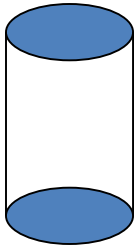
SOLIDS

To understand and remember various solids in this subject properly, those are classified & arranged in to two major groups.

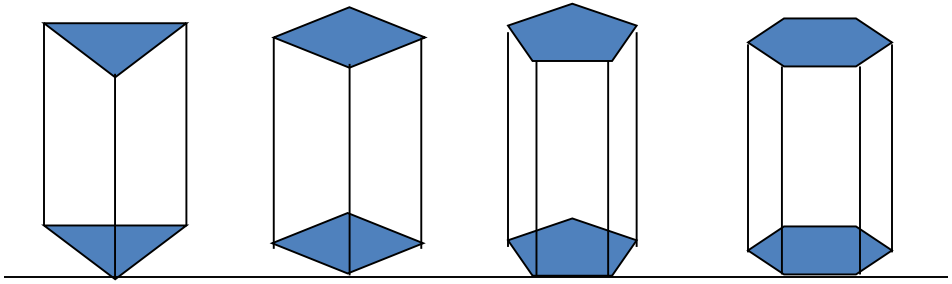
Group A

Solids having top and base of same shape

Cylinder

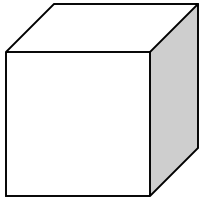


Prisms



Triangular Square Pentagonal Hexagonal

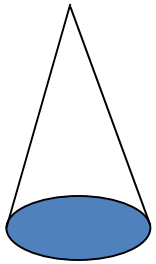
Cube
(A solid having
six square faces)



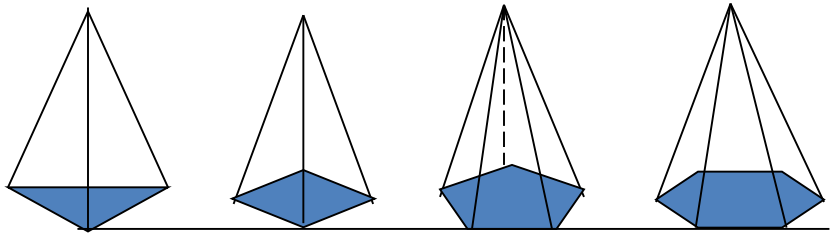
Group B

Solids having base of some shape
and just a point as a top, called apex.

Cone

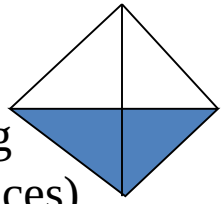


Pyramids



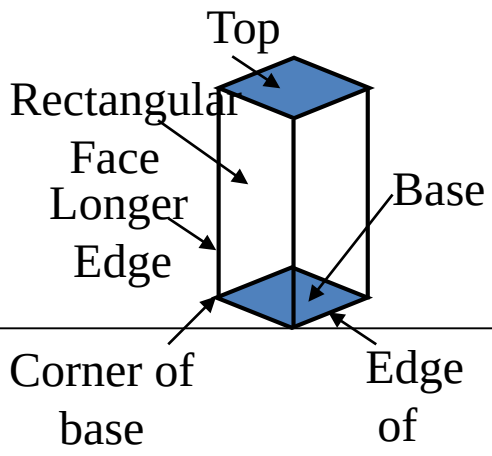
Triangular Square Pentagonal Hexagonal

Tetrahedron
(A solid having
Four triangular faces)

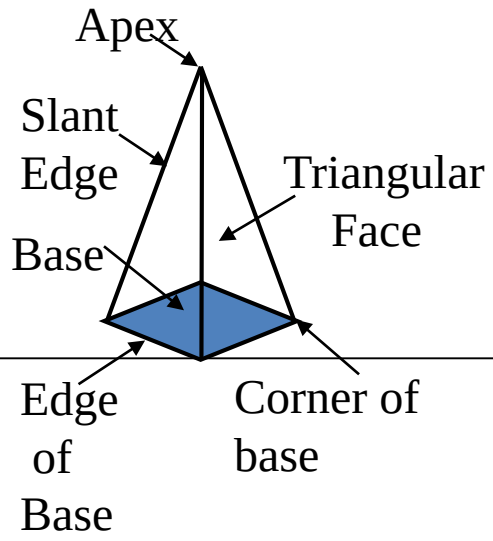


SOLIDS
Dimensional parameters of different solids.

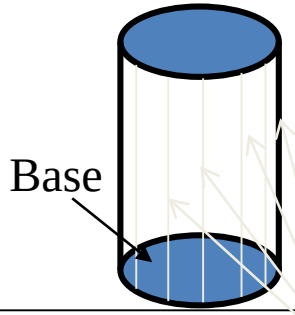
Square Prism



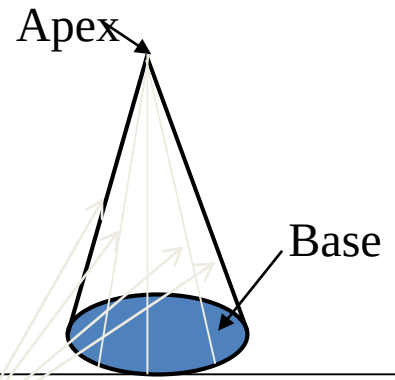
Square Pyramid



Cylinder

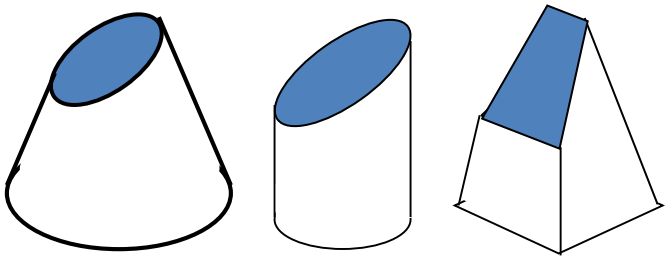


Cone

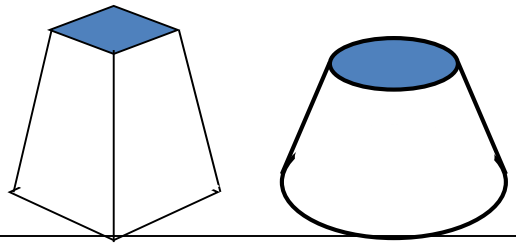


Generators

Imaginary lines generating curved surface of cylinder & cone.



Sections of solids(top & base not parallel)

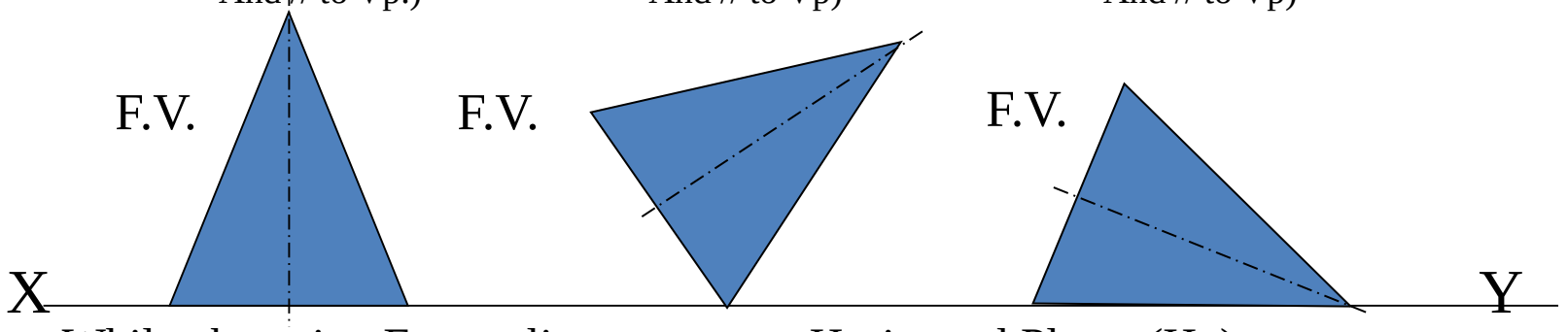


Frustum of cone & pyramids.
(top & base parallel to each other)

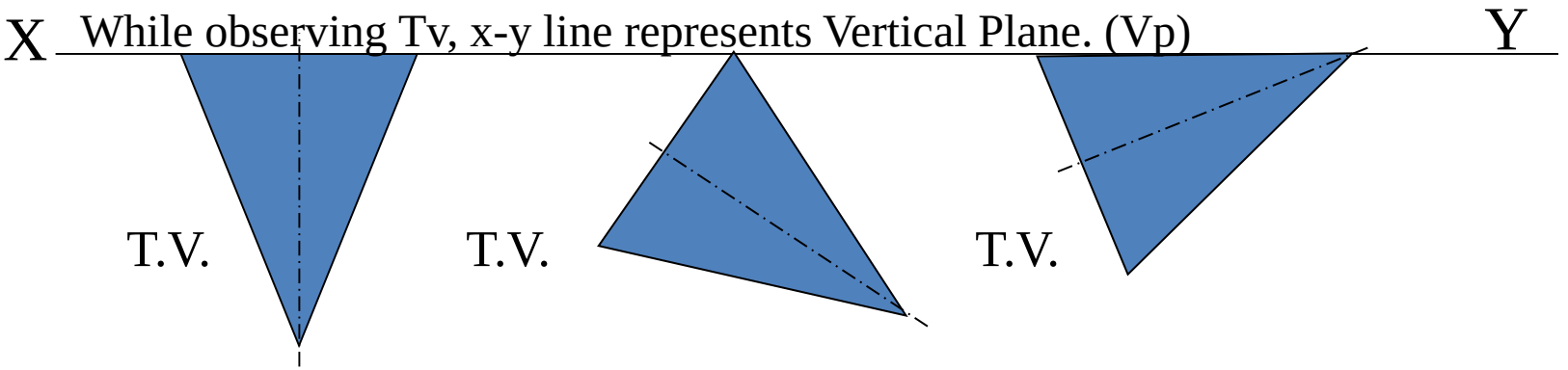
STANDING ON H.P
On it's base.
(Axis perpendicular to Hp
And // to Vp.)

RESTING ON H.P
On one point of base circle.
(Axis inclined to Hp
And // to Vp)

LYING ON H.P
On one generator.
(Axis inclined to Hp
And // to Vp)



While observing Fv, x-y line represents Horizontal Plane. (Hp)



STANDING ON V.P
On it's base.
Axis perpendicular to Vp
And // to Hp

RESTING ON V.P
On one point of base circle.
Axis inclined to Vp
And // to Hp

LYING ON V.P
On one generator.
Axis inclined to Vp
And // to Hp

STEPS TO SOLVE PROBLEMS IN SOLIDS

Problem is solved in three steps:

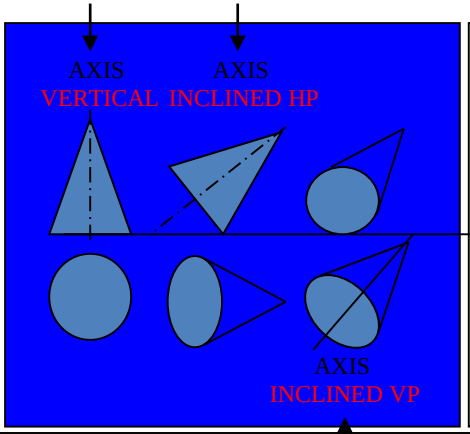
STEP 1: ASSUME SOLID STANDING ON THE PLANE WITH WHICH IT IS MAKING INCLINATION.
(IF IT IS INCLINED TO HP, ASSUME IT STANDING ON HP)
(IF IT IS INCLINED TO VP, ASSUME IT STANDING ON VP)
IF STANDING ON HP - IT'S TV WILL BE TRUE SHAPE OF IT'S BASE OR TOP:
IF STANDING ON VP - IT'S FV WILL BE TRUE SHAPE OF IT'S BASE OR TOP.
BEGIN WITH THIS VIEW:
IT'S OTHER VIEW WILL BE A RECTANGLE (IF SOLID IS *CYLINDER OR ONE OF THE PRISMS)*:
IT'S OTHER VIEW WILL BE A TRIANGLE (IF SOLID IS *CONE OR ONE OF THE PYRAMIDS):*
DRAW FV & TV OF THAT SOLID IN STANDING POSITION:

STEP 2: CONSIDERING SOLID'S INCLINATION (AXIS POSITION) DRAW IT'S FV & TV.

STEP 3: IN LAST STEP, CONSIDERING REMAINING INCLINATION, DRAW IT'S FINAL FV & TV.

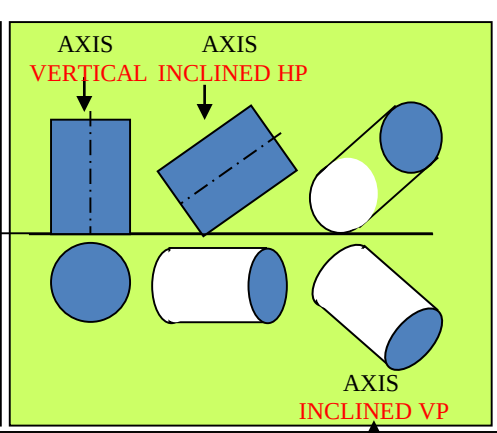
GENERAL PATTERN (THREE STEPS) OF SOLUTION:

GROUP B SOLID.
CONE



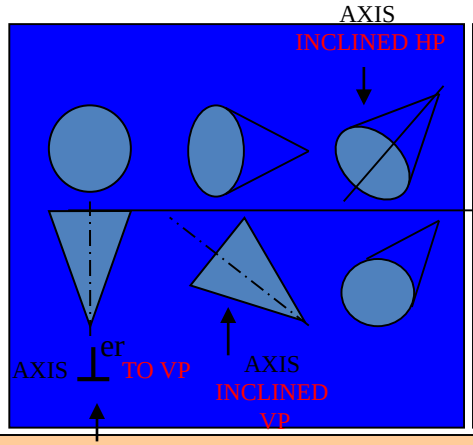
Three steps
If solid is inclined to Hp

GROUP A SOLID.
CYLINDER



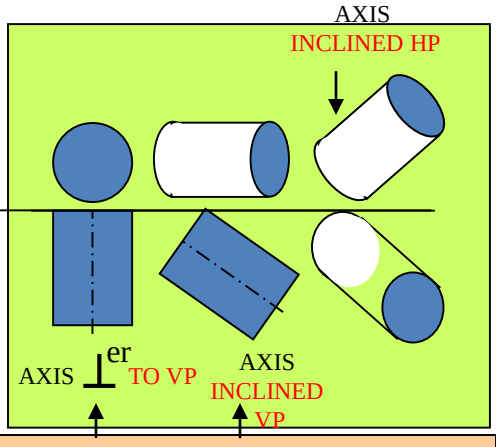
Three steps
If solid is inclined to Hp

GROUP B SOLID.
CONE



Three steps
If solid is inclined to Vp

GROUP A SOLID.
CYLINDER



Three steps
If solid is inclined to Vp

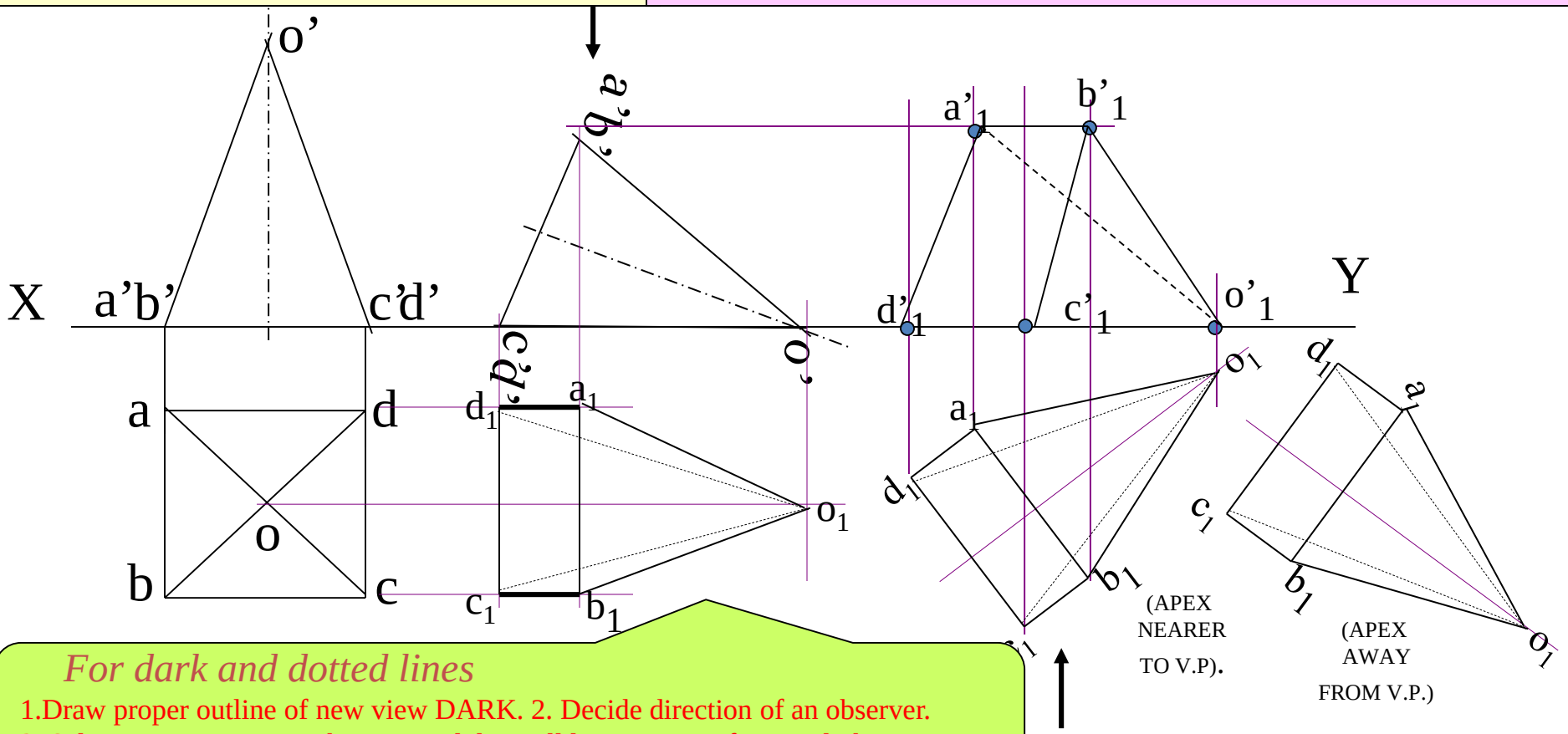
Study Next *Twelve* Problems and Practice them separately !!

Problem 1. A square pyramid, 40 mm base sides and axis 60 mm long, has a triangular face on the ground and the vertical plane containing the axis makes an angle of 45^0 with the VP. Draw its projections. Take apex nearer to VP

Solution Steps :

Triangular face on Hp , means it is lying on Hp:

1. Assume it standing on Hp.
2. It's Tv will show True Shape of base(square)
3. Draw square of 40mm sides with one side vertical Tv & taking 50 mm axis project Fv. (a triangle)
4. Name all points as shown in illustration.
5. Draw 2nd Fv in lying position I.e.o'c'd' face on xy. And project it's Tv.
6. Make visible lines dark and hidden dotted, as per the procedure.
7. Then construct remaining inclination with Vp (Vp containing axis ic the center line of 2nd Tv.Make it 45^0 to xy as shown take apex near to xy, as it is nearer to Vp) & project final Fv.



For dark and dotted lines

1. Draw proper outline of new view DARK. 2. Decide direction of an observer.
3. Select nearest point to observer and draw all lines starting from it-dark.
4. Select farthest point to observer and draw all lines (remaining)from it- dotted.

Problem 2:

A cone 40 mm diameter and 50 mm axis is resting on one generator on Hp which makes 30^0 inclination with Vp Draw it's projections.

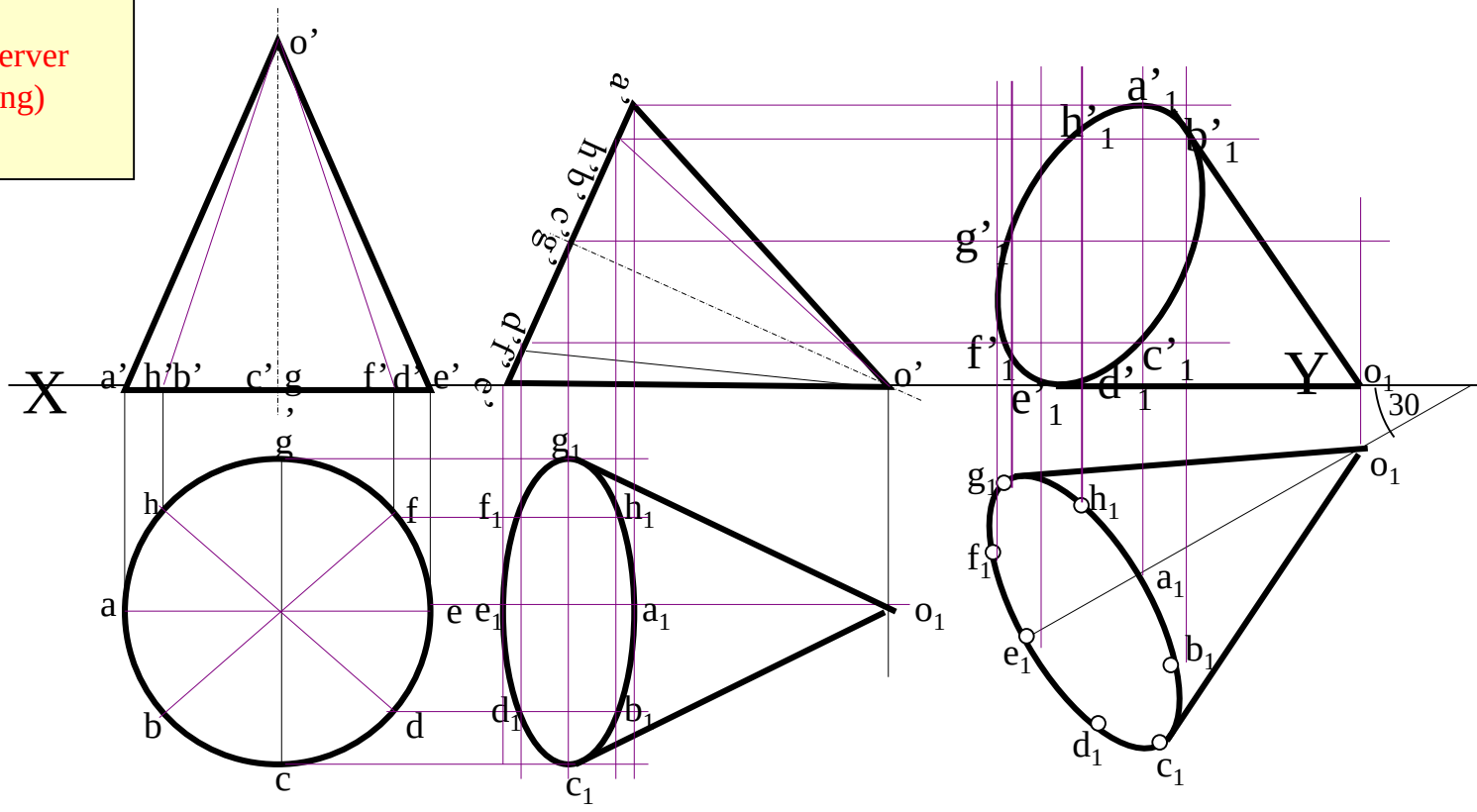
For dark and dotted lines

1. Draw proper outline of new vie DARK.
2. Decide direction of an observer.
3. Select nearest point to observer and draw all lines starting from it-dark.
4. Select farthest point to observer and draw all lines (remaining) from it- dotted.

Solution Steps:

Resting on Hp on one generator, means lying on Hp:

1. Assume it standing on Hp.
2. It's Tv will show True Shape of base(circle)
3. Draw 40mm dia. Circle as Tv & taking 50 mm axis project Fv. (a triangle)
4. Name all points as shown in illustration.
5. Draw 2nd Fv in lying position I.e.o'e' on xy. And project it's Tv below xy.
6. Make visible lines dark and hidden dotted, as per the procedure.
7. Then construct remaining inclination with Vp (generator o_1e_1 30^0 to xy as shown) & project final Fv.



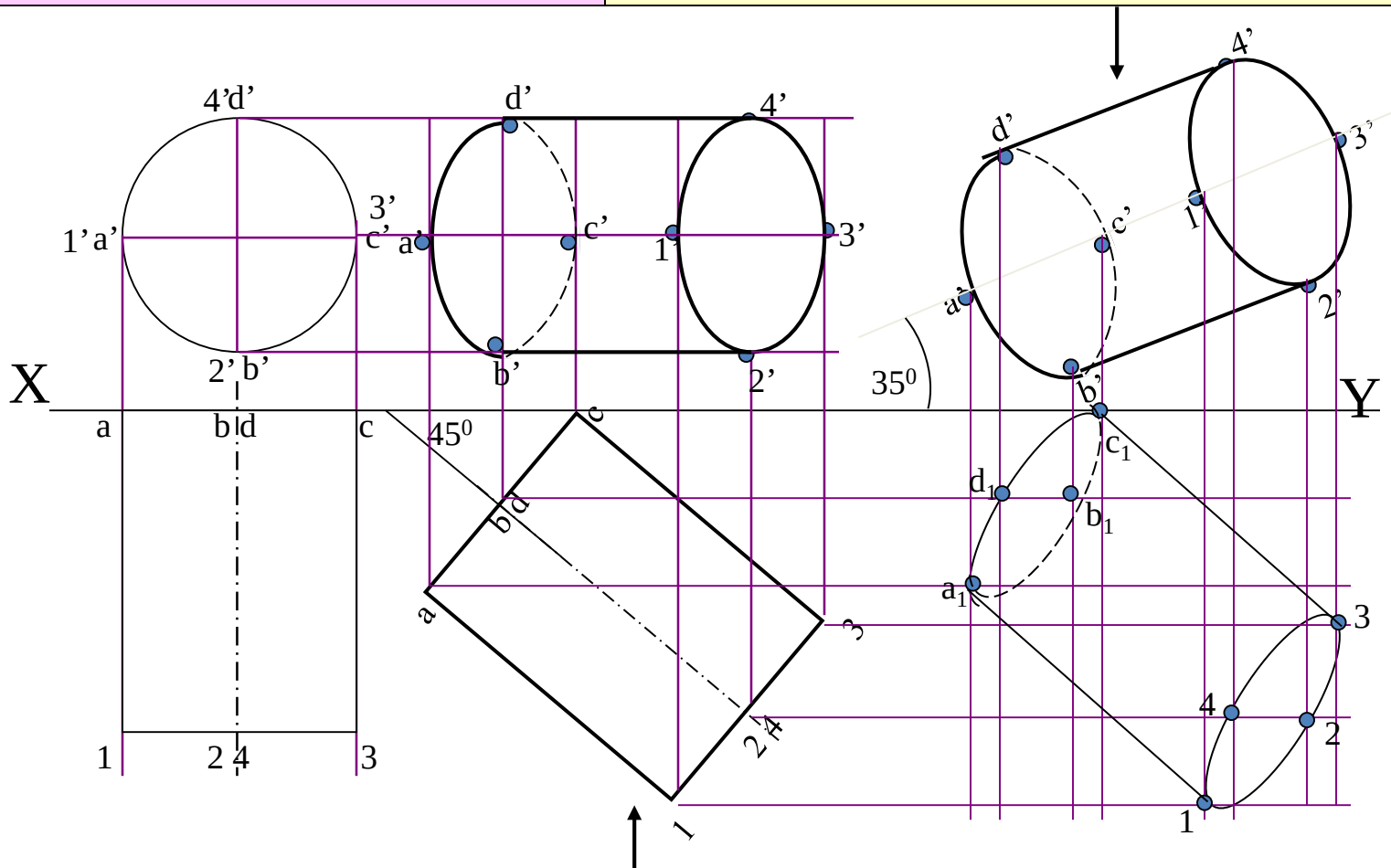
Problem 3:

A cylinder 40 mm diameter and 50 mm axis is resting on one point of a base circle on Vp while it's axis makes 45^0 with Vp and Fv of the axis 35^0 with Hp. Draw projections..

Solution Steps:

Resting on Vp on one point of base, means inclined to Vp:

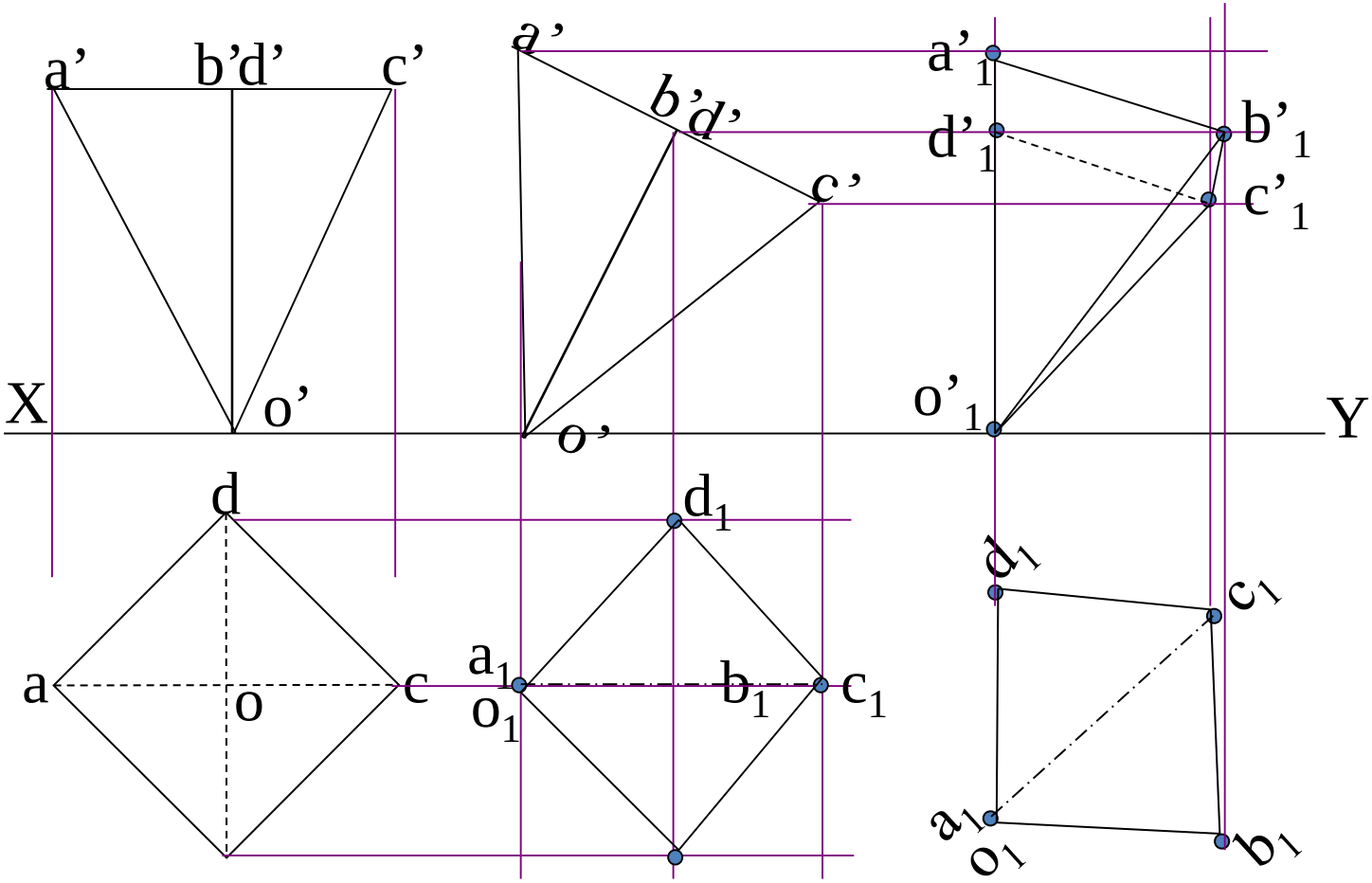
1. Assume it standing on Vp
2. It's Fv will show True Shape of base & top(circle)
3. Draw 40mm dia. Circle as Fv & taking 50 mm axis project Tv. (a Rectangle)
4. Name all points as shown in illustration.
5. Draw 2nd Tv making axis 45^0 to xy And project it's Fv above xy.
6. Make visible lines dark and hidden dotted, as per the procedure.
7. Then construct remaining inclination with Hp (Fv of axis I.e. center line of view to xy as shown) & project final Tv.



Problem 4:A square pyramid 30 mm base side and 50 mm long axis is resting on it's apex on Hp, such that it's one slant edge is vertical and a triangular face through it is perpendicular to Vp. Draw it's projections.

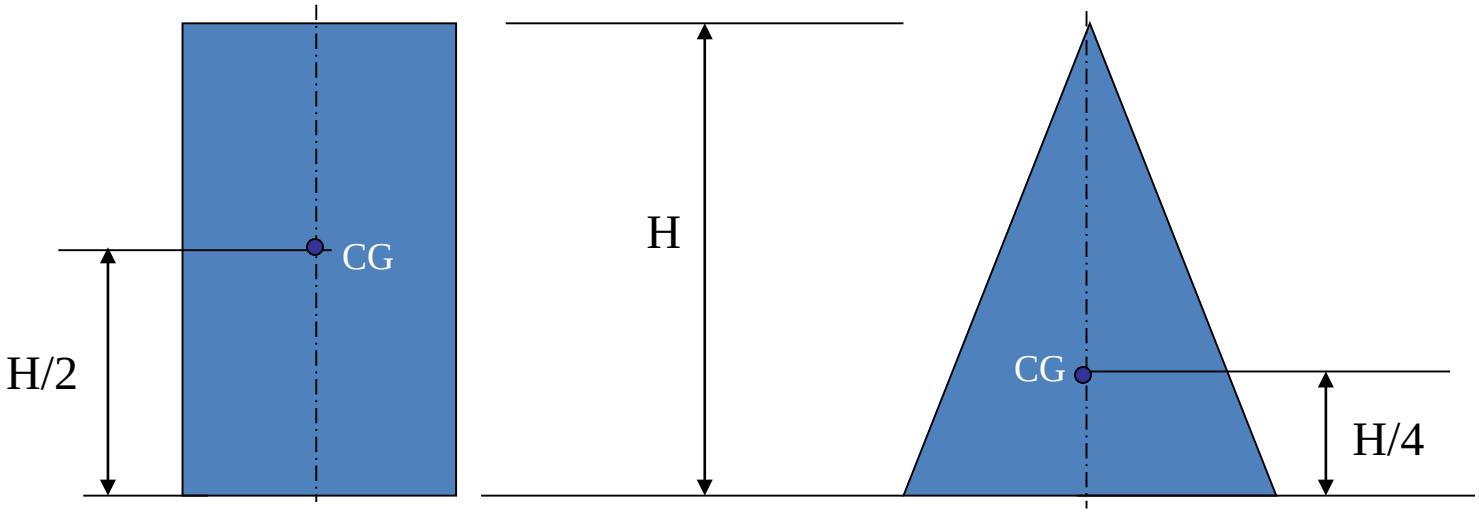
Solution Steps :

1.Assume it standing on Hp but as said on apex.(inverted).
2.It's Tv will show True Shape of base(square)
3.Draw a corner case square of 30 mm sides as Tv(as shown) Showing all slant edges dotted, as those will not be visible from top.
4.taking 50 mm axis project Fv. (a triangle)
5.Name all points as shown in illustration.
6.Draw 2nd Fv keeping o'a' slant edge vertical & project it's Tv
7.Make visible lines dark and hidden dotted, as per the procedure.
8.Then redrew 2nd Tv as final Tv keeping $a_1o_1d_1$ triangular face perpendicular to Vp I.e.xy. Then as usual project final Fv.



FREELY SUSPENDED SOLIDS:

Positions of CG, on axis, from base, for different solids are shown below.



GROUP A SOLIDS
(Cylinder & Prisms)

GROUP B SOLIDS
(Cone & Pyramids)

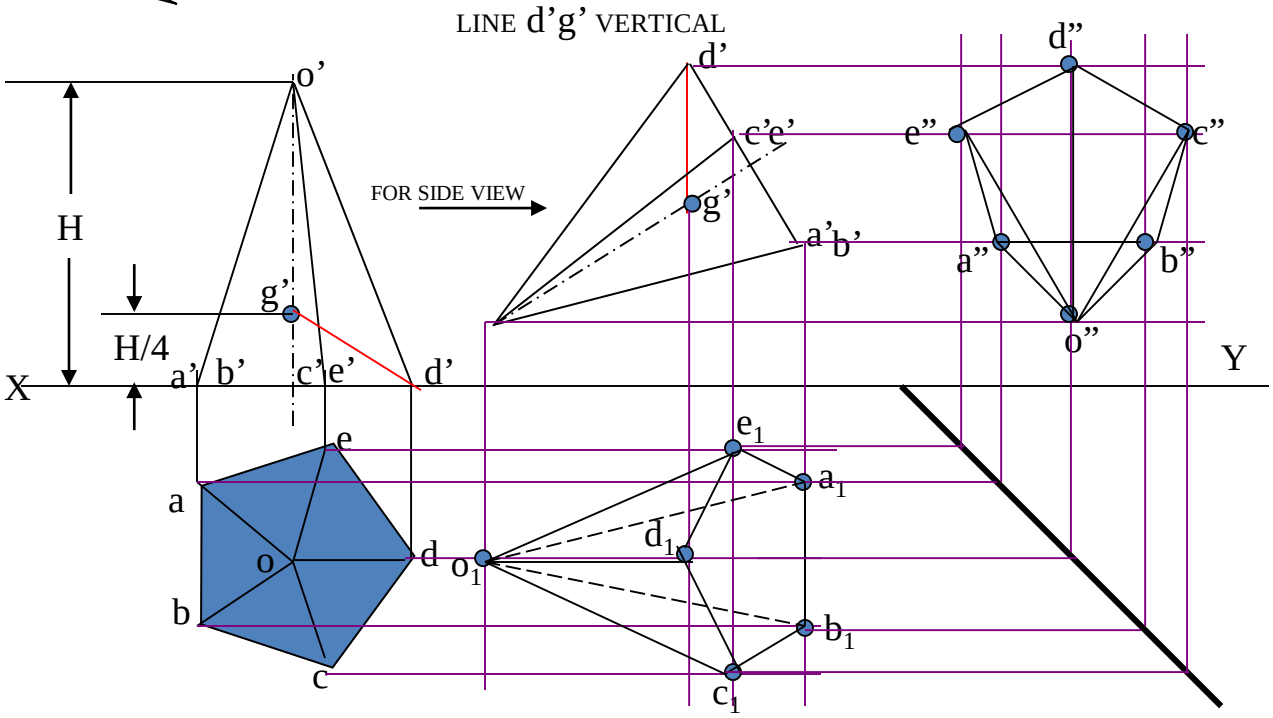
Problem 5: A pentagonal pyramid 30 mm base sides & 60 mm long axis, is freely suspended from one corner of base so that a plane containing it's axis remains parallel to Vp.
Draw it's three views.

Solution Steps:

In all suspended cases axis shows inclination with Hp.

1. Hence assuming it standing on Hp, drew Tv - a regular pentagon,corner case.
2. Project Fv & locate CG position on axis – (¼ H from base.) and name g' and Join it with corner d'
3. As 2nd Fv, redraw first keeping line g'd' vertical.
4. As usual project corresponding Tv and then Side View looking from.

IMPORTANT:
When a solid is freely suspended from a corner, then line joining point of contact & C.G. remains vertical.
(Here axis shows inclination with Hp.)
So in all such cases, assume solid standing on Hp initially.)



Solution Steps:

1.Assuming it standing on Hp begin with Tv, a square of corner case.

2.Project corresponding Fv.& name all points as usual in both views.

3.Join a'1' as body diagonal and draw 2nd Fv making it vertical (I' on xy)

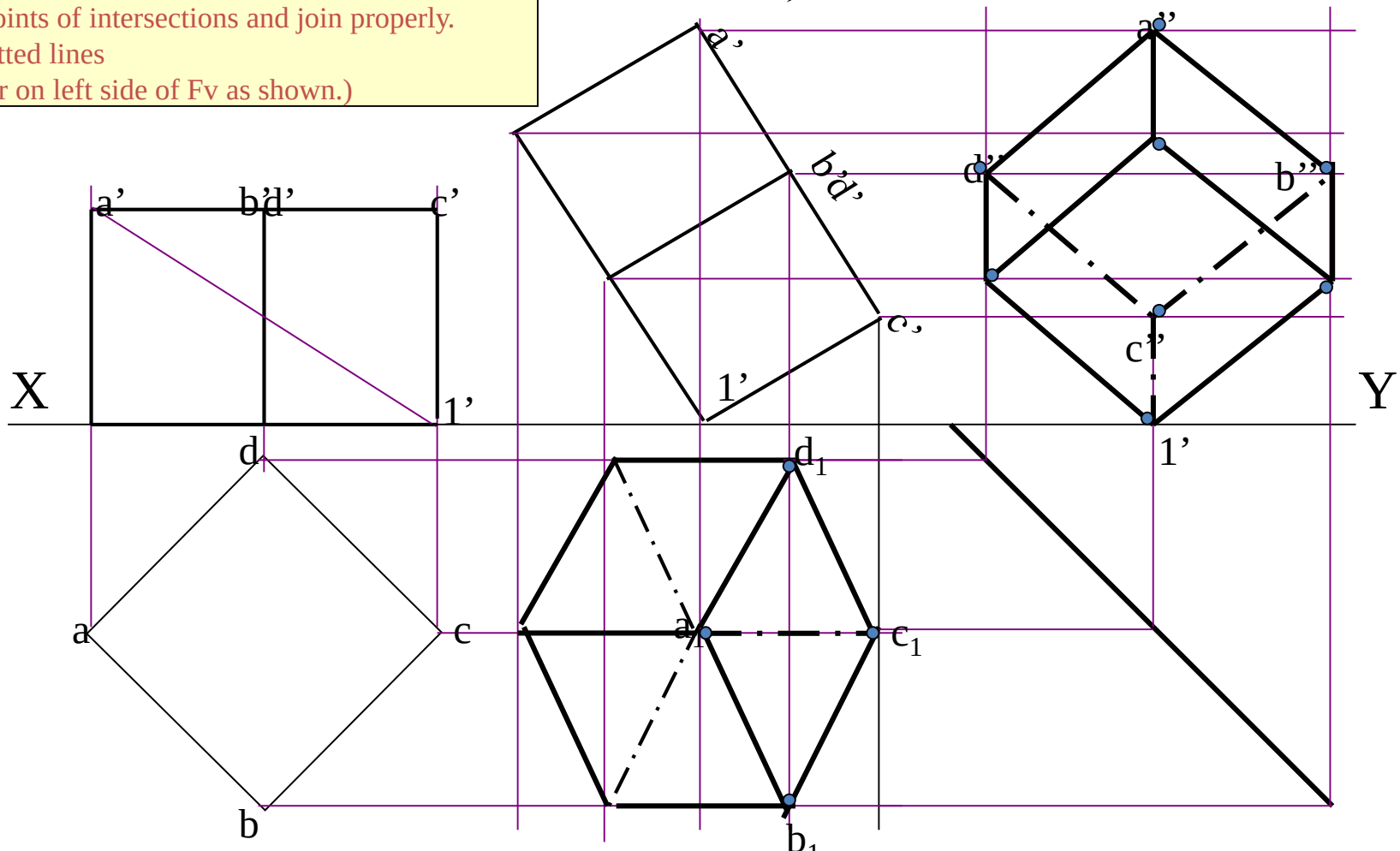
4.Project it's Tv drawing dark and dotted lines as per the procedure.

5.With standard method construct Left-hand side view.

(Draw a 45^0 inclined Line in Tv region (below xy).
Project horizontally all points of Tv on this line and reflect vertically upward, above xy.After this, draw horizontal lines, from all points of Fv, to meet these lines. Name points of intersections and join properly.
For dark & dotted lines
locate observer on left side of Fv as shown.)

Problem 6:

A cube of 50 mm long edges is so placed on Hp on one corner that a body diagonal through this corner is perpendicular to Hp and parallel to Vp Draw it's three views.



Problem 7: A right circular cone, 40 mm base diameter and 60 mm long axis is resting on Hp on one point of base circle such that it's axis makes 45^0 inclination with Hp and 40^0 inclination with Vp. Draw it's projections.

This case resembles to problem no.7 & 9 from projections of planes topic. In previous all cases 2nd inclination was done by a parameter not showing TL.Like Tv of axis is inclined to Vp etc. But here it is clearly said that the axis is 40^0 inclined to Vp. Means here TL inclination is expected. So the same construction done in those Problems is done here also. See carefully the final Tv and inclination taken there.

So assuming it standing on HP begin as usual.