

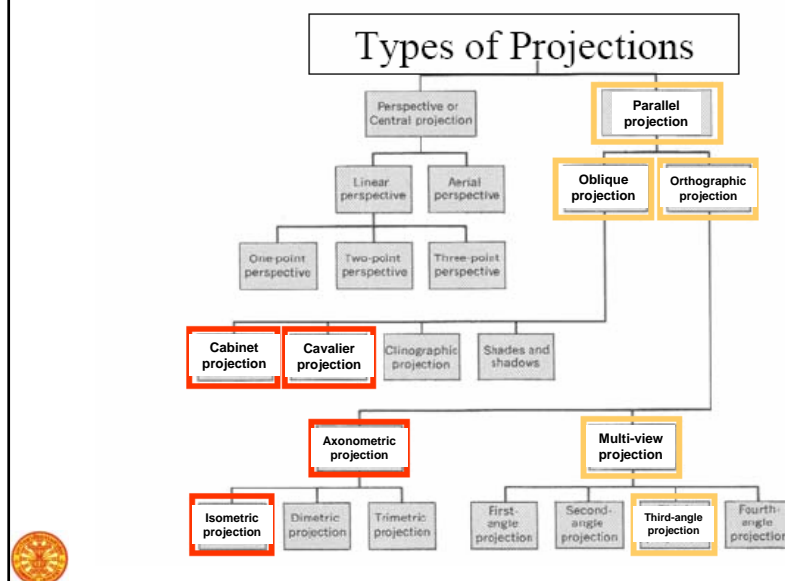


# ME111 ENGINEERING GRAPHICS

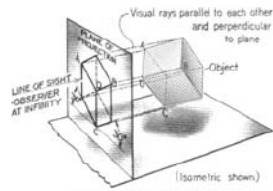
## SESSION 6: Pictorial Drawing

Dr.-Ing. Thira Jearsiripongkul  
FACULTY OF ENGINEERING, THAMMASAT UNIVERSITY

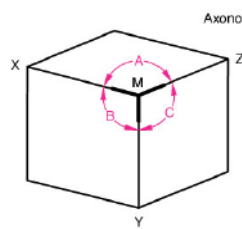
## SESSION 6: PICTORIAL DRAWING



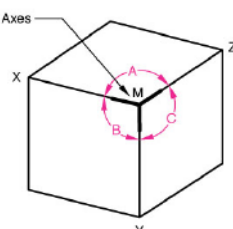
## Axonometric Projection



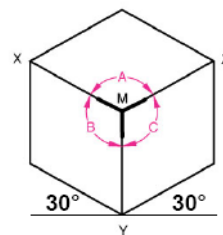
✓ Popular



**TRIMETRIC**  
No equal angles  
No equal corners



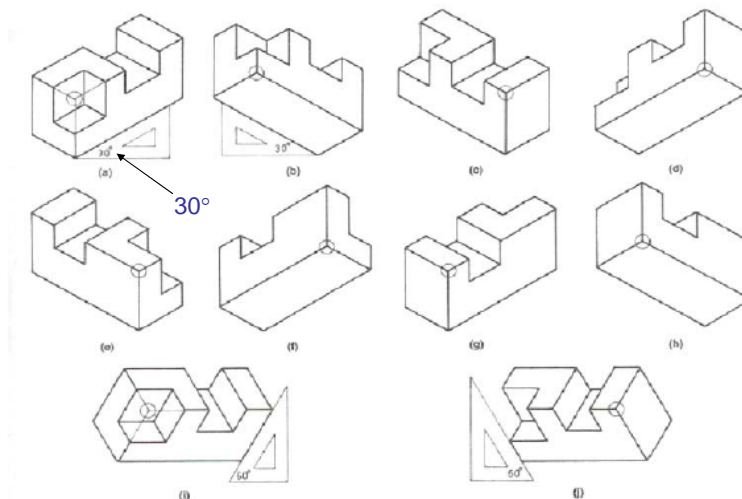
**DIMETRIC**  
Angles A and C are equal  
Corners MY and MX are equal in length



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



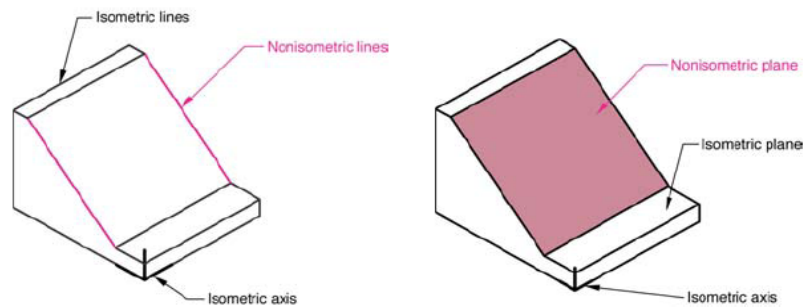
## Selection of isometric axes



• View (a) is preferred as it reveals more detail than the others.



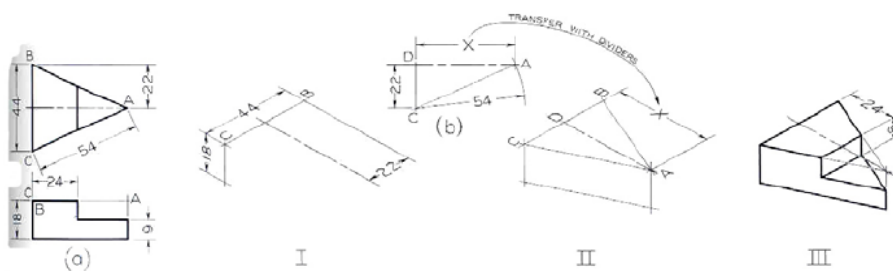
## Isometric axes, lines, and planes



- Lines that are on or parallel to the isometric axes are called isometric lines and are drawn true length in the isometric drawing.



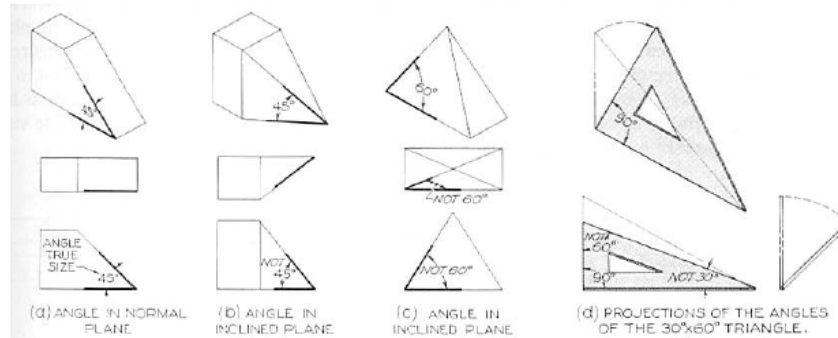
## Lines in isometric projection



- Lines AB & AC show true length in the top view, but they will not be true length in the isometric. Why?
- Such lines are drawn in the isometric by means of box construction and offset measurement.



## Projection of angles

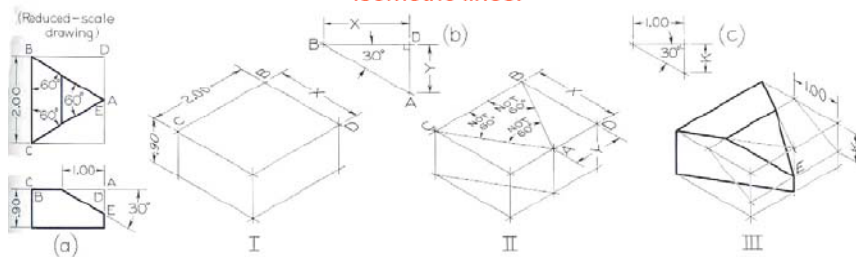


- Angles project true size only when the plane of angle is parallel to the plane of projection.



## Angles in isometric projection

Angular measurements must be converted to linear measurements along isometric lines.



1.1) Draw enclosing box from the given dimensions, except "X" (not given)

1.2) Find "X" from  $\triangle BDA$  at  $30^\circ$

1.3) Transfer "X" to the enclosing box

2.1) Locate point A by finding "Y" from  $\triangle BDA$

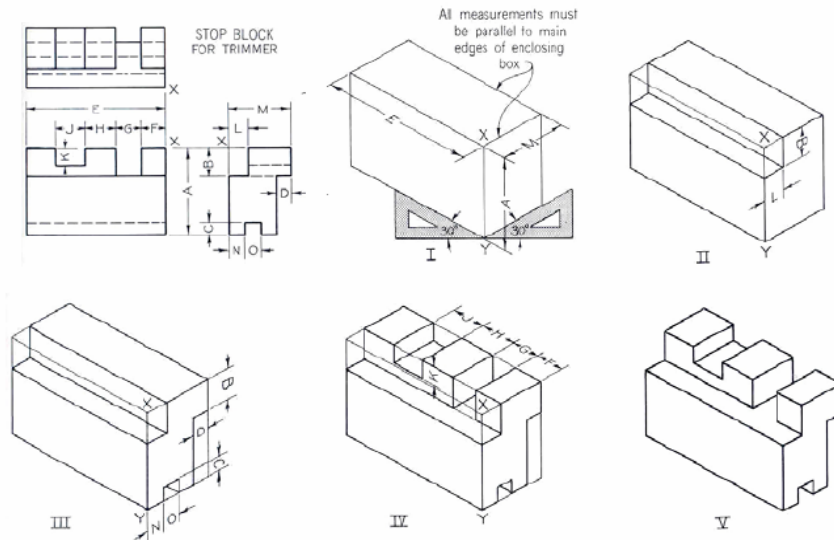
2.2) Transfer "Y" to the enclosing box

3.1) Locate point E by finding "K" from the triangle construction at (c)

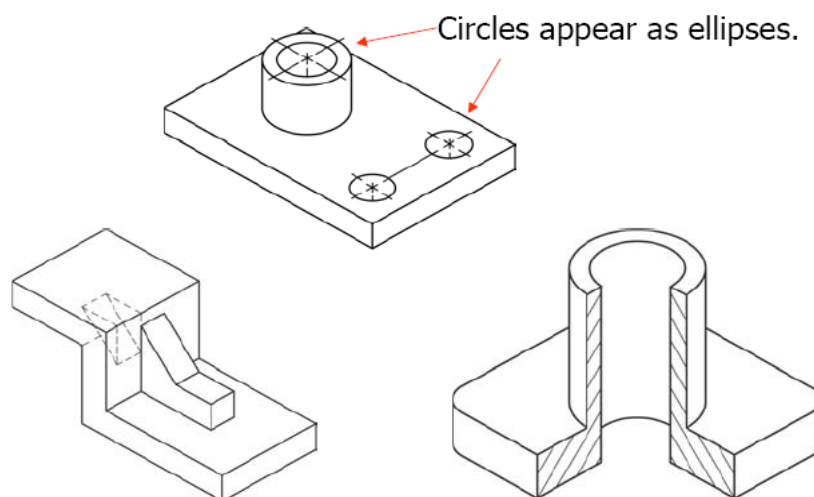
3.2) Transfer "K" to the enclosing box



## Steps to make an isometric drawing

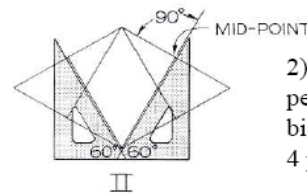
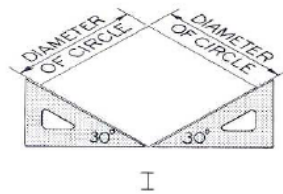


## Isometric projection



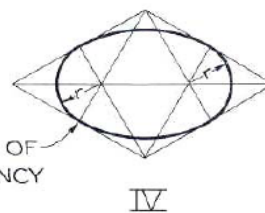
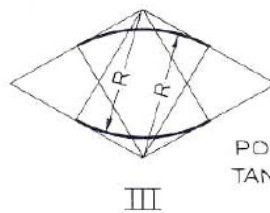
## How to draw an ellipse: Four-center ellipse

1) Draw the equilateral parallelogram



2) Draw the perpendicular bisectors → 4 points

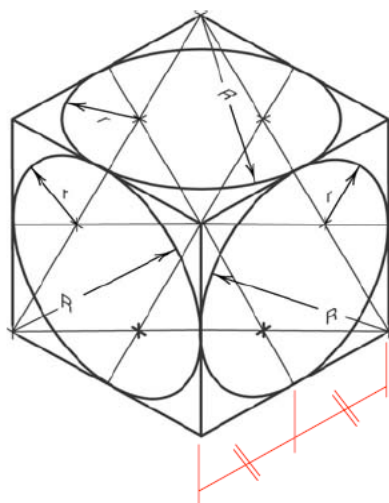
3) Draw two large arcs, with radius R



4) Draw two small arcs, with radius r



## Four-Center Ellipse

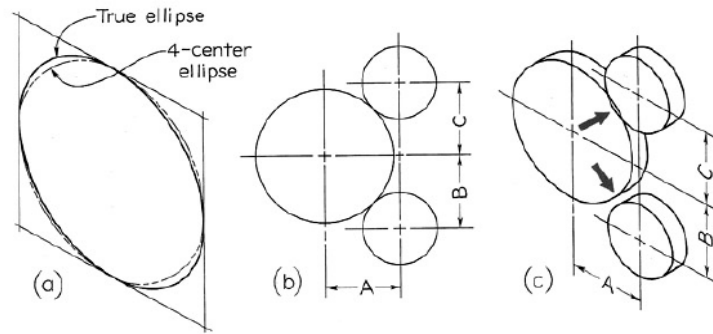


Approximate a circle or an arc in isometric view with an ellipse.

(not accurate)



## Error of Four-Center Ellipse



Four-center ellipse is shorter and fatter than the true one.

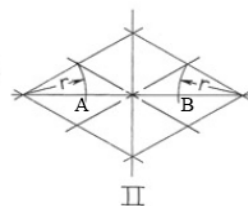
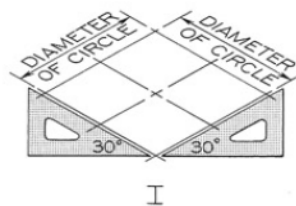
Error occurs between tangencies or intersection of four-center ellipses



## Orth Four-Center Ellipse

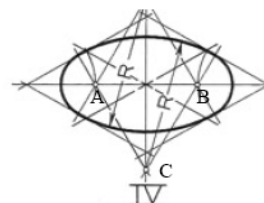
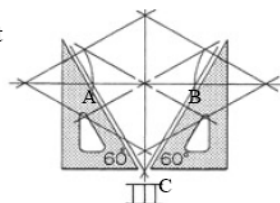
More accurate than the previous method (recommended).

1) Draw the equilateral parallelogram



2) Draw two diagonals & two small arcs, with radius  $r$ ,  $\rightarrow$  get A & B

3) Using  $60^\circ$  set square, draw lines passing through A & B

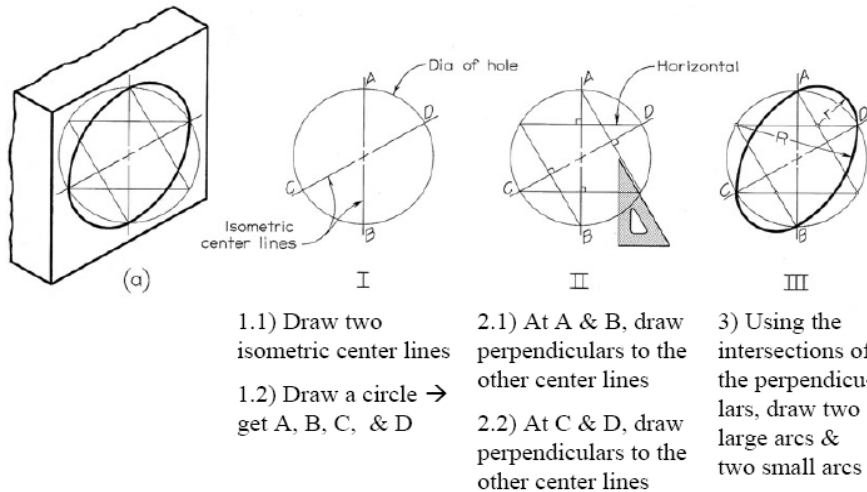


4) Draw two large arcs & two small arcs

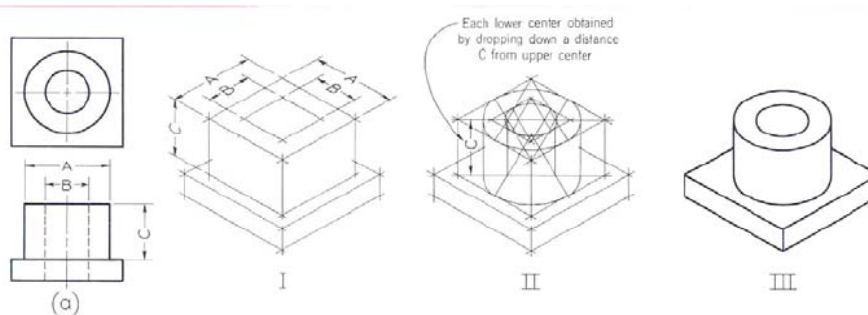


## Alternated Four-Center Ellipse

Same result (not accurate) as the four-center method but do not need parallelogram.



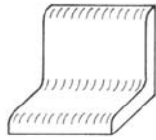
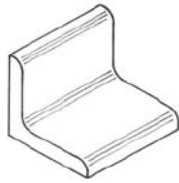
## Isometric projection with cylindrical shape



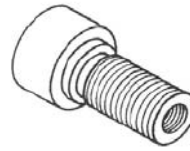
- The centers of the larger ellipse cannot be used for the smaller one.
- The centers of the lower ellipse are obtained by projecting the centers of the upper larger ellipse down by a distance "C".



## Representation of details on pictorial drawing



(a) Fillets & rounds

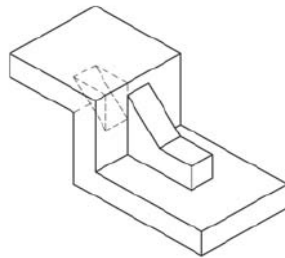


ISOMETRIC VIEW



OBLIQUE VIEW

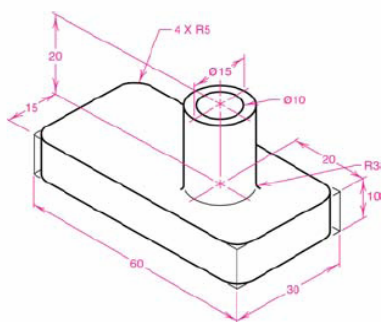
(b) Threads



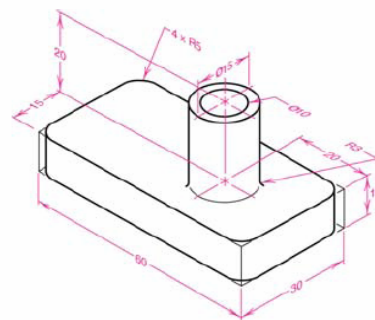
(c) Hidden lines are omitted unless they are needed to make the drawing clear.



## Dimensioning



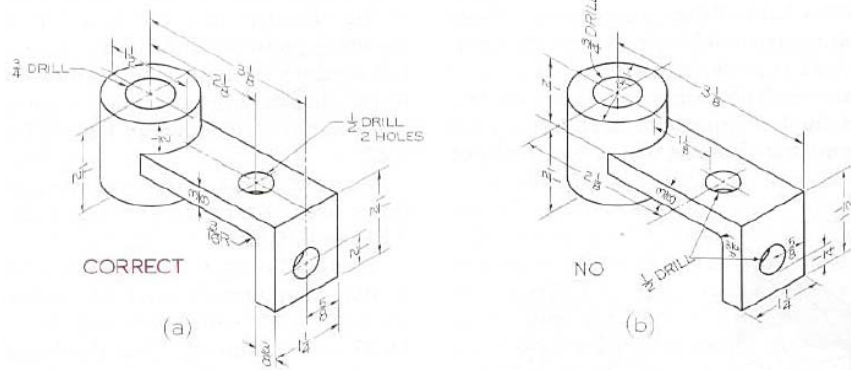
Unidirectional Dimensioning



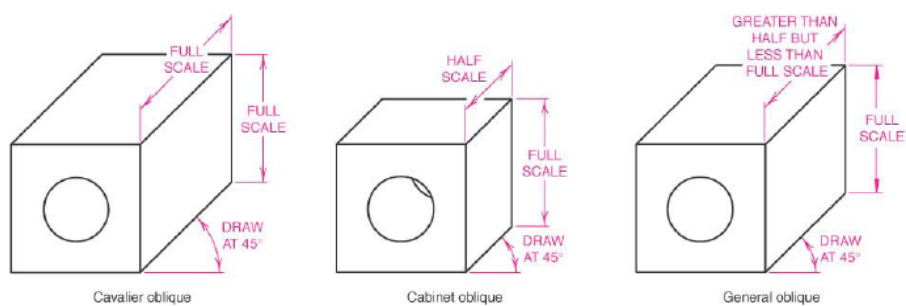
Aligned Dimensioning



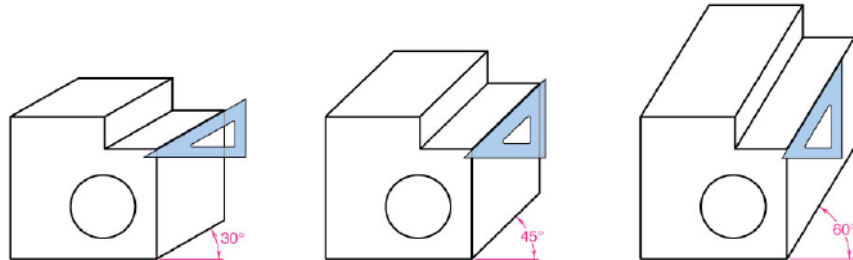
## Correct V.S. incorrect dimensioning



## Various types of Oblique Projection



## Receding Angles

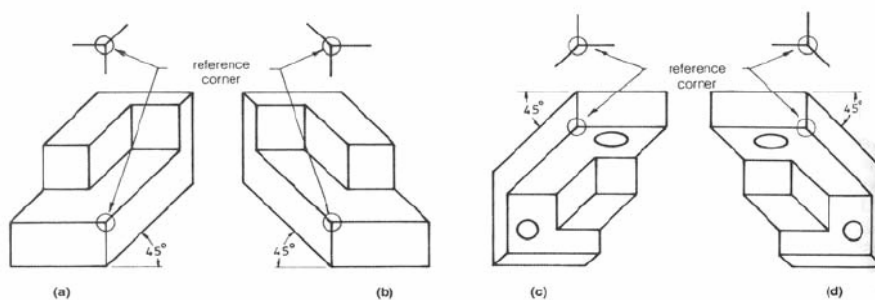


At a smaller receding angle, detail on the side of the object displays clearer



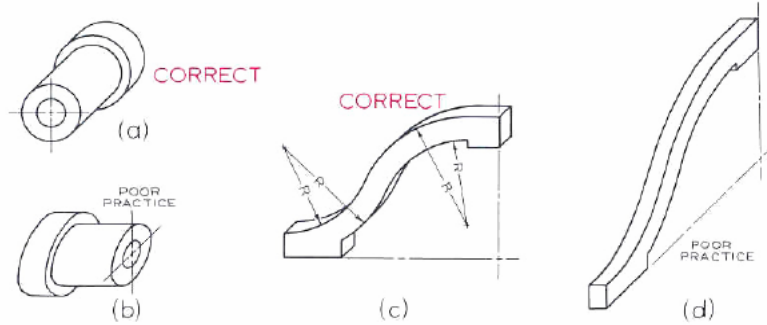
## Selection of oblique axes

Select the reference corner that give the most details



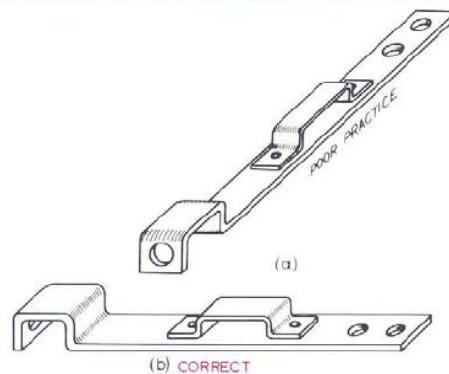
## Choices of position:Rule 1

Rule 1: Essential contours parallel to the plane of projection



## Choices of position:Rule 2

Rule 2: Long axis parallel to the plane of projection

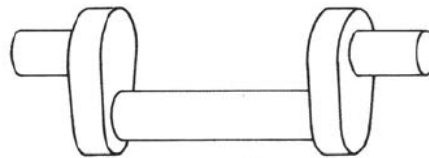


## Choices of position: Rule 3

Rule 3: When the above two rules conflict, Rule 1 has preference over Rule 2



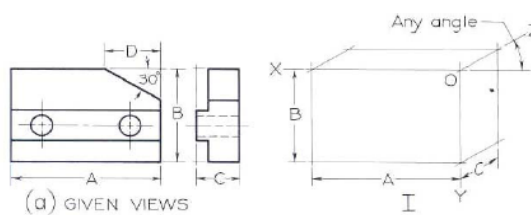
preferred  
(easier to draw as all curves compass drawn)



not preferred  
(difficult to draw as all curves are distorted)

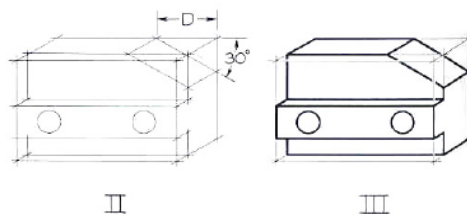


## Steps to make an oblique drawing-Box construction



1) Draw the oblique axes, enclosing box

2) Block in the various shapes in detail



3) Heavy in all final lines

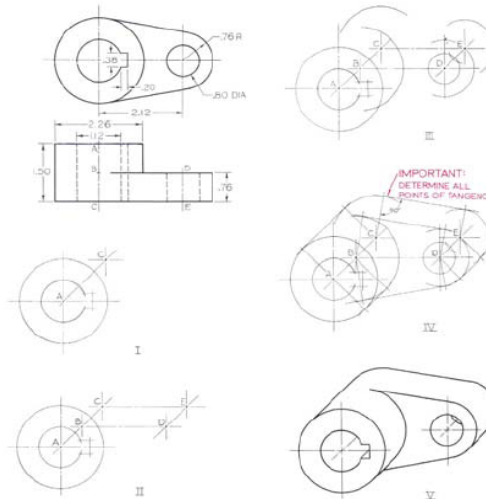


## Steps to make an oblique drawing-Skeleton construction

For cylindrical shape, oblique axes should be selected on the center line.

1) Circles appear as circles and are parallel to the plane of projection.

2) Transfer to other circles along the receding axis.

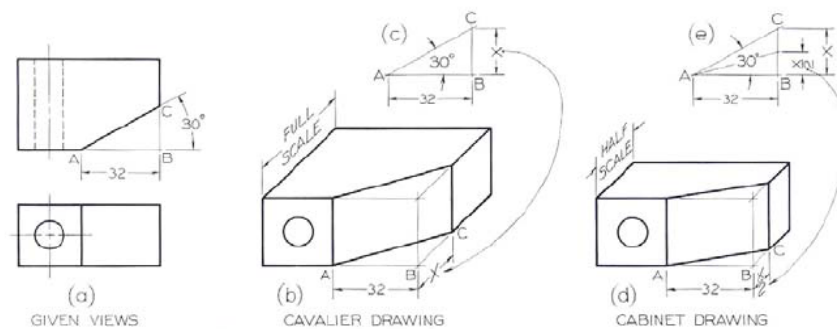


3) Draw arc tangent to all points of tangency.

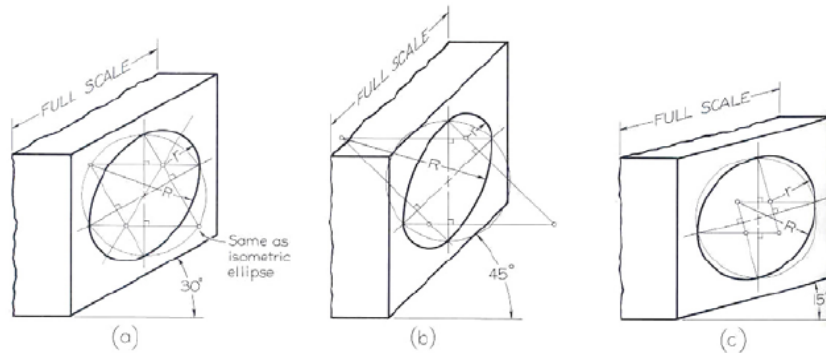
4) Heavy in the final detail.



## Angles in oblique projection



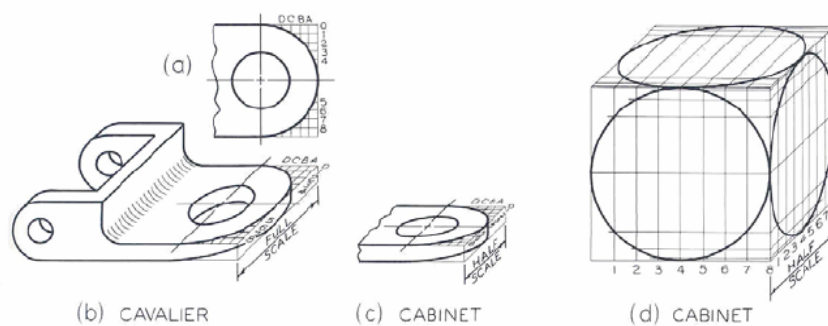
## Alternate four-center ellipse in oblique projection



- This method can be used only in cavalier drawing.
- Same procedure as given in the isometric drawing.



## Offset measurement ellipse in oblique projection



- This method can be used only in both cavalier & cabinet drawings.
- For the cabinet drawing, the offset measurement parallel to the receding axis must be drawn to the same reduced scale.



## Assignment (must submit before 12:30)

Exercise: Make an isometric drawing of the *CI Suspension Bracket* on an A3 sheet. Provide dimensions and complete title block. Omit the hidden lines.

