

# ME 1110 – Engineering Practice 1

## Engineering Drawing and Design - Lecture 2

# Introduction to Engineering Drawing

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

# Objectives for today

- Communication modes in engineering design
- Types of drawings
- Technical (engineering) drawing standards
- Orthographic projections
- 3<sup>rd</sup> and 1<sup>st</sup> Angle Projection

# Introduction to Drawing

- Communicating
  - » engineer to engineer
  - » engineer to non-engineer
  - » non-engineer to engineer
  - » more than words

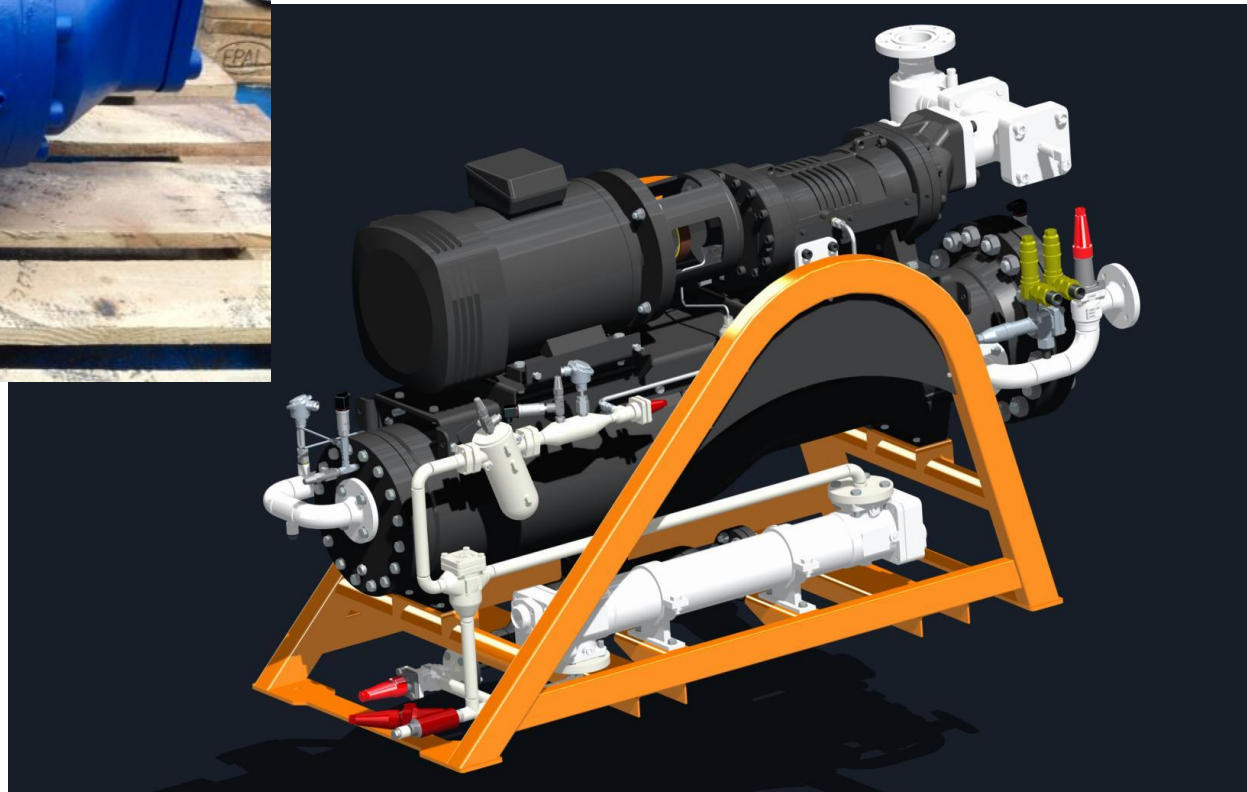
# Types of engineering communication

- » Drawings and sketches
  - Traditional techniques
  - CAD
- » Graphical communication
  - Technical illustrations, diagrams ...
- » Written communication
- » Oral communication

# Engineering Graphics

- Model
  - » Physical or computer generated
- Technical illustration
  - » Representation of part for non-technical person
- Technical sketch
  - » Expression of ideas and preliminary designs

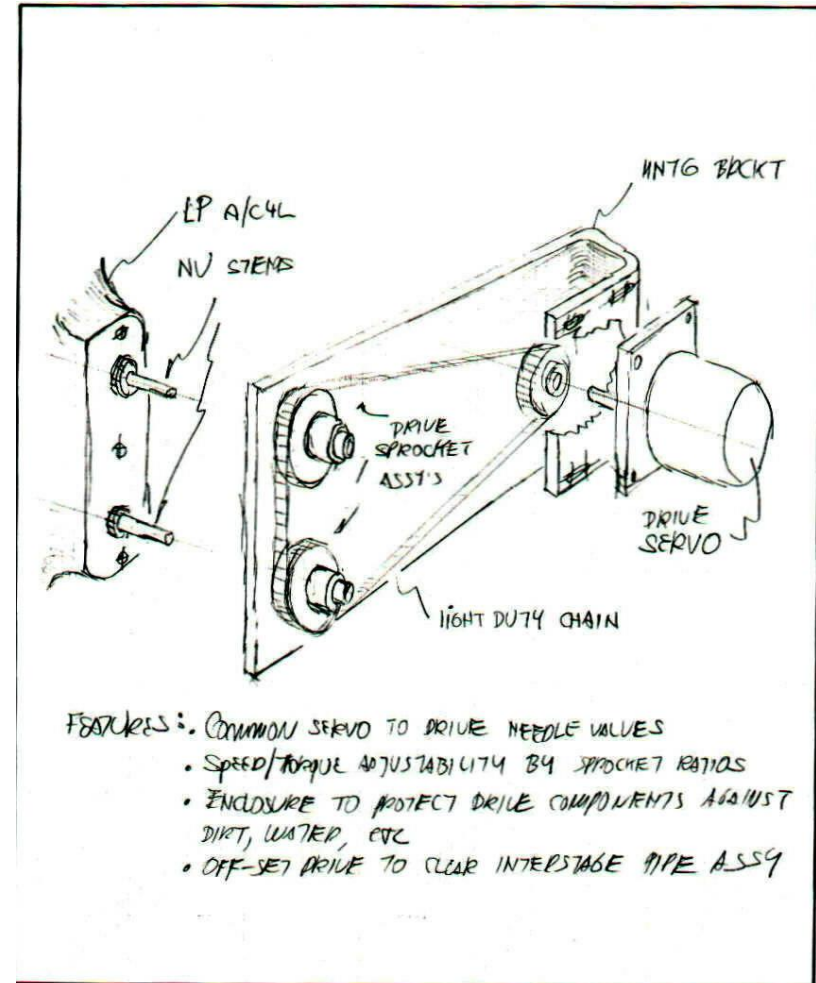
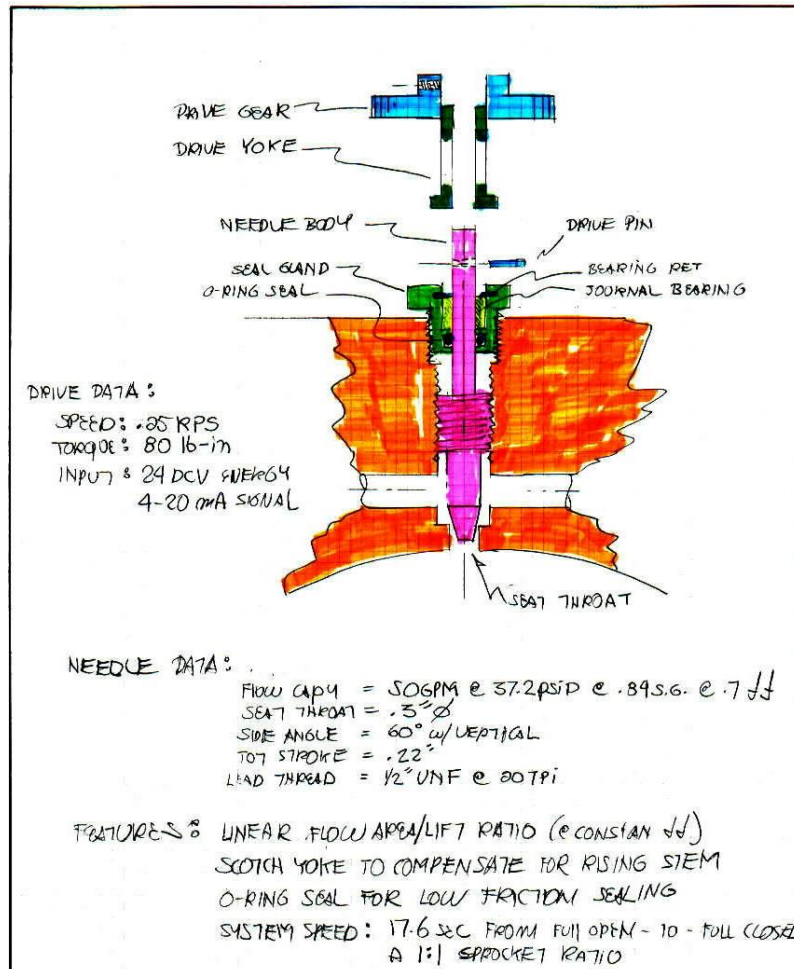
# 3D Model



# Technical Illustration



# Technical Sketching



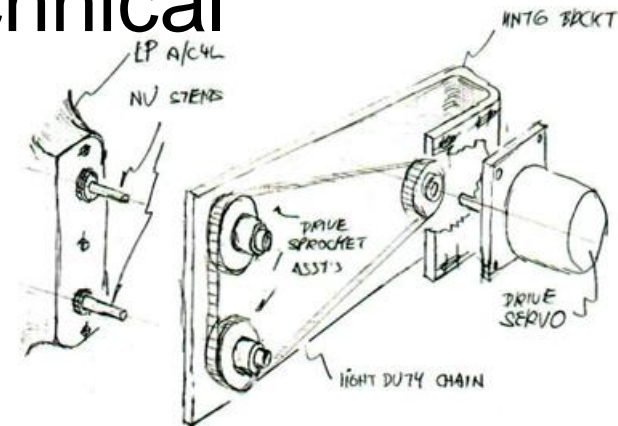


# Technical Drawing

There are various types of technical drawing

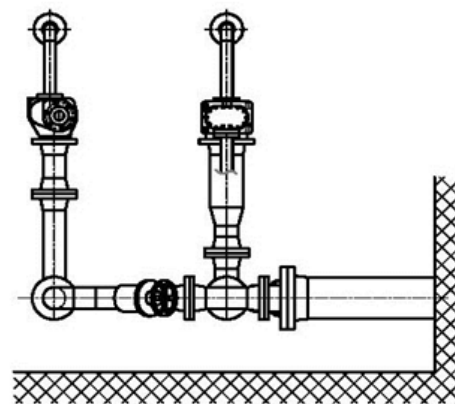
- Design Sketches

- » Initial Ideas and Requirements
- » Calculations and Concepts



- Layout Drawings

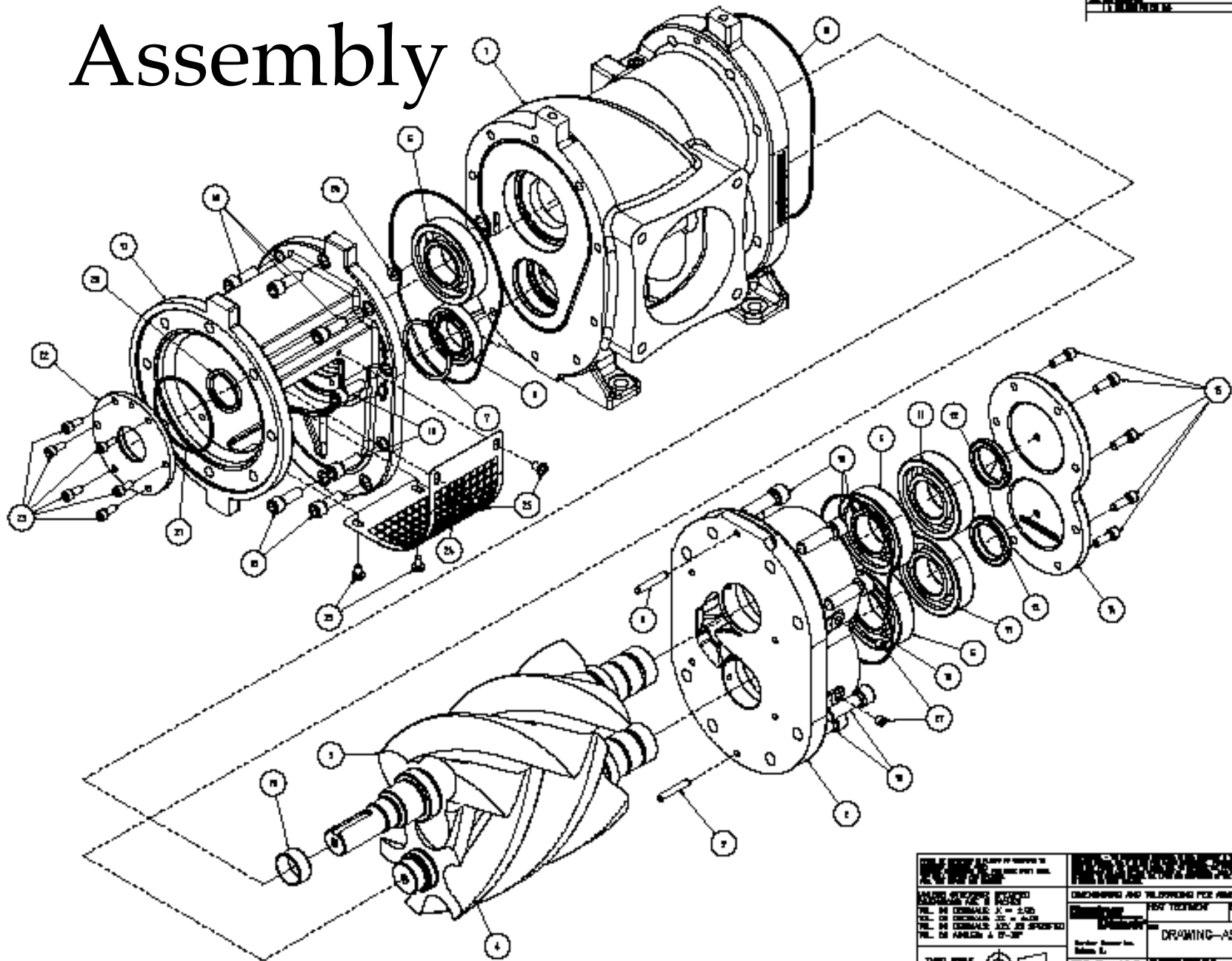
- » development of initial design
- » used to create detailed or assembly drawings



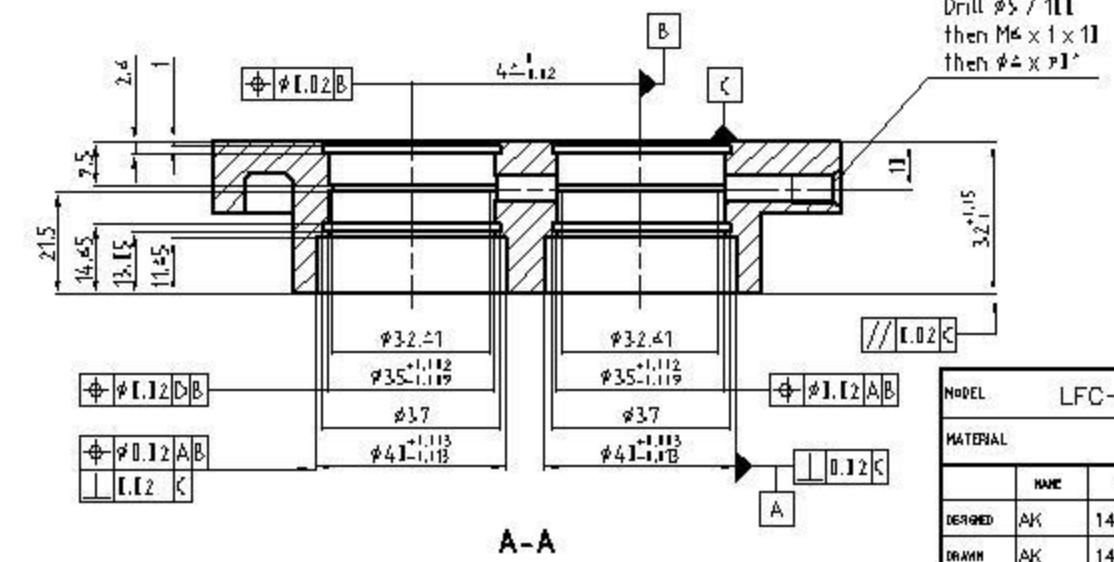
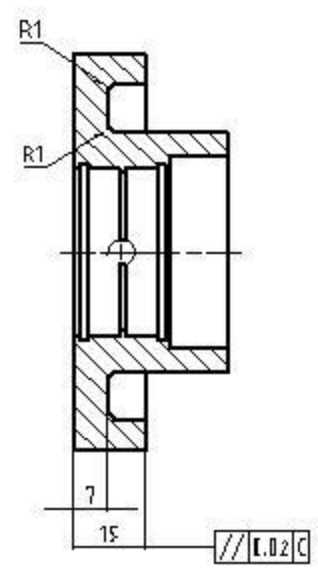
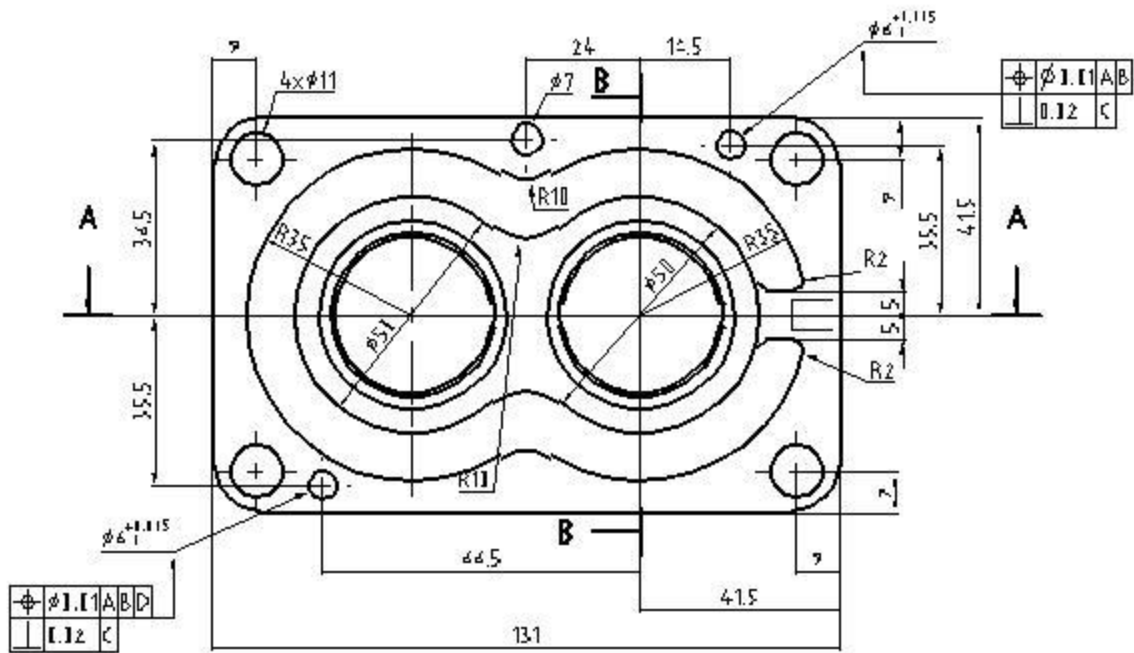
# Technical Drawing - cont

- Assembly Drawings
  - » parts +/- or sub-assemblies = component / machine
  
- Detail Drawings
  - » information to make or purchase
  - » Include shape, dimensions, tolerances, surface finish...

# Assembly



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# Detailed

Item	Qty	Standard	Material	N=tc
4	1		STAINLESS STEEL	

MODEL		LFC-000		CITY UNIVERSITY CENTRE FOR POSITIVE DISPLACEMENT COMPRESSOR TECHNOLOGY	
MATERIAL					
DESIGNED	AK	DATE	14/02/03	Bearing Housing Compressor - Expander	
DRAWN	AK	DATE	14/02/03		
CAP	AK	DATE	14/02/03	SCALE	1:1
CHECKED				DRYING No.	LFC-004
APPROVED				DRG SHEET	1
				REVISION	

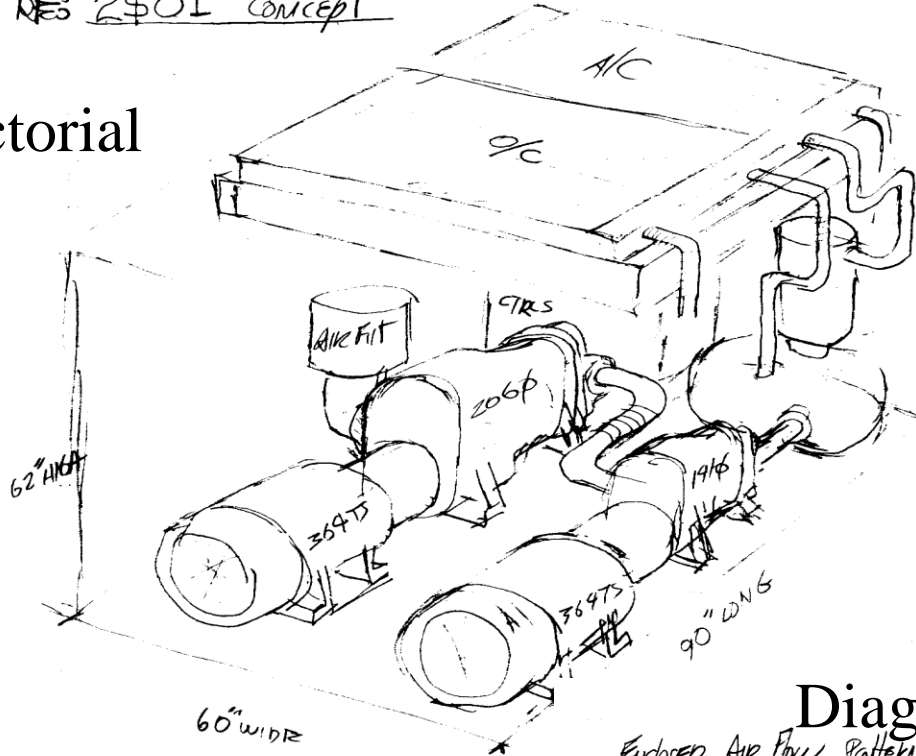
ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.

D:\M-T SCALE THIS DRAWING IF IN D:\M-T A&K DESIGN CENTER

# Sketching

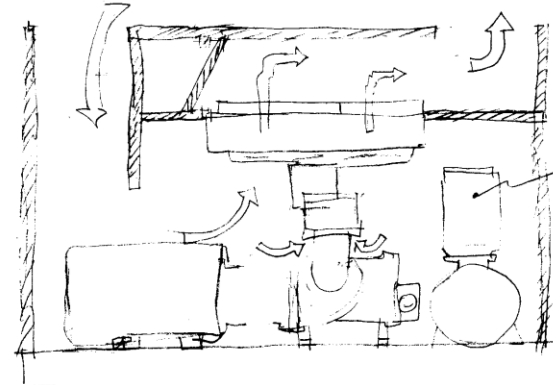
- Communication among engineers
- Three types of sketches
  - » Pictorial
    - Technical Illustration
  - » Multiview
    - Engineering Drawing
  - » Diagrammatic
    - System Illustration

# Pictorial

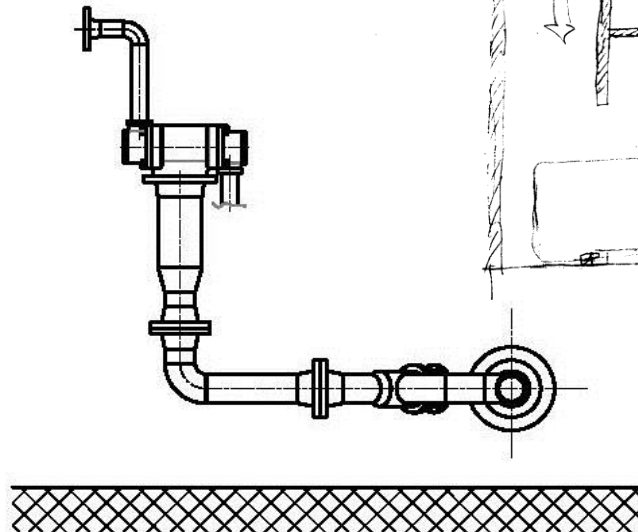
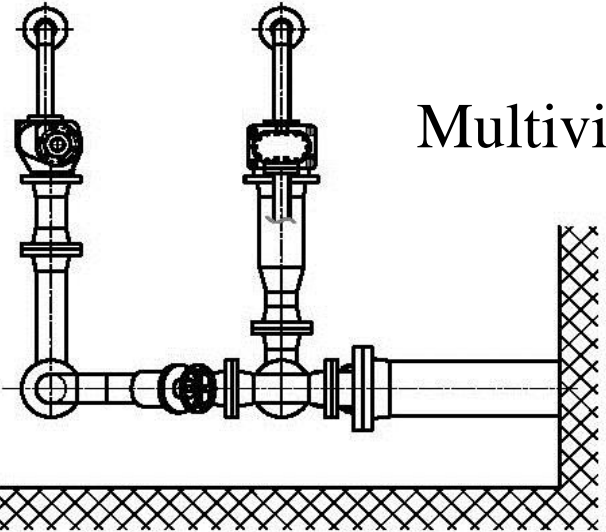
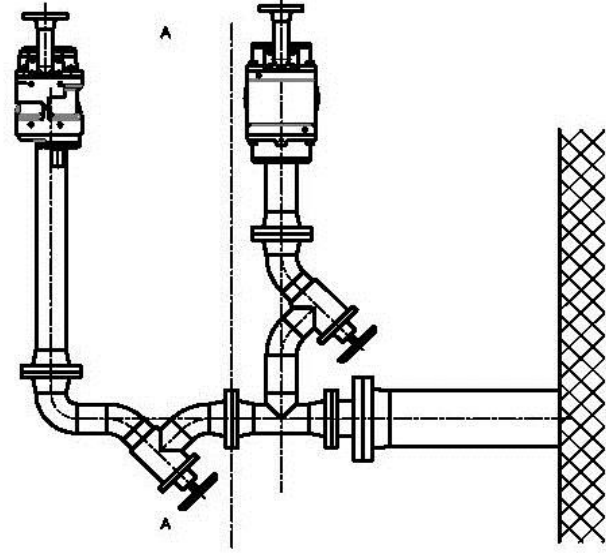


# Diagrammatic

Enclosed Air Flow Pattern

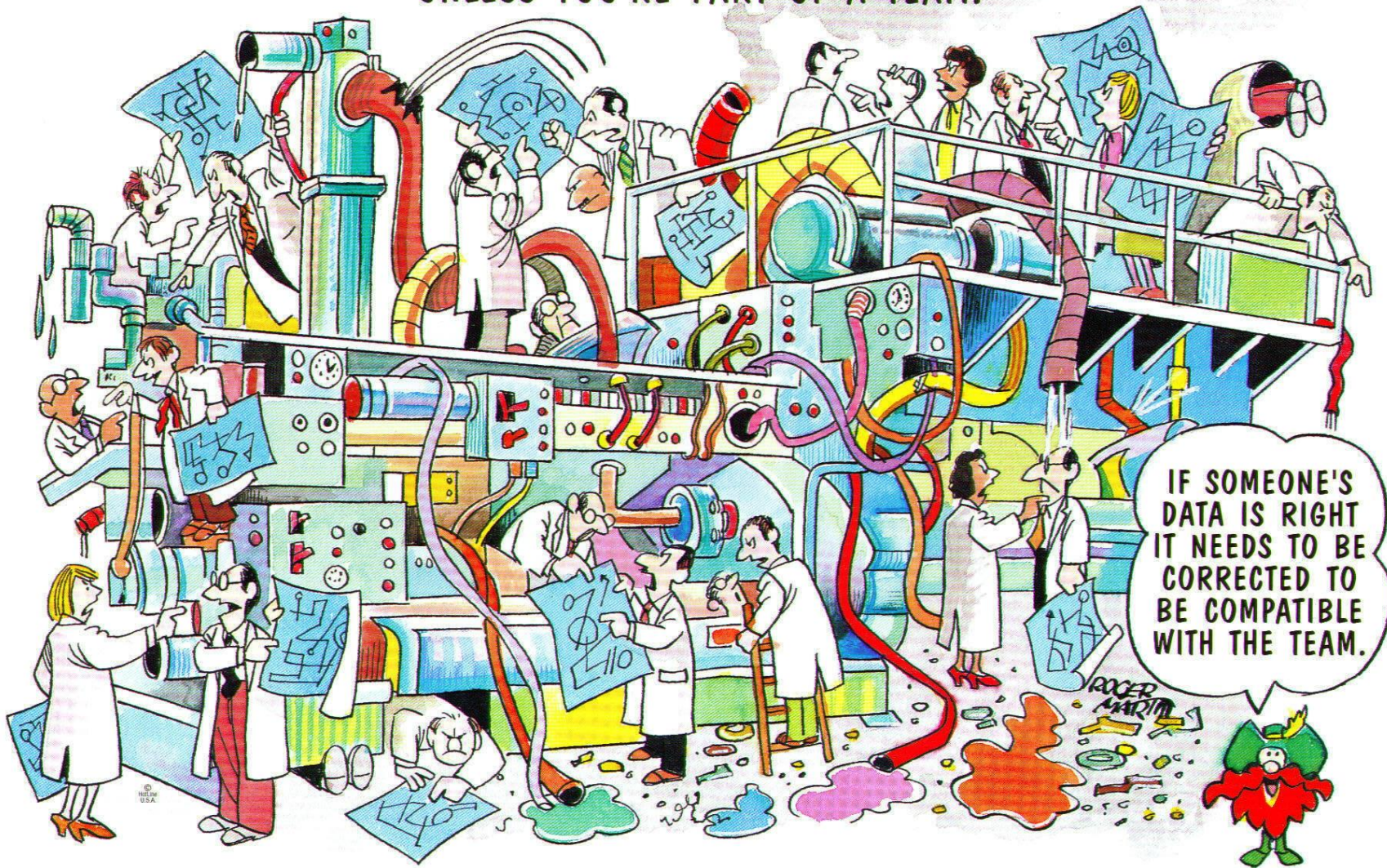


# Multiview



# MURPHY'S LAW

NEVER MAKE THE SAME MISTAKE TWICE  
UNLESS YOU'RE PART OF A TEAM.



# Standard Code

Country	Code	Full name
Thailand	มอก.	สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม
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

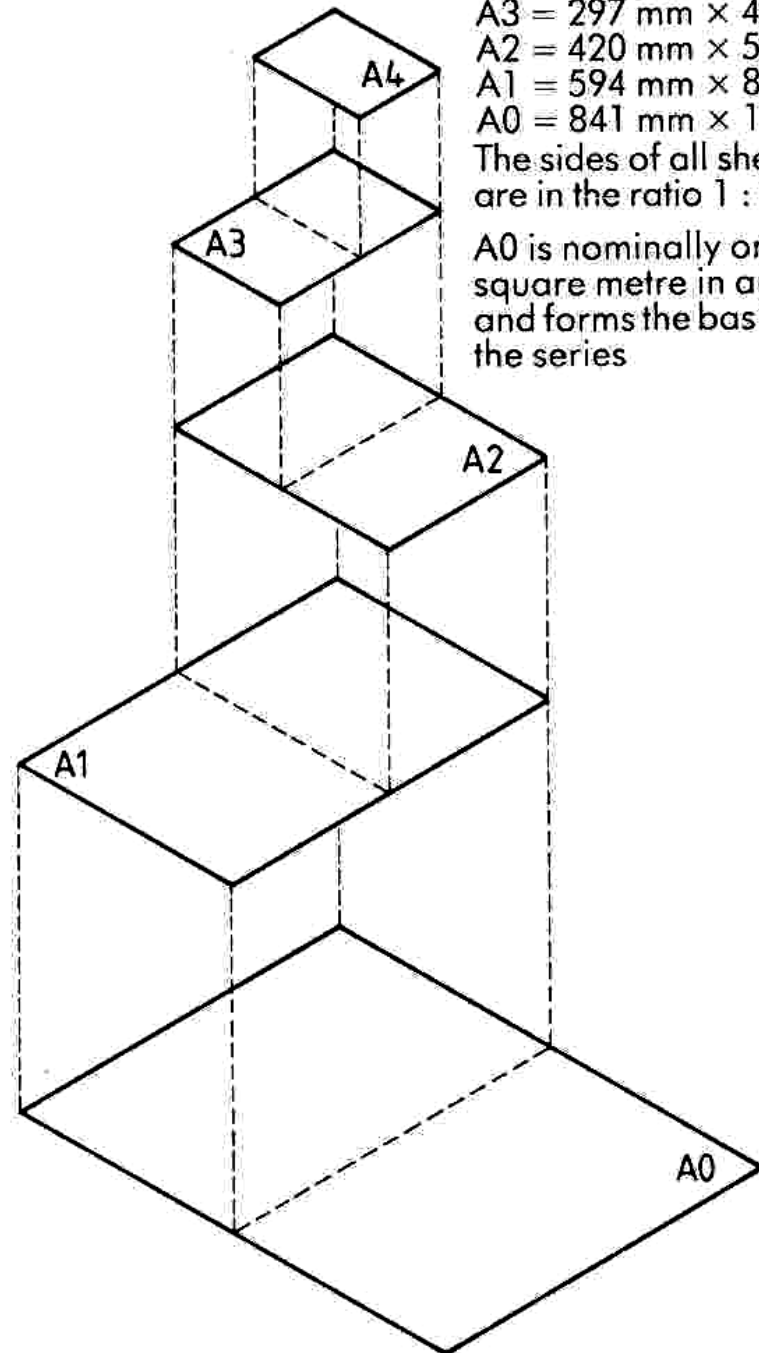


# Drawing Layout

A4 = 210 mm × 297 mm  
 A3 = 297 mm × 420 mm  
 A2 = 420 mm × 594 mm  
 A1 = 594 mm × 841 mm  
 A0 = 841 mm × 1189 mm

The sides of all sheets are in the ratio 1 :  $\sqrt{2}$

A0 is nominally one square metre in area and forms the basis of the series



## BS8888

### British standard for Engineering drawings

Paper size: 420x297 mm (A3)

Border size: 400x287 mm


Distance between border and end of page:

- Left 15mm
- Bottom 5mm
- Right 5mm
- Top 5mm

Always use A3 pages for your exercises if not specified differently in the tutorial sheet.

Use as many A3 pages as you need for your exercise.

All fields on each page in the title block must be filled. Use BS8888 to standardize all elements of the drawing. Minimum text height is 3mm.

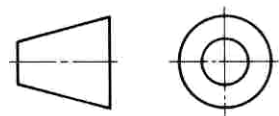
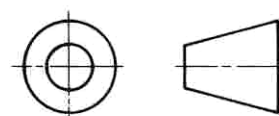
Group and Tutor Name	Exercise Code and Title	Page No		SCALE DATE	Name

# Elements of the Title Block

ABCDEFGHIJKLMNQRST  
UVWXYZ  
1234567890

ABCDEFGHIJKLMN  
OPQRSTUVWXYZ  
1234567890

Text should not be smaller than 3mm.

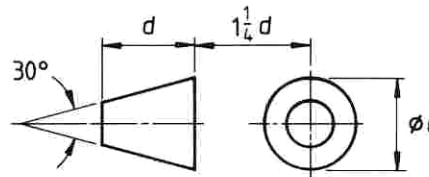
Projection	Symbol
First angle	
Third angle	

On drawings smaller than full size (reduction scales):

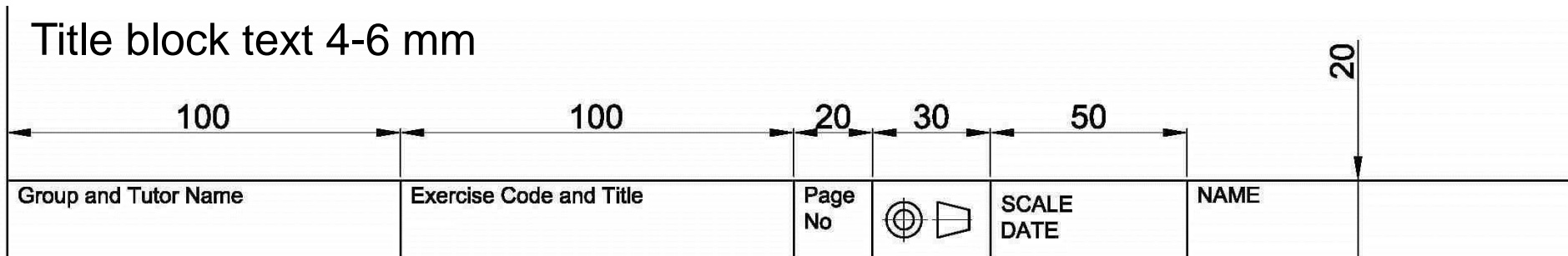
1:2	1:5	1:10
1:20	1:50	1:100
1:200	1:500	1:1000

On drawings larger than full size (enlargement scales):









2:1	5:1	10:1
20:1	50:1	

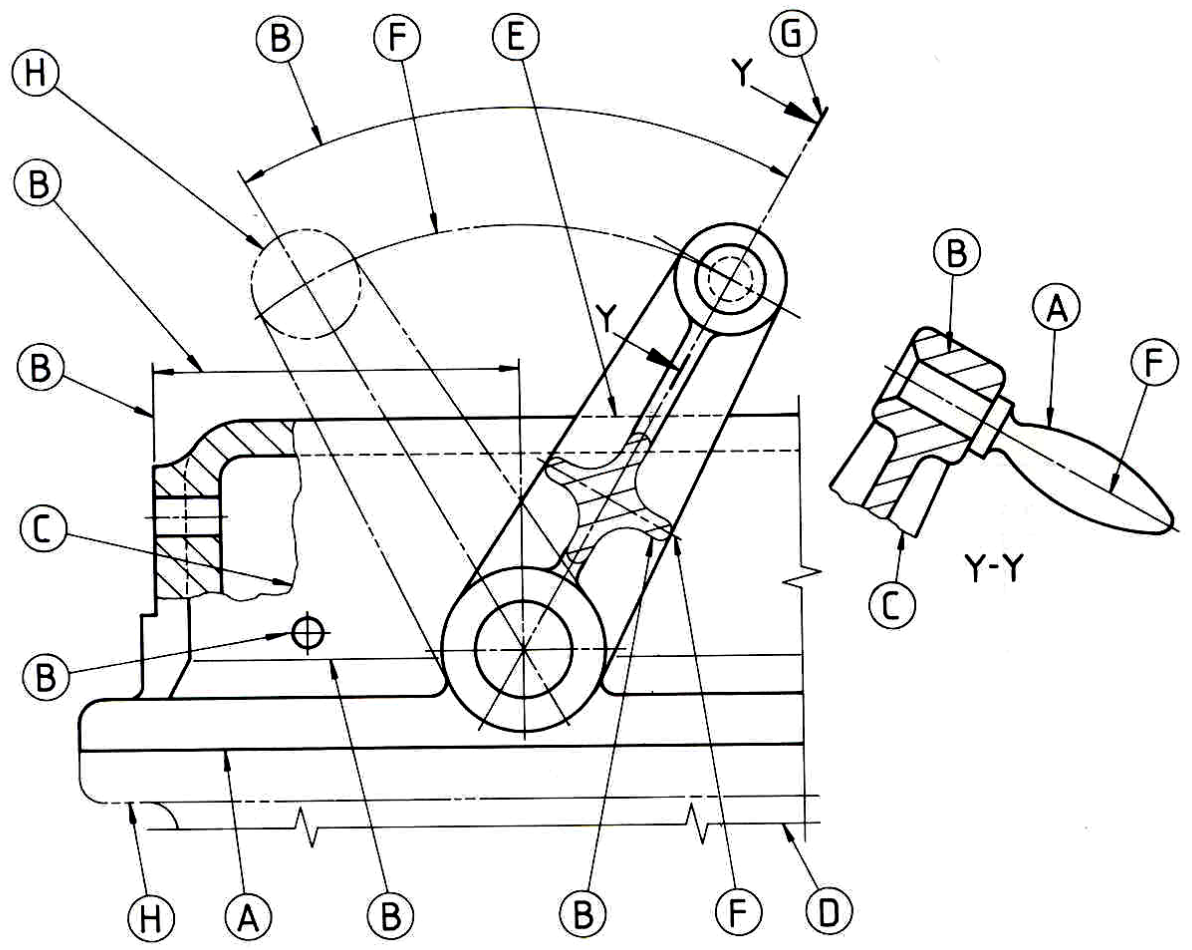


Title block text 4-6 mm

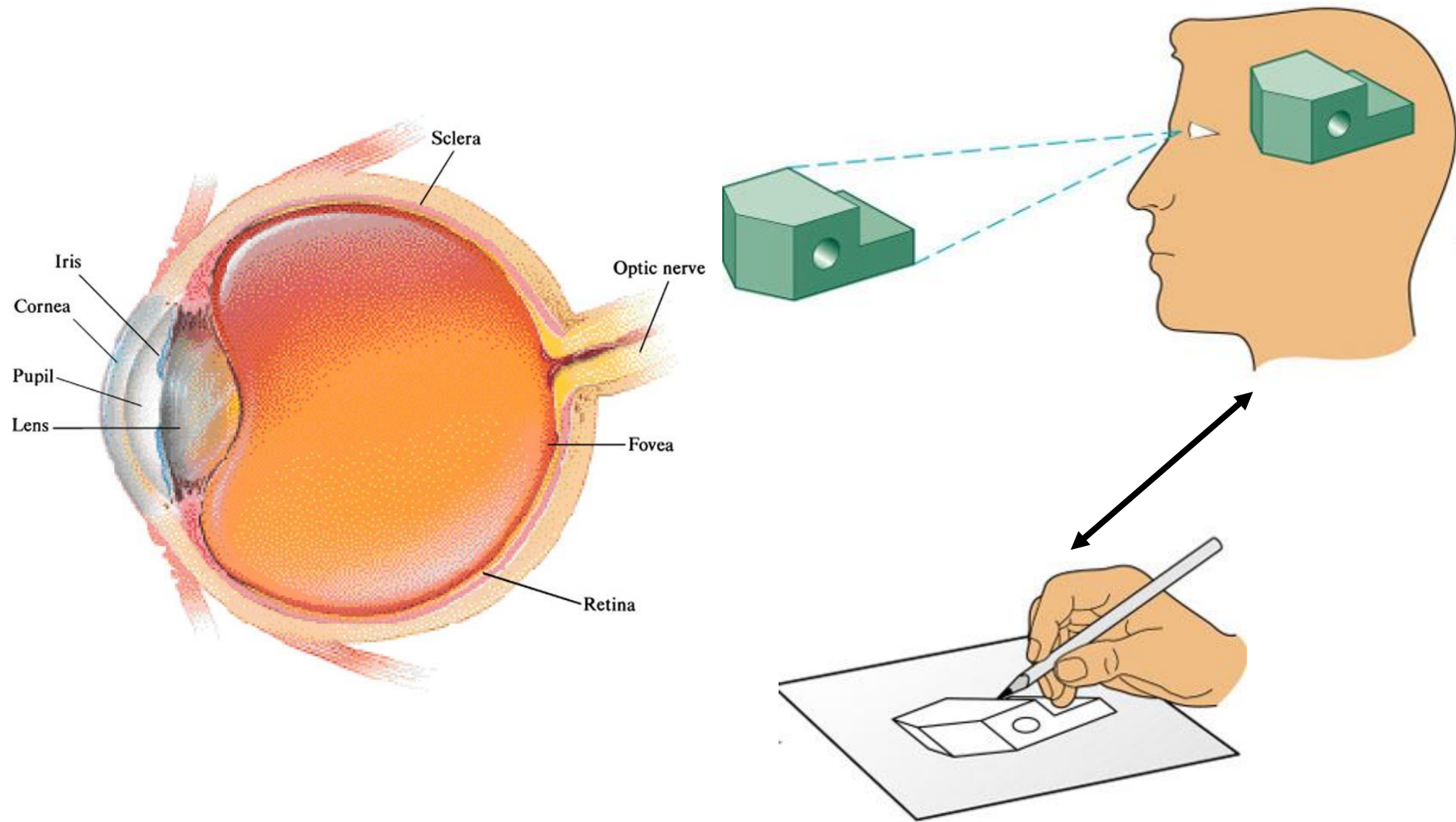


# Lines

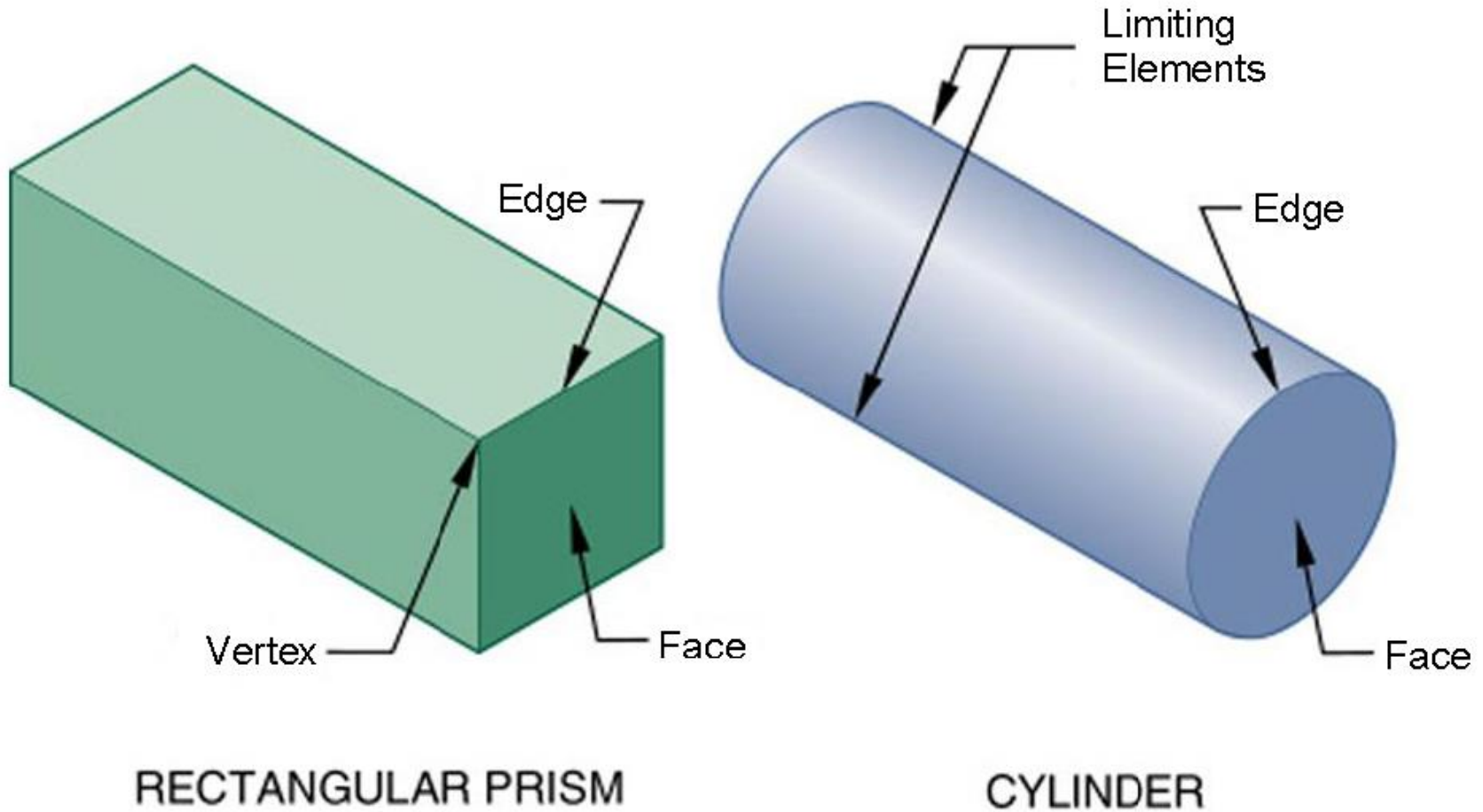
Line	Description	Application
A	 Continuous thick	Visible outlines and edges
B	 Continuous thin	Dimension, projection and leader lines, hatching, outlines of revolved sections, short centre lines, imaginary intersections
C	 Continuous thin irregular	Limits of partial or interrupted views and sections, if the limit is not an axis
D	 Continuous thin straight with zigzags	
E	 Dashed thin	Hidden outlines and edges
F	 Chain thin	Centre lines, lines of symmetry, trajectories and loci, pitch lines and pitch circles
G	 Chain thin, thick at ends and changes of direction	Cutting planes
H	 Chain thin double dashed	Outlines and edges of adjacent parts, outlines and edges of alternative and extreme positions of movable parts, initial outlines prior to forming, bend lines on developed blanks or patterns



# Human vision

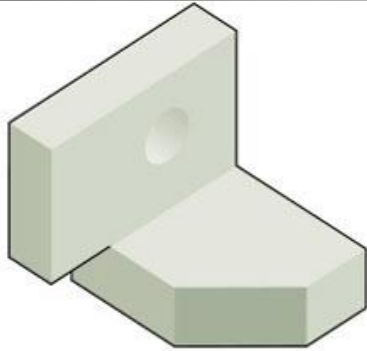


# Features of Solid Objects

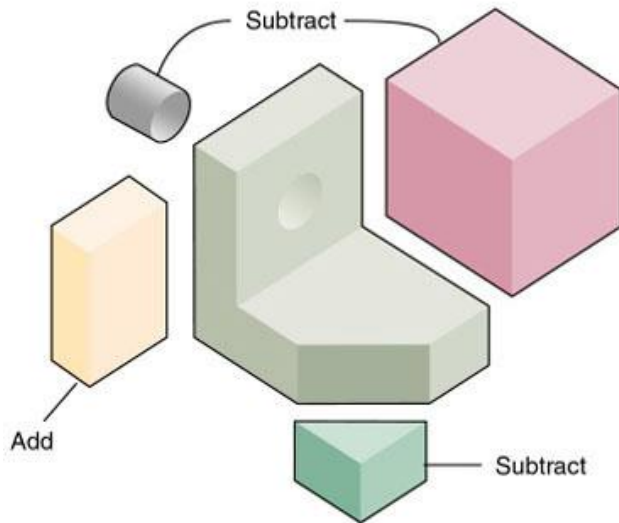


# How to create an Object

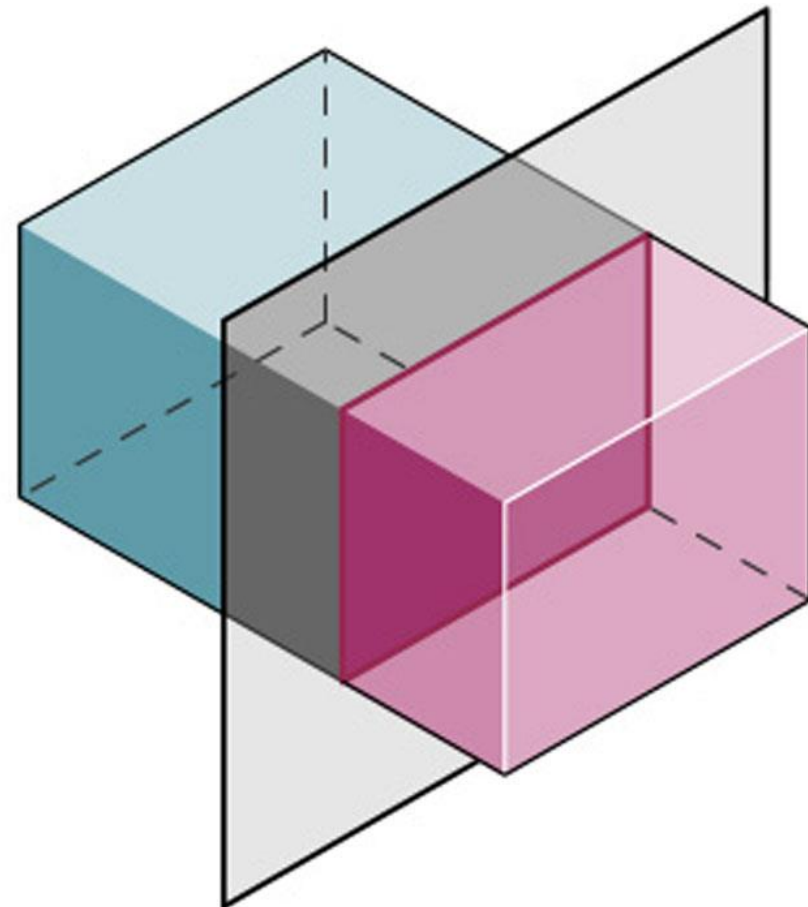
Join, Subtract, Intersect, Cut



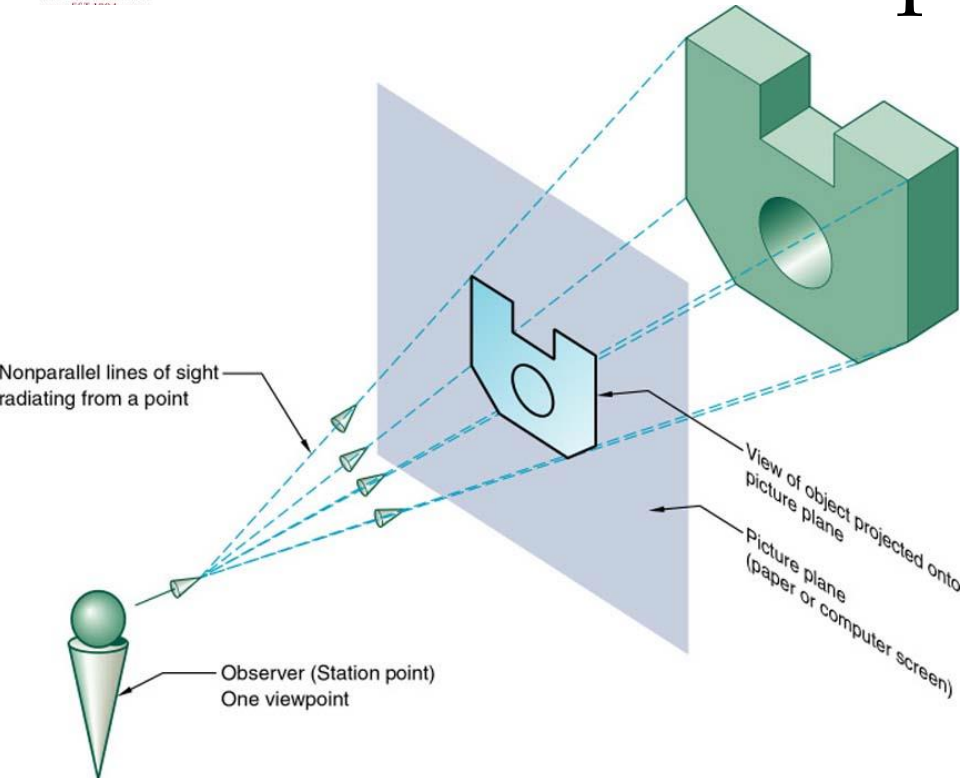
(A)



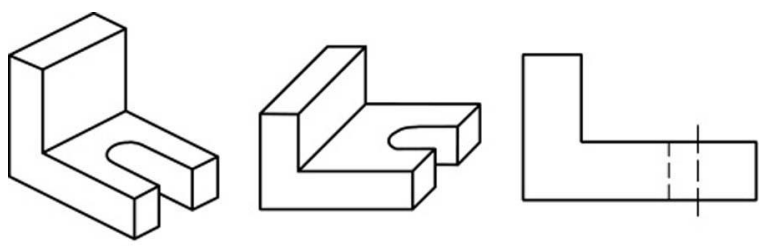
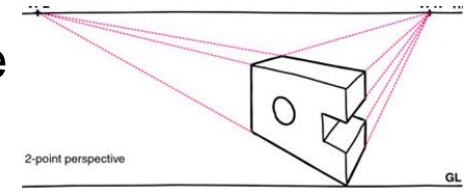
(B)



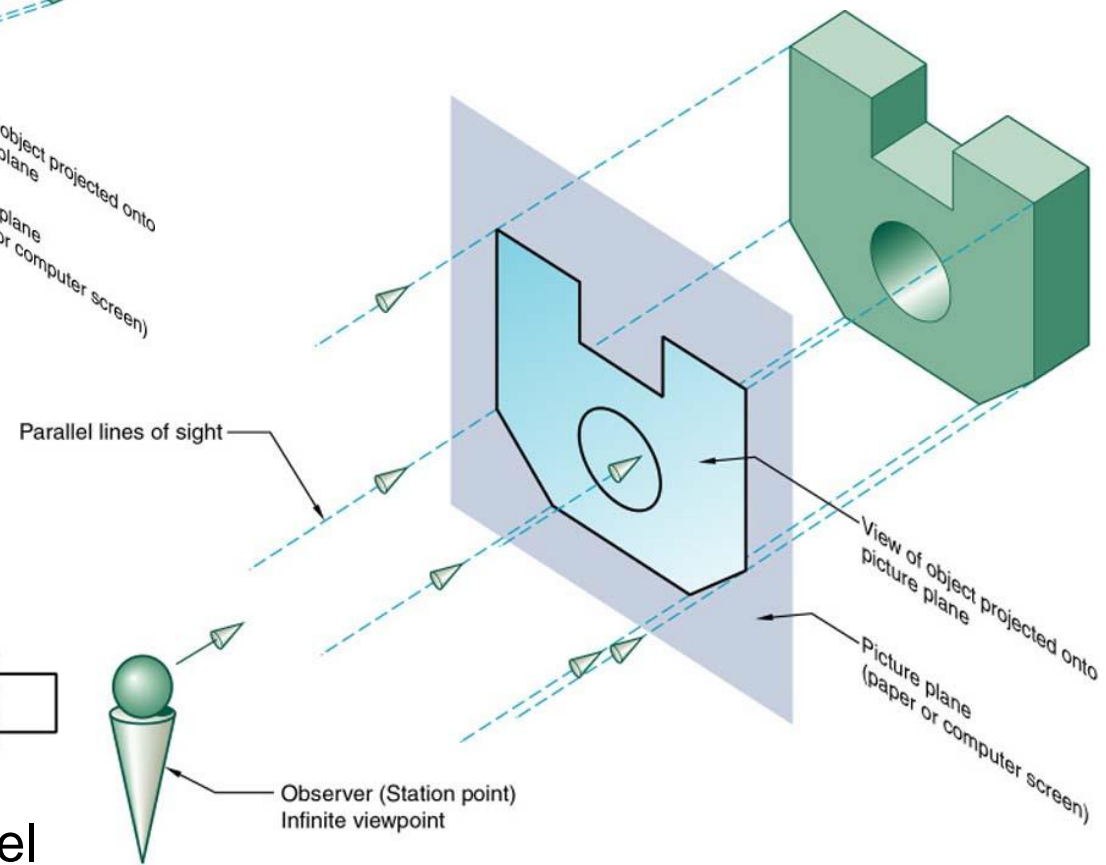
# How to represent an object



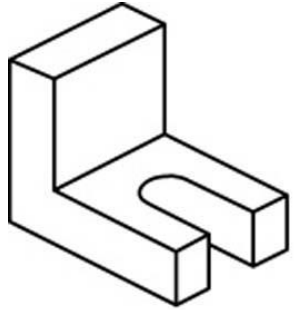
## Perspective



## Parallel



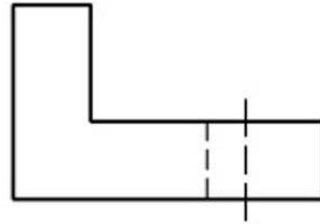
# Multiview - Orthogonal



Isometric

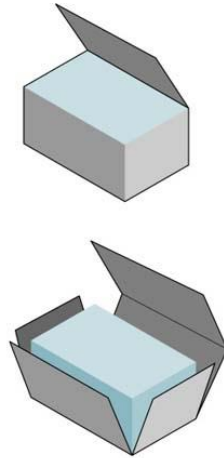


Oblique

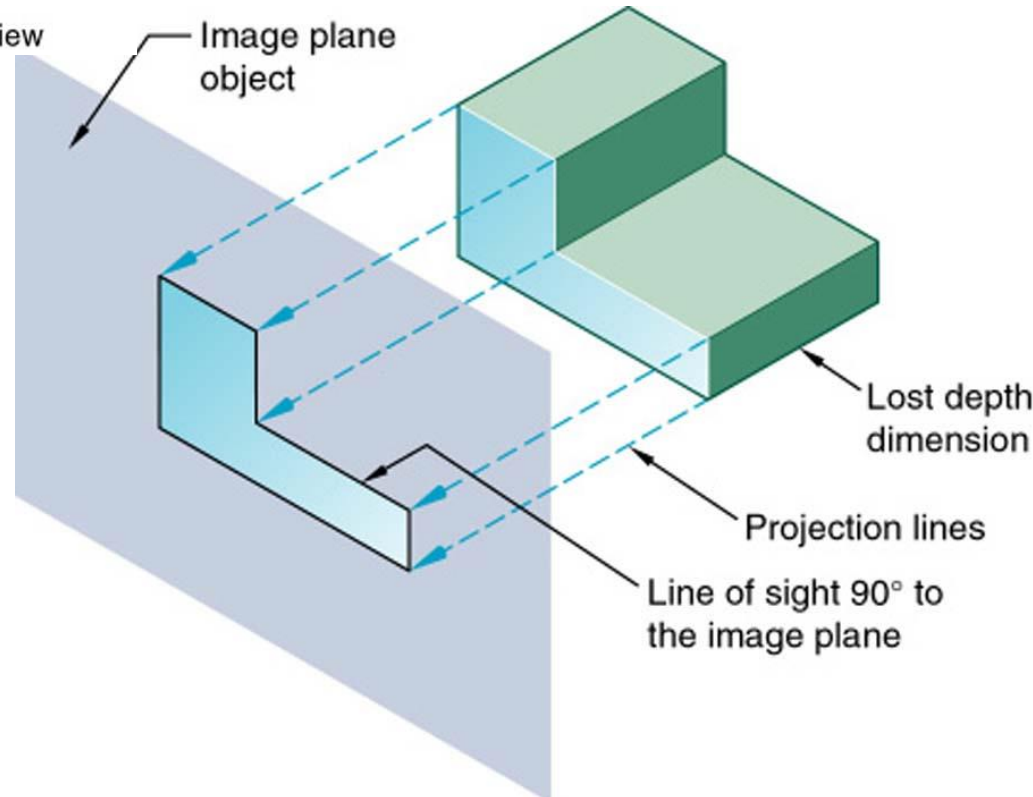
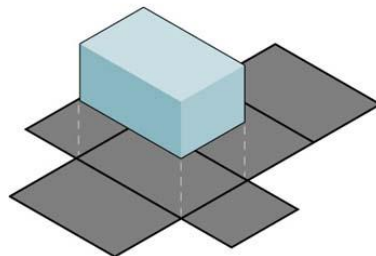


Multiview

Projection

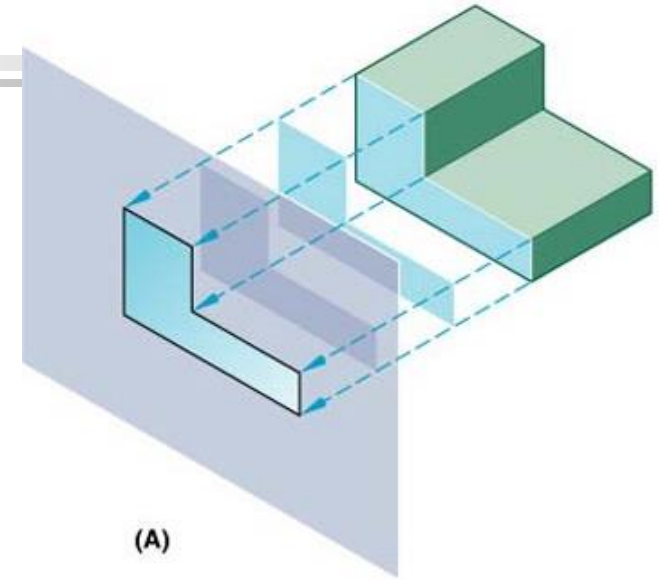
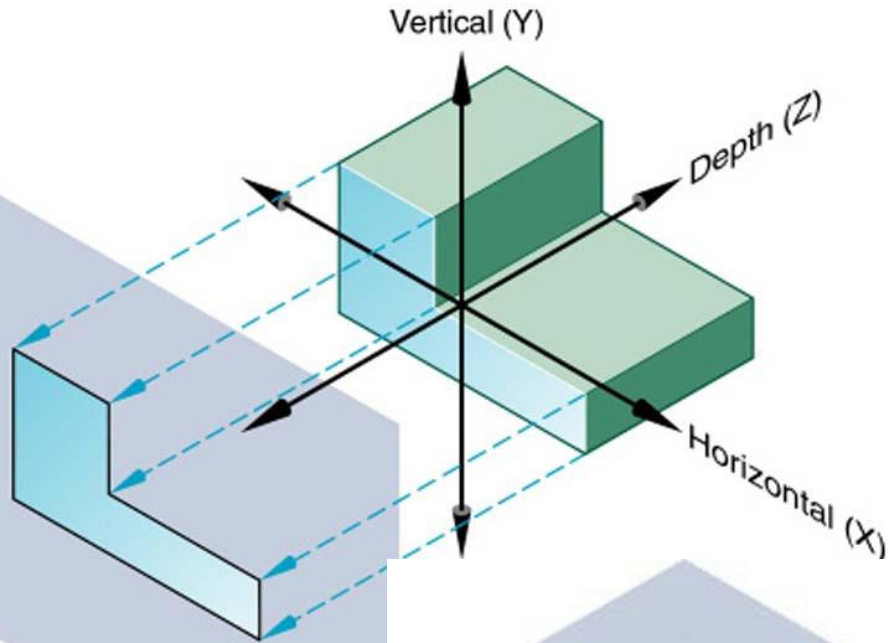


Development

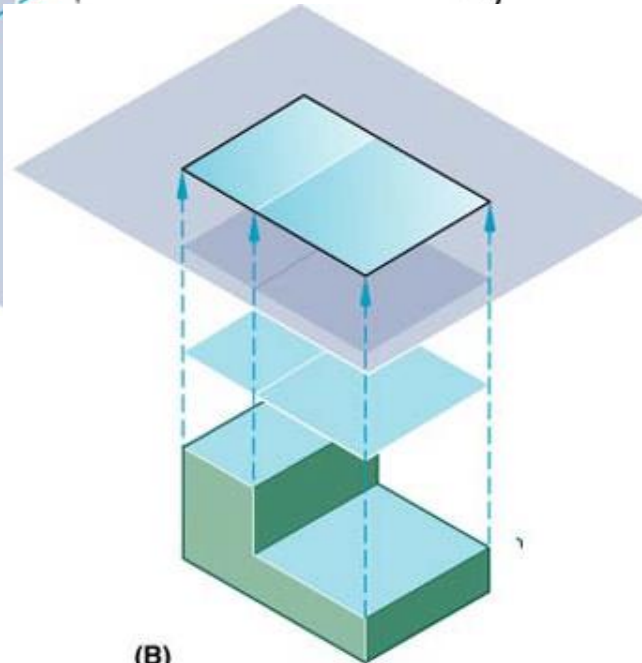




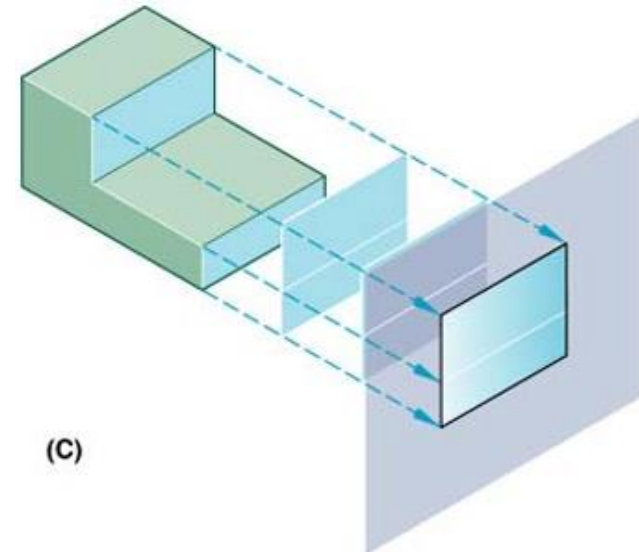
# Image orientation – normal faces



(A)

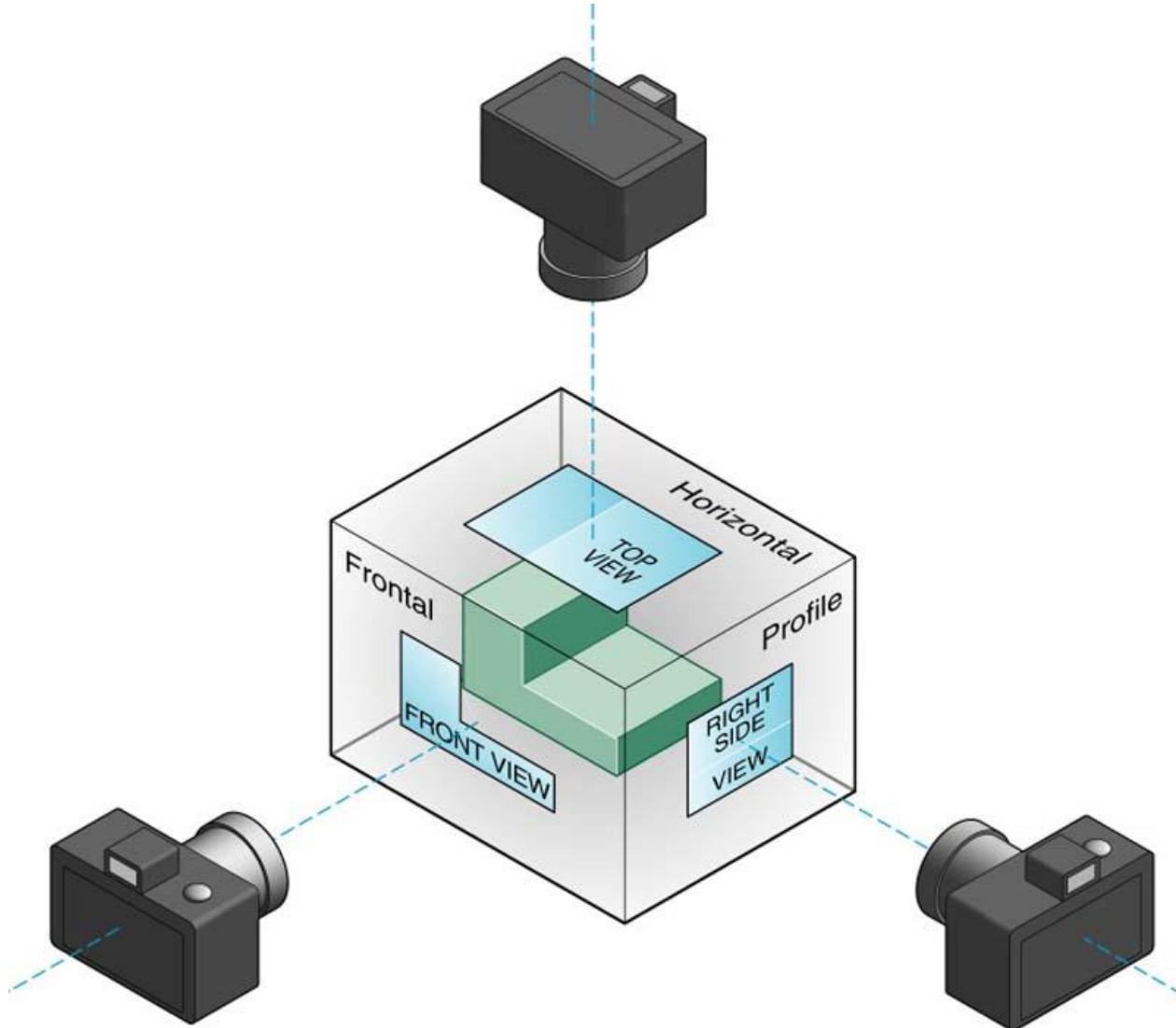


(B)



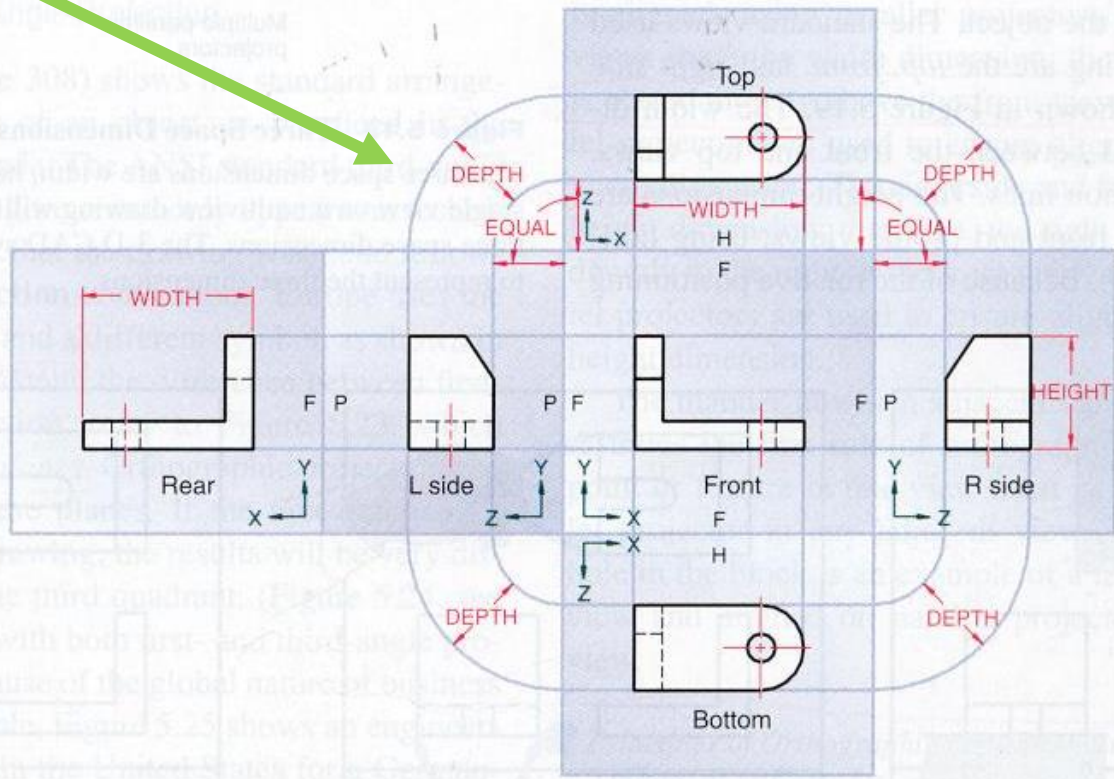
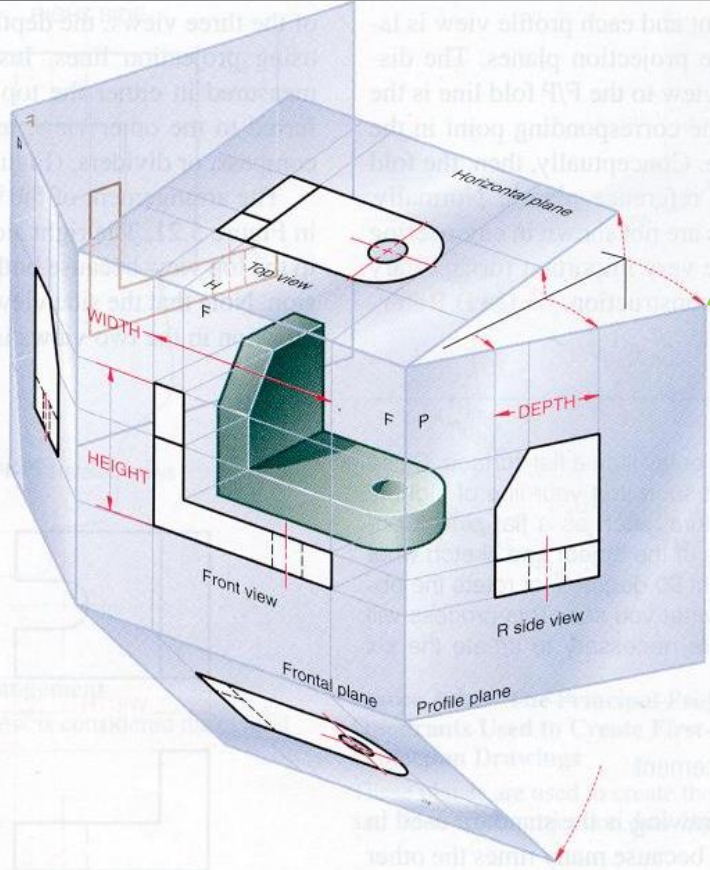
(C)

# Camera metaphor

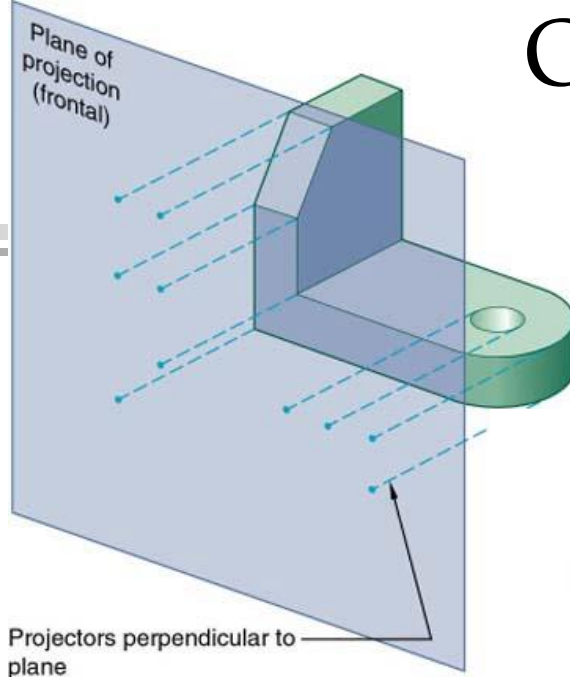


# Orthographic projections

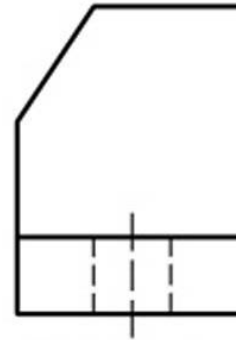
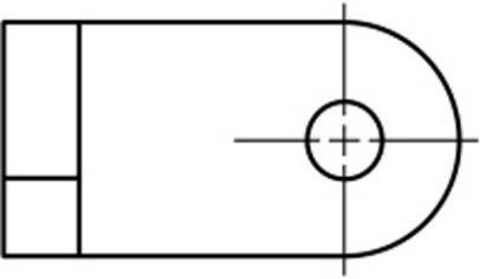
The six principal views



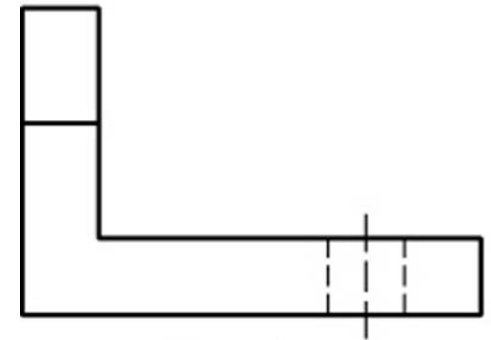
# Orthographic projections



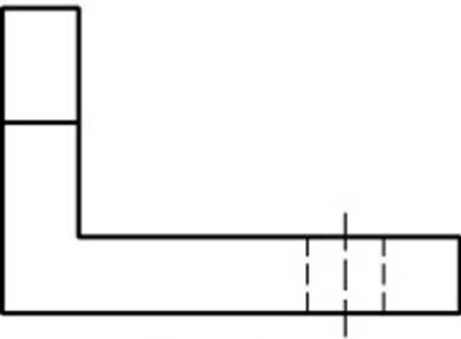
Top view



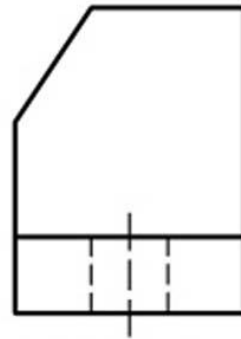
Right side view



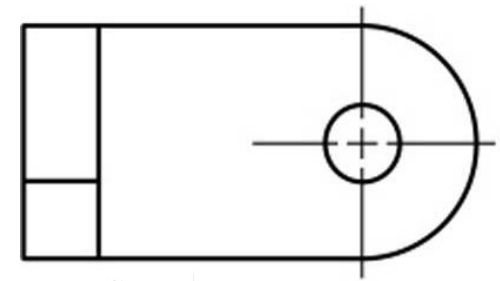
Front view



Front view

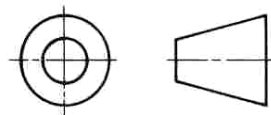


Right side view

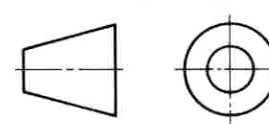


Top view

Third angle

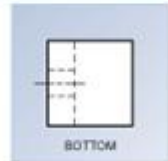
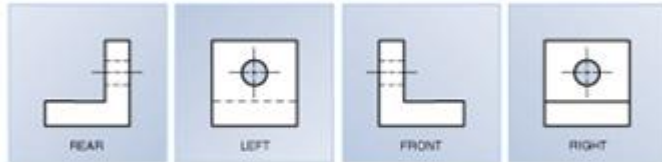
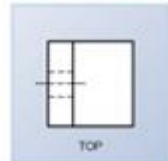
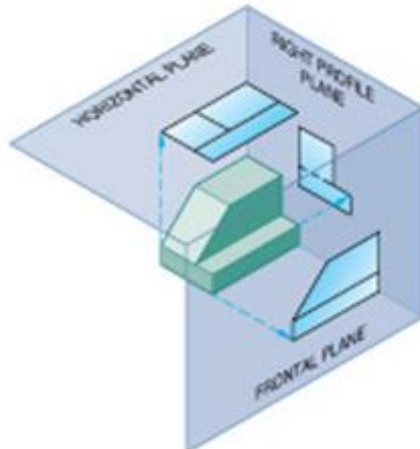


First angle

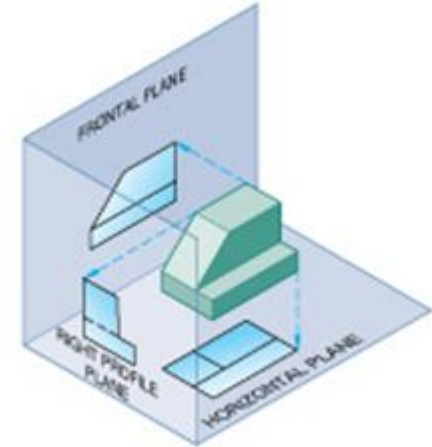
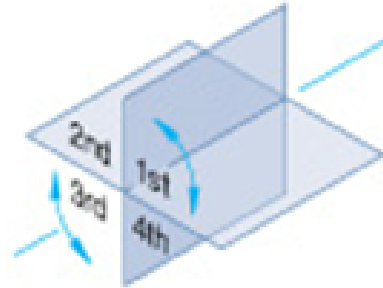


# 3rd and 1st angle projection

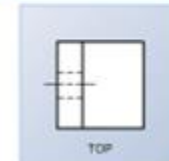
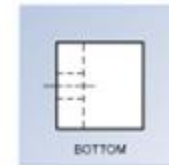
Third-Angle Projection



Standard Third Angle Projection

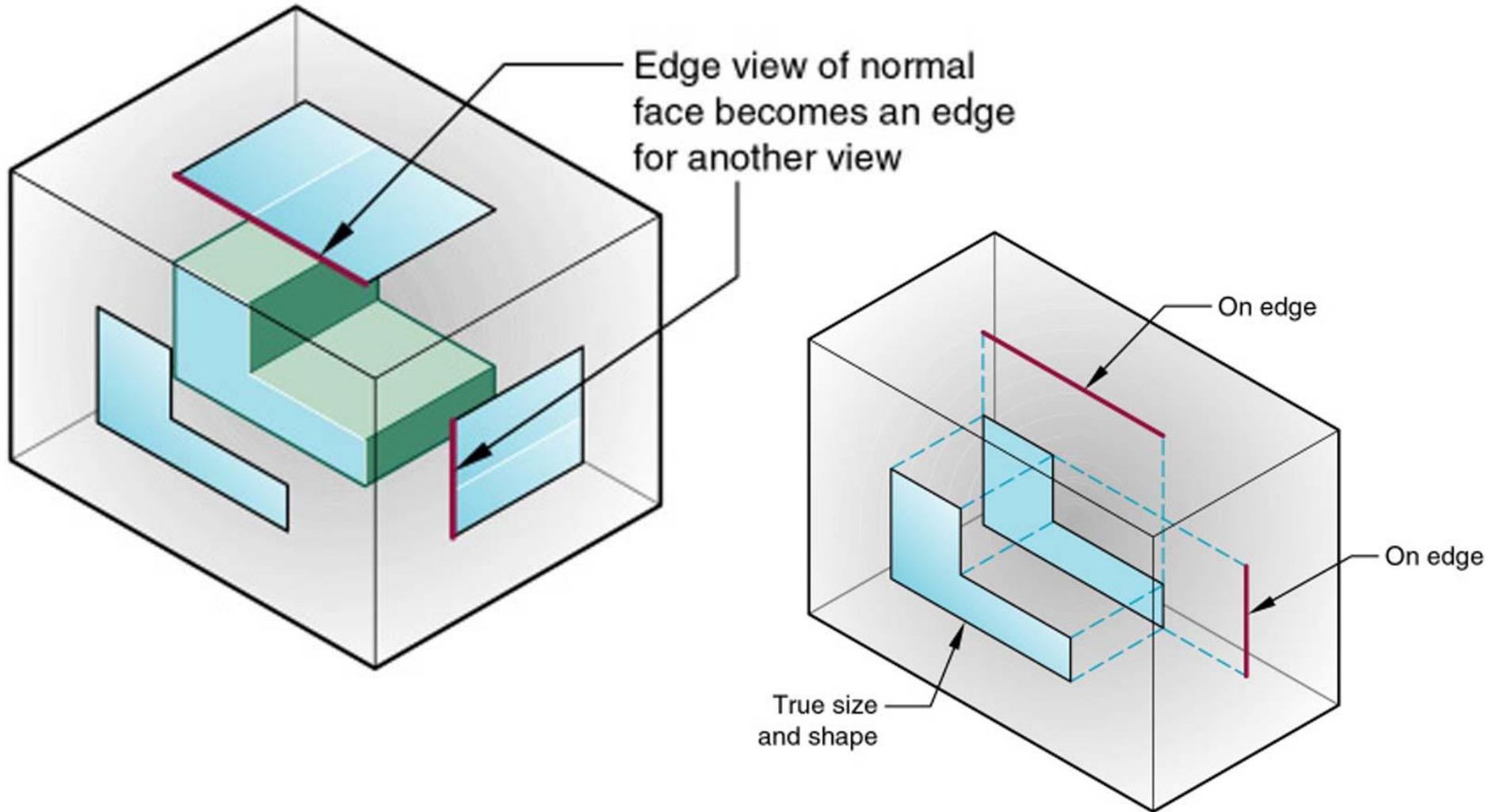


First-Angle Projection

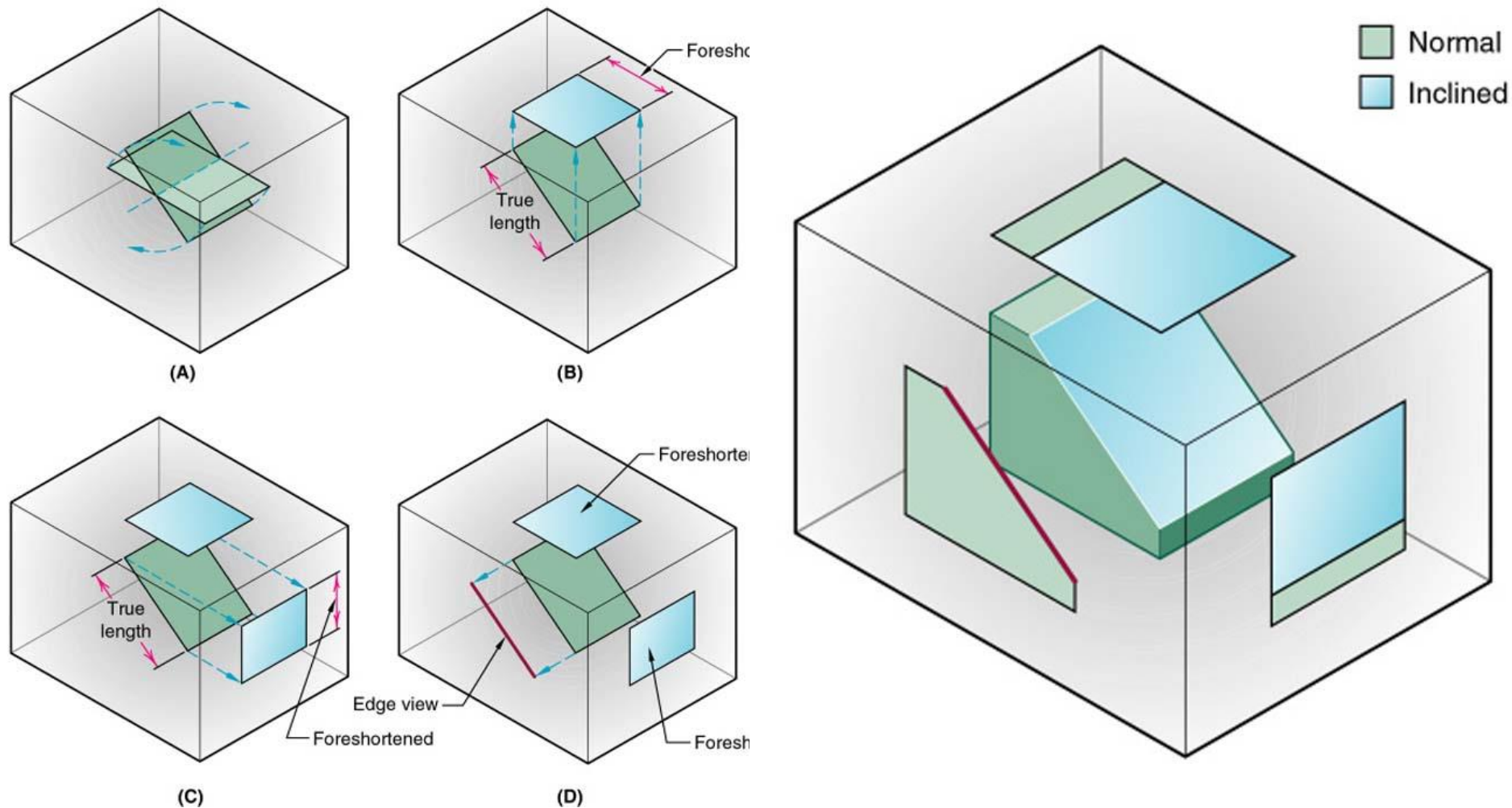


First Angle Projection

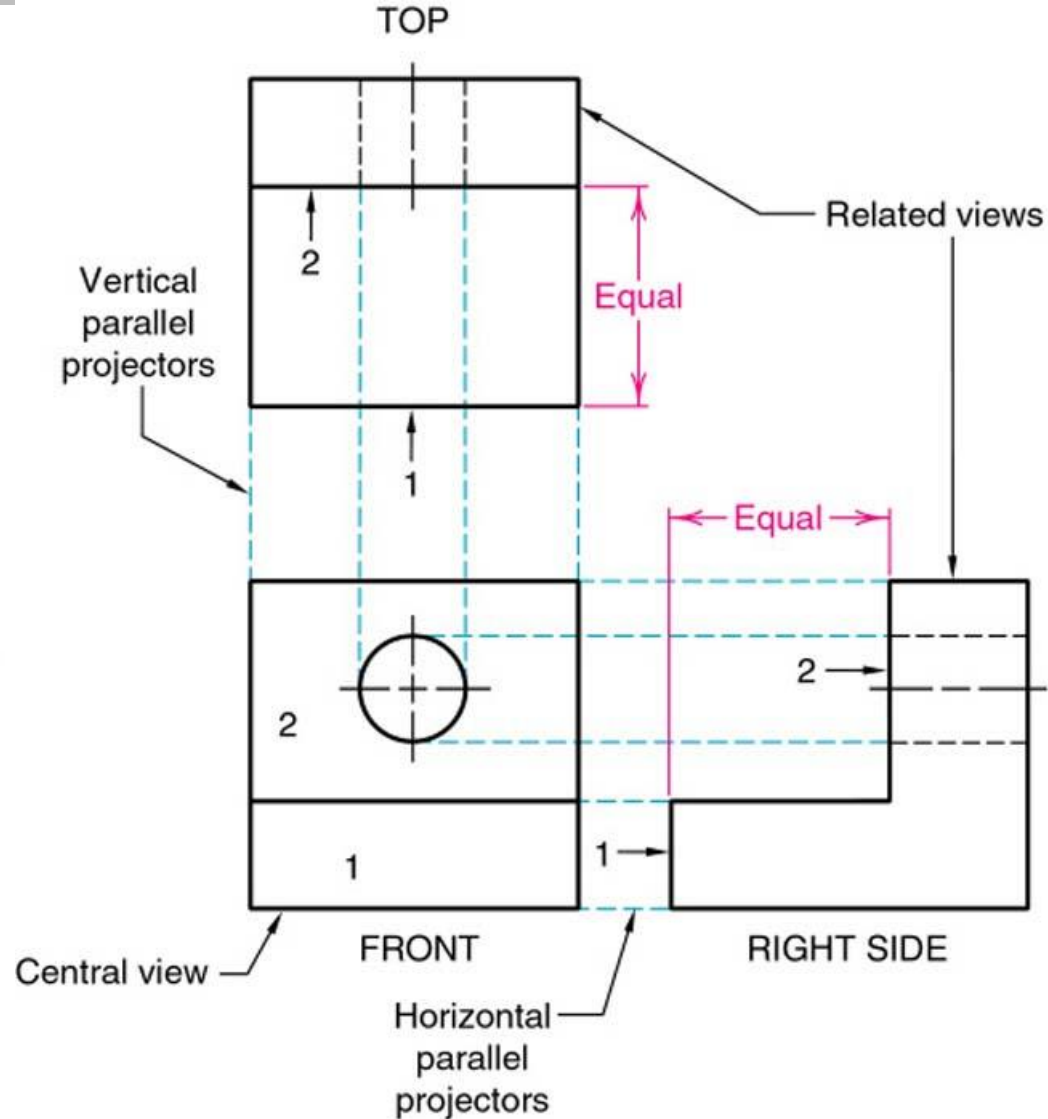
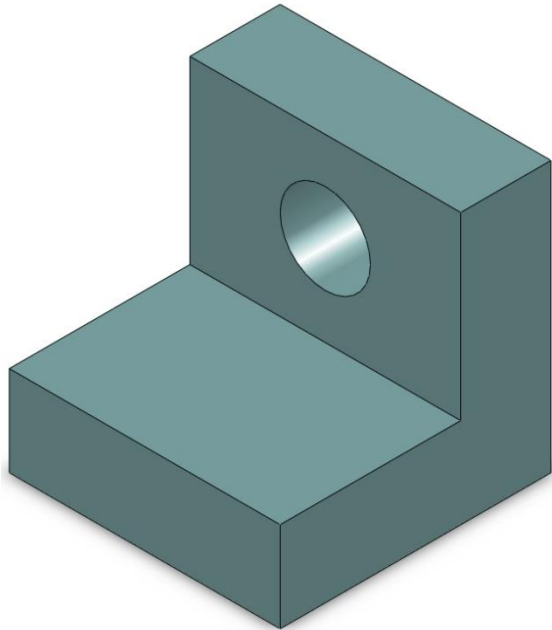
# Normal views and face projection



# Normal and inclined face projections

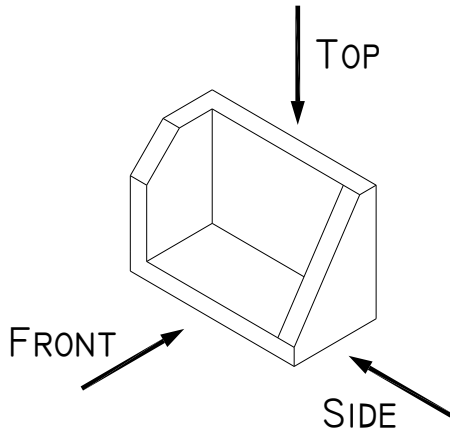


# View alignment and features

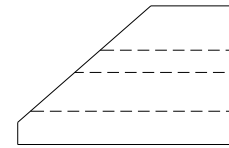
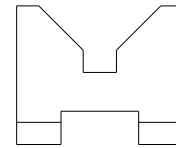




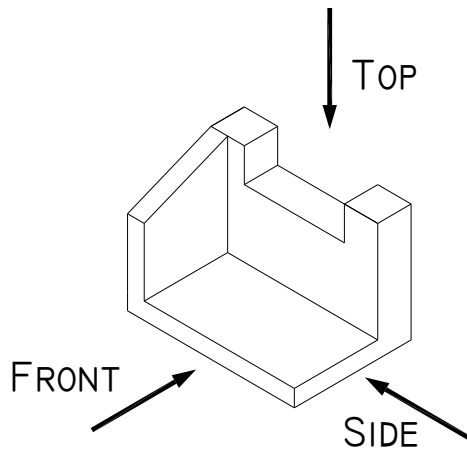
# Exercise DrE-1b



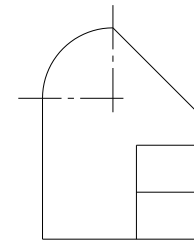
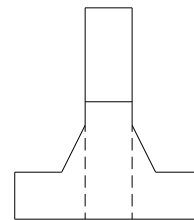
Draw the views shown in 3rd Angle Projection



State whether the views shown are in 1st or 3rd angle.  
Draw the top view in an appropriate position.



Draw the views shown in 1st Angle Projection



State whether the views shown are in 1st or 3rd angle.  
Draw the top view in an appropriate position.