



ADDIS ABABA SCIENCE AND TECHNOLOGY UNIVERSITY



Collage of Electrical and Mechanical Engineering

Department of Mechanical Engineering

**COURSE : ENGINEERING DRAWING
[Meng1011]**

CHAPTER 2

THEORY OF PROJECTION

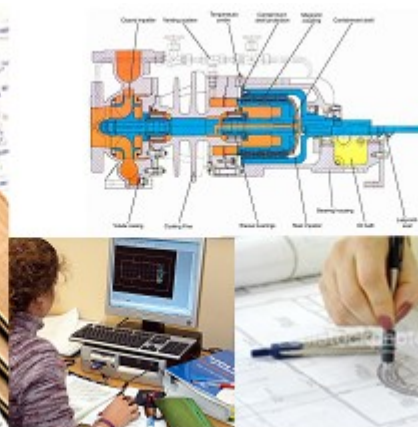


TOPICS

- **INTRODUCTION**
- **CLASSIFICATION OF PROJECTION**
- **PROJECTION OF POINTS**
- **PROJECTION OF LINES**
- **PROJECTION OF PLANES**



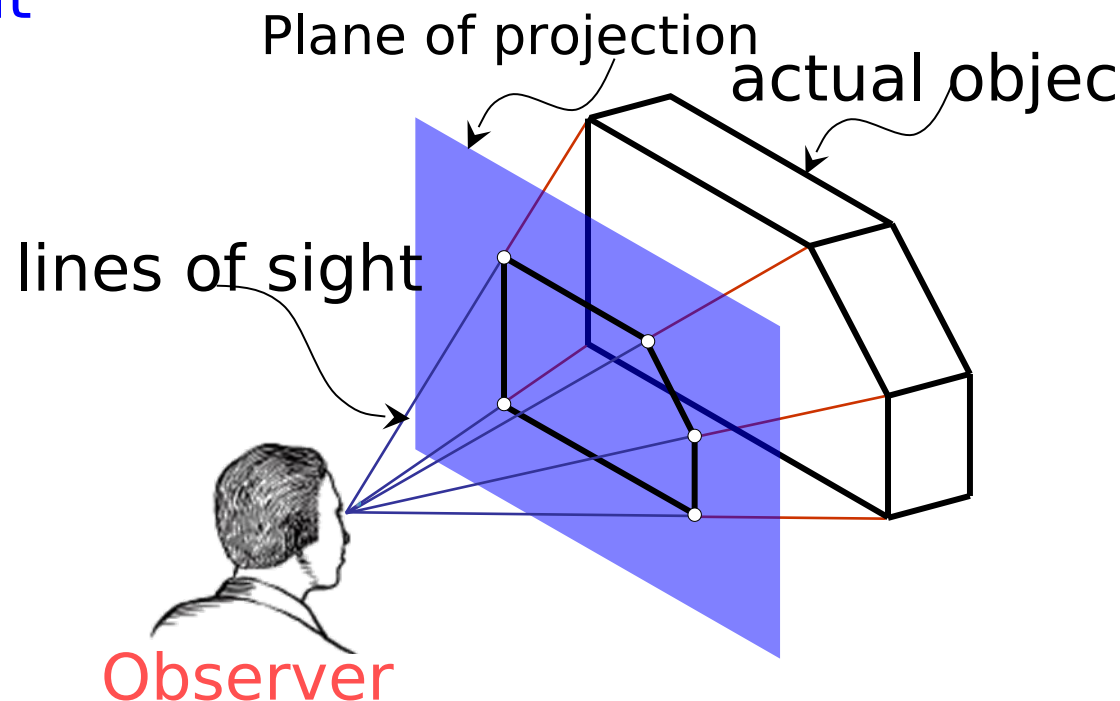
1.1. INTRODUCTION



Introduction

- A projection is a drawing or representation of an entity on an imaginary plane or planes
- A projection involves four components

- The actual object
- Observer looking at the object
- Imaginary projection plane
- Imaginary lines of sight



Introduction...

- The projection theory is used to graphically represent 3-D objects on 2-D media (paper, computer screen).
- The projection theory is based on two variables:
 - Line of sight
 - Plane of projection (image plane or picture plane)

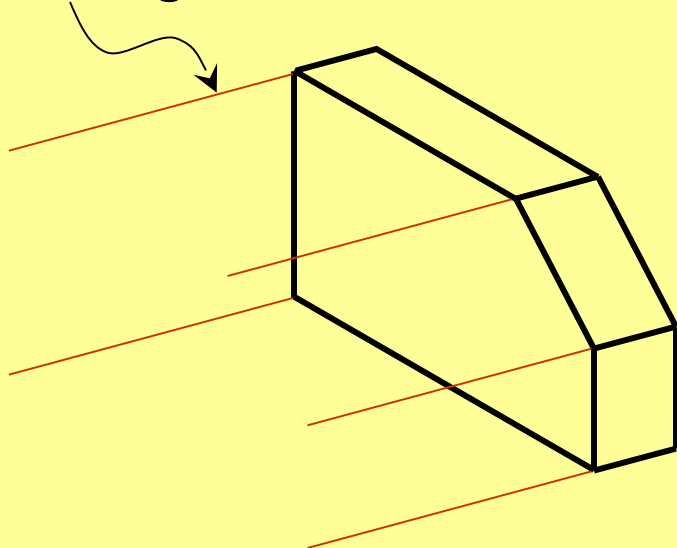
Introduction...

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**

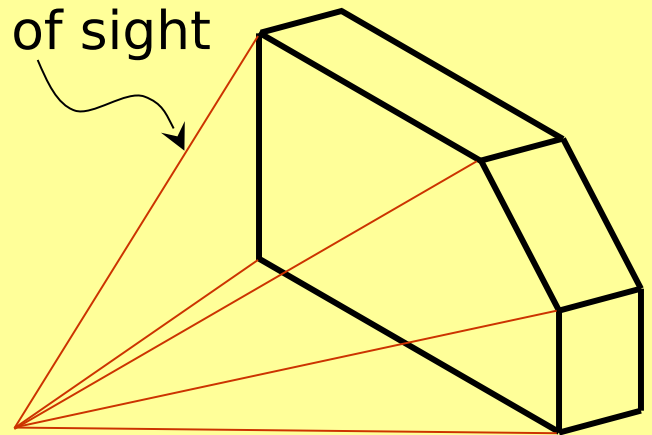
Parallel projection

Line of sight



Perspective projection

Line of sight



Introduction...

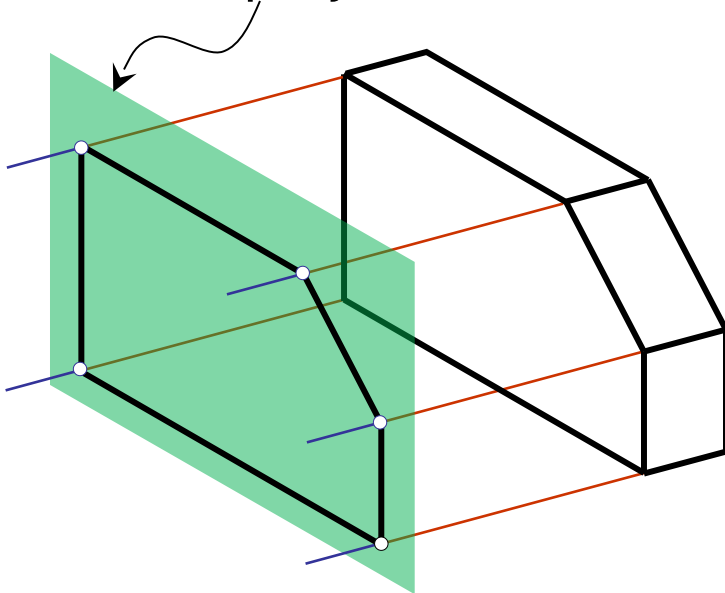
Plane of projection is an imaginary flat plane which the image is created.

■ The image is produced by connecting the points

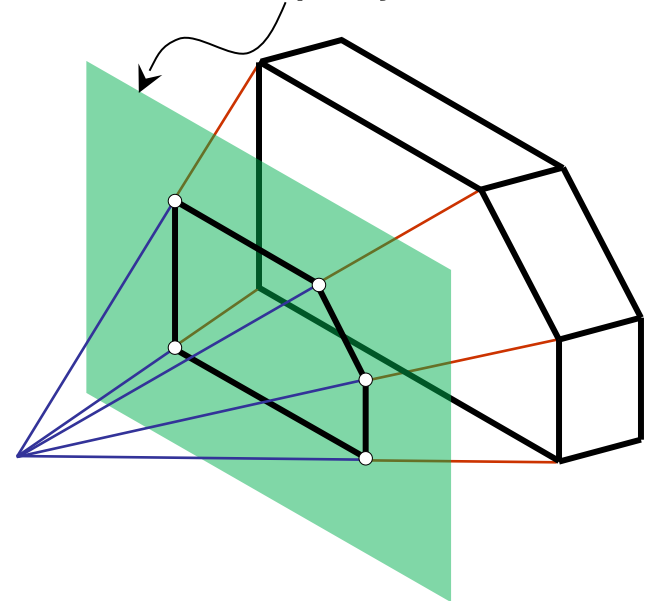
where

Parallel projection the LOS pierce the projection plane. **Perspective projection**

Plane of projection



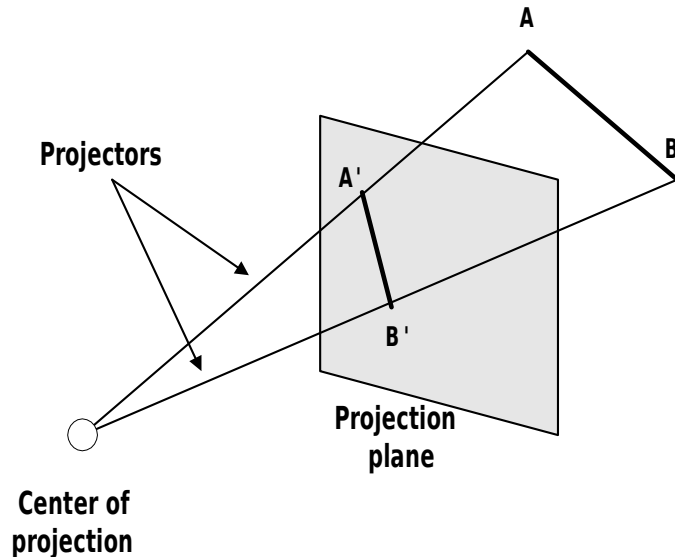
Plane of projection



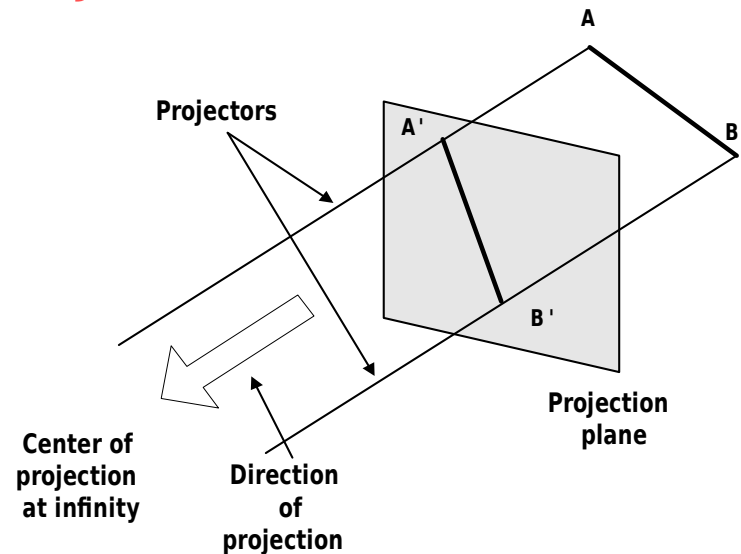
Introduction...

- The two broad types of projections are: *parallel projection* and *perspective projection*.
- Key factor is the **center of projection**: if distance to center of projection is

Finite: Perspective **Infinite** : Parallel
projection projection



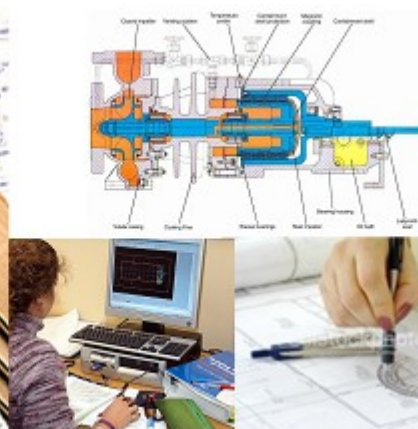
Perspective projection



Parallel projection

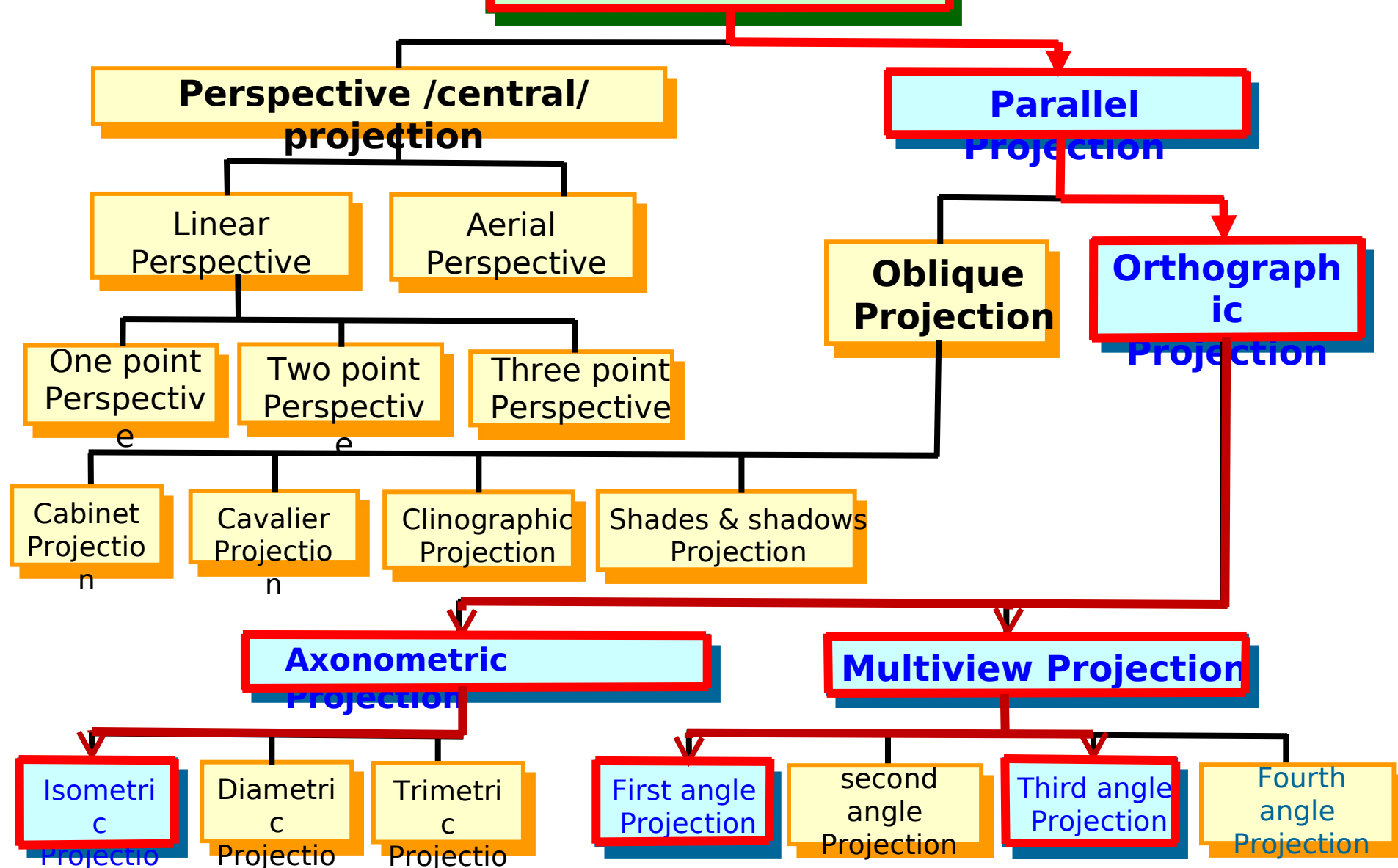


2.2. CLASSIFICATION OF PROJECTION



CLASSIFICATION OF

PROJECTION METHOD

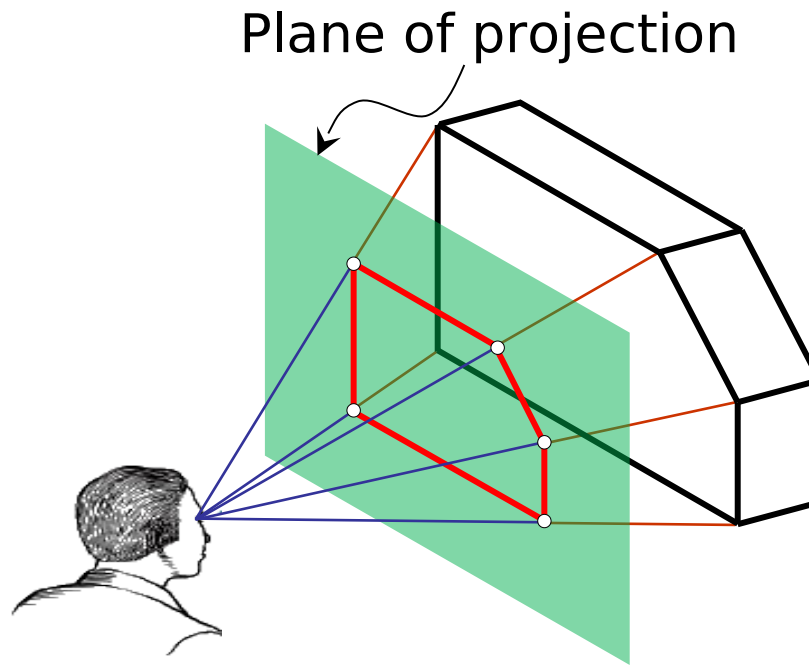


CLASSIFICATION OF PROJECTION

1. Perspective Projections

- ❑ PPs are drawings which attempt to replicate what the human eye actually sees when it views an object.
- ❑ There are three types of perspective projections:

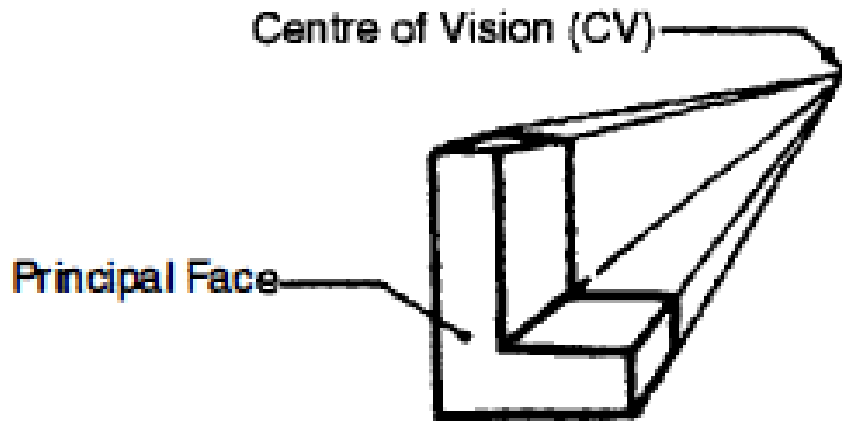
One-point, Two-point and Three-point projections



CLASSIFICATION OF PROJECTION

1.1. One point perspective projection

- If the principal face of the object viewed, is parallel to the picture plane, the perspective view formed is called parallel perspective /one point perspective/.
- The horizontal lines receding the object converge to a single point called vanishing point (V.P.)
- Generally used to present the interior details of a room, interior features of various components, etc.



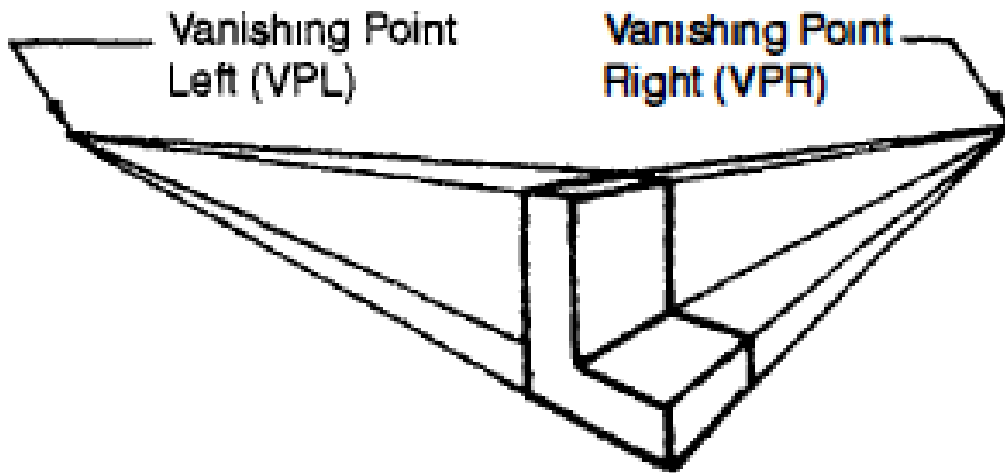
(a) Parallel Perspective



CLASSIFICATION OF PROJECTION

1.2. Two-point perspective projection

- If the two principal faces of the object viewed are inclined to the picture plane, the perspective view formed is called angular perspective /two point perspective/.
- This is often used in architectural, engineering and industrial design drawings



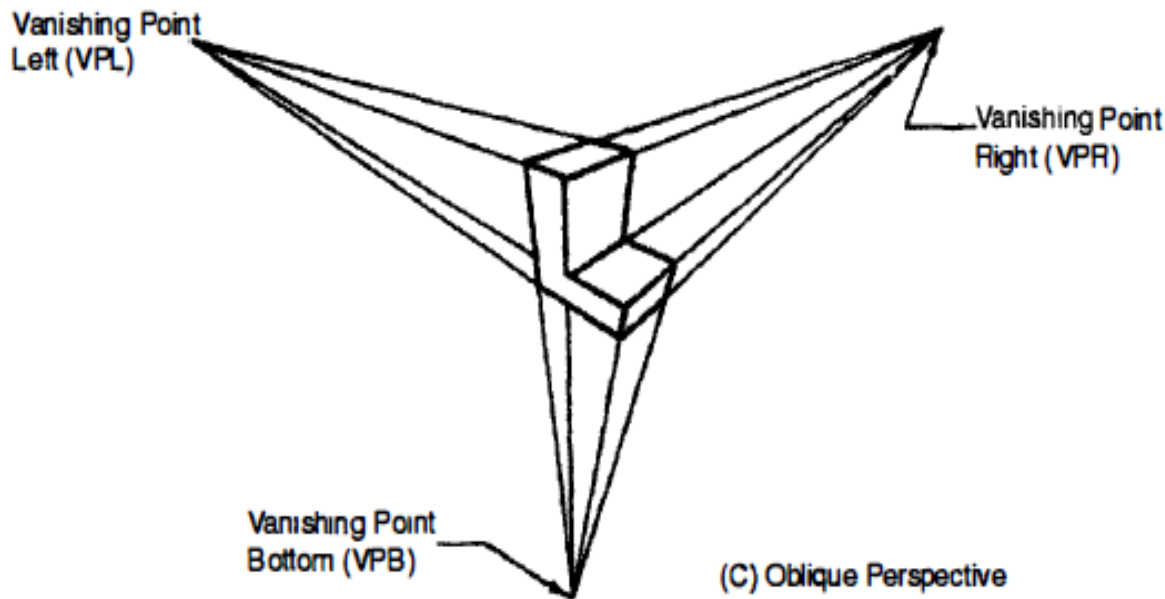
(b) Angular Perspective



CLASSIFICATION OF PROJECTION

1.3. Three point perspective projection:

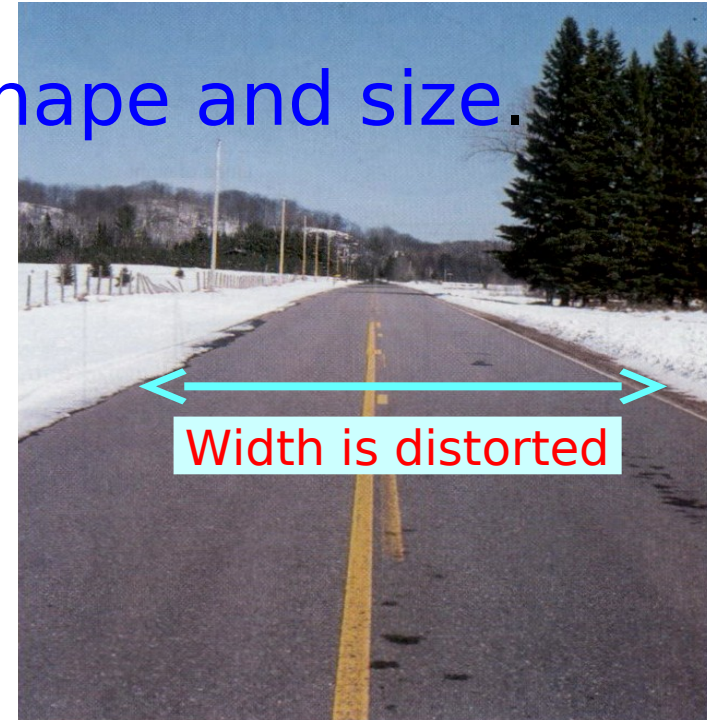
- If all the three mutually perpendicular principal faces of the object viewed, are inclined to the picture plane, the perspective view formed is called oblique perspective /three point perspective / .
- Used to draw pictorial views of huge and tall objects like tall buildings, towers, structures, etc.



CLASSIFICATION OF PROJECTION

Disadvantage of Perspective Projection

- Perspective projection is **not** used by engineer for manufacturing of parts, because
 - It does not reveal **exact shape and size**.
 - It is difficult to **create**.

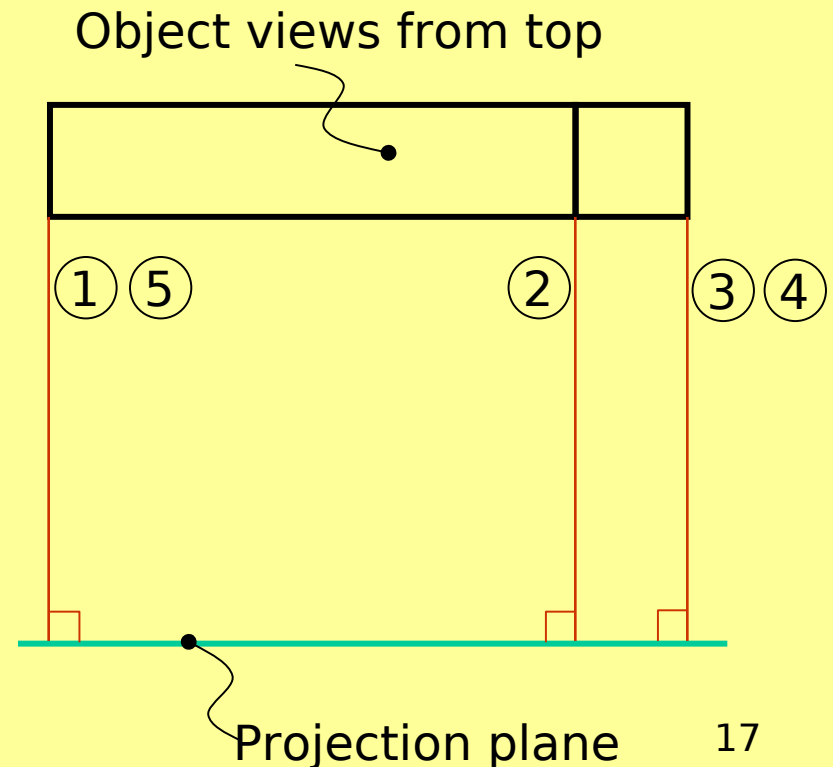
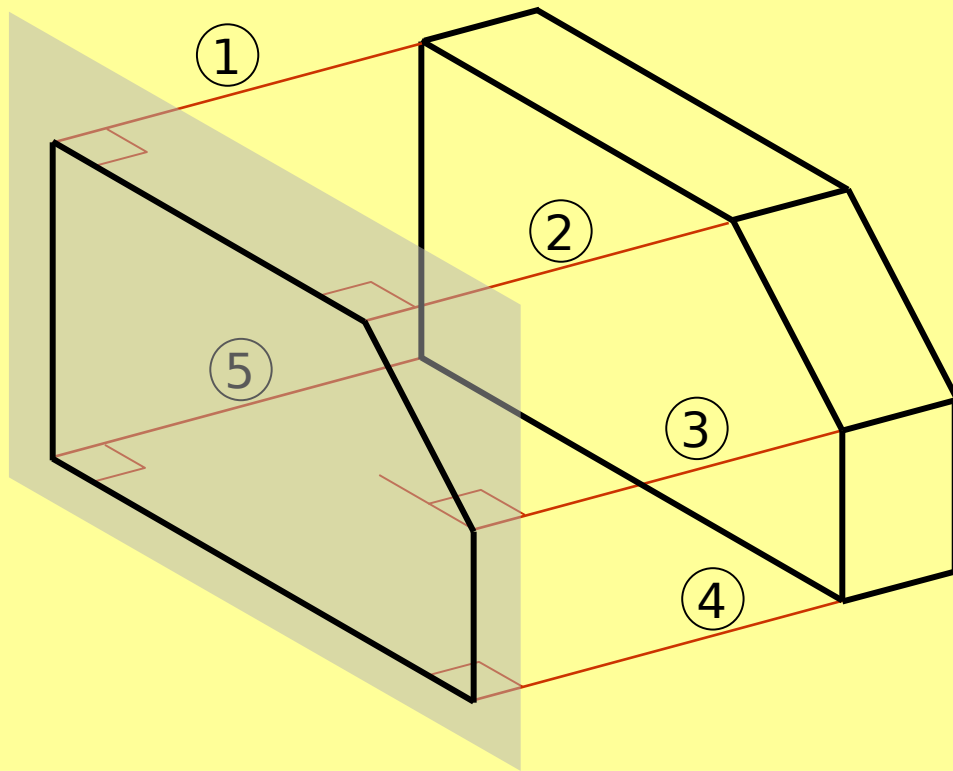


CLASSIFICATION OF PROJECTION

2.Parallel Projection

- It is subdivided into the following two categories:
Orthographic & Oblique projections

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



CLASSIFICATION OF PROJECTION

- Orthographic projection technique can produce either

2.1.1.Multiview drawing : that each view show an object in two dimensions. / chapter 3/

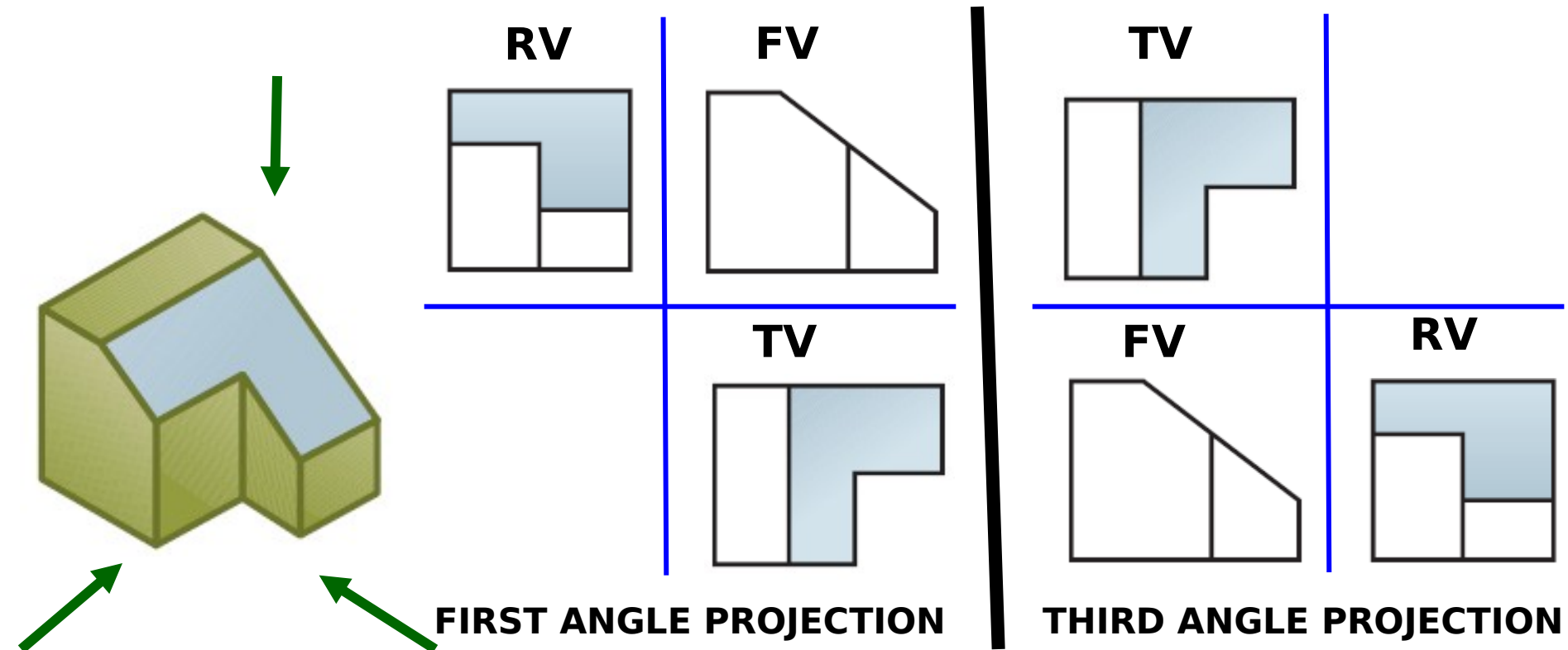
2.1.2.Axonometric drawing : that show all three dimensions of an object in one view /chapter 4/.

- Both drawing types are used in technical drawing for communication.

CLASSIFICATION OF PROJECTION

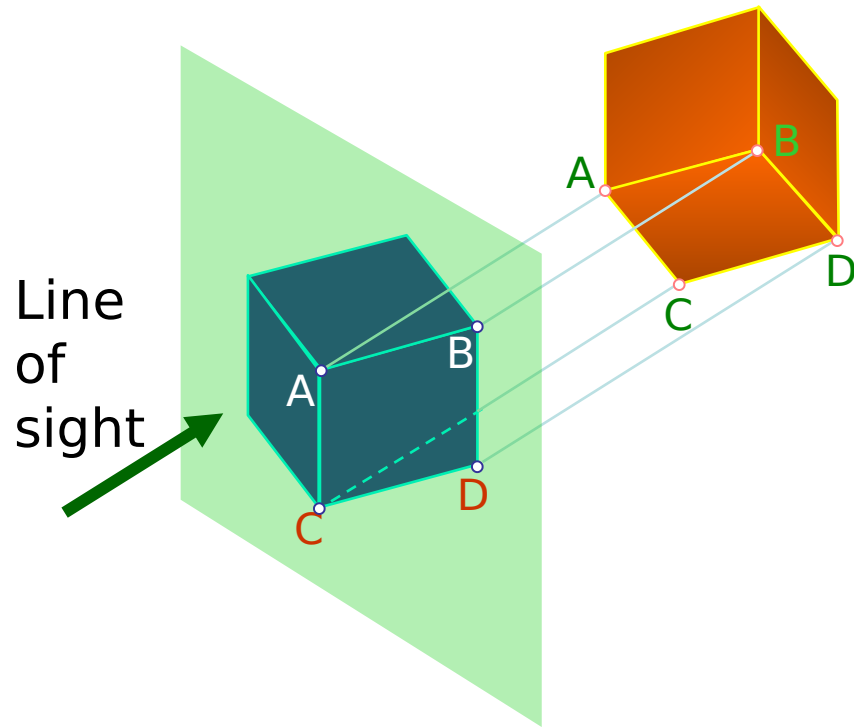
1.1. Multiview drawing : technique can produce either
1st , 2nd , 3rd and 4th angle projection

But this course focus on **1st** , and **3rd** angle projection



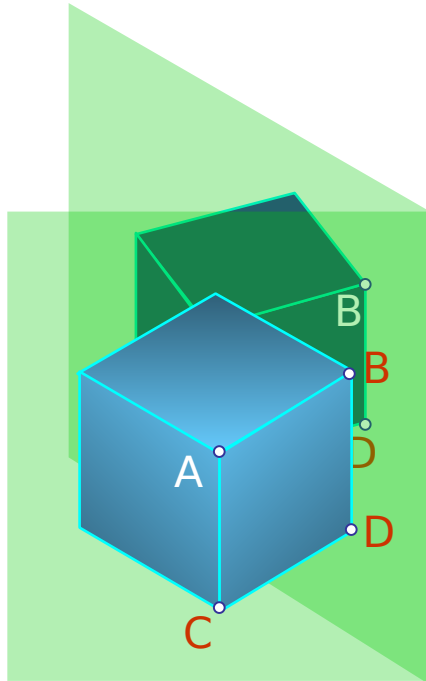
CLASSIFICATION OF PROJECTION

2.1.2. Axonometric Projection

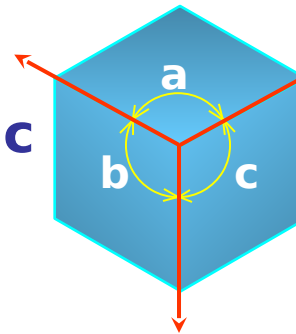


CLASSIFICATION OF PROJECTION

Type of axonometric drawing



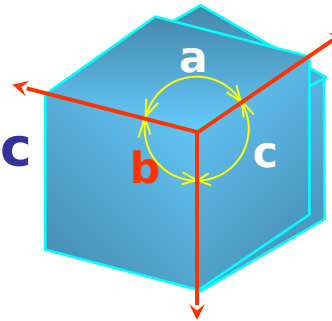
1. Isometric



Axonometric axis

All angles are equal.

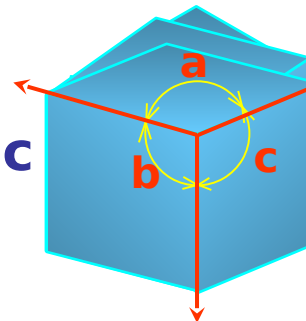
2. Dimetric



Axonometric axis

Two angles are equal.

3. Trimetric



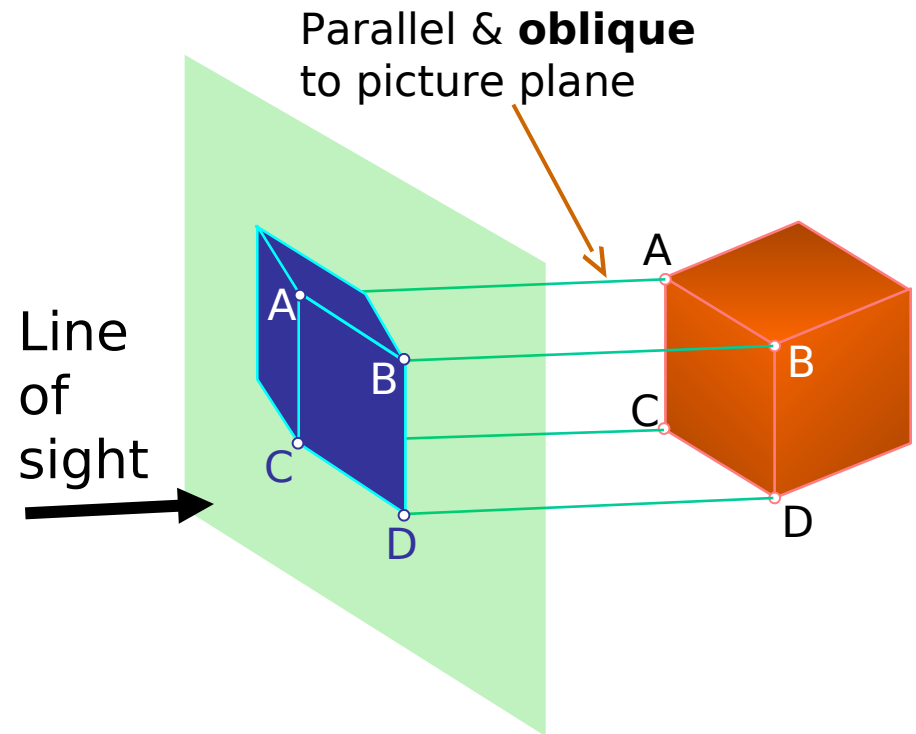
Axonometric axis

None of angles are equal.

CLASSIFICATION OF PROJECTION

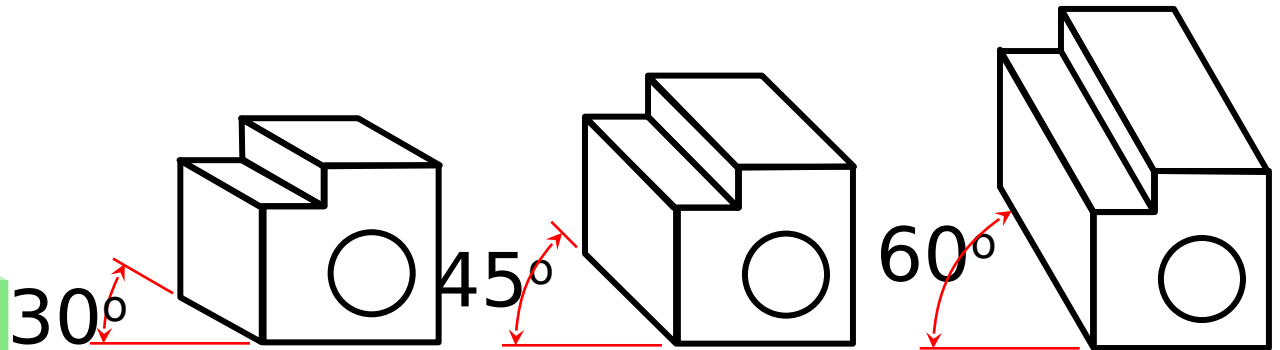
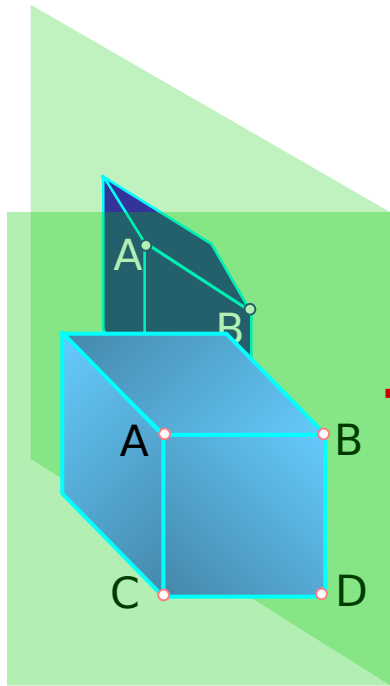
2.2. Oblique projections

- ❑ Actually show the full size of one view.
- ❑ When one face of the object is kept parallel to the plane and the other adjacent face is inclined at 45° to the plane.
- ❑ Two axes are perpendicular to each other and the third is drawn either at 30° or 45° to the horizontal.



CLASSIFICATION OF PROJECTION

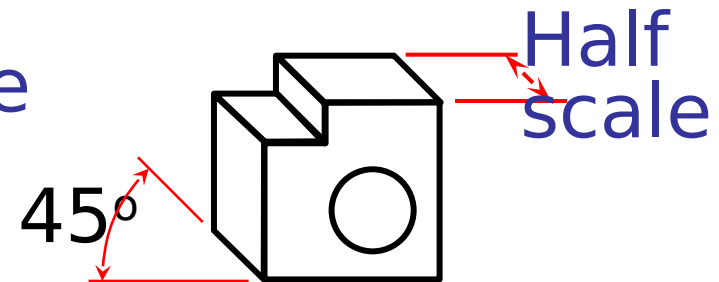
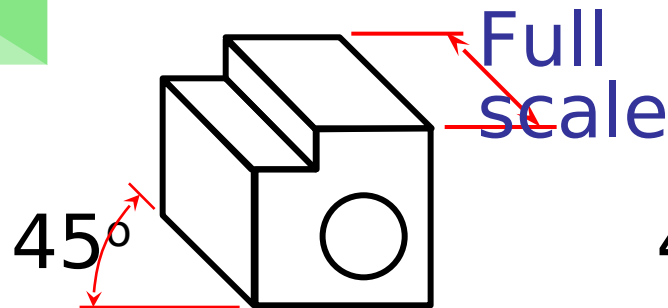
Oblique drawing angle



Type of Oblique drawing

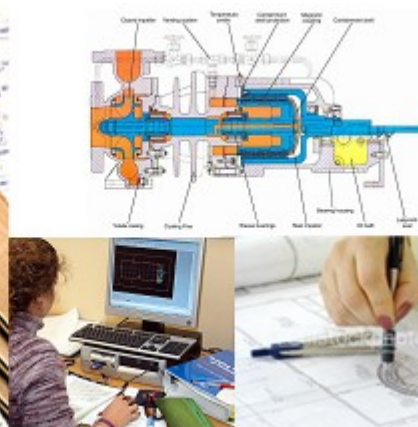
1) Cavalier

2) Cabinet





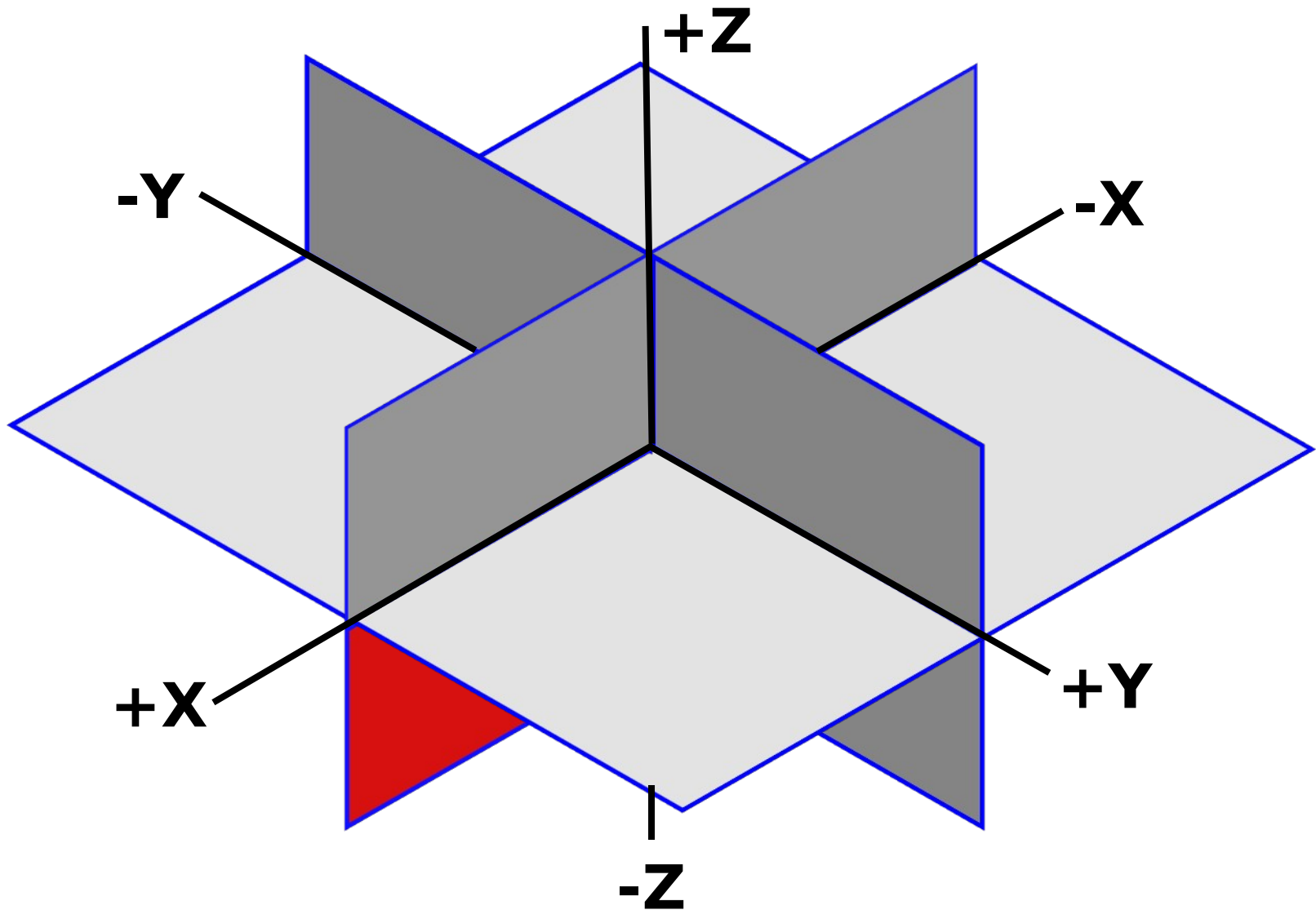
2.3. PROJECTION OF POINT(S)



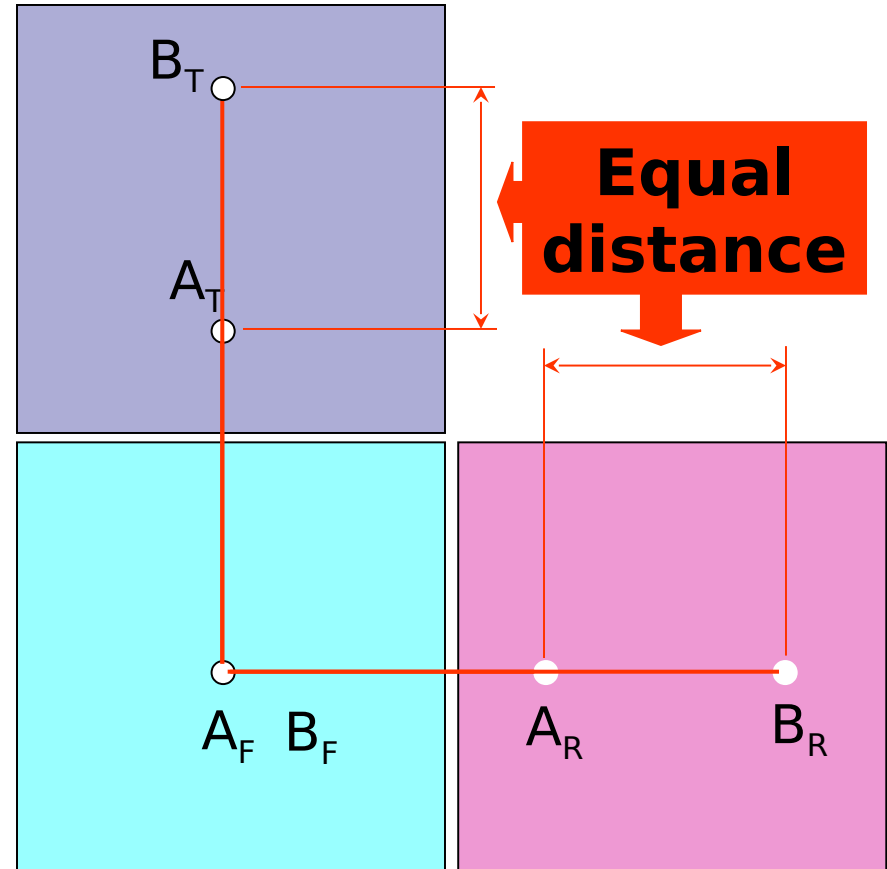
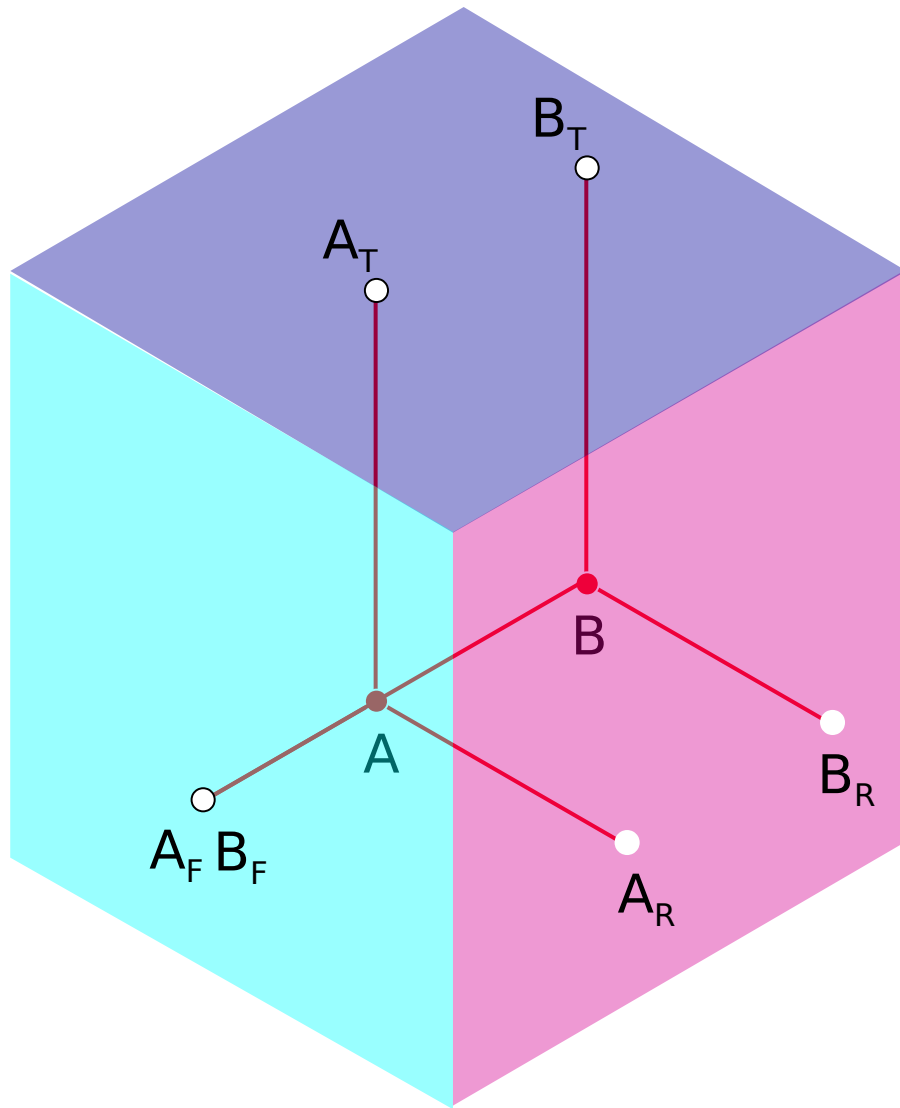
PROJECTION OF POINT(S)

- A plane of projection (**POP**) is a plane on which a particular view is projected.
- Three such planes, perpendicular to each other, are called principal planes or reference planes (RP).
 - When the observer looks at the object from the front, the view obtained is called the front view or elevation and is seen on the vertical plane (VP)/ frontal plane (FP).
 - When the observer looks at the object from above, the view obtained is called top view or plan and is seen on the horizontal plane (HP).
 - When the observer looks at the object from side, i.e., from his left-hand side or right-hand side, the view obtained is called side view and is seen on the profile plane (PP).

PROJECTION OF POINT(S)

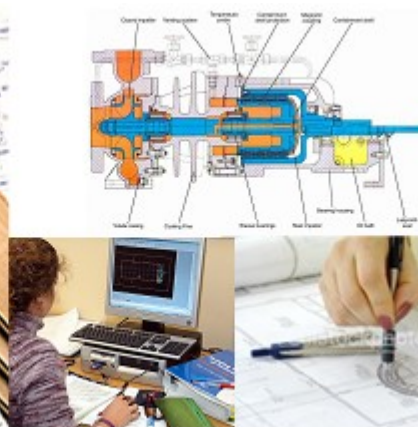


PROJECTION OF POINT(S)

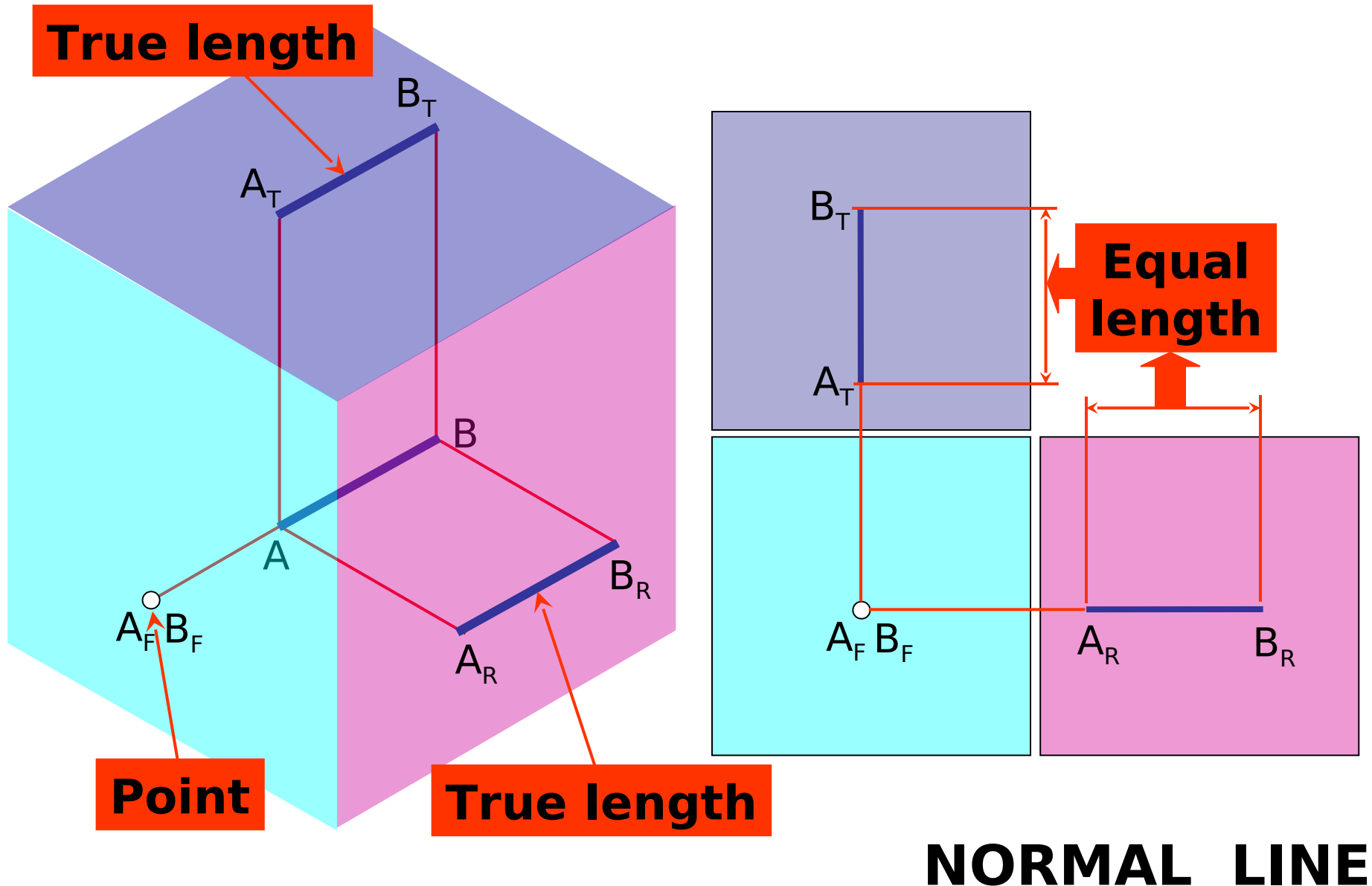




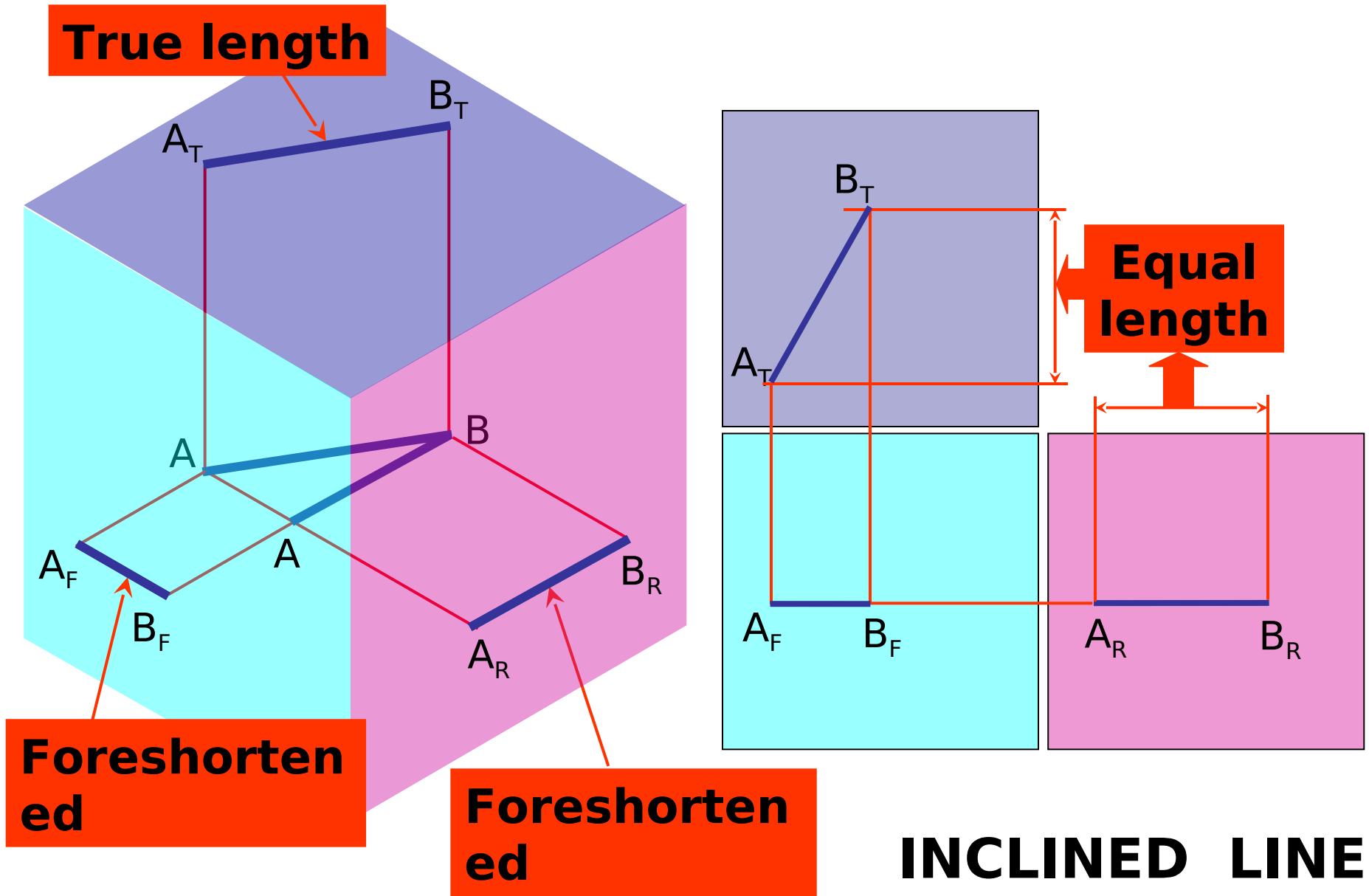
2.4. PROJECTION OF LINES



PROJECTION OF LINES

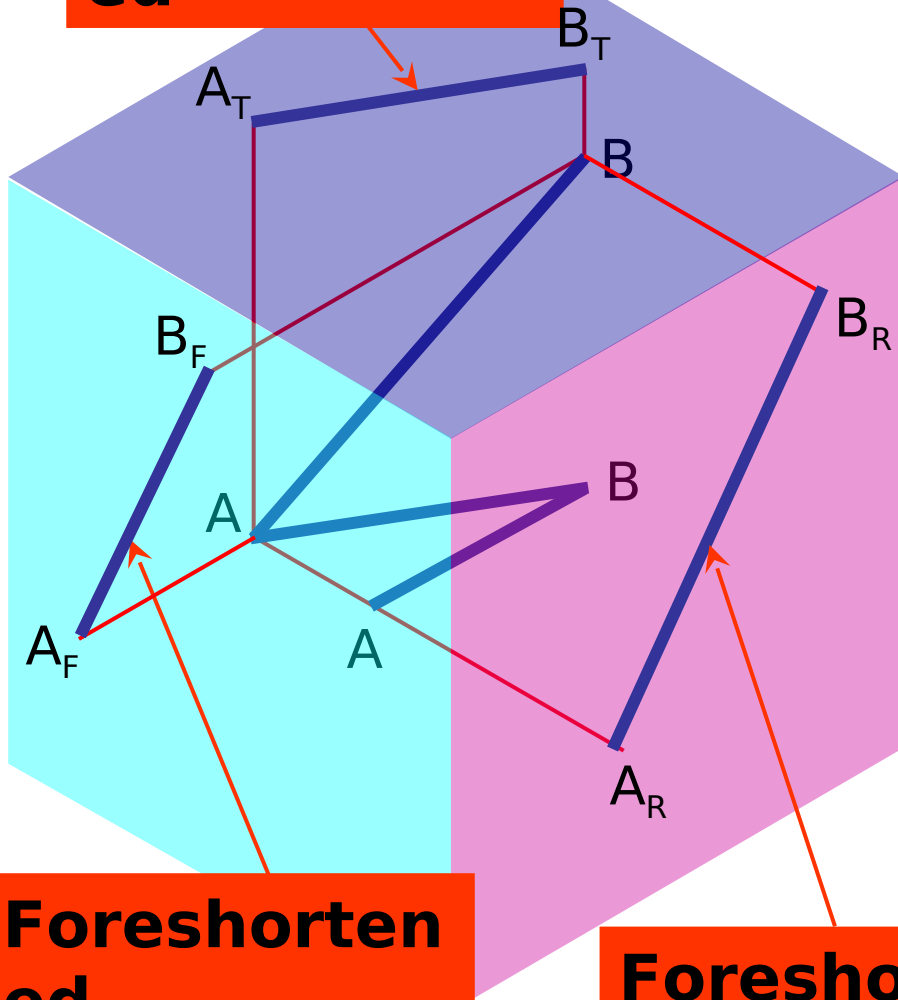


PROJECTION OF LINES



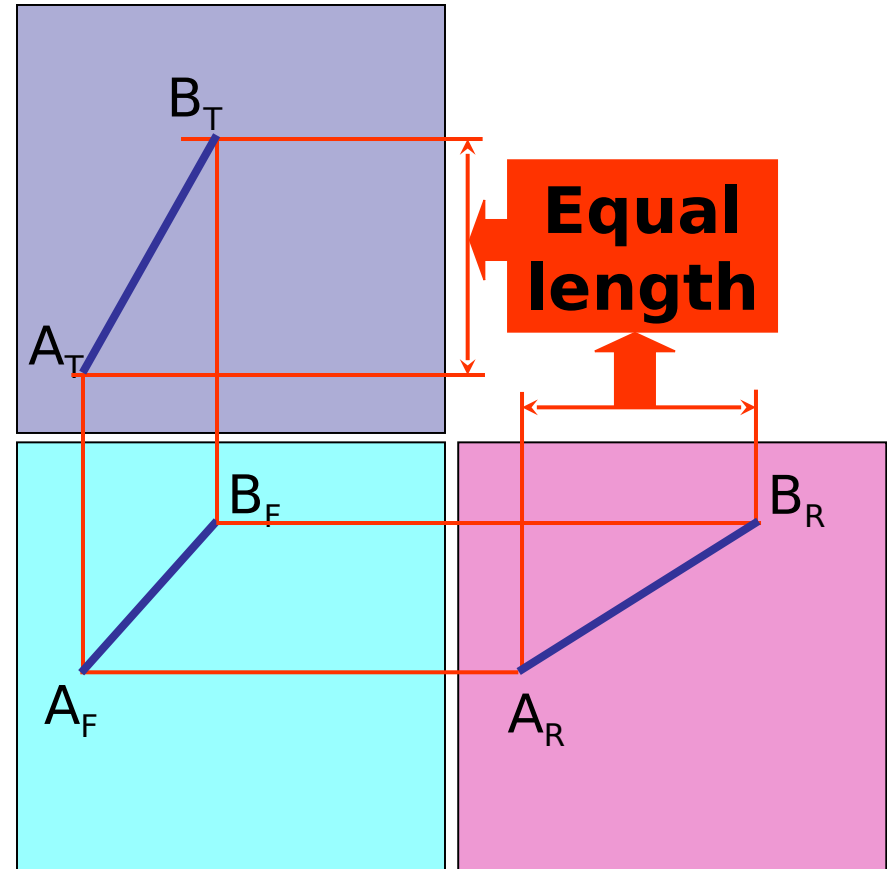
PROJECTION OF LINES

**Foreshorten
ed**



**Foreshorten
ed**

**Foreshorten
ed**

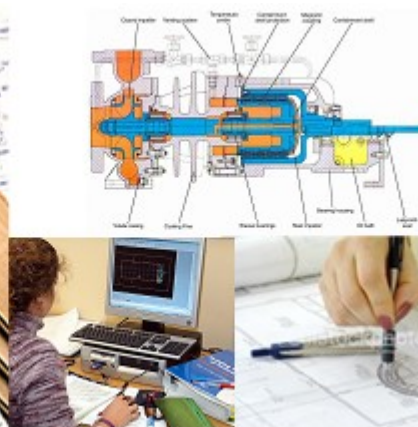


**Equal
length**

OBLIQUED LINE



2.5. PROJECTION OF PLANES

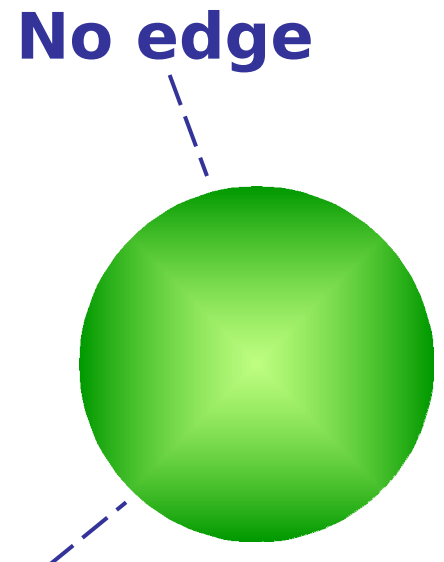
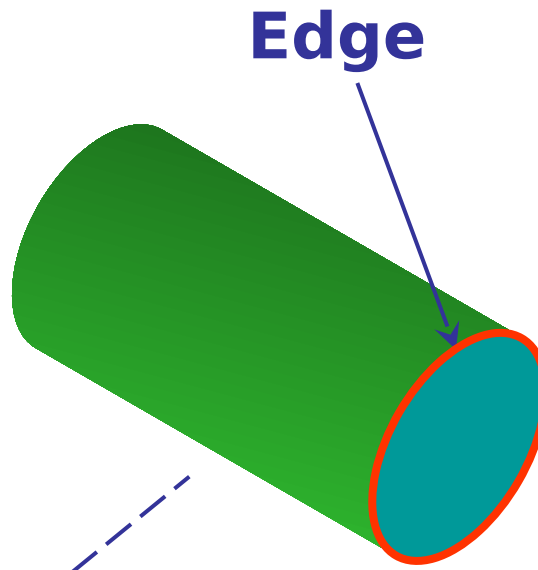
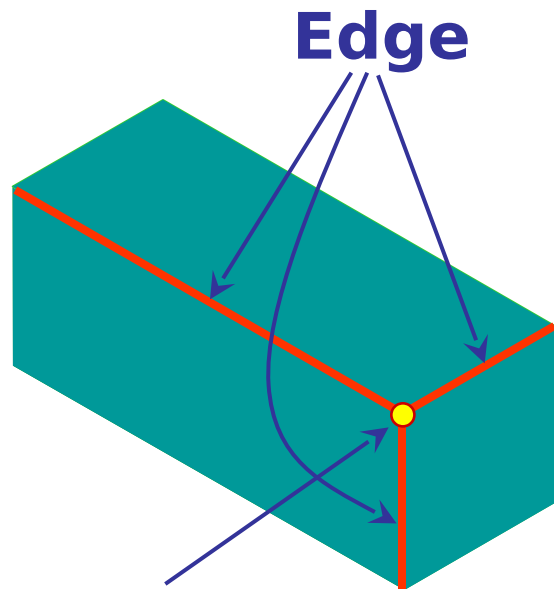


PROJECTION OF PLANES

OBJECT FEATURES

Edges are lines that represent the boundary between two faces.

Corner Represent the intersection of two or more edges.



No corner

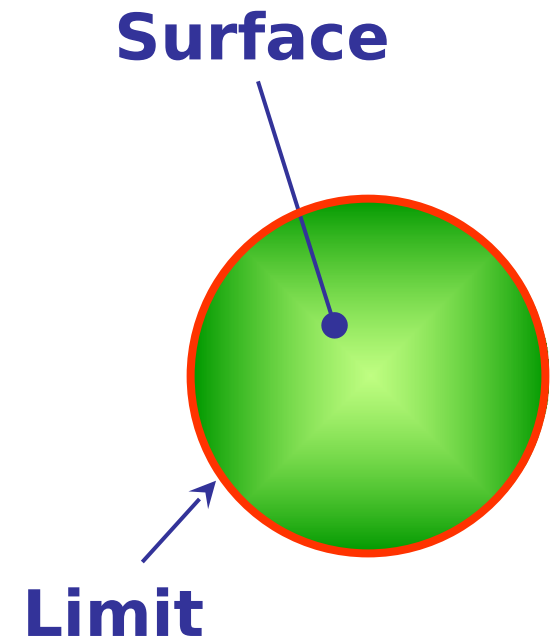
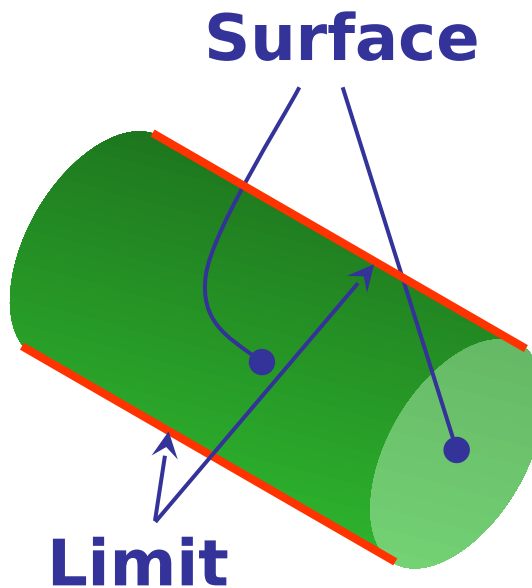
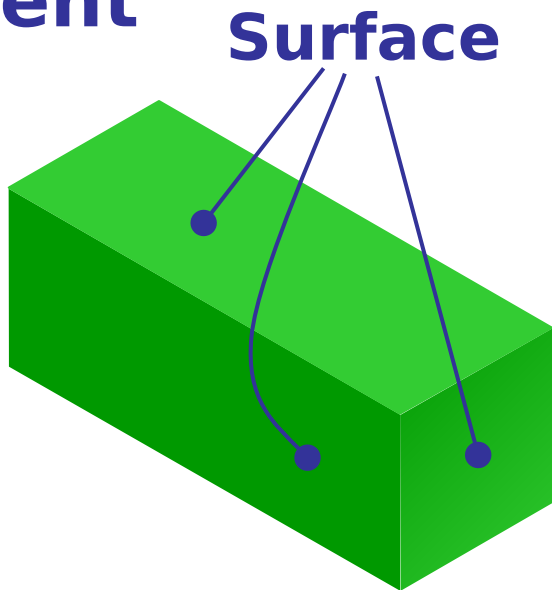
No corner

PROJECTION OF PLANES

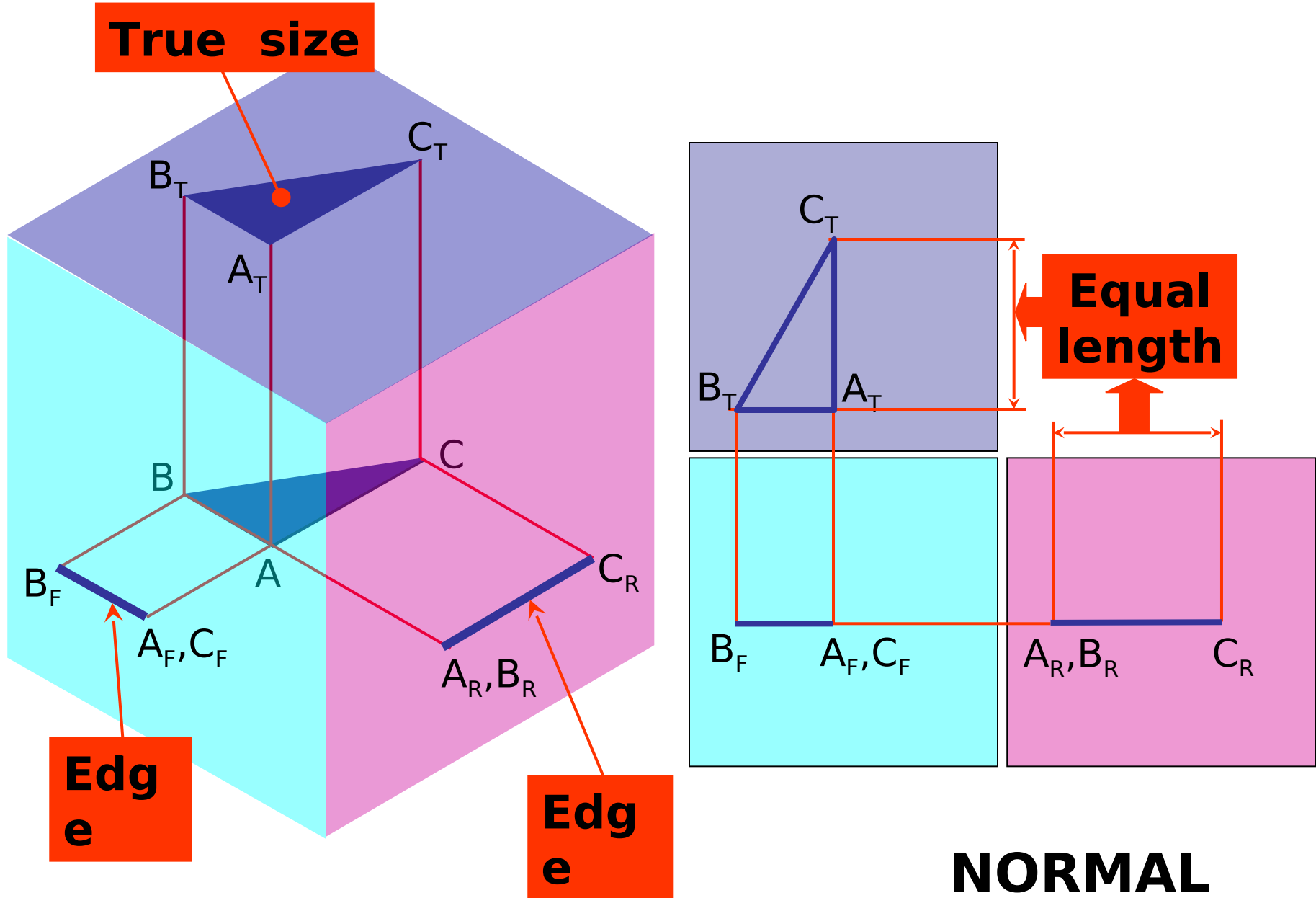
OBJECT FEATURES

Surface 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.

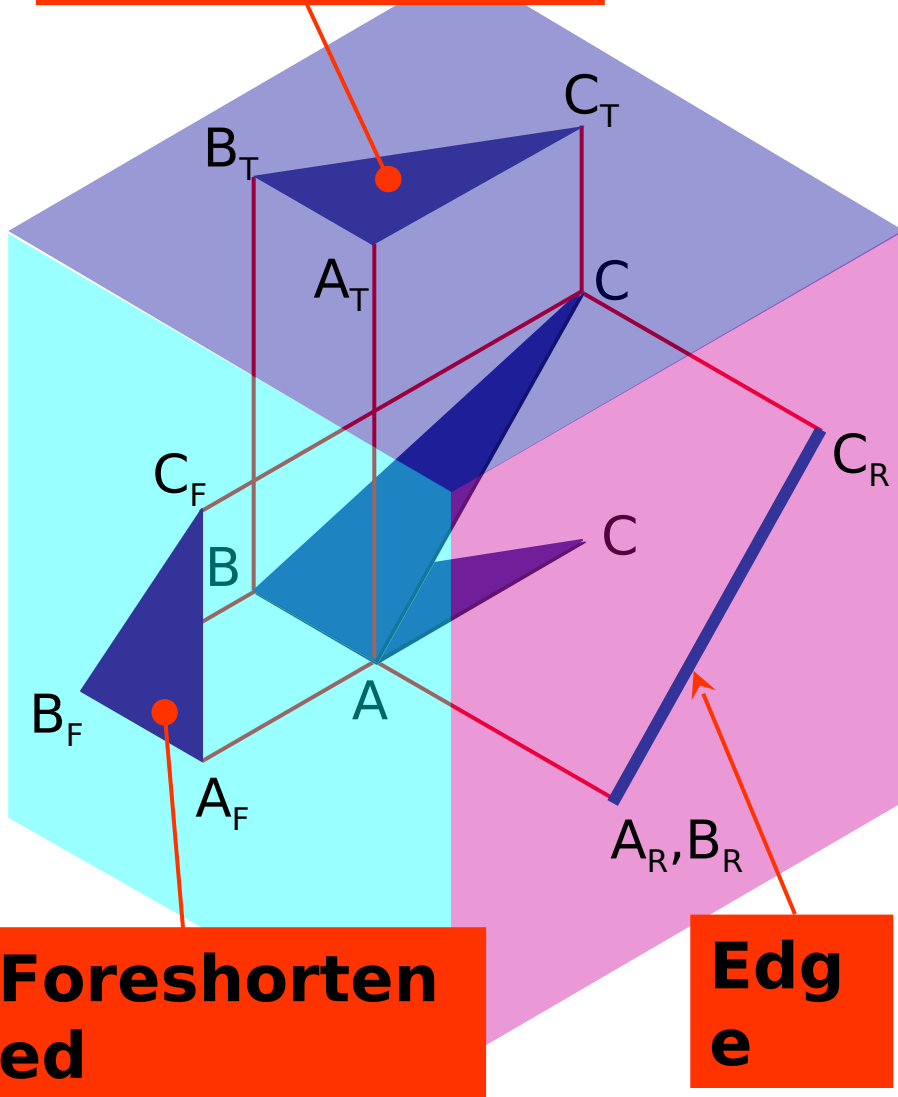


PROJECTION OF PLANES



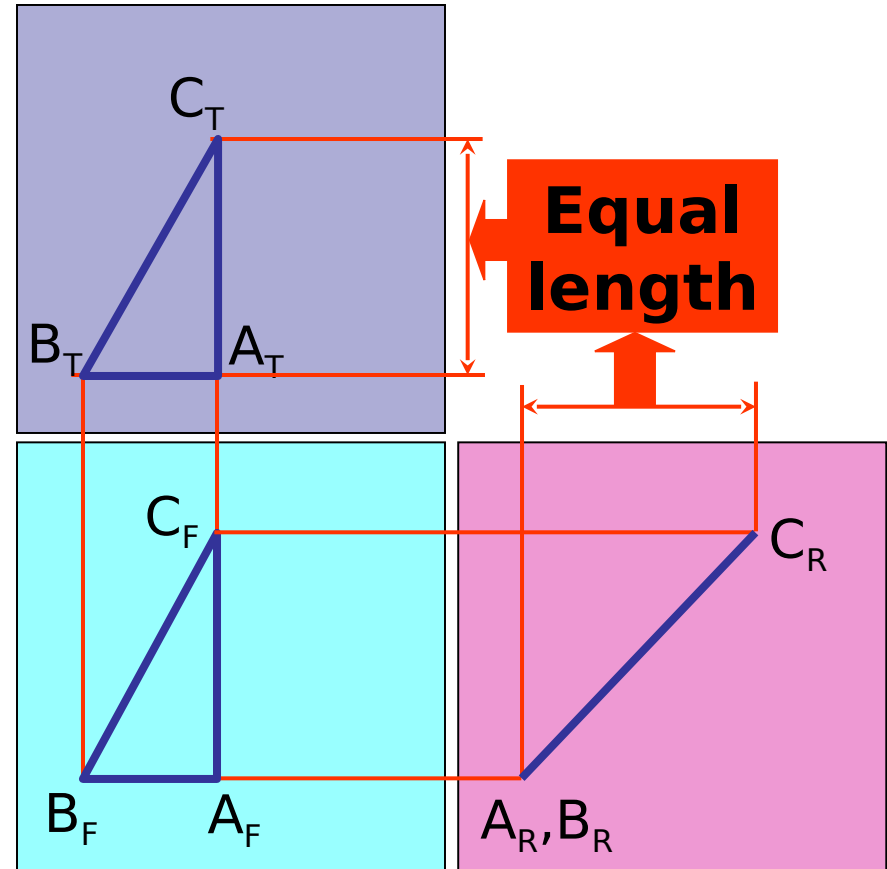
PROJECTION OF PLANES

Foreshortened



**Foreshorten
ed**

**Edg
e**

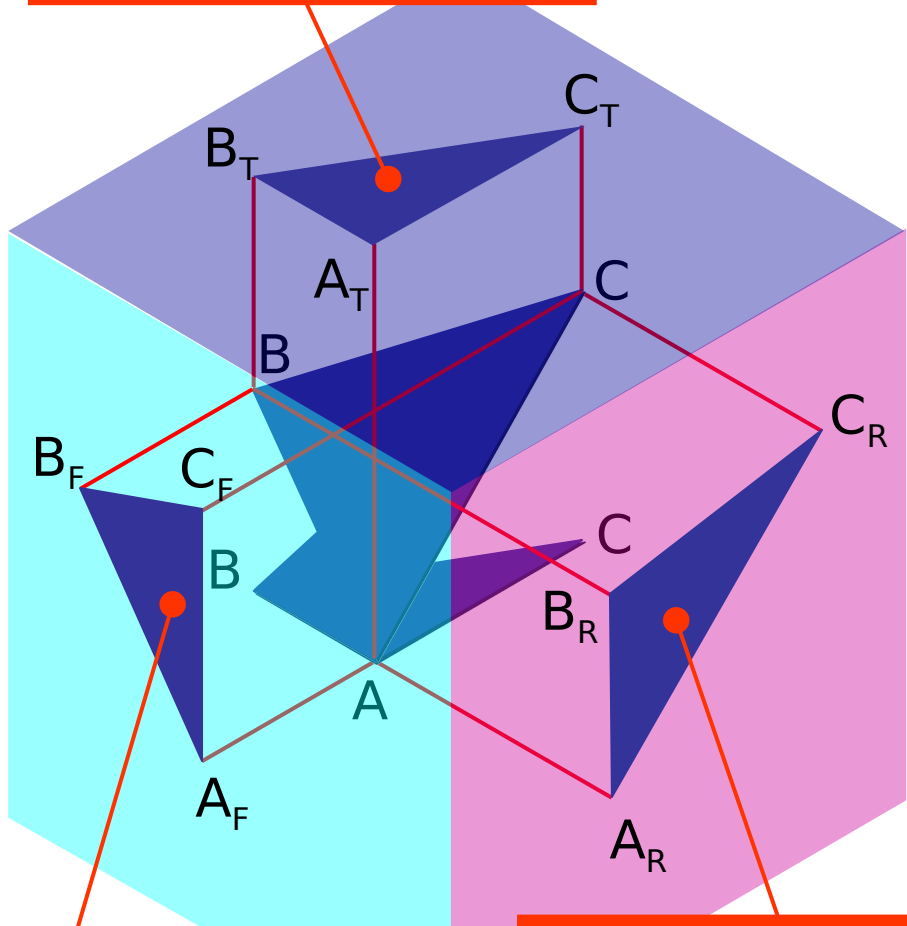


**Equal
length**

INCLINED

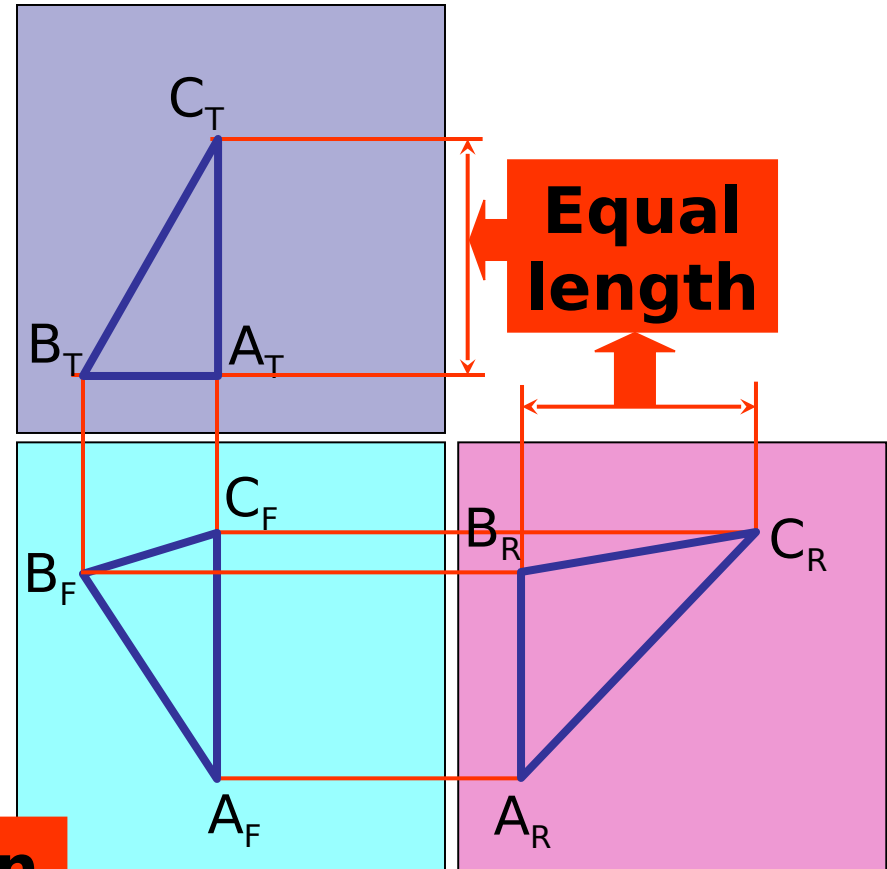
PROJECTION OF PLANES

Foreshortened



**Foreshorten
ed**

**Foreshorten
ed**



OBLIQUED

**END OF CHAPTER
TWO**