CE 1100
CIVIL ENGINEERING DRAWING - I

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Drawing

- Describing any object/ information diagrammatically

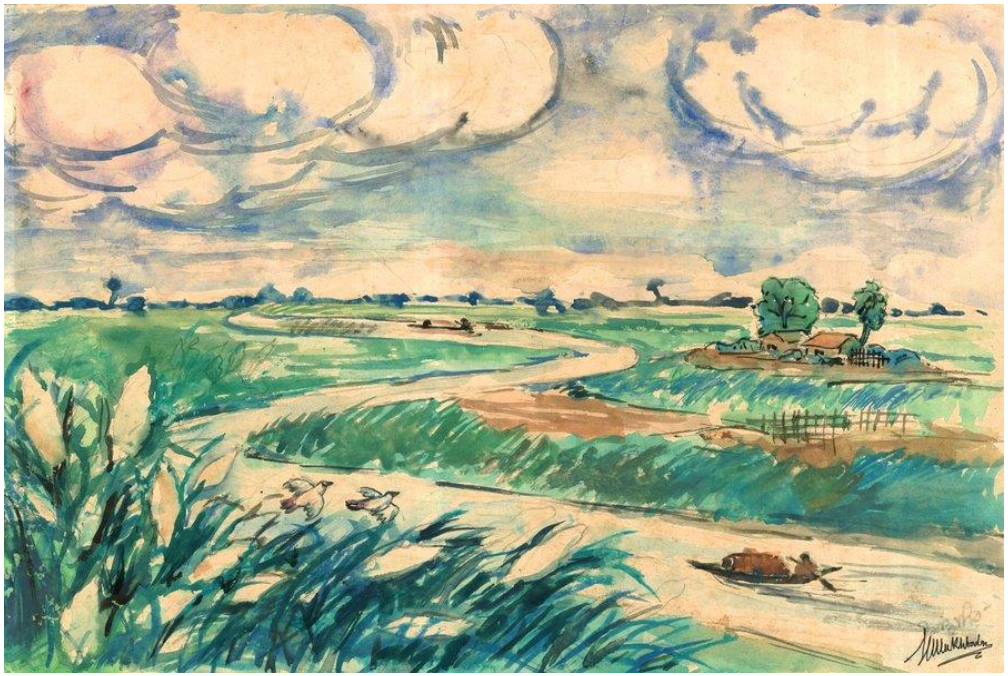
- A **Graphical representation** of an idea, a concept or an entity which actually or potentially exists in life.

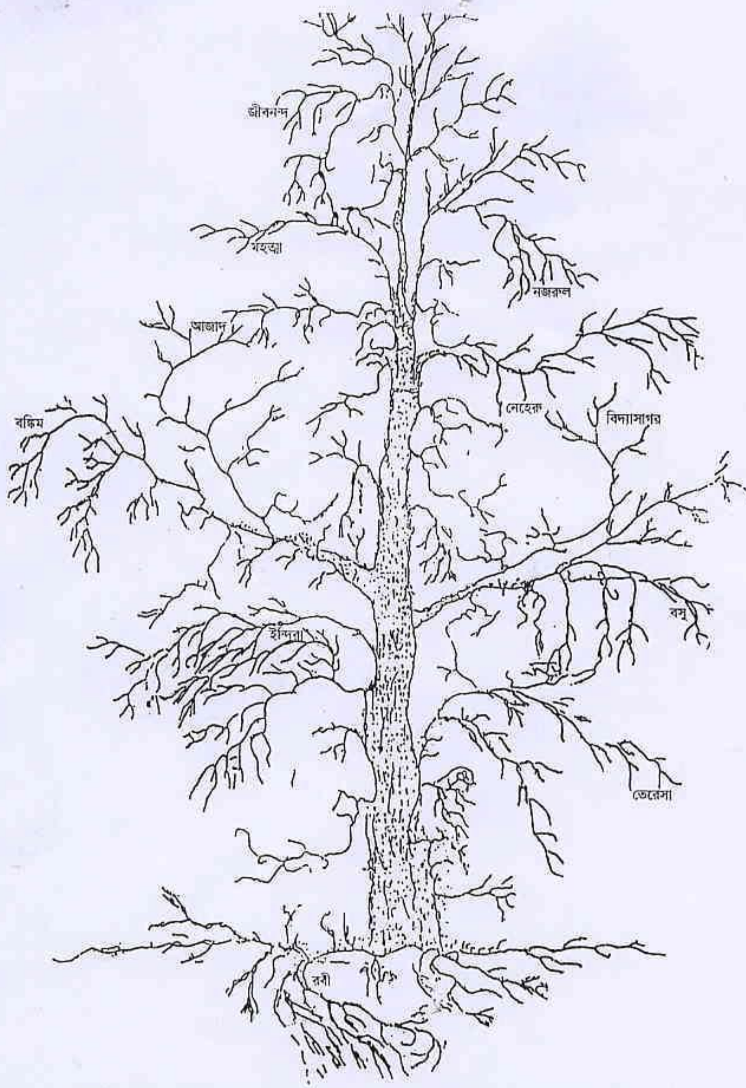
Types of Drawings

- Artistic Drawings
- Technical/Engineering Drawings

Artistic Drawing

- Used to express the feelings, beliefs, philosophies or abstract ideas of the **artist.**
- **Sometimes difficult to understand** what is being communicated by a work of art.

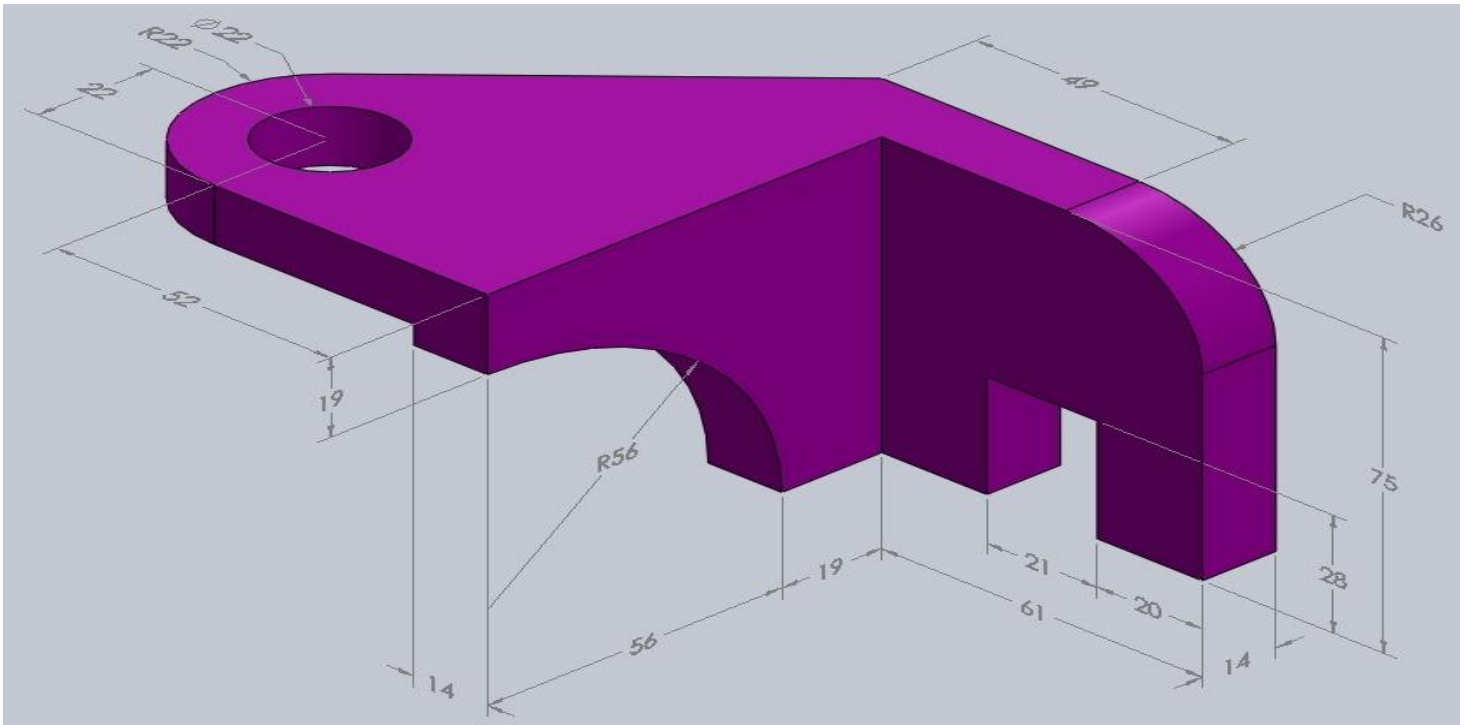




হাসপাতালে বসে আঁকা সত্যজিৎ রায়ের জীবনের সর্বশেষ ছবি।
এই ছবিতে বিখ্যাত এগারজন ব্যক্তির ছবি রয়েছে।

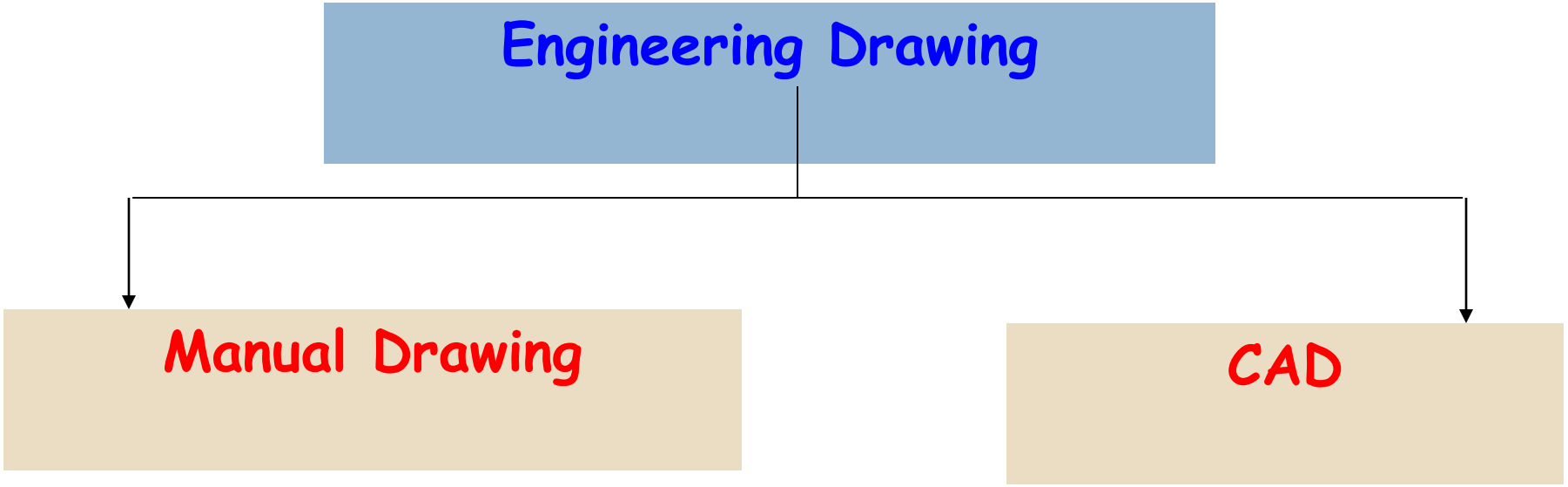
Engineering Drawing

- Clearly and concisely communicating **all of the information necessary** to transform an idea or a concept to reality.
- Engineering drawing of an object should contain all information like actual shape, accurate size etc.



Engineering Drawing

- Universal language for engineers
- Drawing is important for all branches of engineering.
- An engineering drawing is worth a thousand words.
- Drawings are the road maps which show how to build/manufacture structures and products.



Computer has a major impact for the creation of technical drawings.

Design and drafting on computer are cheap and less time consuming.

Why we go for manual drawing?

Why we go for manual drawing?

Computer cannot replace the drafting board and equipment as a learning tool.

Once you have learned the basics of mathematics, you are allowed the use of calculator and computer.

If basic fundamentals are clear, better use can be made by the power of the software.

To be an expert in technical drawing, this first course on Engineering (manual) Drawing is the first step.

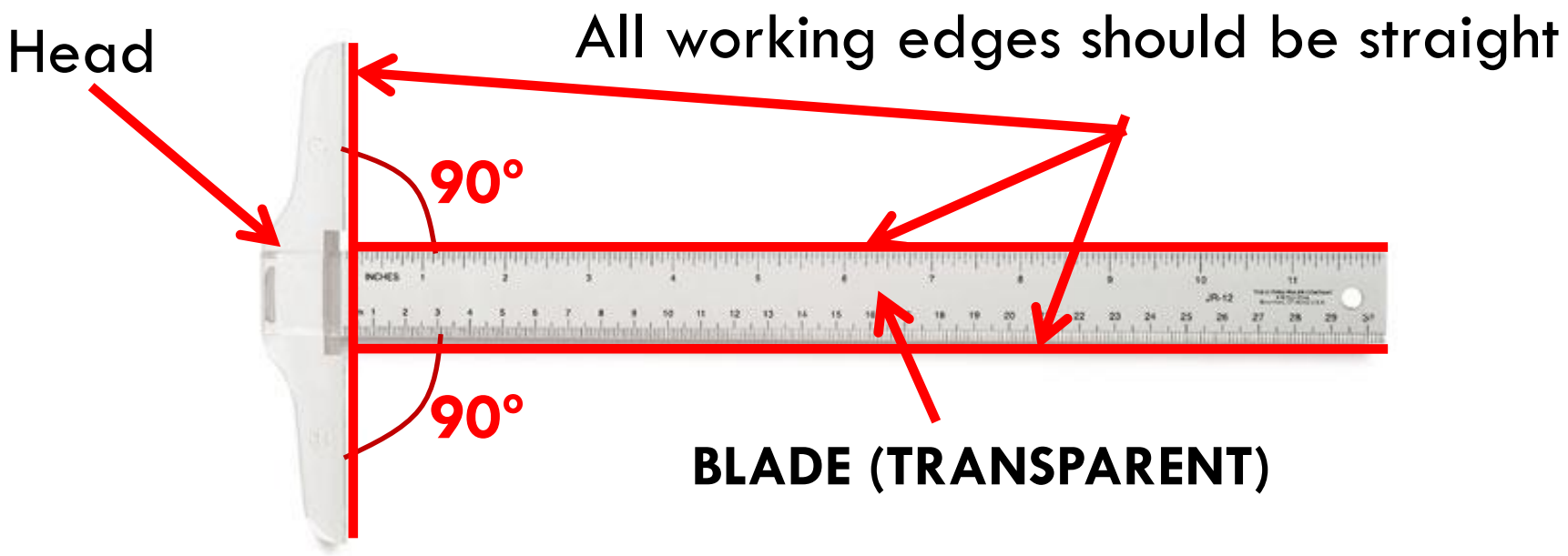
Drawing Equipments

- Drawing Board-(36in×24in)
- Drawing Paper-(28in×22in)
- T-square
- 45° triangle
- 30°-60° triangle
- Bow compass
- Divider
- Pencils (HB and 2H)
- Eraser
- Scotch Tape

Drawing Board

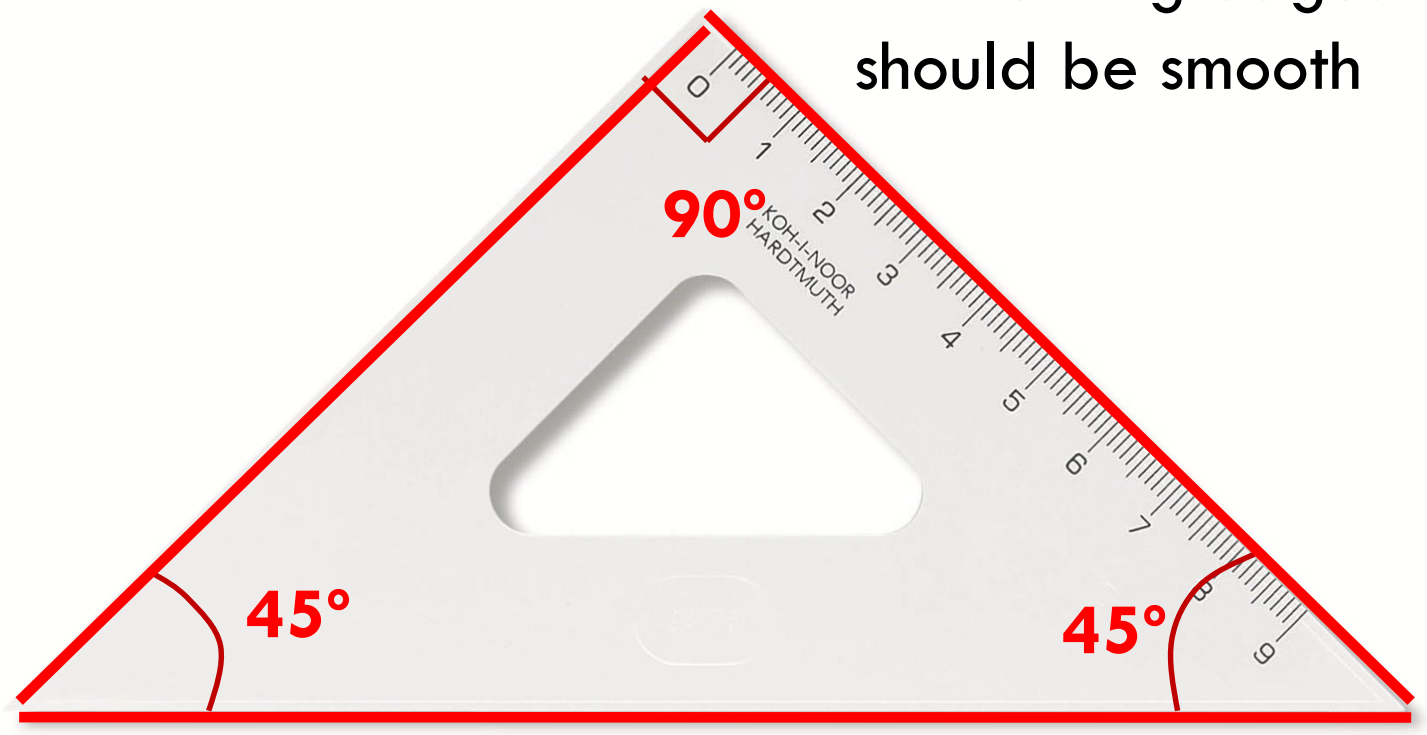
Drawing Paper

T-square

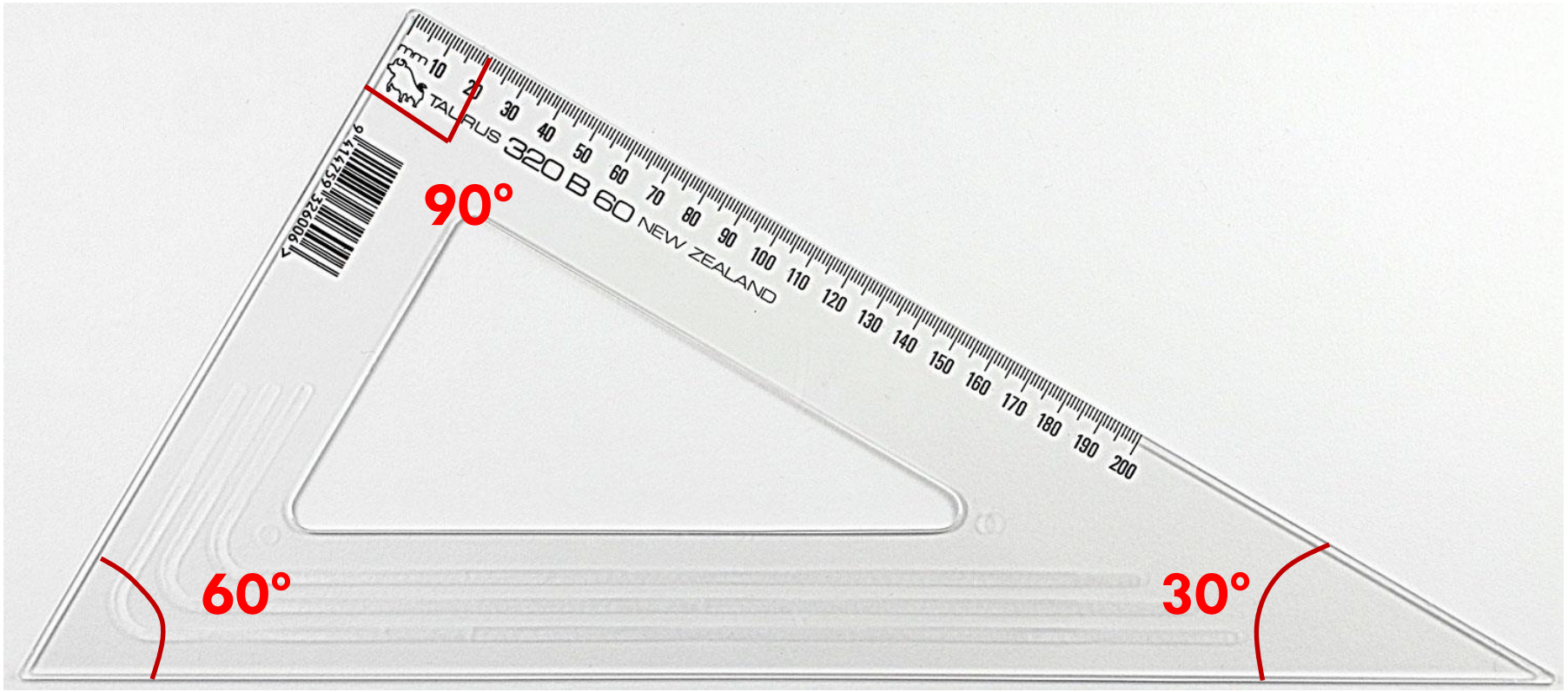

Head
All working edges should be straight
90°
90°
BLADE (TRANSPARENT)

45° triangle

All working edges should be smooth

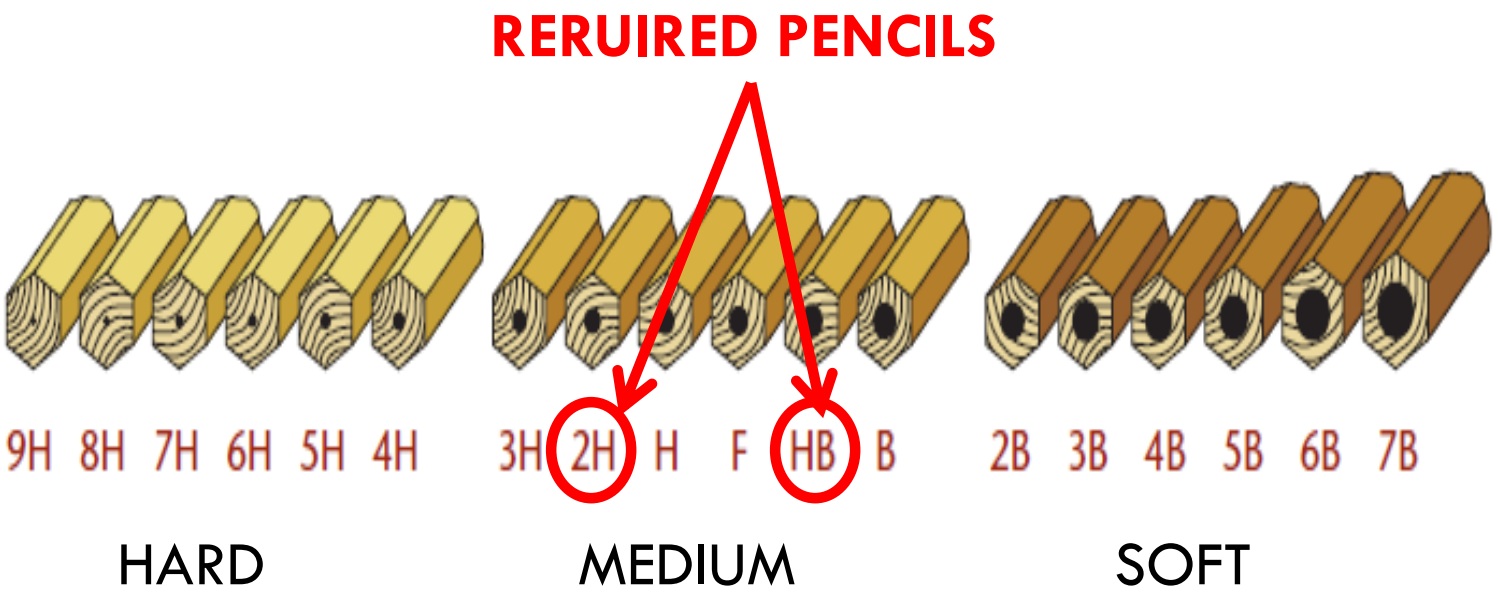


30°-60° triangle



Bow compass And Divider

Pencils



GRADES OF PENCIL LEAD

Eraser And Scotch Tape

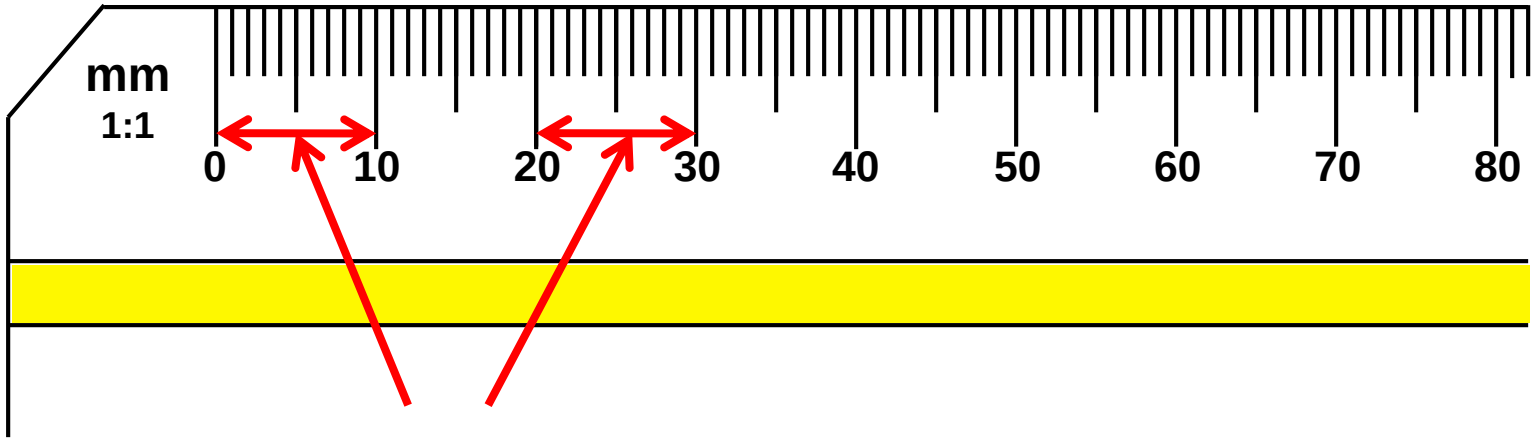
DUST FREE

TRANSPARENT

Scales

- **METRIC SCALE**
- **CIVIL ENGINEER SCALE**
- **ARCHITECT SCALE**

METRIC SCALE

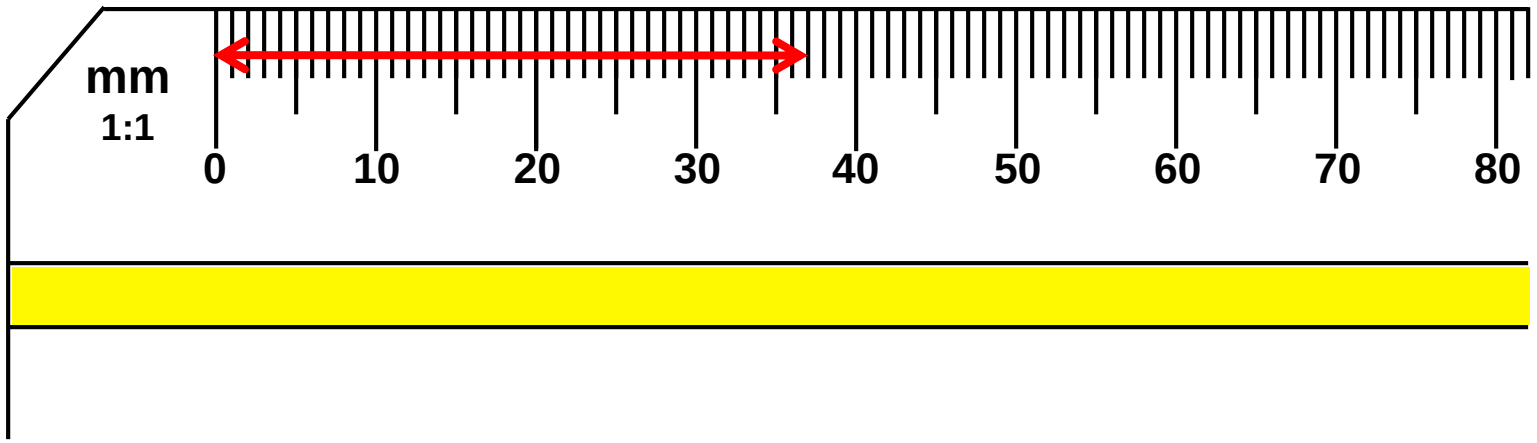


No. of Division = 10

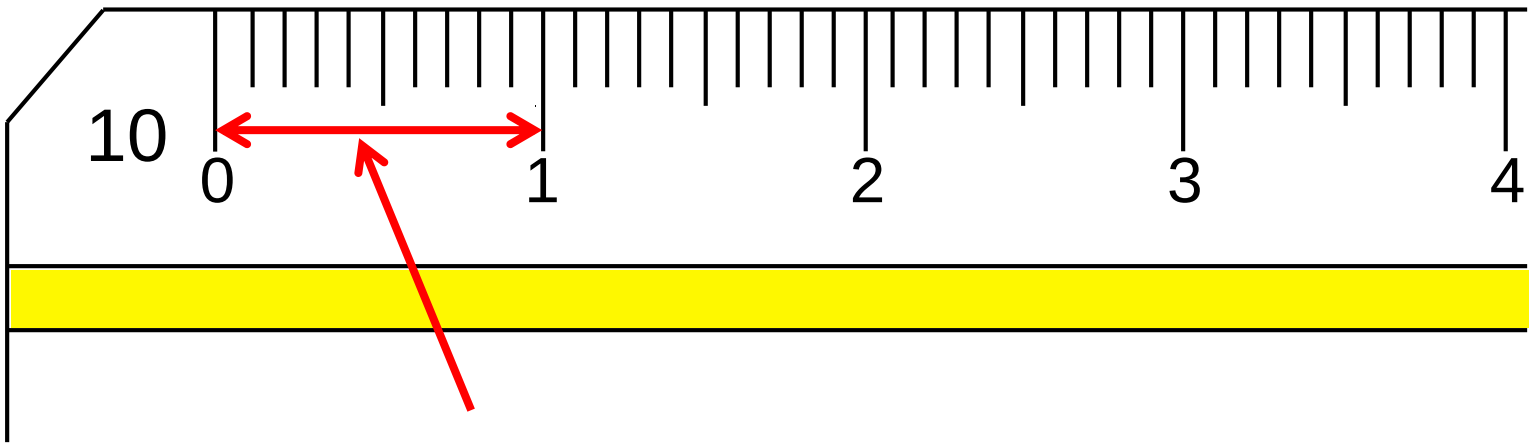
Each division = 1 mm = 0.1 cm

METRIC SCALE

So, how 37 mm or 3.7 cm can be measured?



CIVIL ENGINEER SCALE

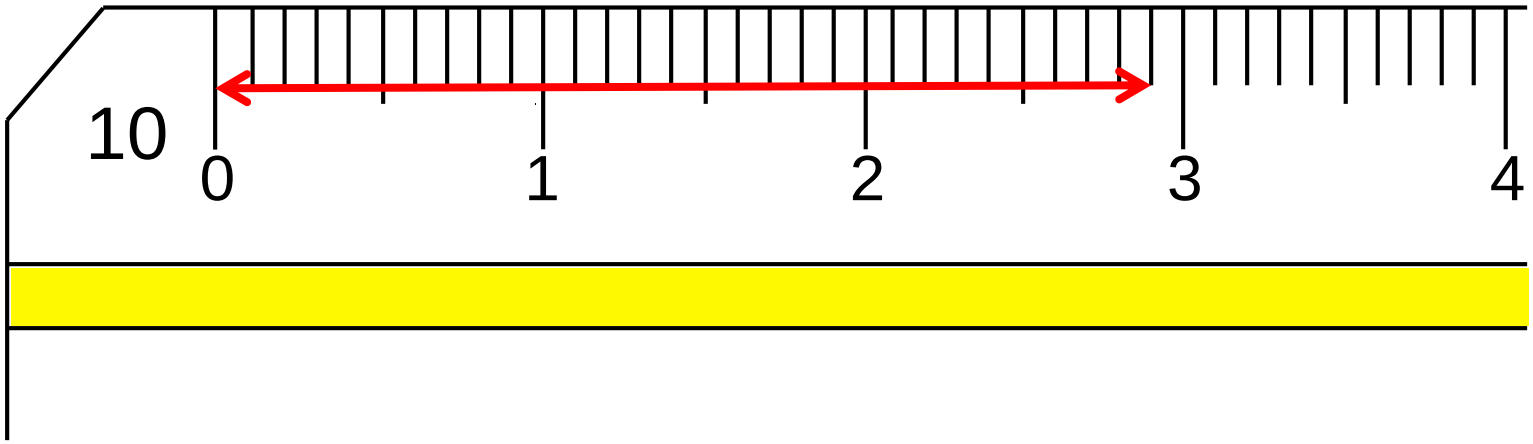


No. of Division = 10

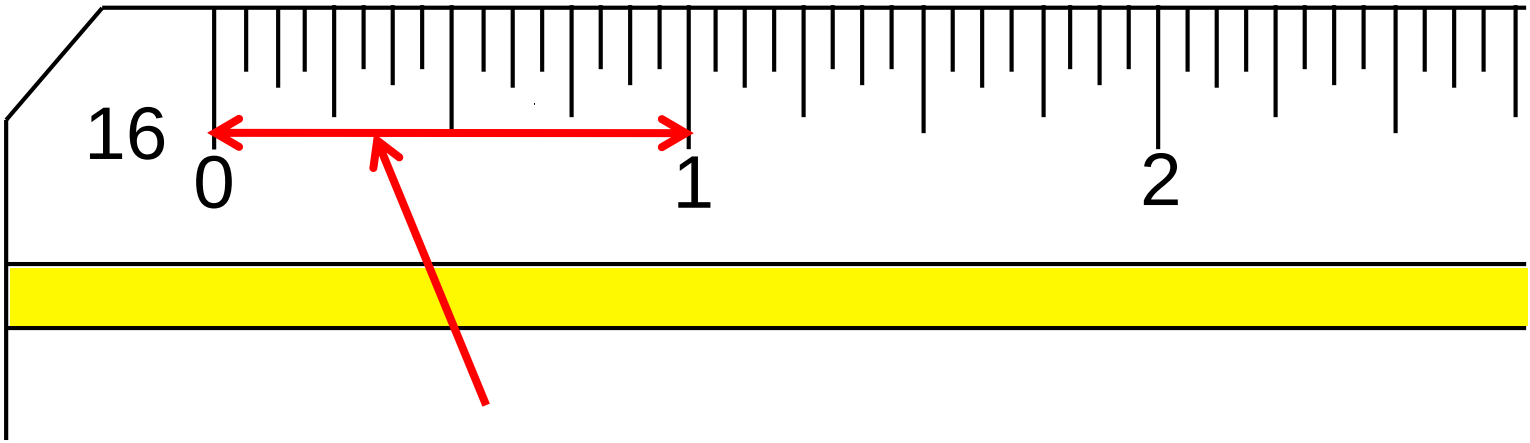
Each division = 0.1 in

CIVIL ENGINEER SCALE

So, how 2.9 in can be measured?



ARCHITECT SCALE



No. of Division = 16

Each division = $\frac{1}{16}$ in

ARCHITECT SCALE

1 small division = $\frac{1}{16}$in

2 small division = $\frac{1}{8}$in

3 small division = $\frac{3}{16}$in

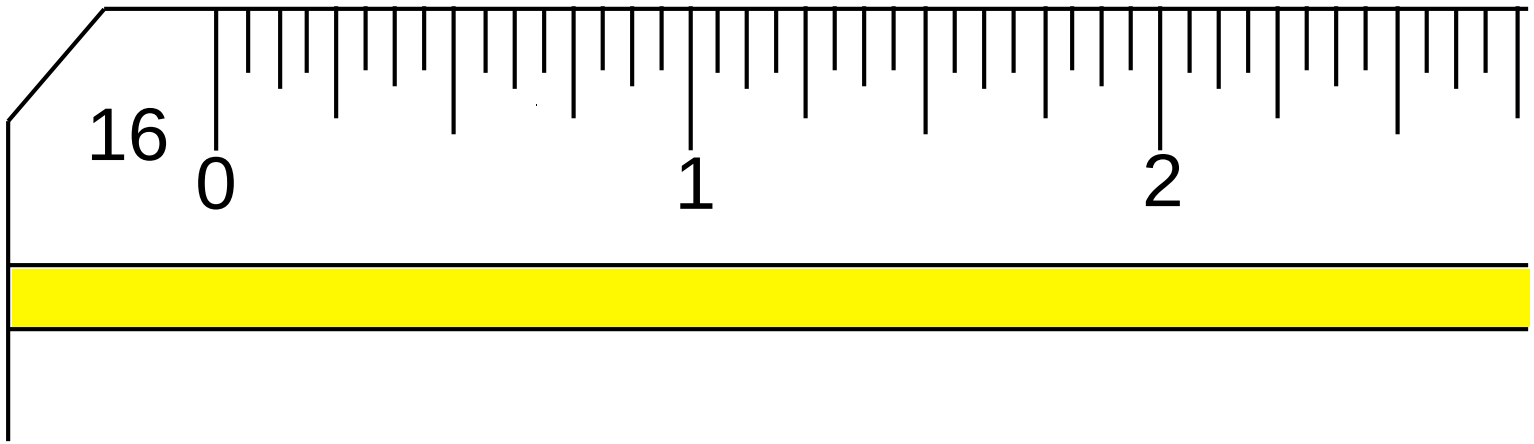
4 small division = $\frac{1}{4}$in

5 small division = $\frac{5}{16}$in

6 small division = $\frac{3}{8}$in

7 small division = $\frac{7}{16}$in

8 small division = $\frac{1}{2}$in



ARCHITECT SCALE

9 small division = $\frac{9}{16}$ in

10 small division = $\frac{5}{8}$ in

11 small division = $\frac{11}{16}$ in

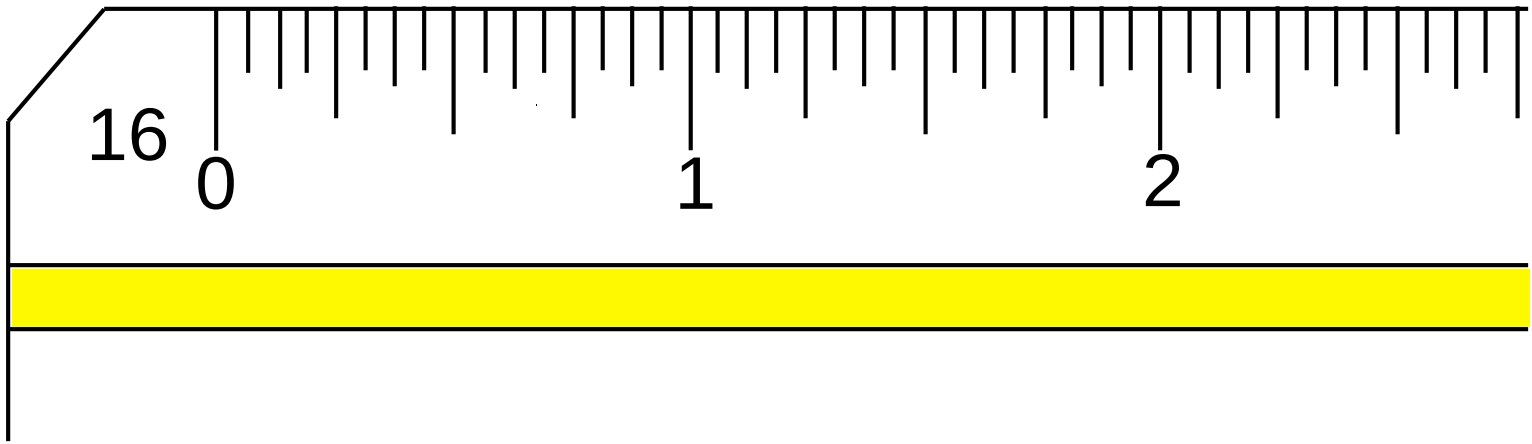
12 small division = $\frac{3}{4}$ in

13 small division = $\frac{13}{16}$ in

14 small division = $\frac{7}{8}$ in

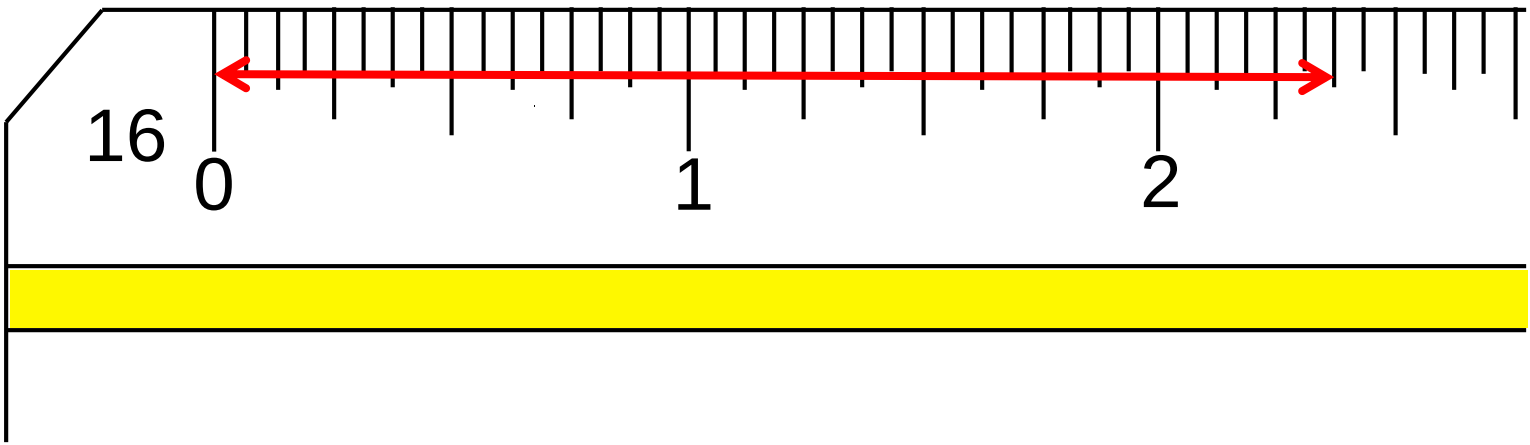
15 small division = $\frac{15}{16}$ in

16 small division = 1 in



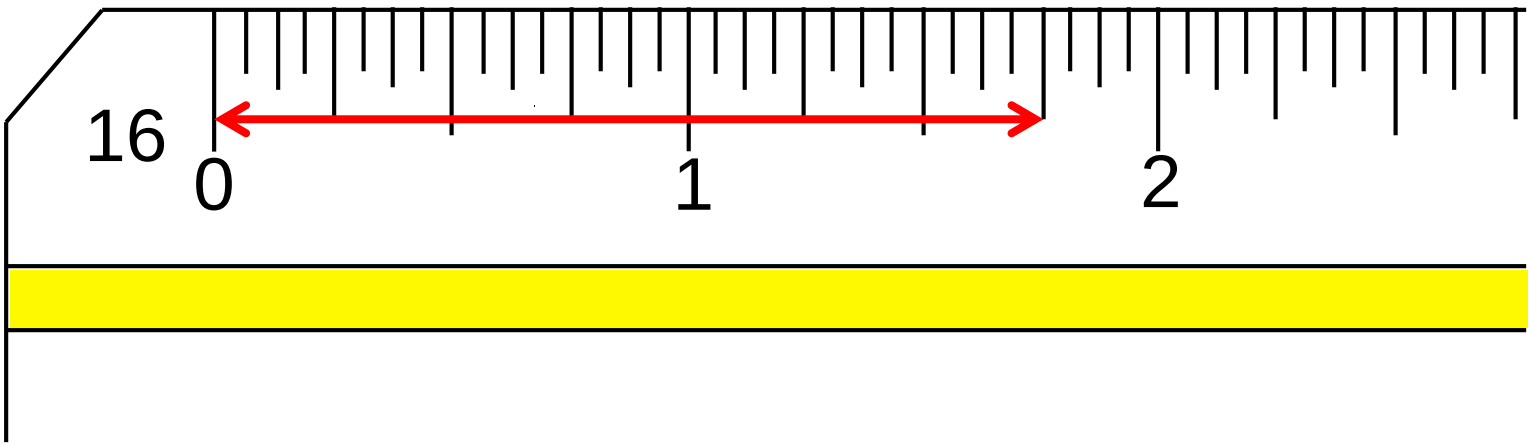
ARCHITECT SCALE

So, how $2\frac{3}{8}$ in can be measured?

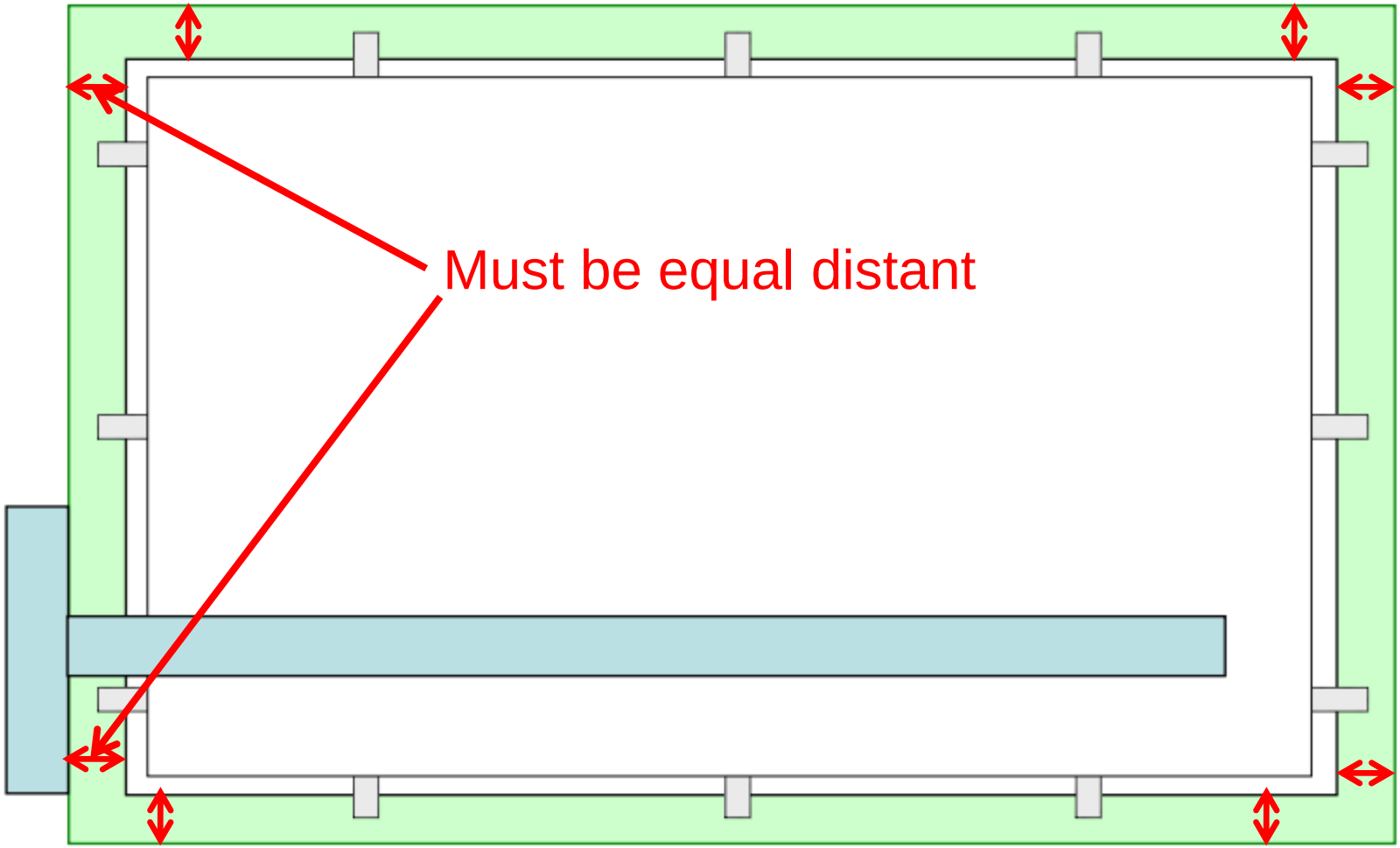


ARCHITECT SCALE

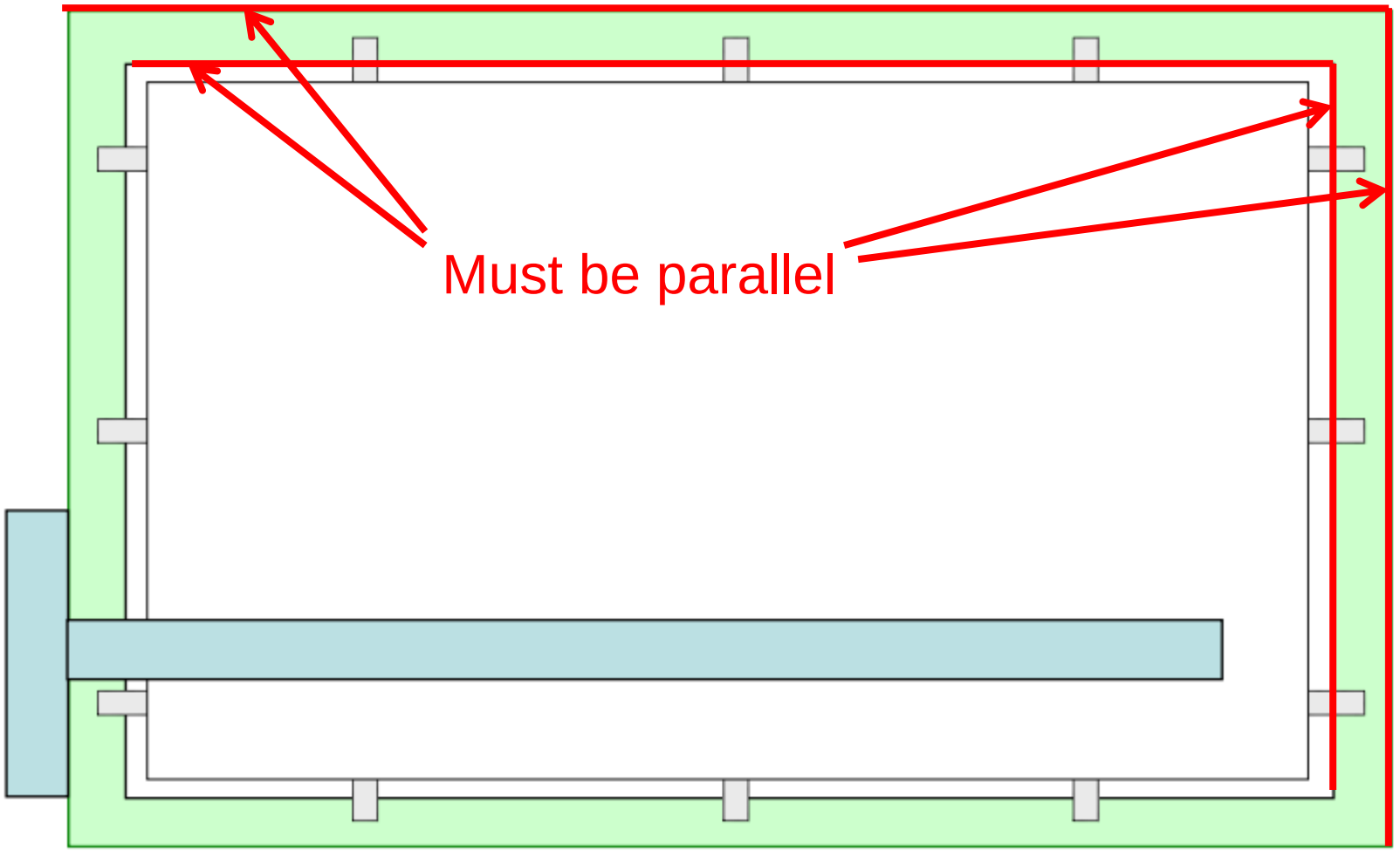
So, how $1\frac{3}{4}$ in can be measured?



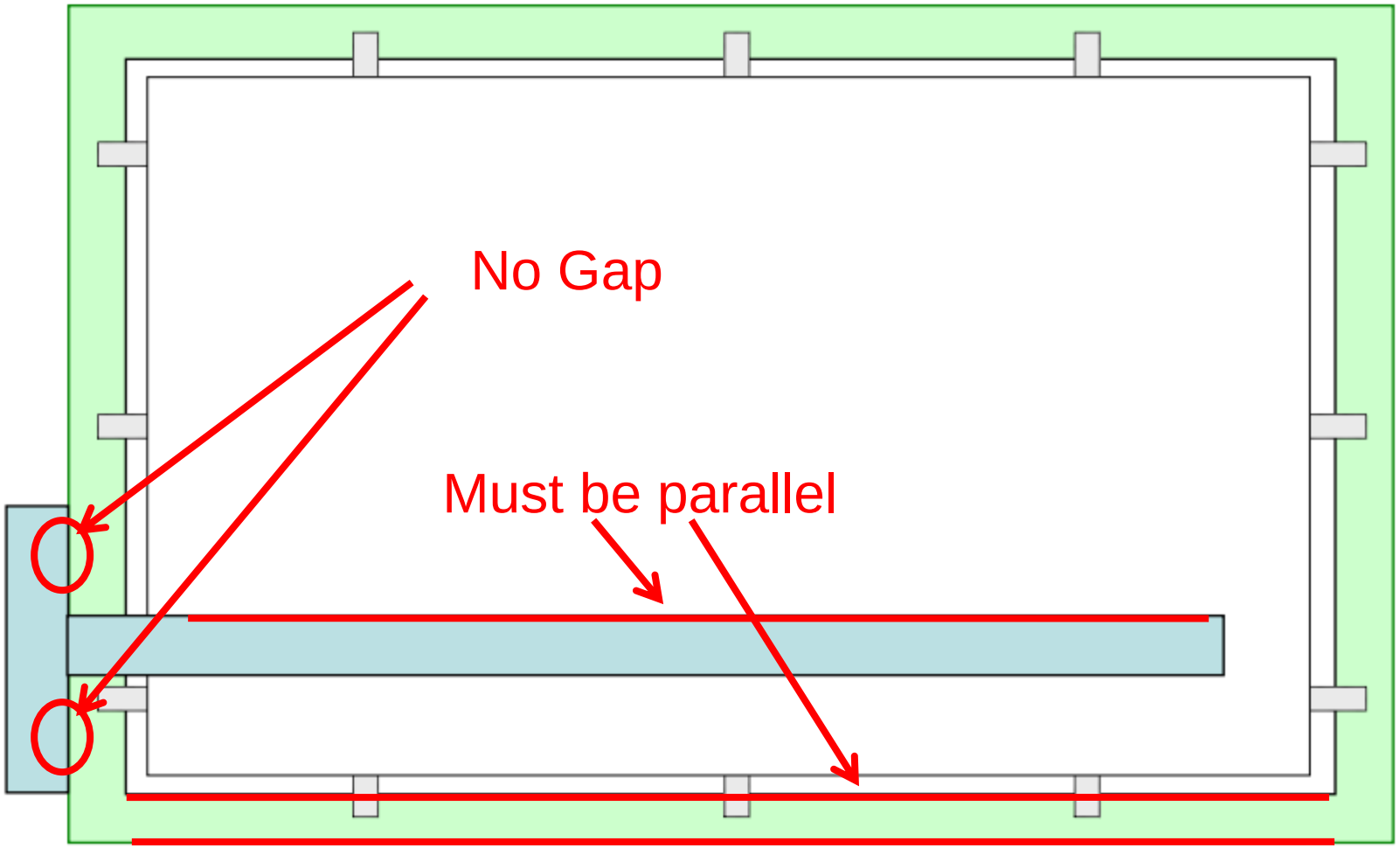
Orientation of Drawing Paper



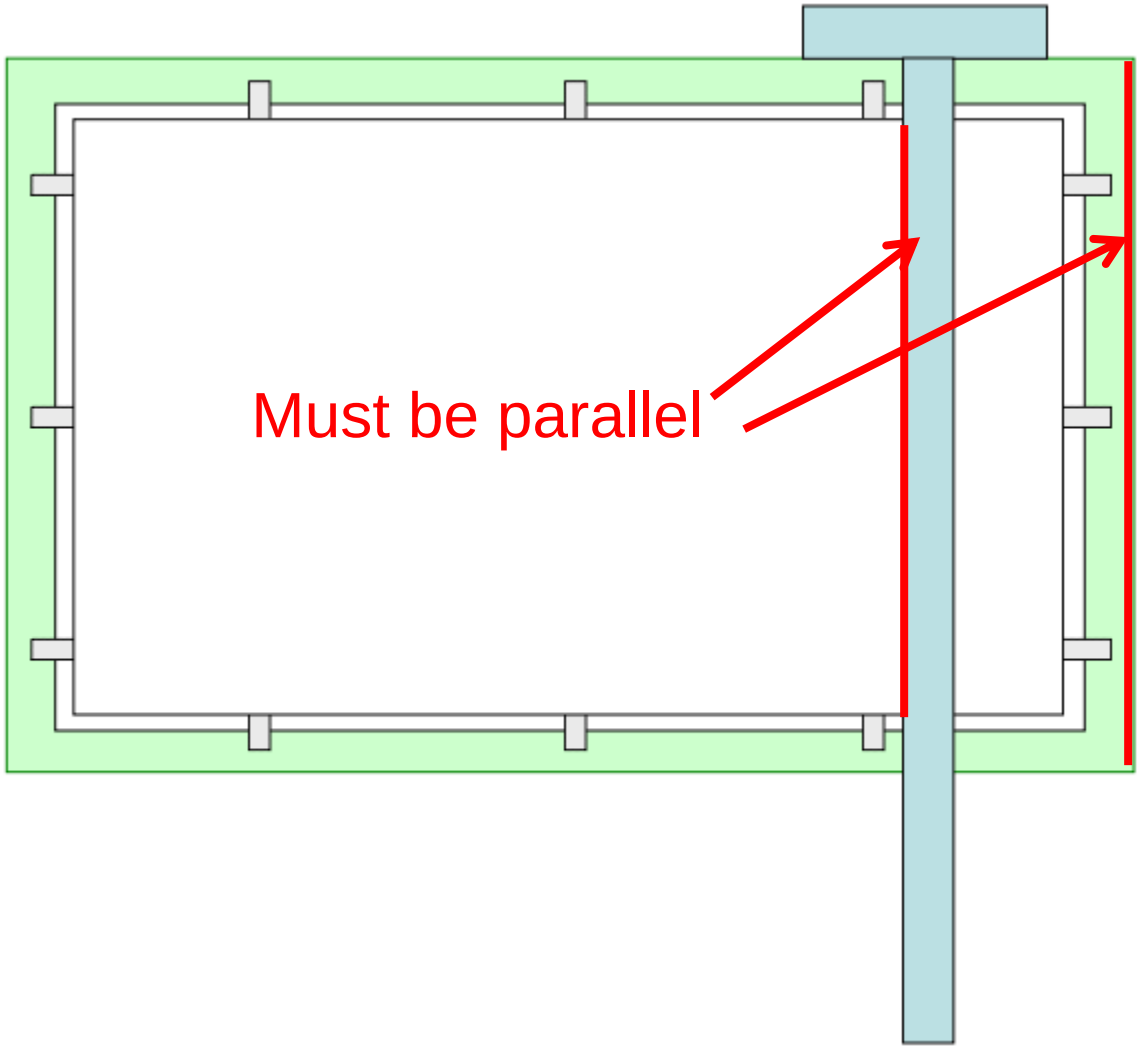
Orientation of Drawing Paper



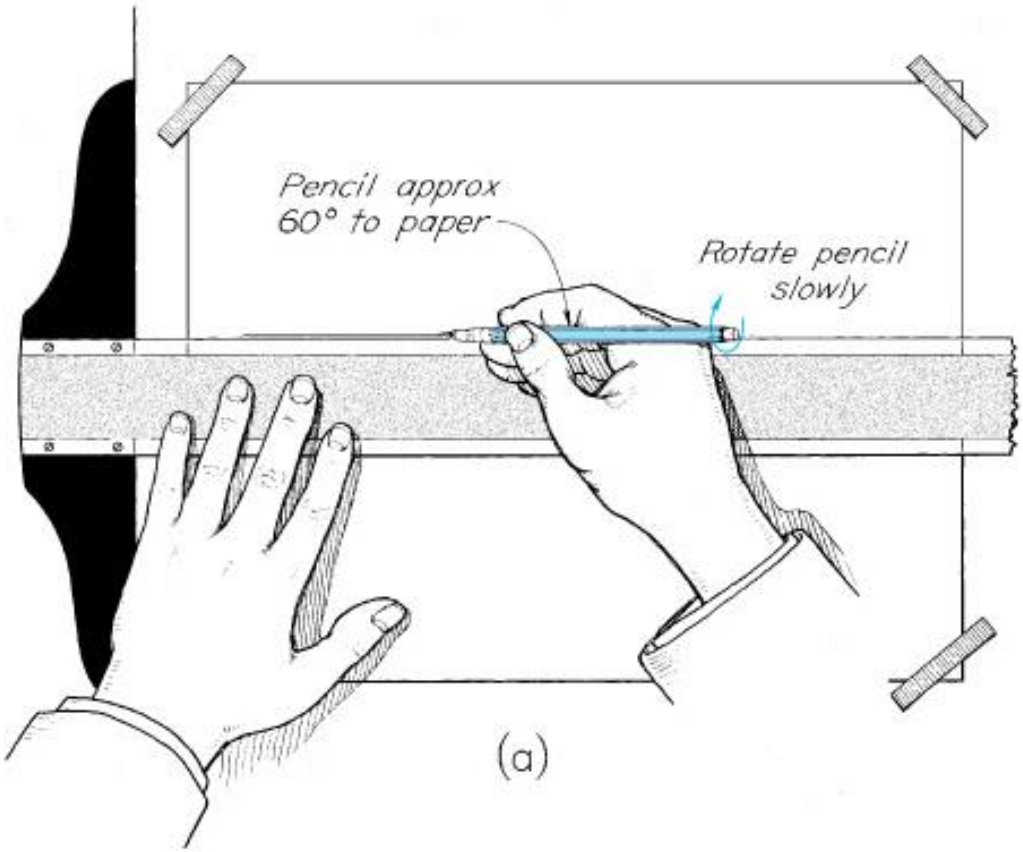
Uses of T-Scale

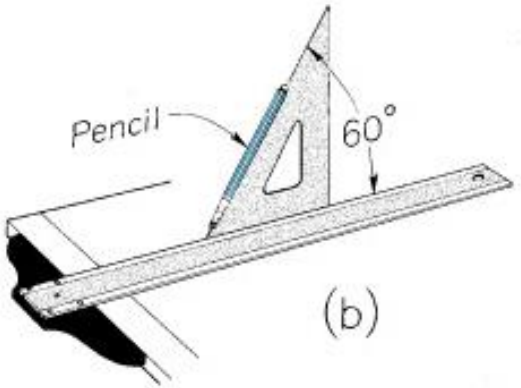


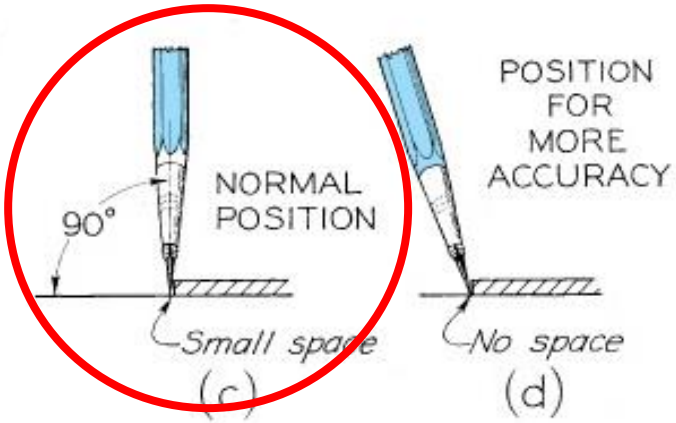
Uses of T-Scale



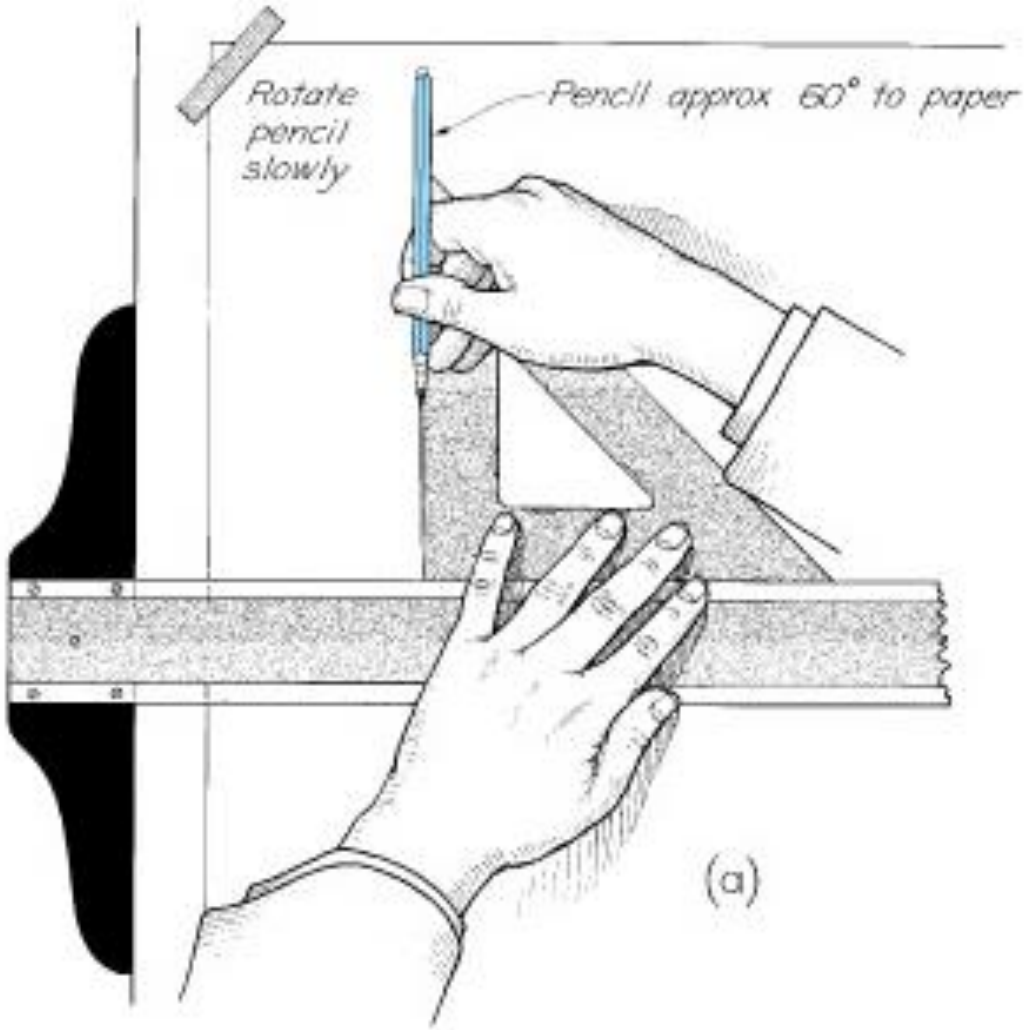
Drawing Horizontal Lines



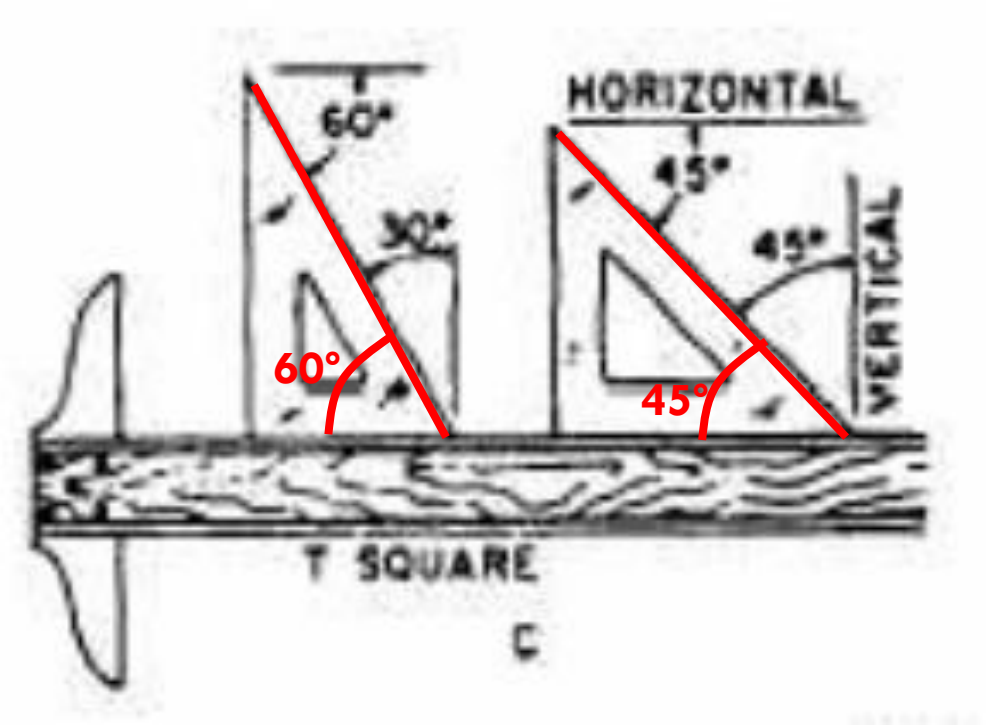




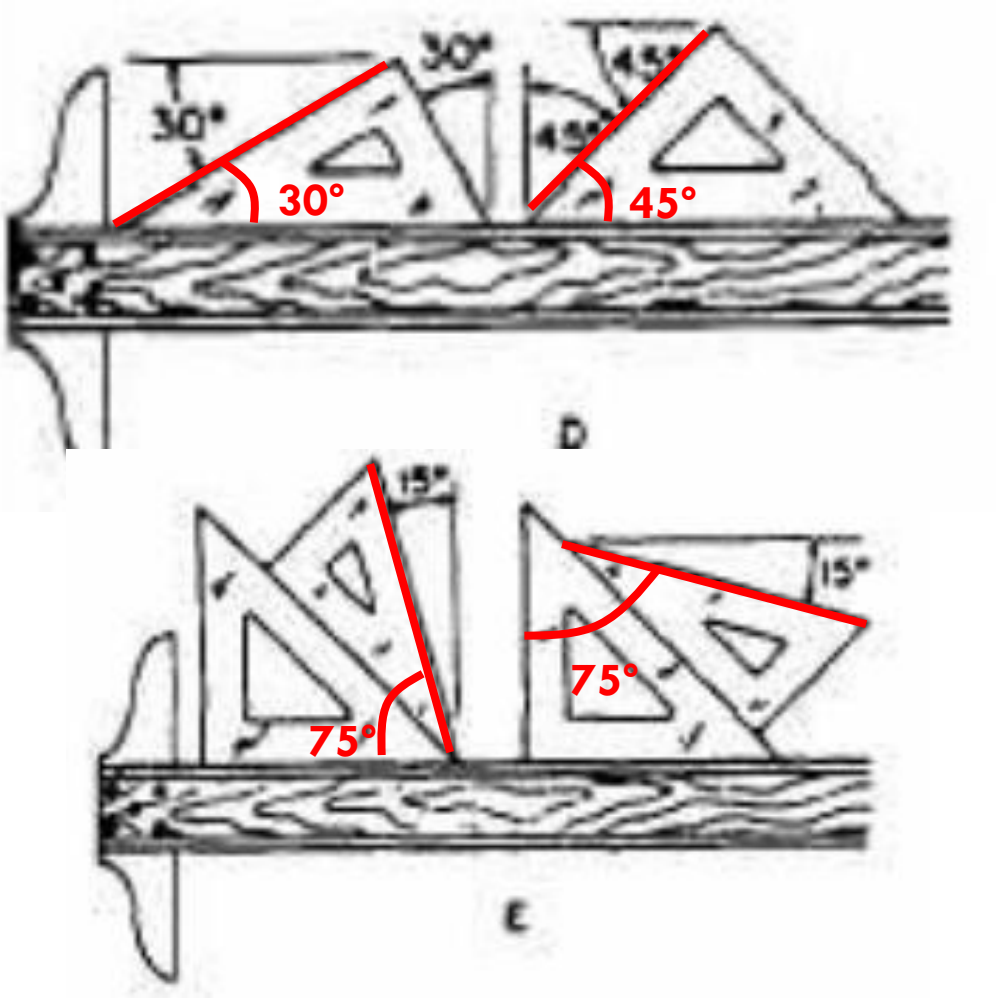
Drawing Vertical Lines

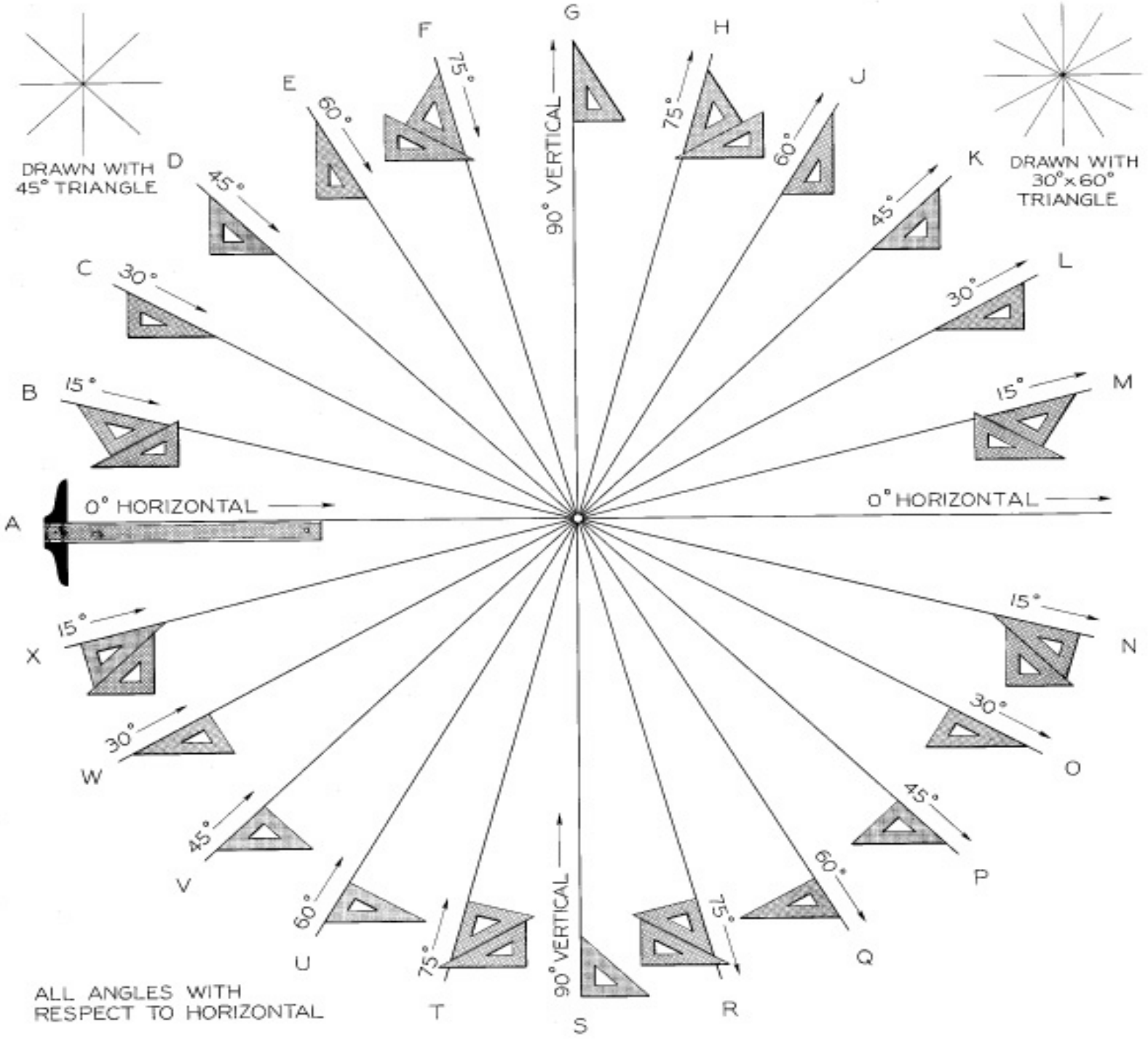


Drawing Inclined Lines

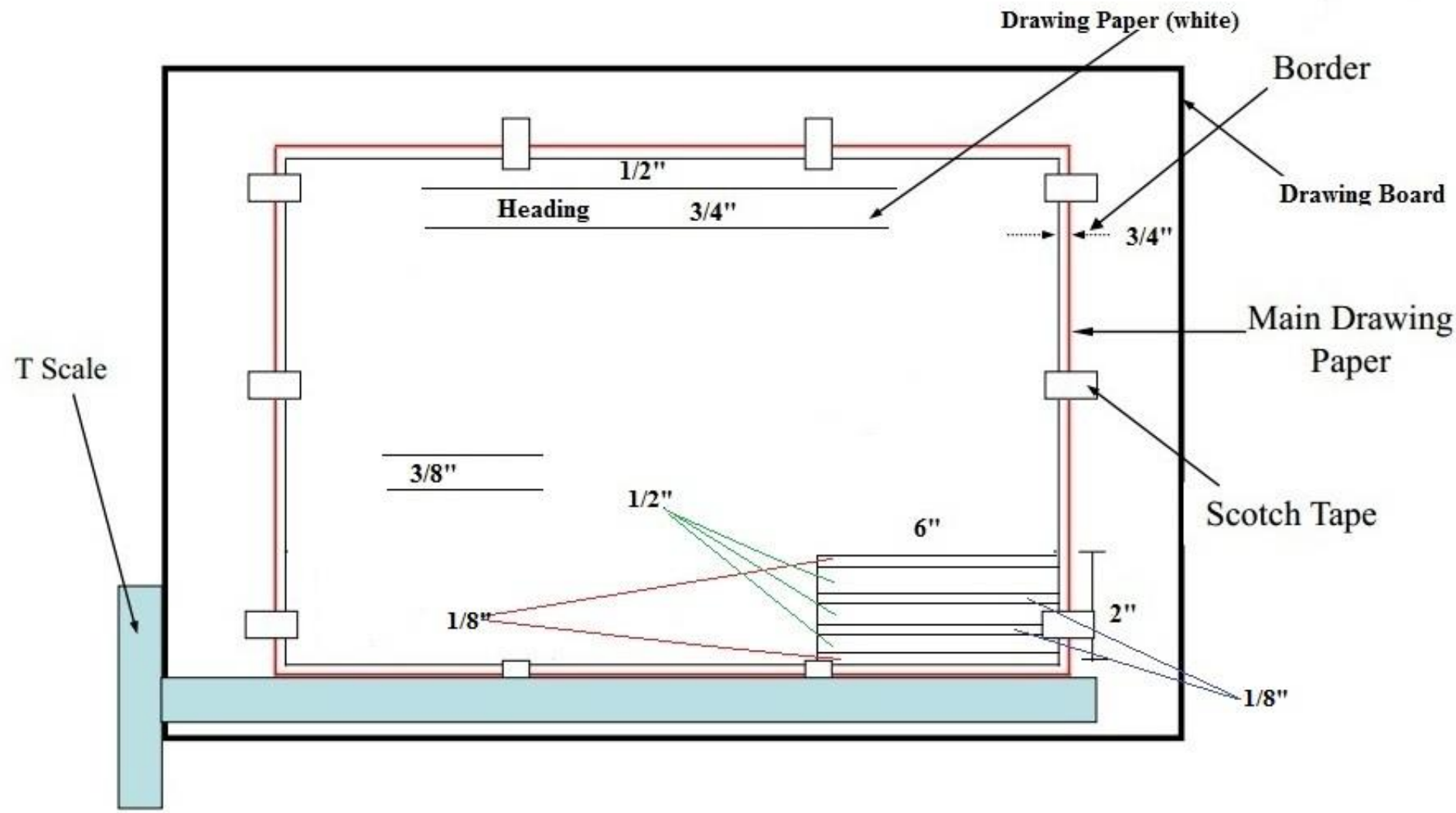


Drawing Inclined Lines

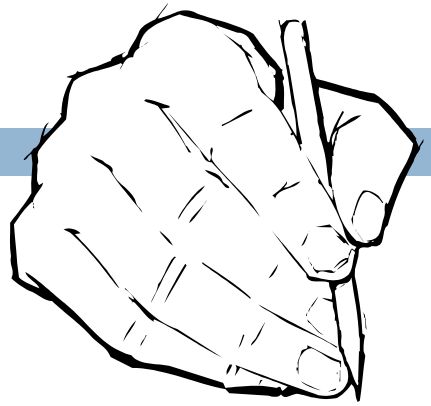



DRAWN WITH
45° TRIANGLE
DRAWN WITH
30°×60°
TRIANGLE
A
0° HORIZONTAL
B
15°
C
30°
D
45°
E
60°
F
75°
G
90° VERTICAL
H
75°
J
60°
K
45°
L
30°
M
15°
0° HORIZONTAL
N
15°
O
30°
P
45°
Q
60°
R
75°
S
90° VERTICAL
T
75°
U
60°
V
45°
W
30°
X
15°
ALL ANGLES WITH
RESPECT TO HORIZONTAL

Preparation of Drawing Paper



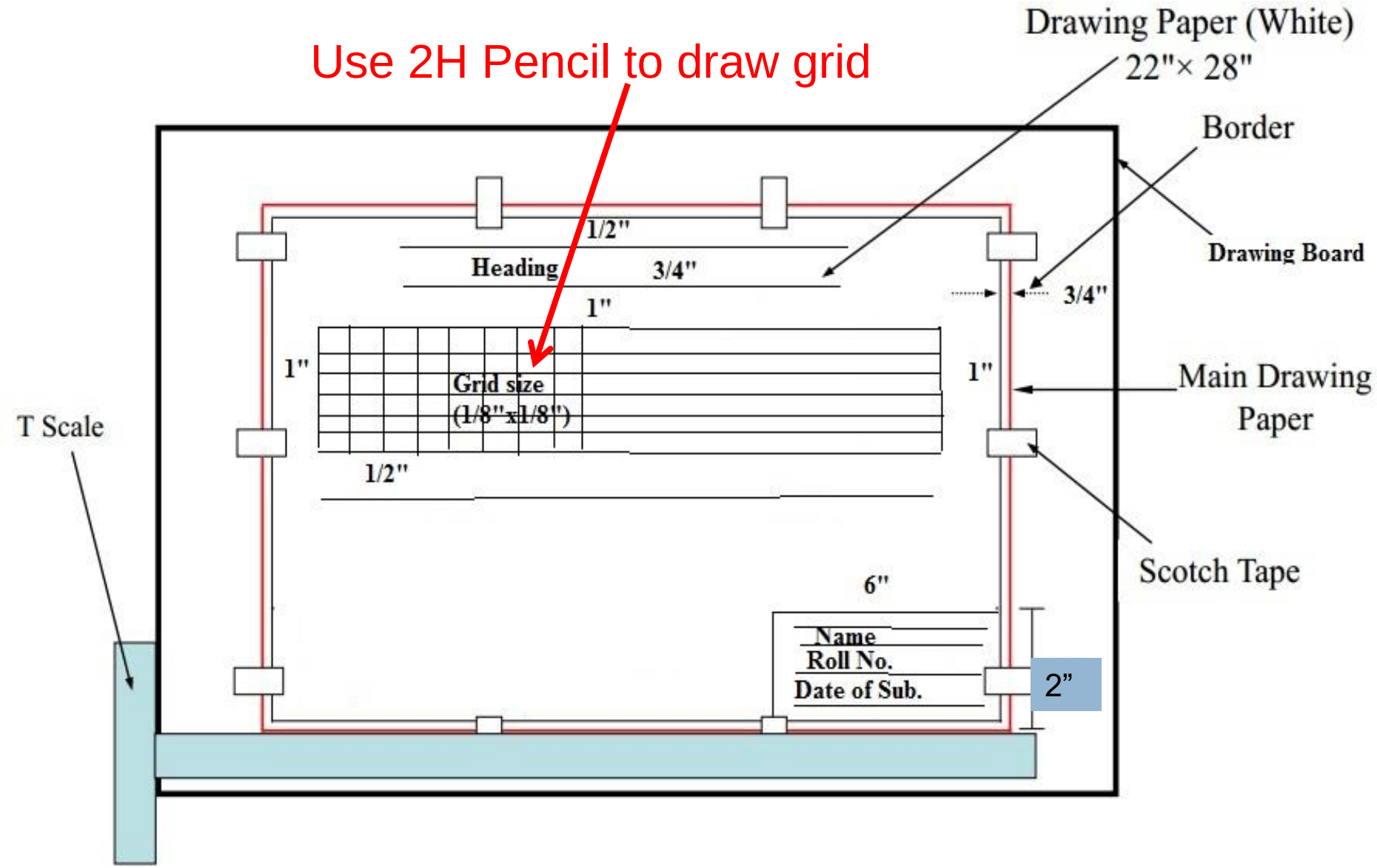
Lettering



- Lettering is drawing, not writing.
- An engineering drawing should provide ***dimensions*** and ***specifications*** to communicate how the part is to be made.
- To eliminate errors, these notes must contain words made of ***uniform letters*** that are neat and easy to read.

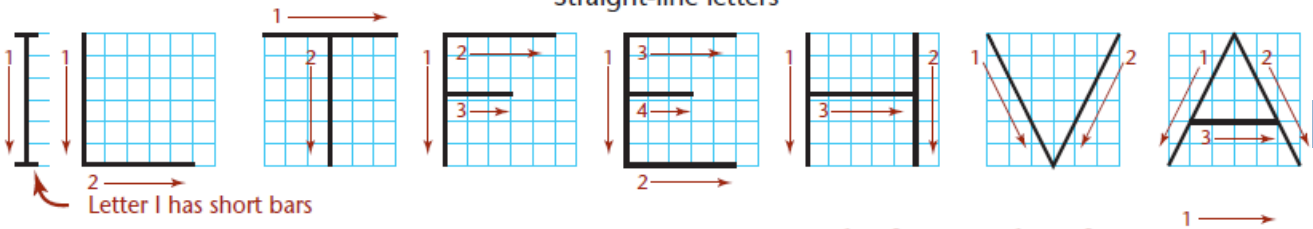
Purpose of Neat Lettering

- Most important reason is to convey information without misunderstanding
- Increase overall appearance of the drawing

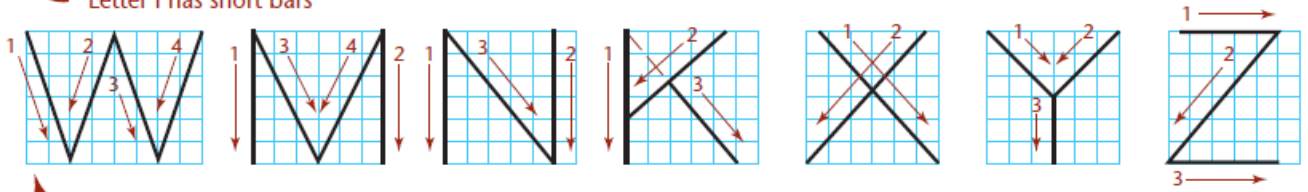

Use 2H Pencil to draw grid
Drawing Paper (White)
22"× 28"
Border
Drawing Board
1/2"
Heading
3/4"
3/4"
1"
1"
1"
Grid size
(1/8"x1/8")
Main Drawing
Paper
T Scale
1/2"
Scotch Tape
6"
Name
Roll No.
Date of Sub.
2”

Vertical Capital Letters and Numerals

Straight-line letters

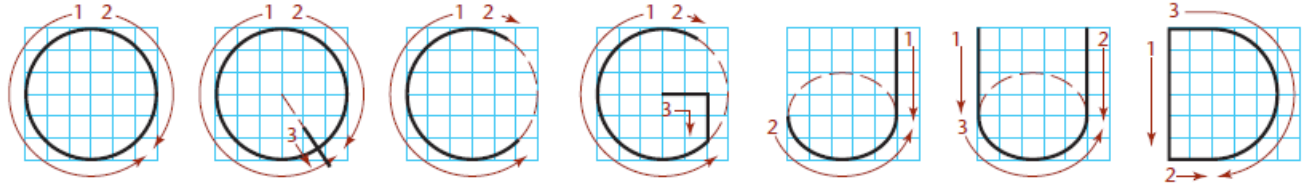


Letter I has short bars



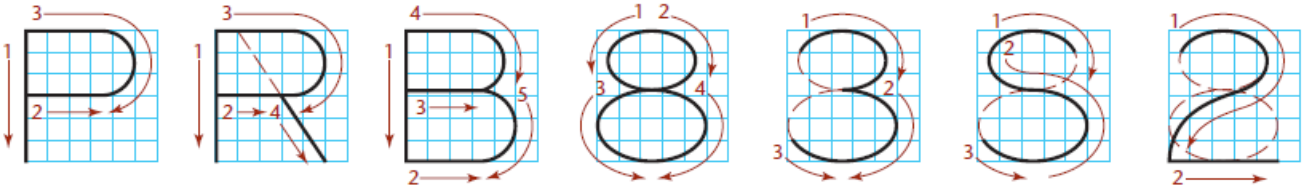
W is only letter over 6 units wide. Letters in "TOM Q. VAXY" are 6 units wide—all others are 5, except I and W

Curved-line letters



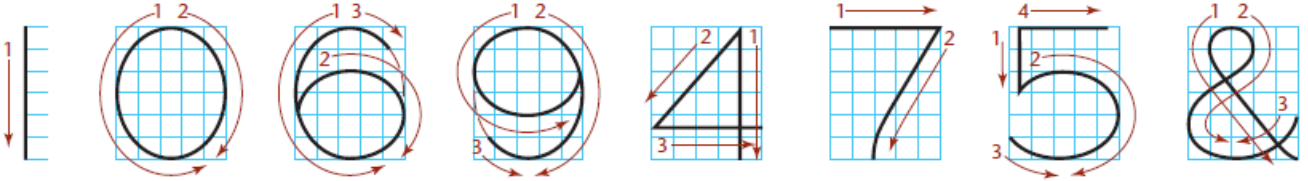
The letters O, Q, C, G and D are based on a true circle. The lower portion of the J and U is elliptical

Curved-line letters and numerals



The 8 is composed of two ellipses. The 3, S, and 2 are based on the 8

Curved-line letters and numerals



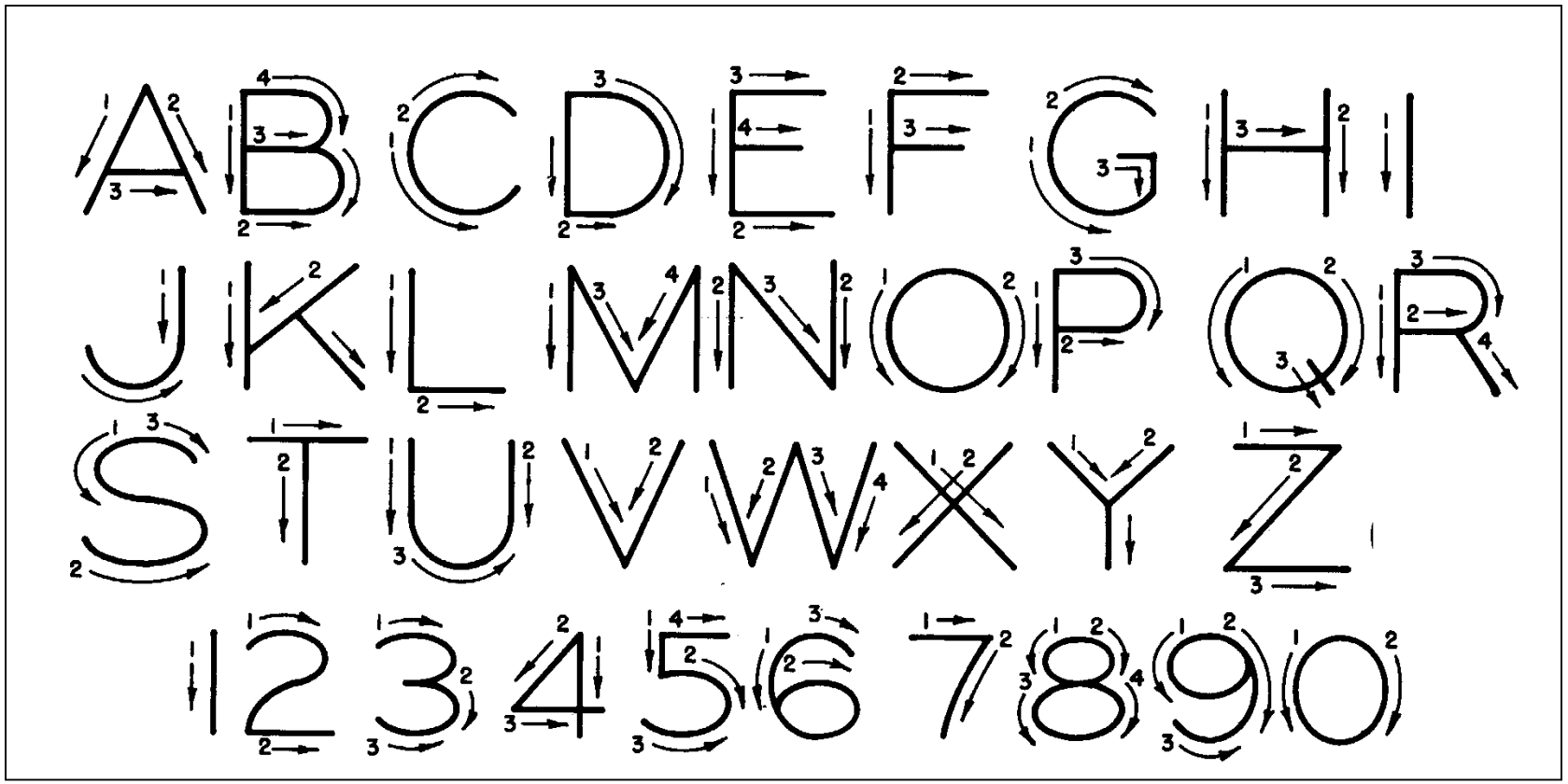
Number 1 is a straight line. The 0, 6, and 9 are elliptical

Guidelines

- All letters and numerals should write in a grid of **6 units height.**

- The width of letters and numerals
  - Letter **I**, or the numeral **1**, has **no** width
  - Letter **W** is **8** units wide
  - **TOM Q VAXY** are **6** units wide
  - **All other** letters and numerals are **5** units wide
  - Spacing of letters should be **2** units

Single Stroke Uppercase Letters

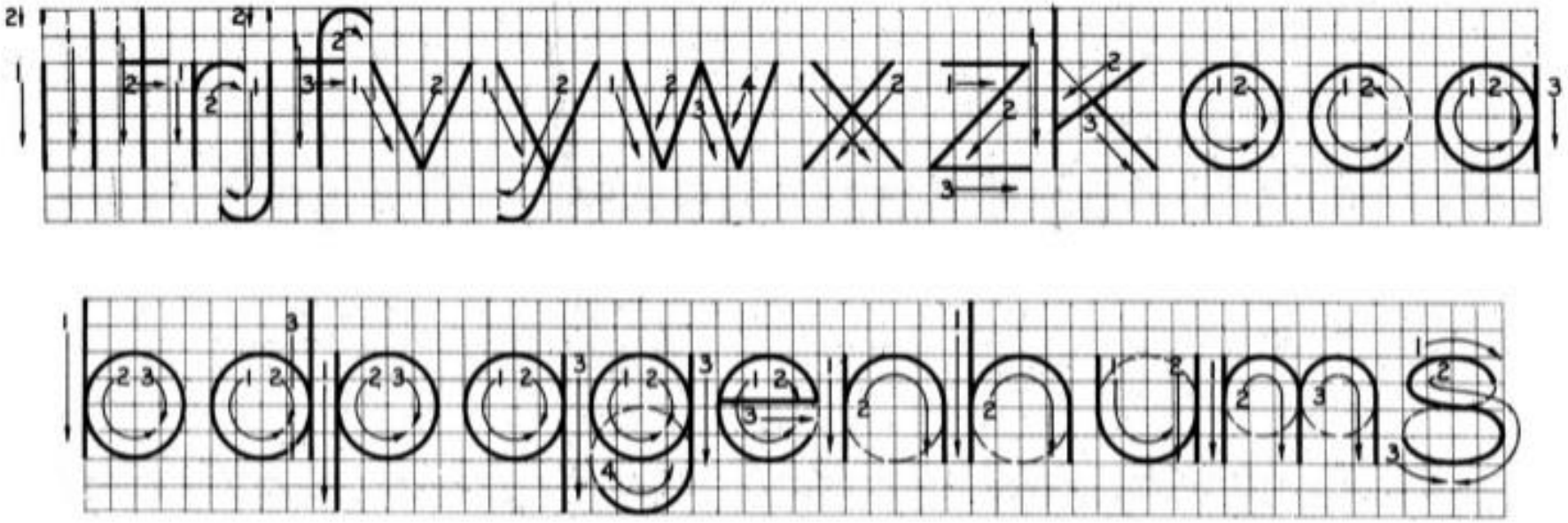


Guidelines for Writing Sentences

- Letters in words are not placed at equal distances from each other; they are placed so that the spaces between letters look ***equal*.**

- The **distance between words**, called *word spacing*, should be equal.

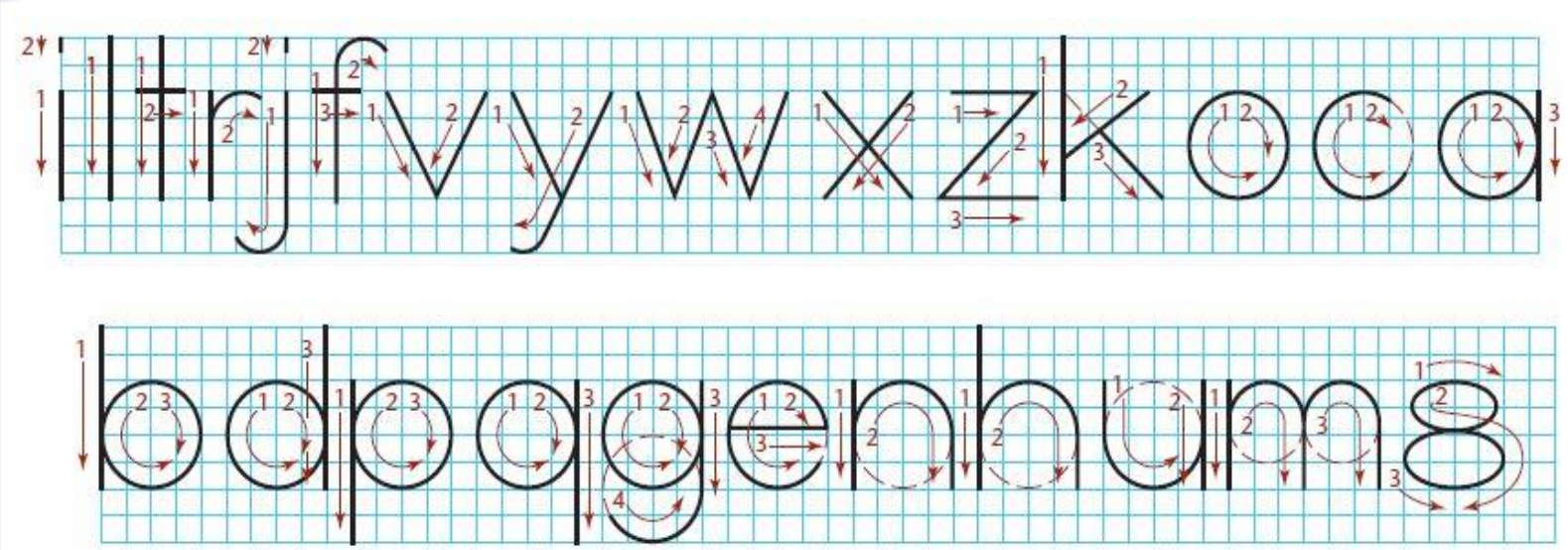
Lower-case letters



- The text' s body height is about 2/3 the height of a capital letter.

Vertical Lowercase Letters

Lowercase letters are rarely used in engineering sketches except for lettering large volumes of notes. Vertical lowercase letters are used on map drawings, but very seldom on machine drawings.



When large and small capitals are combined, the small capitals should be three fifths to two thirds the height of the large capitals.

CE 1100
CIVIL ENGINEERING DRAWING-I

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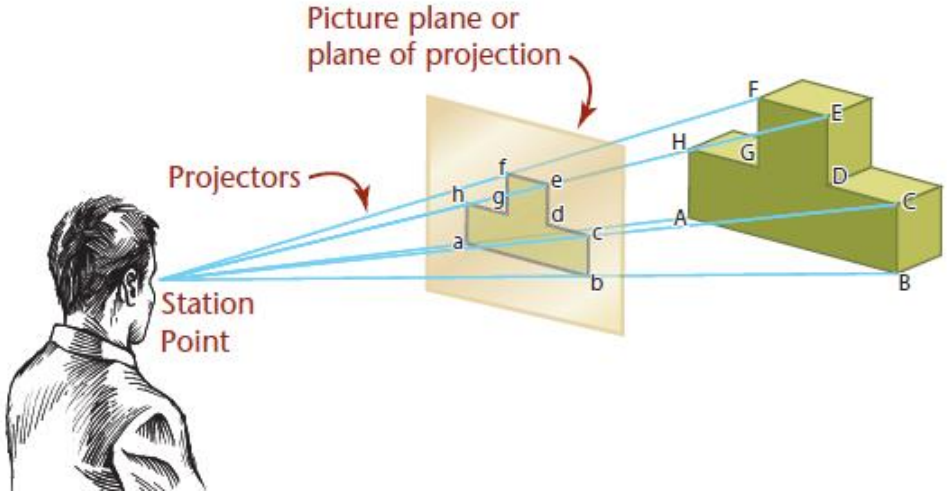
PROJECTION

- Representation of an entity on an imaginary projection plane.



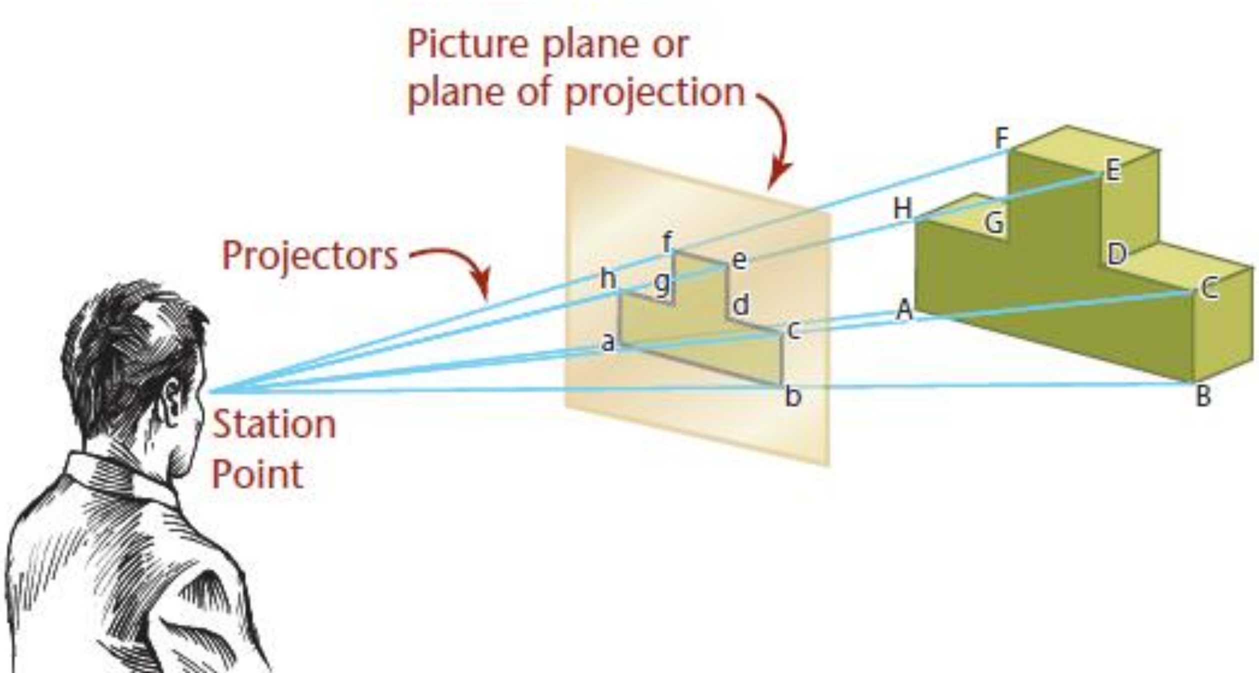
- Projection involves 4 components
  - Actual Object
  - Viewer
  - Imaginary Projection Plane
  - Imaginary Lines or Projectors

A *p* … as a

pl … ***ne***, is

an … tween

th…

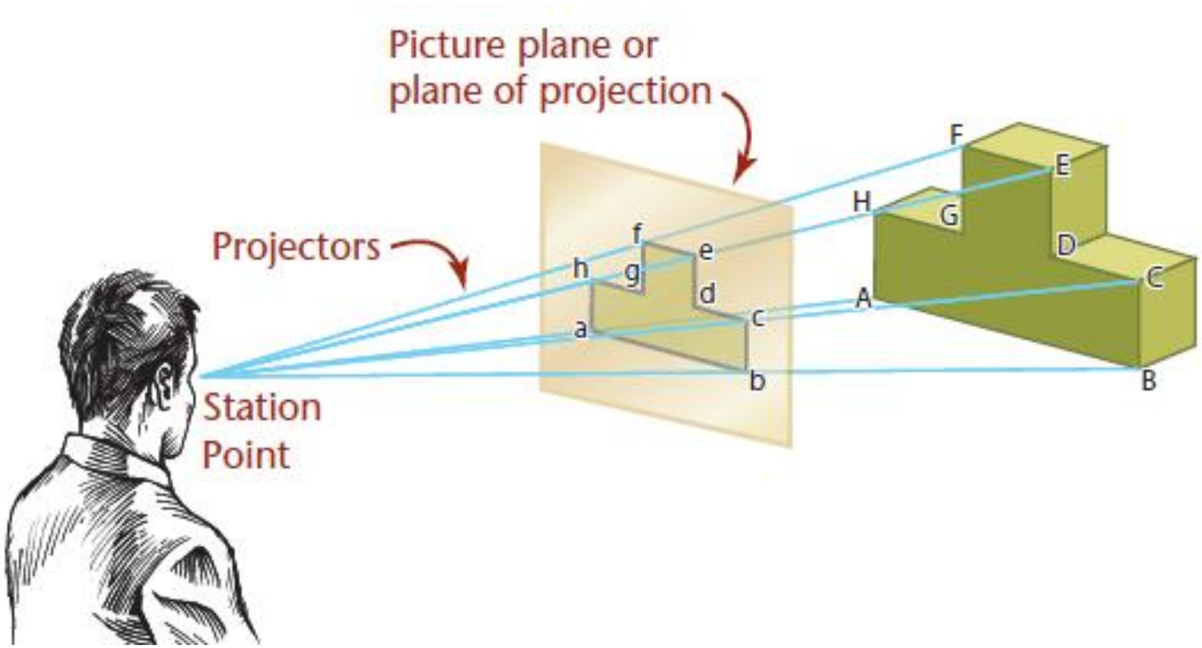


The … onto

whic … three-

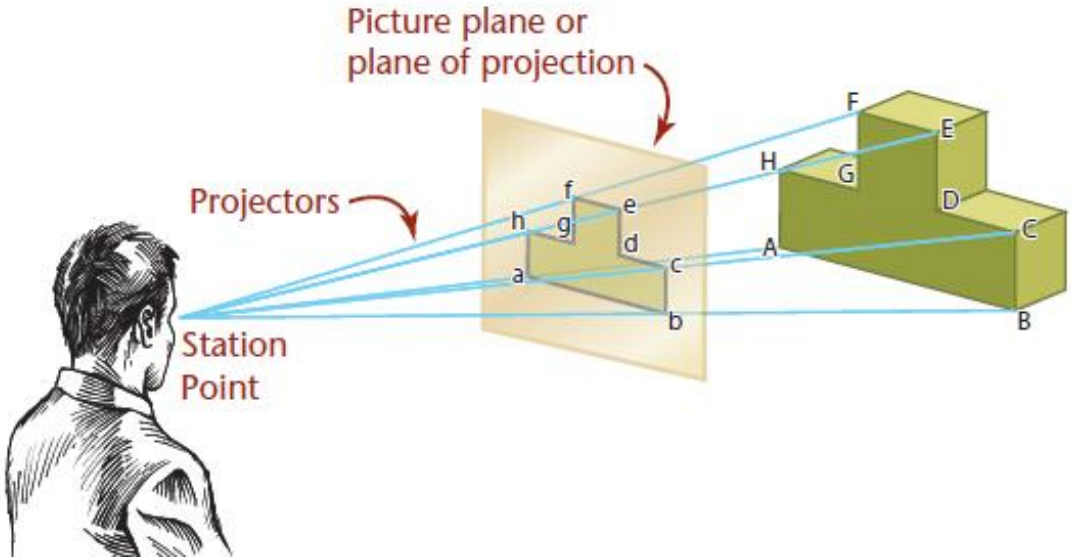
dim…

crea…

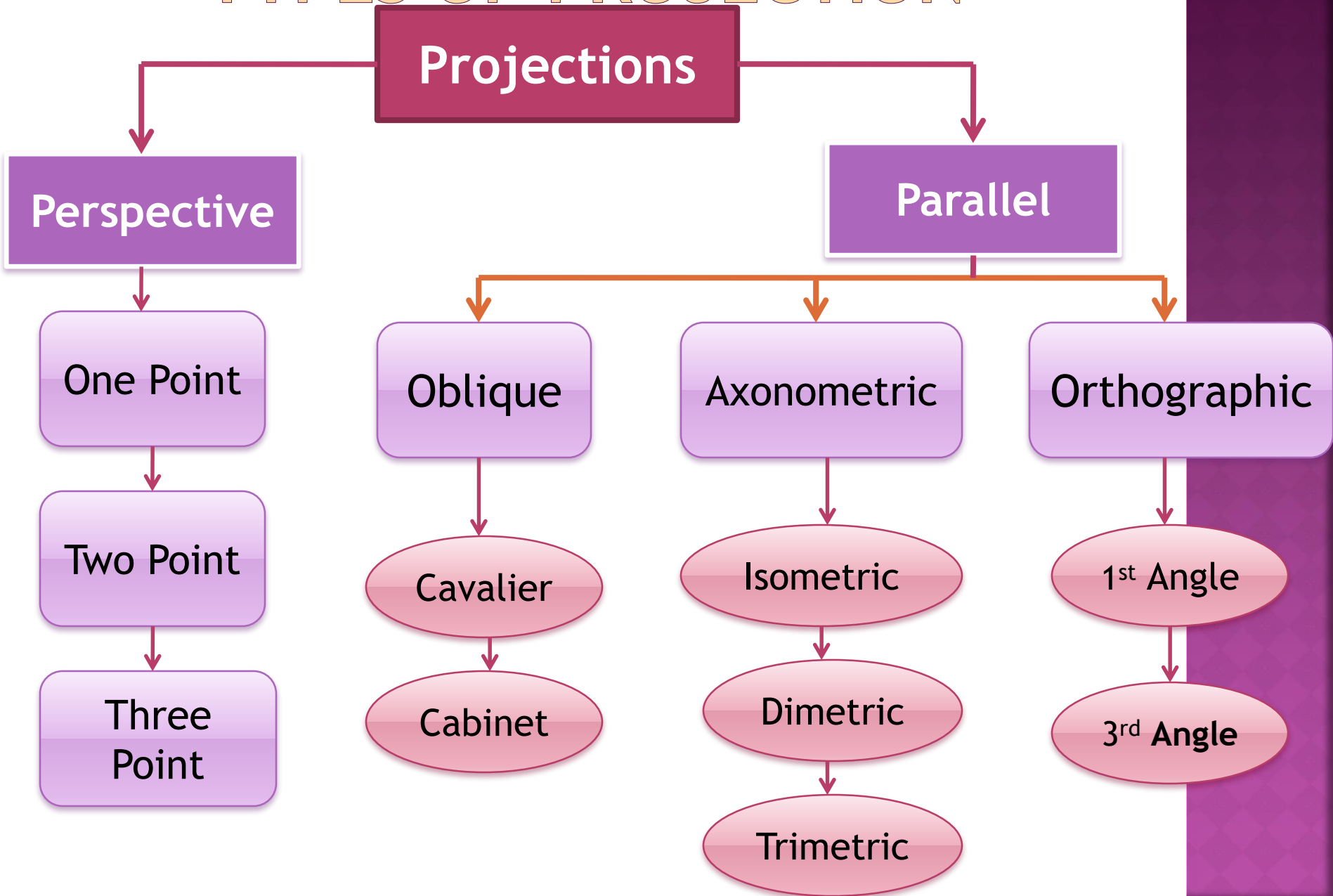


Projection Lines

A ***projection line*** is an imaginary line that is used to locate or project the corners, edges, and features of a three-dimensional object onto an imaginary two-dimensional surface.

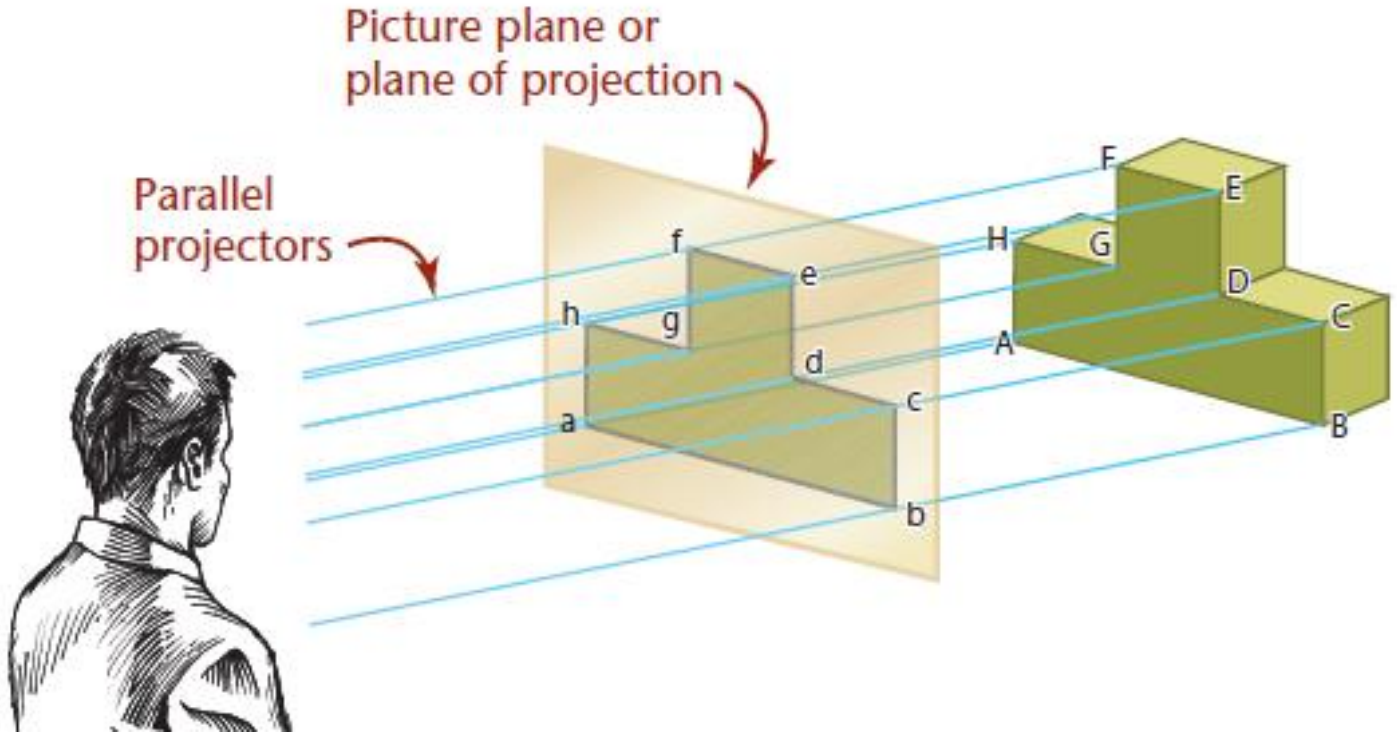


TYPES OF PROJECTION



PARALLEL PROJECTION

- The observer is imagined as infinitely distant from the object and the plane of projection, the projectors will be parallel.

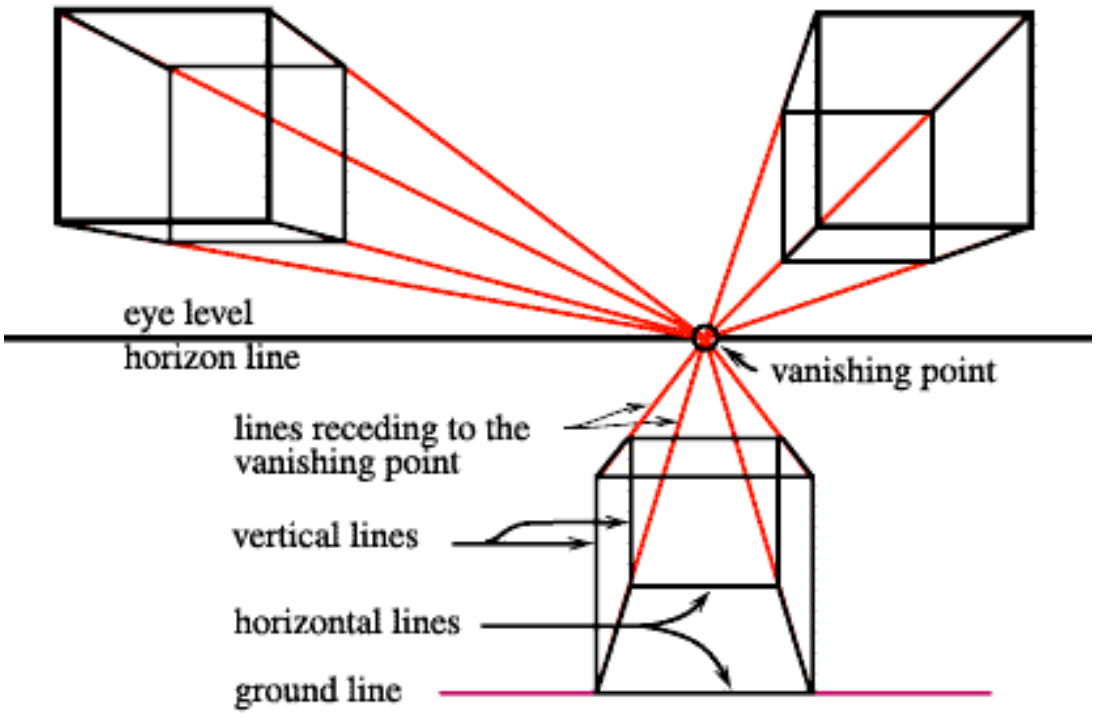


PERSPECTIVE PROJECTION

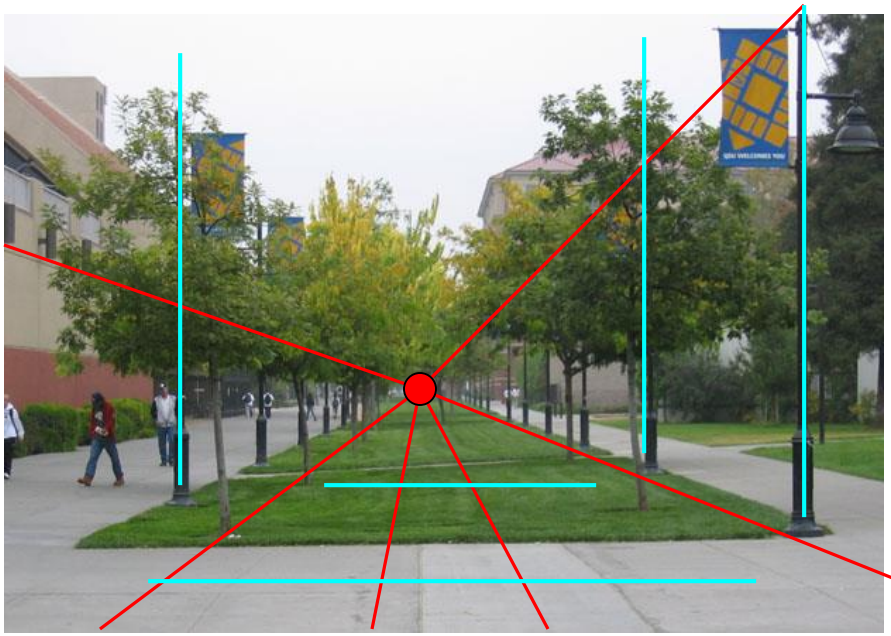
- More realistic-looking
- Object appear to converge at some distant point termed as *vanishing point*.
- Perspectives most closely duplicate what our eye or a camera sees.

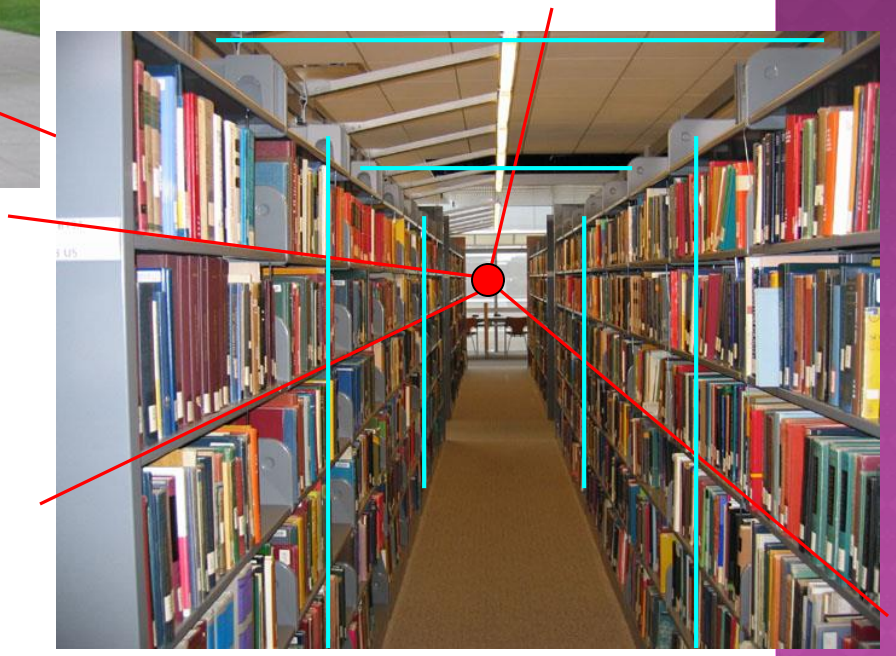
ONE-POINT PERSPECTIVE

- The front face of the drawing is parallel to the picture plane.
- The sides will recede to a single vanishing point



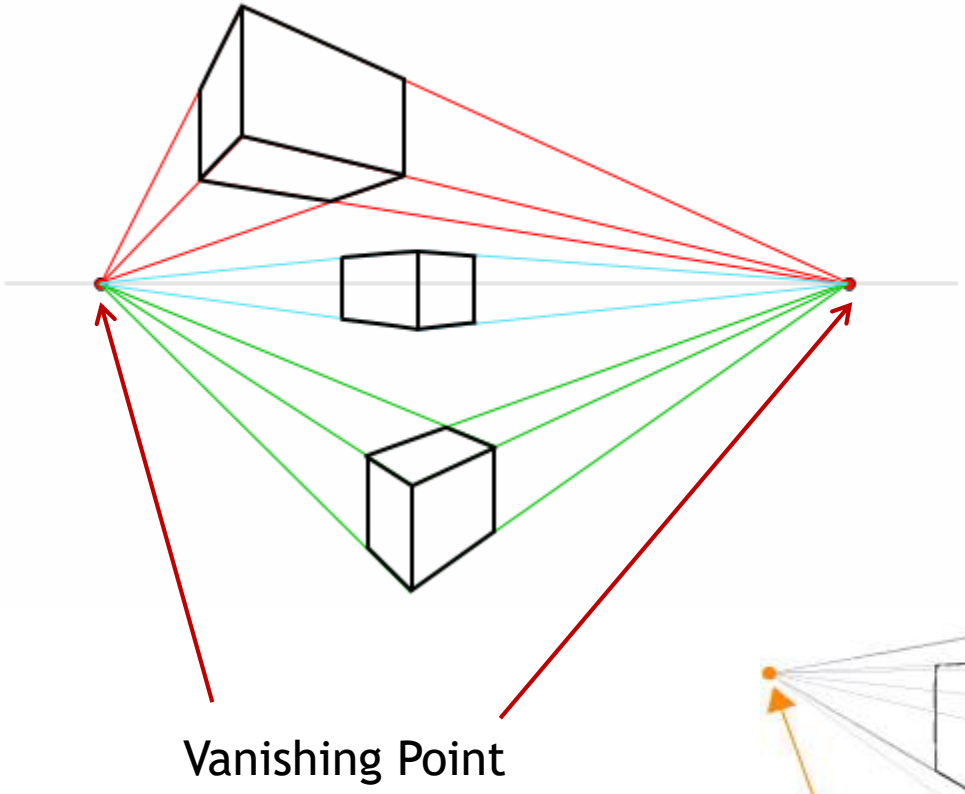
ONE-POINT PERSPECTIVE

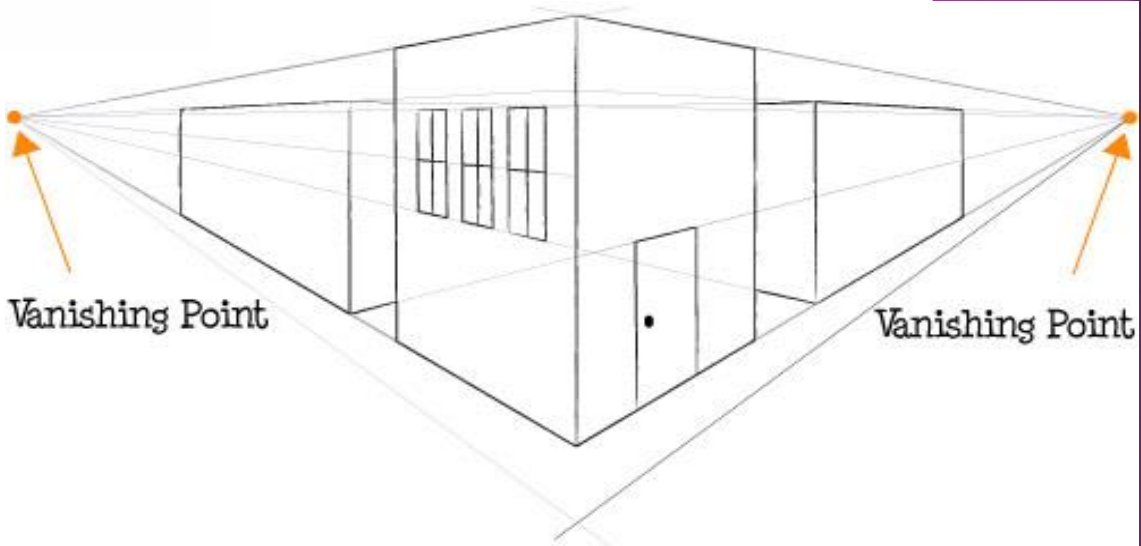




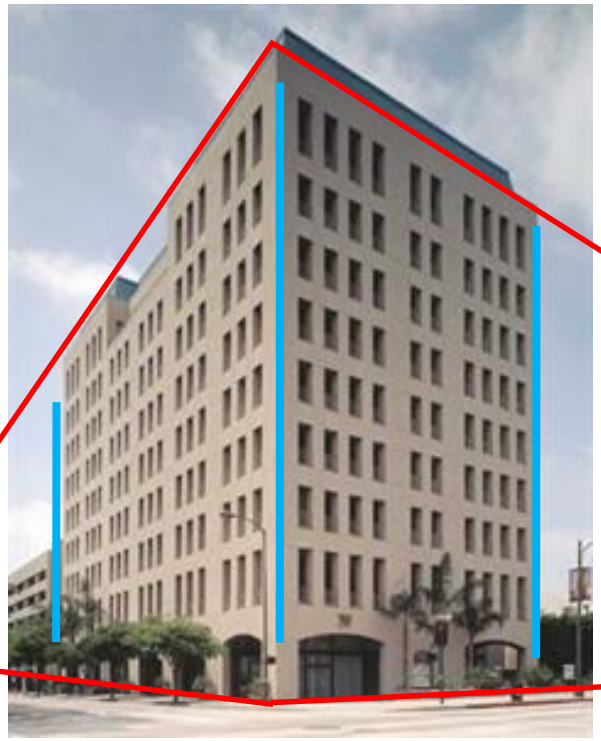
TWO-POINT PERSPECTIVE

- Both sides of the object recede at an angle from the front corner to two vanishing points.



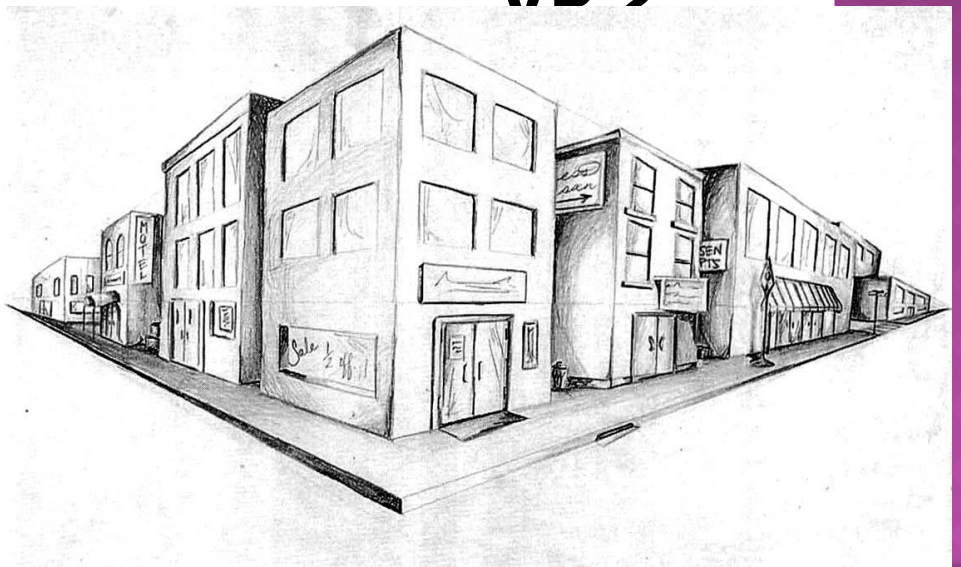


TWO-POINT PERSPECTIVE



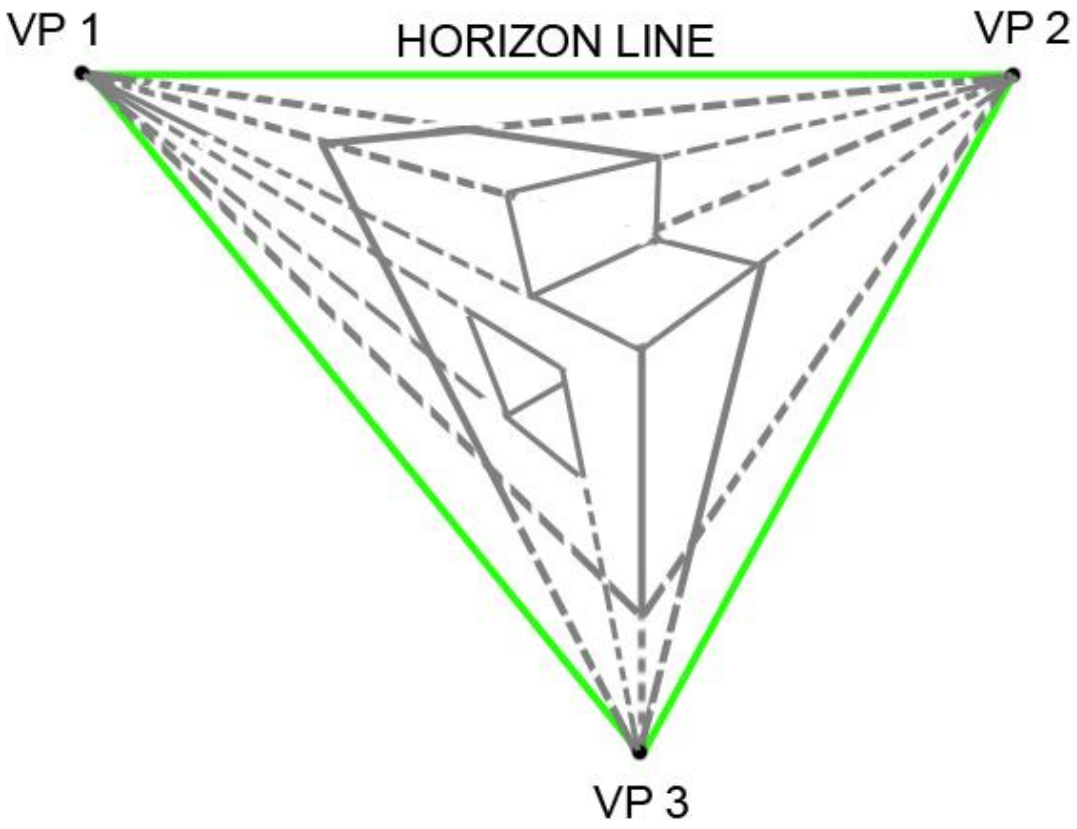
VP 1

VP 2

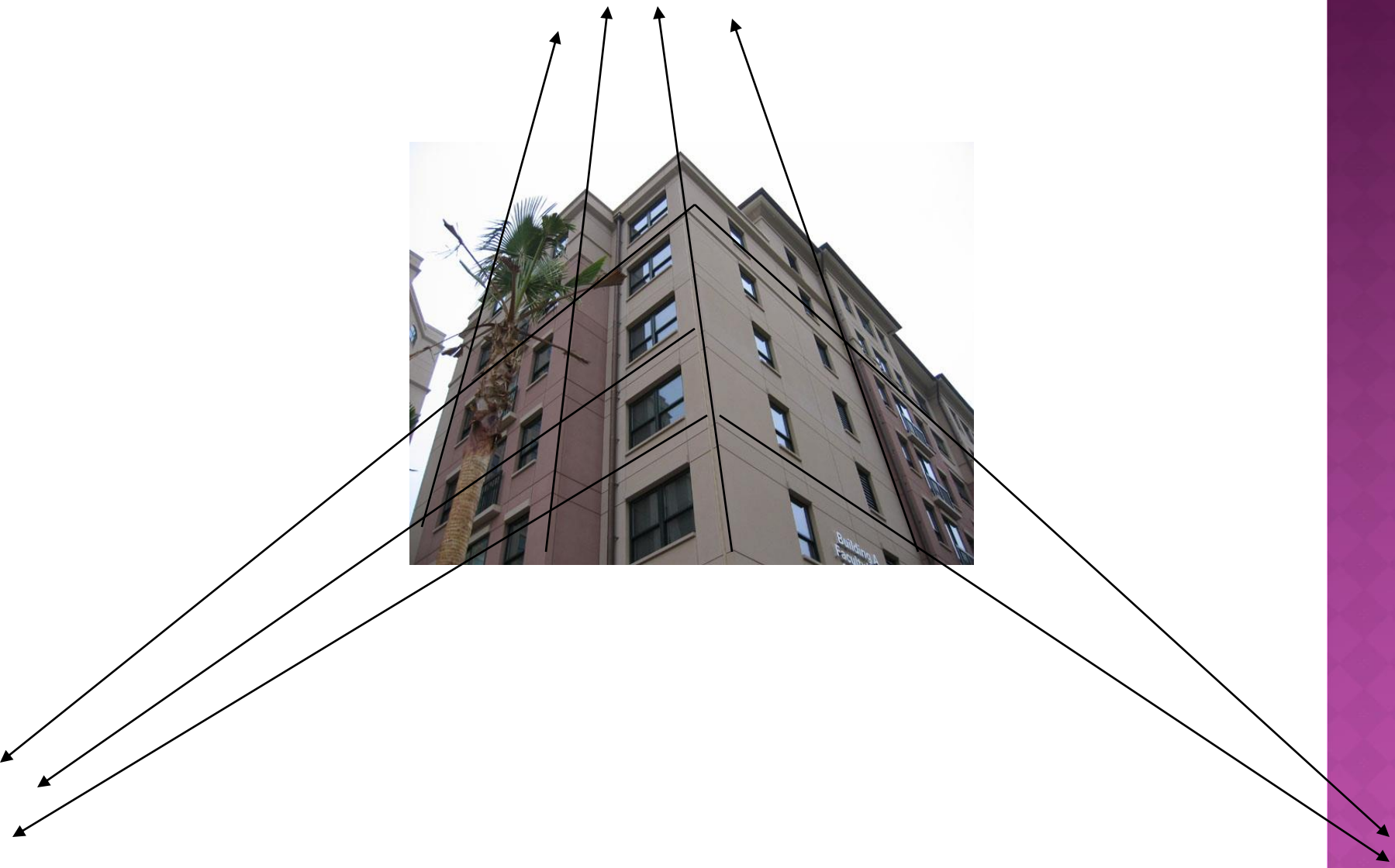


THREE-POINT PERSPECTIVE

- All sides of a perspective drawing will recede to three vanishing points.



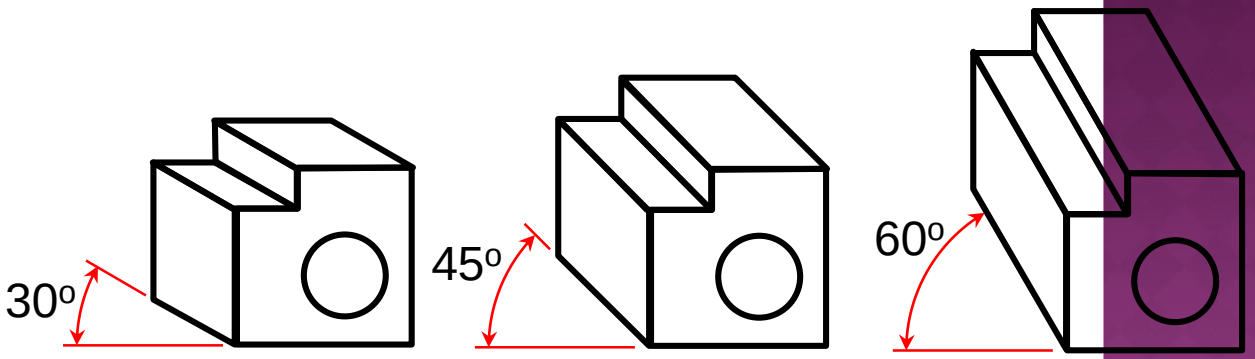
THREE-POINT PERSPECTIVE

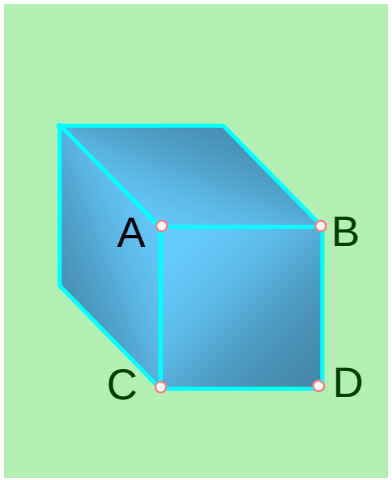


PARALLEL PROJECTION

Oblique Projection

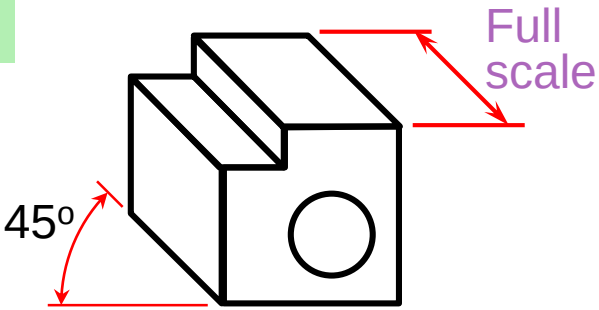
Oblique drawing angle



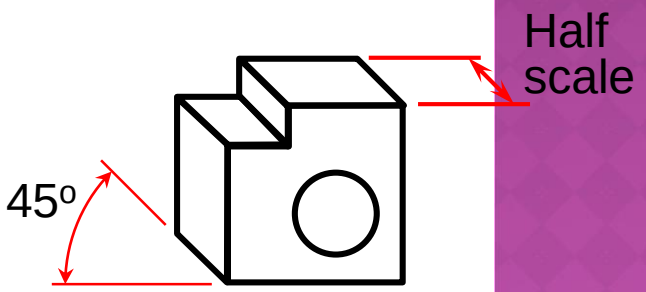


Type of Oblique drawing

1) Cavalier

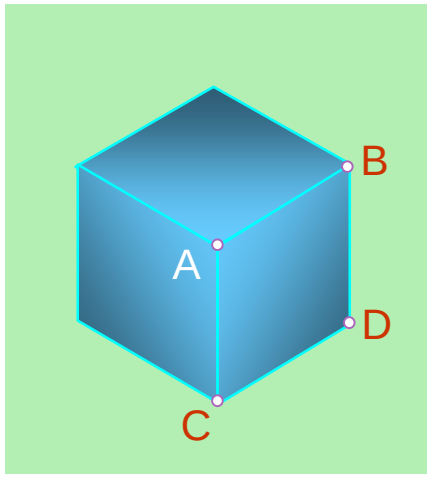


2) Cabinet

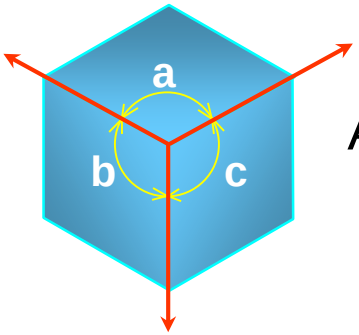


Axonometric Projection

Type of axonometric drawing



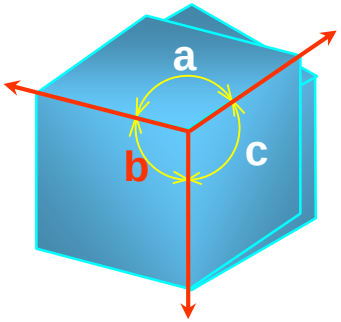
1. Isometric



Axonometric axis

All angles are equal.

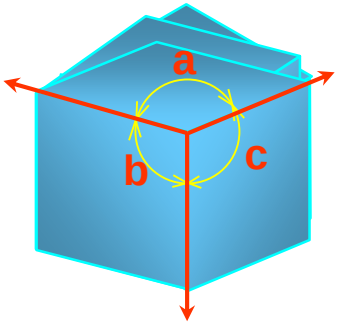
2. Dimetric



Axonometric axis

Two angles are equal.

3. Trimetric

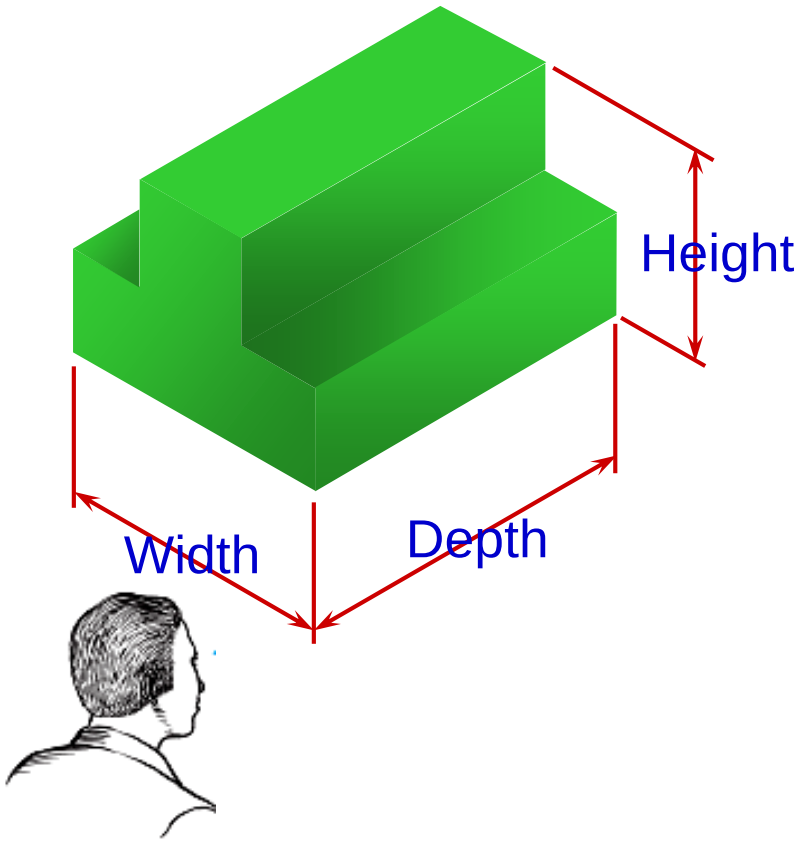


Axonometric axis

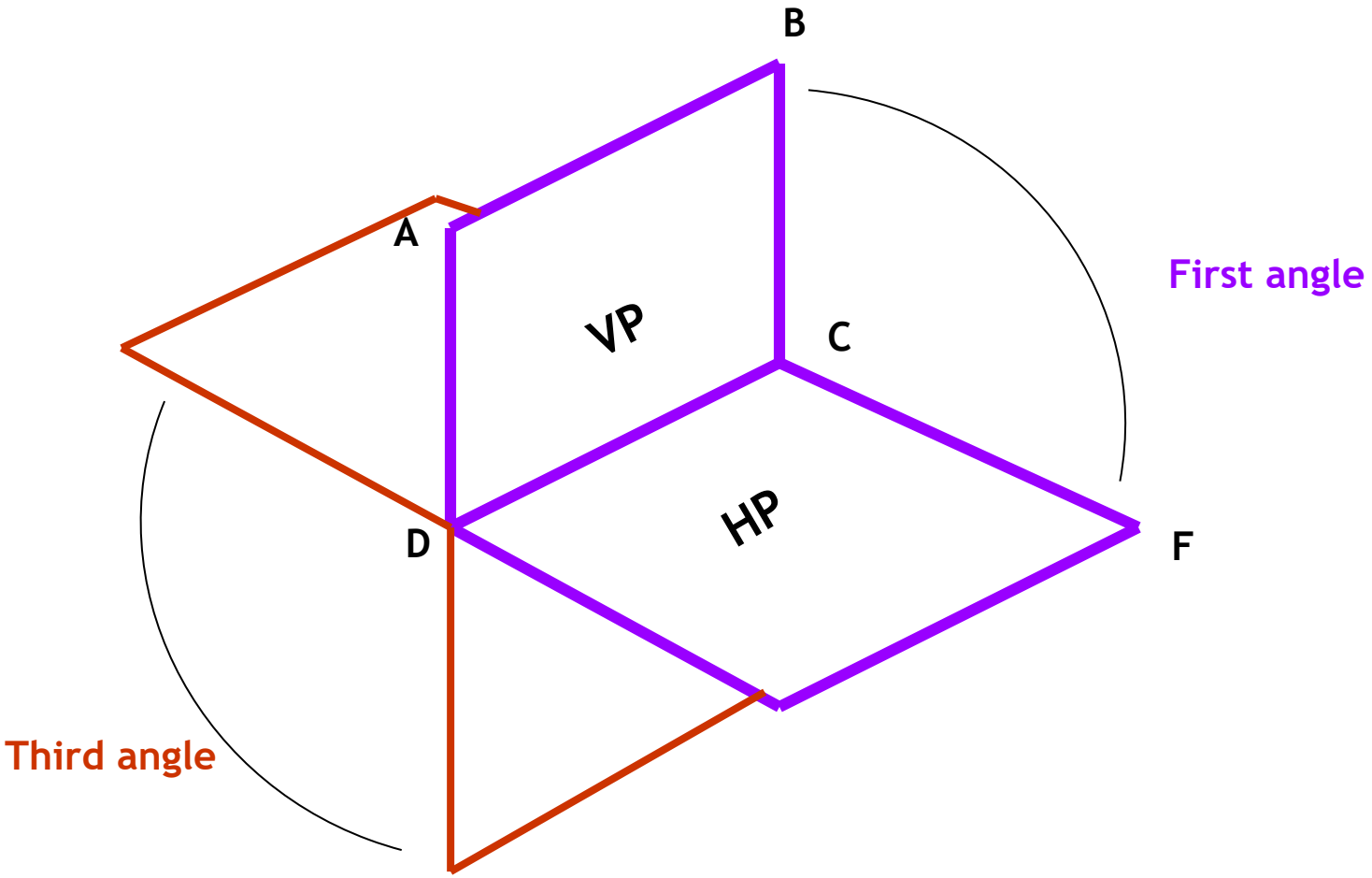
None of angles are equal.

ORTHOGRAPHIC PROJECTION

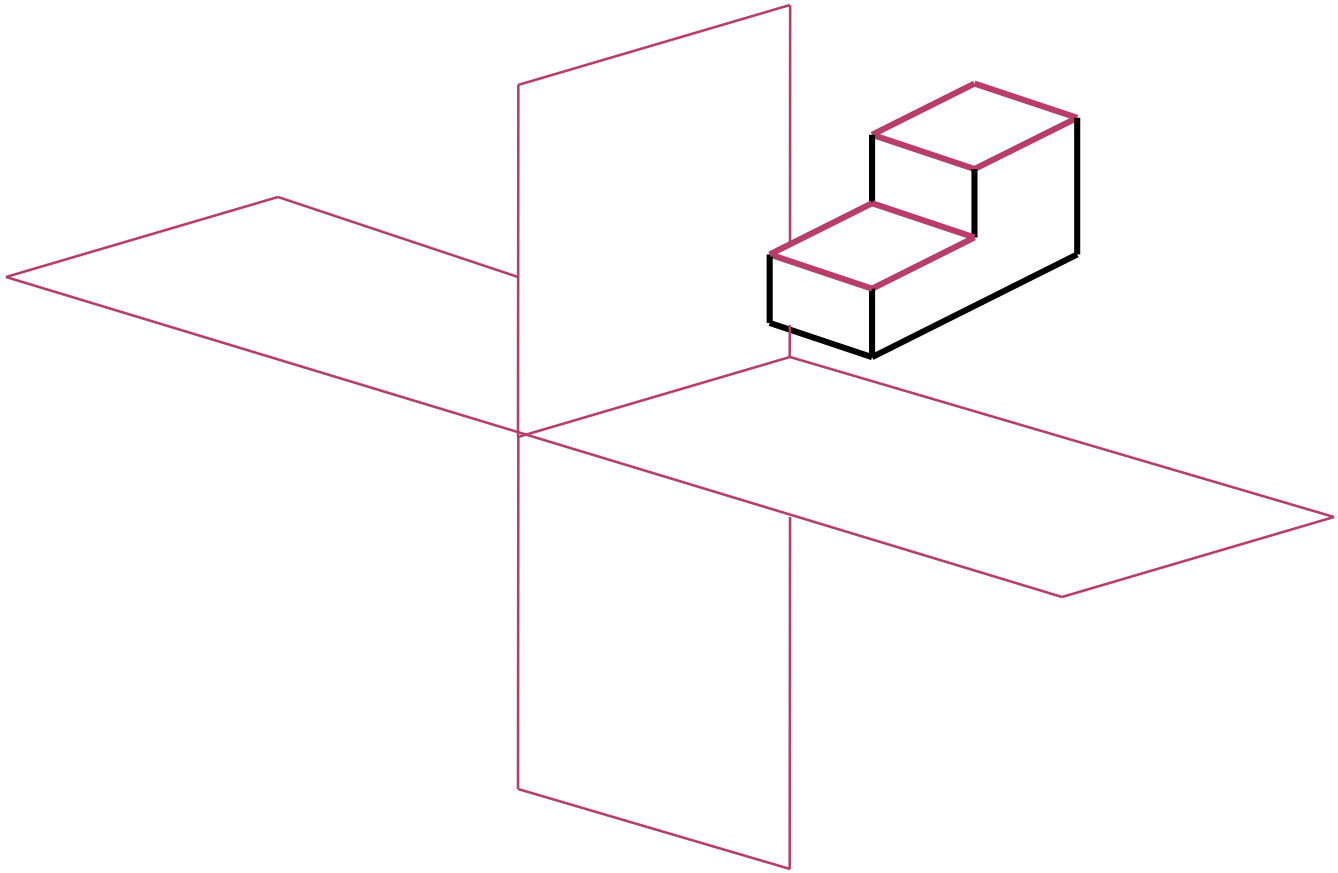
- Orthographic Projection is a method of representing a three dimensional object on paper using several two dimensional views.



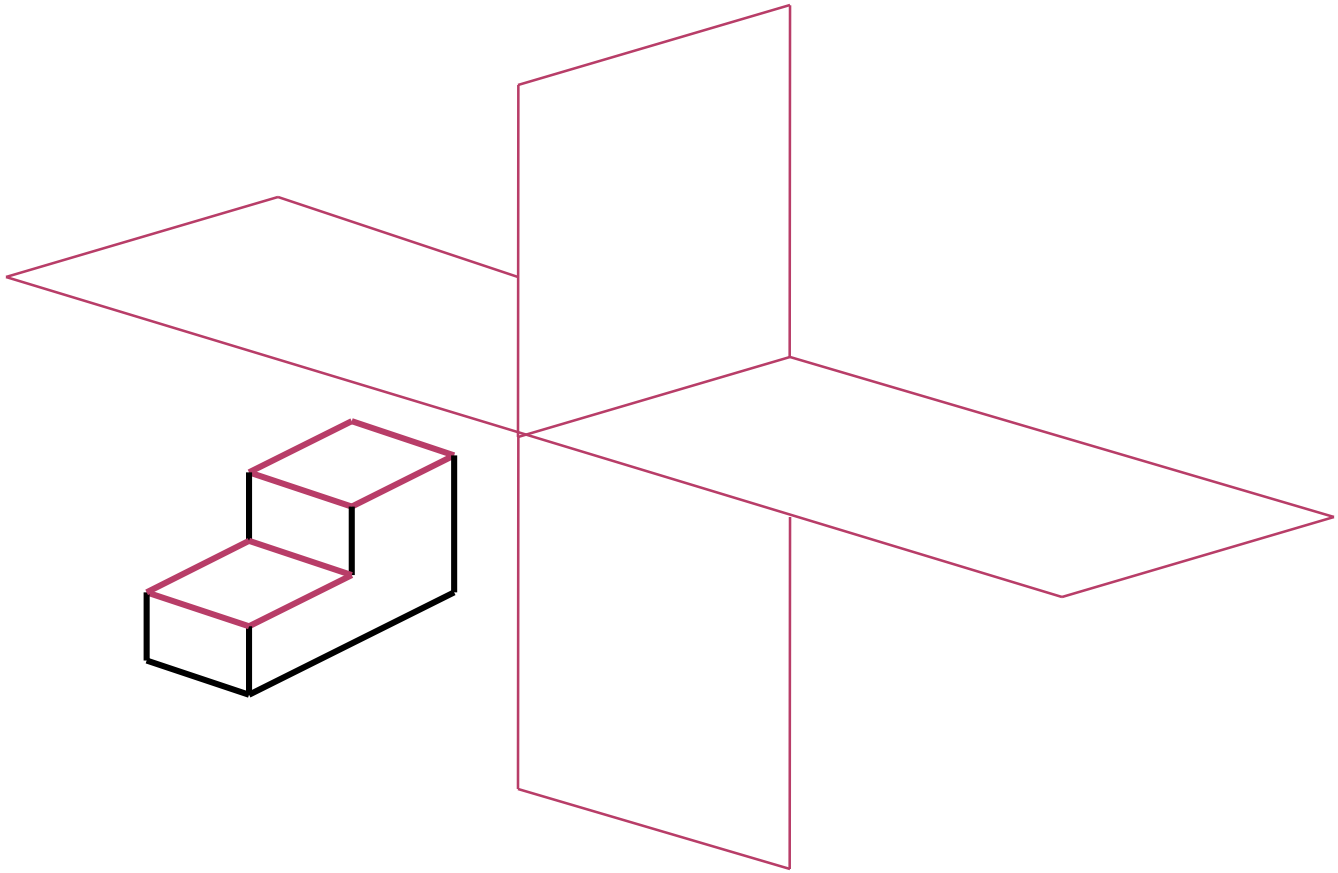
ORTHOGRAPHIC PROJECTION

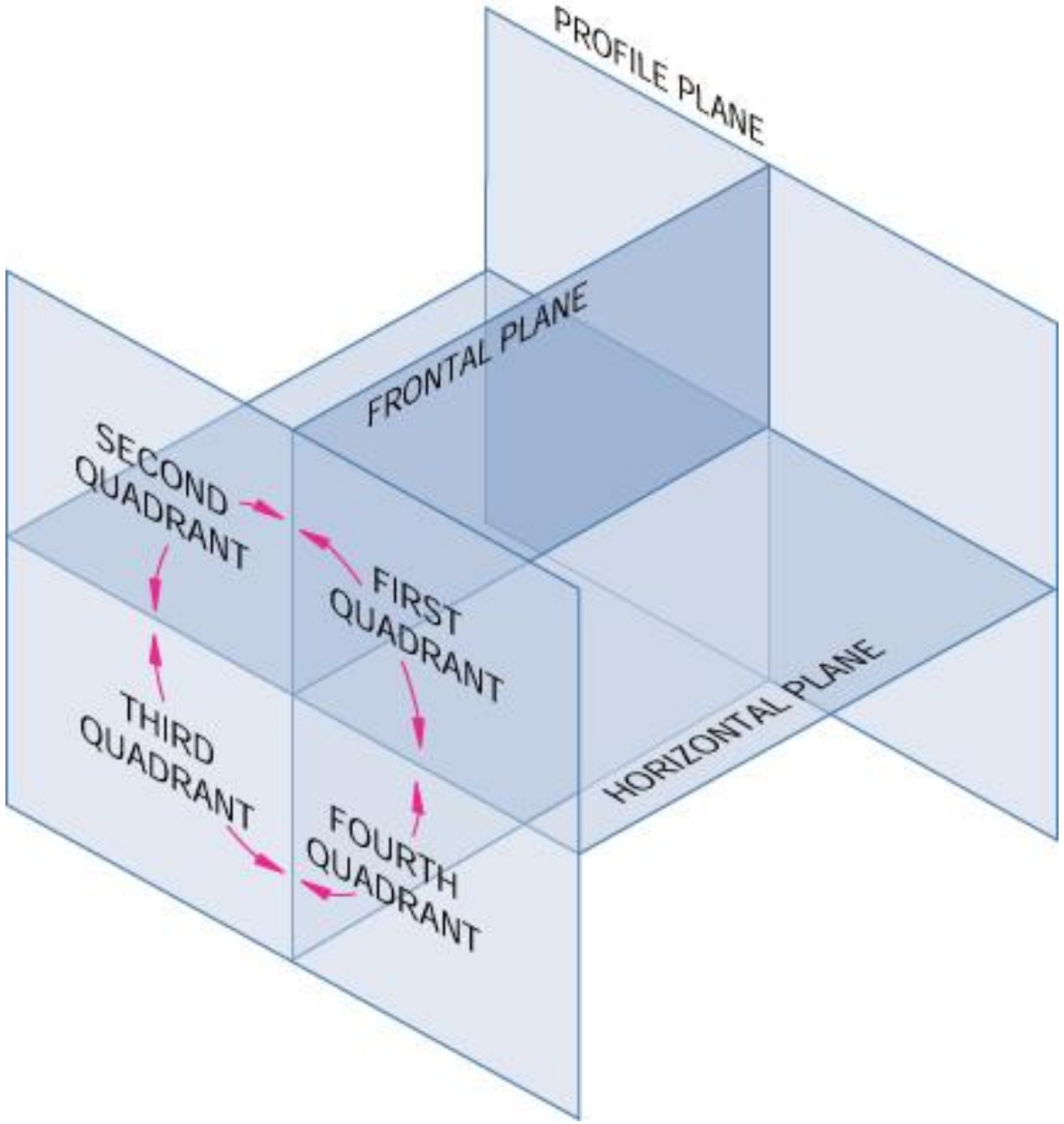


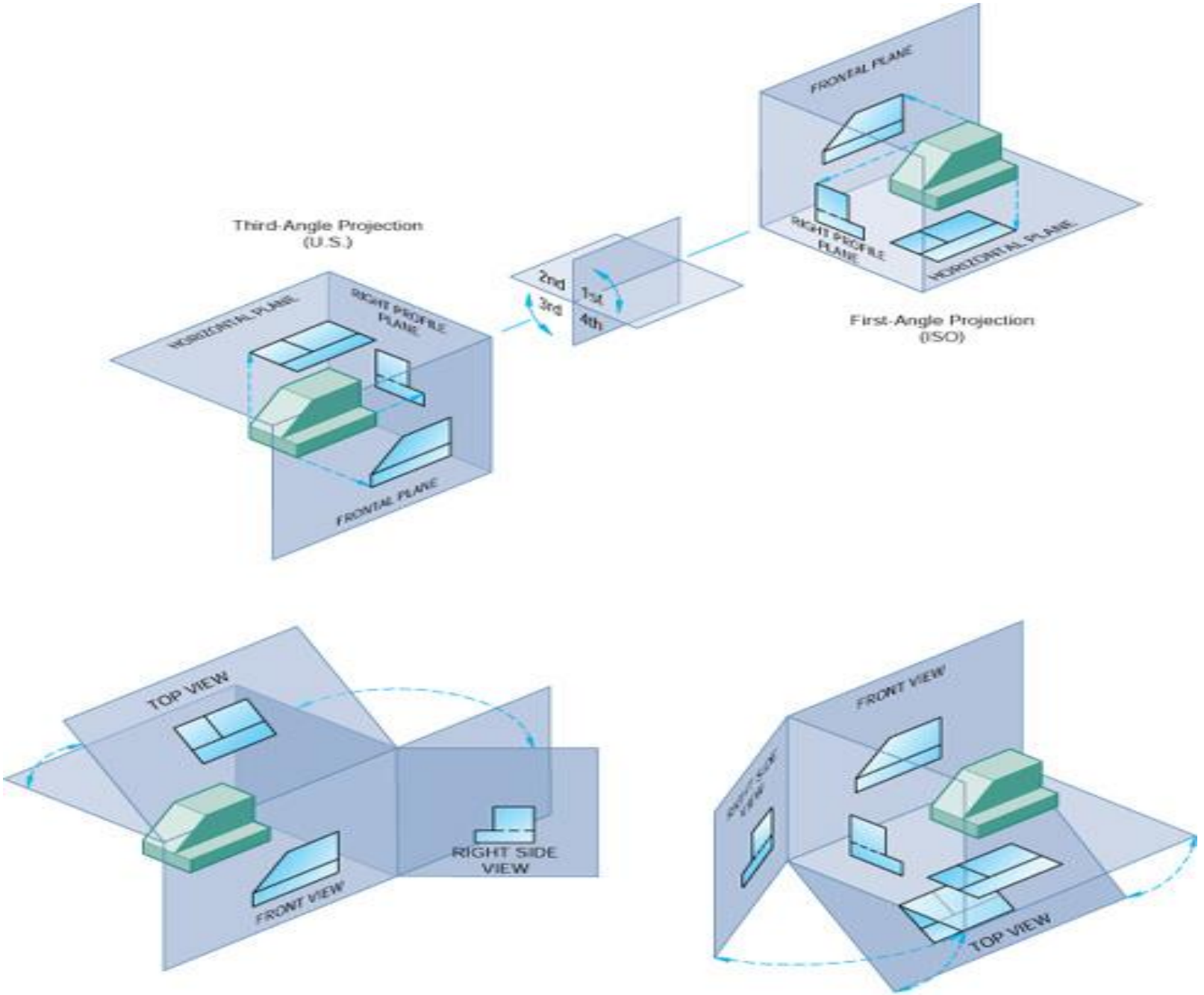
FIRST ANGLE PROJECTION

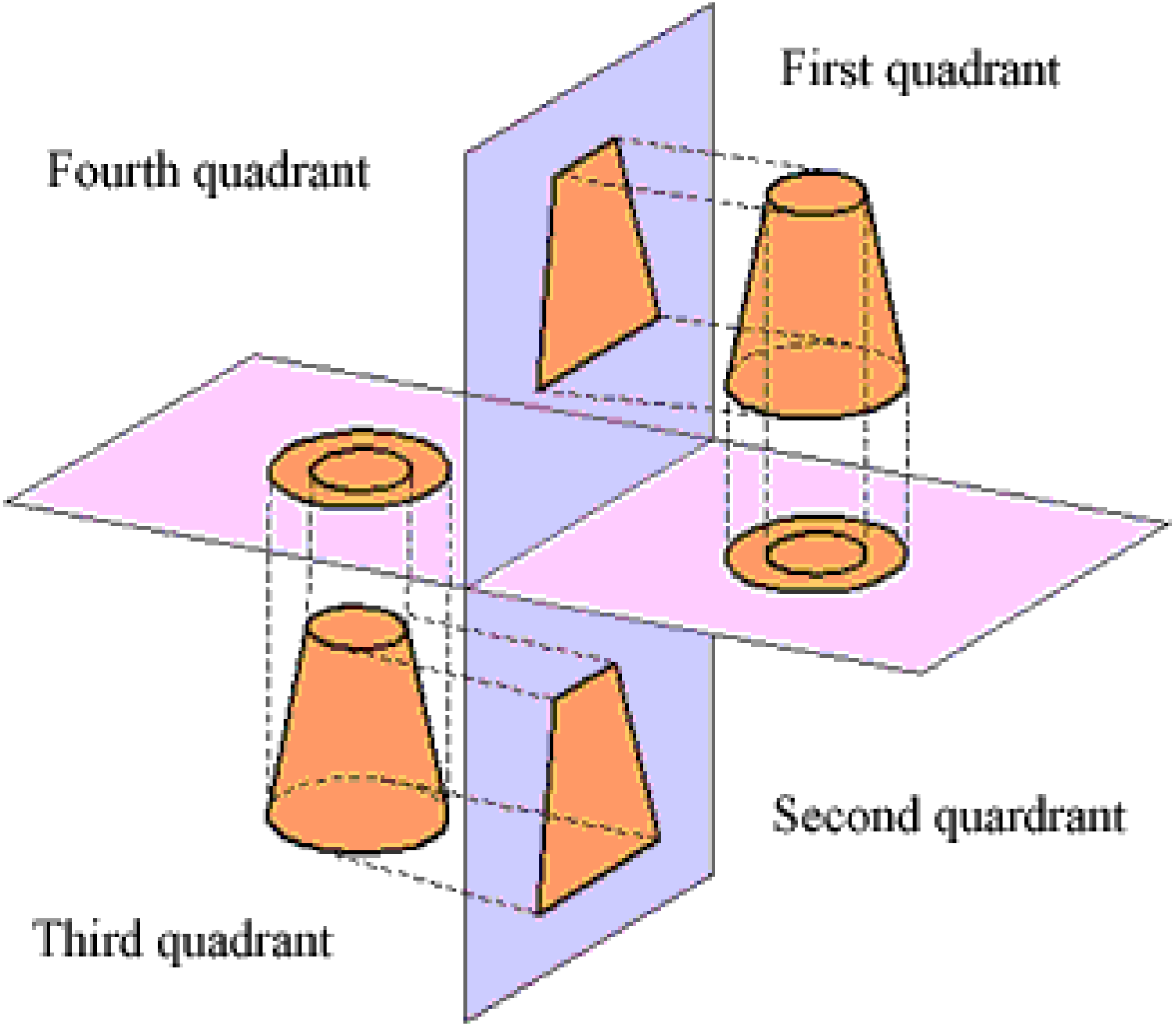


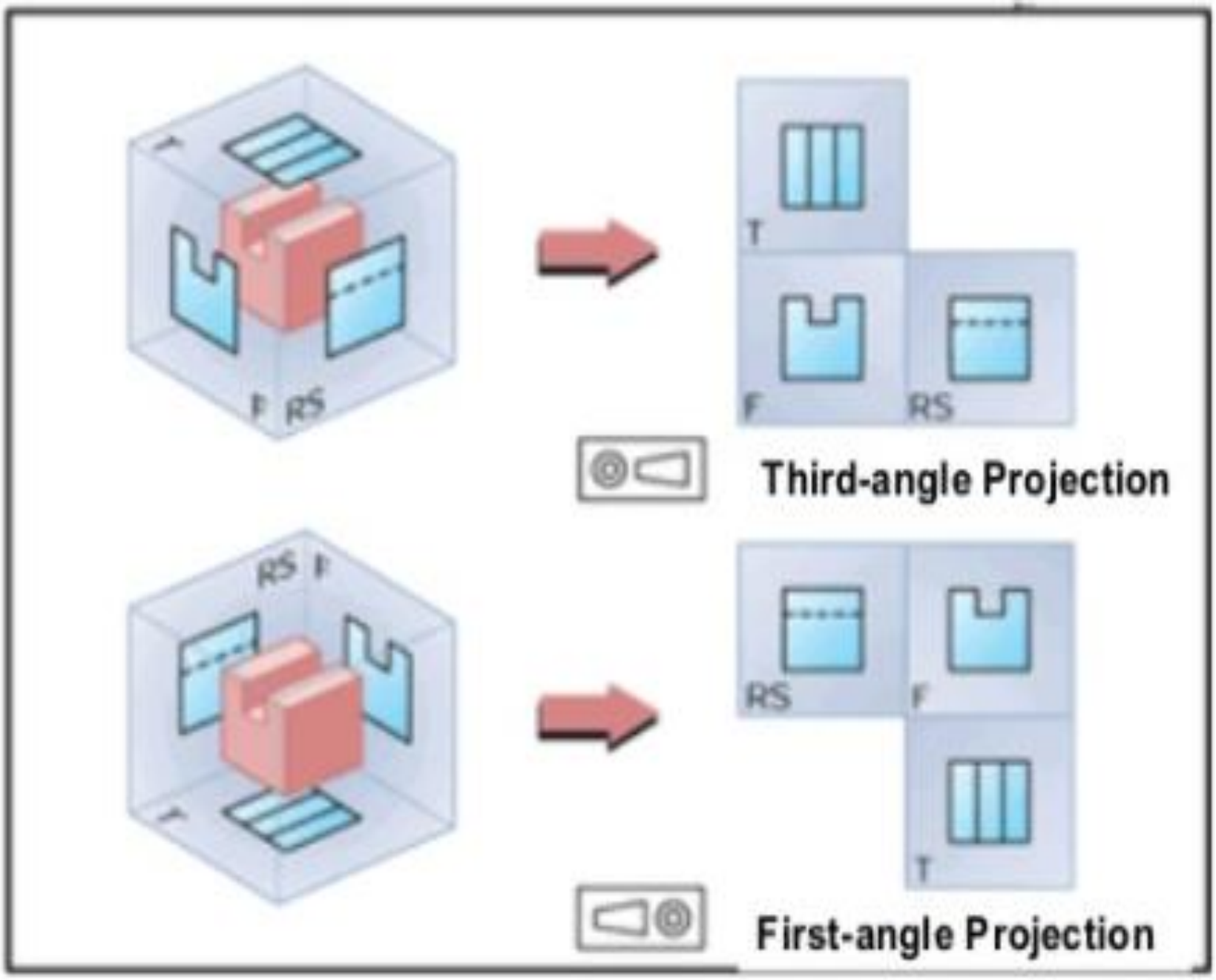
THIRD ANGLE PROJECTION




PROFILE PLANE
FRONTAL PLANE
HORIZONTAL PLANE
SECOND QUADRANT
FIRST QUADRANT
THIRD QUADRANT
FOURTH QUADRANT


Third-Angle Projection
(U.S.)
HORIZONTAL PLANE
RIGHT PROFILE PLANE
FRONTAL PLANE
2nd
1st
3rd
4th
FRONTAL PLANE
RIGHT PROFILE PLANE
HORIZONTAL PLANE
First-Angle Projection
(ISO)
TOP VIEW
RIGHT SIDE VIEW
FRONT VIEW
(A) Third-Angle Projection
FRONT VIEW
TOP VIEW
(B) First-Angle Projection

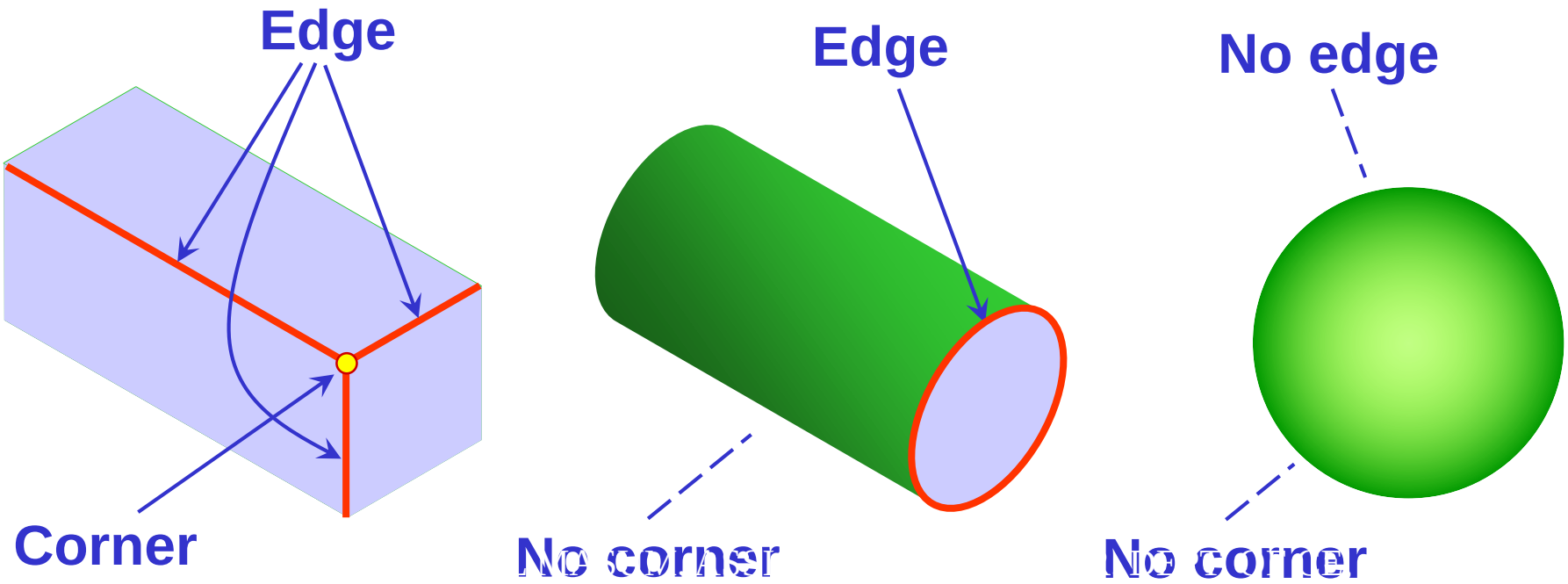

First quadrant
Fourth quadrant
Second quardrant
Third quadrant


T
F
RS
T
F
RS
Third-angle Projection
RS
F
T
RS
F
T
First-angle Projection

OBJECT FEATURES

Edges are lines that represent the boundary between two faces.

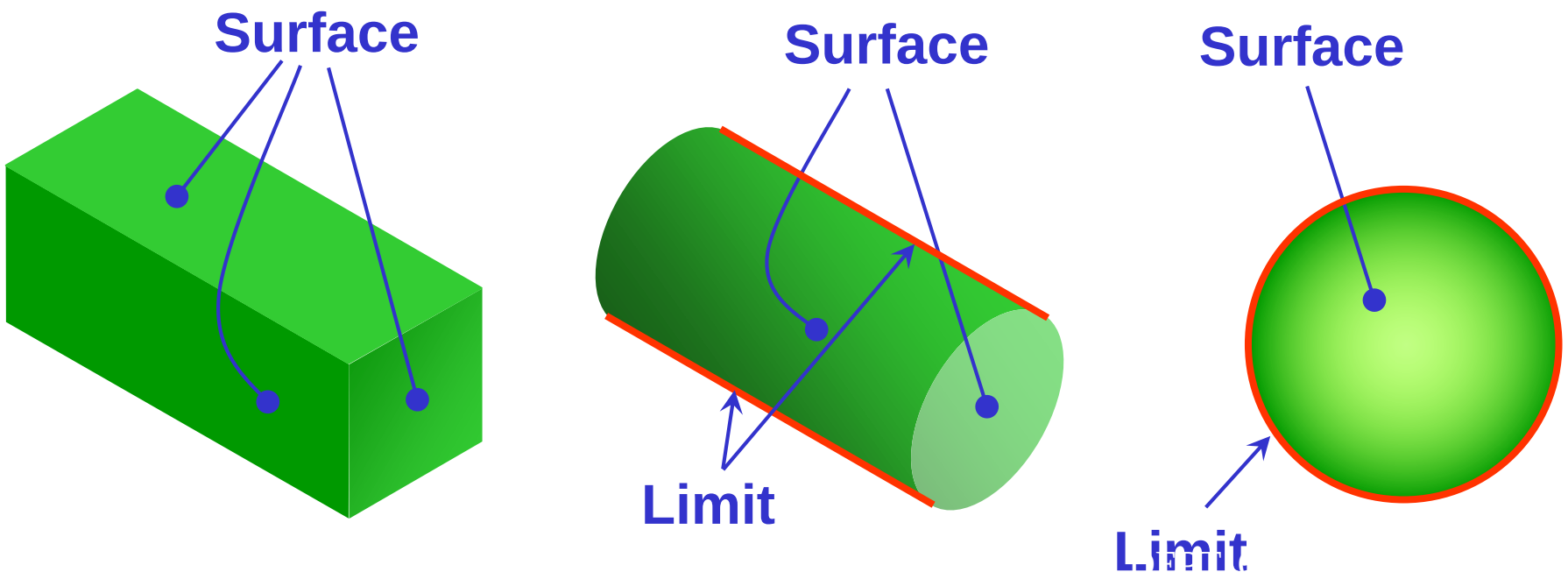
Corners Represent the intersection of two or more edges.



OBJECT FEATURES

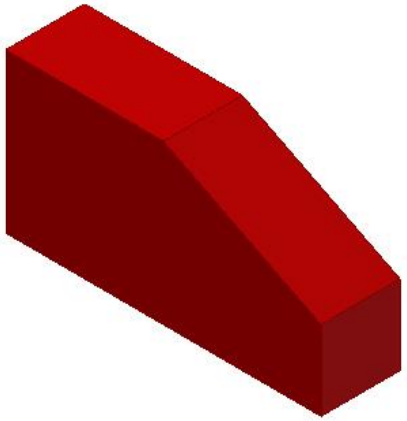
Surfaces are areas that are bounded by edges or limiting element.

Limiting element is a line that represents the last visible part of the curve surface.



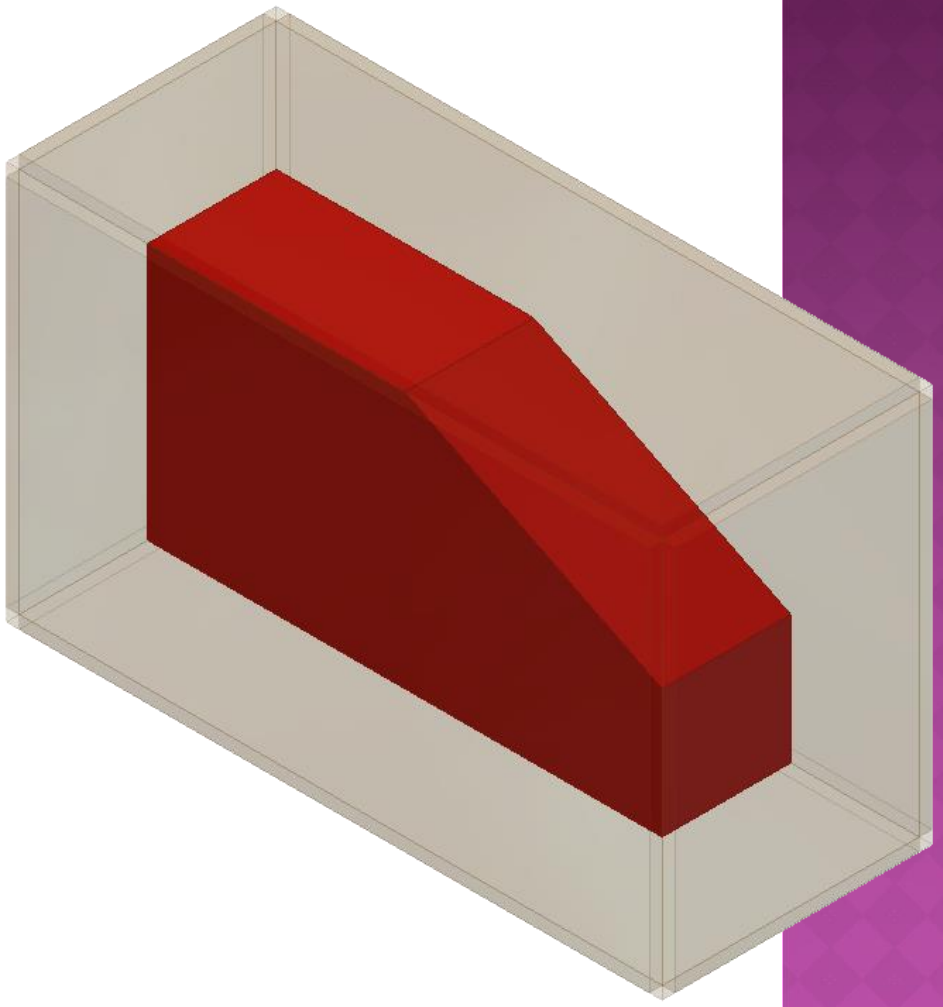
Orthographic Projection

The best way to understand ***orthographic projection*** is to imagine an object contained inside a glass box.



Orthographic Projection

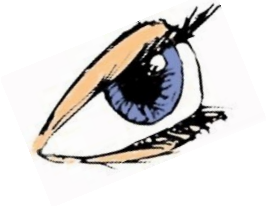
There is a total of six glass walls surrounding the object. Each wall represents a ***projection plane*** onto which a two-dimensional object view will be created.

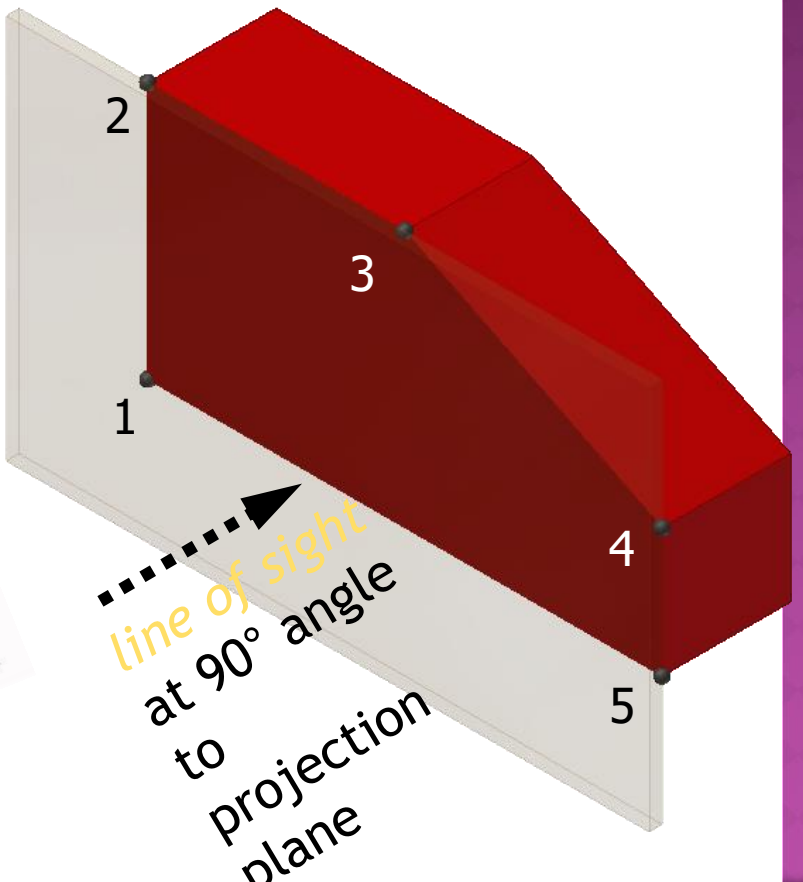


Orthographic Projection

Start by focusing only on the front ***projection plane***.

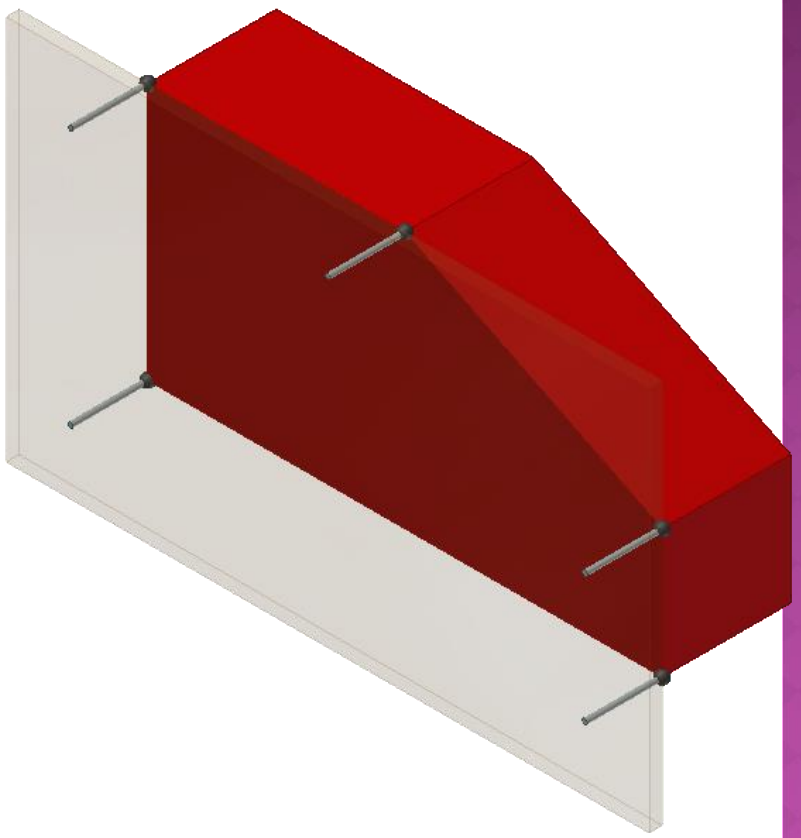
A person standing in front of the object would see only the five corners identified in black.





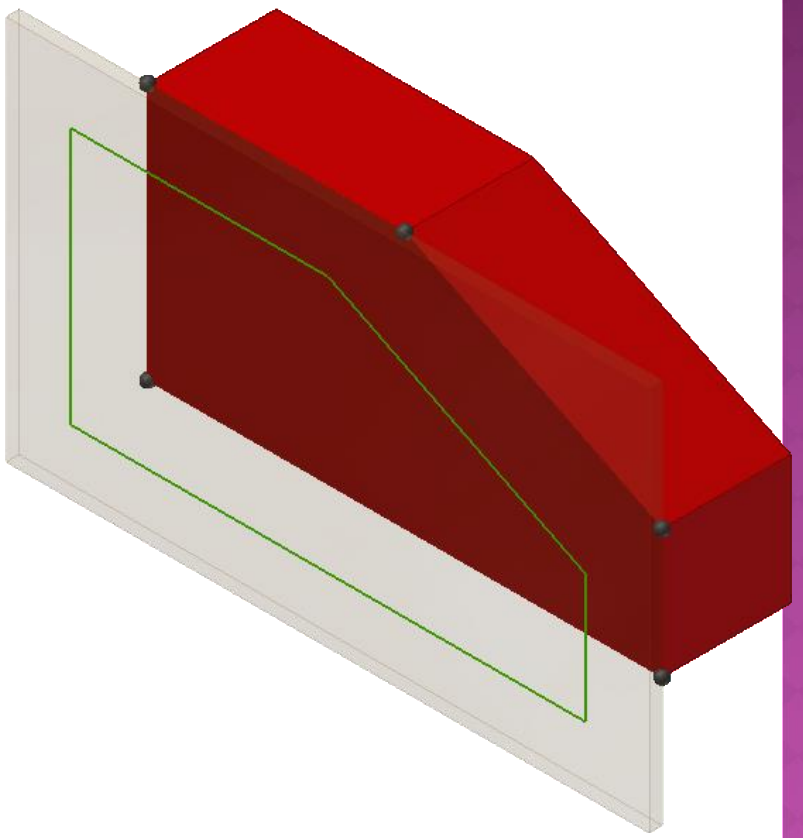
Orthographic Projection

Projection lines are used to project each corner outward until they reach the ***projection plane***.



Orthographic Projection

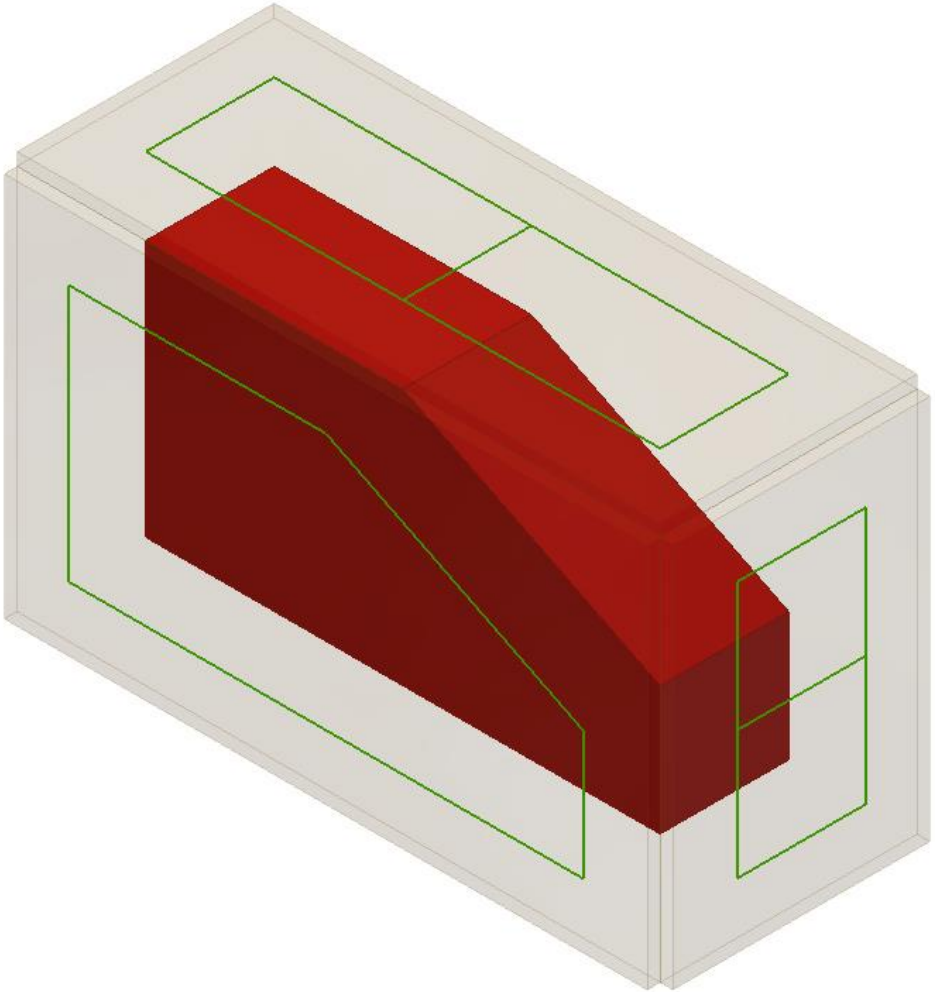
The *visible edges* of the object are then identified on the ***projection plane*** by connecting the projected corners with ***object lines***.



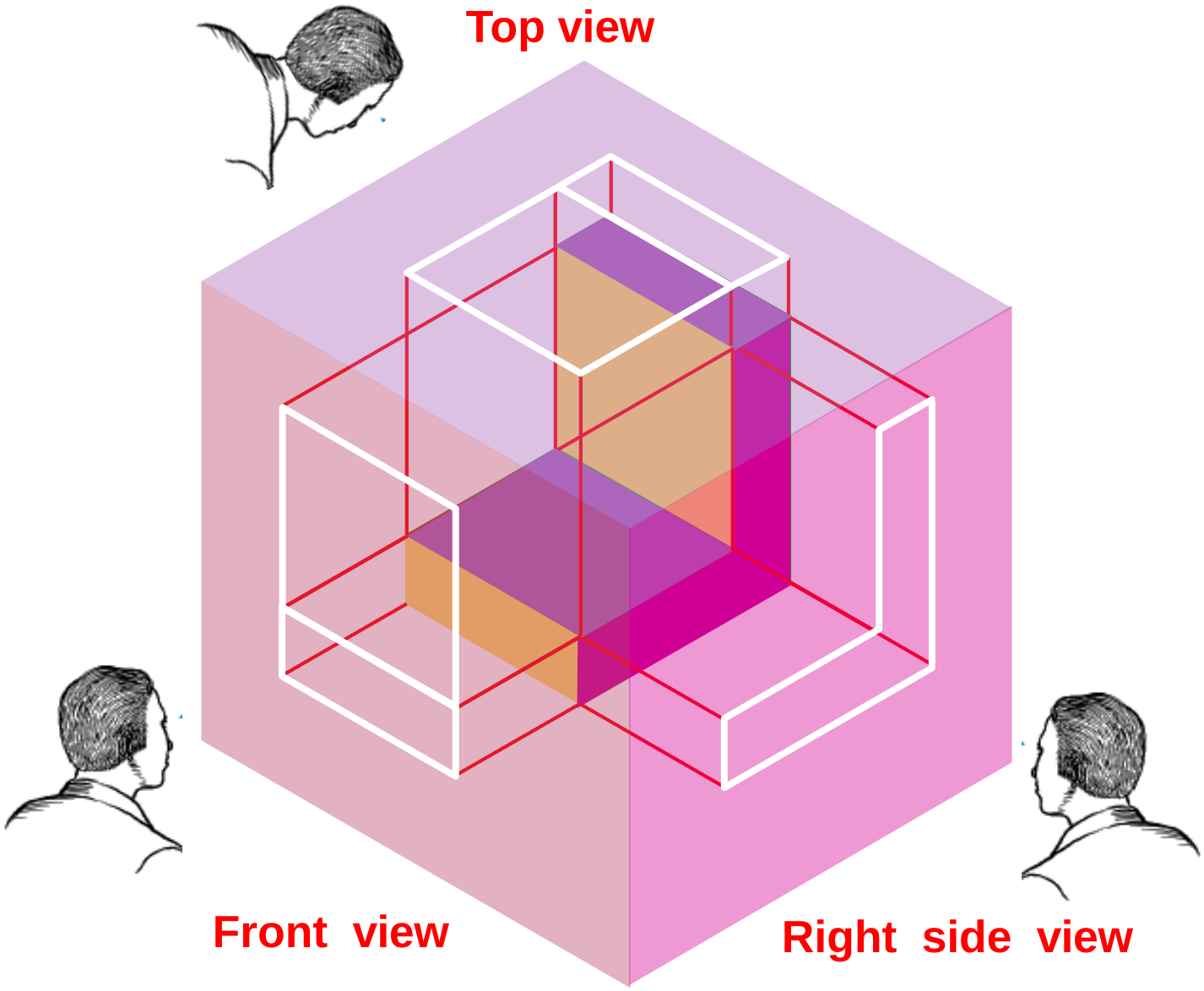
Orthographic Projection

The ***orthographic***

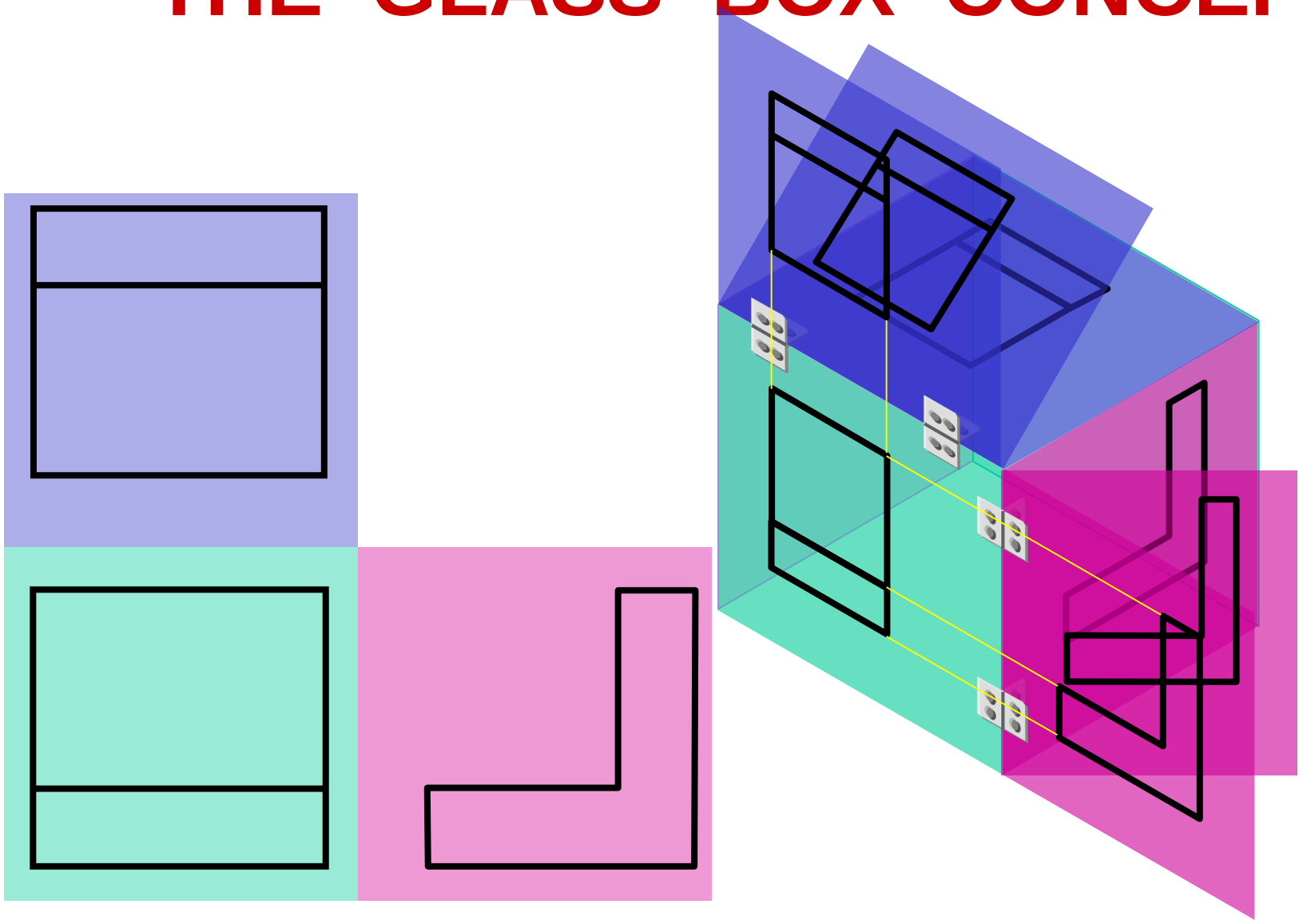
planes.



MULTIVIEW PROJECTION

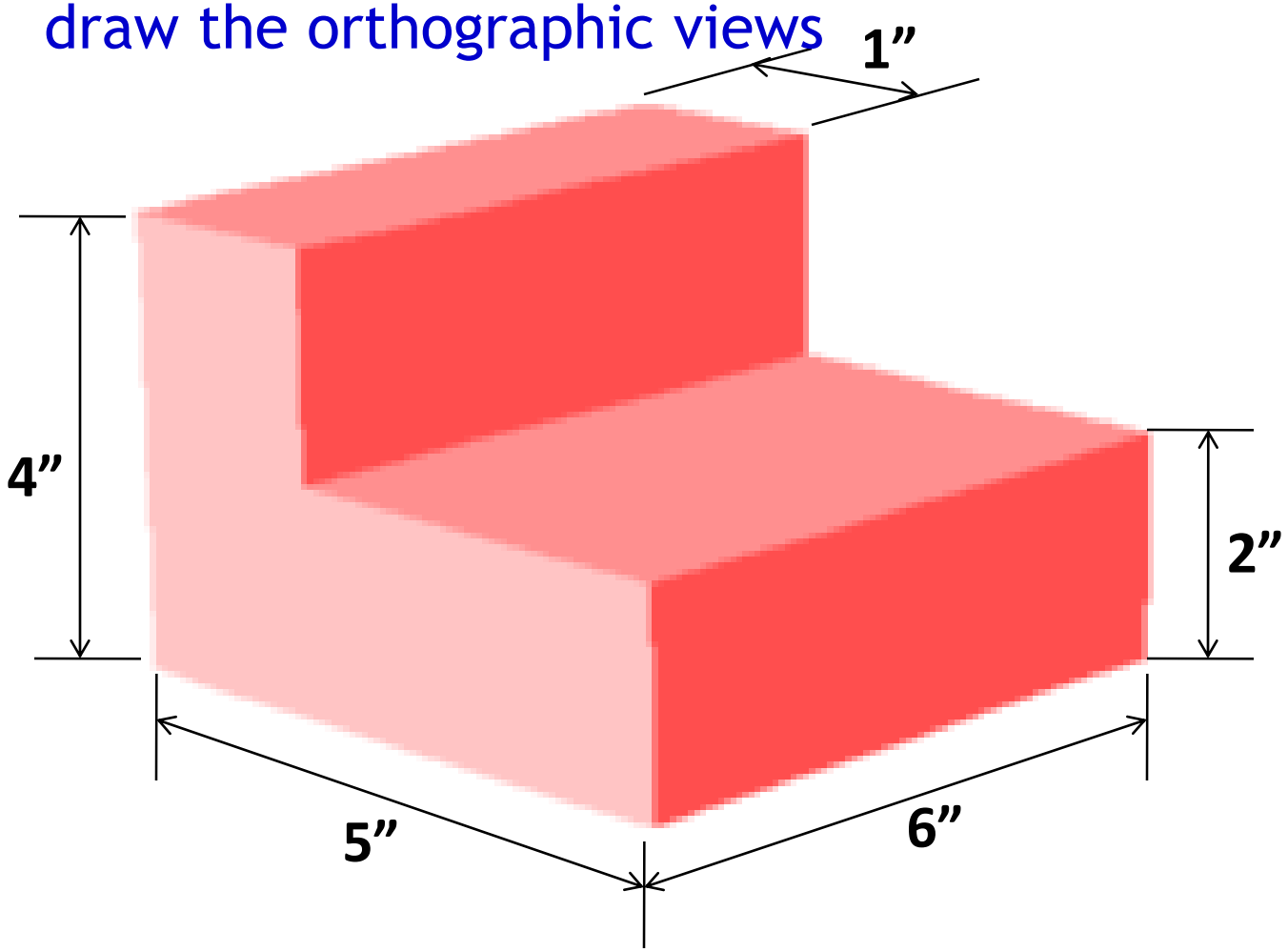


THE GLASS BOX CONCEPT

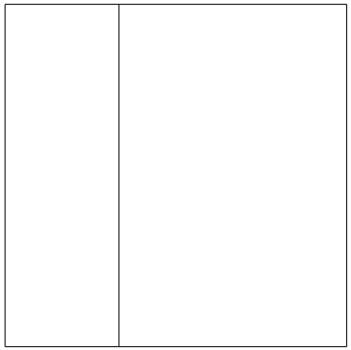


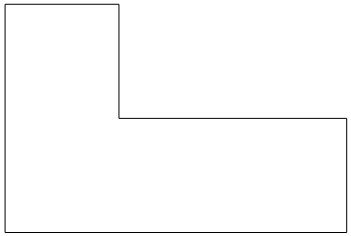
Given: object as shown

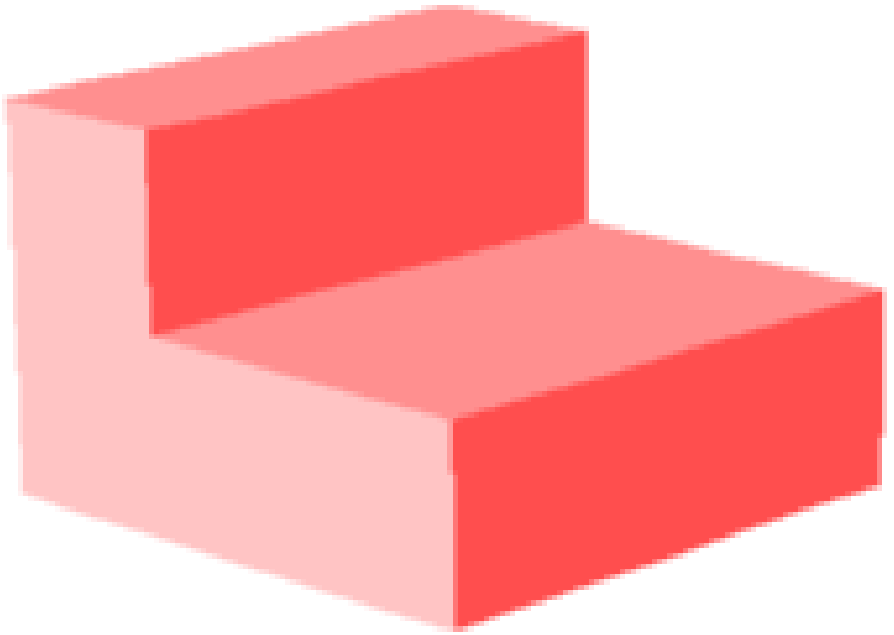
Find: draw the orthographic views



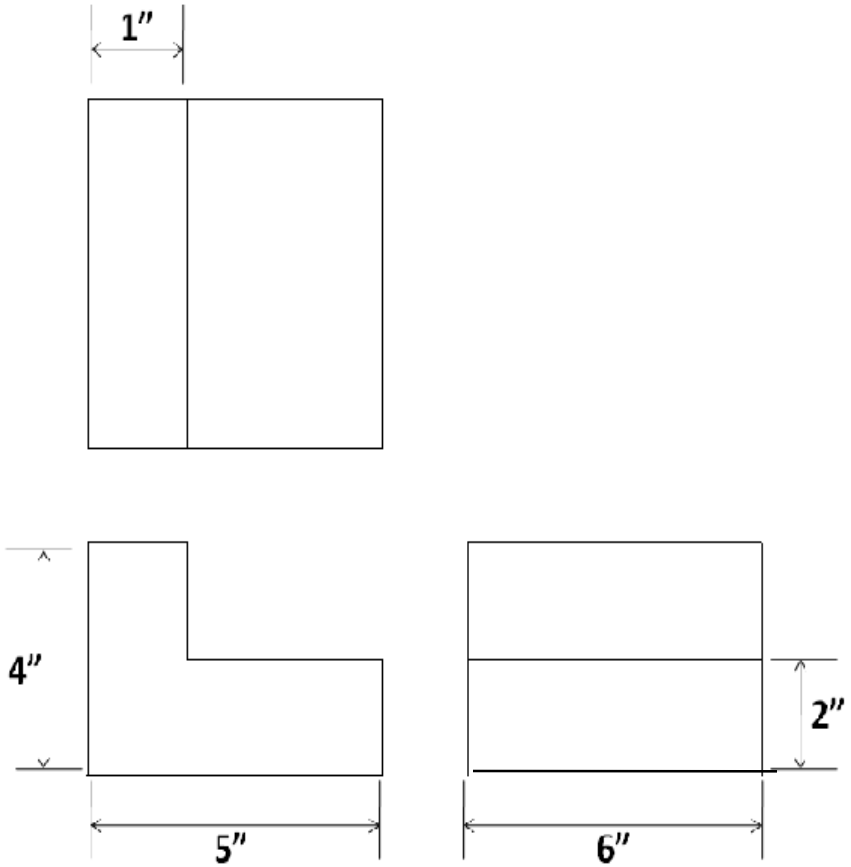
ORTHOGRAPHIC PROJECTION

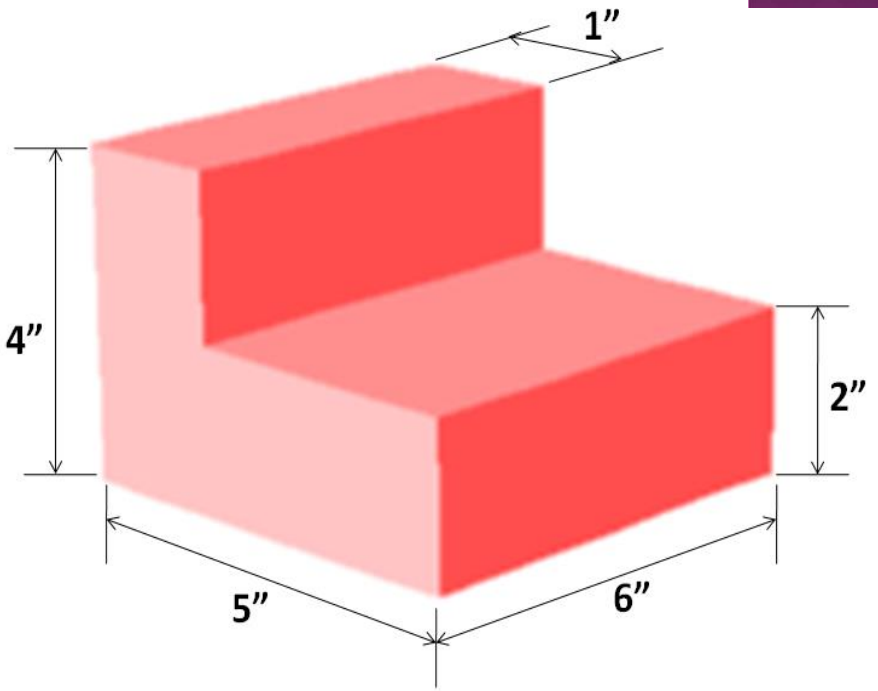


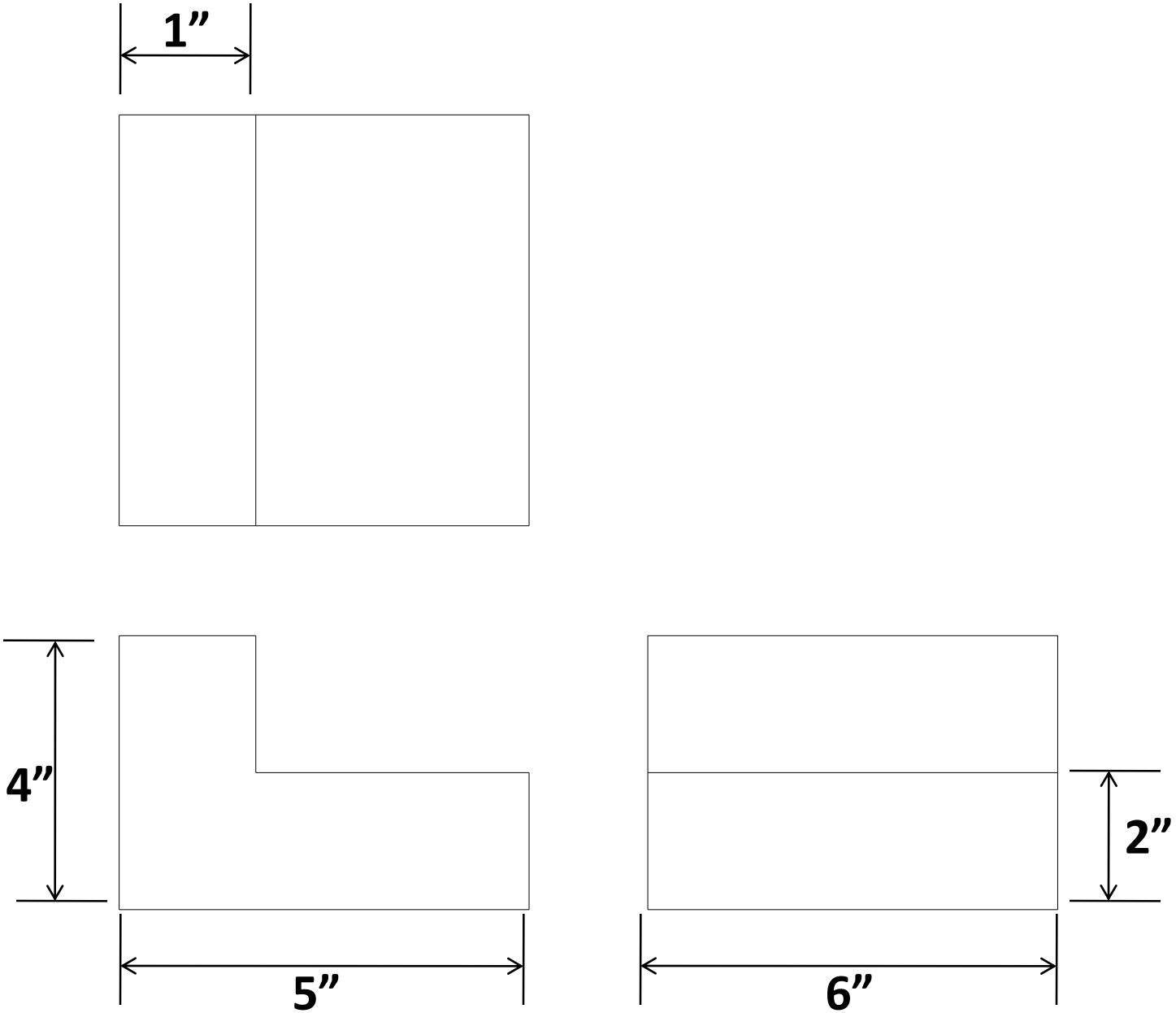




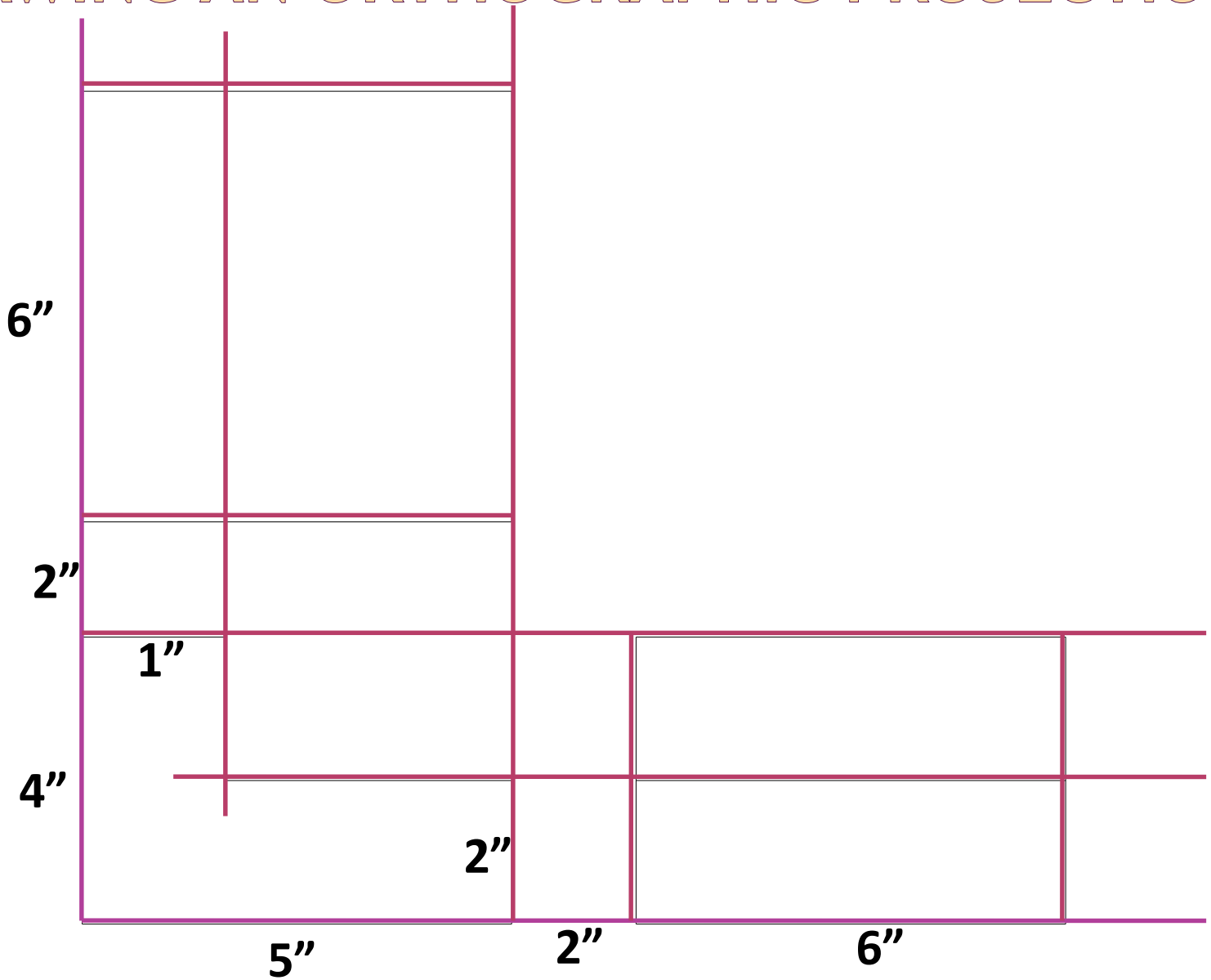
ORTHOGRAPHIC PROJECTION



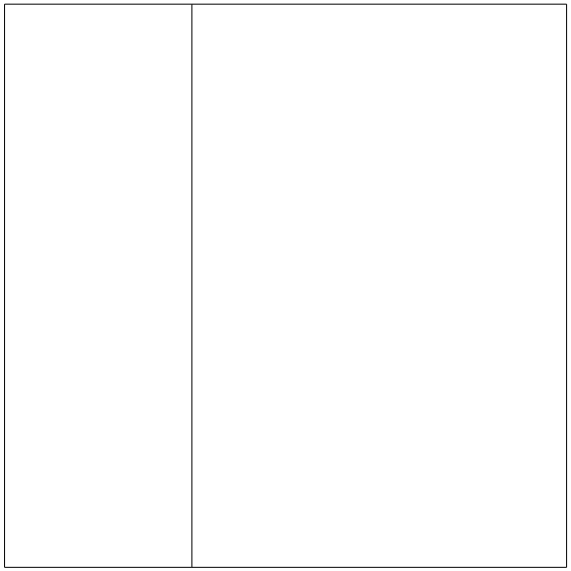


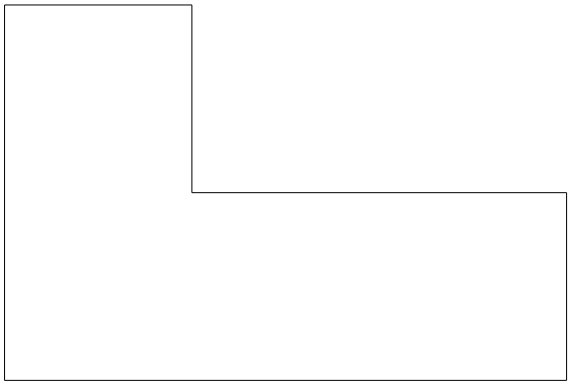

1”
4”
5”
2”
6”

DRAWING AN ORTHOGRAPHIC PROJECTION

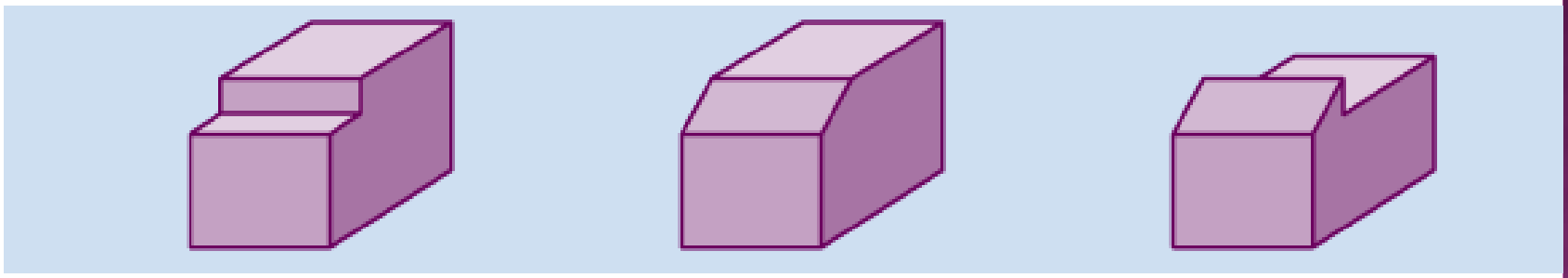


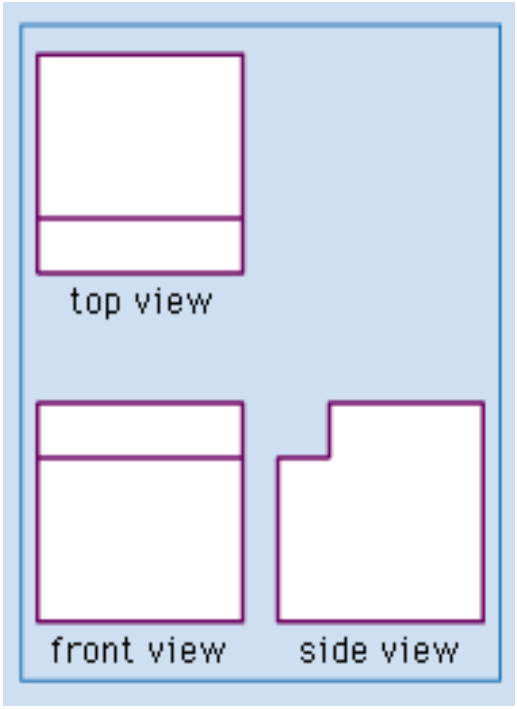
COMPLETED DRAWING

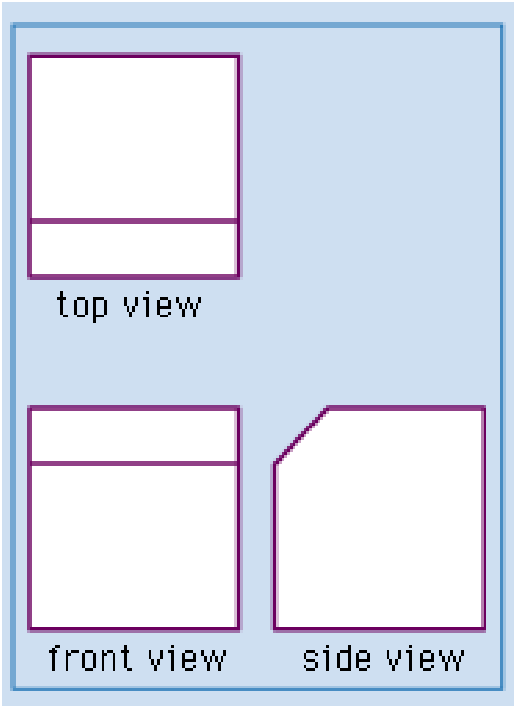


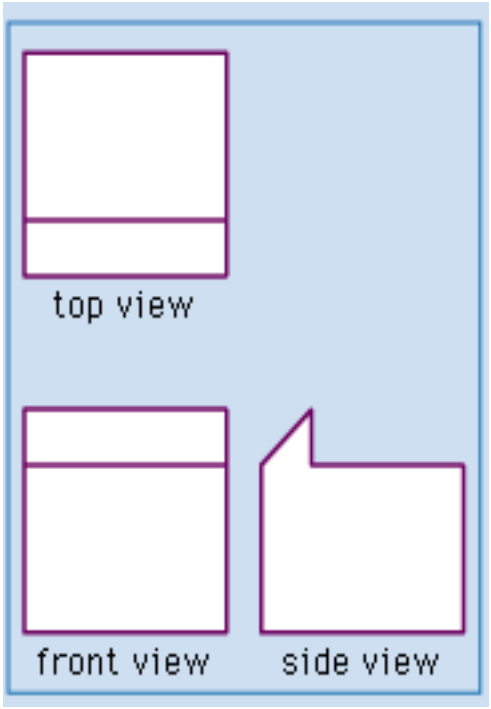


DRAWING AN ORTHOGRAPHIC PROJECTION



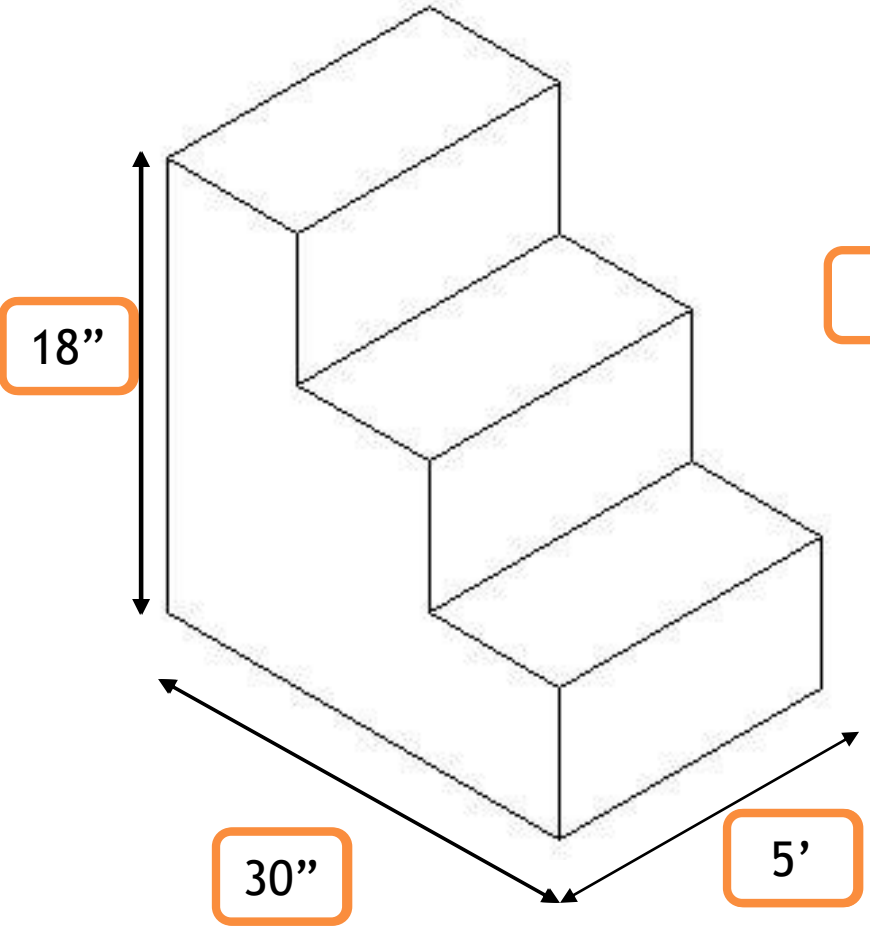


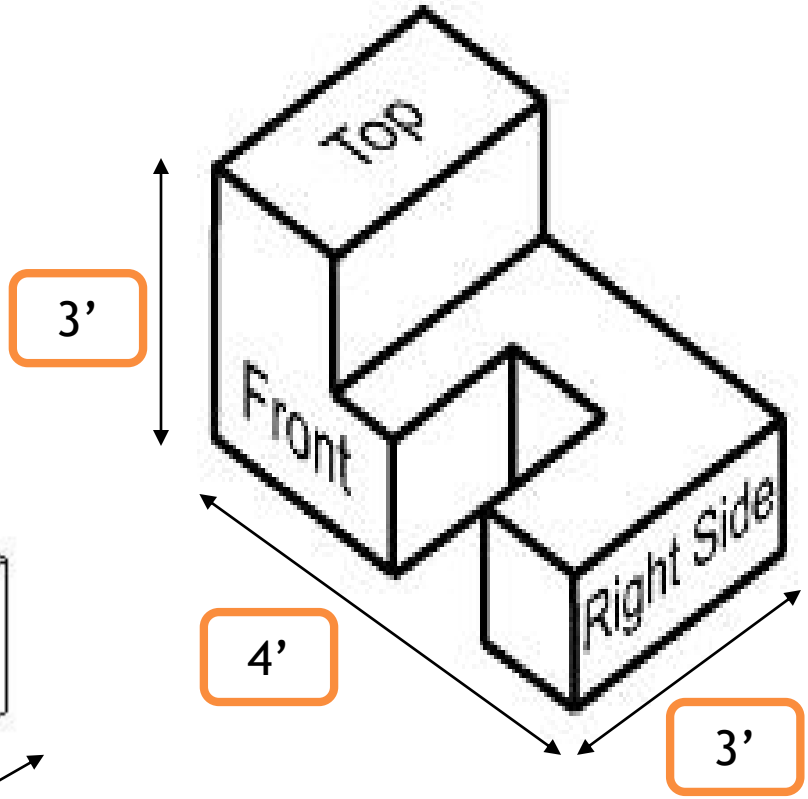




Given: object as shown (ASSIGNMENT)

Find: draw the orthographic views



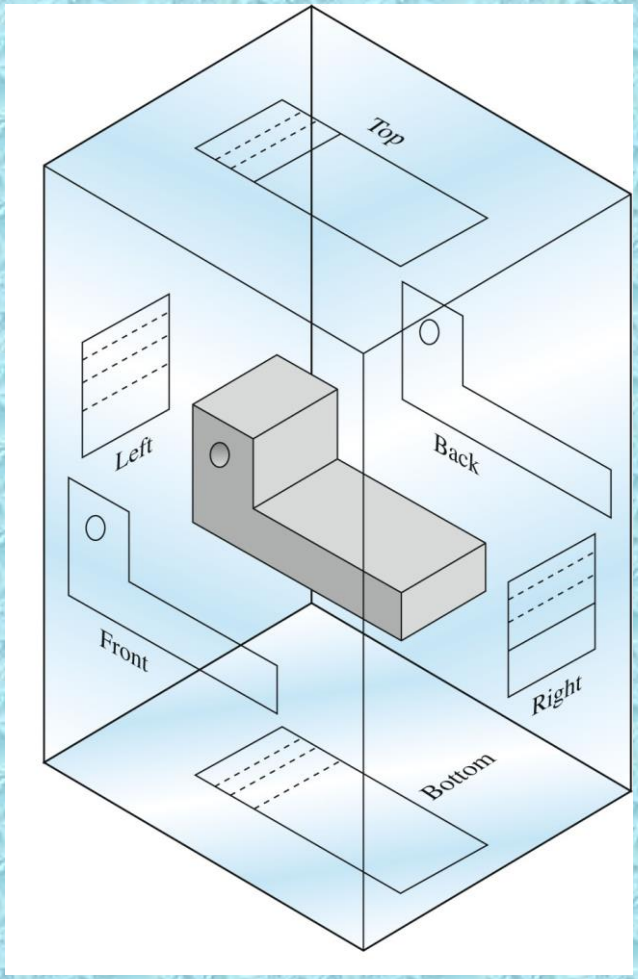


CE 1100
CIVIL ENGINEERING DRAWING-I

G.M. Harun-Or-Rashid
Lecturer
DEPARTMENT OF CIVIL ENGINEERING
RUET, RAJSHAHI-6204

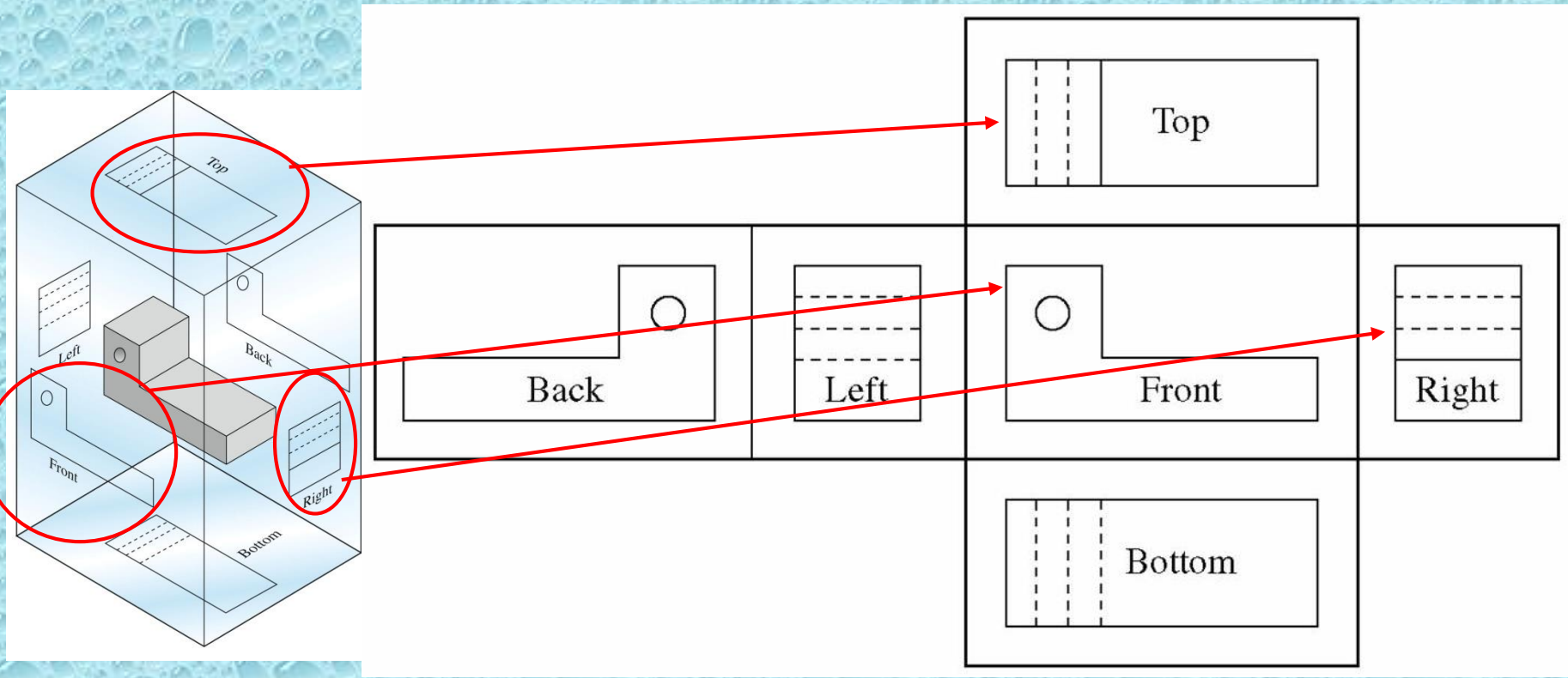
Orthographic Views

Orthographic views show what an object's projection looks like when seen from the top, the front, or the side



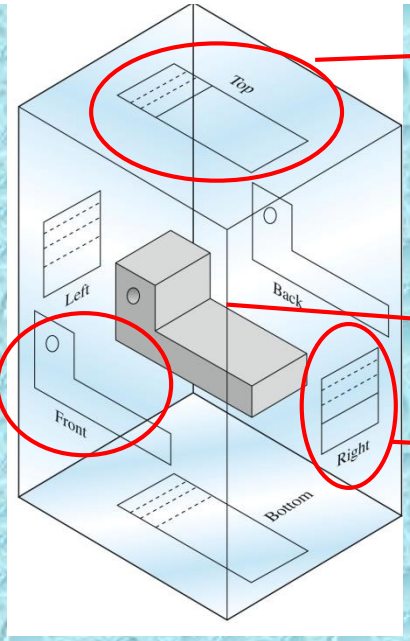
Orthographic Views

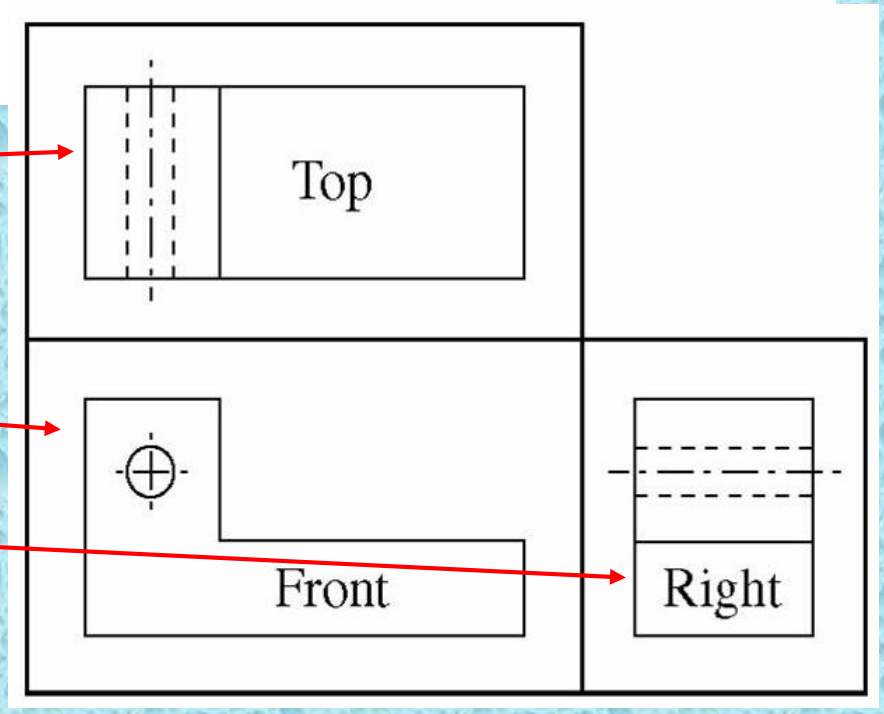
Relative locations of the top, bottom, front, back, right-side, and left-side view



Orthographic Views

- Views needed to fully describe an object
  - Top view
  - Front view
  - Right-side view

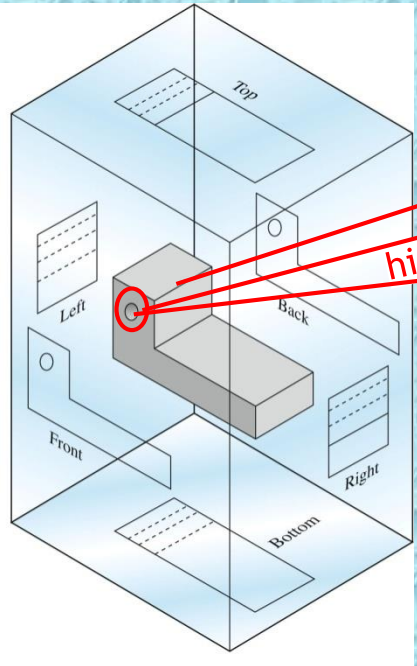




Orthographic Views

- *Three* types of lines used in orthographical views
  - *Solid lines* represent
    - Visible edges of the surfaces
    - Visible Intersection of two surfaces
  - *Hidden* or *dashed lines* represent
    - Intersection of two surfaces not visible from the direction you are looking
    - Extreme limits of a cylindrical hole inside the object
  - *Centerlines* represent
    - Center of holes/circles
    - Center of cylinders
    - Line of symmetry

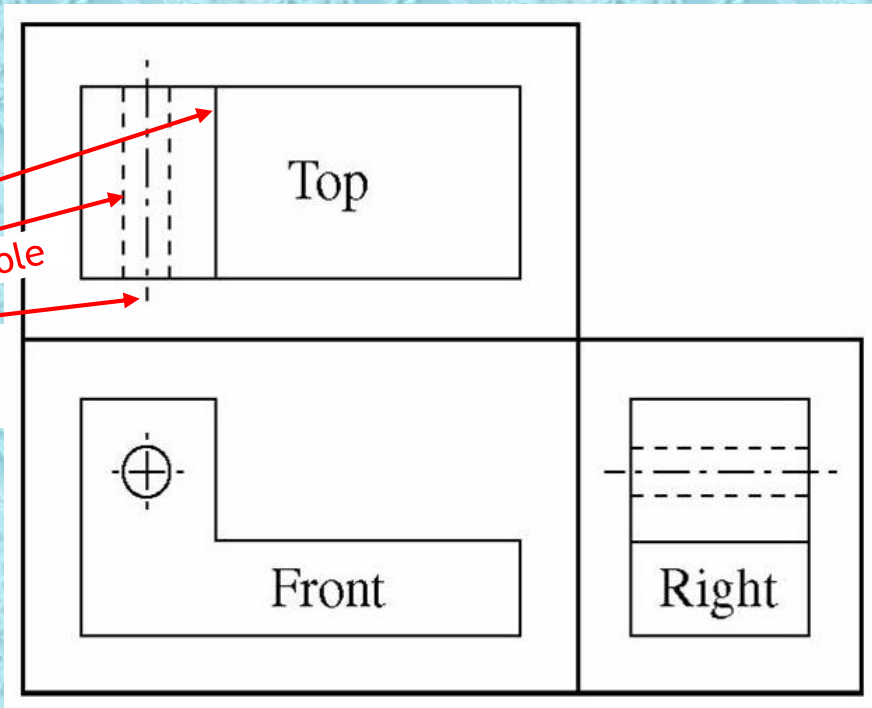
Orthographic Views



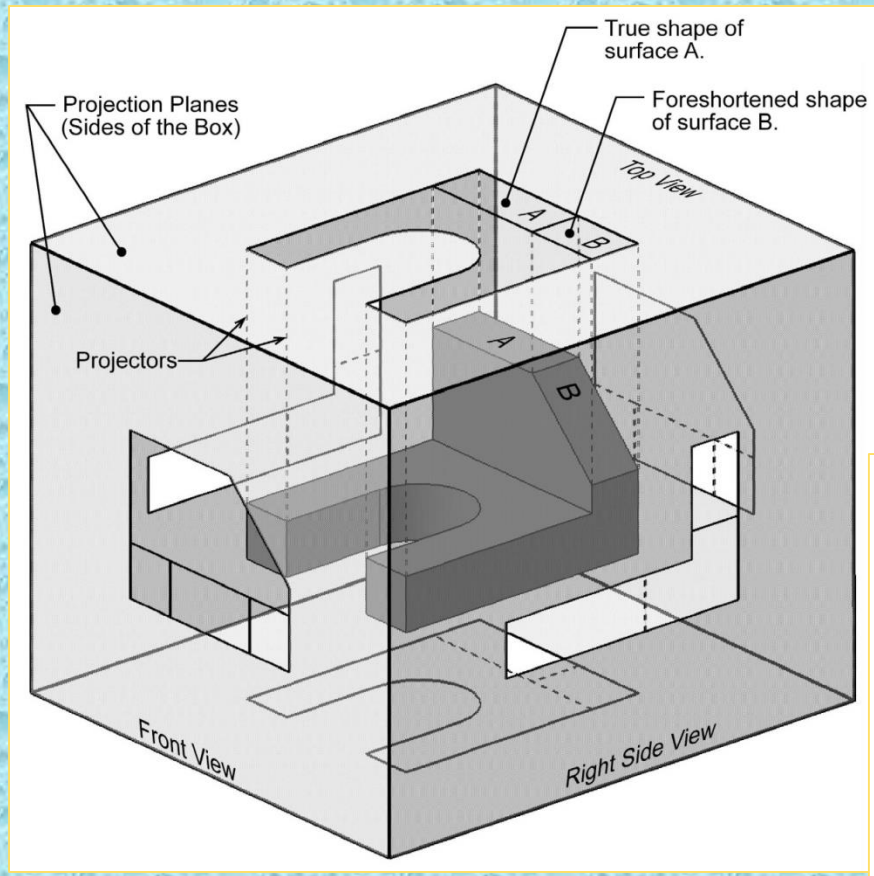
visual edge

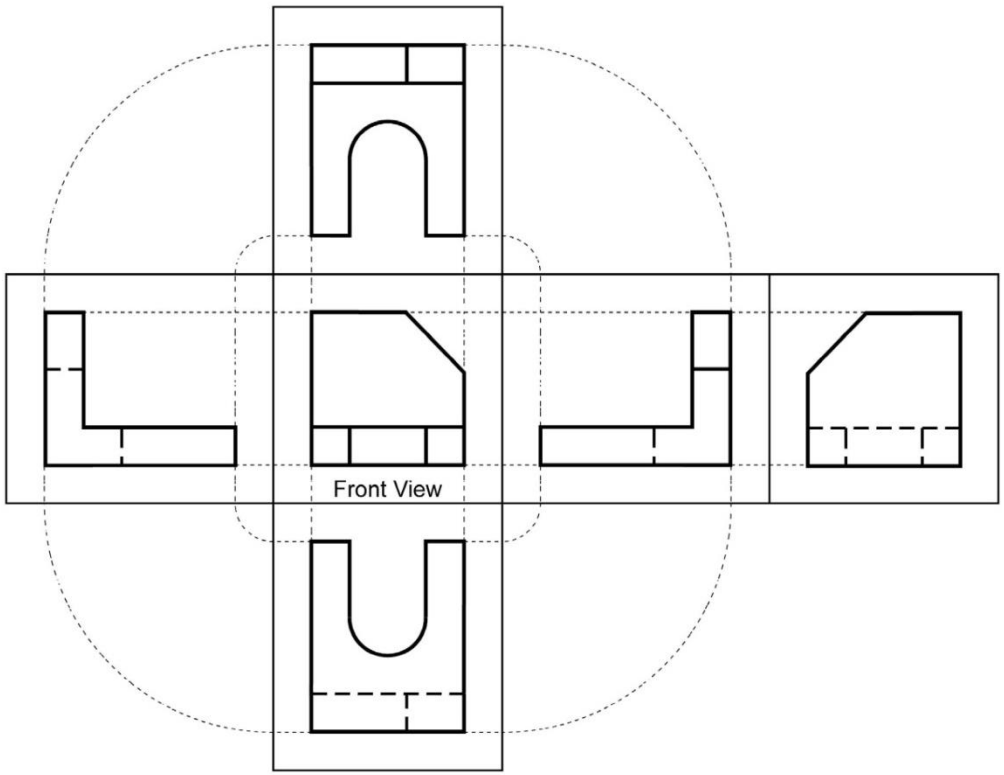
hidden cylindrical hole

centerline of cylinder



Orthographic Views

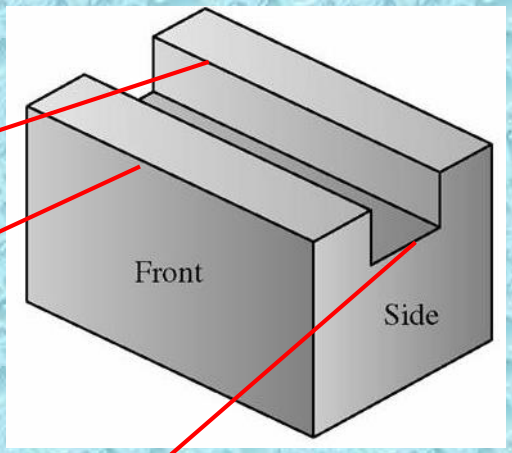


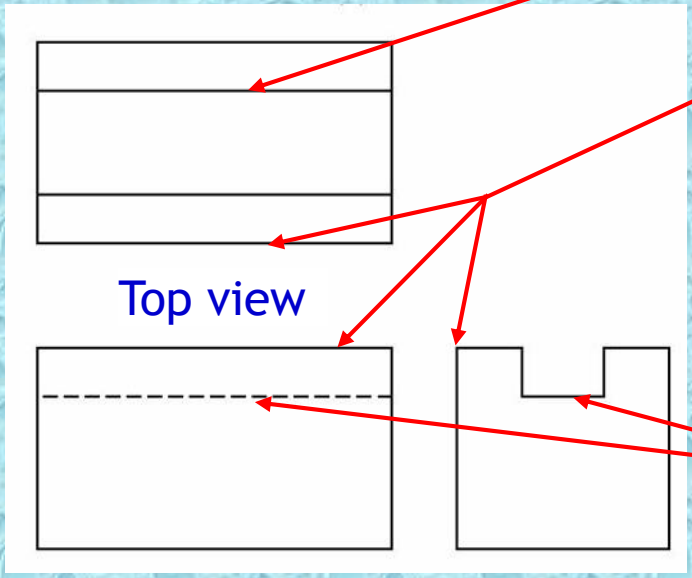


Orthographic Views

Given: object as shown

Find: draw the orthographic views





Top view

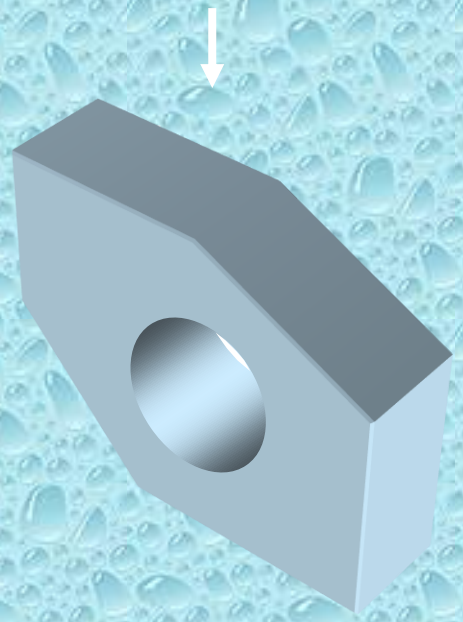
Front view

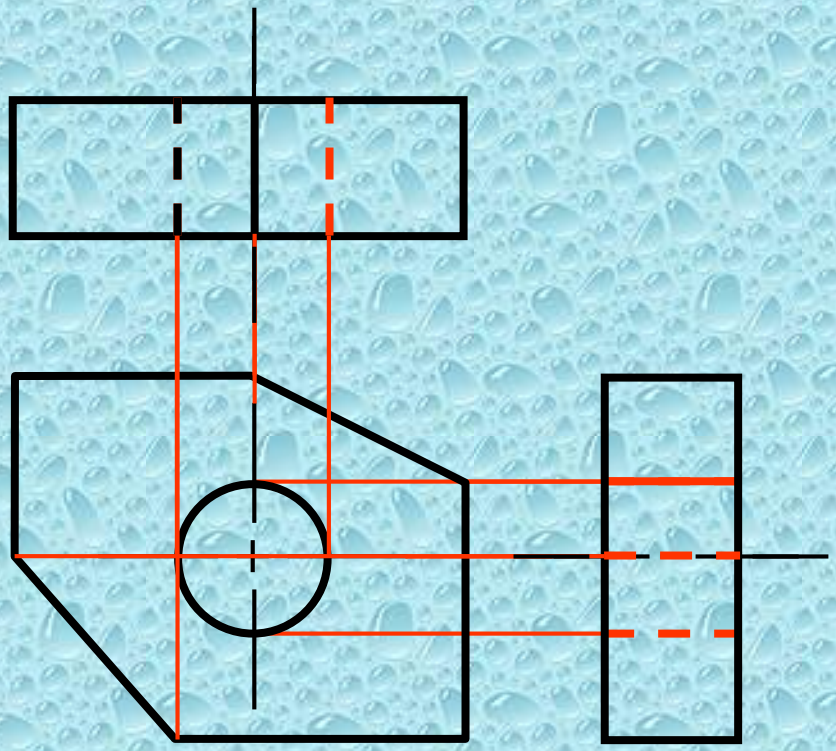
Side view

PRECEDENCE OF LINE

Order of importance

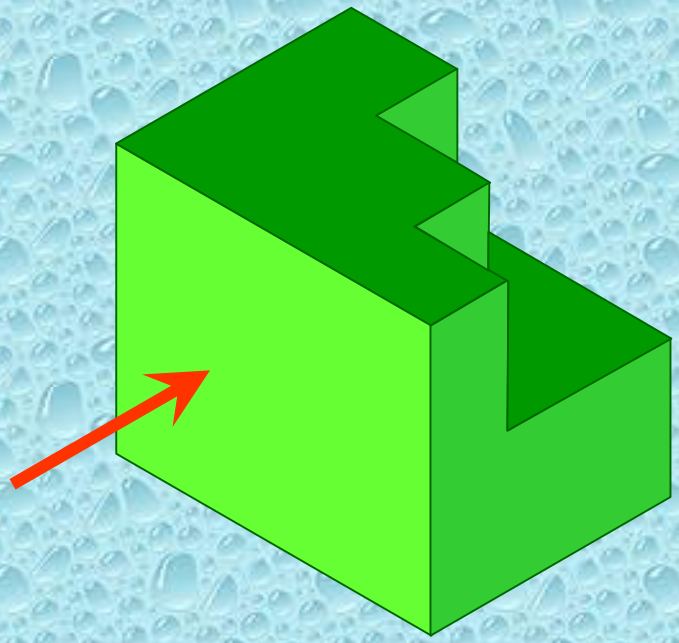
Visible line → **Hidden line** → **Center line**

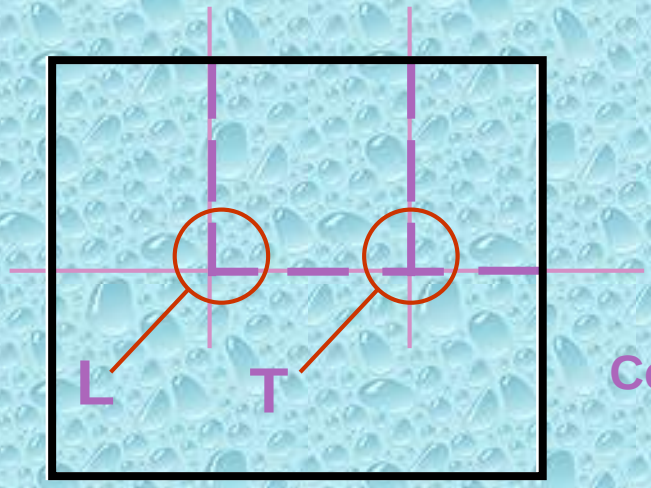




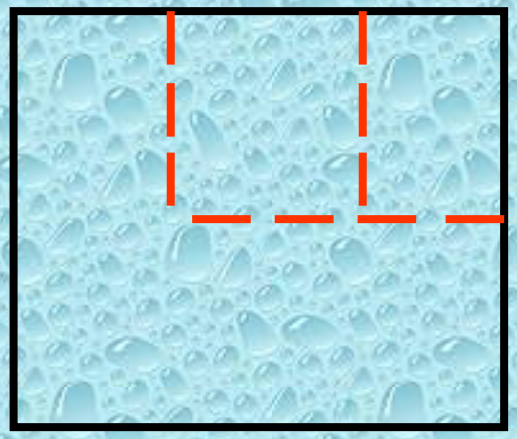
HIDDEN LINE PRACTICE

- Hidden line should intersect to form **L** and **T** corners.





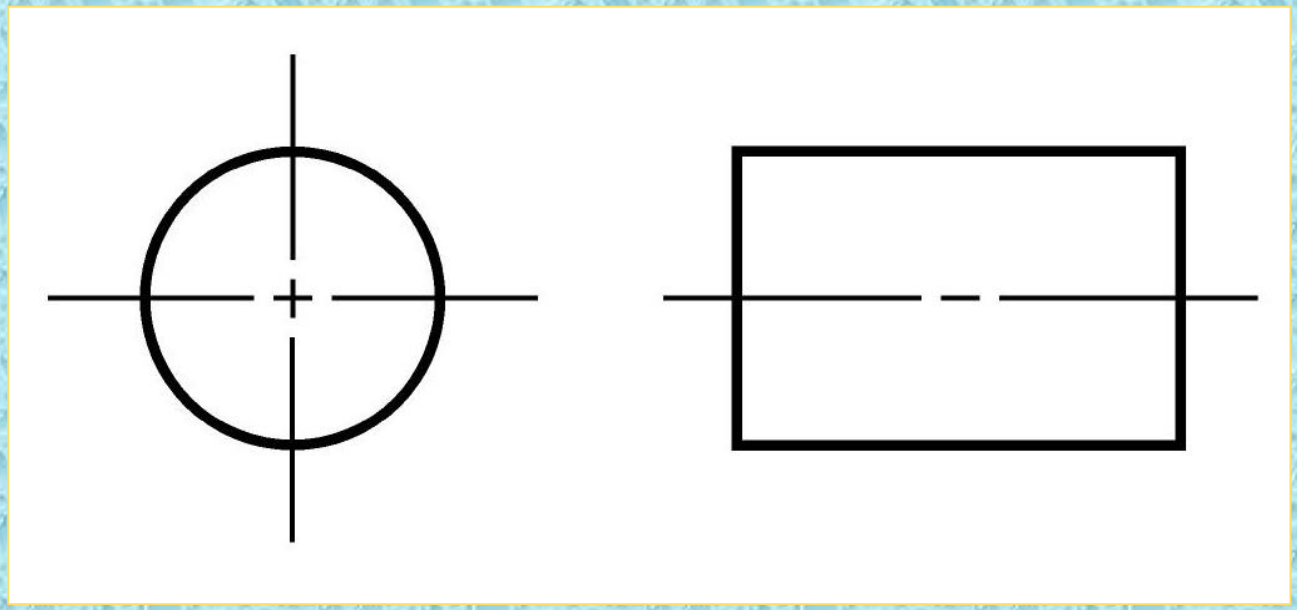
Correct



No !

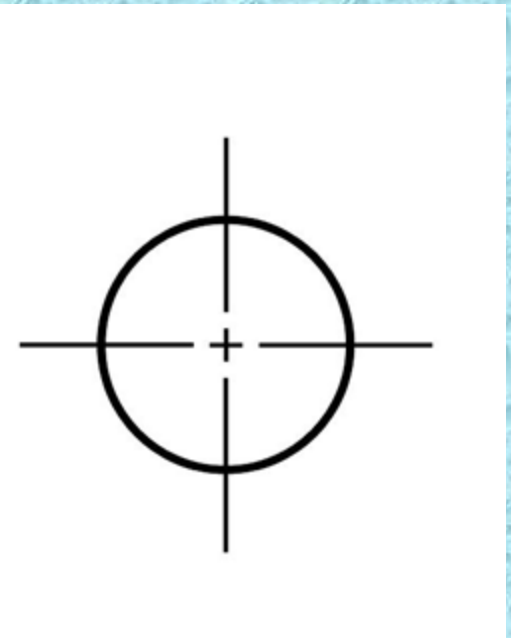
USING CENTER LINES

- Center lines represent axes of symmetry.
  - They are important for interpreting cylindrical shapes.



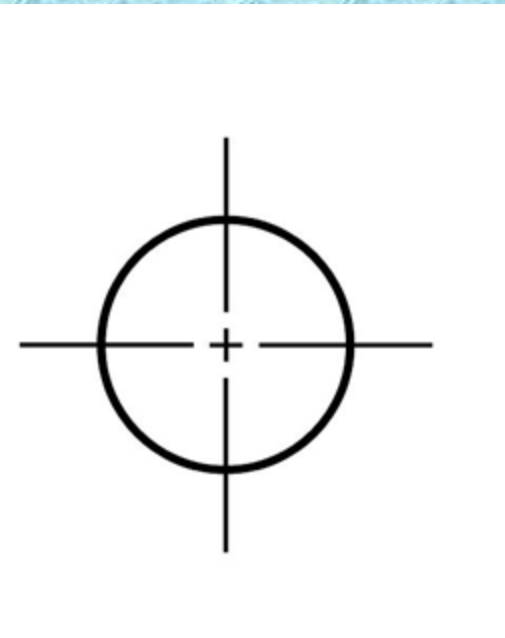
CREATING CENTER LINES

- Rule 1:
  - Center lines should start and end with long dashes.



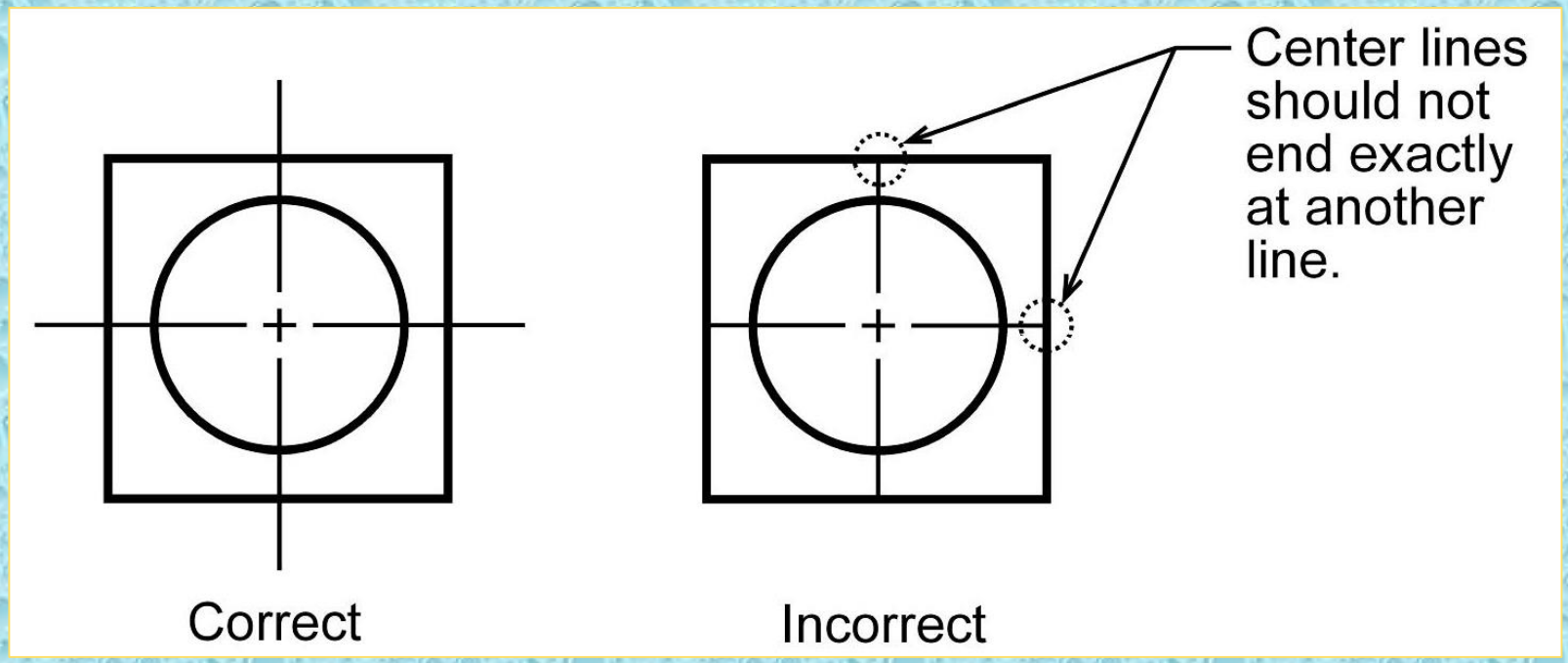
CREATING CENTER LINES

- Rule 2:
  - Center lines should intersect circle by crossing long dashes.



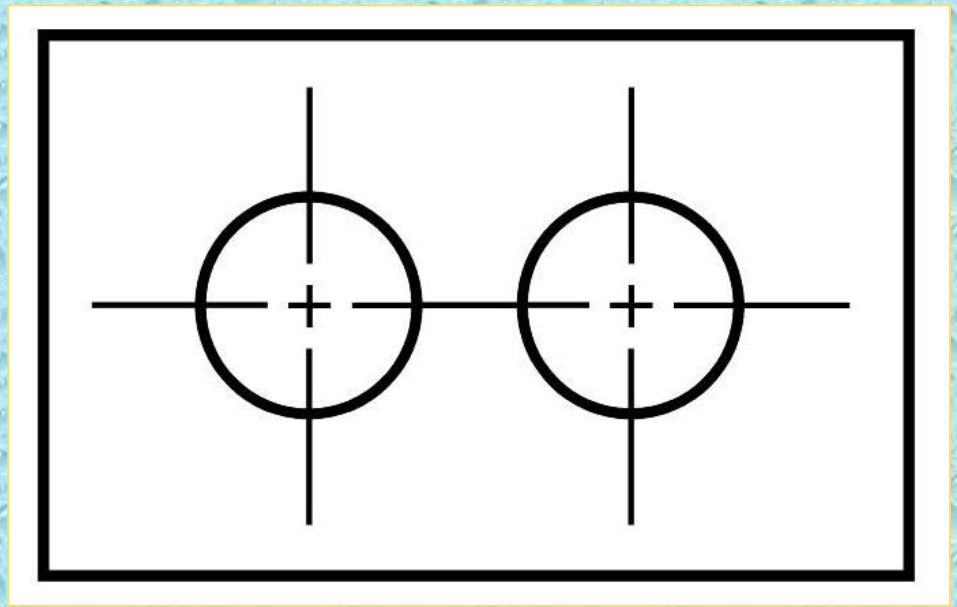
CREATING CENTER LINES

- Rule 3:
  - Center lines should extend a short distance beyond the object or feature.

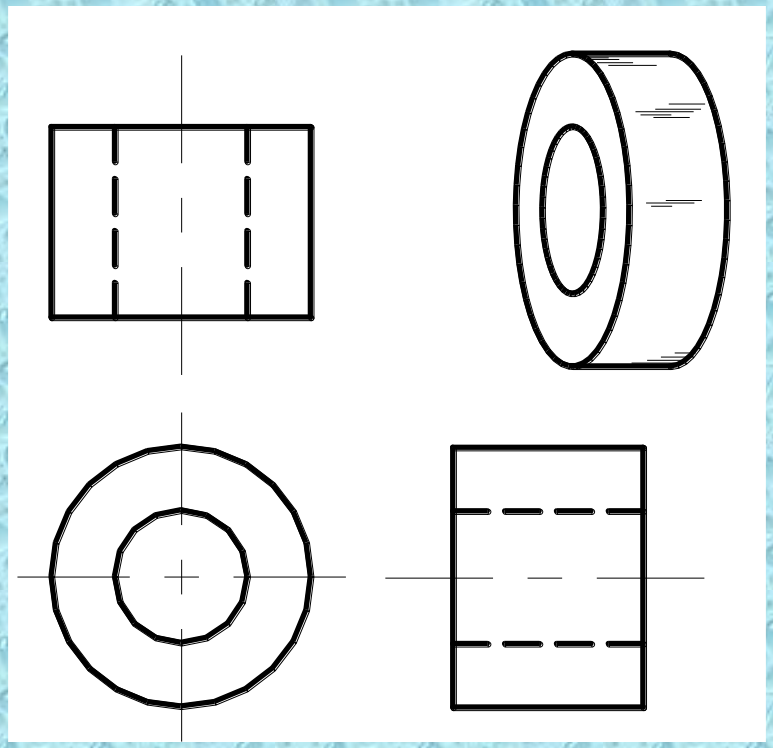


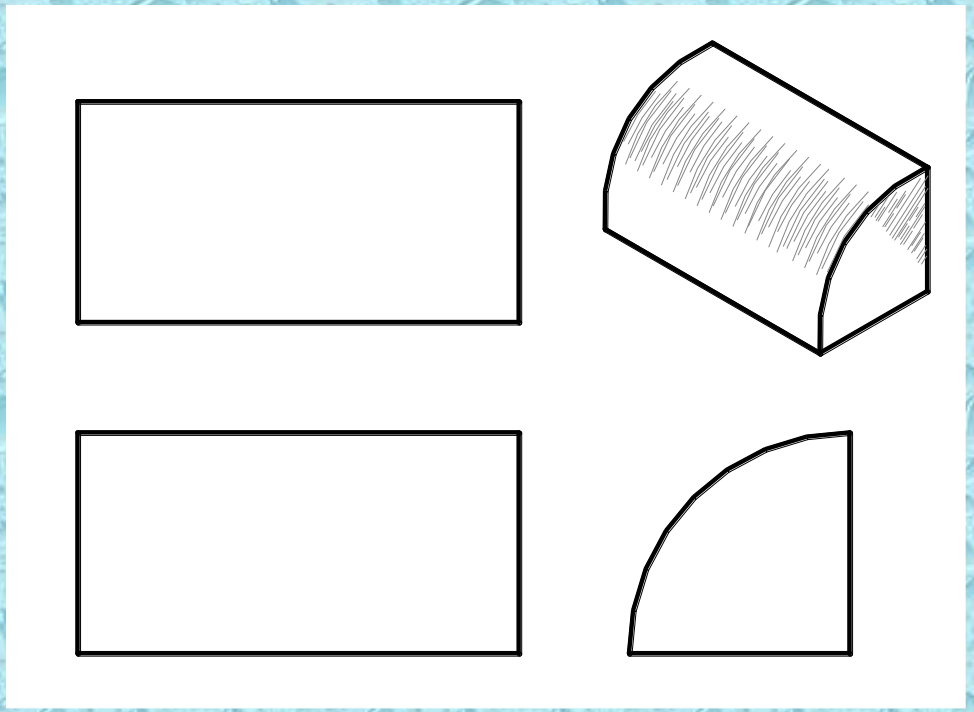
CREATING CENTER LINES

- Rule 4:
  - Center lines may be connected **within a single view** to show that two or more features lie in the same plane.

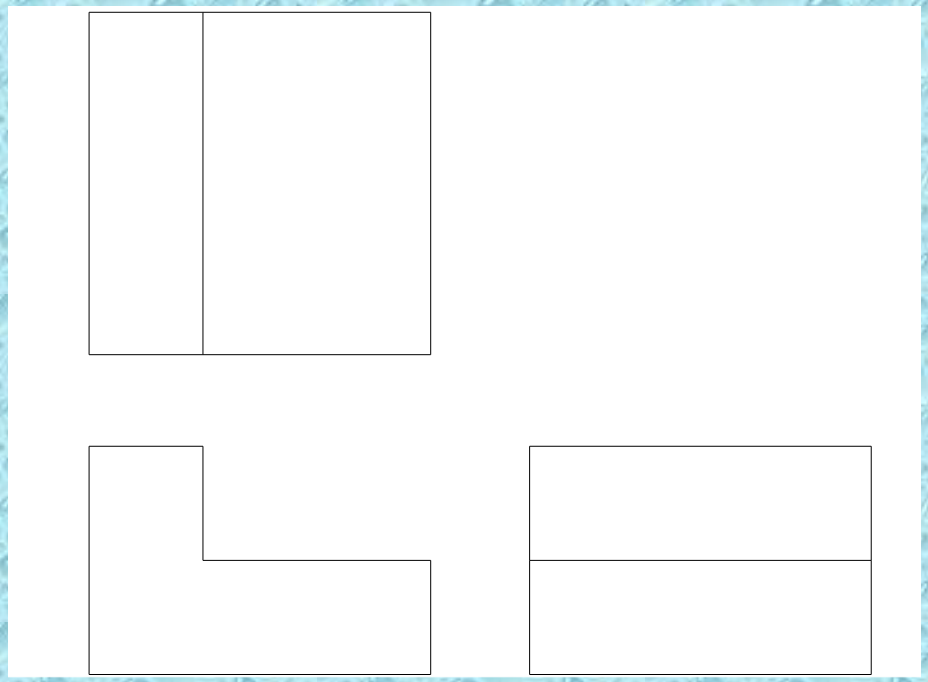


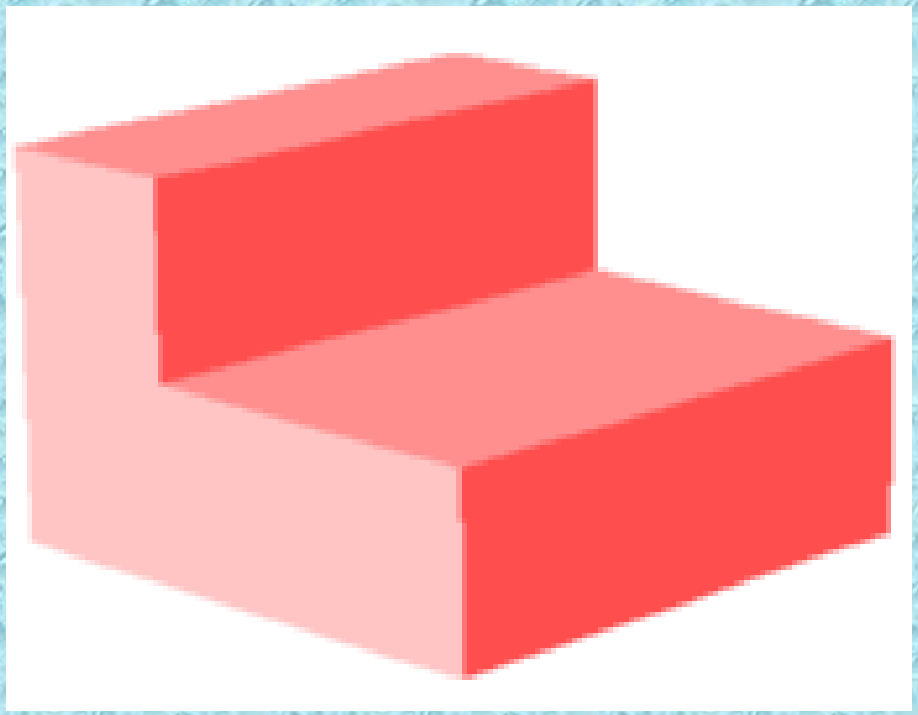
CURVED EDGES



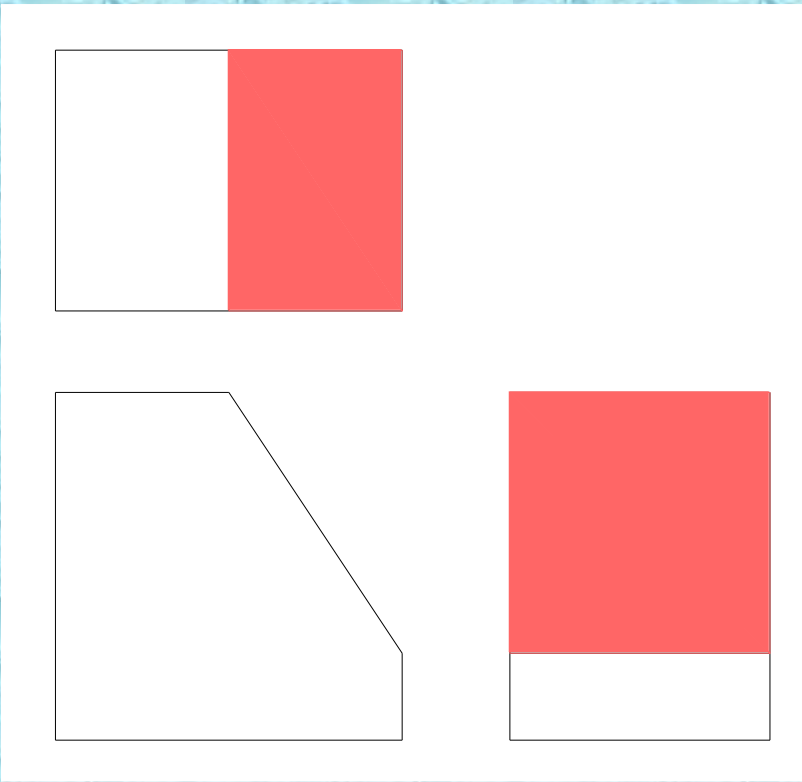


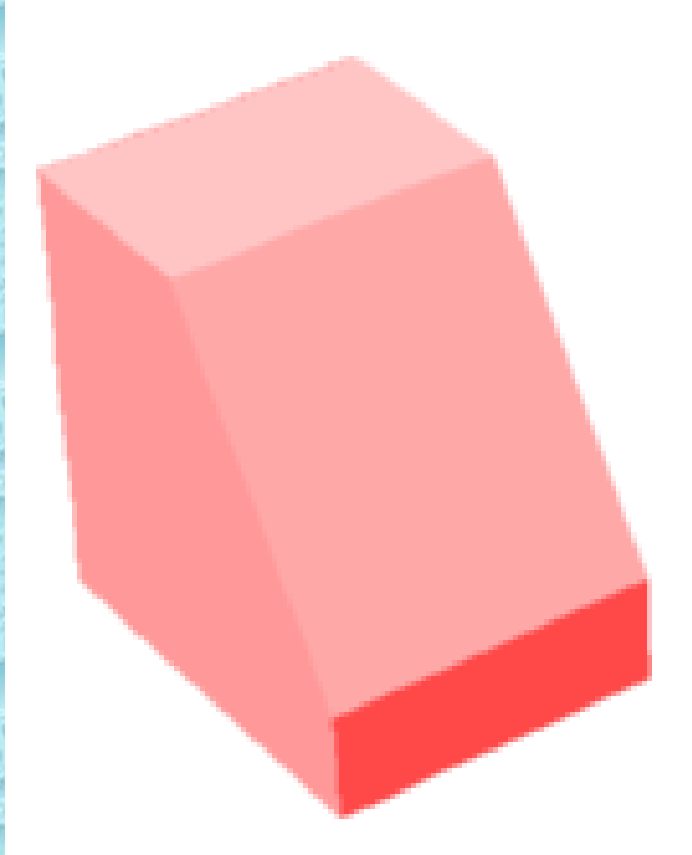
NORMAL SURFACES



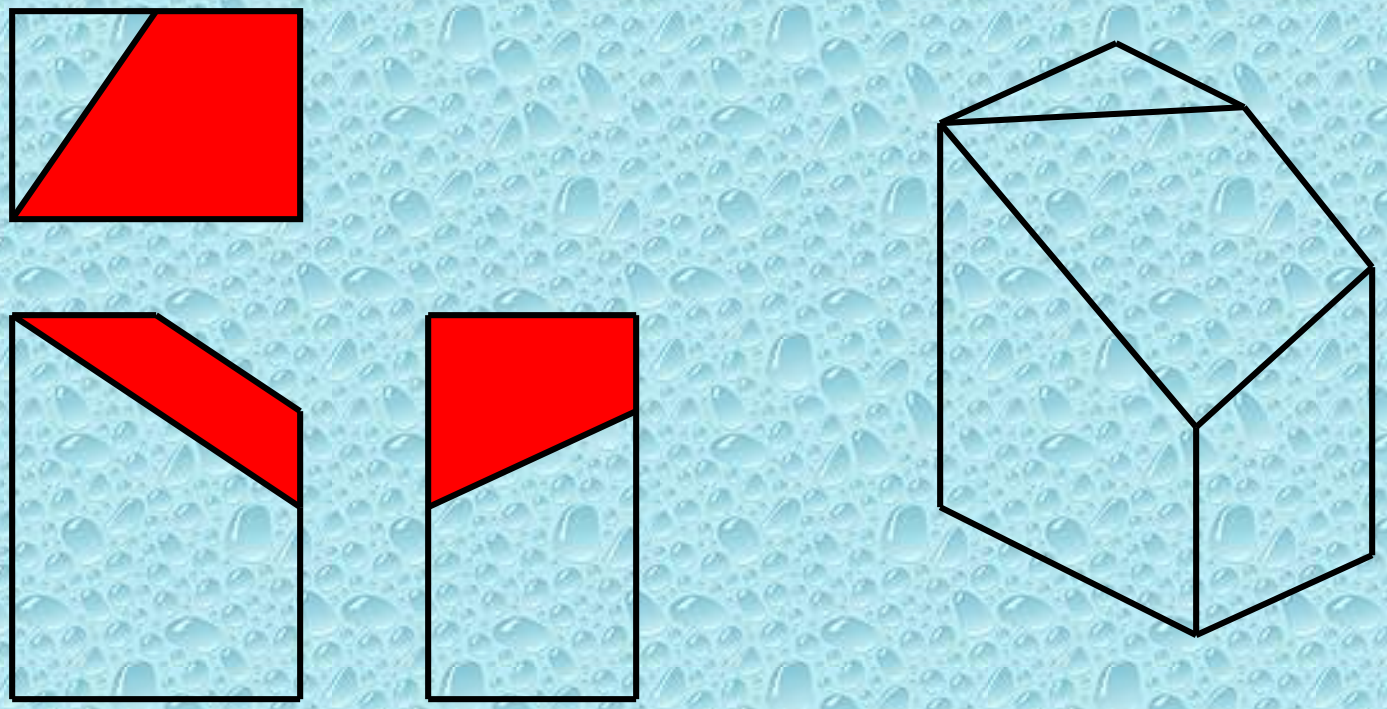


INCLINED SURFACES

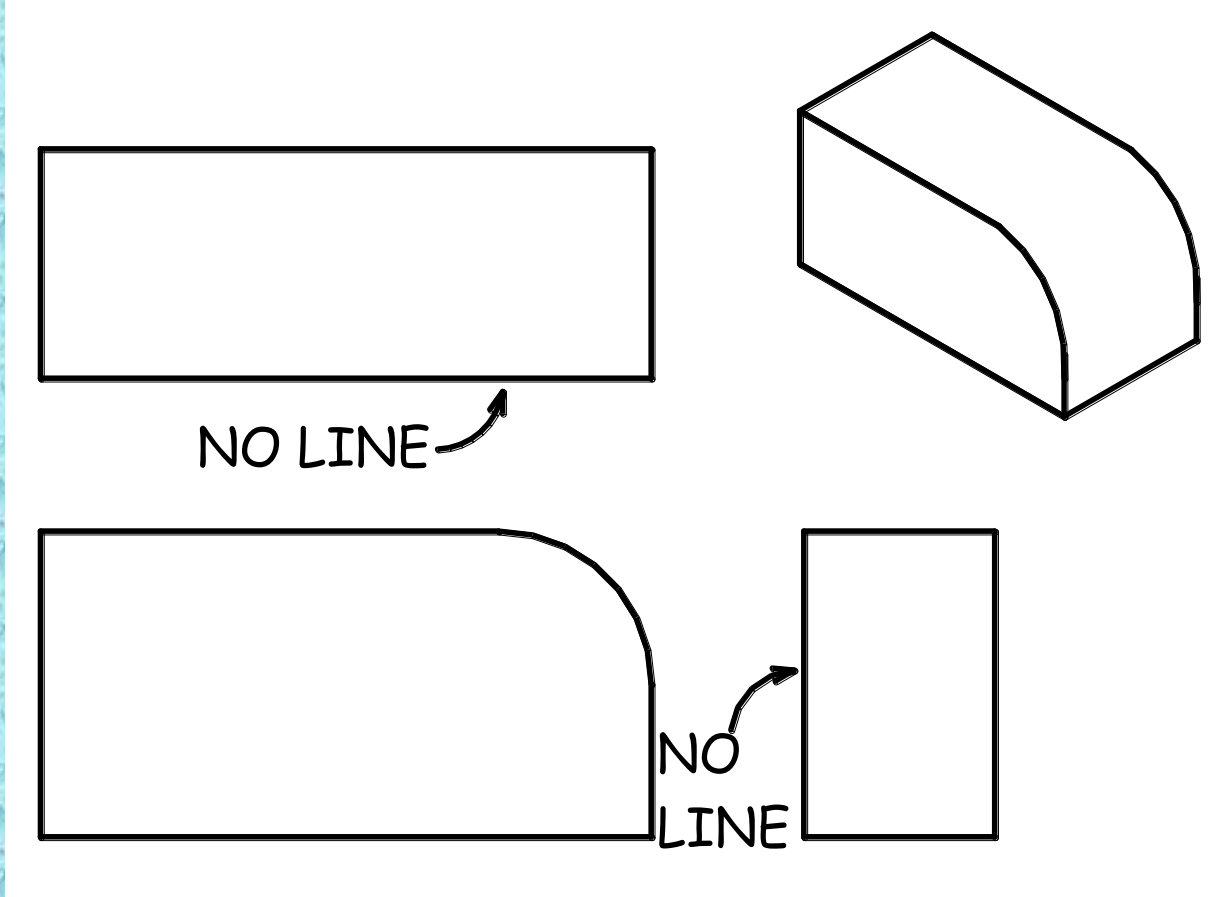


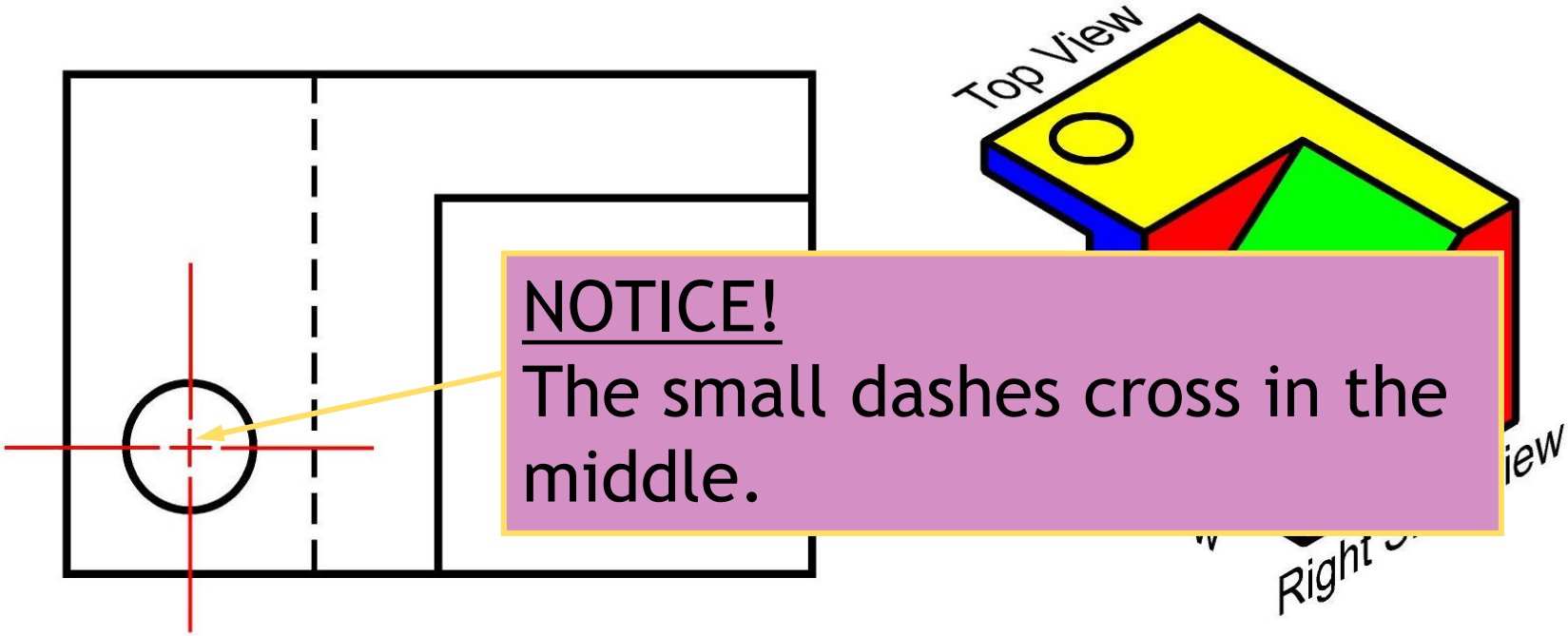


OBLIQUE SURFACES

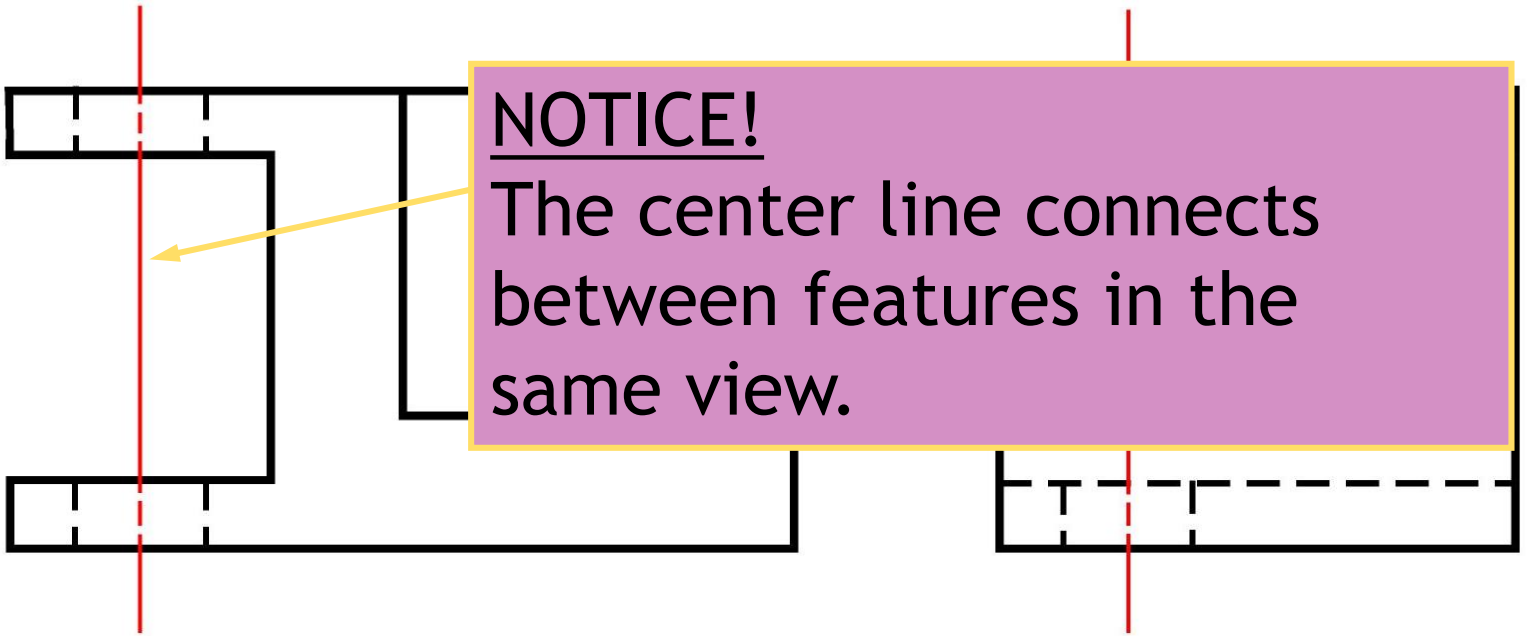


INTERSECTIONS & TANGENCIES



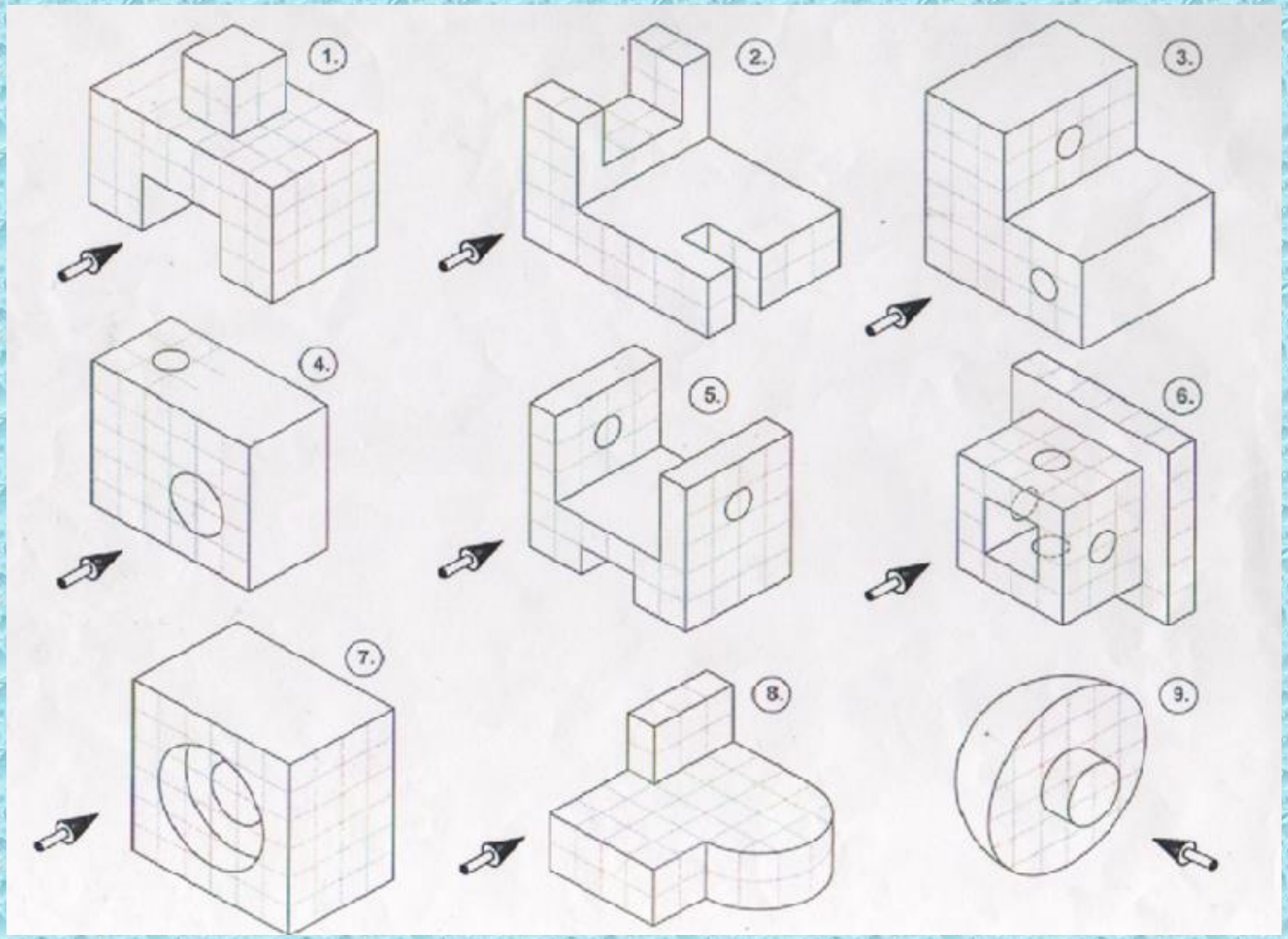


NOTICE!
The small dashes cross in the middle.

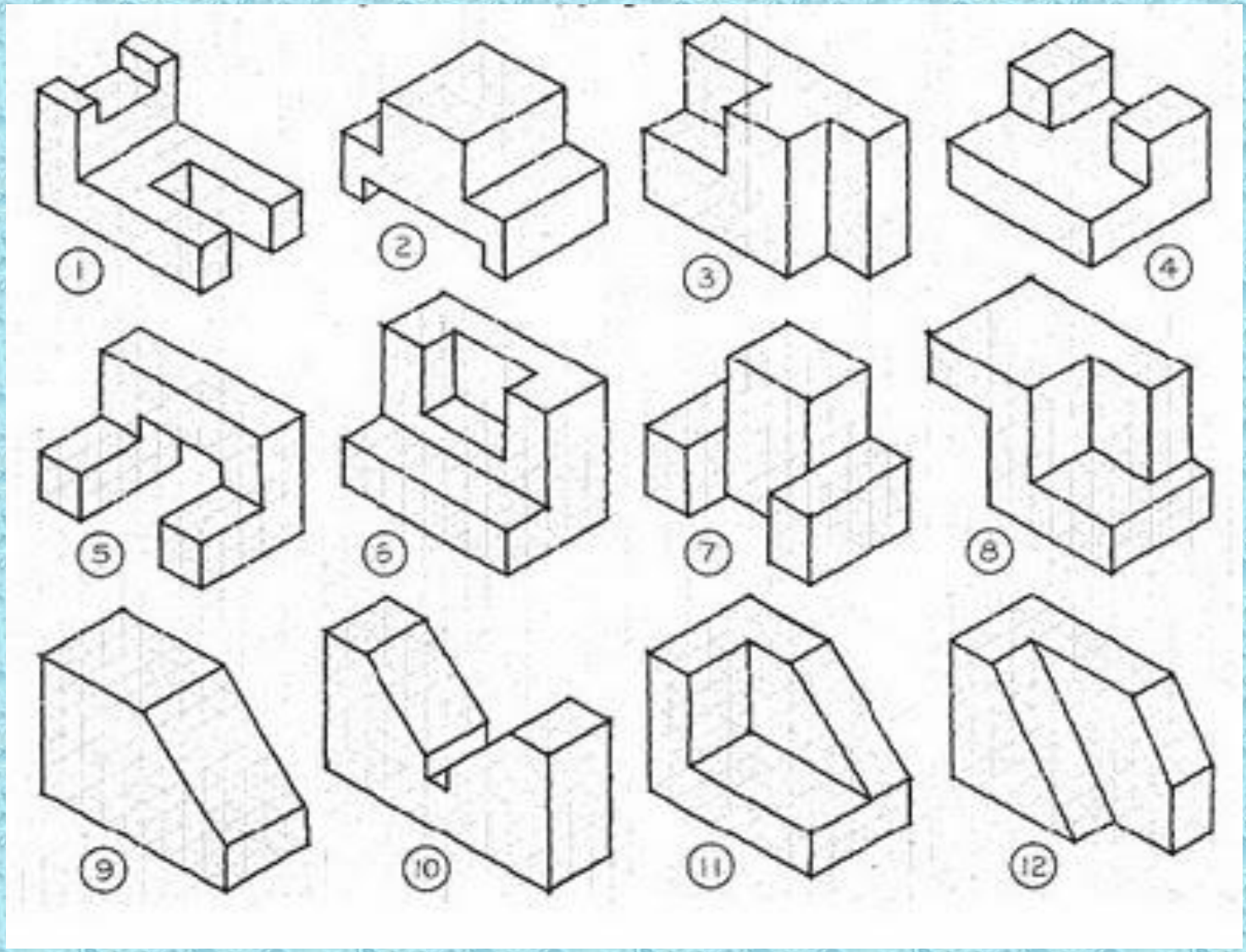


NOTICE!
The center line connects between features in the same view.

- **Draw 3 views of each object showing object, hidden and center lines if applicable.**

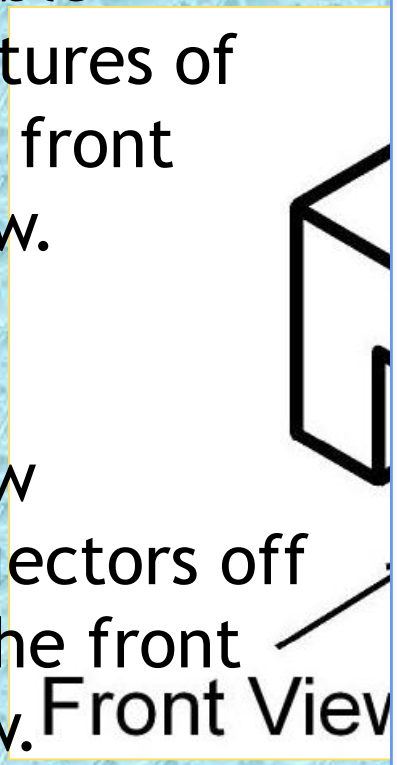


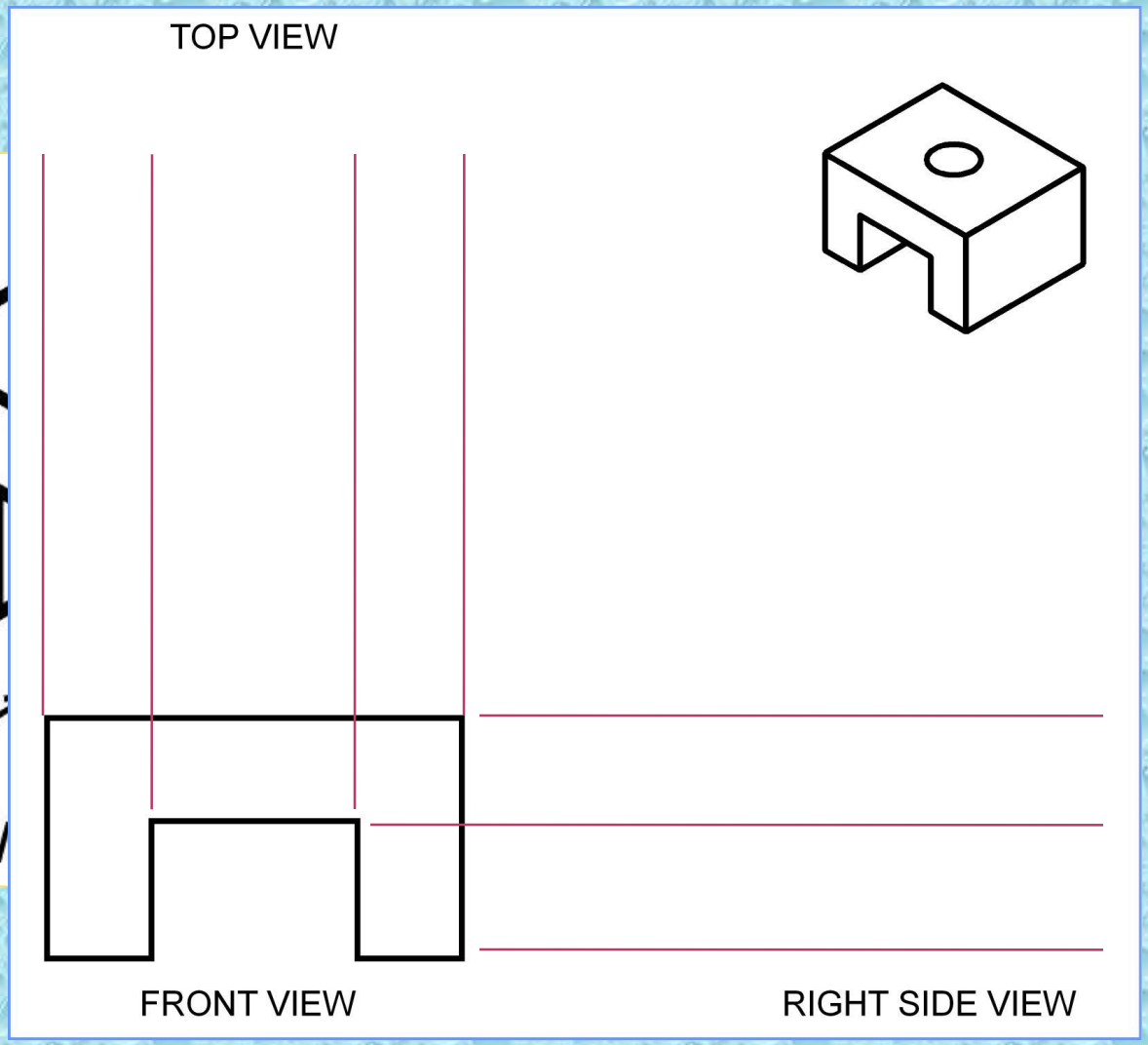
- **Draw 3 views of each object showing object, hidden and center lines if applicable.**



DRAWING AN ORTHOGRAPHIC PROJECTION

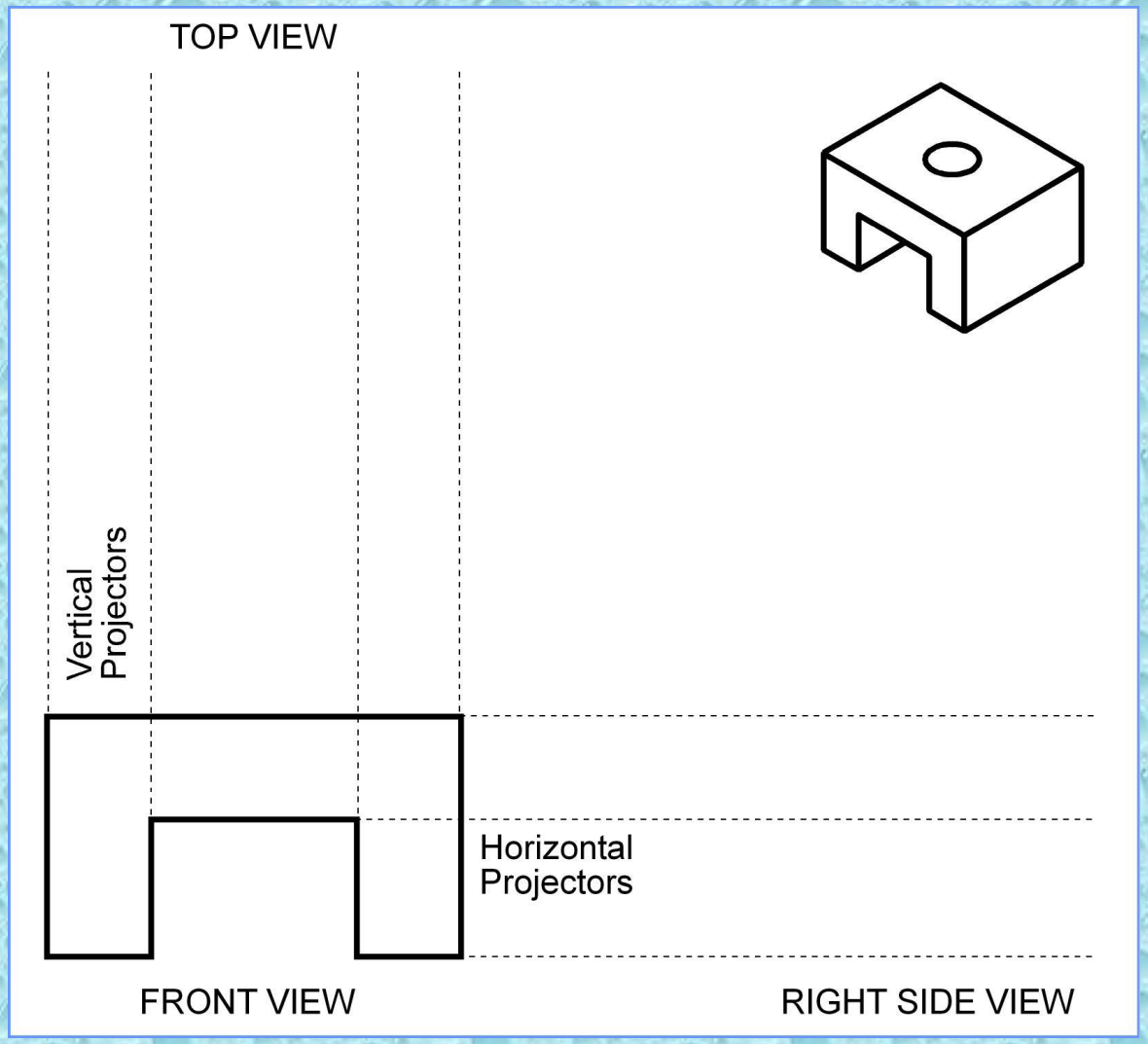
- Draw the visible features of the front view.
- Draw projectors off of the front view.





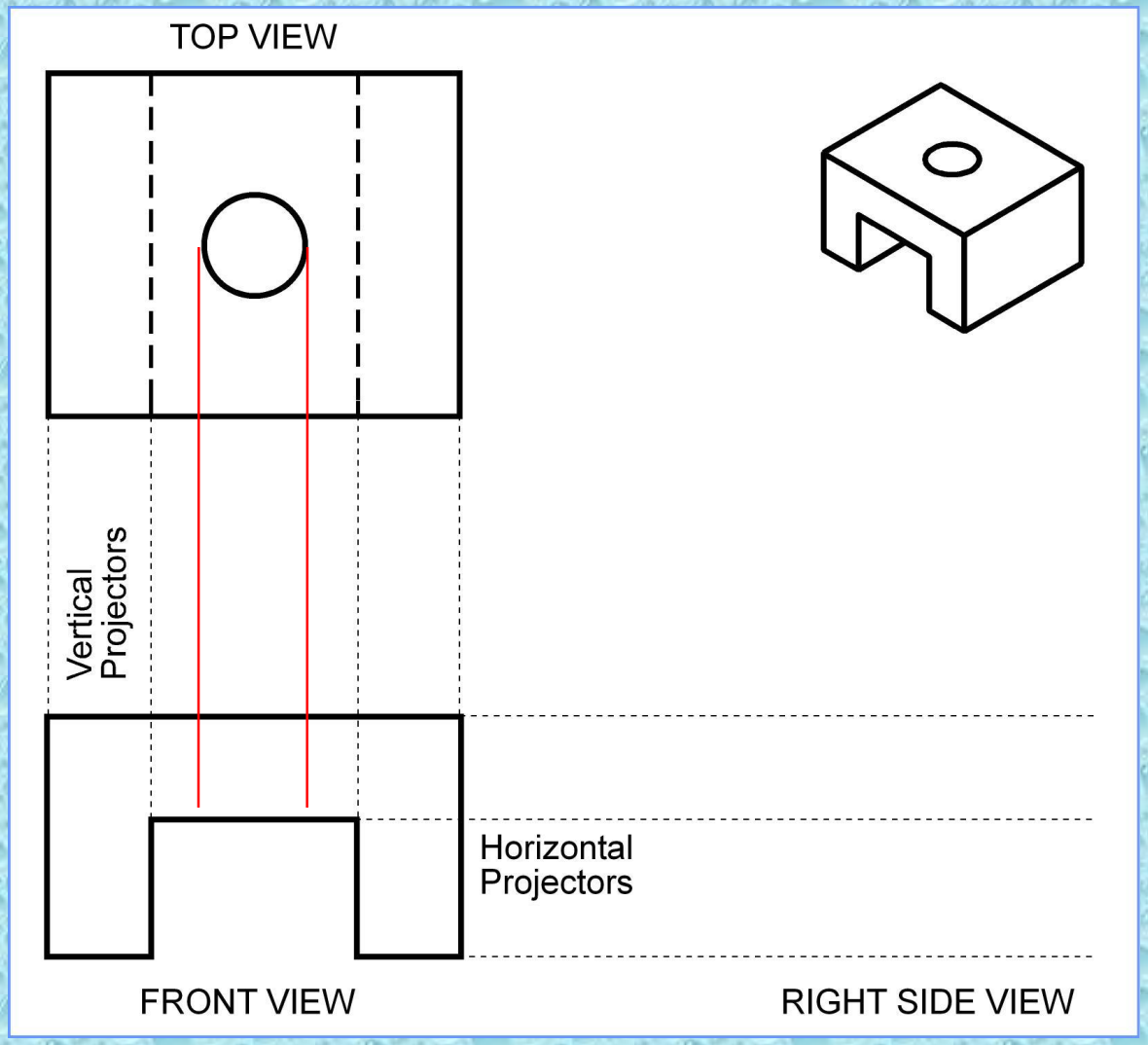
Creating an Orthographic Projection

- Draw projectors off of the front view.



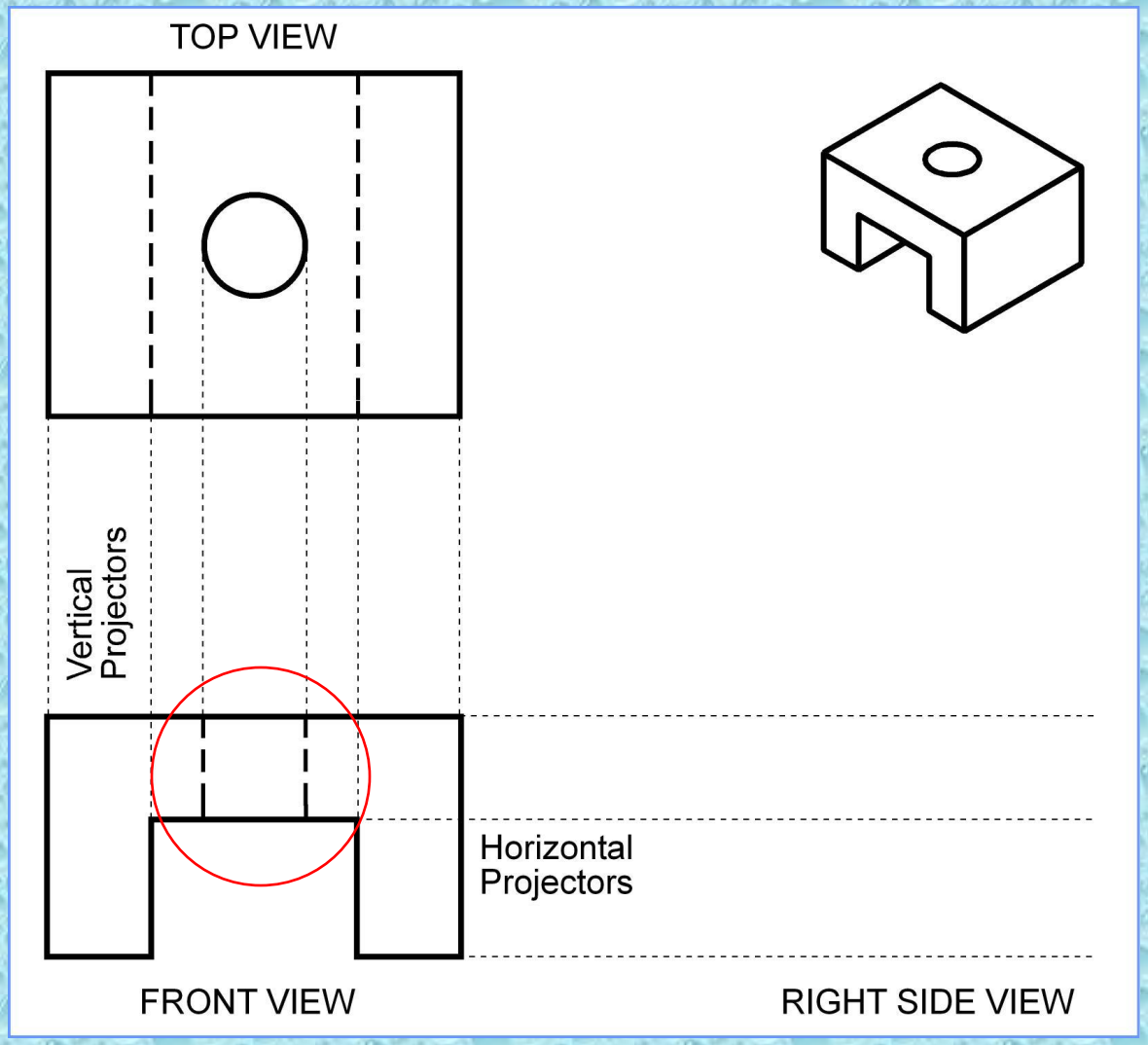
Creating an Orthographic Projection

- Draw the top view.
- Project back to the front view.



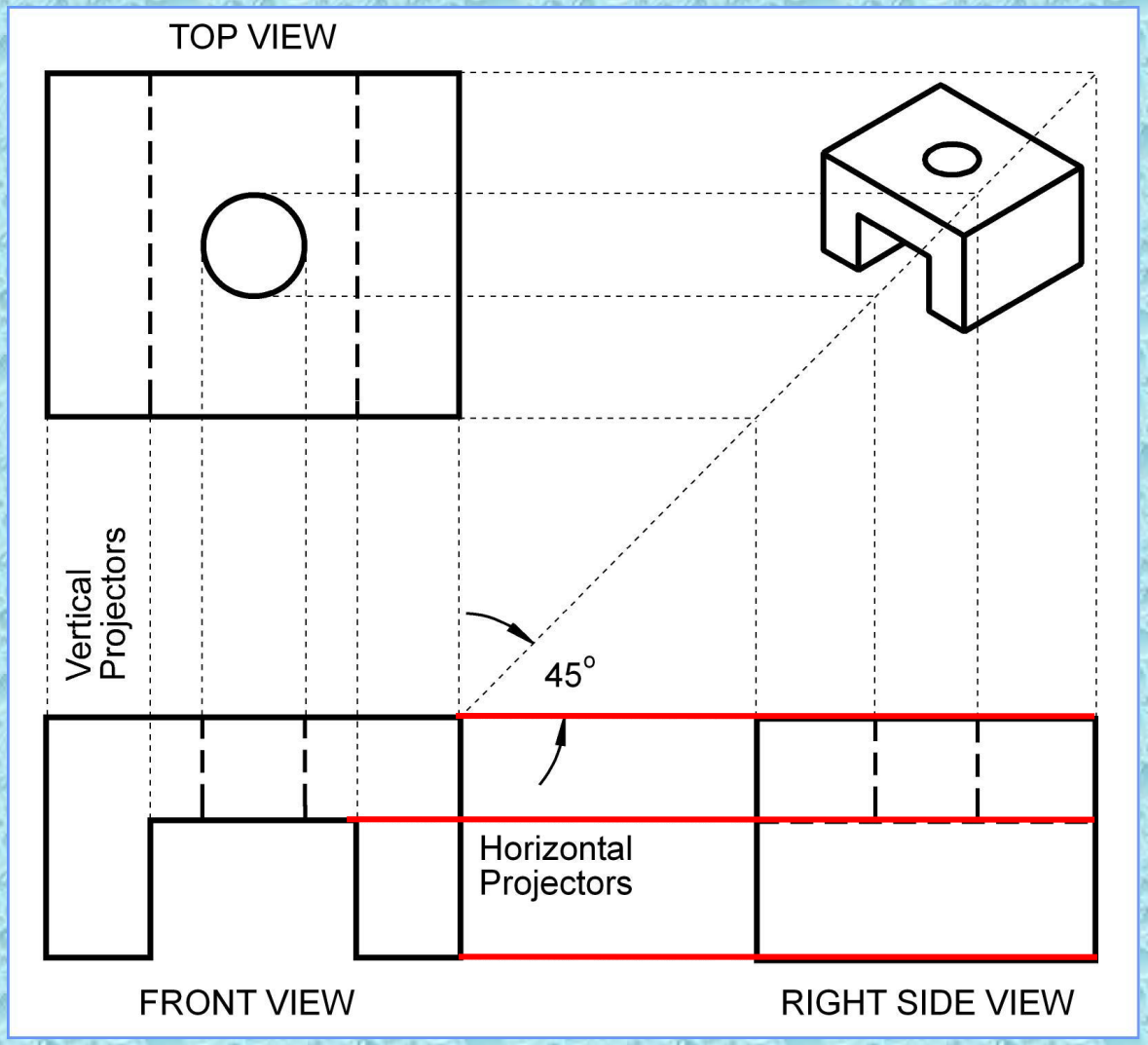
Creating an Orthographic Projection

- Project back to the front view.



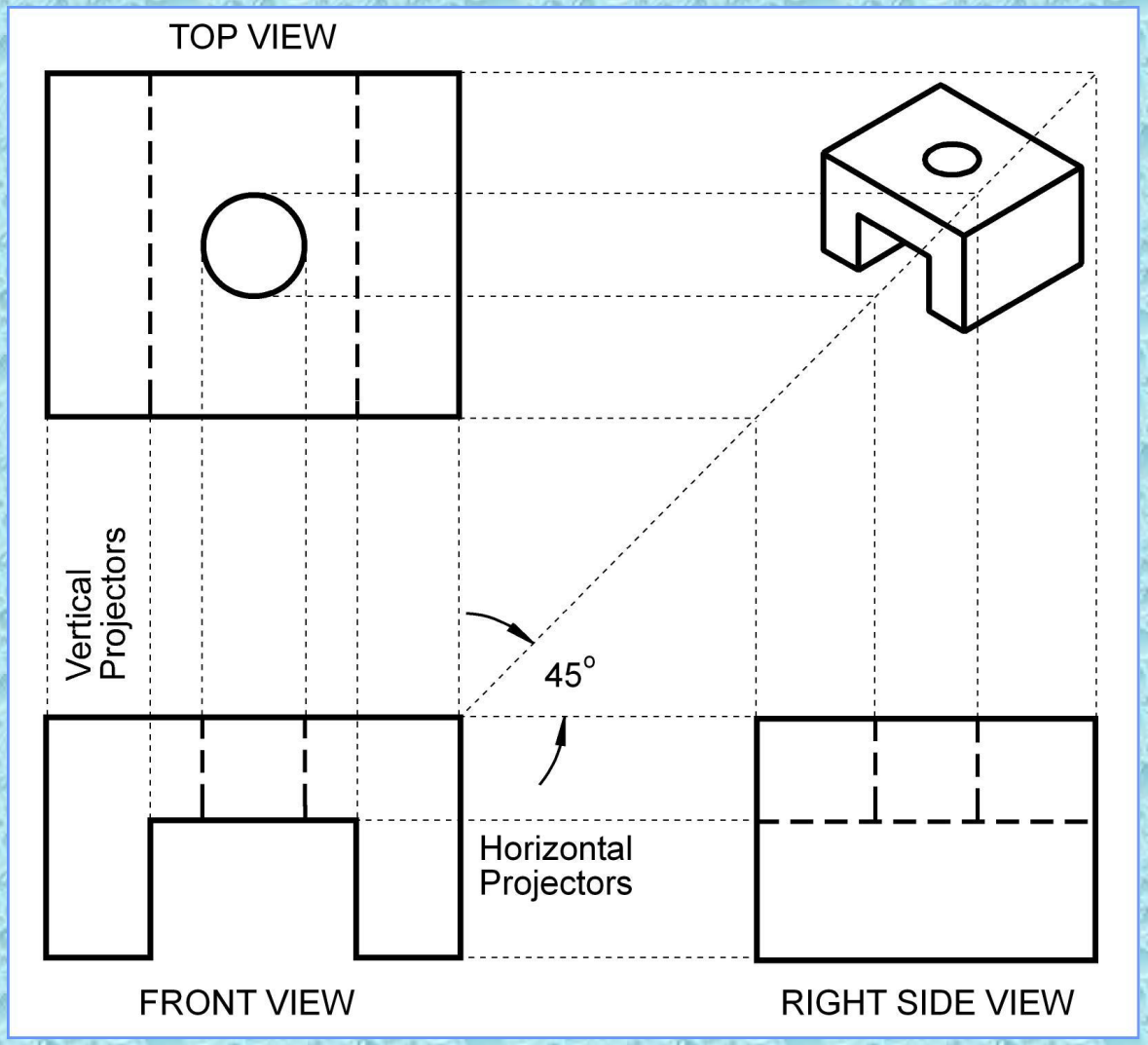
Creating an Orthographic Projection

- Draw the right side view.



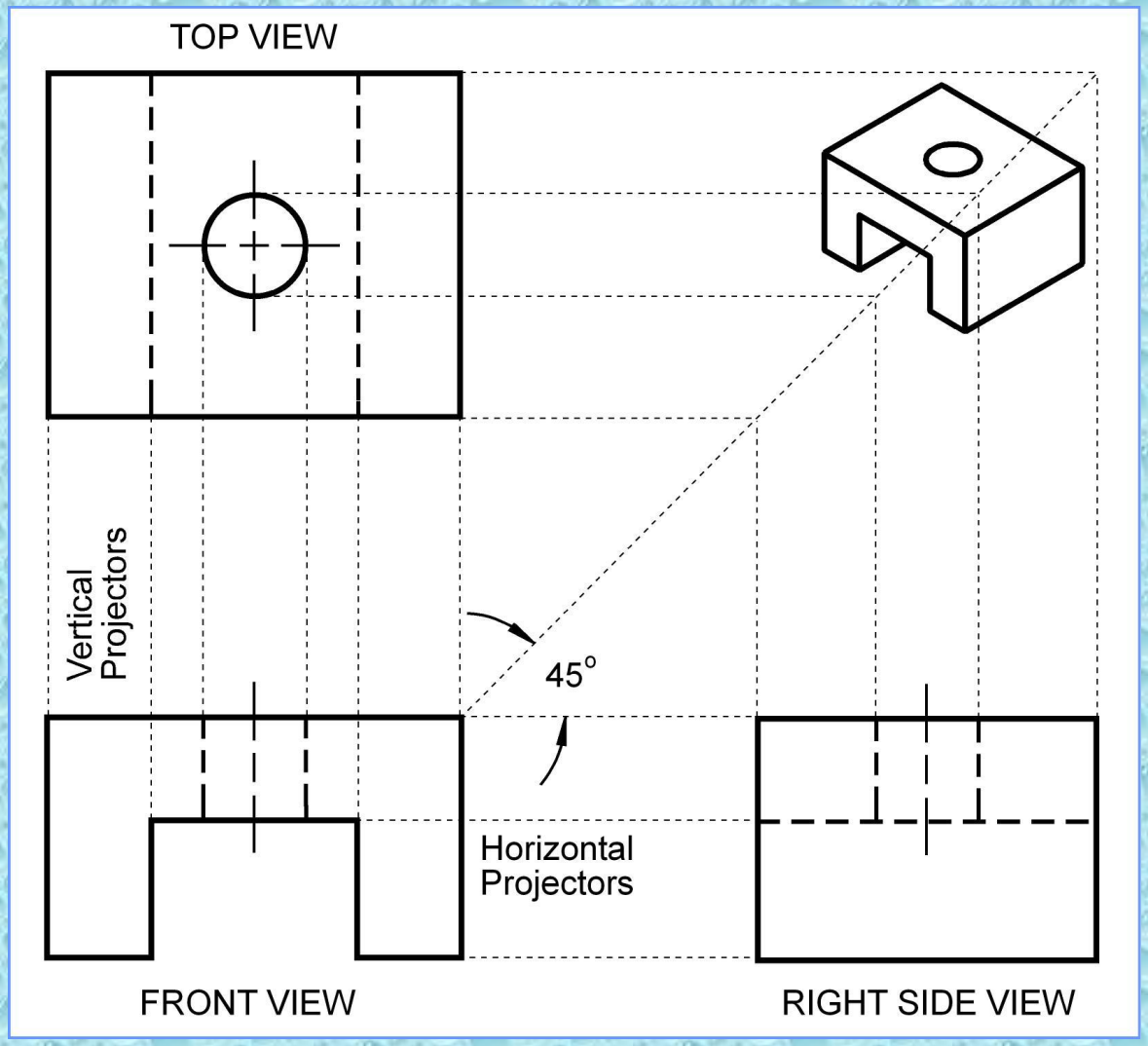
Creating an Orthographic Projection

- Project back if needed.

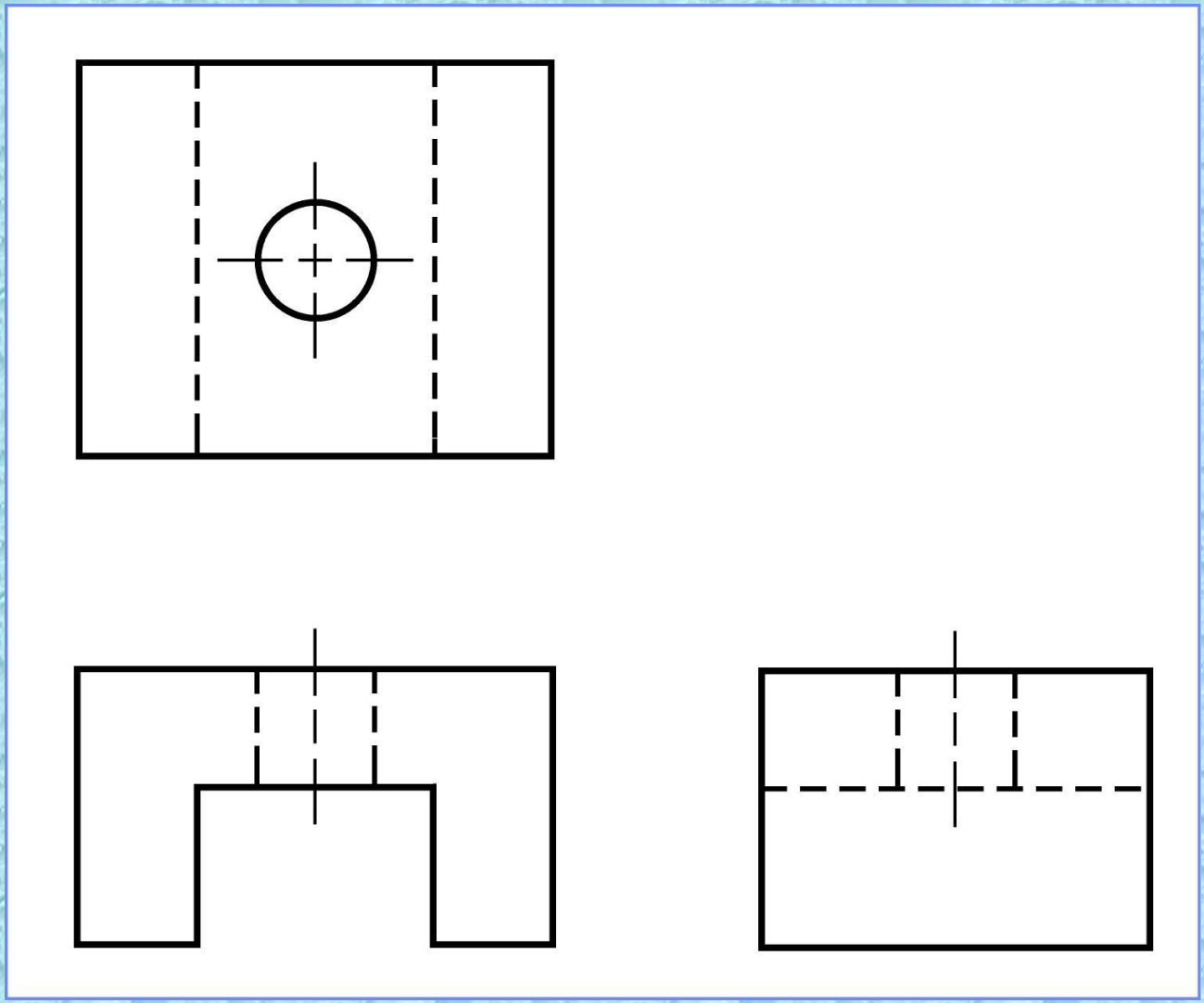


Creating an Orthographic Projection

- Draw centerlines where necessary.

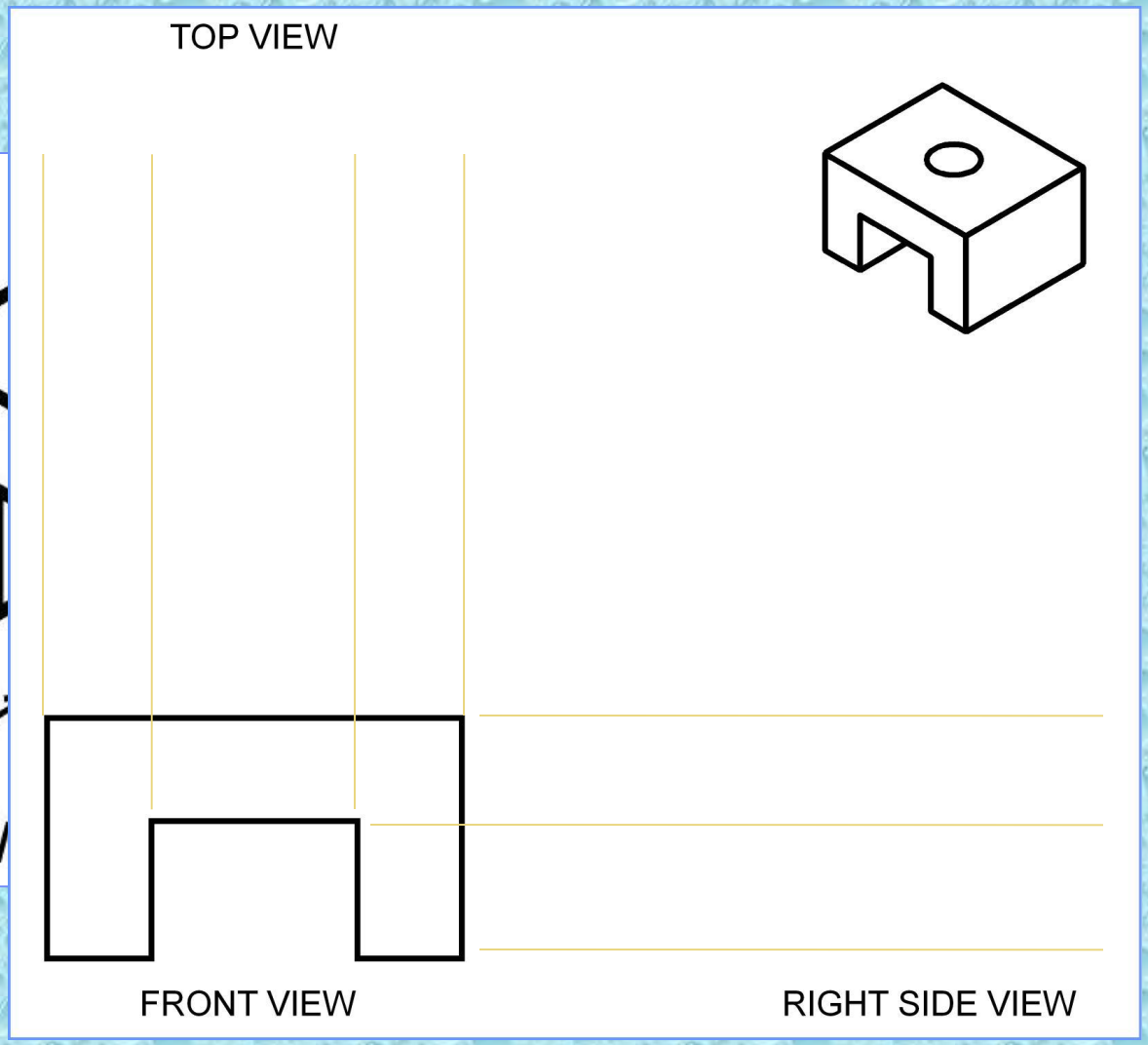


Completed Drawing

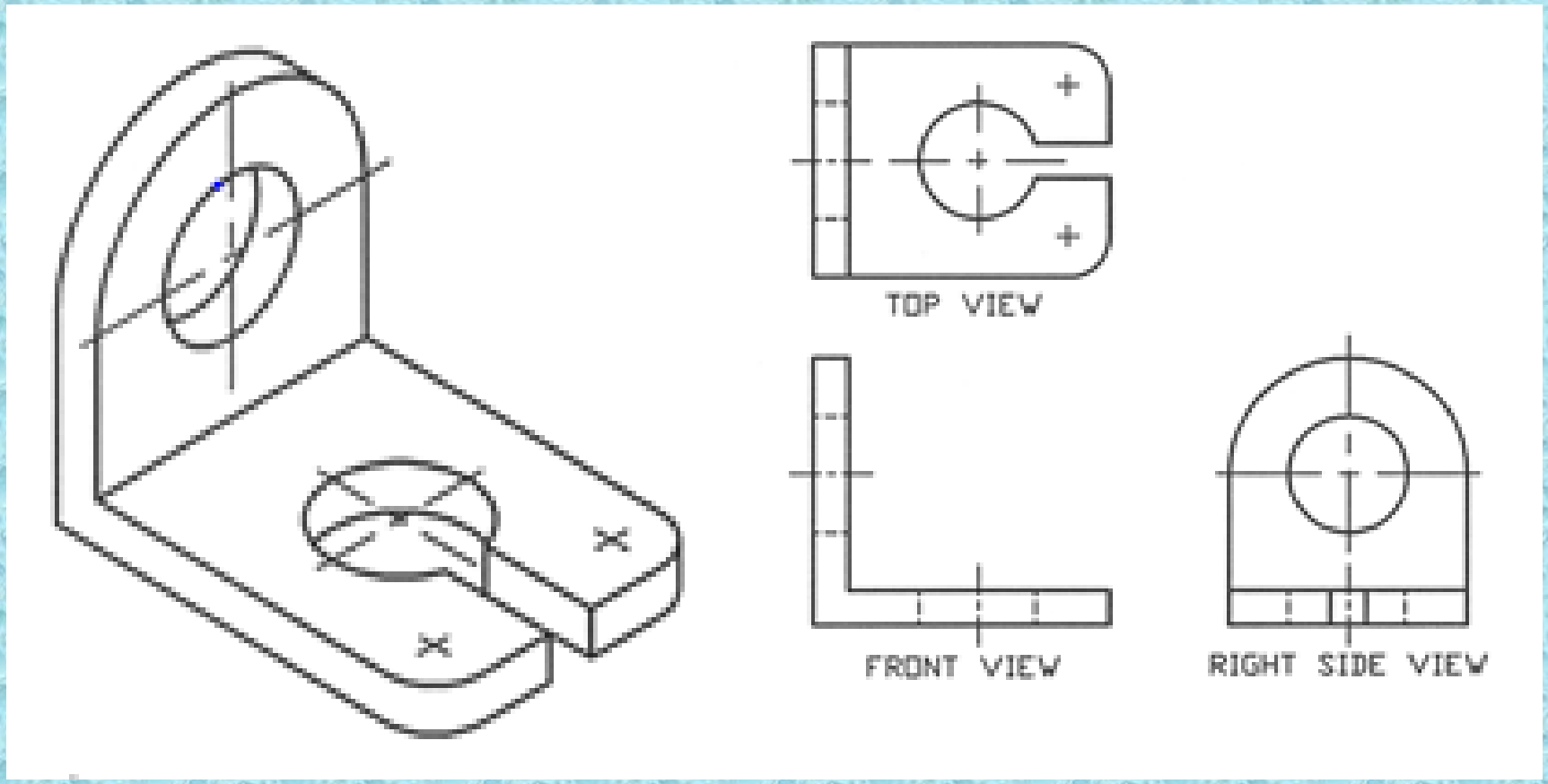


Drawing an Orthographic Projection

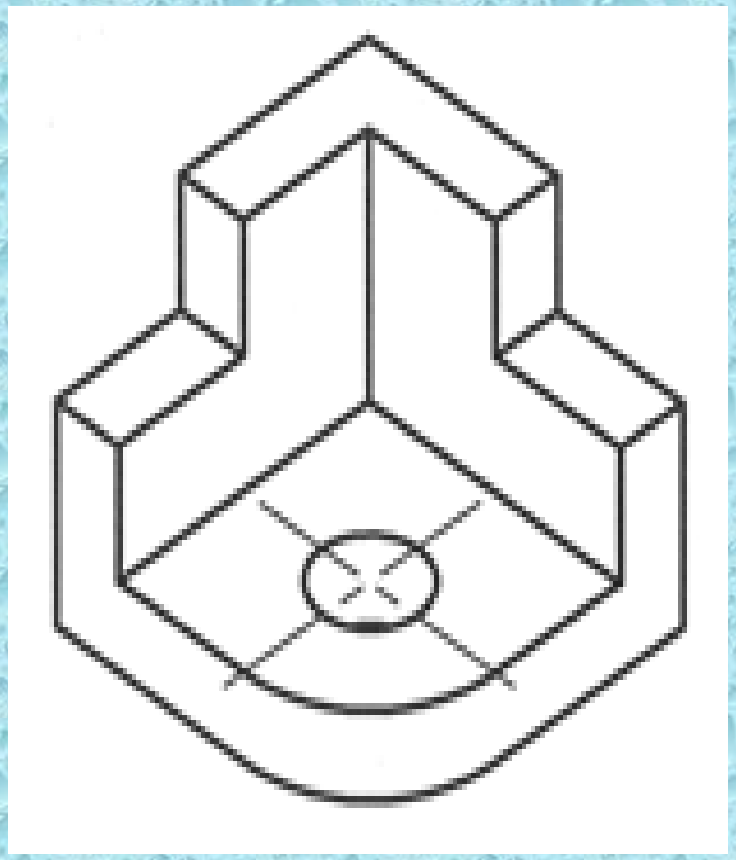
- Draw the visible features of the front view.
- Draw projectors off of the front view.

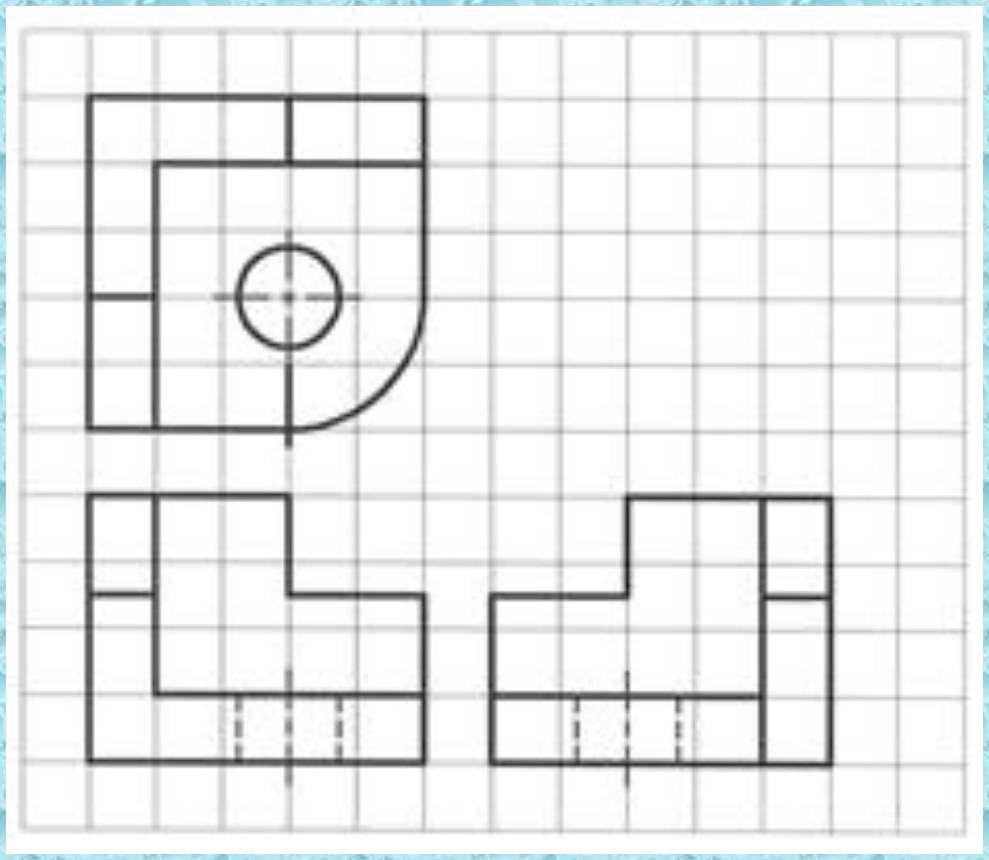


Drawing an Orthographic Projection

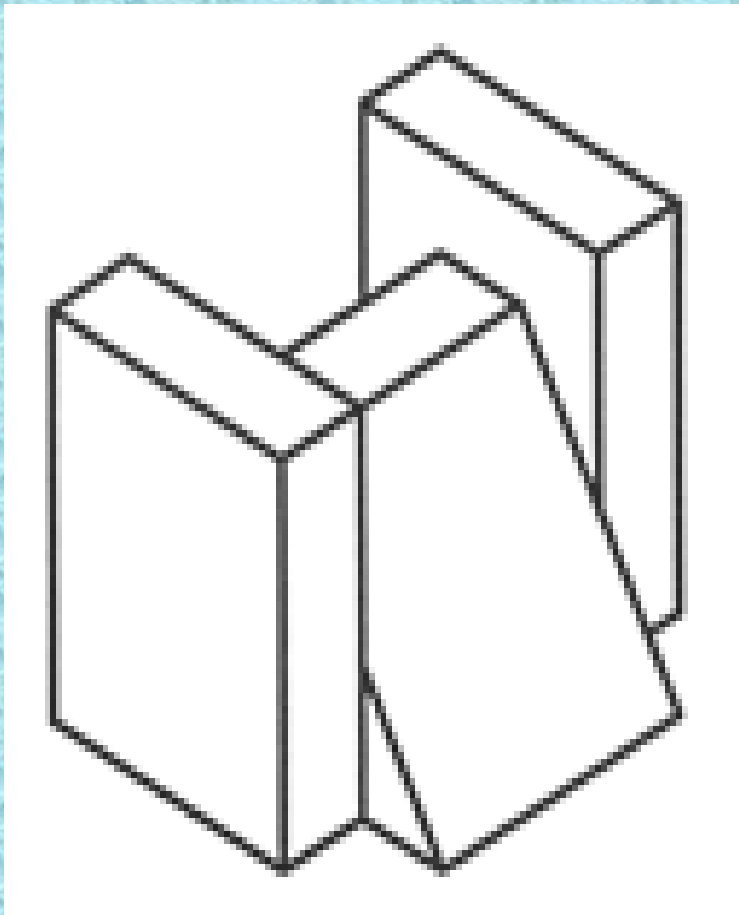


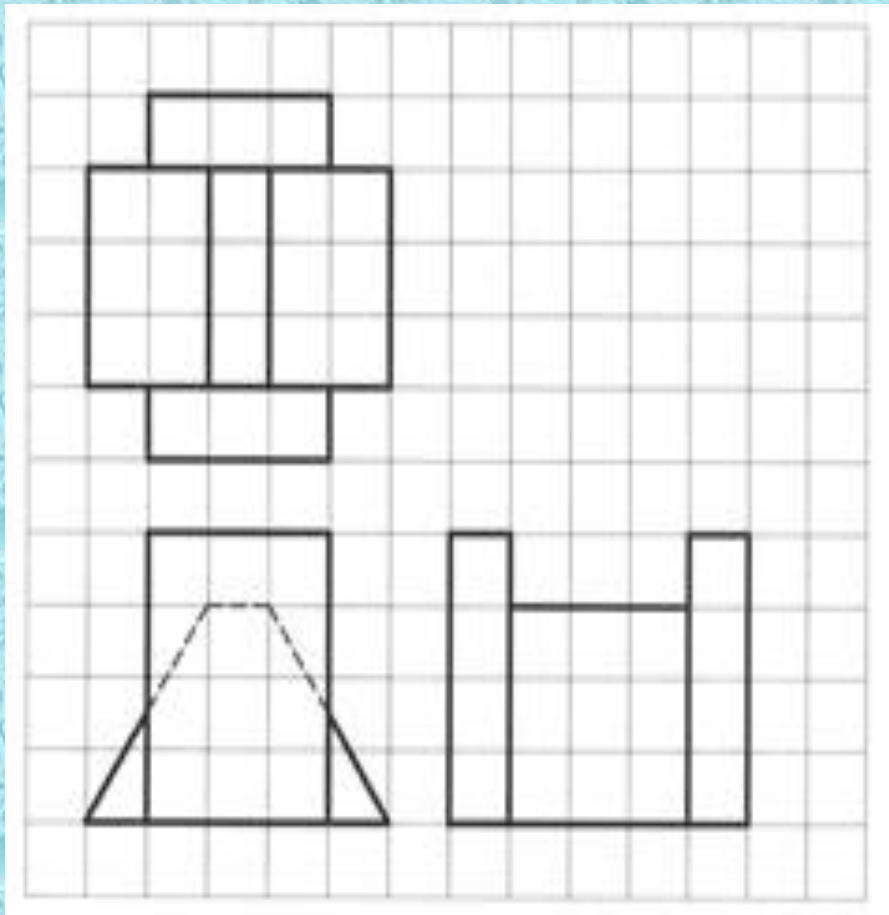
Drawing an Orthographic Projection



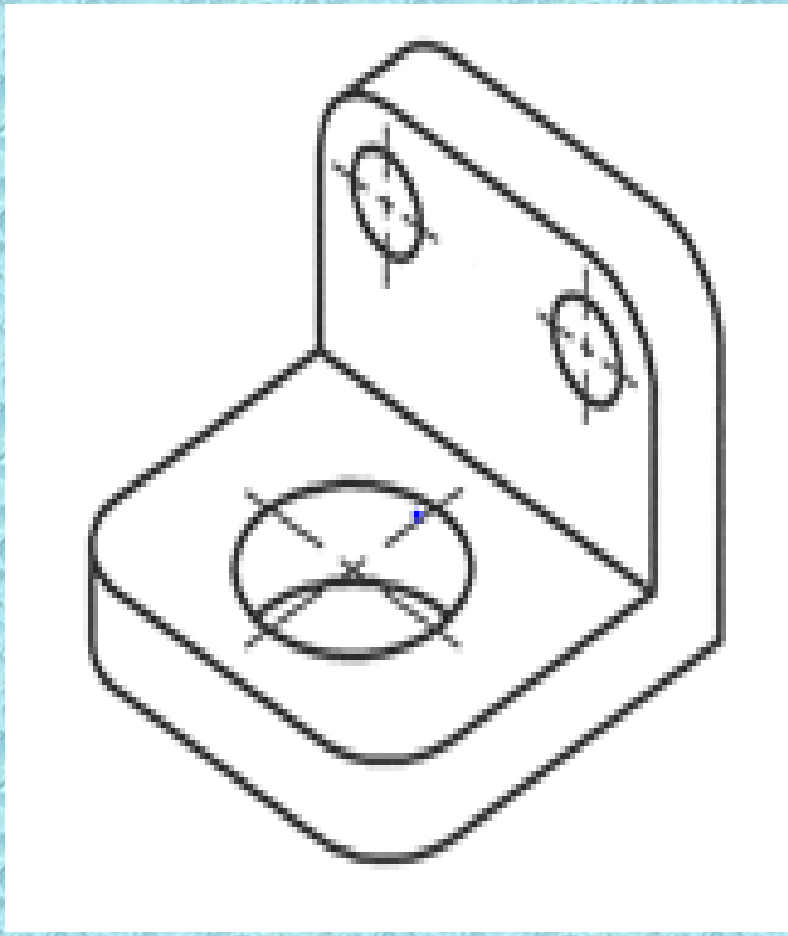


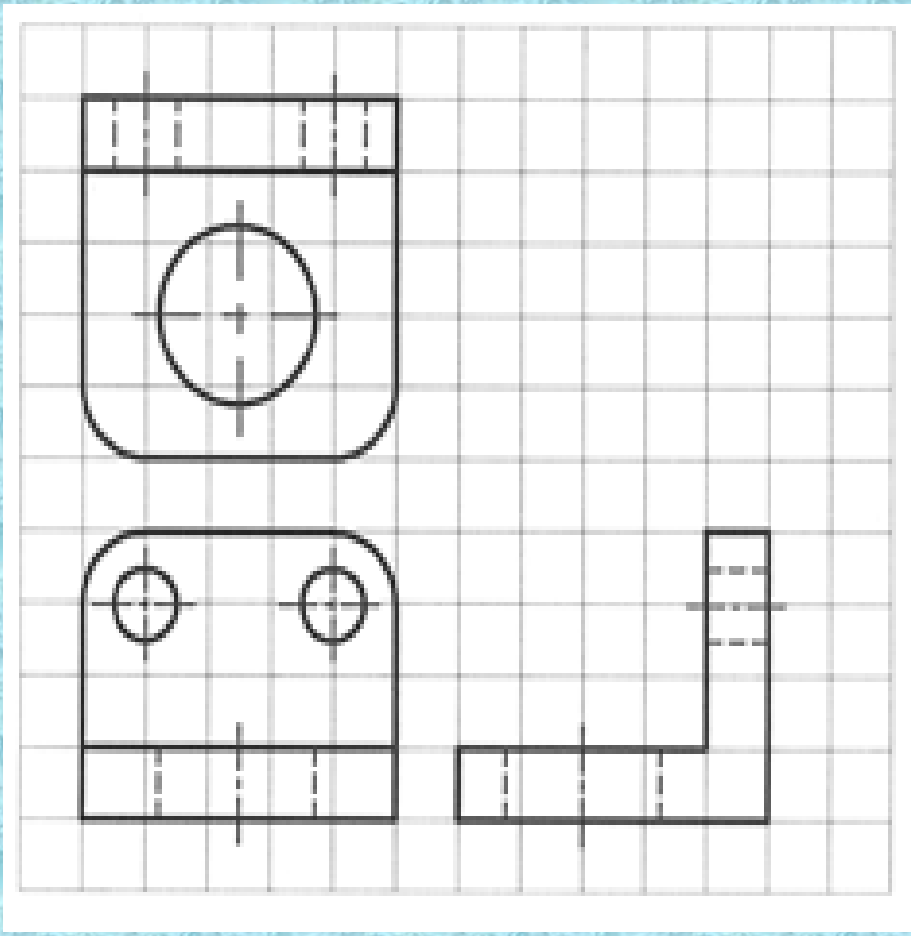
Drawing an Orthographic Projection



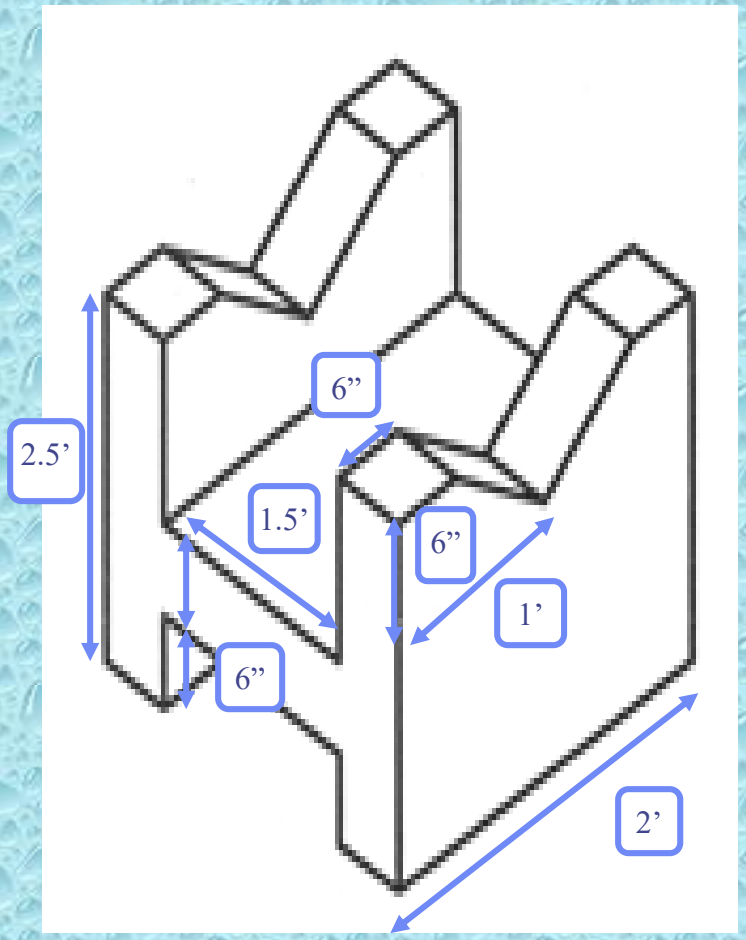


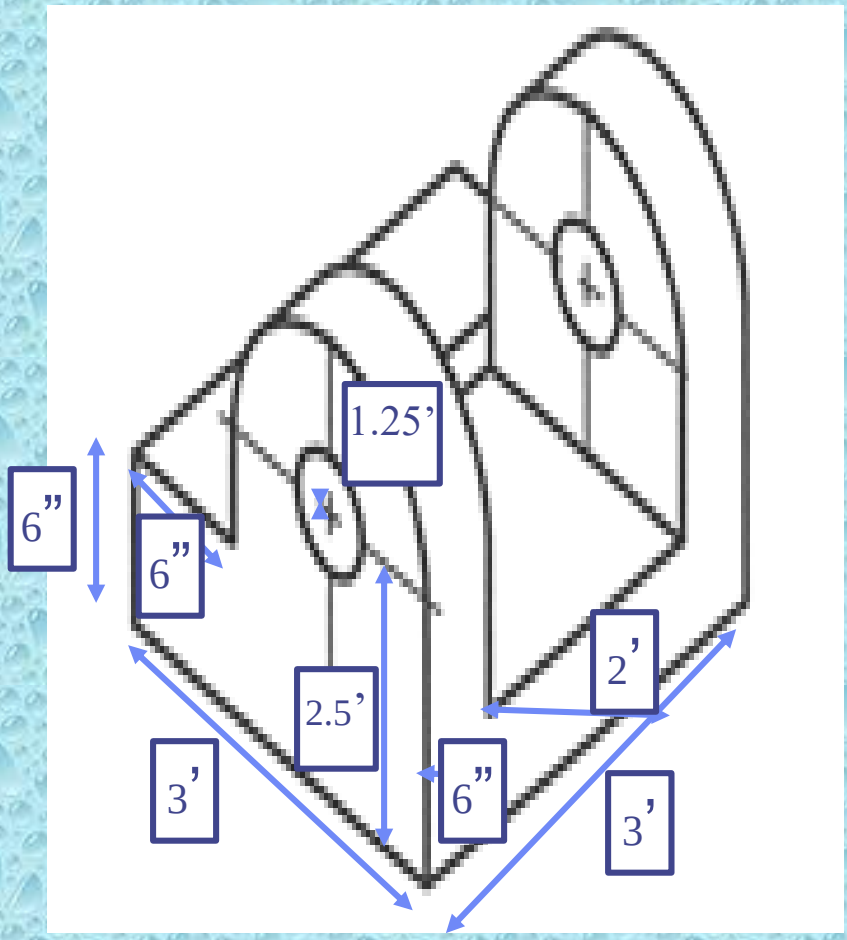
Drawing an Orthographic Projection



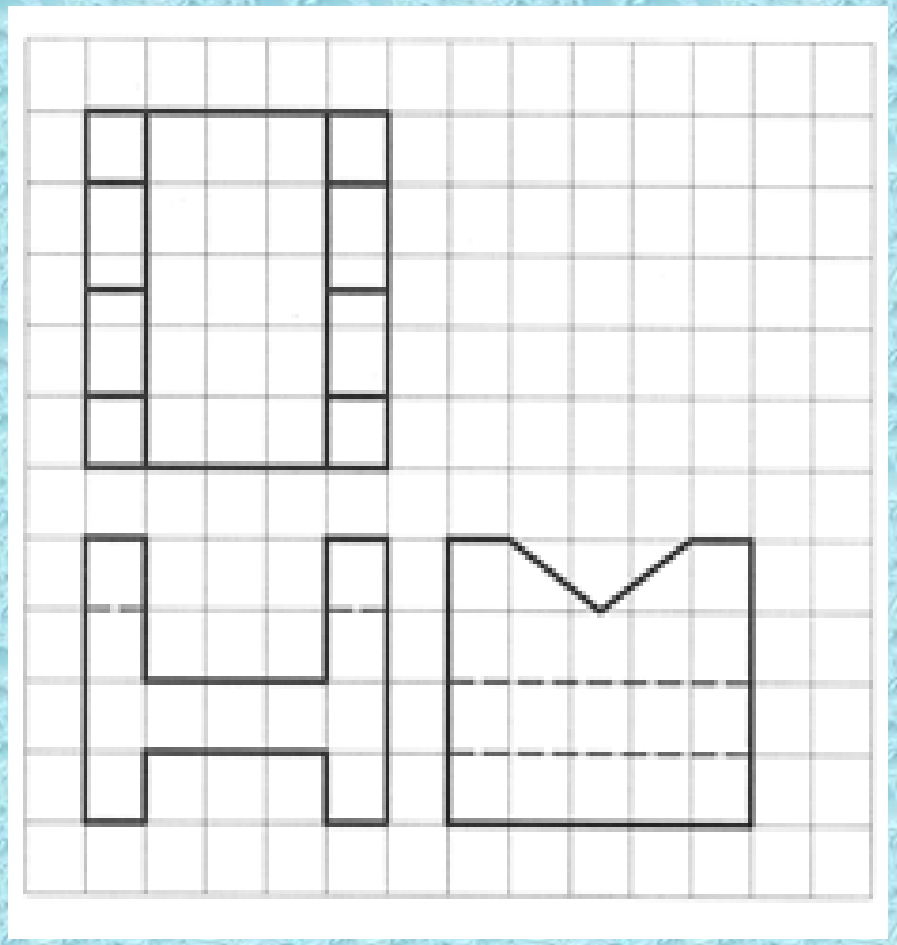


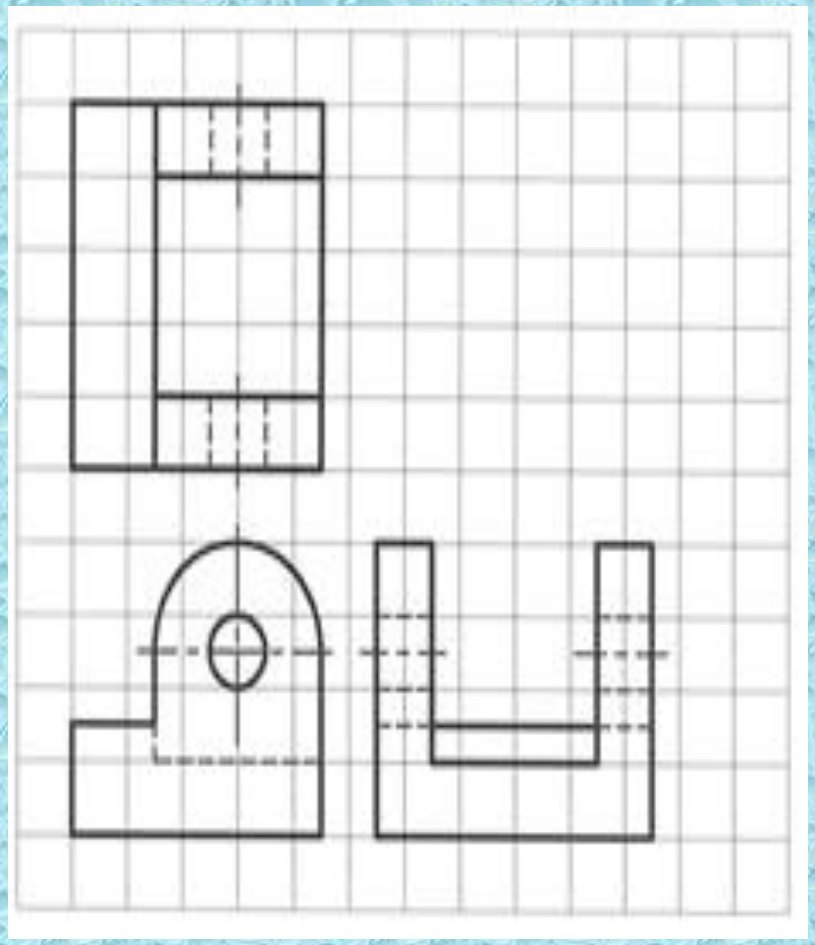
Drawing an Orthographic Projection





Drawing an Orthographic Projection





CE 1100
Civil Engineering Drawing-I

G. M. Harun -Or- Rashid
Lecturer
Dept. of CE, RUET

Dimensioning and Notation

- Dimensioning is the process wherein size and location data for the subject of a technical drawing are provided.
- Notation is the process wherein needed information not covered by dimensions is placed on a technical drawing.
- Dimension and Notation should be drawn by 2H pencil.

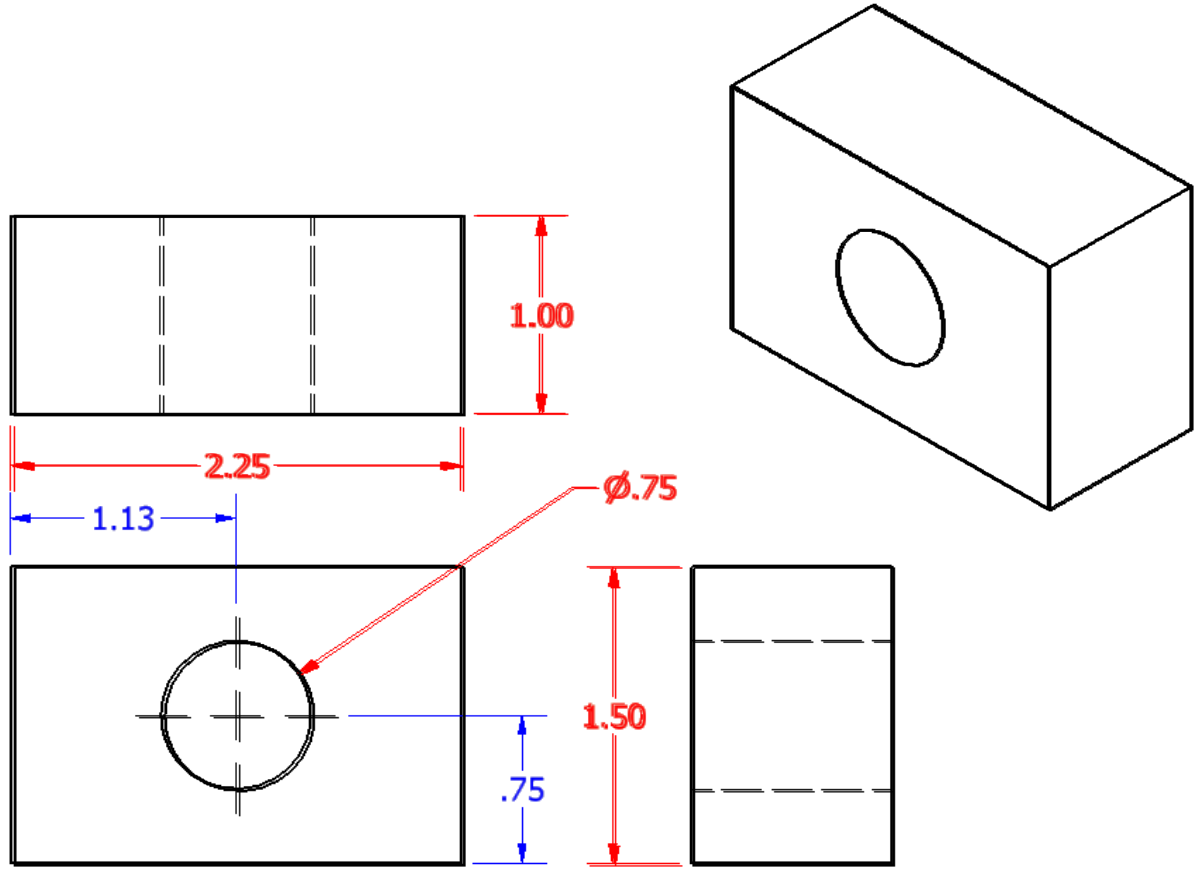
Why Dimension?

Engineers, designers, and engineering technologists need to know

- Size

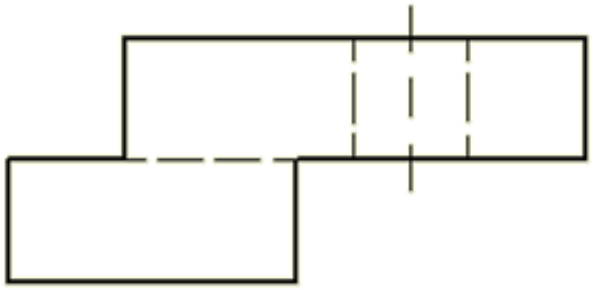
  and

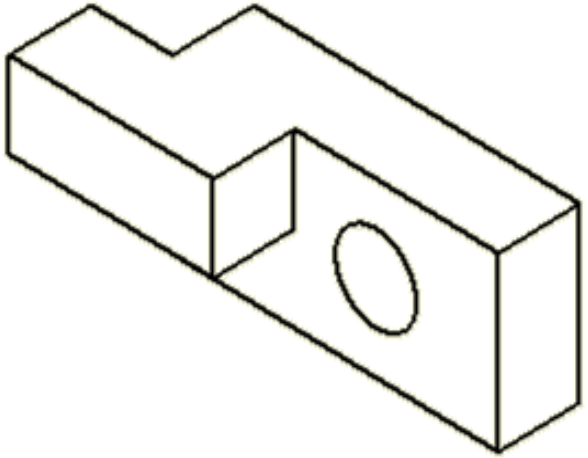
- Location of all features

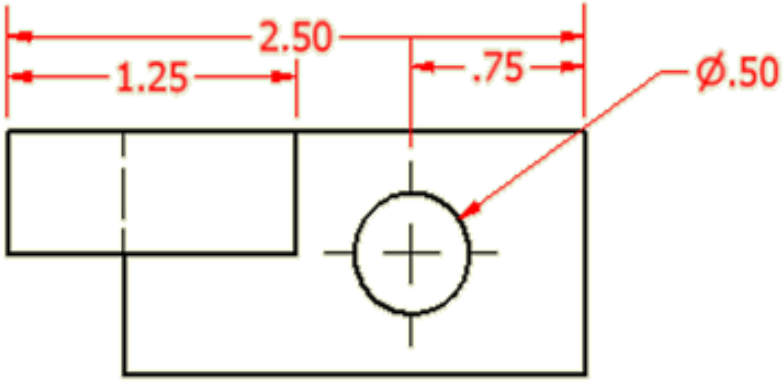


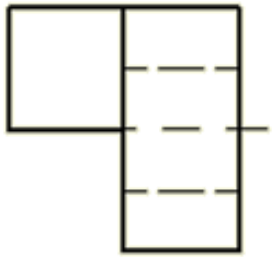
Dimension Completely

Width





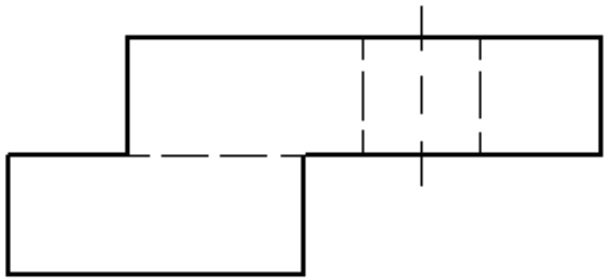


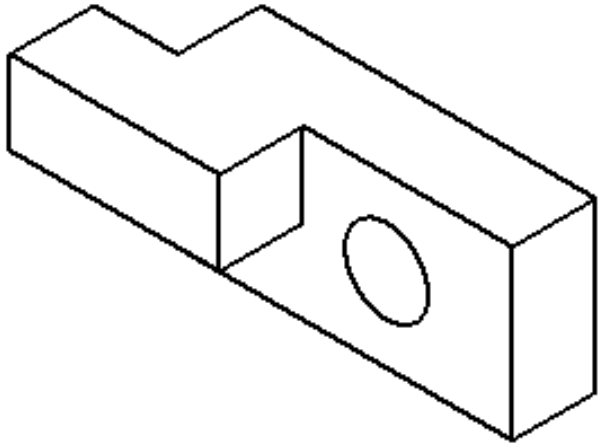


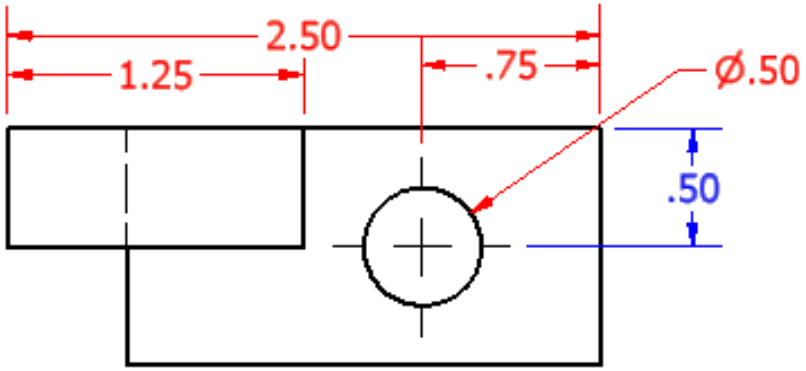
Dimension Completely

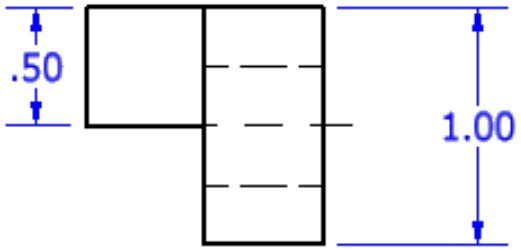
Width

Height







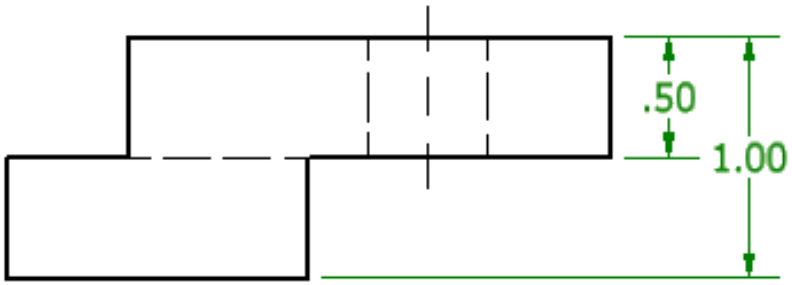


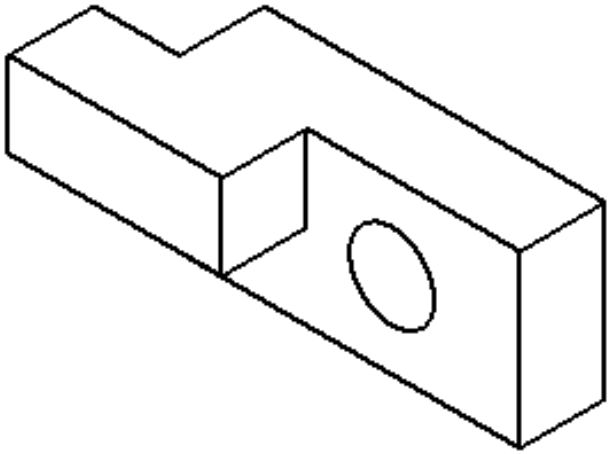
Dimension Completely

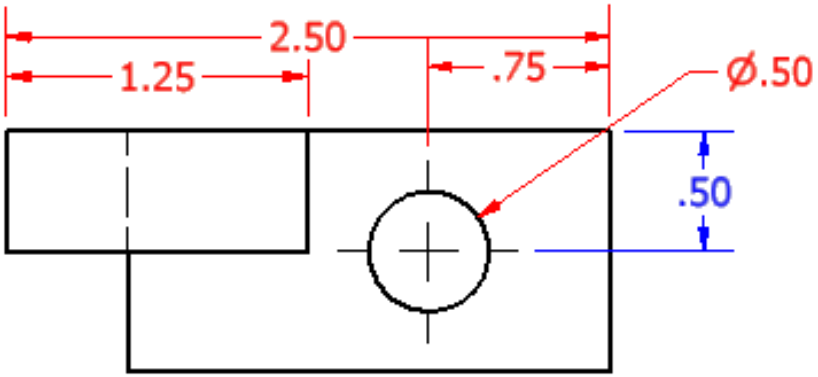
Width

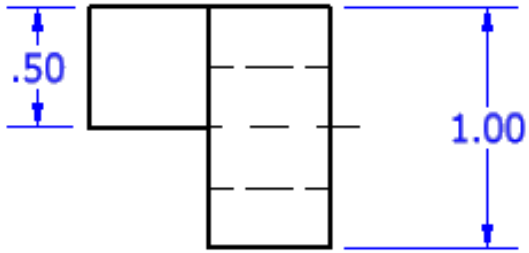
Height

Depth







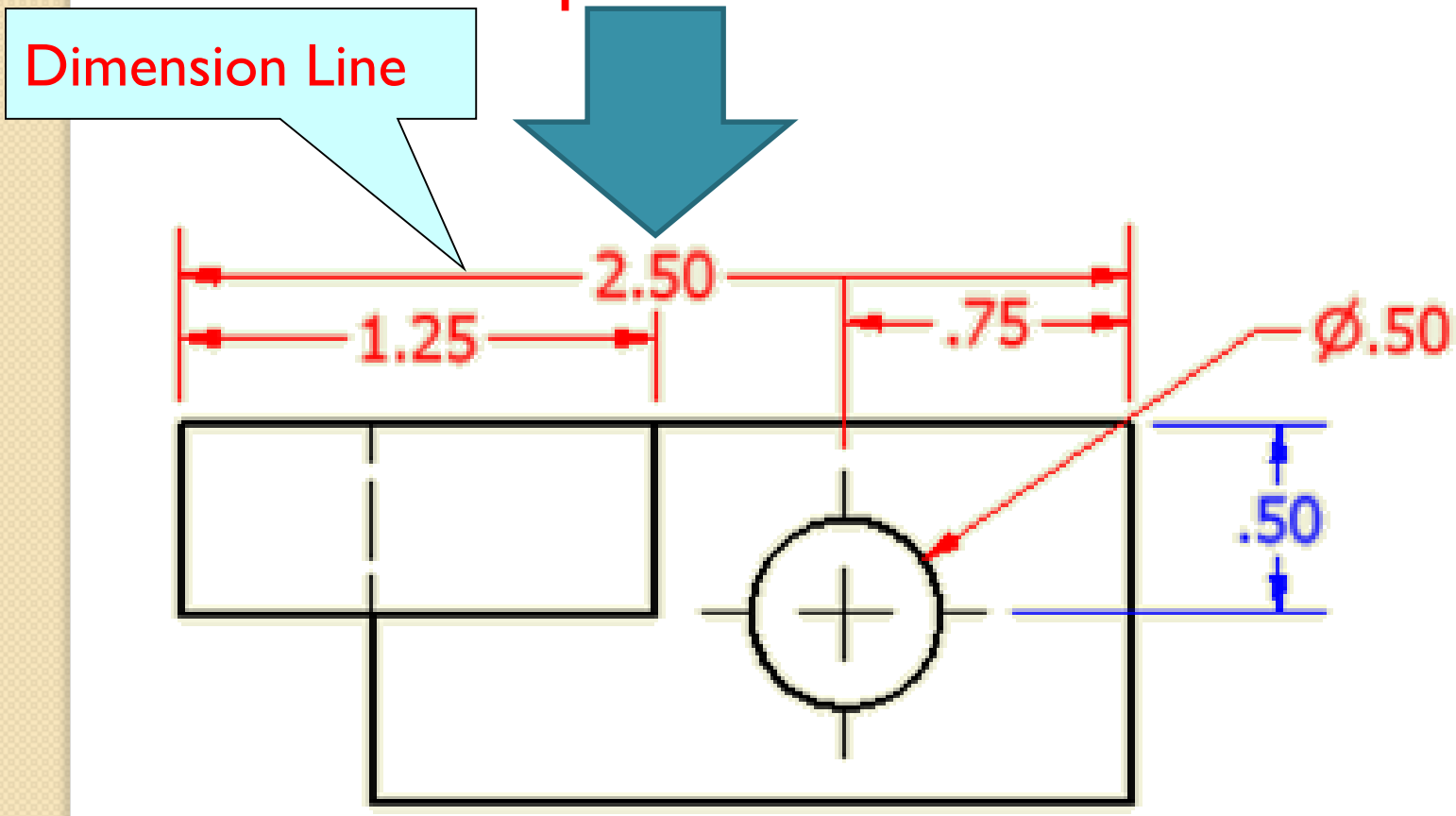


Dimension Components

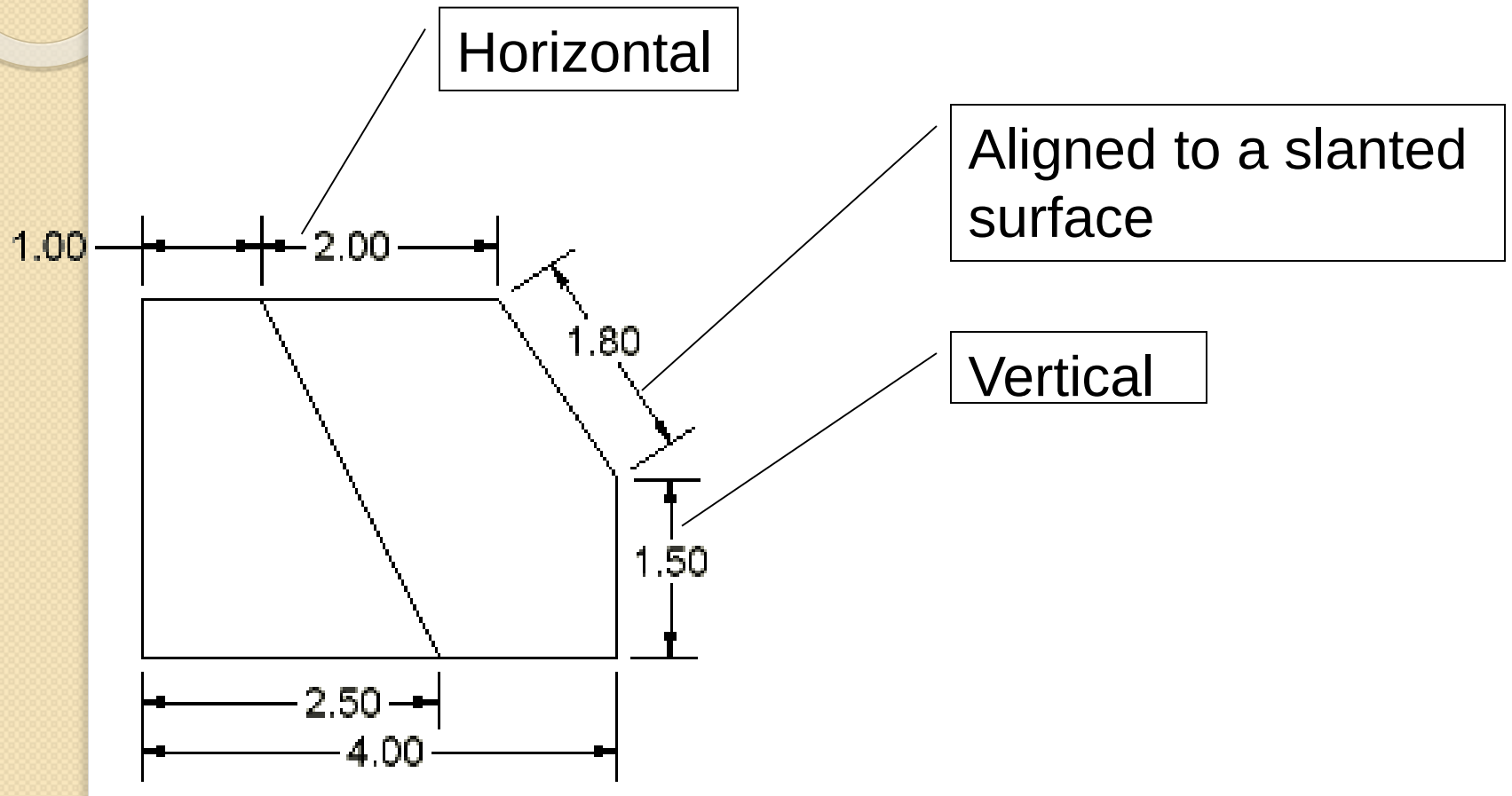
- DIMENSION LINES
- EXTENSION LINES
- LEADER LINES
- ARROW HEADS
- DIMENSION TEXTS

DIMENSION LINES

- A dimension line is a thin, solid line used to indicate graphically the linear distance being dimensioned. Dimension lines are normally broken for placement of the dimension.

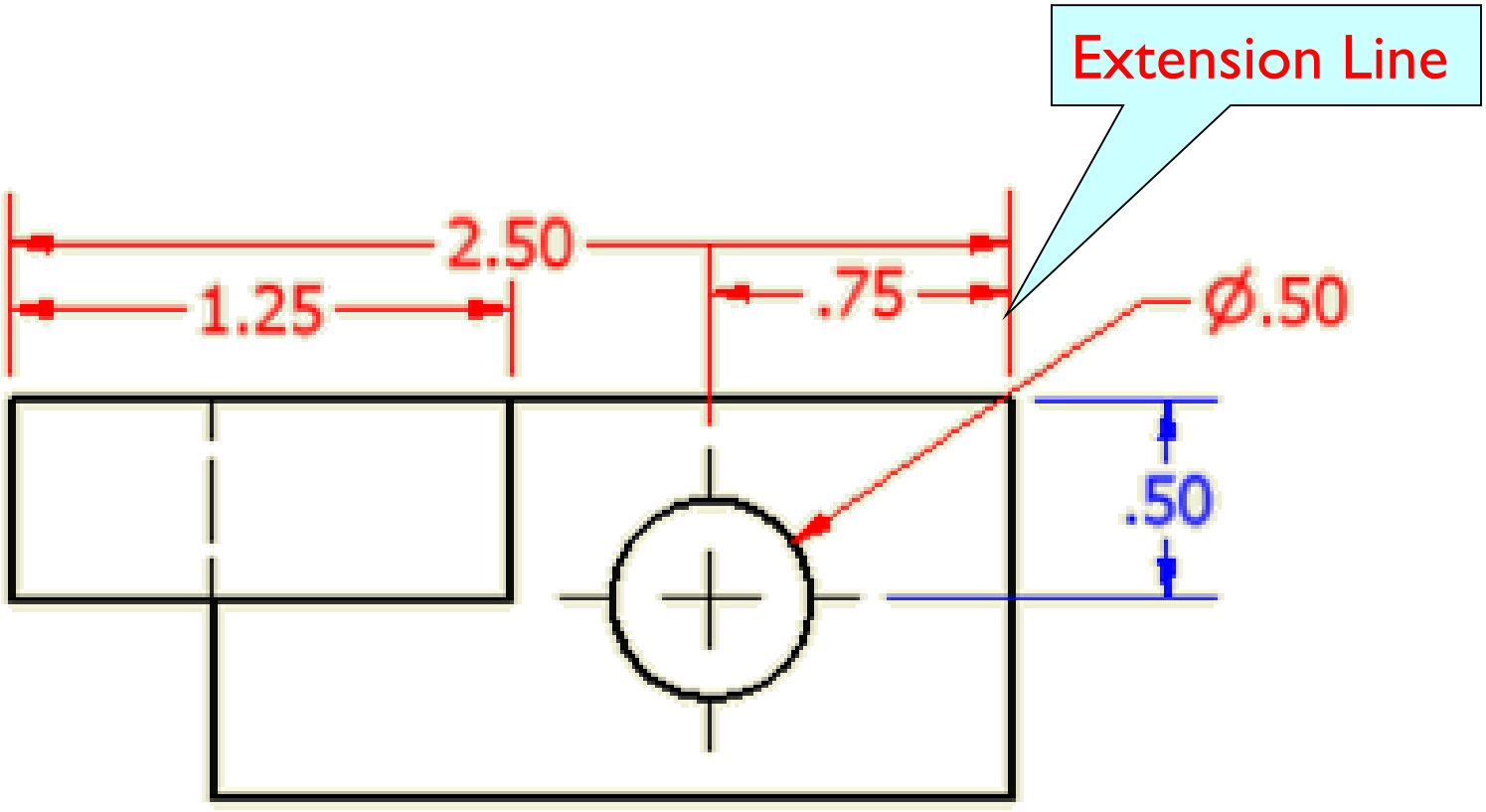


Dimension Lines



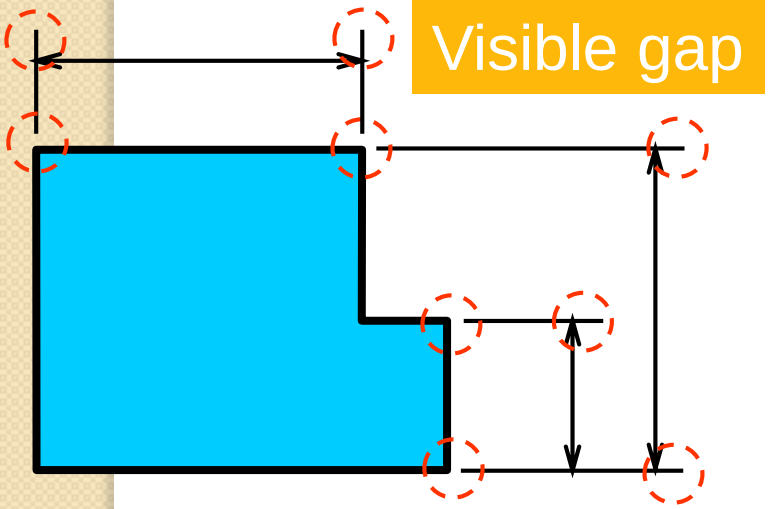
EXTENSION LINES

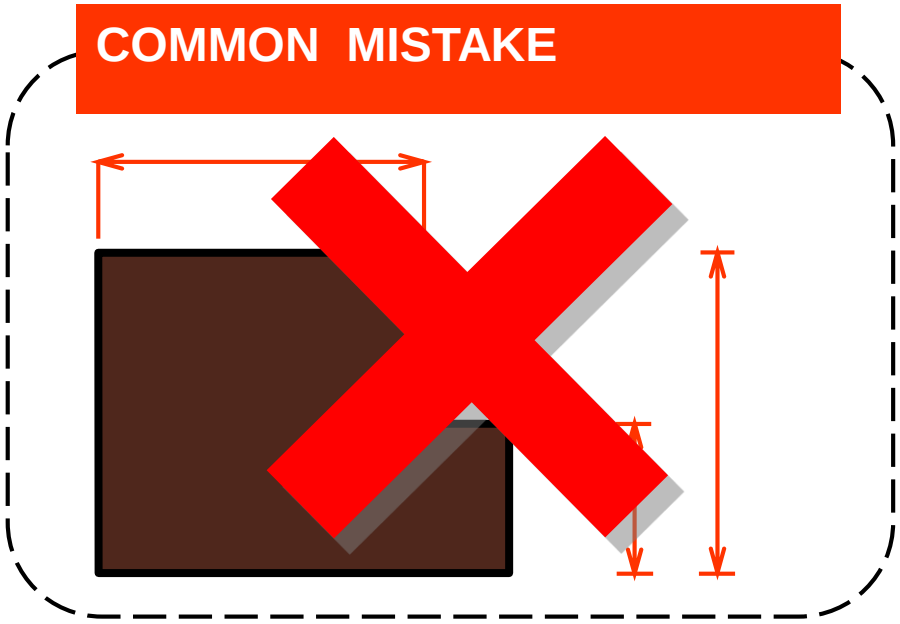
- An extension line is a thin, solid line that extends from the object.



EXTENSION LINES

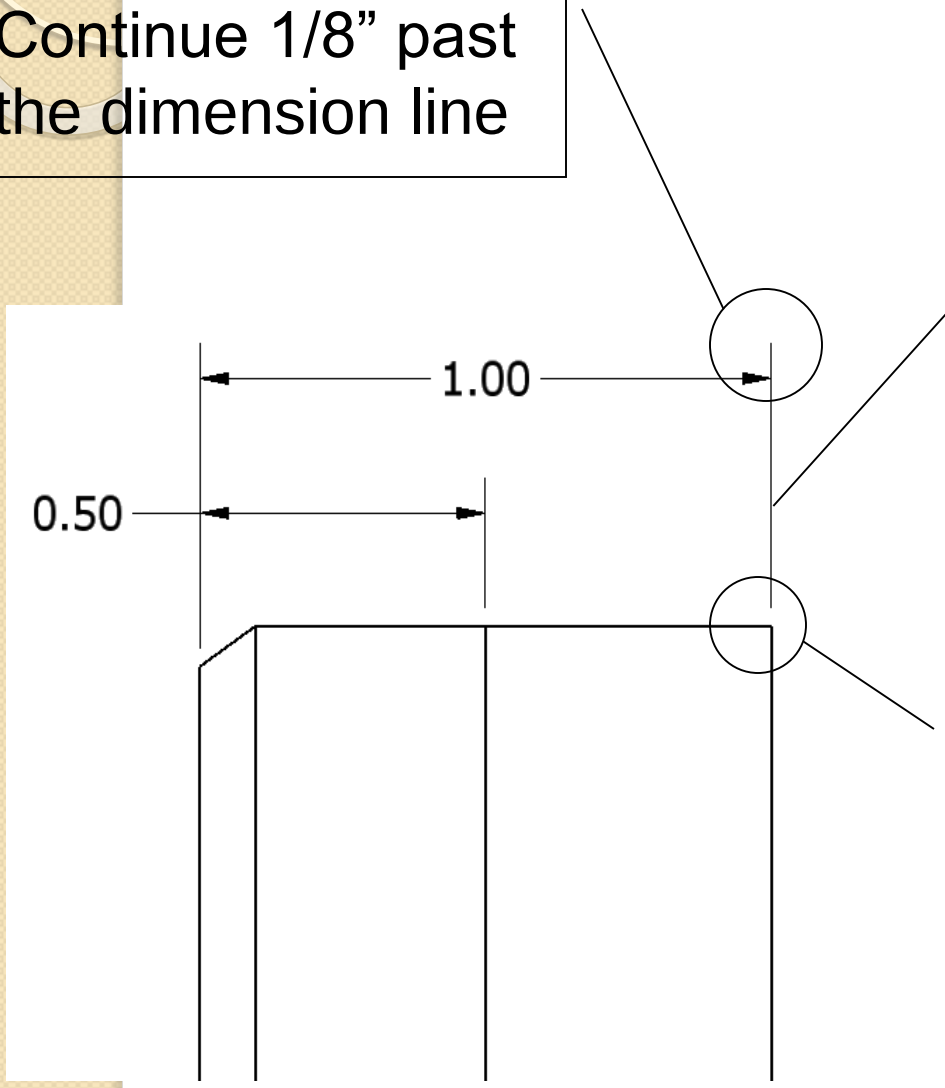
- Leave a **visible gap** (≈ 1/16”) from a view and start drawing an extension line.
- Extend the lines beyond the (last) dimension line 1/8”.





Extension Lines

Continue 1/8” past the dimension line



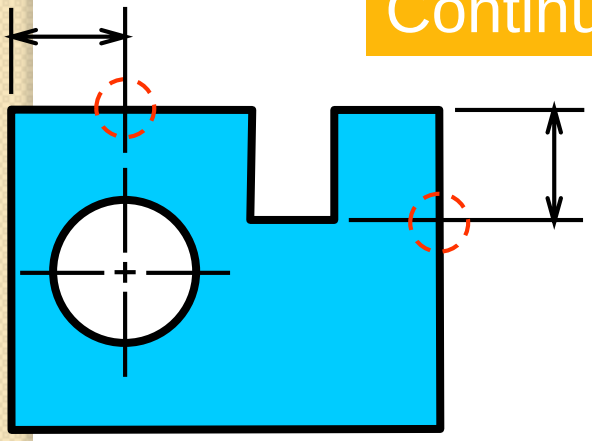
Extended from the view to indicate the edges referenced and hold the dimension line

1/16” gap from the view so they are not confused with the visible lines

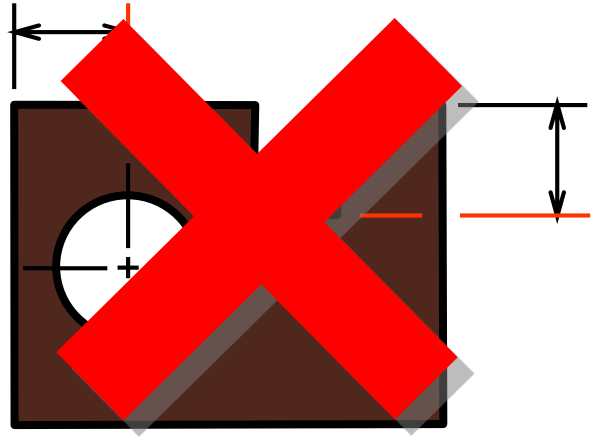
EXTENSION LINES

- **Do not** break the lines as they cross object lines.

Continuous

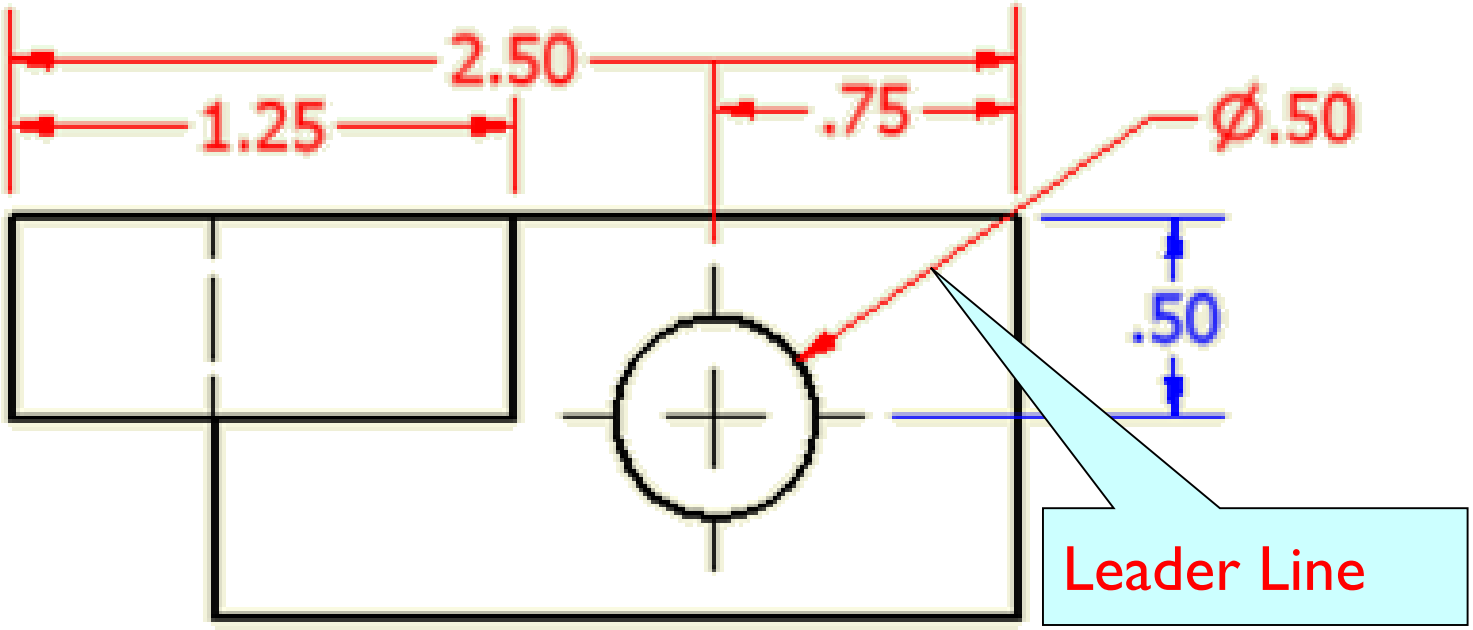


COMMON MISTAKE



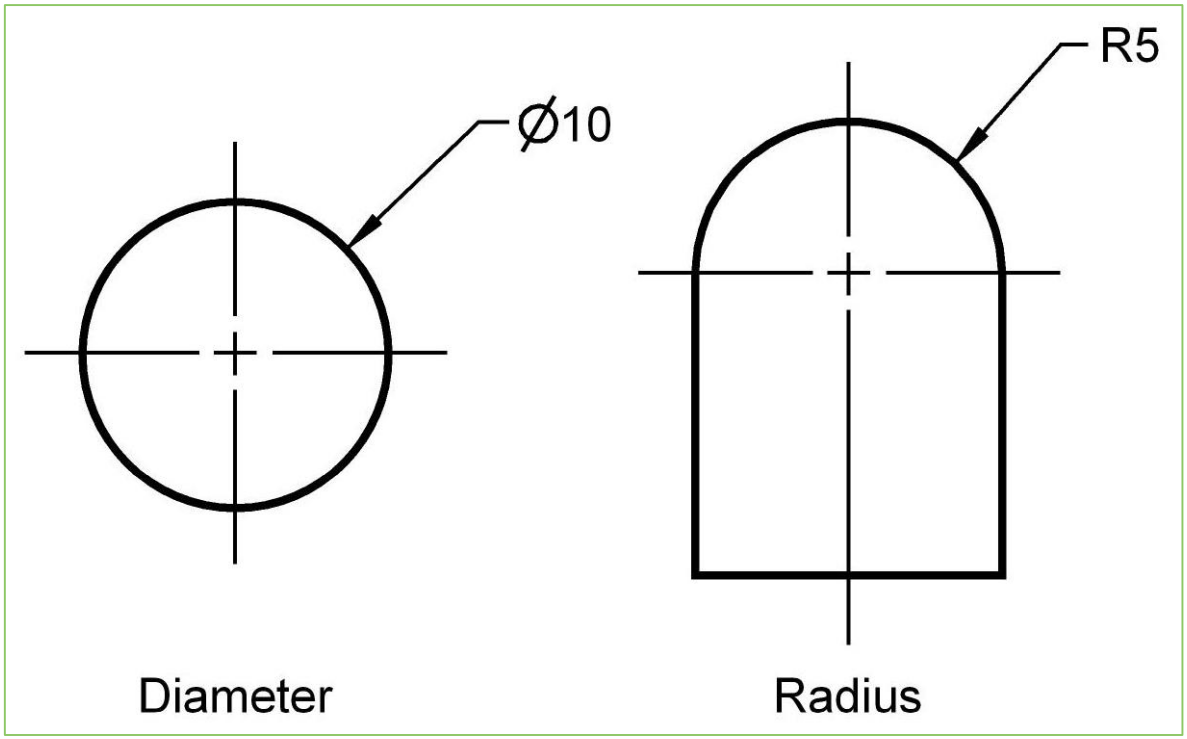
LEADER LINES

- A leader line is a thin, solid line that begins horizontally, breaks at an angle (usually downward) and terminates in an arrowhead.



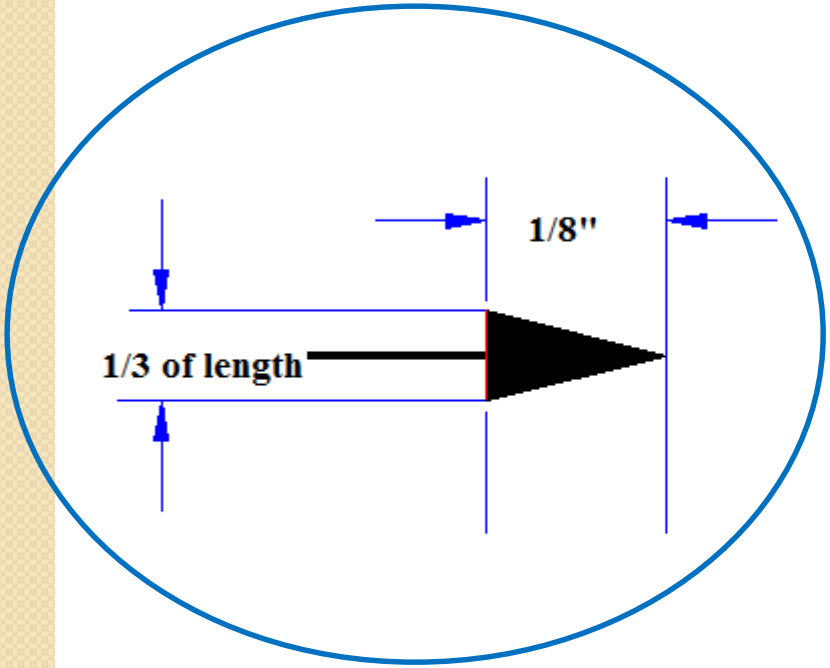
LEADER LINES

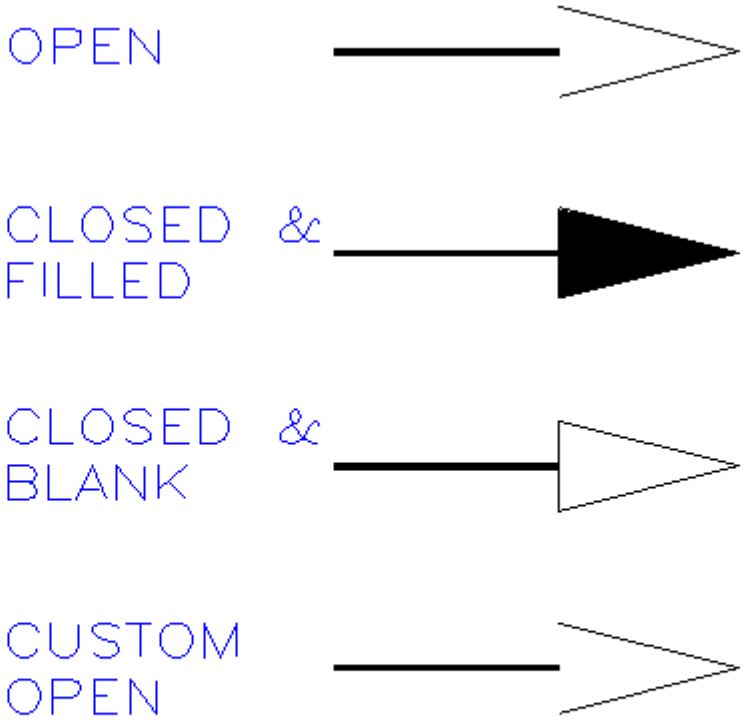
- A circle is dimensioned by its diameter and an arc by its radius using a leader line.



ARROWHEADS

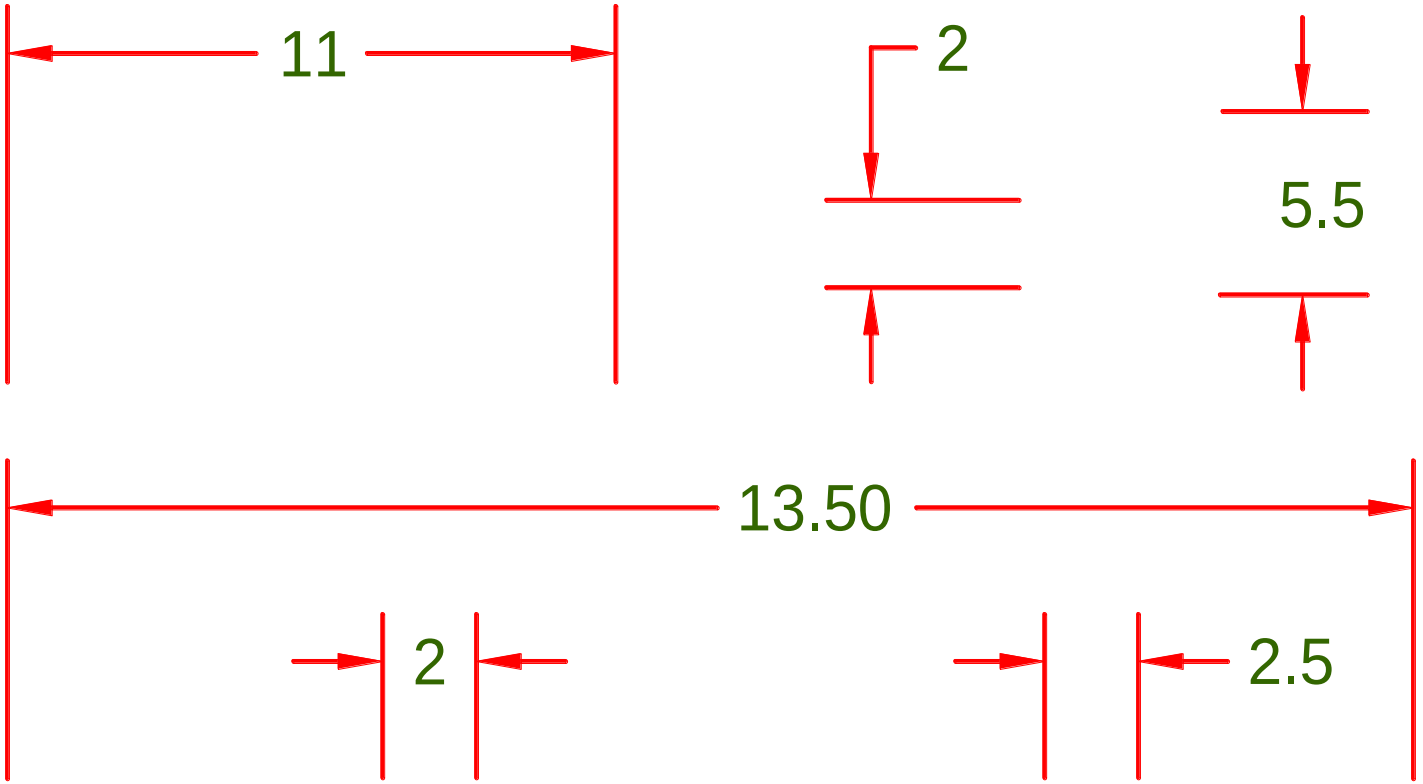
- An Arrowhead is the most commonly used termination symbol for dimension and leader lines.
- Width should be 1/3 of length.





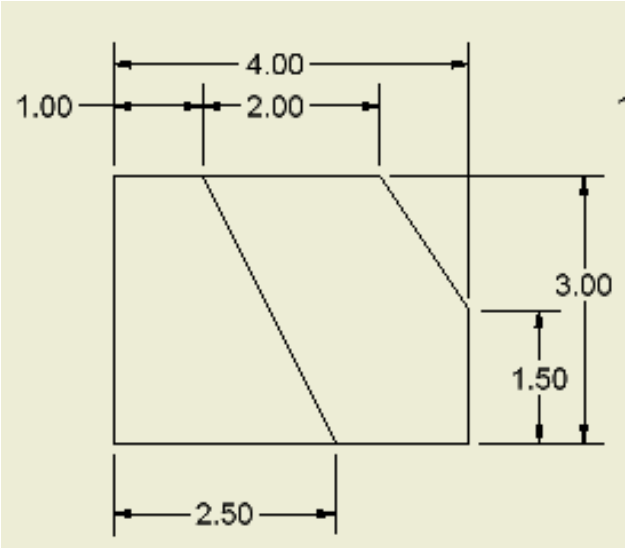
Arrowheads

- Arrowheads are drawn between the extension lines if possible. If space is limited, they may be drawn on the outside.

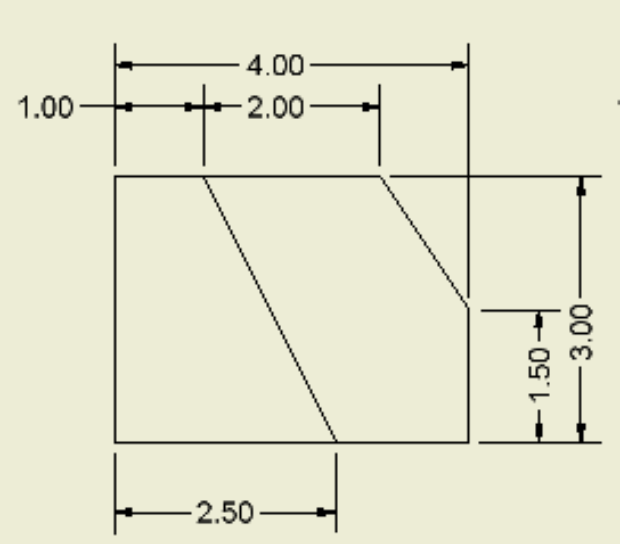


Dimension Text

- The *unidirectional* method means all dimensions are read in the same direction.



- The *aligned* method means some read horizontally and others read vertically. (Dimension texts are in same line with dimension lines)



Units of measurement

1. Metric system :

- Whole numbers **2 NOT 02 or 2.0**
- Decimal **0.2 NOT .2 or .20**
- Large numbers **32545** (no comma or spaces to separate digits)
- General note like: unless otherwise specified dimensions are in **millimeters**

2. Decimal-inch system

- Whole dimensions: **24.0 NOT 24**
- Decimal dimensions: **0.4**

Units of measurement

3. Fractional-inch system

Examples $\frac{1}{4}$, $5\frac{3}{8}$ etc.

$\frac{1}{8}$

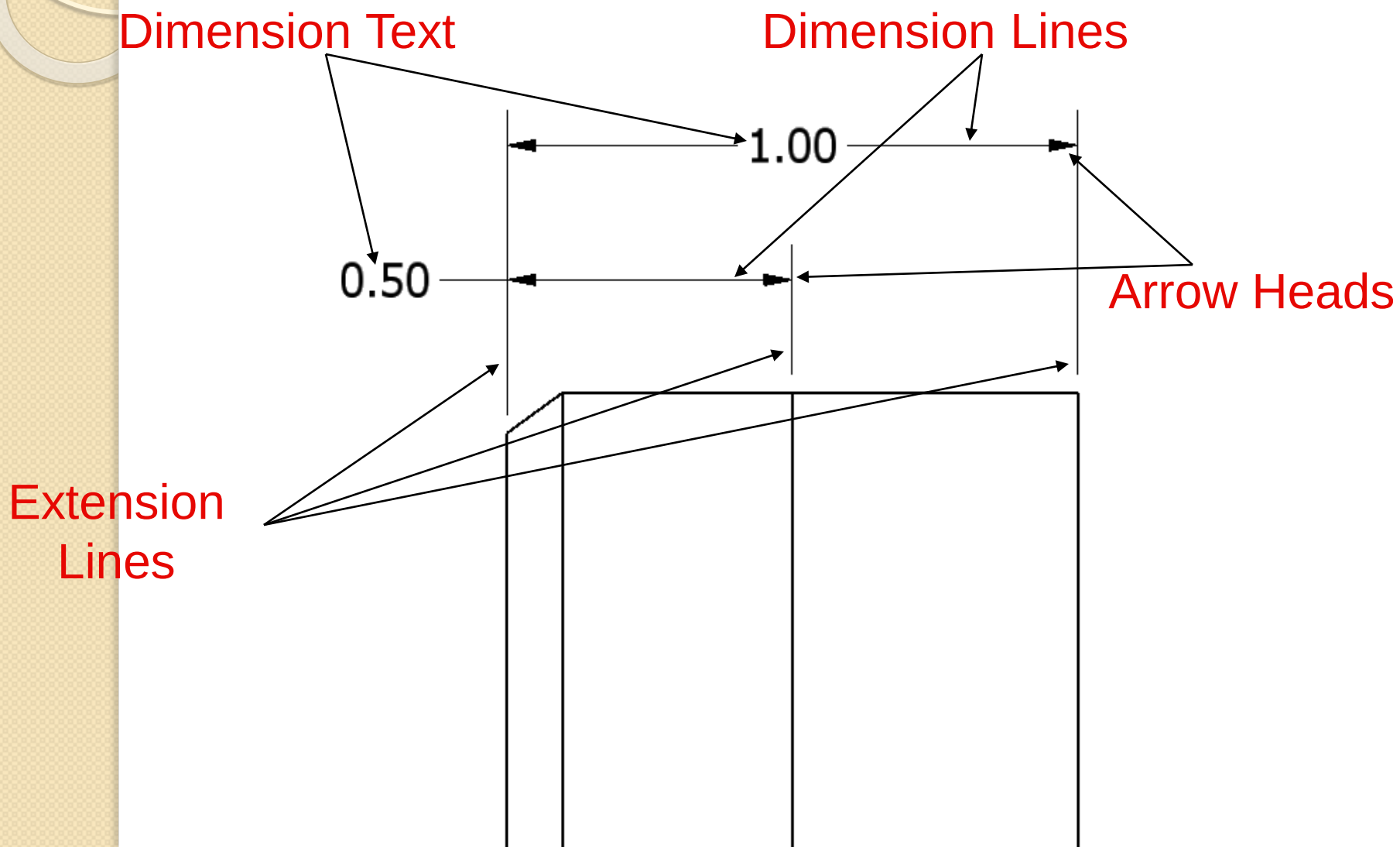
CORRECT

$1/8$

INCORRECT

$\frac{1}{8}''$ $2\frac{7}{16}$ $\frac{1}{4}''$

Components of Linear dimensions:

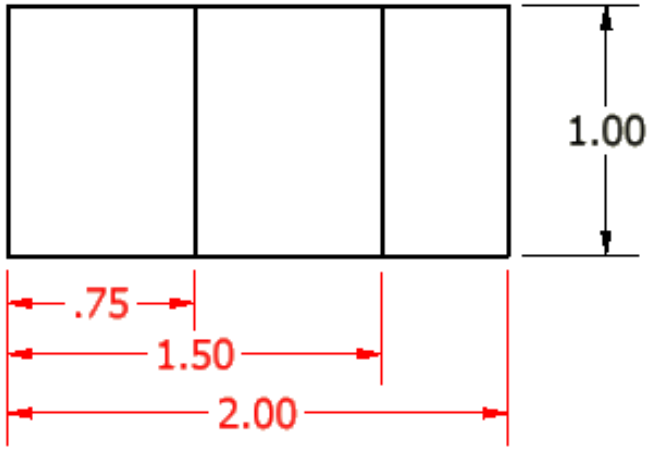


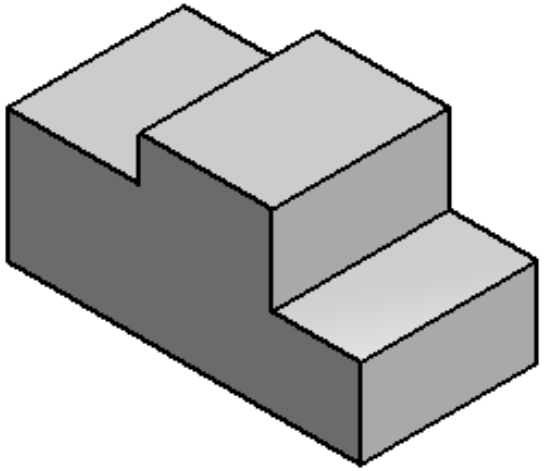
Next:

Dimensioning Guidelines (Rules)

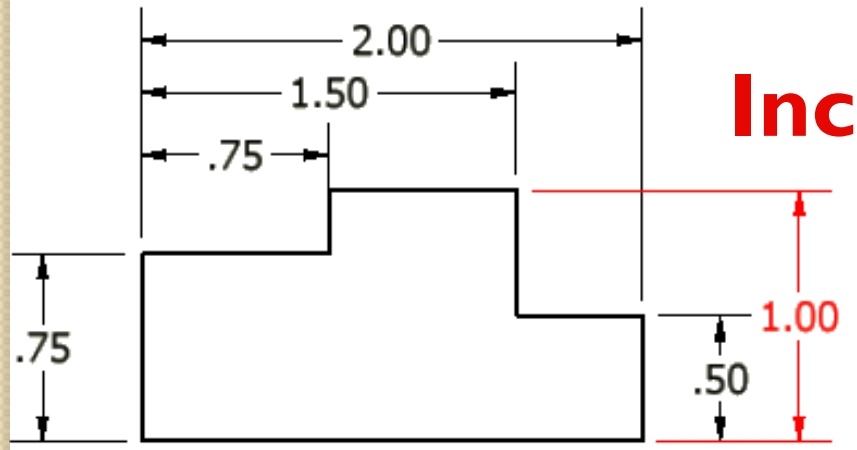
- Incorrect dimensions will be shown in RED
- Correct dimensions will be shown in GREEN

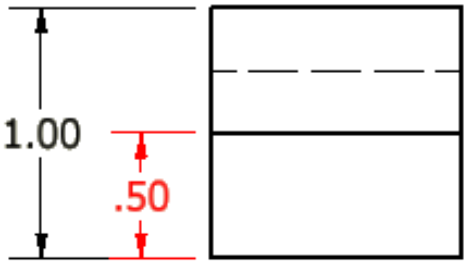
Dimensions should NOT be duplicated, nor should the same information be given in two different ways.



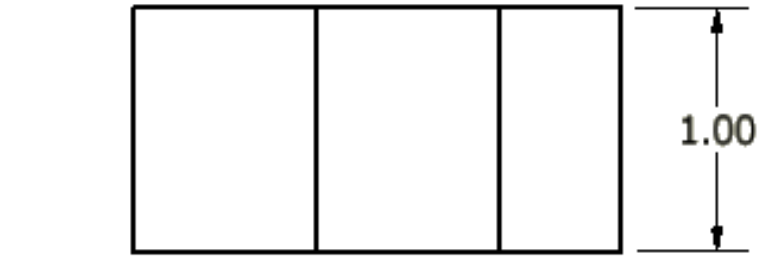


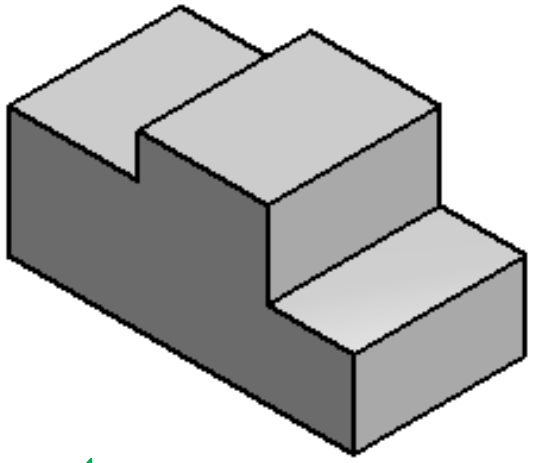
Incorrect

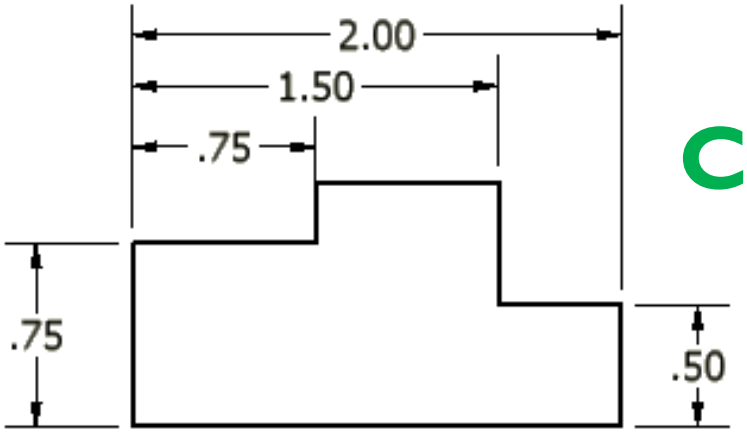




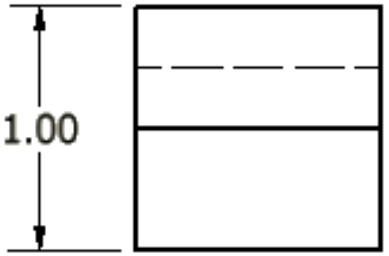
Dimensions should NOT be duplicated, nor should the same information be given in two different ways.



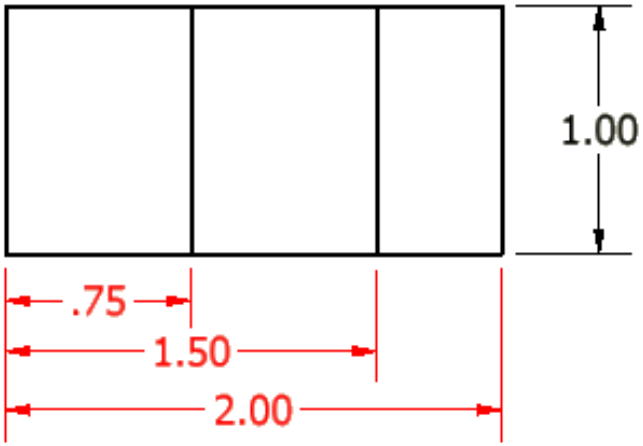


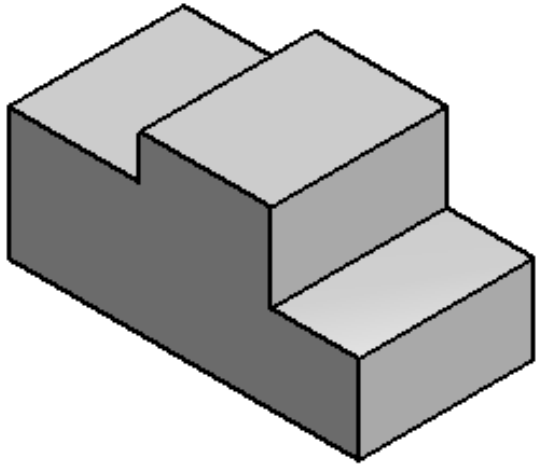


Correct

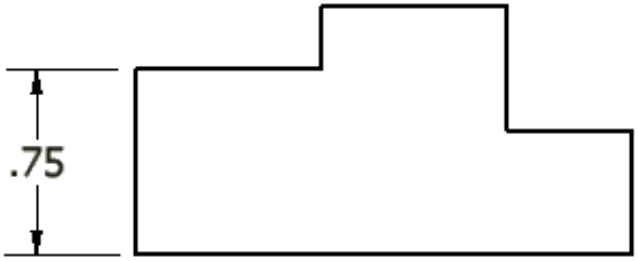


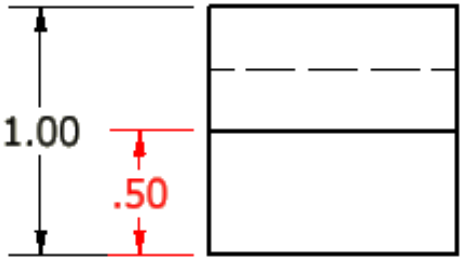
Dimensions should be attached to the view that best shows the ***contour*** (curve, shape) of the feature to be dimensioned.



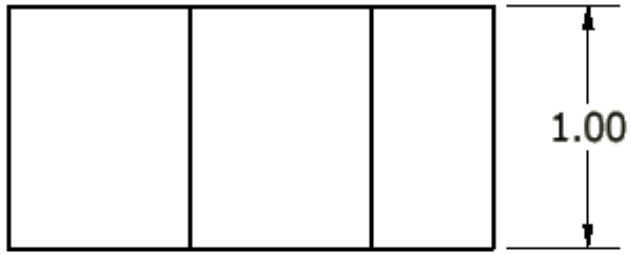


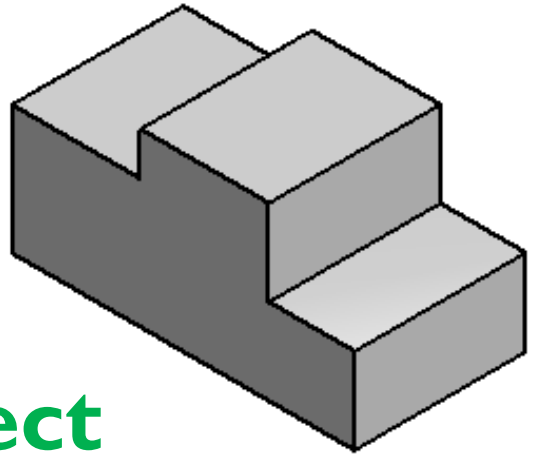
Incorrect



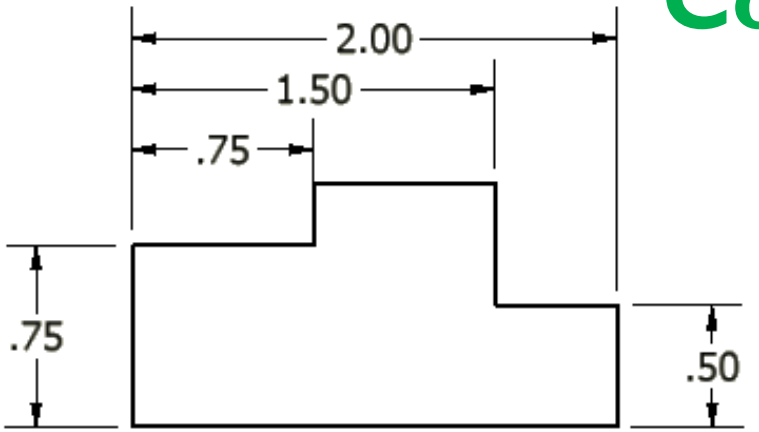


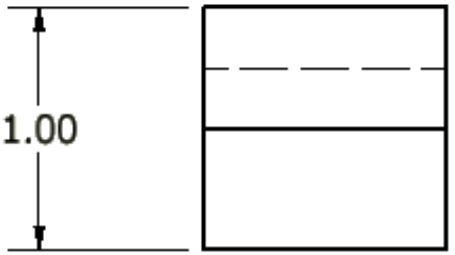
Dimensions should be attached to the view that best shows the ***contour*** of the feature to be dimensioned.



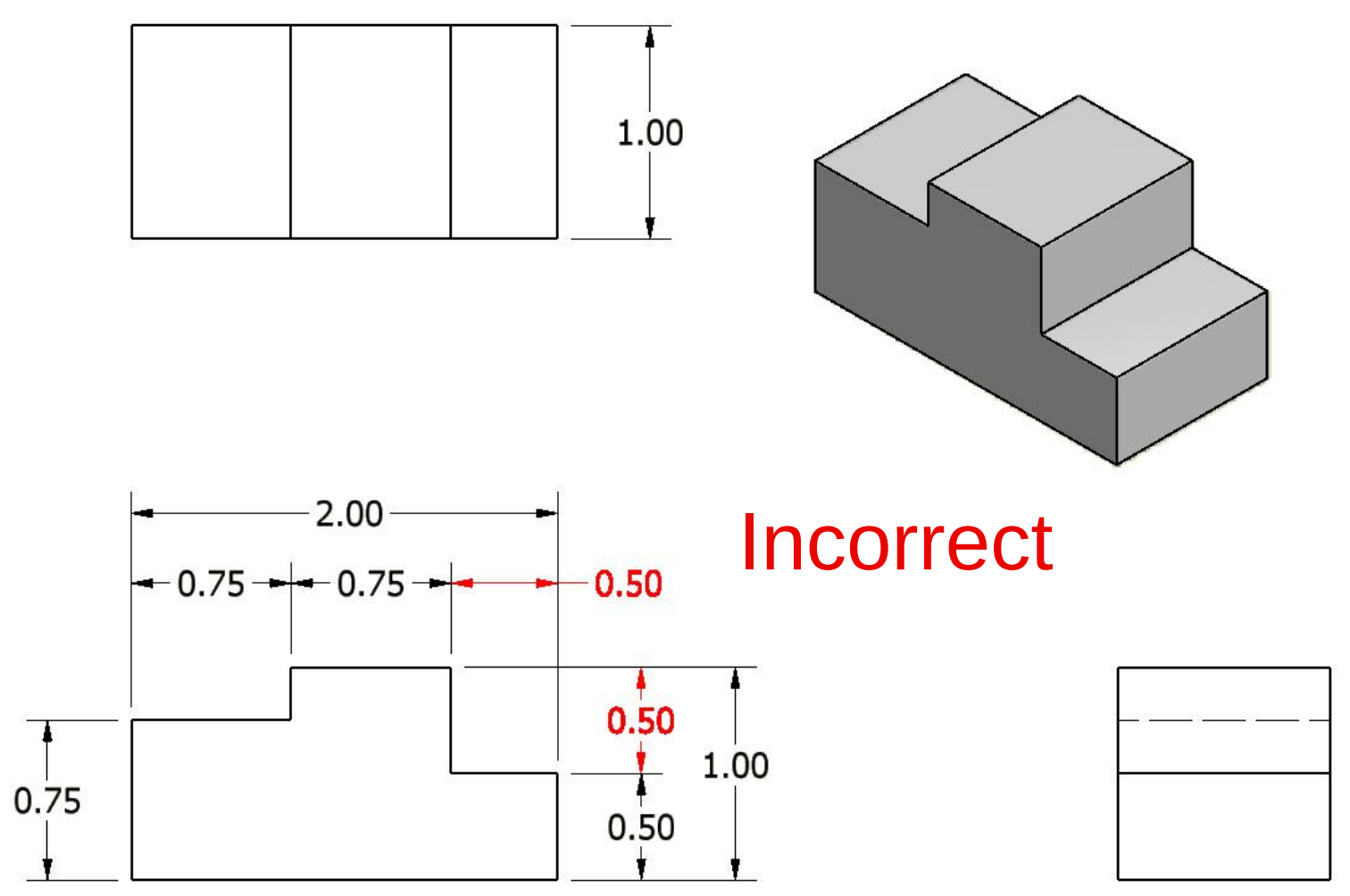


Correct

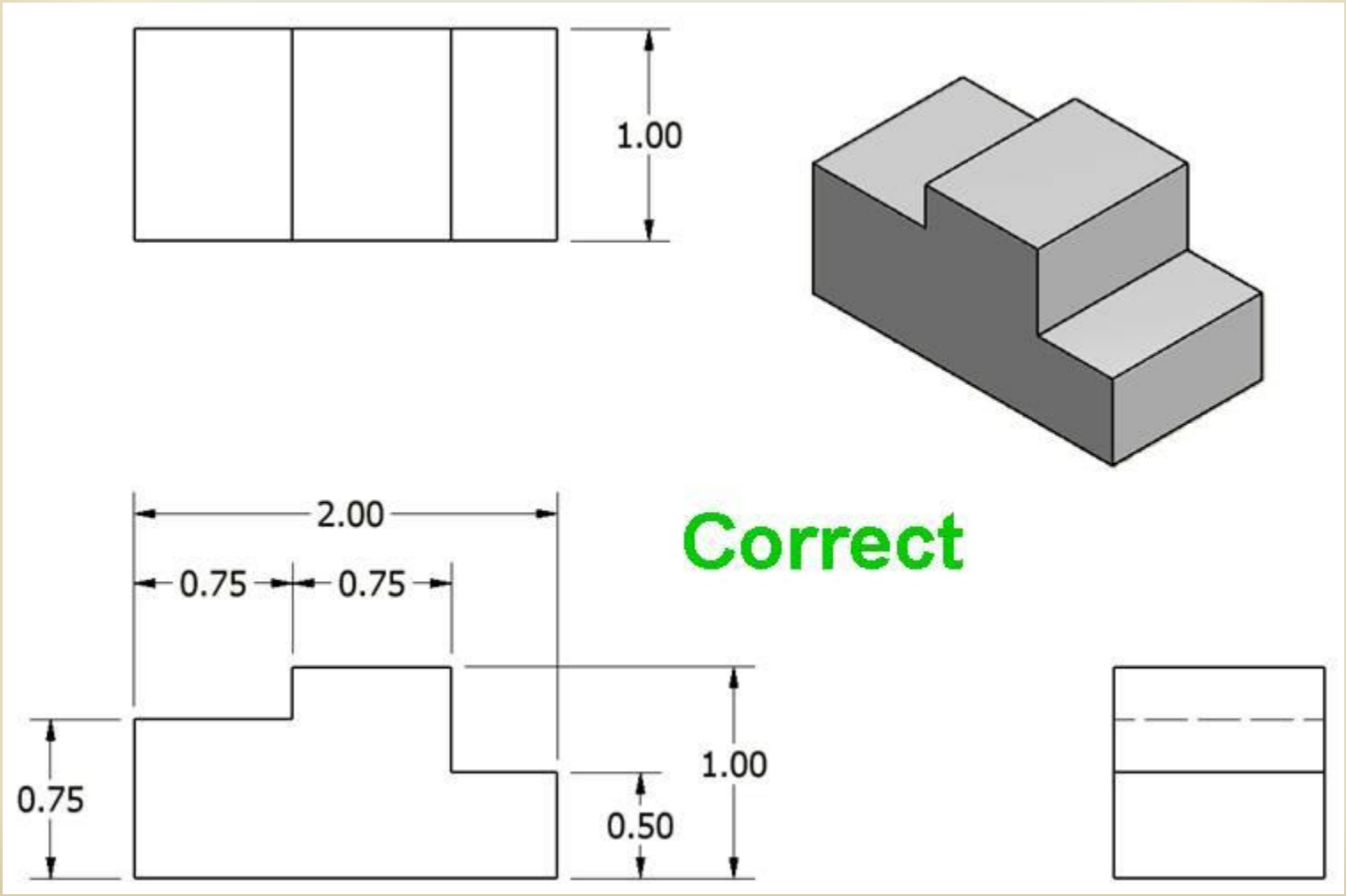




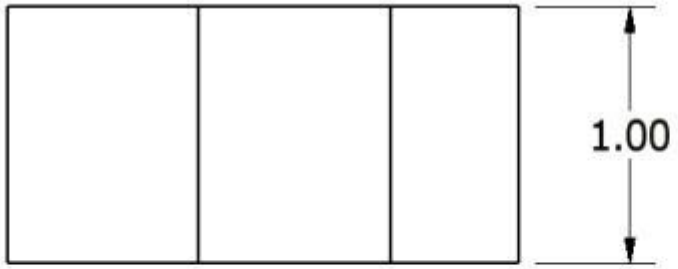
No unnecessary dimensions should be used

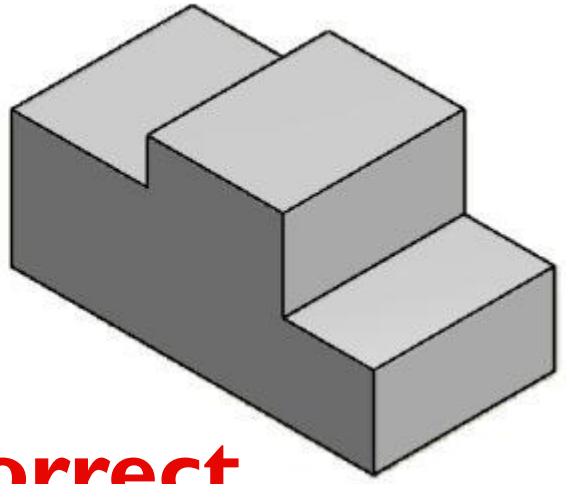


No unnecessary dimensions should be used

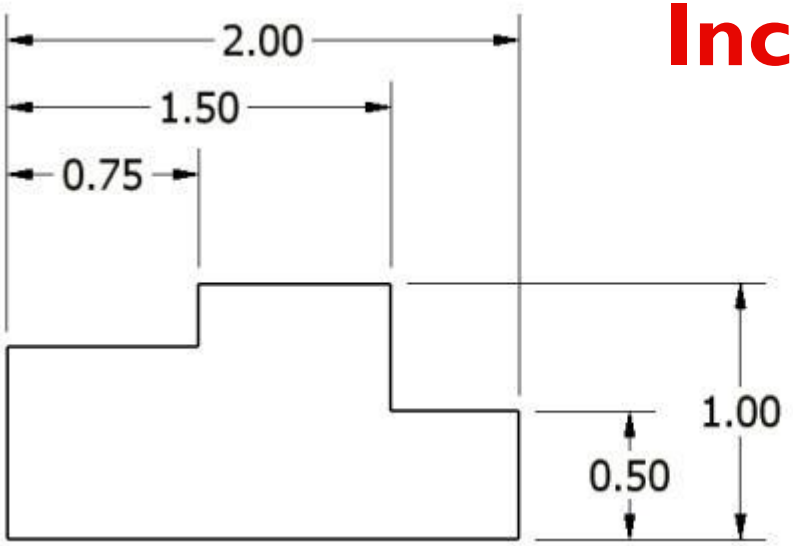


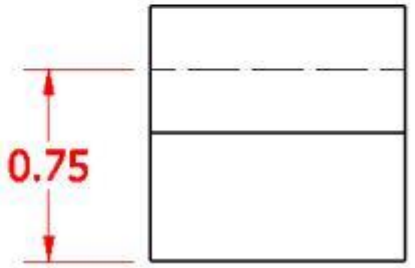
Avoid dimensioning to hidden lines and features.



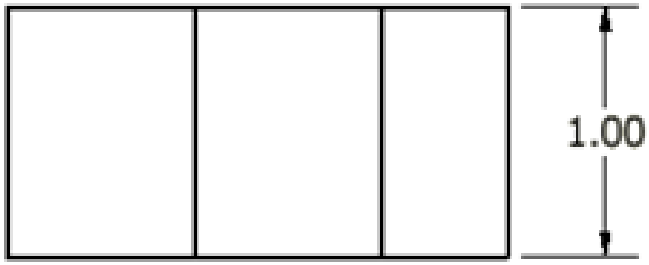


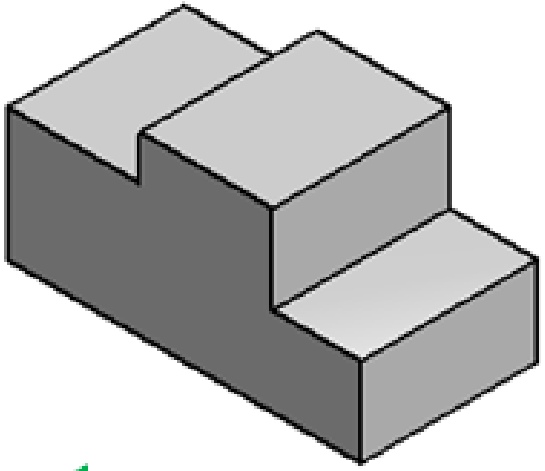
Incorrect

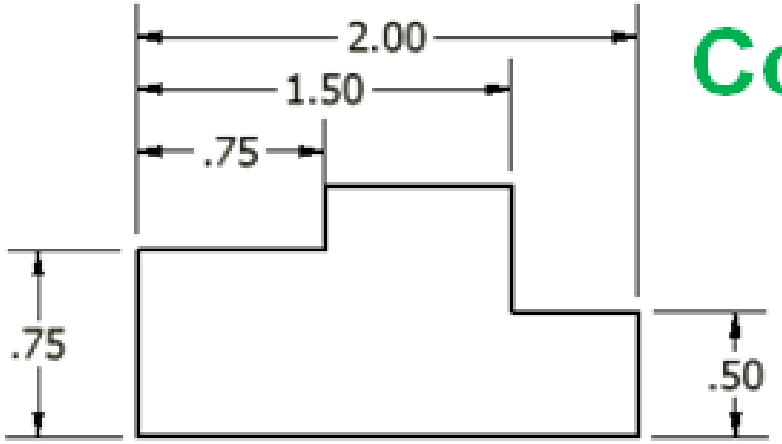




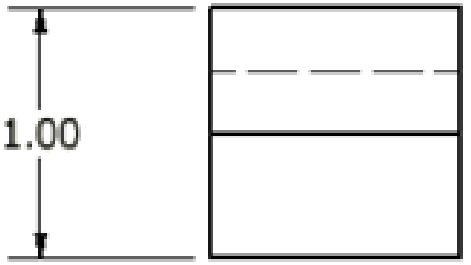
Avoid dimensioning to hidden lines and features.



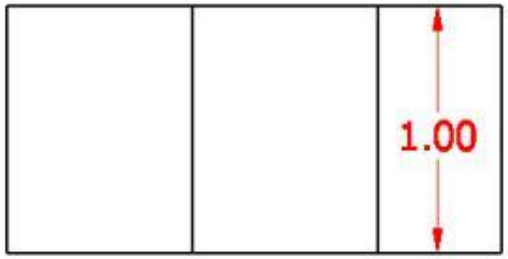


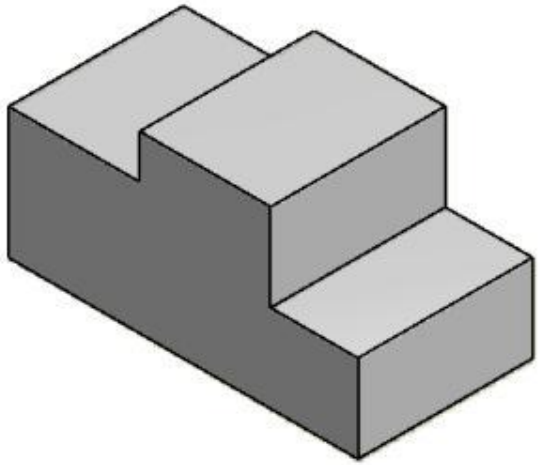


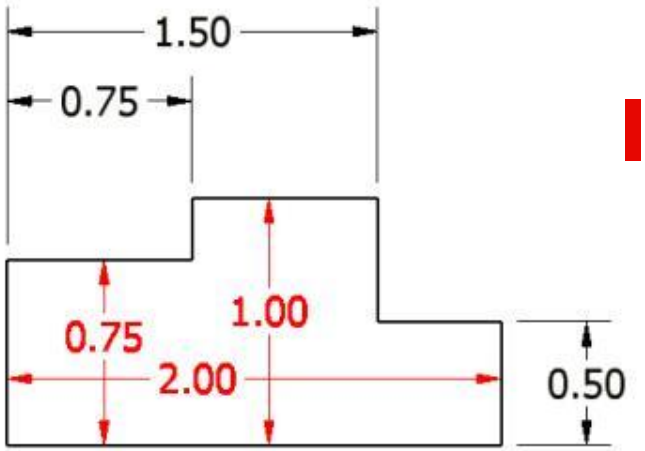
Correct



Don't dimension over or through an object. (not *inside* any view)







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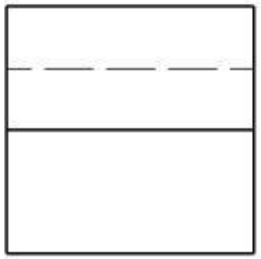
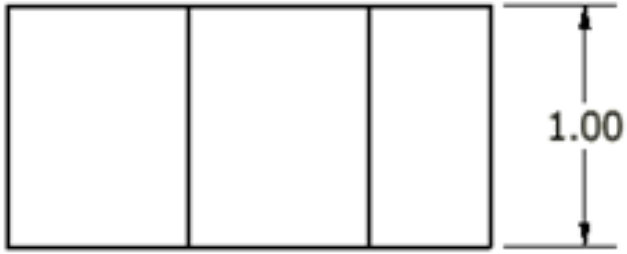
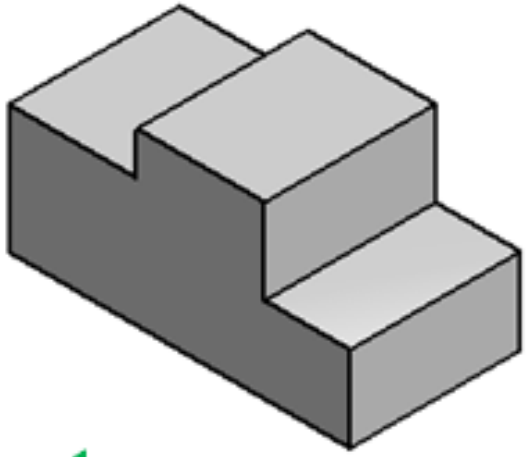
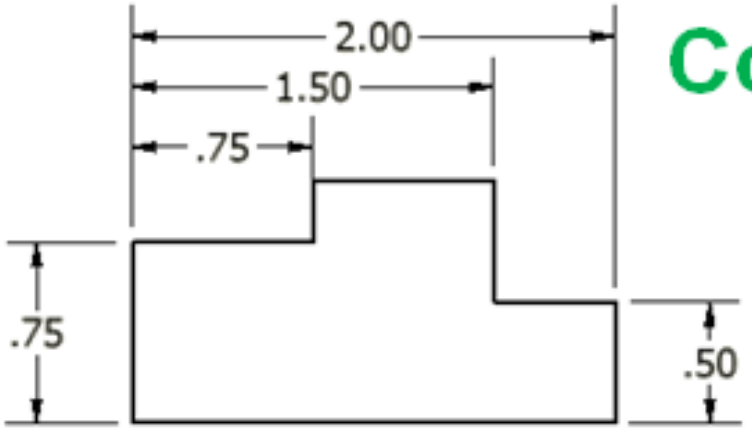


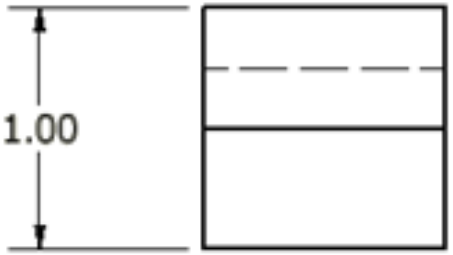
Don't dimension over or through an object. (not *inside* any view)



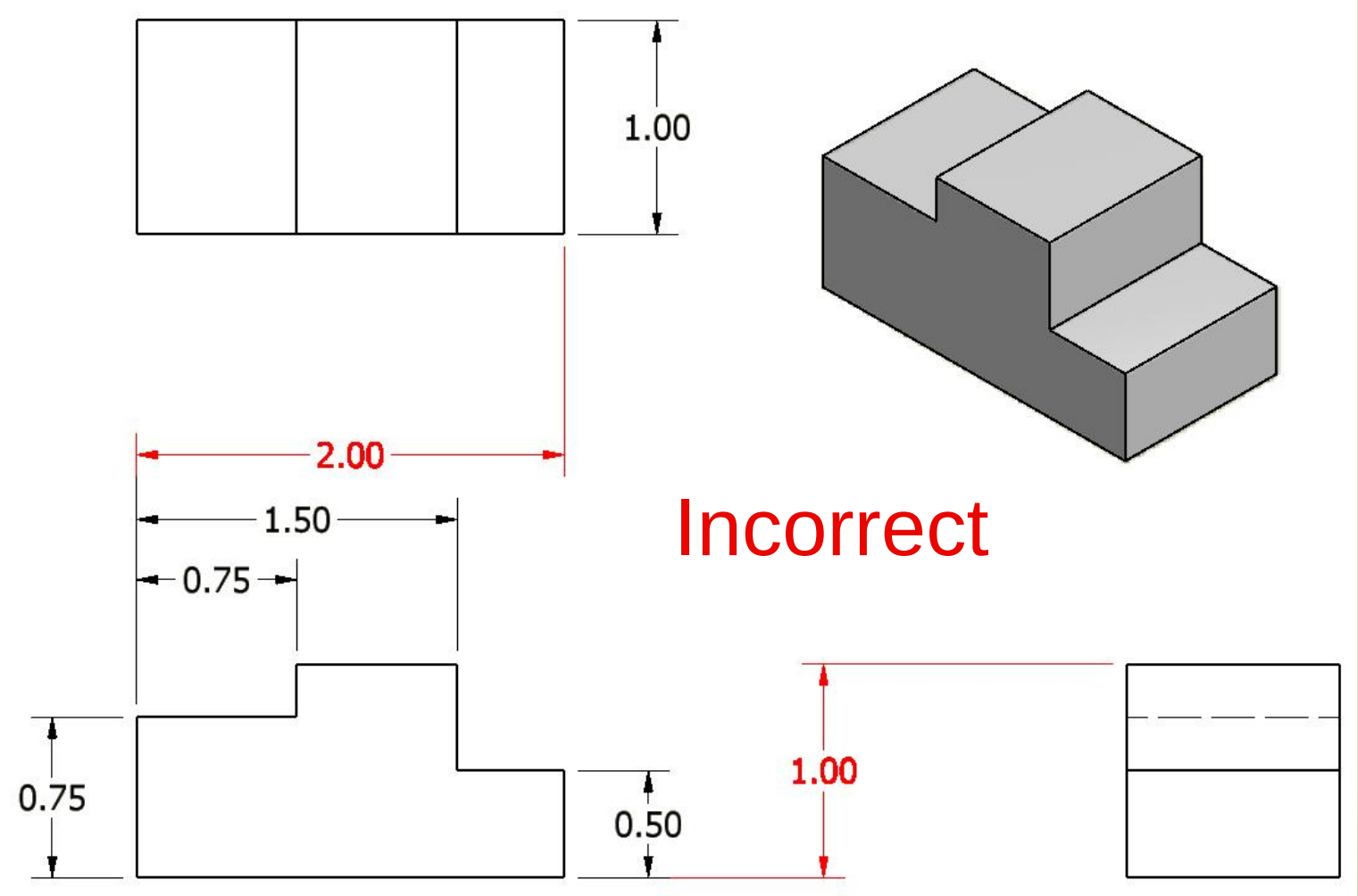




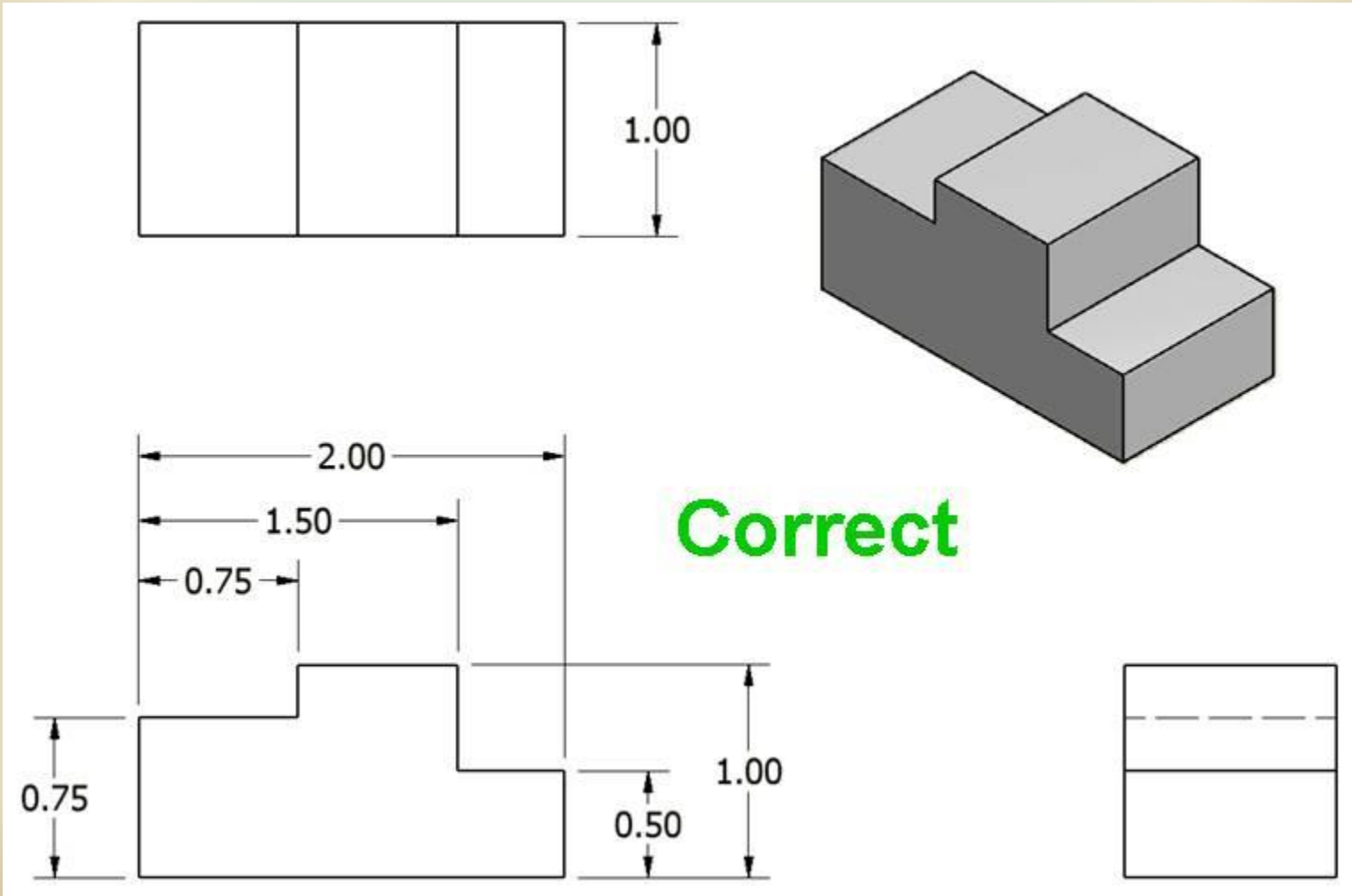
Correct



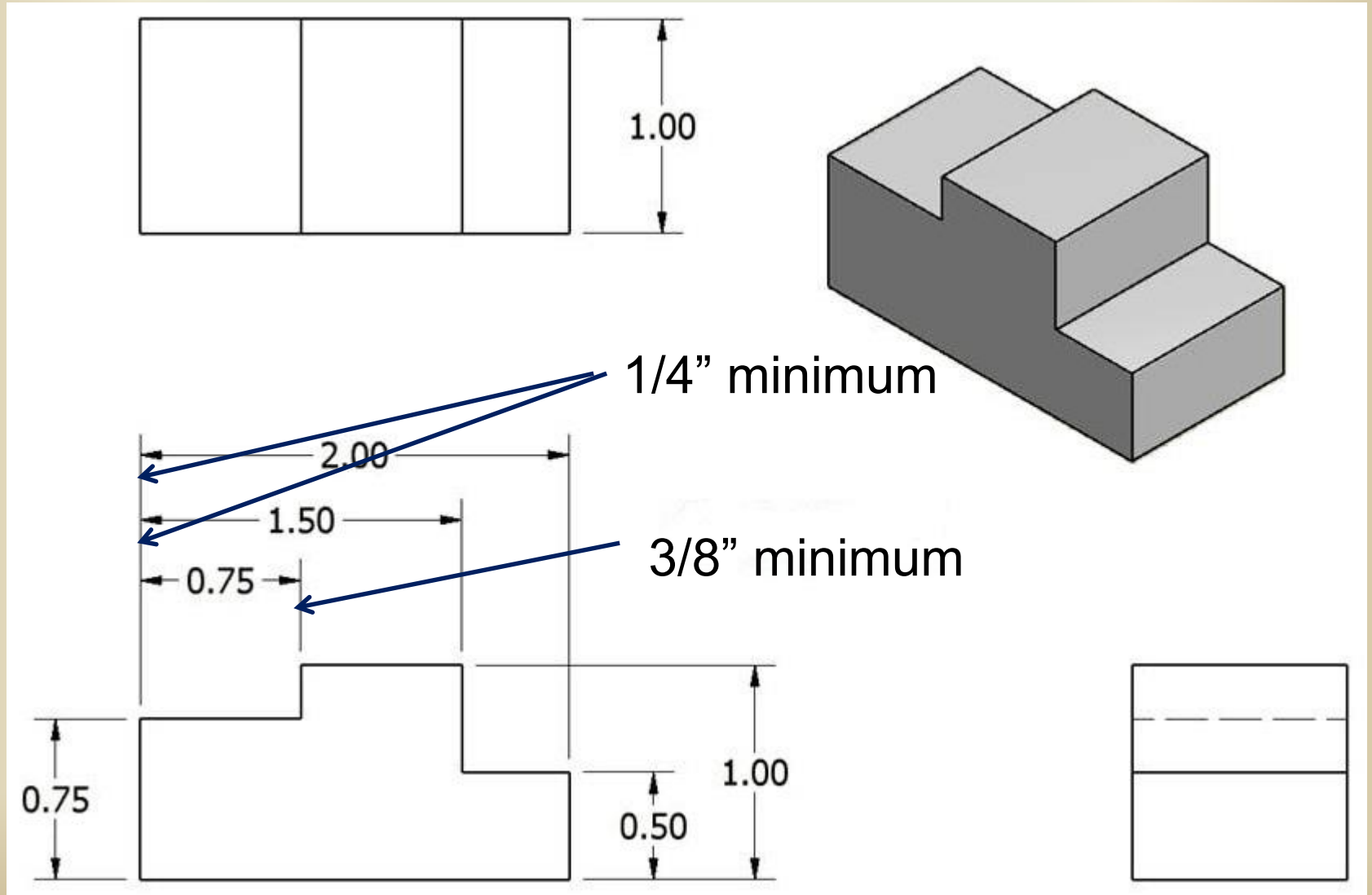
A dimension should be attached to only one view; for example, extension lines should not connect two views.



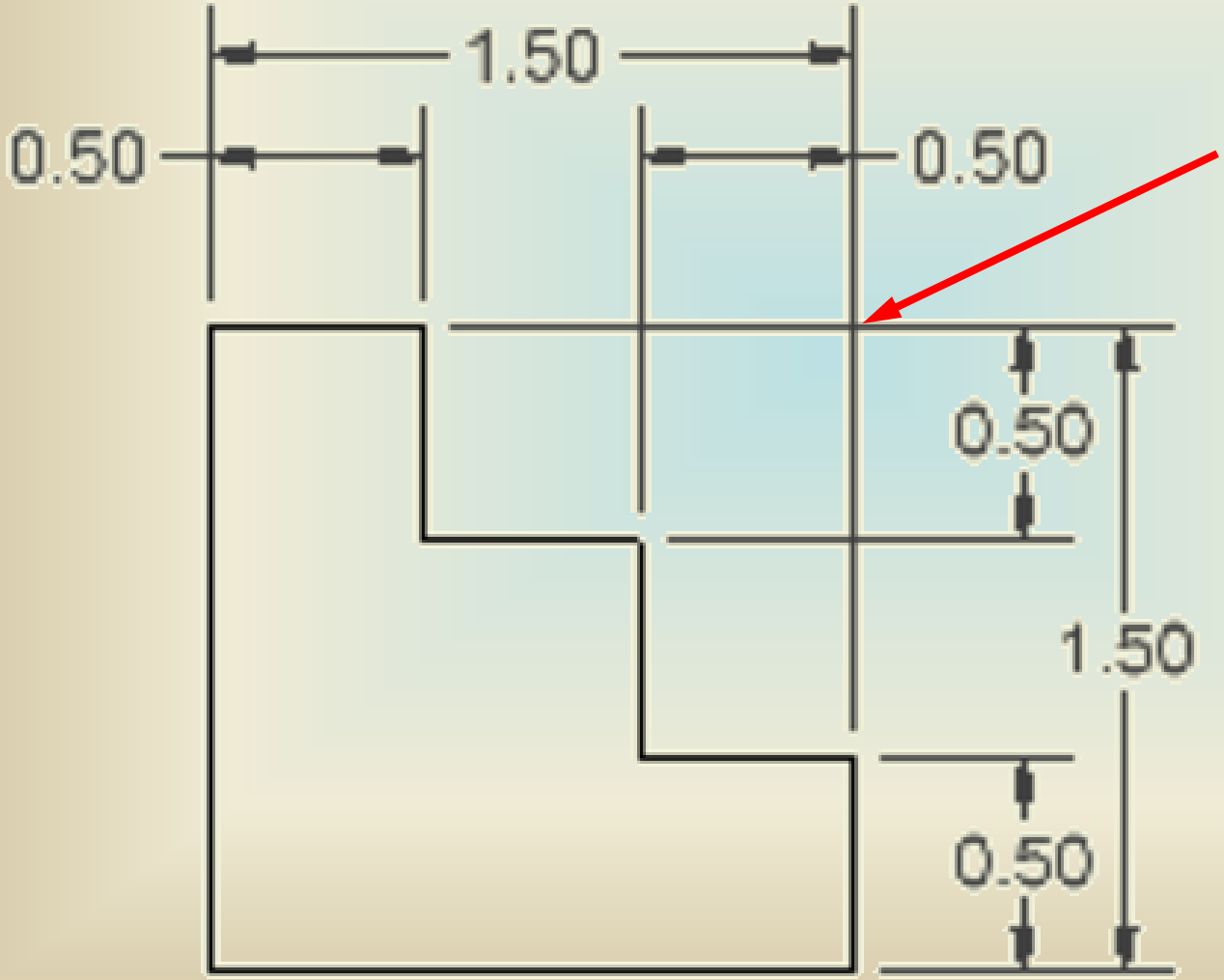
A dimension should be attached to only one view; for example, extension lines should not connect two views.



Successive Dimension Lines

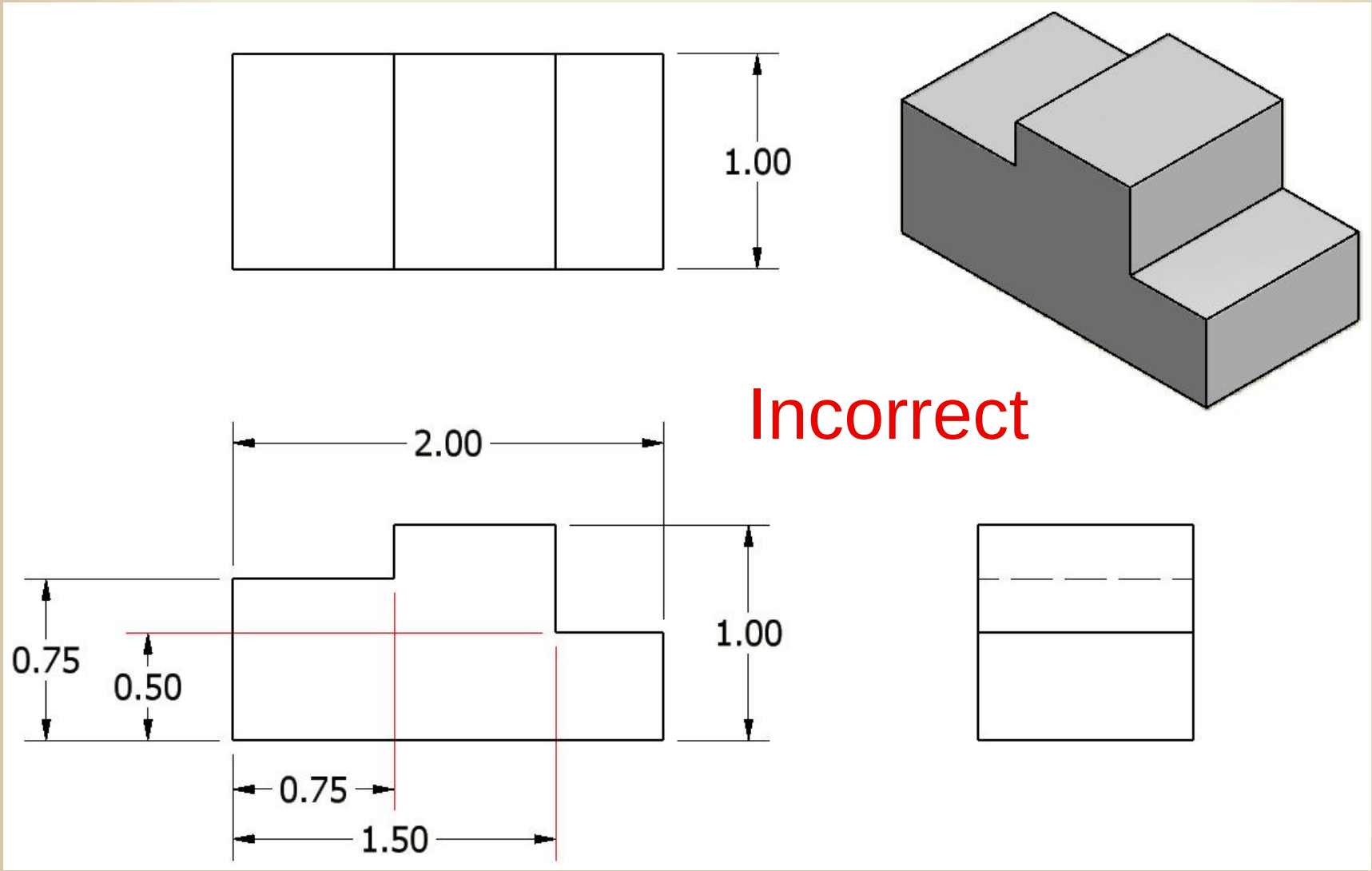


Whenever possible, Avoid crossing extension lines, but do not break them when they do cross.

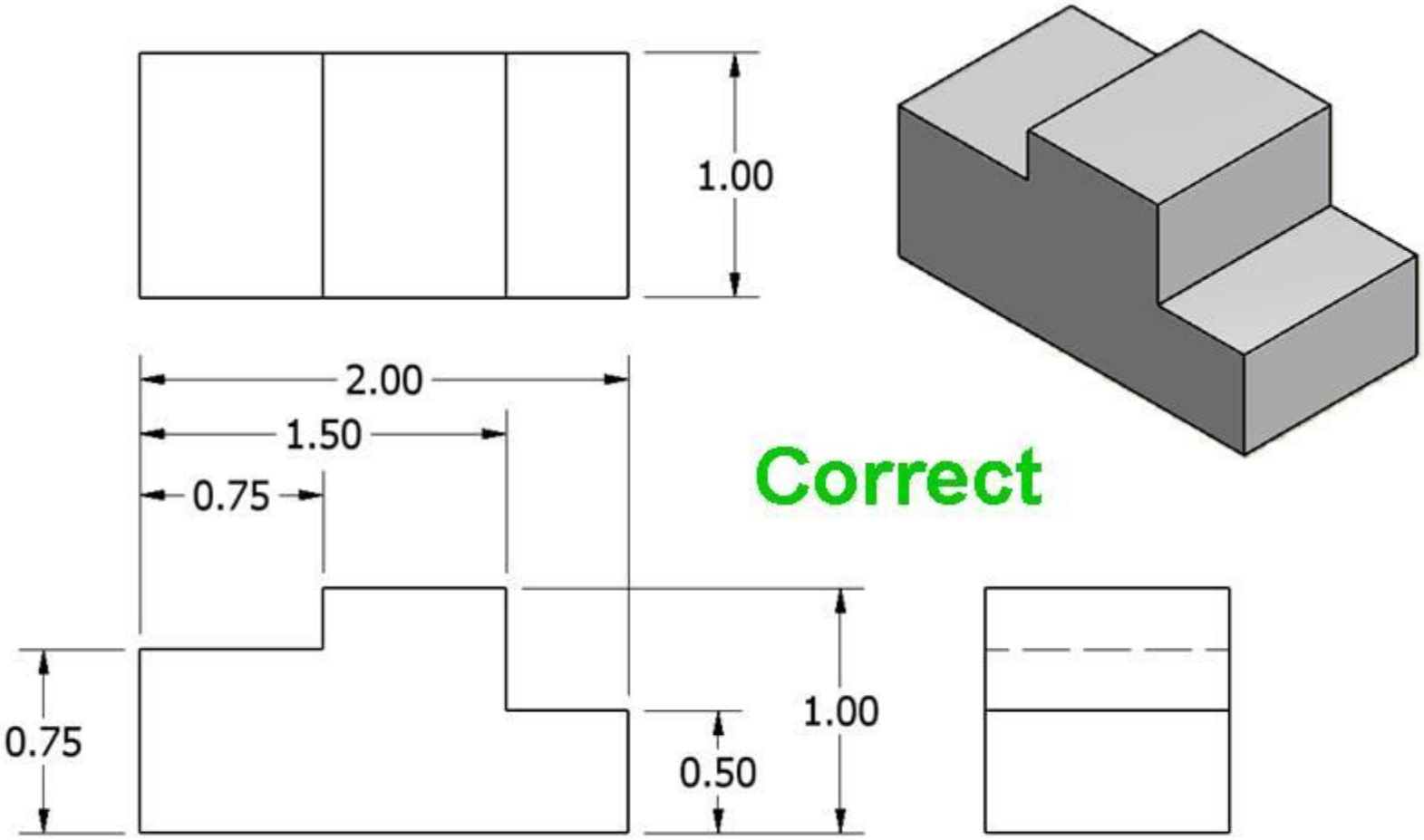


Multiple extension line crossings may be confused for the outside corner of the part.

Whenever possible, avoid sending extension lines through object views.

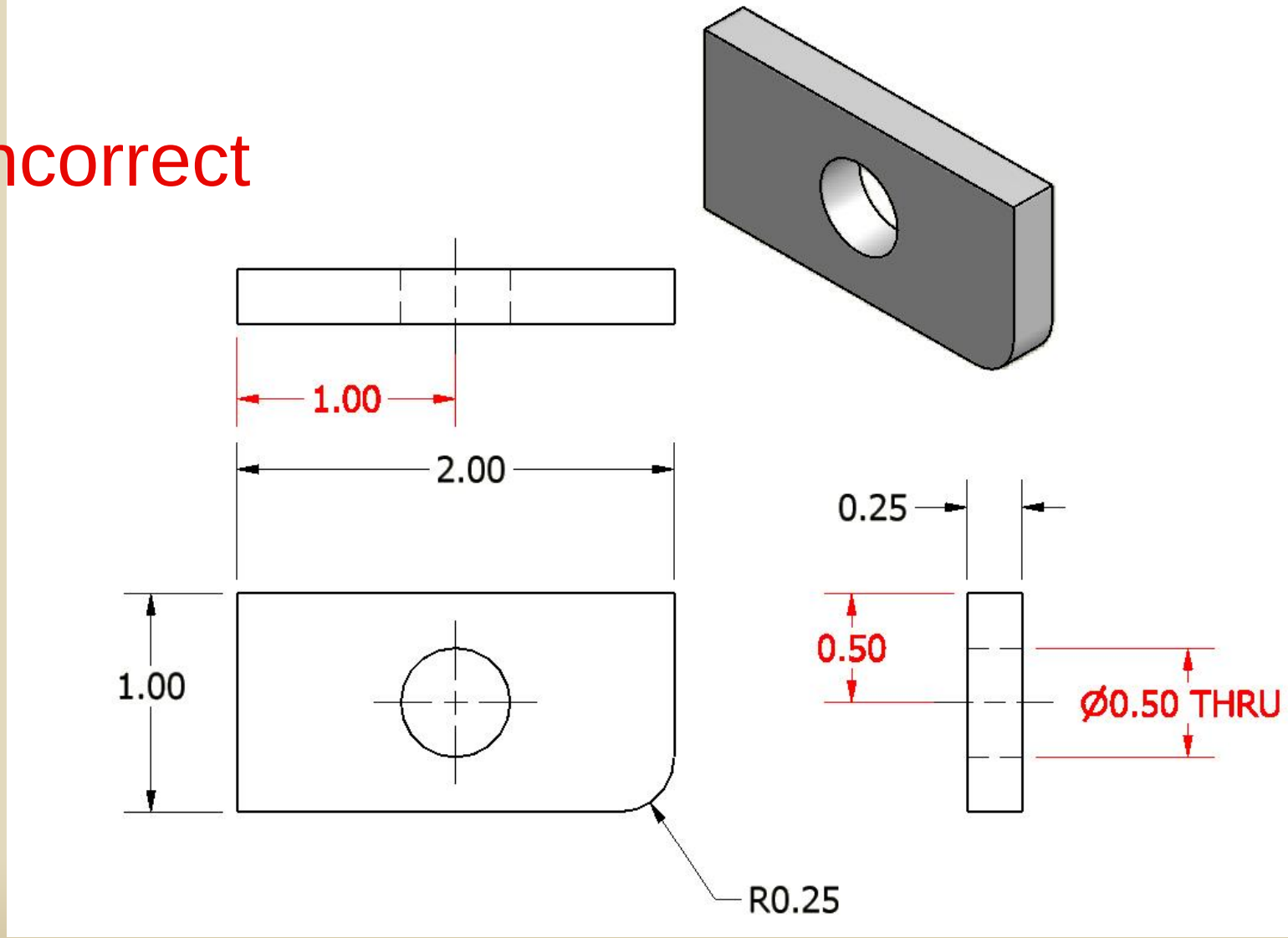


Whenever possible, avoid sending extension lines through object views.

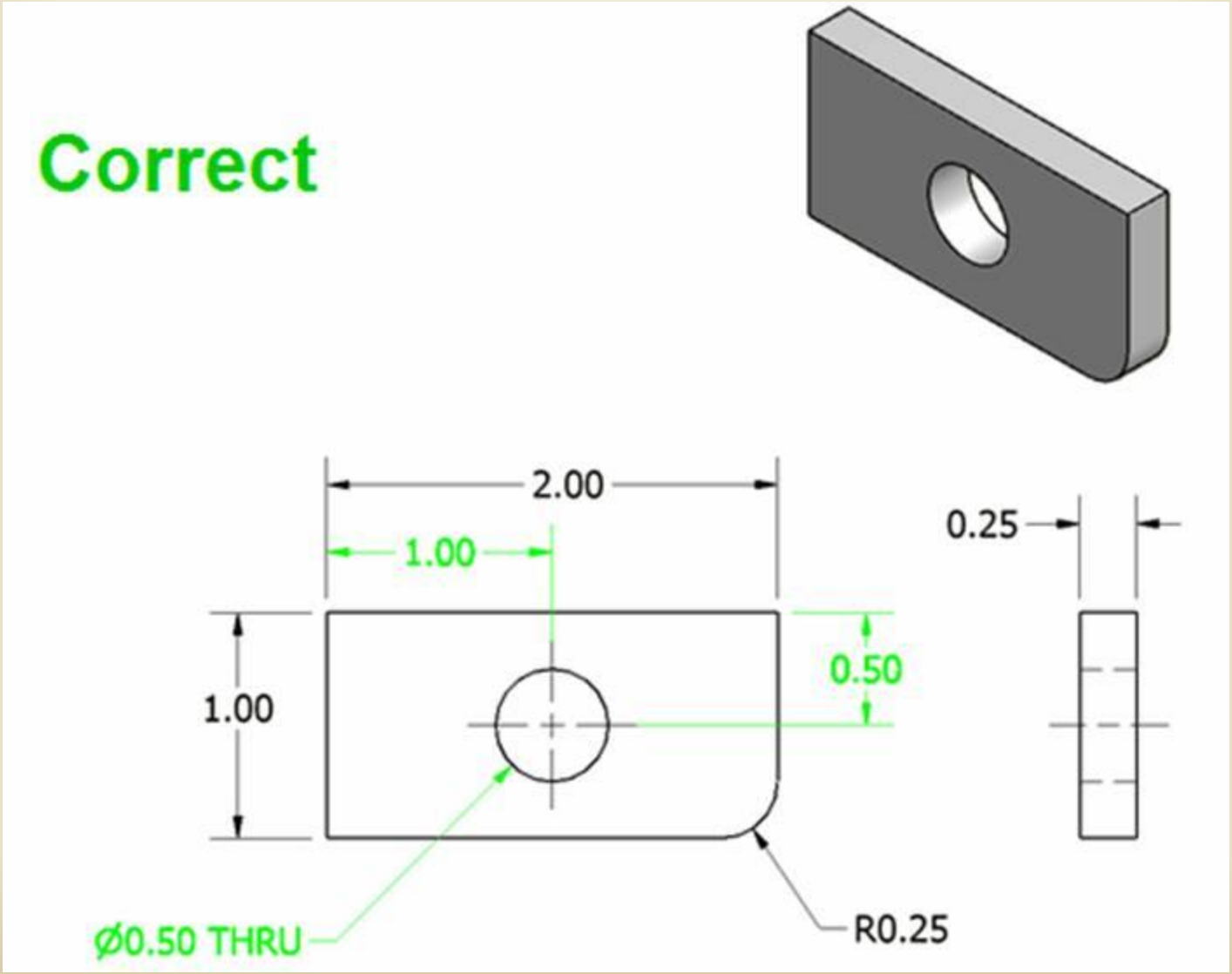


Holes should be located and sized in the view that shows the feature as a circle.

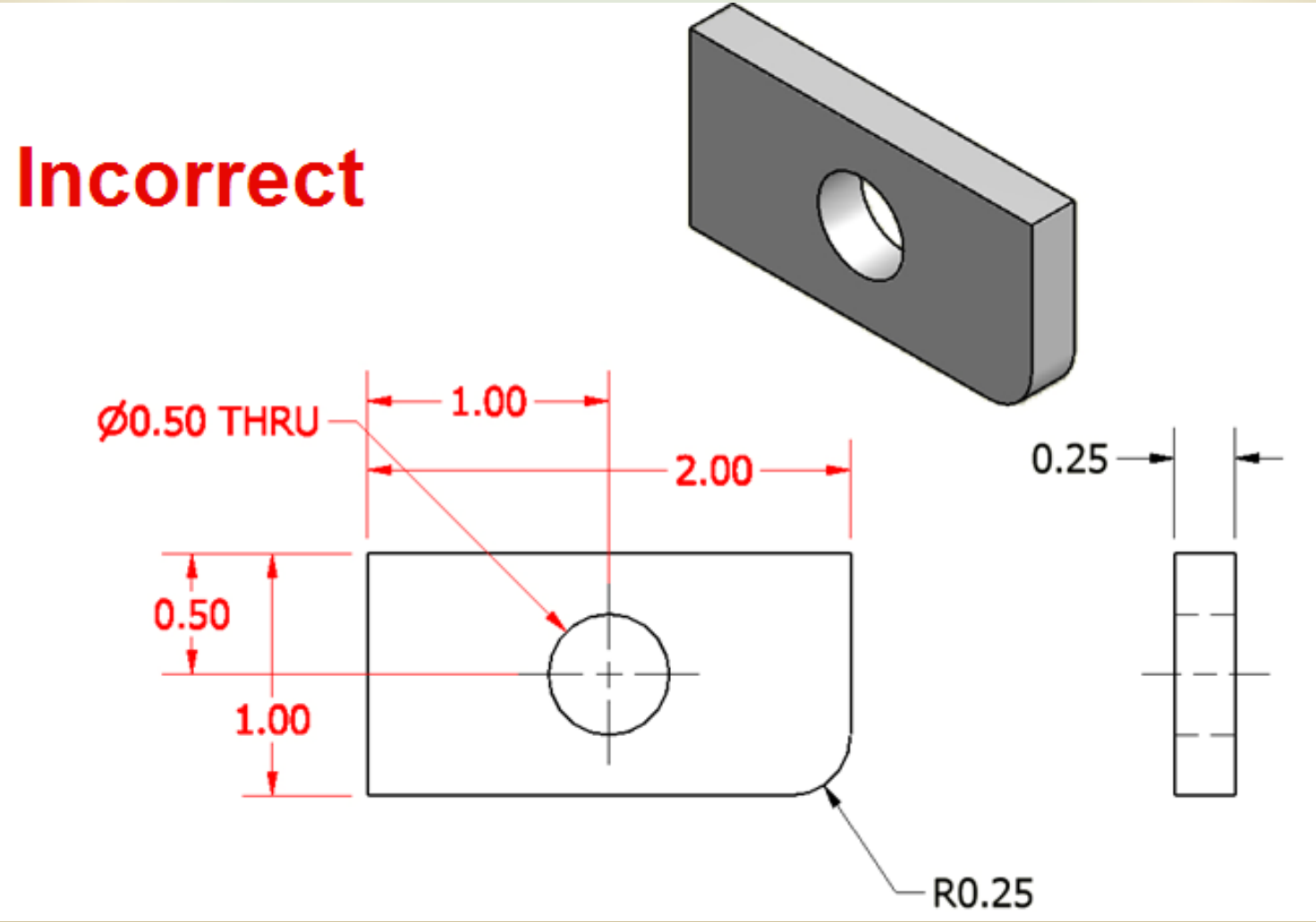
Incorrect



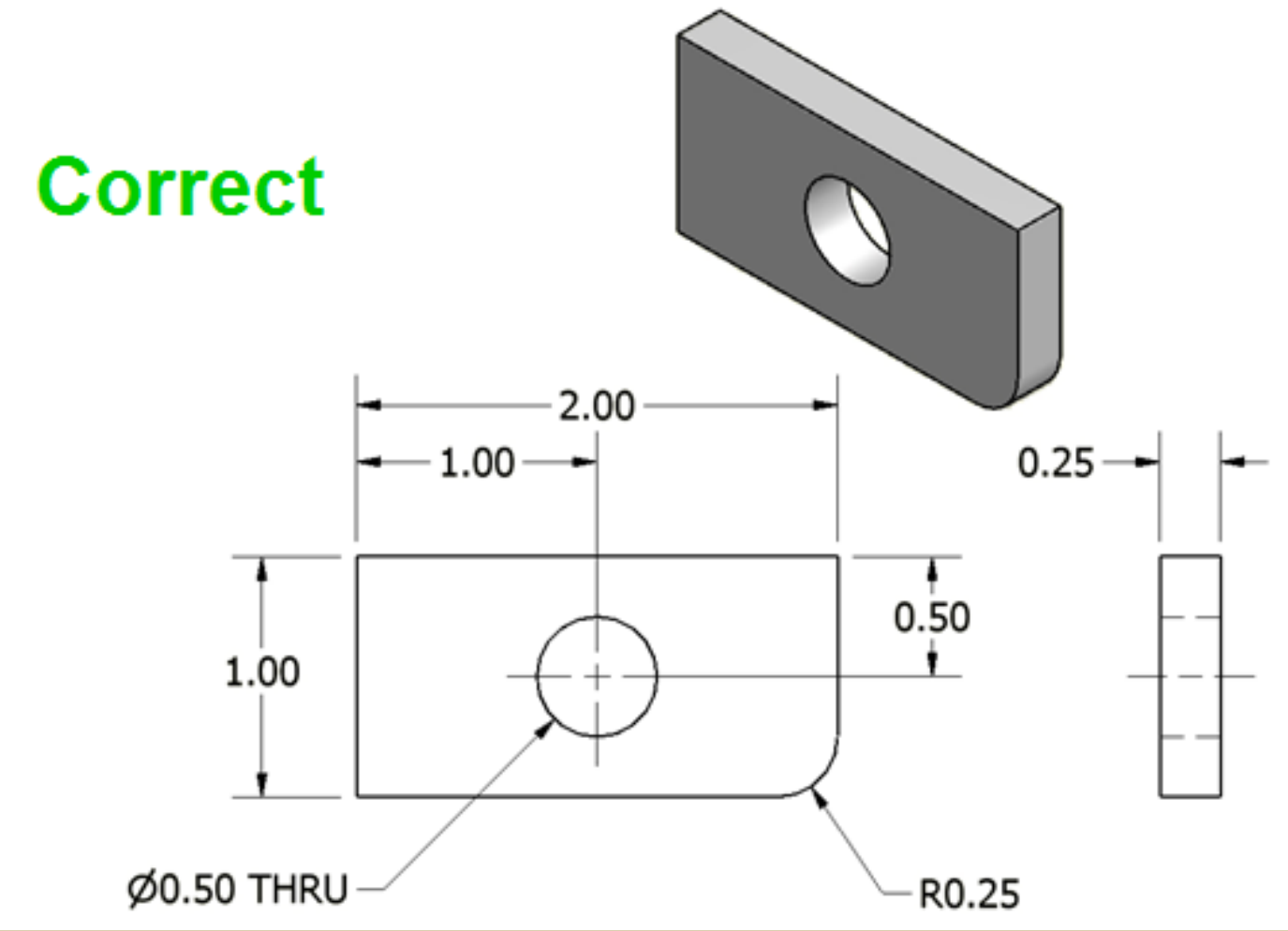
Holes should be located and sized in the view that shows the feature as a circle.



Do not cross a dimension line with an extension line, and avoid crossing dimensions with leader lines.

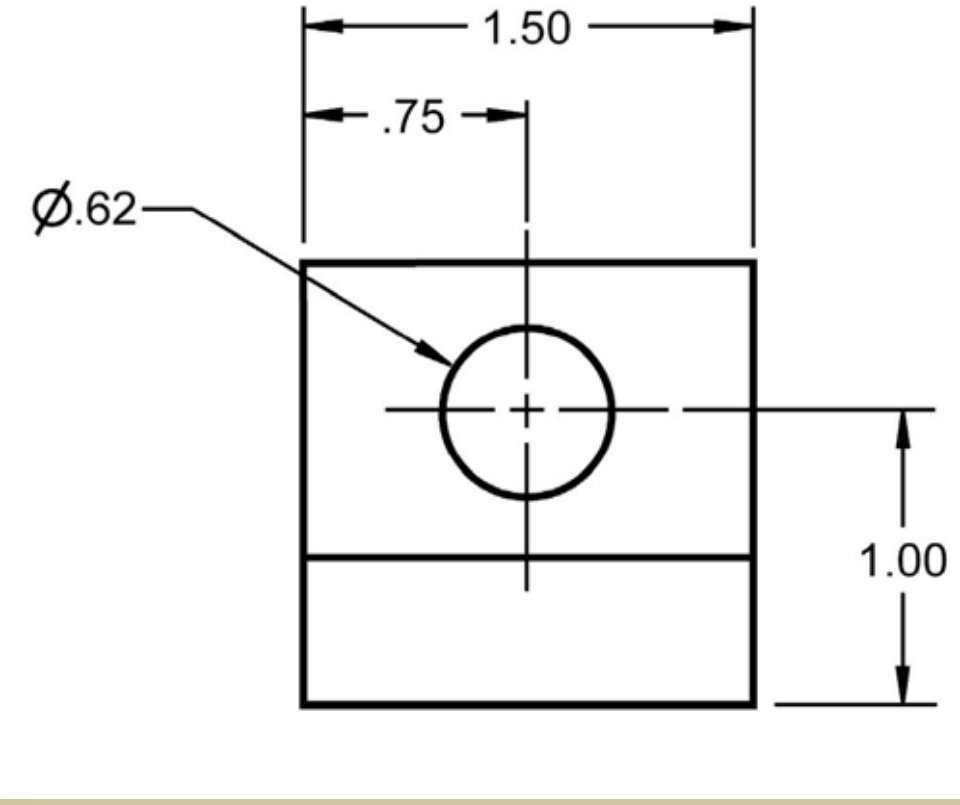


Do not cross a dimension line with an extension line, and avoid crossing dimensions with leader lines.

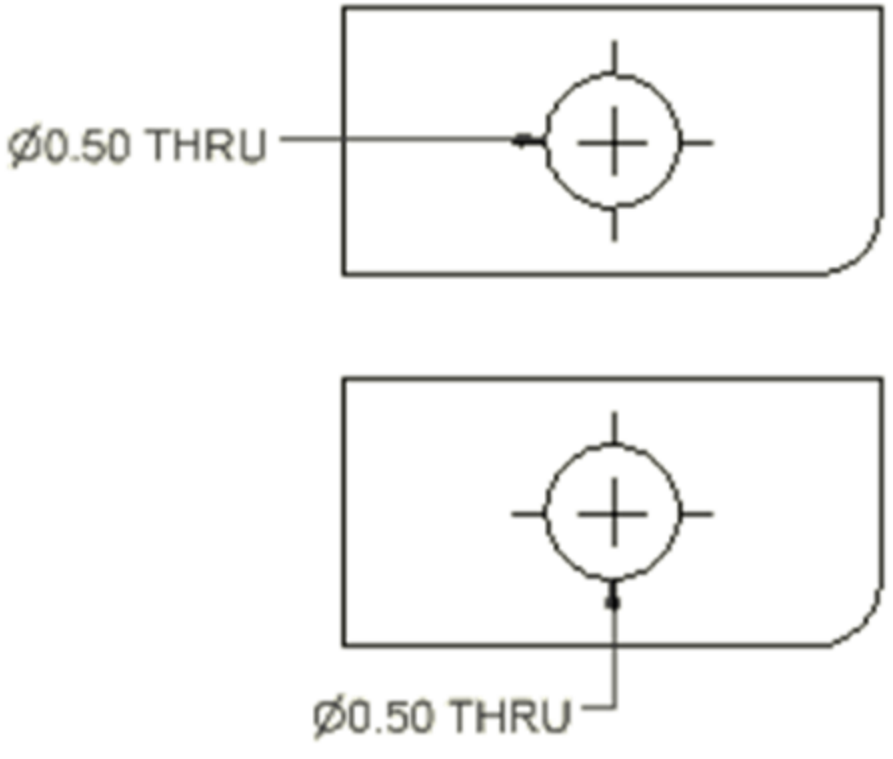


Leader lines point toward the center of the feature, and should not occur horizontally or vertically.

This

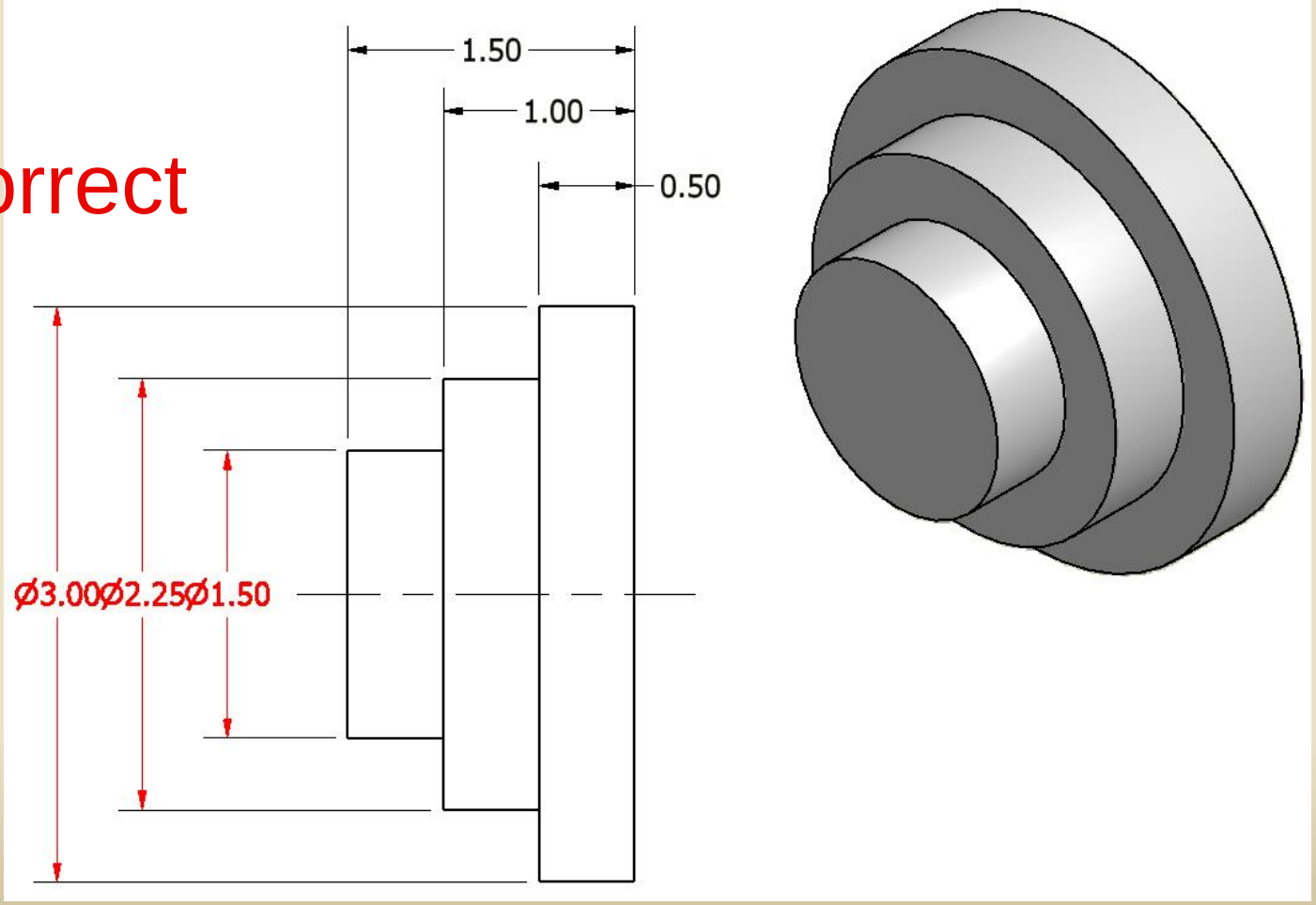


Not This

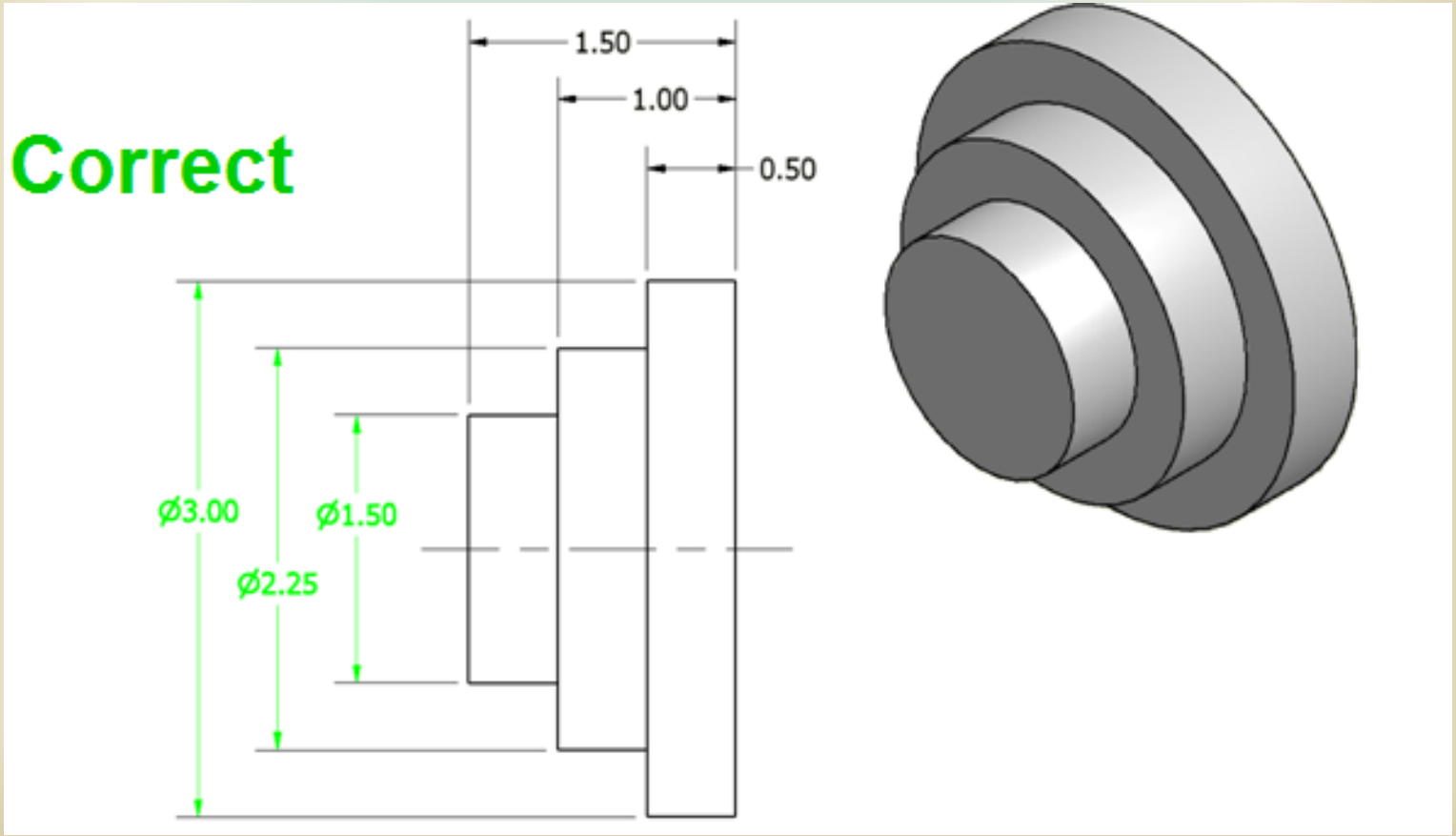


Dimension numbers should be centered between arrowheads, except when using stacked dimensions, and then the numbers should be staggered.

Incorrect

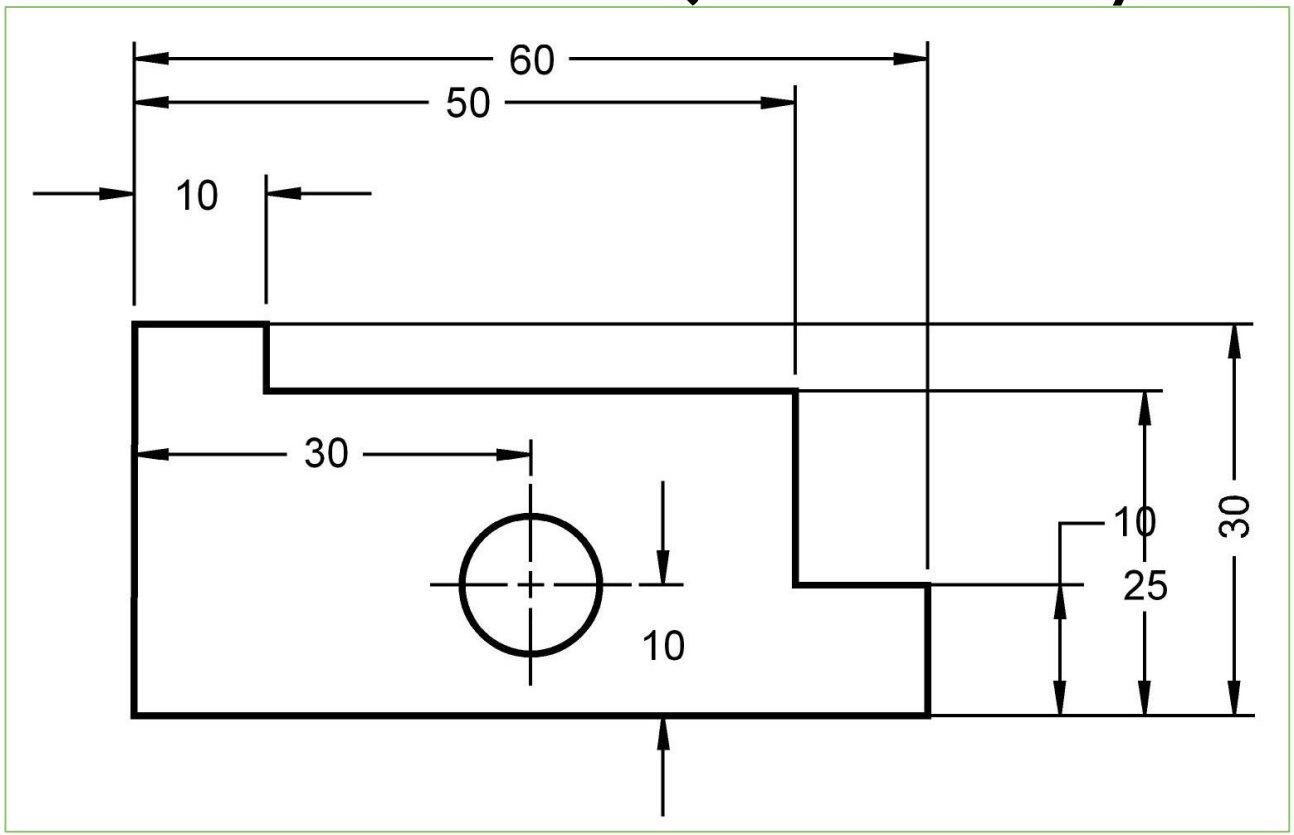


Dimension numbers should be centered between arrowheads, except when using stacked dimensions, and then the numbers should be staggered.

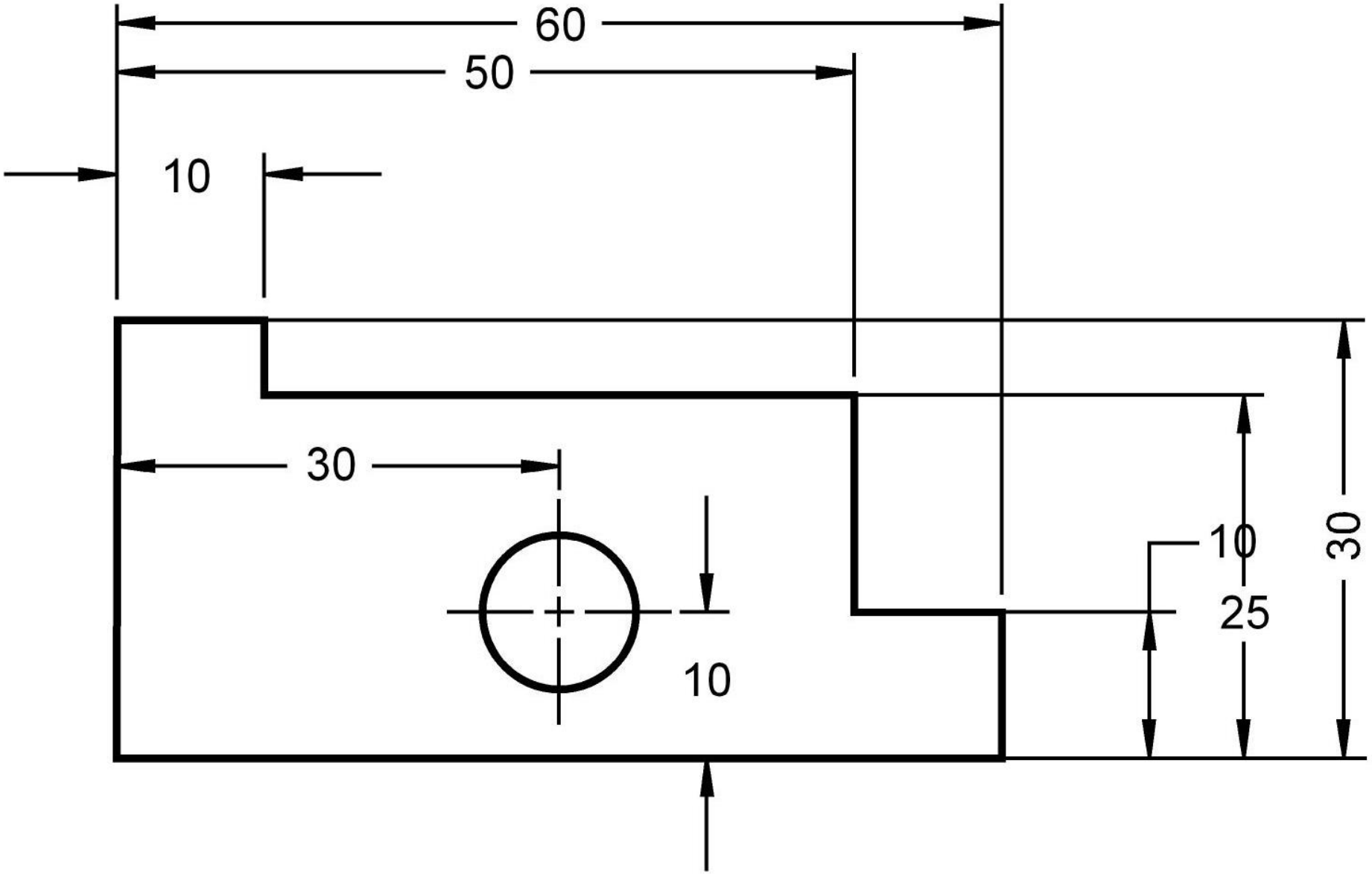


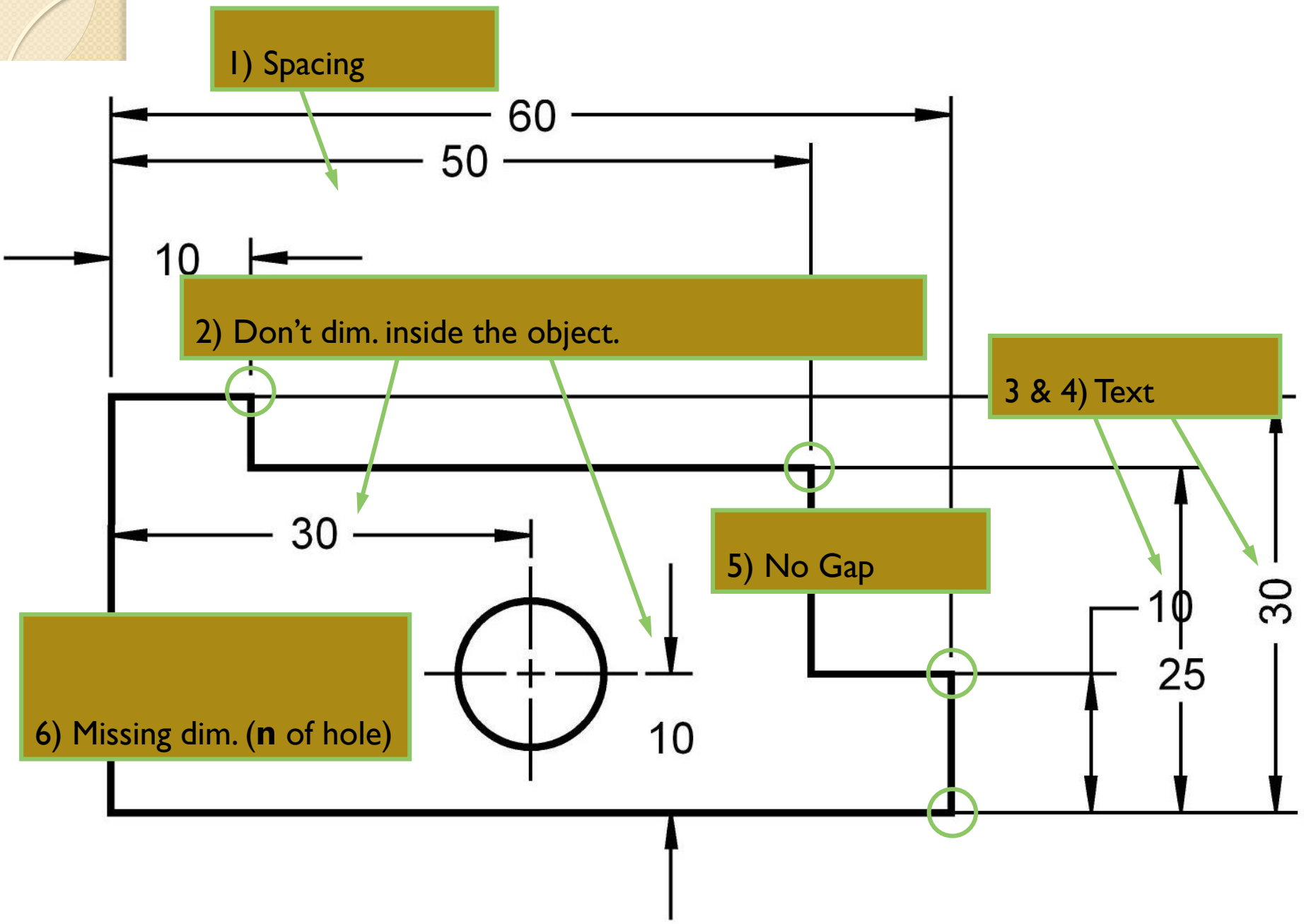
Exercise 01

- List the dimensioning mistakes and then dimension the object correctly.

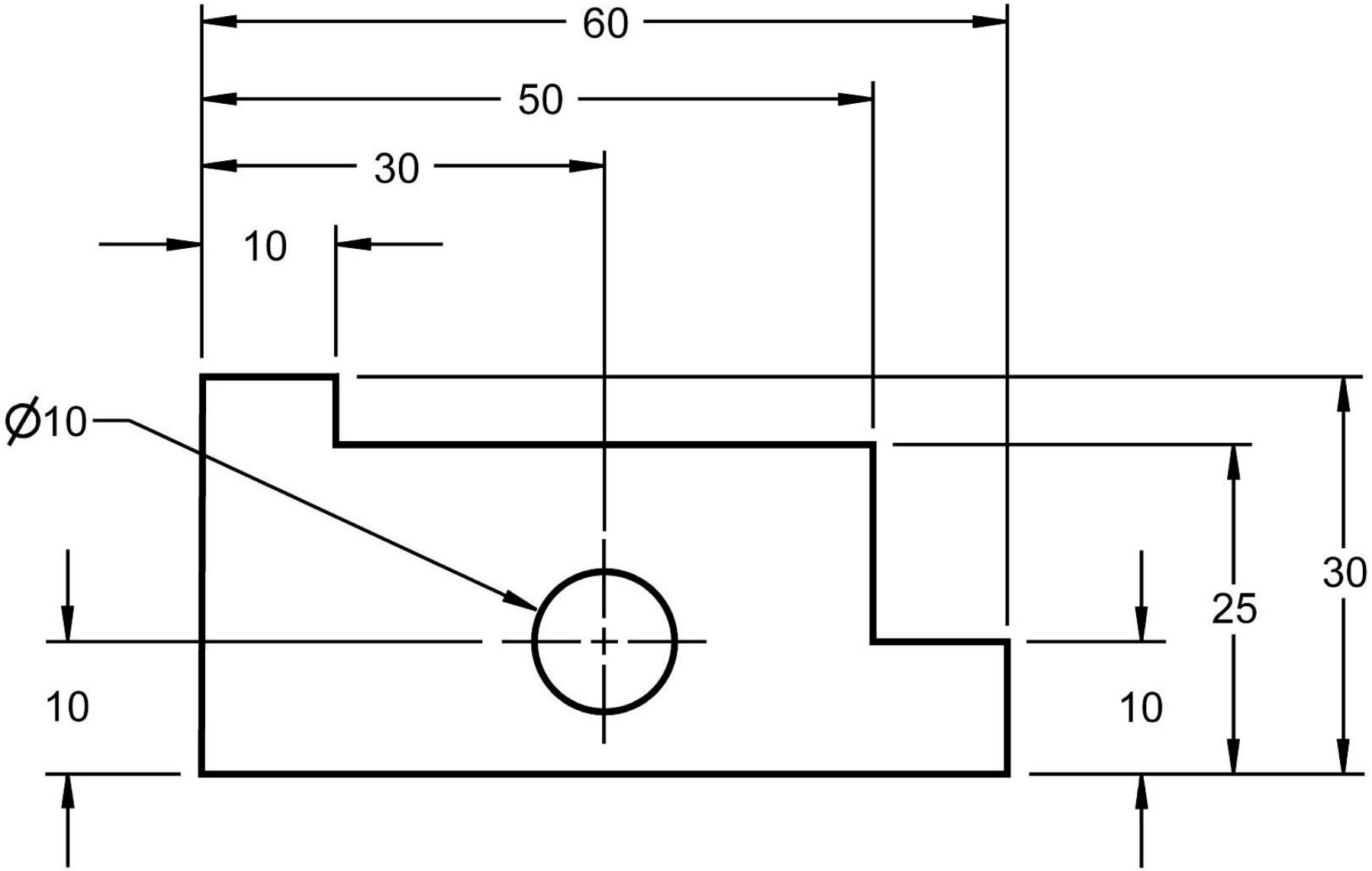


What are the 6 dimensioning mistakes?



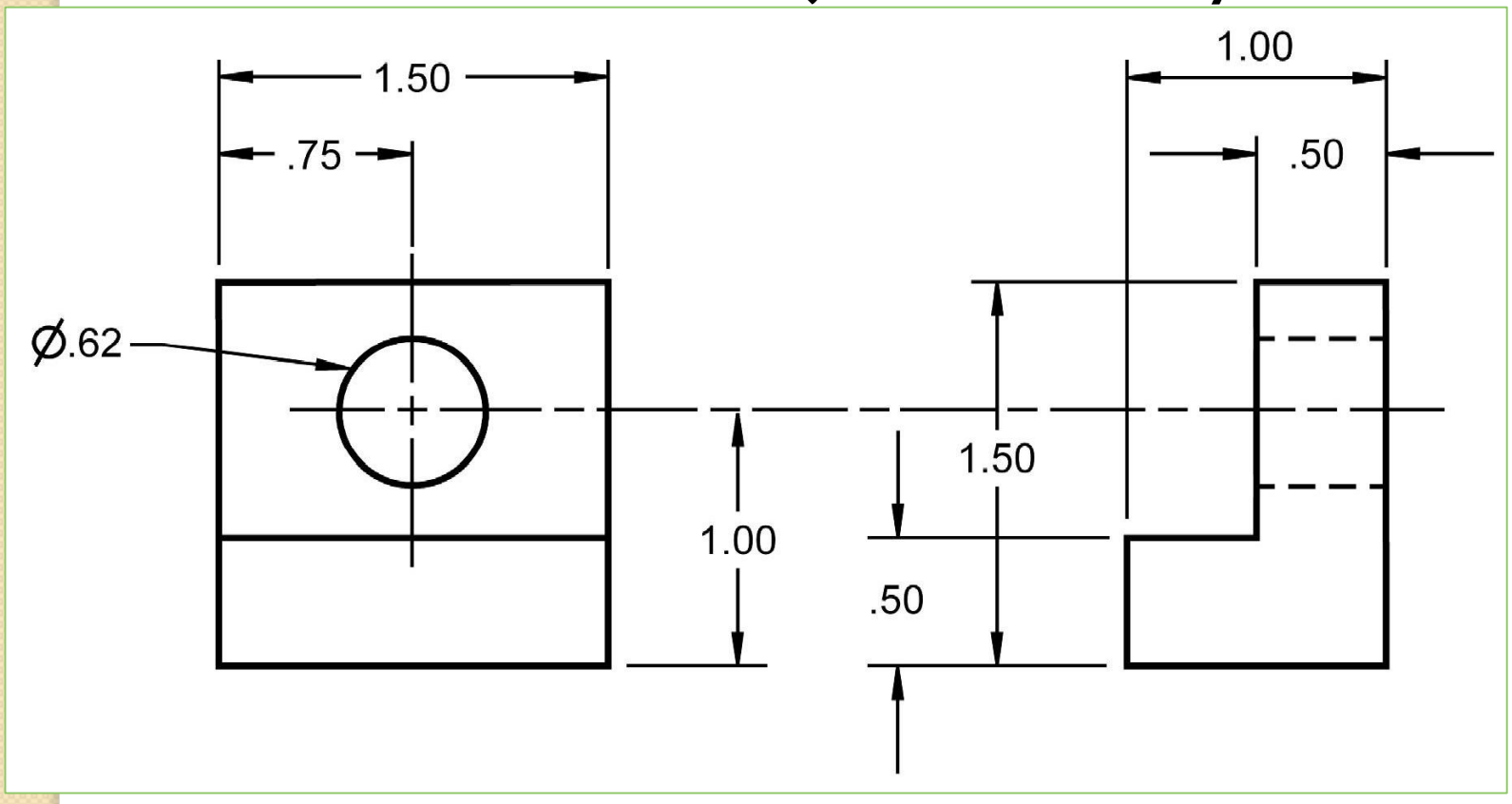

1) Spacing
60
50
10
2) Don't dim. inside the object.
3 & 4) Text
30
5) No Gap
10
30
10
25
6) Missing dim. (n of hole)
10

Correctly Dimensioned

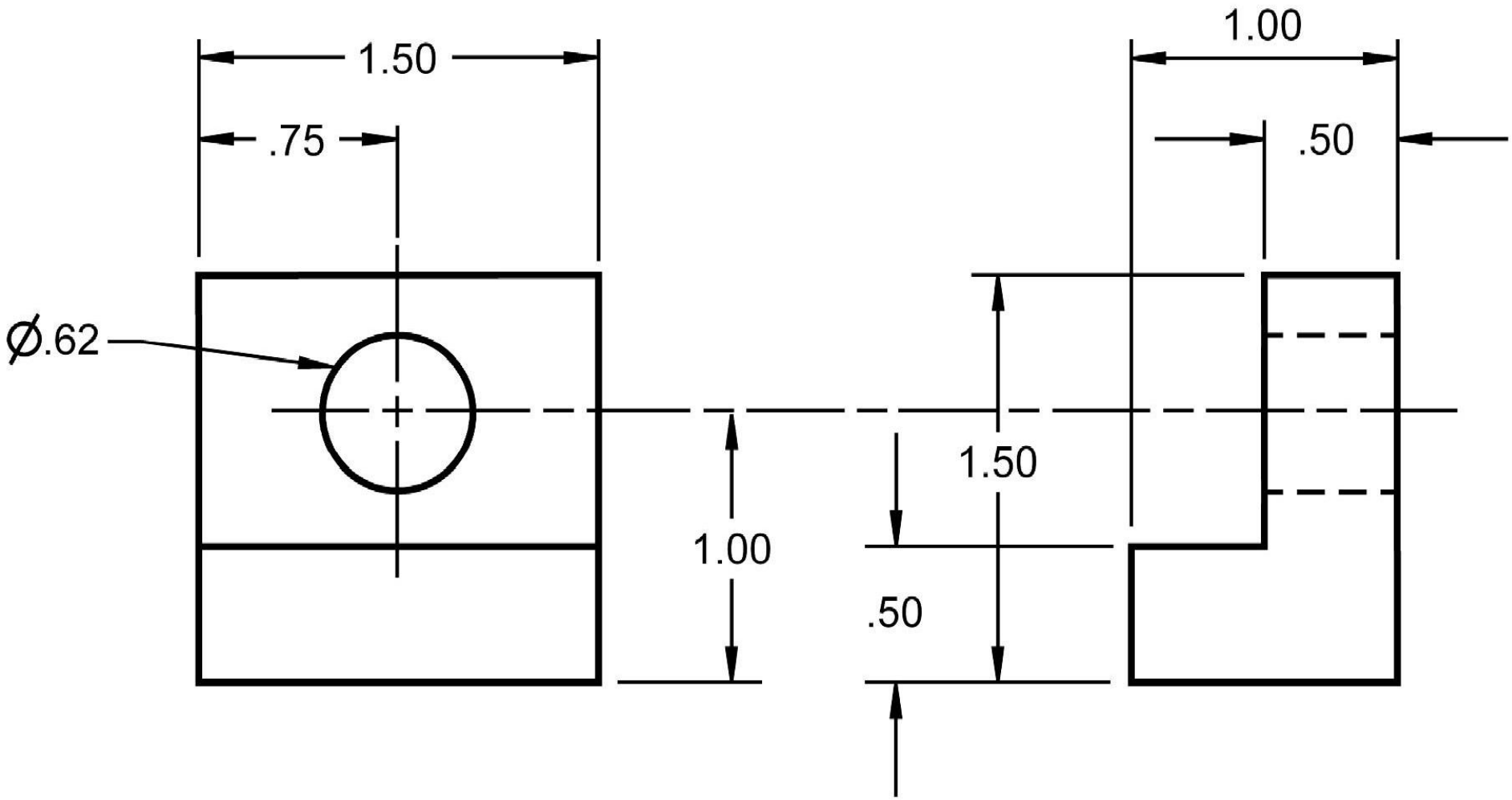


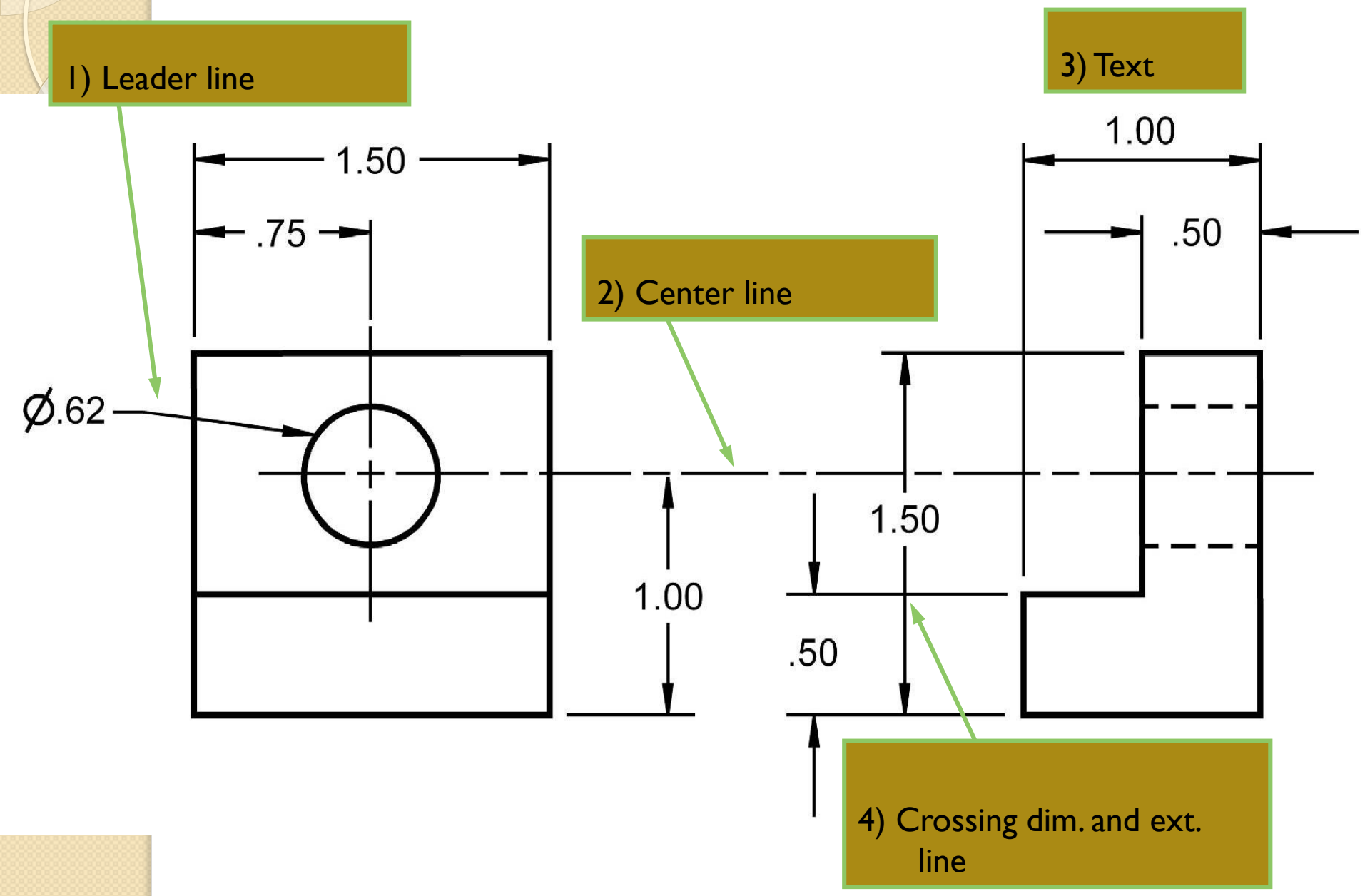
Exercise 02

- List the dimensioning mistakes and then dimension the object correctly.

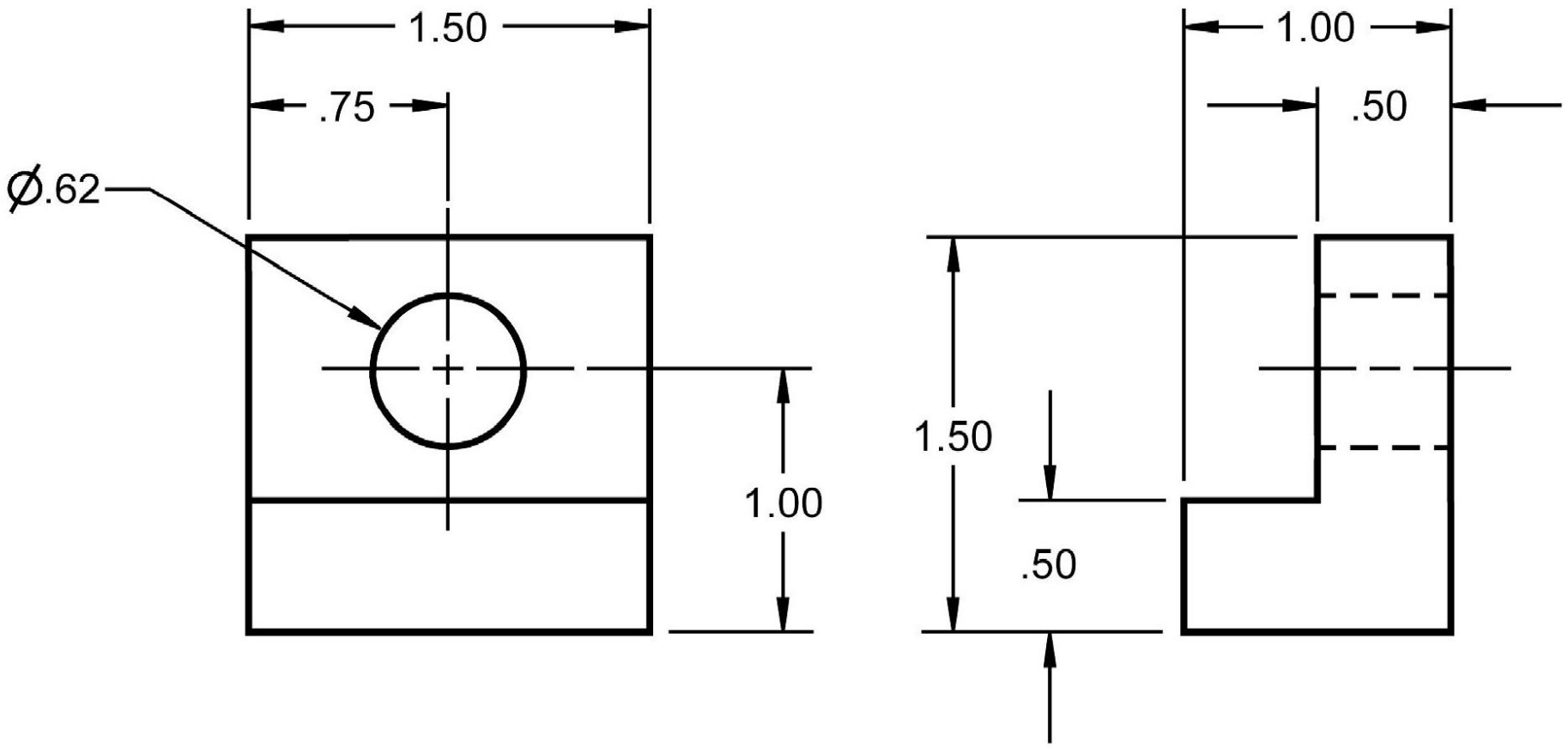


What are the 4 dimensioning mistakes?



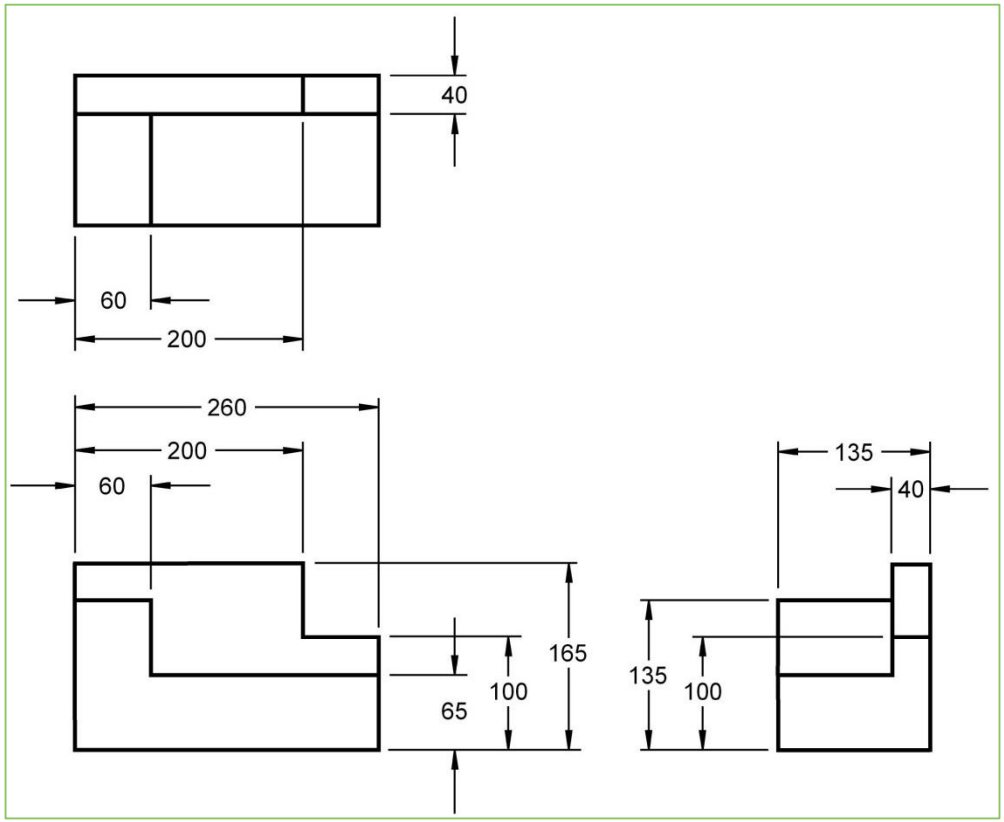

1) Leader line
3) Text
1.00
1.50
.75
.50
2) Center line
Ø.62
1.50
1.00
.50
4) Crossing dim. and ext. line

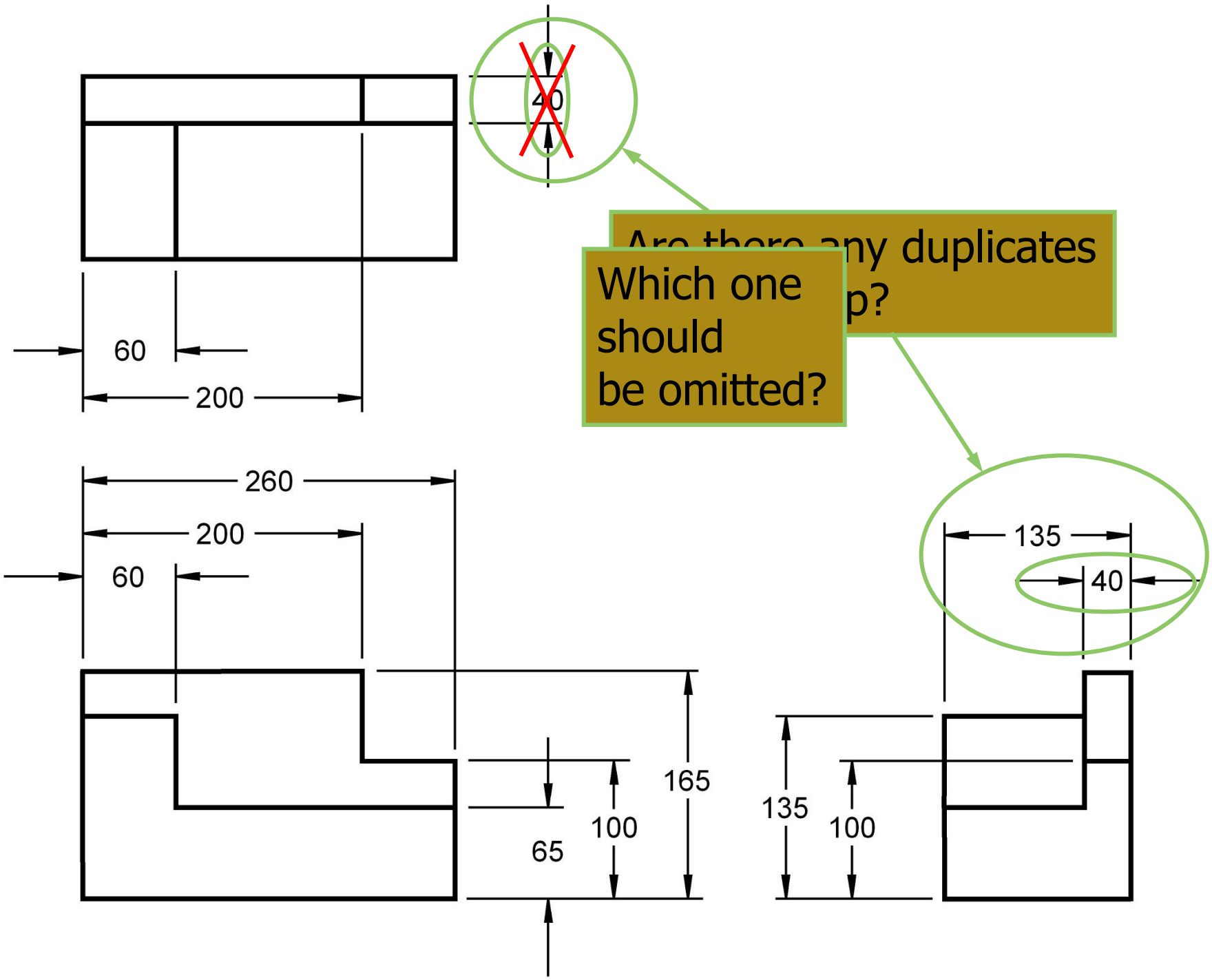
Correctly Dimensioned

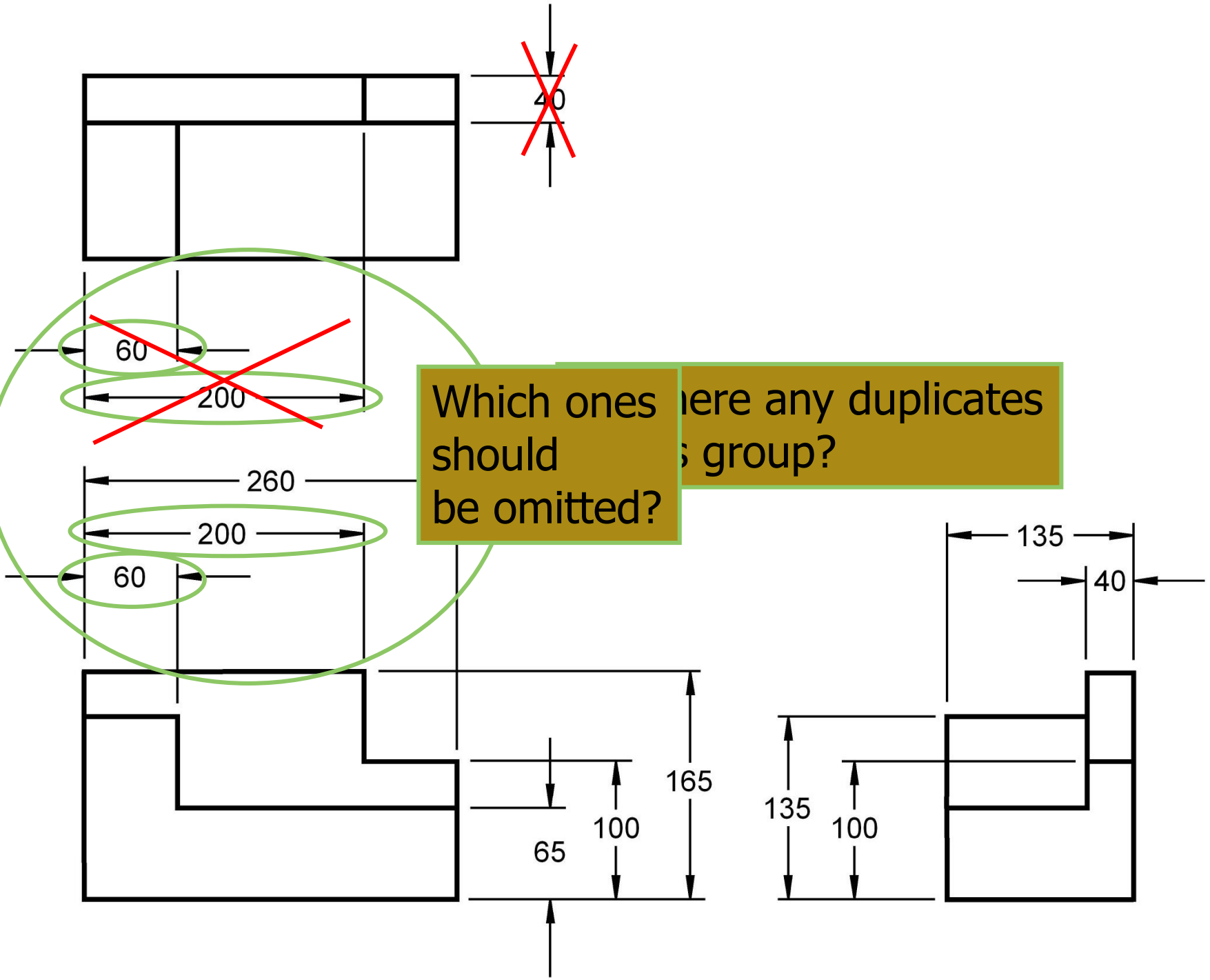


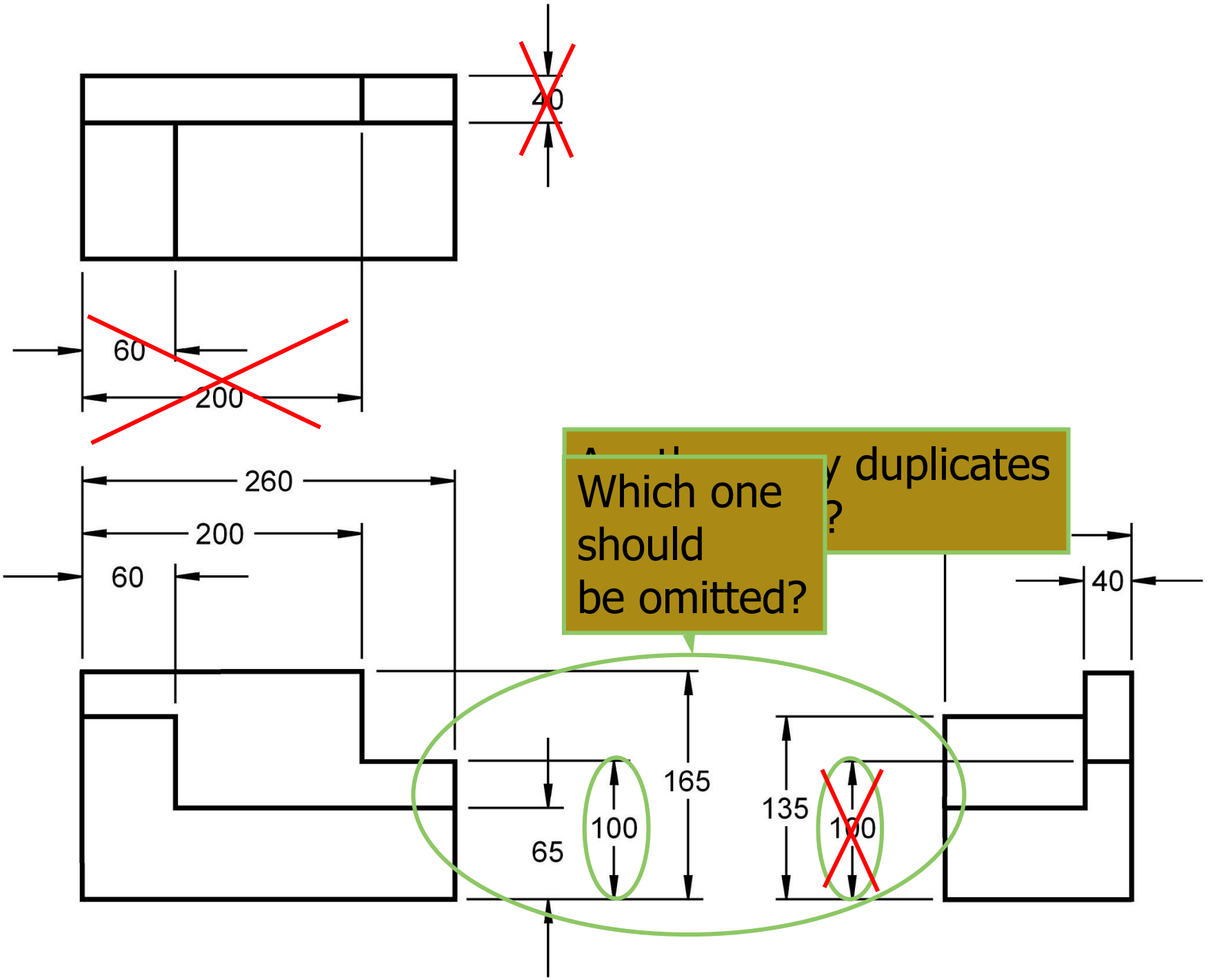
Exercise 3

- Find the duplicate dimensions and cross out the ones that you feel should be omitted.



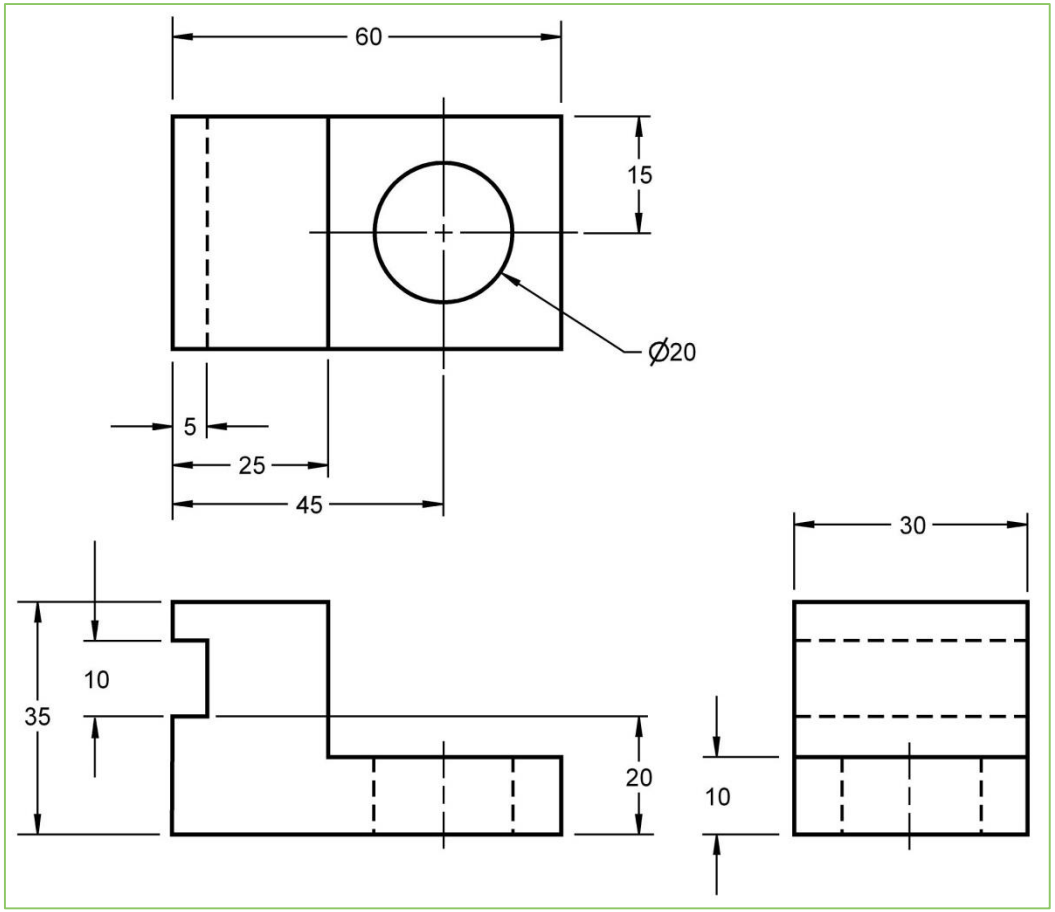

40
60
200
Are there any duplicates
p?
Which one
should
be omitted?
260
200
60
135
40
165
100
65
135
100

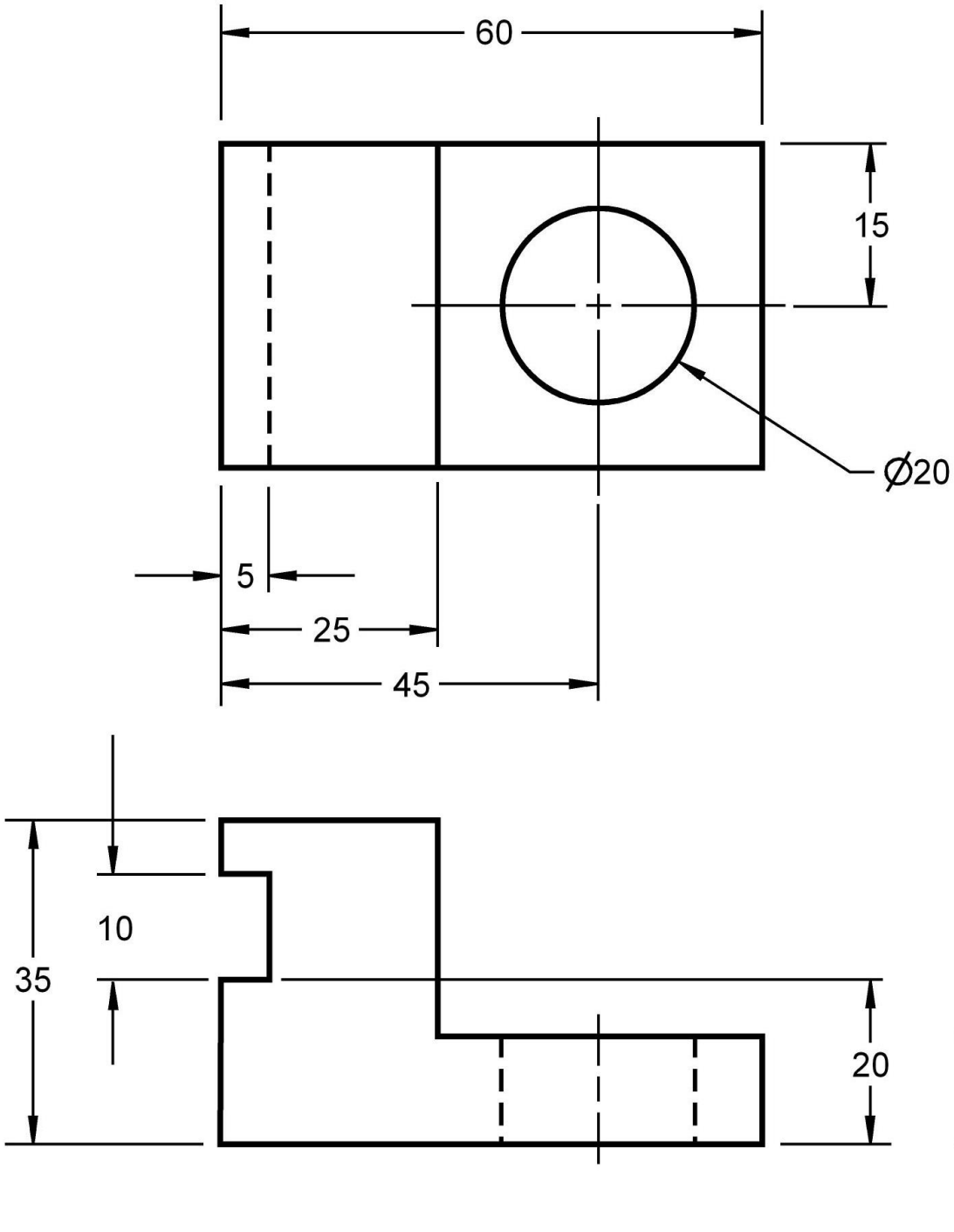

40
60
200
260
200
60
Which ones should be omitted?
ere any duplicates
group?
135
40
165
100
65
135
100


40
60
200
260
200
60
40
Which one should be omitted?
duplicates
?
165
65
100
135
100

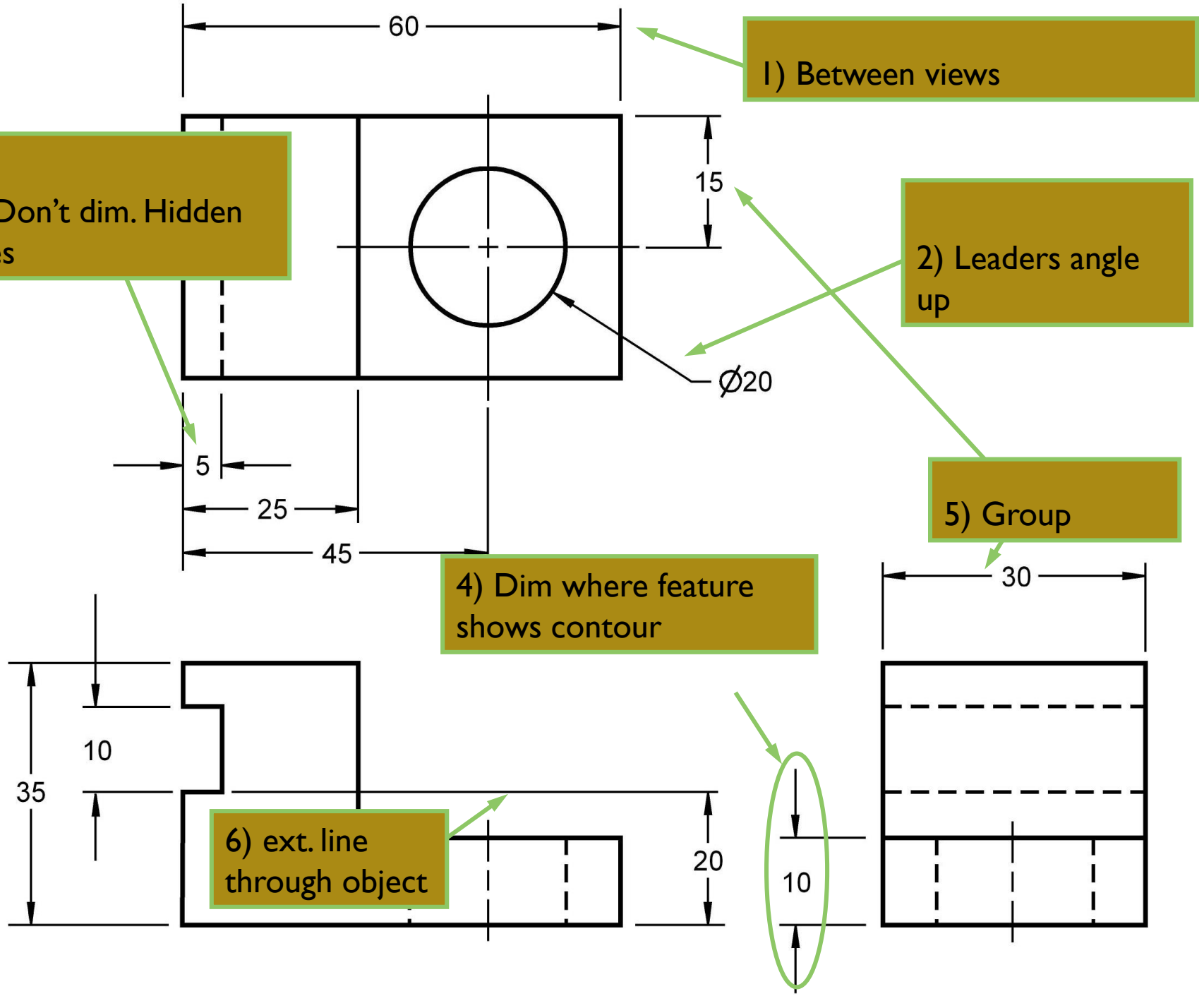
Exercise 4

- List the dimensioning mistakes and then dimension the object correctly.

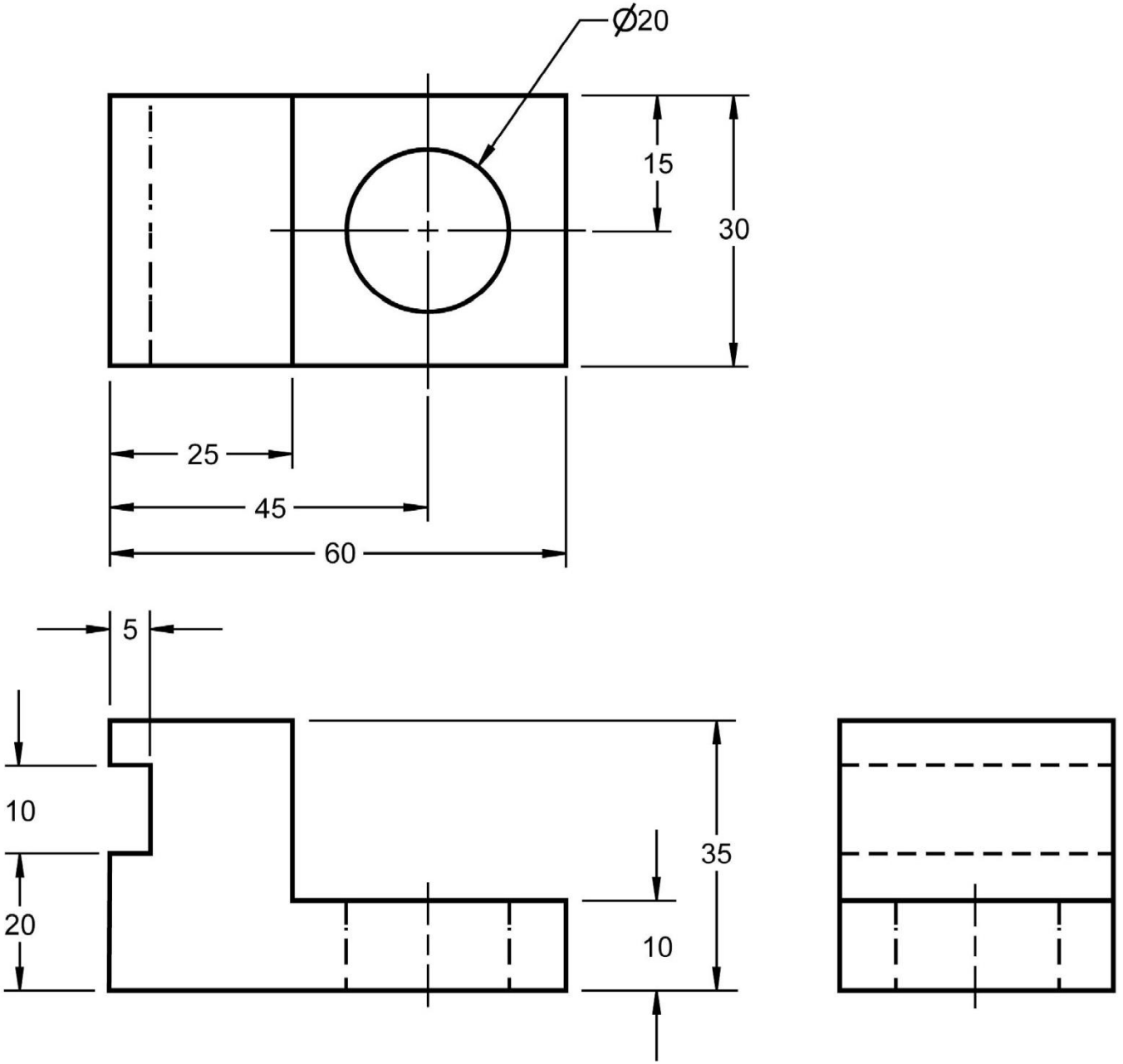




What are the 6 dimensioning mistakes?


60
15
Ø20
5
25
45
30
10
35
20
10
1) Between views
2) Leaders angle up
3) Don't dim. Hidden lines
4) Dim where feature shows contour
5) Group
6) ext. line through object

Correctly Dimensioned



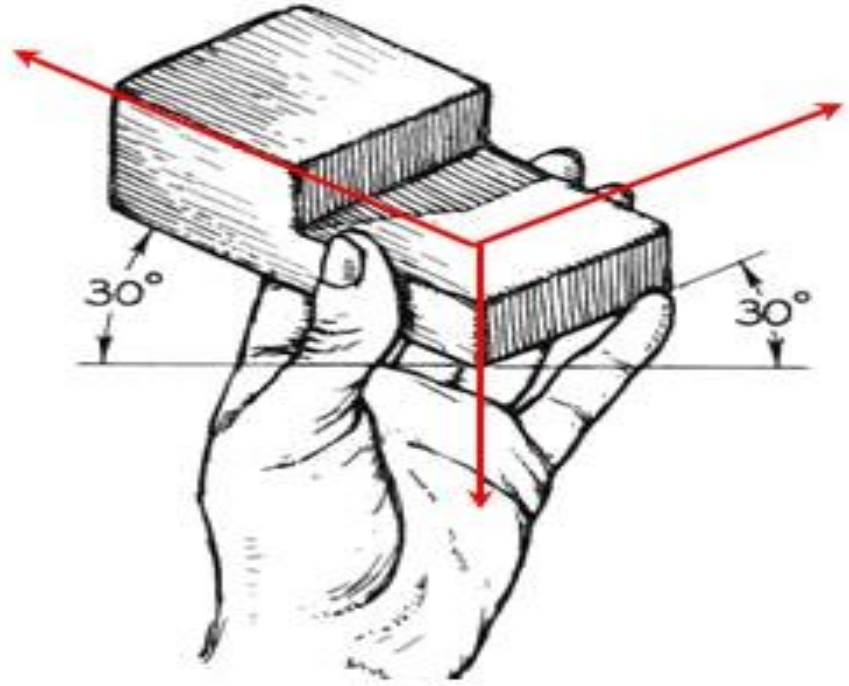
Department of Civil Engineering
RUET

ISOMETRIC DRAWING

G. M. Harun-Or- Rashid
Lecturer

ISOMETRIC DRAWINGS

- **The object is held with one vertical edge, then tilted toward the viewer until the other horizontal edge are at a 30 degree angles.**
- **All three axes are scaled equally at 120 degrees.**
- **Since all lines are parallel, isometric drawings can be created quickly.**



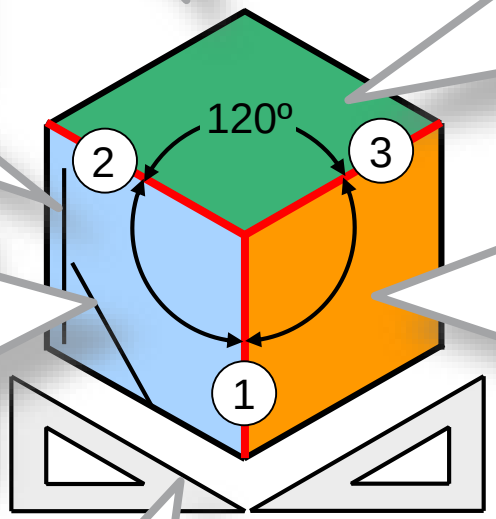
Isometric projections

Characteristics of isometric projections

All lines parallel to axes 1, 2 and 3 are isometric lines.

Axes 1, 2 and 3 form 120º angles between one another.

The projection is isometric (equal measures) because the height of axis 1, the length of axis 2 and the width of axis 3 are all proportionally reduced.



The lines not parallel to axes 1, 2 and 3 are non-isometric lines.

The sides of the cube and all planes parallel to them are isometric planes.

The isometric lines are angled at 30º.

Isometric projections

Characteristics of isometric projections

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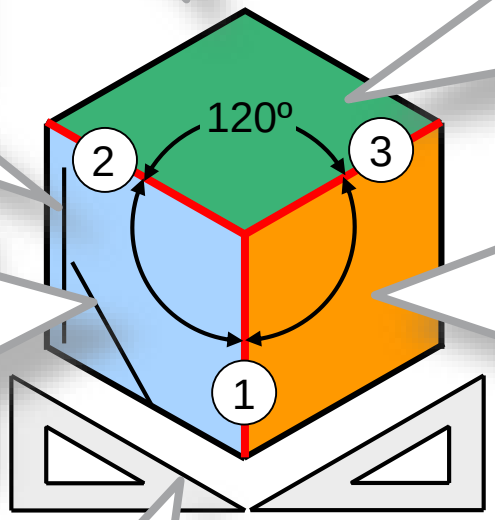


The lines not parallel to axes 1, 2 and 3 are non-isometric lines.

The sides of the cube and all planes parallel to them are isometric planes.

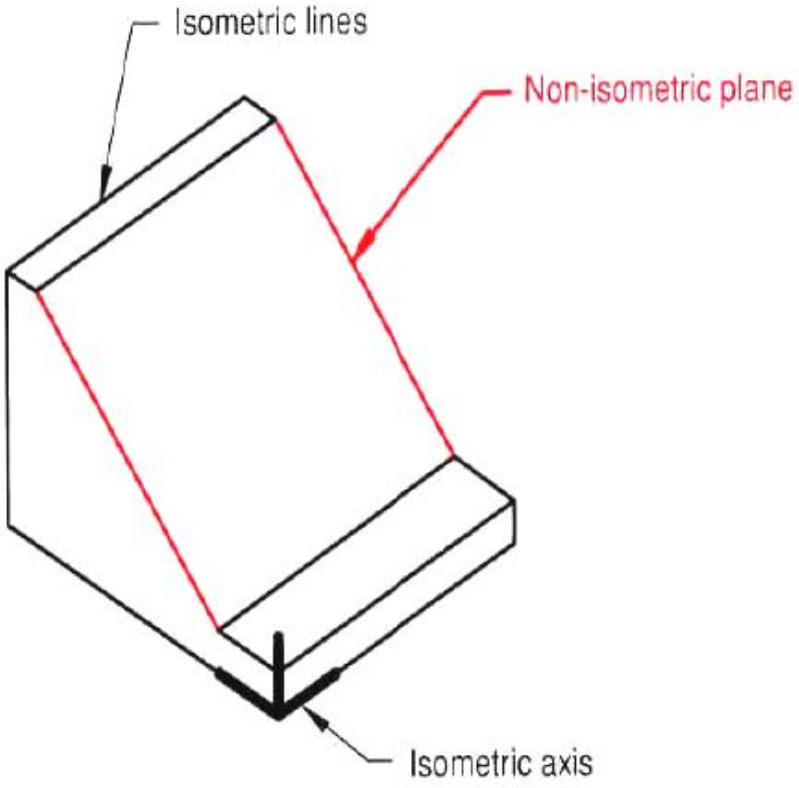
The isometric lines are angled at 30º.

ISOMETRIC AND NON-ISOMETRIC LINES & PLANES

- In an isometric drawing, true length distances can only be measured along isometric lines, that is, lines that run parallel to any of the isometric axes.

- Any line that does not run parallel to an isometric axis is called a **non-isometric line**

- Non-isometric lines include inclined and oblique lines and can not be measured directly. Instead they must be created by locating two end points.

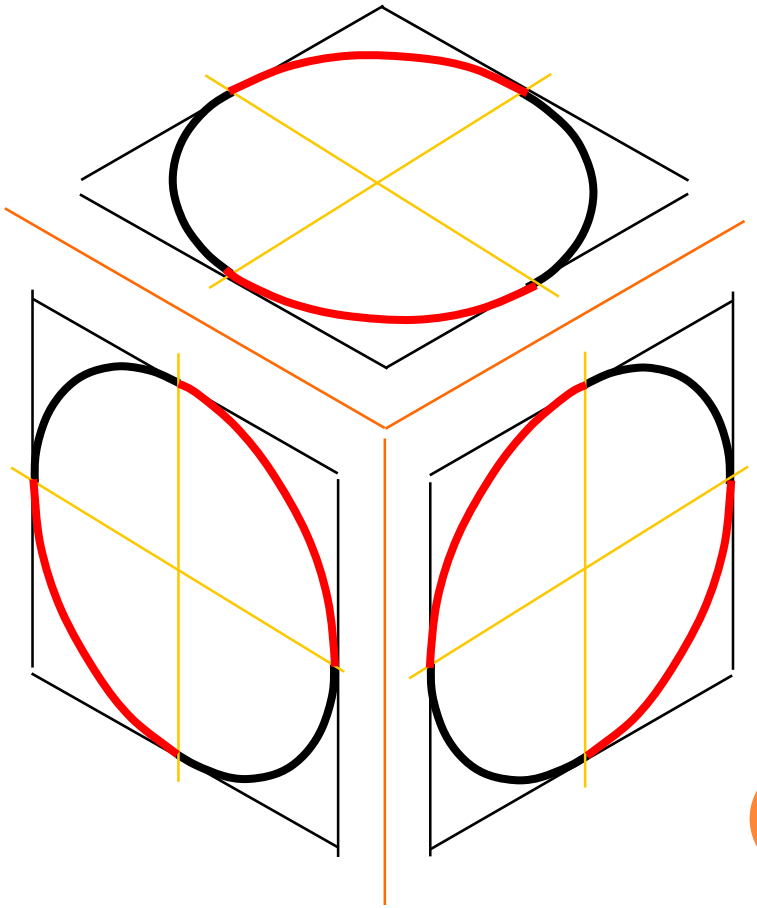


Drawing of Circle and Arcs

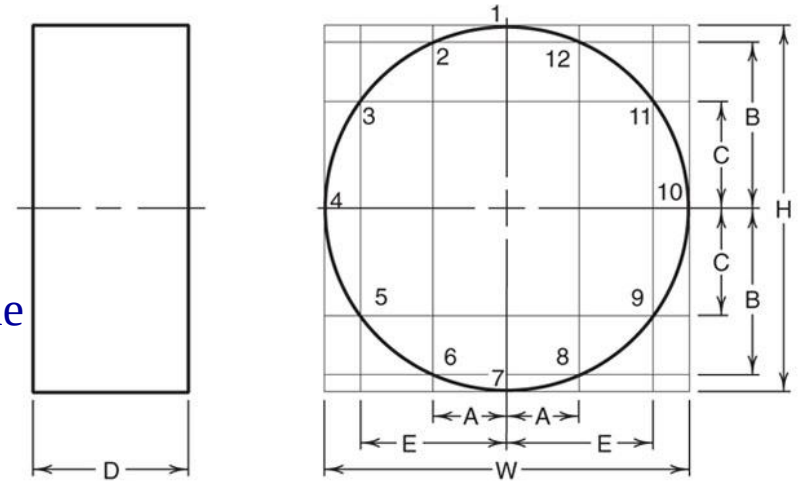
- In isometric drawing, a circle appears as an ellipse.

Sketching Steps

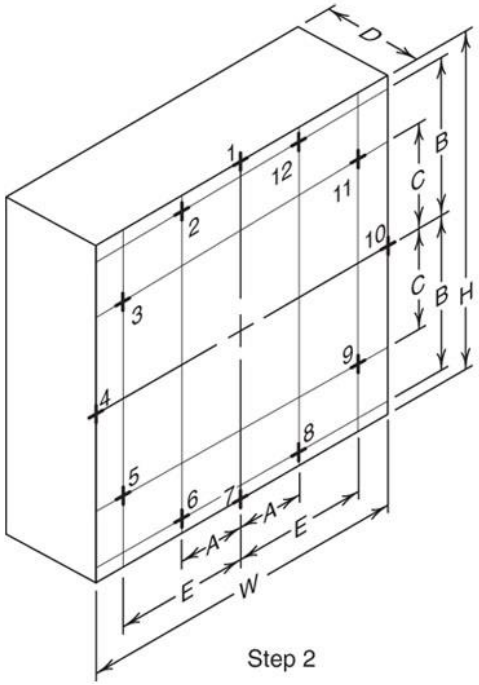
1. Locate the center of an ellipse.
2. Construct an isometric square.
3. Sketch arcs that connect the tangent points.



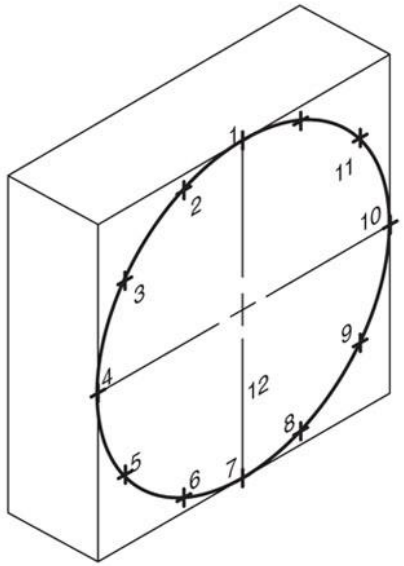
Constructing a true isometric ellipse.



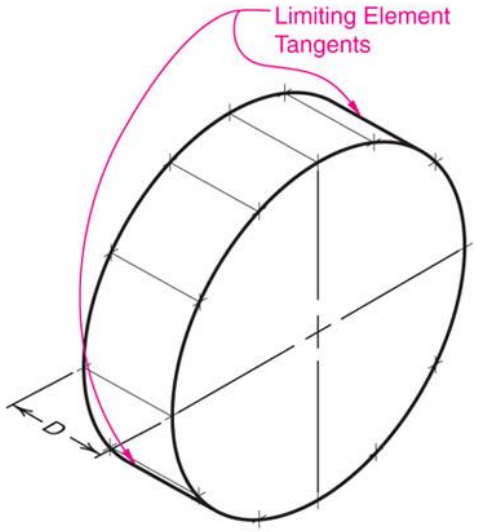
Step 1



Step 2



Step 3



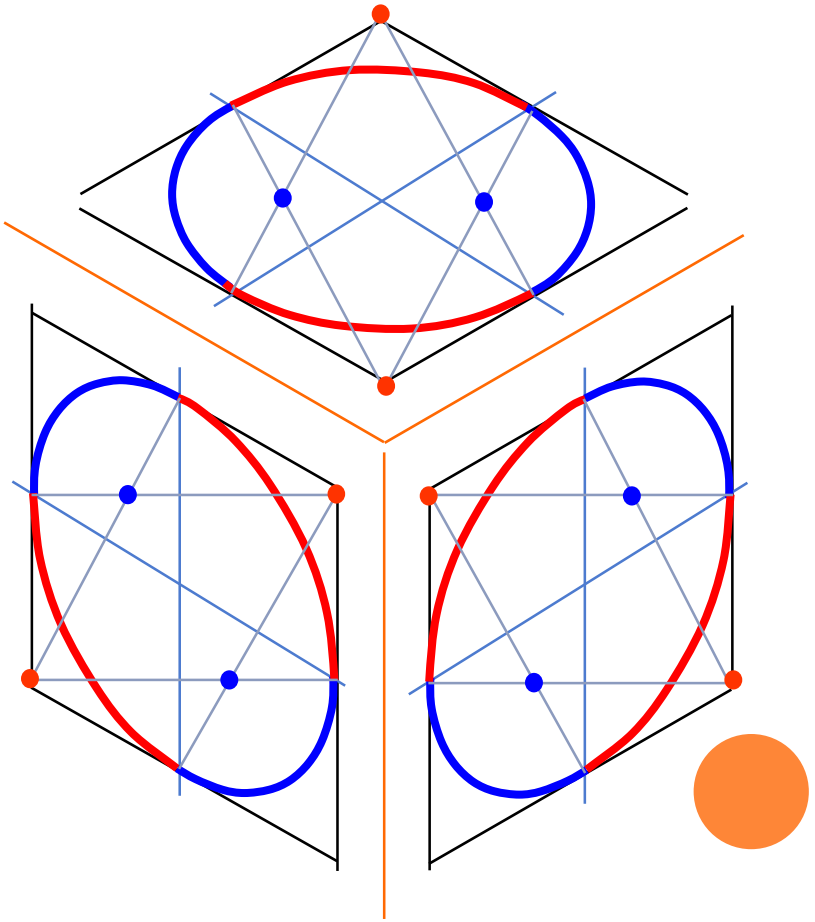
Step 4

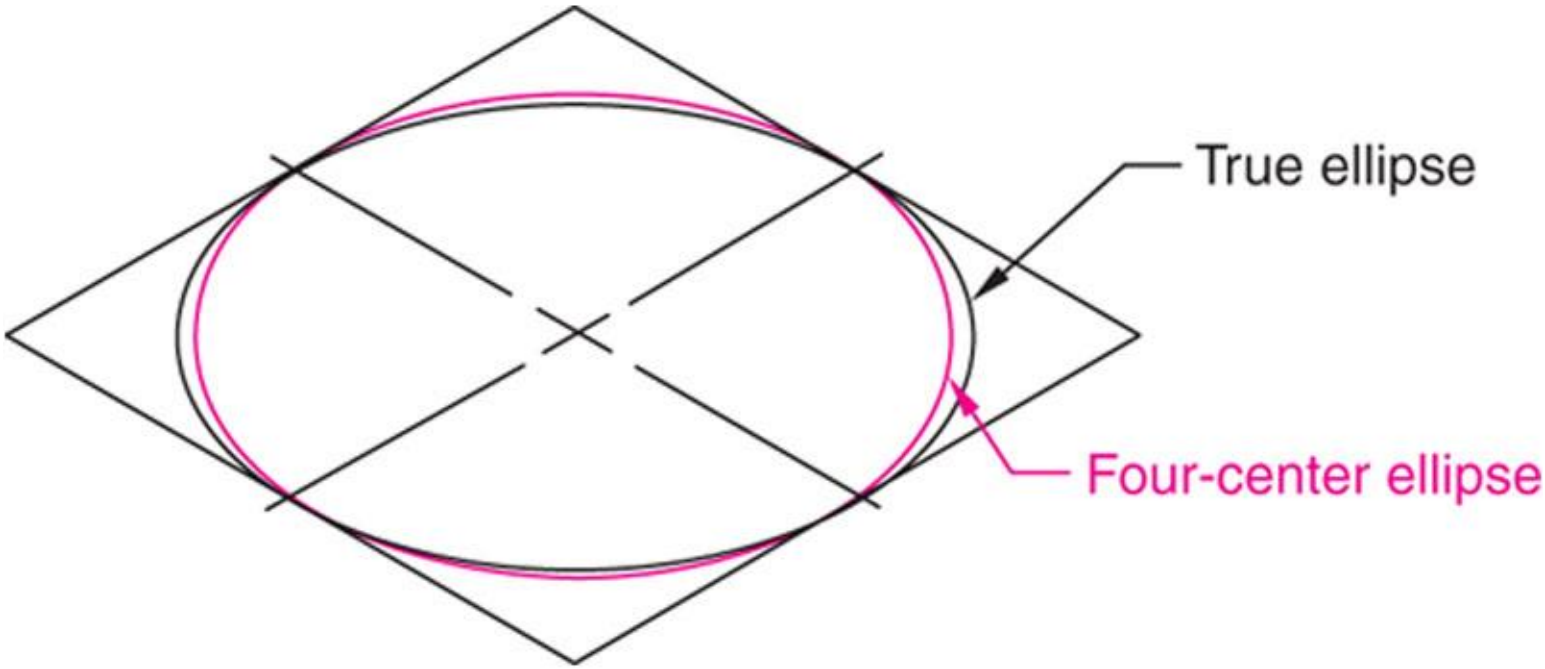
Drawing of Circle and Arcs

- *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.

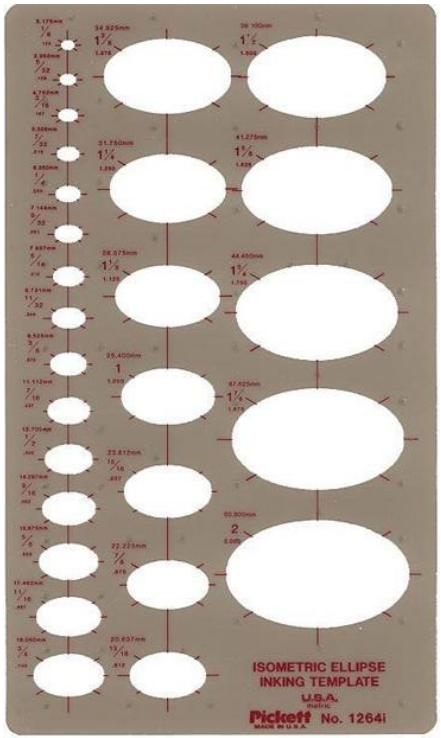


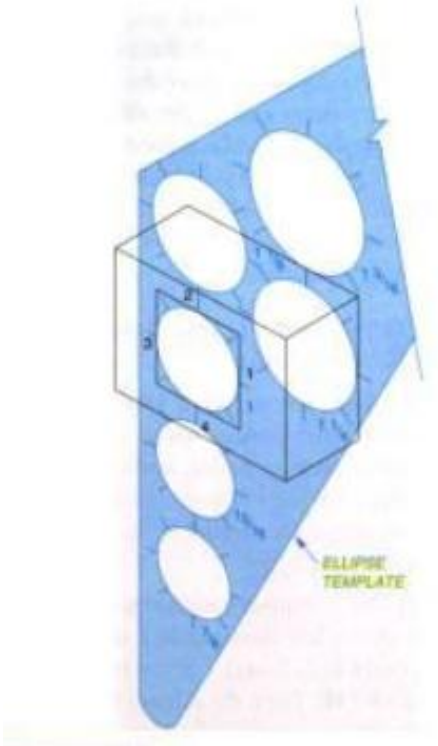


The comparison between a true ellipse and one constructed by the four-center method.

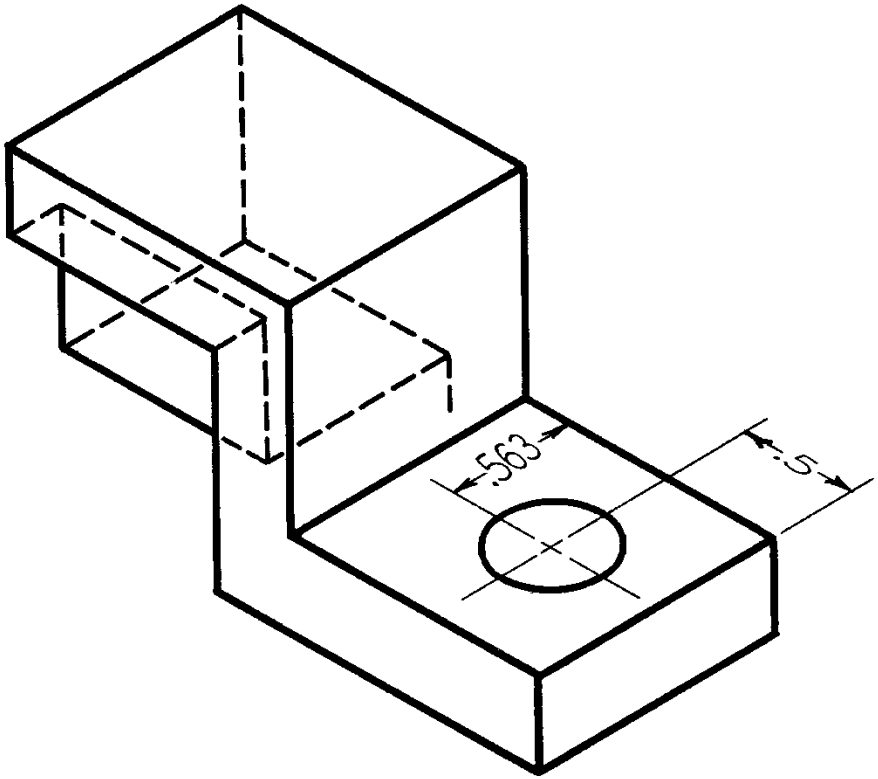
Drawing of Circle and Arcs

The fastest and most accurate way to draw an ellipse for an isometric drawing is to use an **ellipse template**.





Hidden Lines



Hidden lines are not usually shown in isometric sketches unless they are needed to show a feature that would be unclear.

Usually the orientation for the isometric drawing should be chosen so that hidden lines aren't needed.

Holes are assumed to go completely through the object unless their depth is indicated with a note or with hidden lines.

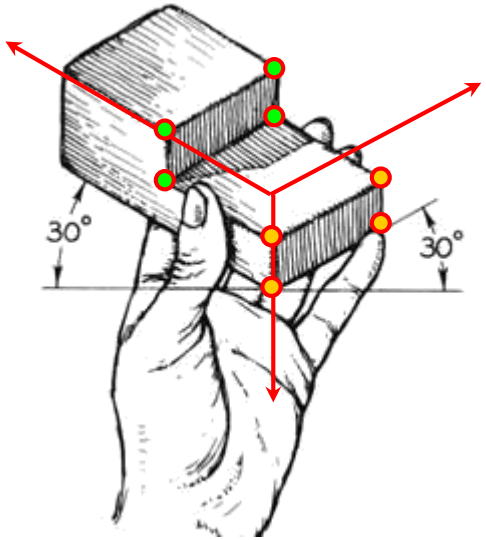
Sketch from an actual object

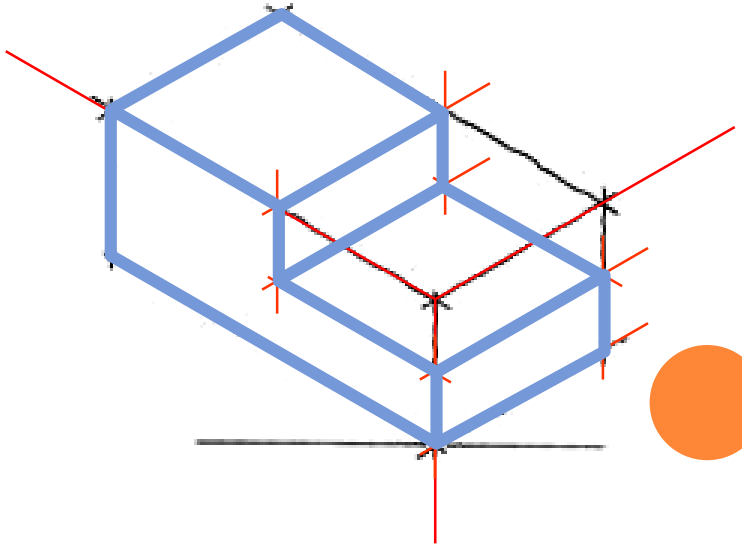
1. Place the object in the position which its shape and features are clearly seen.
2. Define an isometric axis.
3. Sketching the enclosing box.
4. Estimate the size an and relationship of each details.
5. Darken all visible lines.

Sketch from an actual object

STEPS

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

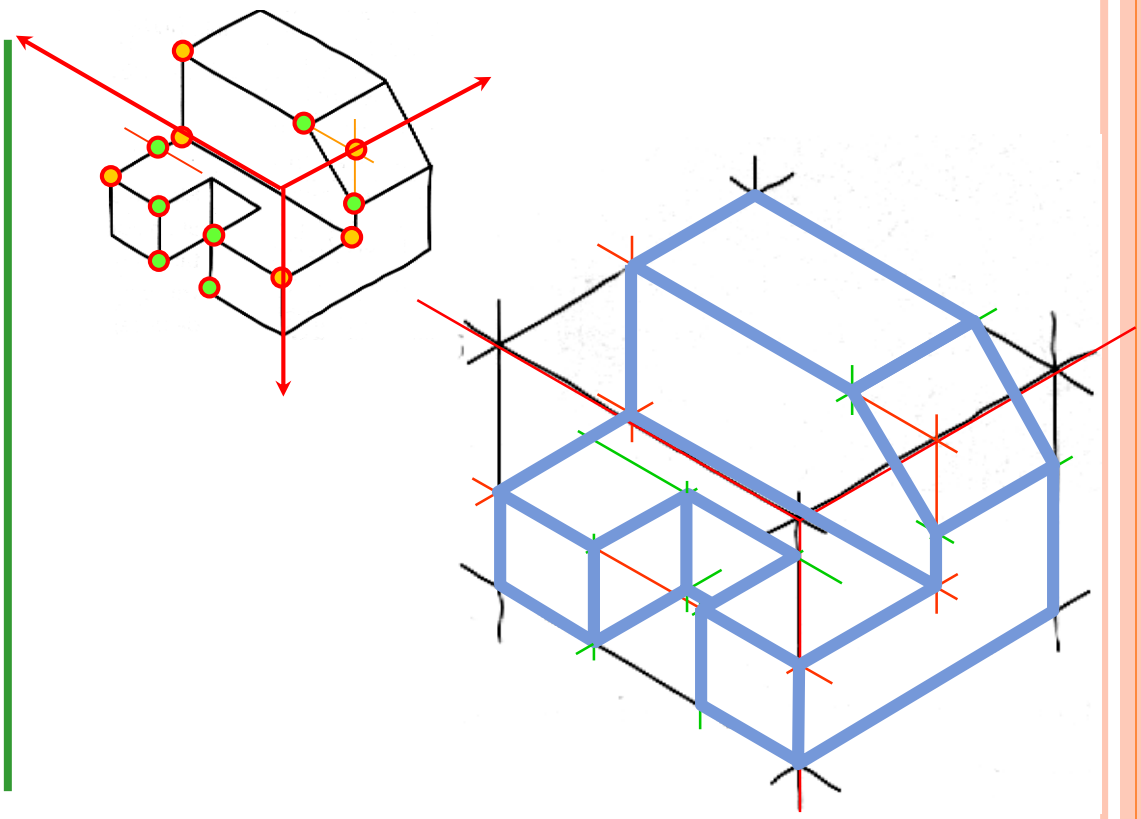




Sketch from an actual object

STEPS

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

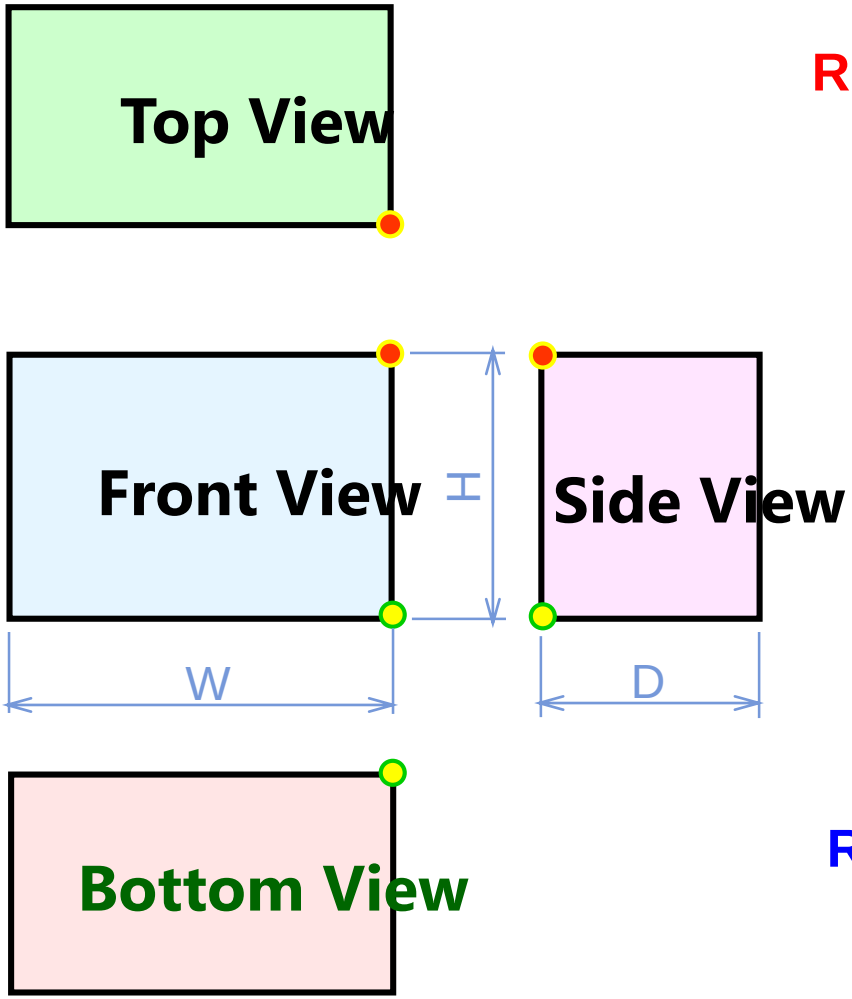


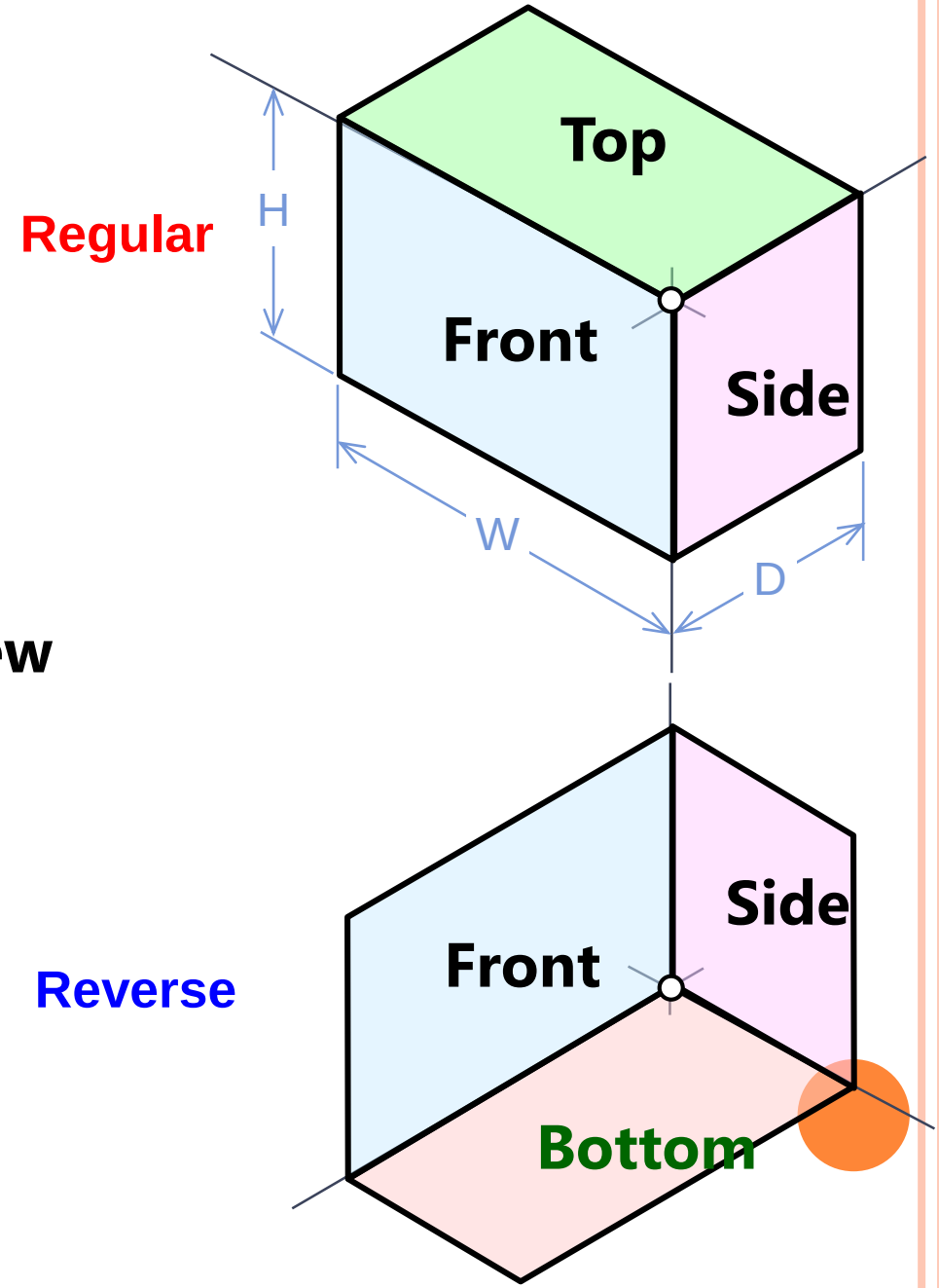
Note In isometric sketch/drawing), hidden lines are ***omitted*** unless they are absolutely necessary to completely describe the object.

Sketch from multiview drawing

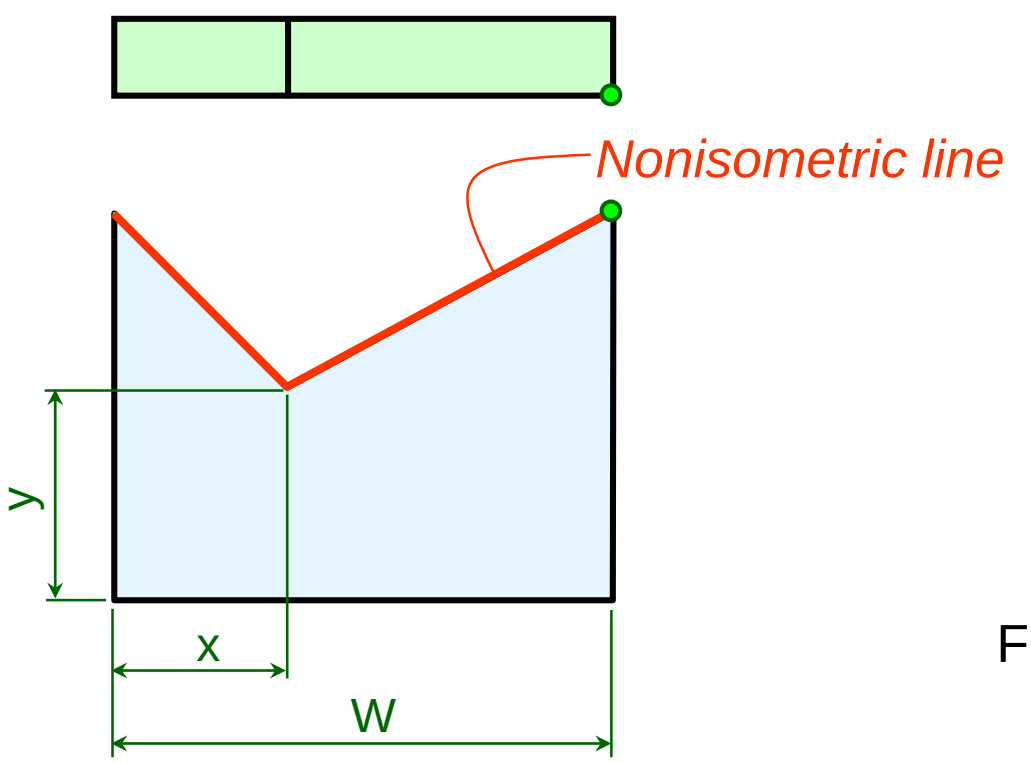
1. Interprete the ***meaning of lines/areas*** in multiview drawing.
2. Locate the lines or surfaces relative to isometric axis.

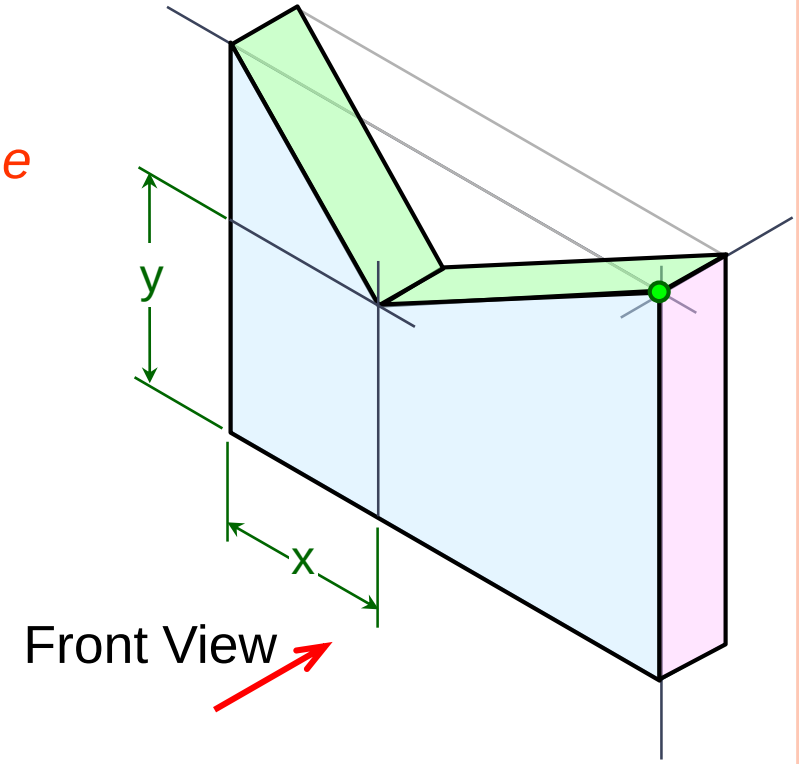
Example 1 : Object has only normal surfaces



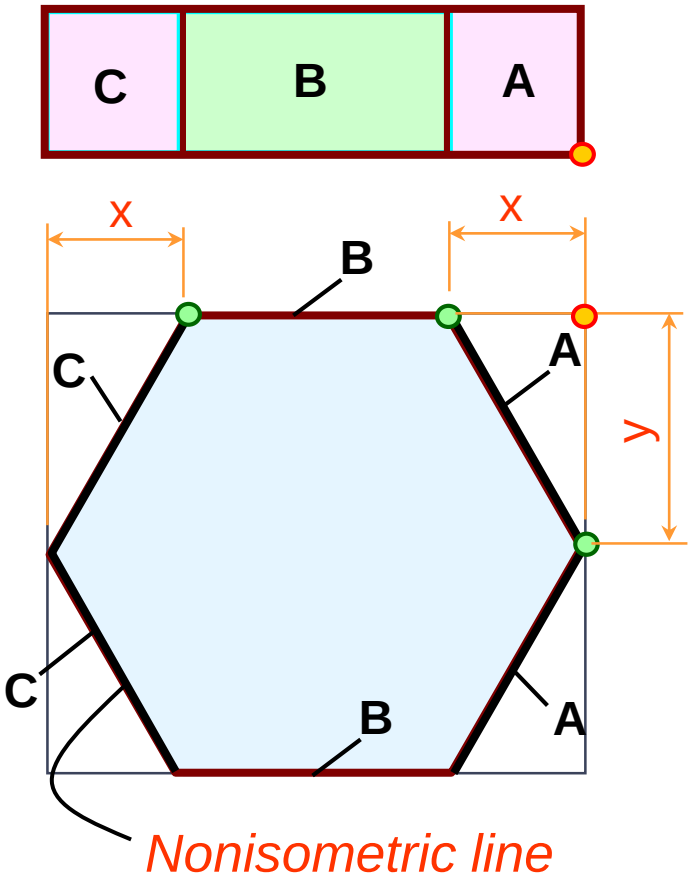


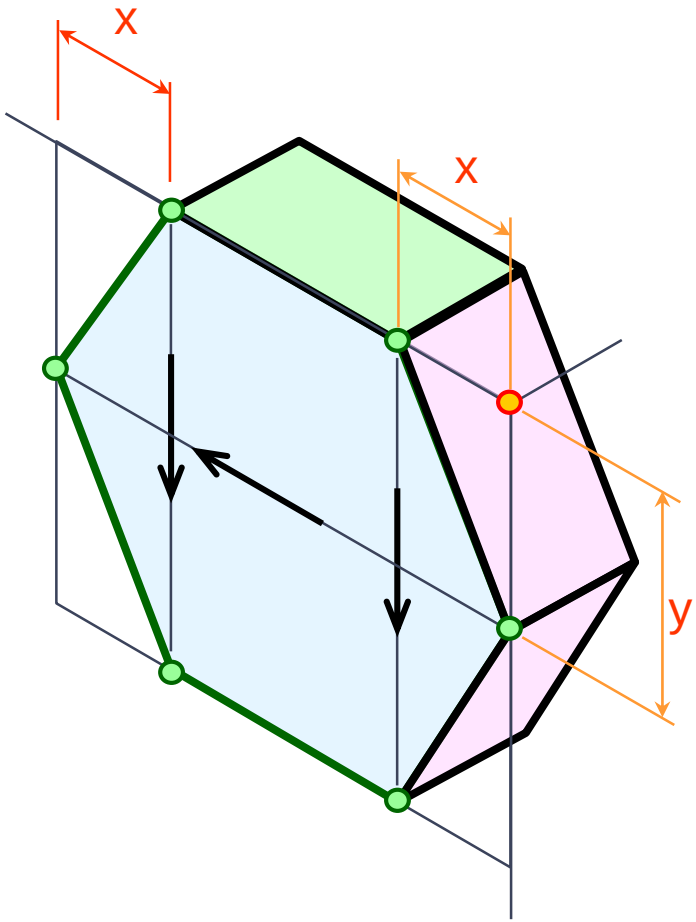
Example 2 : Object has inclined surfaces





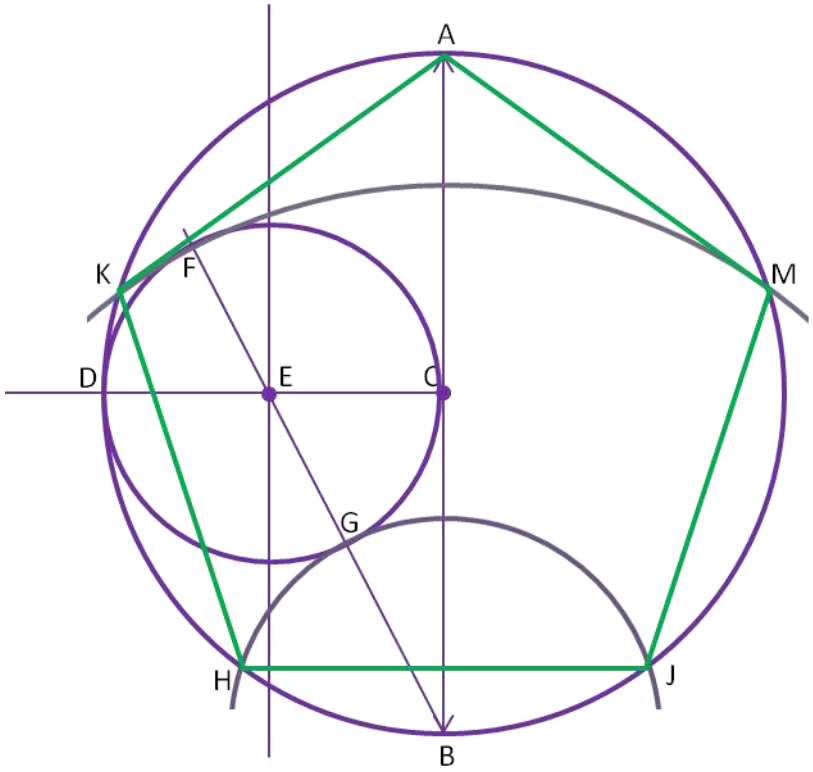
Example 3 : Object has inclined surfaces





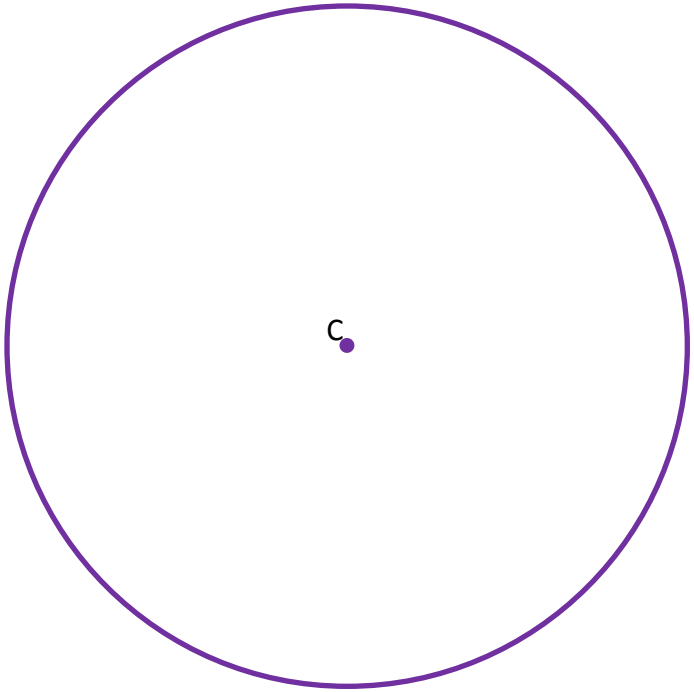
Prepare Templates and Moulds

Constructing a Pentagon

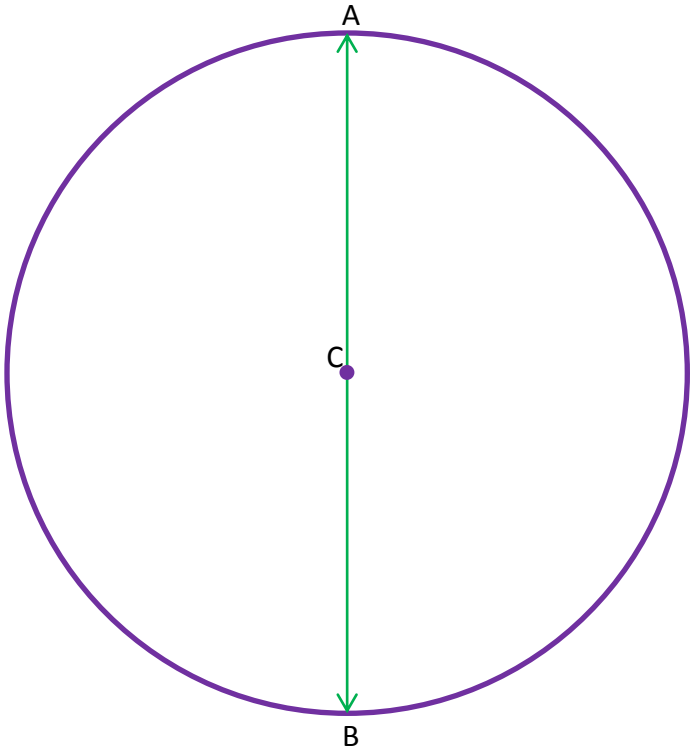


Constructing a Pentagon

Begin by marking a circle with the centre point C.



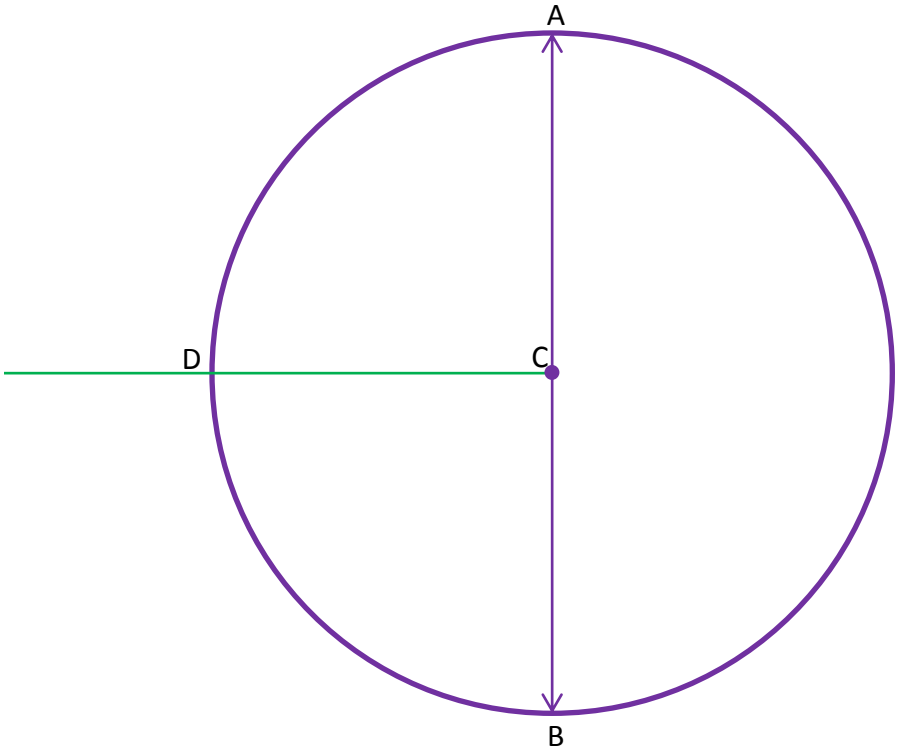
Constructing a Pentagon



Begin by marking a circle with the centre point C.

Mark the diameter of the circle to form line AB

Constructing a Pentagon

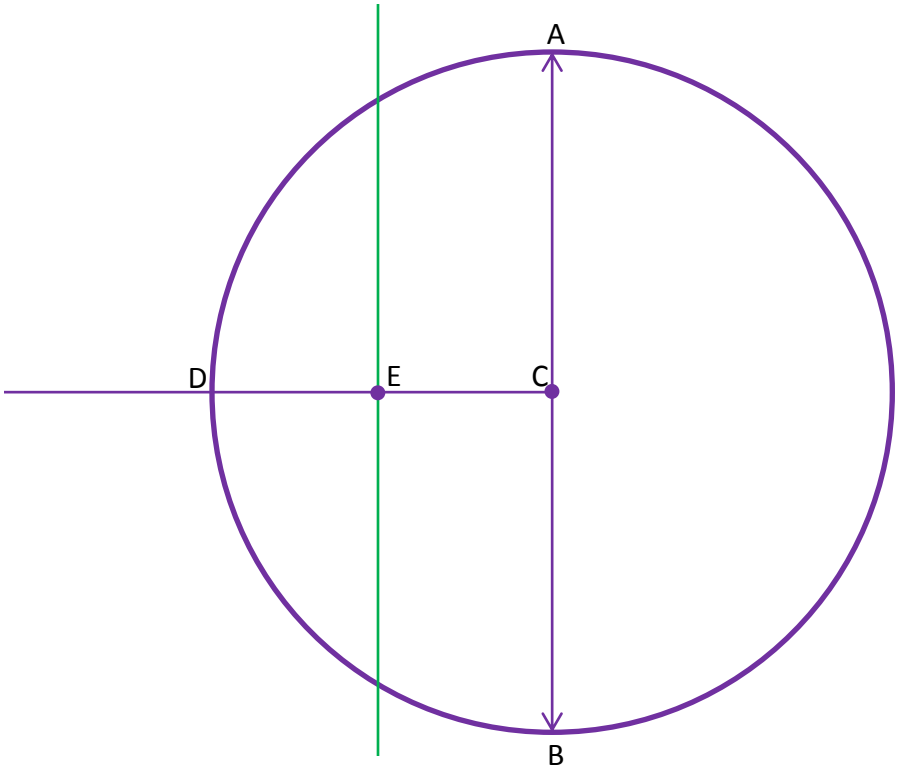


Begin by marking a circle with the centre point C.

Mark the diameter of the circle to form line AB

Mark a perpendicular to line AB to form line DC using line bisection

Constructing a Pentagon



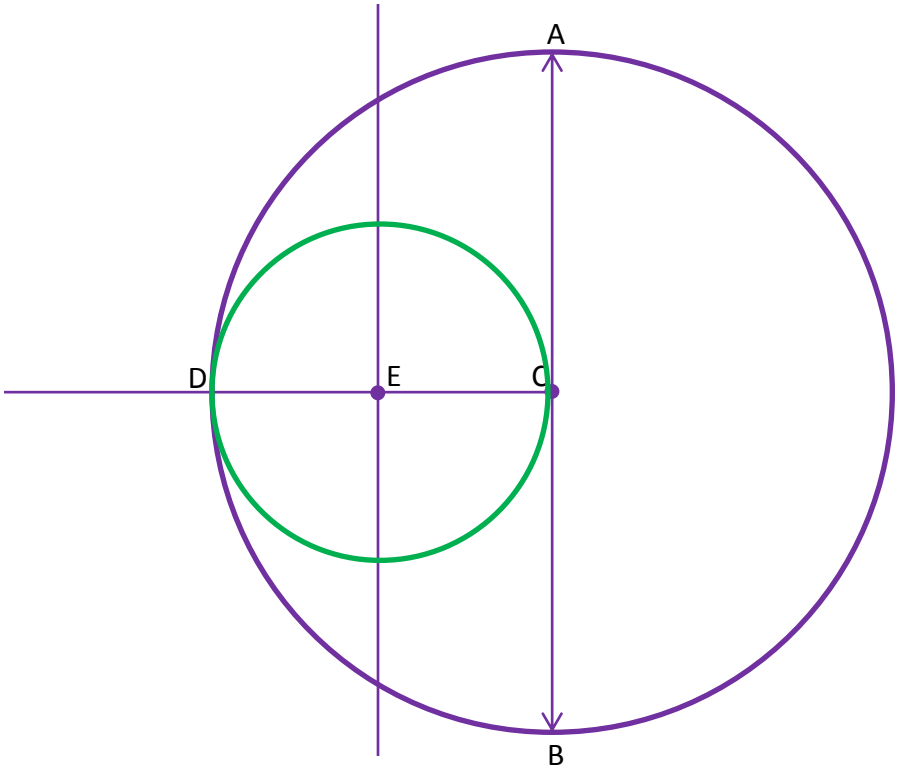
Begin by marking a circle with the centre point C.

Mark the diameter of the circle to form line AB

Mark a perpendicular to line AB to form line DC using line bisection

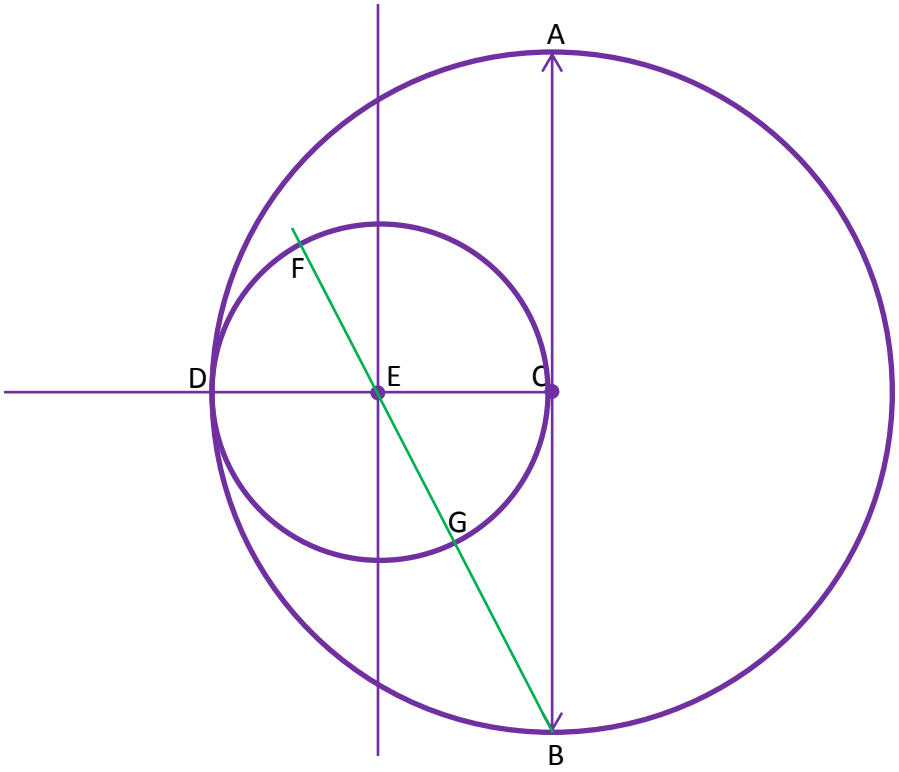
Mark a perpendicular to line DC to form point E using line bisection

Constructing a Pentagon



Construct a circle with centre point E with the diameter DC

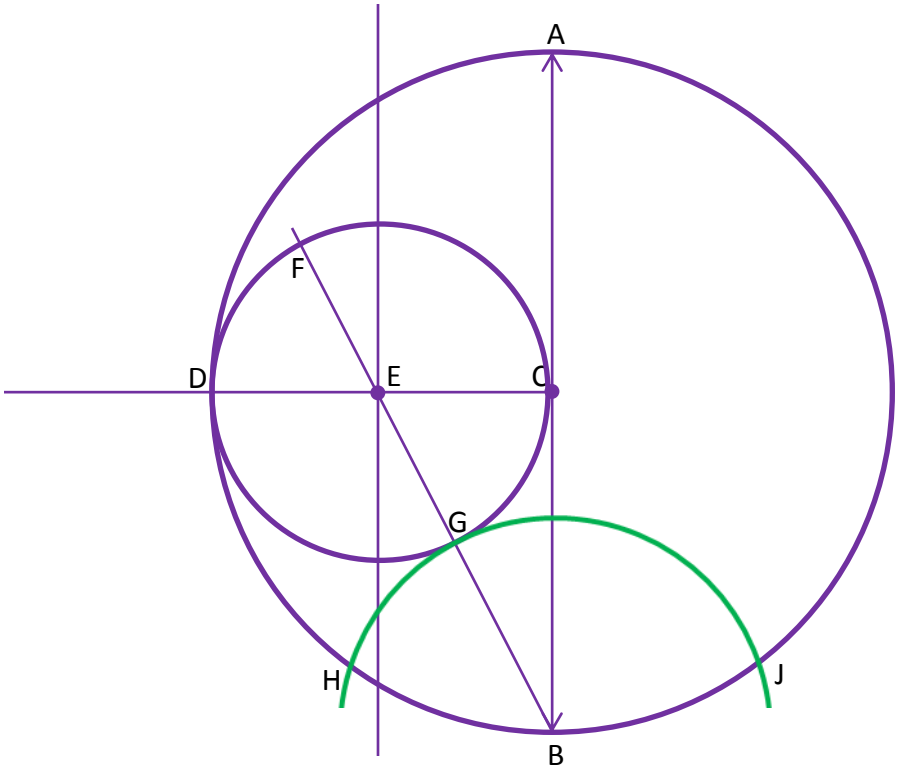
Constructing a Pentagon



Construct a circle with centre point E with the diameter DC

Extend a line through points B and E to form points F and G

Constructing a Pentagon

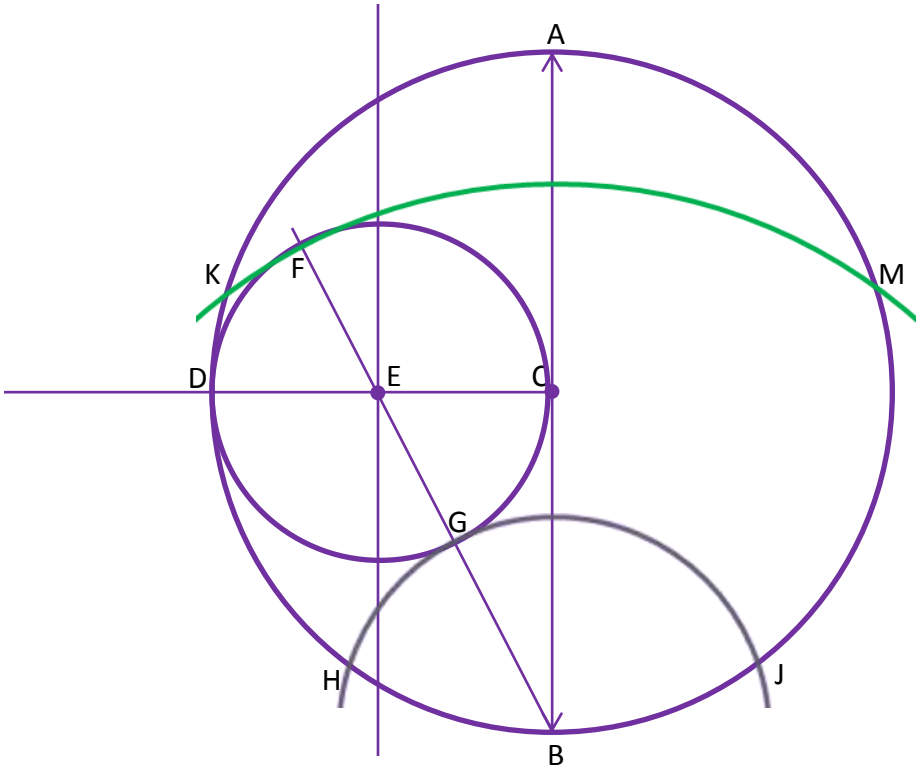


Construct a circle with centre point E with the diameter DC

Extend a line through points B and E to form points F and G

From centre point B mark an arc with radius BG to intersect the circle forming points H and J

Constructing a Pentagon



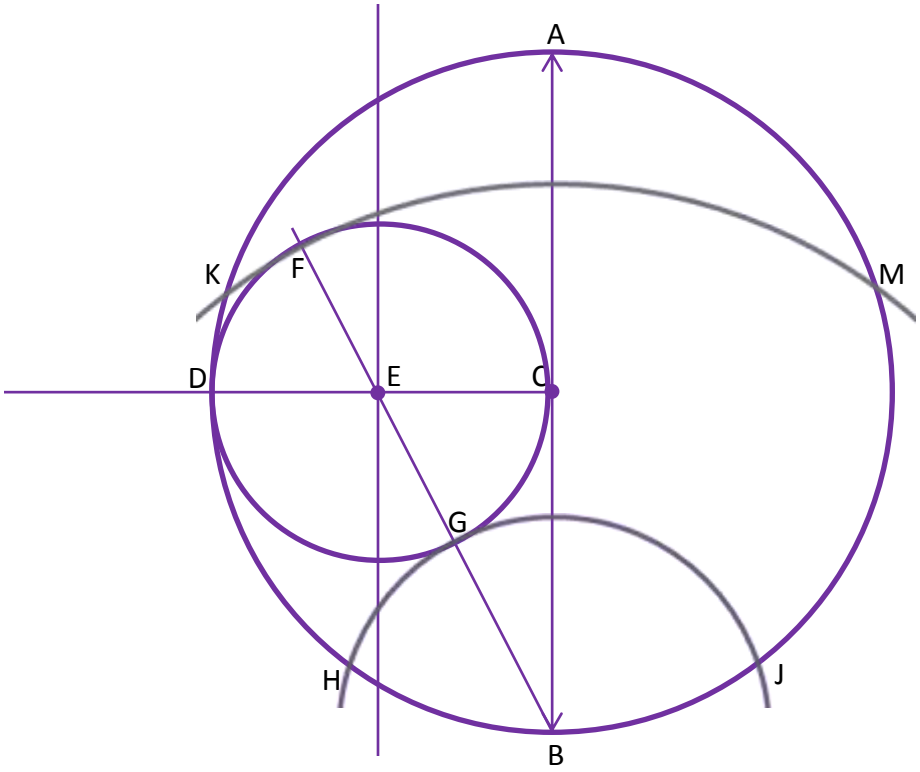
Construct a circle with centre point E with the diameter DC

Extend a line through points B and E to form points F and G

From centre point B mark an arc with radius BG to intersect the circle forming points H and J

From centre point B mark an arc with radius BG to intersect the circle forming points K and M

Constructing a Pentagon



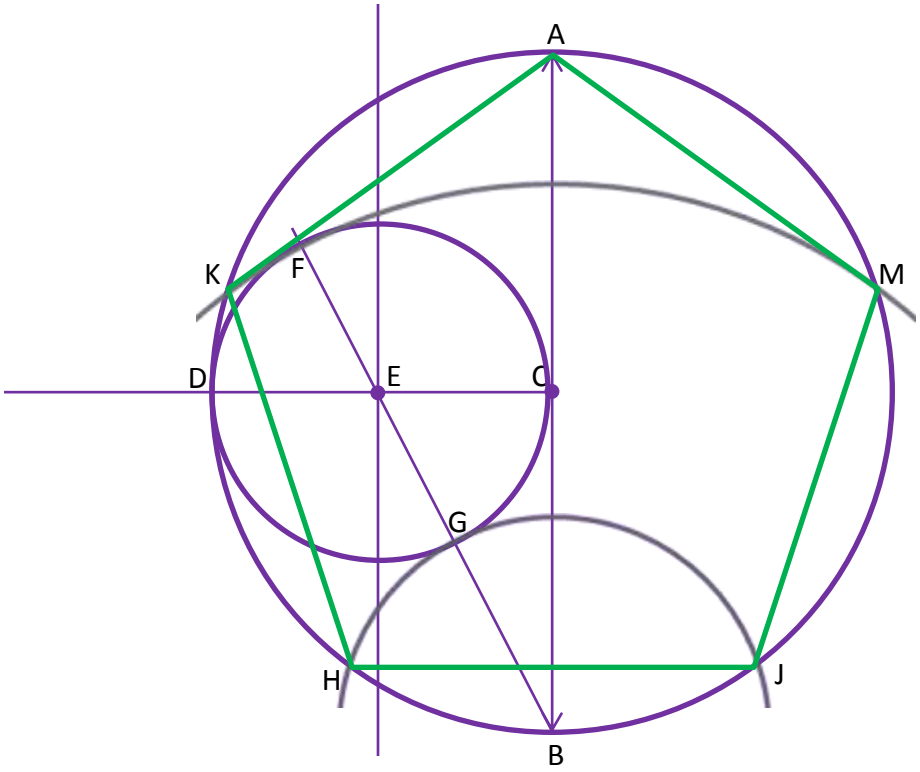
Construct a circle with centre point E with the diameter DC

Extend a line through points B and E to form points F and G

From centre point B mark an arc with radius BG to intersect the circle forming points H and J

From centre point B mark an arc with radius BG to intersect the circle forming points K and M

Constructing a Pentagon



Complete the pentagon by constructing lines HK, KA, AM, MJ and JH

Developed by The Stonemasonry Department
City of Glasgow College
2013

Department of Civil Engineering
RUET

Full Syllabus Review

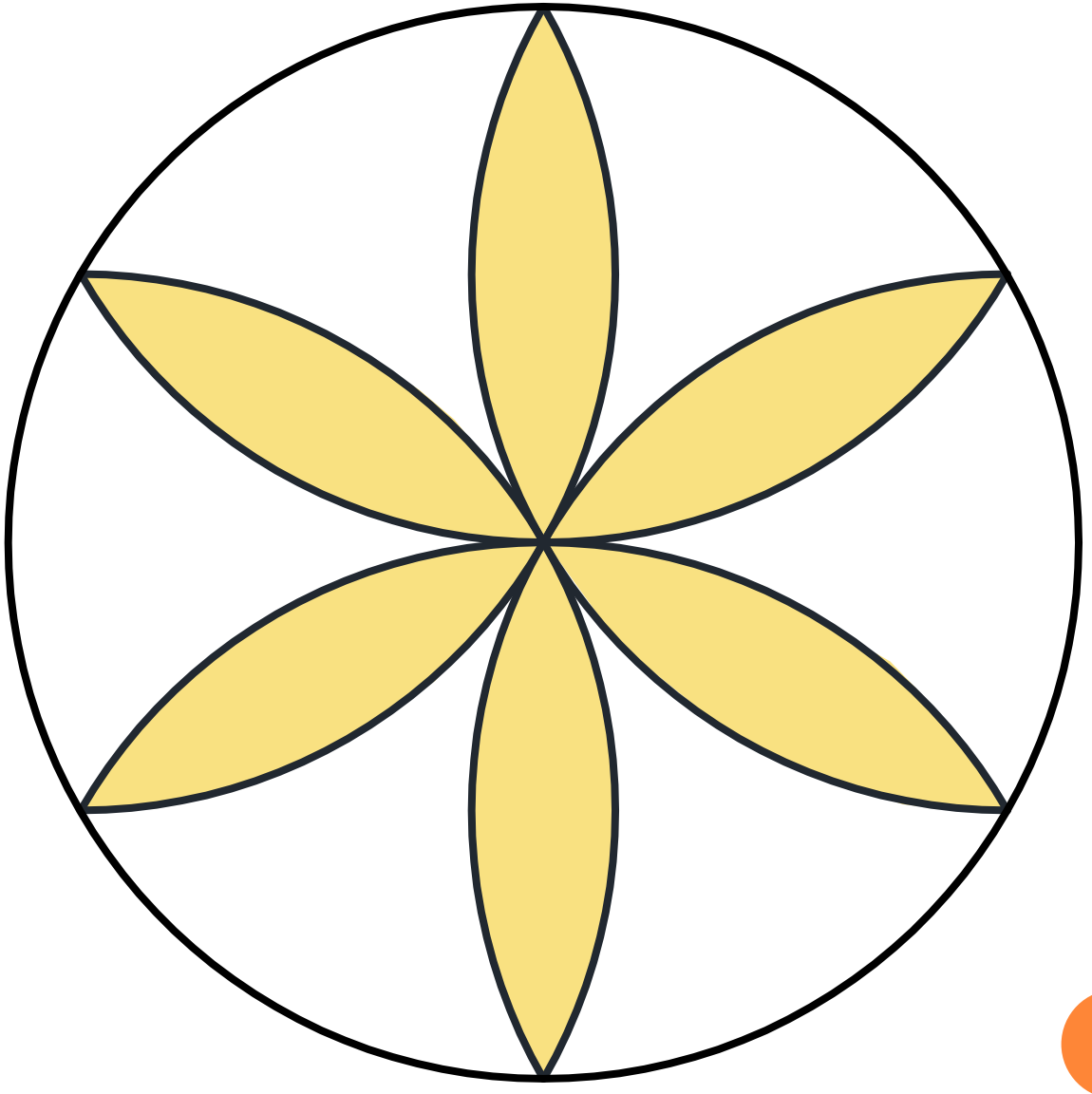
G. M. Harun-Or- Rashid
Lecturer

Plane Geometry

Drawing a regular Pentagon

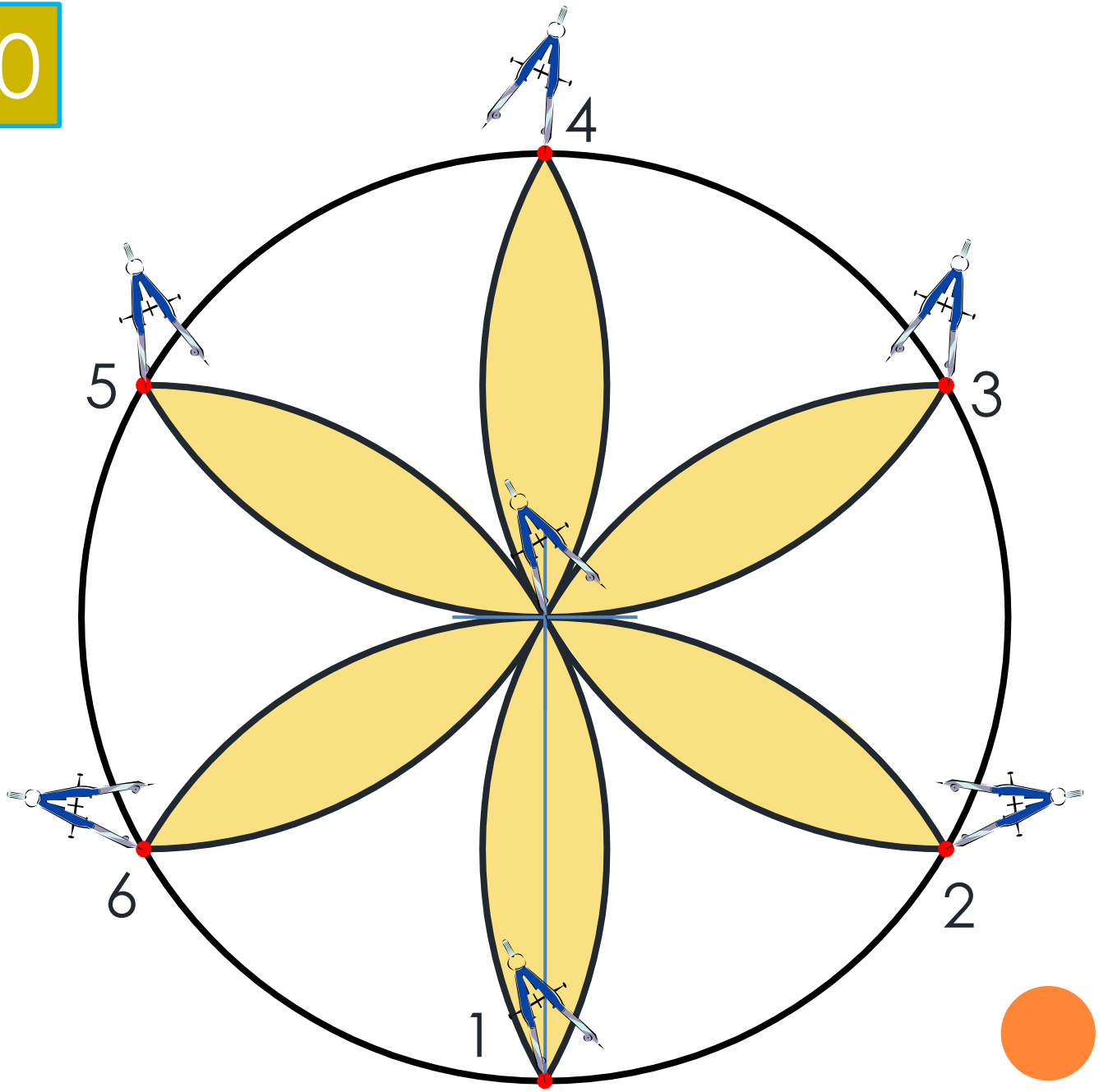
DRAWING A REGULAR HEXAGON

Activity 10

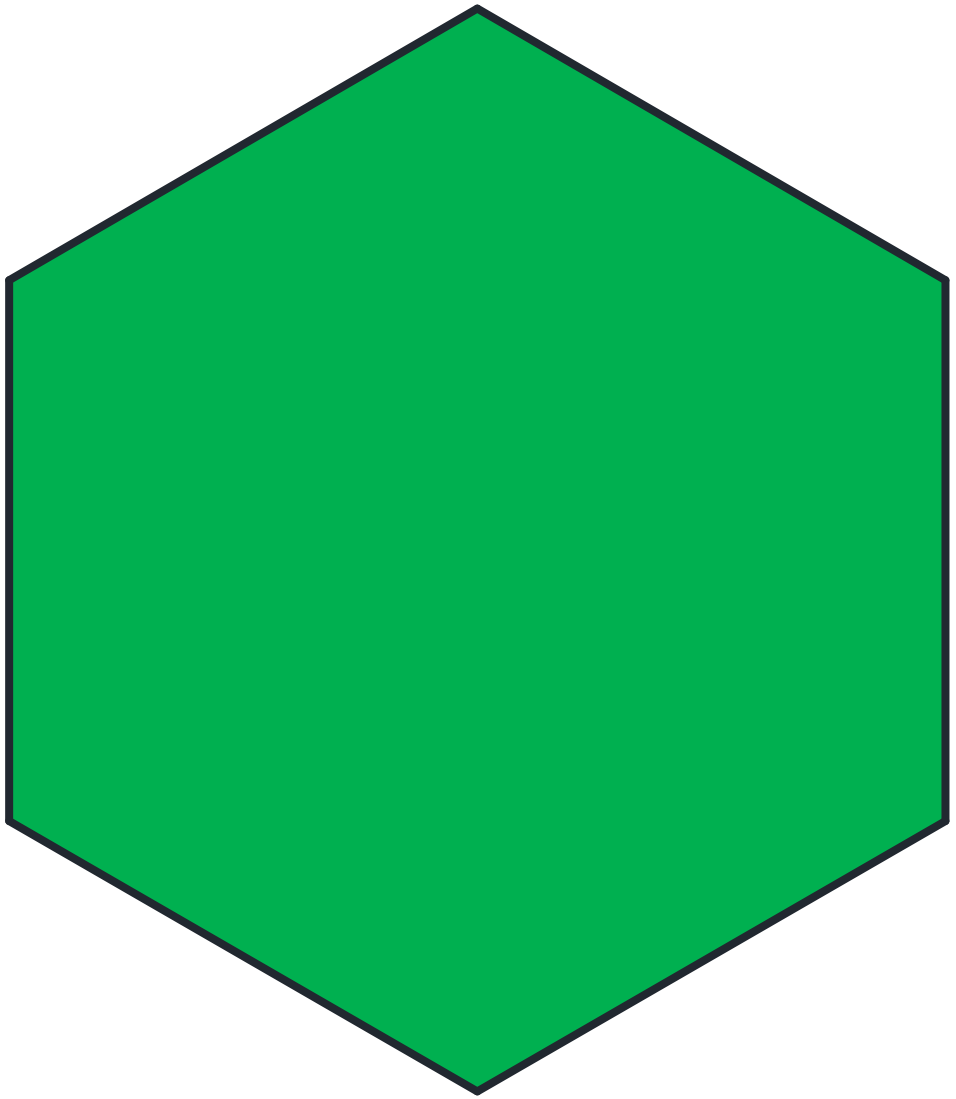


Activity 10

Set your compass at the required radius and **do not change it.**

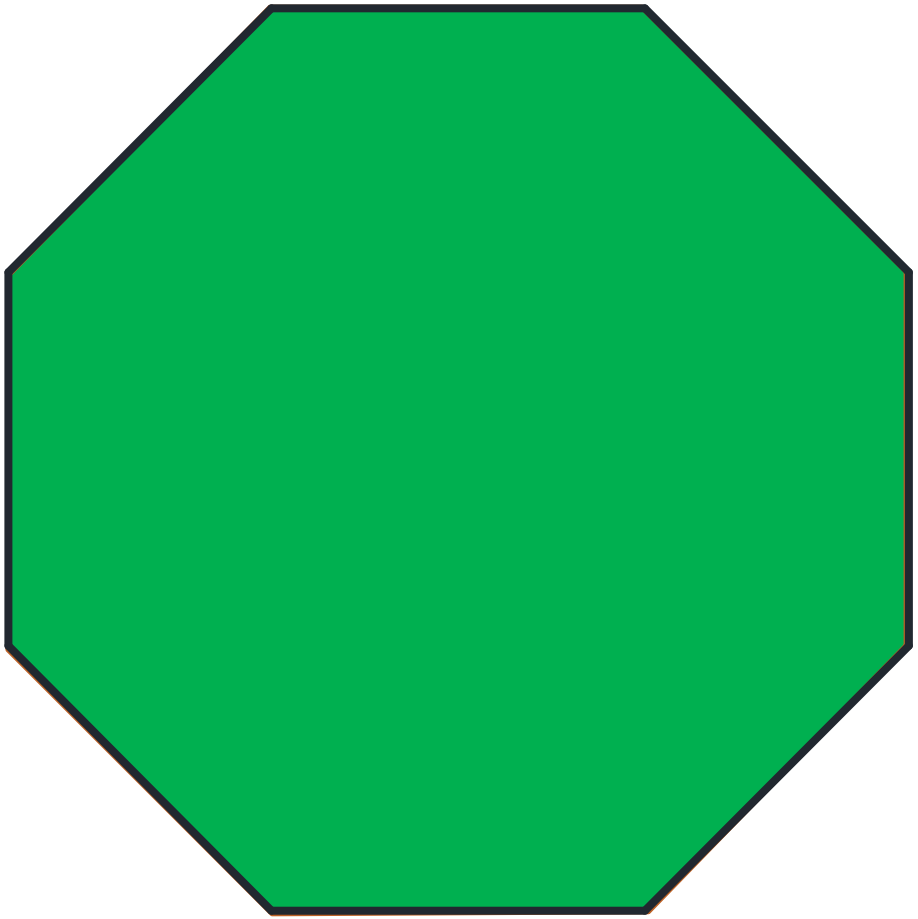


Activity 11

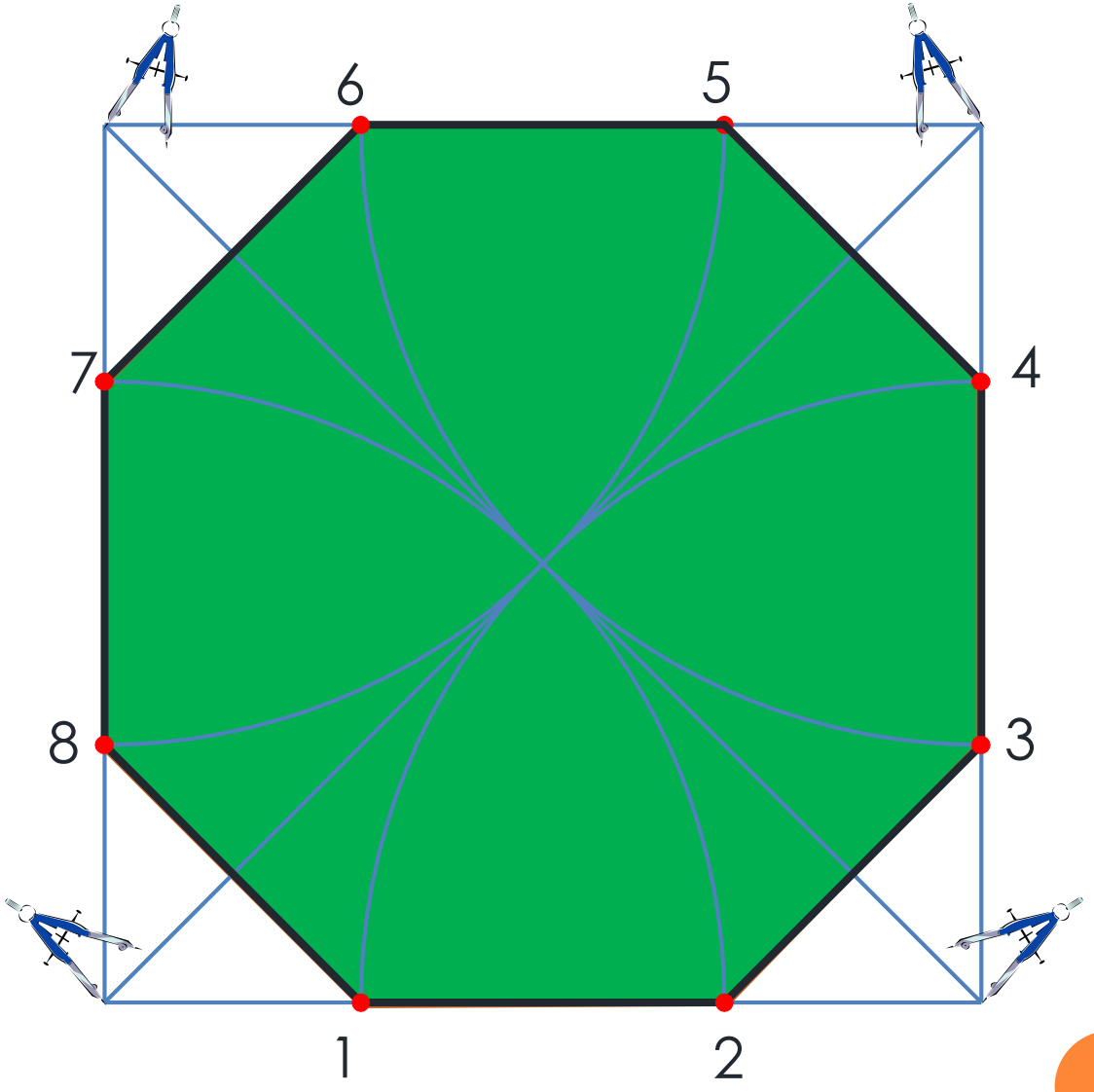


DRAWING A REGULAR OCTAGON

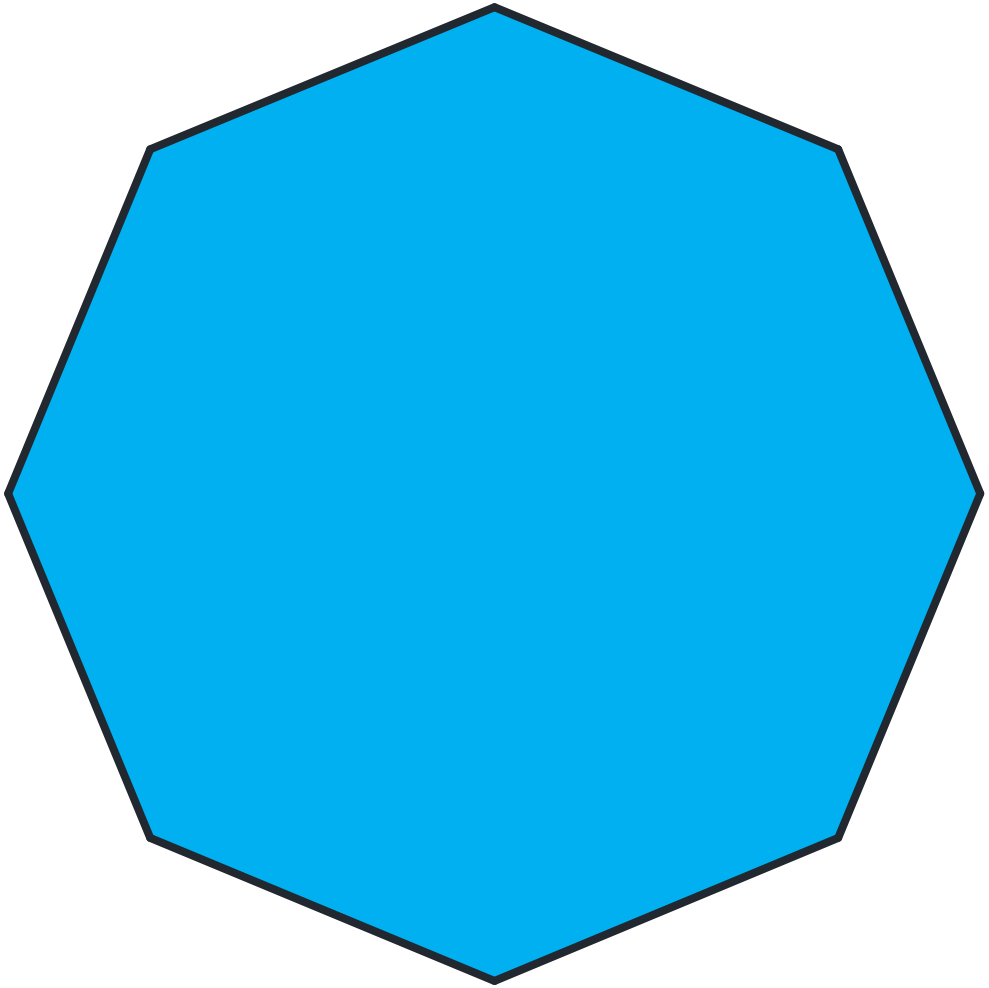
Activity 19



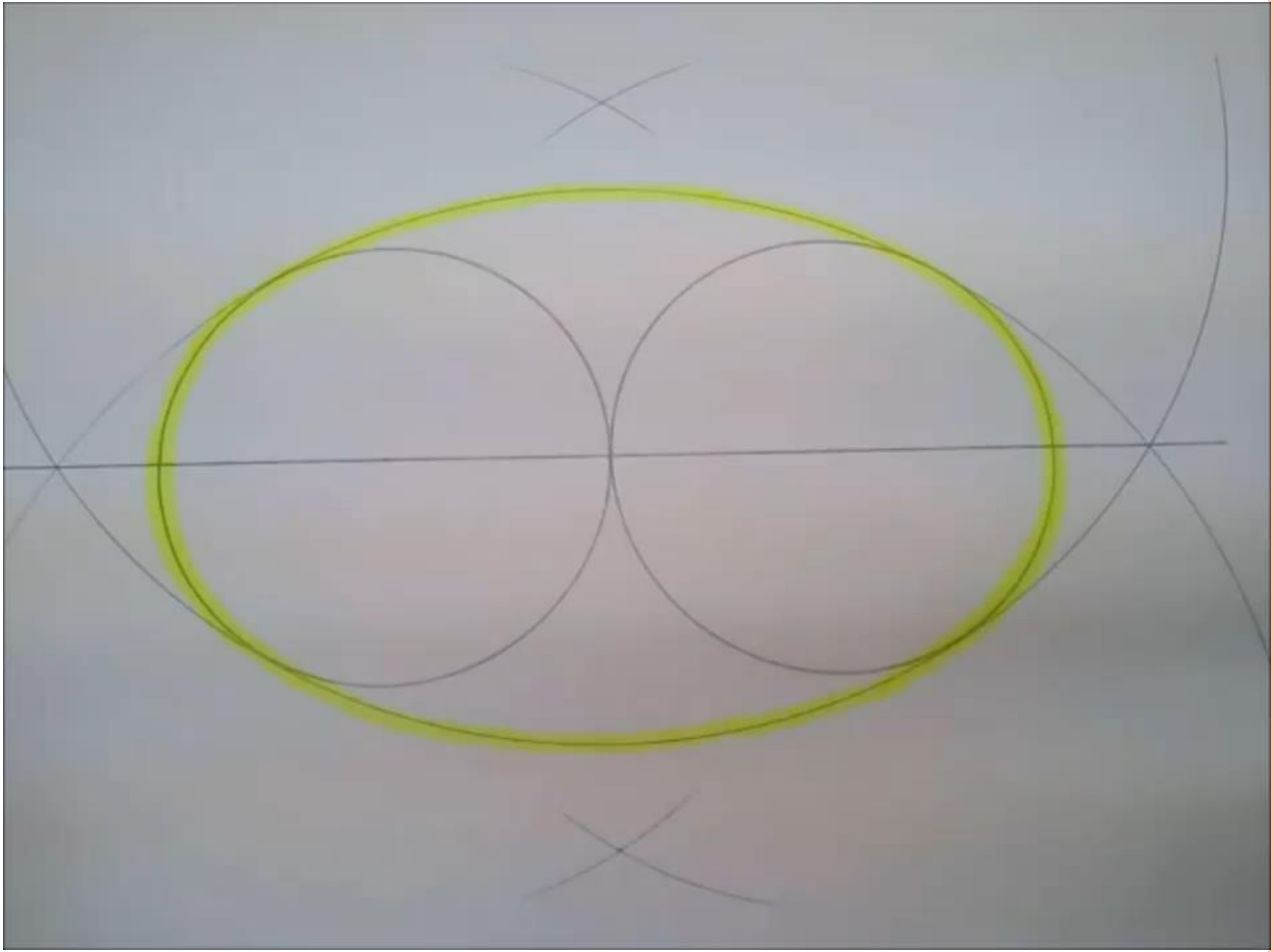
Activity 19



Activity 20



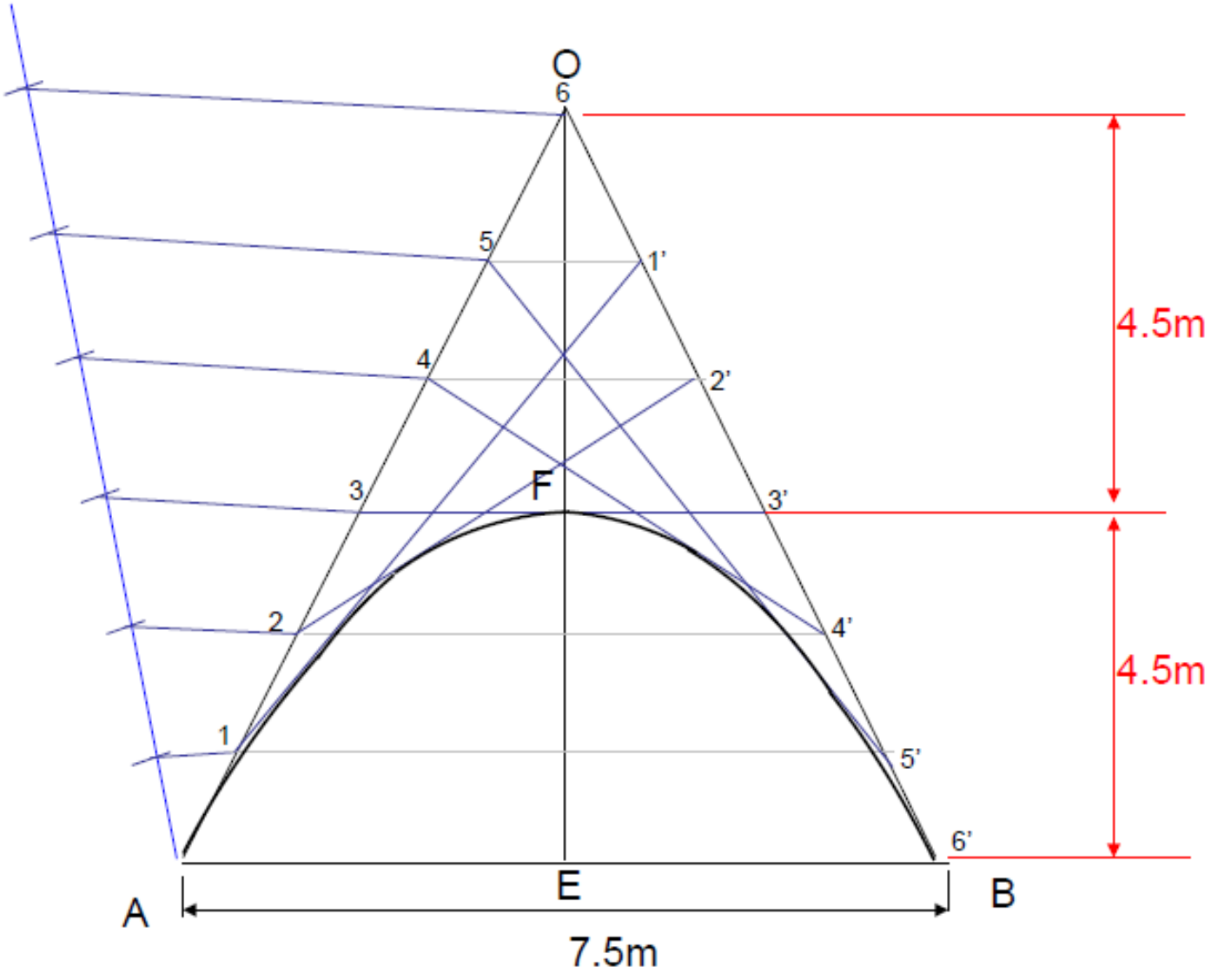
Drawing An Ellipse



Drawing A Parabola

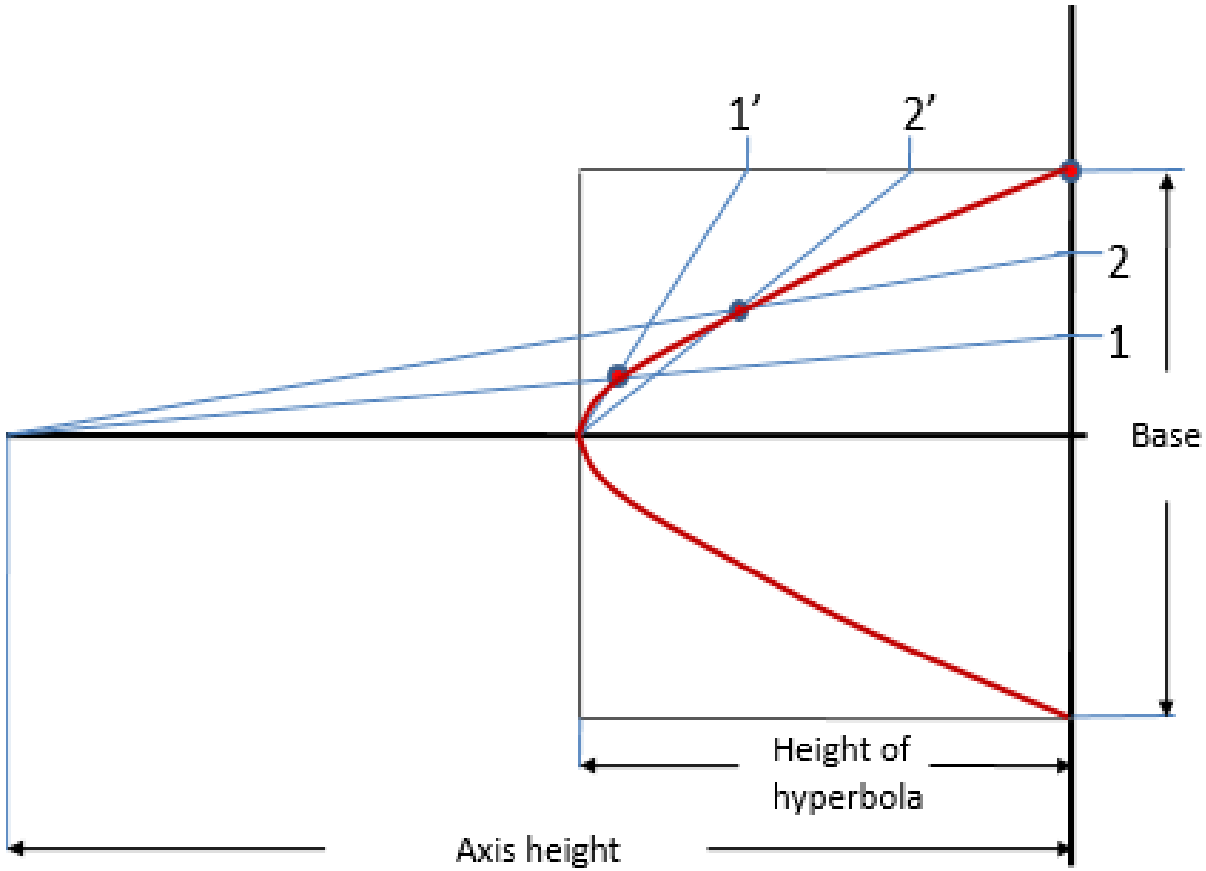
Draw a parabola by tangent method given base 7.5m and axis 4.5m

Take scale 1cm = 0.5m



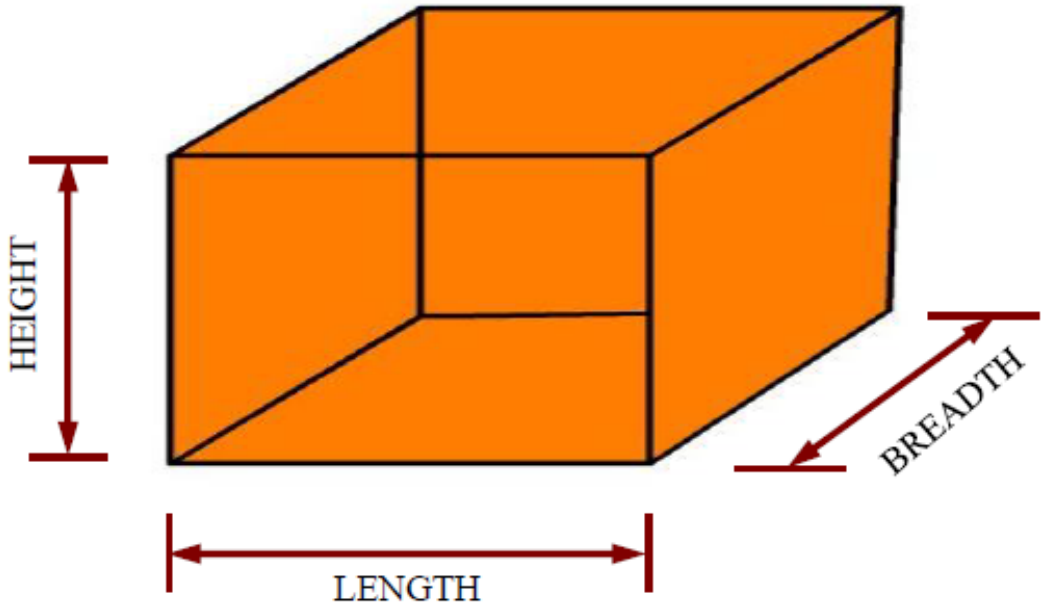
Drawing A Hyperbola

Hyperbola-rectangle method

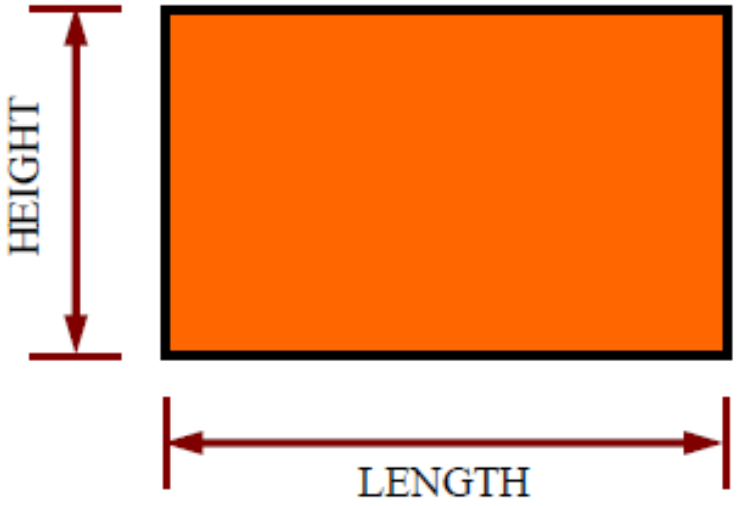


WHAT IS SOLID?

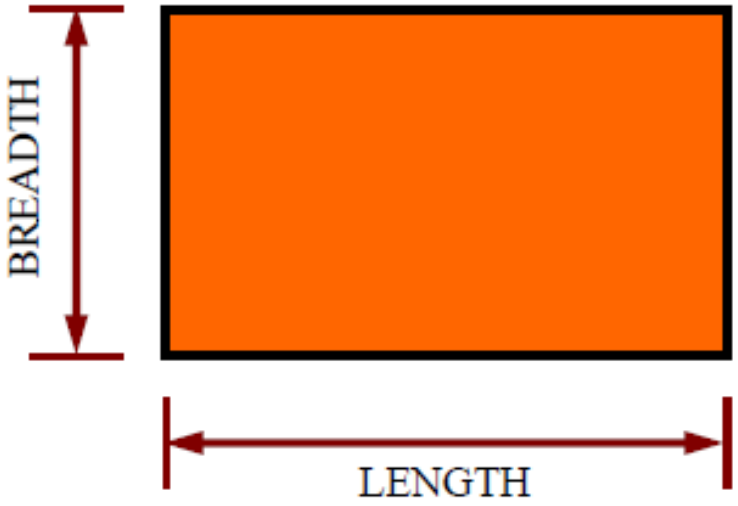
An object having three dimensions, i.e., length, breadth and height or thickness is called a **SOLID**.



WHAT IS FRONT VIEW & TOP VIEW?



FRONT VIEW



TOP VIEW

To represent a solid in the orthographic projection, at least two views are necessary; one view to represent length and height, called **FRONT VIEW** and the other view to represent length and breadth, called **TOP VIEW**.

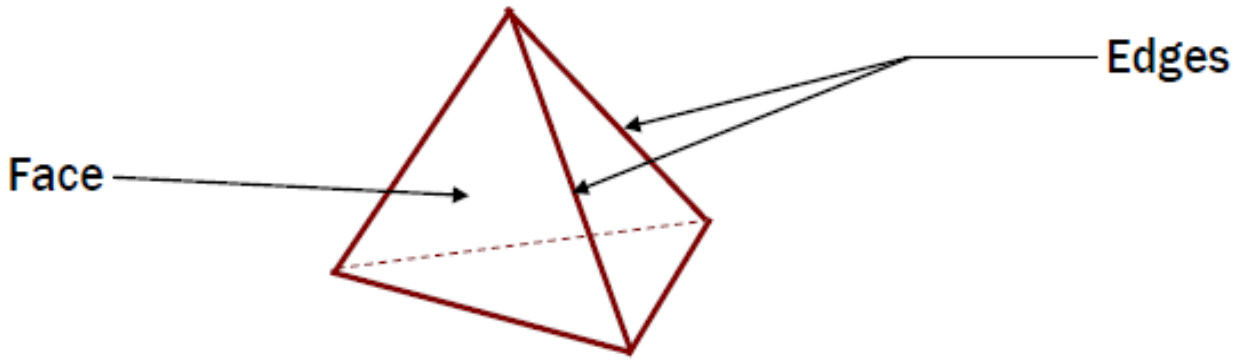
POLYHEDRON

The solid which is bounded by plane surfaces or faces is called **Polyhedron**. The polyhedra are further sub-divided into three groups:

- Regular Polyhedra
- Prisms
- Pyramids

REGULAR POLYHEDRA

A polyhedron is regular if each of its plane surfaces is a **Regular Polygon**. The regular plane surfaces which form the surfaces of the polyhedra are called **Faces**. The lines at which two faces intersect are called **Edges**.

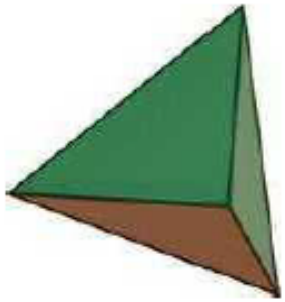


Tetrahedron

TYPES OF POLYHEDRA

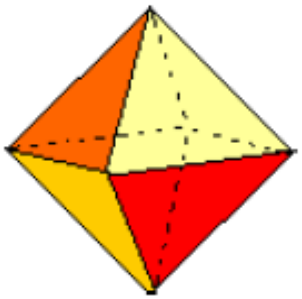
The **Three** important regular polyhedra are:

- Tetrahedron —– 4 equal regular squares
- Cube or Hexahedron — 6 equal regular squares
- Octahedron — 8 equal equilateral triangles



Tetrahedron

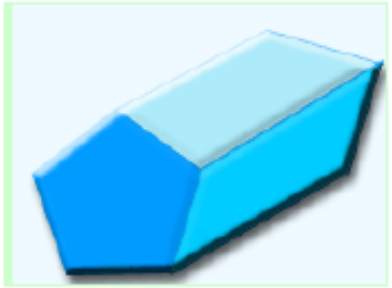
Cube or Hexahedron



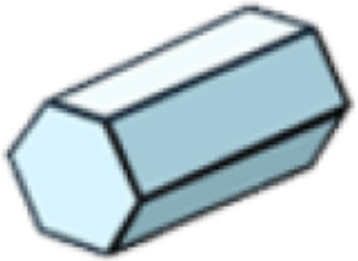
Octahedron

WHAT IS PRISM?

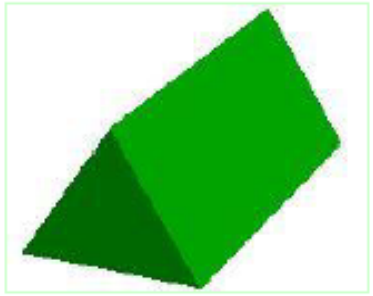
A solid figure whose bases or ends have the same size and shape and are parallel to one another, and each of whose sides is a parallelogram



Pentagonal Prism

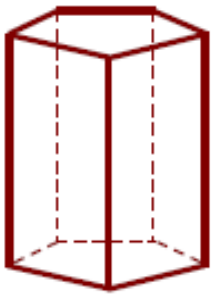


Hexagonal Prism

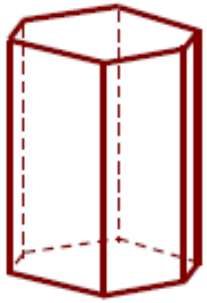


Triangular Prism

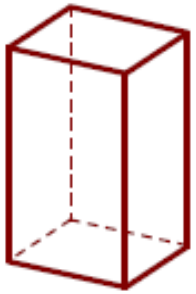
Triangular Prism



Pentagonal Prism



Hexagonal Prism



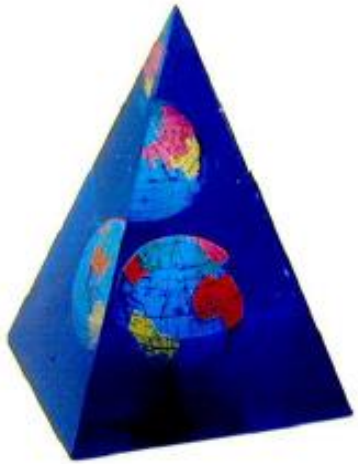
Rectangular Prism

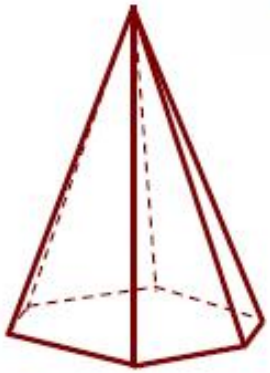
PYRAMID

A massive monument of ancient Egypt having a rectangular base and four triangular faces culminating in a single apex, built over or around a crypt or tomb

WHAT IS PYRAMID?

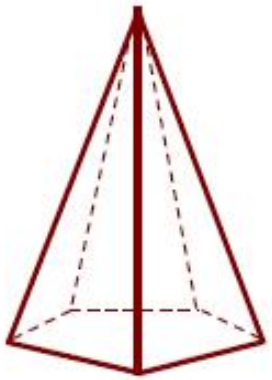
A solid figure with a polygonal base and triangular faces that meet at a common point





Hexagonal Pyramid

Square Pyramid



Pentagonal Pyramid

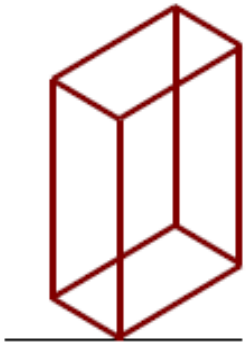
ISOMETRIC PROJECTION

"**Iso**" means '**equal**' and "**metric projection**" means '**a projection to a reduced measure**'. An *isometric projection* is one type of pictorial projection in which the three dimensions of a solid are not only shown in one view, but also their dimension can be scaled from this drawing.

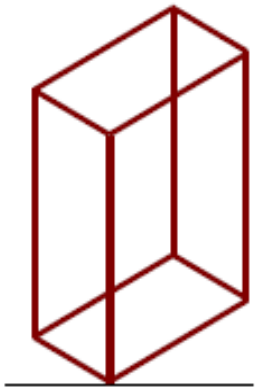
Difference between Isometric Projection & Isometric View

Isometric View	Isometric Projection
Drawn to actual scale	Drawn to isometric scale
When lines are drawn parallel to isometric axes, the true lengths are laid off.	When lines are drawn parallel to isometric axes, the lengths are foreshortened to 0.81 time the actual lengths.

ORTHOGRAPHIC PROJECTION

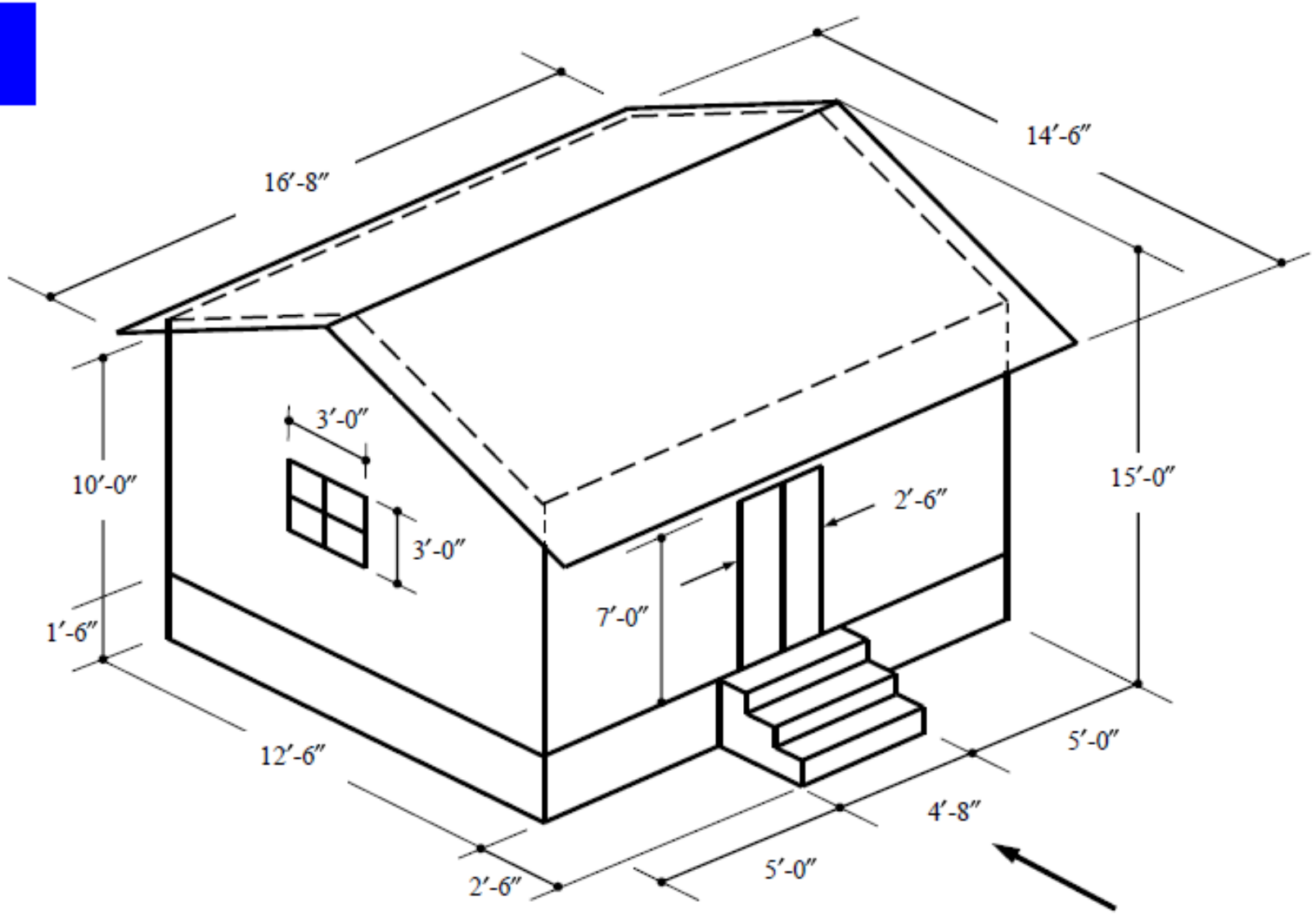


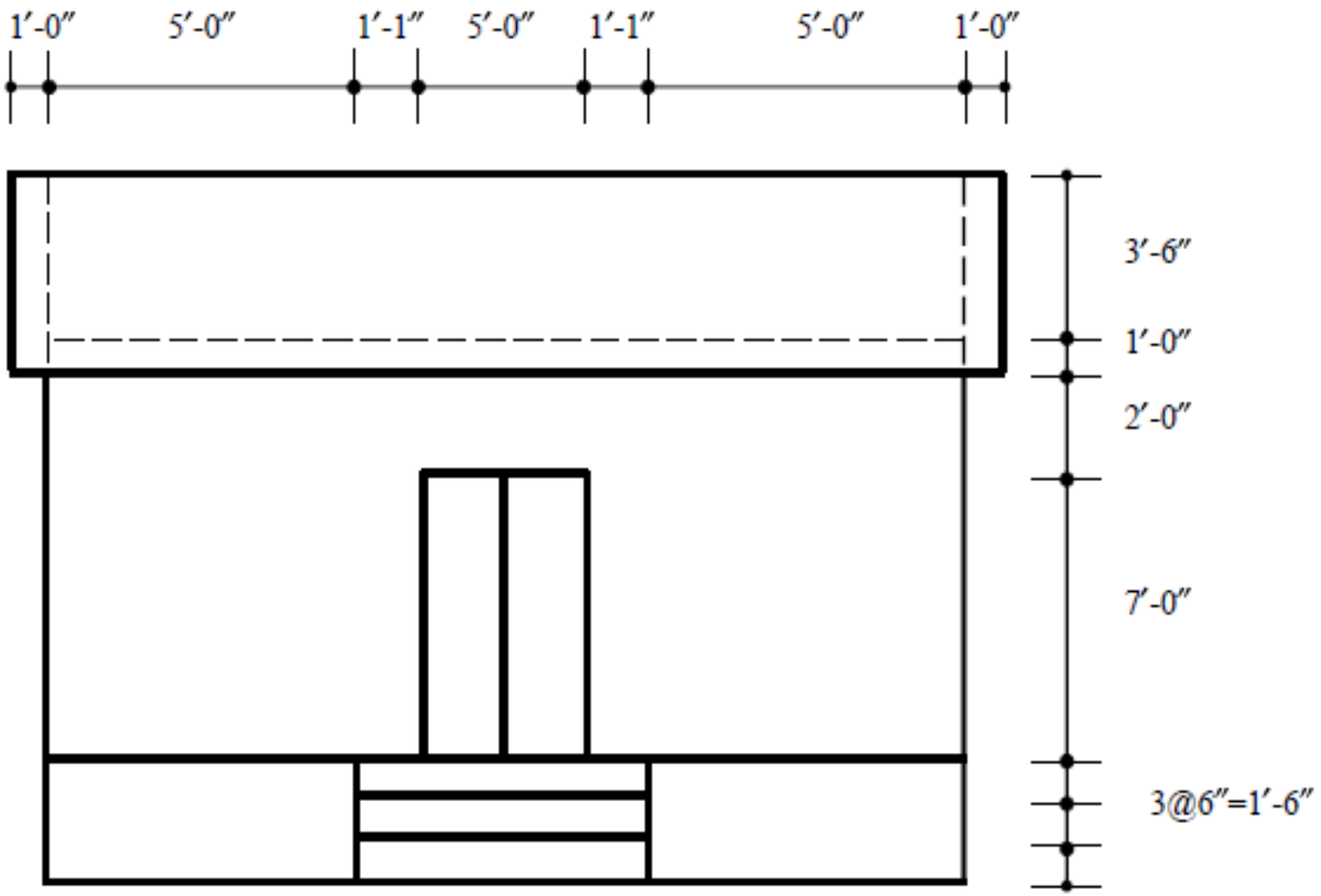
ISOMETRIC PROJECTION



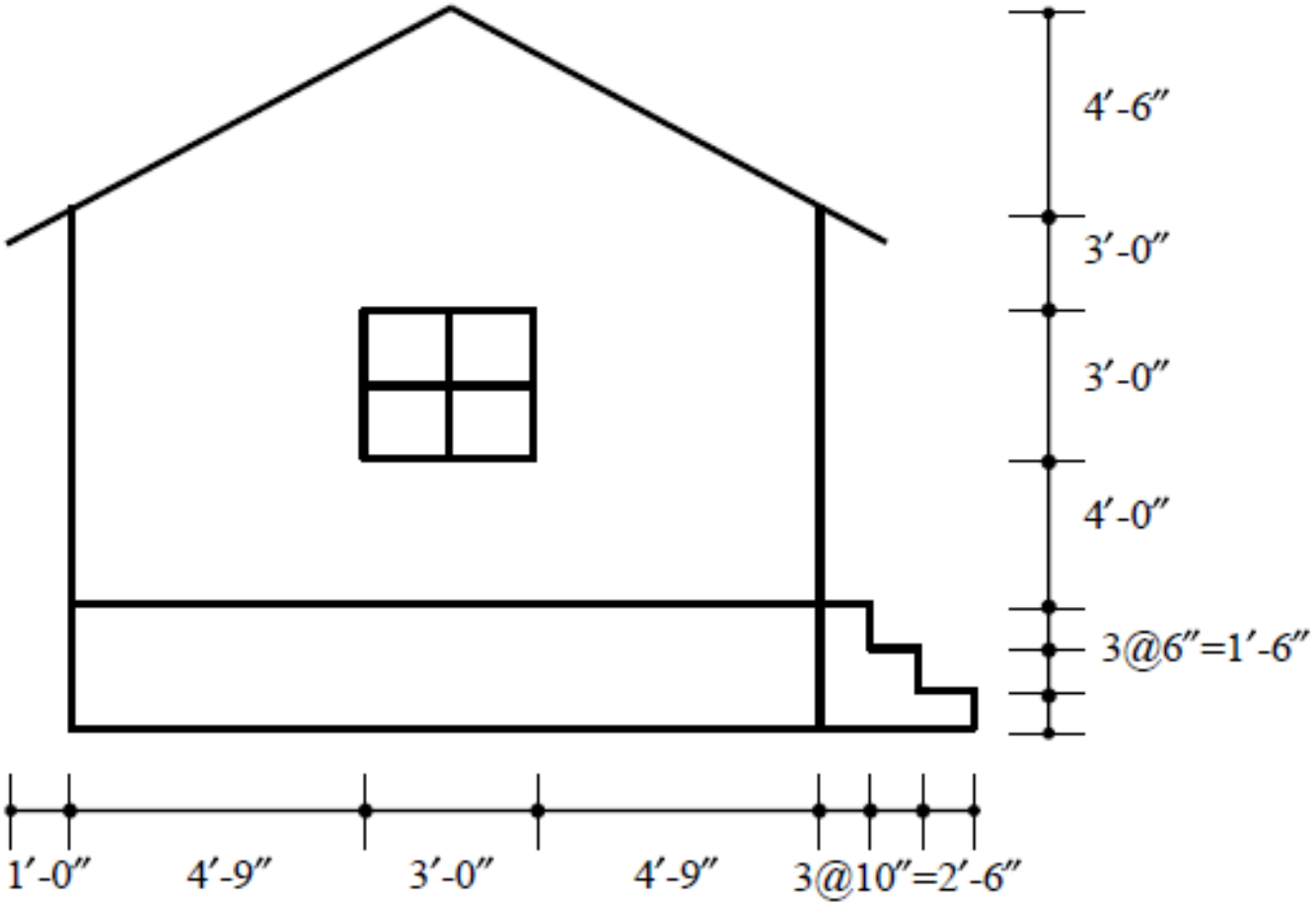
ISOMETRIC VIEW

7





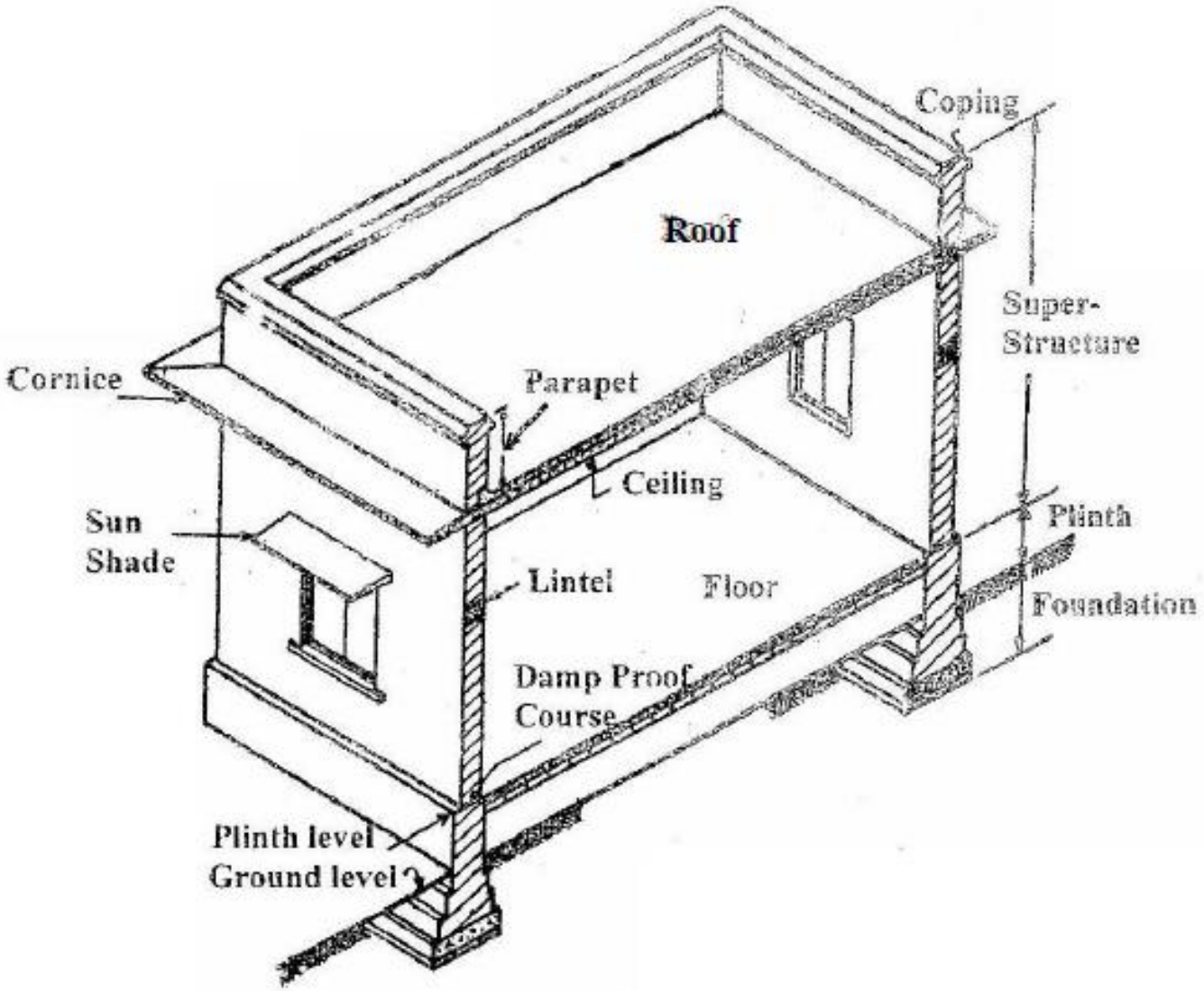
FRONT VIEW



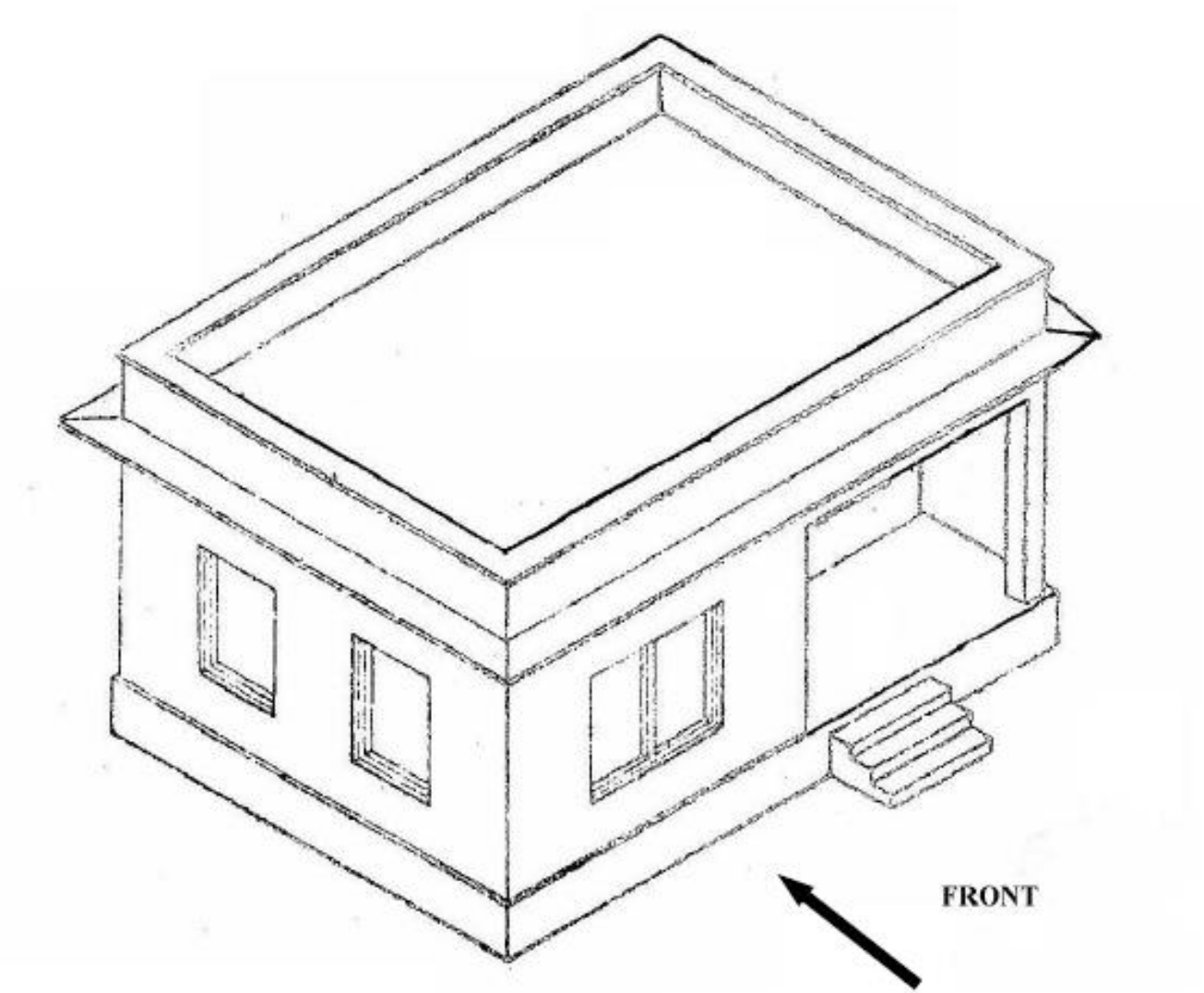
LEFT VIEW

Introduction To Plan, Elevation And Section

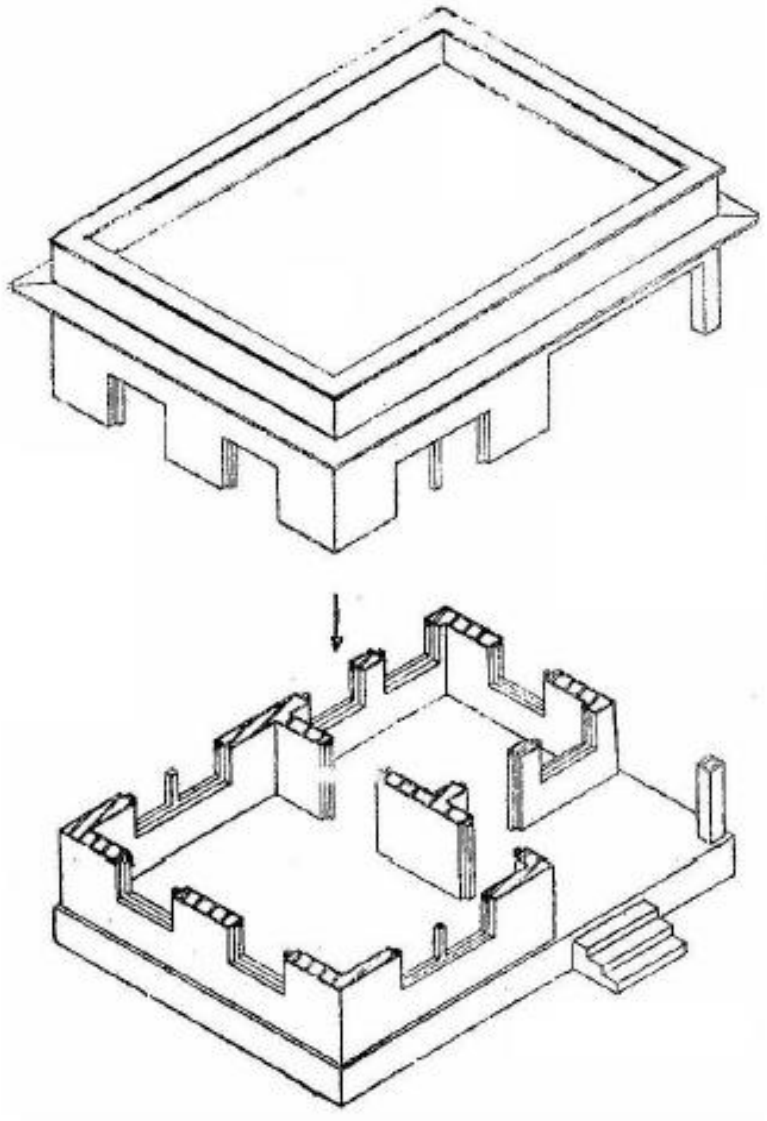
Main Parts of a One Storied Building



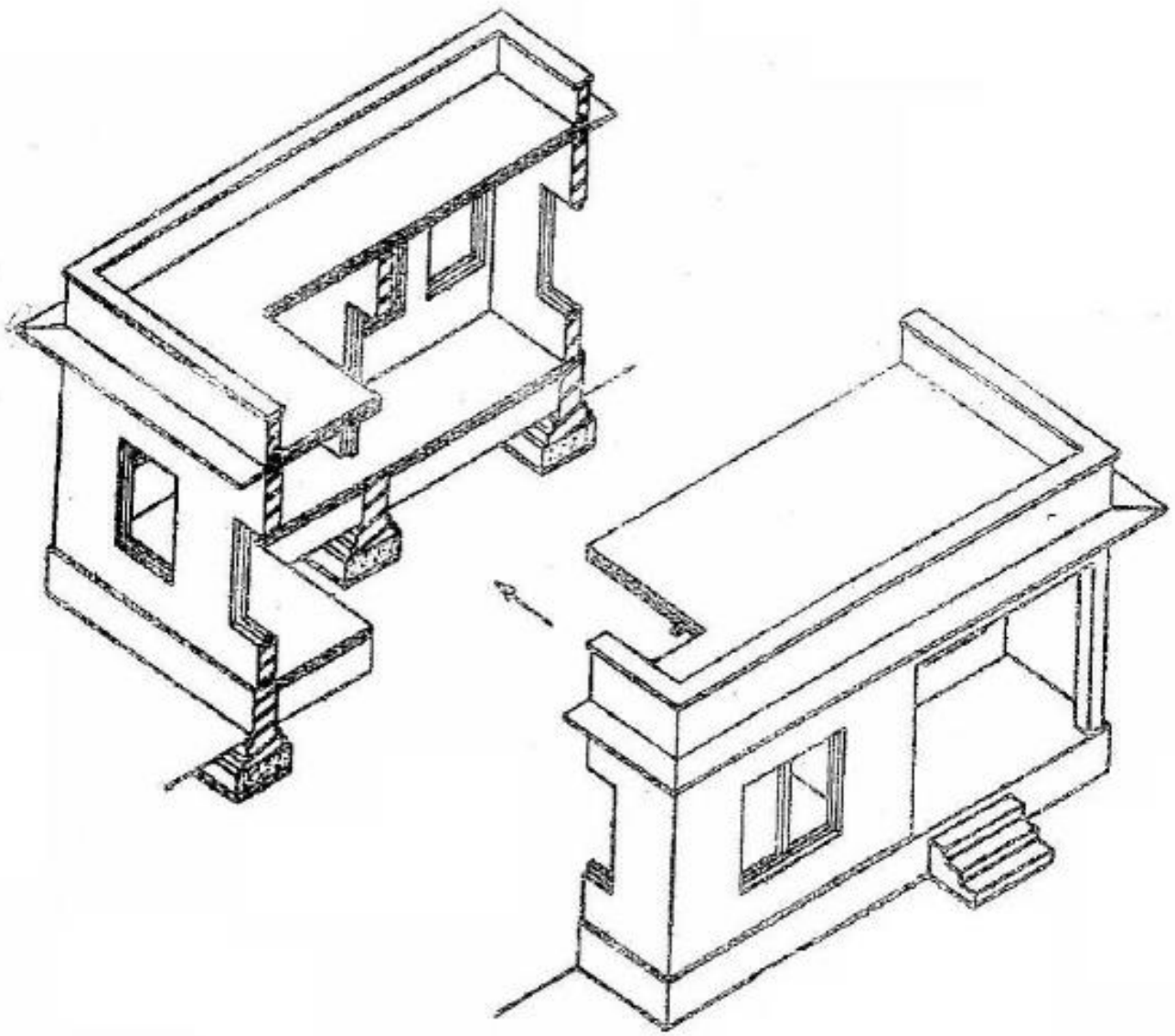
Isometric view of a One Storied Building



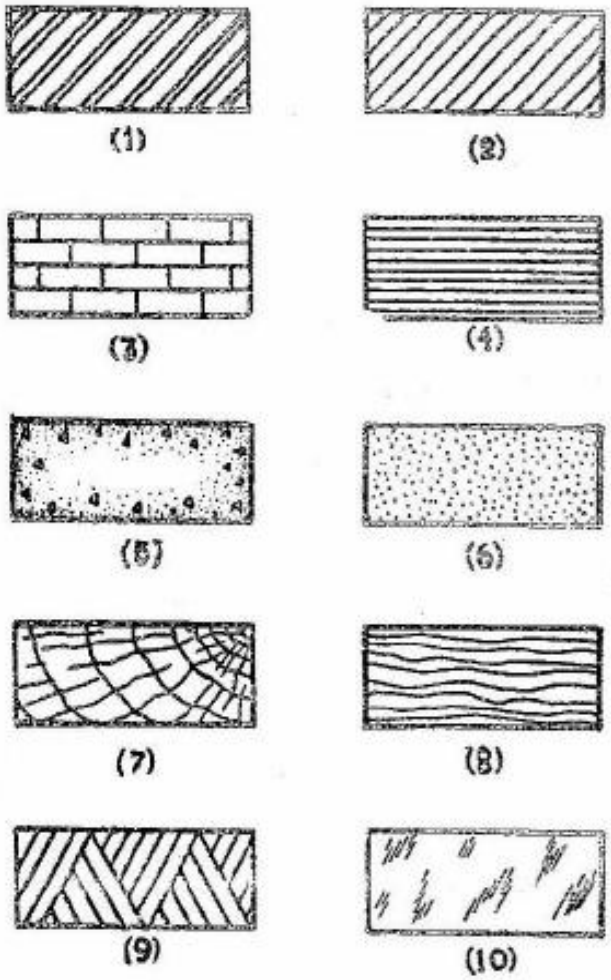
A horizontal section is cut at the mid height of the windows, to get the plan of the building



A vertical section is cut to get the Front Sectional Elevation



Sign Conventions



(1) or (2) Masonry Section
Used in Elevation

(3) or (4) Masonry Pointing
Used in Elevation

(5) Concrete Section
Used in Plan or Elevation

(6) Plaster or brick concrete section
Used in Plan or Elevation

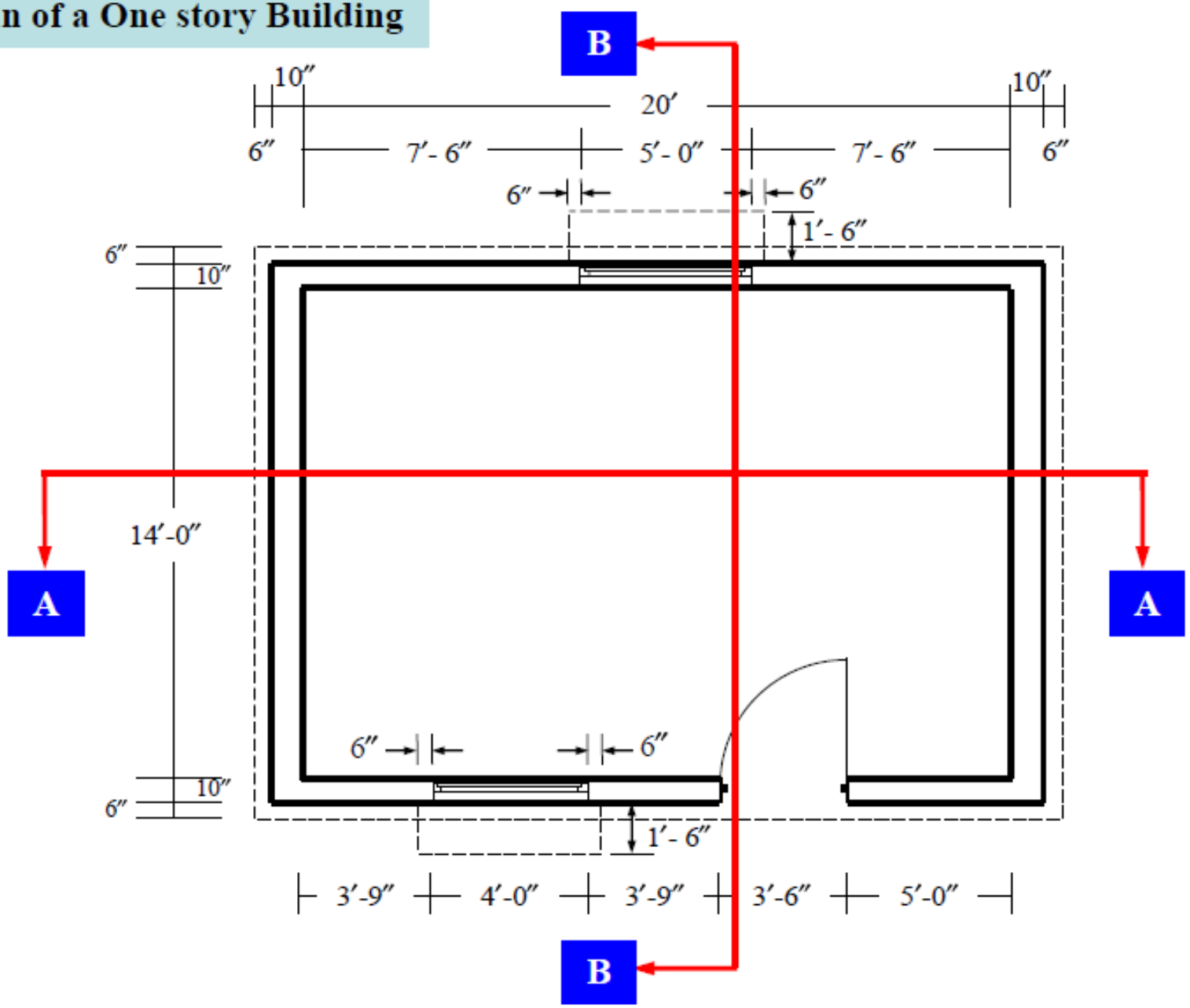
(7) Wood Section, having the section at right angle of the fiber
Used in Plan or Elevation

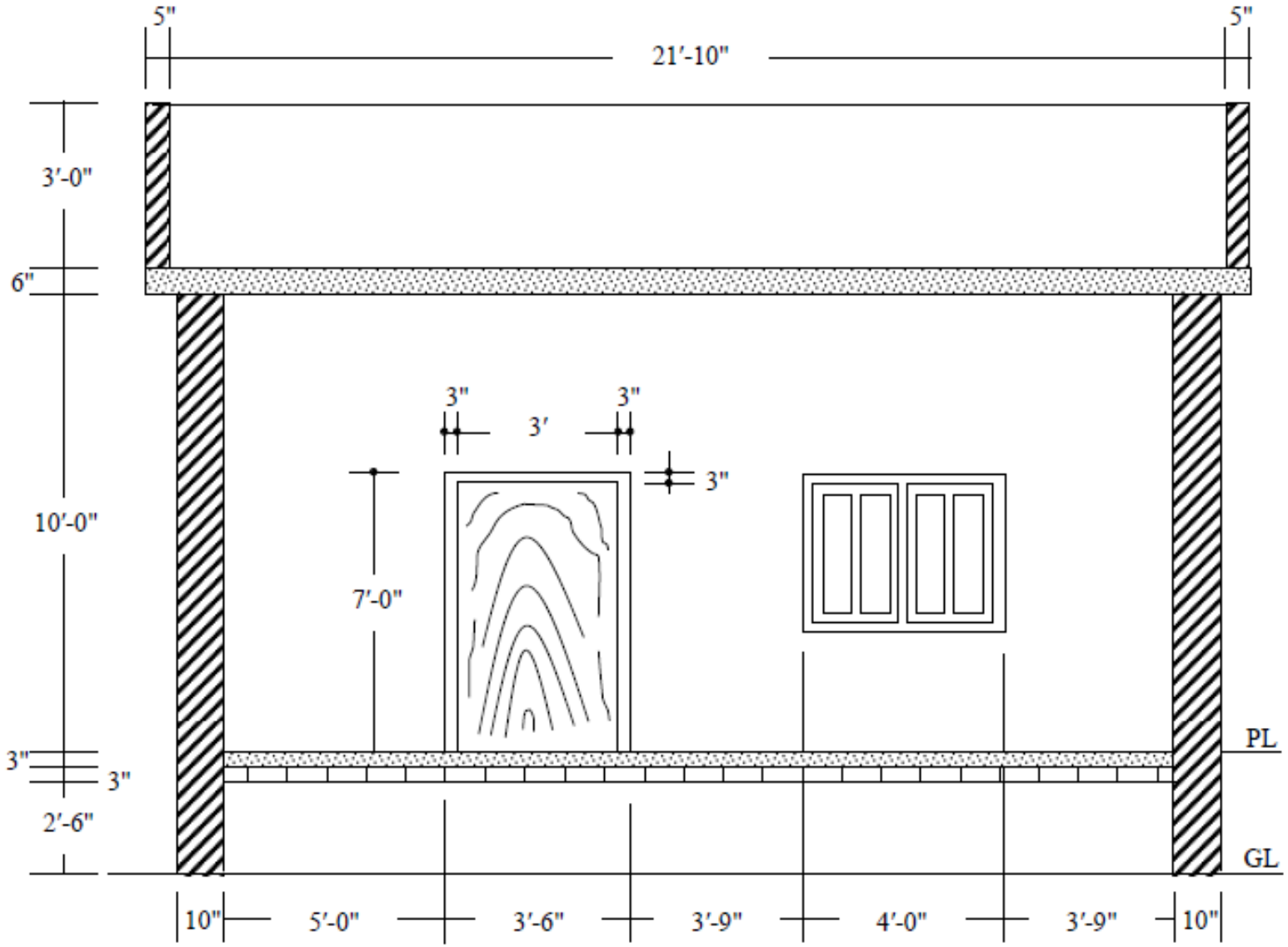
(8) Wood Section taken along the length of the fiber
Used in Plan or Elevation

(9) Soil
Used in Elevation

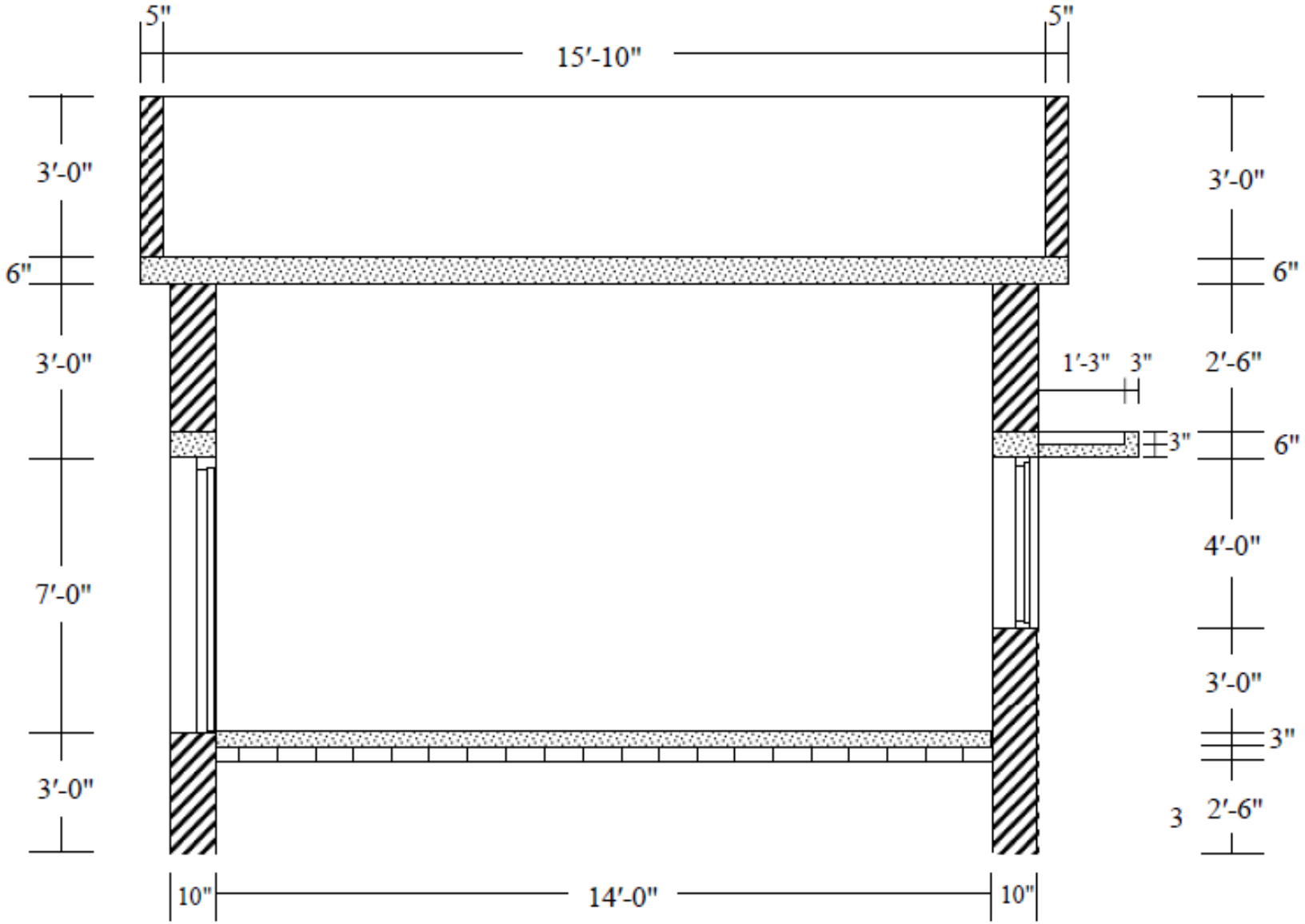
(10) Glass
Used in Elevation

Plan of a One story Building



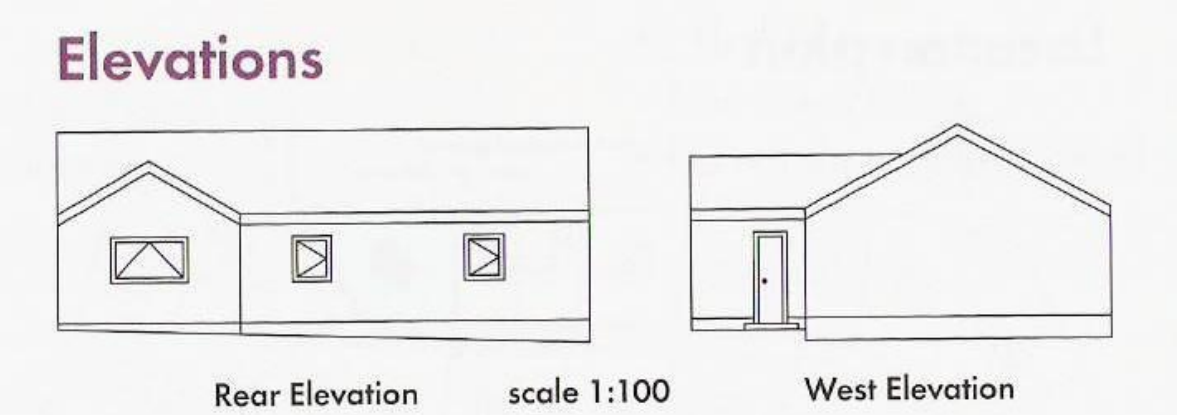


Section A-A



Section B-B

Elevations



Elevations are orthographic views of the outside of the building that enable clients and customers to see what the finished building will look like.

Elevations show:

- The style of the building
- The external proportions of the building
- The external features of the building; windows styles and wall finishes.
- The type of roof
- The position of the doors and windows from the ouside.

The scale of an elevation is normally **1:100** or **1:50**

THANKS TO ALL