

# ME 1110 – Engineering Practice 1

## Engineering Drawing and Design - Lecture 3

### Pictorial projections

Prof Ahmed Kovacevic

School of Engineering and Mathematical Sciences  
Room CG25, Phone: 8780, E-Mail: **a.kovacevic@city.ac.uk**

**[www.staff.city.ac.uk/~ra600/intro.htm](http://www.staff.city.ac.uk/~ra600/intro.htm)**

# Objectives for today

- How to represent a 3-D object effectively on a 2-D drawing surface with a single view (pictorials)
- How to generate pictorials using only hand drawing tools
- Recognize types of pictorials

# Exercise DrE-2 for this week

## **City University London**

*School of Engineering and Mathematical Sciences*

*Engineering Drawing and Design, EM 1105 (EM1.5)*

Exercise code: DrE-2  
Exercise type: Individual  
Exercise title: Freehand Pictorial Sketching

### **Exercise Assignment:**

Divide space of an A3 paper horizontally in 3 equal portions that have the same height equal to the height of the page. In these spaces sketch in good proportion:

- 1) One perspective human eye view of an object shown in 2.1
- 2) Isometric view of an object given as 2.2 showing hidden lines
- 3) General oblique view of an object in figure 2.3

### **Exercise tips:**

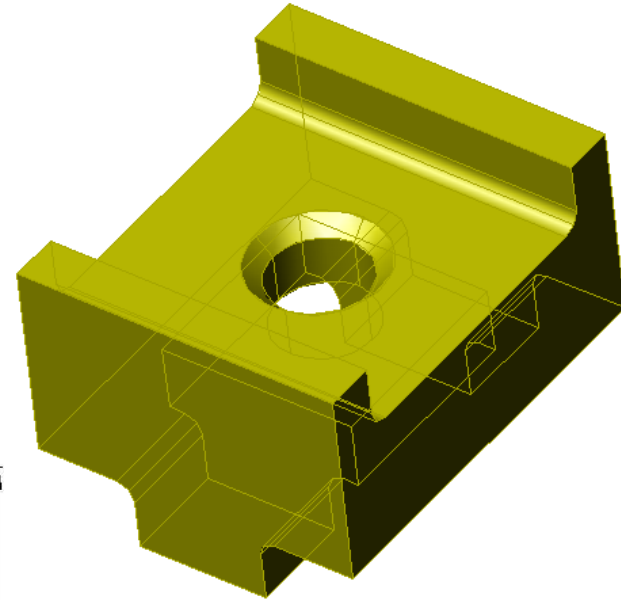
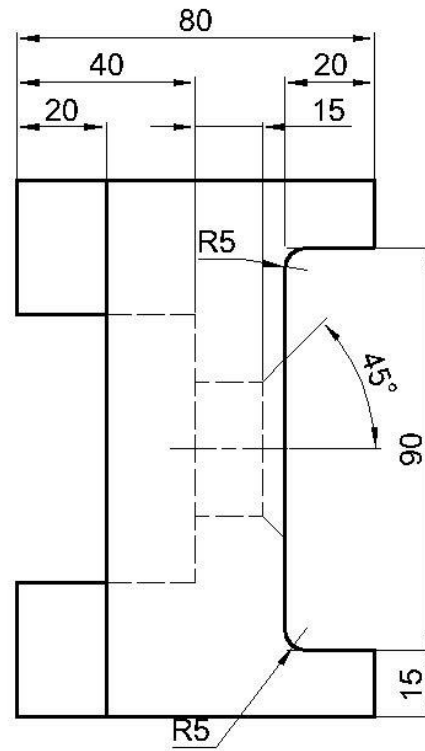
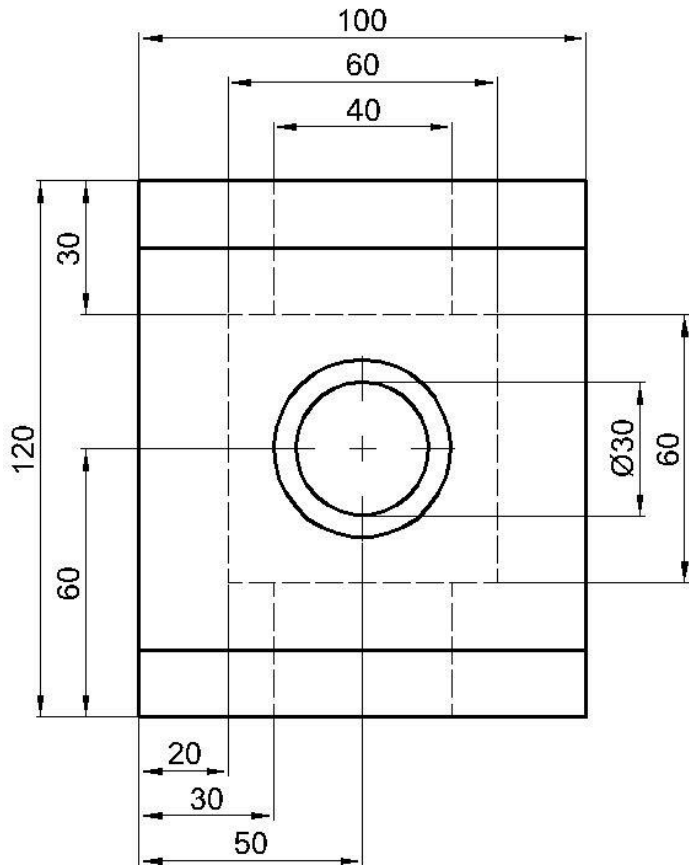
*Always read exercise assignment carefully.*

*This is freehand sketching exercise. Only pencil and rubber are allowed.*

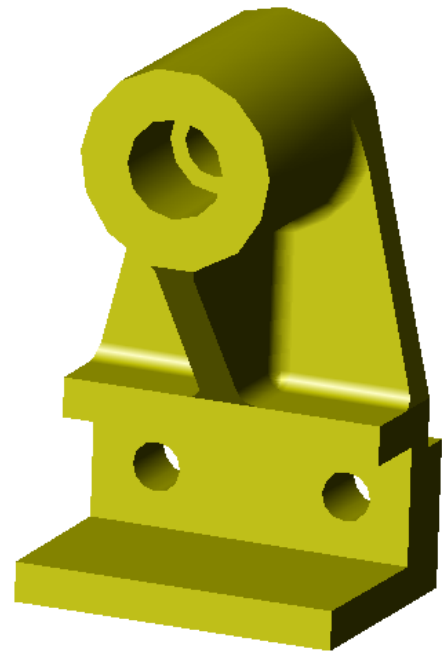
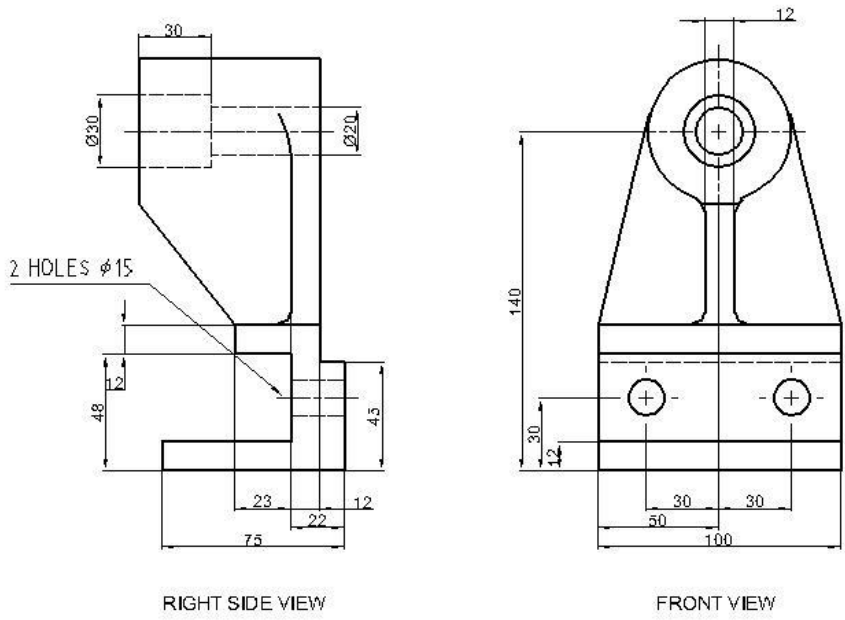
*Arrange sketches neatly and ensure all letters and lines are made according to BS308.*

*Hand in A3 sketch to your tutor during tutorials in week 5 (30<sup>th</sup> and 31<sup>st</sup> October 2003). Ensure that the name, group and other relevant data are filled in the title block*

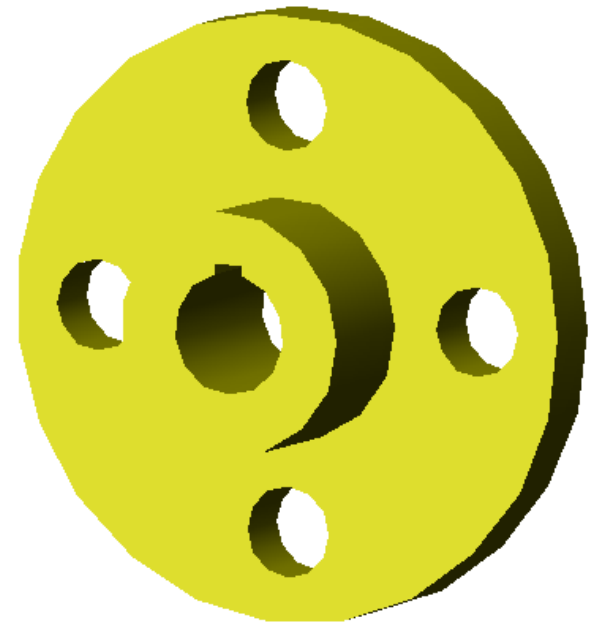
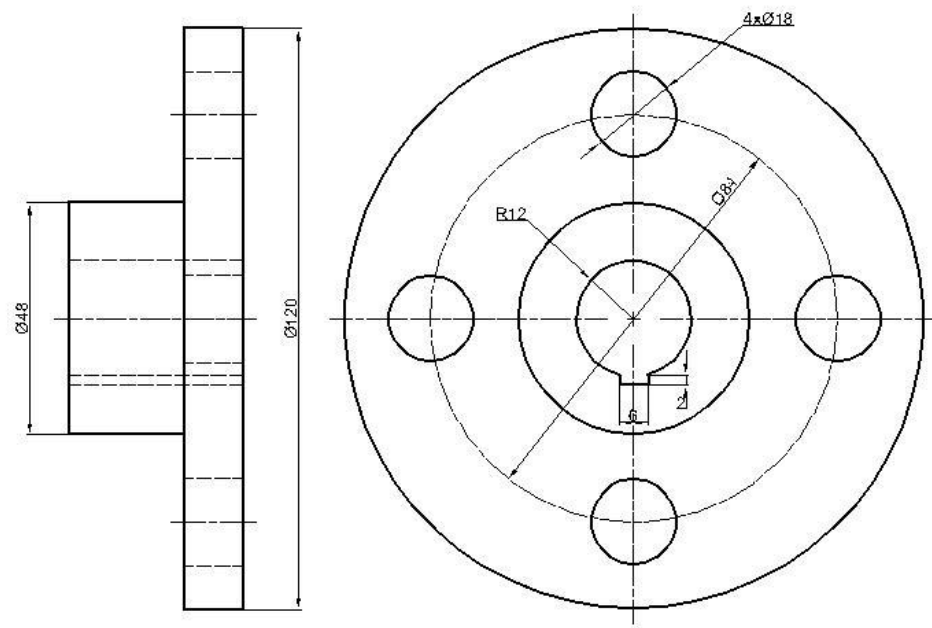
## Exercise 2.1



Exercise 2.2



Exercise 2.3

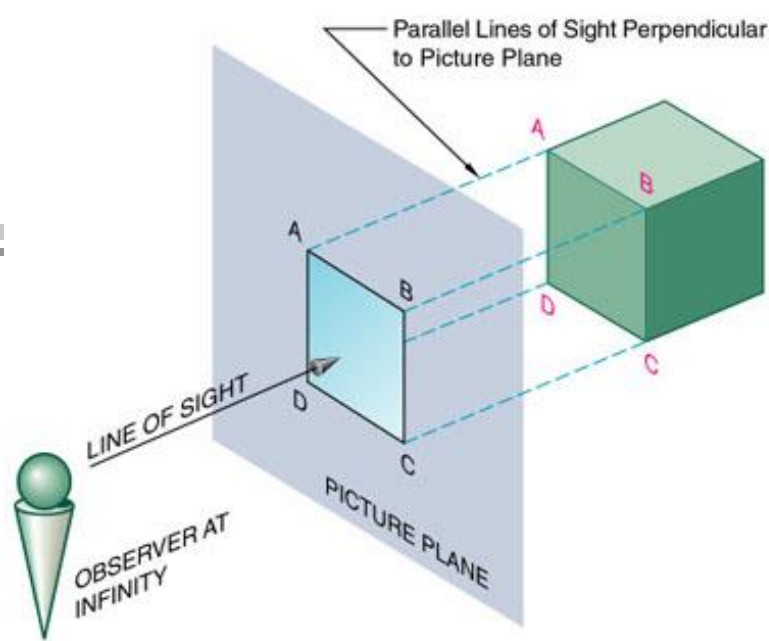


# Pictorials

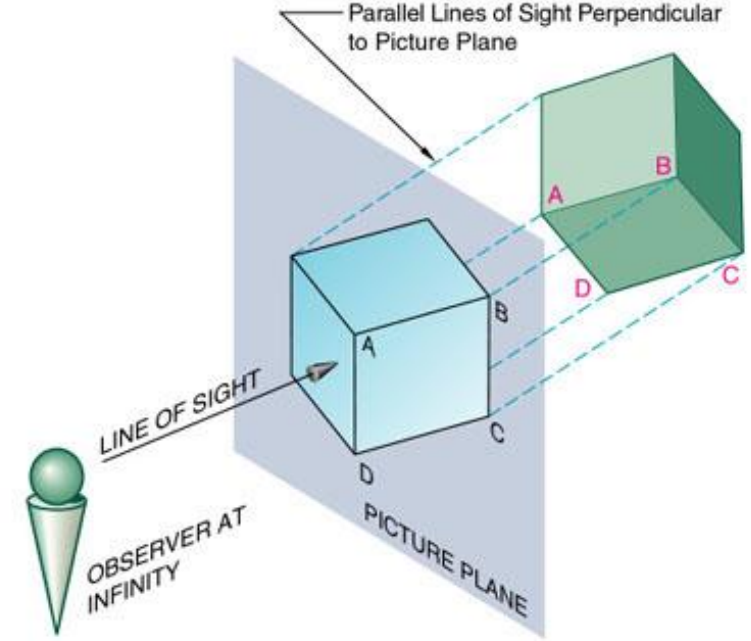
- Definition:  
A sketch developed for ease of visualization that shows an objects height, width, and depth in a single view
- Particularly useful for non-technical audiences
  - » Pictorials are generally not dimensioned
  - » Surfaces are often shaded
  - » Hidden lines are not shown
- Helpful in the ideation phase of design
- May be easily drawn with CAD programs

# Pictorials

- Parallel Projection
  - » Oblique Pictorials
    - Parallel projectors are not perpendicular to the projection plane
  - » Axonometric Pictorials
    - Projection lines are perpendicular to the projection plane as in a multiview drawing
    - Example is Isometric
- Perspective Projection
  - » Conveys information about distance and size
  - » Not as common as parallel projection

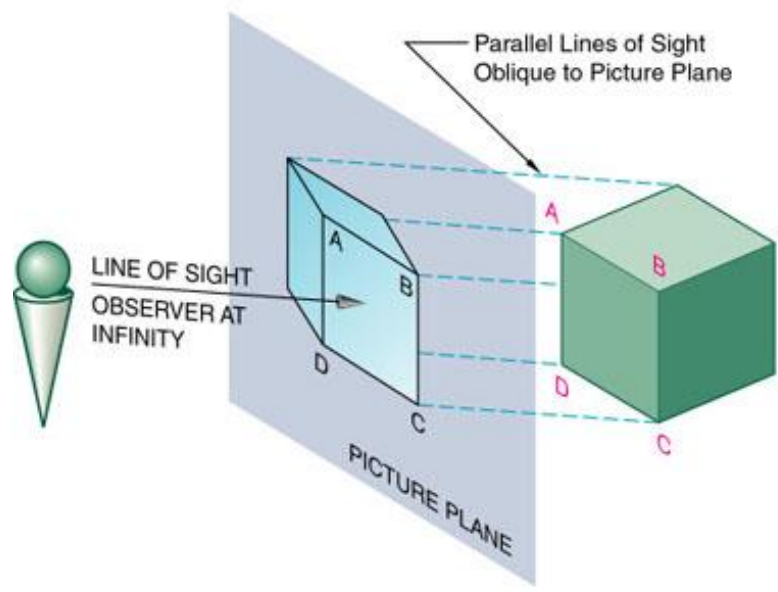


(A) Multiview Projection

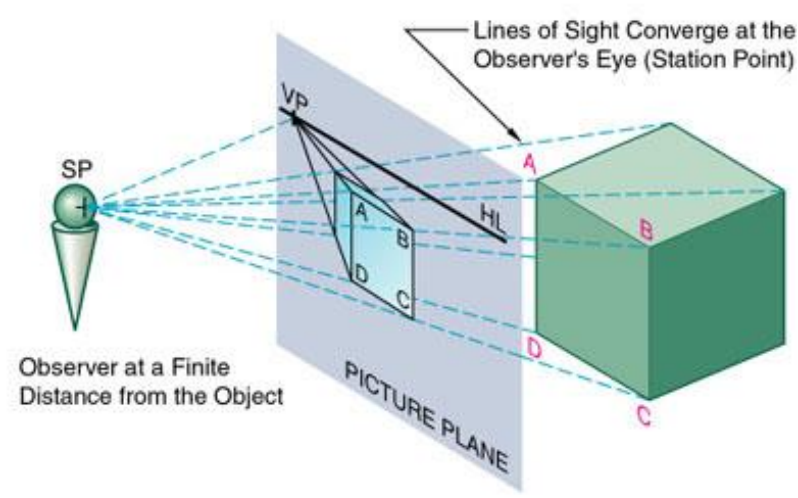


(B) Axonometric Projection

# Pictorials



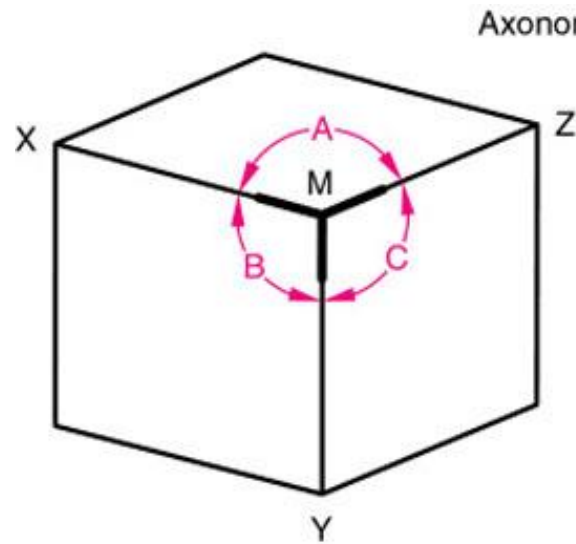
(C) Oblique Projection



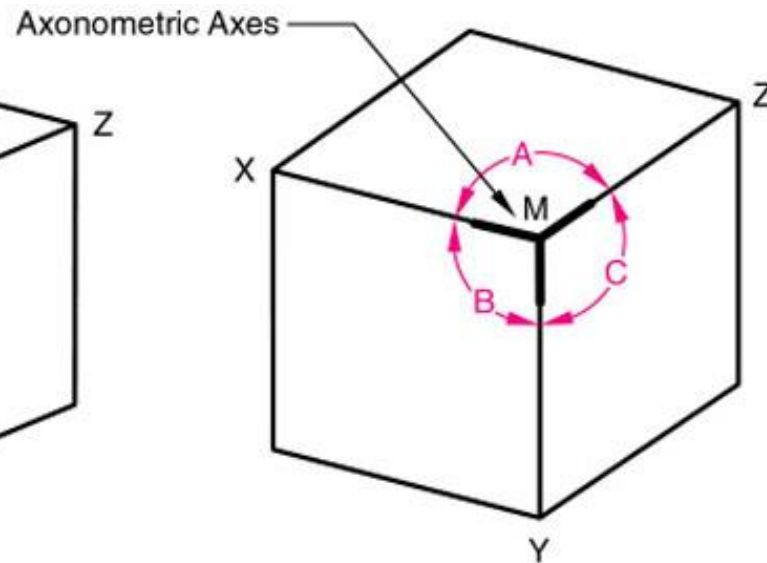
(D) Perspective Projection



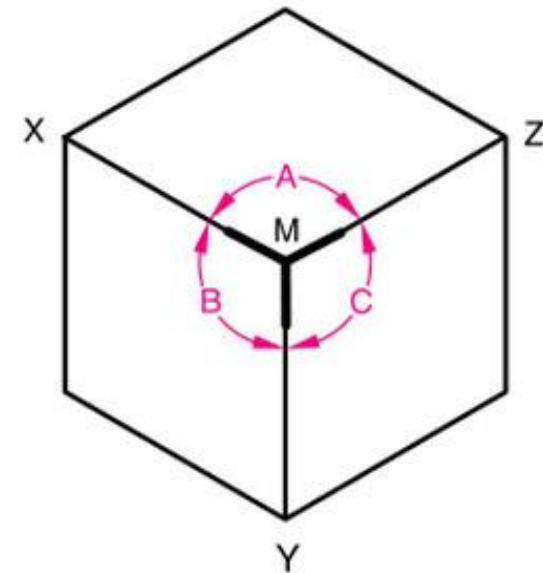
# Axonometric views



**TRIMETRIC**  
No equal angles  
No equal corners

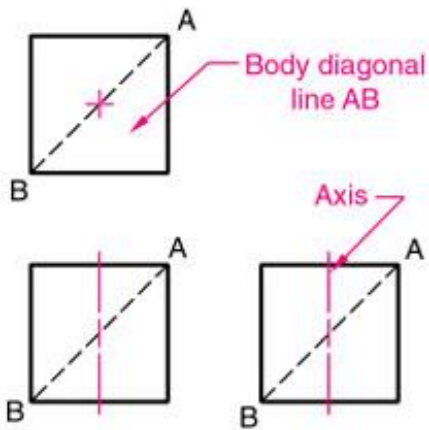
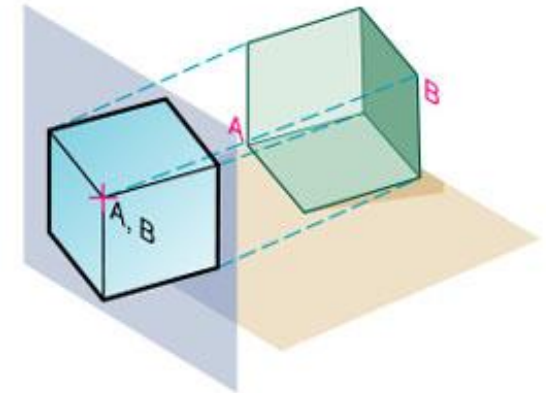
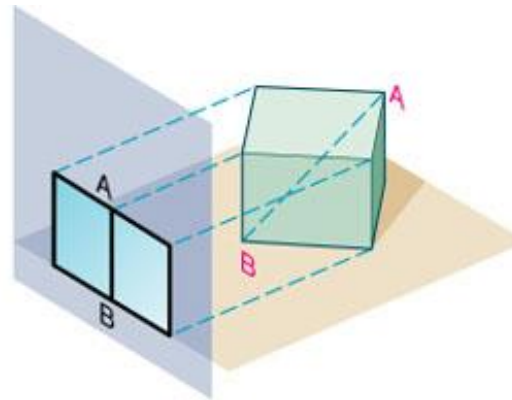
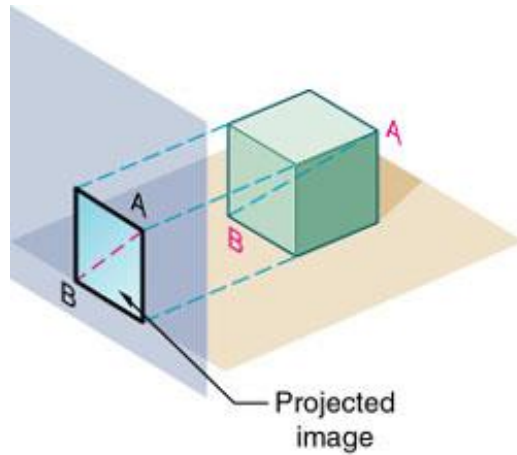


**DIMETRIC**  
Angles A and C are equal  
Corners MY and MX are equal in length

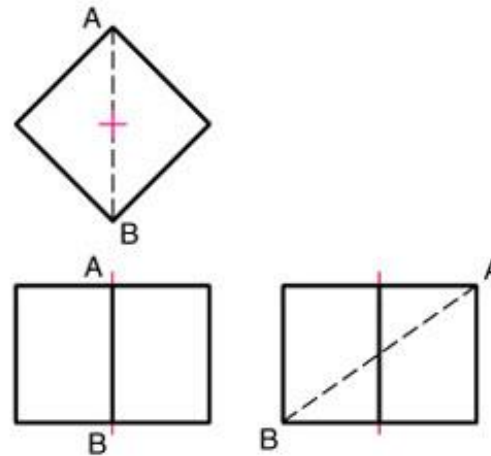


**ISOMETRIC**  
Angles A, B, and C are equal  
Corners MZ, MY, and MX are equal in length

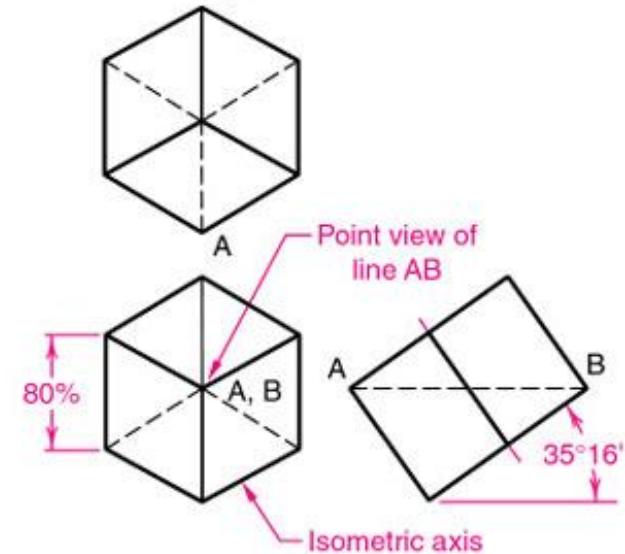
# Theory of isometric projection



(A) Orthographic views of a cube.

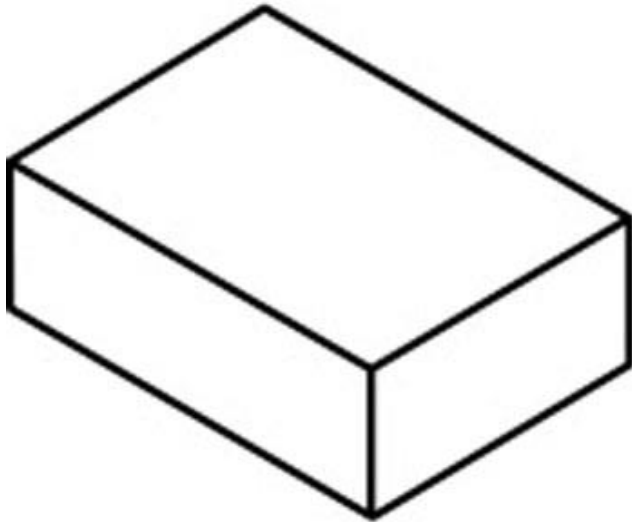


(B) Cube rotated 45° about axis.

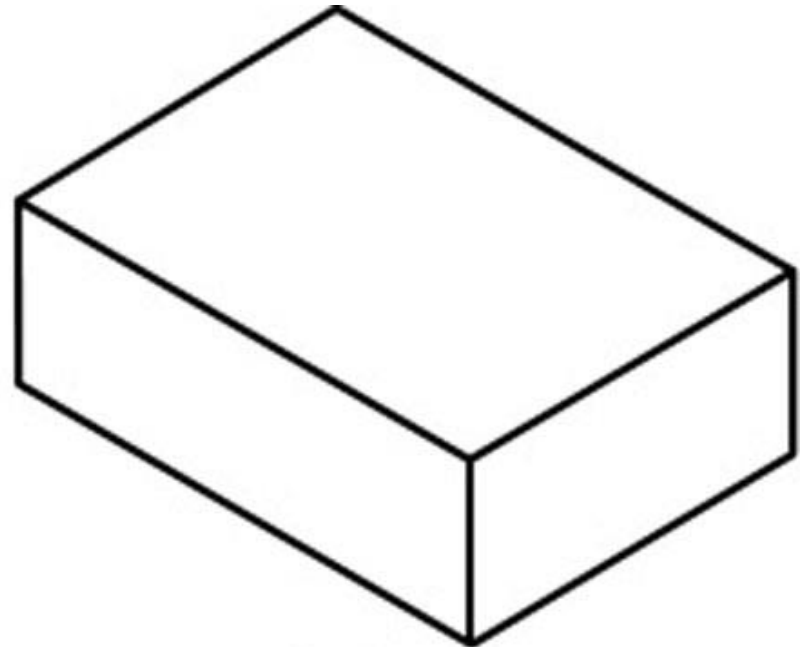


(C) Cube rotated forward 35° 16' (35.27°).

# Isometric projection - drawing

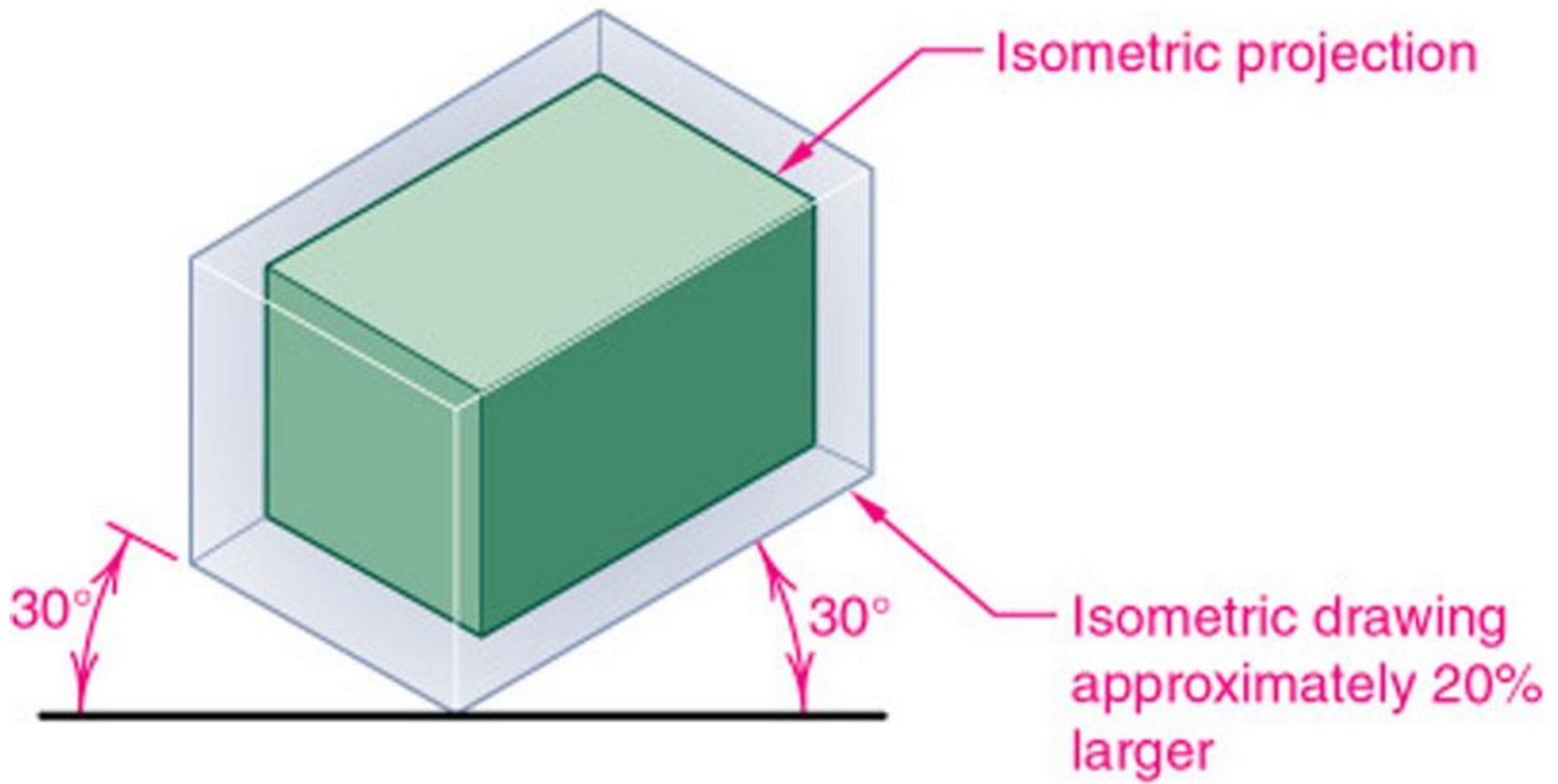


80% isometric  
projection

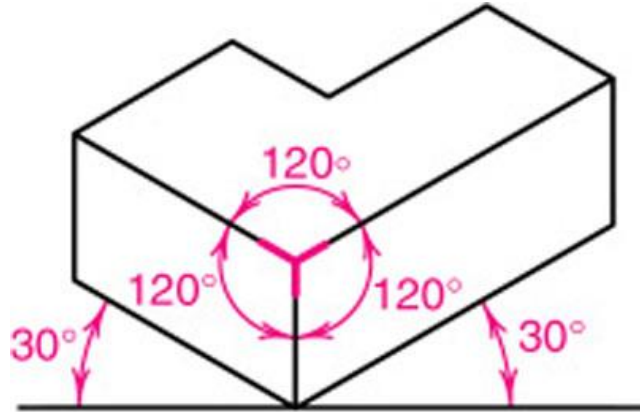


Full scale  
isometric drawing

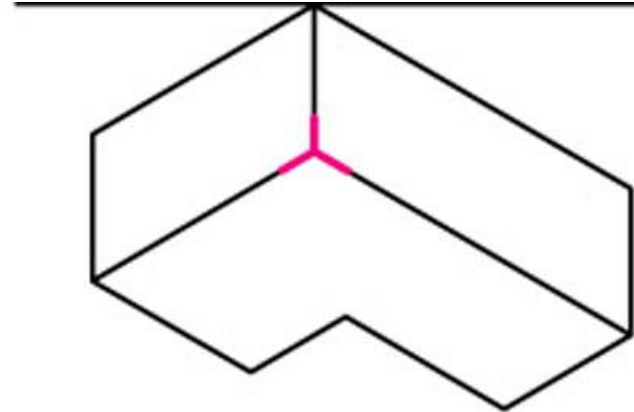
# Size



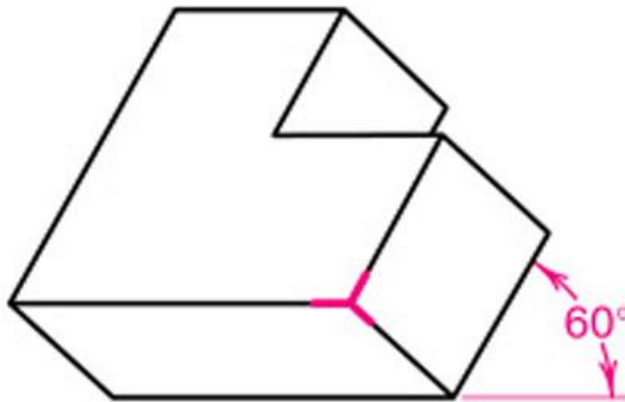
# Positions of isometric axes and their effect on the view created



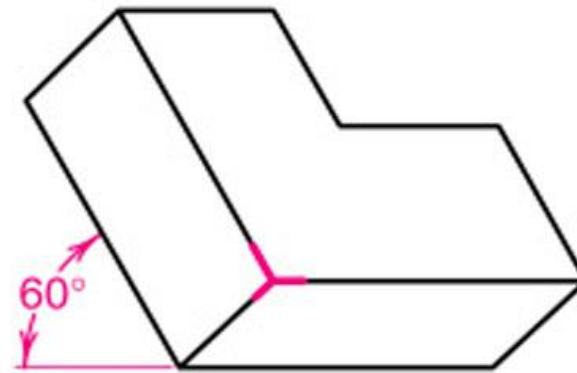
(A) Regular isometric



(B) Reversed axis isometric

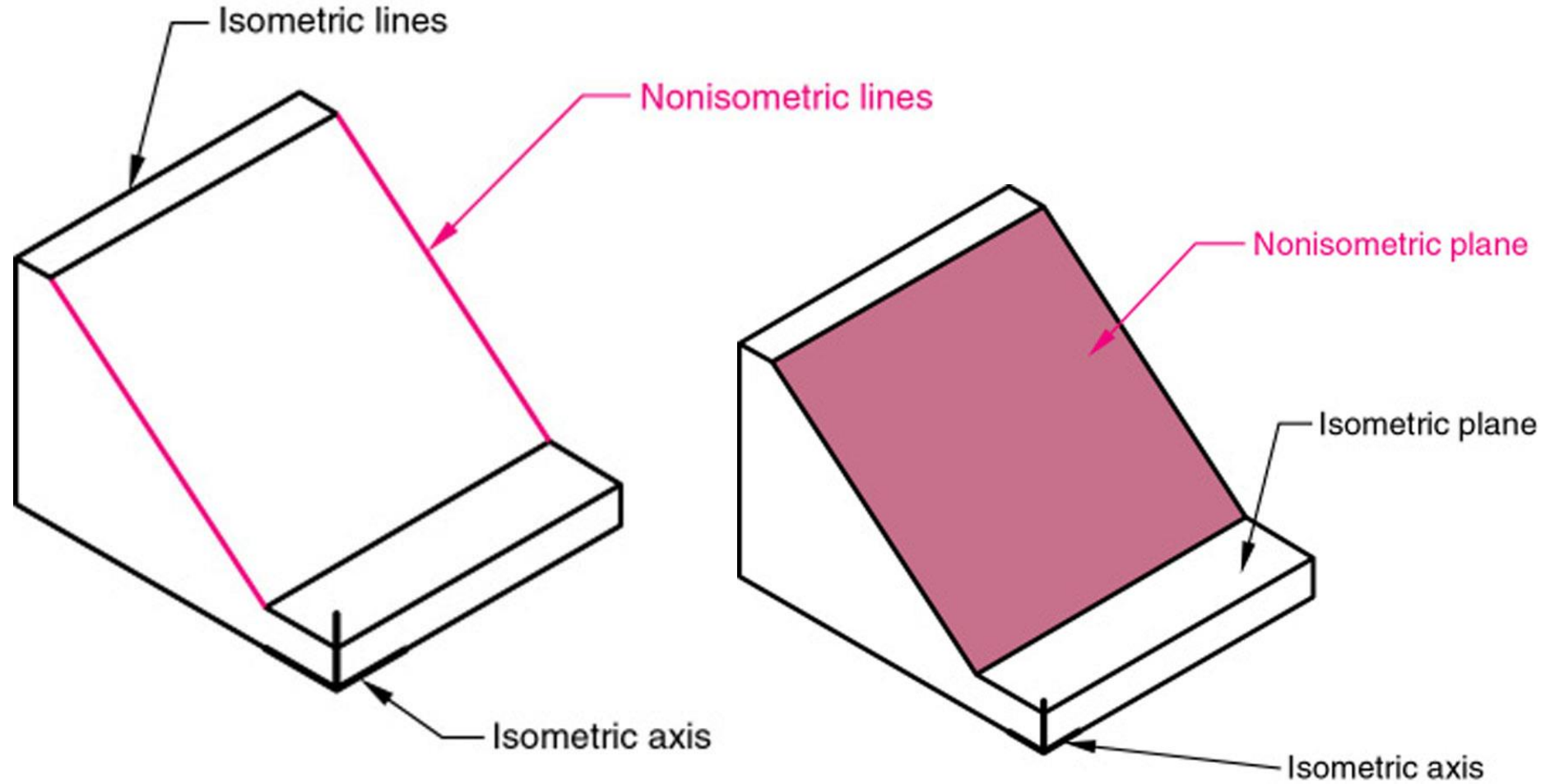


(C) Long axis isometric



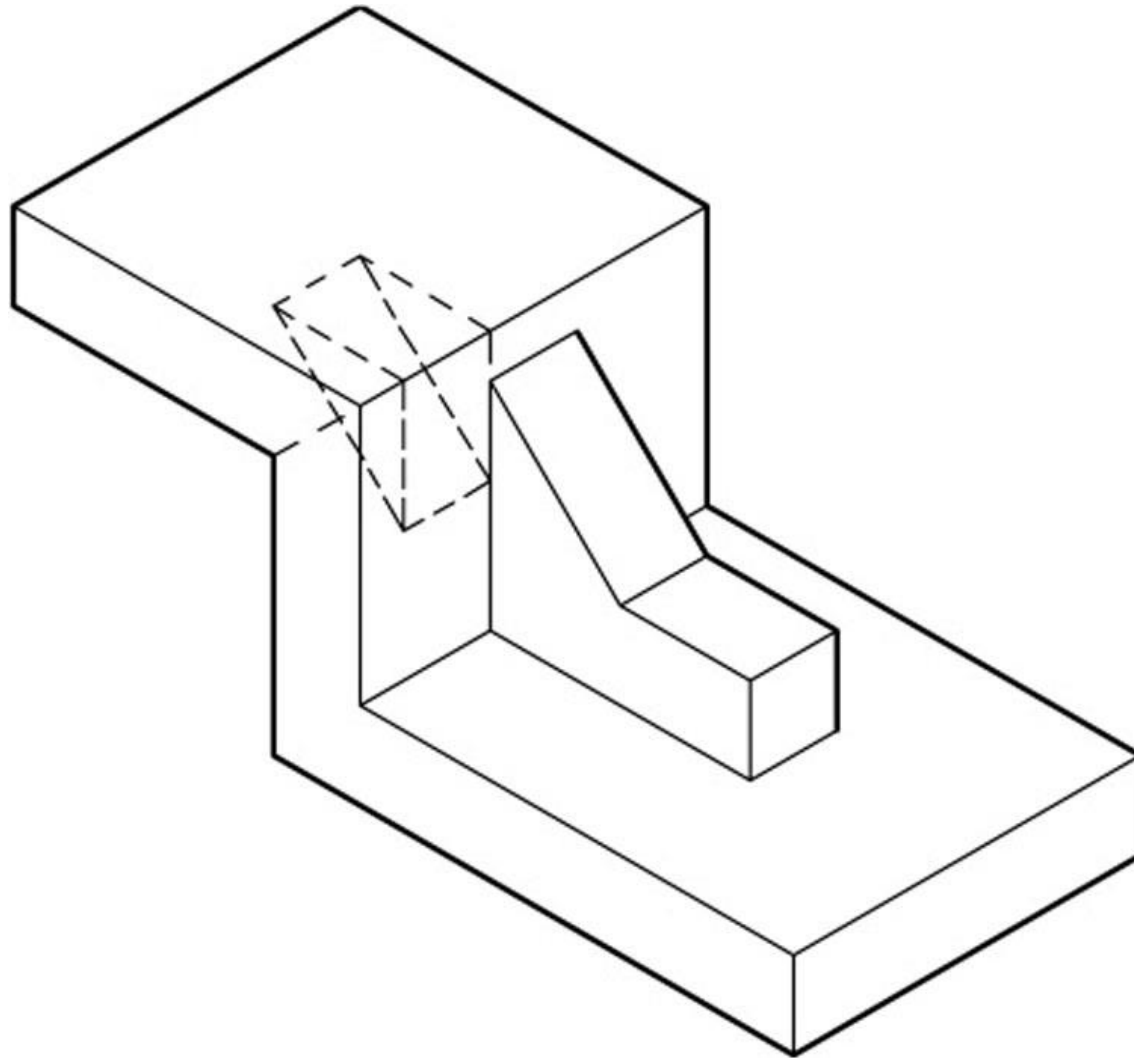
(D) Long axis isometric

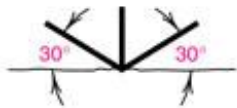
# Isometric and non-isometric lines



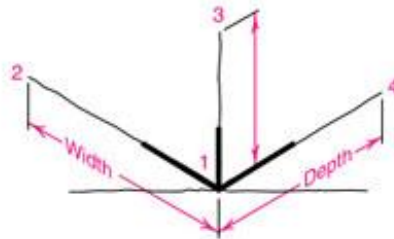
# An isometric drawing

## Hidden lines are usually not shown

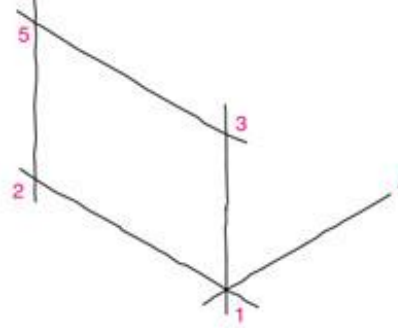




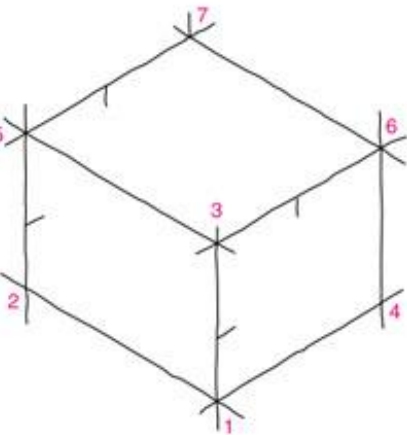
**Step 1**  
Isometric axis



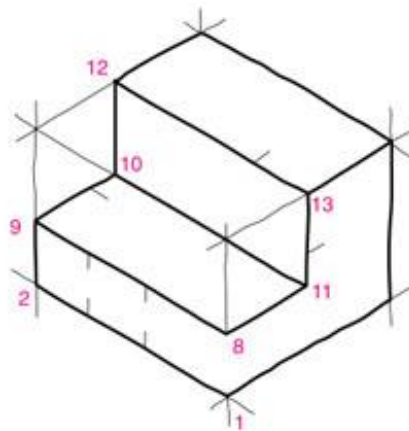
**Step 2**



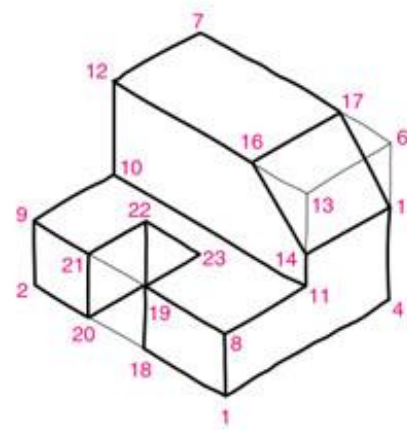
**Step 3**  
Front face



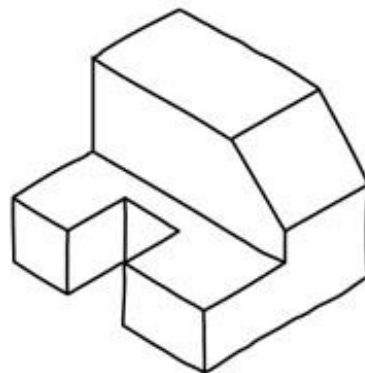
**Step 4**  
Top + side faces



**Step 5**



**Step 6**



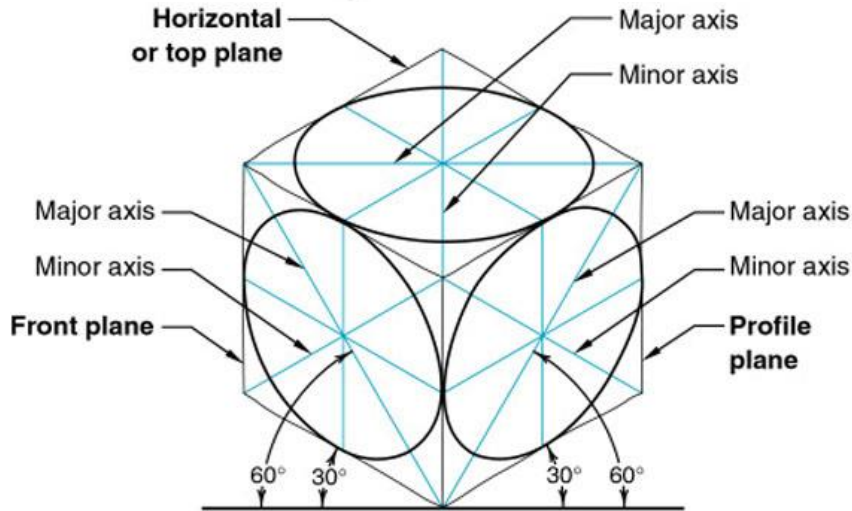
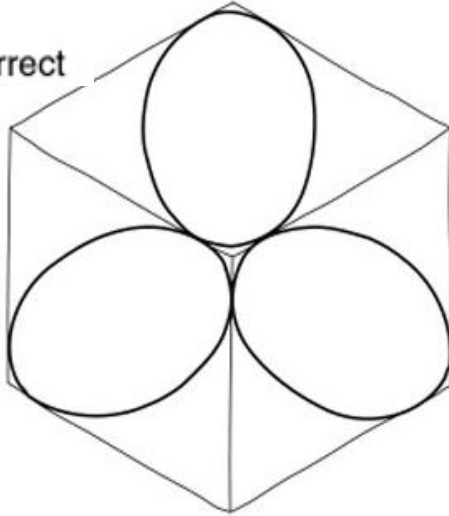
**Step 7**

**The basic steps used to create an isometric sketch of an object**

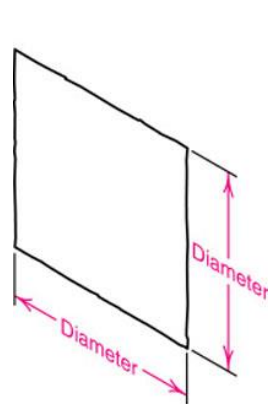


# Isometric representation of circles

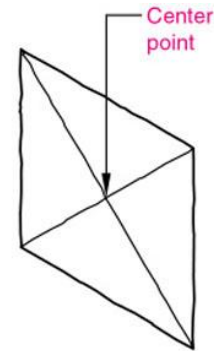
**(B) Incorrect**



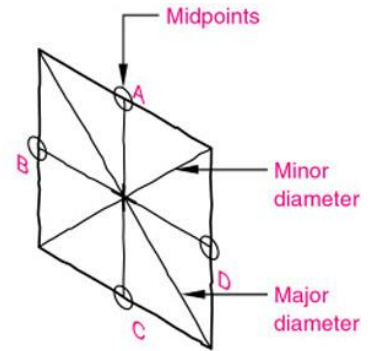
**(A) Correct**



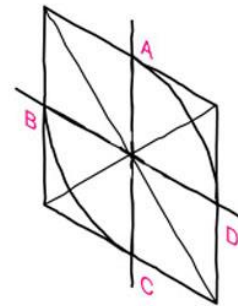
**Step 1**  
Isometric Square



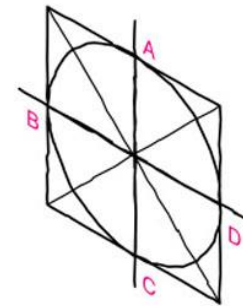
**Step 2**  
Sketch Diagonals



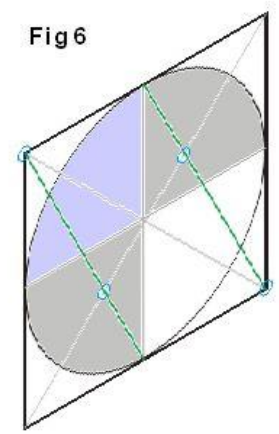
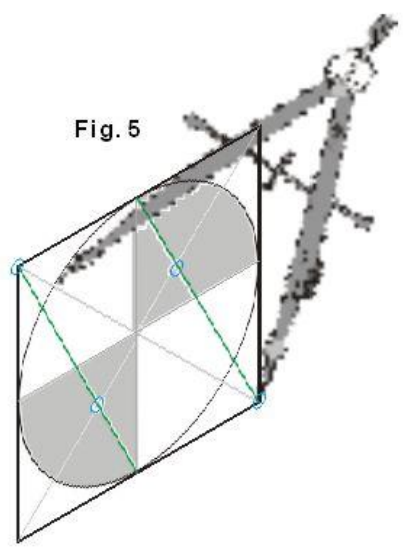
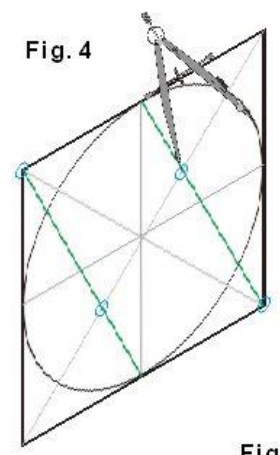
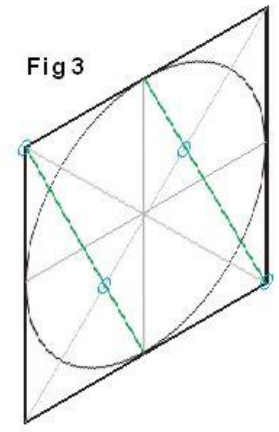
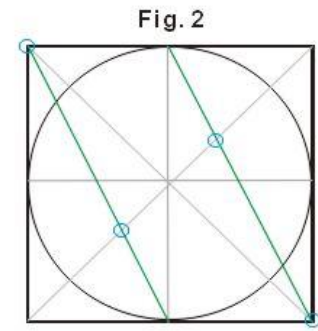
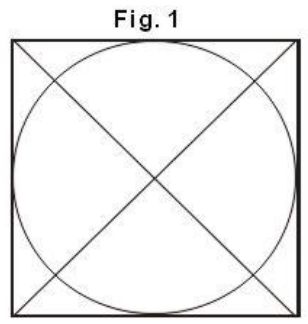
**Step 3**  
Locate Midpoints



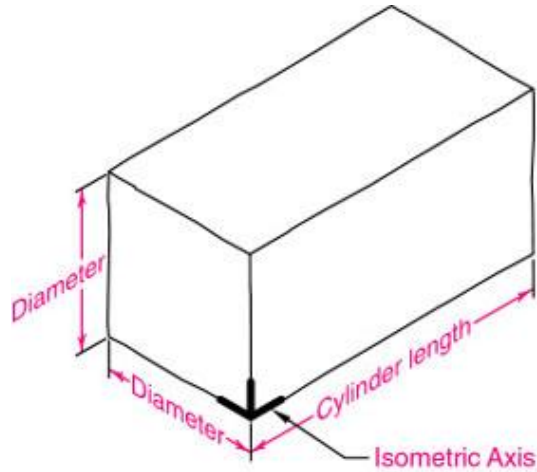
**Step 4**  
Sketch Arcs



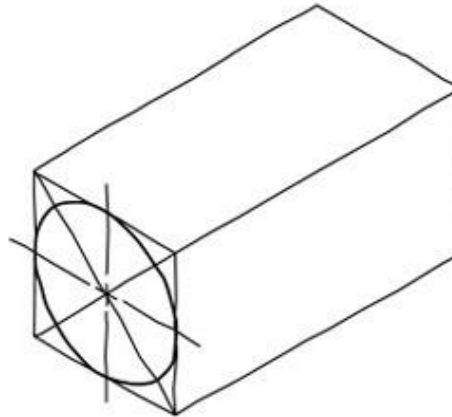
**Step 5**  
Finish the Ellipse



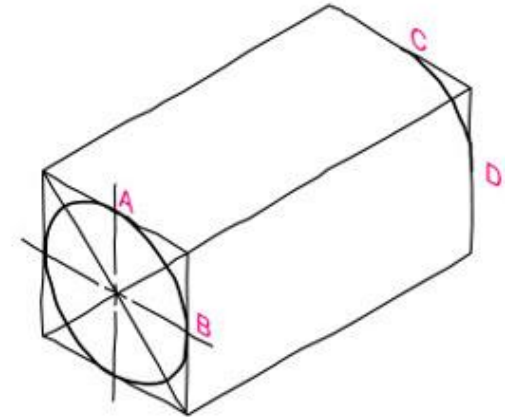
# CITY Steps used to construct a sketch of an isometric cylinder



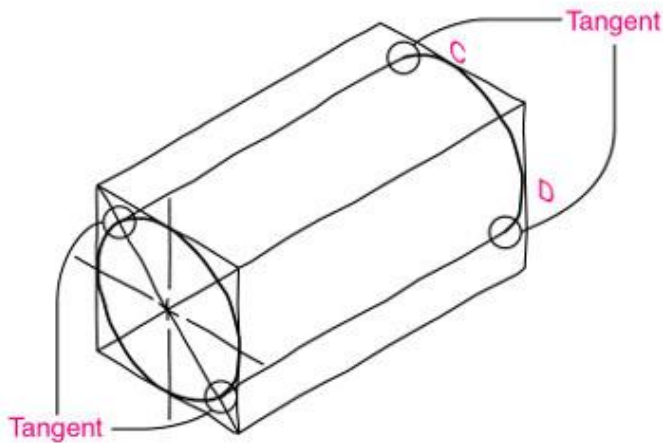
**Step 1**  
Sketch Bounding Box



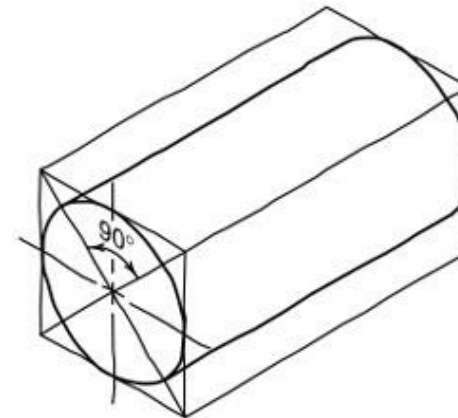
**Step 2**  
Sketch End of Cylinder



**Step 3**  
Sketch Far End of Cylinder

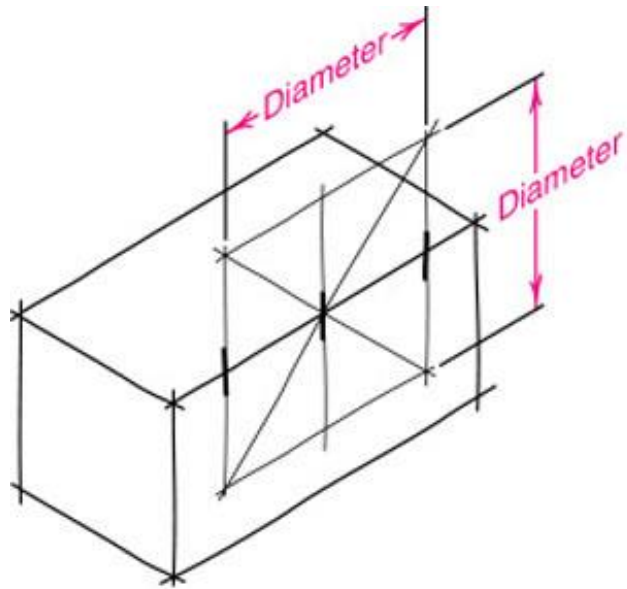


**Step 4**  
Sketch Sides of Cylinder

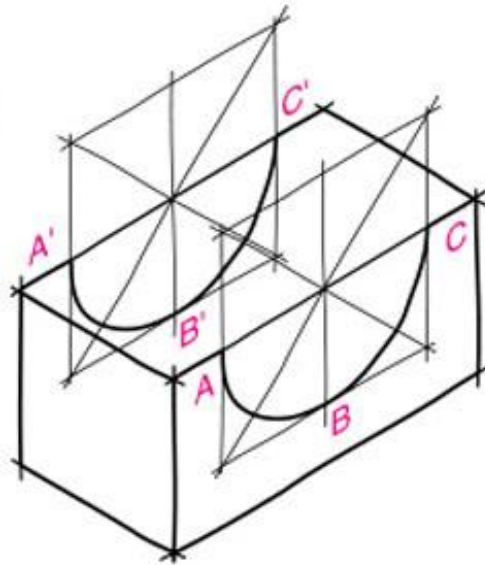


**Step 5**  
Complete the Sketch

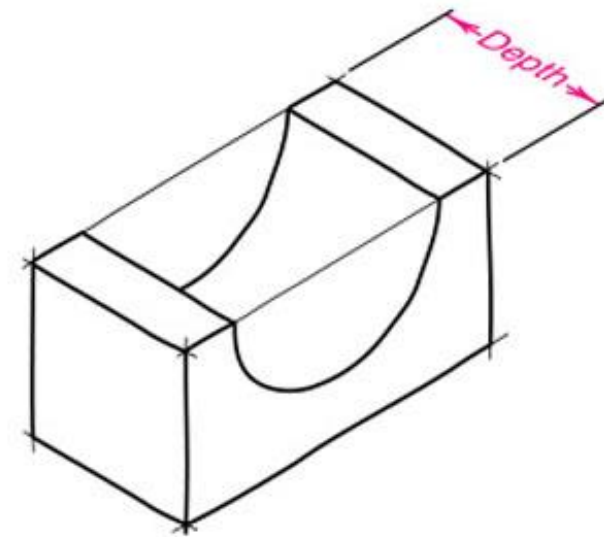
# Steps used to construct a sketch of a semi-ellipse



**Step 1**  
**Sketch Isometric Square**

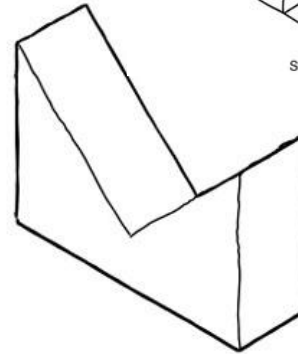
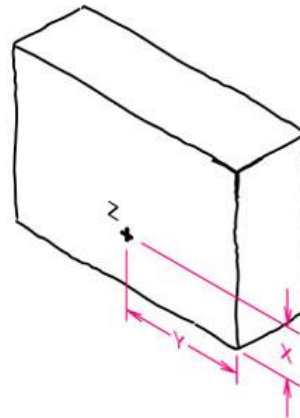
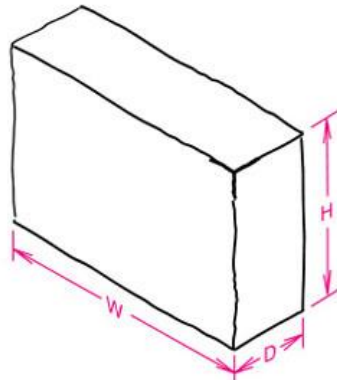
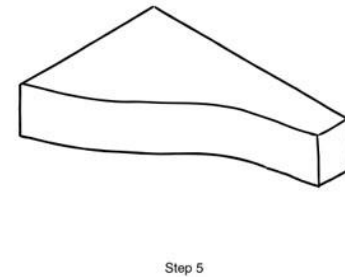
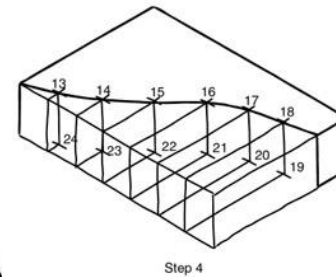
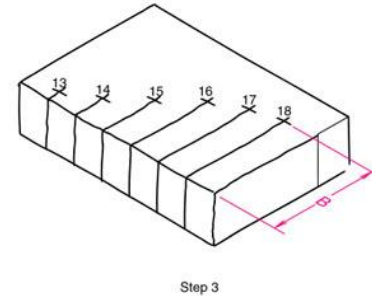
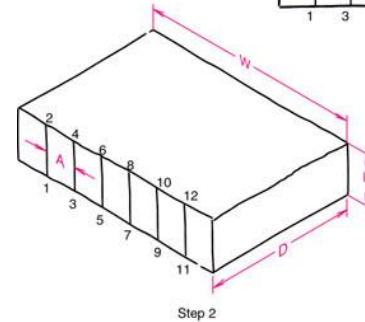
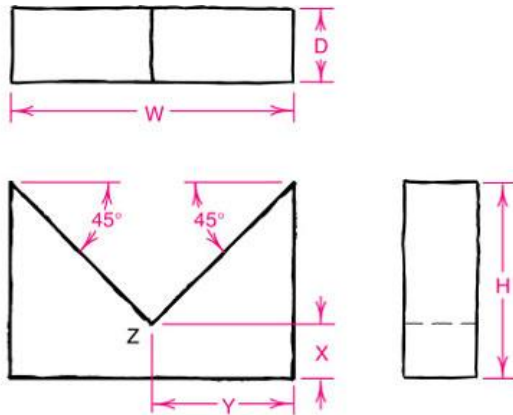
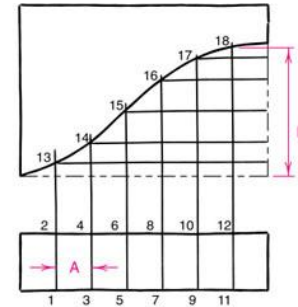


**Step 2**  
**Sketch Second Arc**



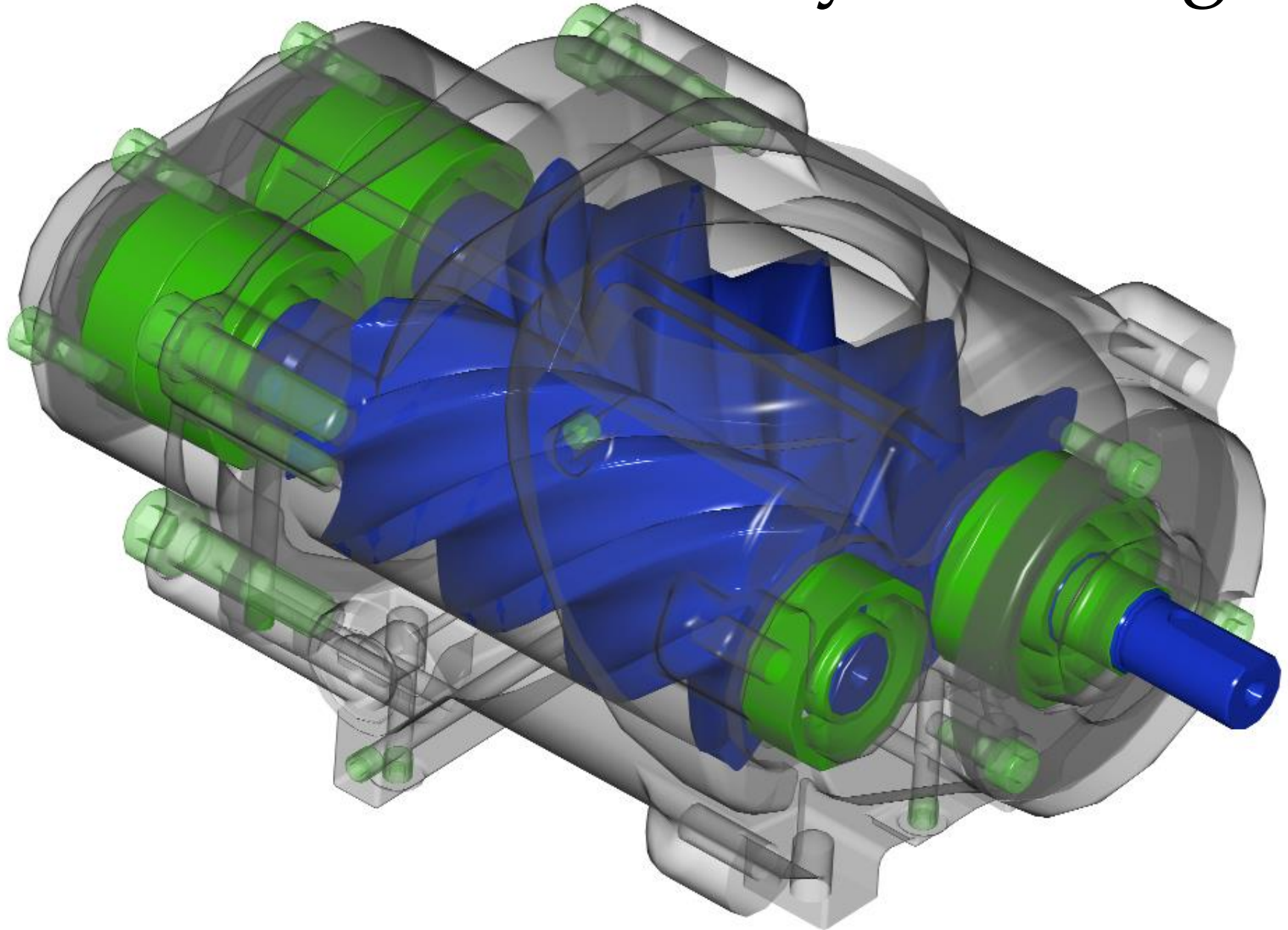
**Step 3**  
**Complete the Sketch**

# Angles and irregular shapes in an isometric sketch

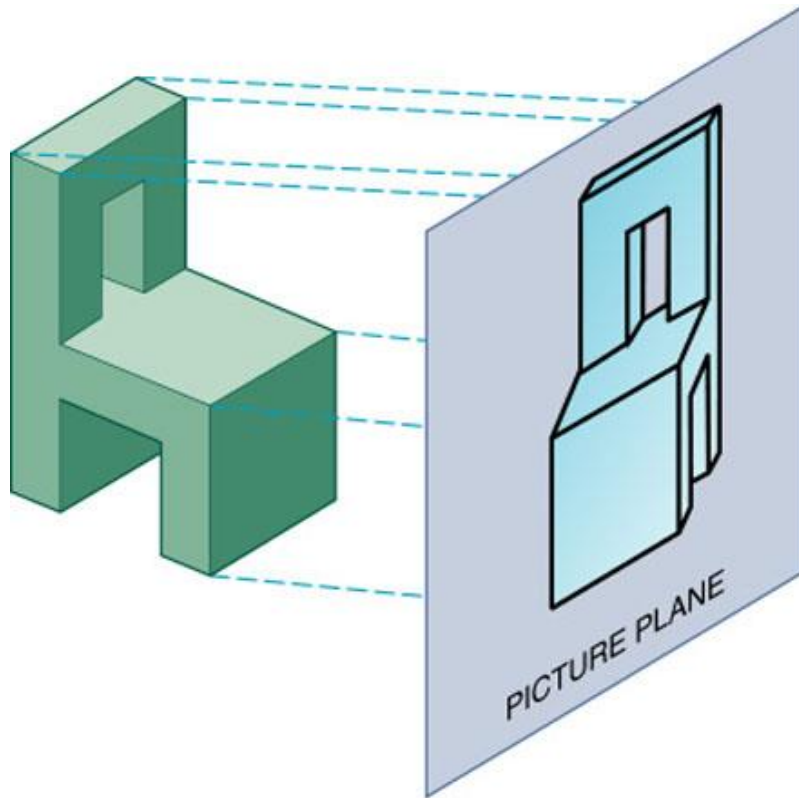




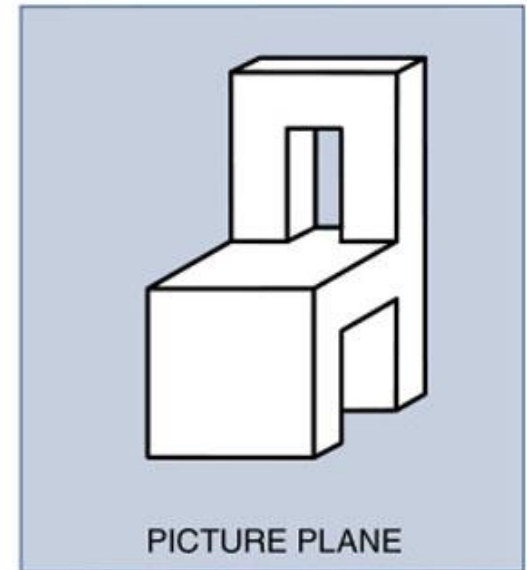
# Isometric Assembly Drawing



# Oblique projection



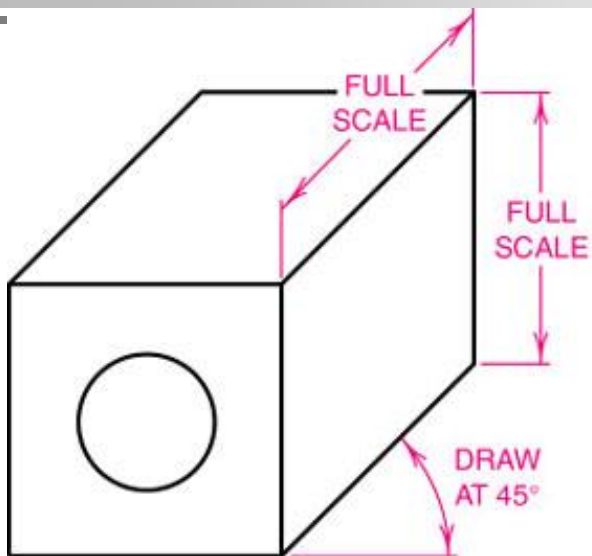
(A)



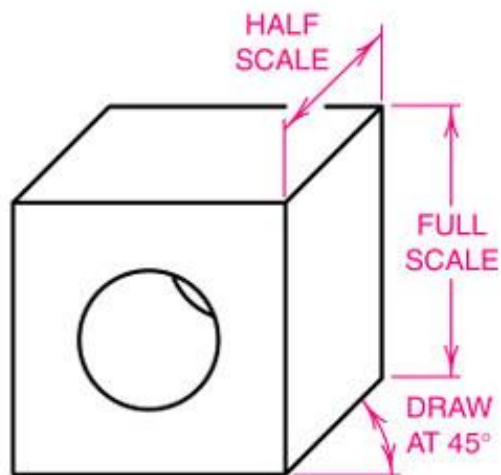
Oblique

(B)

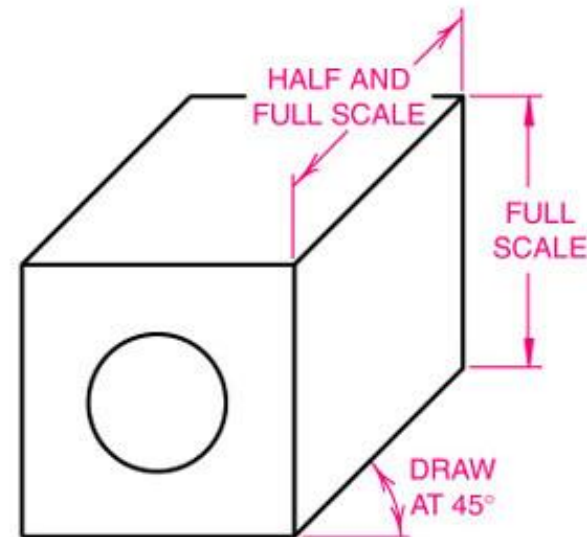
# Types and angles of oblique projections



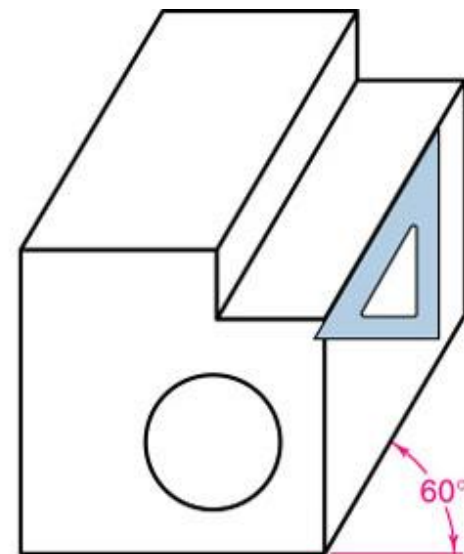
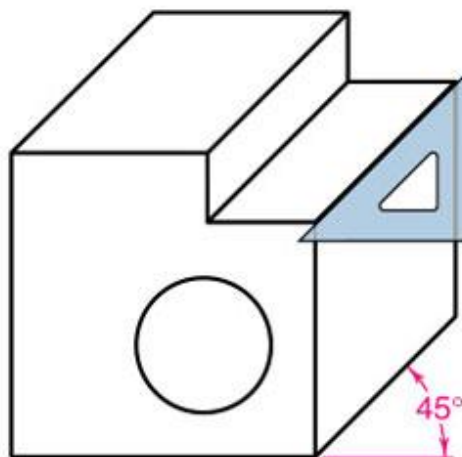
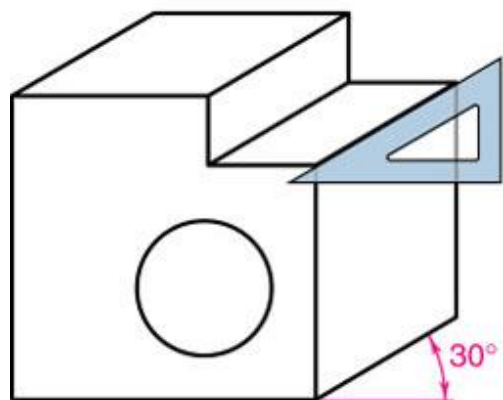
Cavalier oblique



Cabinet oblique

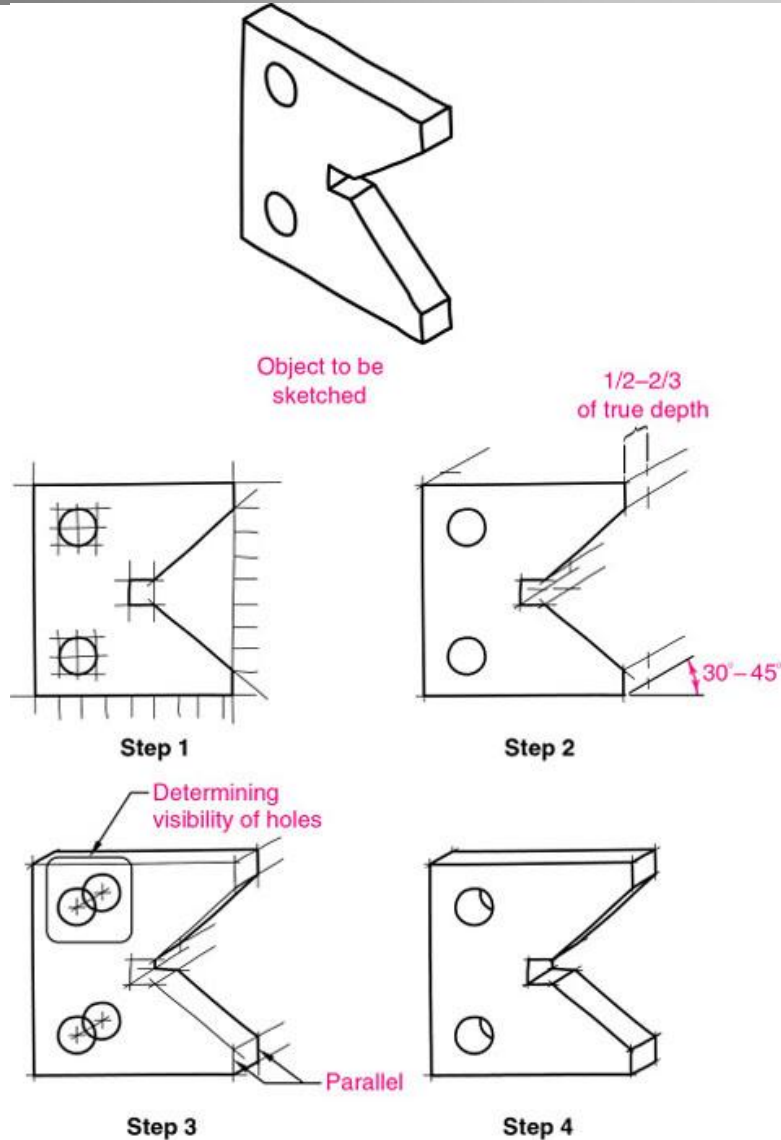


General oblique



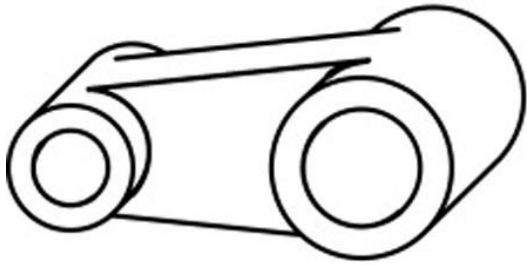


# How to generate oblique projection

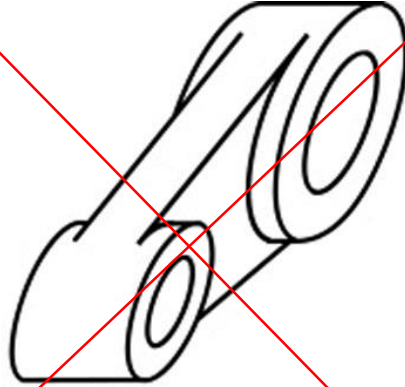


The construction of an oblique sketch is a multistep process that begins by boxing in the front view, adding details, and then boxing in the depth dimension

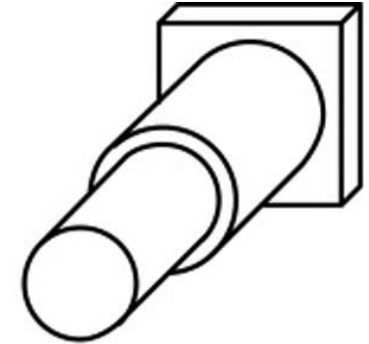
# Yes and No for oblique projections



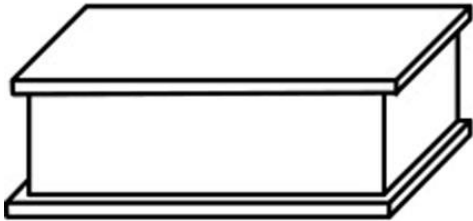
Parallel to frontal plane  
Yes  
(A)



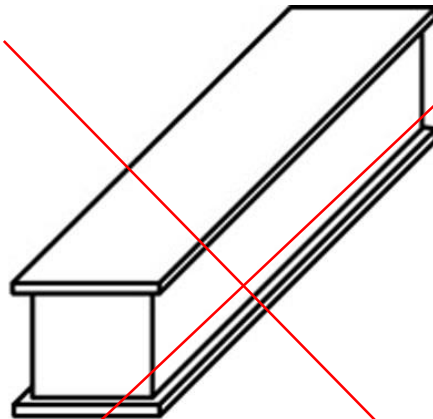
Not parallel to frontal plane  
No!  
(B)



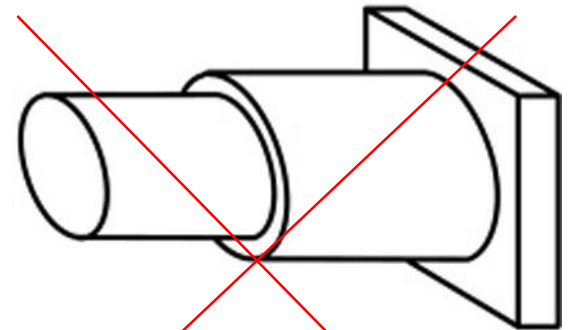
Rule #1-Parallel to  
frontal plane  
Yes  
(A)



Longest feature parallel  
to frontal plane  
Yes  
(A)

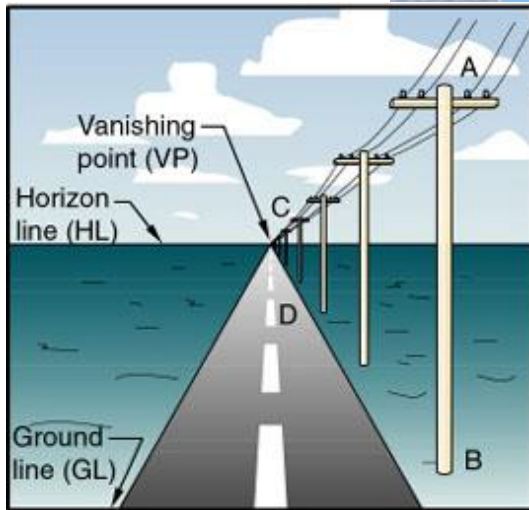


Longest feature perpendicular  
to frontal plane  
No!  
(B)

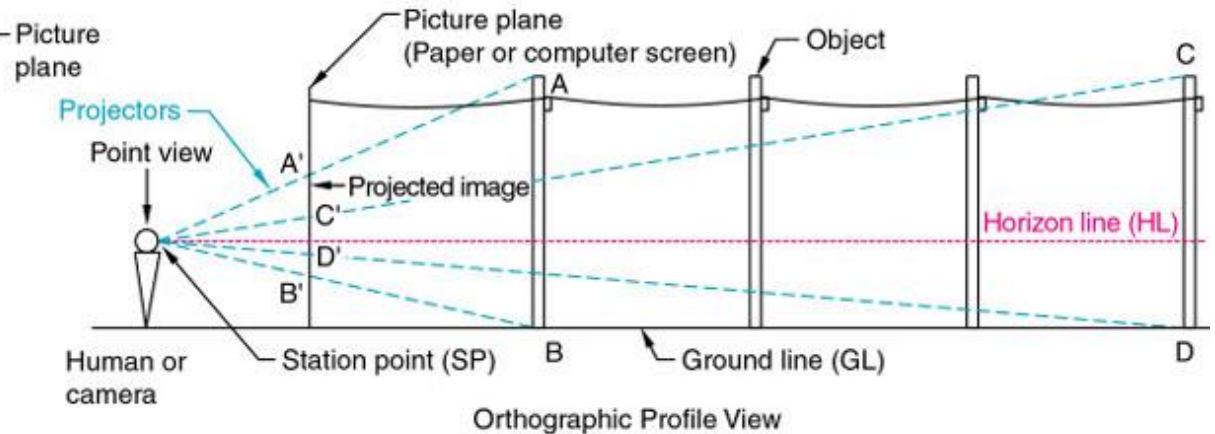


Rule #2-Longest feature parallel  
to frontal plane  
No!  
(B)

# Perspective projections

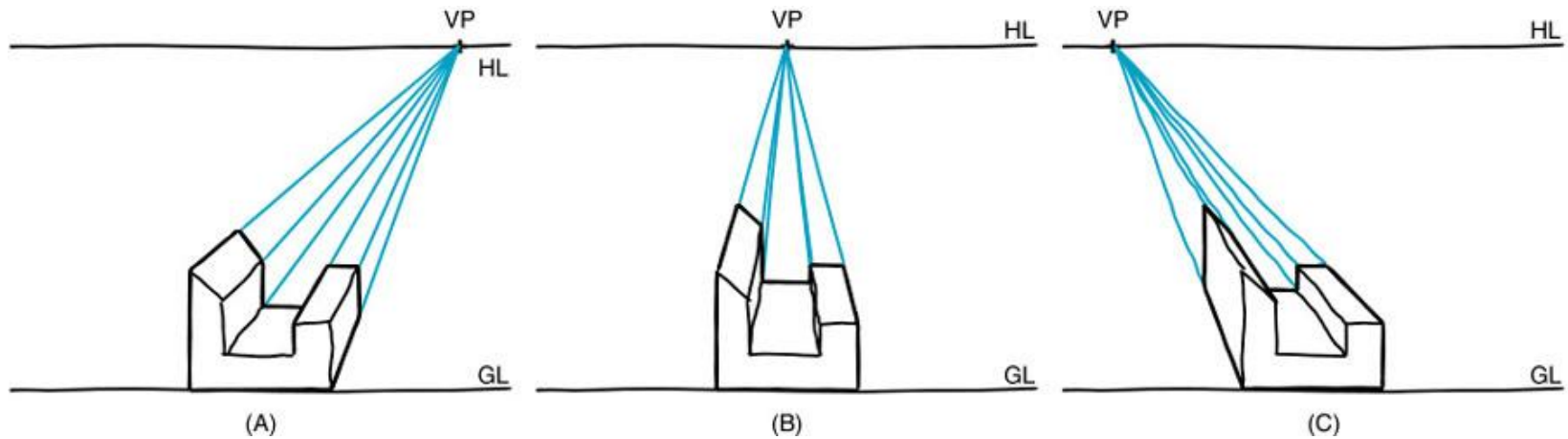


Perspective View

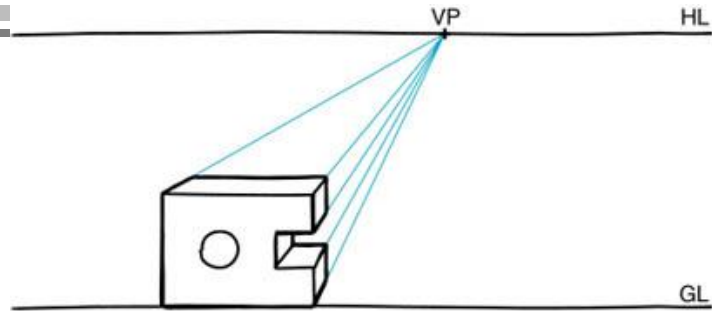


Orthographic Profile View

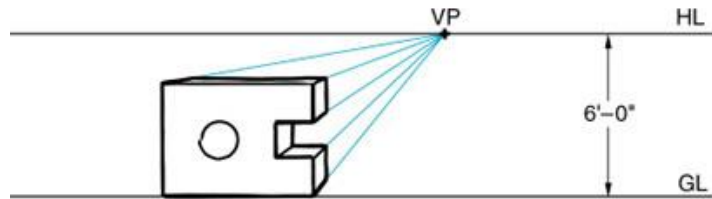
# Vanishing point



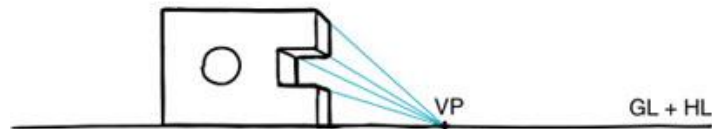
# Horizon line position



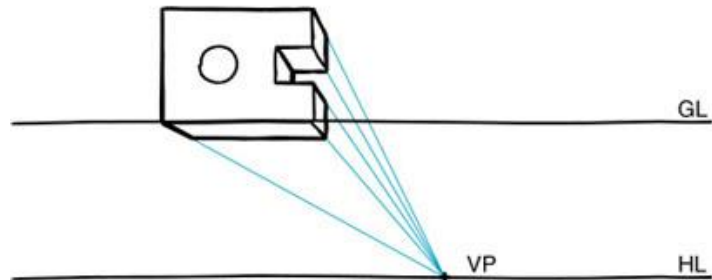
Bird's Eye View—Ground Line below Horizon Line



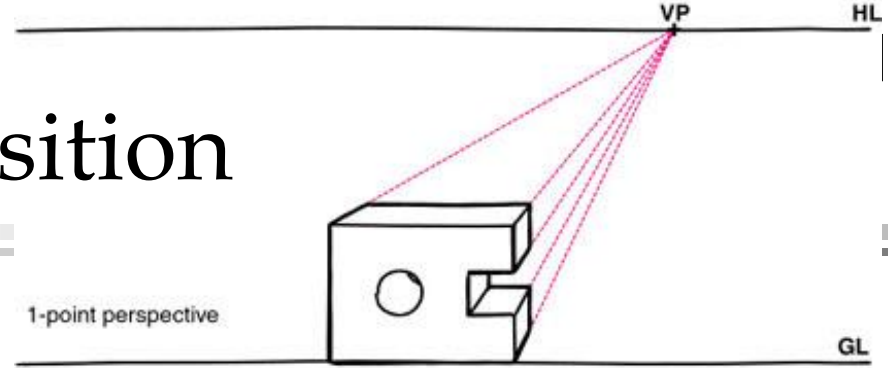
Human's Eye View—Ground Line 6' below Horizon



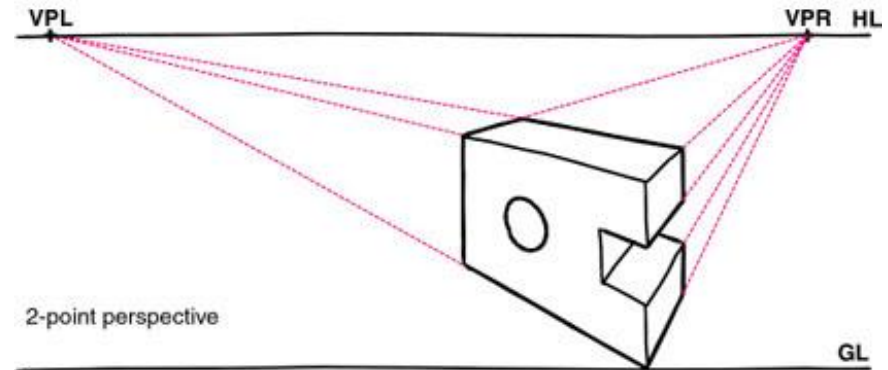
Ground's Eye View—Ground Line on the Same Level as the Horizon Line



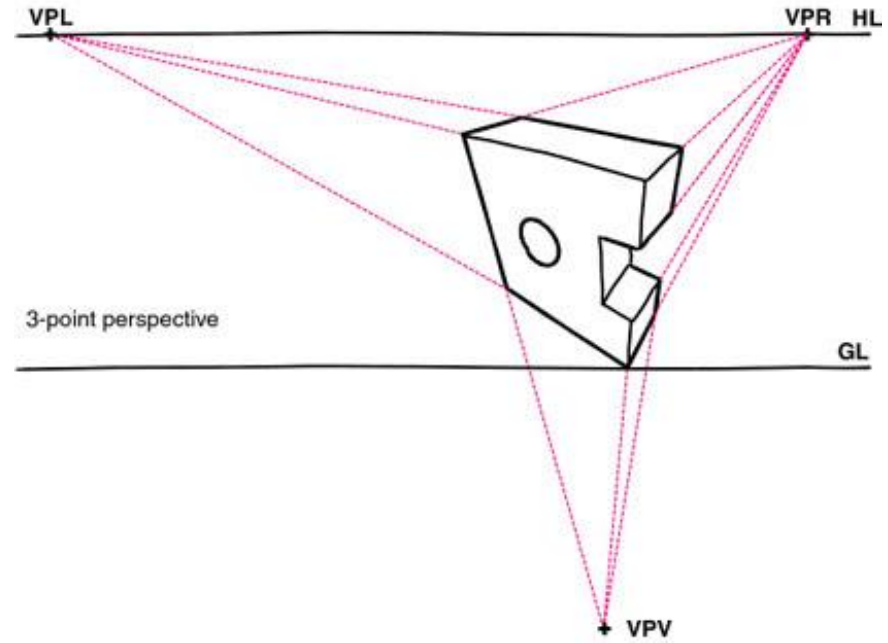
Worm's Eye View—Ground Line above the Horizon Line



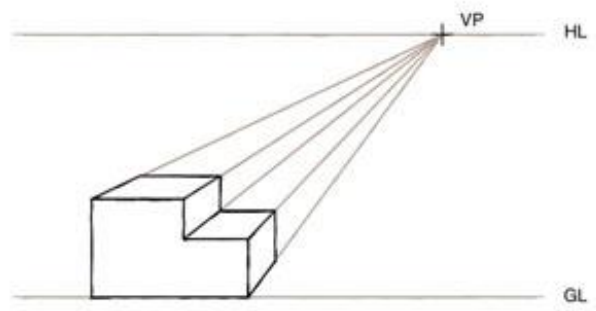
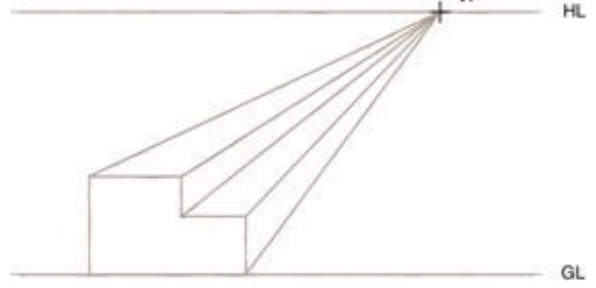
1-point perspective



2-point perspective



3-point perspective



How to create a one point perspective?

# Exercise DrE-2

