

Orthographic Projection

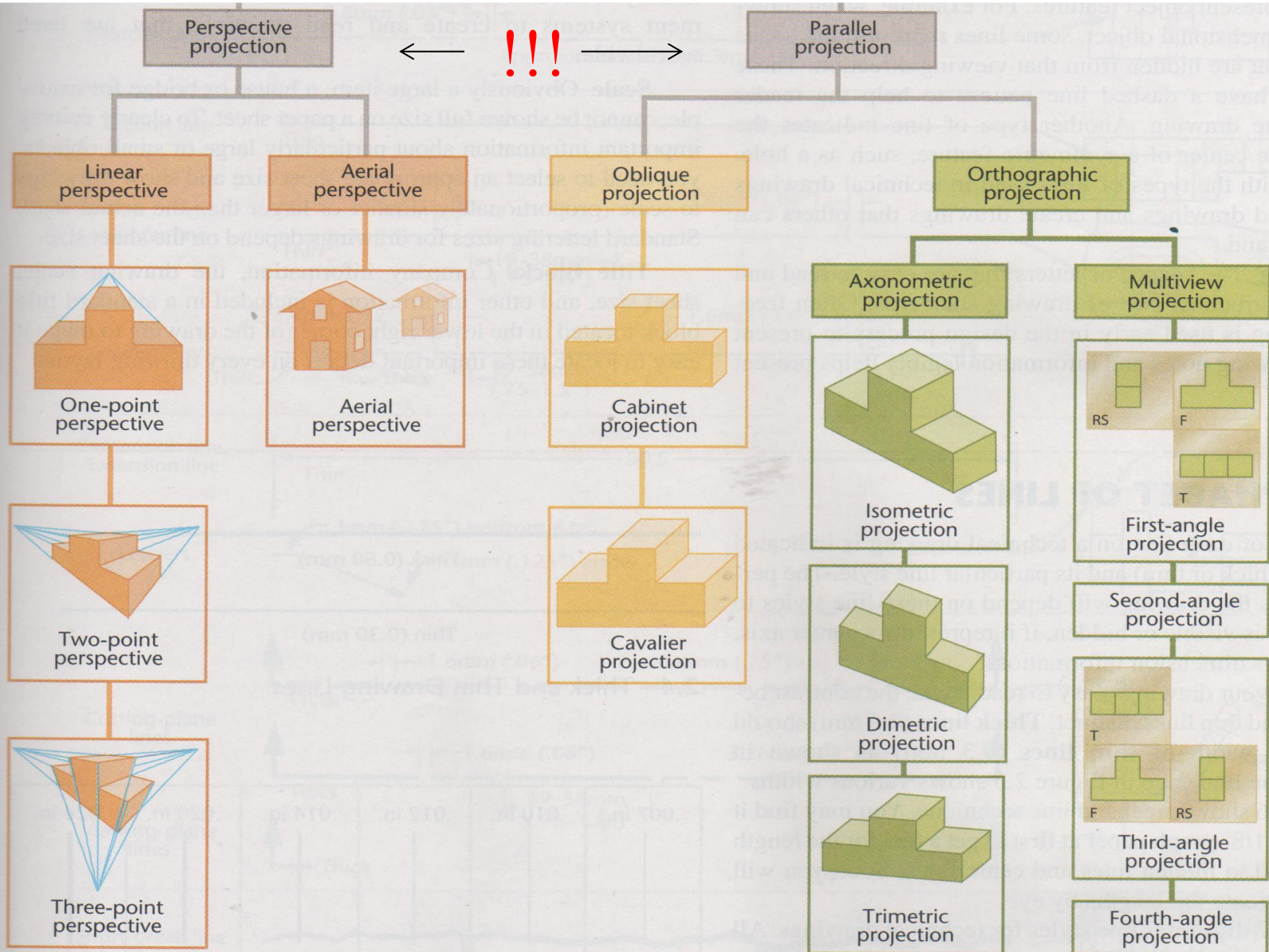
Review:

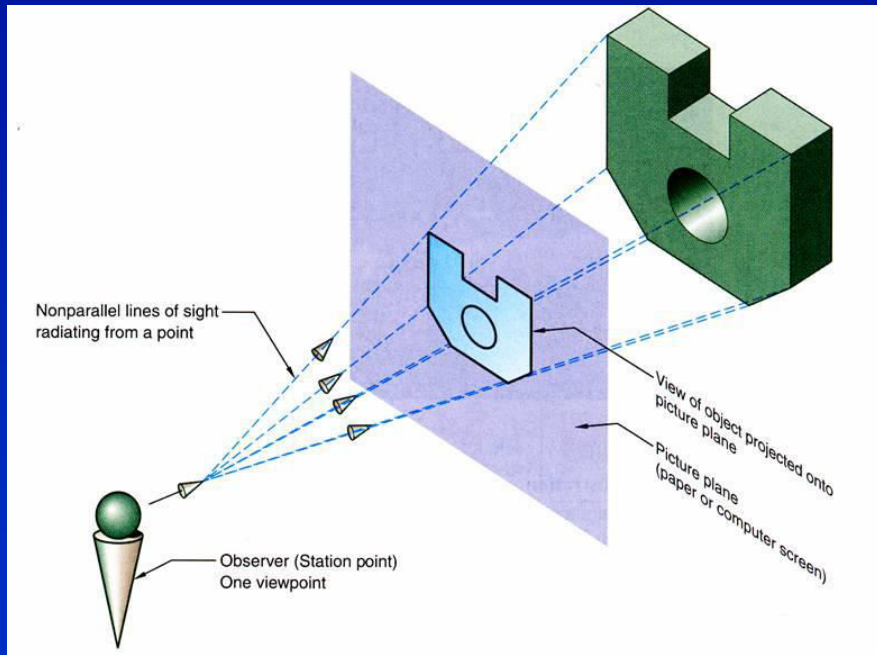
- Projections
- Orthographic projections

OBJECTIVES

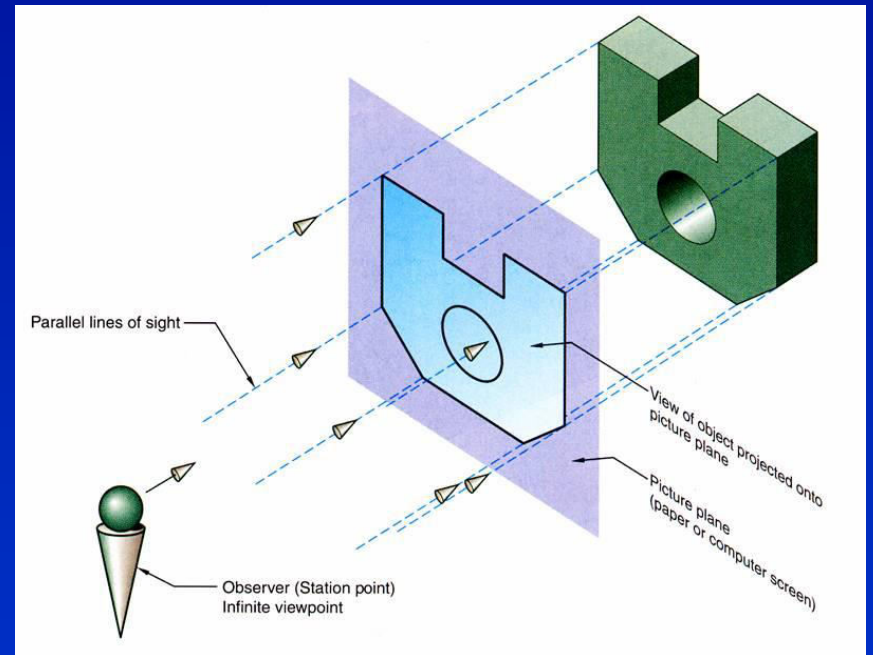
1. Recognize and sketch the symbol for third-angle projection.
2. List the six principal views of projection.
3. Sketch the top, front, and right-side views of an object with normal, inclined, and oblique surfaces.
4. Understand which views show depth in a drawing showing top, front, and right-side views.
5. Know the meaning of normal, inclined, and oblique surfaces.
6. Transfer depth between the top and right-side views.
7. Label points where surfaces intersect.

PROJECTIONS





**Perspective
Projection**

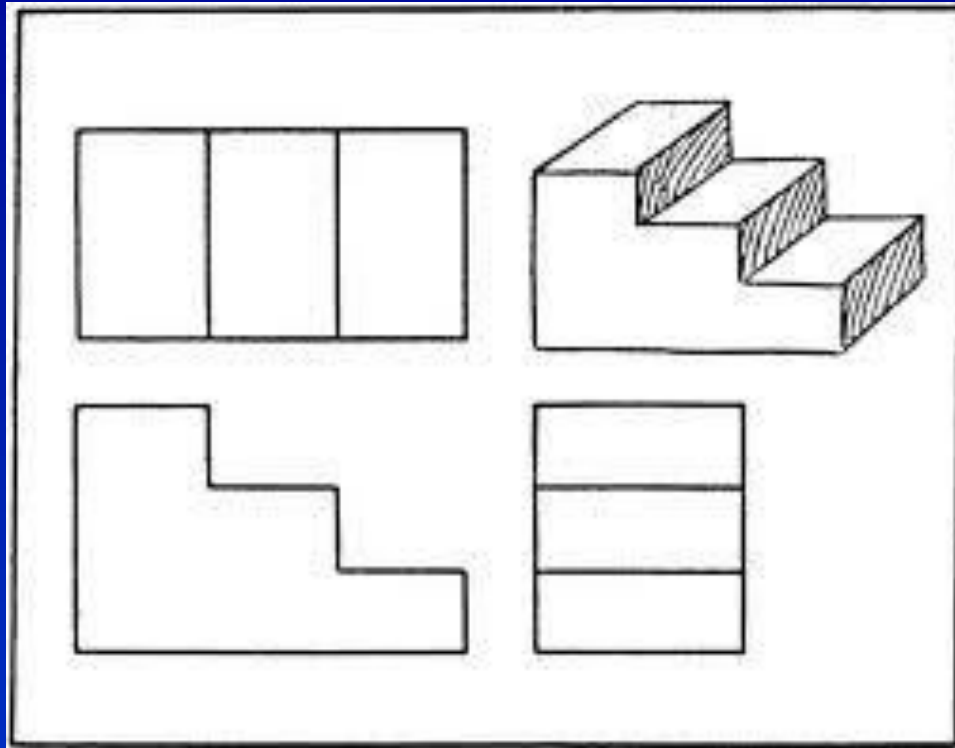


**Parallel
projection**

Orthographic Projection

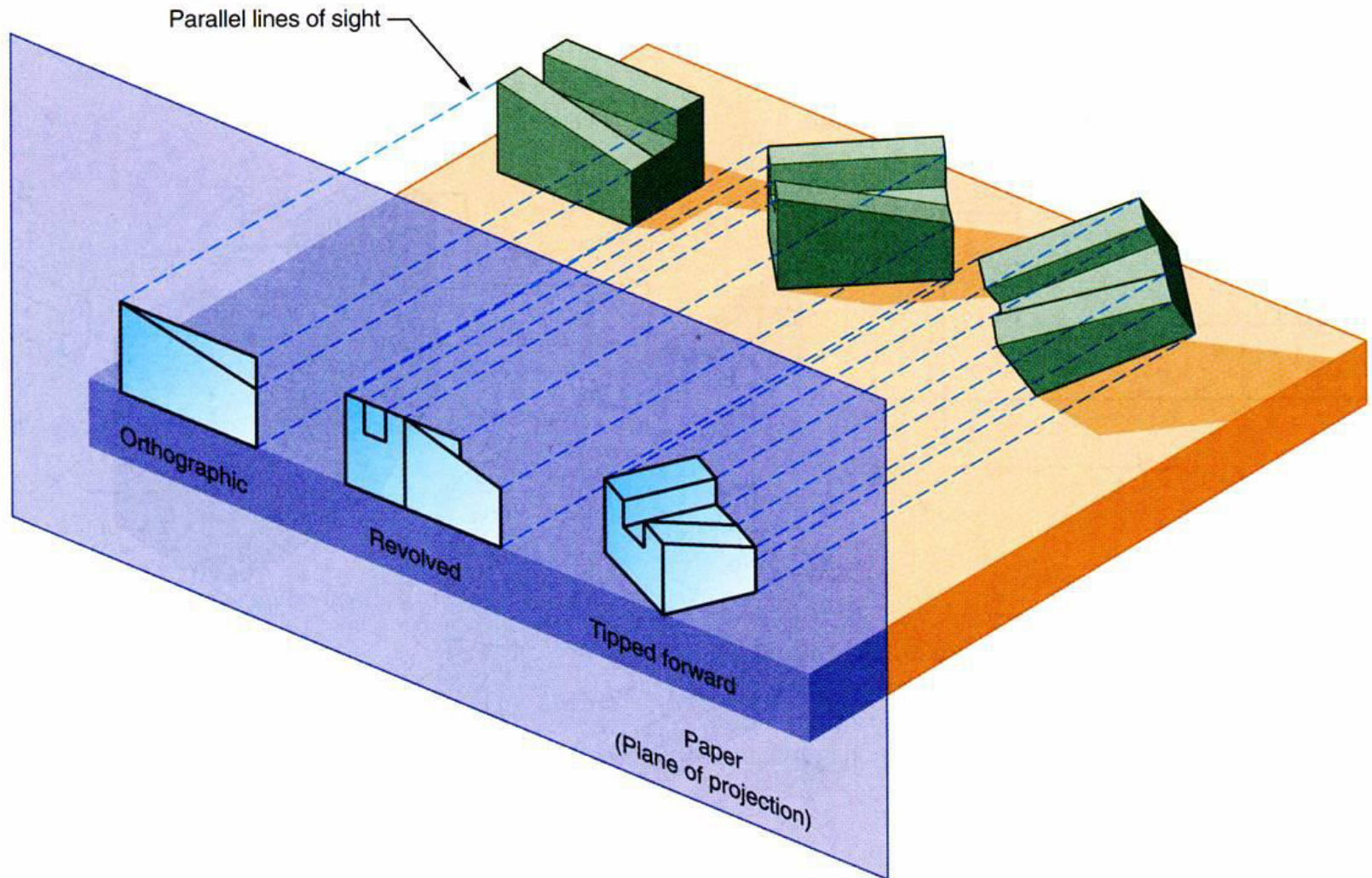
(Multiview Projection)

Orthographic Projection

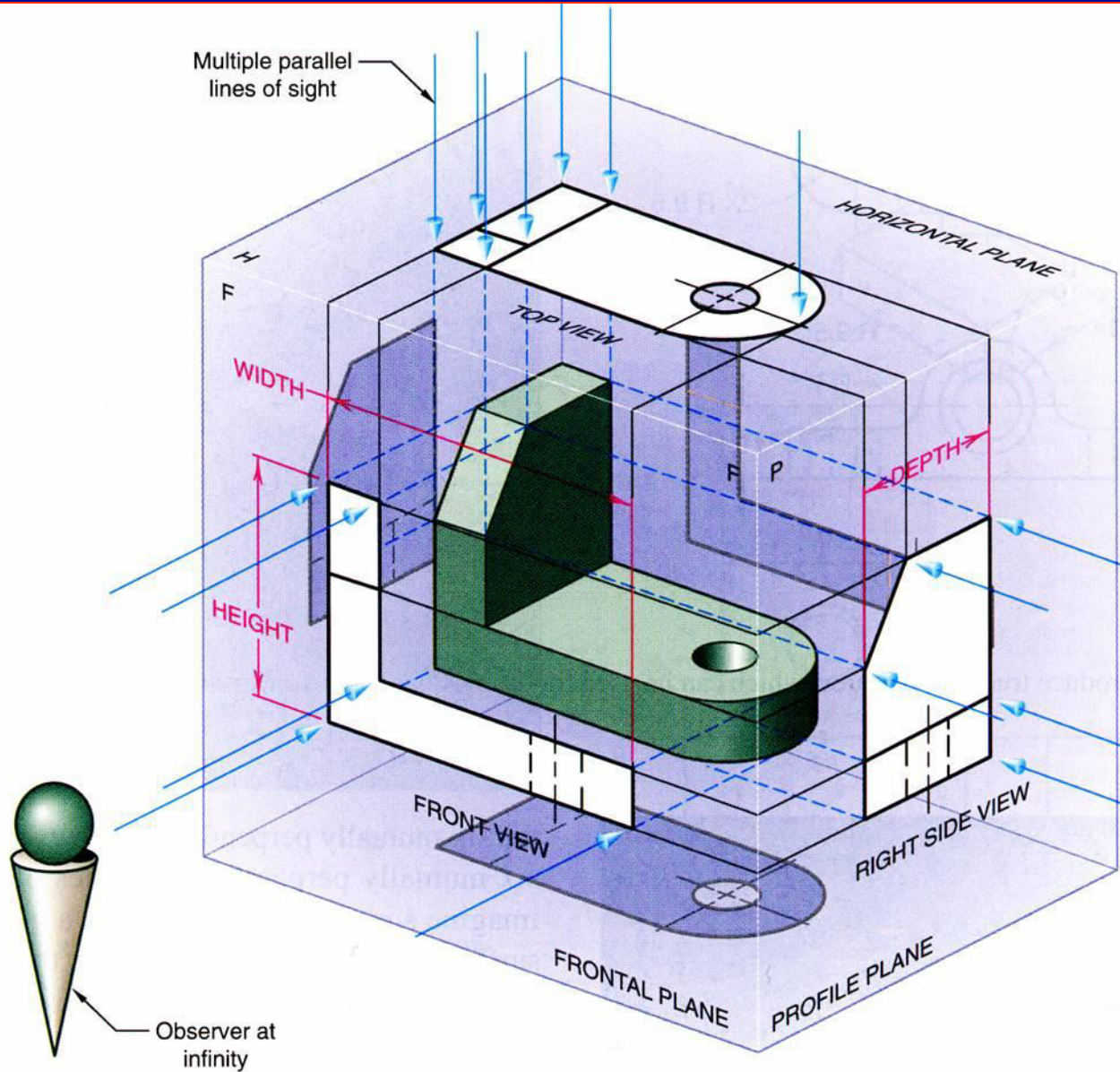


The orthographic projections shows the object as it looks from the front, right, left, top, bottom, or rear, and are typically positioned relative to each other according to the rules of either first angle or third angle projection. The origin and vector direction of the projectors (also called projection lines) differs, as explained below.

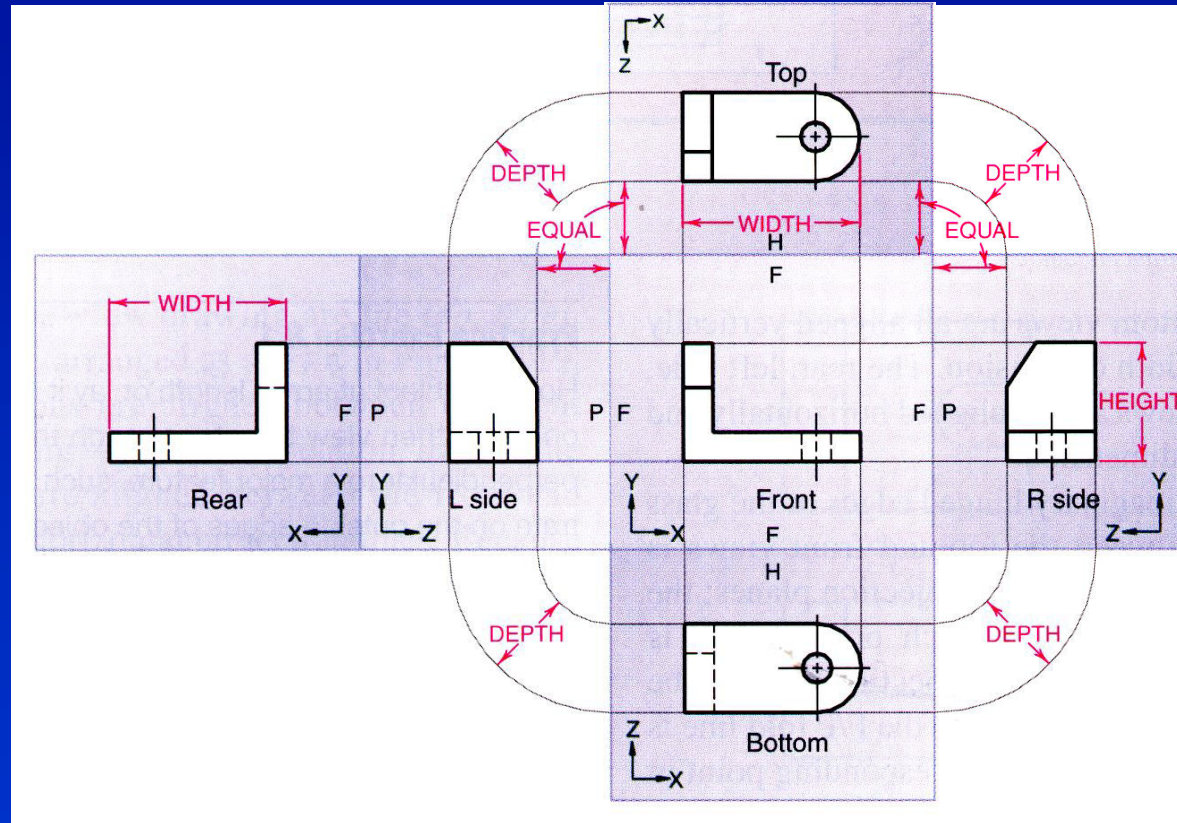
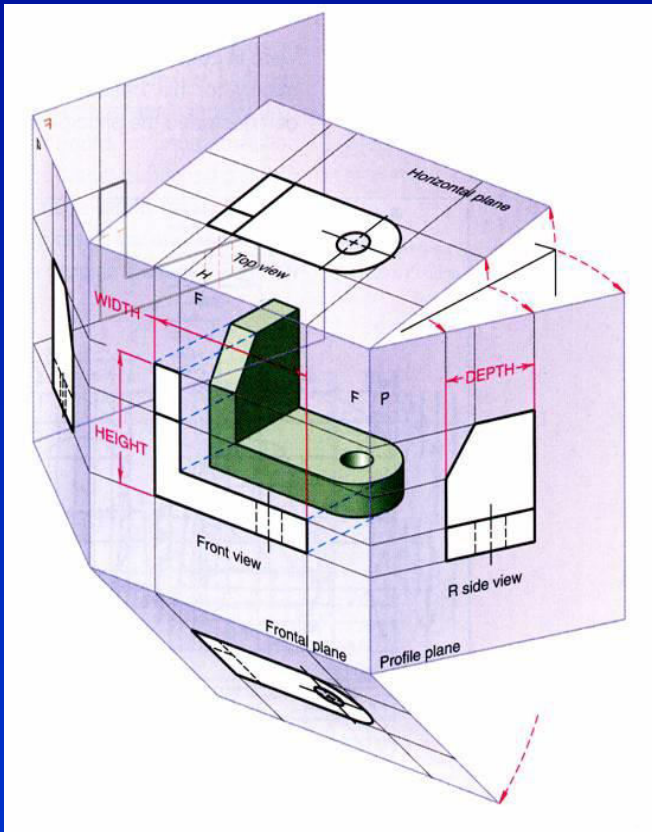
Different Viewpoint



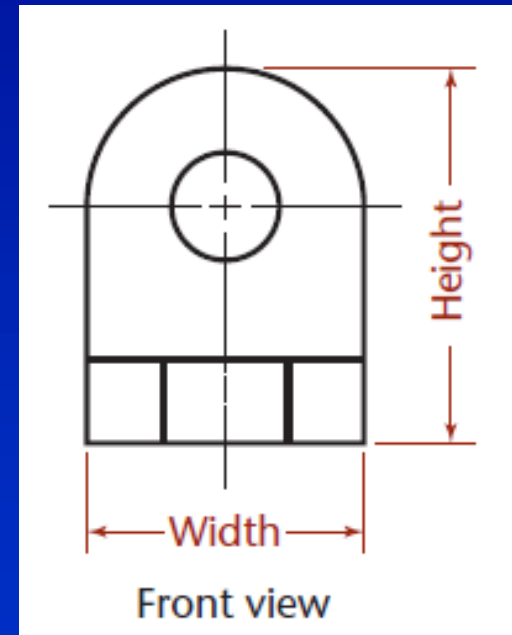
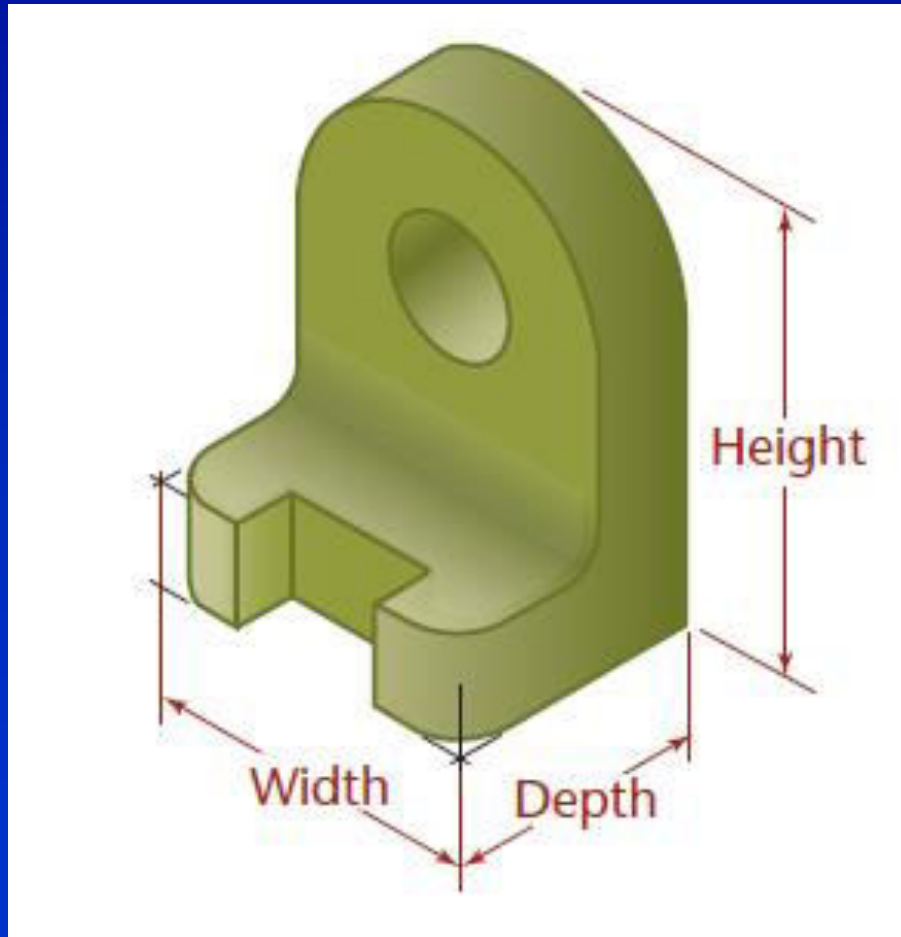
Orthographic Projection



Standard 2D views

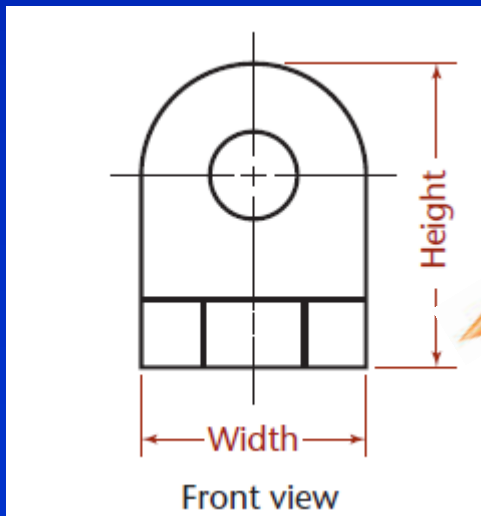
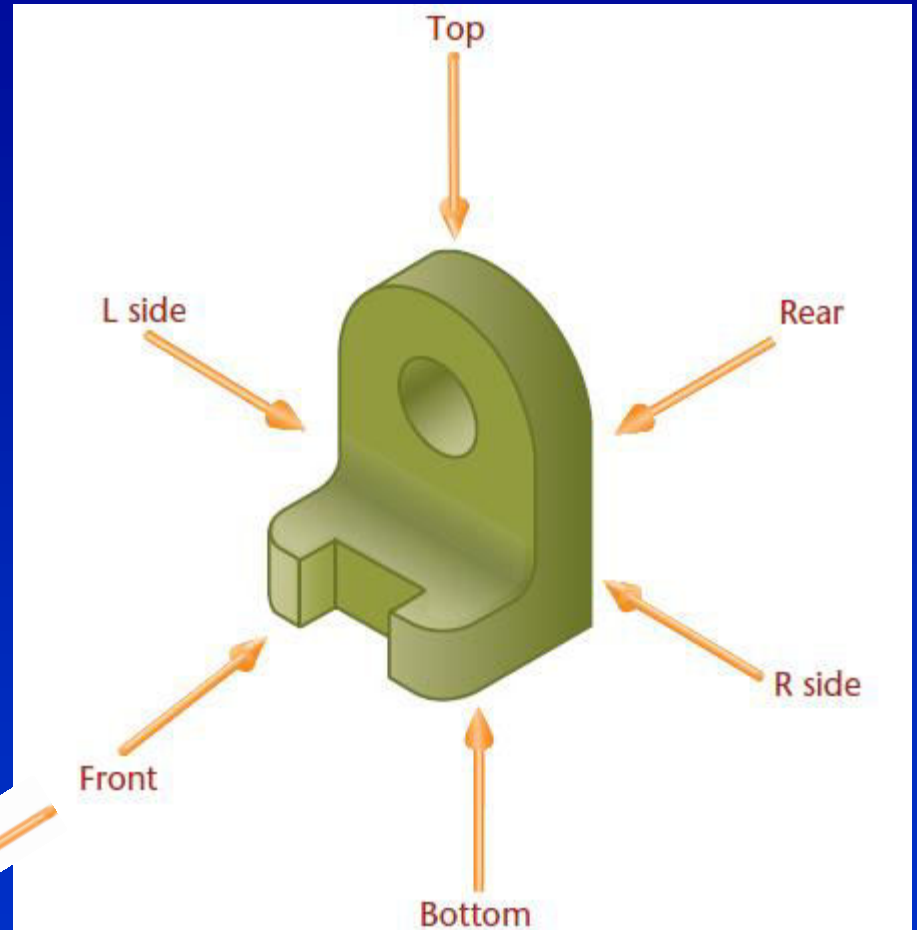


The Principal Dimensions of an Object



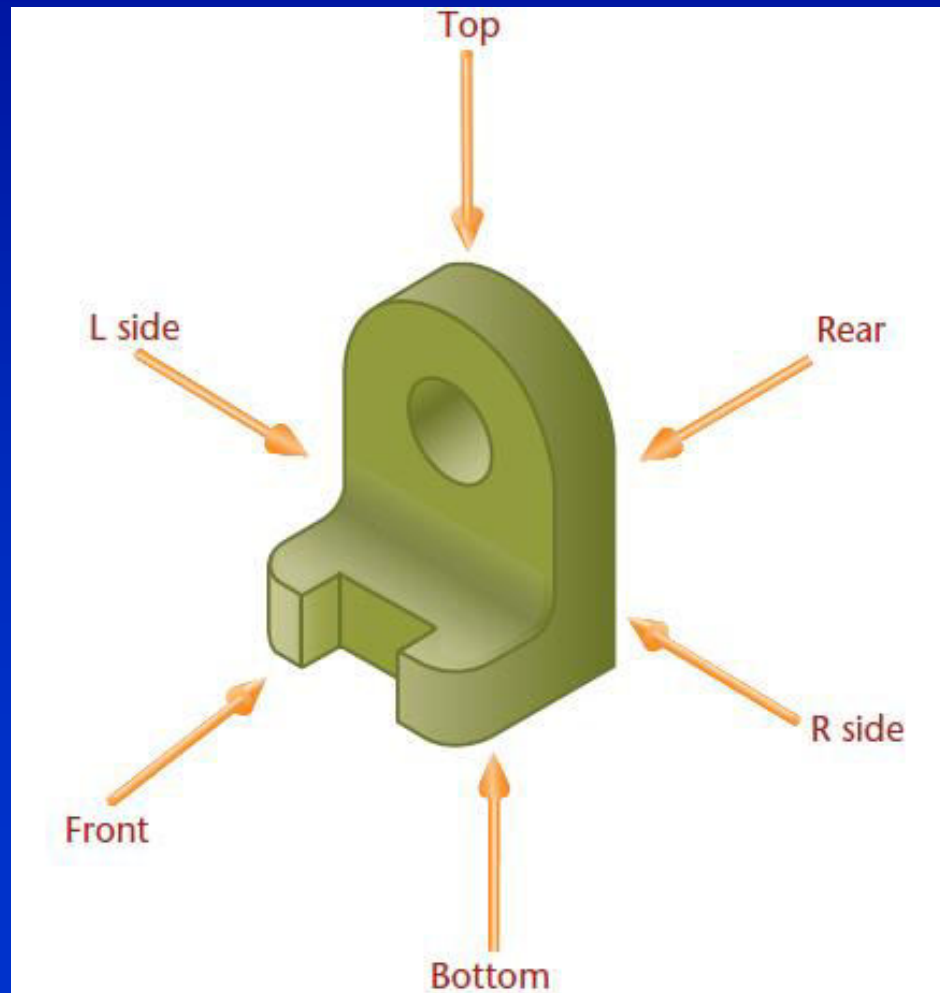
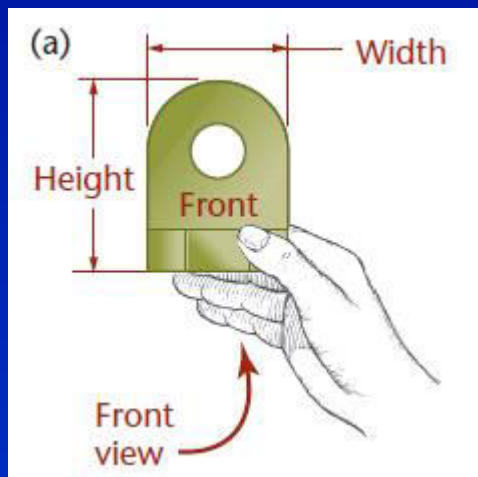
Views of Objects

The system of views is called multiview projection. Each view provides certain definite information. For example, a front view shows the true shape and size of surfaces that are parallel to the front of the object.



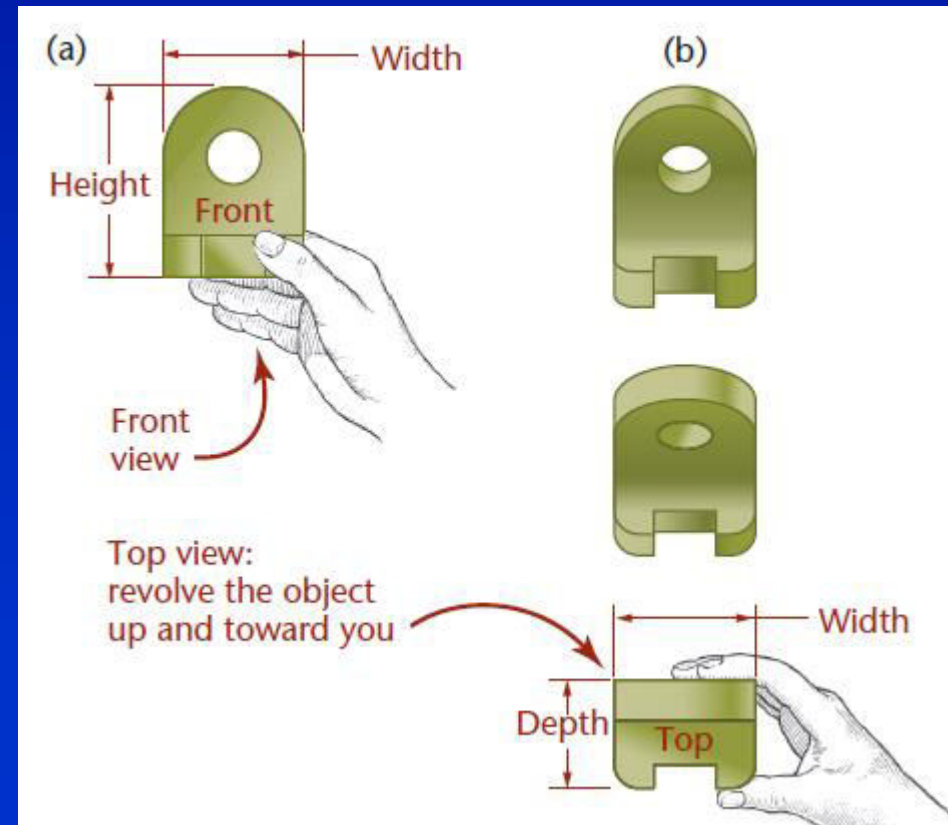
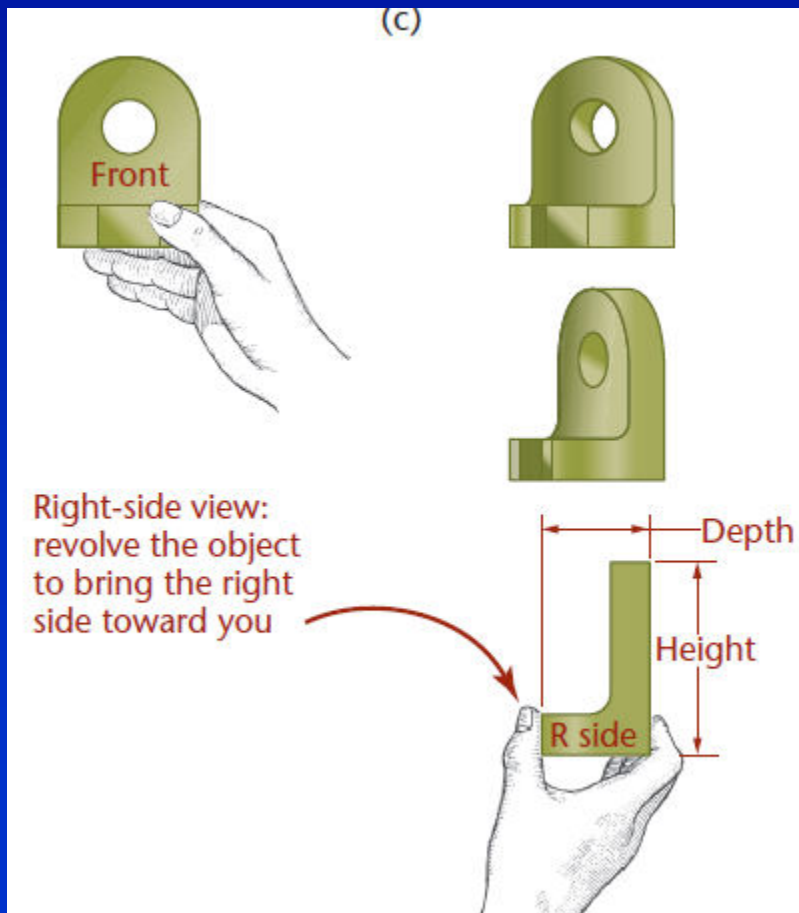
The Six Standard Views

Any object can be viewed from six mutually perpendicular directions,



Revolving the Object to Produce Views

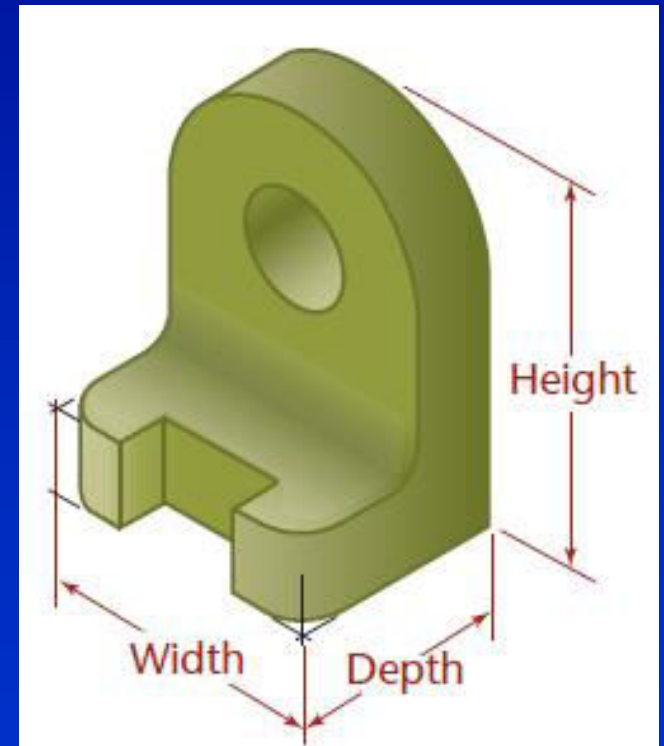
Revolving the Object to Produce Views. You can experience different views by revolving an object.



Principal Dimensions

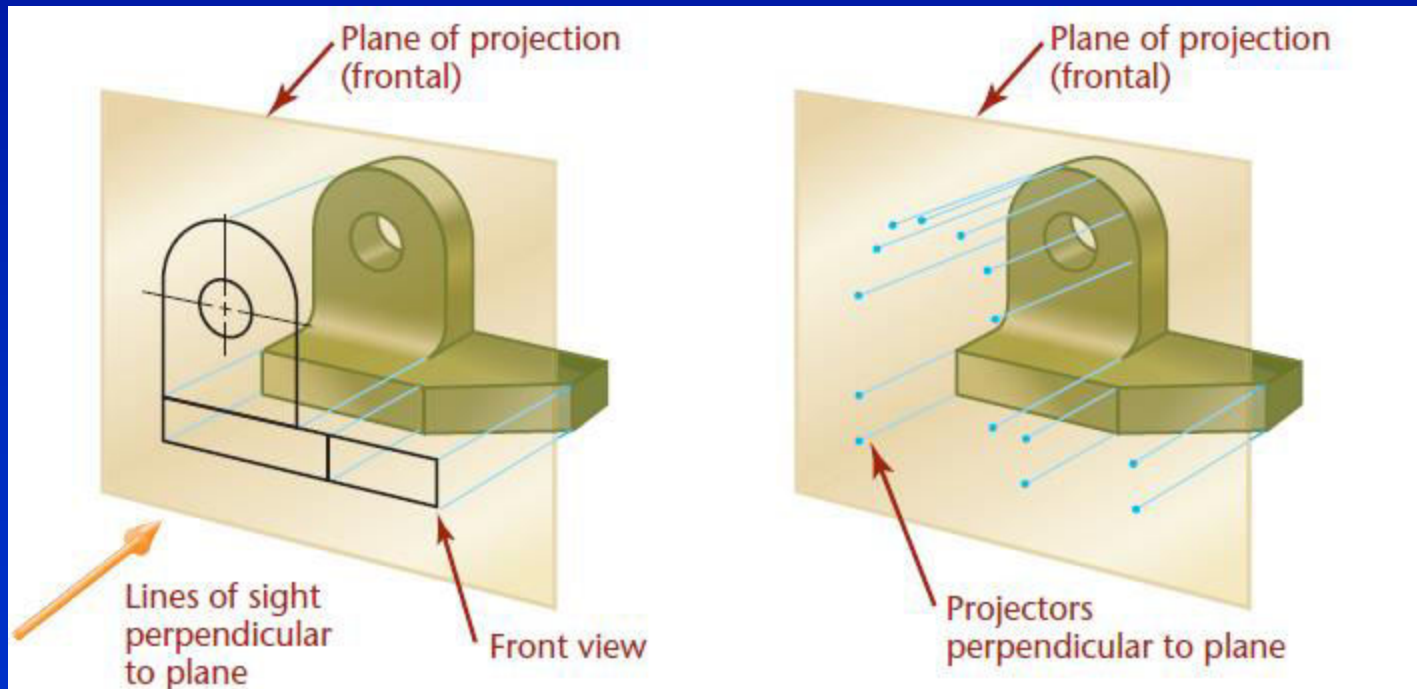
The three principal dimensions of an object are width, height, and depth.

The front view shows only the height and width of the object and not the depth. In fact, any principal view of a 3D object shows only two of the three principal dimensions; the third is found in an adjacent view. Height is shown in the rear, left-side, front, and right-side views. Width is shown in the rear, top, front, and bottom views. Depth is shown in the left-side, top, right-side, and bottom views.



Projection Method

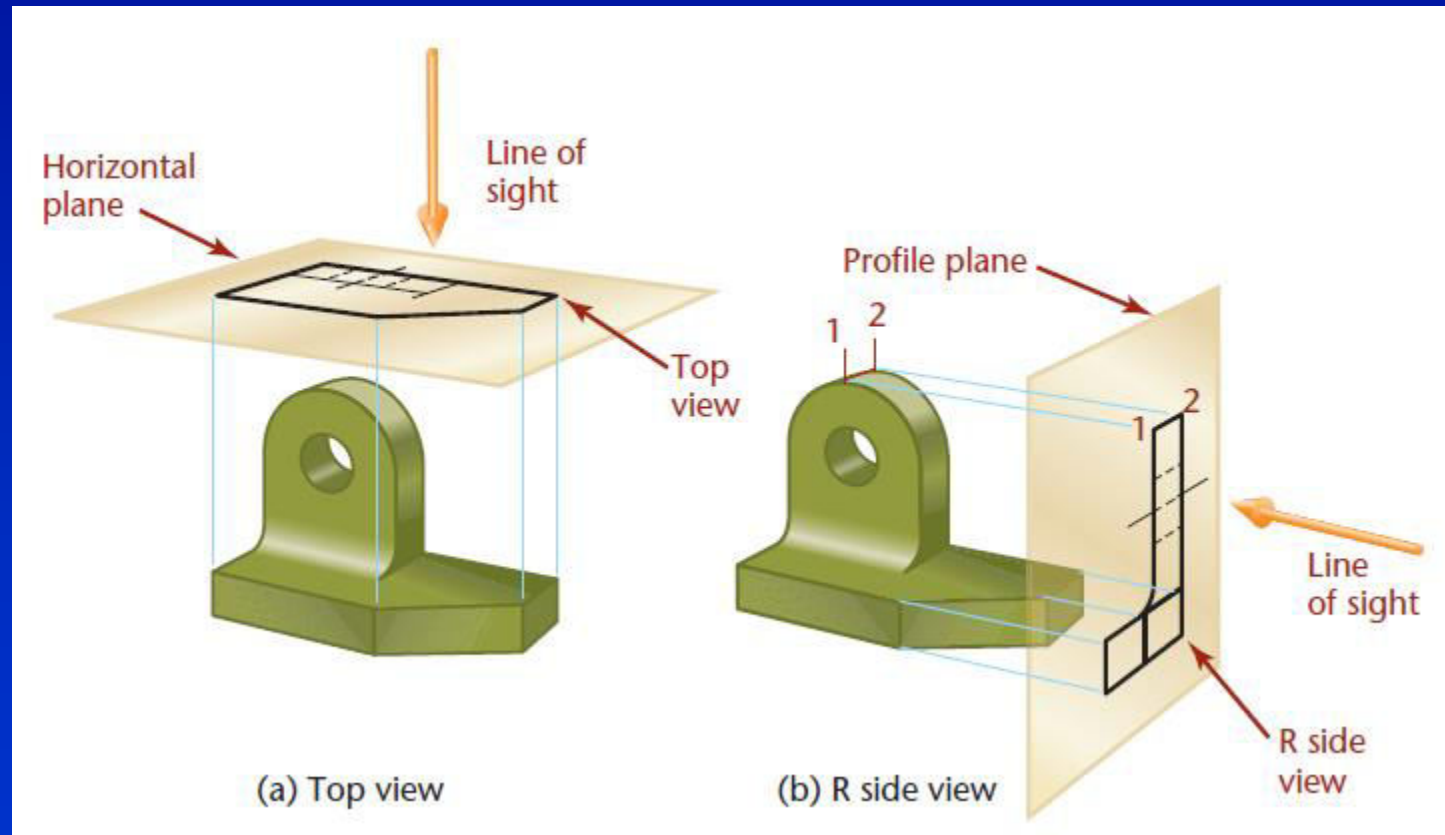
The outline on the plane of projection shows how the object appears to the observer. In orthographic projection, rays (or projectors) from all points on the edges or contours of the object extend parallel to each other and perpendicular to the plane of projection. The word orthographic means “at right angles.”



Projection of an Object

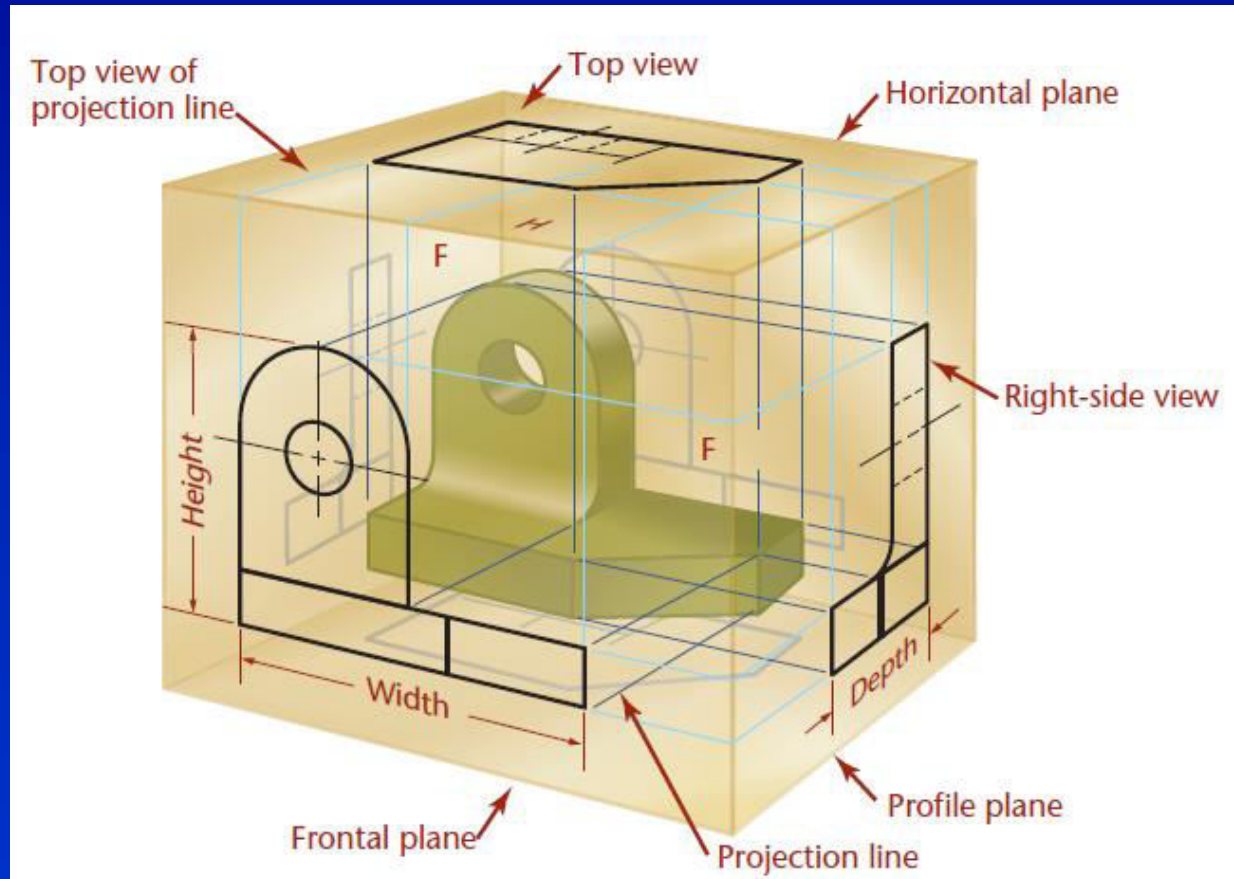
Horizontal and Profile Projection Planes

Specific names are given to the planes of projection. The front view is projected to the frontal plane. The top view is projected to the horizontal plane. The side view is projected to the profile plane.



The Glass Box

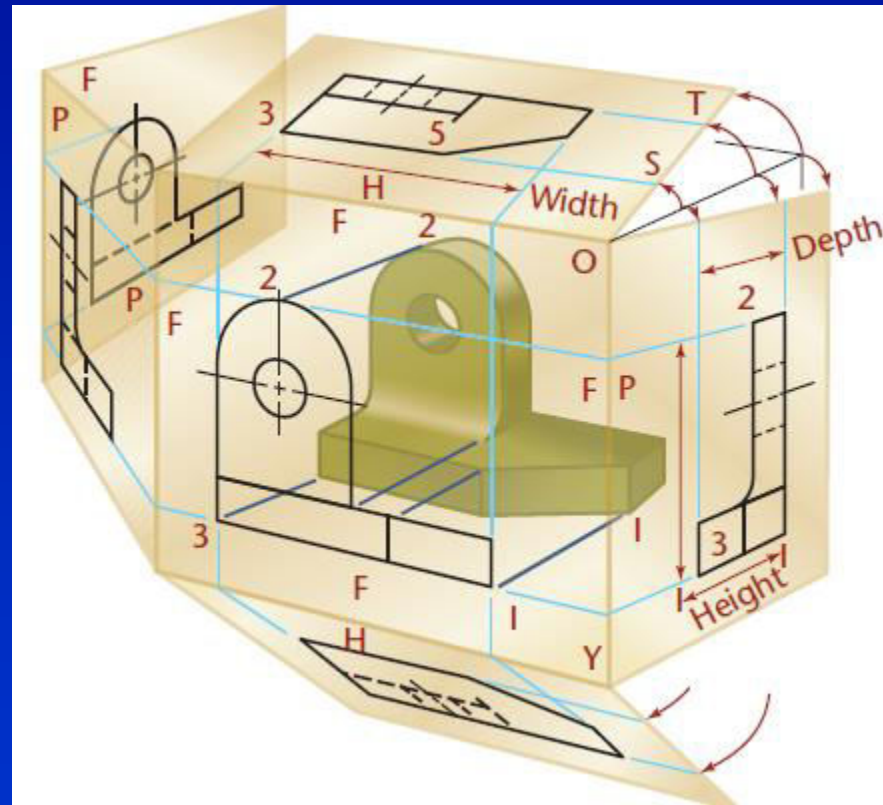
One way to understand the standard arrangement of views on the sheet of paper is to envision a *glass box*.



If planes of projection were placed parallel to each principal face of the object, they would form a box.

Unfolding the Glass Box

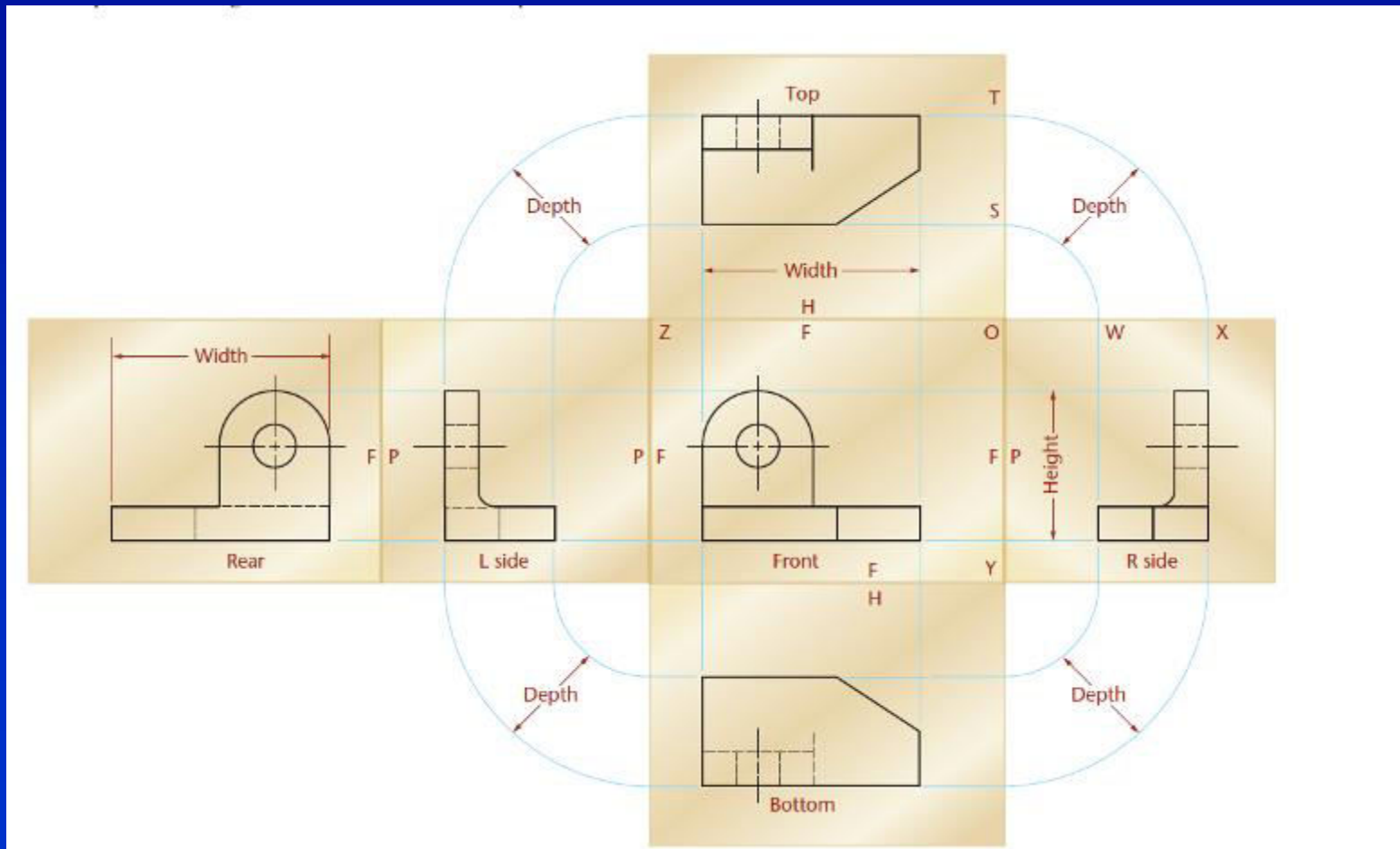
To organize the views of a 3D object on a flat sheet of paper, imagine the six planes of the glass box being unfolded to lie flat.



Note the six standard views
(front, rear, top, bottom,
right side, left side).

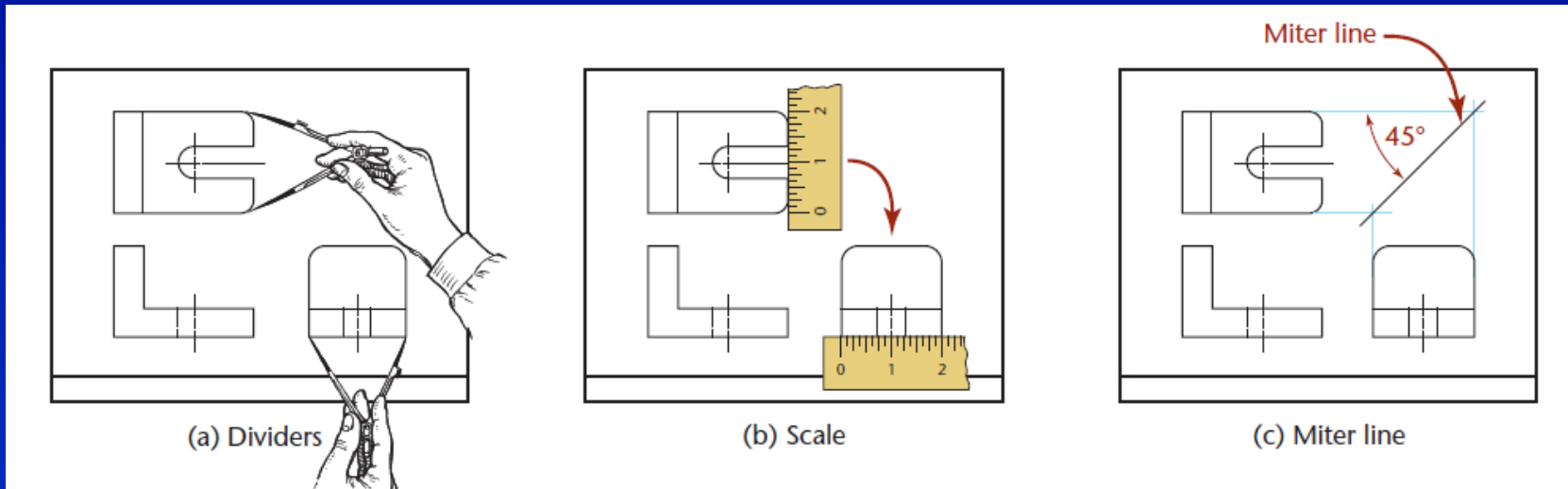
The Glass Box Unfolded

Lines extend around the glass box from one view to another on the planes of projection. These are the projectors from a point in one view to the same point in another view.



Transferring Depth Dimensions

The depth dimensions in the top and side views must correspond point-for-point. When using CAD or instruments, transfer these distances accurately.

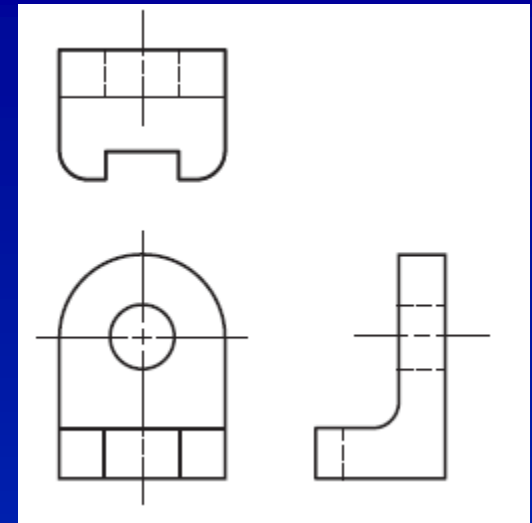


You can transfer dimensions between the top and side views either with **dividers** or with a **scale**.

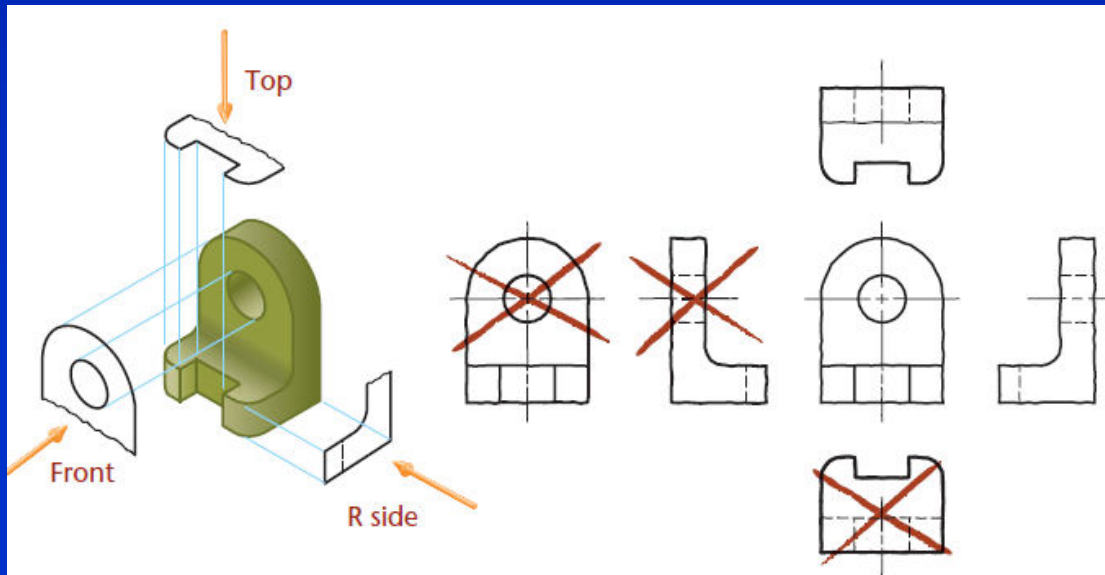
You may find it convenient to use a 45° **miter line** to project dimensions between top and side views.

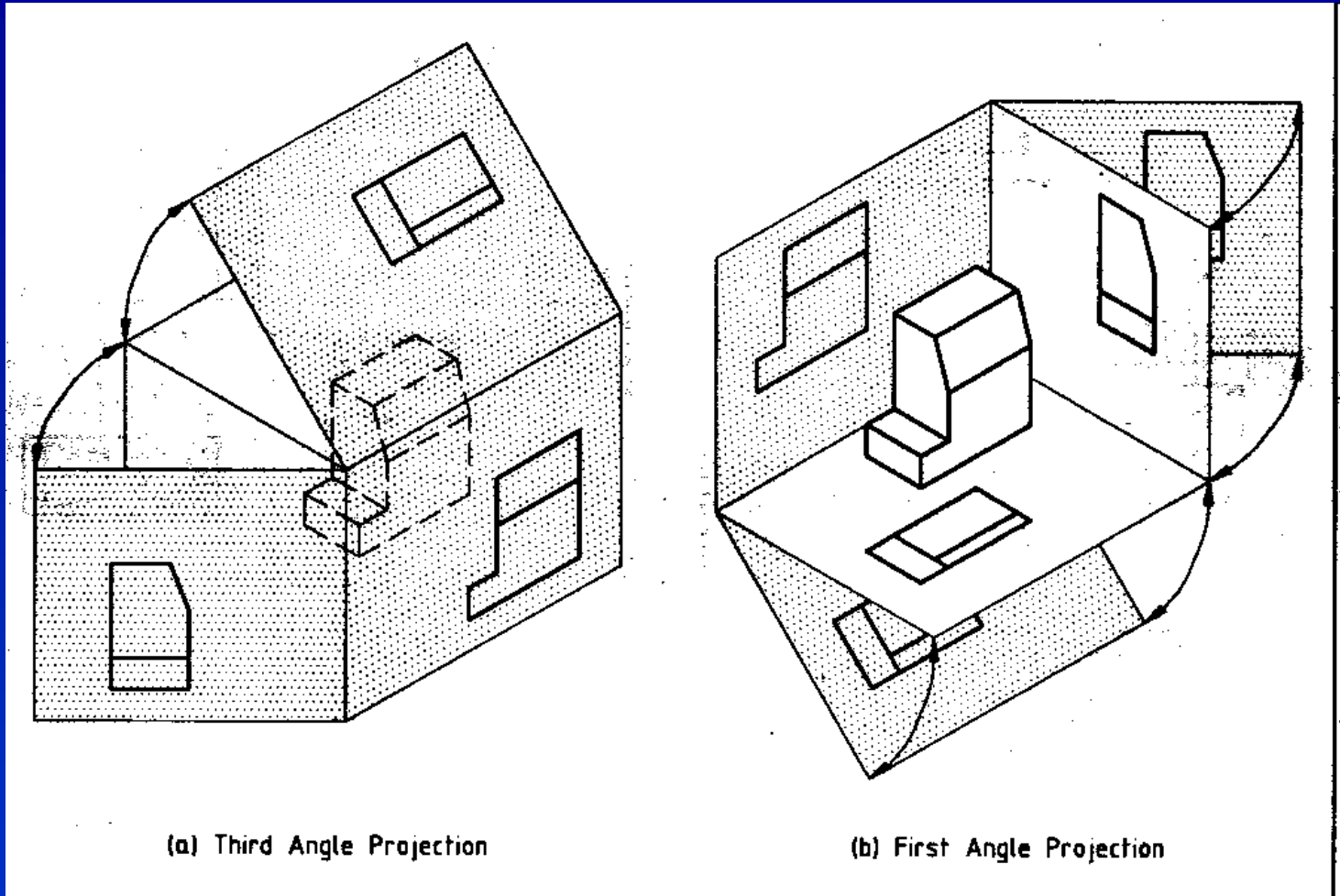
Necessary Views

The top, front, and right-side views, arranged together, are called the **three regular views** because they are the views most frequently used.



A sketch or drawing should contain only the views needed to clearly and completely describe the object.





(a) Third Angle Projection

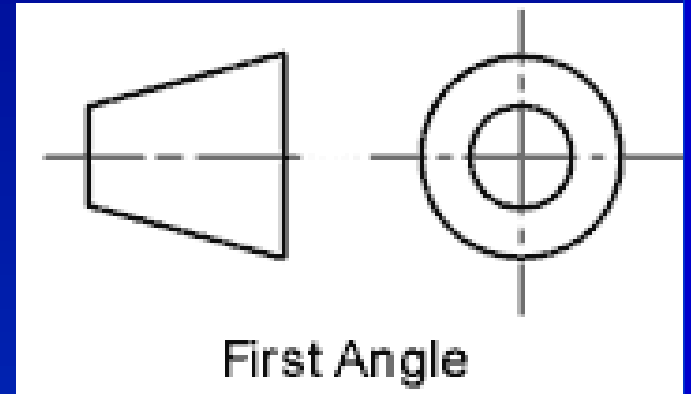
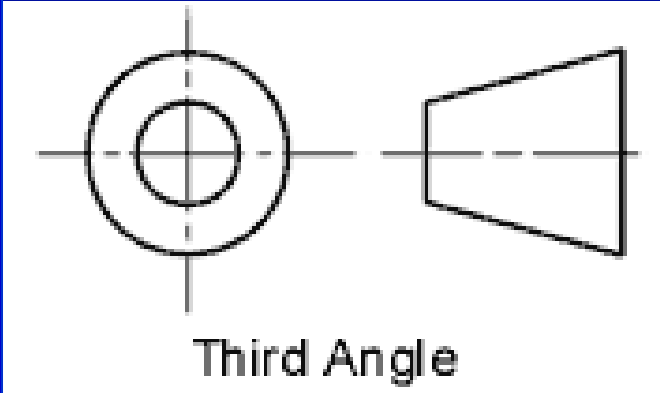
(b) First Angle Projection

Third Angle Projection

USA, Canada

First Angle Projection

Europe, Asia



Third Angle Projection

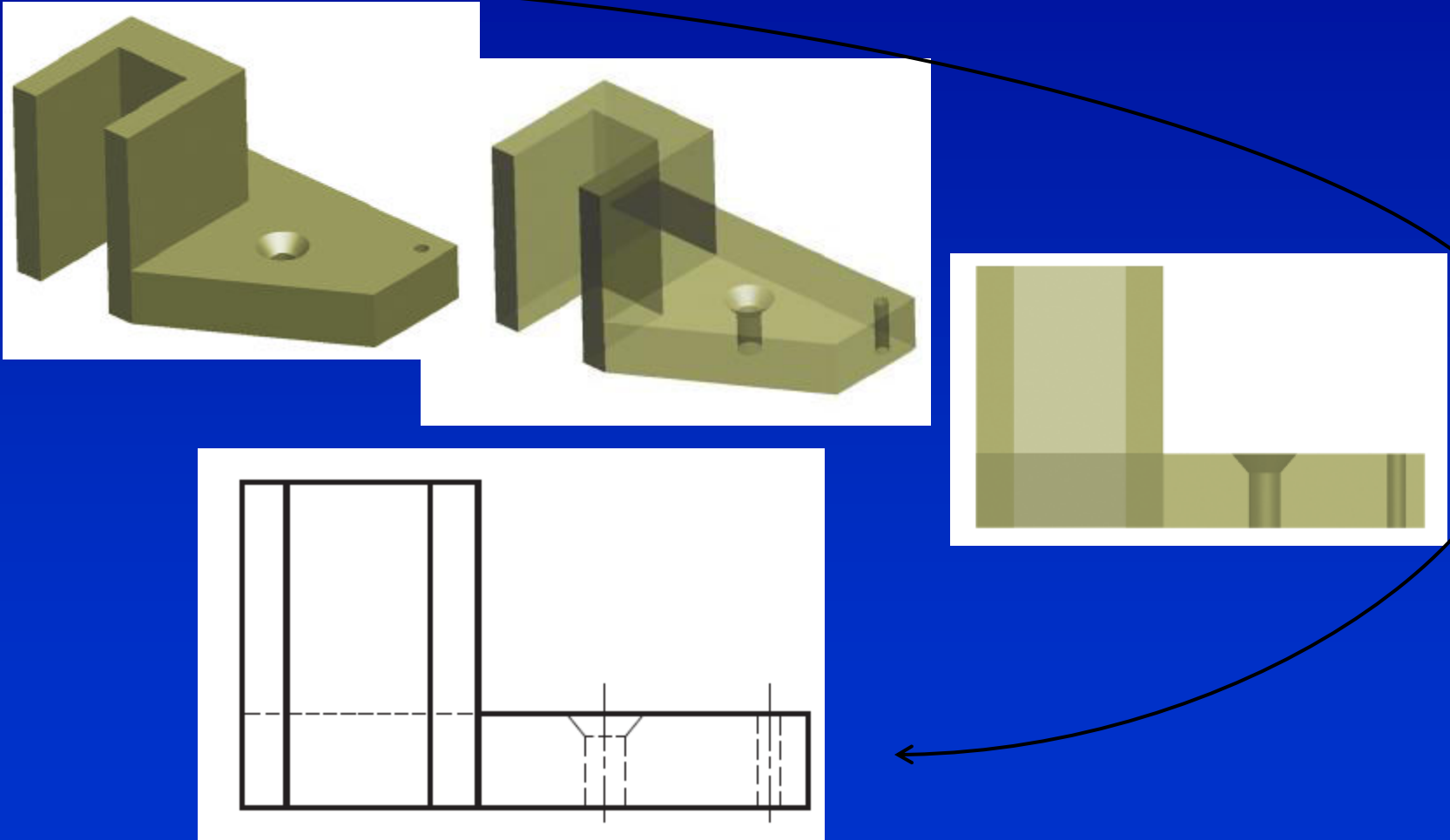
USA, Canada

First Angle Projection

Europe, Asia

Hidden Lines

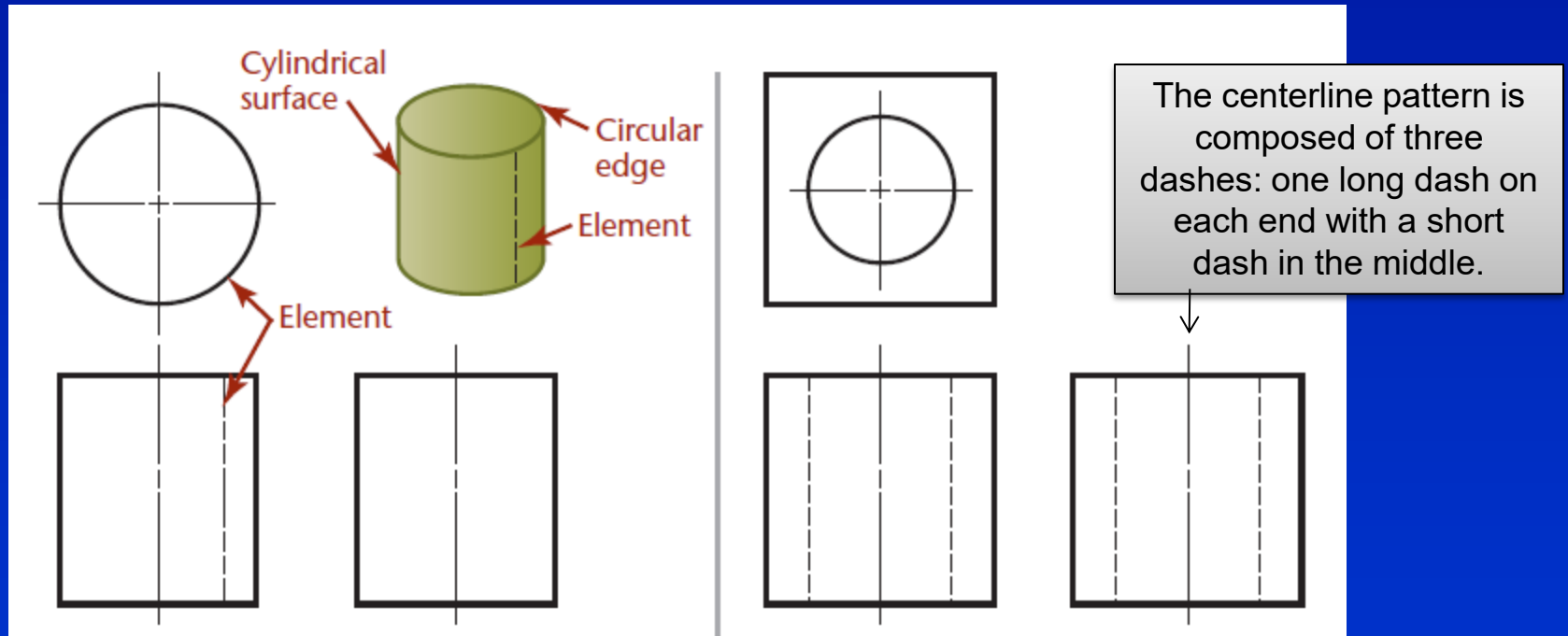
Thick, dark lines represent features of the object that are directly visible. Dashed lines represent features that would be hidden behind other surfaces.



Centerlines

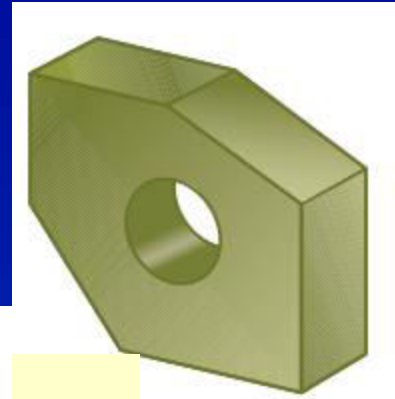
The centerline pattern is used to:

- show the axis of symmetry for a feature or part
 - indicate a path of motion
- show the location for bolt circles and other circular patterns

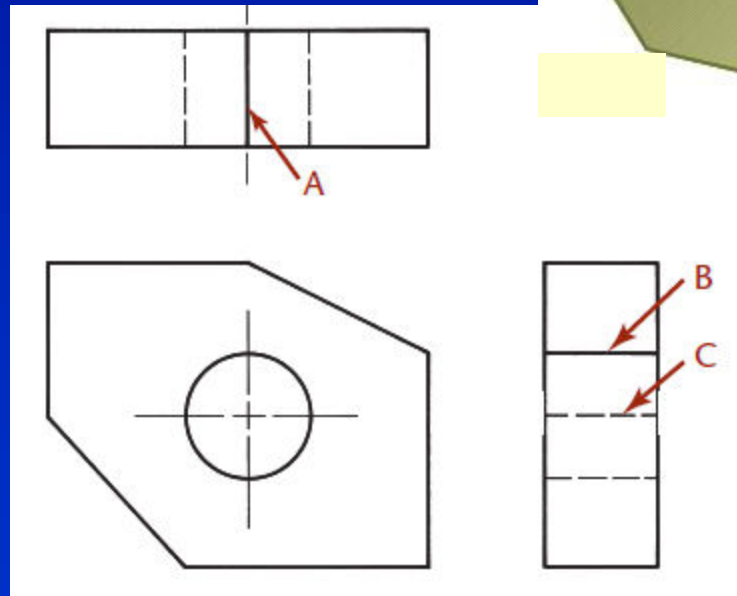


PRECEDENCE OF LINES

A visible line always takes precedence over and covers up a centerline or a hidden line when they coincide in a view (A and B).

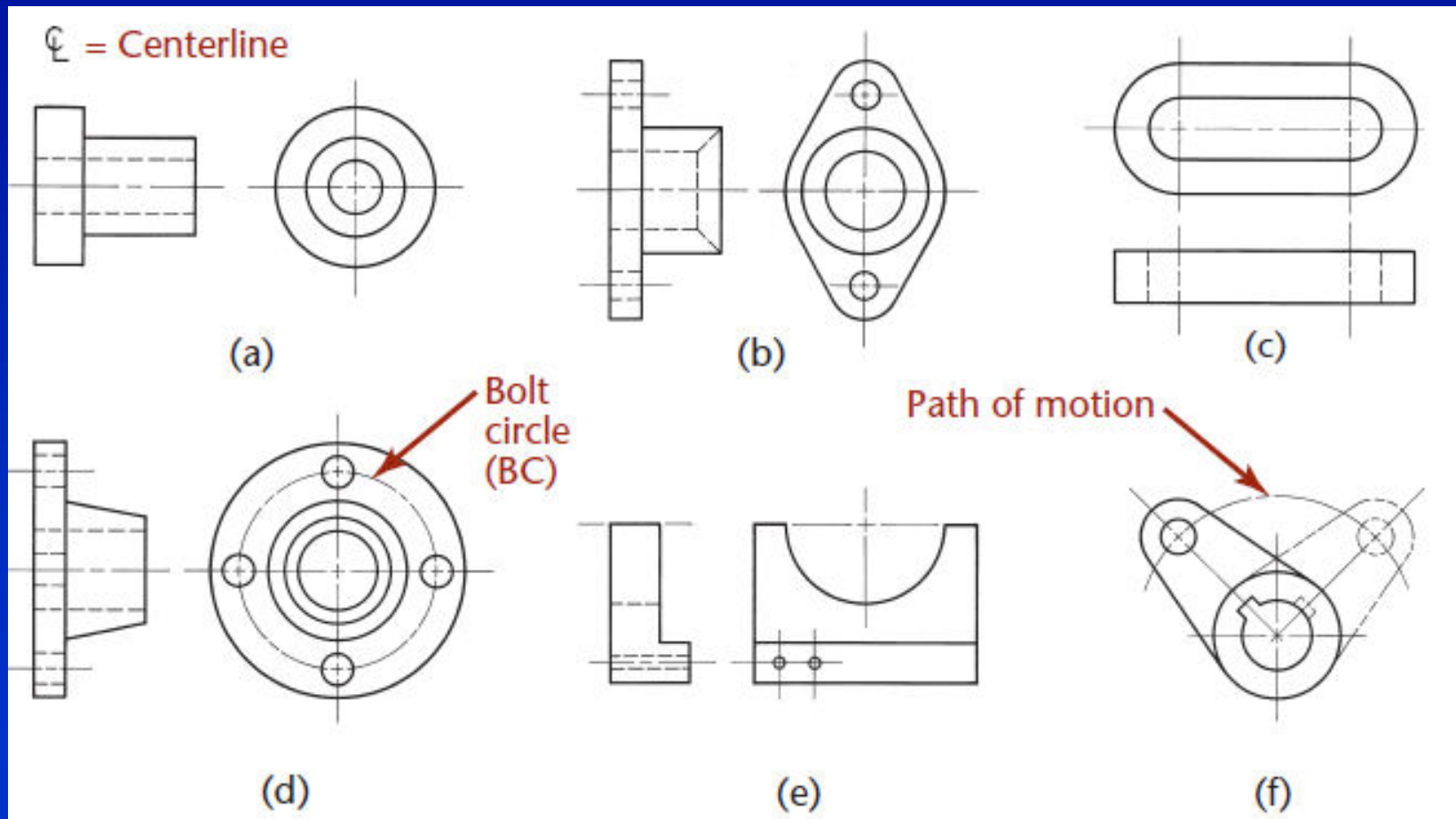


A hidden line takes precedence over a centerline (C).



Centerlines continued...

Centerlines (symbol ϕ) are used to indicate symmetrical axes of objects or features, bolt circles, and paths of motion.



Standard Views of Primitive Solids

