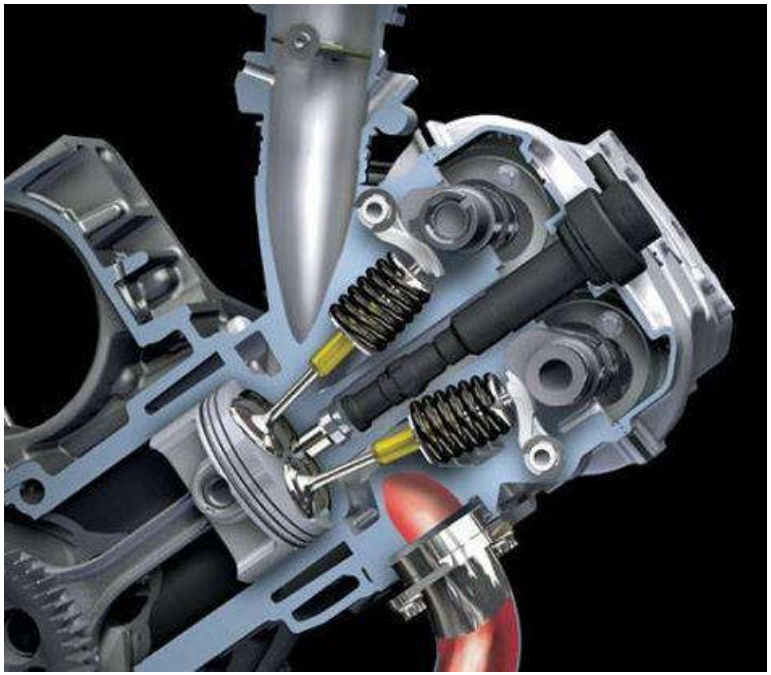
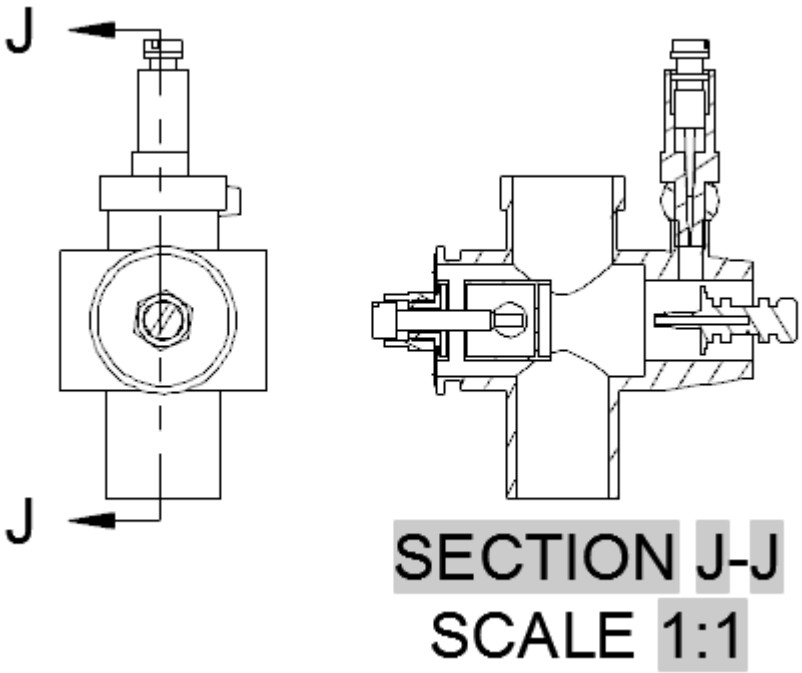
ME119: Sections of Solids
Lecture – 7
Vivek Sangwan

Based on slides by Prof. Salil S. Kulkarni

Motivation

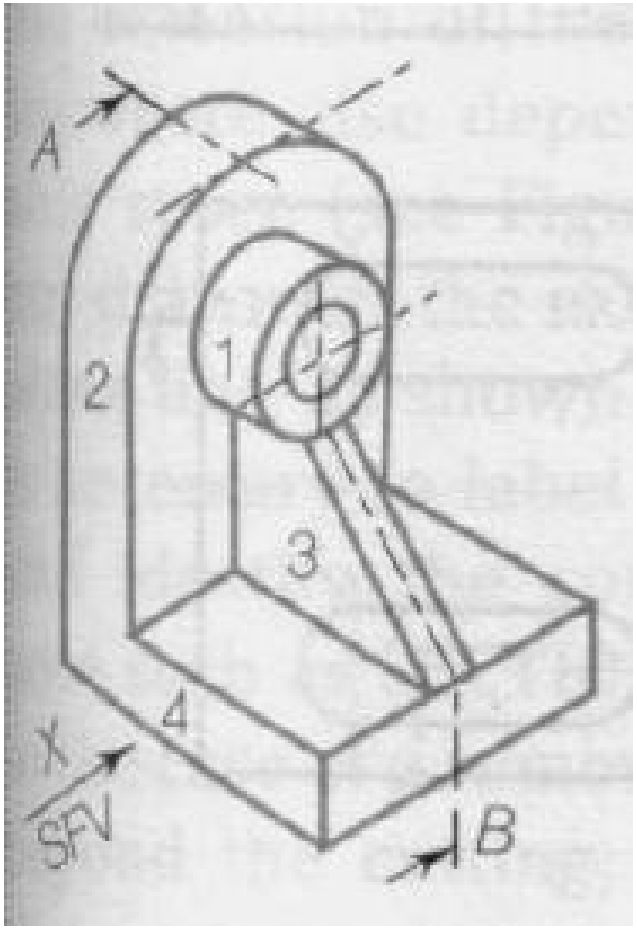
- Hidden features of an object are shown using dotted lines in their projected views
- When there are too many hidden features, it becomes difficult to visualize the object
- In such cases one usually shows a sectioned view of the solid – the view obtained by by virtually cutting the solid by a plane called the section (cutting) plane and removing the part between the observer and the plane



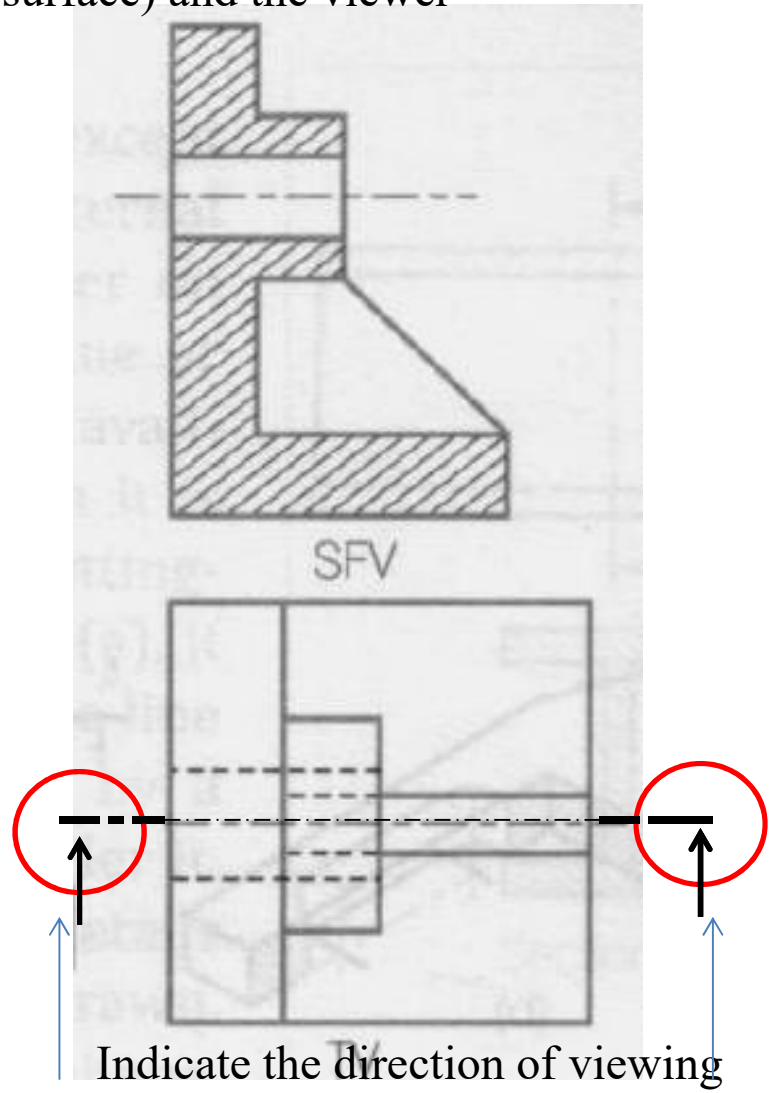


Basics of Sectional Views

Draw the top view and the sectional front view.
The part of the object between the cutting plane (cut surface) and the viewer is assumed to be removed.



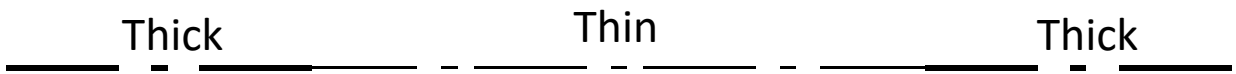
Engineering Drawing, Shah and Rana



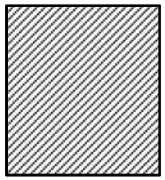
Indicate the direction of viewing for the drawing the sectional view

Nomenclature

Section (cutting) plane – Virtual or imaginary plane cutting the solid.



Section – The surface obtained by virtually cutting the object by the cutting plane. It is indicated by thin section lines uniformly spaced at 45^0



Sectional view – The projection of the section along with the remaining part of the object.

Types of Section Planes and Typical Problems

Types of section planes

- Parallel to the V.P. .
- Parallel to the H.P.
- Perpendicular to both the H.P. and the V.P.
- Perpendicular to the V.P. and inclined to the H.P.
- Perpendicular to the H.P. and inclined to the V.P.

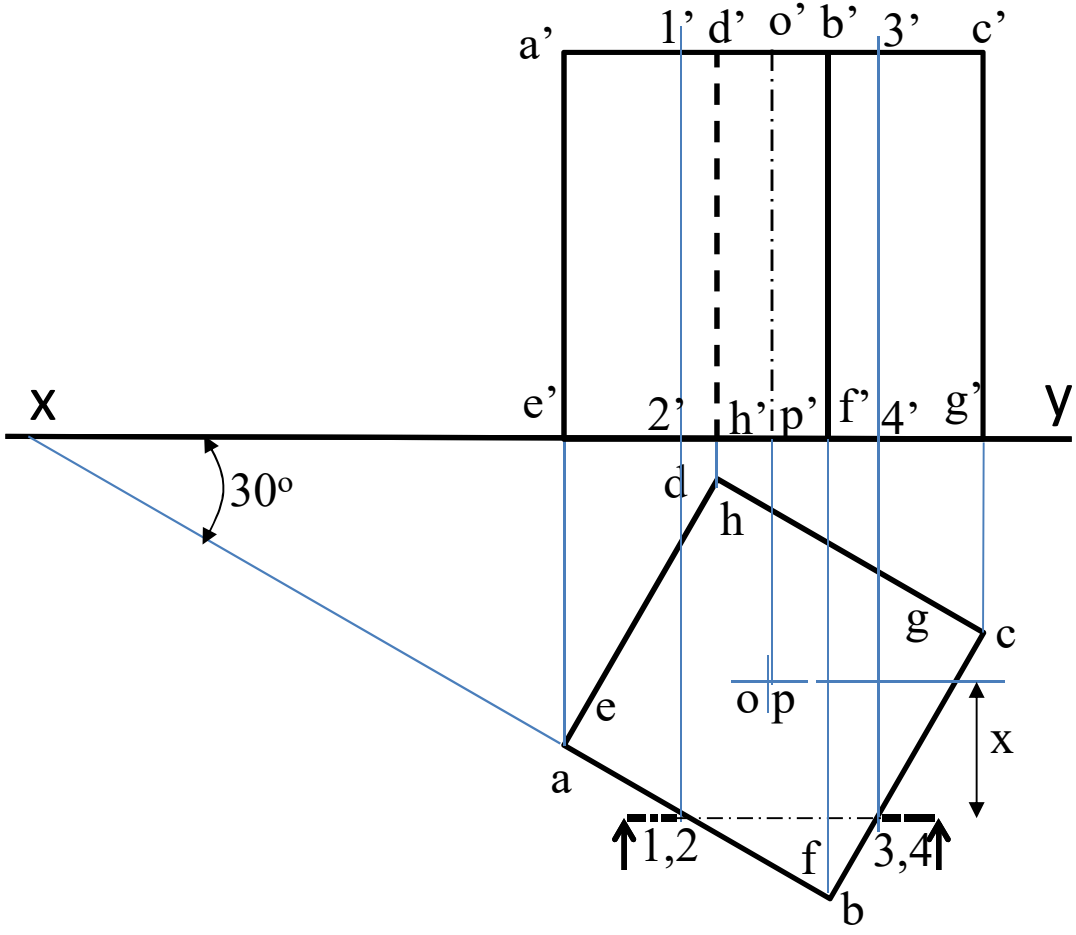
Typical Problems

- To draw the sectional views of the solid and the true shape of the section given the inclination of the cutting plane

- To determine the inclination of the cutting plane given the true shape of the section

Sections of Prisms

Consider a square prism resting on the H.P. and one of the faces making an angle of 30° with the V.P. It is cut by a section plane parallel to the V.P. and 'x' mm from the axis. Draw the sectional front view and the top view



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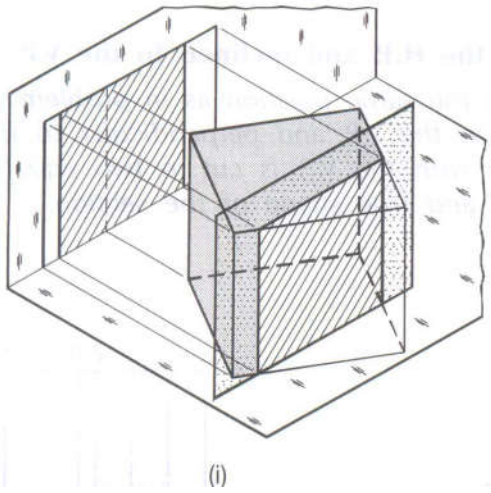
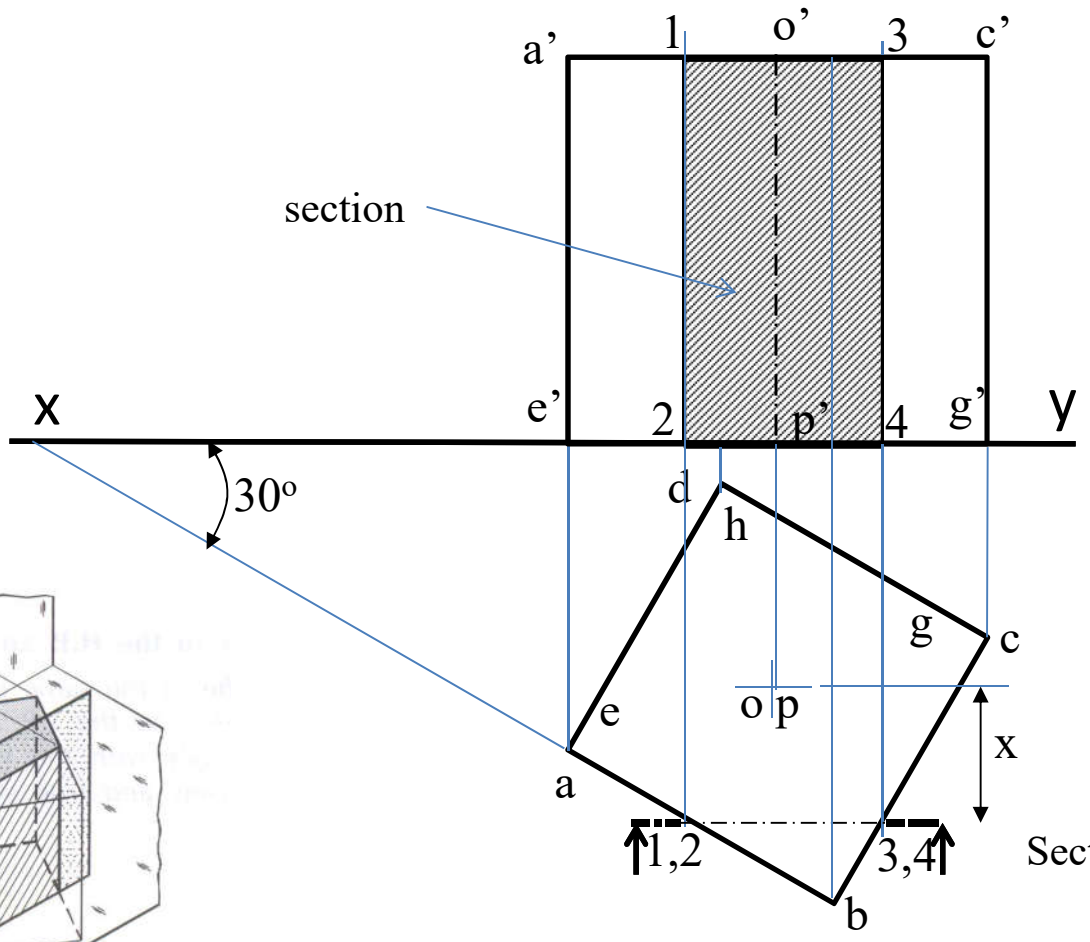


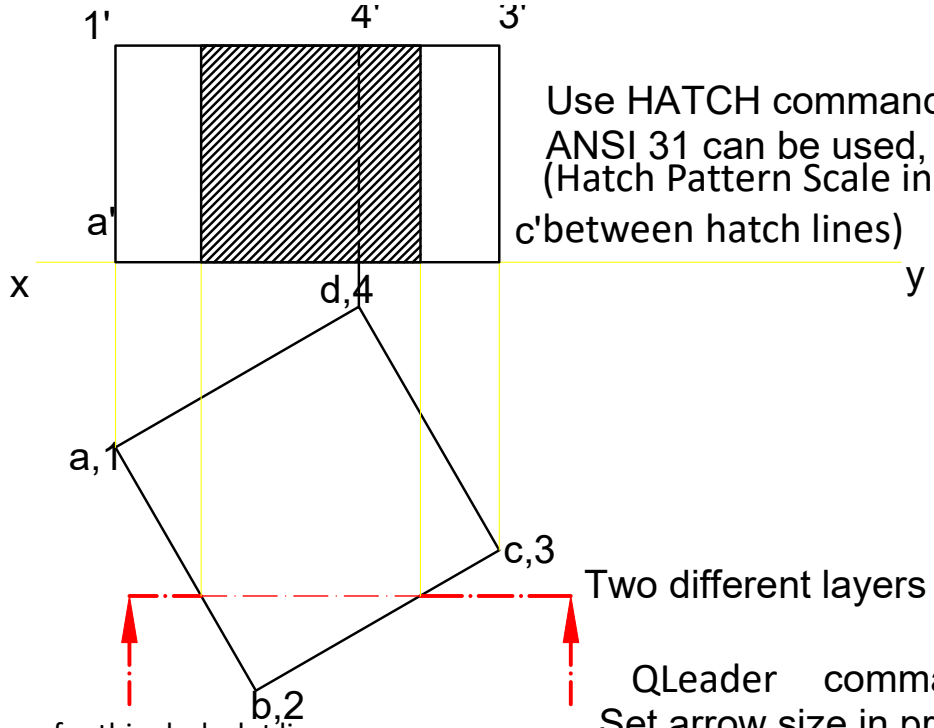


Hidden lines are not shown in the section view

Sectional/cutting plane

Sectioning In AutoCAD

AutoCAD does not have a section line. We will have to make our own section lines



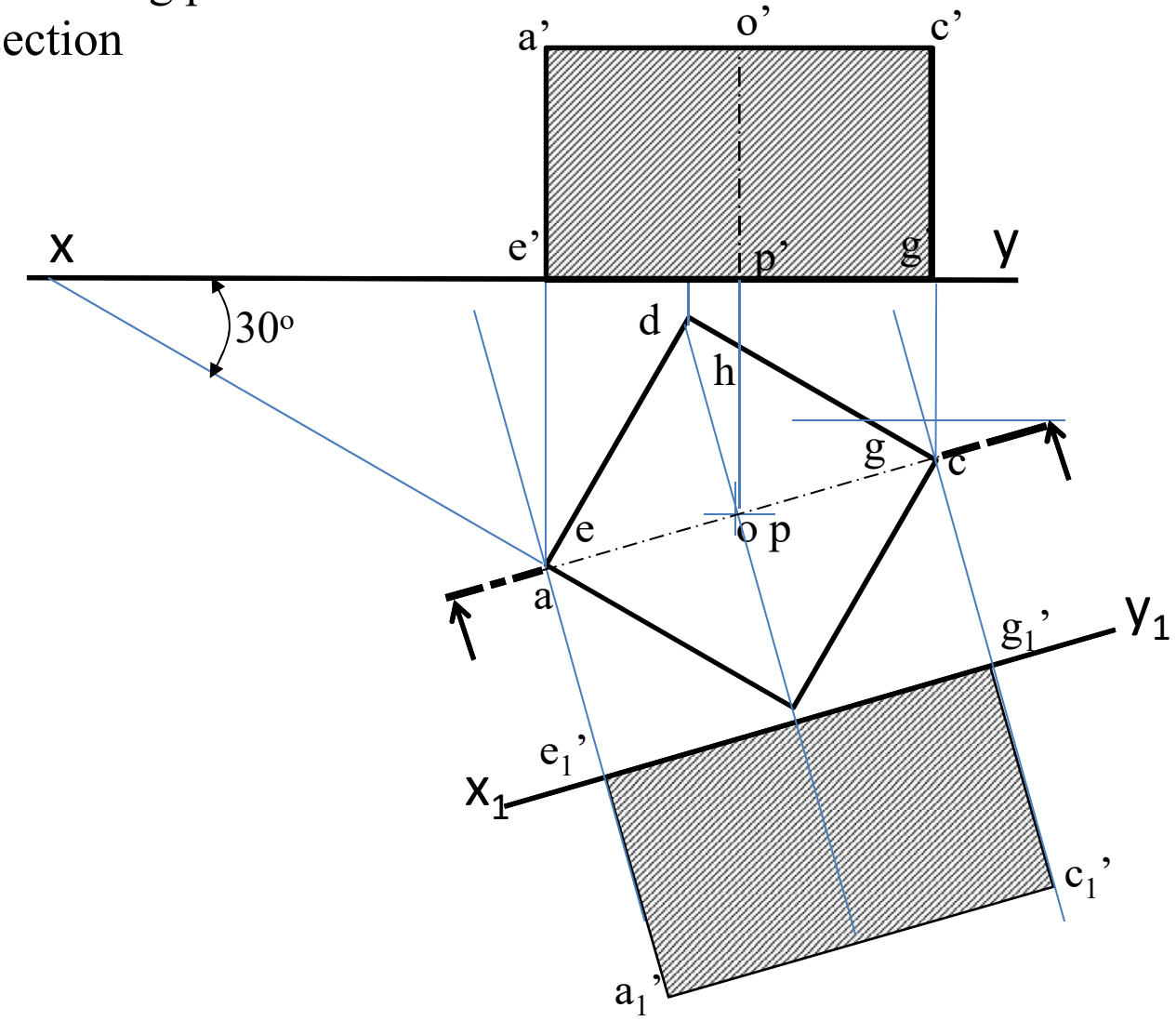
Use HATCH command to hatch the section
ANSI 31 can be used, along with appropriate scaling
(Hatch Pattern Scale in AutoCAD for changing distance between hatch lines)

Two different layers are required for the dash-dot lines

QLeader command for arrow
Set arrow size in properties

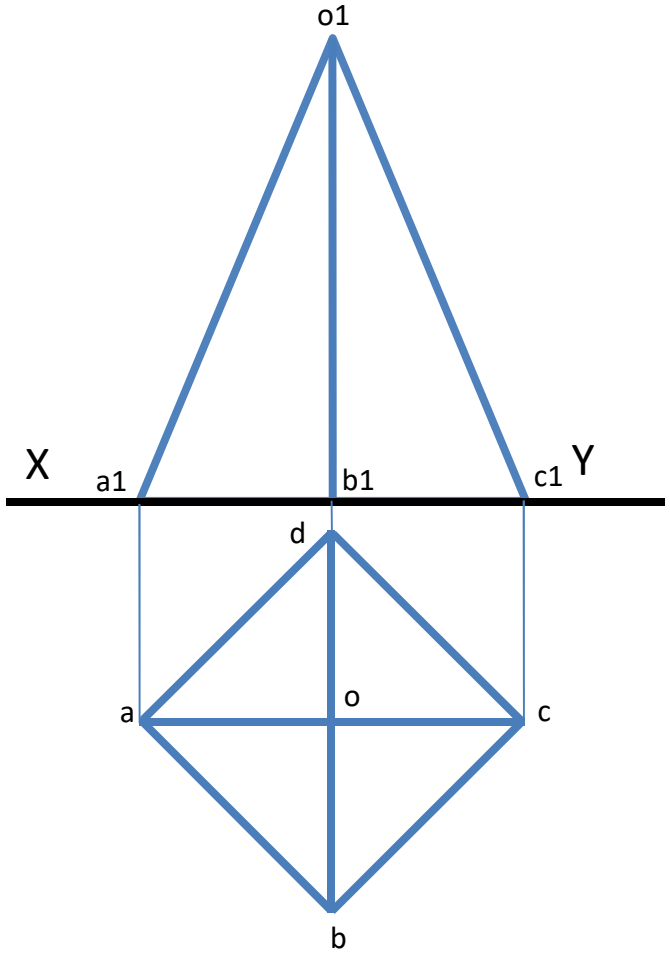
0.25mm thickness for thin dash-dot line
0.5mm thickness for thick dash-dot line
0.25mm thickness for dash-dot line used for arrowhead/leader

Consider a square prism resting on the H.P. and one of the faces making an angle of 30° with the V.P. It is cut by a section plane perpendicular to the H.P. and inclined to the V.P. such that the section is a rectangle with the largest area. Find the inclination of the cutting plane with the V.P. Draw the sectional front view and the true shape of the section



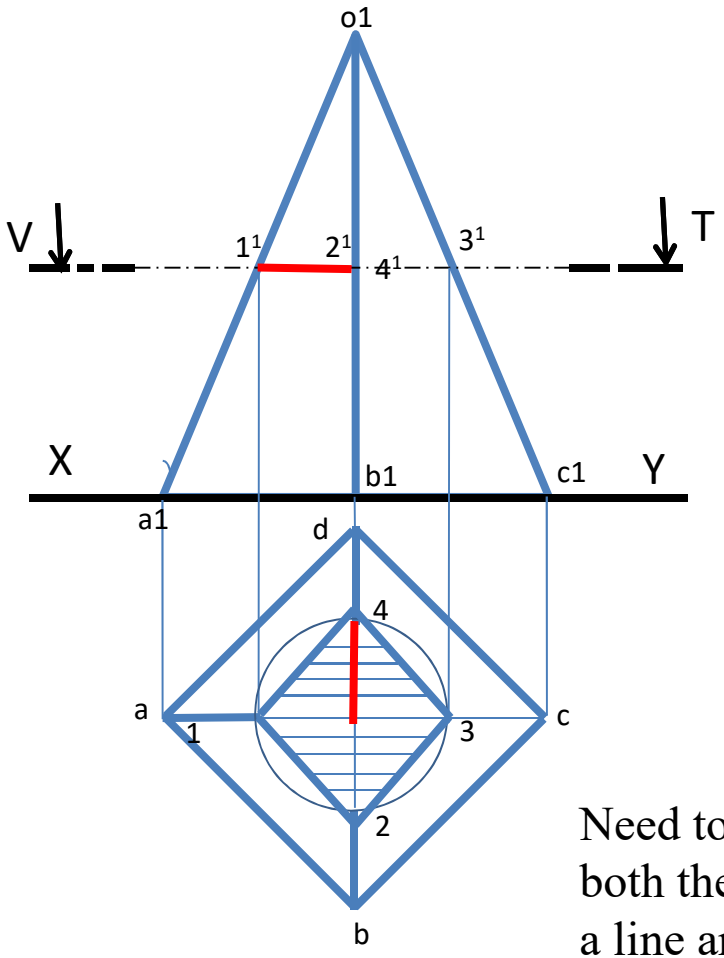
Sections of pyramid

A square pyramid, base 40 mm side & axis 65 mm long has its base on H.P. and all the edges of the base equally inclined to the V.P. It is cut by a section plane, parallel to the H.P. & bisecting the axis . Draw its sectional top view.



Sections of pyramids

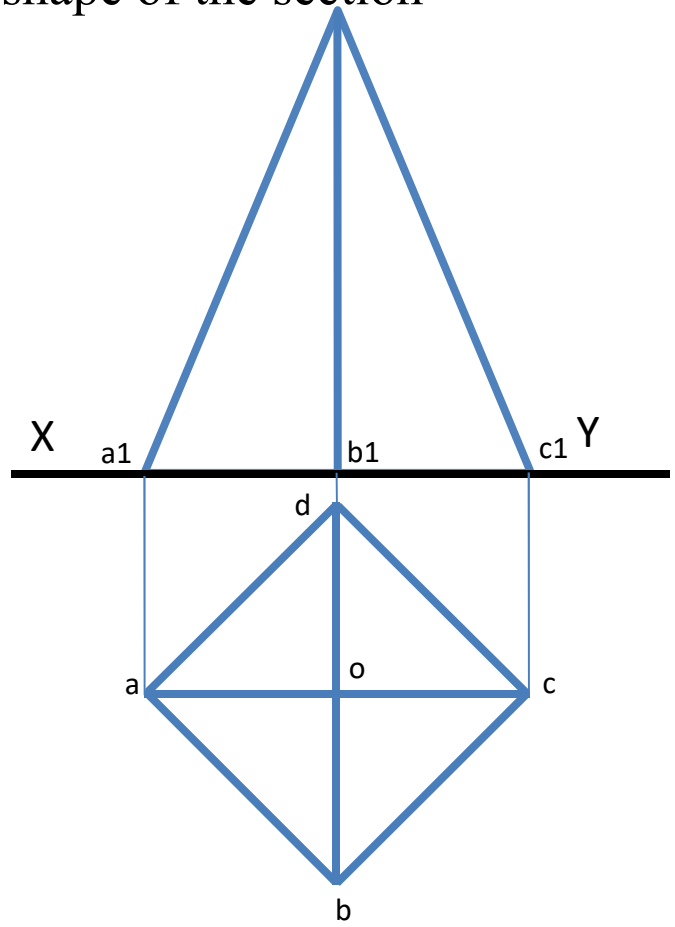
2.Draw line VT parallel to the XY line bisecting the axis & then draw the sectional top view



Need to give special attention when both the front view and the top view of a line are perpendicular to the xy line

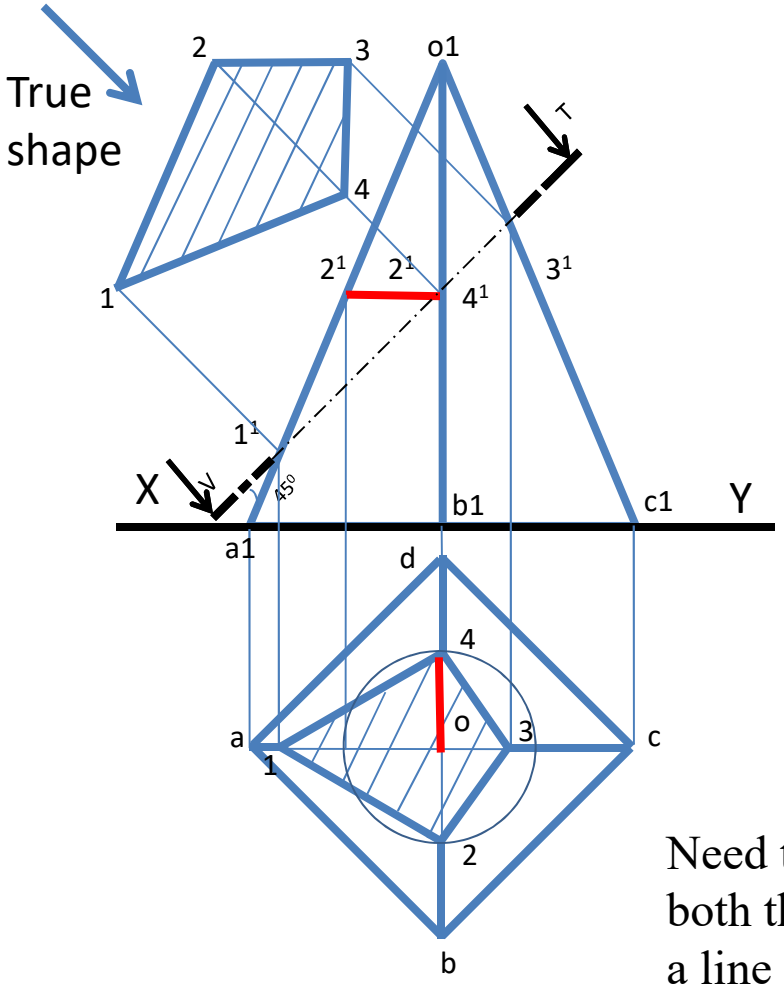
Sections of pyramid

A square pyramid, base 40 mm side & axis 65 mm long has its base on H.P. and all the edges of the base equally inclined to the V.P. It is cut by a section plane, perpendicular to the V.P. , inclined at 45^0 to the H.P. & bisecting the axis . Draw its sectional top view and true shape of the section



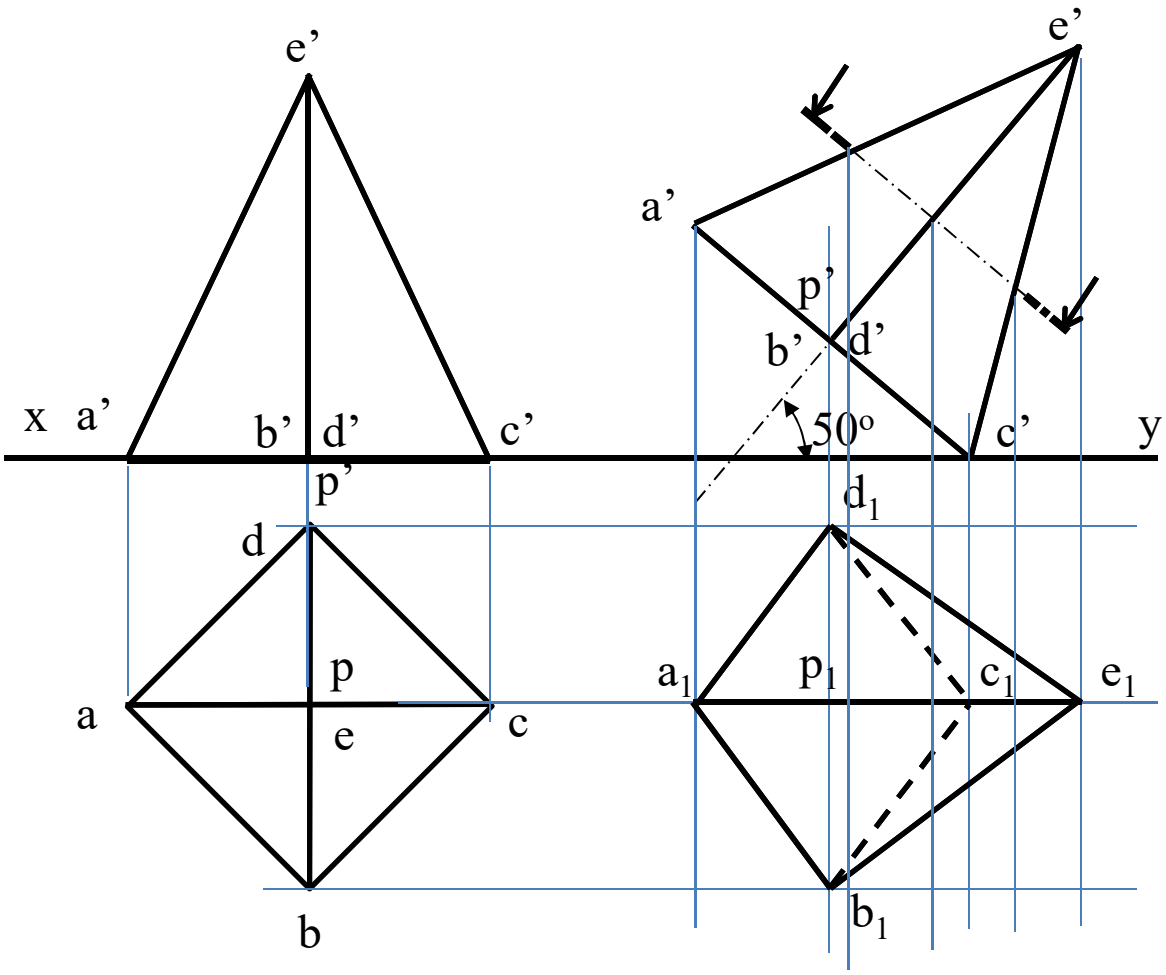
Sections of pyramids

2.Draw line V-T 45^0 to X-Y bisecting the axis & then all sectional views and true shape



Need to give special attention when both the front view and the top view of a line are perpendicular to the xy line

A square pyramid, base 25 mm and axis 50 mm long, is resting on one of the corners in the H.P. and its axis making 50° with the H.P. and parallel to the V.P. It is cut by a cutting plane, perpendicular to the V.P., parallel to the base and bisecting its axis. Draw the sectional top view



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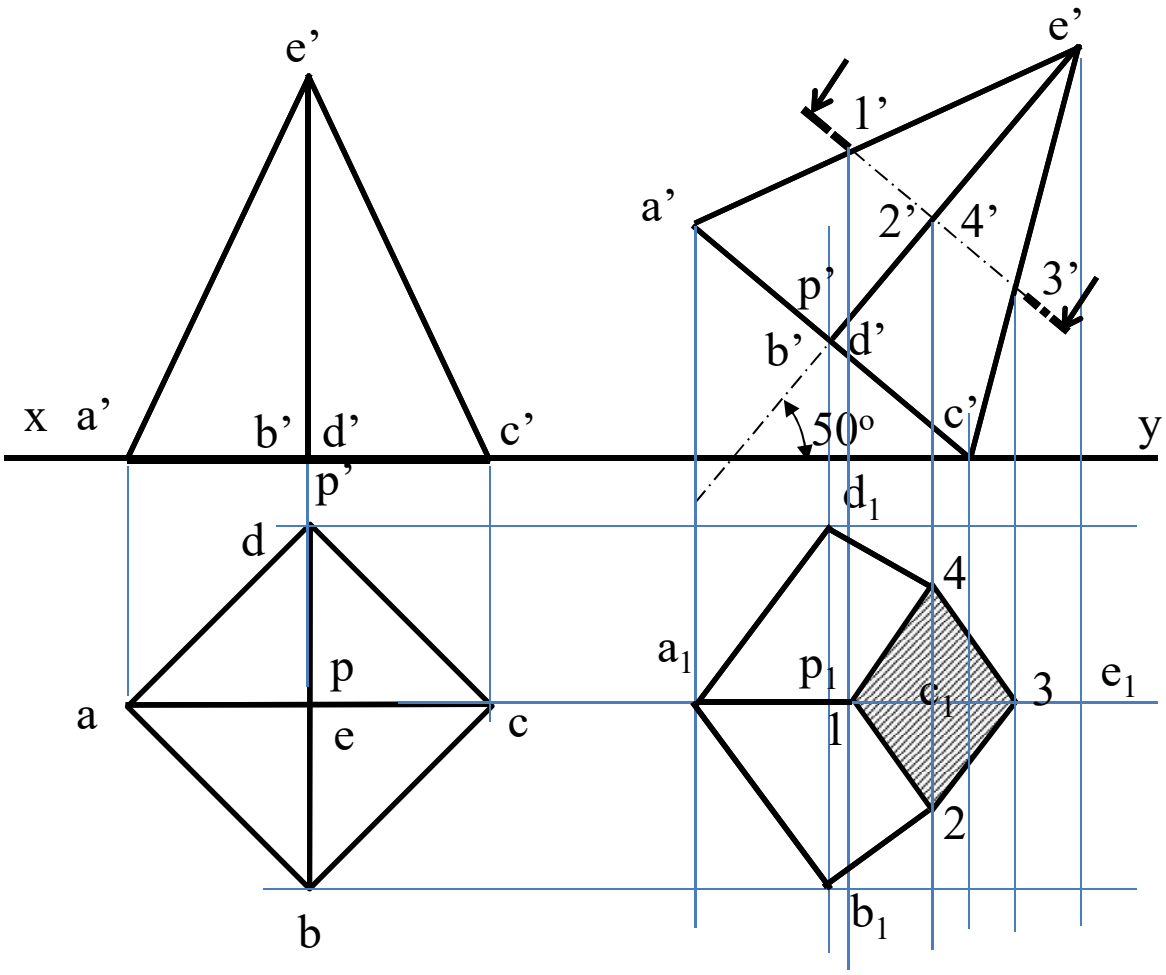
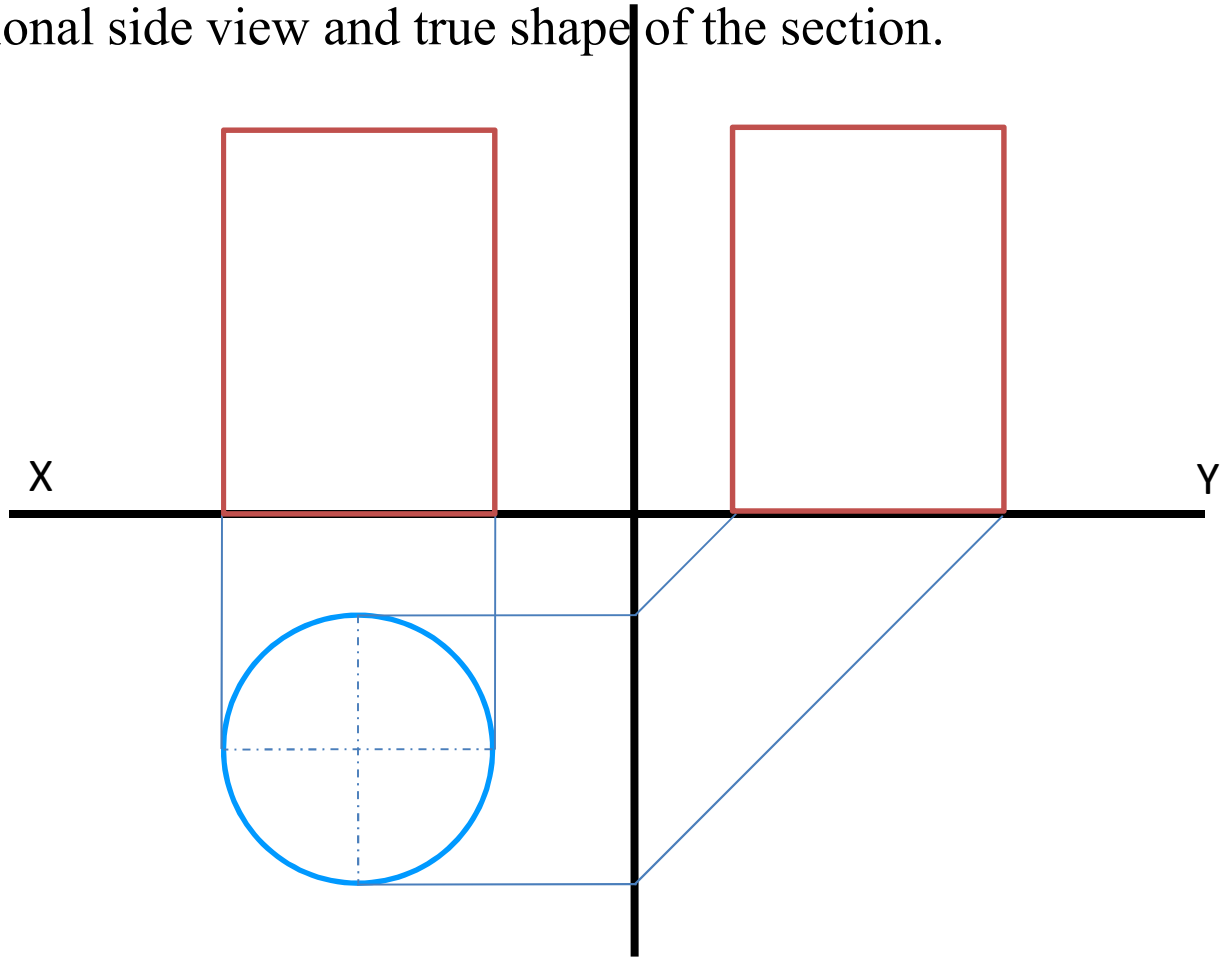


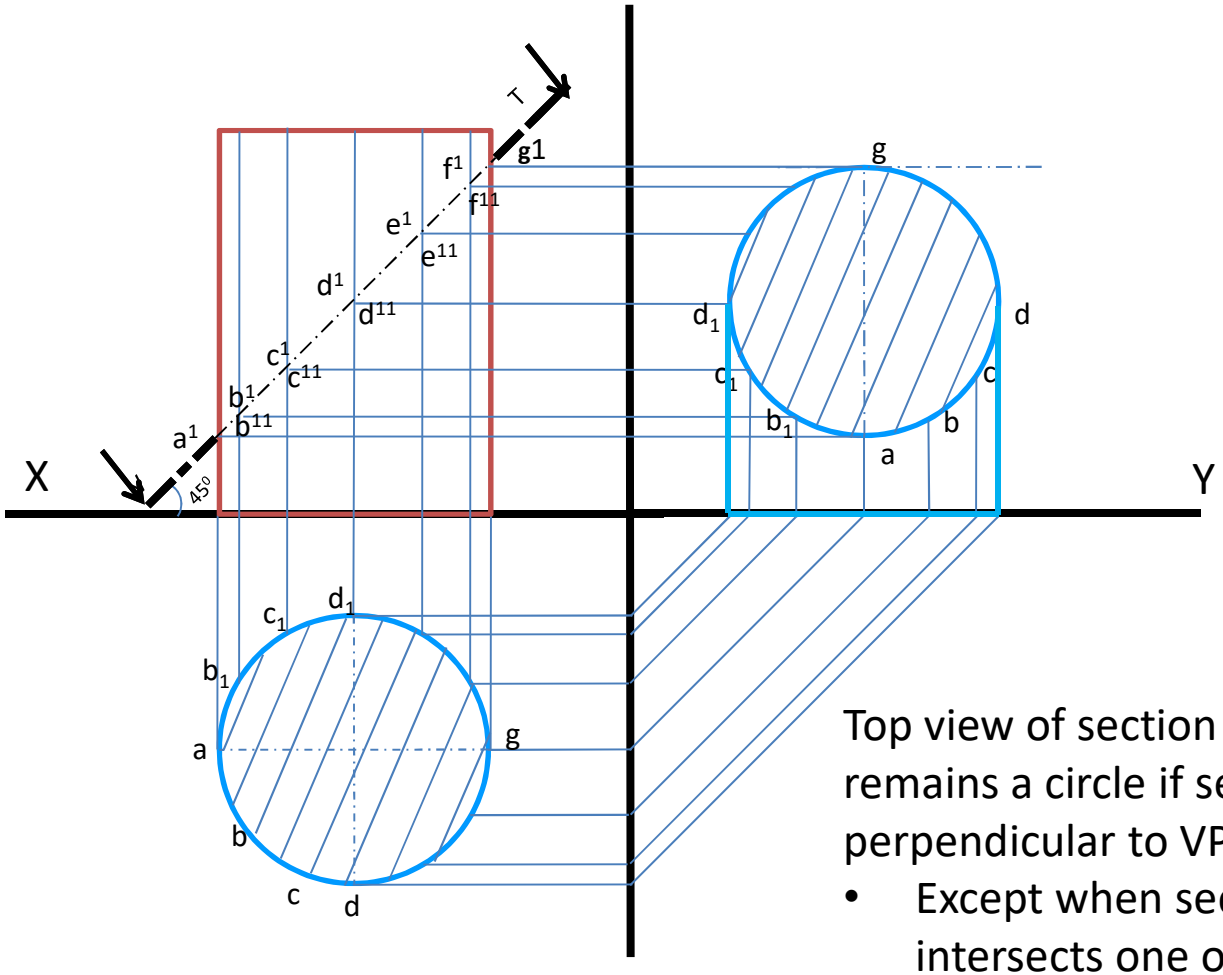
Sections of cylinders

- Ex. A cylinder of 40 mm diameter, 60 mm height & having its axis vertical, is cut by a section plane perpendicular to the V.P., inclined at 45^0 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.



Sections of cylinders

2.Draw sectional line VT & complete the sectional views

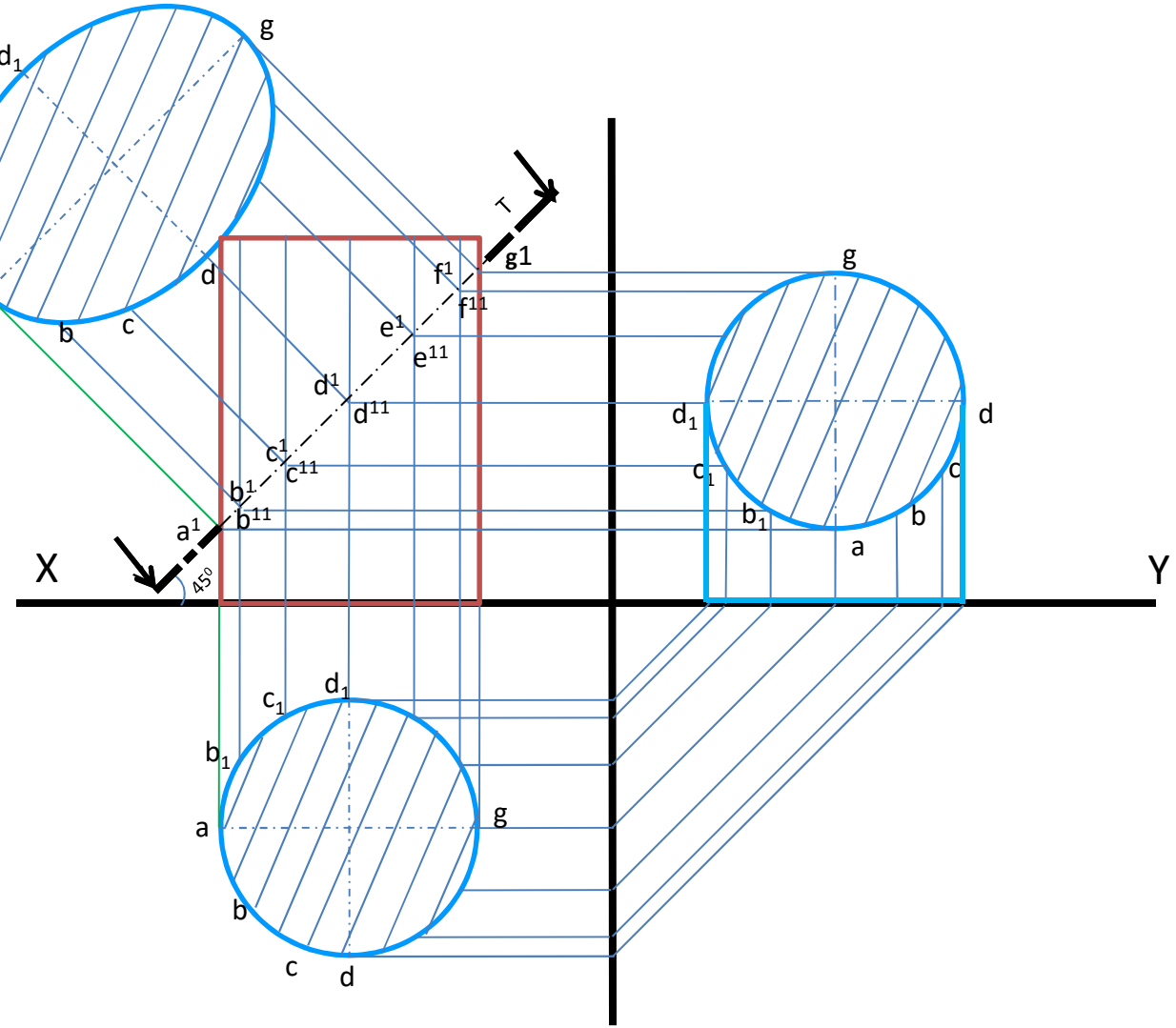


Top view of section of cylinder remains a circle if section plane is perpendicular to VP

- Except when section intersects one or both of the bases

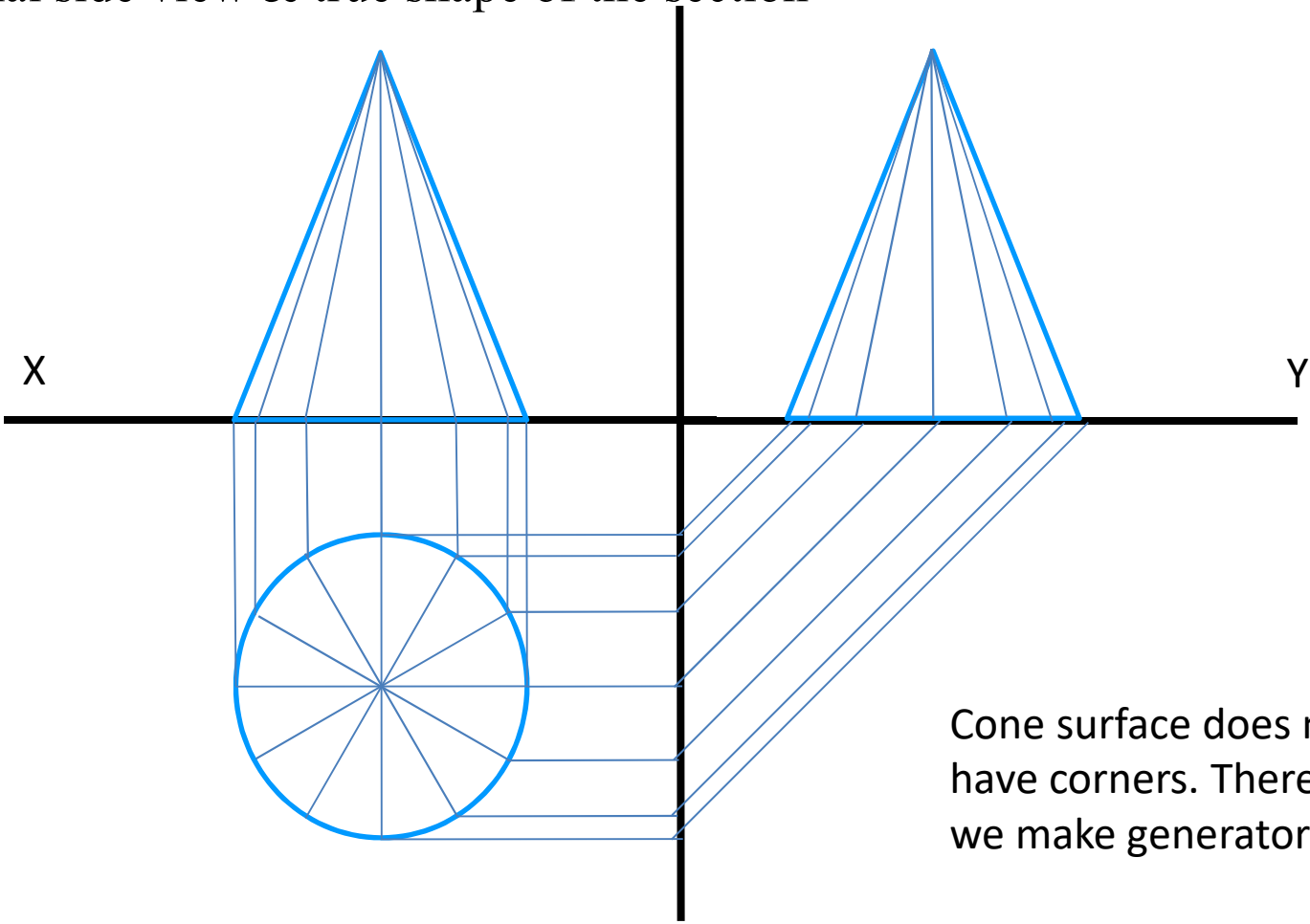
Sections of cylinders

True shape



Sections of cones

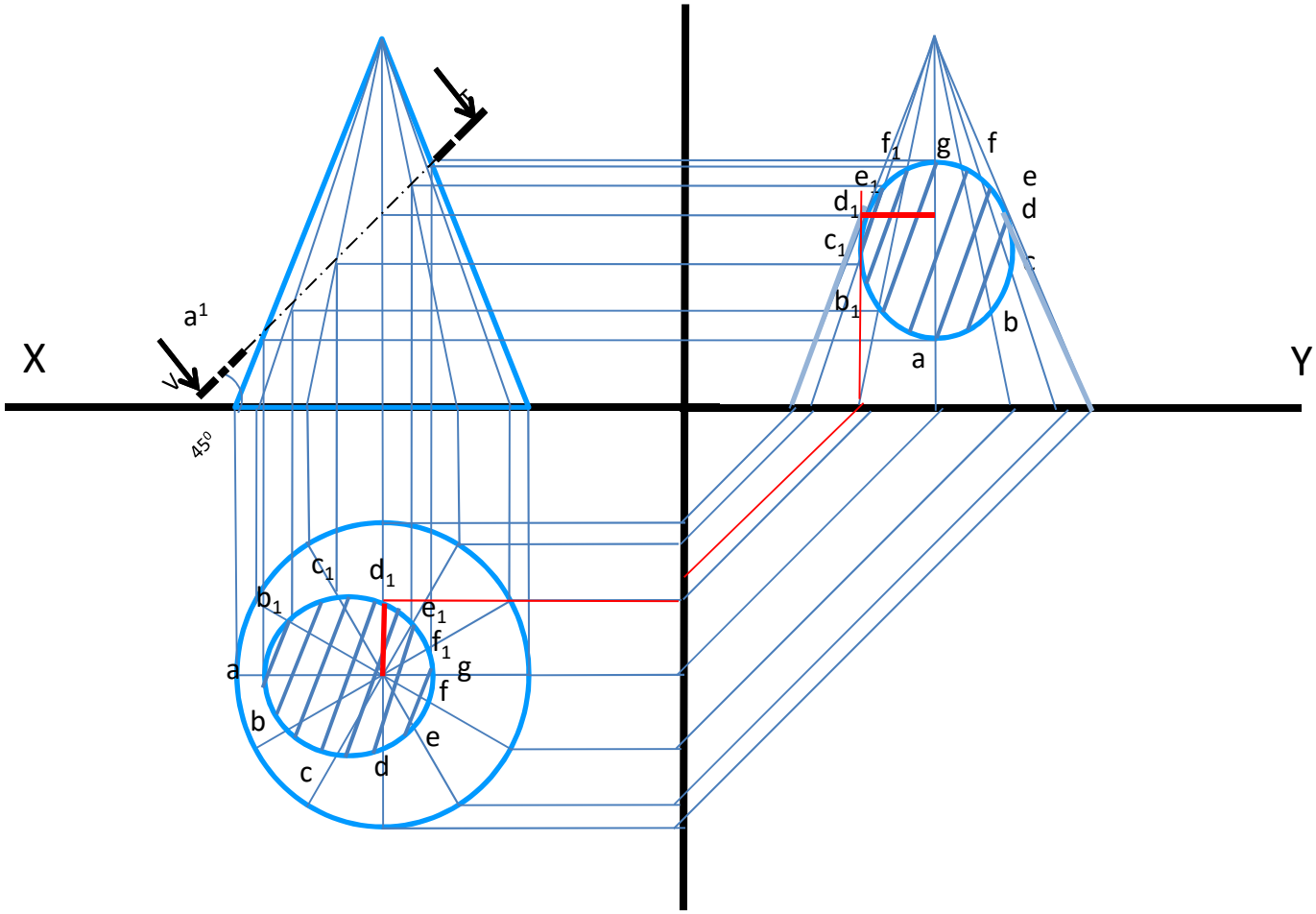
A cone , base 75 mm diameter & axis 80 mm long is resting on its base on the H.P. it is cut by a section plane perpendicular to the V.P., inclined at 45^0 to the H.P. & cutting the axis at a point 35 mm from the apex . Draw its F.V., sectional T.V., sectional side view & true shape of the section



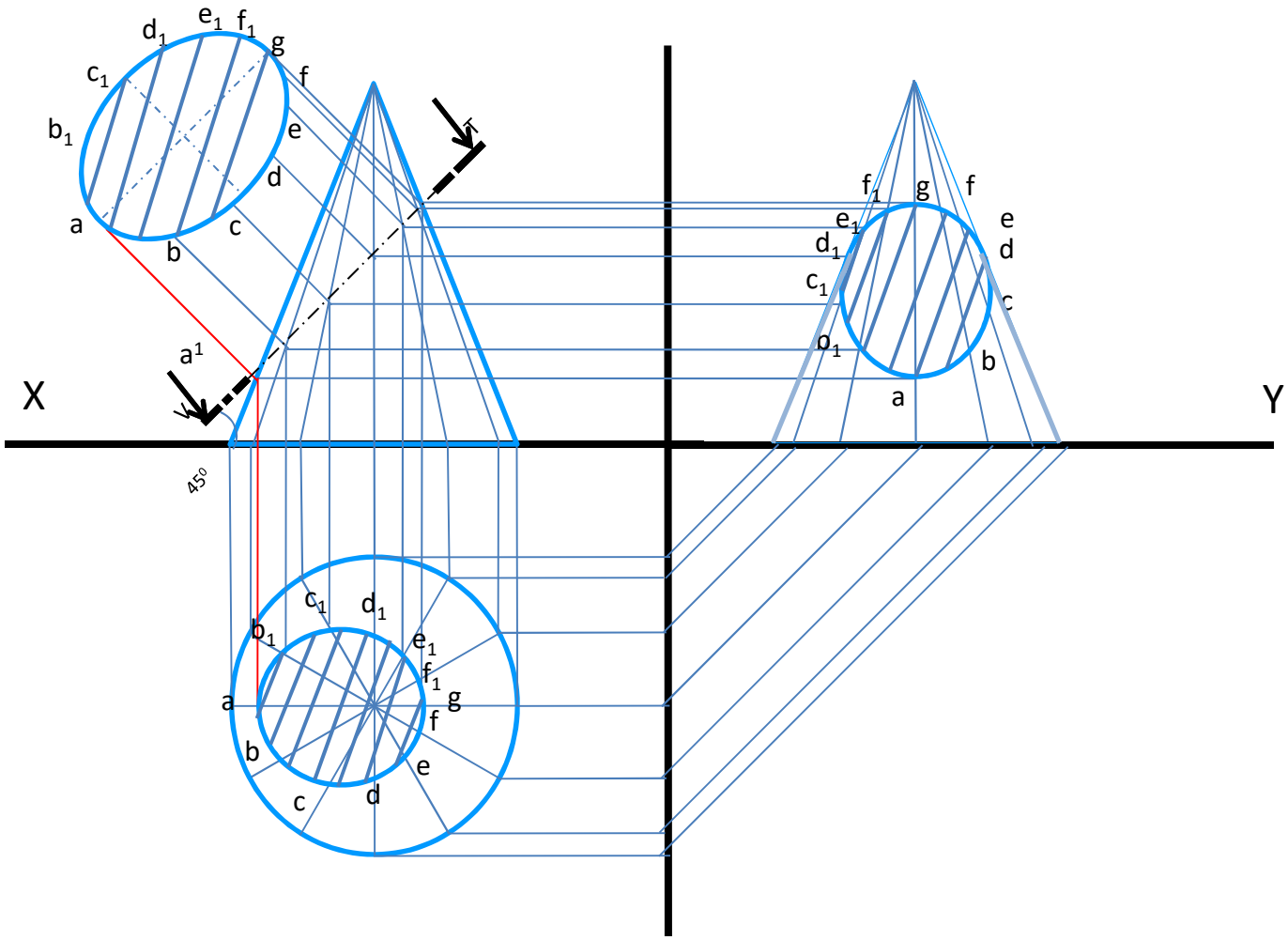
Cone surface does not have corners. Therefore we make generator lines

Sections of cones

Draw sectional line VT & complete the sectional views

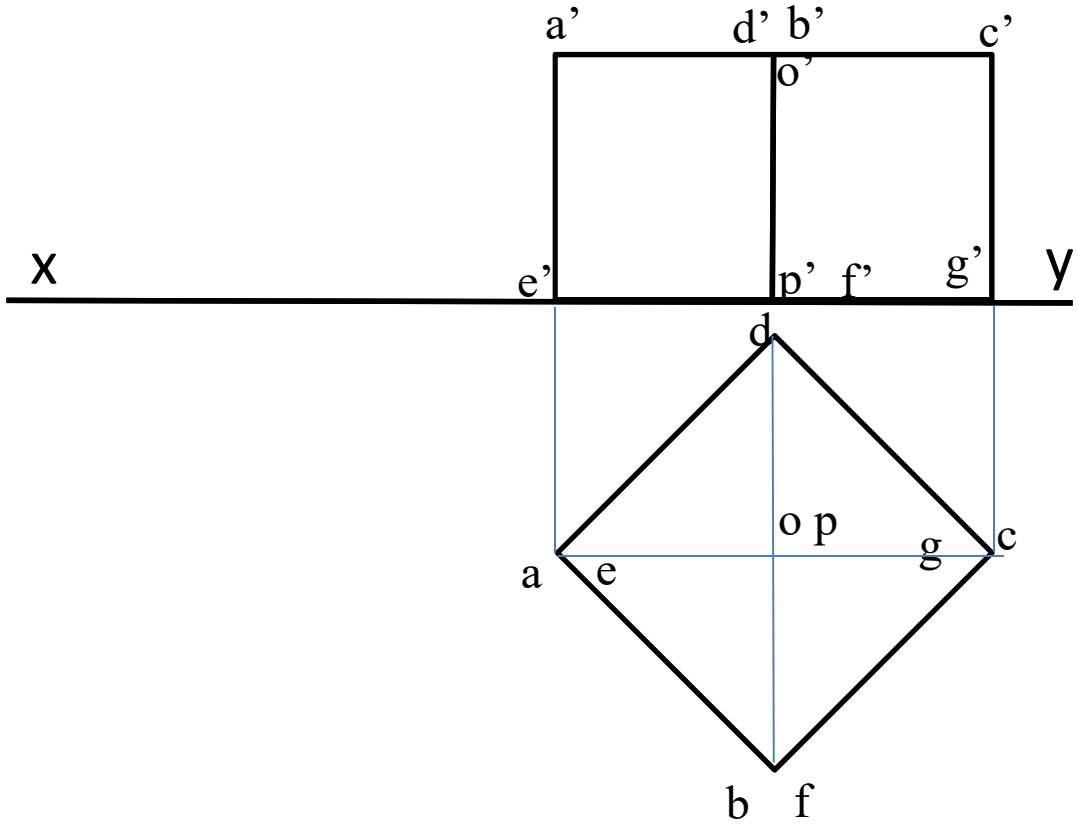


Sections of cones

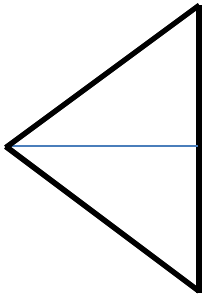


Projection of a Solid with Axis Perpendicular to the H.P.

A square prism, base 1.6” side & axis 1.3” long has its base on H.P. and all the edges of the base equally inclined to the V.P. It is cut by a section plane, perpendicular to the V.P. , inclined to the H.P. such that true shape of the section is an isosceles triangle with 1.5” base and 1” altitude . Draw the sectional top view and the front view

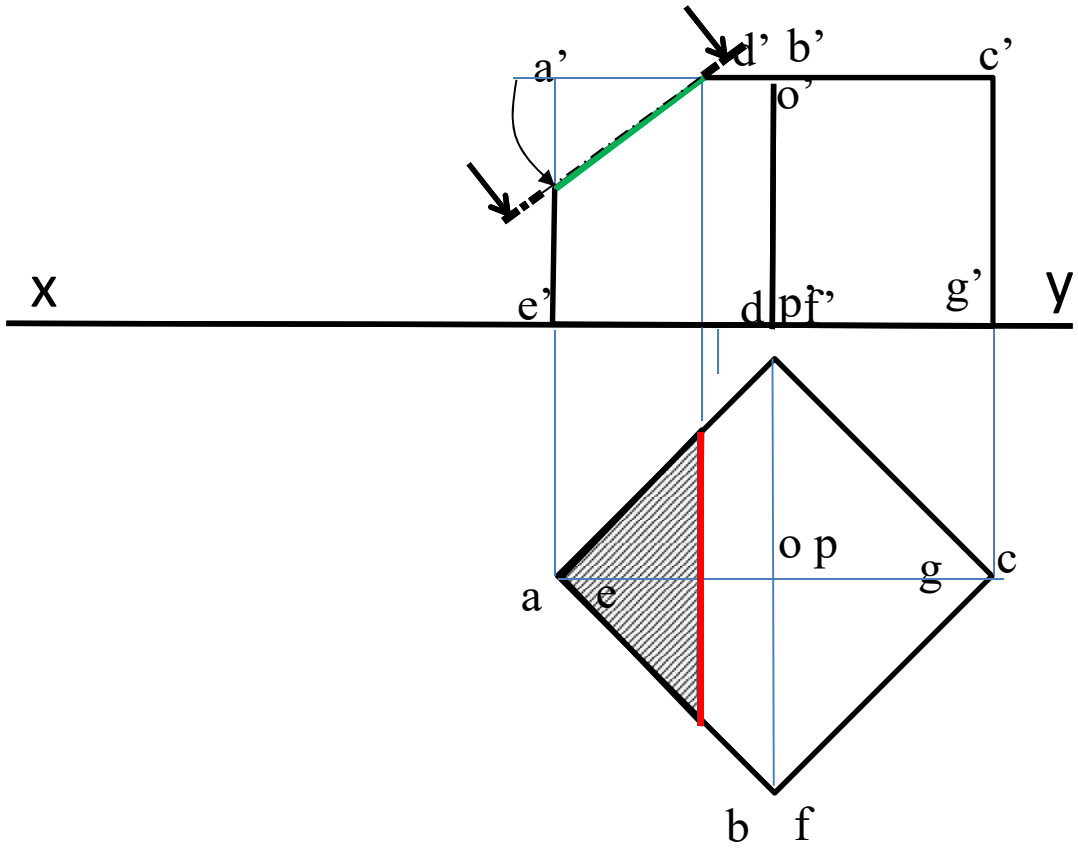


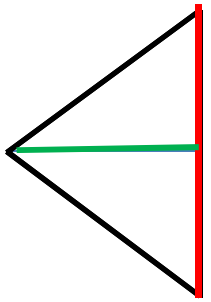
True shape of the section



Projection of a Solid with Axis Perpendicular to the H.P.

A square prism, base 1.6” side & axis 1.3” long has its base on H.P. and all the edges of the base equally inclined to the V.P. It is cut by a section plane, perpendicular to the V.P. , inclined to the H.P. such that true shape of the section is an isosceles triangle with 1.5” base and 1” altitude . Draw the sectional top view and the front view





Points to Remember

1. If the section plane is parallel to the H.P. then the true shape of the section is seen in the top view.
2. If the section plane is parallel to the V.P. then the true shape of the section is seen in the front view
3. The true shape of the section is seen on a plane parallel to the section plane.
4. For prisms and cylinder – If the section plane is parallel to the base, the section is the true shape and size of the base. If the section plane is perpendicular to the base, the section is a rectangle
5. For cones and pyramids – If the section plane is parallel to the base, the section is the true shape of the base but of smaller size. If the section plane passes through the apex, then the section is a triangle
6. The number of corners in the true and apparent shape of a section is equal to the number of edges of the solid that are cut by the cutting plane
7. The number of corners and edges in the apparent shape and the true shape are the same.
8. Any pair of lines which is parallel in one view will be parallel in any other view.
9. When the cutting plane cuts all the generators of a cone or an cylinder, then the true shape of the section is an ellipse
10. When the cutting plane is inclined to the base of the cone at an angle that is equal (greater) [less] to that made by the generator with the base, then the true shape of the section is a parabola (hyperbola) [ellipse].

END