4.0 Projection of Planes (Manual Drawing)

SEMESTER: I/II

COURSE TITLE: **COMPUTER AIDED ENGINEERING GRAPHICS**

COURSE CODE: **22MED13/23**

Solution Manual

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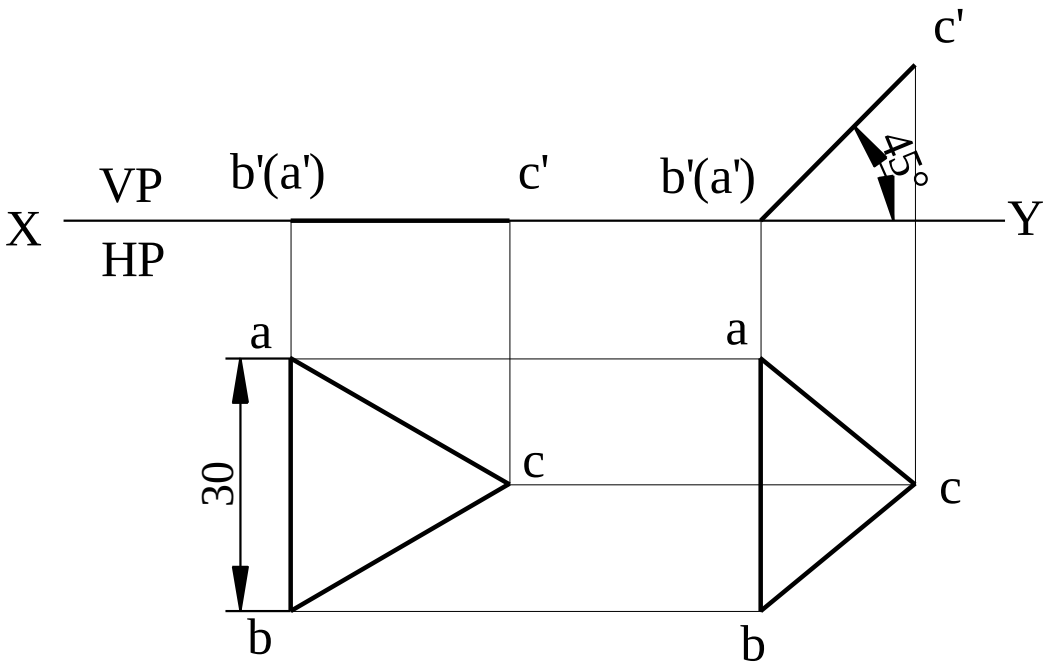
Important Points to remember in Projection of plane surfaces.

1. The problems are approached by ***"Change of position method"*** which may have either two positions or three positions.
2. The ***initial position*** (true shape of the polygon) must be drawn i***n the top view*** if the surface of the lamina is to be ***inclined to HP.*** If the surface of the lamina is to be ***inclined to VP,*** the initial position must be taken in the ***top view.***
3. If an edge (side) of the plane surface is ***resting on HP (or VP)*** that edge must be ***perpendicular to the XY line*** in the initial position.
4. In the second position, the inclination of the surface with HP (or VP) will be drawn.
5. In the third position, the inclination (if any) of the resting side with VP or position of any side or corner of the polygon w.r.t VP will be drawn.
6. ***In the third position, if the edge to be inclined to VP is not in the true length, apparent angle made by that edge must be calculated.***

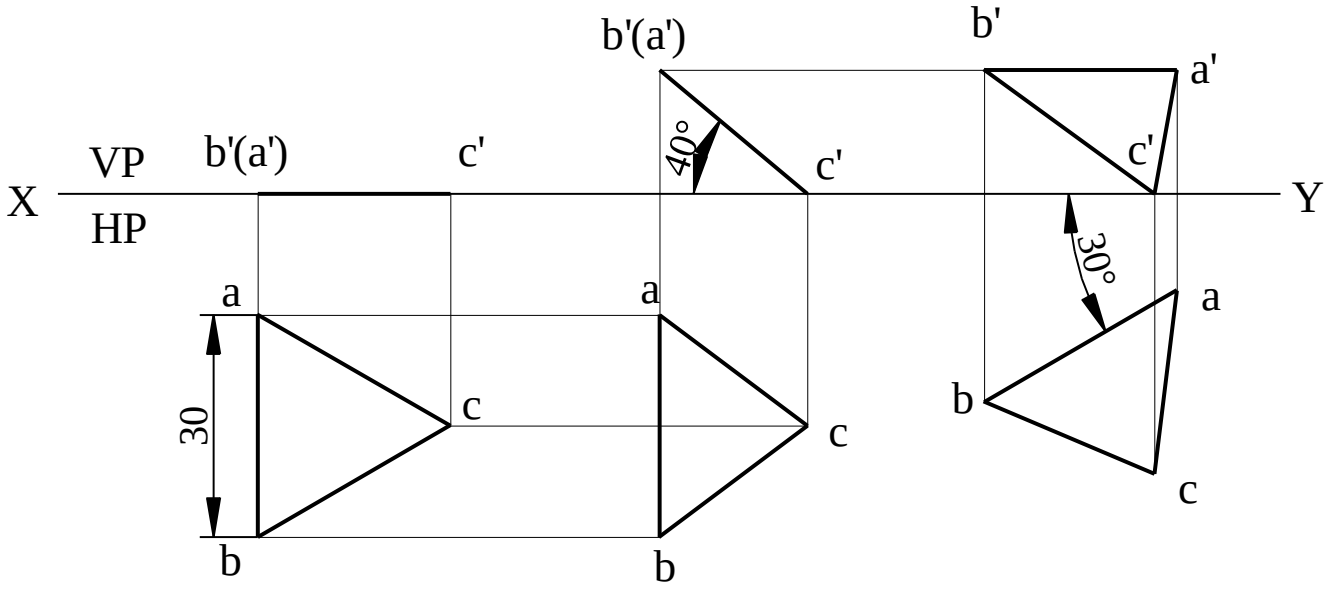
4.1 An equilateral triangular lamina of 30mm sides resting on one of its sides on HP. The lamina makes 45^0 with HP. Draw its front view and top view.



- Draw XY line & mark VP & HP as per First angle projection.
- As the surface of the lamina is to be inclined to HP, draw the initial position in the top view.
- Also as the lamina rests on one of its sides, draw one side of the triangle perpendicular to XY line. (In the fig, side ab)
- Assuming that the lamina fully rests on HP, draw its front view on XY line.
- In the second position, redraw the front view at 45^0 to the XY line, keeping the front view of ab i.e. (b'a') on XY line.
- Draw the top view of the lamina in the apparent shape by drawing vertical projectors from front view and horizontal projectors from previous top view.

Note: As there is no mention of the inclination with VP, the problem has only two positions.

4.2 An equilateral triangular lamina of 30mm sides resting on one of its corners on HP. The lamina makes 40^0 with HP and the side opposite to the corner on which it rests is inclined at 30^0 to VP. Draw its front view and top view.

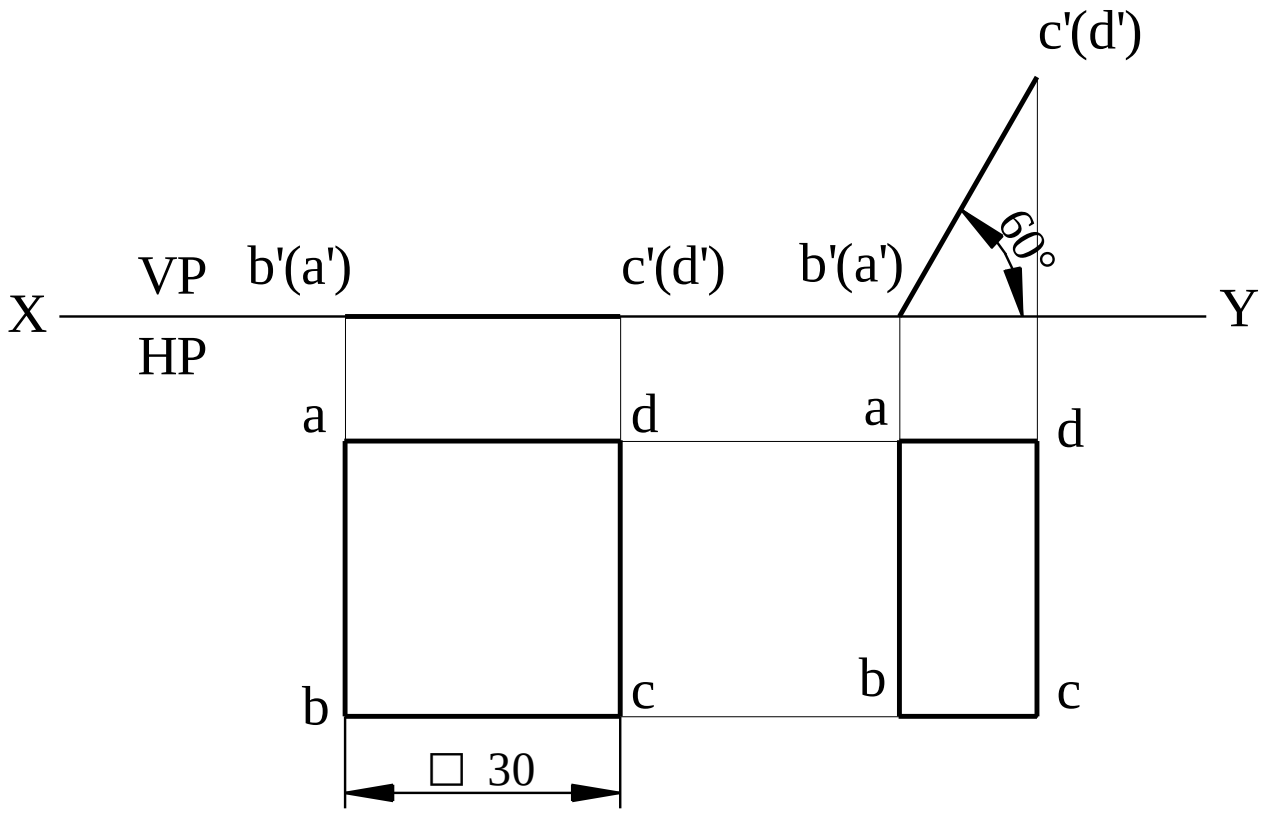


Note:

- For triangular lamina and pentagonal lamina, the initial position is same for both resting on one edge or resting on corner condition.
- This is because there will be an edge on the left side and opposite corner on the right side. However, the surface must be tilted accordingly in the second position.

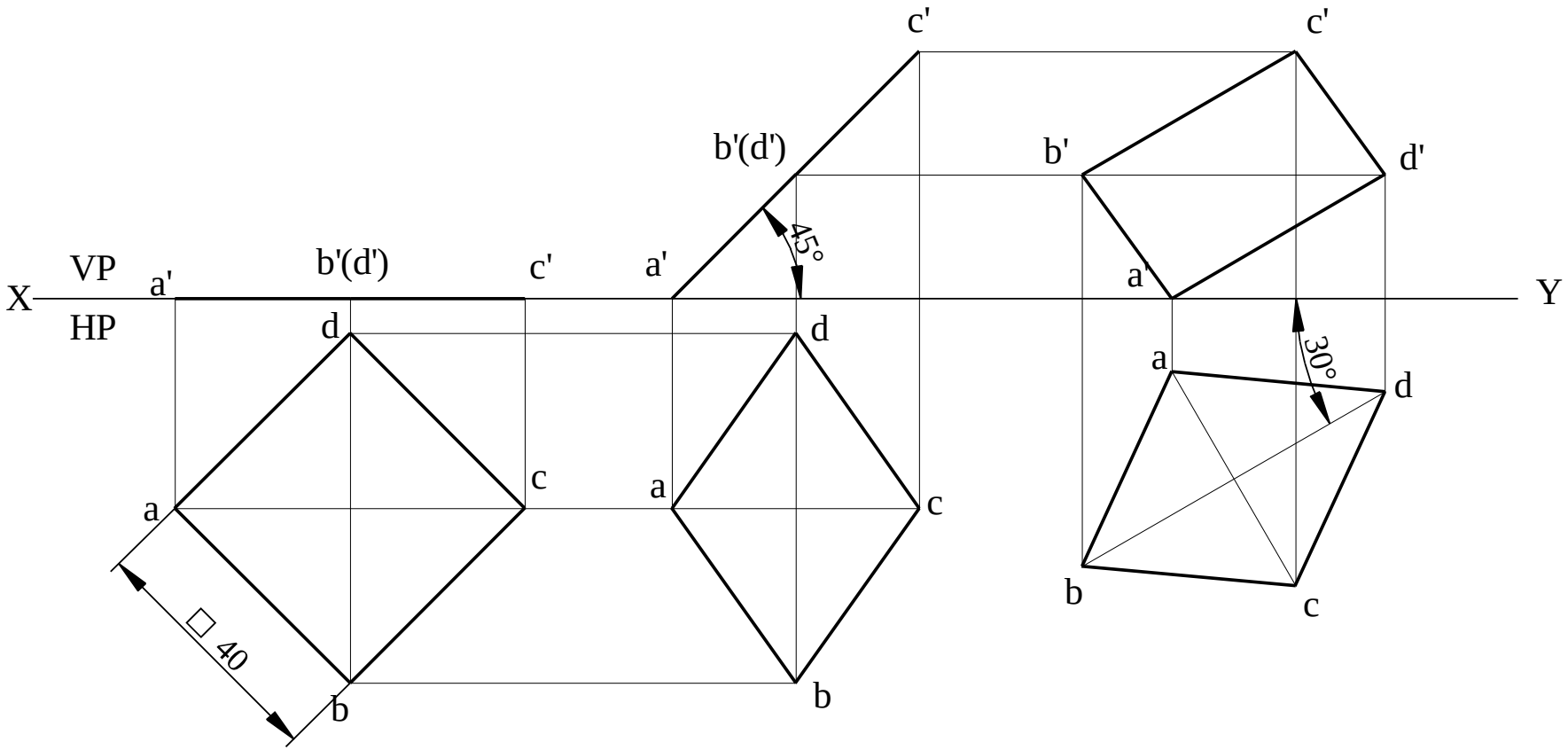
- Draw XY line & mark VP & HP as per First angle projection.
- As the surface of the lamina is to be inclined to HP, draw the initial position in the top view.
- Assume that the lamina fully rests on HP and draw its front view on XY line.
- In the second position, redraw the front view at 40^0 to the XY line, with corner (in fig, c') on XY line.
- Draw the top view in which the side opposite to the corner i.e. ab is perpendicular to VP.
- Redraw the top view with ab at 30^0 to VP (XY line) and project the final front view.

4.3 A square lamina of 30mm side rests on one of its sides on HP. The lamina makes 60^0 to HP. Draw its front view and top view.



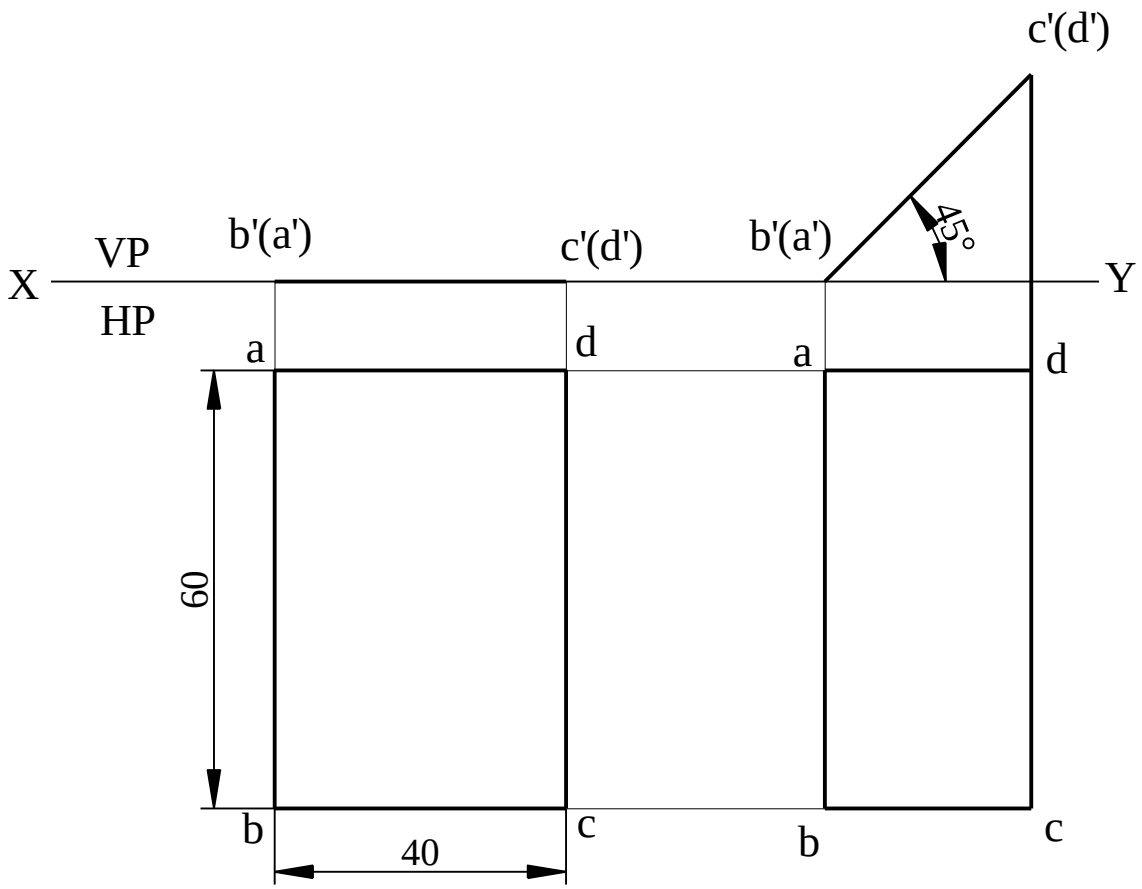
- Draw XY line & mark VP & HP as per First angle projection.
- As the surface of the lamina is to be inclined to HP, draw the initial position in the top view.
- As it is resting on a side on HP, draw the top view with an edge perpendicular to XY line.
- Assume that the lamina fully rests on HP and draw its front view on XY line.
- In the second position, redraw the front view at 60^0 to the XY line, with one side (in fig, b'a') on XY line.
- Draw the top view which shows apparent shape of the rectangular lamina.

4.4 A square ABCD of 40mm side has its diagonal AC inclined at 45^0 to HP and the diagonal BD inclined at 30^0 to VP and parallel to HP. Draw its front view and top view.



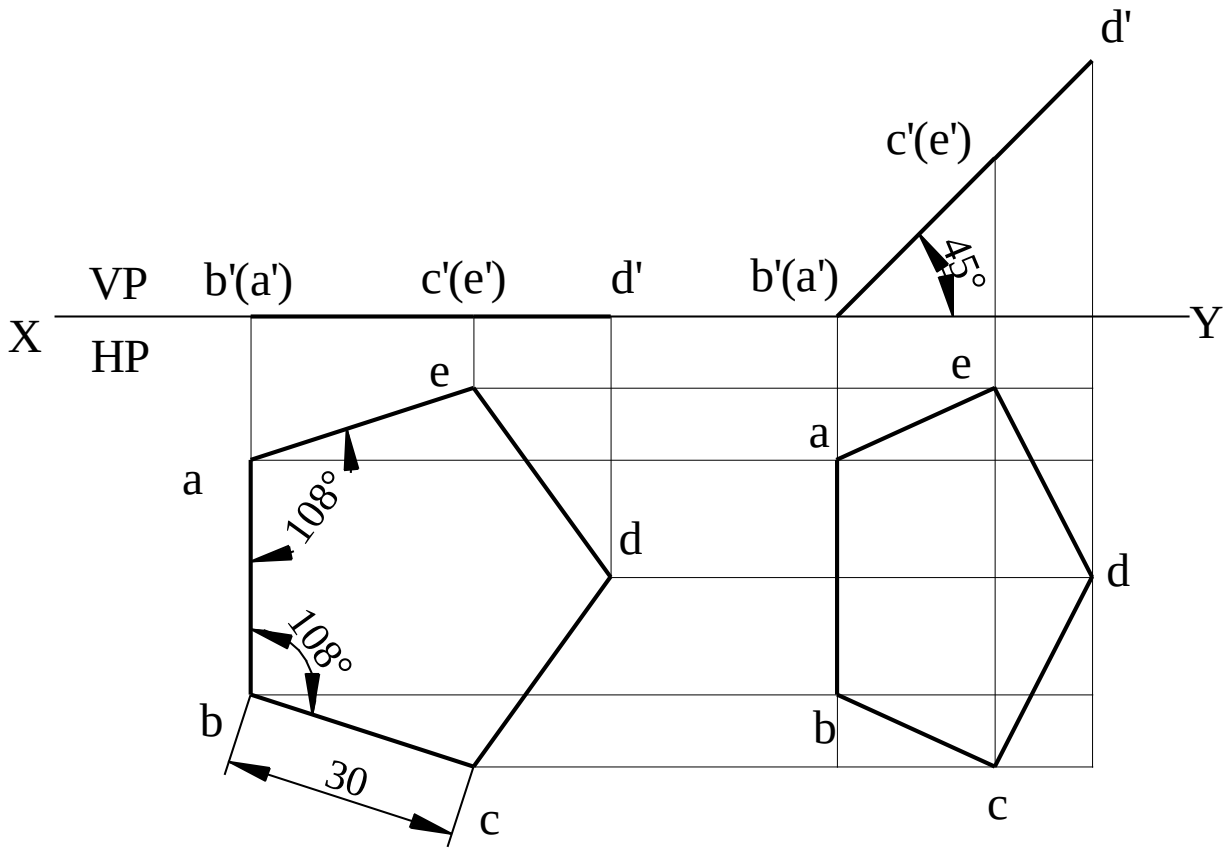
- As the question says that a diagonal is inclined to HP, that diagonal must be parallel to VP (XY line) in the initial position. Hence draw the top view of square in the equally inclined position.**(corner position)**
- In the second position, redraw the front view of the lamina at 45 deg to HP and project the top view.
- In the third position, redraw the top view with diagonal bd inclined at 30^0 to XY line and project the final front view.

4.5 A rectangular lamina of sides 40mm X 60mm rests on HP on one of its longer edges. The lamina is tilted about the edge on which it rests till its plane surface is inclined to HP at 45^0.The edge on which it rests is perpendicular to VP. Draw its front view and top view.



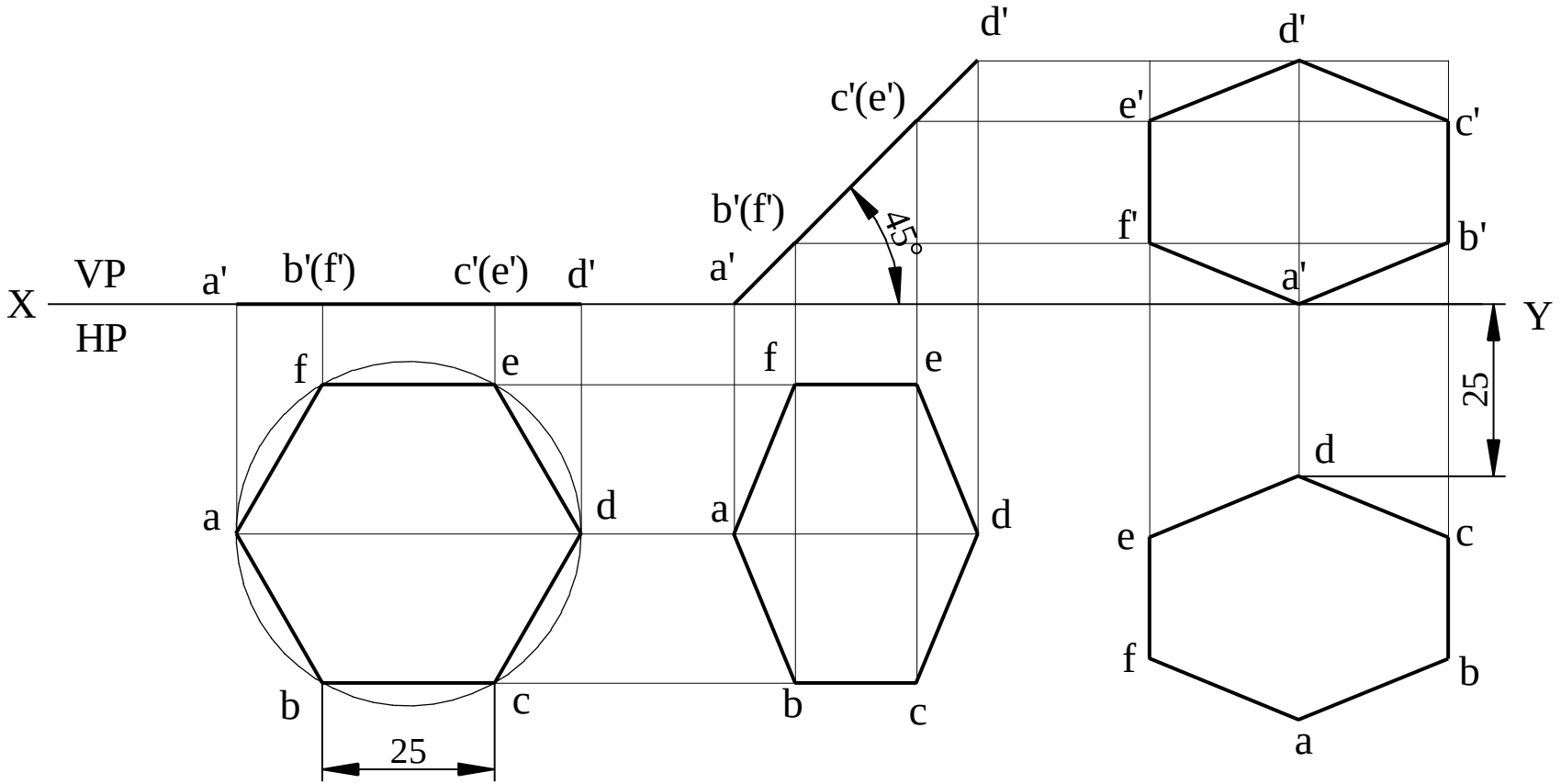
- As the rectangular lamina rests on one of its longer edges and its surface is inclined to HP, draw the initial position in top view with a longer edge perpendicular to XY line.
- In the second position, redraw the front view of the lamina at 45 deg to HP and project the top view.

4.6 A pentagonal lamina of 30mm sides resting on one of its sides on HP. The lamina makes 45^0 with HP. Draw its front view and top view.



- As the pentagonal lamina rests on one of its sides on HP and its surface is inclined to HP, draw the initial position in top view with a an edge perpendicular to XY line.
- In the second position, redraw the front view of the lamina at 45 deg to HP and project the top view.

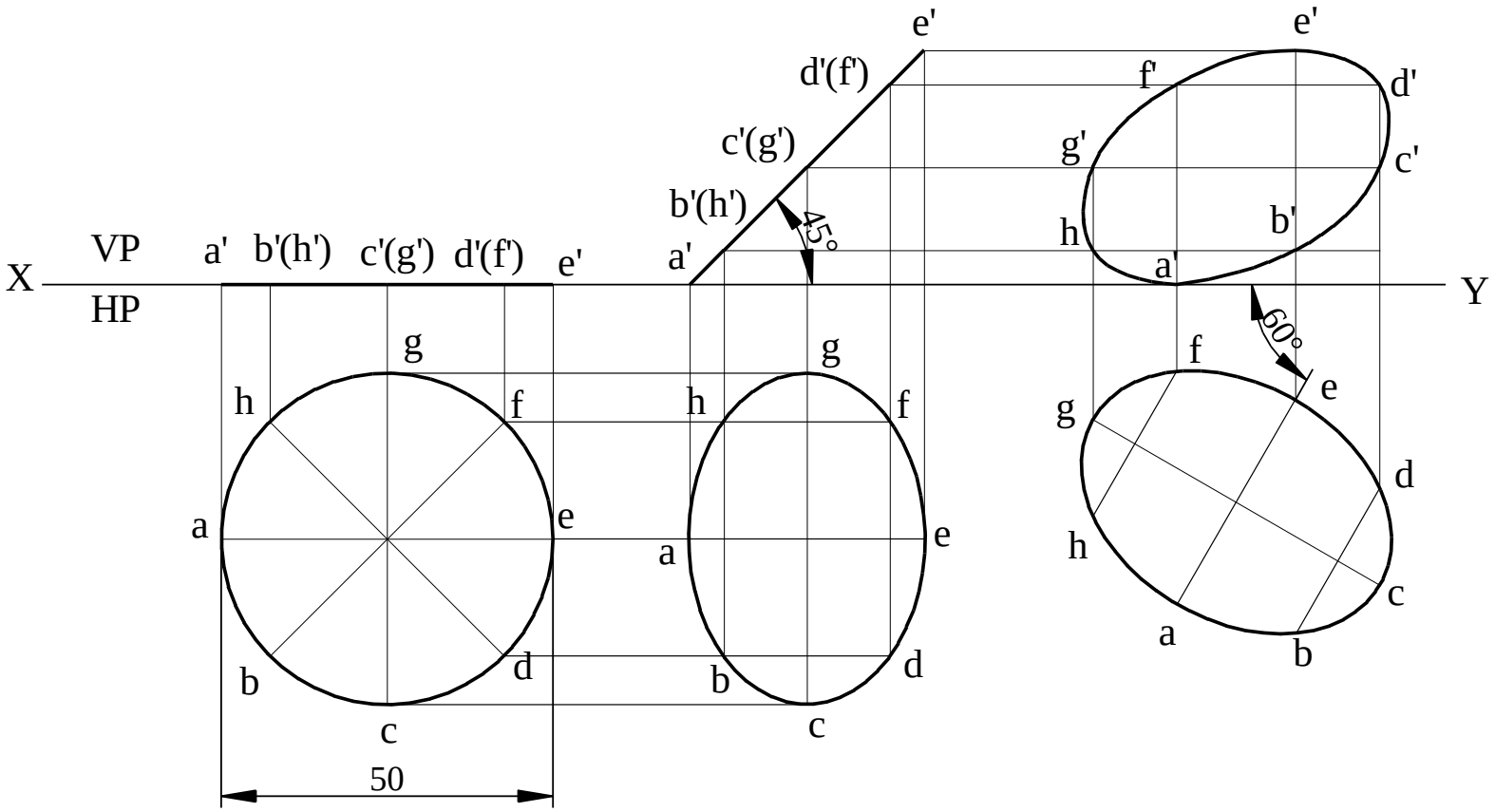
4.7 The hexagonal lamina of 25mm sides resting on one of its corners on HP. The lamina makes 45^0 with HP and the corner opposite to corner on which it rests is 25mm in front of VP and nearer to it. Draw its front view and top view.



- As the hexagonal lamina rests on one of its corners on HP and its surface is inclined to HP, draw the initial position in top view in the corner position.
- In the second position, redraw the front view of the lamina at 45 deg to HP with a corner (a' in fig) on XY line and project the top view.

- In the third position redraw the previous top view by rotating it through 90^0 keeping the opposite corner d at 25 mm from XY line.

4.8 A circular lamina of 50mm diameter rests on HP on a point A on the circumference, with its surface inclined at 45^0 to HP. The top view of the diameter passing through point A makes 60^0 to VP. Draw its front view and top view.



- As the circular lamina rests on a point of its rim on HP and its surface is inclined to HP, draw the initial position in top view.
- Divide the circle into 8 equal parts and draw projectors to get front view.
- In the second position, redraw the front view of the lamina at 45 deg to HP with a point (a' in fig) on XY line and project the top view which is an ellipse.

- In the third position redraw the previous top view by rotating it such that the top view of diameter ***ae*** becomes 60^0 to XY line and project the final front view.