SESSION 2

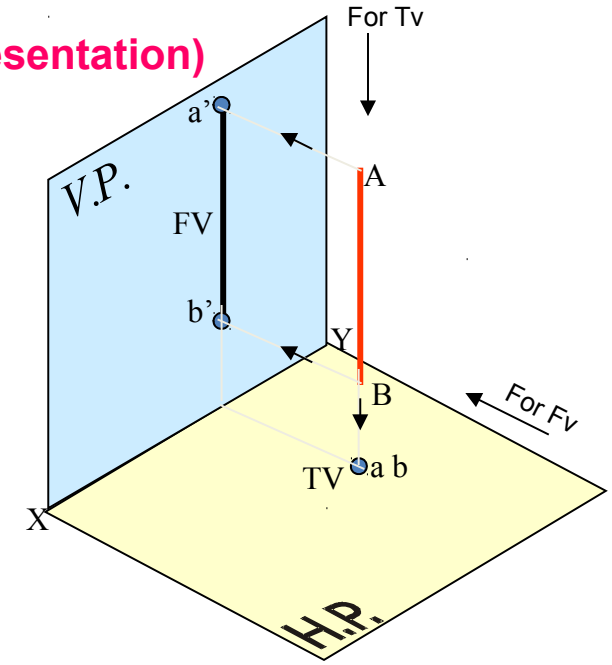
PROJECTION OF LINES

S1 ME 2017

(Pictorial Presentation)

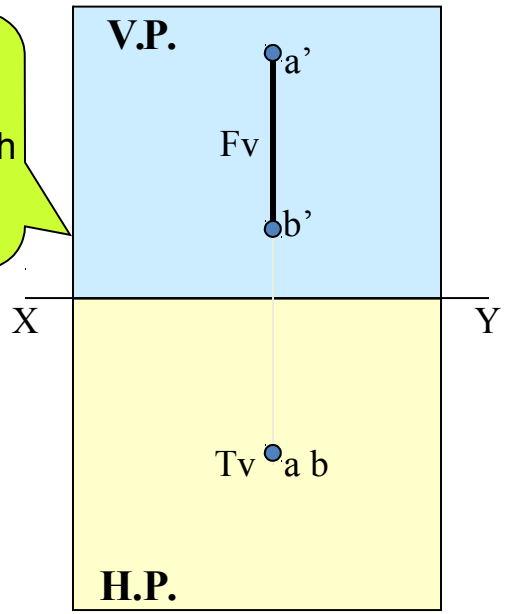
1.

A Line perpendicular to Hp & // to Vp



Orthographic Pattern

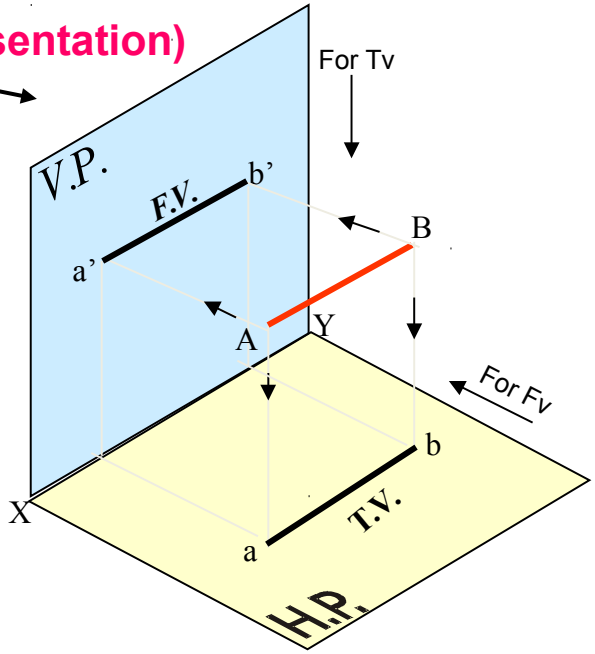
Note:
Fv is a vertical line
Showing True Length
&
Tv is a point.



(Pictorial Presentation)

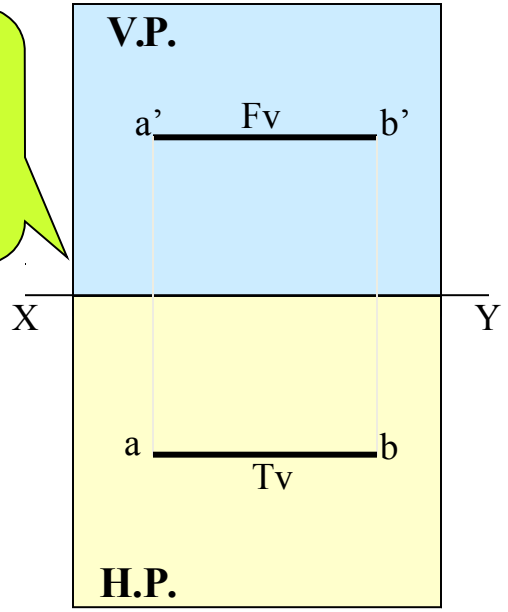
2.

A Line // to Hp & // to Vp



Orthographic Pattern

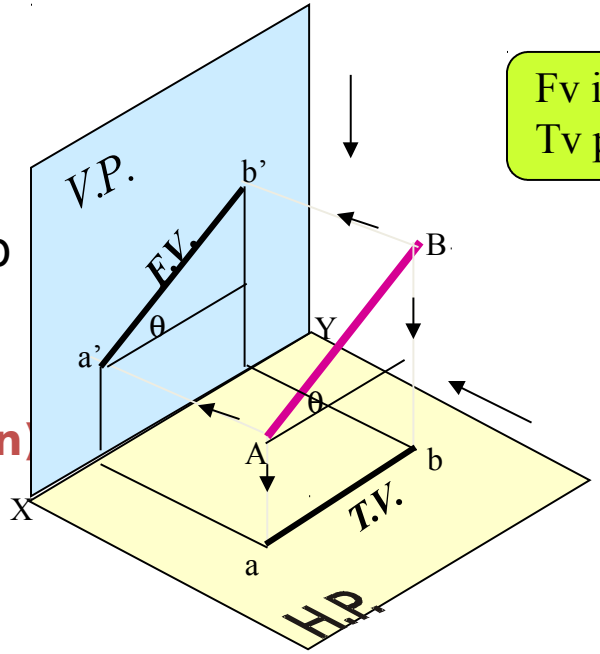
Note:
Fv & Tv both are
// to xy
&
both show T. L.



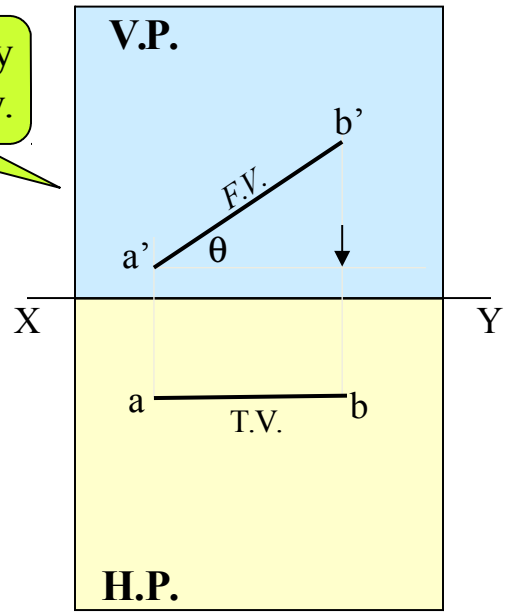
3.

A Line inclined to Hp
and
parallel to Vp

(Pictorial presentation)



Fv inclined to xy
Tv parallel to xy.

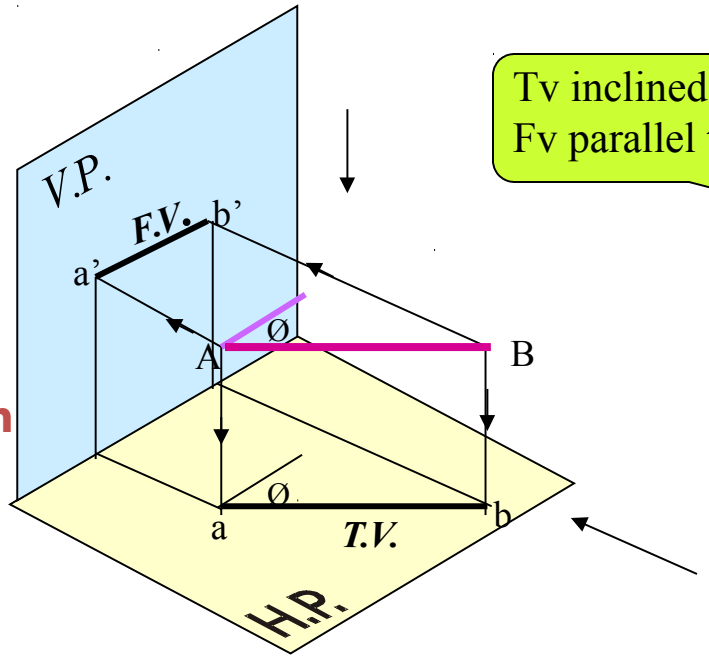


Orthographic Projections

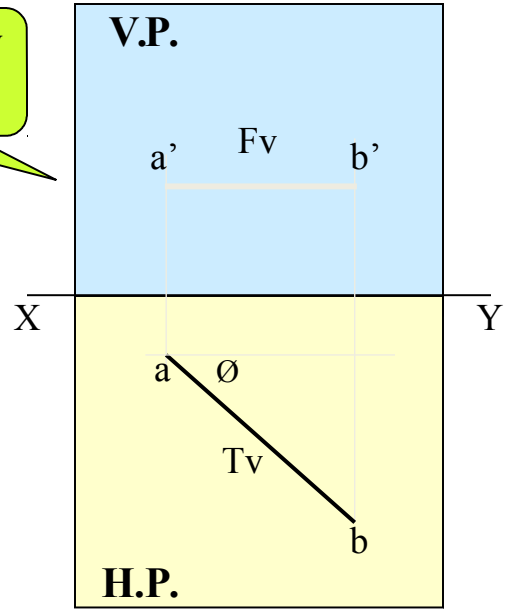
4.

A Line inclined to Vp
and
parallel to Hp

(Pictorial presentation

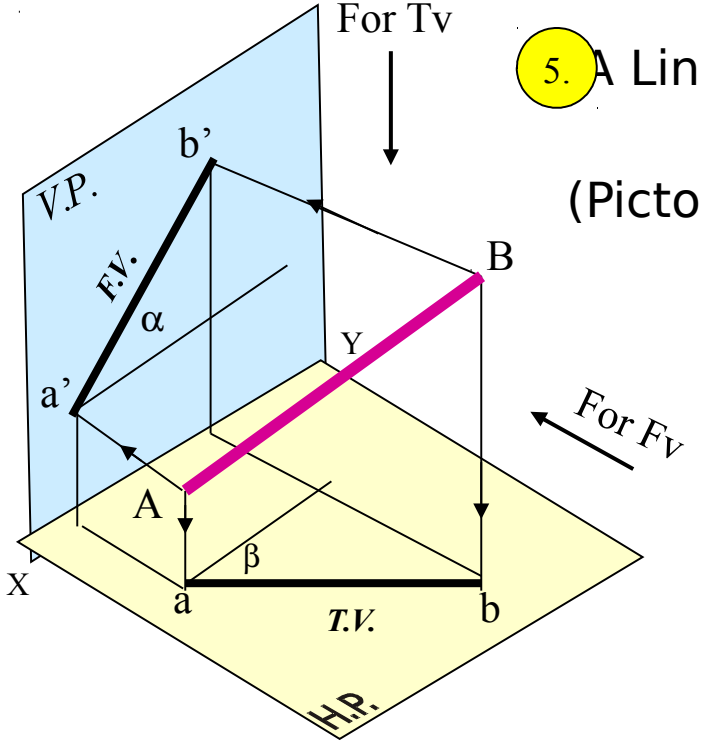


Tv inclined to xy
Fv parallel to xy.

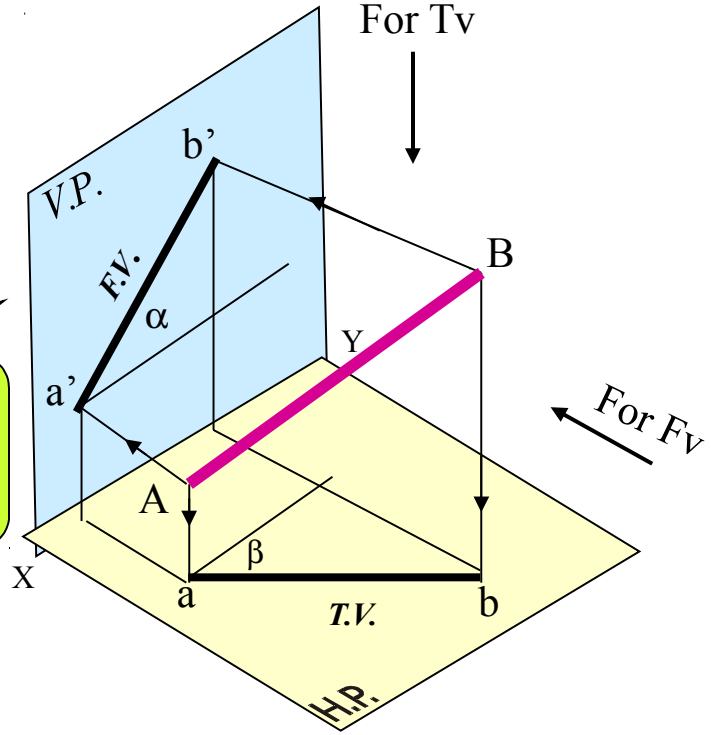


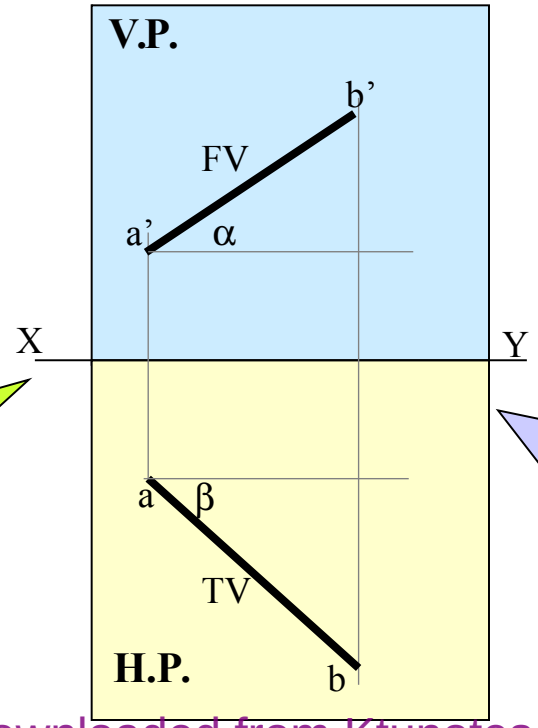
5. A Line inclined to both Hp and Vp

(Pictorial presentation)



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

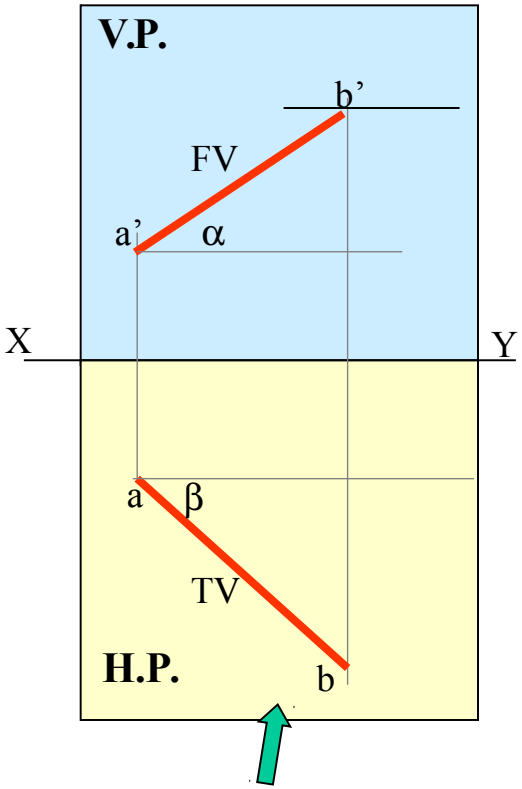




Orthographic Projections
Fv is seen on Vp clearly.
To see Tv clearly, HP is rotated 90⁰ downwards,
Hence it comes below xy.

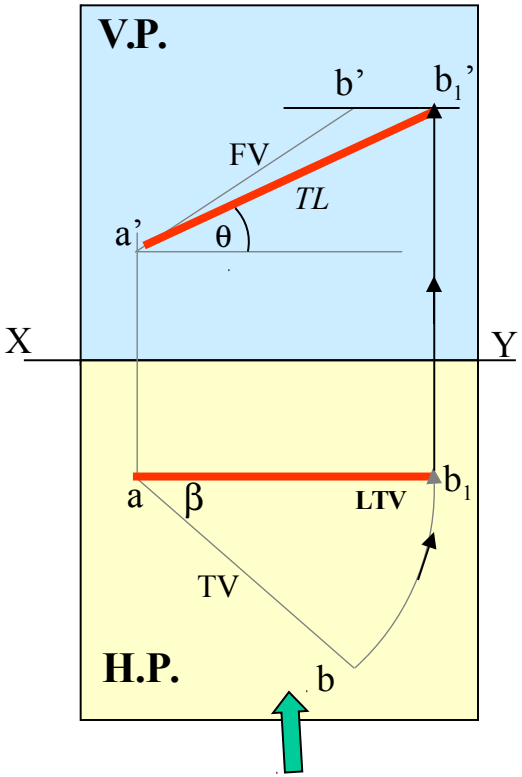
Note These Facts:-
Both Fv & Tv are inclined to xy.
(No view is parallel to xy)
Both Fv & Tv are reduced lengths.
(No view shows True Length)

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



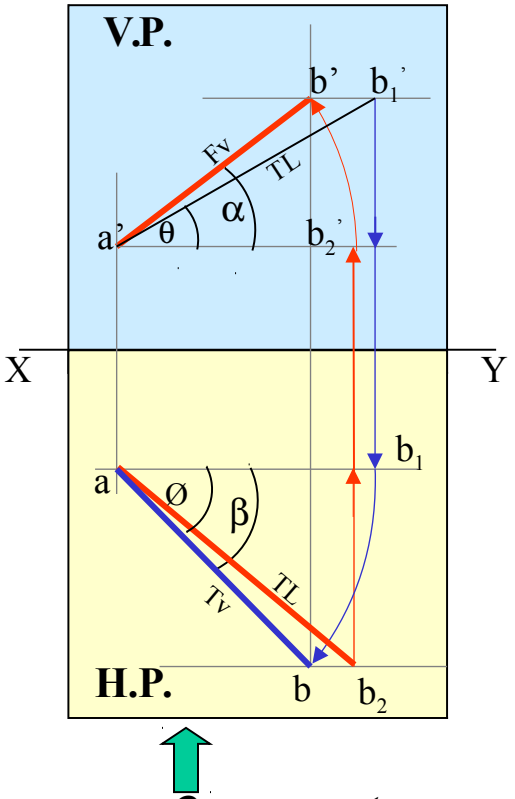
Here TV (ab) is not // to XY line
Hence it's corresponding FV
a' b' is not showing
True Length &
True Inclination with Hp.

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).



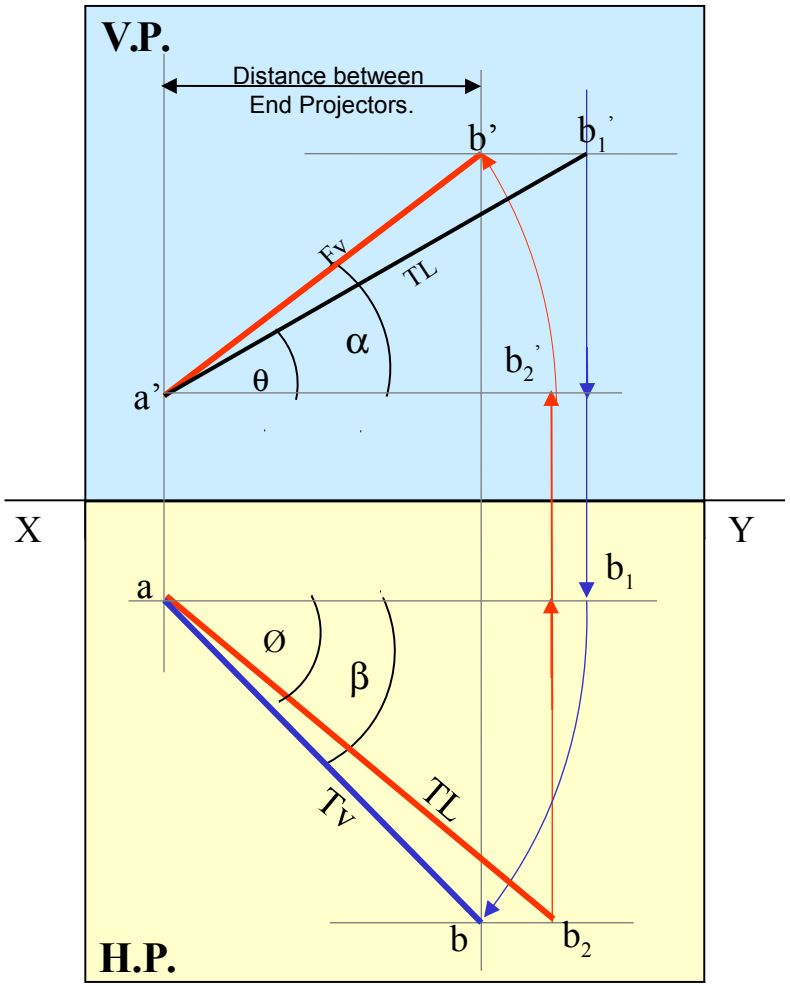
In this sketch, TV is rotated
and made // to XY line.
Hence it's corresponding
FV a' b1' Is showing
True Length
&
True Inclination with Hp.

Note the procedure
When True Length is known,
How to locate Fv & Tv.



Component
of TL ab_2 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.

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
2) Angle of TL with Hp - θ
3) Angle of TL with Vp – Ø
4) Angle of FV with xy – α
5) Angle of TV with xy – β
6) LFV (length of FV) – Component **(a'- b_2')**
7) LTV (length of TV) – Component **(a- b_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'***

Ø & β Construct with ***a***

b' & b_1' on same locus.

b & b_2 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

GROUP (A)

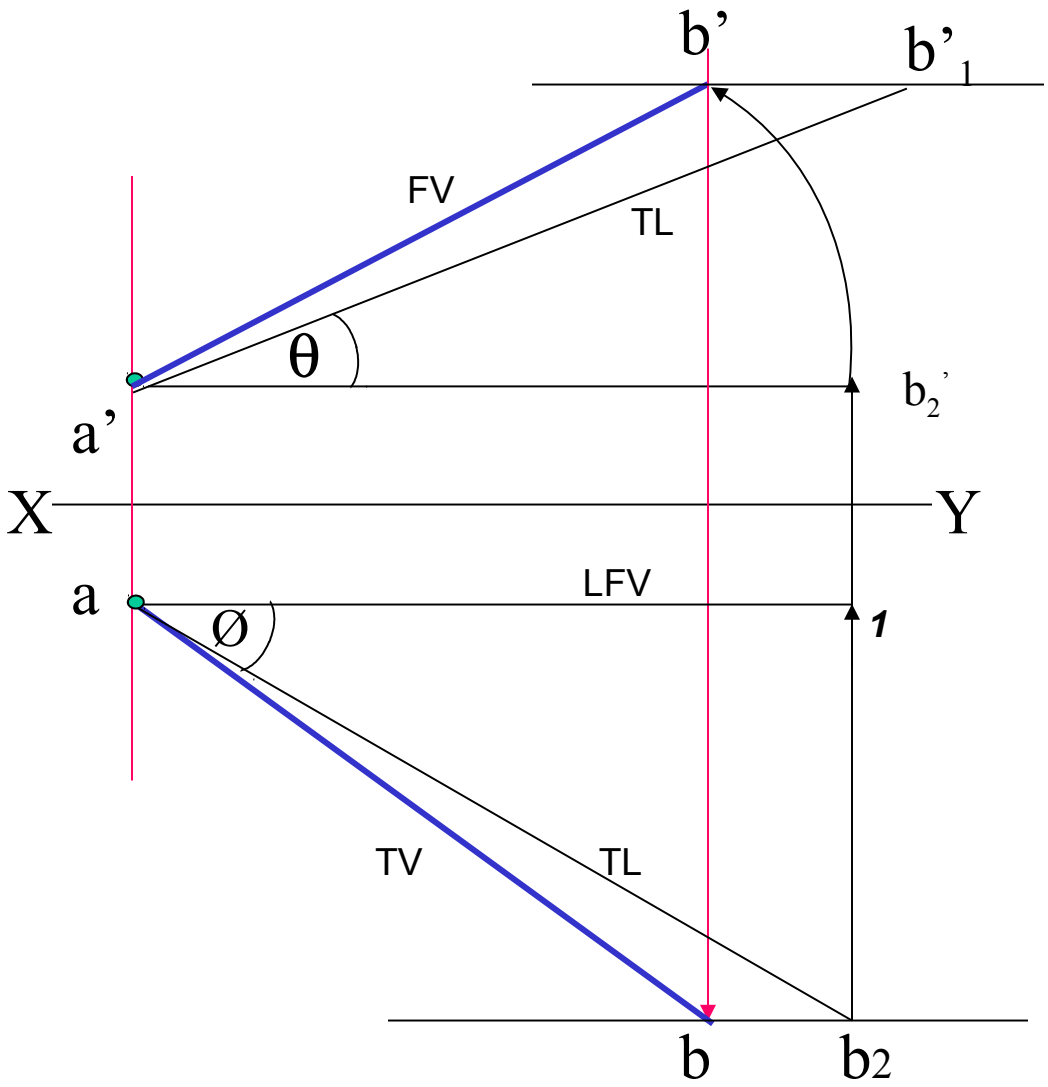
GENERAL CASES OF THE LINE INCLINED TO BOTH HP & VP (based on 10 parameters).

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



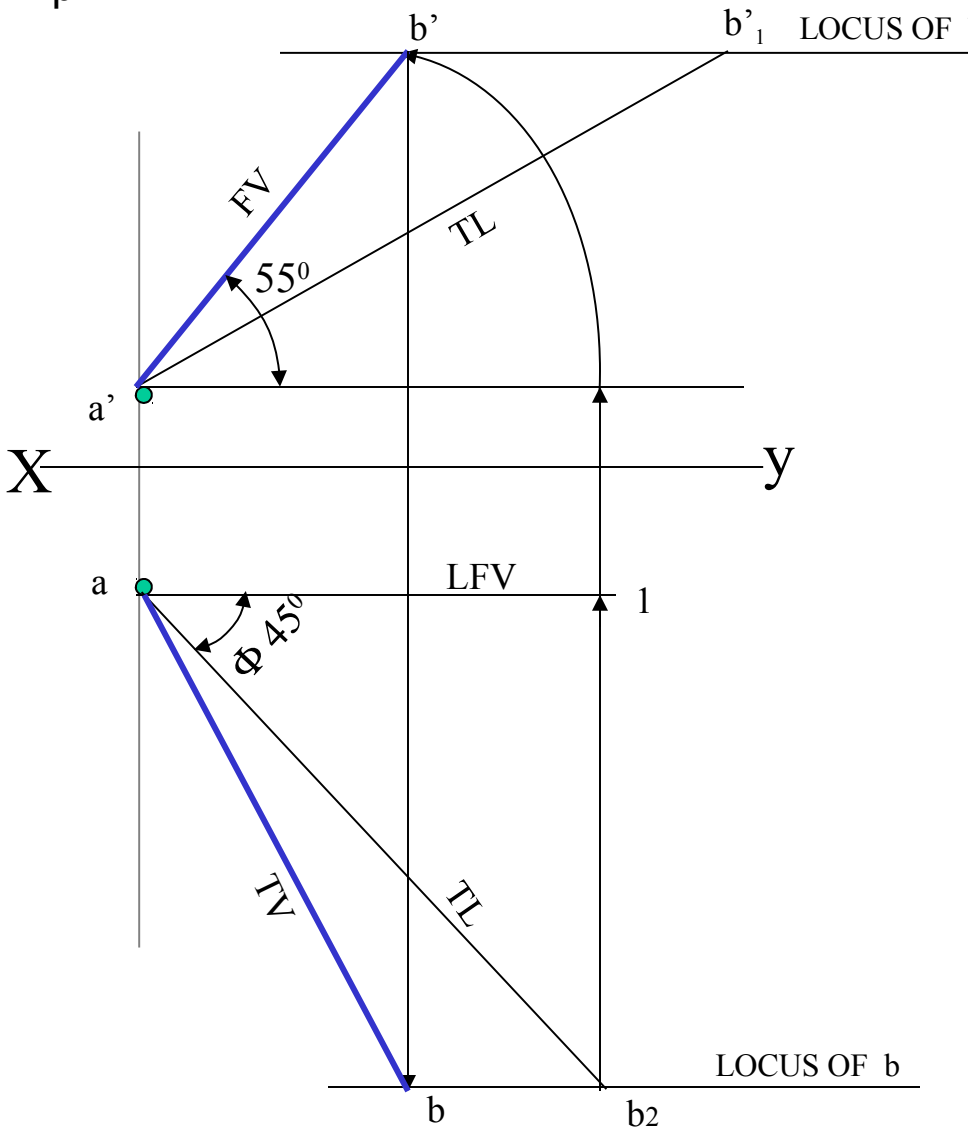
PROBLEM 2:

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*$_1$' as TL and measure it's angle at *a'*.

It will be true angle of line with HP.

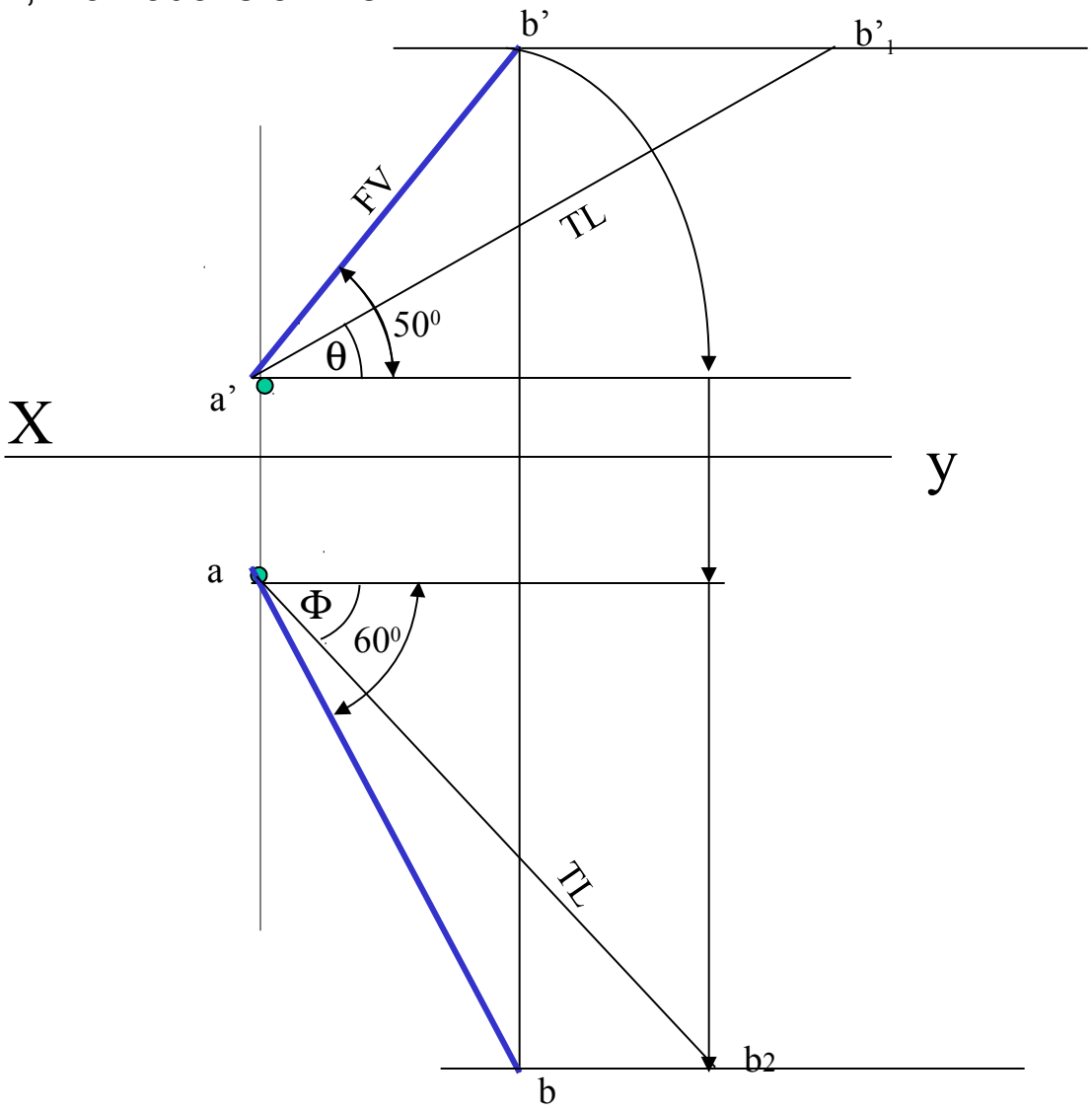


PROBLEM 3: Fv

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.

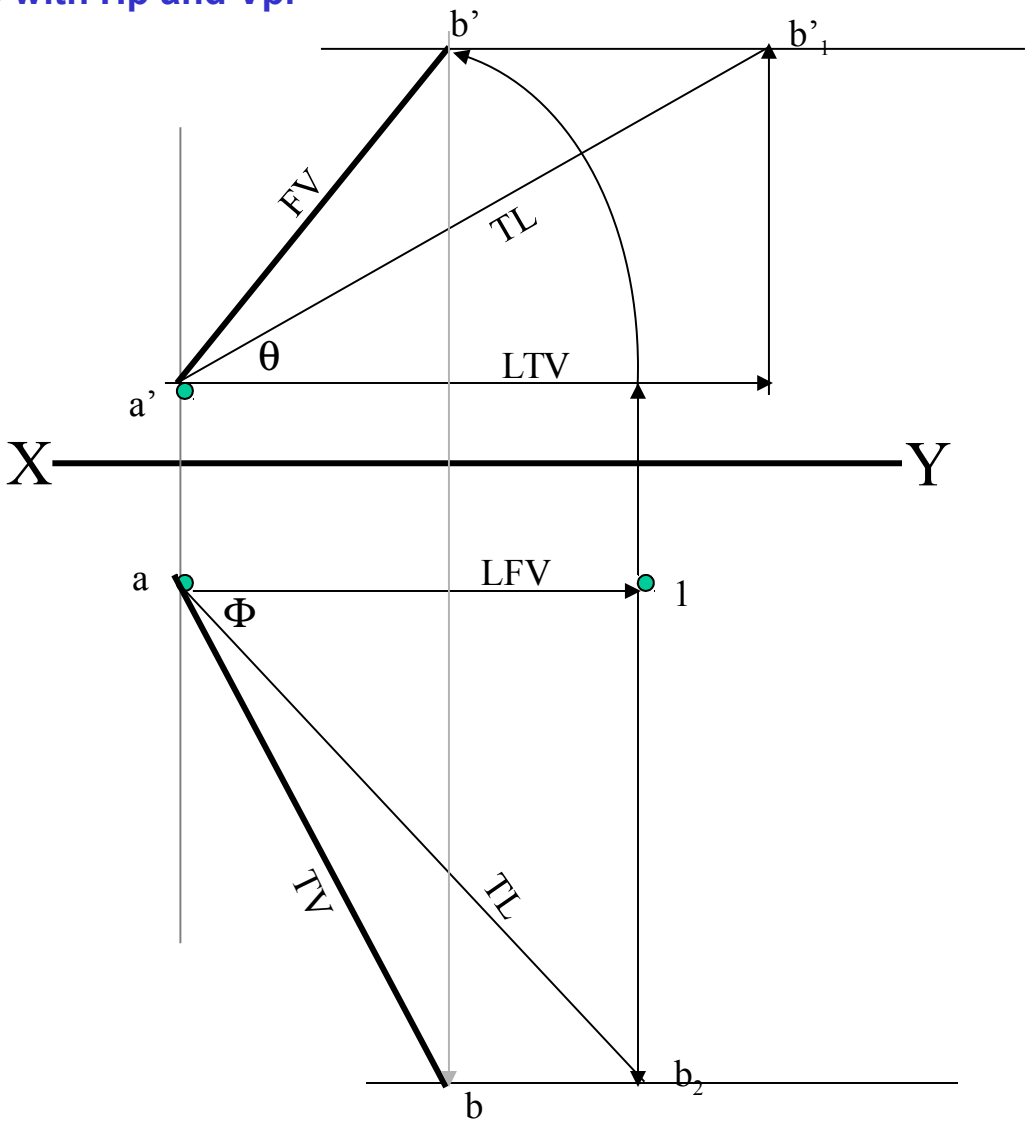


PROBLEM 4 :-

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

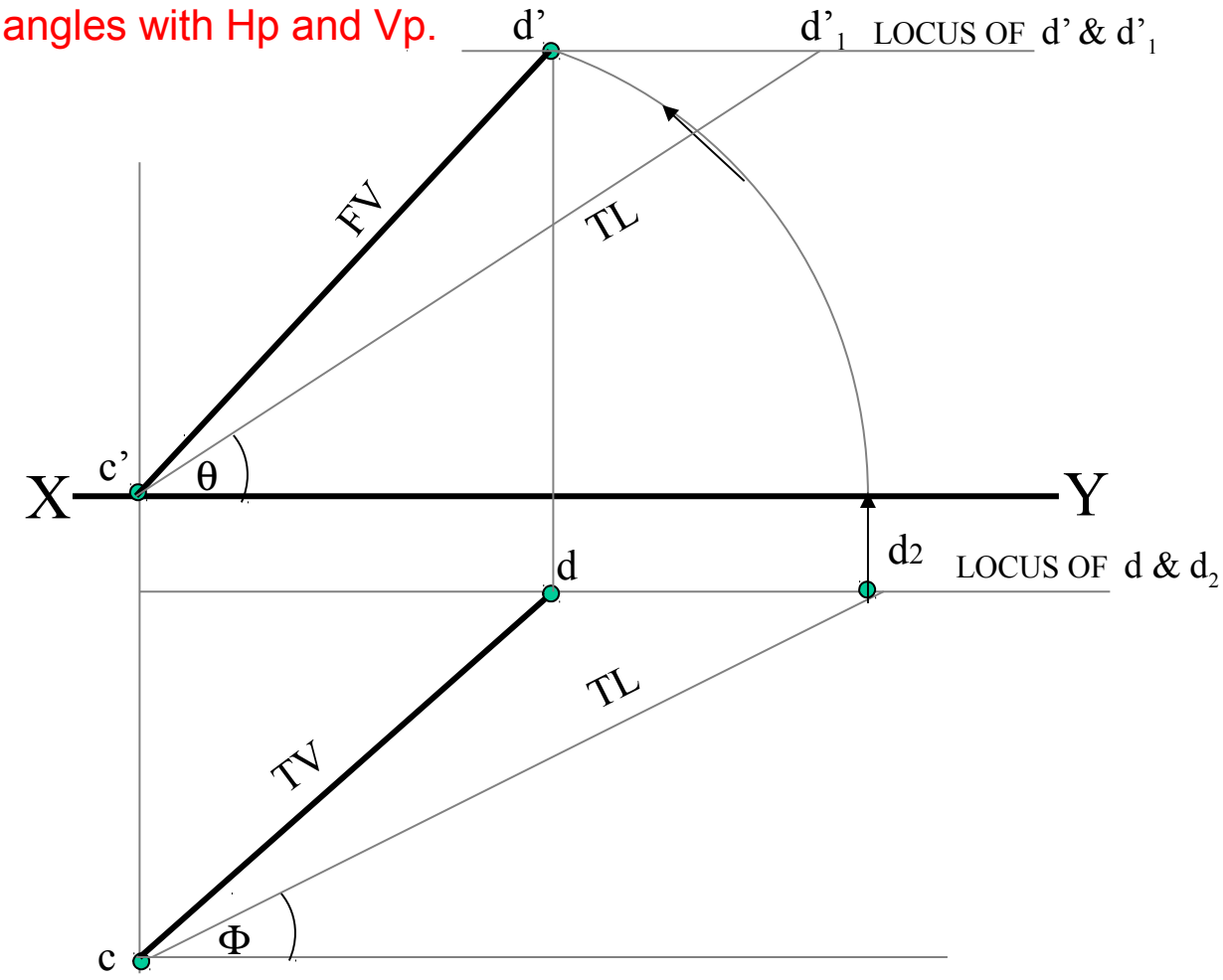


PROBLEM 5 :-

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



GROUP (B)
PROBLEMS INVOLVING TRACES OF THE LINE.

TRACES OF THE LINE:-

THESE ARE THE POINTS OF INTERSECTIONS OF A LINE (OR IT'S EXTENSION) WITH RESPECTIVE REFFERENCE PLANES.

A LINE ITSELF OR IT'S EXTENSION, WHERE EVER TOUCHES H.P., THAT POINT IS CALLED TRACE OF THE LINE ON H.P.(IT IS CALLED H.T.)

SIMILARLY, A LINE ITSELF OR IT'S EXTENSION, WHERE EVER TOUCHES V.P., THAT POINT IS CALLED TRACE OF THE LINE ON V.P.(IT IS CALLED V.T.)

V.T.:- It is a point on **Vp**.

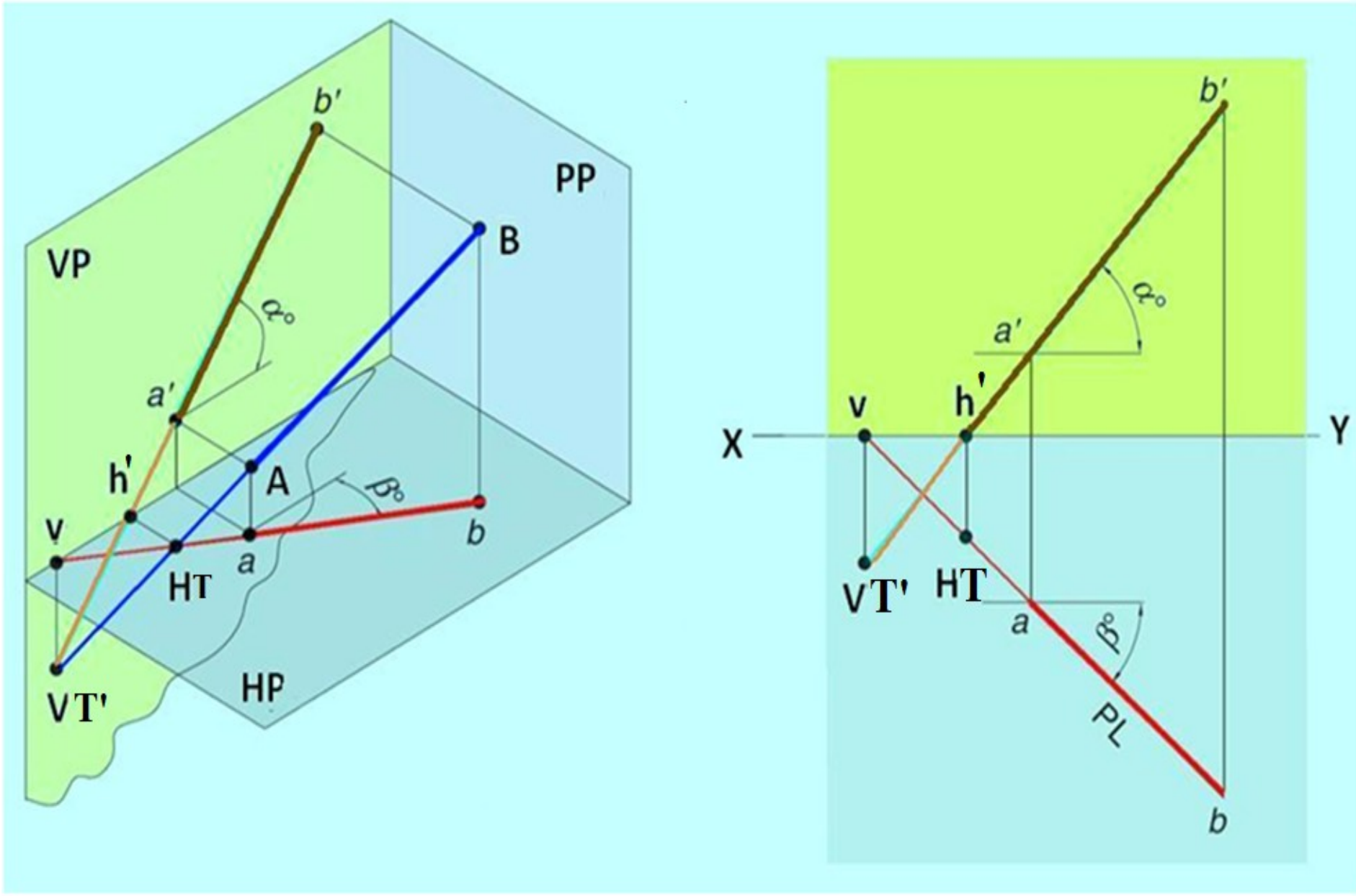
Hence it is called ***Fv*** of a point in **Vp.**

Hence it's ***Tv*** comes on XY line.(Here onward named as **v**)

H.T.:- It is a point on **Hp.**

Hence it is called ***Tv*** of a point in **Hp**.

Hence it's ***Fv*** comes on **XY line**.(Here onward named as **'h')**

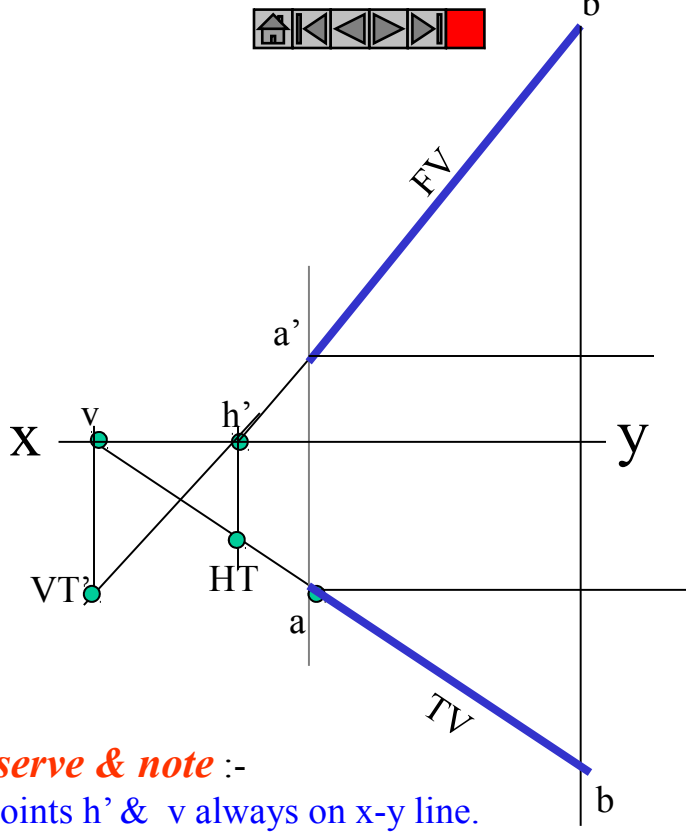


STEPS TO LOCATE HT.
(WHEN PROJECTIONS ARE GIVEN.)

1. Begin with FV. Extend FV up to XY line.
2. Name this point **h'**
   (as it is a Fv of a point in Hp)
3. Draw one projector from **h'**.
4. Now extend Tv to meet this projector.
   This point is HT

STEPS TO LOCATE VT.
(WHEN PROJECTIONS ARE GIVEN.)

1. Begin with TV. Extend TV up to XY line.
2. Name this point **v**
   (as it is a Tv of a point in Vp)
3. Draw one projector from **v.**
4. Now extend Fv to meet this projector.
   This point is VT

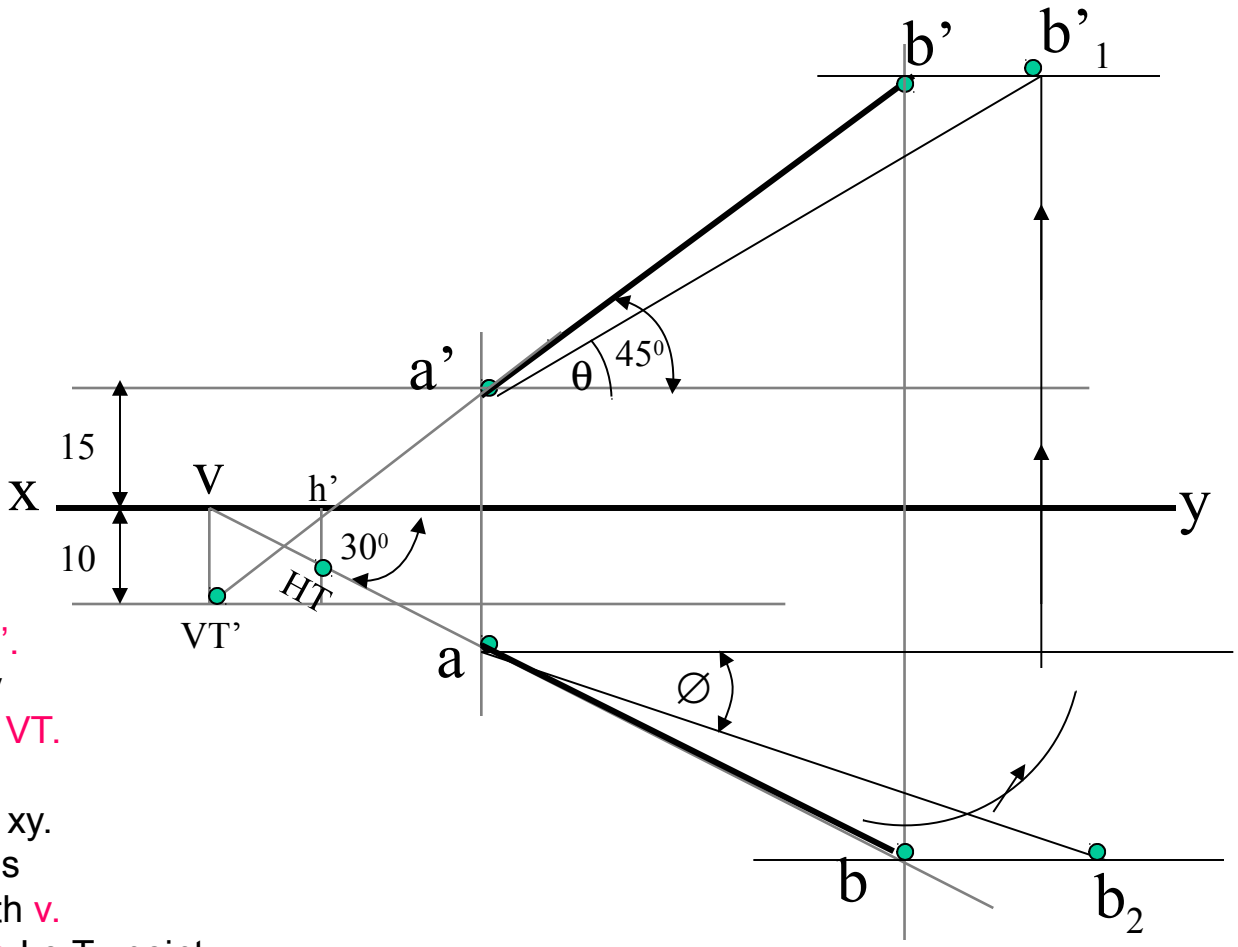


Observe & note :-

1. Points h' & v always on x-y line.
2. VT' & v always on one projector.
3. HT & h' always on one projector.
4. FV - h'- VT' always co-linear.
5. TV - v - HT always co-linear.

These points are used to solve next three problems.

PROBLEM 6 :- Fv of line AB makes 45^0 angle with XY line and measures 60 mm. Line's Tv makes 30^0 with XY line. End A is 15 mm above Hp and it's VT is 10 mm below Hp. Draw projections of line AB,determine inclinations with Hp & Vp and locate HT, VT.

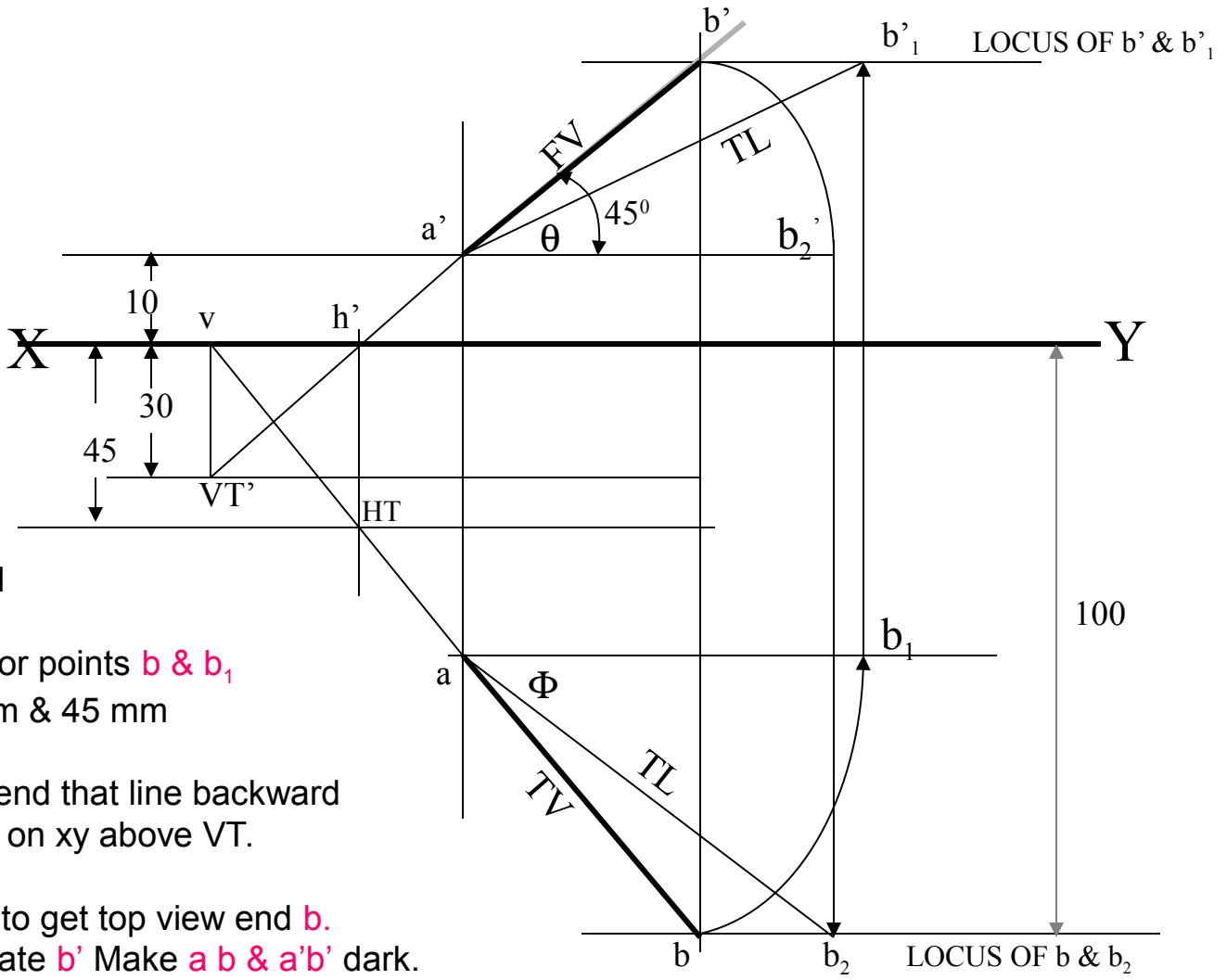


SOLUTION STEPS:-

Draw xy line, one projector and locate fv a' 15 mm above xy.
Take 45^0 angle from a' and marking 60 mm on it locate point b'.
Draw locus of VT, 10 mm below xy & extending Fv to this locus locate VT. as fv-h'-vt' lie on one st.line.
Draw projector from vt, locate v on xy.
From v take 30^0 angle downward as Tv and it's inclination can begin with v.
Draw projector from b' and locate b I.e.Tv point.
Now rotating views as usual TL and it's inclinations can be found.
Name extension of Fv, touching xy as h' and below it, on extension of Tv, locate HT.

PROBLEM 7 :

One end of line AB is 10mm above Hp and other end is 100 mm in-front of Vp.
It's Fv is 45⁰ inclined to xy while it's HT & VT are 45mm and 30 mm below xy respectively.
Draw projections and find TL with it's inclinations with Hp & VP.



SOLUTION STEPS:-

Draw xy line, one projector and locate a' 10 mm above xy.
Draw locus 100 mm below xy for points b & b_1
Draw loci for VT and HT, 30 mm & 45 mm below xy respectively.
Take 45⁰ angle from a' and extend that line backward to locate h' and VT, & Locate v on xy above VT.
Locate HT below h' as shown.
Then join v – HT – and extend to get top view end b.
Draw projector upward and locate b' Make a b & a'b' dark.
Now as usual rotating views find TL and it's inclinations.

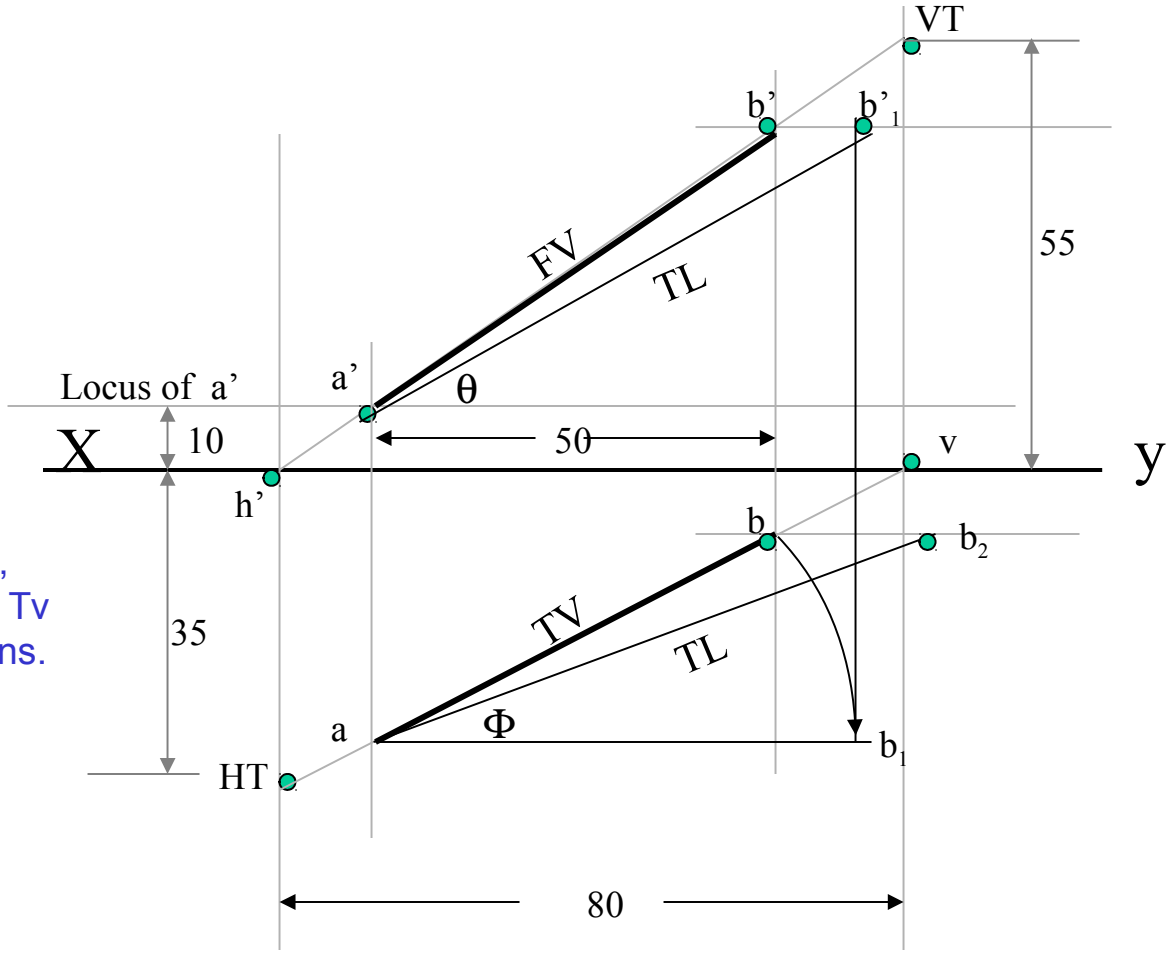
PROBLEM 8 :- Projectors drawn from HT and VT of a line AB are 80 mm apart and those drawn from it's ends are 50 mm apart. End A is 10 mm above Hp, VT is 35 mm below Hp while it's HT is 45 mm in front of Vp. Draw projections, locate traces and find TL of line & inclinations with Hp and Vp.

SOLUTION STEPS:-

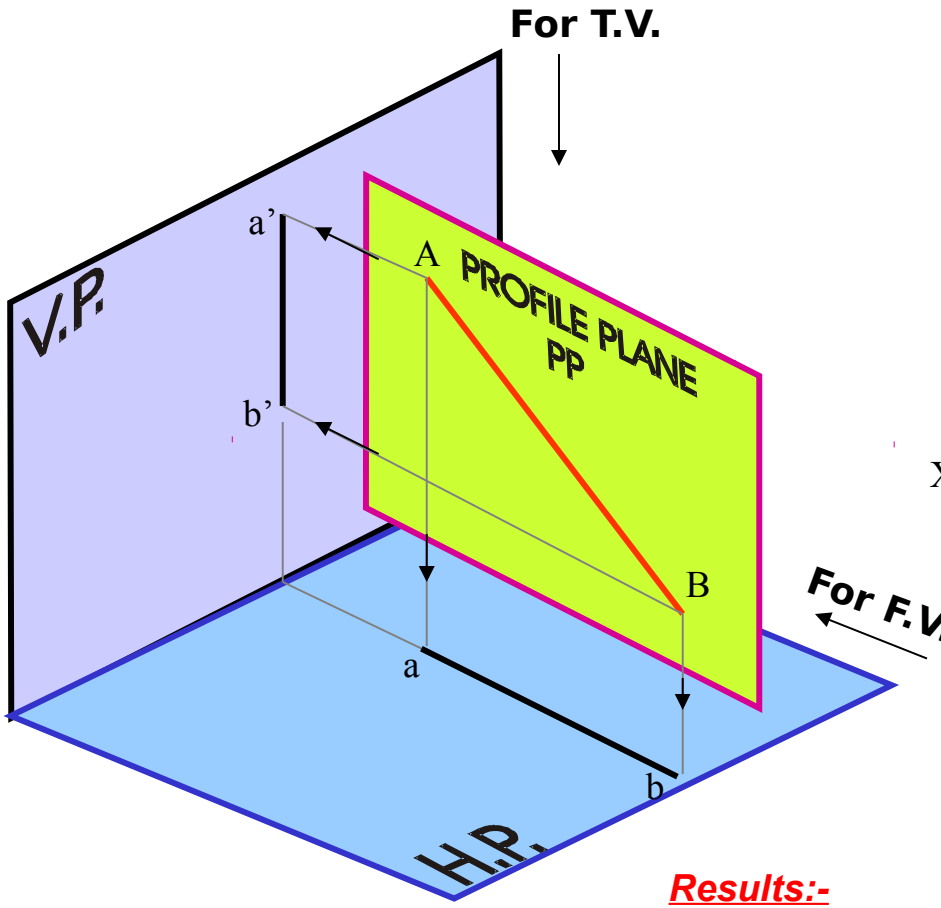
1.Draw xy line and two projectors, 80 mm apart and locate HT & VT , 35 mm below xy and 55 mm above xy respectively on these projectors.

2.Locate h' and v on xy as usual.

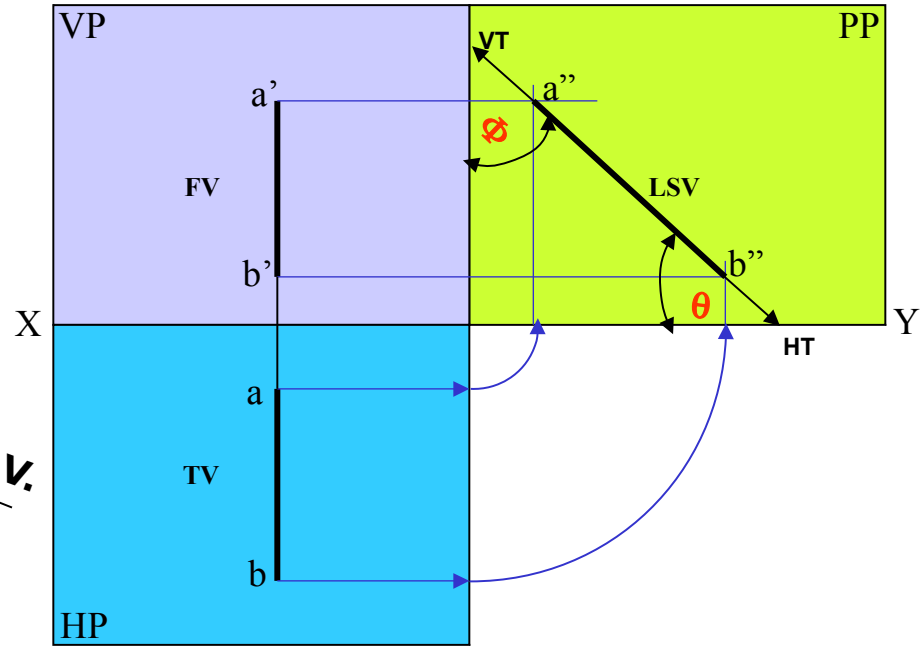
3.Now just like previous two problems, Extending certain lines complete Fv & Tv And as usual find TL and it's inclinations.



LINE IN A PROFILE PLANE (MEANS IN A PLANE PERPENDICULAR TO BOTH HP & VP)



ORTHOGRAPHIC PATTERN OF LINE IN PROFILE PLANE

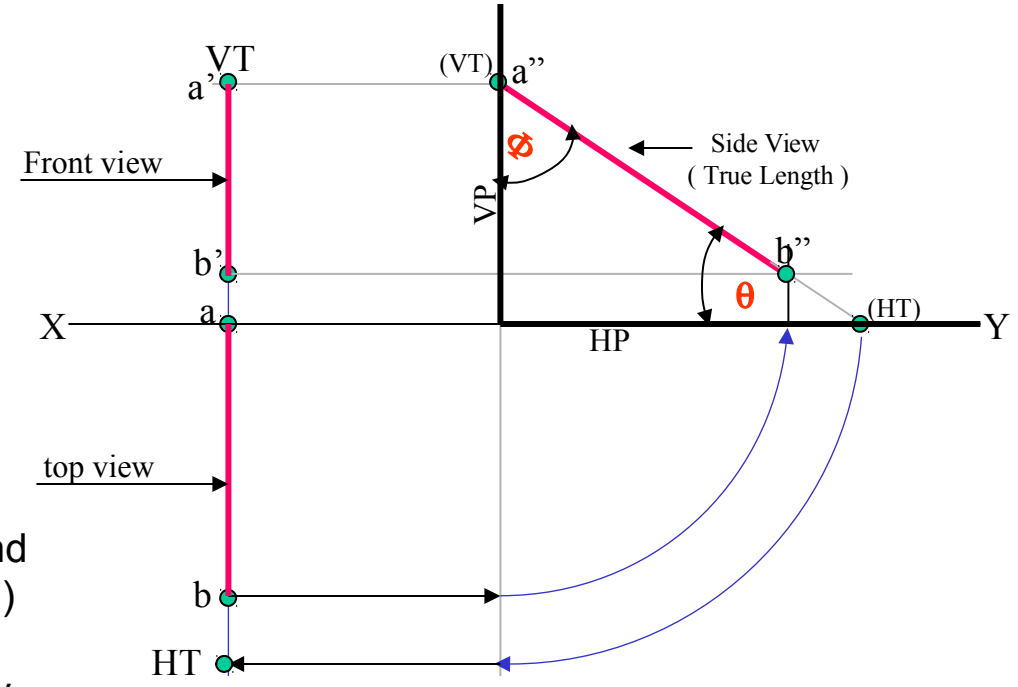


Results:-

1. TV & FV both are vertical, hence arrive on one single projector.
2. It's Side View shows True Length (TL)
3. Sum of it's inclinations with HP & VP equals to 90^0 ($\theta + \Phi = 90^0$)
4. It's HT & VT arrive on same projector and can be easily located From Side View.

OBSERVE CAREFULLY ABOVE GIVEN ILLUSTRATION AND 2nd SOLVED PROBLEM.

PROBLEM 13 :- A line AB, 75mm long, has one end A in Vp. Other end B is 15 mm above Hp and 50 mm in front of Vp.Draw the projections of the line when sum of it's Inclinations with HP & Vp is 90^0, means it is lying in a profile plane.
Find true angles with ref.planes and it's traces.



SOLUTION STEPS:-

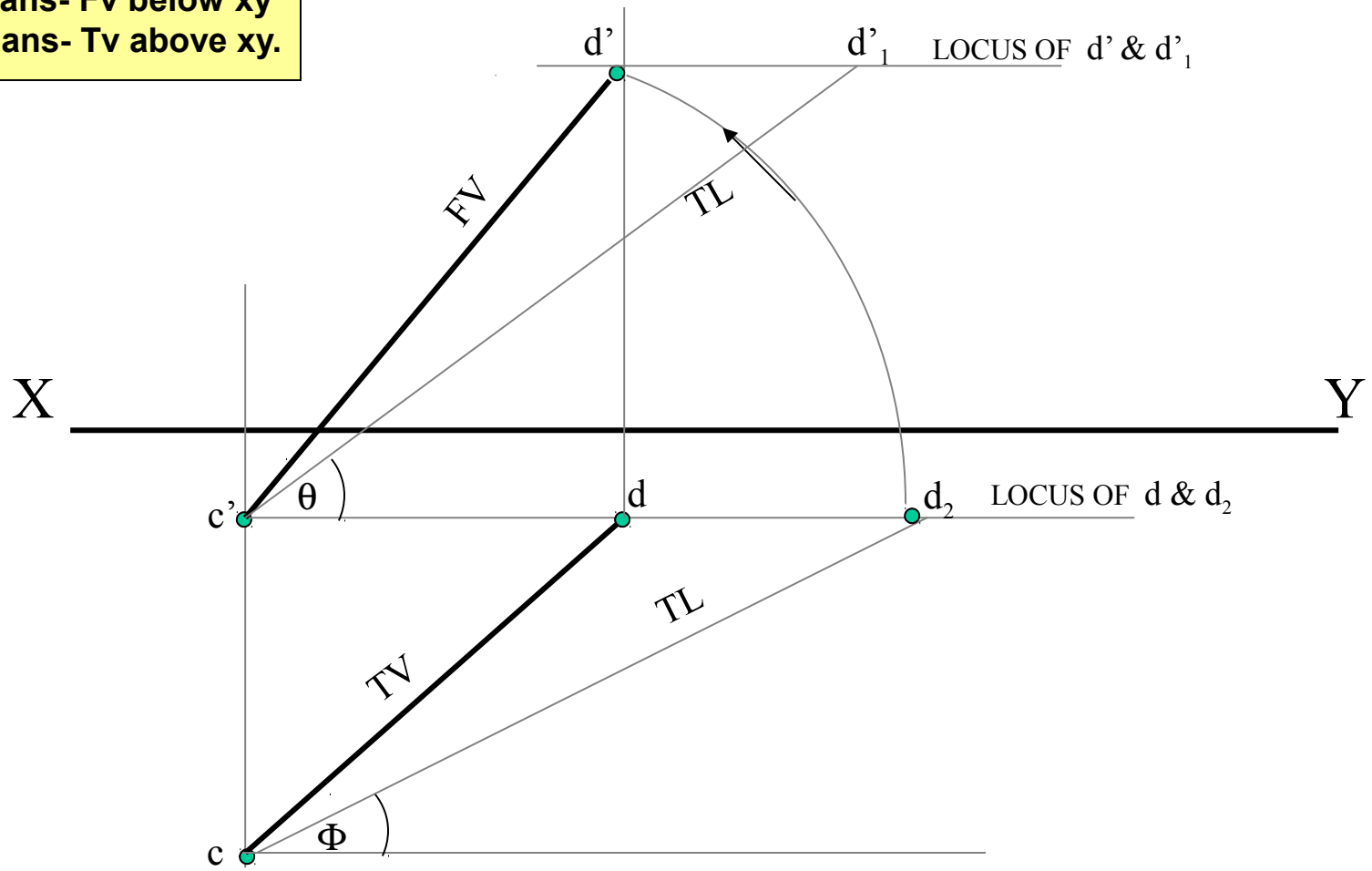
After drawing xy line and one projector
Locate top view of A I.e point a on xy as It is in Vp,
Locate Fv of B i.e.b'15 mm above xy as it is above Hp.and Tv of B i.e. b, 50 mm below xy asit is 50 mm in front of Vp
Draw side view structure of Vp and Hp and locate S.V. of point B i.e. b"
From this point cut 75 mm distance on Vp and Mark a" as A is in Vp. (This is also VT of line.)
From this point draw locus to left & get a'
Extend SV up to Hp. It will be HT. As it is a Tv
Rotate it and bring it on projector of b.
Now as discussed earlier SV gives TL of line and at the same time on extension up to Hp & Vp gives inclinations with those panes.

SOME CASES OF THE LINE IN DIFFERENT QUADRANTS.

REMEMBER:
BELOW HP- Means- Fv below xy
BEHIND V p- Means- Tv above xy.

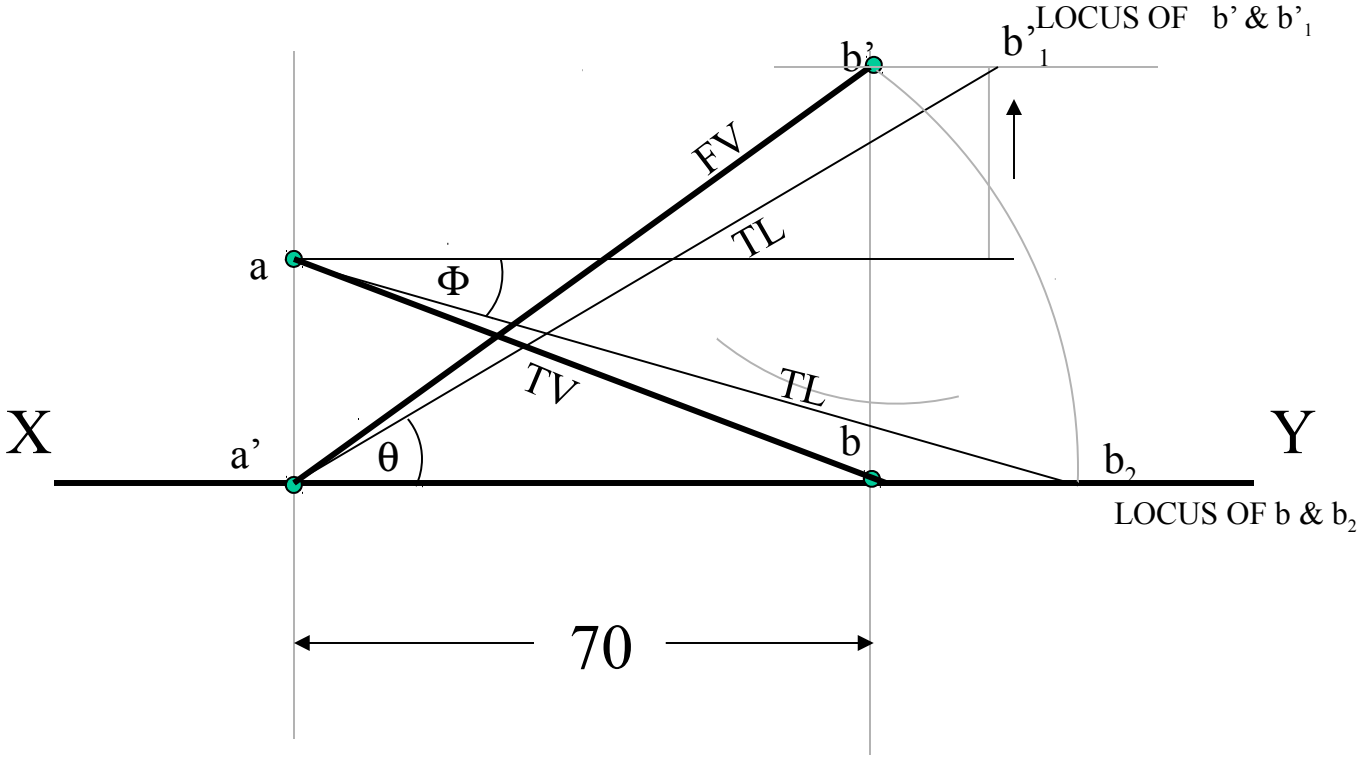
PROBLEM NO.24

T.V. of a 75 mm long Line CD, measures 50 mm.
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 projections of CD and find angles with Hp and Vp.



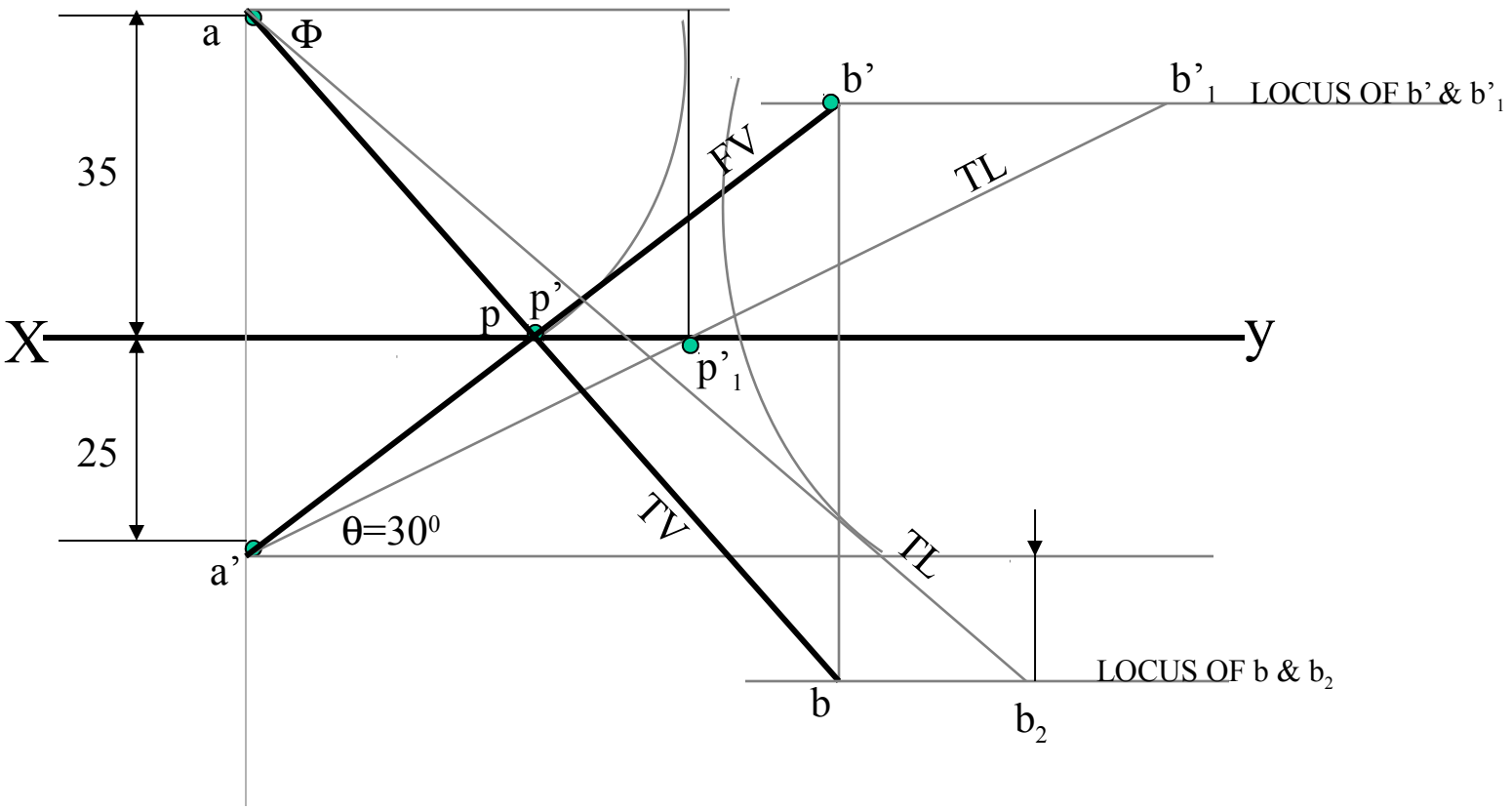
PROBLEM NO.25

End A of line AB is in Hp and 25 mm behind Vp.
End B in Vp.and 50mm above Hp.
Distance between projectors is 70mm.
Draw projections and find it's inclinations with Ht, Vt.



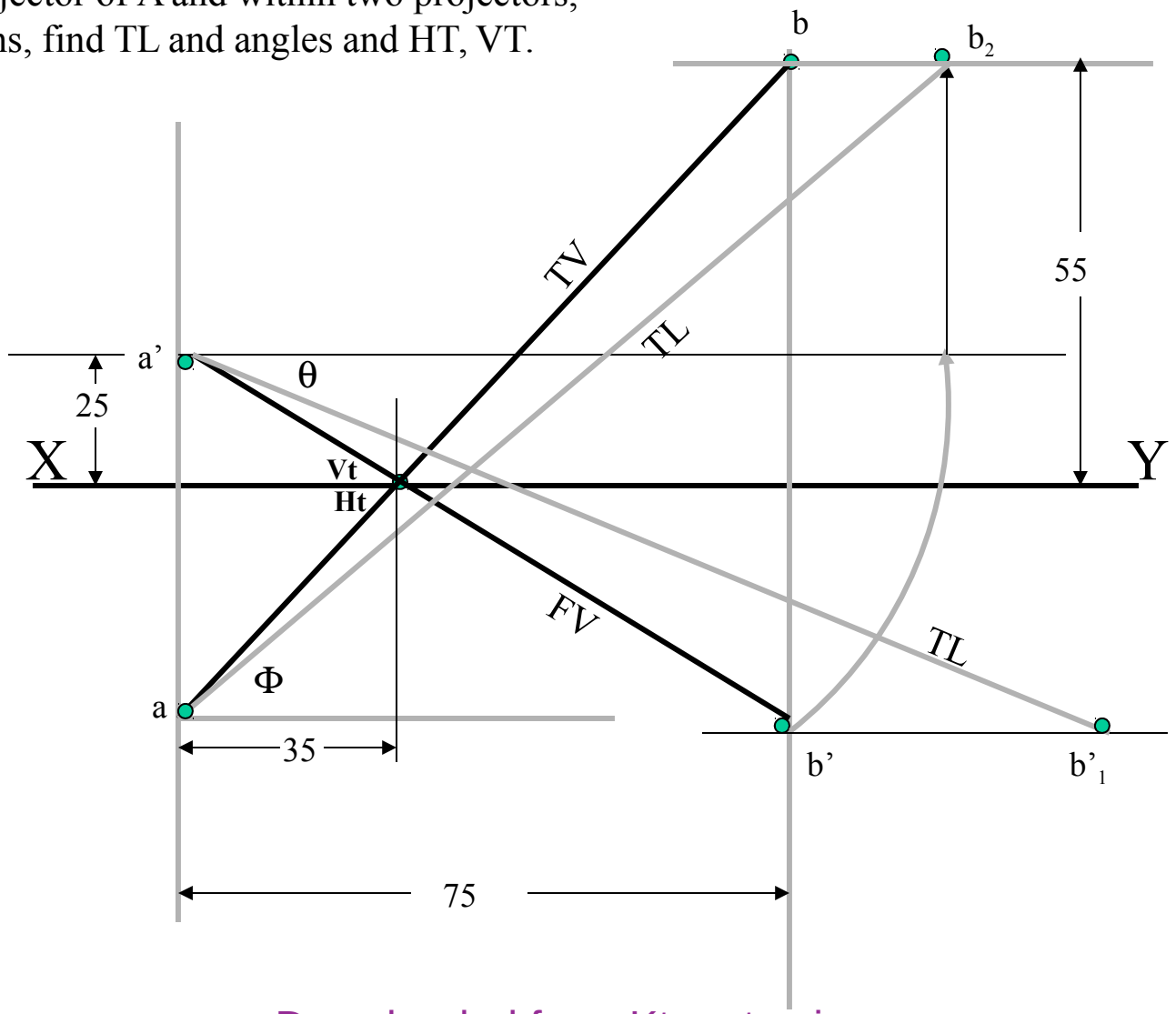
PROBLEM NO.26

End A of a line AB is 25mm below Hp and 35mm behind Vp.
Line is 300 inclined to Hp.
There is a point P on AB contained by both HP & VP.
Draw projections, find inclination with Vp and traces.

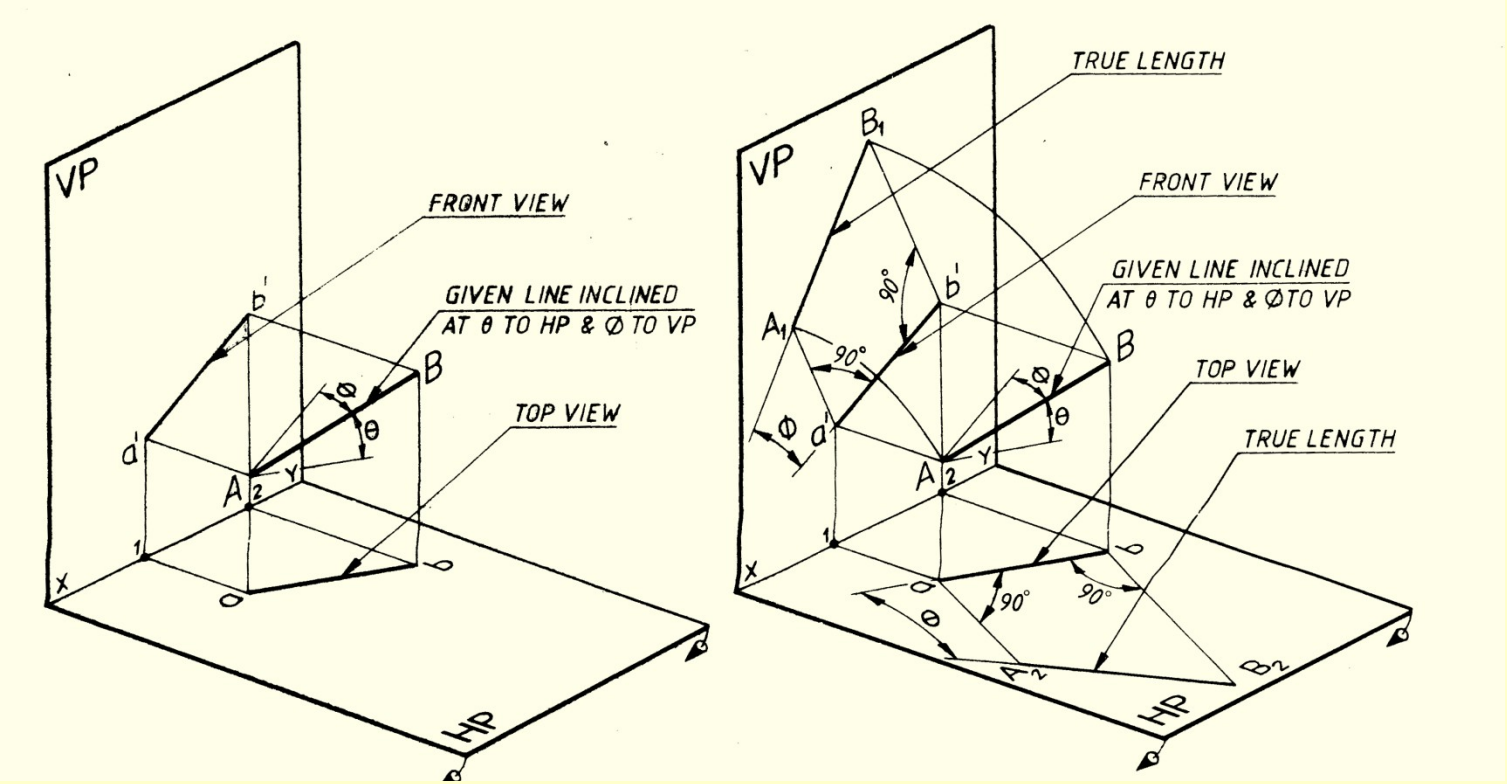


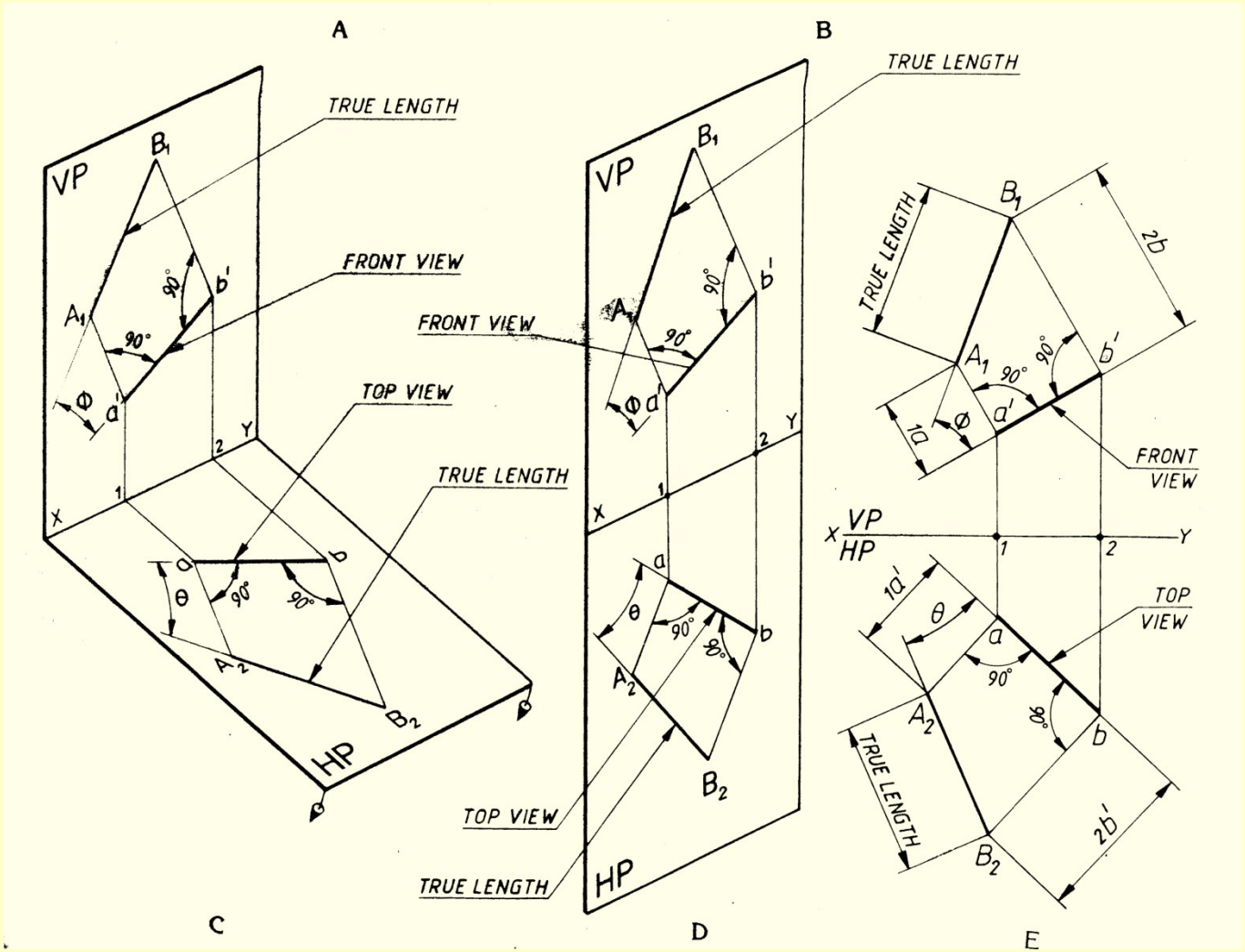
PROBLEM NO.27

End A of a line AB is 25mm above Hp and end B is 55mm behind Vp.
The distance between end projectors is 75mm.
If both it's HT & VT coincide on xy in a point,
35mm from projector of A and within two projectors,
Draw projections, find TL and angles and HT, VT.

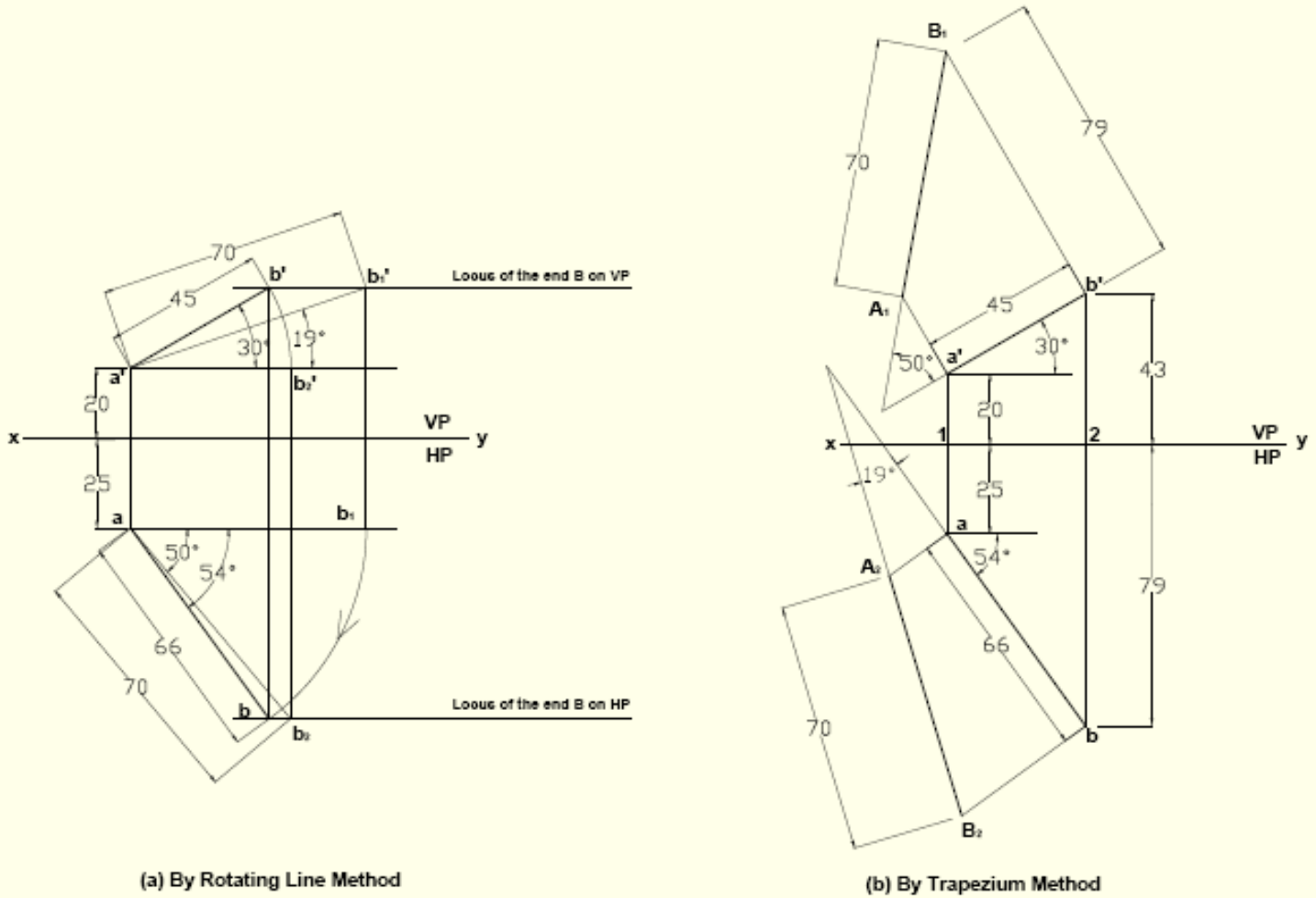


Rotating Plane or Trapezoidal method





(13) The front view of the line AB of length 70 mm is inclined at 30° to xy line and measures 45 mm. The end A is 20 mm above HP and 25 mm in front of VP. Draw the projections of the line and find the inclinations with HP and VP by i) rotating line method and ii) trapezoidal method.



(a) By Rotating Line Method

(b) By Trapezium Method

Fig. 7.5.7 Example 7.8

END OF SESSION 2

NEXT SESSION

APPLICATION PROBLEMS OF PROJECTION OF LINES