Projection of Lines

ORTHOGRAPHIC PROJECTIONS

OF POINTS, LINES, PLANES, AND SOLIDS.

TO DRAW PROJECTIONS OF ANY OBJECT, ONE MUST HAVE FOLLOWING INFORMATION

A) **OBJECT**

{ WITH IT'S DESCRIPTION, WELL DEFINED.}

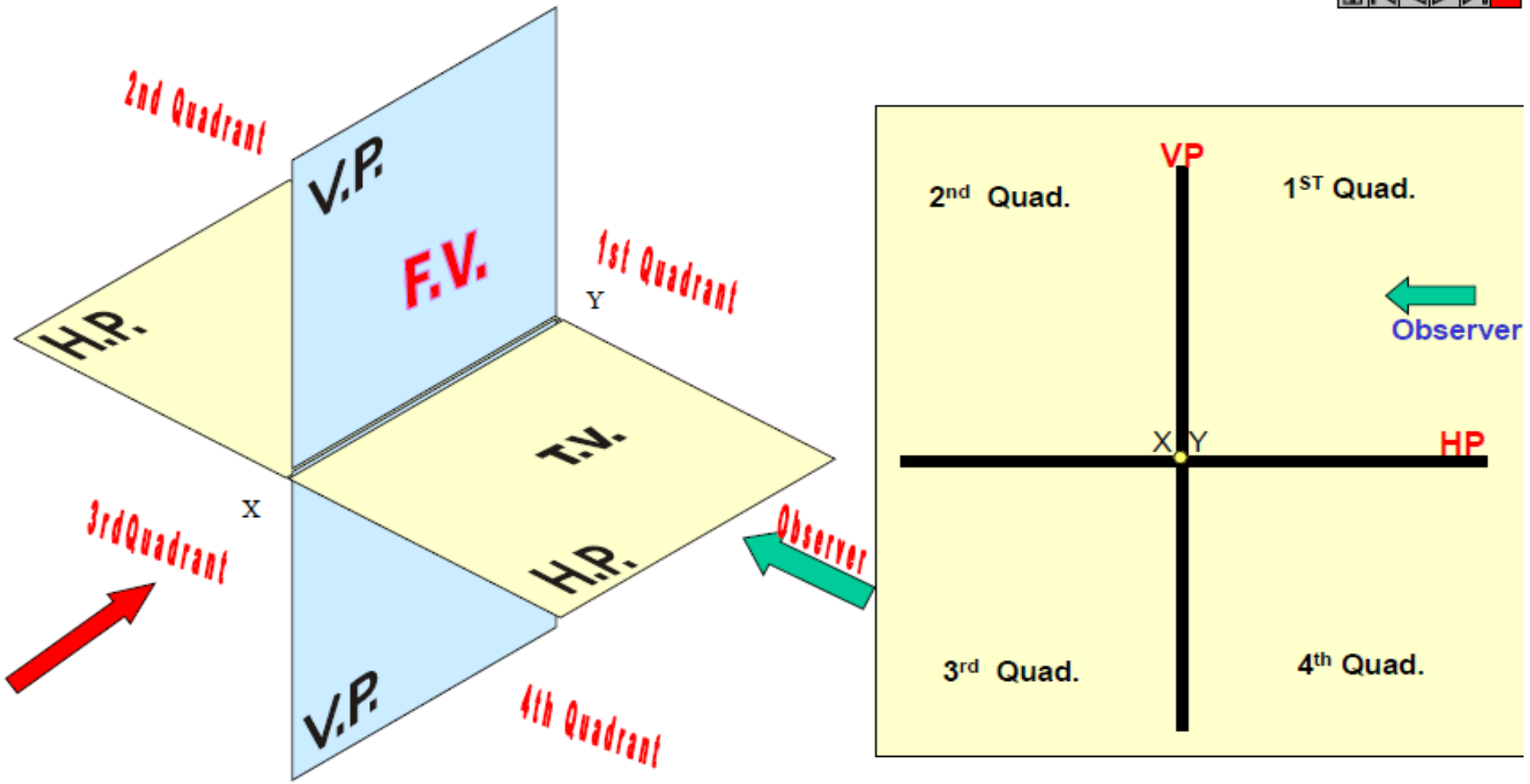
B) **OBSERVER**

{ ALWAYS OBSERVING PERPENDICULAR TO RESP. REF.PLANE}.

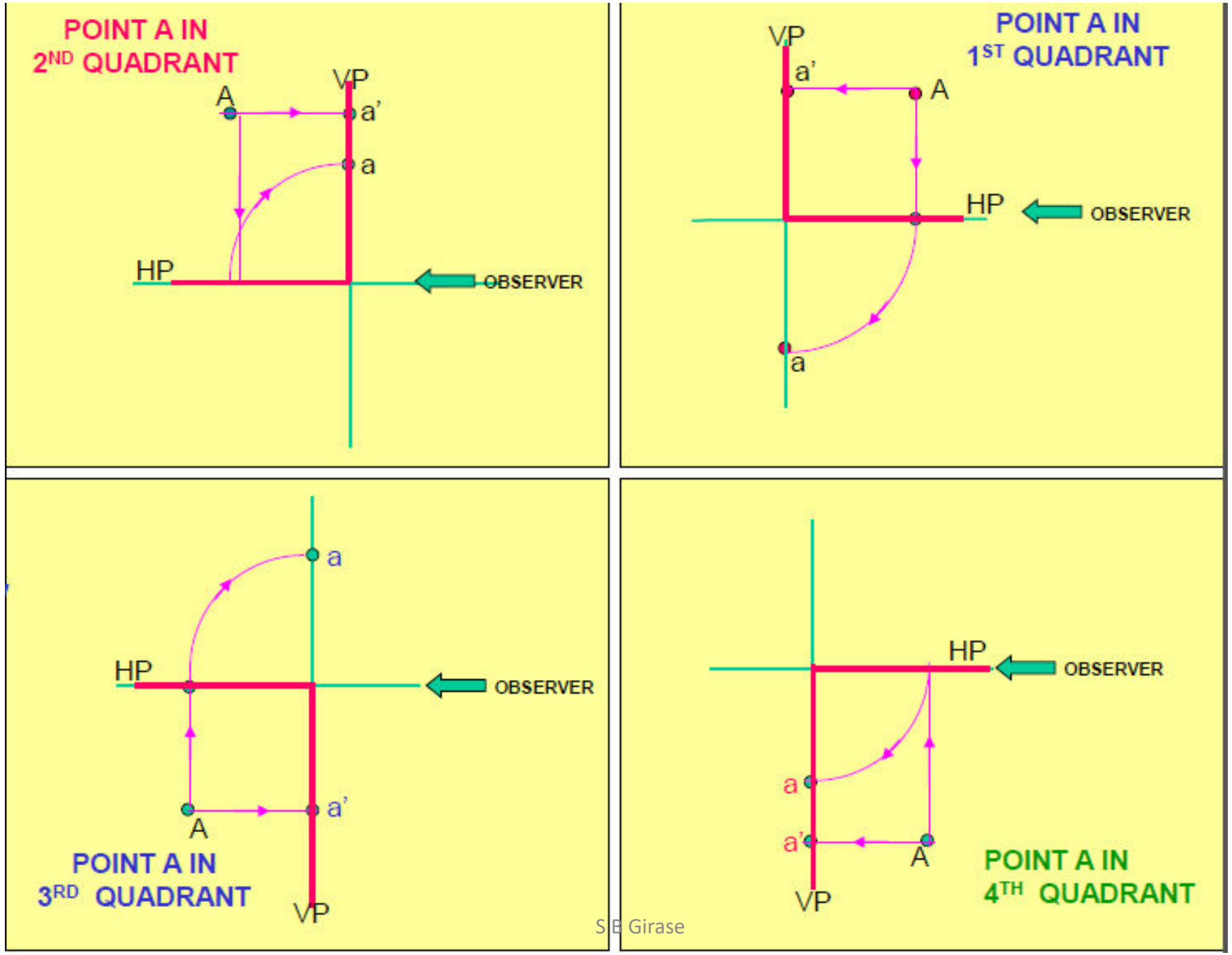
C) **LOCATION OF OBJECT**,

{ MEANS IT'S POSITION WITH REFFERENCE TO H.P. & V.P.}

TERMS 'ABOVE' & 'BELOW' WITH RESPECTIVE TO H.P.
AND TERMS 'INFRONT' & 'BEHIND' WITH RESPECTIVE TO V.P
FORM 4 QUADRANTS.
OBJECTS CAN BE PLACED IN ANY ONE OF THESE 4 QUADRANTS.

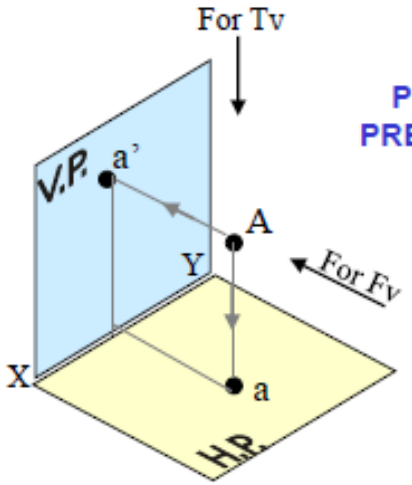


THIS QUADRANT PATTERN,
IF OBSERVED ALONG X-Y LINE (IN RED ARROW DIRECTION)
WILL EXACTLY APPEAR AS SHOWN ON RIGHT SIDE AND HENCE,
IT IS FURTHER USED TO UNDERSTAND ILLUSTRATION PROPERLLY.


POINT A IN
2ND QUADRANT
A
VP
a'
a
HP
OBSERVER
VP
a'
A
POINT A IN
1ST QUADRANT
HP
OBSERVER
a
a
HP
OBSERVER
a'
A
POINT A IN
3RD QUADRANT
VP
HP
OBSERVER
a
a'
A
VP
POINT A IN
4TH QUADRANT

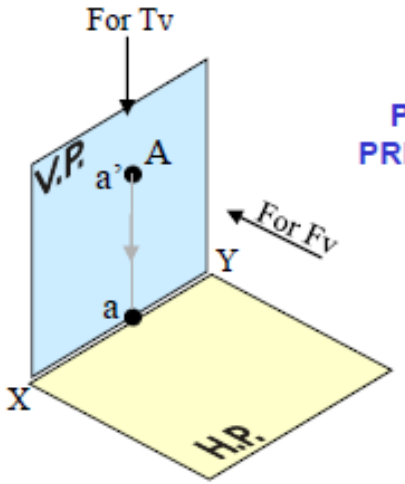
PROJECTIONS OF A POINT IN FIRST QUADRANT.

POINT A ABOVE HP & INFRONT OF VP



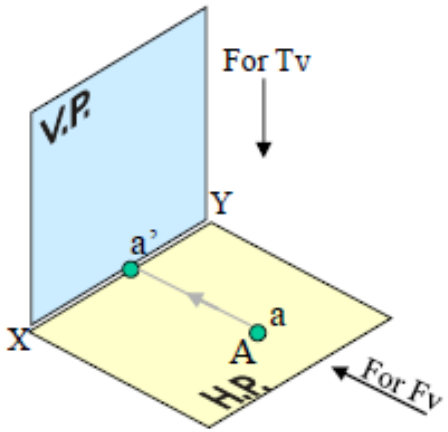
PICTORIAL PRESENTATION

POINT A ABOVE HP & IN VP



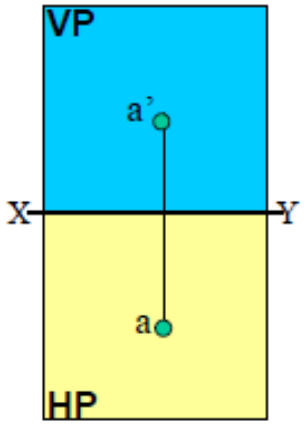
PICTORIAL PRESENTATION

POINT A IN HP & INFRONT OF VP

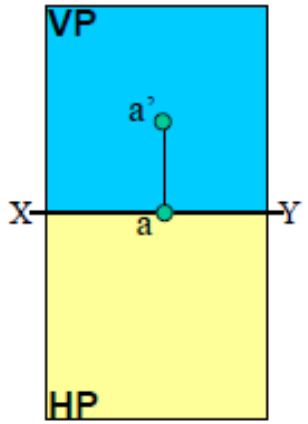


ORTHOGRAPHIC PRESENTATIONS OF ALL ABOVE CASES.

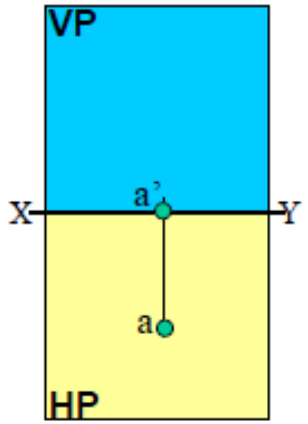
Fv above xy, Tv below xy.



Fv above xy, Tv on xy.



Fv on xy, Tv below xy.



PROJECTIONS OF STRAIGHT LINES.

INFORMATION REGARDING A LINE *means*
IT'S LENGTH,
POSITION OF IT'S ENDS WITH HP & VP
IT'S INCLINATIONS WITH HP & VP WILL BE GIVEN.
AIM:- TO DRAW IT'S PROJECTIONS - MEANS FV & TV.

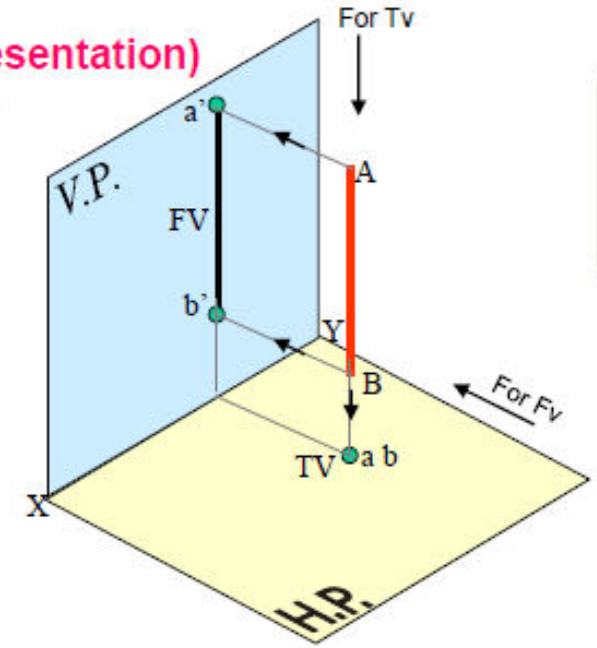
SIMPLE CASES OF THE LINE

1. A VERTICAL LINE (LINE PERPENDICULAR TO HP & // TO VP)
2. LINE PARALLEL TO BOTH HP & VP.
3. LINE INCLINED TO HP & PARALLEL TO VP.
4. LINE INCLINED TO VP & PARALLEL TO HP.
5. LINE INCLINED TO BOTH HP & VP.

(Pictorial Presentation)

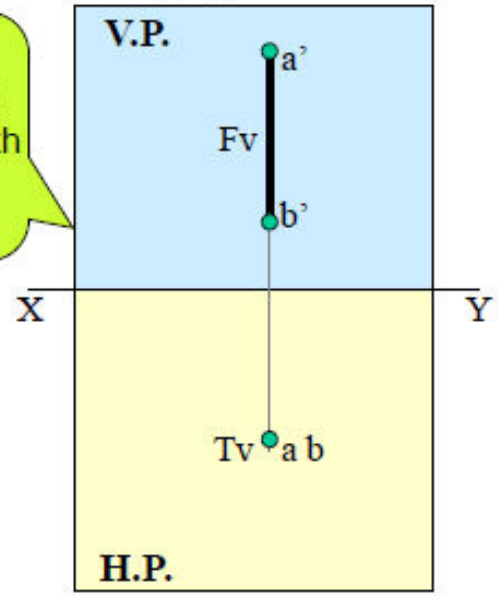
1.

A Line perpendicular to Hp & // to Vp



Orthographic Pattern

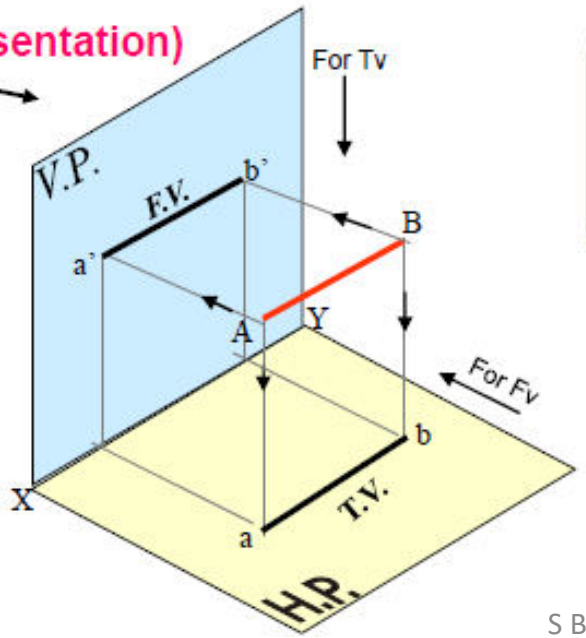
Note:
Fv is a vertical line
Showing True Length
&
Tv is a point.



(Pictorial Presentation)

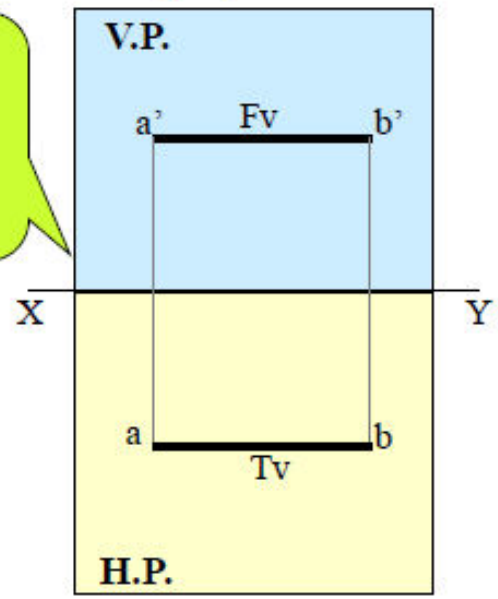
2.

A Line // to Hp & // to Vp



Orthographic Pattern

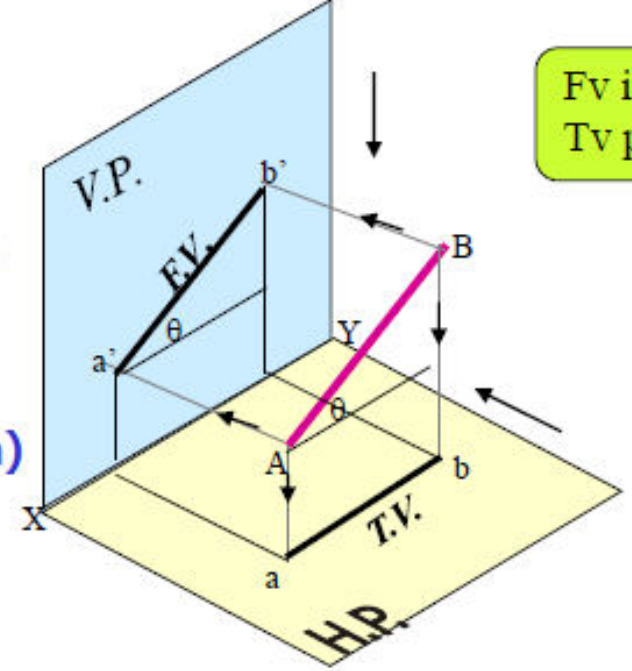
Note:
Fv & Tv both are
// to xy
&
both show T. L.



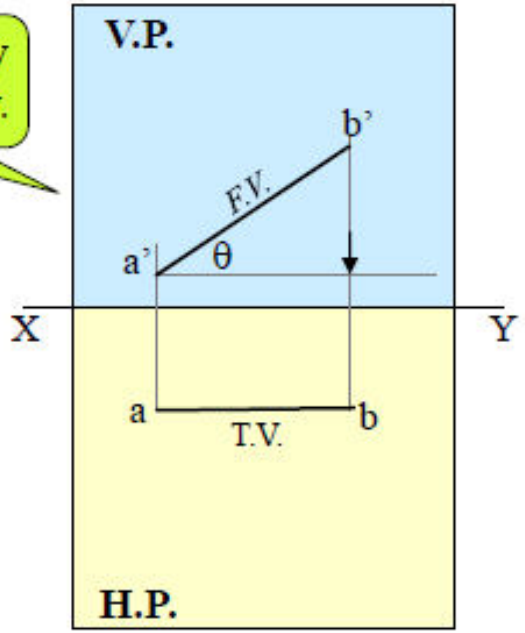
3.

A Line inclined to Hp
and
parallel to Vp

(Pictorial presentation)



Fv inclined to xy
Tv parallel to xy.

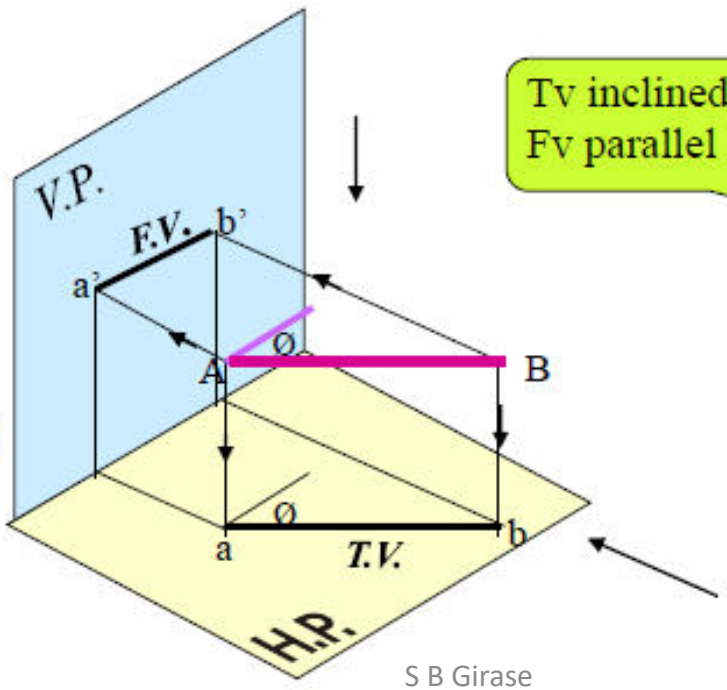


Orthographic Projections

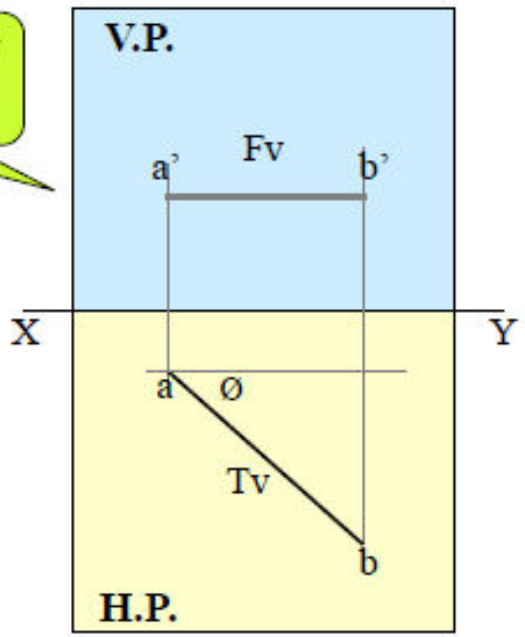
4.

A Line inclined to Vp
and
parallel to Hp

(Pictorial presentation)

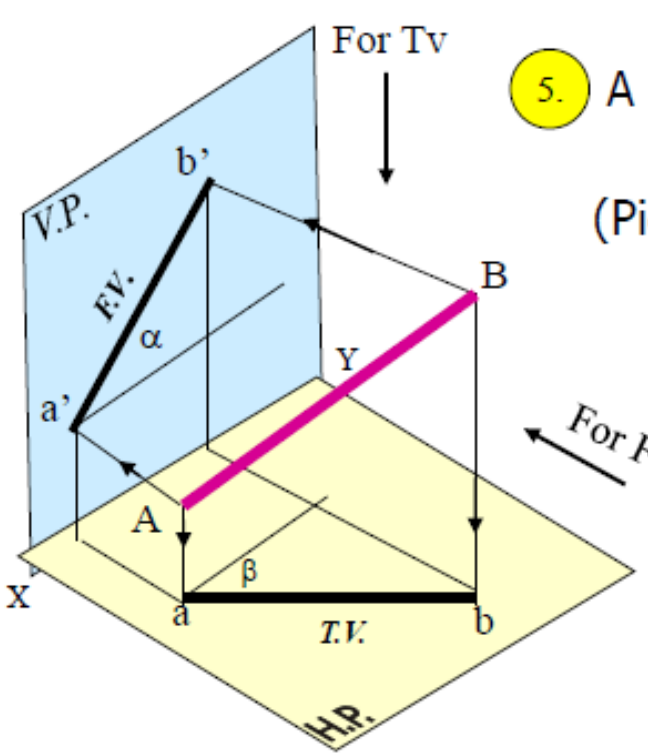


Tv inclined to xy
Fv parallel to xy.

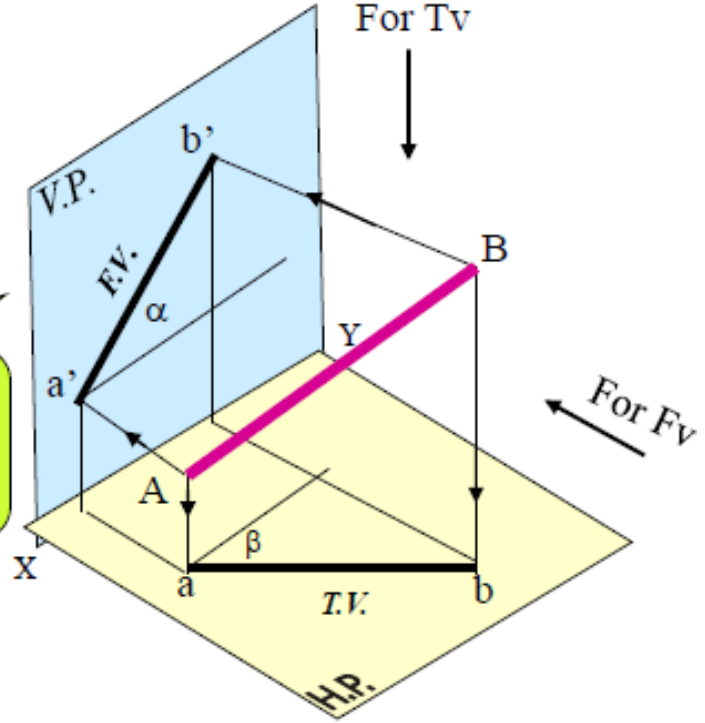


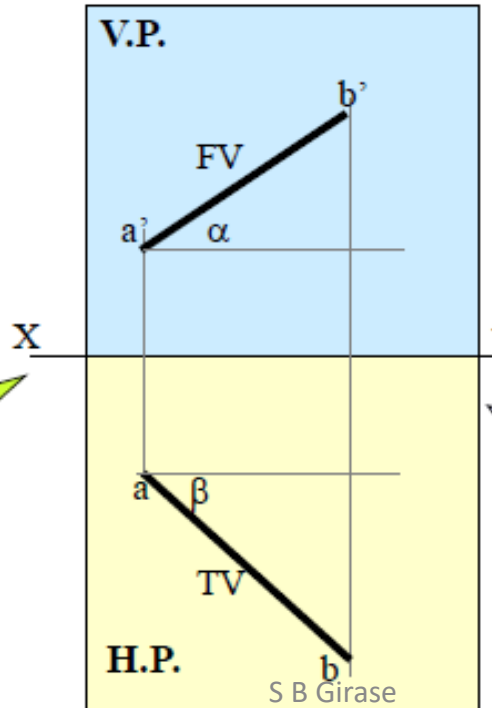
5. A Line inclined to both Hp and Vp

(Pictorial presentation)



On removal of object i.e. Line AB
Fv as a image on Vp.
Tv as a image on Hp,

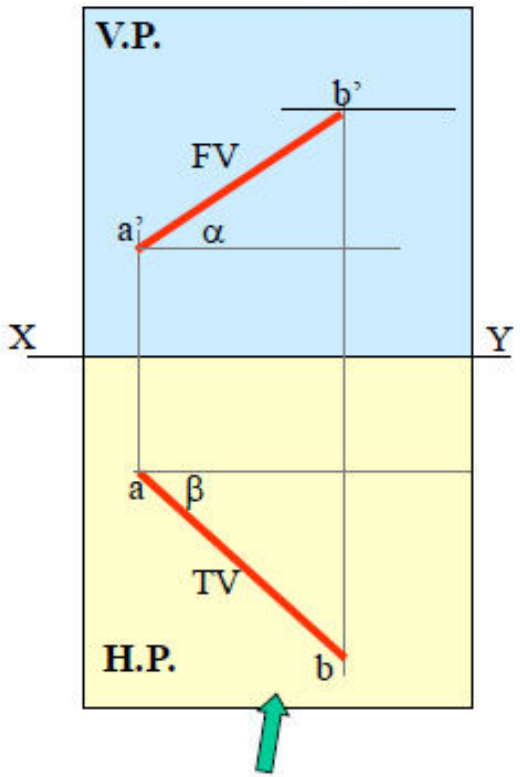




Orthographic Projections
Fv is seen on Vp clearly.
To see Tv clearly, HP is rotated 90^0 downwards,
Hence it comes below xy.

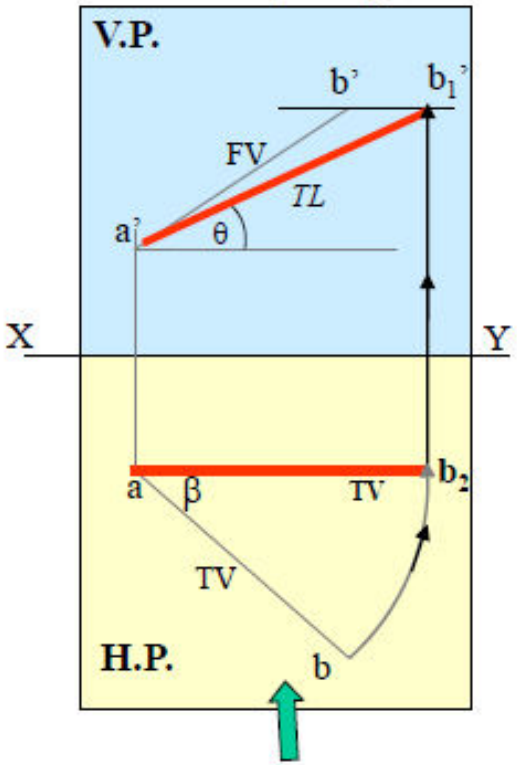
Note These Facts:-
Both Fv & Tv are inclined to xy.
(No view is parallel to xy)
Both Fv & Tv are reduced lengths.
(No view shows True Length)

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



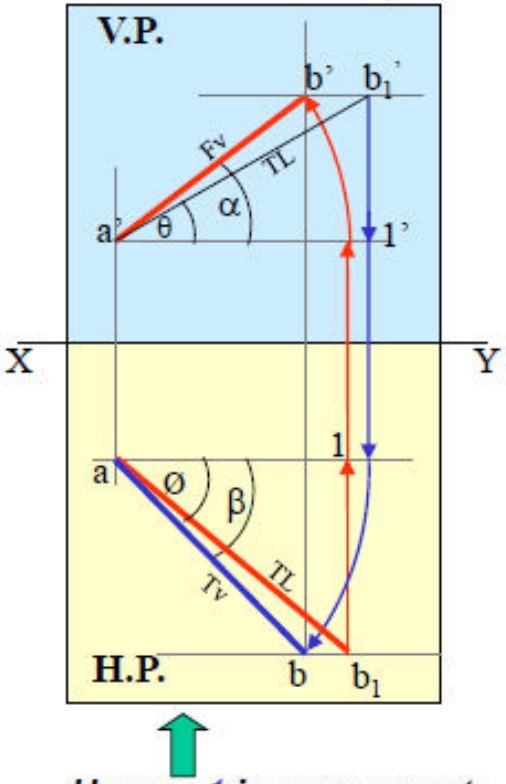
Here TV (ab) is not // to XY line
Hence it's corresponding FV
a' b' is not showing
True Length &
True Inclination with Hp.

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).



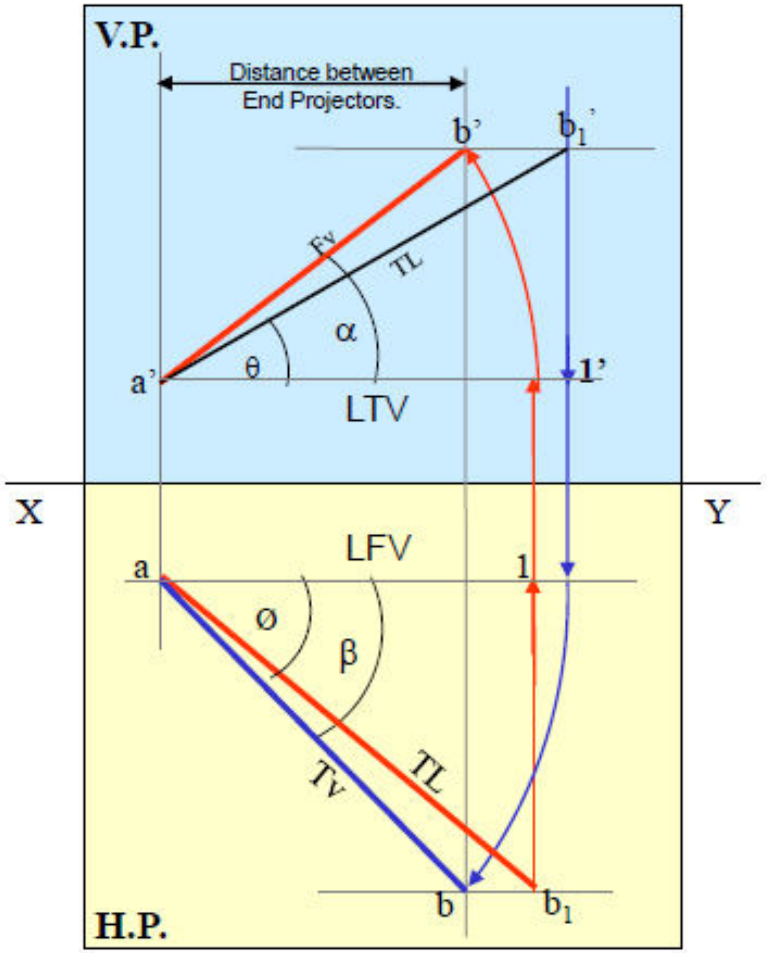
In this sketch, TV is rotated
and made // to XY line.
Hence it's corresponding
FV a' b1' Is showing
True Length
&
True Inclination with Hp.

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 ab1 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' b1') Tv can be drawn.

The most important diagram showing graphical relations among all important parameters of this topic.
Study and memorize it as a ***CIRCUIT DIAGRAM***
And use in solving various problems.



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

Important TEN parameters to be remembered with Notations used here onward

NOTE this

θ & α Construct with ***a'***

$\emptyset$ & β Construct with ***a***

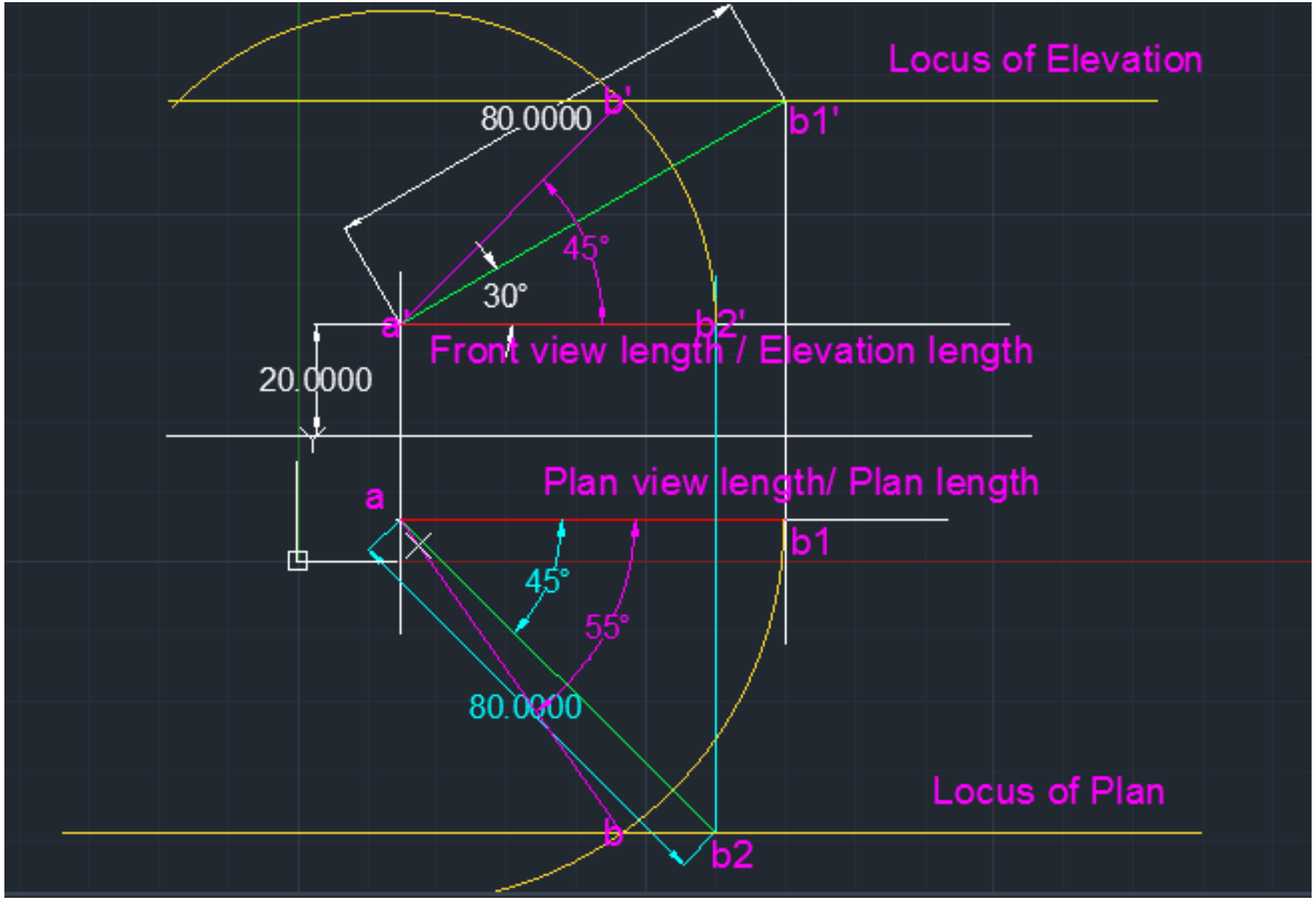
b' & b_1' on same locus.

b & b_1 on same locus.

Also Remember

True Length is never rotated. It's horizontal component is drawn & it is further rotated to locate view.

Views are always rotated, made horizontal & further extended to locate TL, θ & Ø


Locus of Elevation
80.0000
b'
b1'
45°
30°
a'
b2'
Front view length / Elevation length
20.0000
Plan view length/ Plan length
a
b1
45°
55°
80.0000
Locus of Plan
b
b2

GROUP (A)

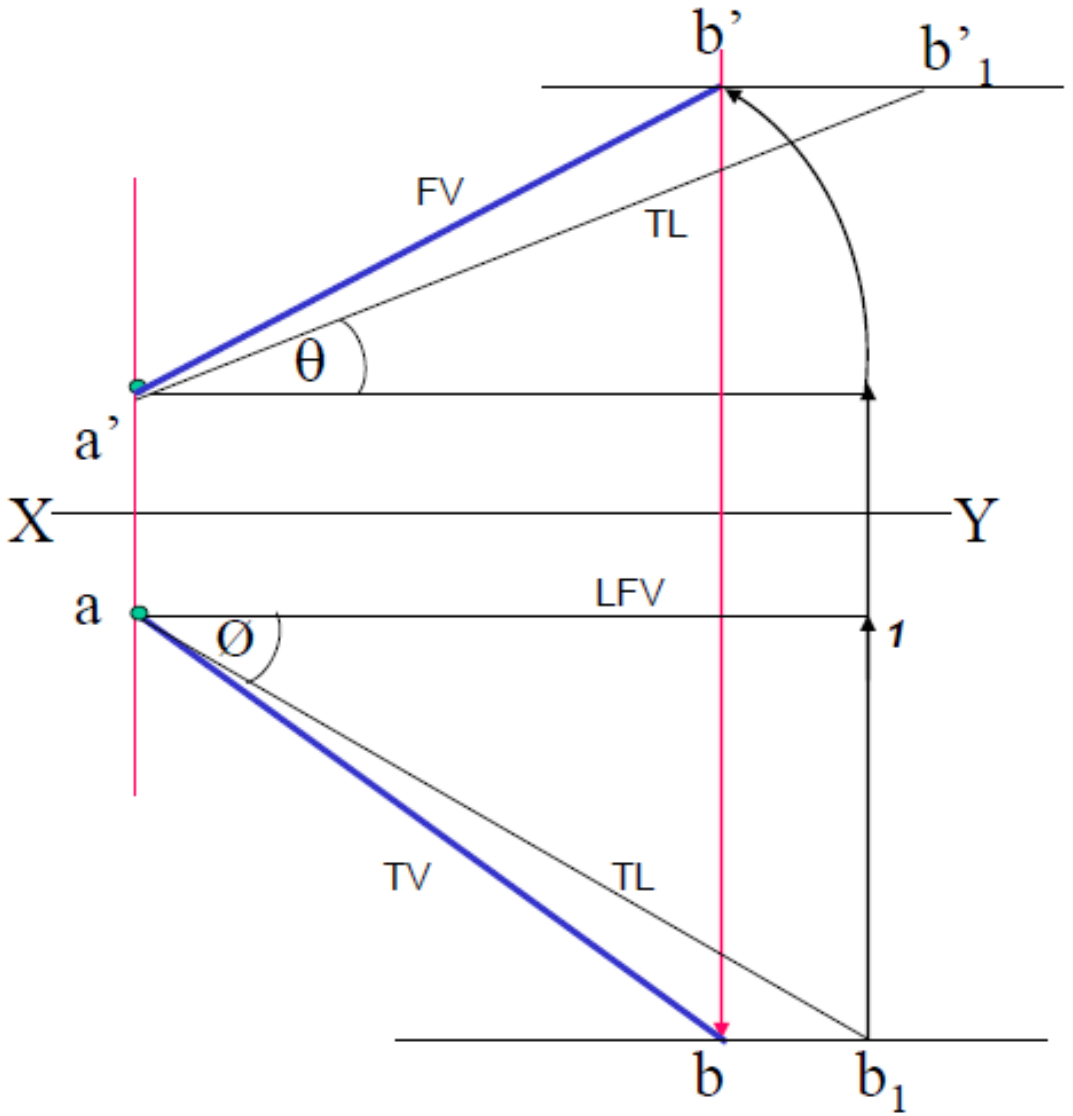
GENERAL CASES OF THE LINE INCLINED TO BOTH HP & VP
(based on 10 parameters).

PROBLEM 1)

Line AB is 75 mm long and it is 30^0 & 40^0 Inclined to Hp & Vp respectively. End A is 12mm above Hp and 10 mm in front of Vp.
Draw projections. Line is in 1st quadrant.

SOLUTION STEPS:

1) Draw xy line and one projector.
2) Locate a' 12mm above xy line & a 10mm below xy line.
3) Take 30^0 angle from a' & 40^0 from a and mark TL I.e. 75mm on both lines. Name those points b_1' and b_1 respectively.
4) Join both points with a' and a resp.
5) Draw horizontal lines (Locus) from both points.
6) Draw horizontal component of TL a b_1 from point b_1 and name it 1. (the length a-1 gives length of Fv as we have seen already.)
7) Extend it up to locus of a' and rotating a' as center locate b' as shown. Join a' b' as Fv.
8) From b' drop a projector down ward & get point b. Join a & b I.e. Tv.



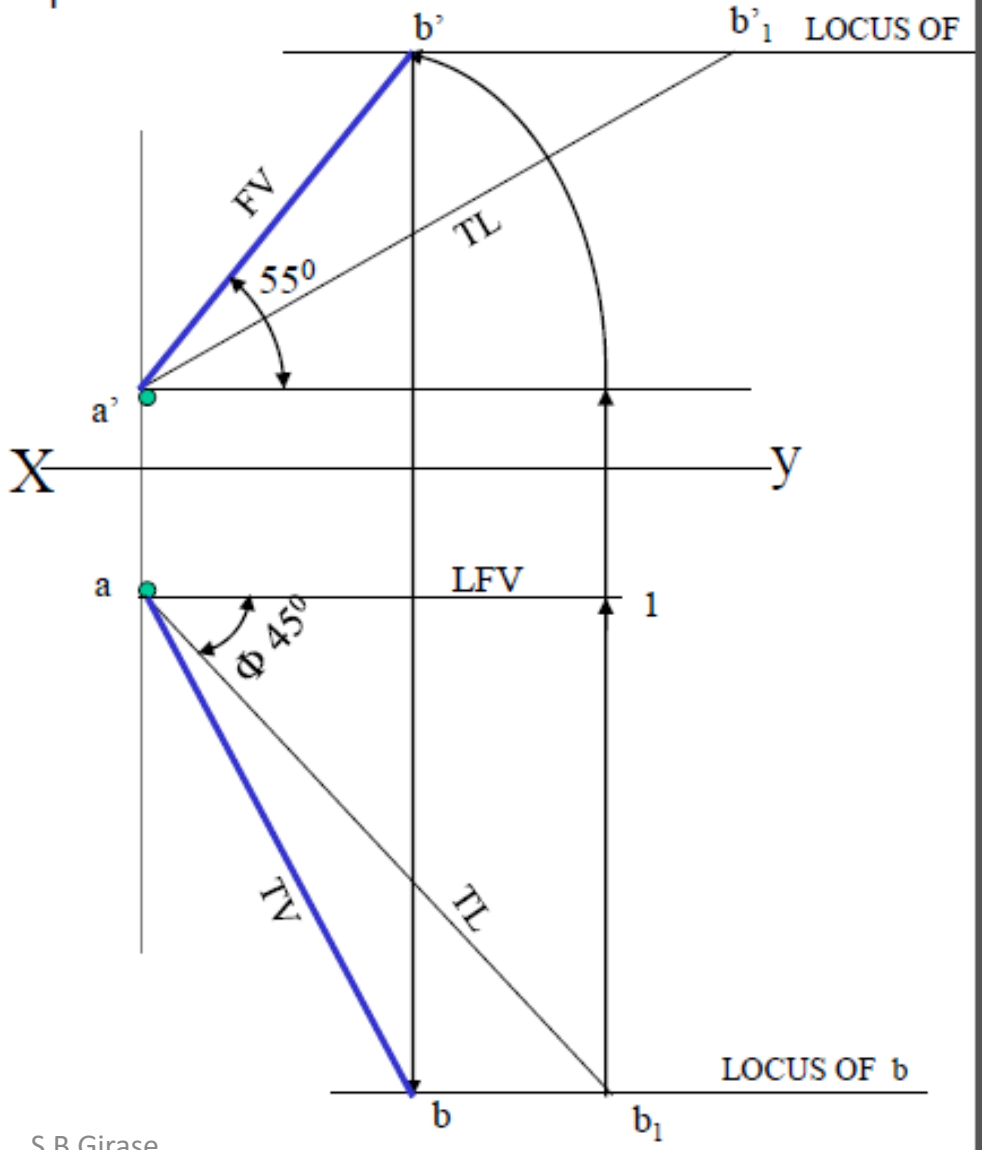
PROBLEM 2:

Line AB 75mm long makes 45^0 inclination with Vp while it's Fv makes 55^0. End A is 10 mm above Hp and 15 mm in front of Vp.If line is in 1st quadrant draw it's projections and find it's inclination with Hp.

Solution Steps:-

1. Draw x-y line.
2. Draw one projector for a' & a
3. Locate *a'* 10mm above x-y & Tv *a* 15 mm below xy.
4. Draw a line 45^0 inclined to xy from point *a* and cut TL 75 mm on it and name that point b_1 Draw locus from point b_1
5. Take 55^0 angle from *a'* for Fv above xy line.
6. Draw a vertical line from b_1 up to locus of a and name it *1*. It is horizontal component of TL & is LFV.
7. Continue it to locus of *a'* and rotate upward up to the line of Fv and name it *b'*.This *a' b'* line is Fv.
8. Drop a projector from b' on locus from point b_1 and name intersecting point *b*. Line *a b* is Tv of line AB.
9. Draw locus from *b'* and from *a'* with TL distance cut point b_1'
10. Join *a' b'* as TL and measure it's angle at *a'*.

It will be true angle of line with HP.

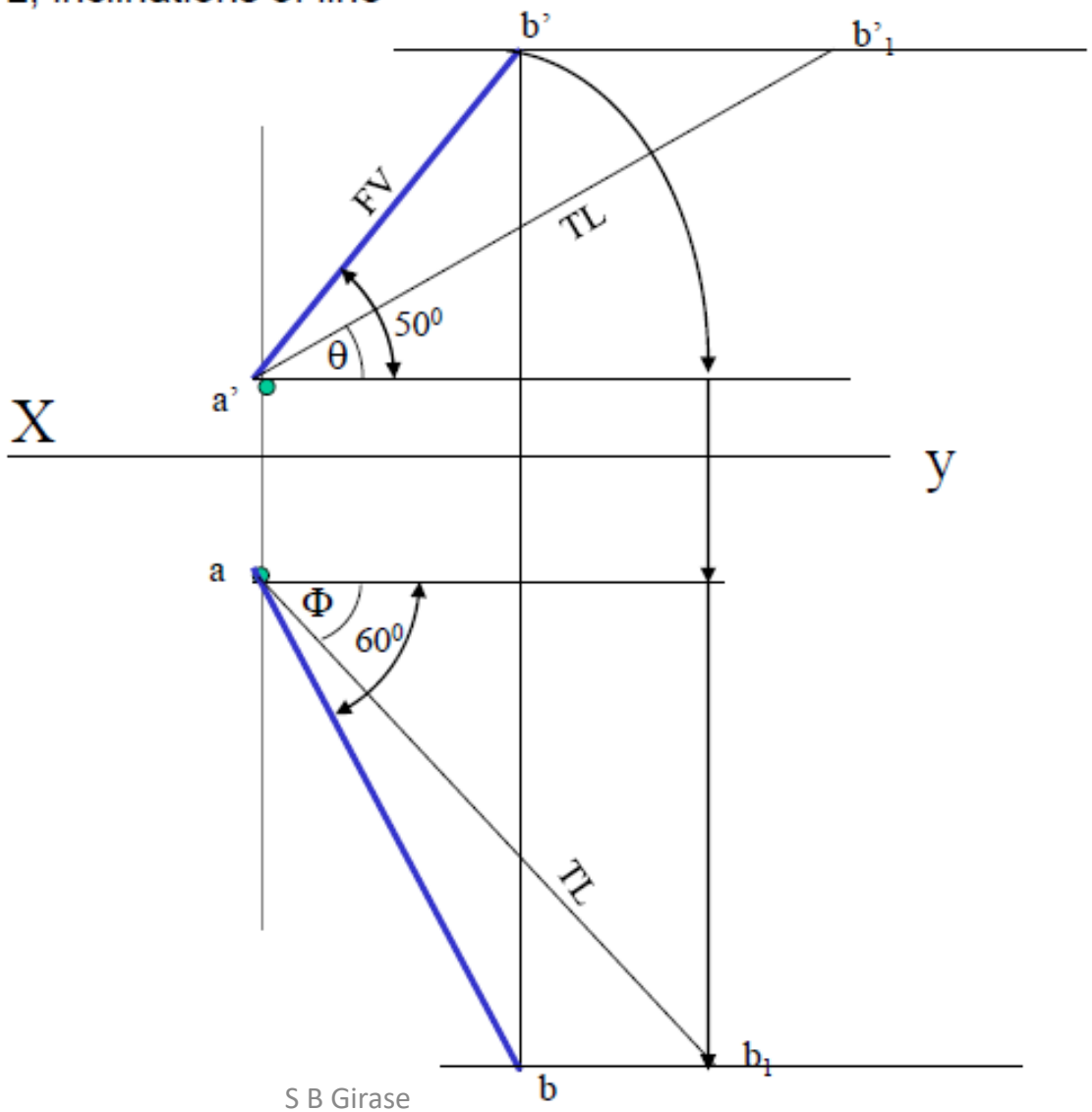


PROBLEM 3:

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.

SOLUTION STEPS:

1.Draw xy line and one projector.
2.Locate a' 10 mm above xy and a 15 mm below xy line.
3.Draw locus from these points.
4.Draw Fv 50^0 to xy from a' and mark b' Cutting 55mm on it.
5.Similarly draw Tv 60^0 to xy from a & drawing projector from b' Locate point b and join a b.
6.Then rotating views as shown, locate True Lengths ab_1 & $a'b_1'$ and their angles with Hp and Vp.

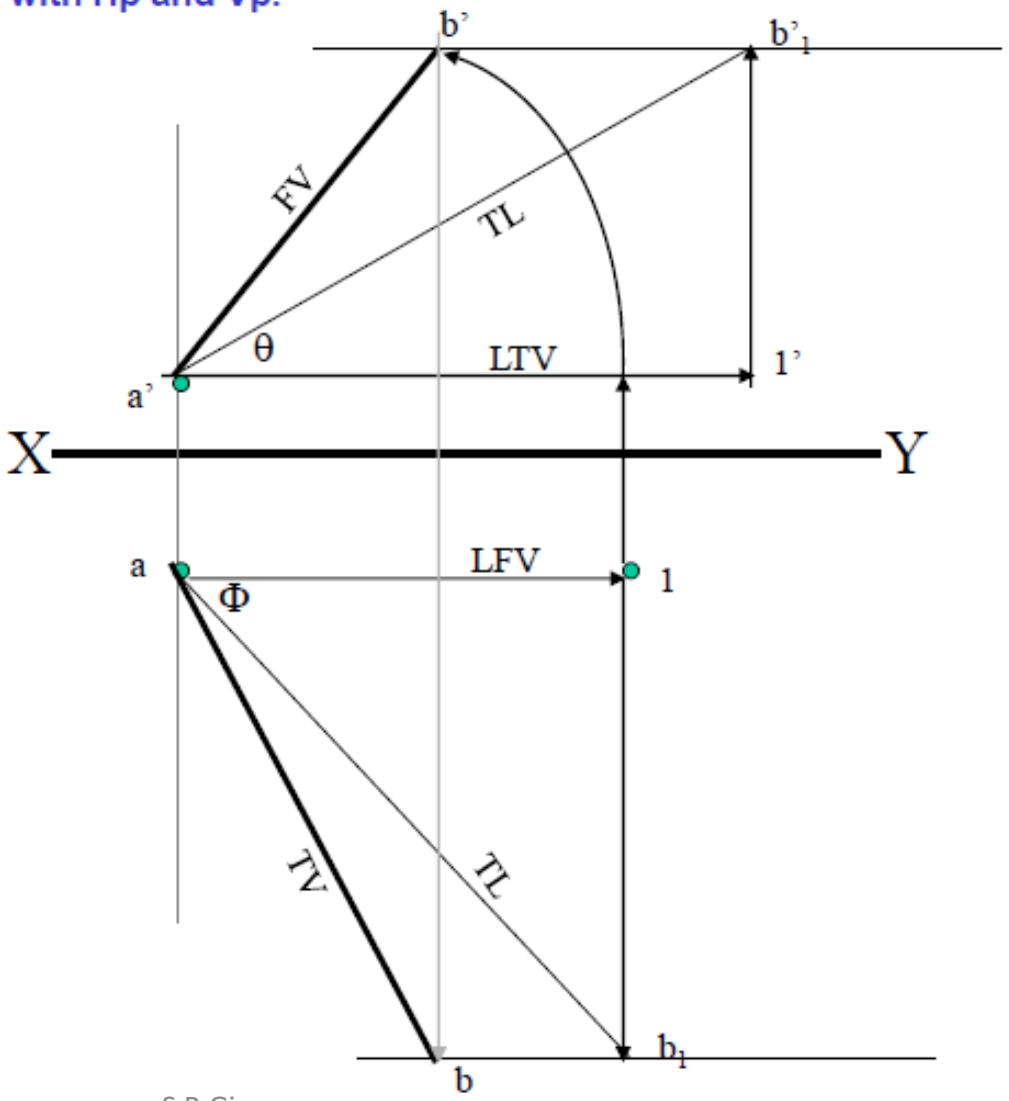


PROBLEM 4 :-

Line AB is 75 mm long .It's Fv and Tv measure 50 mm & 60 mm long respectively. End A is 10 mm above Hp and 15 mm in front of Vp. Draw projections of line AB if end B is in first quadrant.Find angle with Hp and Vp.

SOLUTION STEPS:

1. Draw xy line and one projector.
2. Locate a' 10 mm above xy and a 15 mm below xy line.
3. Draw locus from these points.
4. Cut 60mm distance on locus of a' & mark 1' on it as it is LTV.
5. Similarly Similarly cut 50mm on locus of a and mark point 1 as it is LFV.
6. From 1' draw a vertical line upward and from a' taking TL (75mm) in compass, mark b'_1 point on it. Join a' b'_1 points.
7. Draw locus from b'_1
8. With same steps below get b_1 point and draw also locus from it.
9. Now rotating one of the components I.e. a-1 locate b' and join a' with it to get Fv.
10. Locate tv similarly and measure Angles θ & Φ

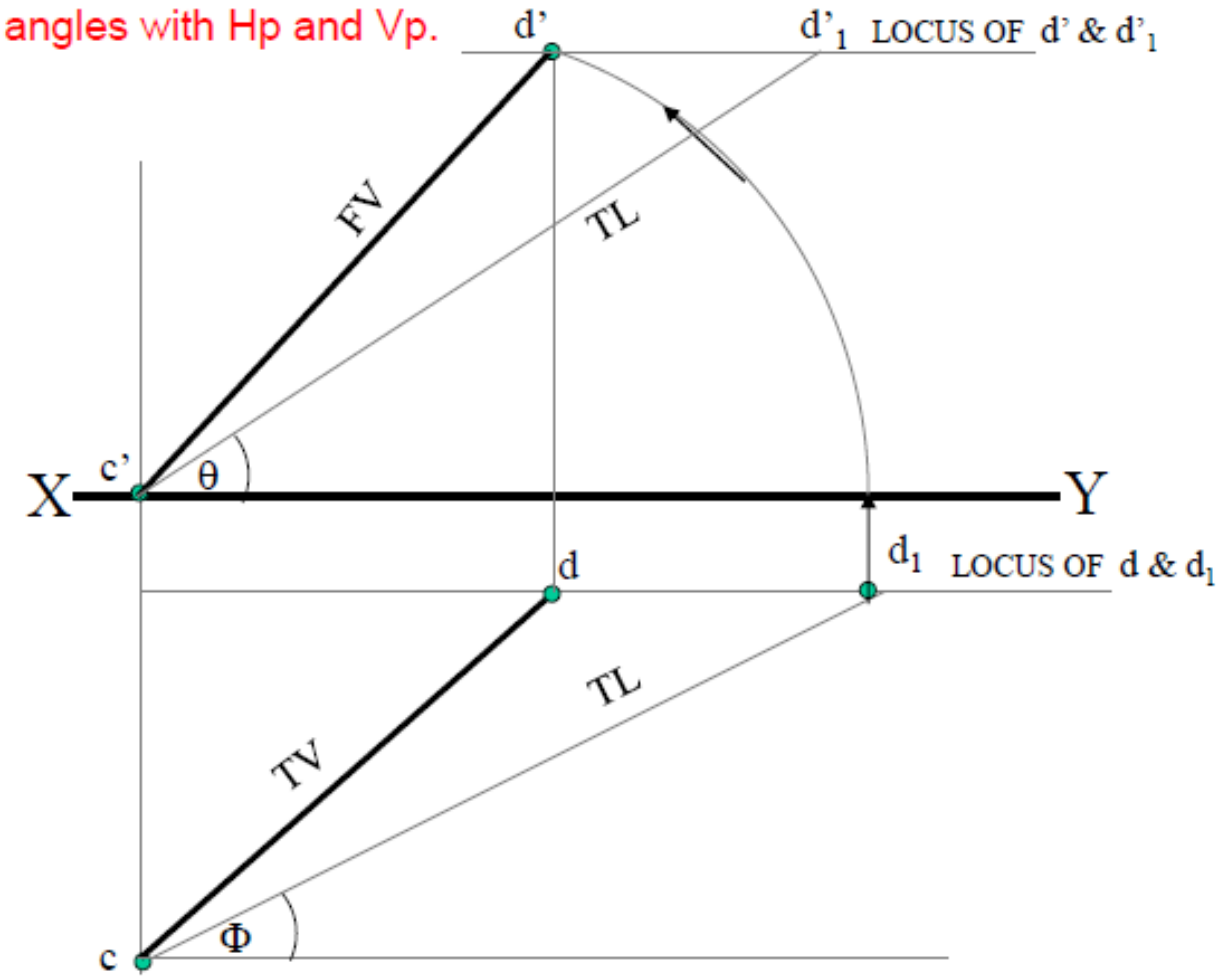


PROBLEM 5 :-

T.V. of a 75 mm long Line CD, measures 50 mm.
End C is in Hp and 50 mm in front of Vp.
End D is 15 mm in front of Vp and it is above Hp.
Draw projections of CD and find angles with Hp and Vp.

SOLUTION STEPS:

1.Draw xy line and one projector.
2.Locate c' on xy and
c 50mm below xy line.
3.Draw locus from these points.
4.Draw locus of d 15 mm below xy
5.Cut 50mm & 75 mm distances on locus of d from c and mark points d & d_1 as these are Tv and line CD lengths resp.& join both with c.
6.From d_1 draw a vertical line upward up to xy I.e. up to locus of c' and draw an arc as shown.
7 Then draw one projector from d to meet this arc in d' point & join c' d'
8. Draw locus of d' and cut 75 mm on it from c' as TL
9.Measure Angles θ & Φ



- **Question 6]** Draw the projections of a line AB when its end A is 20 mm above HP and 10 mm in front of VP it's end ‘B’ is 55 mm above HP and 60 mm in front of VP and the distance between the projectors of A and B (measured parallel to XY line) is 45 mm. Find TL, Θ and Φ the line AB

To draw the projections of line AB :

Step 1 : Draw two projectors perpendicular to the *XY* line and 45 mm apart.

Step 2 : Mark point *a′* 16 mm above the *XY* line and point '*a*' 25 mm below the *XY* line on one of the projectors.

tep 3 : Draw an arc with centre *a′* and radius 65 mm to intersect another projector at point *b′*. Join *a′* and *b′*.

ep 4 : Draw an arc with centre '*a*' and radius 60 mm to intersect another projector at point '*b*'. Join '*a*' and '*b*'.

locate the traces of the line :

izontal Trace (H.T.) :

1 : Extend F.V. *b′a′* to intersect the *XY* line at point *h′*. Draw a projector through point *h′* vertically downward.

2 : Extend T.V. *ba* to intersect the vertical projector through *h′* at '*h*'.

al Trace (V.T.) :

: Extend T.V. *ba* to intersect the *XY* line at point '*v*'. Draw a projector through point '*v*' vertically downward.

Extend F.V. *b′a′* to intersect the vertical projector through point '*v*' at *v′*.

TL, θ and ϕ :

Draw loci of end *B* in the F.V. and T.V.

Draw a line th

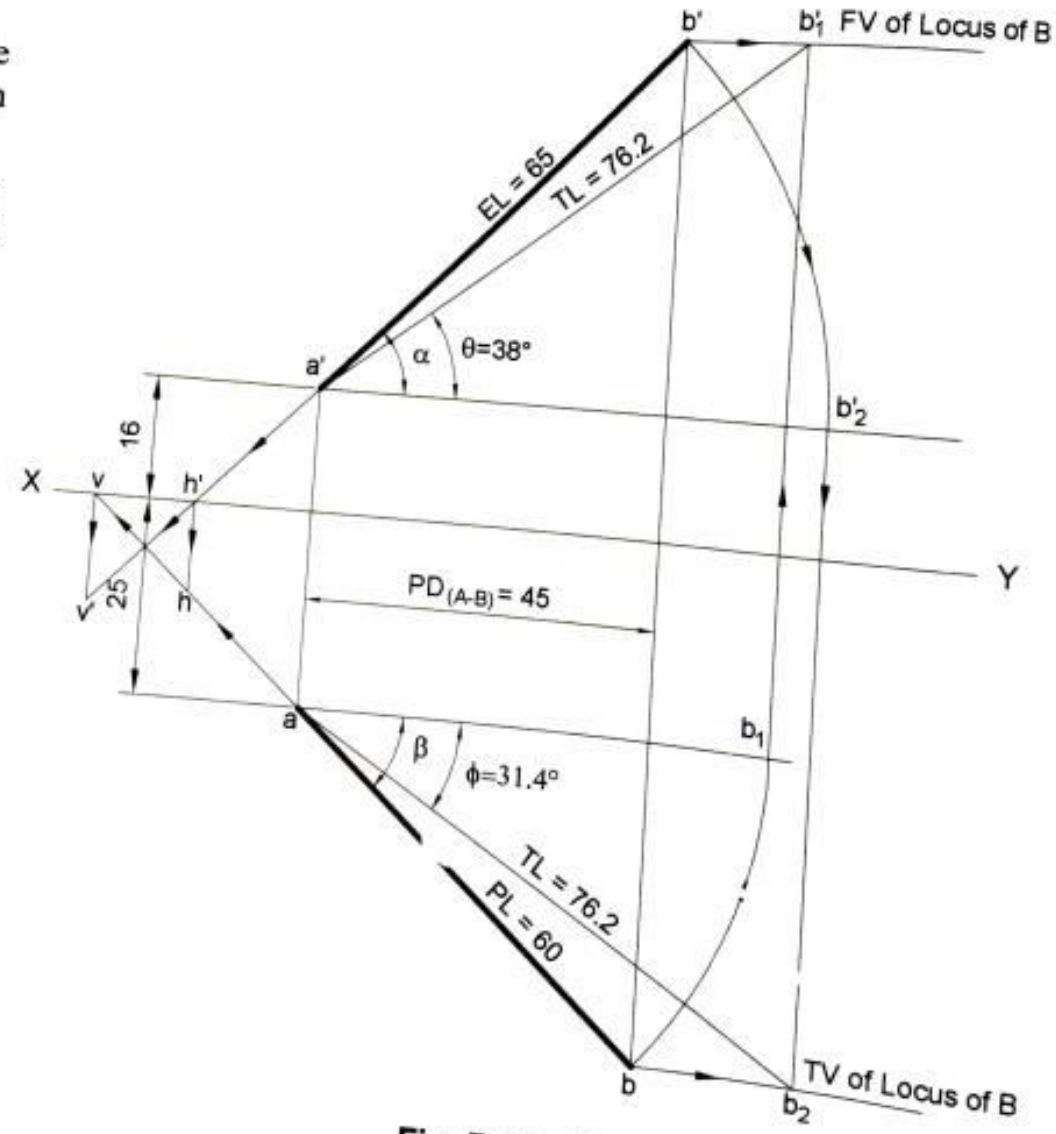


Fig. Prob. 62