PROJECTION OF PLANES

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- A plane is a two dimensional object having length and breadth only. Its thickness is always neglected.
- Various shapes of plane figures are considered such as square, rectangle, circle, pentagon, hexagon, ellipse etc.
- Plane is bounded by either straight lines or curved lines and may be regular plane or an irregular plane.

1. A regular plane is one in which all the side are equal whereas,
2. An irregular plane is one in which all the sides are unequal.

DIFFERENT POSITIONS OF PLANE IN SPACE

- The plane may be assumed in the space with reference to the three principal planes of projection and also classified according to their three different types of position with respect to three principal planes.
- Planes are classified by their position with reference to two other principal planes of projection, based on this the planes are of three types:

1. Planes which are parallel to one and perpendicular to two other planes. Such planes are called the Normal Plane. (also know as Perpendicular Plane)
2. Planes which are Inclined to one and Perpendicular to other principal planes. Such planes are called the Inclined Planes.
3. Planes which are inclined to all three principal plane. Such planes are called the Oblique Plane.

DIFFERENT POSITIONS OF PLANE IN SPACE

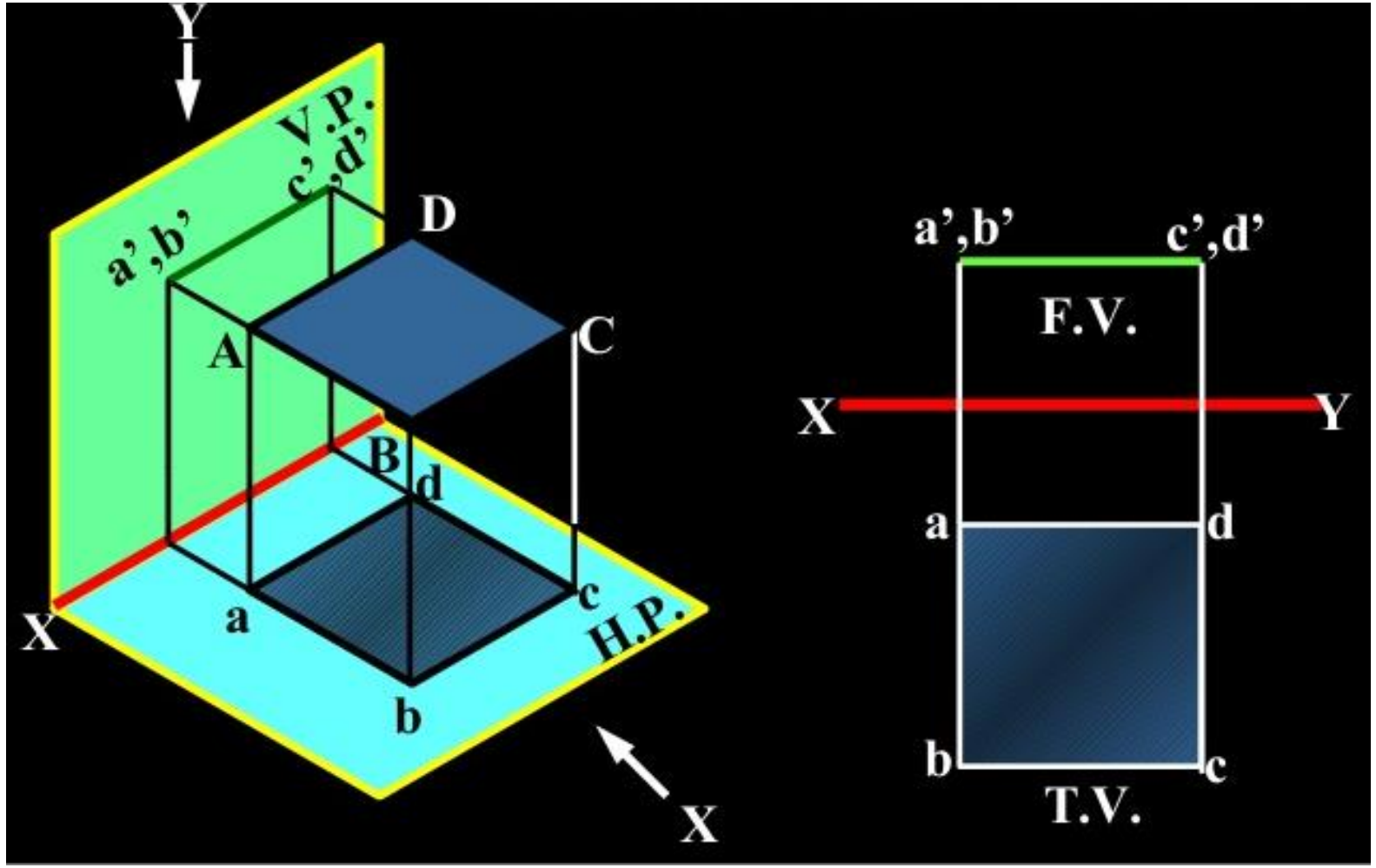
- Even if the position and the inclination of the plane are defined, it does not completely describe a plane, as there may be infinite planes with the same position and inclination.
- Hence to describe a unique plane, the position of the plane becomes an important element.
- An orientation of at least one of its geometric elements such as side, diagonal or diameter, etc. with respect to HP and VP is required to completely define the plane.

1. PLANE PARALLEL TO ONE AND PERPENDICULAR TO TWO OTHER PLANES (NORMAL PLANE)

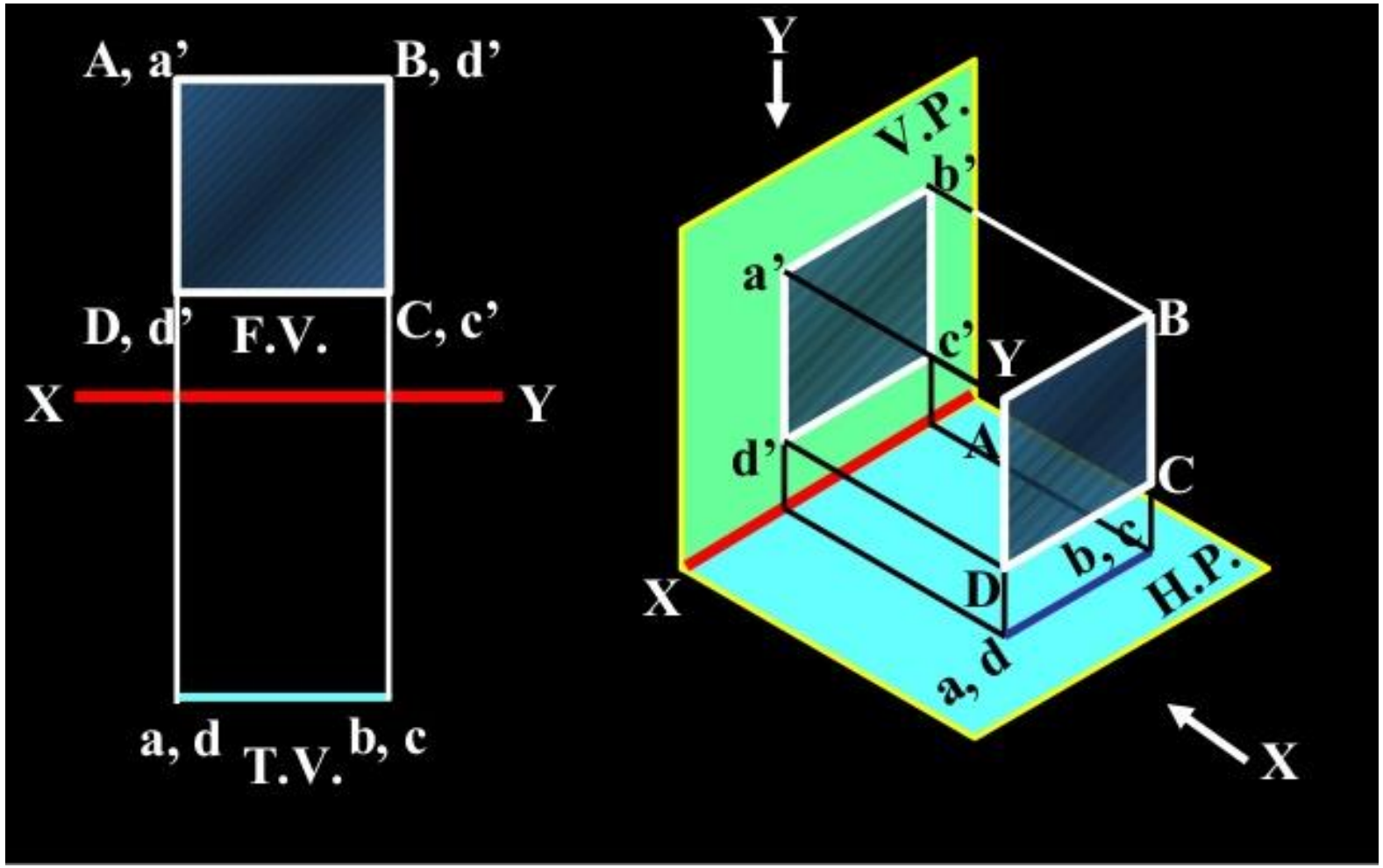
- The planes which are parallel to one and perpendicular to other two principal planes can be put into following three types:

1. Plane parallel to HP and Perpendicular to VP and PP.
2. Plane parallel to VP and Perpendicular to HP and PP.
3. Plane parallel to PP and Perpendicular to HP and VP.

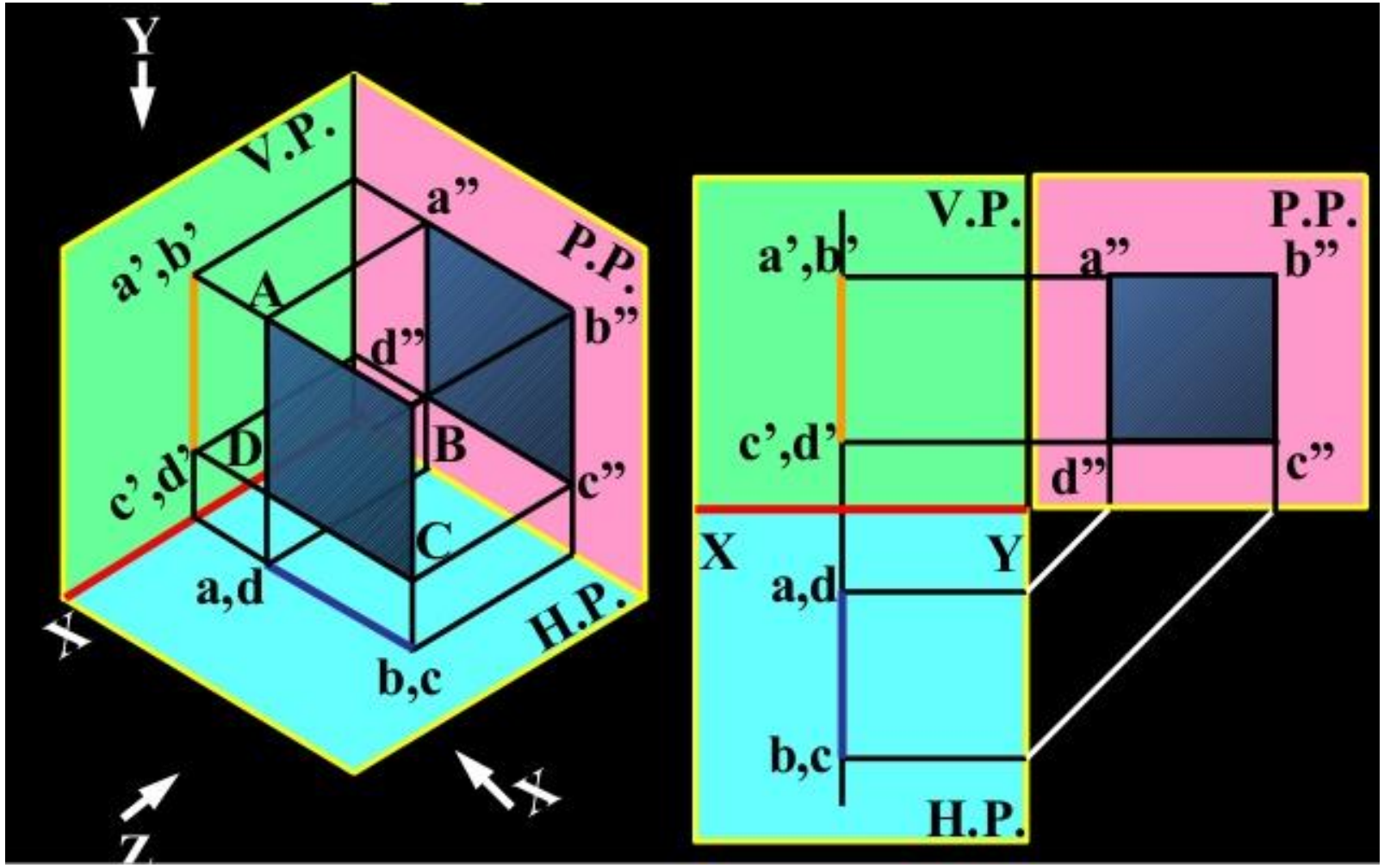
1. PLANE PARALLEL TO HP AND PERPENDICULAR TO VP AND PP.



2. PLANE PARALLEL TO VP AND PERPENDICULAR TO HP AND PP.



3. PLANE PARALLEL TO PP AND PERPENDICULAR TO HP AND VP.



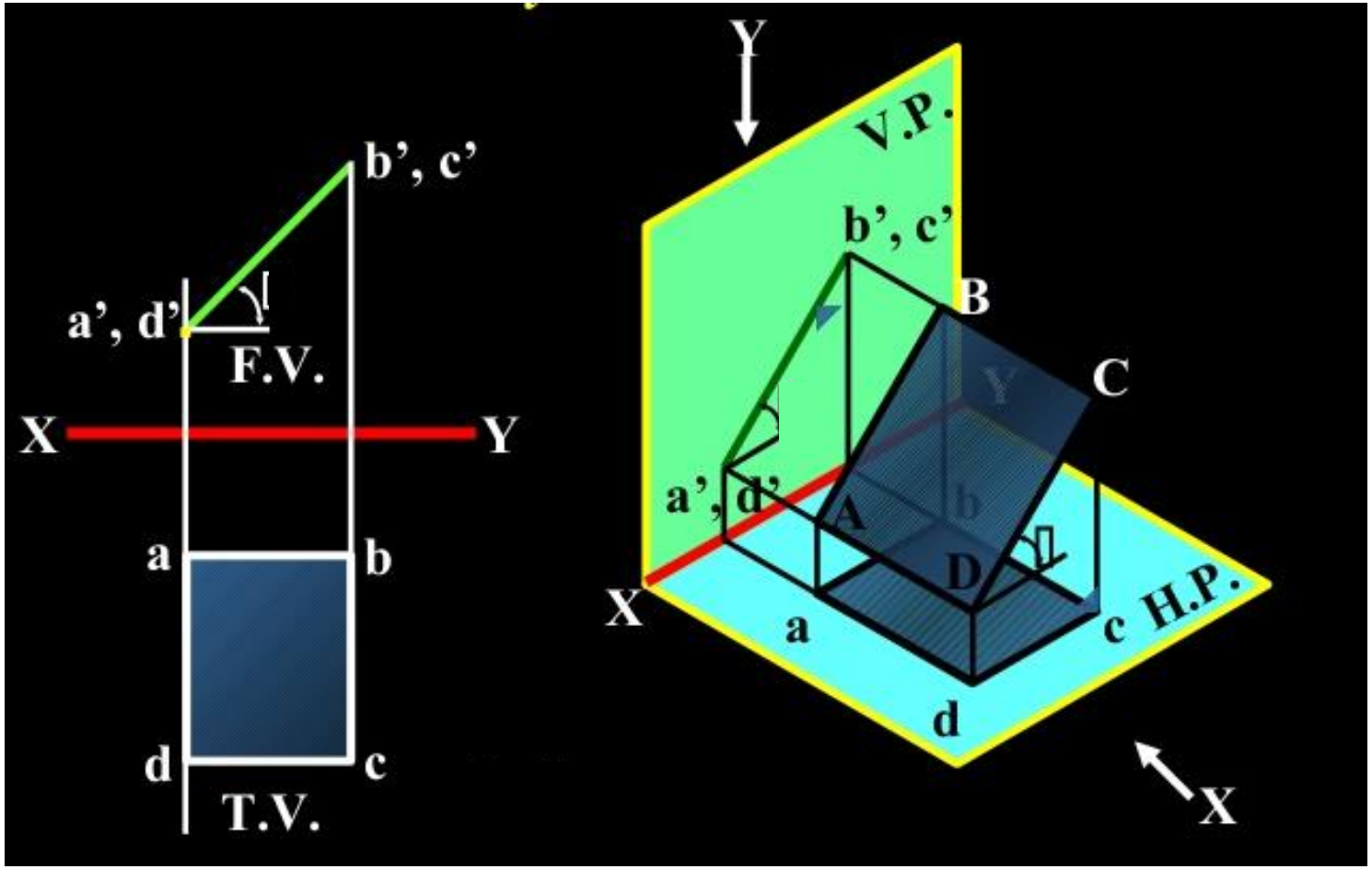
2. PLANE INCLINED TO ONE AND PERPENDICULAR TO OTHER PLANE (INCLINED PLANE)

- The Inclined plane can be of two types

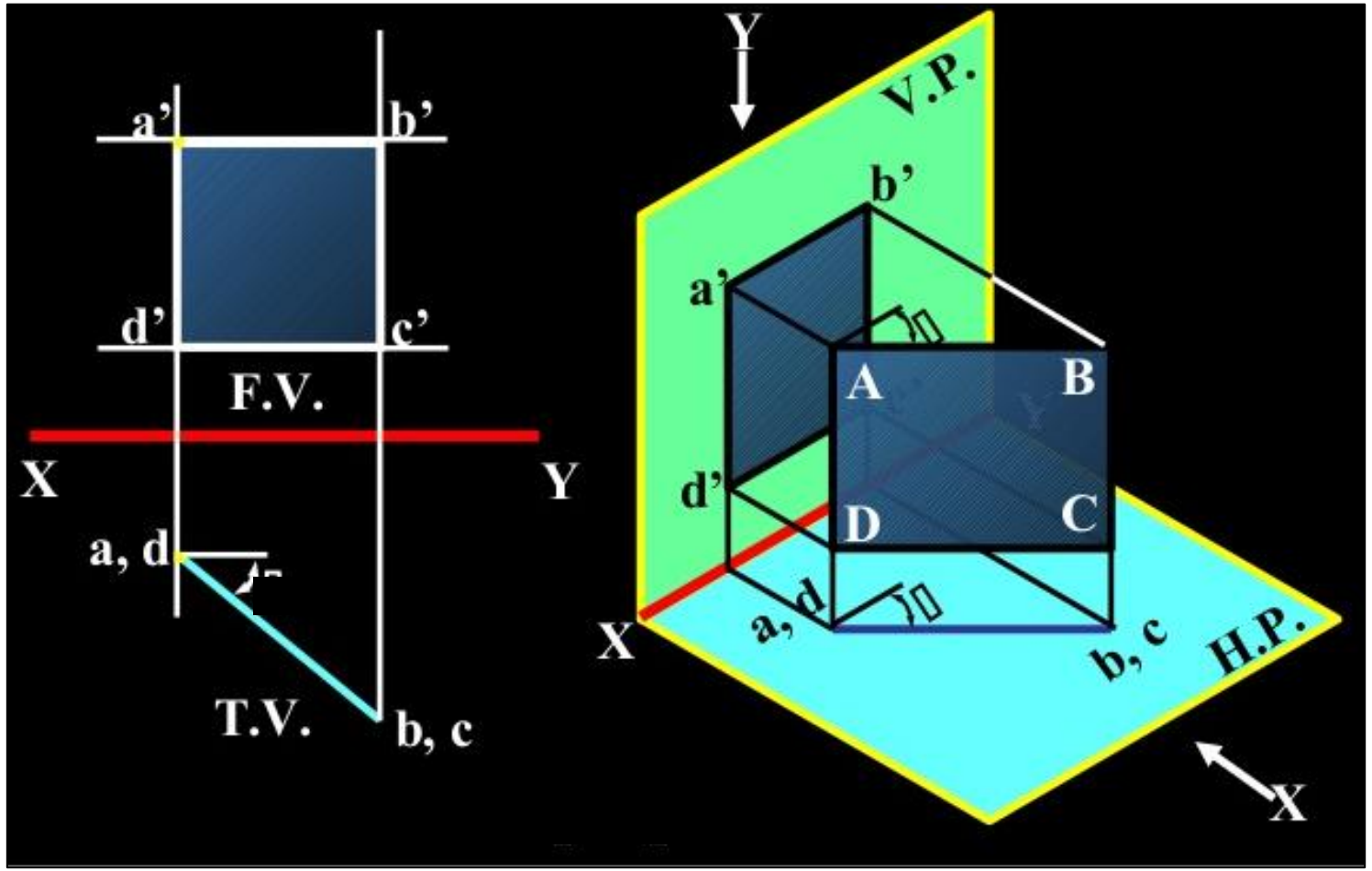
1. Plane inclined to HP and perpendicular to VP
2. Plane inclined to VP and perpendicular to HP

- When a plane is inclined to one of the reference planes and perpendicular to other, its inclination can be shown by its projection on the plane to which it is perpendicular.
- The projection of the plane in such case will be the line.
- The angle which the line makes with the reference line XY will be the inclination of the plane with the principal plane.
- The projection on the plane to which it is inclined will be different then the true shape of the plane. This shape of the plane is called the apparent shape.
- It becomes difficult to predict the true shape and size of the plane from its apparent shape and hence it is impossible to draw the projection of such plane.

PLANE INCLINED TO HP AND PERPENDICULAR TO VP



PLANE INCLINED TO VP AND PERPENDICULAR TO HP



2. PLANE INCLINED TO ONE AND PERPENDICULAR TO OTHER PLANE (INCLINED PLANE)

- To overcome above when the plane is inclined to one of the reference planes, its projections are drawn through two stages.
- In the initial stage, the plane is assumed to be parallel to or kept on that principle plane to which it is inclined. The plane is rotated to the given inclination in the second stage.
- When the plane is rotated for the required inclination, there are two possibilities,

a) The plane will have one of the sides on the principal plane.

b) The plane will have one of the corners on the principal plane.

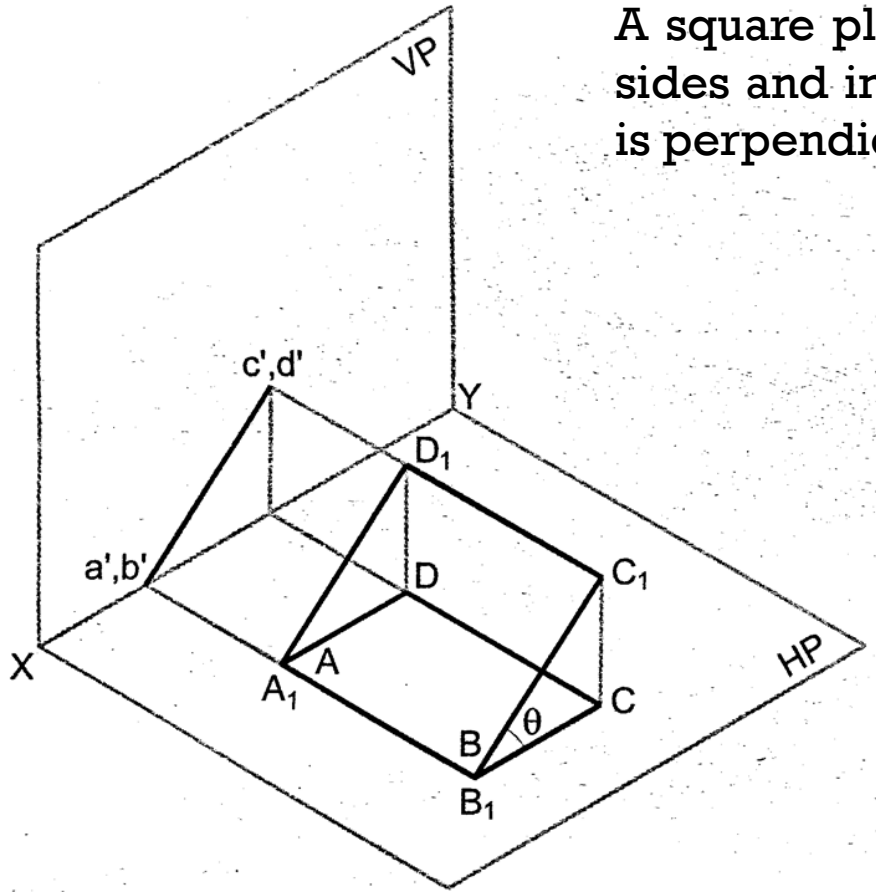
- In the initial stage, the plane should be kept in such a way that out of two possibilities the required positions can be obtained in the final stage.

2. PLANE INCLINED TO ONE AND PERPENDICULAR TO OTHER PLANE (INCLINED PLANE)

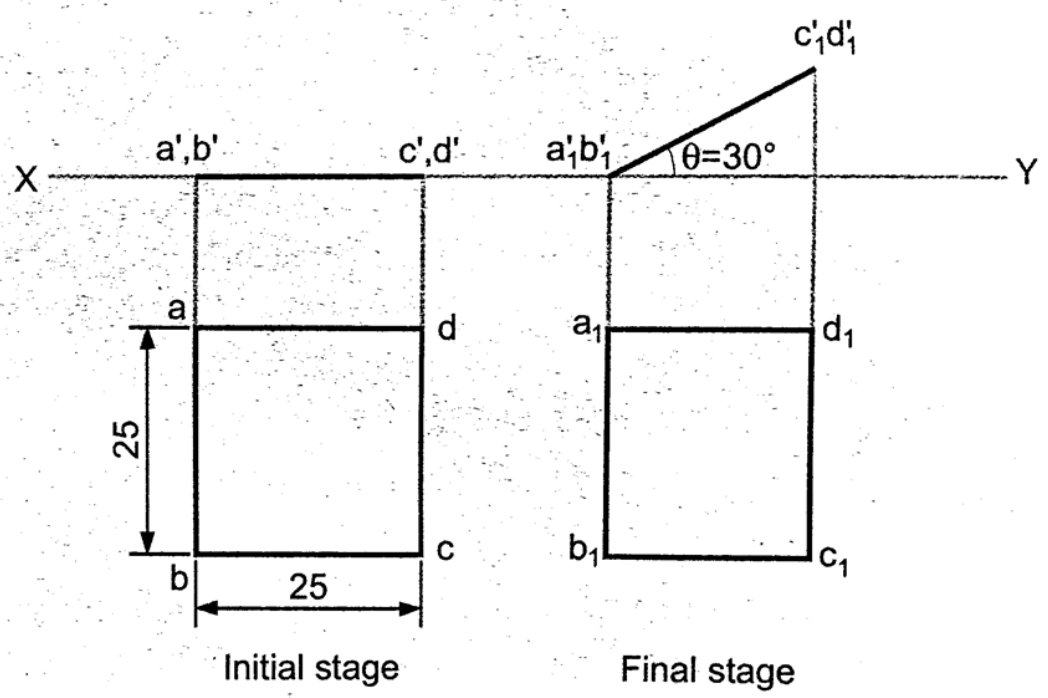
- The inclined plane can have the following different positions with respect to the position of the sides or the corners of the plane on the principal planes.

1. Plane inclined to HP and perpendicular to VP with one of the sides of the plane on HP.
2. Plane inclined to HP and perpendicular to VP with one of the corners of the plane on HP.
3. Plane inclined to VP and perpendicular to HP with one of the sides of the Of the plane on VP.
4. Plane inclined to VP and perpendicular to HP with one of the corners of the plane on VP.

1. PLANE INCLINED TO HP AND PERPENDICULAR TO VP WITH ONE OF THE SIDES OF THE PLANE ON HP.

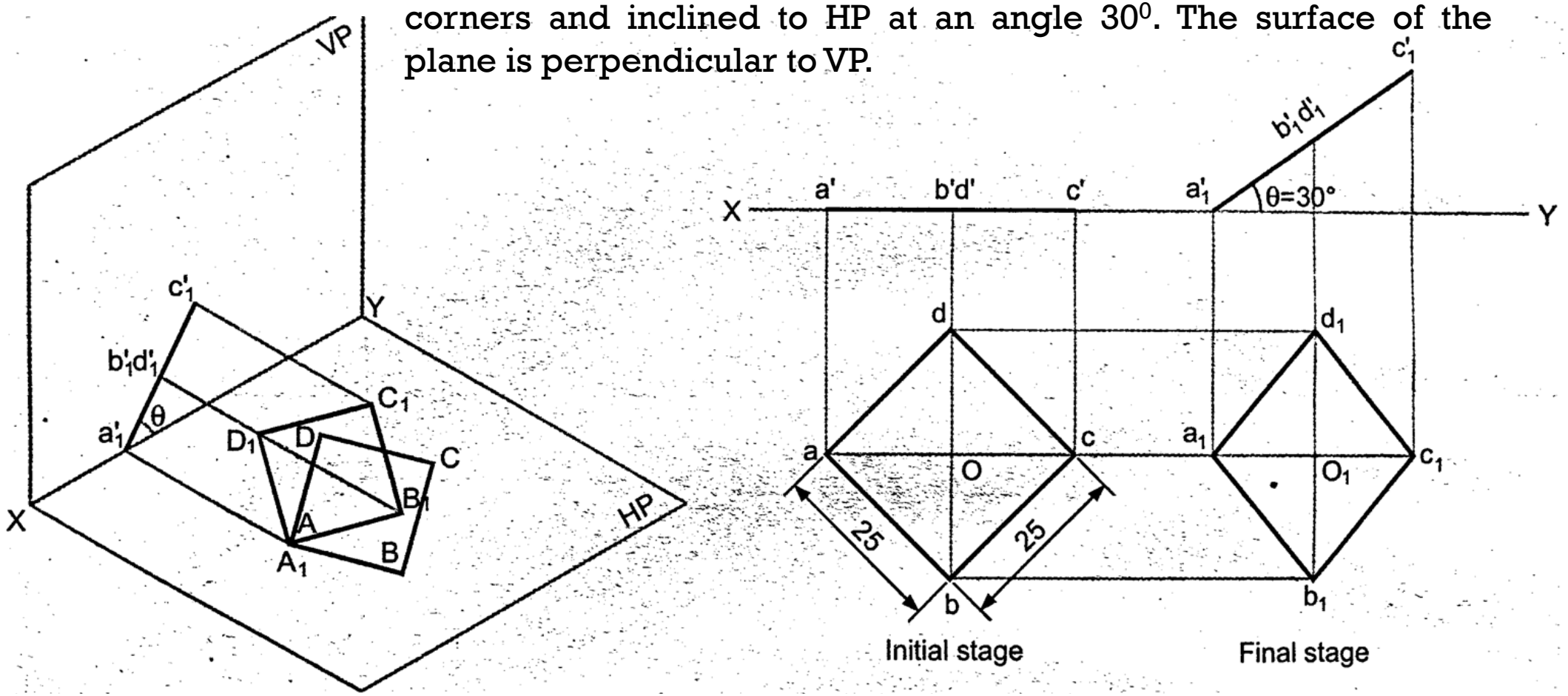


A square plane ABCD is of 25 mm side, kept on HP on one of its sides and inclined to HP at an angle 30^0. The surface of the plane is perpendicular to VP.

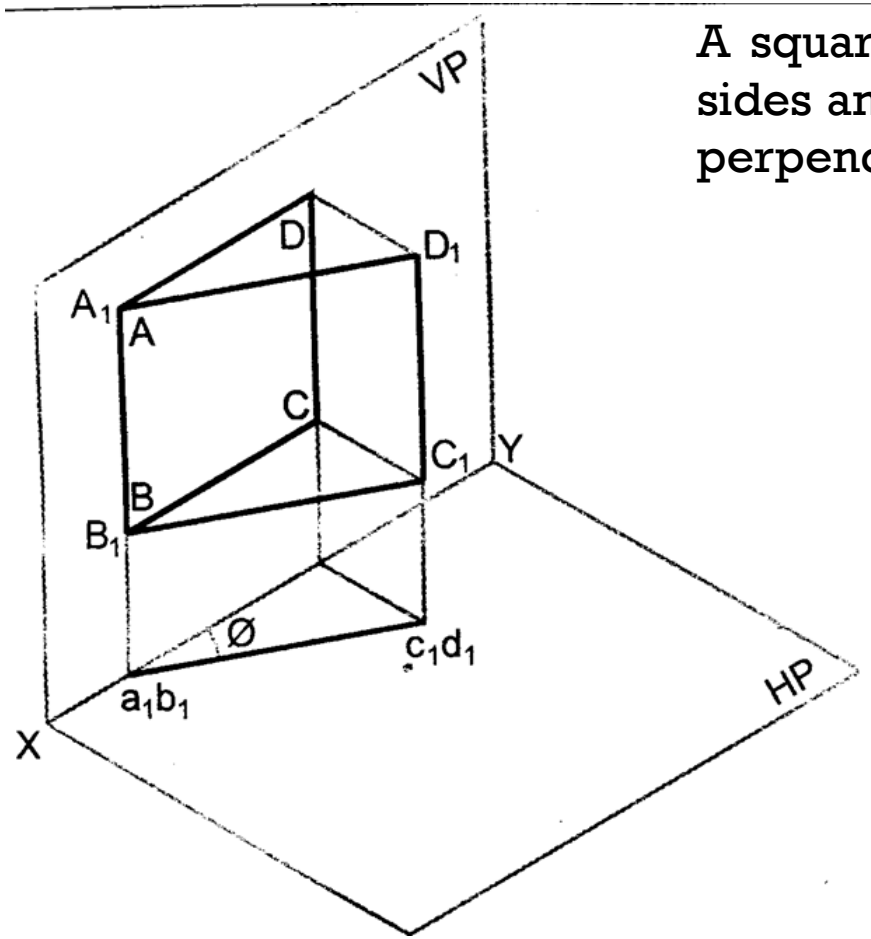


2. PLANE INCLINED TO HP AND PERPENDICULAR TO VP WITH ONE OF THE CORNERS OF THE PLANE ON HP.

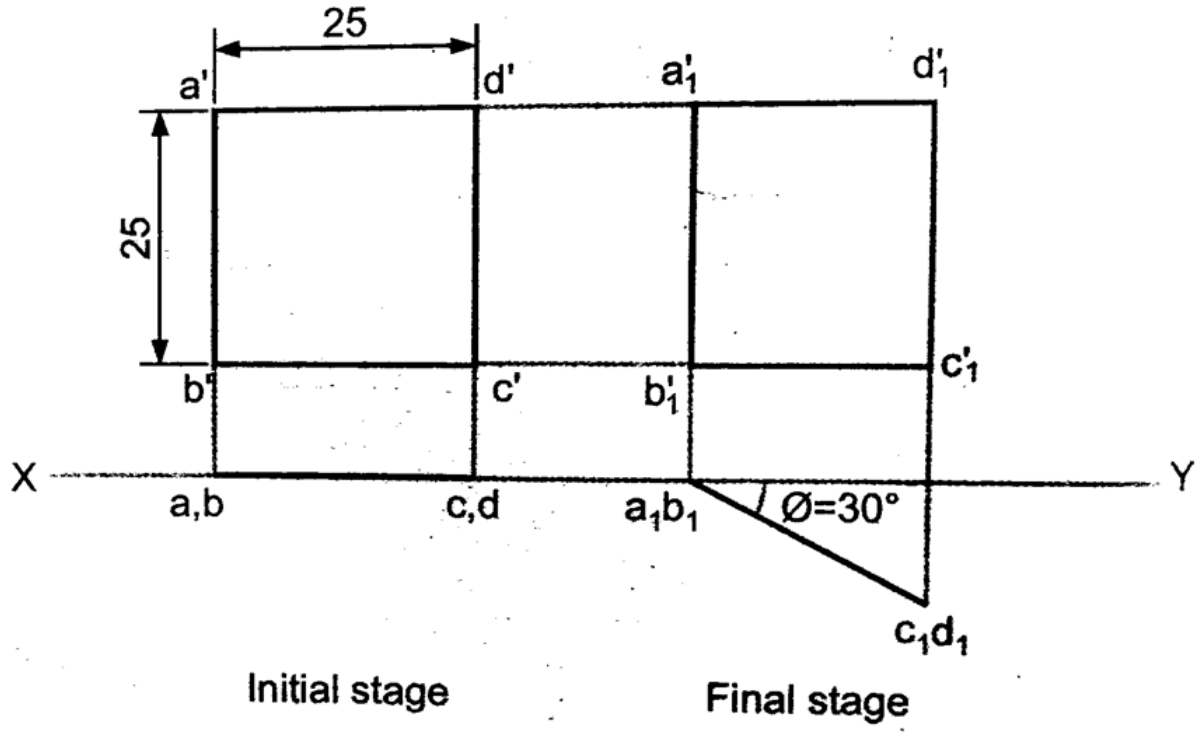
A square plane ABCD is of 25 mm side, kept on HP on one of its corners and inclined to HP at an angle 30^0. The surface of the plane is perpendicular to VP.



3. PLANE INCLINED TO VP AND PERPENDICULAR TO HP WITH ONE OF THE SIDES OF THE OF THE PLANE ON VP.

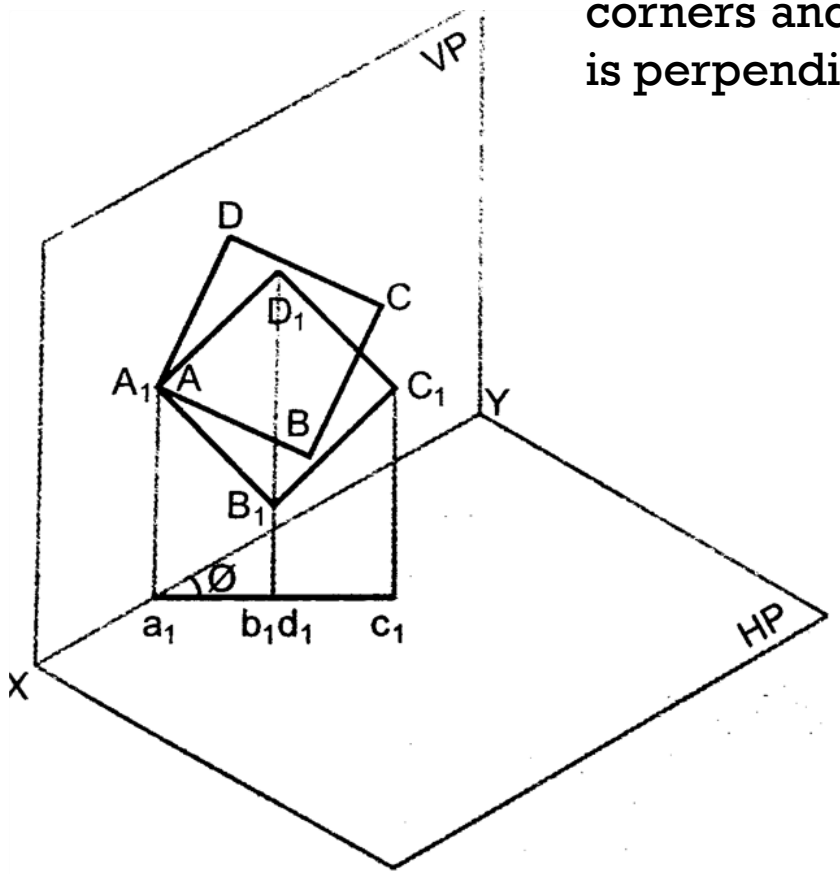


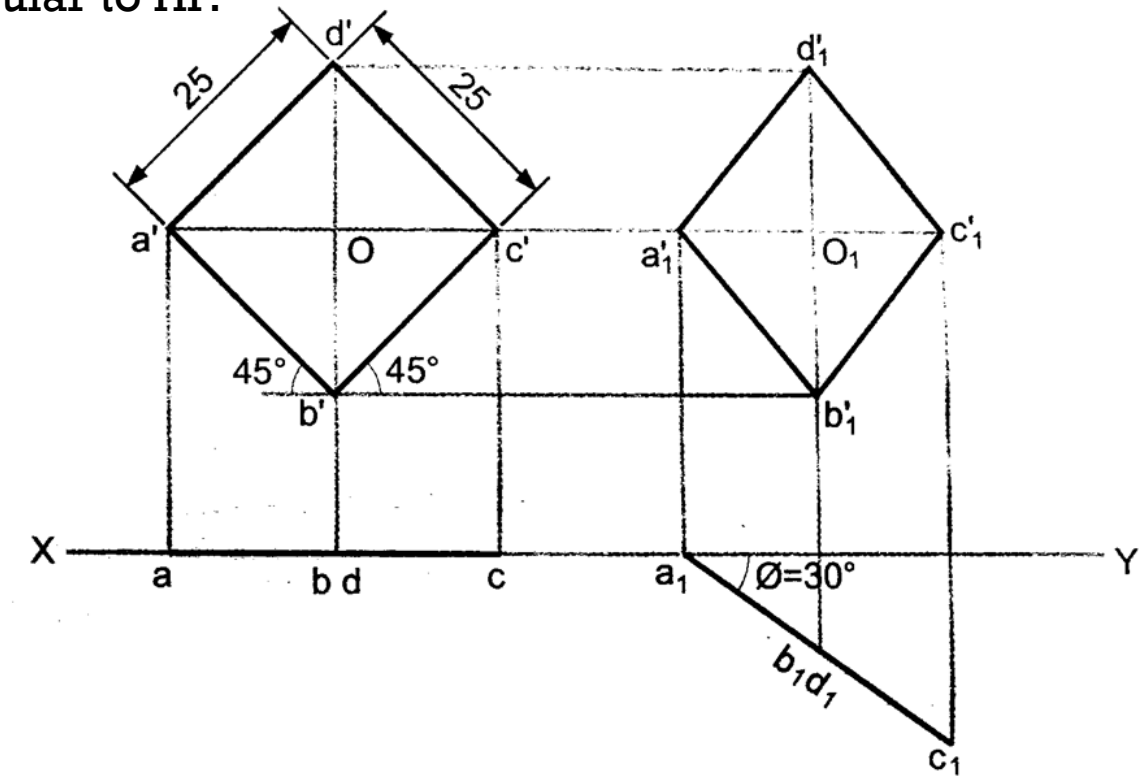
A square plane ABCD is of 25 mm side, kept on VP on one of its sides and inclined to VP at an angle 30^0. The surface of the plane is perpendicular to HP.



4. PLANE INCLINED TO VP AND PERPENDICULAR TO HP WITH ONE OF THE CORNERS OF THE PLANE ON VP.

A square plane ABCD is of 25 mm side, kept on VP on one of its corners and inclined to VP at an angle 30^0. The surface of the plane is perpendicular to HP.





3. PLANES INCLINED TO ALL PRINCIPAL PLANE (OBLIQUE PLANE).

- When the surface of the plane inclined to one of the principal planes and the side or the diagonal or the diameter is parallel to that principal plane and inclined to the other principal plane, the given plane is called the oblique plane.
- In other words it is a plane, which is inclined to both in HP and VP at an angle other than 90°.
- Neither the elevation nor the plan will give the line view. No view will give the true shape of the plane. The views will be smaller than the true shape of the plane.
- Projections of the oblique can be drawn in three stages.

1. Initial Stage
2. Intermediate Stage
3. Final Stage

3. PLANES INCLINED TO ALL PRINCIPAL PLANE (OBLIQUE PLANE).

- The initial stage mostly consist of one view as the true shape and other view as a straight line view.
- In the intermediate stage, the straight line view is to be rearranged to set the angle of plane surface with the principal plane or to set the distance of specific corner or edge from principal plane or to get the required shape in the subsequent projection.
- In the final stage, the intermediate stage view is rearranged in elevation or plan to set the required position of the plane and the subsequent projection is drawn according to get the final plan or elevation.
- The oblique plane can be divided into following two categories,

1. The surface of the plane inclined to HP.
2. The surface of the plane inclined to VP

THE SURFACE OF THE PLANE INCLINED TO HP.

- When the surface of the plane is inclined to HP and the side or the diagonal or the diameter of the plane is parallel to HP and inclined to VP, the projections of such a plane can be drawn by carrying out the following three stages.

1. Initial stage:

- Assume the plane to be on HP. (or parallel to and h mm from HP)
- If the plane is to be kept on one of the side in the next stage then that side should be drawn perpendicular to the reference line XY.
- If the plane is to be kept on one of the corners in the next stage then the plane should be drawn in such a way the line joining that corner with the centre of the plane is parallel to the reference line XY.
- The top view or the plan will be the true shape of the plane and the front view or the elevation will be the line view.

THE SURFACE OF THE PLANE INCLINED TO HP.

2. Intermediate stage:

- As the surface of the plane is inclined to HP rotate the plane about one of its sides or one of its corners to get the required inclination.
- The line View is made Inclined To the reference line XY to such an angle which the surface of the plane makes with HP.
- The front view or the elevation of the plane will be still the line view and the top view or the plan will be the apparent shape of the plane. The apparent shape of the plane will be smaller than the true shape of the plane.

THE SURFACE OF THE PLANE INCLINED TO HP.

3. Final stage:

- The intermediate stage top view or the plan is redrawn by adjusting or rotating it to certain position to get the required inclination of the side or the diagonal or the diameter of the plane with VP the shape and the size of the view will remain the same.
- In the front of you or elevation the distances of all the corners of the plane from the reference line XY will be the same as in the front view of the elevation of the intermediate stage.

THE SURFACE OF THE PLANE INCLINED TO VP.

- When the surface of the plane is inclined to VP and the side or the diagonal or the diameter of the plane is parallel to VP and inclined to HP, the projections of such a plane can be drawn by carrying out the following three stages.

1. Initial stage:

- Assume the plane to be on VP. (or parallel to and v mm from VP)
- If the plane is to be kept on one of the side in the next stage then that side should be drawn perpendicular to the reference line XY.
- If the plane is to be kept on one of the corners in the next stage then the plane should be drawn in such a way the line joining that corner with the centre of the plane is parallel to the reference line XY.
- The front view or the elevation will be the true shape of the plane and the top view or the plan will be the line view.

THE SURFACE OF THE PLANE INCLINED TO VP.

2. Intermediate stage:

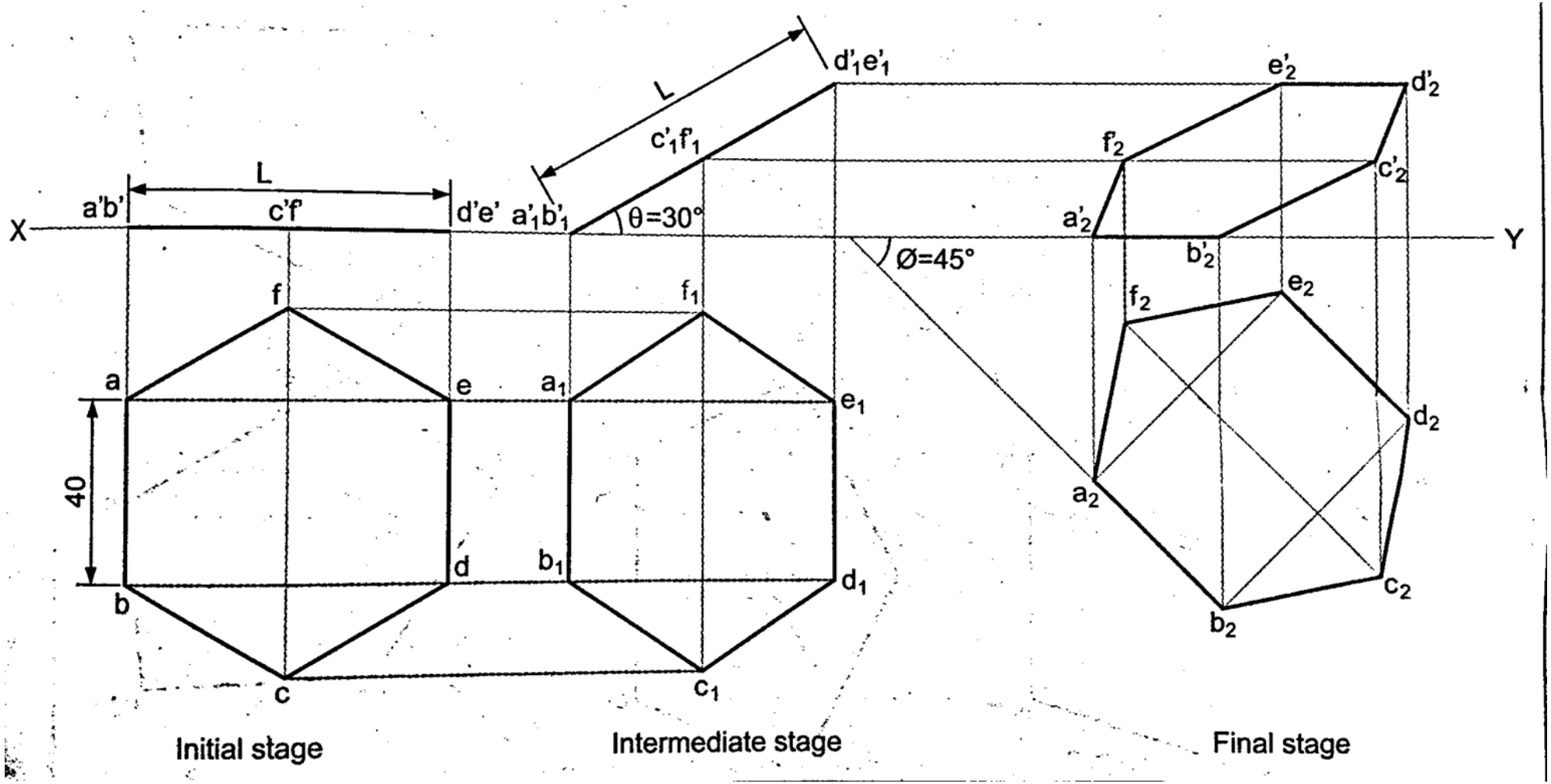
- As the surface of the plane is inclined to VP rotate the plane about one of its sides or one of its corners to get the required inclination.
- The line View is made inclined to the reference line XY to such an angle, which the surface of the plane makes with VP.
- The top view or the plan of the plane will be still the line view and the front view or the elevation will be the apparent shape of the plane. The apparent shape of the plane will be smaller than the true shape of the plane.

THE SURFACE OF THE PLANE INCLINED TO VP.

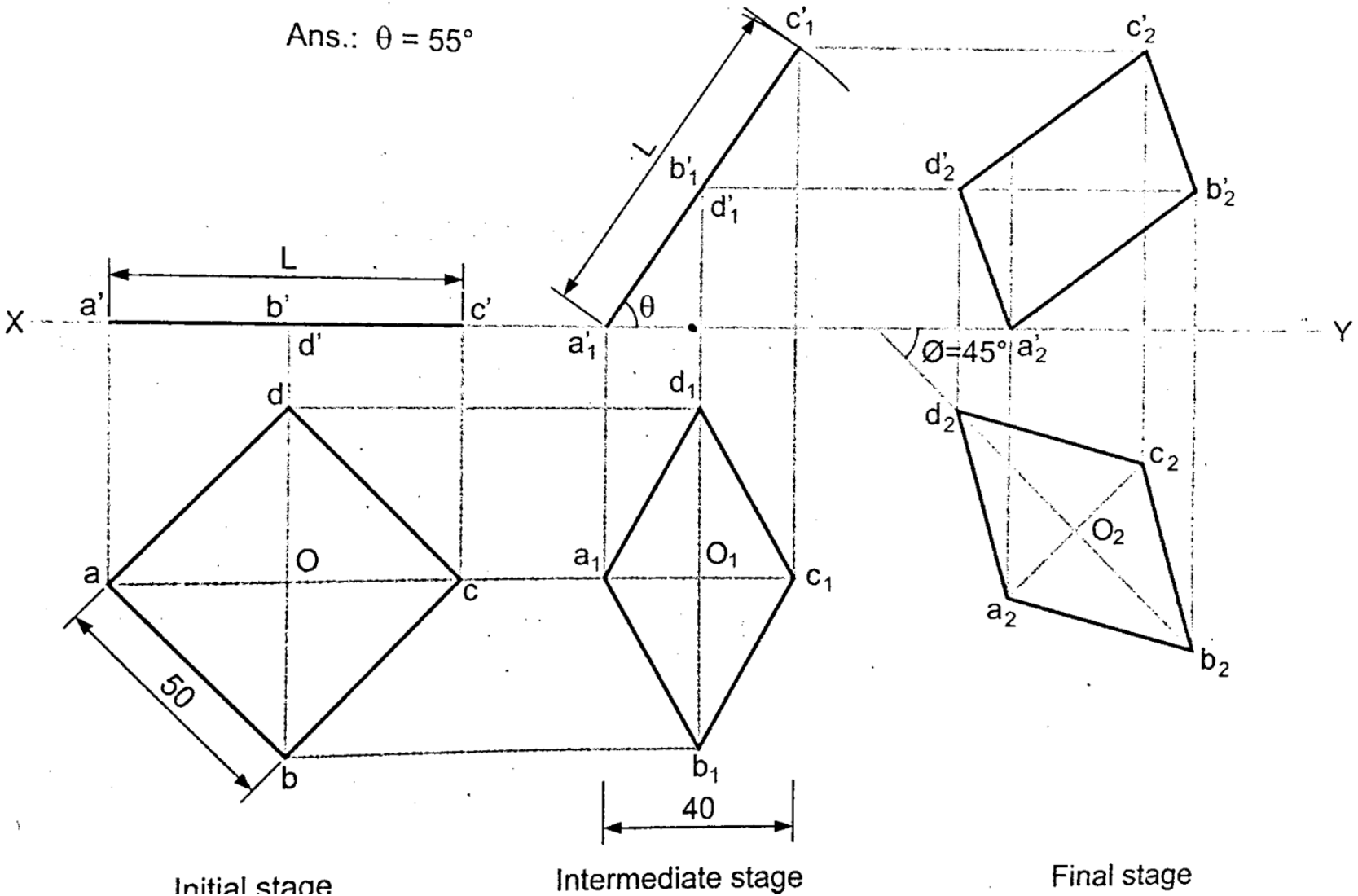
3. Final stage:

- The intermediate stage front view or the elevation is redrawn by adjusting or rotating it to certain position to get the required inclination of the side or the diagonal or the diameter of the plane with HP. The shape and the size of the view will remain the same.
- In the top view or plan, the distances of all the corners of the plane from the reference line XY will be the same as in the top view or the plan of the intermediate stage.

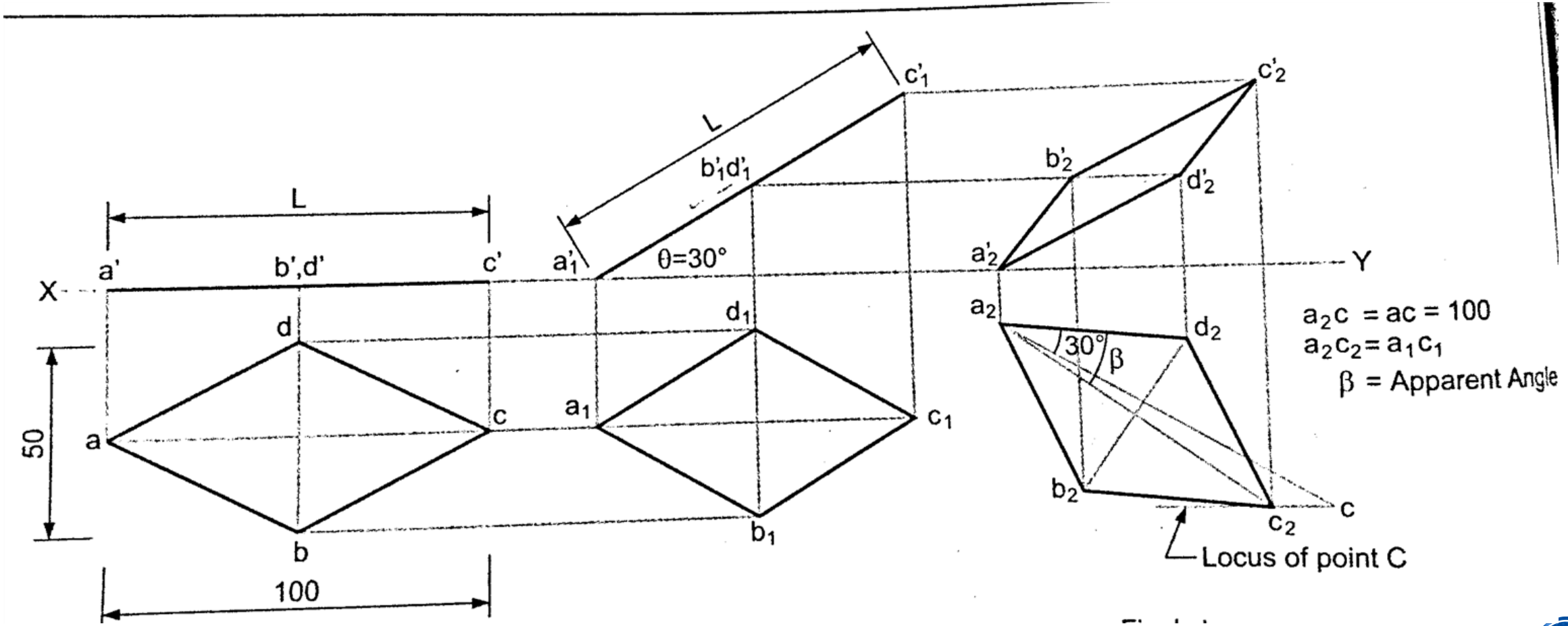
EXAMPLES 1


X
Y
L
a'b'
c'f'
d'e'
a'1b'1
c'1f'1
d'1e'1
θ=30°
Ø=45°
40
a
b
c
d
e
f
a1
b1
c1
d1
e1
f1
a2
b2
c2
d2
e2
f2
a'2
b'2
c'2
d'2
e'2
f'2
Initial stage
Intermediate stage
Final stage

EXAMPLE 2


Ans.: θ = 55°
X
Y
L
a'
b'
c'
d'
a'1
b'1
c'1
d'1
θ
a'2
b'2
c'2
d'2
Ø=45°
a
b
c
d
O
a1
b1
c1
d1
O1
a2
b2
c2
d2
O2
50
40
Initial stage
Intermediate stage
Final stage

EXAMPLE 3


L
a'
b',d'
c'
X
d
c
a
b
50
100
L
$b'_1d'_1$
a'_1
c'_1
θ=30°
d_1
a_1
c_1
b_1
c'_2
b'_2
d'_2
a'_2
Y
a_2
d_2
30°
β
b_2
c_2
c
$a_2c = ac = 100$
$a_2c_2 = a_1c_1$
β = Apparent Angle
Locus of point C

THANK YOU