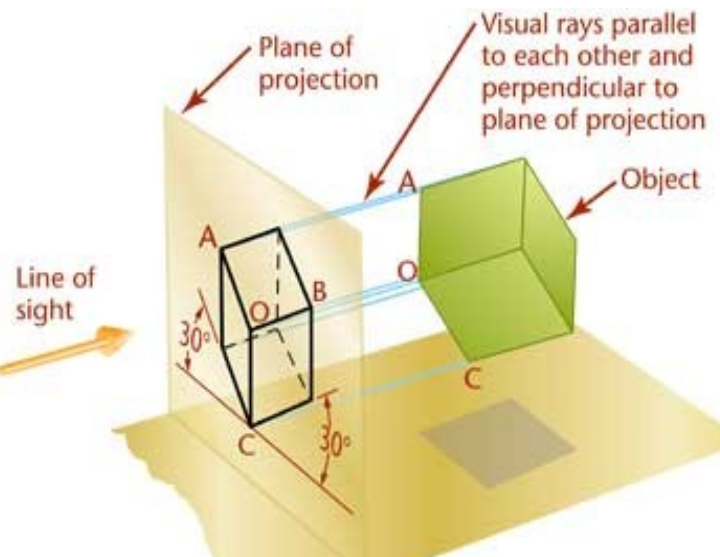




**College of Electrical and Mechanical
Engineering
Department of Mechanical Engineering
Engineering Drawing (MEng2001)**

I. Pictorial Drawing

By Tolina T.



April, 2022

Topics

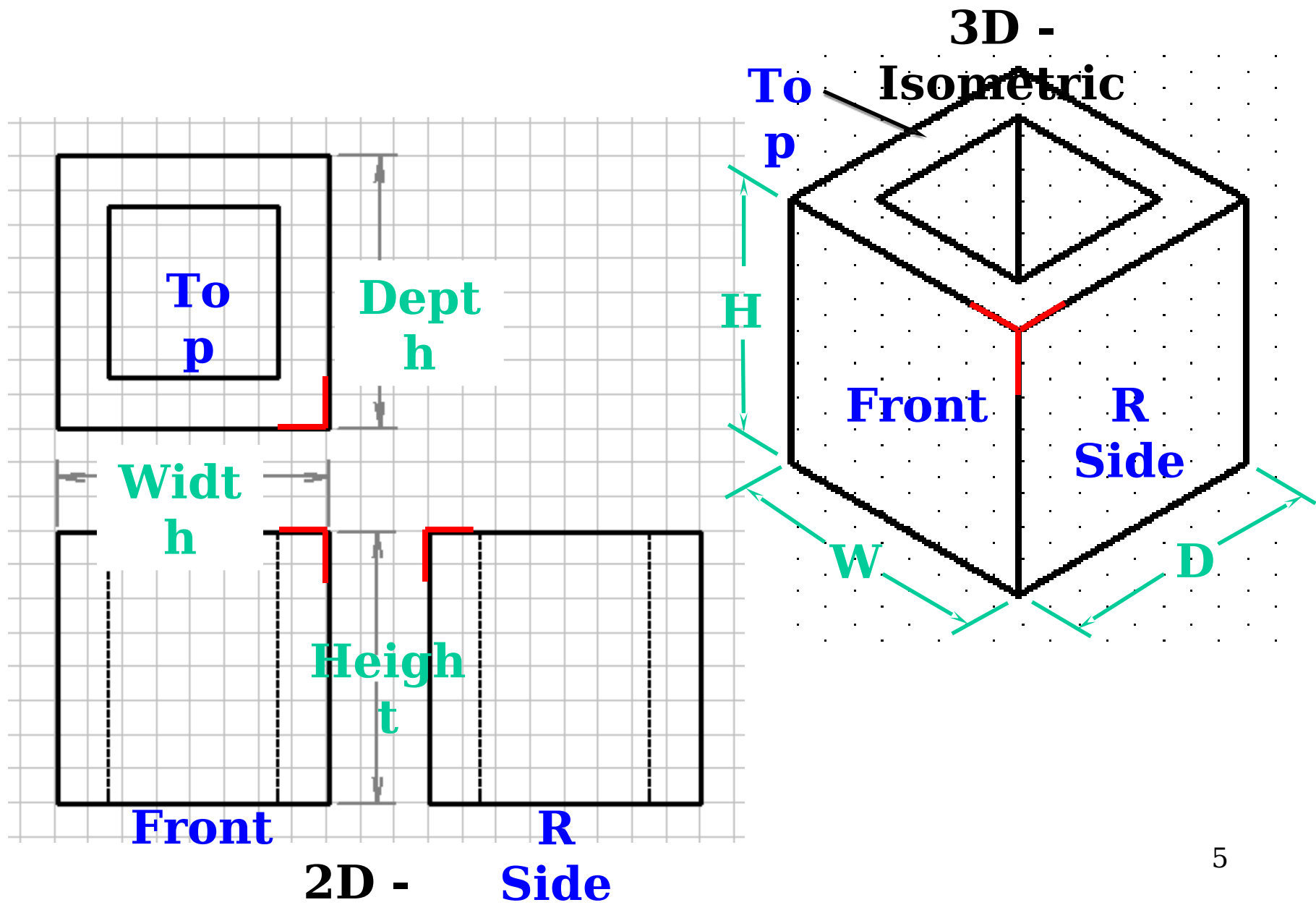
- *Comparison between multi-view and pictorial drawing*
- *Types of pictorial projections*
- *Isometric drawings*
- *Oblique drawings*

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.



Pictorial Distortion

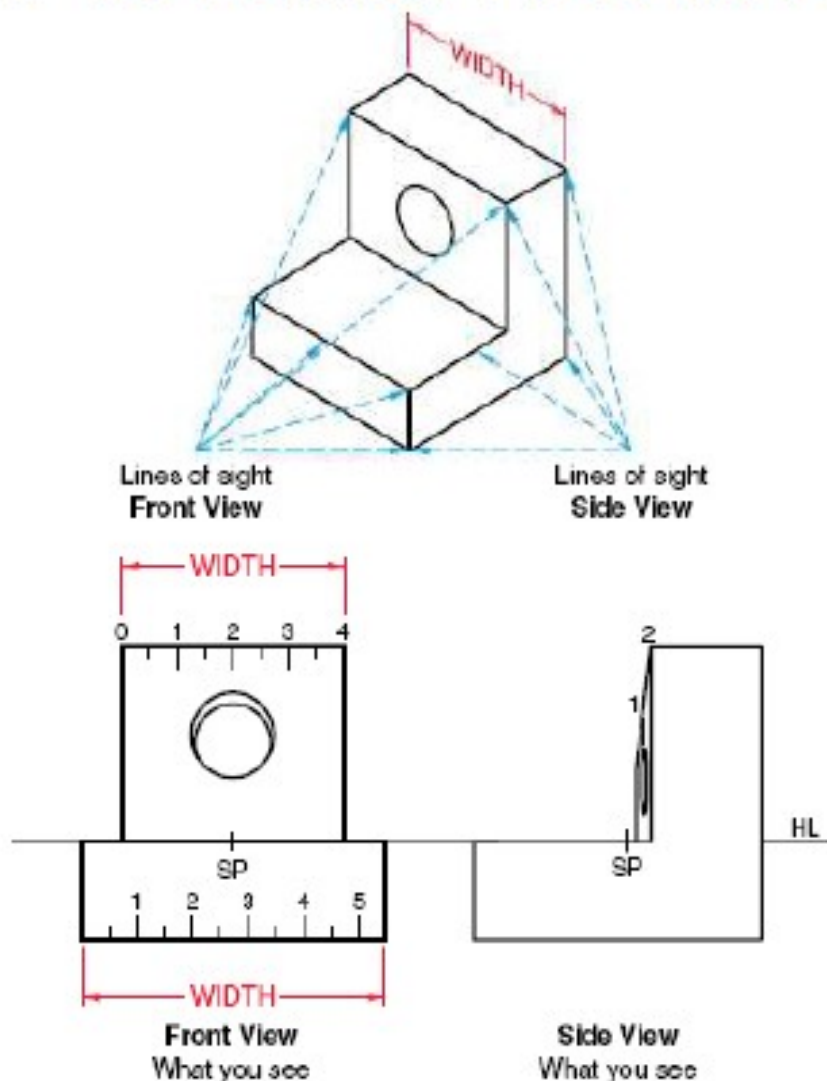


Figure 5.13

Distorted dimensions

Perspective drawings distort true dimensions.

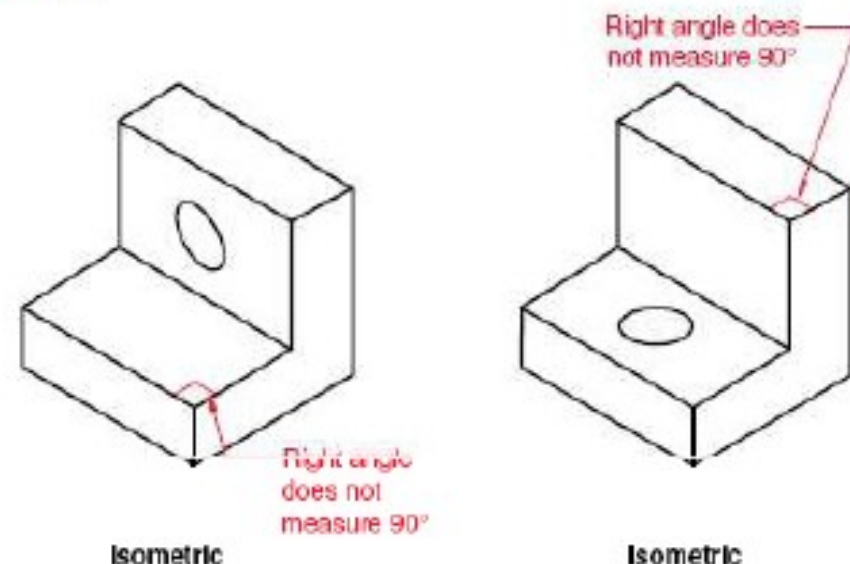


Figure 5.14

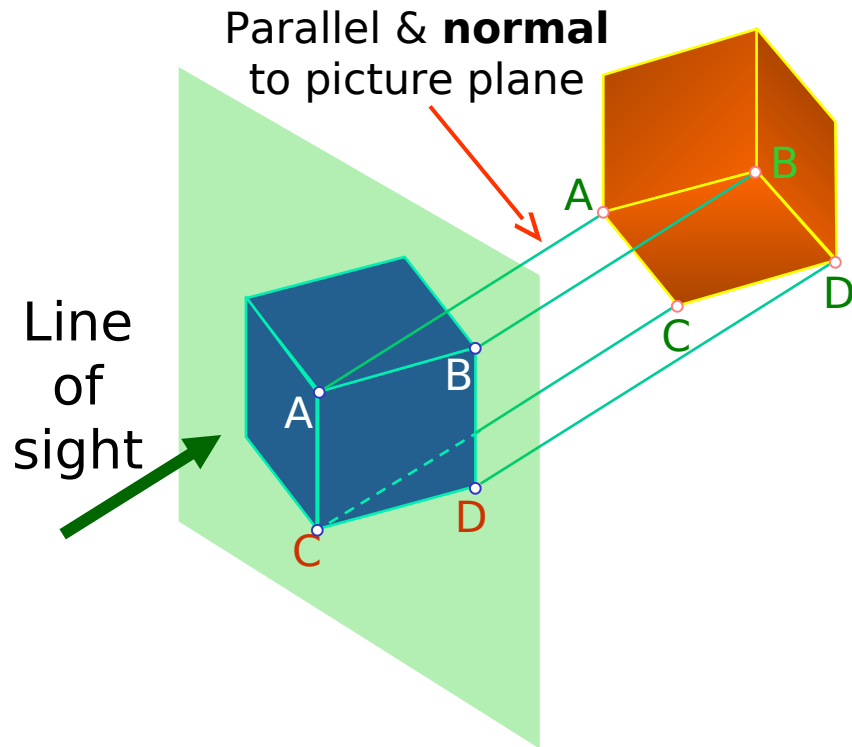
Distorted angles

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

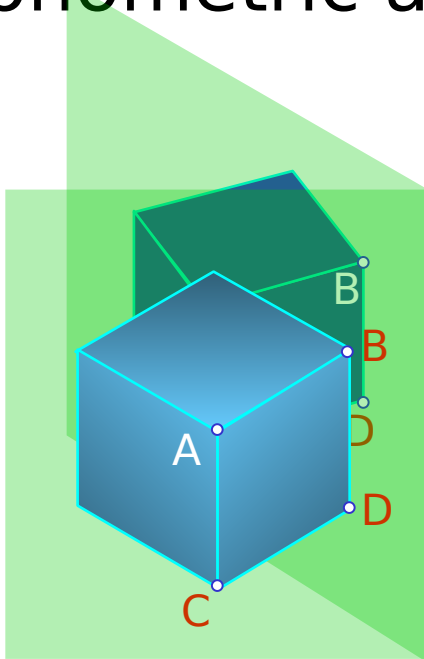
Axonometric Projection



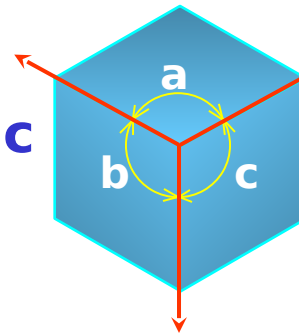
Axonometric projection is a parallel projection technique used to create pictorial drawings of objects by rotating the object on an axis relative to a projection plane to create a pictorial view.

Type of axonometric drawing

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



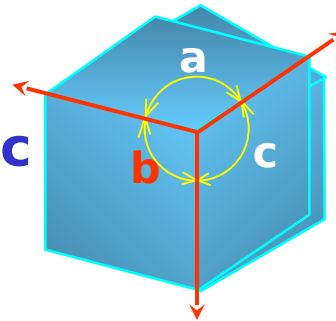
1. Isometric



Axonometric axis

All angles are equal.

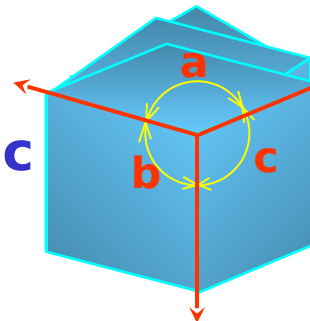
2. Dimetric



Axonometric axis

Two angles are equal.

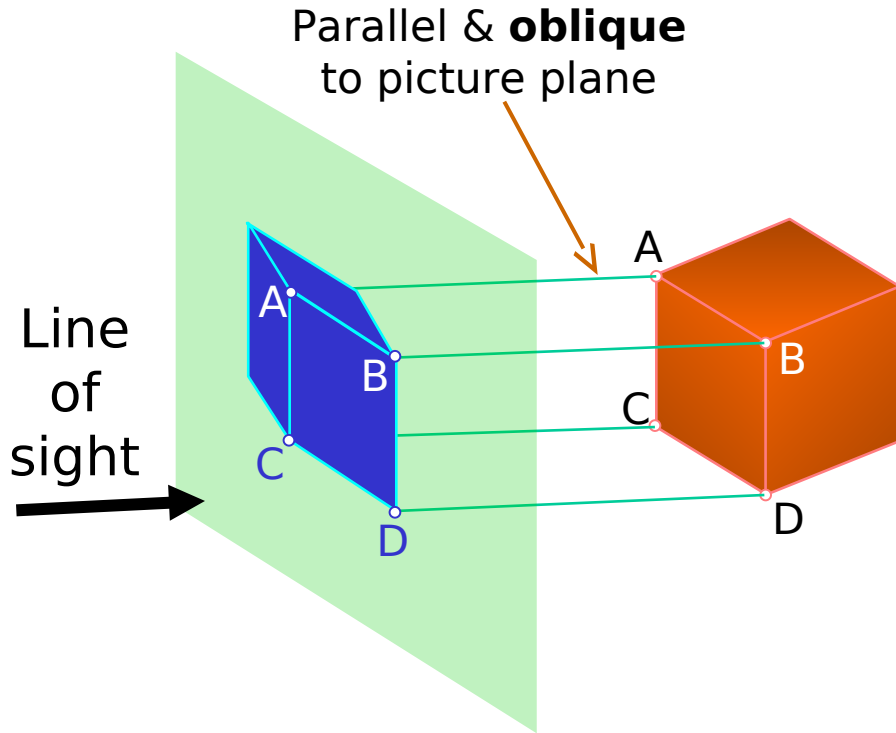
3. Trimetric



Axonometric axis

None of angles are equal.

Oblique Projection



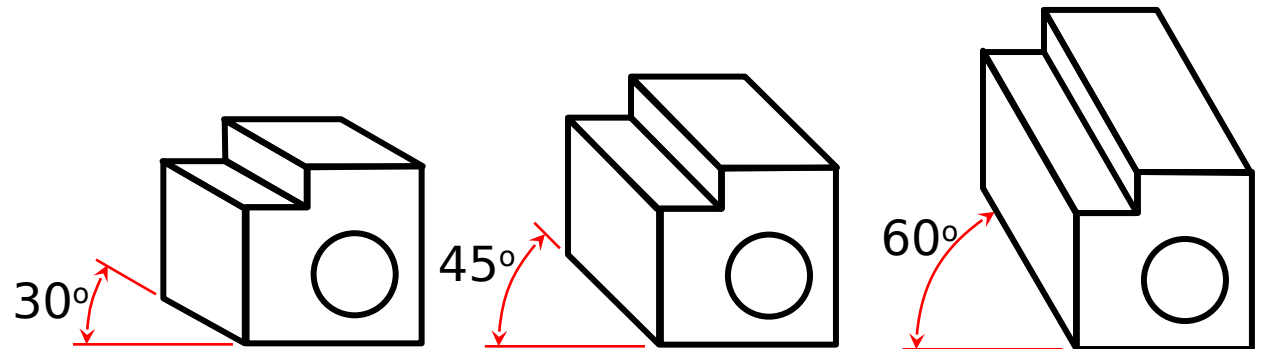
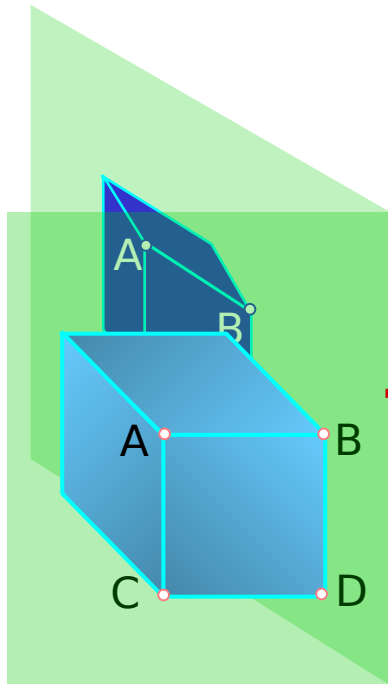
Oblique projections are a form of pictorial drawings in which the most descriptive or natural front view is placed parallel to the plane of projection.

It is used in:

- ✓ Furniture manufacturing
- ✓ Cabinet making

Oblique Projection

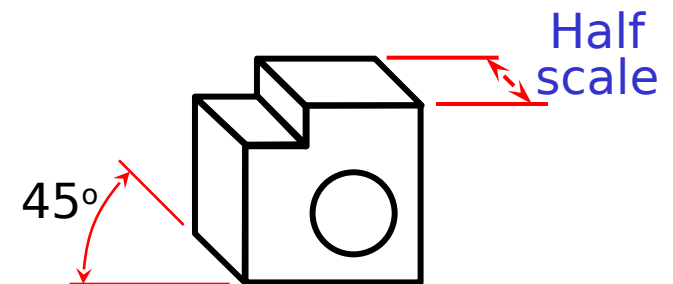
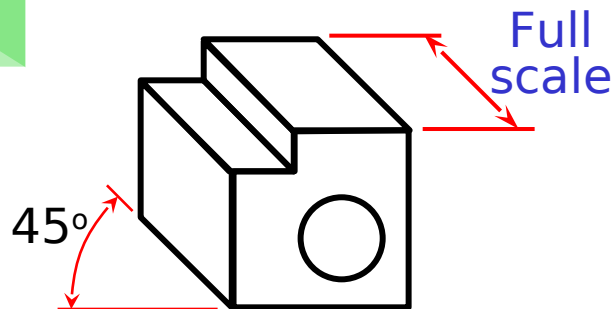
Oblique drawing angle



Type of Oblique drawing

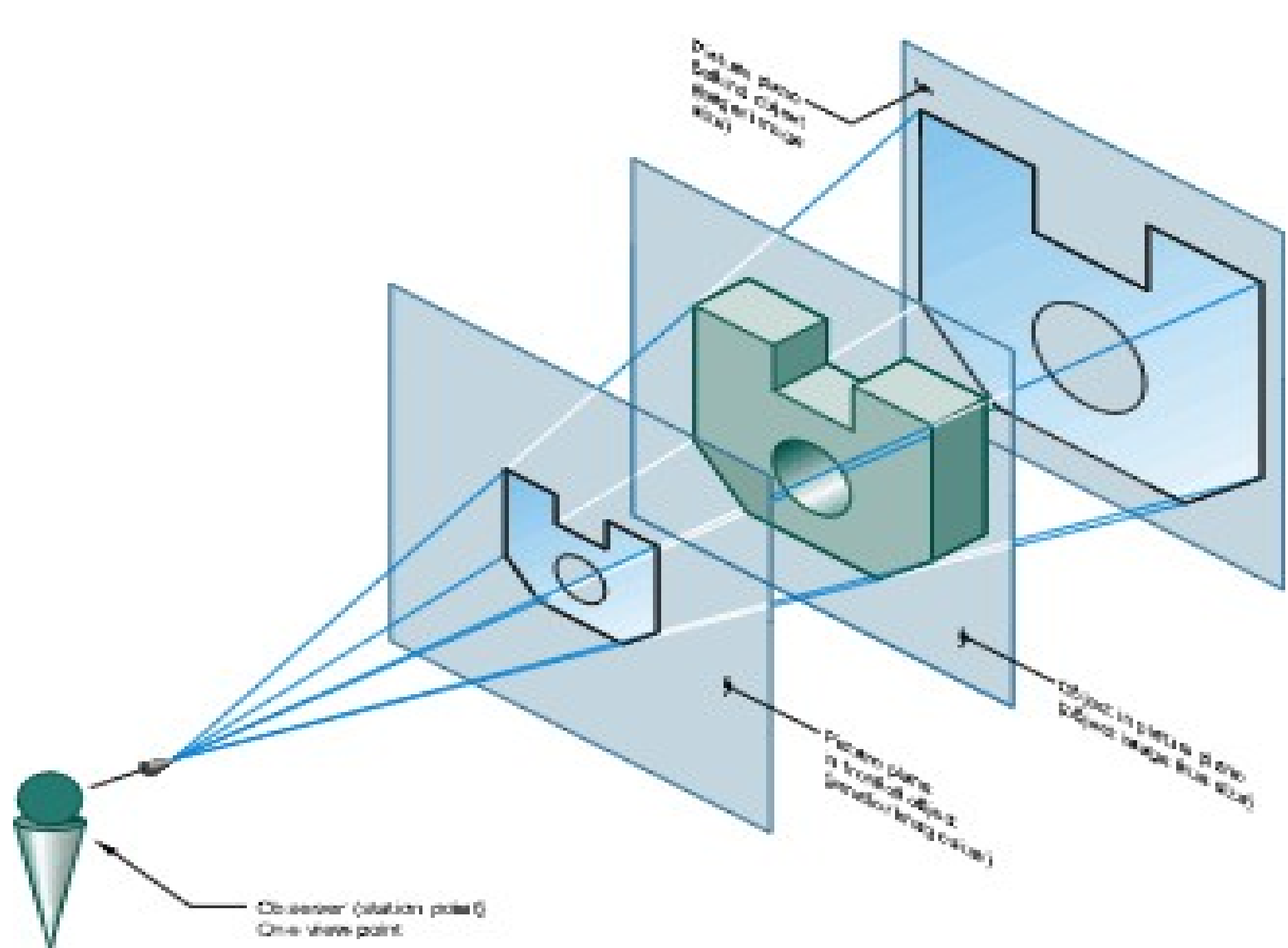
1) Cavalier

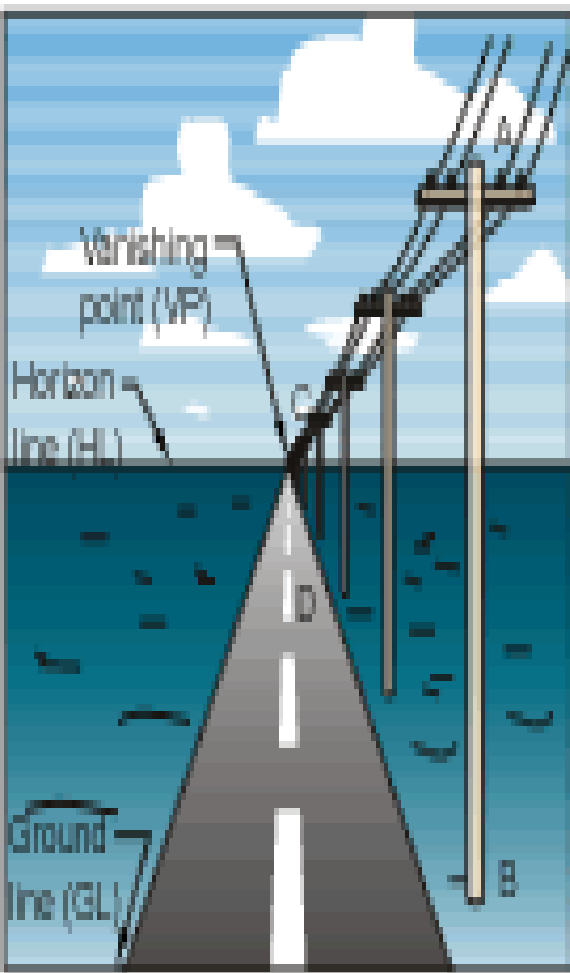
2) Cabinet



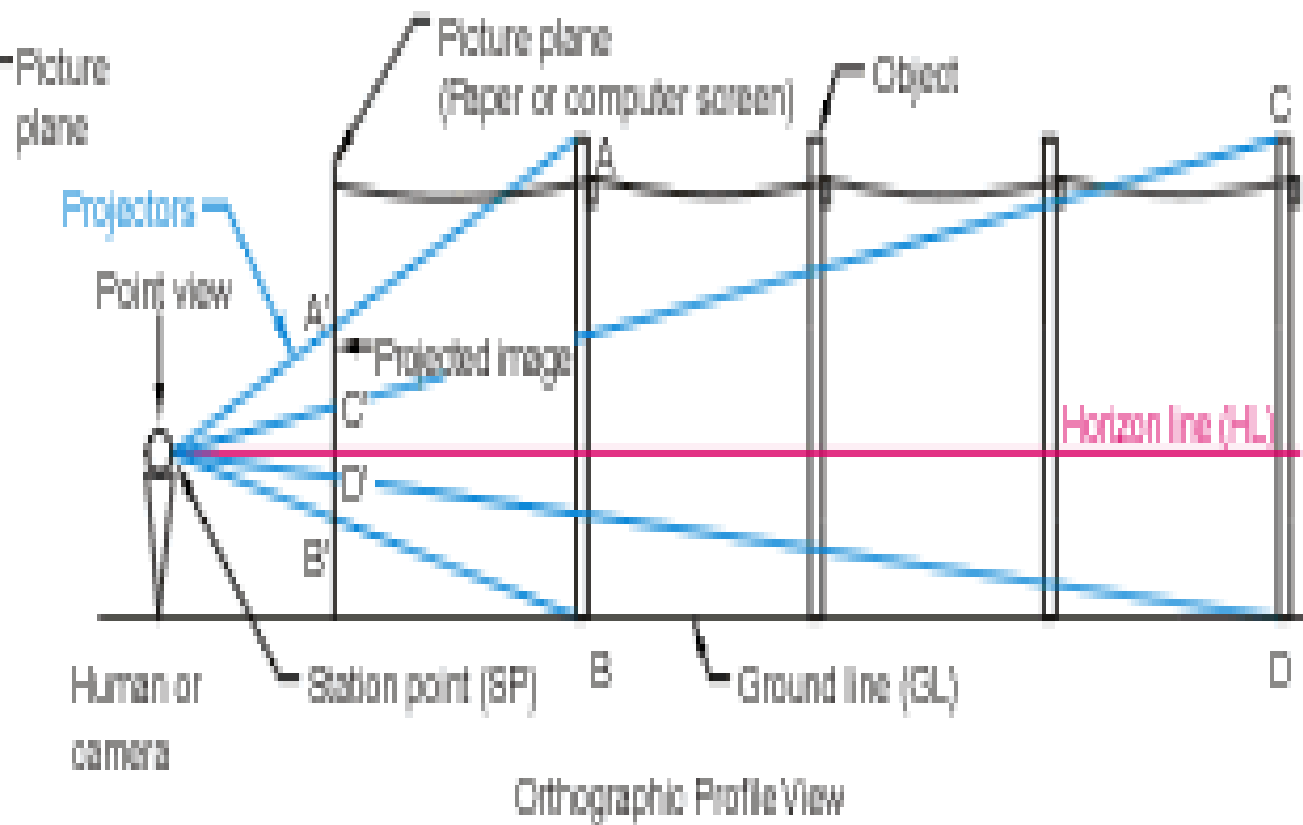
Perspective Projections

- 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

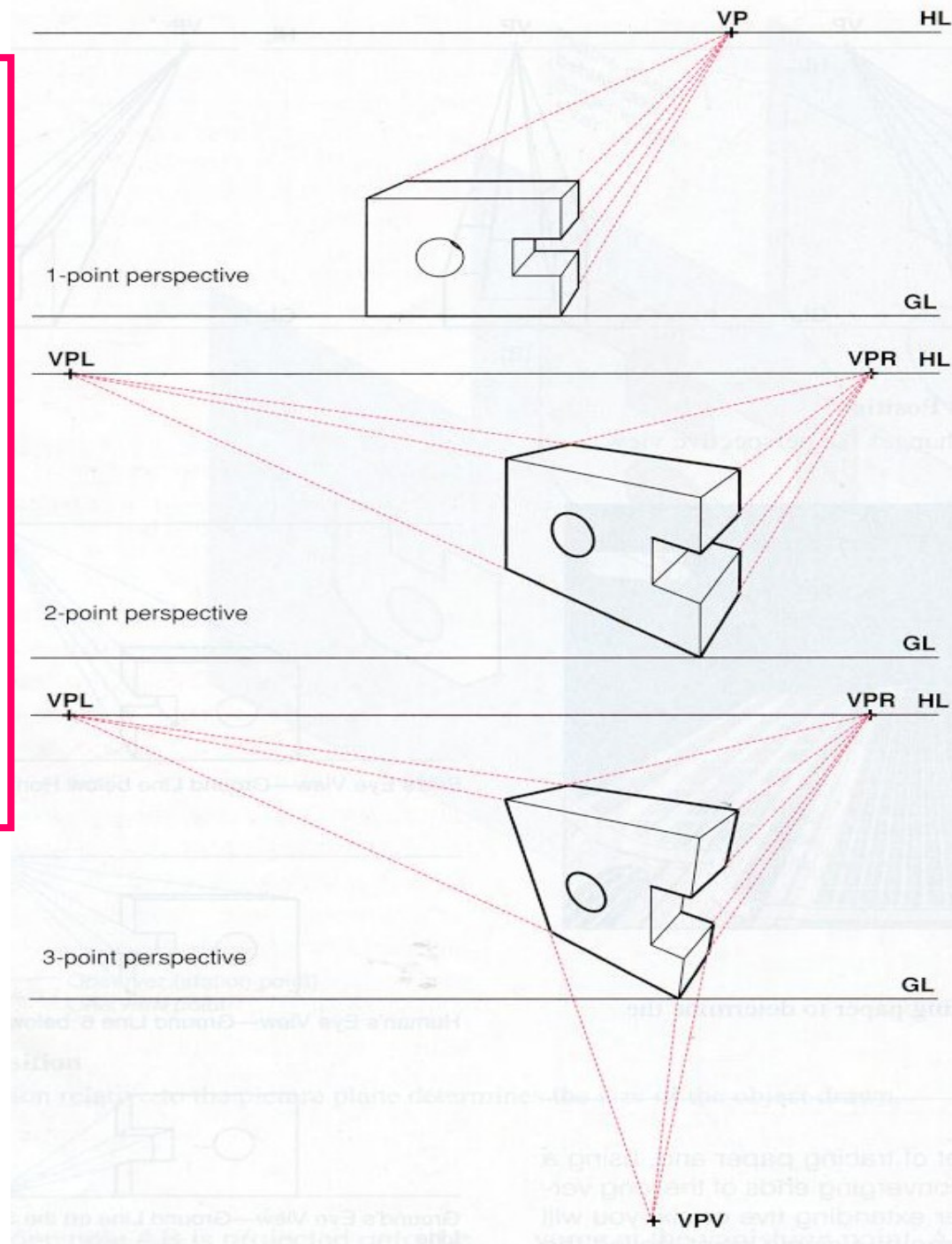


4 variables in perspective drawings:

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

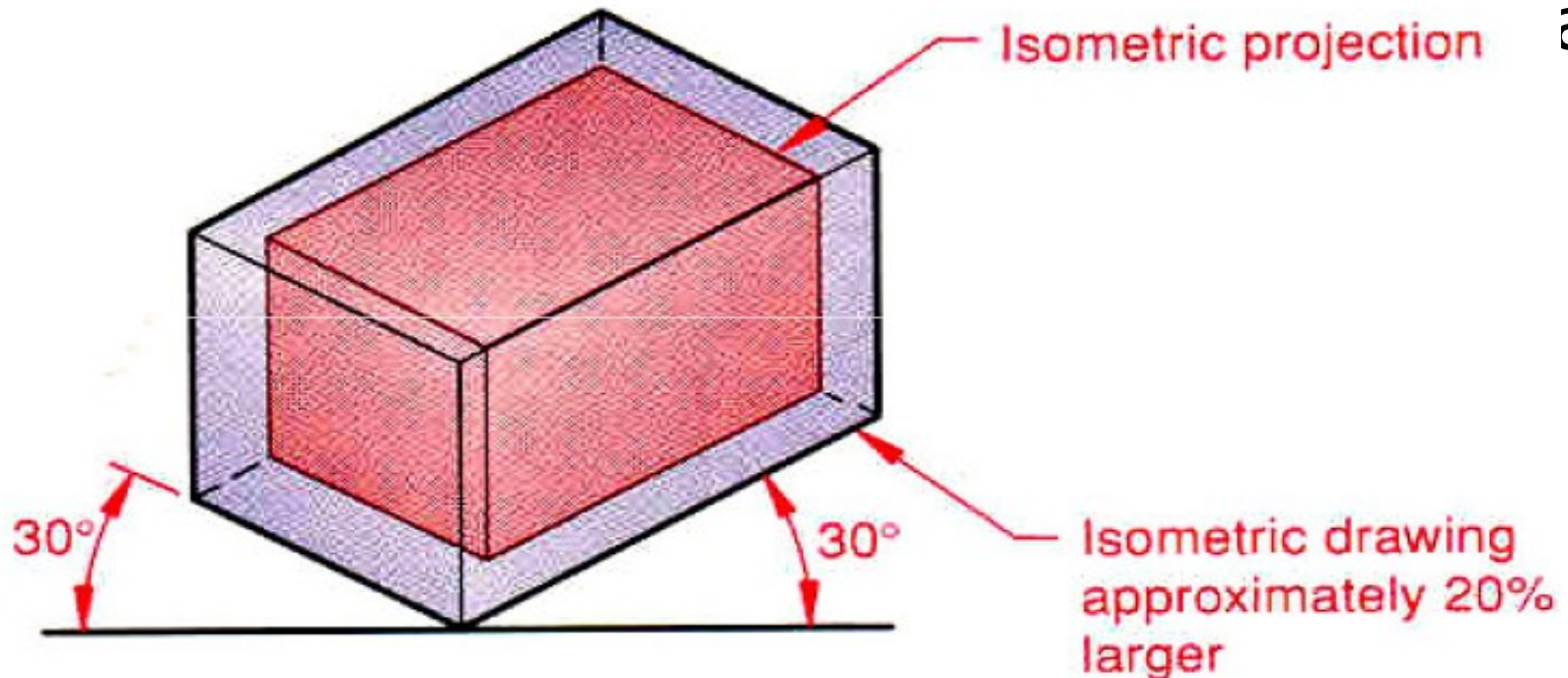
Classifications

1-point perspective
2-point perspective
3-point perspective



Isometric drawings

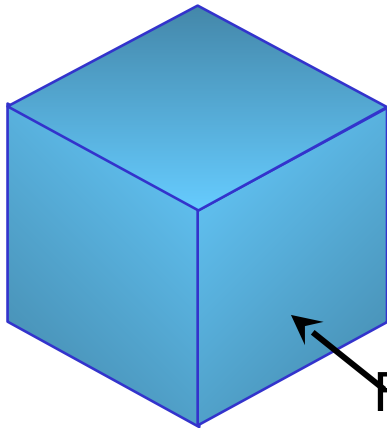
- *Isometric drawings* are almost always preferred over isometric projection for engineering drawings, because they are easier to produce.
- An *isometric drawing* is an *axonometric pictorial drawing* for which the angle



Isometric Drawing / View

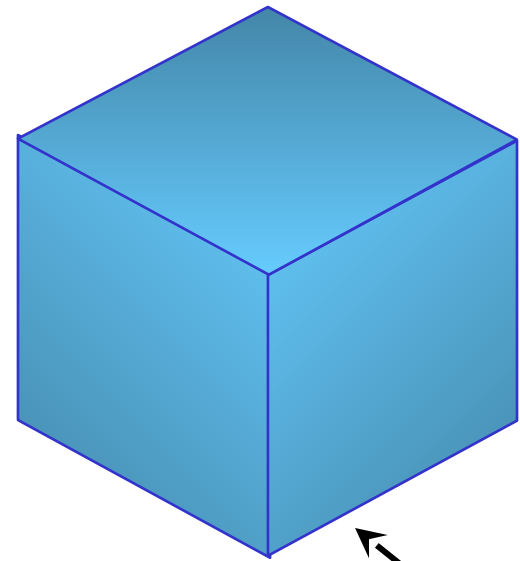
Isometric drawing is a drawing drawn on an isometric axes using ***full scale***.

Isometric projection
(True projection)

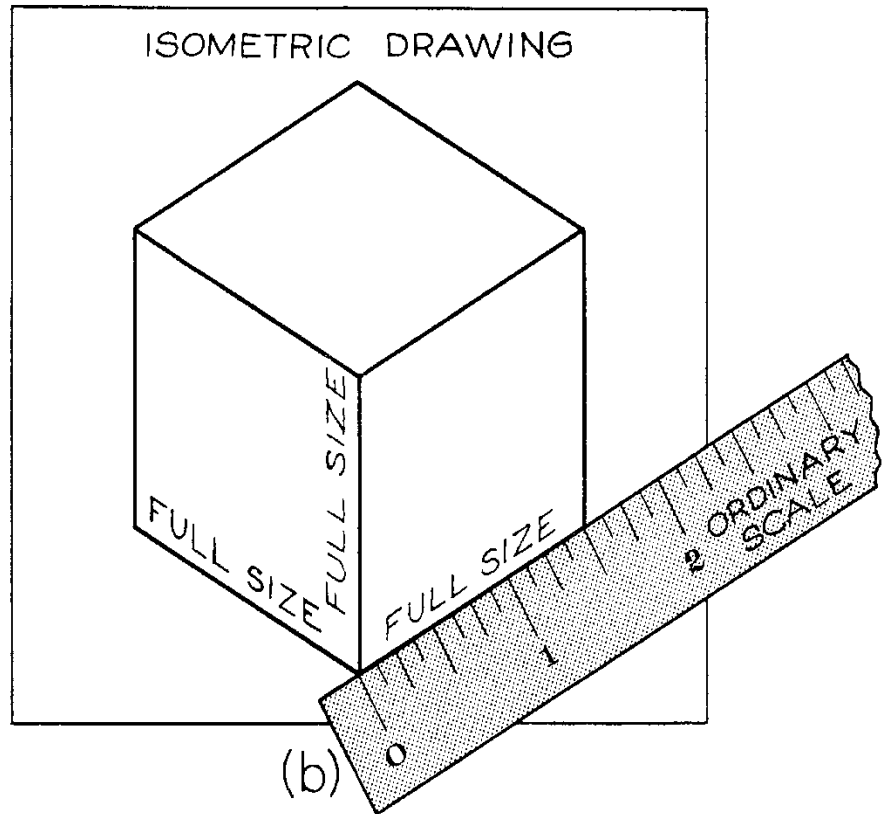
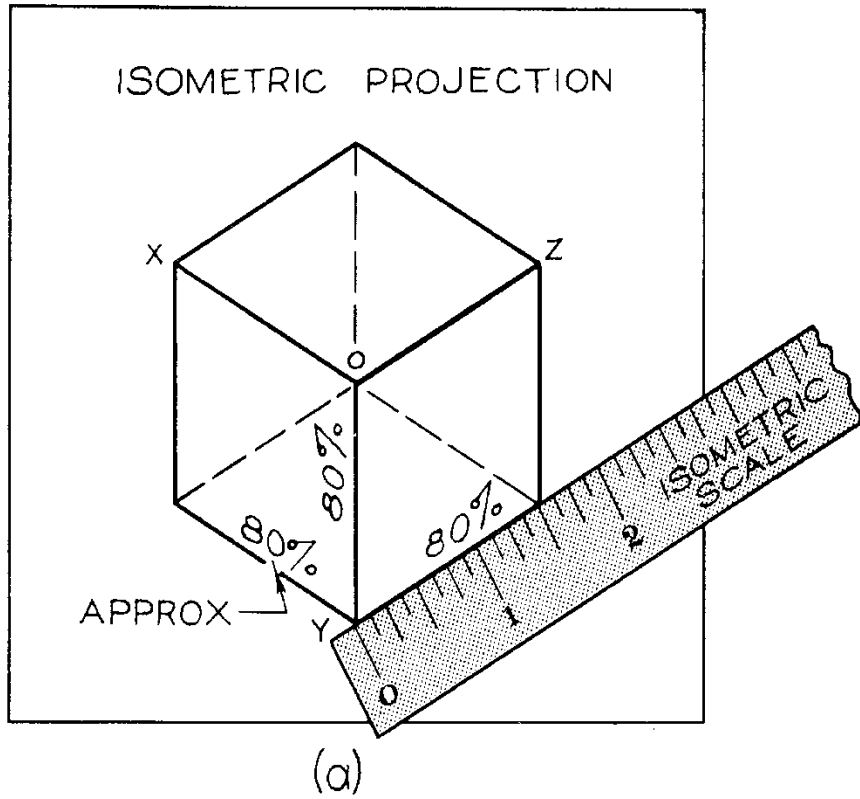


← Foreshortened
Length

Isometric drawing / View
(Full scale)



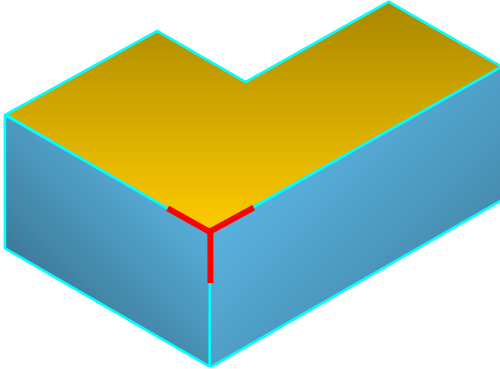
← Full scale



Positions of Isometric Axes

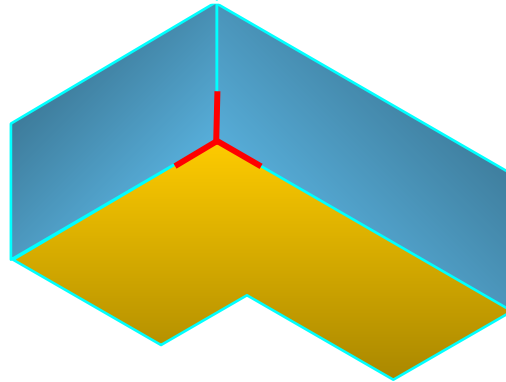
Isometric axes can be arbitrarily positioned to create different views of a single object.

**Regular
isometric**



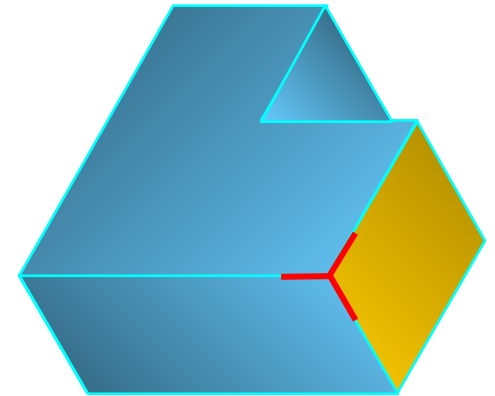
View point is looking down on the top of the object.

**Reverse axis
isometric**



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

**Long axis
isometric**

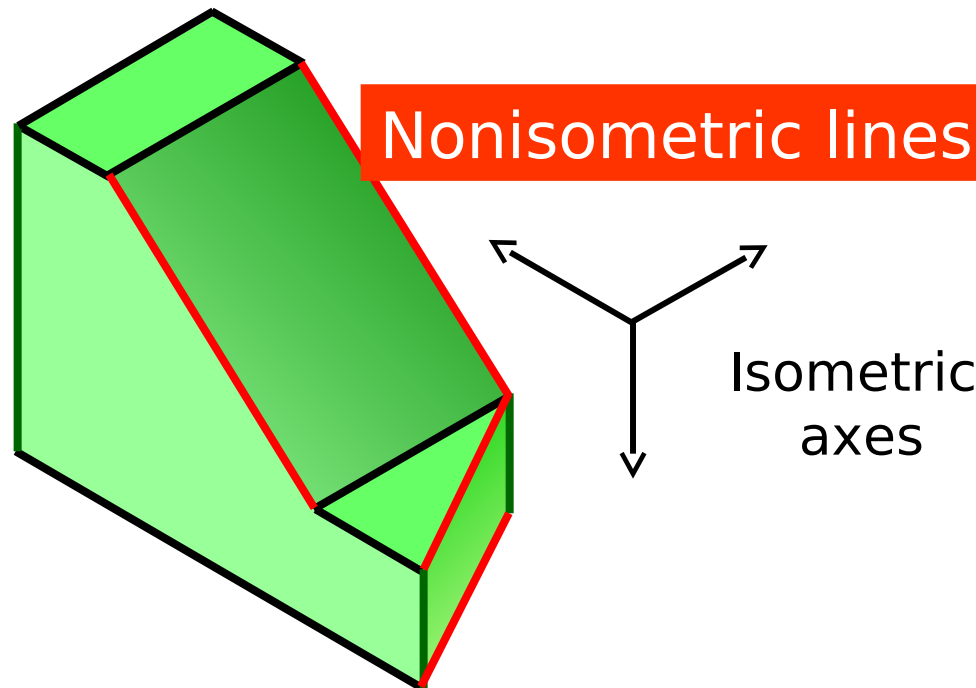


View point is looking from the right (or left) of the object.

Distance in Isometric Drawing

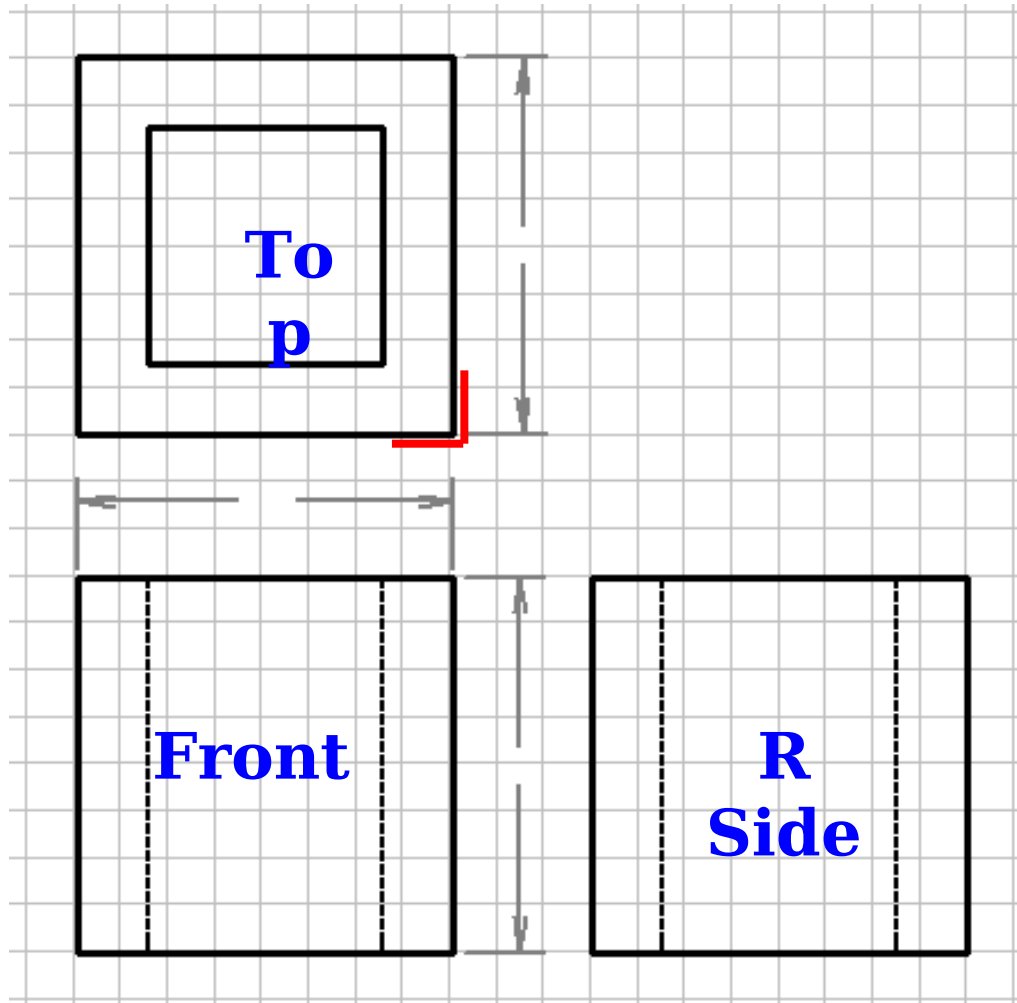
- **True-length distances** are shown along isometric lines.

- ***Isometric line*** is the line that run ***parallel*** to any of the isometric axes.

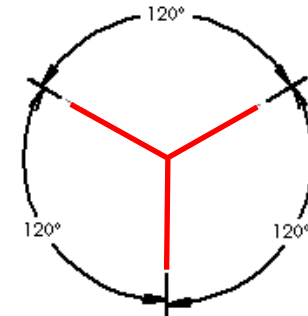
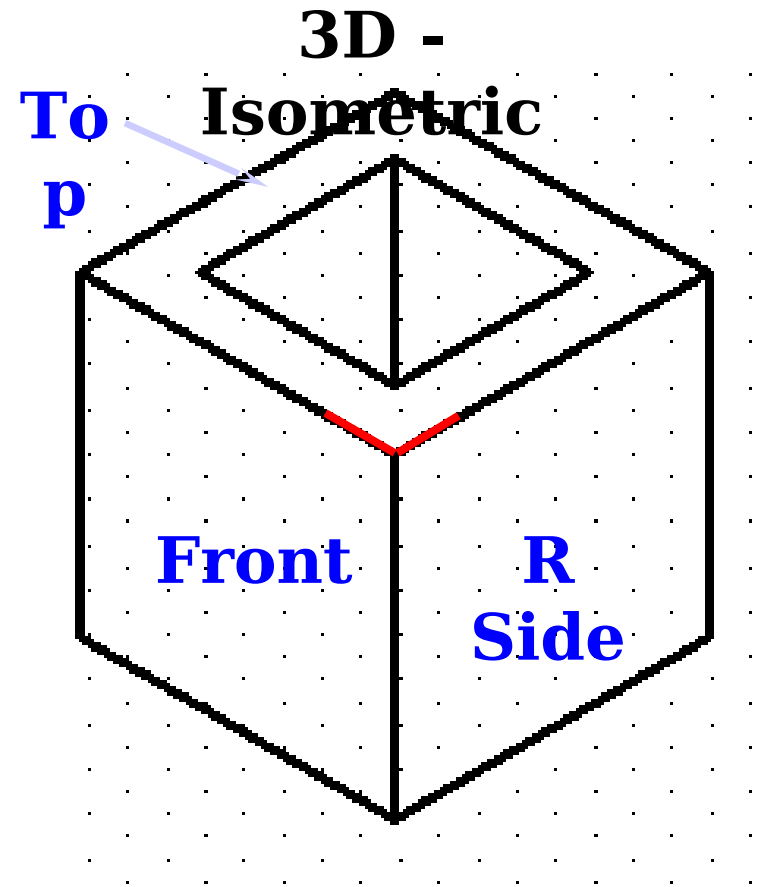


Axis, Views and Dimensions

Views? Axis?



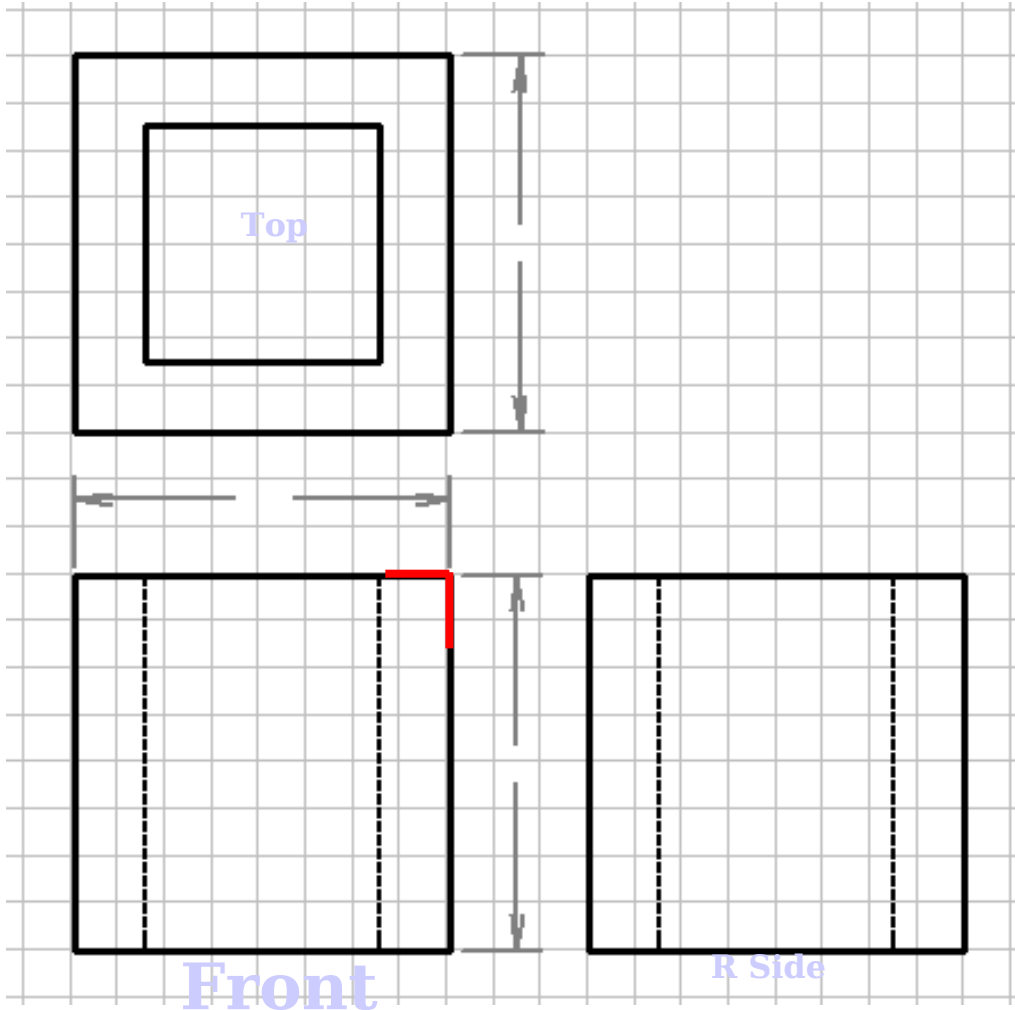
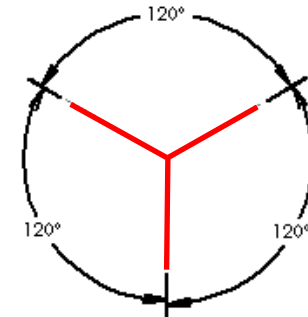
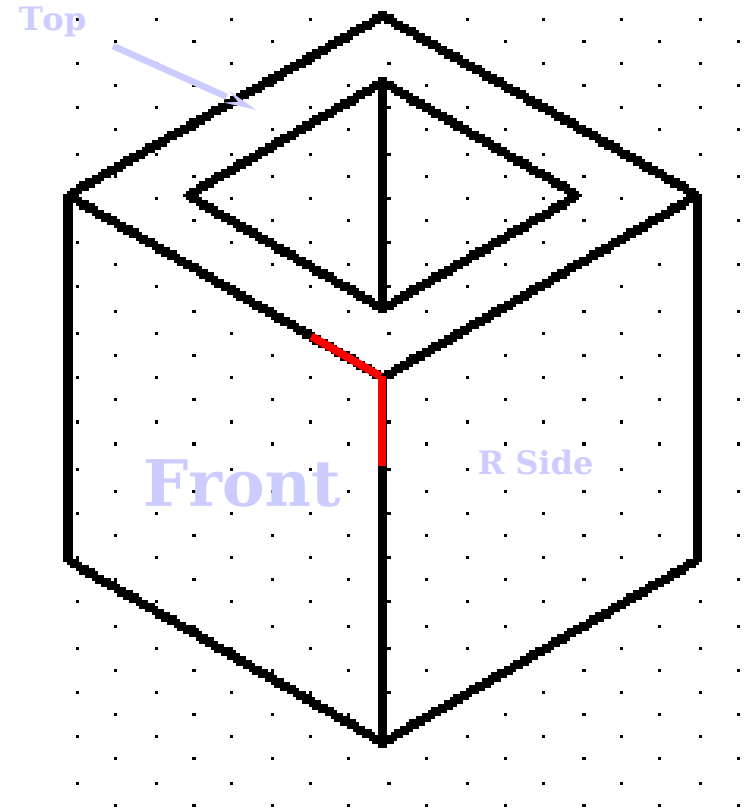
2D - Orthographic



Axis, Views and Dimensions

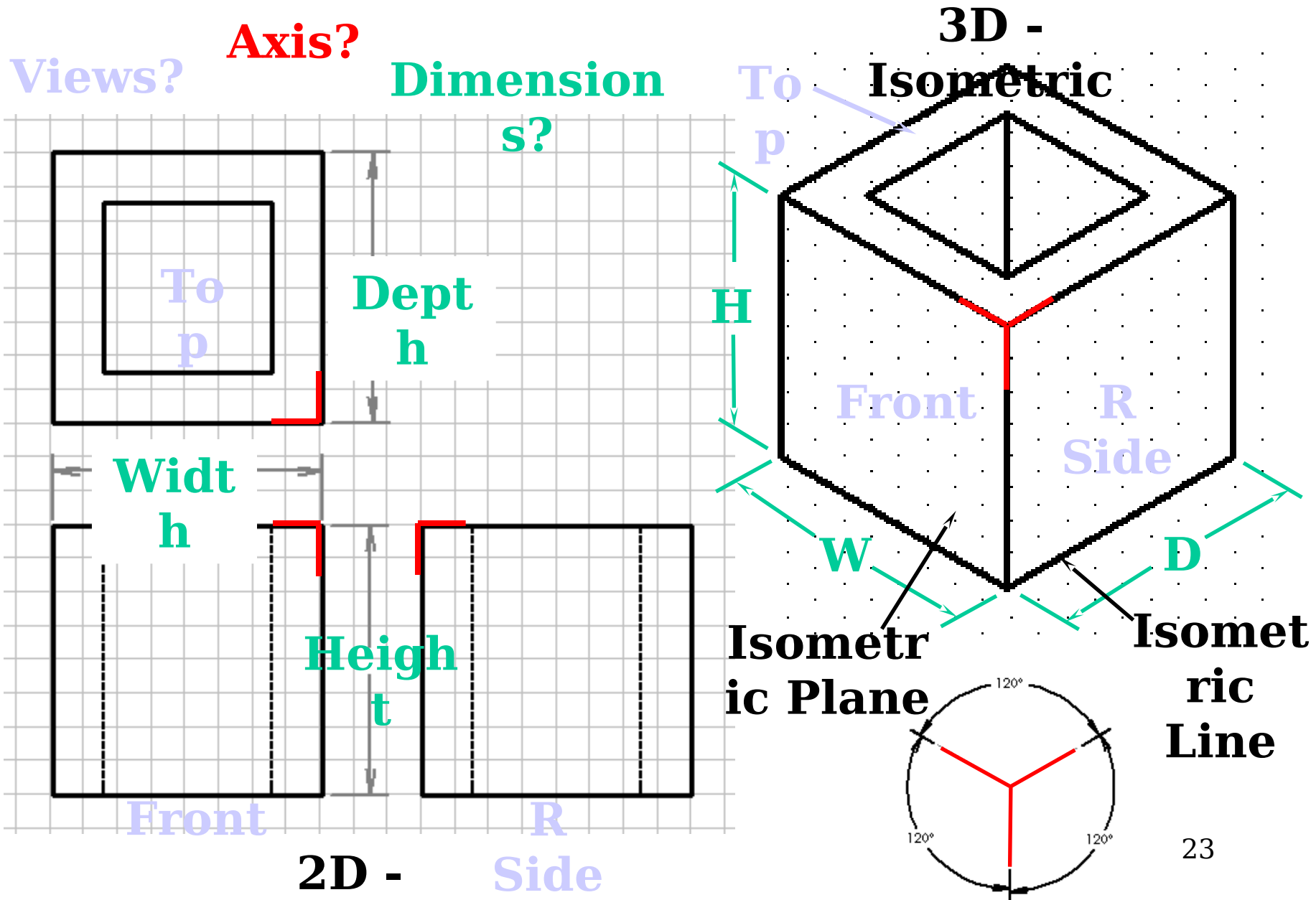
Views? Axis?

3D - Isometric



2D - Orthographic

Axis, Views and Dimensions



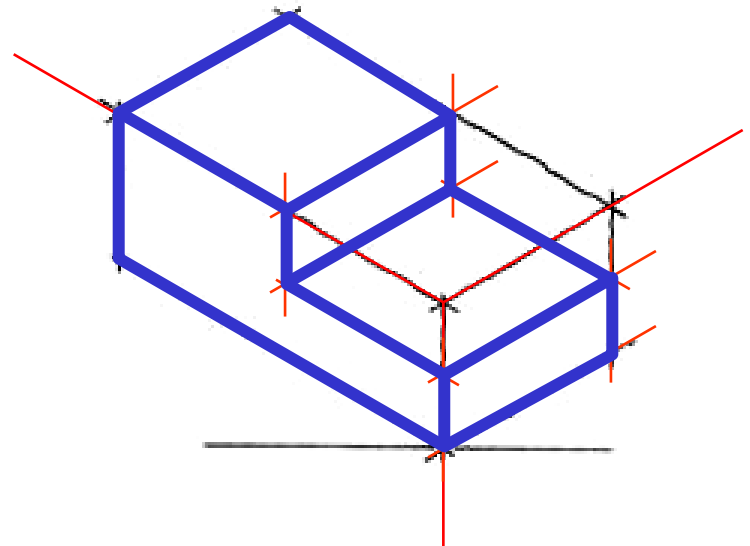
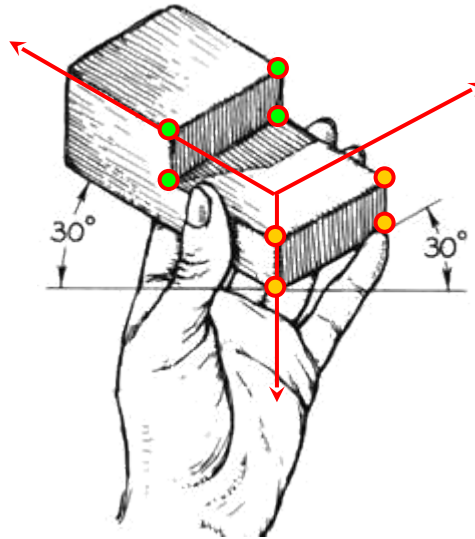
Sketch isometric from an actual object

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 detail.
5. Darken all visible lines.

Sketch from an actual object

STEPS

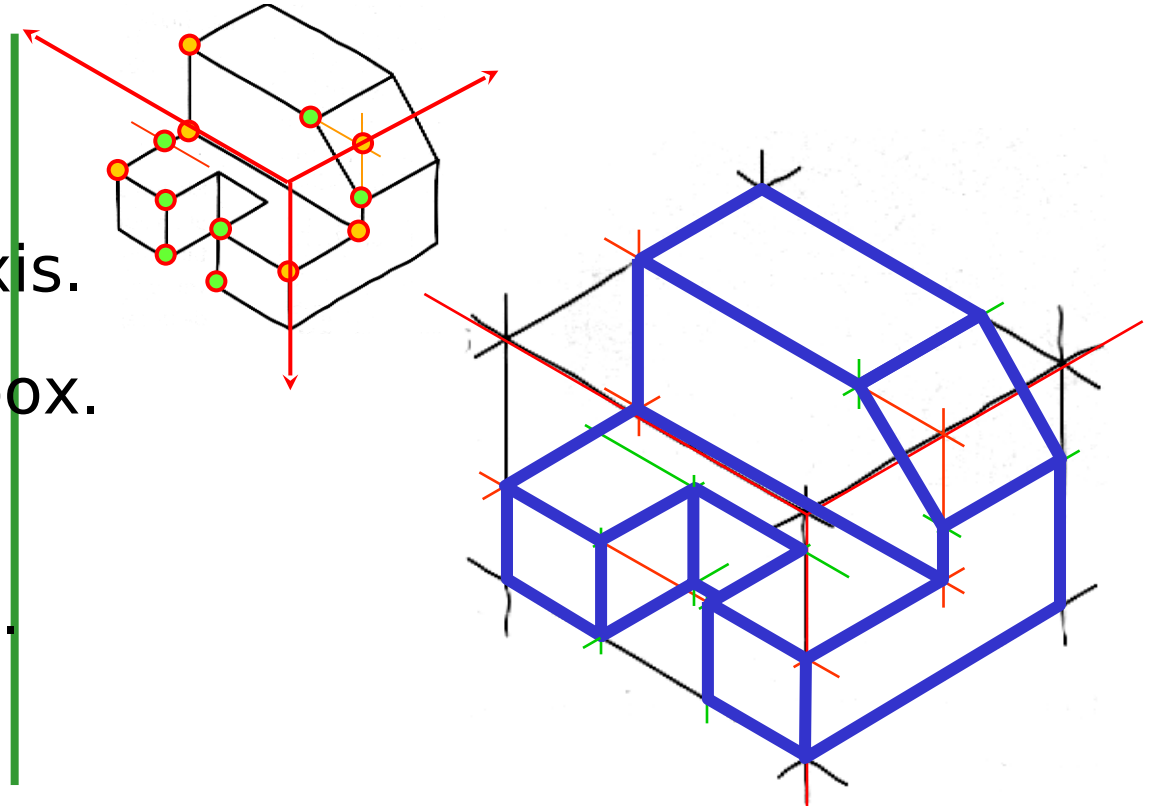
1. Positioning object.
2. Select isometric axis.
3. Sketch enclosing box.
4. Add details.
5. Darken visible lines.



Sketch from an actual object

STEPS

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

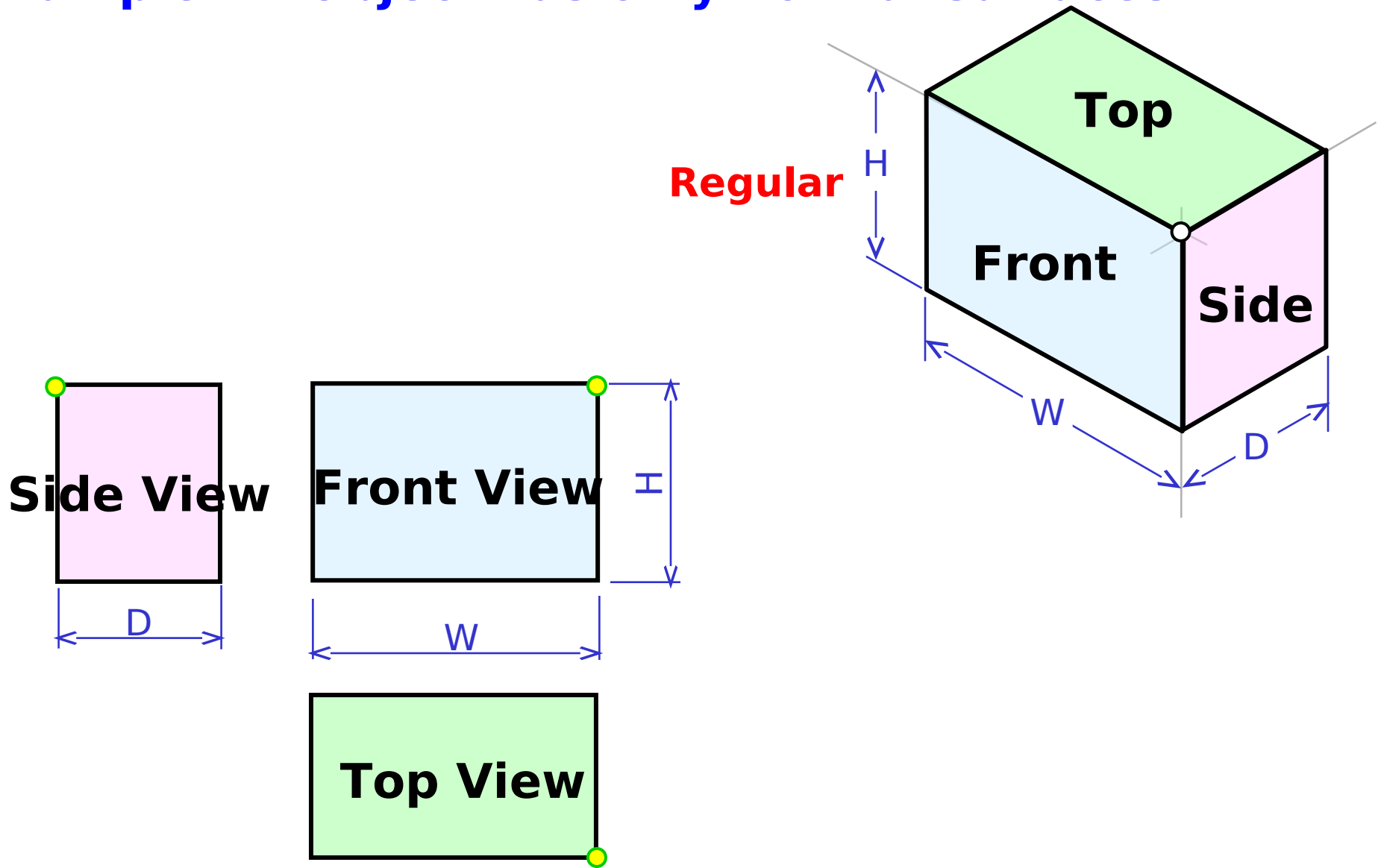


Note In isometric sketch/drawing, hidden lines are **omitted** unless they are absolutely necessary to completely describe the object.

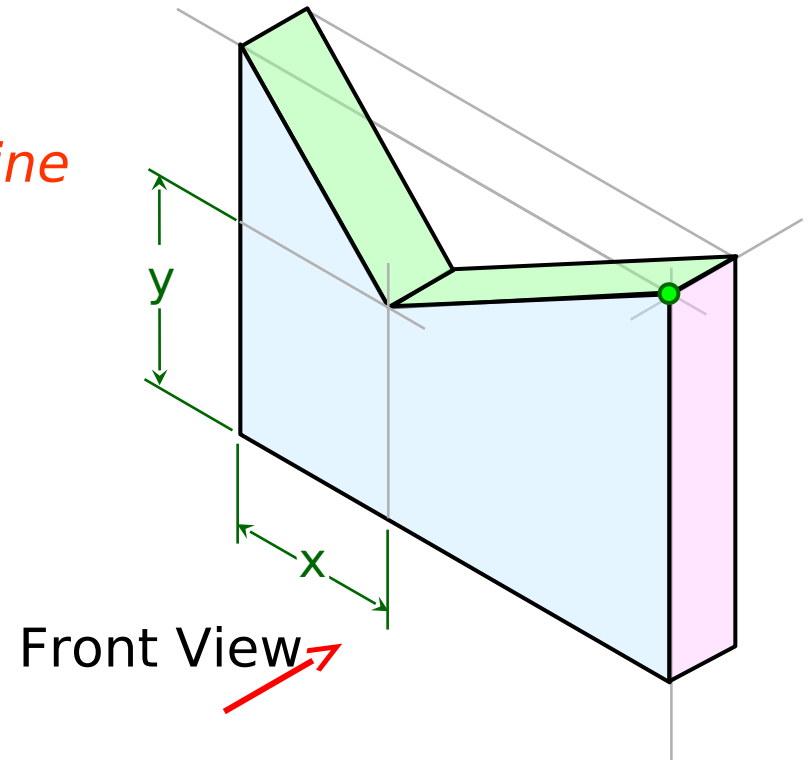
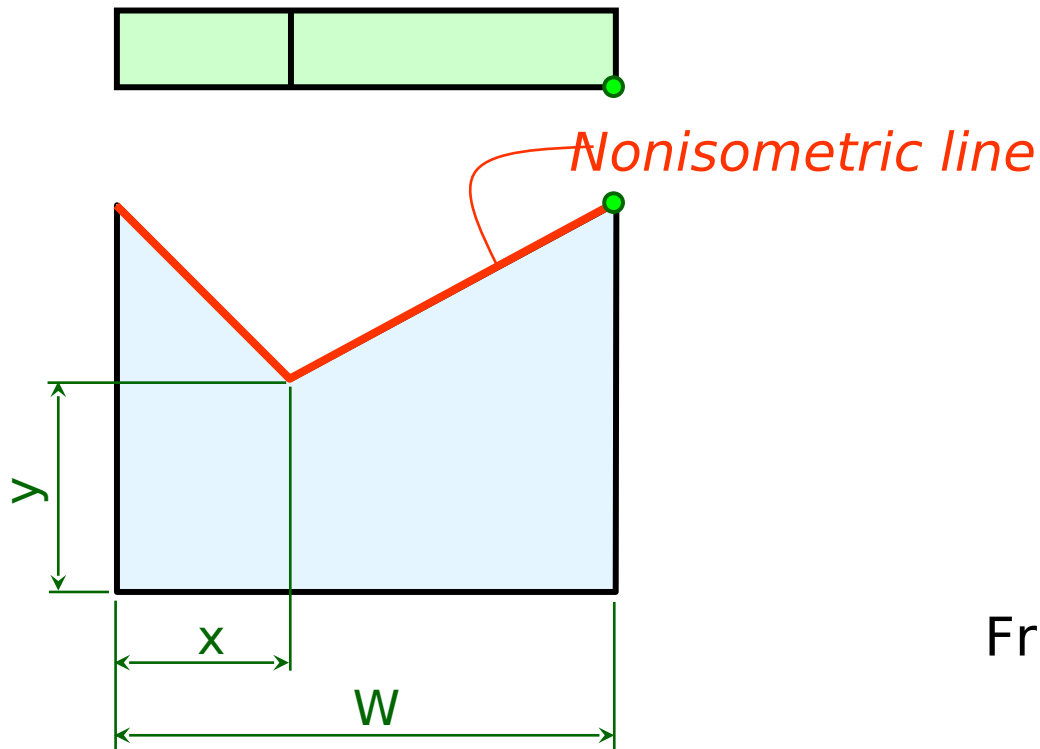
Sketch from multiview drawing

1. Interpret the *meaning of lines/areas* in
multiview drawing.
2. Locate the lines or surfaces relative to isometric axis.

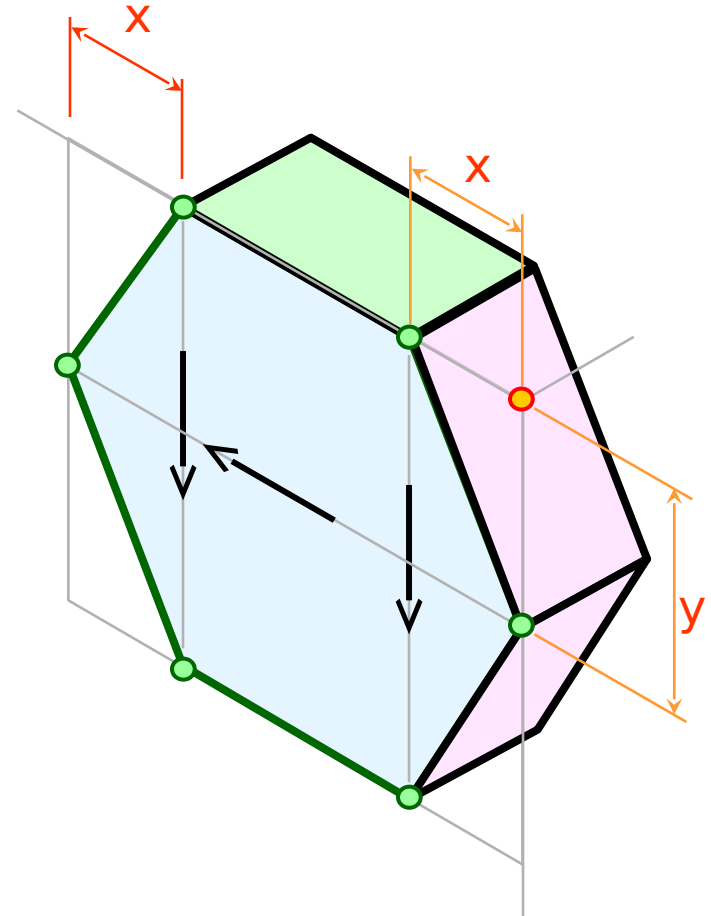
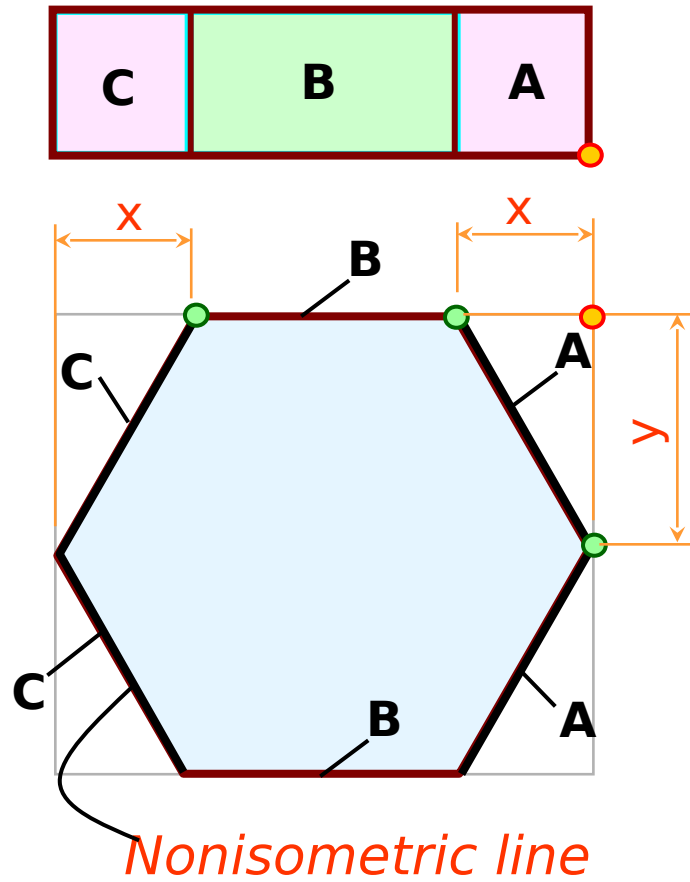
Example 1 : Object has only normal surfaces



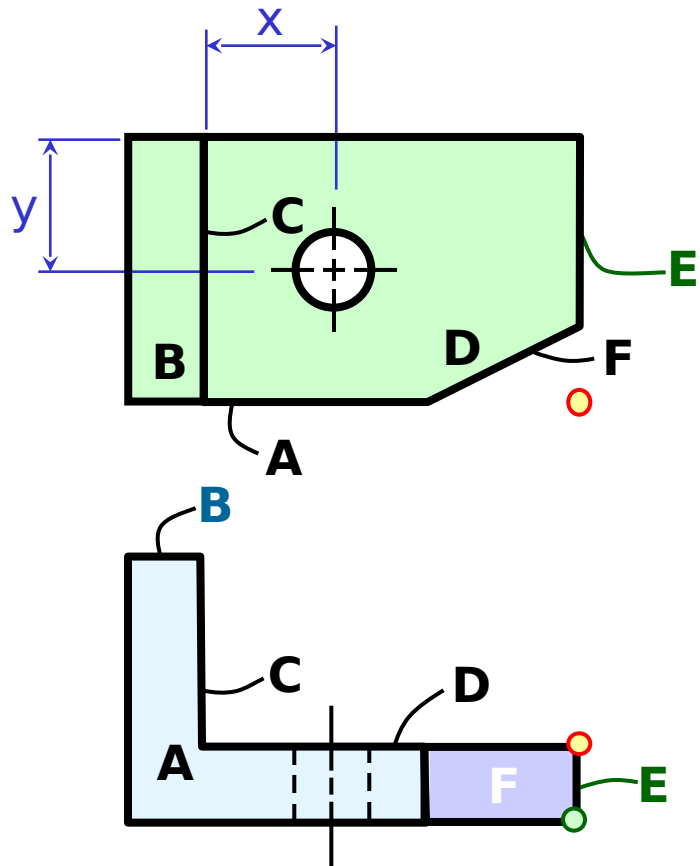
Example 2 : Object has inclined surfaces



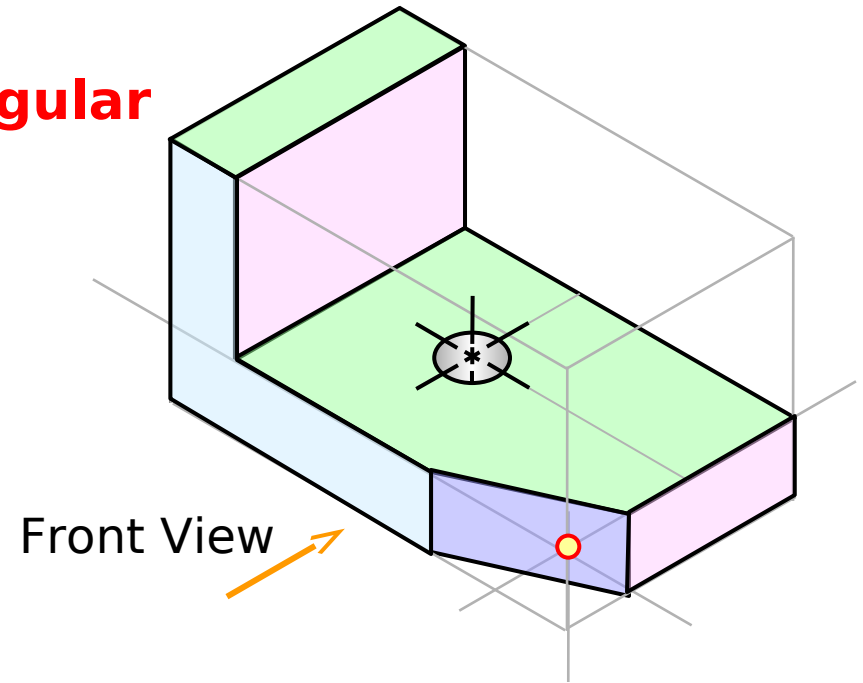
Example 3 : Object has inclined surfaces



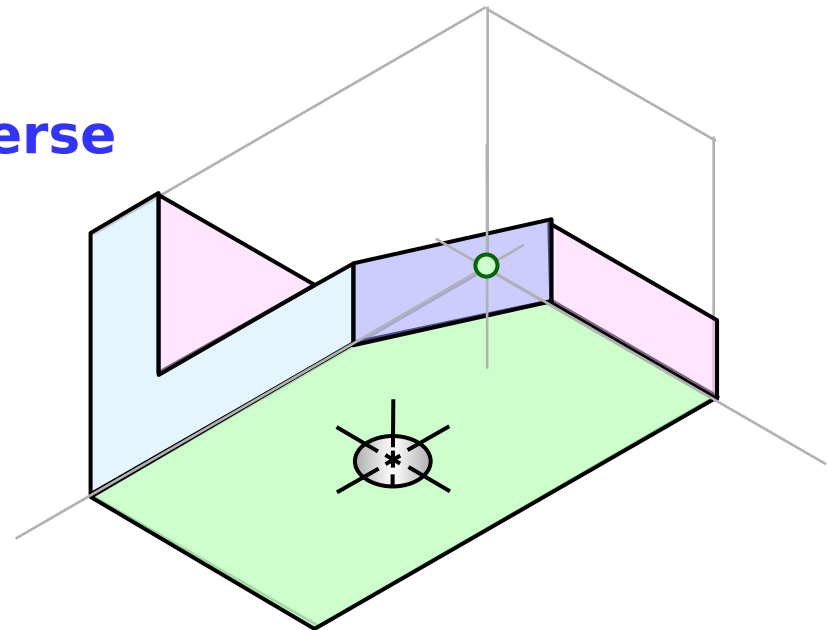
Example 4



Regular



Reverse

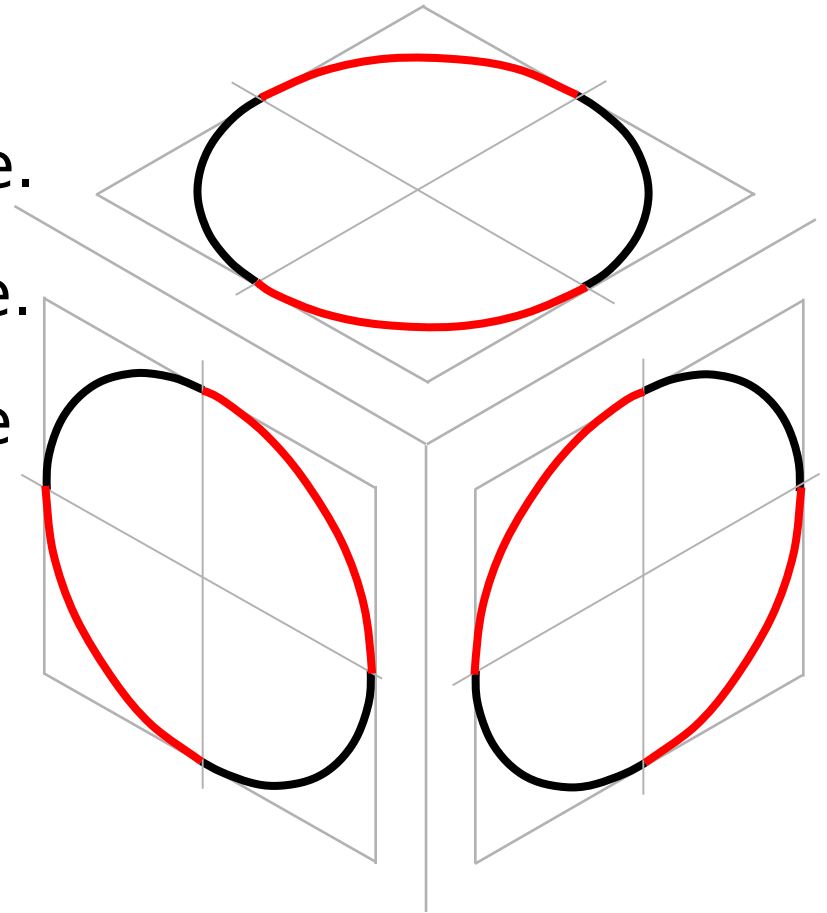


Circle & Arc in Isometric

- 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.

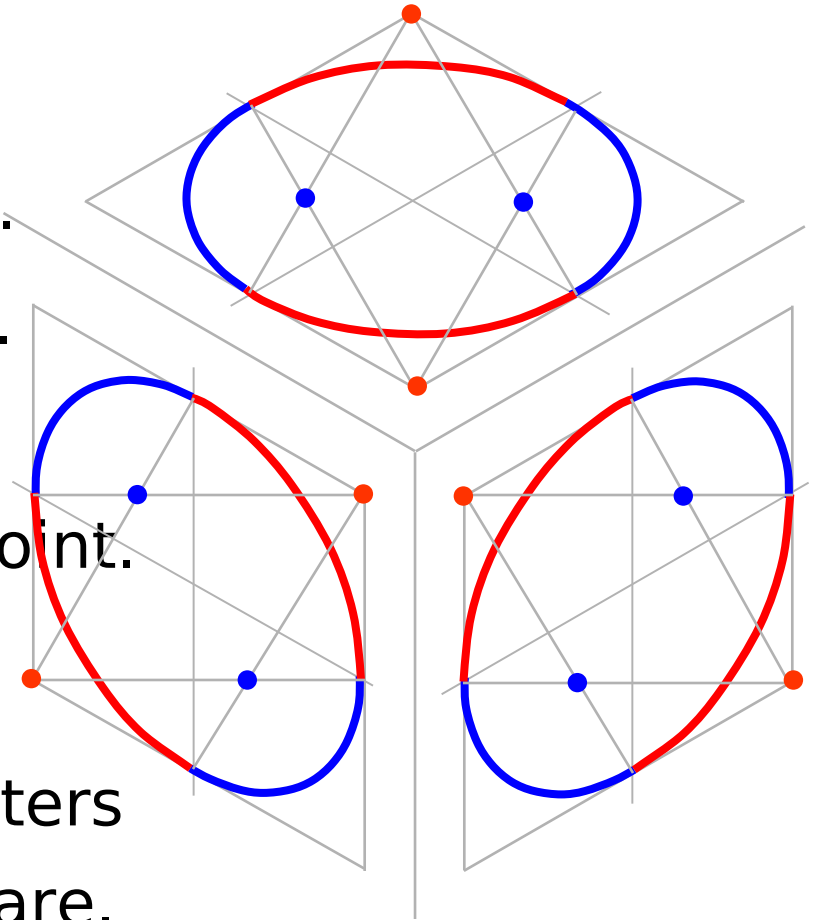


Circle & Arc in Isometric

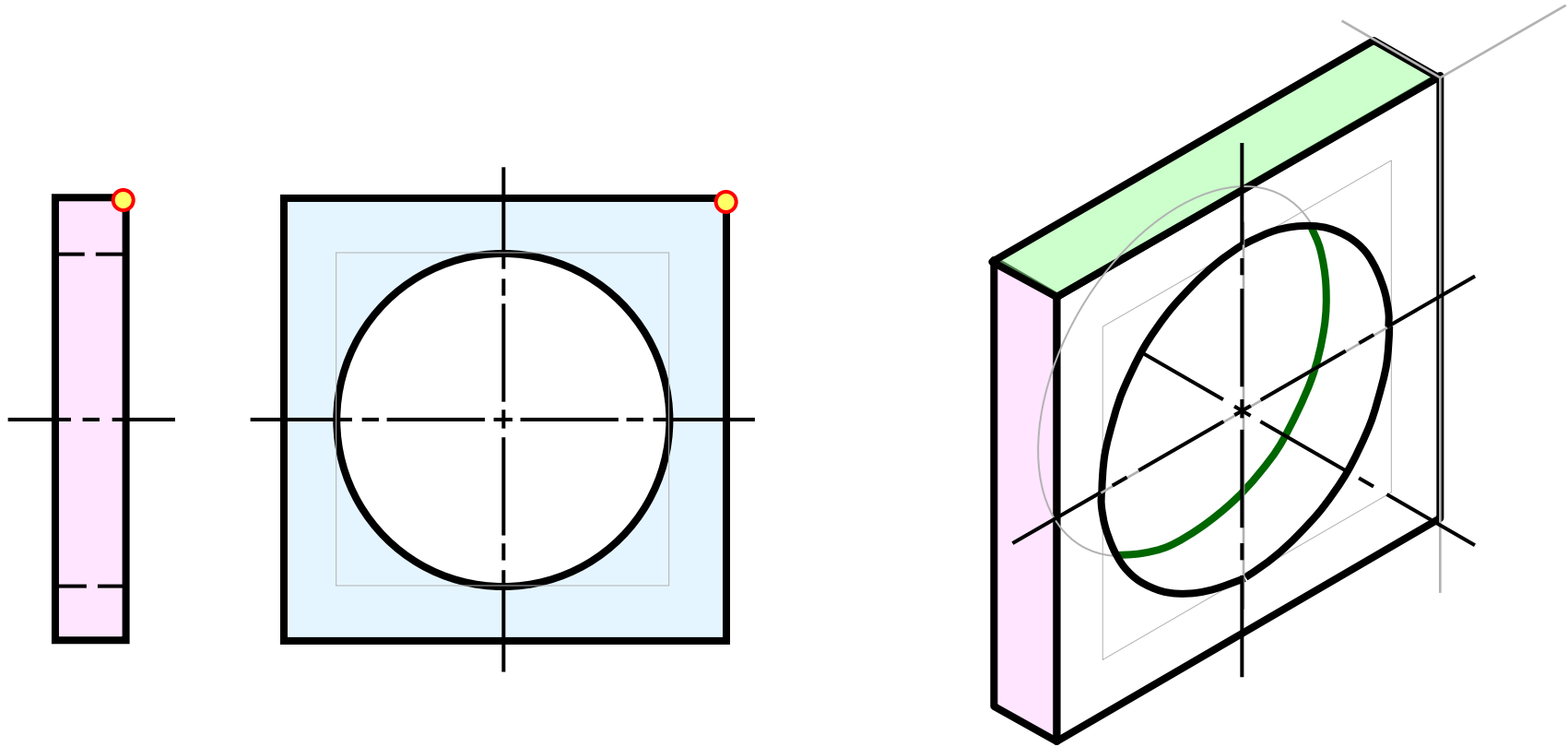
- **Four-center** method is usually used when drawn an isometric ellipse with drawing instrument.

Sketching Steps

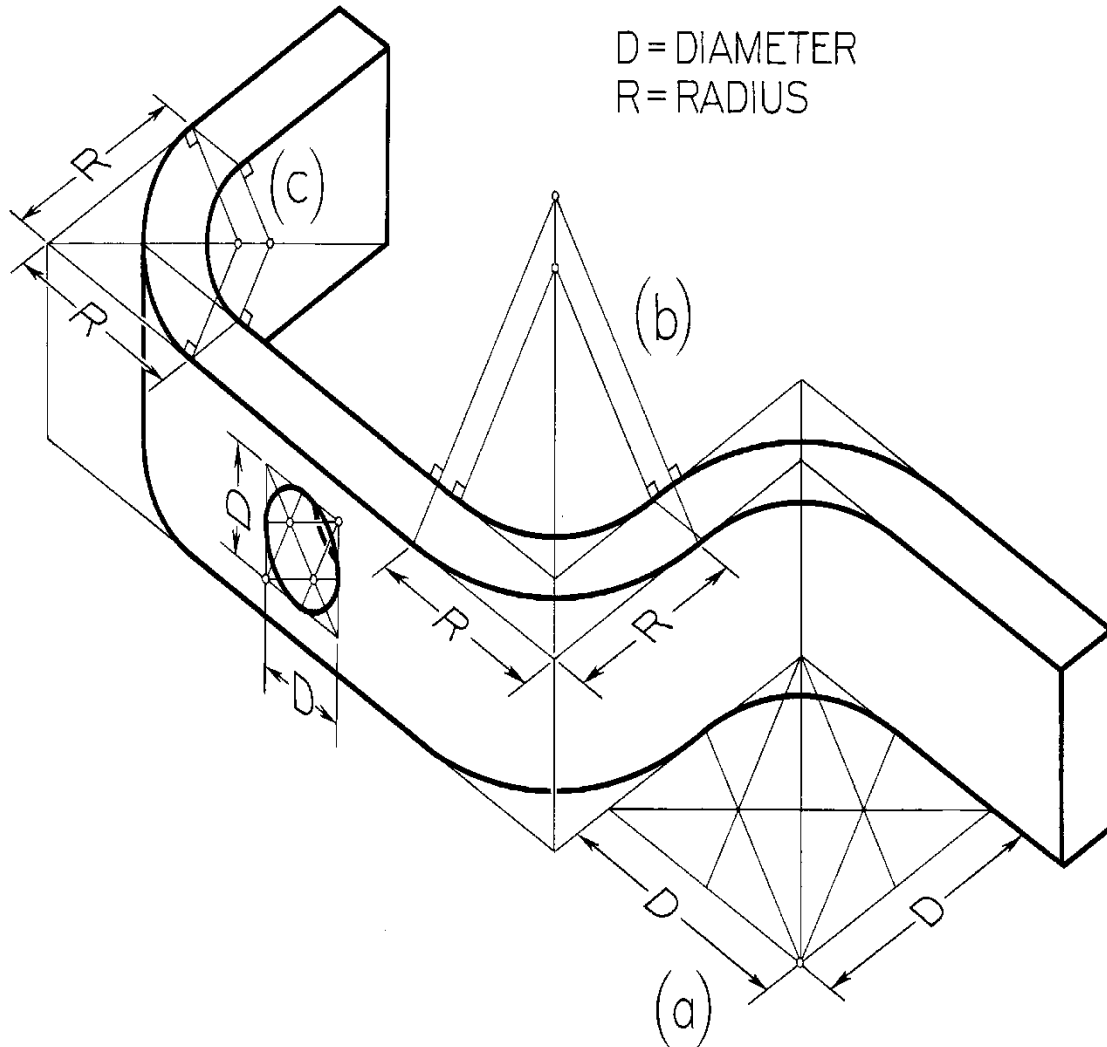
1. Locate the center of an ellipse.
2. Construct an isometric square.
3. Construct a perpendicular bisector from each tangent point.
4. Locate the **four** centers.
5. Draw the arcs with these centers and tangent to isometric square.



Example 5



Arcs in isometric drawing

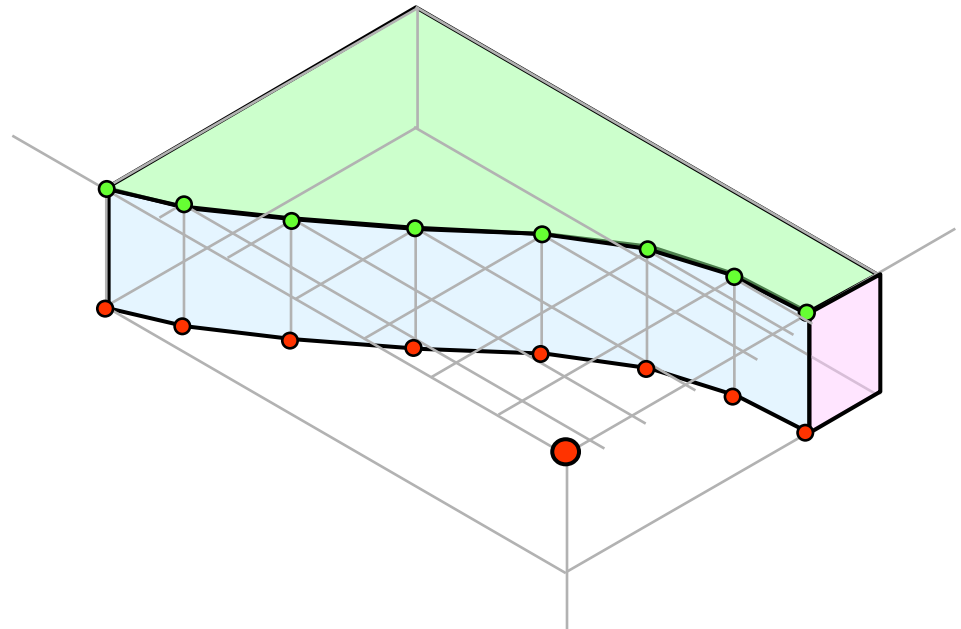
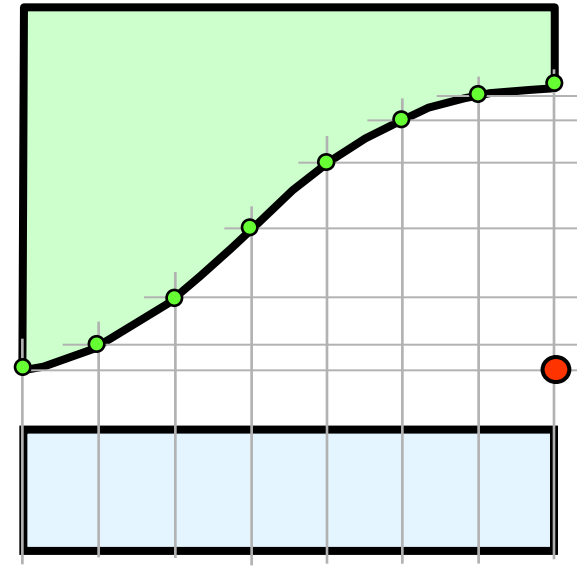


- Arcs are usually sketched by locating their centers and then boxing in the enclosing parallelogram.
- Sketch the arc tangent to the enclosing box, which is drawn along isometric lines.

Irregular Curve in Isometric

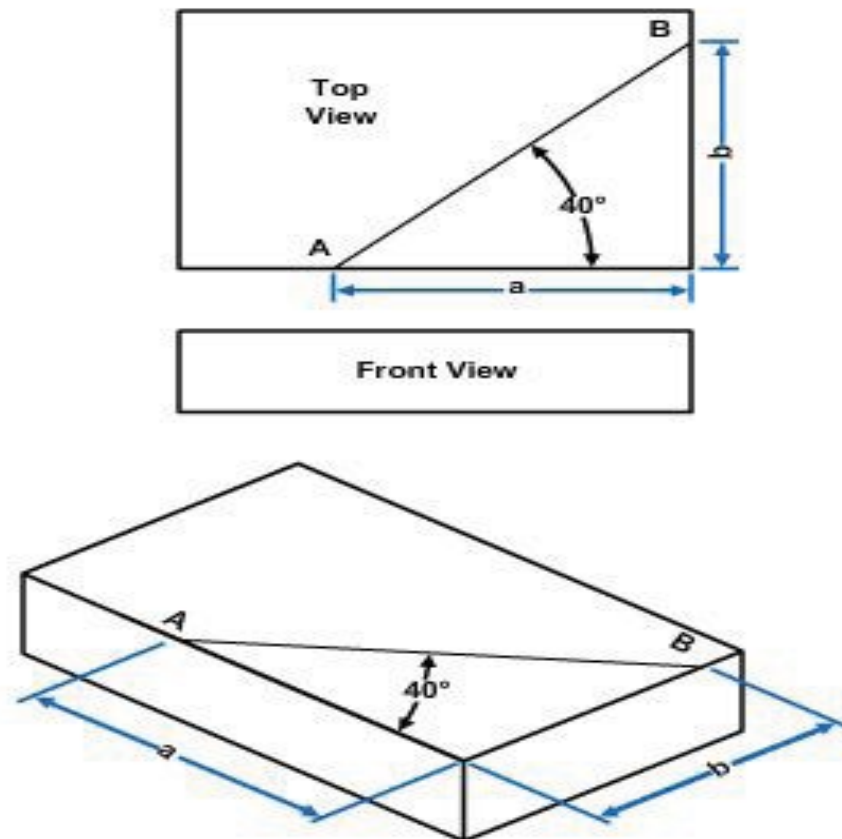
Steps

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



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

30° half the Width

30° half the Depth

90° half the Height

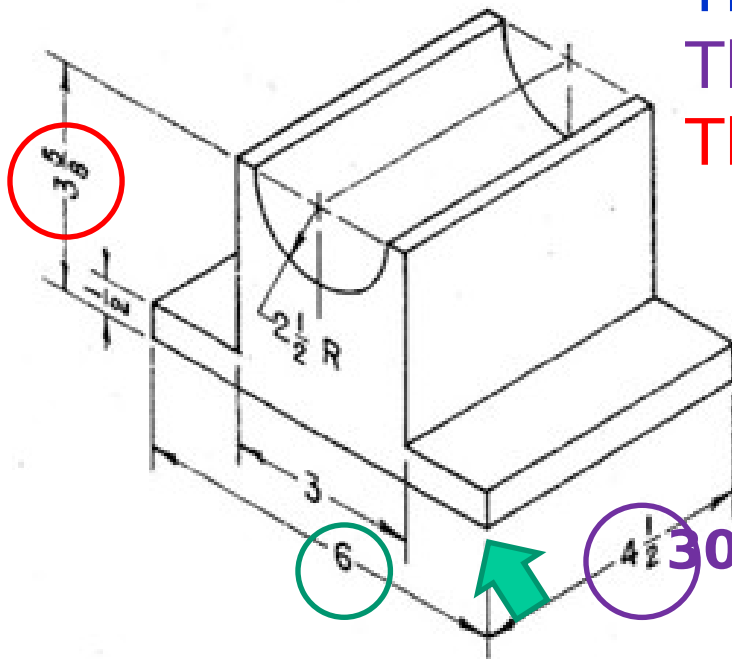
Centering an Isometric Object

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.



X 30° half the width = 3"

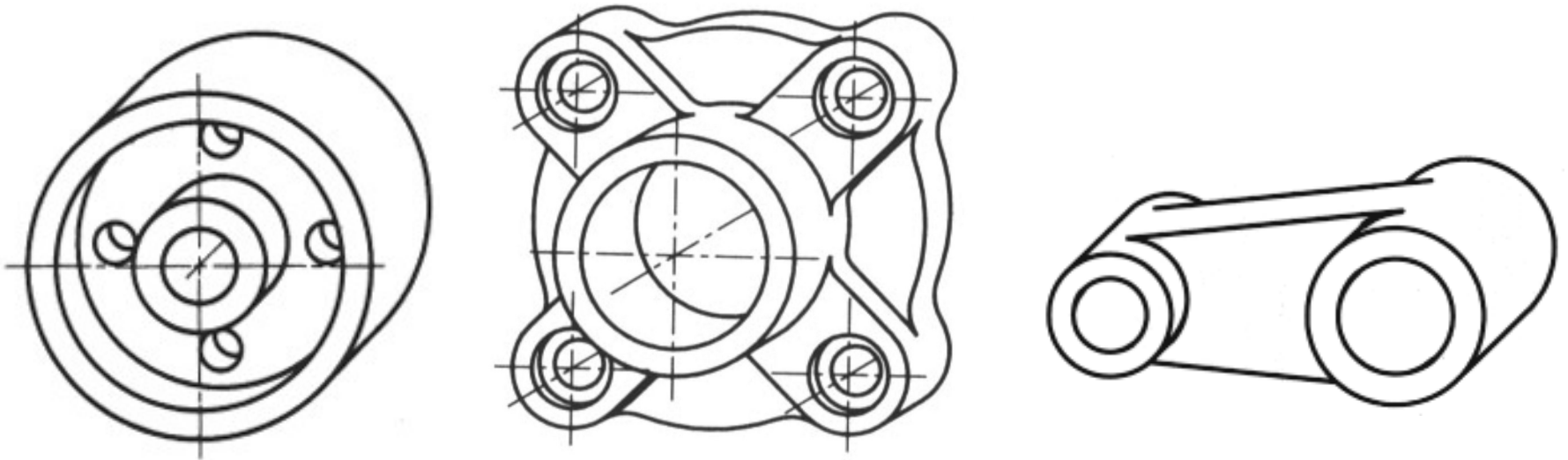
30° half the depth = $2 \frac{1}{4}$ "

90° half the height = $1 \frac{13}{16}$ "

Oblique Drawings

Object Orientation Guidelines

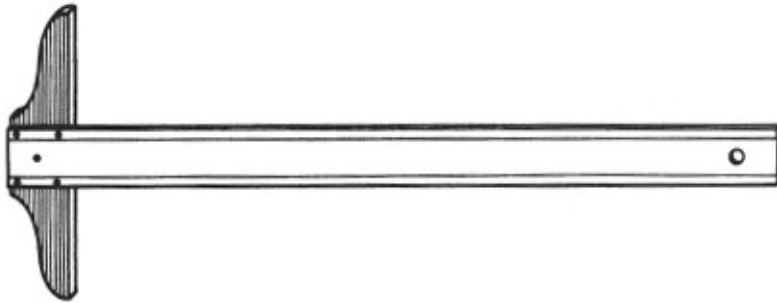
- Place complex features (arc, hole, irregular shape) surface parallel to frontal plane.



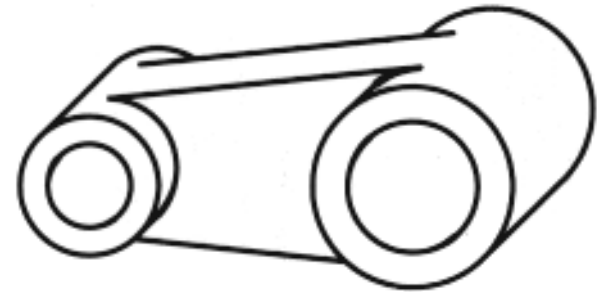
Object Orientation Guidelines

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

GOOD



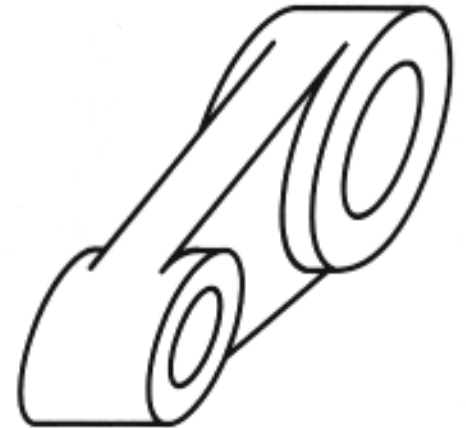
GOOD



WORSE



WORSE



Cavalier & Cabinet Drawings

Cavalier drawings are drawn with the full depth.

Reason for doing a cavalier drawing:

Accurate dimensions.

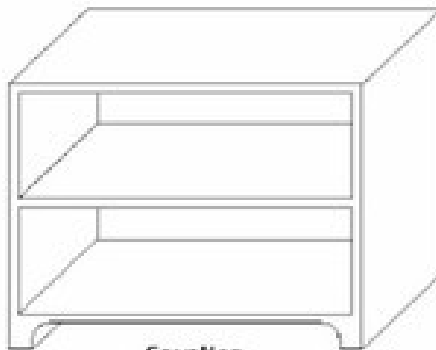
Cabinet drawings are drawn with a shortened(1/2) depth.

They get their name from the furniture industry.

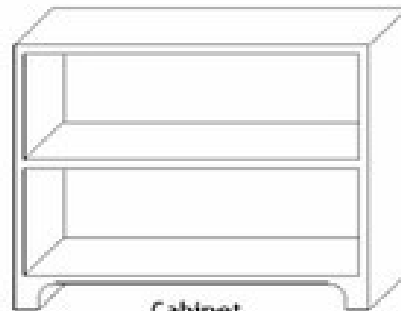
Reasons for doing cabinet drawing:

More natural look.

Two drawings of a bookcase.....



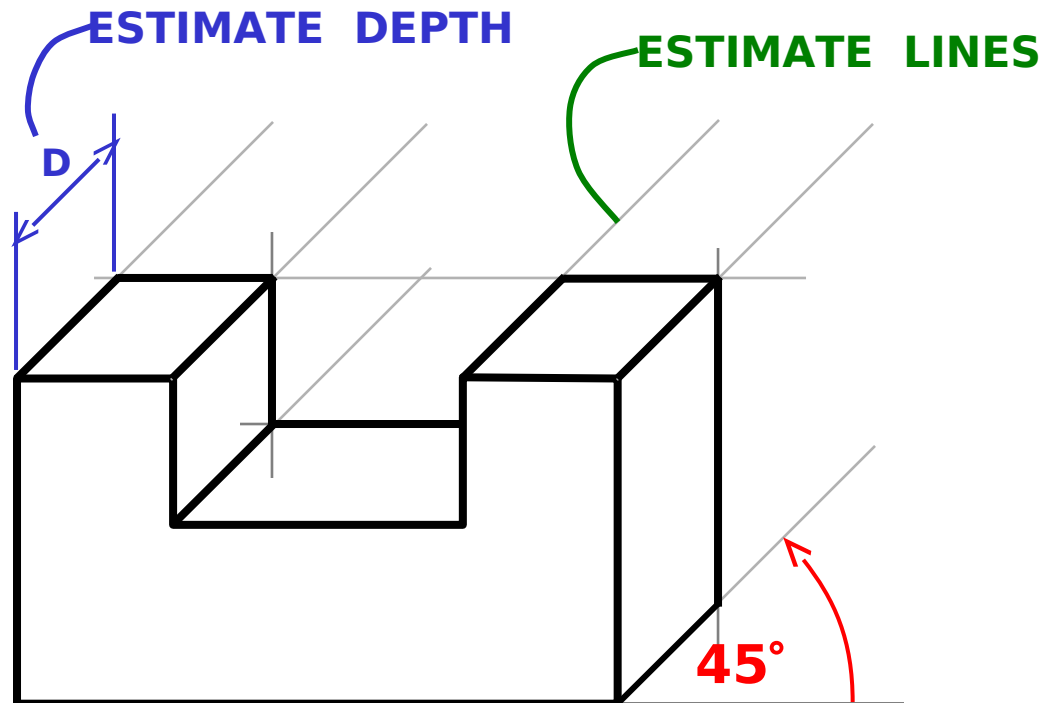
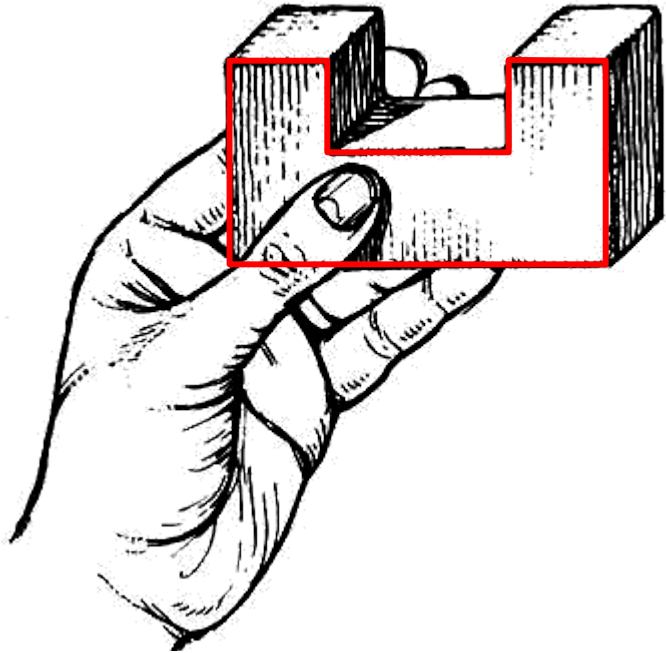
Cavalier
45 degrees



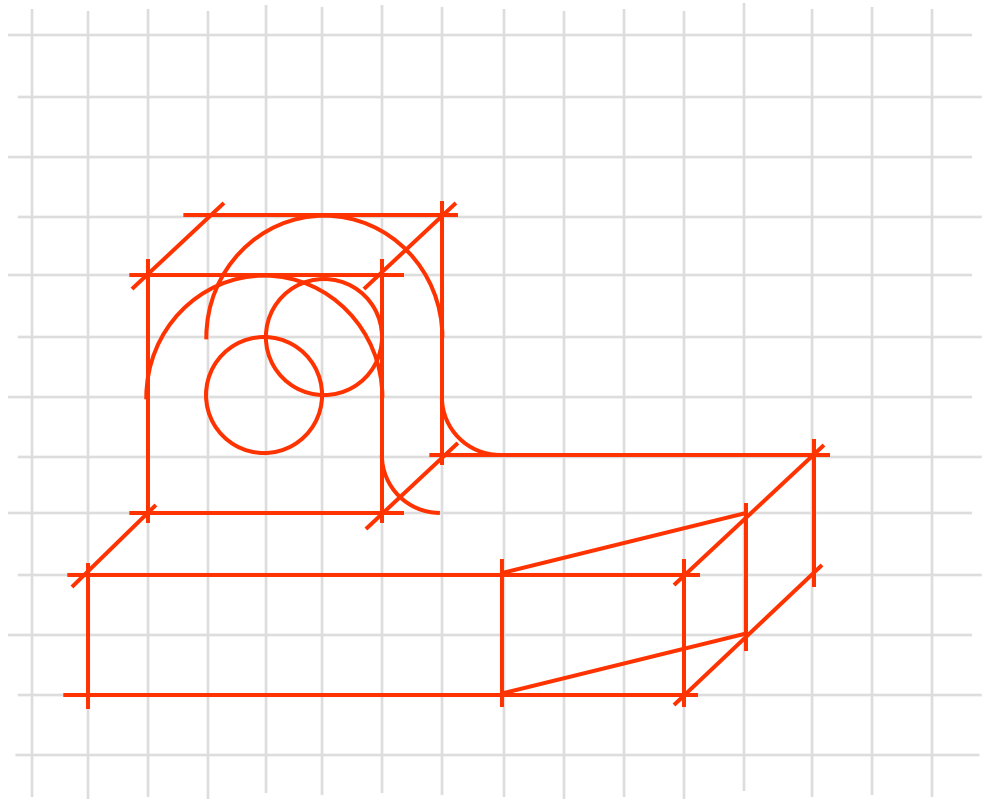
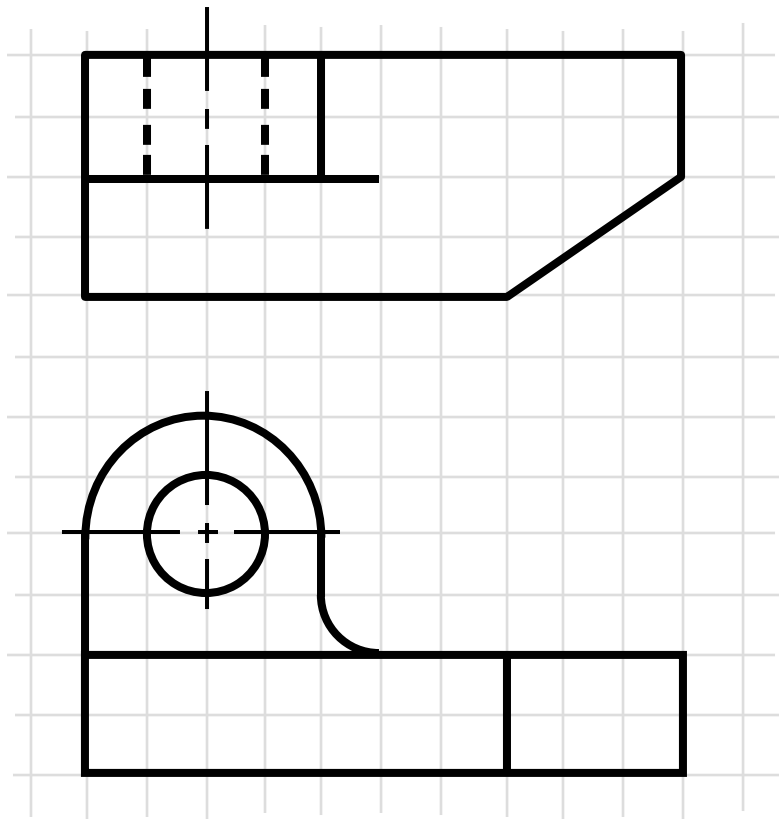
Cabinet
45 degrees

which one is the most realistic looking?

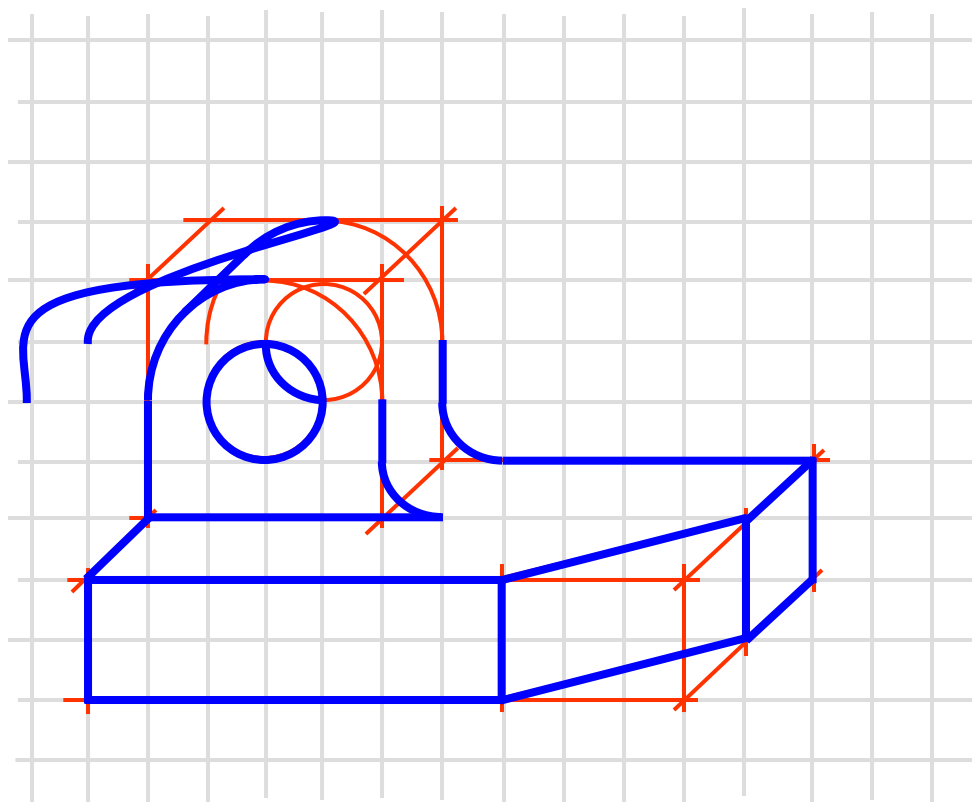
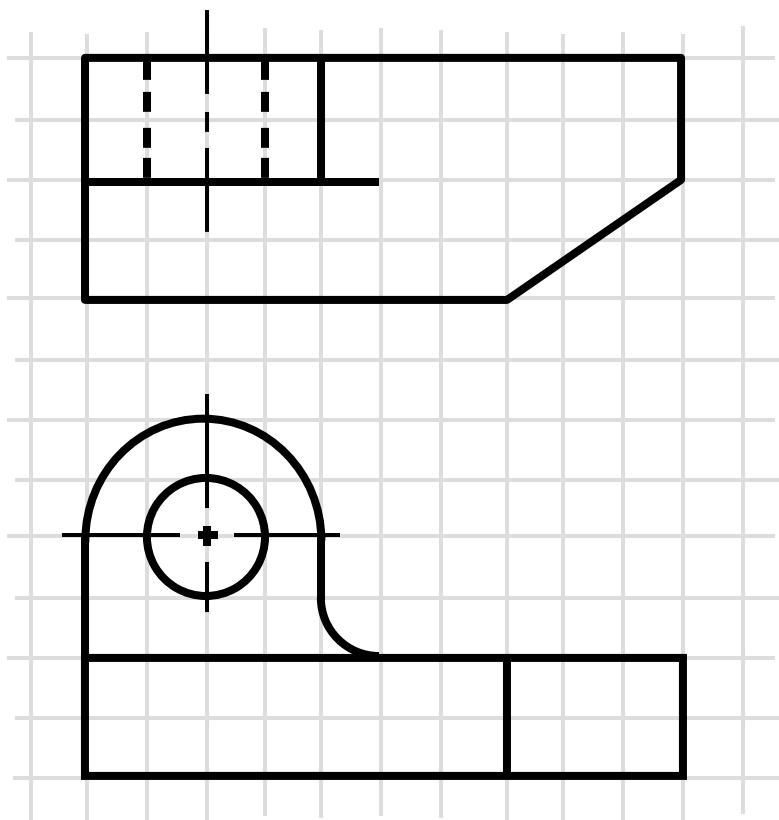
Sketch oblique drawing from actual object



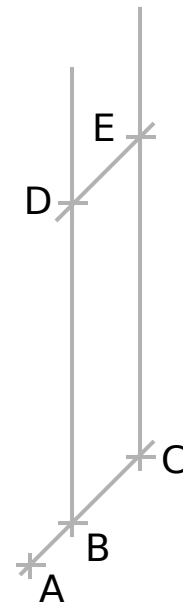
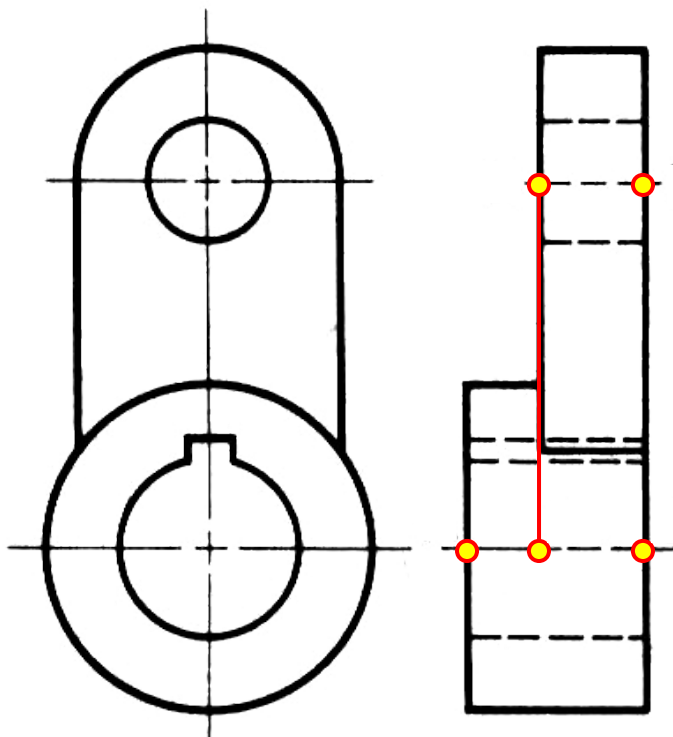
Sketch oblique drawing from multiview drawing



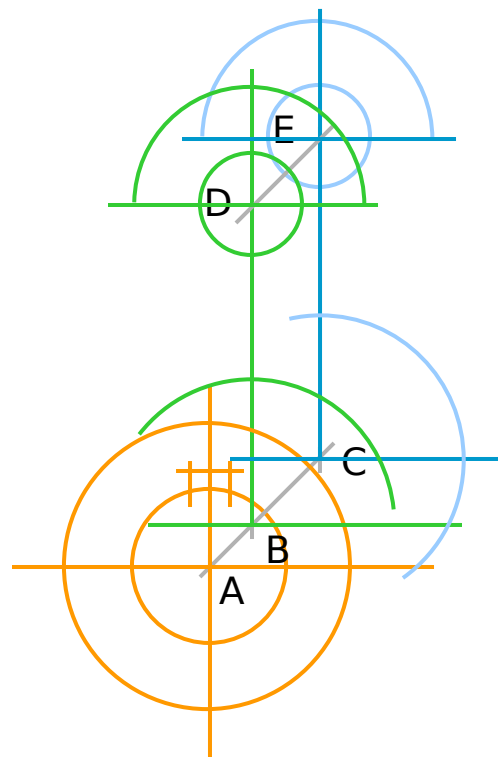
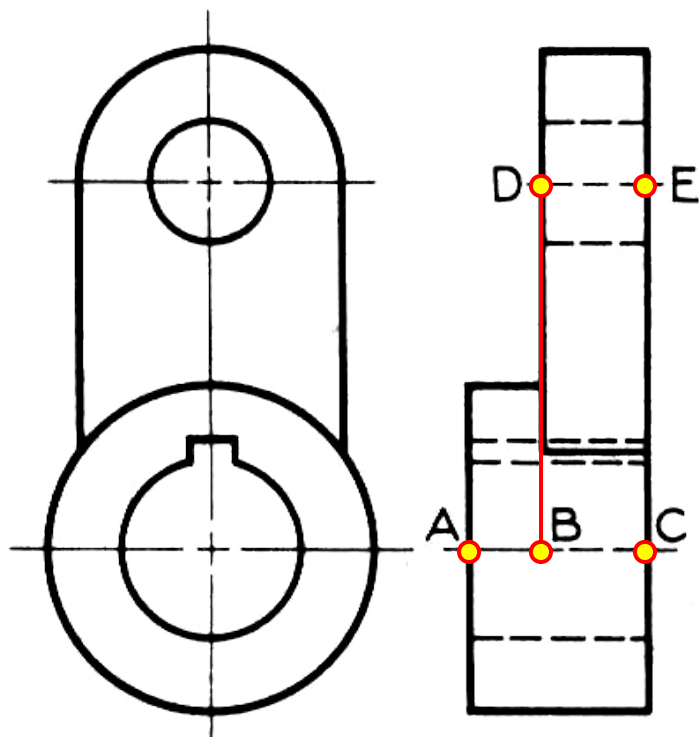
Sketch oblique drawing from multiview drawing



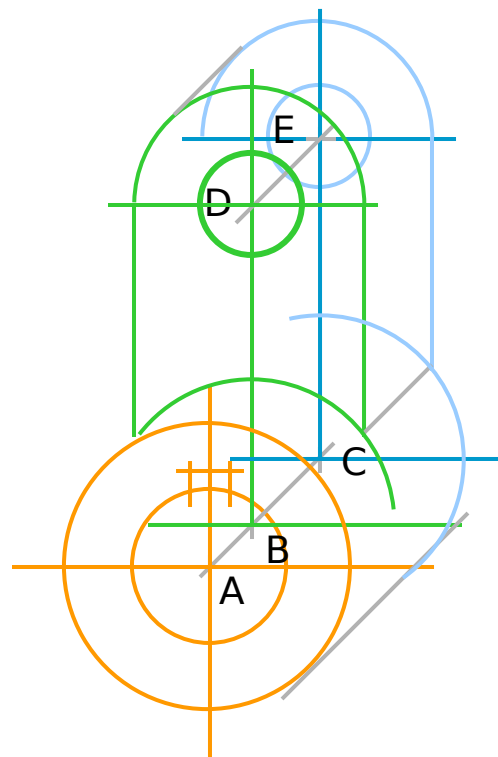
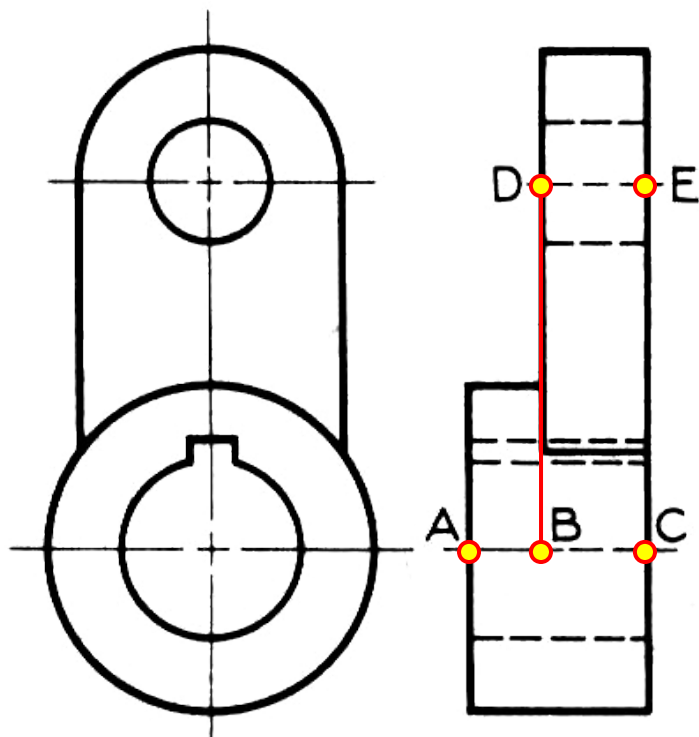
Sketch oblique drawing from multiview drawing

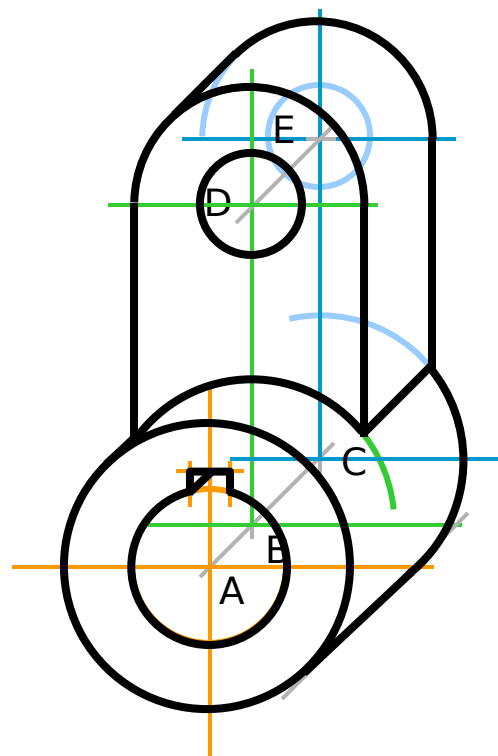
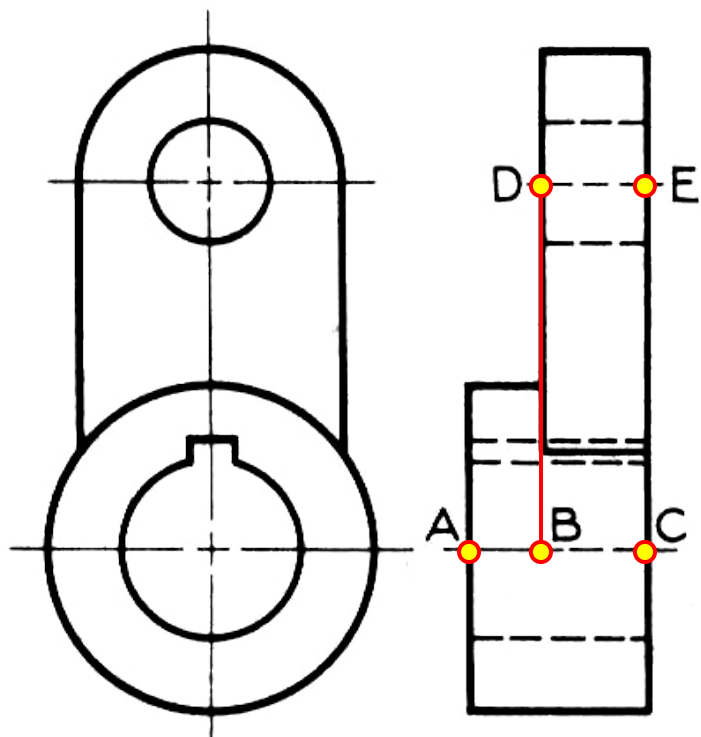


Sketch oblique drawing from multiview drawing



Sketch oblique drawing from multiview drawing



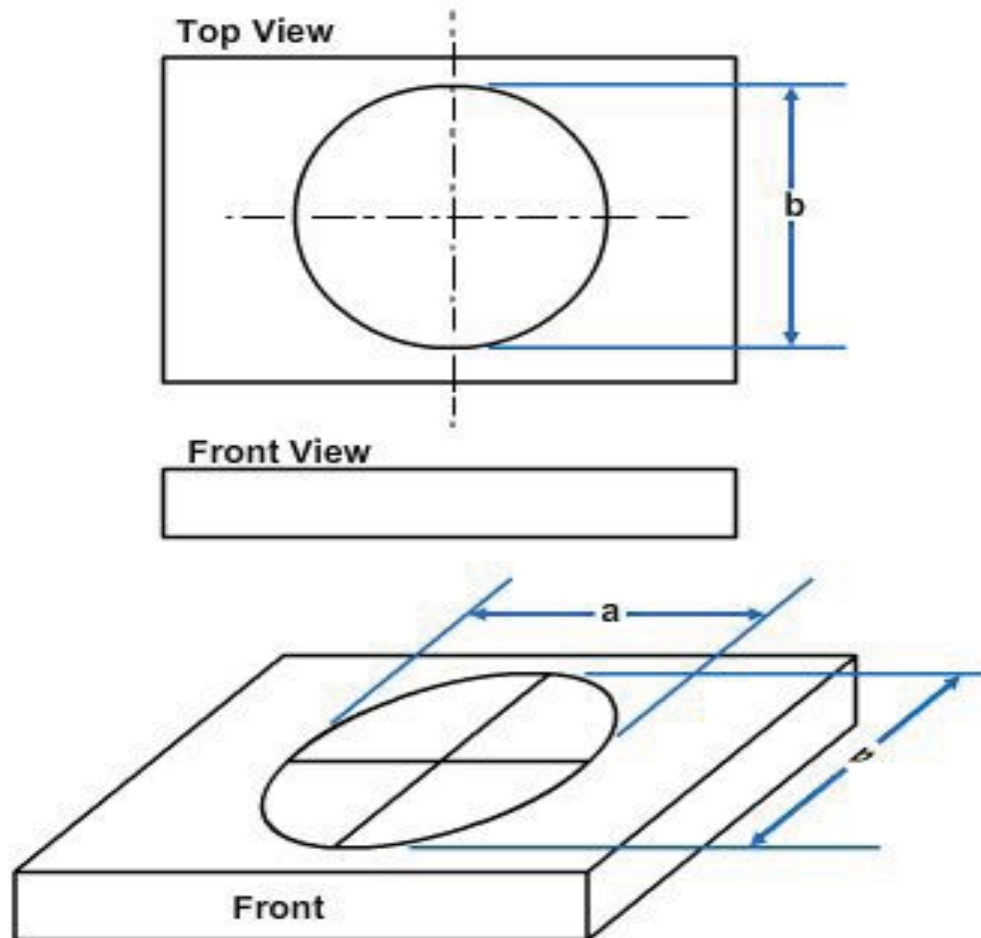


Circles in oblique drawings

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

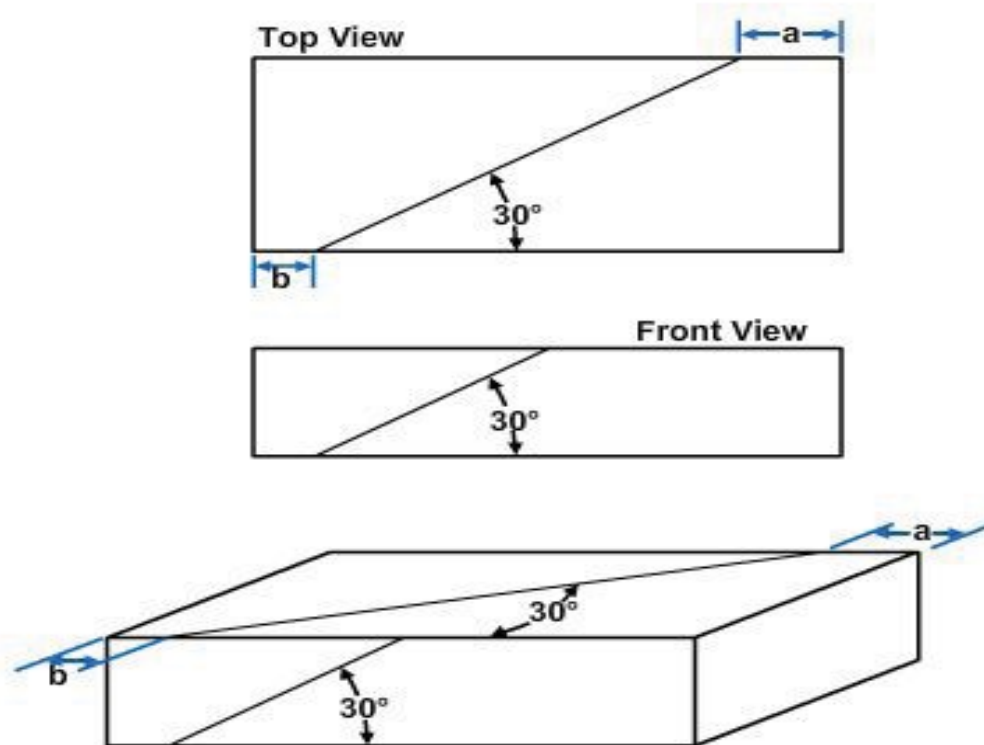
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Angles in oblique drawing

- 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 measurement*



End of Chapter Four