Engineering Graphics
&
Drawing
ESC/2-P

By
Dr. Vikas Gupta
CDLSIET Panniwala Mota

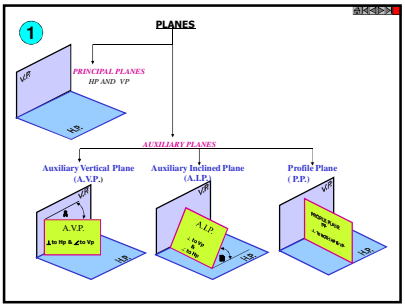
ORTHOGRAPHIC PROJECTIONS:

IT IS A TECHNICAL DRAWING IN WHICH DIFFERENT VIEWS OF AN OBJECT ARE PROJECTED ON DIFFERENT REFERENCE PLANES OBSERVING PERPENDICULAR TO RESPECTIVE REFERENCE PLANE

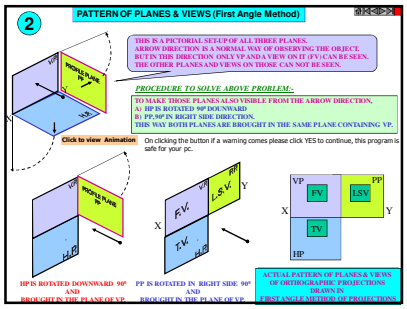
Different Reference planes are
Horizontal Plane (HP),
Vertical Frontal Plane (VP)
Side Or Profile Plane (PP)
And
Different Views are Front View (FV), Top View (TV) and Side View (SV)
FV is a view projected on VP.
TV is a view projected on HP.
SV is a view projected on PP.

IMPORTANT TERMS OF ORTHOGRAPHIC PROJECTIONS:
1. Planes.
2. Pattern of planes & Pattern of views
3. Methods of drawing Orthographic Projections

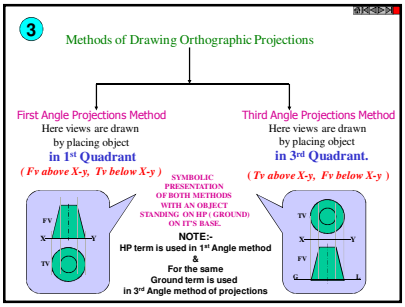
1 PLANES



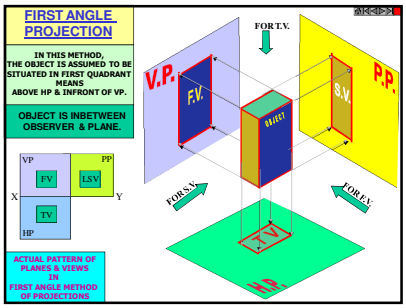
2 PATTERN OF PLANES & VIEWS (First Angle Method)



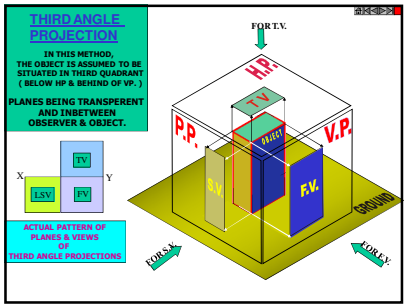
3 Methods of Drawing Orthographic Projections



FIRST ANGLE PROJECTION



THIRD ANGLE PROJECTION



ORTHOGRAPHIC PROJECTIONS { MACHINE ELEMENTS }

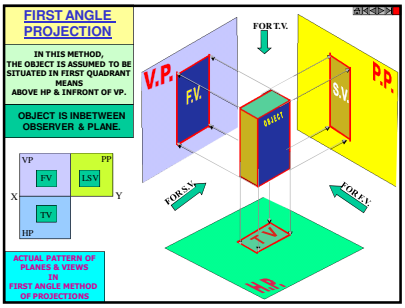
OBJECT IS OBSERVED IN THREE DIRECTIONS.
THE DIRECTIONS SHOULD BE NORMAL TO THE RESPECTIVE PLANES.
AND NOW PROJECT THREE DIFFERENT VIEWS ON THOSE PLANES.
THESE VEWS ARE FRONT VIEW , TOP VIEW AND SIDE VIEW.

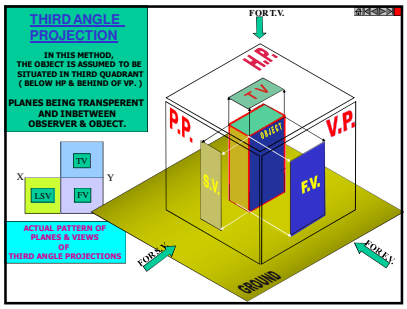
FRONT VIEW IS A VIEW PROJECTED ON VERTICAL PLANE (VP)
TOP VIEW IS A VIEW PROJECTED ON HORIZONTAL PLANE (HP)
SIDE VIEW IS A VIEW PROJECTED ON PROFILE PLANE (PP)

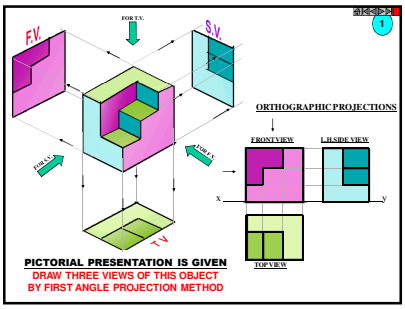
FIRST STUDY THE CONCEPT OF 1ST AND 3RD ANGLE PROJECTION METHODS

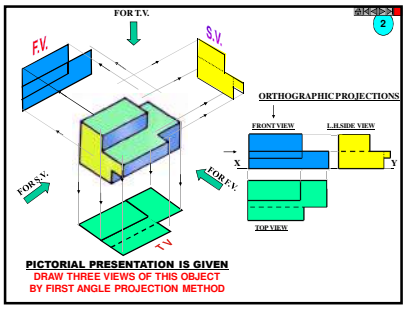
AND THEIR STUDY NEXT 26 ILLUSTRATED CASES CAREFULLY.
TRY TO RECOGNIZE SURFACES
PERPENDICULAR TO THE ARROW DIRECTIONS.

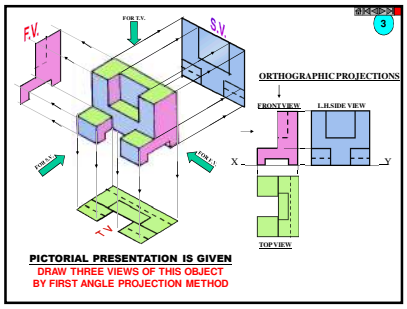
FIRST ANGLE PROJECTION

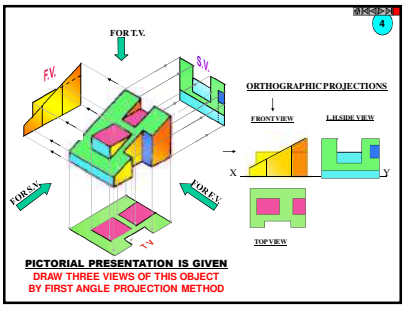


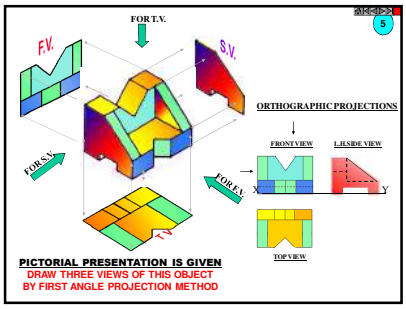

THIRD ANGLE PROJECTION
IN THIS METHOD, THE OBJECT IS ASSUMED TO BE SITUATED IN THIRD QUADRANT (BELOW HP & BEHIND OF VP.)
PLANES BEING TRANSPERENT AND INBETWEEN OBSERVER & OBJECT.
FOR T.V.
H.P.
T.V
P.P.
V.P.
F.V.
S.V.
TV
LSV
FV
X
Y
ACTUAL PATTERN OF PLANES & VIEWS OF THIRD ANGLE PROJECTIONS
FOR S.V.
FOR F.V.
GROUND

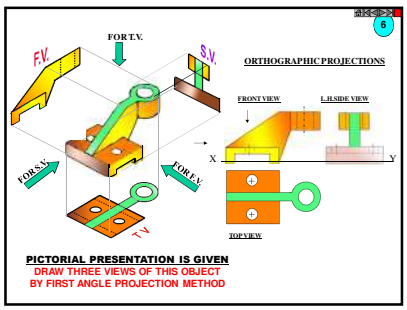

1
FOR T.V.
F.V.
S.V.
ORTHOGRAPHIC PROJECTIONS
FRONT VIEW
L.H.SIDE VIEW
TOP VIEW
X
Y
T.V
PICTORIAL PRESENTATION IS GIVEN
DRAW THREE VIEWS OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD

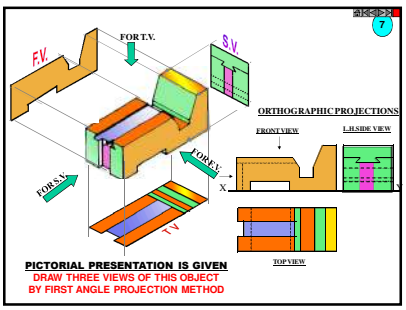

2
FOR T.V.
F.V.
S.V.
ORTHOGRAPHIC PROJECTIONS
FRONT VIEW
L.H.SIDE VIEW
TOP VIEW
X
Y
T.V
PICTORIAL PRESENTATION IS GIVEN
DRAW THREE VIEWS OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD

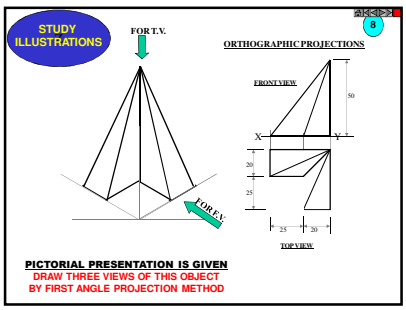

3
FOR T.V.
F.V.
S.V.
ORTHOGRAPHIC PROJECTIONS
FRONT VIEW
L.H.SIDE VIEW
TOP VIEW
X
Y
T.V
PICTORIAL PRESENTATION IS GIVEN
DRAW THREE VIEWS OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD

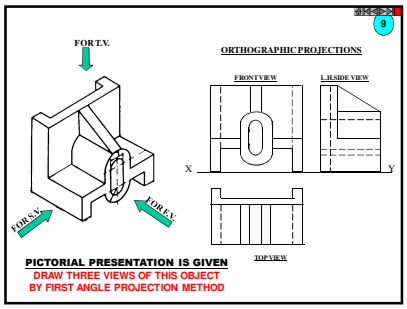

4
FOR T.V.
F.V.
S.V.
ORTHOGRAPHIC PROJECTIONS
FRONT VIEW
L.H.SIDE VIEW
TOP VIEW
X
Y
T.V
PICTORIAL PRESENTATION IS GIVEN
DRAW THREE VIEWS OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD

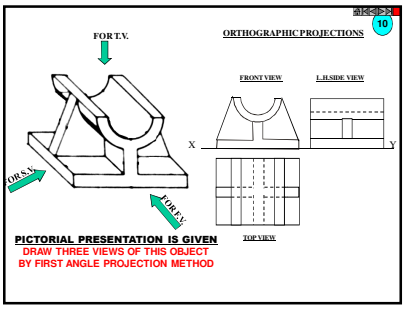

5
FOR T.V.
F.V.
S.V.
ORTHOGRAPHIC PROJECTIONS
FRONT VIEW
L.H.SIDE VIEW
TOP VIEW
X
Y
T.V
PICTORIAL PRESENTATION IS GIVEN
DRAW THREE VIEWS OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD

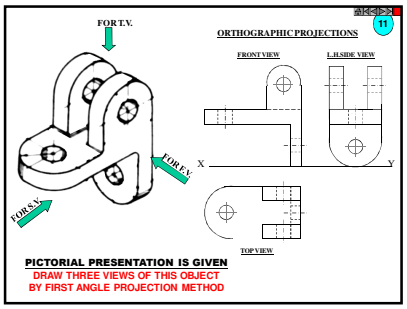

6
FOR T.V.
F.V.
S.V.
ORTHOGRAPHIC PROJECTIONS
FRONT VIEW
L.H.SIDE VIEW
TOP VIEW
X
Y
T.V
PICTORIAL PRESENTATION IS GIVEN
DRAW THREE VIEWS OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD

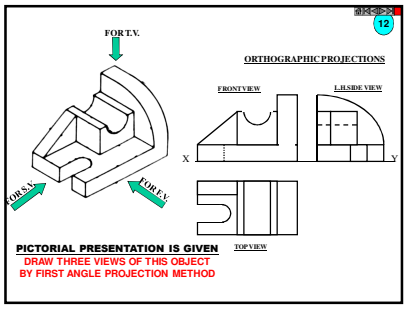

7
FOR T.V.
F.V.
S.V.
ORTHOGRAPHIC PROJECTIONS
FRONT VIEW
L.H.SIDE VIEW
TOP VIEW
X
Y
T.V
PICTORIAL PRESENTATION IS GIVEN
DRAW THREE VIEWS OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD

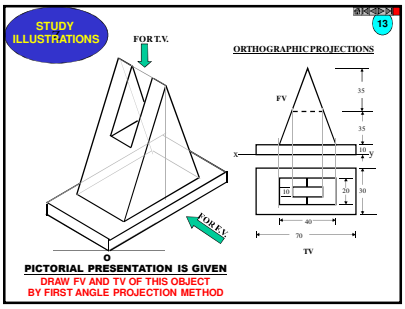

STUDY ILLUSTRATIONS
8
FOR T.V.
ORTHOGRAPHIC PROJECTIONS
FRONT VIEW
TOP VIEW
X
Y
50
20
25
PICTORIAL PRESENTATION IS GIVEN
DRAW THREE VIEWS OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD

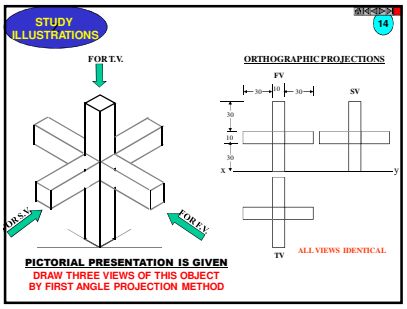

9
FOR T.V.
ORTHOGRAPHIC PROJECTIONS
FRONT VIEW
L.H.SIDE VIEW
X
Y
TOP VIEW
FOR S.V.
FOR F.V.
PICTORIAL PRESENTATION IS GIVEN
DRAW THREE VIEWS OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD

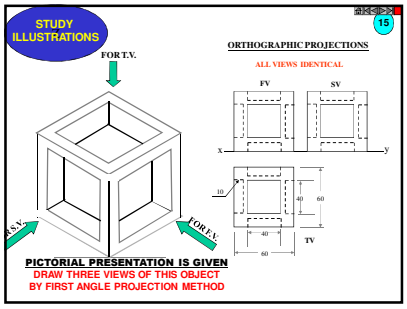

10
FOR T.V.
ORTHOGRAPHIC PROJECTIONS
FRONT VIEW
L.H.SIDE VIEW
X
Y
TOP VIEW
FOR S.V.
FOR F.V.
PICTORIAL PRESENTATION IS GIVEN
DRAW THREE VIEWS OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD

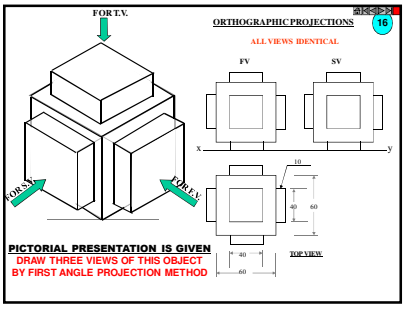

11
FOR T.V.
ORTHOGRAPHIC PROJECTIONS
FRONT VIEW
L.H.SIDE VIEW
X
Y
TOP VIEW
FOR S.V.
FOR F.V.
PICTORIAL PRESENTATION IS GIVEN
DRAW THREE VIEWS OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD

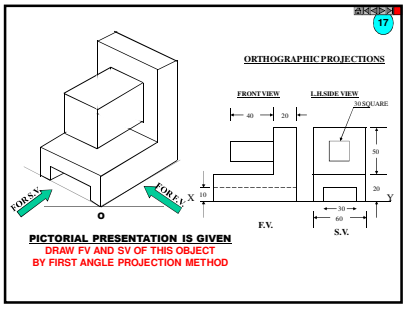

12
FOR T.V.
ORTHOGRAPHIC PROJECTIONS
FRONT VIEW
L.H.SIDE VIEW
X
Y
TOP VIEW
FOR S.V.
FOR F.V.
PICTORIAL PRESENTATION IS GIVEN
DRAW THREE VIEWS OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD

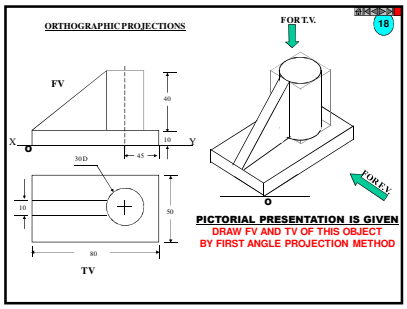

STUDY
ILLUSTRATIONS
13
FOR T.V.
ORTHOGRAPHIC PROJECTIONS
FV
TV
FOR S.V.
FOR F.V.
PICTORIAL PRESENTATION IS GIVEN
DRAW FV AND TV OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD

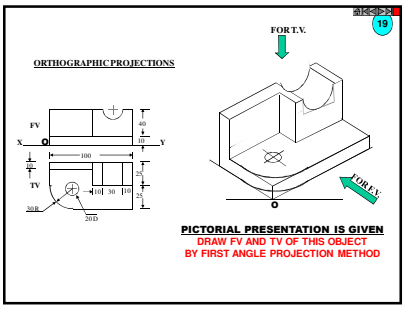

STUDY
ILLUSTRATIONS
14
FOR T.V.
ORTHOGRAPHIC PROJECTIONS
FV
SV
TV
ALL VIEWS IDENTICAL
FOR S.V.
FOR F.V.
PICTORIAL PRESENTATION IS GIVEN
DRAW THREE VIEWS OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD

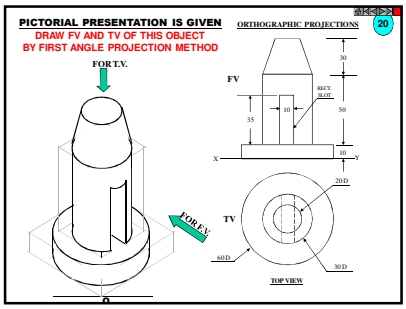

STUDY
ILLUSTRATIONS
15
FOR T.V.
ORTHOGRAPHIC PROJECTIONS
ALL VIEWS IDENTICAL
FV
SV
TV
S.V.
FOR F.V.
PICTORIAL PRESENTATION IS GIVEN
DRAW THREE VIEWS OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD

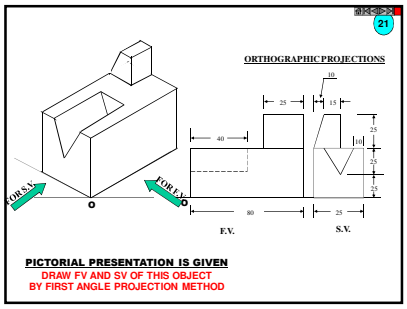

16
FOR T.V.
ORTHOGRAPHIC PROJECTIONS
ALL VIEWS IDENTICAL
FV
SV
TOP VIEW
FOR S.V.
FOR F.V.
PICTORIAL PRESENTATION IS GIVEN
DRAW THREE VIEWS OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD

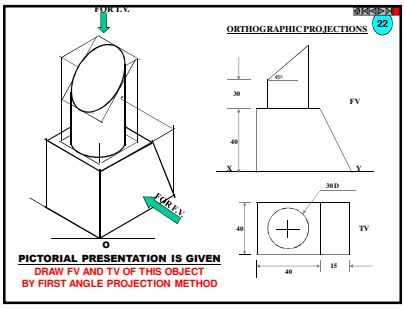

17
ORTHOGRAPHIC PROJECTIONS
FRONT VIEW
L.H.SIDE VIEW
30SQUARE
F.V.
S.V.
FOR S.V.
FOR F.V.
PICTORIAL PRESENTATION IS GIVEN
DRAW FV AND SV OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD

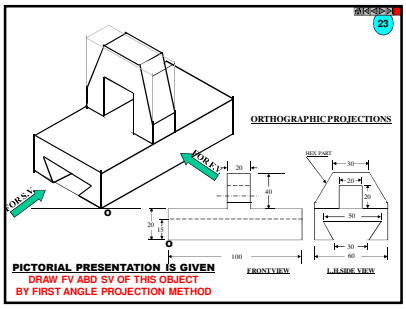

18
ORTHOGRAPHIC PROJECTIONS
FV
TV
FOR T.V.
FOR F.V.
PICTORIAL PRESENTATION IS GIVEN
DRAW FV AND TV OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD

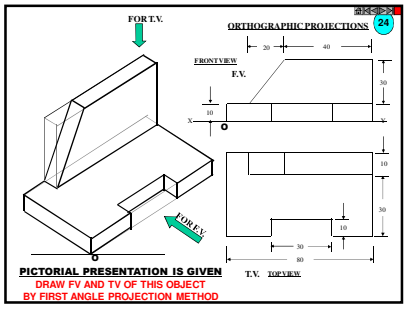

19
ORTHOGRAPHIC PROJECTIONS
FV
TV
FOR T.V.
FOR F.V.
PICTORIAL PRESENTATION IS GIVEN
DRAW FV AND TV OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD

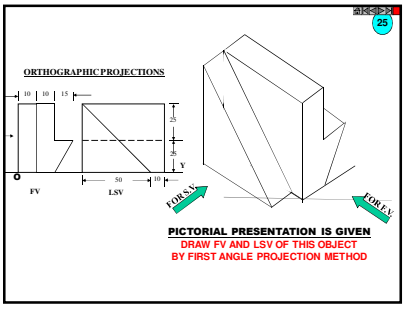

20
PICTORIAL PRESENTATION IS GIVEN
DRAW FV AND TV OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD
ORTHOGRAPHIC PROJECTIONS
FOR T.V.
FV
TV
FOR F.V.
TOP VIEW

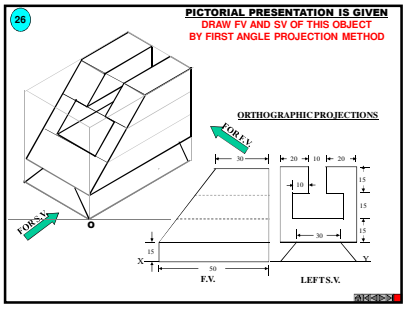

21
ORTHOGRAPHIC PROJECTIONS
FOR S.V.
FOR F.V.
F.V.
S.V.
PICTORIAL PRESENTATION IS GIVEN
DRAW FV AND SV OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD


22
FOR T.V.
ORTHOGRAPHIC PROJECTIONS
FV
TV
FOR F.V.
PICTORIAL PRESENTATION IS GIVEN
DRAW FV AND TV OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD


23
ORTHOGRAPHIC PROJECTIONS
FOR S.V.
FOR F.V.
FRONTVIEW
L.H.SIDE VIEW
PICTORIAL PRESENTATION IS GIVEN
DRAW FV ABD SV OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD


24
FOR T.V.
ORTHOGRAPHIC PROJECTIONS
FRONTVIEW
F.V.
FOR F.V.
T.V. TOPVIEW
PICTORIAL PRESENTATION IS GIVEN
DRAW FV AND TV OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD


25
ORTHOGRAPHIC PROJECTIONS
FV
LSV
FOR S.V.
FOR F.V.
PICTORIAL PRESENTATION IS GIVEN
DRAW FV AND LSV OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD


26
PICTORIAL PRESENTATION IS GIVEN
DRAW FV AND SV OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD
ORTHOGRAPHIC PROJECTIONS
FOR F.V.
FOR S.V.
F.V.
LEFT S.V.

ORTHOGRAPHIC PROJECTIONS

OF POINTS, LINES, PLANES, AND SOLIDS.

TO DRAW PROJECTIONS OF ANY OBJECT,
ONE MUST HAVE FOLLOWING INFORMATION

A) OBJECT
{ WITH IT'S DESCRIPTION, WELL DEFINED.}

B) OBSERVER
{ ALWAYS OBSERVING PERPENDICULAR TO RESP. REF.PLANE}.

C) LOCATION OF OBJECT,
{ MEANS IT'S POSITION WITH REFFERENCE TO H.P. & V.P.}

TERMS 'ABOVE' & 'BELOW' WITH RESPECTIVE TO H.P.
AND TERMS 'INFRONT' & 'BEHIND' WITH RESPECTIVE TO V.P
FORM 4 QUADRANTS.
OBJECTS CAN BE PLACED IN ANY ONE OF THESE 4 QUADRANTS.

IT IS INTERESTING TO LEARN THE EFFECT ON THE POSITIONS OF VIEWS (FV, TV) OF THE OBJECT WITH RESP. TO X-Y LINE, WHEN PLACED IN DIFFERENT QUADRANTS.

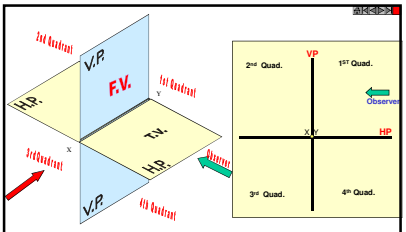
STUDY ILLUSTRATIONS GIVEN ON NEXT PAGES AND NOTE THE RESULTS.TO MAKE IT EASY HERE A POINT (A) IS TAKEN AS AN OBJECT. BECAUSE IT'S ALL VIEWS ARE JUST POINTS.

NOTATIONS

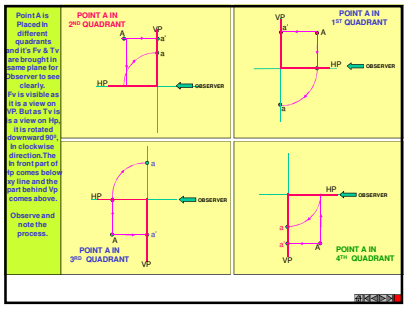
FOLLOWING NOTATIONS SHOULD BE FOLLOWED WHILE NAMEING DIFFERENT VIEWS IN ORTHOGRAPHIC PROJECTIONS.

OBJECT	POINT A	LINE AB
IT'S TOP VIEW	a	a b
IT'S FRONT VIEW	a'	a' b'
IT'S SIDE VIEW	a''	a'' b''

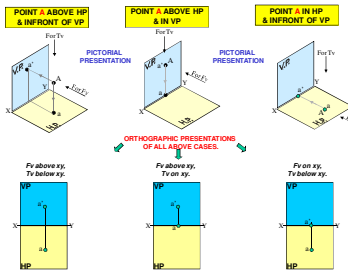
SAME SYSTEM OF NOTATIONS SHOULD BE FOLLOWED INCASE NUMBERS, LIKE 1, 2, 3 – ARE USED.



THIS QUADRANT PATTERN,
IF OBSERVED ALONG X-Y LINE (IN RED ARROW DIRECTION)
WILL EXACTLY APPEAR AS SHOWN ON RIGHT SIDE AND HENCE,
IT IS FURTHER USED TO UNDERSTAND ILLUSTRATION PROPERLLY.



PROJECTIONS OF A POINT IN FIRST QUADRANT.



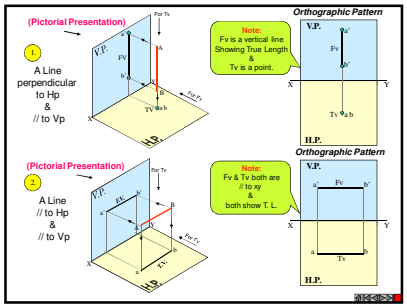
PROJECTIONS OF STRAIGHT LINES.

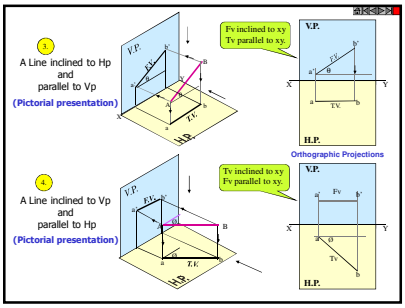
INFORMATION REGARDING A LINE *means*
IT'S LENGTH,
POSITION OF IT'S ENDS WITH HP & VP
IT'S INCLINATIONS WITH HP & VP WILL BE GIVEN.
AIM:- TO DRAW IT'S PROJECTIONS - MEANS FV & TV.

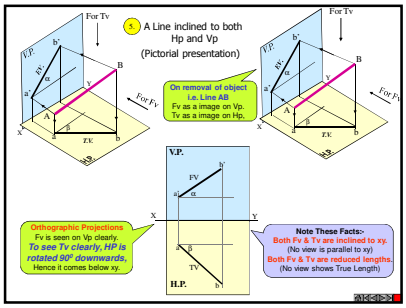
SIMPLE CASES OF THE LINE

1. A VERTICAL LINE (LINE PERPENDICULAR TO HP & // TO VP)
2. LINE PARALLEL TO BOTH HP & VP.
3. LINE INCLINED TO HP & PARALLEL TO VP.
4. LINE INCLINED TO VP & PARALLEL TO HP.
5. LINE INCLINED TO BOTH HP & VP.

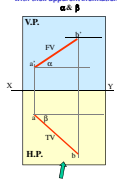
STUDY ILLUSTRATIONS GIVEN ON NEXT PAGE SHOWING CLEARLY THE NATURE OF FV & TV OF LINES LISTED ABOVE AND NOTE RESULTS.





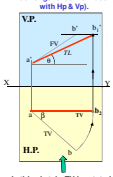


Orthographic Projections
Means Fv & Tv of Line AB
are shown below,
with their apparent Inclinations
α & β



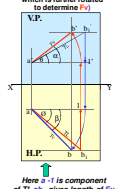
Here TV (ab) is not // to XY line
Hence it's corresponding FV
a' b' is not showing
True Length &
True Inclination with Hp.

Note the procedure
When Fv & Tv known,
How to find True Length.
(Views are rotated to determine
True Length & it's inclinations
with Hp & Vp).



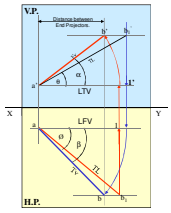
In this sketch, TV is rotated
and made // to XY line.
Hence it's corresponding
FV a' b1' is showing
True Length
&
True Inclination with Hp.

Note the procedure
When True Length is known,
How to locate Fv & Tv.
(Component a-1 of TL is drawn
which is further rotated
to determine Fv)



Here a' -1' is component
of TL ab, gives length of Fv.
Hence it is brought Up to
Locus of a' and further rotated
to get point b1'. a' b1' will be Fv.
Similarly drawing component
of other TL(a' b1') Tv can be drawn.

The most important diagram showing graphical relations among all important parameters of this topic.
Study and memorize it as a *CIRCUIT DIAGRAM*
And use in solving various problems.



1) True Length (TL) = a' b1' & a b1
2) Angle of TL with Hp - θ
3) Angle of TL with Vp – Ø
4) Angle of FV with xy – α
5) Angle of TV with xy – β
6) LTV (length of FV) – Component (a-1)
7) LFV (length of TV) – Component (a'-1')
8) Position of A- Distances of a & a' from xy
9) Position of B- Distances of b & b' from xy
10) Distance between End Projectors

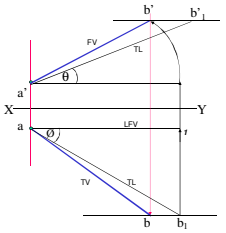
Important
TEN parameters
to be remembered
with Notations
used here onward

NOTE this
θ & α Construct with a'
Ø & β Construct with a
b' & b1' on same locus.
b & b1 on same locus.

Also Remember
True Length is never rotated. It's horizontal component is drawn & it is further rotated to locate view.
Views are always rotated, made horizontal & further extended to locate TL, θ & Ø

GROUP (A)
GENERAL CASES OF THE LINE INCLINED TO BOTH HP & VP
(based on 10 parameters).

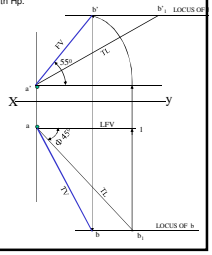
PROBLEM 1)
Line AB is 75 mm long and it is 30º & 40º Inclined to Hp & Vp respectively.
End A is 12mm above Hp and 10 mm in front of Vp.
Draw projections. Line is in 1st quadrant.



SOLUTION STEPS:
1) Draw xy line and one projector.
2) Locate a' 12mm above xy line & a 10mm below xy line.
3) Take 30º angle from a' & 40º from a and mark TL i.e. 75mm on both lines. Name those points b_1' and b_1 respectively.
4) Join both points with a' and a resp.
5) Draw horizontal lines (Locus) from both points.
6) Draw horizontal component of TL a b_1 from point b_1 and name it 1. (the length a-1 gives length of Fv as we have seen already.)
7) Extend it up to locus of a' and rotating a' as center locate b' as shown. Join a' b' as Fv.
8) From b' drop a projector down ward & get point b. Join a & b i.e. Tv.

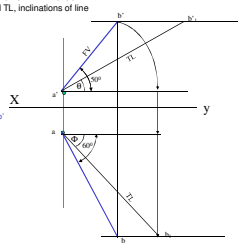
PROBLEM 2:
Line AB 75mm long makes 45º inclination with Vp while it's Fv makes 55º.
End A is 10 mm above Hp and 15 mm in front of Vp.If line is in 1st quadrant draw it's projections and find it's inclination with Hp.

Solution Steps:-
1.Draw x-y line.
2.Draw one projector for a' & a
3.Locate a' 10mm above x-y & Tv a 15 mm below xy.
4.Draw a line 45º inclined to xy from point a and cut TL 75 mm on it and name that point b_1 Draw locus from point b_1
5.Take 55º angle from a' for Fv above xy line.
6.Draw a vertical line from b_1 up to locus of a and name it 1. It is horizontal component of TL is LFV.
7.Continue it to locus of a' and rotate upward up to the line of Fv and name it b_1'.This a' b_1' line is Fv.
8. Drop a projector from b' on locus from point b_1 and name intersecting point b. Line a b is Tv of line AB.
9.Draw locus from b' and from a' with TL distance cut point b_1'
10.Join a' b_1' as TL and measure it's angle at a'.
It will be true angle of line with HP.



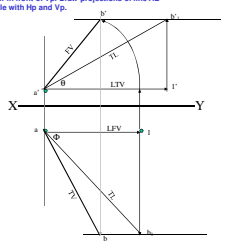
PROBLEM 3:
Fv of line AB is 50º inclined to xy and measures 55 mm long while it's Tv is 60º inclined to xy line. If end A is 10 mm above Hp and 15 mm in front of Vp, draw it's projections,find TL, inclinations of line with Hp & Vp.

SOLUTION STEPS:
1.Draw xy line and one projector.
2.Locate a' 10 mm above xy and a 15 mm below xy line.
3.Draw locus from these points.
4.Draw Fv 50º to xy from a' and mark b' Cutting 55mm on it.
5.Similarly draw Tv 60º to xy from a & drawing projector from b' Locate point b and join a b.
6.Then rotating views as shown, locate True Lengths ab, & a'b_1 and their angles with Hp and Vp.



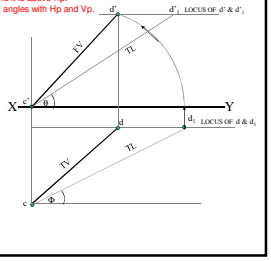
PROBLEM 4 >
Line AB is 75 mm long .It's Fv and Tv measure 50 mm & 60 mm long respectively.
End A is 10 mm above Hp and 15 mm in front of Vp. Draw projections of line AB if end B is in first quadrant.Find angle with Hp and Vp.

SOLUTION STEPS:
1.Draw xy line and one projector.
2.Locate a' 10 mm above xy and a 15 mm below xy line.
3.Draw locus from these points.
4.Cut 60mm distance on locus of a' & mark 1' on it as it is LTV.
5.Similarly Similarly cut 50mm on locus of a and mark point 1 as it is LFV.
6.From 1' draw a vertical line upward and from a' taking TL (75mm) in compass, mark b_1' point on it. Join a' b_1' points.
7. Draw locus from b_1'
8. With same steps below get b_1 point and draw also locus from it.
9. Now rotating one of the components i.e. a-1 locate b' and join a' with it to get Fv.
10. Locate tv similarly and measure Angles θ & Φ



PROBLEM 5 >
T.V. of a 75 mm long Line CD, measures 50 mm.
End C is in Hp and 50 mm in front of Vp.
End D is 15 mm in front of Vp and it is above Hp.
Draw projections of CD and find angles with Hp and Vp.

SOLUTION STEPS:
1.Draw xy line and one projector.
2.Locate c' on xy and c 50mm below xy line.
3.Draw locus from these points.
4.Draw locus of d 15 mm below xy
5.Cut 50mm & 75 mm distances on locus of d from c and mark points d & d_1 as these are Tv and line CD length resp.& join both with c.
6.From d_1 draw a vertical line upward up to xy i.e. up to locus of c' and draw an arc as shown.
7.Then draw one projector from d to meet this arc in d' point & join c' d'
8. Draw locus of d and cut 75 mm on it from c' as TL
9.Measure Angles θ & Φ



GROUP (B)
PROBLEMS INVOLVING TRACES OF THE LINE.

TRACES OF THE LINE:-

THESE ARE THE POINTS OF INTERSECTIONS OF A LINE (OR IT'S EXTENSION) WITH RESPECTIVE REFFERENCE PLANES.

A LINE ITSELF OR IT'S EXTENSION, WHERE EVER TOUCHES H.P., THAT POINT IS CALLED TRACE OF THE LINE ON H.P.(IT IS CALLED H.T.)

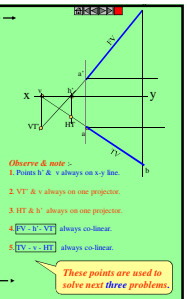
SIMILARLY, A LINE ITSELF OR IT'S EXTENSION, WHERE EVER TOUCHES V.P., THAT POINT IS CALLED TRACE OF THE LINE ON V.P.(IT IS CALLED V.T.)

V.T.:- It is a point on **Vp**.
Hence it is called ***Fv*** of a point in **Vp.**
Hence it's ***Tv*** comes on XY line.(Here onward named as **V**)

H.T.:- It is a point on **Hp.**
Hence it is called ***Tv*** of a point in **Hp.**
Hence it's ***Fv*** comes on **XY line.**(Here onward named as **'h')**

STEPS TO LOCATE HT.
(WHEN PROJECTIONS ARE GIVEN.)
1. **Begin with FV. Extend FV up to XY line.**
2. **Name this point h'**
(as it is a Fv of a point in Hp)
3. **Draw one projector from h'.**
4. **Now extend Tv to meet this projector.**
This point is HT

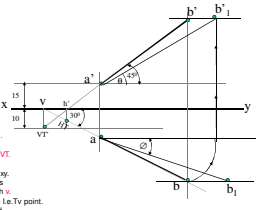
STEPS TO LOCATE VT.
(WHEN PROJECTIONS ARE GIVEN.)
1. **Begin with TV. Extend TV up to XY line.**
2. **Name this point V**
(as it is a Tv of a point in Vp)
3. **Draw one projector from v.**
4. **Now extend Fv to meet this projector.**
This point is VT



(Observe & note :-
1. Points h' & v always on x-y line.
2. VT' & v always on one projector.
3. HT & h' always on one projector.
4. FV - h'- VT always co-linear.
5. TV - v - HT always co-linear.

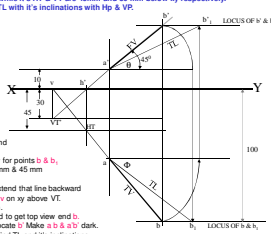
These points are used to solve next three problems.

PROBLEM 6 :- Fv of line AB makes 45º angle with XY line and measures 60 mm.
Line's Tv makes 30º with XY line. End A is 15 mm above Hp and it's VT is 10 mm
below Hp. Draw projections of line AB,determine inclinations with Hp & Vp and locate HT, VT.



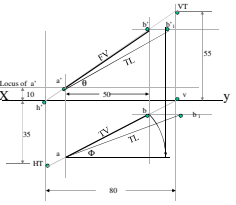
SOLUTION STEPS:-
Draw xy line, one projector and locate fv a' 15 mm above xy.
Take 45º angle from a' and marking 60 mm on it locate point b'.
Draw locus of VT, 10 mm below xy & extending Fv to this locus locate VT.
as fv-h'-vt' lie on one st.line.
Draw projector from vt, locate v on xy.
From v take 30º angle downward as Tv and it's inclination can begin with v.
Draw projector from b' and locate b i.e.Tv point.
Now rotating views as usual TL and it's inclinations can be found.
Name extension of Fv, touching xy as h'
and below it, on extension of Tv, locate HT.

PROBLEM 7 :
One end of line AB is 10mm above Hp and other end is 100 mm in-front of Vp.
It's Fv is 45º inclined to xy while it's HT & VT are 45mm and 30 mm below xy respectively.
Draw projections and find TL with it's inclinations with Hp & VP.



SOLUTION STEPS:-
Draw xy line, one projector and locate a' 10 mm above xy.
Draw locus 100 mm below xy for points b & b_1
Draw loci for VT and HT, 30 mm & 45 mm below xy respectively.
Take 45º angle from a' and extend that line backward to locate h' and VT, & Locate v on xy above VT.
Locate HT below h' as shown.
Then join v – HT – and extend to get top view end b.
Draw projector upward and locate b' Make a b & a b' dark.
Now as usual rotating views find TL and it's inclinations.

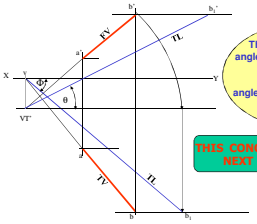
PROBLEM 8 :- Projectors drawn from HT and VT of a line AB
are 80 mm apart and those drawn from it's ends are 50 mm apart.
End A is 10 mm above Hp, VT is 35 mm below Hp
while it's HT is 45 mm in front of Vp. Draw projections,
locate traces and find TL of line & inclinations with Hp and Vp.



SOLUTION STEPS:-
1.Draw xy line and two projectors, 80 mm apart and locate HT & VT , 35 mm below xy and 55 mm above xy respectively on these projectors.
2.Locate h' and v on xy as usual.

3.Now just like previous two problems, Extending certain lines complete Fv & Tv And as usual find TL and it's inclinations.

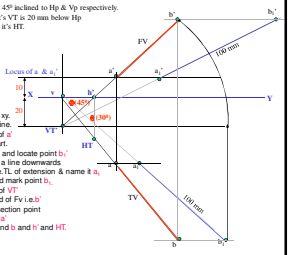
Instead of considering a & a' as projections of first point, if v & VT' are considered as first point , then true inclinations of line with Hp & Vp i.e. angles θ & Φ can be constructed with points VT' & V respectively.



Then from point v & HT angles β & Φ can be drawn.
&
From point VT' & h' angles α & θ can be drawn.

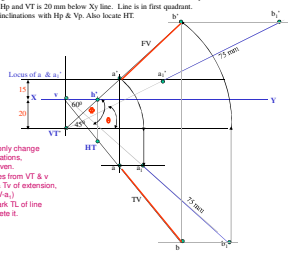
THIS CONCEPT IS USED TO SOLVE NEXT *THREE* PROBLEMS.

PROBLEM 9 :-
Line AB 100 mm long is 30º and 45º inclined to Hp & Vp respectively.
End A is 10 mm above Hp and it's VT is 20 mm below Hp
.Draw projections of the line and it's HT.



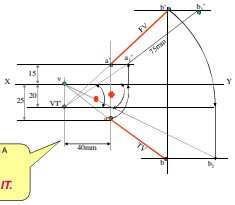
SOLUTION STEPS:-
Draw xy, one projector and locate on it VT and V.
Draw locus of a' 10 mm above xy.
Take 30º from VT and draw a line.
Where it intersects with locus of a' name it a_1' as it is TL of that part.
From a_1' cut 100 mm (TL) on it and locate point b_1'
Now from v take 45º and draw a line downwards & Mark on it distance VT-a_1' I.e.TL of extension & name it a_1
Extend this line by 100 mm and mark point b_1
Draw it's component on locus of VT'
& further rotate to get other end of Fv i.e.b'
Join it with VT' and mark intersection point (with locus of a_1) and name it a'
Now as usual locate points a and b and h' and HT.

PROBLEM 10 :-
A line AB is 75 mm long. It's Fv & Tv make 45º and 60º inclinations with X-Y line resp
End A is 15 mm above Hp and VT is 20 mm below Xy line. Line is in first quadrant.
Draw projections, find inclinations with Hp & Vp. Also locate HT.



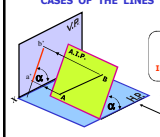
SOLUTION STEPS:-
Similar to the previous only change is instead of line's inclinations, views inclinations are given.
So first take those angles from VT & v Properly, construct Fv & Tv of extension, then determine it's TL($V.a_1$) and on it's extension mark TL of line and proceed and complete it.

PROBLEM 11 :- The projectors drawn from VT & end A of line AB are 40mm apart.
End A is 15mm above Hp and 25 mm in front of Vp. VT of line is 20 mm below Hp.
If line is 75mm long, draw it's projections, find inclinations with HP & Vp

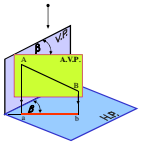


Draw two projectors for VT & end A
Locate these points and then
YES !
YOU CAN COMPLETE IT.

GROUP (C)
CASES OF THE LINES IN A.V.P., A.I.P. & PROFILE PLANE.

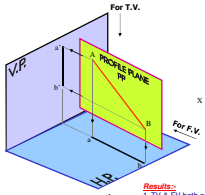


Line AB is in AIP as shown in above figure no 1.
It's FV (a'b') is shown projected on Vp.(Looking in arrow direction)
Here one can clearly see that the
Inclination of AIP with HP = Inclination of FV with XY line

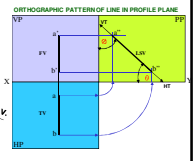


Line AB is in AVP as shown in above figure no 2.
It's TV (a b) is shown projected on Hp.(Looking in arrow direction)
Here one can clearly see that the
Inclination of AVP with VP = Inclination of TV with XY line

LINE IN A PROFILE PLANE **(MEANS IN A PLANE PERPENDICULAR TO BOTH HP & VP)**



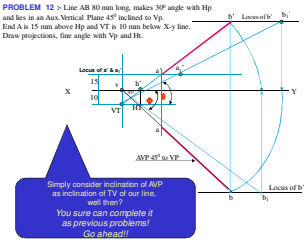
ORTHOGRAPHIC PATTERN OF LINE IN PROFILE PLANE



Results:-
1. TV & FV both are vertical, hence arrive on one single projector.
2. It's Side View shows True Length (TL)
3. Sum of it's inclinations with HP & VP equals to 90º (θ + Φ = 90º)
4. It's HT & VT arrive on same projector and can be easily located From Side View.

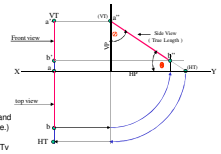
OBSERVE CAREFULLY ABOVE GIVEN ILLUSTRATION AND 2nd SOLVED PROBLEM.

PROBLEM 12 > Line AB 80 mm long, makes 30º angle with Hp and lies in an Aux.Vertical Plane 45º inclined to Vp. End A is 15 mm above Hp and VT is 10 mm below X-y line. Draw projections, fine angle with Vp and Ht.



PROBLEM 13 > A line AB, 75mm long, has one end A in Vp. Other end B is 15 mm above Hp and 50 mm in front of Vp.Draw the projections of the line when sum of it's Inclinations with HP & Vp is 90º, means it is lying in a profile plane. Find true angles with ref.planes and it's traces.

SOLUTION STEPS:-
After drawing xy line and one projector
Locate top view of A i.e point a on xy as it is in Vp.
Locate Fv of B i.e.b'15 mm above xy as it is above Hp.and Tv of B i.e. b, 50 mm below xy asit is 50 mm in front of Vp
Draw side view structure of Vp and Hp and locate S.V. of point B i.e. b"
From this point cut 75 mm distance on Vp and Mark a" as A is in Vp. (This is also VT of line.)
From this point draw locus to left & get a'
Extend SV up to Hp. It will be HT. As it is a Tv
Rotate it and bring it on projector of b.
Now as discussed earlier SV gives TL of line and at the same time on extension up to Hp & Vp gives inclinations with those panes.



APPLICATIONS OF PRINCIPLES OF PROJECTIONS OF LINES
IN SOLVING CASES OF DIFFERENT PRACTICAL SITUATIONS.

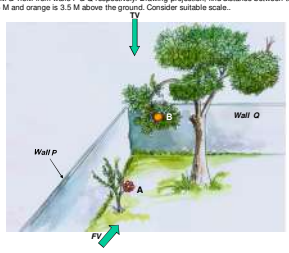
In these types of problems some situation in the field
or
some object will be described .
It's relation with Ground (HP)
And
a Wall or some vertical object (VP) will be given.

Indirectly information regarding Fv & Tv of some line or lines, inclined to both reference Planes will be given
and
you are supposed to draw it's projections
and
further to determine it's true Length and it's inclinations with ground.

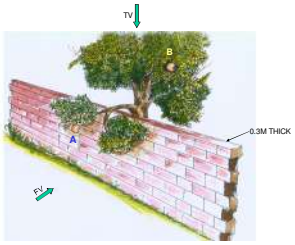
Here various problems along with actual pictures of those situations are given for you to understand those clearly.
Now looking for views in given ARROW directions, YOU are supposed to draw projections & find answers.
Off course you must visualize the situation properly.

CHECK YOUR ANSWERS WITH THE SOLUTIONS GIVEN IN THE END.
ALL THE BEST !!

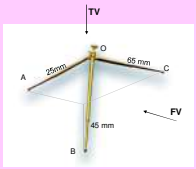
PROBLEM 14:-Two objects, a flower (A) and an orange (B) are within a rectangular compound wall, whose P & Q are walls meeting at 90º. Flower A is 1M & 5.5 M from walls P & Q respectively. Orange B is 4M & 1.5M from walls P & Q respectively. Drawing projection, find distance between them If flower is 1.5 M and orange is 3.5 M above the ground. Consider suitable scale..



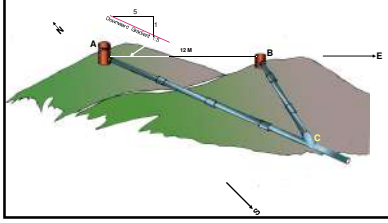
PROBLEM 15 > Two mangos on a tree A & B are 1.5 m and 3.00 m above ground and those are 1.2 m & 1.5 m from a 0.3 m thick wall but on opposite sides of it. If the distance measured between them along the ground and parallel to wall is 2.6 m, Then find real distance between them by drawing their projections.



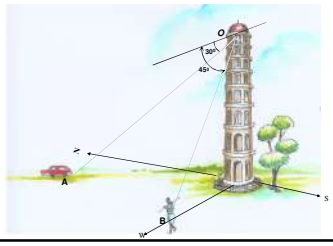
PROBLEM 16 > oa, ob & oc are three lines, 25mm, 45mm and 65mm long respectively.All equally inclined and the shortest is vertical.This fig. is TV of three rods OA, OB and OC whose ends A,B & C are on ground and end O is 100mm above ground. Draw their projections and find length of each along with their angles with ground.



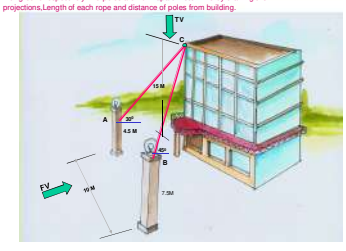
PROBLEM 17:- A pipe line from point **A** has a downward gradient 1:5 and it runs due East-South. Another Point B is 12 M from **A** and due East of **A** and in same level of **A.** Pipe line from **B** runs 20º Due East of South and meets pipe line from **A** at point **C.**
Draw projections and find length of pipe line from B and it's inclination with ground.



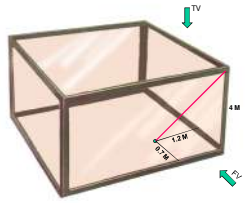
PROBLEM 18: A person observes two objects, A & B, on the ground, from a tower, 15 M high, At the angles of depression 30º & 45º. Object A is is due North-West direction of observer and object B is due West direction. Draw projections of situation and find distance of objects from observer and from tower also.



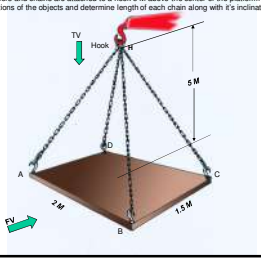
PROBLEM 19:-Guy ropes of two poles fixed at 4.5m and 7.5 m above ground, are attached to a corner of a building 15 M high, make 300 and 450 inclinations with ground respectively.The poles are 10 M apart. Determine by drawing their projections,Length of each rope and distance of poles from building.



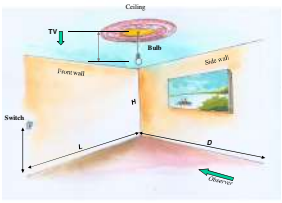
PROBLEM 20:- A tank of 4 M height is to be strengthened by four stay rods from each corner by fixing their other ends to the flooring, at a point 1.2 M and 0.7 M from two adjacent walls respectively, as shown. Determine graphically length and angle of each rod with flooring.



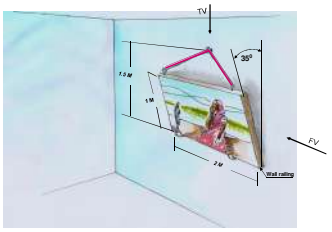
PROBLEM 21:- A horizontal wooden platform 2 M long and 1.5 M wide is supported by four chains from it's corners and chains are attached to a hook 5 M above the center of the platform.
Draw projections of the objects and determine length of each chain along with it's inclination with ground.



PROBLEM 22.
A room is of size 6.5m L ,5m D,3.5m high.
An electric bulb hangs 1m below the center of ceiling.
A switch is placed in one of the corners of the room, 1.5m above the flooring.
Draw the projections an determine real distance between the bulb and switch.



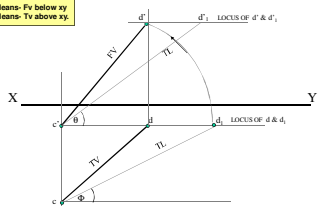
PROBLEM 23:-
A PICTURE FRAME 2 M WIDE AND 1 M TALL IS RESTING ON HORIZONTAL WALL RAILING MAKES 35° INCLINATION WITH WALL. IT IS ATTAACHED TO A HOOK IN THE WALL BY TWO STRINGS. THE HOOK IS 1.5 M ABOVE WALL RAILING. DETERMINE LENGTH OF EACH CHAIN AND TRUE ANGLE BETWEEN THEM



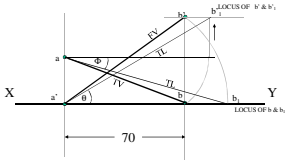
SOME CASES OF THE LINE IN DIFFERENT QUADRANTS.

REMEMBER:
BELOW HP- Means- Fv below xy
BEHIND V p- Means- Tv above xy.

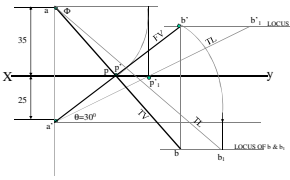
PROBLEM NO.24
T.V. of a 75 mm long Line CD, measures 50 mm.
End C is 15 mm below Hp and 50 mm in front of Vp.
End D is 15 mm in front of Vp and it is above Hp.
Draw projections of CD and find angles with Hp and Vp.



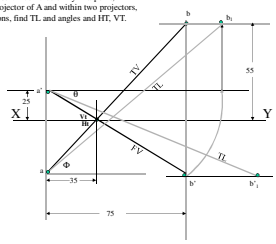
PROBLEM NO.25
End A of line AB is in Hp and 25 mm behind Vp.
End B in Vp.and 50mm above Hp.
Distance between projectors is 70mm.
Draw projections and find it's inclinations with Ht, Vt.



PROBLEM NO.26
End A of a line AB is 25mm below Hp and 35mm behind Vp.
Line is 300 inclined to Hp.
There is a point P on AB contained by both HP & VP.
Draw projections, find inclination with Vp and traces.



PROBLEM NO.27
End A of a line AB is 25mm above Hp and end B is 55mm behind Vp.
The distance between end projectors is 75mm.
If both it's HT & VT coincide on xy in a point,
35mm from projector of A and within two projectors,
Draw projections, find TL and angles and HT, VT.



PROJECTIONS OF PLANES

In this topic various plane figures are the objects.

What is usually asked in the problem?

To draw their projections means F.V, T.V. & S.V.

What will be given in the problem?

1. Description of the plane figure.
2. It's position with HP and VP.

In which manner it's position with HP & VP will be described?

1. **Inclination of it's SURFACE with one of the reference planes will be given.**
2. Inclination of one of it's EDGES with other reference plane will be given

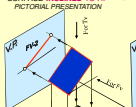
(Hence this will be a case of an object inclined to both reference Planes.)

Study the illustration showing surface & side inclination given on next page.

CASE OF A RECTANGLE – OBSERVE AND NOTE ALL STEPS.

SURFACE **PARALLEL** TO HP
PICTORIAL PRESENTATION

SURFACE **INCLINED** TO HP
PICTORIAL PRESENTATION

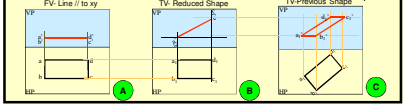


ONE SMALL SIDE INCLINED TO VP
PICTORIAL PRESENTATION

ORTHOGRAPHIC
TV-True Shape
FV- Line // to xy

ORTHOGRAPHIC
FV- Inclined to XY
TV- Reduced Shape

ORTHOGRAPHIC
FV- Apparent Shape
TV-Previous Shape



PROCEDURE OF SOLVING THE PROBLEM:

IN THREE STEPS EACH PROBLEM CAN BE SOLVED: (As Shown In Previous Illustration)

STEP 1. Assume suitable conditions & draw Fv & Tv of initial position.
STEP 2. Now consider surface inclination & draw 2nd Fv & Tv.
STEP 3. After this,consider side/edge inclination and draw 3rd (final) Fv & Tv.

ASSUMPTIONS FOR INITIAL POSITION:
(Initial Position means assuming surface // to HP or VP)

1.If in problem surface is inclined to HP – assume it // HP
Or If surface is inclined to VP – assume it // to VP
2. Now if surface is assumed // to HP- It's TV will show True Shape.
And If surface is assumed // to VP – It's FV will show True Shape.
3. Hence begin with drawing TV or FV as True Shape.
4. While drawing this True Shape –
keep one side/edge (which is making inclination) perpendicular to xy line
(similar to pair no. A on previous page illustration).

Now Complete STEP 2. By making surface inclined to the resp plane & project it's other view *(Ref. 2nd pair B on previous page illustration)*

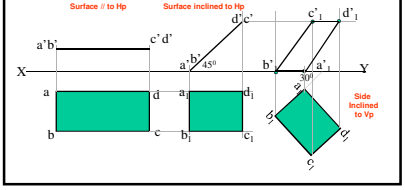
Now Complete STEP 3. By making side inclined to the resp plane & project it's other view. *(Ref. 3rd pair C on previous page illustration)*

APPLY SAME STEPS TO SOLVE NEXT *ELEVEN* PROBLEMS

Problem 1:
Rectangle 30mm and 50mm sides is resting on HP on one small side which is 30º inclined to VP,while the surface of the plane makes 45º inclination with HP. Draw it's projections.

Read problem and answer following questions
1. Surface inclined to which plane? ------- HP
2. Assumption for initial position? -------// to HP
3. So which view will show True shape? --- TV
4. Which side will be vertical? ---One small side.
Hence begin with TV, draw rectangle below X-Y drawing one small side vertical.

Surface // to Hp | Surface inclined to Hp

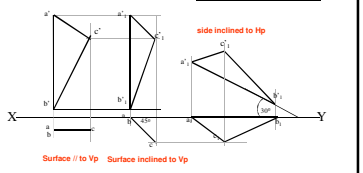


Problem 2:
A 30º – 60º set square of longest side 100 mm long, is in VP and 30º inclined to HP while it's surface is 45º inclined to VP.Draw it's projections

(Surface & Side inclinations directly given)

Read problem and answer following questions
1.Surface inclined to which plane? -------- VP
2. Assumption for initial position? ------// to VP
3. So which view will show True shape? --- FV
4. Which side will be vertical? ------longest side.

Hence begin with FV, draw triangle above X-Y keeping longest side vertical.



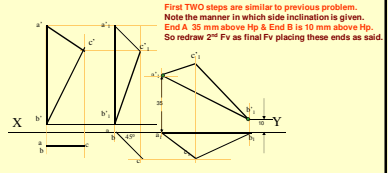
Problem 3:
A 30º – 60º set square of longest side 100 mm long is in VP and it's surface 45º inclined to VP. One end of longest side is 10 mm and other end is 35 mm above HP. Draw it's projections

(Surface inclination directly given. Side inclination indirectly given)

Read problem and answer following questions
1.Surface inclined to which plane? -------- VP
2. Assumption for initial position? ------// to VP
3. So which view will show True shape? --- FV
4. Which side will be vertical? ------longest side.

Hence begin with FV, draw triangle above X-Y keeping longest side vertical.

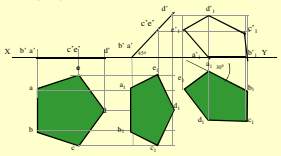
First TWO steps are similar to previous problem.
Note the manner in which side inclination is given.
End A 35 mm above Hp & End B is 10 mm above Hp.
So redraw 2nd Fv as final Fv placing these ends as said.



Problem 4:
A regular pentagon of 30 mm sides is resting on HP on one of it's sides with it's surface 45º inclined to HP.
Draw it's projections when the side in HP makes 30º angle with VP

SURFACE AND SIDE INCLINATIONS ARE DIRECTLY GIVEN.

Read problem and answer following questions
1. Surface inclined to which plane? -------- ***HP***
2. Assumption for initial position? ------ ***// to HP***
3. So which view will show True shape? --- ***TV***
4. Which side will be vertical? --------- ***any side.***
Hence begin with TV,draw pentagon below X-Y line, taking one side vertical.

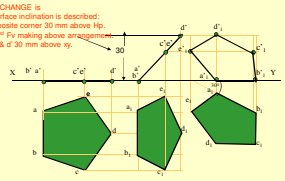


Problem 5:
A regular pentagon of 30 mm sides is resting on **HP** on one of it's sides while it's opposite vertex (corner) is 30 mm above HP.
Draw projections when side in HP is 30º inclined to VP.

SURFACE INCLINATION INDIRECTLY GIVEN SIDE INCLINATION DIRECTLY GIVEN:

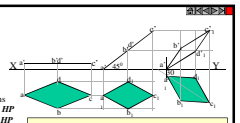
ONLY CHANGE is
the manner in which surface inclination is described:
One side on Hp & it's opposite corner 30 mm above Hp.
Hence redraw 1st Fv as a 2nd Fv making above arrangement.
Keep a'b' on xy & d' 30 mm above xy.

Read problem and answer following questions
1. Surface inclined to which plane? -------- ***HP***
2. Assumption for initial position? ------ ***// to HP***
3. So which view will show True shape? --- ***TV***
4. Which side will be vertical? --------- ***any side.***
Hence begin with TV,draw pentagon below X-Y line, taking one side vertical.



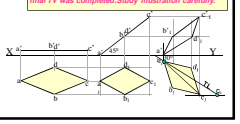
Problem 6: A rhombus of diagonals 40 mm and 70 mm long respectively has one end of it's longer diagonal in HP while that diagonal is 35º inclined to HP. If the top-view of the same diagonal makes 40º inclination with VP, draw it's projections.

Read problem and answer following questions
1. Surface inclined to which plane? -------- ***HP***
2. Assumption for initial position? ------ ***// to HP***
3. So which view will show True shape? --- ***TV***
4. Which diagonal horizontal? ---------- ***Longer***
Hence begin with TV,draw rhombus below X-Y line, taking longer diagonal // to X-Y



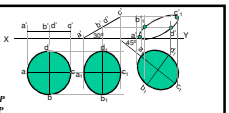
The difference in these two problems is in step 3 only. In problem no.6 inclination of Tv of that diagonal is given,It could be drawn directly as shown in 3rd step.
While in no.7 angle of diagonal itself i.e. it's TL, is given. Hence here angle of TL is taken,locus of c_1 is drawn and then LTV i.e. a1 c1 is marked and final TV was completed.Study illustration carefully.

Problem 7: A rhombus of diagonals 40 mm and 70 mm long respectively having one end of it's longer diagonal in HP while that diagonal is 35º inclined to HP and makes 40º inclination with VP. Draw it's projections.



Note the difference in construction of 3rd step in both solutions.

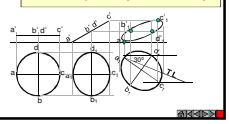
Problem 8: A circle of 50 mm diameter is resting on Hp on end A of it's diameter AC which is 30º inclined to Hp while it's Tv is 45º inclined to Vp.Draw it's projections.



Read problem and answer following questions
1. Surface inclined to which plane? -------- ***HP***
2. Assumption for initial position? ------ ***// to HP***
3. So which view will show True shape? --- ***TV***
4. Which diameter horizontal? ---------- ***AC***
Hence begin with TV,draw rhombus below X-Y line, taking longer diagonal // to X-Y

The difference in these two problems is in step 3 only. In problem no.8 inclination of Tv of that AC is given,It could be drawn directly as shown in 3rd step.
While in no.9 angle of AC itself i.e. it's TL, is given. Hence here angle of TL is taken,locus of c_1 is drawn and then LTV i.e. a_1 c_1 is marked and final TV was completed.Study illustration carefully.

Problem 9: A circle of 50 mm diameter is resting on Hp on end A of it's diameter AC which is 30º inclined to Hp while it makes 45º inclined to Vp. Draw it's projections.

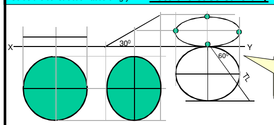


Note the difference in construction of 3rd step in both solutions.

Problem 10: End A of diameter AB of a circle is in HP
A nd end B is in VP.Diameter AB, 50 mm long is
30^0 & 60^0 inclined to HP & VP respectively.
Draw projections of circle.

Read problem and answer following questions
1. Surface inclined to which plane? ------- ***HP***
2. Assumption for initial position? ------ ***// to HP***
3. So which view will show True shape? --- ***TV***
4. Which diameter horizontal? ---------- ***AB***
Hence begin with TV,draw CIRCLE below X-Y line, taking DIA. AB // to X-Y

The problem is similar to previous problem of circle – no.9.
But in the 3rd step there is one more change.
Like 9th problem True Length inclination of dia.AB is definitely expected but if you carefully note - the the SUM of it's inclinations with HP & VP is 90^0.
Means Line AB lies in a Profile Plane.
Hence it's both Tv & Fv must arrive on one single projector.
So do the construction accordingly AND ***note the case carefully***..

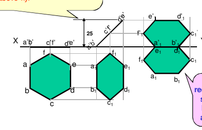


SOLVE SEPARATELY
ON DRAWING SHEET
GIVING NAMES TO VARIOUS
POINTS AS USUAL,
AS THE CASE IS IMPORTANT

Problem 11:
A hexagonal lamina has its one side in HP and
Its apposite parallel side is 25mm above Hp and
In Vp. Draw it's projections.
Take side of hexagon 30 mm long.

Read problem and answer following questions
1. Surface inclined to which plane? ------- ***HP***
2. Assumption for initial position? ------ ***// to HP***
3. So which view will show True shape? --- ***TV***
4. Which diameter horizontal? ---------- ***AC***
Hence begin with TV,draw rhombus below X-Y line, taking longer diagonal // to X-Y

ONLY CHANGE is the manner in which surface inclination is described:
One side on Hp & it's opposite side 25 mm above Hp.
Hence redraw 1st Fv as a 2nd Fv making above arrangement.
Keep a'b' on xy & d'e' 25 mm above xy.



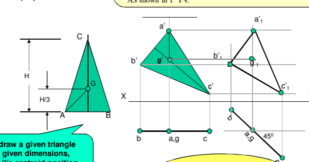
As 3rd step redraw 2nd Tv keeping side DE on xy line. Because it is in VP as said in problem.

FREELY SUSPENDED CASES.

Problem 12:
An isosceles triangle of 40 mm long base side, 60 mm long altitude Is freely suspended from one corner of Base side.It's plane is 45^0 inclined to Vp. Draw it's projections.

IMPORTANT POINTS

1.In this case the plane of the figure always remains *perpendicular to Hp*.
2.It may remain parallel or inclined to Vp.
3.Hence *TV* in this case will be always a *LINE view.*
4.Assuming surface // to Vp, draw true shape in suspended position as FV.
(Here keep *line joining* ***point of contact & centroid of fig. vertical***)
5.Always begin with FV as a True Shape but in a suspended position.
AS shown in 1st FV.



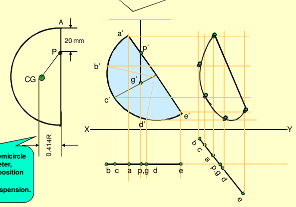
First draw a given triangle With given dimensions, Locate it's centroid position And join it with point of suspension.

Similarly solve next problem of Semi-circle

IMPORTANT POINTS

Problem 13
:A semicircle of 100 mm diameter
is suspended from a point on its
straight edge 30 mm from the midpoint
of that edge so that the surface makes
an angle of 45^0 with VP.
Draw its projections.

1.In this case the plane of the figure always remains *perpendicular to Hp*.
2.It may remain parallel or inclined to Vp.
3.Hence *TV* in this case will be always a *LINE view.*
4.Assuming surface // to Vp, draw true shape in suspended position as FV.
(Here keep *line joining* ***point of contact & centroid of fig. vertical***)
5.Always begin with FV as a True Shape but in a suspended position.
AS shown in 1st FV.



First draw a given semicircle With given diameter, Locate it's centroid position And join it with point of suspension.

To determine true shape of plane figure when it's projections are given.
BY USING AUXILIARY PLANE METHOD

WHAT WILL BE THE PROBLEM?
Description of final Fv & Tv will be given.
You are supposed to determine true shape of that plane figure

Follow the below given steps:
1. Draw the given Fv & Tv as per the given information in problem.
2. Then among all lines of Fv & Tv select a line showing True Length (T.L.) (It's other view must be // to xy)
3. Draw x_1-y_1 perpendicular to this line showing T.L.
4. Project view on x_1-y_1 (it must be a line view)
5. Draw x_2-y_2 // to this line view & project new view on it.

It will be the required answer i.e. True Shape.

The facts you must know:-
If you carefully study and observe the solutions of all previous problems
You will find
IF ONE VIEW IS A LINE VIEW & THAT TOO PARALLEL TO XY LINE,
THEN AND THEN IT'S OTHER VIEW WILL SHOW TRUE SHAPE:

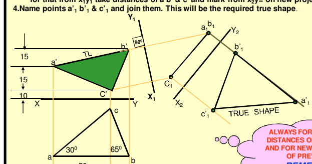
NOW FINAL VIEWS ARE ALWAYS SOME SHAPE, NOT LINE VIEWS:
SO APPLYING ABOVE METHOD:
WE FIRST CONVERT ONE VIEW IN INCLINED LINE VIEW .(By using x1y1 aux.plane)
THEN BY MAKING IT // TO X2-Y2 WE GET TRUE SHAPE.

Study Next Four Cases

Problem 14 **Tv is a triangle abc. Ab is 50 mm long, angle cab is 300 and angle cba is 650. a'b'c' is a Fv. a' is 25 mm, b' is 40 mm and c' is 10 mm above Hp respectively. Draw projections of that figure and find it's true shape.**

As per the procedure-

1.First draw Fv & Tv as per the data.
2.In Tv line ab is // to xy hence it's other view a'b' is TL. So draw x_1y_1 perpendicular to it.
3.Project view on x1y1.
a) First draw projectors from a'b' & c' on x_1y_1.
b) from xy take distances of a,b & c(Tv) mark on these projectors from x_1y_1. Name points a1b1 & c1.
c) This line view is an Aux.Tv. Draw x_2y_2 // to this line view and project Aux. Fv on it.
for that from x_1y_1 take distances of a'b' & c' and mark from x_2y= on new projectors.
4.Name points a'_1 b'_1 & c'_1 and join them. This will be the required true shape.



ALWAYS FOR NEW FV TAKE DISTANCES OF PREVIOUS FV AND FOR NEW TV, DISTANCES OF PREVIOUS TV
REMEMBER!!

Problem 15: Fv & Tv of a triangular plate are shown.
Determine it's true shape.

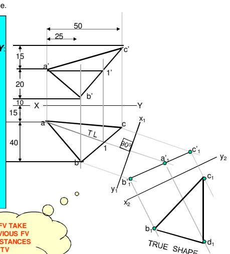
USE SAME PROCEDURE STEPS
OF PREVIOUS PROBLEM:
BUT THERE IS ONE DIFFICULTY:

NO LINE IS // TO XY IN ANY VIEW.
MEANS NO TL IS AVAILABLE.

IN SUCH CASES DRAW ONE LINE
// TO XY IN ANY VIEW & IT'S OTHER
VIEW CAN BE CONSIDERED AS TL
FOR THE PURPOSE.

HERE a' 1' line in Fv is drawn // to xy.
HENCE it's Tv a-1 becomes TL.

THEN FOLLOW SAME STEPS AND
DETERMINE TRUE SHAPE.
(STUDY THE ILLUSTRATION)

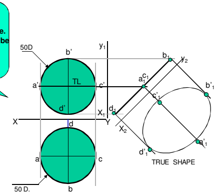


ALWAYS FOR NEW FV TAKE DISTANCES OF PREVIOUS FV AND FOR NEW TV, DISTANCES OF PREVIOUS TV
REMEMBER!!

PROBLEM 16: **Fv & Tv both are circles of 50 mm diameter. Determine true shape of an elliptical plate.**

ADOPT SAME PROCEDURE.
a c is considered as line // to xy.
Then a'c' becomes TL for the purpose.
Using steps properly true shape can be Easily determined.

Study the illustration.



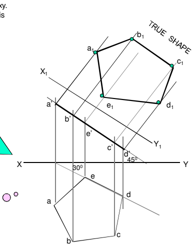
ALWAYS, FOR NEW FV TAKE DISTANCES OF PREVIOUS FV AND FOR NEW TV, DISTANCES OF PREVIOUS TV
REMEMBER!!

Problem 17 : Draw a regular pentagon of
30 mm sides with one side 30^0 inclined to xy.
This figure is Tv of some plane whose Fv is
A line 45^0 inclined to xy.
Determine it's true shape.

IN THIS CASE ALSO TRUE LENGTH
IS NOT AVAILABLE IN ANY VIEW.

BUT ACTUALLY WE DONOT REQUIRE
TL TO FIND IT'S TRUE SHAPE, AS ONE
VIEW (FV) IS ALREADY A LINE VIEW.
SO JUST BY DRAWING X1Y1 // TO THIS
VIEW WE CAN PROJECT VIEW ON IT
AND GET TRUE SHAPE:

STUDY THE ILLUSTRATION..



ALWAYS FOR NEW FV TAKE DISTANCES OF PREVIOUS FV AND FOR NEW TV, DISTANCES OF PREVIOUS TV
REMEMBER!!