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1) The distance between the end projectors of a line AB is 70 mm and the projectors through the traces are 100 mm apart. The end A of the line is 10 mm above HP. The HT of the line is 25 mm in front of VP and the VT is 50 mm above the HP. Draw the projections of the line & determine its inclinations with HP & VP.

Ans) Given data:

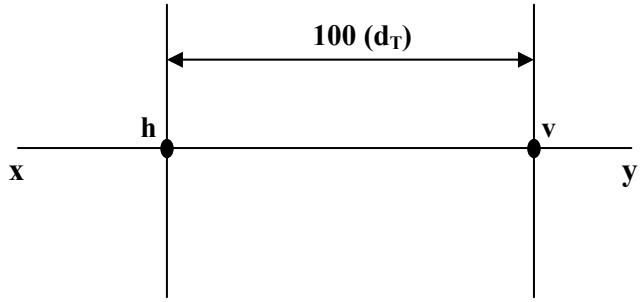
Dist between the ***projectors*** **(d_p) = 70**
Dist between the ***traces*** **(d_T) = 100**
End **A** from HP **(*a')* *(above HP)* = 10**
HT (below xy as it is in front of VP) = **25**
VT (above xy as it is in above HP) = **50**

Logic:

- → Whenever distance between traces (d_T) is given, draw two vertical lines at the given distance to mark h & v on x-y where these two lines cut x-y.
- → On h & v, locate HT & VT.
- → Join ***(h, VT)*** & **(v, HT)**. On these lines, the Front View (FV) & Top View (TV) will lie.
- → Locate starting point **a'** & then draw 2 vertical lines (d_p) starting from **a'** which will cut (h, VT) & (v, HT).
- → Since the FV & TV lie between d_p, we can get the FV & TV. Then the True Length (TL) & angles can be found.

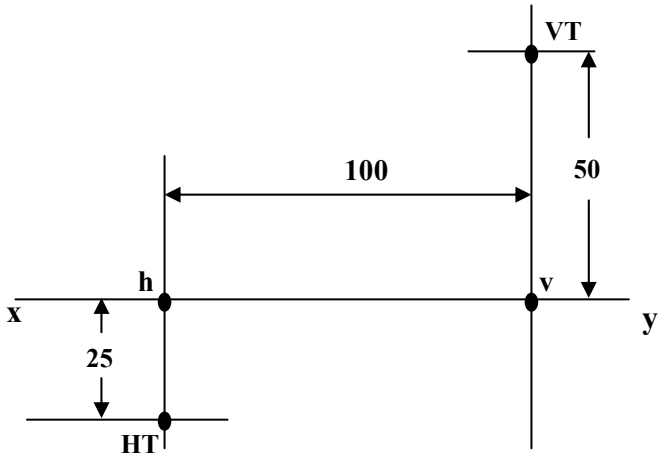
Steps:

i) Draw x-y line & draw 2 vertical lines (d_T) 100 mm apart. Mark h & v at points where these 2 lines cut x-y line.

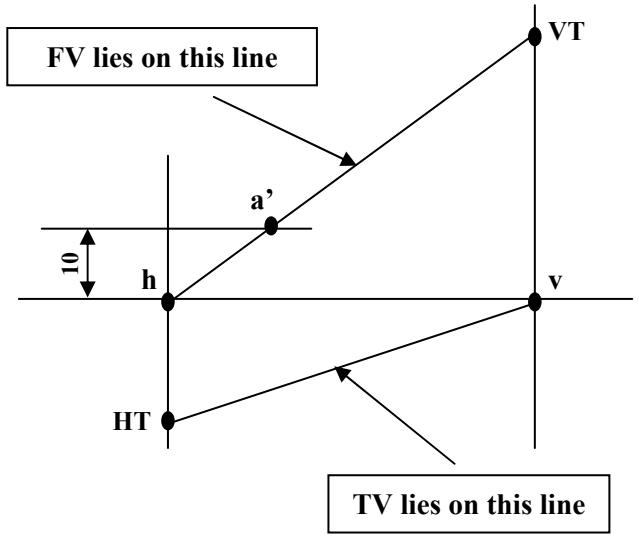


(ii) Below x-y, draw a line ‖ to x-y at 25 mm & the point where it cuts the line through h, mark HT.

(iii) Similarly, above x-y, draw a line ‖ to x-y at 50 mm & the point where it cuts the line through v, mark VT.



(iv) Now join (h, VT) & (v, HT).



(v) To mark a', draw a line ‖ to x-y (above) at 10 mm cutting (h, VT) at a'.

If we observe the above figure, the FV & TV will lie on lines joining (h, VT) & (v, HT).

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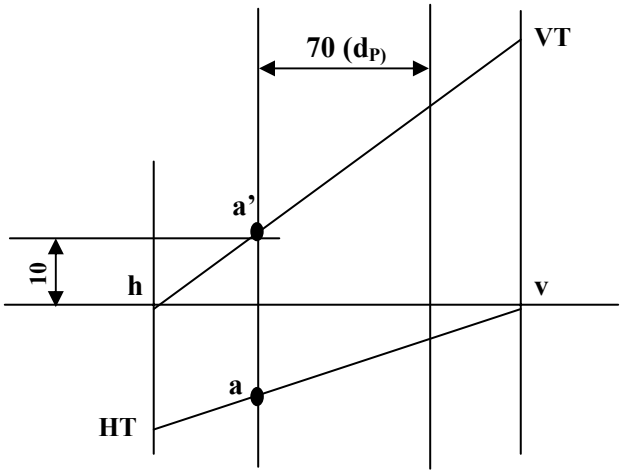
(vi) Now, draw 2 vertical lines (d_p) at 70 mm apart on a'. These lines are called as projectors & the final FV & TV lie between these lines.

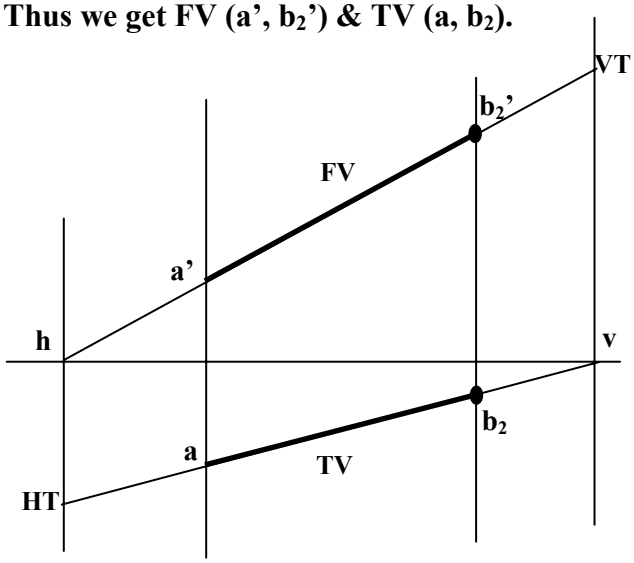


(vii) To locate FV & TV, start with a'.

Locate **a** on line **(v, HT)** and below **a'.**

Since FV & TV lie on d_p lines, we get FV & TV by joining the points between d_p on (h, VT) & (v, HT) through a' & a.

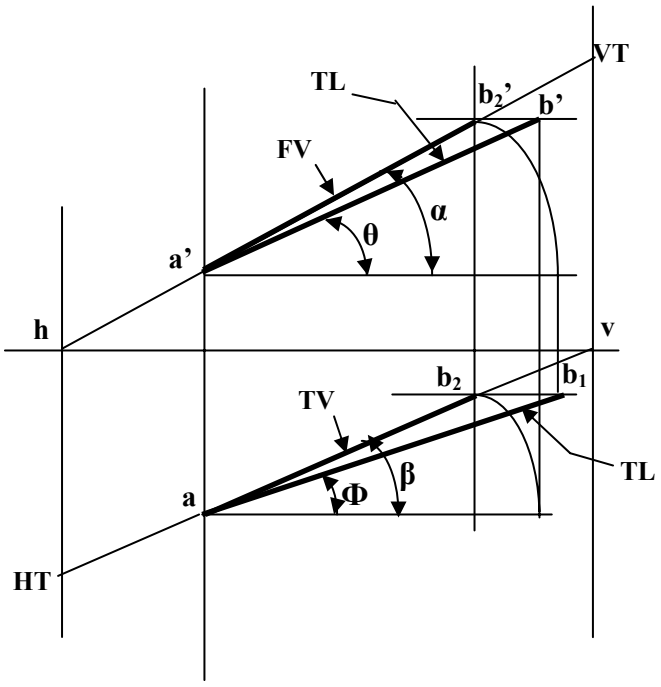
Thus we get FV (a', b_2') & TV (a, b_2).



(viii) Now, we know how to draw the TL when FV & TV are given. All we need to do is rotate the FV & TV to get TL in the opposite projections.

The true length is obtained as follows:

(a) Draw Locus lines on b_2' & b_2.
(b) Rotate FV (a' b_2') about a' by drawing an arc of radius a'-b_2' up to a' level & project onto locus of b_2 to get b_1.
(c) Join a b_1 to get the True Length (TL) a-b_1.



(d) Similarly to get TL in FV, rotate TV <u>a b_2</u> about <u>a</u> by drawing an arc of radius <u>*a-b_2*</u> to line on <u>a</u> level & project on to locus of b_2' to get b'.
(e) Join a' b' to get the TL.
(f) The angles θ, Φ, α & β can be measured from the figure.

<u>The answer is as follows:</u>

TL = 58 mm; θ = 30^0; Φ = 18^0; α = 33^0; β = 22^0

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2) The distance between the end projectors of a line AB is 45 mm and the projectors through the traces are 90 mm apart. The end A of the line is in the HP. The HT of the line is 60 mm in front of VP and the VT is 36 mm above the HP. Draw the projections of the line & determine its inclinations with HP & VP.

Ans) Given data:

Dist between the ***projectors*** **(d_p)** **= 45**
Dist between the ***traces*** **(d_T)** **= 90**
End **A** from HP **(*a'*) *(in HP)*** **= 0**
HT (below xy as it is in front of VP) = **60**
VT (above xy as it is in above HP) = **36**

Logic: Same as earlier problem with only change of position of a'

→ Whenever distance between traces (d_T) is given, draw two vertical lines at the given distance to mark h & v on x-y where these two lines cut x-y.

→ On h & v, locate HT & VT.

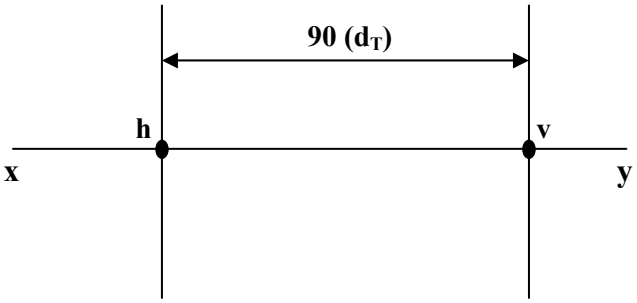
→ Join ***(h, VT)*** & **(v, HT)**. On these lines, the Front View (FV) & Top View (TV) will lie.

→ Locate starting point **a'** & then draw 2 vertical lines (d_p) starting from **a'** which will cut (h, VT) & (v, HT).

→ Since the FV & TV lie between d_p, we can get the FV & TV. Then the True Length (TL) & angles can be found.

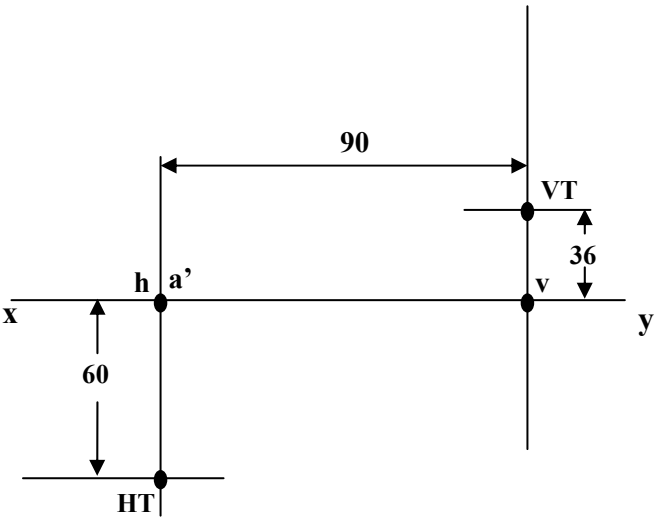
Steps:

i) Draw x-y line & draw 2 vertical lines (d_T) 90 mm apart. Mark h & v at points where these 2 lines cut x-y line.

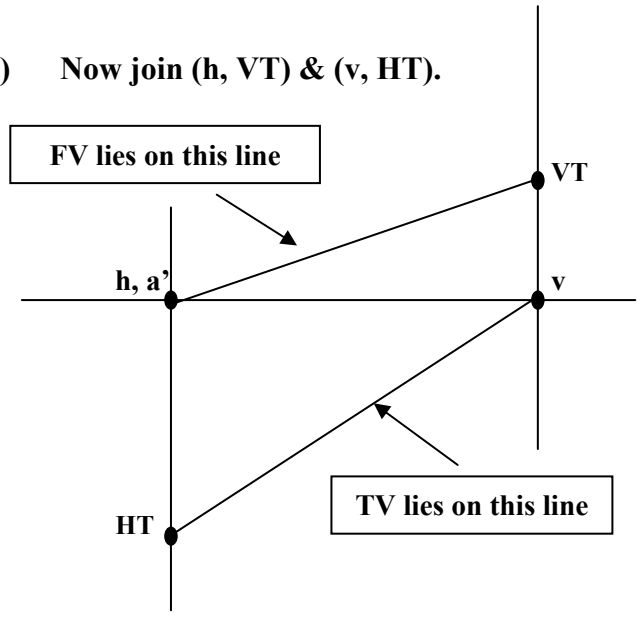


(ii) Below x-y, draw a line ‖ to x-y at 60 mm & the point where it cuts the line through h, mark HT.

(iii) Similarly, above x-y, draw a line ‖ to x-y at 36 mm & the point where it cuts the line through v, mark VT.



(iv) Now join (h, VT) & (v, HT).



(v) To mark a', since it is on HP, h itself becomes a'.

If we observe the above figure, the FV & TV will lie on lines joining (h, VT) & (v, HT).

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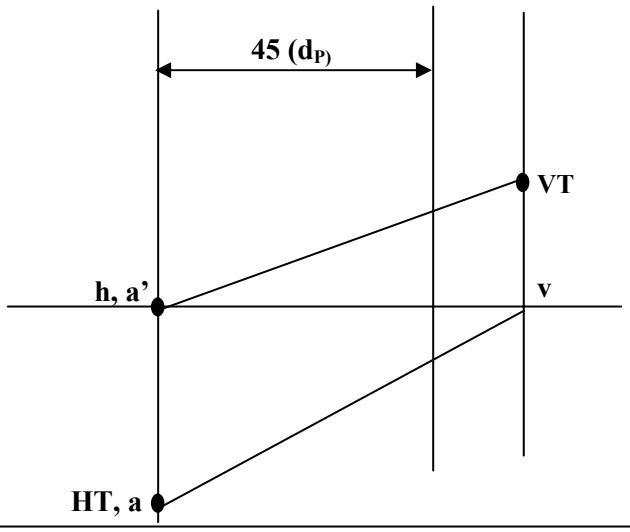
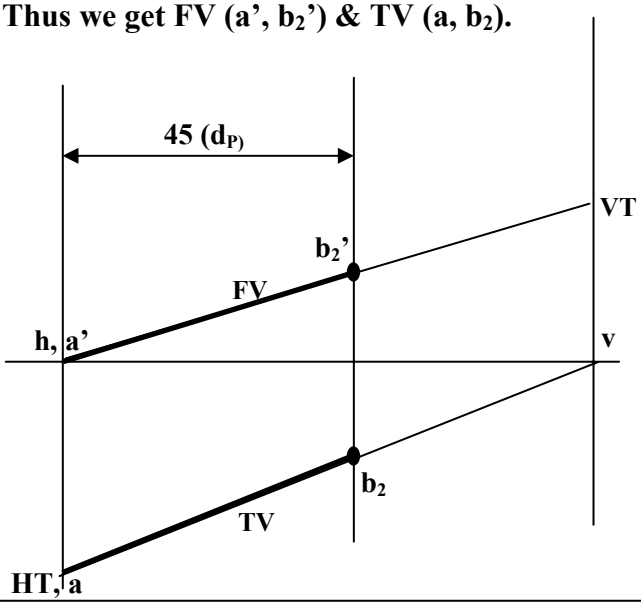
(vi) Now, draw 2 vertical lines (d_p) at 45 mm apart on a'. These lines are called as projectors & the final FV & TV lie between these lines.



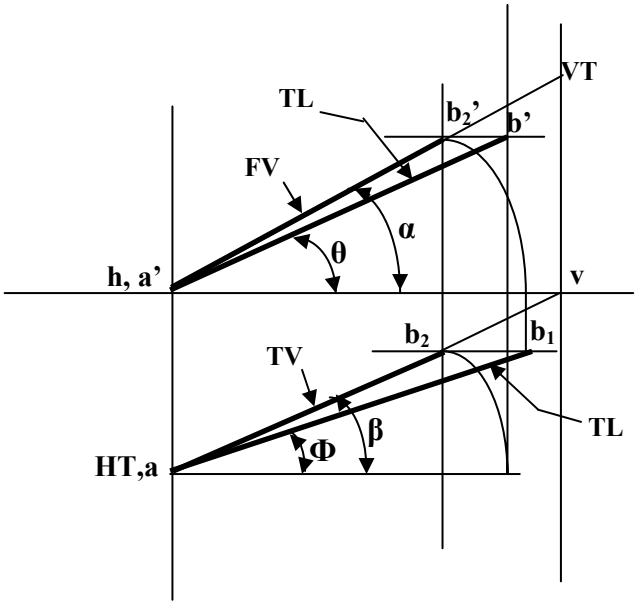
(vii) To locate FV & TV, start with a'.

Locate **a** on line **(v, HT)** and below **a'.**
Here a coincides with HT.
Since FV & TV lie on d_p lines, we get FV & TV by joining the points between d_p on (h, VT) & (v, HT) through a' & a.
Thus we get FV (a', b_2') & TV (a, b_2).



(viii) Now, we know how to draw the TL when FV & TV are given. All we need to do is rotate the FV & TV to get TL in the opposite projections.
The true length is obtained as follows:

- **(a) Draw Locus lines on b_2' & b_2.**
- **(b) Rotate FV (a' b_2') about a' by drawing an arc of radius a'-b_2' up to a' level & project onto locus of b_2 to get b_1.**
- **(c) Join a b_1 to get the True Length (TL) a-b_1 & angle Φ**



(d)Similarly to get TL in FV, rotate TV <u>a b_2</u> about <u>a</u> by drawing an arc of radius <u>*a-b_2*</u> to line on <u>a</u> level & project on to locus of b_2' to get b'.

(e)Join a' b' to get the TL & angle θ.

(f)The angles θ, Φ, α & β can be measured from the figure.
The answer is as follows:

TL = 58 mm; $\theta = 19^0$; $\Phi = 31^0$; $\alpha = 22^0$; $\beta = 34^0$

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This is Prob 10.28 of pg 208 in text book.

3) The distance between the end projectors of a line AB is 70 mm and the projectors through the traces are 110 mm apart. The end A of the line is 10 mm above HP. If the top view & front view of the line make 30^0 & 60^0 with xy respectively, draw the projections of the line and find the true length, inclinations with HP & VP & the traces.

Ans) Given data:

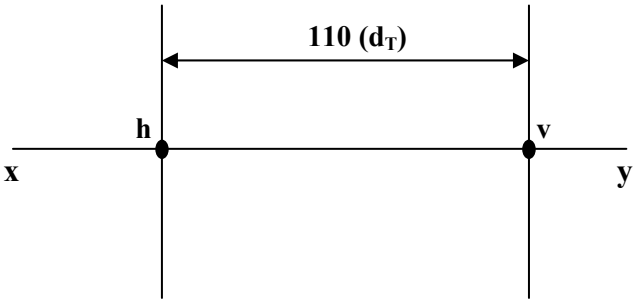
Dist between the ***projectors*** (d_p)	= 70
Dist between the ***traces*** (d_T)	= 110
End **A** from HP ***(a') (above HP)***	= 10
α (angle made by FV with xy)	= 60^0
β (angle made by TV with xy)	= 30^0

Logic:

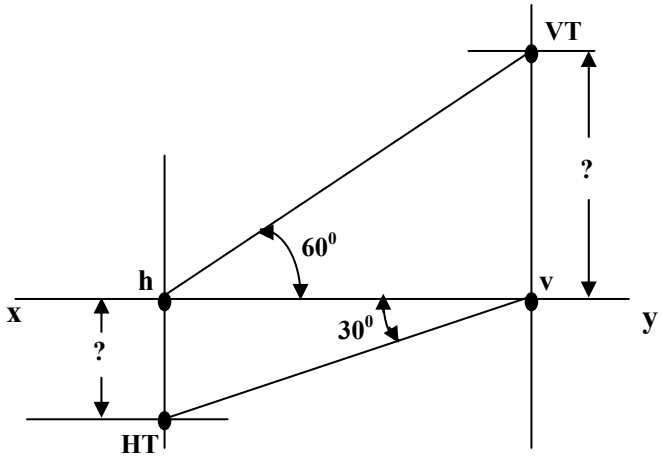
- → Whenever distance between traces (d_T) is given, draw two vertical lines at the given distance to mark h & v on x-y where these two lines cut x-y.
- → On h & v, draw lines at 60^0 & 30^0 to cut the $\mathbf{d_T}$ at VT & HT respectively.
- → Join ***(h, VT)*** & **(v, HT)**. On these lines, the Front View (FV) & Top View (TV) will lie.
- → Locate starting point **a'** & then draw 2 vertical lines (d_p) starting from **a'** which will cut (h, VT) & (v, HT).
- → Since the FV & TV lie between d_p, we can get the FV & TV. Then the True Length (TL) & angles can be found.

Steps:

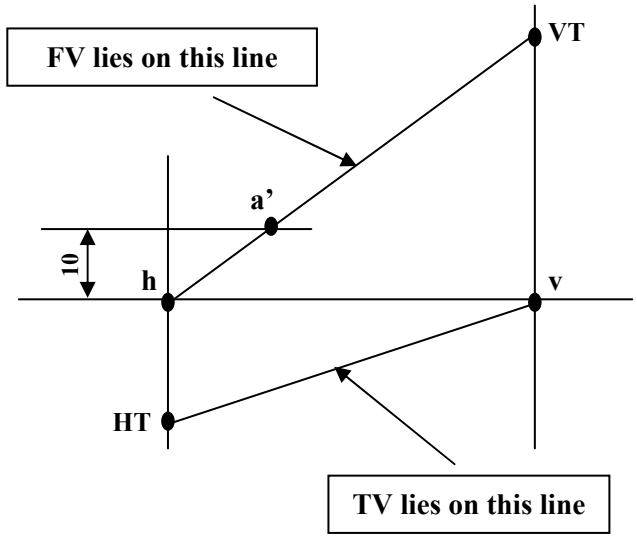
i) Draw x-y line & draw 2 vertical lines (d_T) 110 mm apart. Mark h & v at points where these 2 lines cut x-y line.



(ii) On h, draw a line at 60^0 to cut v at VT.
(iii) On v, draw a line at 30^0 to cut h at HT.



Measure and find out distances of HT & VT.



(iv) To mark a', draw a line ‖ to x-y (above) at 10 mm cutting (h, VT) at a'.

If we observe the above figure, the FV & TV will lie on lines joining (h, VT) & (v, HT).

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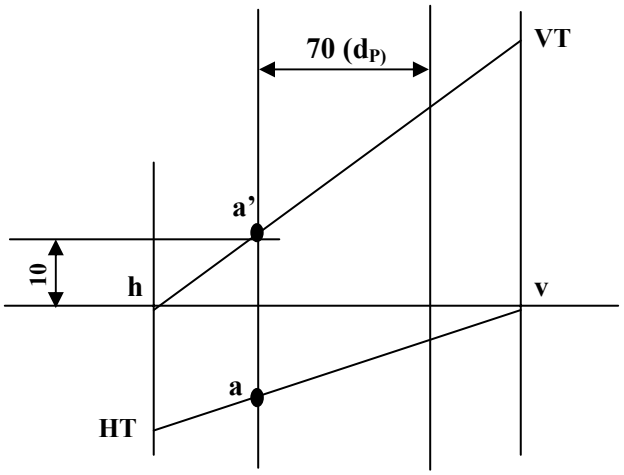
(v) Now, draw 2 vertical lines (d_p) at 70 mm apart on a'. These lines are called as projectors & the final FV & TV lie between these lines.

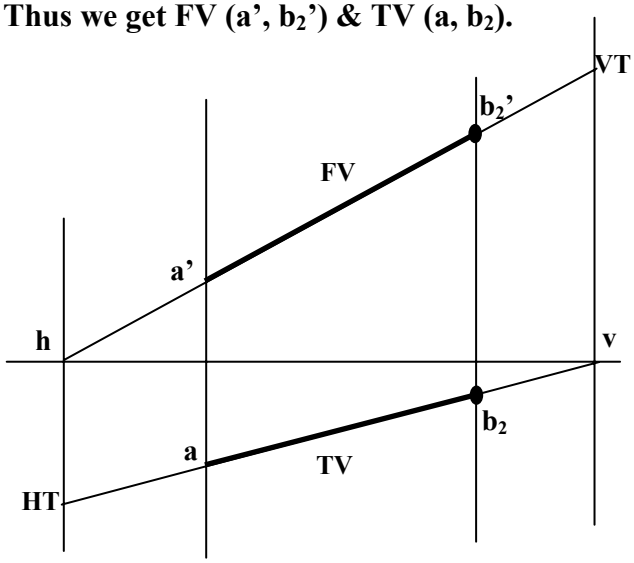


(vi) To locate FV & TV, start with a'.

Locate **a** on line **(v, HT)** and below **a'.**

Since FV & TV lie on d_p lines, we get FV & TV by joining the points between d_p on (h, VT) & (v, HT) through a' & a.

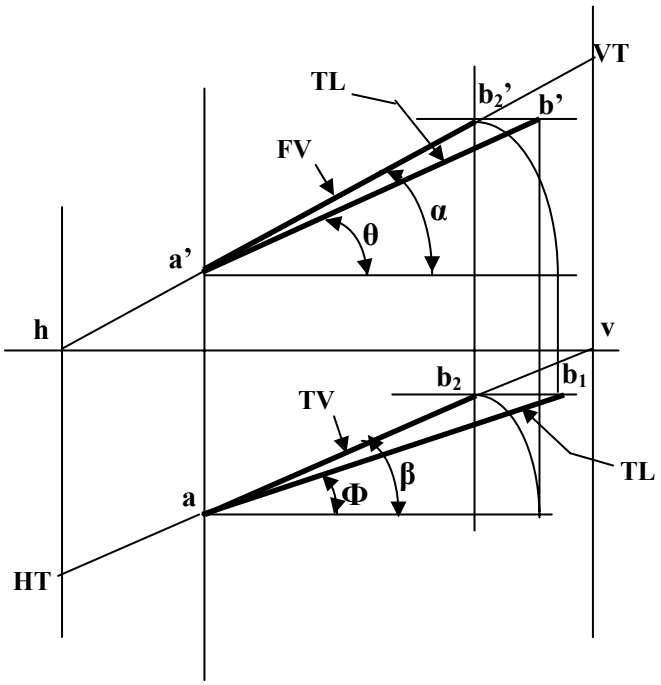
Thus we get FV (a', b_2') & TV (a, b_2).



(vii) Now, we know how to draw the TL when FV & TV are given. All we need to do is rotate the FV & TV to get TL in the opposite projections.

The true length is obtained as follows:

(g) Draw Locus lines on b_2' & b_2.
(h) Rotate FV (a' b_2') about a' by drawing an arc of radius a'-b_2' up to a' level & project onto locus of b_2 to get b_1.
(i) Join a b_1 to get the True Length (TL) a-b_1.



(j) Similarly to get TL in FV, rotate TV <u>a b_2</u> about <u>a</u> by drawing an arc of radius <u>*a-b_2*</u> to line on <u>a</u> level & project on to locus of b_2' to get b'.
(k) Join a' b' to get the TL.
(l) The angles θ, Φ, α & β can be measured from the figure.

TL = 146 mm; θ = 56^0; Φ = 16^0; α = 60^0; β = 30^0
VT = 192 above HP; HT= 64 in front of VP.

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This is Prob 23 of pg 217 in text book.

4) The front view of a line makes an angle of 30^0 with xy. The HT of the line is 45 mm in front of VP while its VT is 30 mm below the HP. One end of the line is 10 mm above the HP & the other end is 100 mm in front of the VP. Draw the projections of the line & determine its true length & its inclinations with HP & VP.

Ans) Given data:

α (angle made by FV with xy)	= **30^0**
End **A** from HP ***(a')(above HP)***	**= 10**
HT (below xy as it is in front of VP)	= **45**
VT (below xy as it is below HP)	= **30**
End B (locus of B) (below xy)	**= 100**

Logic: Since FV angle **α** is given & **a'** is also given, we can get the point h on xy.

→ By drawing locus of VT below xy, we can get VT on the line (h, a').

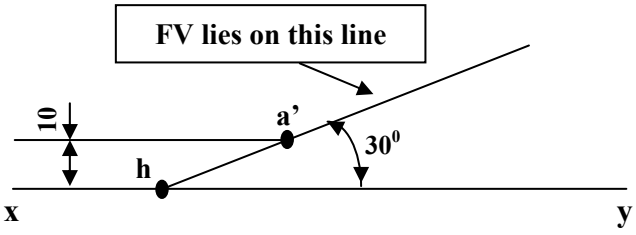
→ On h & VT, locate HT & v. Join ***(h, VT)*** & **(v, HT)**. On these lines, the Front View (FV) & Top View (TV) will lie. Join (v, HT) & extend below xy to cut locus of B.

→ The point of intersection will give the point $\mathbf{b_2}$ which is the final position of top view. Locate **a** on projector of **a'** and then join $\mathbf{a\text{-}b_2}$ to get the top view.

→ Project top view above to get b_2' on (h, VT). Since FV & TV are found now, the TL can be found by drawing arcs & projecting onto opposite quadrants.

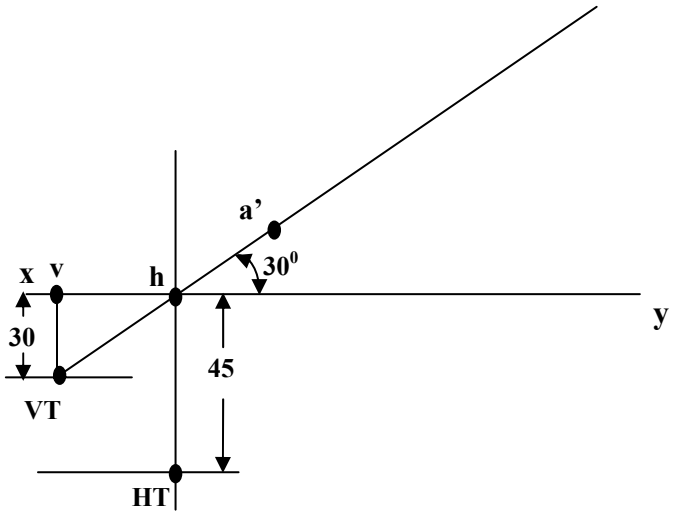
Steps:

i) Draw x-y line & mark a' at 10 mm above xy. On a'. draw a line at $\alpha = 30^0$ which is the FV line. Extend the FV line to cut xy at h.

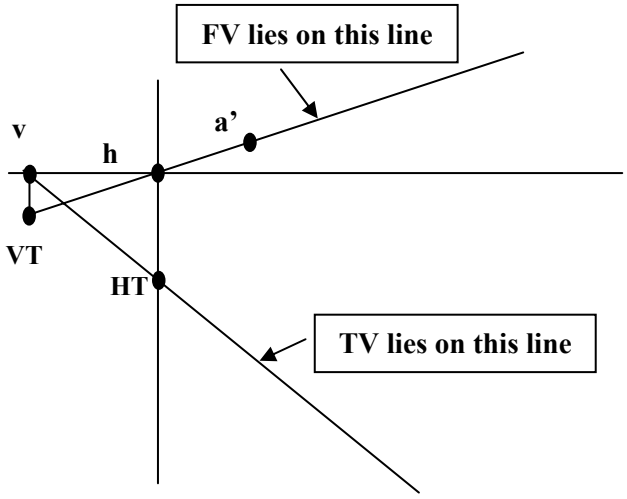


(ii) Below x-y, draw a line ‖ to x-y at 30 mm & the point where it cuts the line through h & a', mark VT.

(iii) On VT, draw a ⊥ to meet xy at v. On h, draw a ⊥ to get HT at 45 mm. Join (v, HT) and extend it.



(iv) Now join (h, VT) & (v, HT).



(v) To mark b_2, draw the locus line ‖ to xy & below xy at 100 mm. This line represents the end B from VP.

If we observe the above figure, the FV & TV will lie on lines joining (h, VT) & (v, HT).

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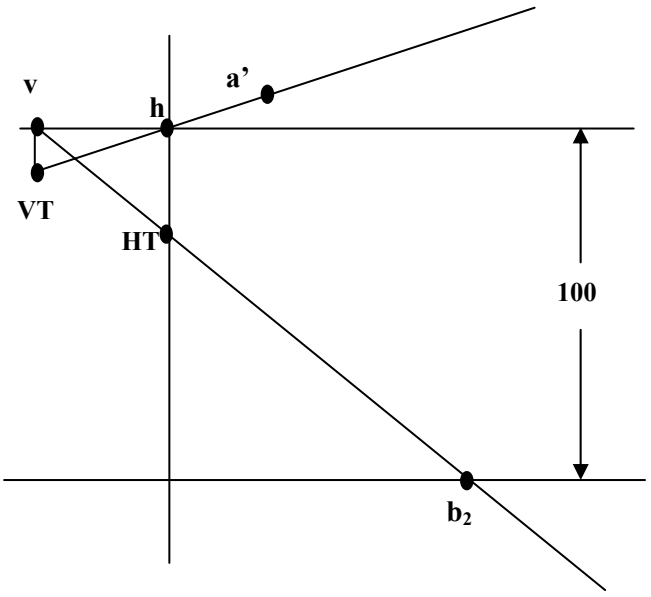
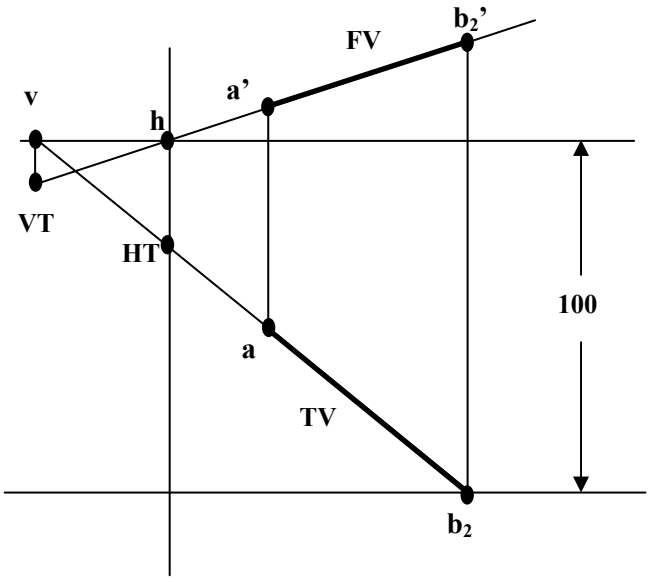
(vi) Now, extend the line joining (v, HT) to cut the locus line of B at 100 mm below xy. This point is end point of top view, b_2.



(vii) To locate FV & TV, start with a'.

Locate **a** on line **(v, HT)** and below **a'.**
Project b_2 to cut FV line (VT, h, a') at b_2'.
a' b_2' represents the FV & a b_2 is the TV.



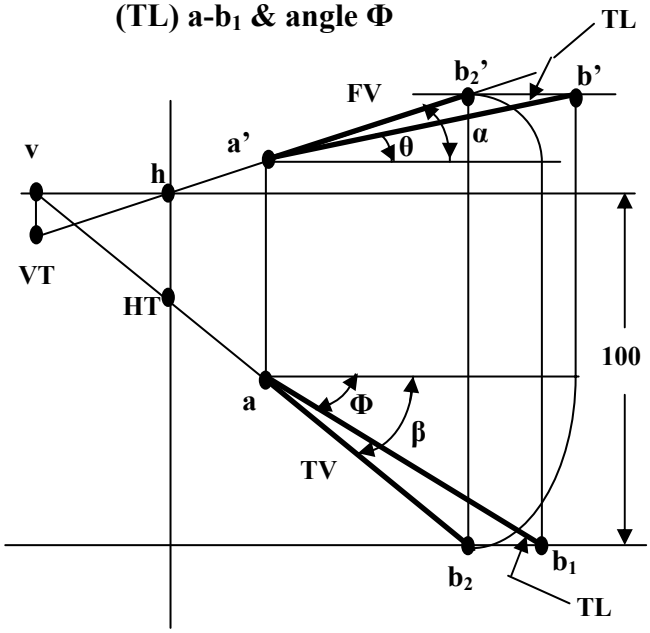
(viii) Now, we know how to draw the TL when FV & TV are given. All we need to do is rotate the FV & TV to get TL in the opposite projections.

The true length is obtained as follows:

(a) Draw Locus lines on b_2' & b_2.

(b) Rotate FV (a' b_2') about a' by drawing an arc of radius a'-b_2' up to a' level & project onto locus of b_2 to get b_1.

(c) Join a b_1 to get the True Length (TL) a-b_1 & angle Φ



(d)Similarly to get TL in FV, rotate TV <u>a b_2</u> about <u>a</u> by drawing an arc of radius <u>*a-b_2*</u> to line on <u>a</u> level & project on to locus of b_2' to get b'.

(e)Join a' b' to get the TL & angle θ.

(f)The angles θ, Φ, α & β can be measured from the figure.

The answer is as follows:

TL = 68 mm; $\theta = 23^0$; $\Phi = 37^0$; $\alpha = 30^0$; $\beta = 41^0$