Projection of Lines with Traces

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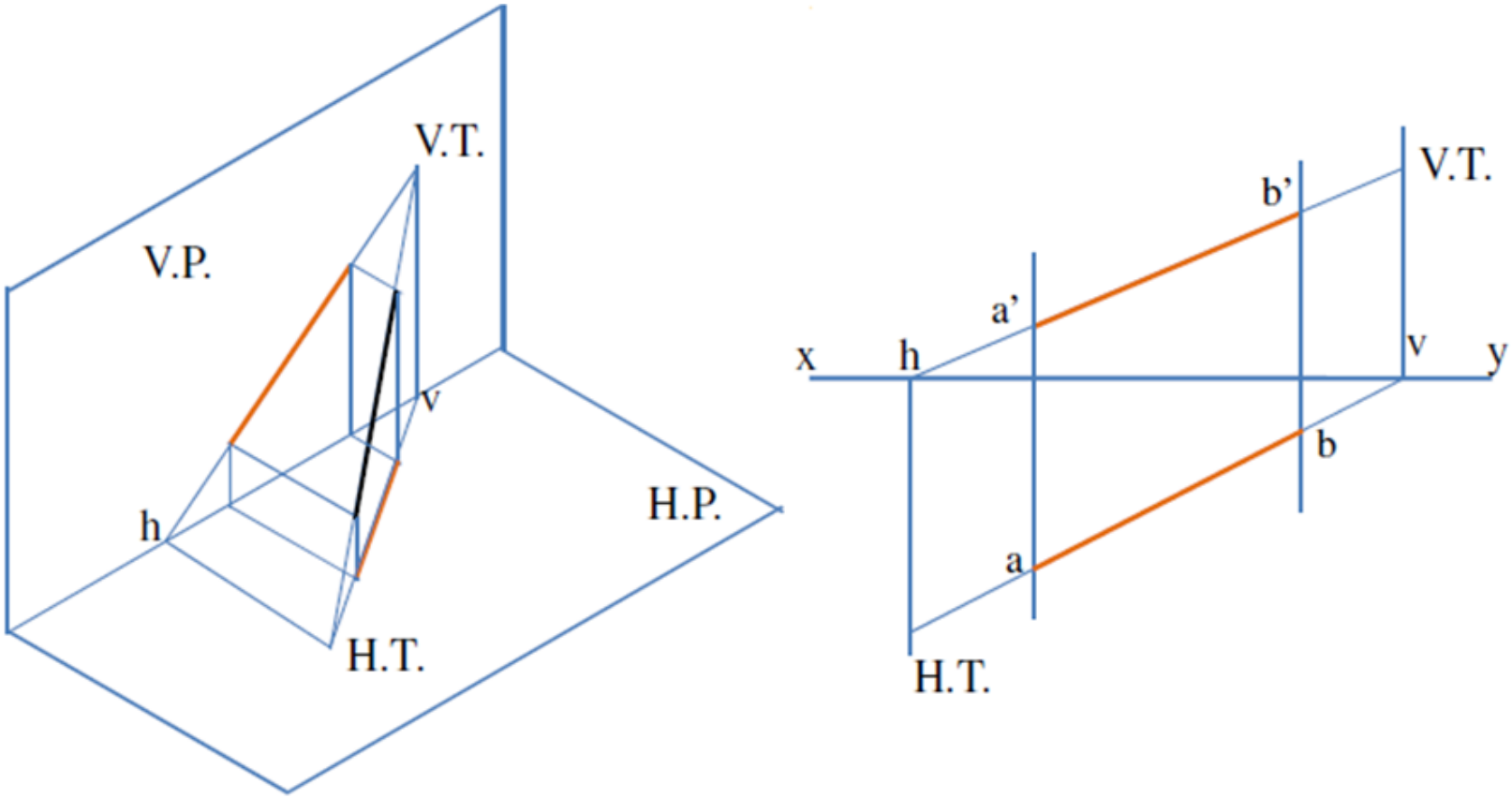
Traces of a line

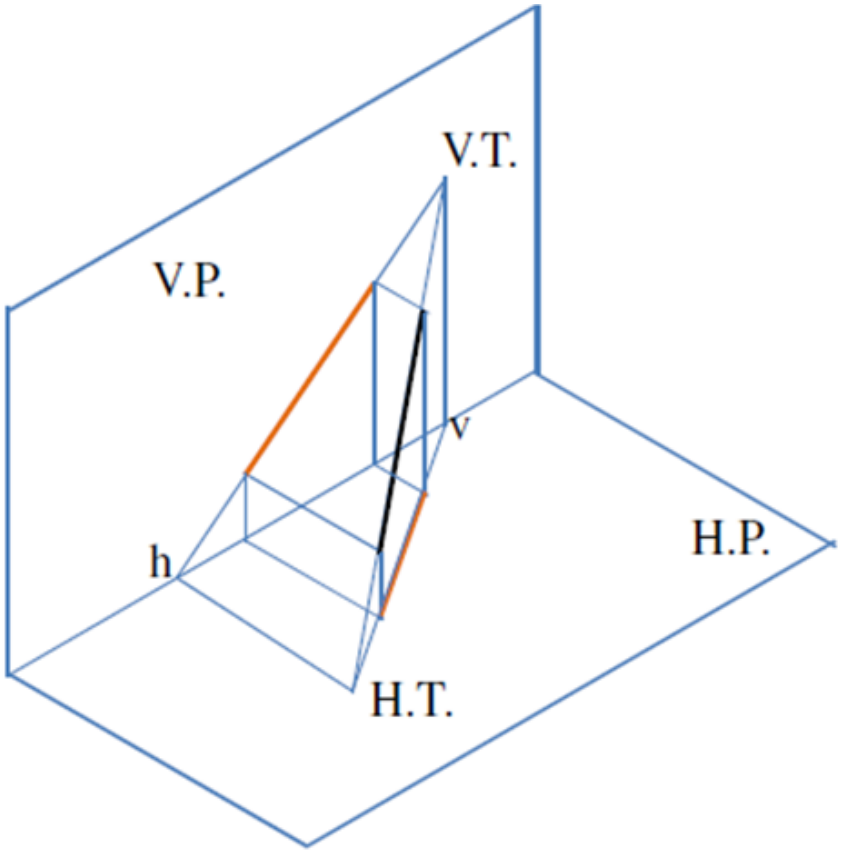


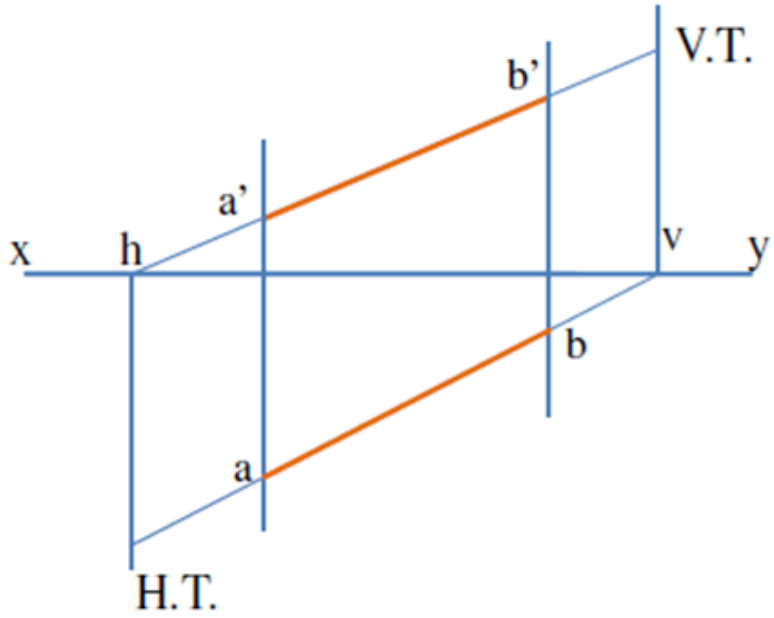
The points of intersection of a line (or its extension) with the respective reference planes are called Traces.

A Line or its extension intersects the *H. P.* at the trace of the line on *H.P.* (called *H. T.*)

A Line or its extension intersects the *V. P.* at the trace of the line on *V.P.* (called *V. T.*)

Traces of a line





H.T.:-

It is a point on **H.P.**

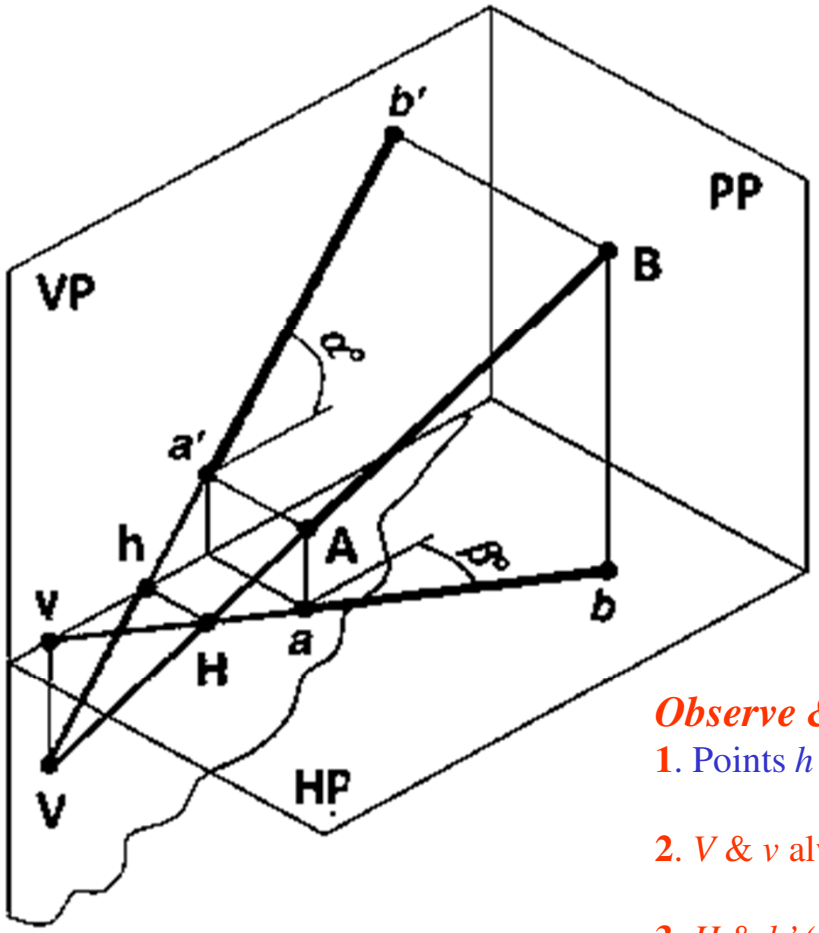
Hence, its ***Fv*** comes on **XY line**.(named ***h***)

V.T.:-

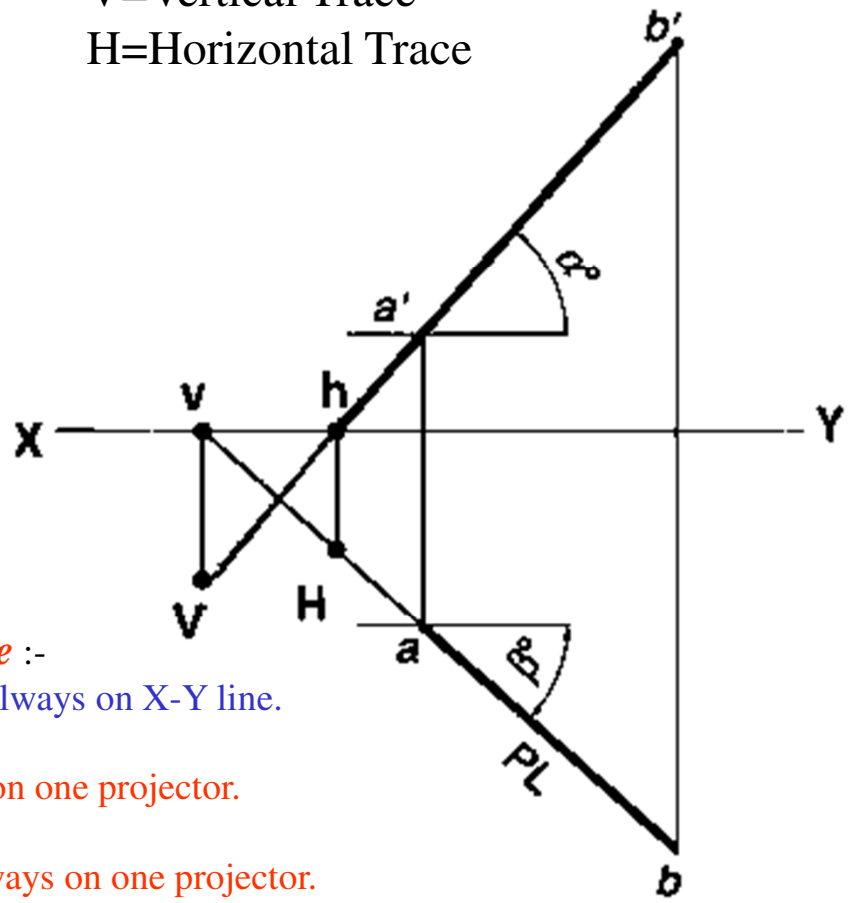
It is a point on **V.P.**

Hence, its ***Tv*** comes on XY line. (named ***v***)

Traces of a line



V=Vertical Trace
H=Horizontal Trace



Observe & note :-

1. Points *h* & *v* always on X-Y line.

2. *V* & *v* always on one projector.

3. *H* & *h'(h)* always on one projector.

4. FV - *h- V* (VT) always co-linear.

5. TV - *v – H (HT)* always co-linear.

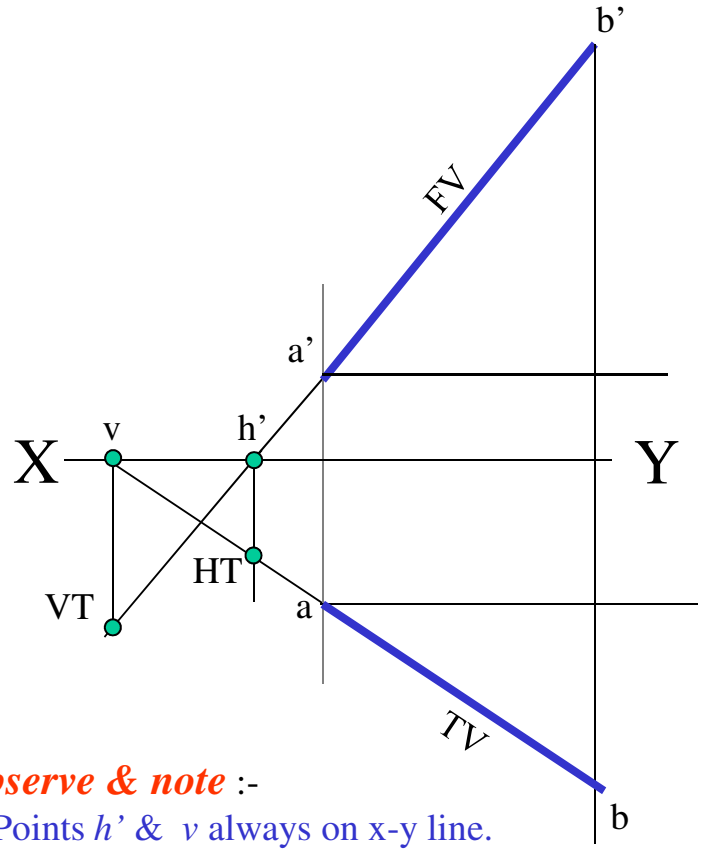
Traces of a line (Steps)

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.

Traces of a line (Example 1)

The *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 its *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'*.

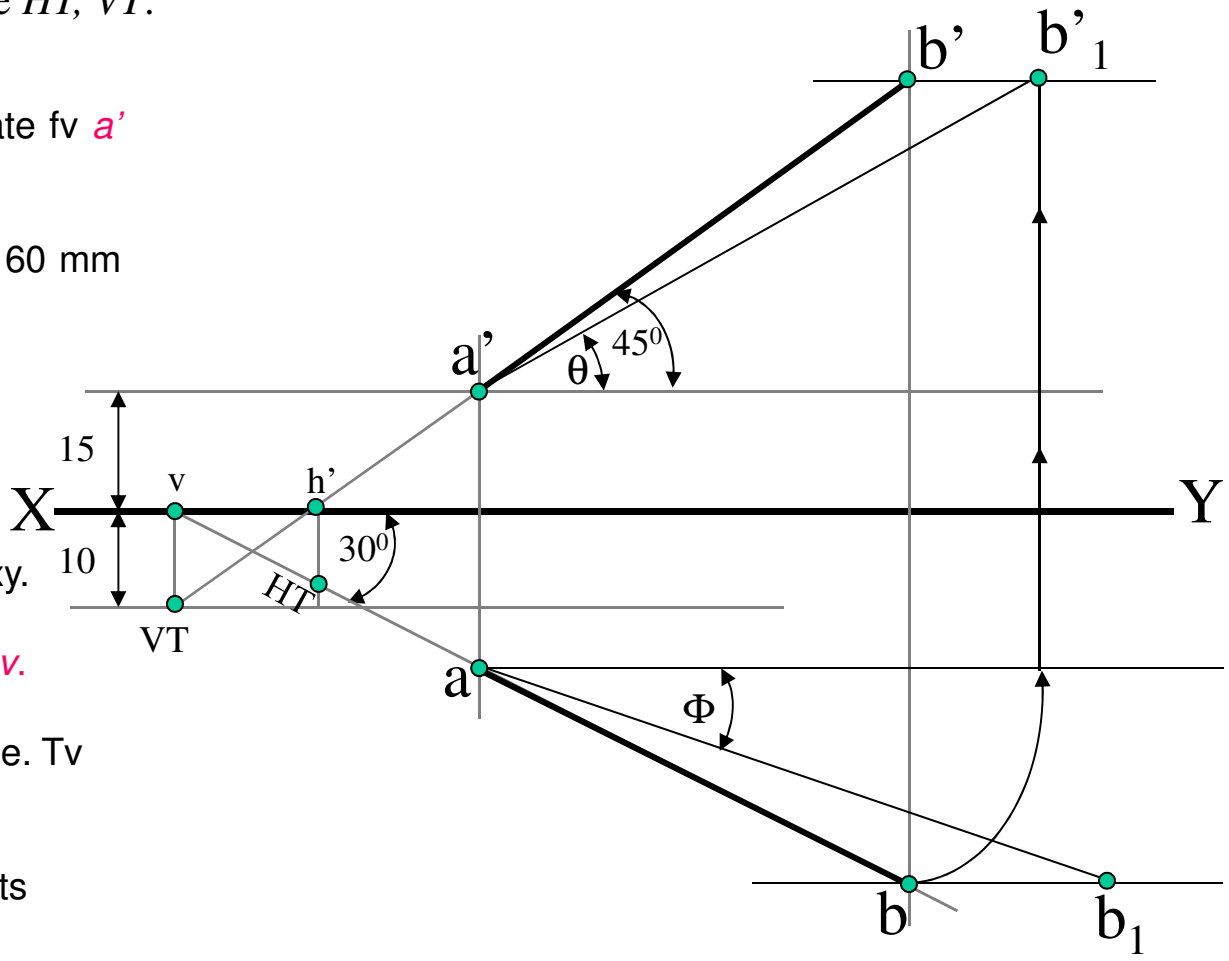
Draw locus of VT, 10 mm below xy & extending Fv to this locus locate VT. as Fv-h'-VT lie on one st. line.

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 its inclinations can be found.

Name extension of Fv, touching xy as *h'* and below it, on extension of Tv, locate HT.



Traces of a line (Example 2)

One end of line *AB* is 10mm above *Hp* and other end is 100 mm in-front of *Vp*. Its *Fv* is 45^0 inclined to xy while its *HT* & *VT* are 45mm and 30 mm below *xy* respectively. Draw projections and find *TL* with its inclinations with *Hp* & *VP*.

SOLUTION STEPS:-

Draw XY line, one projector and locate *a'* 10 mm above XY.

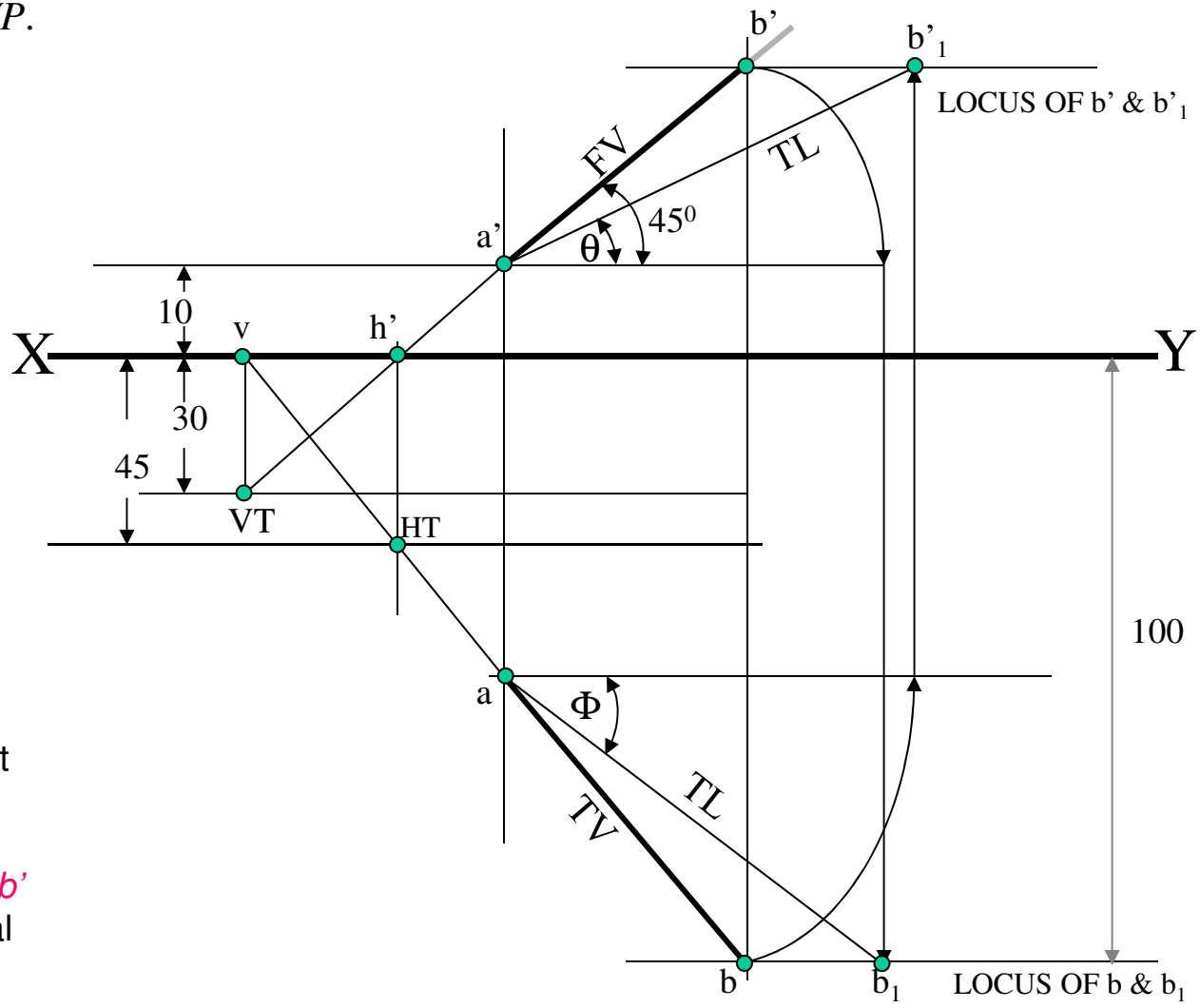
Draw locus 100 mm below XY for points *b* & b_1

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 its inclinations.



Traces of a line (Example 3)

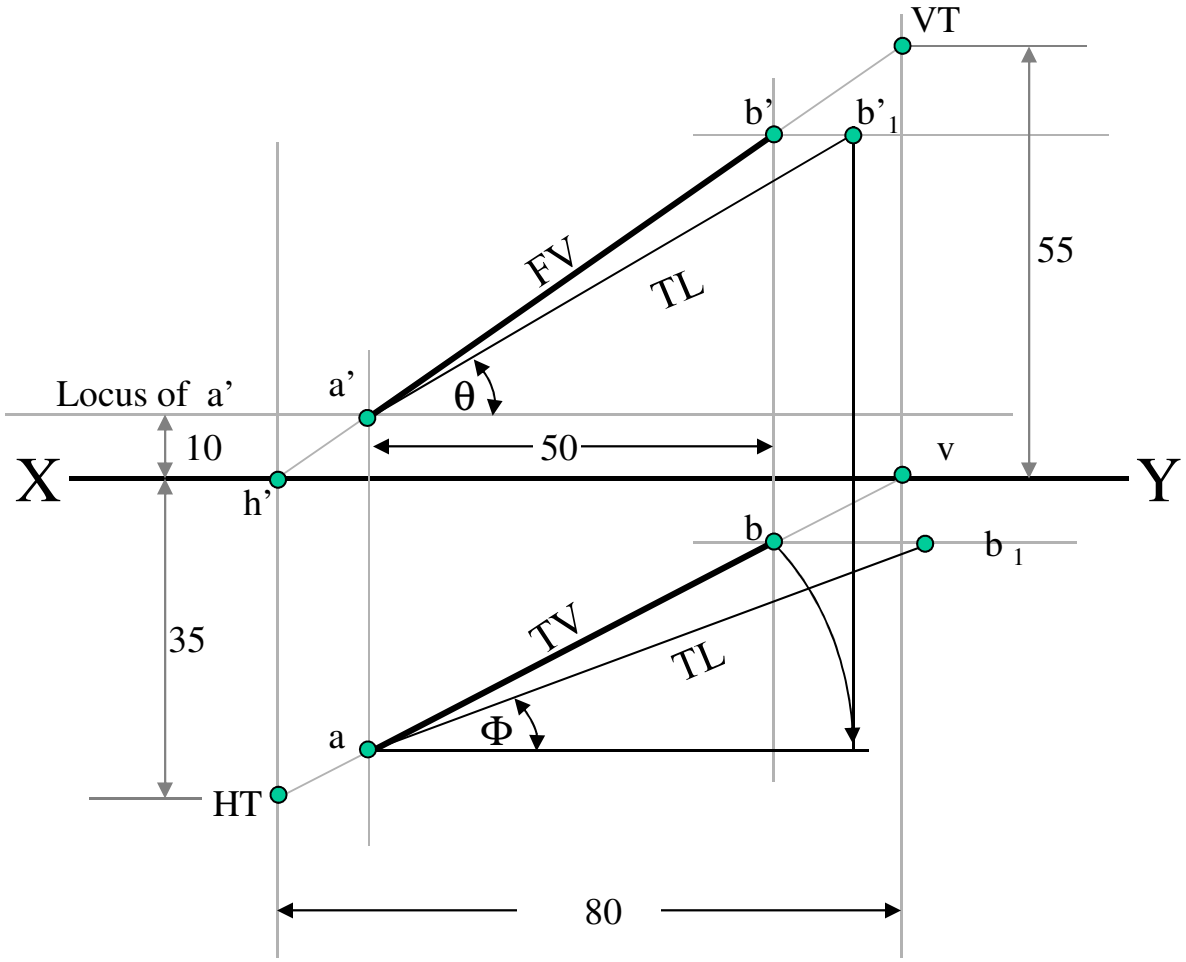
Projectors drawn from *HT* and *VT* of a line *AB* are 80 mm apart and those drawn from its ends are 50 mm apart. End *A* is 10 mm above *Hp*, *HT* is 35 mm below *XY* while its *VT* is 55 mm above *XY*. Draw projections, locate traces and find *TL* of line & inclinations with *Hp* and *Vp*.

SOLUTION STEPS:-

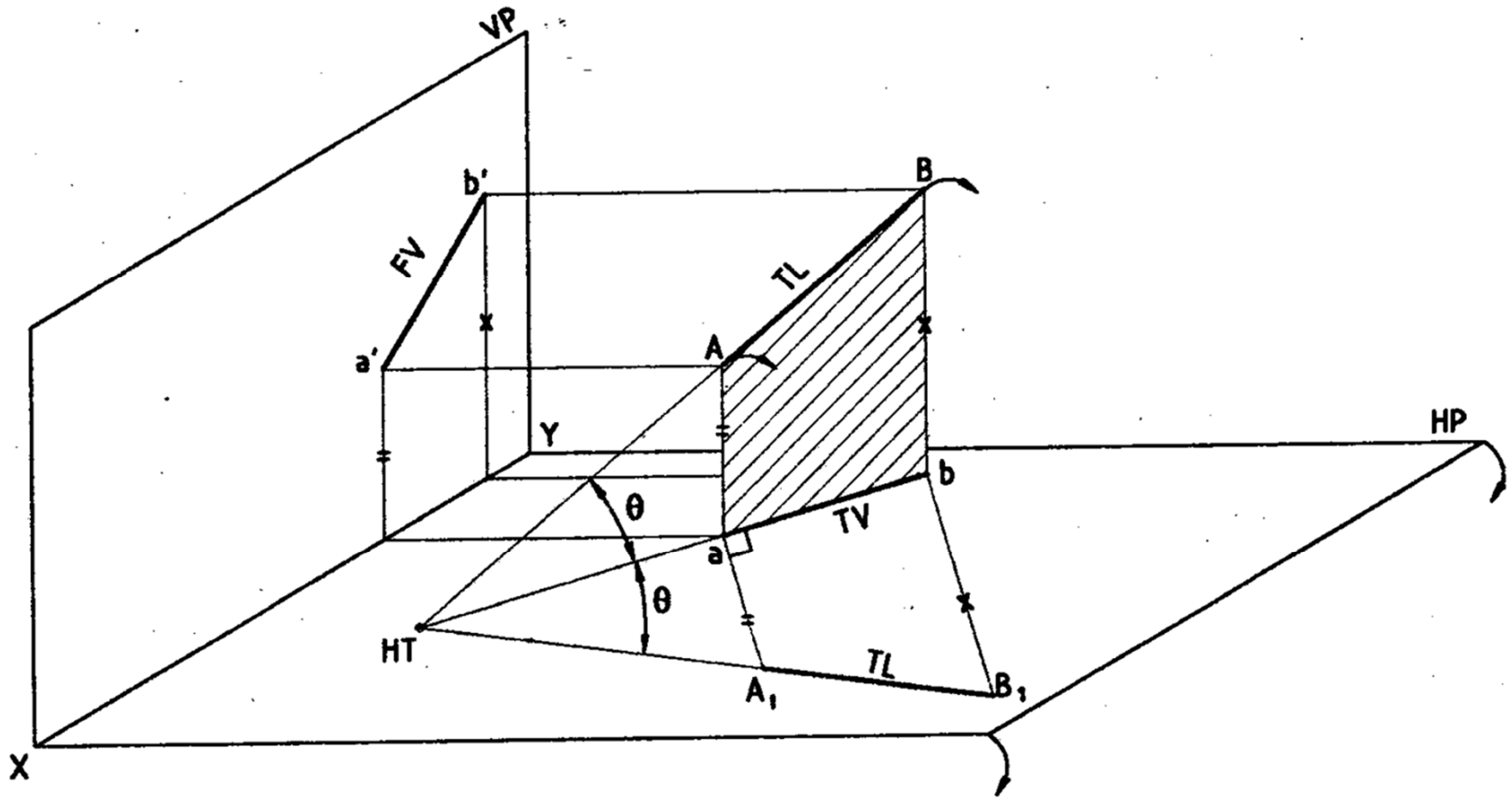
1.Draw XY line and two projectors, 80 mm apart and locate HT & VT , 35 mm below XY and 55 mm above XY respectively on these projectors.

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

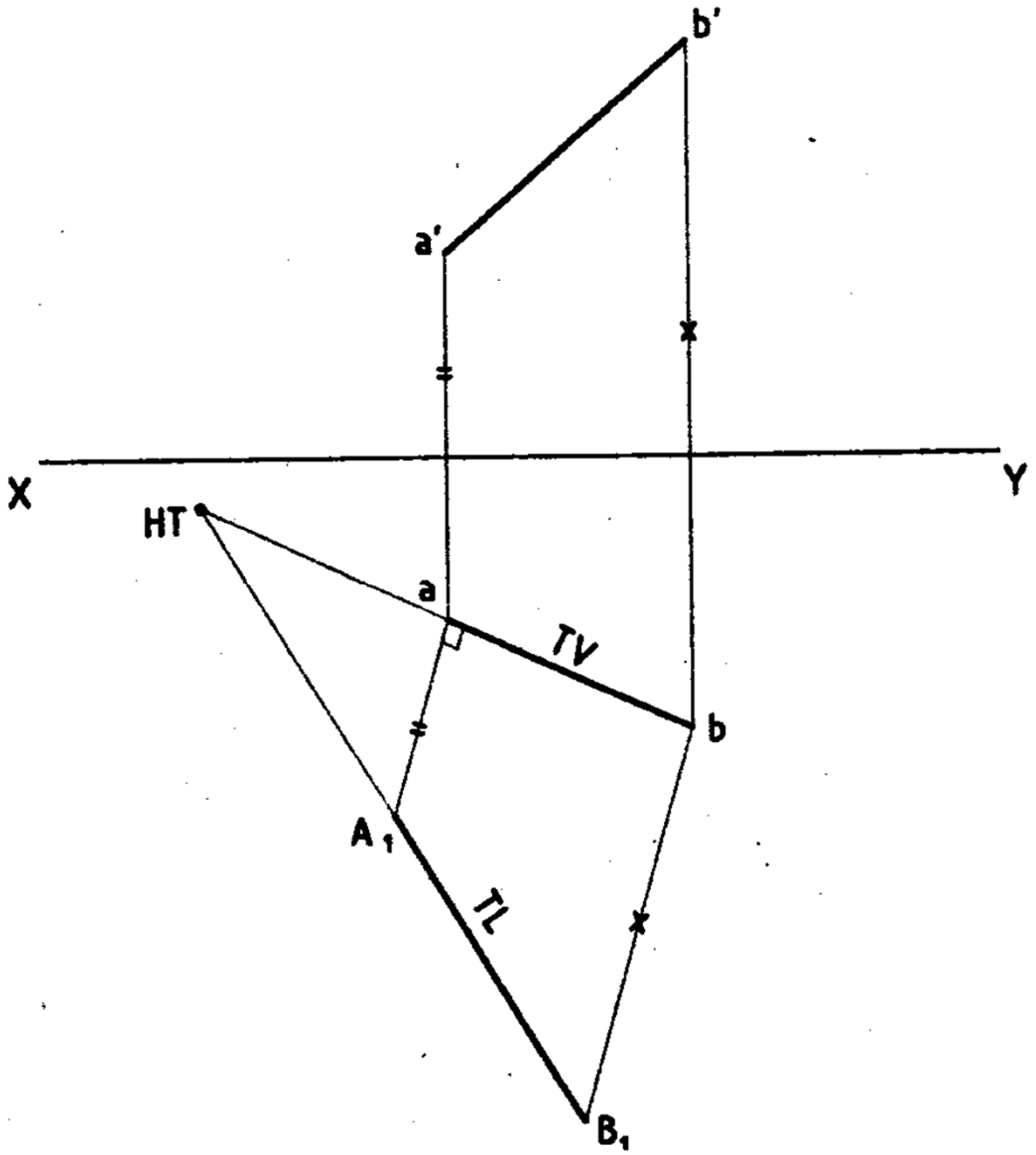
3.Now just like previous two problems, Extending certain lines complete Fv & Tv and as usual find TL and its inclinations.



Trapezoid Method

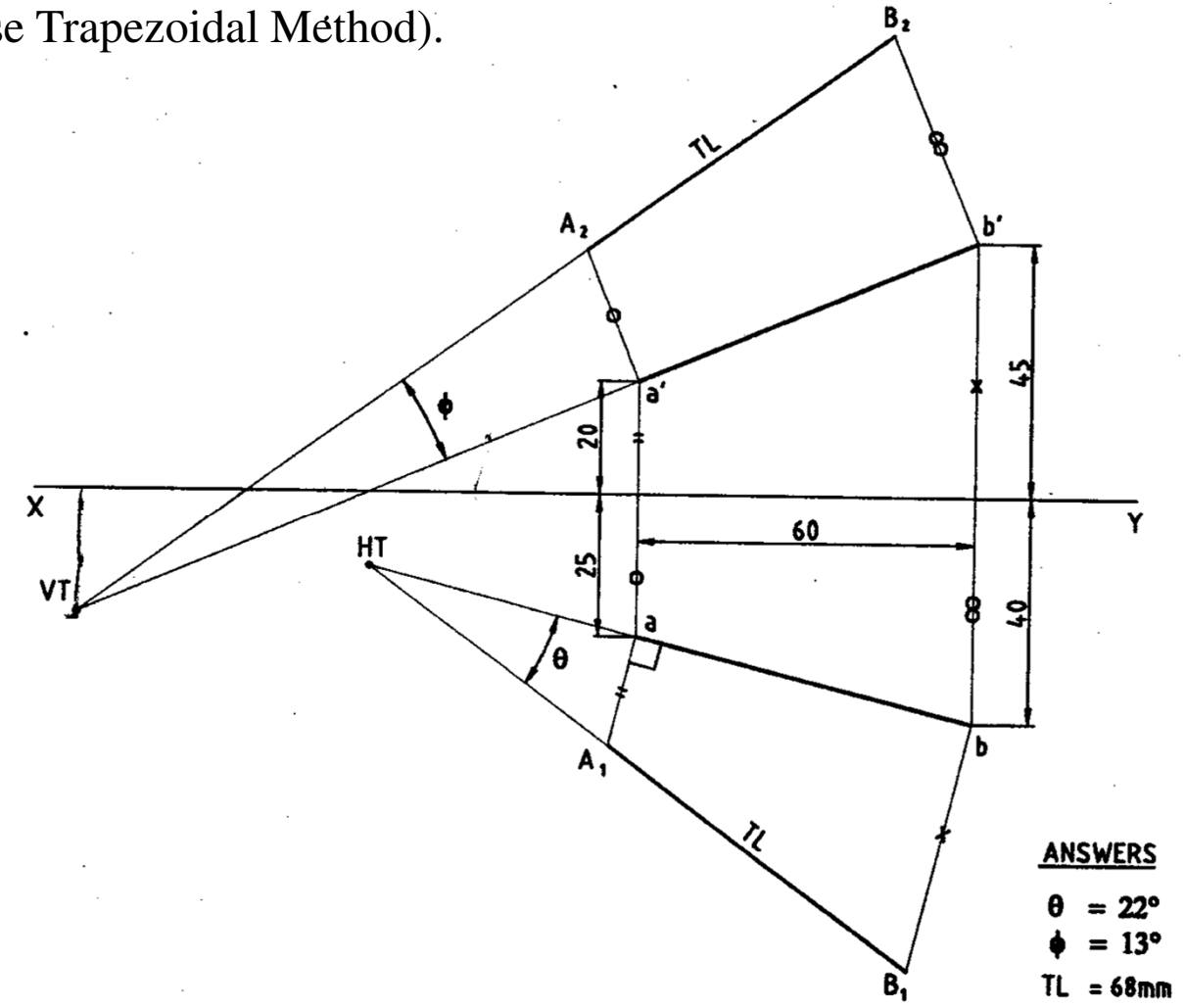


Trapezoid Method



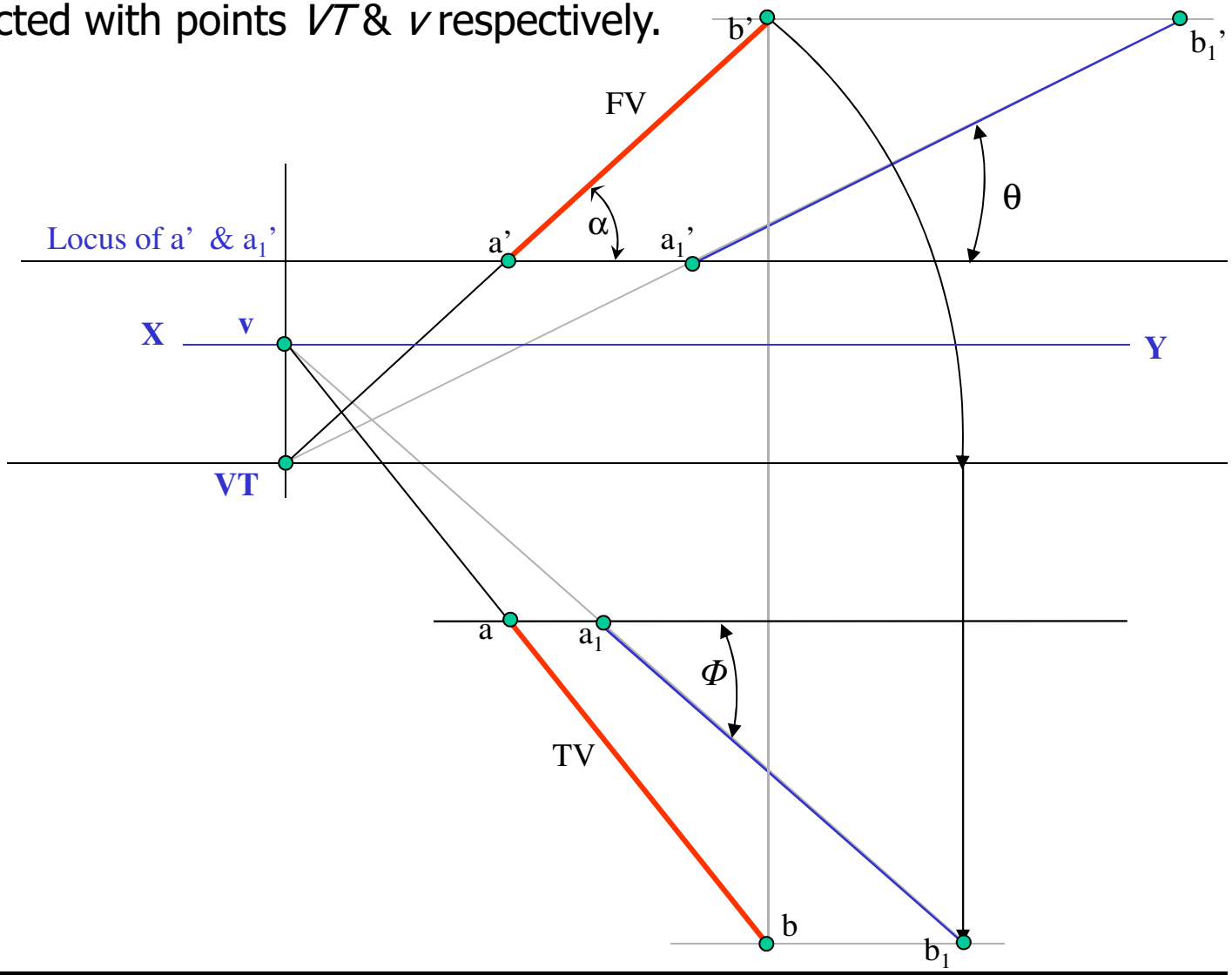
Trapezoid Method (Example 4)

A line *AB* has its end *A* 20 mm above *HP* and 25 mm in front of *VP*. The other end *B* is 45 mm above *HP* and 40 mm in front of *VP*. The distance between the end projectors is 60 mm. Draw its projections, also find the true length and true inclinations of the line with *HP* and *VP* and mark the traces (Use Trapezoidal Method).



Traces of a line (Another Method)

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



Traces of a line (Another Method)

$VTb' = VTa' + a'b' = VTa' + \sqrt{q1^2 + r1^2}$

$VTe = VTa' + \sqrt{q1^2 + r1^2}$

$ve1 = VTa' + \sqrt{q1^2 + r1^2}$

$ve1 = vo1 + a1e2 = VTa' + \sqrt{q1^2 + r1^2}$

So if I can prove $\dfrac{vo_1}{a_1e2} = \dfrac{VTa'}{\sqrt{q1^2 + r1^2}}$

then $a1e2 = \sqrt{q1^2 + r1^2}$

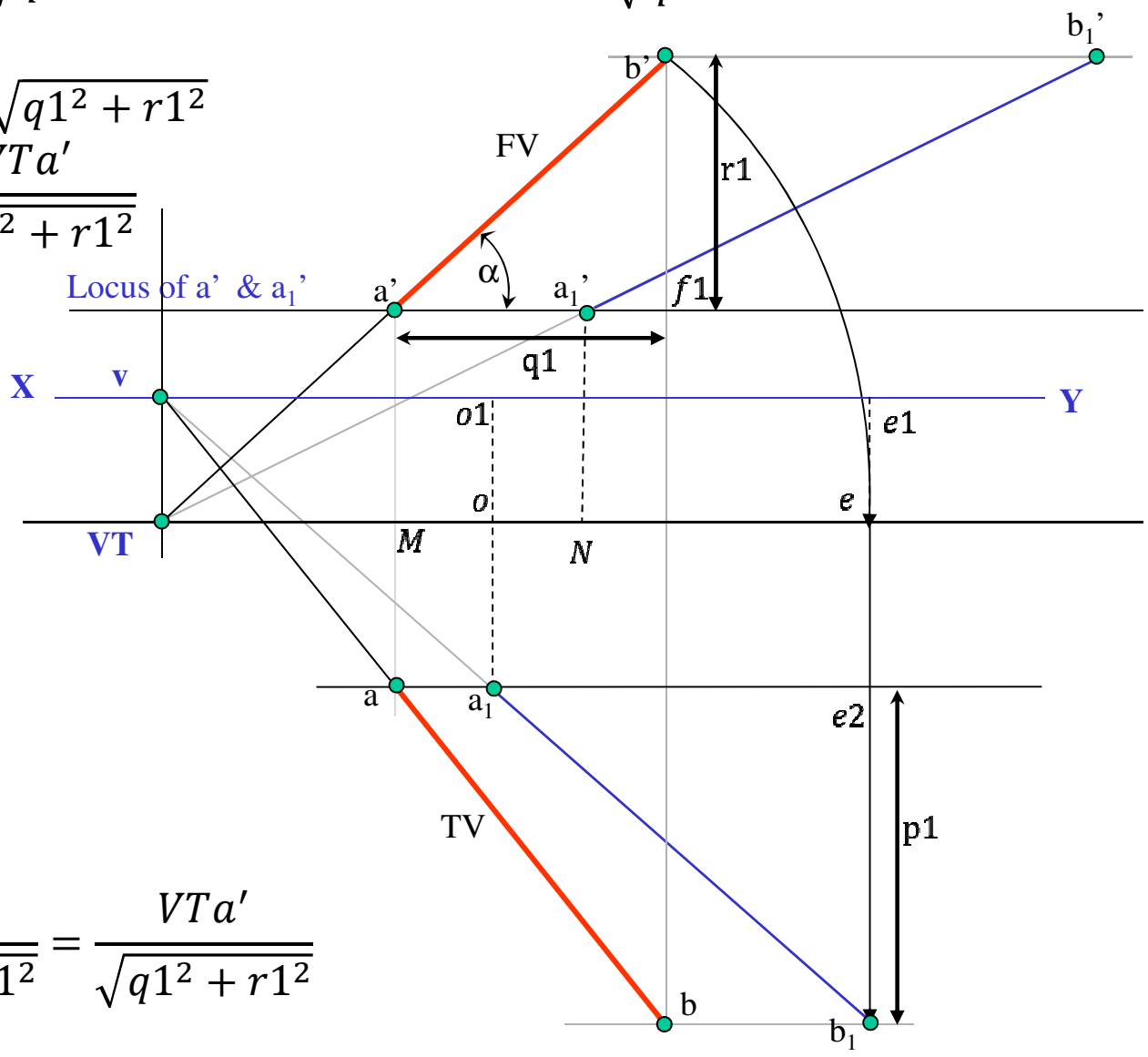
So $a1b1$ will be TL

$$\sin\alpha = \frac{a'M}{VTa'} = \frac{r1}{\sqrt{q1^2 + r1^2}}$$

$$a'M = \frac{(r1)VTa'}{\sqrt{q1^2 + r1^2}}$$

$$a_1'N = a'M = \frac{(r1)VTa'}{\sqrt{q1^2 + r1^2}}$$

$$\frac{VTa_1'}{a_1'b_1'} = \frac{a_1'N}{b'f1} = \frac{(r1)VTa'}{r1\sqrt{q1^2 + r1^2}} = \frac{VTa'}{\sqrt{q1^2 + r1^2}}$$



Traces of a line (Another Method)

$$\frac{VTa_1'}{a_1'b_1'} = \frac{VTa'}{\sqrt{q1^2 + r1^2}}$$

As per the method, $vb_1 = VT\ b_1'$ and $a_1b_1 = a_1'b_1'$

Therefore, $va_1 = VT\ a_1'$

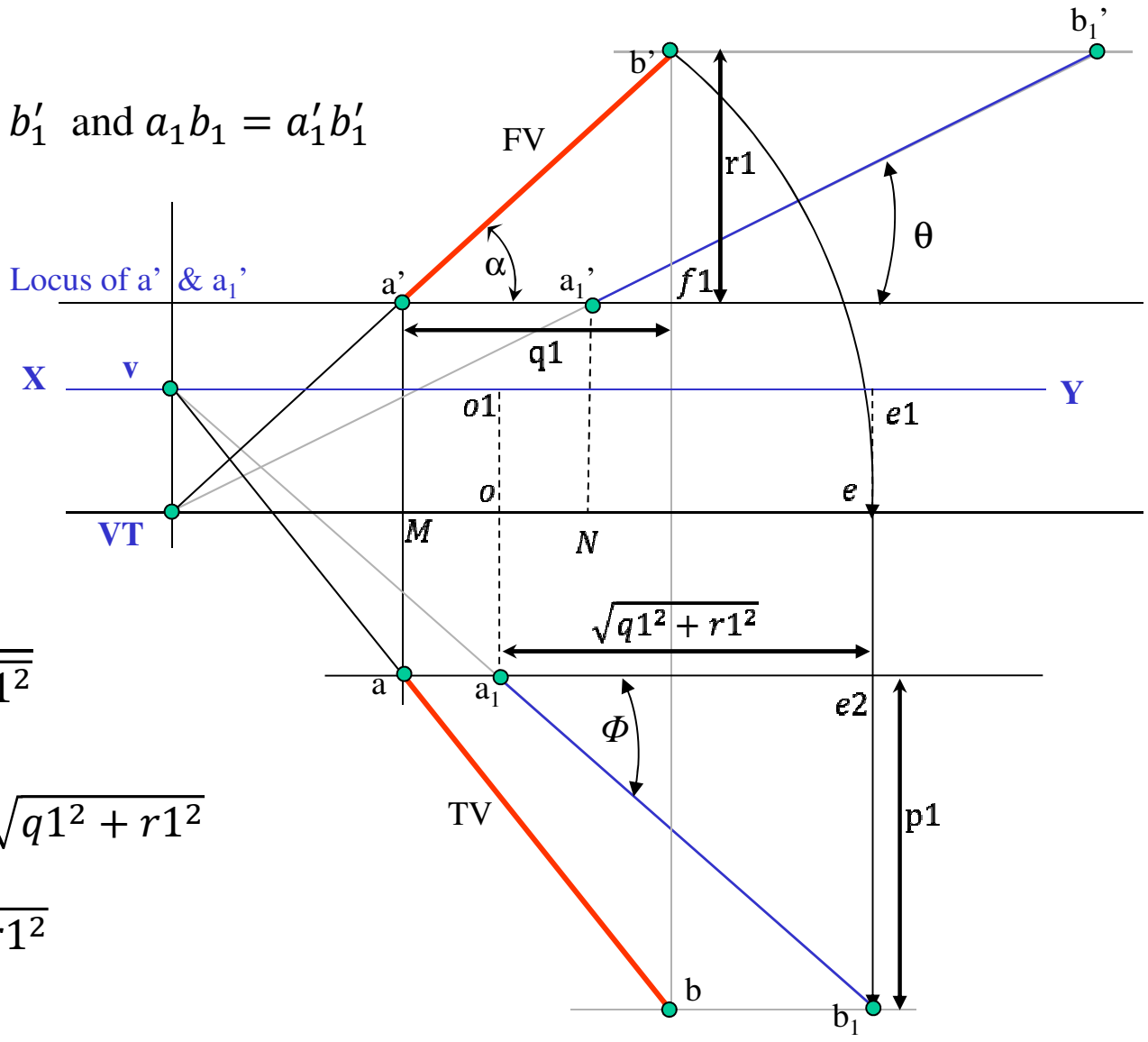
$$\frac{va_1}{a_1b_1} = \frac{VTa_1'}{a_1'b_1'}$$

$$\frac{va_1}{a_1b_1} = \frac{VTa'}{\sqrt{q1^2 + r1^2}}$$

$$\frac{vo_1}{a_1e2} = \frac{va_1}{a_1b_1} = \frac{VTa'}{\sqrt{q1^2 + r1^2}}$$

$$ve1 = vo1 + a_1e2 = VTa' + \sqrt{q1^2 + r1^2}$$

Therefore, $a_1e2 = \sqrt{q1^2 + r1^2}$



Traces of a line (Another Method, Example 5)

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

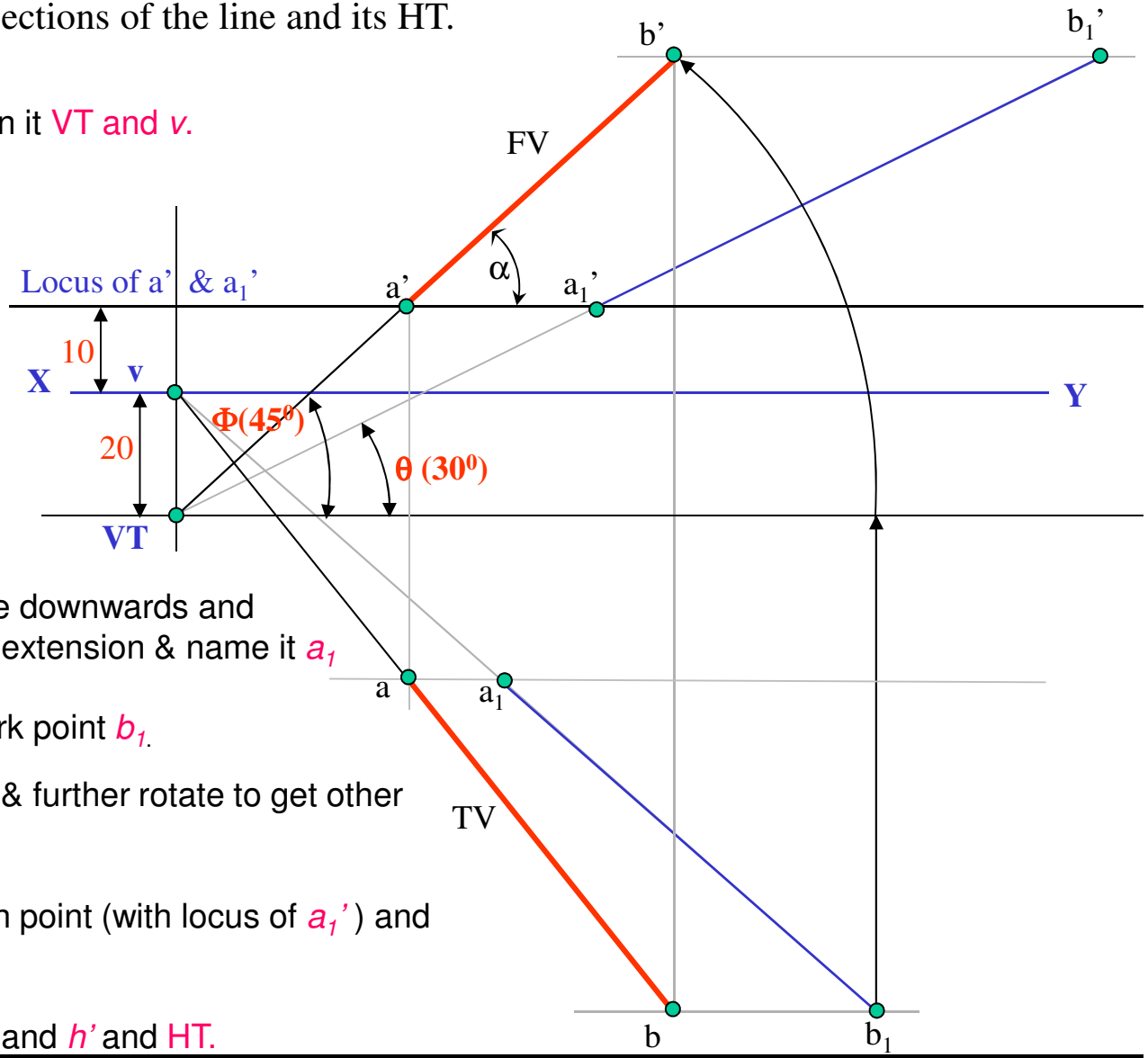
Now from *v* take 45^0 and draw a line downwards and mark on it distance VT- a_1' i.e.TL of extension & name it a_1

Extend this line by 100 mm and mark point b_1.

Draw its component on locus of VT & further rotate to get other end of Fv i.e. *b'*.

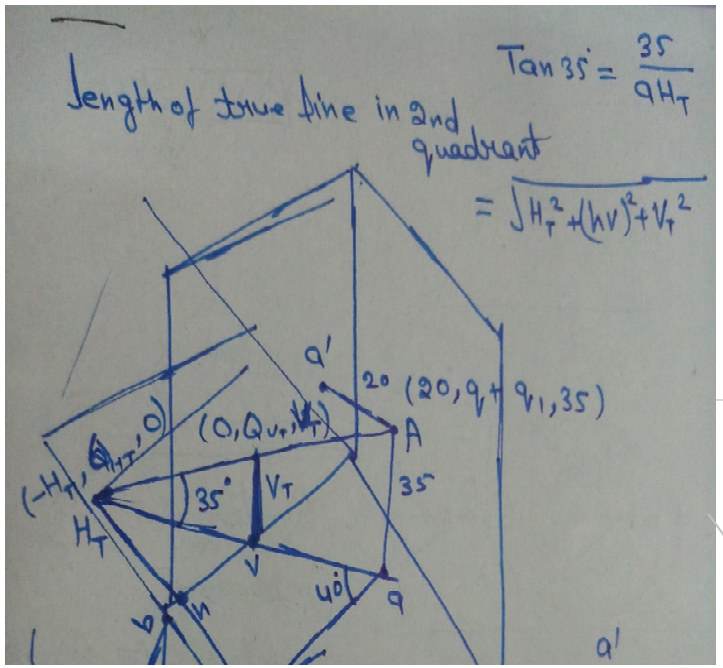
Join it with VT and mark intersection point (with locus of a_1') and name it *a'*

Now as usual locate points *a* and *b* and *h'* and HT.

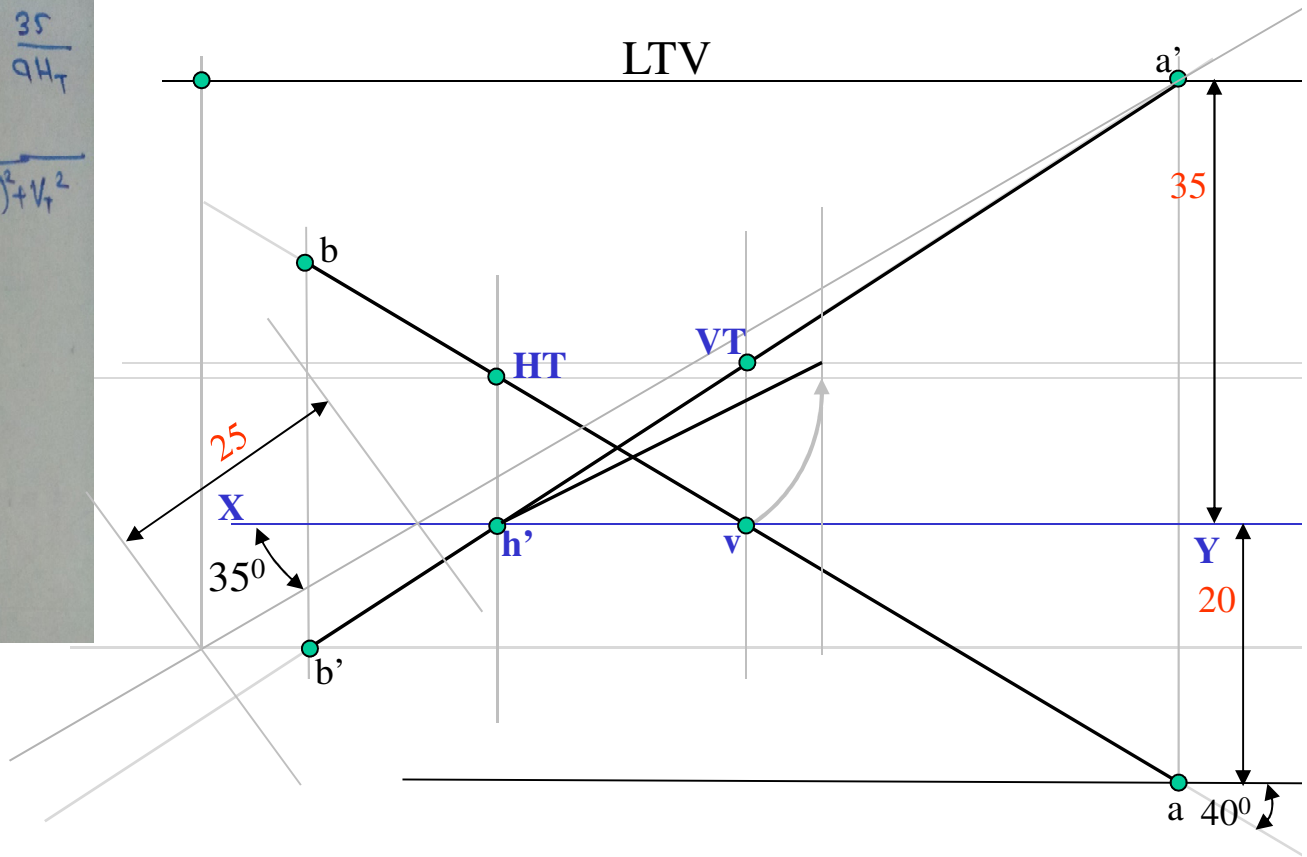


Exam Question (Earlier Year)

End ‘A’ of a line AB is 35 mm above HP and 20 mm in front of VP. The line makes an angle of 35° with HP. End ‘B’ is in 3rd quadrant. The portion of true length in 3rd quadrant is 25 mm. The top view makes an angle of 40°. Draw the projection of the line, find its true length, angle with VP and locate the traces. Also find the length of the true line in 2nd quadrant.



rough notes



2 ways; find HT first and h’ then b’
Or find b’ first and then HT and h’

Thank you