Projection of Points and 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.

IT IS INTERESTING TO LEARN THE EFFECT ON THE POSITIONS OF VIEWS (FV, TV) OF THE OBJECT WITH RESP. TO X-Y LINE, WHEN PLACED IN DIFFERENT QUADRANTS.

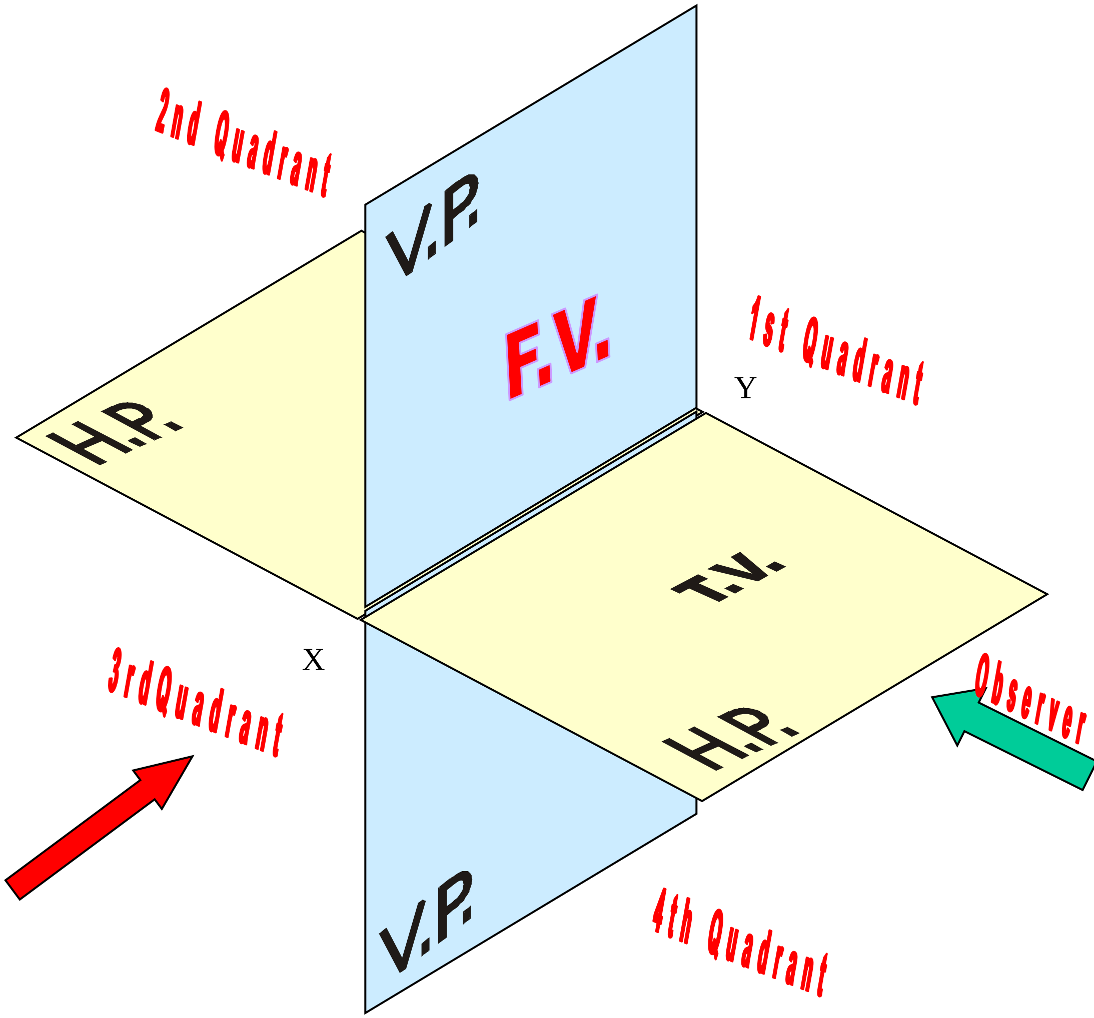
STUDY ILLUSTRATIONS GIVEN ON HEXT PAGES AND NOTE THE RESULTS.TO MAKE IT EASY HERE A POINT A IS TAKEN AS AN OBJECT. BECAUSE IT'S ALL VIEWS ARE JUST POINTS.

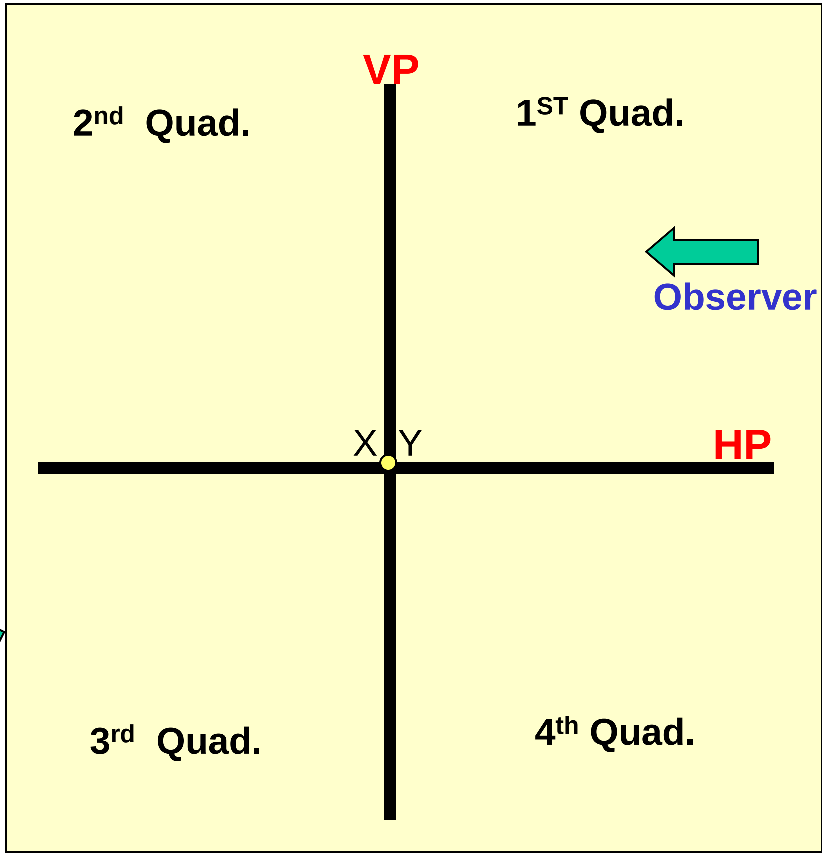
NOTATIONS

FOLLOWING NOTATIONS SHOULD BE FOLLOWED WHILE NAMEING DIFFERENT VIEWS IN ORTHOGRAPHIC PROJECTIONS.

OBJECT	POINT A	LINE AB
IT'S TOP VIEW	a	a b
IT'S FRONT VIEW	a'	a' b'
IT'S SIDE VIEW	a"	a" b"

SAME SYSTEM OF NOTATIONS SHOULD BE FOLLOWED INCASE NUMBERS, LIKE 1, 2, 3 – ARE USED.

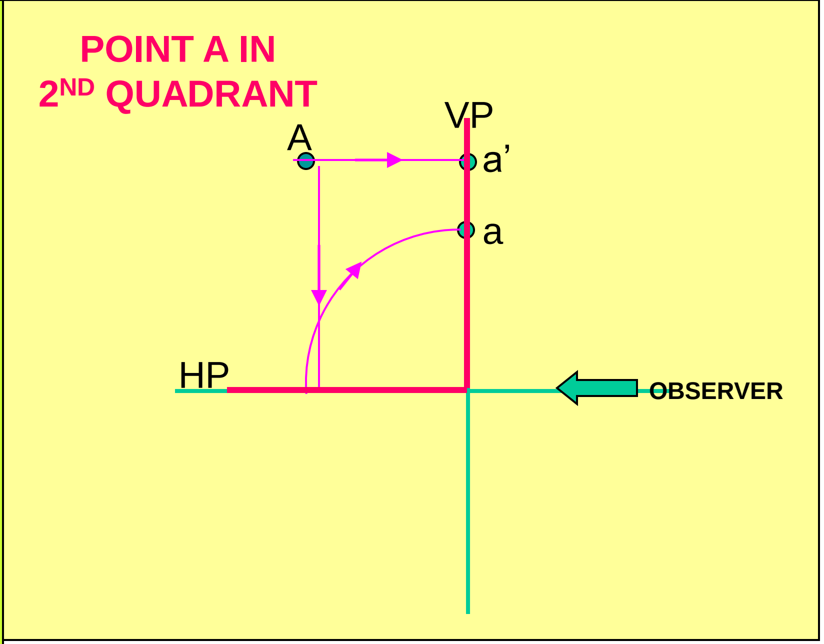


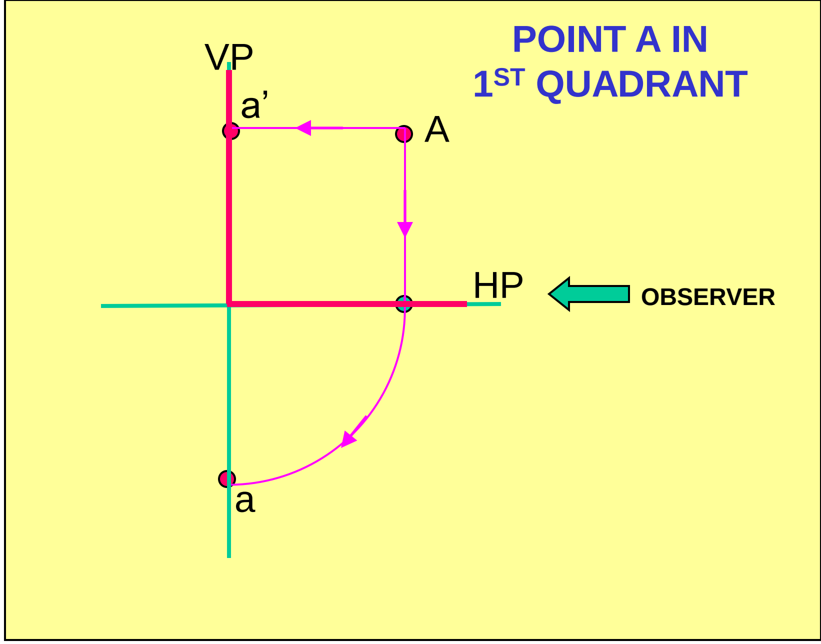


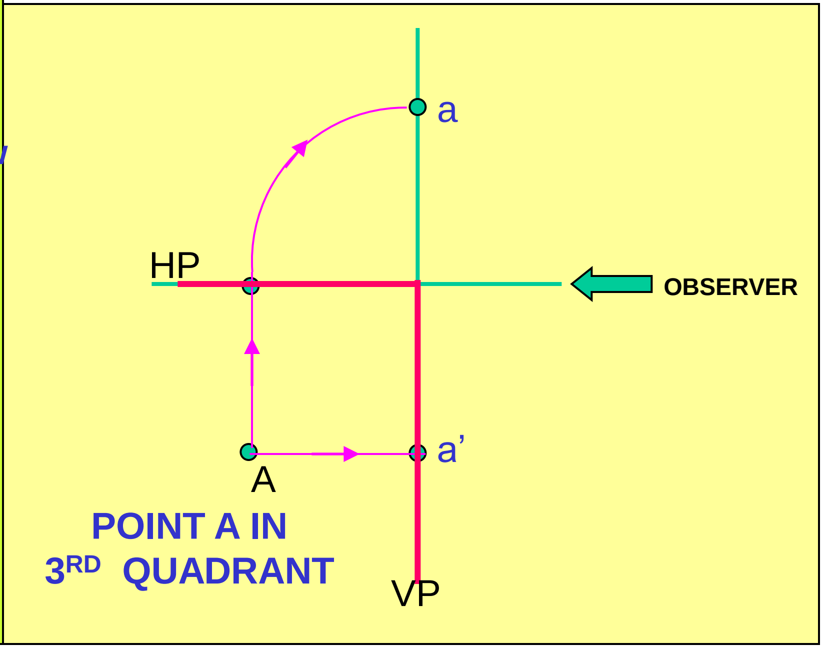
**THIS QUADRANT PATTERN,
IF OBSERVED ALONG X-Y LINE (IN RED ARROW DIRECTION)
WILL EXACTLY APPEAR AS SHOWN ON RIGHT SIDE AND HENCE,
IT IS FURTHER USED TO UNDERSTAND ILLUSTRATION PROPERLLY.**

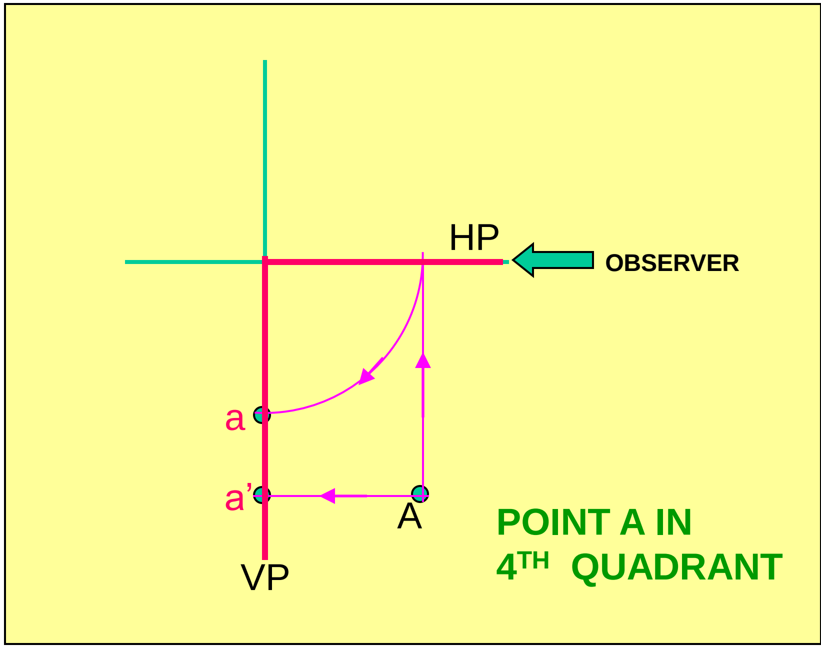
Point A is Placed In different quadrants and it’s Fv & Tv are brought in same plane for Observer to see clearly.
Fv is visible as it is a view on VP. But as Tv is is a view on Hp, it is rotated downward 90^0, In clockwise direction.The In front part of Hp comes below xy line and the part behind Vp comes above.

Observe and note the process.



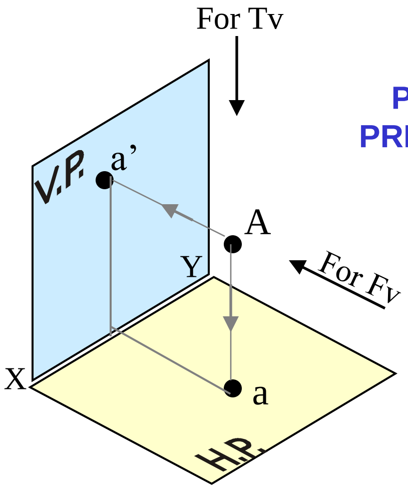






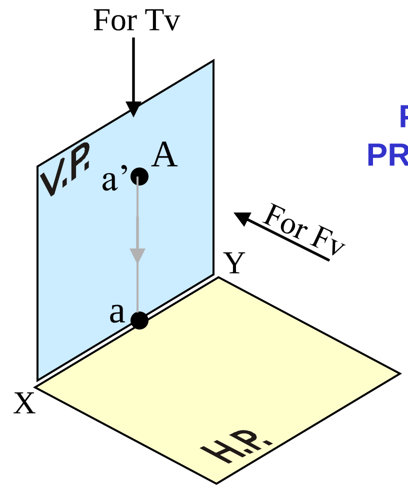
PROJECTIONS OF A POINT IN FIRST QUADRANT.

POINT A ABOVE HP & INFRONT OF VP



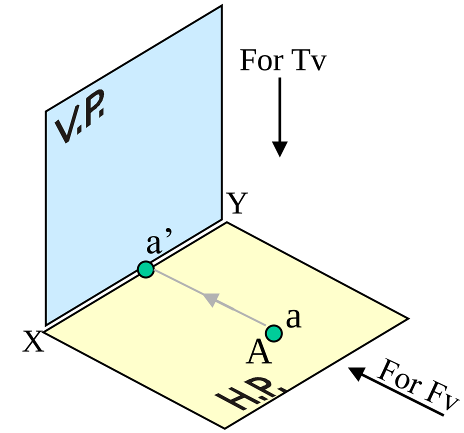
PICTORIAL PRESENTATION

POINT A ABOVE HP & IN VP



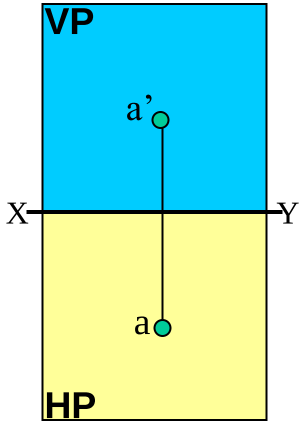
PICTORIAL PRESENTATION

POINT A IN HP & INFRONT OF VP

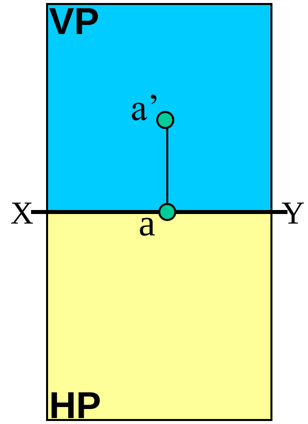


ORTHOGRAPHIC PRESENTATIONS OF ALL ABOVE CASES.

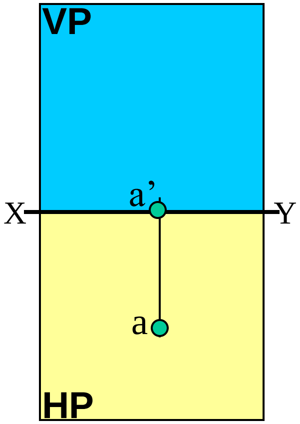
Fv above xy, Tv below xy.



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

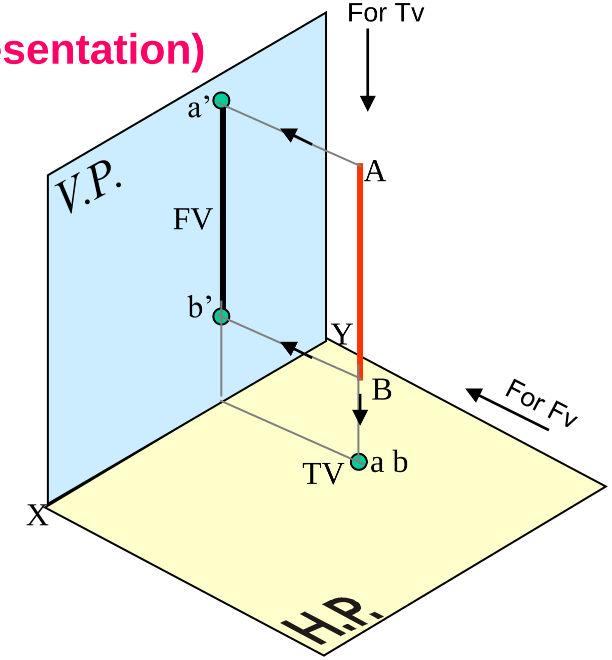
1. A VERTICAL LINE (LINE PERPENDICULAR TO HP & // TO VP)
2. LINE PARALLEL TO BOTH HP & VP.
3. LINE INCLINED TO HP & PARALLEL TO VP.
4. LINE INCLINED TO VP & PARALLEL TO HP.
5. LINE INCLINED TO BOTH HP & VP.

STUDY ILLUSTRATIONS GIVEN ON NEXT PAGE SHOWING CLEARLY THE NATURE OF FV & TV OF LINES LISTED ABOVE AND NOTE RESULTS.

(Pictorial Presentation)

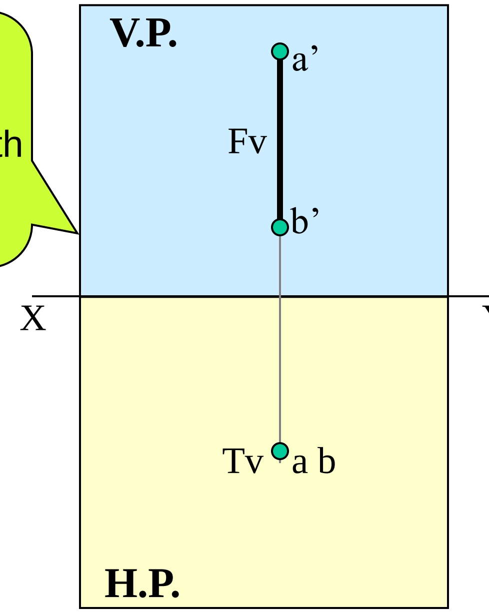
1.

A Line
perpendicular
to Hp
&
// to Vp



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

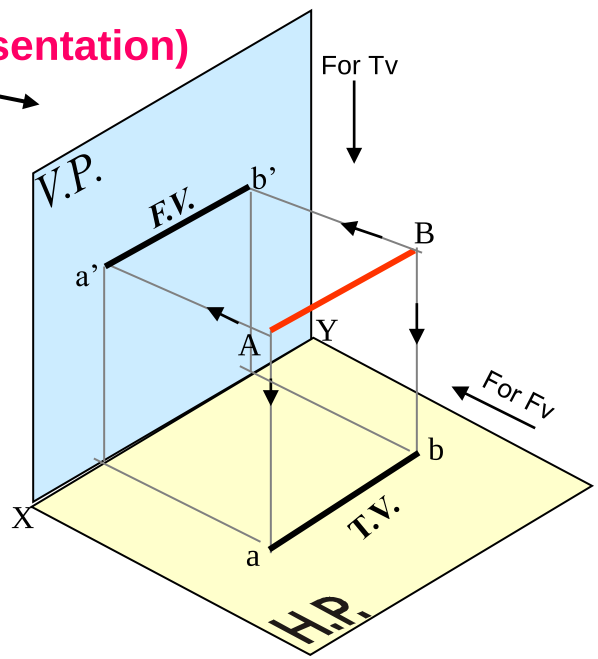
Orthographic Pattern



(Pictorial Presentation)

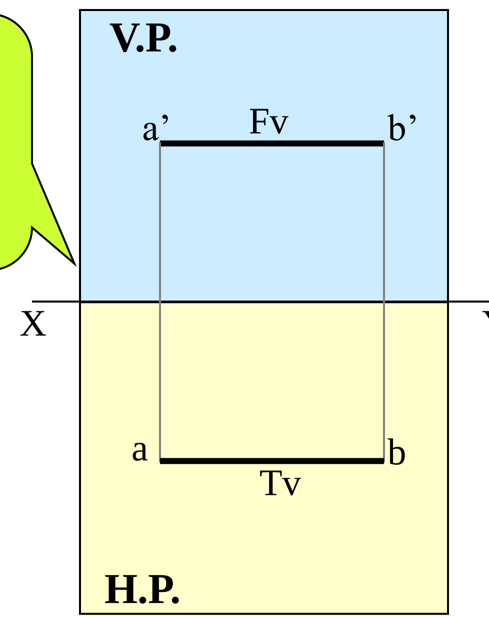
2.

A Line
// to Hp
&
// to Vp



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

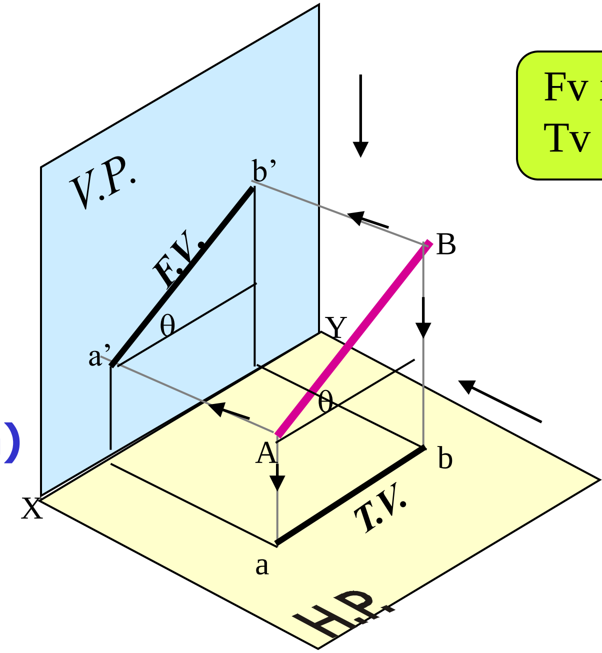
Orthographic Pattern



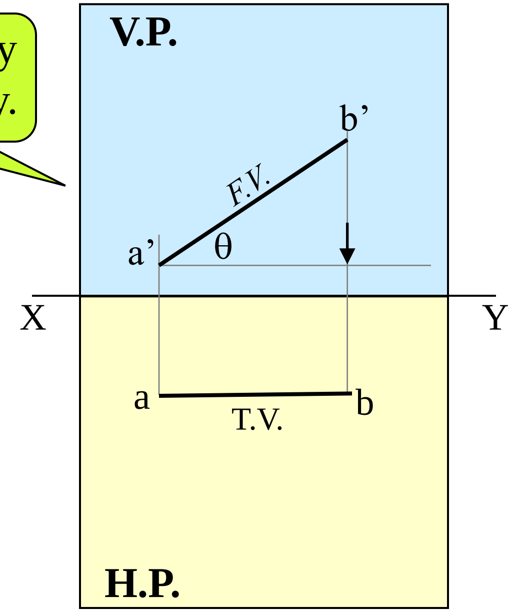
3.

A Line inclined to Hp
and
parallel to Vp

(Pictorial presentation)



Fv inclined to xy
Tv parallel to xy.

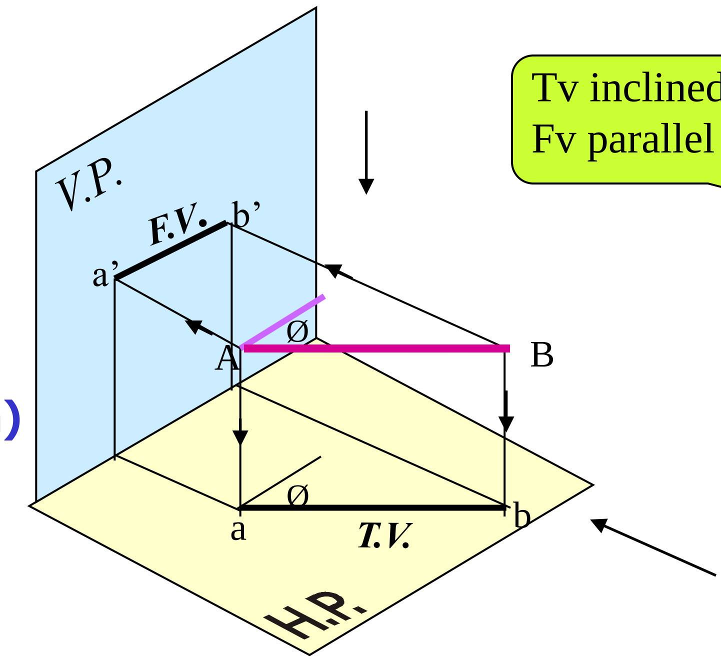


Orthographic Projections

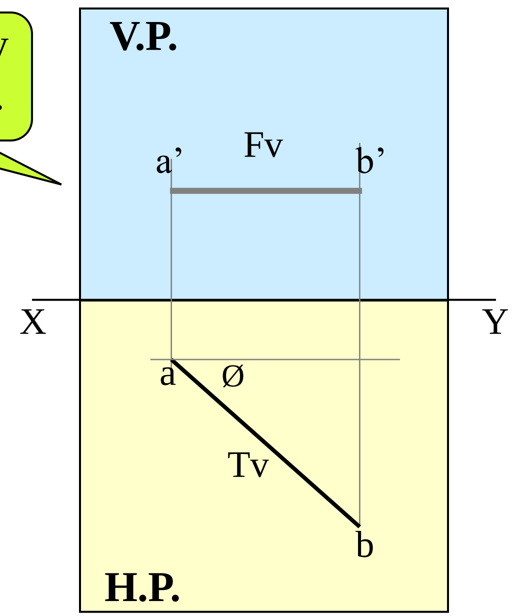
4.

A Line inclined to Vp
and
parallel to Hp

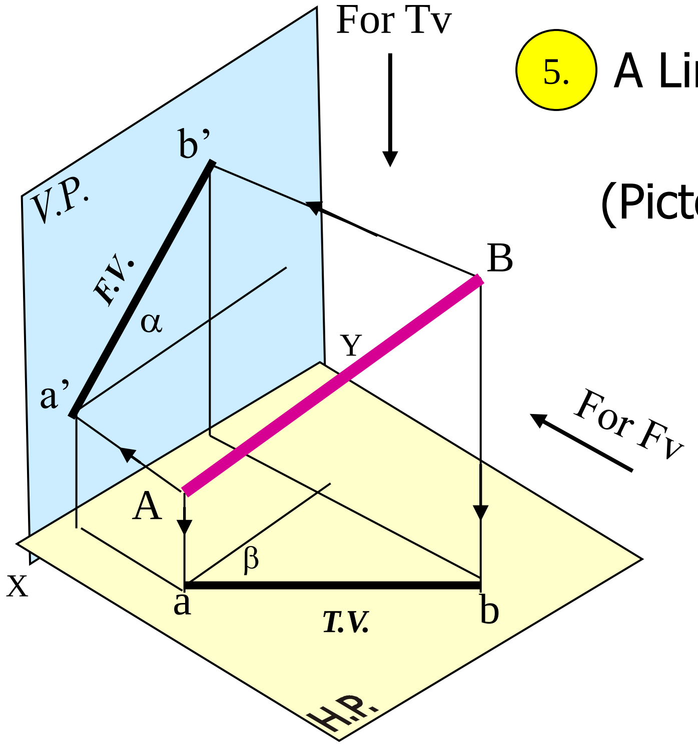
(Pictorial presentation)

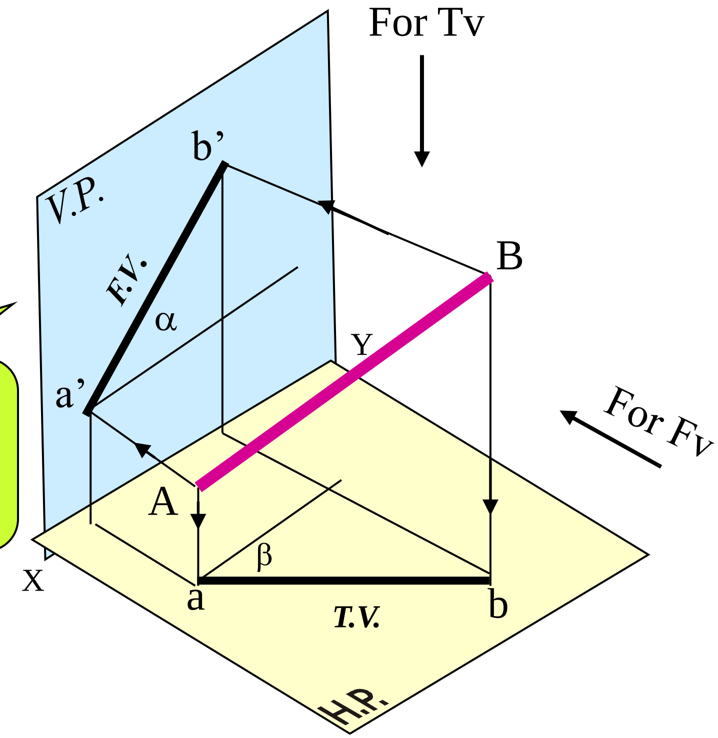


Tv inclined to xy
Fv parallel to xy.

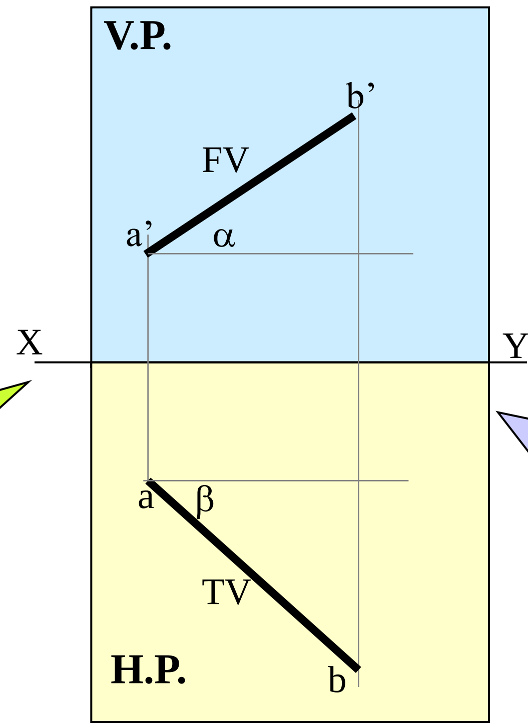


5. A Line inclined to both Hp and Vp (Pictorial presentation)





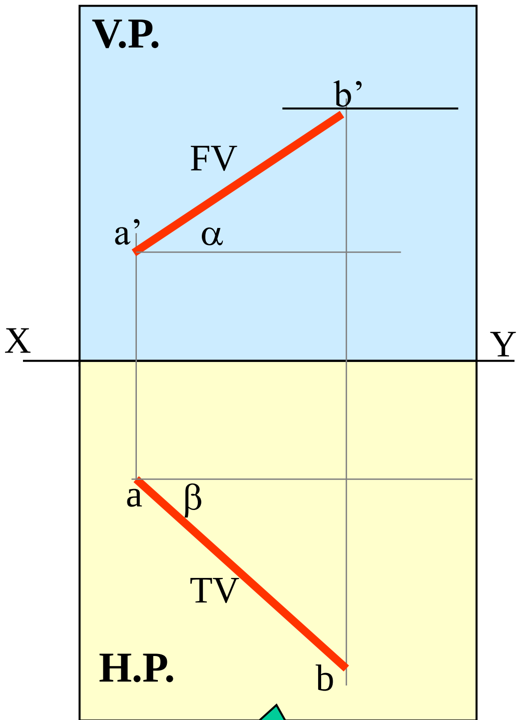
On removal of object
i.e. Line AB
Fv as a image on Vp.
Tv as a image on Hp,



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

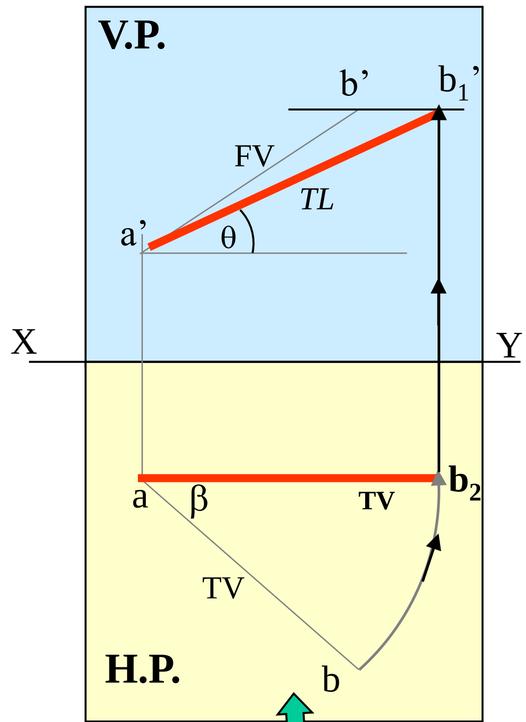
Note These Facts:-
Both Fv & Tv are inclined to xy.
(No view is parallel to xy)
Both Fv & Tv are reduced lengths.
(No view shows True Length)

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



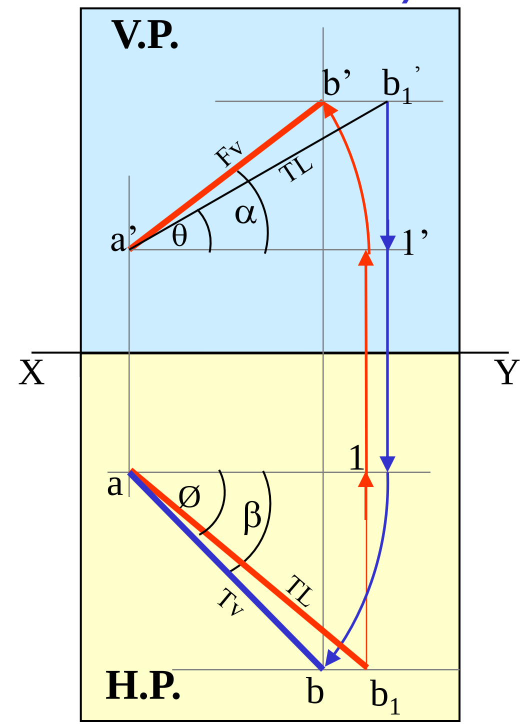
Here TV (ab) is not // to XY line
Hence it's corresponding FV
a' b' is not showing
True Length &
True Inclination with Hp.

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).



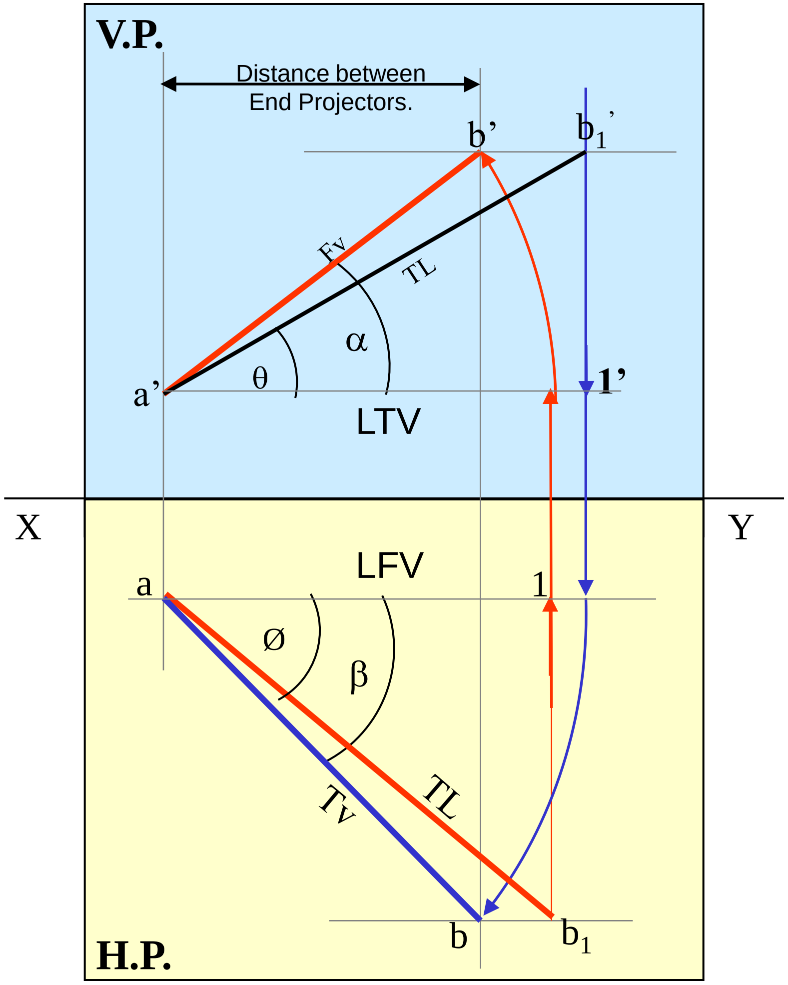
In this sketch, TV is rotated
and made // to XY line.
Hence it's corresponding
FV a' b_1' Is showing
True Length
&
True Inclination with Hp.

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.

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 – Ø
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'***

Ø & 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

GROUP (A)

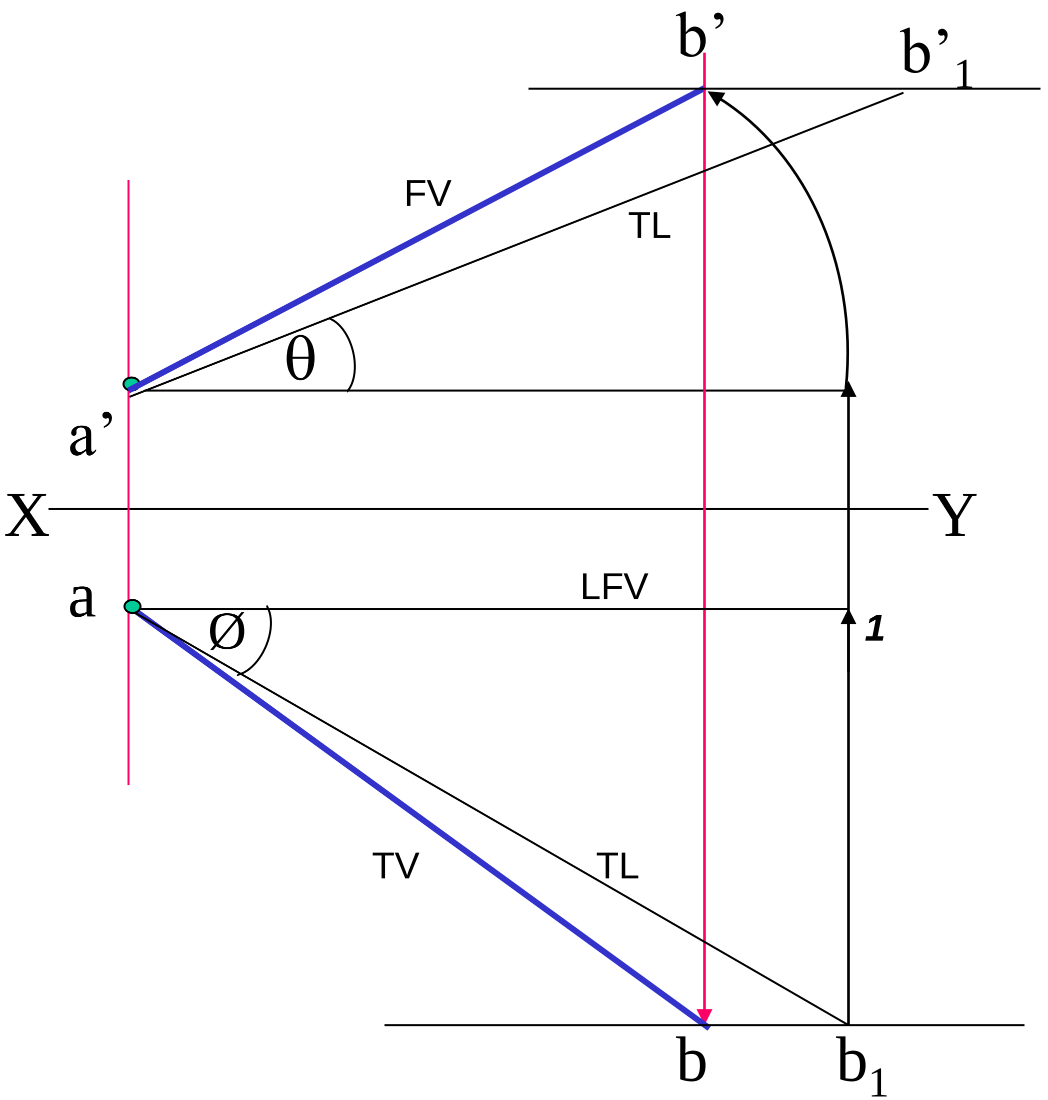
GENERAL CASES OF THE LINE INCLINED TO BOTH HP & VP
(based on 10 parameters).

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:

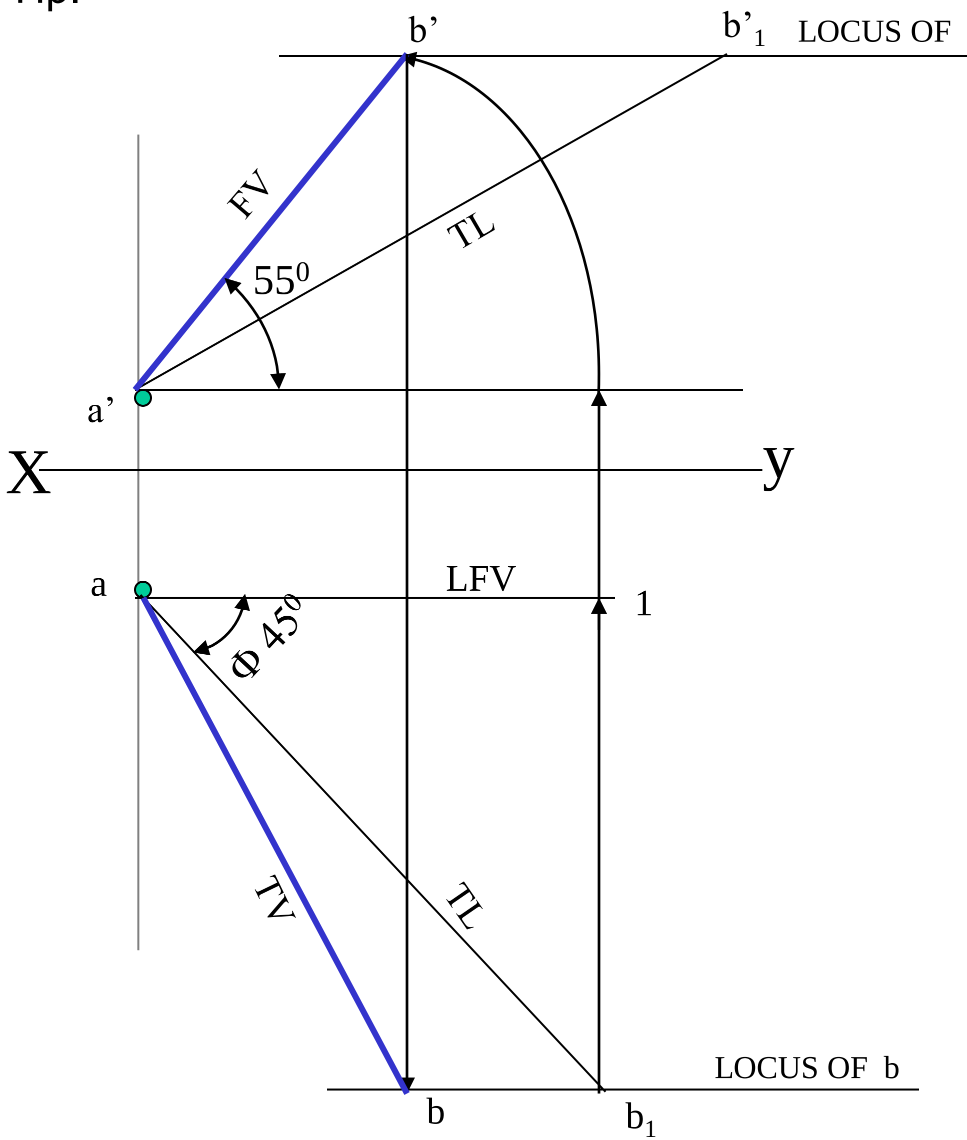
1) Draw xy line and one projector.
2) Locate a' 12mm above xy line & a 10mm below xy line.
3) Take 30^0 angle from a' & 40^0 from a and mark TL I.e. 75mm on both lines. Name those points b_1' and b_1 respectively.
4) Join both points with a' and a resp.
5) Draw horizontal lines (Locus) from both points.
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.

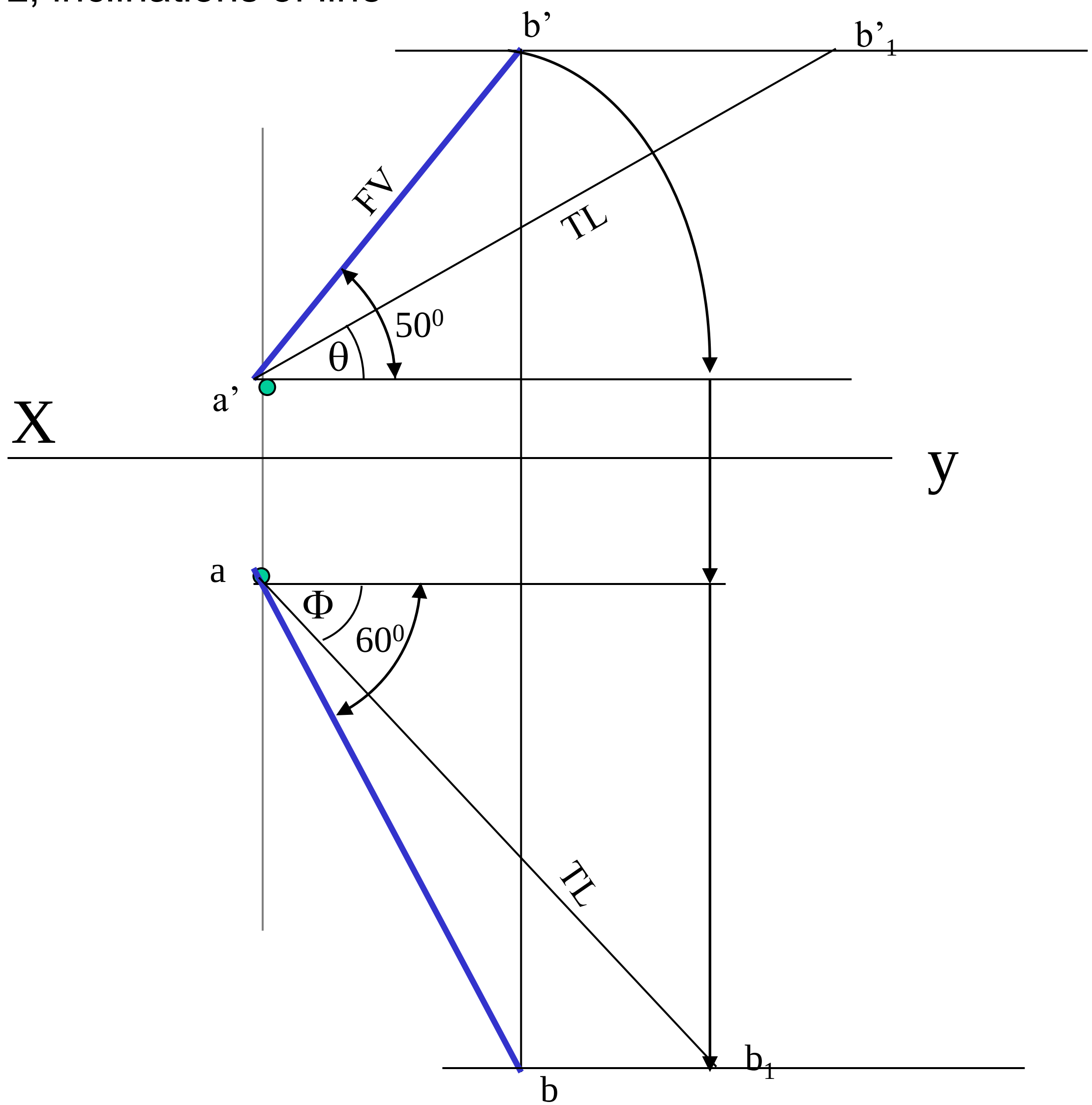
2.Locate a' 10 mm above xy and a 15 mm below xy line.

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.

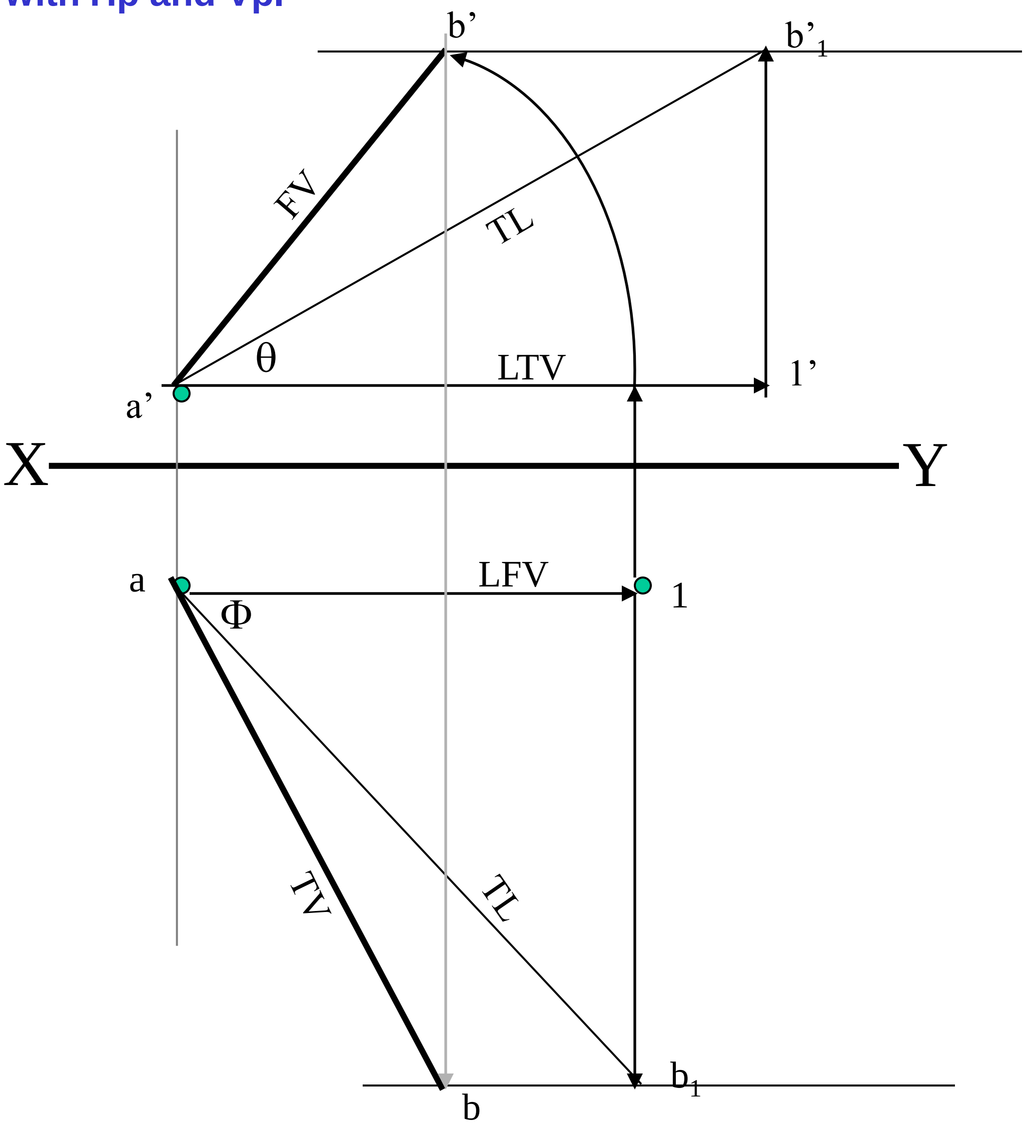
6.Then rotating views as shown, locate True Lengths ab_1 & $a'b_1'$ and their angles with Hp and Vp.



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

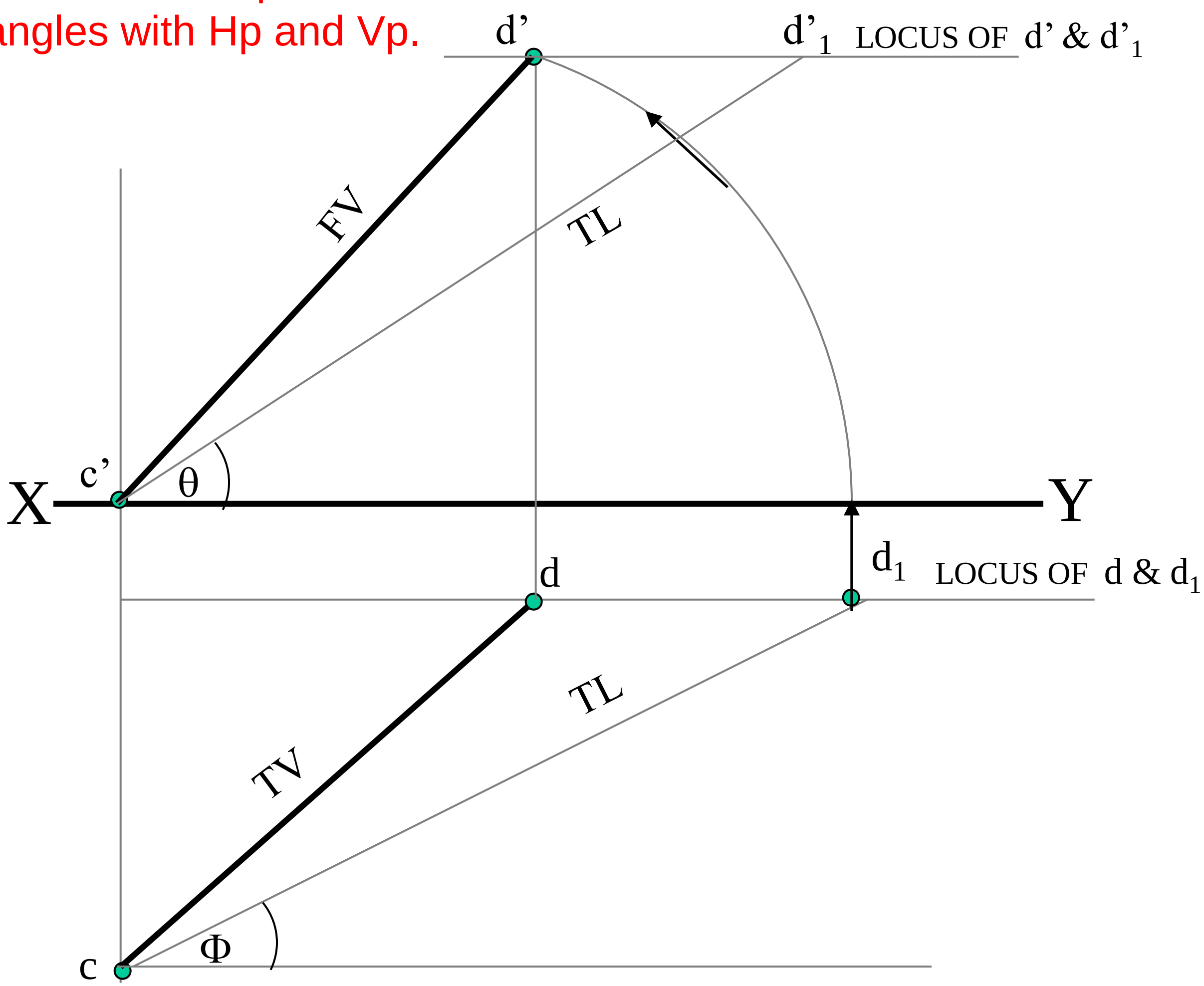


PROBLEM 5 :-

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)**

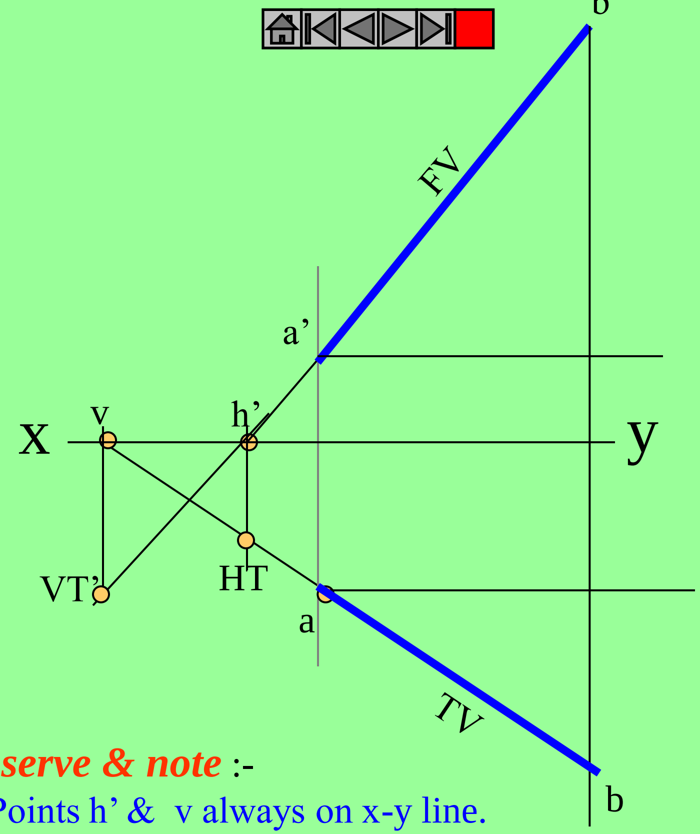
H.T.:- It is a point on **Hp.**
Hence it is called ***Tv*** of a point in **Hp**.
Hence it's ***Fv*** comes on **XY line**.(Here onward named as **'h')**

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

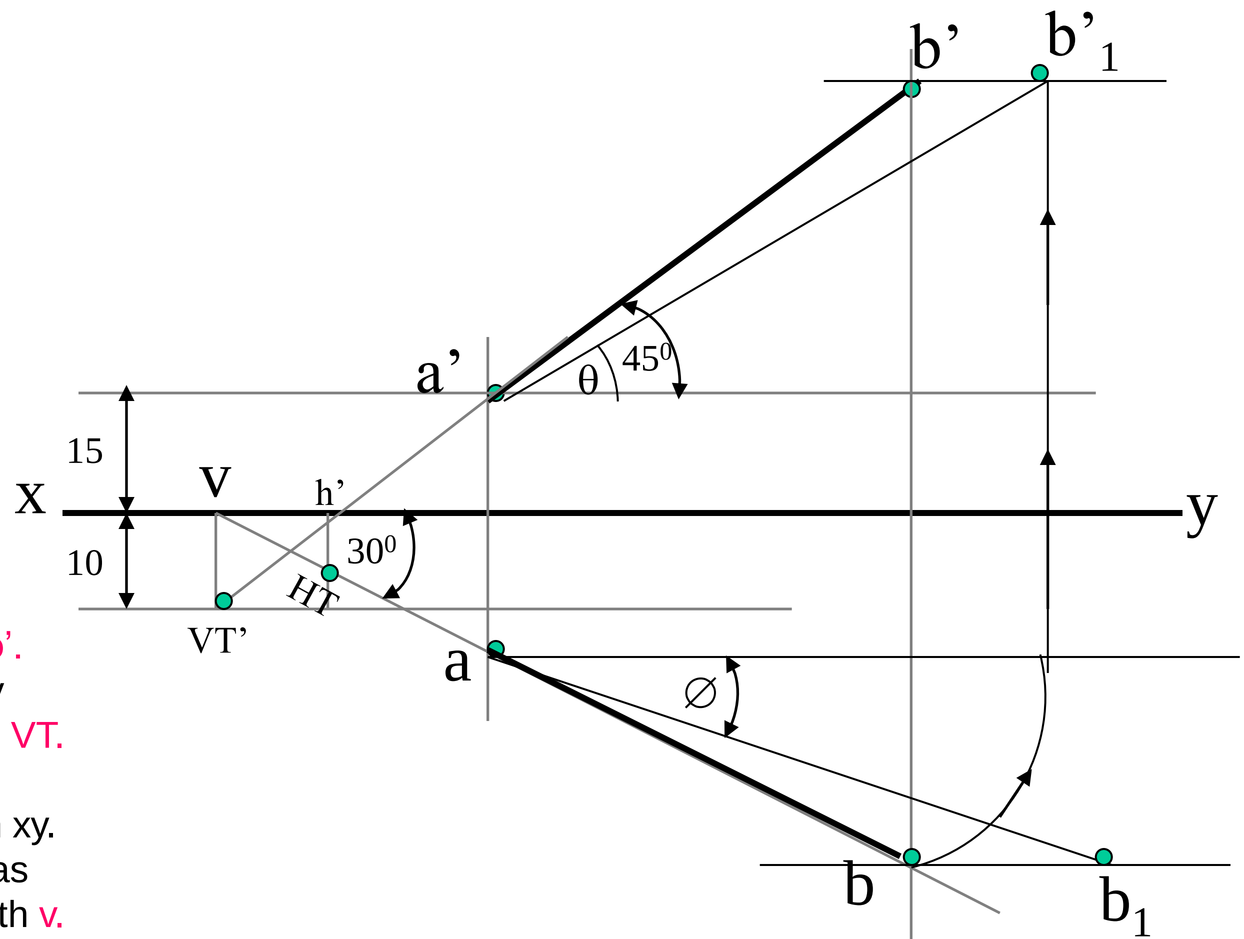


Observe & note :-

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.

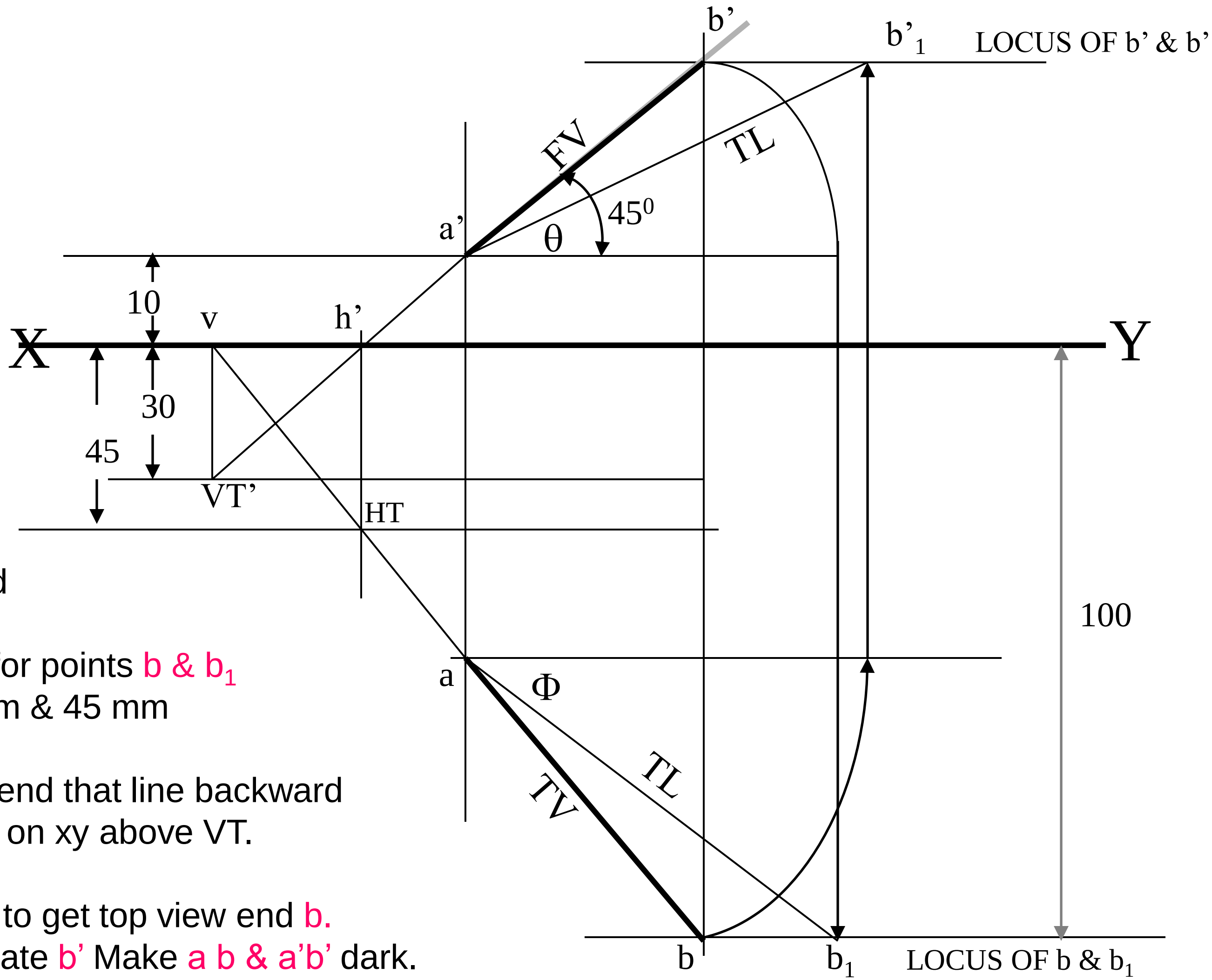
PROBLEM 6 :- Fv of line AB makes 45^0 angle with XY line and measures 60 mm. Line's Tv makes 30^0 with XY line. End A is 15 mm above Hp and it's VT is 10 mm below Hp. Draw projections of line AB,determine inclinations with Hp & Vp and locate HT, VT.



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 45^0 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 45^0 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.

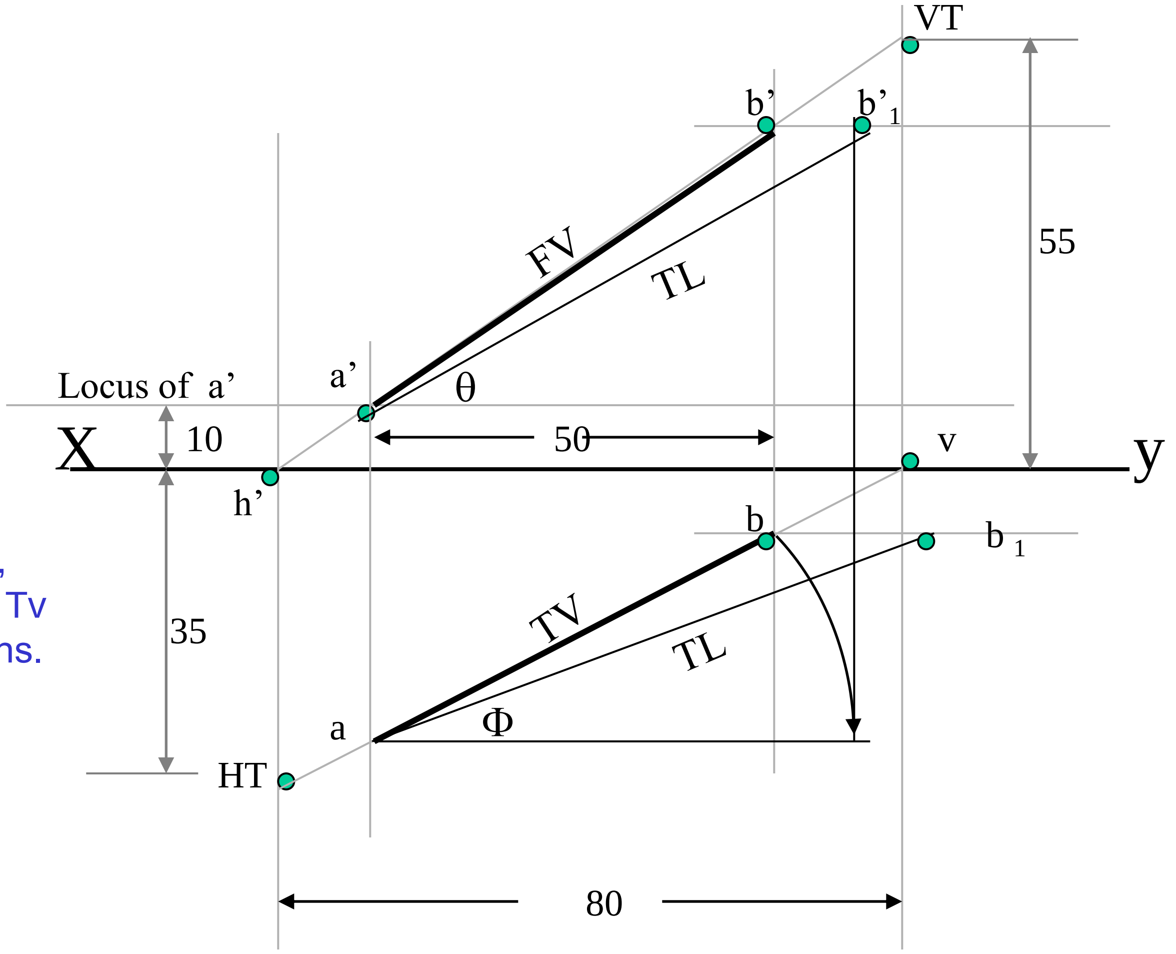
PROBLEM 8 :- Projectors drawn from HT and VT of a line AB are 80 mm apart and those drawn from it's ends are 50 mm apart. End A is 10 mm above Hp, VT is 35 mm below Hp while it's HT is 45 mm in front of Vp. Draw projections, locate traces and find TL of line & inclinations with Hp and Vp.

SOLUTION STEPS:-

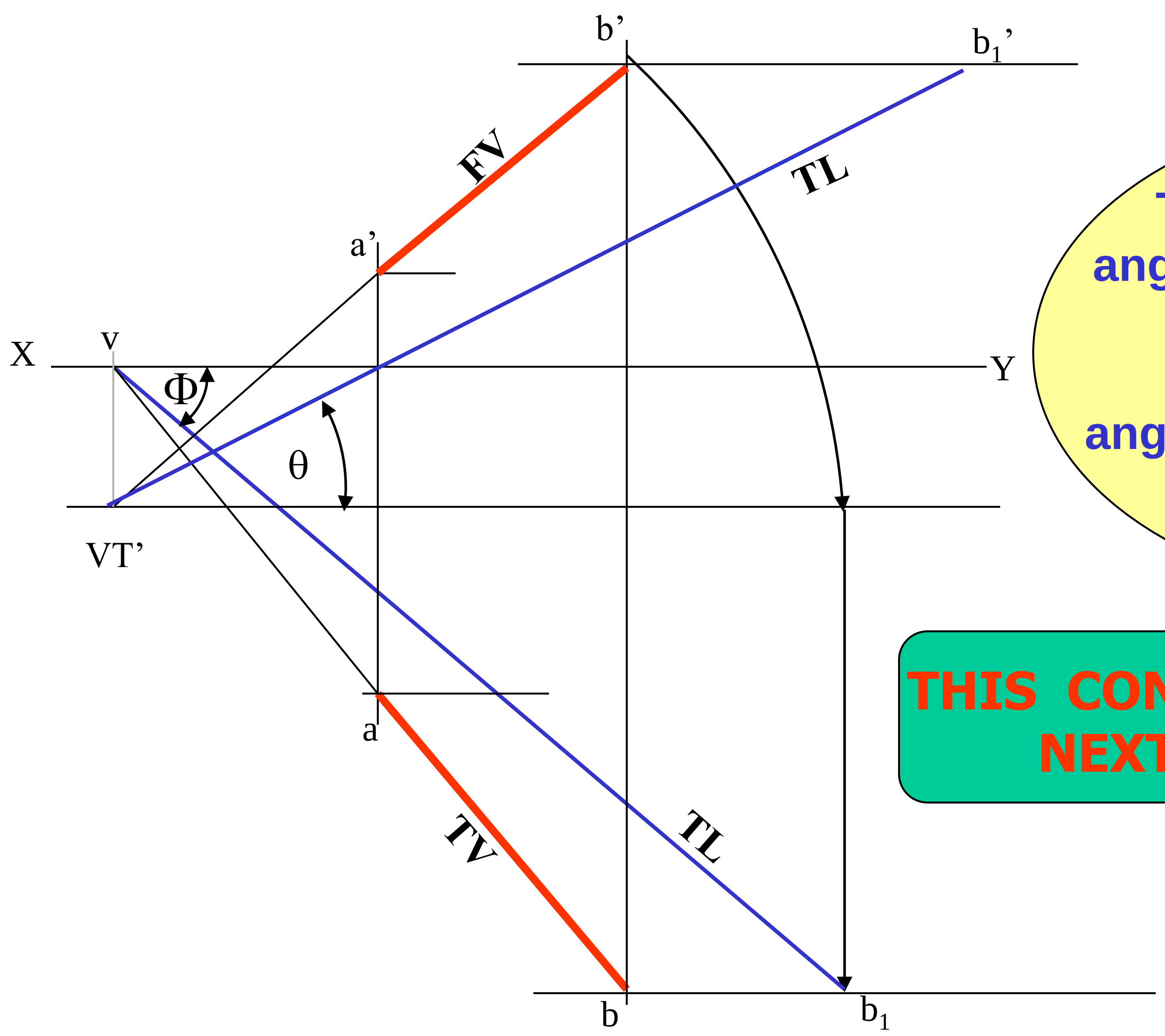
1.Draw xy line and two projectors, 80 mm apart and locate HT & VT , 35 mm below xy and 55 mm above xy respectively on these projectors.

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.



Instead of considering a & a' as projections of first point,
if v & VT' are considered as first point , then true inclinations of line with Hp & Vp i.e. angles θ & Φ can be constructed with points VT' & V respectively.

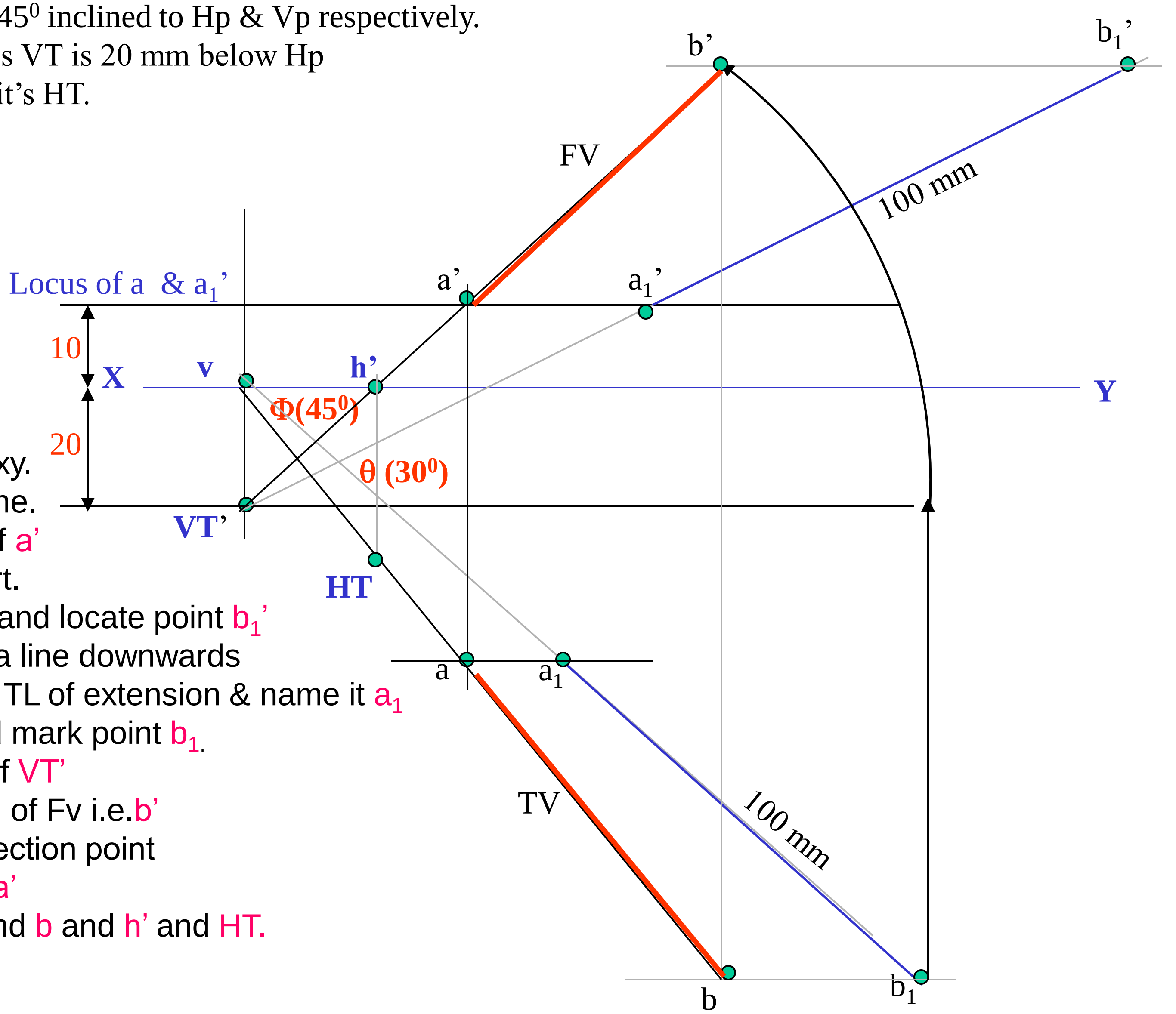


Then from point v & HT angles β & Φ can be drawn.
&
From point VT' & h' angles α & θ can be drawn.

THIS CONCEPT IS USED TO SOLVE NEXT *THREE* PROBLEMS.

PROBLEM 9 :-

Line AB 100 mm long is 30^0 and 45^0 inclined to Hp & Vp respectively.
End A is 10 mm above Hp and it's VT is 20 mm below Hp
.Draw projections of the line and it's HT.

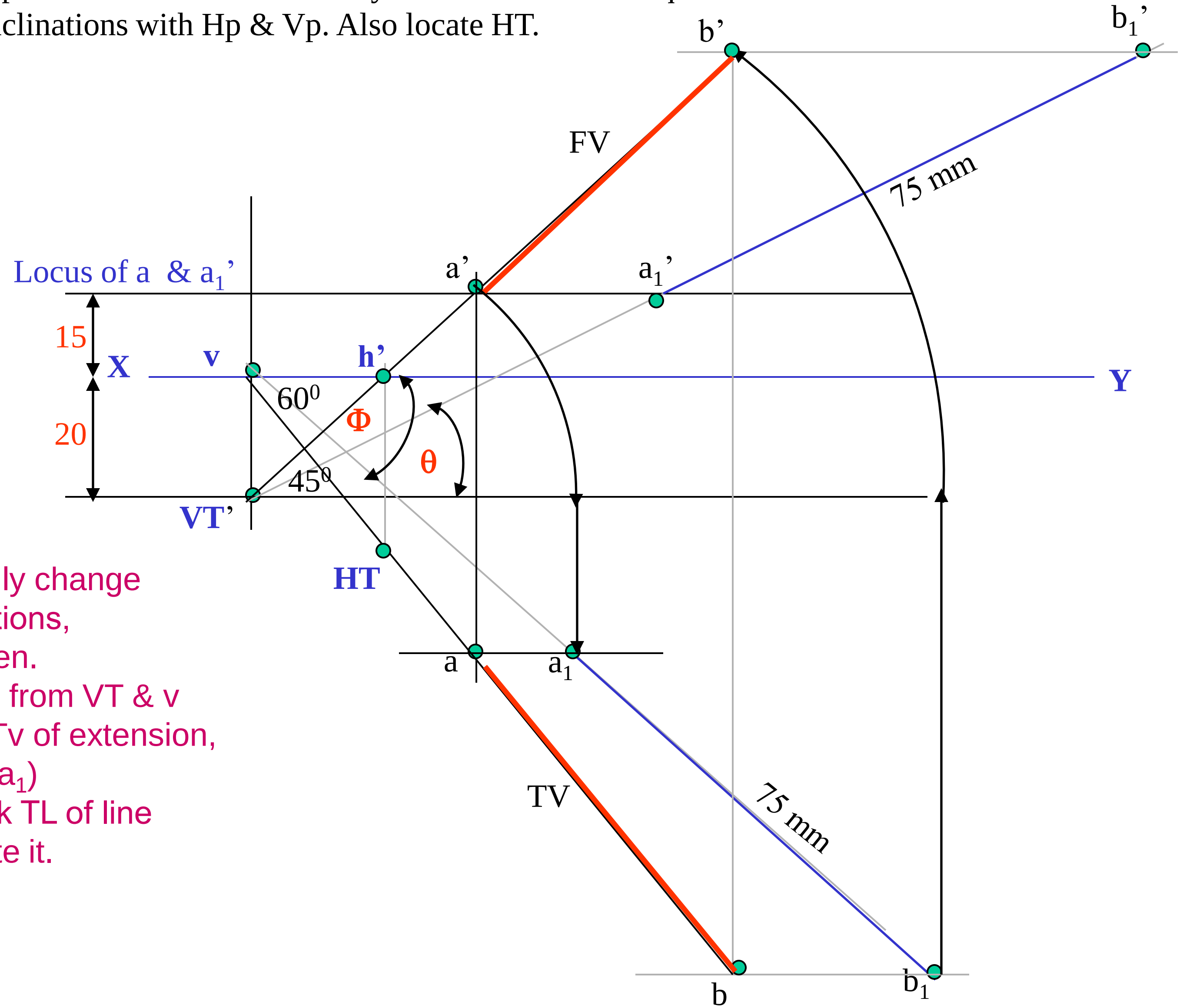


SOLUTION STEPS:-

Draw xy, one projector
and locate on it VT and V.
Draw locus of a' 10 mm above xy.
Take 30^0 from VT and draw a line.
Where it intersects with locus of a'
name it a_1' as it is TL of that part.
From a_1' cut 100 mm (TL) on it and locate point b_1'
Now from v take 45^0 and draw a line downwards
& Mark on it distance VT-a_1' I.e.TL of extension & name it a_1
Extend this line by 100 mm and mark point b_1.
Draw it's component on locus of VT'
& further rotate to get other end of Fv i.e.b'
Join it with VT' and mark intersection point
(with locus of a_1') and name it a'
Now as usual locate points a and b and h' and HT.

PROBLEM 10 :-

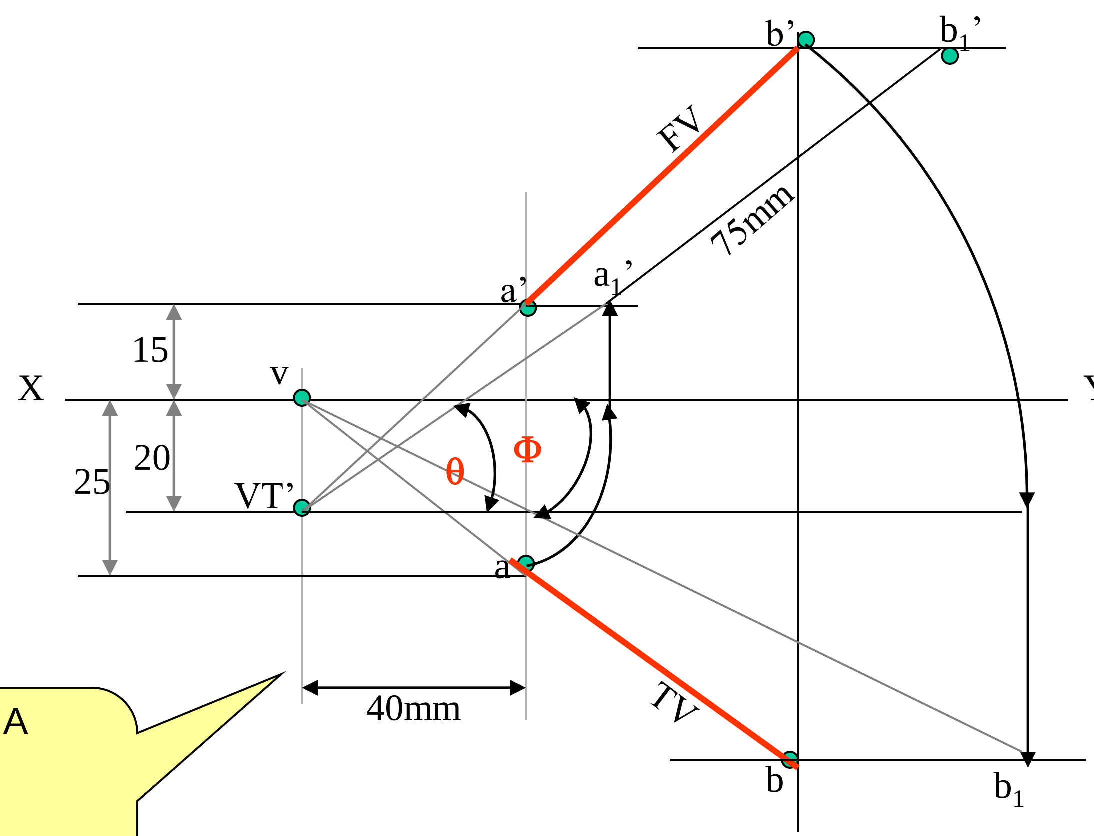
A line AB is 75 mm long. It's Fv & Tv make 45^0 and 60^0 inclinations with X-Y line resp
End A is 15 mm above Hp and VT is 20 mm below Xy line. Line is in first quadrant.
Draw projections, find inclinations with Hp & Vp. Also locate HT.



SOLUTION STEPS:-

Similar to the previous only change
is instead of line's inclinations,
views inclinations are given.
So first take those angles from VT & v
Properly, construct Fv & Tv of extension,
then determine it's TL(V-a_1)
and on it's extension mark TL of line
and proceed and complete it.

PROBLEM 11 :- The projectors drawn from VT & end A of line AB are 40mm apart. End A is 15mm above Hp and 25 mm in front of Vp. VT of line is 20 mm below Hp. If line is 75mm long, draw it's projections, find inclinations with HP & Vp



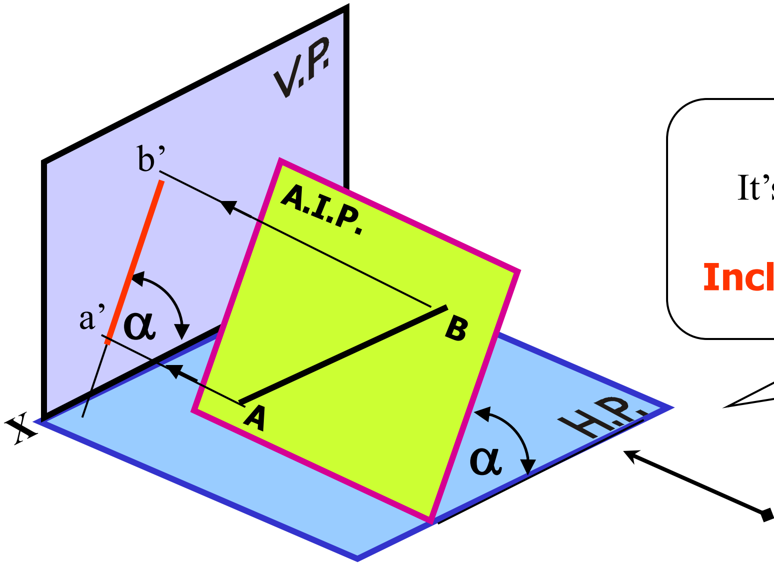
Draw two projectors for VT & end A
Locate these points and then

YES !

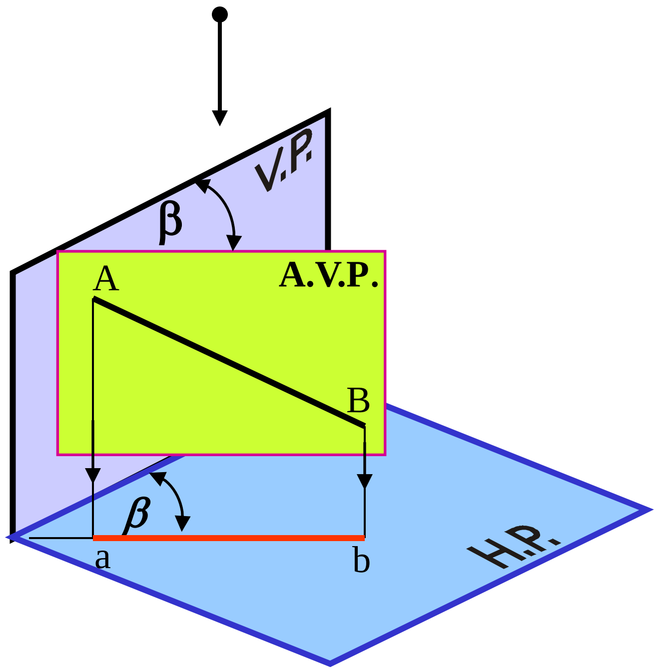
YOU CAN COMPLETE IT.

GROUP (C)

CASES OF THE LINES IN A.V.P., A.I.P. & PROFILE PLANE.

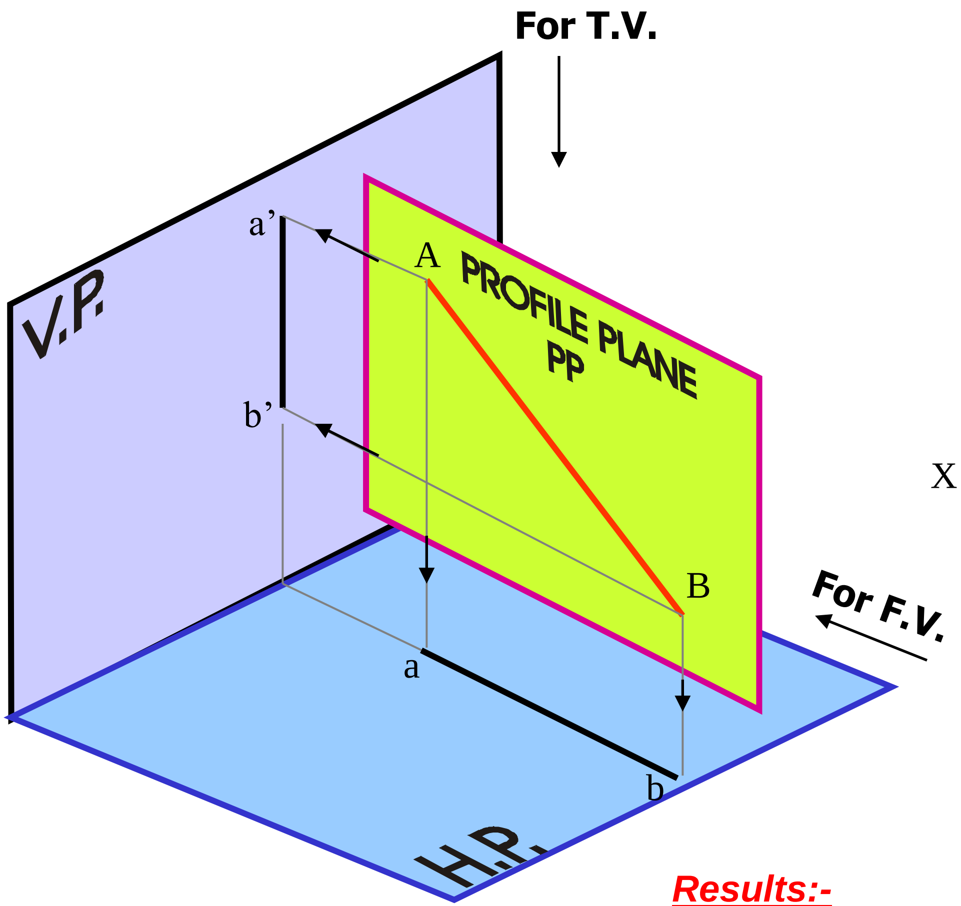


Line AB is in AIP as shown in above figure no 1.
It's FV (a'b') is shown projected on Vp.(Looking in arrow direction)
Here one can clearly see that the
Inclination of AIP with HP = Inclination of FV with XY line

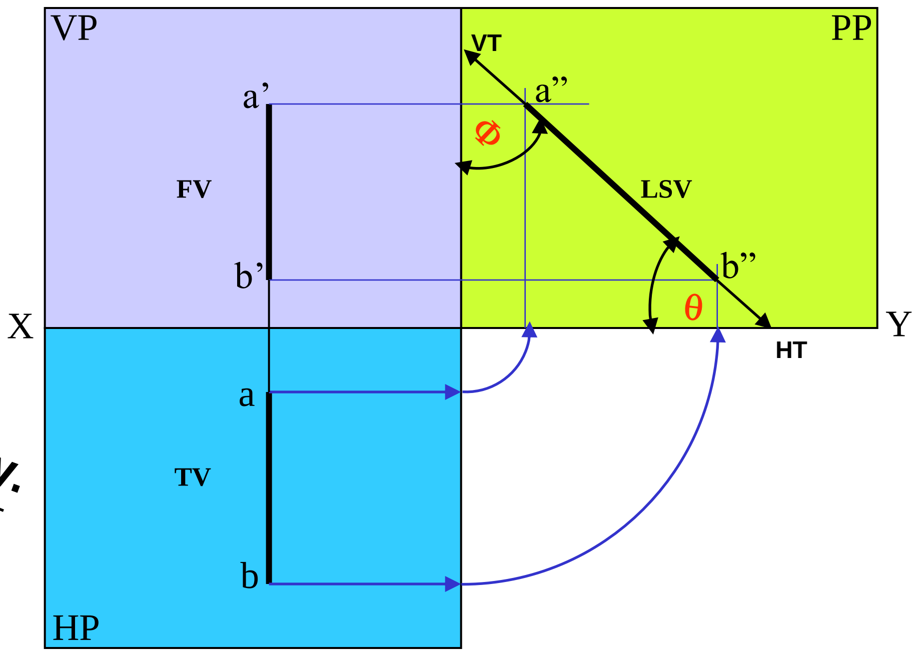


Line AB is in AVP as shown in above figure no 2..
It's TV (a b) is shown projected on Hp.(Looking in arrow direction)
Here one can clearly see that the
Inclination of AVP with VP = Inclination of TV with XY line

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



ORTHOGRAPHIC PATTERN OF LINE IN PROFILE PLANE

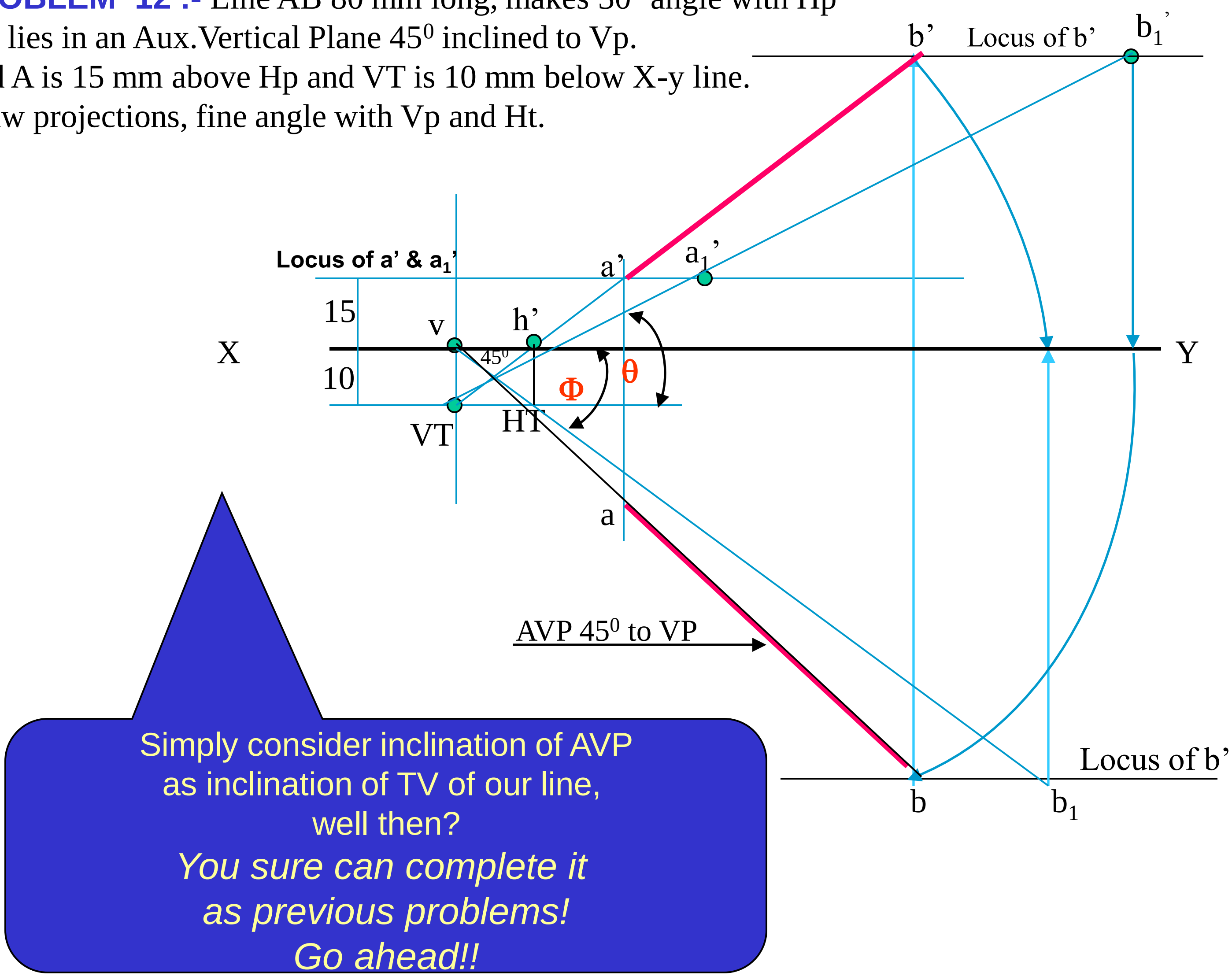


Results:-

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 2^{nd} SOLVED PROBLEM.

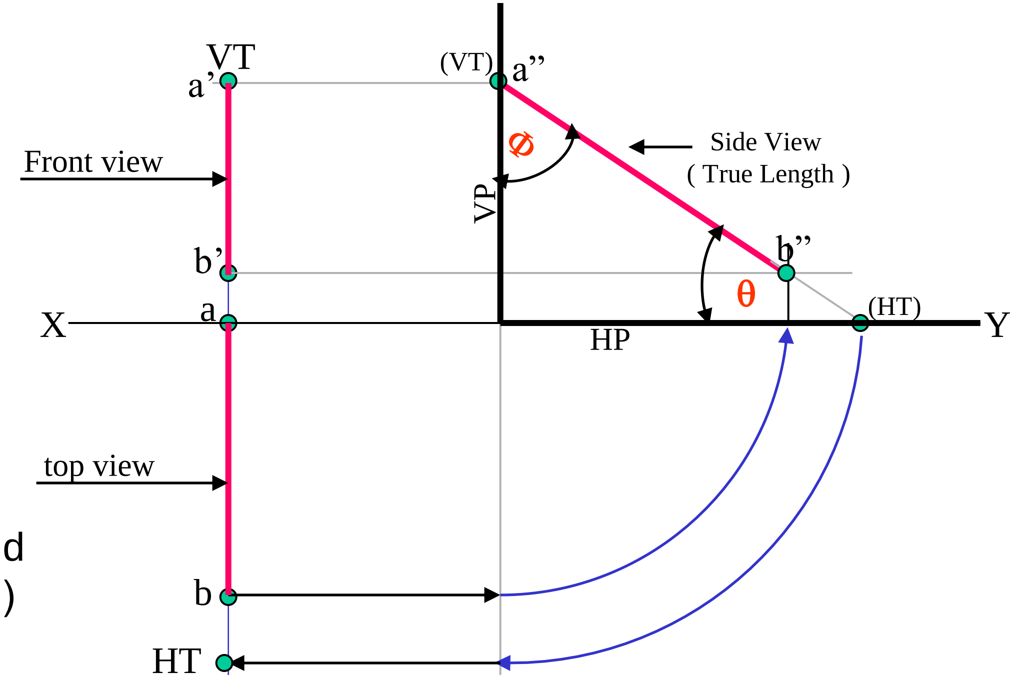
PROBLEM 12 :- Line AB 80 mm long, makes 30^0 angle with Hp and lies in an Aux.Vertical Plane 45^0 inclined to Vp. End A is 15 mm above Hp and VT is 10 mm below X-y line. Draw projections, fine angle with Vp and Ht.



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.



APPLICATIONS OF PRINCIPLES OF PROJECTIONS OF LINES
IN SOLVING CASES OF DIFFERENT PRACTICAL SITUATIONS.

In these types of problems some situation in the field
or
some object will be described .
It's relation with Ground (HP)
And
a Wall or some vertical object (VP) will be given.

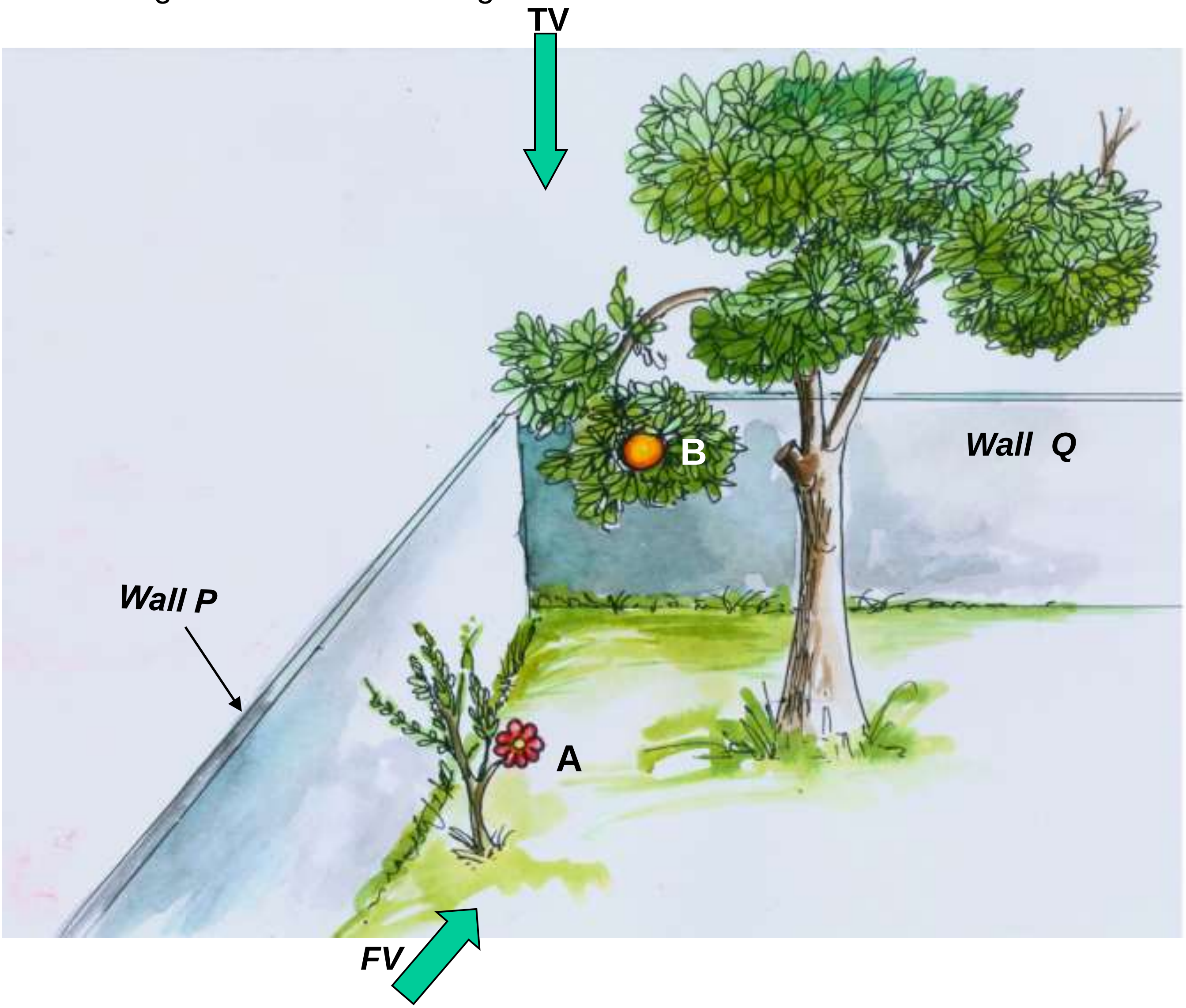
Indirectly information regarding Fv & Tv of some line or lines,
inclined to both reference Planes will be given
and
you are supposed to draw it's projections
and
further to determine it's true Length and it's inclinations with ground.

Here various problems along with
actual pictures of those situations are given
for you to understand those clearly.
Now looking for views in given ARROW directions,
YOU are supposed to draw projections & find answers,
Off course you must visualize the situation properly.

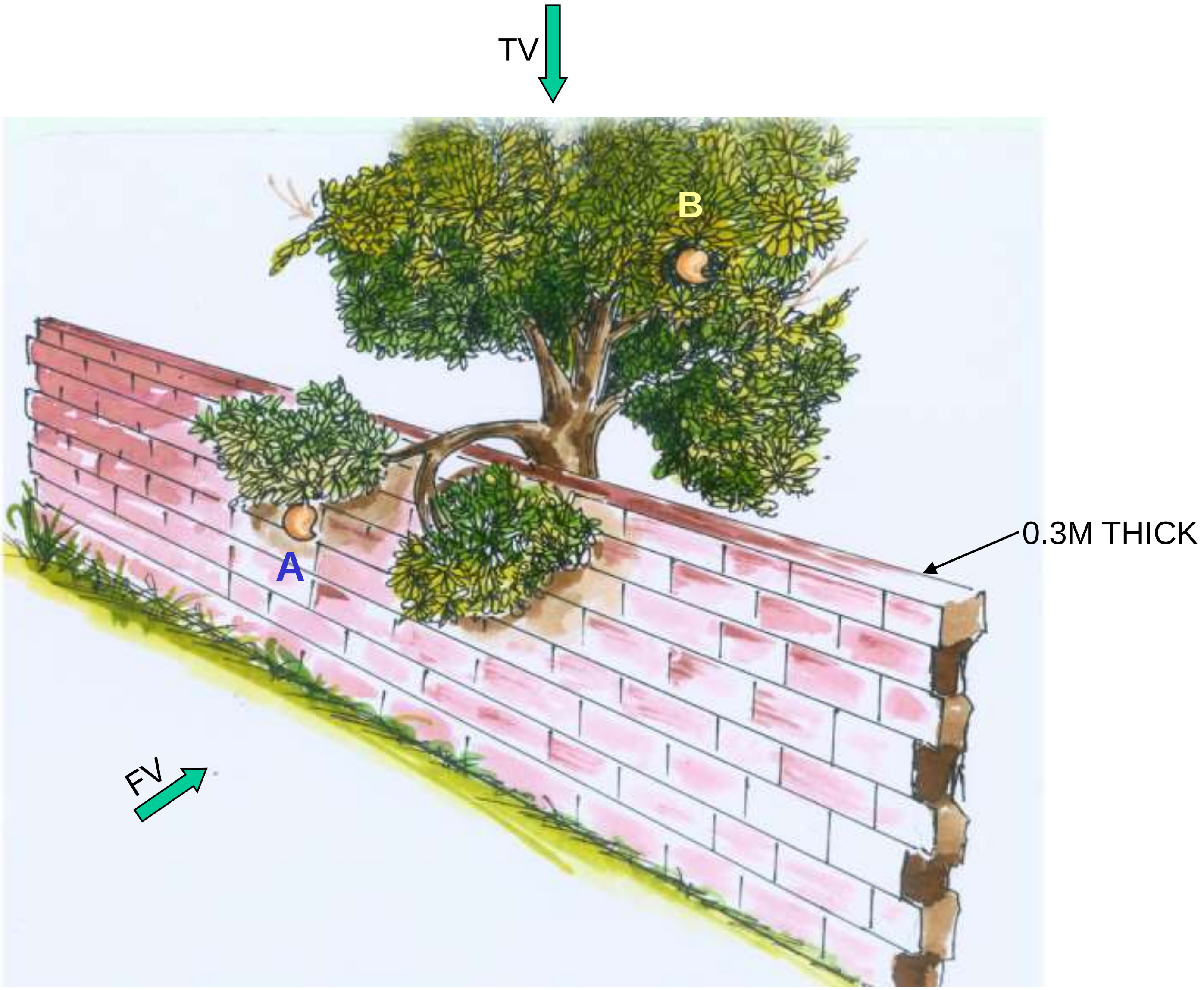
CHECK YOUR ANSWERS
WITH THE SOLUTIONS
GIVEN IN THE END.

ALL THE BEST !!

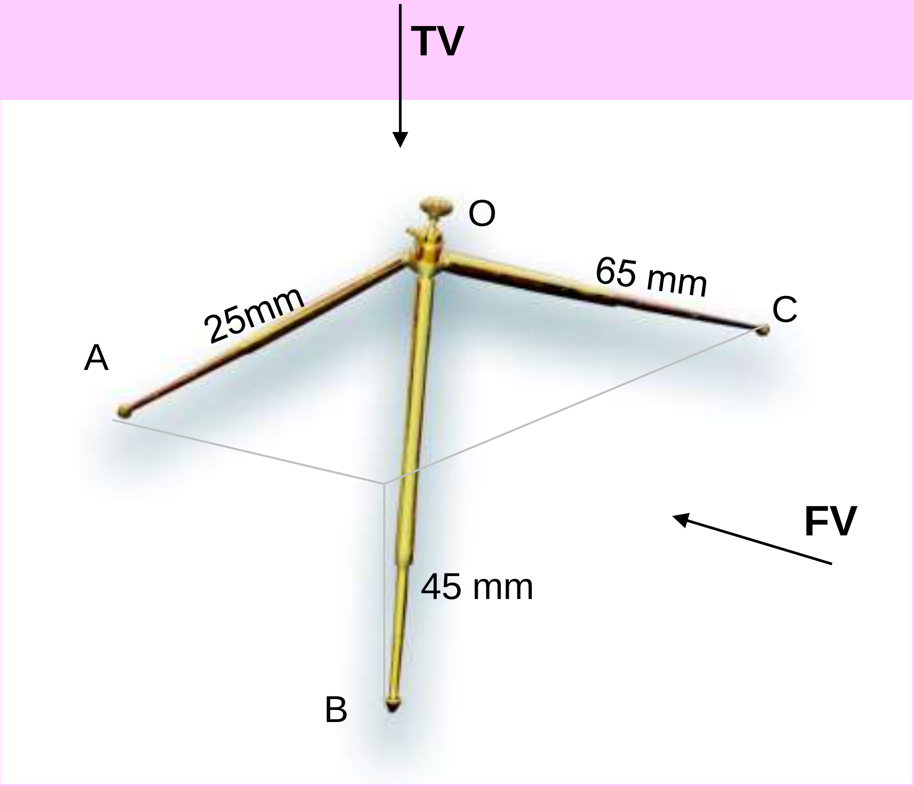
PROBLEM 14:-Two objects, a flower (A) and an orange (B) are within a rectangular compound wall, whose P & Q are walls meeting at 90^0. Flower A is 1M & 5.5 M from walls P & Q respectively. Orange B is 4M & 1.5M from walls P & Q respectively. Drawing projection, find distance between them If flower is 1.5 M and orange is 3.5 M above the ground. Consider suitable scale..



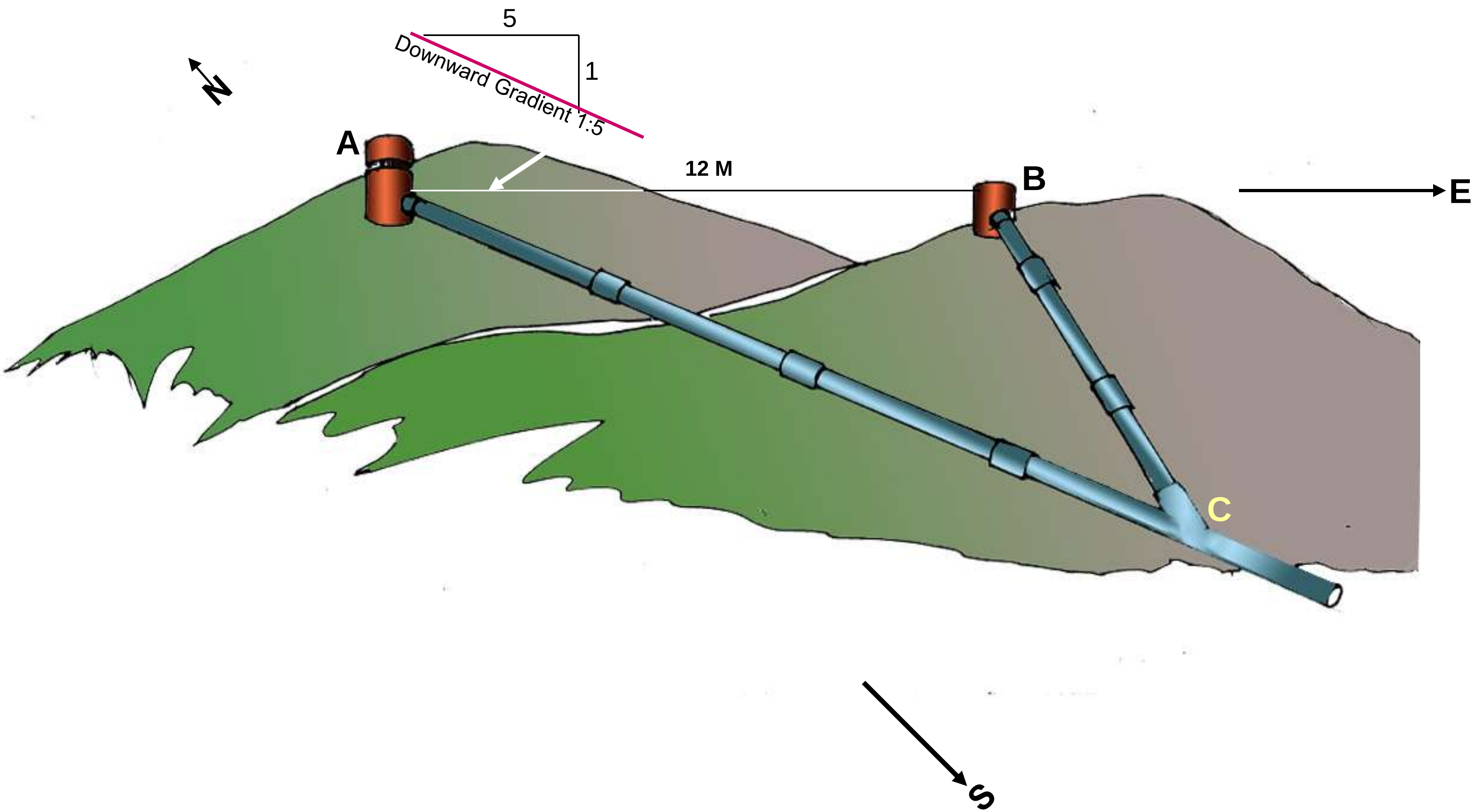
PROBLEM 15 :- Two mangos on a tree A & B are 1.5 m and 3.00 m above ground and those are 1.2 m & 1.5 m from a 0.3 m thick wall but on opposite sides of it.
If the distance measured between them along the ground and parallel to wall is 2.6 m,
Then find real distance between them by drawing their projections.



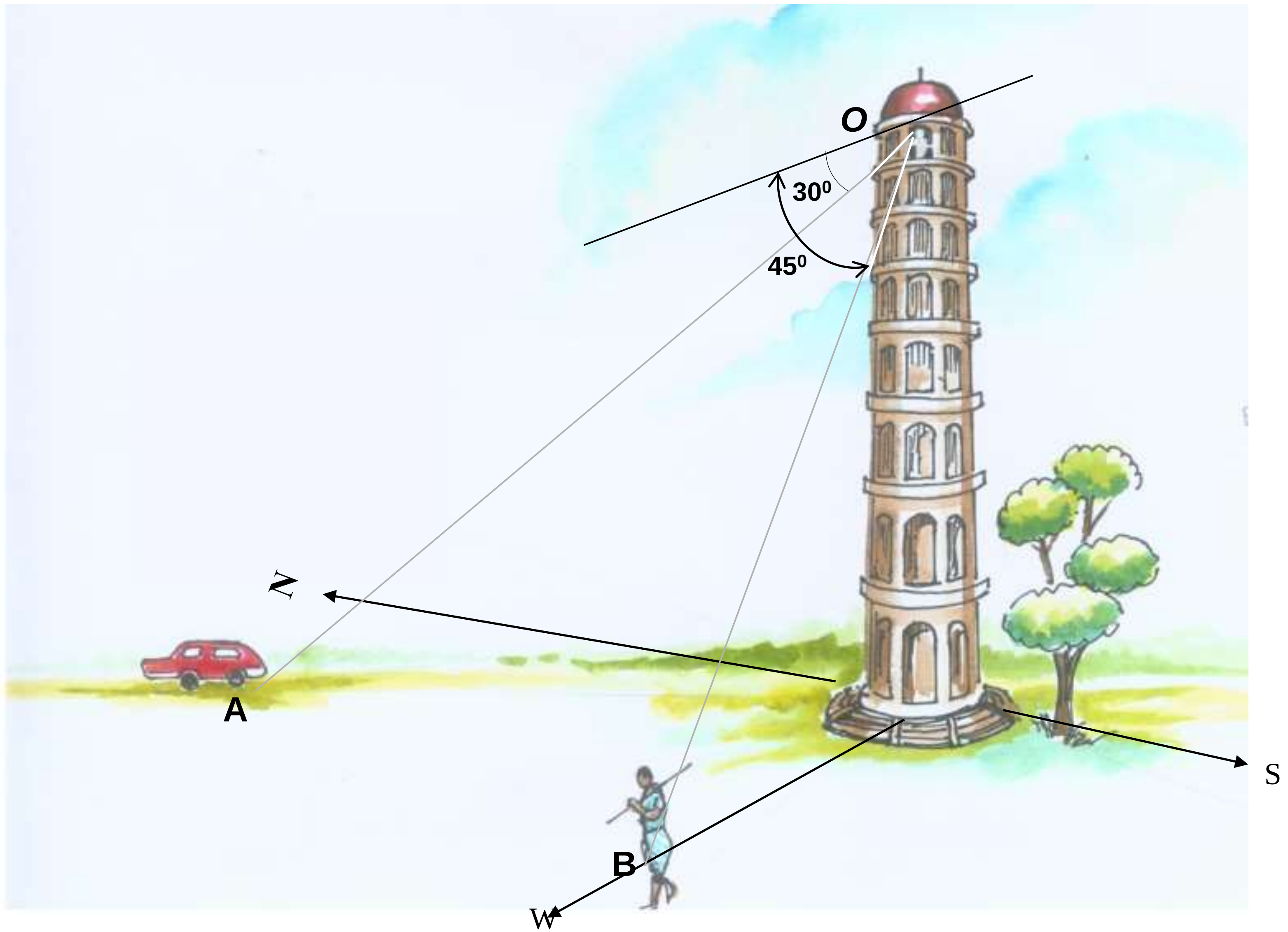
PROBLEM 16 :- oa, ob & oc are three lines, 25mm, 45mm and 65mm long respectively.All equally inclined and the shortest is vertical.This fig. is TV of three rods OA, OB and OC whose ends A,B & C are on ground and end O is 100mm above ground. Draw their projections and find length of each along with their angles with ground.



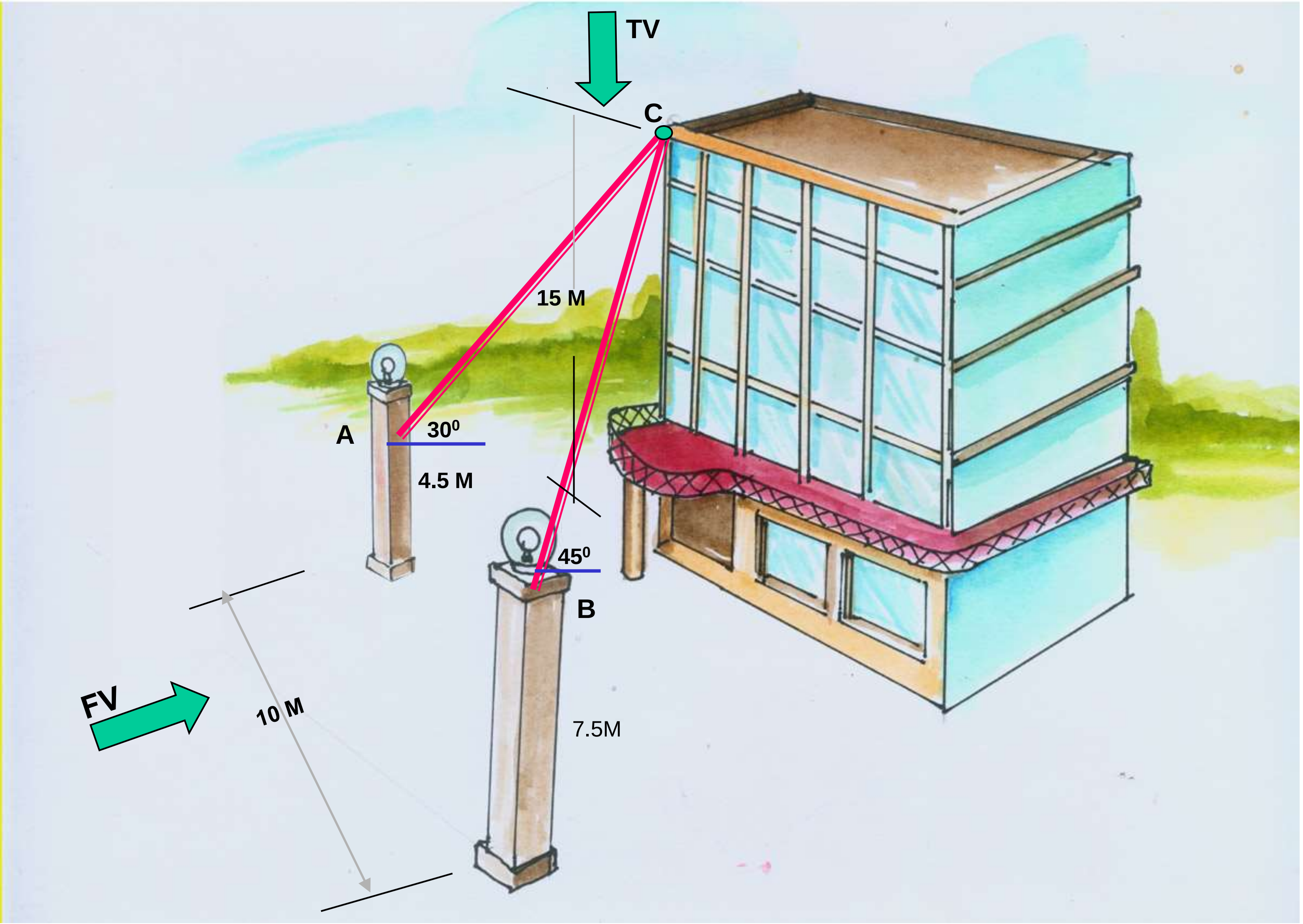
PROBLEM 17:- A pipe line from point **A** has a downward gradient 1:5 and it runs due East-South. Another Point B is 12 M from **A** and due East of **A** and in same level of **A.** Pipe line from **B** runs 20^0 Due East of South and meets pipe line from **A** at point **C.**
Draw projections and find length of pipe line from B and it's inclination with ground.



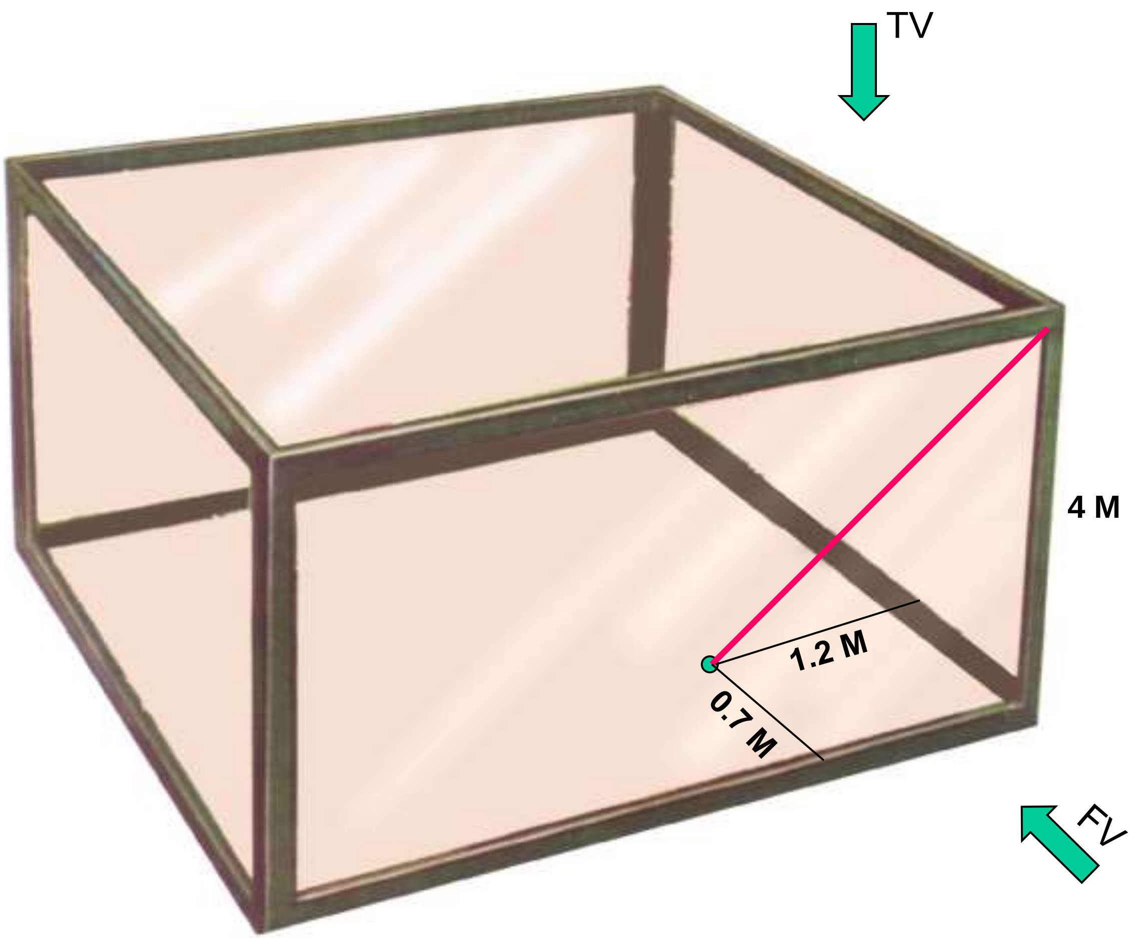
PROBLEM 18: A person observes two objects, A & B, on the ground, from a tower, 15 M high, At the angles of depression 30^0 & 45^0. Object A is is due North-West direction of observer and object B is due West direction. Draw projections of situation and find distance of objects from observer and from tower also.



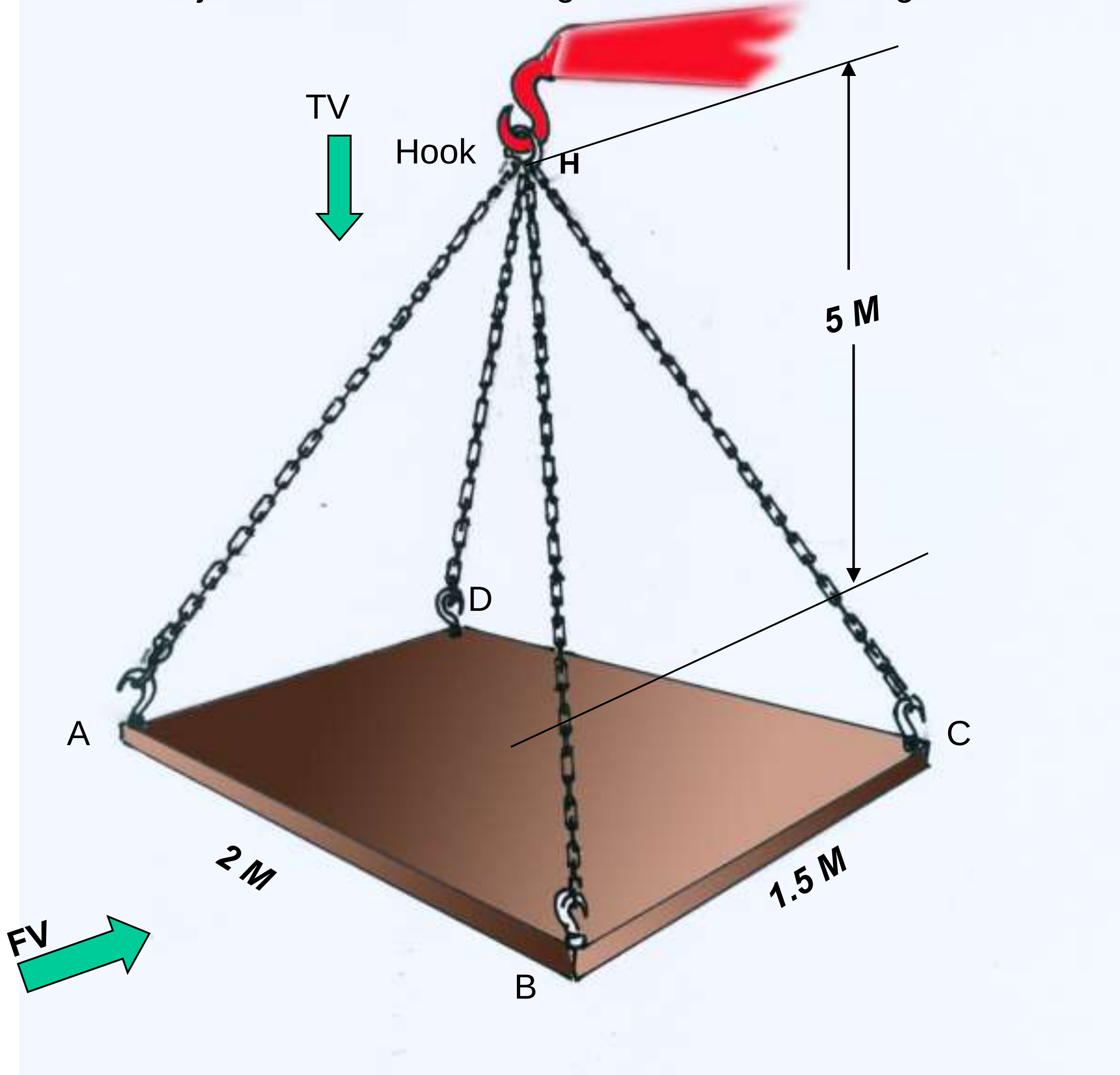
PROBLEM 19:-Guy ropes of two poles fixed at 4.5m and 7.5 m above ground, are attached to a corner of a building 15 M high, make 300 and 450 inclinations with ground respectively.The poles are 10 M apart. Determine by drawing their projections,Length of each rope and distance of poles from building.



PROBLEM 20:- A tank of 4 M height is to be strengthened by four stay rods from each corner by fixing their other ends to the flooring, at a point 1.2 M and 0.7 M from two adjacent walls respectively, as shown. Determine graphically length and angle of each rod with flooring.

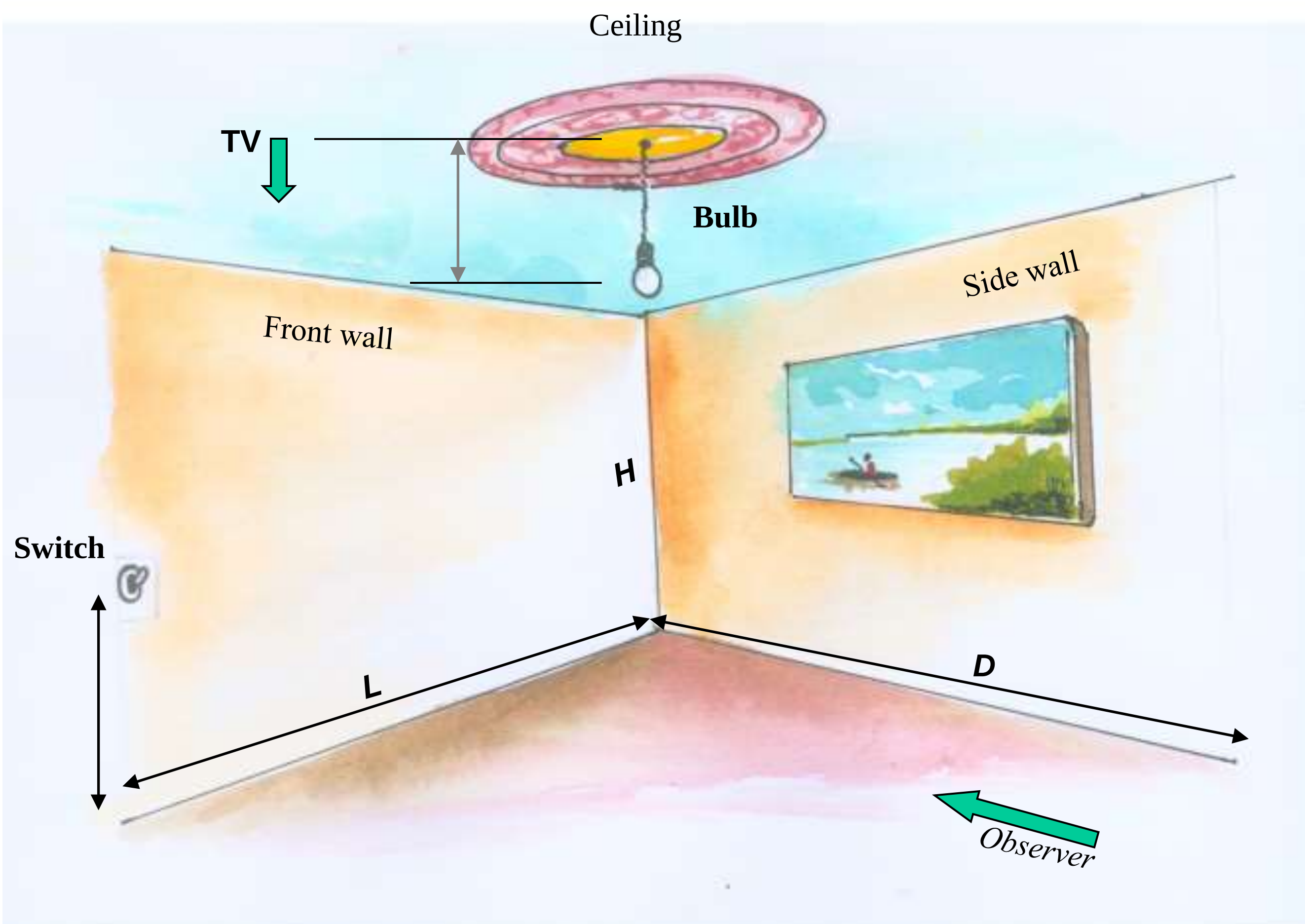


PROBLEM 21:- A horizontal wooden platform 2 M long and 1.5 M wide is supported by four chains from it's corners and chains are attached to a hook 5 M above the center of the platform.
Draw projections of the objects and determine length of each chain along with it's inclination with ground.



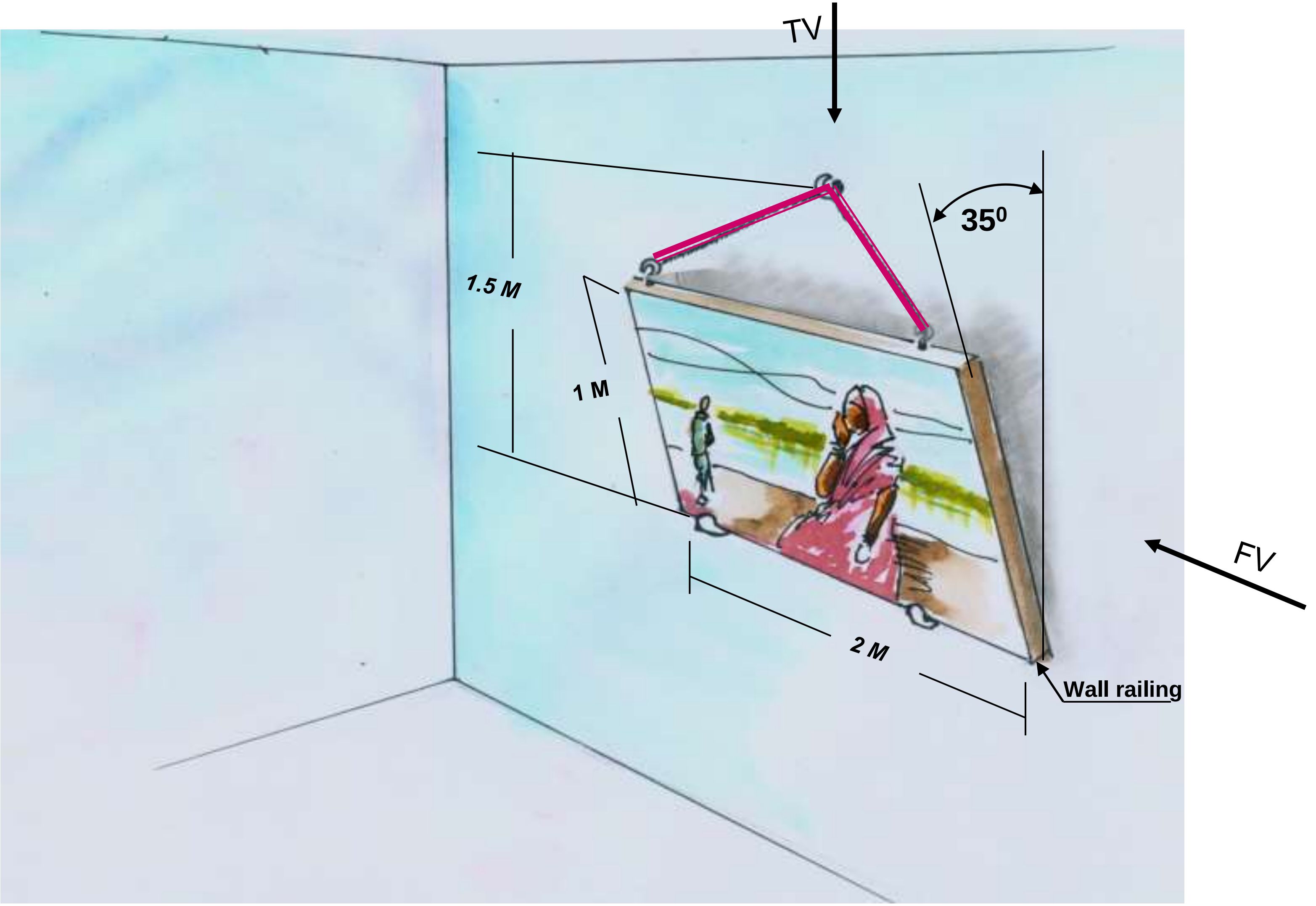
PROBLEM 22.

A room is of size 6.5m L ,5m D,3.5m high.
An electric bulb hangs 1m below the center of ceiling.
A switch is placed in one of the corners of the room, 1.5m above the flooring.
Draw the projections an determine real distance between the bulb and switch.



PROBLEM 23:-

A PICTURE FRAME 2 M WIDE AND 1 M TALL IS RESTING ON HORIZONTAL WALL RAILING MAKES 35^0 INCLINATION WITH WALL. IT IS ATTAACHED TO A HOOK IN THE WALL BY TWO STRINGS. THE HOOK IS 1.5 M ABOVE WALL RAILING. DETERMINE LENGTH OF EACH CHAIN AND TRUE ANGLE BETWEEN THEM



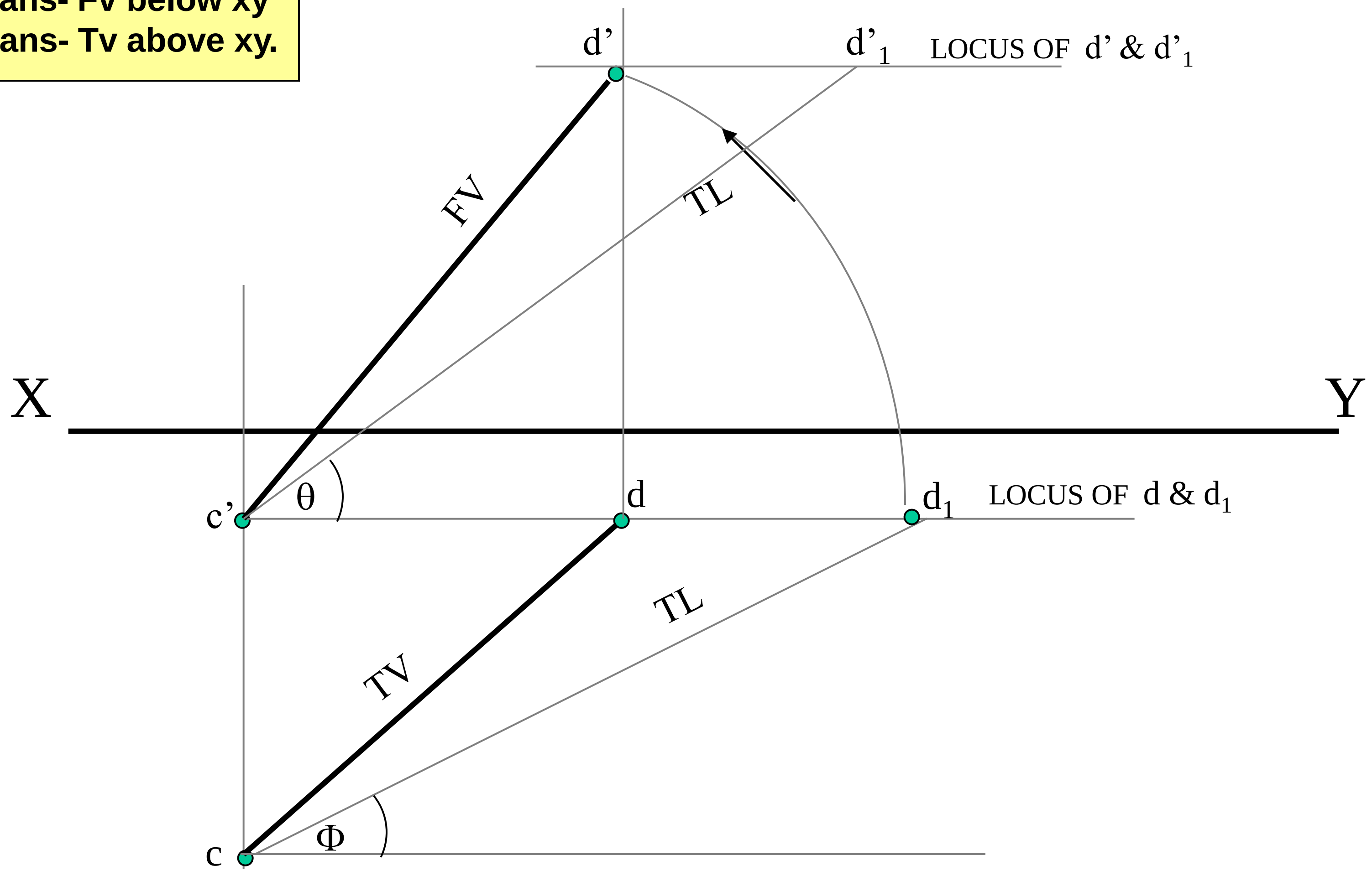
PROBLEM NO.24

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.

SOME CASES OF THE LINE IN DIFFERENT QUADRANTS.

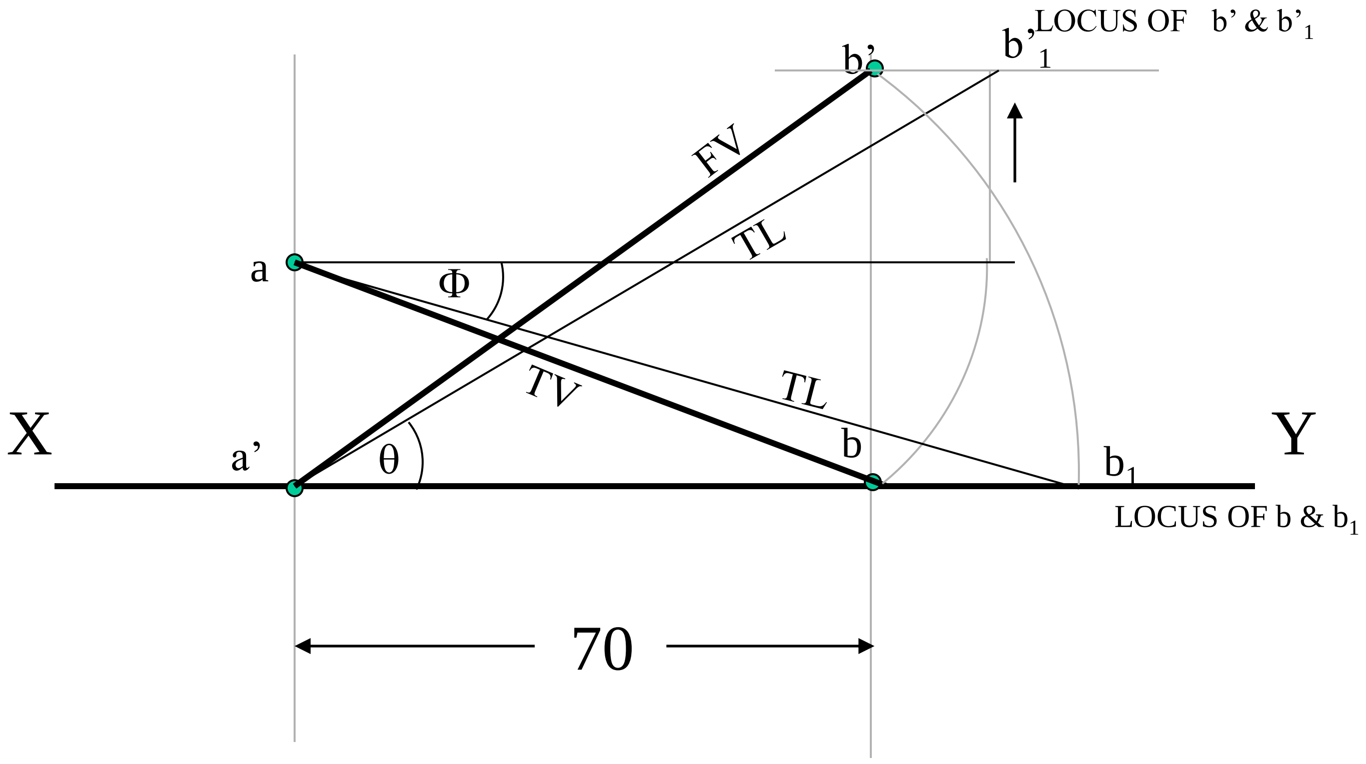
REMEMBER:

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



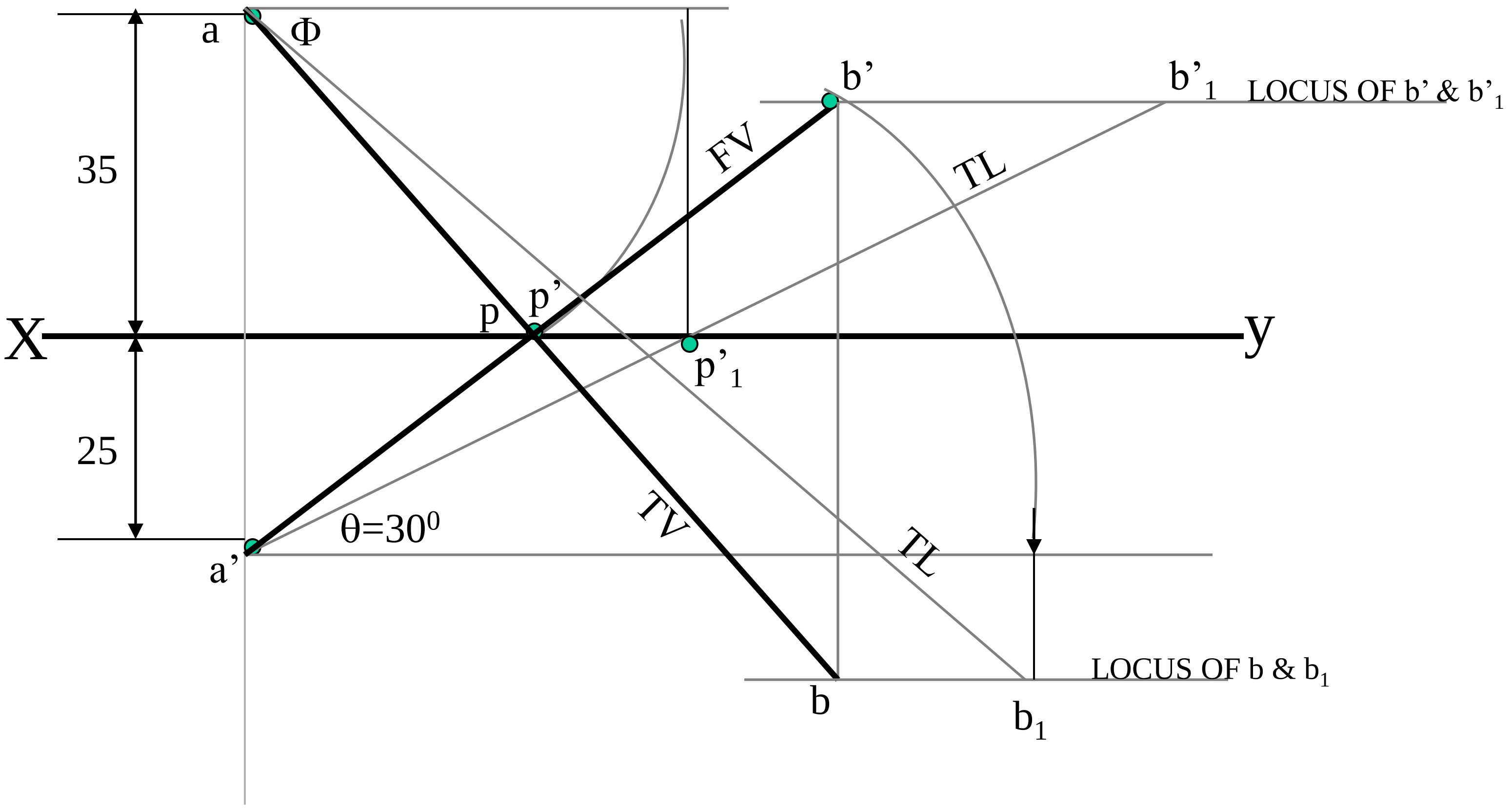
PROBLEM NO.25

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.



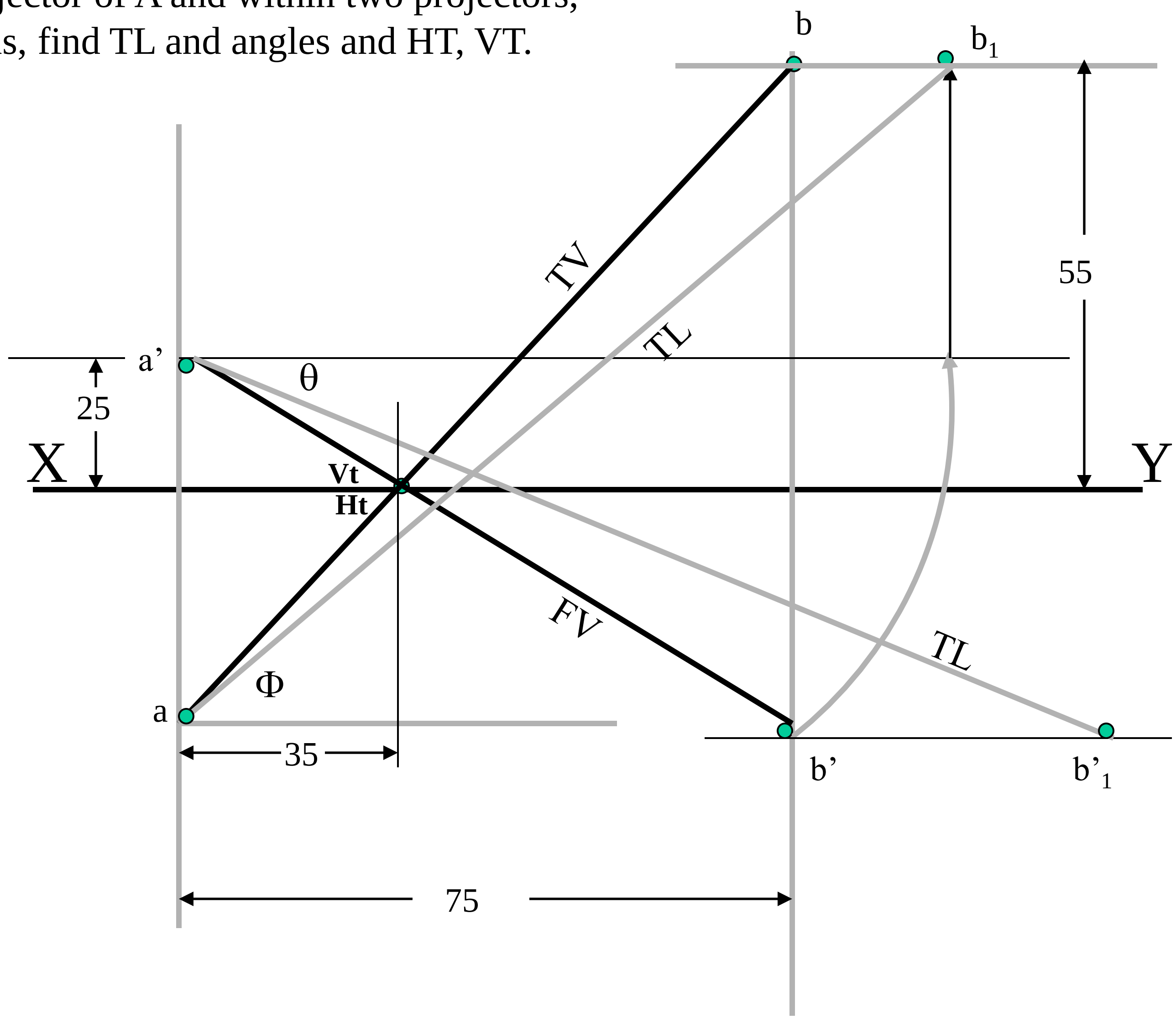
PROBLEM NO.26

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.

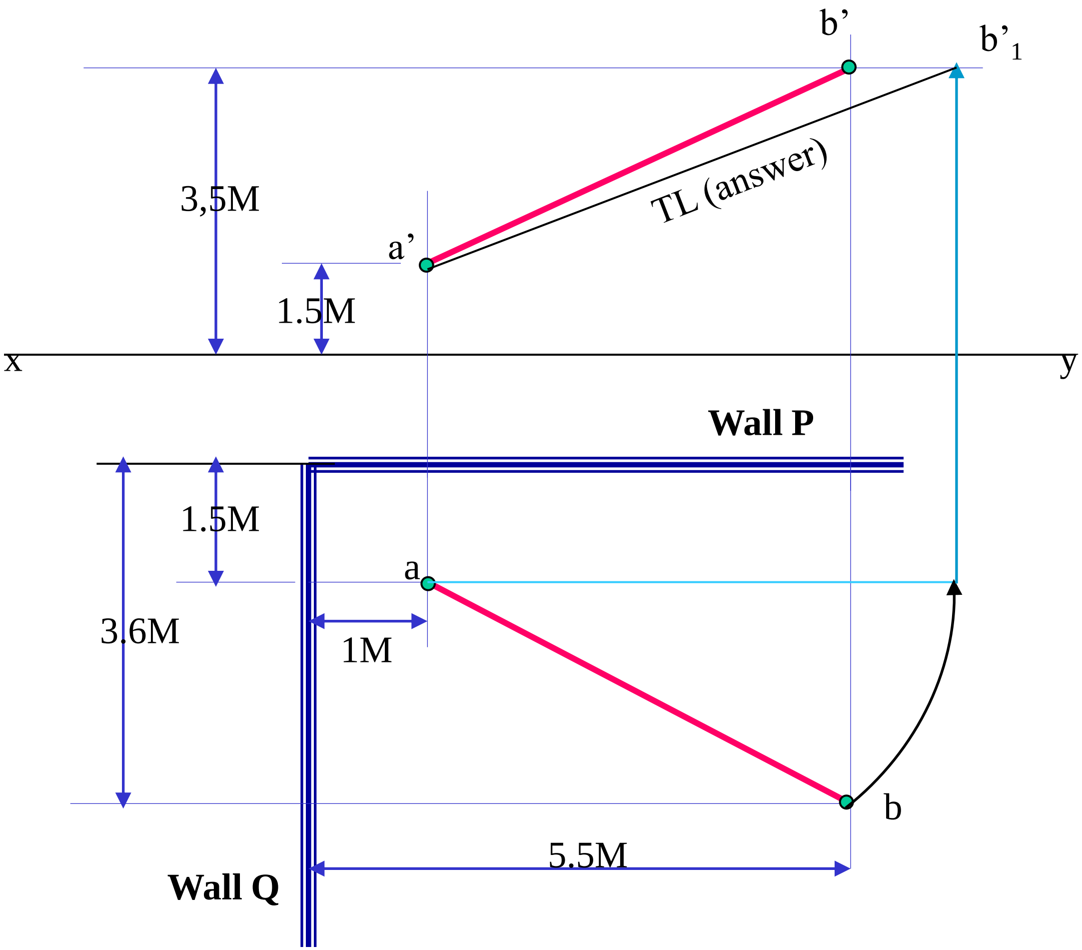


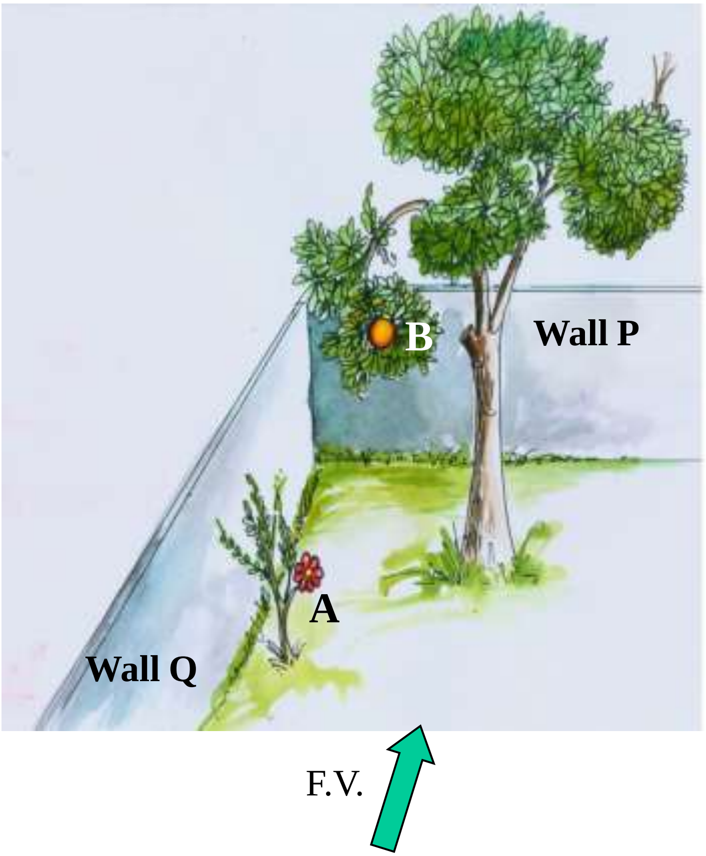
PROBLEM NO.27

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.

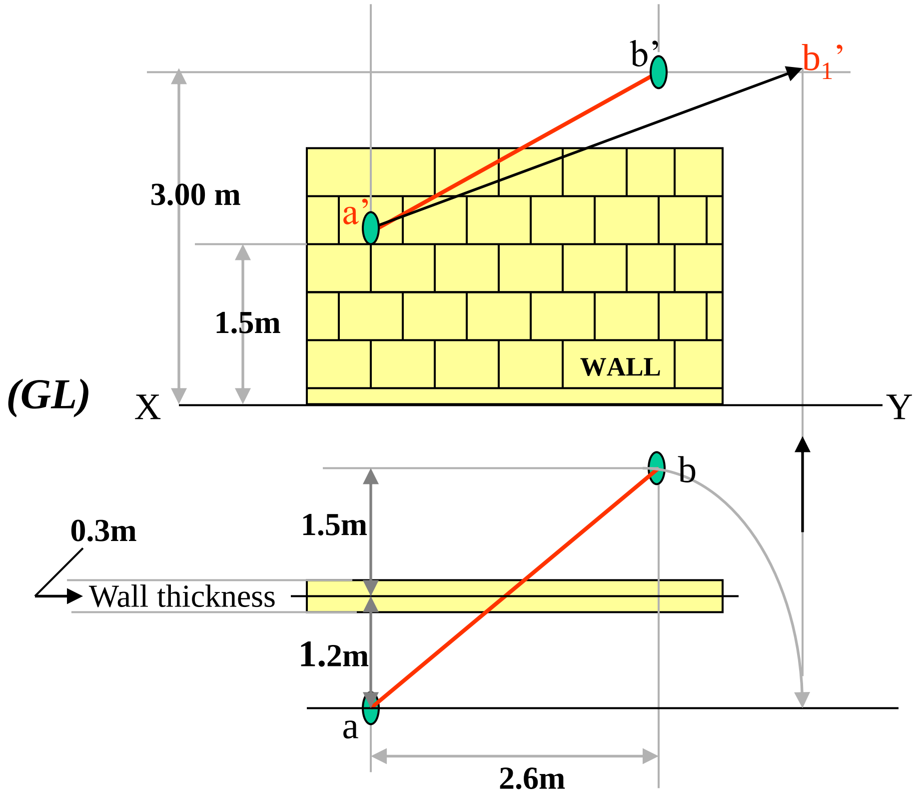


PROBLEM 14:-Two objects, a flower (A) and an orange (B) are within a rectangular compound wall, whose P & Q are walls meeting at 90^0. Flower A is 1.5M & 1 M from walls P & Q respectively. Orange B is 3.5M & 5.5M from walls P & Q respectively. Drawing projection, find distance between them If flower is 1.5 M and orange is 3.5 M above the ground. Consider suitable scale..

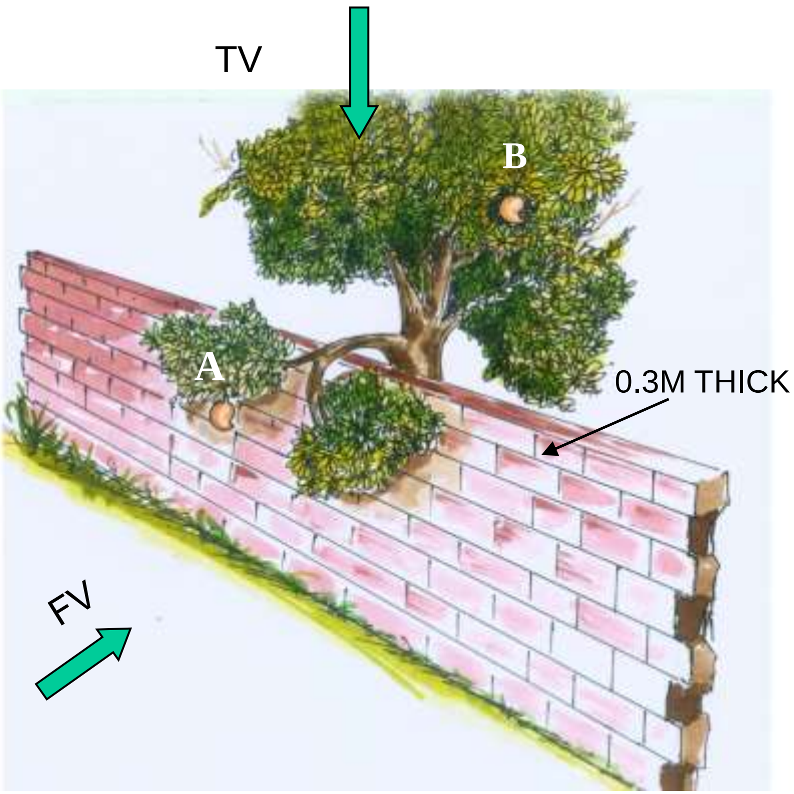




PROBLEM 15 :- Two mangos on a tree A & B are 1.5 m and 3.00 m above ground and those are 1.2 m & 1.5 m from a 0.3 m thick wall but on opposite sides of it. If the distance measured between them along the ground and parallel to wall is 2.6 m, Then find real distance between them by drawing their projections.

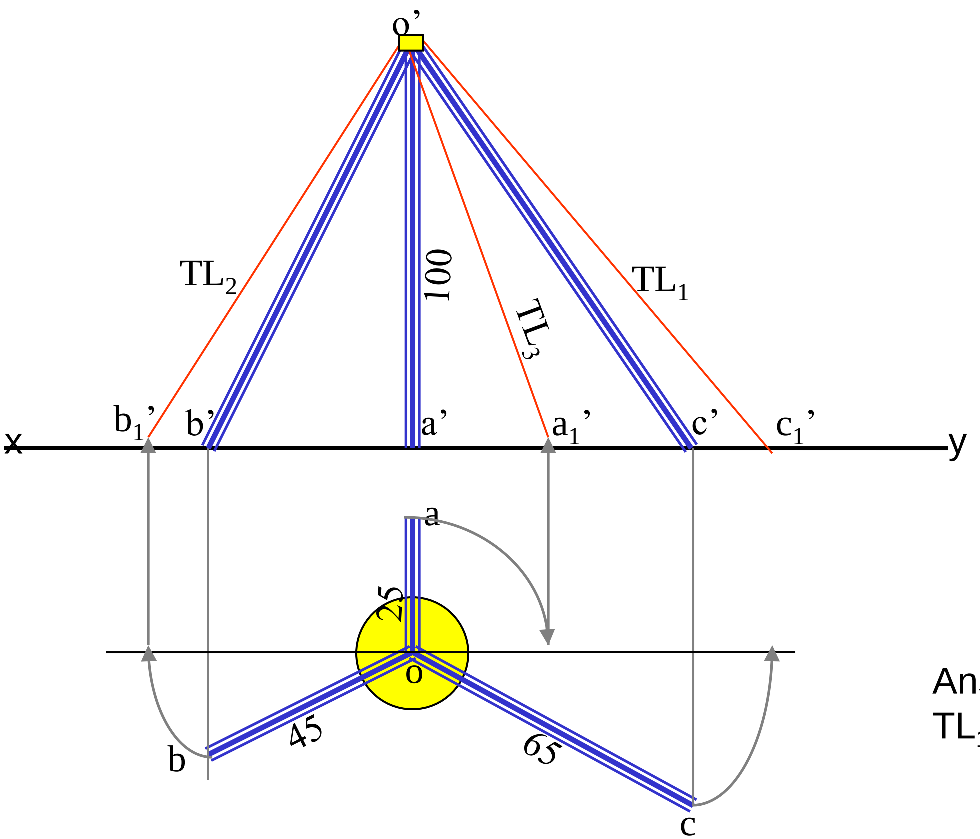


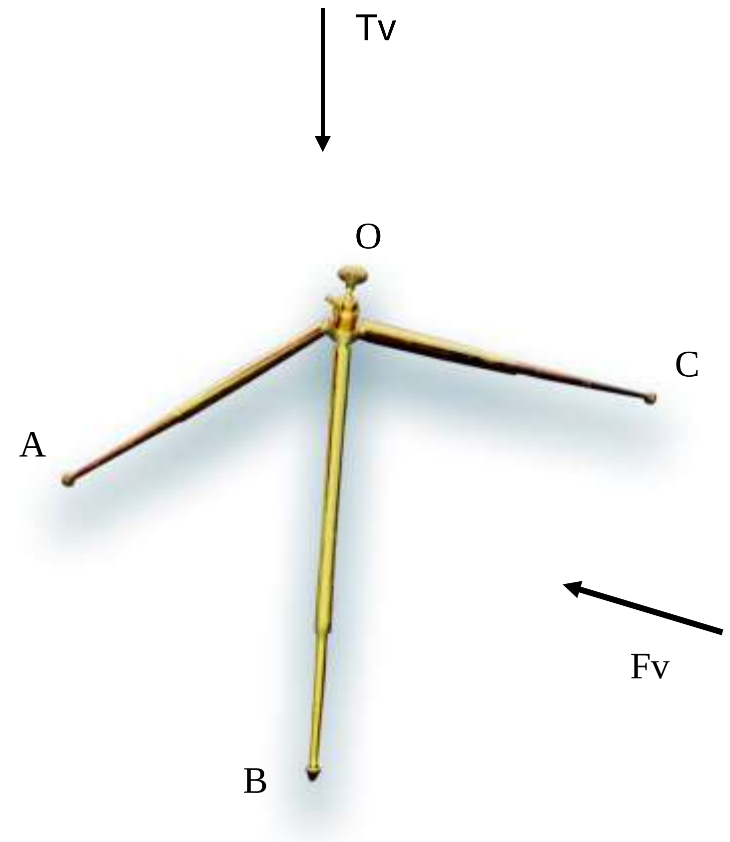
REAL DISTANCE BETWEEN MANGOS A & B IS = a' b_1'



PROBLEM 16 :-

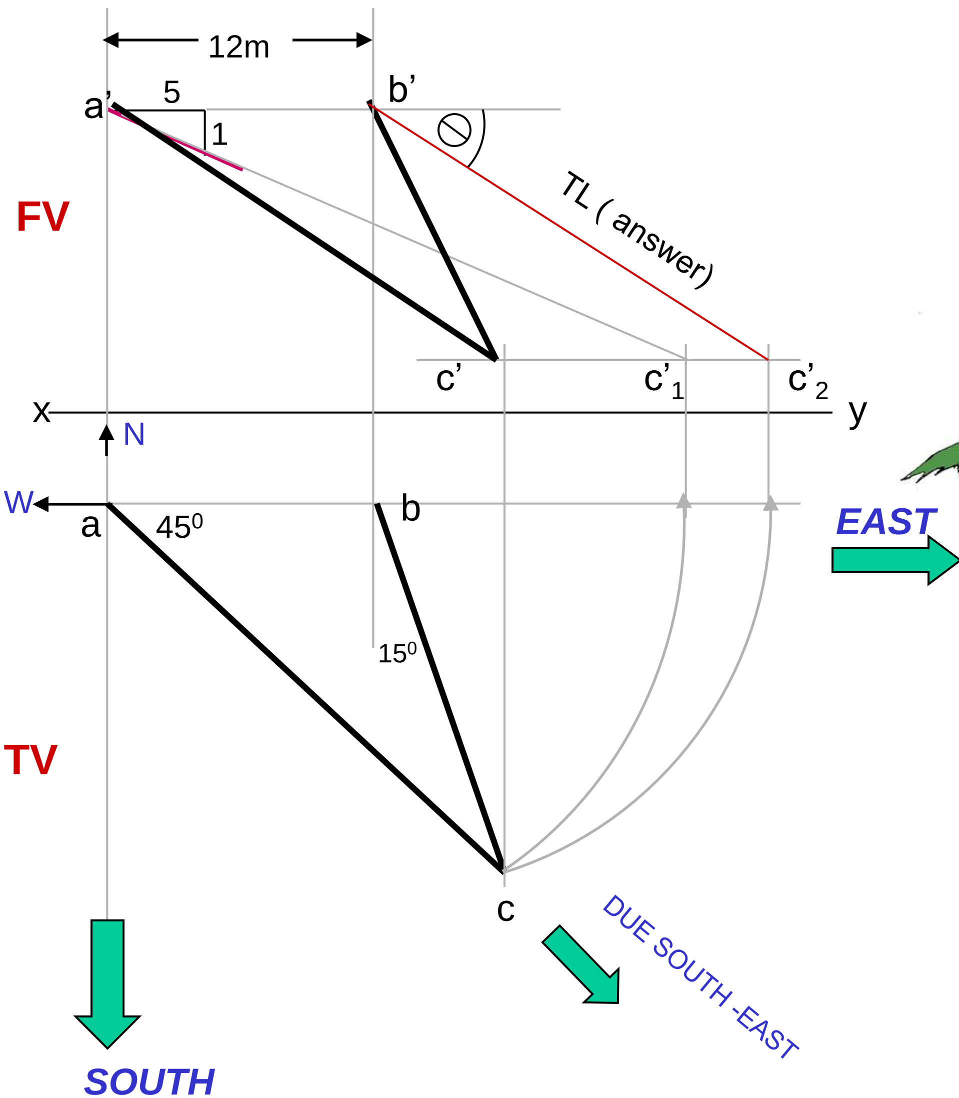
oa, ob & oc are three lines, 25mm, 45mm and 65mm long respectively.All equally inclined and the shortest is vertical.This fig. is TV of three rods OA, OB and OC whose ends A,B & C are on ground and end O is 100mm above ground. Draw their projections and find length o each along with their angles with ground.

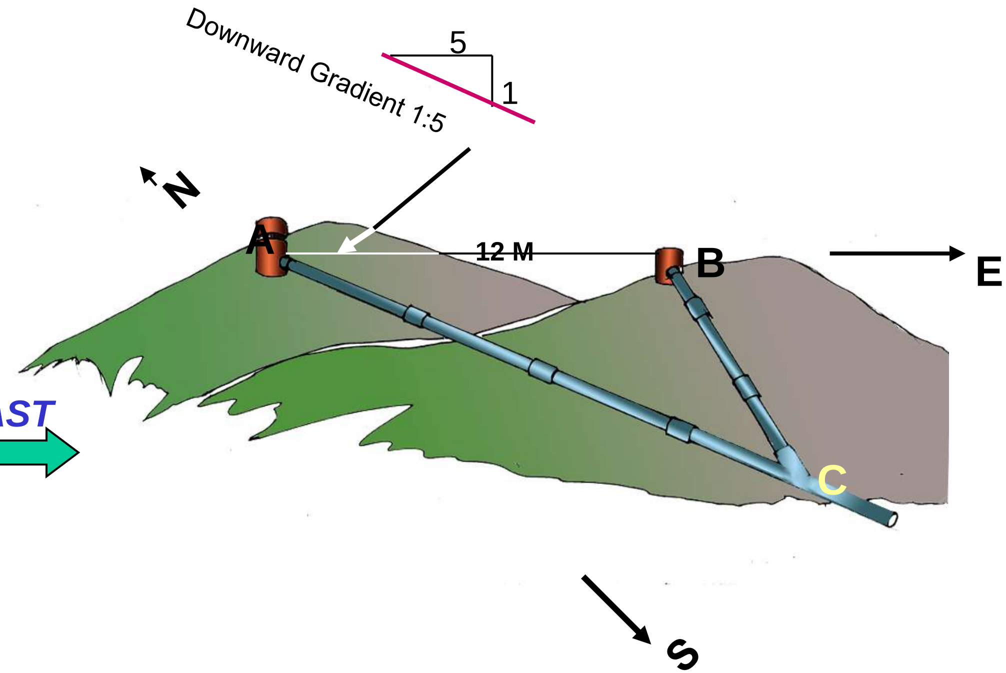




Answers:
TL_1 TL_2 & TL_3

PROBLEM 17:- **A pipe line from point A has a downward gradient 1:5 and it runs due South - East. Another Point B is 12 M from A and due East of A and in same level of A. Pipe line from B runs 15^0 Due East of South and meets pipe line from A at point C.**
Draw projections and find length of pipe line from B and it's inclination with ground.

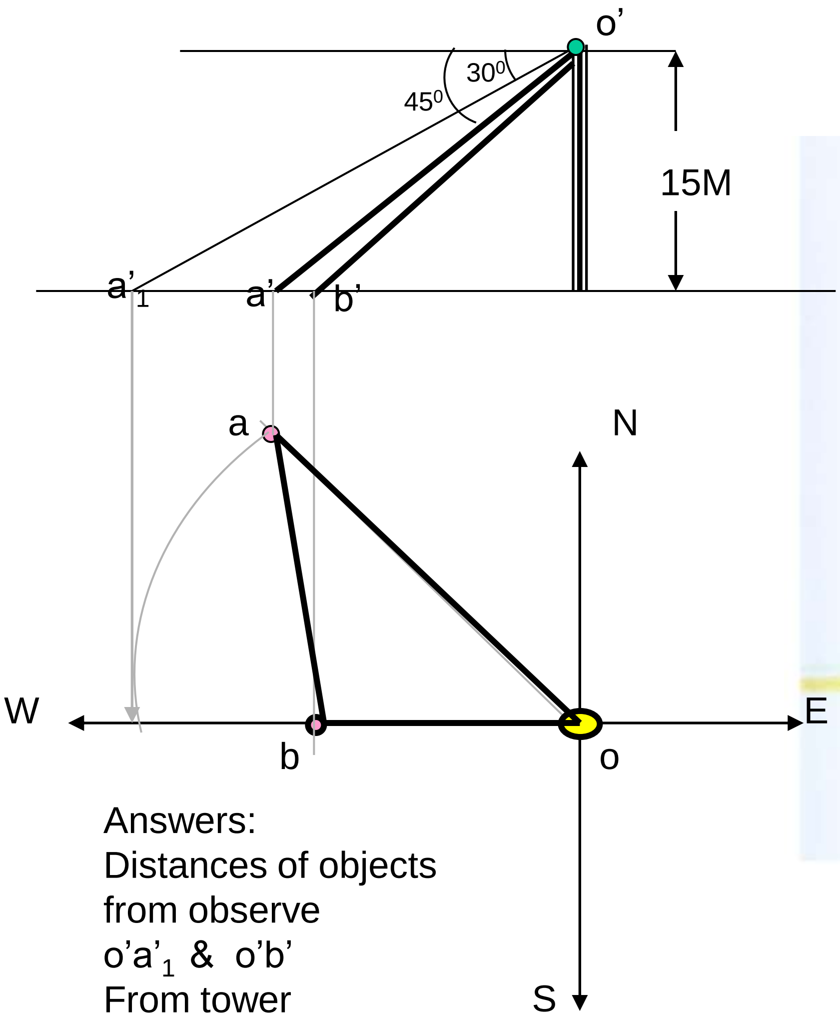




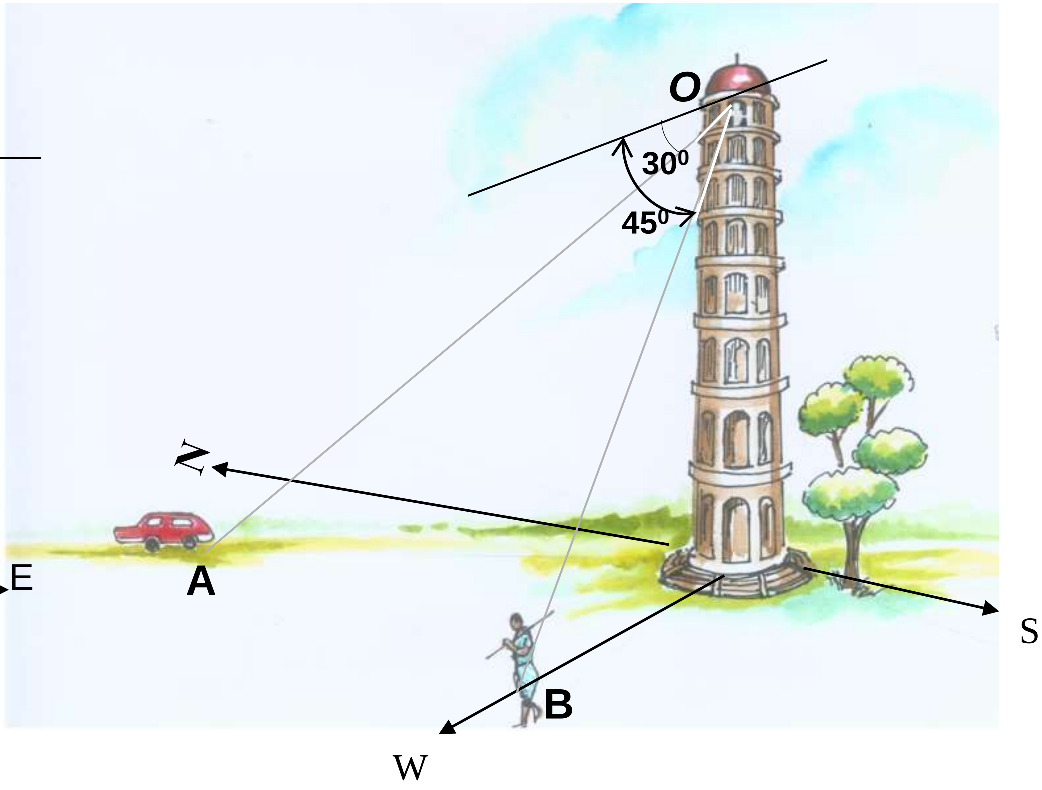
TL (answer) = a' c'_2

⊘ = Inclination of pipe line BC

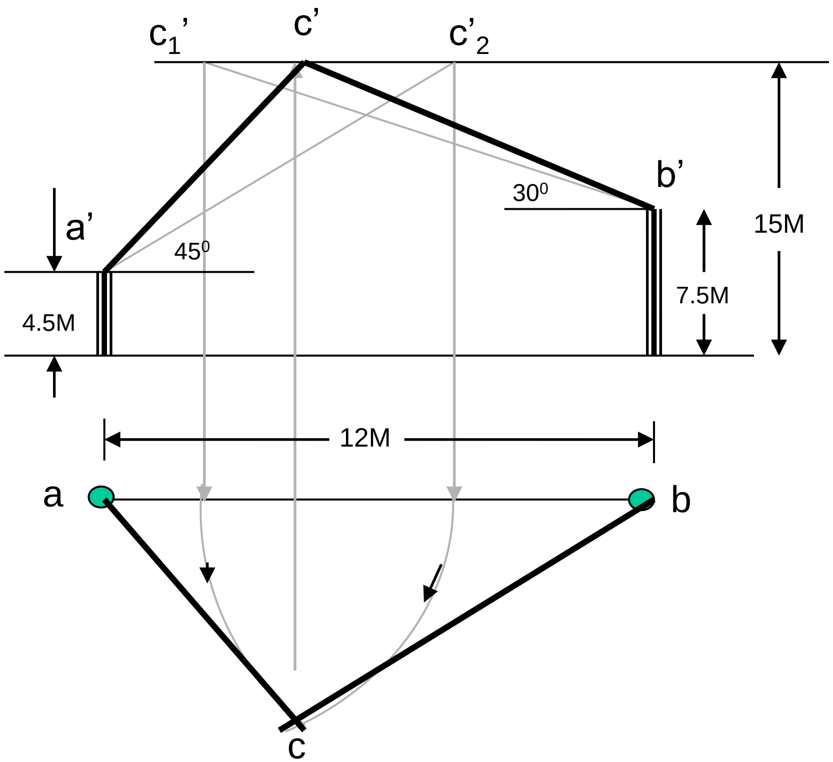
PROBLEM 18: **A person observes two objects, A & B, on the ground, from a tower, 15 M high, At the angles of depression 30⁰ & 45⁰. Object A is is due North-West direction of observer and object B is due West direction. Draw projections of situation and find distance of objects from observer and from tower also.**

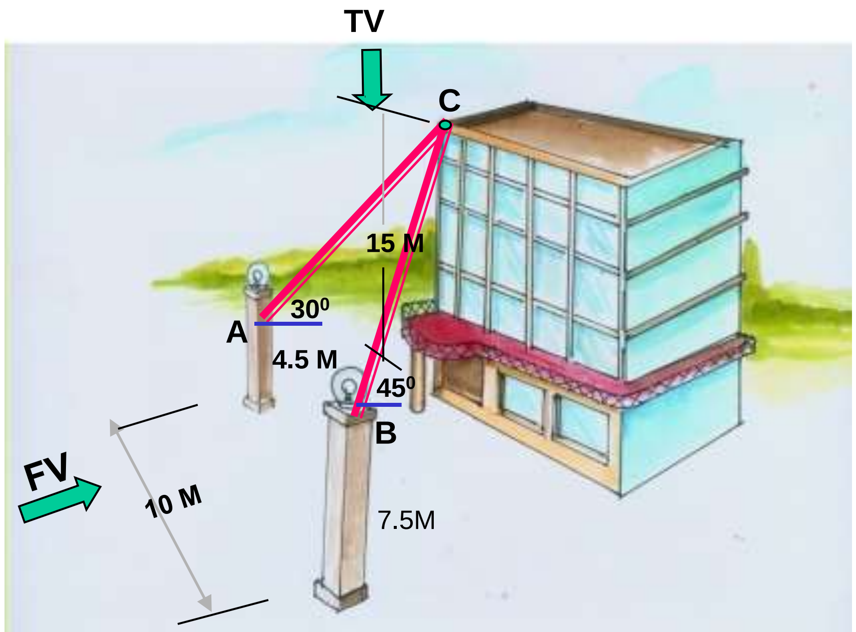


Answers:
Distances of objects
from observe
o'a'$_1$ & o'b'
From tower
oa & ob



PROBLEM 19:-Guy ropes of two poles fixed at 4.5m and 7.5 m above ground, are attached to a corner of a building 15 M high, make 30^0 and 45^0 inclinations with ground respectively.The poles are 10 M apart. Determine by drawing their projections,Length of each rope and distance of poles from building.



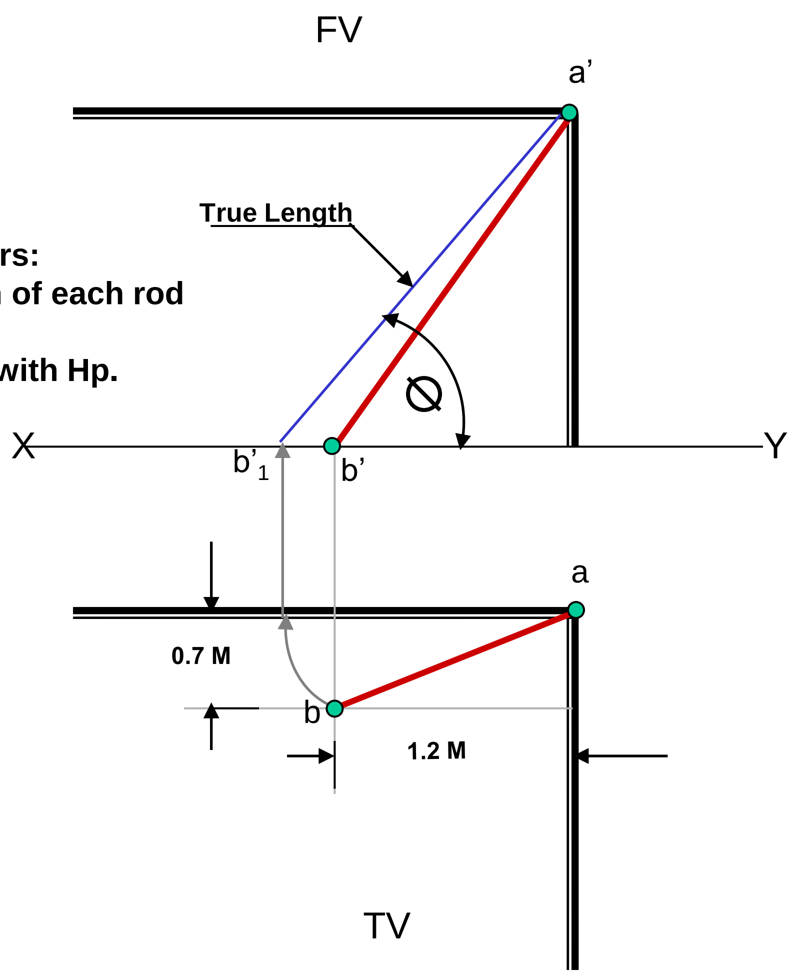


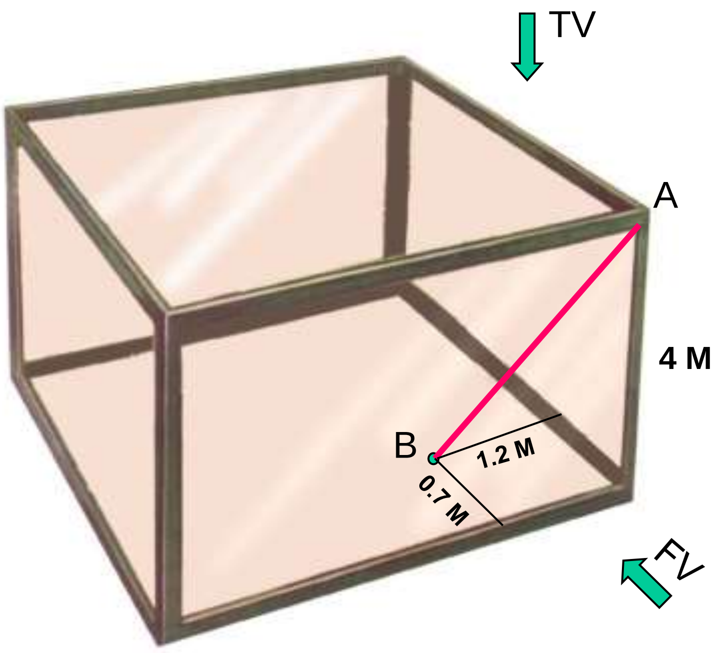
Answers:
Length of Rope BC= $b'c'_2$
Length of Rope AC= $a'c'_1$

Distances of poles from building = ca & cb

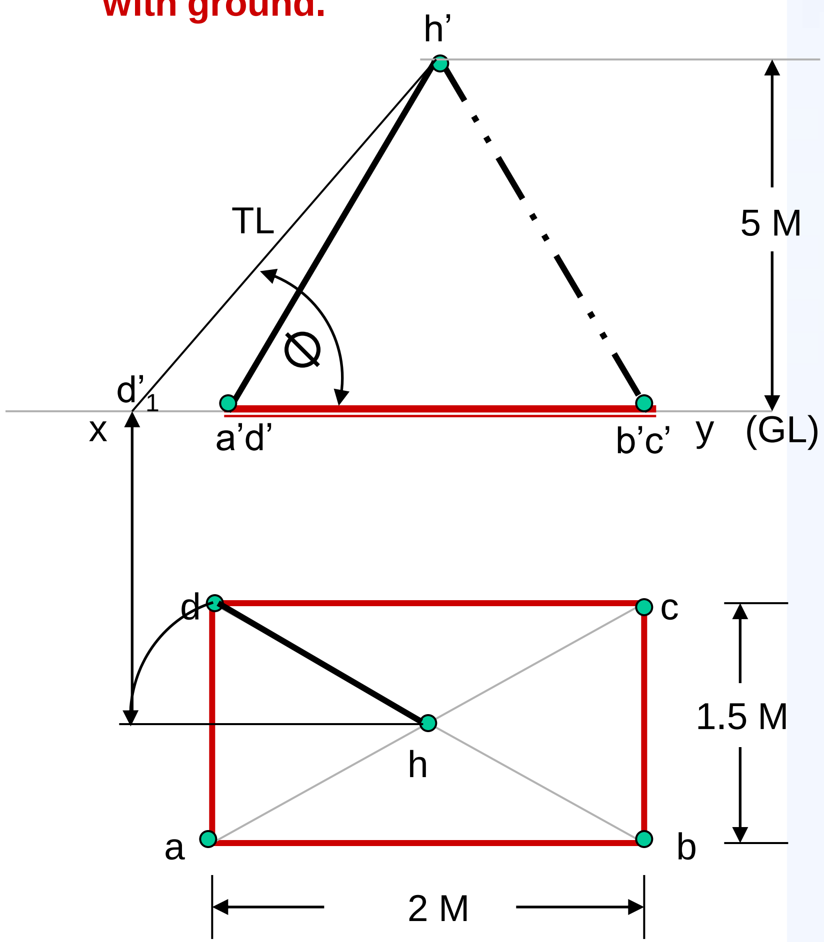
PROBLEM 20:- A tank of 4 M height is to be strengthened by four stay rods from each corner by fixing their other ends to the flooring, at a point 1.2 M and 0.7 M from two adjacent walls respectively, as shown. Determine graphically length and angle of each rod with flooring.

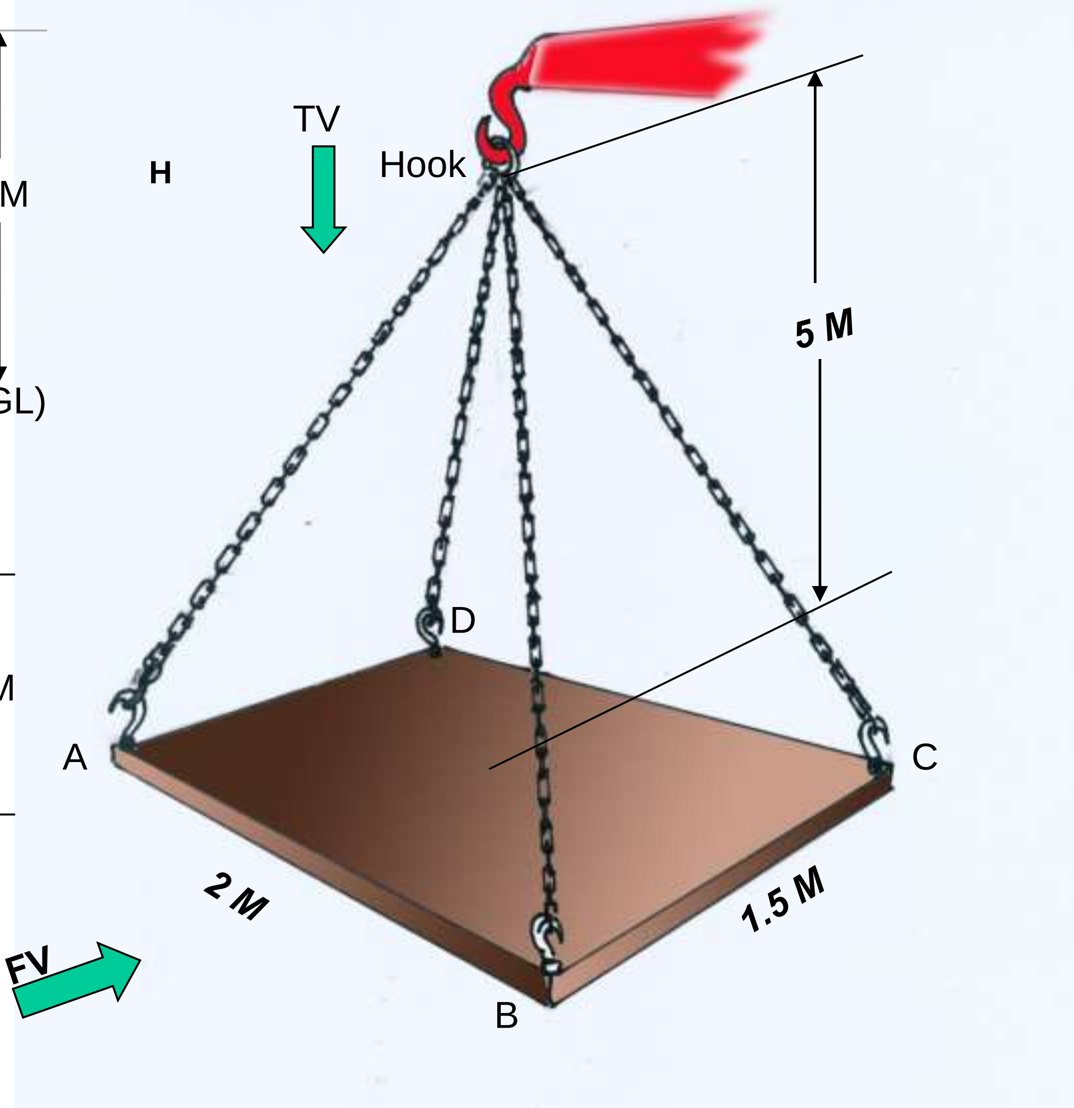
Answers:
Length of each rod
= a'b'$_1$
Angle with Hp.
= Ø





PROBLEM 21:- A horizontal wooden platform 2 M long and 1.5 M wide is supported by four chains from it's corners and chains are attached to a hook 5 M above the center of the platform. Draw projections of the objects and determine length of each chain along with it's inclination with ground.

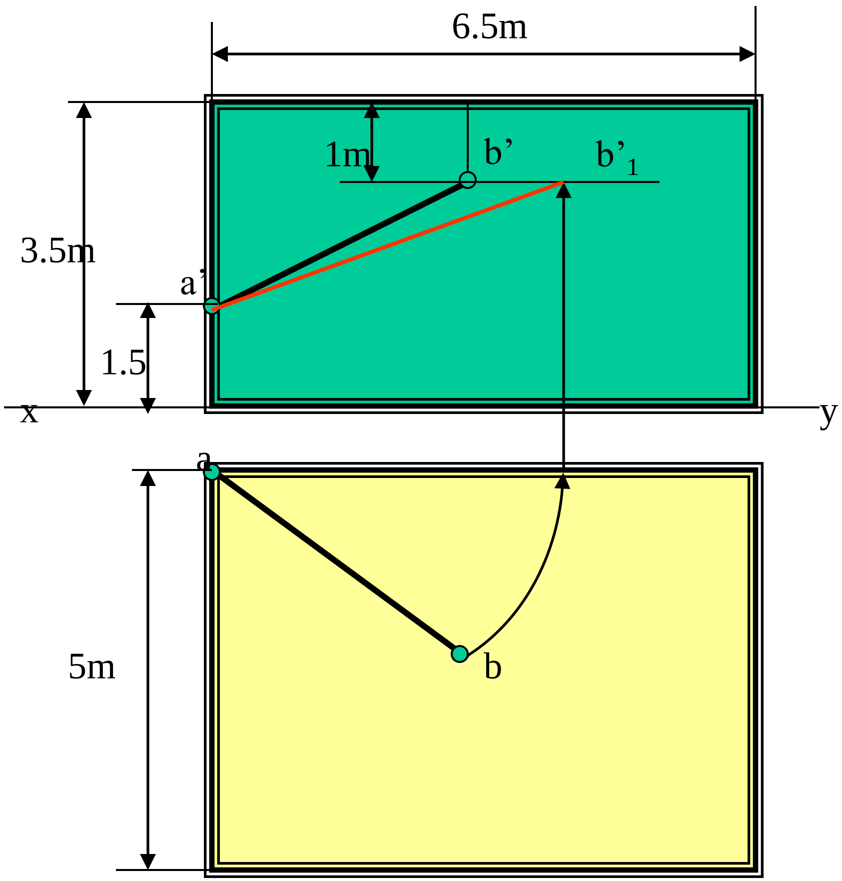


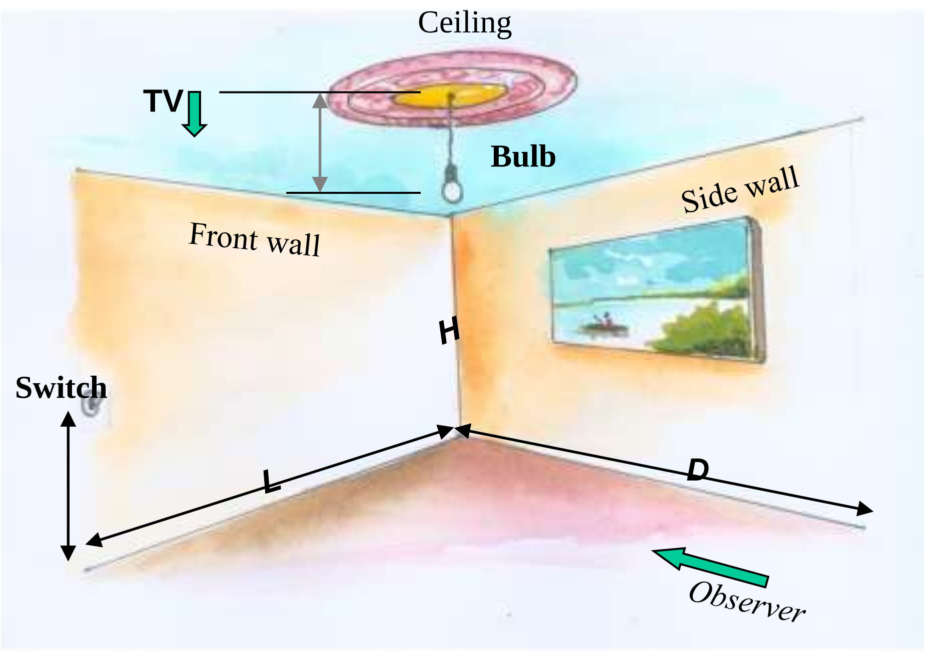


Answers:
Length of each chain
= a'd'$_1$
Angle with Hp.
= Ø

PROBLEM 22.

A room is of size 6.5m L ,5m D,3.5m high.
An electric bulb hangs 1m below the center of ceiling.
A switch is placed in one of the corners of the room, 1.5m above the flooring.
Draw the projections an determine real distance between the bulb and switch.

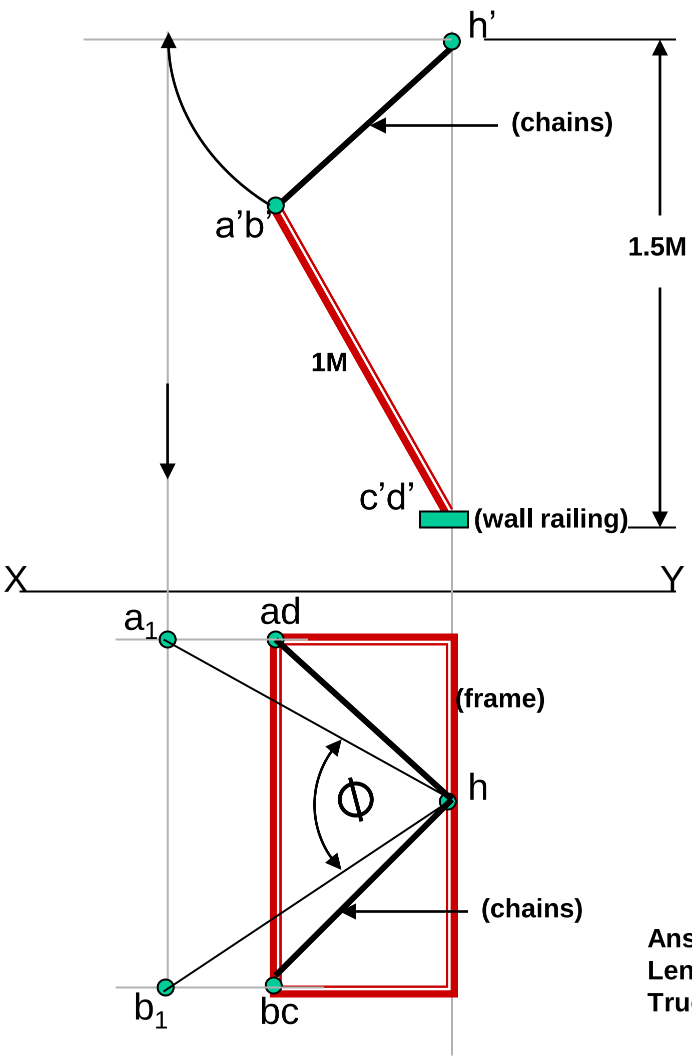


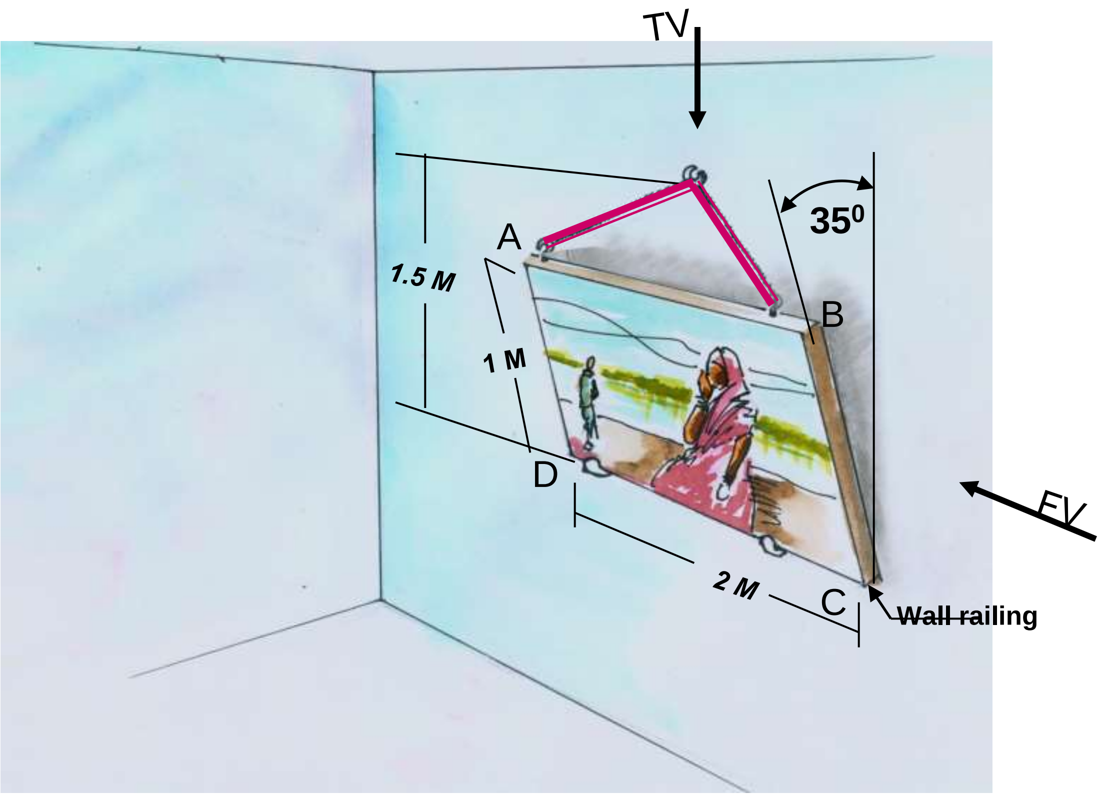


B- Bulb
A-Switch
Answer :- a' b'$_1$

PROBLEM 23:-

A PICTURE FRAME 2 M WIDE AND 1 M TALL IS RESTING ON HORIZONTAL WALL RAILING MAKES 35^0 INCLINATION WITH WALL. IT IS ATTAACHED TO A HOOK IN THE WALL BY TWO STRINGS. THE HOOK IS 1.5 M ABOVE WALL RAILING. DETERMINE LENGTH OF EACH CHAIN AND TRUE ANGLE BETWEEN THEM





Answers:
Length of each chain= hb_1
True angle between chains = ϕ