216U06C105 – Engineering Drawing

- Module - I
- FY Div-C5

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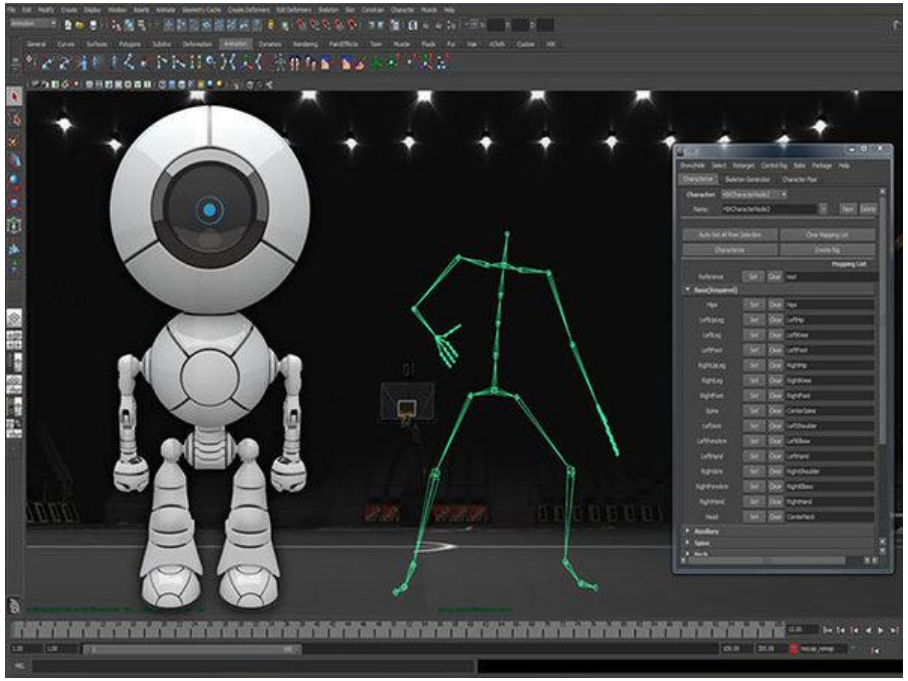
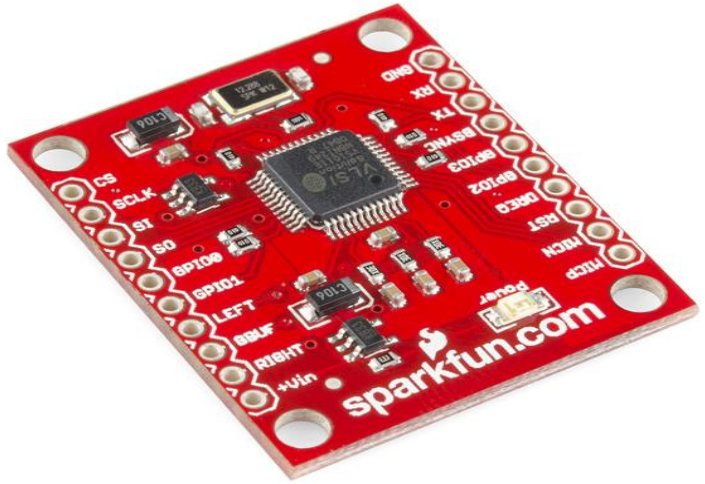
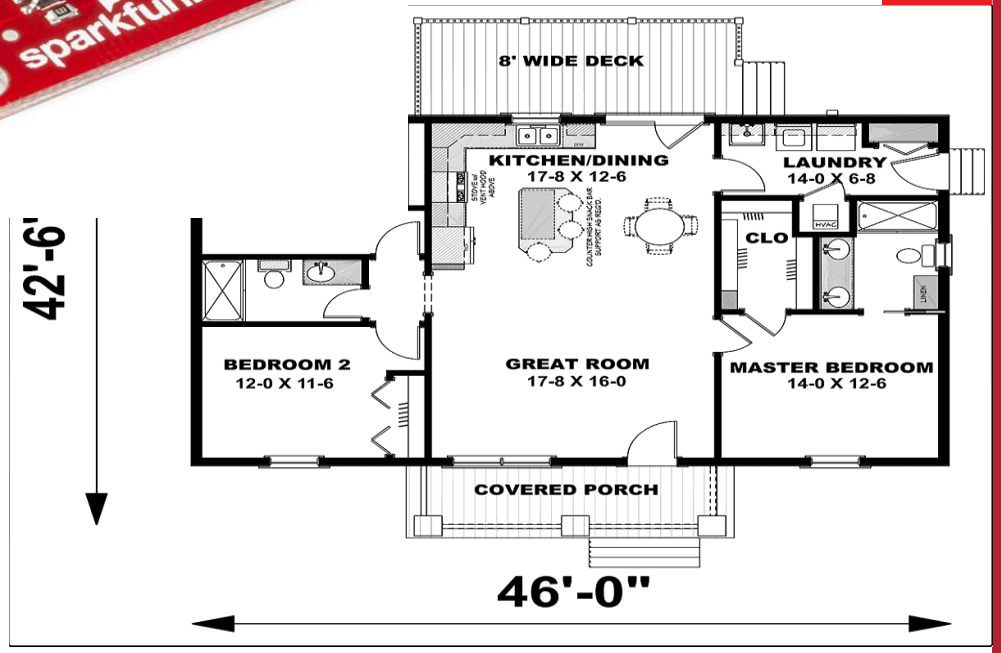
Why is this course IMPORTANT !!







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What you will learn ?

Module No.	Unit No.	Contents	No of Hrs.	CO
1	**Projection of points, lines and planes**		08	CO1
	1.1	Introduction to Engineering Drawing, Standard sizes of drawing sheets, Types of lines, Dimensioning, Scales, Drawing pencils etc.		
	1.2	Projection of points, Projection of lines inclined to both the reference planes. (Line in 1st quadrant ONLY)		
	1.3	Projection of Planes: Triangular, Square, Rectangular, Pentagonal, Hexagonal and Circular planes inclined to one reference plane only and perpendicular to other.		
2	**Orthographic Projection**		06	CO2
	2.1	Orthographic projections of simple machine parts by first angle method as recommended by Indian standards		
	2.2	Sectional views of simple machine parts (full section ONLY).		
3	**Isometric View/Drawing**		04	CO3
	3.1	Introduction to isometric view/drawing, isometric projection		
	3.2	Construction of isometric drawing of simple machine parts		
4	**Projection of Solids**		06	CO4
	4.1	Introduction to Projection of Solids, Classification of Solids		
	4.2	Projection of right regular solids (prism, pyramid, cylinder, and cone) inclined to one reference plane only (excluding spheres, hollow and composite solids)		
5	**Section and Development of Solids**		06	CO5
	5.1	Projection of sectional views of solids (prism, pyramid, cylinder, and cone) cut by the plane perpendicular to one and inclined to other reference plane only (excluding curved cutting planes).		
	5.2	Lateral surface development of solids (prism, pyramid, cylinder, and cone) cut by the section plane inclined to one reference plane only. (excluding reverse development)		
		Total	30	--

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Engineering Drawing Syllabus !!

Mod. I

Types of lines, Dimensioning, Drawing Sheets, Scales, Pencils etc.

Projection of points and **Projections of lines** inclined to both planes

Projection of Planes: Triangular, Square, Rectangular, Pentagonal, Hexagonal and circular planes inclined to one reference plane and perpendicular to other.

Mod. II

Orthographic projections of simple machine parts by first angle method as recommended by Indian standards, Sectional views of simple machine parts (full section)

Mod. III

Introduction to **Isometric drawing** and construction of isometric drawing of machine parts

Mod. IV

Introduction to **Projection of Solids**, Classification of Solids and Projection of right **regular solids** (prism, pyramid, cylinder, and cone) inclined to both reference planes (excluding spheres, hollow and composite solids)

Mod. V

Projection of **sectional views for solids** (prism, pyramid, cylinder, and cone) cut by plane perpendicular to one and inclined to other reference planes (excluding curved cutting planes).

Lateral surface development of prism, pyramid, cylinder, cone with section plane inclined to one reference plane only. (excluding reverse development)

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Course Pre-requisites

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Knowledge of Various geometric constructions, Basics of trigonometry

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Course Objectives

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Course Outcomes	After successful completion of the course students should be able to:
1	Familiarize with the conventions and standards along with the principles of projections applied to lines and points
2	Apply the principles of orthographic projections to draw elevation, plan, End view, Isometric views etc.
3	Apply the principles of orthographic projections to draw to draw various views of regular solid objects
4	Apply the fundamentals of solid geometry and develop lateral surfaces of solids

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Course Outcomes

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Course Outcomes	After successful completion of the course students should be able to visualize and draw :
CO1	Projection of lines and planes
CO2	Orthographic and sectional views of any 3D object
CO3	Isometric drawing
CO4	Projection of regular solids
CO5	Section and lateral development of regular solids

References

Name/s of Author/s	Title of Book	Name of Publisher with country
N.D. Bhatt	Engineering Drawing (Plane and solid geometry)	Charotar Publishing House Pvt. Ltd
N.D. Bhatt V.M. Panchal	Machine Drawing	Charotar Publishing House Pvt. Ltd
P. S. Gill	Engineering Graphics and Drafting	S.K. Kataria & Sons
P.J. Shah	Engineering Graphics	S. Chand Publications
Dhananjay Jolhe	Engineering Drawing	Tata McGraw Hill

References

Sr. No	Name/s of Author/s	Title of Book	Publisher	Edition/ Year
1	N.D. Bhatt	Engineering Drawing	Charotar Publishing House Pvt. Ltd	53rd Revised 2014
2	P. S. Gill	Engineering Graphics and Drafting	S.K. Kataria & Sons	Revised Edition, India, 2014
3	Lakhwinder Pal Singh	Engineering Drawing Principles And Applications	Cambridge University Press	2021

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Scheme

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Course Code	Course Title						
216U06C105	Engineering Drawing						
	TH		P		TUT		Total
Teaching Scheme(Hrs.)	02		--		01*		03
Credits Assigned	02		--		01		03
Examination Scheme	Marks						
	CA		ESE	TW	O	P&O	Total
	ISE	IA					
	30	20	50	--	--	--	100

* Batch wise Tutorial

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Things to Note!!!

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- Please check your LMS regularly for announcements
- Always sit for the lecture with an unruled book and drawing instruments
- Be NEAT in your drawings !
- Tutorial submissions should be done on a separate A3 sized drawing book
- Follow the instructions given in the LAB during ED Lab hours
- Timely submissions is required and be regular in attending lectures.
- Failure of submitting Term Work – YOU LOOSE A YEAR !!

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Drawing Instruments and Accessories

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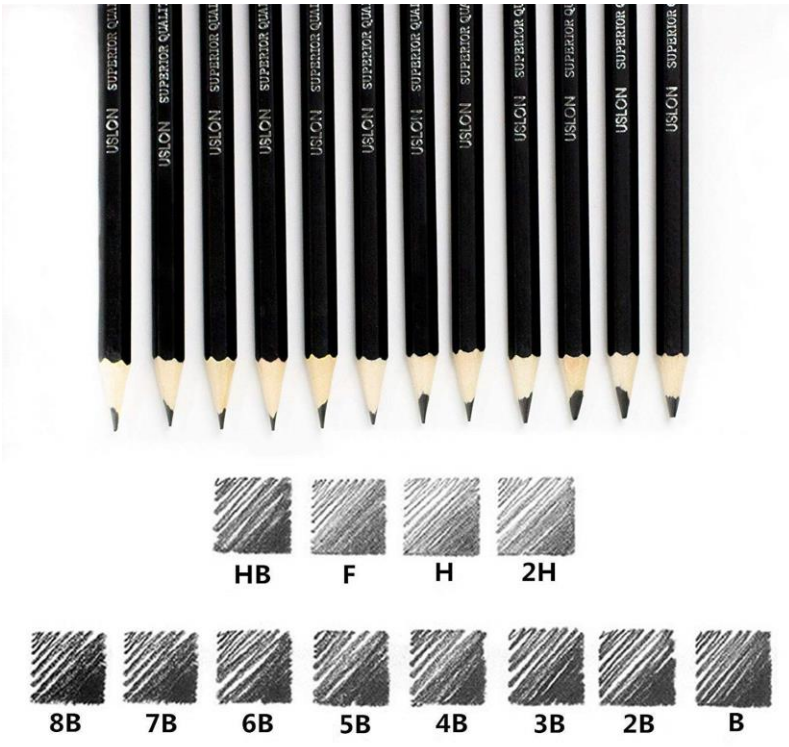
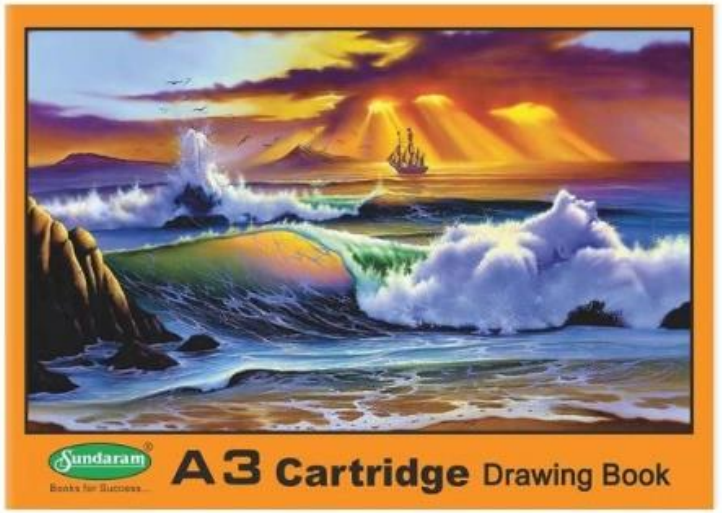
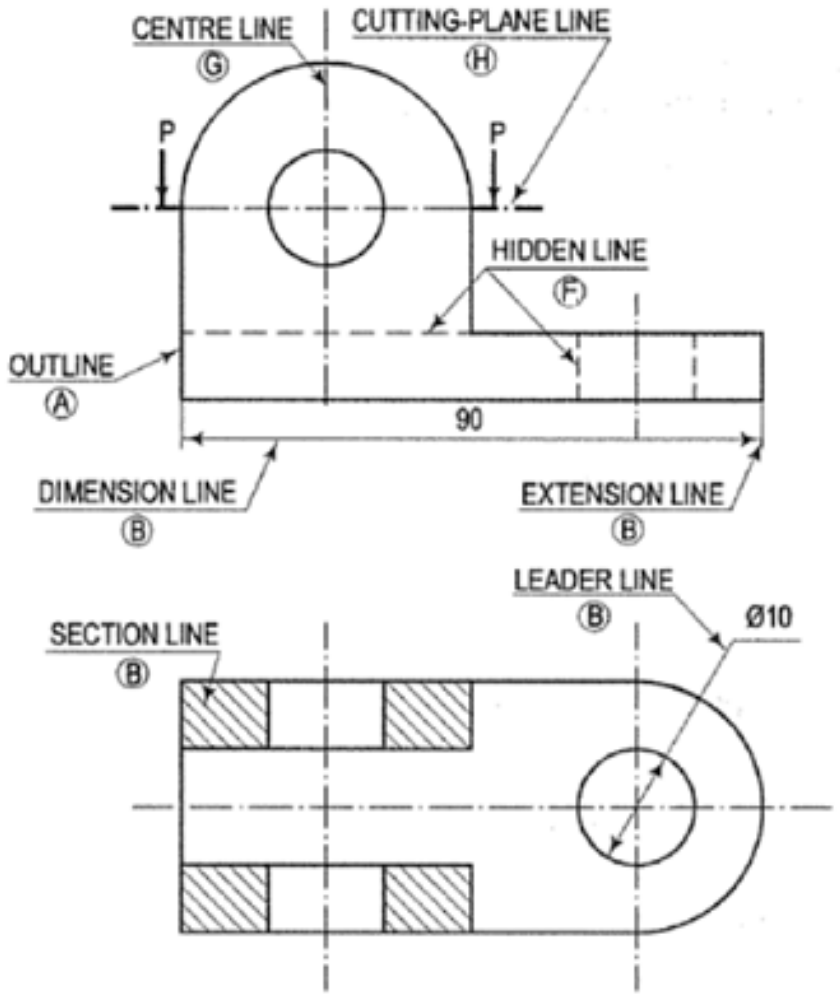
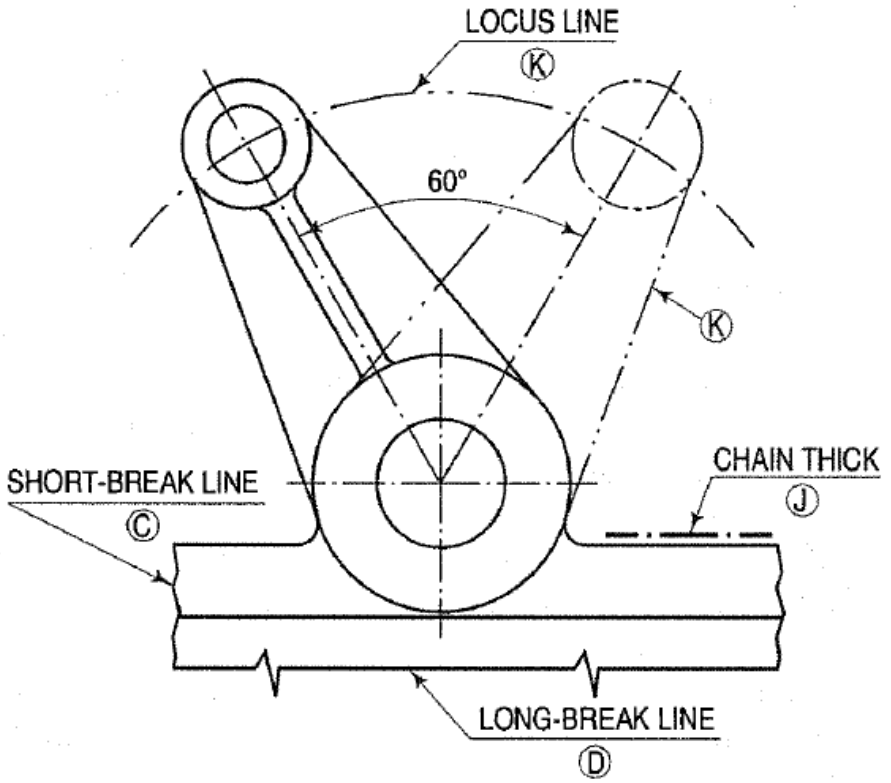




Types of lines

Type of lines !!

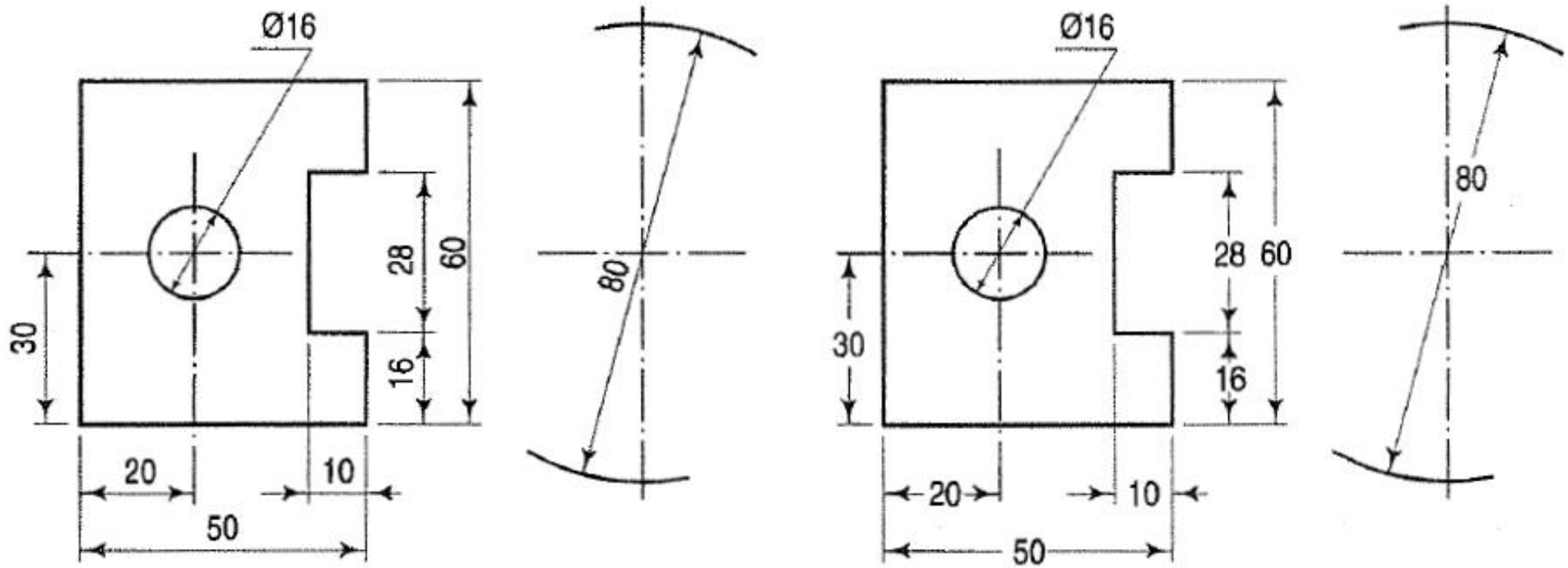




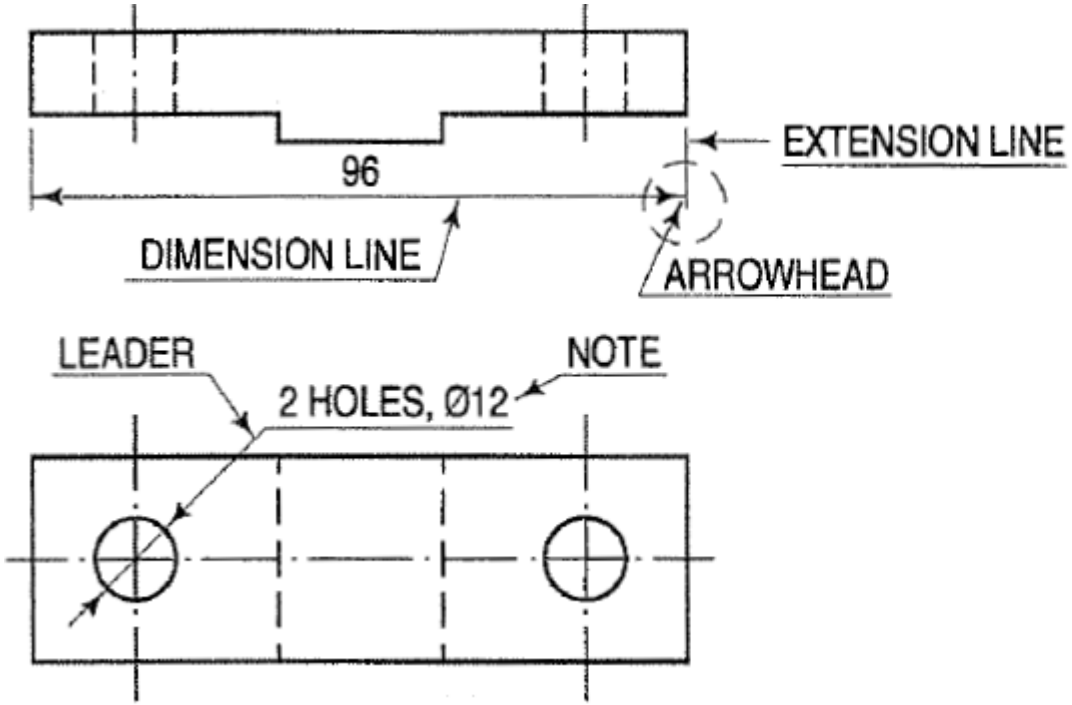
Type of lines !!

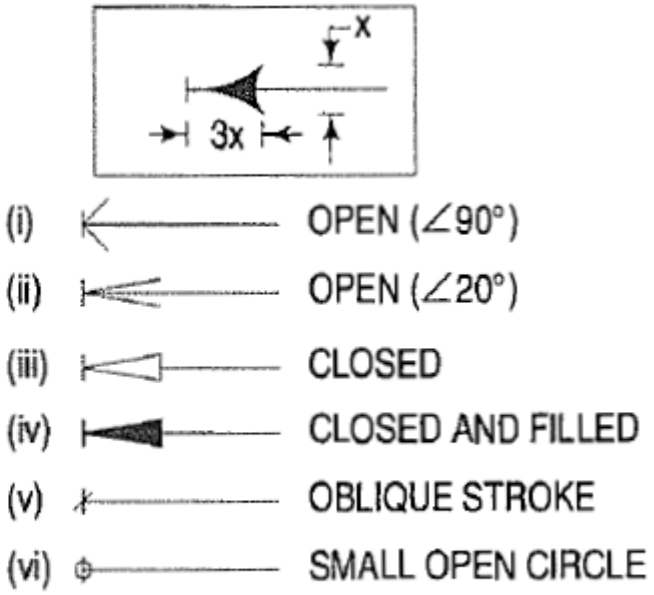
Line	Description	General applications
A	Continuous thick or Continuous wide	Visible outlines, visible edges; crests of screw threads; limits of length of full deph thread,lines of cuts and section arrows; parting lines of moulds in views; main representations in diagrams, maps, flow charts; system lines(structural metal engg.)
B	Continuous thin (narrow) (straight or curved)	Imaginary lines of intersection; grid, dimension, extension, projection, short centre, leader, reference lines; hatching; outlines of revolved sections; root of screw threads; interpretation lines of tapered features; framing of details; indication of repetitiv details;
C 	Continuous thin (narrow) freehand	Limits of partial or interrupted views and sections, if the limit is not a chain thin line
D 	Continuous thin (narrow) with zigzags (straight)	Long-break line
E	Dashed thick (wide)	Line showing permissible of surface treatment
F	Dashed thin (narrow)	Hidden outlines; hidden edges
G	Chain thin Long-dashed dotted (narrow)	Centre line; lines of symmetry; trajectories; pitch circle of gears, pitch circle of holes,
H 	Chain thin (narrow) with thick (wide) at the ends and at changing of position	Cutting planes
J	Chain thick or Long-dashed dotted (wide)	Indication of lines or surfaces to which a special requirement applies
K	Chain thin double-dashed or long-dashed double-dotted (narrow)	Outlines of adjacent parts Alternative and extreme positions of movable parts Centroidal lines Initial outlines prior to forming Parts situated in front of the cutting plane

Dimensioning



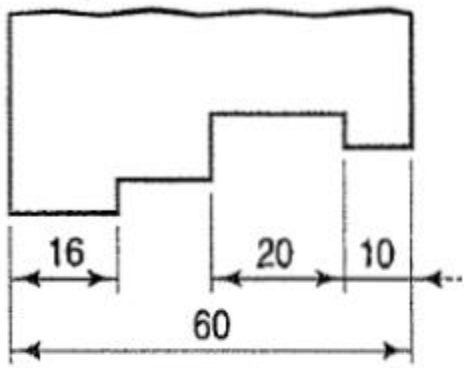
Aligned and Unidirectional System

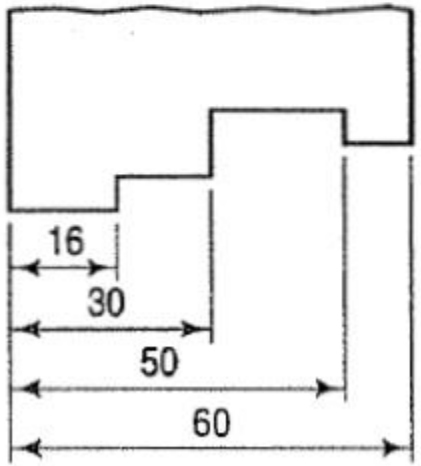


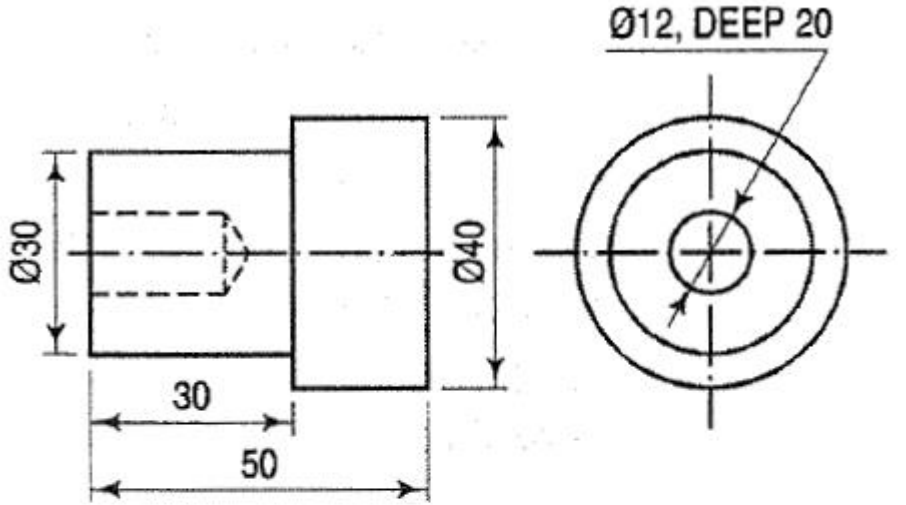


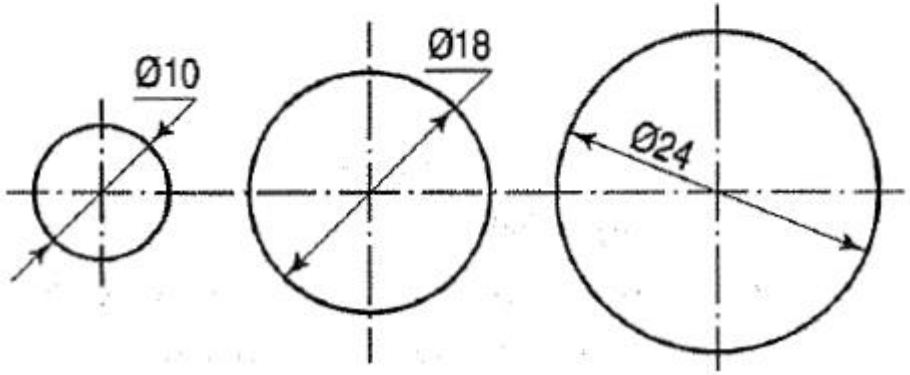
Dimension lines Vs Extension lines

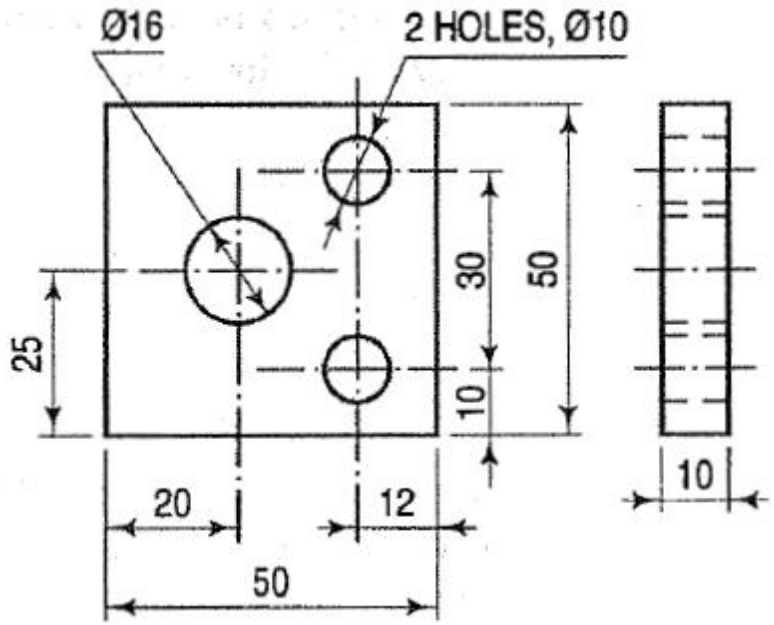
Ways to dimension features !



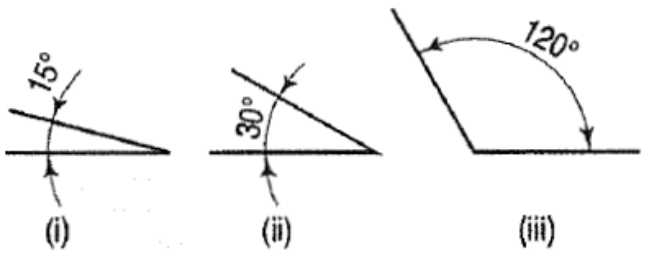


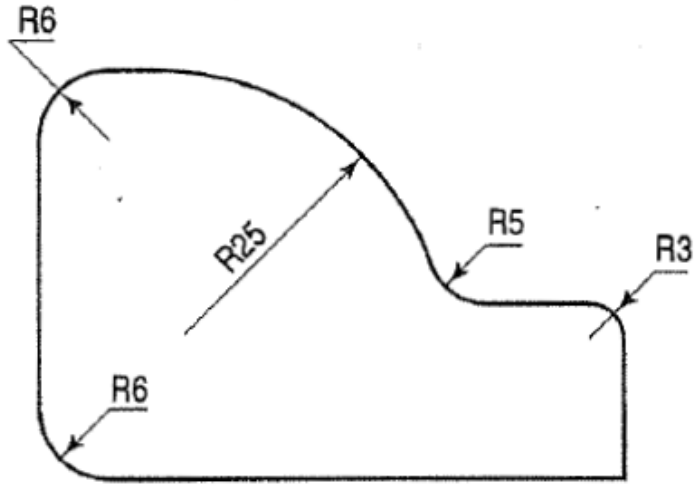


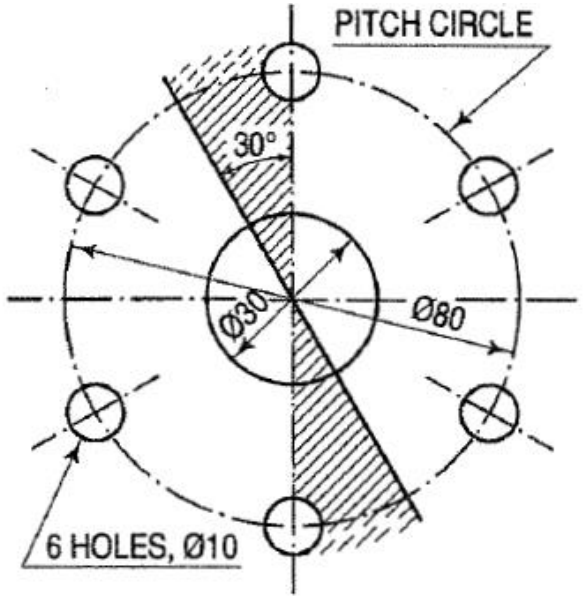


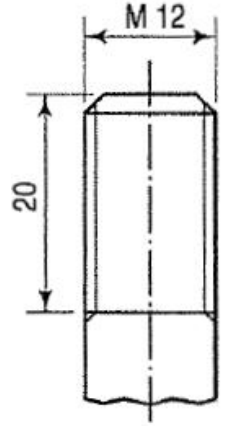


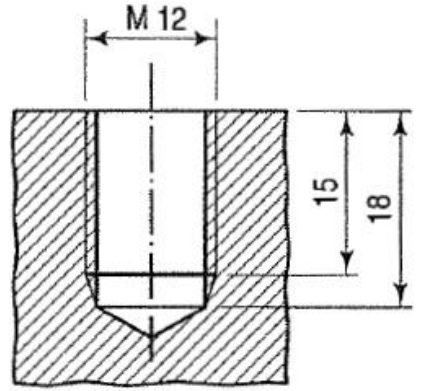
Ways to dimension features !

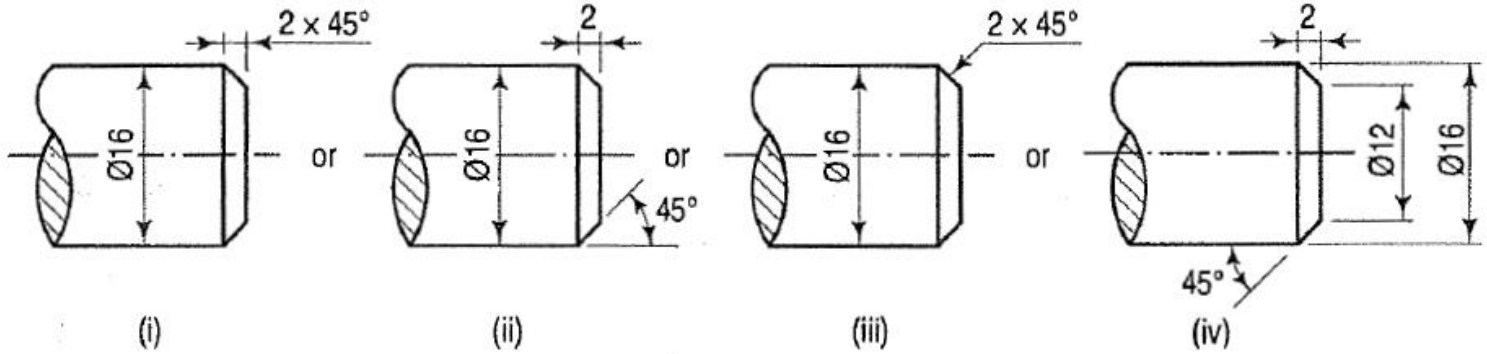




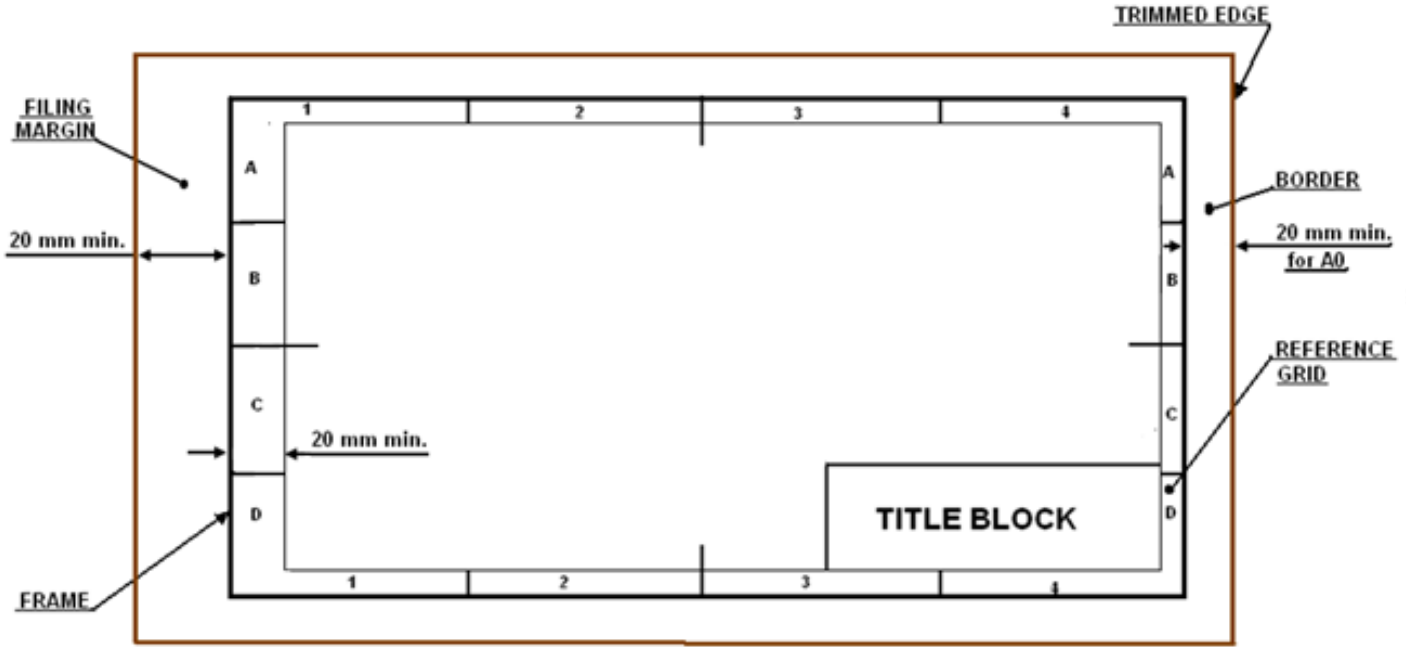


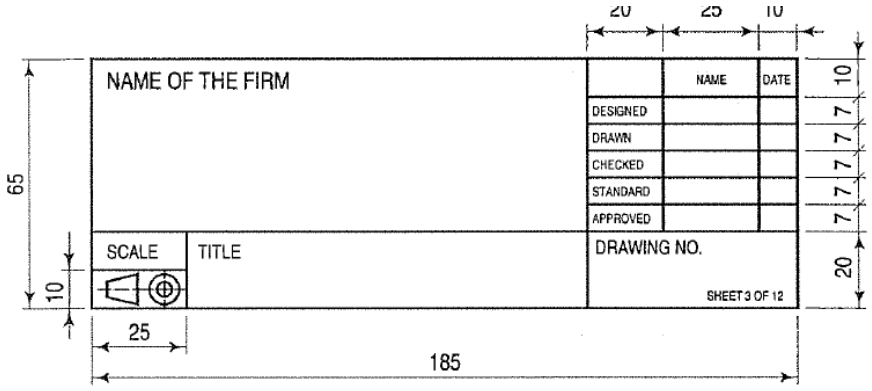


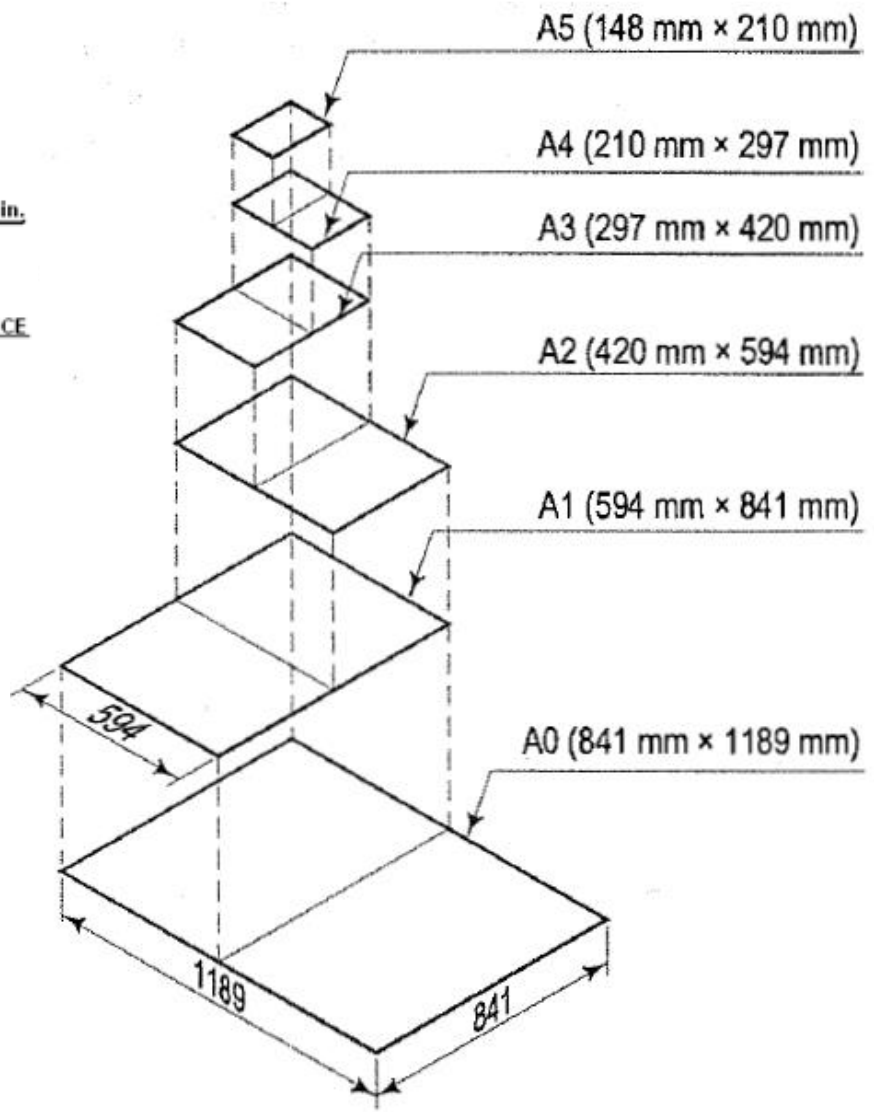




Drawing sheet layout and size







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Scales

SCALES

Scaling is used for shrinking a large object on paper

OR

To enlarge an object which otherwise is too small to draw on the paper.

(i)	Reducing scales	1 : 2	1 : 5	1 : 10
		1 : 20	1 : 50	1 : 100
		1 : 200	1 : 500	1 : 1000
		1 : 2000	1 : 5000	1 : 10000
(ii)	Enlarging scales	50 : 1	20 : 1	10 : 1
		5 : 1	2 : 1	
(iii)	Full size scales			1 : 1

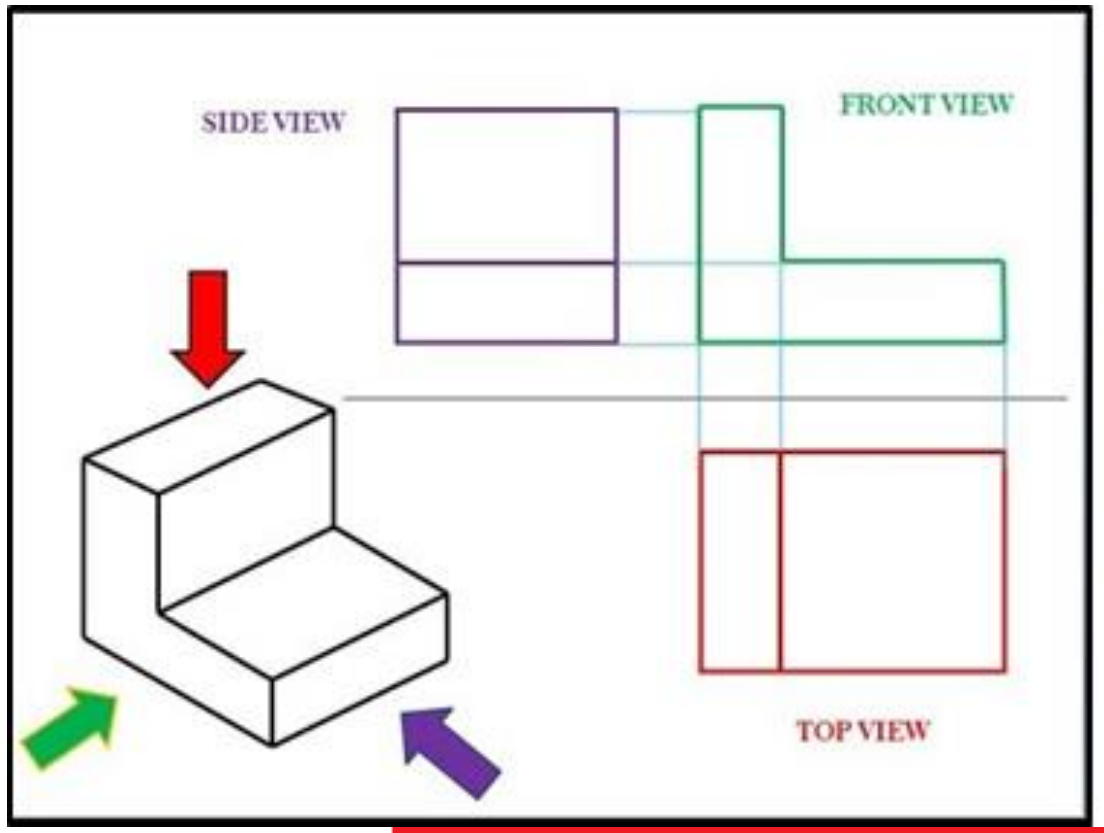
Projection of Points

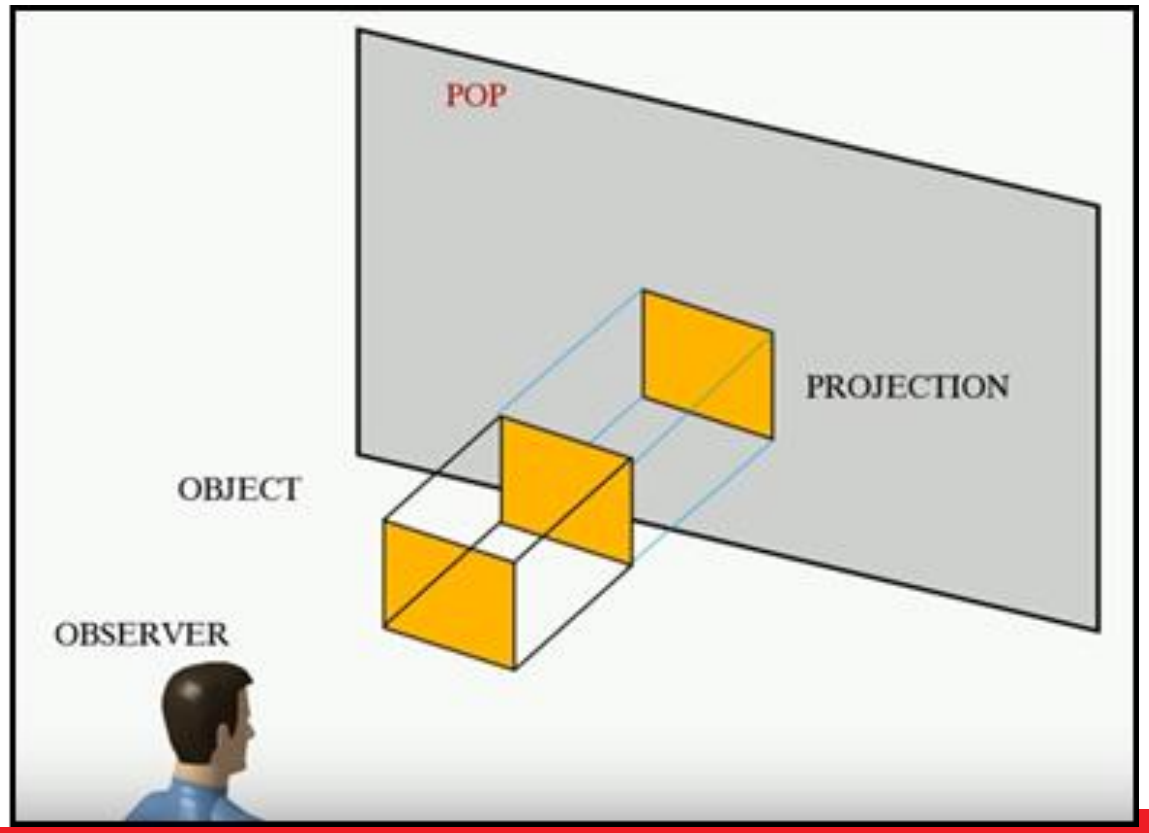
What is Projection ?

- In engineering, 3-dimensonal objects and structures are represented graphically on a 2-dimensional media. The act of obtaining the image of an object is termed “projection”. The image obtained by projection is known as a “view”. A simple projection system is shown in figure .
- All projection theory are based on two variables:
  - Lines of projection (sight): I*t is an imaginary ray of light between an observer’s eye and an object.*
  - Plane of projection: *It is an imaginary flat plane which the image is created.*

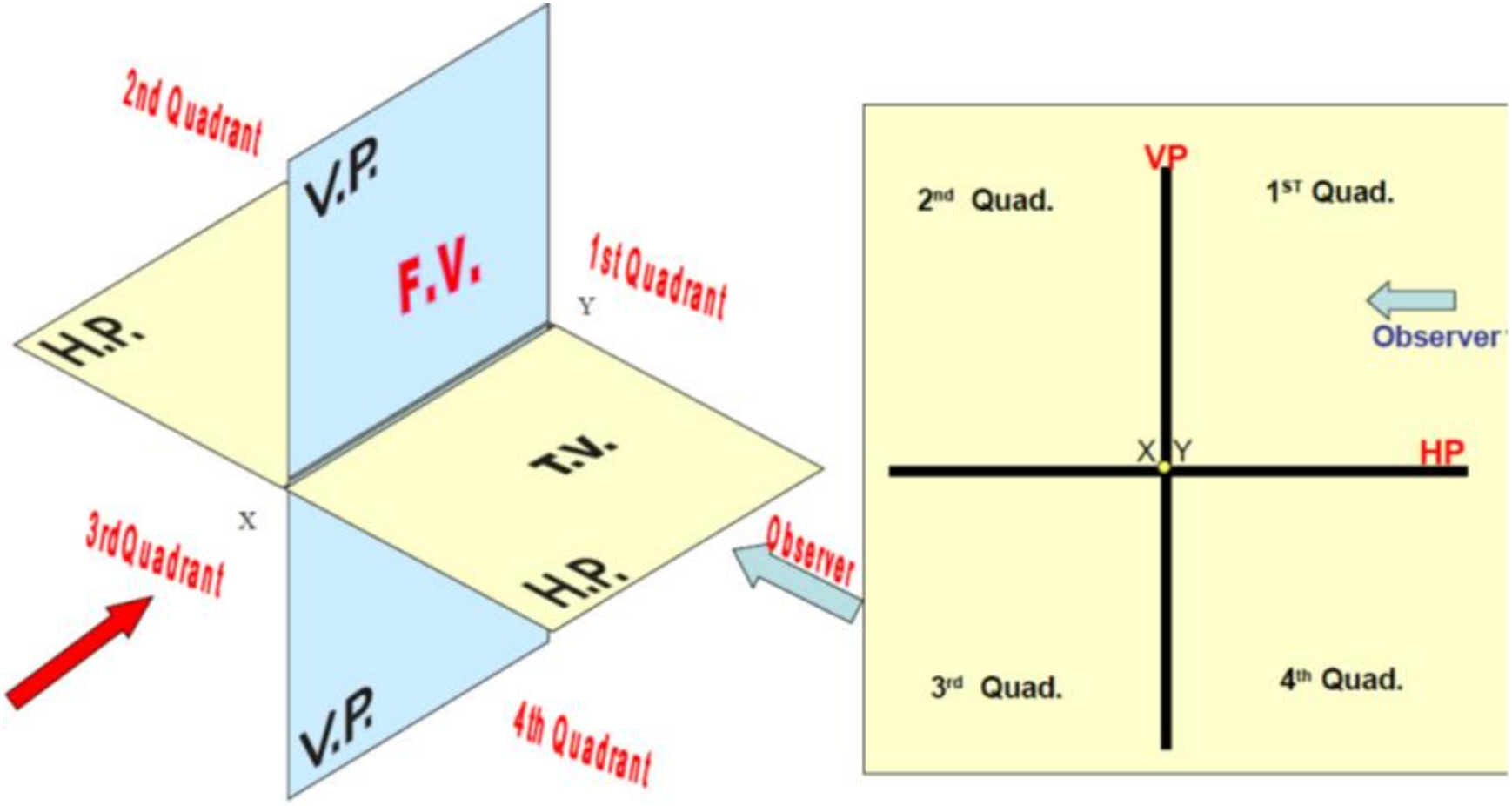
What is Projection ?

Orthographic Projection: The projection in which the projectors are parallel to each other and perpendicular to the plane

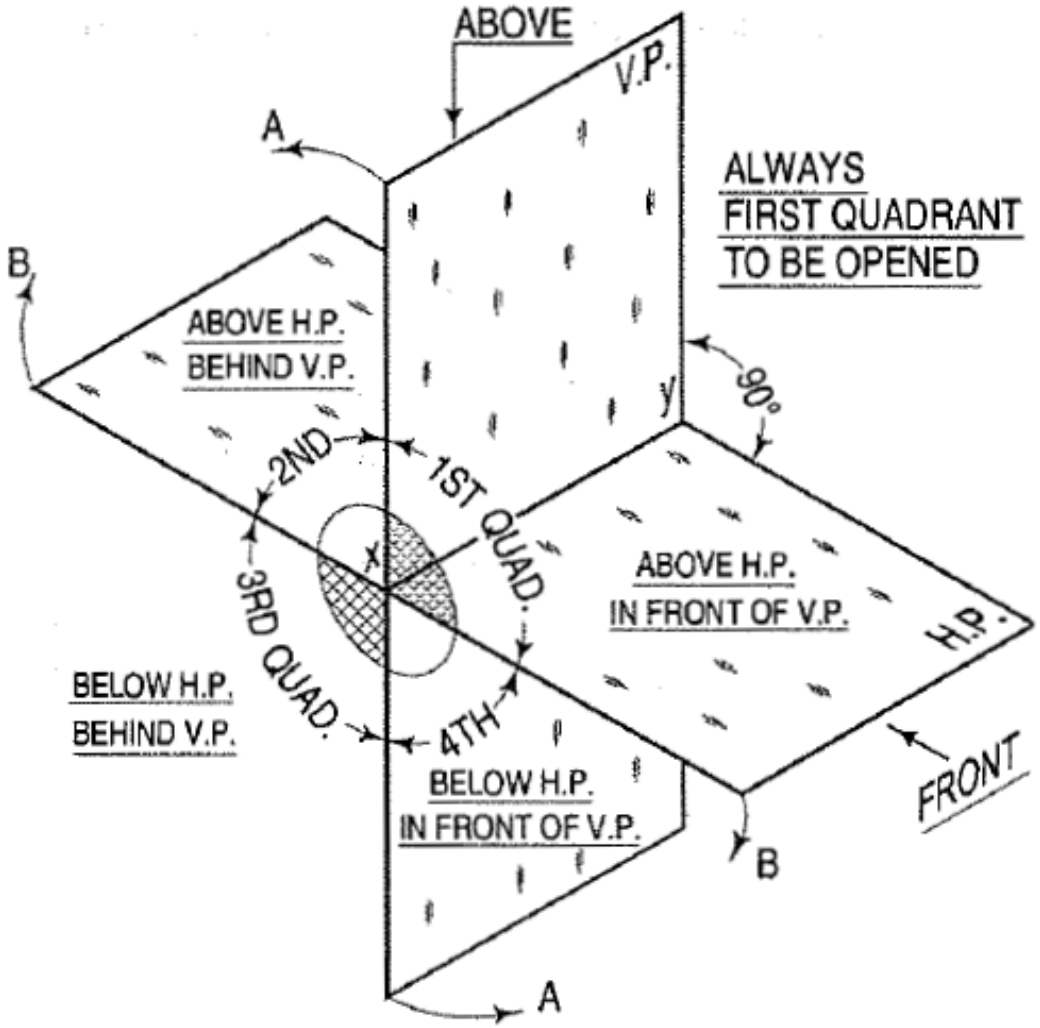


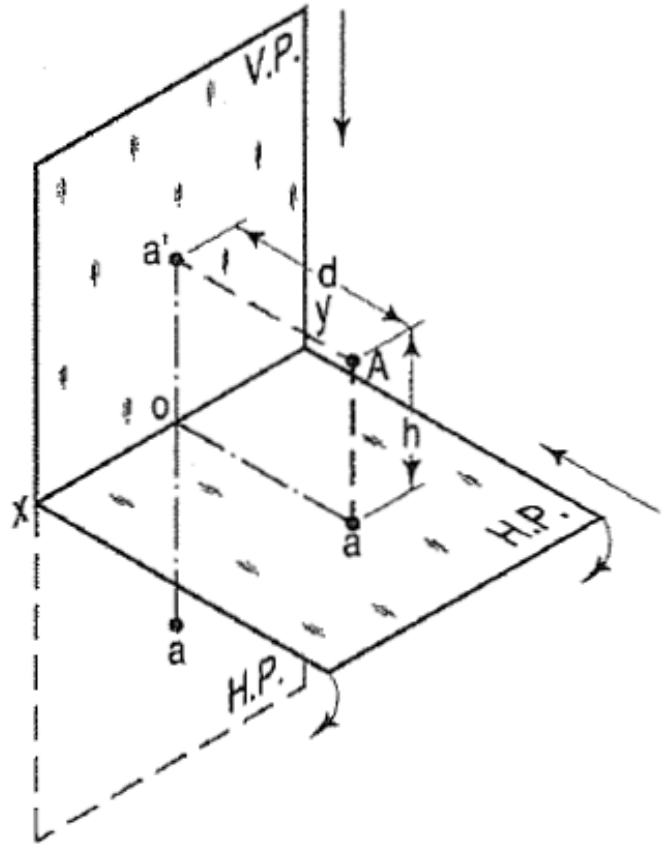


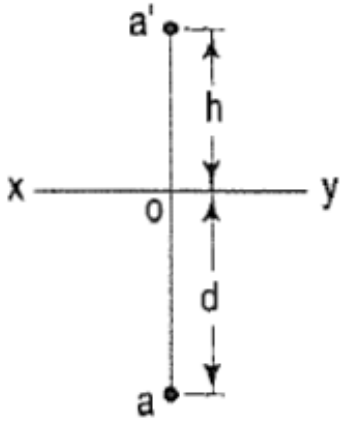
Quadrant System



Quadrant System

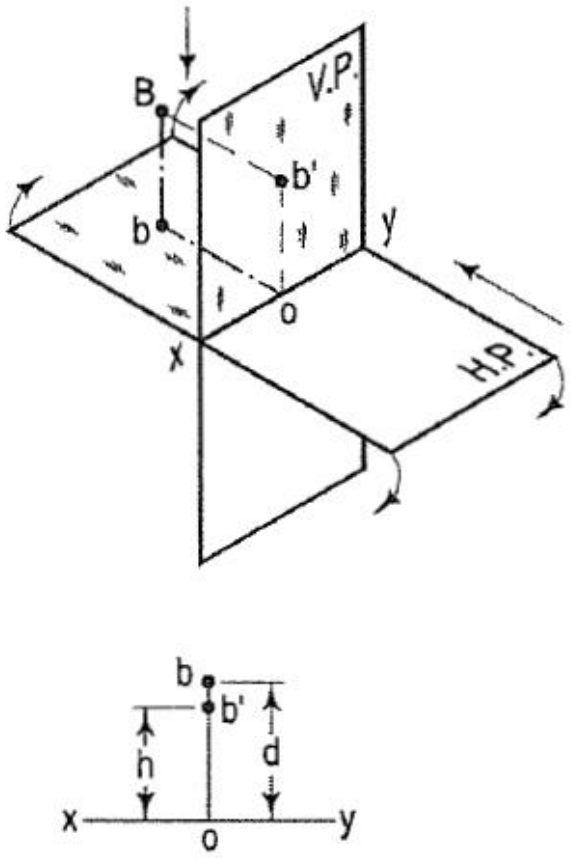




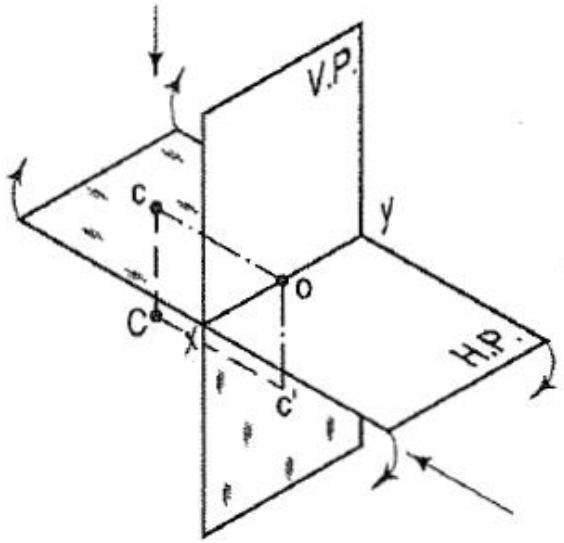


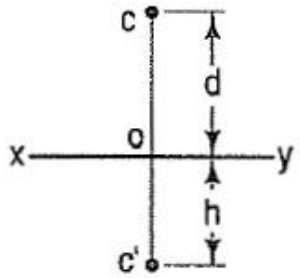
First Quadrant

Projection of Points in various Quadrants

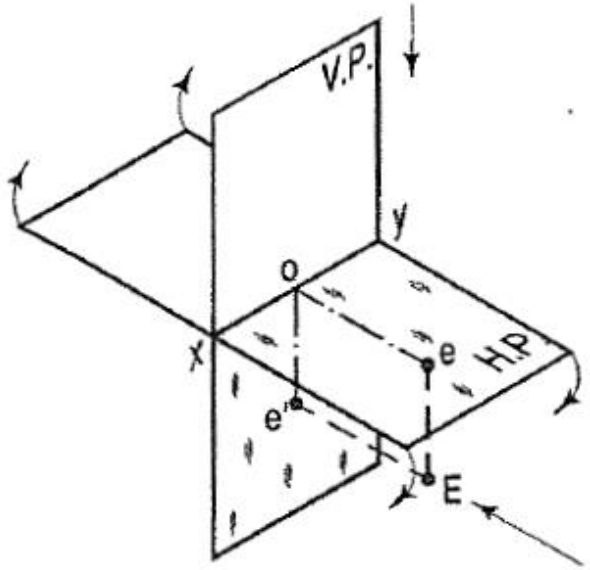


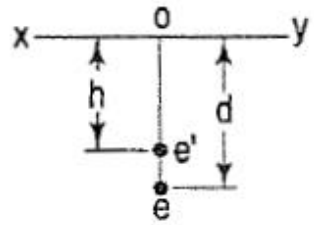
Second Quadrant





Third Quadrant





Fourth Quadrant

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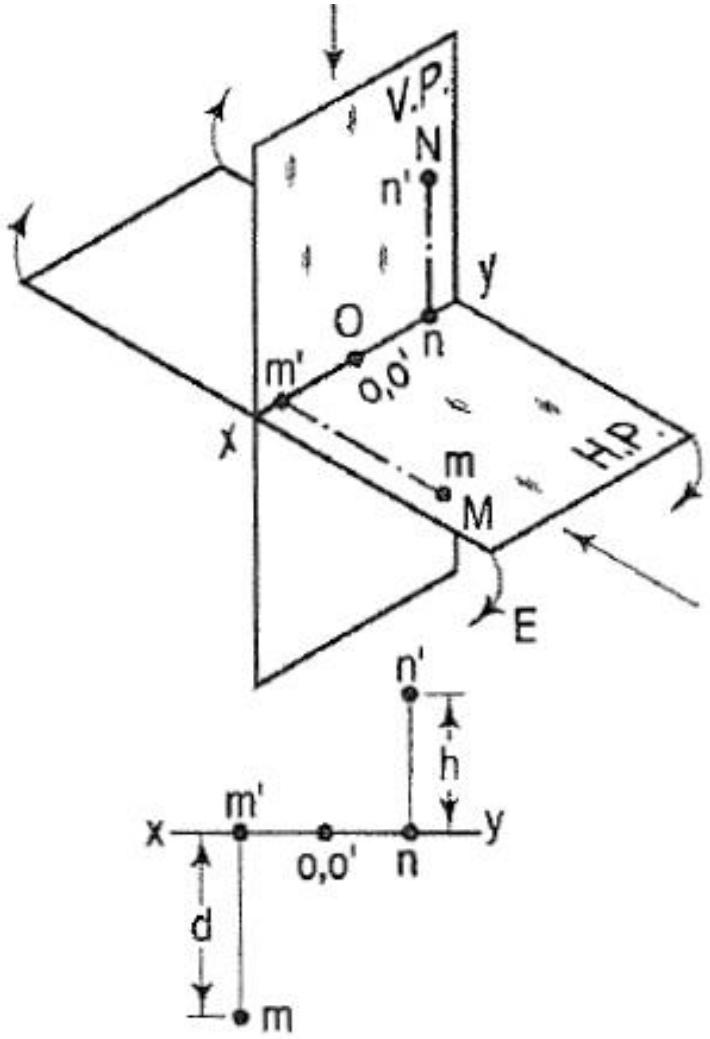
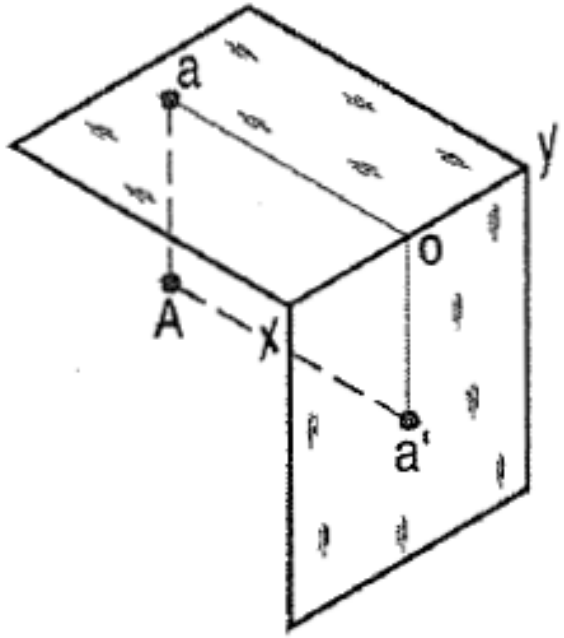
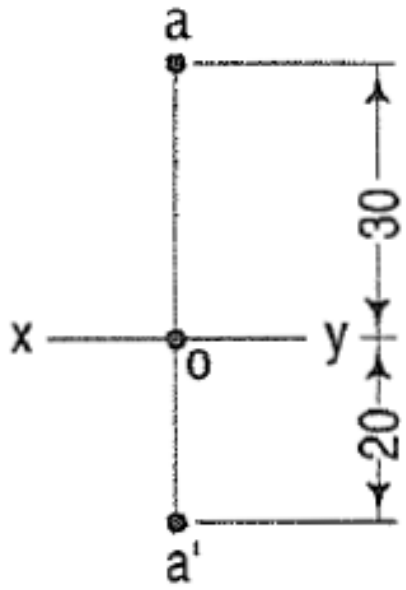
Special Cases



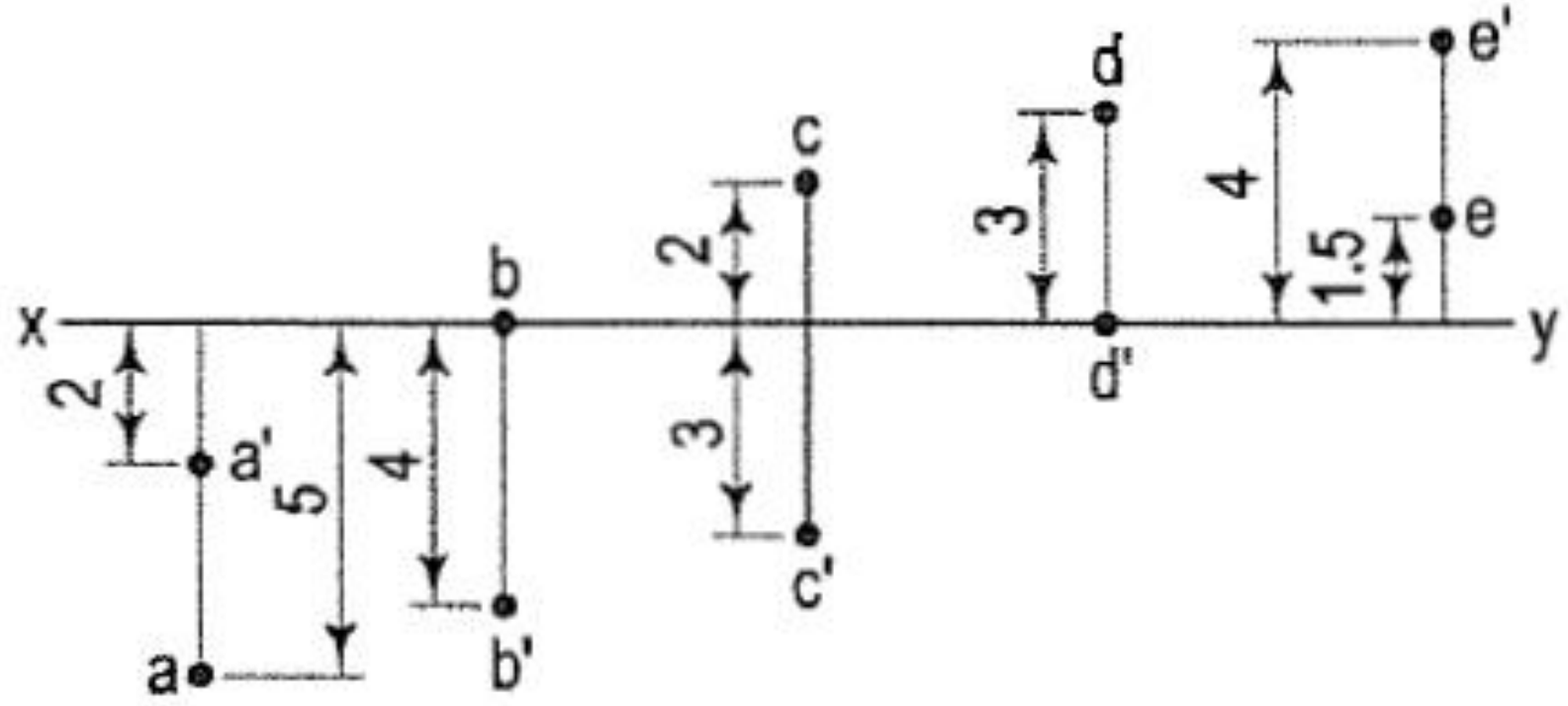
Problems

A Point A is 20 mm below HP and 30 mm behind VP. Draw its projections





Problems



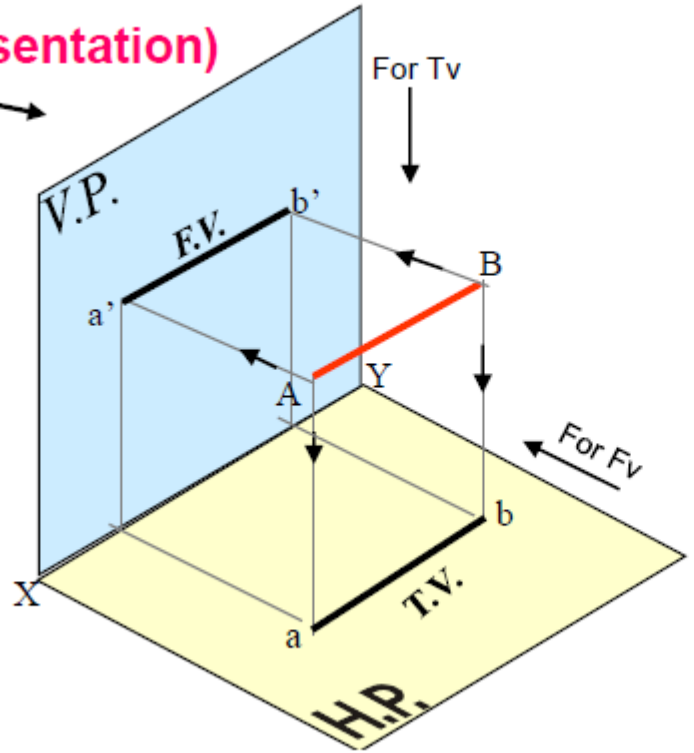
Projection of Lines

Line in First Quadrant – Case I

(Pictorial Presentation)

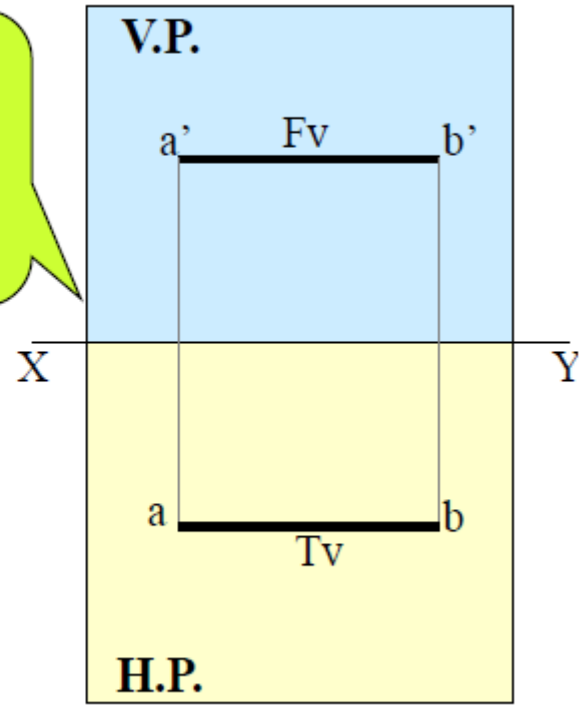
1.

A Line
// to Hp
&
// to Vp



Note:
Fv & Tv both are
// to xy
&
both show T. L.

Orthographic Pattern

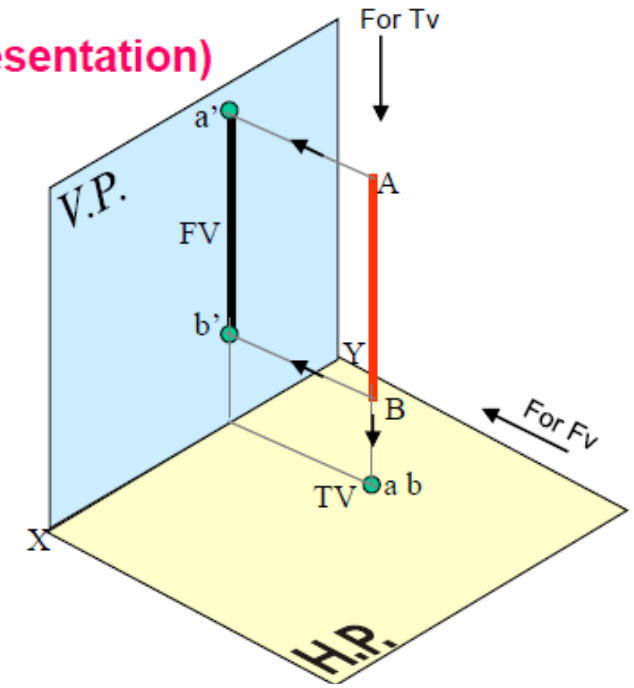


Line in First Quadrant – Case II

(Pictorial Presentation)

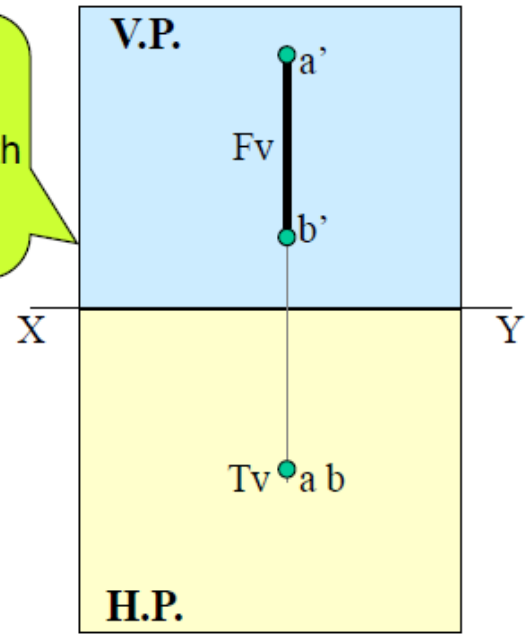
2.

A Line perpendicular to Hp & // to Vp



Note:
Fv is a vertical line
Showing True Length
&
Tv is a point.

Orthographic Pattern

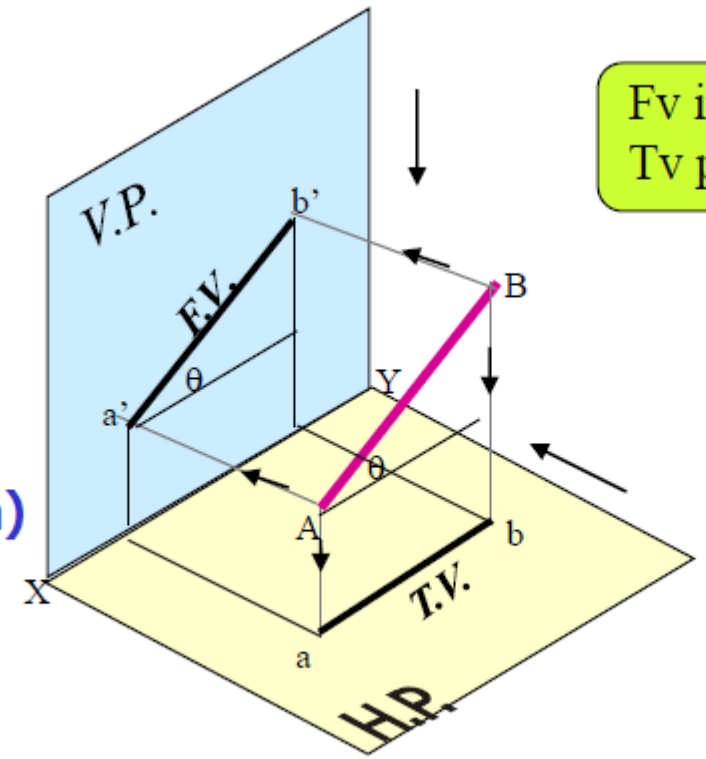


Line in First Quadrant – Case III

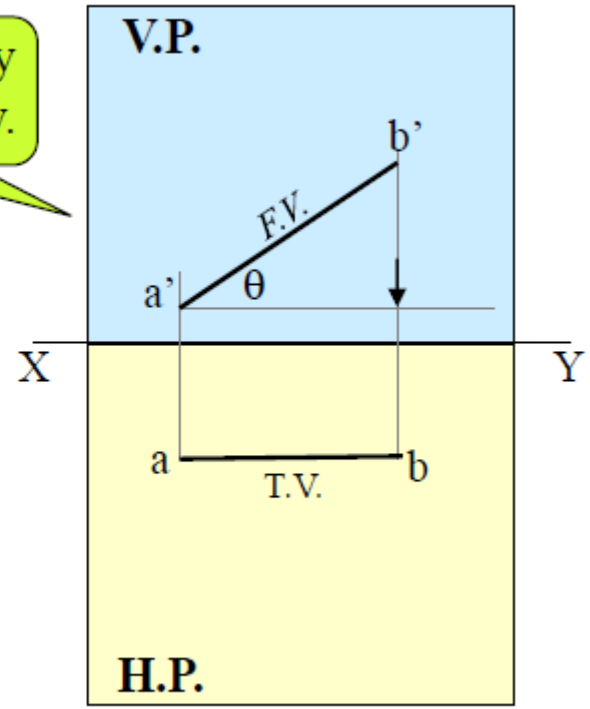
3.

A Line inclined to Hp
and
parallel to Vp

(Pictorial presentation)



Fv inclined to xy
Tv parallel to xy.

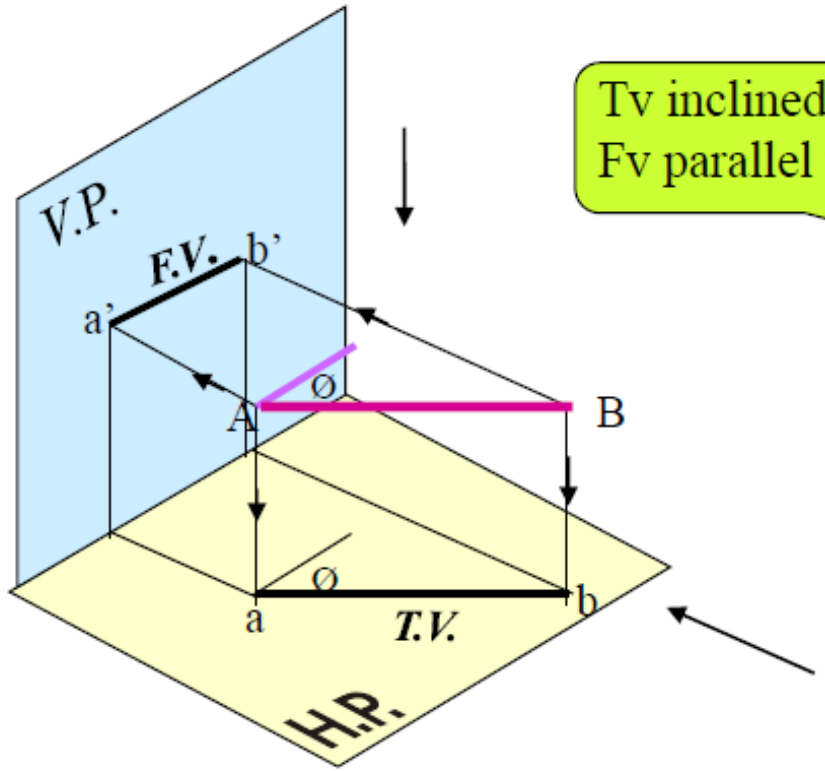


Line in First Quadrant – Case IV

4.

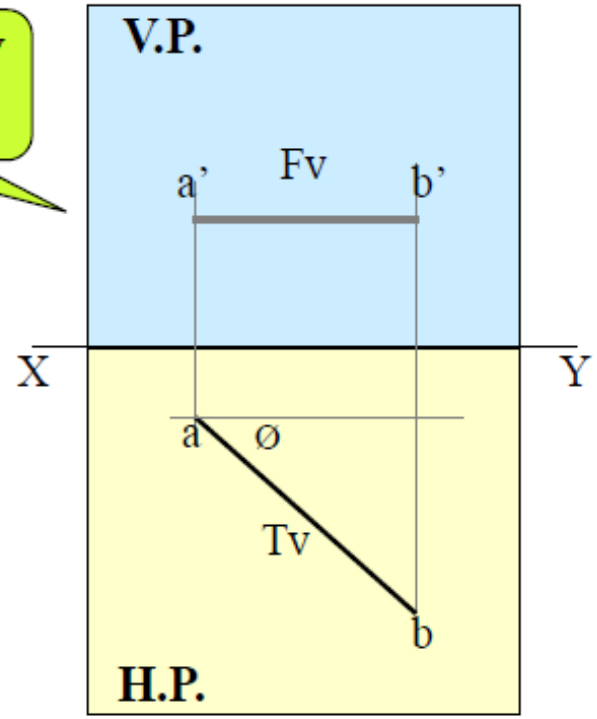
A Line inclined to Vp
and
parallel to Hp

(Pictorial presentation)

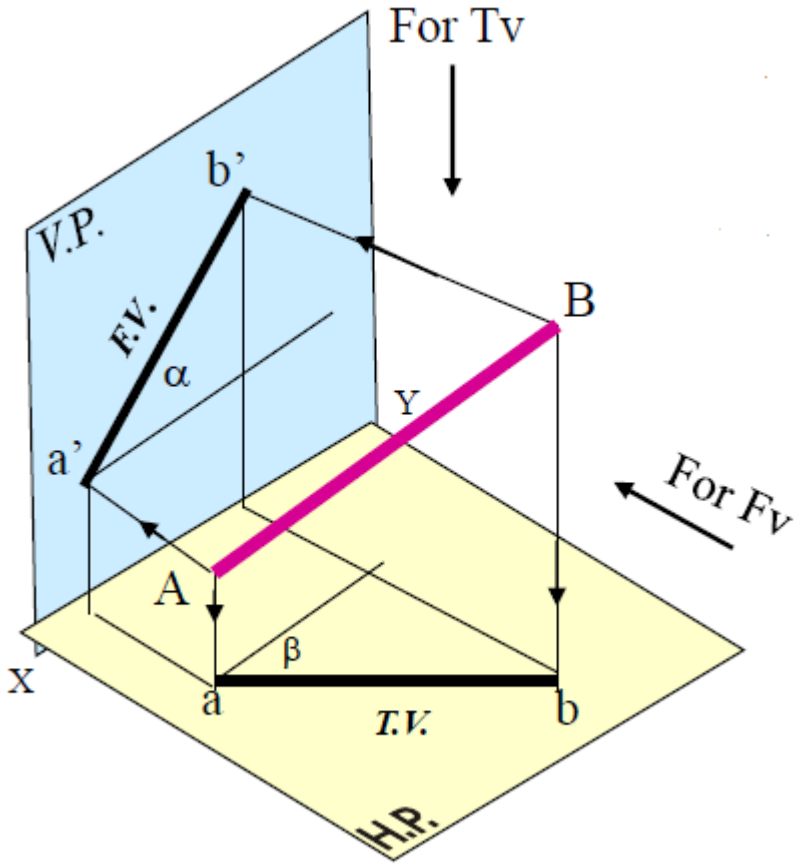


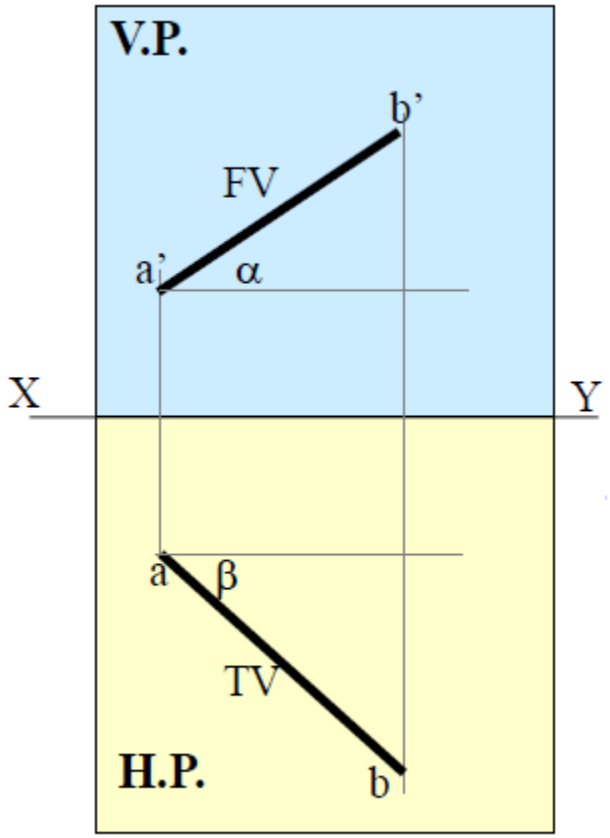
Tv inclined to xy
Fv parallel to xy.

Orthographic Projections



Lines inclined to both planes !





Are the angles shown here the real inclinations ?

What about the true length of the line ?

How to find the true length and inclinations of the line ?

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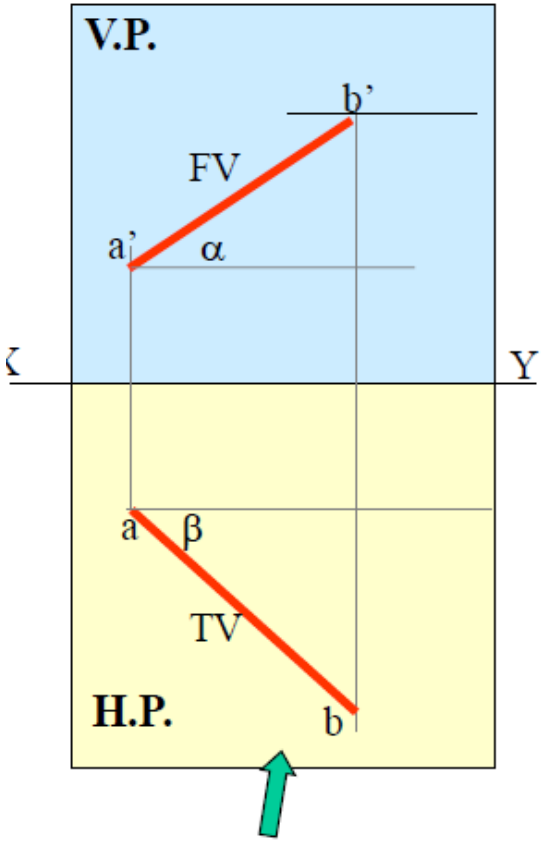
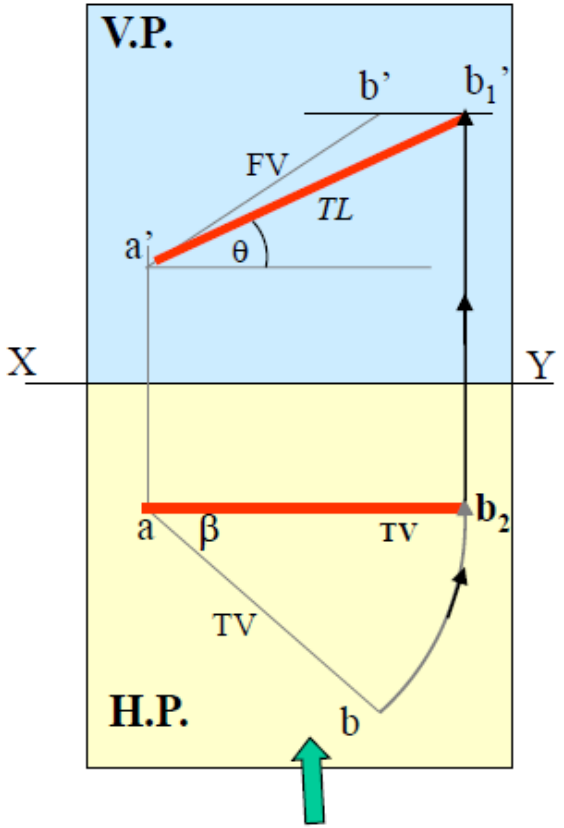
Orthographic Projections
Means Fv & Tv of Line AB
are shown below,
with their apparent Inclinations
α & β



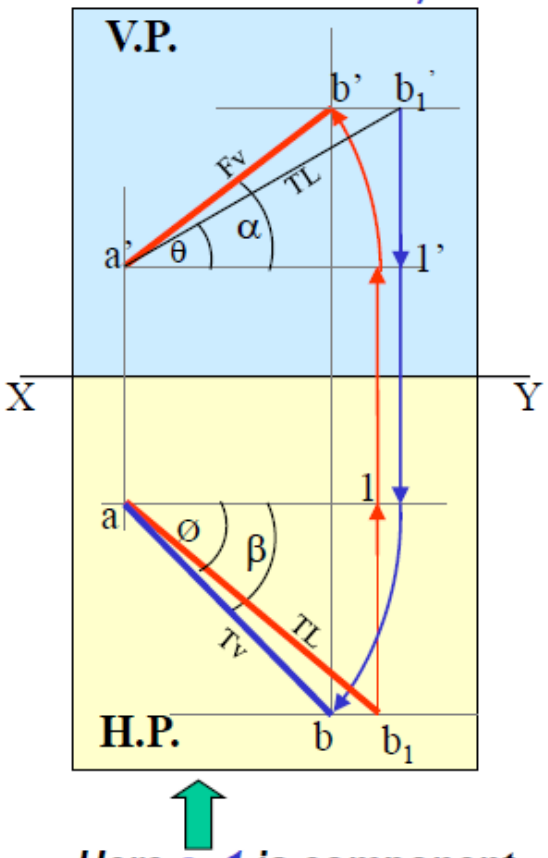
Here TV (ab) is not // to XY line
Hence it's corresponding FV
a' b' is not showing
True Length &
True Inclination with Hp.

Note the procedure
When Fv & Tv known,
How to find True Length.
(Views are rotated to determine
True Length & it's inclinations
with Hp & Vp).



In this sketch, TV is rotated
and made // to XY line.
Hence it's corresponding
FV a' b1' Is showing
True Length
&
True Inclination with Hp.

Note the procedure
When True Length is known,
How to locate Fv & Tv.
(Component a-1 of TL is drawn
which is further rotated
to determine Fv)



Here a -1 is component
of TL ab_1 gives length of Fv.
Hence it is brought Up to
Locus of a' and further rotated
to get point b'. a' b' will be Fv.
Similarly drawing component
of other TL(a' b_1') Tv can be drawn.

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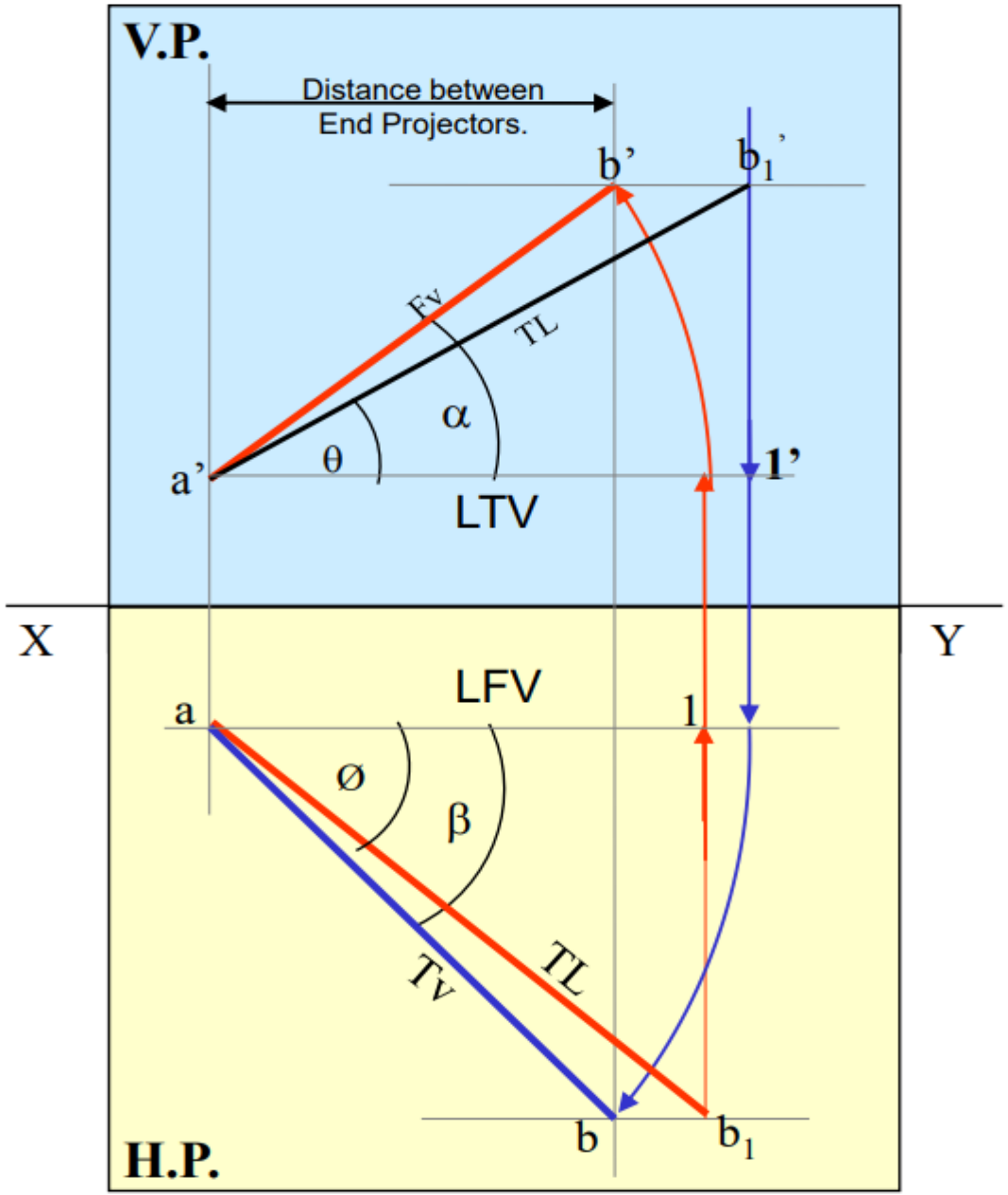
1) True Length (TL) – a' b_1' & a b
2) Angle of TL with Hp - θ
3) Angle of TL with Vp – $\emptyset$
4) Angle of FV with xy – α
5) Angle of TV with xy – β
6) LTV (length of FV) – Component **(a-1)**
7) LFV (length of TV) – Component **(a'-1')**
8) Position of A- **Distances of a & a' from xy**
9) Position of B- **Distances of b & b' from xy**
10) Distance between End Projectors



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Lecture 8 : Date 31-08-2023

Topic: Problems on Lines inclined to both planes

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Q1. The F.V and T.V of the line PQ measures 50 mm and 60 mm respectively. The line is 75 mm long. Point P is 35 mm above H.P. and 15 mm in front of V.P. Draw the projections of the line PQ and determine its inclinations with the H.P and V.P. Assume the line to be in 1st quadrant.

Q2. Line AB is 75 mm long makes 45º inclination with VP while its FV makes 55º. End A is 10mm above HP and 15 mm in front of VP. If the line is in the first Quadrant, draw the projections and find its inclination with HP.

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Lecture 9 : Date 1-09-2023

Topic: Problems on Lines inclined to both planes

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Q3. The plan length of the line AB, 70 mm long measures 50 mm. The end point A is 50 mm in front of V.P and 15 mm above the H.P. The end B is 15 mm in front of V.P and above the H.P. Draw the projections of the line AB and determine its inclinations with H.P and V.P

Q4. A line AB, 90 mm long has its one end A in the H.P. and 35 mm behind V.P and the other end B in V.P and 55 mm below H.P. Draw the projections of the line and find its inclinations with H.P and V.P.

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Lecture 10 : Date 05-09-2023

Topic: Practice problems on Lines inclined to both planes

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Problems

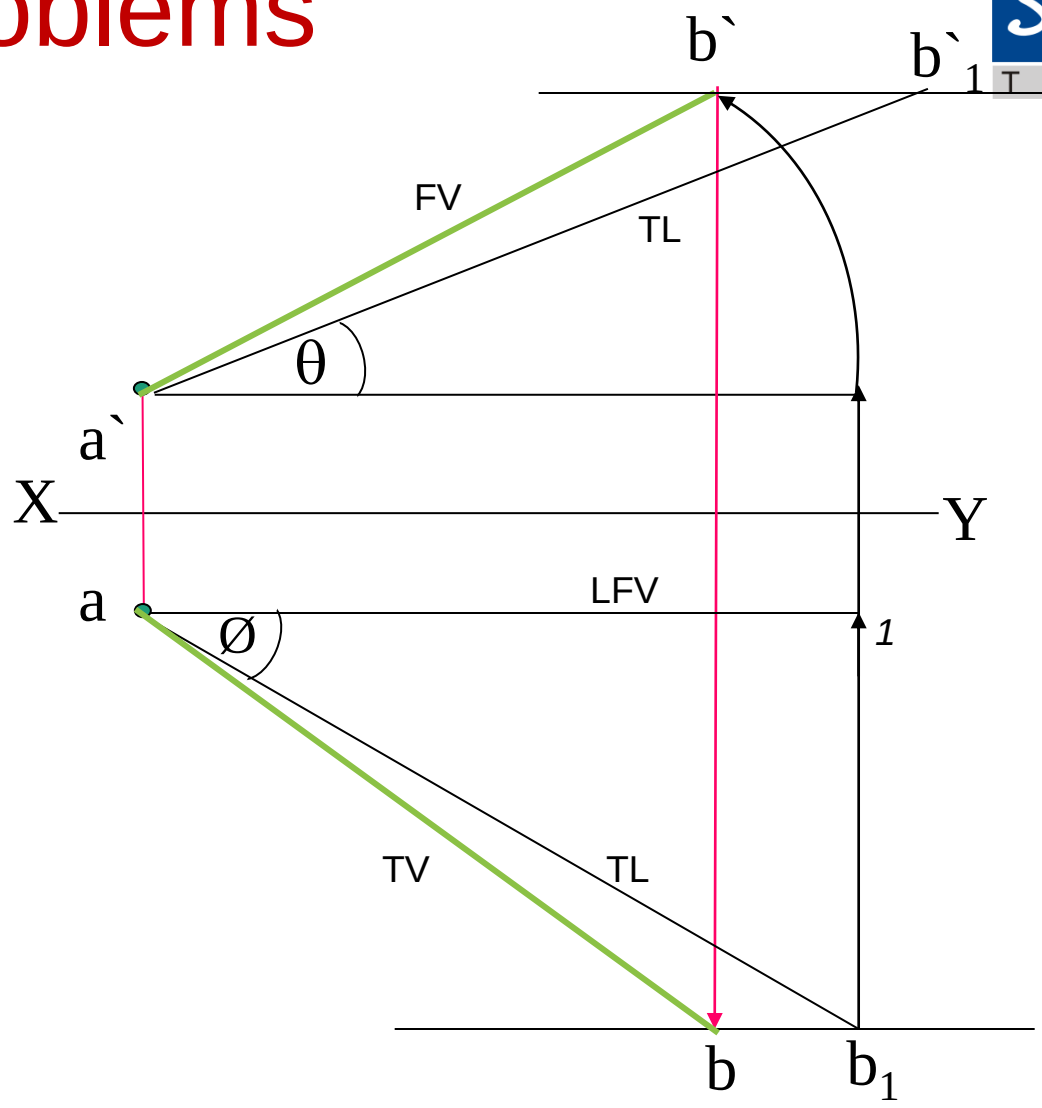
Line AB is 75 mm long and it is 30º and 40º inclined to HP and VP respectively. End A is 12mm above HP and 10 mm in front of VP. Draw the projections. Assume line is in the first quadrant.

Given Data:

TL

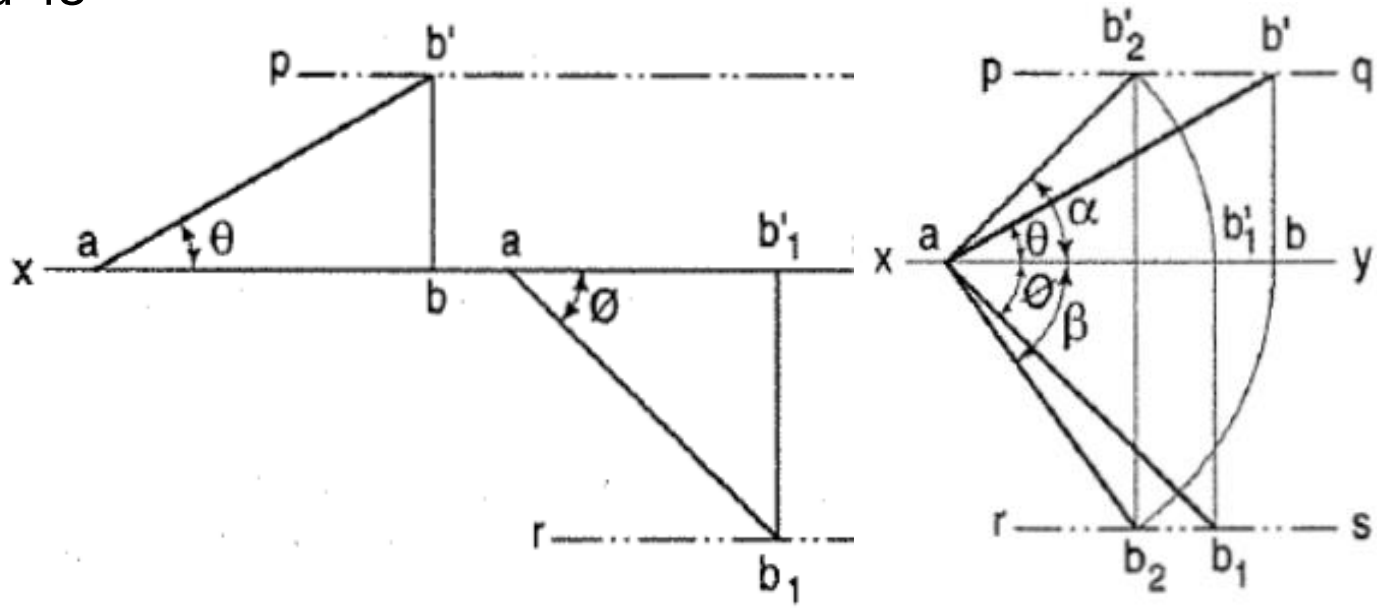
True inclinations to HP and VP (θ and ϕ)

Position of point A wrt. HP and VP



Problems

A line AB, 50 mm long has its end A in both HP and VP. It is inclined at 30º to HP and 45º to VP. Draw the projections.



Given Data:

TL

True inclinations to HP and VP (θ and ϕ)

Position of point A wrt. HP and VP

Problems

Line AB is 75 mm long makes 45º inclination with VP while its FV makes 55º. End A is 10mm above HP and 15 mm in front of VP. If the line is in the first Quadrant, draw the projections and find its inclination with HP.

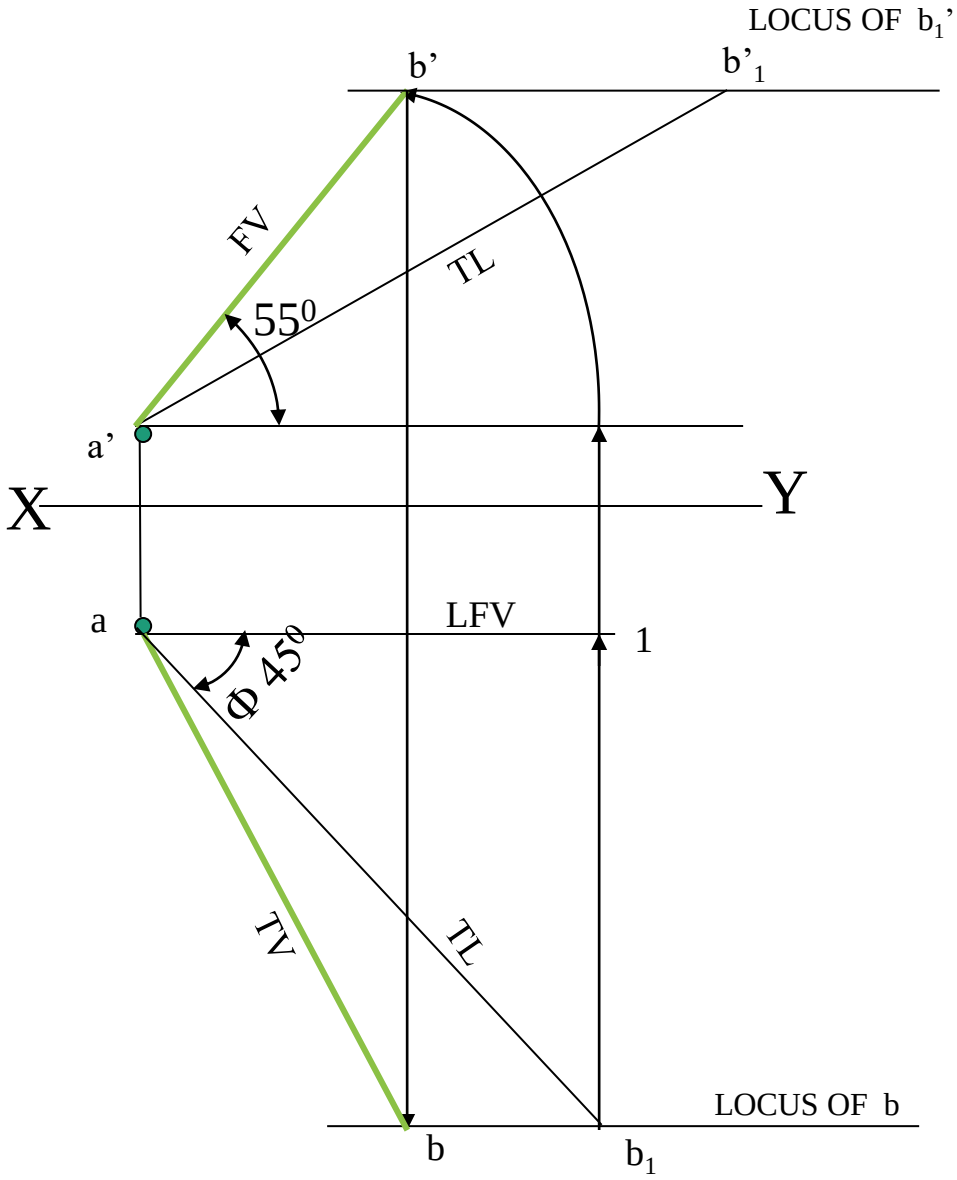
Given Data:

TL

True inclinations to VP (ϕ)

Apparent inclination with HP (α)

Position of point A wrt. HP and VP



Problems

FV of line AB is 50^0 inclined to XY and measures 55 mm long while it's TV is 60^0 inclined to XY line. If end A is 10 mm above HP and 15 mm in front of VP, draw it's projections, find TL, inclinations of line with HP & VP.

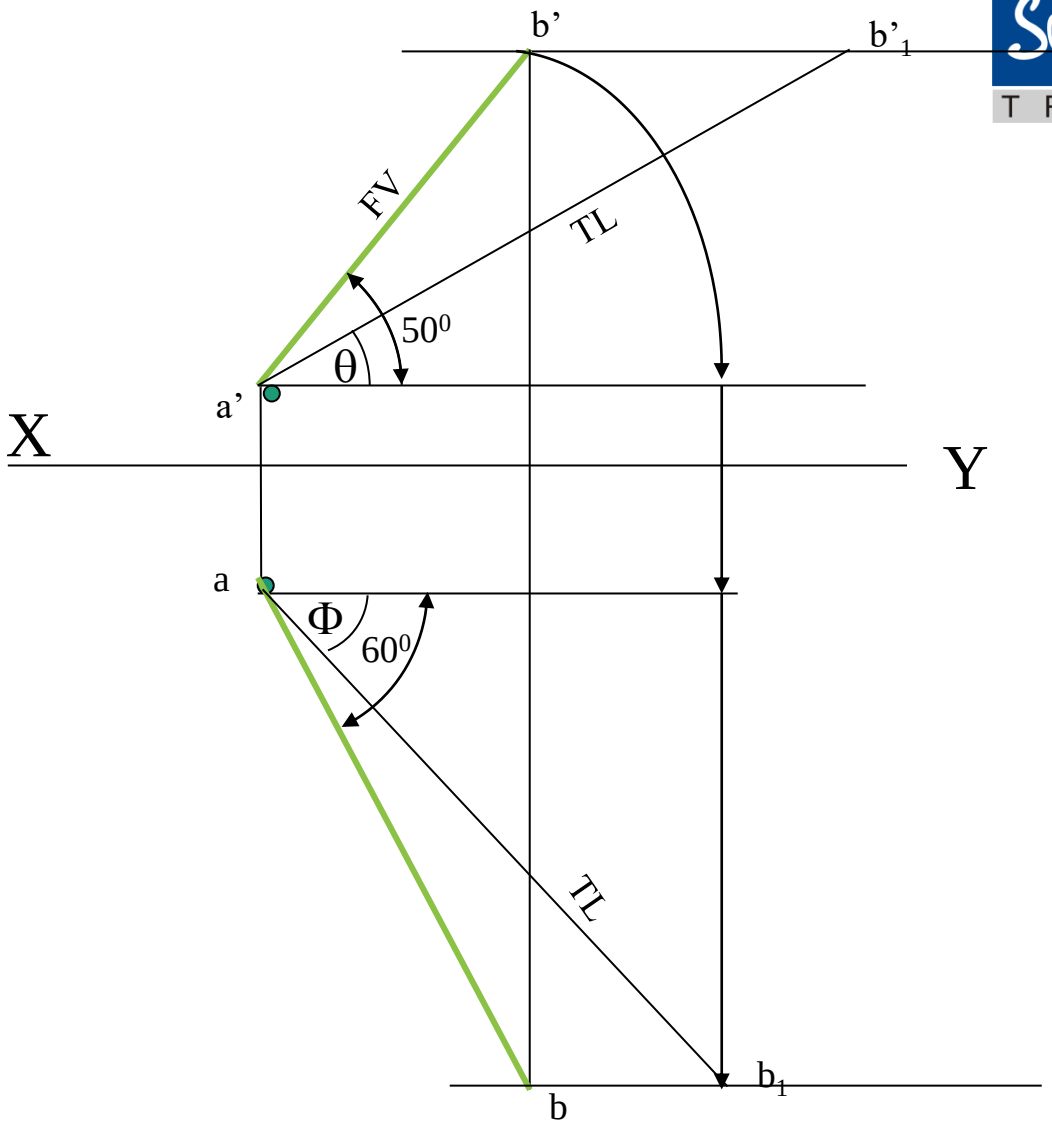
Given Data:

FV

Apparent inclinations to VP (ϕ)

Apparent inclination to HP (β)

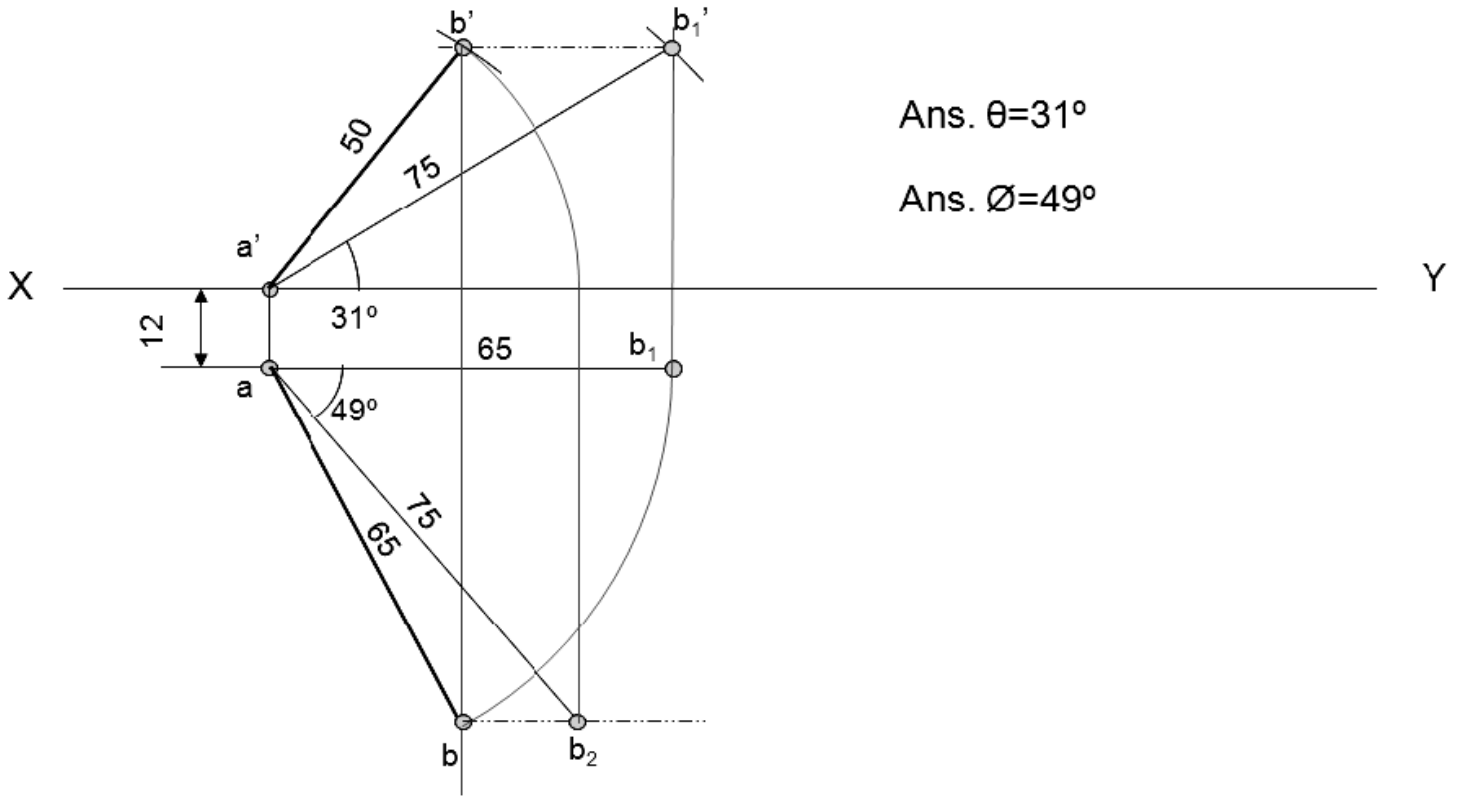
Position of point A wrt. HP and VP



Problems

The top view of a 75 mm line AB measures 65 mm, while its front view measures 50 mm. Its one end A is in HP and 12 mm in front of VP. Draw the projections of AB and determine its inclination with HP and VP.

Given Data:
TV and TL
FV
Position of point A wrt. HP and VP

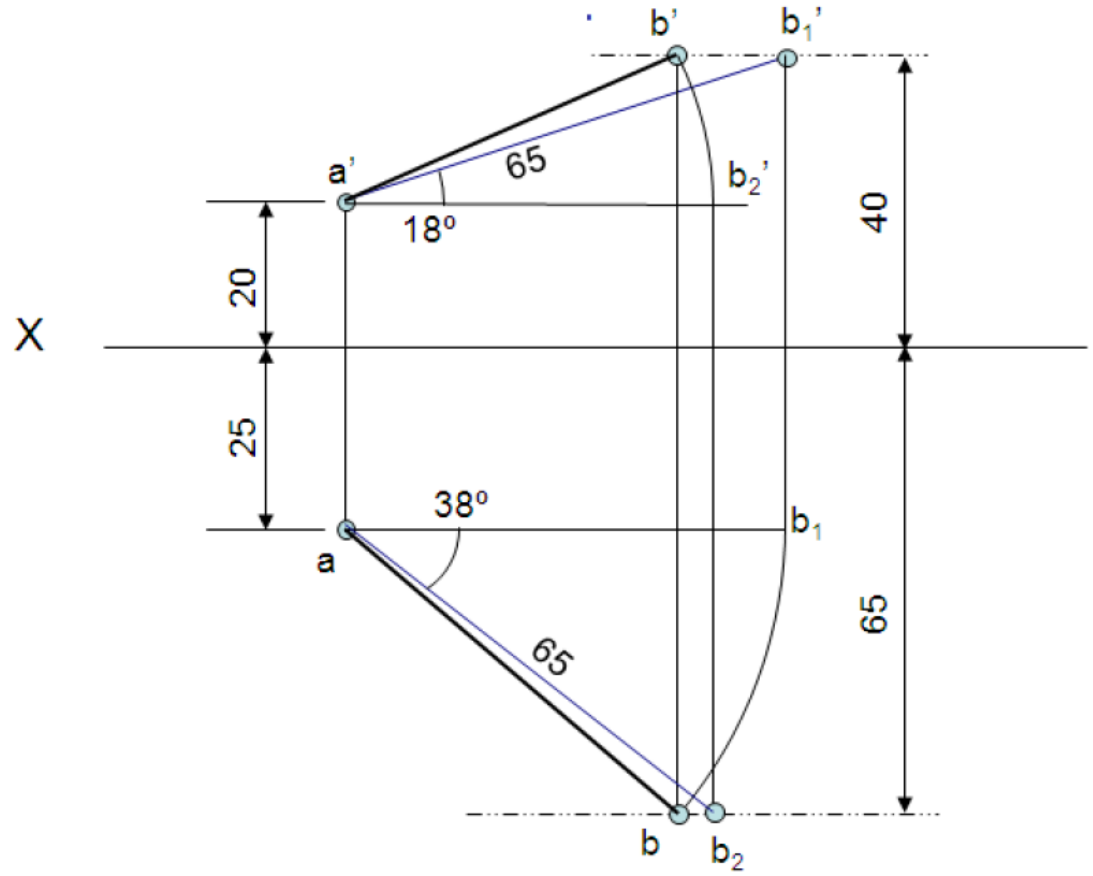


Ans. θ=31°

Ans. Ø=49°

Problems

The top view of a 75 mm line AB measures 65 mm, while its front view measures 50 mm. Its one end A is in HP and 12 mm in front of VP. Draw the projections of AB and determine its inclination with HP and VP.



Ans. θ=18°

Ans. Ø=38°

Given Data:

TV and TL

FV

Position of point A wrt. HP and VP

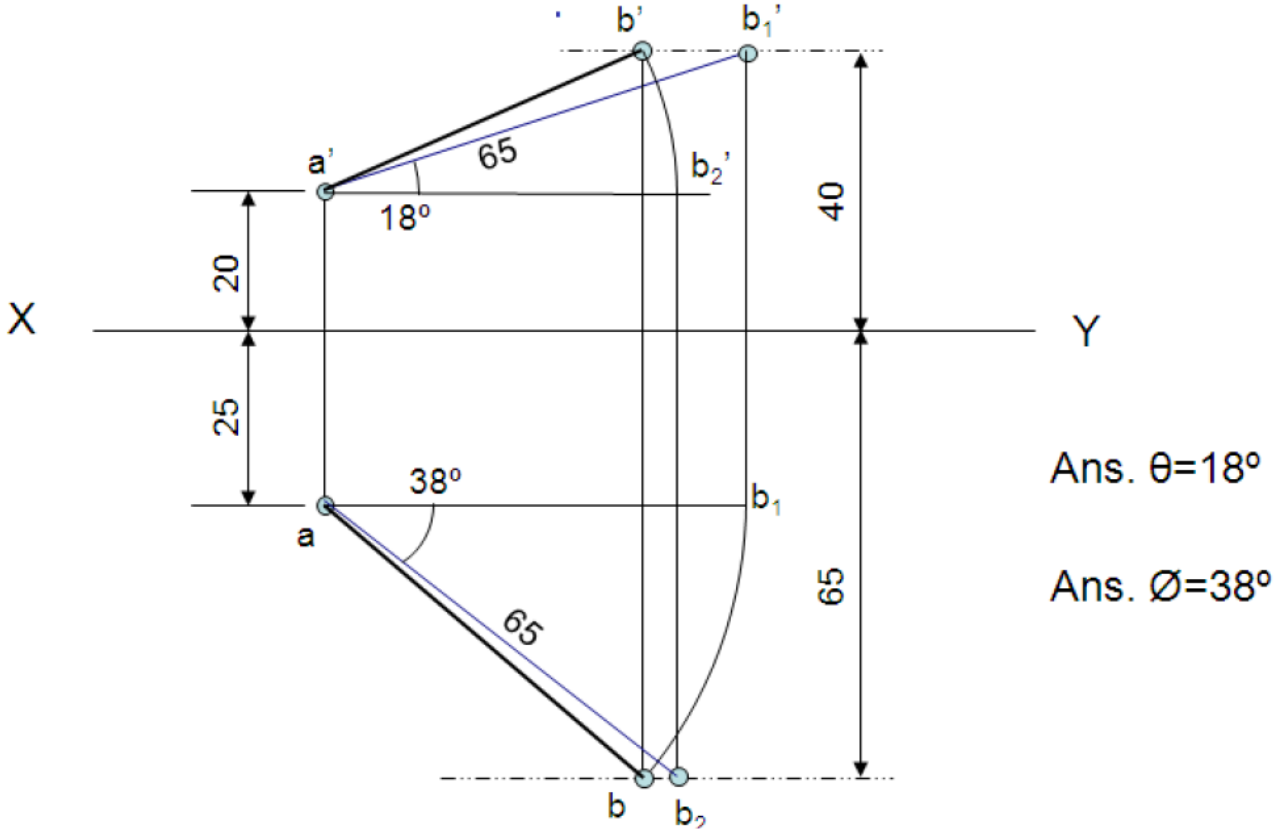
Problems

A line AB is 65 mm long has its end A 20 mm above HP and 25 mm in front of VP. The end B is 40 mm above HP and 65 mm in front of VP. Draw the projections of AB and show its inclination with HP.

Given Data:

TL

Position of point A and B wrt. HP and VP



Ans. θ=18°

Ans. Ø=38°

Line in two quadrants

Problems

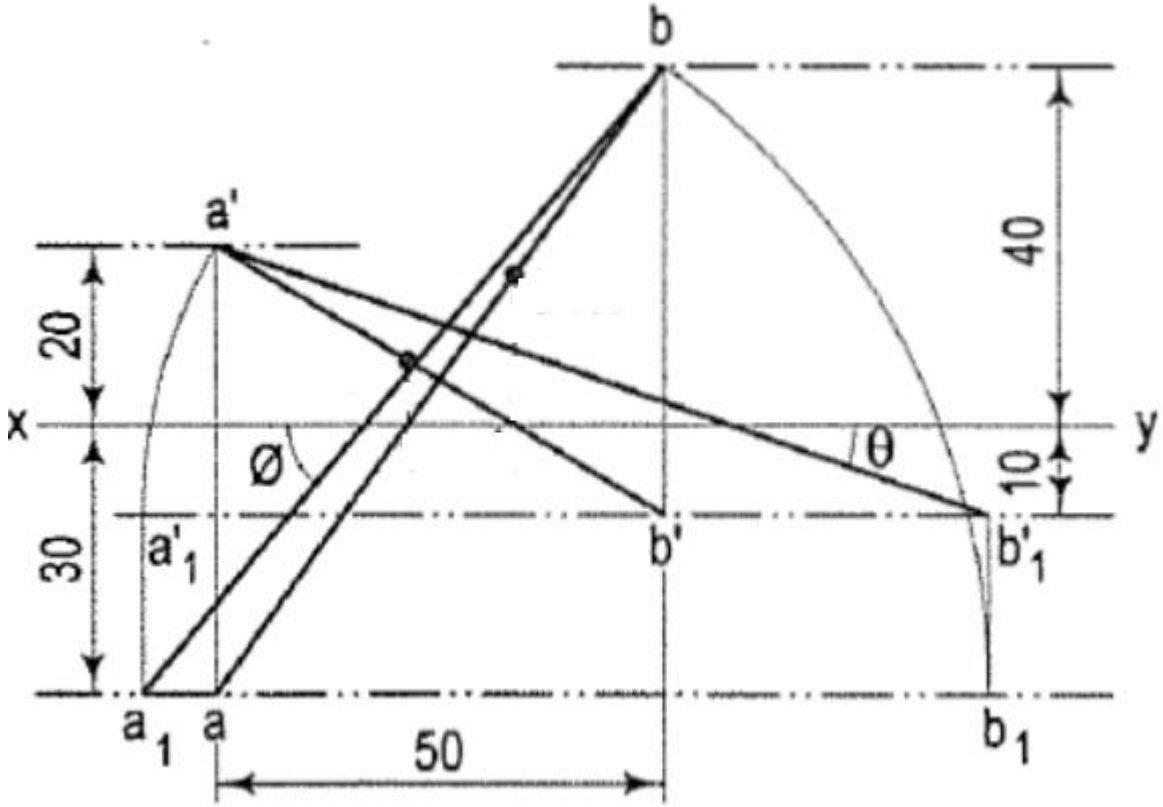
The projectors of the ends of a line AB are 50 mm apart . The end A is 20 mm above the HP and 30 mm in front of the VP. The end B is 10 mm below the HP and 40 mm behind the VP. Determine the true length and its inclinations with the two planes.

Given Data:

Distance between end projectors

Position of point A wrt. HP and VP

Position of point B wrt. HP and VP



Problems

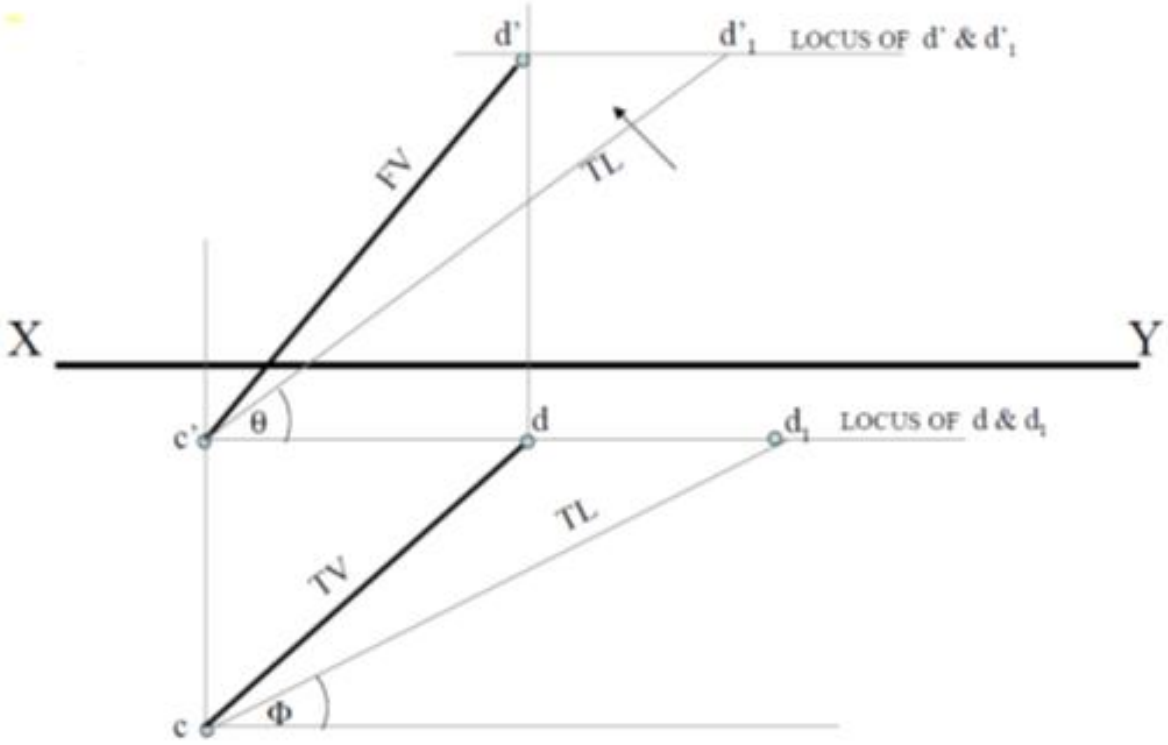
The top view of a 75 mm long line CD measures 50 mm. The end C is 15 mm below HP and 50 mm in front of VP. End D is 15 mm in front of VP and it is above HP. Draw the projections of CD and find angles with HP and VP

Given Data:

TL, TV

Position of point C wrt. HP and VP

Position of point D wrt. VP



Problems

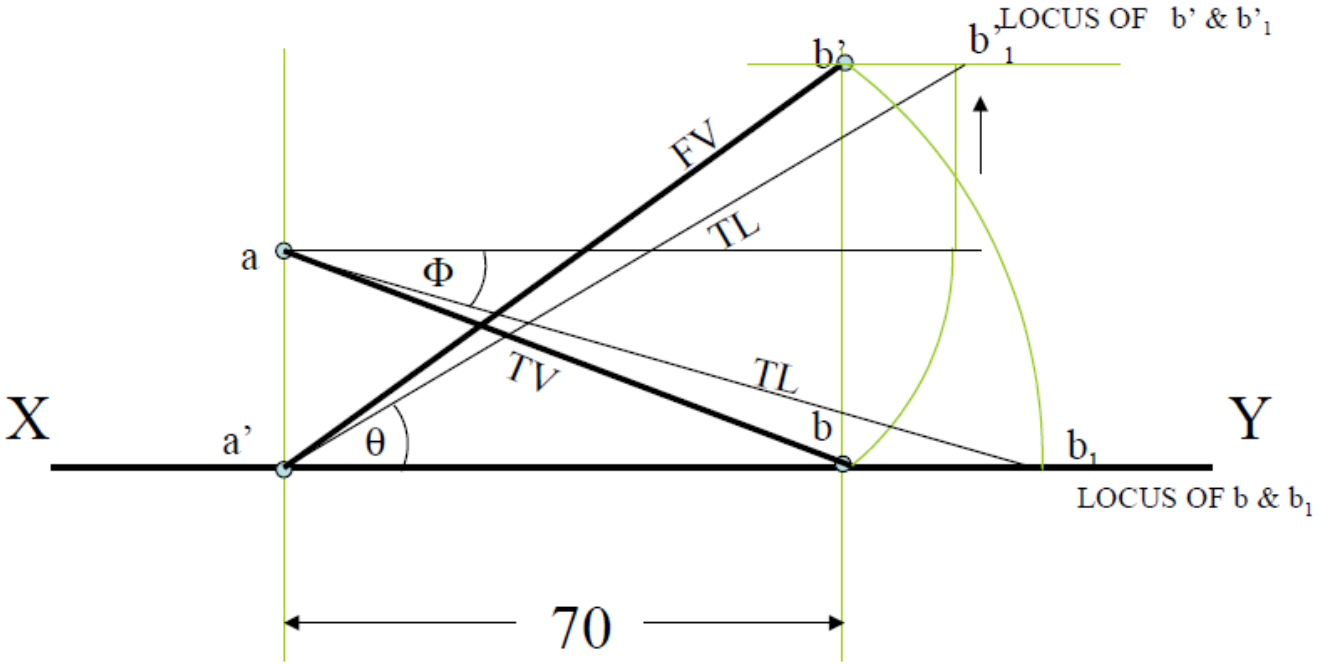
End A of a line AB is in HP and 25 mm behind VP. End B is in VP and 50 mm above HP. Distance between the end projectors is 70 mm. Draw the projections and find the angles made by the line with HP and VP.

Given Data:

TL, TV

Position of point C wrt. HP and VP

Position of point D wrt. VP



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Thank you !!

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