ME 111: Engineering Drawing

## Lecture 8
22-08-2011
Projection of Planes

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# Positioning of a Plane surface

- A plane surface may be positioned in space with reference to the three principal planes of projection in any of the following positions:

  - *Parallel to one of the principal planes and perpendicular to the other two.*

  - *Perpendicular to one of the principal planes and inclined to the other two.*

  - *Inclined to all the three principal planes.*

Example.1

A rectangle ABCD of size 30 mm x 20mm is parallel to the HP and has a shorter side AB perpendicular to the VP. Draw its projections

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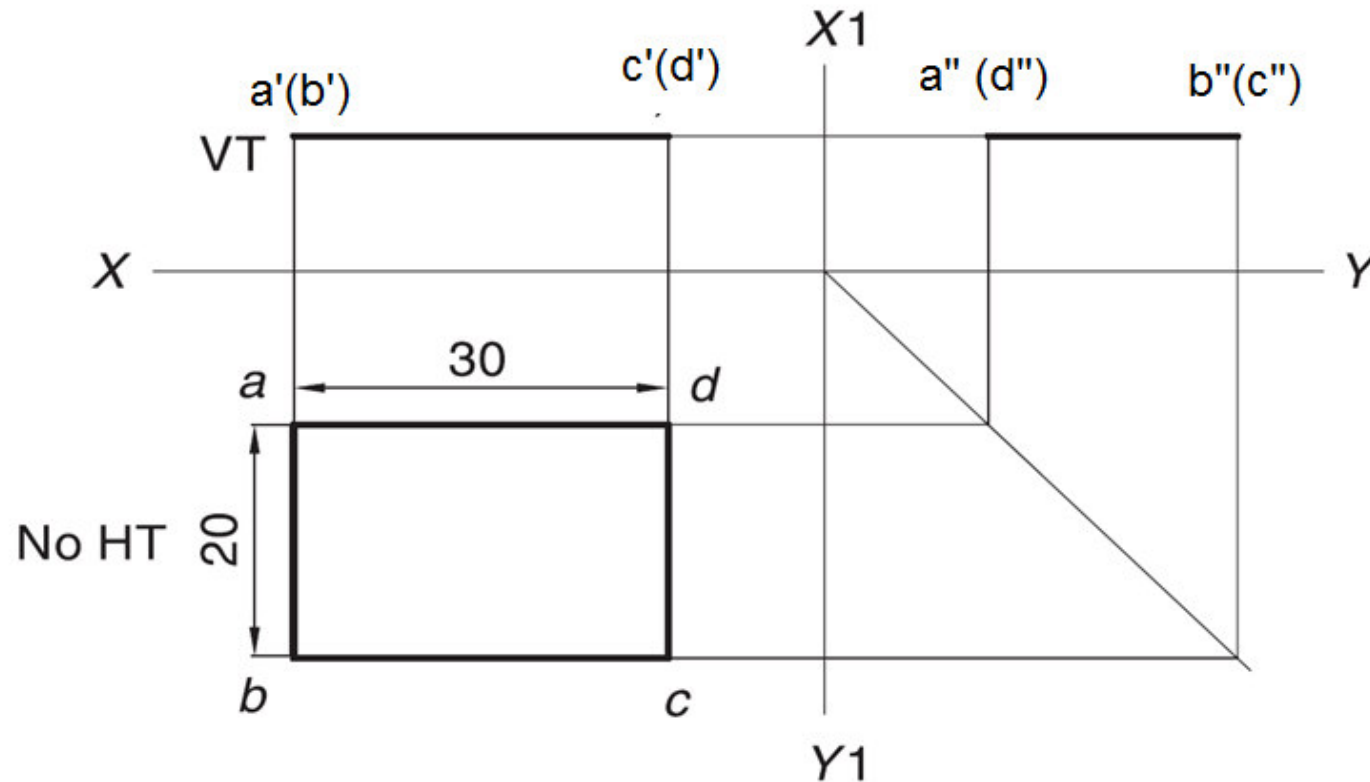
# 3. Plane parallel to PP and perpendicular to both HP and VP
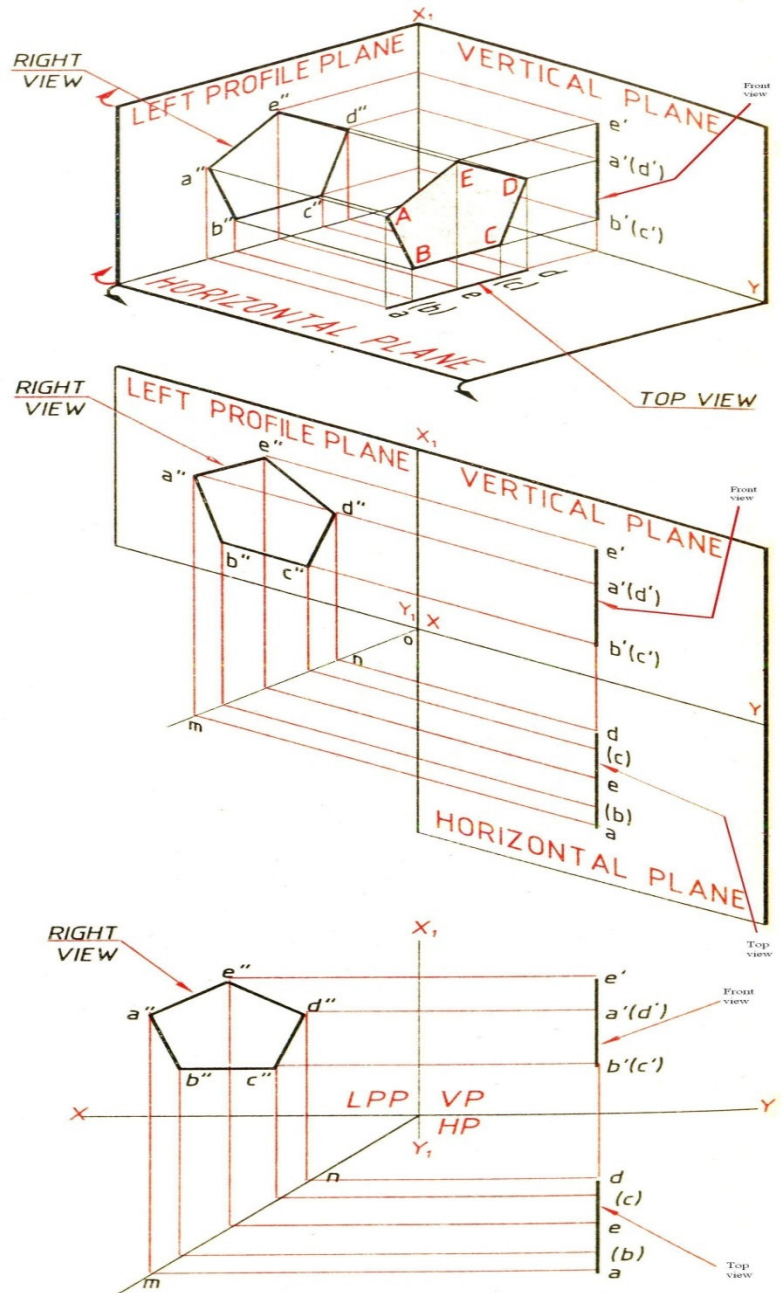
A pentagon lamina (plane surface) placed in the first quadrant - its surface is parallel to **left PP** and perpendicular to both **VP** and **HP**.

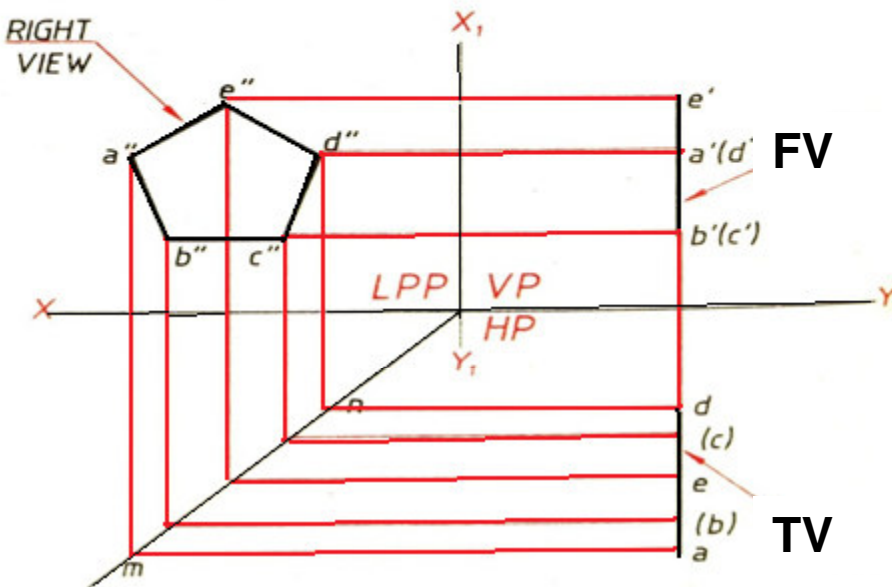**a"b"c"d"e"** – side view **a(b)e(c)d** – top view, and **b'(c')a'(d')e'** - front view,

Side view – **a"b"c"d"e"** - in true shape – plane is **parallel** to **PP.**

Front and top views - projected as lines – plane is perpendicular to **VP** and **HP.**
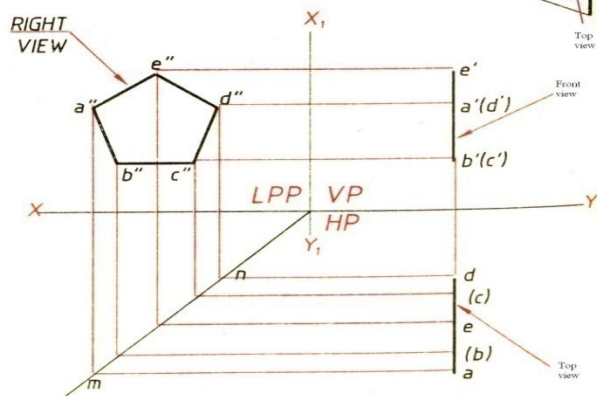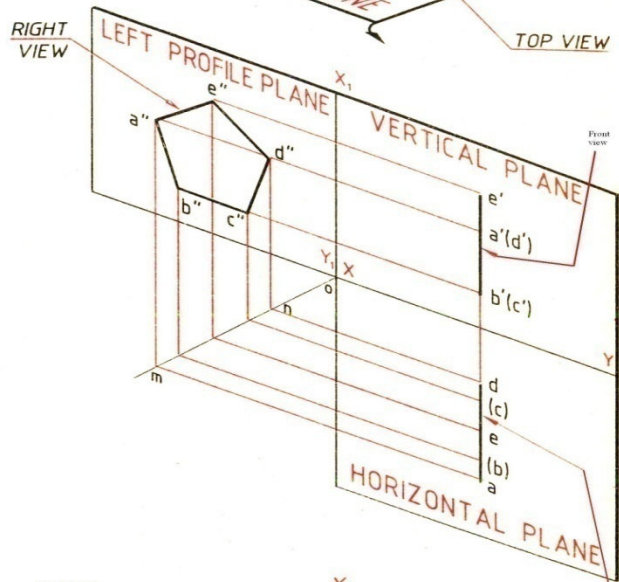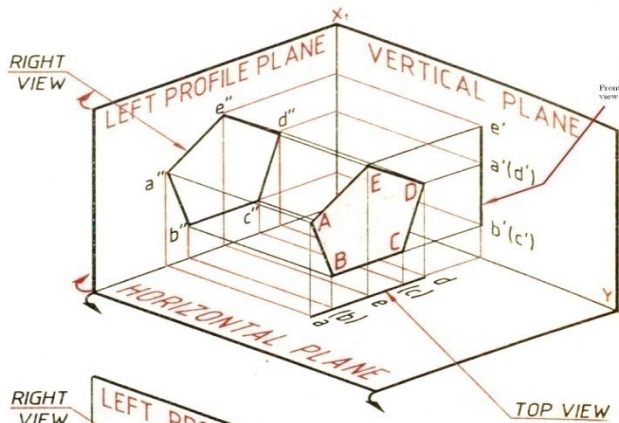
After projecting the pentagon lamina on **VP**, **HP** and **PP**, both **HP** and **PP** are rotated about **XY** and **X₁Y₁** lines till they lie in-plane with that of **VP**.

Orthographic projections

Draw **XY** and **X_1Y_1** lines, and mark **HP, VP** and left **PP** .

Draw the pentagon **a"b"c"d"e"** in true shape to represent the side view at any convenient distance above the **XY** line and left of **X_1Y_1** line.

The top and front views of the lamina appear as lines perpendicular to **XY** line.

Obtain the front view **b'(c')a'(d')e'** as a line projecting from the right view at any convenient distance from the **X_1Y_1** line.

In the front view, the rear corners **D** and **C** coincide with **A** and **B** respectively, hence **d'** and **c'** are indicated within brackets.

Since the pentagon lamina is also perpendicular to **HP**, the top view also appears as a line. Project the top view from the right and front views.

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B: Plane surface perpendicular to one plane and inclined to the other two

1. Plane inclined at φ to VP and perpendicular to HP

A triangular lamina (plane surface) placed in the first quadrant - its surface is inclined at φ to VP and perpendicular to the HP.

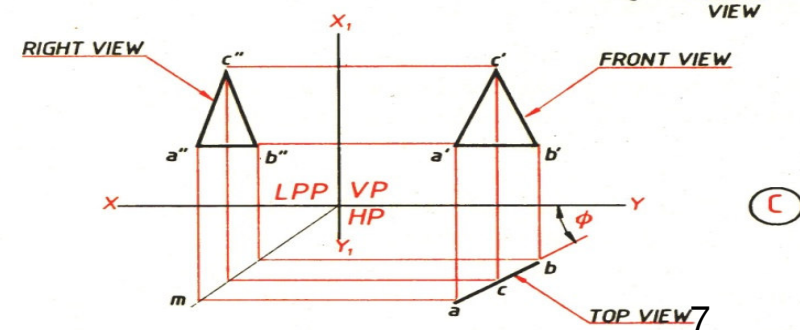Since the lamina is inclined to VP, it is also inclined to left PP at (90 - φ).

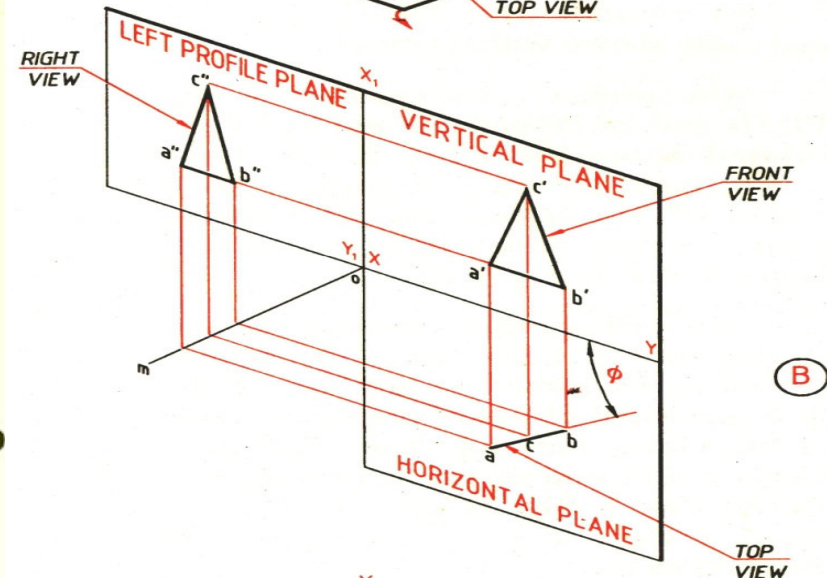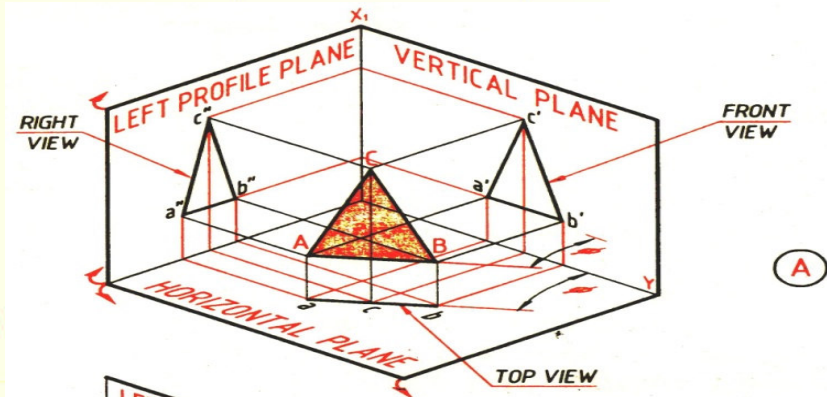The triangular lamina ABC is projected onto VP, HP and left PP.
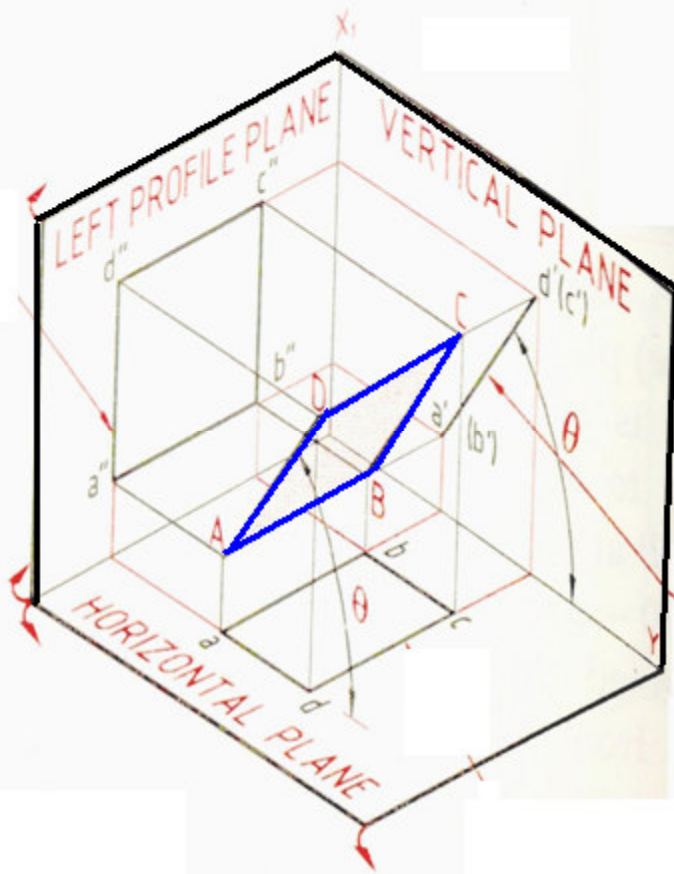
a'b'c' – is the front view projected on on VP.

a"b"c" – is the right view projected on left PP

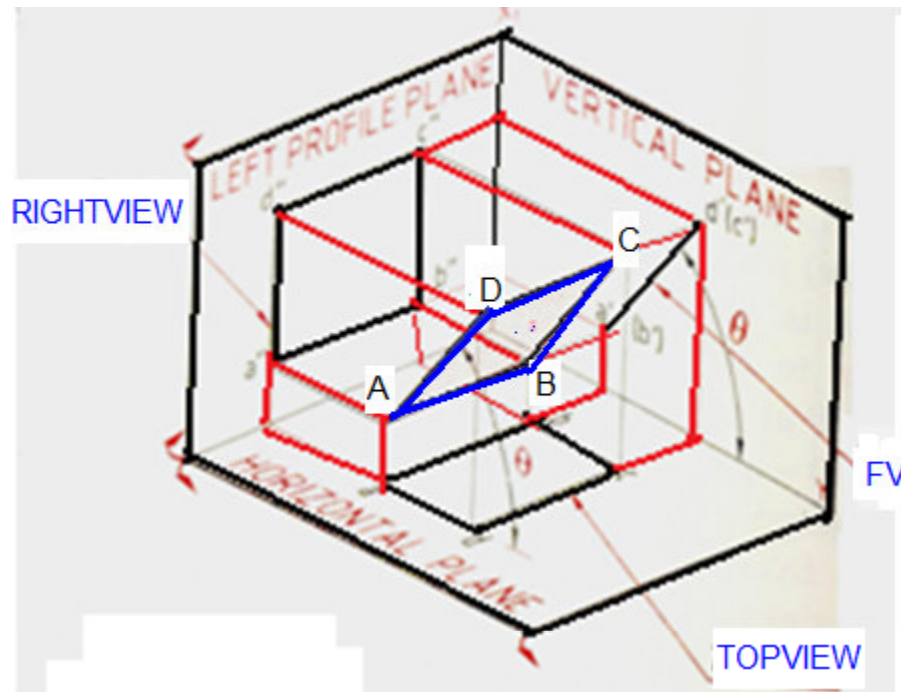Since lamina is inclined to VP and PP, front and side views are not in true shape.

Since lamina is perpendicular to HP, its top view is projected as a line acb

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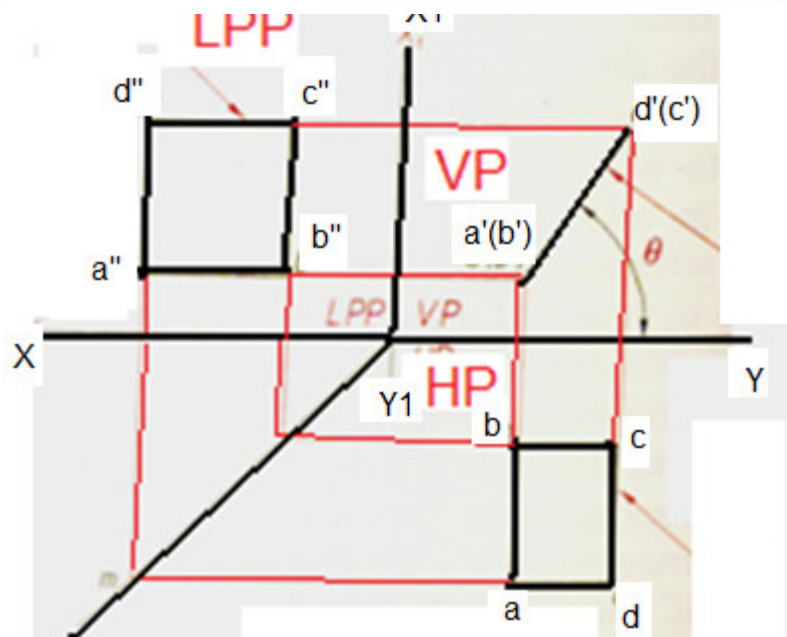# 2. Plane inclined at θ to HP and perpendicular to VP

Since the lamina is inclined to HP at θ, it is also inclined to the left PP at (90- θ). The square lamina is projected on to VP, HP and left PP. abcd is the top view projected on the left PP. Since the lamina is perpendicular to VP, its front view is projected as a line a'(b')d'(c'). The corners B and C coincide with A and D.

RIGHTVIEW

LEFT PROFILE PLANE VERTICAL PLANE

C
D
A   B

HORIZONTAL PLANE

FV

TOPVIEW

θ
θ

LPP
d"   c"   d'(c')

VP

b"   a'(b')   θ

a"

LPP VP

X
                 HP
   Y1   b   c   Y

a   d

After projecting the square lamina on VP, HP and left PP, both HP and left PP are rotated about the XY and X_1Y_1 line respectively till they lie inplane with that of the VP.

Example.2 : Draw the projection of a circle of 5 cm diameter, having its plane vertical and inclined at 30 to the VP. Its center is 3 cm above the HP and 2 cm in front of the VP.
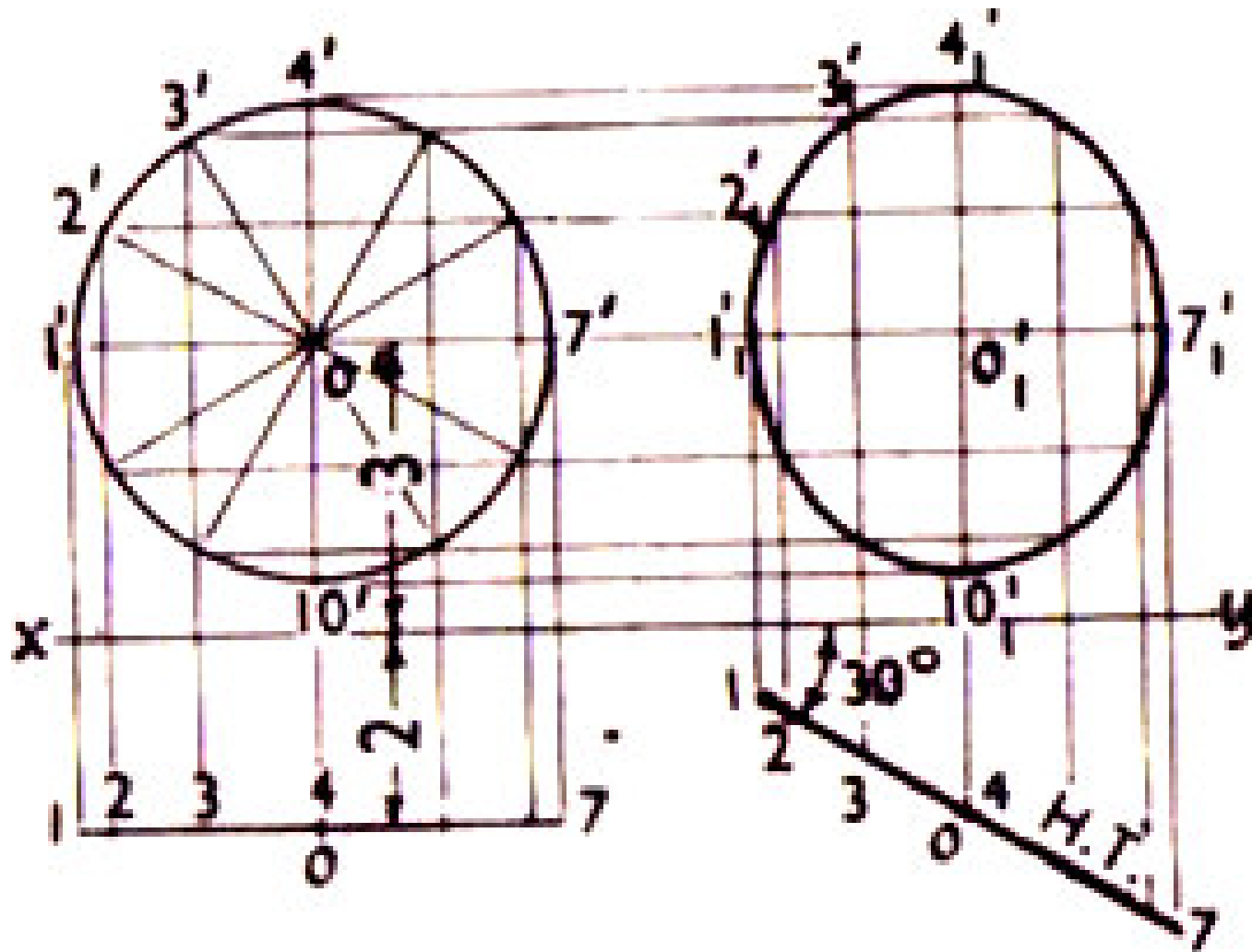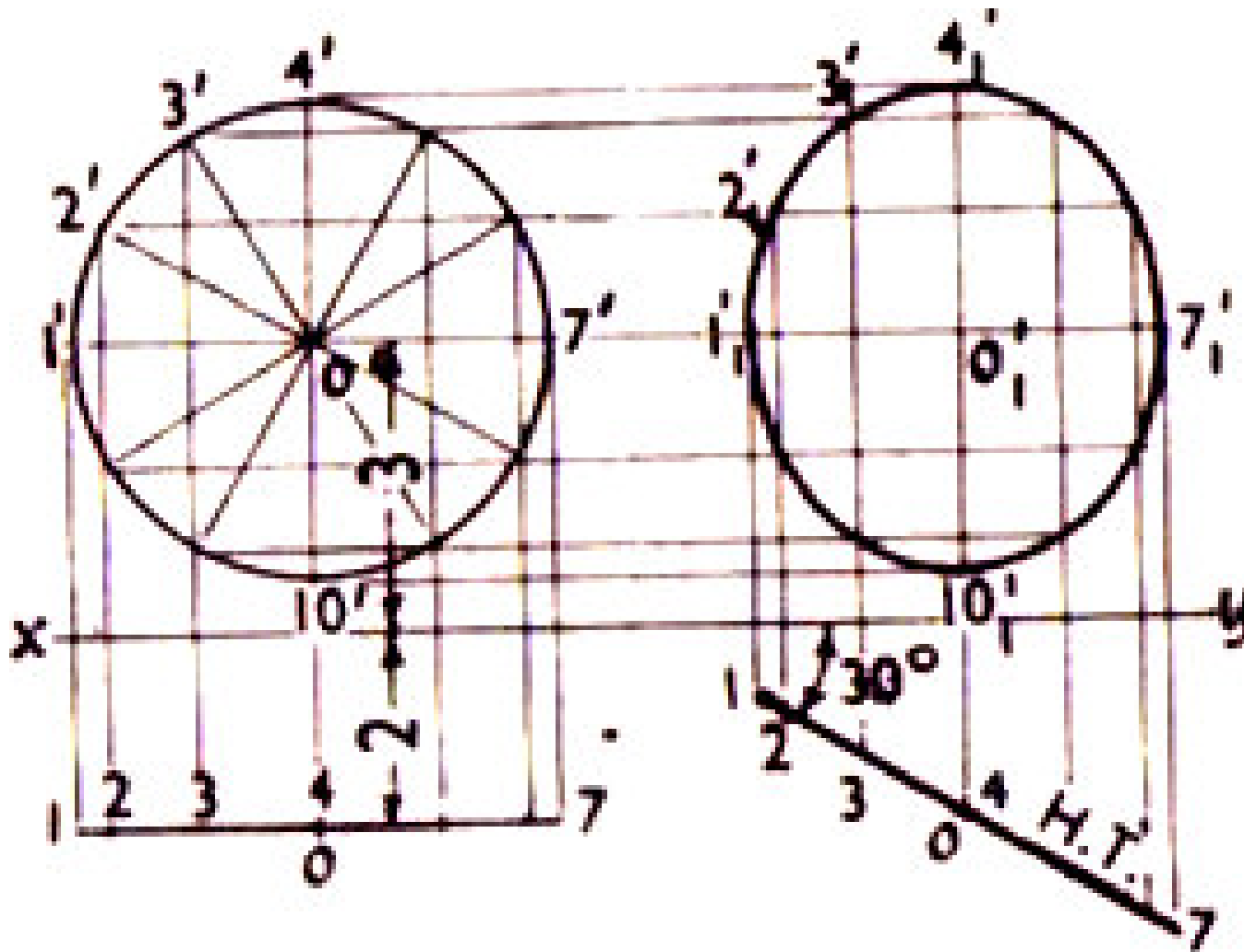
Let us first assume that the plane is perpendicular to HP and parallel to VP.
**So in top view a straight line and in front view the circle.**
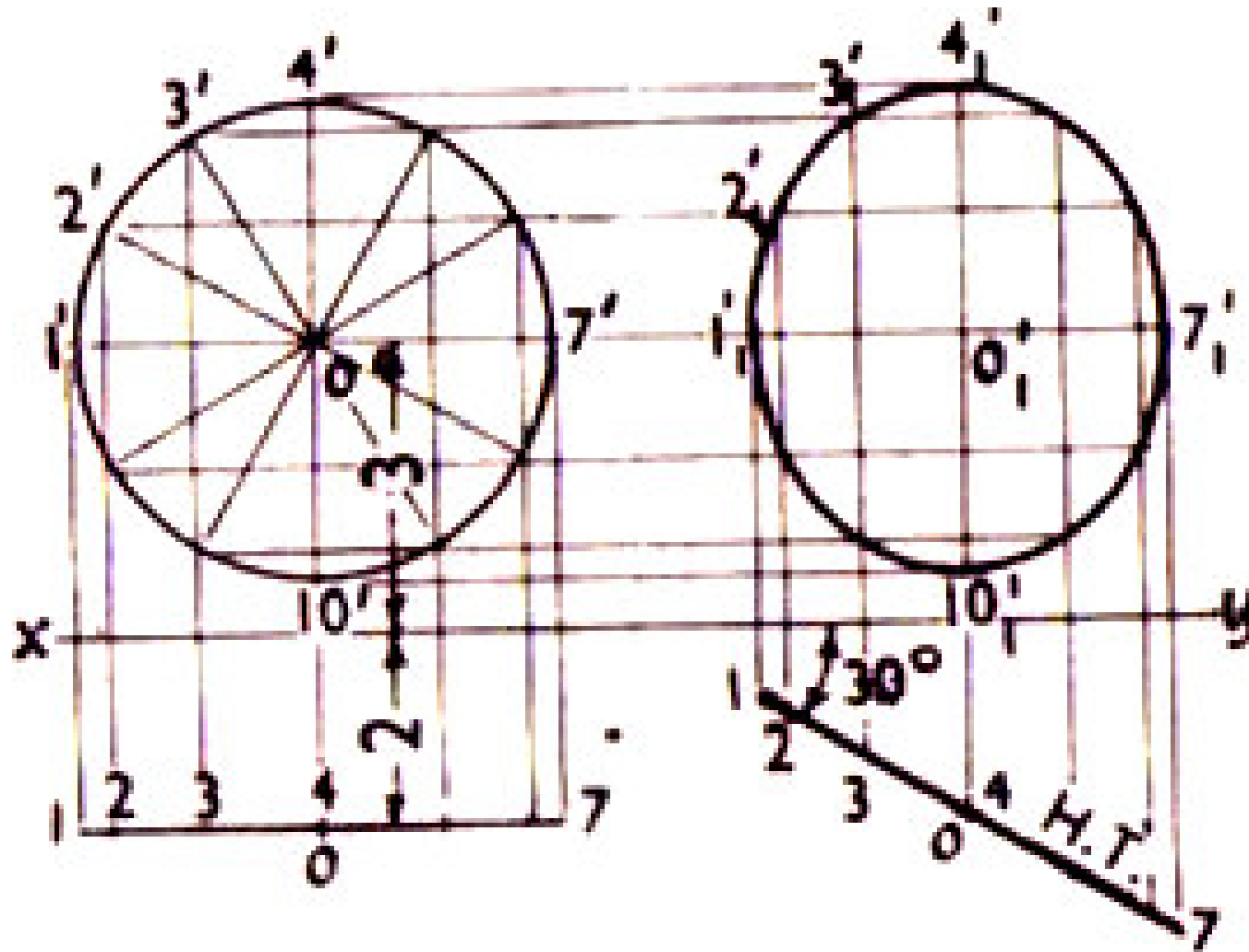
Divide the circle into 12 equal parts and name them 1´, 2´, 3´, 4´ etc.
Project these points to top view.

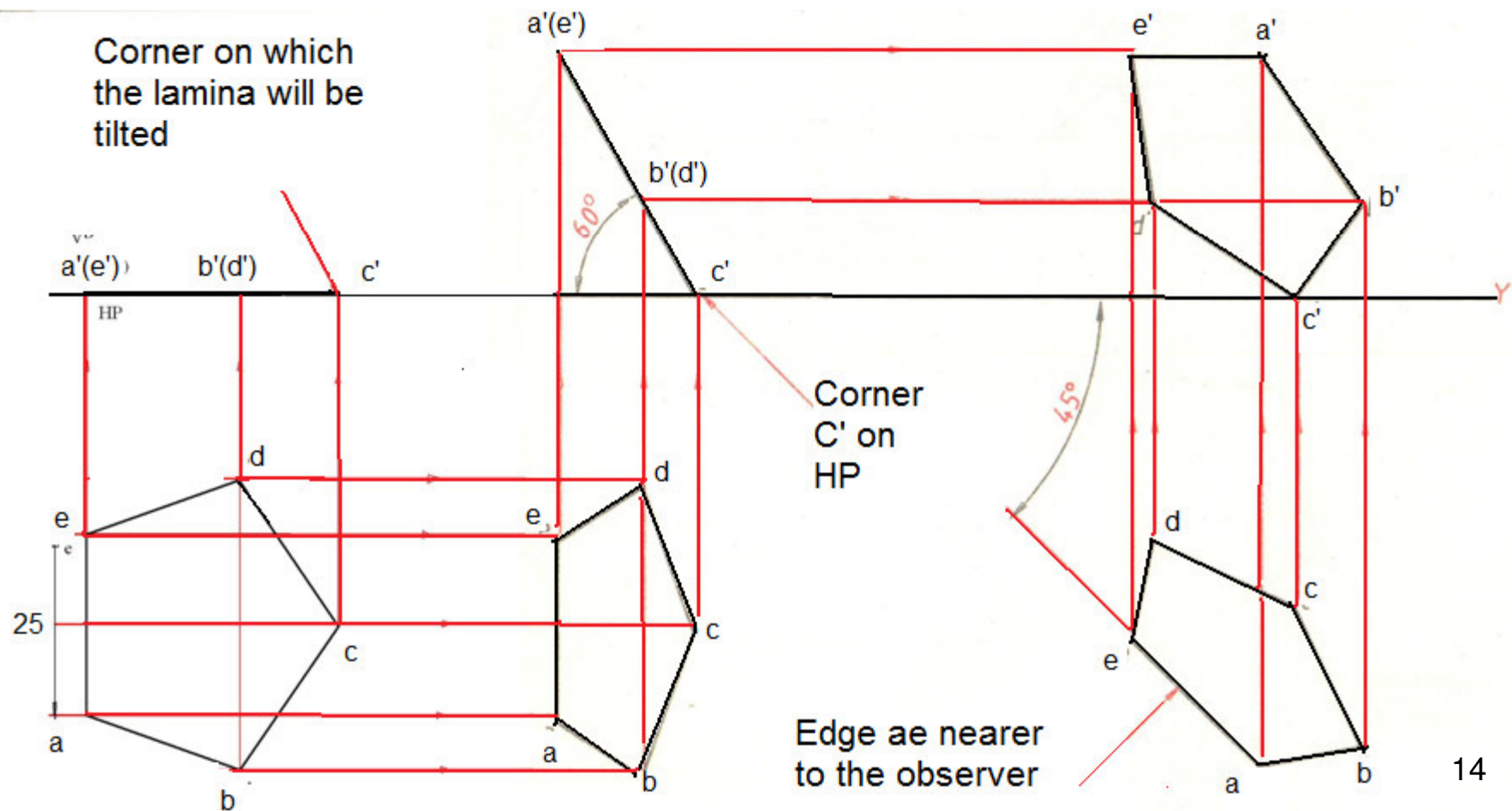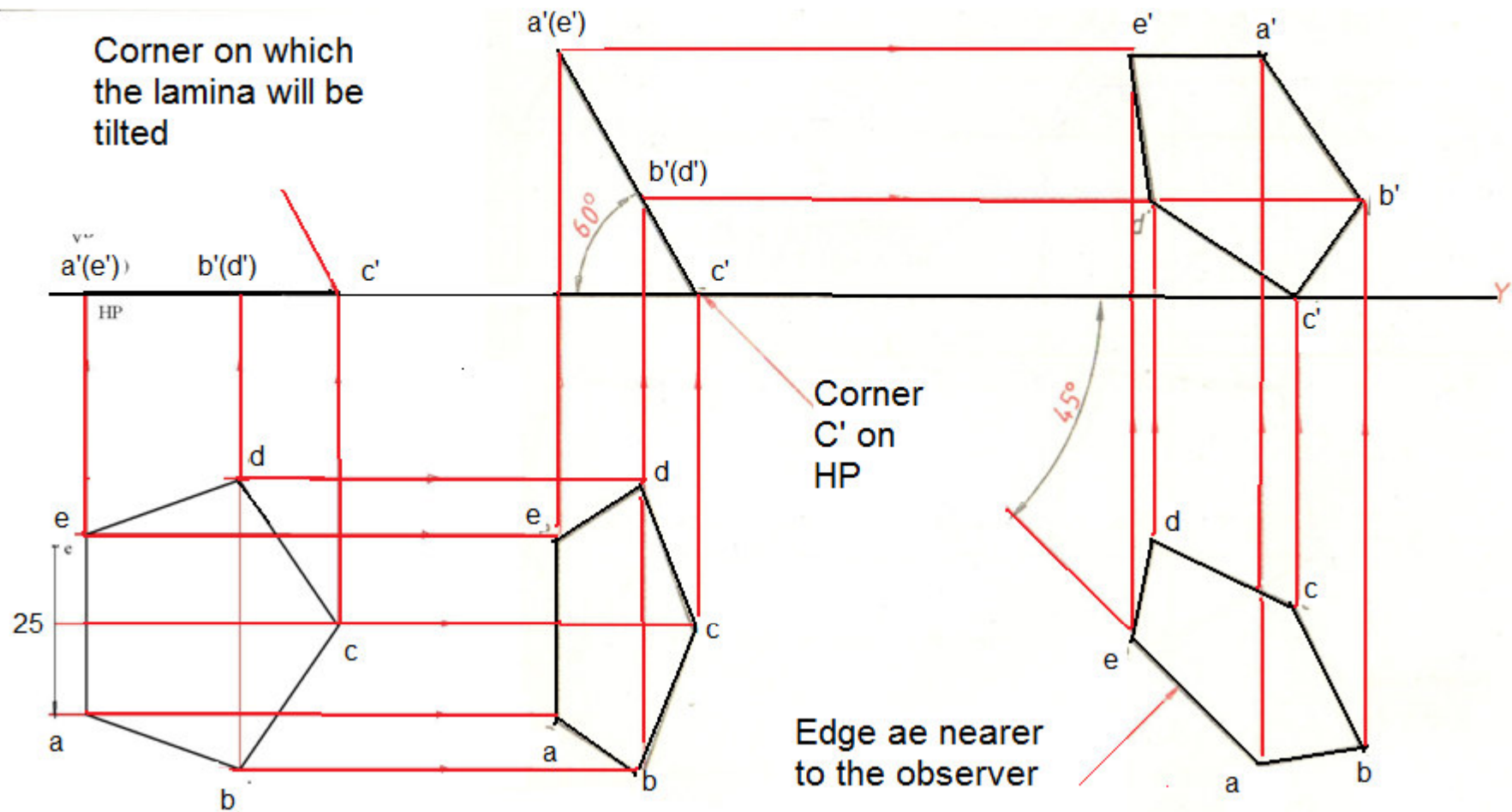**Rotate the top view by 30° to the XY line (because it is inclined to VP at 30°)**

Project the points to front view to get the final front view.

Example: A rectangle ABCD of size 30 mm x 20 mm is inclined to the HP at 30°. Its shorter side AB is parallel to the HP and inclined at 45° to the VP. Draw the projections of the rectangle.

Stage I   Stage II   Stage III

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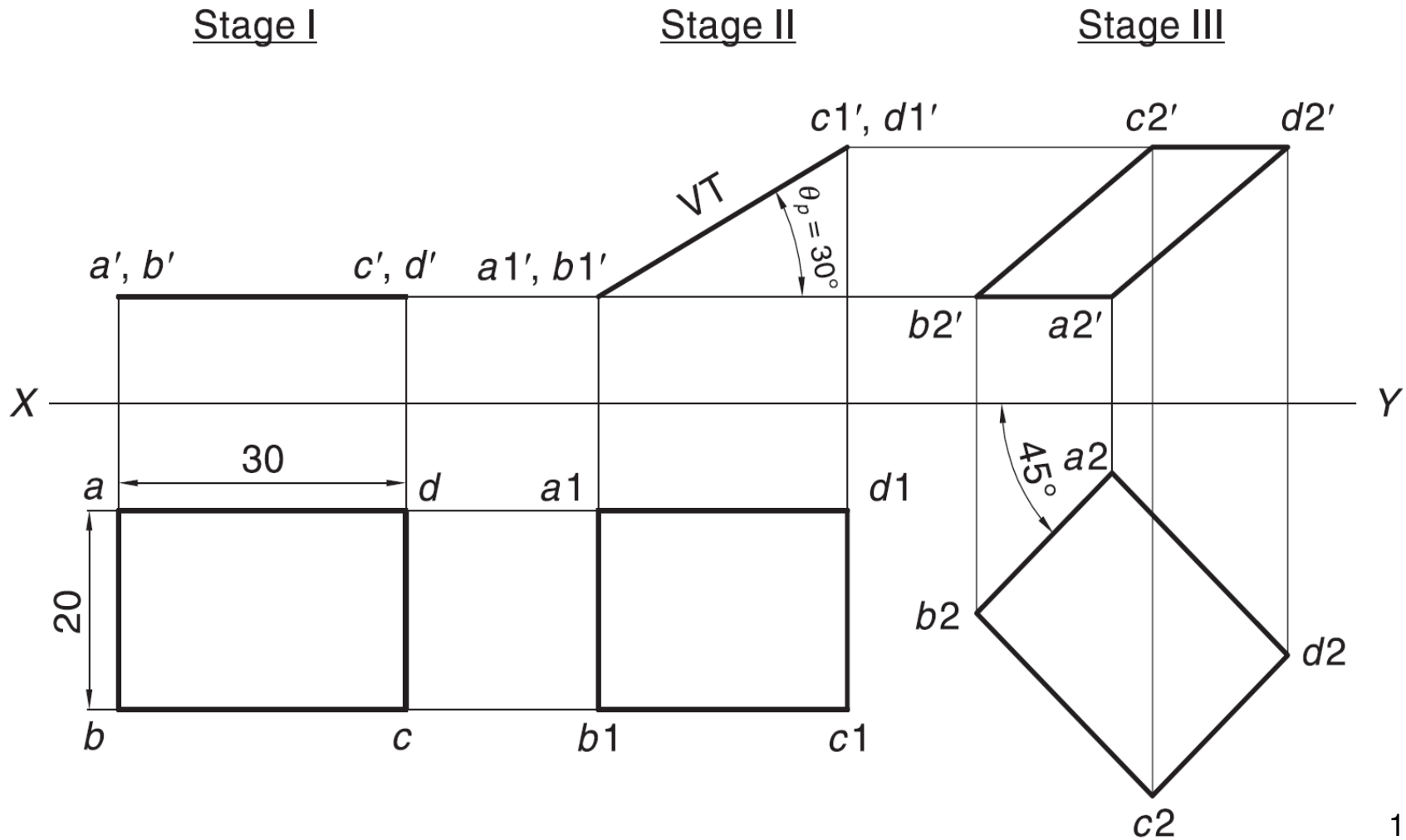
Example 4. A Pentagonal plane lamina of edge 25 mm is resting on HP with one of its corners touching it such that the plane surface makes an angle of 60° with HP. **Two of the edges containing the corner on which the lamina rests make equal inclinations with HP.** **When the edge opposite to this corner makes an angle of 45° with VP and nearer to the observer, draw the TV and FV of the lamina.**

Corner on which the lamina will be tilted

a'(e')

b'(d')

60°

a'(e')₁   b'(d')   c'

HP

Corner C' on HP

45°

Edge ae nearer to the observer

e'   a'

b'

c'

d

c

e

a   b

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Corner on which the lamina will be tilted

60°

a'(e')

b'(d')

c'

v»

a'(e')

b'(d')

c'

HP

25

e

c

d

c

a

b

e

d

c

a

b

Corner C' on HP

45°

Edge ae nearer to the observer

d

c

e

a

b

A. The lamina is resting on **HP.**

B. The lamina rests with corner **C** on **HP** such that lamina is inclined at **60° to HP.** Edge **ae** is perpendicular to **XY** line.

C. Lamina is rotated such that edge **AE** is inclined at **45°** to **VP** and redrawn.

THANK YOU