ENGINEERING APPLICATIONS
OF
THE PRINCIPLES
OF
PROJECTIONS OF SOLIDS.

SECTIONS OF SOLIDS.

Some times the objects are so complicated that, it becomes very difficult to visualize the object with the help of its front view and top view

Some objects are hollow. Their internal details are not visible with the help of simple front view and top view.

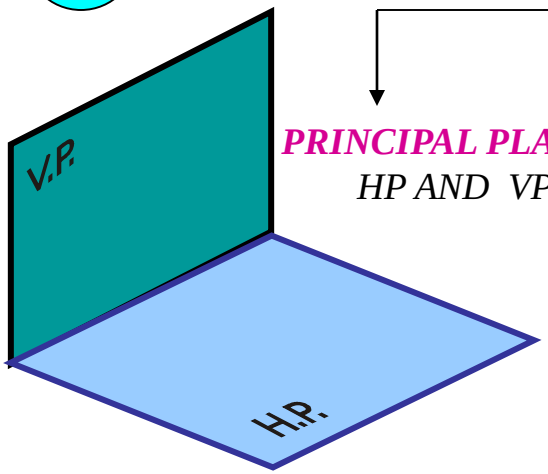
In such cases the object is cut by some imaginary cutting plane to understand internal details of that object

The action of cutting is called
SECTIONING a solid
&
The plane of cutting is called
SECTION PLANE.

First let us know the types of cutting planes.

1

PLANES

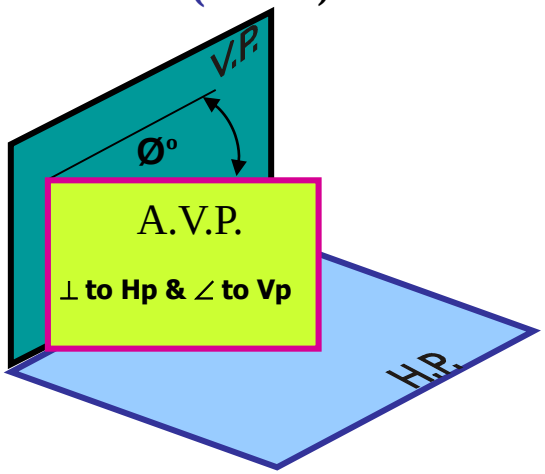


PRINCIPAL PLANES

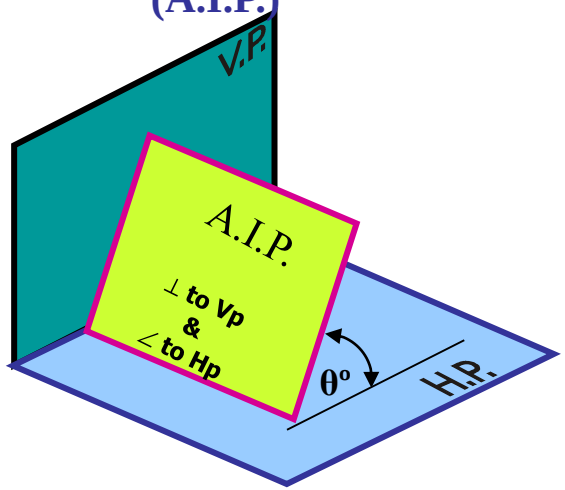
HP AND VP

AUXILIARY PLANES

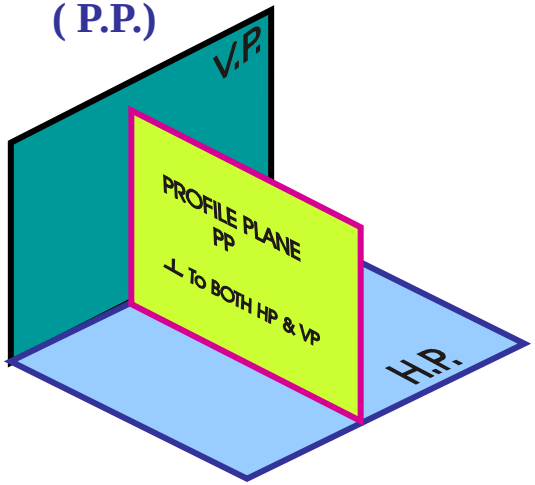
Auxiliary Vertical Plane (A.V.P.)



Auxiliary Inclined Plane (A.I.P.)



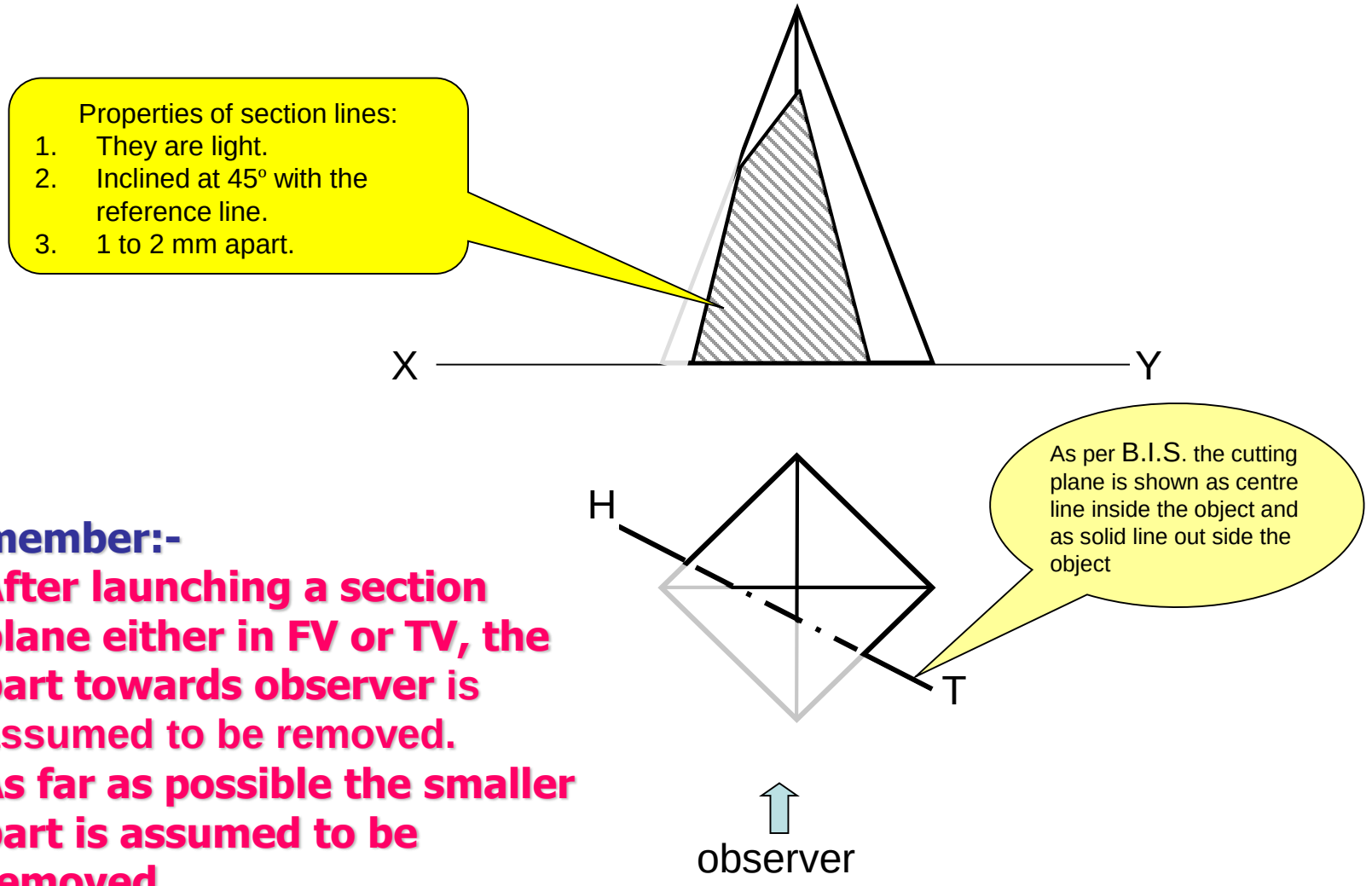
Profile Plane (P.P.)



An A.V.P. appears as a straight line in its top view. The straight line is its H.T.

So an A.V.P. always cuts T.V. of a solid

Its position is described in the problem



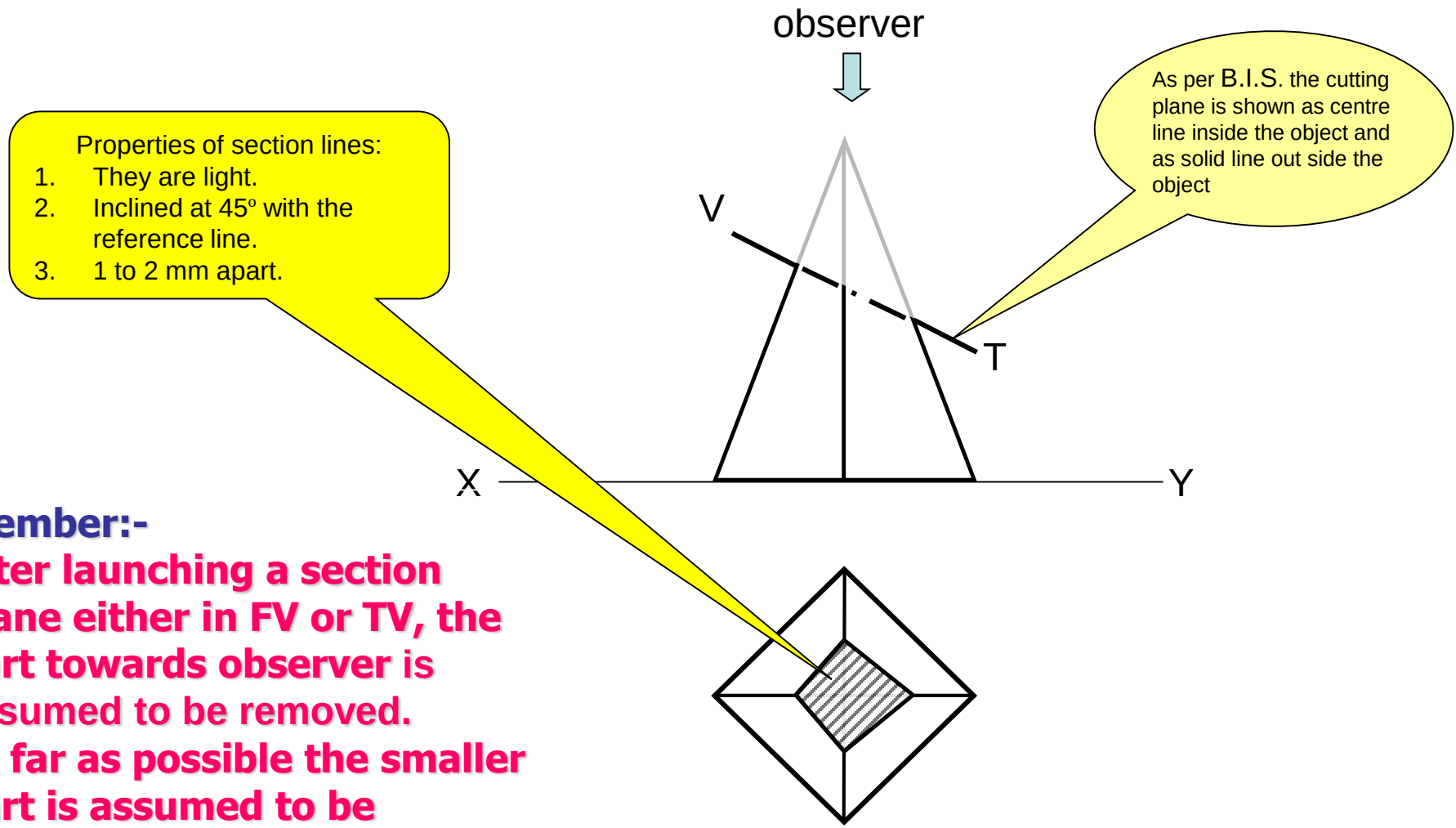
Remember:-

1. **After launching a section plane either in FV or TV, the part towards observer is assumed to be removed.**
2. **As far as possible the smaller part is assumed to be removed.**

An A.I.P. appears as a straight line in its front view. The straight line is its V.T.

So an A.I.P. always cuts F.V. of a solid

Its position is described in the problem



Remember:-

1. **After launching a section plane either in FV or TV, the part towards observer is assumed to be removed.**
2. **As far as possible the smaller part is assumed to be removed.**

SECTIONING A SOLID.

An object (here a solid) is cut by some imaginary cutting plane to understand internal details of that object.

The action of cutting is called SECTIONING a solid

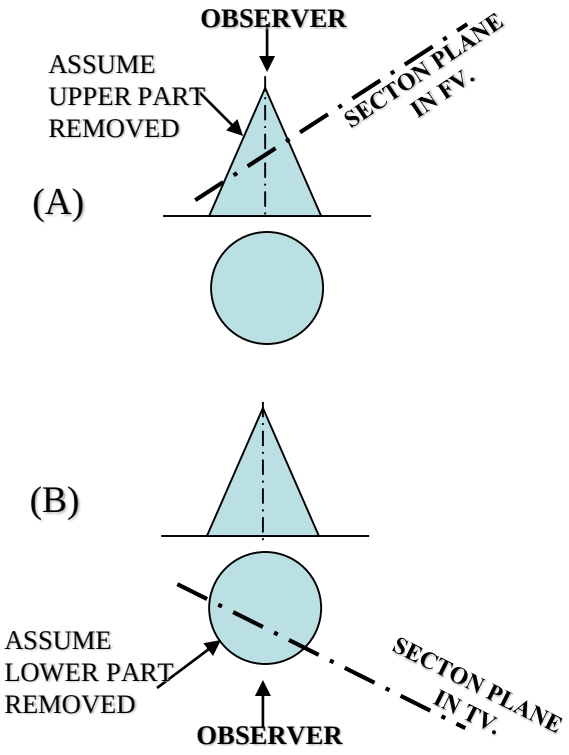
&

The plane of cutting is called SECTION PLANE.

Two cutting actions means section planes are recommended.

A) Section Plane perpendicular to Vp and inclined to Hp.
(This is a definition of an Aux. Inclined Plane i.e. A.I.P.)
NOTE:- This section plane appears as a straight line in FV.

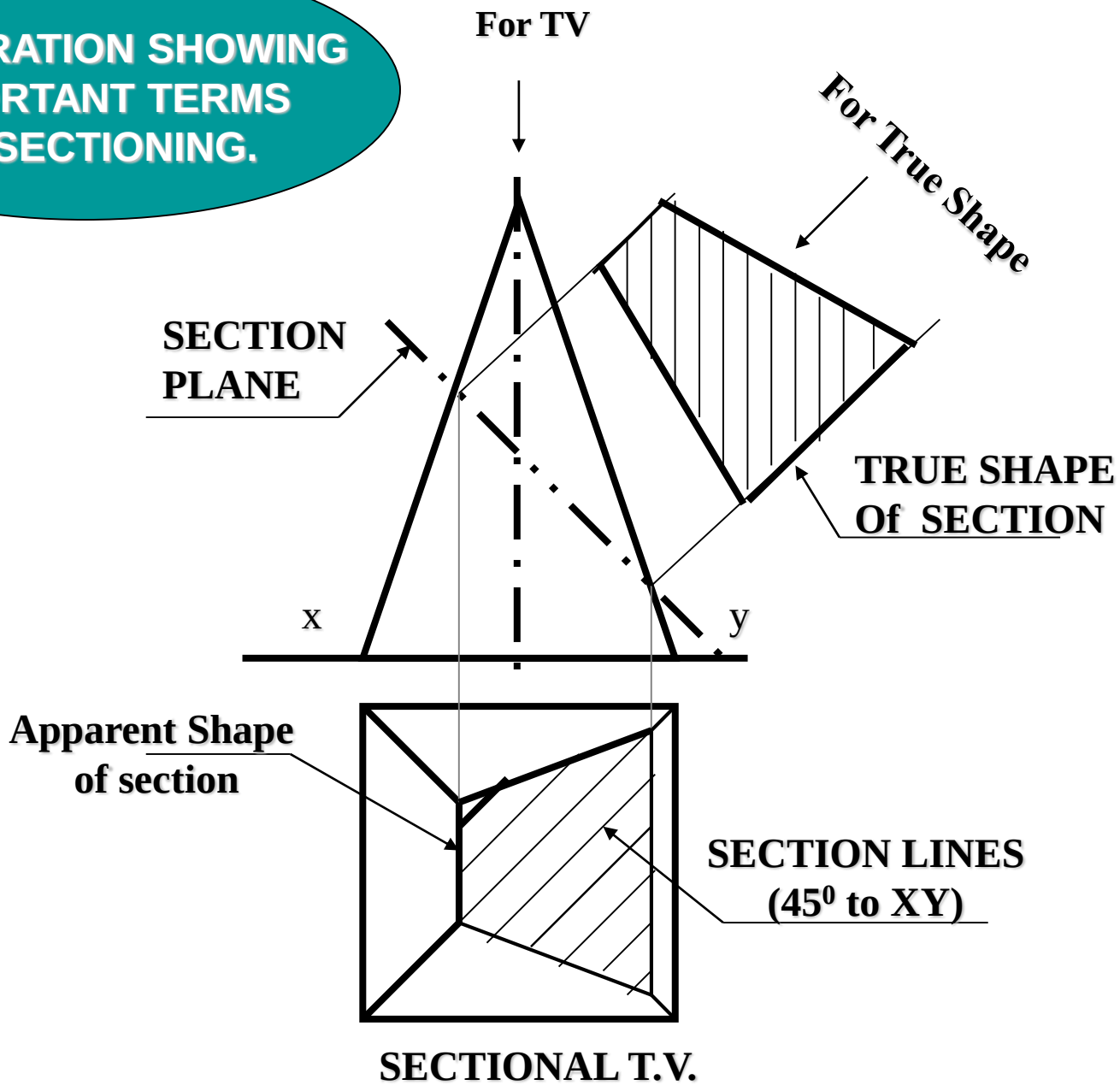
B) Section Plane perpendicular to Hp and inclined to Vp.
(This is a definition of an Aux. Vertical Plane i.e. A.V.P.)
NOTE:- This section plane appears as a straight line in TV.



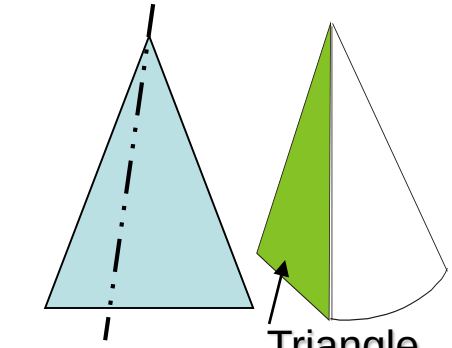
Remember:-

1. **After launching a section plane either in FV or TV, the part towards observer is assumed to be removed.**
2. **As far as possible the smaller part is assumed to be removed.**

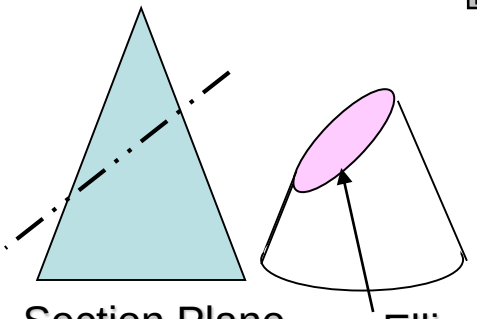
ILLUSTRATION SHOWING IMPORTANT TERMS IN SECTIONING.



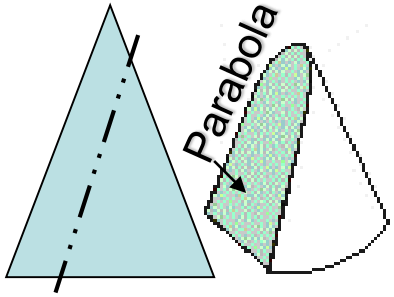
Typical Section Planes & Typical Shapes Of Sections.



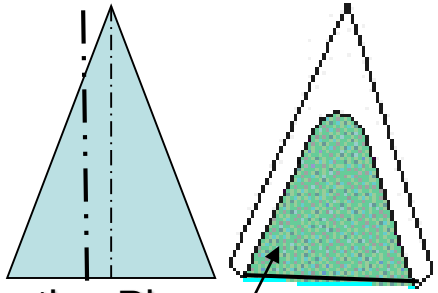
Section Plane Through Apex



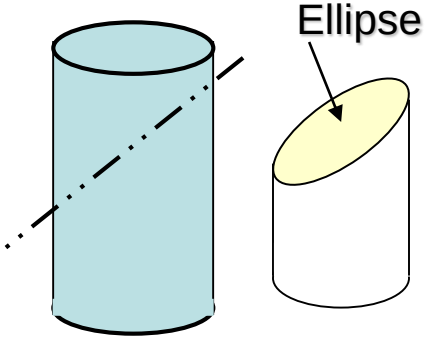
Section Plane Through Generators



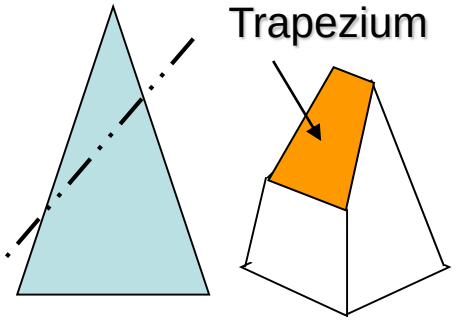
Section Plane Parallel to end generator.



Section Plane Parallel to Axis.

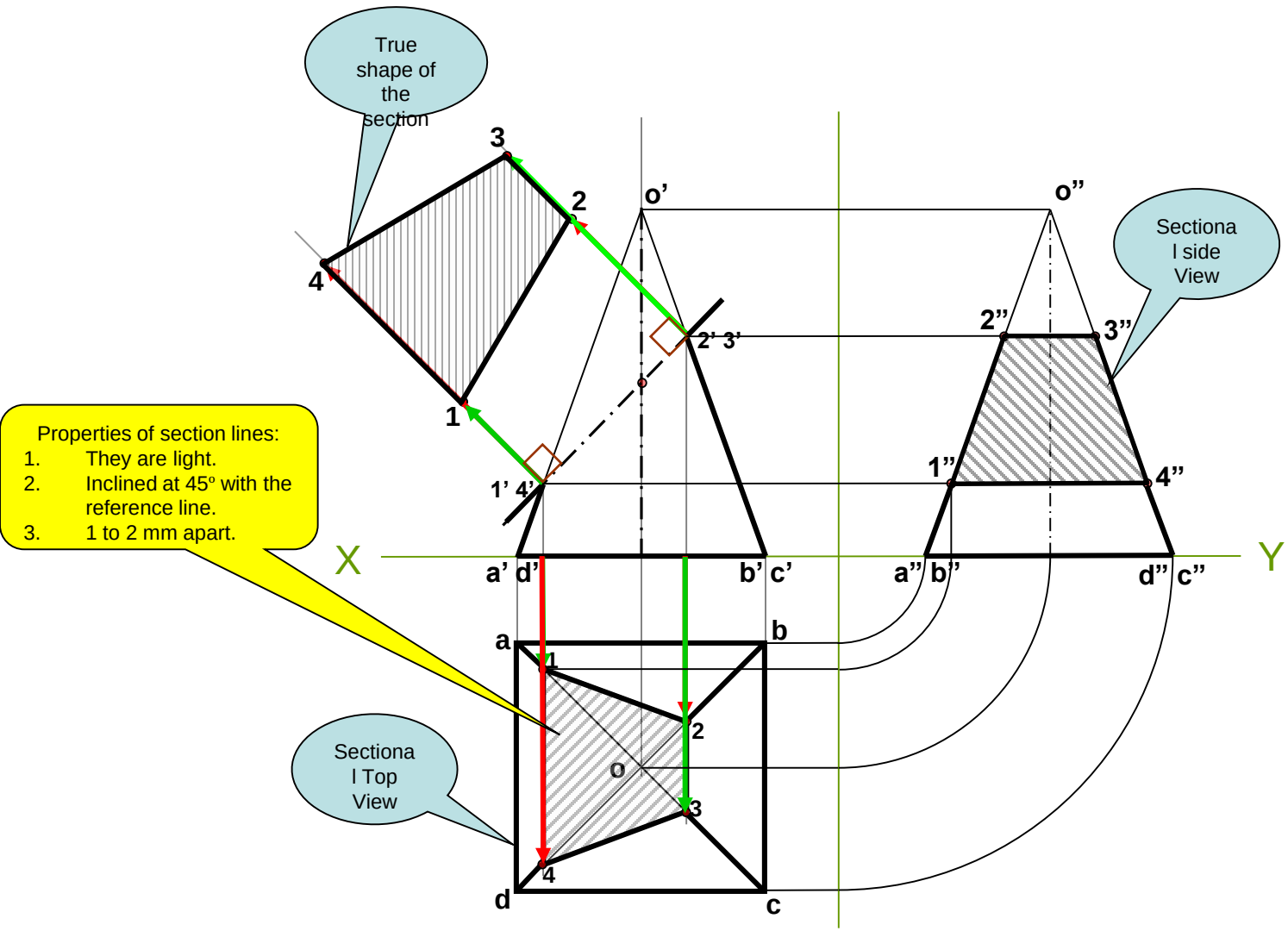


Cylinder through generators.

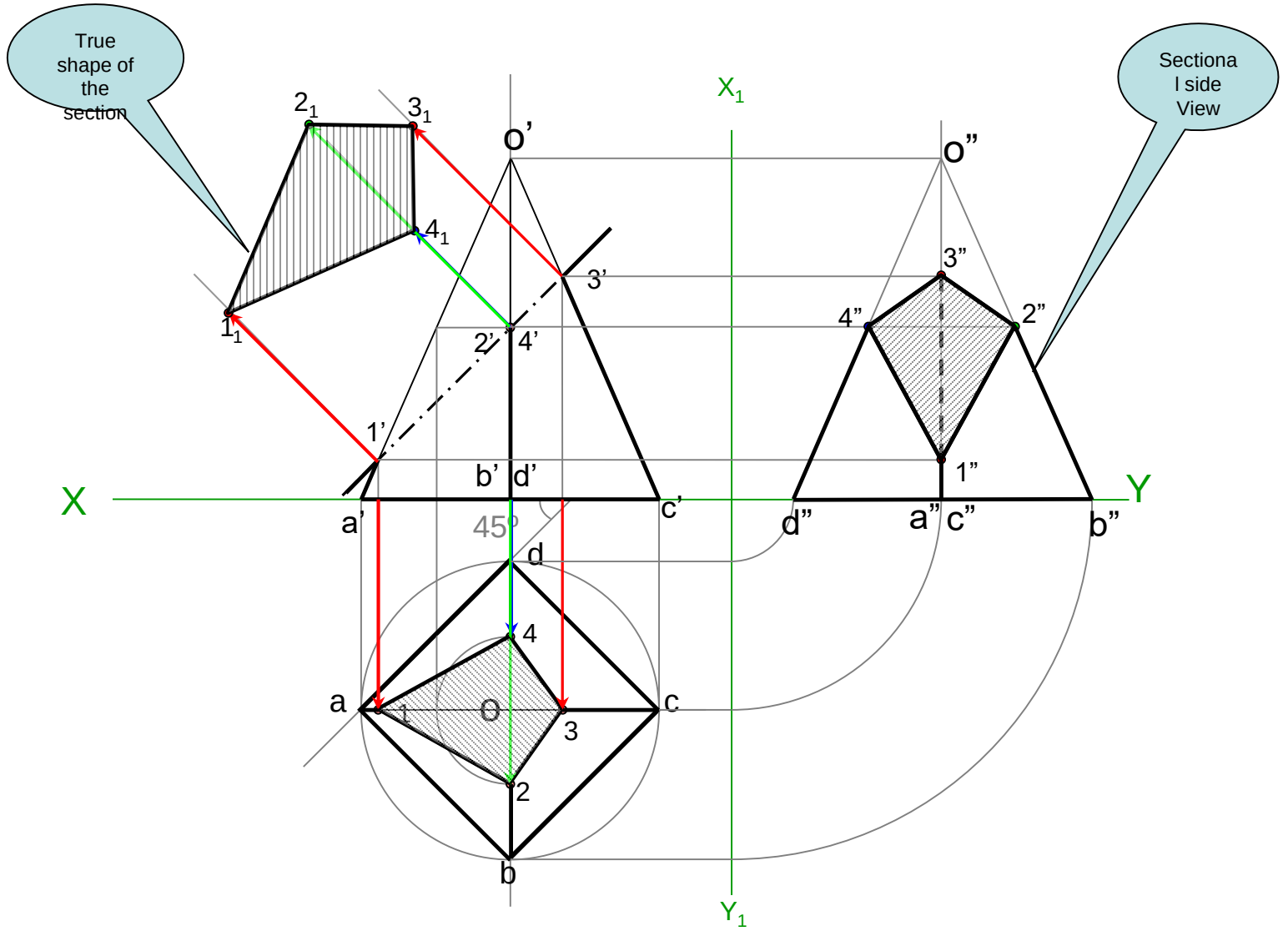


Sq. Pyramid through all slant edges

Problem 1: A square pyramid, base 40 mm side and axis 65 mm long, has its base on the HP with two edges of the base perpendicular to the VP. It is cut by a section plane, perpendicular to the VP, inclined at 45º to the HP and bisecting the axis. Draw its sectional top view, sectional side view and true shape of the section.



Q 14.11: A square pyramid, base 40 mm side and axis 65 mm long, has its base on the HP and all the edges of the base equally inclined to the VP. It is cut by a section plane, perpendicular to the VP, inclined at 45° to the HP and bisecting the axis. Draw its sectional top view, sectional side view and true shape of the section.



Problems on Section of Solids

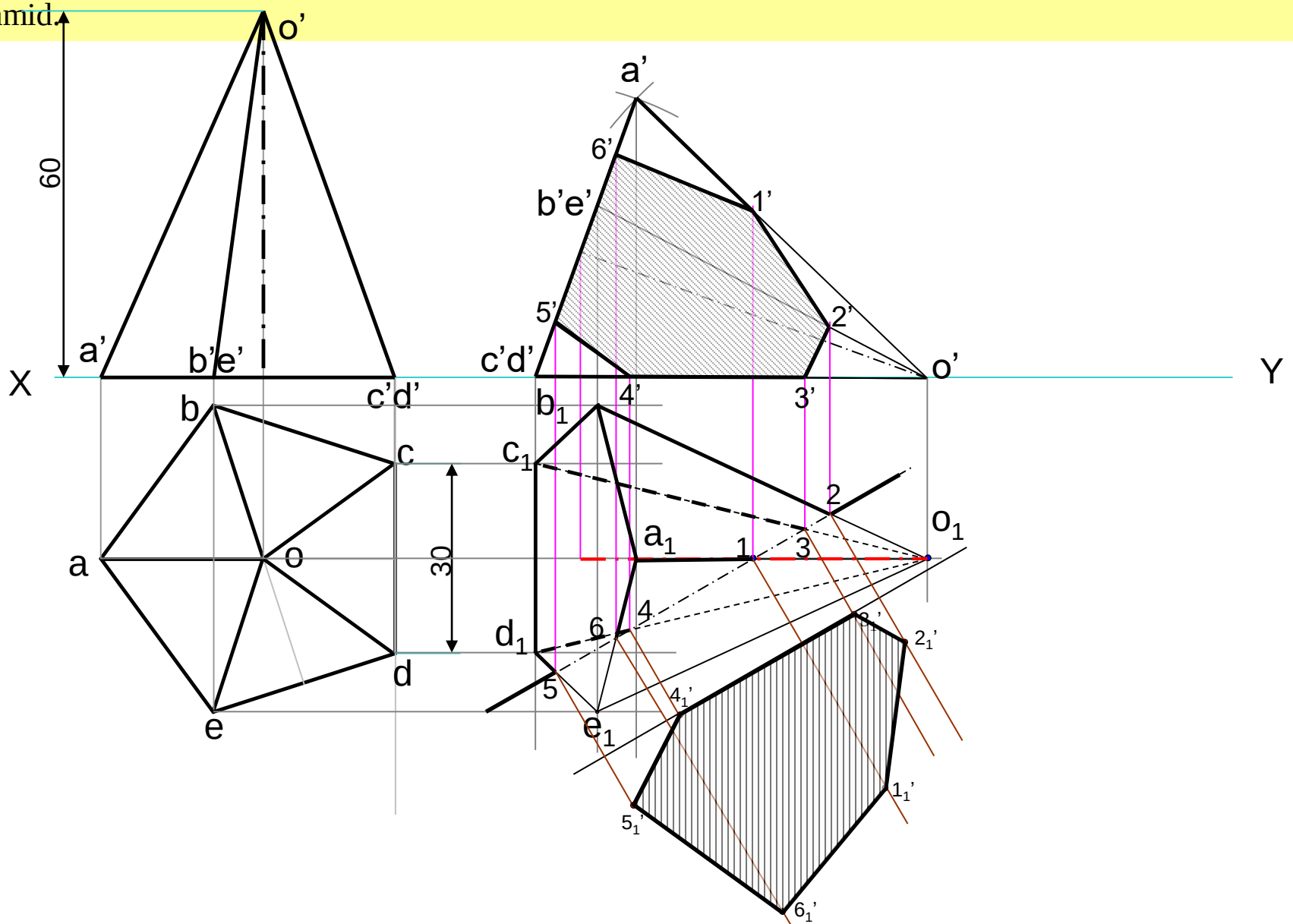
To be discussed in the class

14.5,14.11,14.14,14.24,14.25

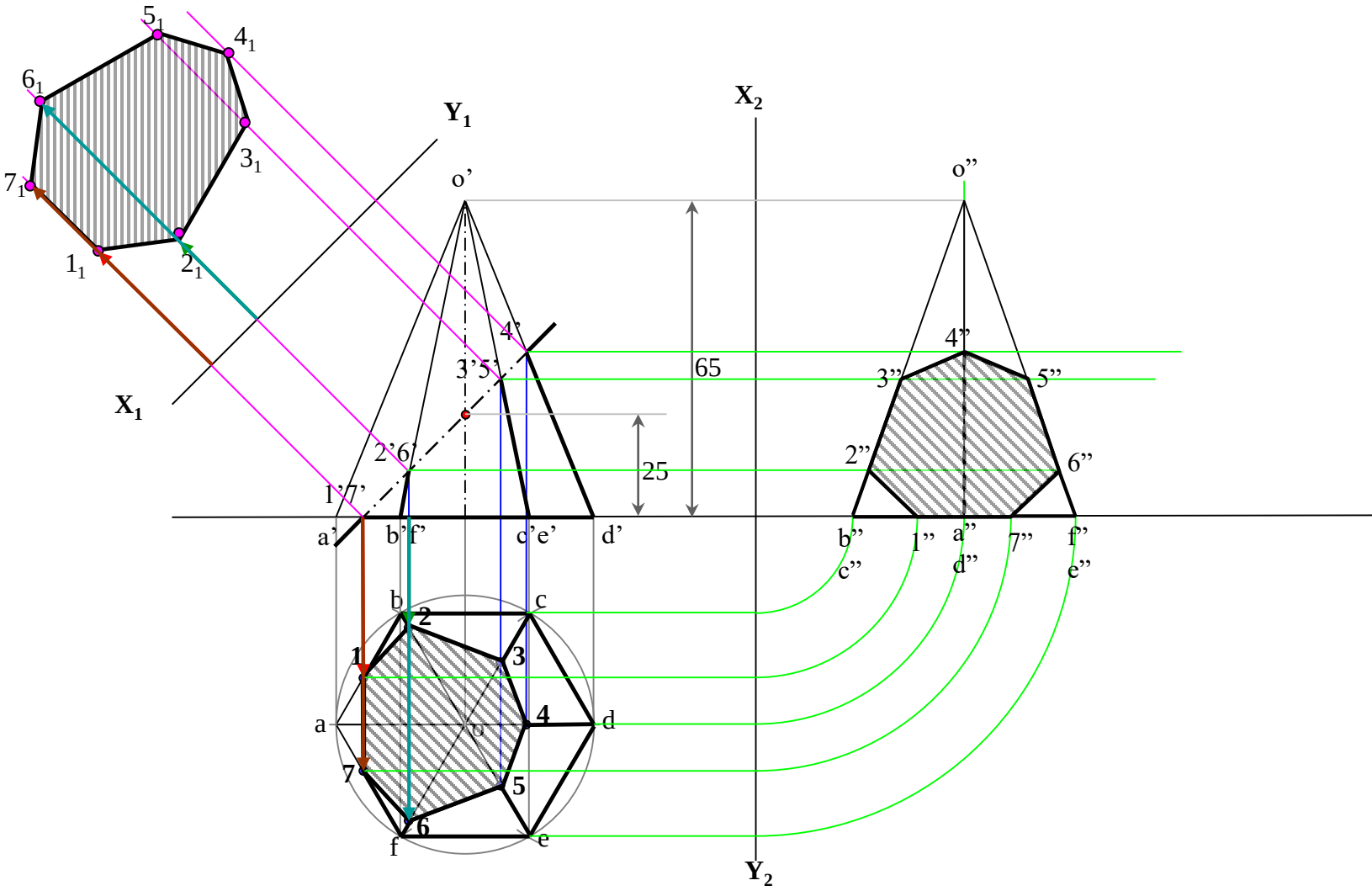
To draw on the sheet

14.6,14.15,14.26,14.35,14.39,14.17

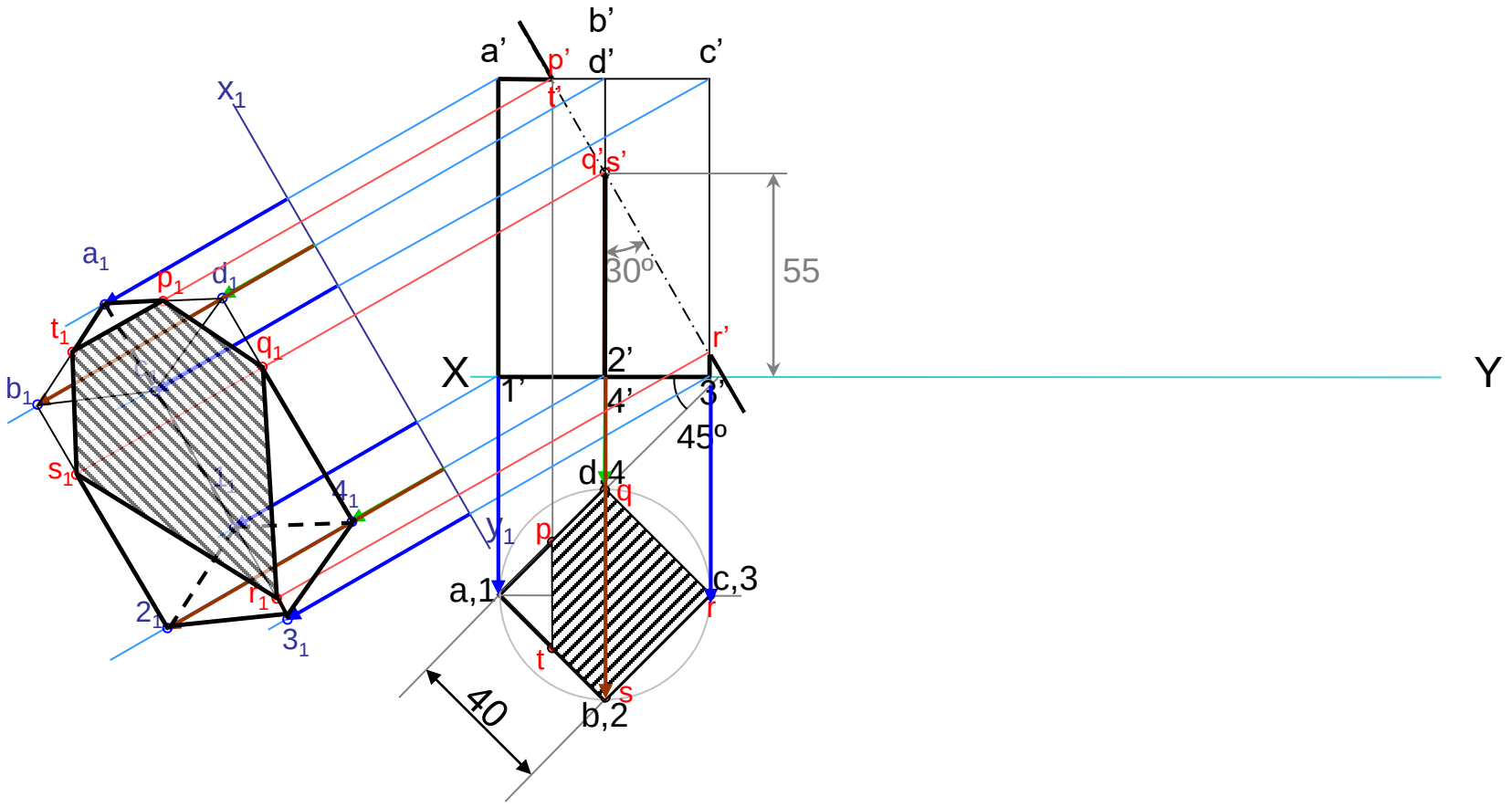
Q 14.14: A pentagonal pyramid , base 30mm side and axis 60 mm long is lying on one of its triangular faces on the HP with the axis parallel to the VP. A vertical section plane, whose HT bisects the top view of the axis and makes an angle of 30º with the reference line, cuts the pyramid removing its top part. Draw the top view, sectional front view and true shape of the section and development of the surface of the remaining portion of the pyramid.



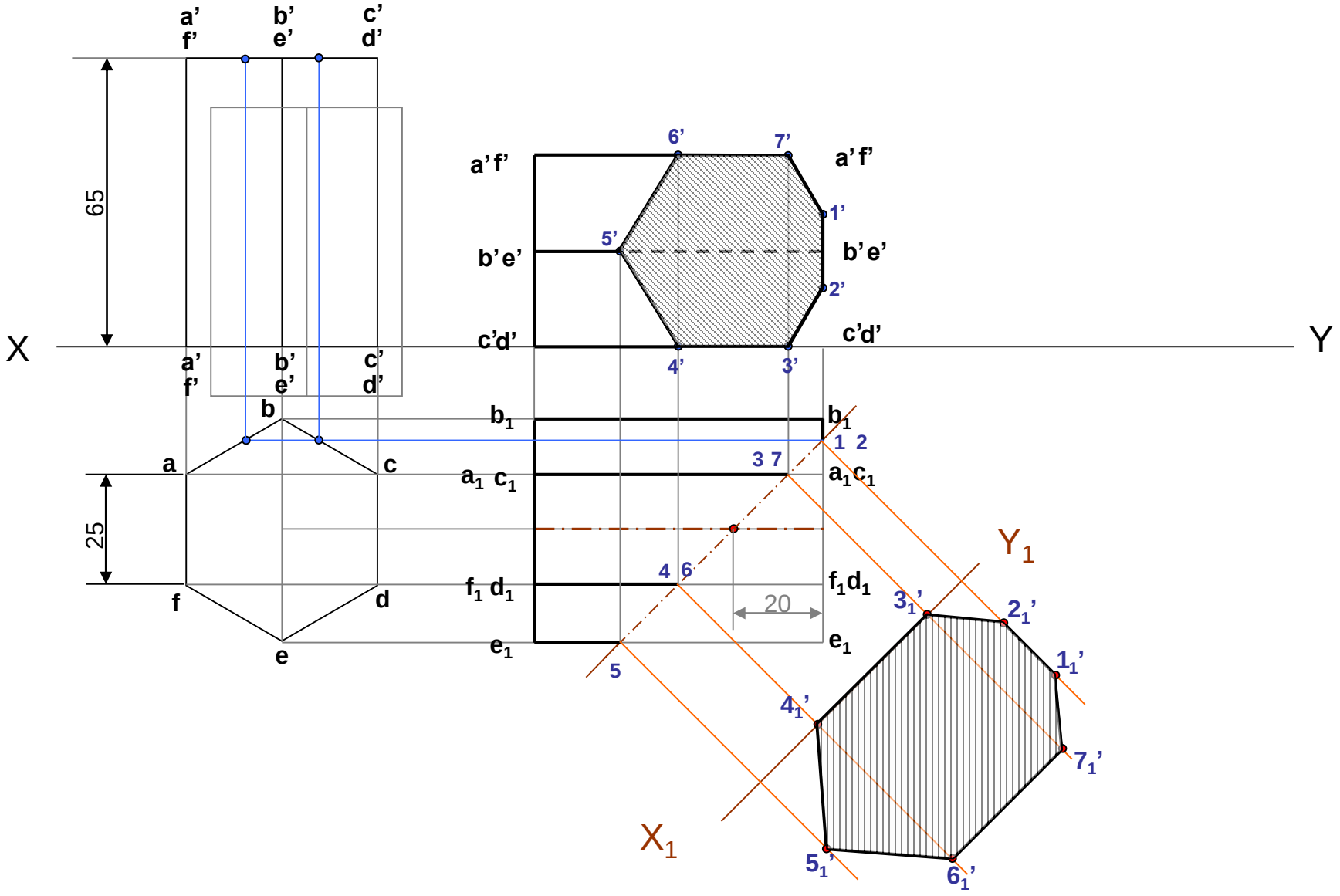
Q14.13: A hexagonal pyramid, base 30 mm side and axis 65 mm long is resting on its base on the HP, with two edges of the base parallel to the VP. It is cut by a section plane perpendicular to VP and inclined at 45º to the HP, intersecting the axis at a point 25 mm above the base. Draw the front view, sectional top view, sectional side view and true shape of the section.



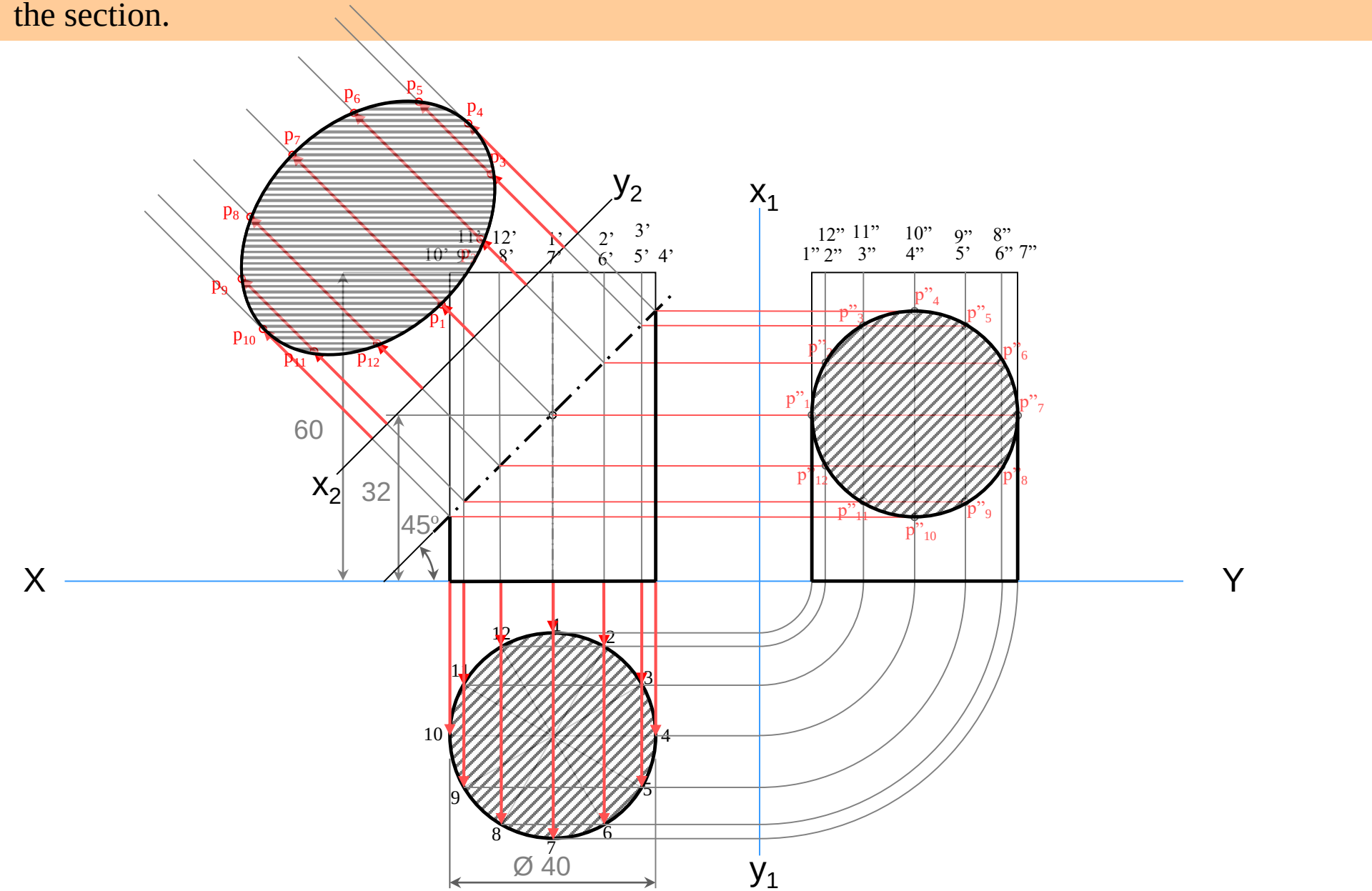
Problem 14.5: A square prism base 40 mm side, axis 80 mm long, has its base on the H.P. and its faces equally inclined to the V.P. It is cut by a plane, perpendicular to the V.P., inclined at 60° to the H.P. and passing through a point on the axis, 55 mm above the H.P. Draw its front view, sectional top view and another top view on an A.I.P. parallel to the section plane.



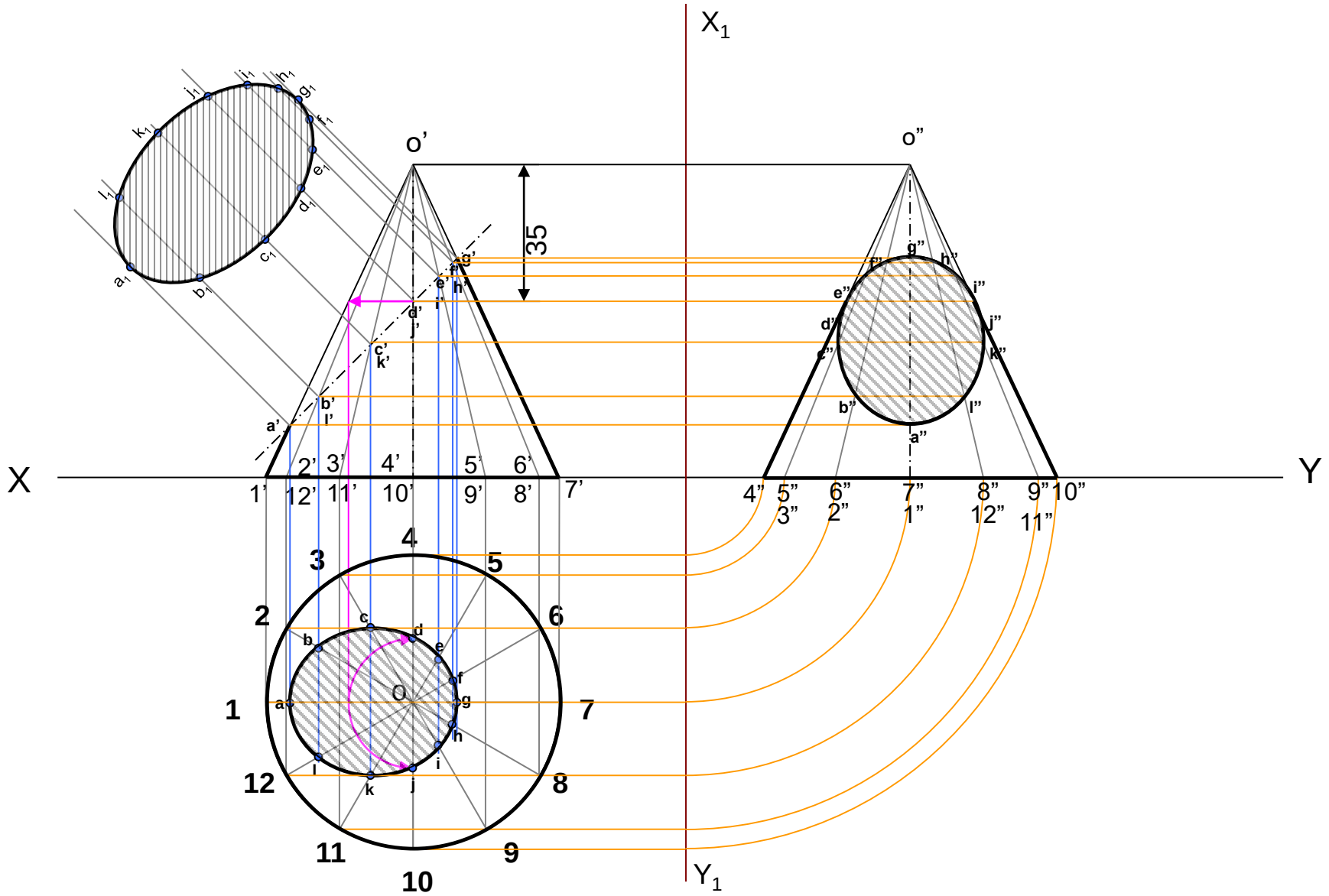
Q 14.6: A Hexagonal prism has a face on the H.P. and the axis parallel to the V.P. It is cut by a vertical section plane the H.T. of which makes an angle of 45 with XY and which cuts the axis at a point 20 mm from one of its ends. Draw its sectional front view and the true shape of the section. Side of base 25 mm long height 65mm.



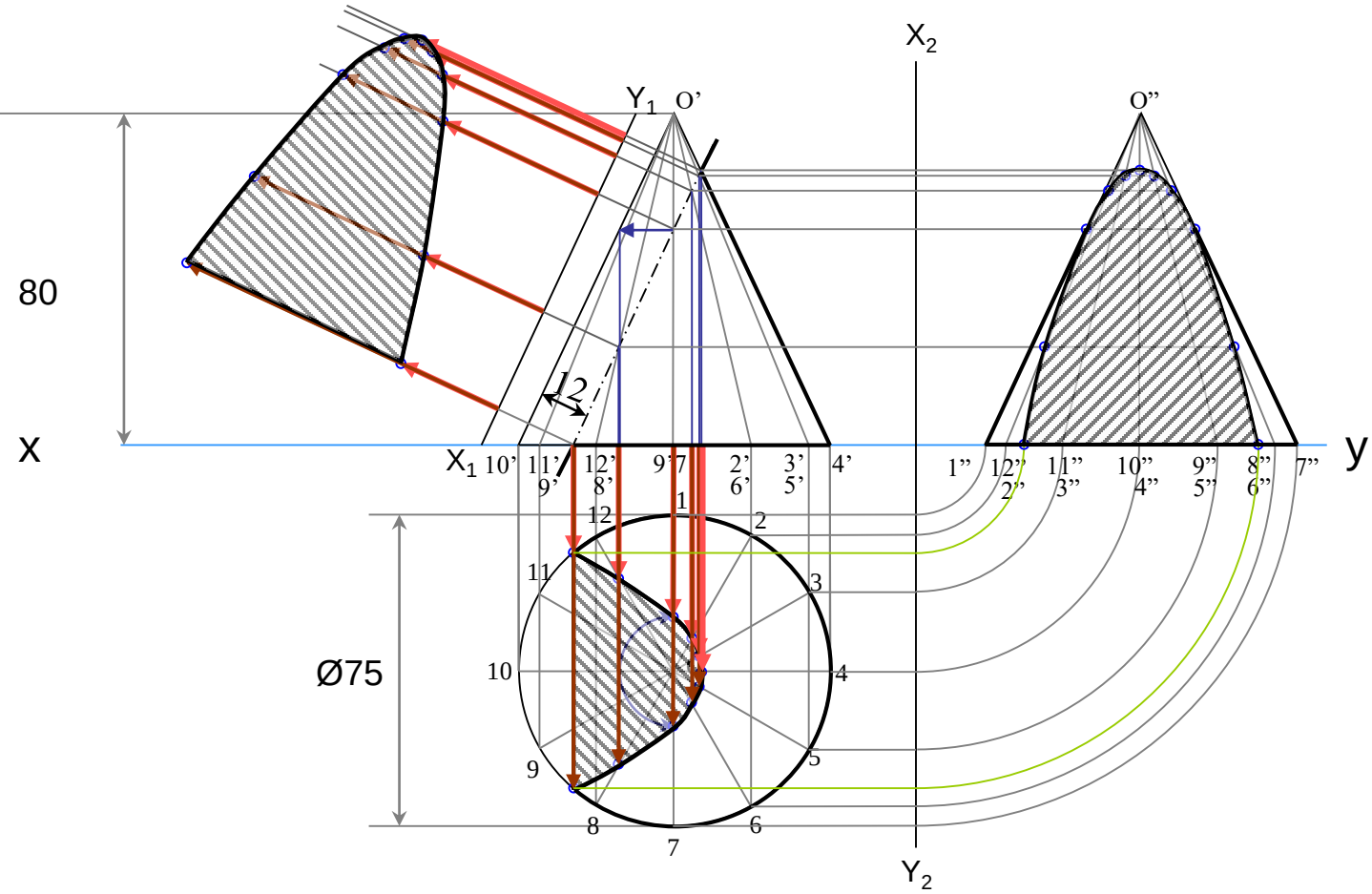
Problem 14.17: A cylinder of 40 mm diameter, 60 mm height and having its axis vertical, is cut by a section plane perpendicular to the V.P., inclined at 45° to the H.P. and intersecting the axis 32 mm above the base. Draw its front view, sectional top view, sectional side view and true shape of the section.



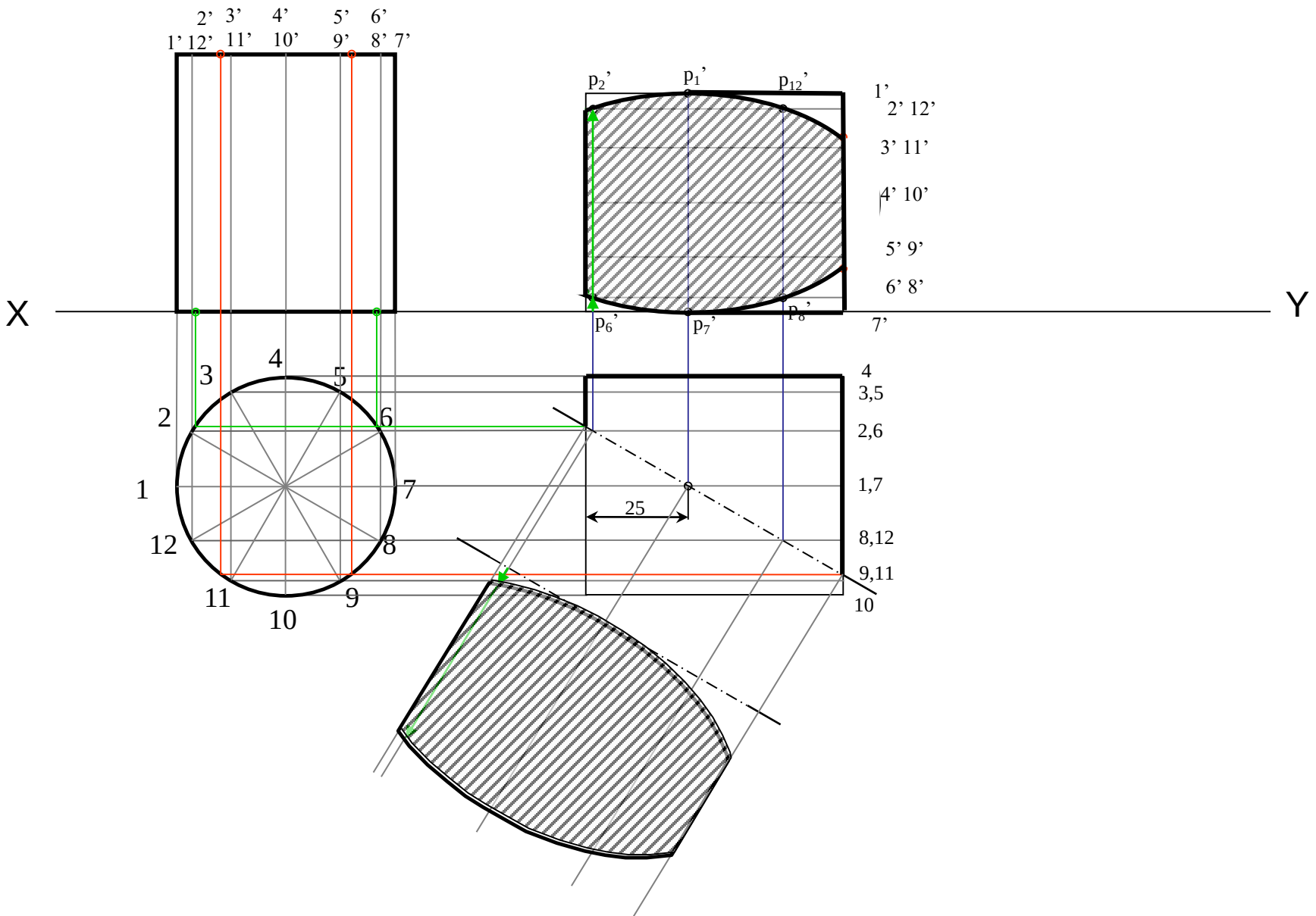
Q 14.24: A Cone base 75 mm diameter and axis 80 mm long is resting on its base on H.P. It is cut by a section plane perpendicular to the V.P., inclined at 45° to the H.P. and cutting the axis at a point 35 mm from the apex. Draw the front view, sectional top view, sectional side view and true shape of the section.



Problem 14.25: A cone, base 75 mm diameter and axis 80 mm long is resting on its base on the HP. It is cut by a section plane perpendicular to the VP, and parallel to and 12 mm away from one of its generators. Draw the front view, sectional top view and true shape of the section. Draw the front view, sectional top view and sectional side view.



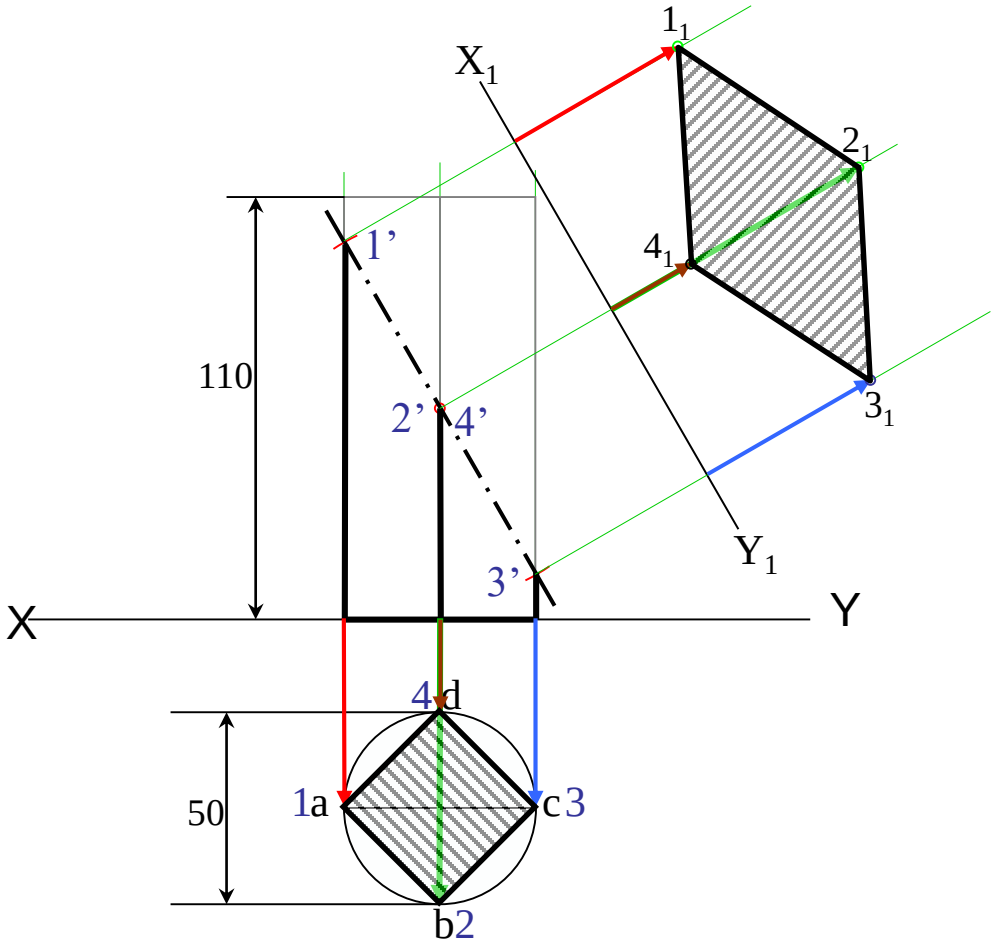
Q 14.19: A cylinder 55 mm diameter and 65 mm long, has its axis parallel to both the HP and the VP. It is cut by a vertical section plane inclined at 30º to the VP so that axis is cut at a point 25 mm from one of its ends and boyh the bases of cylinder are partly cut. Draw its sectional front view and true shape of the section.



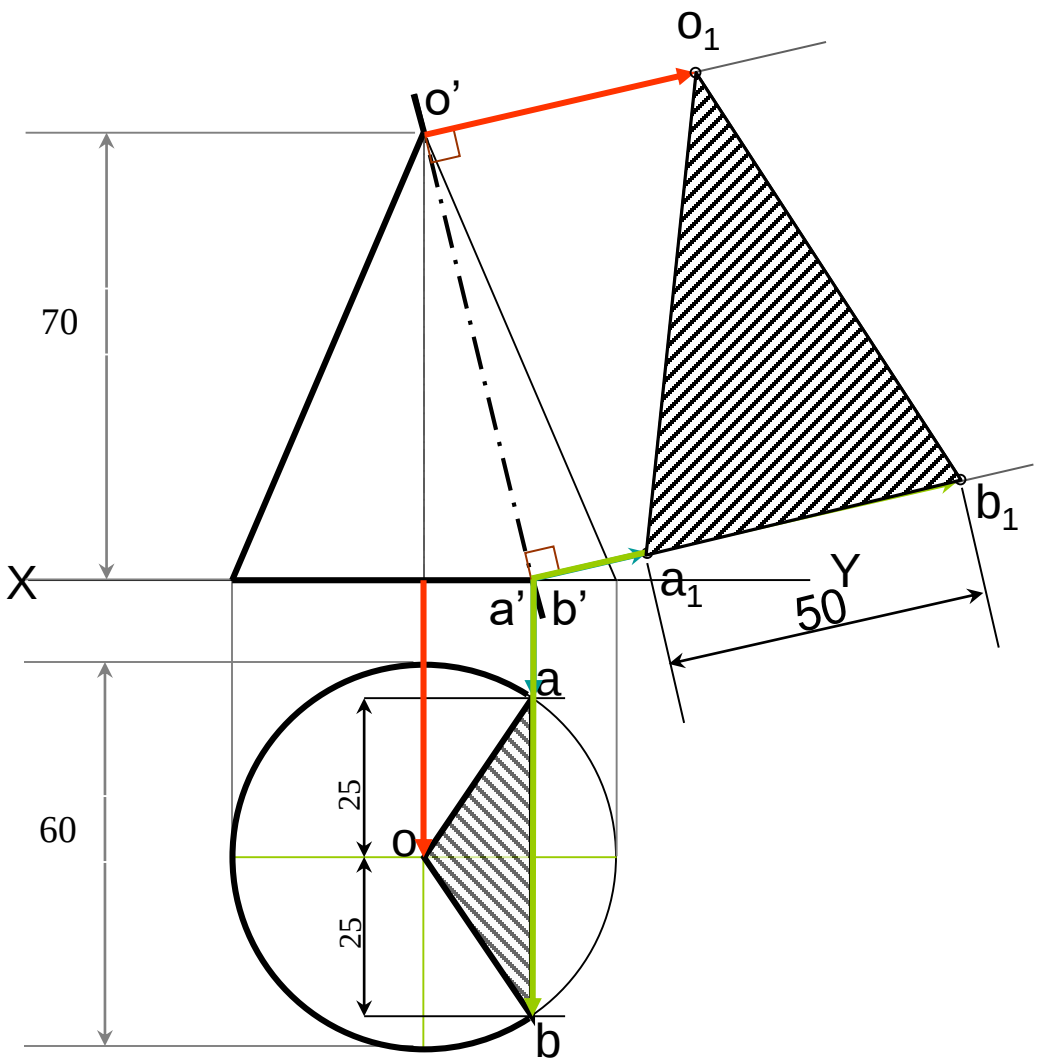
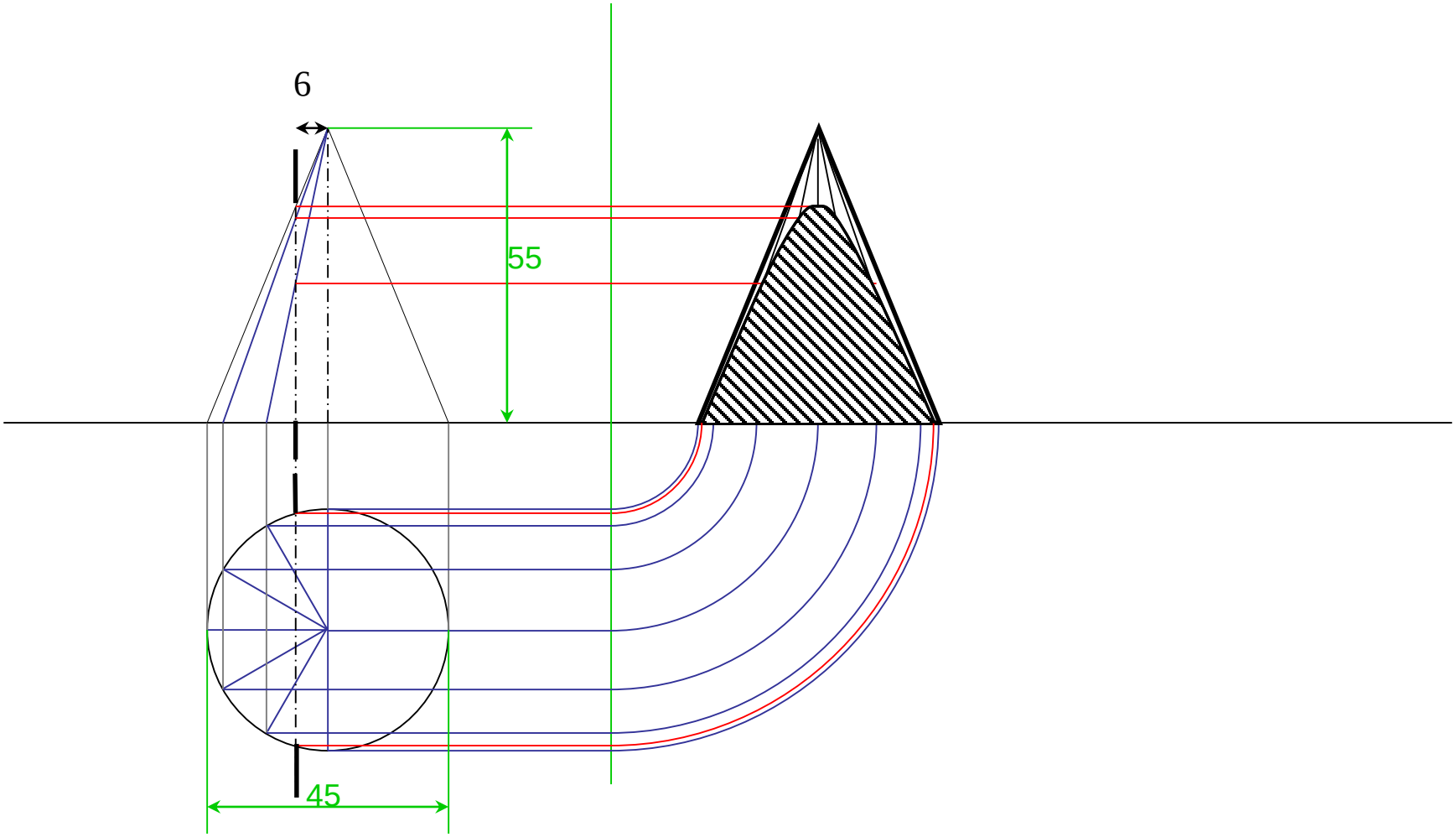
Problem 14.35: A square prism axis 110 mm long is resting on its base in the H.P. the edges of the base are equally inclined to the V.P. The prism is cut by an A.I.P. passing through the mid point of the axis in such a way that the true shape of the section is a rhombus having diagonals of 100 mm and 50 mm. Draw the projections and determine the inclination of A.I.P. with the H.P.

Here we are not given side of base of square prism. But the shorter diagonal of the rhombus will be equal to base diagonal of the prism. So to begin with, draw a square in the top view with base diagonal 50 mm.

The inclination of the cutting plane decides the length of longer diagonal. From the mid point of the axis cut two arcs of 50 mm radius, one on long edge '**b**' and the other on the long edge '**d**'



Problem 14.39: A cone, diameter of the base 60 mm and axis 70 mm long is resting on its base on the H.P. It is cut by an A.I.P. so that the true shape of the section is an isosceles triangle having 50 mm base. Draw the plan, the elevation and the true shape of the section.



Problem 14.26: A cone, base 45 mm diameter and axis 55 mm long is resting on the H.P. on its base. It is cut by a section plane, perpendicular to both the H.P. and the V.P. and 6 mm away from the axis. Draw its front view, top view and sectional side view.