

Syllabus

Unit-1:- Introduction to engineering drawing.

Principles of engineering drawing and their significance. Conventions in drawing, letters, BIS [Bureau of Indian standards] Conventions.

- a) Conic sections including the rectangular hyperbola - General methods only.
- b) Cycloid, Epicycloid and hypocycloid - General methods only.

Unit-2 :- Projection of points

Projection of points in co-ordinate lines inclined to one or both planes, finding true lengths, true angles made by line.

Unit-3 :- Projection of planes

Projection of regular plane inclined to both the planes and also draw the projections of different planes in auto CAD (Computer Aided designs)

Unit-4 :- Projection of Solids.

- a) Projections of regular solids inclined to one (or) both planes by rotational methods.

b) Development of Solids.

Development of lateral surfaces of right regular solids (without section) - Prism, Cylinder, Pyramid and Cone.

Unit-5 :- Isometric and Orthographic projections.

Principles of isometric projections, isometric scale, isometric views, conventions, isometric use of lines, planes, simple solids

(cube, cylinder and cone), isometric projections of spherical parts,

Convention of isometric views to Orthographic views and also draw the isometric views using auto CAD.

Engineering Drawing

- Engineering drawing is a two dimensional representation of a three dimension object.
- Engineering drawing is a universal language for engineers.
- In engineering drawing it is possible to manufacture a drawing if the given dimensions as per require shape and sizes.

Different sizes of drawing sheets :-

A₀ - 1189 x 841

A₁ - 841 x 594

A₂ - 594 x 420

A₃ - 420 x 297

A₄ - 297 x 210

A₅ - 210 x 148

Different types of lines :-

— Continuous thin line

— Continuous thick line

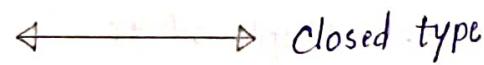
- - - Continuous dotted line (or) hidden line

— — — Centre line (or) Axis lines.

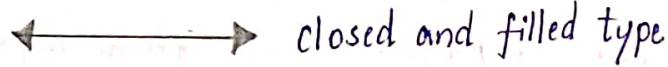
Different types of arrow heads :-



Open type



Closed type



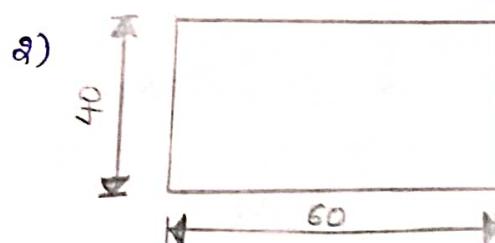
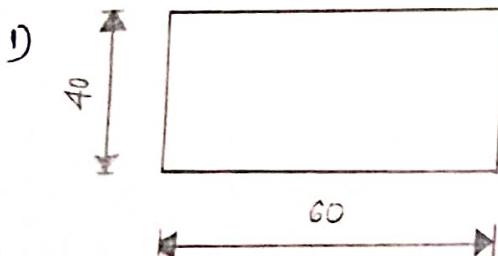
Closed and filled type

→ Ratio of arrow heads is 3d : d (or) 3n : n

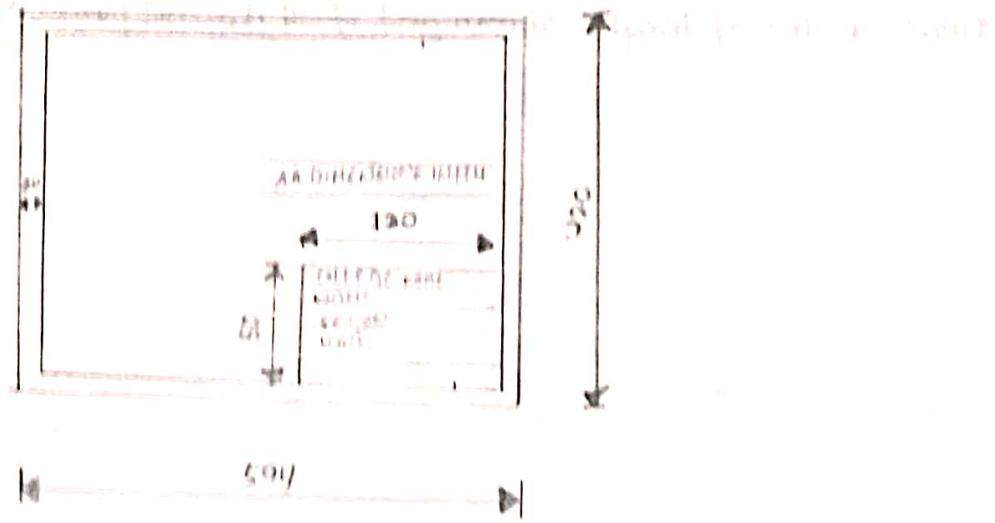
Dimension systems :-

i) Allined system

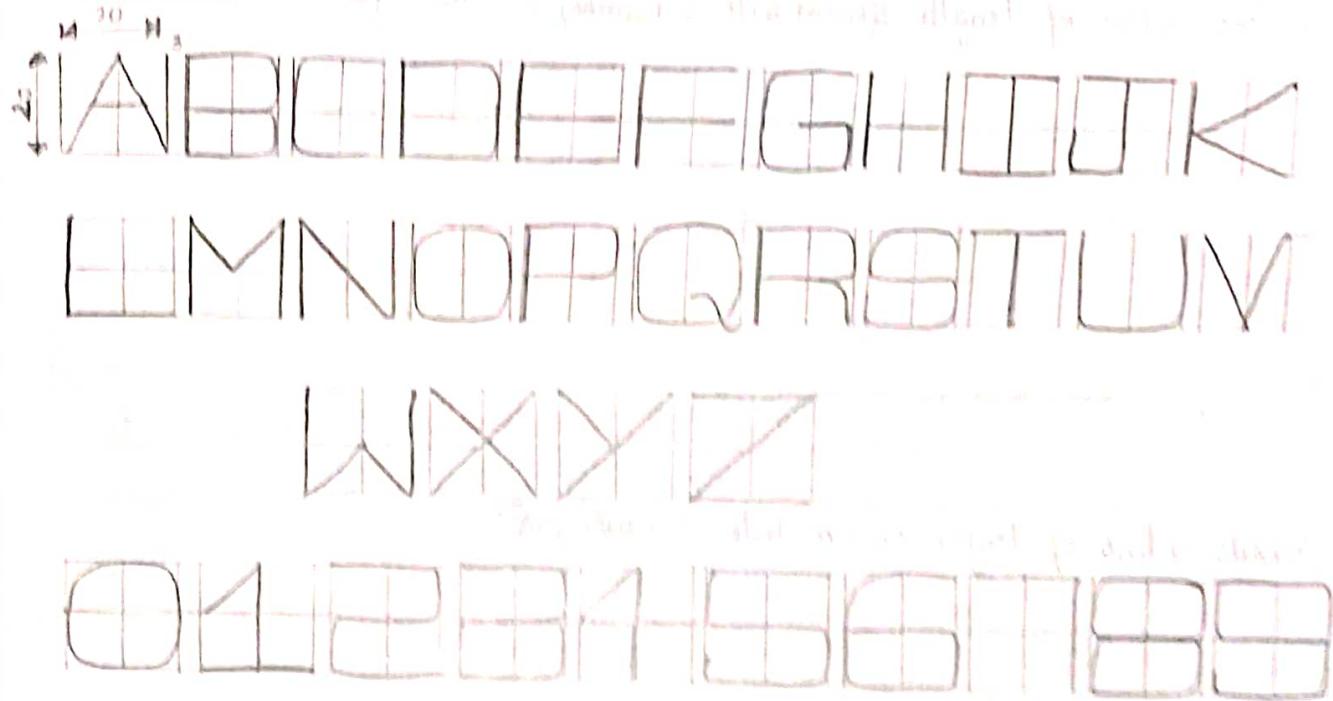
ii) Unidimensional system.



Layout of drawing sheet :-

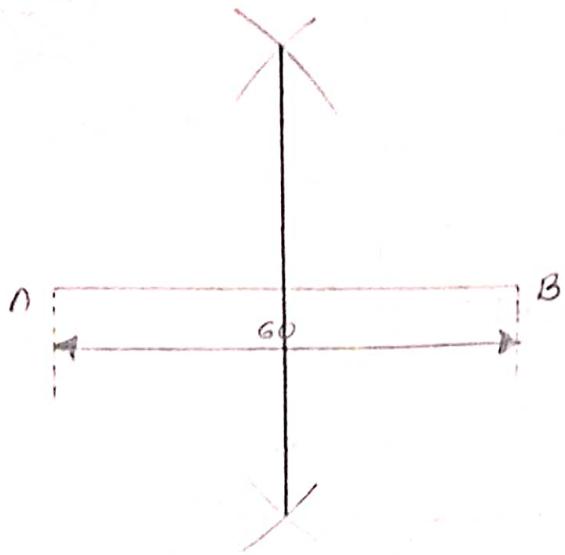


Lettering :-

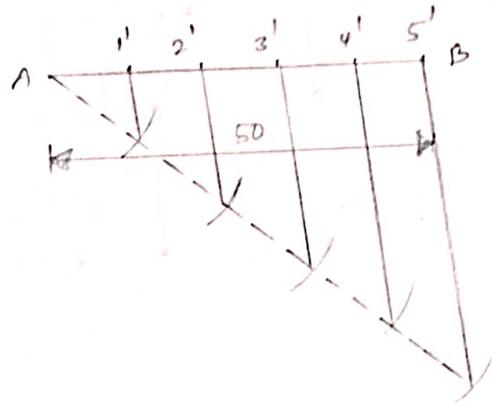


Geometrical Constructions:-

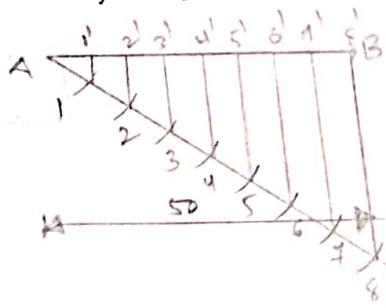
draw a line of length 60mm and find it's mid point by line bisection.



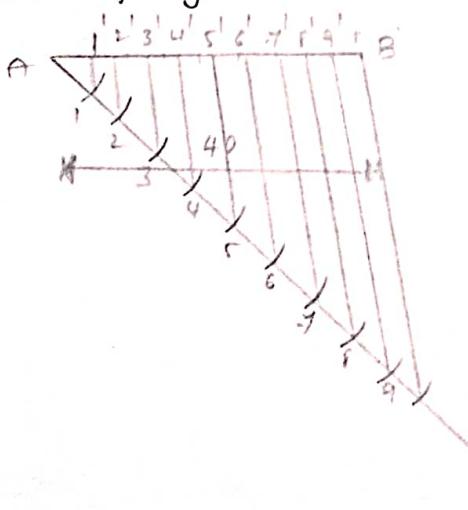
Divide a line of length 50mm into 5 numbers of equal parts.

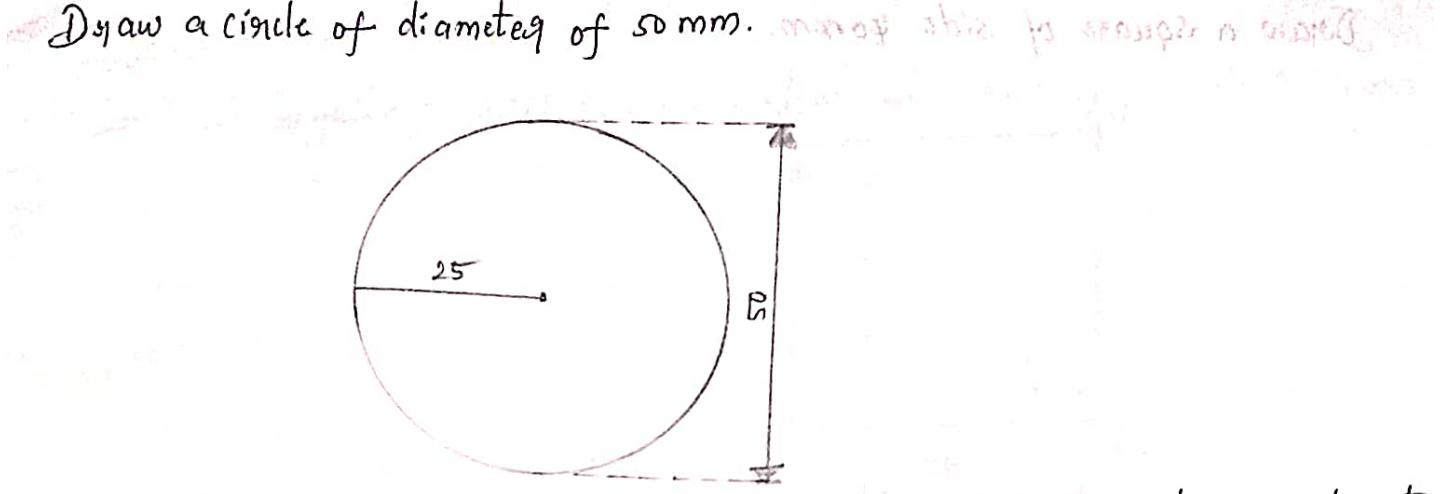


Divide a line of length 50mm into 8 equal parts.

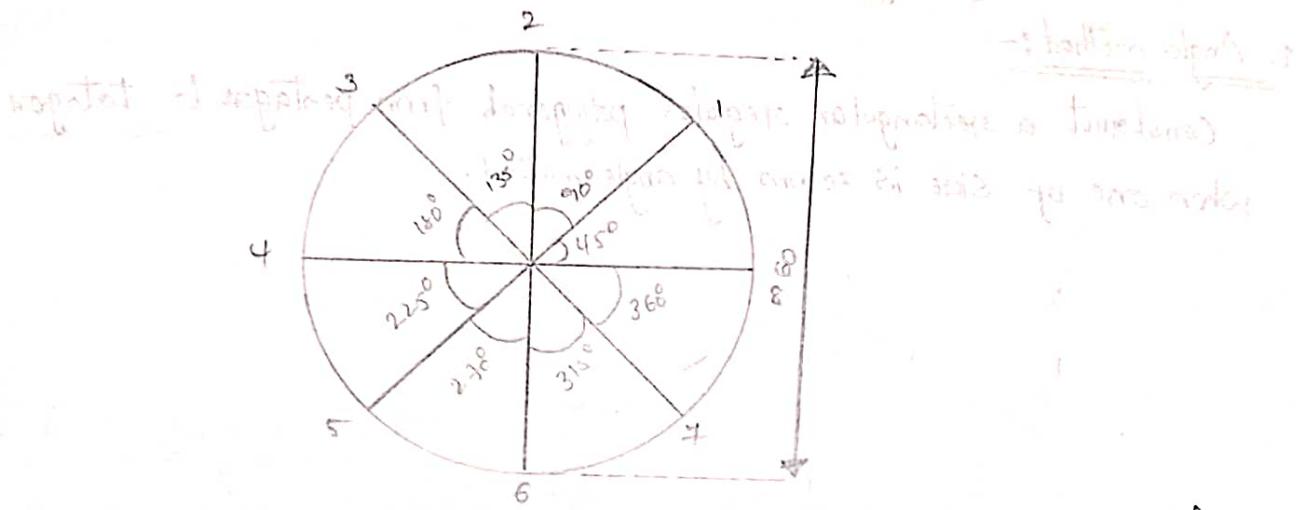


Divide a line of length 40mm into 9 equal parts.

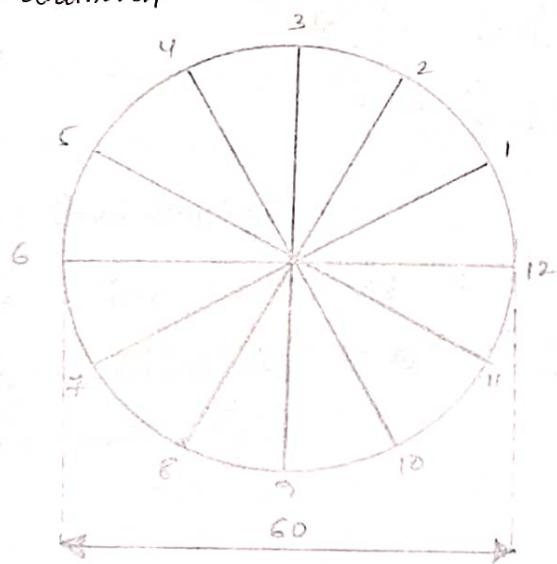




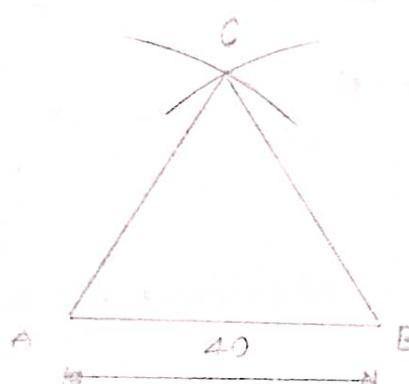
Draw a circle of radius 30mm and divide the circle into 8 equal parts.



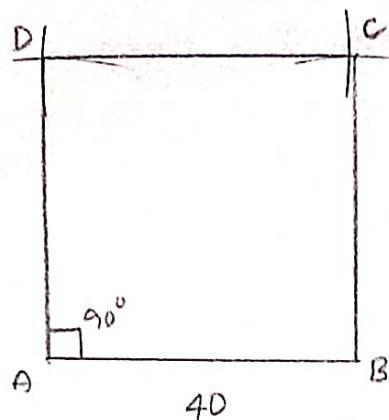
Draw a circle of diameter 60mm and divide it into 12 part no of equal parts.



Draw a equilateral triangle of length of the side 40mm.



Draw a square of side 40 mm.

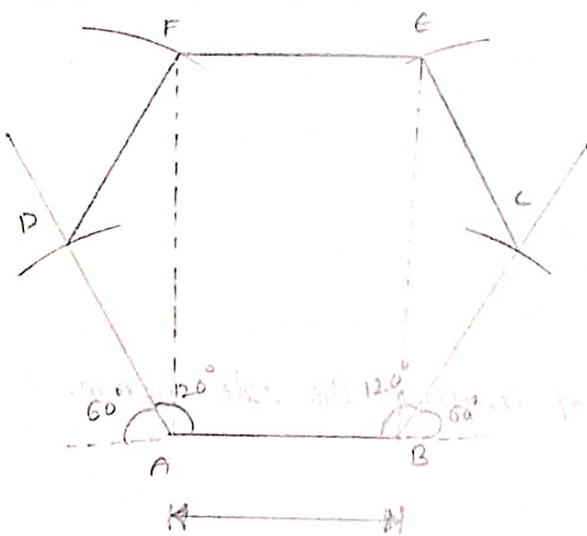
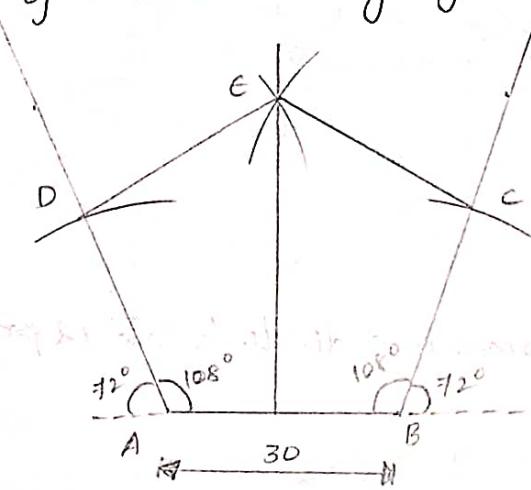


Using compass & set square draw other sides to obtain a square.

Construction of polygons :-

1. Angle method :-

Construct a rectangular regular polygonal from pentagon to octagon when one of side is 30mm by angle method.



Inscribed circle method :-

Construct regular polygons by angle method when one of its sides is known.

Construction of circle inscribed in polygon
Inscribed circle method for construction

Construction :-

Construction of circle inscribed in polygon
Construction of circle inscribed in polygon
Construction of circle inscribed in polygon



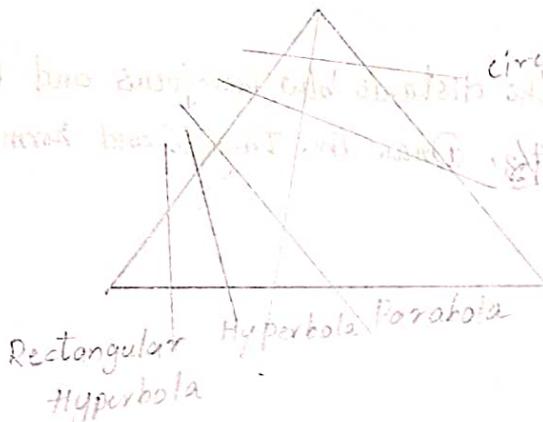
Engineering Curves :-

- 1) Conic sections (or) Conic curves. Ellipse $e = \frac{VF}{VA} < 1$
- 2) Cyclodial curves (or) cycloids Parabola $e = \frac{VF}{VA} = 1$
- 3) Involute curves
- 4) Helices.

1) Conic Section (or) Conic Curves :-

Definition :- The section obtained by the intersection of a right circular cone by a cutting plane in different positions are called

conic sections or conics.



Eccentricity method :- General method.

Eccentricity - The ratio of shortest distance from the focus to the shortest distance from the directrix is called eccentricity.

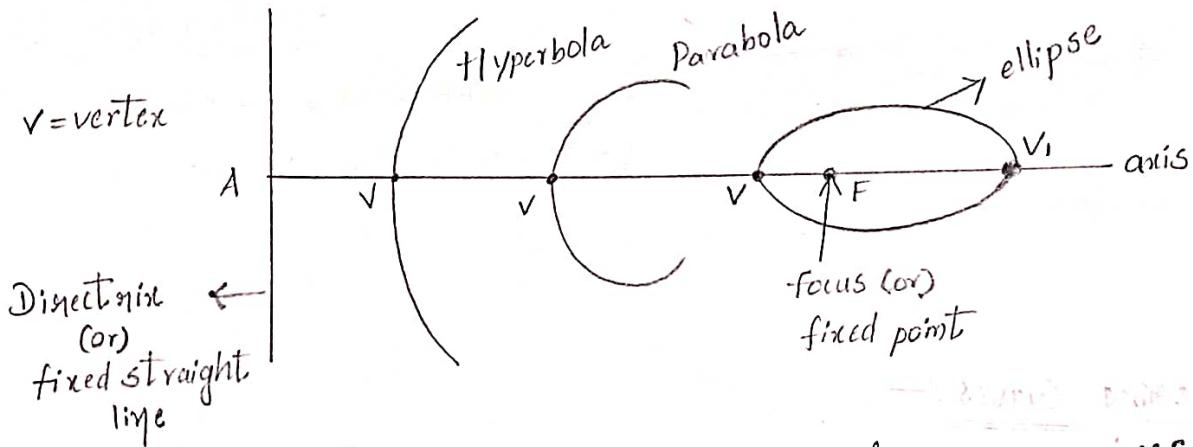
$$\text{Eccentricity} = \frac{\text{Distance of the point from the focus}}{\text{Distance of the point from the directrix}}$$

$$e = \frac{VF}{VA} = \text{Constant}$$

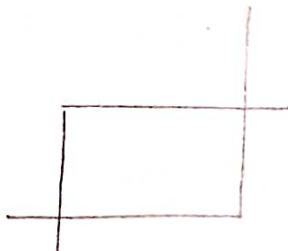
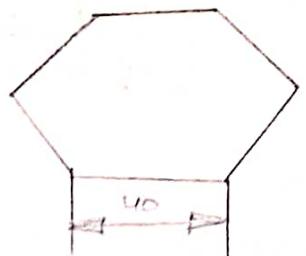
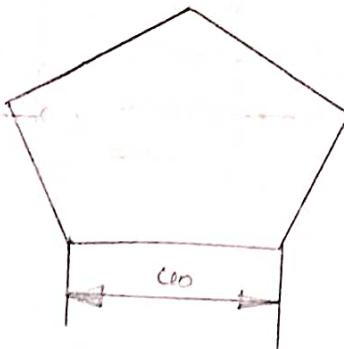
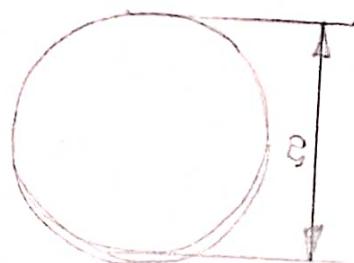
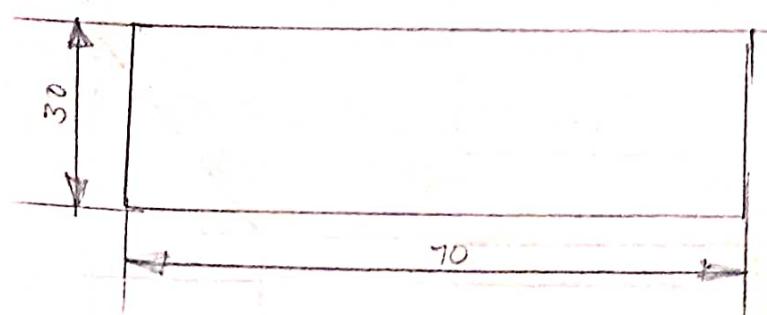
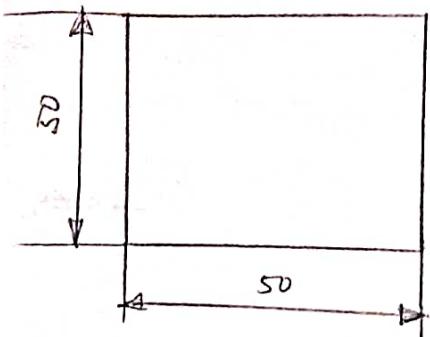
If $e < 1$ then the curve obtained is an Ellipse.

If $e = 1$ then the curve obtained is a Parabola.

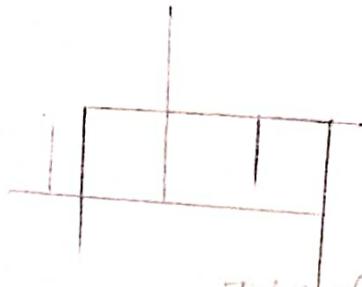
If $e > 1$ then the curve obtained is a Hyperbola.



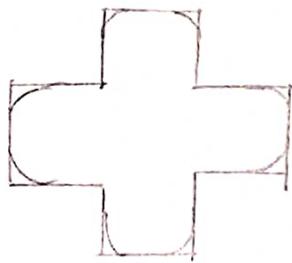
- 1) A fixed point is 75 mm from a fixed ST line. Draw the focus of a point 'B' moving such a way that its distance from the fixed ST line is equal to its distance from the fixed point. Name the curve.
- 2) Construct a conic when the distance of a point 'B' between a directrix and the focus is a constant of 30mm. Draw the curve if the eccentricity is $5/3$. Draw a tangent and a normal at any point on the curve.
- 3) The vertex of the hyperbola is 60 mm from its focus. Draw the curve if the eccentricity is $3/2$. and also draw a tangent and normal at any point on the curve.
- 4) Construct a hyperbola when the distance b/w the focus and the directrix is 30mm and eccentricity is $4/3$. Draw the tangent and normal at any point on the curve.



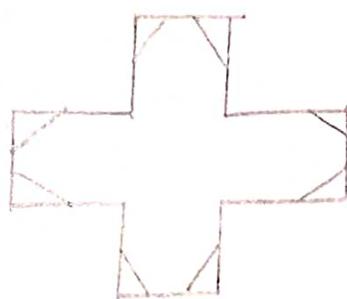
Use trim option.



Trim or extension

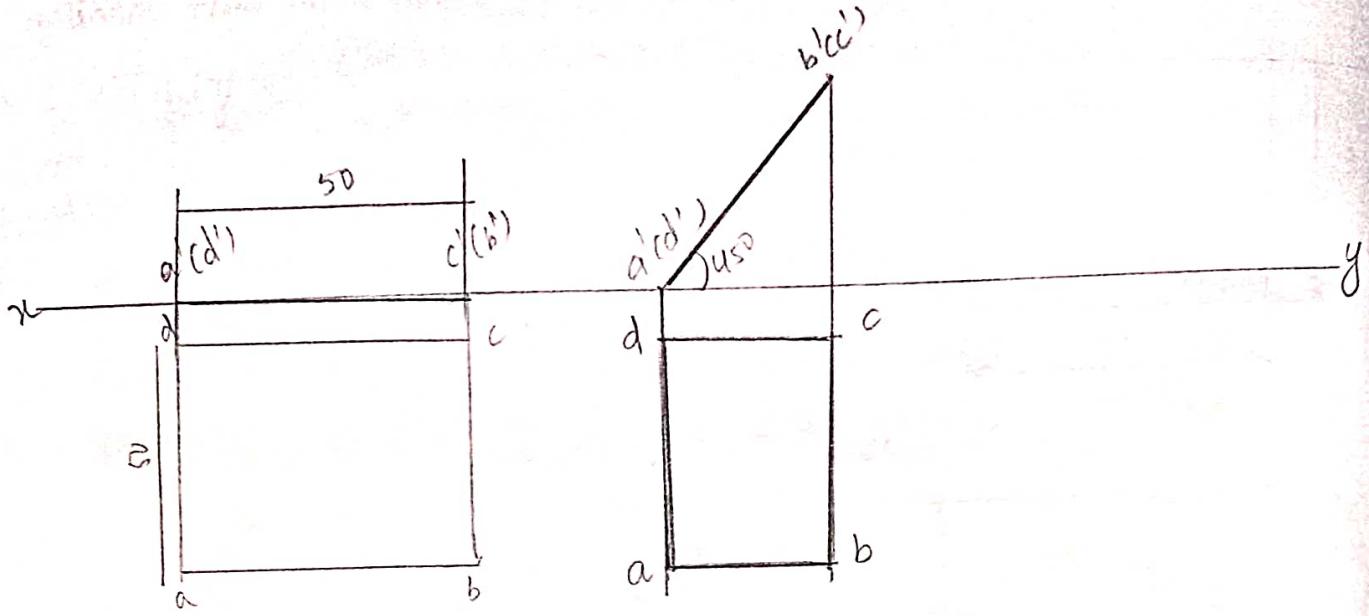


Use fillet option.



Use chamfer option.

metric on

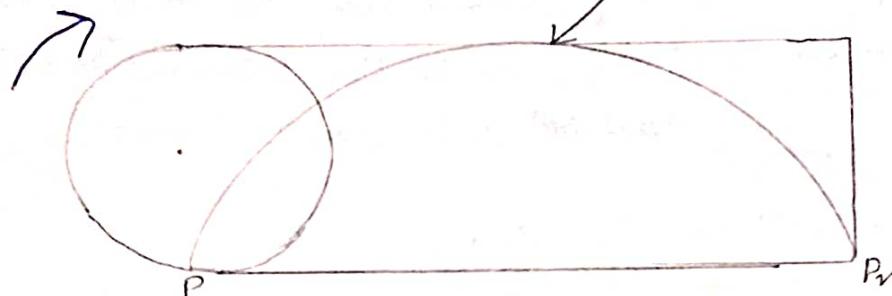


Cycloidal Curves :-

- Cycloidal Curves are generated by a fixed point on the circumference of a generating circle as it rolls in a clockwise direction or anti-clockwise direction on a straight line or on directrix circle.
- Cycloidal curves are mainly 3 types.

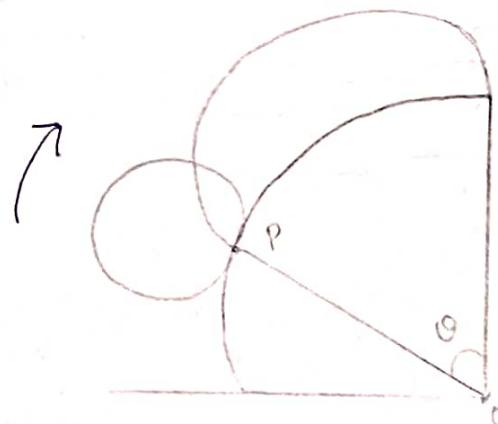
They are :-

1) Cycloide



Cycloide is a curve traced by a fixed point on the circumference of a generating circle (or) rolling circle which rolls on a straight line in clockwise direction for one complete revolution.

Epicycloid :-

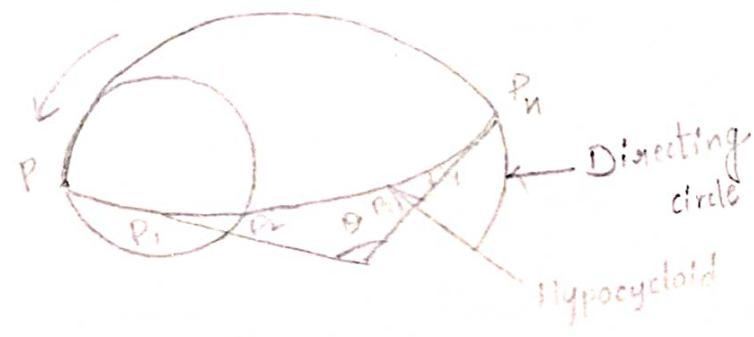


Epicycloid is a curve traced by a point on the circumference of a generating circle (or) rolling circle which rolls on clockwise direction on directrix circle outside.

$$\theta = \frac{r}{R} \times 360^\circ$$

(or)

$$\theta = \frac{d}{D} \times 360^\circ$$

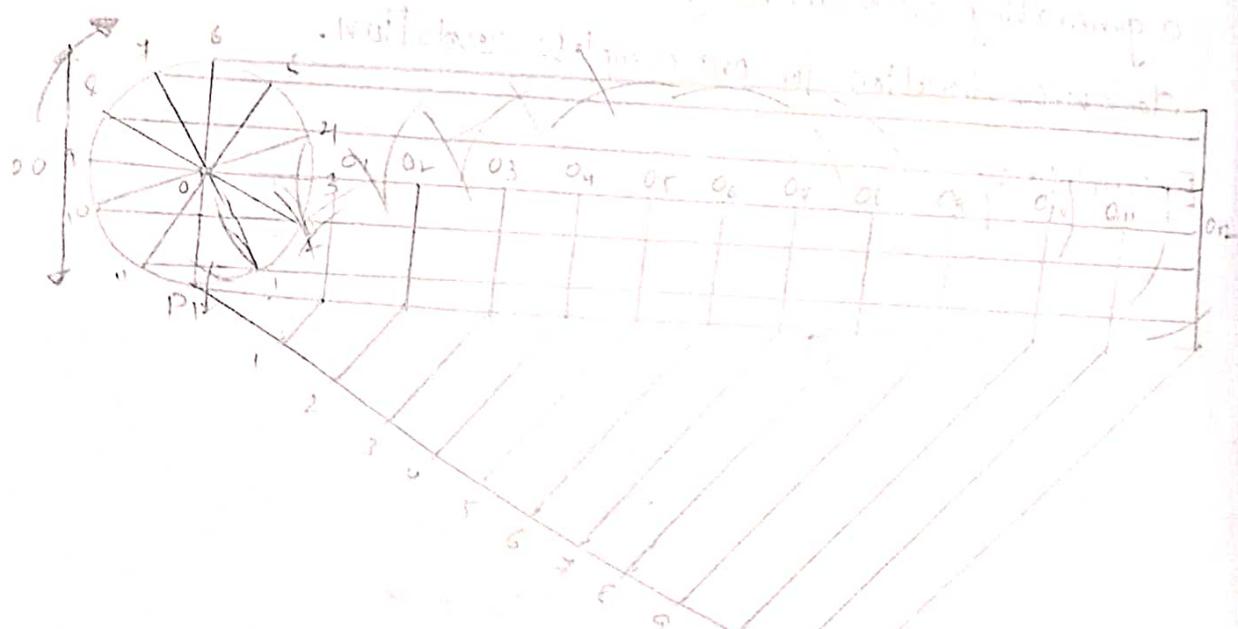


Hypocycloid :-

→ Hypocycloid is a curve traced by a fixed point on the circumference of a generating circle (or) rolling circle which rolls anticlockwise direction on directrix circle inside.

Problems :-

- 1) Construct a cycloid, given diameter of generating circle as 40. Draw tangent and normal at a point on the curve 35 from line.



2) For construction of cycloid, draw a circle of diameter 40. Draw a horizontal line segment of length 40 units to the right of the circle. Divide the circle into 12 equal parts. Take 12 points on the circumference and connect them to the line segment. Find the intersection of the tangents at these points with the line segment. These points will give the points of cycloid.

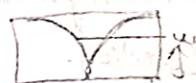
$$\text{Area} = \frac{\pi r^2}{3}$$

$$(12)$$

$$\text{Area} = \frac{r^2}{9} \cdot 3$$

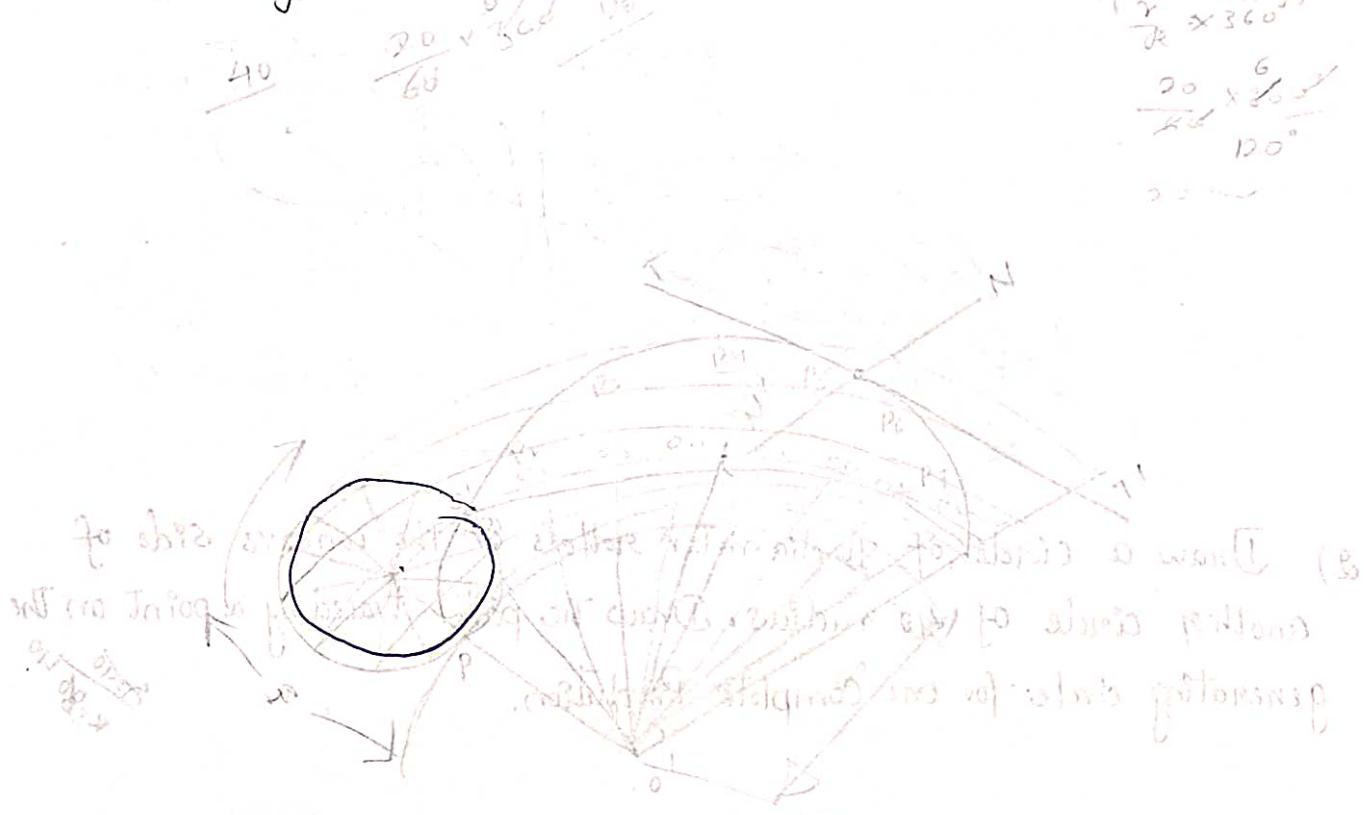
2) Draw a curve when the radius of the generating circle as 25 rolling in a clockwise direction a straight line. Name the curve and also draw a tangent and normal at any point from the curve.

3) Draw a cycloid when the generating circle diameter as 50 roller's in a clockwise direction. Draw Tangent and Normal at a point on the curve 40° from the line. Take point P position opposite to the initial position.



4) Construct a cycloid for 1.5 revolution of a generating circle when the diameter of generating circle as 40 roller's in a clockwise direction. Draw tangent and normal at any point on the curve.

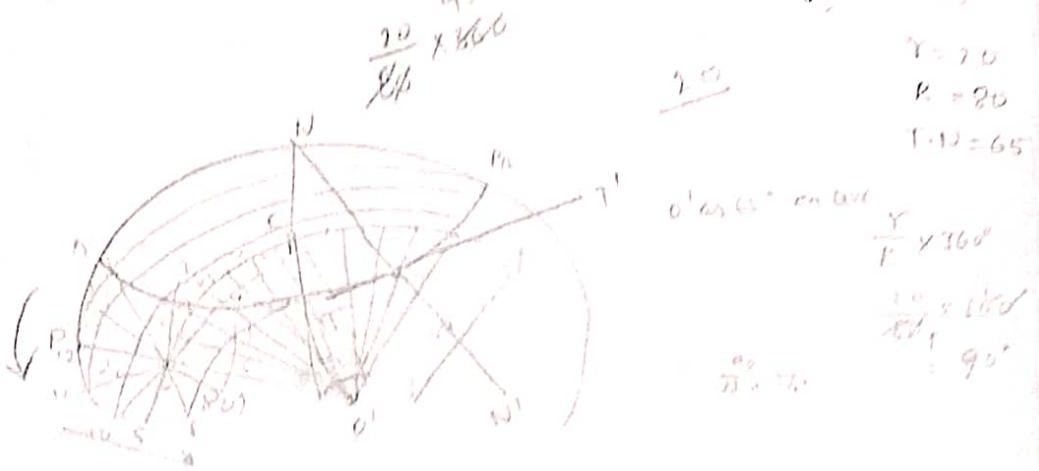
5) Draw an epicycloid when the diameter of generating circle 40 which rolls on directing circle in clockwise. Draw tangent and normal at a point ^{outside the} on the curve 90° from the centre of directing circle. Take directing circle diameter as 120.



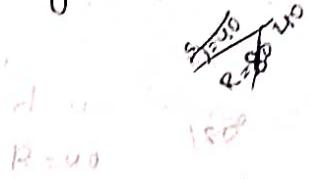
Epi-cycloid: A curve generated by a point on the circumference of a circle of 50 diameter, which rolls on another circle of diameter 100, clockwise and outside same the same, and also draw tangent and normal at any point on the curve.

- 1) Draw a curve when traced by a point on generating circle of 50 diameter, which rolls on another directing circle of 100 diameter, in clockwise and outside the directing circle. Take initial point P opposite.
- 2) Draw an epicycloid when the diameter of the rolling circle (generating circle) and directing circle is same as 40. \rightarrow Special problem Cardiod.
- 3) Draw a curve when the radius of a rolling circle is 20, gollers on another circle of radius 80, in a clockwise direction outside. Draw a tangent and normal at any point on the curve, and name the curve.

- 05/01/2012
- 4) Draw a hypocycloid when the diameter of the rolling circle is 40, gollers on another directing circle inside and counter-clockwise the diameter of the directing circle as 100. Draw tangent and normal to the curve at a point 65 on the curve from centre of directing circle.

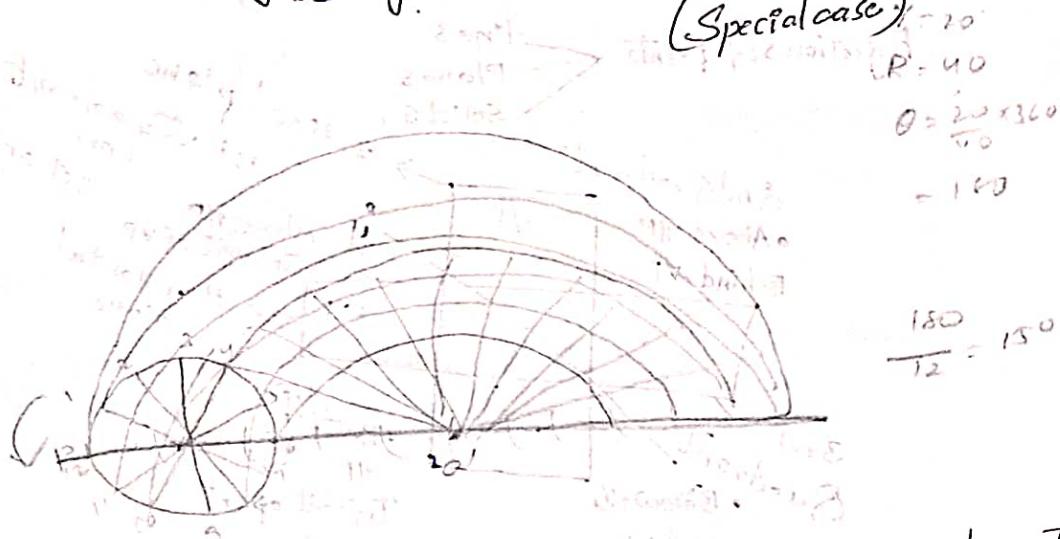


- 5) Draw a circle of 40 diameter gollers on the concave side of another circle of 100 radius. Draw the path traced by a point on the generating circle for one complete Revolution.



3) Show by means of a drawing that when the diameter of the directing circle is twice that of the generating circle, the hypocycloid is a straight line. Take the diameter of the generating circle equal to 40.

(Special case)



Circus man rights rides a motor bike in side a globe 6 m diameter. The motor bike has the wheel of 1 meter diameter. Draw the locus of the point on the circumference of the motor bike wheel for one complete revolution. Adapt suitable scale.

Scale :-

driving wheel diameter = 40 mm
Assume motorcycle wheel radius = 20 mm
global diameter = 6 x 20 = 120 mm
 $\theta = 60^\circ$



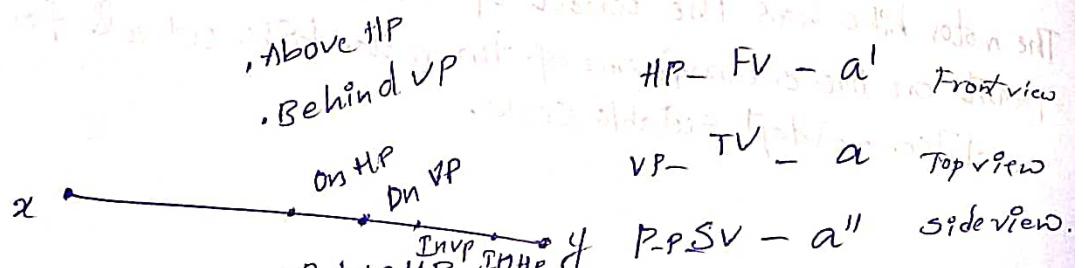
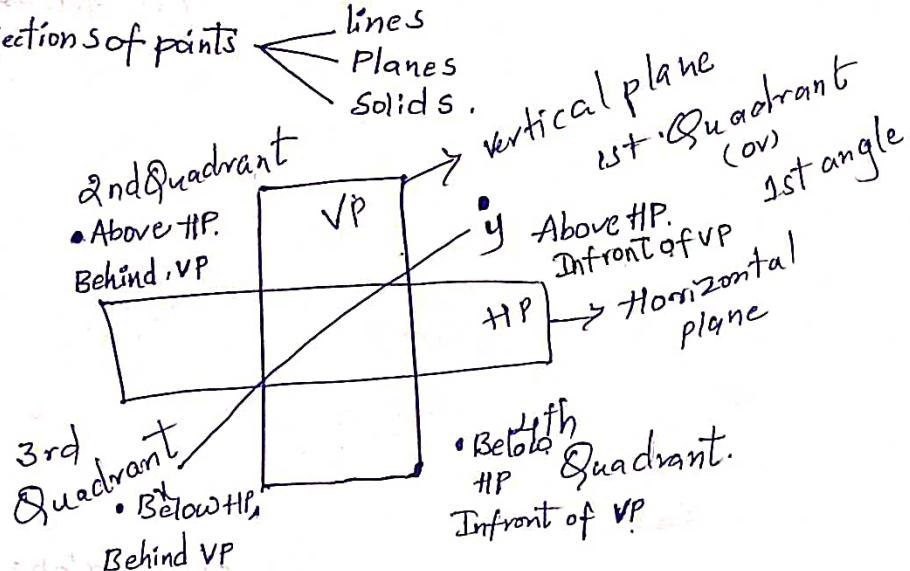
Date
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UNIT - 2

PROJECTION OF POINTS

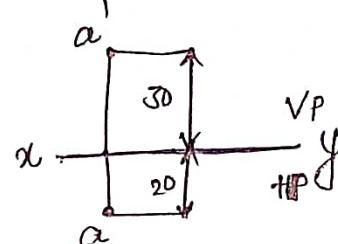
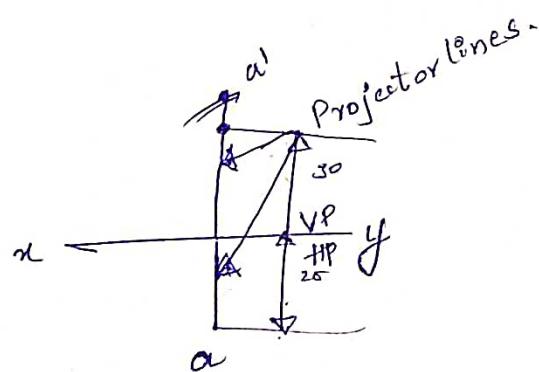
Projections of points

lines
Planes
Solids.

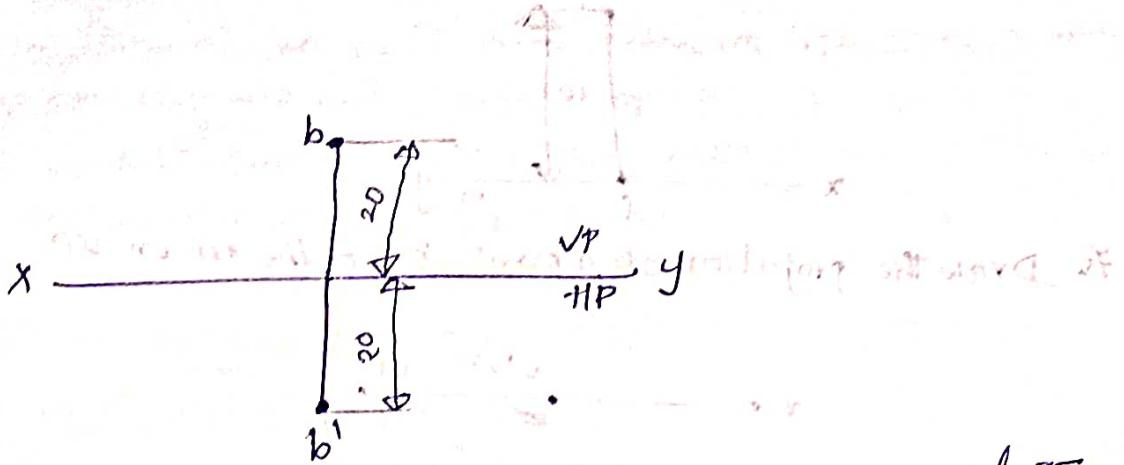


Problems

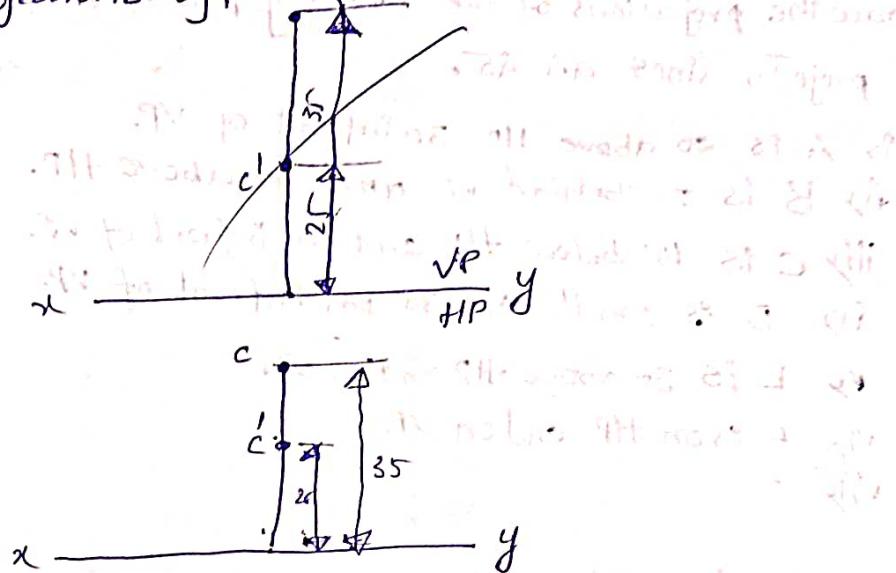
- 1) Draw the projections of point A is in 1st Quadrant, 30mm above HP and 25mm in front of VP



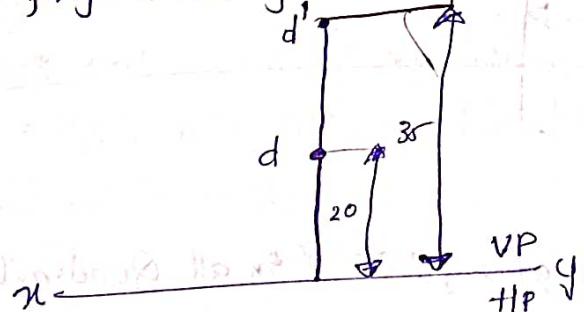
Q) Point B is 20 mm below H.P. & 20 mm behind V.P. Draw the projections of point B.



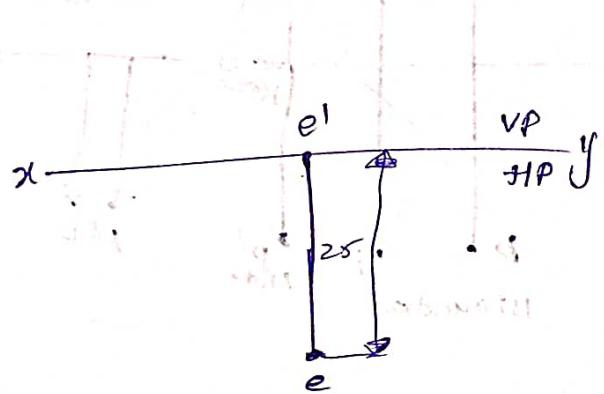
Q) Draw the projections of point C. It is located 25 mm above H.P. and 35 mm behind V.P.

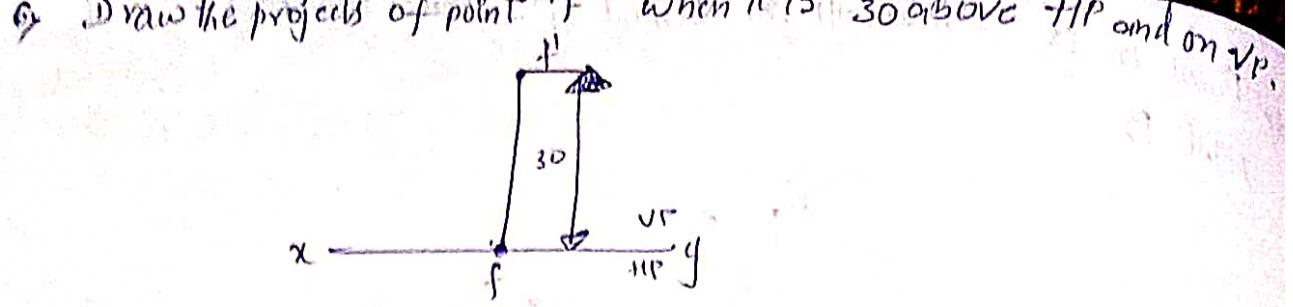


Q) Draw the projections of point D. It is 35 mm above H.P. & 20 mm behind V.P.

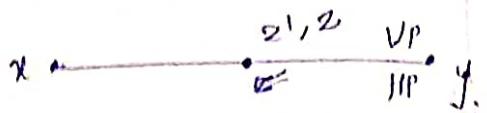


Q) Draw the projections of point E. It is on H.P. 25 mm in front of V.P.





Q) Draw the projections of a point 'Z' on the HP on VP.



Q) Draw the projections of the following points, keeping the distance b/w the projector lines as 25.

i) A is 20 above HP, 30 in front of VP.

ii) B is 20 behind VP and 30 above HP.

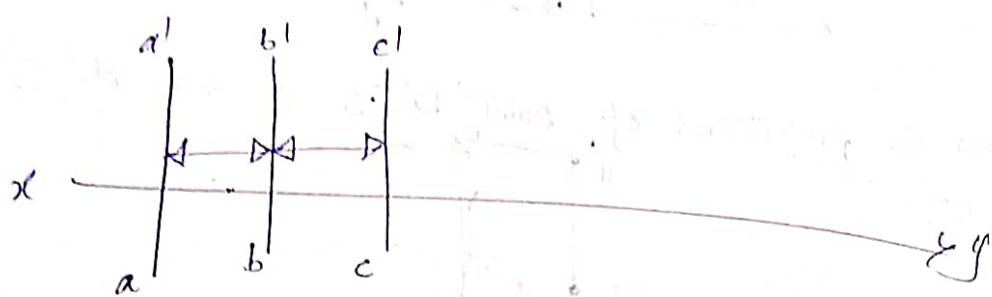
iii) C is 15 below HP and 35 in front of VP.

iv) D is on HP and 30 on in front of VP.

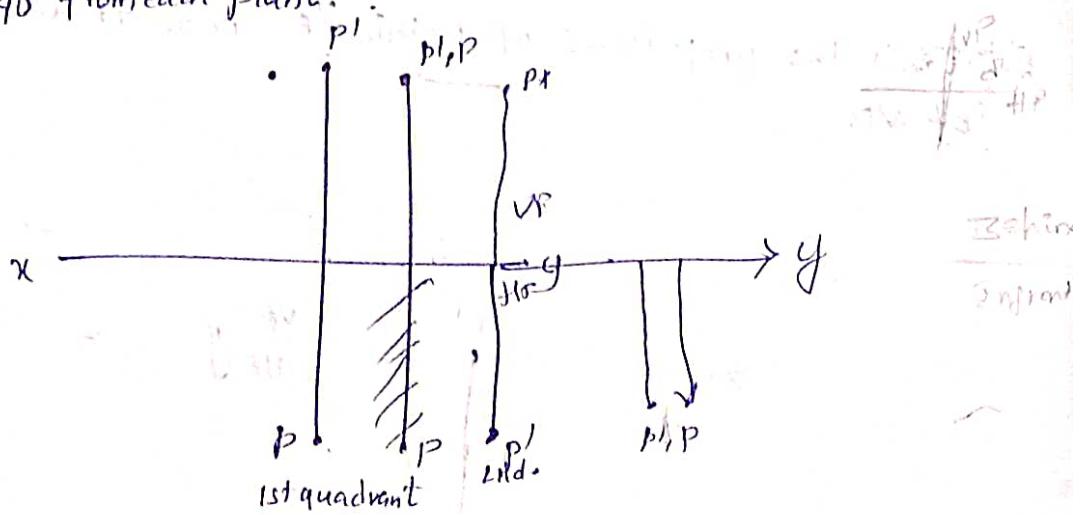
v) E is 30 above HP and on VP.

vi) F is on HP and on VP.

vii)



Q) Draw the Projections of a point 'P' in all Quadrants take it the distance 40 from each plane.



Orthographic projections of following points keeping the distance b/w
the projector lines as 20 on the same reference line.

1. A is 20 above HP and 15 in front of VP.

2. B is 25 behind VP and 20 below of HP.

3. C is 30 in front of VP and 10 below HP.

4. D is 10 above HP and 15 behind VP.

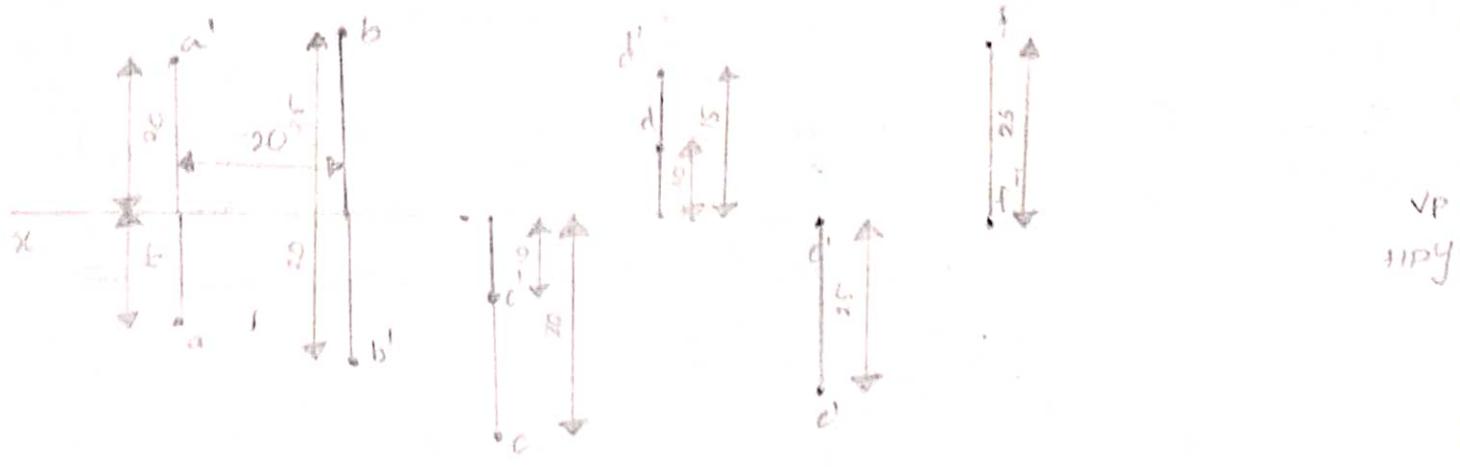
5. E is on HP and 25 in front of VP.

6. F is on VP and 25 above HP.

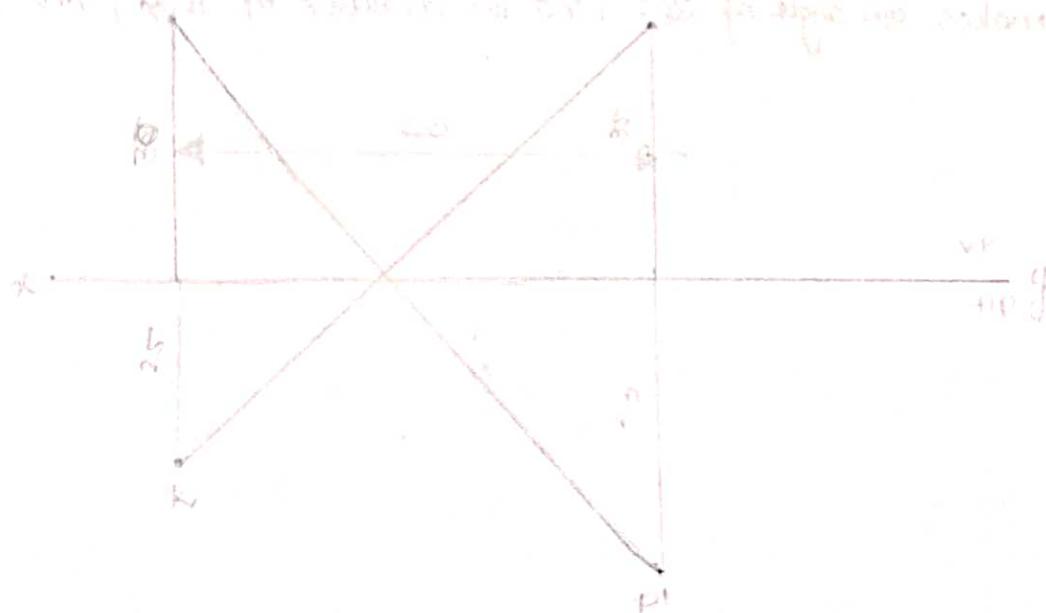
7. G is on VP and behind 40 HP.

8. H is on HP 35 in front of VP.

9. I is on HP and VP.

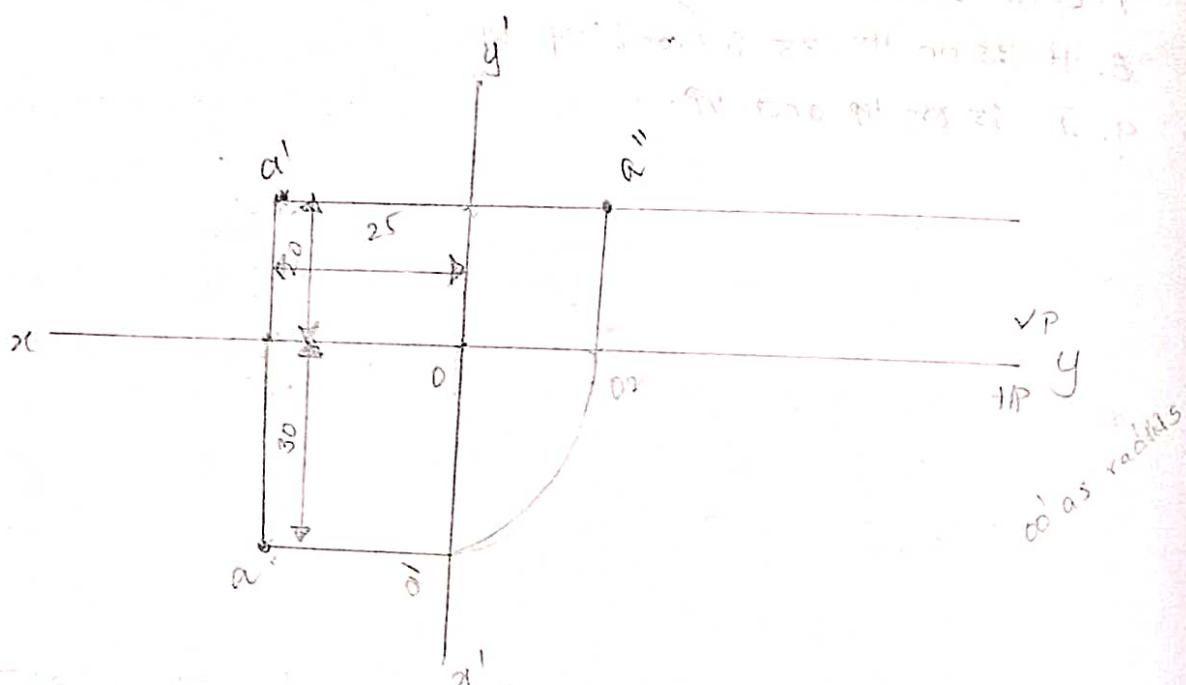


Point 'K' 30 above HP 25 in front of VP and another point 'P'
is 40 below HP and 25 behind VP. Draw the projections and join
their front and top views with a straight line. Keeping the distance
b/w the projector's lines as 160.

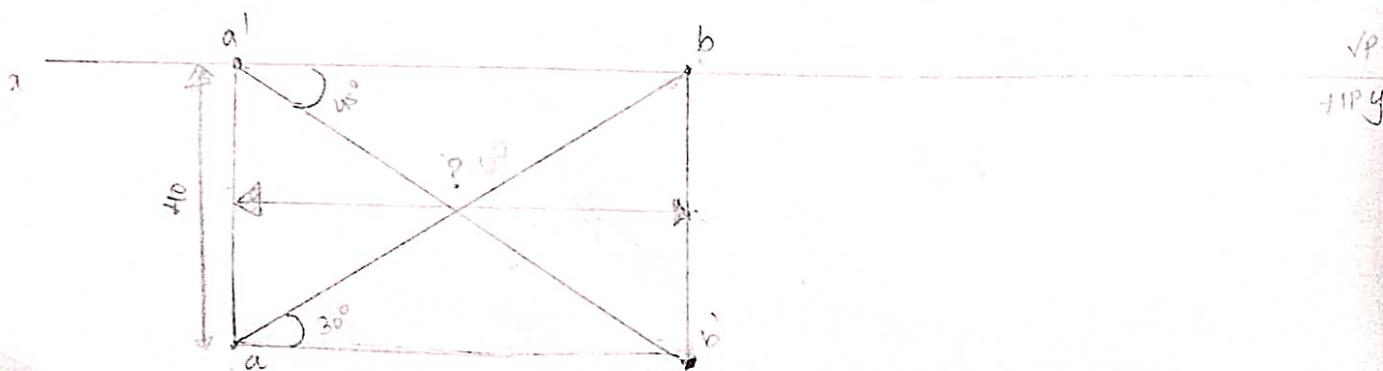


A point 'A' is 15 above H.P and 20 in front of V.P another point 'P' is 25 behind V.P and 40 below H.P. Draw the projections of A and keeping the distance b/w the projections equal to 90 draw s.t lines joining their topviews and front views.

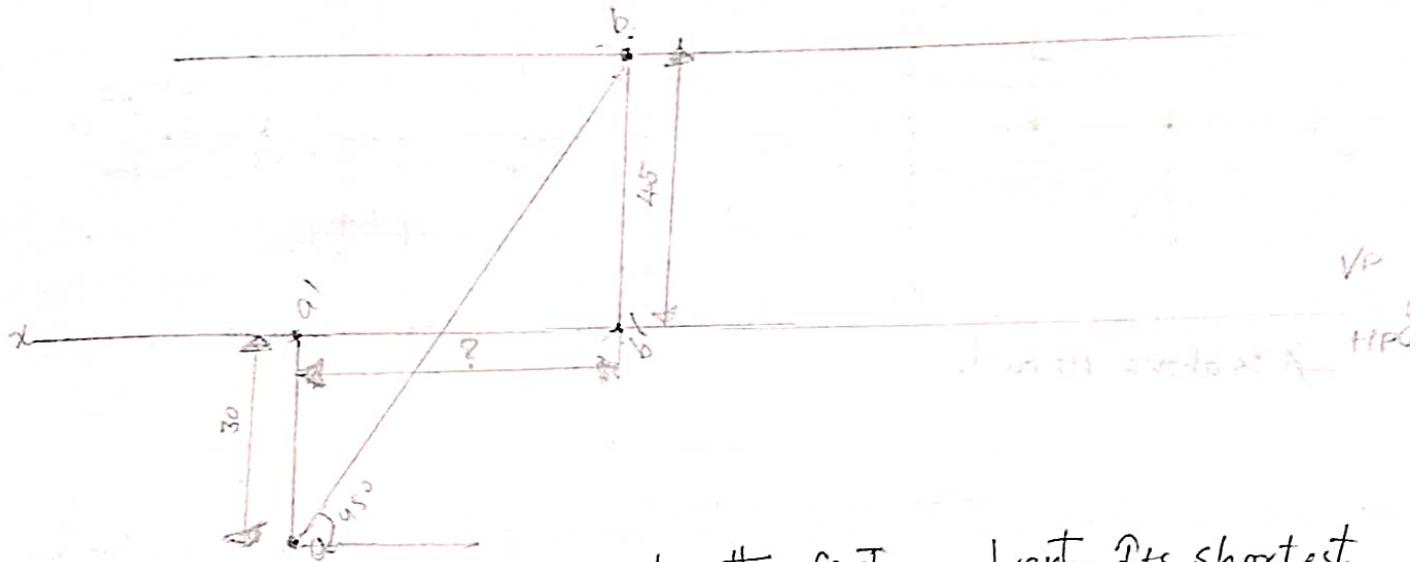
A point 'A' is 20 above H.P, 30 in front of V.P and 25 in front of P.P (Profile plane). Draw front view, top view and left side view and left side view on the point.



A point 'A' is on H.P and 40 in front of V.P another point B is on V.P and below H.P. The line joining their front views makes an angle of 45° with xy , while the line joining their top views makes an angle of 30° . Find the distance of the point B from H.P.



Two points A and B are on HP point A is 30 in front of VP, while 'B' is 45 behind VP. The line joining their top views makes an angle of 45° with xy. find the horizontal distance b/w two points.



A Point 'A' is 20 above H.P. and in the first quadrant. Its shortest distance from the reference line xy is 40. Draw the projections of the point and determine this distance from VP.

xy is 30 unit at distance from

(unit of reference line) and distance from

unit of reference line is 40 unit from

unit of reference line is 20 at horizontal and 40

unit of reference line is 20 at vertical and 40

unit of reference line is 20 at horizontal and 40

unit of reference line is 20 at vertical and 40

unit of reference line is 20 at horizontal and 40

unit of reference line is 20 at vertical and 40

unit of reference line is 20 at horizontal and 40

unit of reference line is 20 at vertical and 40

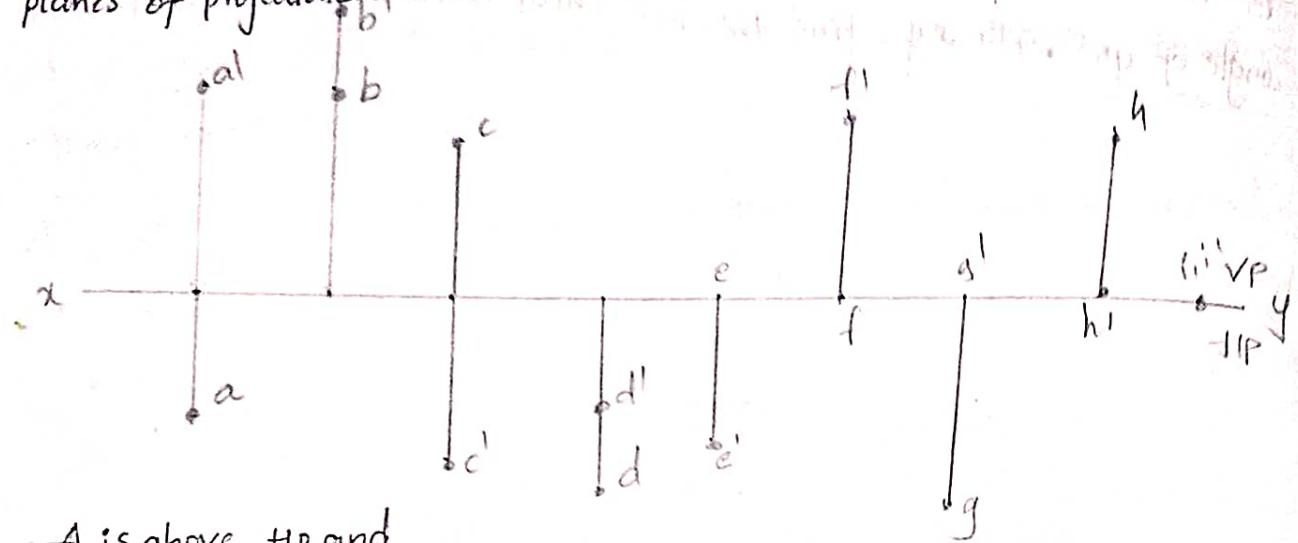
unit of reference line is 20 at horizontal and 40

unit of reference line is 20 at vertical and 40

unit of reference line is 20 at horizontal and 40

unit of reference line is 20 at vertical and 40

Indicate the positions of the points shown in figure, with respect to the planes of projections.



A is above H.P. and.

Projection of lines / Projection of straight lines.

Simple cases of the line.

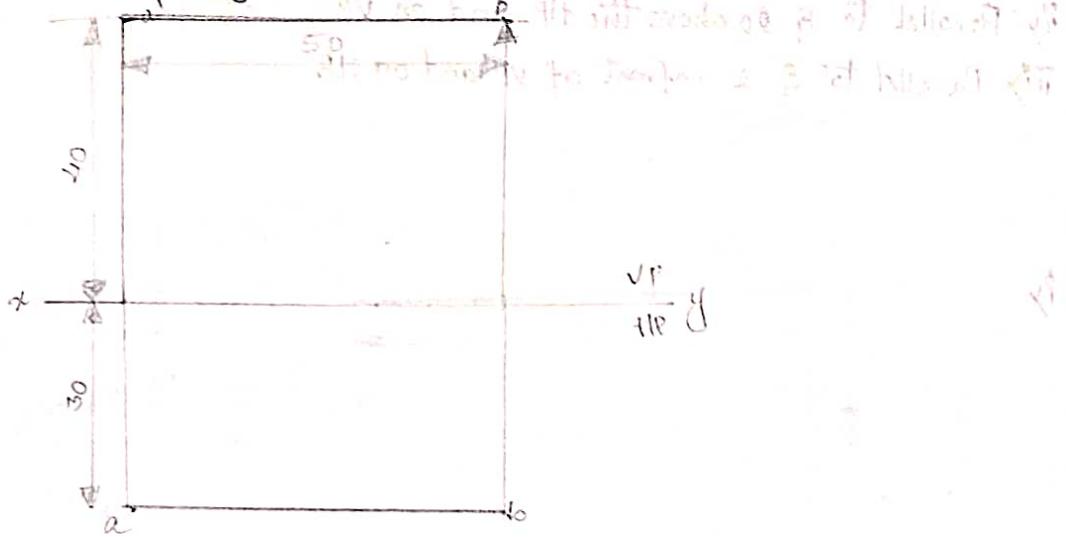
- 1) Line parallel to both H.P. & V.P.
- 2) A vertical line (Line perpendicular to H.P. & II to V.P.)
- 3) Line inclined to H.P. & parallel to V.P.
- 4) Line inclined to V.P. & parallel to H.P.
- 5) Line inclined to both H.P. & V.P.

⇒ The shortest distance b/w two end points is called a straight line
⇒ The projectors of a straight line are drawn. Therefore by joining the projections of its end points!

⇒ The possible projections of a straight lines with respect to the V.P. and H.P. in the 1st Quadrant are as follows.

- 1) Line is parallel to both planes (H.P. and V.P.).
- 2) Line is parallel perpendicular to one plane and II to the other.
- 3) Parallel to one plane and inclined to the other.
- 4) Line is inclined to both planes.

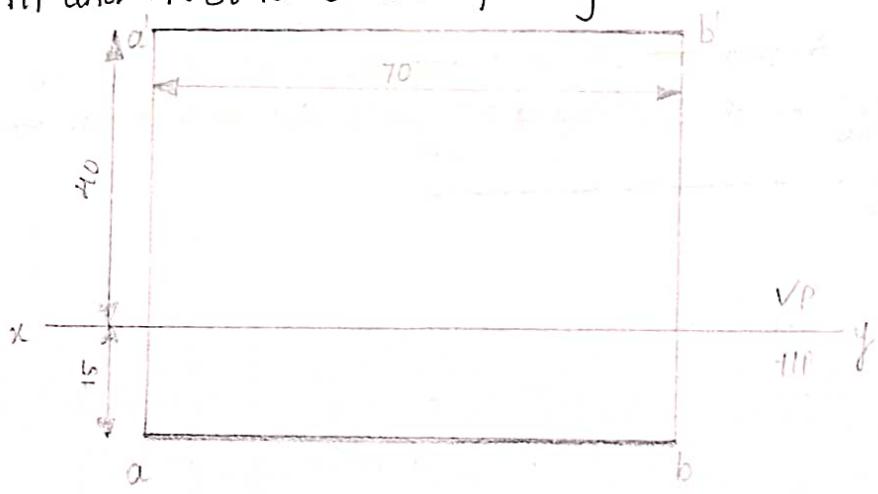
- i) Line parallel to both planes :-
- Pb) A line AB of 50 long, is parallel to both H.P. and V.P. A line is 40 above H.P. and 30 in front of V.P. Draw the projections of the line.



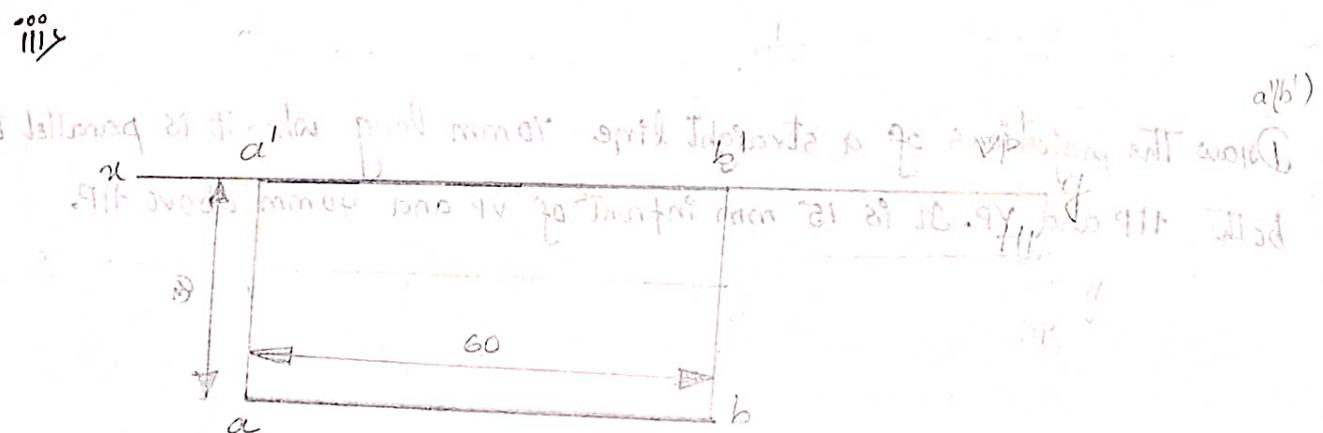
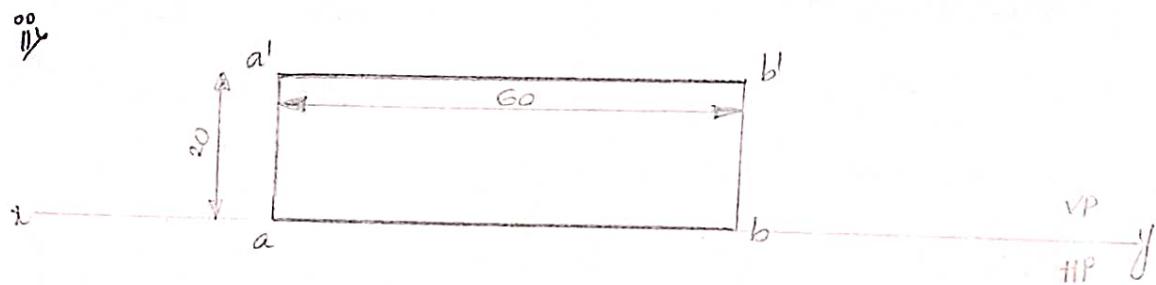
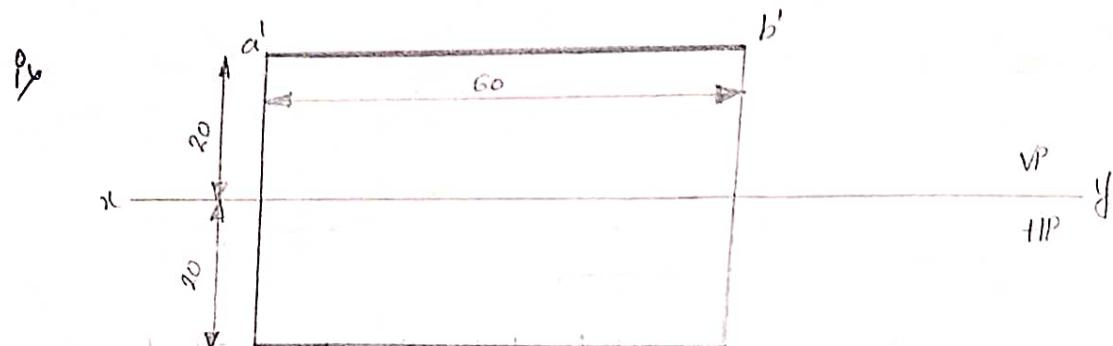
A line CD 30 mm long is parallel to both the planes. The line is 40mm above H.P. and 20mm in front of V.P. Draw the projections.



Draw the projections of a straight line 70mm long when it is parallel to both H.P. and V.P. It is 15 mm in front of V.P and 40mm above H.P.



- iii) Draw the projections of a rectangle of 60 mm length and 20 mm width at distance of 20 mm from each position.
- Parallel to both H.P. and V.P. and 20 mm from each.
 - Parallel to & 20 mm above the H.P. and on V.P.
 - Parallel to & 20 mm in front of V.P. and on H.P.

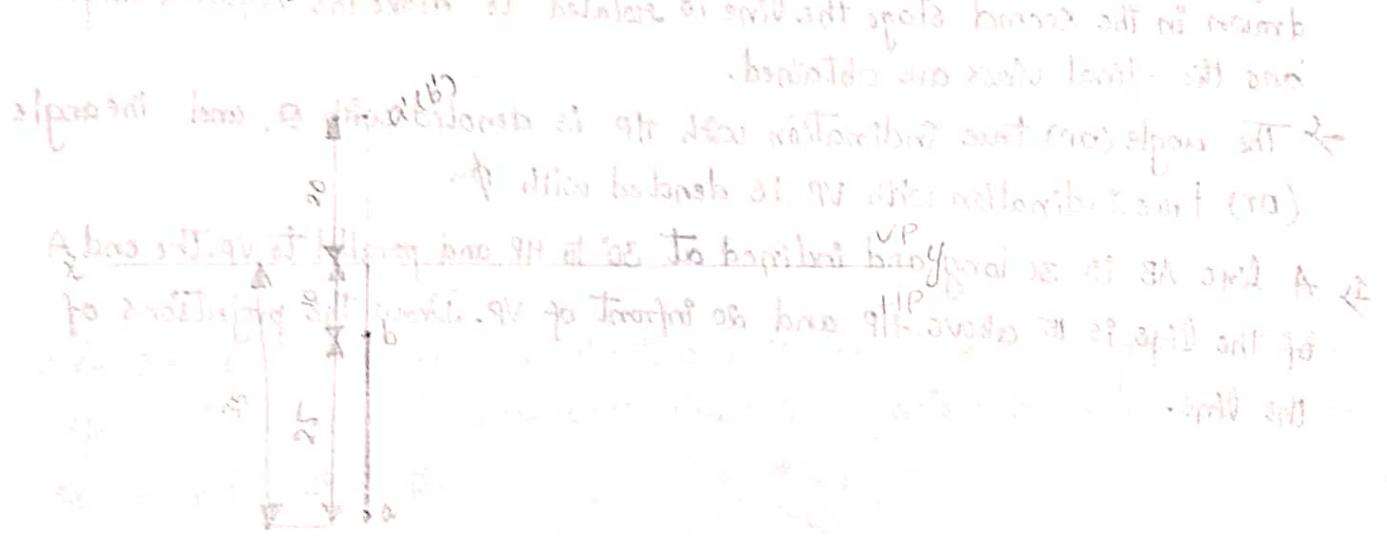


(2) Line AB is 40 mm long, A is 10 mm in front of VP and B is 20 mm above HP.

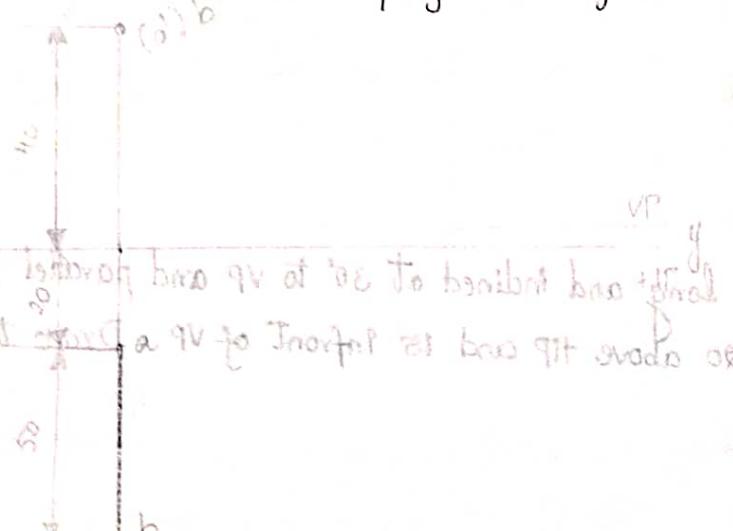
- ① A line AB of 40 mm length is 10 mm in front of VP and 20 mm above HP. The end points A and B of the line are 35 and 10 mm above HP respectively. The line is 20 mm in front of VP. Draw the projections of the line.



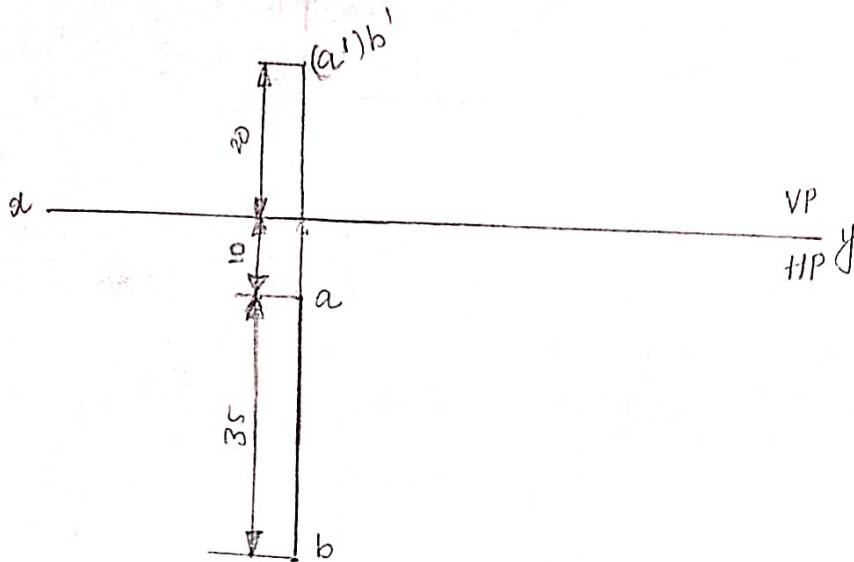
- ② A line AB of 40 mm length is 10 mm in front of VP and 20 mm above HP. The end points A and B of the line are 35 and 10 mm in front of VP respectively. The line is 20 mm above HP. Draw its projections.



- ③ A line AB 50 mm long is 10 mm in front of VP and 20 mm above HP. The end A is 20 mm in front of VP and the line is 40 mm above HP. Draw the projections of the line.



④ A line AB 35 long is parallel to HP and Ir to VP. The end A is 10° in front of VP and the line is 20 above HP. Draw the projections of the line.

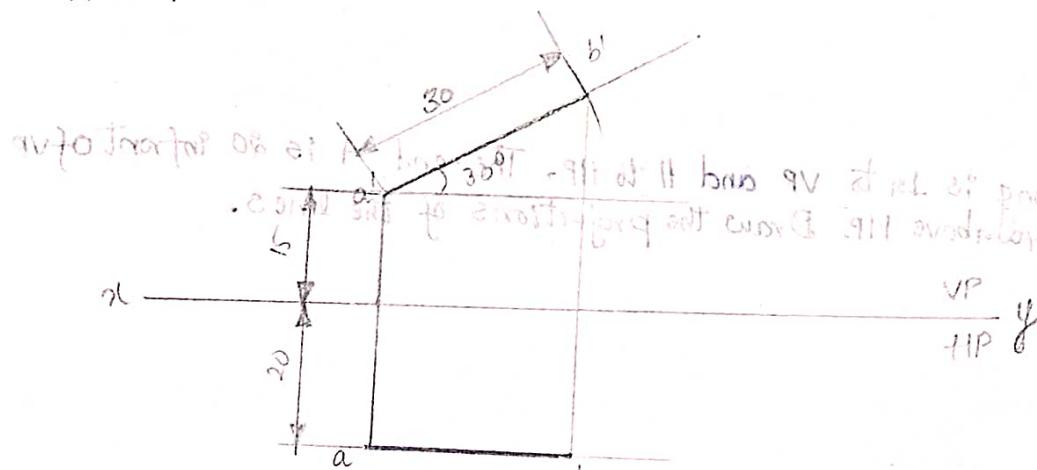


3) Line inclined to one plane and parallel to the other.

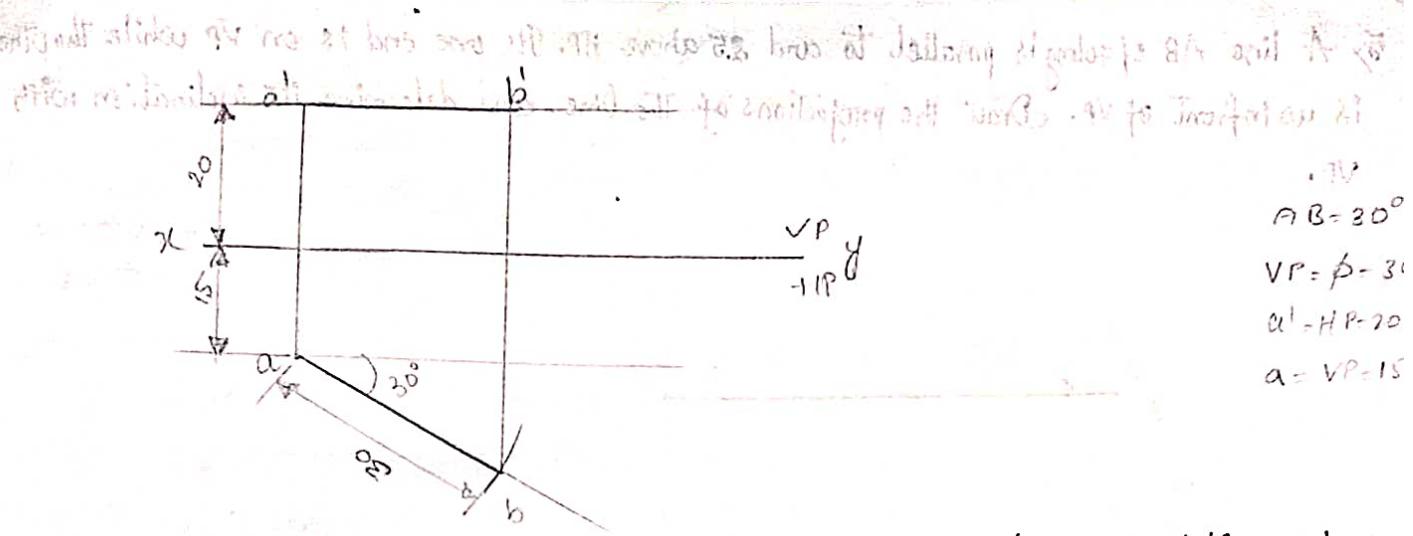
⇒ The problems of this nature are normally solved in two stages. In the 1st stage the line is assumed to be parallel to both planes and projections are drawn in the second stage the line is rotated to make the required angle and the final views are obtained.

⇒ The angle (or) true inclination with HP is denoted with θ , and the angle (or) true inclination with VP is denoted with ϕ .

1) A line AB is 30 long and inclined at 30° to HP and parallel to VP. The end A of the line is 15 above HP and 20 in front of VP. Draw the projections of the line.



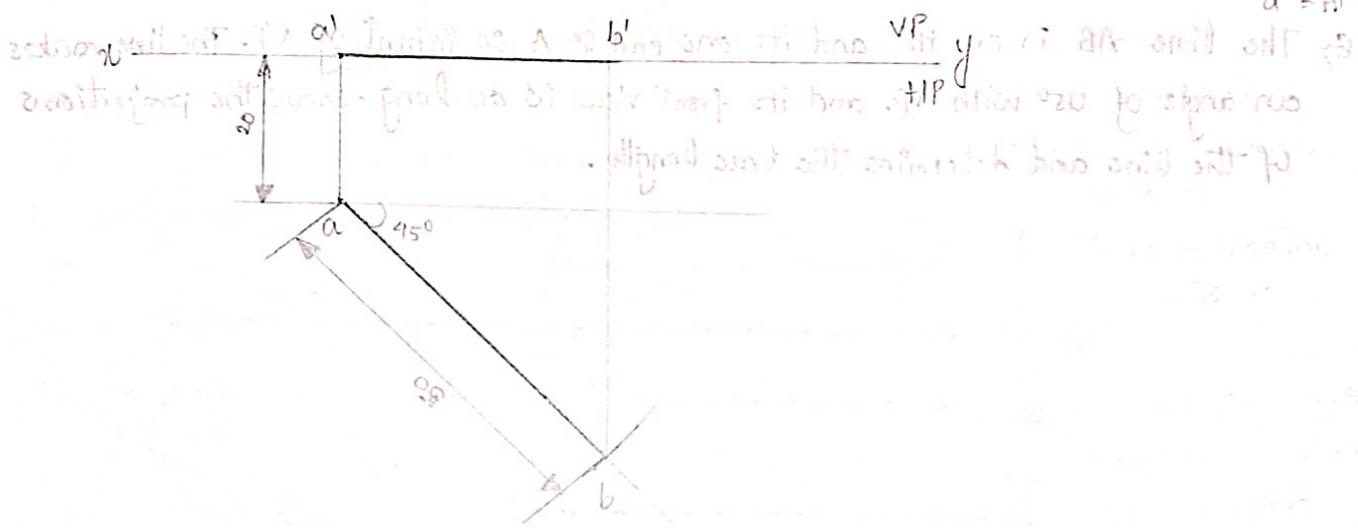
2) A line AB of 30 long and inclined at 30° to VP and parallel to HP. The end A of the line is 20 above HP and 15 in front of VP. Draw the projections.



$$\begin{aligned} & \text{IV} \\ & AB = 80^\circ \\ & VP = \phi - 30^\circ \\ & a' - HP = 20 \\ & a = VP = 15 \end{aligned}$$

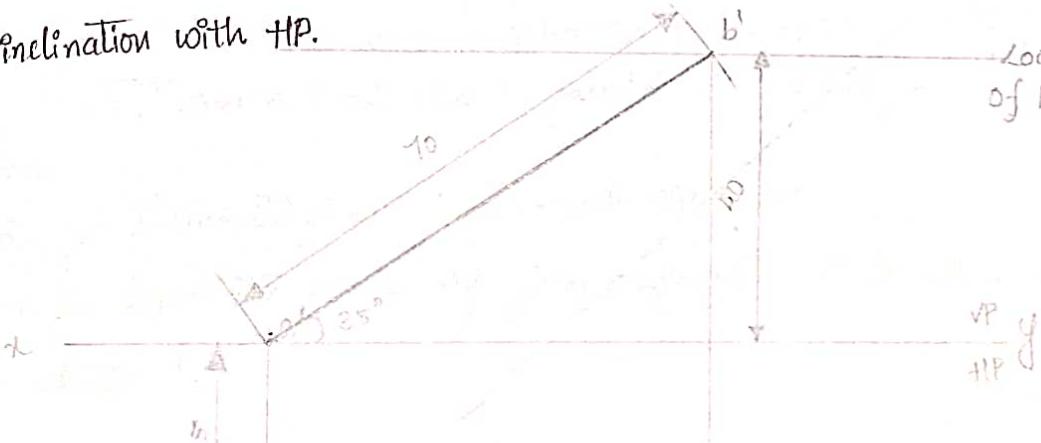
- 3) A line AB is on HP and its one end A is 20 in front of VP. A line makes an angle of 45° with VP and length of the line is 50 mm. Draw the projections of the line.

$$\begin{aligned} & AB = 50 \\ & \phi = 45^\circ \\ & a - VP = 20 \\ & a' = HP \end{aligned}$$



- 4) A line AB of 70 long is parallel to and 25 in front of VP. Its one end is on HP while the other is 40 above HP. Draw the projections of the line and determine its inclination with HP.

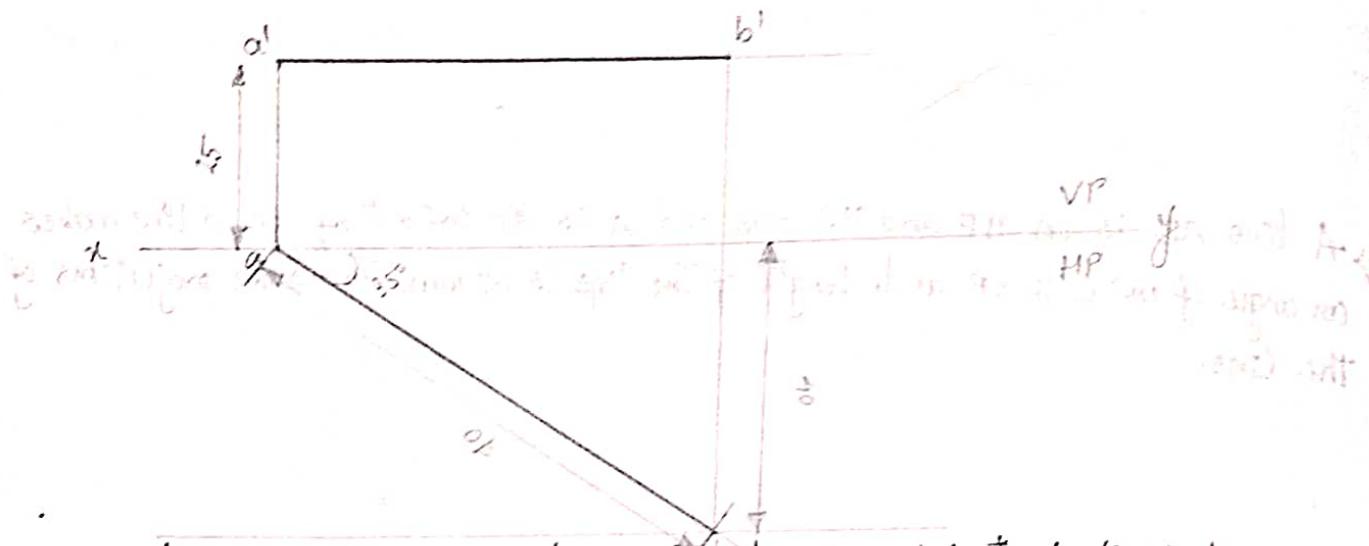
$$\begin{aligned} & AB = 70 \\ & a' - HP = 40 \\ & a = VP = 25 \\ & \theta = ? \end{aligned}$$



Orthographic projections of a line AB of 70 mm length having angle of 25° to VP and 40 mm in front of VP. Its one end is on HP while the other is 25 mm in front of VP. Draw the projections of the line and determine its inclination with HP.

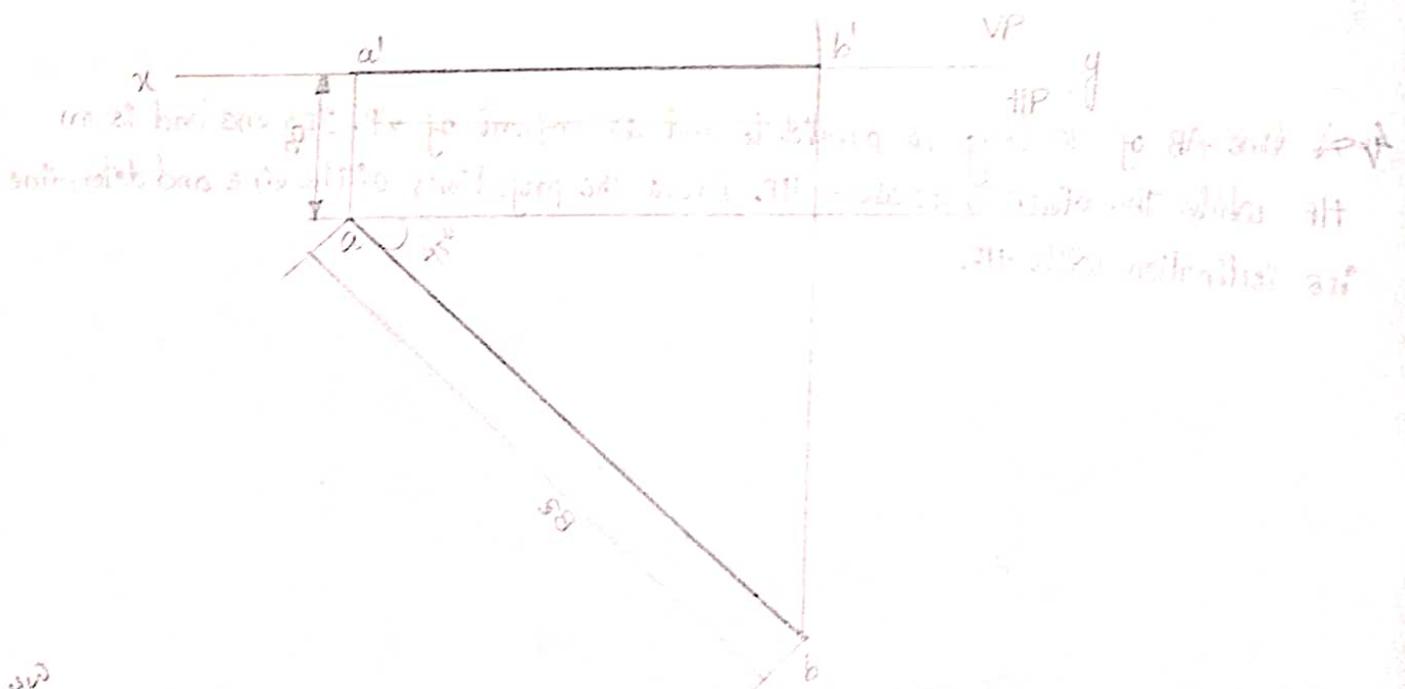
Ex A line AB of 70 mm is parallel to and 25 mm above HP. Its one end is on VP and is 40 mm in front of VP. Draw the projections of the line and determine its inclination with VP.

$$\begin{aligned}AB &= 70 \\a = VP &= 40 \text{ mm} \\&\phi = ?\end{aligned}$$

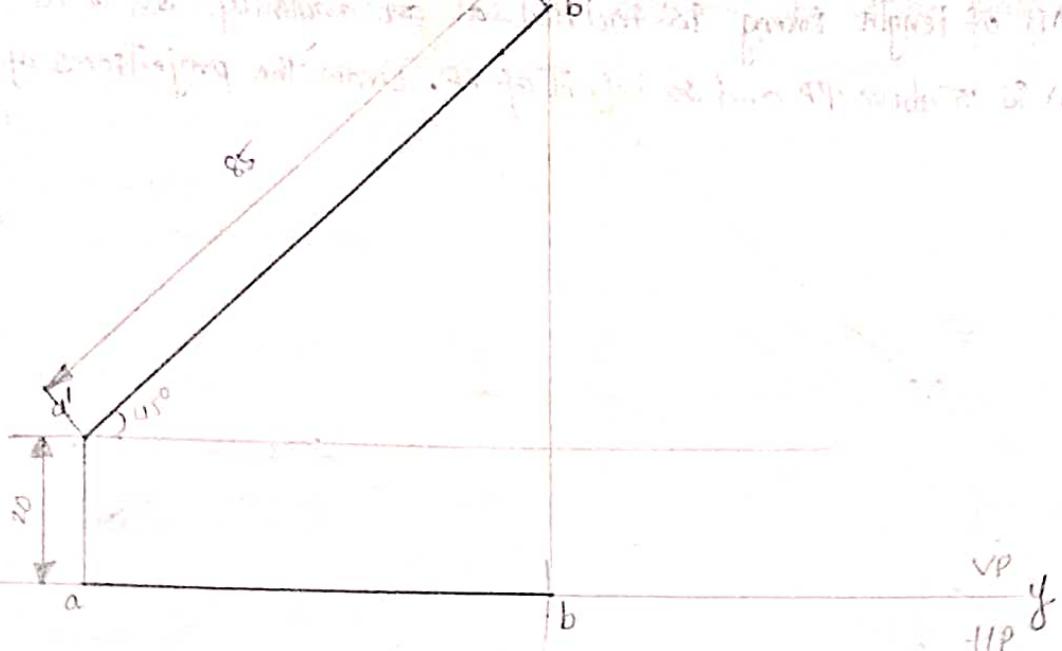


Ex The line AB is on HP and its one end is 20 mm in front of VP. The line makes an angle of 45° with VP and its front view is 60 mm long. Draw the projections of the line and determine the true length.

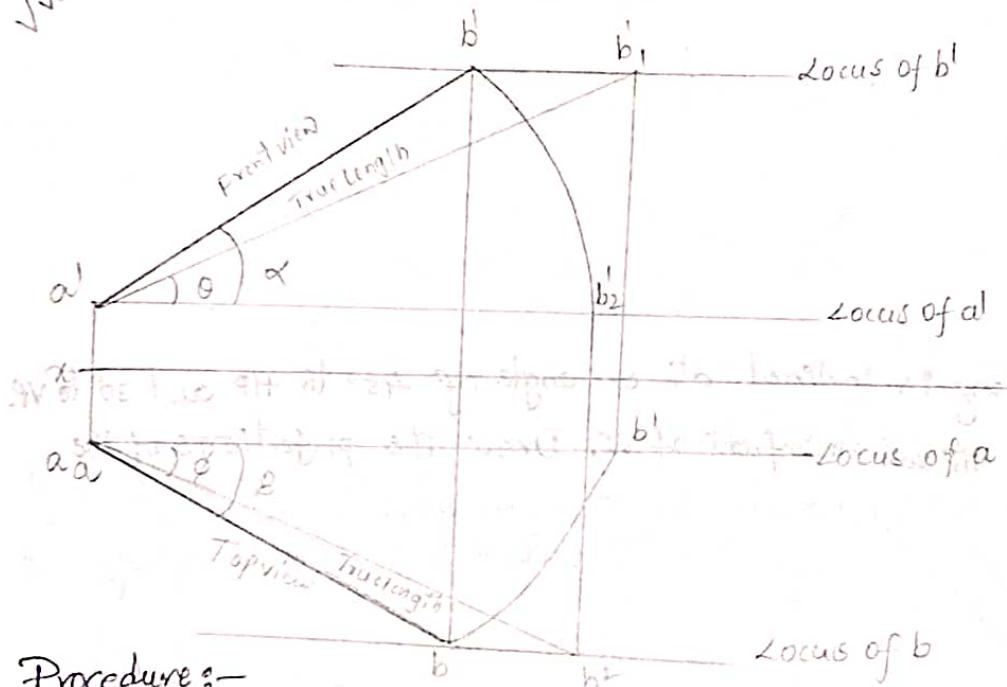
$$\begin{aligned}a = b' &= 60 \\a \cdot VP &= 20 \\&\phi = 45^\circ\end{aligned}$$



Ex A line CD is on VP and its one end C is 20 mm above HP. The line makes an angle of 45° with HP and its top view is 60 mm long. Draw the projections of the line and determine the true length.



* * *
Q) Line inclined to both the planes :-



Procedure :-

1) This type of problems we can solve in 3 stages.

1. \Rightarrow Assume that line is parallel to both the planes.

2. \Rightarrow Draw the given inclination with F.P. or V.P.

3. \Rightarrow Draw the remaining given angle with H.P. or V.P. and projections to be obtained.

FV = Front View

TV = Top View

TL = True Length

θ = True inclination
with H.P.

ϕ = True inclination
with V.P.

α = Front view angle /
Front view inclination

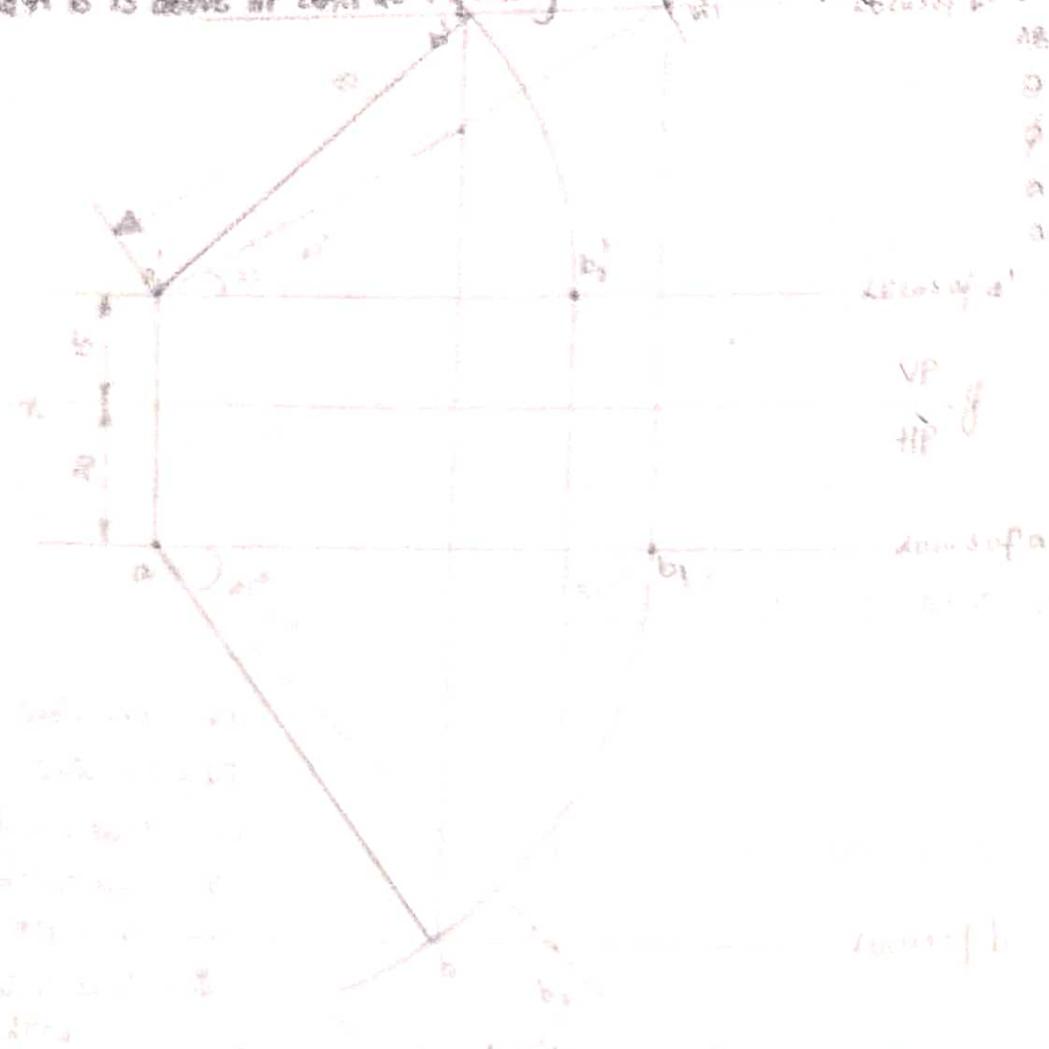
β = Top view angle /
Top view inclination

$a'b'_1 = ab_2 = \text{True Length}$

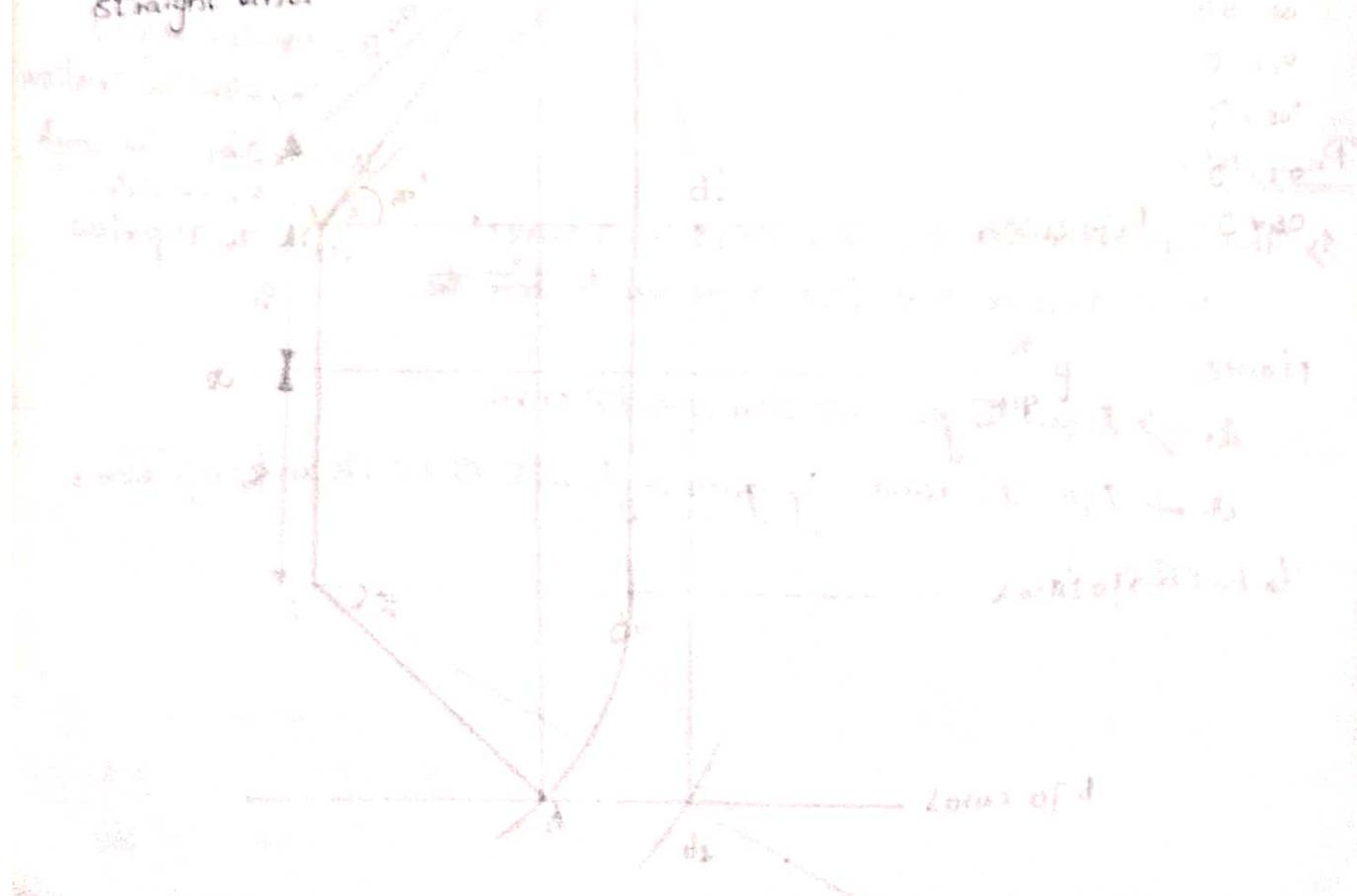
$a'b' = FV, \text{Frontview}$

$ab = TV, \text{Top view}$

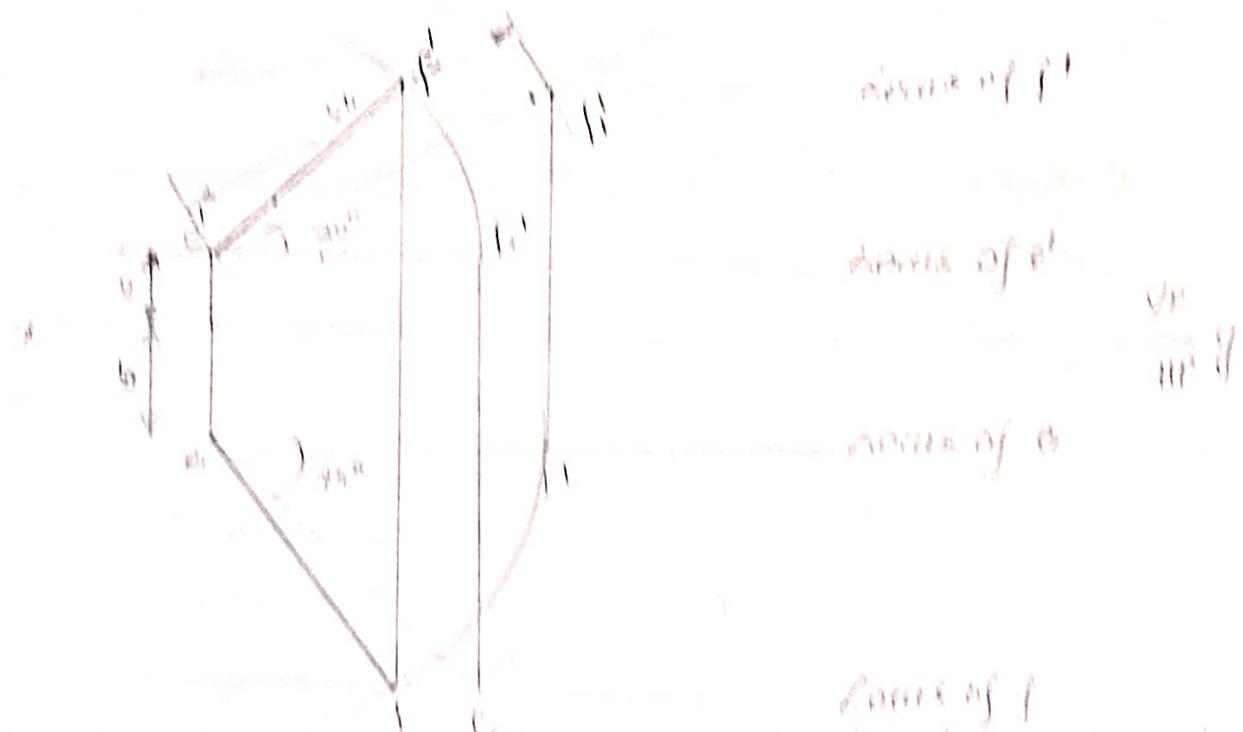
Q3) A line AB of length 40mm is inclined at an angle of 30° to H.P & vertical to V.P. The end A is 15 mm above H.P and 30 mm in front of V.P. Draw the projections of the line.



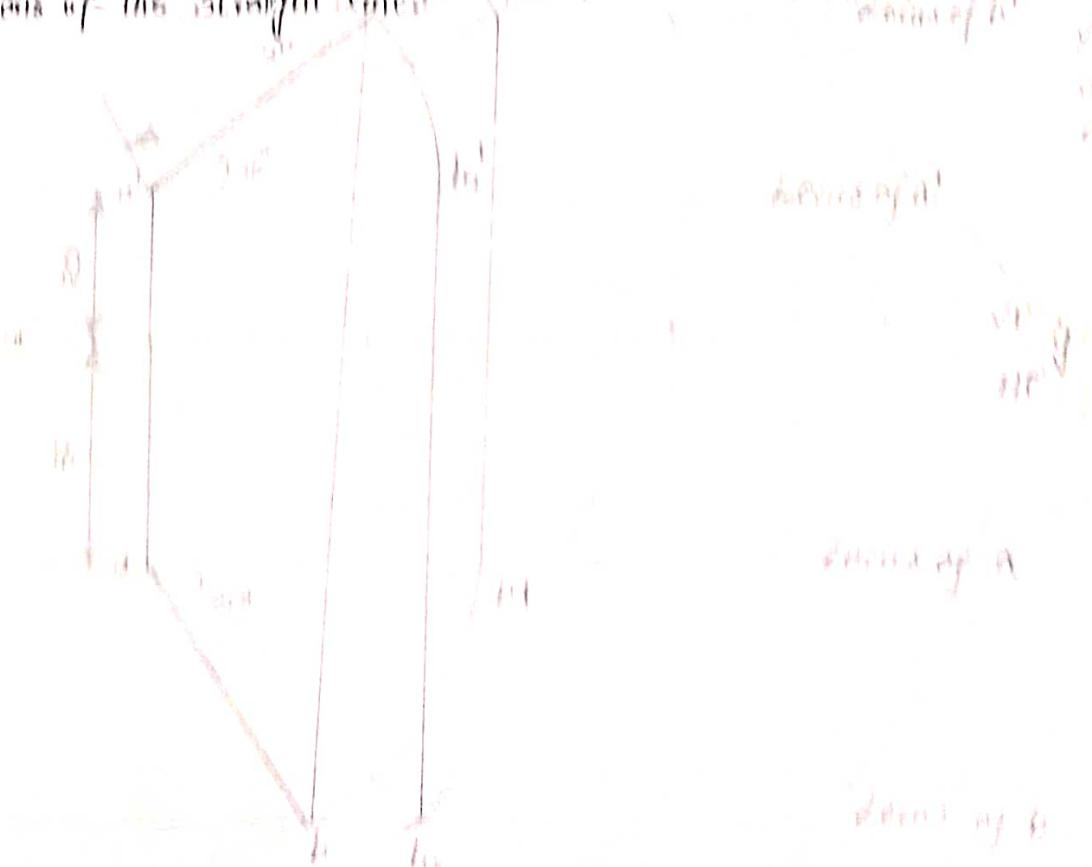
Q3) A line CD of 60 mm is inclined at an angle of 45° to H.P and 30° to V.P. The point is 20 mm above H.P and 30 mm in front of V.P. Draw the projections of the straight line.



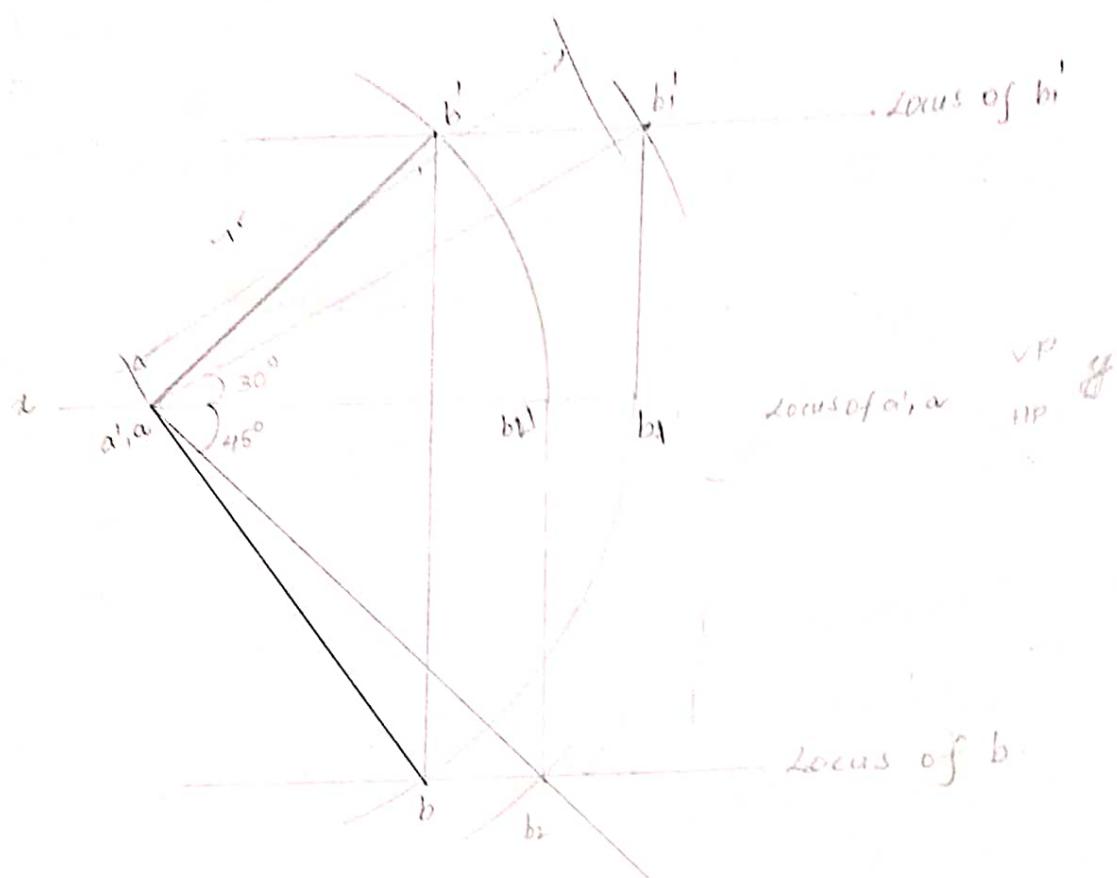
Ex. A line AB of length 20 units is inclined at 30° to VP and lies in VP.
The end A is 10 units above VP and lies in front of VP. Draw the projections of
the line.



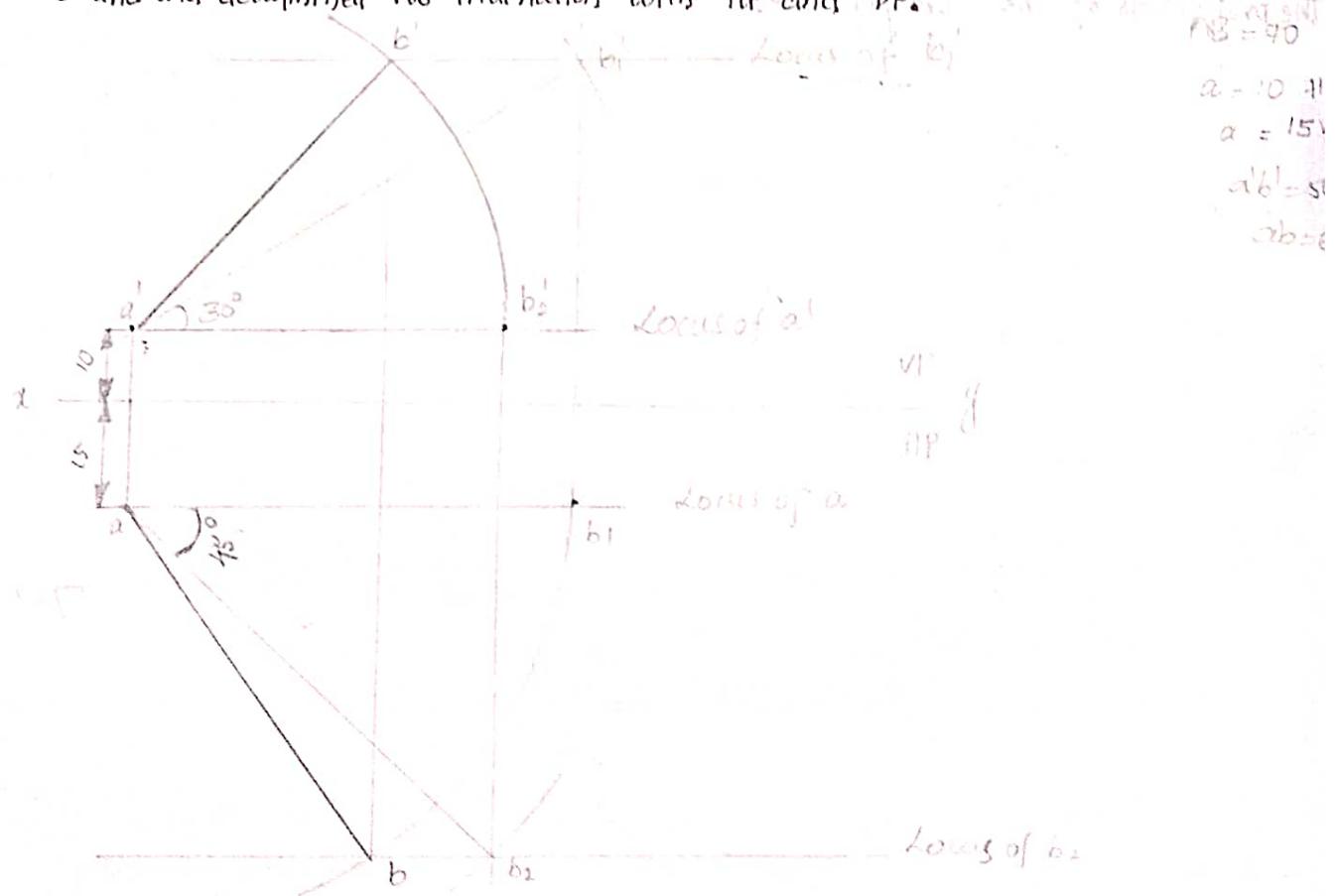
Ex. A line AB measuring 80 mm is inclined at an angle of 30° to VP and lies in VP. The end A is 40 mm above VP and lies in front of VP. Draw
the projections of the straight line.



Ex A line AB 75 mm long has its ends A if both H.P. and V.P. inclinations of line with H.P. and V.P. are 30° and 45° respectively. Draw the projections of the line.

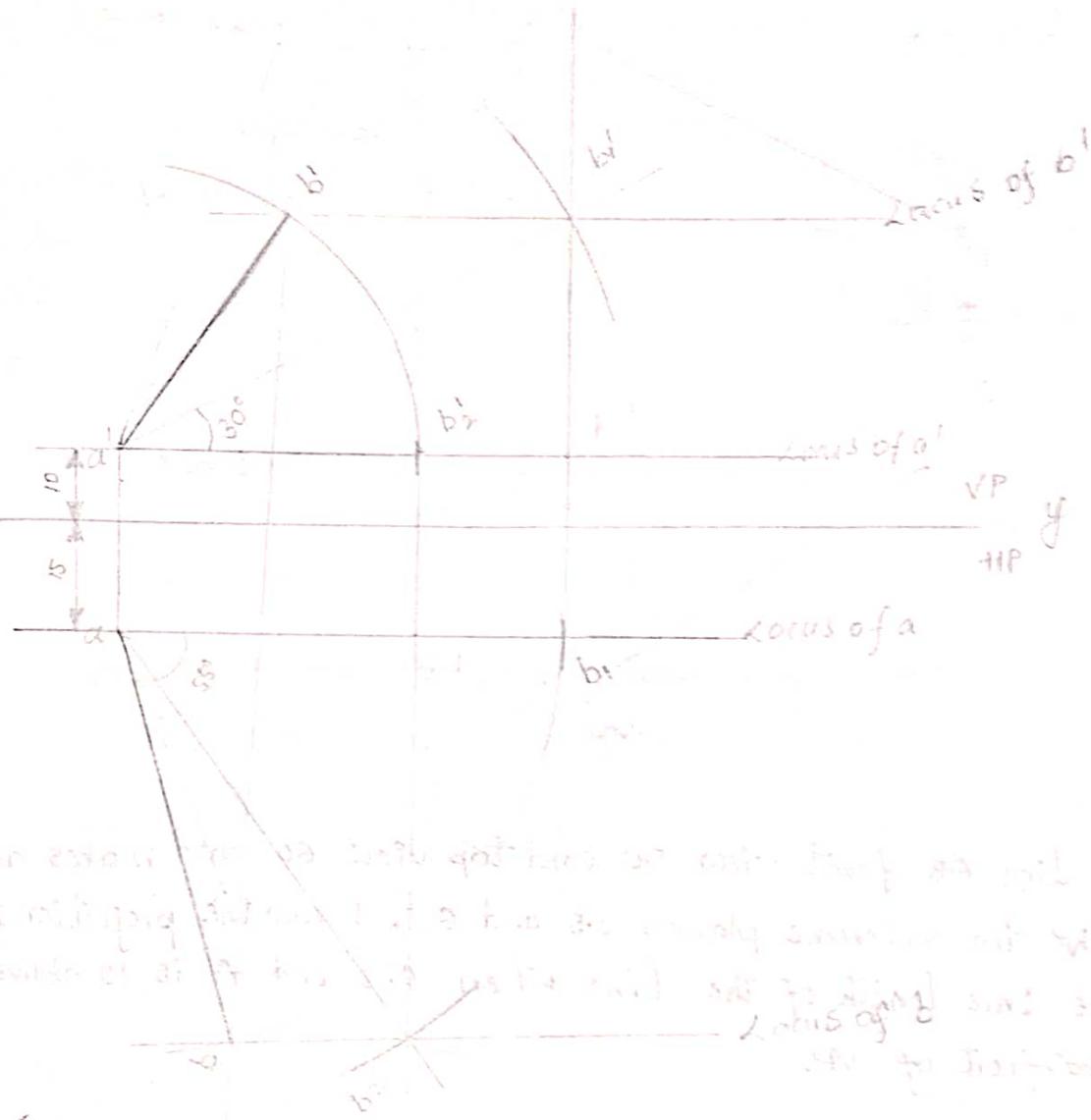


Ex A line AB of 70 long has its end A at 10 above H.P. and 15 in front of V.P. Its front view and top view measures 50 and 60 respectively. Draw the projections of the line and determine its inclination with H.P. and V.P.

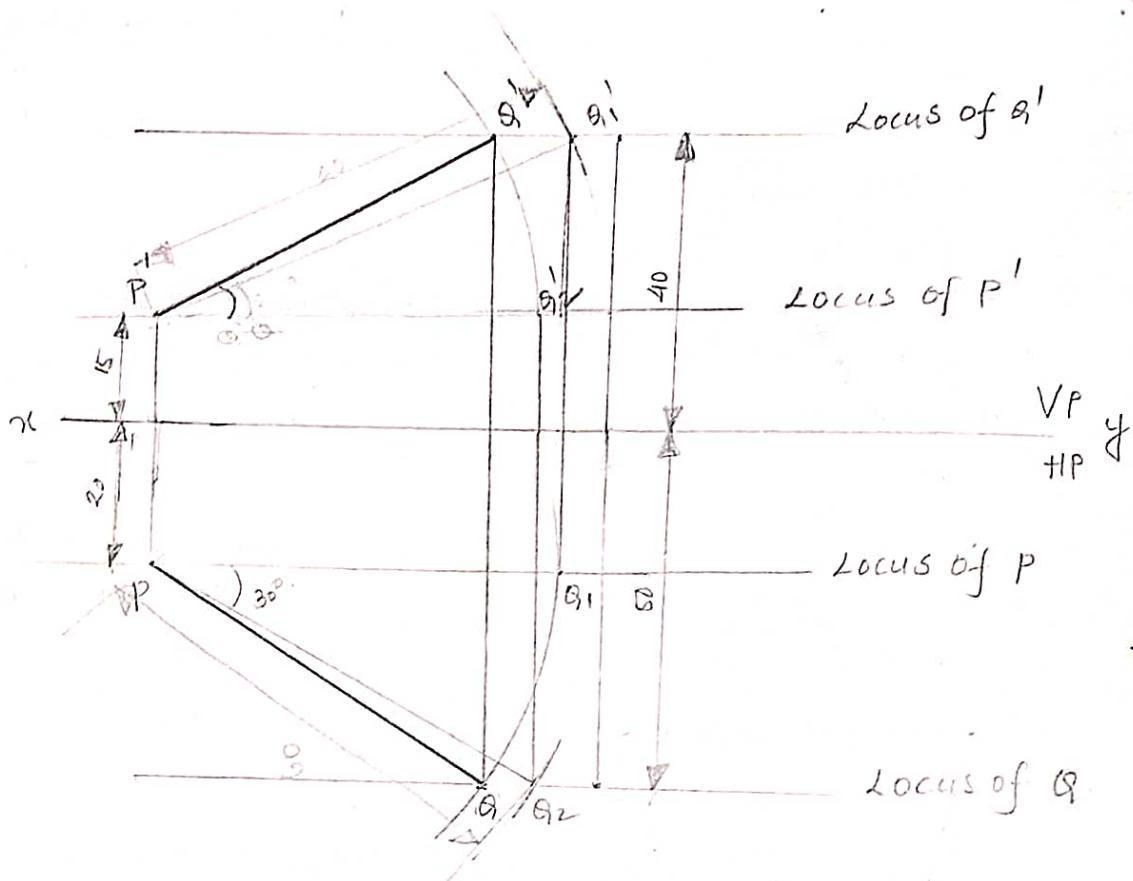


* A line PQ 70 mm long has its end P 10 mm above H.P. and 15 mm in front of V.P. Its top view and front view measures 60 mm & 40 mm respectively. Draw the projections of the line and determine its inclination with H.P. and V.P.

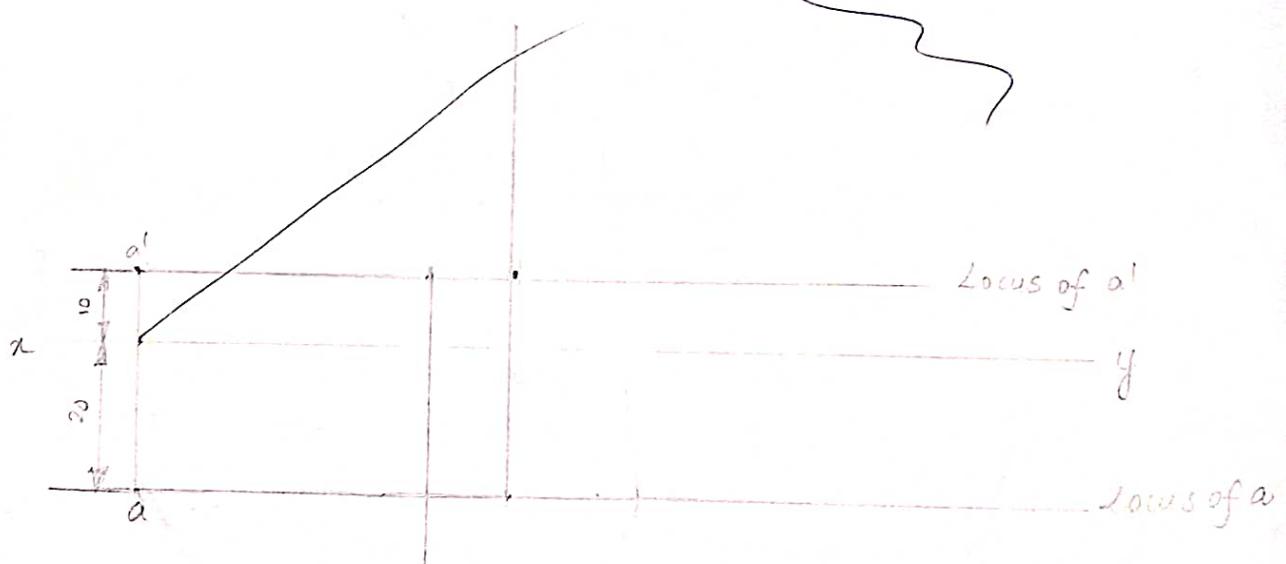
$$\begin{aligned} AB &= 70 \\ \alpha' &= 10 \\ \alpha &= 15 \end{aligned}$$



1) A line PQR measures 60, one end of the line is 16 and 40 above H.P and 20 and 50 in front of V.P. Draw the projections of the line and find its inclination.

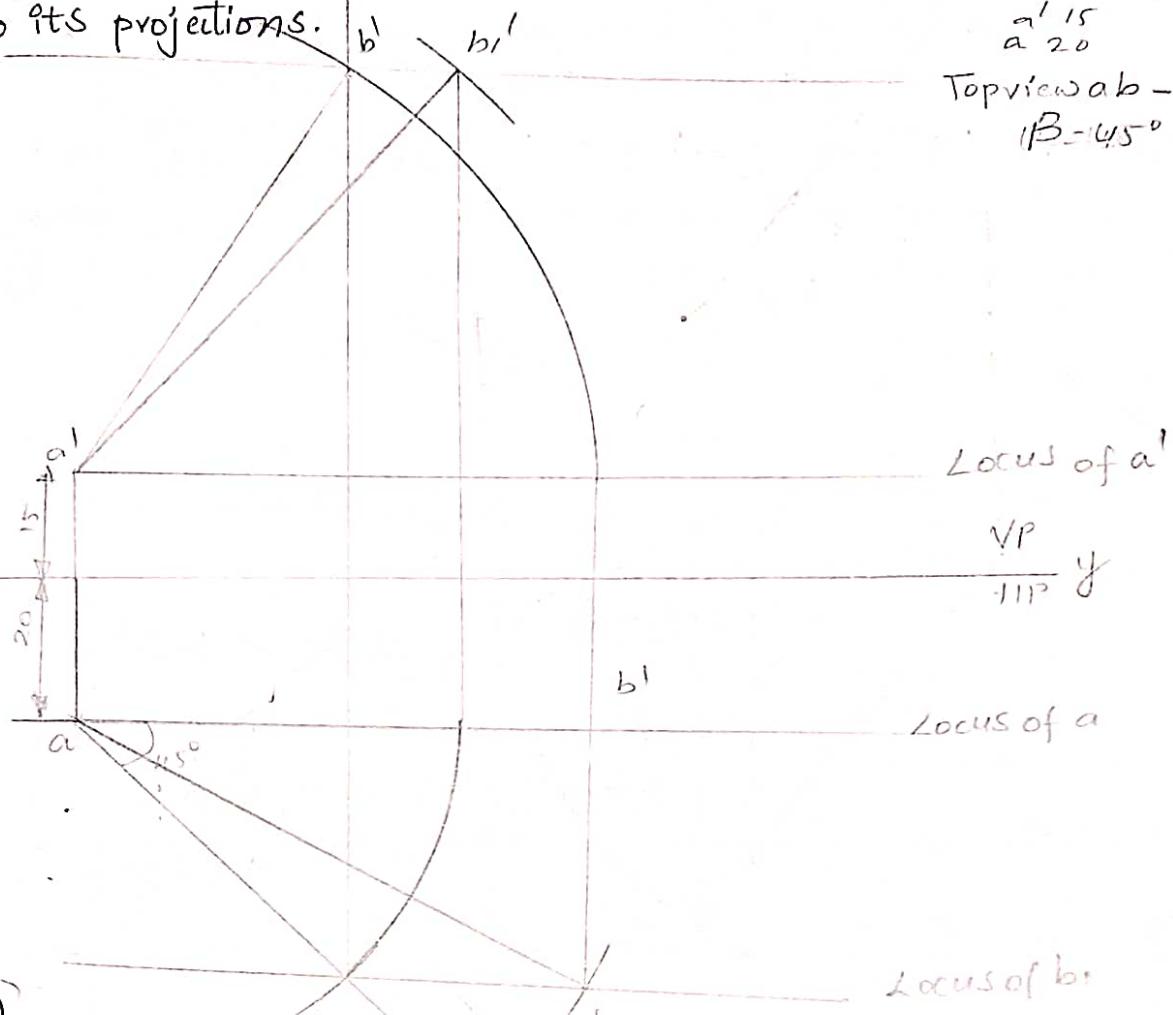


2) A line AB front view 50 and top view 60 and makes an angles with the reference planes 55° and 65° . Draw the projections and find true length of the line. When one end A is 10 above H.P and 20 in front of V.P.

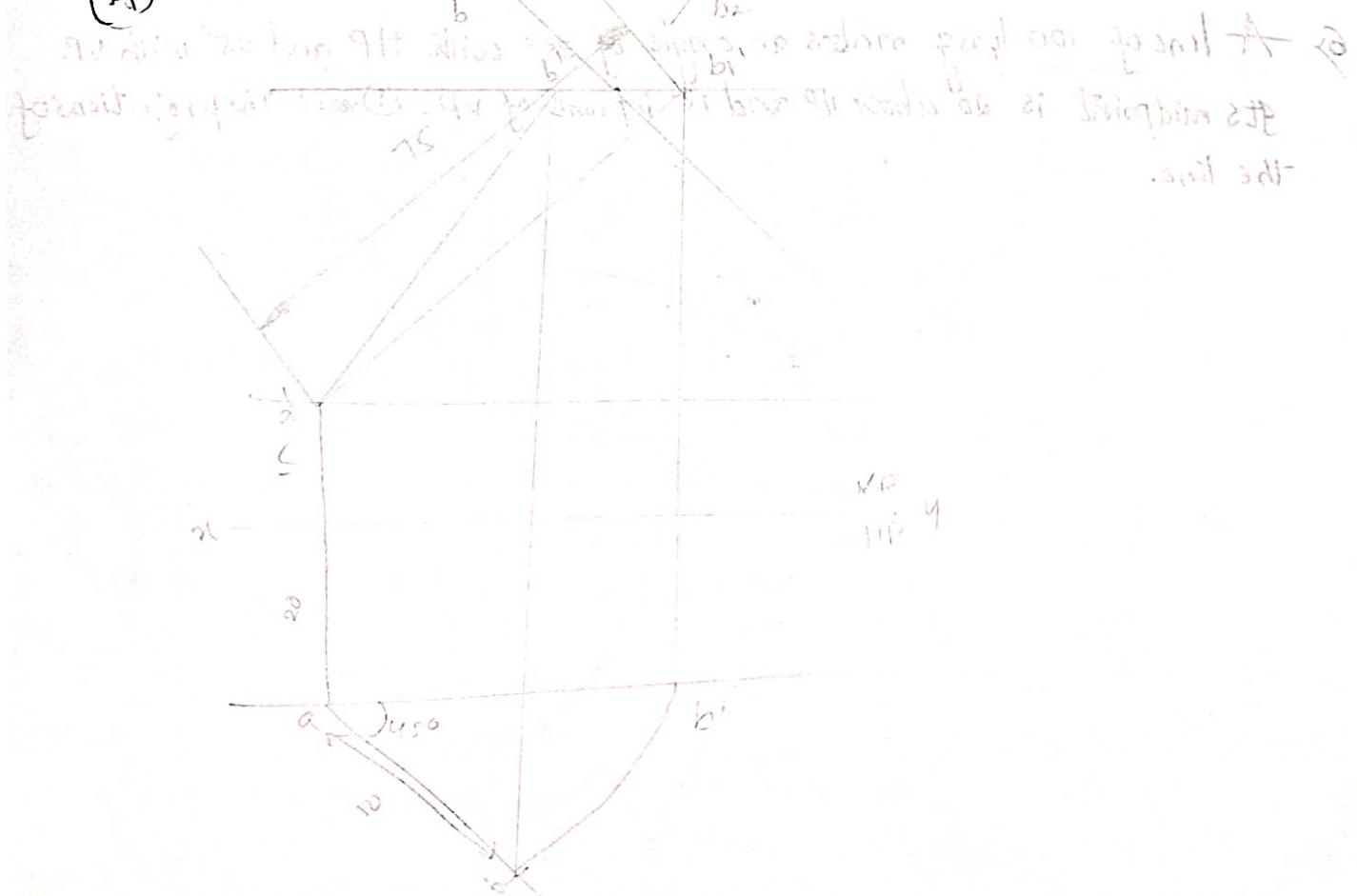


- 3) A line AB of 75 length has its end A 20 above H.P. & 15 in front of V.P a line is inclined at 30° to H.P & 60° to V.P. Draw its projections
 4) A line AB of 75 length has its end A 15 above H.P. & 20 in front of V.P. The length of top view is 50 and top view makes an angle 45° with xlf. Draw its projections.

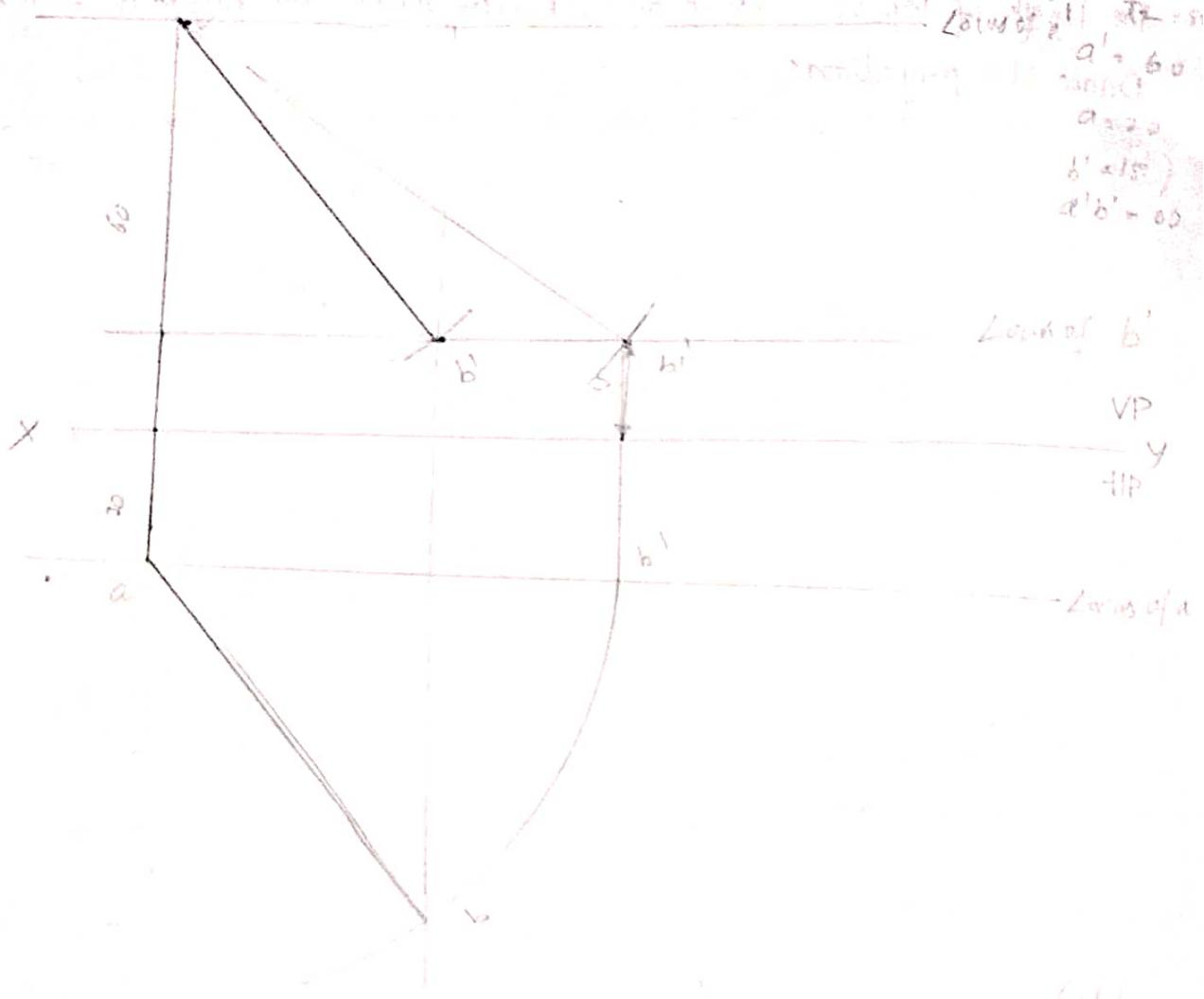
(3)



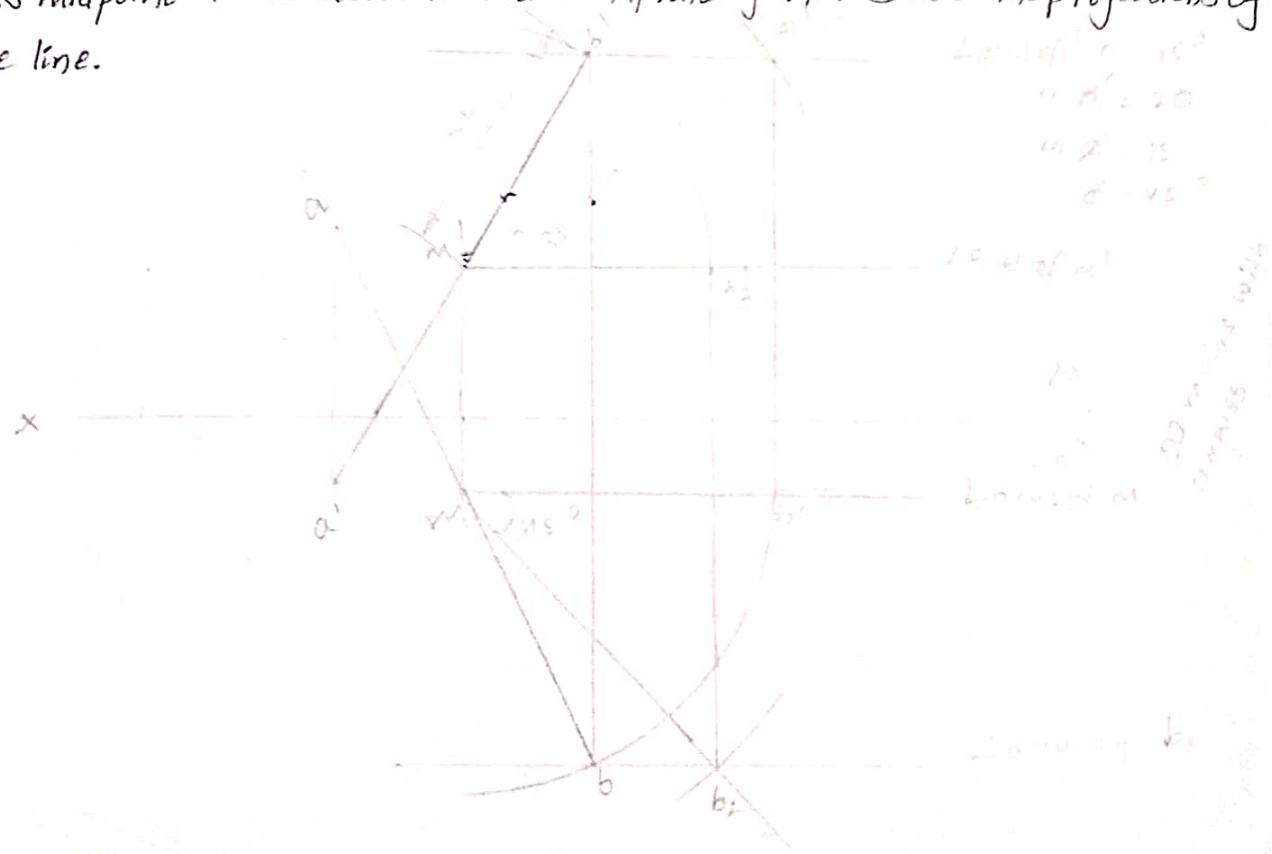
(4)



5) A line measuring 80 long has one of its ends 60 above H.P & 20 in front of V.P. the line is parallel to the H.P and other end is 15 above H.P & in front of V.P. the front view of the line is 60 long. Draw its projections.

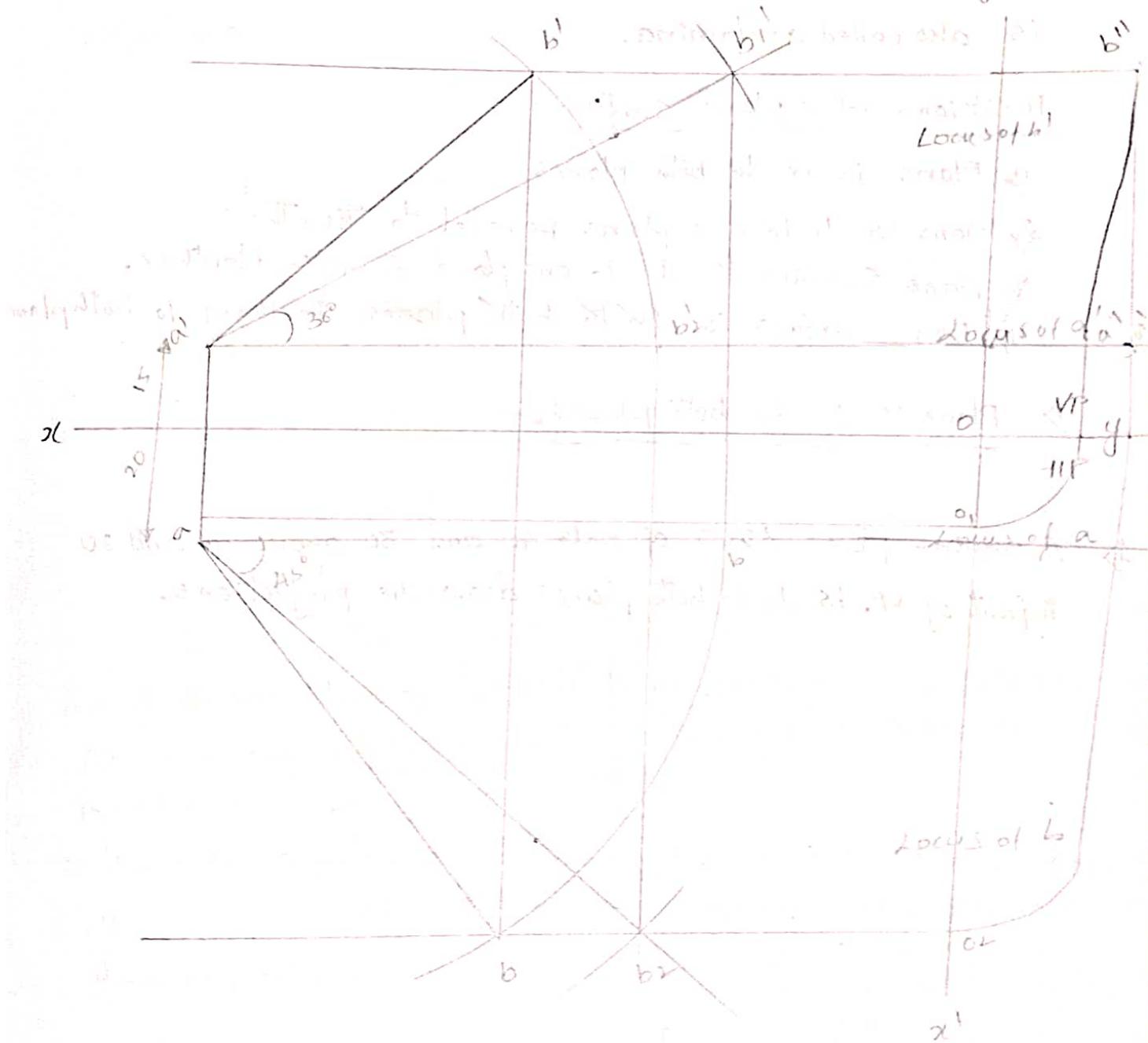


6) A line of 100 long makes an angle of 35° with H.P and 45° with V.P. its midpoint is 20 above H.P and 15 in front of V.P. Draw the projections of the line.



7) Front view of a 120 long line PQ measures 80 and its top view measures 100. Its end Q and the midpoint M are in the 1st Quadrant. M being 20 from both the planes. Draw the projections of the line PQ.

8) A line AB of 100 length is inclined 30° to HP and 45° inclined to VP. The end A is 15 above HP and 20 in front of VP and 125 from RPP (Right Profile plane). Draw the front view, top view and Side view left.



Date
05/02/2022
Saturday

UNIT - 3

PROJECTIONS OF PLANES

PLANE (OR) LAMINA (OR) SURFACE :-

A plane or plane surfaces have only two dimensions such that length and height or breadth, which does not have thickness. The polygonal surfaces such as triangle, square, rectangle, polyhedral [Pentagon, Hexagon...etc.] and circle has are defined as plane figures the plane are plane surface is also called as lamina.

Positions of a plane surface :-

1) Plane is $\perp r$ to both planes.

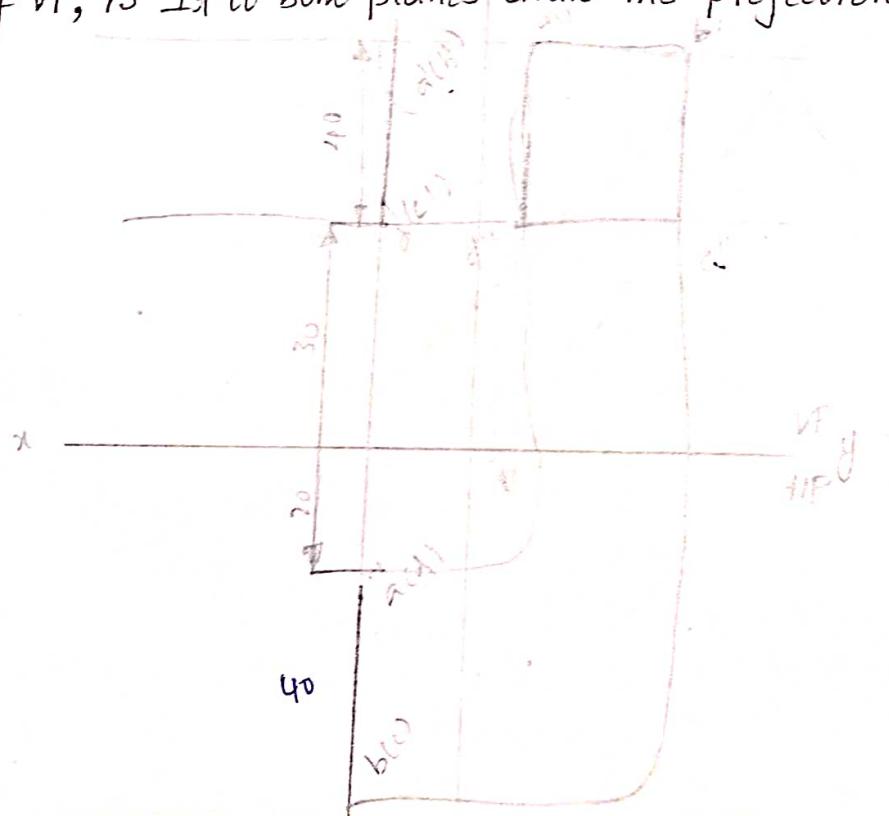
2) Plane is $\perp r$ to one plane parallel to the other

3) Plane Surface is $\perp r$ to one plane & inclined to the other.

4) Plane Surface is $\perp r$ to both planes. inclined to both planes

Plane is $\perp r$ to both planes :-

1) A square plane ABCD of side 40 and 30 above HP and 20 in front of VP, is $\perp r$ to both planes draw the projections.

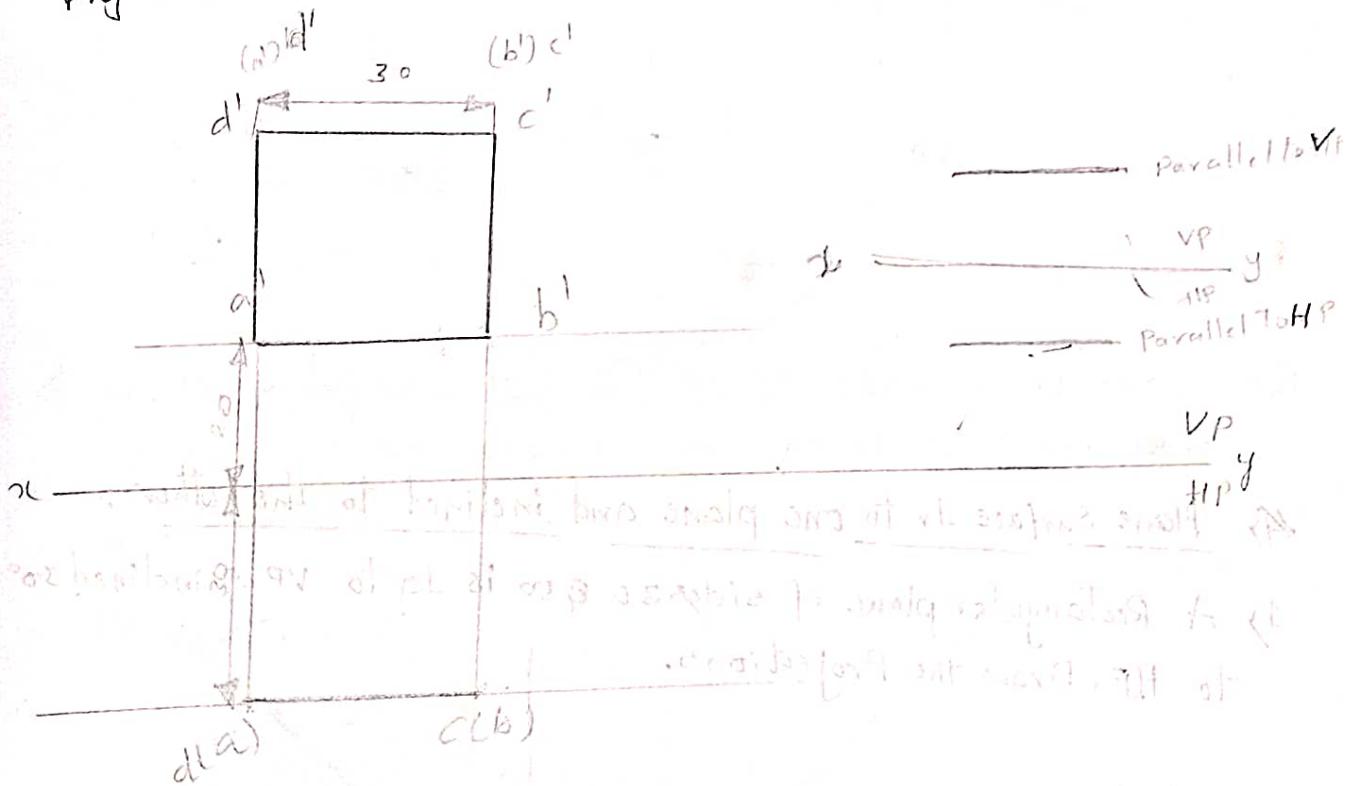


2) A square plane PQRS having side 30 and located at 15 above HP and 15 in front of VP. Draw the projections of the square plane and also draw left and right side views.

3) A rectangular lamina of 20×40 its is 20 above HP & 15 in front of VP and Lr to both the planes. Draw the projections, front view, top view & left side view of the rectangular lamina

4) Plane is Lr to one plane & parallel to the other.

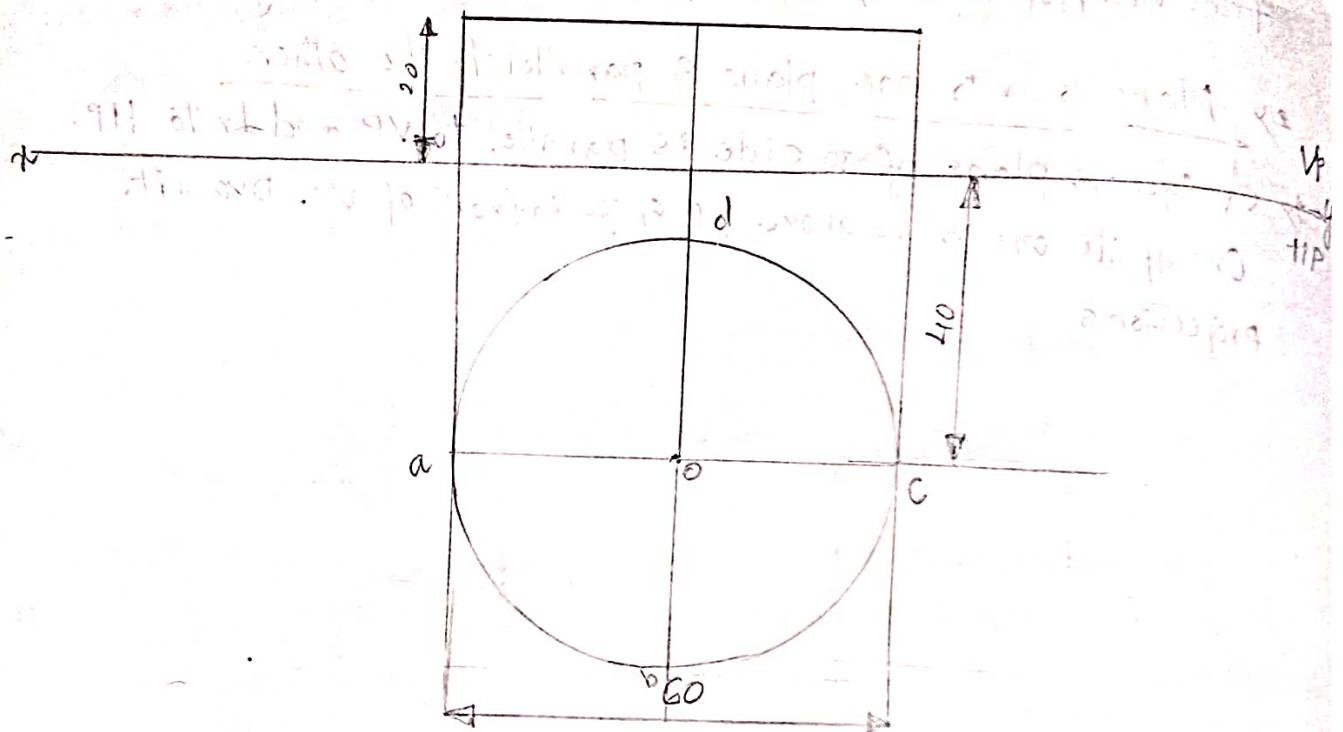
5) A square plane of 30 side is parallel to VP and Lr to HP. One of its side is 20 above HP & 30 in front of VP. Draw its projections.



6) A square plane of 30 side is parallel to HP and Lr to VP. one of its side is 30 above HP 20 in front of VP. Draw its projections.

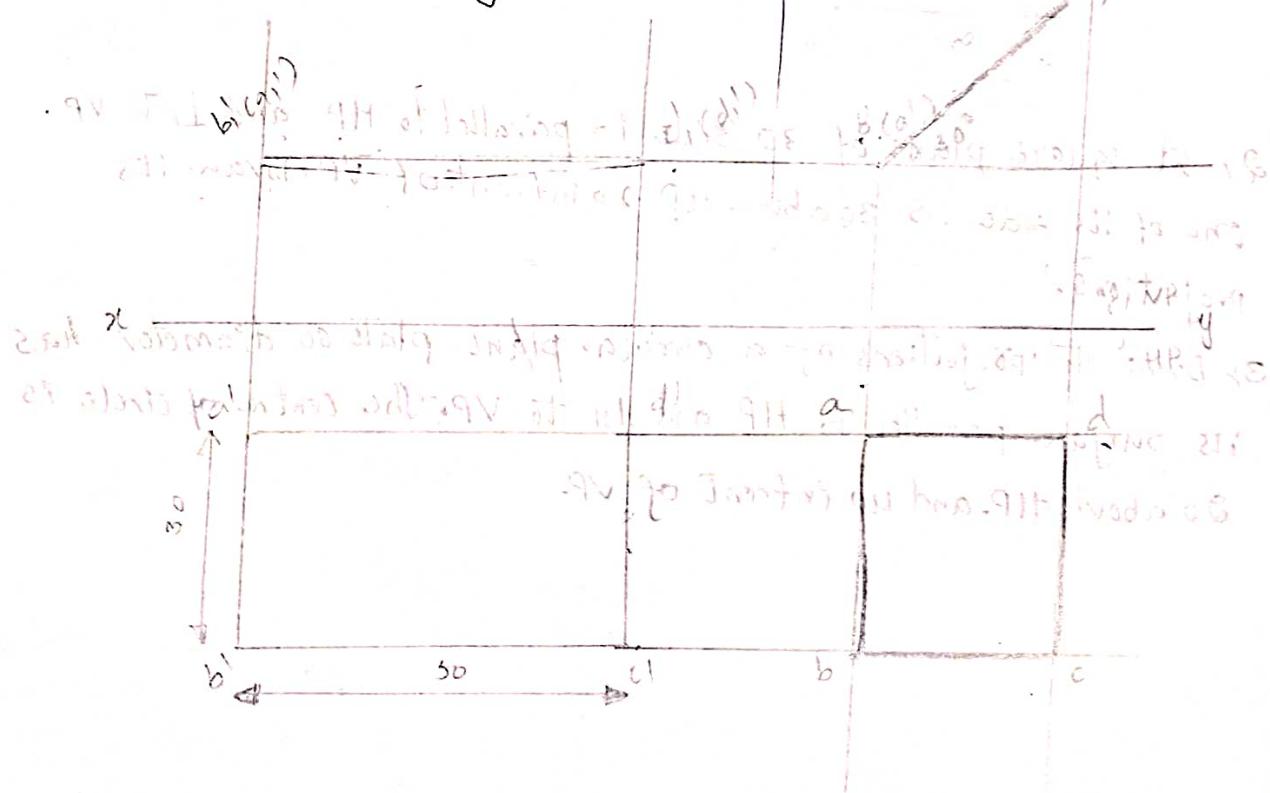
7) Draw the projections of a circular plate 60 diameter has its surface parallel to HP and Lr to VP. The centre of circle is 20 above HP and 10 in front of VP.

Ques. A horizontal rectangular plate of 30 mm width and 20 mm thickness is inclined at 30° to the XY reference line. It has a circular hole of diameter 20 mm at its center. The top edge of the plate is 40 mm above the reference line. Draw the orthographic projections.



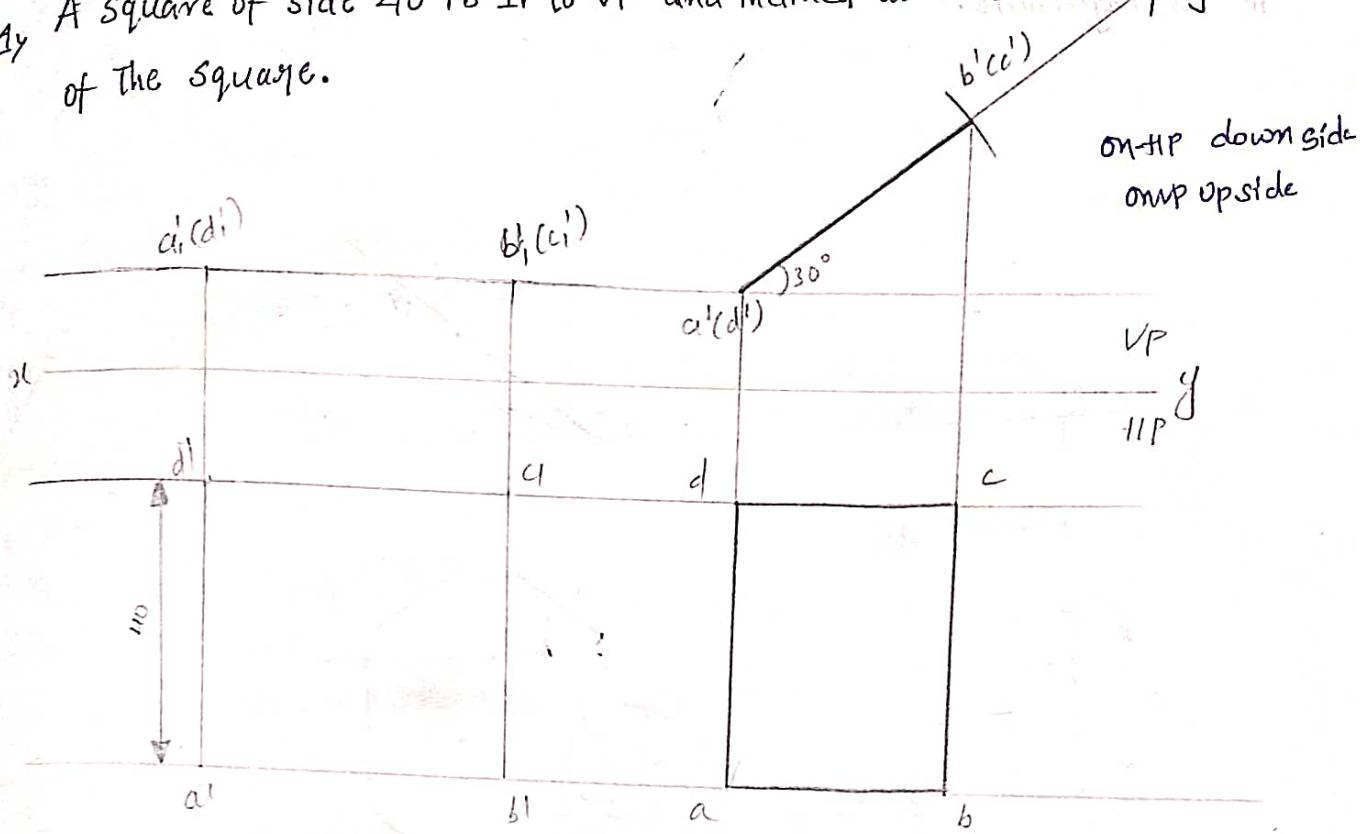
4) Plane surface tr to one plane and inclined to the other :-

- 1) A Rectangular plane of sides 30 & 50 is tr to VP & inclined 30° to HP. Draw the Projections.



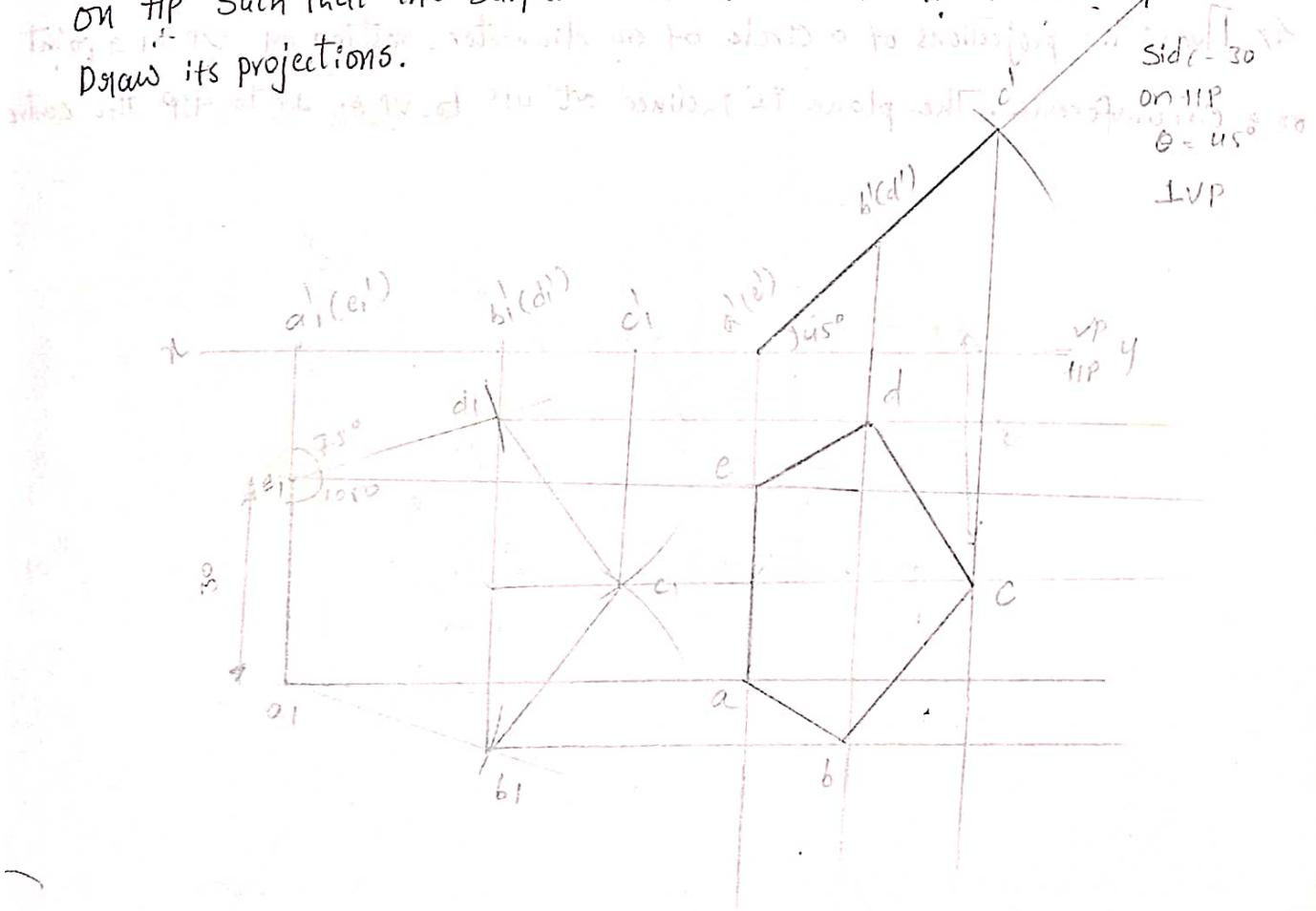
A square of side 40, one of its sides is on HP and inclined at 30° to VP. Draw the projections of the square.

1) A square of side 40 is Lr to VP and inclined at 30° . Draw the projections of the square.

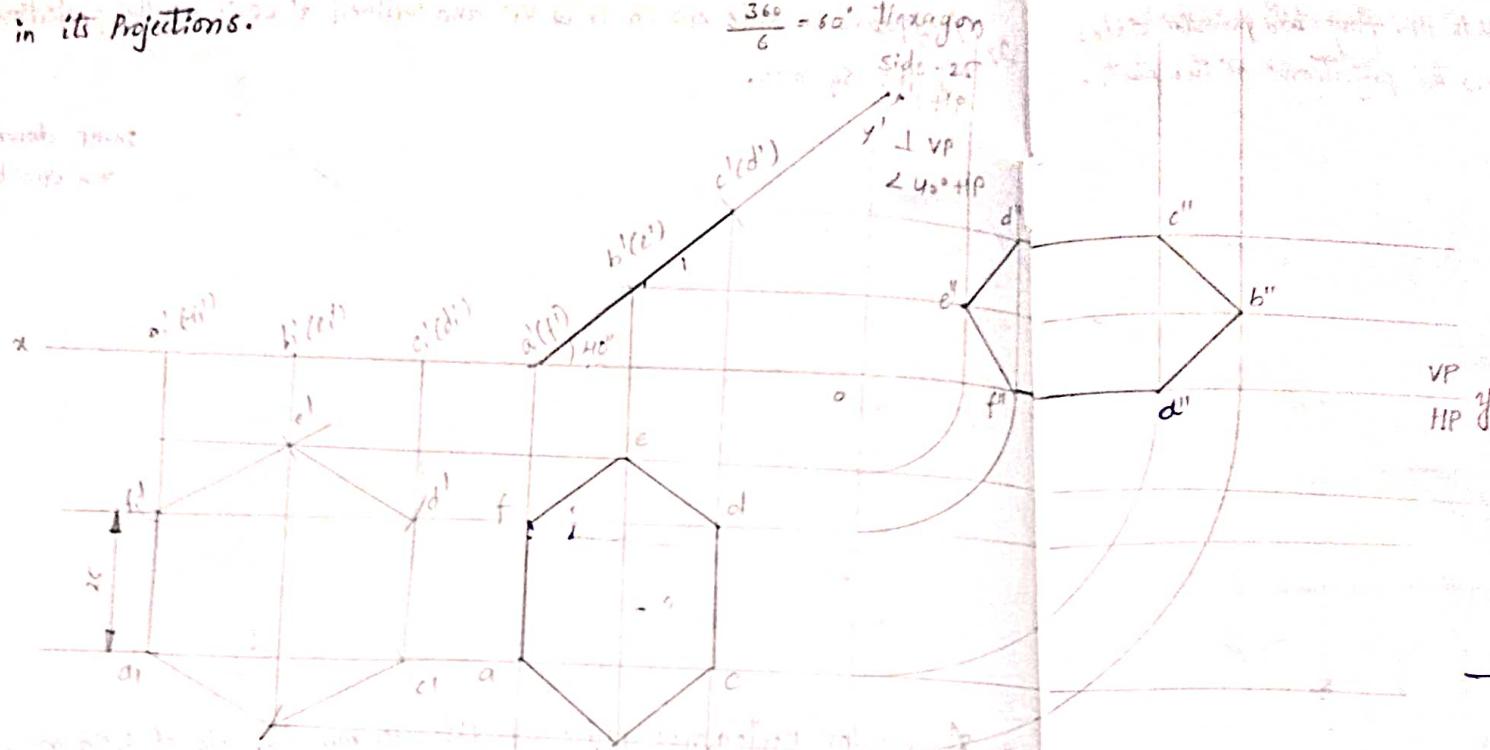


2) A regular pentagonal plate of side 30 mm is placed with one side on HP such that the surface is inclined at 45° to H.P. and Lr to V.P.

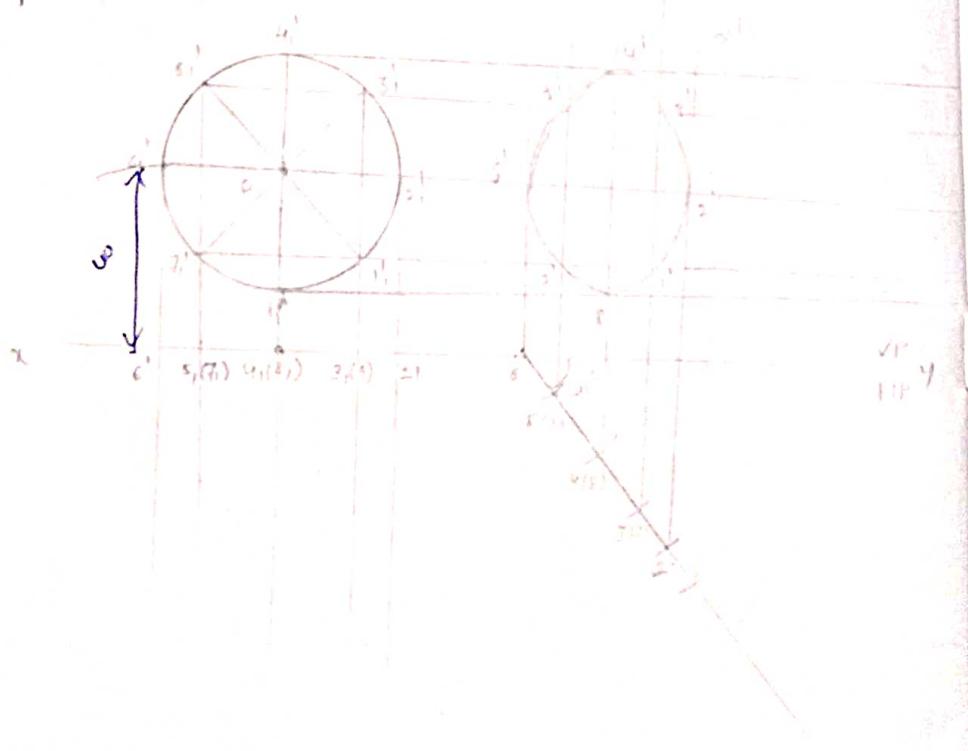
Draw its projections.



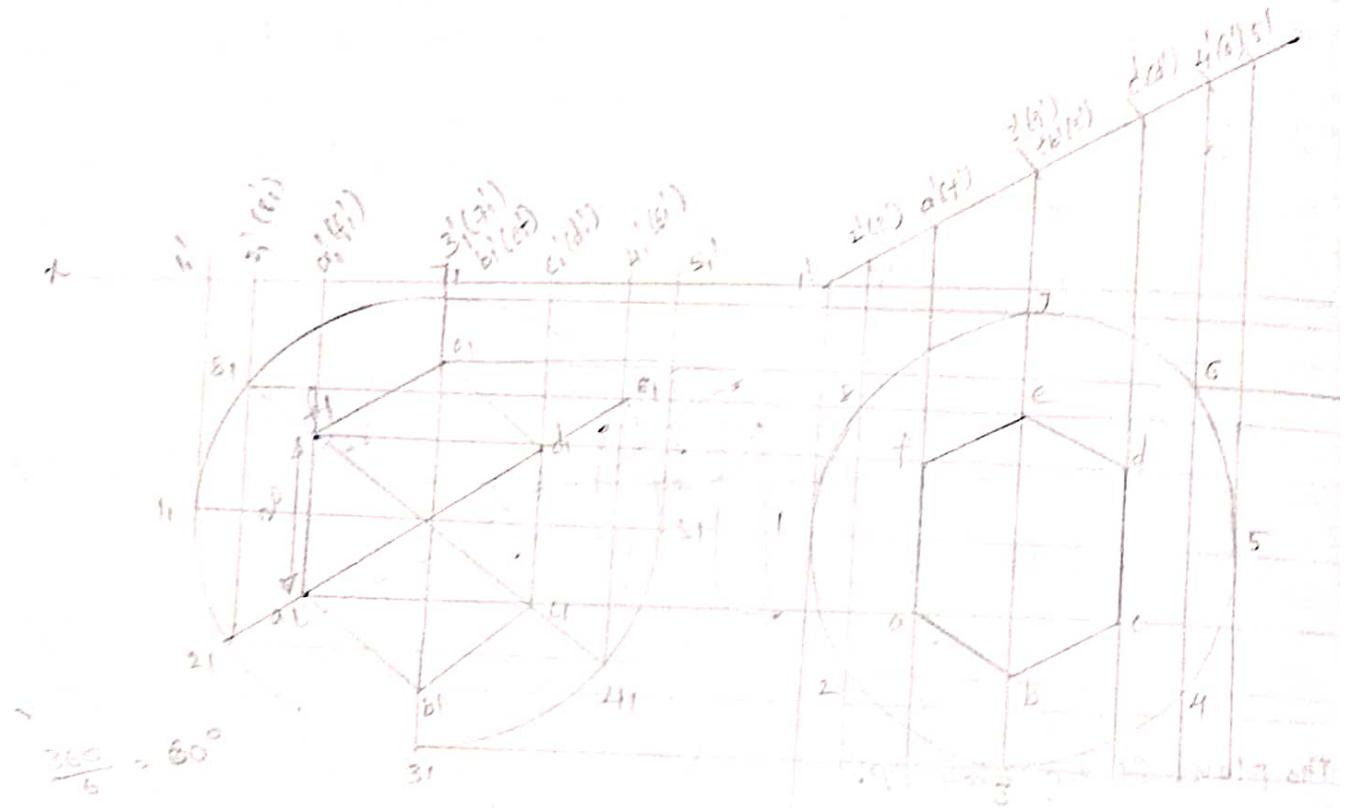
3) A regular hexagon of 25 side has its one edge on H.P. The surface of the plane is Jr to VP & inclined to 40° to H.P. Draw the 3 views in its projections.



4) Draw the projections of a circle of 60 diameter, resting on VP on a point on a circumference. The plane is inclined at 45° to VP & Jr to HP the centre of the plane is 40 above H.P.



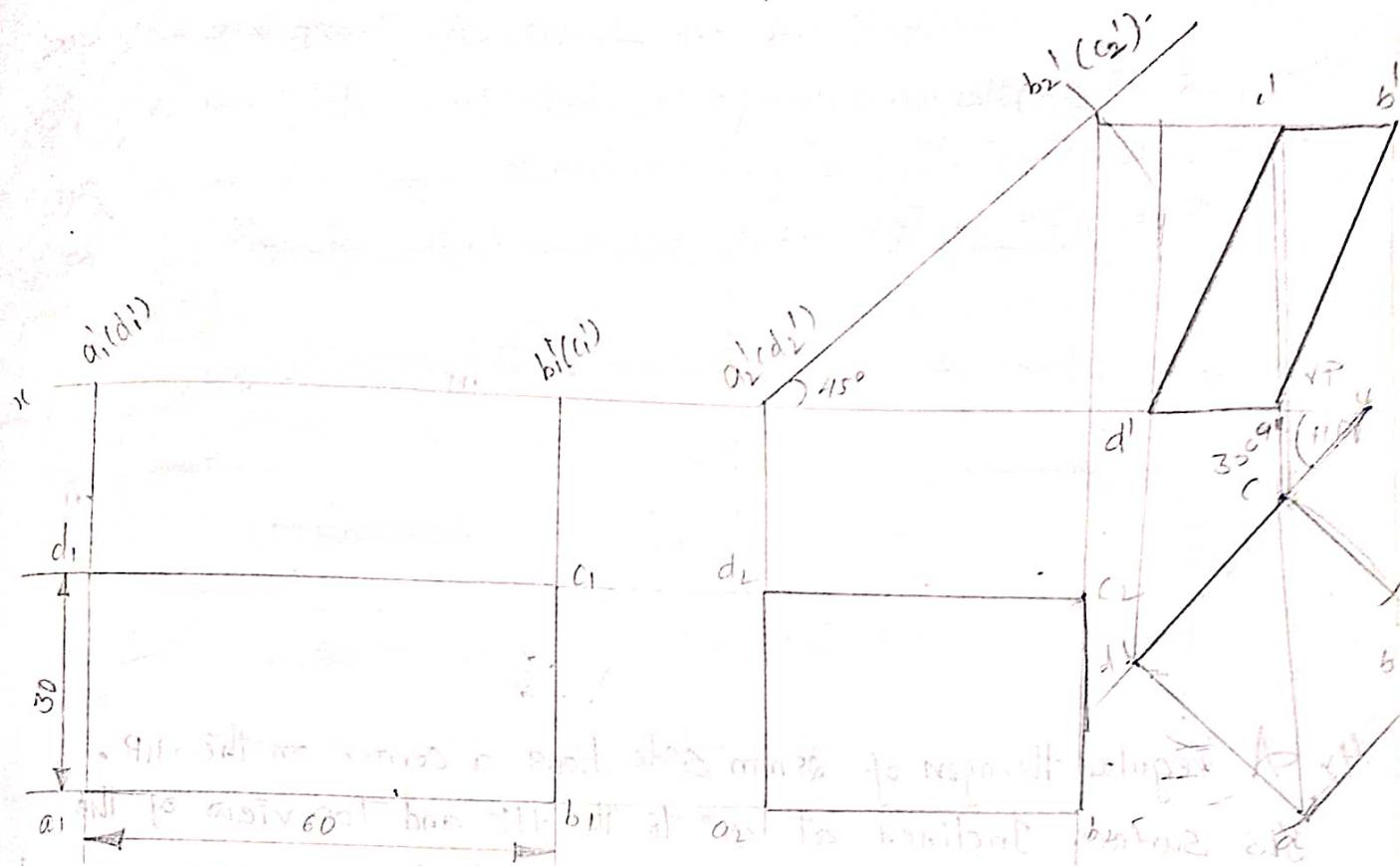
Ex: Circular plate of 60 diameter has a hexagonal hole of 20 side, centrally punched draw the projections of the plate resting on H.P on a point, with its surface is inclined at 30° to H.P. Any two parallel sides of the hexagonal hole are L.R to V.P. Draw the projections of the plate.



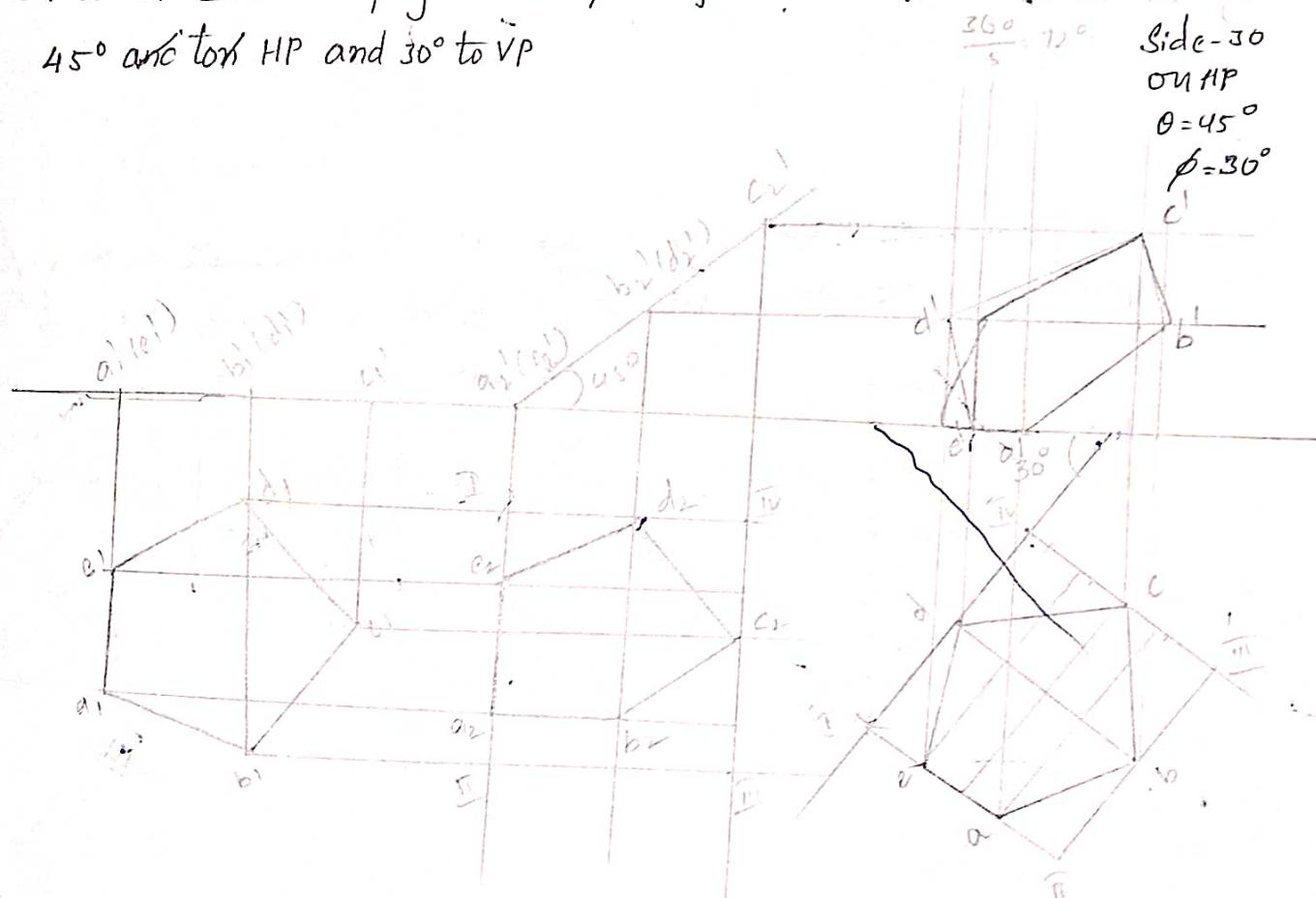
Plane inclined to both planes :-

- 1) Plane surface is L.R to one plane // to the other.
- 2) " " angle

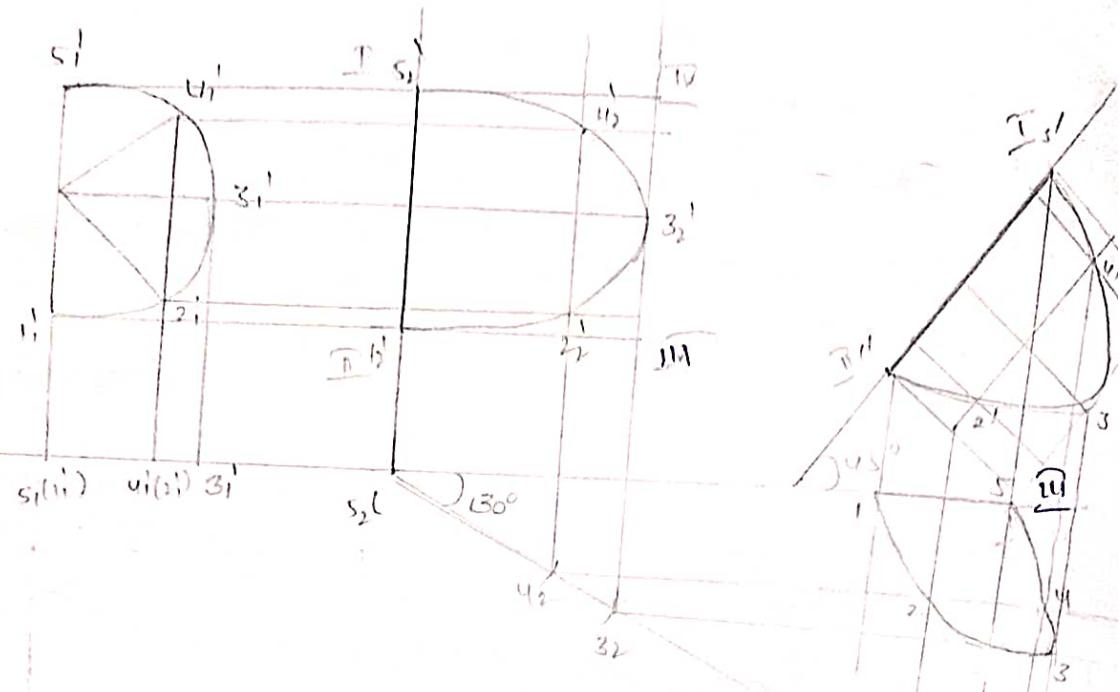
1) A rectangular plane of 60×30 has its shorter side on HP and inclined 30° to VP. Draw the projections of the plane, if its surface is inclined to 45° to HP and 30° to VP.



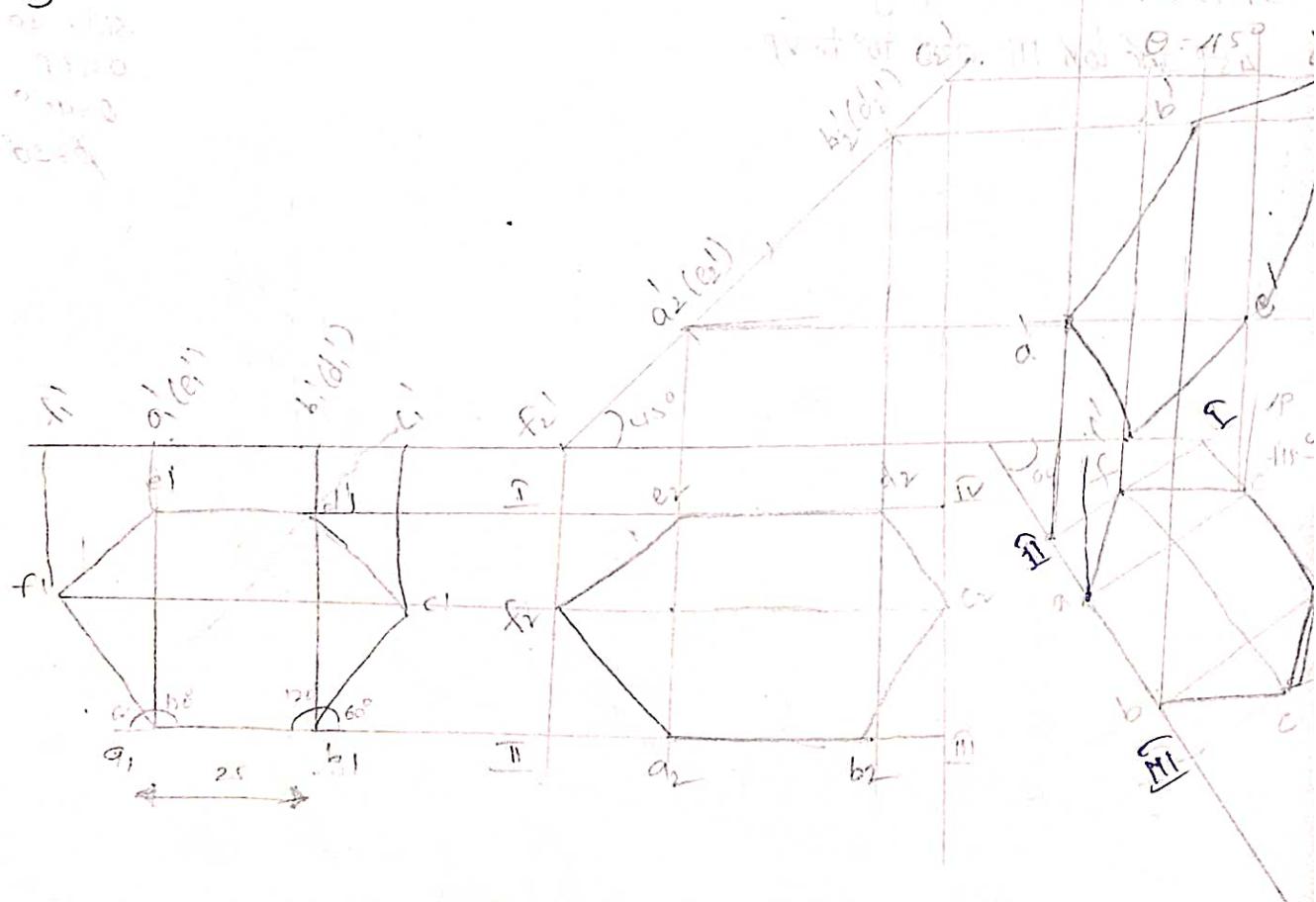
2) A regular pentagon of 30 side is resting on HP on one of its side is 45° to VP. Draw the projections by one of its side is on HP and inclined 45° and to HP and 30° to VP



3) A semicircular plate plane of 60 mm diameter has its straight edge the VP & inclined at 45° to H.P. The surface of the plate makes an angle of 45° to VP. Draw its projections.



4) A regular hexagon of 25 mm side has a corner on the HP. Its surface inclined at 45° to the HP and top view of the diagonal through the corner which is in the HP makes an angle of 60° with the VP. Draw the projections.



Orthographic projections

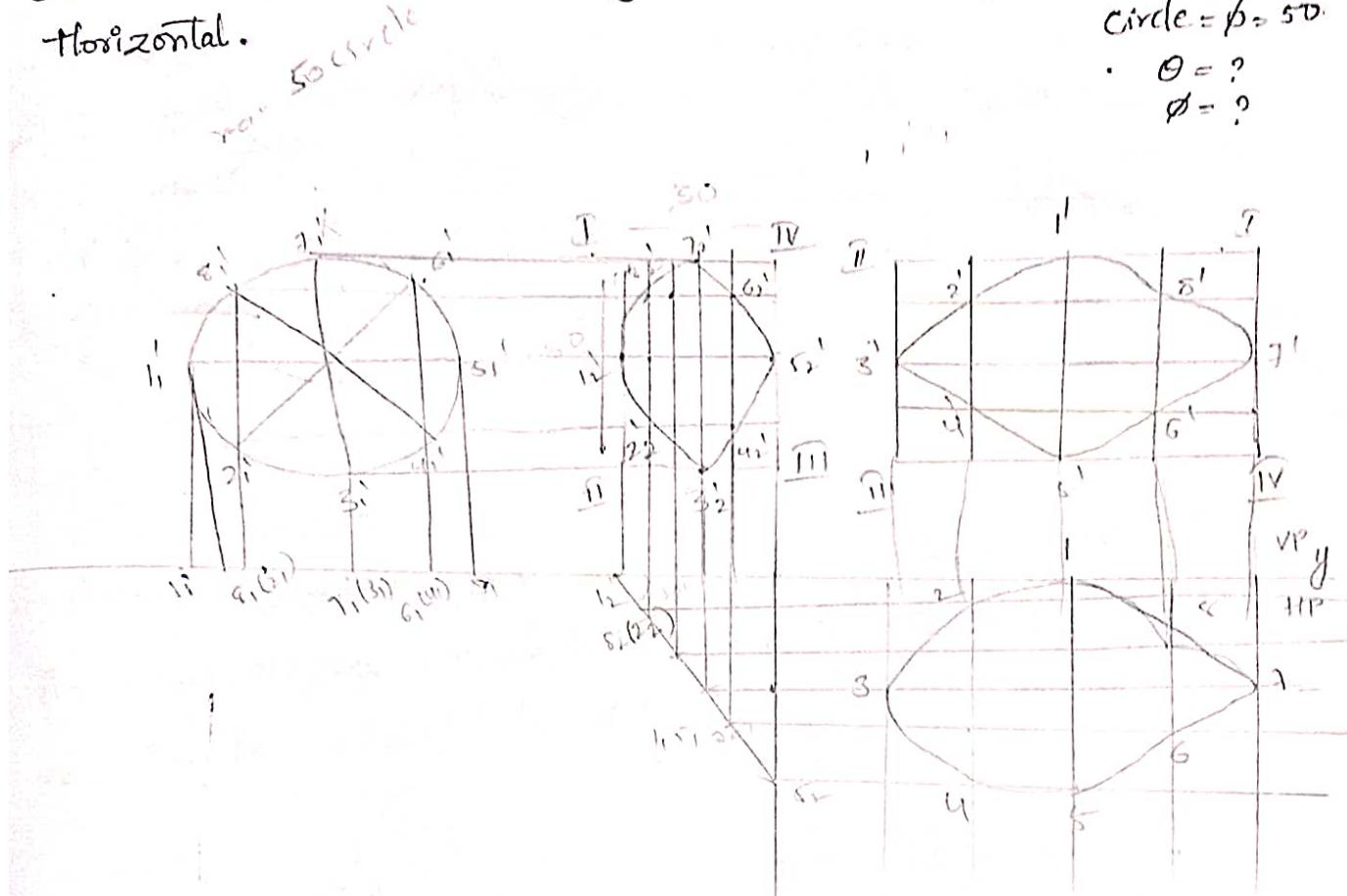
A Circular lamina of 50 diameter rests on HP. Such that one of its diameter is inclined at 30° to VP and 45° to HP. Draw the top view and front view of the circular lamina.

A circular plate of 50 diameter appears an ellipse in the front view having its major access 50 long and minor access 30 long. Draw the top view when the major access of the ellipse is horizontal.

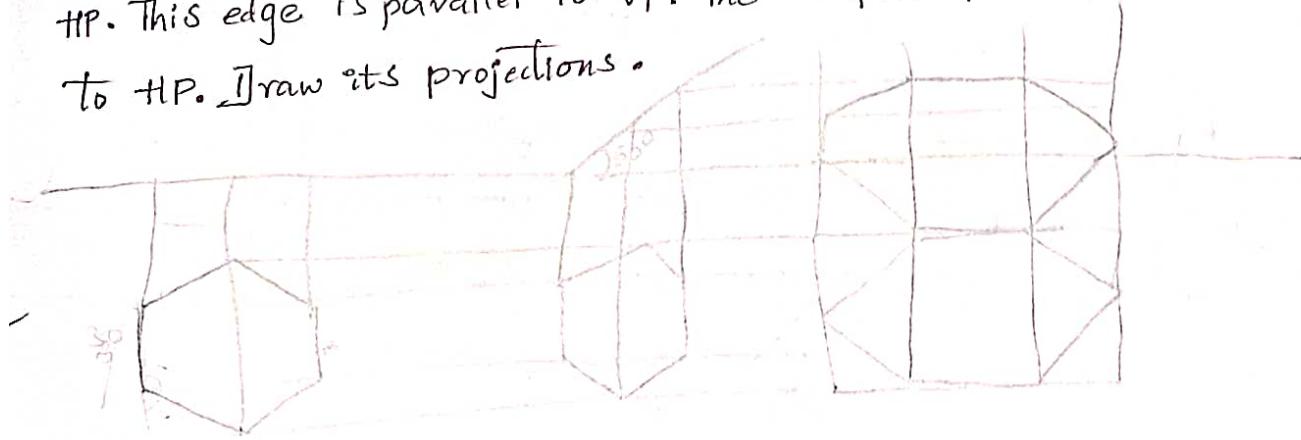
$$\text{circle} = \phi = 50$$

$$\theta = ?$$

$$\phi = ?$$

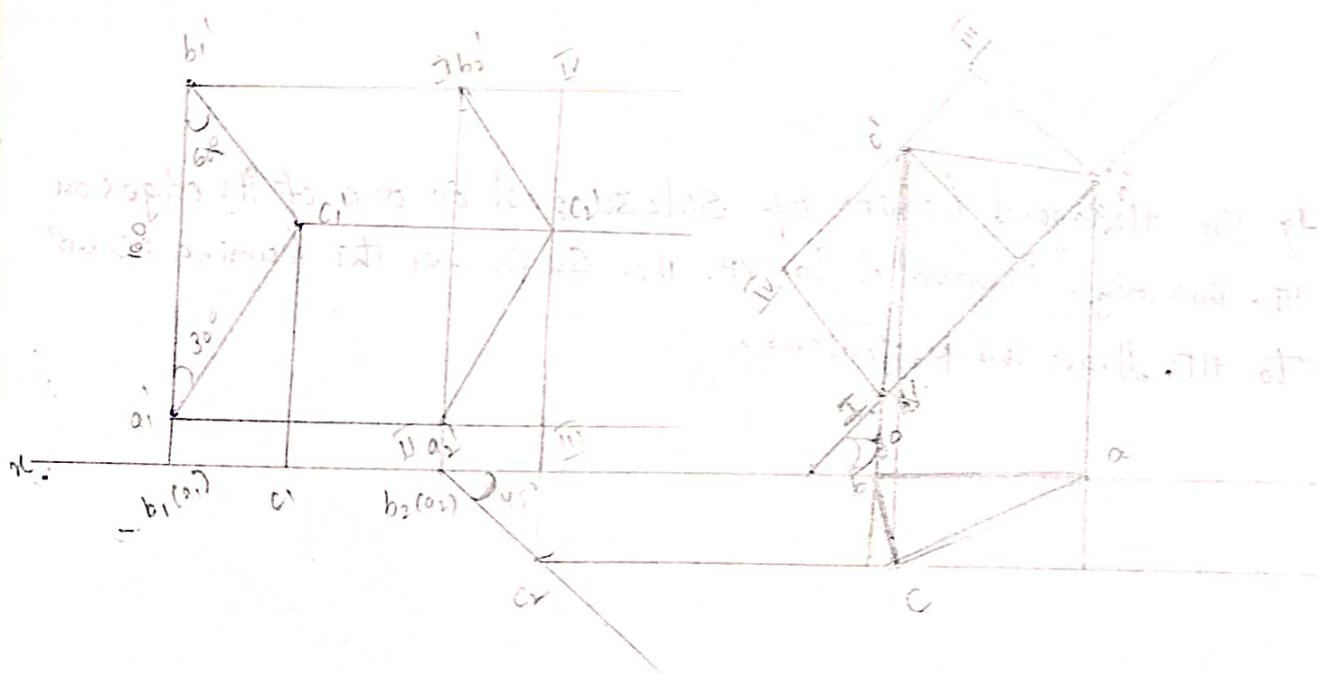
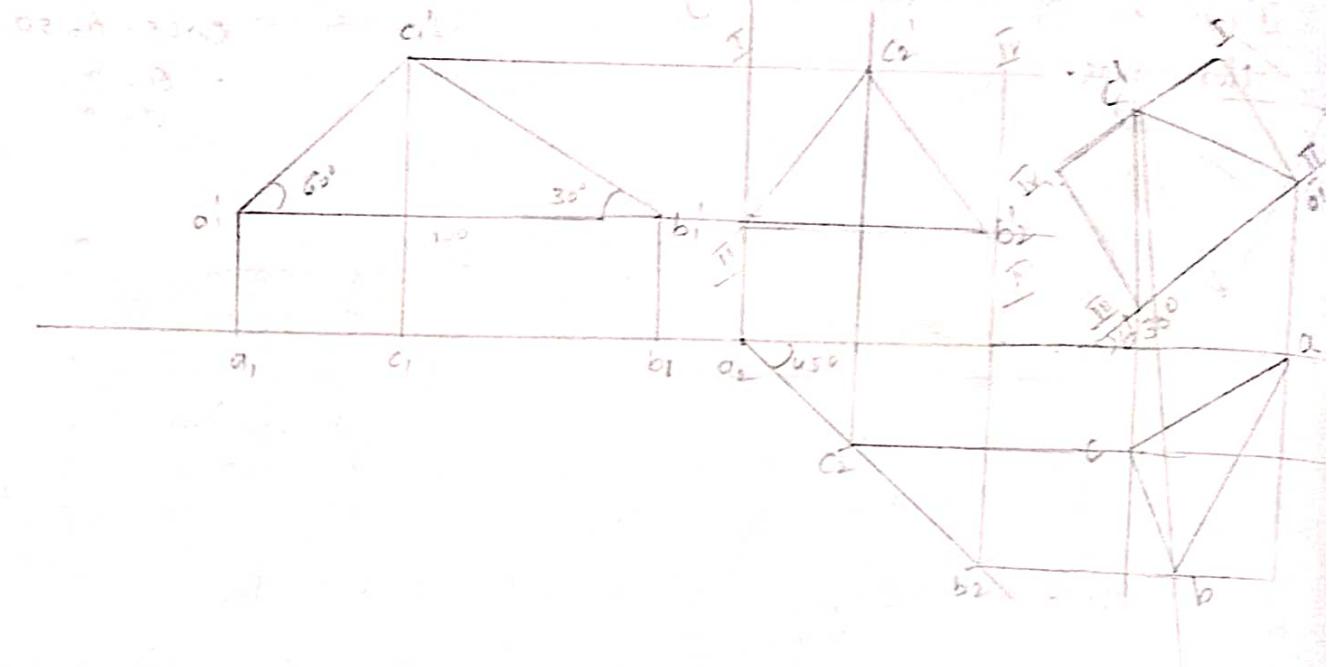


In hexagonal Lamina of Side 30 rest on one of its edges on HP. This edge is parallel to VP. The Surface of the Lamina is 60° to HP. Draw its projections.

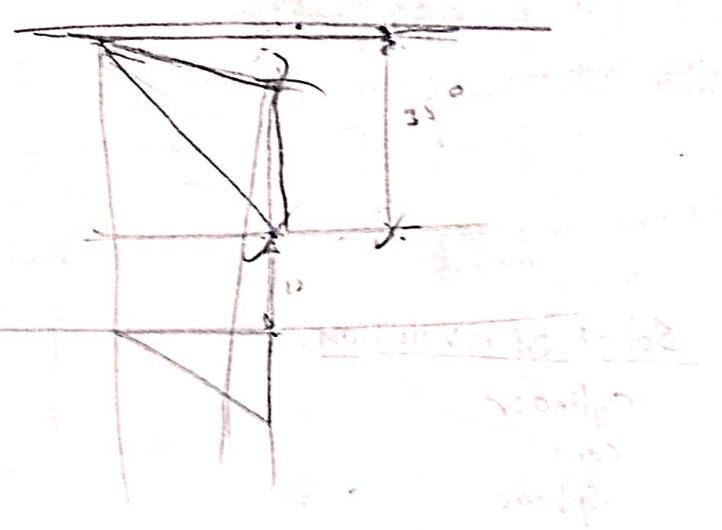


16/02/20

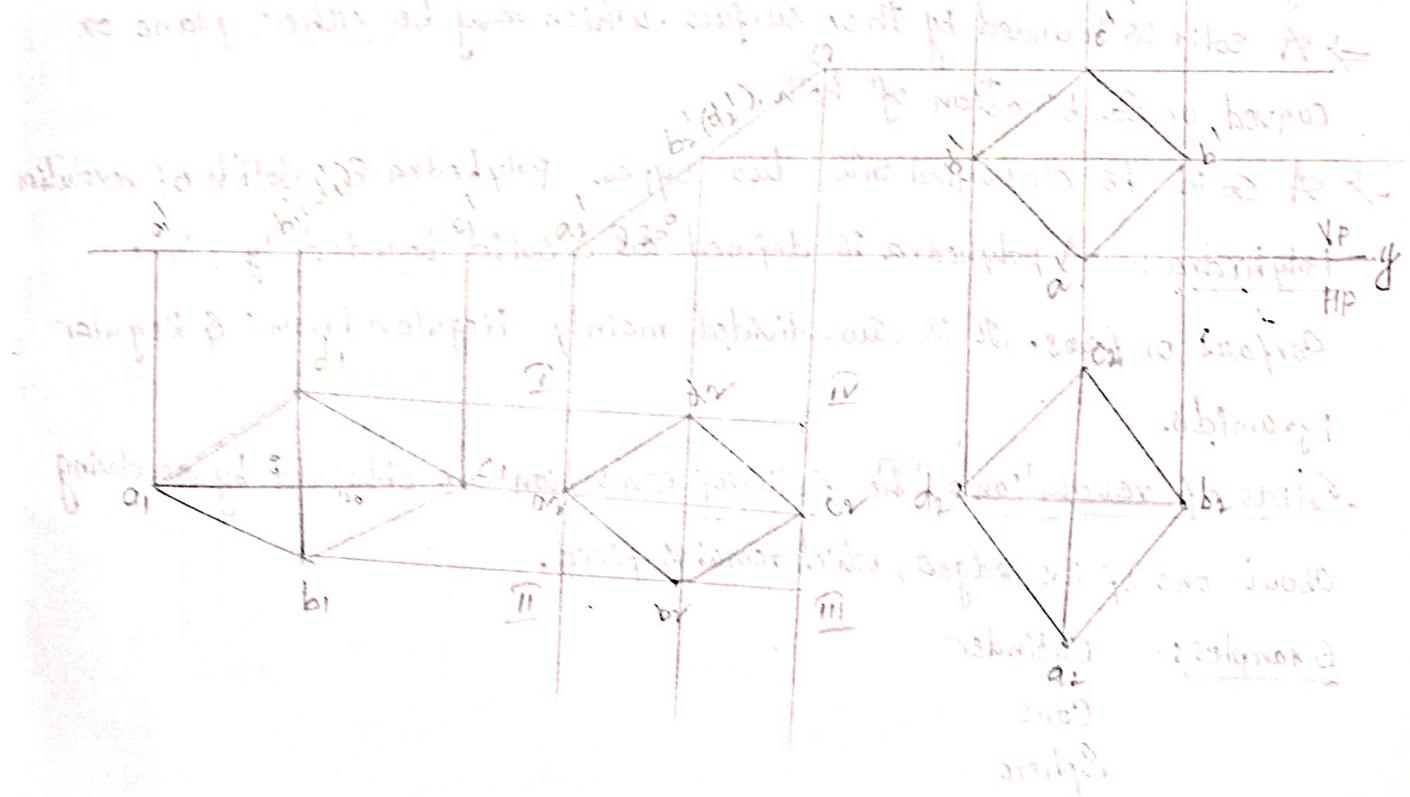
8) A 30° and 60° set square of longest side 100 mm long is in VP. And 30° inclined to HP while its surface is 45° inclined to VP. Draw its projections.



A 30° and 60° set square the long distance 100mm is at in VP and it is surface 45° inclined to VP. One end of longest side is 10mm & other end is 35mm above HP. Draw its projections.

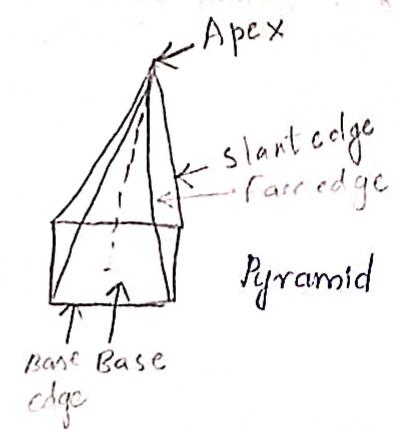
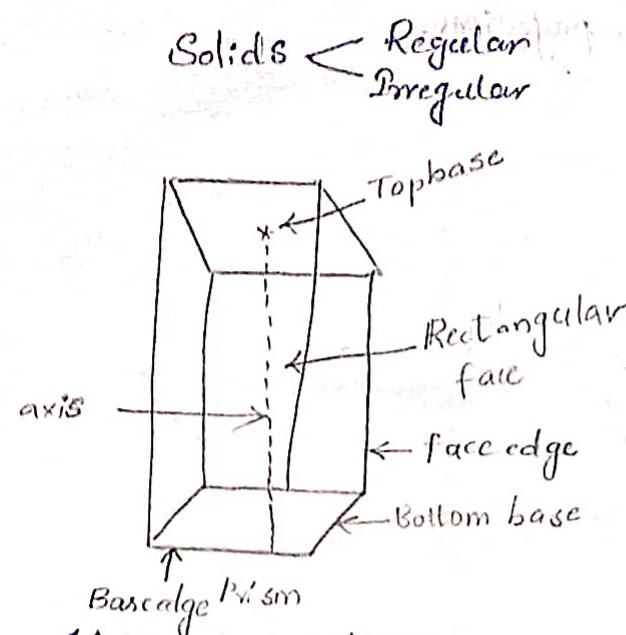


- 10) Draw the projections of a rhombus, having diagonals 120° & 60° on the smaller diagonal of which is parallel to both the principal planes, while the other is inclined to 30° to H.P. while the other is inclined to 30° to H.P.



Date

UNIT-4 PROJECTIONS OF SOLIDS

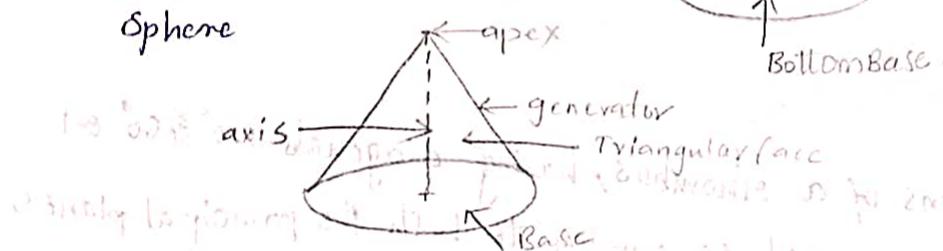
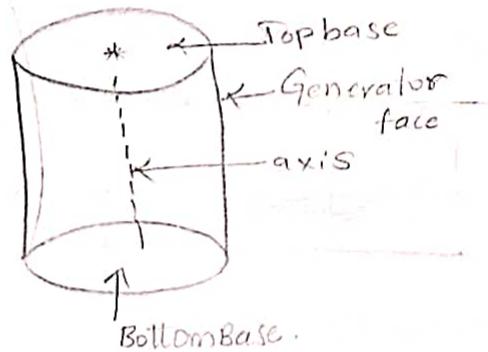


Solids of revolution.

cylinder

cone

sphere



Solids - A solid is a three dimensional object, which is described by length, height and breadth or thickness.

⇒ A solid is bounded by the surface, which may be either plane or curved or combination of both.

⇒ A solid is classified into two types. Polyhedra & Solids of revolution.

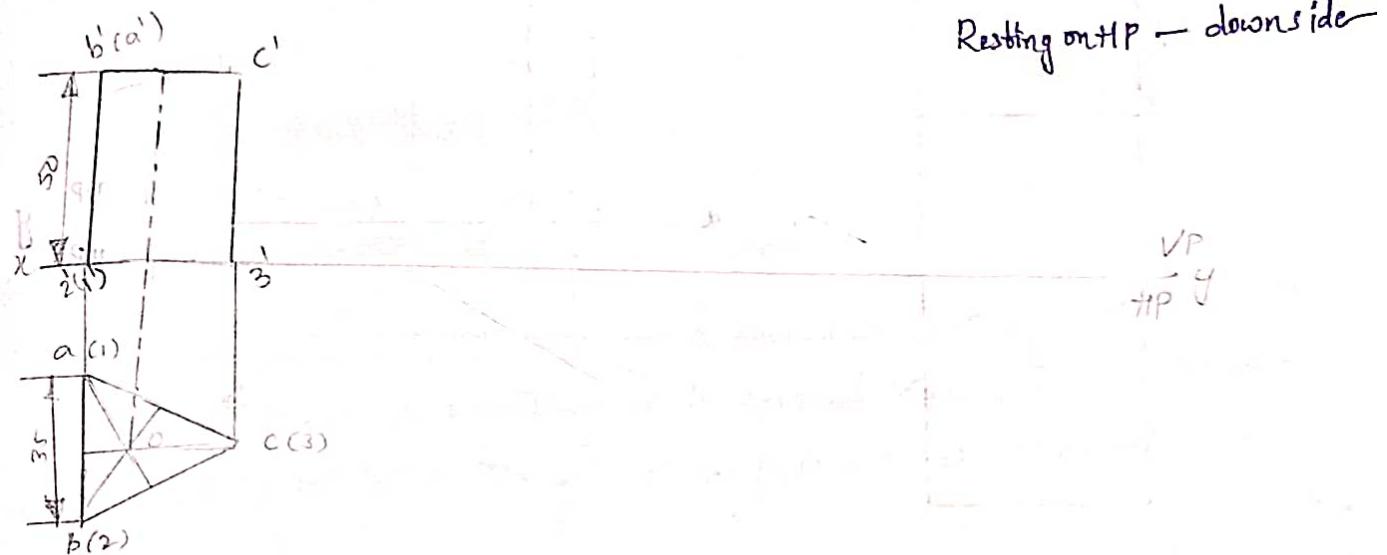
Polyhedra :- A polyhedra is defined as a solid bounded by plane surfaces or faces. It is sub-divided mainly Regular Prisms & Regular pyramids.

Solids of revolution :- The solids of revolution are obtained by revolving about one of its edges, which remains fixed.

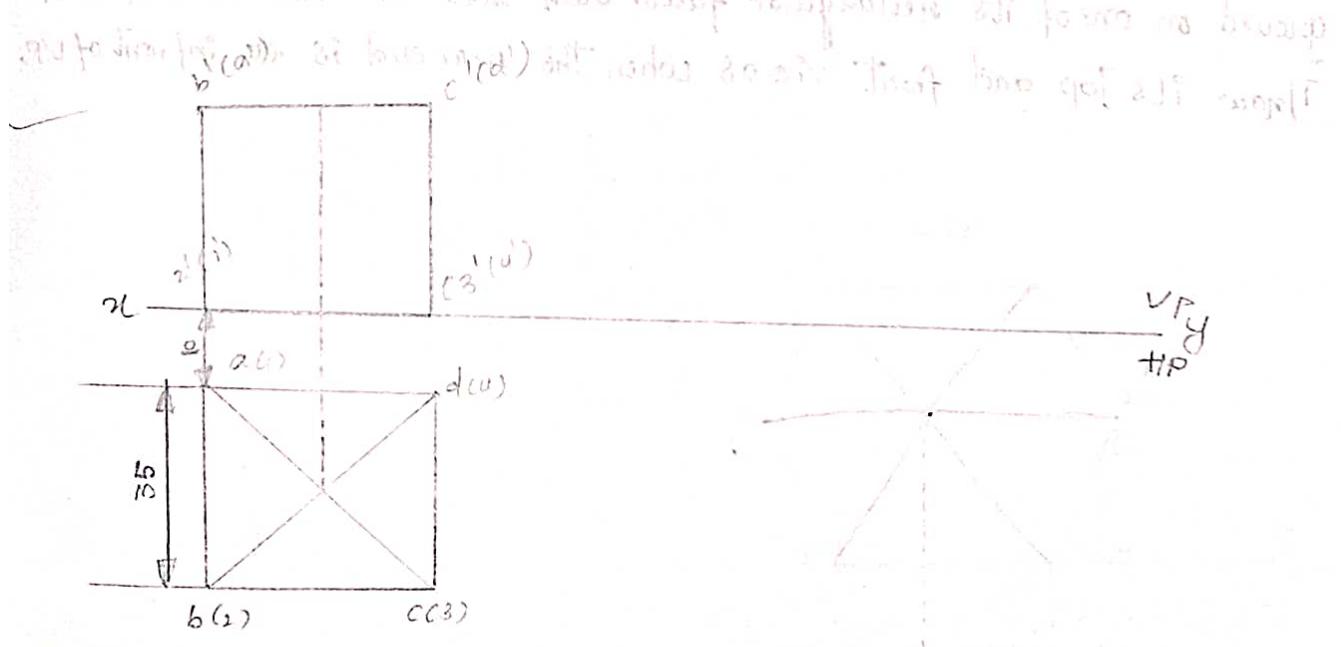
Examples :- Cylinder
Cone
Sphere

- Positions :-
- 1) Solid axis || to one plane and $\perp r$ to the other.
 - 2) Solid axis || to both planes.
 - 3) Solid axis || to one plane inclined to other.
 - 4) Solid axis inclined to both the planes.
- 1) Solid axis || to one plane and $\perp r$ to the other:-

1) A triangular Prism with side of base 35 and axis 50 long is resting on its base on H.P. Draw the projections of the prism, when one of its base edge perpendicular to V.P.

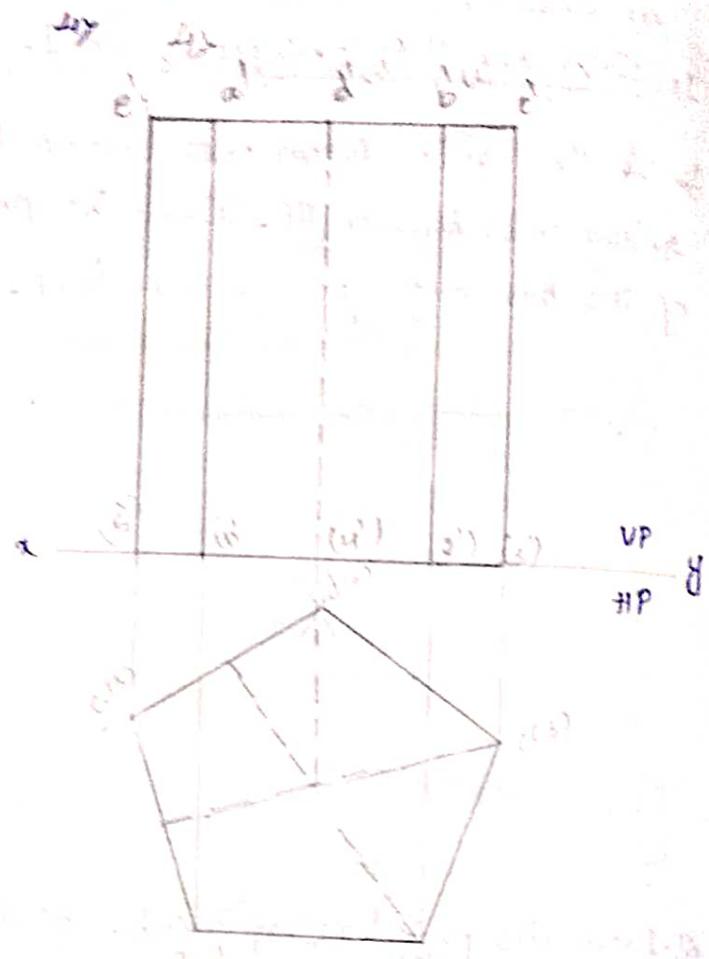
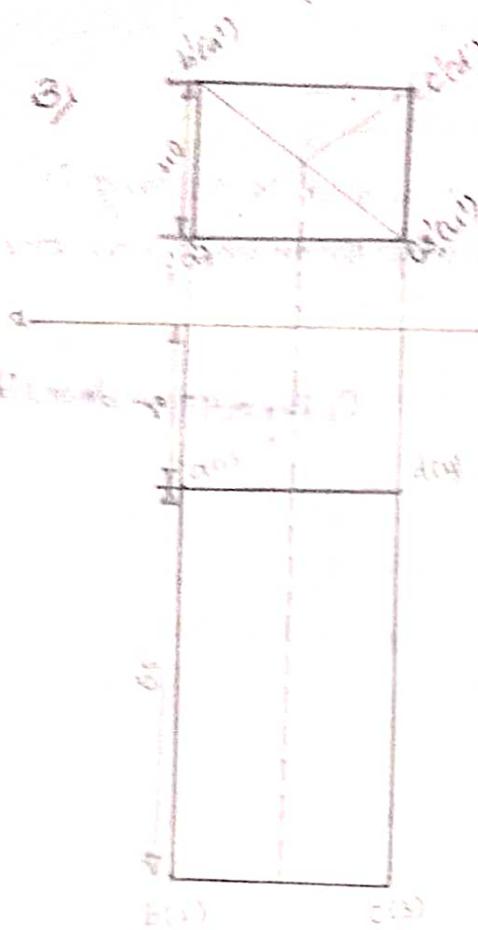


2) Draw the projections of a cube of 35 side, resting on one of its faces (bases) on H.P. such that one of its vertical faces is parallel to and in front of V.P.

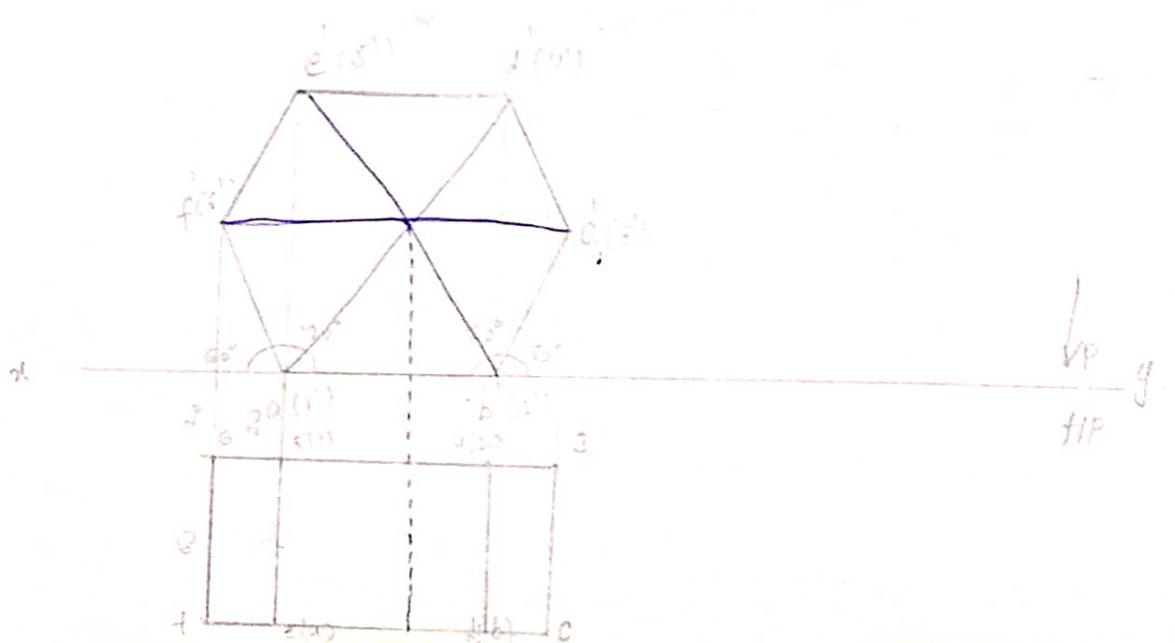


Q3 A square prism of base 40 & axis length 65 is kept on HP such that its axis is L.L to VP & receding from it. Draw the projections of square.

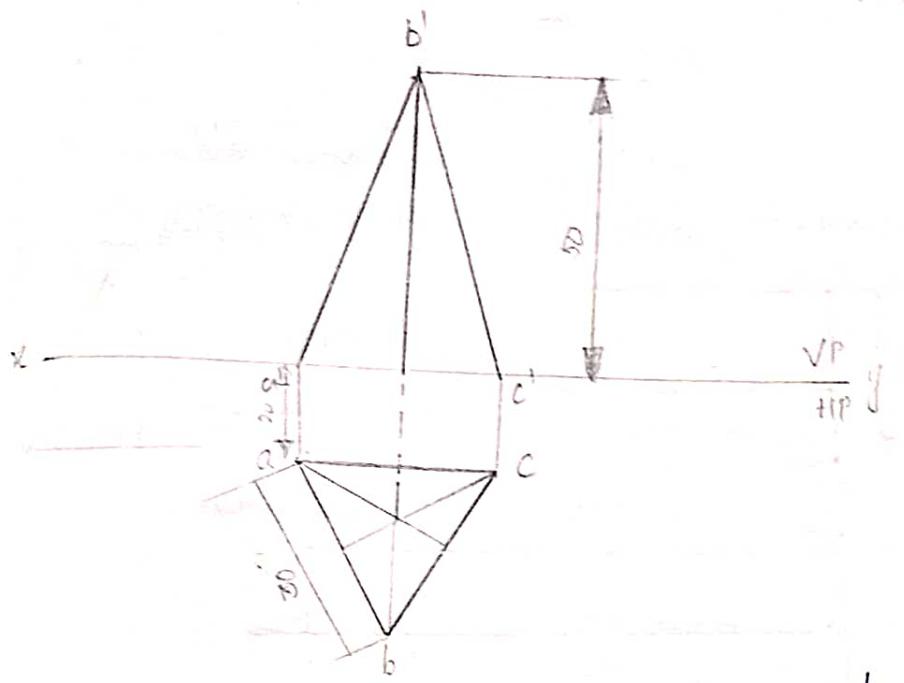
Q4 Draw the projections of a pentagonal prism base is 30 and axis length is 60 resting on the HP on one of its bases in a side of base L.L to VP.



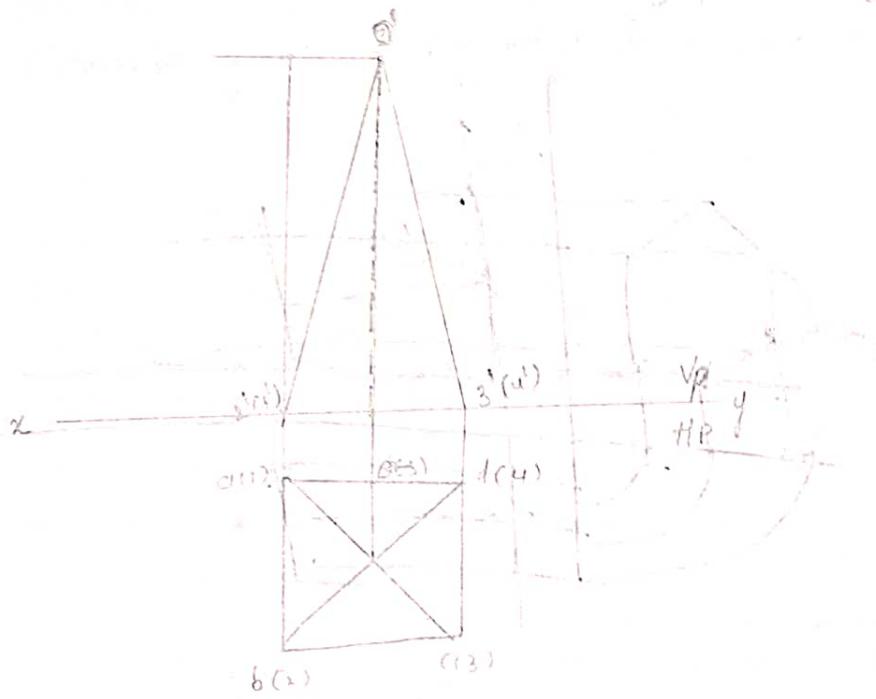
~~Q5~~ A hexagonal prism of base side 30 and axis line 60 is lying on the ground on one of its rectangular faces. Such that the axis is L.L to VP. Draw its top and front views when the near end is 40 in front of VP.



6) A triangular pyramid with 30 mm edge at a square and 50 mm long axis is resting on its face on the ground with an edge of the base near the VP, parallel to and 30 mm from the VP. Draw the projections of the pyramid.

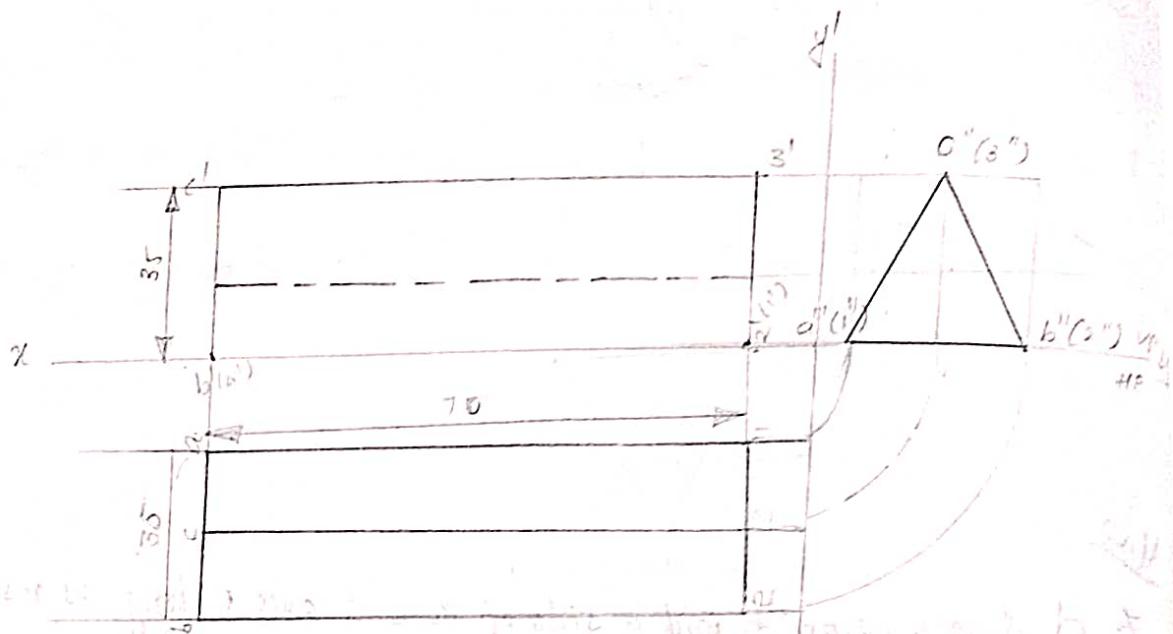


H.W
7) A square pyramid with a side of 30 and axis 50 long is resting with its base of HP. Draw the projections of the pyramid is parallel to and one of its base edge is 116 to VP. The axis of the pyramid is 30 in front of VP.

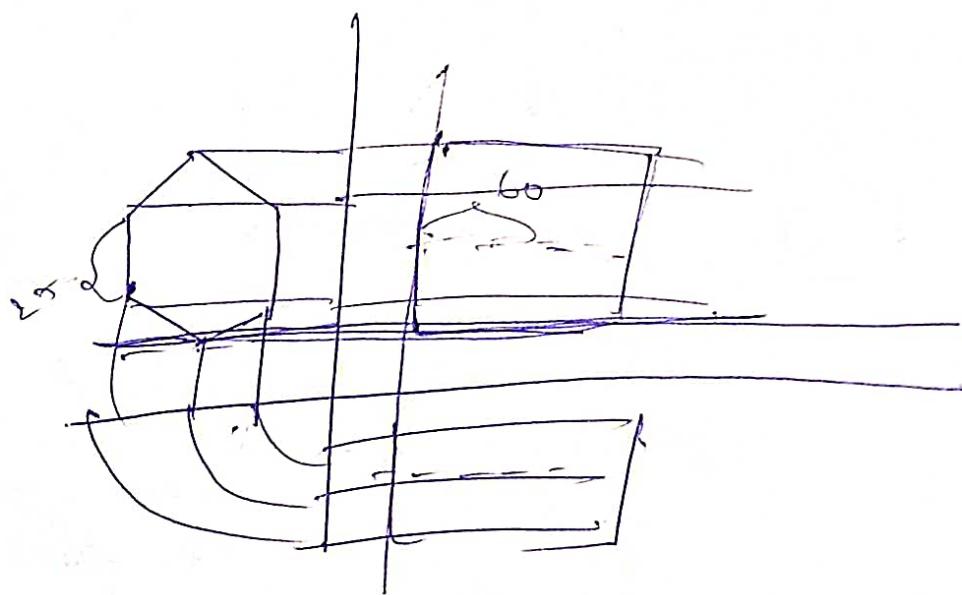


Projections of solids having axis parallel to both H.P. and V.P.

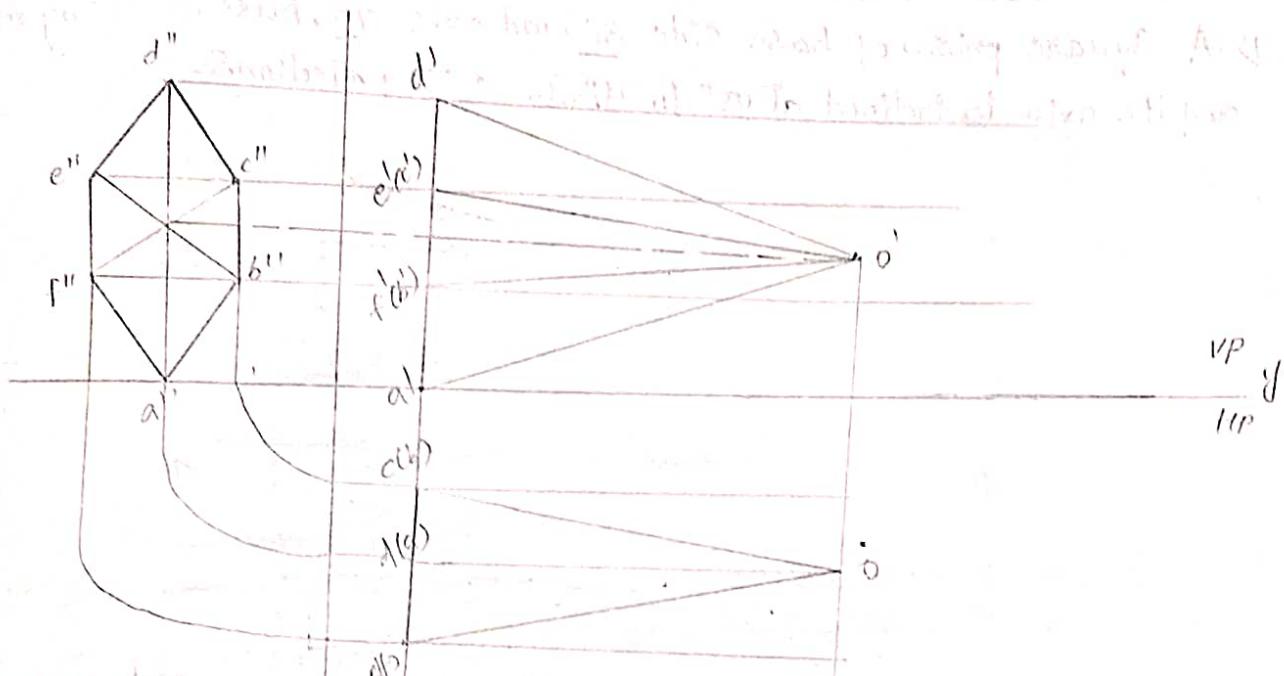
Ex 1) A triangular prism of side of base 35 and axis 70 long is suspended resting on the H.P. on one of its rectangular faces. If the axis is parallel to both H.P. & V.P. Draw the projections.



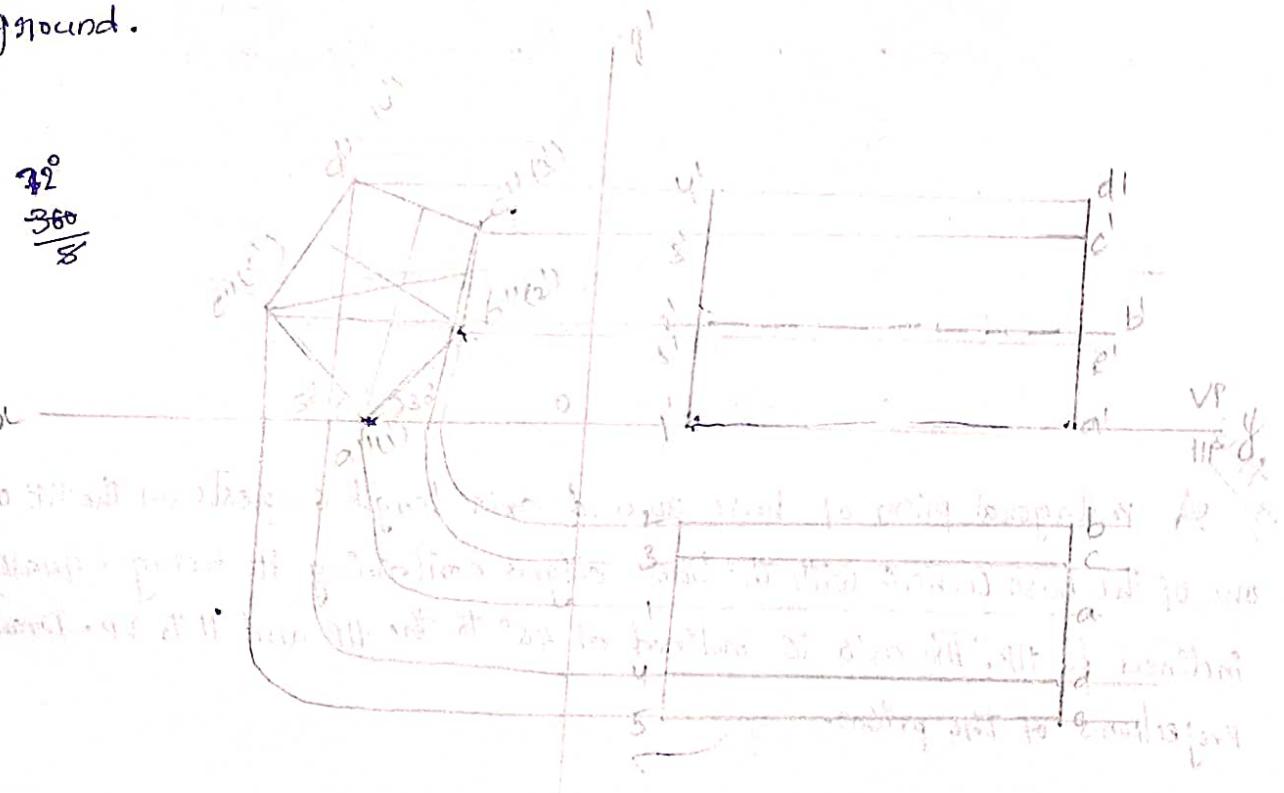
H.W.
Ex 2) A hexagonal prism of base side 25 and axis 60 long lies on the ground one of its rectangular faces such that axis is parallel to both H.P. and V.P. Draw its projections.



3) Draw the projections of a hexagonal pyramid of side of base 25 and axis 60 long resting on the H.P. on one of its base corners with sides containing the corner equally inclined to the H.P. and its axis parallel to both the planes H.P. and V.P.



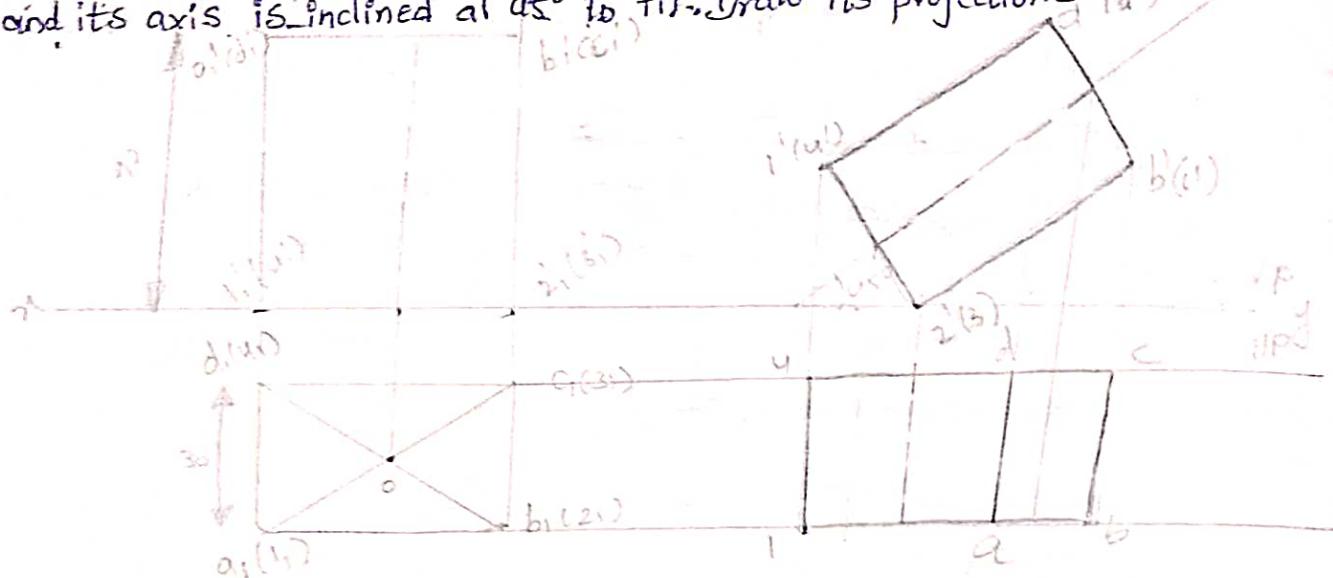
4) A pentagonal prism of side of base 30 and axis 60 long lies on the ground on one of its longer edges with its axis parallel to both the H.P. and V.P. Draw its top view and front view when one of the rectangular faces containing the resting edge is inclined at 30° to the ground.



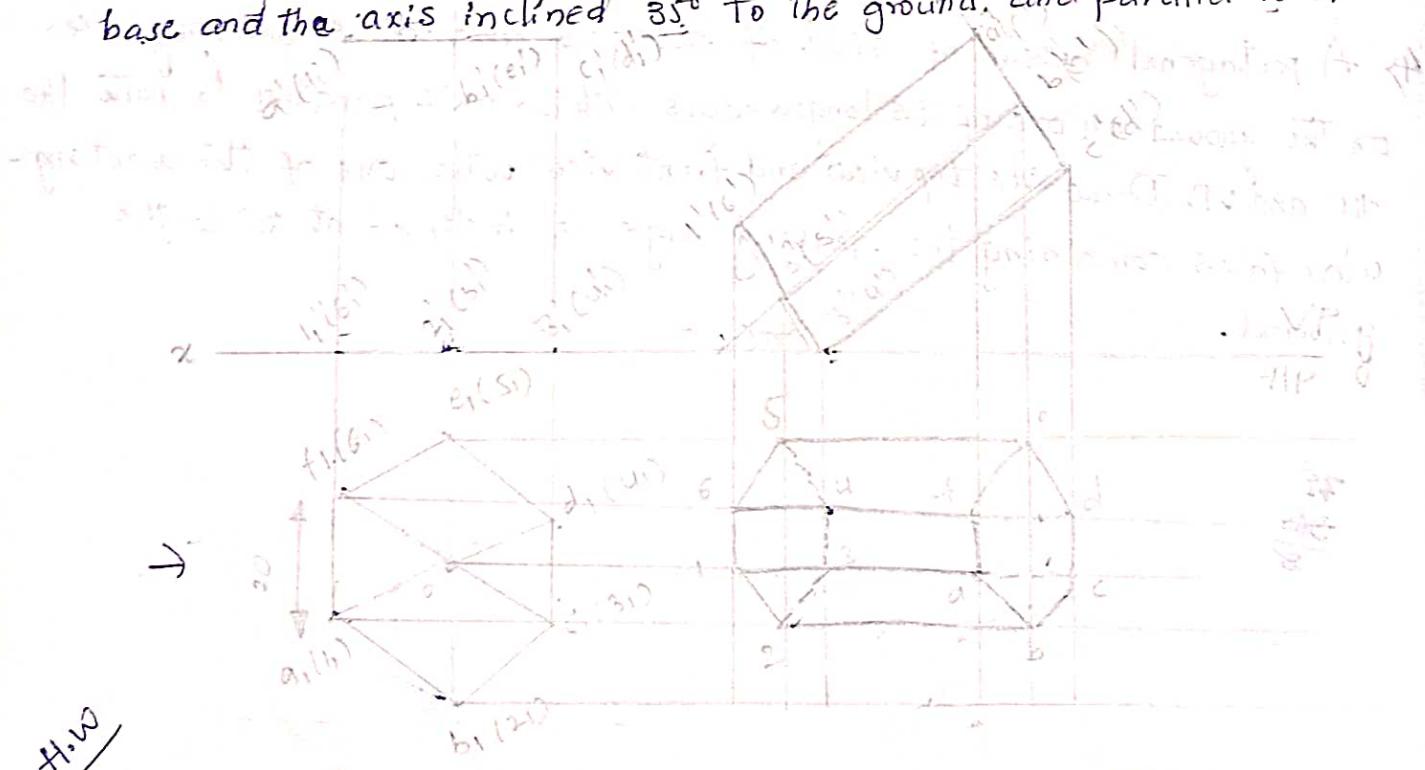
5) Draw the projections of a cylinder of 50 diameter and axis 80 long resting on the ground when its axis is parallel to both the planes.

Parallel to one plane and inclined to other:-

3) A square prism of base side 30 and axis 70, base is resting on H.P. and its axis is inclined at 45° to H.P. Draw its projections! (d')

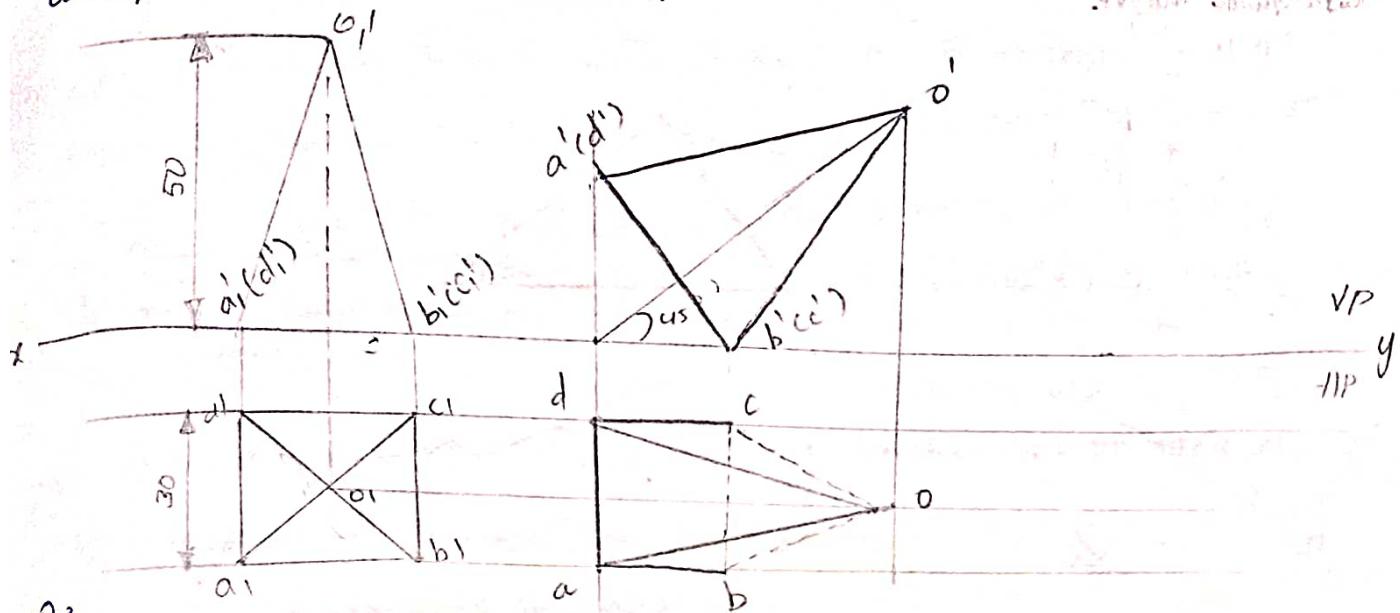


8) Draw the projections of a hexagonal prism of base side 20 and axis line 50 when it rests on the ground on one of the edges of the base and the axis inclined 35° to the ground, and parallel to VP.



3) A pentagonal prism of base 20 and axis length 60 rests on the H.P. on one of the base corners with the base edges containing it being equally inclined to H.P. The axis is inclined at 45° to the H.P. and 11° to VP. Draw the projections of the prism.

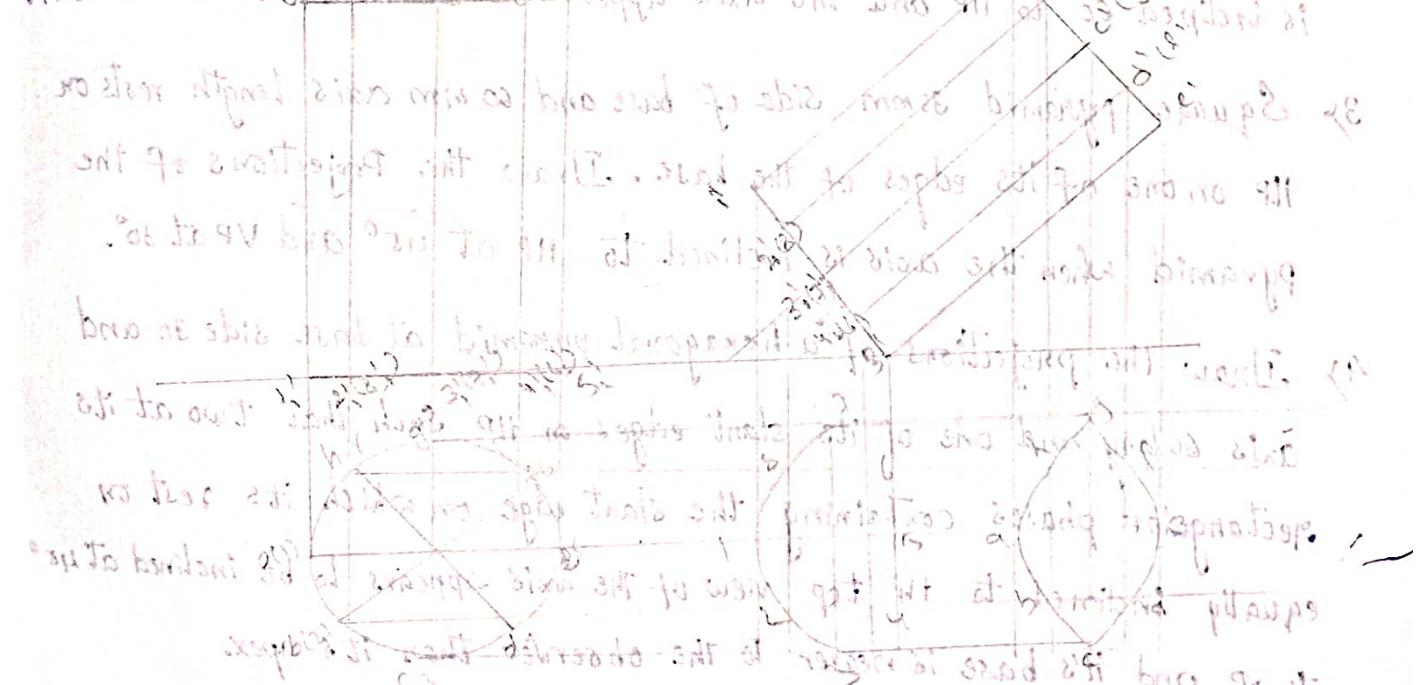
4) A Square pyramid of base side 30 and height 50 rests on the ground on one of its base edges such that its axis is inclined 45° to the ground and parallel to VP. Draw its projections.



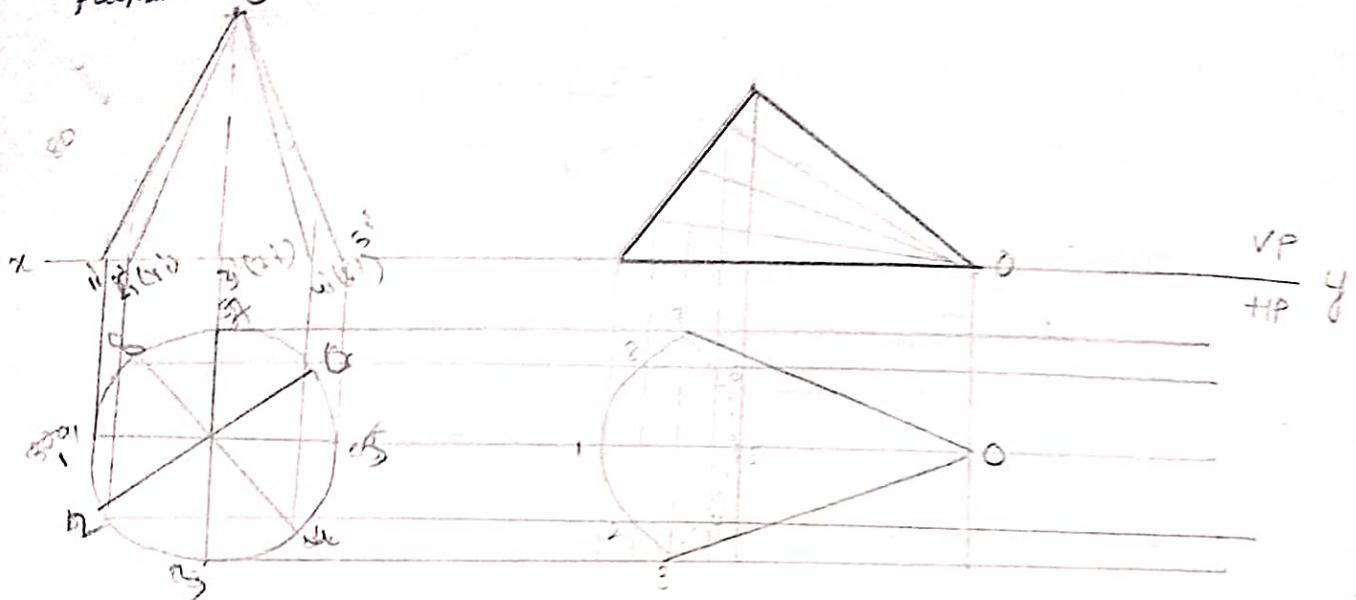
~~5)~~ A pentagonal pyramid of side of base 25 and axis 60 long lies with one of its slant edges on HP such that its axis is parallel to VP. Draw its projections.

~~6)~~ A hexagonal pyramid of side of base 25 and axis length 50 lying with one of its triangular face on the HP, and its axis is parallel to the VP. Draw the projections.

7) A cylinder diameter of base 60 and height 70, its having a point of its periphery of base on HP with axis of the cylinder inclined to HP at 45° and parallel to VP. Draw the projections of the cylinder.



Ex) Draw the projections of a circular cone, axis length 30 mm, axis altitude 80 lying on the H.P. with one of its generator to the axis is parallel to V.P.



Projections of Solids inclined to both planes :-

- 1) Draw the projections of a square prism, side of base 30 and axis 60 long resting with one of the edges of its base on H.P., its axis is inclined at 30° to H.P. and the top of view of the axis at 45° to XY line.
- 2) Pentagonal Prism of side of base 25 and axis 40 long resting on a corner of its base. Draw the projections of a prism when the base is inclined 60° to H.P. and the axis appears to be inclined to 30° to V.P.
- 3) Square pyramid 35mm side of base and 60 mm axis length rests on H.P. on one of its edges of the base. Draw the Projections of the pyramid when the axis is inclined to H.P. at 45° and V.P at 30° .
- 4) Draw the projections of a hexagonal pyramid at base side 30 and axis 60 long and one of its slant edges on H.P. such that two at its rectangular phases containing the slant edge on which its rest on equally inclined to H.P. top view of the axis appears to be inclined at 45° to V.P. and it's base is nearer to the observer than its apex.

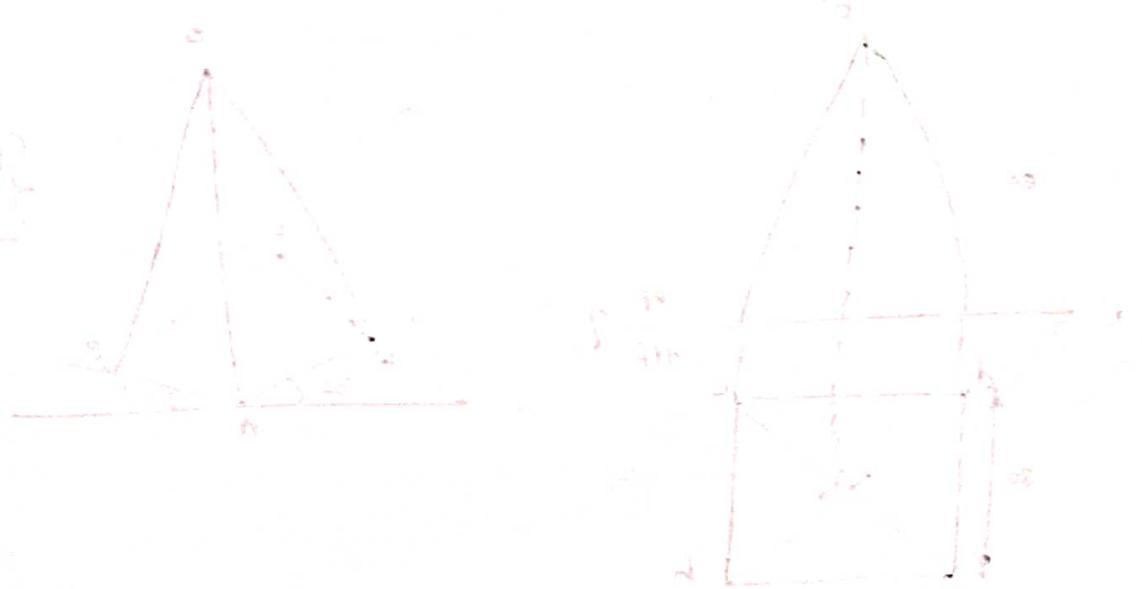
5) Draw the projections of the cylinder base 40 diameter and axis 60 long and resting with a point at its base circle on HP. Such that the axis is making an angle 30° with the H.P. and its top view is $1:1$ to V.P. $V=90^\circ$

6) One diameter of 50 and height of axis 60 is resting one of its reem of base on the H.P. in such a way that apex remains 45° above H.P. and the plane of axis makes 30° to V.P. Draw its projection when apex is away from P and inclination of base with H.P.

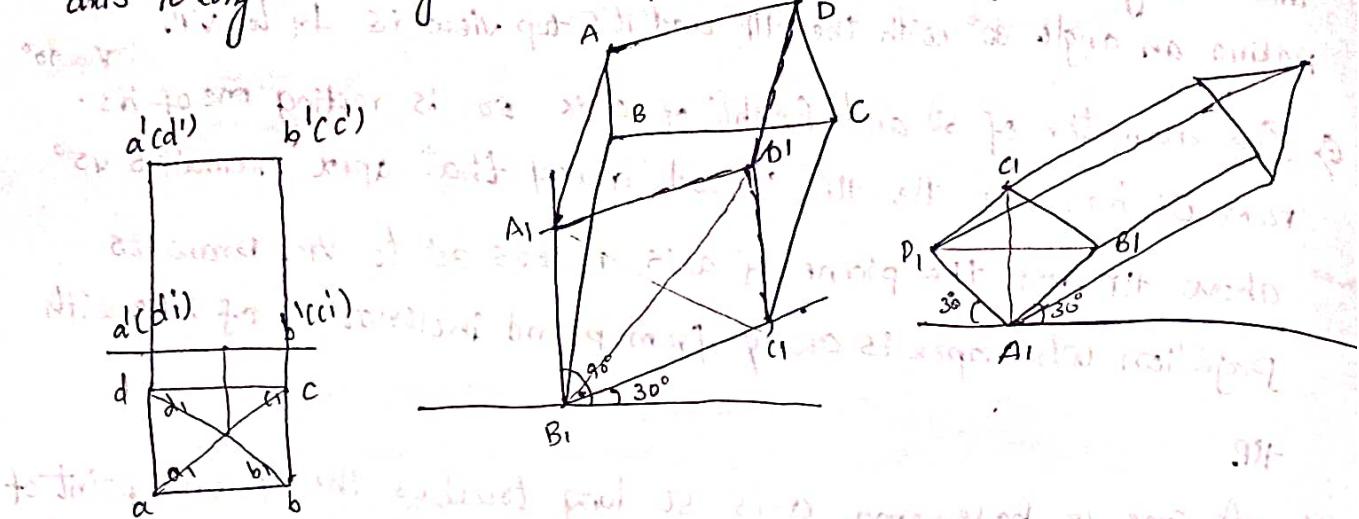
7) A cone 40 base and axis 50 long touches the V.P. on a point of its base circle. The axis is inclined at 30° to V.P. and the front view of the axis is inclined at 45° to H.P. Draw the projections.



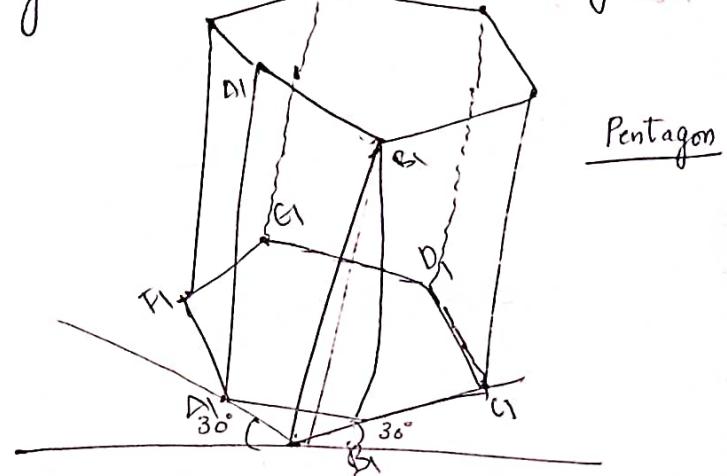
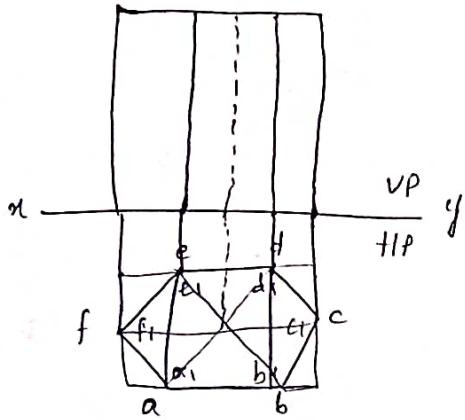
All dimensions are to be taken in mm.
All parallel lines in the views are parallel to each other.



Draw the isometric view of a square prism when one of its side is 40 & its axis 70 long is resting with one of its base on H.P. & axis L.R. to V.P.



Draw the isometric view of a hexagonal prism with size of bases 60 and axis 60 long. Prism is resting on its base on H.P. with an edge of the base parallel to V.P.



Draw the isometric view of a square pyramid. One of its base side 30 and axis 60 long is resting one of its with base on H.P.

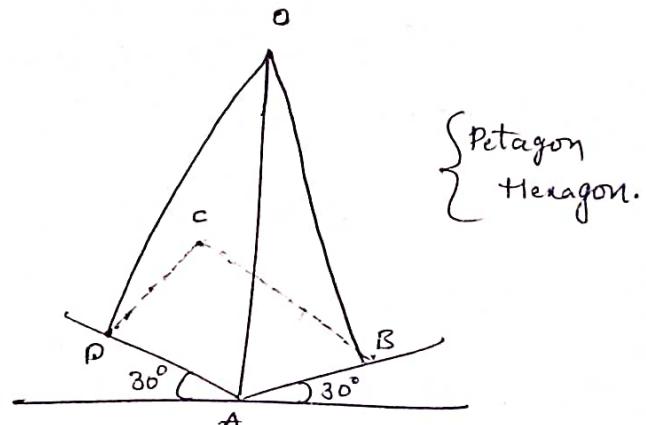
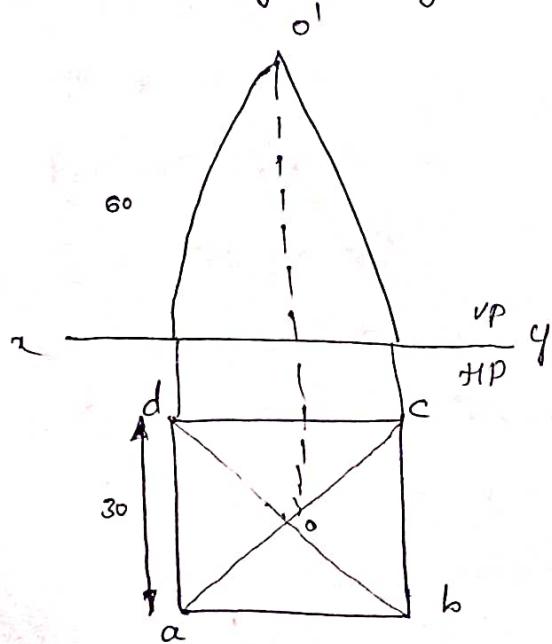
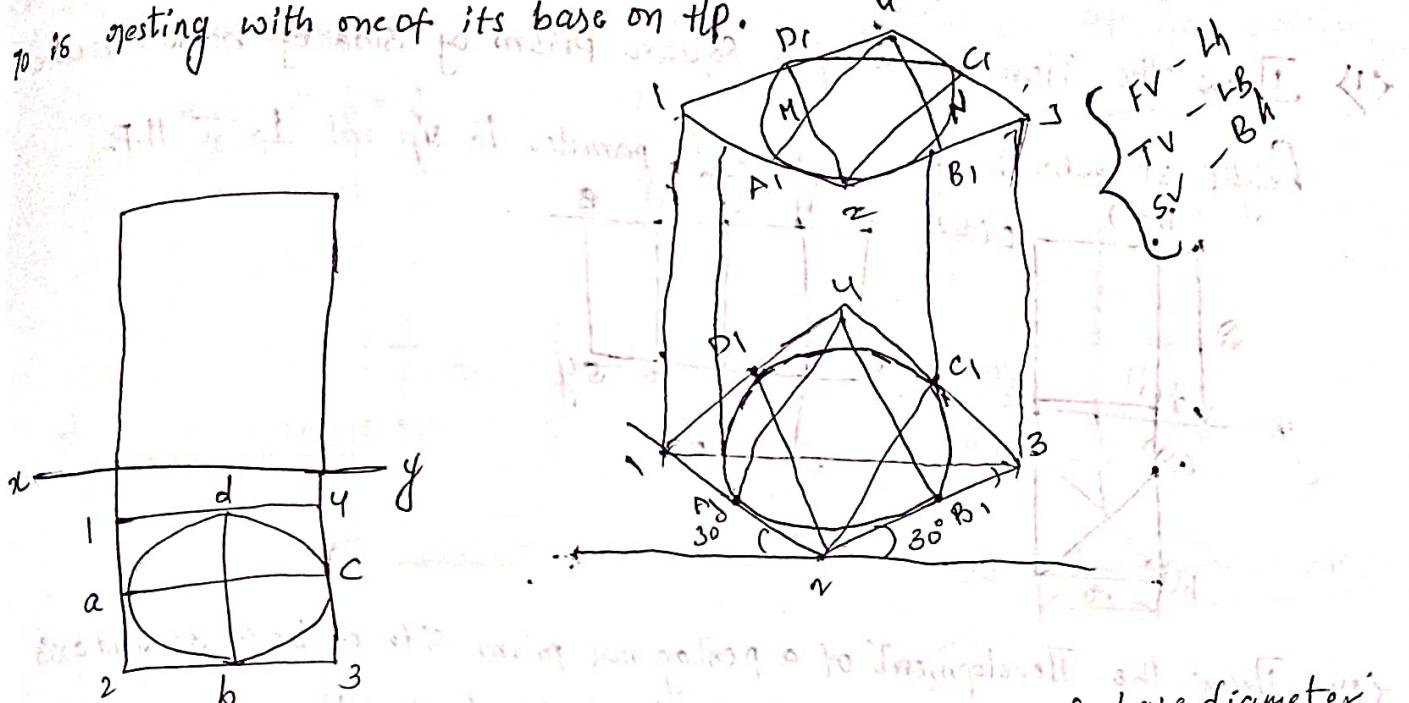
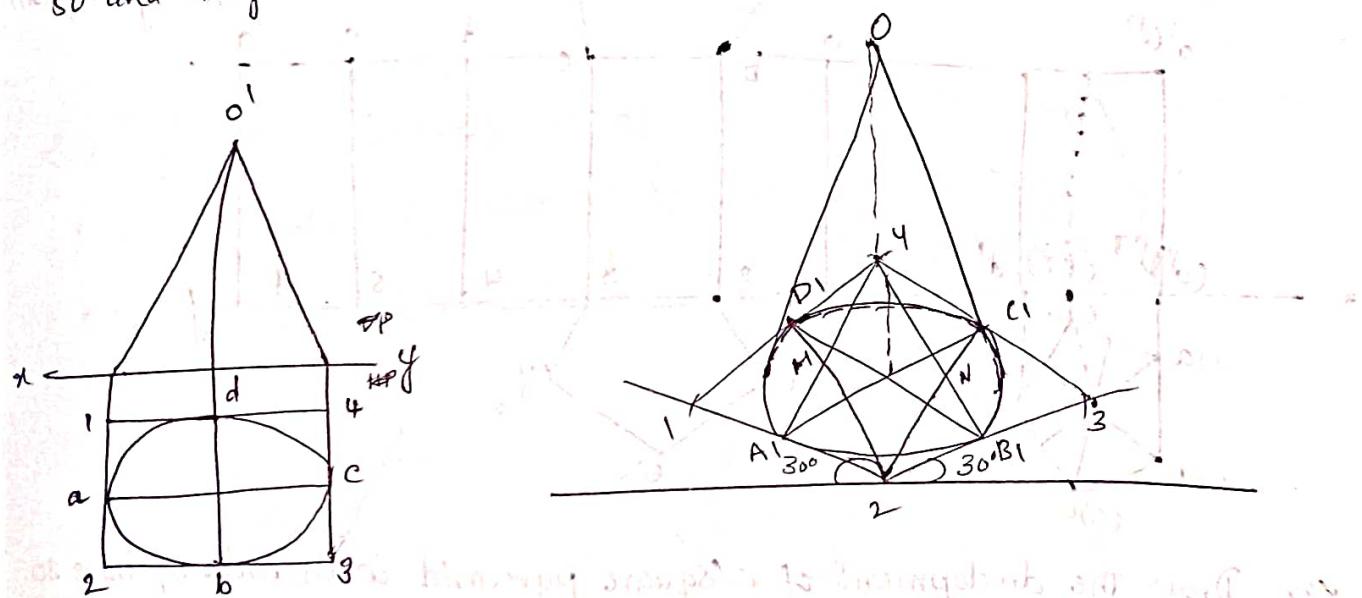


Diagram showing the construction of a cylinder in one of its base diameter 60 and axis is 100 resting with one of its base on H.P.



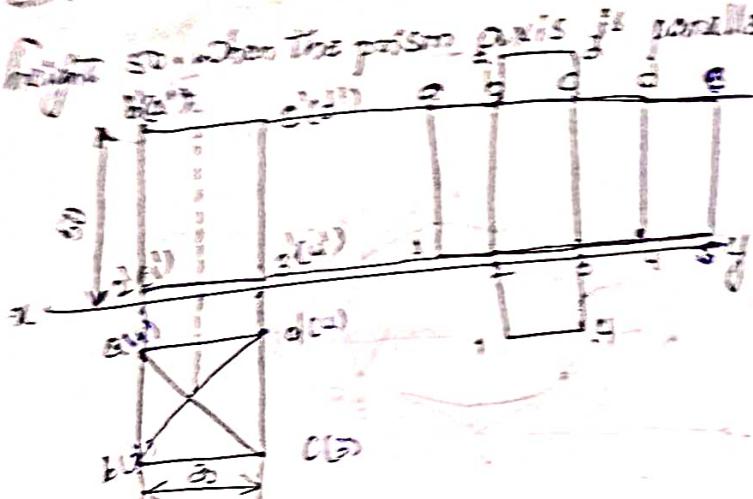
Draw the isometric projection of right circular cone of base diameter 50 and height 60 when its base rests on H.P.



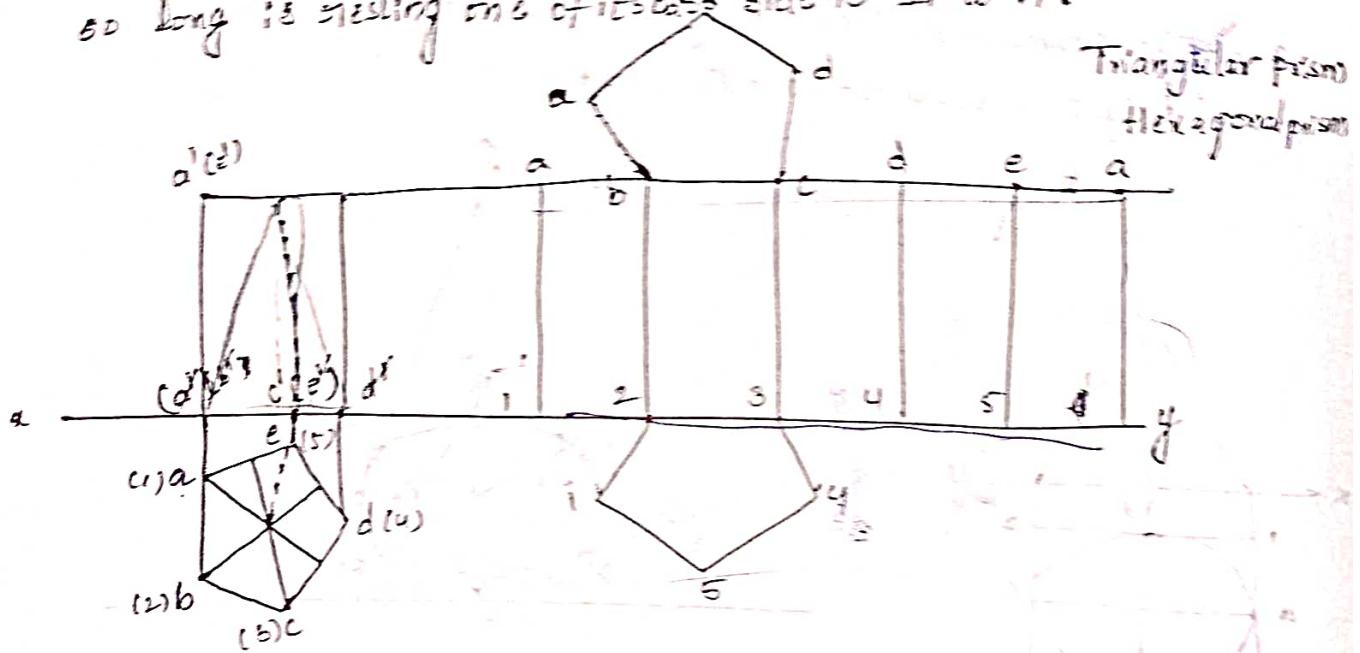
Isometric at three stations

Unit-4 Development of Surface of Solids.

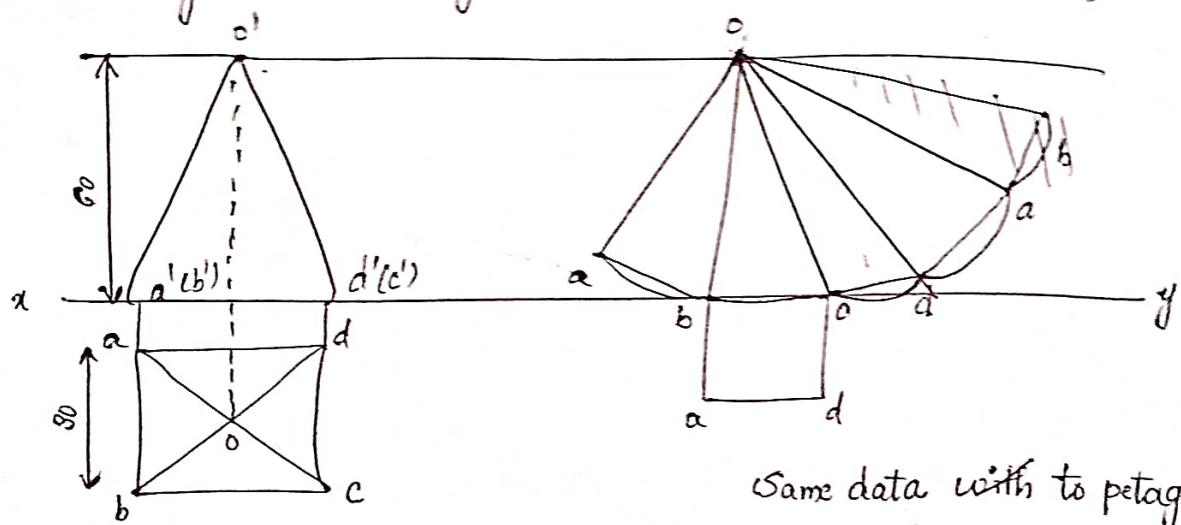
Q33 Draw the Development of a Square Prism of side of base 30 and height 20. When the prism axis is parallel to Up and L to VP.



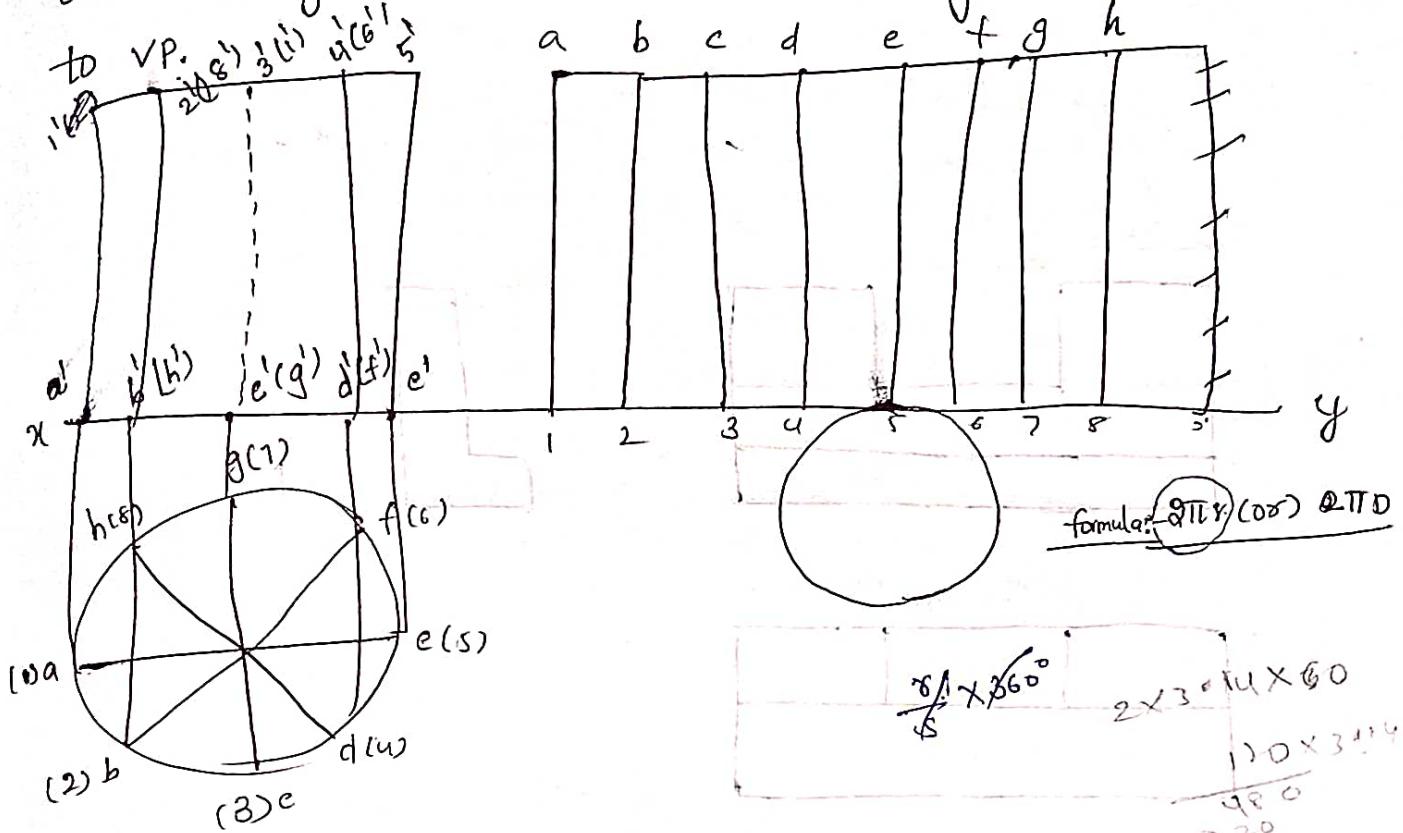
Q34 Draw the Development of a pentagonal prism side of base 30 and axis 50 long is resting on its base side is L to VP.



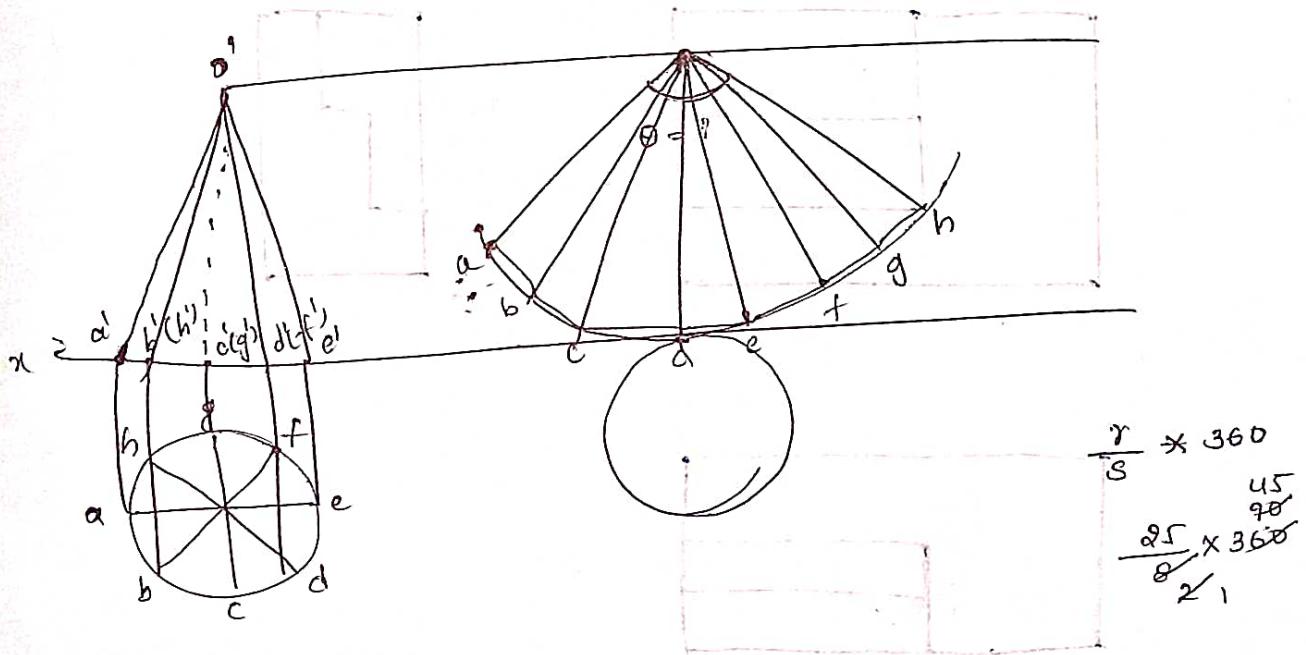
Q35 Draw the development of a square pyramid with side of base 30 and height 20 is resting on tip. with it's base O.



24) Draw the Development of a Cylinder base of 30 diameter and axis 50 long and one of its base is resting on HP and parallel to VP.



25) Draw the Development of the Lateral Surface of the cone when the radius of circle is 25 and length of the axis is 60, base of the cone is Ir to HP and parallel to VP.



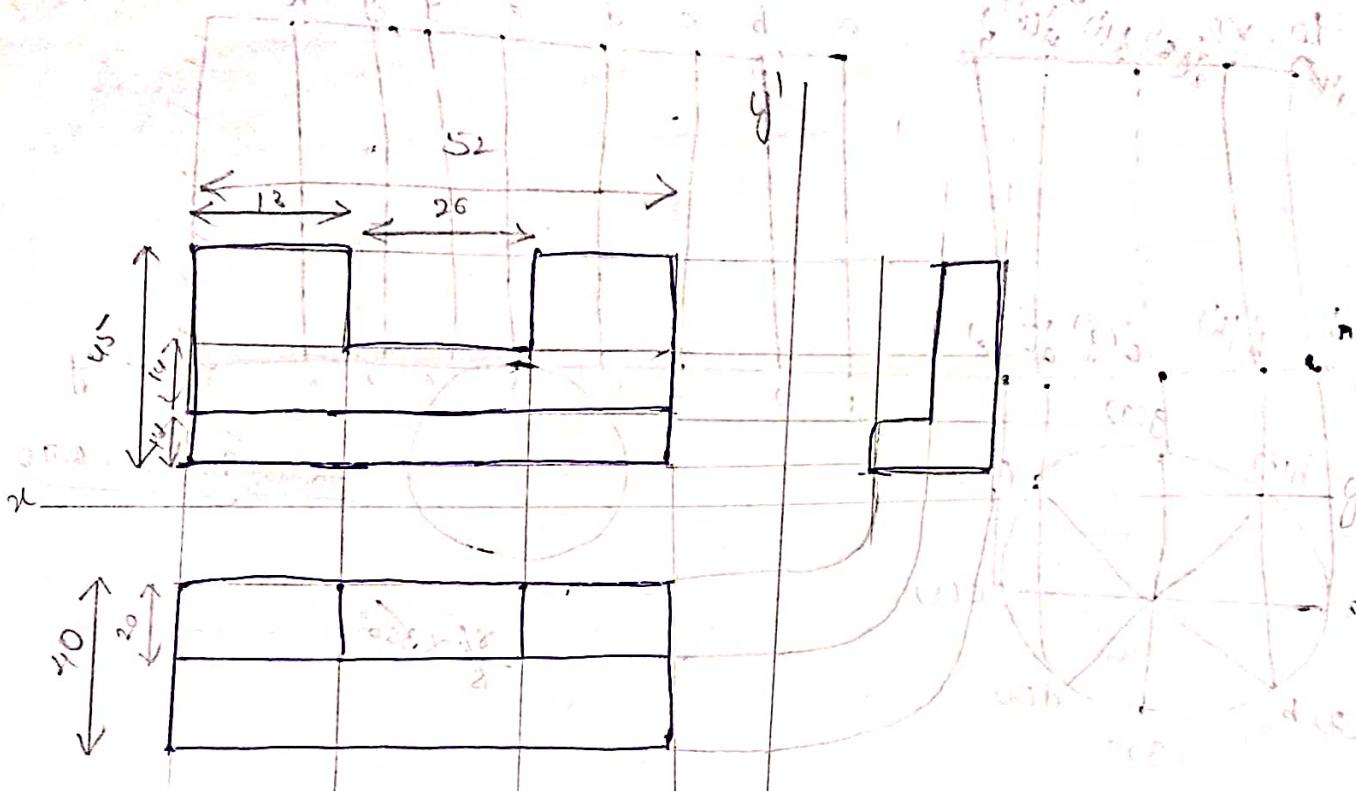


Diagram of a building footprint on a grid with dimensions and a legend.

