

Sections of Solids.

16

A triangular prism, $(30, 50)$ is lying on the ground on one of its rectangular faces with the axis inclined at 30° to the VP. It is cut by a section plane (Horizontal plane) parallel to xy and at 15mm above the ground. Draw its Front view and sectional top view.

A

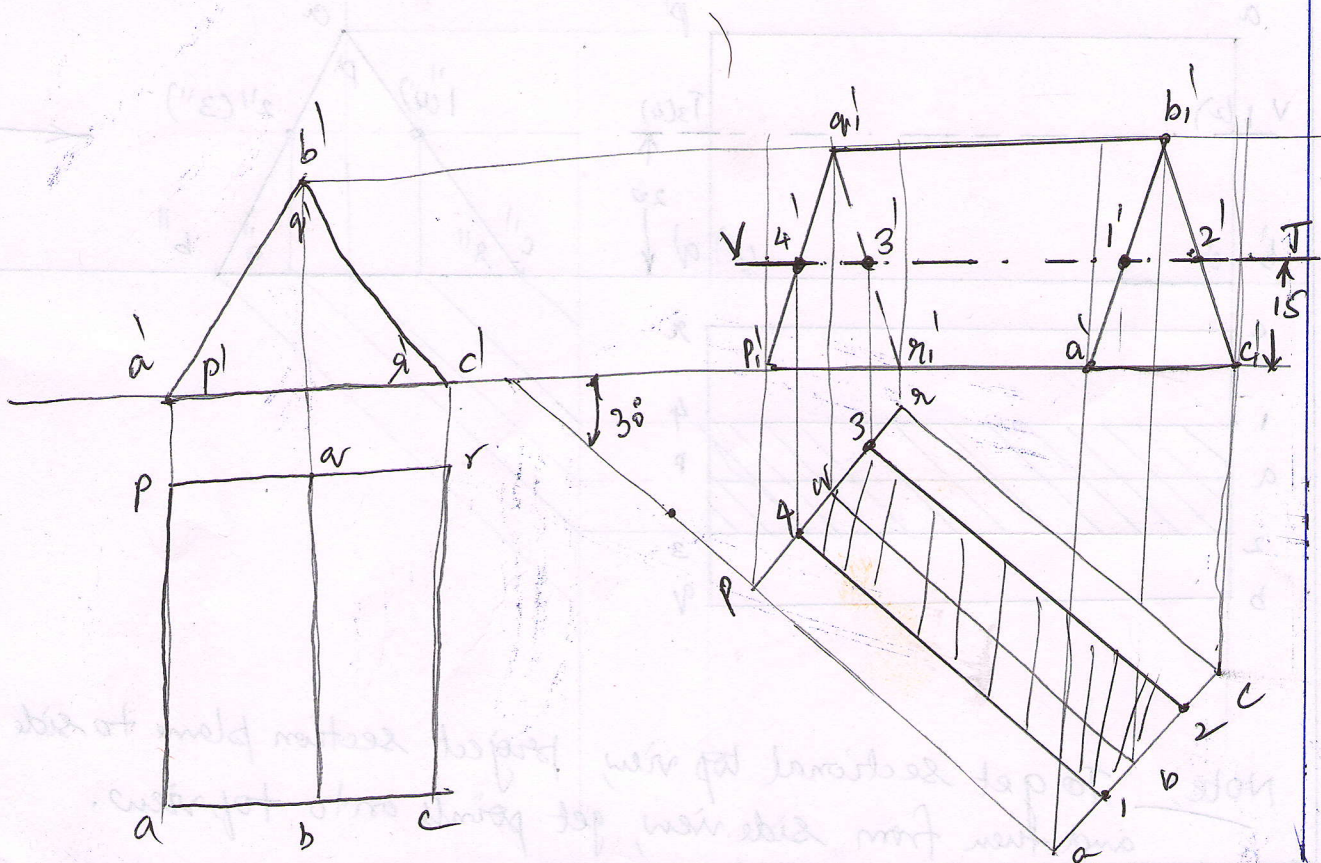
Data: shape : Triangular prism \rightarrow (Base 30mm, Axis 50mm)

Axis position $\rightarrow 30^\circ$ to VP

It is a two stage problem, 1st stage Axis \perp to VP.

face/side position \rightarrow Red' face on HP \Rightarrow side on HP \Rightarrow $(11^\circ$ to xy)

Section plane data: 11° to HP, 15mm above xy.



(17)

A triangular prism, side of base 40mm and length of axis 70mm is lying on one of its rectangular faces in the HP. Its axis is parallel to both HP and VP. It is cut by a section plane parallel to and at a distance of 20mm from the HP. Draw its front view and sectional top view.

(A)

Given data:

Solid Orientation:

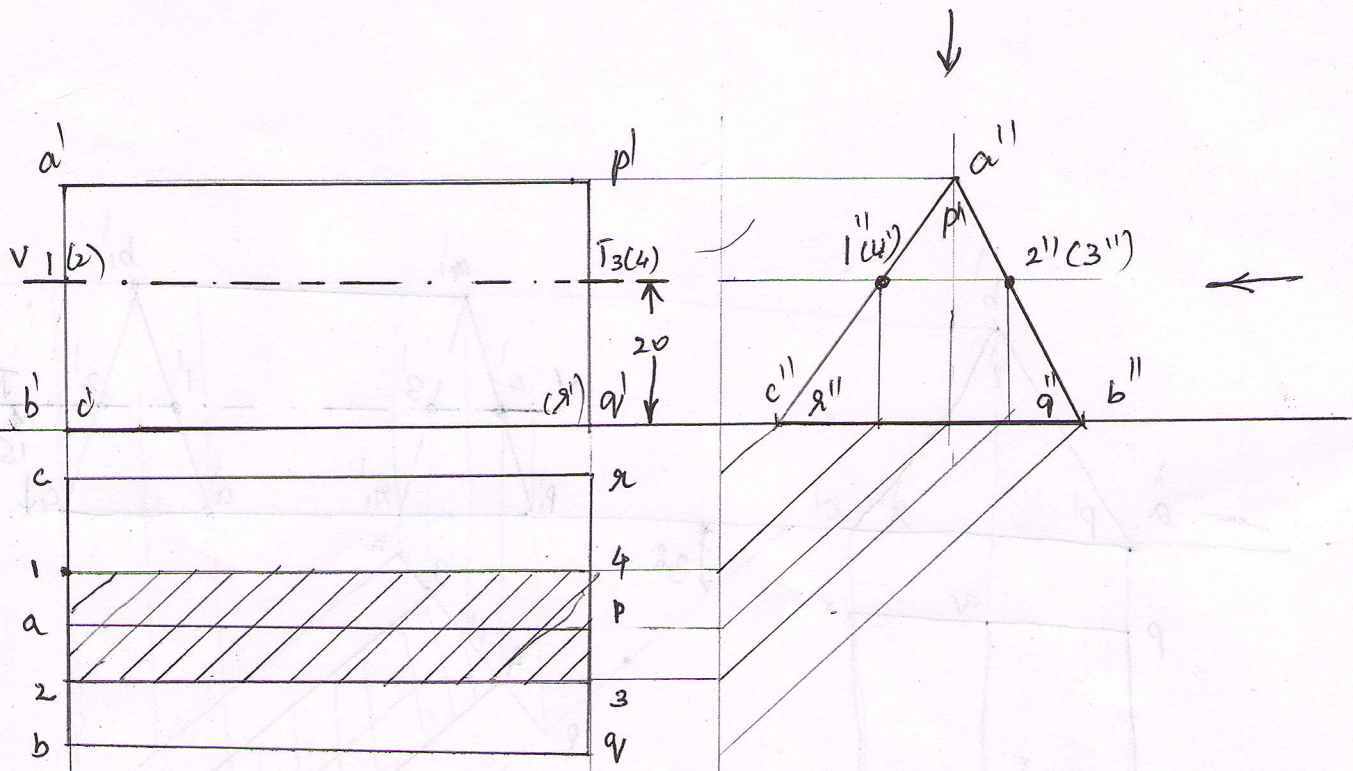
(Base, Ht) \rightarrow (40, 70)

Axis / face orientation: Axis \parallel HP & VP.

\therefore Can be drawn in 2 stages or from side view.

starting side: face on HP \Rightarrow side on HP (\parallel to xy)

Section plane data: \parallel HP & 20 above xy.



Note: To get sectional top view, project section plane to side view and then from side view, get points onto top view.

18. A Square prism of base 50mm sides and axis 100mm long is resting on its edge ~~of base~~ on H.P. such that its axis is parallel to VP and its faces are equally inclined to V.P. The prism is cut by an AIP passing through the midpoint of the axis, normal to the H.P. and inclined at 30° to the VP (also stated as the HT of the plane makes 45° to the XY). Draw the sectional front view, top view and the true shape of the section.

Soln

Given data: Shape: Square prism (B, H) = (50, 100)

Solid details:

Axis condition: \parallel^{el} to VP.

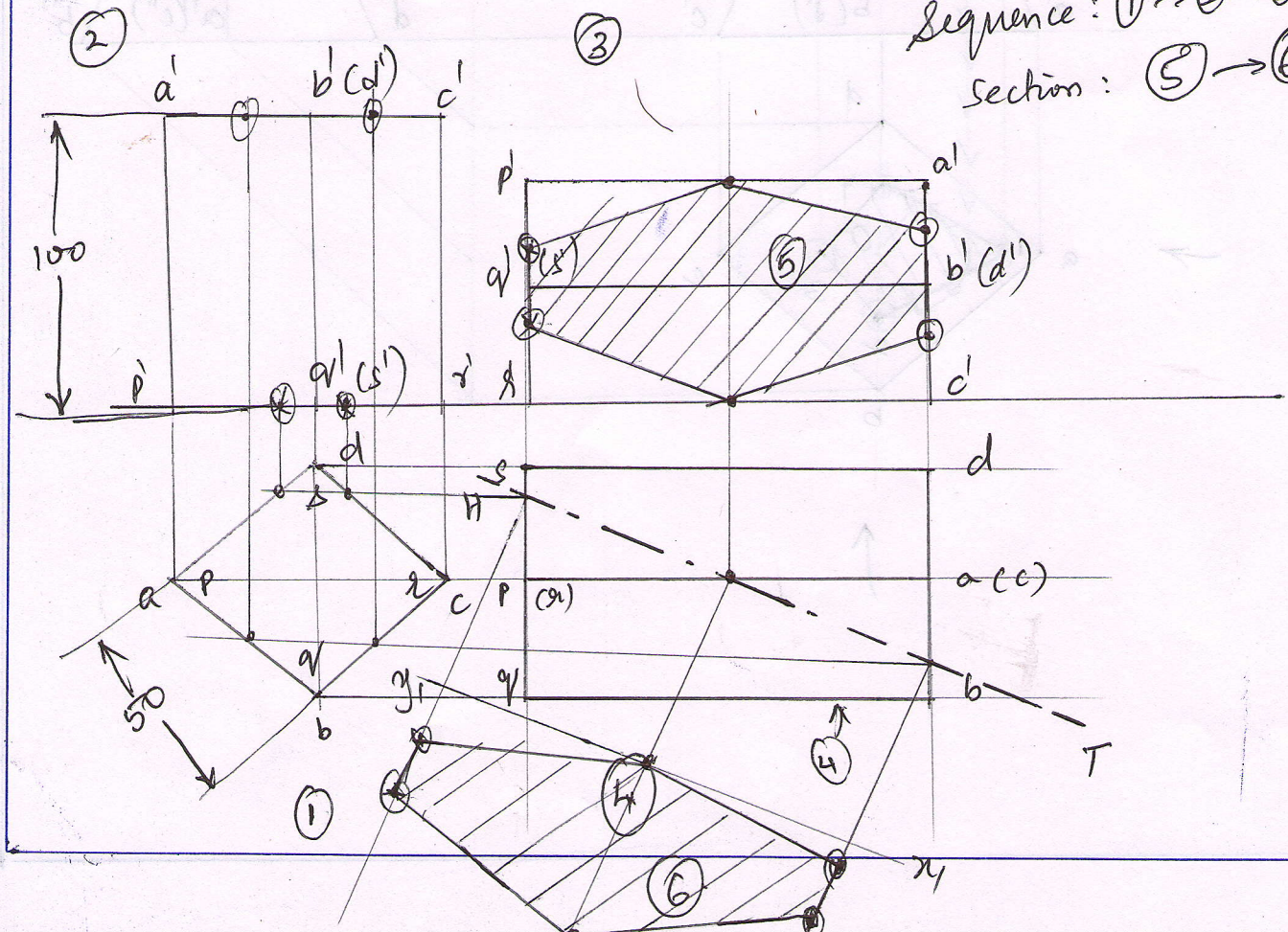
When axis parallel to VP, it can be solved in 2 methods:

- (i) Base on HP & turning such that edge on HP [Vertical Edge]
- (ii) starting from side view.

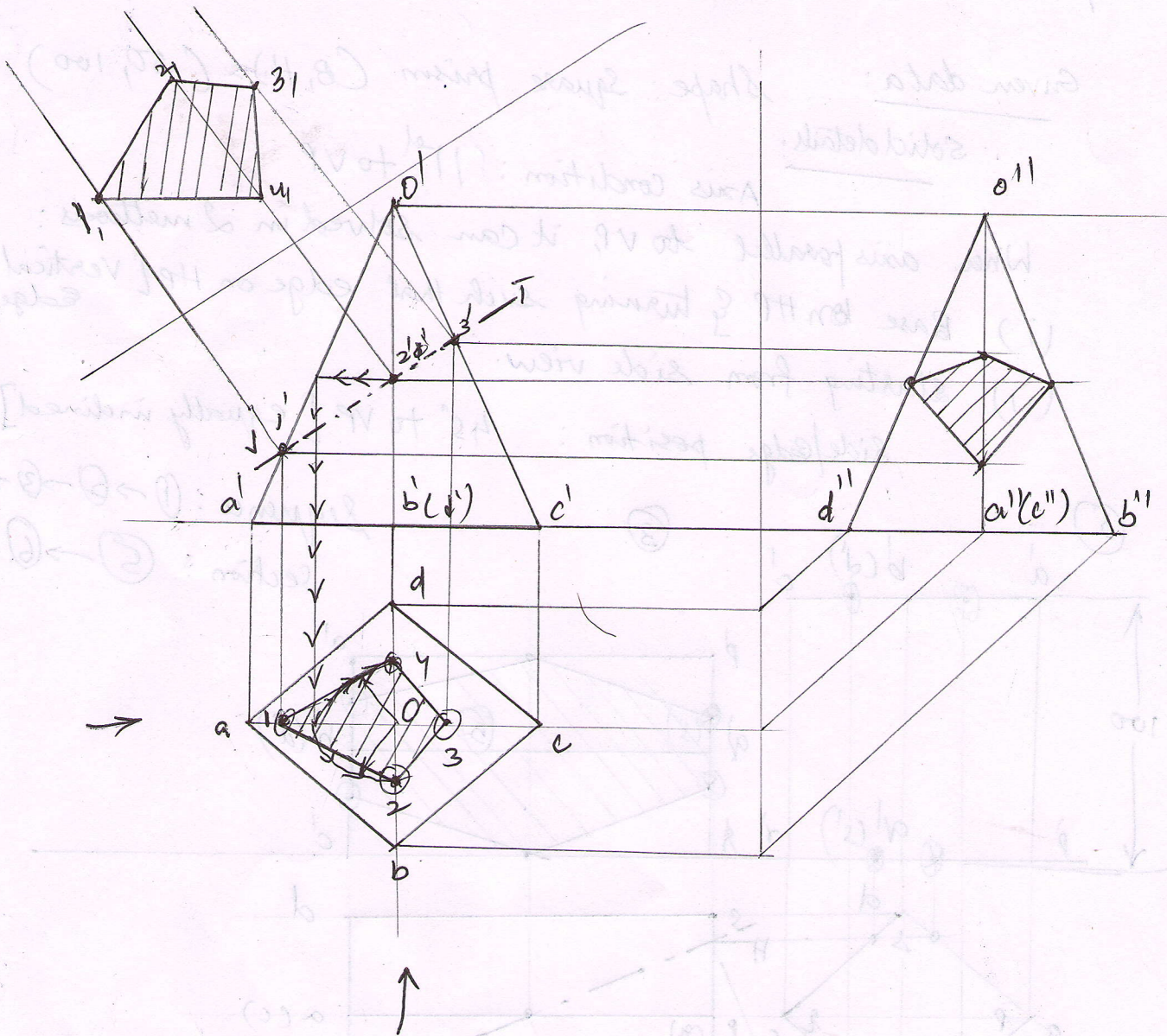
Side/edge position: 45° to VP [equally inclined].

Sequence: ① → ② → ③ → ④

Section: ⑤ → ⑥

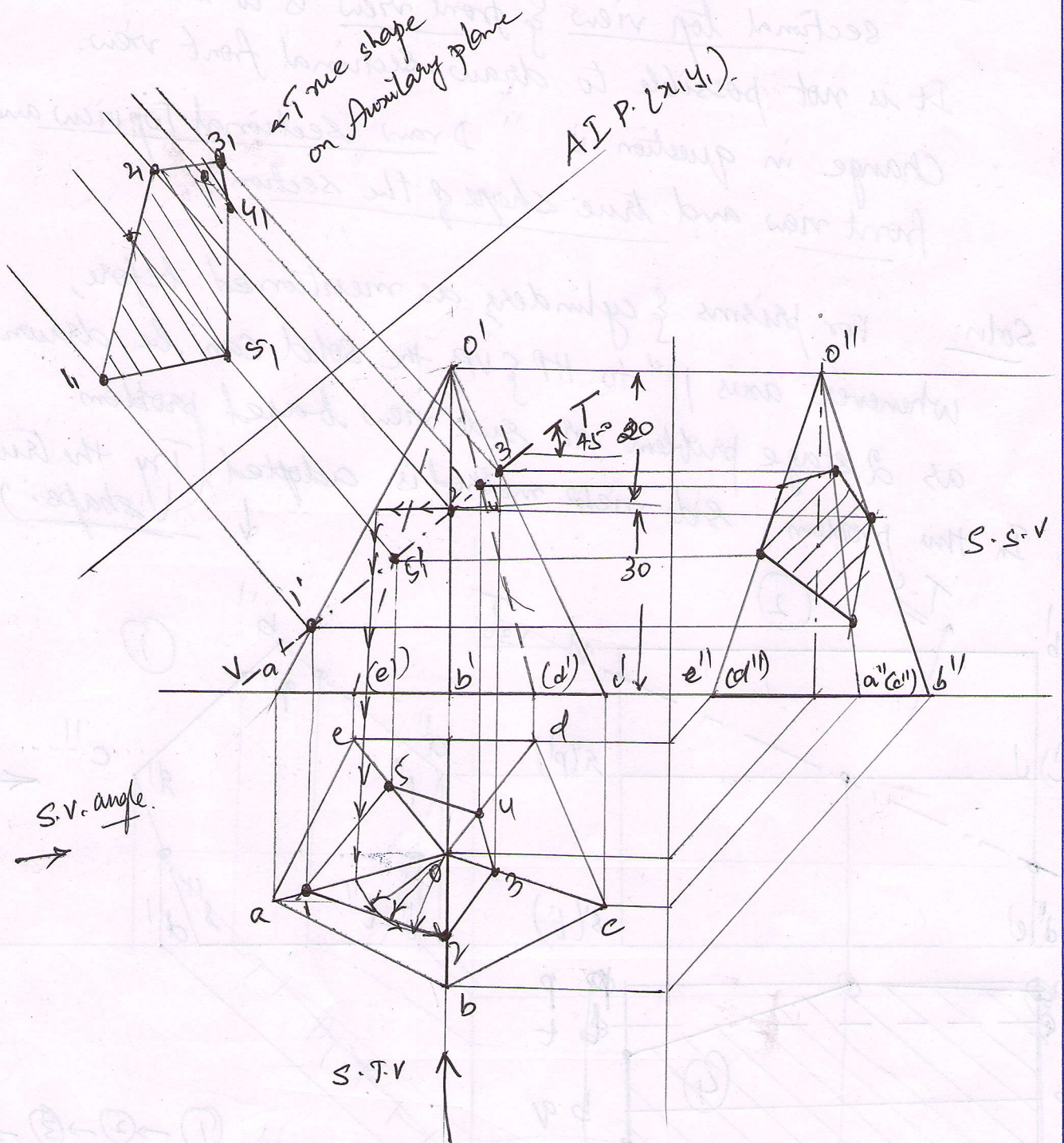


19. A square pyramid side of base 40mm and axis height 75mm long has its base in H.P with all the base edges equally inclined to the V.P. it is cut by a section plane perpendicular to the VP and the VT of which is inclined at 45° to XY and bisects the axis. Draw its sectional top view, Sectional side view and the true shape of the section. (hint: VT \rightarrow angle to HP).



Q. A pentagonal pyramid of base 30mm side and height 50mm stands with its base on HP such that an edge of its base is parallel to VP. It is cut by a plane, normal to VP, the VT of which makes 45° to the XY, passing through a point on the axis, 30mm above the base. Draw its sectional top view, sectional side view and true shape of the section. (Hint: VT \rightarrow angle is w.r.t HP)

Soln.

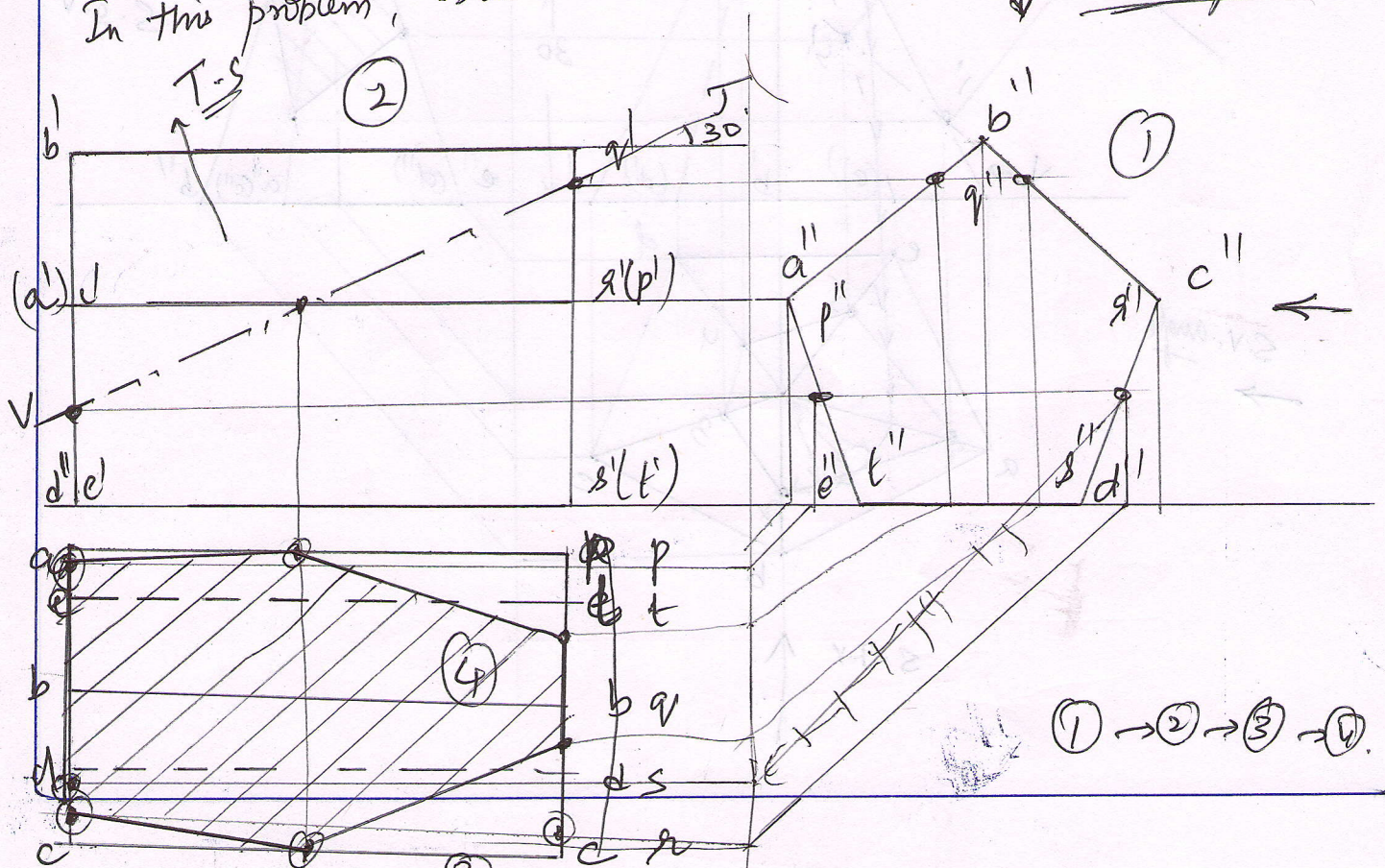


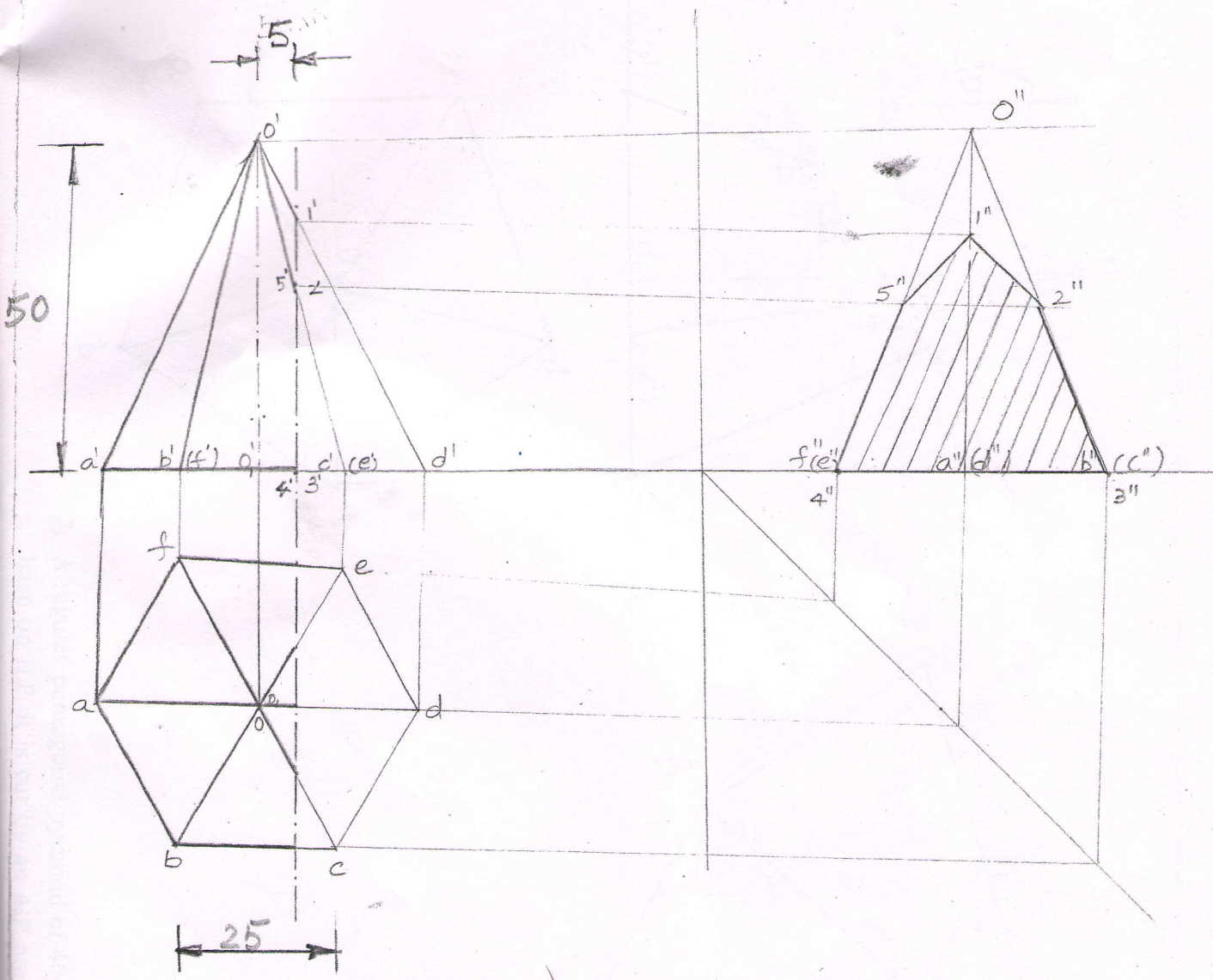
Q1. A pentagonal prism with side of its base 50mm and length 100mm has a rectangular face on the HP and the axis parallel to the VP. It is cut by a section plane normal to the VP and makes an angle of 30° with the horizontal and bisects the axis of the prism. Draw sectional front view, top view and true shape of the section.

(A) Correction: When section plane is 30° with HP, then sectional top view & front view is to be drawn.

It is not possible to draw sectional front view.
 \therefore Change in question is "Draw Sectional Top view and front view and true shape of the section"

Soln: For prisms & cylinders, as mentioned before, whenever axis \parallel to HP & VP, the solid can be drawn as 2 stage problem or side view based problem. In this problem, side view method is adopted. (Try the true shape.)





Q.22

A hexagonal pyramid, side of base 25 mm axis 50 mm long is resting on its base on H.P, with an edge of the base parallel to V.P. A section plane perpendicular to both H.P and V.P cuts the solid, 5mm away from the axis. Draw the sectional side view of the cut solid.

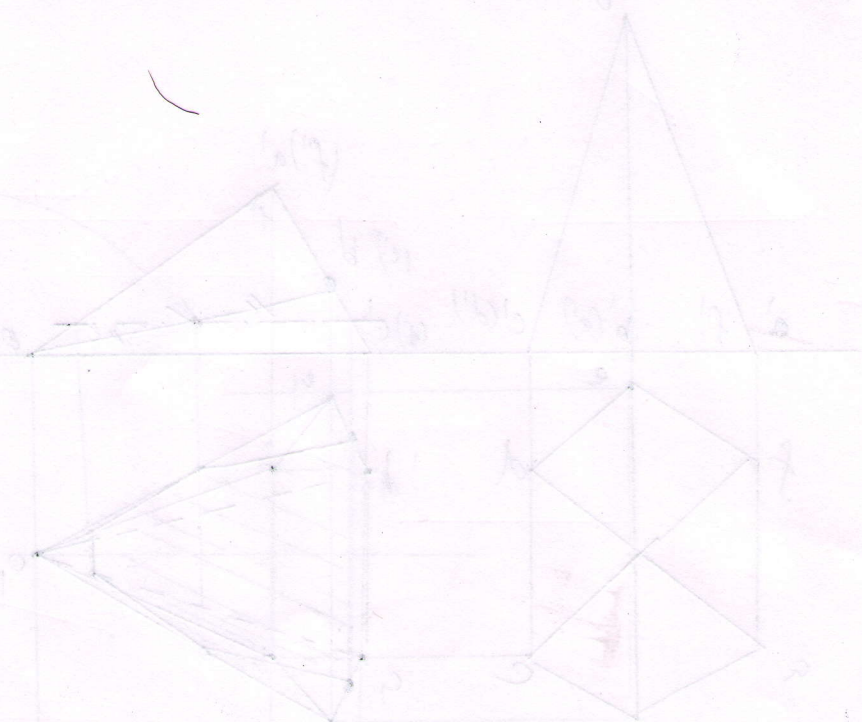
(Jan 2011)

Q2. A hexagonal pyramid, side of base 25mm axis 50mm long is resting on its base on HP, with an edge of the base parallel to VP. A section plane perpendicular to both HP and VP cuts the solid, 5mm away from the axis. Draw the sectional side view of the cut solid.

Whenever the section plane is perpendicular to both HP & VP, its sectional side view alone can give some picture about the cut portion.

Hence, sectional front view & sectional ^{TOP} ~~side~~ view do not exist for this type of section planes.

Refer solution enclosed.



A hexagonal pyramid, base 30 mm sides and axis 65 mm long is resting on one of its triangular faces on the HP with its axis parallel to the VP. A horizontal section plane bisects the axis of the solid. Draw the projections and sectional view. [Refer Text book Probs NO: 14.14, 14.15]

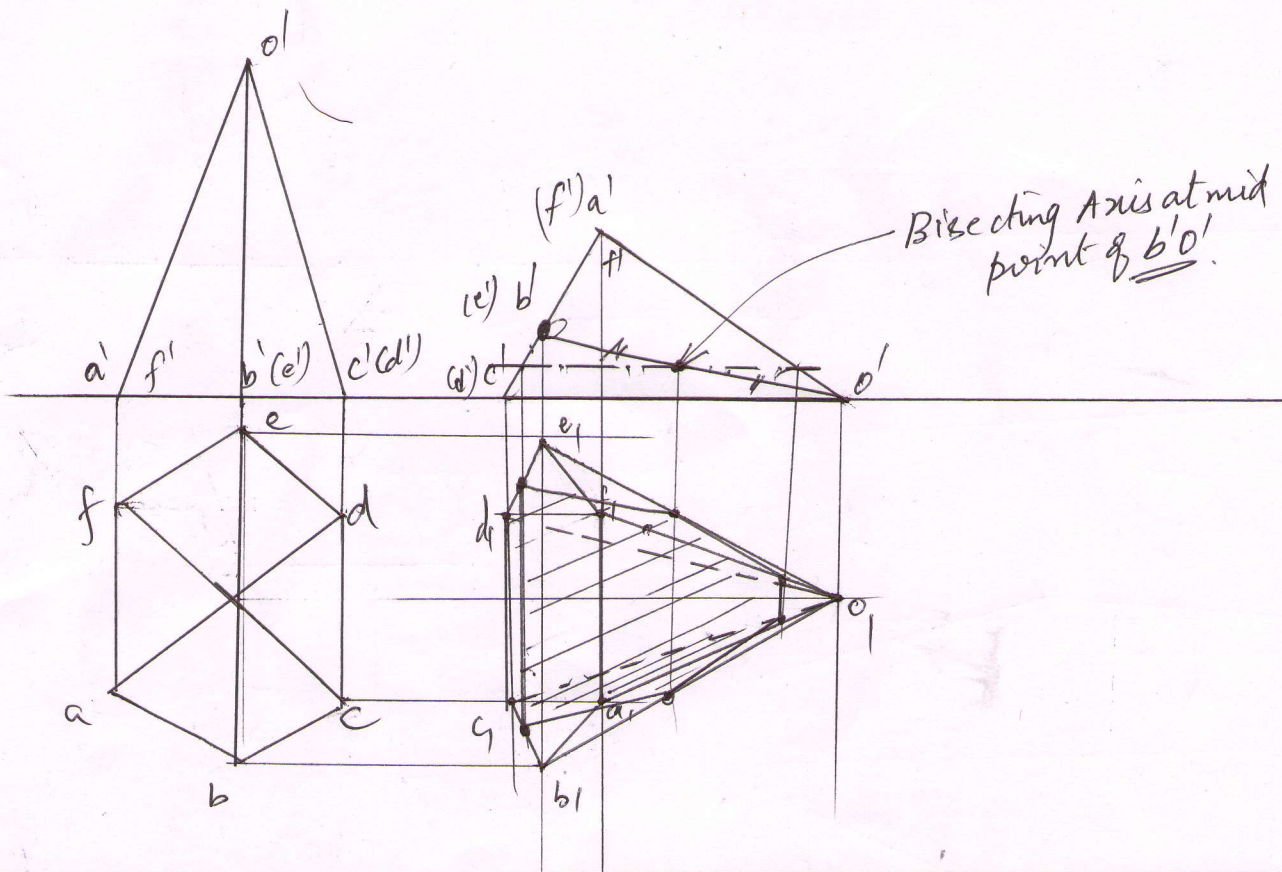
Hexagonal pyramid (B, H) = (30, 65). ($\theta = 120^\circ$)

Axis/Face condition: Triangular face on HP.

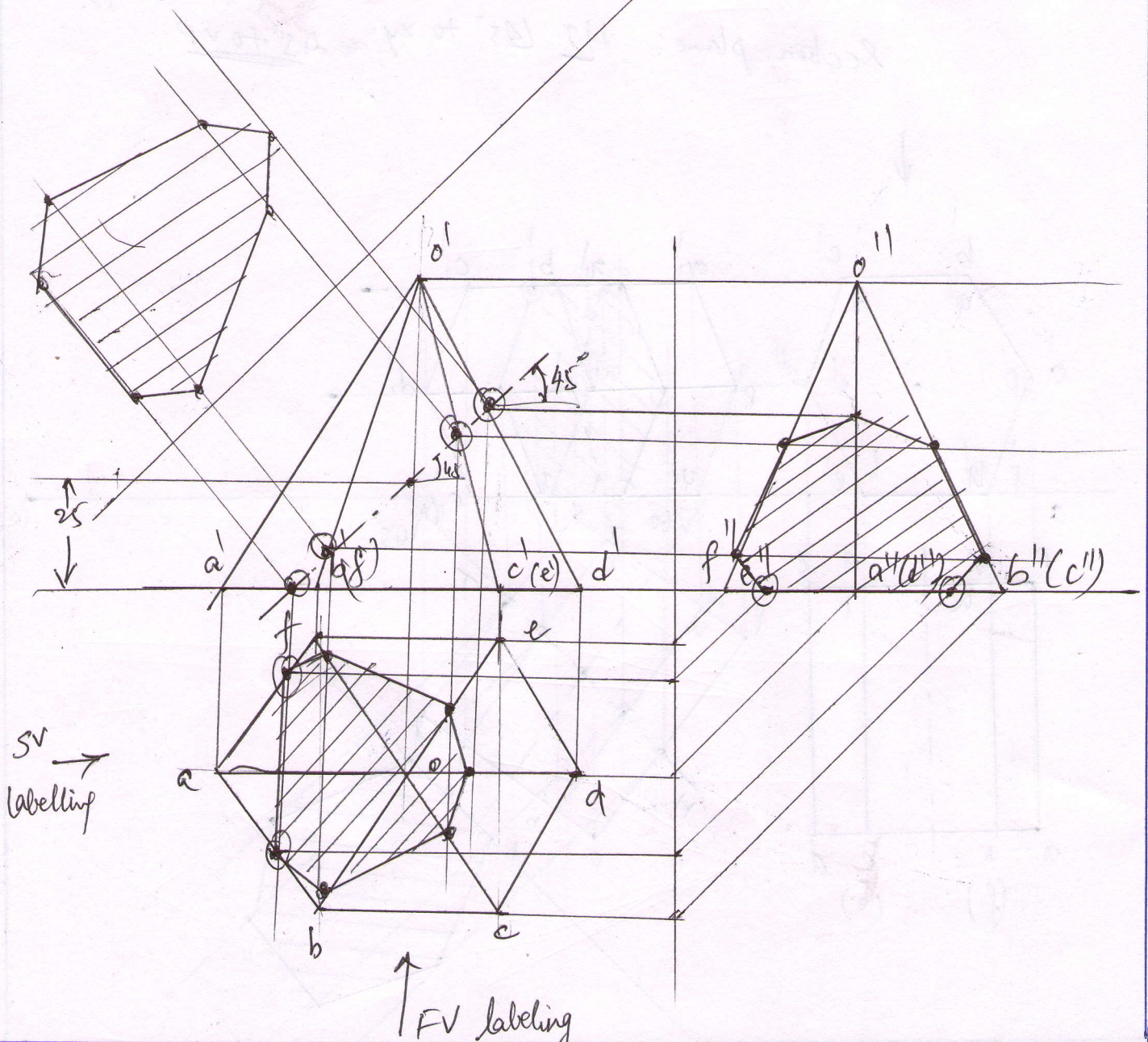
\therefore It is a 2 stage problem, to be started with base on HP & starting side \perp to xy [Refer Triangular face probs in Solids].

Section plane: Horizontal \Rightarrow \parallel to HP

\therefore It cuts above xy & hence sectional top view is to be drawn.



4. A hexagonal pyramid, base 30mm side and axis 65mm long, is resting on its base on the HP with two edges parallel to the VP. It is cut by a sectional plane, perpendicular to the VP, inclined at 45° to the HP (also stated as the VT of the plane makes 45° to the XY) and intersecting the axis at a point 25mm above the base. Draw the front view, sectional top view, sectional side view and true shape of the section. (Refer Prob NO: 14.13 in text book).



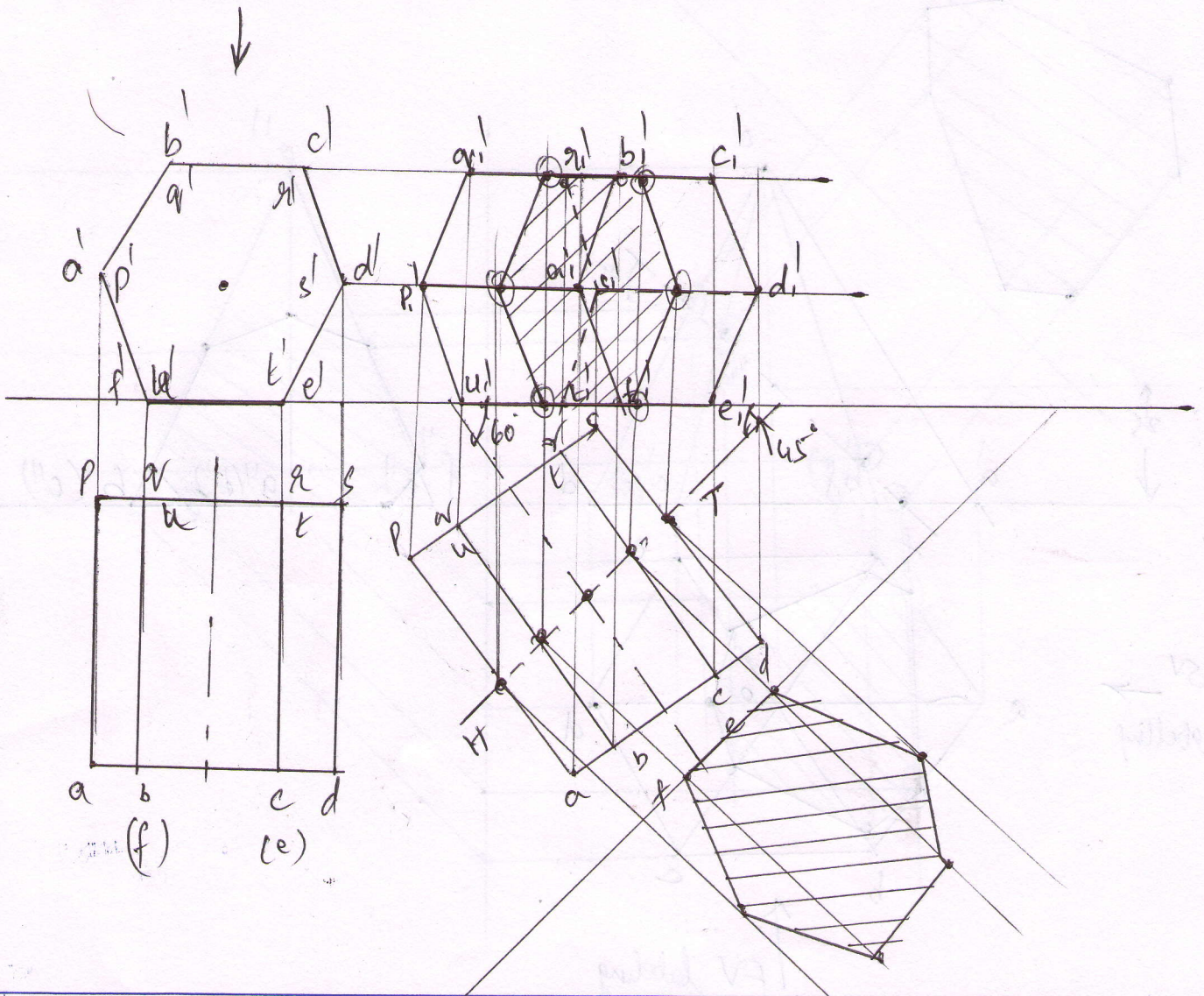
A hexagonal prism of base 30mm and axis 50mm has a rectangular face on the HP and its axis makes an angle of 60° with the V.P. It is cut by a vertical plane, the HT of which makes 45° to the XY line, bisecting the axis. Draw the sectional front view of the section and true shape of the section. (Hint: HT angle \rightarrow angle w.r.t to VP)

Hexagonal prism: $(B, H) = (30, 50)$.

Axis position: 60° to VP \Rightarrow 2 stage problem.

face / side position: Rect' face on HP \Rightarrow side on HP (11° to xy).

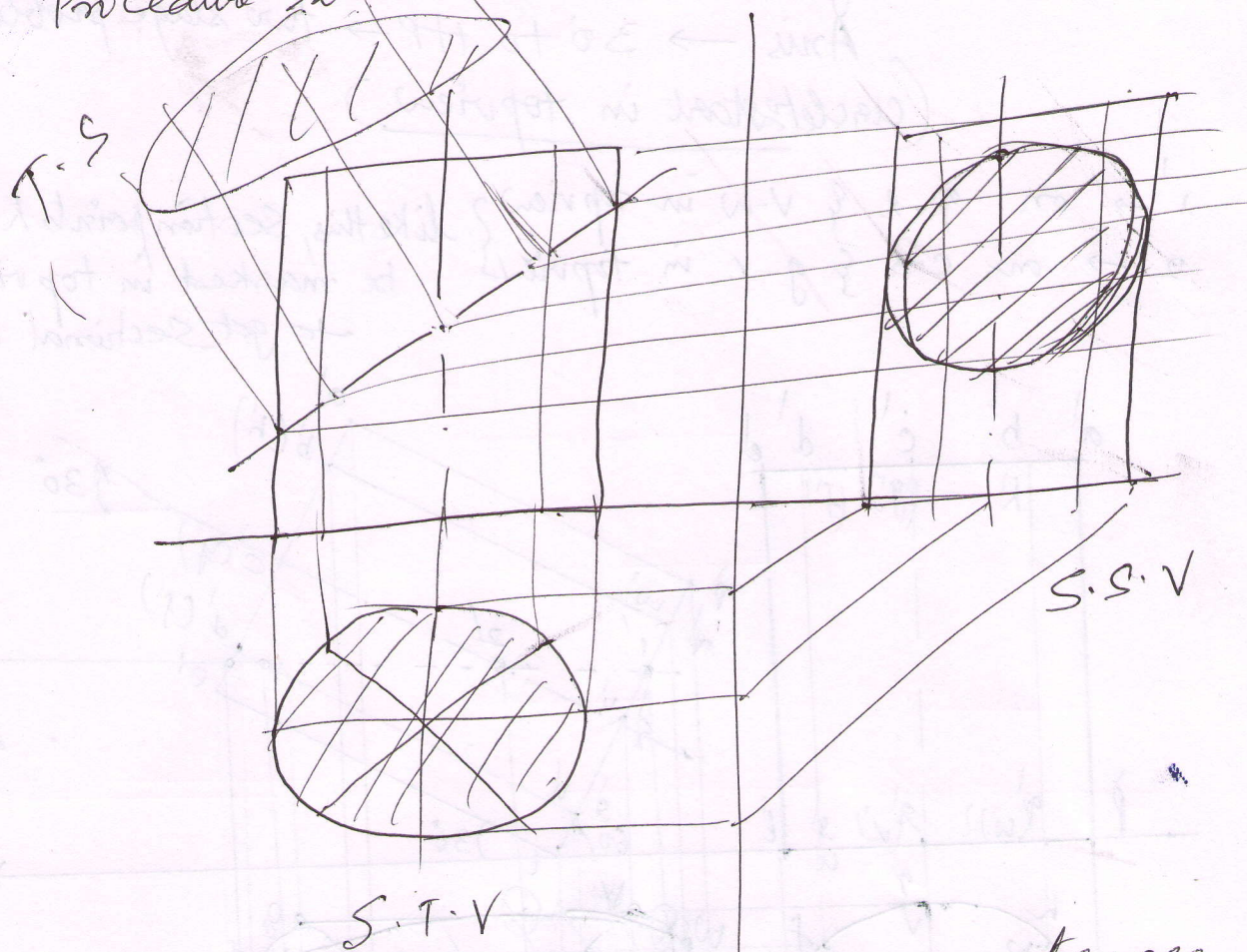
Section plane: HT 45° to xy \Rightarrow 45° to VP



A cylinder of base 40mm diameter and 60mm height, having its axis vertical is cut by a section plane, perpendicular to the VP and inclined at 45° to the H.P, intersecting the axis 30mm above the base. Draw the sectional side view, sectional top view and obtain the true shape of the section.

Refer prob NO: 14.17 of Text book.

Procedure similar to probs NO: 19, 21 & 27.



* Note

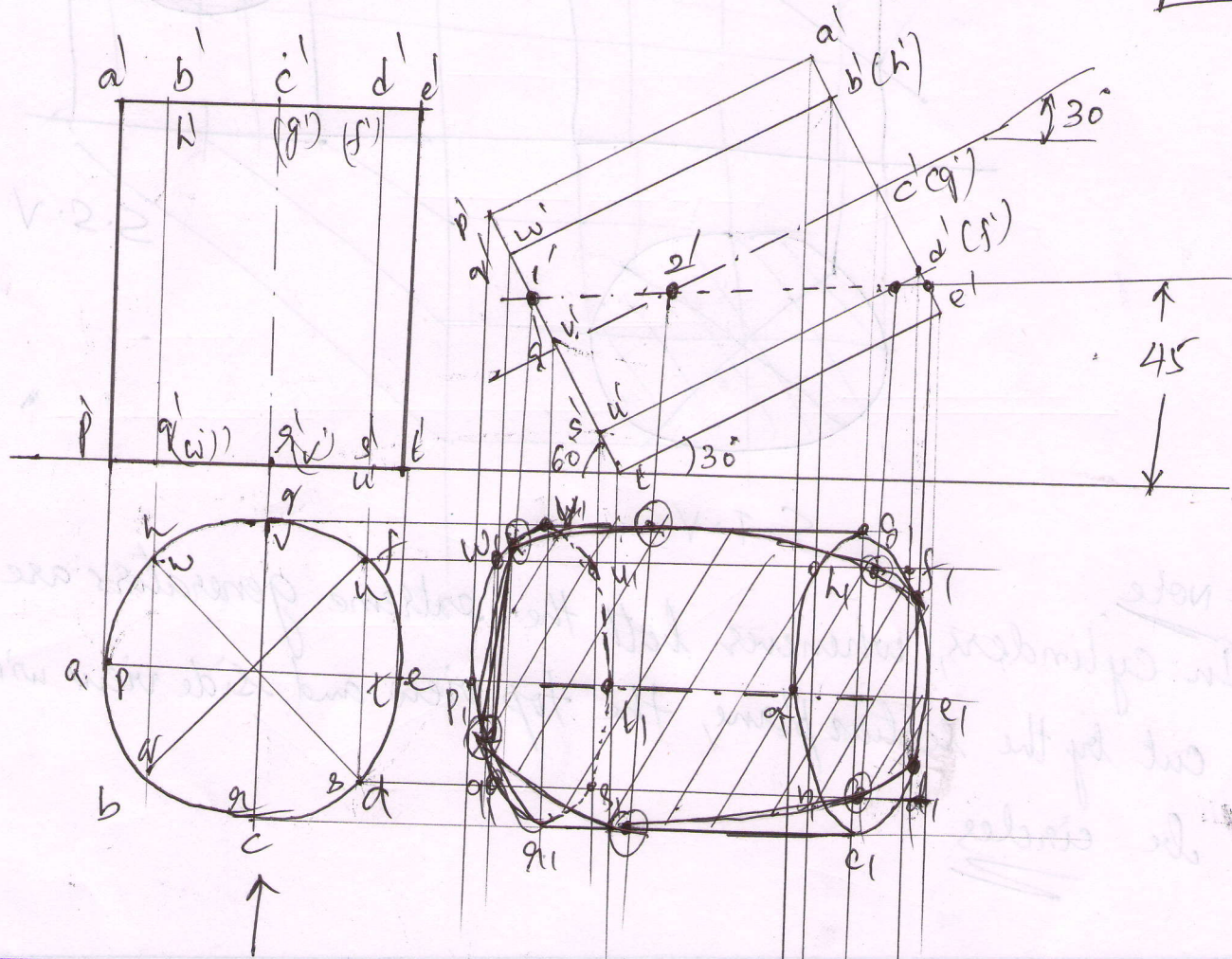
In cylinders, whenever both the extreme generators are cut by the section plane, the top view and side view will be circles

27. A Cylinder of diameter 50mm and axis 75mm long rests on one of the points of the base in HP and its axis parallel to VP and inclined to HP at 30° . A horizontal sectioning plane cuts the cylinder at a distance 45mm above the HP. Draw the sectional plan and elevation and the true shape of the section (plan \rightarrow TV ; Elevation \rightarrow FV)

Solid: Cylinder (ϕ 50, 75);

Axis $\rightarrow 30^\circ$ to HP \rightarrow two stage problem.
 (construction start in top view)

1' \rightarrow on p-r & v-w in top view } like this, section points have to
 2' \rightarrow on c-r & g-v in top view } be marked in top view
 to get sectional top view



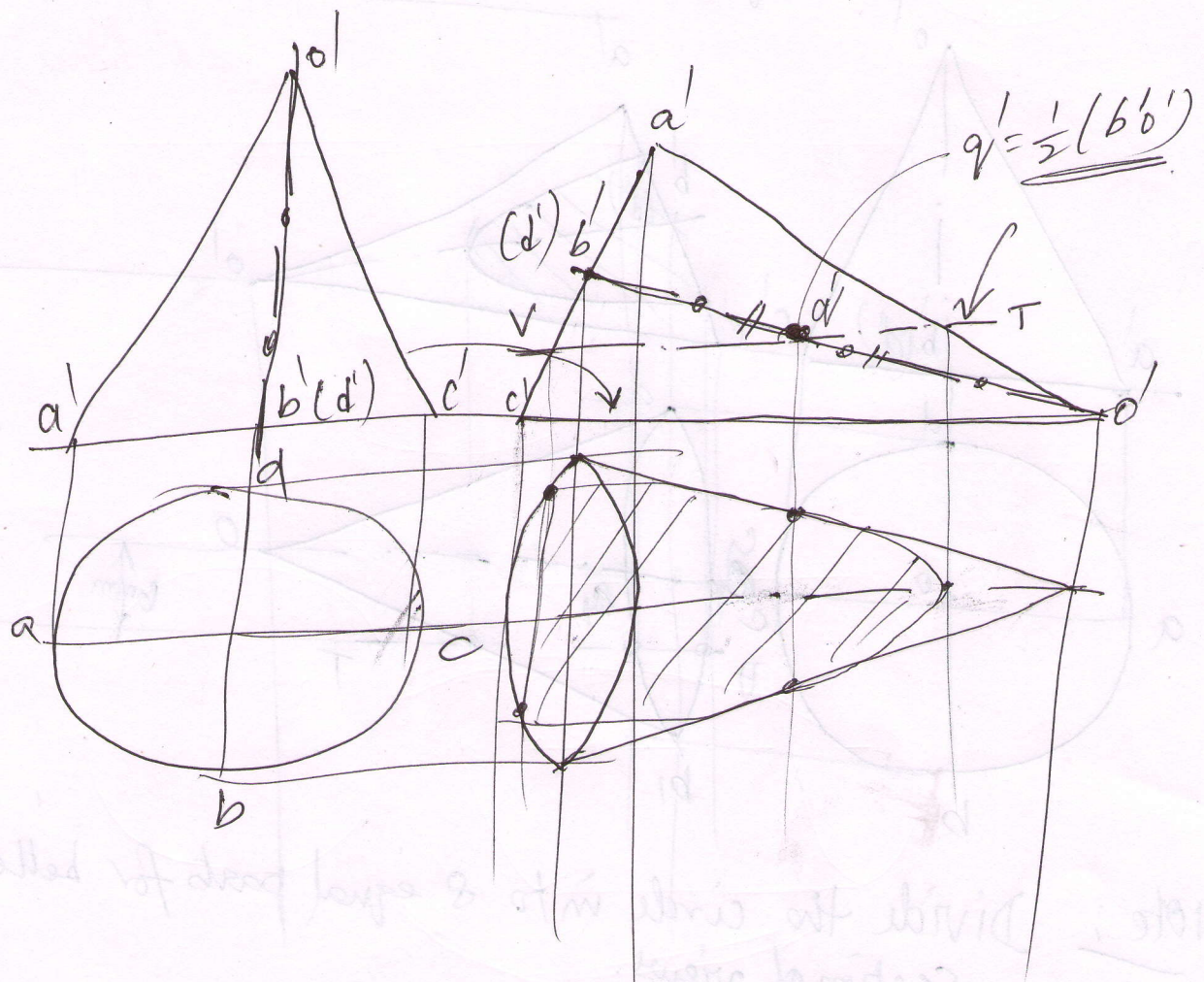
98.

A cone of base 50mm diameter and axis 80mm long is lying on one of its generators with the axis parallel to the VP. A horizontal section plane bisects the axis of the solid. Draw the projections showing its sectional top view.

Refer to prob No: 14.27 in text book

Note: → Cone to be drawn in two stages as generators on HP (Refer solids → Generator based 2 stage problems)

→ Horizontal section plane ⇒ ||^{er} to HP
 ∴ above xy line to be drawn.



29.

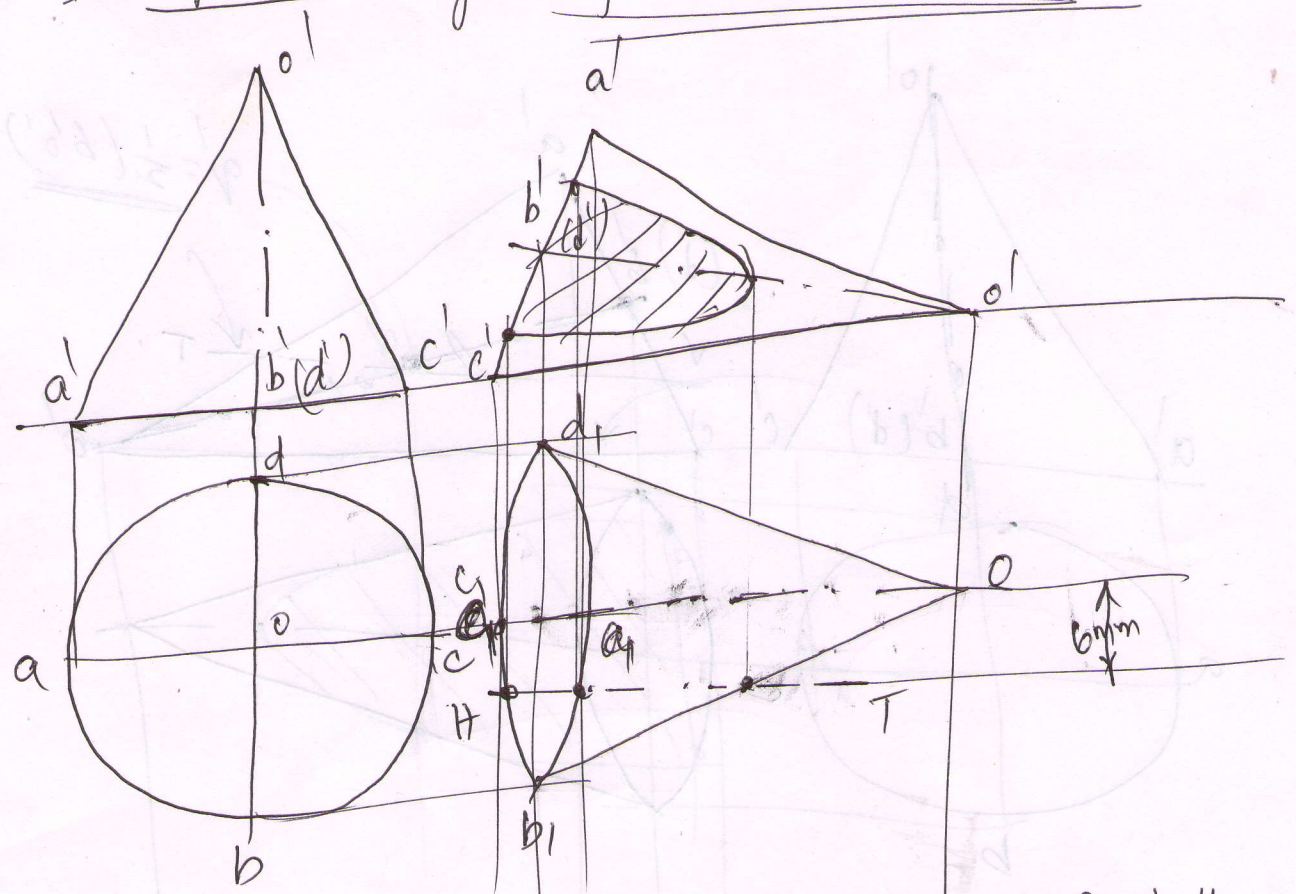
A cone, base 65mm diameter and axis 75mm long is lying on the HP on one of its generators with the axis parallel to the VP. A section plane which is parallel to the VP cuts the cone 6mm away from the axis. Draw the sectional front view and development of the surface of the remaining portion of the cone.

(A)

Solid \rightarrow Cone \rightarrow ($\phi 65, 75$) \rightarrow 2 stage problem
 (\because Generator on HP \rightarrow ① Base on HP ② Generator on HP.)

Section plane: \parallel^e VP \rightarrow in TV to be drawn.
 6mm away from axis \Rightarrow can be towards VP or away from VP

Development: Try using Radial line method.

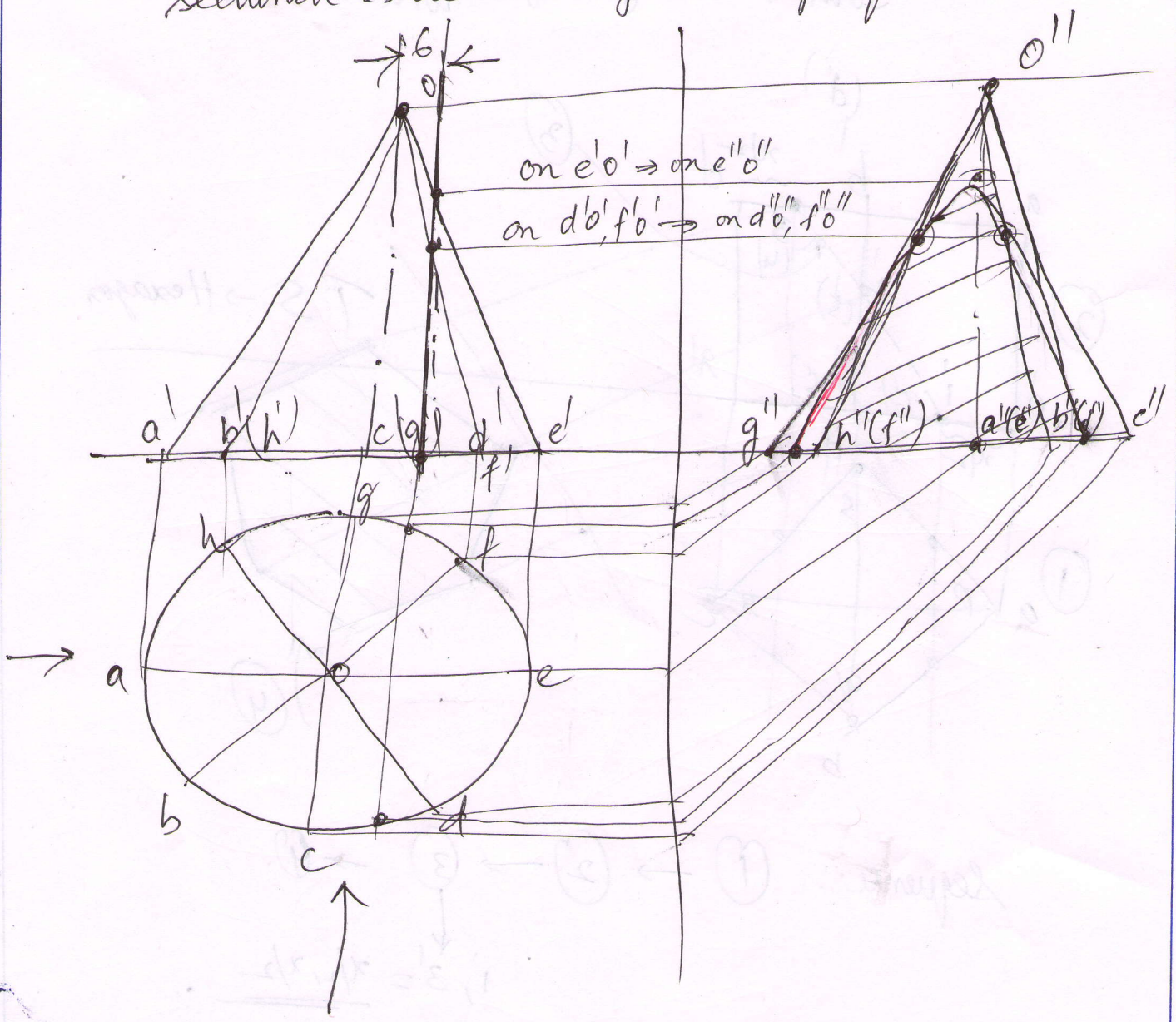


Note: Divide the circle into 8 equal parts for better sectional views.

30. A cone of base 45mm diameter and axis 55mm long is resting on the HP on its base. It is cut by a section plane, perpendicular to both HP and VP and 6mm away from the axis. Draw its front view, top view and sectional side view.

Refer prob No: 14.26 in Sections of Cones in textbook.

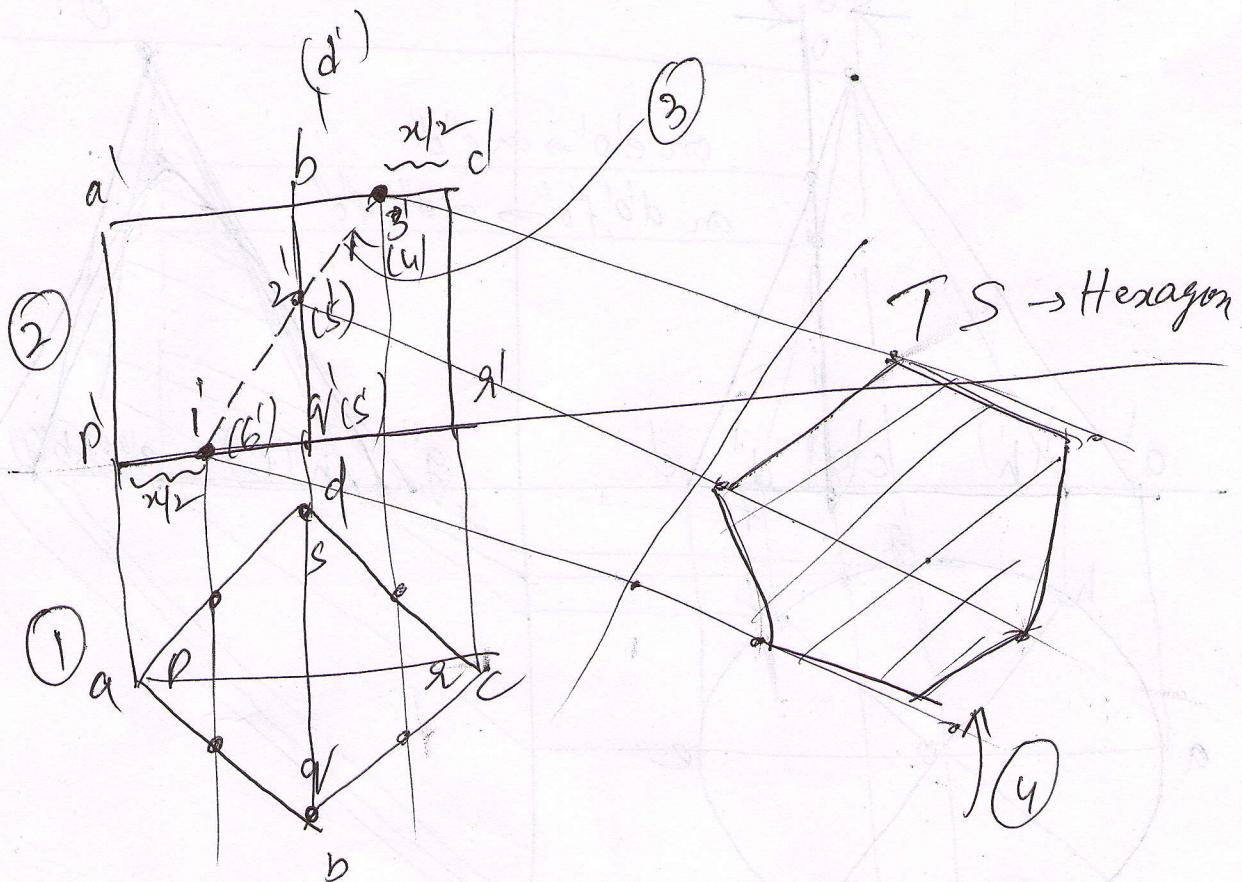
As section plane is \perp to both HP & VP, the sectional side view gives shape of section.



A cube of 65mm long edges has its vertical faces equally inclined to the VP. It is cut by a section plane, perpendicular to the VP, so that the true shape is a regular hexagon. Determine the inclination of the cutting plane with the HP and draw the sectional top view and true shape of the section.

Refer Solution

Hint: choose $1' \ \& \ 3'$ as midpoints of $p'q'$ and $b'd'$.
Join $1'-3'$ to get angle of the plane & true shape will be hexagon.



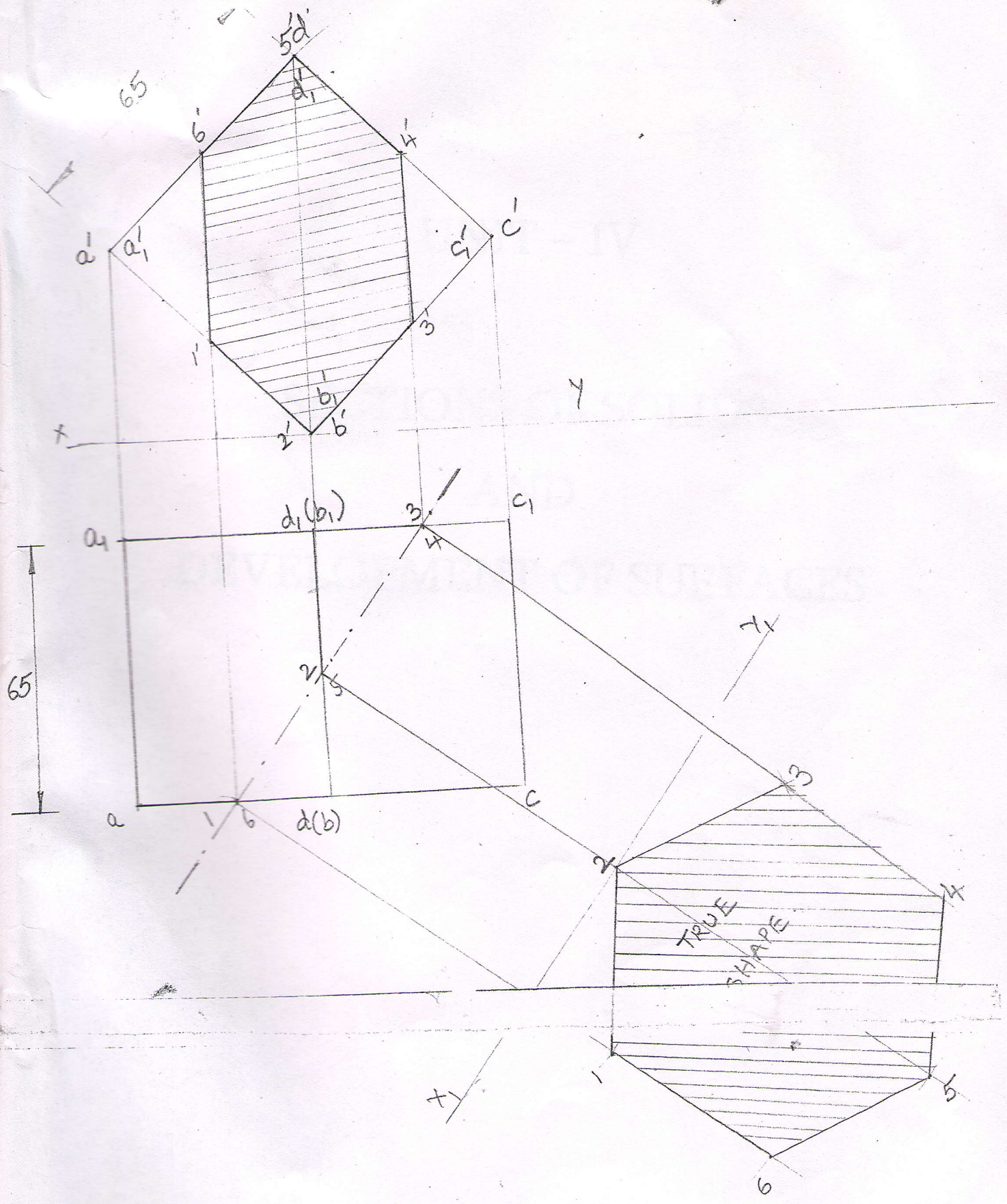
Sequence: (1) → (2) → (3) → (4)

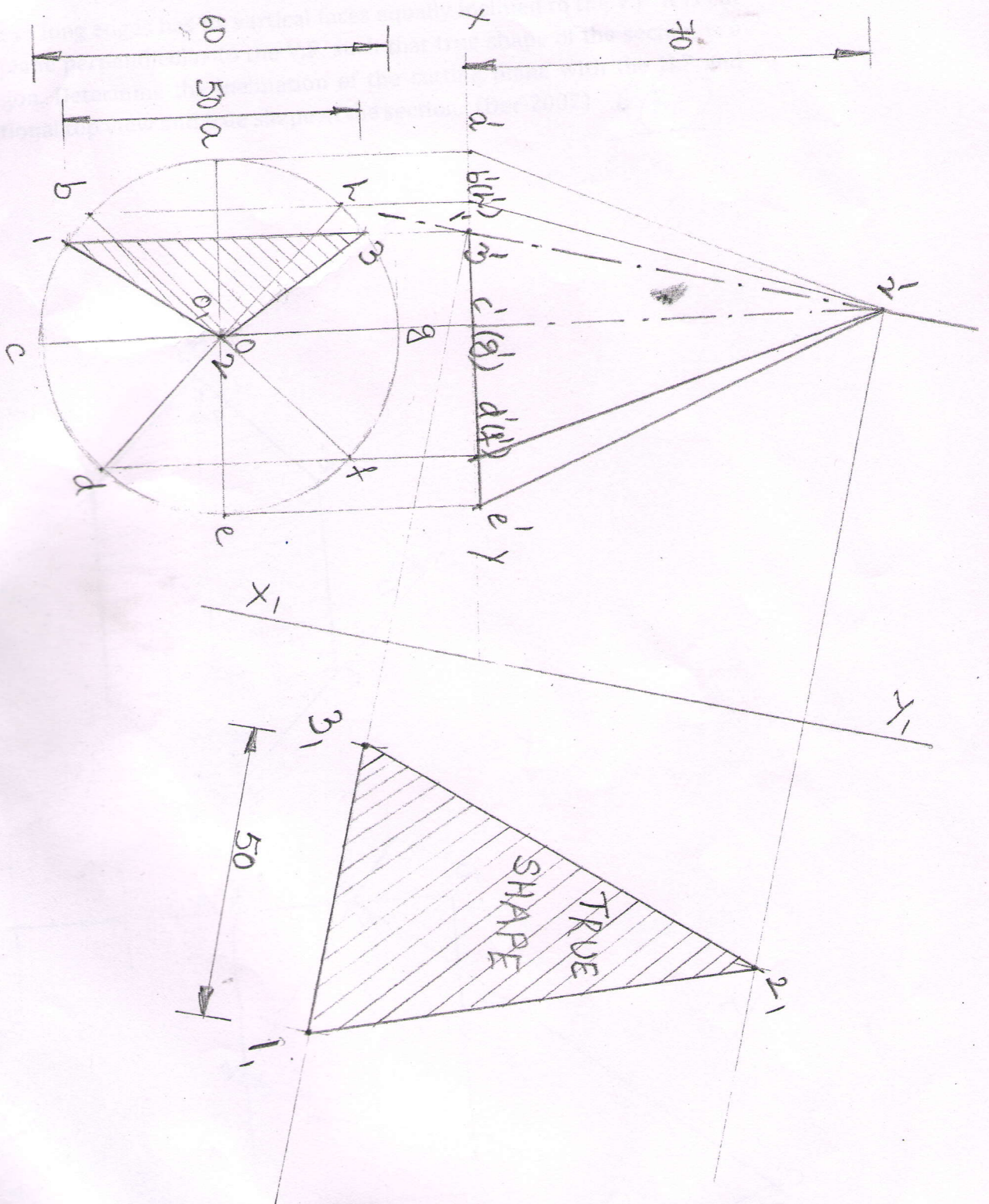
$$1', 3' = \underline{\underline{x/2, x/2}}$$

21
10

A cube of 65mm long edges has its vertical faces equally inclined to the V.P. It is cut by a section plane perpendicular to the V.P. such that true shape of the section is a regular hexagon. Determine the inclination of the cutting plane with the H.P and draw the sectional top view and true shape of the section. (Dec 2007)

31





9. A cone diameter of the base 60 mm and axis 70 mm long is resting on its base on the ground. It is cut by an auxiliary inclined plane so that the true shape of the section is an isosceles triangle having 50mm base. Draw the front view sectional top view and the true shape of the section

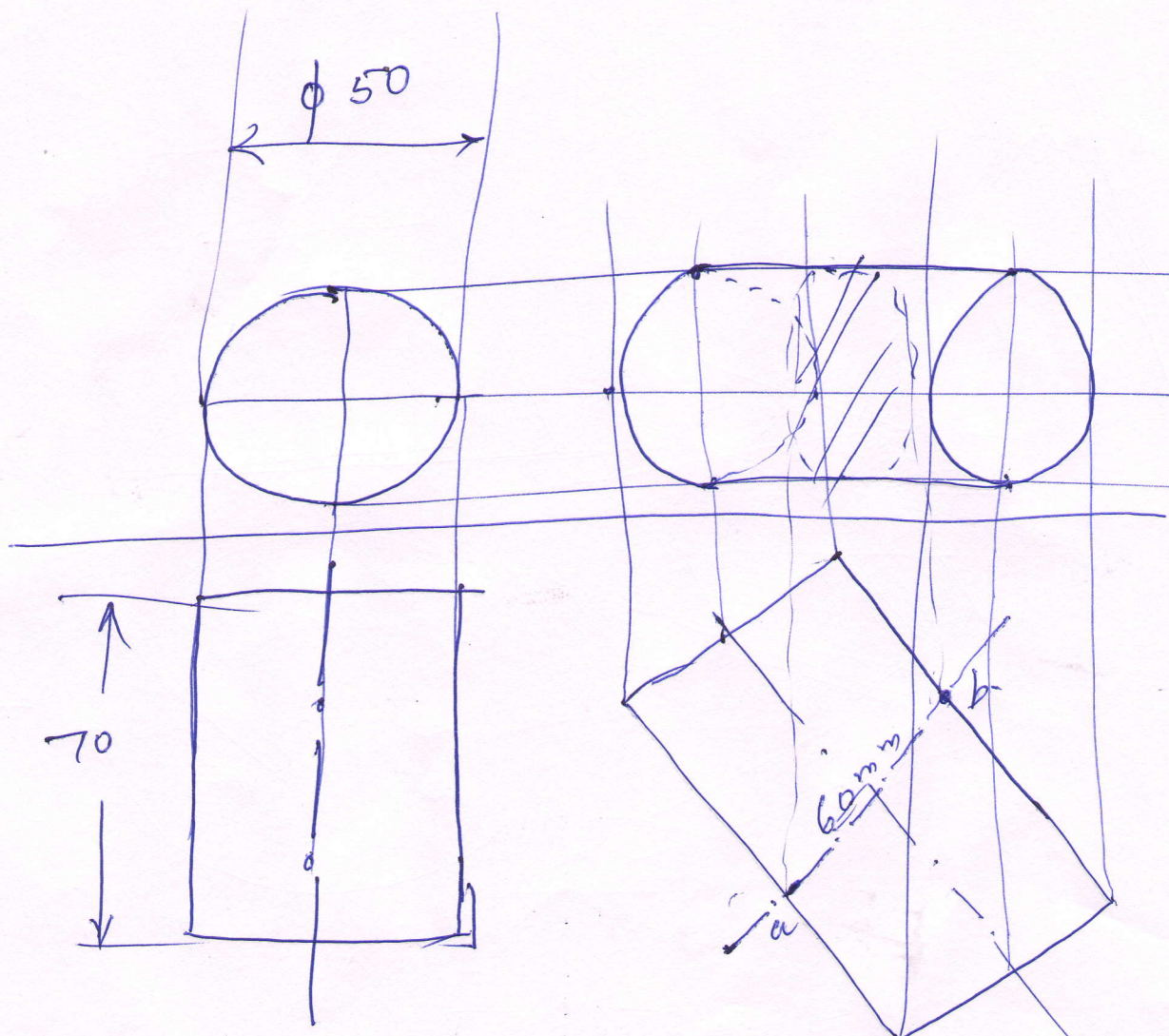
32.

A cylindrical prism of 50mm diameter and 70mm long has its axis parallel to H.P. and inclined at 30° with V.P. It is cut by a vertical section plane such that the true shape of the section is an ellipse with major axis of 60mm long. Draw its sectional front view and true shape of the section.

Assignment

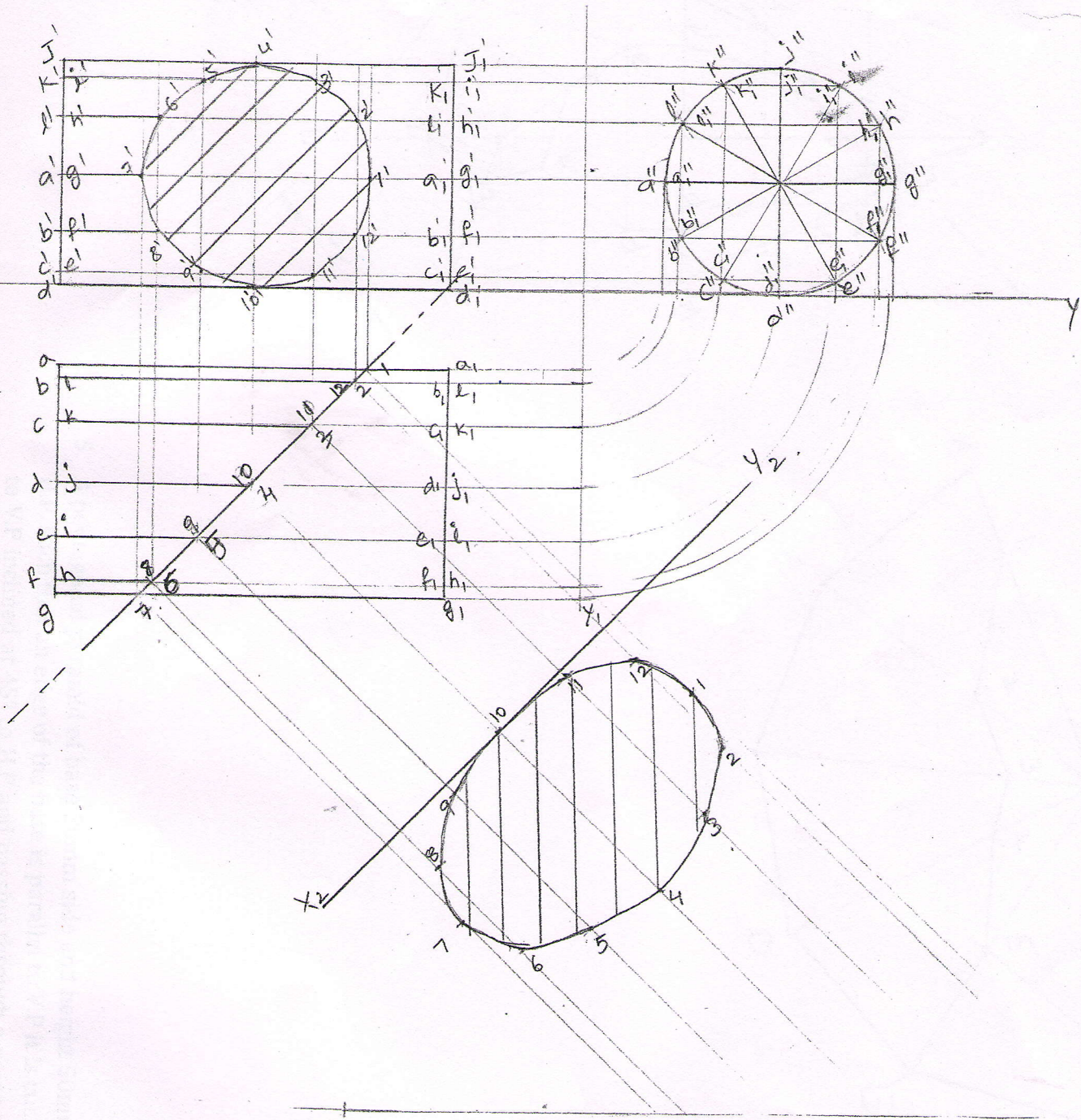
(A)

Solution similar to problem No: (31)



Select angle of section plane such that ab = 60mm

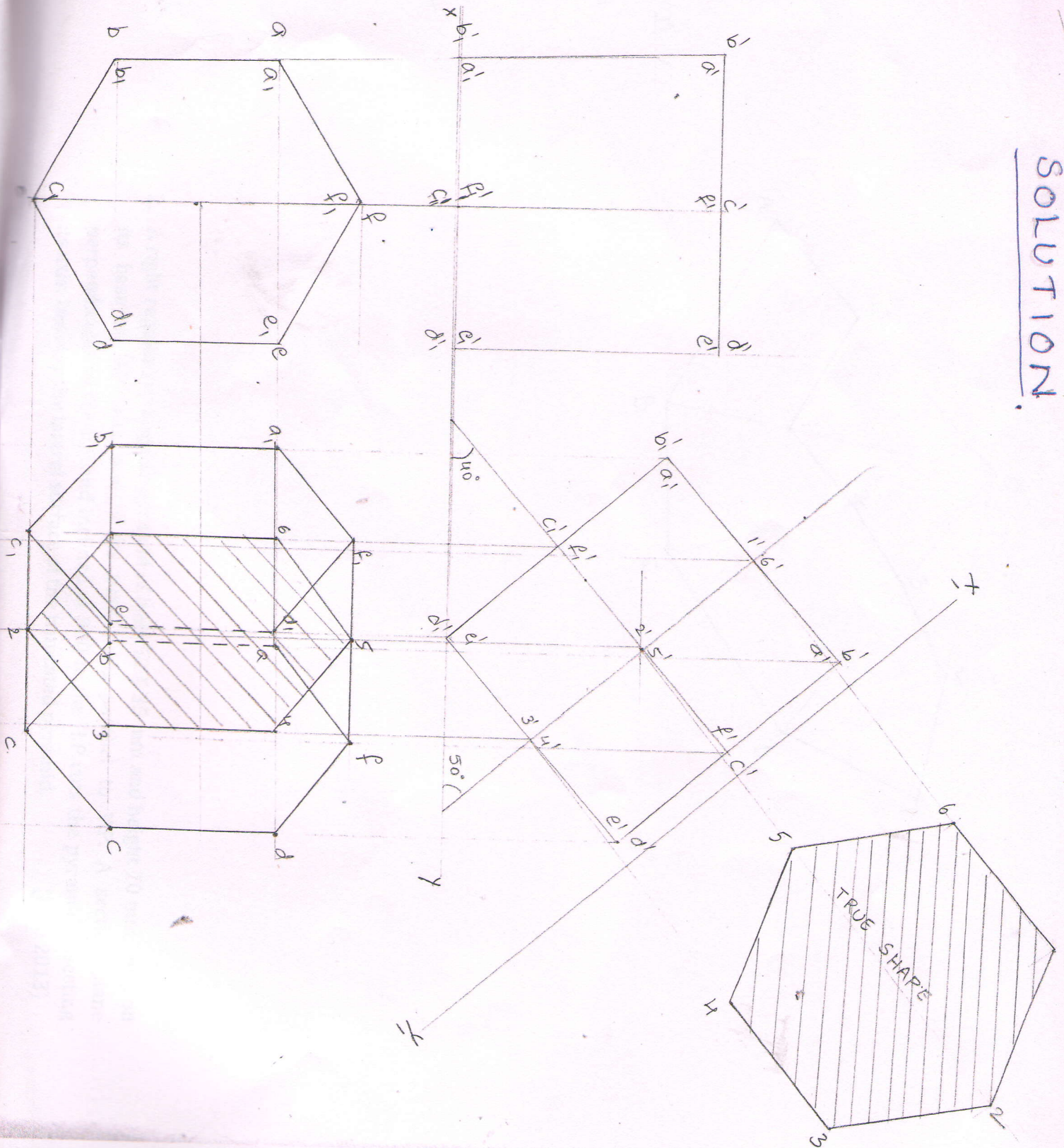
4. A cylinder of base diameter 40 mm and axis height 70 mm is resting in H.P on one of its generators with the axis parallel to both H.P and V.P. It is cut by a section plane that is perpendicular to H.P and inclined at 45° to V.P. Draw the sectional view and true shape of the section if the section plane bisects the axis (June 2012)



1. A hexagonal prism is standing in H.P on one of its edges with this edge perpendicular to the V.P. The axis makes an angle of 40° with H.P. it is cut by a section plane that is perpendicular to both V.P and the axis. The section plane bisects the axis. Draw its sectional views and true shape of the section. Base side is 40 mm, axis height is 65 mm.

(Dec 2013)

SOLUTION.



3. A right regular pentagonal pyramid, side of base 25mm and length of axis 60mm lies on one of its triangular faces on H.P with its axis parallel to V.P. A section plane perpendicular to the H.P and inclined to the V.P at 35° cuts the pyramid bisecting its axis. Draw its top view sectional front view and true shape of the section.

