Projection of Lines

Engineering Graphics
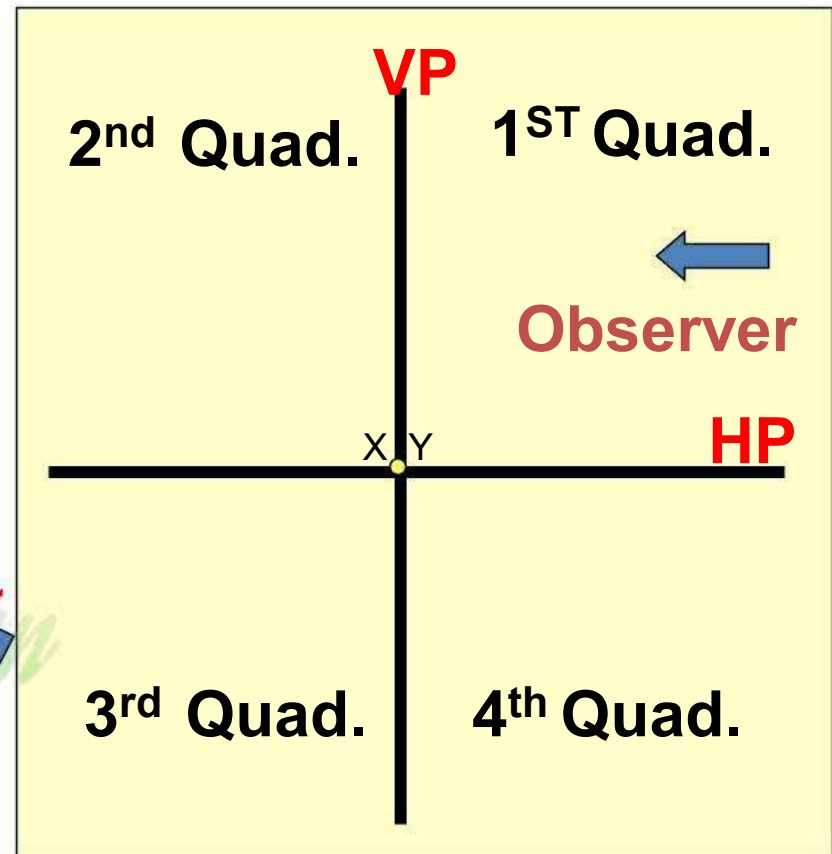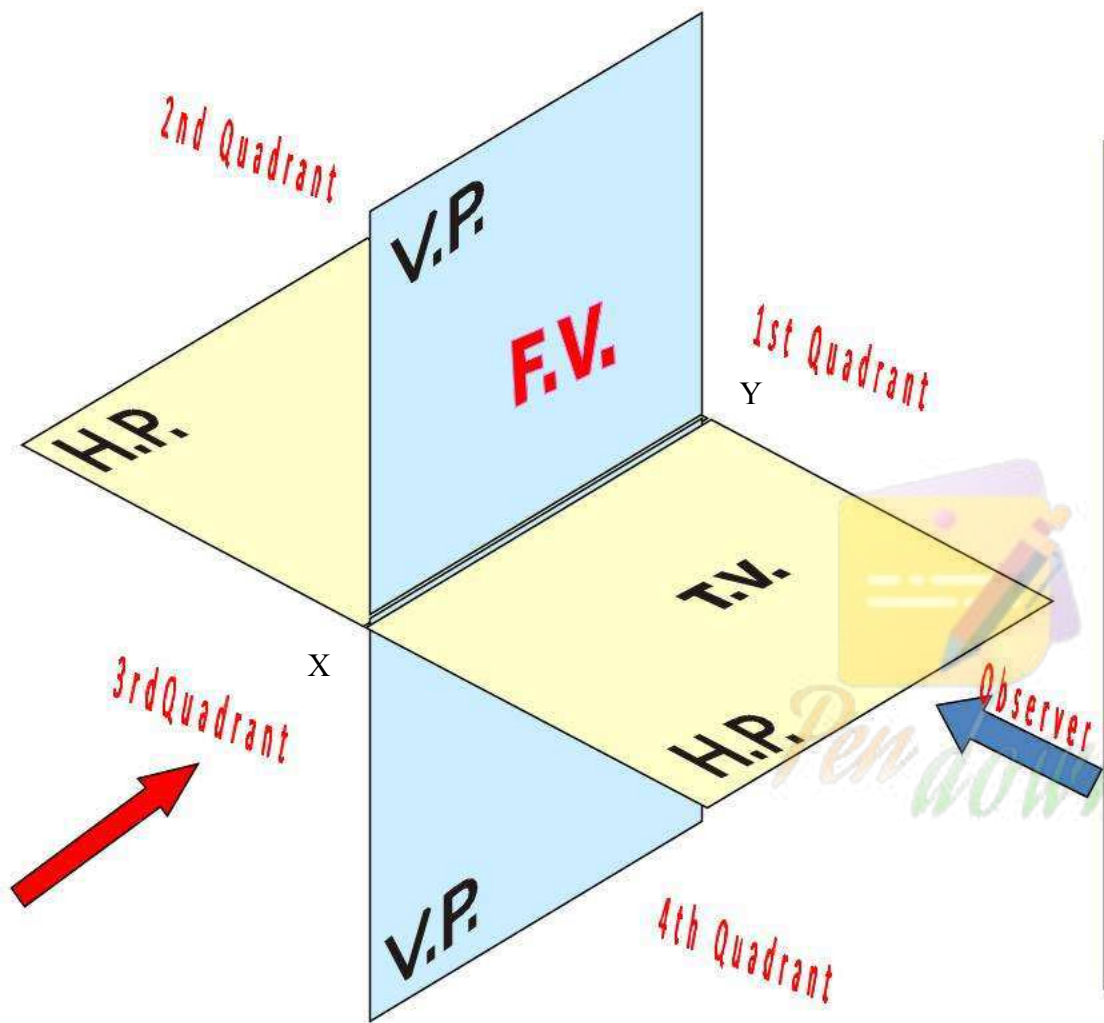
NOTATIONS

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

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

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

2nd Quadrant

V.P.

F.V.

1st Quadrant

H.P.

Y

T.V.

X

3rdQuadrant

H.P.

V.P.

4th Quadrant

Observer

VP

2nd Quad.   **1ST Quad.**

Observer

X Y   **HP**

3rd Quad.   **4th Quad.**

RED

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.
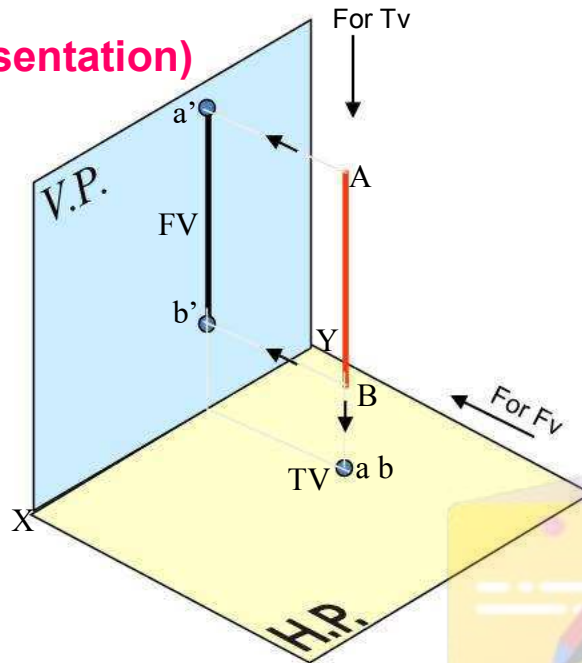**AIM:- TO DRAW IT'S PROJECTIONS - MEANS FV & TV.**

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.**

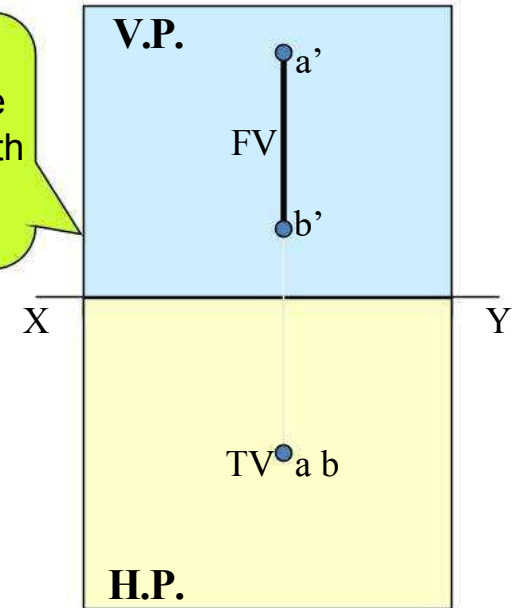5. **LINE INCLINED TO BOTH HP & VP.**

(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
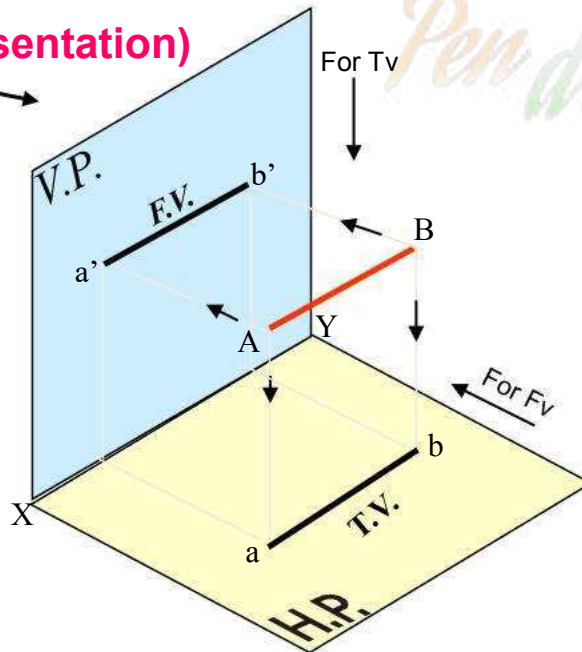
Note:
FV & TV both are
// to xy
&
both show T. L.

5
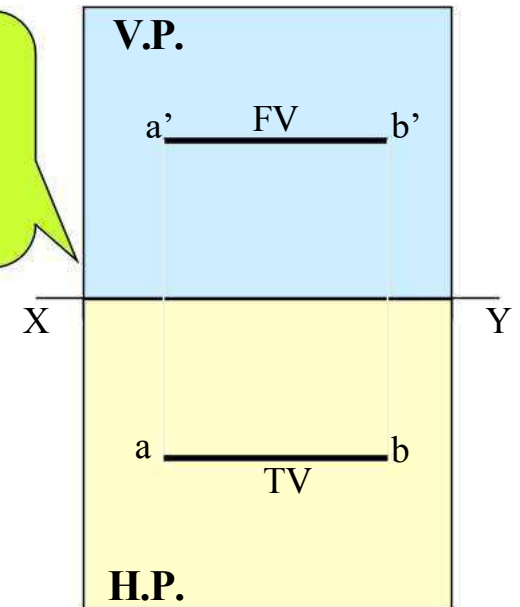
3.

A Line inclined to Hp
and
parallel to VP

(Pictorial presentation)

V.P.

F.V.

θ

a'

b'

B

Y

θ

A

b

X

a

T.V.

H.P.
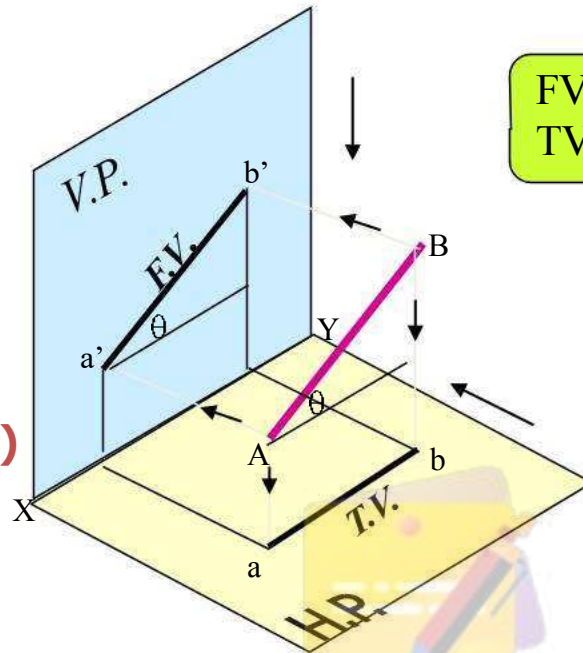
FV inclined to xy
TV parallel to xy.

V.P.

b'

F.V.

θ

a'

X ——————————————— Y
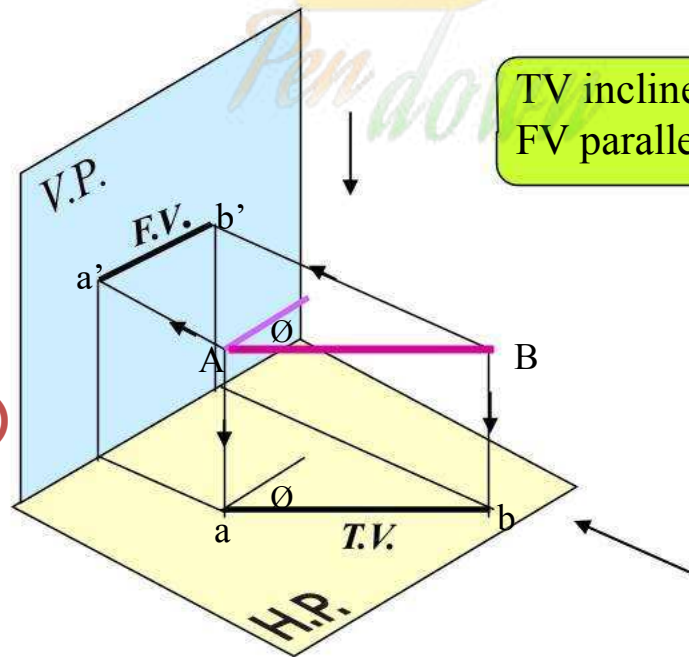
a ——————— b

T.V.

H.P.
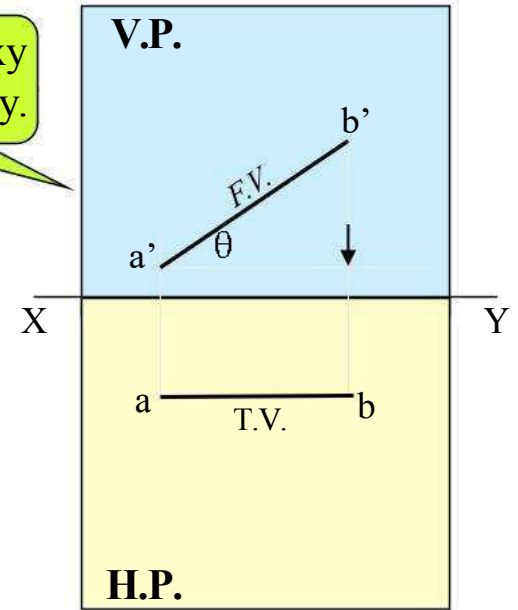
Orthographic Projections

4.

A Line inclined to VP
and
parallel to HP

(Pictorial presentation)

V.P.

F.V. b'

a'

A

Ø

B

Ø

a

T.V.

b

H.P.

TV inclined to xy
FV parallel to xy.

V.P.

a'   Fv   b'

X ——————————————— Y

a   Ø

Tv

b

H.P.

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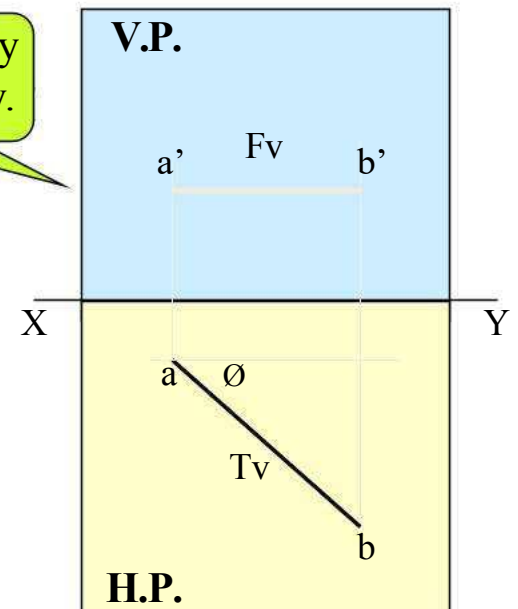
A Line inclined to both HP and VP

(Pictorial presentation)

For TV

V.P.

F.V.

b'

α

a'

A

X

a

β

T.V.

b

B

Y

For Fv

H.P.
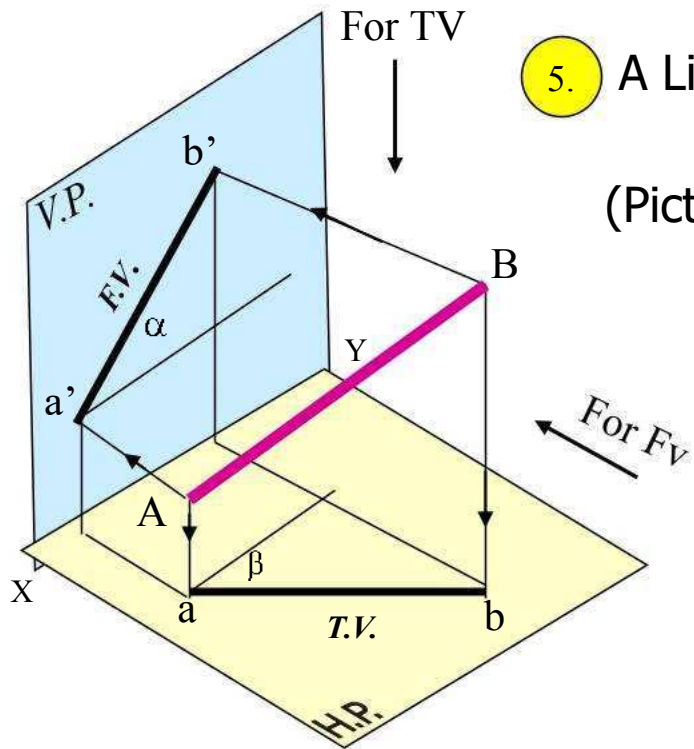
On removal of object i.e. Line AB
FV as a image on VP.
TV as a image on HP,

For TV

V.P.

F.V.

b'

α

a'

A

X

a

β

T.V.

b

B

Y

For FV

H.P.

V.P.

FV

b'

a'

α

X ————————————————— Y

a

β

TV

b

H.P.
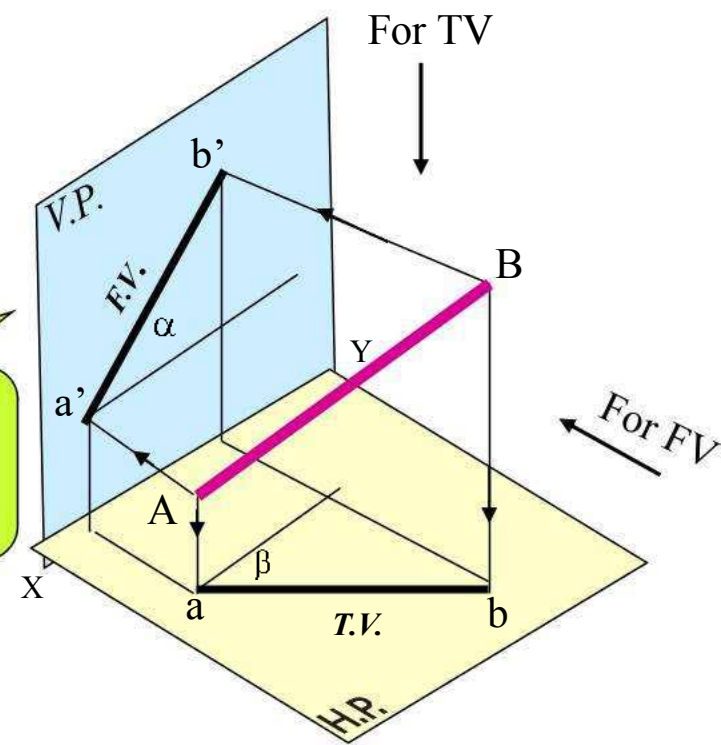
Orthographic Projections
FV is seen on VP clearly.
To see TV clearly, HP is rotated 90^0 downwards,
Hence it comes below xy.
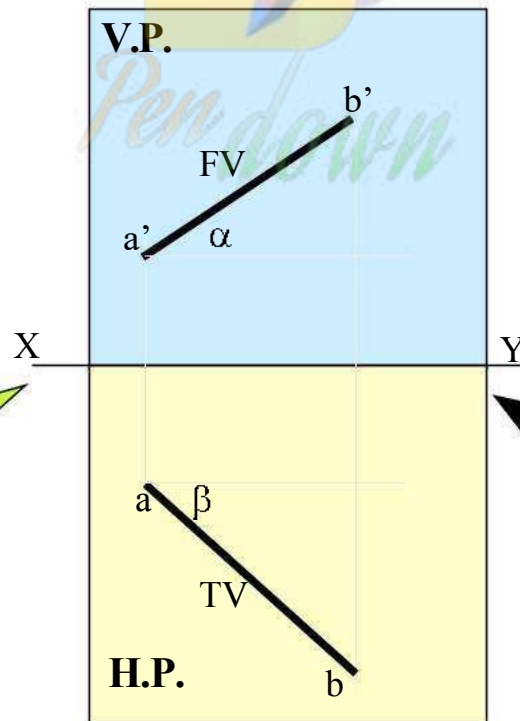
Both FV & TV are inclined to xy.

Both FV & TV are reduced lengths

(No view shows True Length)

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Orthographic Projections
Means FV & TV of Line AB
are shown below,
with their apparent Inclinations
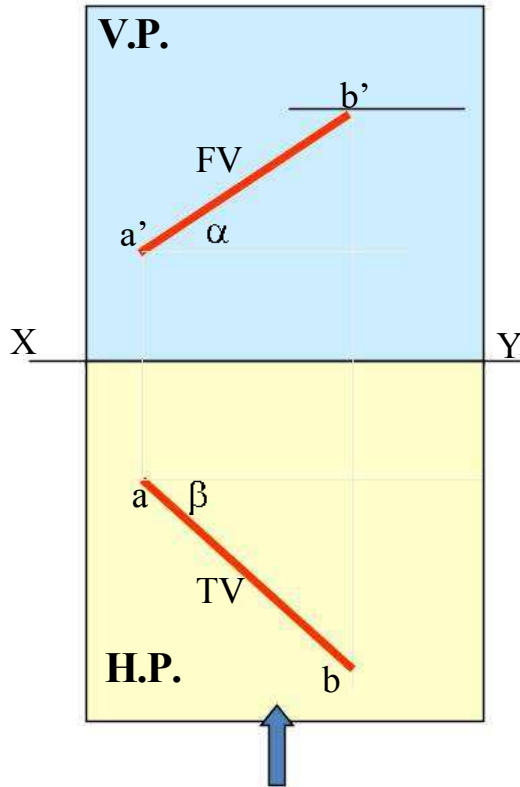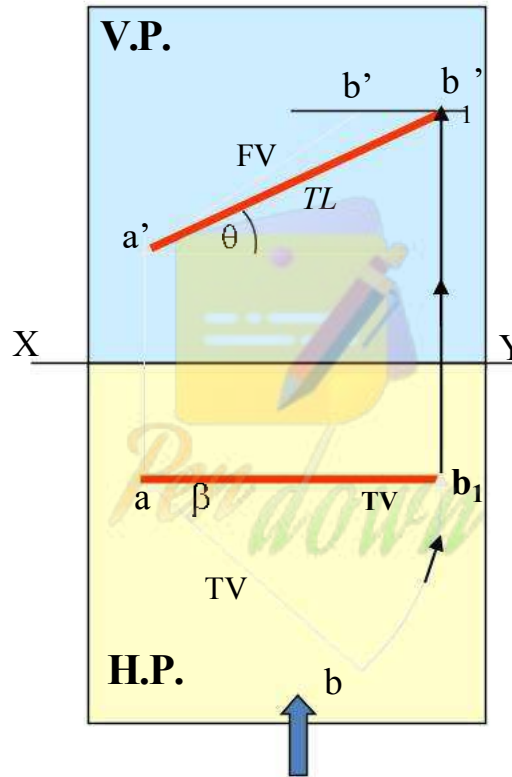**α & β**

V.P.

FV

a' α

b'

X —————————————— Y

a β

TV

b

H.P.

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).

V.P.

b' b_1'

FV

TL

a' θ

X —————————————— Y

a β TV b_1

TV

b

H.P.

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 $a'b_2'$ of TL is drawn
which is further rotated
to determine FV)

V.P.

b' b_1'

Fv TL

a' θ α b_2'

X —————————————— Y

a $\varnothing$ β

b_1

Tv TL

H.P. b b_2
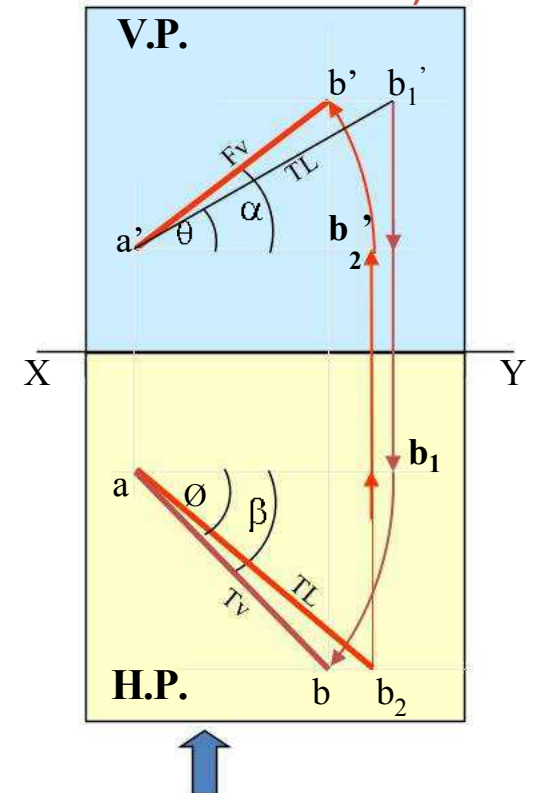
Here $a'b_1'$ is component
of TL ab_1 gives length of FV.
Hence it is brought Up to
Locus of a' and further rotated
to get point b'. a' b' will be FV.
Similarly drawing component
of other TL($a'b_1$') TV can be drawn.

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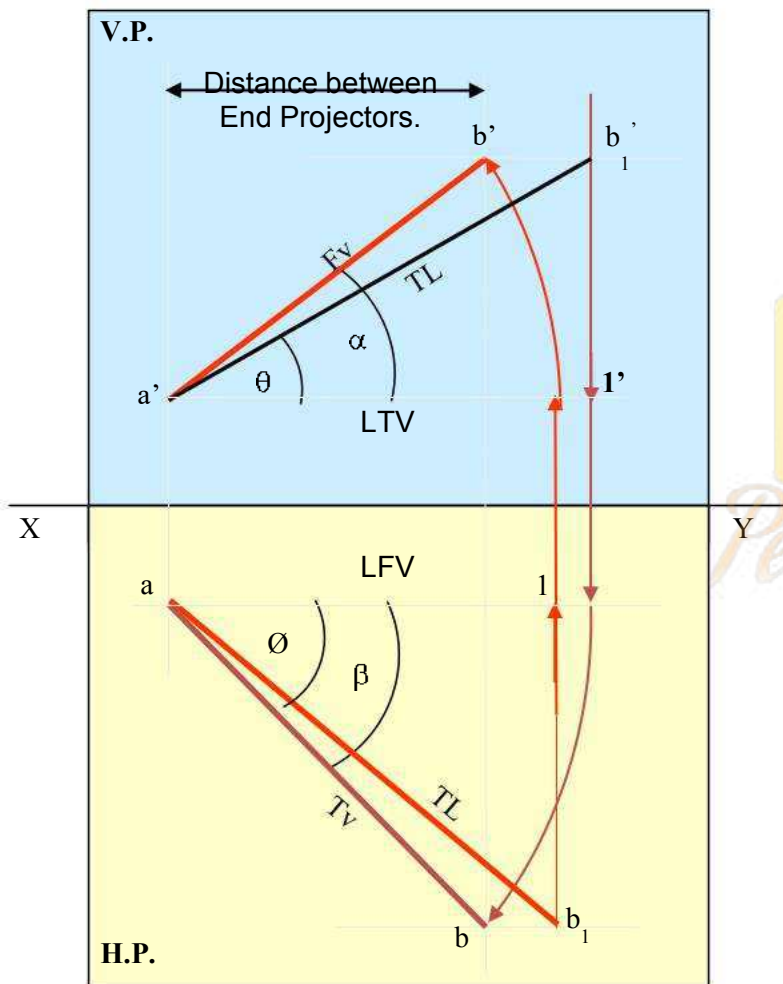
1) True Length (TL) – a' b₁' & a b
2) Angle of TL with HP - θ
3) Angle of TL with VP – Ø
4) Angle of FV with xy – α
5) Angle of TV with xy – β
6) LTV (length of FV) – Component (a-1)
7) LFV (length of TV) – Component (a'-1')
8) Position of A- **Distances of a & a' from xy**
9) Position of B- **Distances 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' & b₁' on same locus.

b & b₁ 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

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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.
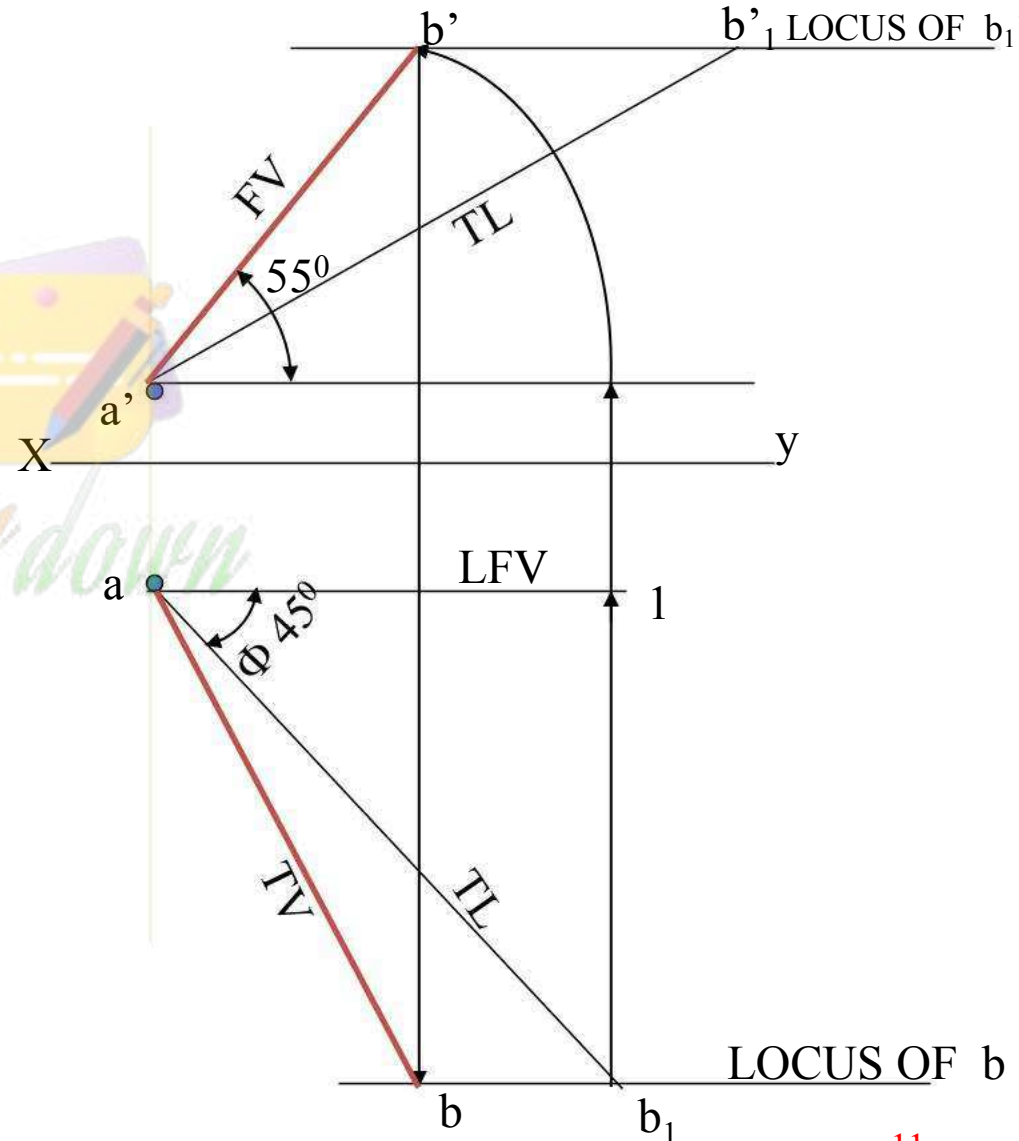
SOLUTION:

1) Draw xy line and one projector.

2) Locate a' 12mm above xy line & a 10mm below xy line.

3) Take 30^0 (θ) angle from a' & 40^0 (Φ) 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.

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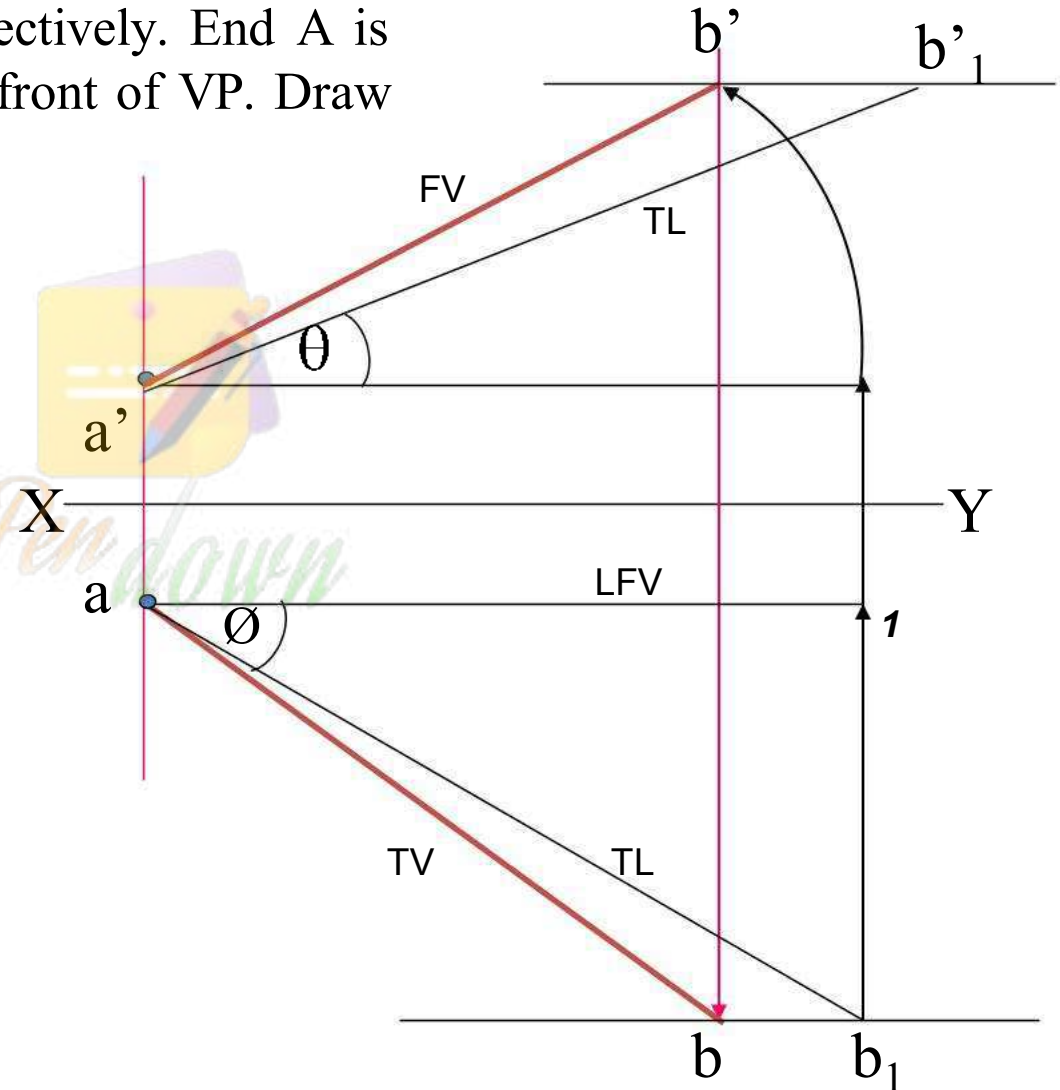
PROBLEM 2: Line AB 75mm long makes 45^0 inclination with VP while it's FV makes 55^0. End A is 10 mm above HP and 15 mm in front of VP. If line is in 1st quadrant draw it's projections and find it's inclination with HP.
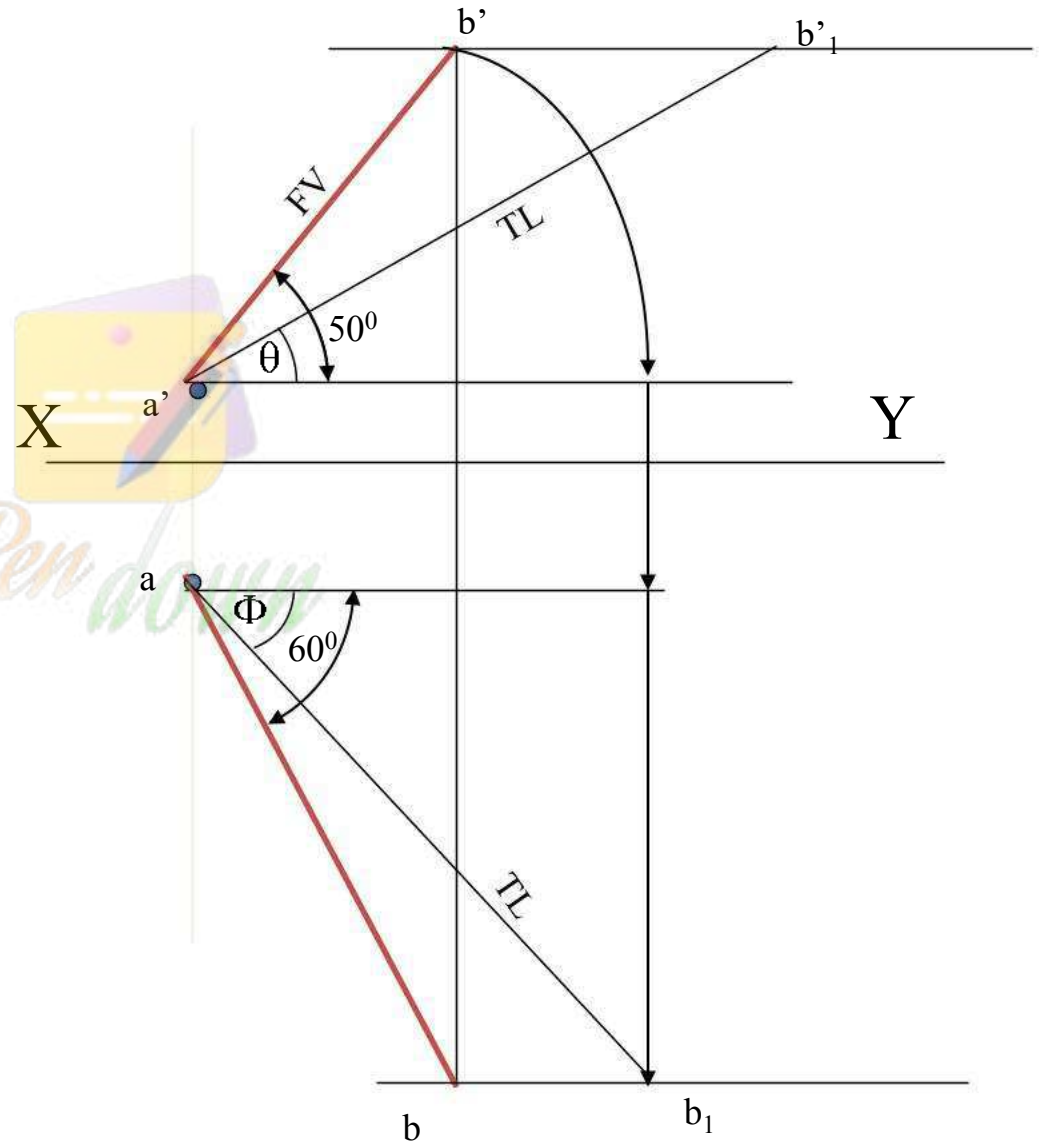
Solution:

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.

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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.
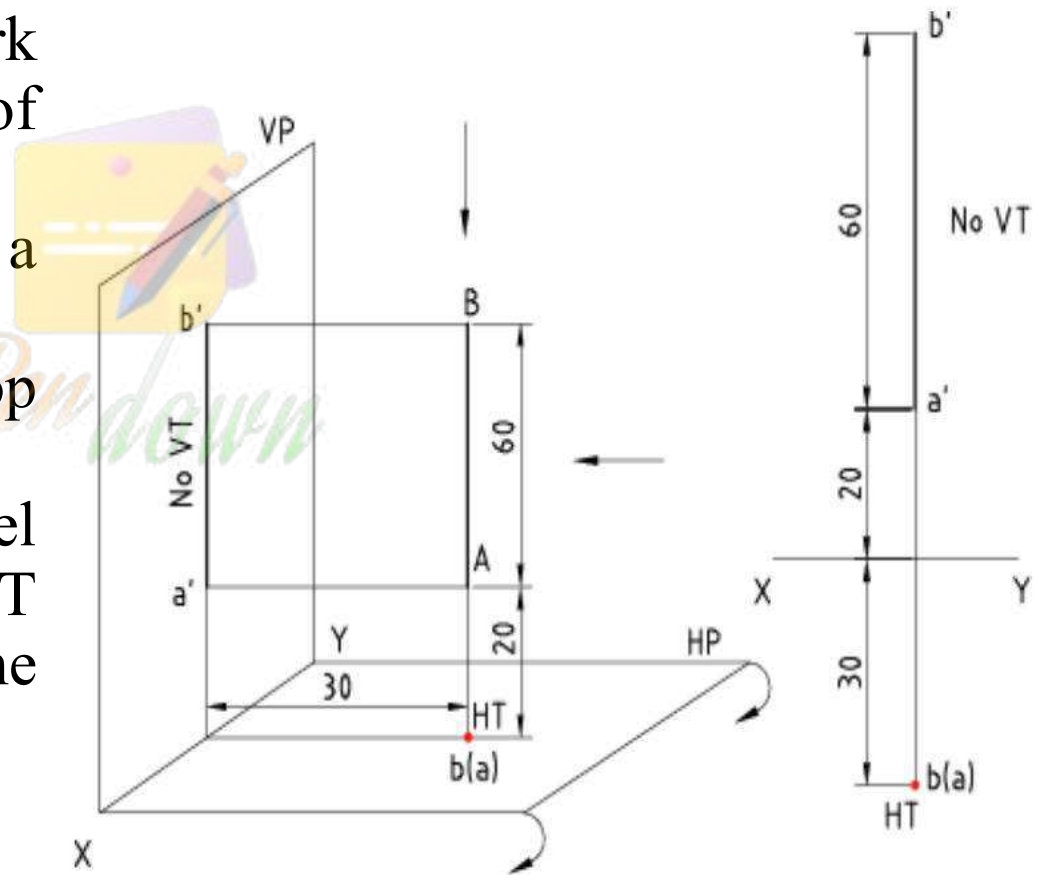10. Locate tv similarly and measure Angles θ and Φ

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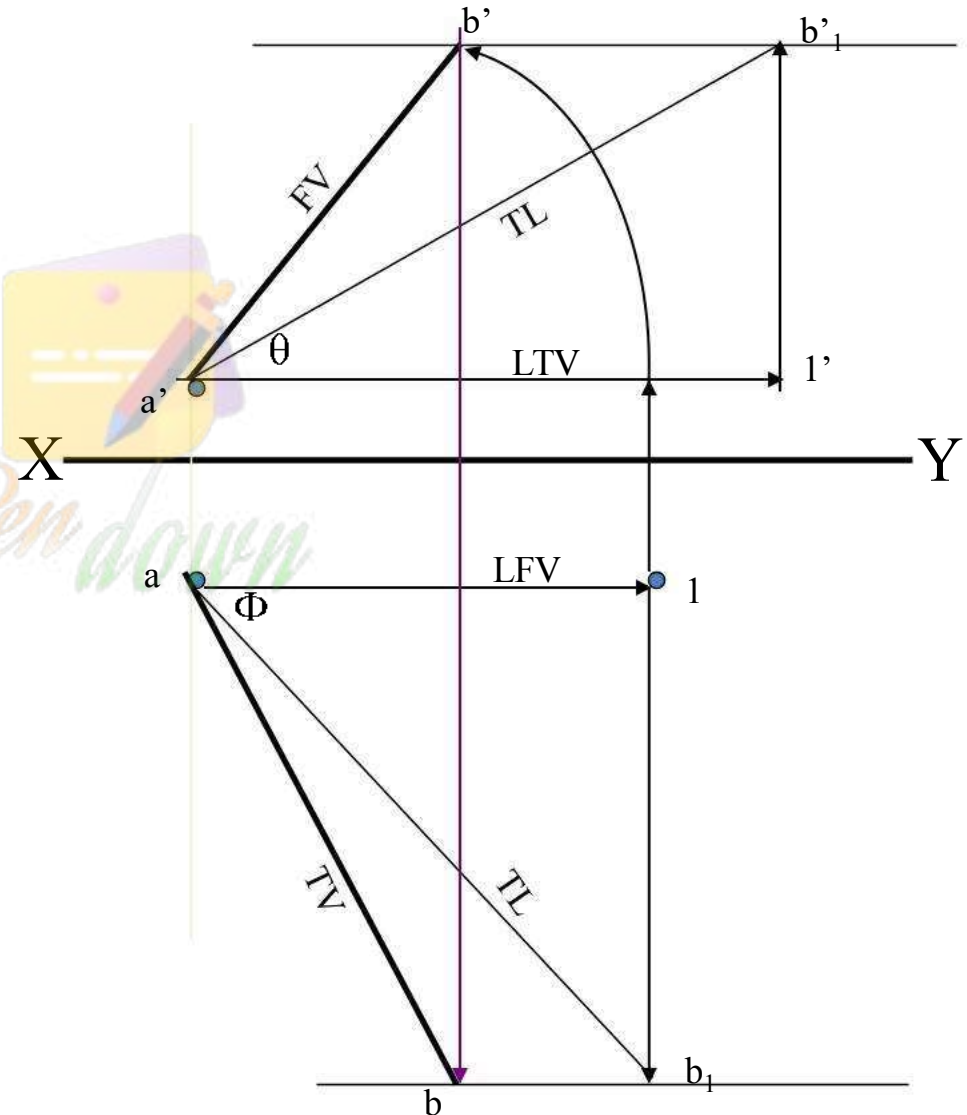
Example 1: **A line AB 60mm long has its end A 20mm above HP and 30mm in front of VP. The line is kept perpendicular to HP and parallel to VP. Draw its projections. Also mark the traces.**

Draw the XY line and mark the projections of the end A of the line.

Draw the front view as a vertical line of 60mm long.

Draw and complete the top view as a point.

Since the line is kept parallel to VP, no VT and the HT coincides with top view of the line.
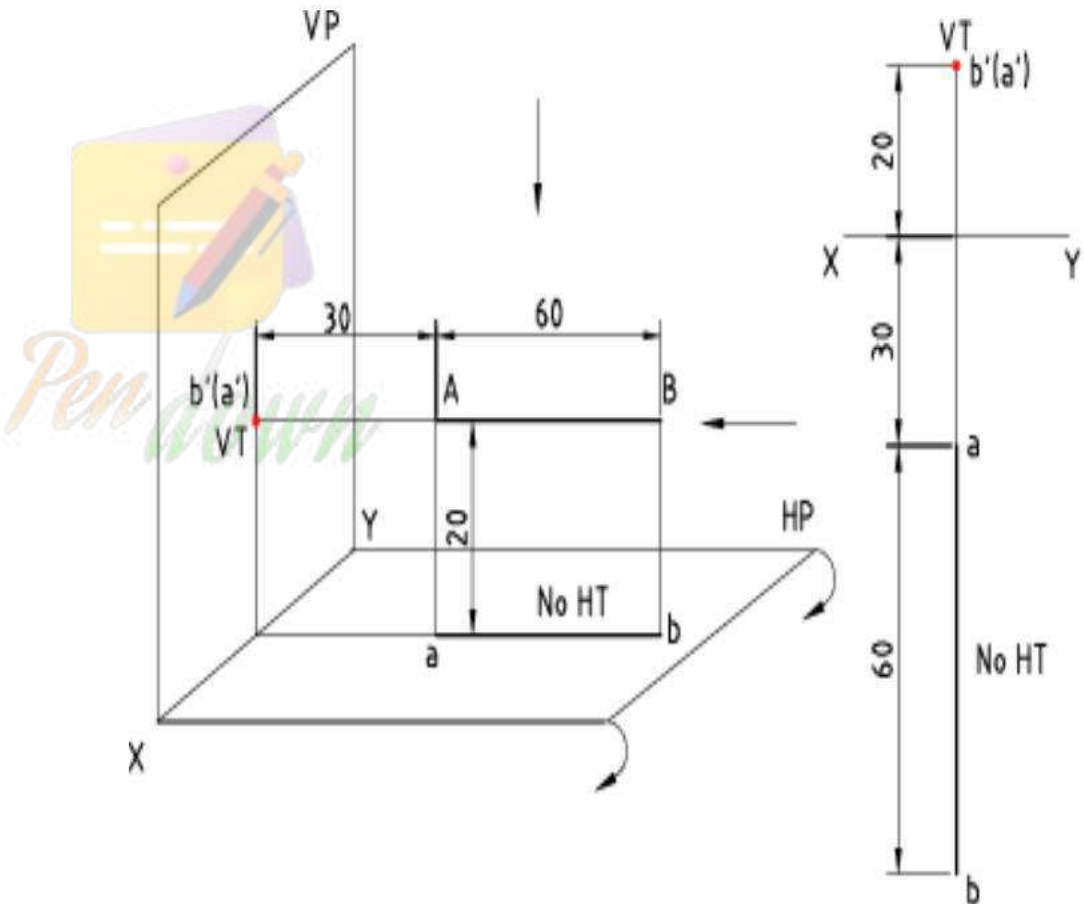
Example 2: **A line AB 60mm long has its end A 20mm above HP and 30mm in front of VP. The line is kept perpendicular to VP and parallel to HP. Draw its projections. Also mark the traces.**

Draw the XY line and mark the projections of the end A of the line.

Draw the top view as a line perpendicular to XY of 60mm long.

Draw and complete the front view as a point.

Since the line is kept parallel to HP, no HT and the VT coincides with front view of the line.
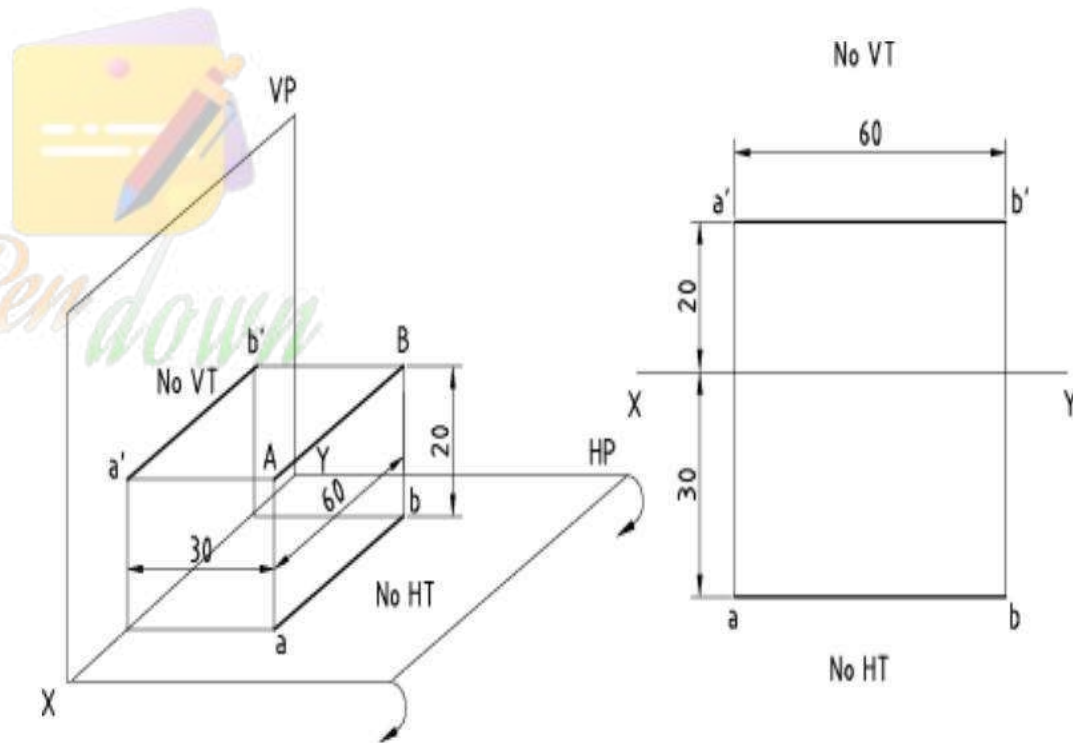
Example 3: A line AB 60mm long has its end A 20mm above HP and 30mm in front of VP. The line is kept parallel to both HP and VP. Draw its projections. Also mark the traces.

Draw the XY line and mark the projections of the end A of the line.

Draw the top view as a line parallel to XY of 60mm long.

Draw and complete the front view also a line of 60mm long.
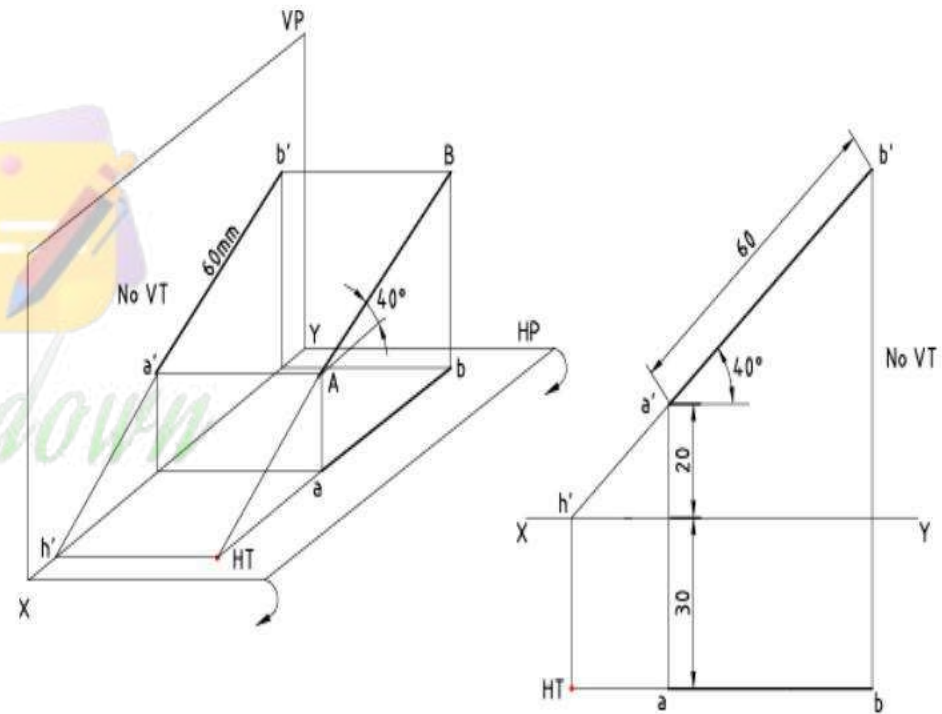
Since the line parallel to HP and VP, no HT and VT.

Example 4: **A line AB 60mm long has its end A 20mm above HP and 30mm in front of VP. The line is kept incline at 40º to HP and parallel VP. Draw its projections. Also mark the traces.**

Draw the XY line and mark the projections of the end A of the line.

Draw the front view as an inclined line at 40º to XY of 60mm long.

Draw the top view as a line parallel to XY line by drawing the projector (vertical line) from b'.

Since the line parallel to VP, no VT and HT is marked as shown in fig.

Example 5: **A line AB 60mm long has its end A 20mm above HP and 30mm in front of VP. The line is kept incline at 40º to VP and parallel HP. Draw its projections. Also mark the traces.**

Draw the XY line and mark the projections of the end A of the line.

Draw the top view as an inclined line at 40º to XY of 60mm long.

Draw the front view as a line parallel to XY by drawing the projector (vertical line) from b.

Since the line parallel to HP, no HT and VT is marked as shown in fig.