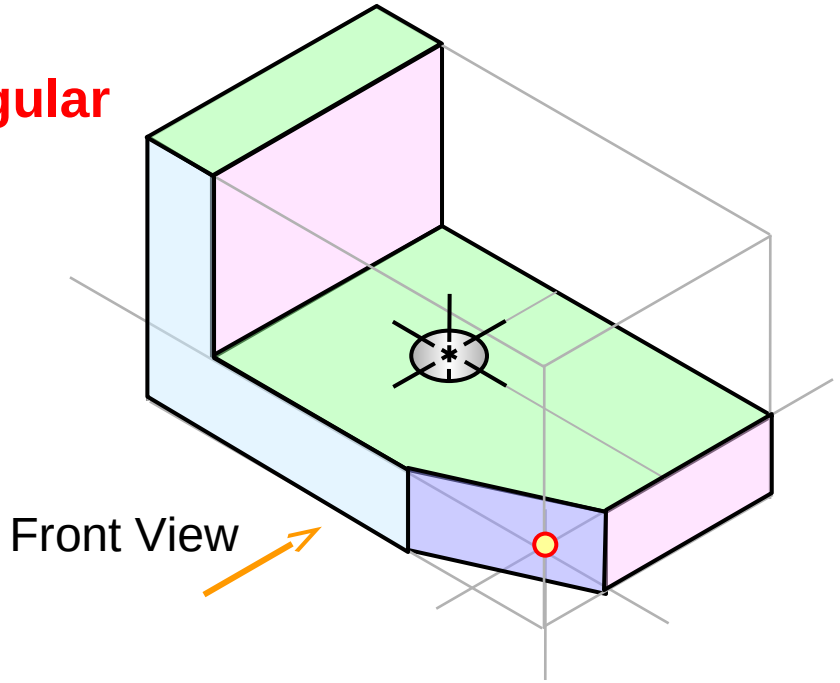




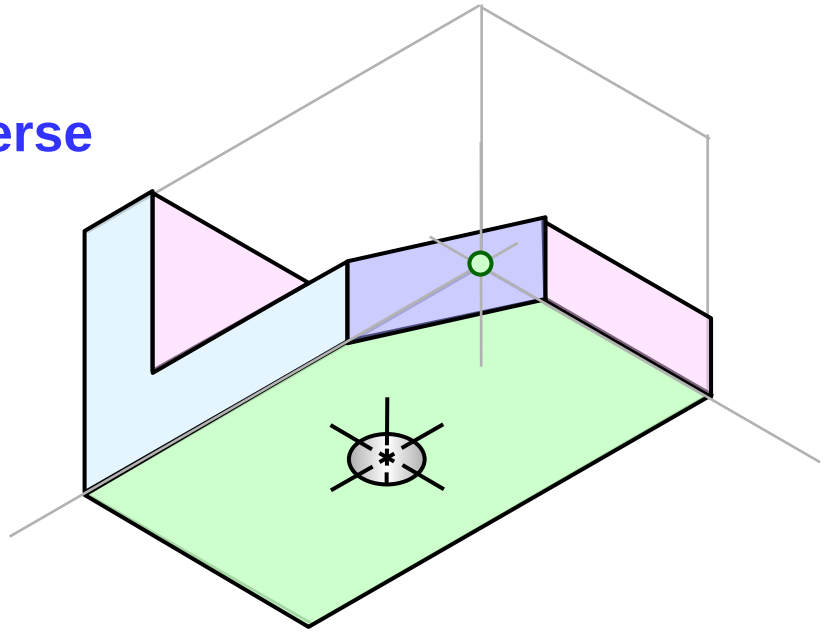
Example 4



Regular



Reverse

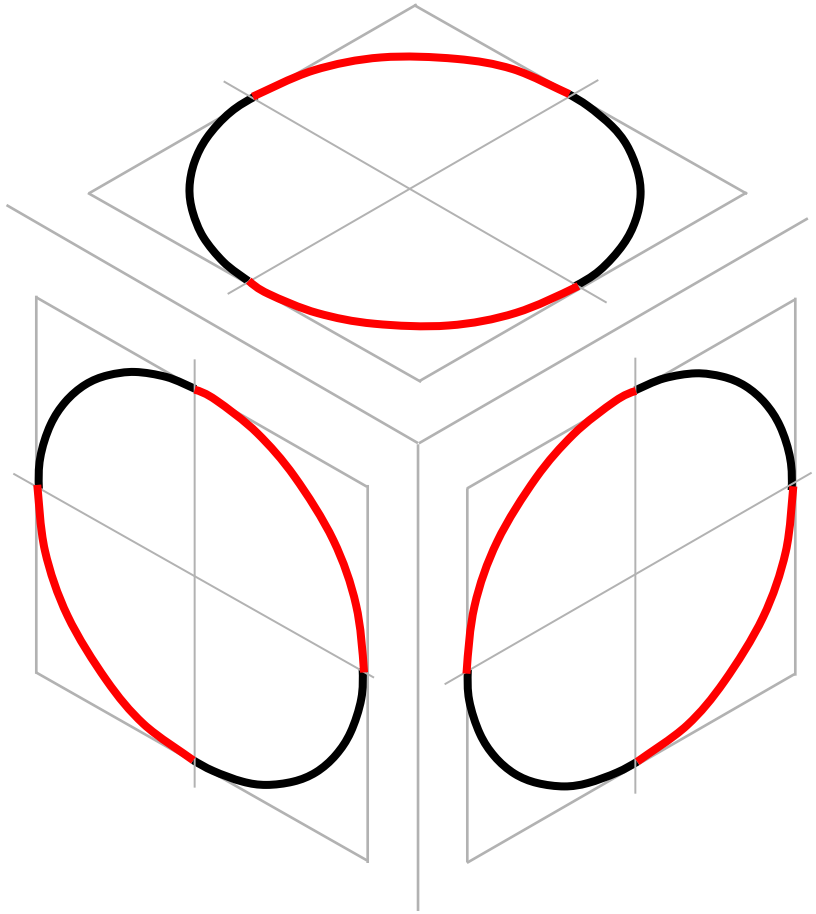


Circle & Arc in Isometric

- *In isometric drawing, a circle appears as an ellipse.*

Sketching Steps

1. Locate the center of an ellipse.
2. Construct an isometric square.
3. Sketch arcs that connect the tangent points.

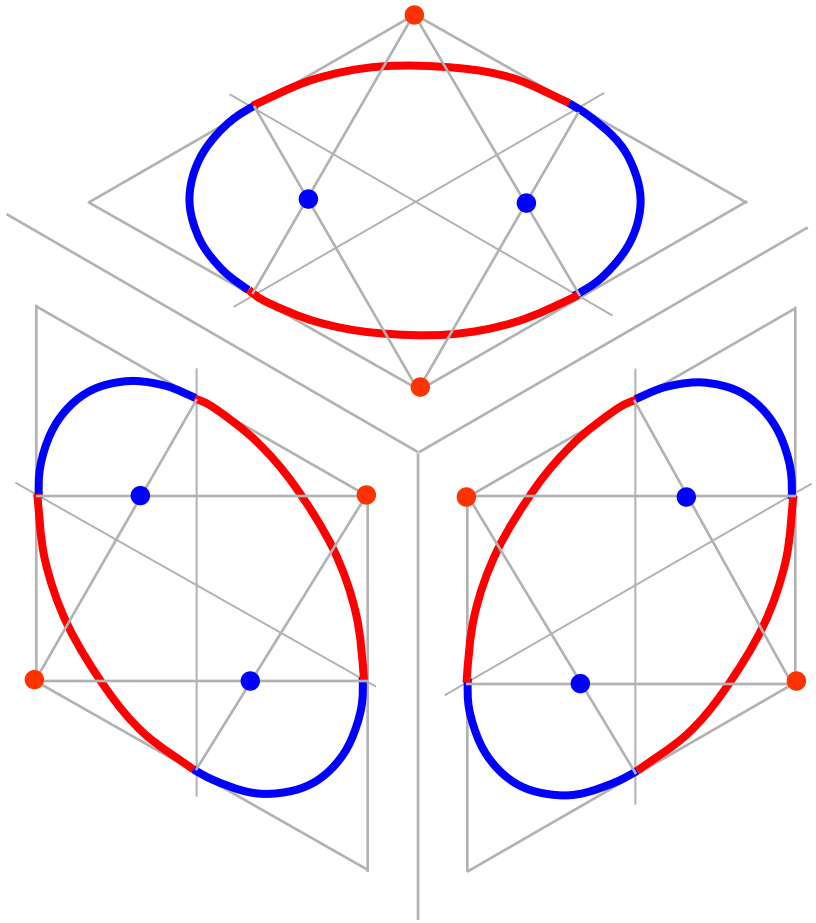


Circle & Arc in Isometric

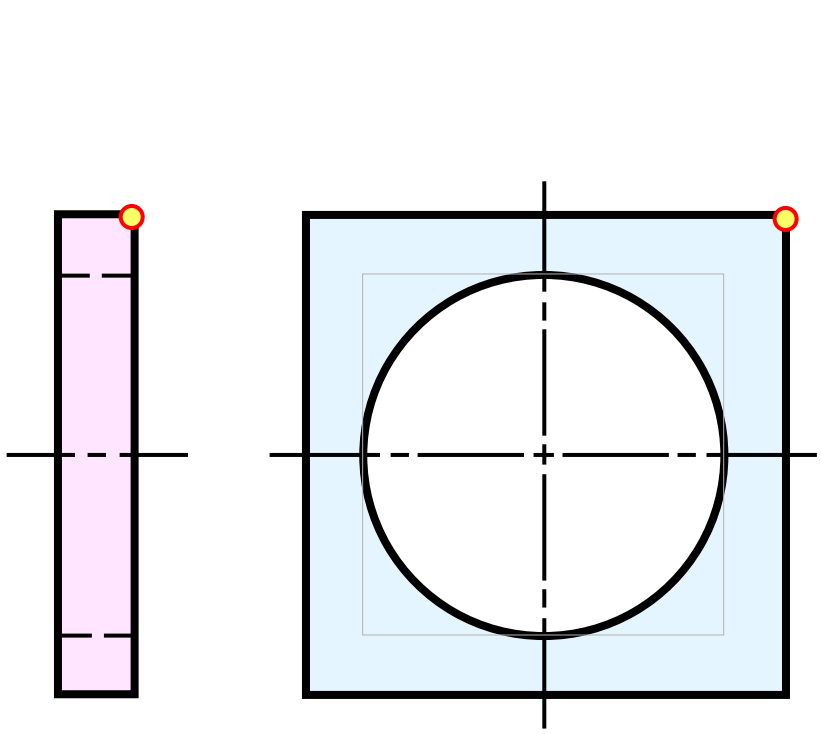
- *Four-center* method is usually used when drawn an isometric ellipse with drawing instrument.

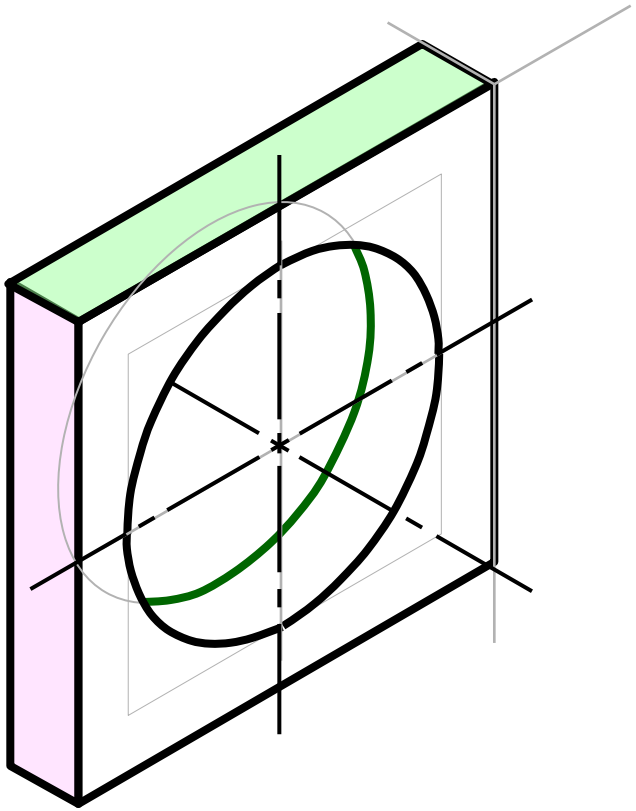
Sketching Steps

1. Locate the center of an ellipse.
2. Construct an isometric square.
3. Construct a perpendicular bisector from each tangent point.
4. Locate the four centers.
5. Draw the arcs with these centers and tangent to isometric square.

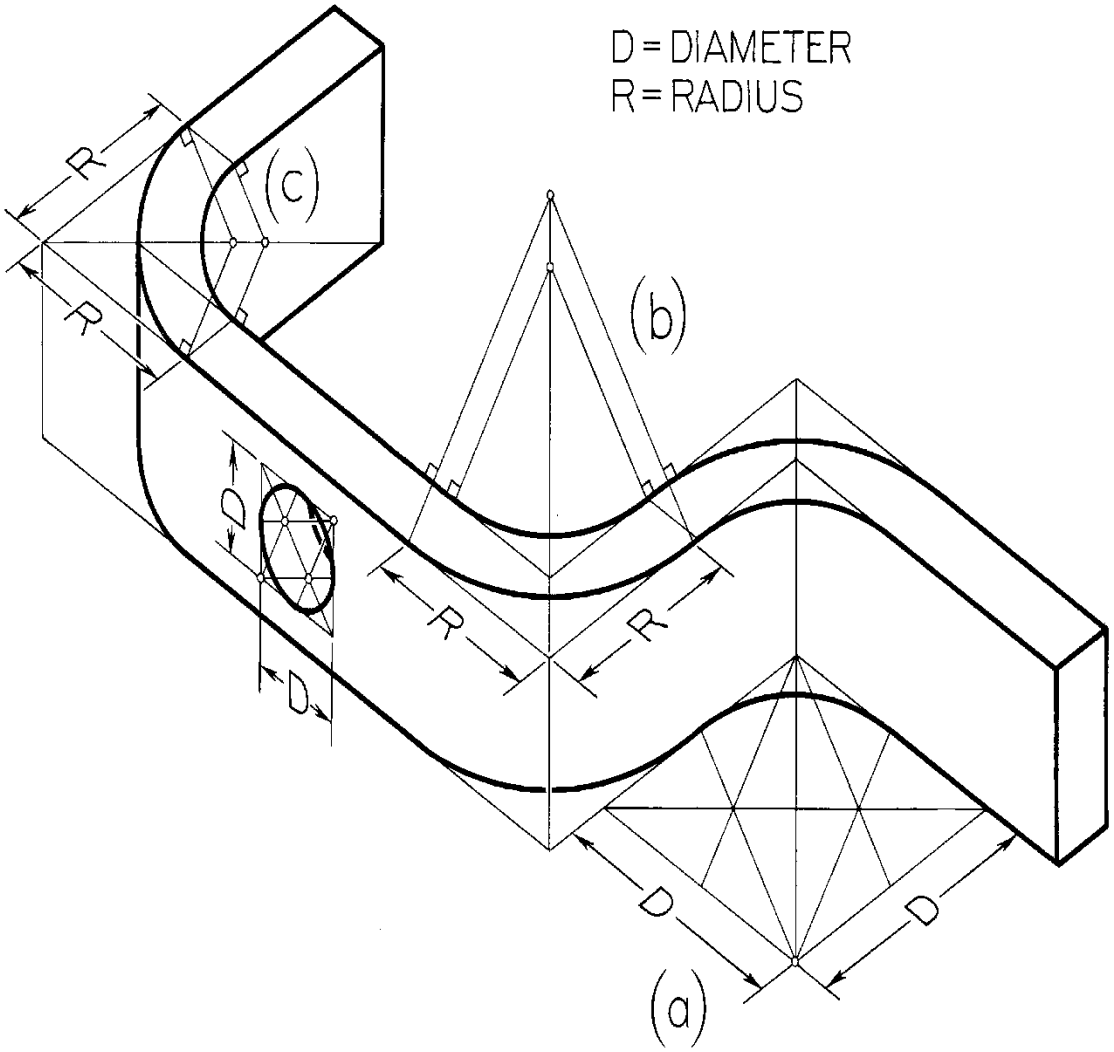


Example 5





Arcs in isometric drawing

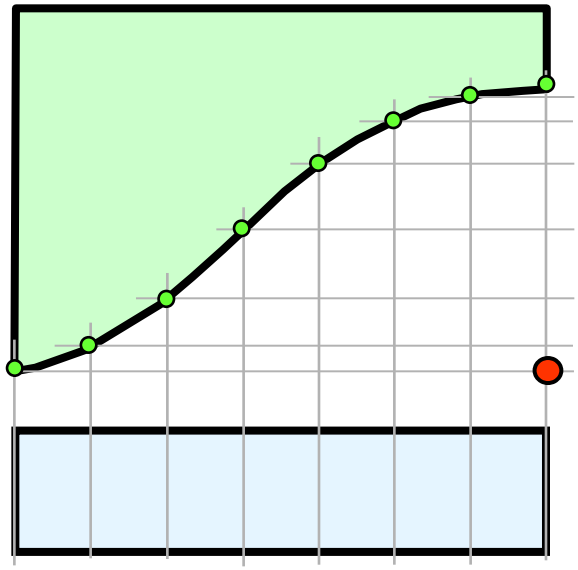


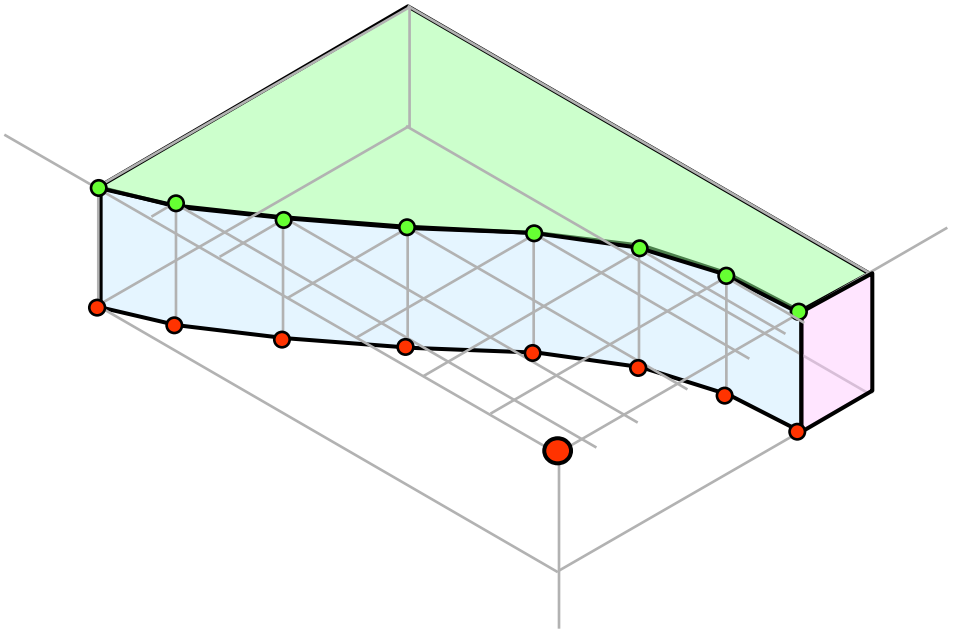
- *Arcs are usually sketched by locating their centers and then boxing in the enclosing parallelogram.*
- *Sketch the arc tangent to the enclosing box, which is drawn along isometric lines.*

Irregular Curve in Isometric

Steps

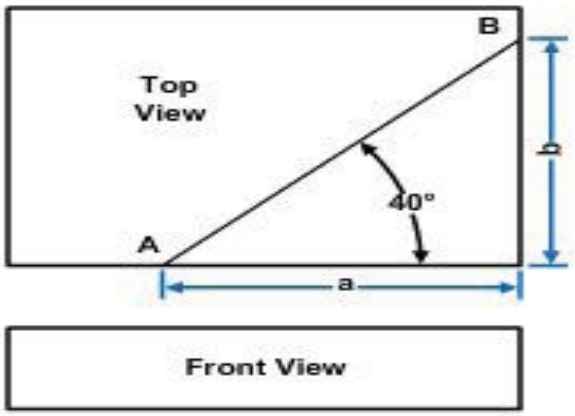
1. Construct points along the curve in multiview drawing.
2. Locate these points in the isometric view.
3. Sketch the connecting lines.

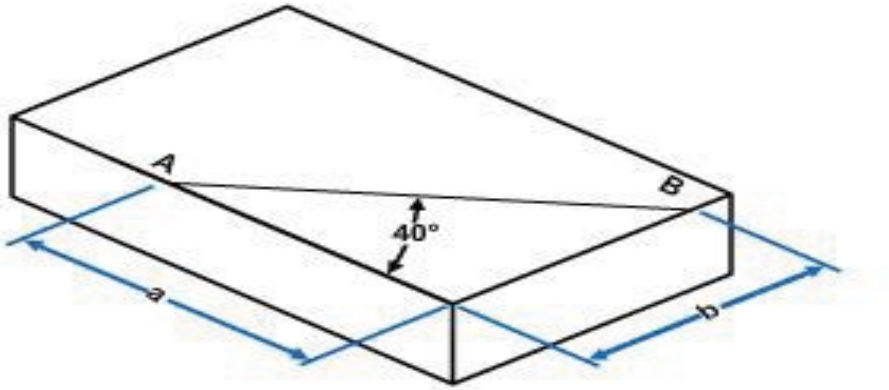




Angles in isometric drawings

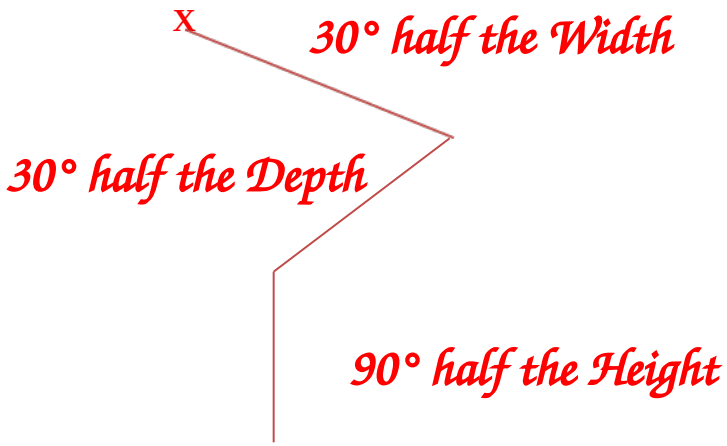
- In an isometric drawing, *an angle* never appear as in its true length.
- The same principle used in *transferring a non-isometric line is used to transfer an angles in isometric.*





Centering an Isometric Drawing

1. After drawing the border and title block find the center of the workspace.
2. Starting at the center of the workspace draw a 30 degrees line down to the right half the width of the object.
3. From the end of the first line draw a 30 degree line to the left half the depth of the object.
4. From the end of the second line draw a 90 degree line down half the height of the object.
5. Start drawing the overall isometric box for the object from the last point.



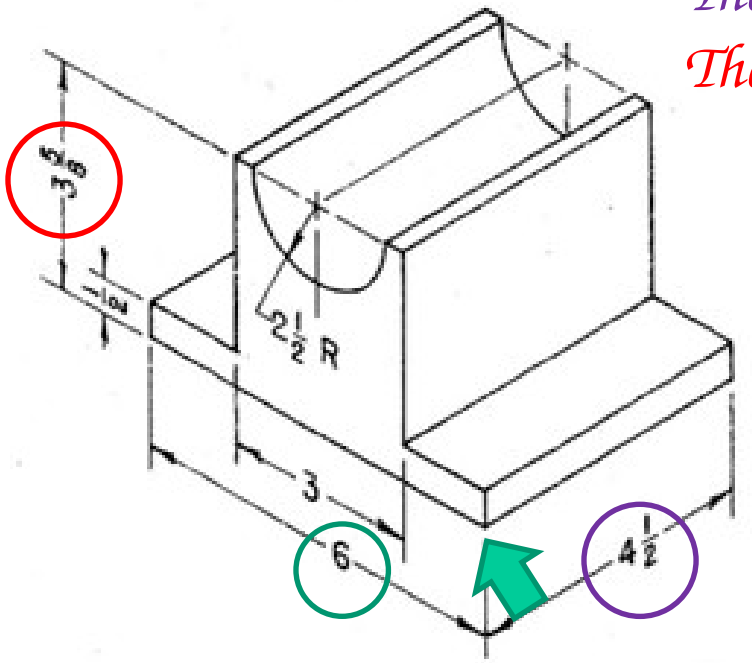
Centering an Isometric Object

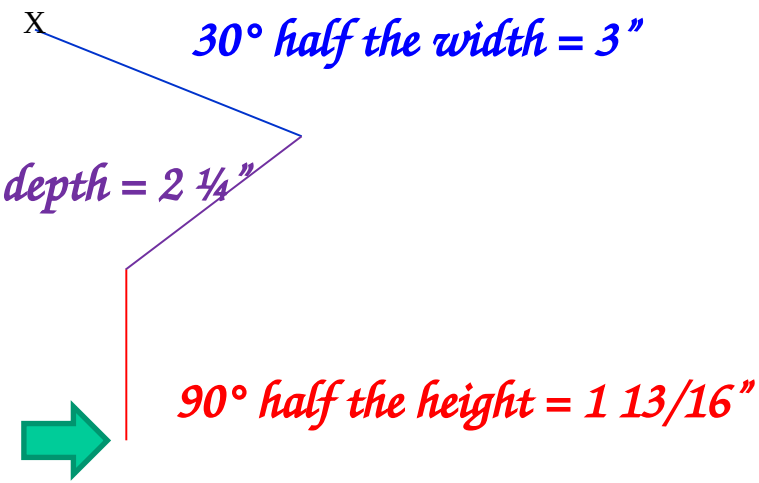
What are the measurements needed to center this object as an isometric drawing?

The width of the object.

The depth of the object.

The height of the object.

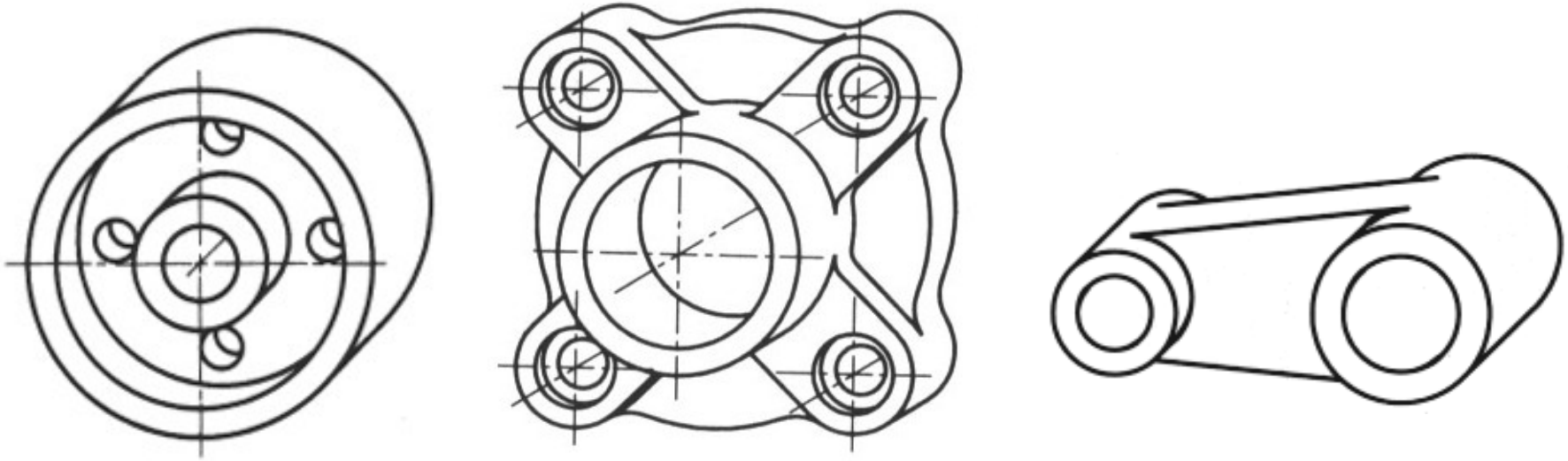




Oblique Drawings

Object Orientation Guidelines

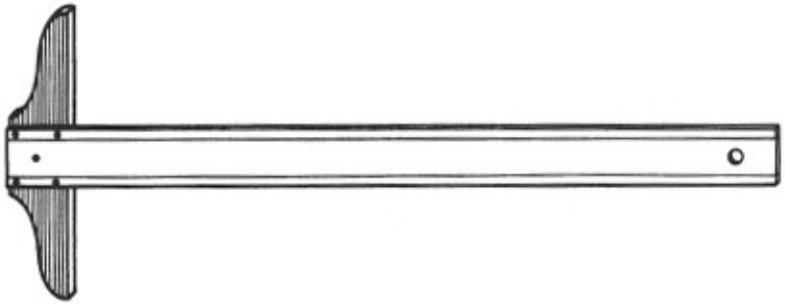
- Place complex features (arc, hole, irregular shape surface parallel to frontal plane.



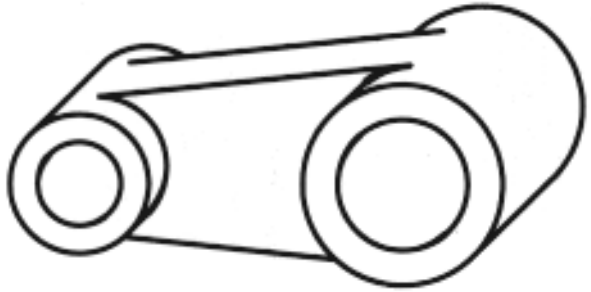
Object Orientation Guidelines

The longest dimension of an object should be parallel to the frontal plane.

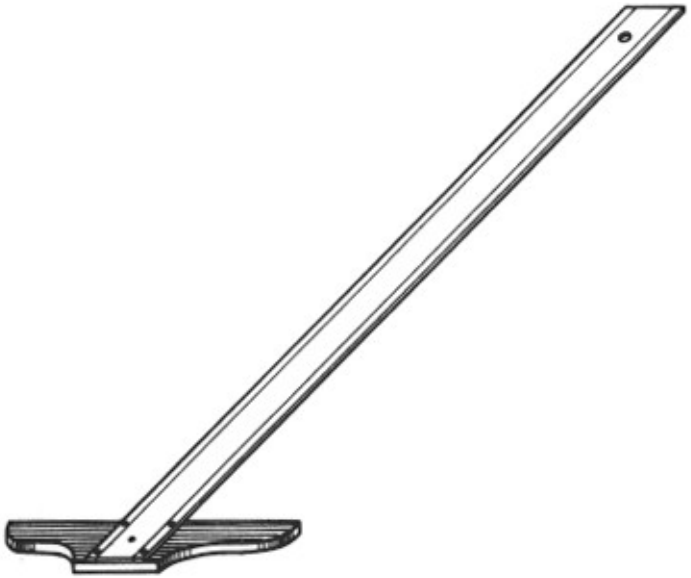
GOOD



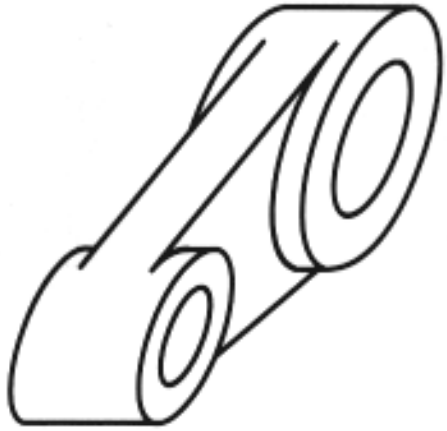
GOOD



WORSE



WORSE



Cavalier & Cabinet Drawings

Cavalier drawings *are drawn with the full depth.*

Reason for doing a cavalier drawing:

Accurate dimensions.

Cabinet drawings *are drawn with a shortened(1/2) depth.*

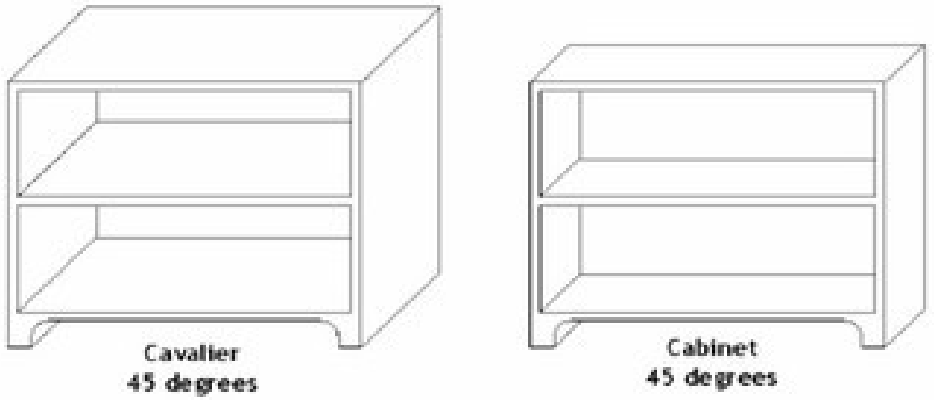
They get their name from the furniture industry.

Reasons for doing cabinet drawing:

More natural look.

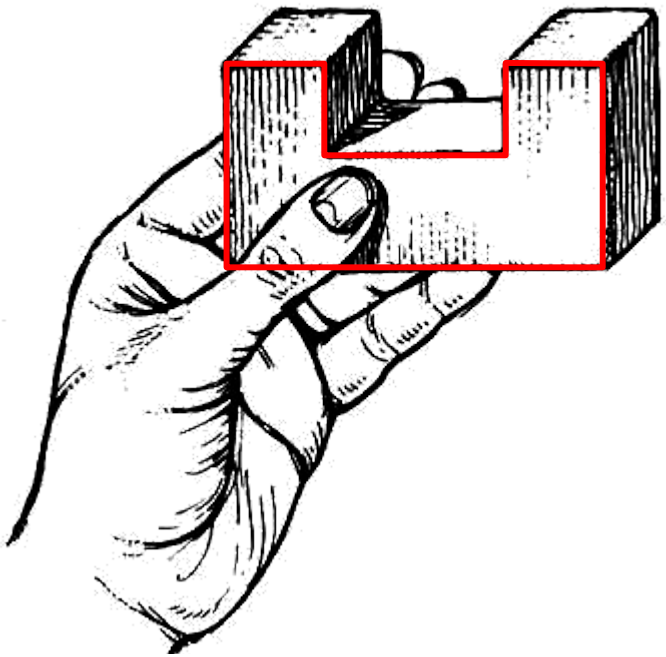
Sometimes shows more detail.

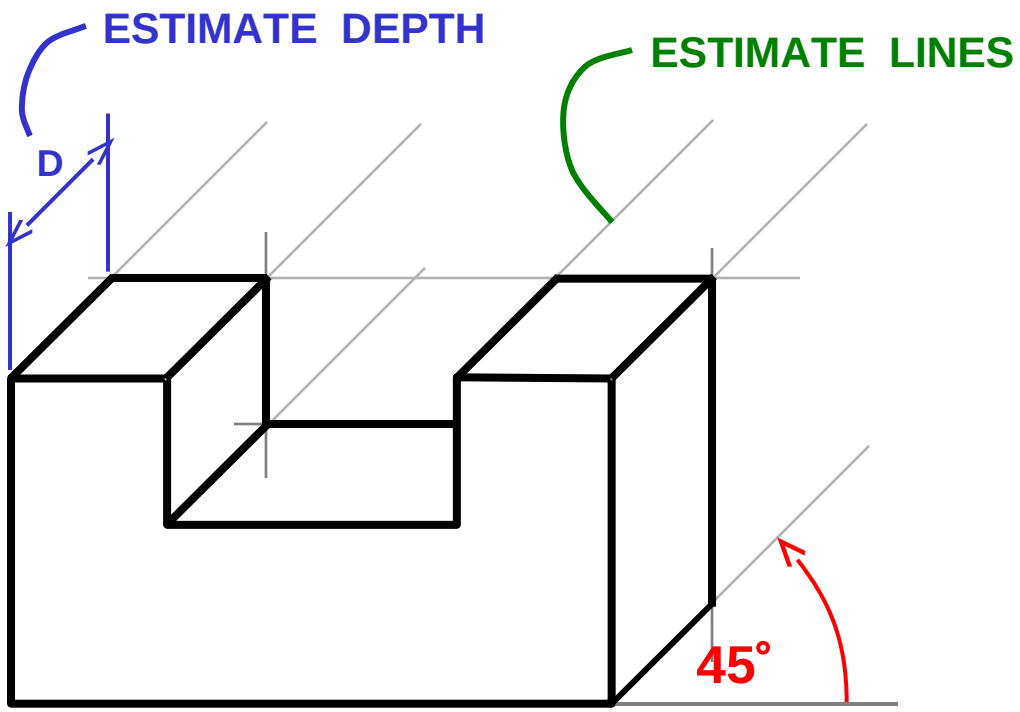
Two drawings of a bookcase.....



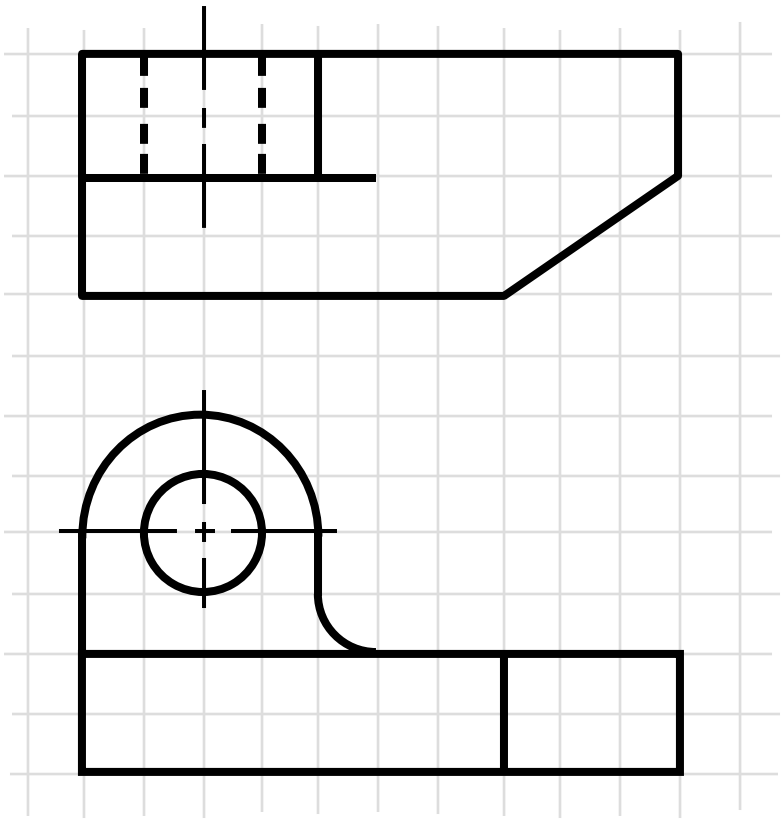
which one is the most realistic looking?

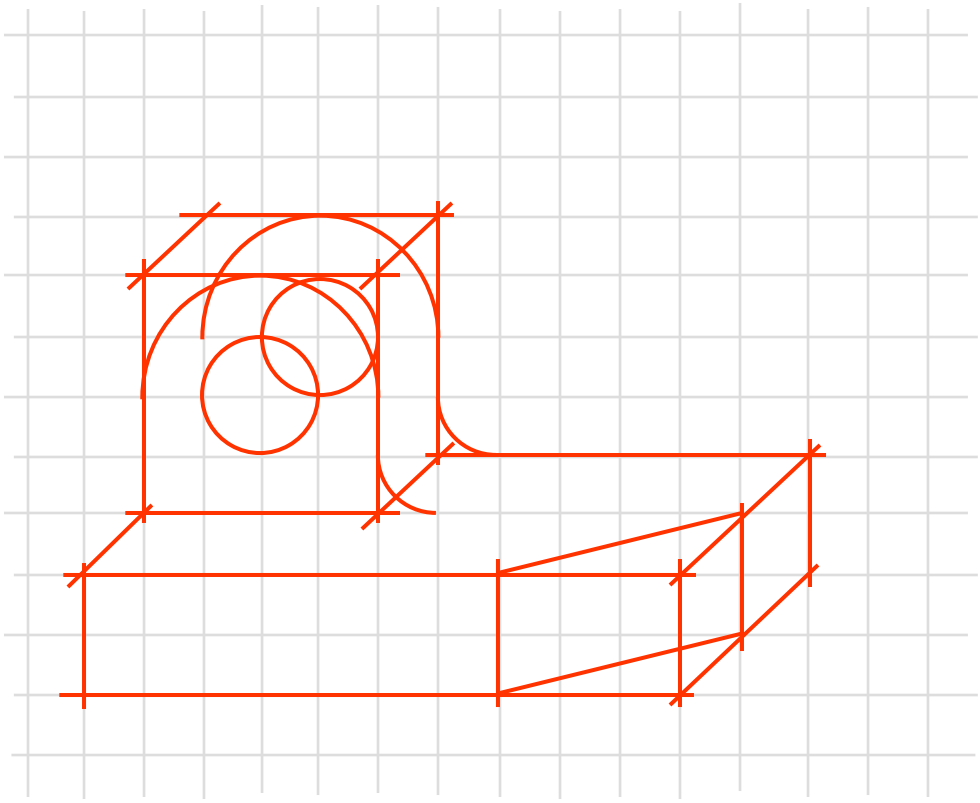
Sketch oblique drawing from actual object



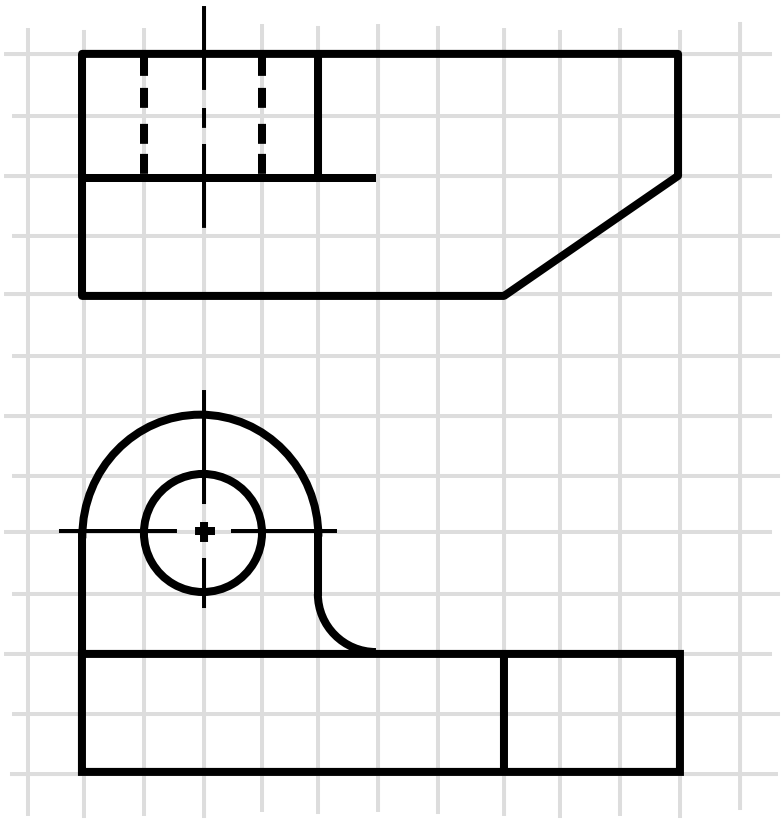


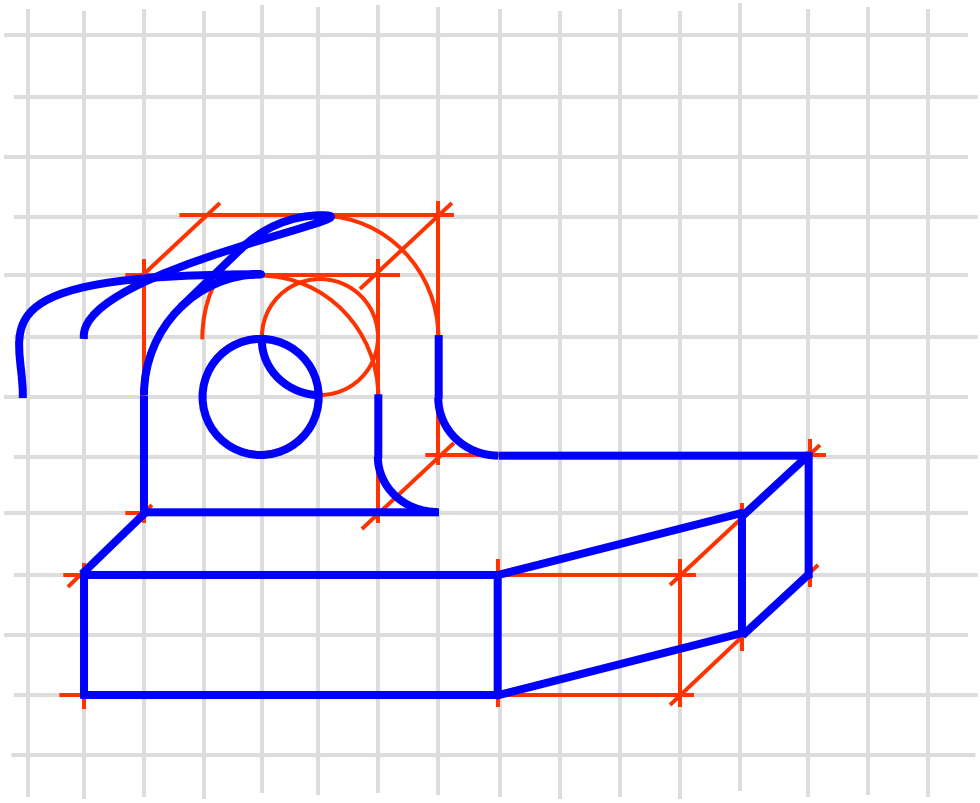
Sketch oblique drawing from multiview drawing



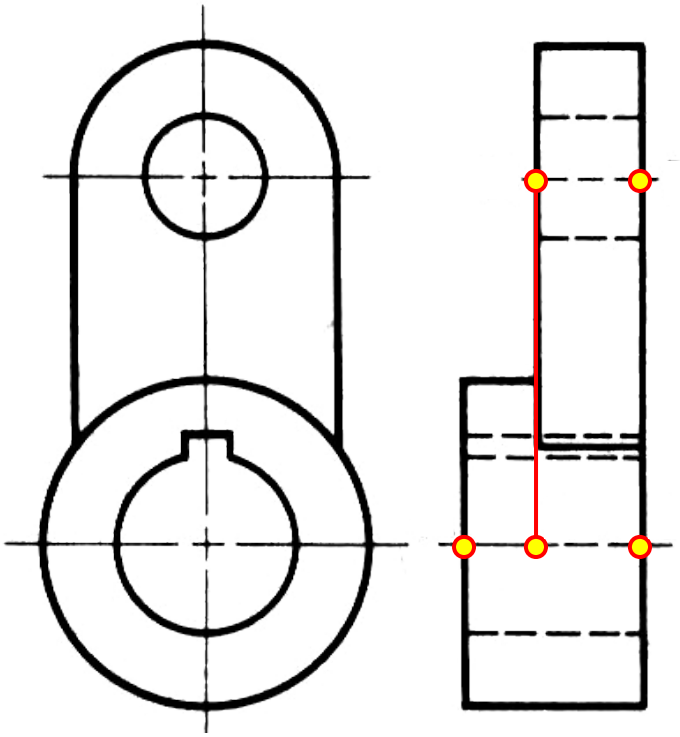


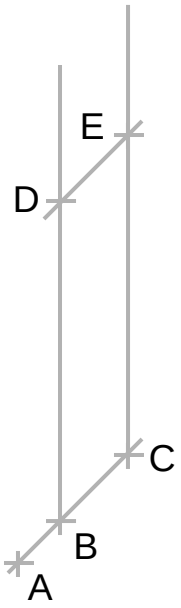
Sketch oblique drawing from multiview drawing



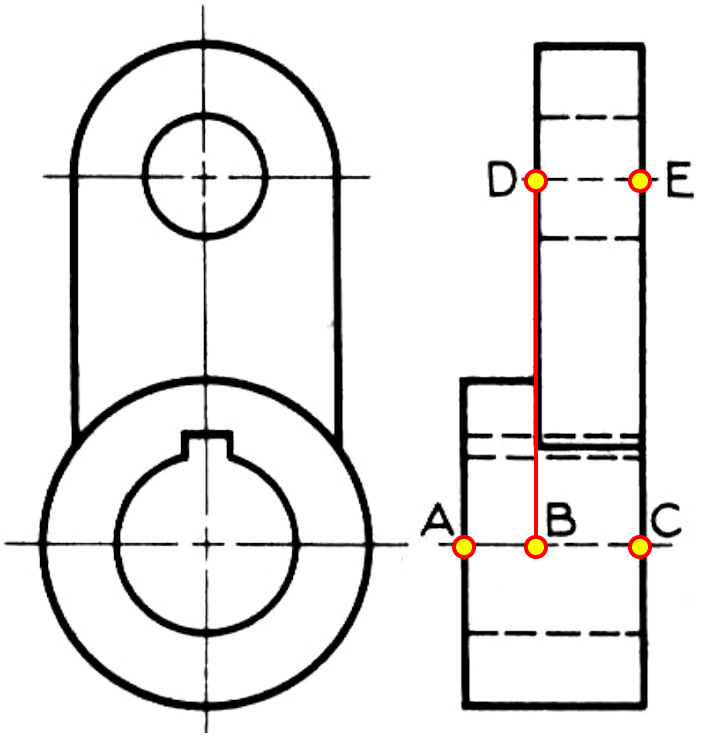


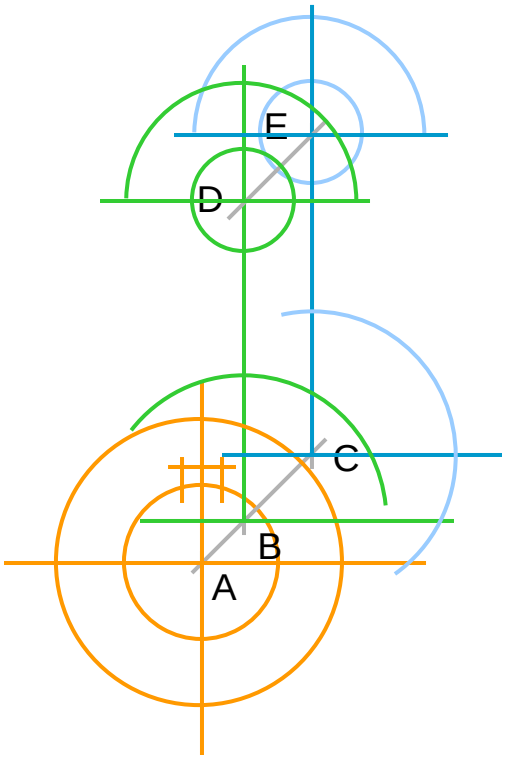
Sketch oblique drawing from multiview drawing



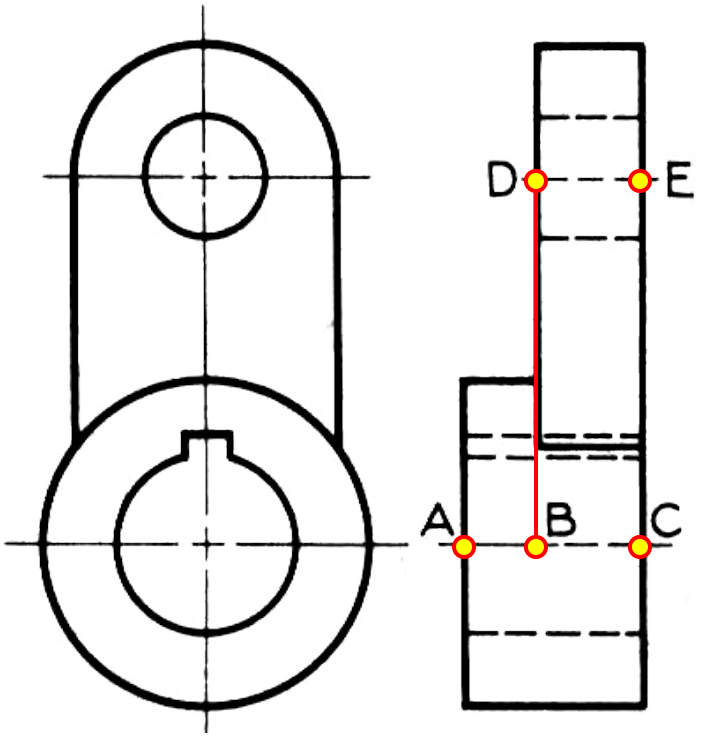


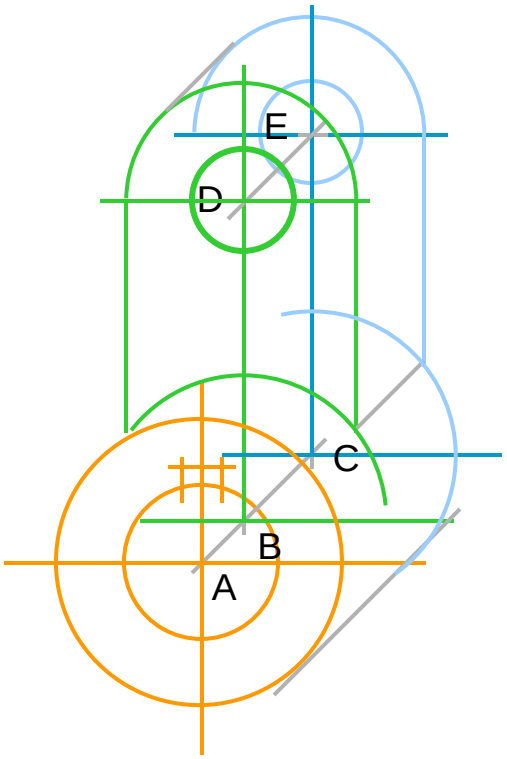
Sketch oblique drawing from multiview drawing

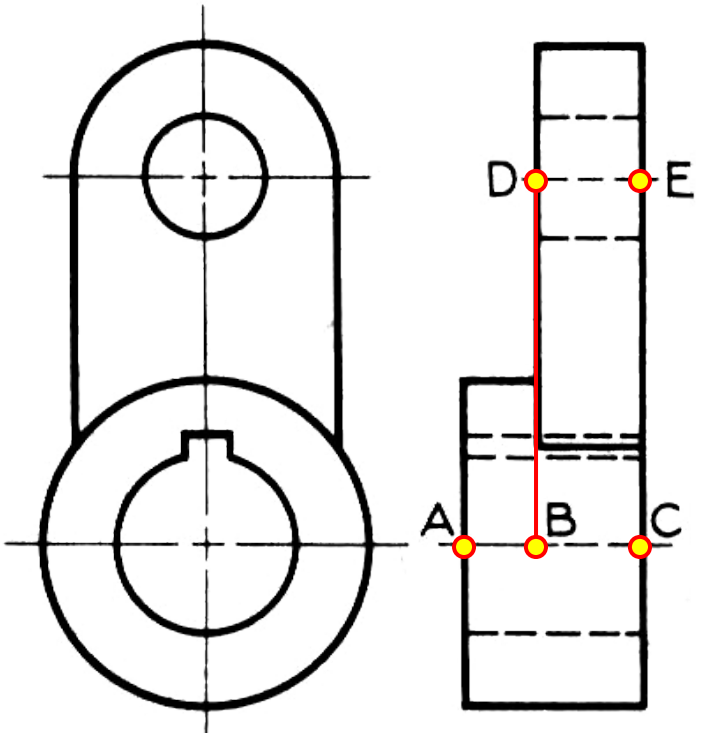


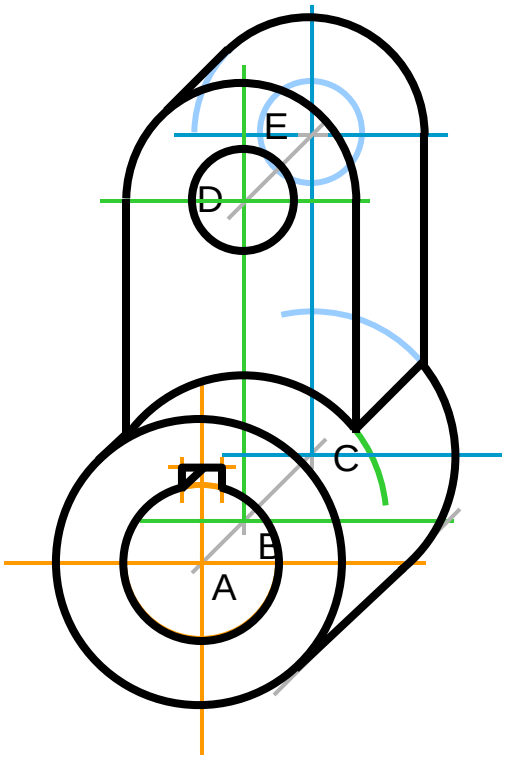


Sketch oblique drawing from multiview drawing



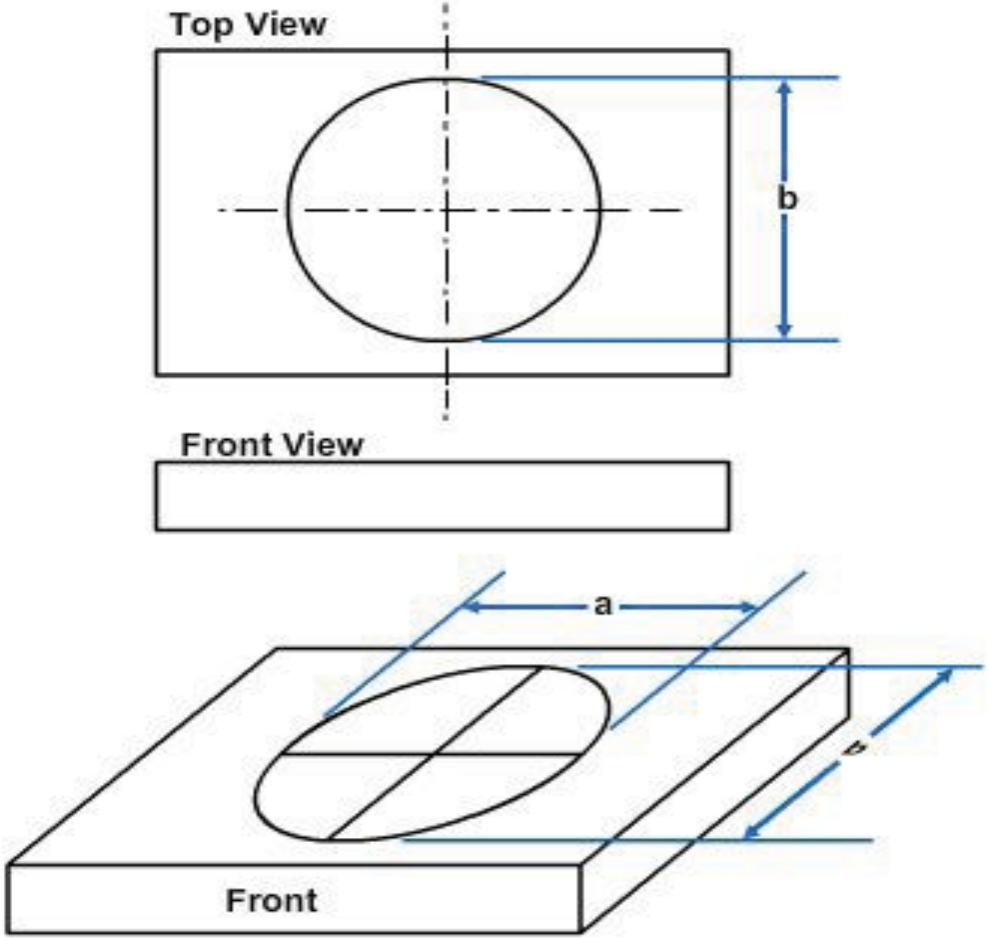



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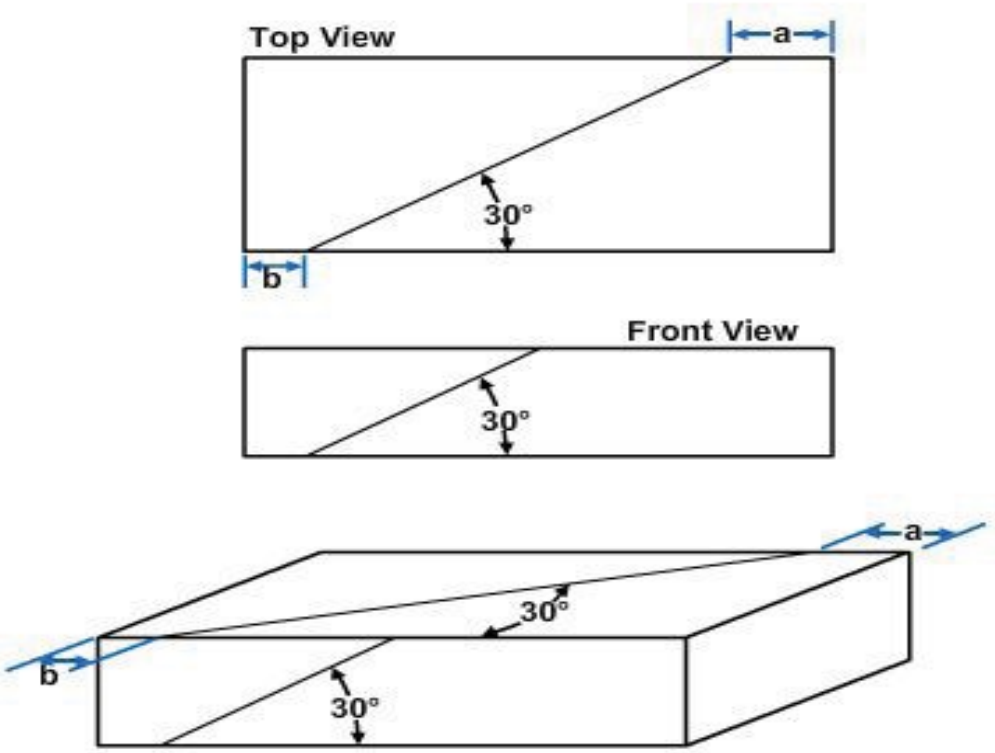
Circles in oblique drawings

- On an oblique drawing, a circle on the surface parallel to of projection plane will appear as a circle.
- But a circle on any other surfaces will appear as ellipse.



Angles in oblique drawing

- *In an oblique drawing, an angle on the surface that is parallel to the projection plane will appear as in its true length, but an angle on any other surface will not and transferred by locating the end points of the line by measurements along regular lines.*



End of Chapter Four