Drawing Project

Syllabus

- Introduction, Scale drawing, Isometric views, Orthographic view, Missing line, Sectional view, Auxiliary view, Project on Engineering Drawingand CAD using AutoCAD or contemporary packages instructed by the teachers.

Course Plan

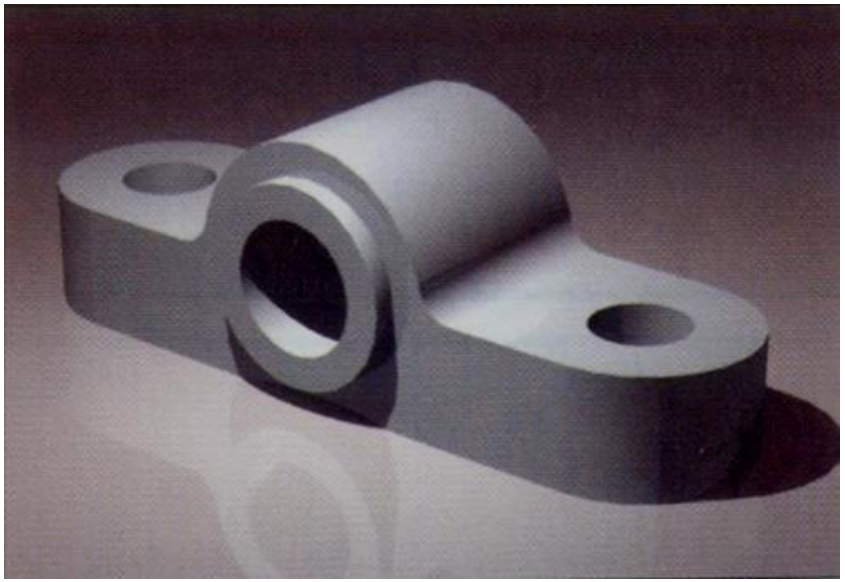
Week	Topics
1	Introduction
2-6	Orthographic Projection
7-12	Isometric Projection
13	Final Drawing (Paper)

GRAPHICS LANGUAGE

Effectiveness of Graphics Language

1. Try to write a description of this object.

2. Test your written description by having someone attempt to make a sketch from your description.



You can easily understand that …

The word languages are <u>inadequate</u> for describing the ***size***, ***shape*** and ***features*** completely as well as concisely.

Composition of Graphic Language

Graphic language in **"engineering application"** use ***lines*** to represent the ***surfaces***, ***edges*** and ***contours*** of objects.

The language is known as"***drawing***"or "***drafting***" .

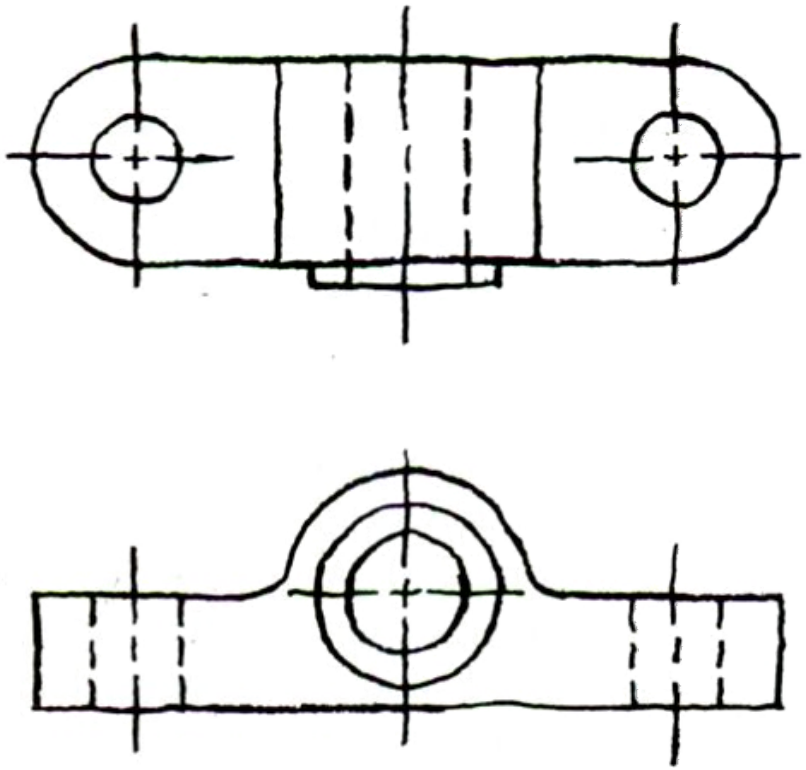
A drawing can be done using ***freehand***,

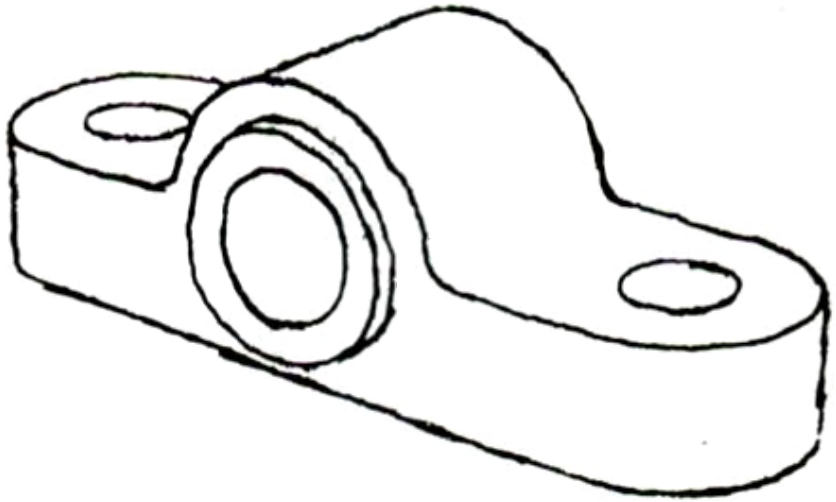
instruments or ***computer*** methods.

Freehand drawing

The lines are sketched without using instruments other than pencils and erasers.

Example

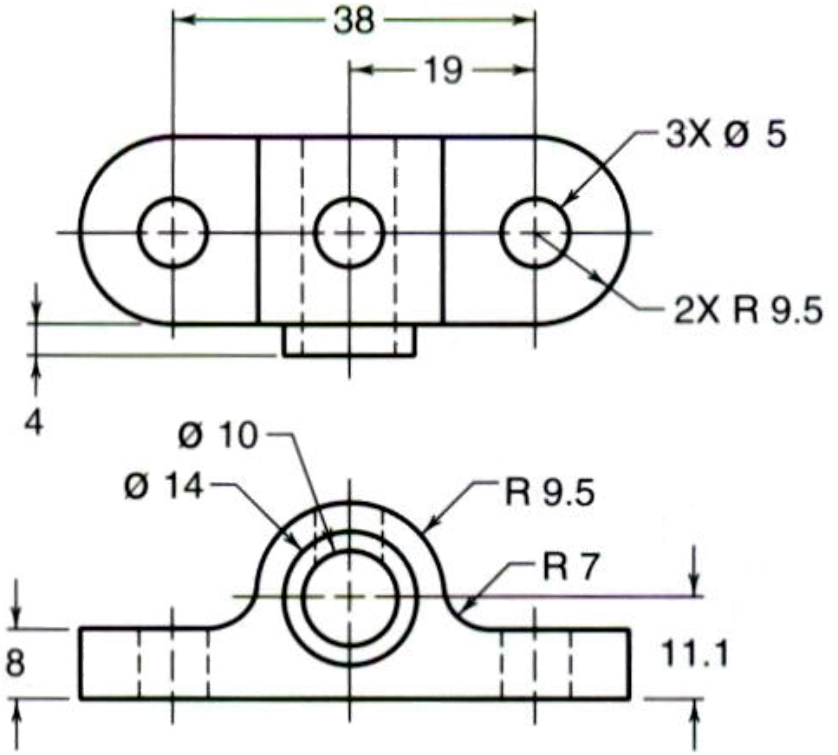




Instrument drawing

Instruments are used to draw straight lines, circles, and curves concisely and accurately. Thus, the drawings are usually made to scale.

Example



Computer drawing

The drawings are usually made by commercial software such as AutoCAD, solid works etc.

Example

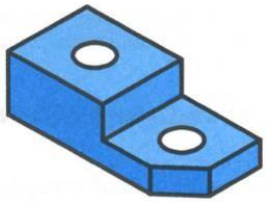
Engineering Drawing

Introduction

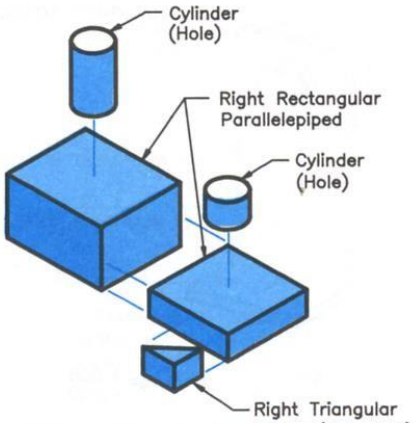
- An **engineering drawing** is a type of technical drawing, used to fully and clearly define requirements for engineered items, and is usually created in accordance with standardized conventions forlayout, nomenclature, interpretation, appearance size, etc.
- Its purpose is to accurately and unambiguously capture all the geometric features of a product or a component.
- The end goal of an engineering drawing is to convey all the required information that will allow a manufacturer to produce that component.

Purpose of an Engineering Drawing

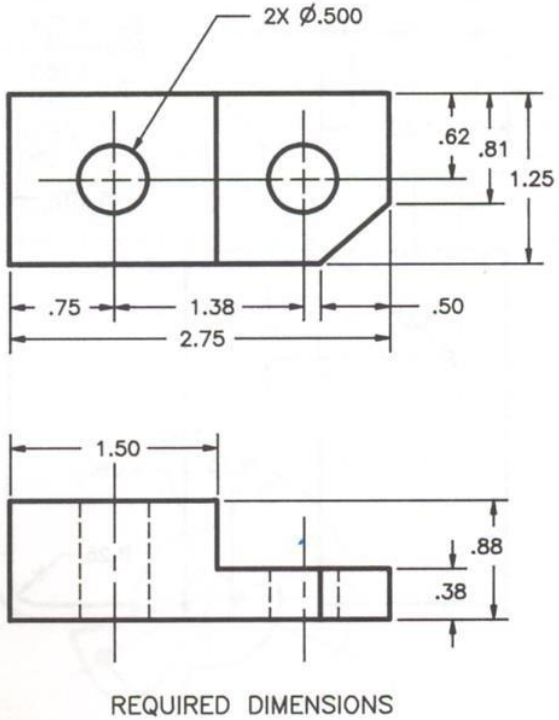
1. An engineering drawing is not an illustration.
2. It is a specification of the size and shape of a part or assembly.
3. The important information on a drawing is the dimension and tolerance of all of its features.



STEP BLOCK



GEOMETRIC COMPOSITION



REQUIRED DIMENSIONS

Figure 3-23. Mentally breaking a part into the geometric shapes that form the part is one method for determining the dimensions needed on a drawing.

Elements of Engineering Drawing

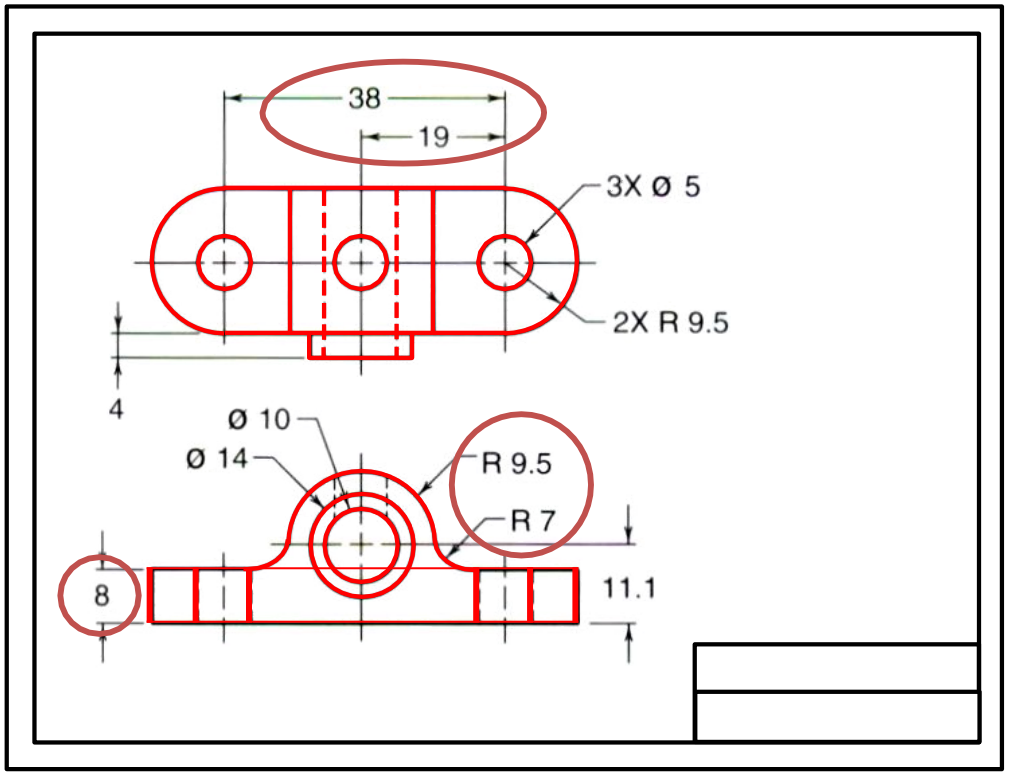
Engineering drawing are made up of ***graphics language*** and ***word language***.

Graphics language

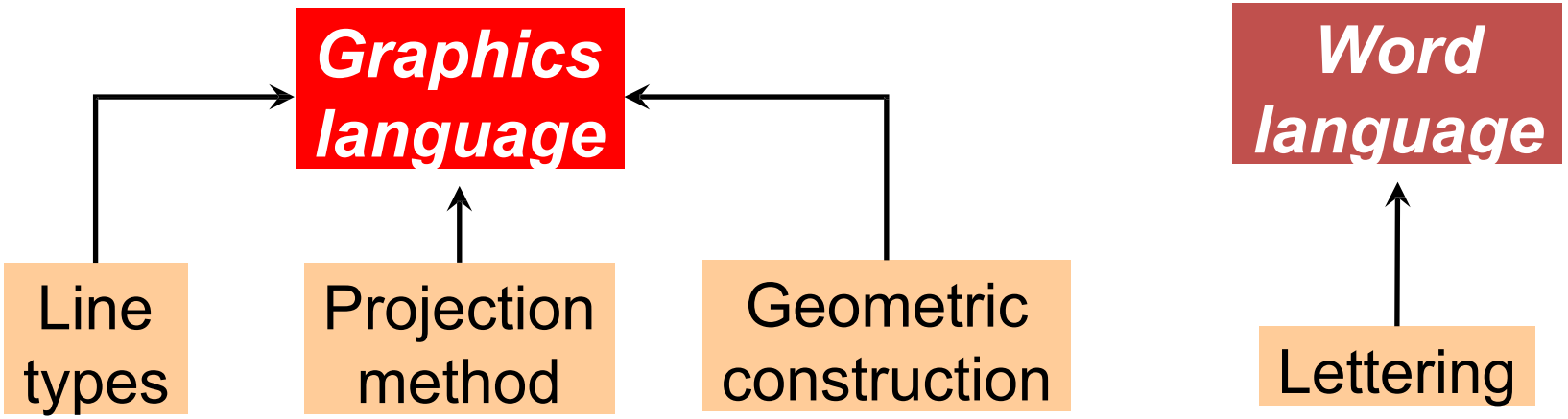
Describe a shape (mainly).

Word language

Describe size, location and specification of the object.



Basic Knowledge for Drafting



Drawing Standard

Introduction

Standards are set of rules that govern how technical drawings are represented.

- Drawing standards are used so that drawings convey the same meaning to everyone who reads them.

Standard Code

Country	Code	Full name
USA	ANSI	American National Standard Institute
Japan	JIS	Japanese Industrial Standard
UK	BS	British Standard
Australia	AS	Australian Standard
Germany	DIN	Deutsches Institut für Normung
	ISO	International Standards Organization

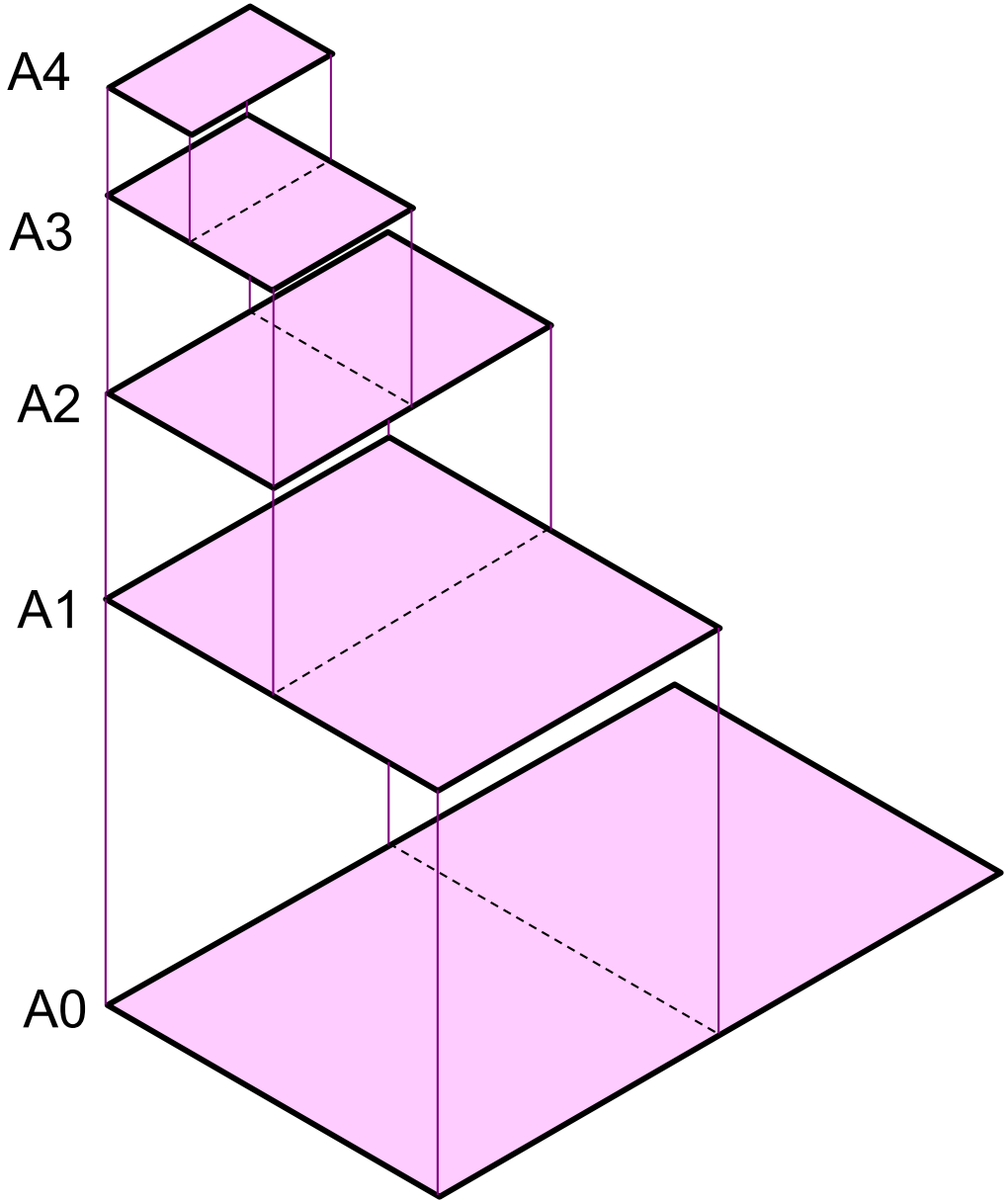
Drawing Sheet

- Trimmed paper of a size A0 ~ A4.

- Standard sheet size (**JIS**)

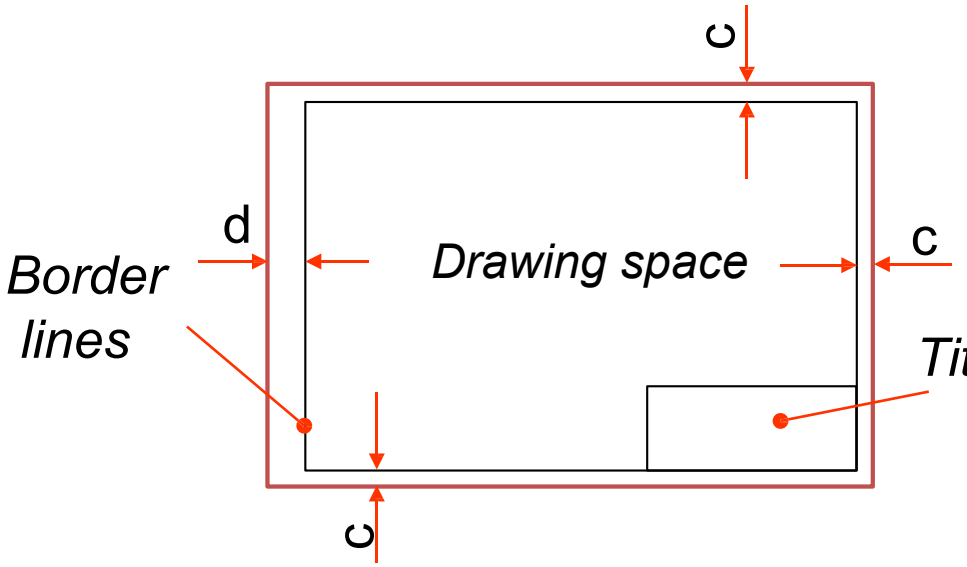
A4	210 x 297
A3	297 x 420
A2	420 x 594
A1	594 x 841
A0	841 x 1189

(Dimensions in millimeters)

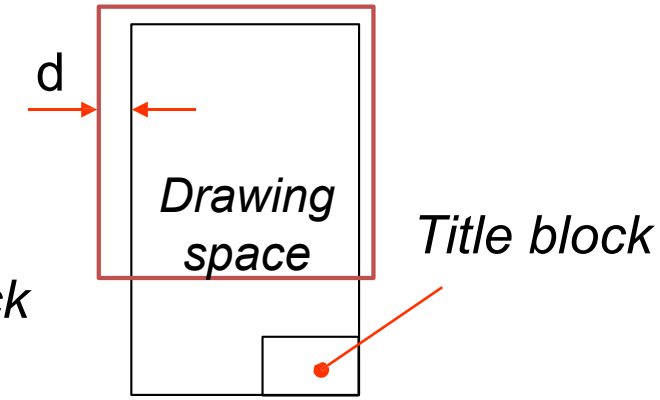


Orientation of drawing sheet

1. Type X (A0~A4)



2. Type Y (A4 only)



Sheet size	c (min)	d (min)
A4	10	25
A3	10	25
A2	10	25
A1	20	25
A0	20	25

Drawing Scales

- Designation of a scale consists of the word "SCALE" followed by the indication of its ratio, as follow

SCALE 1:1	for full size	
SCALE **X**:1	for ***enlargement*** scales	(X > 1)
SCALE 1:**X**	for ***reduction*** scales	(X > 1)

- Dimension numbers shown in the drawing are correspond to "true size" of the object and they are independent of the scale used in creating that drawing.

Basic Line Types

Types of Lines	Appearance	Name according to application
Continuous thick line		Visible line
Continuous thin line		Dimension line Extension line Leader line
Dash thick line		Hidden line
Chain thin line		Center line

NOTE : We will learn other types of line in later chapters.

Meaning of Lines

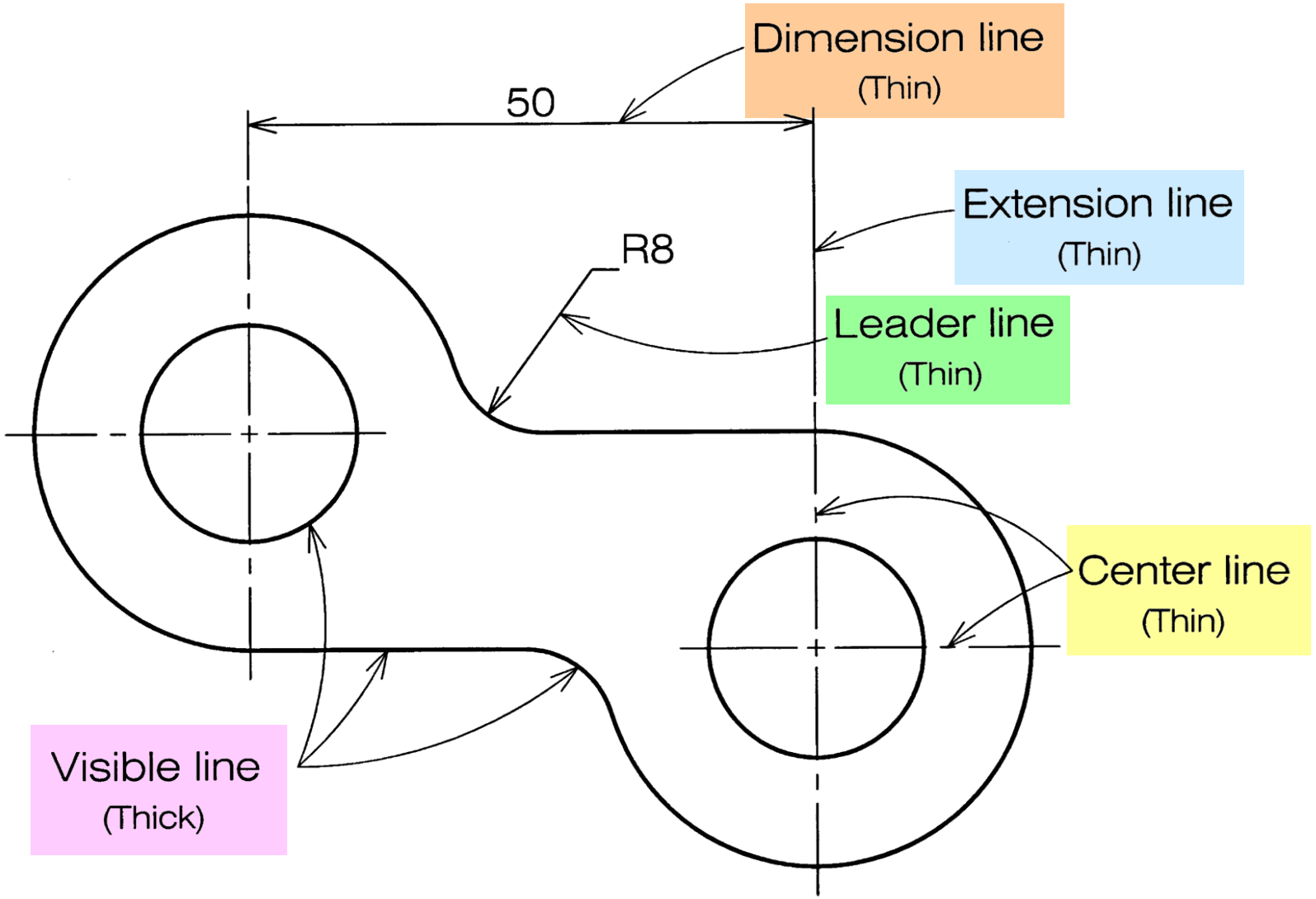
Visible lines represent features that can be seen in the current view

Hidden lines represent features that can not be seen in the current view

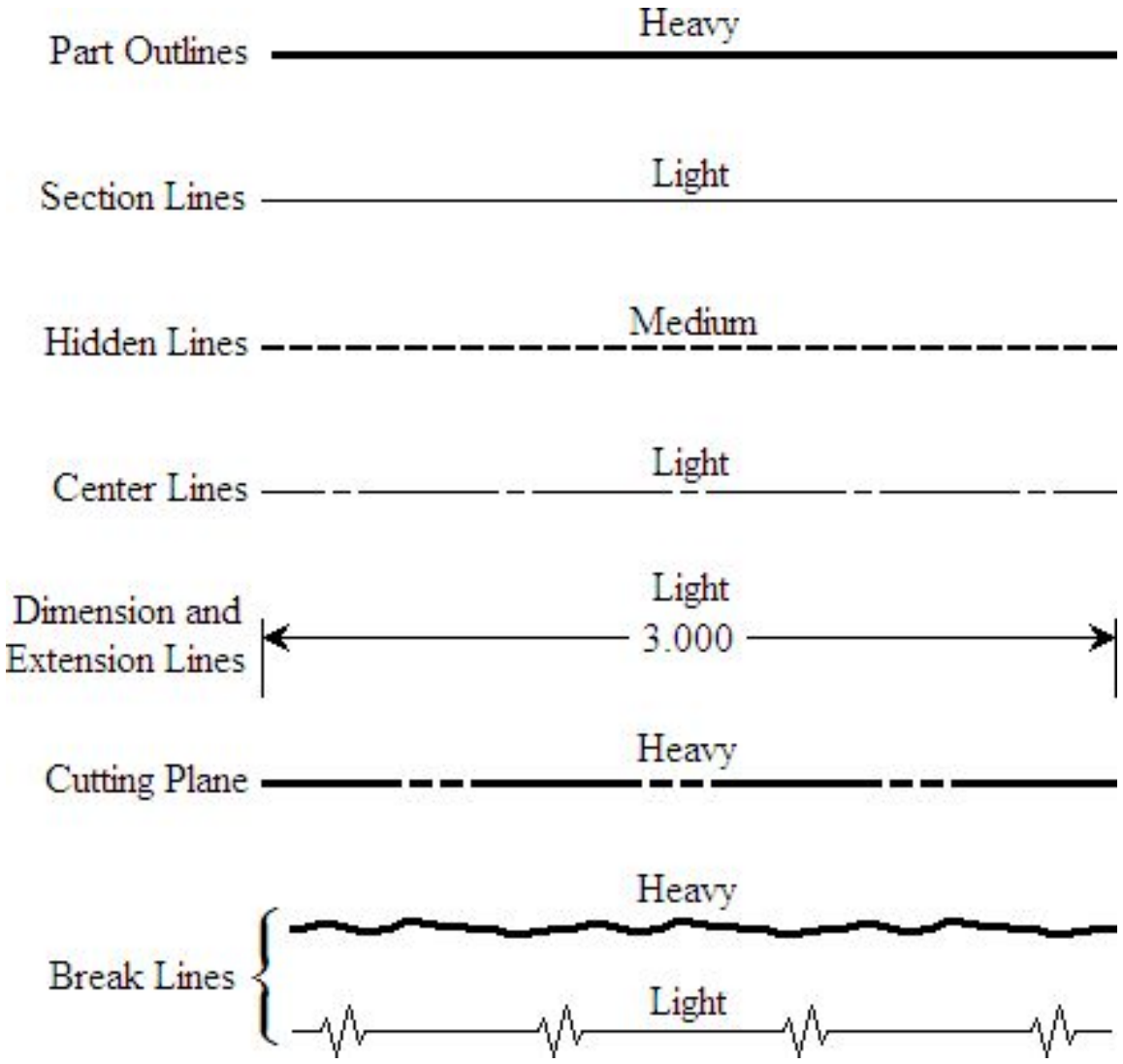
Center line represents symmetry, path of motion, centers of circles, axis of axisymmetrical parts

Dimension and Extension lines indicate the sizes and location of features on a drawing

Example : *Line conventions in engineering drawing*

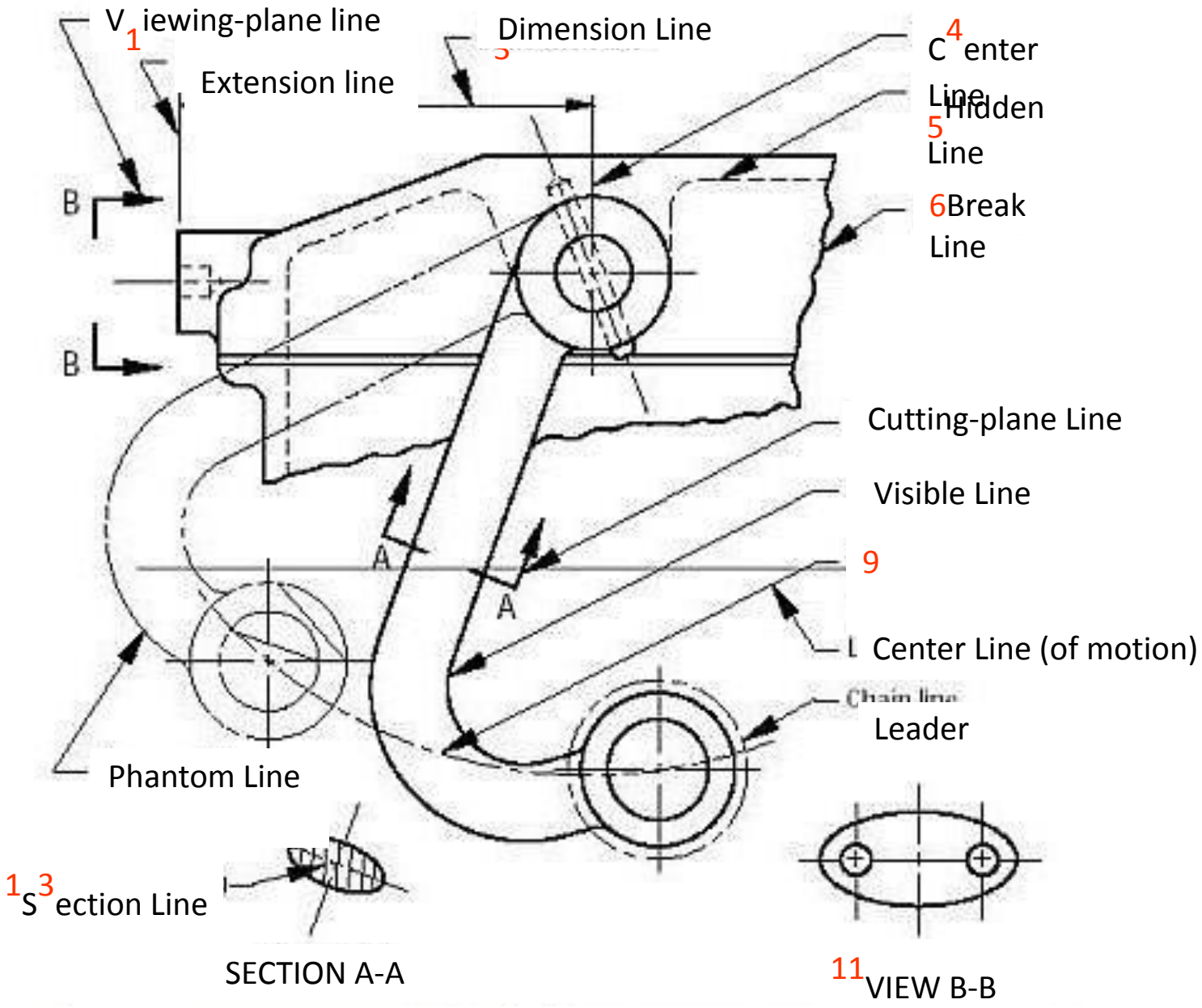


Types of Line



Line Conventions

- Visible Lines – solid thick lines that represent visible edges or contours
- Hidden Lines – short evenly spaced dashes that depict hidden features
- Section Lines – solid thin lines that indicate cut surfaces
- Center Lines – alternating long and short dashes
- Dimensioning
  - Dimension Lines - solid thin lines showing dimension extent/direction
  - Extension Lines - solid thin lines showing point or line to which dimension applies
  - Leaders – direct notes, dimensions, symbols, part numbers, etc. to features on drawing
- Cutting-Plane and Viewing-Plane Lines – indicate location of cutting planes for sectional views and the viewing position for removed partial views
- Break Lines – indicate only portion of object is drawn. May be random “squiggled” line or thin dashes joined by zigzags.
- Phantom Lines – long thin dashes separated by pairs of short dashes indicate alternate positions of moving parts, adjacent position of related parts and repeated detail
- Chain Line – Lines or surfaces with special requirements

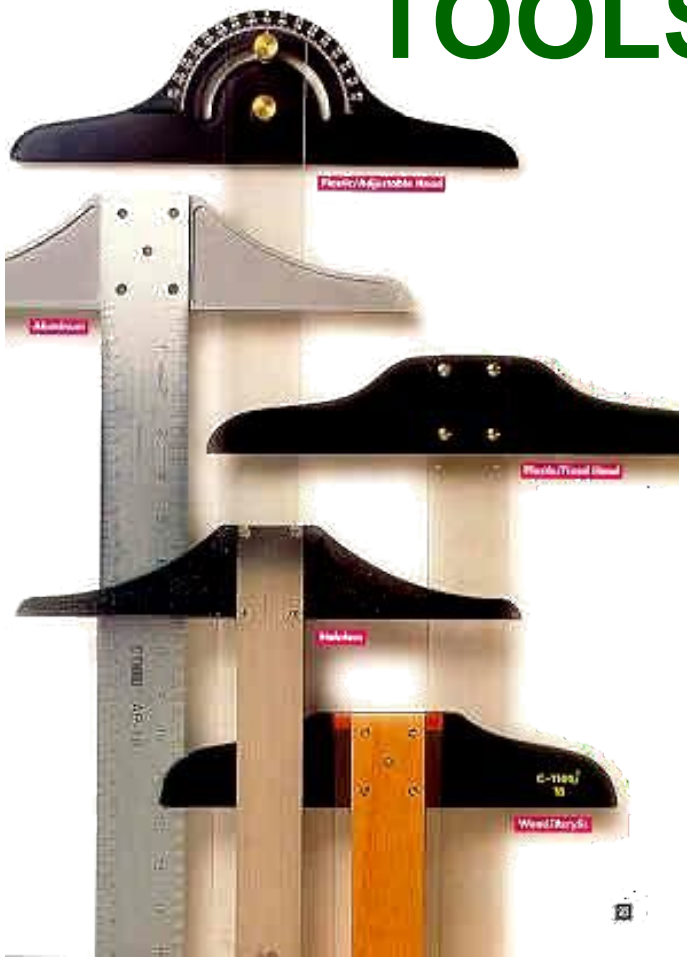

1 Viewing-plane line
Extension line
3 Dimension Line
4 Center Line
5 Hidden Line
6 Break Line
B
B
Cutting-plane Line
Visible Line
9
A
A
Center Line (of motion)
Leader
Phantom Line
1 3 Section Line
SECTION A-A
11 VIEW B-B

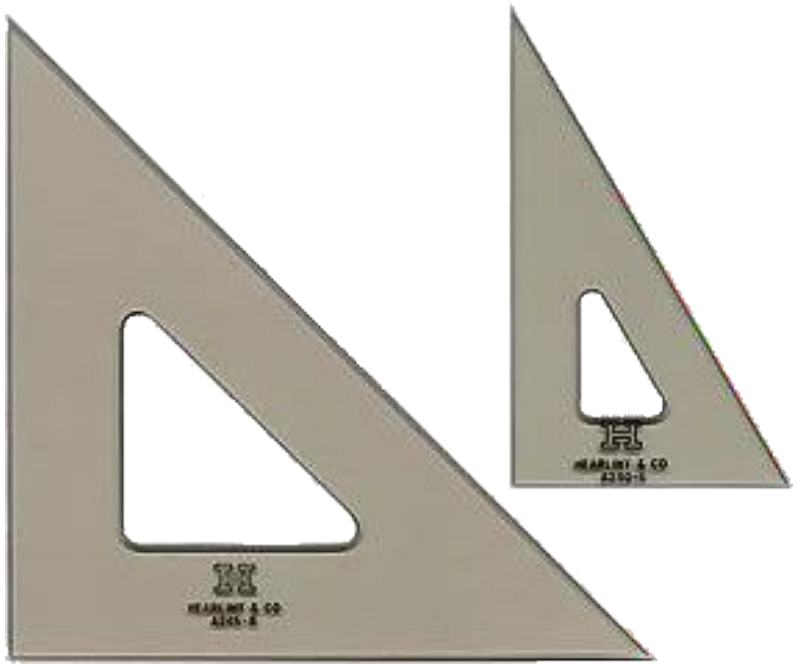
Traditional Drawing Tools

Tools

DRAWING TOOLS

DRAWING TOOLS





1. T-Square

2. Triangles

DRAWING TOOLS

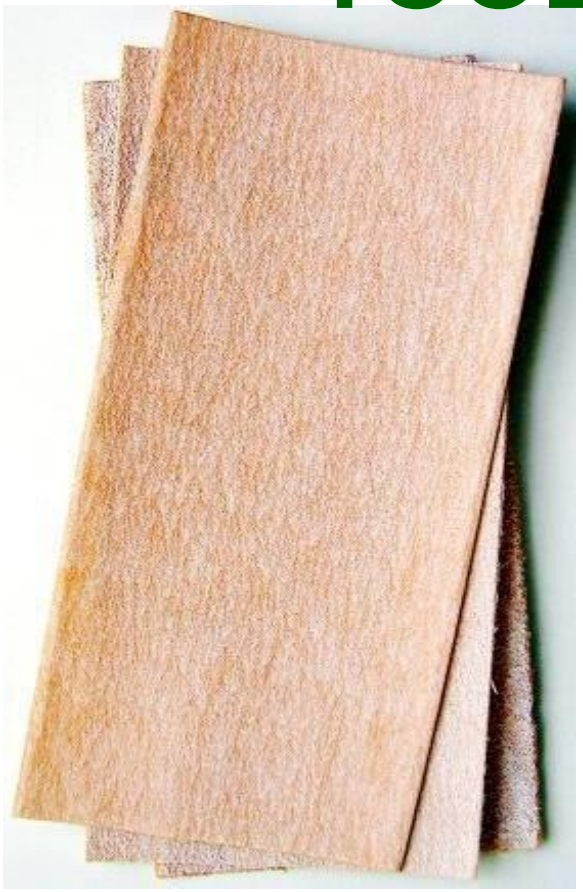
3. Adhesive Tape

2H or HB for thick line

4H for thin line

4. Pencils

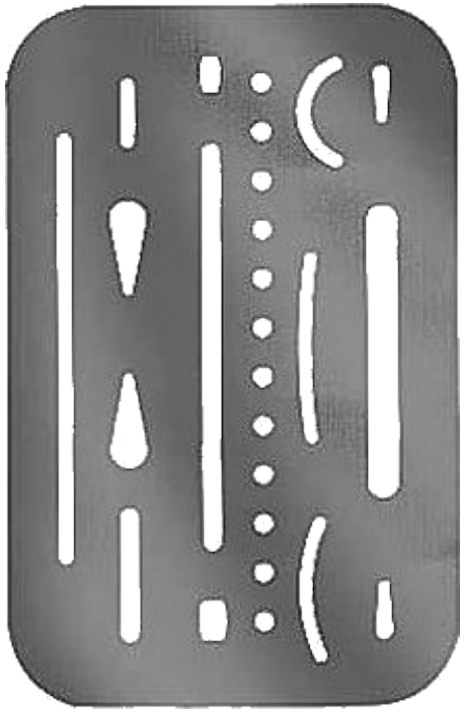
DRAWING TOOLS



5. Sandpaper

6. Compass

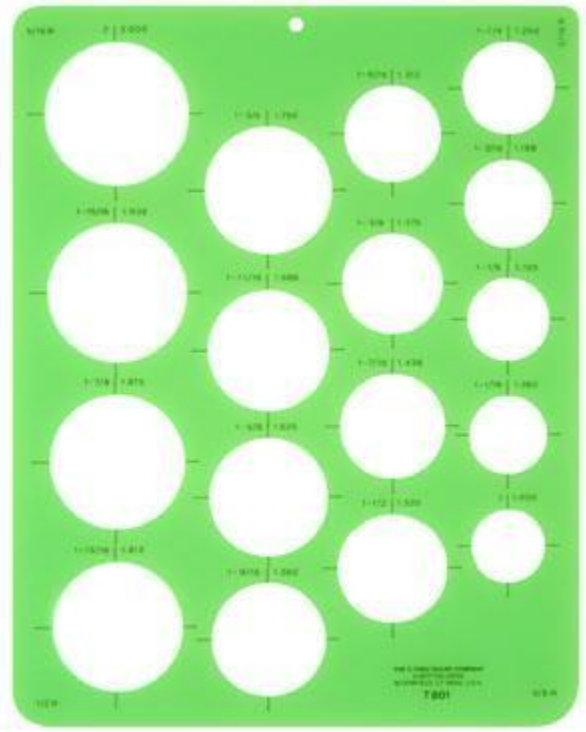
DRAWING TOOLS



7. Pencil Eraser

8. Erasing Shield

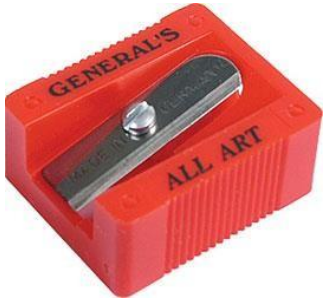
DRAWING TOOLS



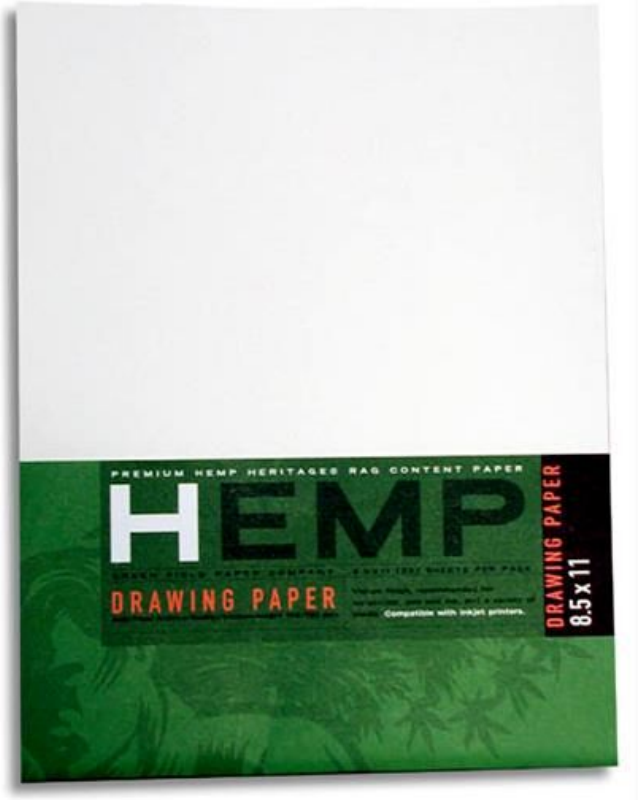
9. Circle Template

10. Tissue paper

DRAWING TOOLS



11. Sharpener



12. Clean paper

Lettering

Text on Drawings

Text on engineering drawing is used :

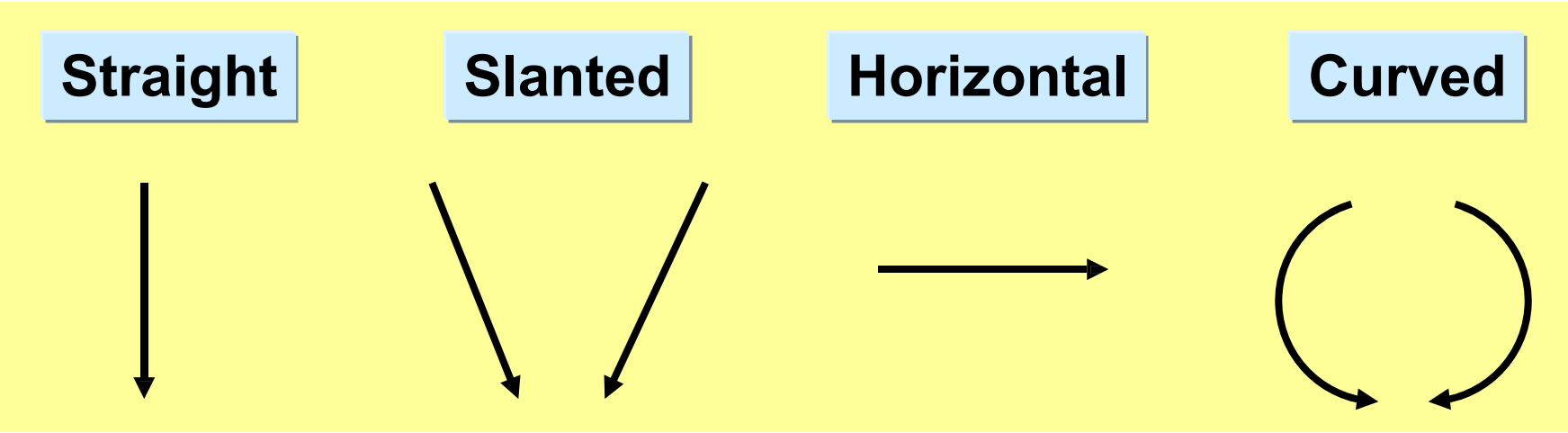
- To communicate nongraphic information.
- As a substitute for graphic information, in those instance where text can communicate the needed information more clearly and quickly.

Thus, it must be written with

Legibility - shape
- space between letters and words

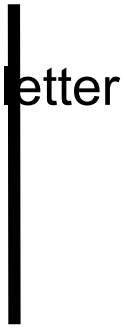
Uniformity - size
- line thickness

Basic Strokes

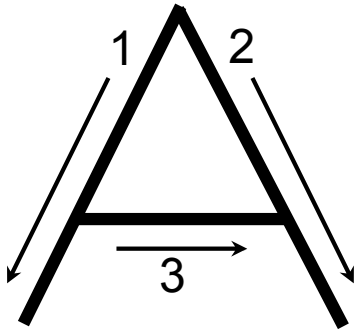


Examples : *Application of basic stroke*

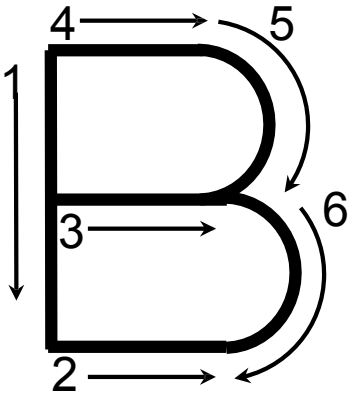
"**I**" letter



"**A**" letter



"**B**" letter

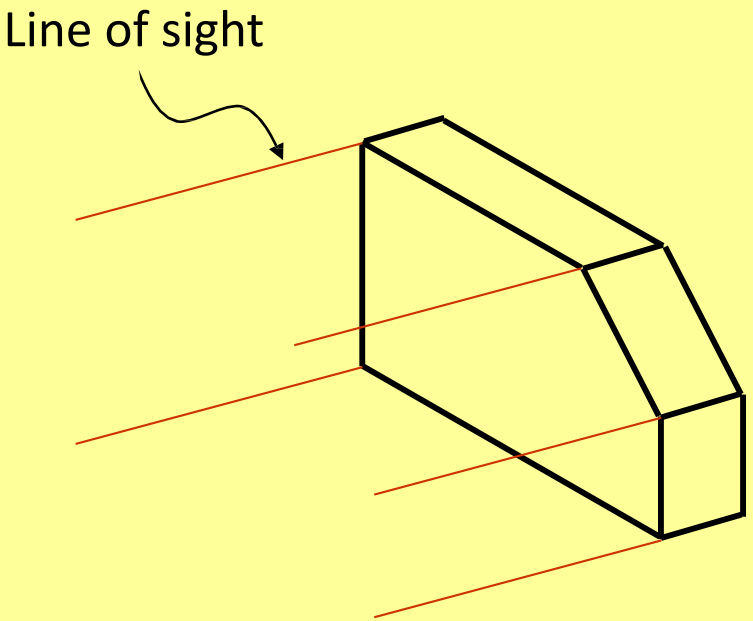


Line Convention

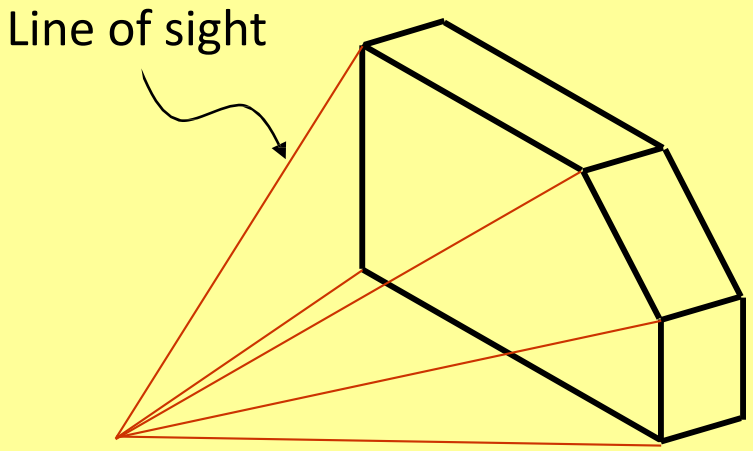
Line of sight is an imaginary ray of light between an observer's eye and an object.

- There are 2 types of LOS : parallel and converge

Parallel projection



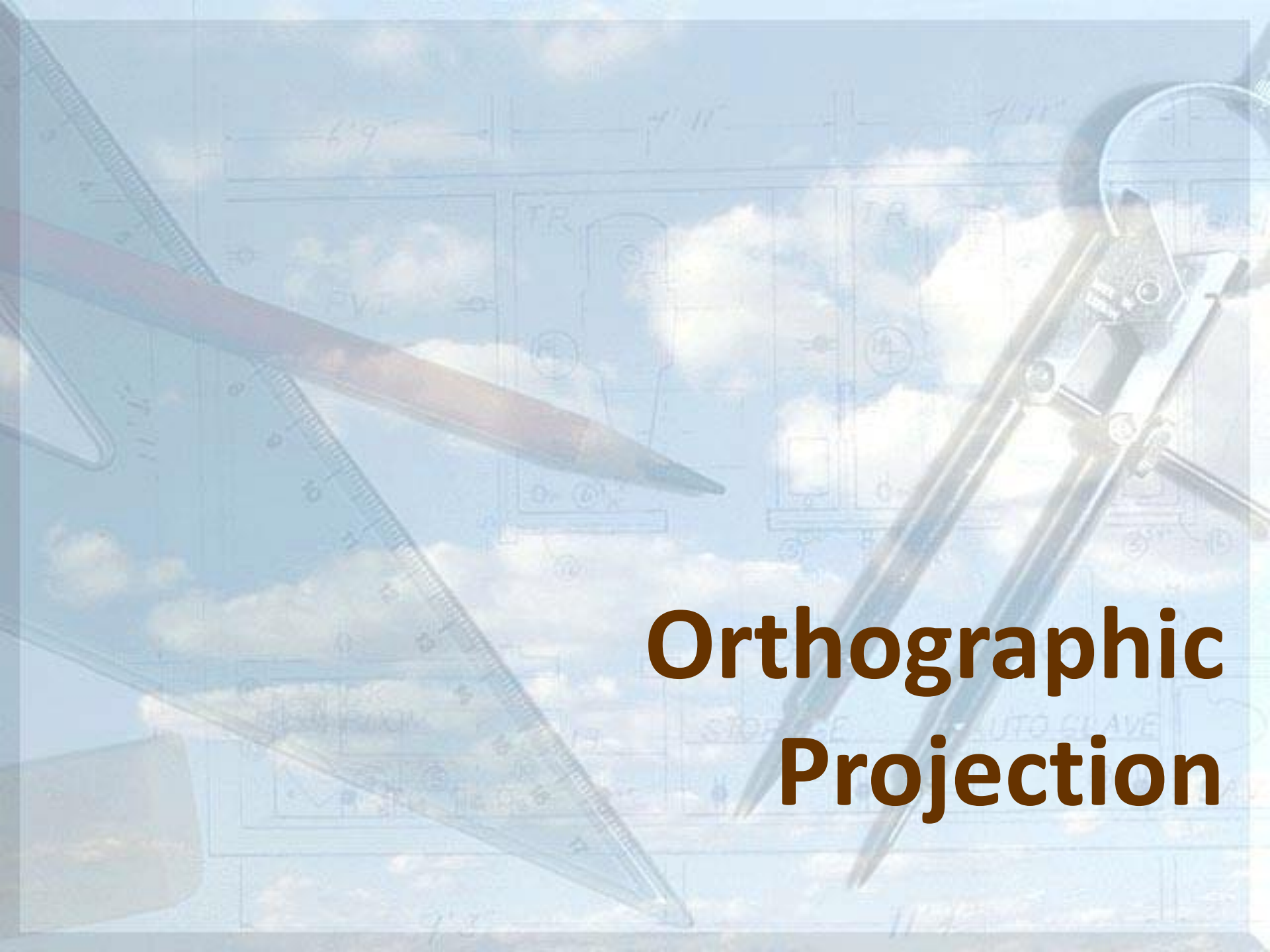
Perspective projection



Disadvantage of Perspective Projection

- Perspective projection is ***not*** used by engineer for manu-facturing of parts, because

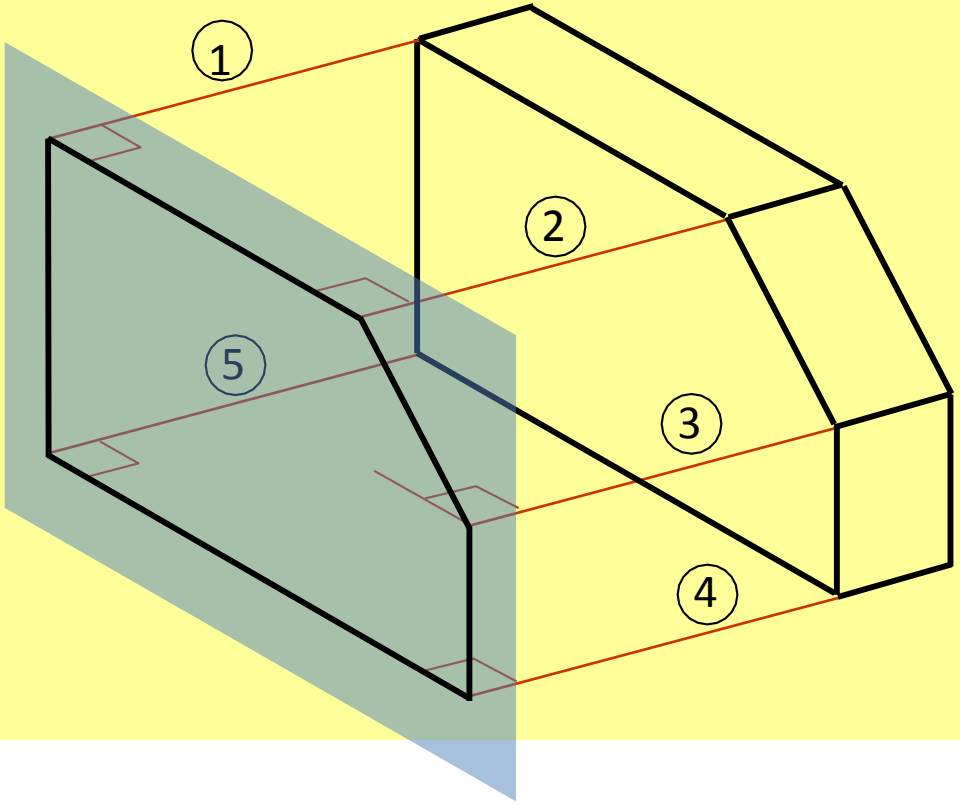
1) It is difficult to create.
2) It does not reveal exact shape and size.



Orthographic Projection

MEANING

Orthographic projection is a parallel projection technique in which the parallel lines of sight are ***perpendicular*** to the projection plane



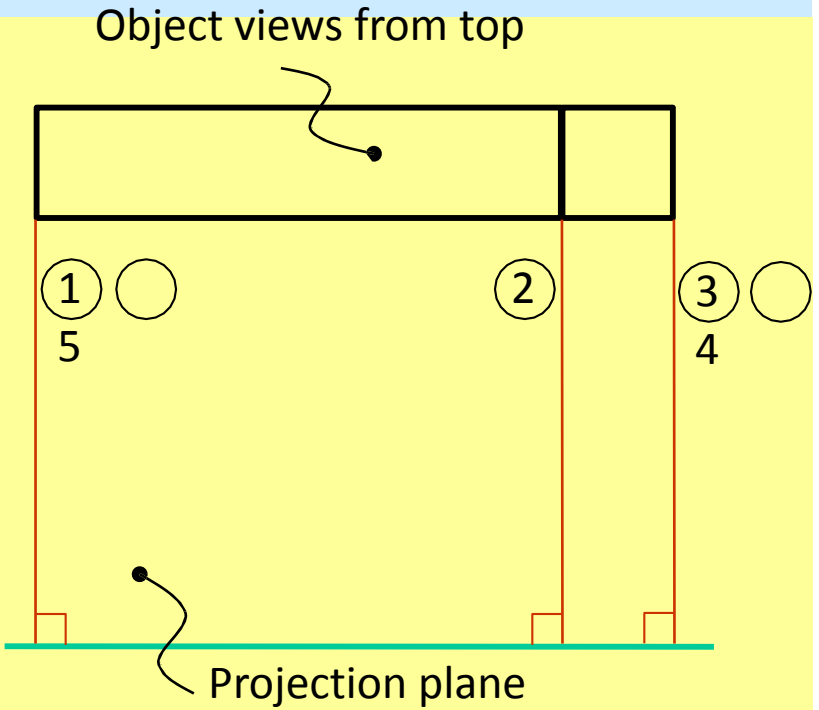
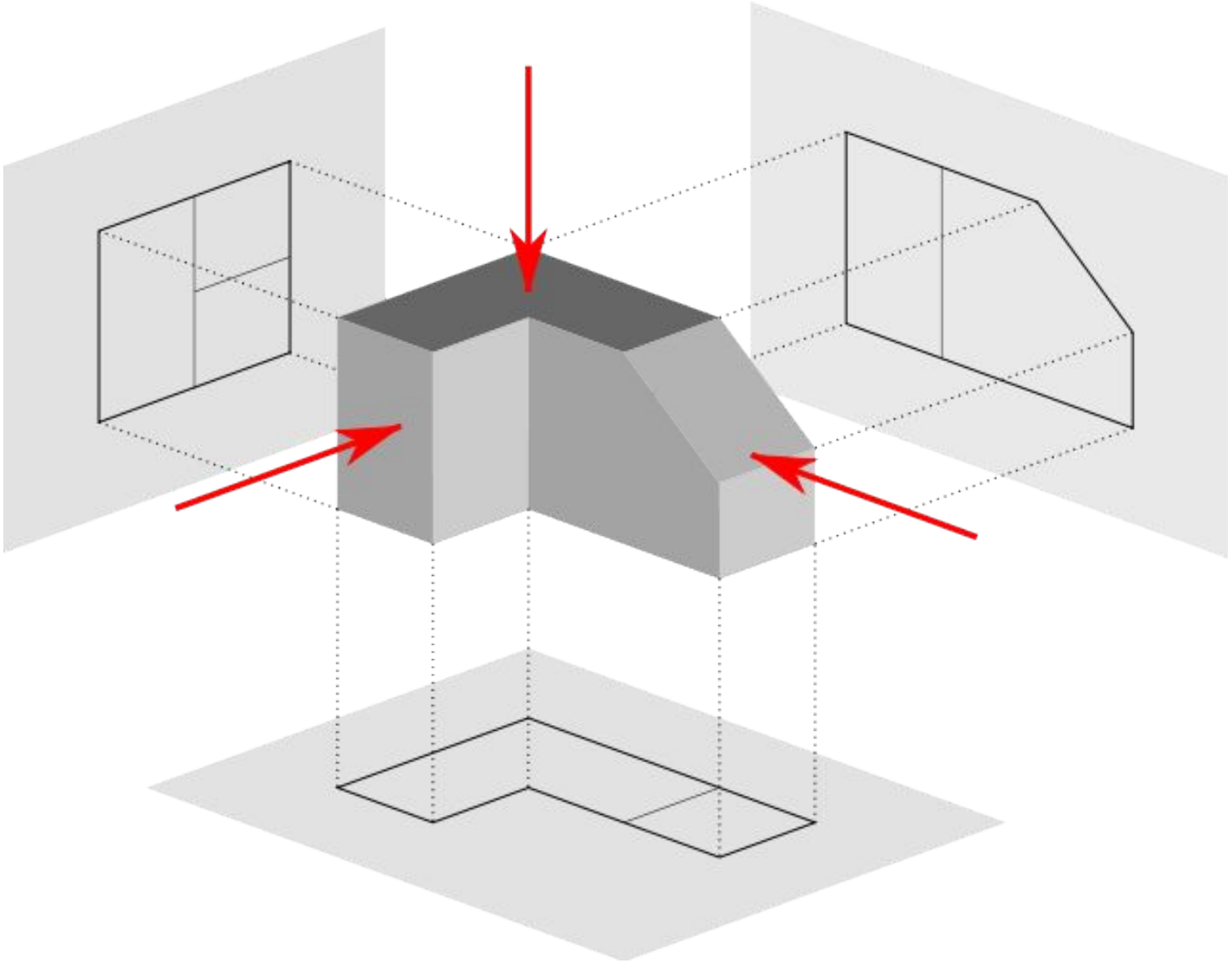
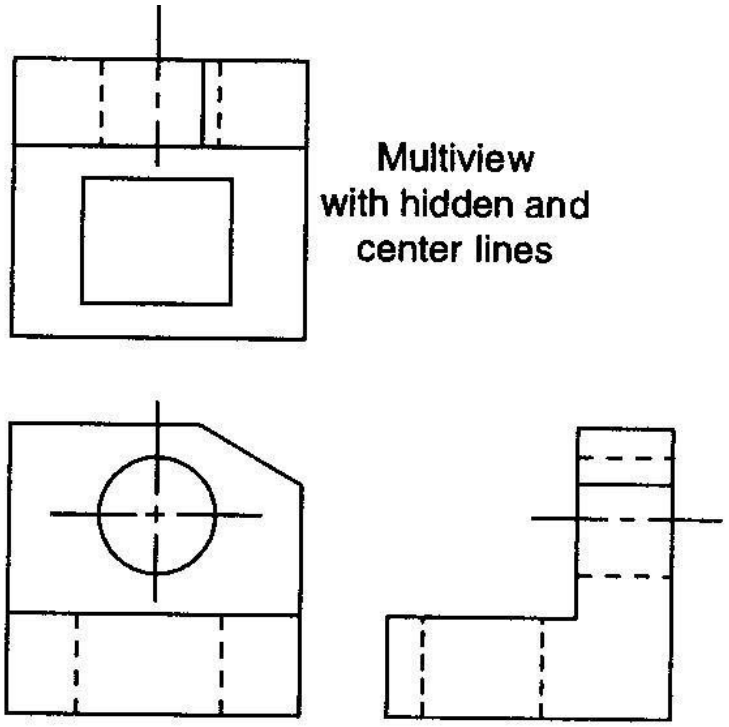


Image of a part represented in First Angle Projection

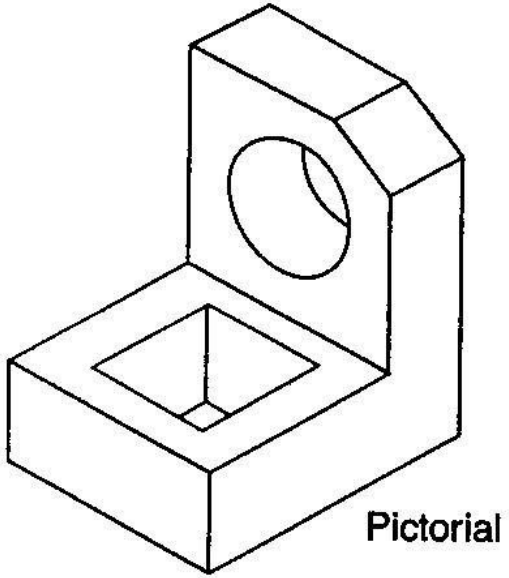


Orthographic / Multiview

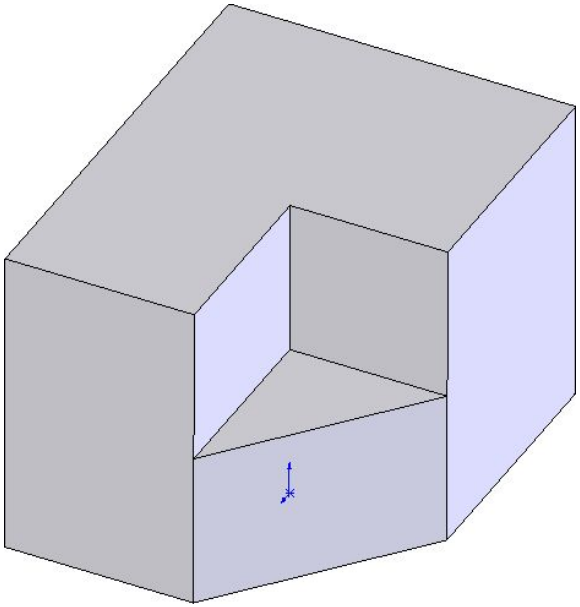
- Draw object from two / three perpendicular views

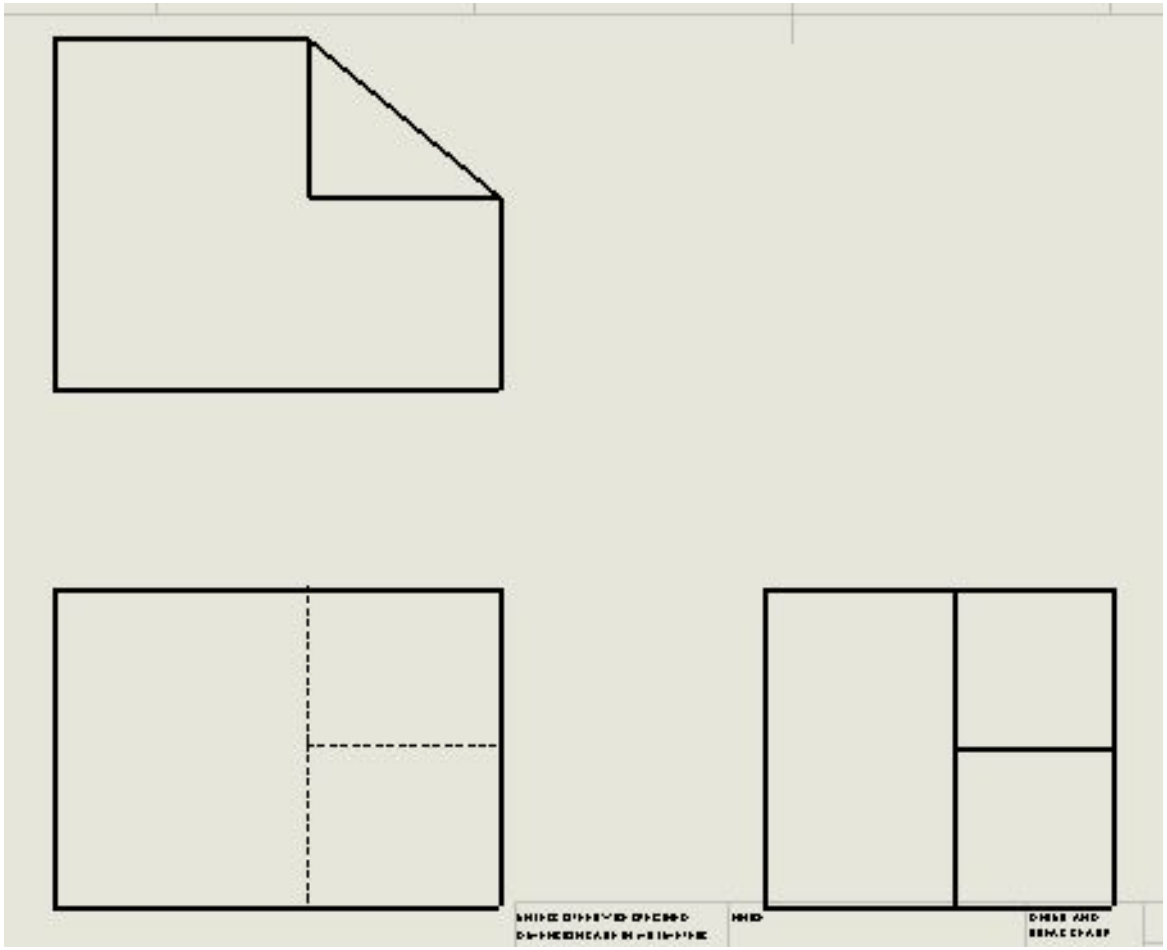


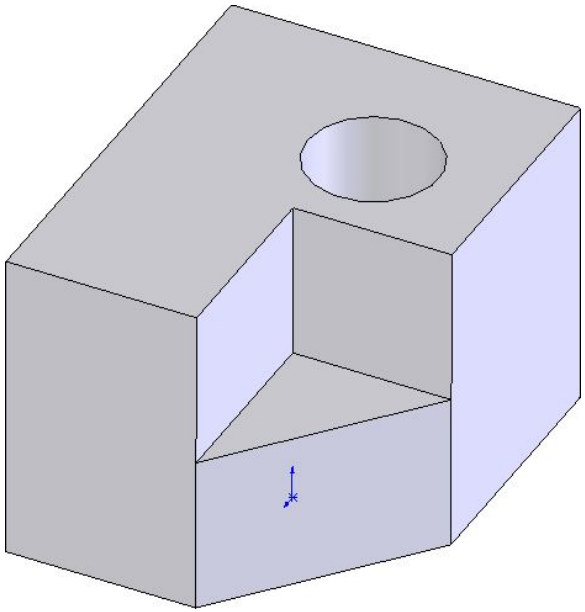
Multiview drawing. / Orthographic

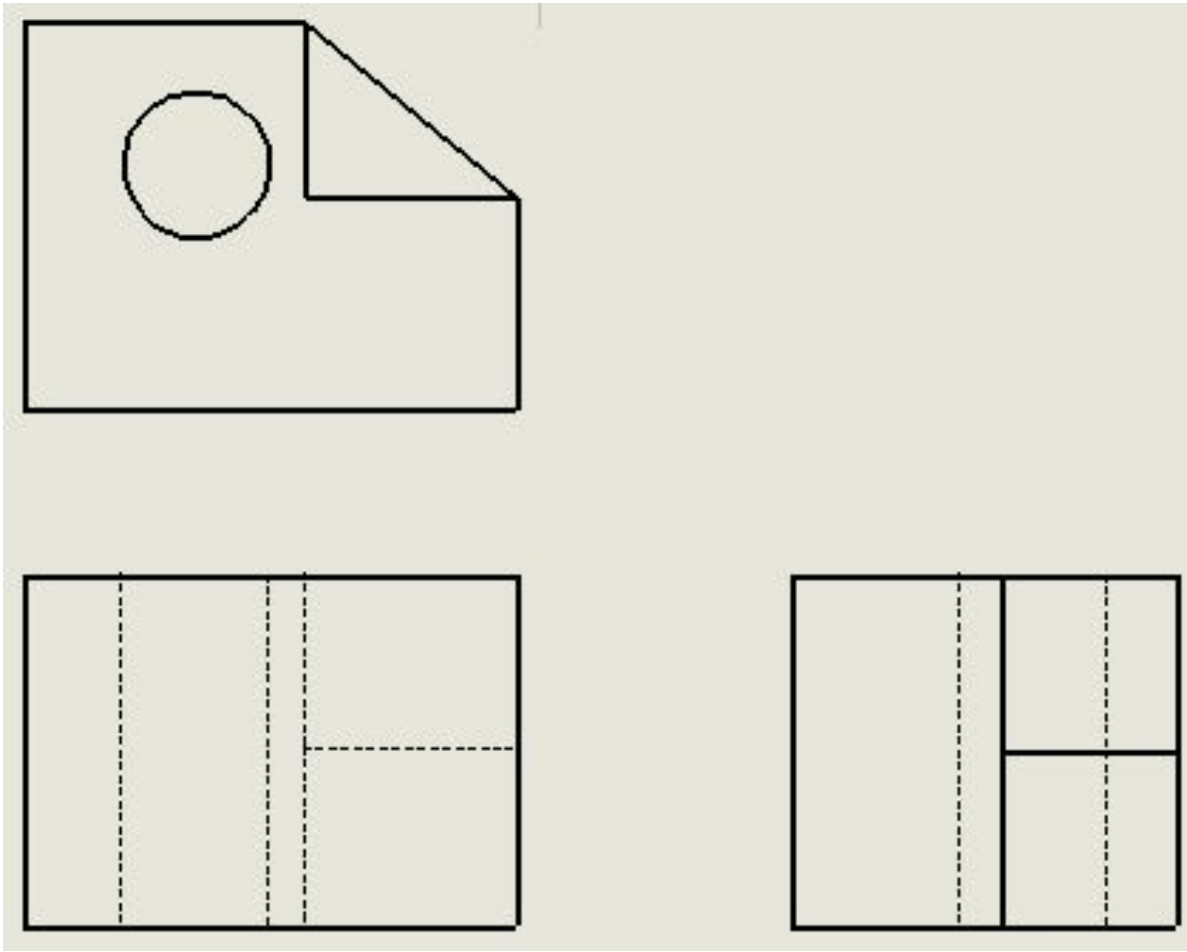


What it looks
like pictorially









ORTHOGRAPHIC VIEW

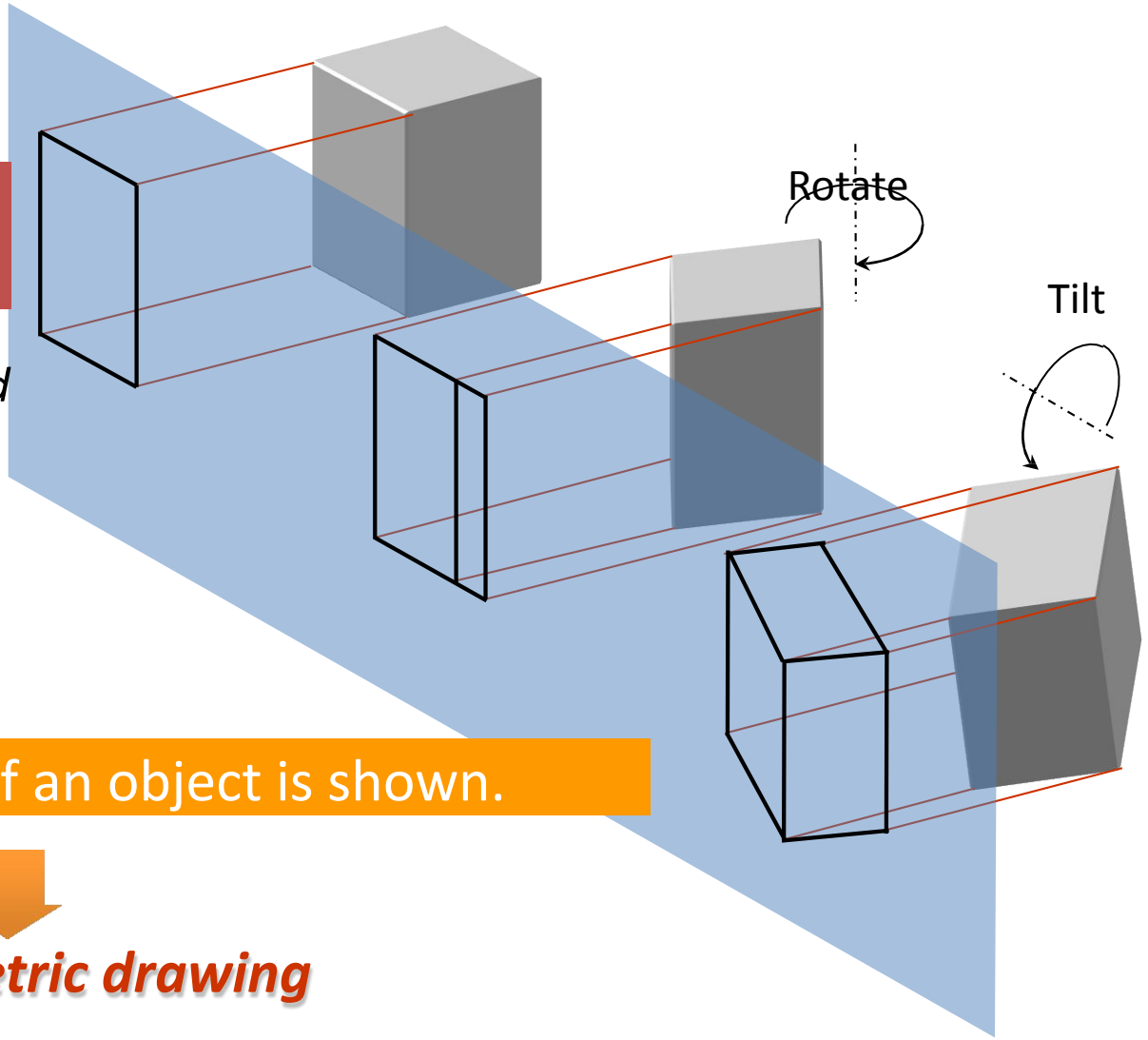
Orthographic view depends on relative position of the object

to the line of sight.

Two dimensions of an object is shown.

More than one view is needed to represent the object.

Multiview drawing



Three dimensions of an object is shown.

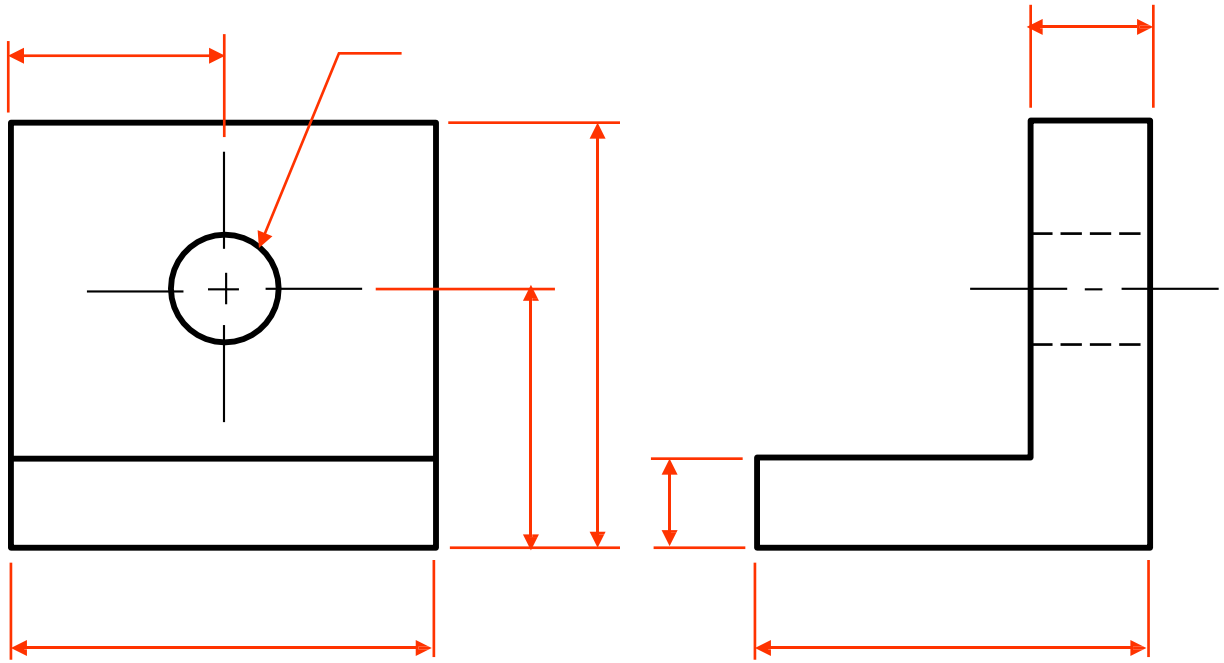
Axonometric drawing

Multiview Drawing

Advantage It represents accurate **shape and size.**

Disadvantage Require practice in writing and reading.

Example Multiviews drawing (2-view drawing)

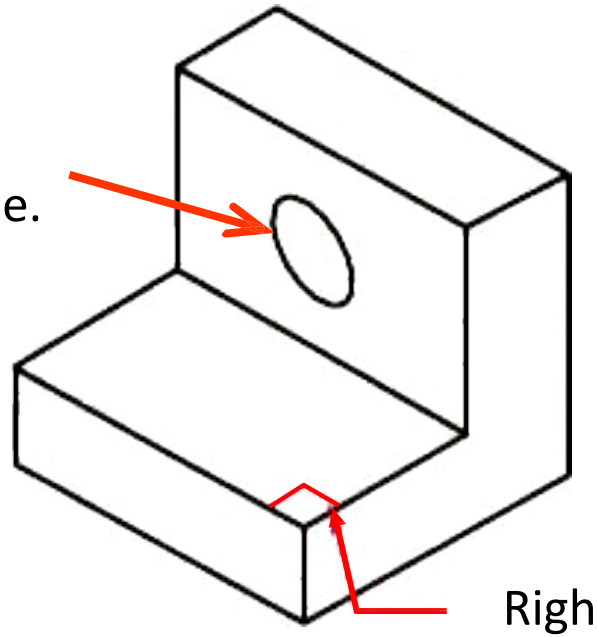


Axonometric (Isometric) Drawing

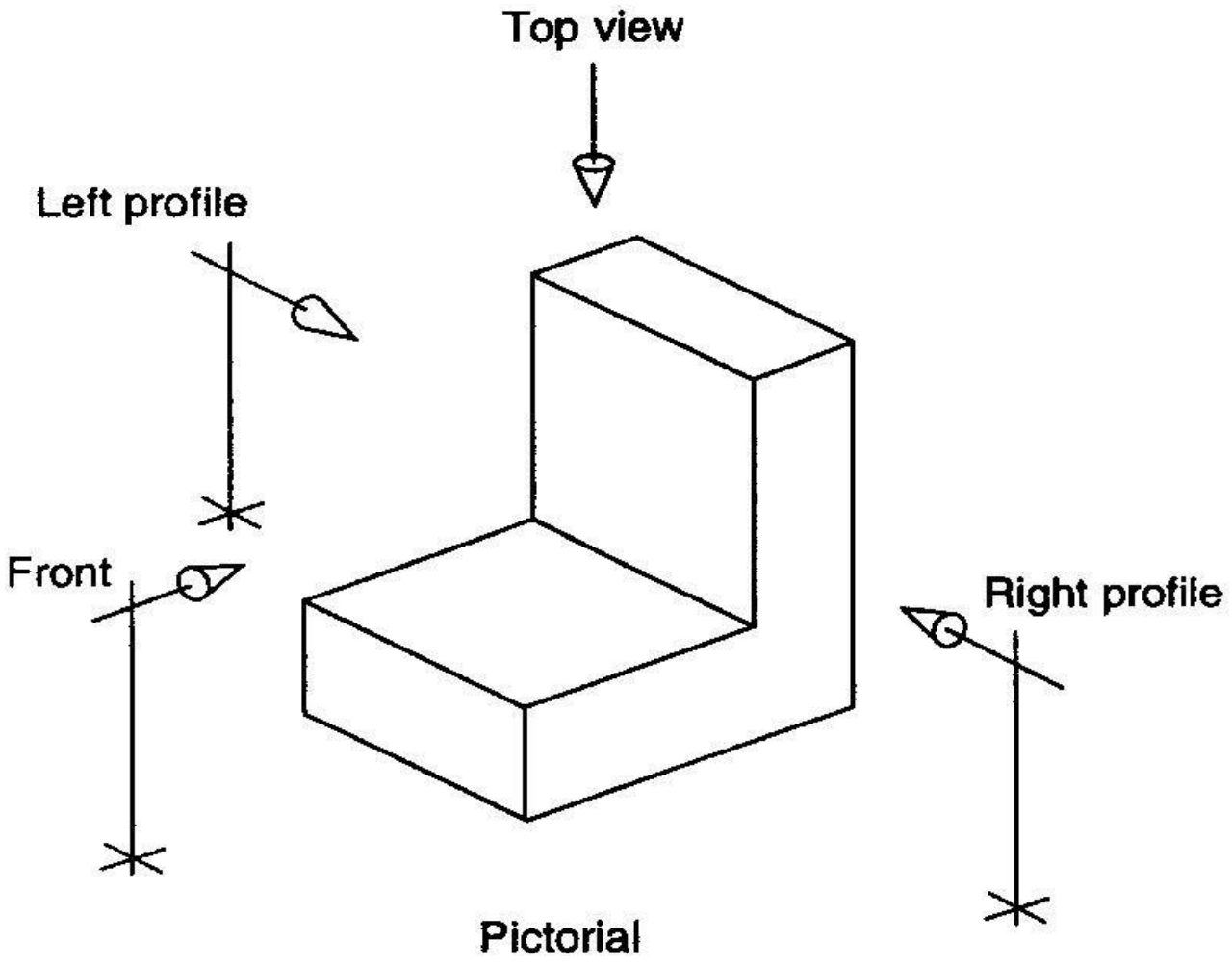
Advantage Easy to understand

Disadvantage Shape and angle distortion

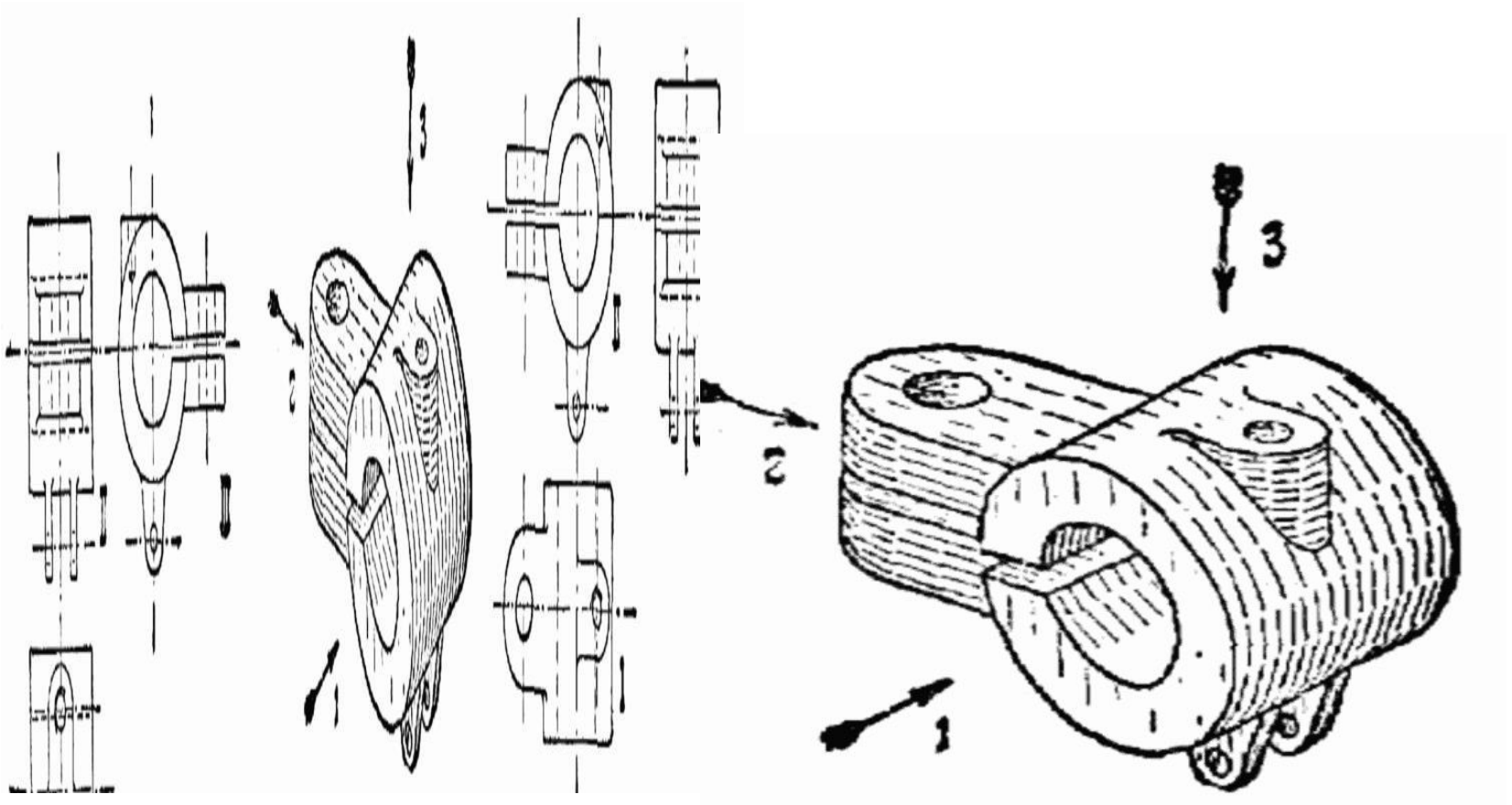
Example Distortions of shape and size in isometric drawing



Isometric projection

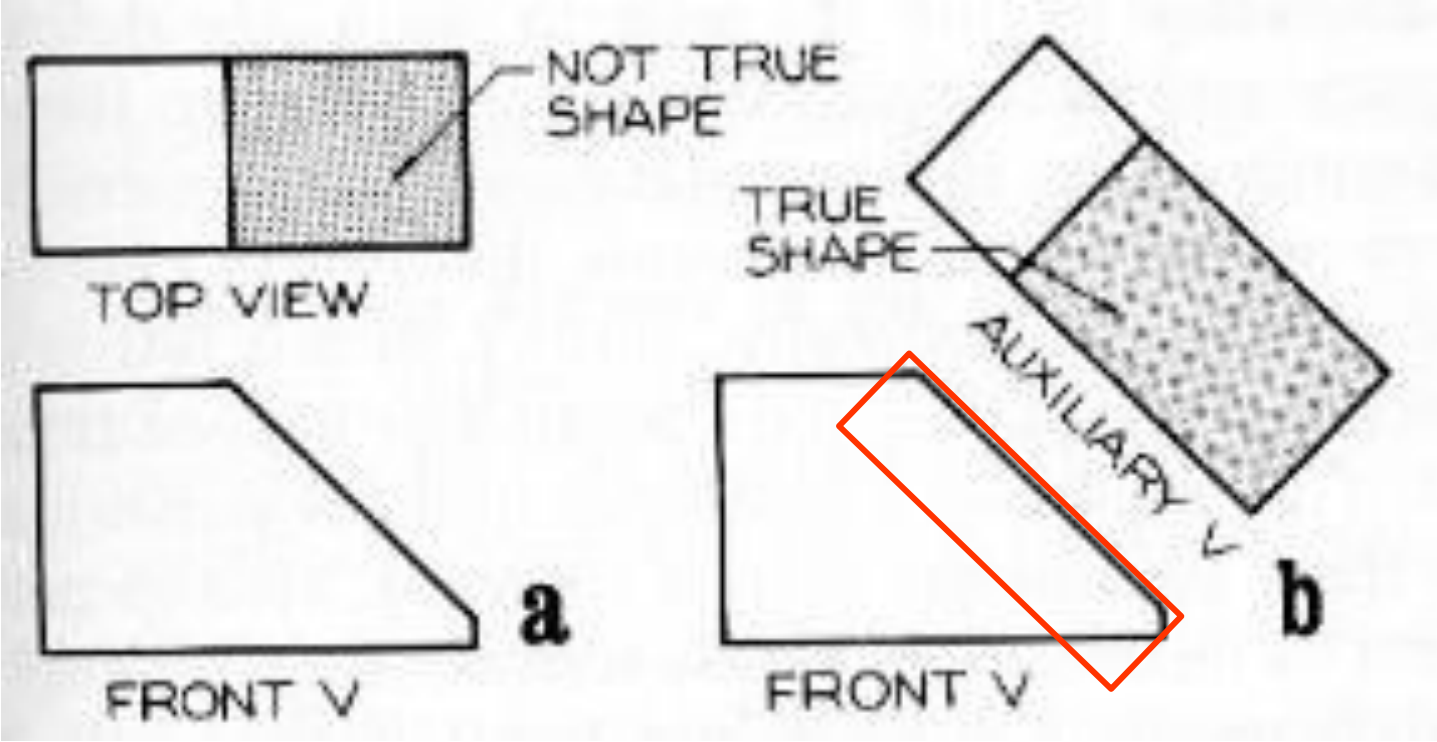


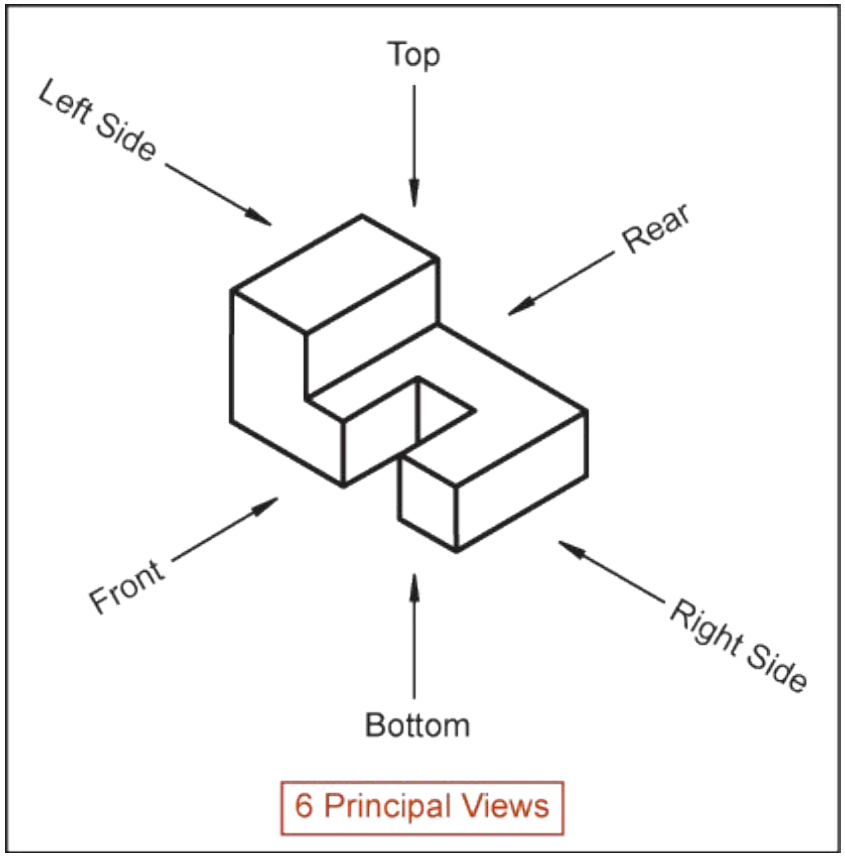
Isometric projection



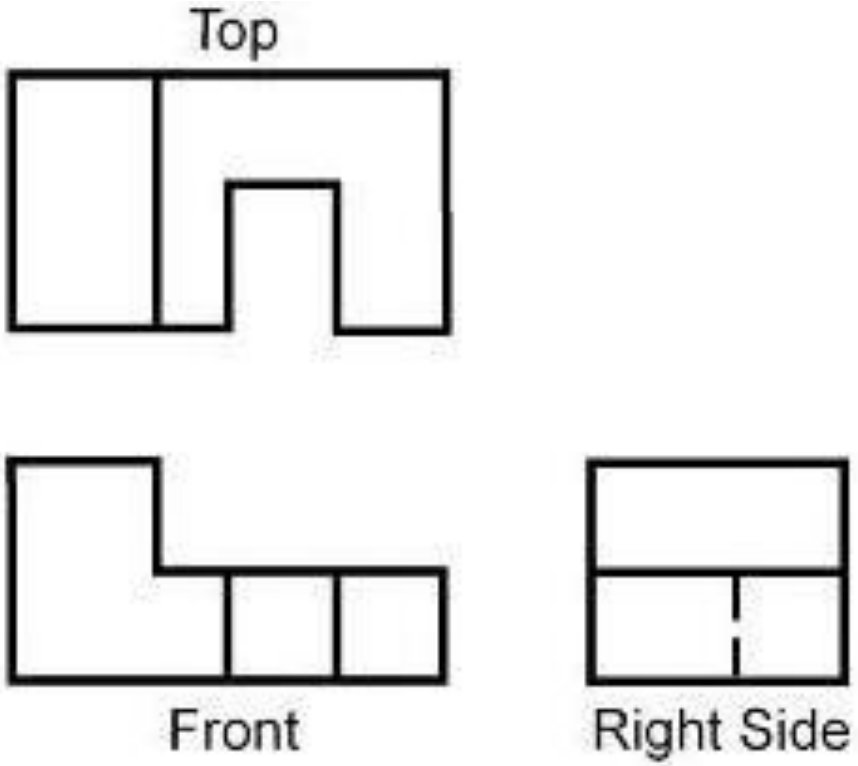
Auxiliary Views

- Used to show true dimensions of an inclined plane.





6 Principal Views



2D Orthographic Projection