3.0 Projection of Lines (Manual Drawing)

SEMESTER: I/II

COURSE TITLE: **COMPUTER AIDED ENGINEERING GRAPHICS**

COURSE CODE: **22MED13/23**

Solution Manual

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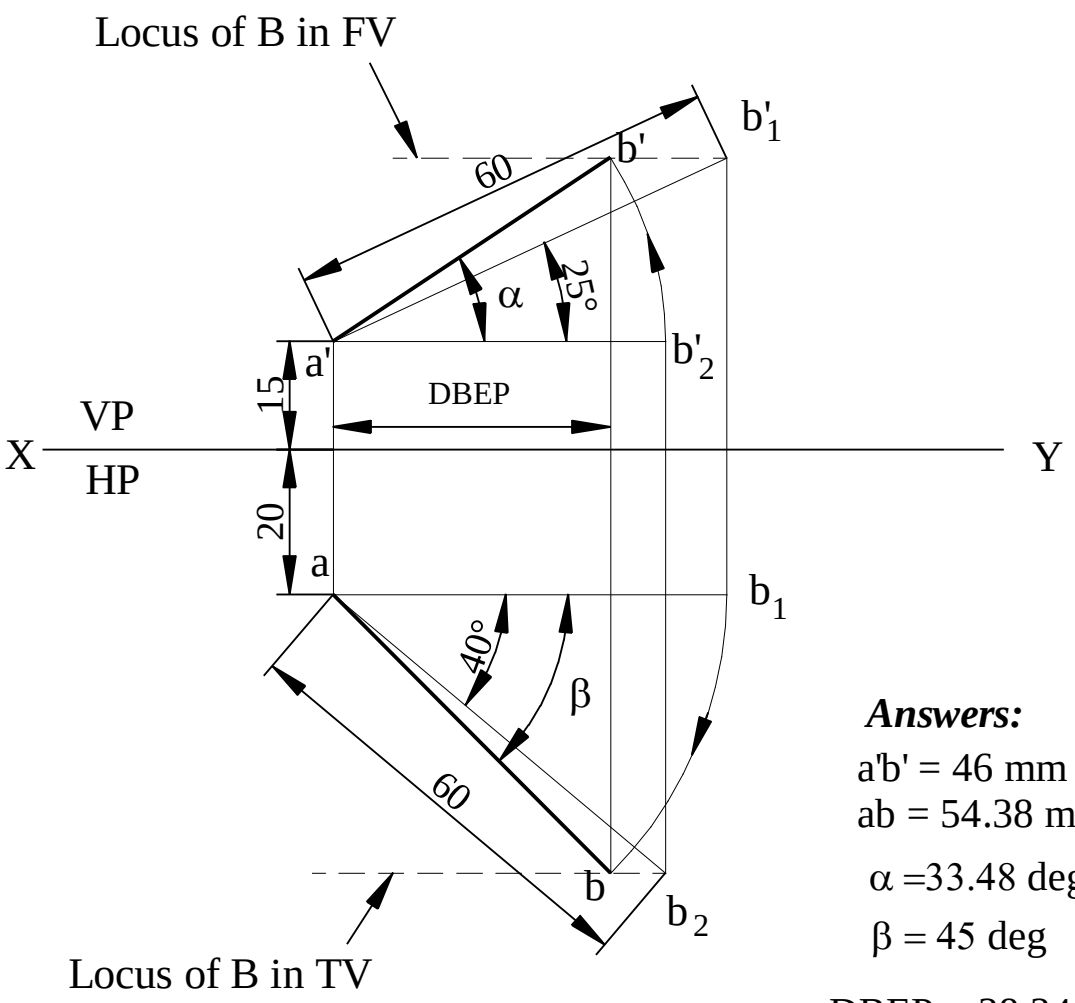
3.1 A line AB 60mm long has one end 20mm in front of VP and 15mm above HP. The line is inclined at 25^0 to HP and 40^0 to VP. Draw the front view and the top view of the line.



Answers:

a'b' = 46 mm

ab = 54.38 mm

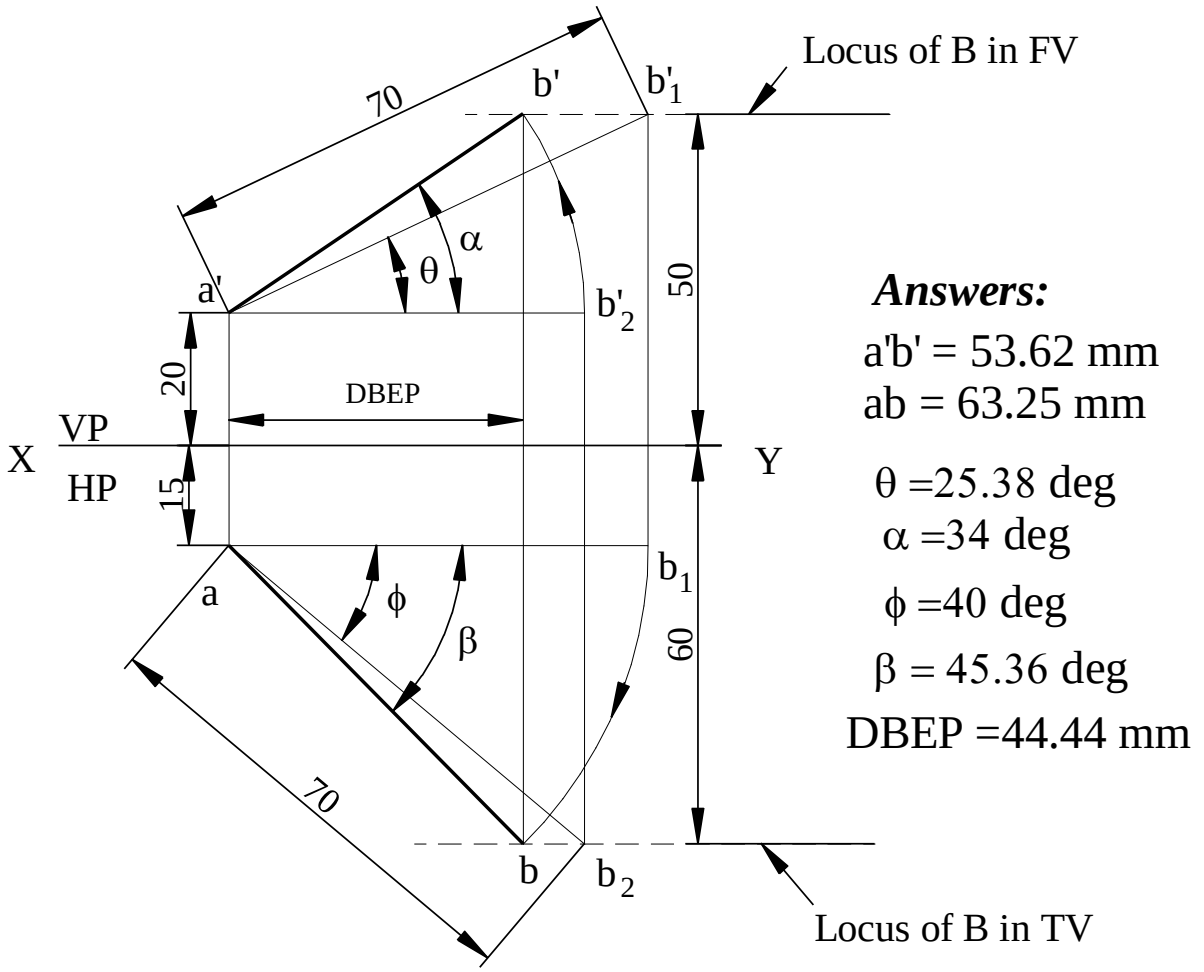
α =33.48 deg

β = 45 deg

DBEP = 38.34 mm

- Draw XY line & mark front & top views of point A.
- From a' draw true length ab_1' equal to 60 mm at 25^0 and from a, draw ab_2 equal to 60 mm at 40^0 to XY line.
- Draw a horizontal dotted line parallel to XY line passing through b_1' and b_2 to obtain the loci of end B in Front & top views.
- Draw ab_1 which is top view of ab_1' and ab_2' which is front view of ab_2.
- With a' as center, rotate the front view ab_2' to touch the locus of B in FV to obtain b'.
- With a as center, rotate the top view ab_1 to touch the locus of B in TV at b,
- Join a'b' and ab with thick lines which are the final position of front and top views when line is inclined to both HP & VP.
- Measure apparent lengths, Apparent angles & distance between end projectors.

3.2 The line AB measuring 70mm has its end A 15mm in front of VP and 20mm above HP, the other end B is 60mm in front of VP and 50mm above HP. Draw the projections of the line and find the inclinations of the line with both the reference planes of projection.



Answers:

a'b' = 53.62 mm

ab = 63.25 mm

θ =25.38 deg

α =34 deg

ϕ =40 deg

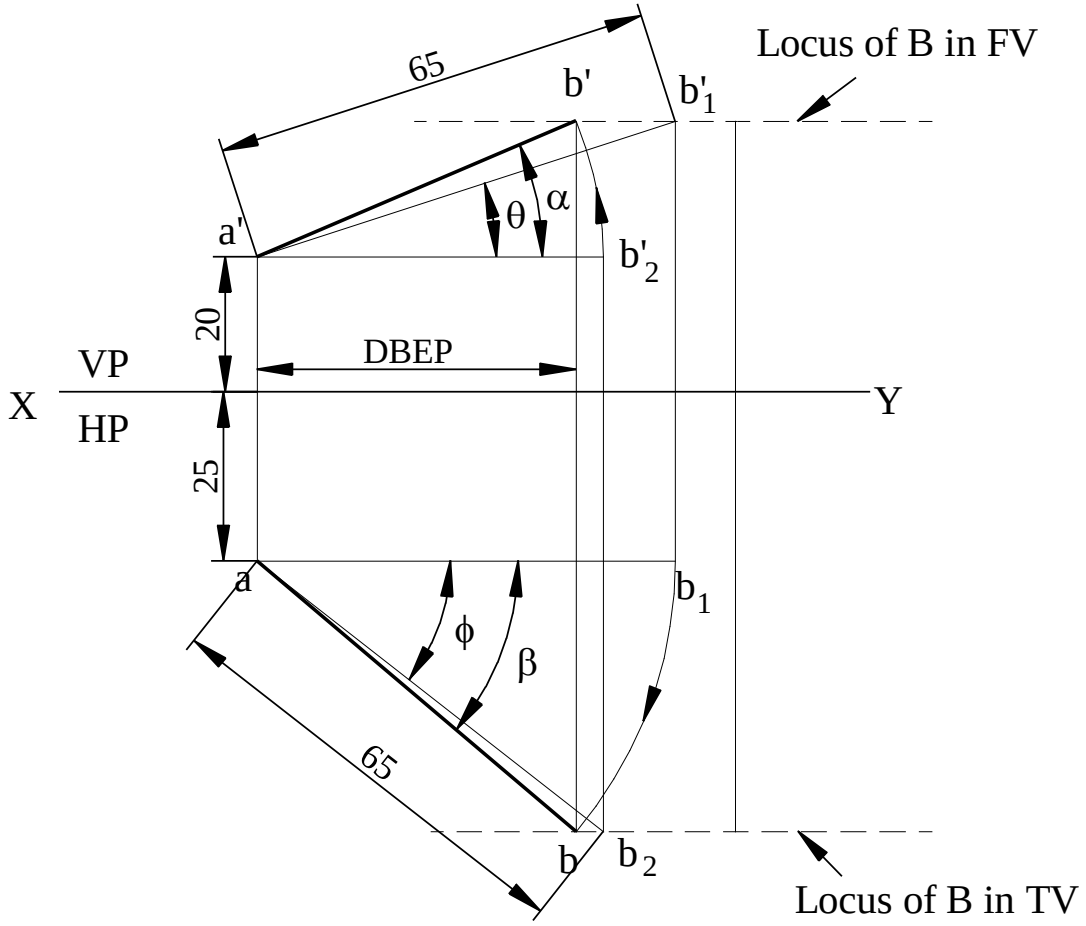
β = 45.36 deg

DBEP =44.44 mm

- Draw XY line & mark front & top views of point A.
- Draw the loci of end B parallel to XY at a distance 50 mm above & 60 mm below XY line.
- Draw an arc of 70 mm to intersect the loci of B at b_1' and b_2.
- Join ab_1' and ab_2 and measure true inclinations of the line with HP & VP.
- Draw the top view ab_1 & front view ab_2' parallel to XY line.
- With centers a' and a, rotate the front view ab_2' and top view ab_1 to touch the loci of B in FV & TV respectively to obtain points b' and b.
- Join a'b' and ab with thick lines which are the final position of front and top views when line is inclined to both HP & VP.
- Measure apparent lengths, Apparent angles & distance between end projectors.

Q 3.3 A line AB, 65 mm long, has its end 20 mm above HP and 25 mm in front of VP. The end B is 40 mm above HP and 65 mm in front of VP. Draw the projections AB and show its inclinations with the HP and VP.

Solution: Graphical solution is Similar to Q 3.2



Answers:

a'b' = 51.23 mm

ab = 61.85 mm

θ =18 deg

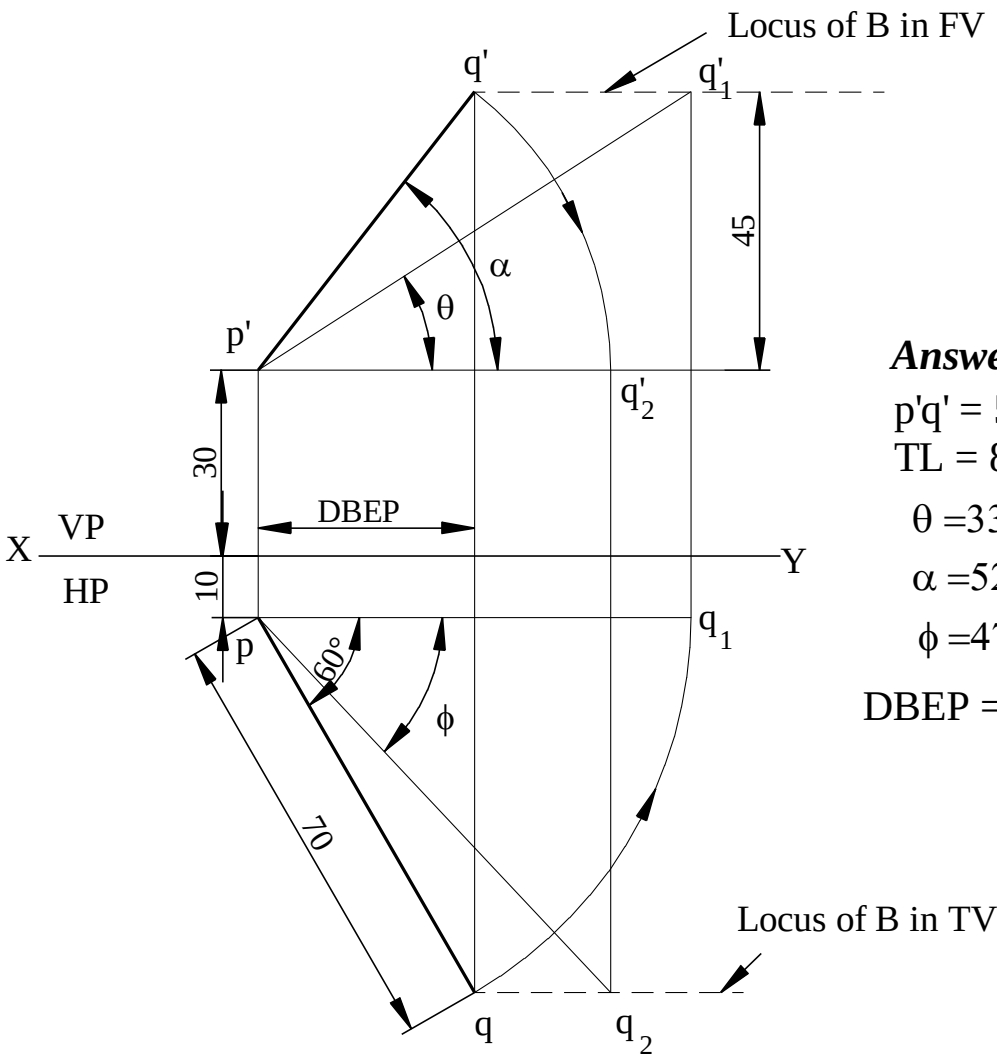
α =23 deg

ϕ =38 deg

β = 40.3 deg

DBEP =47.17 mm

3.4 The top view pq of a straight line is 70mm and makes an angle of 60^0 to XY line. End P is 10 mm in front of VP and 30mm above HP. The difference between the distances of P and Q above HP is 45mm. Draw the projections and determine the true length and true inclinations with HP and VP.



Answers:

p'q' = 57

TL = 83.22mm

θ =33 deg

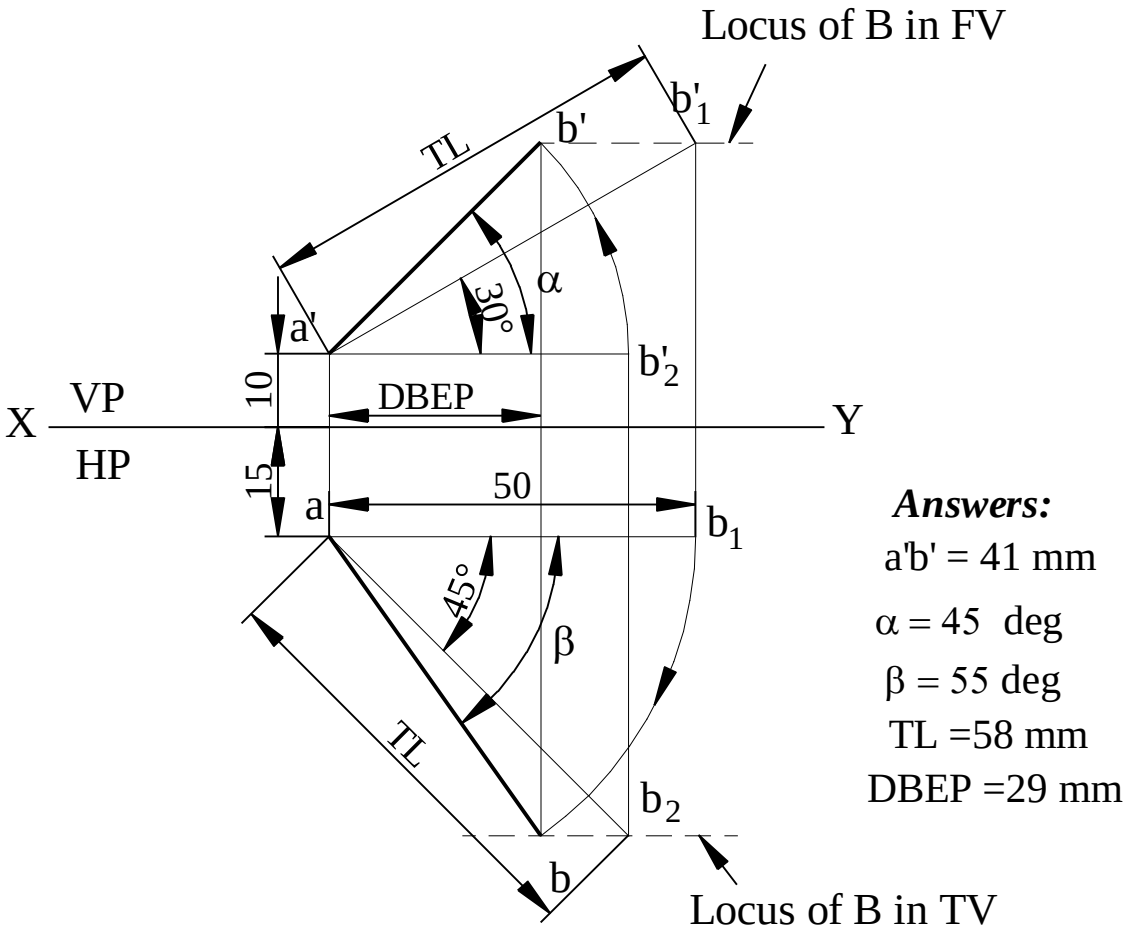
α =52 deg

ϕ =47 deg

DBEP =35 mm

- Draw XY line & mark front & top views of point P.
- Draw the locus of end Q parallel to XY at a distance 45 mm above level of point P.
- Draw 70 mm line at 60^0 to XY line which is the top view pq of the line. Also draw a horizontal dotted line through q to get locus of Q in Top view.
- Draw a vertical from q to meet the locus of Q in FV to get q' and join p'q', which the front view of the line PQ.
- With centers p' and p, rotate the front view p'q' and top view pq parallel to XY and draw vertical projectors to meet the locus of Q in FV at q_1' and locus of Q in TV at q_2
- Join p'q_1' and pq_2 which give the true length of the line PQ.
- Measure true length and true angles, Apparent angle with HP & distance between end projectors.

3.5 A line AB having one of its end 10mm above HP and 15mm of VP is inclined at 30^0 to HP and 45^0 to VP. Its top view is 50mm long. Draw the projections of the line and find out its true length.



Answers:

a'b' = 41 mm

$\alpha = 45$ deg

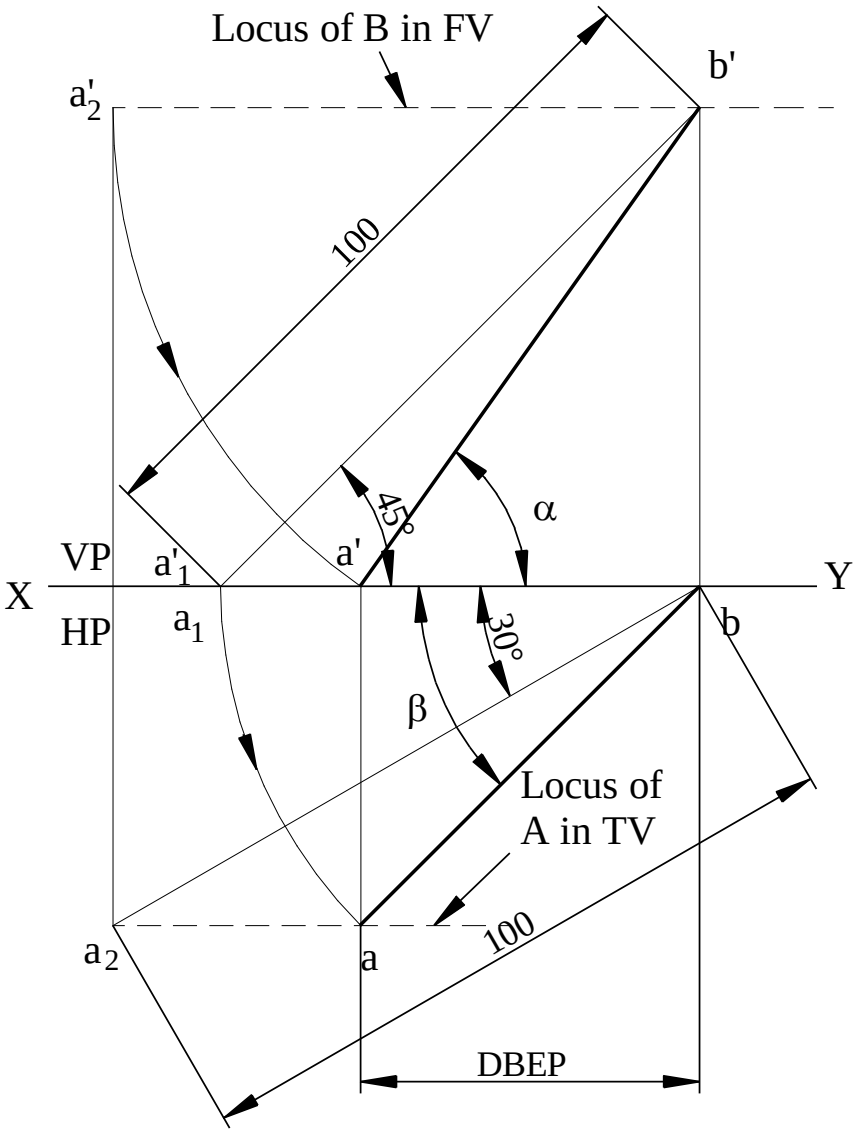
$\beta = 55$ deg

TL =58 mm

DBEP =29 mm

- Draw XY line & mark front & top views of point A.
- Draw the top view ab_1 50 mm parallel to XY line and project b_1 vertically upwards.
- From a' , draw a 30^0 line to XY to meet the vertical drawn from b_1 at b_1'. Join a'b_1' to measure true length of line AB.
- Draw the locus of B in front view parallel to XY line through b_1'
- From a, draw a line ab_2 at 45^0 to XY line and length equal to true length. From b_2, draw the locus of B in top view.
- With a as center, rotate ab_1 such that the arc touches locus of B in TV at b. Join ab which is actual top view.
- From b, draw a vertical projector to meet locus of B in FV to get b'. Join a'b',
- Measure true length Apparent angles with HP, VP & distance between end projectors.

3.6 Draw the projections of a straight line AB, 100mm long, inclined at 45^0 to HP and 30^0 VP. The end A is in HP and the end B is in VP.



Answers:

a'b' = 87 mm

ab = 71 mm

$\alpha = 55$ deg

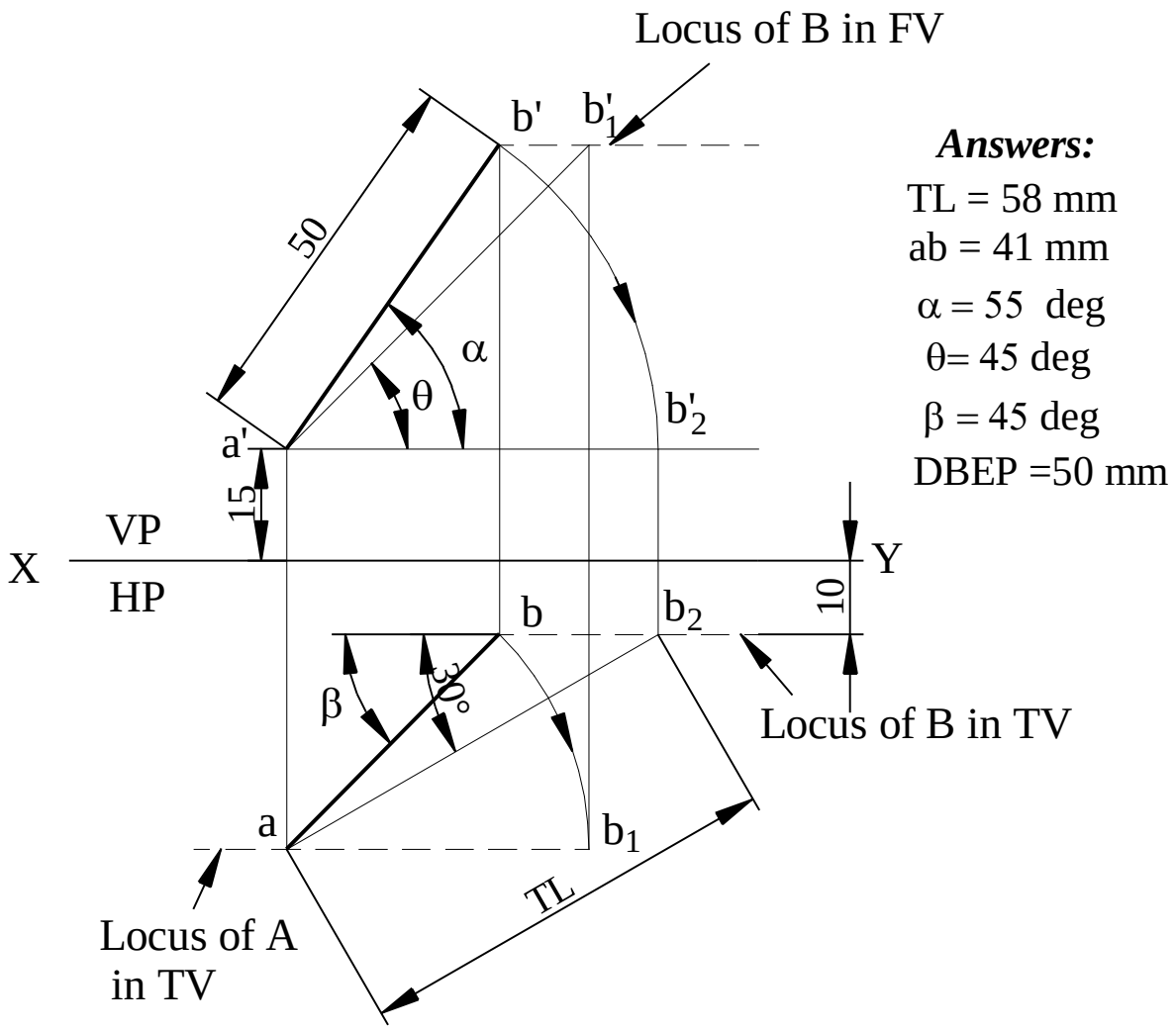
$\beta = 45$ deg

DBEP =50 mm

NOTE: Whenever a line has one end in HP & one end in VP, assume the line to be fully lying in VP and fix the end b in VP.

- Assume the line to be lying completely in VP. Draw true length a_1'b 100 mm at true angle 45^0.
- Mark b' in VP and a_1' on HP. Its top view a_1b will be on XY line as the line is fully lying in VP.
- From b, draw true length of 100 mm at 45^0.
- Draw the locus of B in front view and locus of A in top view.
- With b as center and a_1b as radius, rotate the line to locus of A in TV to get point a. Join ab which is the actual top view.
- From a, draw a vertical to locus of A in front view (XY line) to get a'. Then join a'b' to get front view.
- [It can also be obtained by projecting a_2b to front view and then rotating a_2' to the XY line]
- Measure Apparent lengths, Apparent angles with HP, VP & distance between end projectors.

3.7 The front view of a line is 50mm long and 55^0 to the XY line. The line is inclined at 30^0 to VP. Draw the projections of the line and find its true length and true inclination with HP. One end is 15mm above HP and the other end is 10mm in front of VP.



Answers:

TL = 58 mm

ab = 41 mm

$\alpha = 55$ deg

$\theta = 45$ deg

$\beta = 45$ deg

DBEP =50 mm

- Mark point a' 15 mm above XY and draw locus of B in Top view 10 mm in front of VP.
- Draw front view a'b' 50 mm at 55^0 to XY line.
- Project b' vertically downward to meet locus of B in Tope view to get point b.
- With a' as center, rotate a'b' to make it parallel to XY line and project it to the locus of B in TV to get the point b_2
- With b_2 as center, draw a line at an angle 30^0 to XY line to meet the vertical projector from a' at a. Measure ab_2 which is true length of the line.
- Join ab to get the actual top view of the line.
- Make ab parallel to XY line and project to locus of B in front view o get point b_1'
- Join a'b_1' which is also equal to true length of the line.
- Measure true length, length of TV, Apparent angles with HP & VP, distance between end projectors.