Short Answer Questions

1. State the difference between first and third angle projections?

First Angle	Third Angle
The object lies in the first angle i.e. in front of the VP and above HP	The object lies in the Third angle i.e. behind VP and below HP
The object lies between the observer and the plane of projection.	The object lies between the observer and the plane of projection.
Top view is drawn below the front view	Top view is drawn above the front view

2. Define trace, HT, VT?

Trace: The points of intersection of a straight line extended if necessary with the reference plane are called traces of that line.

Horizontal Trace (HT): When a straight line is inclined to HP then the point of intersection of the line to the HP is called its horizontal trace and is generally represented by HT

Vertical Trace (VT): When a straight line is inclined to VP then the point of intersection of the line to the VP is called its vertical trace and is generally represented by VT

3. Draw the projections of a circle of diameter 50mm, resting on one of its ends of the diameter on HP.
   Procedure
   - Draw a circle of diameter 50mm. to represent the top view.
   - Divide the circle into 12 equal parts and mark a, b, c, d, e, f, g, h, I, j, k, l.
   - Project from all the points i.e a, b, c, d, e, f, g, h, I, j, k, l. to meet xy at a', b', c', d', e', f', g', h', l', j', k', l'.
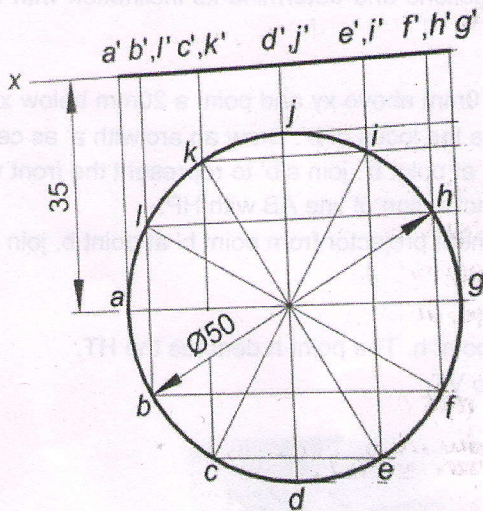
4. State the quadrants in which the following points are situated.
   I. A point D, its top view is 35mm below XY and its front view is on the XY line.
   II. A point C, its top view is 35mm above XY and its front view is 25mm below the XY line

   Answer: The point D is in I quadrant. While the point C is in III quadrant.

5. A line AB 80mm long inclined at 30^0 to HP and 45^0 to VP. Its end A is in the VP and 20mm above HP. Draw its projections.
   Procedure:
   - Draw a reference line xy. Mark point a' 20mm above xy and point a on xy.

1

- Draw 80mm long line a'b$_1$' inclined at 30^0 to xy
- Draw another 80mm long line ab$_2$ inclined at 45^0 to xy
- Project b$_1$' to meet horizontal line from point 'a' at b$_1$. Draw an arc with a as centre and radius ab$_1$ to meet the horizontal line from point b$_2$ at point b. join ab to represent the top view.
- Project b$_2$ to meet horizontal line from point a' at b$_2$'. Draw an arc with a' as centre and radius a'b$_2$' to meet the horizontal line from point b$_1$' at b1. Join a'b' to represent the front view.
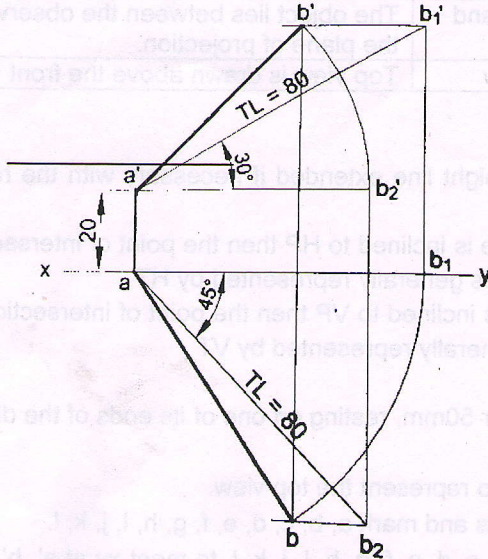
6. A line AB, 60mm long is parallel to 20mm in front of the VP. The ends A and B of the line are 10mm and 50mm above the HP. Draw the projections and determine its inclination with HP and locate its traces.

Procedure

- Draw a reference line xy. Mark point a' 10mm above xy and point a 20mm below xy.
- Draw a horizontal line 50mm above xy as the locus of b'. Draw an arc with a' as centre and radius 60mm to meet the locus of b' at point b'. join a'b' to represent the front view. Determine its inclination with xy as the inclination of line AB with HP.
- Draw the horizontal line from point a to meet projector from point b' at point b. join ab to represent the top view.
- Extend a'b' to meet xy at point h'.
- Project point h' to meet ab produced at point h. The point h denotes the HT.
- As the line is parallel to the VP., it has no VT.

2
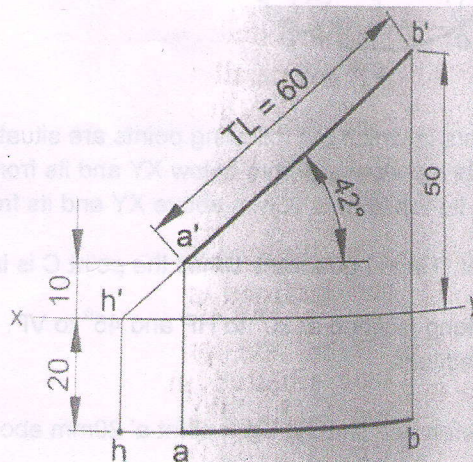
7. A point A is 15 above HP and 20mm in front of VP. Another point B is 25mm behind VP and 40mm below HP. Draw the projections of A and B, keeping the distance between the projectors equal to 90. Draw the straight line joining the top view and front views.

Procedure:

Draw two projectors 90mm apart

Locate the front and the top views of the points A and B on the above projectors

Join the front views a',b' and the top views a,b.
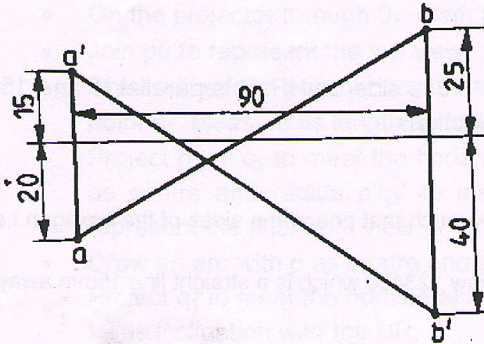
8. A straight line is parallel to both HP and VP. It's one end is 25mm behind VP and 60mm above HP. Length of the line is 50mm. Draw its projections. Locate its traces.
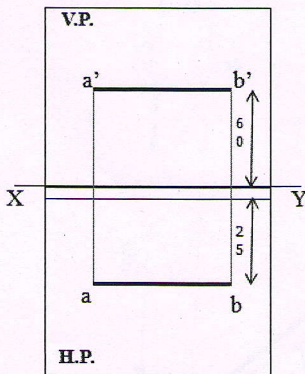
Procedure

Draw a reference line xy.

Mark point p' 60 mm above xy and point p 25mm below xy.

Draw a 50mm long line p'q' parallel to xy to represent its front view

Draw another 50mm long line pq parallel to xy to represent its top view.

As the line is parallel to both planes there will be no HT and VT, even though it is extended in both directions.


9. A regular pentagonal ABCDE 25mm side has its corner on A in the HP and the side CD parallel to the HP. Draw its projections when its plan is parallel to and 10mm away from VP. Also draw its traces.

Procedure:

Draw a pentagon a'b'c'd'e' of 25mm side in front view keeping a' on the reference line xy and the side c'd' parallel to xy.

Project from all the points of the front view on to the top view which is parallel and 10mm below xy.

3

NO V.T.

SIDE CD IS
PARALLEL TO
H.P.

20

CORNER A ON H.P.

TRUE
SHAPE

10

X ——————————————— Y

b   c   a'   d   e
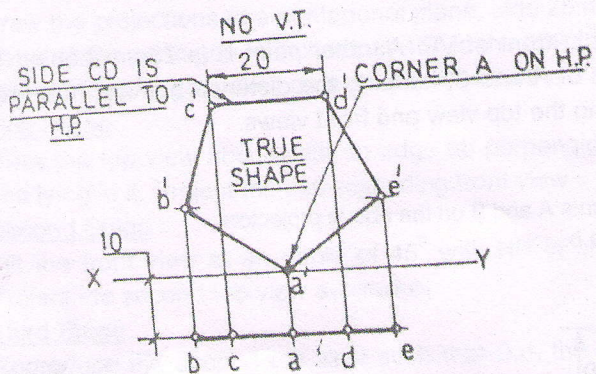
10. A regular hexagonal lamina of 20mm side rests on its side on HP. It is parallel to and 15mm away from VP. And it is in first quadrant. Draw the projections.

Procedure

Draw the xy line.

Draw a hexagon 1'2'3'4'5'6' of 20mm side in front view such that one of the sides of the hexagon i.e. 5'6' is in the HP and parallel to VP.

Project from the front view 1'2'3'4'5'6' to get the top view 123456 which is a straight line 15mm away from xy.

20

V.P.
H.P.

X —————————— Y

15

1   2 6   3 5   4

4
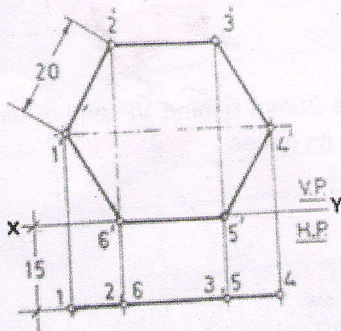
1. A line PQ is in the first quadrant. The end P is 50 mm in front of the V.P and 25mm above HP. The end Q is 10mm in front of VP and above HP. The distance between the end projectors is 50 mm. and the line is inclined at 30° to the VP. Draw the projections of PQ and find its true length and the inclination with the H.P.
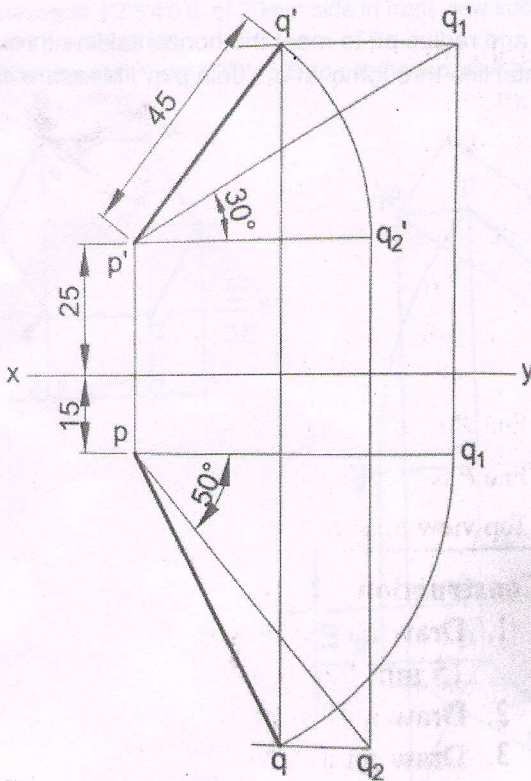
Procedure:

- Draw a reference line xy. Mark points o and o_1 on xy such that oo1 = 50mm
- On the projector through point o, mark point p' 25mm above xy and point p 50mm below xy.
- On the projector through 0_1, mark point q 10mm below xy.
- Join pq to represent the top view.
- Draw a line from point p, inclined at 30^0 with xy to meet the horizontal line through point q at point q_2. Measure its length as true length of line PQ.
- Project point q_2 to meet the horizontal line through point p' at q_2'. Draw an arc with point p' as centre and radius p'q_2' to meet the projector from point q at point q'. Join p'q' to represent the final front view.
- Draw an arc with p as centre and radius pq to meet the horizontal line through point p at q_1. Project q_1 to meet the horizontal line through q' at q_1'. Join p'q_1'. Measure its inclination with xy as inclination with the HP.
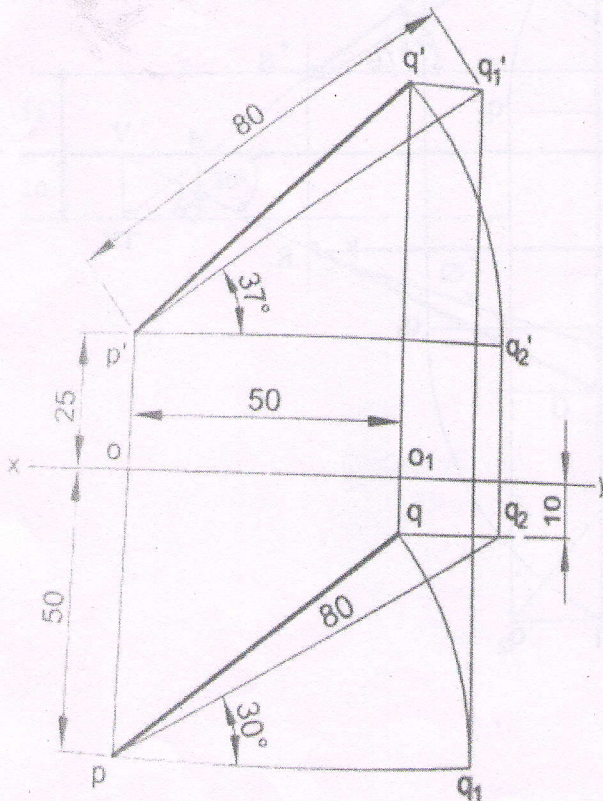
2. A line AB is 70mm long is inclined at 30^0 to HP. Its front view measures 45mm. The end P is 15mm in front of the VP and 25mm above HP. Draw the projection of the line PQ. Determine its traces and its inclination with VP.

Procedure:

- Draw a reference line xy. Mark point p' 25 mm above xy and point p 15 mm below xy.
- Draw a 70mm long line p'q$_1$' inclined at 30^0 to xy.
- Draw an arc with centre p' and radius 45mm to meet the locus line at q'. Join p'q' to represent the final front view.
- Draw an arc with centre p' and radius = p'q' to meet the horizontal line from point p' at q$_2$'. Draw another arc with centre p and radius 70mm to meet the projectors from q$_2$' at point q$_2$. Join pq$_2$ and measure its inclination with VP
- Project point q'$_1$ to meet the horizontal line from point p at q$_1$. Draw an arc with centre p and radius pq$_1$ to meet the horizontal line from point q$_2$ at point q. join pq to represent the top view.

6

3. FV of line AB makes 45^0 with XY line and measures 60 mm. The 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.

- Draw xy line, locate a' 15 mm above xy.
- Take 45^0 angle from a' and mark 60 mm on it and locate point b'.
- Draw locus of VT, 10 mm below xy & extend FV to this locus locate VT.
- a'b'h'VT lie on the same line.
- Draw projector from VT, and locate v on xy.
- At v draw an inclined line of inclination as TV (Assuming that its inclination can begin with v).
- Draw projector from b' and locate locus of b (TV)
- Now rotating views determine the true length and it's inclinations.

4. The front view of a line AB measures 60mm and makes an angle of 45^0 with the XY. A is in the HP and the VT of the line 15mm above HP. The line is inclined at 30^0 to the VP. Draw the projections AB and find its true length, inclination with HP and its HT.

    Procedure:
    - Draw the reference line xy and locate a' at any convenient point on it.
    - Draw a line parallel to xy and 15 mm above it. (locus of VT)
    - Through a' draw an inclined line a'b' of length 60mm and angle 45^0 and locate locus of b'. Draw the projector from VT to meet xy at v.
    - Rotate the line VT-b' about VT, to the position V.T b_2', parallel to xy.
    - Draw a projector through b_2'.
    - Through v, draw an inclined line at 30^0 to xy meeting the above projector at b_2 and locate the locus of b.
    - Draw a projector through b' to get b.
    - Join b,v and extend, meeting the projector through a' at a.
    - Rotate ab about a to the position ab1 parallel to xy
   - Through b_1 draw a projector meeting at b_1'
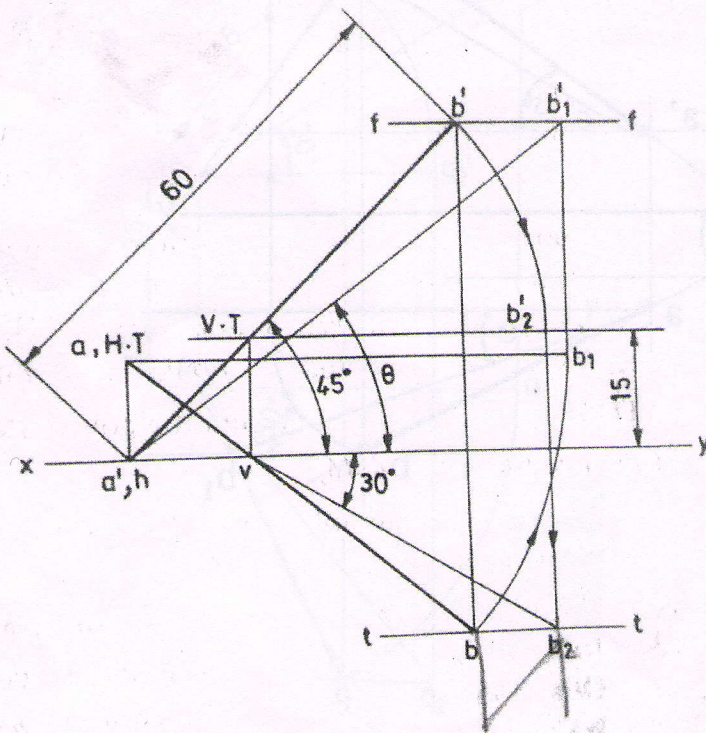
5. One end of line AB is 10mm above Hp and other end is 100 mm in-front of VP. It's Fv is 45^0 inclined to xy while it's HT & VT are 45mm and 30 mm below xy respectively. Draw projections and find TL with it's inclinations with Hp & VP.
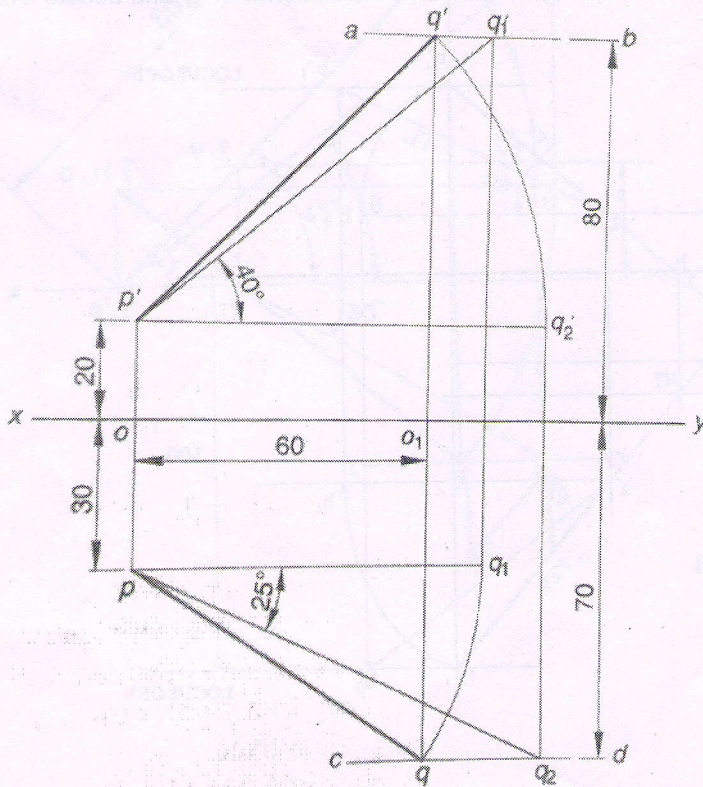
Procedure

- Draw the reference line xy.
- Draw horizontal lines 10mm above xy as the locus of a' , 30mm below xy as the locus of v , 45mm below xy as the locus of h and 100mm below xy as locus of b.
- At a' draw an inclined line of 45^0 to xy. Extend a' to meet the reference line at h. Locate HT and VT.
- Draw projector from VT to meet the xy line at v.
- Join vHT and extend it to meet the locus of b at b. Join ab to represent the final top view (FTV).
- Draw a projector from b to meet ha' at locus of b'. Join a'b' to represent the final front view (FFV).
- Draw an arc with a as centre and radius equal to ab to meet the horizontal line from point a at b_1.
- Project point b_1 to meet the horizontal line from point b' at b_1'. Join a'b_1'. Measure a'b_1' as the true length of AB and its inclination with xy as Θ.
- Draw an arc with a' as centre and radius a'b' to meet the horizontal line from point a' at point b_2'. Project point b_2' to meet horizontal line from b at b_2. Join ab_2. The length of ab_2 should be equal to that of a'b_1' (TL). Measure its inclination with xy and denote it as ϕ.
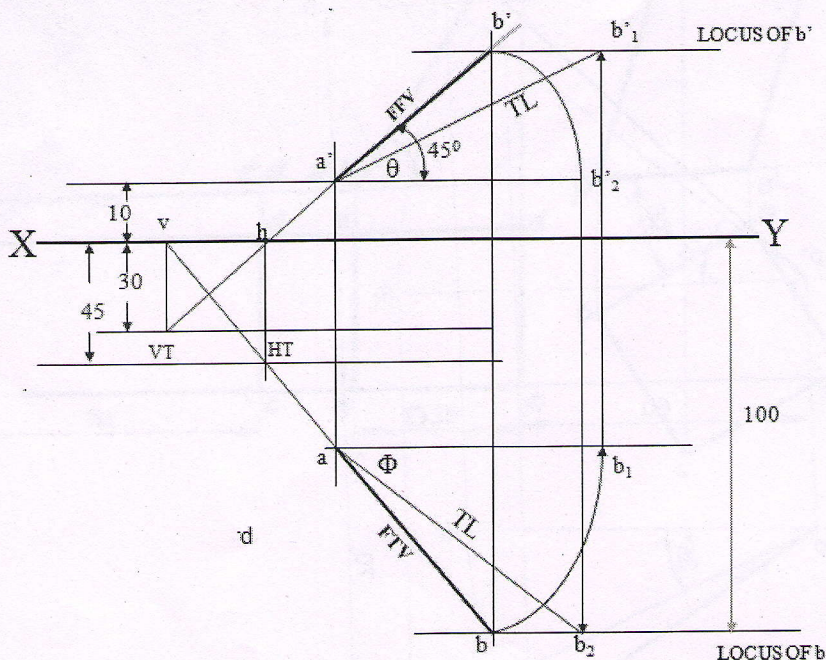
6. One end of a straight line AB is 20mm above HP and 30mm in front VP. The other end is 80mm above HP and 70mm in front VP. The distance between the end projectors are 60mm apart. Draw the projections of the line & find its true length, true inclination with HP & VP and locate traces.

Procedure:
- Draw a reference line xy. Mark points oo_1 on it such that they are 60mm apart.
- On the vertical projector through o mark point p' 20mm above xy and point p 30 mm below xy.
- On the vertical projector through o_1, mark point q' 80mm above xy and point q 70mm below xy.
- Join p'q' and pq to represent the front and the top views of the line.
- Draw an arc with centre p and radius pq to meet the horizontal line from point p at q1.
- Project point q1 to meet the horizontal line ab through point q' at point q_1'.
- Join p'q_1'. The length p'q_1' represents the true length of pq. The inclination of p'q_1' with xy represents the true inclination with HP.
- Draw an arc with centre p' and radius p'q' to meet the horizontal line from point p' at point q_2'.
- Project point q_2' to meet the horizontal line cd through point q at q_2.
- Join pq_2. The length pq_2 represents the true length and the inclination of pq_2 represents true inclination with VP.

7. A rectangular plane of edges 35mm and 70mm is resting on an edge in the HP. The surface is inclined to the HP such that the top view appears as a square. Draw its projections when the edge resting on the HP is inclined at 30^0 to VP.
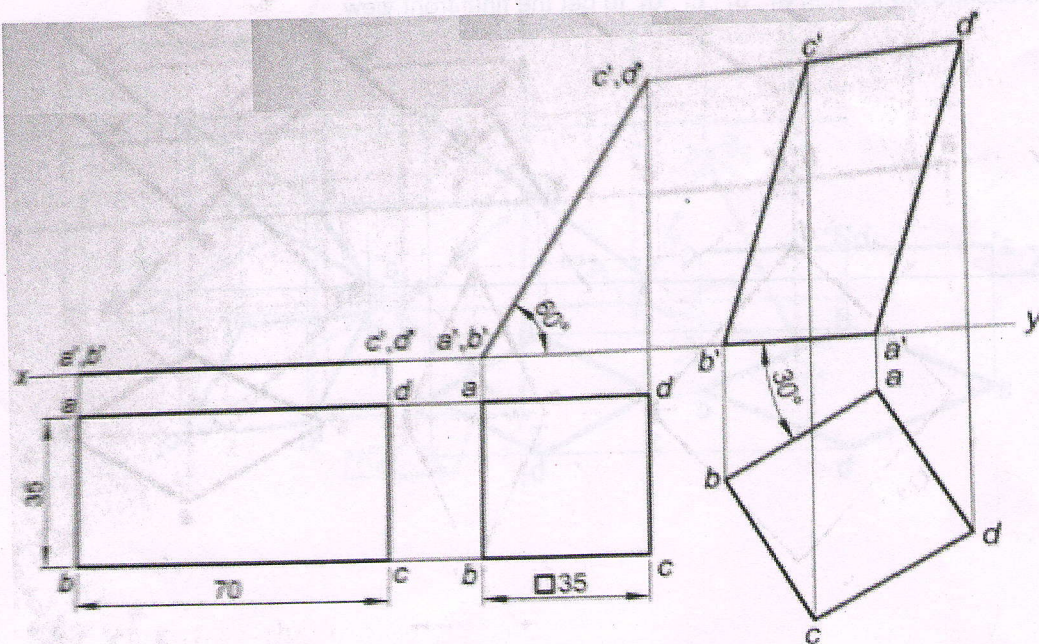
Procedure

First Stage

Draw a rectangle abcd keeping side ab perpendicular to xy to represent the top view. Project the corners to xy and obtain the front view.

Second Stage

Draw a square abcd of 35mm side on the locus line from points a,b,c and d of the first stage. From d extend the projector in the front view, with a' as centre and radius equal to TL mark d' on the projector. Now join a'd' and determine the true inclination with HP.

Third stage

Reproduce the top view of the second stage keeping ab inclined at 30^0 to xy. Obtain a'b'c' and d' in the front view by joining the points of intersection of the projectors from points a,b,c and d of the third stage with the corresponding locus lines from points a',b',c' and d' of the second stage. Join a'b'c'd'.

11

8. A rhombus of diagonals 40 mm and 70 mm long respectively has one end of it's longer diagonal in HP while that diagonal is 35^0 inclined to HP. If the top-view of the same diagonal makes 40^0 inclination with VP, draw it's projections.
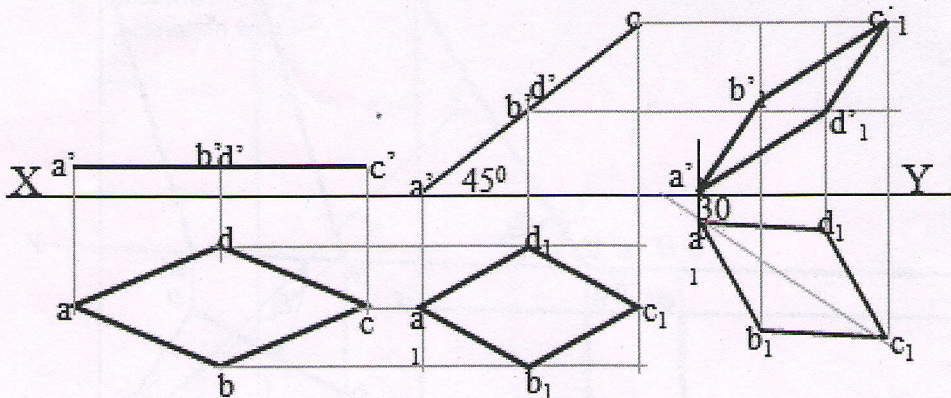
Procedure:

First Stage

Draw a rhombus abcd keeping the diagonal parallel to xy and diagonal bd perpendicular to the xy to represent the top view. Project from all the corners to xy and obtain a'c' as its corresponding front view.

Second Stage

Redraw the front view of the first stage keeping a' on xy and a'c' inclined at 45^0 to xy. Obtain the points a_1, b_1, c_1, d_1 in the top view by joining the points of intersection of the projectors from points a',b',c',d' of the second stage with the corresponding locus lines of the projectors from points a,b,c,d of the first stage. Join $a_1 b_1 c_1 d_1$

Third Stage

Reproduce and redraw the top view of the second stage keeping the diagonal $a_1 c_1$ inclined at 40^0 to VP. Obtain all the points a_1', b_1', c_1', d_1' in the front view by joining the points of intersection of the projectors from points a_1, b_1, c_1, d_1 of the third stage with the corresponding locus lines of a',b',c',d' of the second stage. Join a_1', b_1', c_1', d_1' to get the final front view.

9. An equilateral triangle of negligible thickness 30mm is inclined to HP at 45^0 and has a corner 15 mm above HP and 25 mm in front of VP. Draw its projections when the top view of a side containing the corner makes an angle of 15^0 to VP.

Procedure

First Stage

Drawn an equilateral triangle 123 keeping the apex 25mm away from HP and the base perpendicular to xy. This is the top view. Project from all the corners to xy and obtain 1'2'3' as the front view.

Second Stage

Redraw the front view of the first stage by rotating it with given inclination 45^0 to xy, obtain points $1_1 2_1 3_1$ of the top view by joining the points of intersection of projectors from the points 1'2'3' of second stage with the locus lines of 123 of the first stage.

Third Stage

Reproduce the top view of the second stage keeping the corner inclined at 15^0 to VP. Project form it the final front view.

13
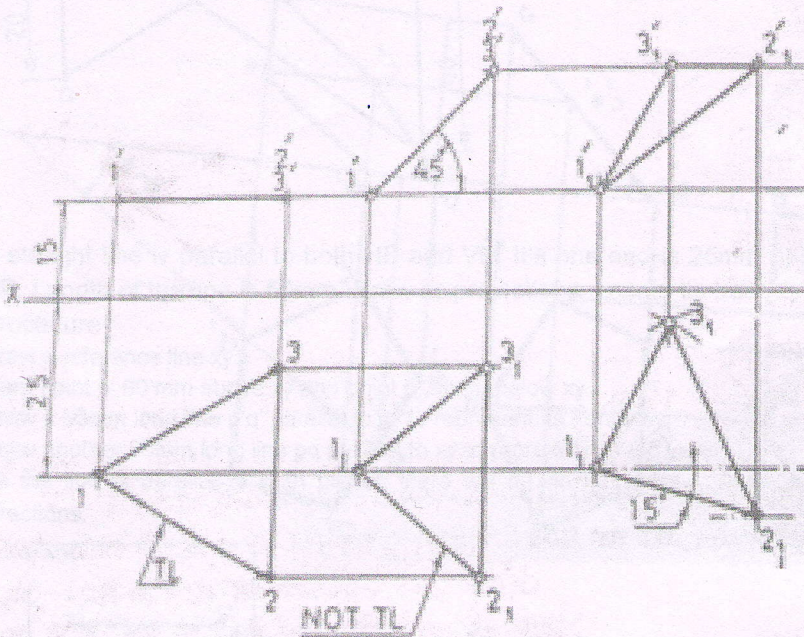
10. Draw the projections of a pentagonal plane, side 25 mm resting on the H.P on one of its edges. The plane of the pentagon is inclined at 45° to the H.P. and the perpendicular drawn from the midpoint of the resting edge makes an angle of 30° with the V.P.

First Stage

Draw the top view abcde with an edge ab perpendicular to xy line after assuming the plane to HP and lying in it. Project the corresponding front view a'b'c'd'e'.

Second Stage

Tilt the front view at an angle of 45^0 with HP in such a way that the edge a'b' touches xy line. Project the second top view $a_1b_1c_1d_1e_1$

Third Stage

Reproduce the second top view such that 0_1d_1 the perpendicular from the midpoint of the resting edge makes 30^0 with the VP. Project the final front view.

14