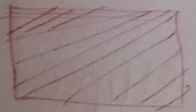
30/04/2022

Lines, Lettering and Dimensioning:

Line	Description/Pencil	Applications
———	Continuous thick (HB)	Visible outlines, edges; main representation
———	Continuous thin (H)	Extension lines
———	Continuous very thin (2H)	Guidelines, projection lines
- - - - -	~~dashed thick lines~~ (HB) dashed thick	Hidden lines
—·—·—·—	Centre / Axis line (H)	Axis
—·—·—·—	Cutting plane HB, H	Sectional lines
	Section (HB)	Section part

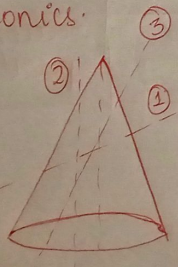
→ Height of headings should be 6mm
→ Height of sub-headings should be 3-5mm.
→ Ratio of height : width = 6:5

Aligned Dimensioning	Uni-Directional
→ dimension is placed ⊥ar to the dimension line.	→ dimensions are placed parallel to dimension line
→ Reading from bottom edge(&R) Right edge	→ Read from bottom edge
→ Dimensions are placed above the line at the centre	→ Dimensions are placed between the lines at centre
→ For small drawings	→ For large drawings

* arrow heads : 3:1

* CONIC SECTIONS :

The sections obtained by intersection of a right circular cone by a plane in different positions relative to axis of cone are called conics.



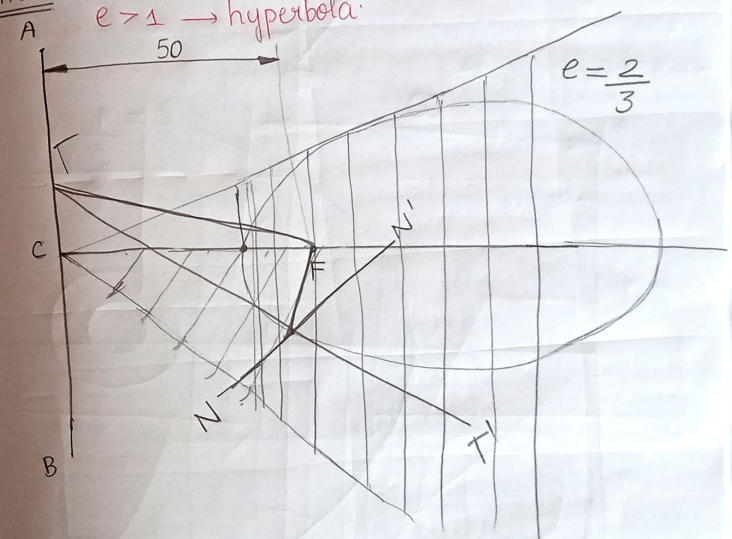
Section plane
① through generator : Ellipse.
② parallel to axis : Hyperbola.
③ parallel to end generator : Parabola.

* Eccentricity : Loci of points moving in a plane such ratio of its distances from fixed point and a fixed line always remains constant and this ratio is called eccentricity.

$$e = \frac{\text{distance of point from a fixed point}}{\text{distance of point from a fixed line}}$$

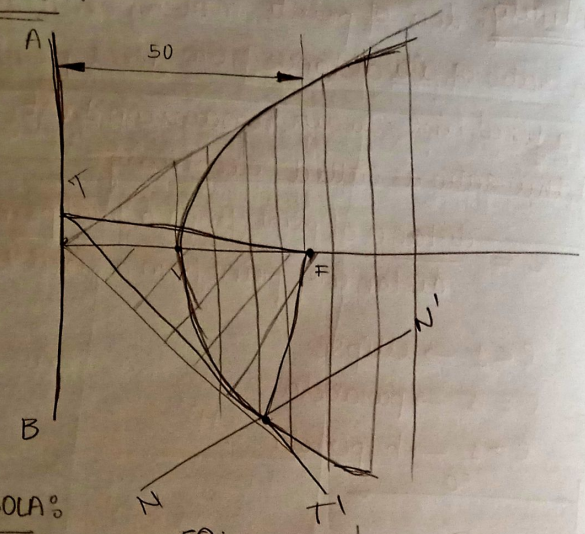
$e < 1$ → ellipse.
$e = 1$ → parabola.
$e > 1$ → hyperbola.

ELLIPSE

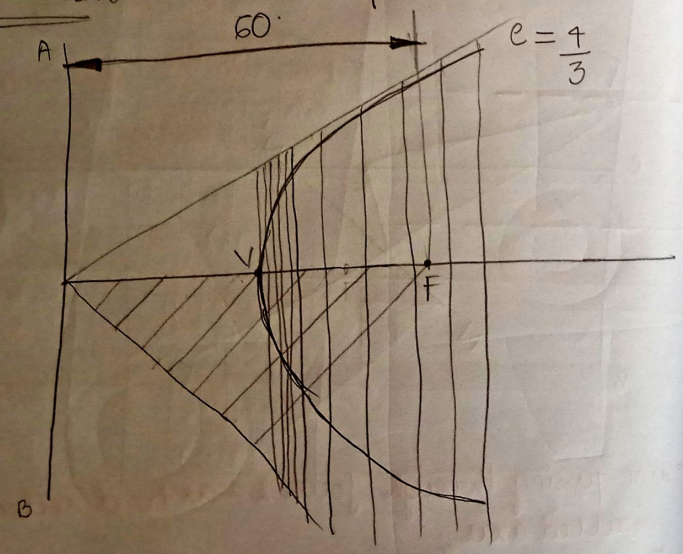


• Line passing through focus & ⊥ar to directrix is called axis.
• Point at which conic cuts the axis is called vertex.

PARABOLA:



HYPERBOLA:



*ORTHOGRAPHIC PROJECTIONS:

*APPLICATIONS:

→ Ellipse: architectural elements, ceilings & windows

→ Parabola: headlight reflectors - ballistic missiles.

→ Hyperbola: Support an object high above the ground.

*ORTHOGRAPHIC PROJECTIONS:

→ The image which is formed on a plane when an object is hit by the light rays and those rays projected on to the plane is called projection.

→ If the rays projected are ⊥ar to the object, such a projection is called orthographic projection.

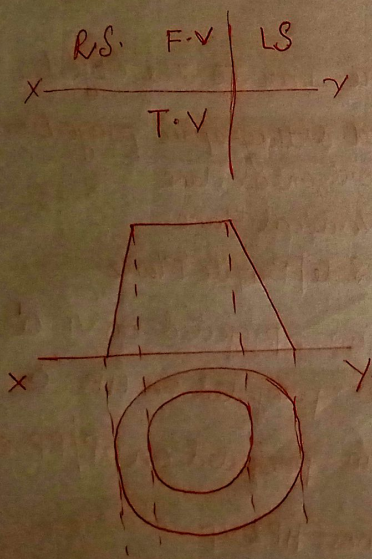
→ 3 Reference planes
- → Horizontal Plane
- → Vertical Plane
- → Side / Profile Plane.

→ 3 views
- → Front View : projected on VP. a'
- → Top View : projected on HP. a
- → Side View : projected on SP/PP. a"

→ Planes
- → Principal Planes: HP & VP
- → Auxiliary Planes
  - → Auxiliary VP ∠ar VP ⊥ HP
  - → Auxiliary HP ∠ HP / ⊥ VP
  - → Profile Plane PP. ⊥ HP & ⊥ VP.

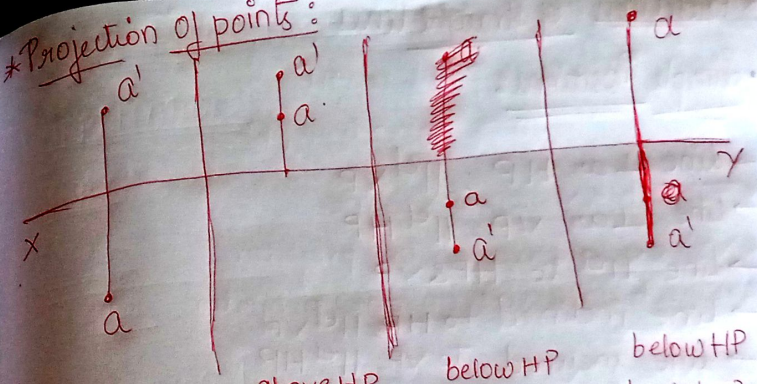
* Projection of VP ⇒ Front View ⇒ Elevation
Projection of HP ⇒ Top view ⇒ Plan

FIRST-ANGLE PROJECTION	THIRD-ANGLE PROJECTION
→ Object kept in I^st quadrant	→ Object kept in III^rd quadrant
→ object b/w observer & plane of projection	→ Plane of projection b/w object & observer.
→ Plane is non-transparent	→ Plane is transparent.
→ Plan comes below the elevation; Left side is drawn to right of elevation.	→ Plan comes above the elevation. Left side is drawn to left of elevation.



* The line joining the T.V & F.V are called projectors

* Projection of points:

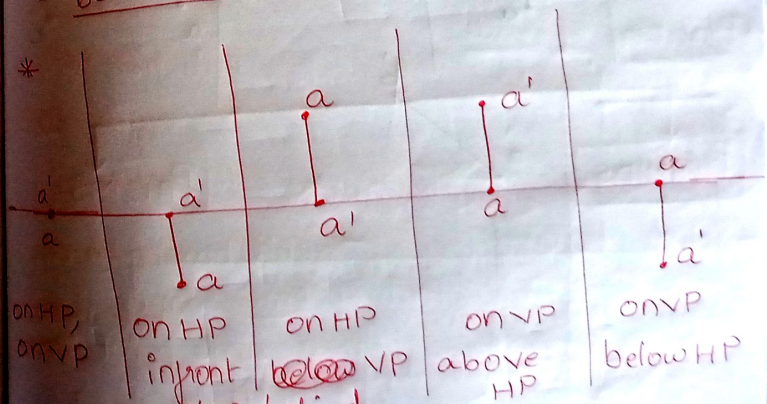


above HP infront of VP | above HP behind VP | below HP infront VP | below HP behind VP

- distance from HP ⇒ F.V distance.
- distance from VP ⇒ T.V distance.

- above HP: FV above XY line
- below HP: FV below XY line
- infront of VP: TV below XY line
- behind VP: T.V above XY line.

*

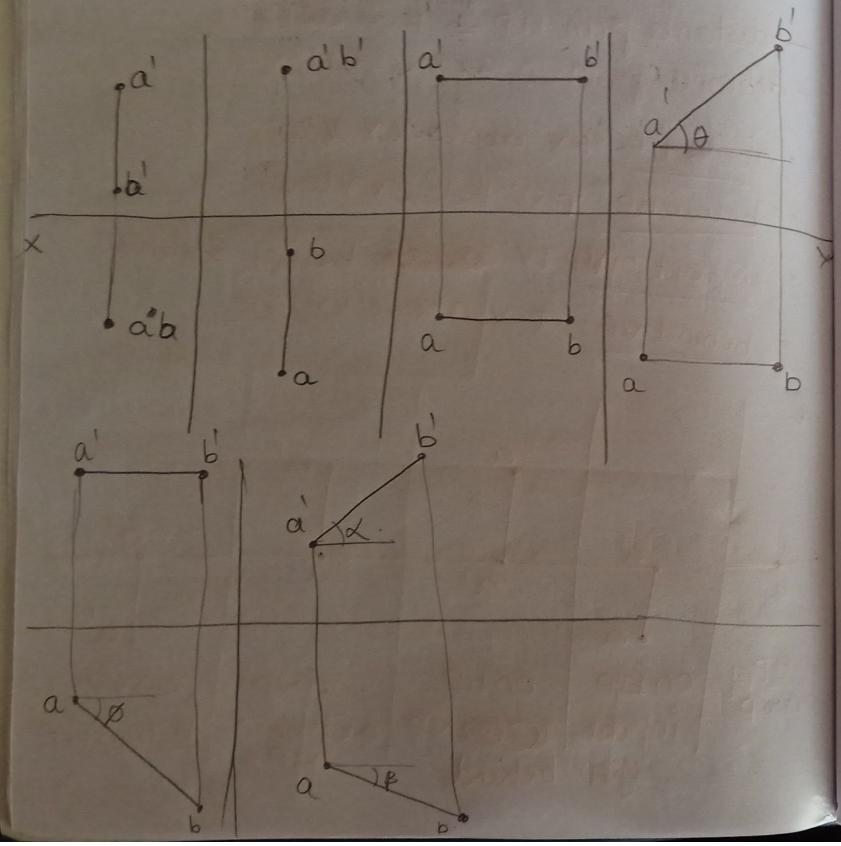


on HP, on VP | on HP infront of VP | on HP behind VP | on VP above HP | on VP below HP

* Projection of straight lines

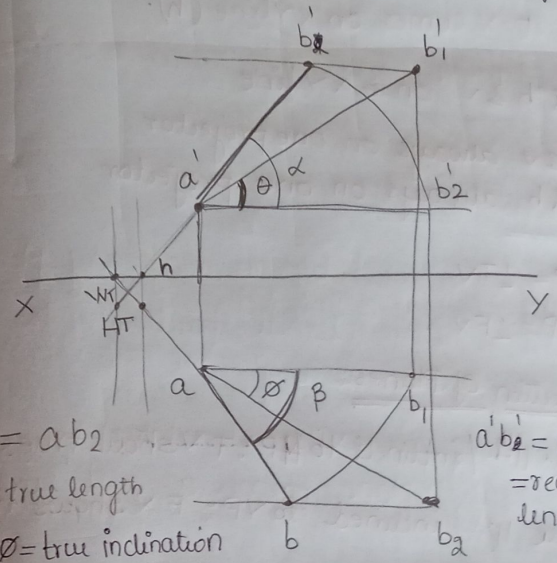
• Simple Positions:

→ line ⊥ar HP ; ||el VP
→ line ⊥ar VP ; ||el HP
→ line ||el to HP & VP
→ line inclined to HP ; ||el VP
→ line inclined To VP ; ||el HP
→ line inclined to both VP & HP.



* Inclined to both the planes:

Both F.V and T.V represent reduced lengths



$a'b_1' = ab_2$
= true length

$a'b_2' = ab$
= reduced lengths

θ, ø = true inclination
α, β = apparent inclination.

* Traces of a line:

Points of intersections of a line with respect to reference planes.

• The point at which the line touches HP is called horizontal trace (H.T.) and touches VP is called vertical trace (V.T).

V.T: point on VP.
F.V. of a point in VP
TV comes on XY line (V)

H.T: point on HP

T.V of a point in HP

F.V comes on xy line (h).

* Points h & v on a xy line
* VT & v always on one projector
* HT & h always on one projector.

$\angle AVP = \angle TV$

$\angle AIP = \angle FV$

* Projection Of Planes:

Surface ||el / inclined to HP: T.V shows true shape.

Surface ||el / inclined to VP: F.V shows true shape

Begin with true shape.

Keeping side/edge that is inclined other plane ⊥ar to xy line.

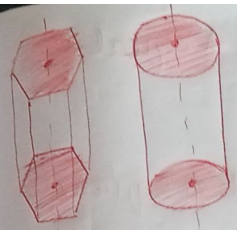
* Projection of Solids:

PYRAMIDS

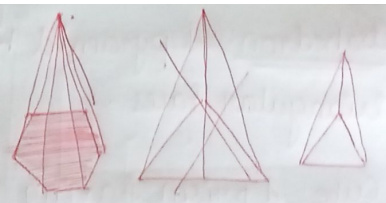
- Solids having the same top & base joined by the ~~generators~~ longer edges.

PRISMS

- Solid having a base of same shape joined to a single point 'apex' at the top by slant edges



- Longer edge joints corner of base to corner of top.
- The faces formed by longer edges are rectangular



- Slant edge joins corner of base to the apex.
- The faces formed by slant edges are triangular

* Longer edges in cylinder & slant edges in cone are called Generators.
* Axis ⊥ar to HP and ||el to VP; base ||el to HP; true shape is seen in top view.
* Axis ⊥ar to VP and ||el to HP; base ||el to VP; true shape is seen in front view.

F.V is a rectangle/ ⇊ T.V is a rectangle/ Triangle

* Types:
  - Polyhedra: Solid bounded by faces faces are equal & regular: regular polyhedron
  - Solids of revolution: Revolution of any 2D plane about a ⊥ar axis generates a 3D solid.

Tetrahedron: A pyramid having 4 equal triangular faces.

Cube: A prism having 6 equal square faces.

* Sections of Solids:

* Cutting of a solid by an imaginary plane to understand the internal structure of the solid is called sectioning.

→ Section Plane ⊥ar to VP & inclined to HP
: Section plane appears as a st. line in F.V

→ Section Plane ⊥ar to HP & inclined to VP
: Section plane appears as a st. line in T.V

* Lateral surface is the surface excluding top & base.

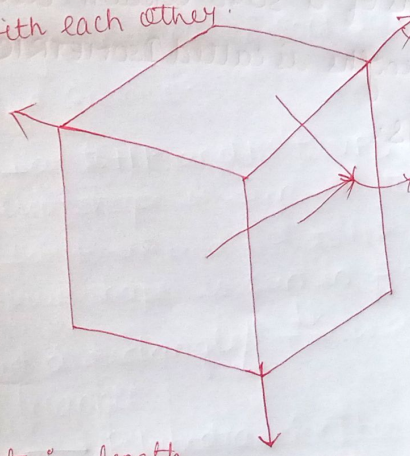
* ~~Isometric Projections~~

* Uses of development of solids:
- Boiler shells & chimneys;
- Body parts automatives; ships and aeroplanes.
- Objects which are difficult to manufacture by convertional manufacturing processes; those are fabricated by development technique.

* Isometric Projections:

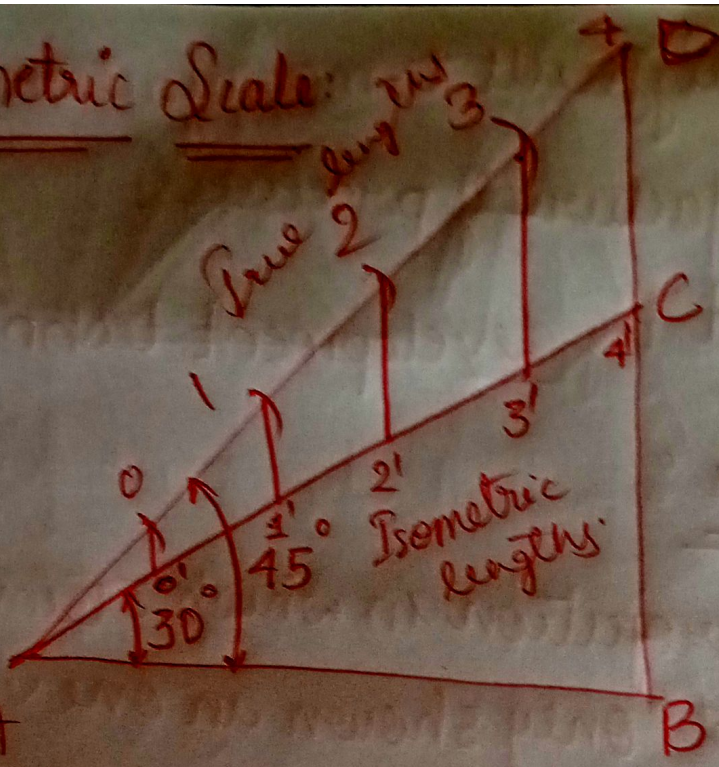
Type of pictorial projection in which 3 Dimensions of a solid are not only shown in one view, but their actual sizes can be measured directly from it.

All the isometric axes make an angle 120° with each other.



$$\frac{\text{isometric length}}{\text{True length}} = 0.815 = \sqrt{\frac{2}{3}}$$

Isometric Scale:



The projections of a solid drawn using true lengths is called ISOMETRIC VIEW.

The projections of a solid drawn using isometric lengths is called ISOMETRIC PROJECTIONS.