JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester		L	T	P	C
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ENGINEERING DRAWING (ES1103)					

Course Objective: Engineering drawing being the principal method of communication for engineers, the objective is to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

Unit I

Objective: To introduce the students to use drawing instruments and to draw polygons, Engg. Curves.
Polygons: Constructing regular polygons by general methods, inscribing and describing polygons on circles.
Curves: Parabola, Ellipse and Hyperbola by general and special methods, cycloids, involutes, tangents & normals for the curves.
Scales: Plain scales, diagonal scales and vernier scales

Unit II

Objective: To introduce the students to use orthographic projections, projections of points & simple lines. To make the students draw the projections of the lines inclined to both the planes.
Orthographic Projections: Reference plane, importance of reference lines, projections of points in various quadrants, projections of lines, line parallel to both the planes, line parallel to one plane and inclined to other plane.
Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclination and traces.

Unit III

Objective: The objective is to make the students draw the projections of the plane inclined to both the planes.
Projections of planes: regular planes perpendicular/parallel to one reference plane and inclined to the other reference plane; inclined to both the reference planes.

Unit IV

Objective: The objective is to make the students draw the projections of the various types of solids in different positions inclined to one of the planes.
Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to both the planes.

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Unit V

Objective: The objective is to represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa.
Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.
Computer Aided Design, Drawing practice using Auto CAD, Creating 2D&3D drawings of objects using Auto CAD

Note: In the End Examination there will be no question from CAD.

TEXT BOOKS:

1. Engineering Drawing by N.D. Butt, Chariot Publications
2. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers

REFERENCE BOOKS:

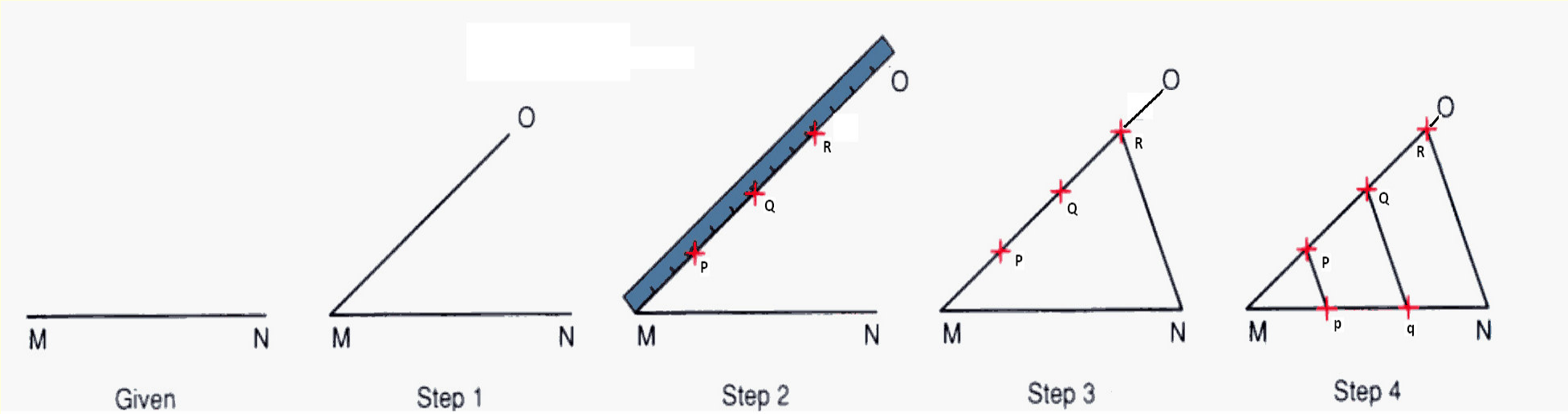
1. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers
2. Engineering Graphics for Degree by K.C. John, PHI Publishers
3. Engineering Graphics by PI Varghese, McGrawHill Publishers
4. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age

Course Outcome: The student will learn how to visualize 2D & 3D objects.

Unit-I

Regular Polygons, Ellipse and Scales

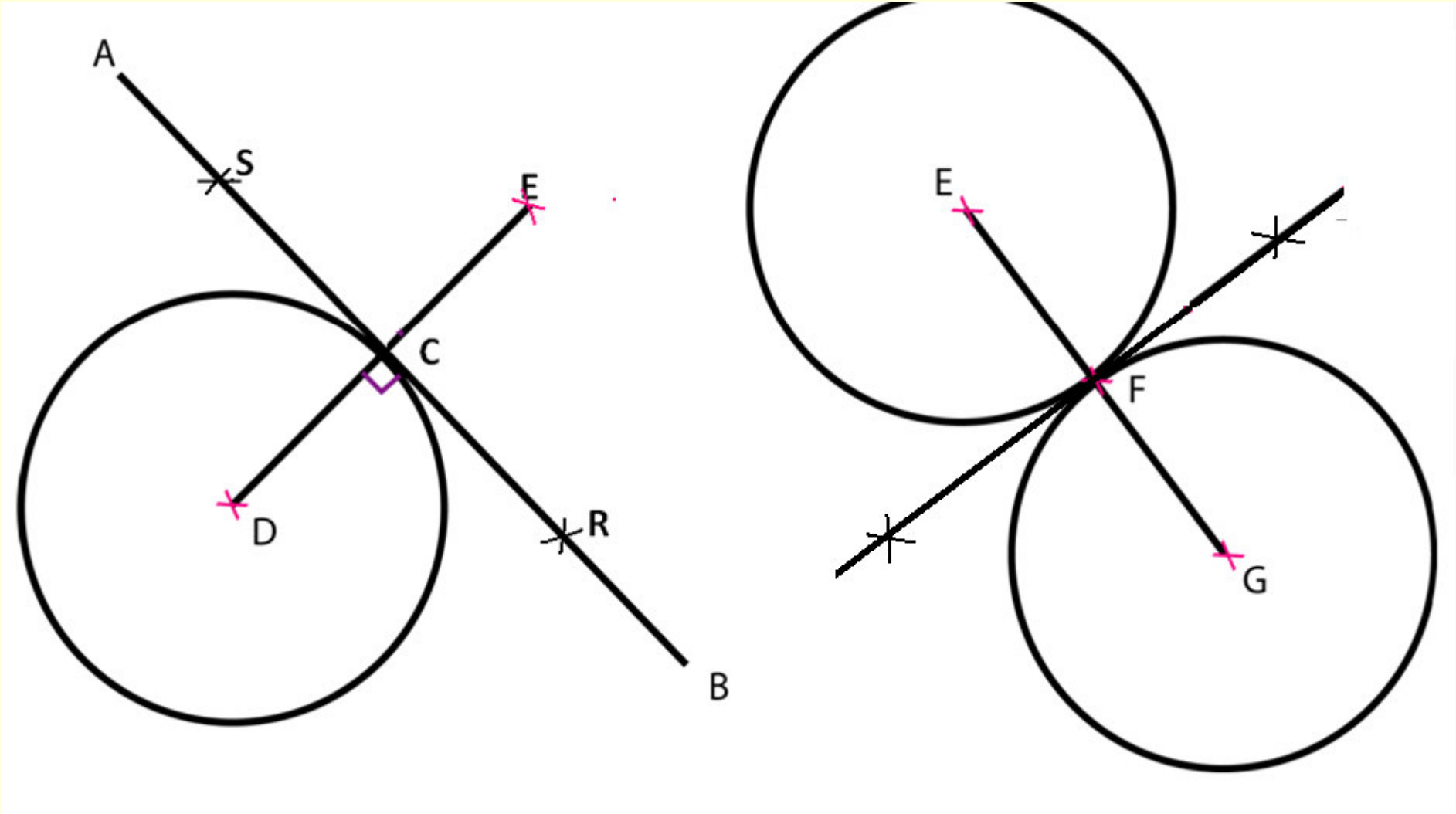
Dividing a line into equal parts



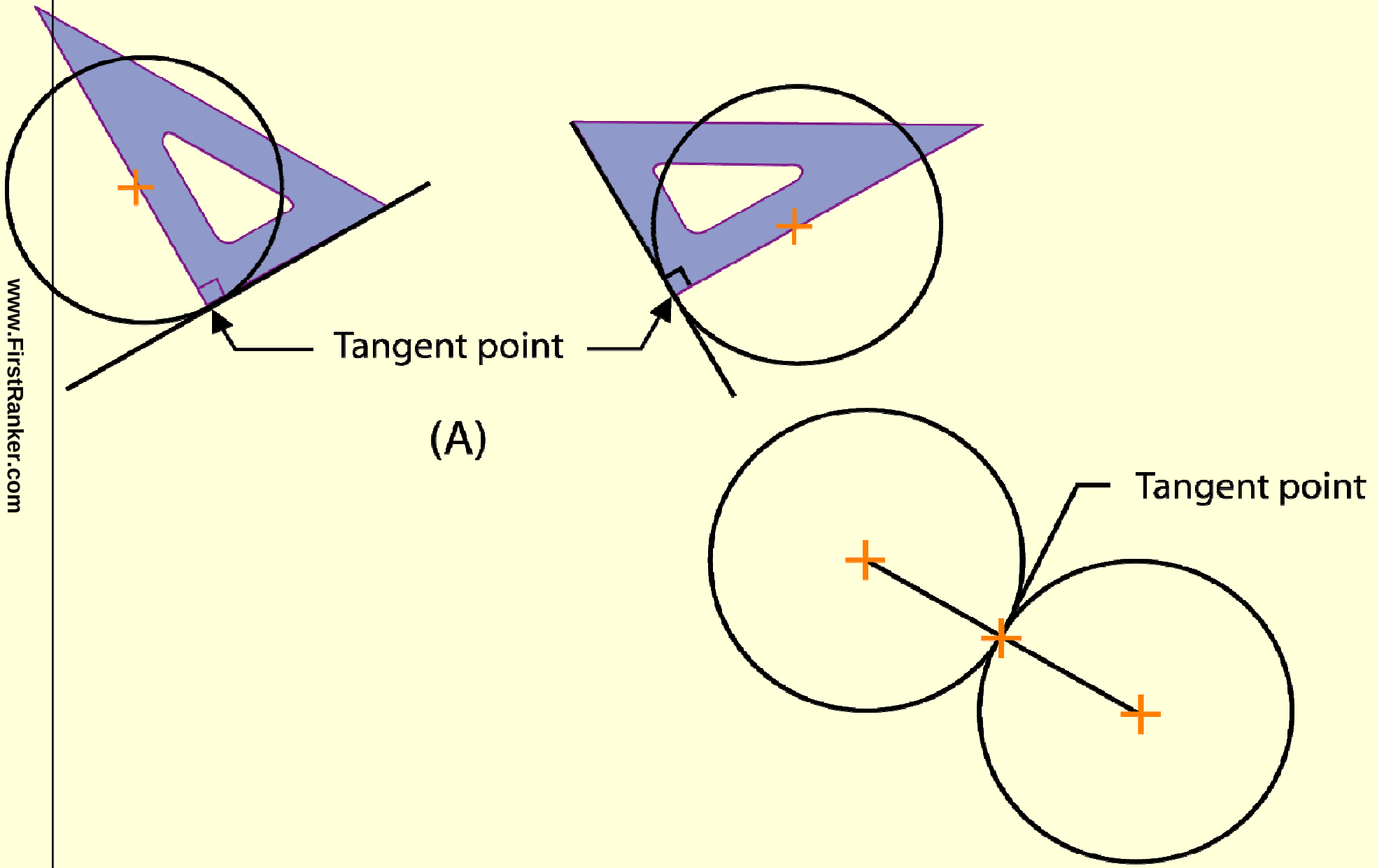
Steps:

- Draw a line MO at any convenient angle (preferably an acute angle) from point M.
- From M and along MO, cut off with a divider equal divisions (say three) of any convenient length.
- Draw a line joining RN.
- Draw lines parallel to RN through the remaining points on line MO. The intersection of these lines with line MN will divide the line into (three) equal parts.

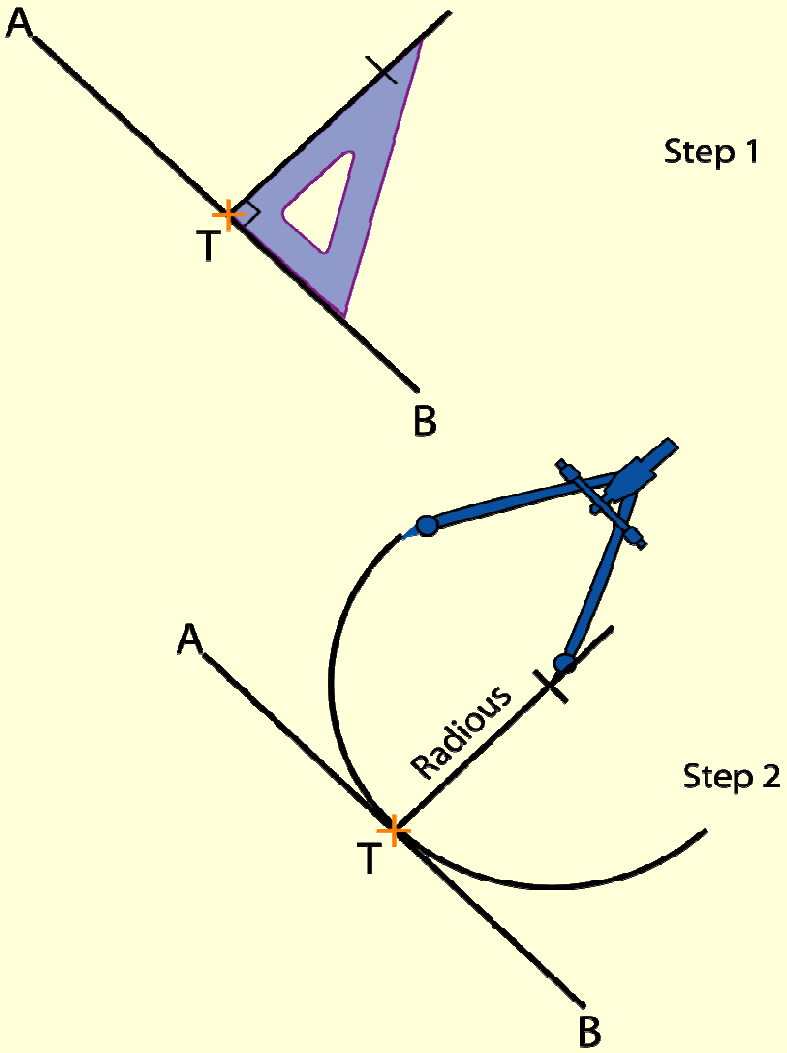
Planar tangent condition exists when two geometric forms meet at a single point and do not intersect.



Locating tangent points on circle and arcs



Drawing an arc tangent to a given point on the line

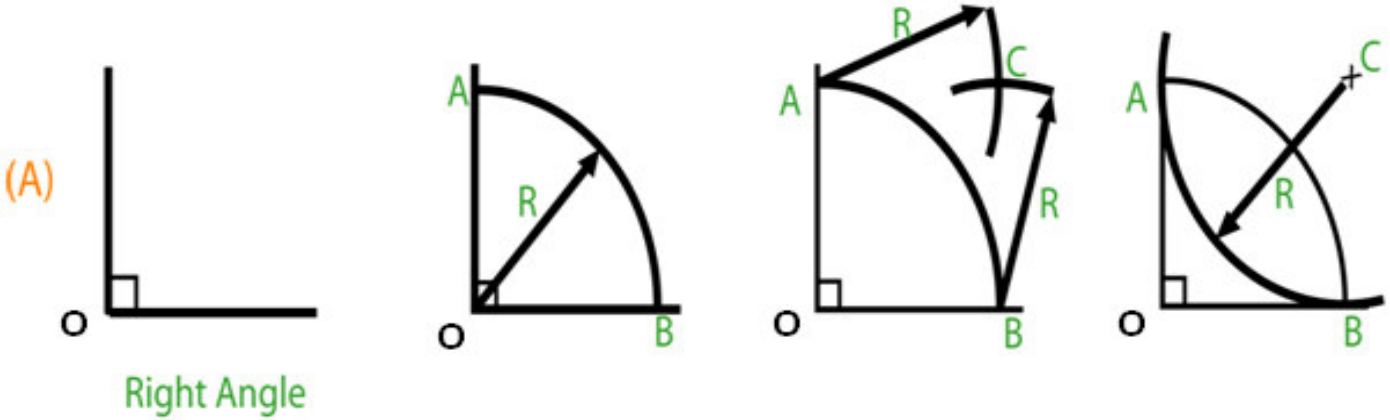


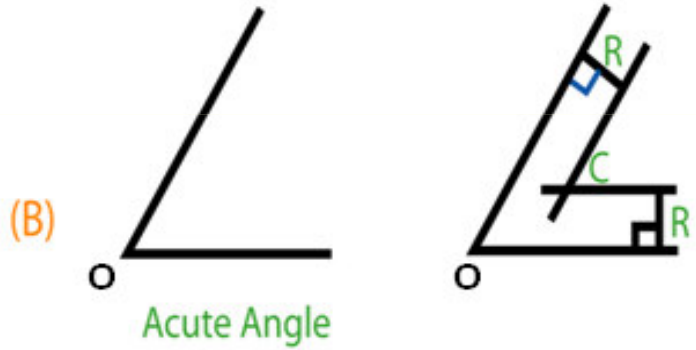
Steps

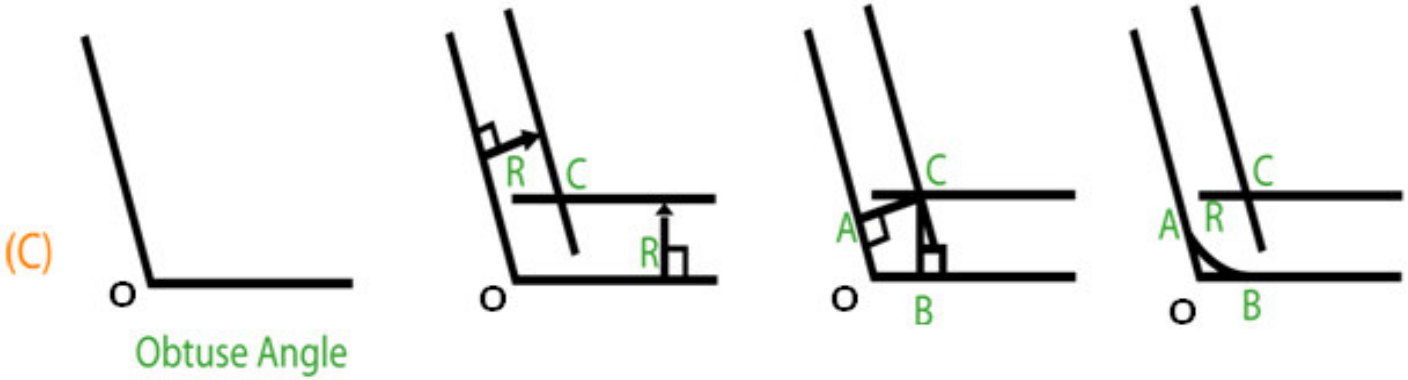
- Given line AB and tangent point T. Construct a line perpendicular to line AB and through point T.

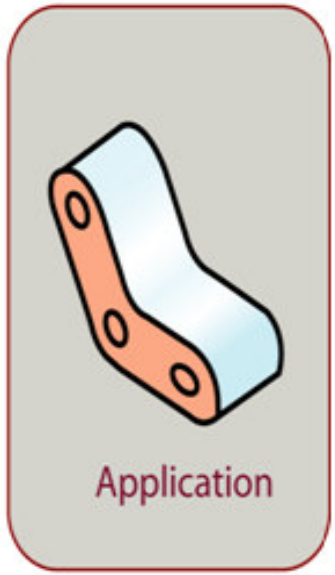
- Locate the center of the arc by making the radius on the perpendicular line. Put the point of the compass at the center of the arc, set the compass for the radius of the arc, and draw the arc which will be tangent to the line through the point T.

Drawing an arc, tangent to two lines



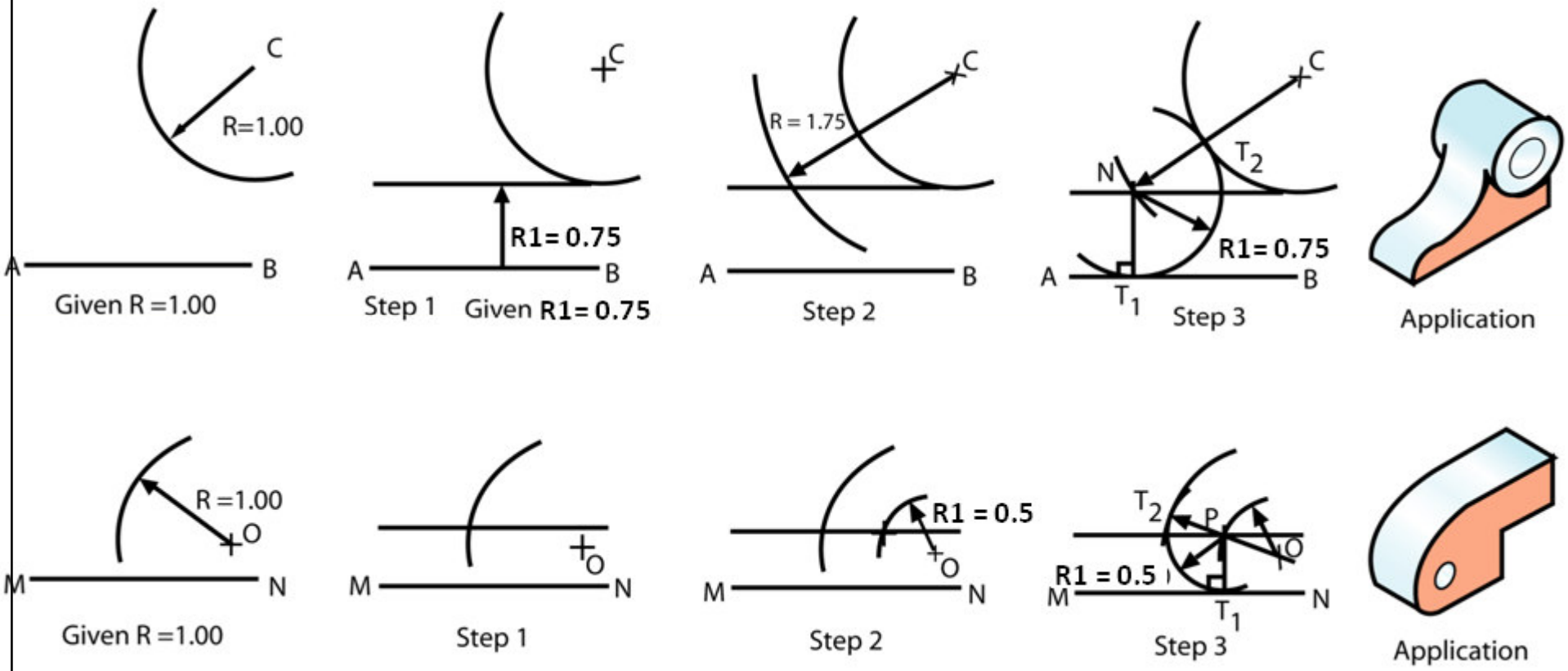




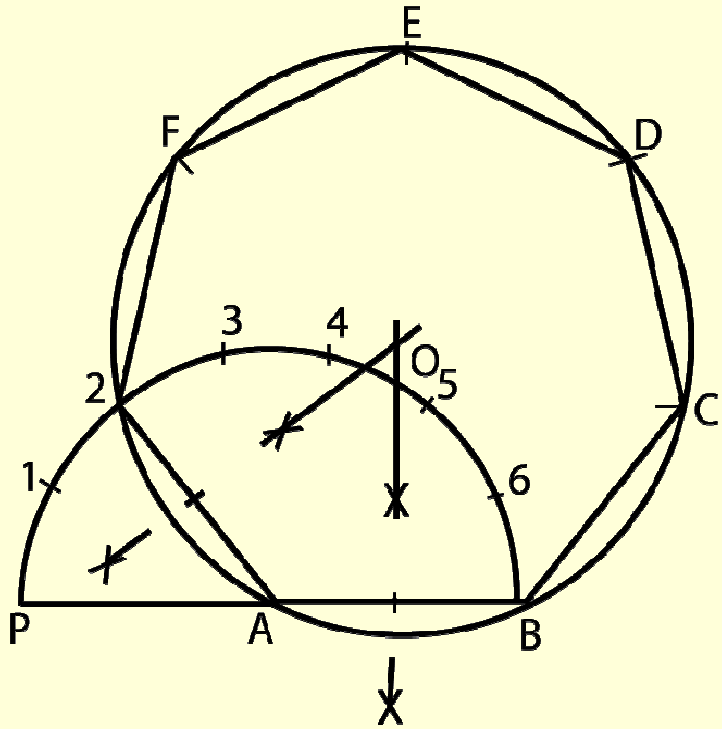


Drawing an arc, tangent to a line and an arc

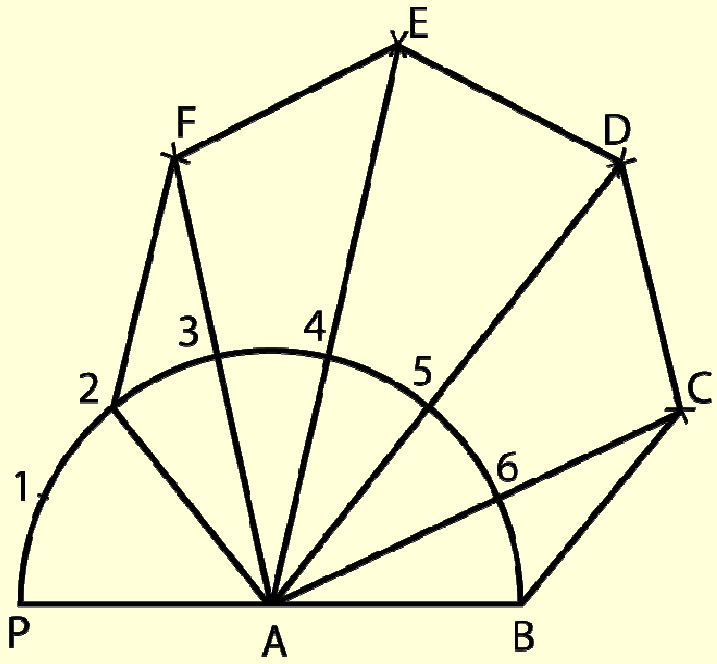
(a) that do not intersect (b) that intersect



Construction of Regular Polygon of given length AB



(A)



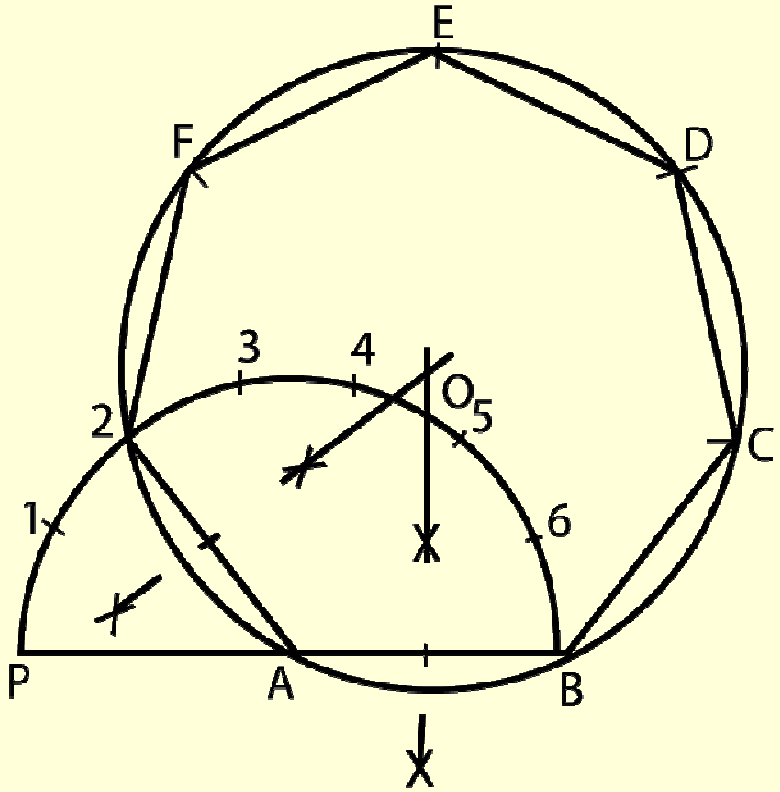
(B)

Draw a line of length AB. With A as centre and radius AB, draw a semicircle.

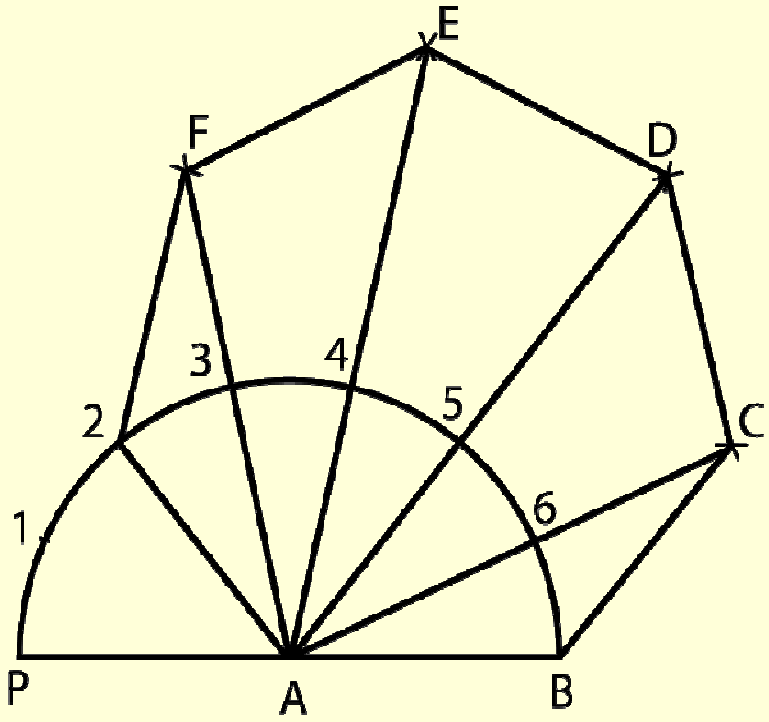
With the divider, divide the semicircle into the number of sides of the polygon.

Draw a line joining A with the second division-point 2.

Construction of Regular Polygon of given length AB.....



(A)



(B)

The perpendicular bisectors of A2 and AB meet at O. Draw a circle with centre O and radius OA. With length A2, mark points F, E, D & C on the circumferences starting from 2 (*Inscribe circle method*)

With centre B and radius AB draw an arc cutting the line A6 produced at C. Repeat this for other points D, E & F (*Arc method*)

General method of drawing any polygon

Draw AB = given length of polygon

At B, Draw BP perpendicular & = AB

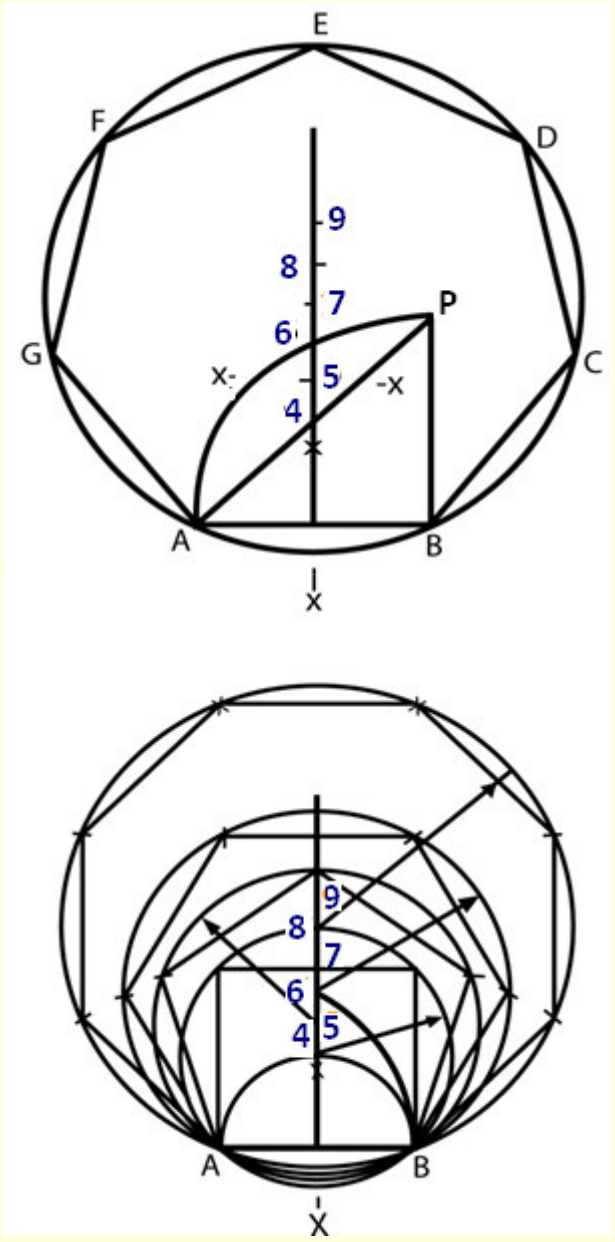
Draw Straight line AP

With center B and radius AB, draw arc AP.

The perpendicular bisector of AB meets st. line AP and arc AP in 4 and 6 respectively.

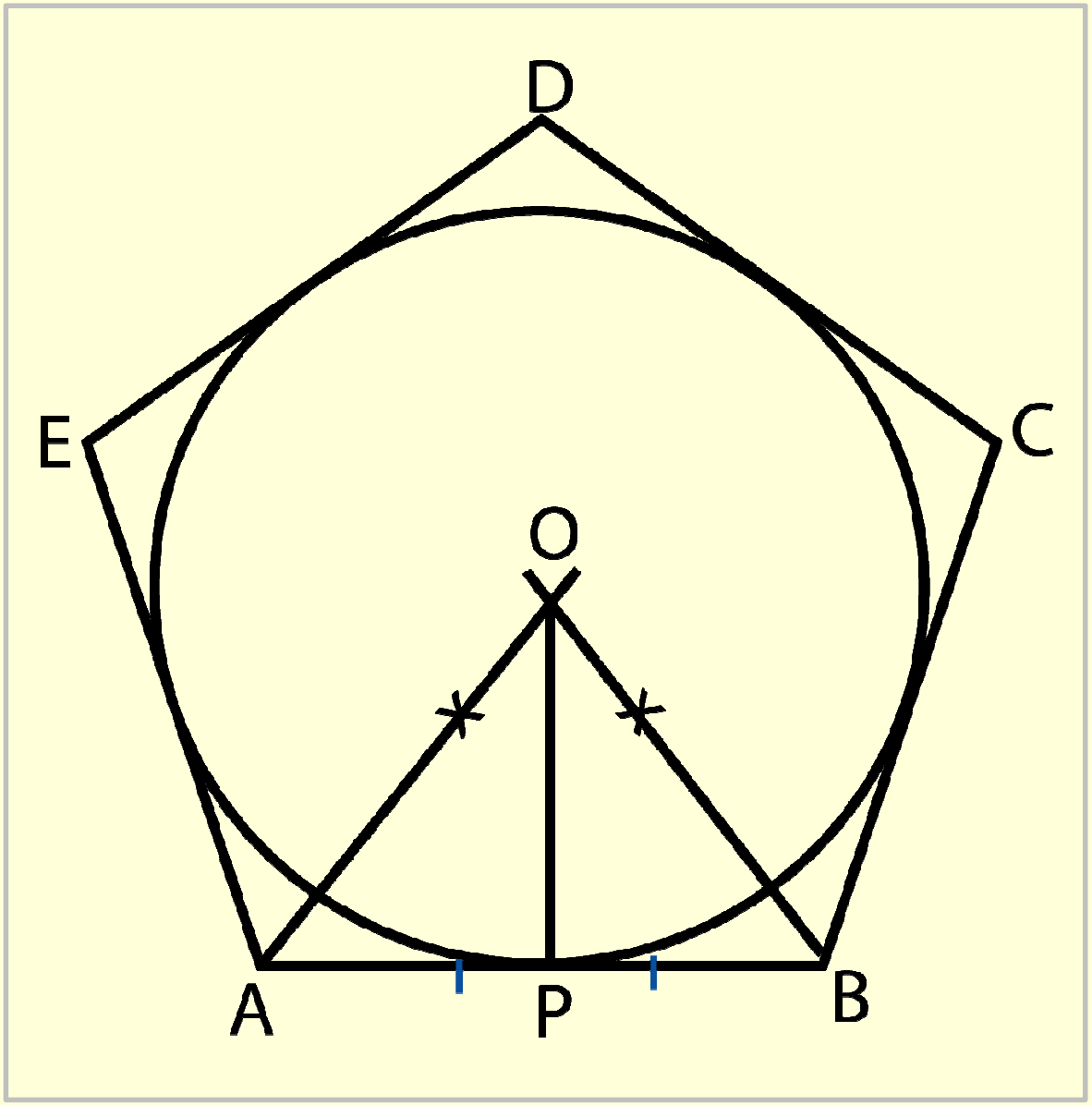
Draw circles with centers as 4, 5,&6 and radii as 4B, 5B, & 6B and inscribe a square, pentagon, & hexagon in the respective circles.

Mark point 7, 8, etc with 6-7,7-8,etc. = 4-5 to get the centers of circles of heptagon and octagon, etc.



Inscribe a circle inside a regular polygon

- Bisect any two adjacent internal angles of the polygon.
- From the intersection of these lines, draw a perpendicular to any one side of the polygon (say OP).
- With OP as radius, draw the circle with O as center.



Inscribe a regular polygon of any number of sides (say n = 5), in a circle

Draw the circle with diameter AB.

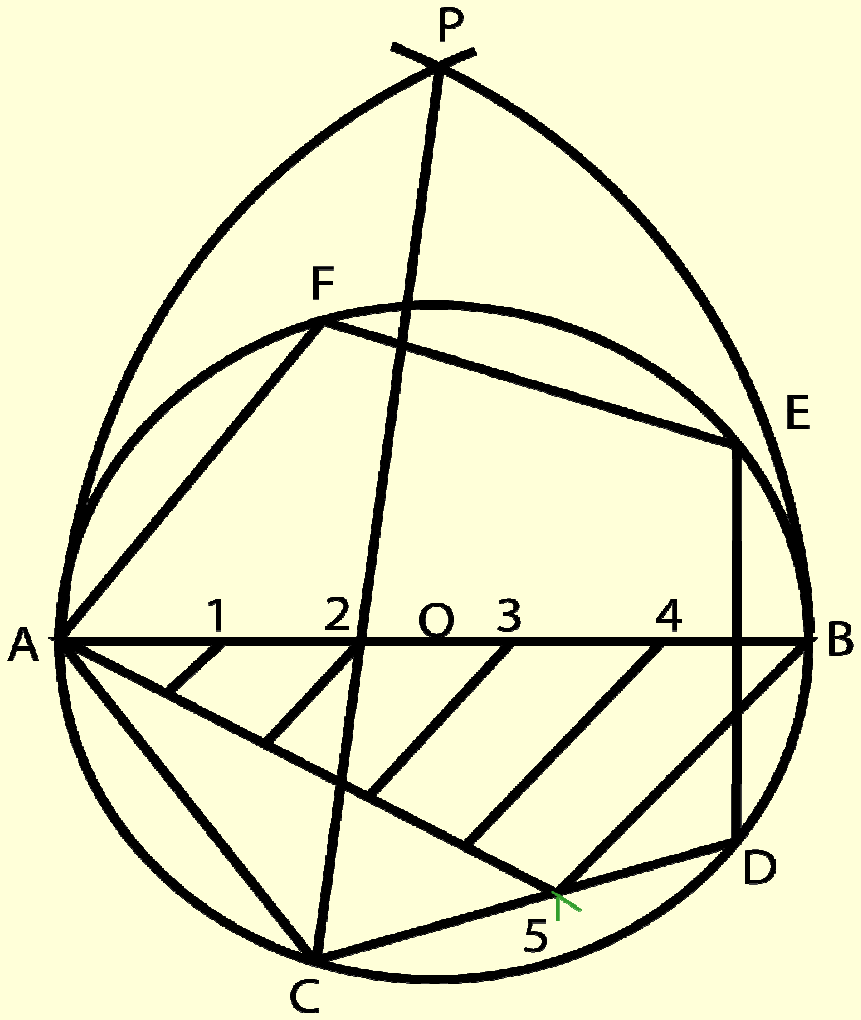
Divide AB in to "n" equal parts

Number them.

With center A & B and radius AB, draw arcs to intersect at P.

Draw line P2 and produce it to meet the circle at C.

AC is the length of the side of the polygon.



ENGINEERING DRAWI

Contents

Scales

1. Basic Information
2. Types and important units
3. Plain Scales (3 Problems)
4. Diagonal Scales - information
5. Diagonal Scales (3 Problems)
6. Comparative Scales (3 Problems)
7. Vernier Scales - information
8. Vernier Scales (2 Problems)
9. Scales of Cords - construction
10. Scales of Cords (2 Problems)

Engineering Curves – I

1. Classification

2. Conic sections - explanation

3. Common Definition

4. Ellipse – (six methods of construction)

5. Parabola – (Three methods of construction)

6. Hyperbola – (Three methods of construction)

7. Methods of drawing Tangents & Normals (four cases)

Engineering Curves – II

1. Classificatio
2. Definitions
3. Involutes - (five cases)
4. Cycloid
5. Trochoids – (Superior and Inferior)
6. Epic cycloid and Hypo - cycloid
7. Spiral (Two cases)
8. Helix – on cylinder & on cone
9. Methods of drawing Tangents and Normals (Three cases)

Loci of Points

1. Definitions - Classifications
2. Basic locus cases (six problems)
3. Oscillating links (two problems)
4. Rotating Links (two problems)

Orthographic Projections - Basics

1. Drawing – The fact about
2. Drawings - Types
3. Orthographic (Definitions and Important terms)
4. Planes - Classifications
5. Pattern of planes & views
6. Methods of orthographic projections
7. 1st angle and 3rd angle method – two illustrations

Conversion of pictorial views in to orthographic v

1. Explanation of various terms
2. 1st angle method - illustration
3. 3rd angle method – illustration
4. To recognize colored surfaces and to draw three Views
5. Seven illustrations (no.1 to 7) draw different orthographic views
6. Total nineteen illustrations (no.8 to 26)

Projection of Points and Lines

1. Projections – Information
2. Notations
3. Quadrant Structure.
4. Object in different Quadrants – Effect on position of views.
5. Projections of a Point – in 1st quadrant.
6. Lines – Objective & Types.

8. Lines inclined to one plane.
9. Lines inclined to both planes.
10. Imp. Observations for solution
11. Important Diagram & Tips.
12. Group A problems 1 to 5
13. Traces of Line (HT & VT)
14. To locate Traces.
15. Group B problems: No. 6 to 8
16. HT-VT additional information.
17. Group B1 problems: No. 9 to 11
18. Group B1 problems: No. 9 to 1
19. Lines in profile plane
20. Group C problems: No.12 & 13
21. Applications of Lines:: Information
22. Group D: Application Problems: 14 to 23
23. Lines in Other Quadrants:(Four Problems)

Projections of Planes:

1. About the topic:
2. Illustration of surface & side inclination.
3. Procedure to solve problem & tips:
4. Problems:1 to 5: Direct inclinations:
5. Problems:6 to 11: Indirect inclinations:
6. Freely suspended cases: Info:
7. Problems: 12 & 13
8. Determination of True Shape: Info:
9. Problems: 14 to 17

Projections of Solids:

1. Classification of Solids:
2. Important parameters:
3. Positions with Hp & Vp: Info:
4. Pattern of Standard Solution.
5. Problem no 1,2,3,4: General cases:
6. Problem no 5 & 6 (cube & tetrahedron)
7. Problem no 7 : Freely suspended:
8. Problem no 8 : Side view case:
9. Problem no 9 : True length case:
10. Problem no 10 & 11 Composite solids:
11. Problem no 12 : Frustum & auxiliary plane:

Section & Development

1. Applications of solids:
2. Sectioning a solid: Information:
3. Sectioning a solid: Illustration Terms:
4. Typical shapes of sections & planes:
5. Development: Information:
6. Development of diff. solids:
7. Development of Frustums:
8. Problems: Standing Prism & Cone: no. 1 & 2
9. Problems: Lying Prism & Cone: no.3 & 4
10. Problem: Composite Solid no. 5
11. Problem: Typical cases no.6 to 9

Intersection of Surfaces:

1. Essential Information:
2. Display of Engineering Applications:
3. Solution Steps to solve Problem:
4. Case 1: Cylinder to Cylinder:
5. Case 2: Prism to Cylinder:
6. Case 3: Cone to Cylinder
7. Case 4: Prism to Prism: Axis Intersecting.
8. Case 5: Triangular Prism to Cylinder
9. Case 6: Prism to Prism: Axis Skew
10. Case 7 Prism to Cone: from top:
11. Case 8: Cylinder to Cone:

Isometric Projections

1. Definitions and explanation
2. Important Terms
3. Types.
4. Isometric of plain shapes-1.
5. Isometric of circle
6. Isometric of a part of circle
7. Isometric of plain shapes-2
8. Isometric of solids & frustums (no.5 to 16)
9. Isometric of sphere & hemi-sphere (no.17 & 18)
10. Isometric of Section of solid.(no.19)
11. Illustrated nineteen Problem (no.20 to 38)

OBJECTIVE OF THIS CD

Sky is the limit for vision.
Vision and memory are close relatives.
Anything in the jurisdiction of vision can be memorized for a lo
We may not remember what we hear for a long time,
but we can easily remember and even visualize what we have see
So vision helps visualization and both help in memorizing an even

Video effects are far more effective, is now an established
Every effort has been done in this CD, to bring various planes, objects
in-front of observer, so that he/she can further visualize in proper
and reach to the correct solution, himself.

Off-course this all will assist & give good results
only when one will practice all these methods and techni
by drawing on sheets with his/her own hands, other wise

So observe each illustration carefully
note proper notes given everywhere
Go through the Tips given & solution steps carefully
Discuss your doubts with your teacher and make practice you
Then success is yours !!

Go ahead confidently! Dream Team wishes you best luck !

SCALES

DIMENSIONS OF LARGE OBJECTS MUST BE REDUCED TO ACCOMMODATE ON STANDARD SIZE DRAWING SHEET.THIS REDUCTION CREATES A SCALE OF THAT REDUCTION RATIO, WHICH IS GENERALLY A FRACTION..

SUCH A SCALE IS CALLED REDUCING SCALE

AND

THAT RATIO IS CALLED REPRESENTATIVE FACTOR.

SIMILARLY IN CASE OF TINY OBJECTS DIMENSIONS MUST BE INCREASED FOR ABOVE PURPOSE. HENCE THIS SCALE IS CALLED ENLARGING SCALE.

HERE THE RATIO CALLED REPRESENTATIVE FACTOR IS MORE THAN UNITY.

USE FOLLOWING FORMULAS FOR THE CALCULATIONS IN THIS TOPIC.

A REPRESENTATIVE FACTOR (R.F.) = $\dfrac{\text{DIMENSION OF DRAWING}}{\text{DIMENSION OF OBJECT}}$

$= \dfrac{\text{LENGTH OF DRAWING}}{\text{ACTUAL LENGTH}}$

$= \sqrt{\dfrac{\text{AREA OF DRAWING}}{\text{ACTUAL AREA}}}$

$= \sqrt[3]{\dfrac{\text{VOLUME AS PER DRWG.}}{\text{ACTUAL VOLUME}}}$

B LENGTH OF SCALE = R.F. X MAX. LENGTH TO BE MEASURED.

BE FRIENDLY WITH

1 KILOMETRE = 10 H
1 HECTOMETRE = 10 D
1 DECAMETRE = 10 M
1 METRE = 10 D
1 DECIMETRE = 10 C
1 CENTIMETRE = 10 M

TYPES OF SCALES:

1. PLAIN SCALES (FOR DIMENSIONS UP TO SINGL
2. DIAGONAL SCALES (FOR DIMENSIONS UP TO TWO
3. VERNIER SCALES (FOR DIMENSIONS UP TO TWO
4. COMPARATIVE SCALES (FOR COMPARING TWO DIFFERE
5. SCALE OF CORDS (FOR MEASURING/CONSTRUCT

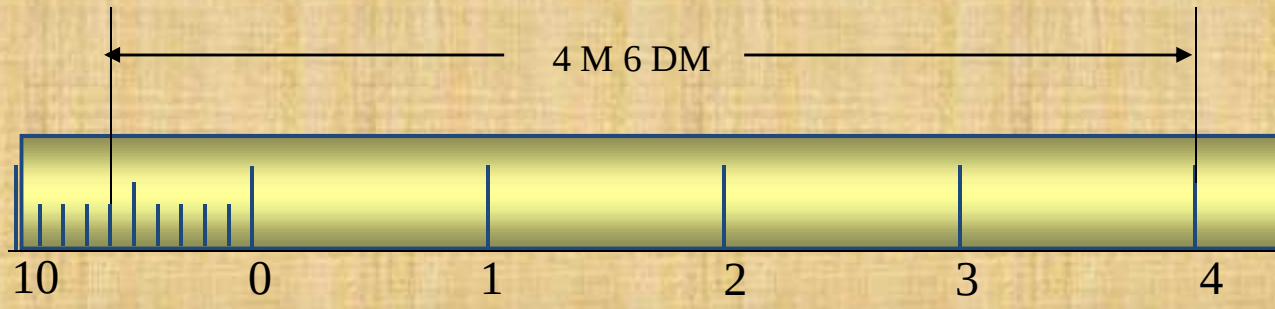
PLAIN SCALE:- This type of scale represents two units or a unit and it's sub-divisi

PROBLEM NO.1:- Draw a scale 1 cm = 1m to read decimeters, to measure maxim
Show on it a distance of 4 m and 6 dm.

CONSTRUCTION:-
a) Calculate R.F.= $\frac{\text{DIMENSION OF DRAWING}}{\text{DIMENSION OF OBJECT}}$

R.F.= 1cm/ 1m = 1/100
Length of scale = R.F. X max. distance
= 1/100 X 600 cm
= 6 cms

b) Draw a line 6 cm long and divide it in 6 equal parts. Each part will represent larg
c) Sub divide the first part which will represent second unit or fraction of first unit.
d) Place (0) at the end of first unit. Number the units on right side of Zero and sub
on left-hand side of Zero. Take height of scale 5 to 10 mm for getting a look of sc
e) After construction of scale mention it's RF and name of scale as shown.
f) Show the distance 4 m 6 dm on it as shown.



R.F. = 1/100
PLANE SCALE SHOWING METERS AND DECIMETERS.

PROBLEM NO.2:- In a map a 36 km distance is shown by a line 45 cms long. Calculat
a plain scale to read kilometers and hectometers, for max. 12 km. Show a distance of 8

CONSTRUCTION:-

a) Calculate R.F.

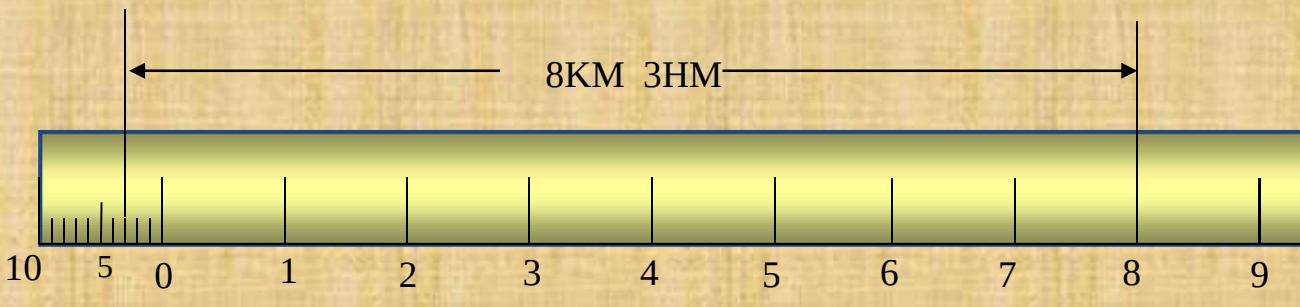
R.F.= 45 cm/ 36 km = 45/ 36 . 1000 . 100 = 1/ 80,000

Length of scale = R.F. × max. distance

= 1/ 80000 × 12 km

= 15 cm

b) Draw a line 15 cm long and divide it in 12 equal parts. Each part will represent large
c) Sub divide the first part which will represent second unit or fraction of first unit.
d) Place (0) at the end of first unit. Number the units on right side of Zero and subdivis
on left-hand side of Zero. Take height of scale 5 to 10 mm for getting a look of scale.
e) After construction of scale mention it's RF and name of scale as shown.
f) Show the distance 8.3 km on it as shown.



R.F. = 1/80,000

PLANE SCALE SHOWING KILOMETERS AND HECTOMETERS

PROBLEM NO.3:- The distance between two stations is 210 km. A passenger train cover
in 7 hours. Construct a plain scale to measure time up to a single minute. RF is 1/200,00
traveled by train in 29 minutes.

CONSTRUCTION:-

a) 210 km in 7 hours. Means speed of the train is 30 km per hour (60 minutes)

PLA

Length of scale = R.F. × max. distance per hour
= 1/ 2,00,000 × 30km
= 15 cm

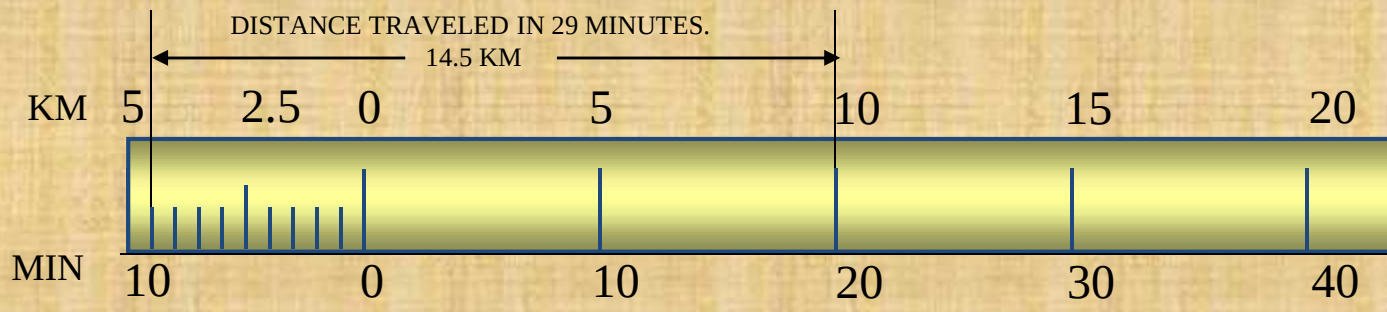
b) 15 cm length will represent 30 km and 1 hour i.e. 60 minutes.
Draw a line 15 cm long and divide it in 6 equal parts. Each part will represent 5 km an

c) Sub divide the first part in 10 equal parts,which will represent second unit or fraction of
Each smaller part will represent distance traveled in one minute.

d) Place (0) at the end of first unit. Number the units on right side of Zero and subdivisio
on left-hand side of Zero. Take height of scale 5 to 10 mm for getting a proper look of s

e) Show km on upper side and time in minutes on lower side of the scale as shown.
After construction of scale mention it's RF and name of scale as shown.

f) Show the distance traveled in 29 minutes, which is 14.5 km, on it as shown.



R.F. = 1/100

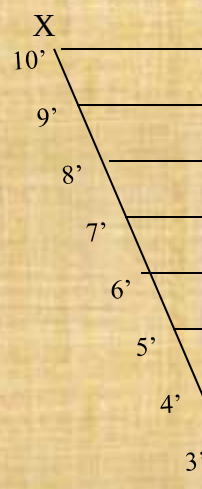
PLANE SCALE SHOWING METERS AND DECIMETERS.

We have seen that the plain scales give only two dimensions, such as a unit and it's subunit or it's fraction.

The diagonal scales give us three successive dimensions that is a unit, a subunit and a subdivision of a subunit.

DI

The principle of construction of a diagonal scale is as follows.
Let the XY in figure be a subunit.
From Y draw a perpendicular YZ to a suitable height.
Join XZ. Divide YZ in to 10 equal parts.
Draw parallel lines to XY from all these divisions
and number them as shown.
From geometry we know that similar triangles have
their like sides proportional.



Consider two similar triangles XYZ and 7' 7Z,
we have 7Z / YZ = 7'7 / XY (each part being one unit)
Means 7' 7 = 7 / 10. x X Y = 0.7 XY
:.
Similarly
1' – 1 = 0.1 XY
2' – 2 = 0.2 XY
Thus, it is very clear that, the sides of small triangles,
which are parallel to divided lines, become progressively
shorter in length by 0.1 XY.

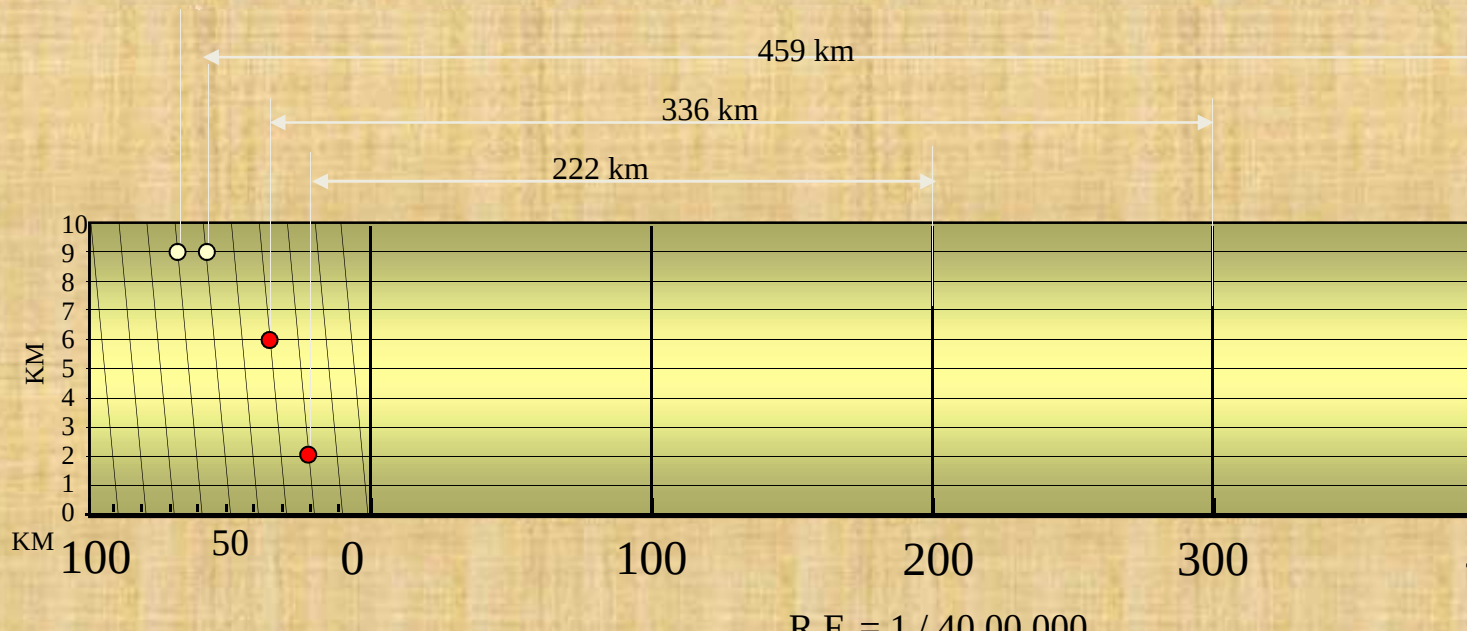
The solved examples ON NEXT PAGES will make the principles of diagonal scales clear.

PROBLEM NO. 4 : The distance between Delhi and Agra is 200 km.
In a railway map it is represented by a line 5 cm long. Find it's R.F.
Draw a diagonal scale to show single km. And maximum 600 km.
Indicate on it following distances. 1) 222 km 2) 336 km 3) 459 km 4) 569 km

SOLUTION STEPS: RF = 5 cm / 200 km = 1 / 40, 00, 000

Length of scale = 1 / 40, 00, 000 X 600 X 10^5 = 15 cm

Draw a line 15 cm long. It will represent 600 km.Divide it in six equal parts.(each will repre
Divide first division in ten equal parts.Each will represent 10 km.Draw a line upward from le
mark 10 parts on it of any distance. Name those parts 0 to 10 as shown. Join 9^{th} sub-divisio
with 10^{th} division of the vertical divisions. Then draw parallel lines to this line from remainir
complete diagonal scale.



R.F. = 1 / 40,00,000

DIAGONAL SCALE SHOWING KILOMETERS.

PROBLEM NO.5: A rectangular plot of land measuring 1.28 hectors is represented on a map by of 8 sq. cm. Calculate RF of the scale. Draw a diagonal scale to read single meter. Show a distan

SOLUTION :

1 hector = 10, 000 sq. meters

1.28 hectors = 1.28 X 10, 000 sq. meters

= 1.28 X 10^4 X 10^4 sq. cm

8 sq. cm area on map represents

= 1.28 X 10^4 X 10^4 sq. cm on land

1 cm sq. on map represents

= 1.28 X 10^4 X 10^4 / 8 sq cm on land

1 cm on map represent

$$= \sqrt{1.28 \times 10^4 \times 10^4 / 8} \text{ cm}$$

= 4. 000 cm

1 cm on drawing represent 4, 000 cm, Means RF = 1 / 4000

Assuming length of scale 15 cm, it will represent 600 m.

Draw a line 15 cm long.

It will represent 600 m.Divide it in six equa

(each will represent 100 m.)

Divide first division in ten equal parts.Each

represent 10 m.

Draw a line upward from left end and

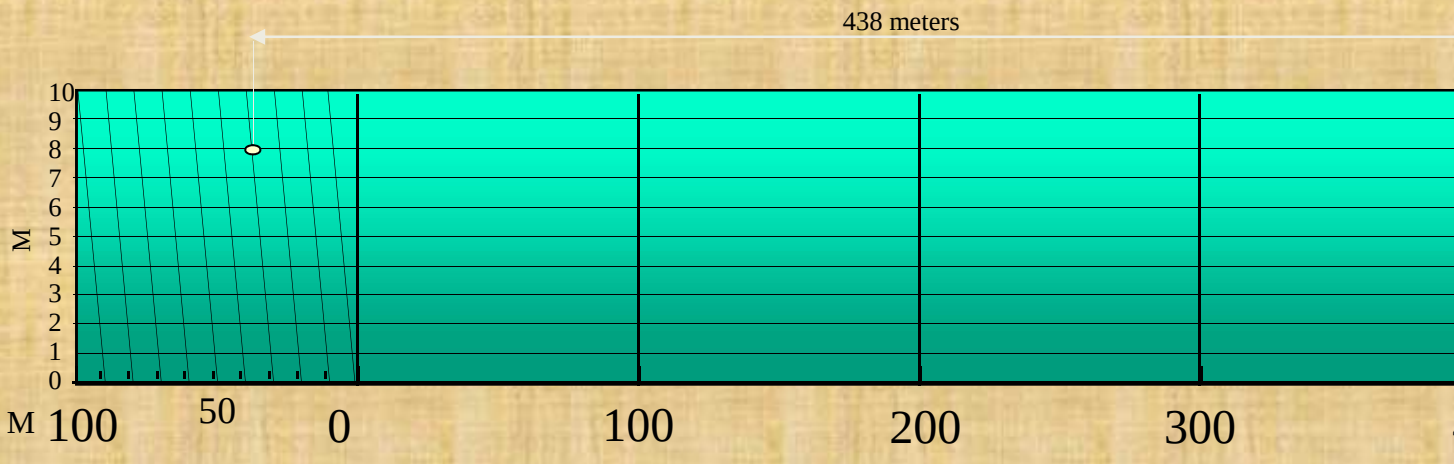
mark 10 parts on it of any distance.

Name those parts 0 to 10 as shown.Join 9t

of horizontal scale with 10th division of the

Then draw parallel lines to this line from re

and complete diagonal scale.



R.F. = 1 / 4000

DIAGONAL SCALE SHOWING METERS.

PROBLEM NO.6:. Draw a diagonal scale of R.F. 1: 2.5, showing centimeters and millimeters and long enough to measure up to 20 centimeters.

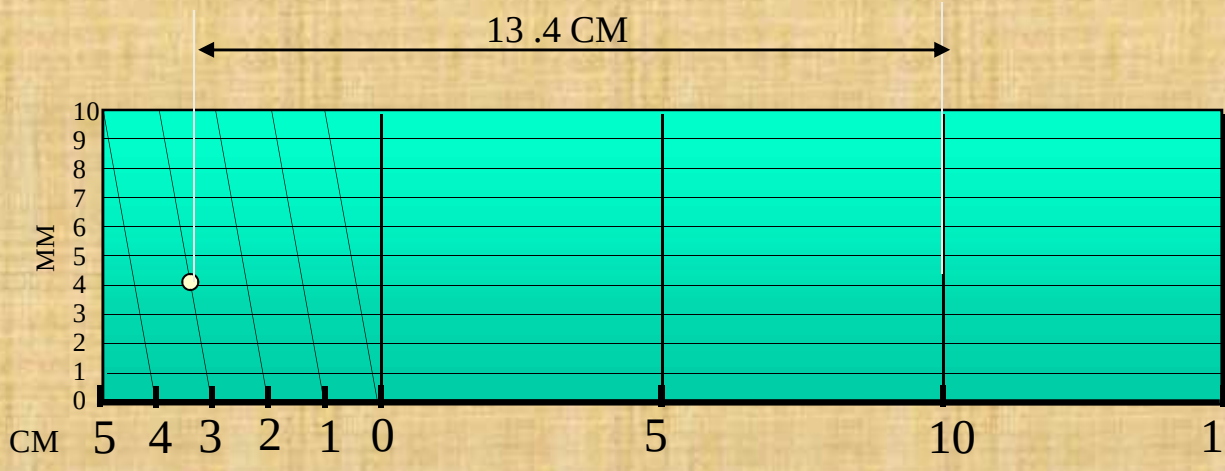
SOLUTION STEPS:

R.F. = 1 / 2.5

Length of scale = 1 / 2.5 X 20 cm.

= 8 cm.

1. Draw a line 8 cm long and divide it in to 4 equal parts.
   (Each part will represent a length of 5 cm.)
2. Divide the first part into 5 equal divisions.
   (Each will show 1 cm.)
3. At the left hand end of the line, draw a vertical line and on it step-off 10 equal divisions of any length.
4. Complete the scale as explained in previous problems.
   Show the distance 13.4 cm on it.



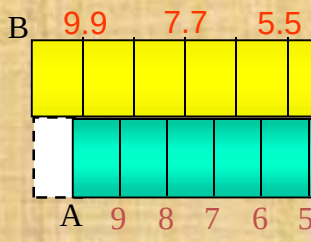
R.F. = 1 / 2.5

DIAGONAL SCALE SHOWING CENTIMETERS.

Vernier Scales:

These scales, like diagonal scales , are used to read to a very small unit with great ac
It consists of two parts – a primary scale and a vernier. The primary scale is a plain sc
divided into minor divisions.
As it would be difficult to sub-divide the minor divisions in ordinary way, it is done with
The graduations on vernier are derived from those on the primary scale.

Figure to the right shows a part of a plain scale in which length A-O represents 10 cm. If we divide A-O into ten equal parts, each will be of 1 cm. Now it would not be easy to divide each of these parts into ten equal divisions to get measurements in millimeters.



Now if we take a length BO equal to 10 + 1 = 11 such equal parts, thus representing 11 cm, and divide it into ten equal divisions, each of these divisions will represent 11 / 10 – 1.1 cm.

The difference between one part of AO and one division of BO will be equal 1.1 – 1.0 = 0.1 cm or 1 mm.

This difference is called Least Count of the scale.

Example 10:

Draw a Vernier scale of RF = 1 / 25 to read centimeters upto 4 meters and on it, show lengths 2.39 m and 0.91 m

Verr

SOLUTION:

Length of scale = RF X max. Distance
= 1 / 25 X 4 X 100
= 16 cm

CONSTRUCTION: (Main scale)

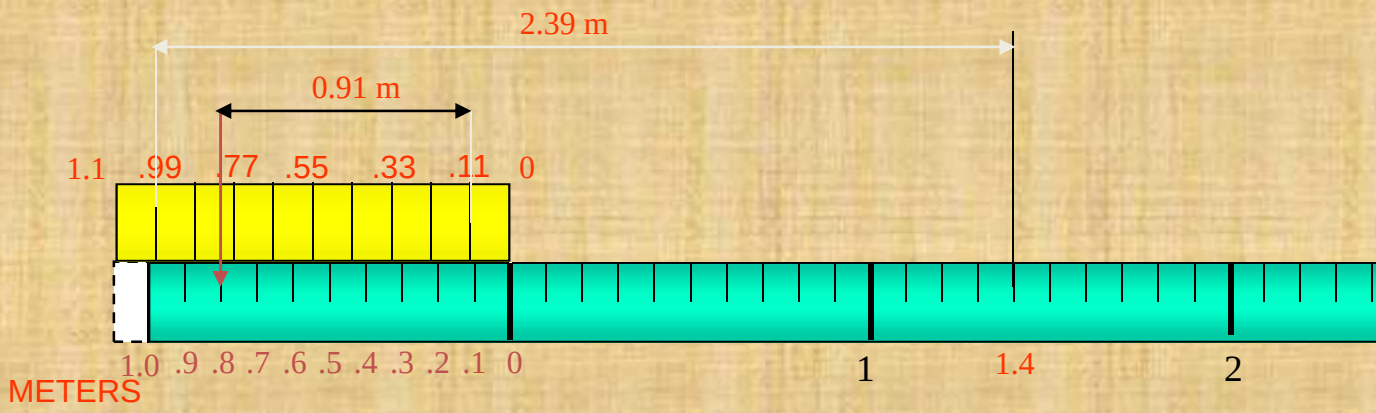
Draw a line 16 cm long.
Divide it in 4 equal parts.
(each will represent meter)
Sub-divide each part in 10 equal parts
(each will represent decimeter)
Name those properly.

CONSTRUCTION: (Vernier)

Take 11 parts of Dm length and divide it in 10 equ
Each will show 0.11 m or 1.1 dm or 11 cm and co
Covering these parts of Vernier.

TO MEASURE GIVEN LENGTHS:

(1) For 2.39 m : Subtract 0.99 from 2.39 i.e. 2.
The distance between 0.99 (left of Zero) and 1.4
(2) For 0.91 m : Subtract 0.11 from 0.91 i.e. 0.91
The distance between 0.11 and 0.80 (both left sic



Example 11: A map of size 500cm X 50cm wide represents an area of 6250 sq.Kms. Construct a vernier scaleto measure kilometers, hectometers and decameters and long enough to measure upto 7 km. Indicate on it a) 5.33 km b) 59 decameters.

SOLUTION:

$$RF = \sqrt{\frac{\text{AREA OF DRAWING}}{\text{ACTUAL AREA}}}$$

$$= \sqrt{\frac{500 \text{ X } 50 \text{ cm sq.}}{6250 \text{ km sq.}}}$$

$$= 2 / 10^5$$

Length of scale = RF X max. Distance

= $2 / 10^5$ X 7 kms

= 14 cm

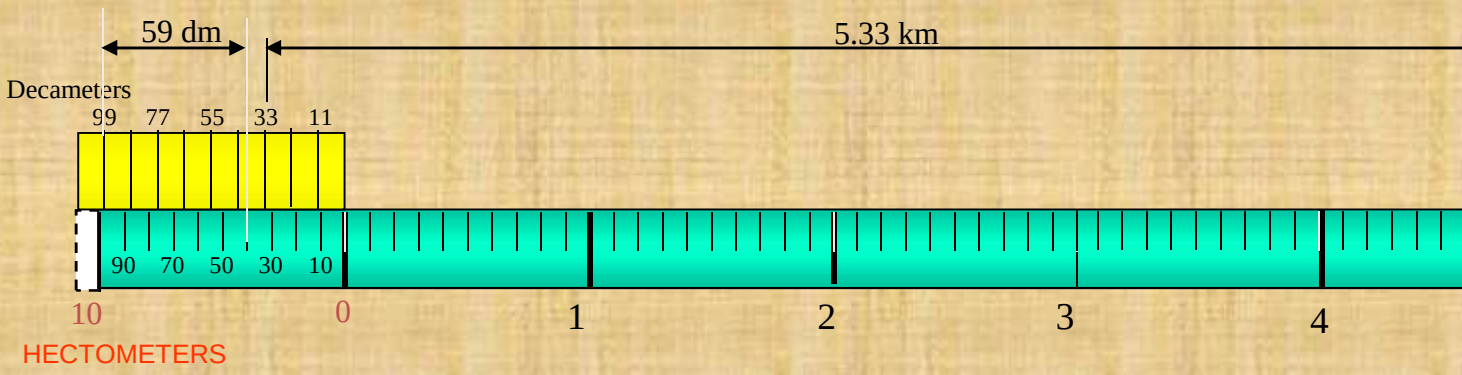
CONSTRUCTION: *(Main scale)*

Draw a line 14 cm long.
Divide it in 7 equal parts.
(each will represent km)
Sub-divide each part in 10 equal parts.
(each will represent hectometer)
Name those properly.

CONSTRUCTION: *(Vernier)*

Take 11 parts of hectometer part length and divide it in 10 equal parts.
Each will show 1.1 hm m or 11 dm and
Covering in a rectangle complete scale.

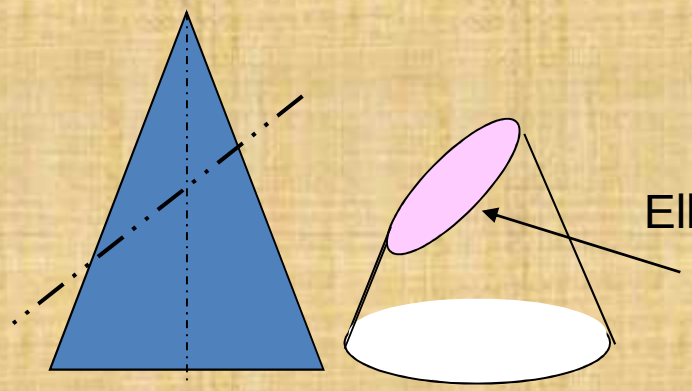
TO ME
a) For 5
Subtrac
i.e. 5.3
The dis
(left of
5.00 (ri
(b) For
Subtrac
i.e. 0.5
(- ve si
The dis
- .4 km
(both le



CONIC SECTIONS

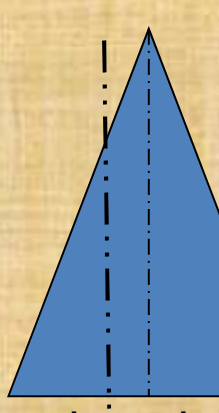
ELLIPSE, PARABOLA AND HYPERBOLA ARE CALLED CONIC SE
BECAUSE
THESE CURVES APPEAR ON THE SURFACE OF A CONE
WHEN IT IS CUT BY SOME TYPICAL CUTTING PLANES.

OBSERVE
ILLUSTRATIONS
GIVEN BELOW..

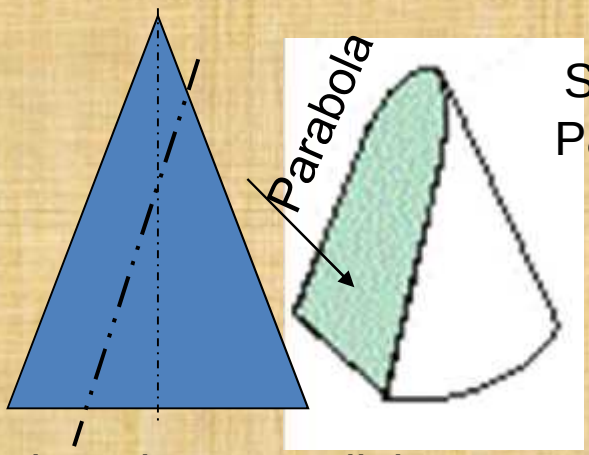


Ellipse

Section Plane
Through Generators



Section Pla
Parallel to A



Section Plane Parallel
to end generator.

COMMON DEFINATION OF ELLIPSE, PARABOLA & HYPERBOLA:

These are the loci of points moving in a plane such that the ratio o
from a *fixed point* And a *fixed line* always remains con
The Ratio is called ECCENTRICITY. (E)

A) For Ellipse E<1
B) For Parabola E=1
C) For Hyperbola E>1

Refer Problem nos. 6. 9 & 12

SECOND DEFINATION OF AN ELLIPSE:

It is a locus of a point moving in a plane
such that the SUM of it's distances from TWO fixe
always remains constant.
{And this *sum equals* to the length of *major ax*
These TWO fixed points are FOCUS 1 & FOCU

Refer Problem no.4
Ellipse by Arcs of Circles Method.

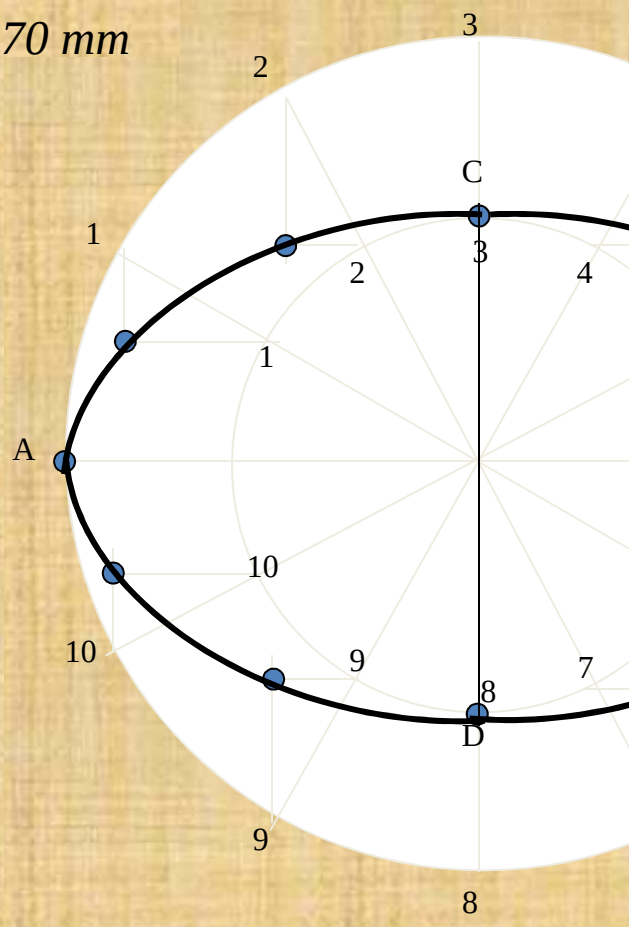
Problem 1 :-

Draw ellipse by concentric circle method.

Take major axis 100 mm and minor axis 70 mm long.

Steps:

1. Draw both axes as perpendicular bisectors of each other & name their ends as shown.
2. Taking their intersecting point as a center, draw two concentric circles considering both as respective diameters.
3. Divide both circles in 12 equal parts & name as shown.
4. From all points of outer circle draw vertical lines downwards and upwards respectively.
5. From all points of inner circle draw horizontal lines to intersect those vertical lines.
6. Mark all intersecting points properly as those are the points on ellipse.
7. Join all these points along with the ends of both axes in smooth possible curve. It is required ellipse.



Steps:

1 Draw a rectangle taking major and minor axes as sides.

2. In this rectangle draw both axes as perpendicular bisectors of each other..

3. For construction, select upper left part of rectangle. Divide vertical small side and horizontal long side into same number of equal parts.(here divided in four parts)

4. Name those as shown..

5. Now join all vertical points 1,2,3,4, to the upper end of minor axis. And all horizontal points i.e.1,2,3,4 to the lower end of minor axis.

6. Then extend C-1 line upto D-1 and mark that point. Similarly extend C-2, C-3, C-4 lines up to D-2, D-3, & D-4 lines.

7. Mark all these points properly and join all along with ends A and D in smooth possible curve. Do similar construction in right side part.along with lower half of the rectangle.Join all points in smooth curve.

It is required ellipse.

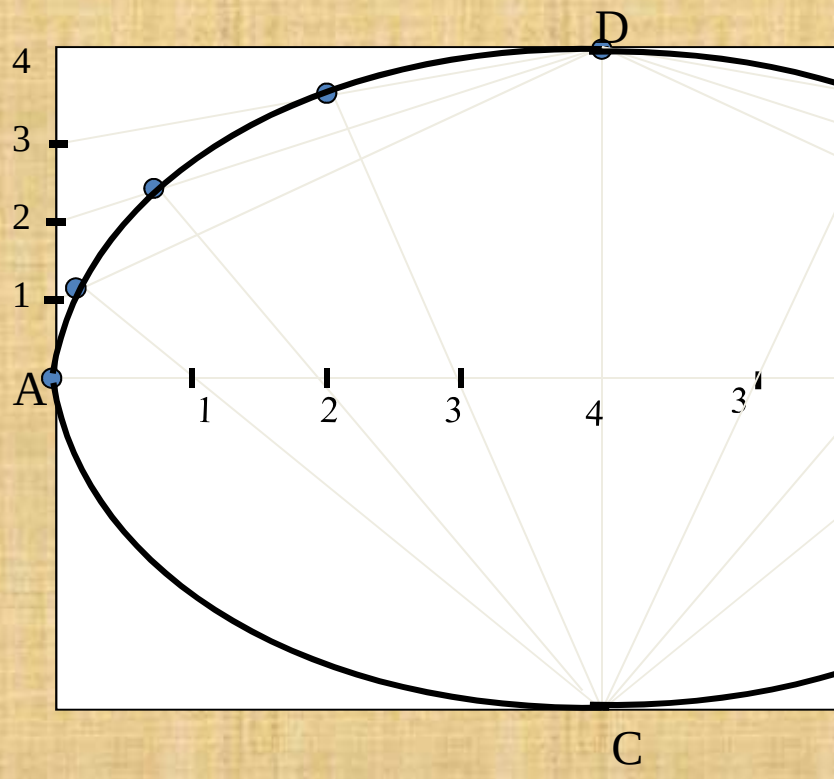
B

Problem 2

Draw ellipse by Rectangle *meth*

Take major axis 100 mm and minor

mm long.

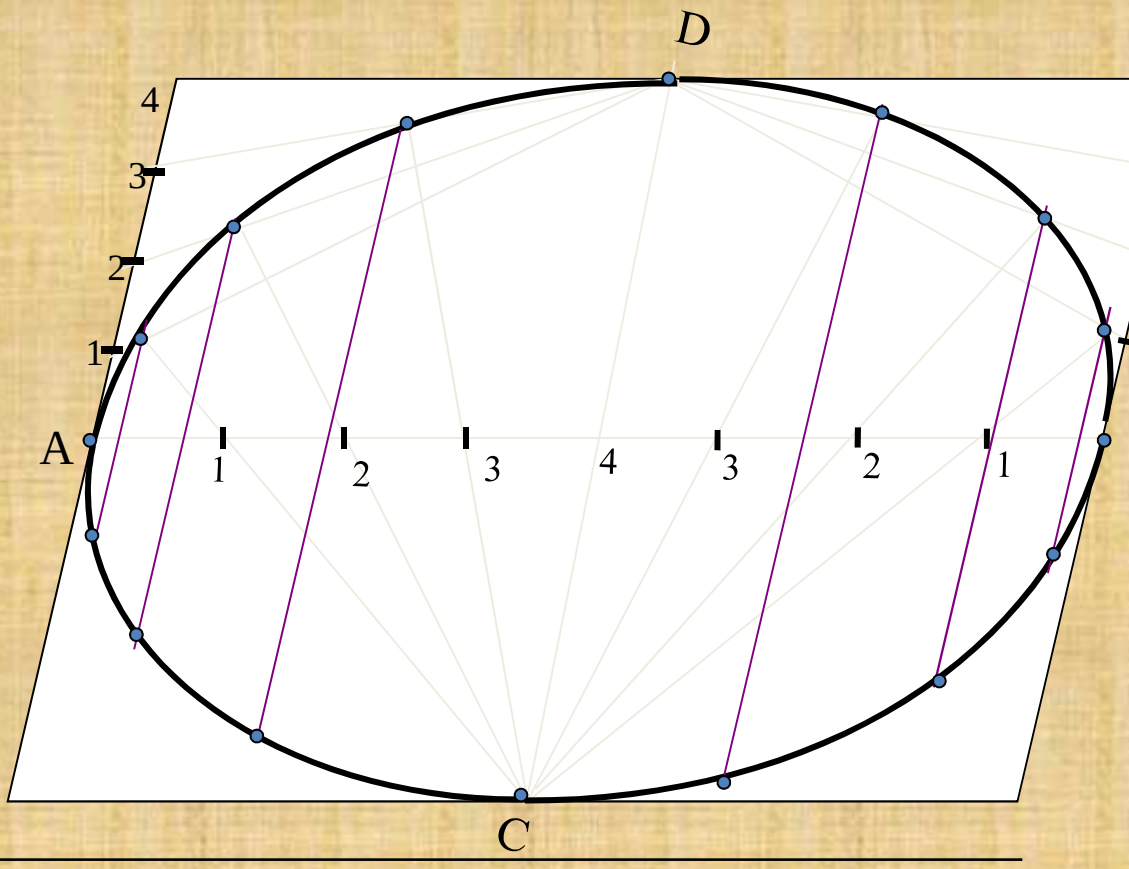


Problem 3:-

Draw ellipse by Oblong method.

Draw a parallelogram of 100 mm and 70 mm long sides with included angle of 75^0. Inscribe

STEPS ARE SIMILAR TO
THE PREVIOUS CASE
(RECTANGLE METHOD)
ONLY IN PLACE OF RECTANGLE,
HERE IS A PARALLELOGRAM.



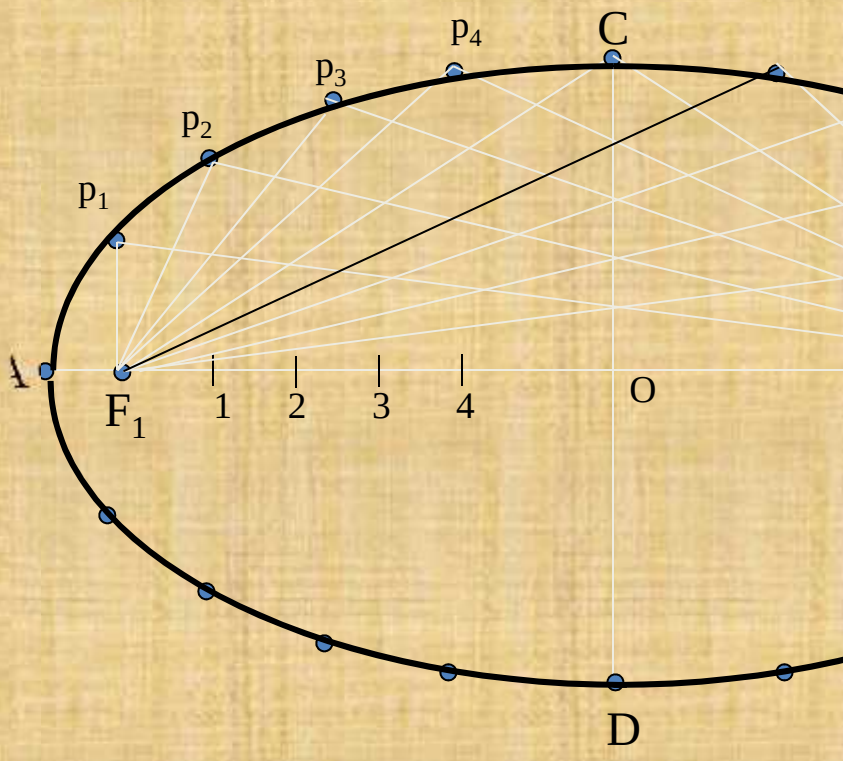
PROBLEM 4.
MAJOR AXIS AB & MINOR AXIS CD ARE 100 AMD 70MM LONG RESPECTIVELY .DRAW ELLIPSE BY ARCS OF CIRLES METHOD.

STEPS:

1. Draw both axes as usual.Name the ends & intersecting point
2. Taking AO distance I.e.half major axis, from C, mark F_1 & F_2 On AB . (focus 1 and 2.)
3. On line F_1- O taking any distance, mark points 1,2,3, & 4
4. Taking F_1 center, with distance A-1 draw an arc above AB and taking F_2 center, with B-1 distance cut this arc. Name the point p_1
5. Repeat this step with same centers but taking now A-2 & B-2 distances for drawing arcs. Name the point p_2
6. Similarly get all other P points. With same steps positions of P can be located below AB.
7. Join all points by smooth curve to get an ellipse/

BY ARC

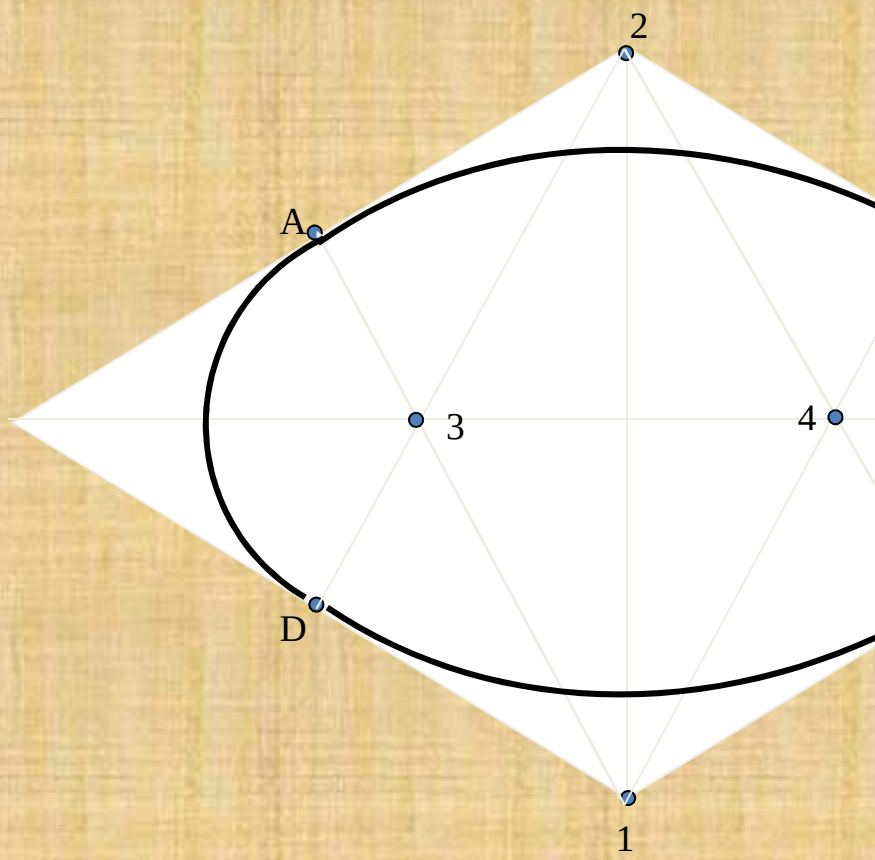
As per the definition Ellipse is locus of point a plane such that the SUM of it's distances points (F_1 & F_2) remains constant and equa of major axis AB.(Note A .1+ B .1=A . 2 + B.



PROBLEM 5.
DRAW RHOMBUS OF 100 MM & 70 MM LONG DIAGONALS AND INSCRIBE AN ELLIPSE IN IT.

STEPS:

1. Draw rhombus of given dimensions.
2. Mark mid points of all sides & name Those A,B,C,& D
3. Join these points to the ends of smaller diagonals.
4. Mark points 1,2,3,4 as four centers.
5. Taking 1 as center and 1-A radius draw an arc AB.
6. Take 2 as center draw an arc CD.
7. Similarly taking 3 & 4 as centers and 3-D radius draw arcs DA & BC.

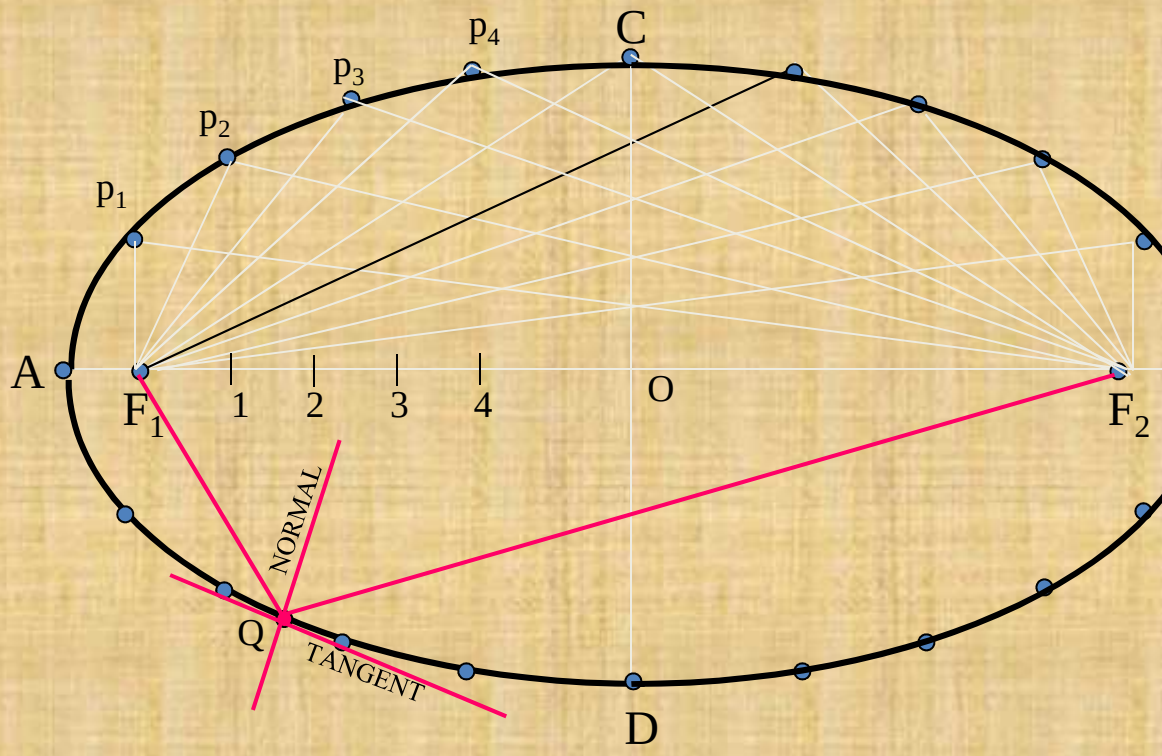


Problem 13:

TANG

TO DRAW TANGENT & NORMAL TO THE CURVE FROM A GIVEN POINT

1. JOIN POINT Q TO F_1 & F_2
2. BISECT ANGLE $F_1Q\,F_2$ THE ANGLE BISECTOR IS NORMAL
3. A PERPENDICULAR LINE DRAWN TO IT IS TANGENT TO THE C



Unit-II

Projections of Points & Lines

ORTHOGRAPHIC PROJECTION

OF POINTS, LINES, PLANES, AND SOLIDS.

TO DRAW PROJECTIONS OF ANY OBJE
ONE MUST HAVE FOLLOWING INFORMA

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

B) OBSERVER
{ ALWAYS OBSERVING PERPENDICULAR TO RESP. P

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

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

IT IS INTERESTING TO LEARN THE EFFECT ON THE POSITIONS O
F THE OBJECT WITH RESP. TO X-Y LINE, WHEN PLACED IN DIFF

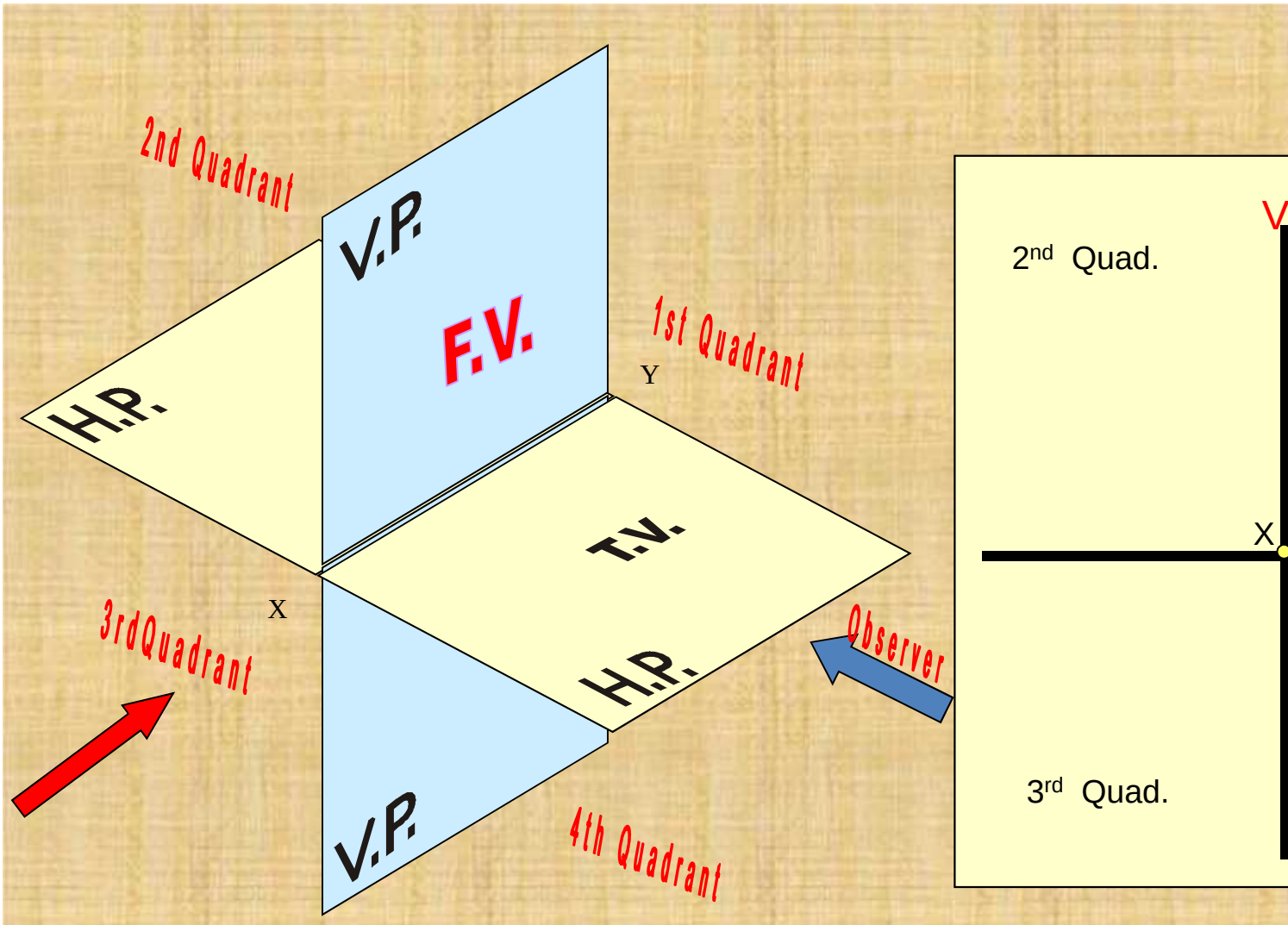
STUDY ILLUSTRATIONS GIVEN ON HEXT PAGES AND NOTE THE RESULTS.T
HERE A POINT A IS TAKEN AS AN OBJECT. BECAUSE IT'S ALL VIEWS ARE

NOTATIONS

FOLLOWING NOTATIONS SHOULD BE FOLLOWED WHILE
DIFFERENT VIEWS IN ORTHOGRAPHIC PROJECTIO

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,

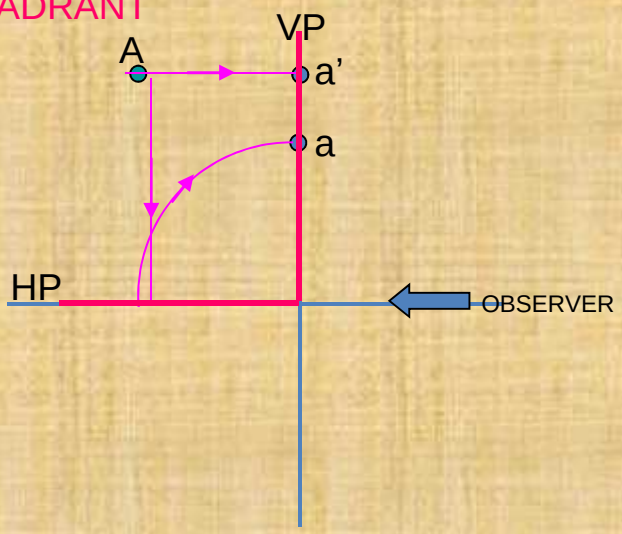


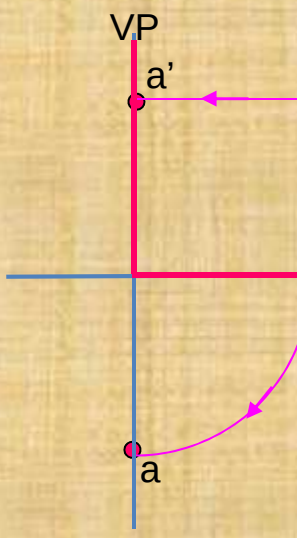
THIS QUADRANT PATTERN,
IF OBSERVED ALONG X-Y LINE (IN RED ARROW DIRECT
WILL EXACTLY APPEAR AS SHOWN ON RIGHT SIDE AND
IT IS FURTHER USED TO UNDERSTAND ILLUSTRATION

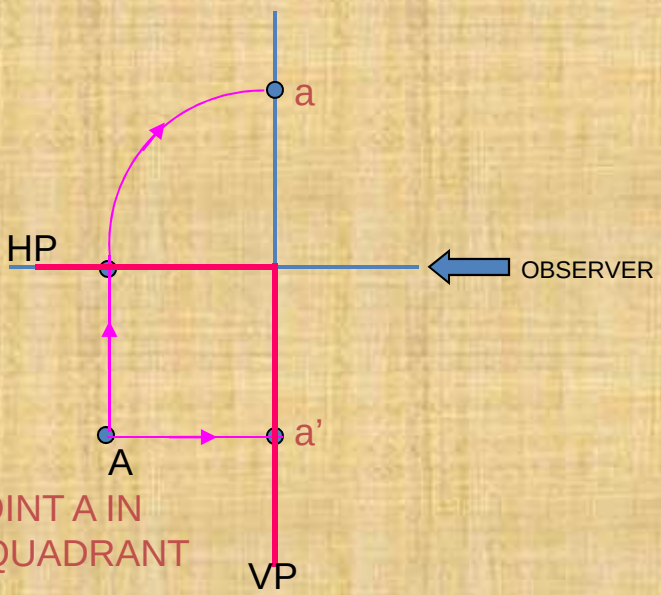
Point A is Placed In different quadrants and it's Fv & Tv are brought in same plane for Observer to see clearly.
Fv is visible as it is a view on VP. But as Tv is is a view on Hp, it is rotated downward 90^0, In clockwise direction.The In front part of Hp comes below xy line and the part behind Vp comes above.

Observe and note the process.

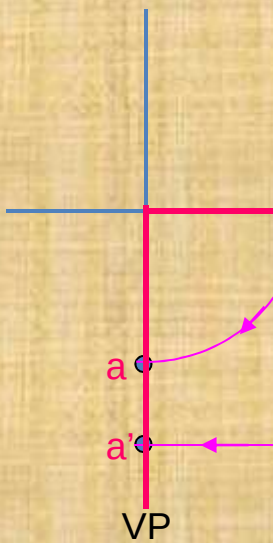
POINT A IN 2ND QUADRANT





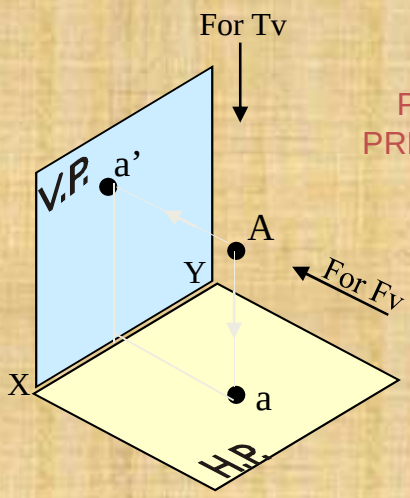


POINT A IN 3RD QUADRANT



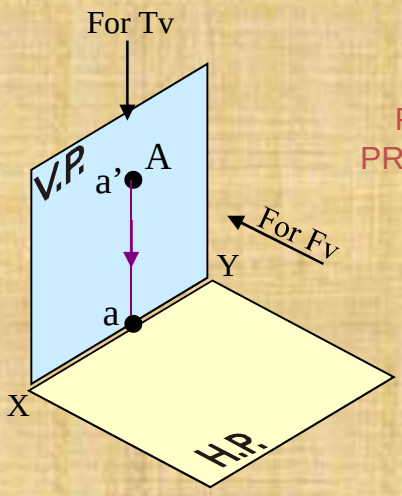
PROJECTIONS OF A POINT IN FIRST QUAD

POINT A ABOVE HP & INFRONT OF VP



PICTORIAL PRESENTATION

POINT A ABOVE HP & IN VP

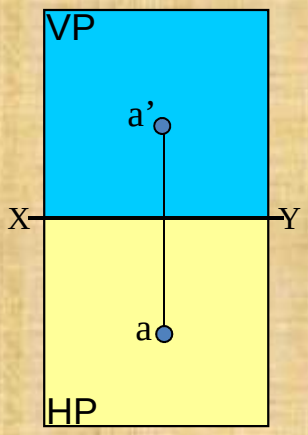


PICTORIAL PRESENTATION

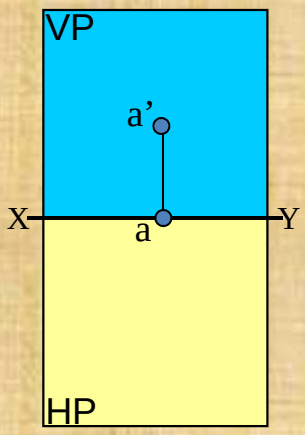
POINT & INFRO

ORTHOGRAPHIC PRESENTATIONS OF ALL ABOVE CASES.

Fv above xy, Tv below xy.



Fv above xy, Tv on xy.



PROJECTIONS OF STRAIGHT LIN

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

SIMPLE CASES OF THE LINE

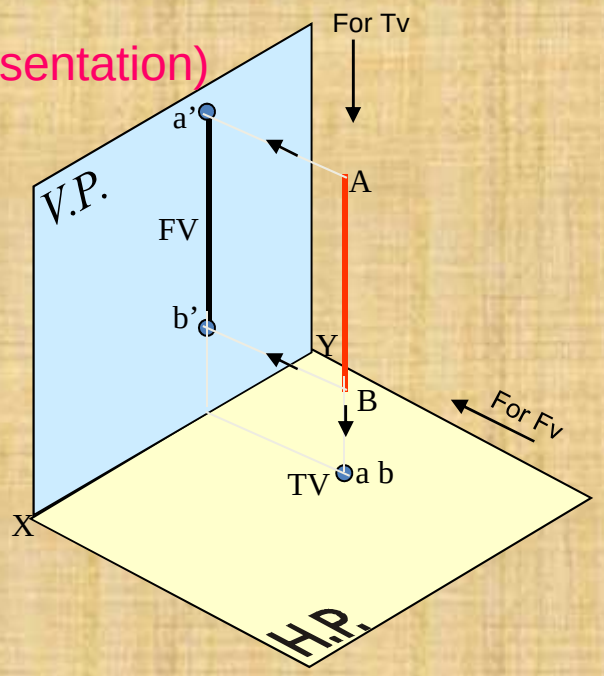
1. A VERTICAL LINE (LINE PERPENDICULAR TO HP
2. LINE PARALLEL TO BOTH HP & VP.
3. LINE INCLINED TO HP & PARALLEL TO VP.
4. LINE INCLINED TO VP & PARALLEL TO HP.
5. LINE INCLINED TO BOTH HP & VP.

STUDY ILLUSTRATIONS GIVEN ON NEXT
SHOWING CLEARLY THE NATURE OF FV &
OF LINES LISTED ABOVE AND NOTE RESU

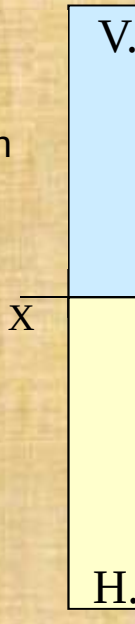
(Pictorial Presentation)

1.

A Line perpendicular to Hp & // to Vp



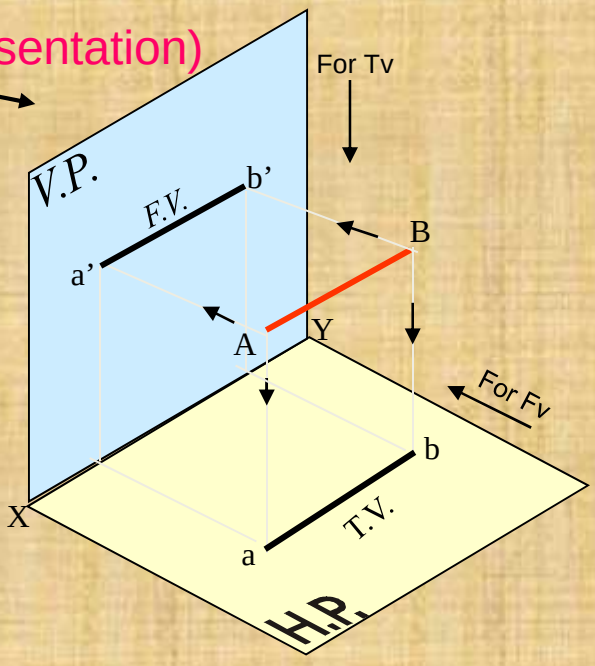
Note:
Fv is a vertical line
Showing True Length
&
Tv is a point.



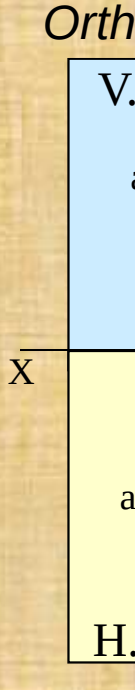
(Pictorial Presentation)

2.

A Line // to Hp & // to Vp



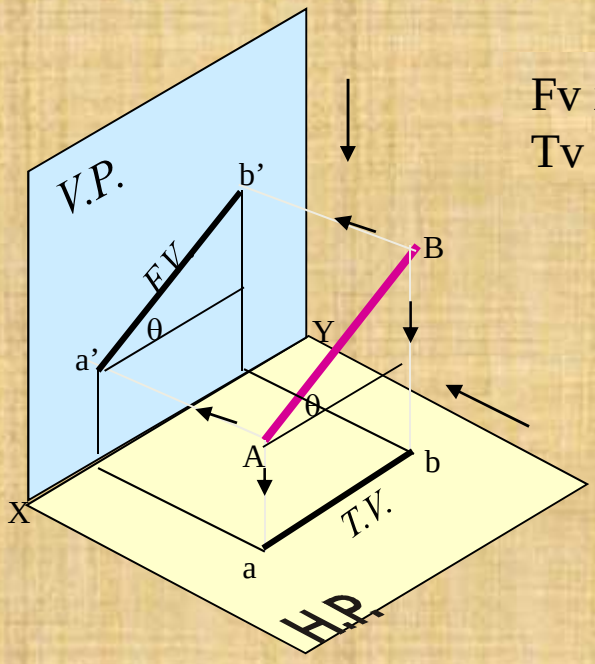
Note:
Fv & Tv both are
// to xy
&
both show T. L.



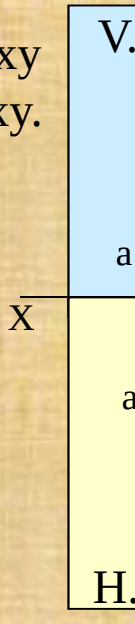
3.

A Line inclined to Hp
and
parallel to Vp

(Pictorial presentation)



Fv inclined to xy
Tv parallel to xy.

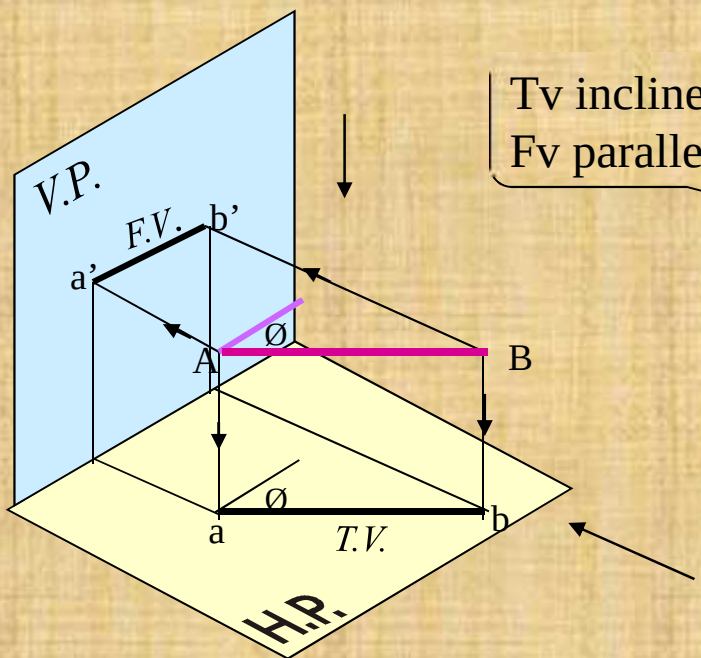


Orthog

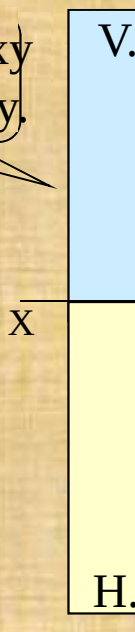
4.

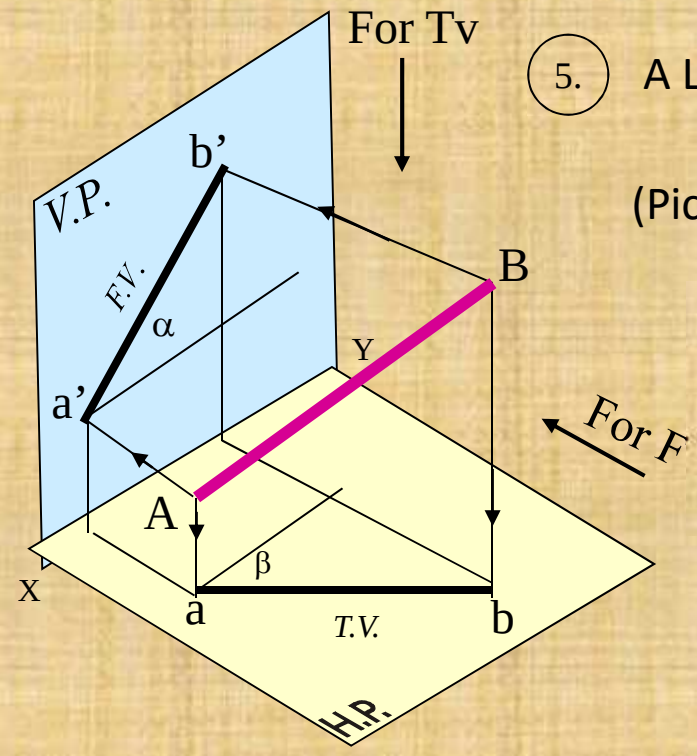
A Line inclined to Vp
and
parallel to Hp

(Pictorial presentation)



Tv inclined to xy
Fv parallel to xy.





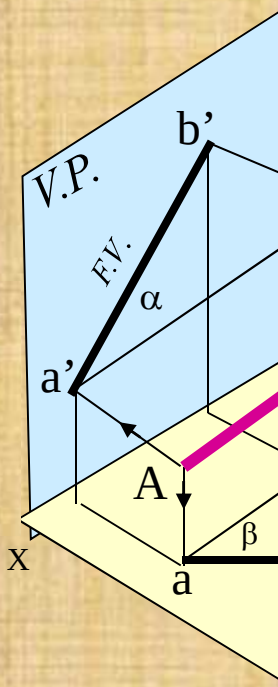
5. A Line inclined to both Hp and Vp

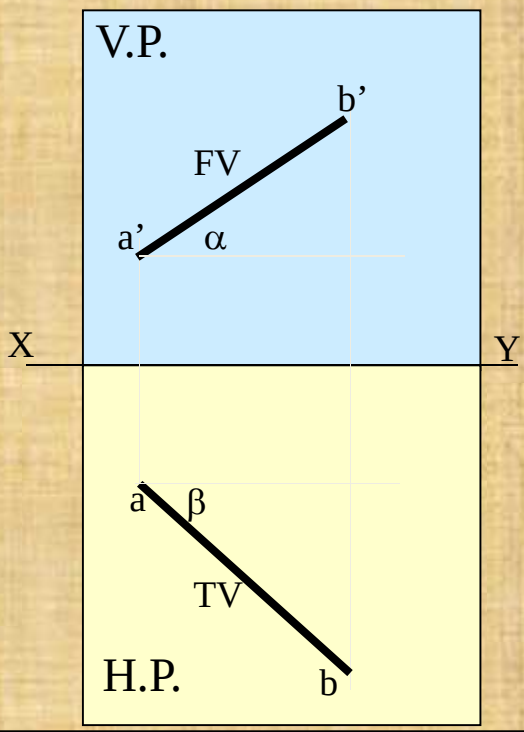
(Pictorial presentation)

On removal of object i.e. Line AB

Fv as a image on Vp.

Tv as a image on Hp,





Orthographic Projections

Fv is seen on Vp clearly.

To see Tv clearly, HP is rotated 90^0 downwards,

Hence it comes below xy.

Note

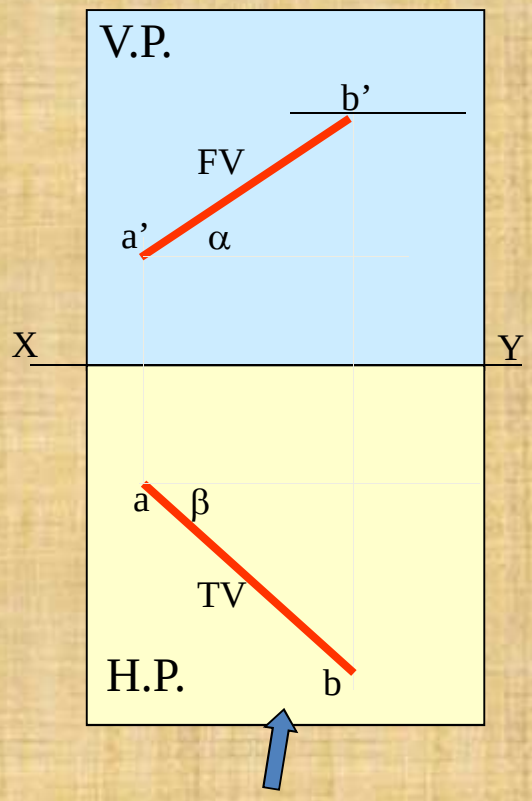
Both Fv &

(No view

Both Fv & T

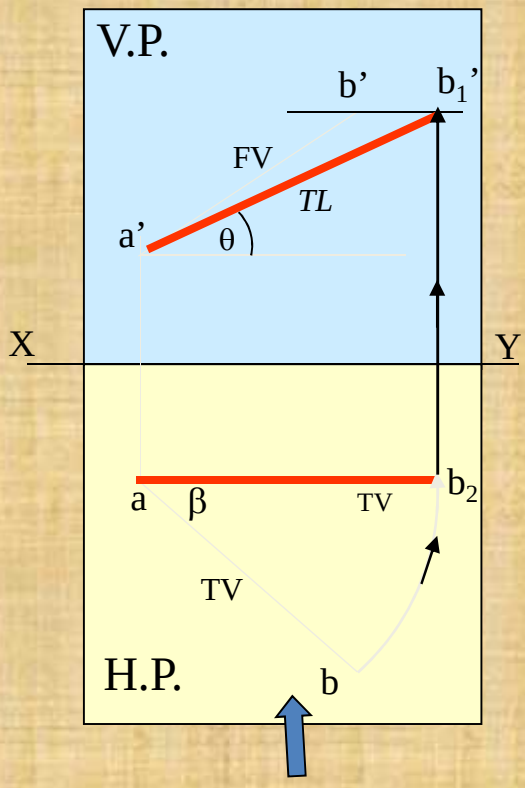
(No view s

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



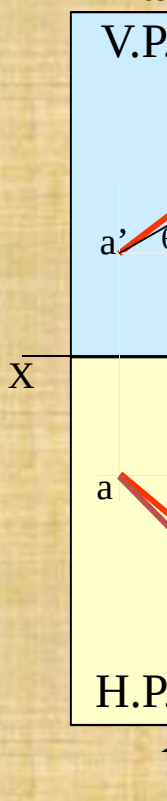
Here TV (ab) is not // to XY line
Hence it's corresponding FV
a' b' is not showing
True Length &
True Inclination with Hp.

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).



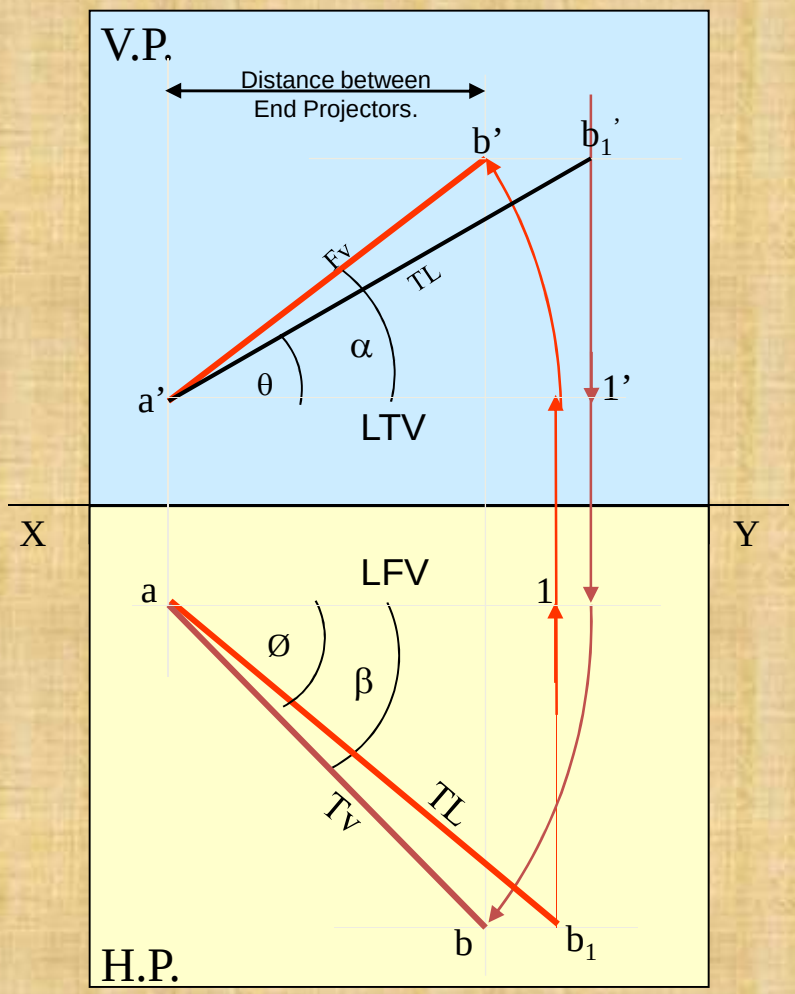
In this sketch, TV is rotated
and made // to XY line.
Hence it's corresponding
FV a' b1' Is showing
True Length
&
True Inclination with Hp.

Not
When T
How
(Compon
which
to



Here
of TL al
Hence
Locus o
to get p
Similar
of other TL

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' b_1' &
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) – Comp
7) LFV (length of TV) – Comp
8) Position of A- Distances of
9) Position of B- Distances of
10) Distance between End Pr

NOTE this

θ & α Construct wi

Ø & β Construct wi

b' & b_1' on same locu

b & b_1 on same locus

Also Remember

True Length is never rotated. It drawn & it is further rota

Views are always rotated, ma extended to locate

GROUP (A)

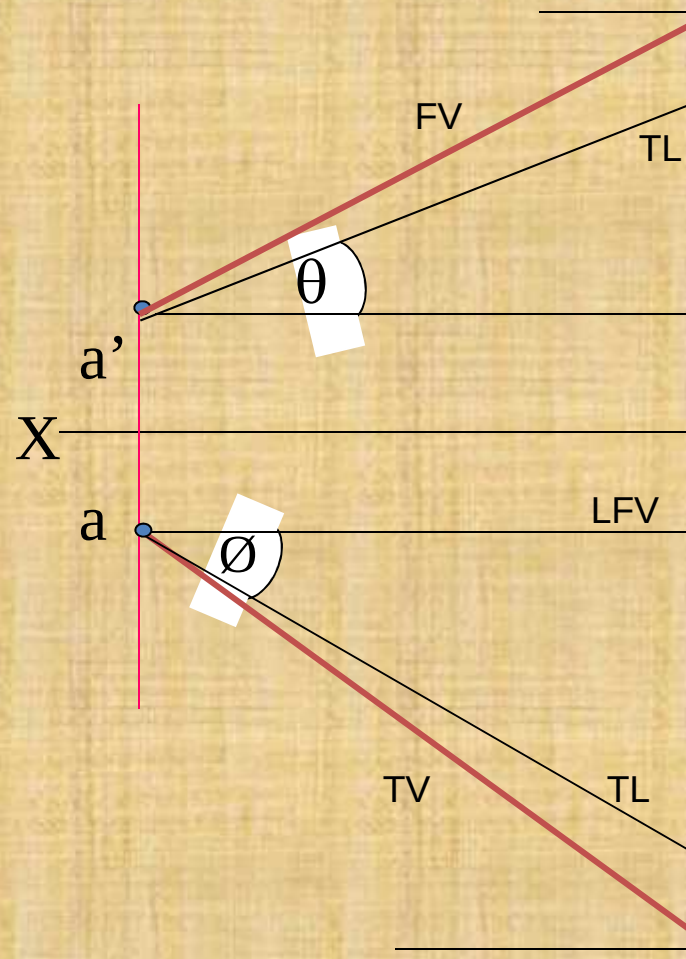
GENERAL CASES OF THE LINE INCLINED TO BOTH H
(based on 10 parameters).

PROBLEM 1)

Line AB is 75 mm long and it is 30^0 & 40^0 Inclined to Hp & Vp respectively. End A is 12mm above Hp and 10 mm in front of Vp.
Draw projections. Line is in 1^{st} quadrant.

SOLUTION STEPS:

1) Draw xy line and one projector.
2) Locate a' 12mm above xy line & a 10mm below xy line.
3) Take 30^0 angle from a' & 40^0 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.



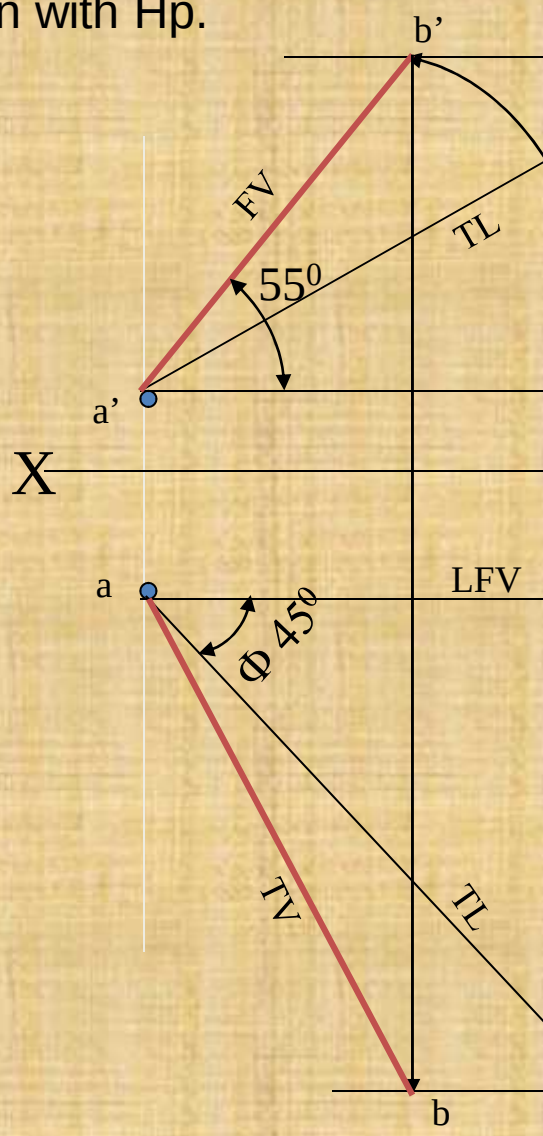
PROBLEM 2:

Line AB 75mm long makes 45^0 inclination with Vp while it's Fv make
End A is 10 mm above Hp and 15 mm in front of Vp.If line is in 1st q
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 45^0 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 55^0 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'*.This *a' b'* 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.

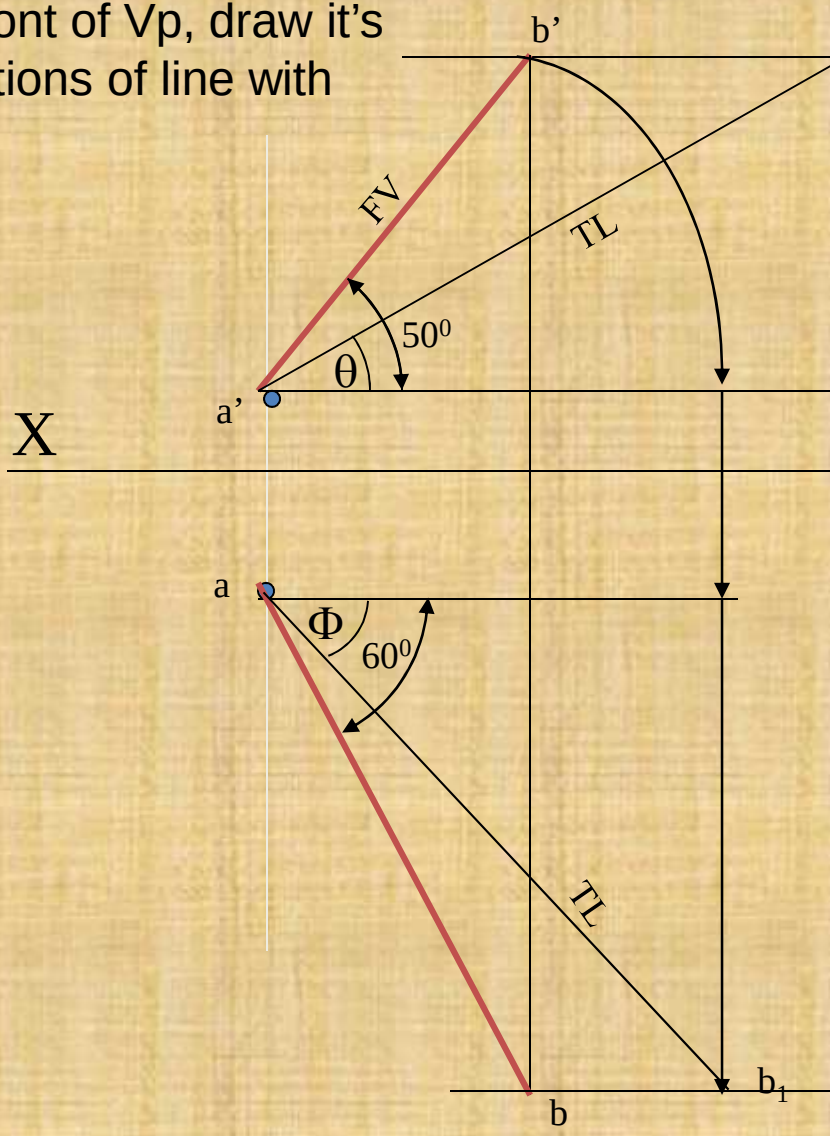


PROBLEM 3:

Fv of line AB is 50^0 inclined to xy and measures 55 mm long while it's Tv is 60^0 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 50^0 to xy from a' and mark b' Cutting 55mm on it.
5. Similarly draw Tv 60^0 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_1 & $a'b_1'$ and their angles with Hp and Vp.

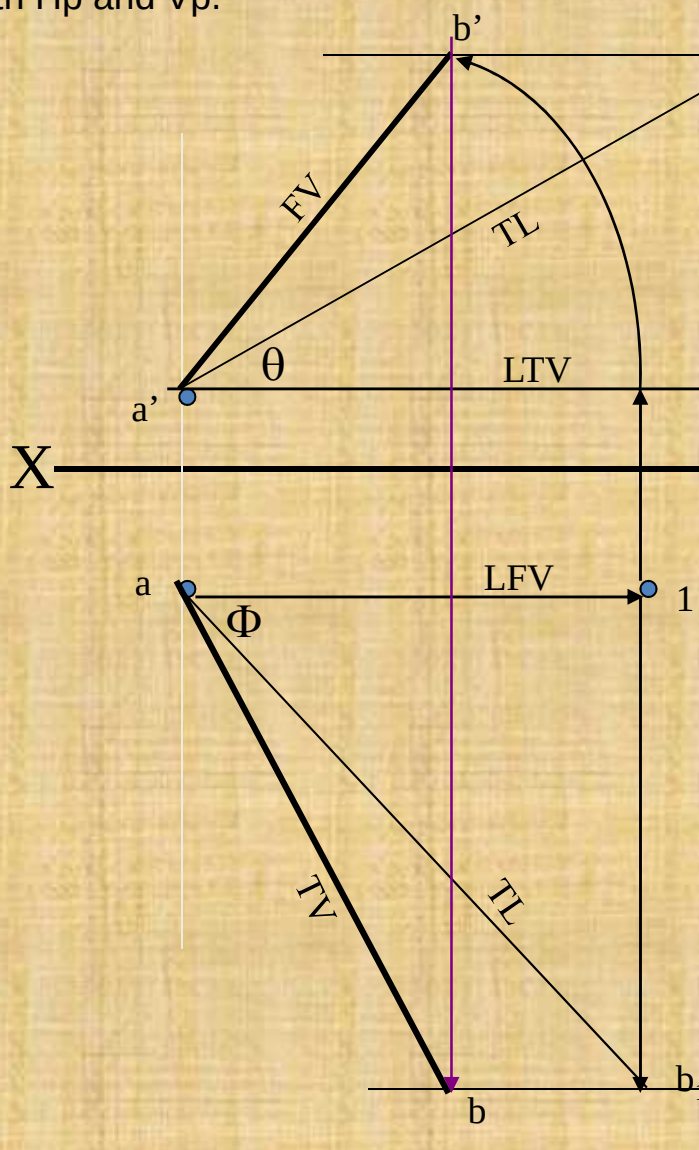


PROBLEM 4 :-

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

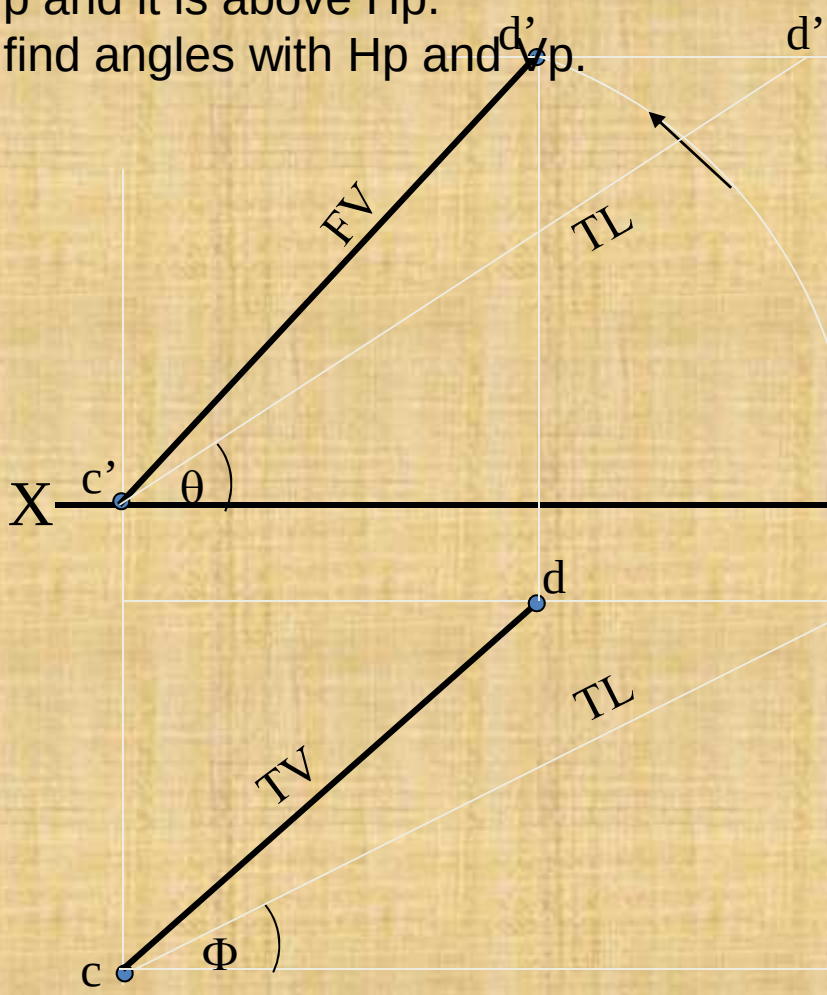


PROBLEM 5 :-

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 lengths 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



Unit- III

Projections of Lines

(Inclined to Both The Planes)

GROUP (B)

PROBLEMS INVOLVING TRACES OF THE LINE.

TRACES OF THE LINE:-

THESE ARE THE POINTS OF INTERSECTIONS OF A LINE (OR I
WITH RESPECTIVE REFFERENCE PLANES.

A LINE ITSELF OR IT'S EXTENSION, WHERE EVER TOUCHES H
THAT POINT IS CALLED TRACE OF THE LINE ON H.P.(IT IS CAL

SIMILARLY, A LINE ITSELF OR IT'S EXTENSION, WHERE EVER
THAT POINT IS CALLED TRACE OF THE LINE ON V.P.(IT IS CAL

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

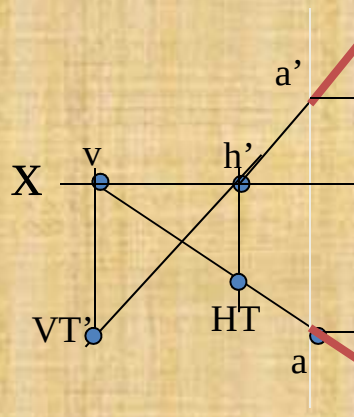
H.T.:- It is a point on Hp.
Hence it is called *Tv* of a point in Hp.
Hence it's *Fv* comes on XY line.(Here onward named as 'h

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

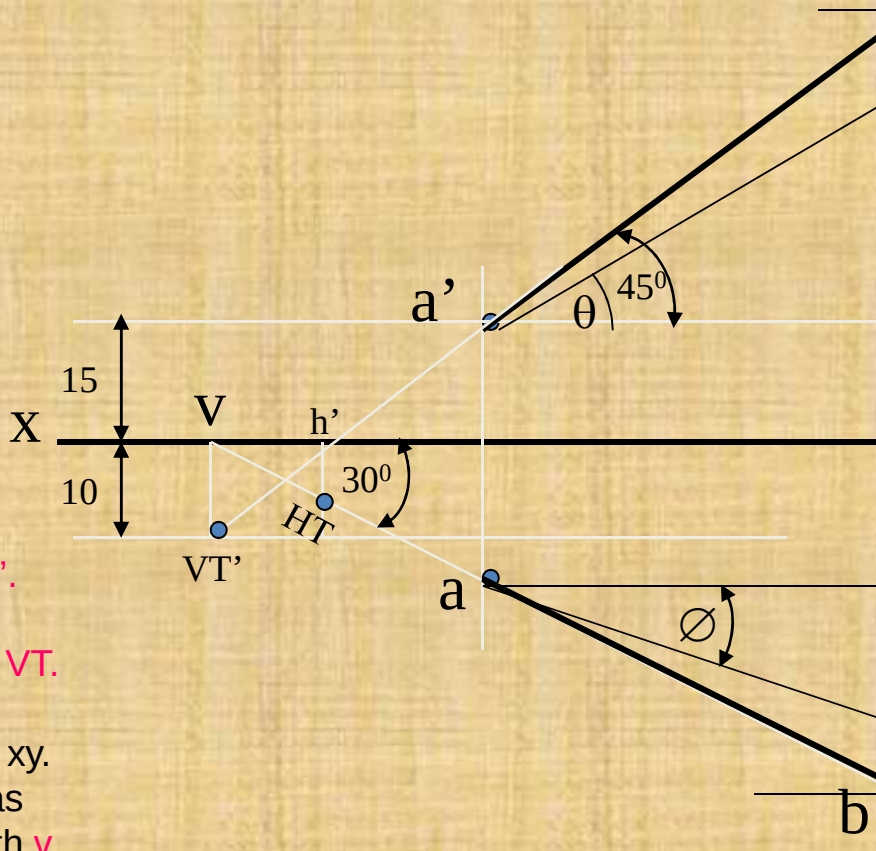


Observe & note :-

1. Points h' & v always on
2. VT' & v always on one p
3. HT & h' always on one p
4. FV - h'- VT' always co-
5. TV - v - HT always co-

These p
solve ne

PROBLEM 6 :- Fv of line AB makes 45^0 angle with XY line and measures 60 mm. Line's Tv makes 30^0 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.

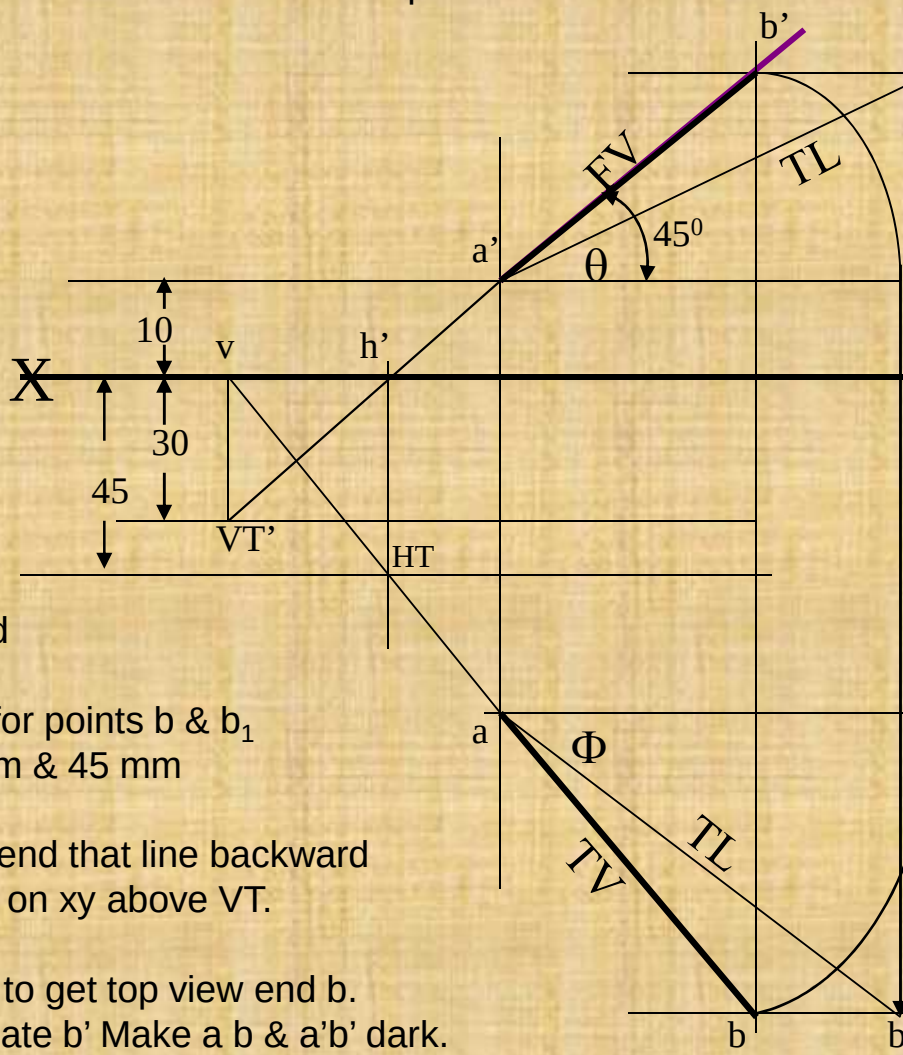


SOLUTION STEPS:-

Draw xy line, one projector and locate fv a' 15 mm above xy.
Take 45^0 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 30^0 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 45^0 inclined to xy while it's HT & VT are 45mm and 30 mm below xy respectiv
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 45^0 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.

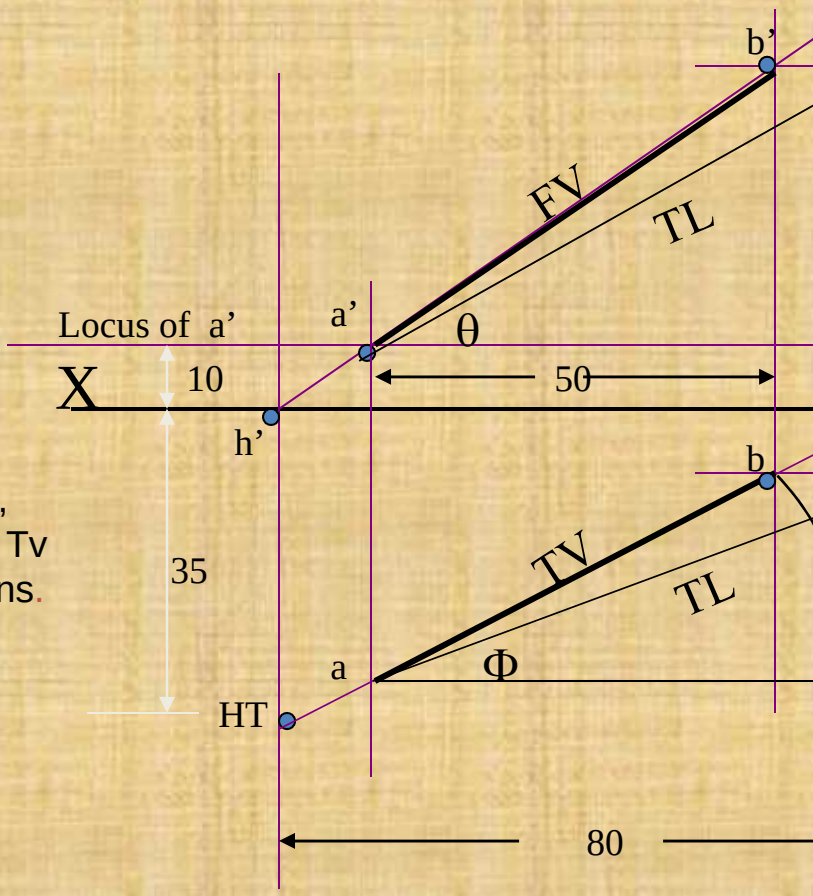
PROBLEM 8 :- Projectors drawn from HT and VT of a line AB are 80 mm apart and those drawn from it's ends are 50 mm apart. End A is 10 mm above Hp, VT is 35 mm below Hp while it's HT is 45 mm in front of Vp. Draw projections, locate traces and find TL of line & inclinations with Hp and Vp.

SOLUTION STEPS:-

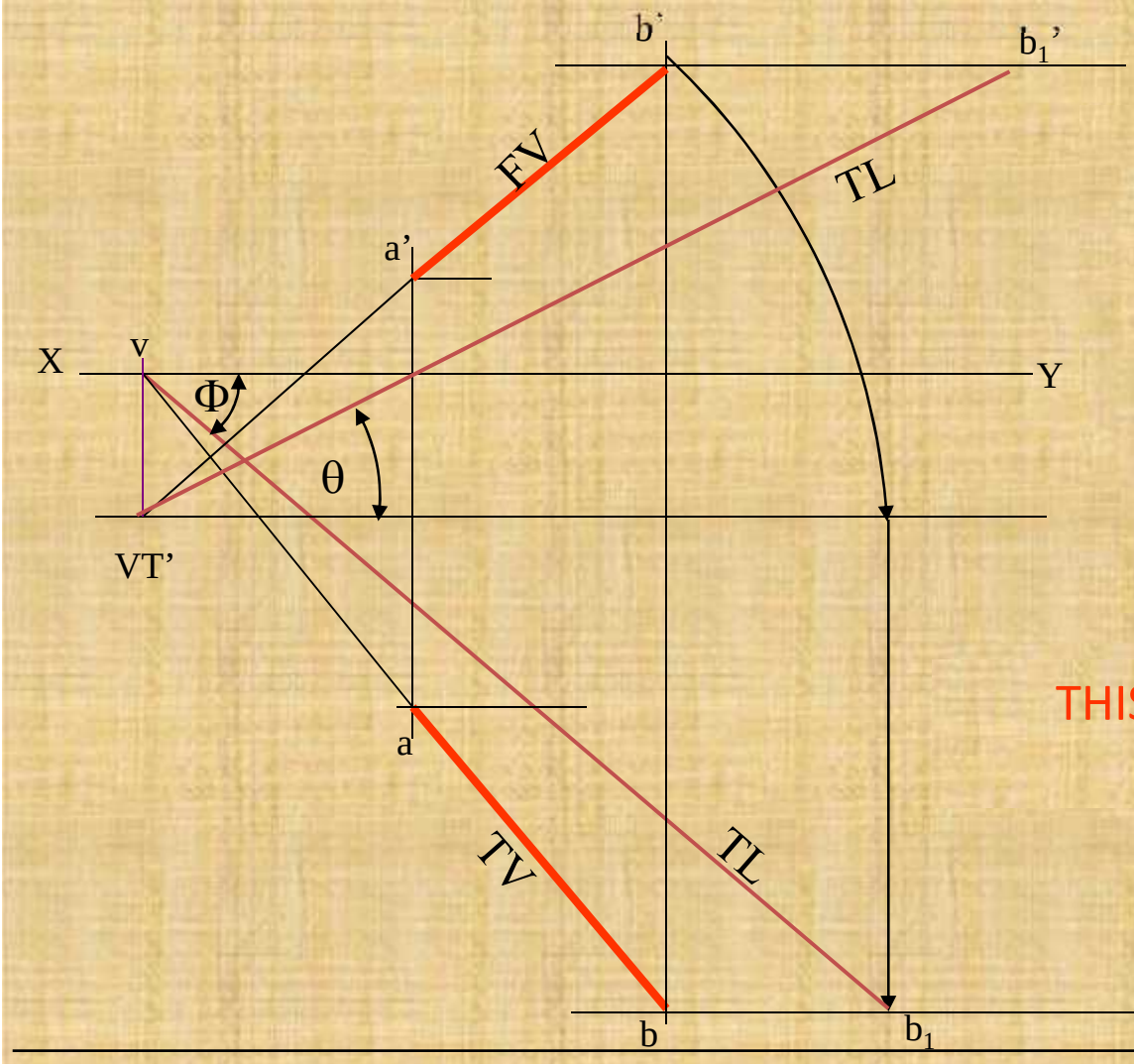
1.Draw xy line and two projectors, 80 mm apart and locate HT & VT , 35 mm below xy and 55 mm above xy respectively on these projectors.

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 poi
if v & VT' are considered as first point , then true inclinations o
Hp & Vp i.e. angles θ & Φ can be constructed with points VT' & V

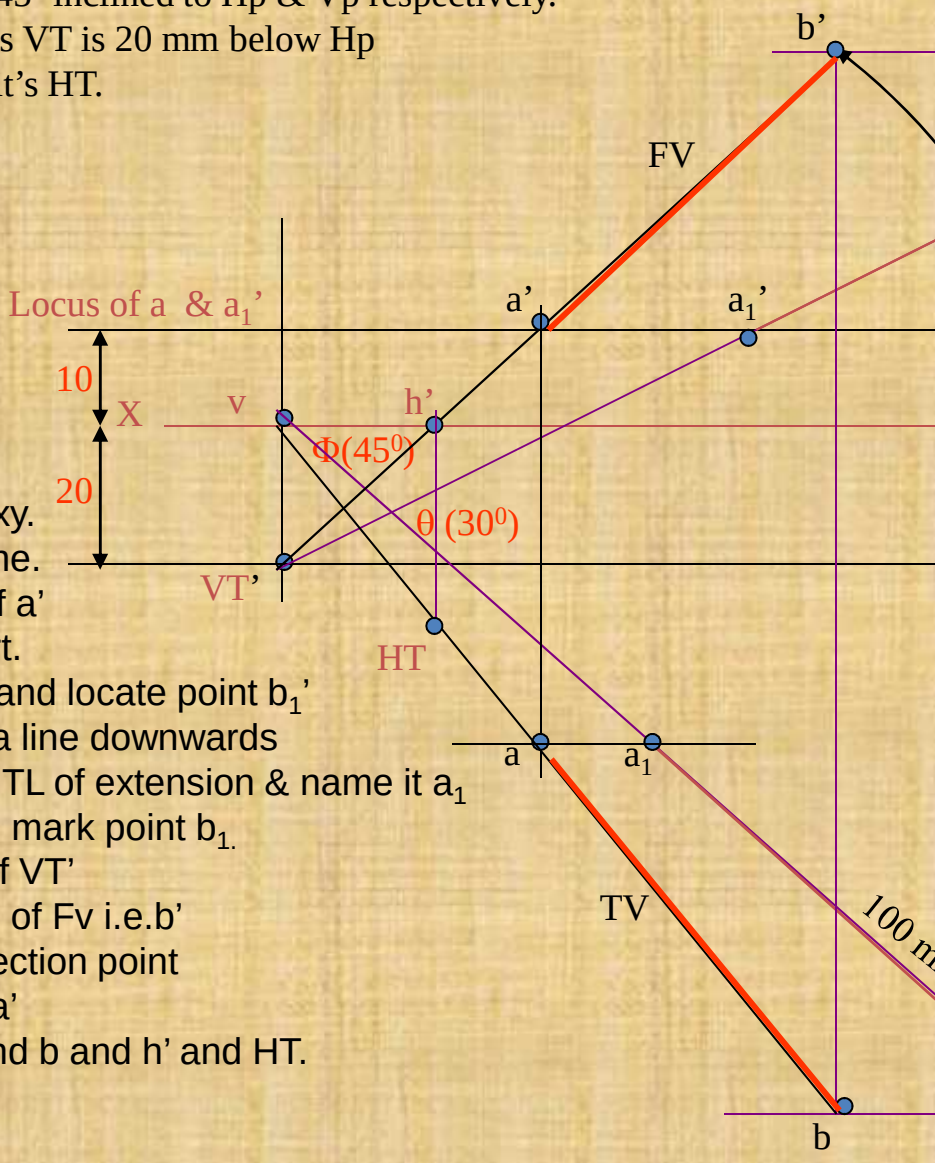


Then from p
angles β & Φ
&
From poin
angles α & θ

THIS CONCEPT IS US
NEXT *THREE* PR

PROBLEM 9 :-

Line AB 100 mm long is 30^0 and 45^0 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.

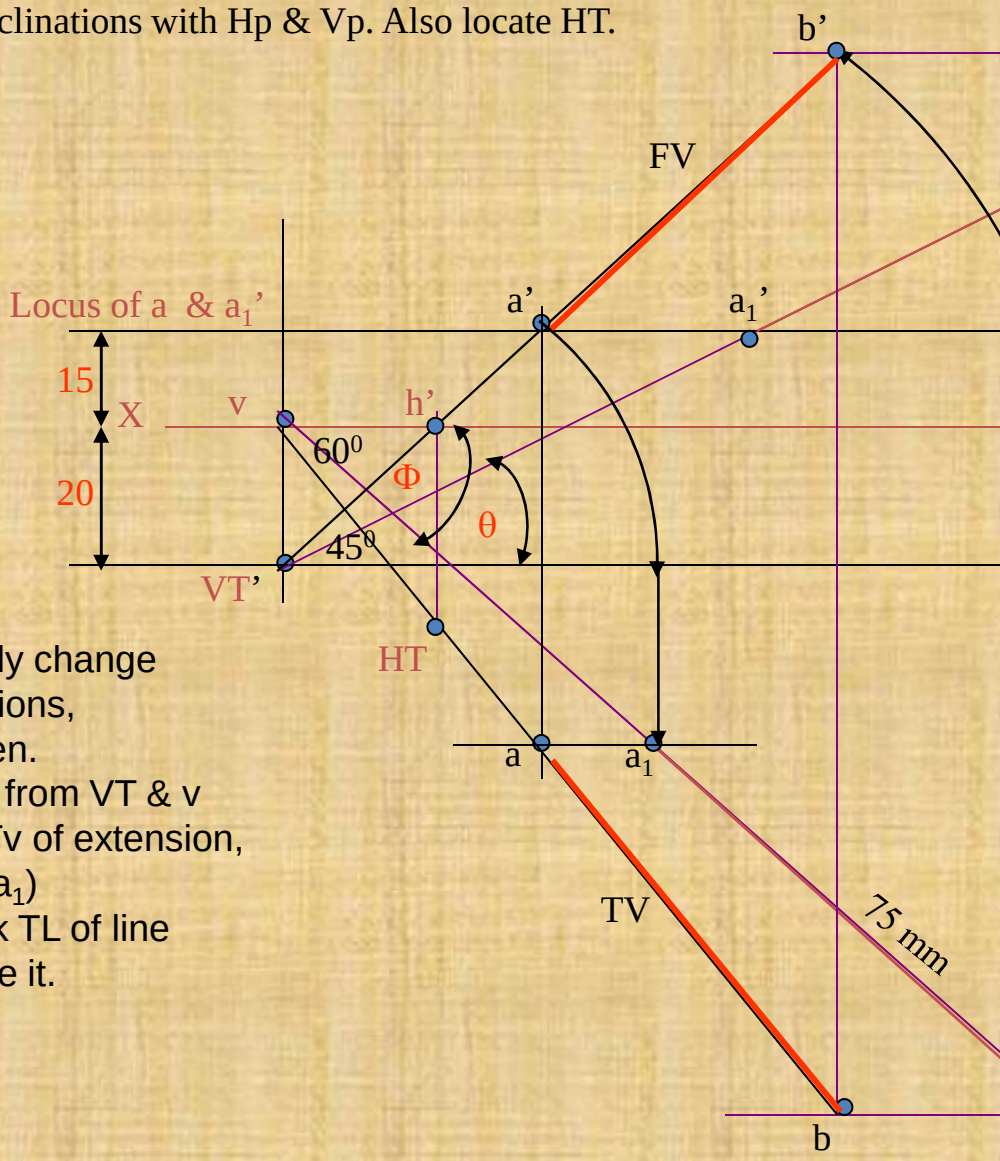


SOLUTION STEPS:-

Draw xy, one projector
and locate on it VT and V.
Draw locus of a' 10 mm above xy.
Take 30^0 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 45^0 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 :-

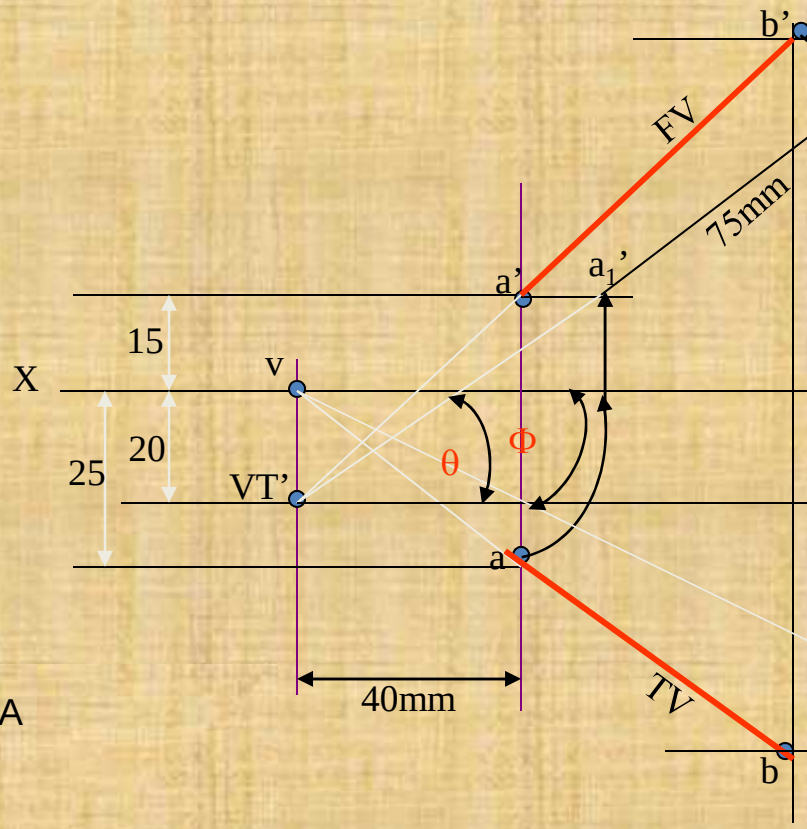
A line AB is 75 mm long. It's Fv & Tv make 45^0 and 60^0 inclinations with X-Y line resp End A is 15 mm above Hp and VT is 20 mm below Xy line. Line is in first quadrant. Draw projections, find inclinations with Hp & Vp. Also locate HT.



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



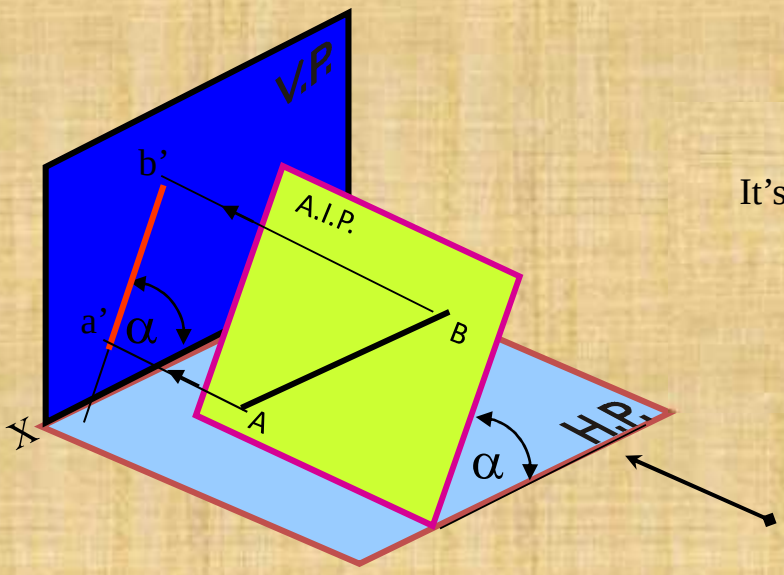
Draw two projectors for VT & end A
Locate these points and then

YES !

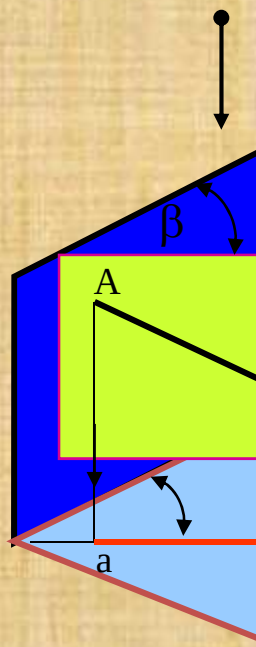
YOU CAN COMPLETE IT.

GROUP (C)

CASES OF THE LINES IN A.V.P., A.I.P. & PROFILE PLANE.

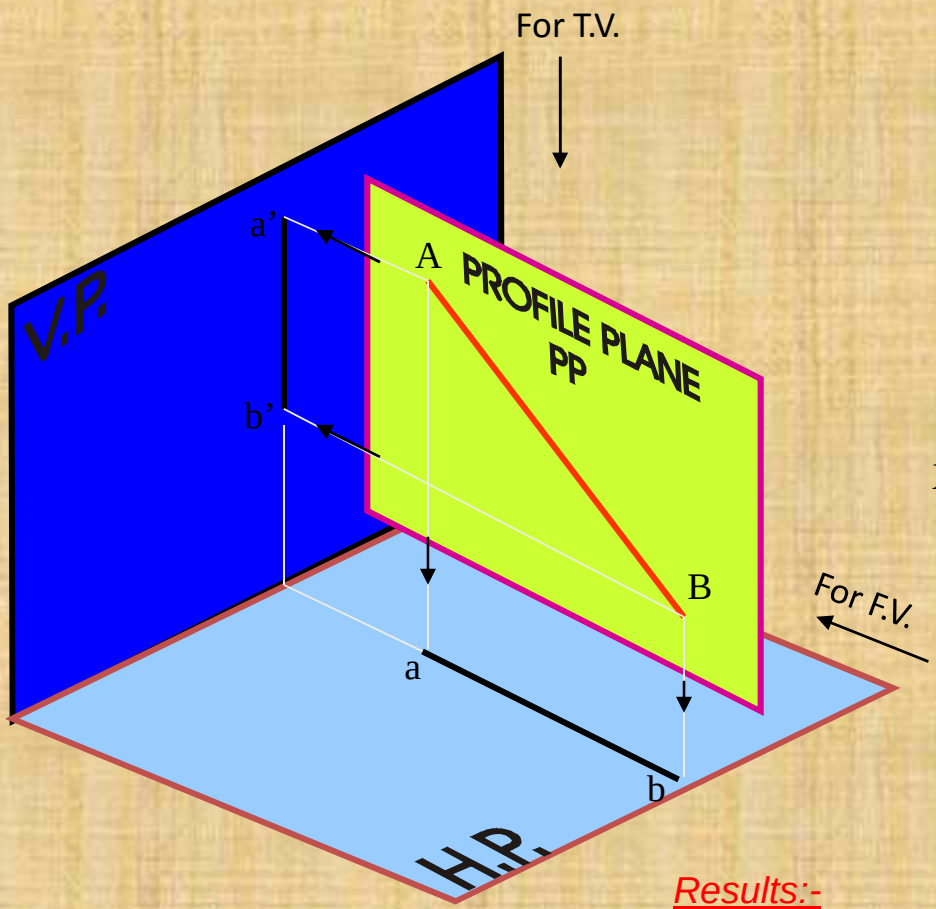


Line AB is in AIP as shown in above f
It's FV (a'b') is shown projected on Vp.(Lookin
Here one can clearly see that t
Inclination of AIP with HP = Inclination of

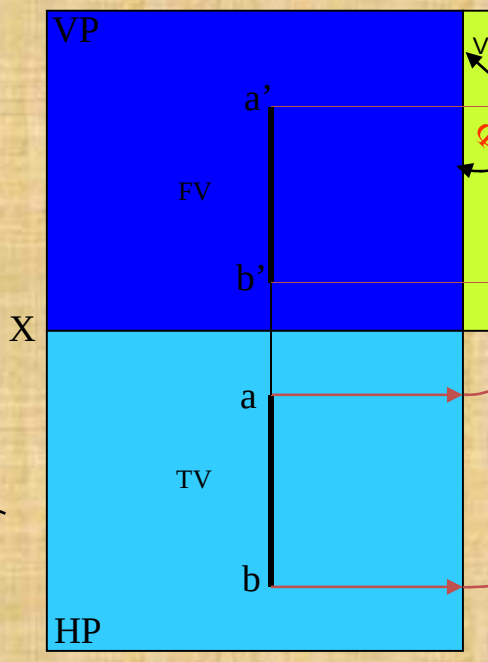


Line AB is in AVP as shown in above figure no 2..
It's TV (a b) is shown projected on Hp.(Looking in arrow direction)
Here one can clearly see that the
Inclination of AVP with VP = Inclination of TV with XY line

LINE IN A PROFILE PLANE (MEANS IN A PLANE PERPENDICULAR TO



ORTHOGRAPHIC PATTERN OF

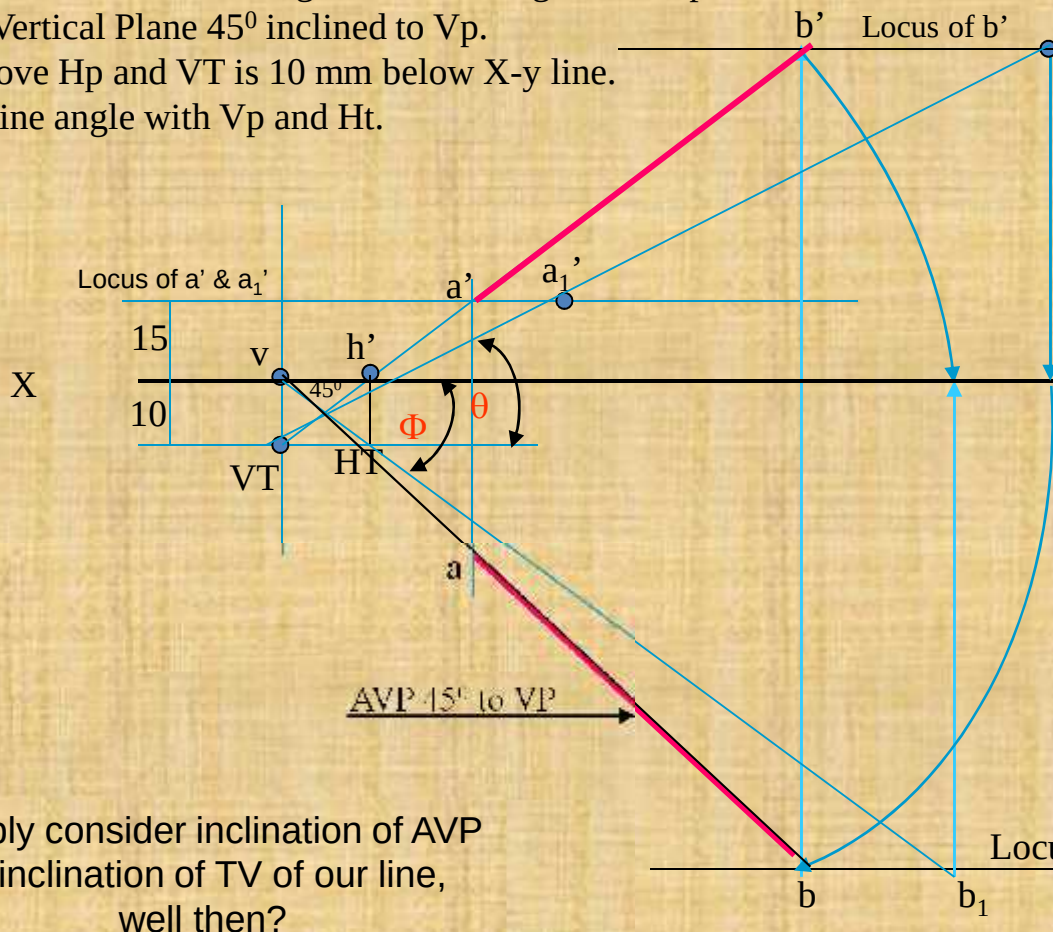


Results:-

1. TV & FV both are vertical, hence arrive on
2. It's Side View shows True Length (TL)
3. Sum of it's inclinations with HP & VP equa
4. It's HT & VT arrive on same projector and From Side View.

OBSERVE CAREFULLY ABOVE GIVEN ILLUSTRATION AND 2nd SOLVED P

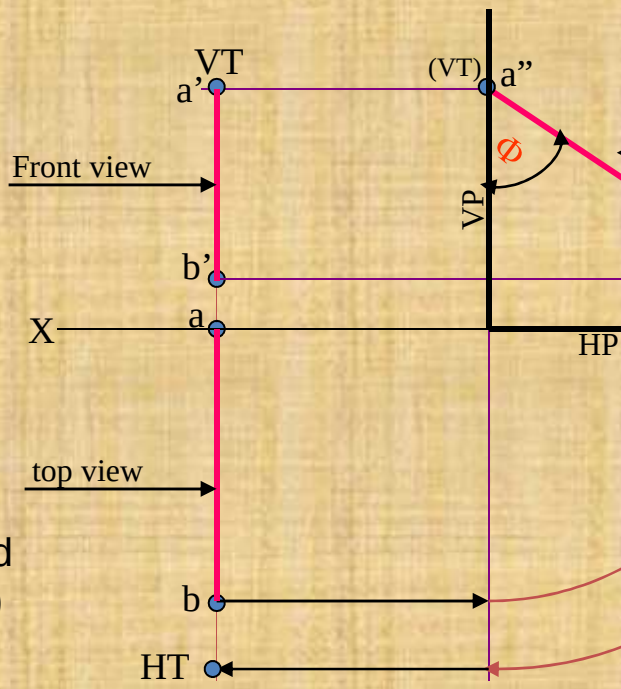
PROBLEM 12 :- Line AB 80 mm long, makes 30^0 angle with Hp and lies in an Aux.Vertical Plane 45^0 inclined to Vp.
End A is 15 mm above Hp and VT is 10 mm below X-y line.
Draw projections, fine angle with Vp and Ht.



Simply consider inclination of AVP as inclination of TV of our line, well then?

You sure can complete it as previous problems! Go ahead!!

PROBLEM 13 :- A line AB, 75mm long, has one end A in Vp. Other end B is 15 mm ab
and 50 mm in front of Vp.Draw the projections of the line when sum of it's
Inclinations with HP & Vp is 90^0, 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.

Unit- III

Projections of Planes

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

What will be given in the problem?

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

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

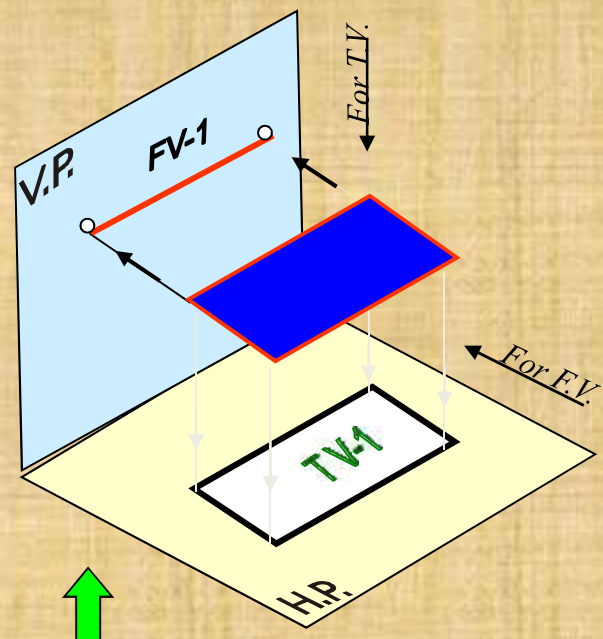
1. Inclination of it's SURFACE with one of the reference planes will be g
2. Inclination of one of it's EDGES with other reference plane will b

(Hence this will be a case of an object inclined to both ref

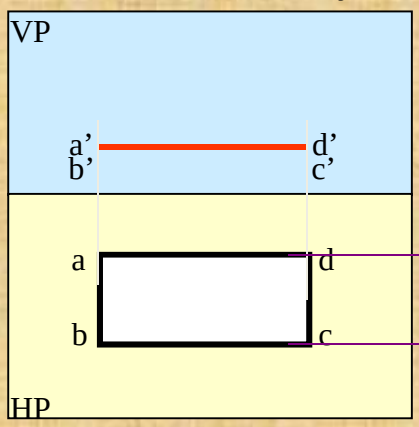
Study the illustration showing
surface & side inclination given on next page.

CASE OF A RECTANGLE – OBSERVE AND NOTE ALL STEPS

SURFACE PARALLEL TO HP
PICTORIAL PRESENTATION

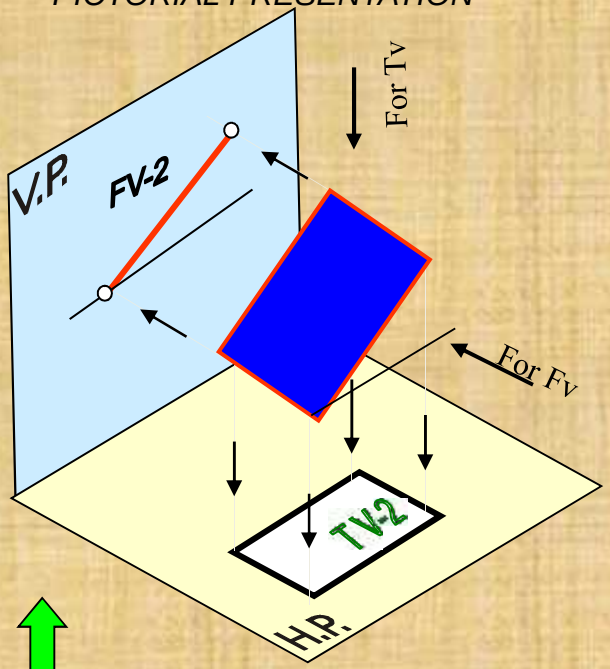


ORTHOGRAPHIC
TV-True Shape
FV- Line // to xy

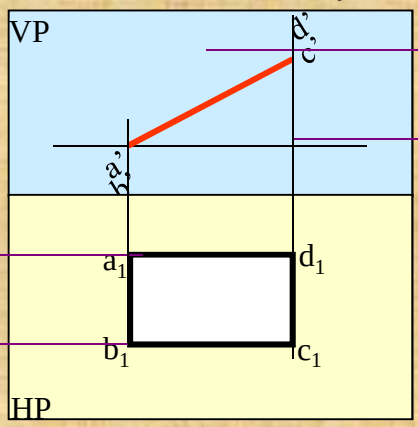


A

SURFACE INCLINED TO HP
PICTORIAL PRESENTATION

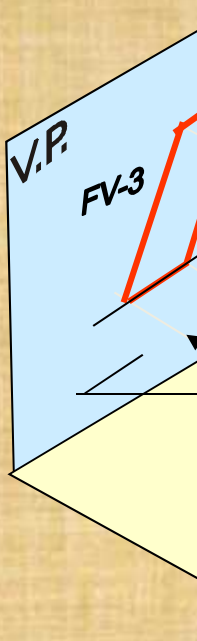


ORTHOGRAPHIC
FV- Inclined to XY
TV- Reduced Shape

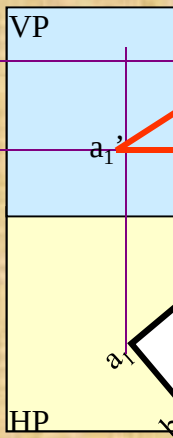


B

ONE SMALL S
PICTORIA



ORTHO
FV- Appa
TV-Prev



PROCEDURE OF SOLVING THE PROBLEM:

IN THREE STEPS EACH PROBLEM CAN BE SOLVED:(As Shown In Previ

STEP 1. Assume suitable conditions & draw Fv & Tv of initial pos

STEP 2. Now consider surface inclination & draw 2nd Fv & Tv.

STEP 3. After this,consider side/edge inclination and draw 3rd (fi

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 Sha

And If surface is assumed // to VP – It's FV will show True Sh

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) perpendicula

(similar to pair no. A on previous page illustration).

low Complete STEP 2. By making surface inclined to the resp plane &

(Ref. 2nd pair B on previous page illustration

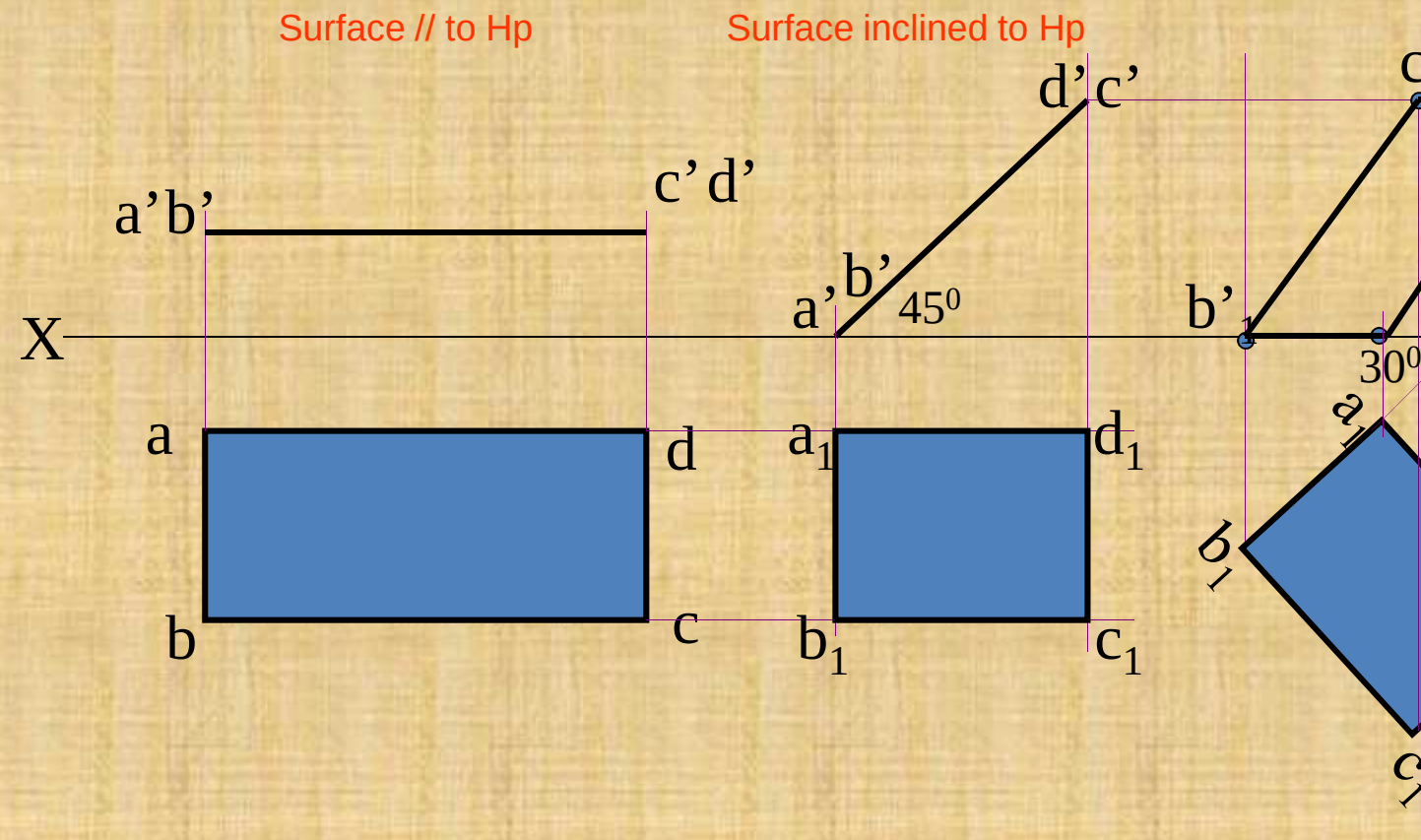
low Complete STEP 3. By making side inclined to the resp plane & pr

(Ref. 3nd pair C on previous page illustration)

APPLY SAME STEPS TO SOLVE NEXT ELEVEN

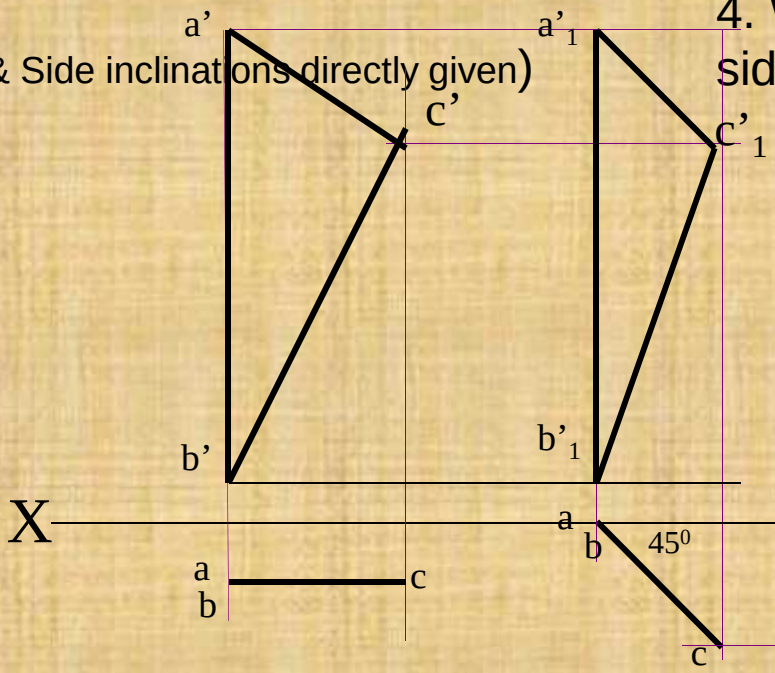
Problem 1:
Rectangle 30mm and 50mm sides is resting on HP on one small side which is 30^0 inclined to VP,while the surface of the plane makes 45^0 inclination with HP. Draw it's projections.

Read problem and answer follow
1. Surface inclined to which plane
2. Assumption for initial position?
3. So which view will show True
4. Which side will be vertical? --
Hence begin with TV, draw rectar
drawing one small side ve



Problem 2:
A $30^0 – 60^0$ set square of longest side
100 mm long, is in VP and 30^0 inclined
to HP while it's surface is 45^0 inclined
to VP.Draw it's projections

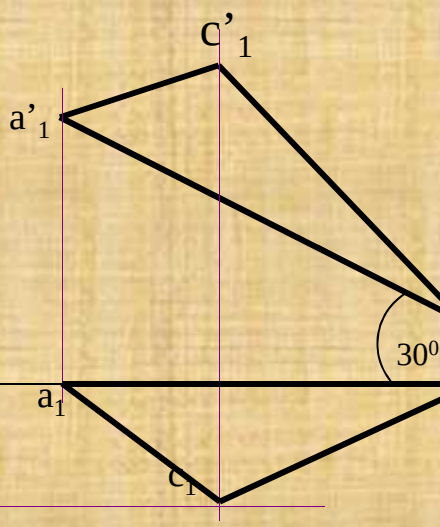
(Surface & Side inclinations directly given)



Surface // to Vp Surface inclined to Vp

Read problem and answer
questions
1 .Surface inclined to whic
VP
2. Assumption for initial po
VP
Hence begin with FV, draw
3. So which view will show
FV *keeping longest s*
4. Which side will be vertic
side.

side inclined to Hp



Problem 3:

A $30^0 – 60^0$ set square of longest side 100 mm long is in VP and it's surface 45^0 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 follo questions

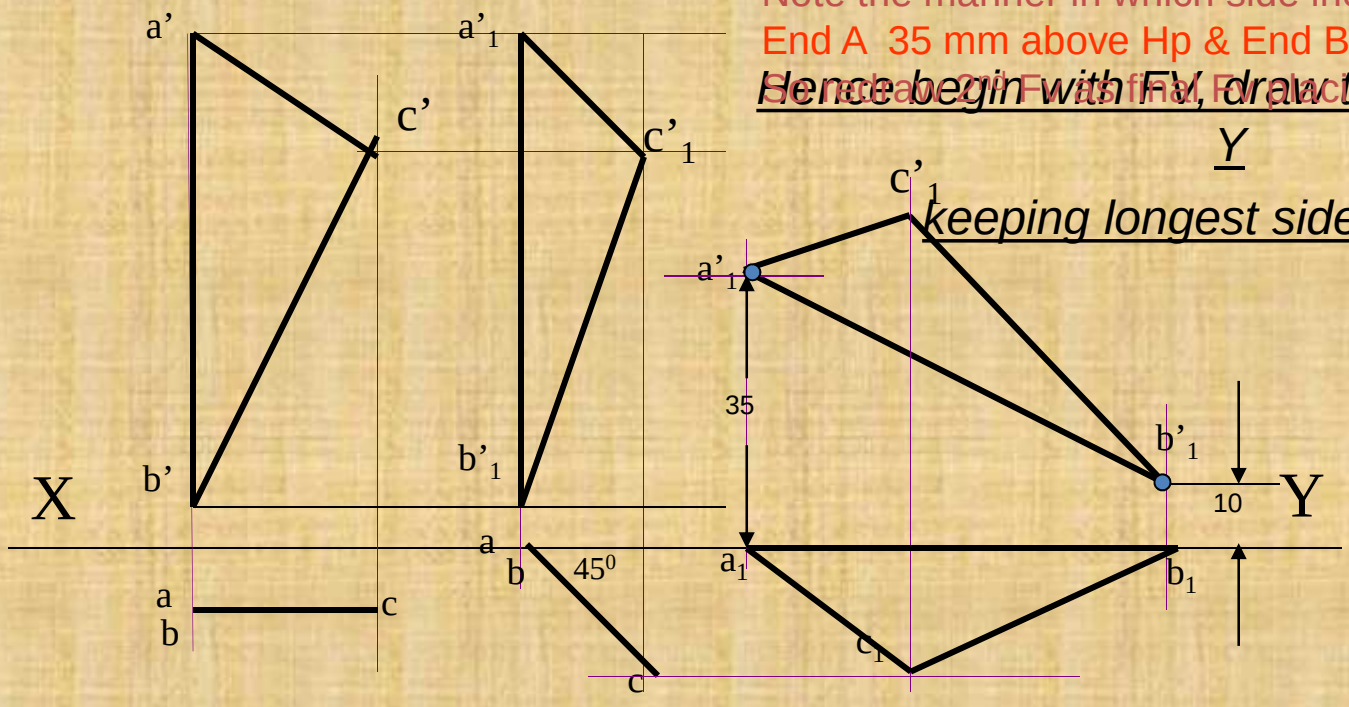
1 .Surface inclined to which pla VP

2. Assumption for initial positio VP

3. So which view will show True FV

4. Which side will be vertical? side.

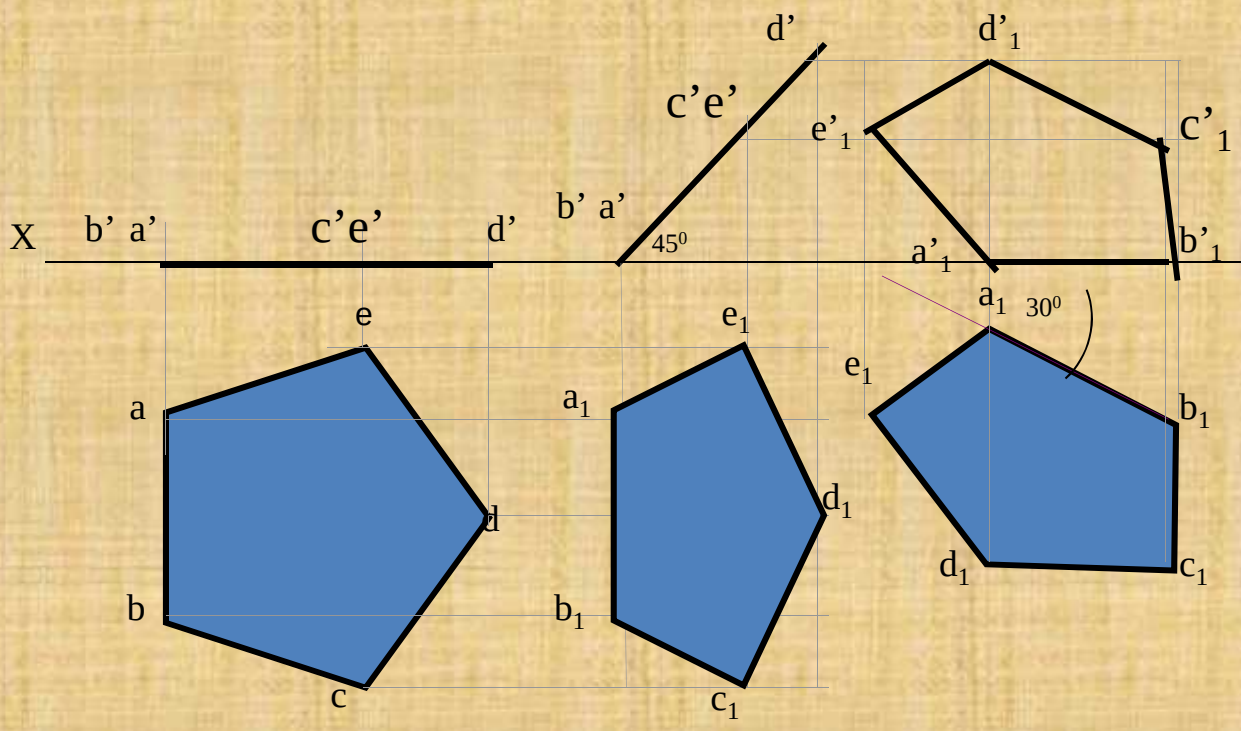
First TWO steps are similar to previo
Note the manner in which side inclin
End A 35 mm above Hp & End B is
Hence begin with FV, draw tria
Scanned with CamScanner



Problem 4:
A regular pentagon of 30 mm sides is resting on HP on one of it's sides with it's surface 45^0 inclined to HP.
Draw it's projections when the side in HP makes 30^0 angle with VP.

SURFACE AND SIDE INCLINATIONS ARE DIRECTLY GIVEN.

Read problem and answer fol
1. Surface inclined to which p
2. Assumption for initial posi
3. So which view will show T
4. Which side will be vertical
Hence begin with TV,draw
X-Y line, taking one side v

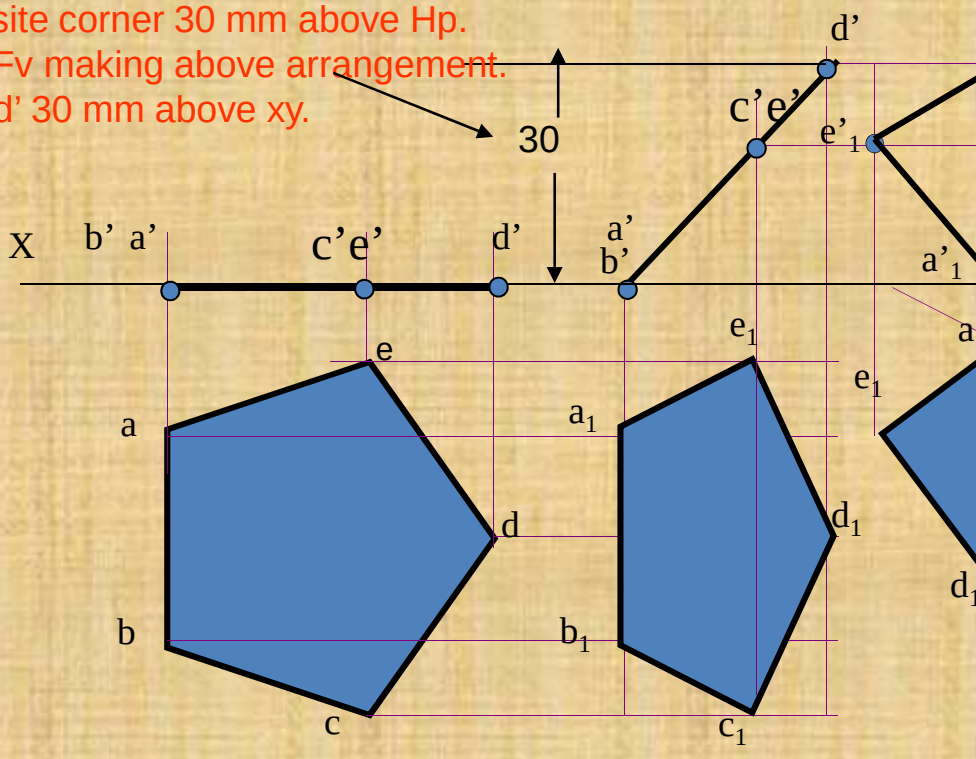


Problem 5:
A regular pentagon of 30 mm sides is resting
on HP on one of it's sides while it's opposite
vertex (corner) is 30 mm above HP.
Draw projections when side in HP is 30^0 inclined to VP.

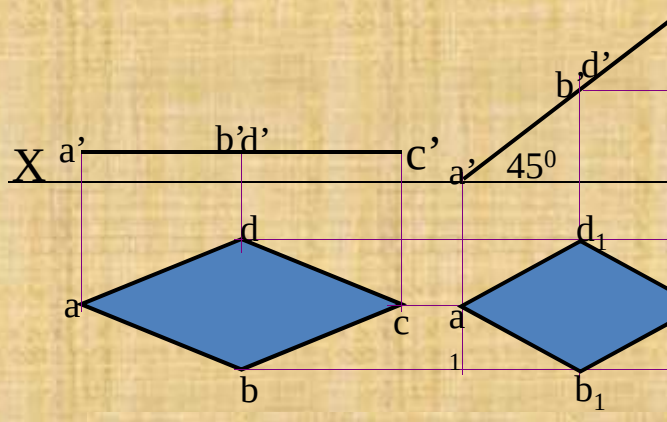
Read problem and answer f
1. Surface inclined to which
2. Assumption for initial po
3. So which view will show
4. Which side will be vertic
Hence begin with TV,dra
X-Y line, taking one side

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.



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 35^0 inclined to HP. If the top-view of the same diagonal makes 40^0 inclination with VP, draw it's projections.



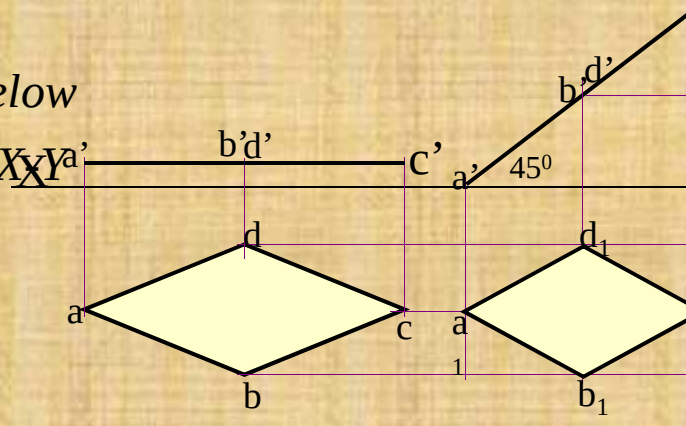
Read problem and answer following questions

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*

The difference in these two proble
In problem no.6 inclination of Tv o
given,It could be drawn directly as
While in no.7 angle of diagonal its
given. Hence here angle of TL is t
Is drawn and then LTV I.e. a1 c1 is
final TV was completed.Study illus

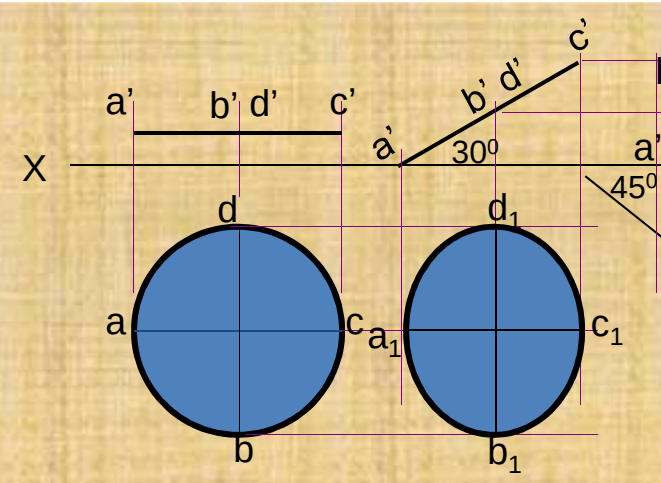
Problem 7: A rhombus of diagonals 40 mm and 70 mm long respectively having one end of it's longer diagonal in HP while that diagonal is 35^0 inclined to HP and makes 40^0 inclination with VP. Draw it's projections.

Begin with TV, draw rhombus below X-Y line, taking longer diagonal // to XY



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 30^0 inclined to Hp while it's Tv is 45^0 inclined to Vp.Draw it's projections.



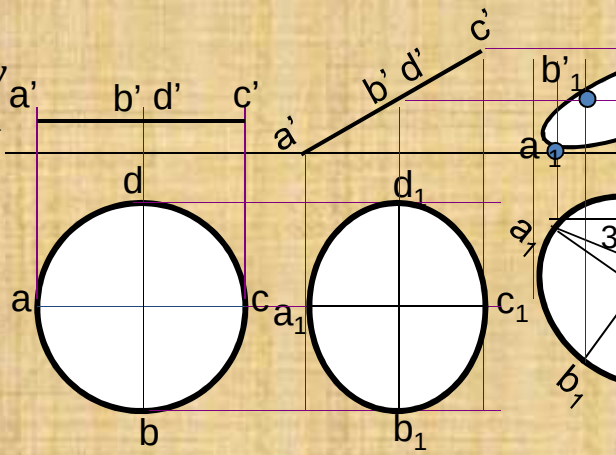
Read problem and answer following questions

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 proble
In problem no.8 inclination of Tv
given,It could be drawn directly a
While in no.9 angle of AC itself i.e
given. Hence here angle of TL is
Is drawn and then LTV I.e. a_1 c_1 i
final TV was completed.Study illu

Problem 9: A circle of 50 mm diameter is resting on Hp on end A of it's diameter AC which is 30^0 inclined to Hp while it makes 45^0 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.

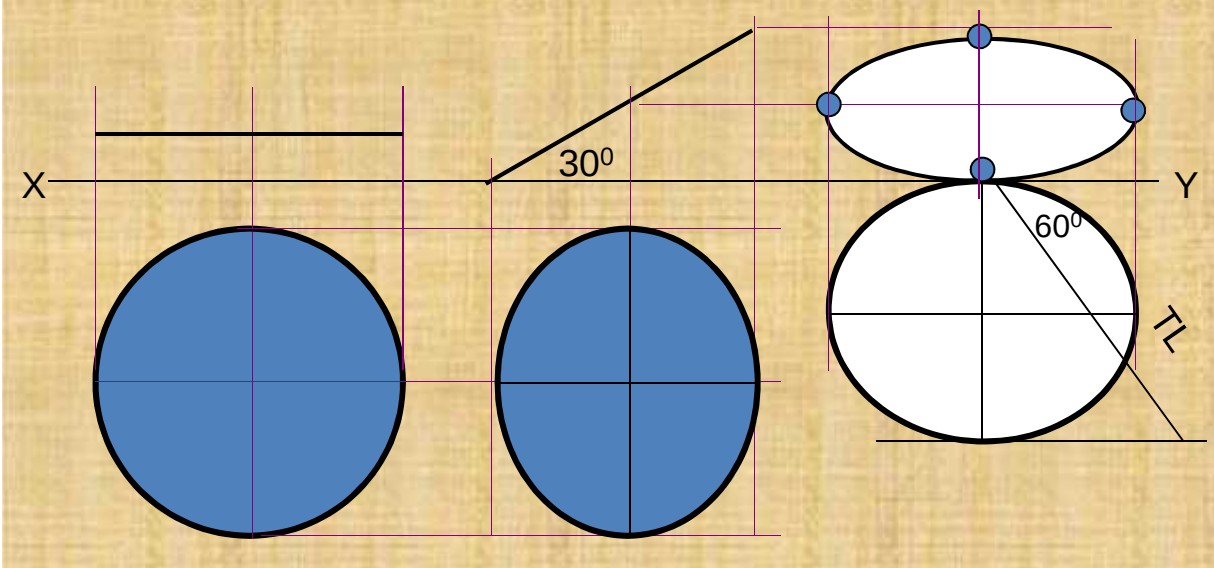
Read problem and answer f
questions
1. Surface inclined to which
HP
2. Assumption for initial po
HP
3. So which view will show
TV
4. Which diameter horizont
AB

Hence begin with TV,dra

X-Y line, taking DIA. AB

The problem is similar to previous problem of circle – no.6.
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*..

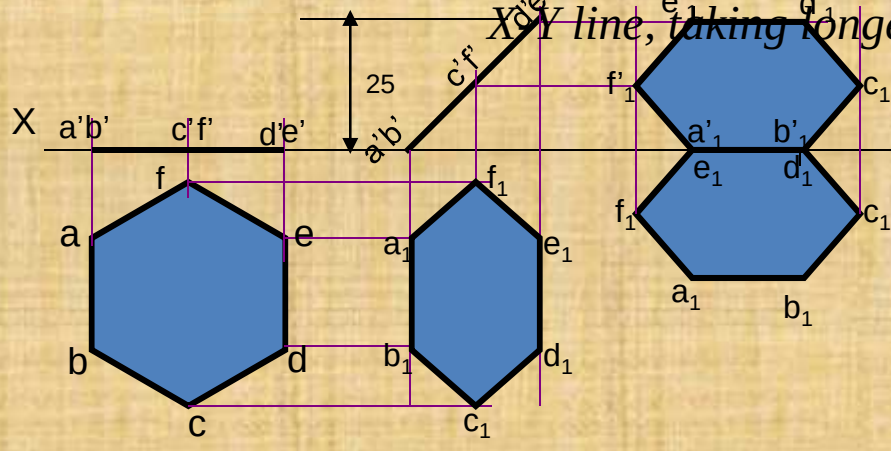


SOLVE S
ON DRA
GIVING
POINTS
AS THE

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.

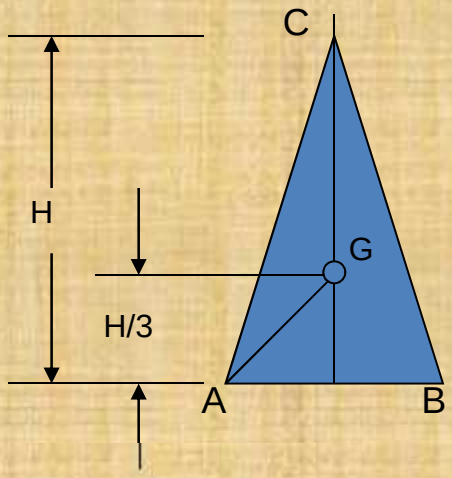
ONLY CHANGE is the manner in which surface inclination is described:
One side on Hp & it's opposite side 25 mm above Hp.
Hence redraw 1st Fv as a 2nd Fv making above arrangement.
Keep a'b' on xy & d'e' 25 mm above xy.

Read problem and answ
questions
1. Surface inclined to wh
HP
2. Assumption for initial
HP
3. So which view will sh
TV
4. Which diameter horiz
AC
Hence begin with TV,
XY line, taking longe



FREELY SUSPENDED CASES.

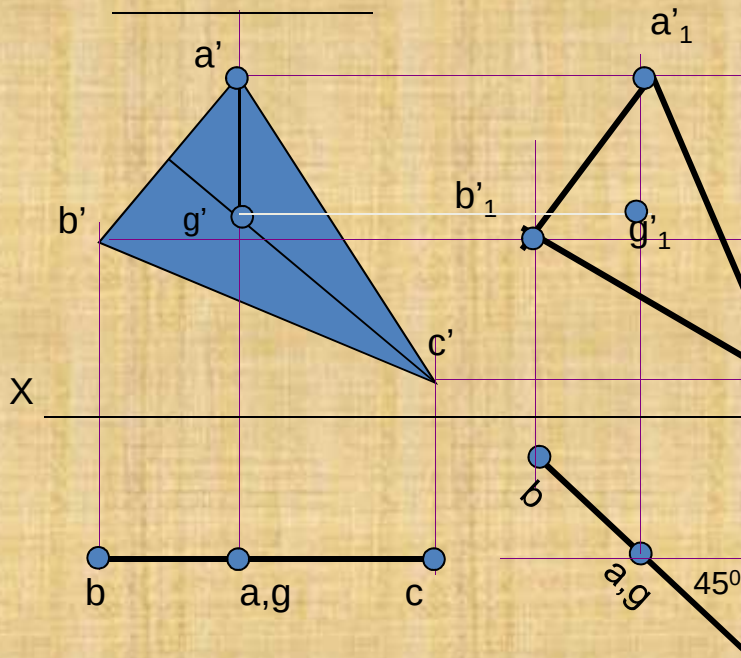
Problem 12:
An isosceles triangle of 40 mm long base side, 60 mm long altitude Is freely suspended from one corner of Base side.It's plane is 45^0 inclined to Vp. Draw it's projections.



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

IMPORTANT POINTS

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



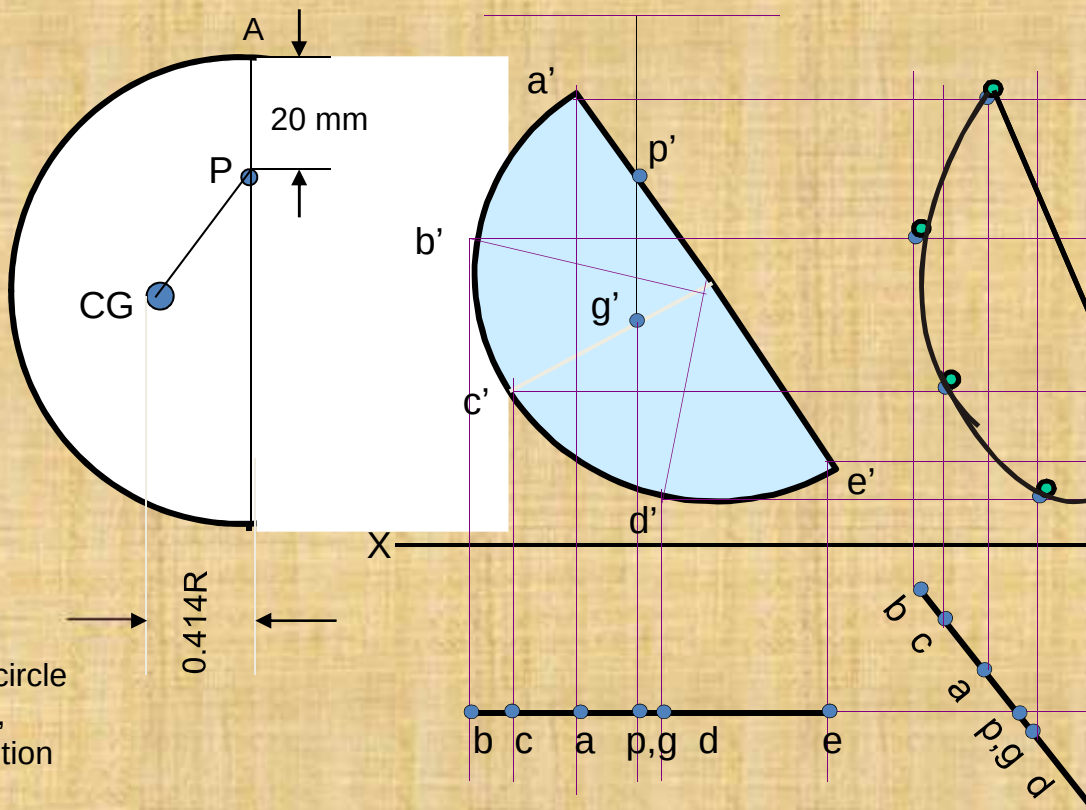
Similarly solve next proble
of Semi-circle

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 rem
2.It may remain parallel or inclined to Vp.
3.Hence *TV* in this case will be always a *LINE*
4.Assuming surface // to Vp, draw true shape in
(Here keep *line joining point of contact & centroid*
5.Always begin with FV as a True Shape but in
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
BY USING AUXILIARY PLANE METHOD

WHAT WILL BE THE PROBLEM?
Description of final Fv & Tv will be giv
You are supposed to determine true

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.

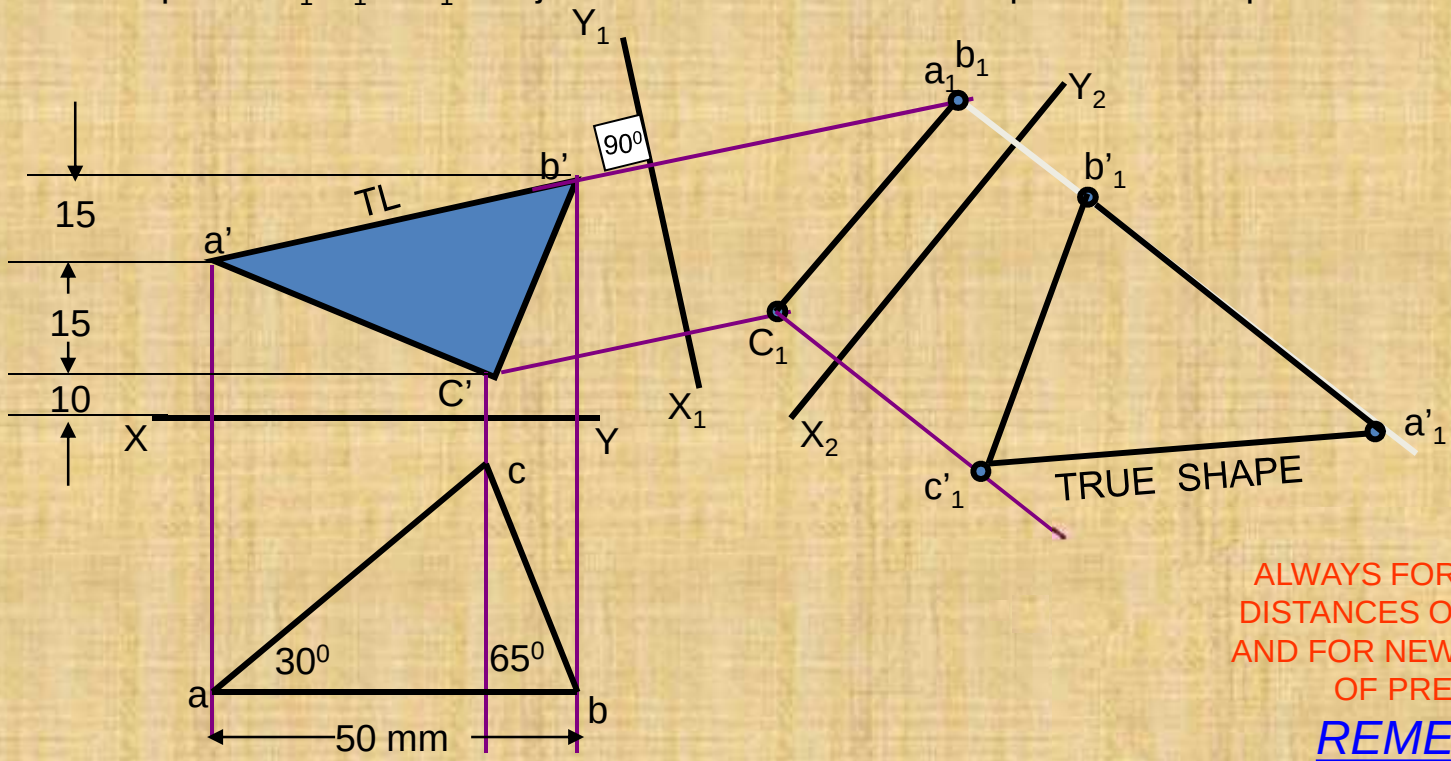
The facts you must know:-
If you carefully study and observe the solutions of all
You will find
IF ONE VIEW IS A LINE VIEW & THAT TOO PARAL
THEN AND THEN IT'S OTHER VIEW WILL SHOW

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.

Problem 14 Tv is a triangle abc. Ab is 50 mm long, angle cab is 300 and angle cba
a'b'c' is a Fv. a' is 25 mm, b' is 40 mm and c' is 10 mm above Hp respectively. Draw pro
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 po
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
DISTANCES OF
AND FOR NEW
OF PREV
REMEM

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

USE SAME PROCEDURE STEPS
OF PREVIOUS PROBLEM:

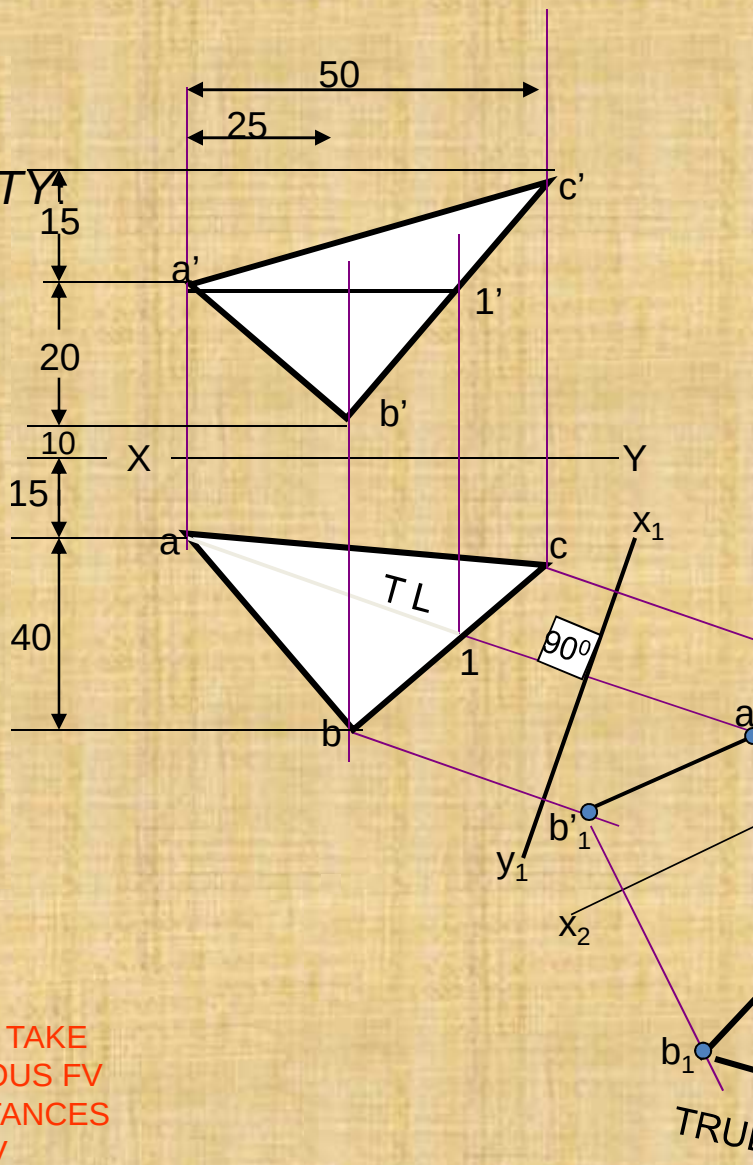
BUT THERE IS ONE DIFFICULTY

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

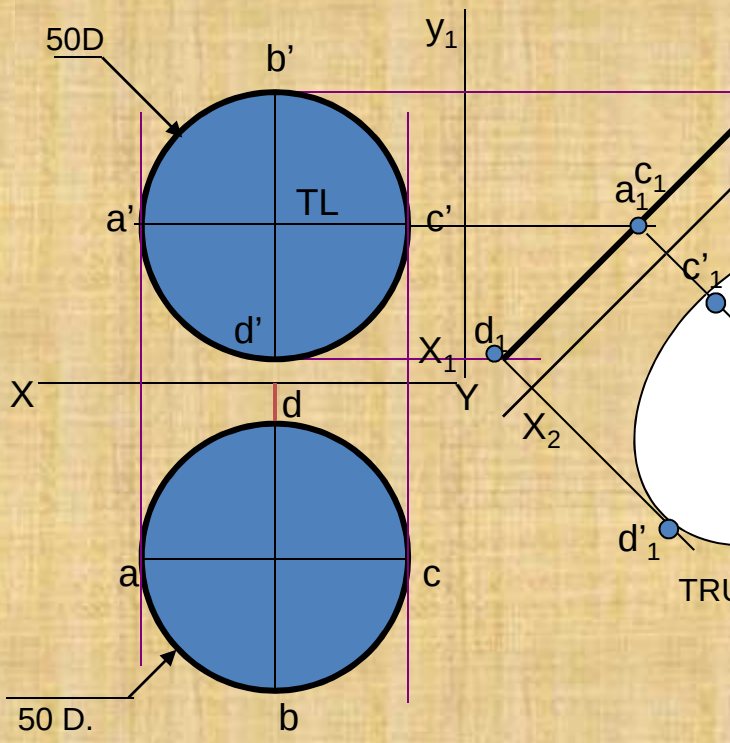
REMEMBER!!

PROBLEM 16: Fv & Tv both are circles of 50 mm diameter. Determine true shap

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

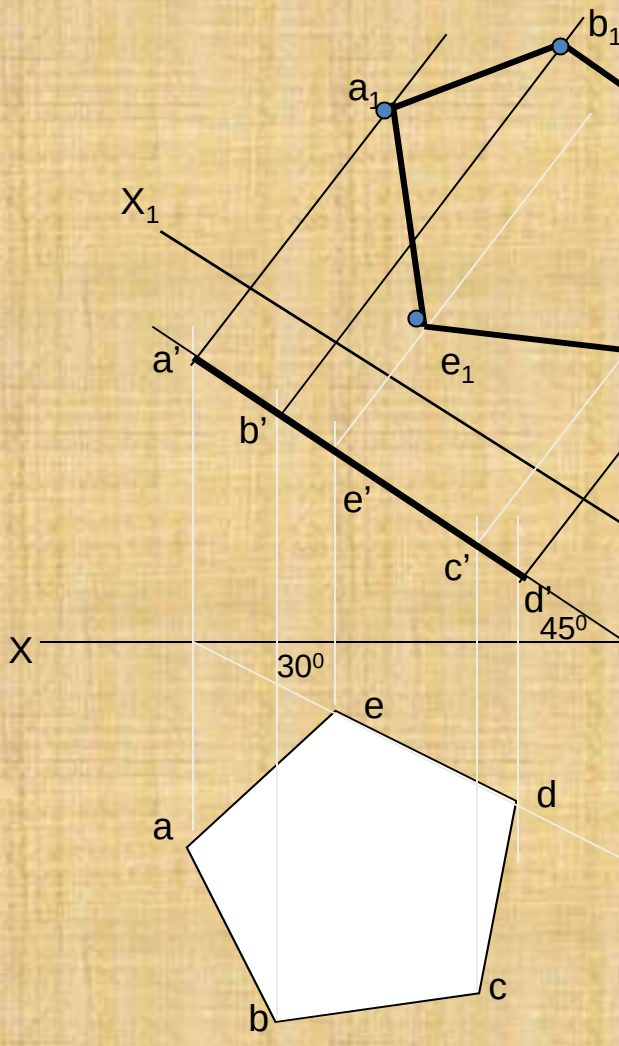
REMEMBER!!

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!!

Unit- IV

Projections of Solids

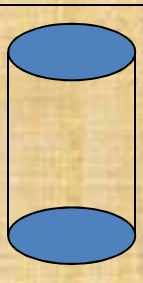
SOLIDS

To understand and remember various solids in this subj
those are classified & arranged in to two major g

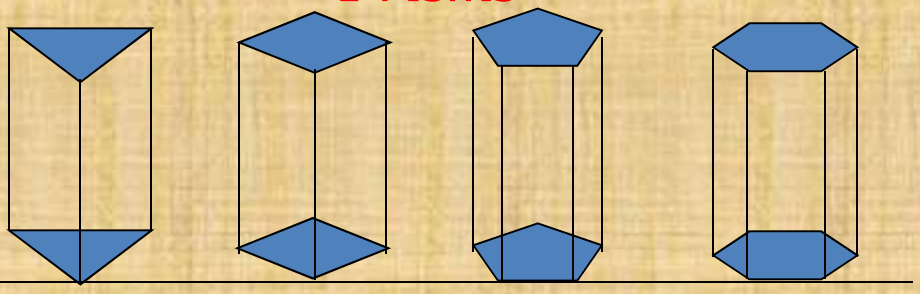
Group A

Solids having top and base of same shape

Cylinder



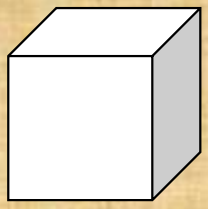
Prisms



Triangular Square Pentagonal Hexagonal

Cube

(A solid having
six square faces)

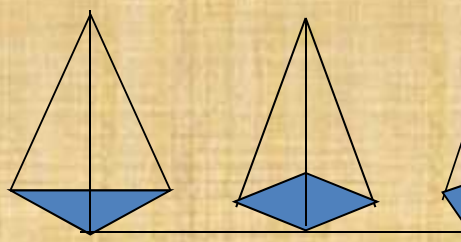


Group B

Solids having base of
and just a point as a to

Cone

Pyram



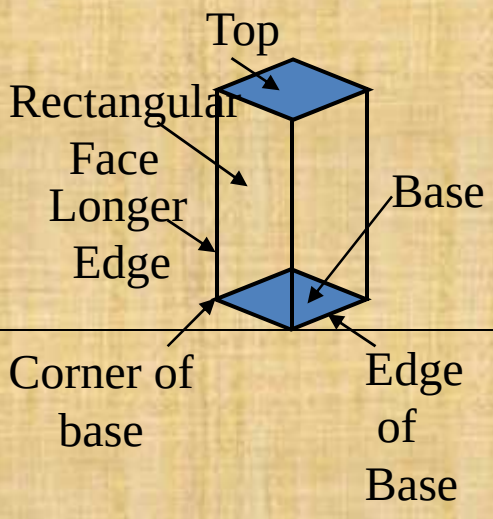
Triangular Square P

Tetrahedron

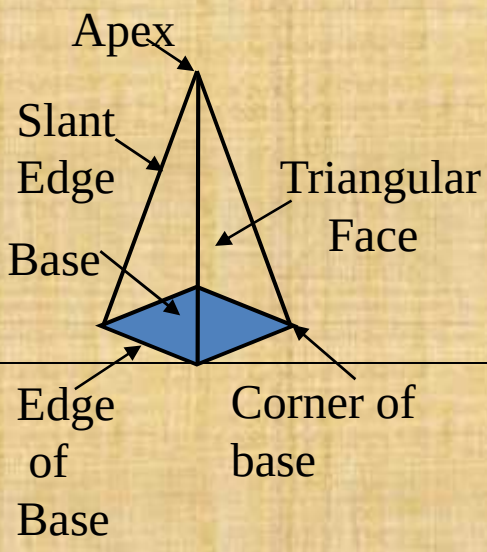
(A solid having
Four triangular faces)

SOLIDS
Dimensional parameters of different solid

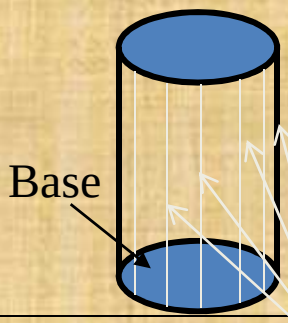
Square Prism



Square Pyramid

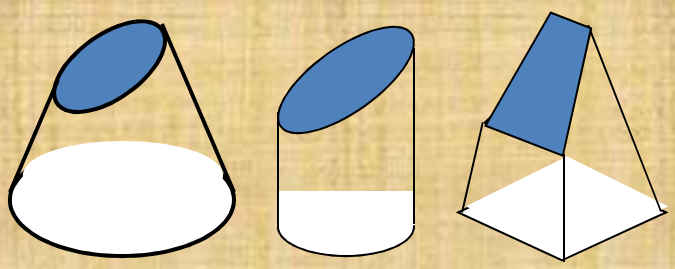


Cylinder

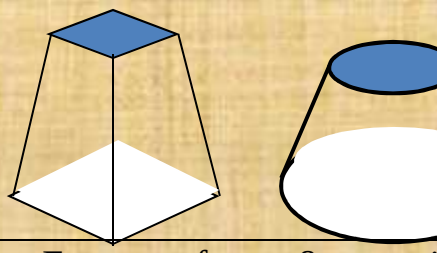


Gener

Imaginar
generating cur
of cylinder



Sections of solids(top & base not parallel)

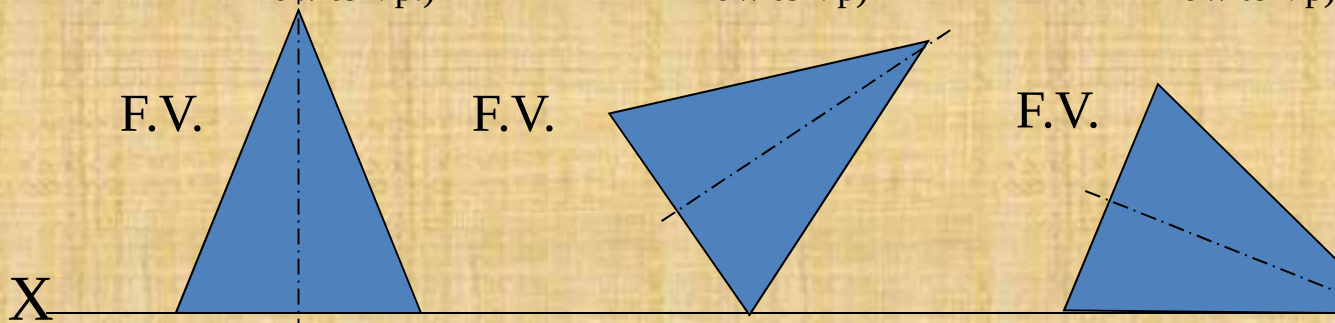


Frustum of cone & pyrami
(top & base parallel to each

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

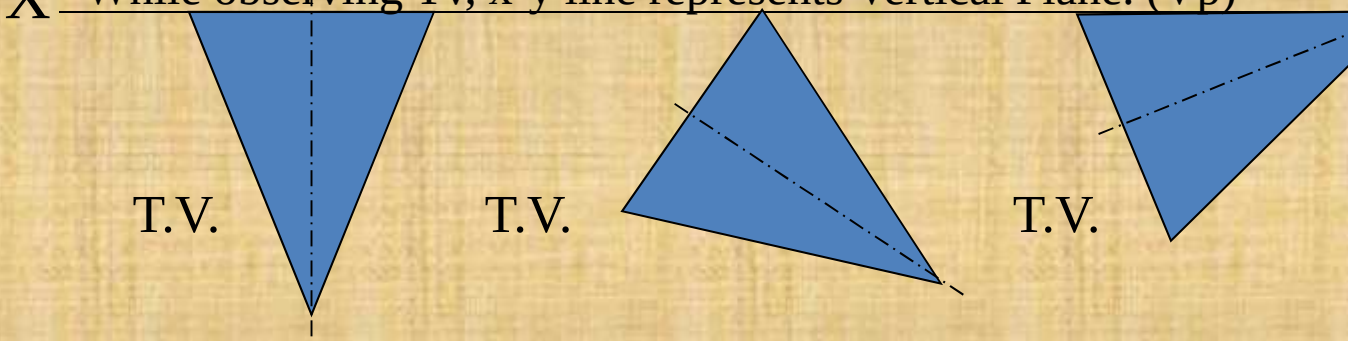
RESTING ON H.P
On one point of base circle.
(Axis inclined to Hp
And // to Vp)

LYING ON H.
On one generato
(Axis inclined to
And // to Vp)



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

X While observing Tv, x-y line represents Vertical Plane. (Vp)



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.
On one generato
Axis inclined to
And // to Hp

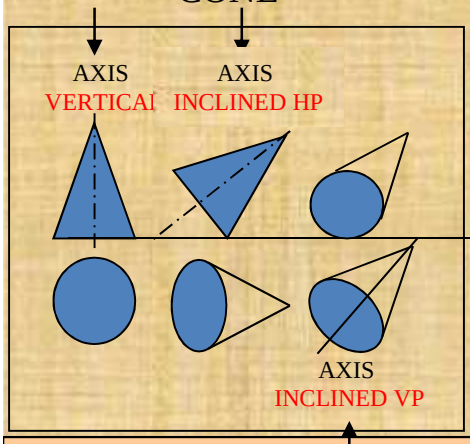
STEPS TO SOLVE PROBLEMS IN SOLIDS

Problem is solved in three steps:

STEP 1: ASSUME SOLID STANDING ON THE PLANE WITH WHICH IT IS MAKING I
(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
IF STANDING ON VP - IT'S FV WILL BE TRUE SHAPE OF IT'S BASE OR
BEGIN WITH THIS VIEW:
IT'S OTHER VIEW WILL BE A RECTANGLE (IF SOLID IS *CYLINDER OR ON*
IT'S OTHER VIEW WILL BE A TRIANGLE (IF SOLID IS *CONE OR ONE OF*
DRAW FV & TV OF THAT SOLID IN STANDING POSITION:
STEP 2: CONSIDERING SOLID'S INCLINATION (AXIS POSITION) DRAW IT'S FV &
STEP 3: IN LAST STEP, CONSIDERING REMAINING INCLINATION, DRAW IT'S FIN

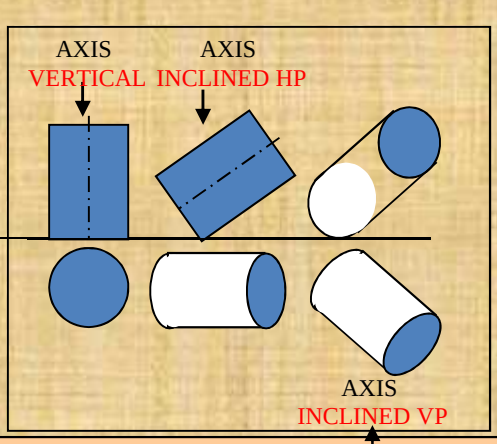
GENERAL PATTERN (THREE STEPS) OF SOLUTION:

GROUP B SOLID.
CONE



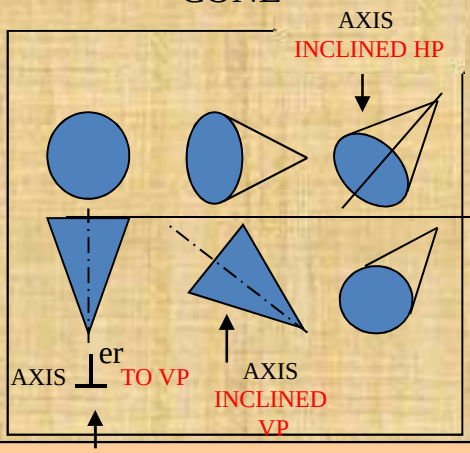
Three steps
If solid is inclined to Hp

GROUP A SOLID.
CYLINDER



Three steps
If solid is inclined to Hp

GROUP B SOLID.
CONE



Three steps
If solid is inclined to Vp

Study Next *Twelve* Problems and Practice them separate

CATEGORIES OF ILLUSTRATED PROBLEM

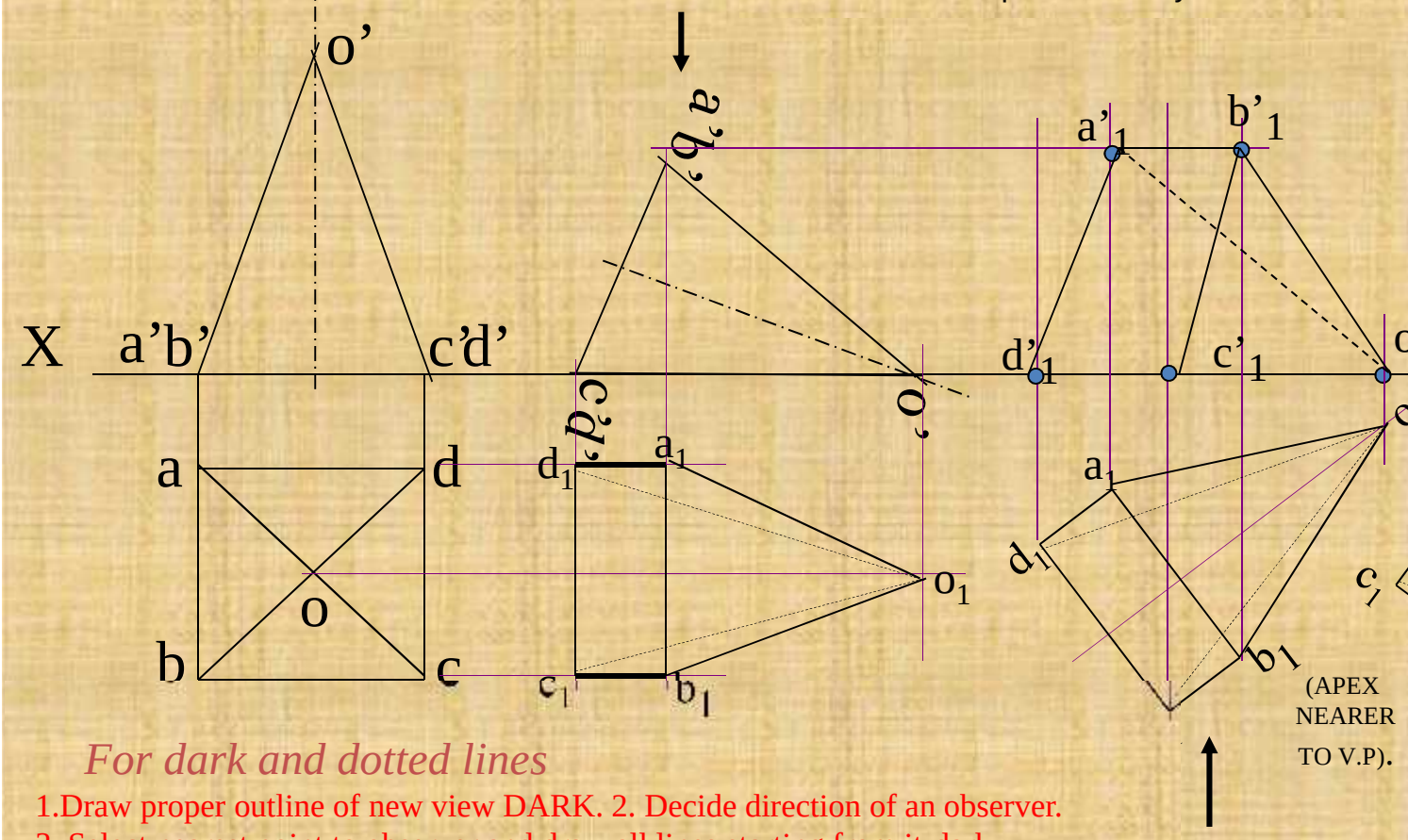
PROBLEM NO.1, 2, 3, 4	GENERAL CASES OF SOLIDS INCLINED TO
PROBLEM NO. 5 & 6	CASES OF CUBE & TETRAHEDRON
PROBLEM NO. 7	CASE OF FREELY SUSPENDED SOLID WI
PROBLEM NO. 8	CASE OF CUBE (WITH SIDE VIEW)
PROBLEM NO. 9	CASE OF TRUE LENGTH INCLINATION W
PROBLEM NO. 10 & 11	CASES OF COMPOSITE SOLIDS. (AUXILIA
PROBLEM NO. 12	CASE OF A FRUSTUM (AUXILIARY PLAN

Problem 1. A square pyramid, 4
mm base sides and axis 60 mr
long, has a triangular face on th
ground and the vertical plan
containing the axis makes a
angle of 45^0 with the VP. Draw it
projections. Take apex nearer t
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 ve
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 or
6.Make visible lines dark and hidden dotted, as
7.Then construct remaining inclination with Vp
(Vp containing axis ic the center line of 2nd T
shown take apex near to xy, as it is nearer to



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.

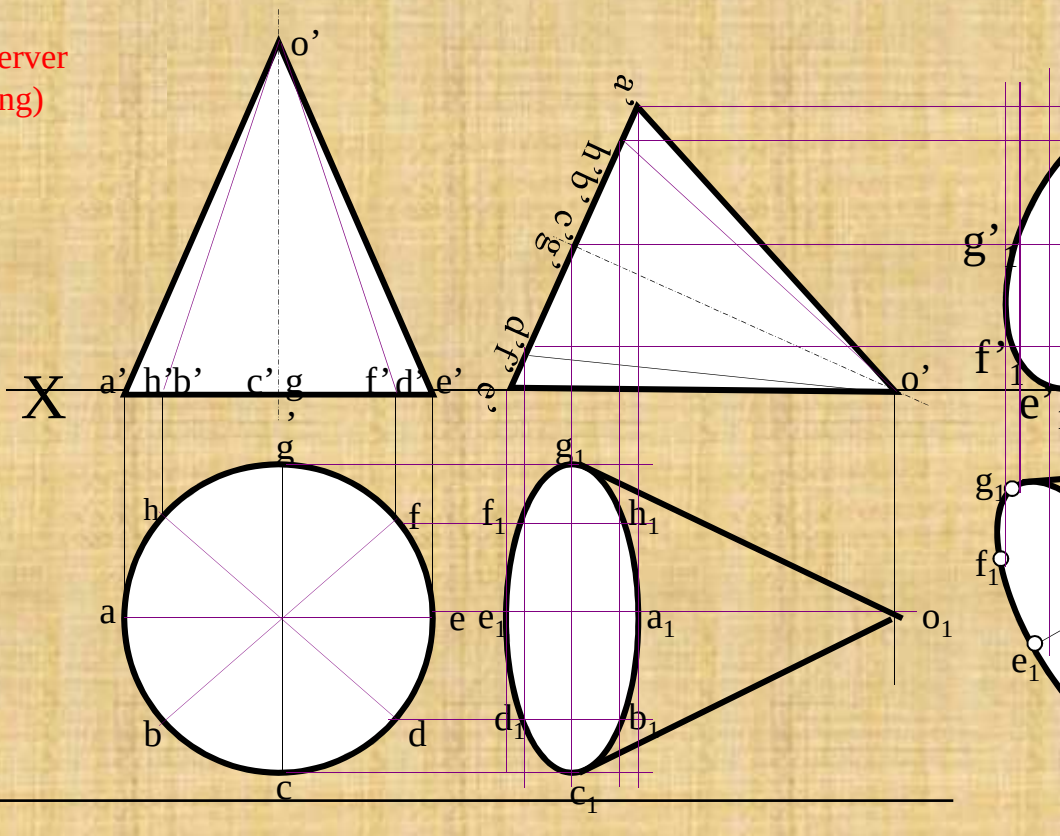
For dark and dotted lines

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 generat

1. Assume it standing on Hp.
2. It's Tv will show True Shape
3. Draw 40mm dia. Circle as T taking 50 mm axis project F
4. Name all points as shown in
5. Draw 2nd Fv in lying position project it's Tv below xy.
6. Make visible lines dark and as per the procedure.
7. Then construct remaining in (generator o_1e_1 30^0 to xy as

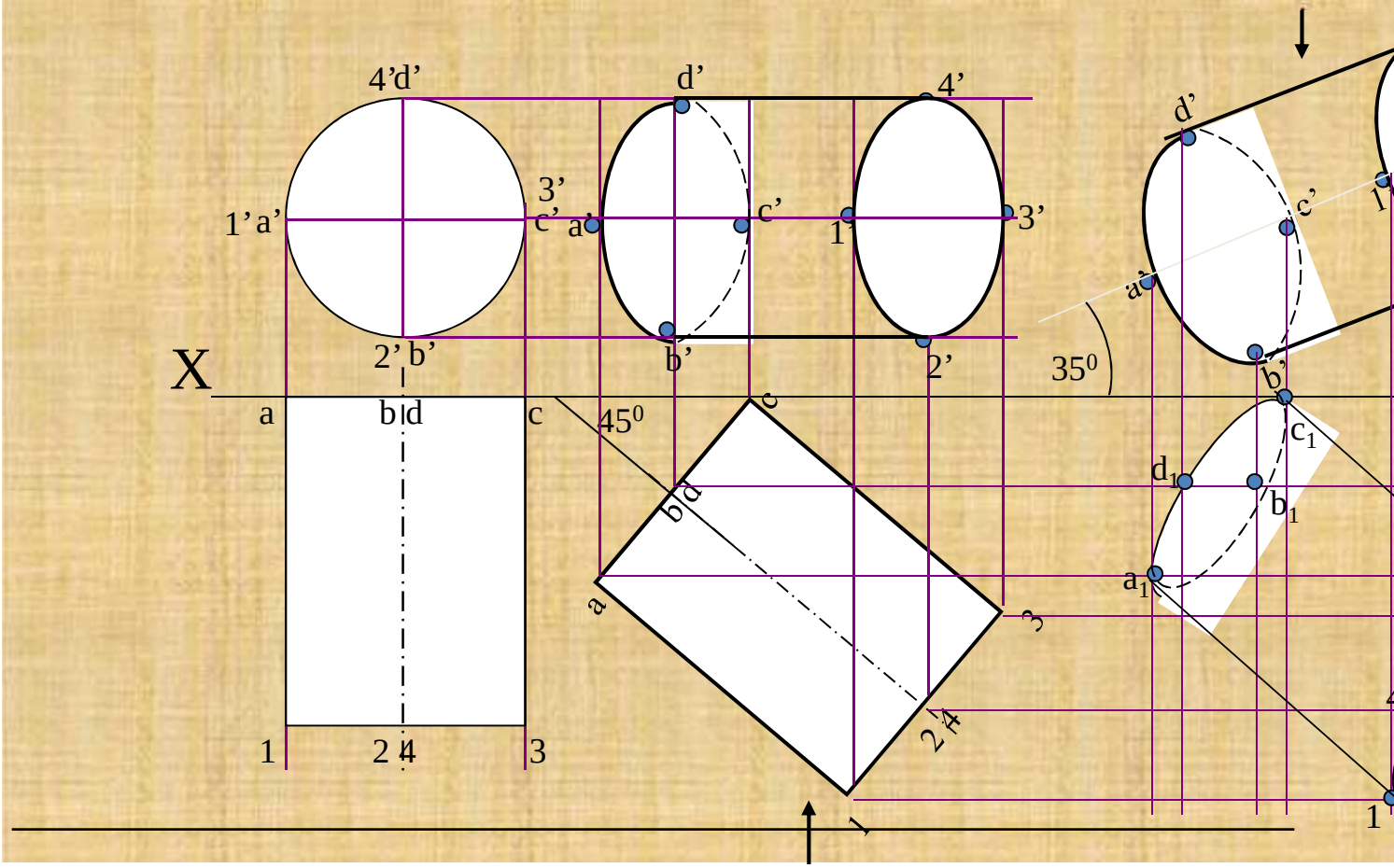


Problem 3:

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:

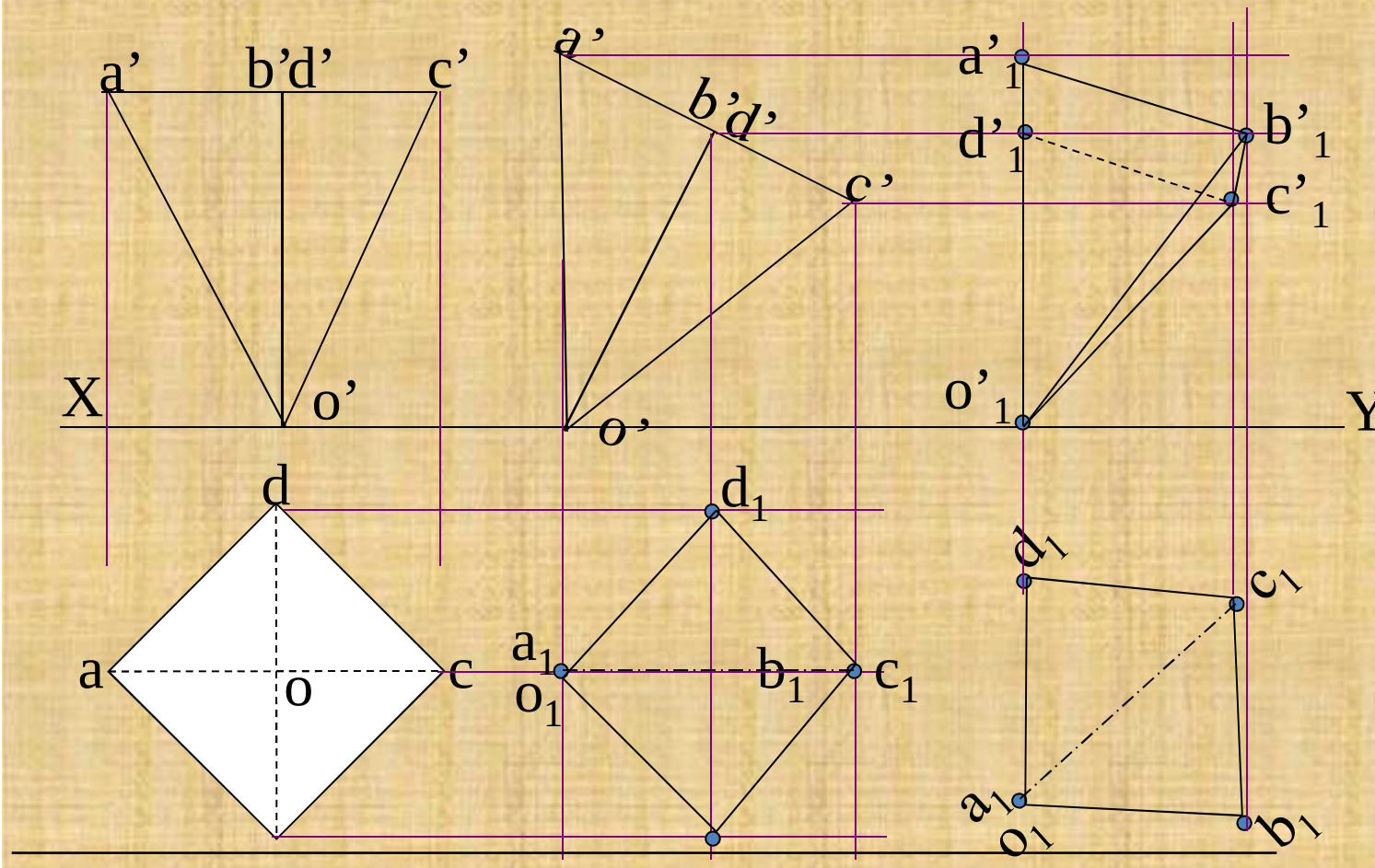
Resting on Vp on one point of base, mean
1.Assume it standing on Vp
2.It's Fv will show True Shape of base & t
3.Draw 40mm dia. Circle as Fv & taking 5
(a Rectangle)
4.Name all points as shown in illustration.
5.Draw 2nd Tv making axis 45^0 to xy And p
6.Make visible lines dark and hidden dotte
7.Then construct remaining inclination wit
(Fv of axis I.e. center line of view to xy a
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 :

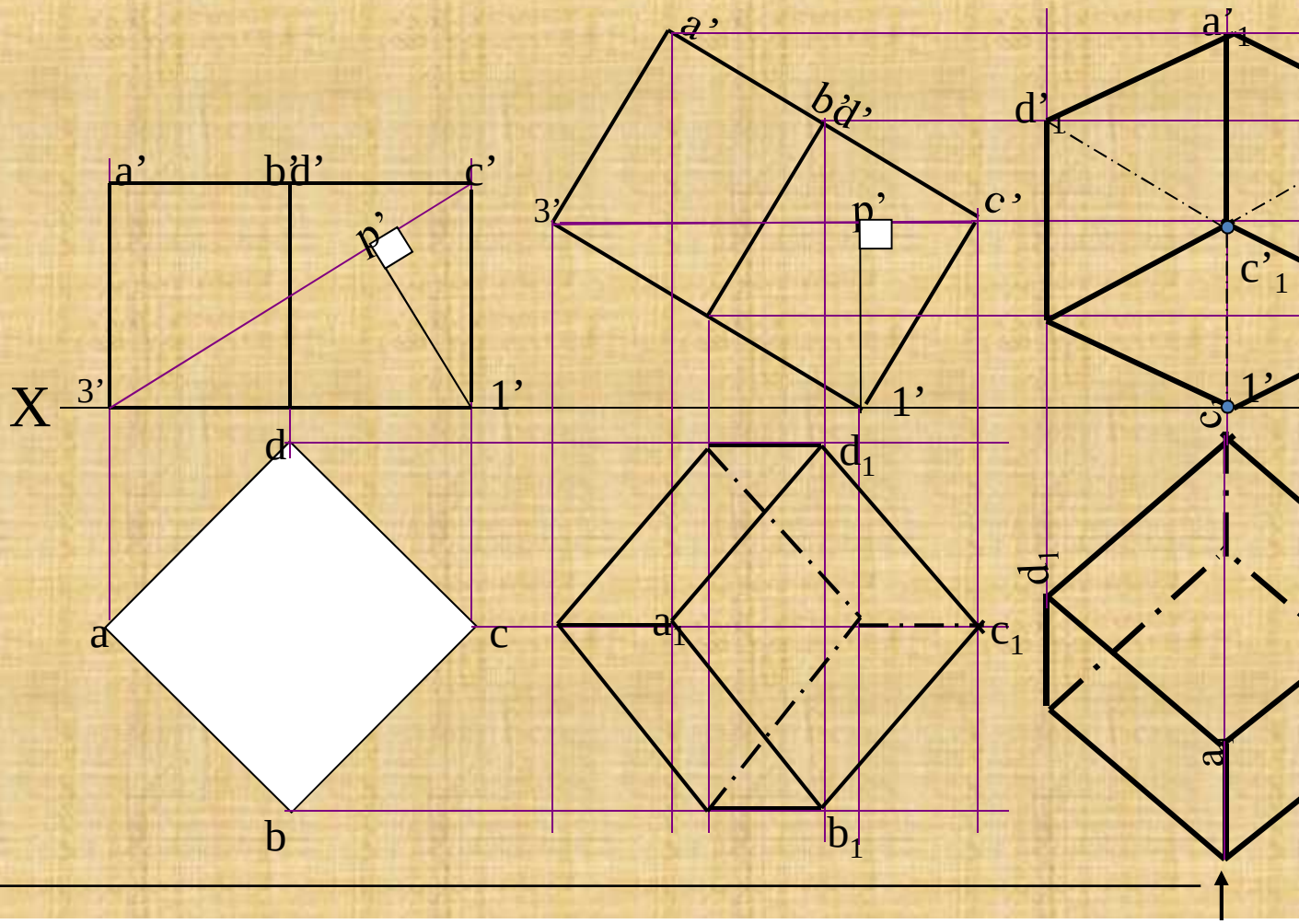
1.Assume it standing on Hp but as said on ap
2.It's Tv will show True Shape of base(squa
3.Draw a corner case square of 30 mm sides
Showing all slant edges dotted, as those will
4.taking 50 mm axis project Fv. (a triangle)
5.Name all points as shown in illustration.
6.Draw 2nd Fv keeping o'a' slant edge vertica
7.Make visible lines dark and hidden dotted,
8.Then redrew 2nd Tv as final Tv keeping a_1c
perpendicular to Vp I.e.xy. Then as usual p



Problem 5: A cube of 50 mm long edges is so placed on Hp on one corner that a body diagonal is parallel to Hp and perpendicular to Vp Draw it's projections.

Solution Steps:

1.Assuming standing on Hp, begin with Tv,a squar
equally inclined to xy.Project Fv and name all poin
2.Draw a body-diagonal joining c' with 3'(This ca
3.From 1' drop a perpendicular on this and name it
4.Draw 2nd Fv in which 1'-p' line is vertical *means*
must be horizontal. .Now as usual project Tv..
6.In final Tv draw same diagonal is perpendicular t
Then as usual project final FV.



Problem 6:A tetrahedron of 50 mm long edges is resting on one edge on Hp while one triangular face containing this edge is vertical and 45^0 inclined to Vp. Draw

p *IMPORTANT:*

Tetrahedron is a special type of triangular pyramid in which base sides & slant edges are equal in length. Solid of four faces. Like cube it is also described by One dimension only.. Axis length generally not given.

Solution Steps

As it is resting assume it standing on

Begin with Tv , an equilateral triang shown:

First project base points of Fv on xy line.

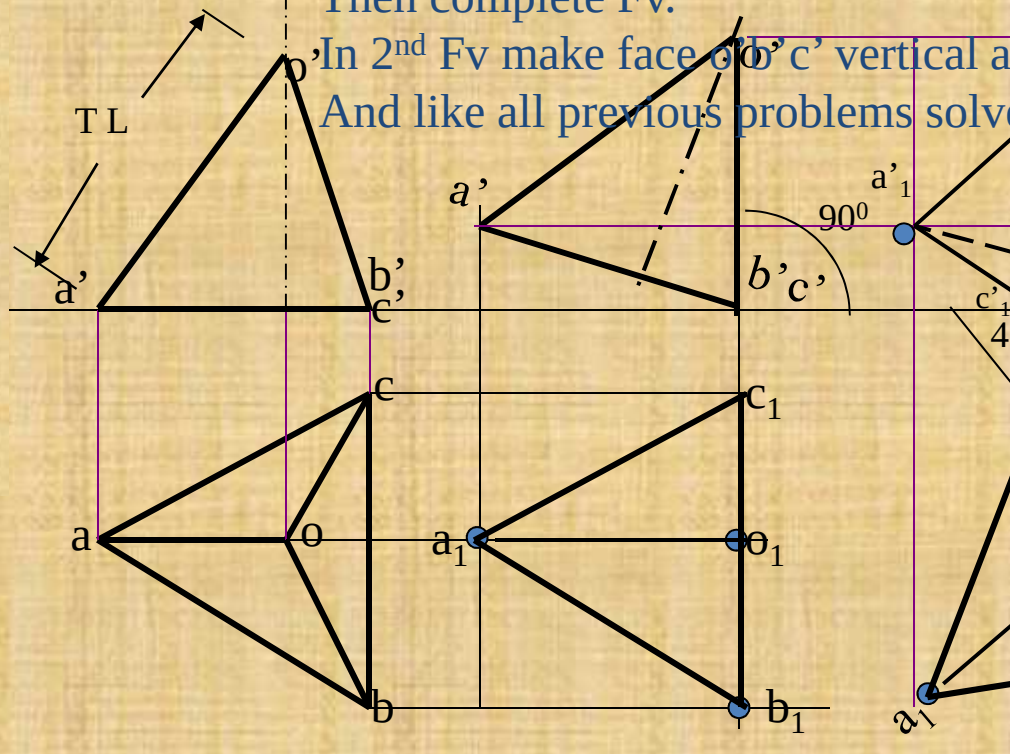
From a' with TL of edge, 50 mm, cu mark o'

(as axis is not known, o' is finalized length)

Then complete Fv.

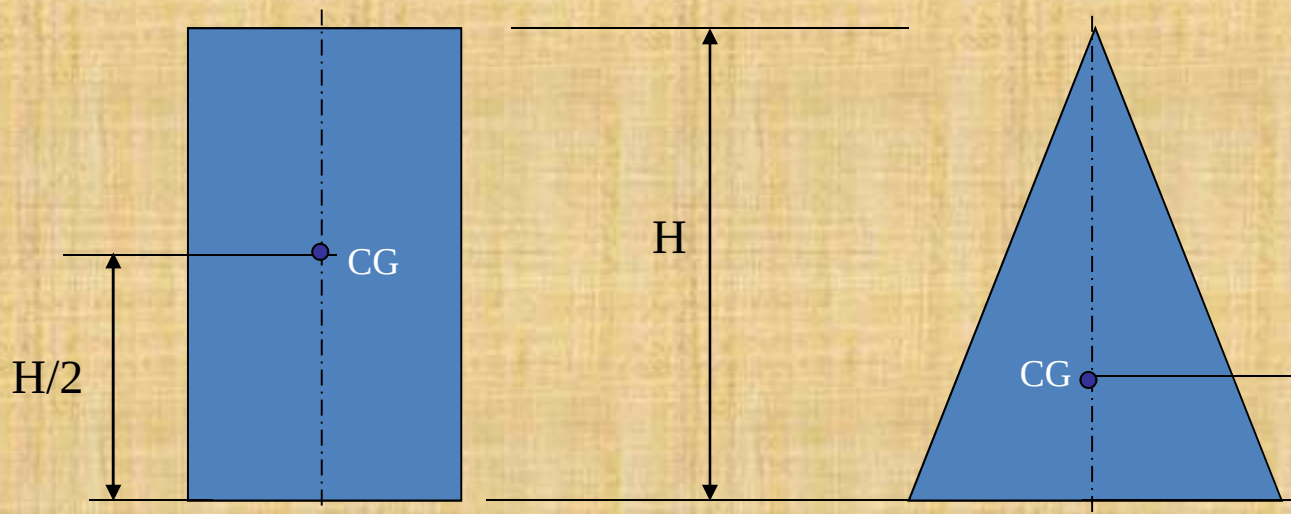
In 2nd Fv make face o'b'c' vertical a

And like all previous problems solv



FREELY SUSPENDED SOLIDS:

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



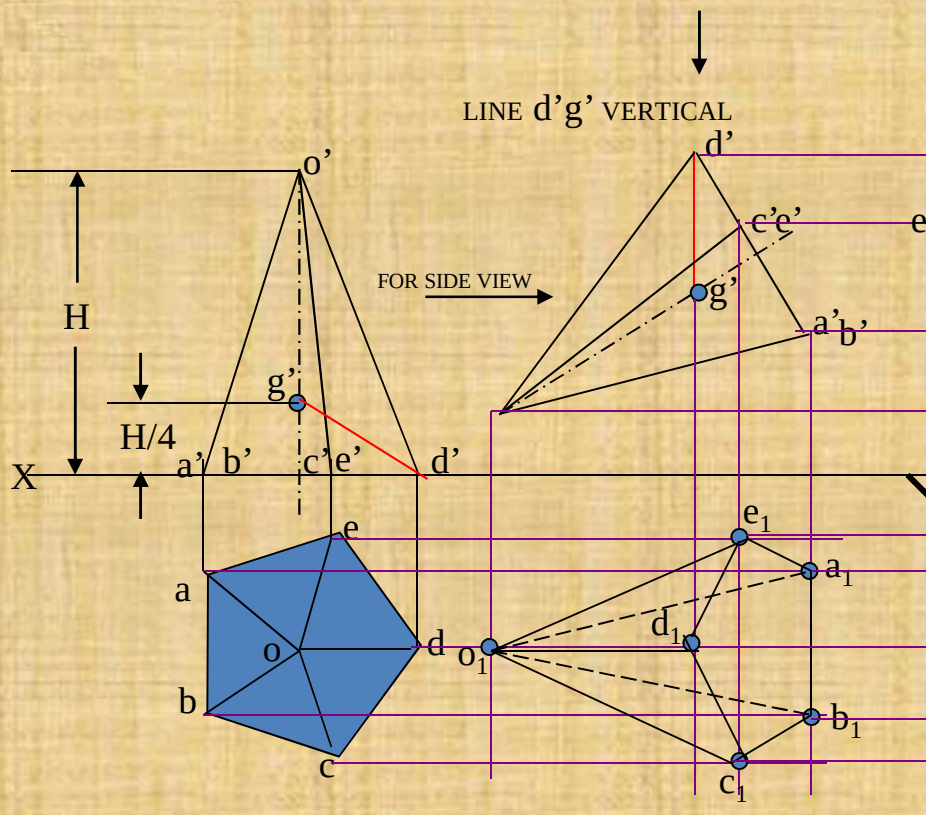
GROUP A SOLIDS
(Cylinder & Prisms)

GROUP B SOLIDS
(Cone & Pyramids

Problem 7: 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 H
1.Hence assuming it standing on Hp, drew Tv - a reg
2.Project Fv & locate CG position on axis – (¼ H fr
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 V



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.)

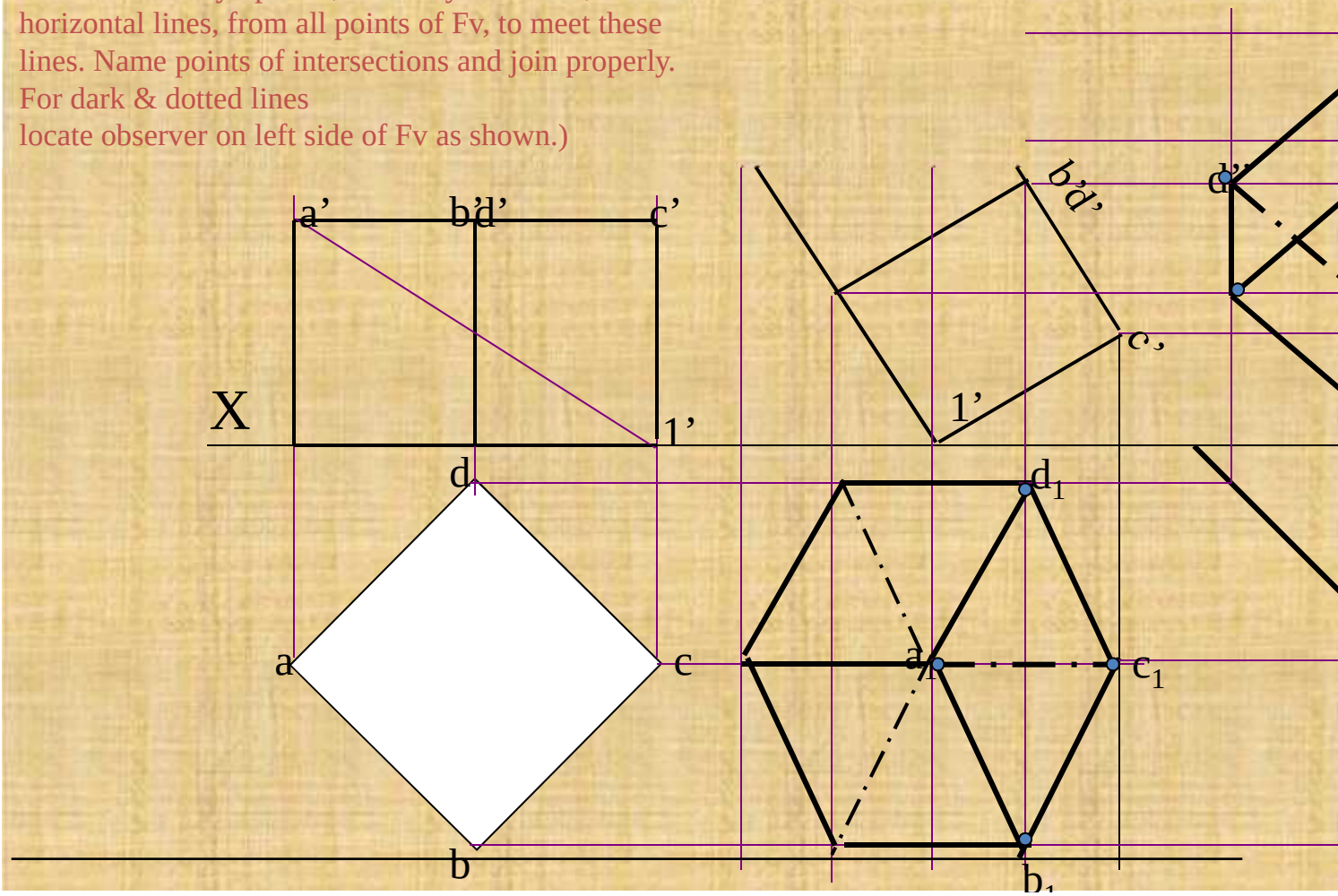
Solution Steps:

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.)

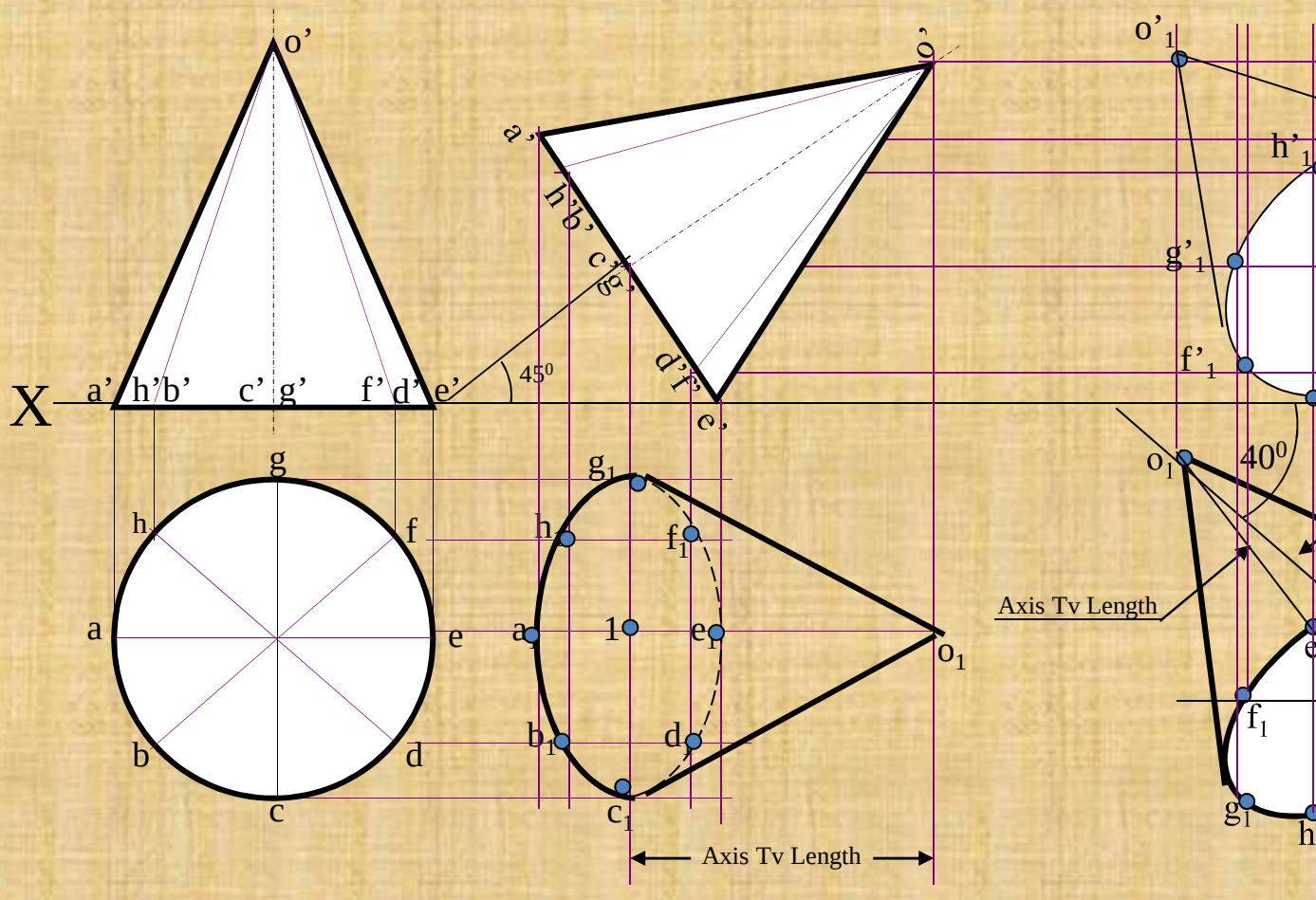
Problem 8:

A cube of 50 mm long
on Hp on one corner t
through this corner is
and parallel to Vp Dra

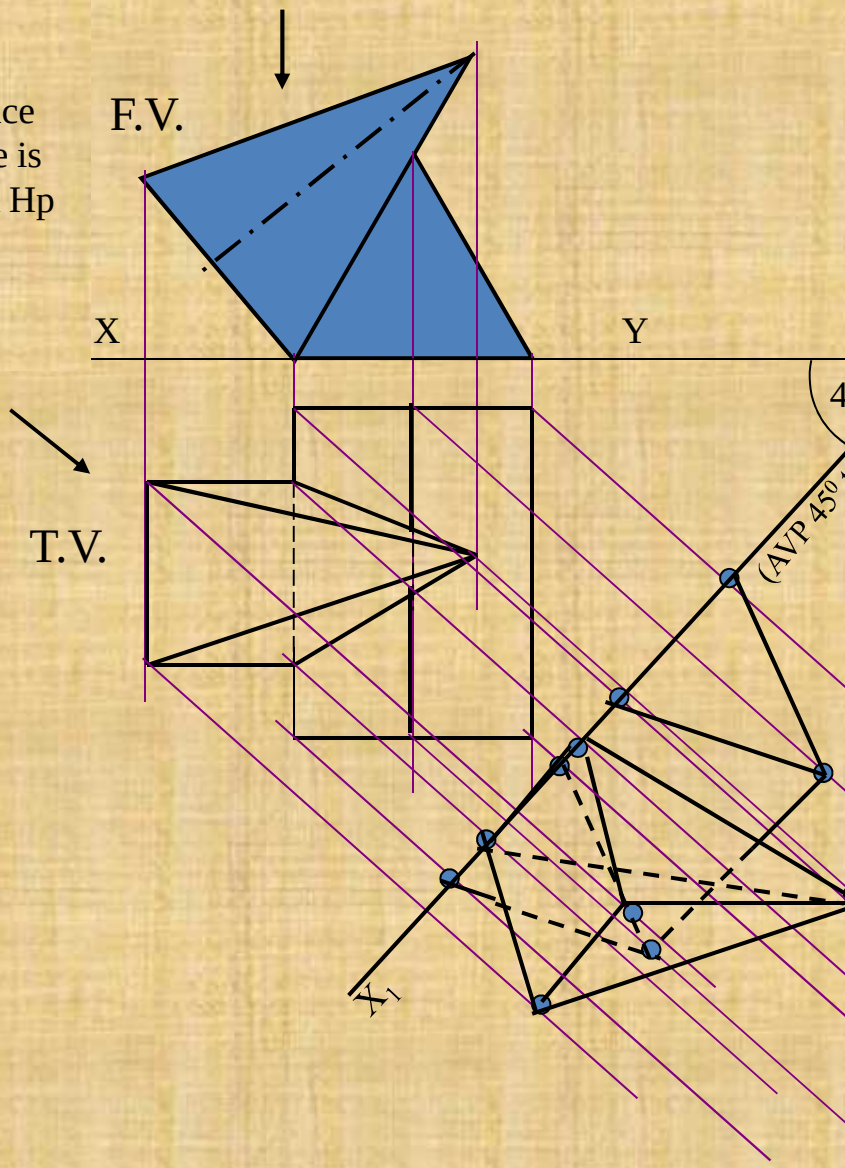


Problem 9: A right circular cone, 40 mm base diameter and 60 mm long axis is resting on Hp on one point of base circle such that it's axis makes 45^0 inclination with Hp and 40^0 inclination with Vp. Draw it's projections.

This case resembles to problem no.7 & 9 from projec
In previous all cases 2nd inclination was done by a parame
Tv of axis is inclined to Vp etc. But here it is clearly said t
to Vp. Means here TL inclination is expected. So the same
Problems is done here also. See carefully the final Tv and
So assuming it standing on HP begin as



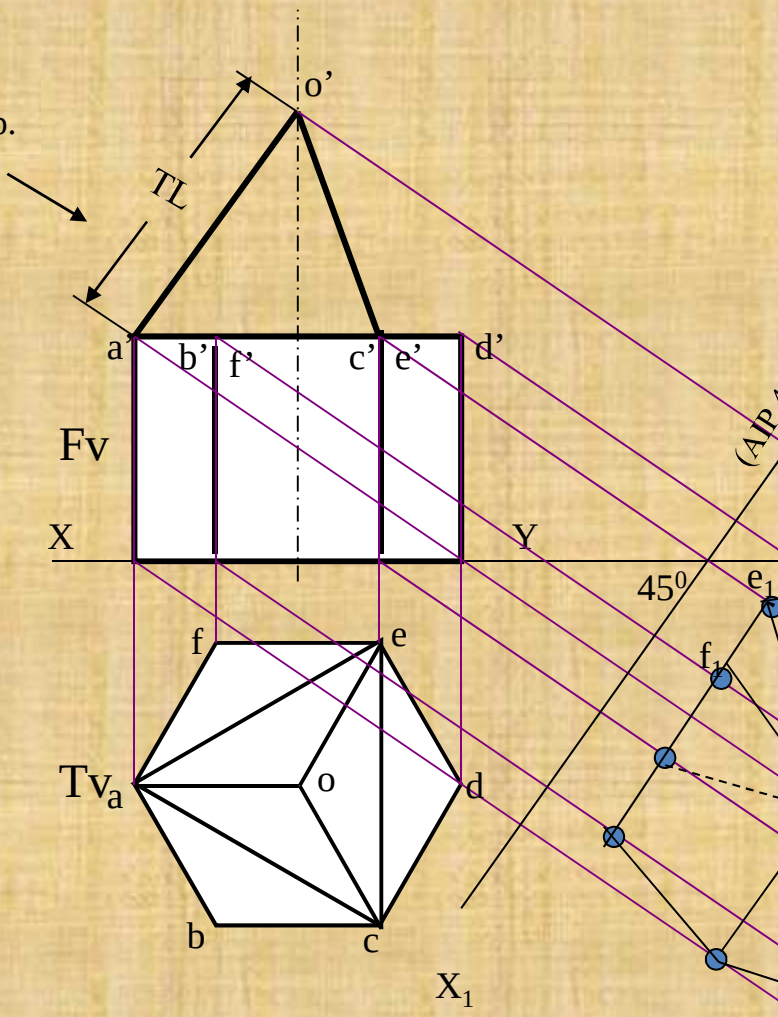
Problem 10: A triangular prism,
40 mm base side 60 mm axis
is lying on Hp on one rectangular face
with axis perpendicular to Vp.
One square pyramid is leaning on it's face
centrally with axis // to vp. It's base side is
30 mm & axis is 60 mm long resting on Hp
on one edge of base.Draw FV & TV of
both solids.Project another FV
on an AVP 45^0 inclined to VP.



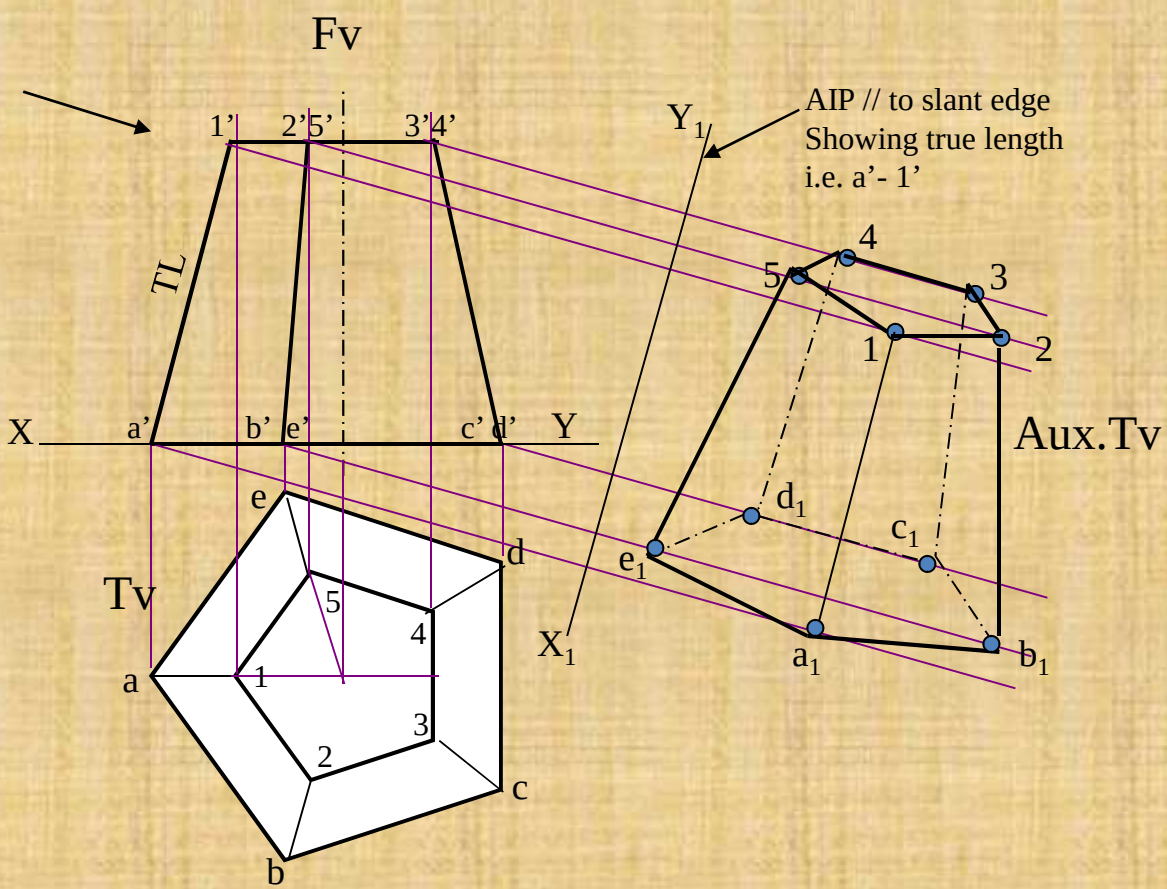
Steps :
Draw Fv of lying prism
(an equilateral Triangle)
And Fv of a leaning pyramid.
Project Tv of both solids.
Draw x_1y_1 45^0 inclined to xy
and project aux.Fv on it.
Mark the distances of first FV
from first xy for the distances
of aux. Fv from x_1y_1 line.
Note the observer's directions
Shown by arrows and further
steps carefully.

Problem 11:A hexagonal prism of base side 30 mm longand axis 40 mm long, is standing on Hp on it's base with one base edge // to Vp.
A tetrahedron is placed centrally on the top of it.The base of tetrahedron is a triangle formed by joining alternate corners of top of prism..Draw projections of both solids.
Project an auxiliary Tv on AIP 45^0 inclined to Hp.

STEPS:
Draw a regular hexagon as Tv of standing prism With one side // to xy and name the top points.Project it's Fv – a rectangle and name it's top.
Now join it's alternate corners a-c-e and the triangle formed is base of a tetrahedron as said.
Locate center of this triangle & locate apex o
Extending it's axis line upward mark apex o'
By cutting TL of edge of tetrahedron equal to a-c. and complete Fv of tetrahedron.
Draw an AIP (x1y1) 45^0 inclined to xy
And project Aux.Tv on it by using similar Steps like previous problem.



Problem 12: A frustum of regular hexagonal pyramid is standing on it's larger base On Hp with one base side perpendicular to Vp.Draw it's Fv & Tv.
Project it's Aux.Tv on an AIP parallel to one of the slant edges showing TL.
Base side is 50 mm long , top side is 30 mm long and 50 mm is height of frustum.



Unit- V

Orthographic and Isometric Projections

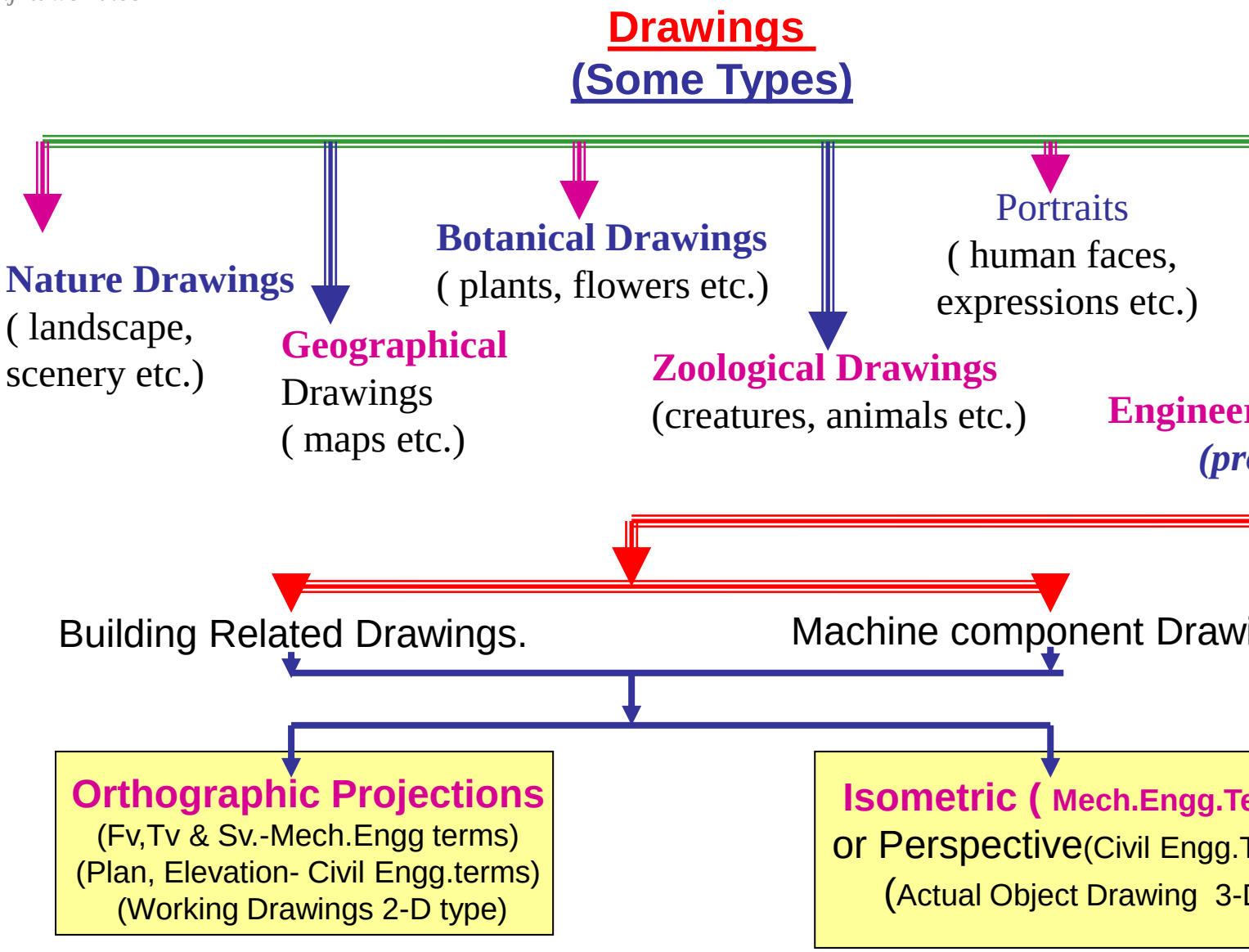
DRAWINGS:

(A Graphical Representation)

The Fact about:

If compared with Verbal or Written Description,
Drawings offer far better idea about the Shape, Size & Appe
any object or situation or location, that too in quite a less

Hence it has become the Best Media of Communicatio
not only in Engineering but in almost all Fields.



ORTHOGRAPHIC PROJECTIONS:

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

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

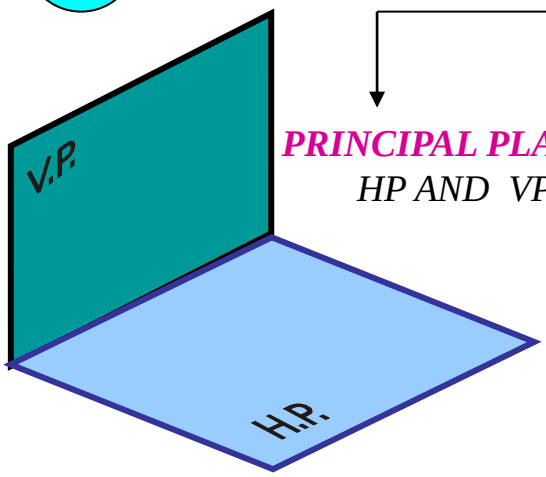
FV is a view projected on VP.
TV is a view projected on HP.
SV is a view projected on PP.

IMPORTANT TERMS OF ORTHOGRAPHIC PROJECTI

1. Planes.
2. Pattern of planes & Pattern of views
3. Methods of drawing Orthographic Projection

1

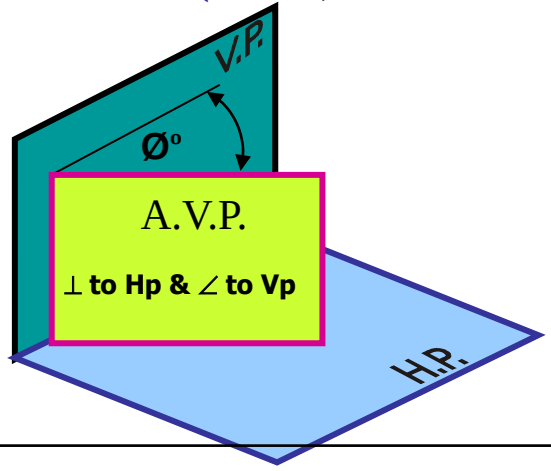
PLANES



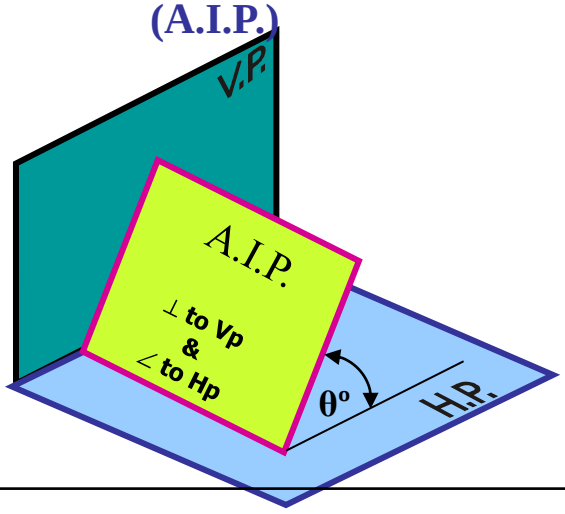
PRINCIPAL PLANES
HP AND VP

AUXILIARY PLANES

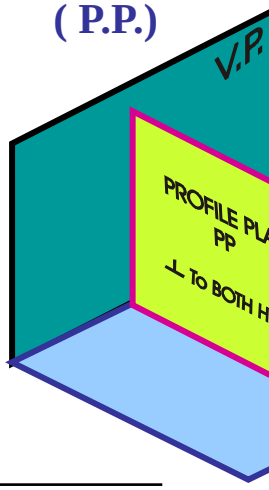
Auxiliary Vertical Plane (A.V.P.)



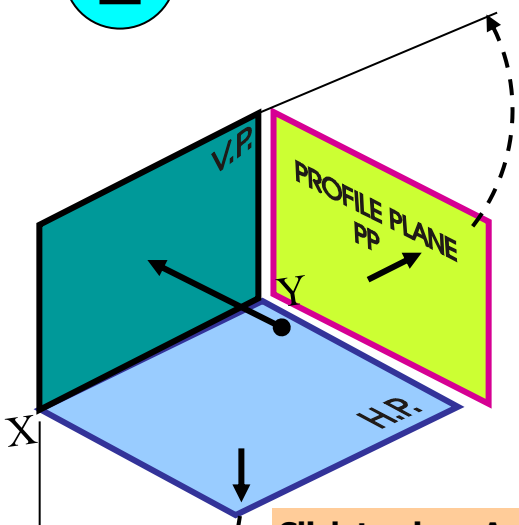
Auxiliary Inclined Plane (A.I.P.)



Profile Plan (P.P.)



2 PATTERN OF PLANES & VIEWS (First Angle Method)



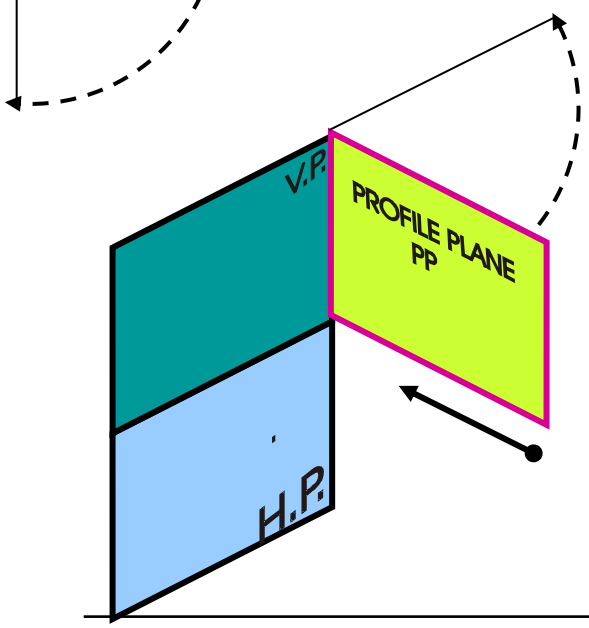
THIS IS A PICTORIAL SET-UP OF ALL THREE PLANES.
ARROW DIRECTION IS A NORMAL WAY OF OBSERVING THE O
BUT IN THIS DIRECTION ONLY VP AND A VIEW ON IT (FV) CA
THE OTHER PLANES AND VIEWS ON THOSE CAN NOT BE SEE

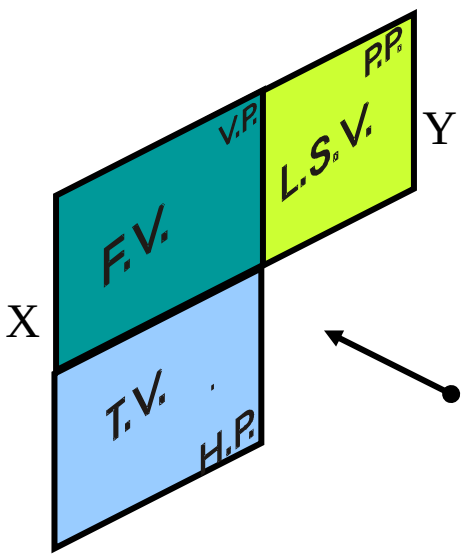
PROCEDURE TO SOLVE ABOVE PROBLEM:-

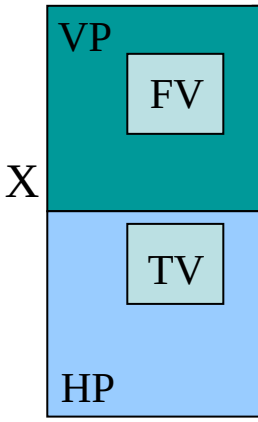
TO MAKE THOSE PLANES ALSO VISIBLE FROM THE ARROW
A) HP IS ROTATED 90^0 DOUNWARD
B) PP, 90^0 IN RIGHT SIDE DIRECTION.
THIS WAY BOTH PLANES ARE BROUGHT IN THE SAME PLANE

Click to view Animation

On clicking the button if a warning comes please click YES to cor
safe for your pc.







HP IS ROTATED DOWNWARD 90^0 AND BROUGHT IN THE PLANE OF VP.

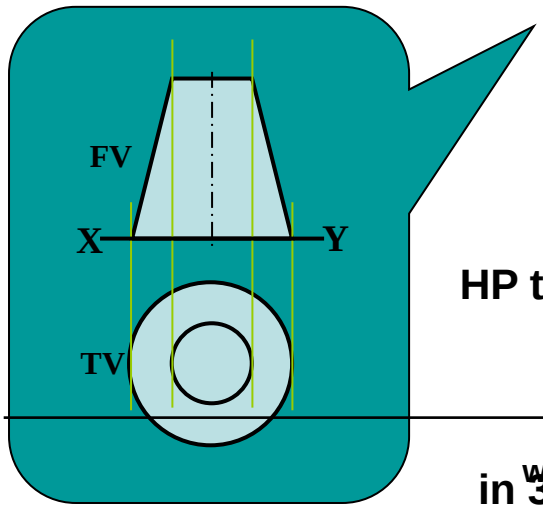
PP IS ROTATED IN RIGHT SIDE 90^0 AND BROUGHT IN THE PLANE OF VP.

ACTUAL PATTERN OF
OF ORTHOGRAPHIC
DRAWN
FIRST ANGLE METHOD

3 Methods of Drawing Orthographic Projections

First Angle Projections Method

Here views are drawn
by placing object
in 1st Quadrant
(Fv above X-y, Tv below X-y)



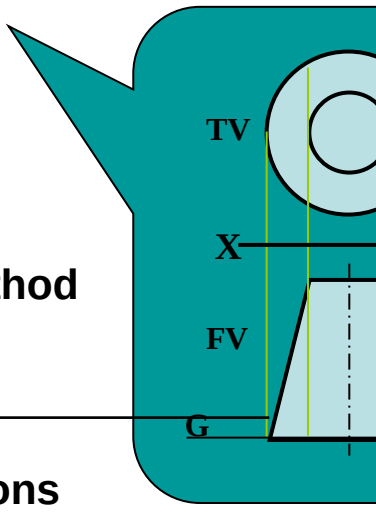
SYMBOLIC PRESENTATION OF BOTH METHODS WITH AN OBJECT STANDING ON HP (GROUND) ON IT'S BASE.

NOTE:-

HP term is used in 1st Angle method
&
For the same
Ground term is used
in 3rd Angle method of projections

Third Angle Project

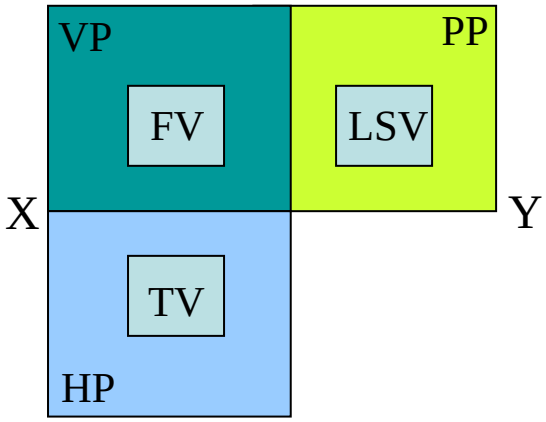
Here views are
by placing o
in 3rd Qua
(Tv above X-y, Fv

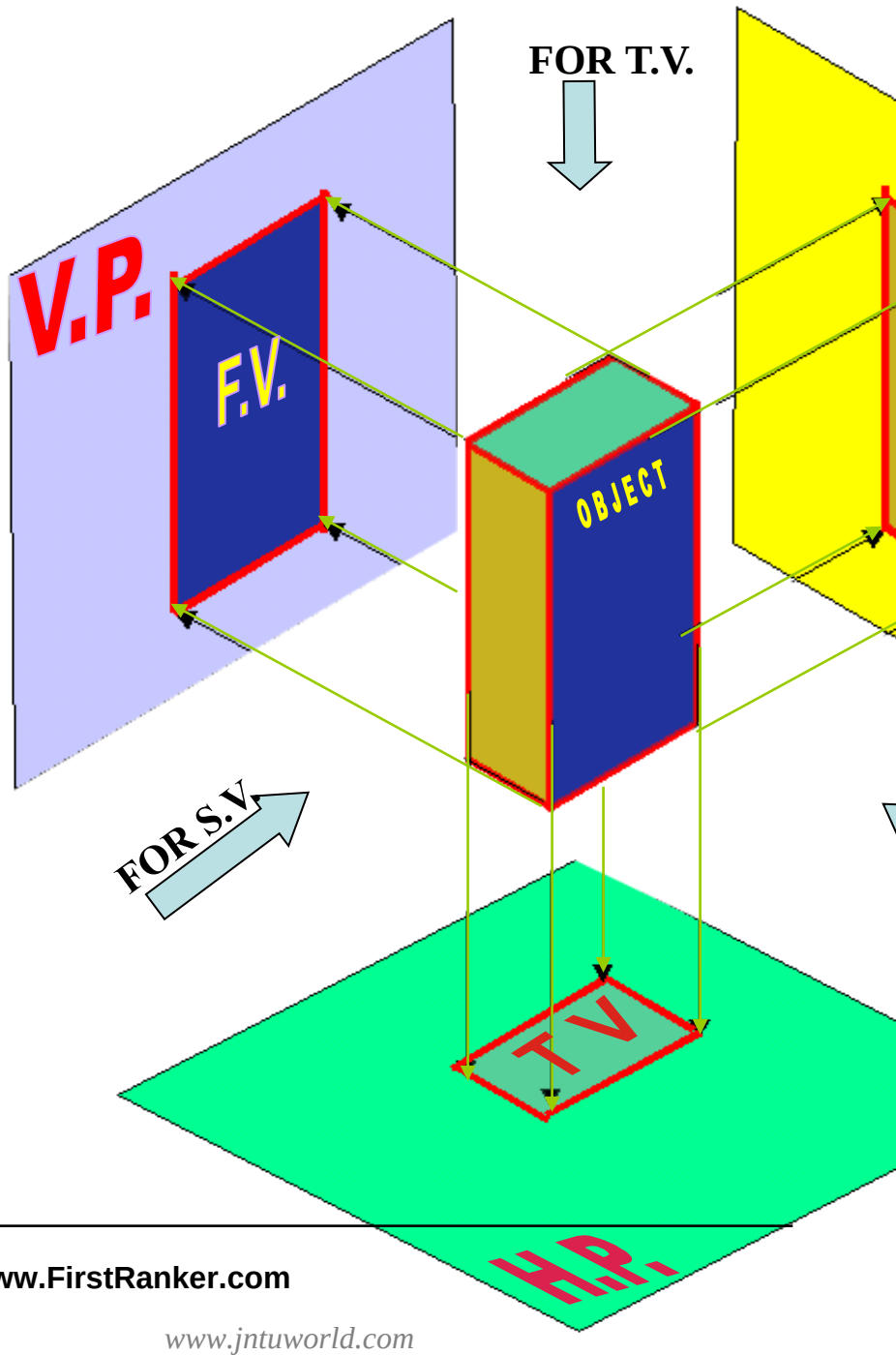


FIRST ANGLE PROJECTION

**IN THIS METHOD,
THE OBJECT IS ASSUMED TO BE SITUATED IN FIRST QUADRANT
MEANS
ABOVE HP & INFRONT OF VP.**

OBJECT IS INBETWEEN OBSERVER & PLANE.



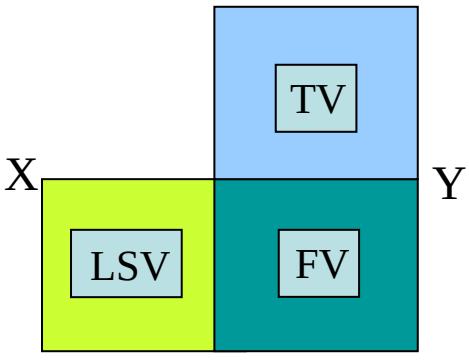


ACTUAL PATTERN OF PLANES & VIEWS IN FIRST ANGLE METHOD OF PROJECTIONS

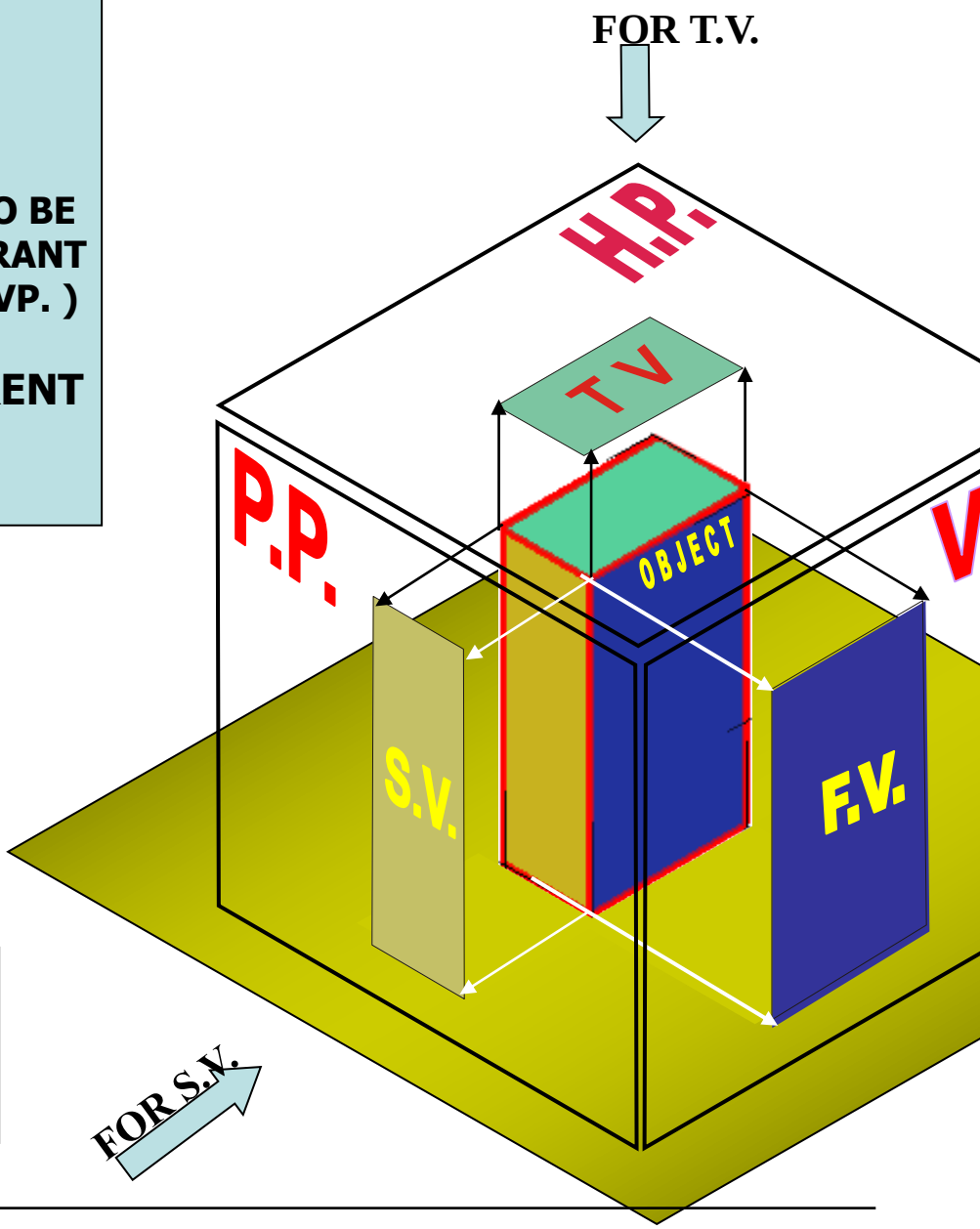
THIRD ANGLE PROJECTION

**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.**



**ACTUAL PATTERN OF
PLANES & VIEWS
OF
THIRD ANGLE PROJECTIONS**



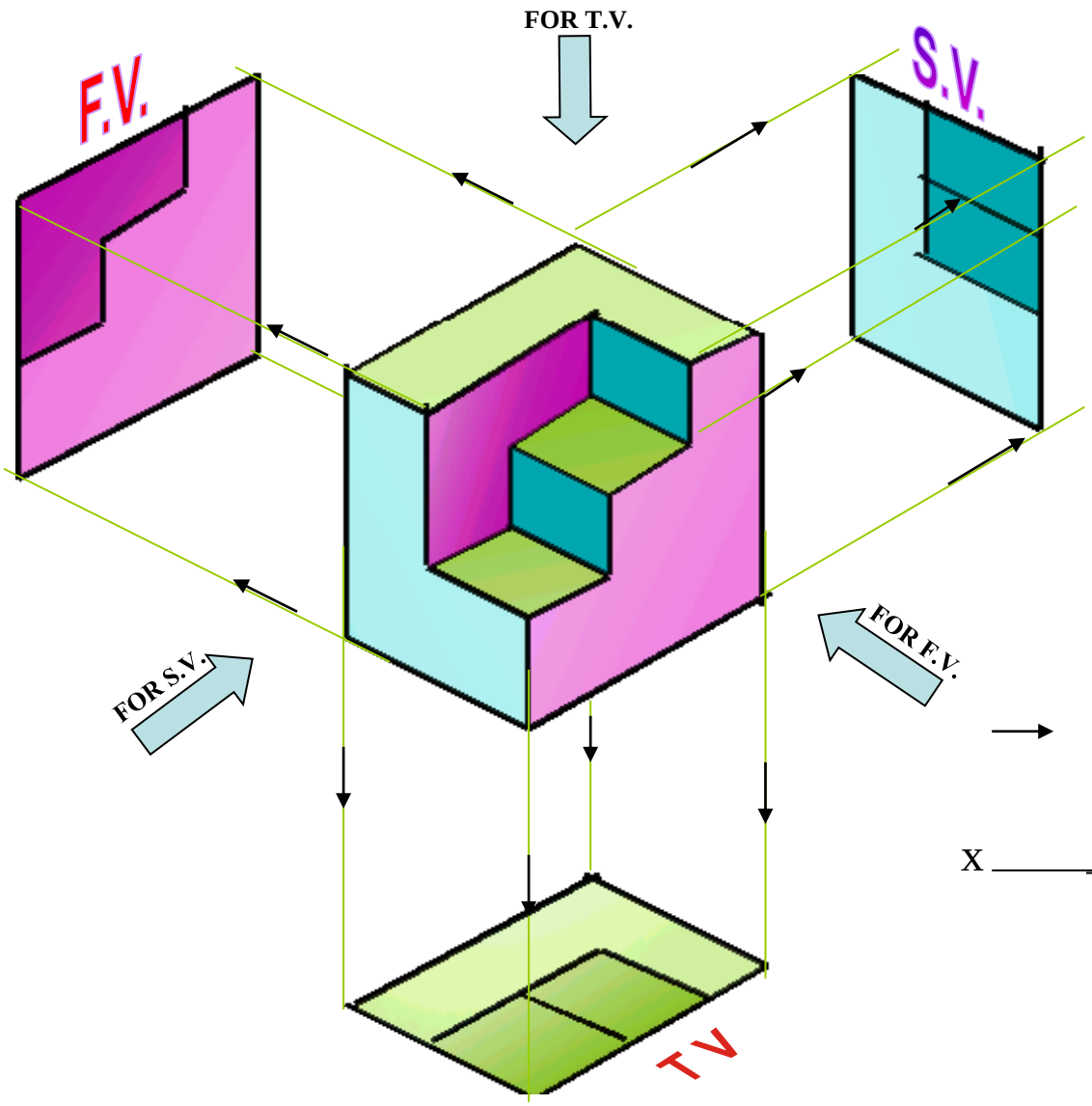
ORTHOGRAPHIC PROJECTIONS
{ MACHINE ELEMENTS }

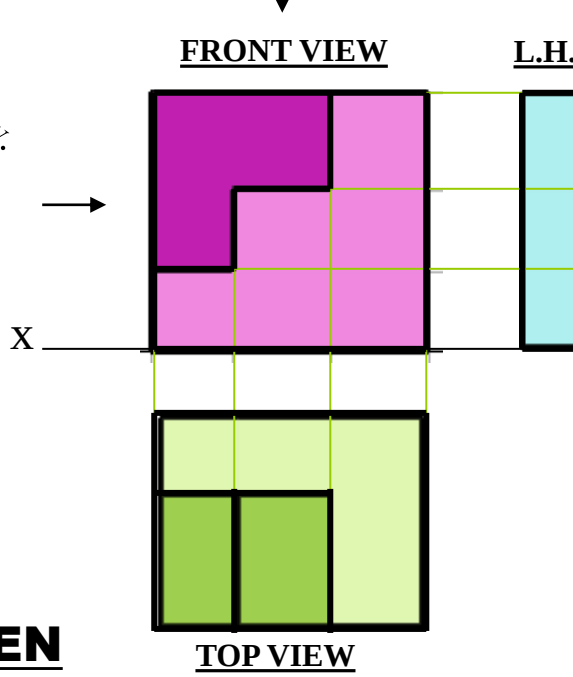
OBJECT IS OBSERVED IN THREE DIRECTIONS.
THE DIRECTIONS SHOULD BE NORMAL
TO THE RESPECTIVE PLANES.
AND NOW PROJECT THREE DIFFERENT VIEWS ON THOSE
THESE VEWS ARE FRONT VIEW , TOP VIEW AND SIDE V

FRONT VIEW IS A VIEW PROJECTED ON VERTICAL PLAN
TOP VIEW IS A VIEW PROJECTED ON HORIZONTAL PLAN
SIDE VIEW IS A VIEW PROJECTED ON PROFILE PLANE

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

AND THEN STUDY NEXT 26 ILLUSTRATED CASES CA
TRY TO RECOGNIZE SURFACES
PERPENDICULAR TO THE ARROW DIRECTIONS

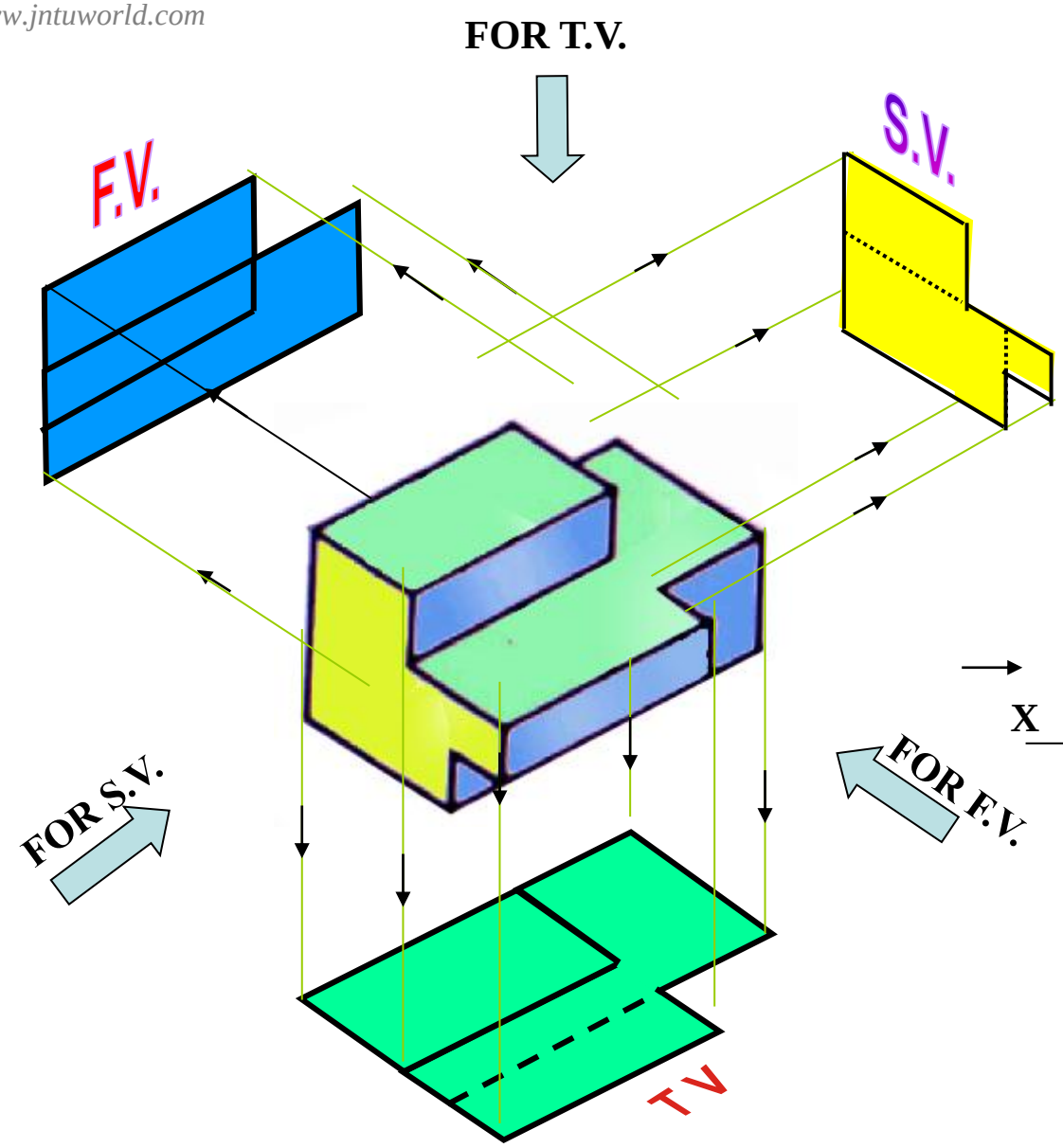


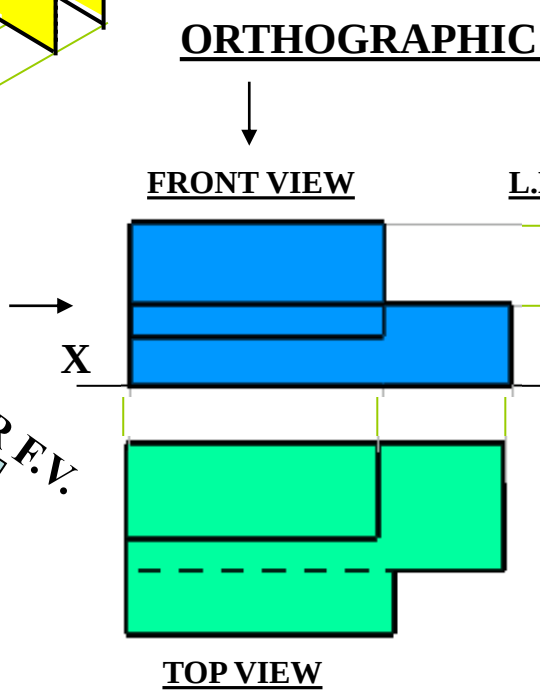


PICTORIAL PRESENTATION IS GIVEN

DRAW THREE VIEWS OF THIS OBJECT

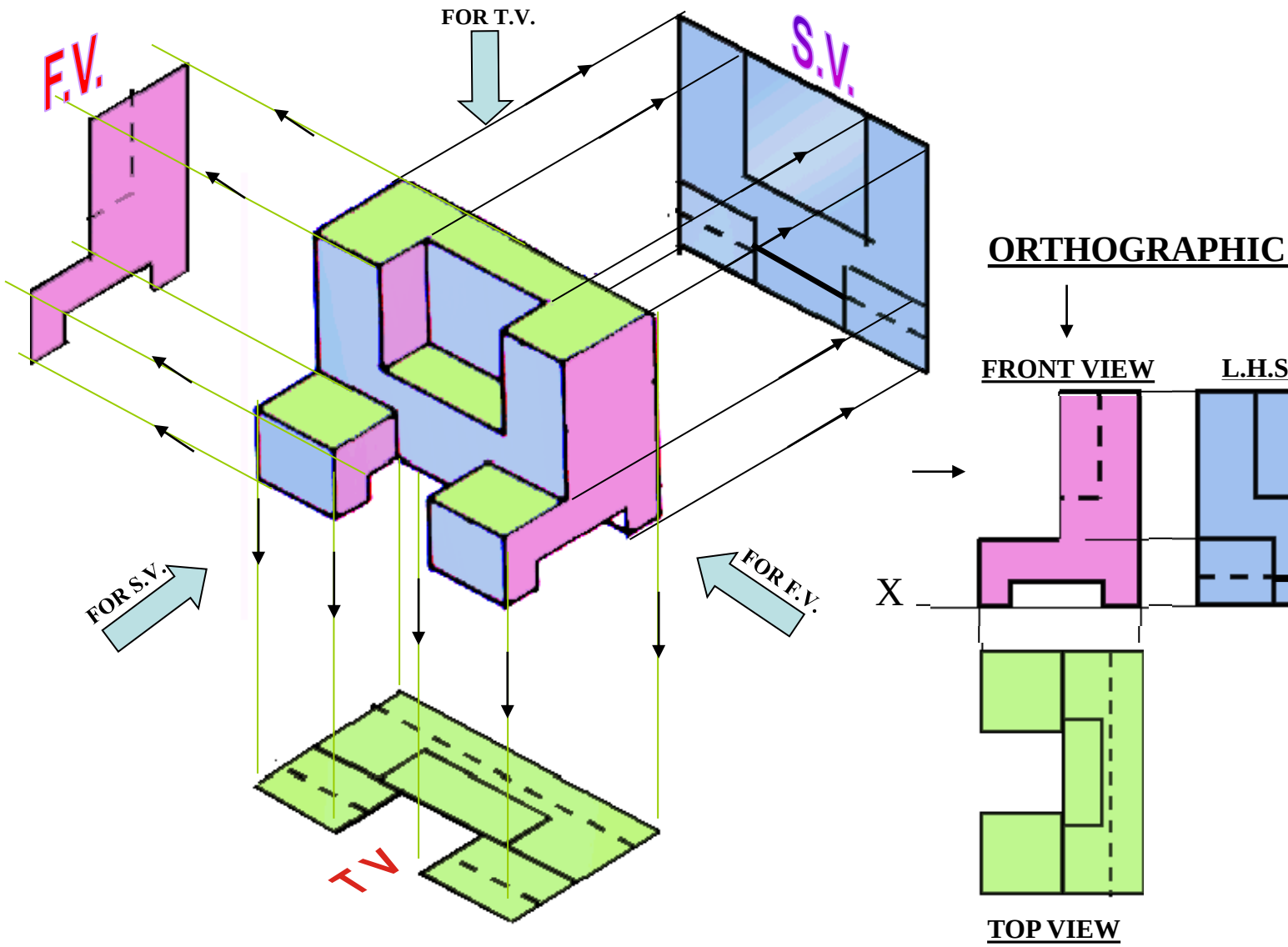
BY FIRST ANGLE PROJECTION METHOD





PICTORIAL PRESENTATION IS GIVEN

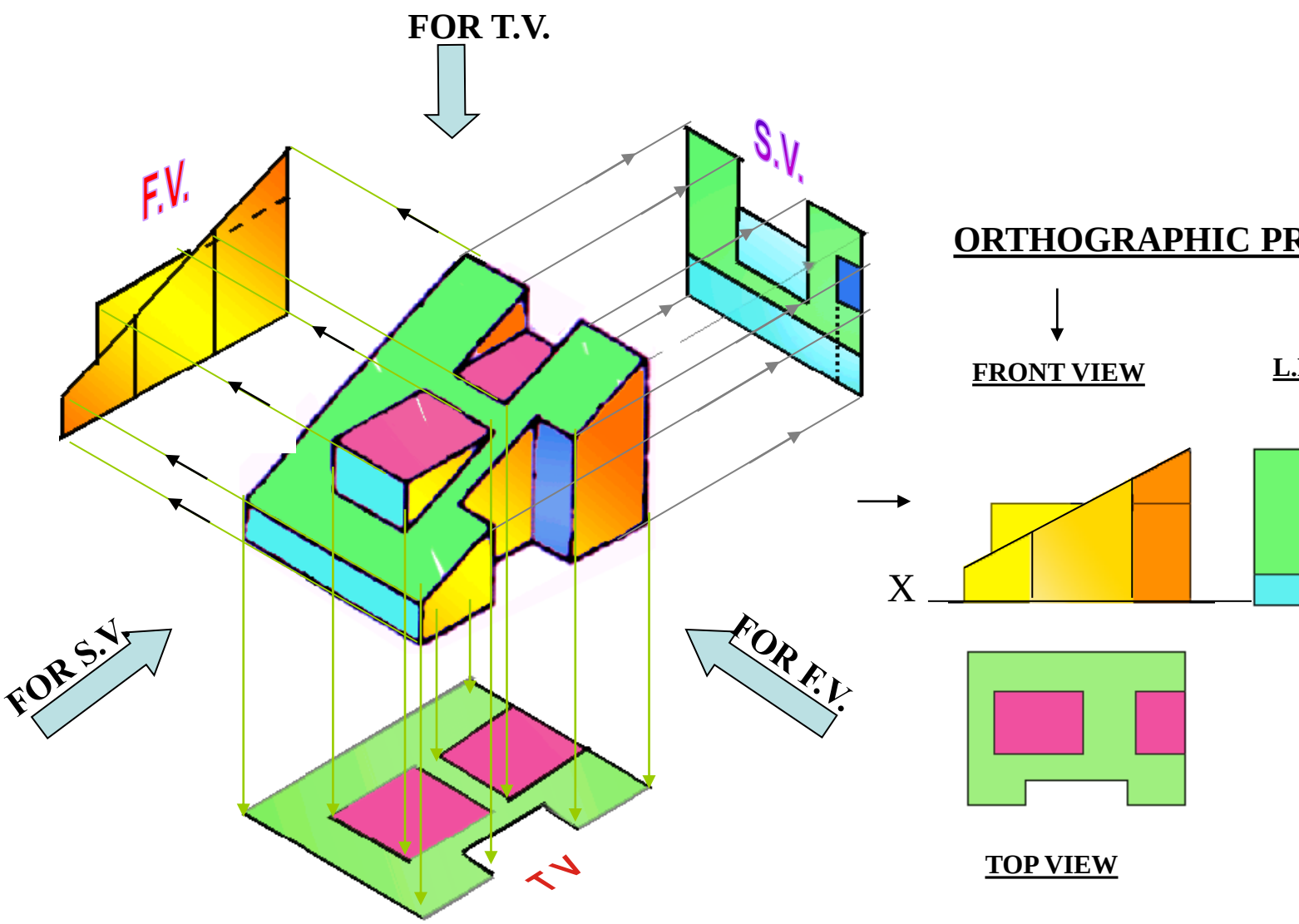
DRAW THREE VIEWS OF THIS OBJECT BY FIRST ANGLE PROJECTION METHOD



PICTORIAL PRESENTATION IS GIVEN

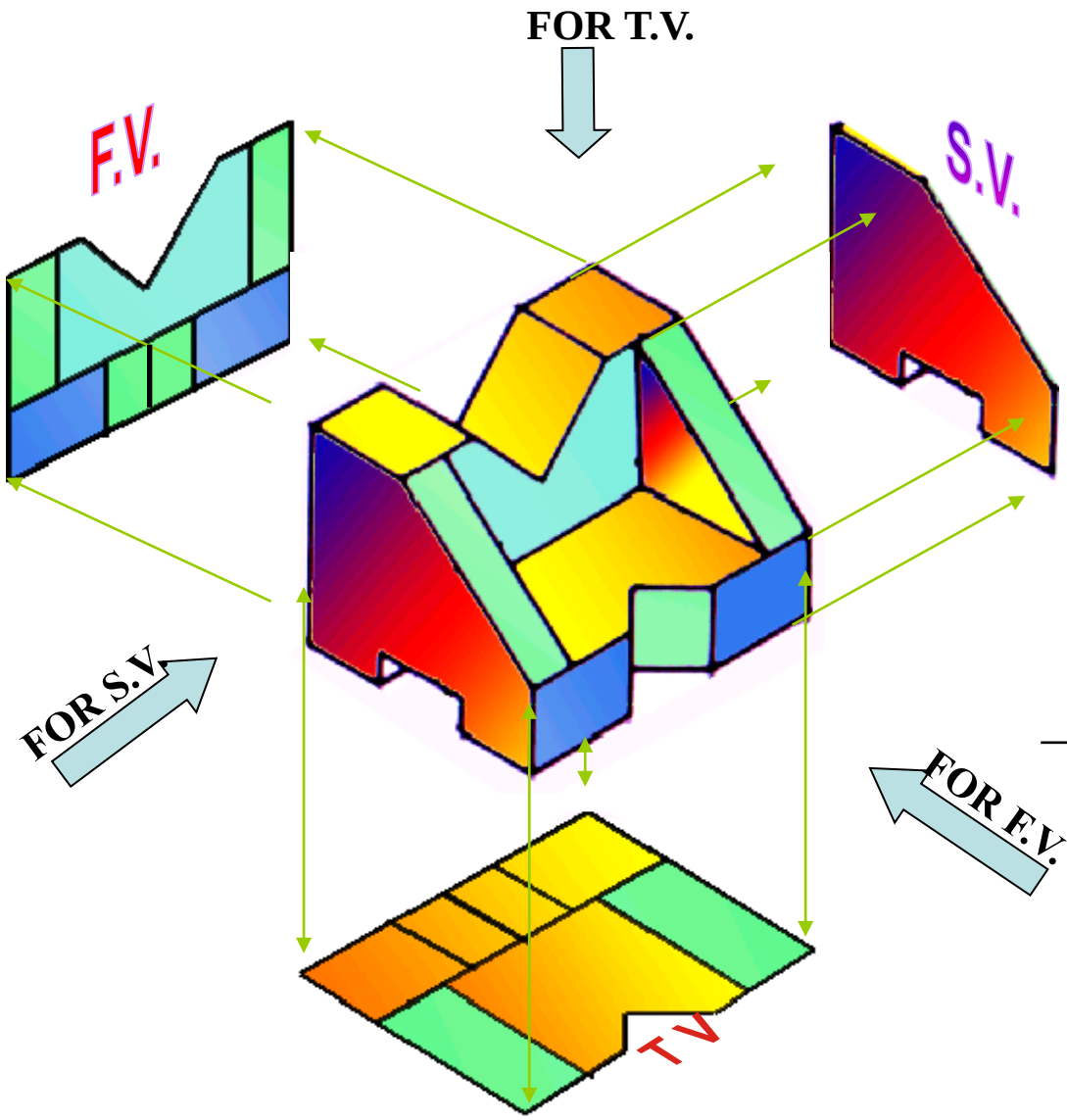
DRAW THREE VIEWS OF THIS OBJECT

BY FIRST ANGLE PROJECTION METHOD



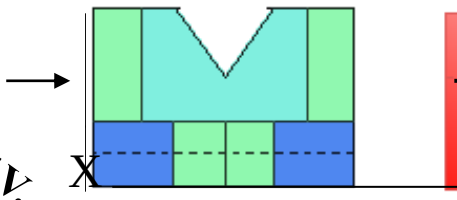
PICTORIAL PRESENTATION IS GIVEN

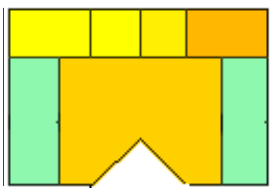
DRAW THREE VIEWS OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD



ORTHOGRAPHIC

FRONT VIEW



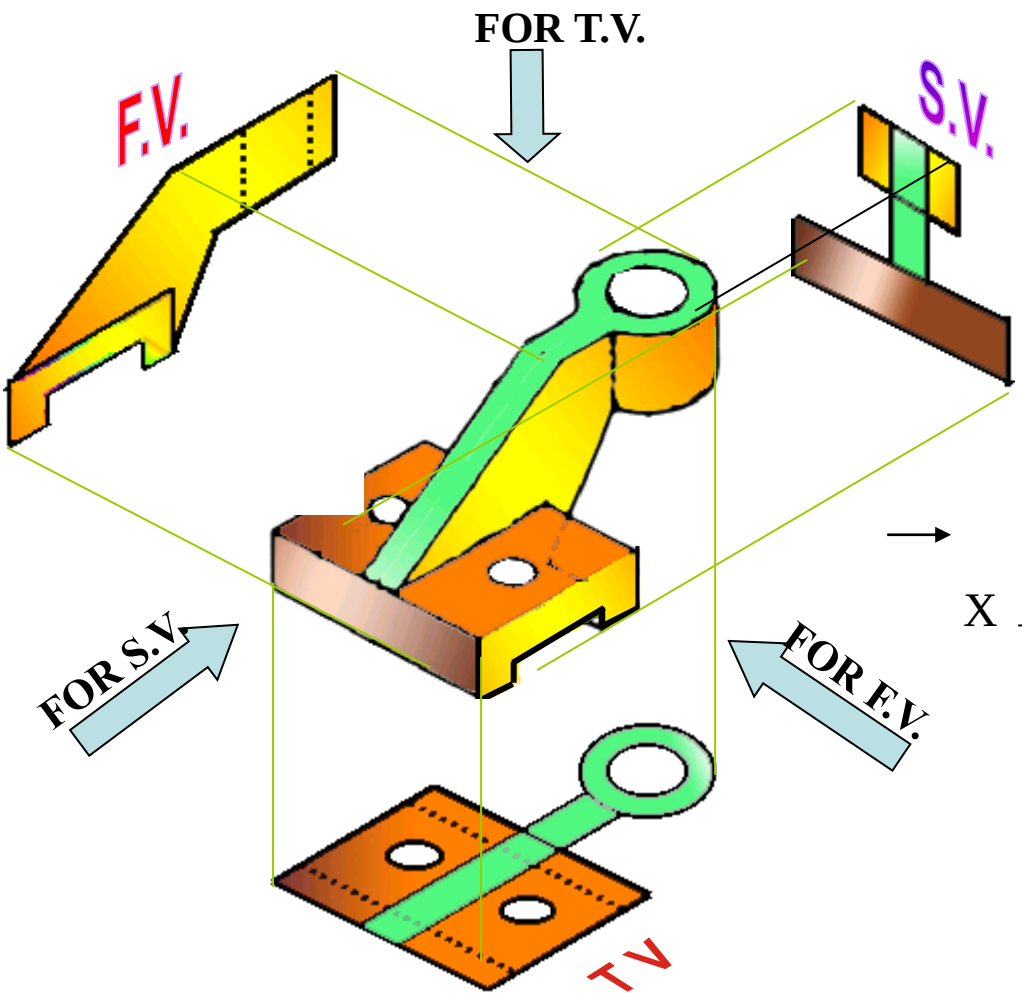


TOP VIEW

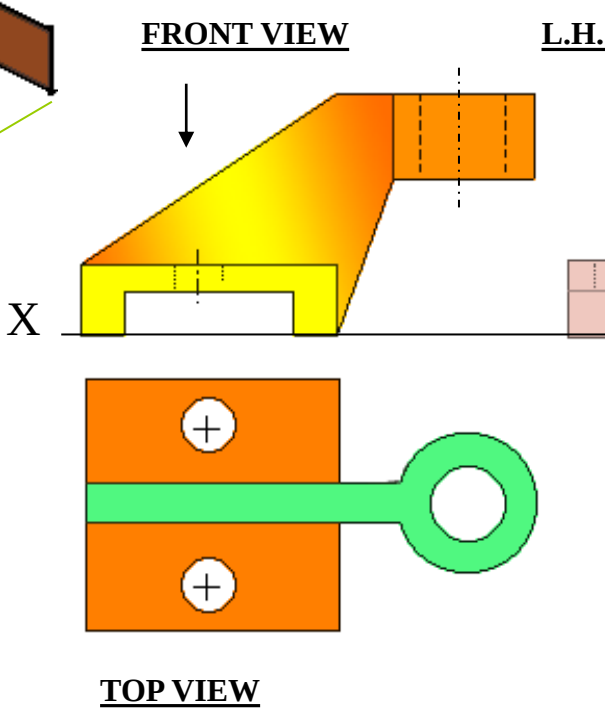
PICTORIAL PRESENTATION IS GIVEN

DRAW THREE VIEWS OF THIS OBJECT

BY FIRST ANGLE PROJECTION METHOD



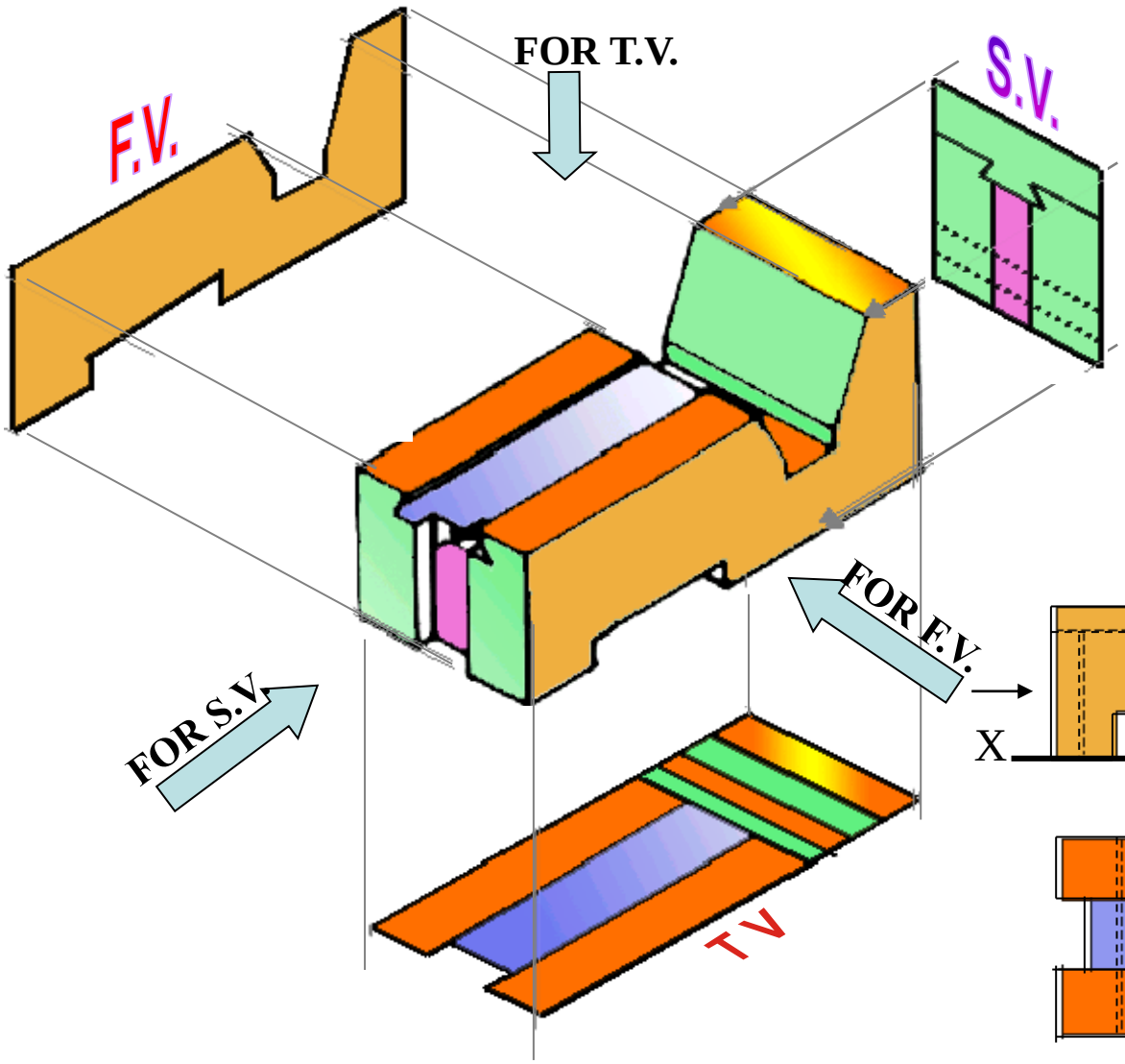
ORTHOGRAPHIC PR



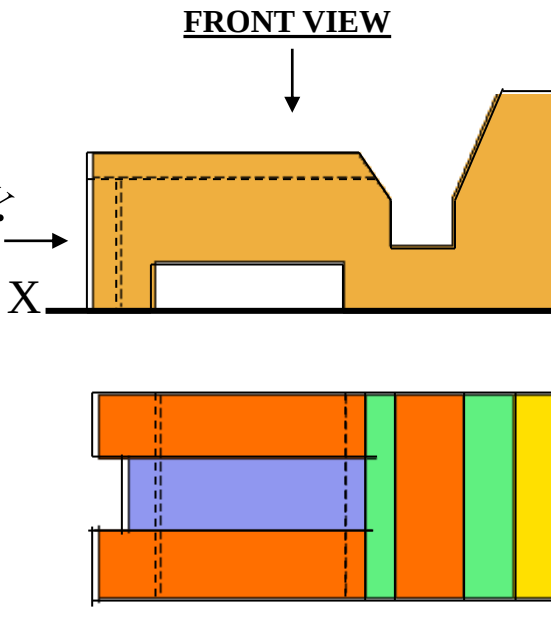
PICTORIAL PRESENTATION IS GIVEN

DRAW THREE VIEWS OF THIS OBJECT

BY FIRST ANGLE PROJECTION METHOD



ORTHOGRAPHIC



PICTORIAL PRESENTATION IS GIVEN

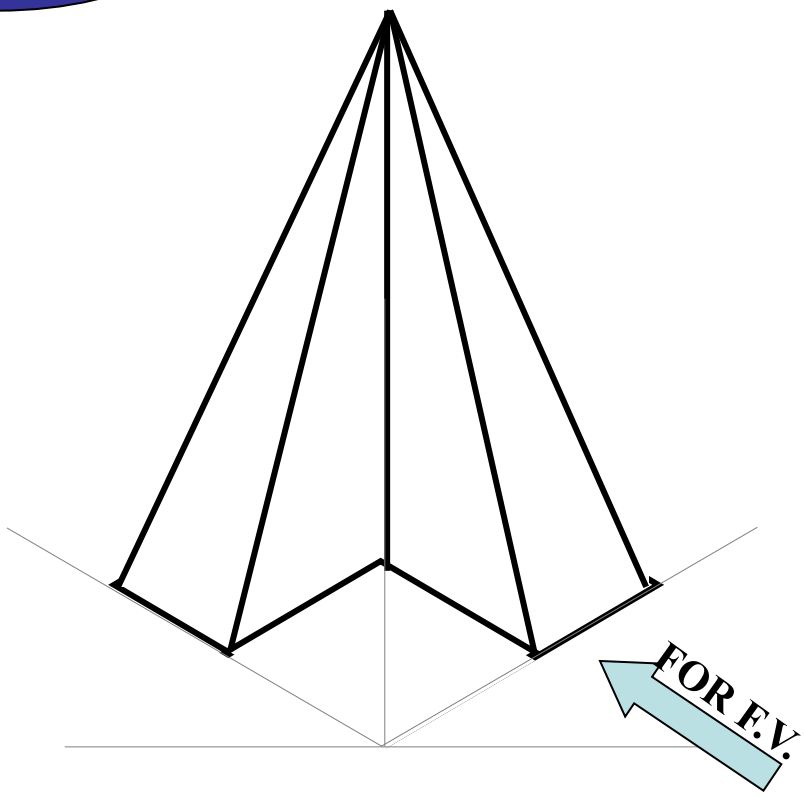
DRAW THREE VIEWS OF THIS OBJECT

BY FIRST ANGLE PROJECTION METHOD

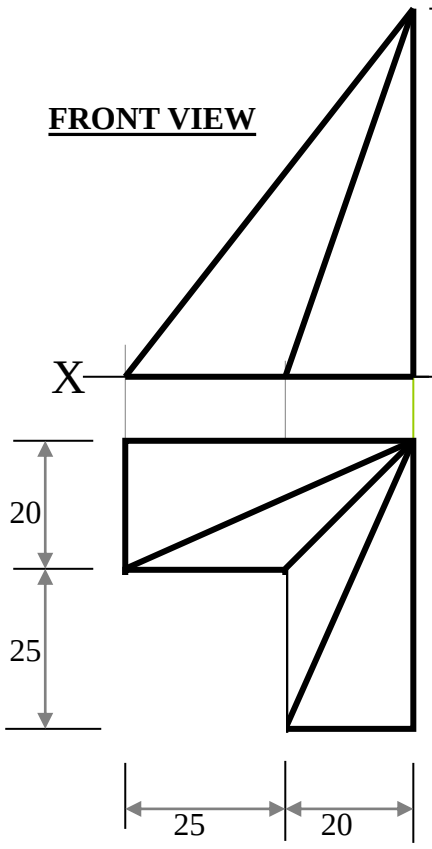
STUDY ILLUSTRATIONS

7

FOR T.V.



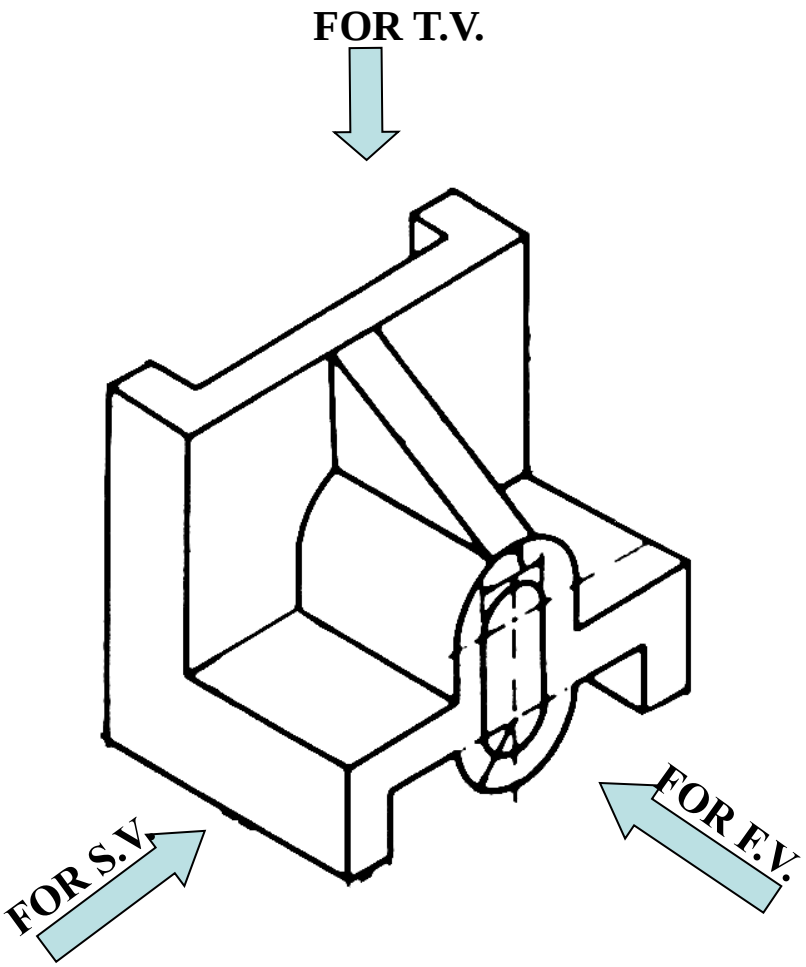
ORTHOGRAPHIC PROJEC



PICTORIAL PRESENTATION IS GIVEN

DRAW THREE VIEWS OF THIS OBJECT

BY FIRST ANGLE PROJECTION METHOD



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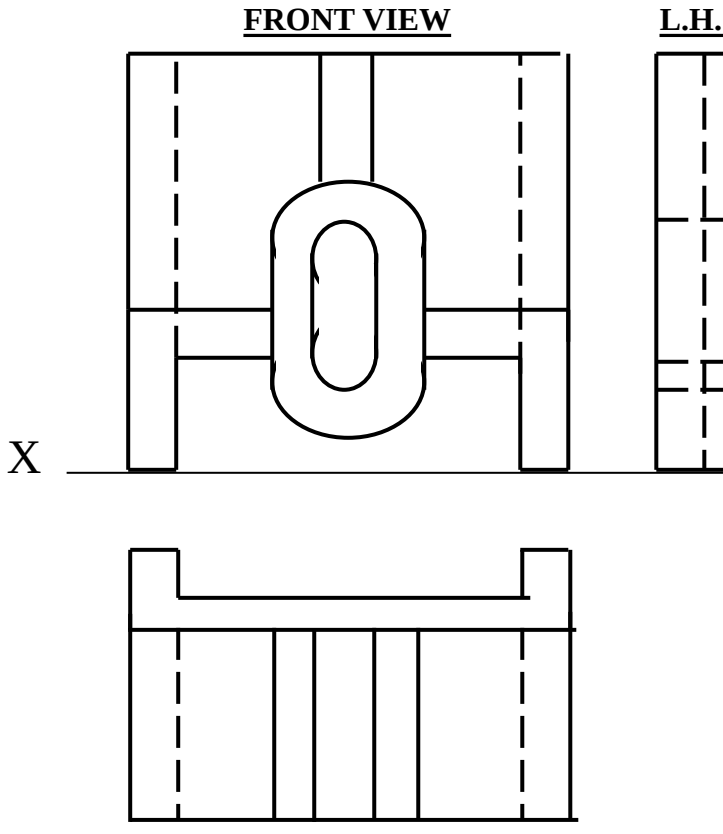
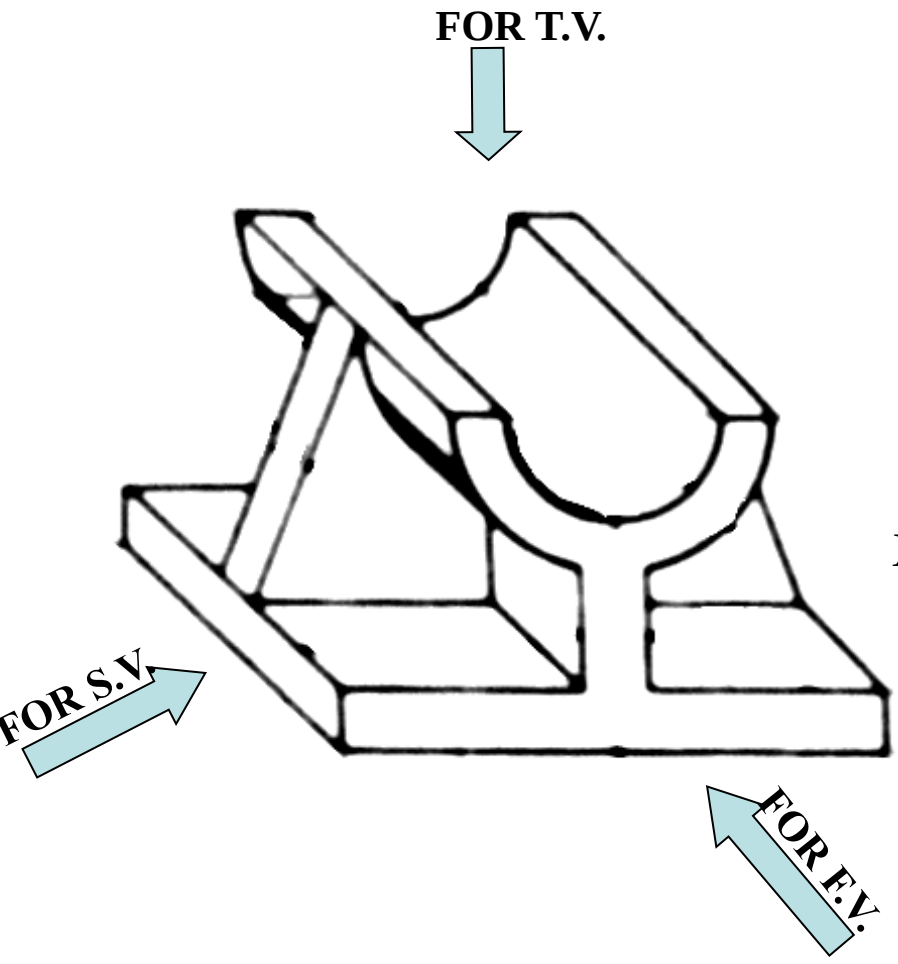
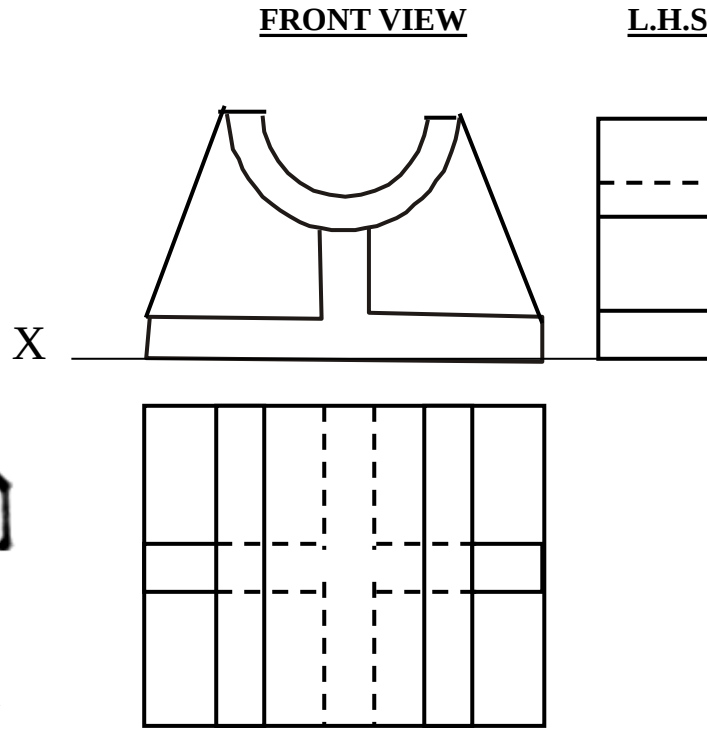


PICTORIAL PRESENTATION IS GIVEN

DRAW THREE VIEWS OF THIS OBJECT BY FIRST ANGLE PROJECTION METHOD

ORTHOGRAPHIC PROJEC





PICTORIAL PRESENTATION IS GIVEN

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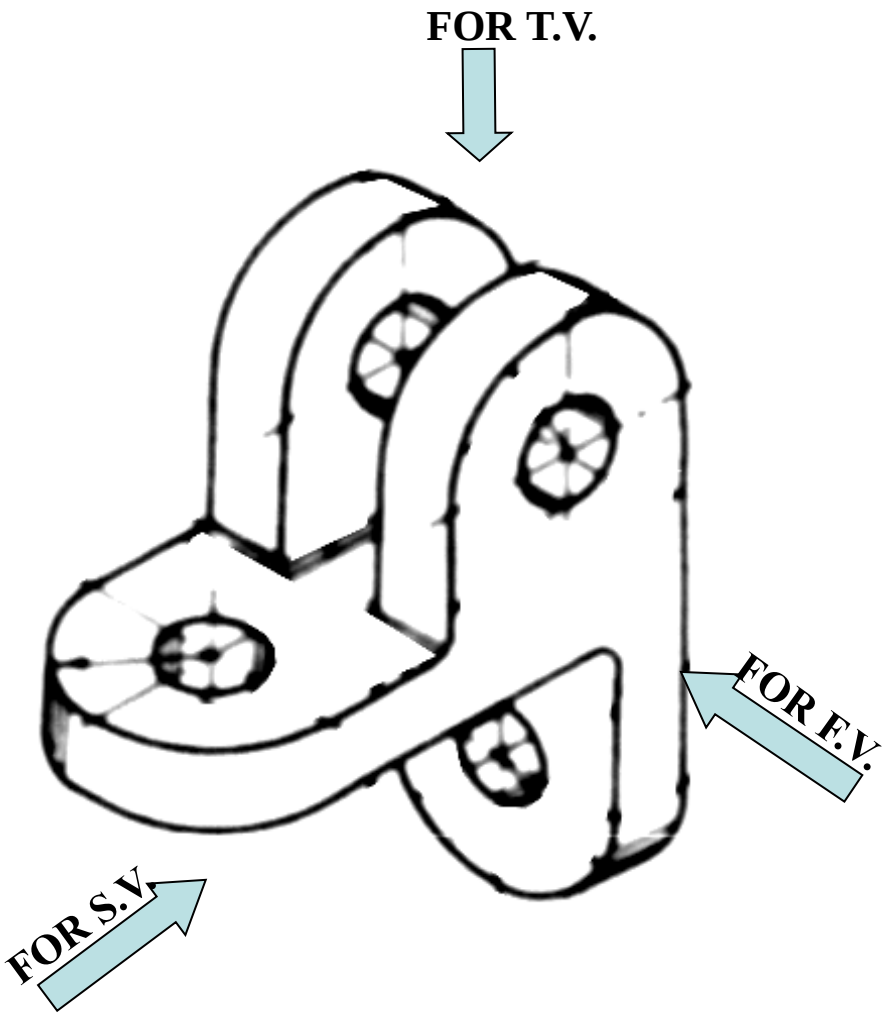
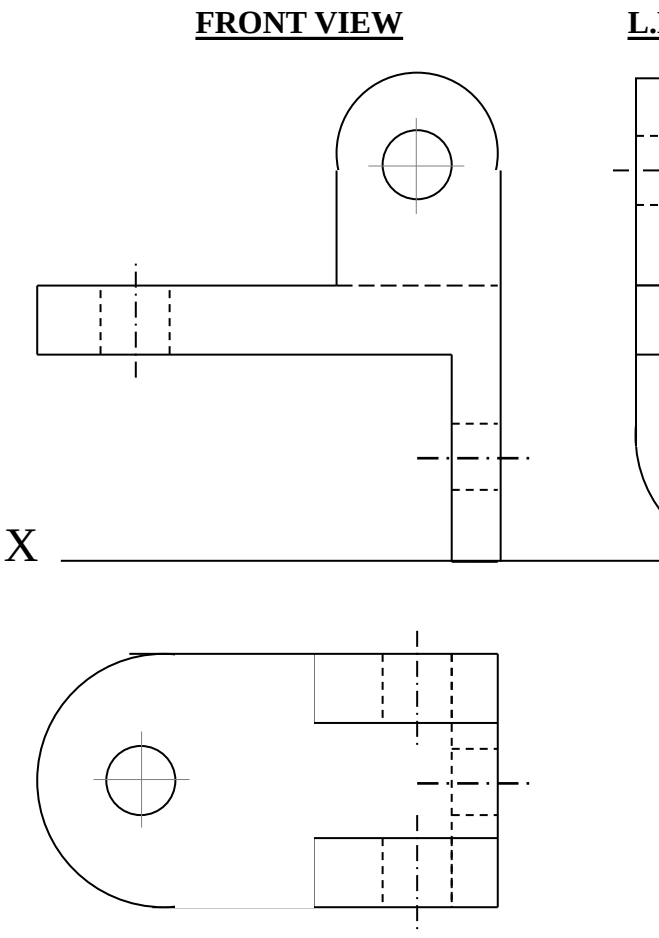


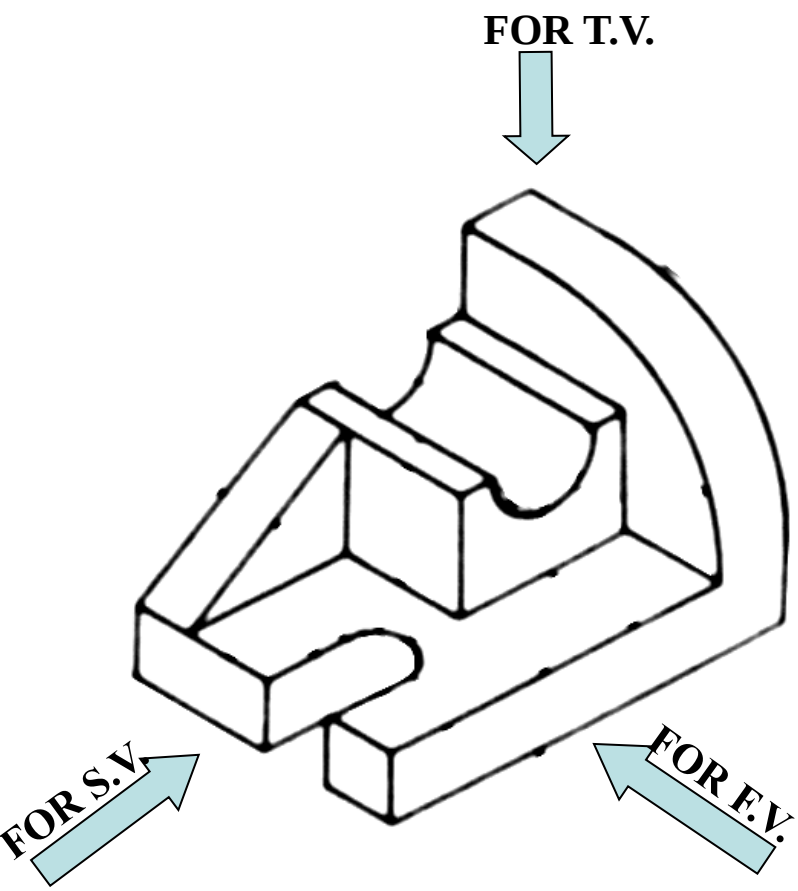
ORTHOGRAPHIC PROJECT



PICTORIAL PRESENTATION IS GIVEN

DRAW THREE VIEWS OF THIS OBJECT

BY FIRST ANGLE PROJECTION METHOD



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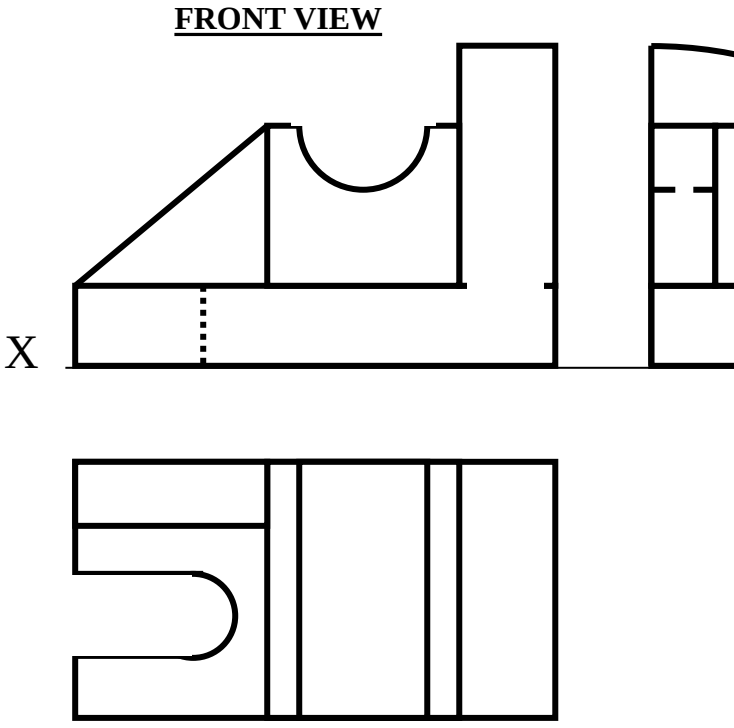
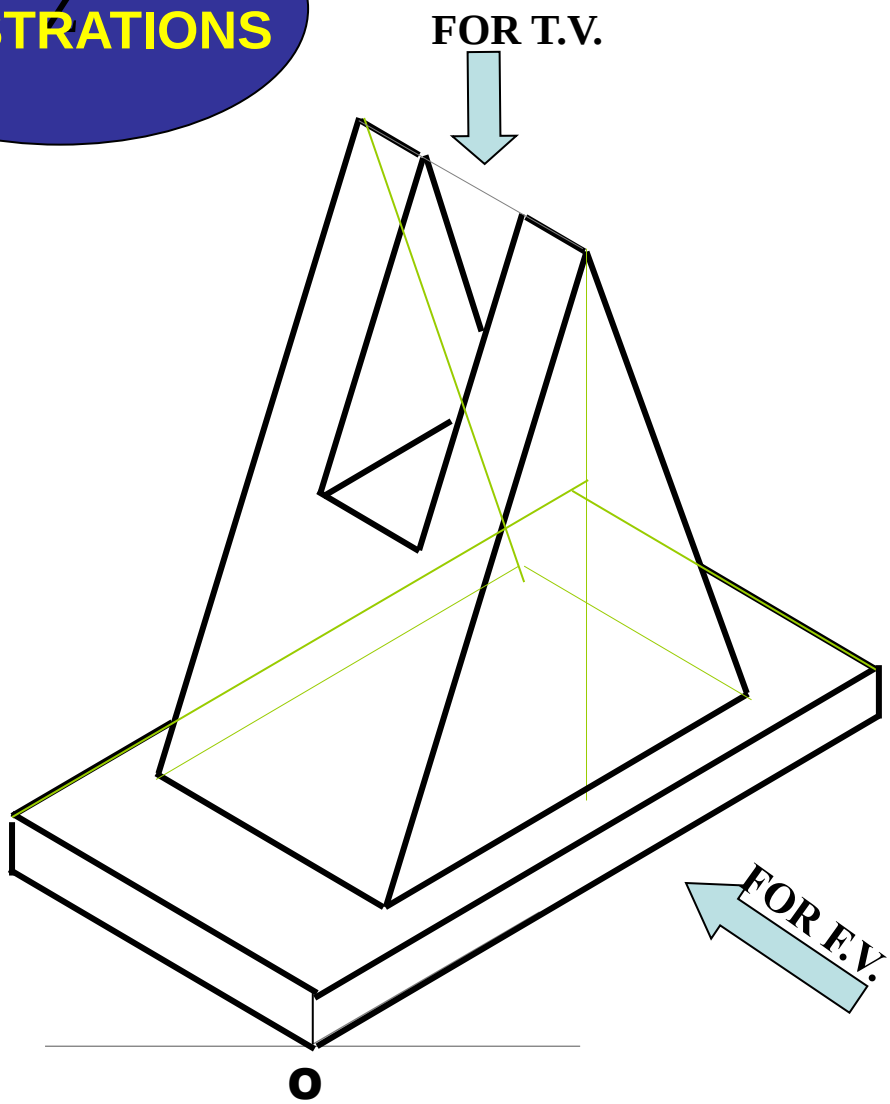


PICTORIAL PRESENTATION IS GIVEN

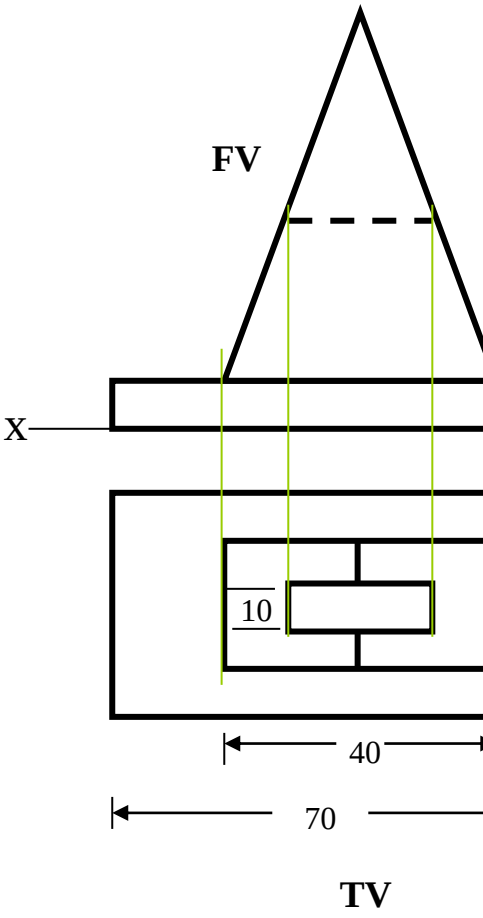
DRAW THREE VIEWS OF THIS OBJECT BY FIRST ANGLE PROJECTION METHOD

STUDY ILLUSTRATIONS

7



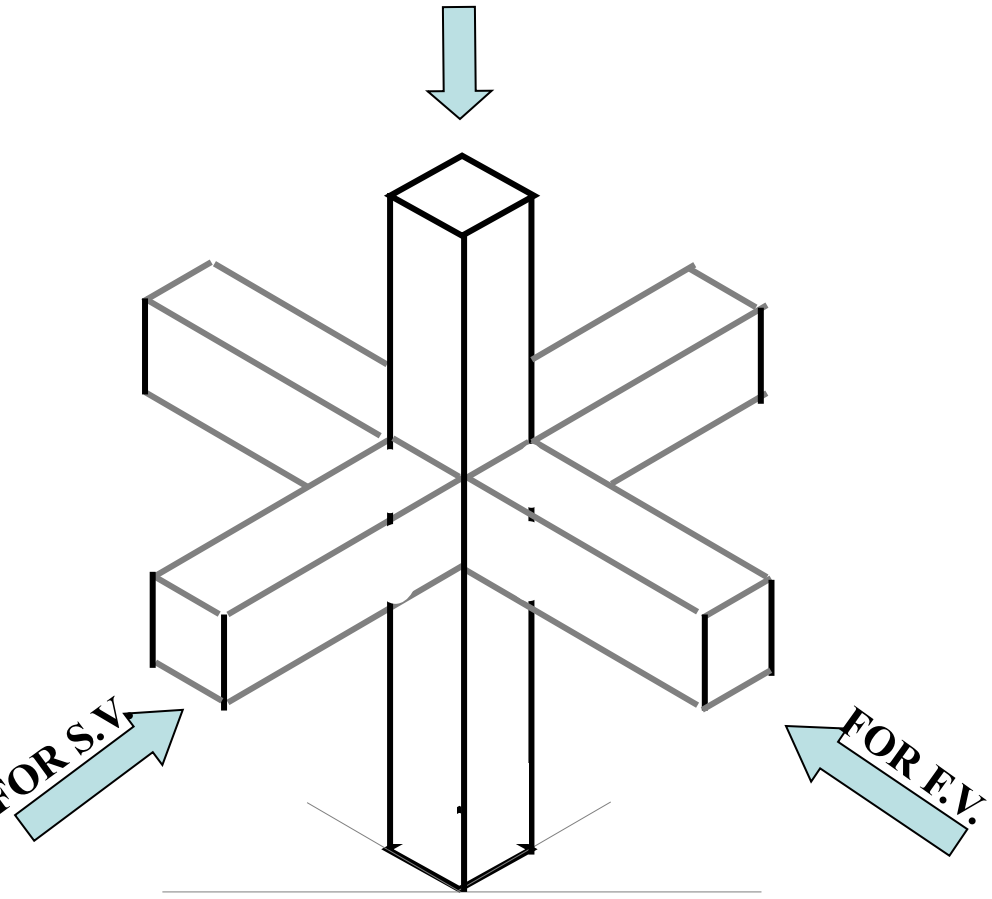
ORTHOGRAPHIC PROJ



PICTORIAL PRESENTATION IS GIVEN

DRAW FV AND TV OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD

STUDY ILLUSTRATIONS



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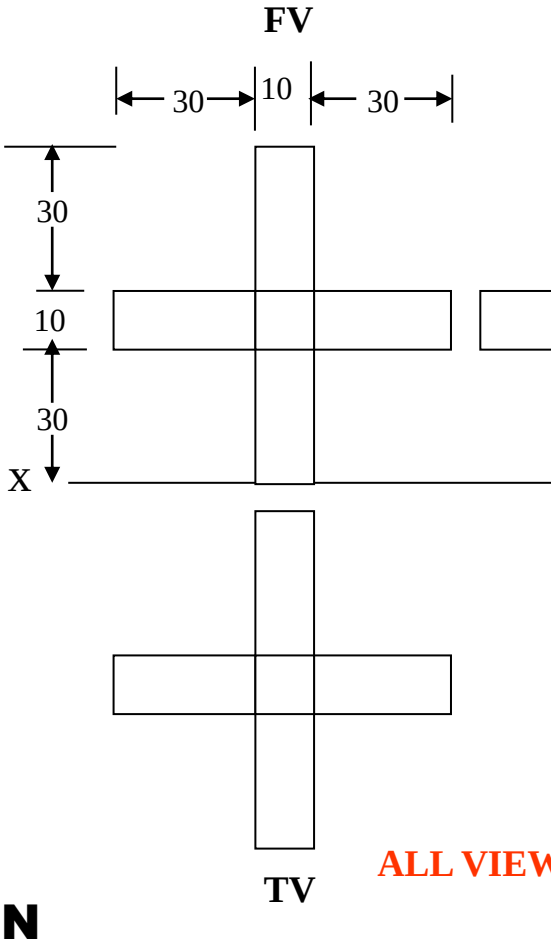


ALL VIEW

PICTORIAL PRESENTATION IS GIVEN

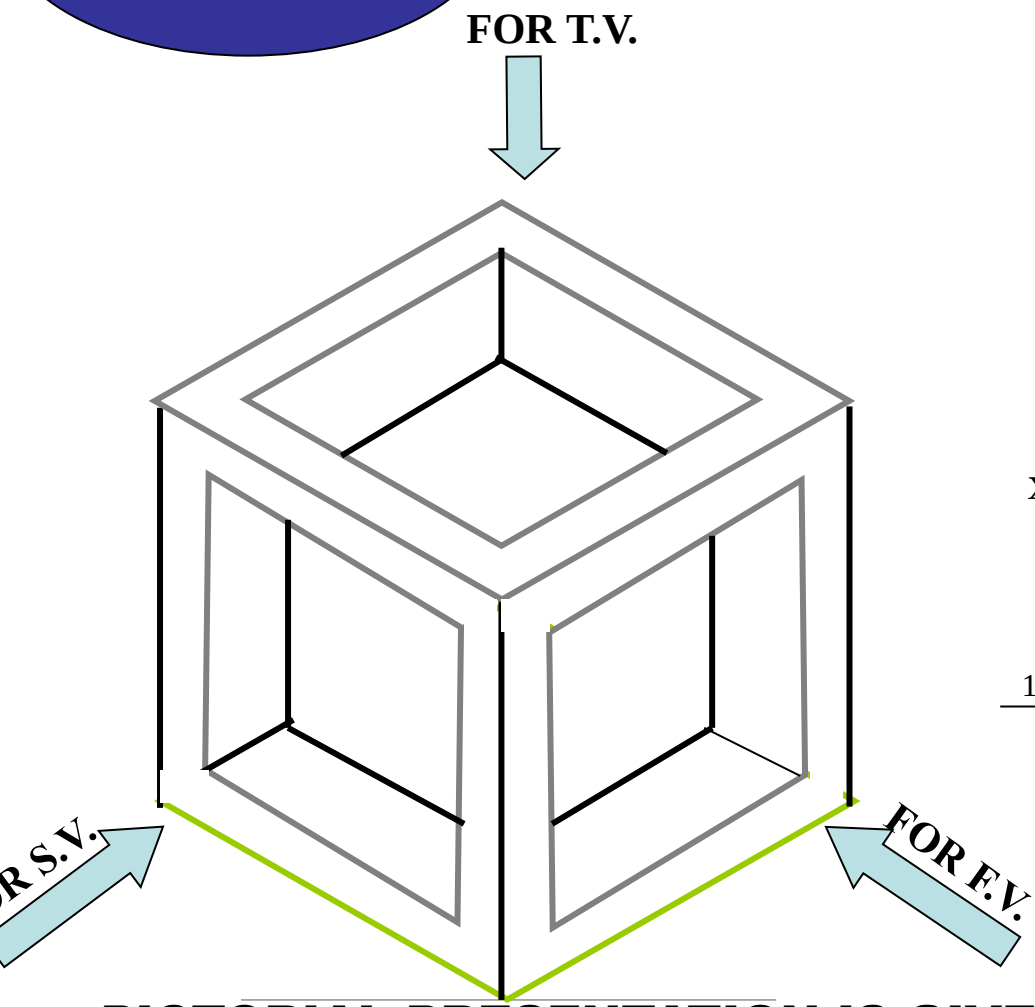
DRAW THREE VIEWS OF THIS OBJECT BY FIRST ANGLE PROJECTION METHOD

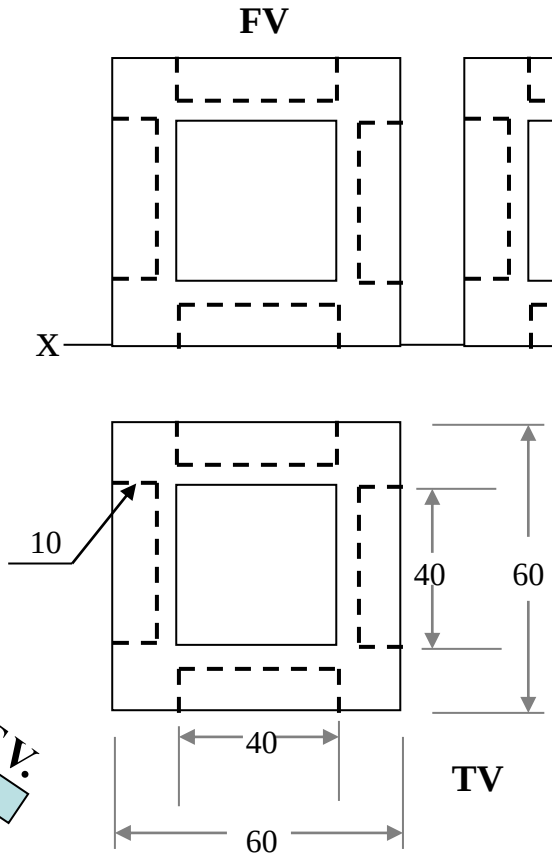
STUDY ILLUSTRATIONS

7

ORTHOGRAPHIC PROJE

ALL VIEWS IDENTIC

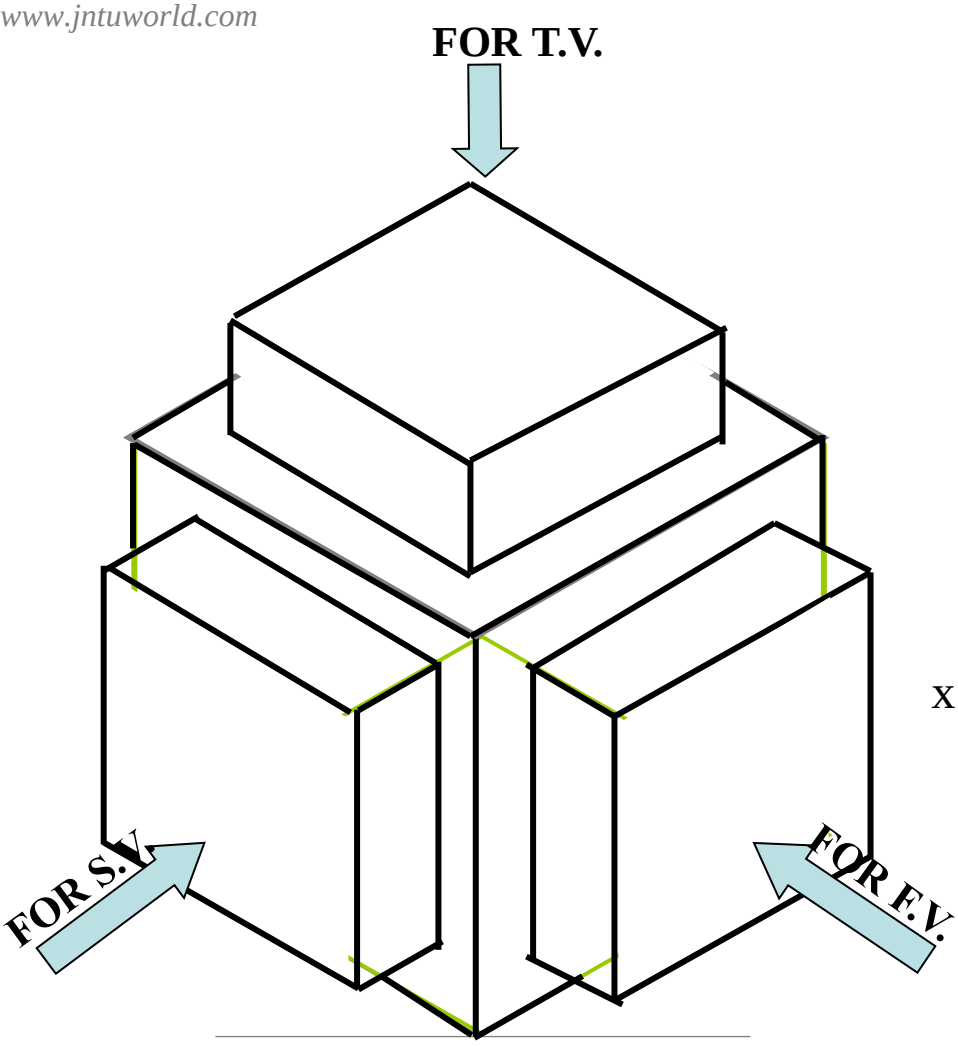




PICTORIAL PRESENTATION IS GIVEN

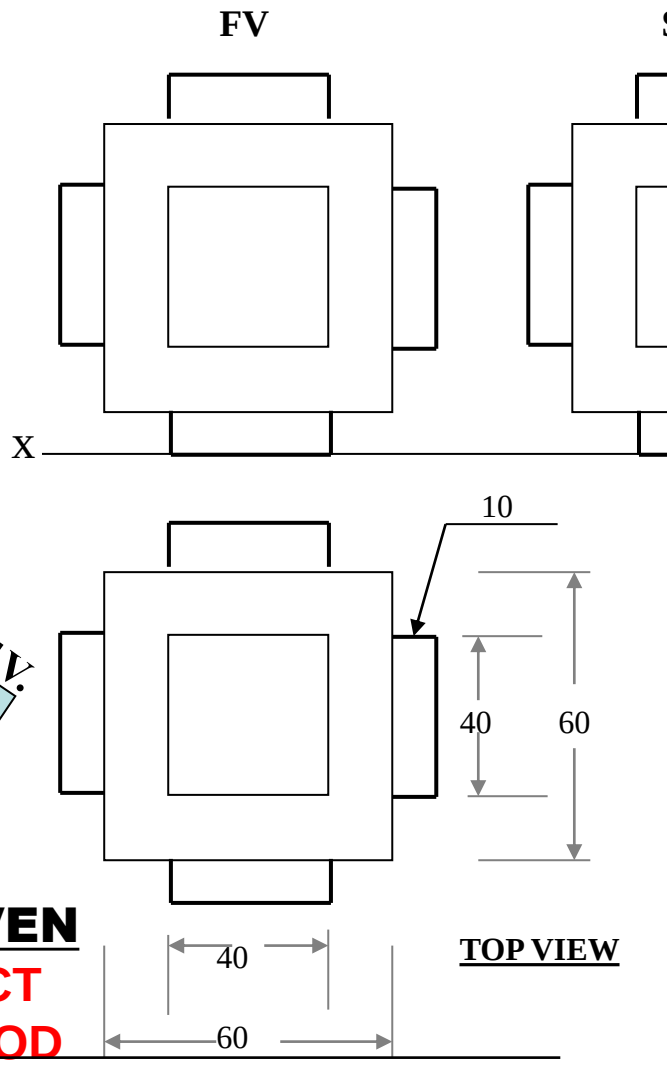
DRAW THREE VIEWS OF THIS OBJECT

BY FIRST ANGLE PROJECTION METHOD



ORTHOGRAPHIC PROJECTI

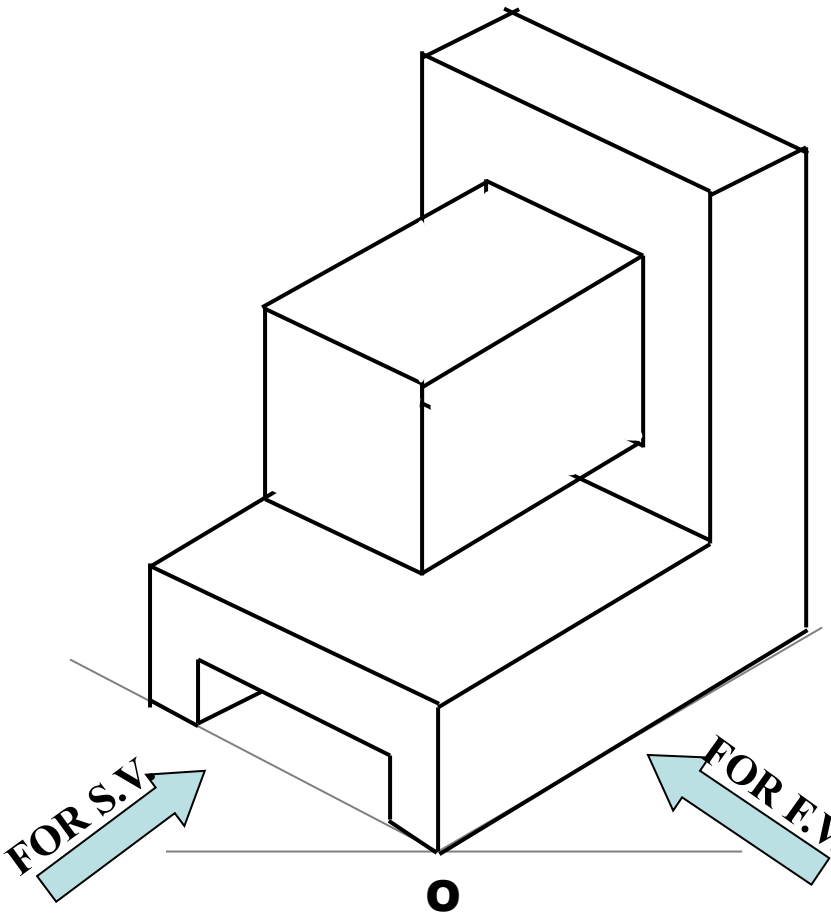
ALL VIEWS IDENTICA



TOP VIEW

PICTORIAL PRESENTATION IS GIVEN

DRAW THREE VIEWS OF THIS OBJECT BY FIRST ANGLE PROJECTION METHOD



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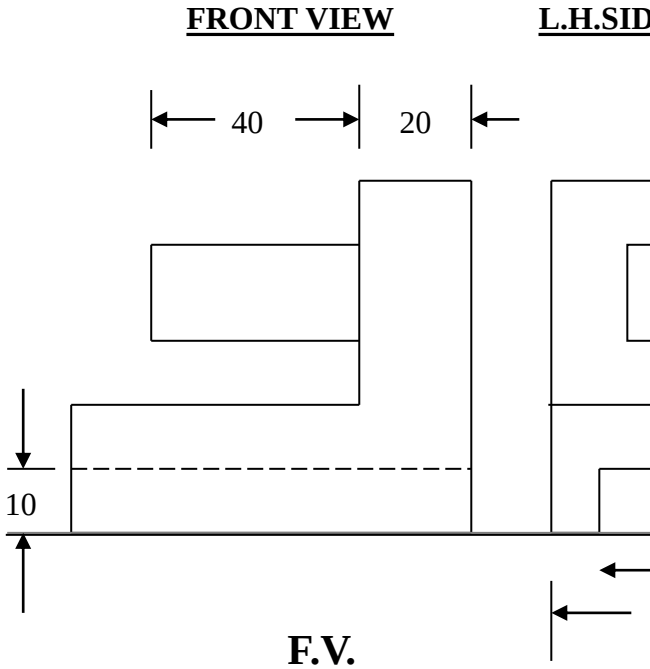
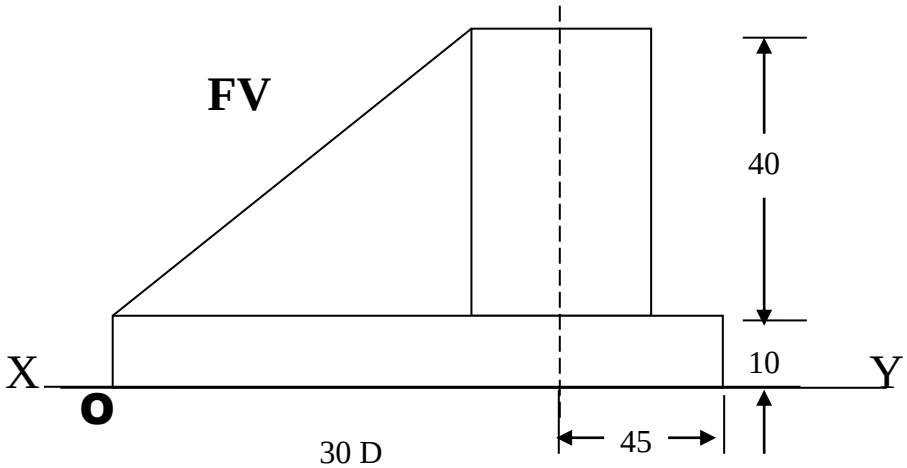
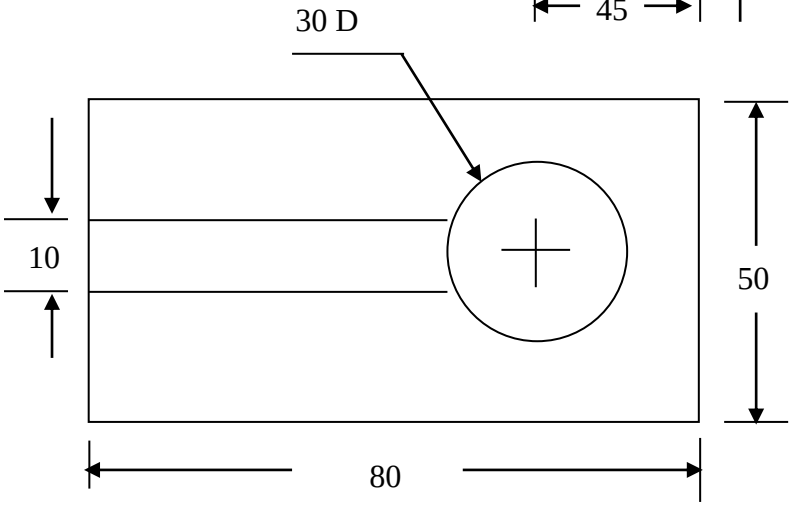


PICTORIAL PRESENTATION IS GIVEN

DRAW FV AND SV OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD

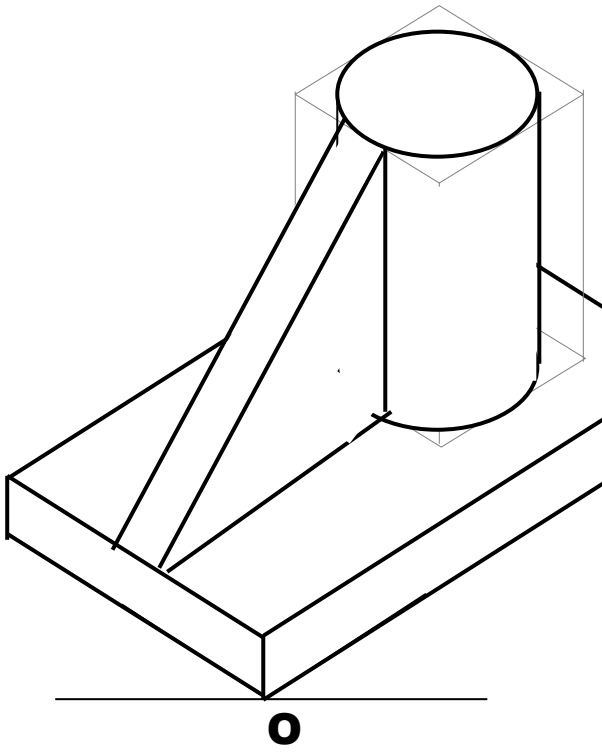
ORTHOGRAPHIC PROJECTIONS





TV

FOR T.V.

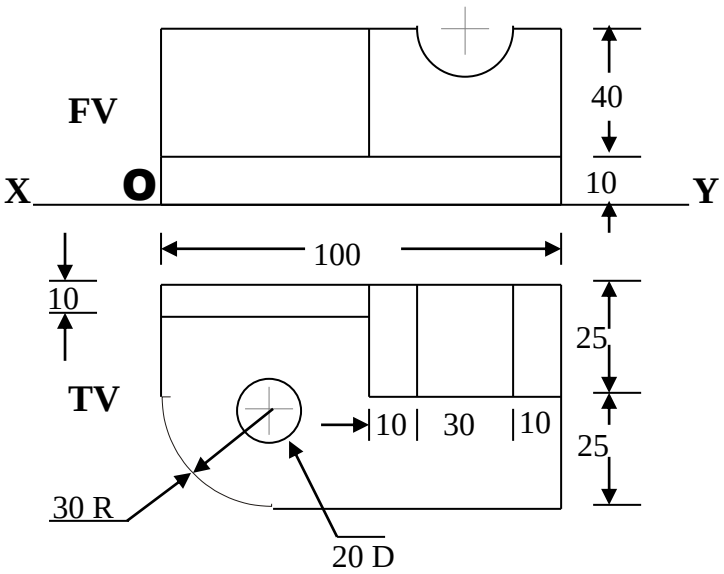


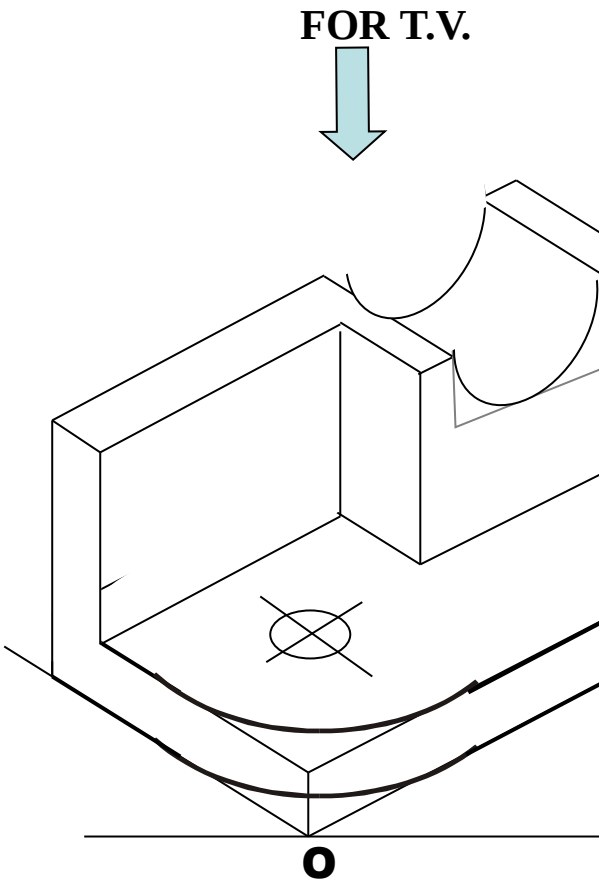
PICTORIAL PRESENTATIO

DRAW FV AND TV OF THI

BY FIRST ANGLE PROJECTI

ORTHOGRAPHIC PROJECTIONS



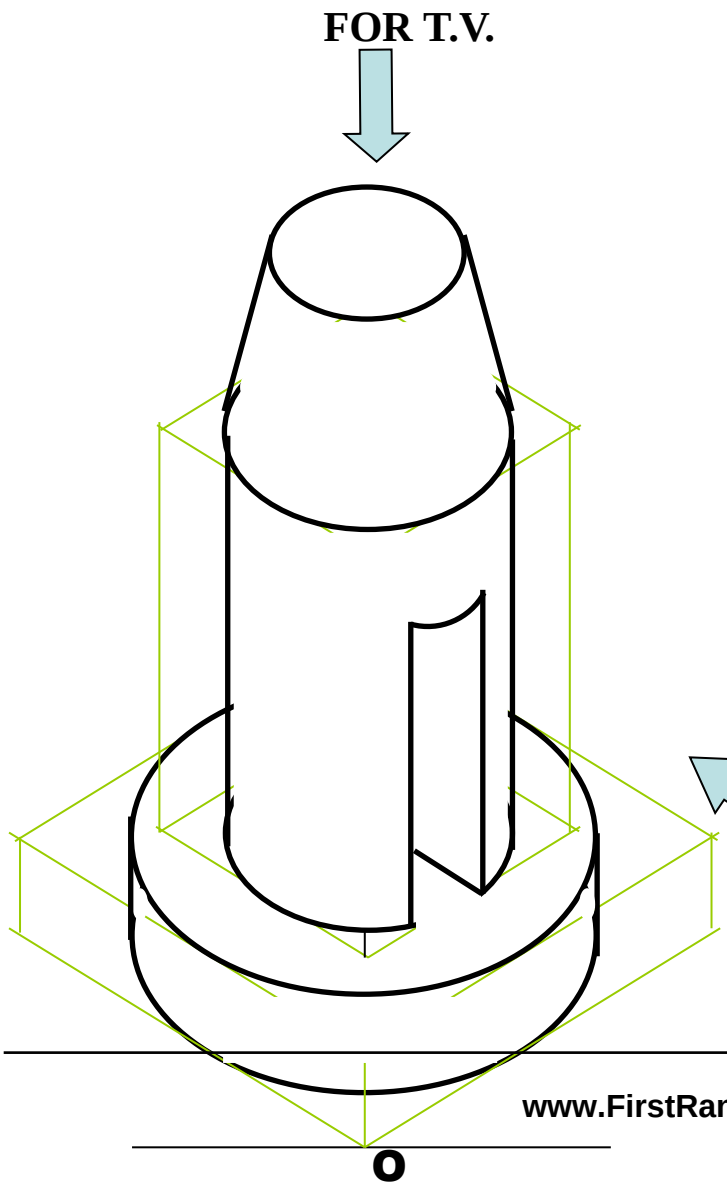


PICTORIAL PRESENTATION

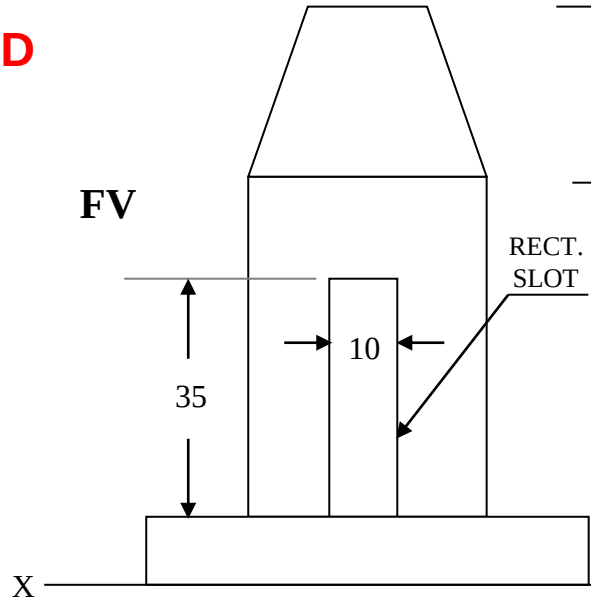
DRAW FV AND TV OF THIS O
BY FIRST ANGLE PROJECTION

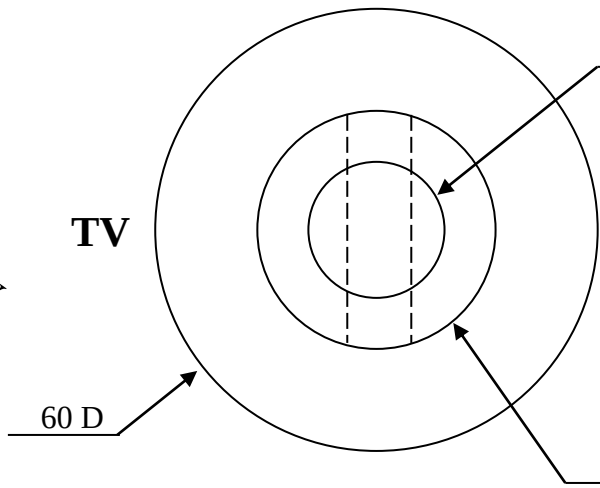
PICTORIAL PRESENTATION IS GIVEN

DRAW FV AND TV OF THIS OBJECT BY FIRST ANGLE PROJECTION METHOD

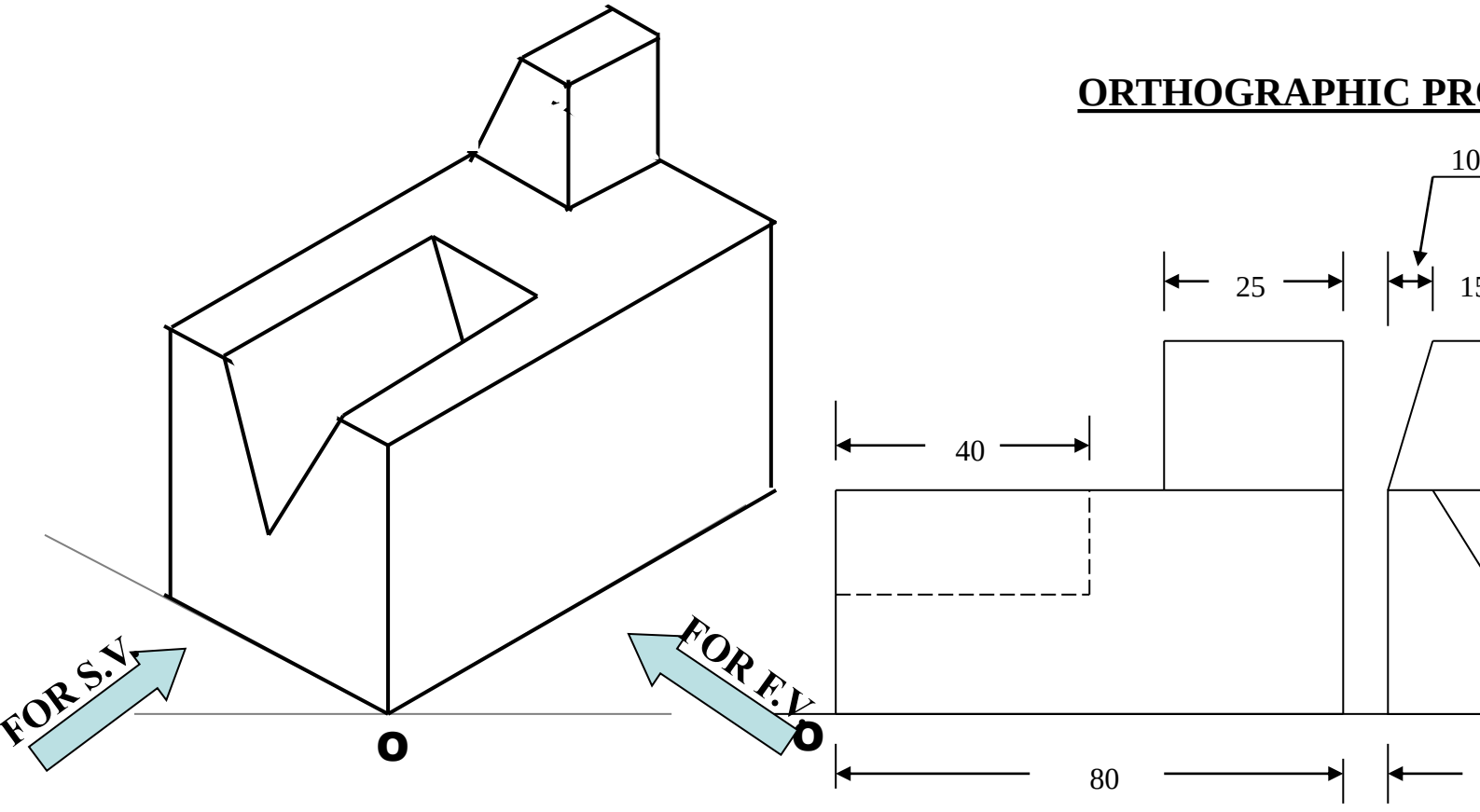


ORTHOGRAPHIC PROJEC





TOP VIEW

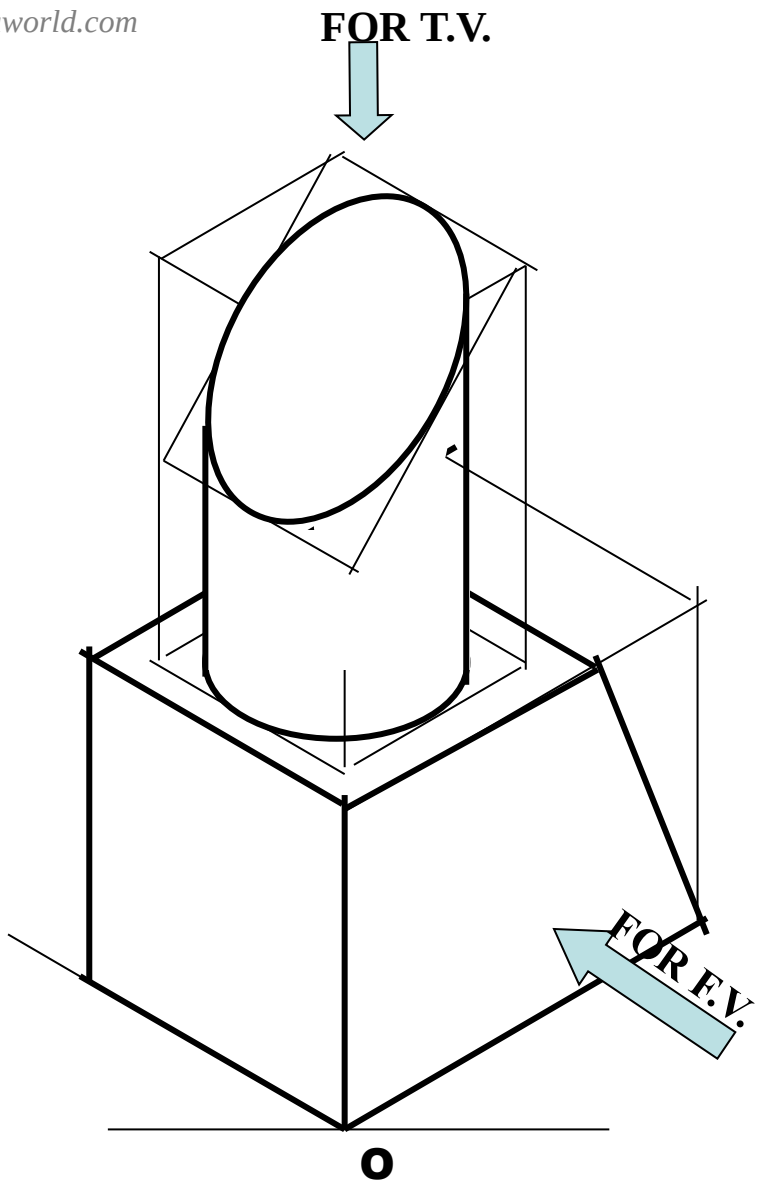


F.V.

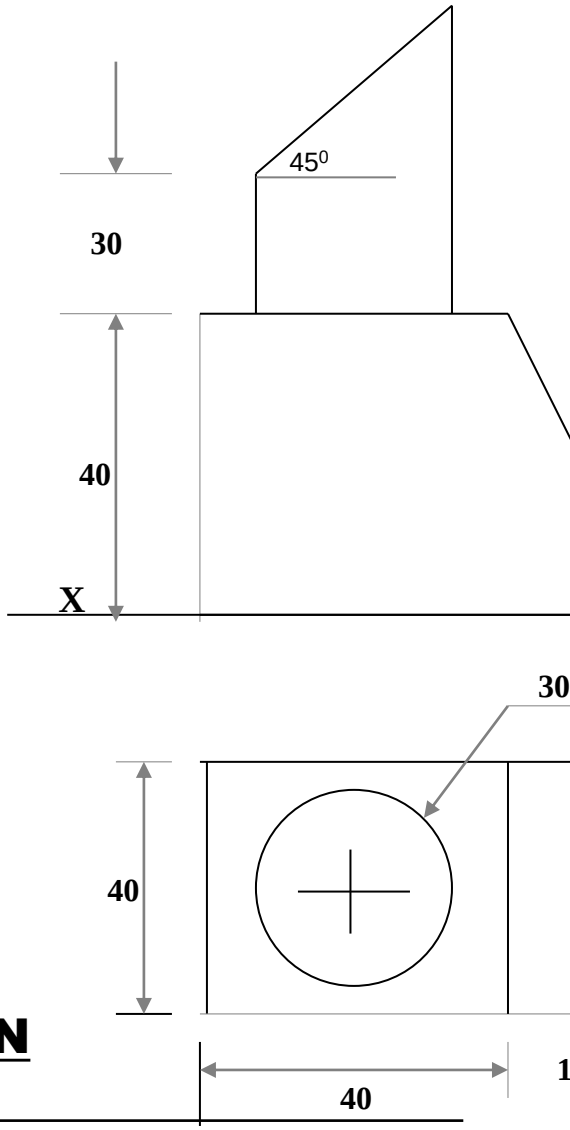
PICTORIAL PRESENTATION IS GIVEN

DRAW FV AND SV OF THIS OBJECT

BY FIRST ANGLE PROJECTION METHOD



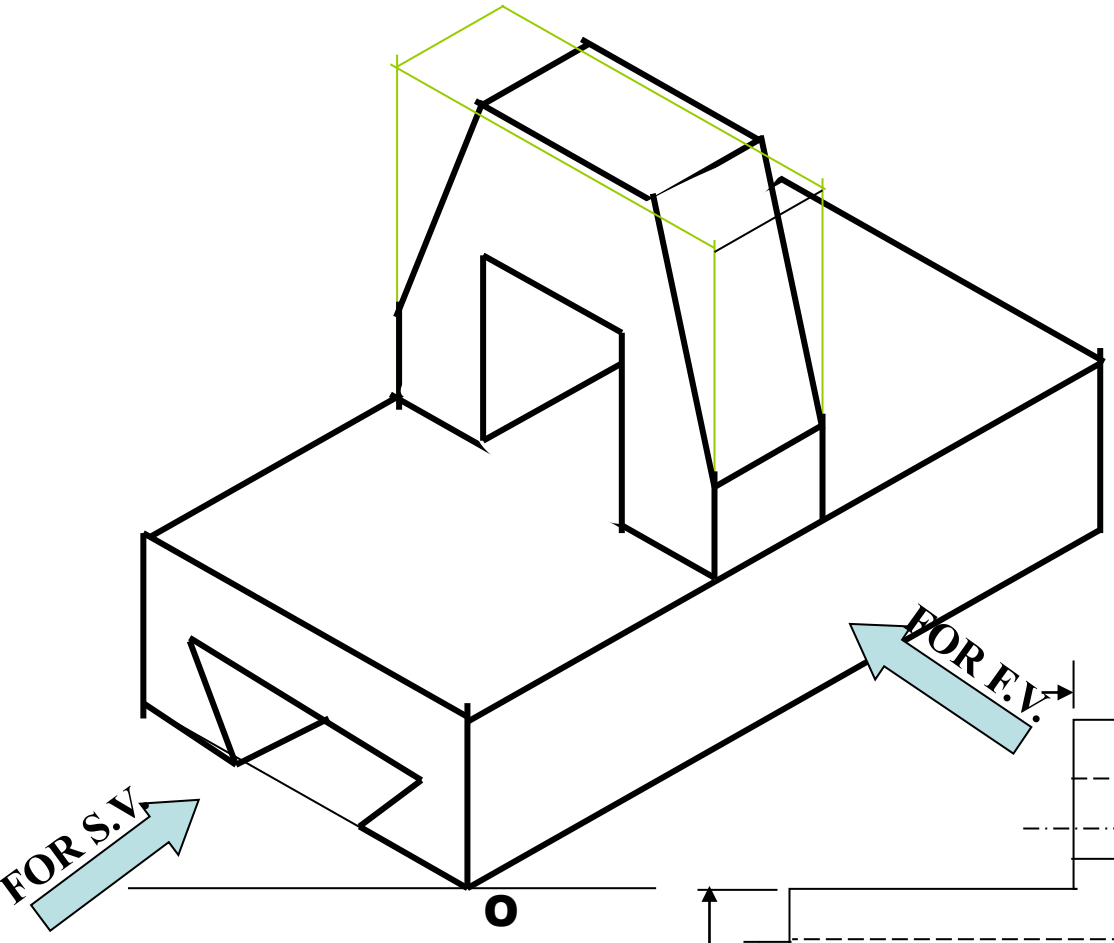
ORTHOGRAPHIC PROJE



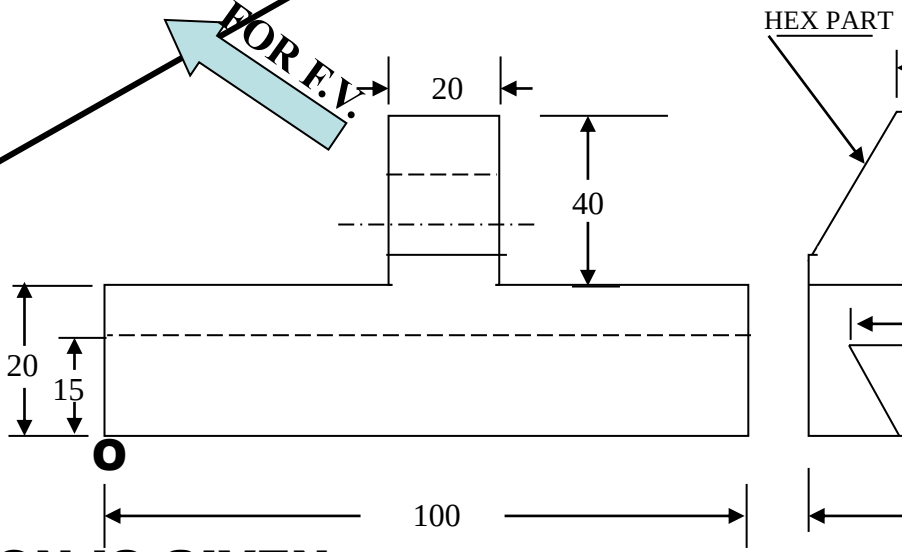
PICTORIAL PRESENTATION IS GIVEN

DRAW FV AND TV OF THIS OBJECT

BY FIRST ANGLE PROJECTION METHOD



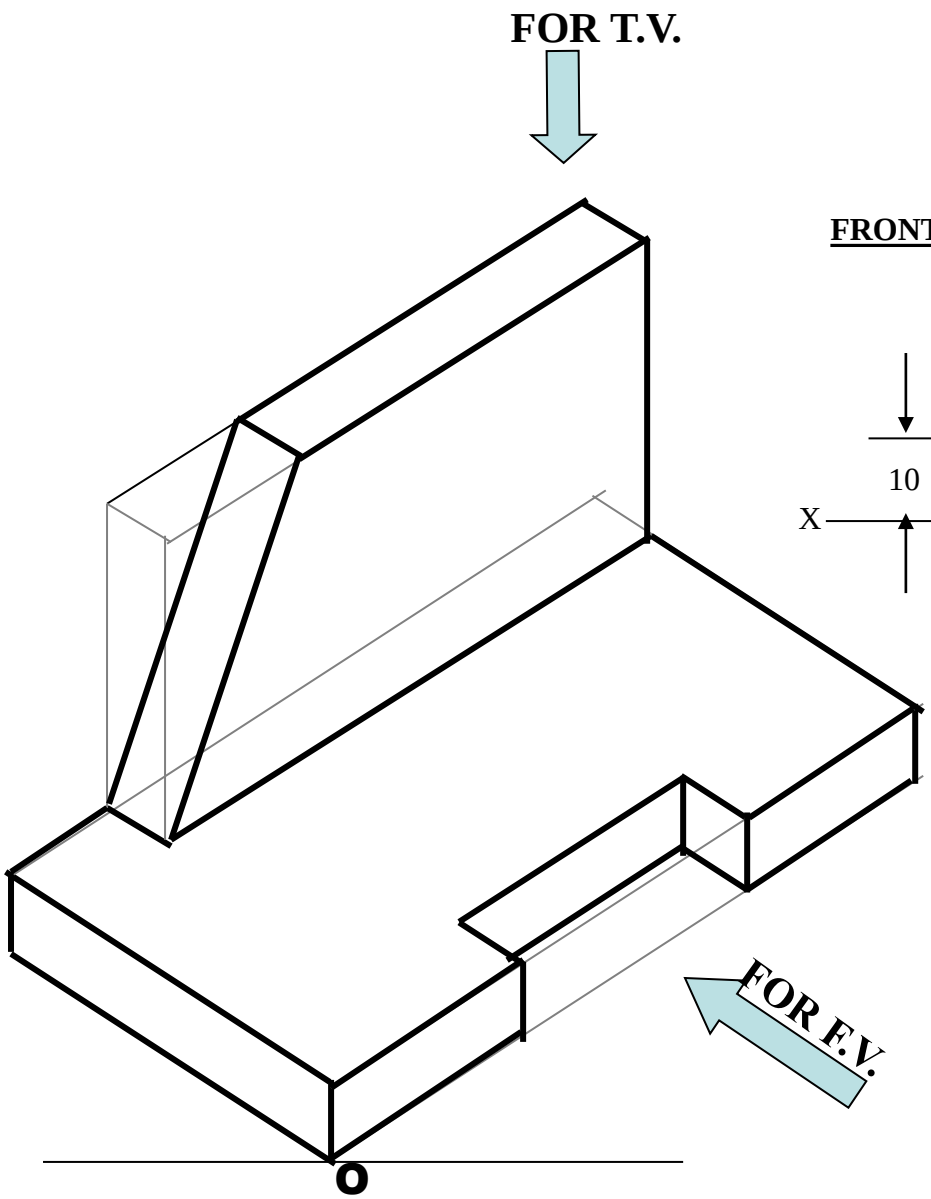
ORTHOGRAPHIC P



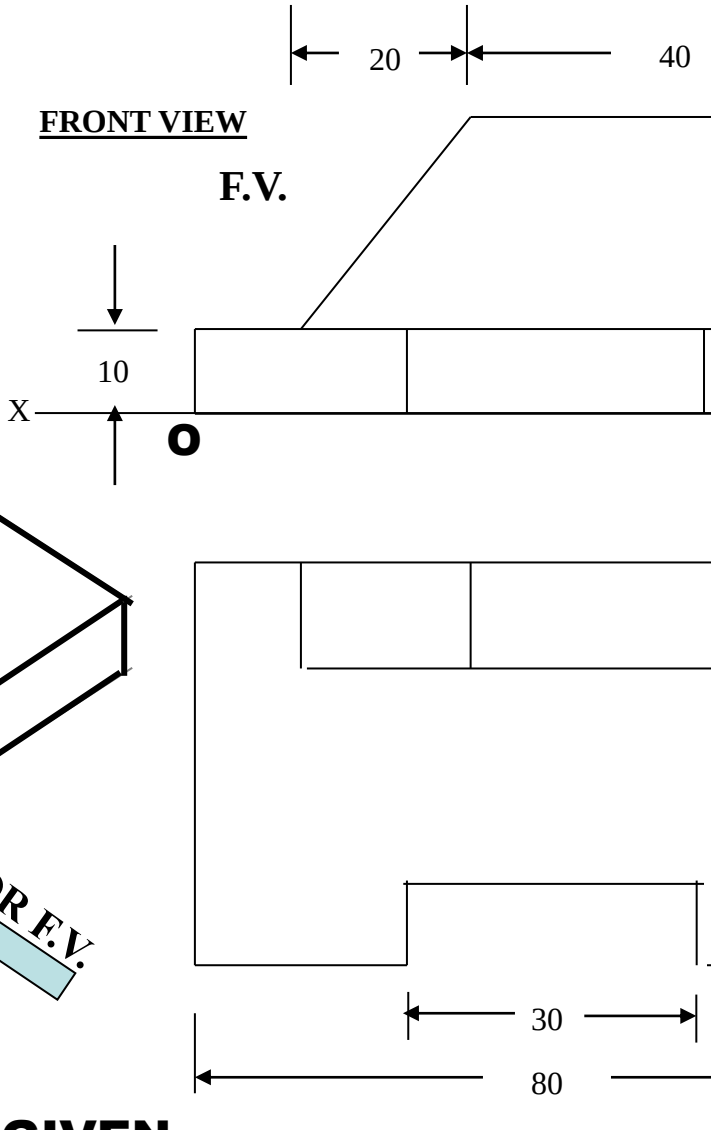
PICTORIAL PRESENTATION IS GIVEN

FRONT VIEW L.

DRAW FV ABD SV OF THIS OBJECT
BY FIRST ANGLE PROJECTION METHOD



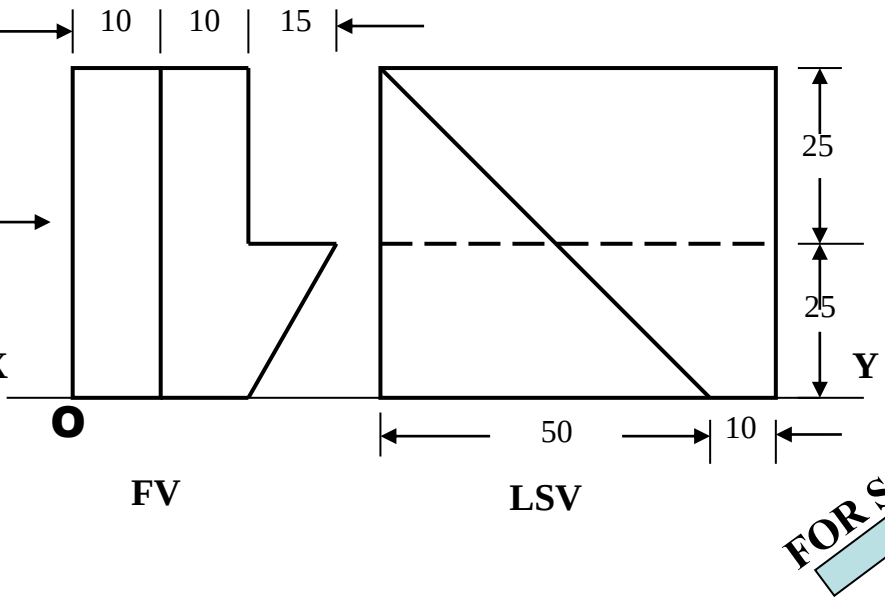
ORTHOGRAPHIC PROJE

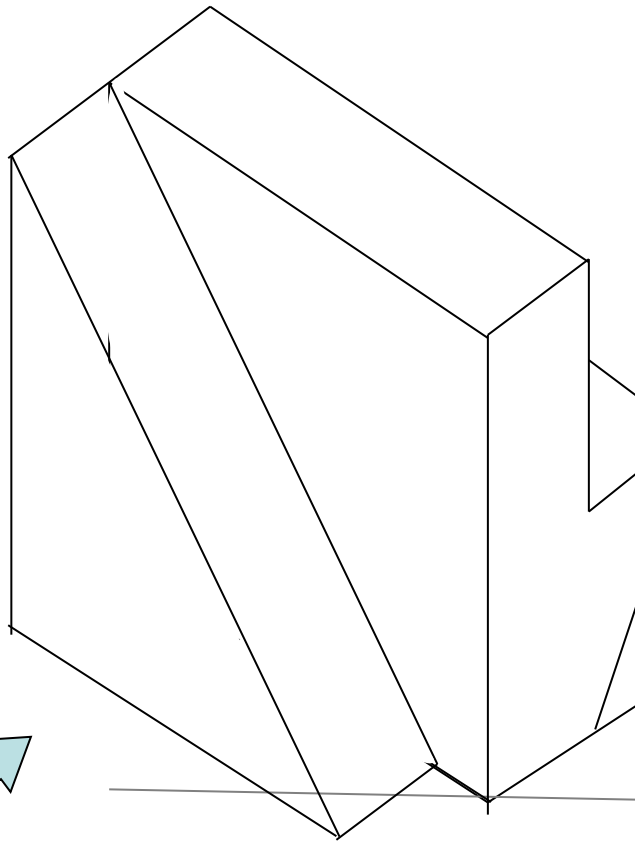


PICTORIAL PRESENTATION IS GIVEN

DRAW FV AND TV OF THIS OBJECT BY FIRST ANGLE PROJECTION METHOD

ORTHOGRAPHIC PROJECTIONS





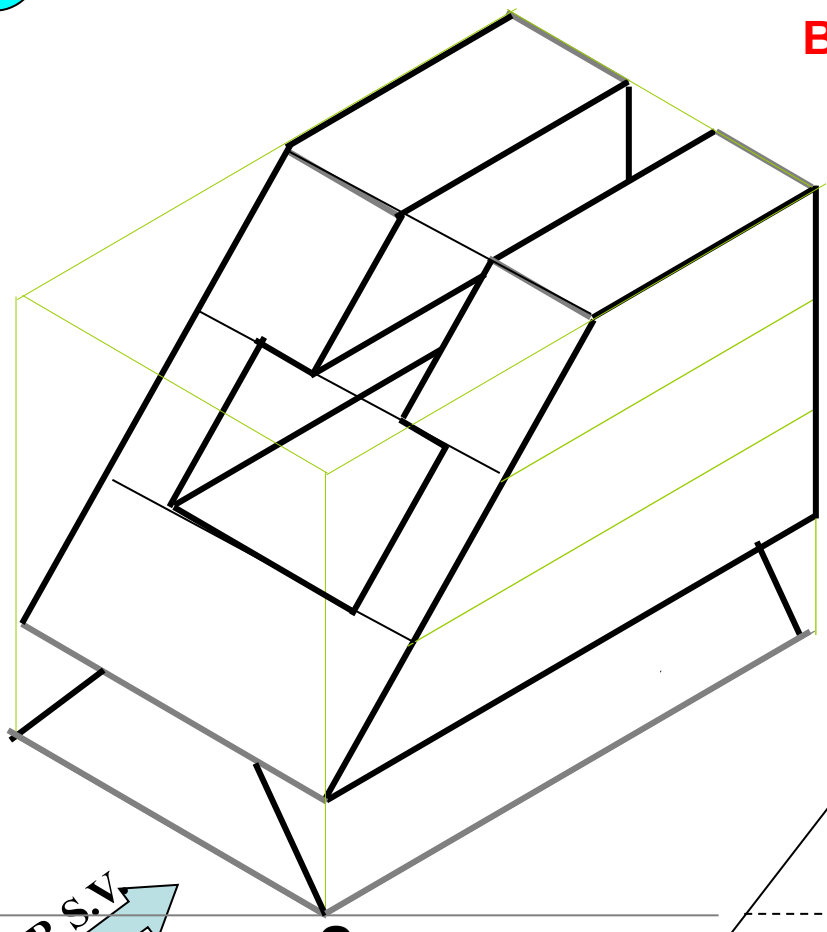
PICTORIAL PRESENTATION IS

DRAW FV AND LSV OF THIS OB
BY FIRST ANGLE PROJECTION M

26

PICTORIAL PRESENTATION

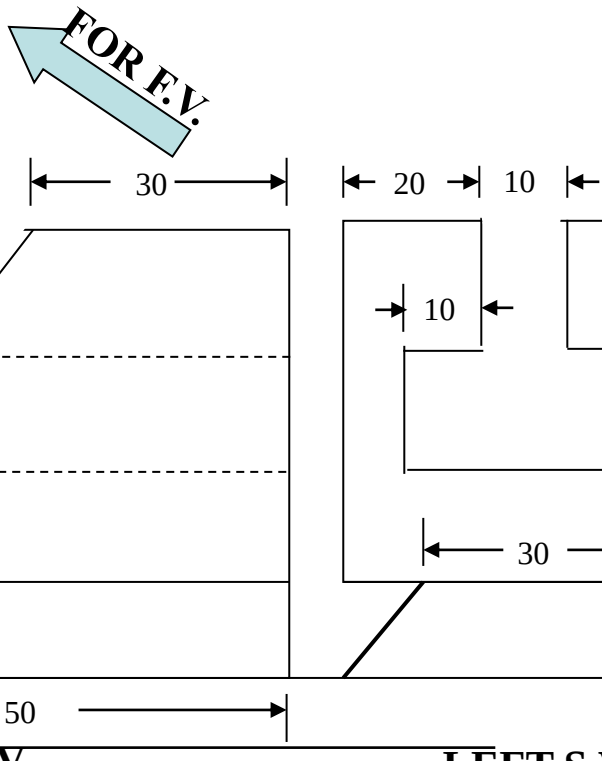
DRAW FV AND SV OF THIS
BY FIRST ANGLE PROJECTION



FOR S.V.

O

ORTHOGRAPHIC PRO



F.V.

LEFT S.

ISOMETRIC DRAWING

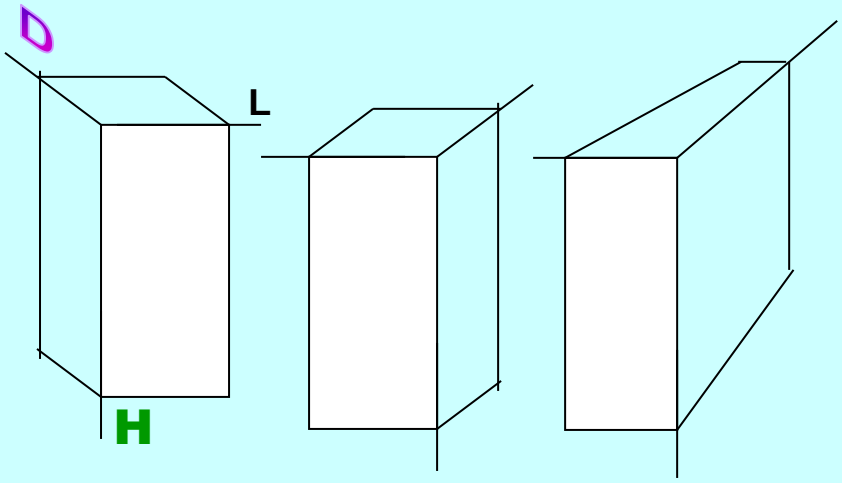
IT IS A TYPE OF PICTORIAL PROJECTION IN WHICH ALL THREE DIMENSIONS OF AN OBJECT ARE SHOWN IN ONE VIEW AND IF REQUIRED, THEIR ACTUAL SIZES CAN BE MEASURED DIRECTLY FROM IT.

TYPICAL CONDI

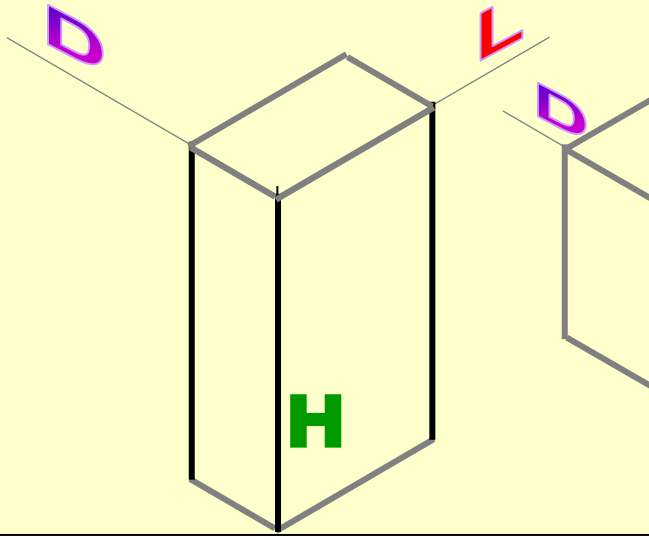
IN THIS 3-D DRAWING OF A
ALL THREE DIMENSIONAL
MENTAINED AT EQUAL INC
WITH EACH OTHER.(

3-D DRAWINGS CAN BE DRAWN IN NUMEROUS WAYS AS SHOWN BELOW. ALL THESE DRAWINGS MAY BE CALLED 3-DIMENSIONAL DRAWINGS, OR PHOTOGRAPHIC OR PICTORIAL DRAWINGS.

HERE NO SPECIFIC RELATION AMONG H, L & D AXES IS MENTAINED.



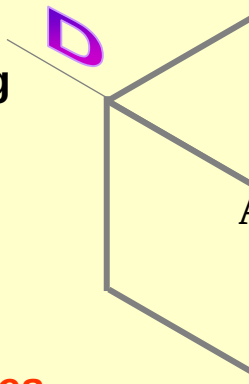
NOW OBSERVE BELOW GIVEN
ONE CAN NOTE SPECIFIC IN
AMONG H, L & D AXE
ISO MEANS SAME, SIMILAR
HERE ONE CAN FIN
EDUAL INCLINATION AMONG H
EACH IS 120^0 INCLINED WITH
HENCE IT IS CALLED ISOMETR



PURPOSE OF ISOMETRIC DRAWING IS TO UNDERSTAND OVERALL SHAPE, SIZE & APPEARANCE OF AN OBJECT PRIOR TO IT'S PR

SOME IMPORTANT TERMS:

ISOMETRIC AXES, LINES AND PLANES:



The three lines AL, AD and AH, meeting at point A and making 120^0 angles with each other are termed *Isometric Axes.*

The lines parallel to these axes are called *Isometric Lines*.

The planes representing the faces of of the cube as well as other planes parallel to these planes are called *Isometric Planes*.

ISOMETRIC SCALE:

When one holds the object in such a way that all three dimensions are visible then in the process all dimensions become proportionally inclined to observer's eye sight and hence appear apparent in lengths.

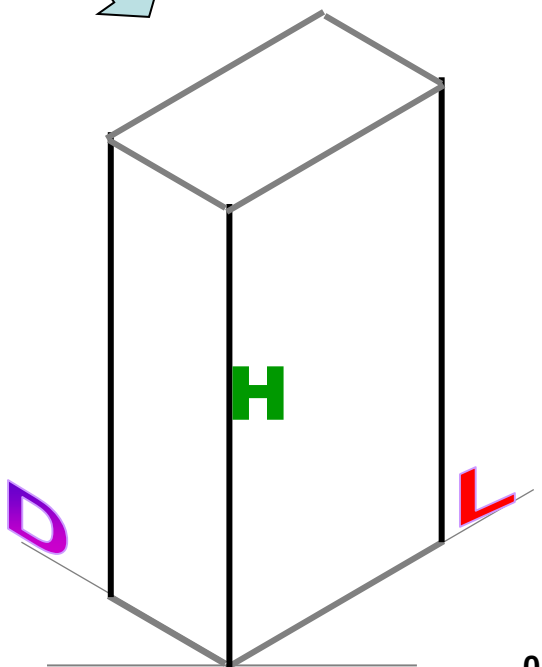
This reduction is 0.815 or 9 / 11 (approx.) It forms a reducing scale which Is used to draw isometric drawings and is called *Isometric scale.*

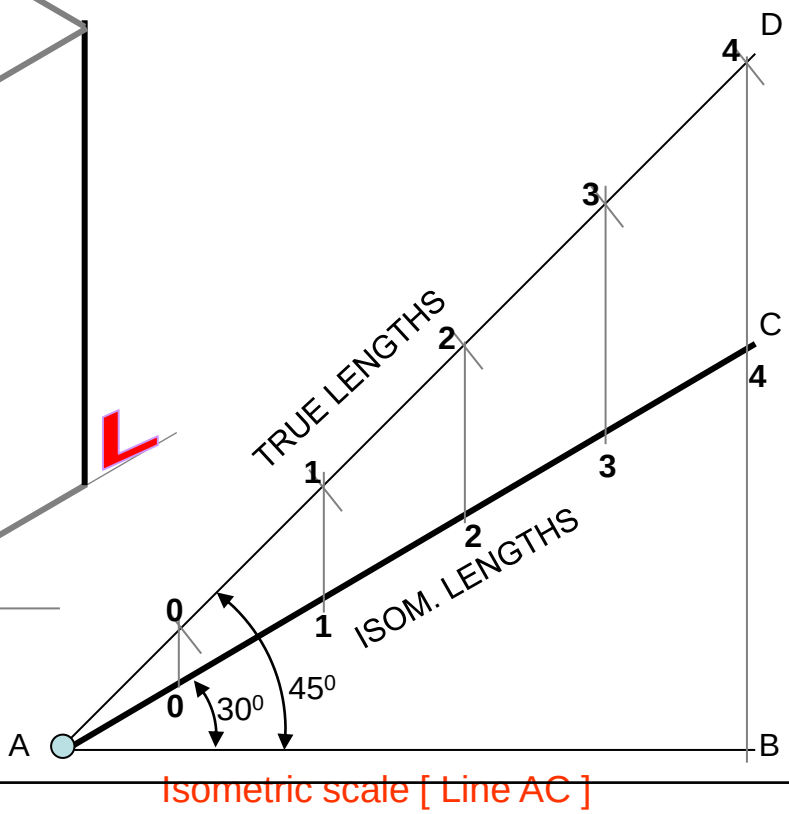
In practice, while drawing isometric projection, it is necessary to convert true lengths into isometric lengths for measuring and marking the sizes. This is conveniently done by constructing an isometric scale as described **on next page.**

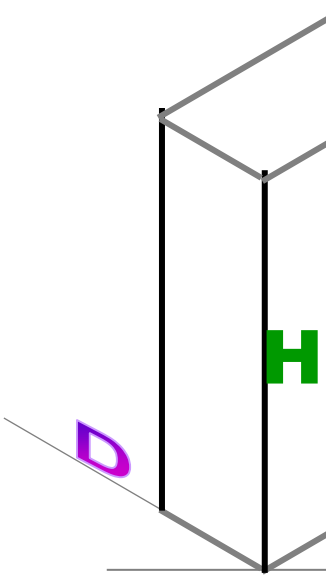
TYPES OF ISOMETRIC DRAWINGS

ISOMETRIC VIEW
Drawn by using True scale
(True dimensions)

ISOMETRIC PRO
Drawn by using Iso
(Reduced dime







CONSTRUCTION OF
From point A, with li
45⁰ inclined lines AC
Mark divisions of tru
each division-point
upto AC line.
The divisions thus o
give lengths on ison

Isometric scale [Line AC]
required for Isometric Projection

1

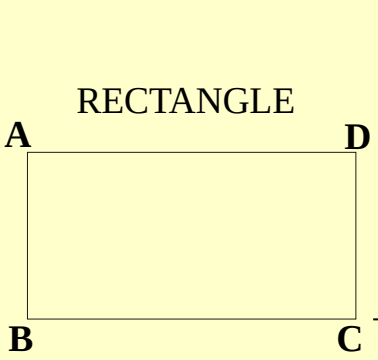
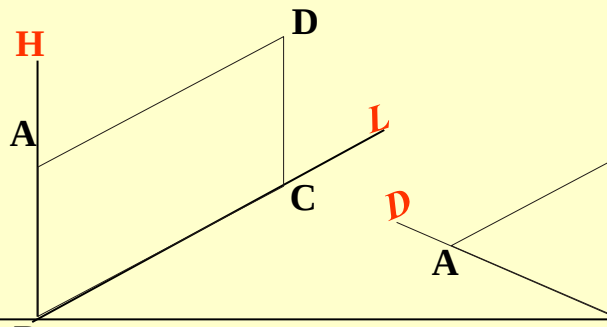
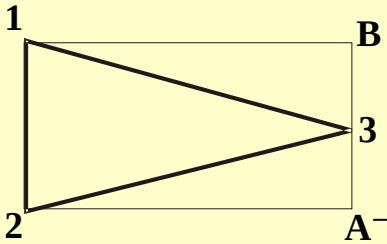
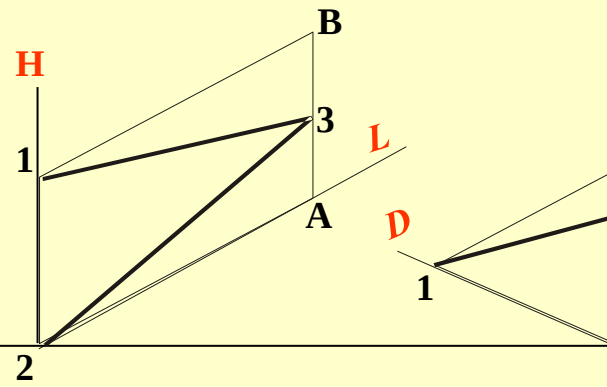
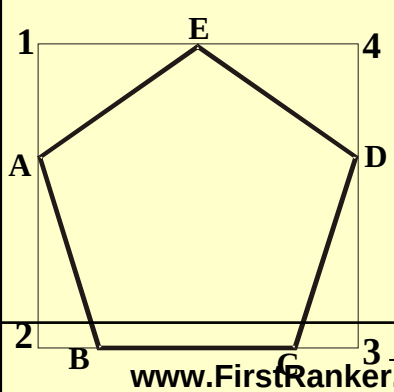
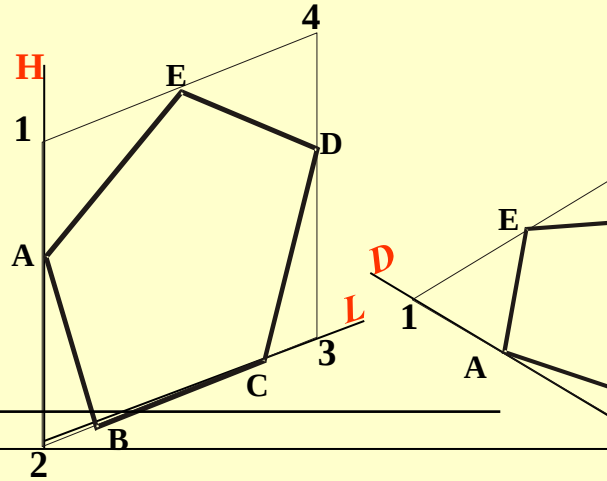
ISOMETRIC OF PLANE FIGURES

AS THESE ALL ARE 2-D FIGURES WE REQUIRE ONLY TWO ISOMETRIC AXES.

IF THE FIGURE IS FRONT VIEW, H & L AXES ARE REQUIRED.

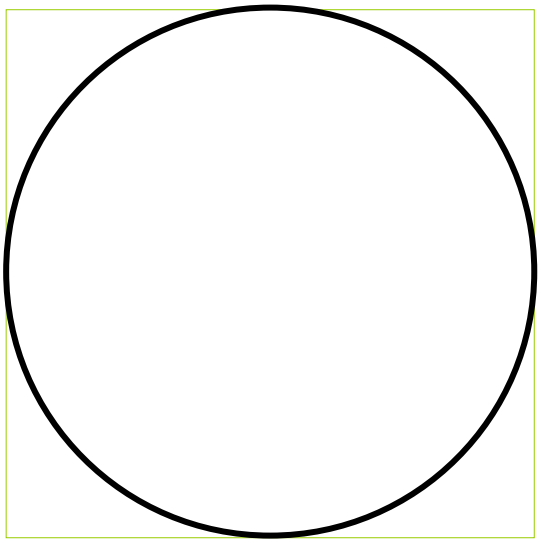
IF THE FIGURE IS TOP VIEW, D & L AXES ARE REQUIRED.

Shapes containing Inclined lines should be enclosed in a rectangle as shown. Then first draw isom. of that rectangle and then inscribe that shape as it is.

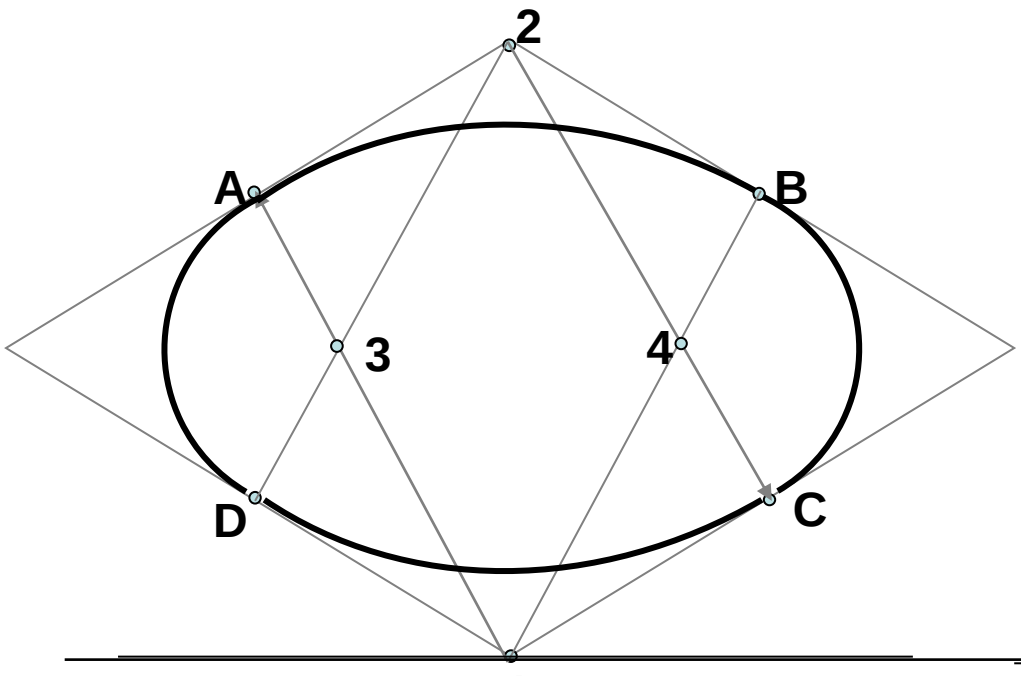
SHAPE	Isometric view if the F.V. or
RECTANGLE 	
TRIANGLE 	
PENTAGON 	

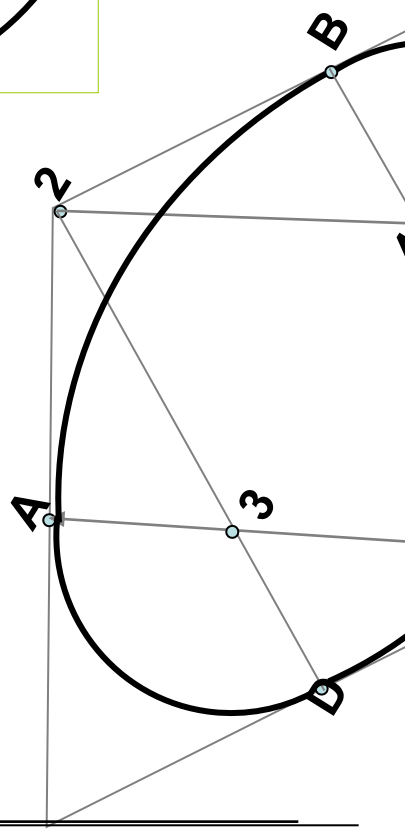
STUDY ILLUSTRATIONS

DRAW ISOMETRIC VIEW OF A CIRCLE IF IT IS A TV OR FV.



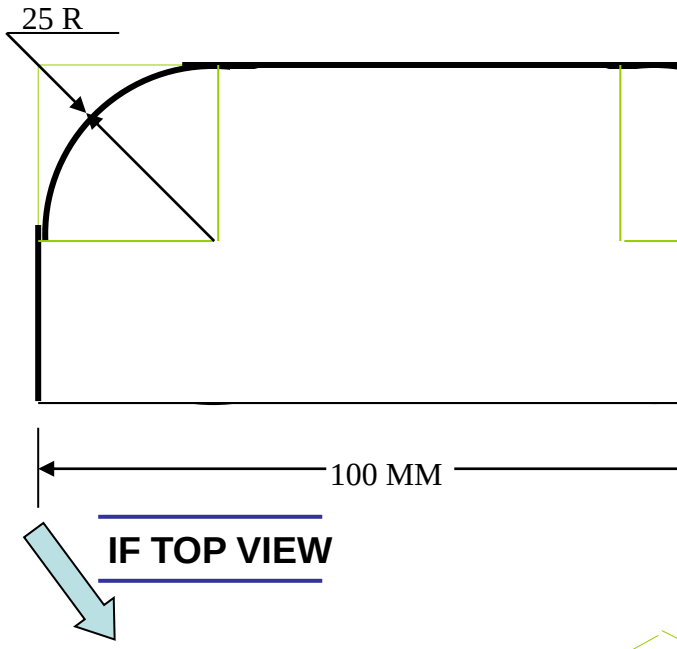
FIRST ENCLOSE IT IN A SQUARE.
IT'S ISOMETRIC IS A RHOMBUS WITH D & L AXES FOR TOP VIEW.
THEN USE H & L AXES FOR ISOMETRIC WHEN IT IS FRONT VIEW.
FOR CONSTRUCTION USE RHOMBUS METHOD SHOWN HERE. STUDY IT.





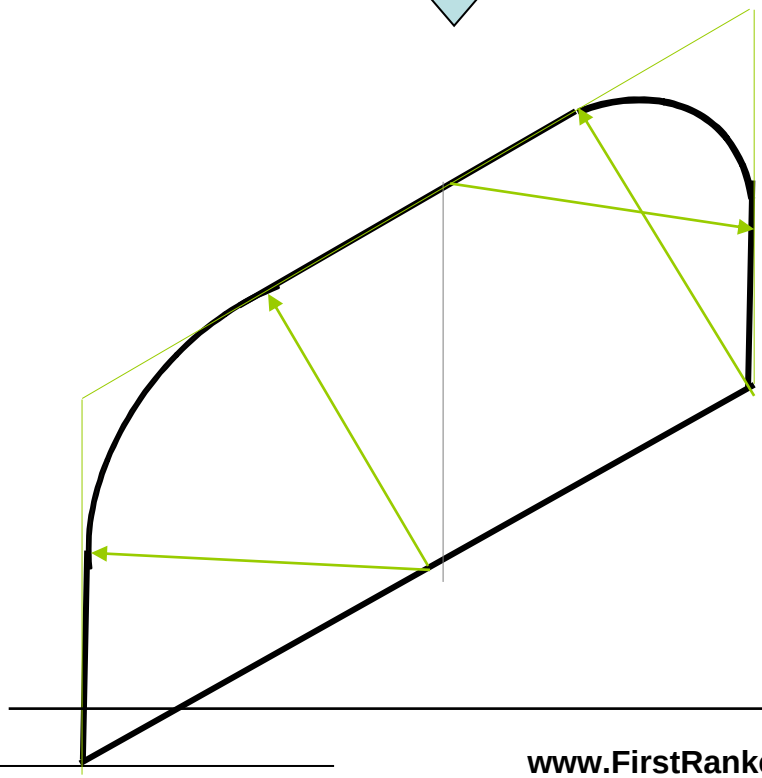
STUDY ILLUSTRATIONS

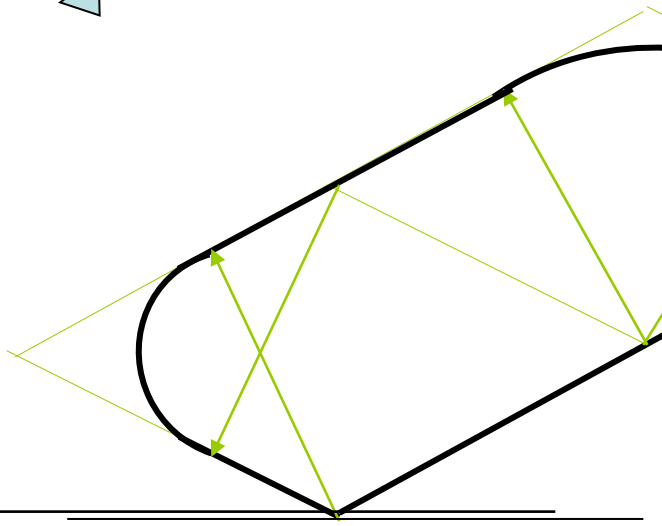
DRAW ISOMETRIC VIEW OF THE FIGURE SHOWN WITH DIMENTIONS (ON RIGHT SIDE) CONSIDERING IT FIRST AS F.V. AND THEN T.V.



IF FRONT VIEW

IF TOP VIEW





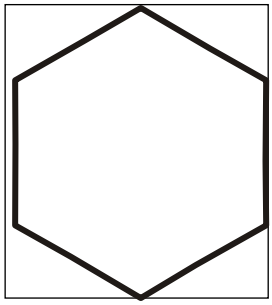
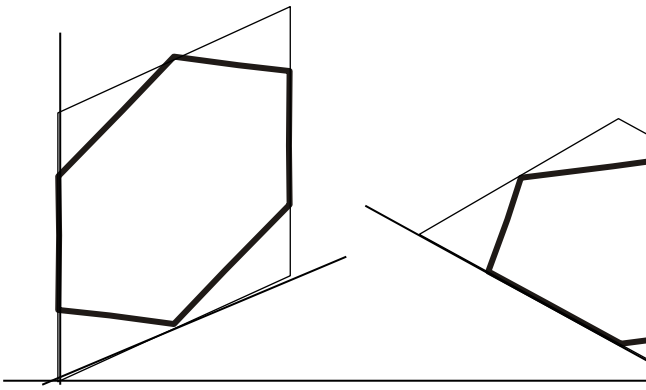
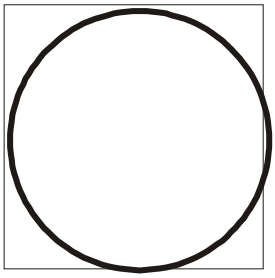
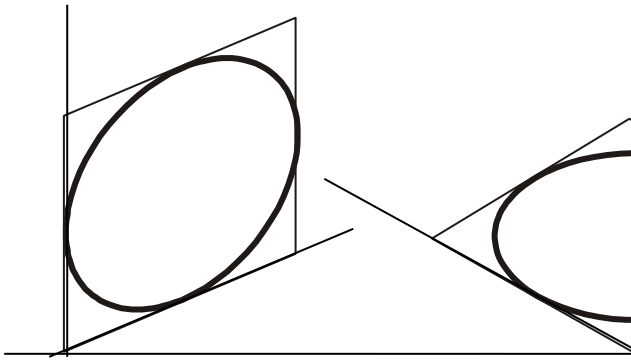
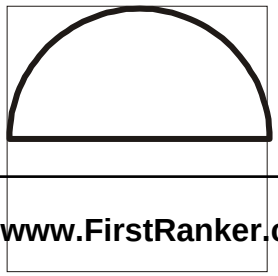
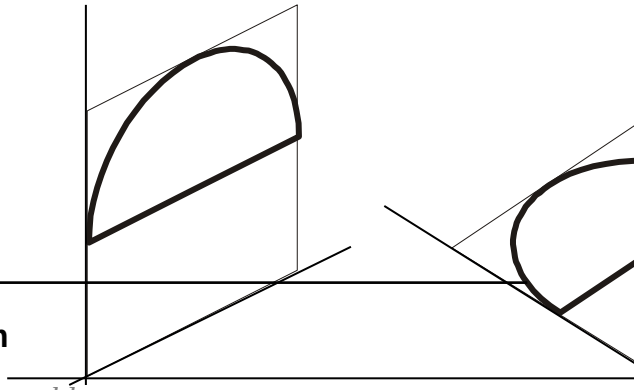
ISOMETRIC OF PLANE FIGURES

AS THESE ALL ARE 2-D FIGURES WE REQUIRE ONLY TWO ISOMETRIC AXES.

IF THE FIGURE IS FRONT VIEW, H & L AXES ARE REQUIRED.

IF THE FIGURE IS TOP VIEW, D & L AXES ARE REQUIRED.

For Isometric of Circle/Semicircle use Rhombus method. Construct it of sides equal to diameter of circle always. (Ref. Previous two pages.)

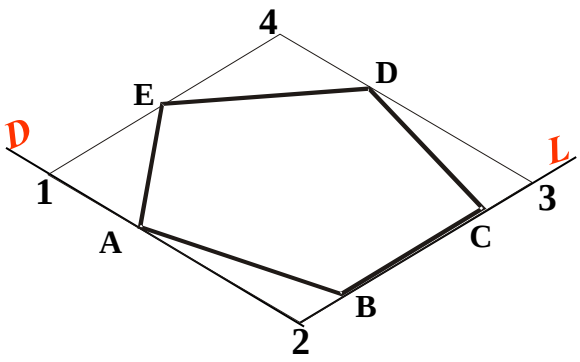
SHAPE	IF F.V.	IF T.V
HEXAGON		
CIRCLE		
SEMI CIRCLE		

For Isometric of Circle/Semicircle use **Rhombus method.** *C*
of sides equal to Diameter of circle always. **(Ref. topic EN**

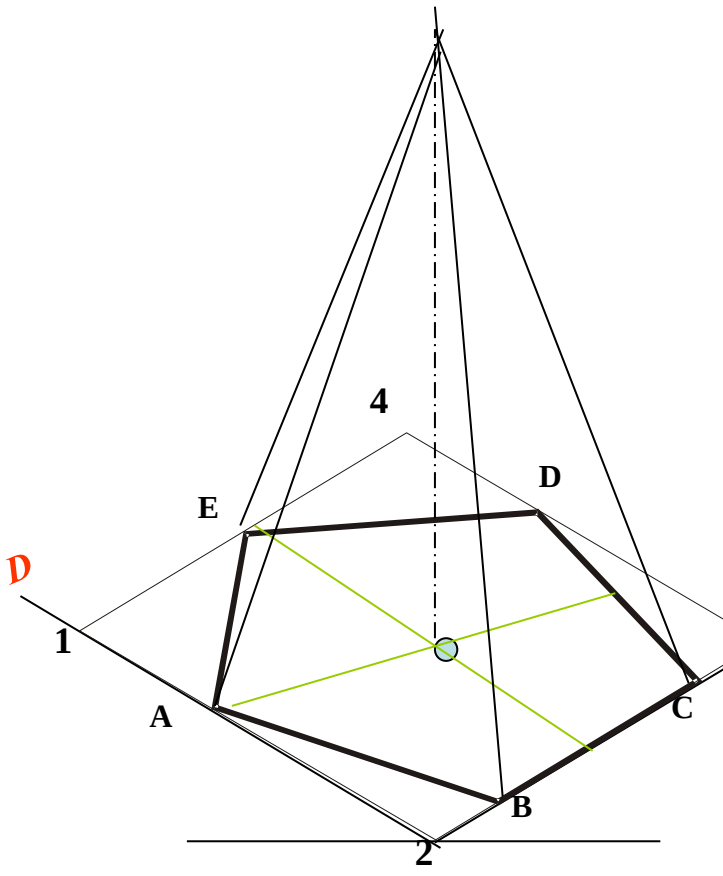
STUDY ILLUSTRATIONS

7

ISOMETRIC VIEW OF BASE OF PENTAGONAL PYRAMID STANDING ON H.P.

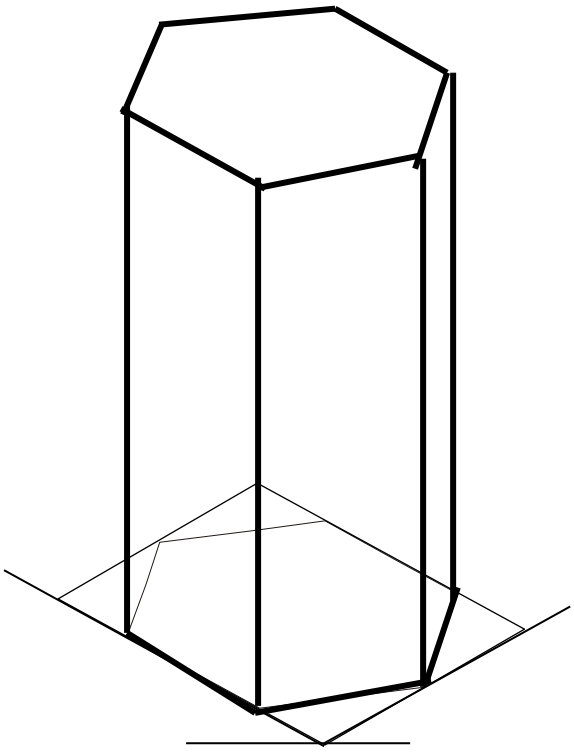


ISOMETRIC VIEW O PENTAGONAL PYRA STANDING ON H.P. (Height is added from center of



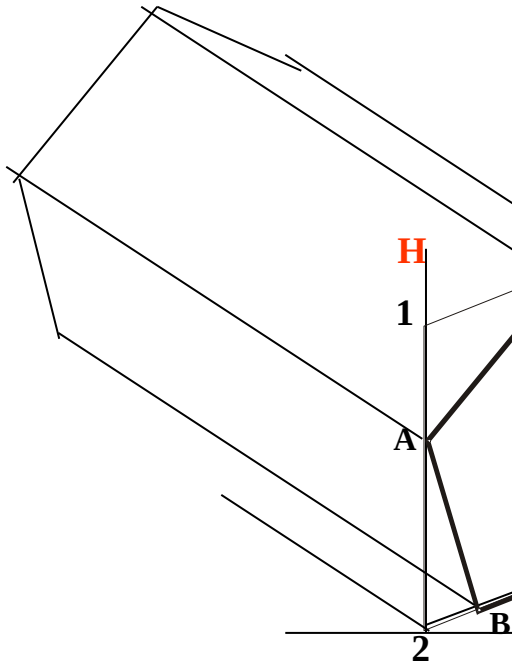
STUDY ILLUSTRATIONS

7



ISOMETRIC VIEW OF
HEXAGONAL PRISM
STANDING ON H.P.

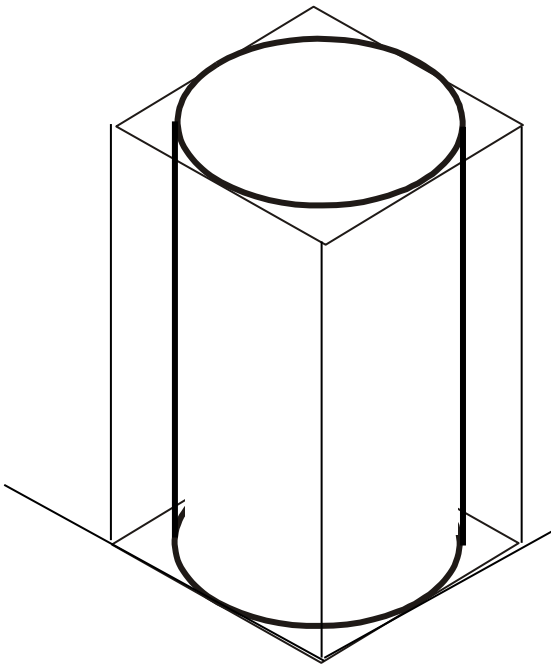
ISOMETRIC VIEW OF
PENTAGONALL PRISM
LYING ON H.P.

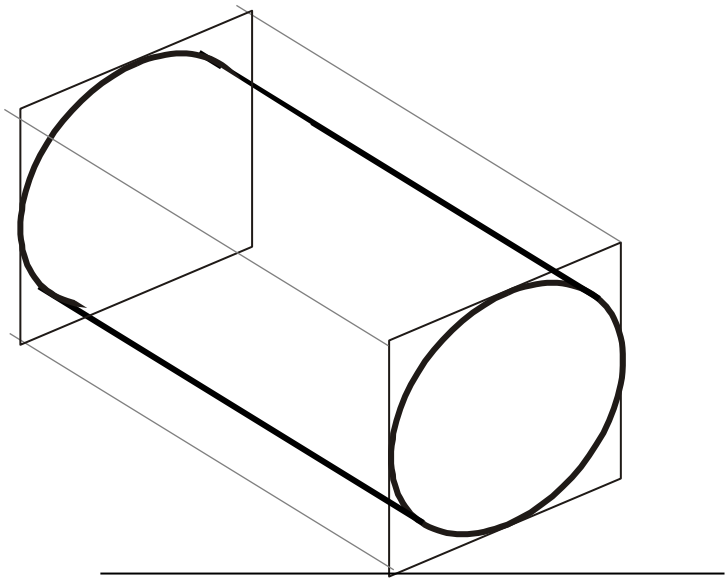


STUDY ILLUSTRATIONS

7

CYLINDER STANDING O



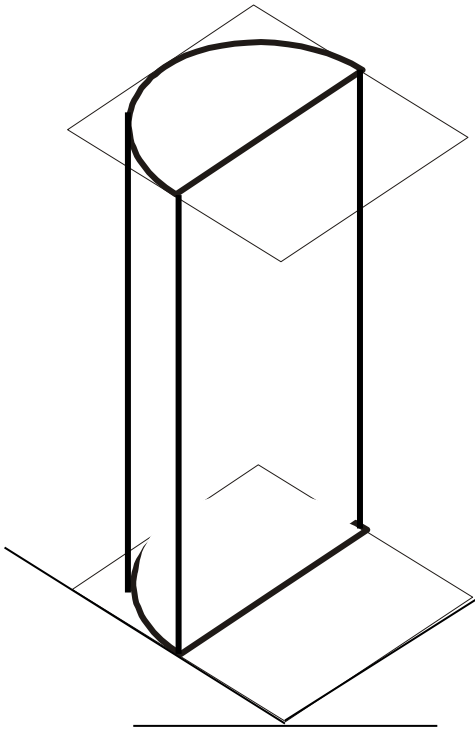


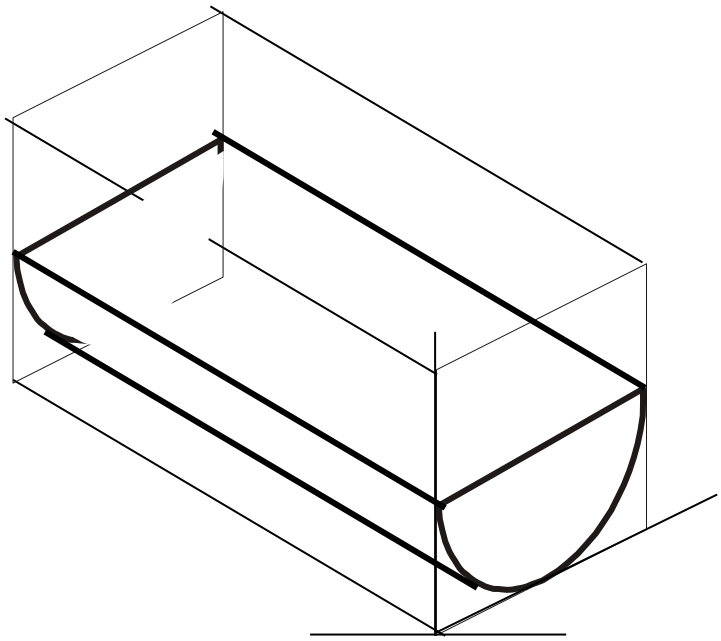
CYLINDER LYING ON H.P.

STUDY ILLUSTRATIONS

7

HALF CYLINDE
STANDING ON H
(ON IT'S SEMICIRCULAR



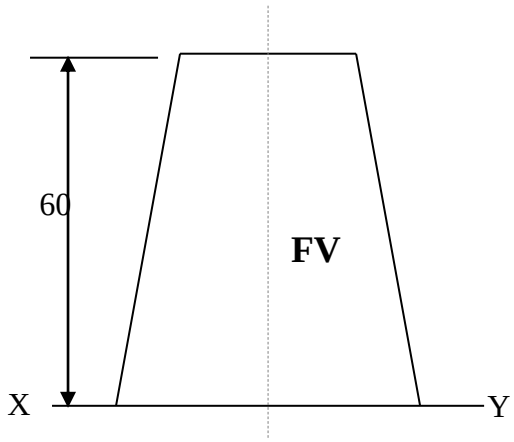


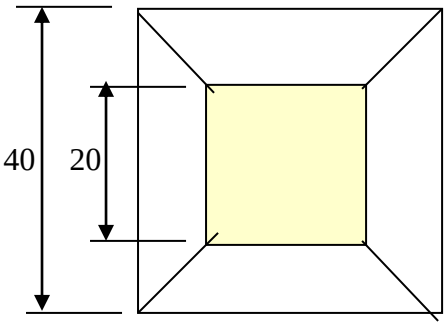
HALF CYLINDER
LYING ON H.P.
(with flat face // to H.P.)

STUDY ILLUSTRATIONS

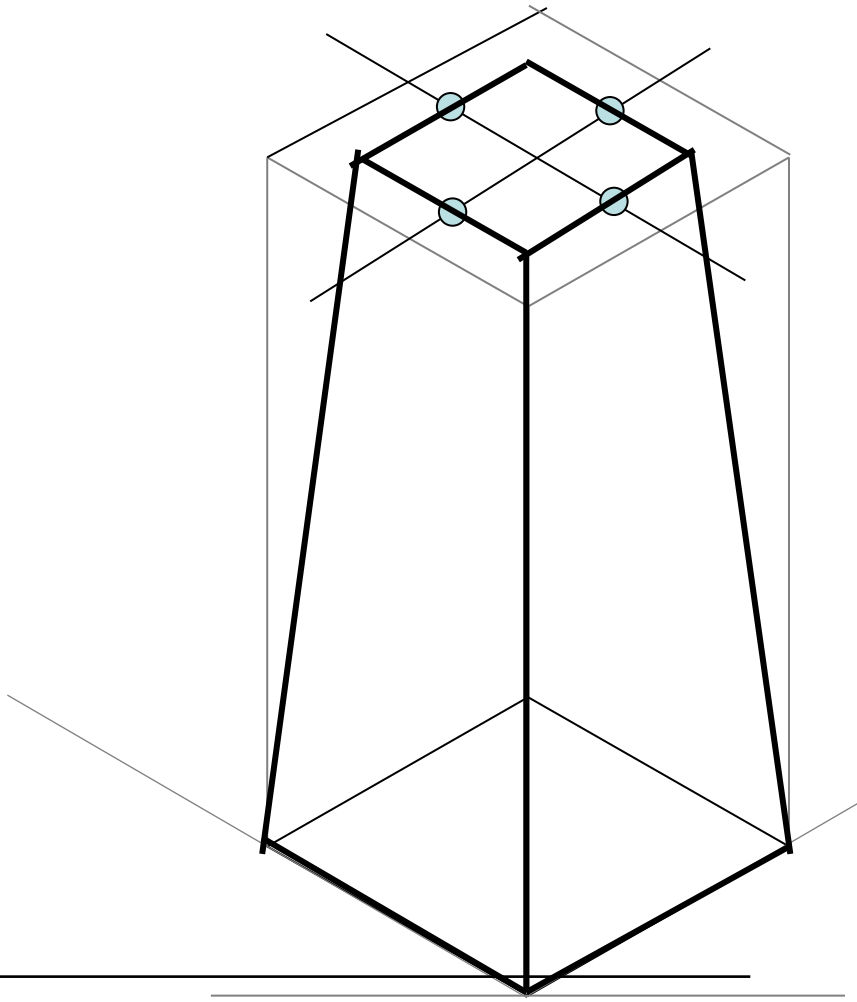
7

ISOMETRIC VIEW OF A FRUSTOM OF SQUARE PYR STANDING ON H.P. ON IT'S LARGE



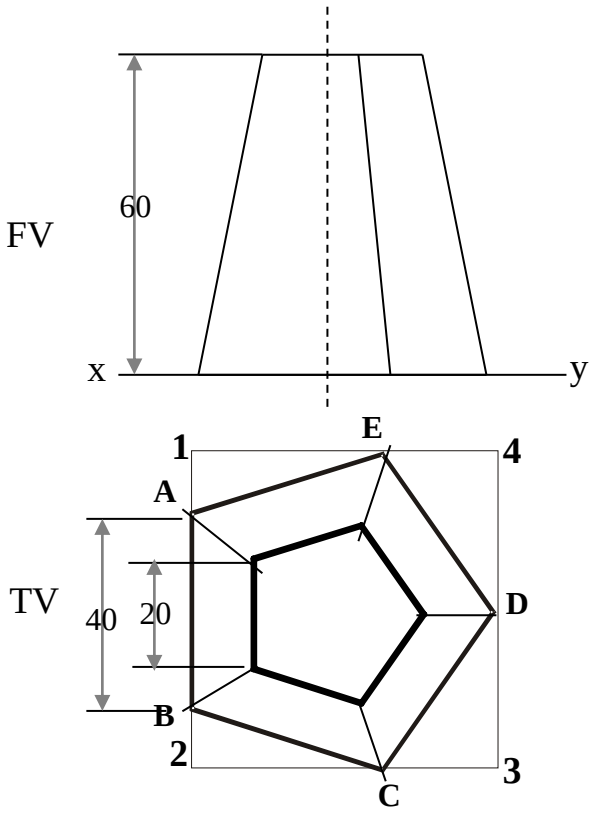


TV



STUDY ILLUSTRATION

PROJECTIONS OF FRUSTOM OF PENTAGONAL PYRAMID ARE GIVEN. DRAW IT'S ISOMETRIC VIEW.



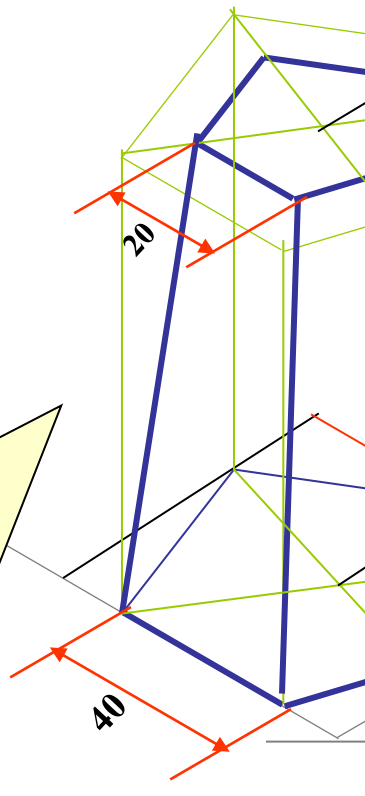
SOLUTION STEPS:

FIRST DRAW ISOMETRIC OF IT'S BASE.

THEN DRAWSAME SHAPE AS TOP, 60 MM ABOVE THE BASE PENTAGON CENTER.

THEN REDUCE THE TOP TO 20 MM SIDES AND JOIN WITH THE PROPER BASE CORNERS.

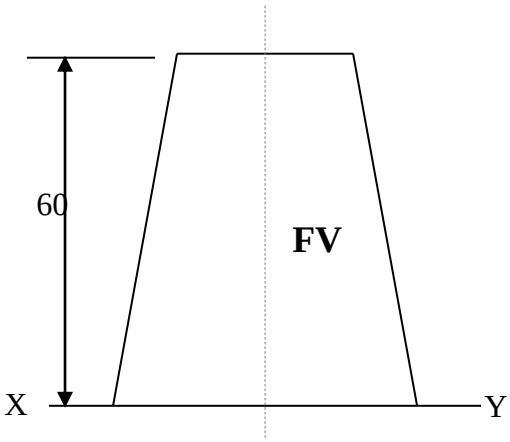
ISOMETRIC V OF FRUSTOM OF PENTAGO

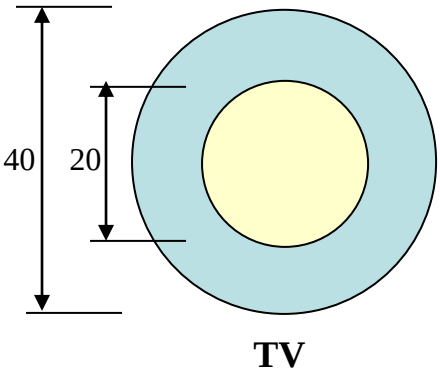


STUDY ILLUSTRATIONS

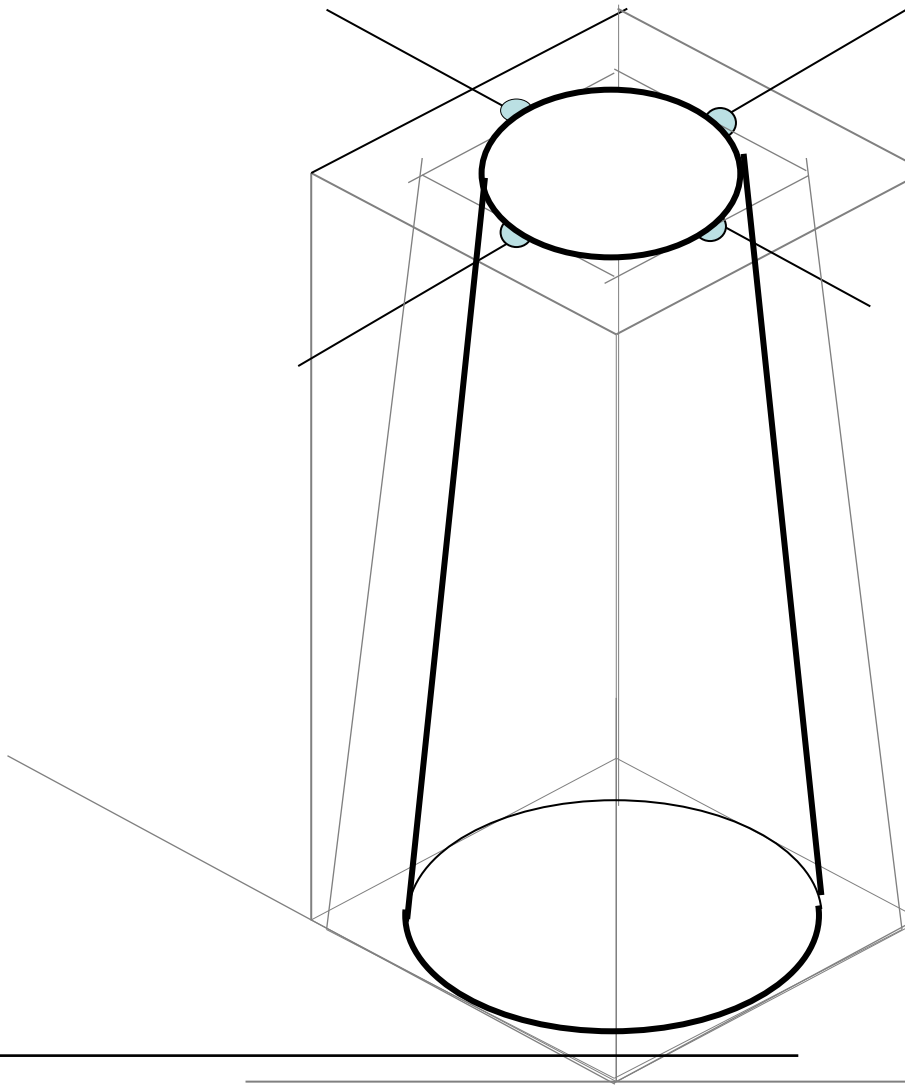
7

ISOMETRIC VIEW OF A FRUSTOM OF CON STANDING ON H.P. ON IT'S LARG





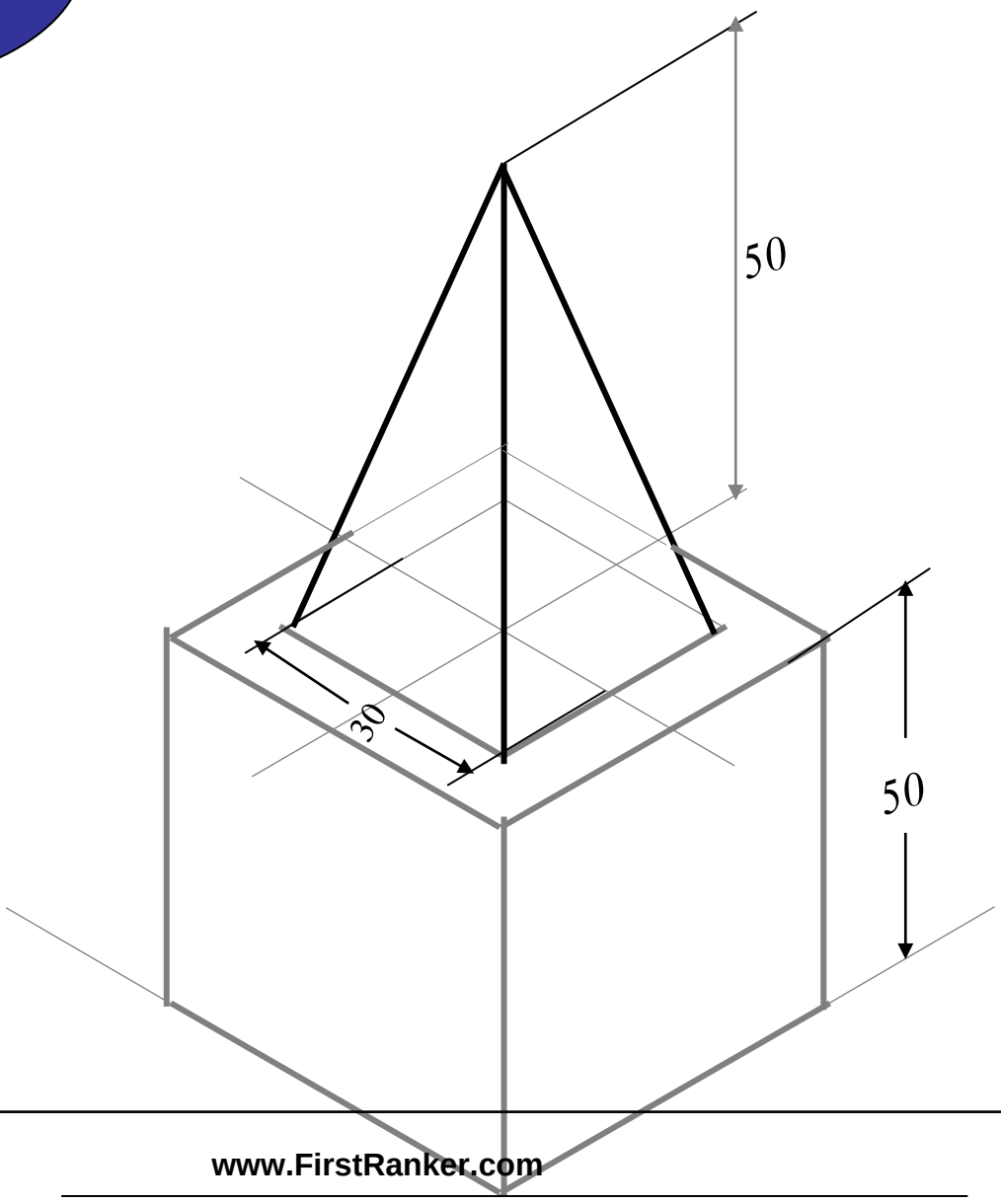
TV



STUDY ILLUSTRATIONS

7

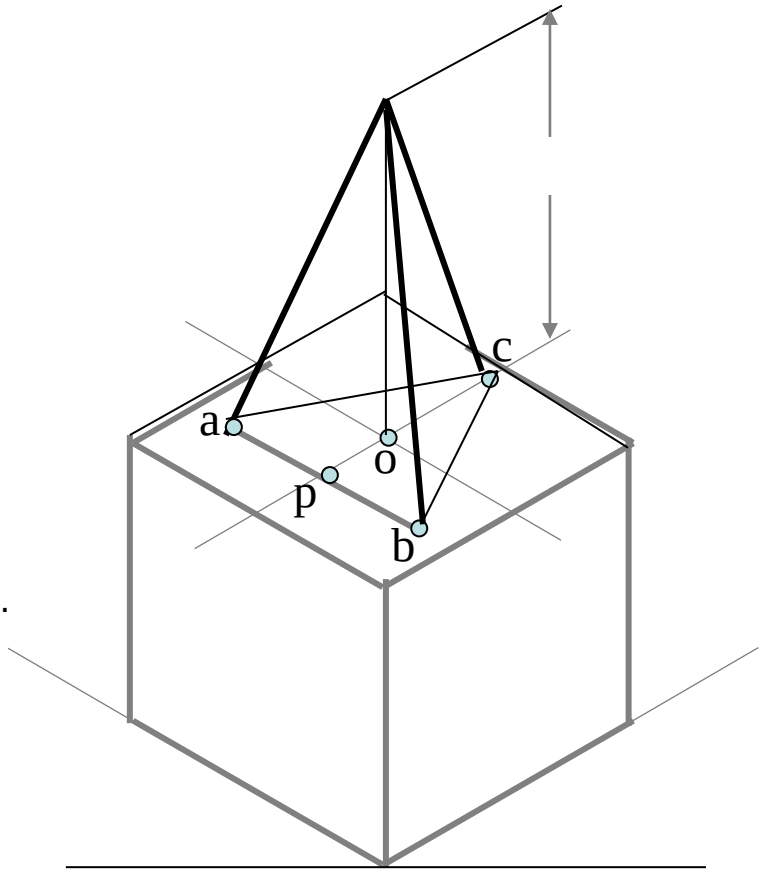
PROBLEM: A SQUARE PYRAMID OF 30 MM BASE SIDES A
50 MM LONG AXIS, IS CENTRALLY PLACED ON THE TOP C
CUBE OF 50 MM LONG EDGES.DRAW ISOMETRIC VIEW O



STUDY ILLUSTRATIONS

7

PROBLEM: A TRIANGULAR PYRAMID OF 30 MM BASE SIDES AND 50 MM LONG AXIS, IS CENTRALLY PLACED ON THE TOP OF A CUBE OF 50 MM LONG EDGES.
DRAW ISOMETRIC VIEW OF THE PAIR.



SOLUTION HINTS.

TO DRAW ISOMETRIC OF A CUBE IS SIMPLE. DRAW IT AS USUAL.

BUT FOR PYRAMID AS IT'S BASE IS AN EQUILATERAL TRIANGLE, IT CAN NOT BE DRAWN DIRECTLY.SUPPORT OF IT'S TV IS REQUIRED.

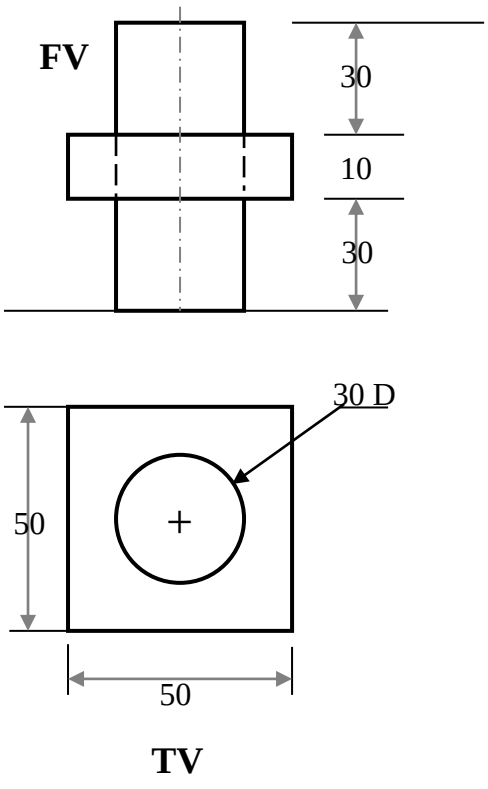
SO DRAW TRIANGLE AS A TV, SEPARATELY AND NAME VARIOUS POINTS AS SHOWN
AFTER THIS PLACE IT ON THE TOP OF CUBE AS SHOWN.
THEN ADD HEIGHT FROM IT'S CENTER AND COMPLETE IT'S ISOMETRIC AS SHOW

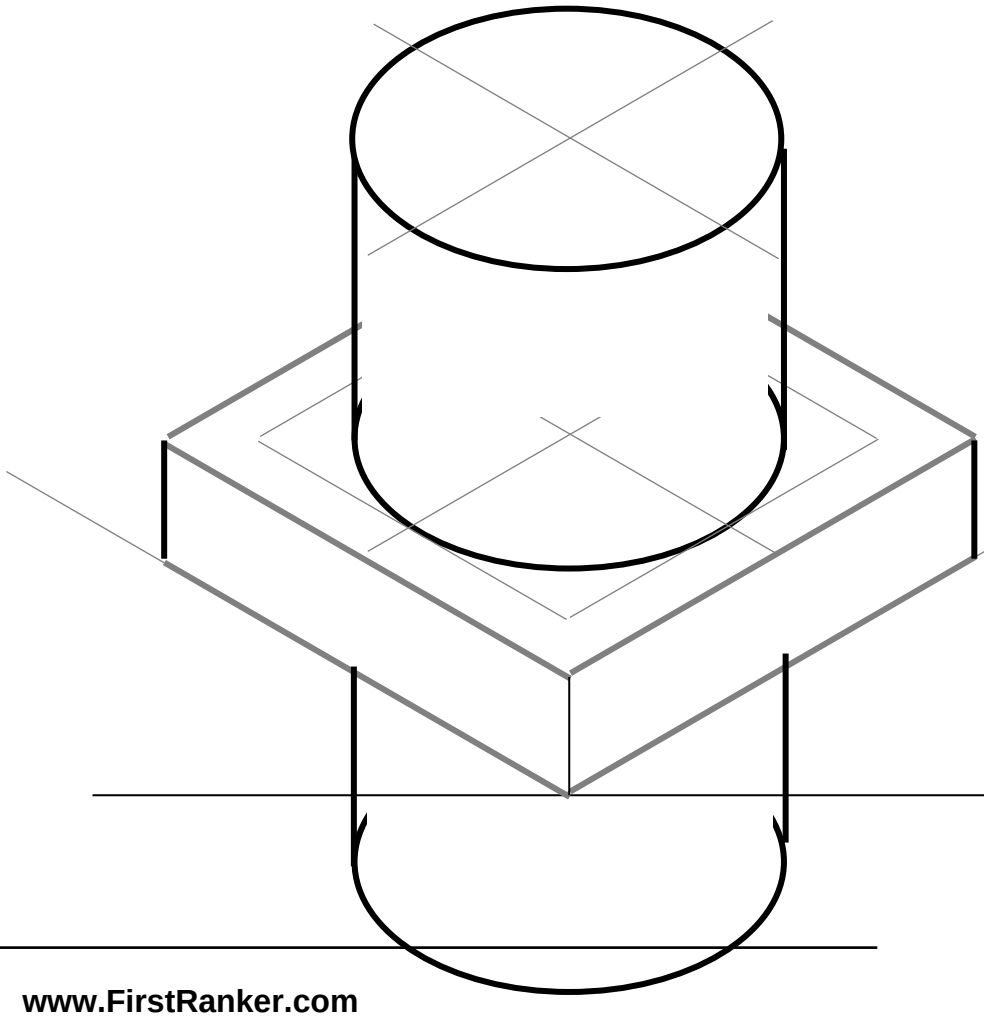
STUDY ILLUSTRATIONS

7

PROBLEM:

A SQUARE PLATE IS PIERCED THROUGH CENTRALLY BY A CYLINDER WHICH COMES OUT EQUALLY FROM BO OF PLATE. IT'S FV & TV ARE SHOWN. DRAW ISOMETRIC



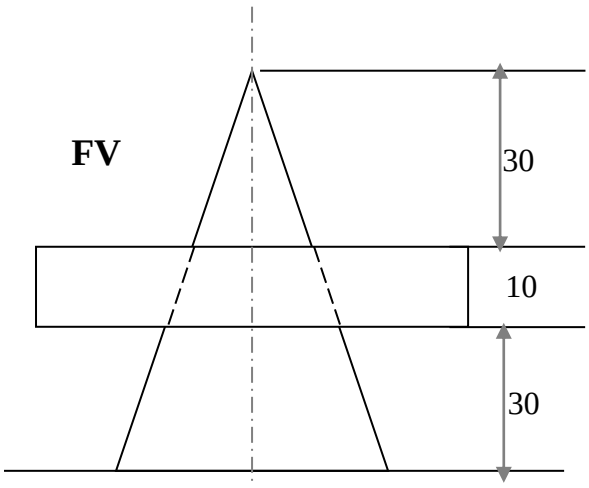


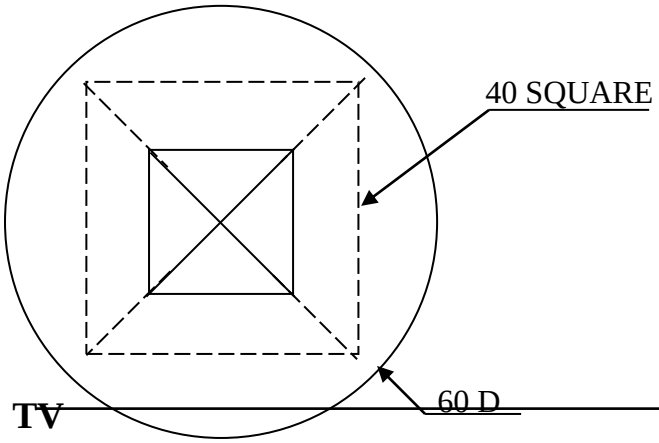
STUDY ILLUSTRATIONS

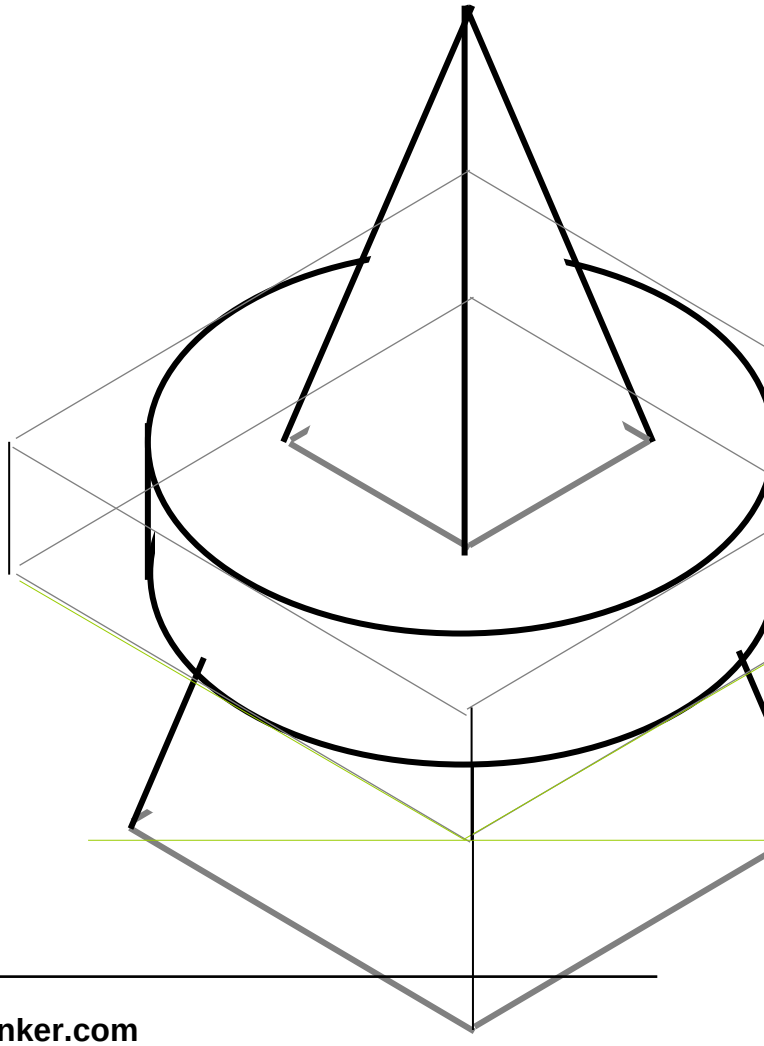
7

PROBLEM:

A CIRCULAR PLATE IS PIERCED THROUGH CENTRALLY BY A SQUARE PYRAMID WHICH COMES OUT EQUALLY F OF PLATE. IT'S FV & TV ARE SHOWN. DRAW ISOMETRIC



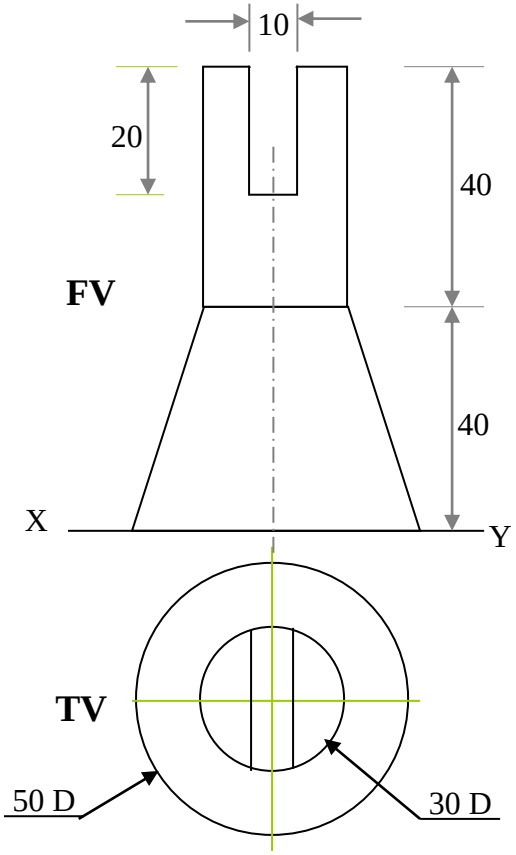


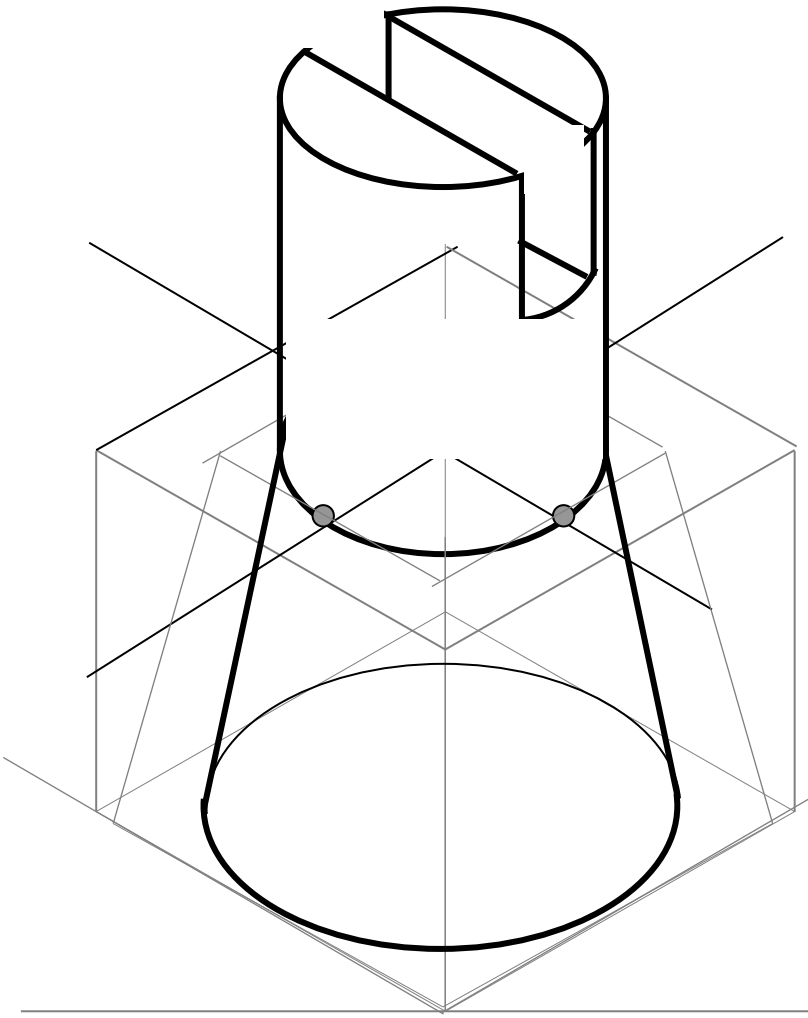


STUDY ILLUSTRATIONS

7

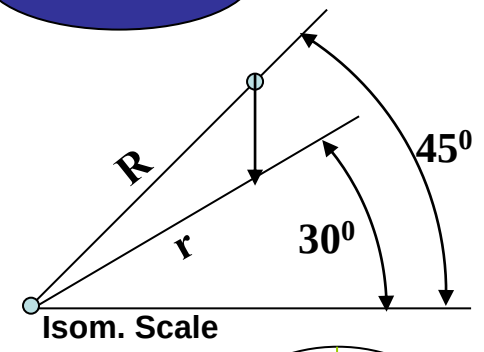
F.V. & T.V. of an object are given. Draw it's isometri

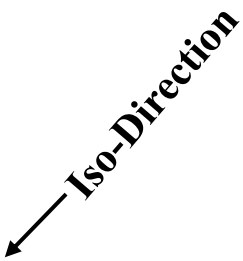


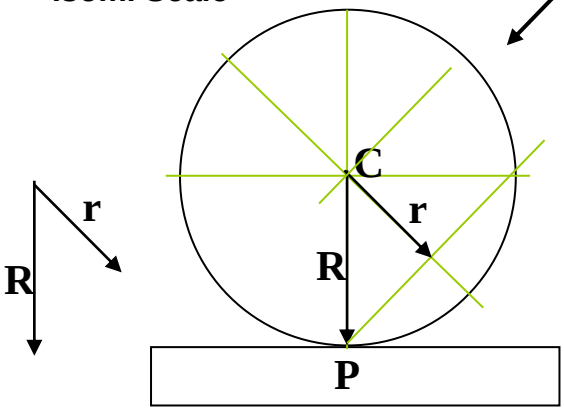


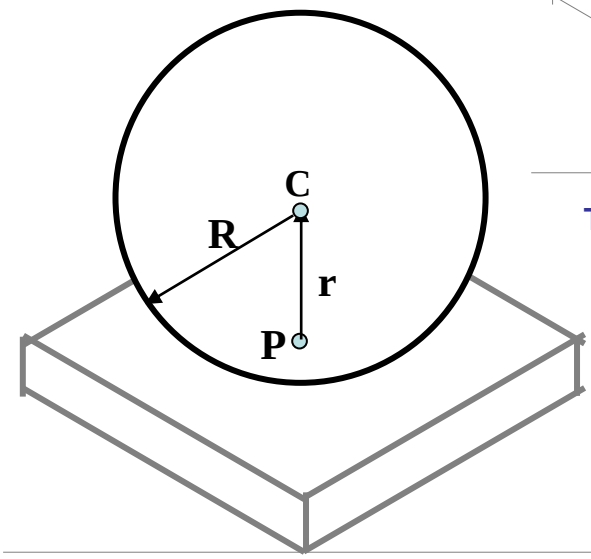
STUDY ILLUSTRATIONS

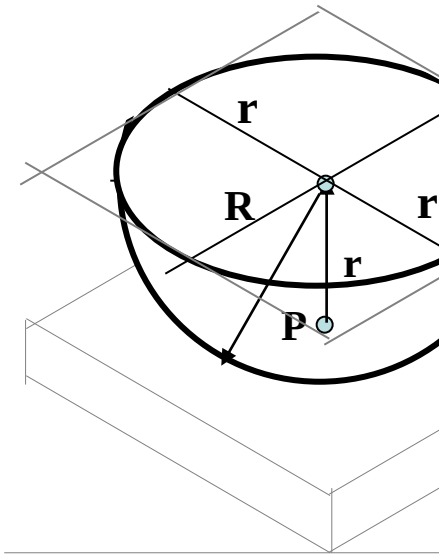
ISOMETRIC PROJECTIONS OF SPHERE & HEMISPHERE











C = Center of Sphere.
P = Point of contact
R = True Radius of Sphere
r = Isometric Radius.

TO DRAW ISOMETRIC PR
OF A HEMISPHE

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Then c
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of

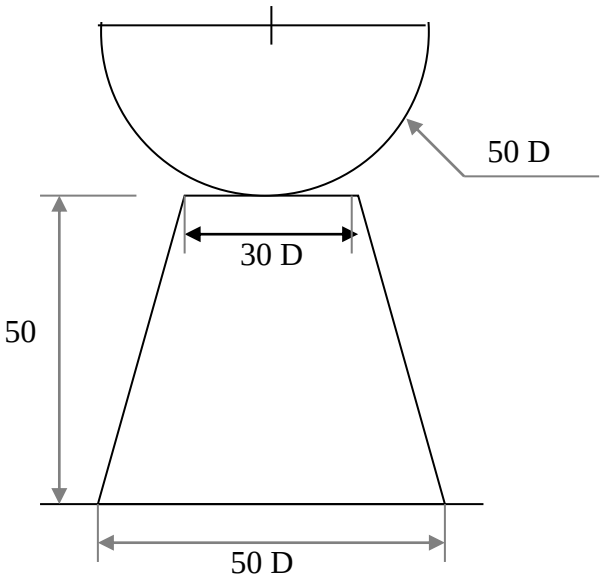
TO DRAW ISOMETRIC PROJECTION OF A SPHERE

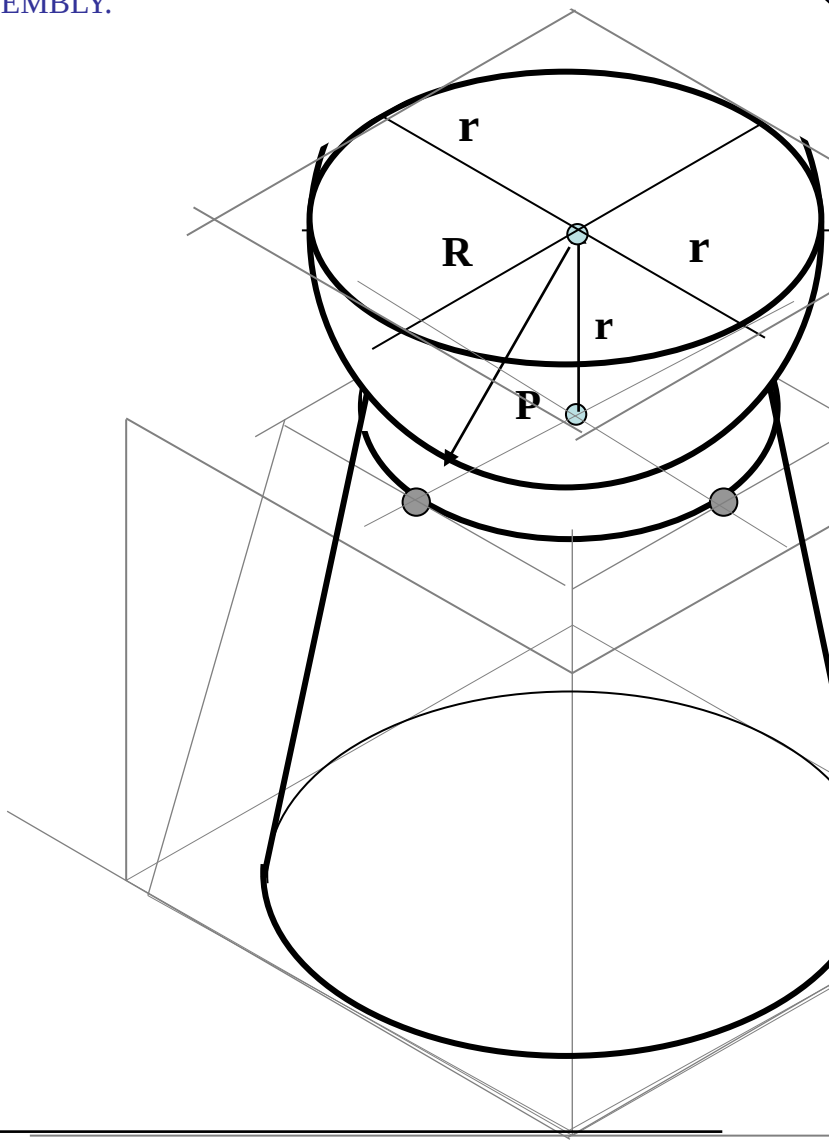
1. FIRST DRAW ISOMETRIC OF SQUARE PLATE.
2. LOCATE IT'S CENTER. NAME IT P.
3. FROM PDRAW VERTICAL LINE UPWARD, LENGTH ' r mm' AND LOCATE CENTER OF SPHERE "C"
4. 'C' AS CENTER, WITH RADIUS 'R' DRAW CIRCLE.

THIS IS ISOMETRIC PROJECTION OF A SPHERE.

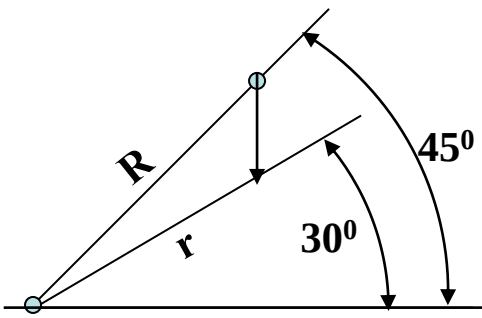
PROBLEM:

A HEMI-SPHERE IS CENTRALLY PLACED
ON THE TOP OF A FRUSTOM OF CONE.
DRAW ISOMETRIC PROJECTIONS OF THE ASSEMBLY.





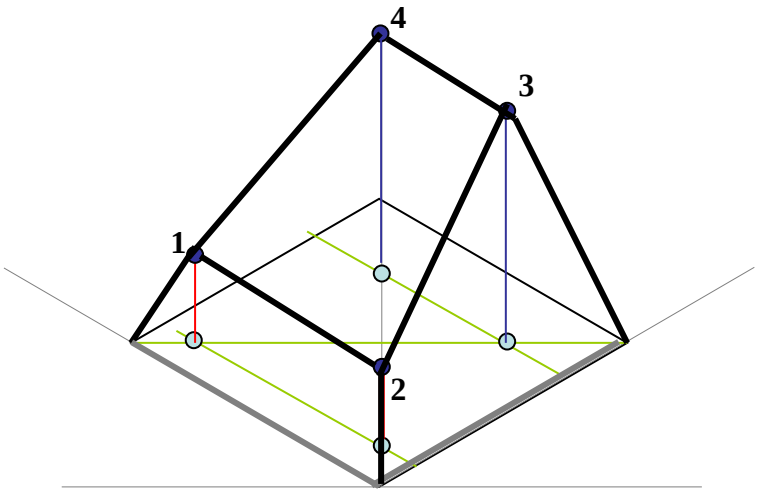
**FIRST CONSTRUCT ISOMETRIC SCALE.
USE THIS SCALE FOR ALL DIMENSIONS
IN THIS PROBLEM.**

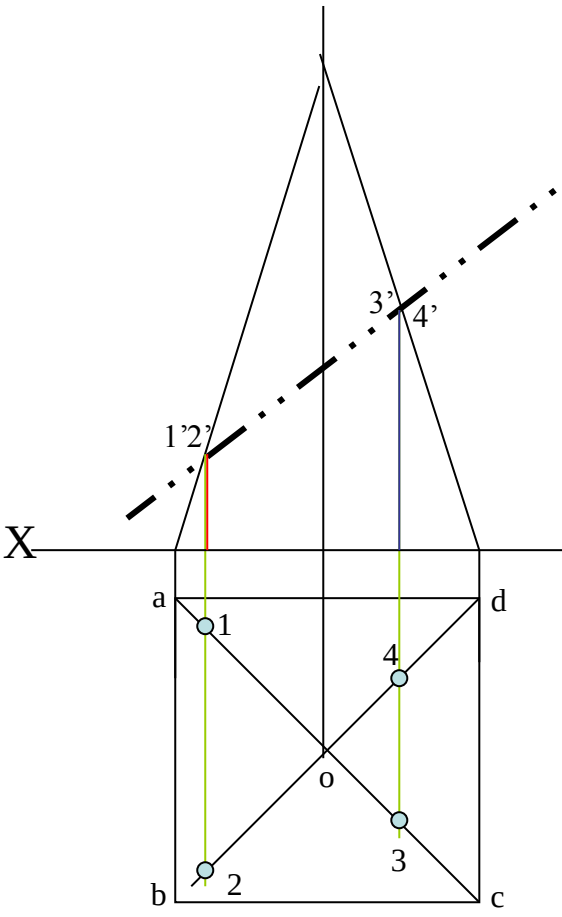


STUDY ILLUSTRATIONS

7

A SQUARE PYRAMID OF 40 MM BASE SIDES AND 60 IS CUT BY AN INCLINED SECTION PLANE THROUGH TH OF AXIS AS SHOWN.DRAW ISOMETRIC VIEW OF SECTION

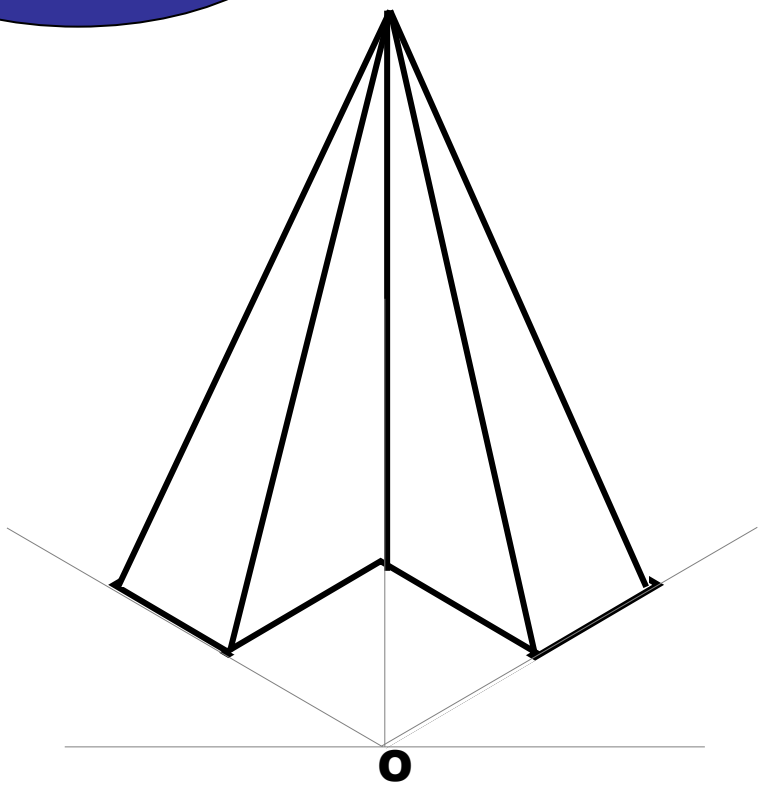


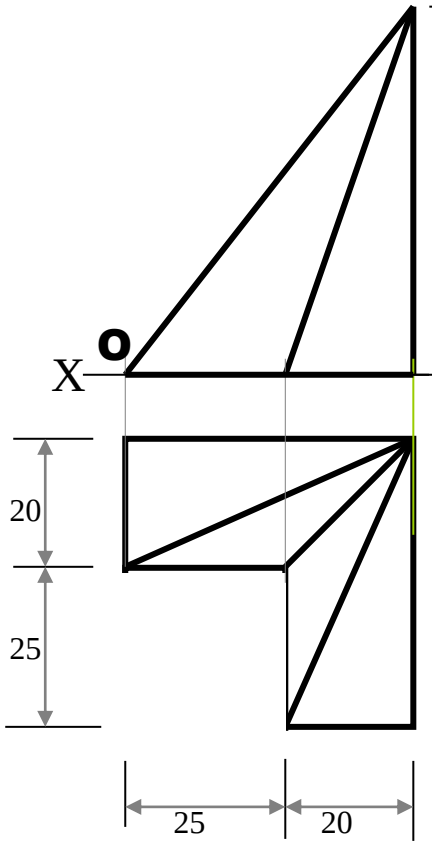


STUDY ILLUSTRATIONS

7

F.V. & T.V. of an object are given. Draw it's isom





STUDY ILLUSTRATIONS

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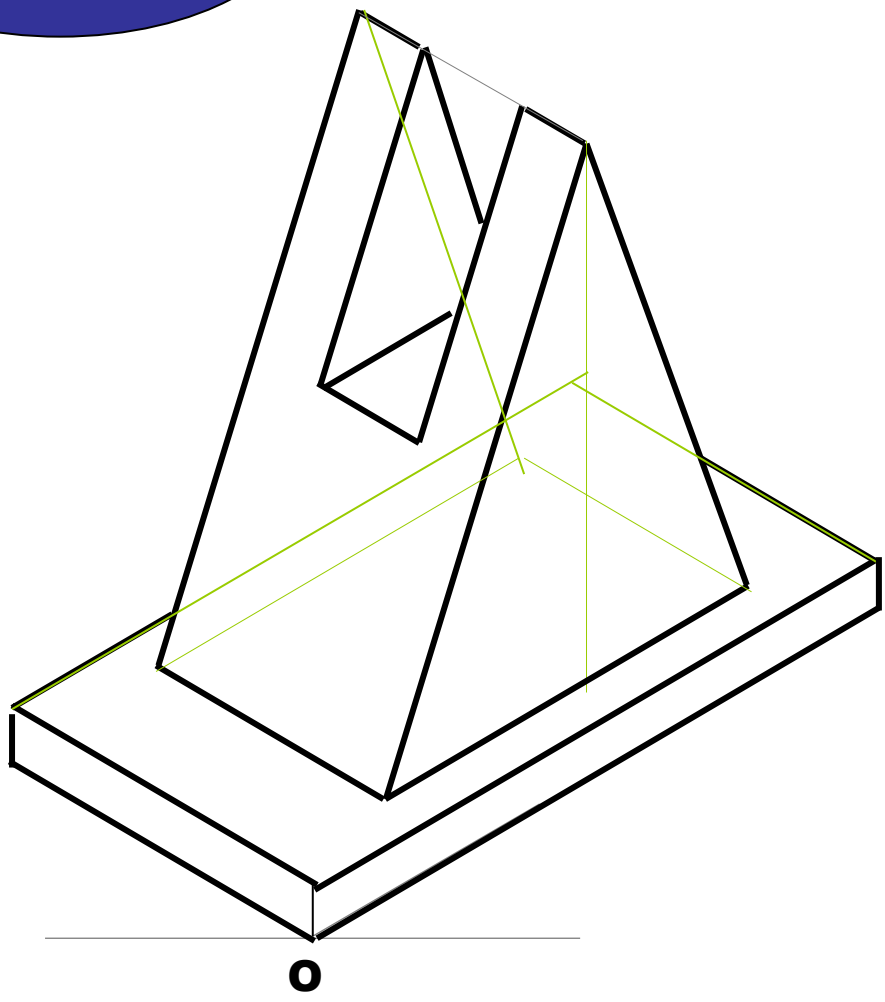
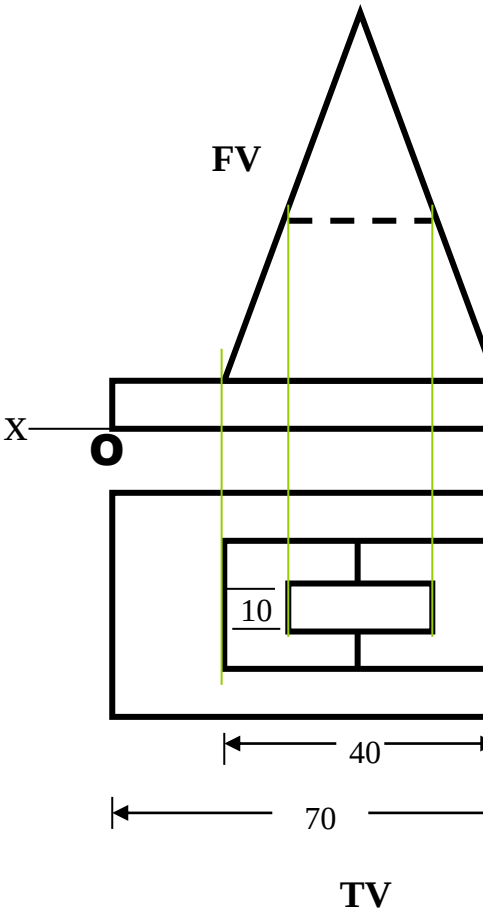
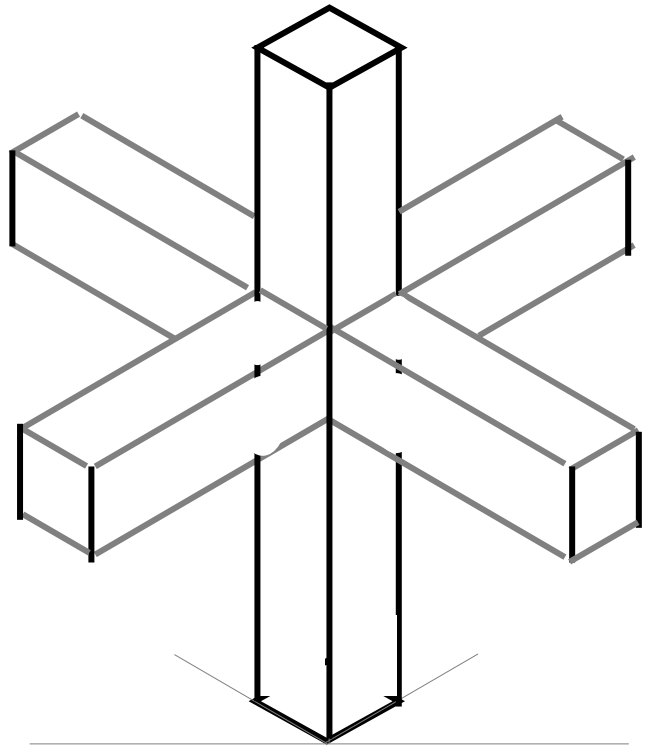
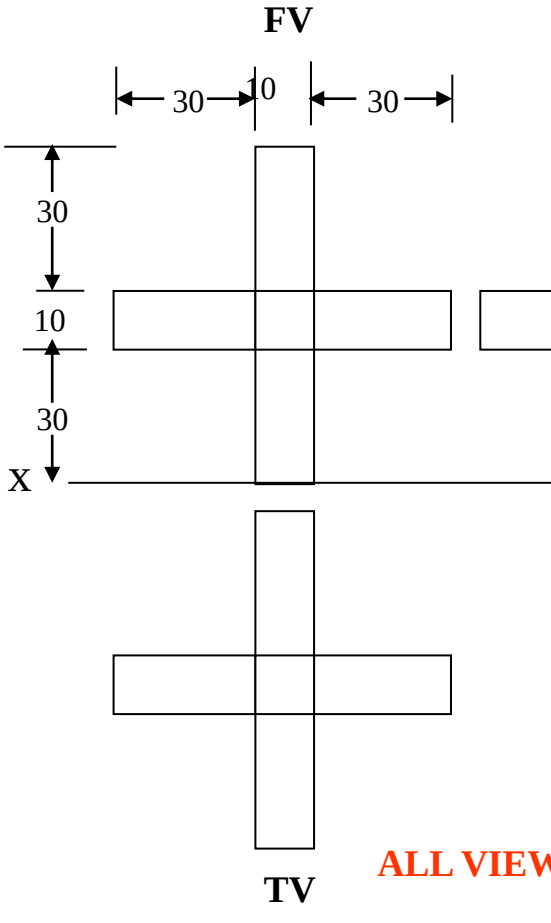




STUDY ILLUSTRATIONS

7 F.V. & T.V. and S.V.of an object are given. Draw it's i





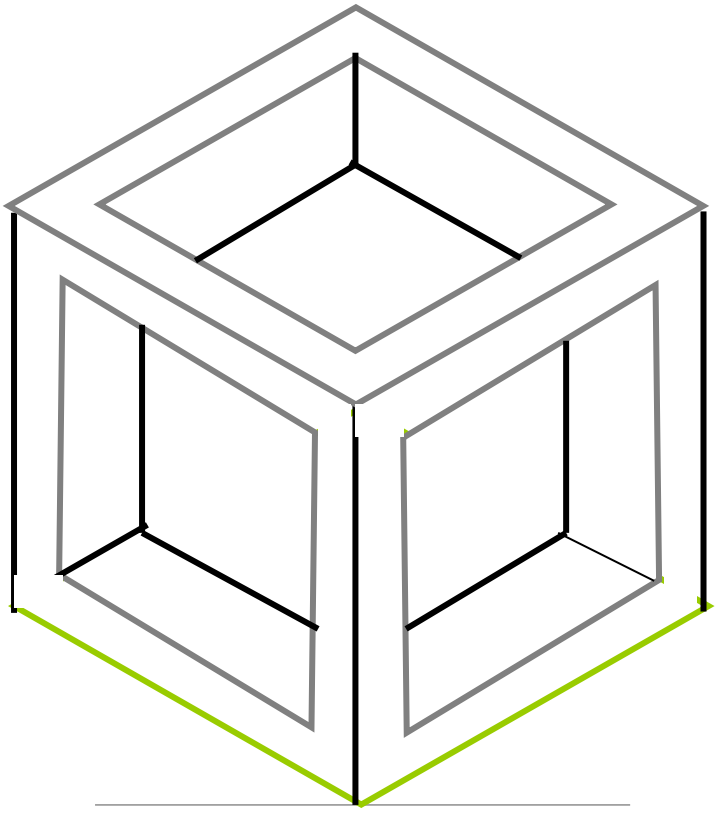
ALL VIEW

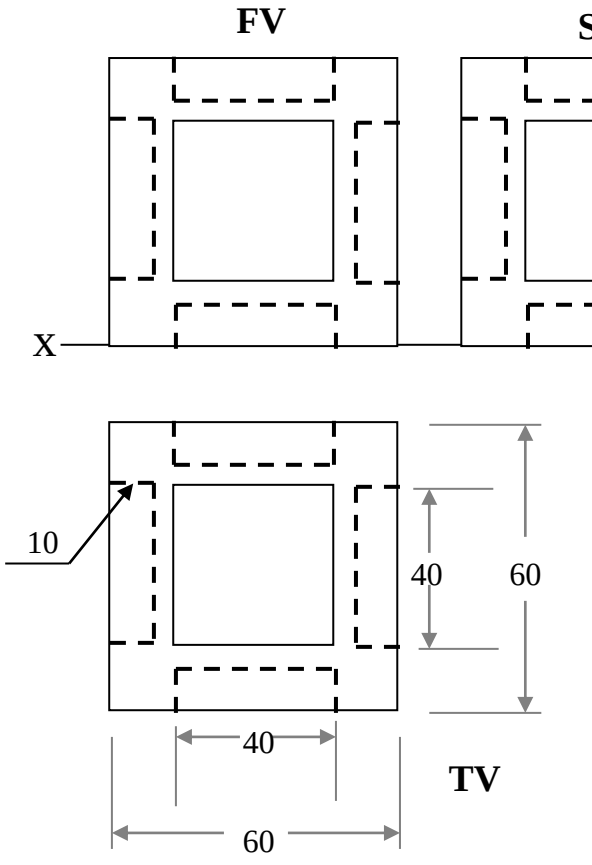
STUDY ILLUSTRATIONS

7

F.V. & T.V. and S.V.of an object are given. Draw it's is

ALL VIEWS IDENTICA

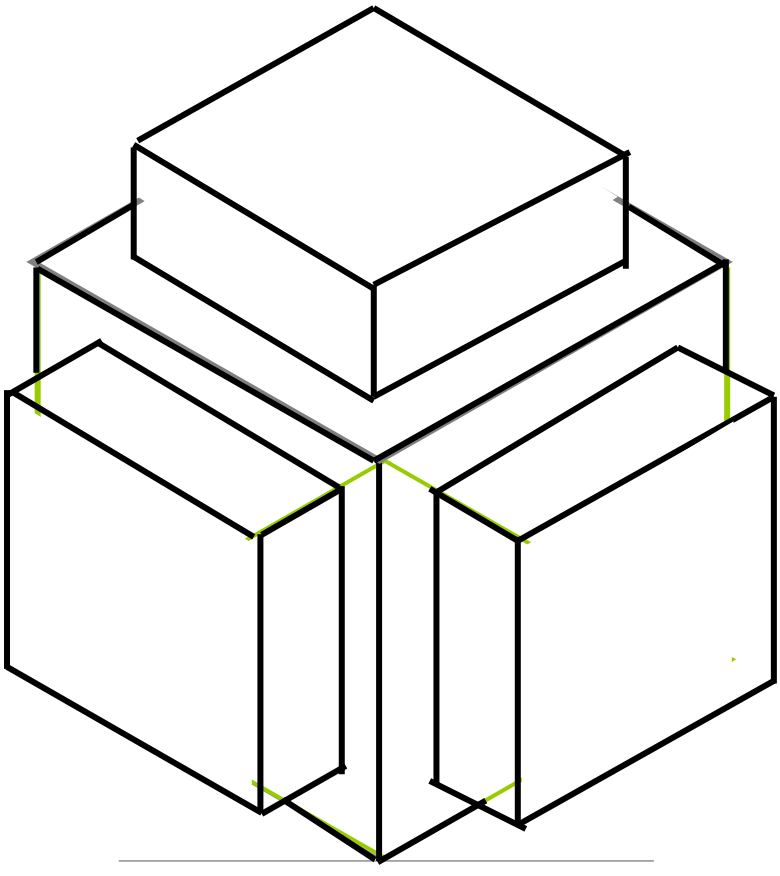


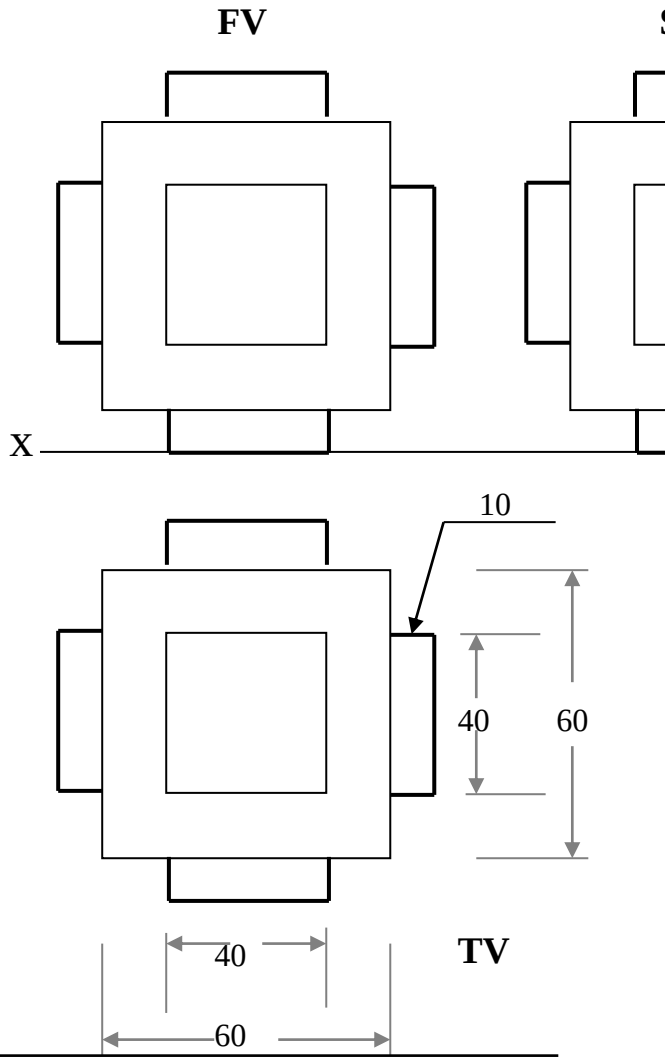


STUDY ILLUSTRATIONS

F.V. & T.V. and S.V.of an object are given. Draw it's isometr

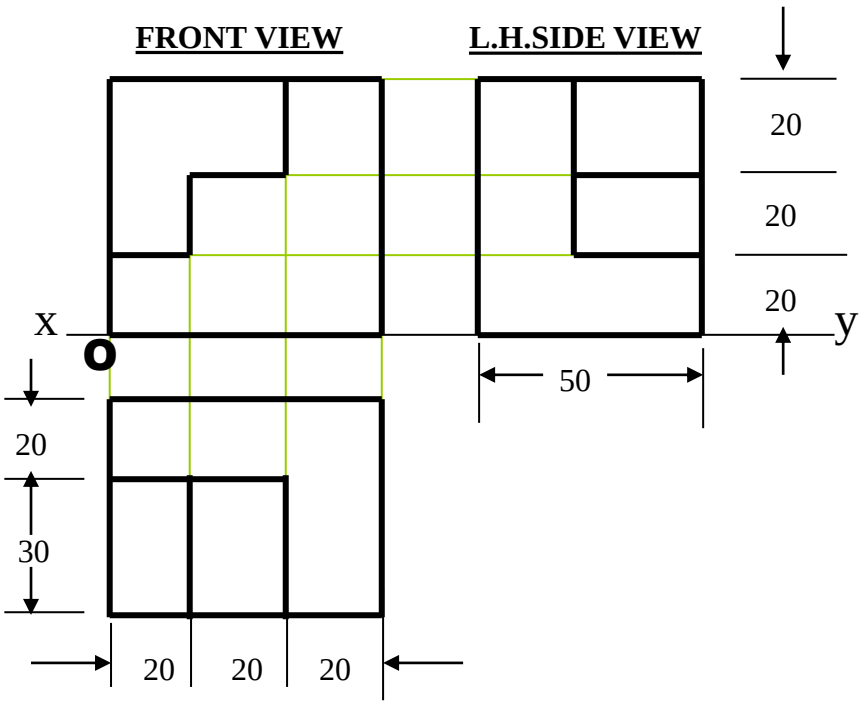
ALL VIEWS IDENTICA

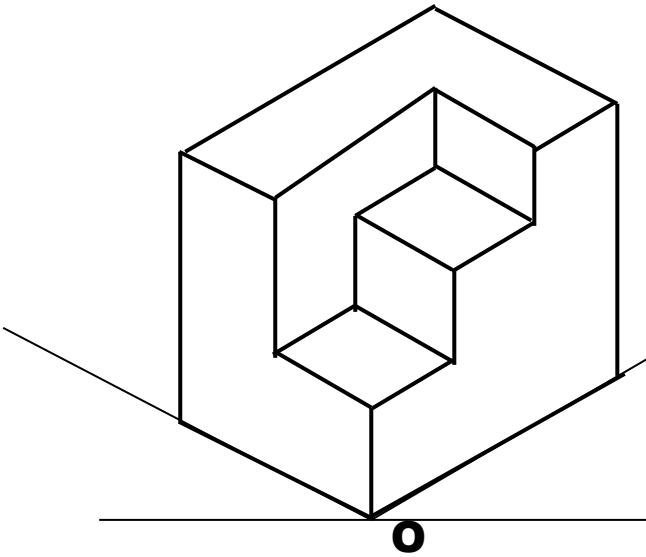




F.V. & T.V. and S.V.of an object are given. Draw it's isometric view.

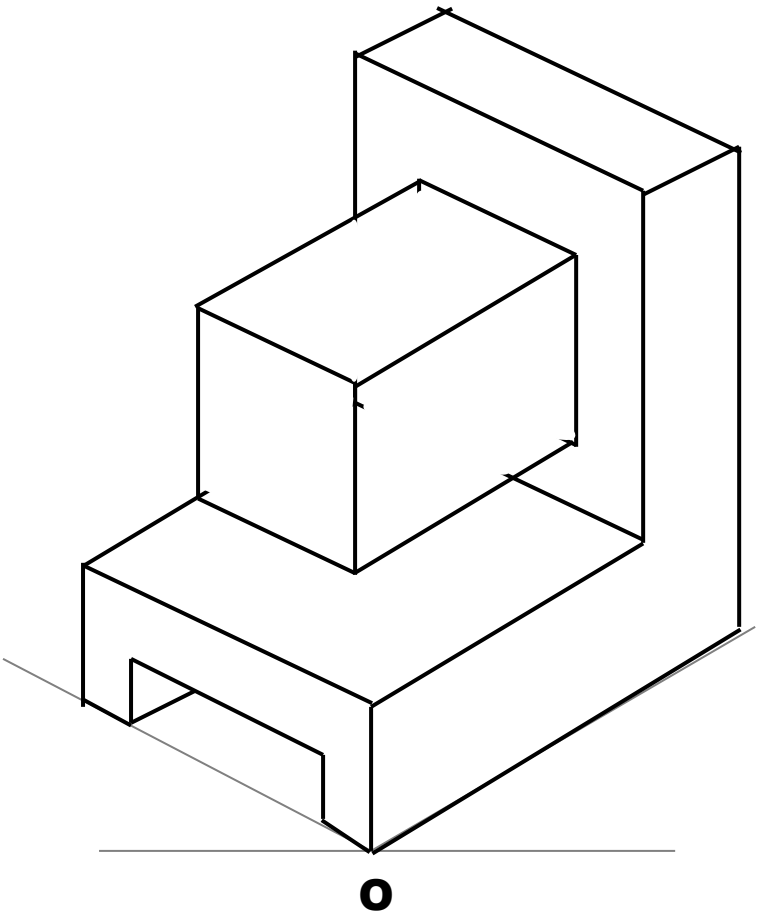
ORTHOGRAPHIC PROJECTIONS

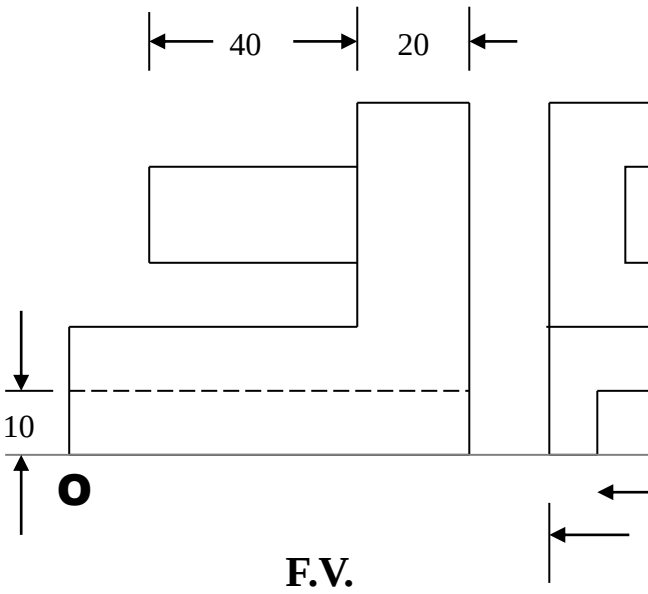




STUDY ILLUSTRATIONS

F.V. and S.V.of an object are gi
Draw it's isometric view.

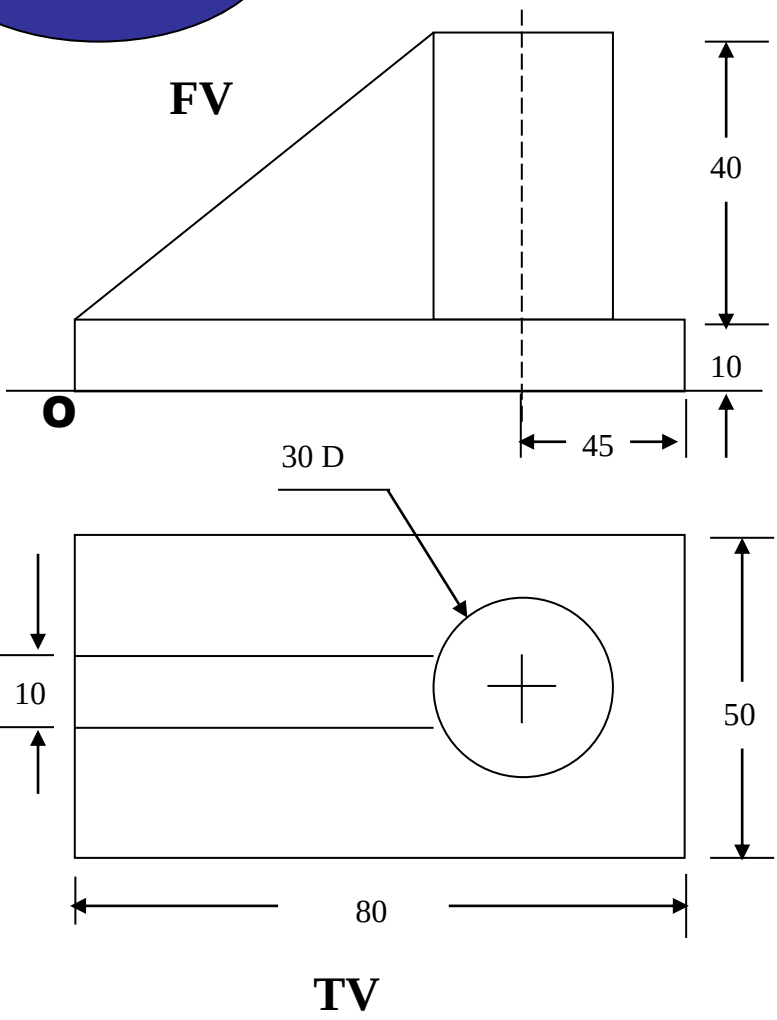


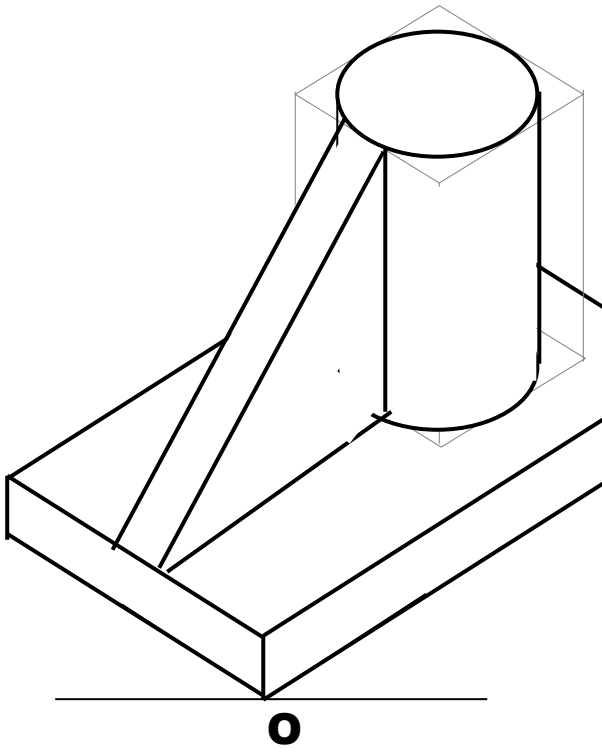


F.V.

STUDY ILLUSTRATIONS

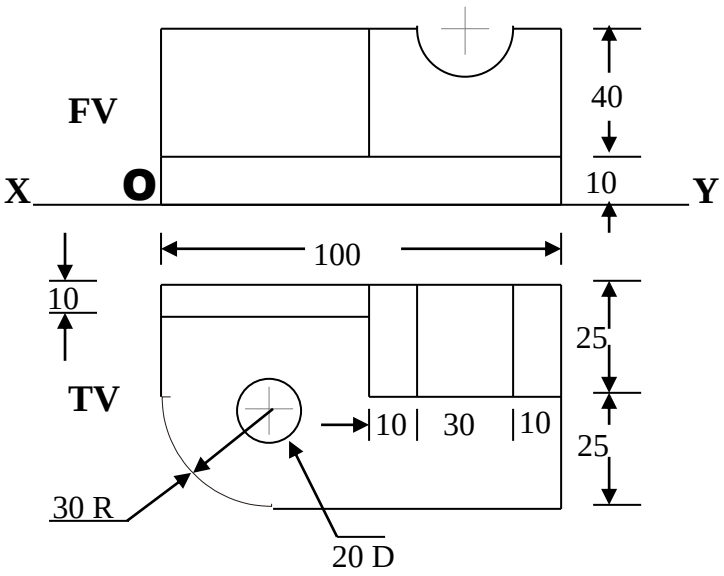
F.V. & T.V. of an object are given. Draw it's isometric view

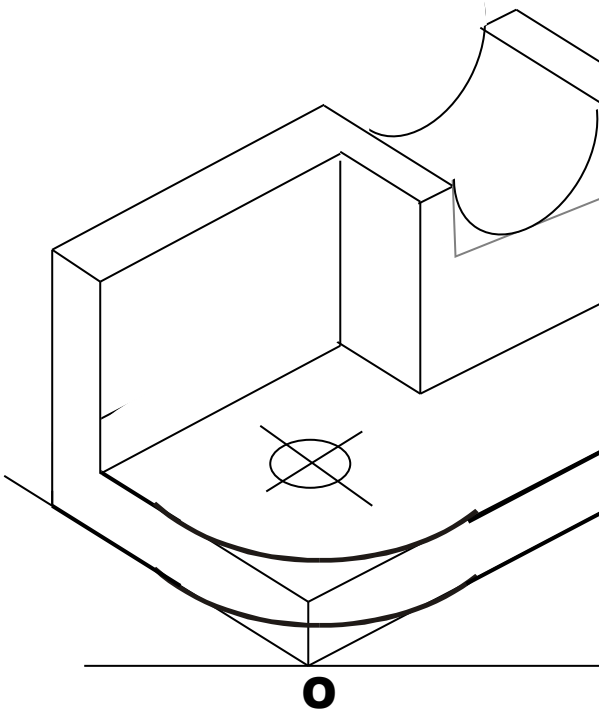




STUDY ILLUSTRATIONS

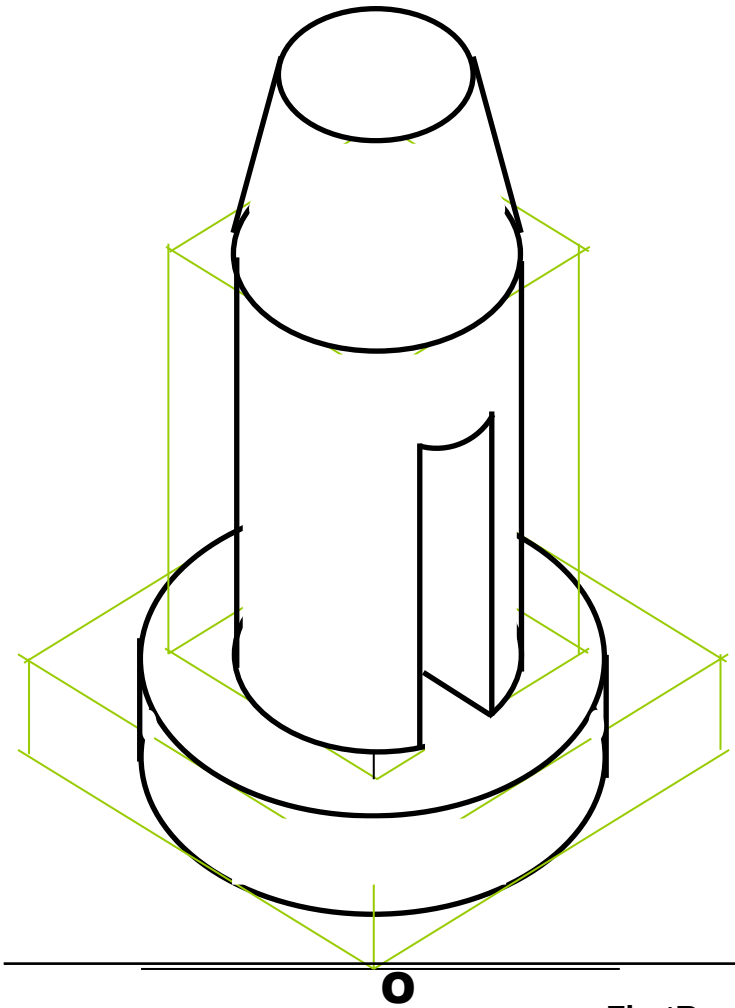
F.V. & T.V. of an object are given. Draw it's isometric view.

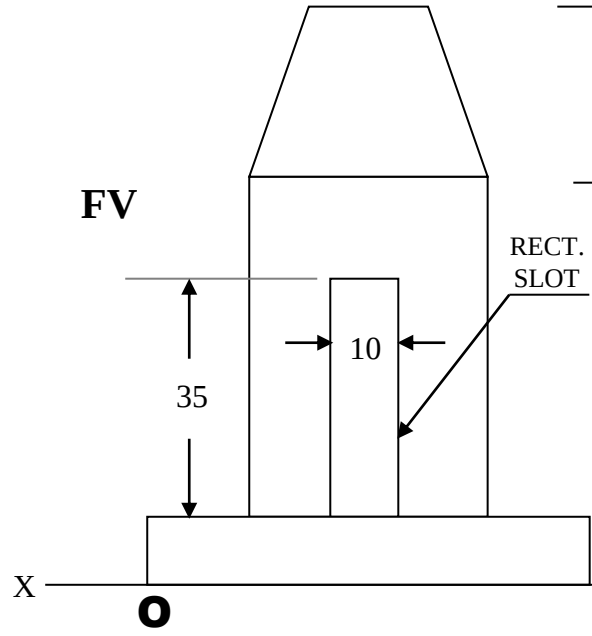


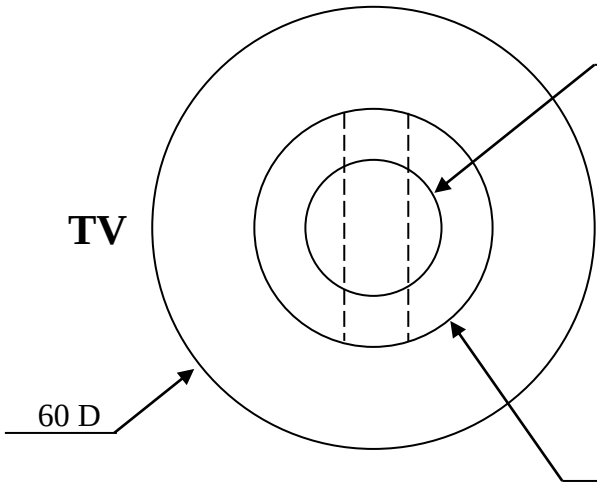


STUDY ILLUSTRATIONS

F.V. & T.V. of an object are given. Draw it's isometric vie

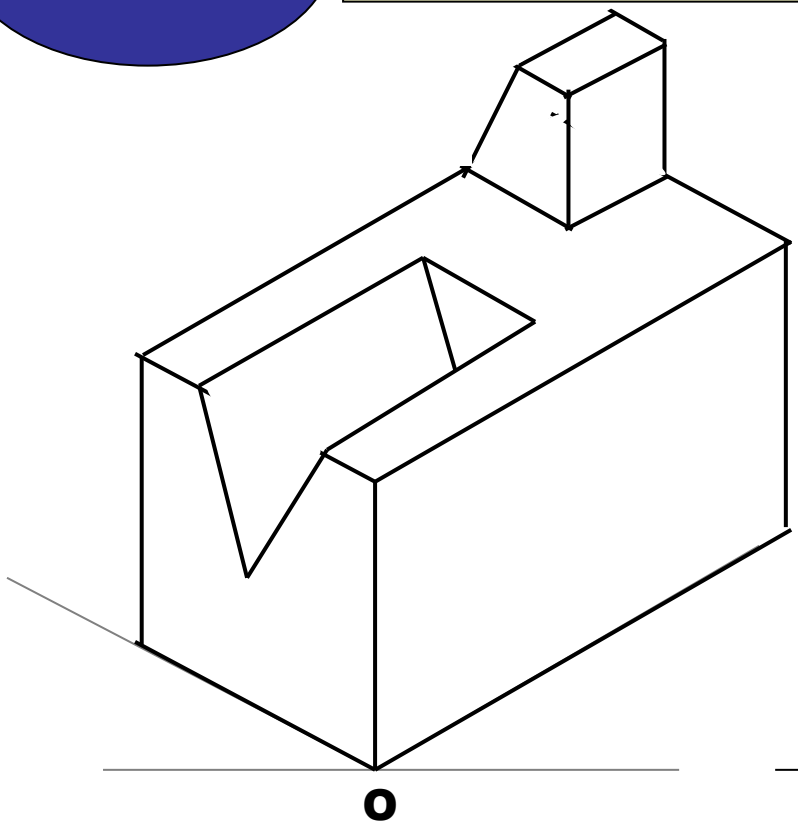


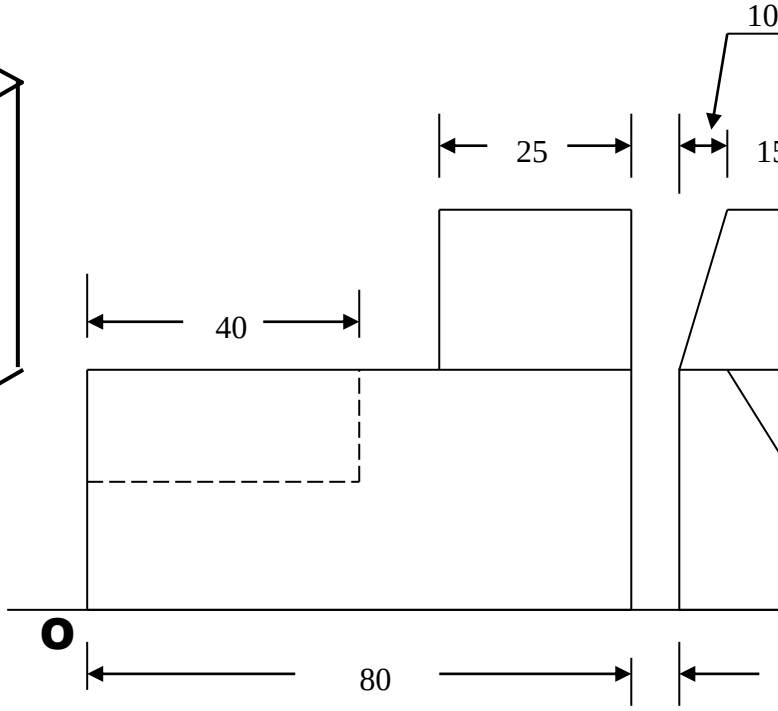




STUDY ILLUSTRATIONS

F.V. and S.V.of an object are given. Draw it's isometric v

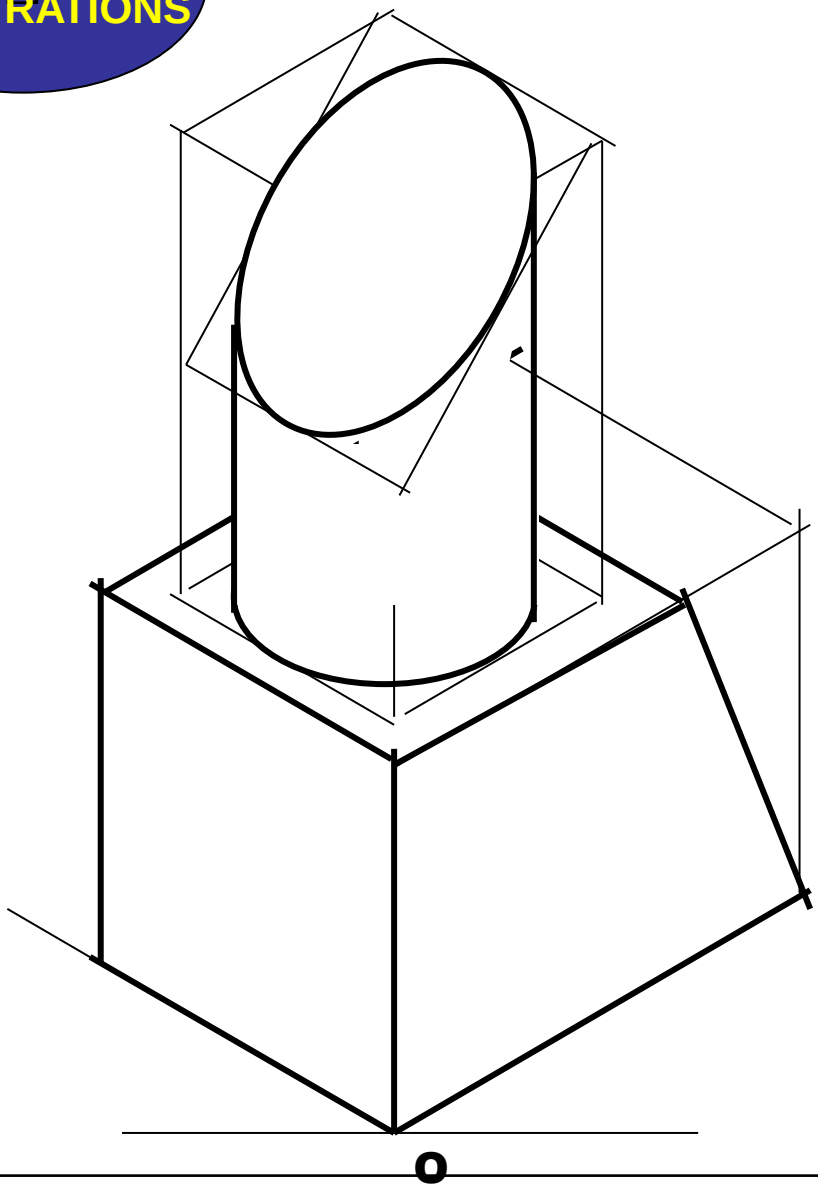


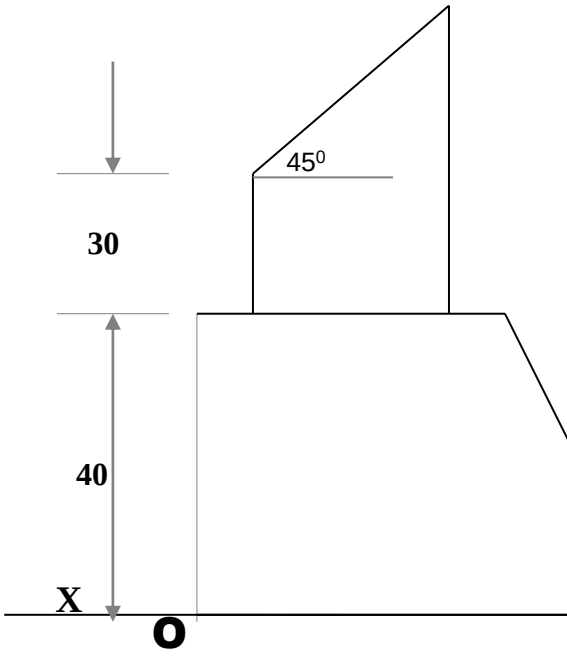


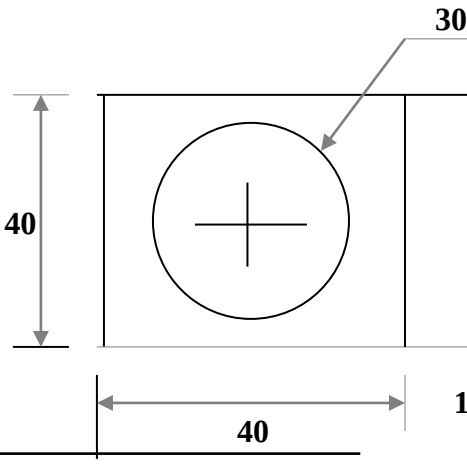
F.V.

STUDY ILLUSTRATIONS

F.V. & T.V. of an object are given. Draw it's isometric vi

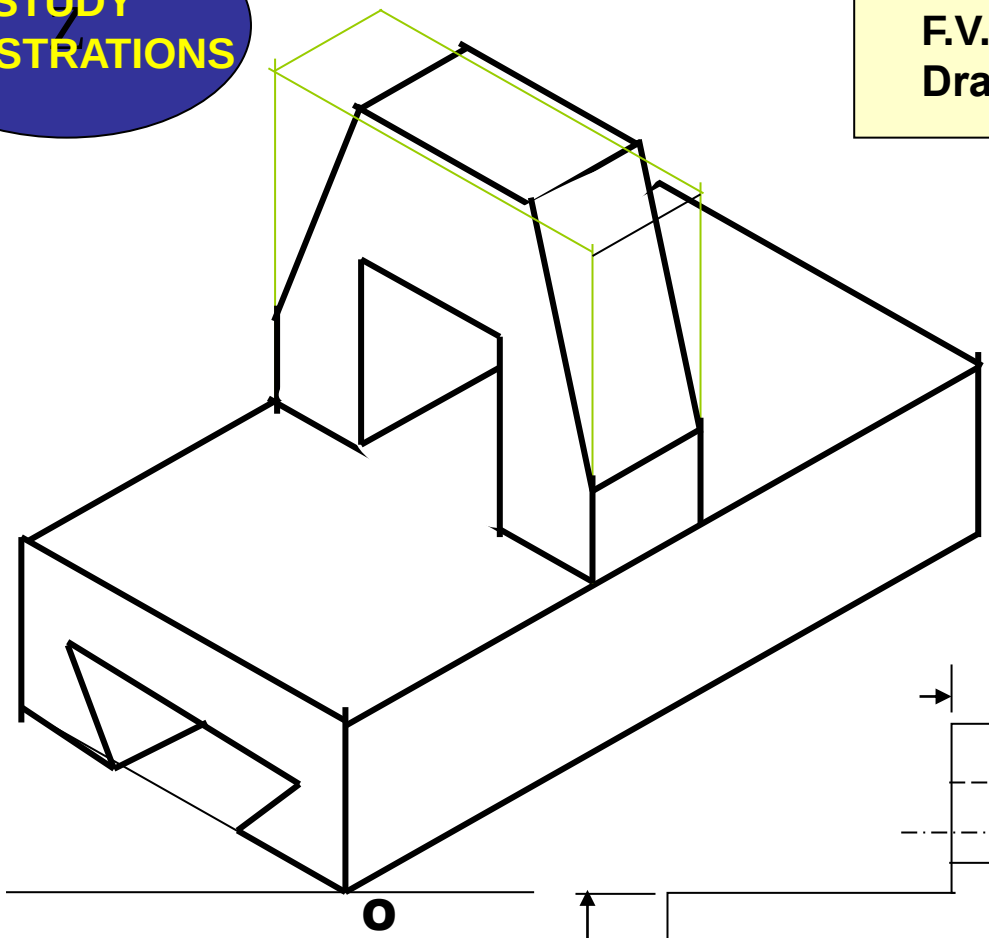


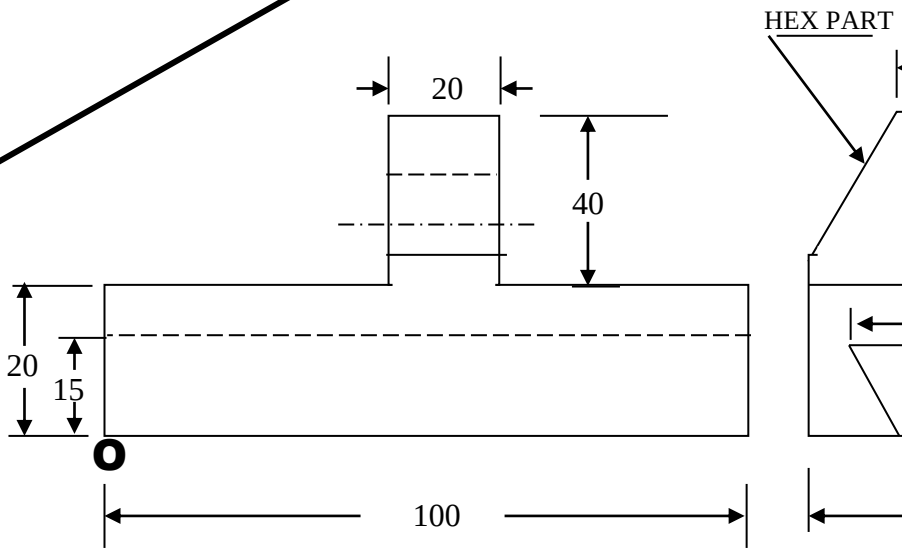




STUDY ILLUSTRATIONS

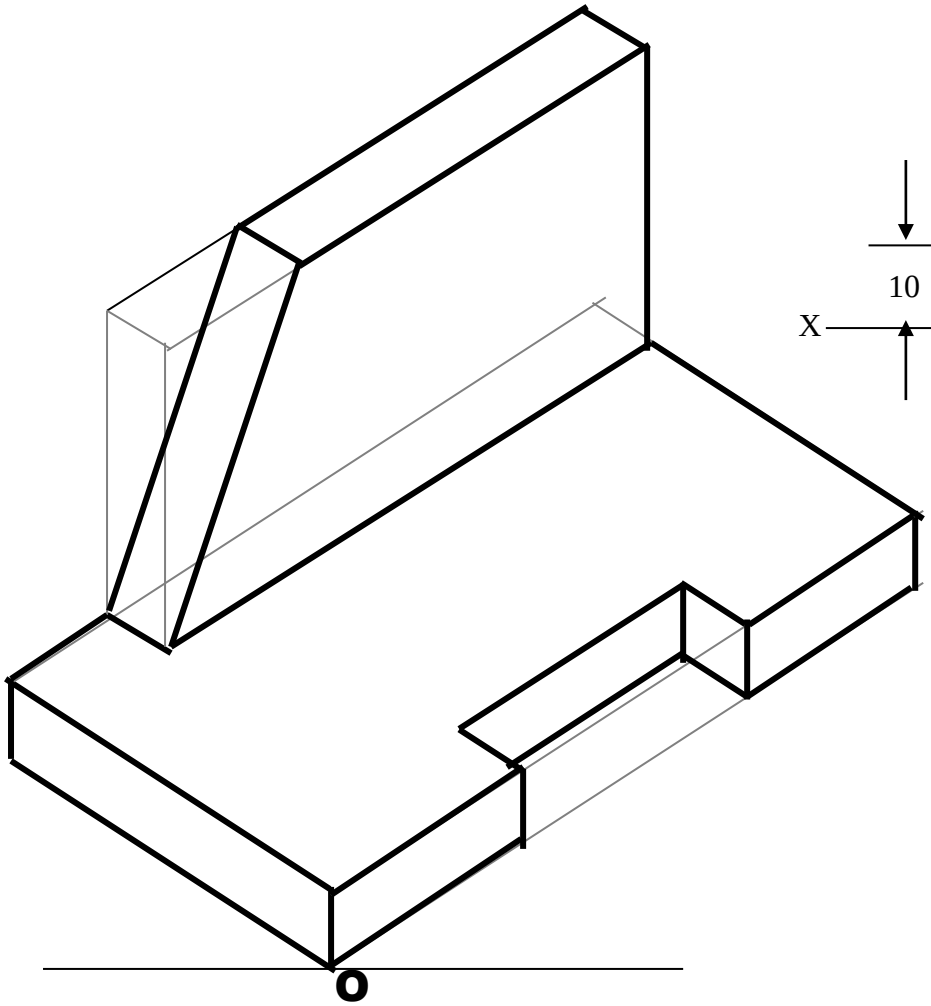
F.V. and S.V.of an object ar
Draw it's isometric view.

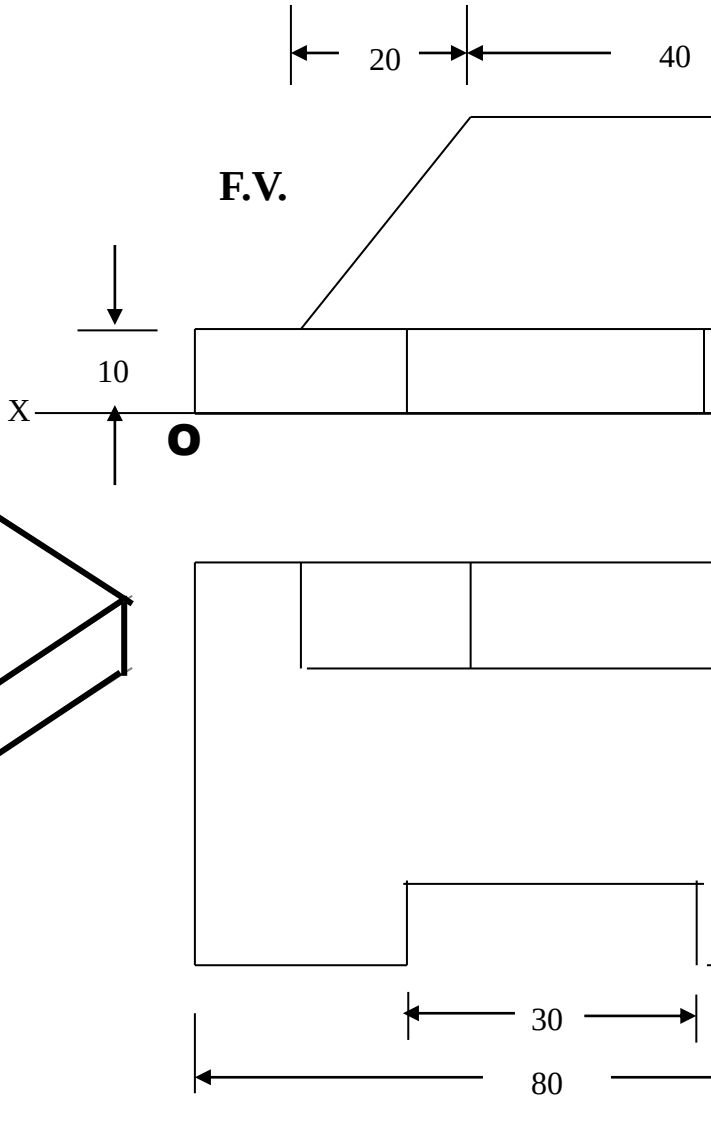




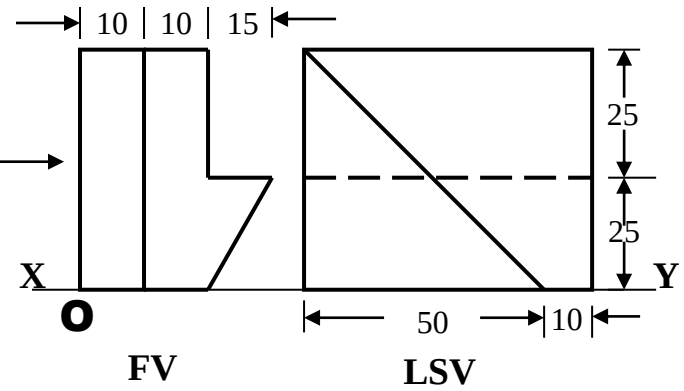
STUDY ILLUSTRATIONS

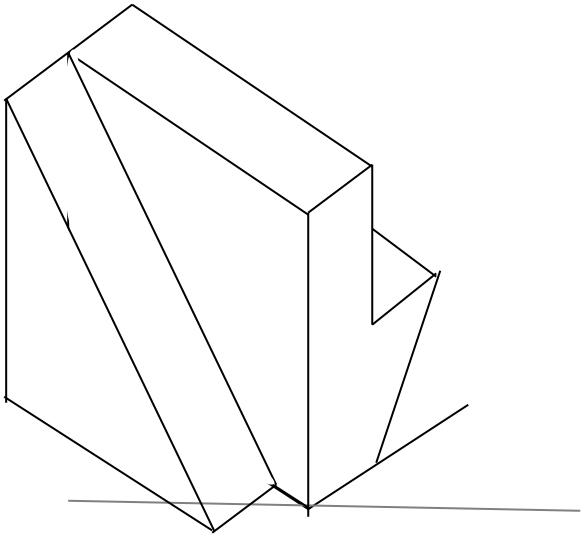
F.V. & T.V. of an object are given. Draw it's isometric vi



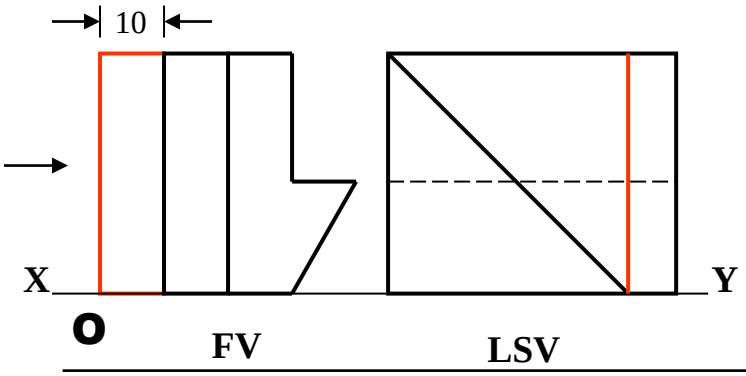


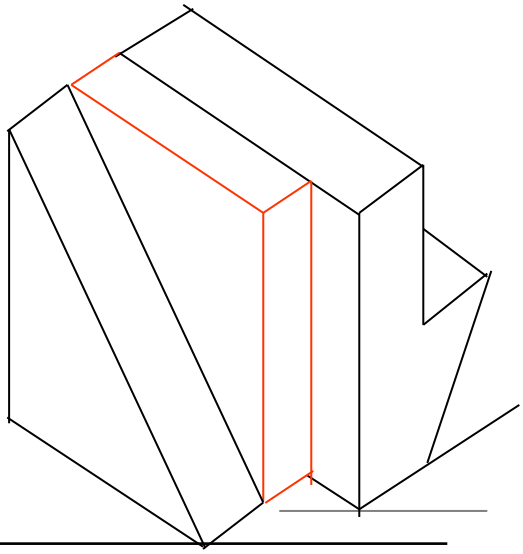
F.V. and S.V.of an object are given. Draw it's isometric view.



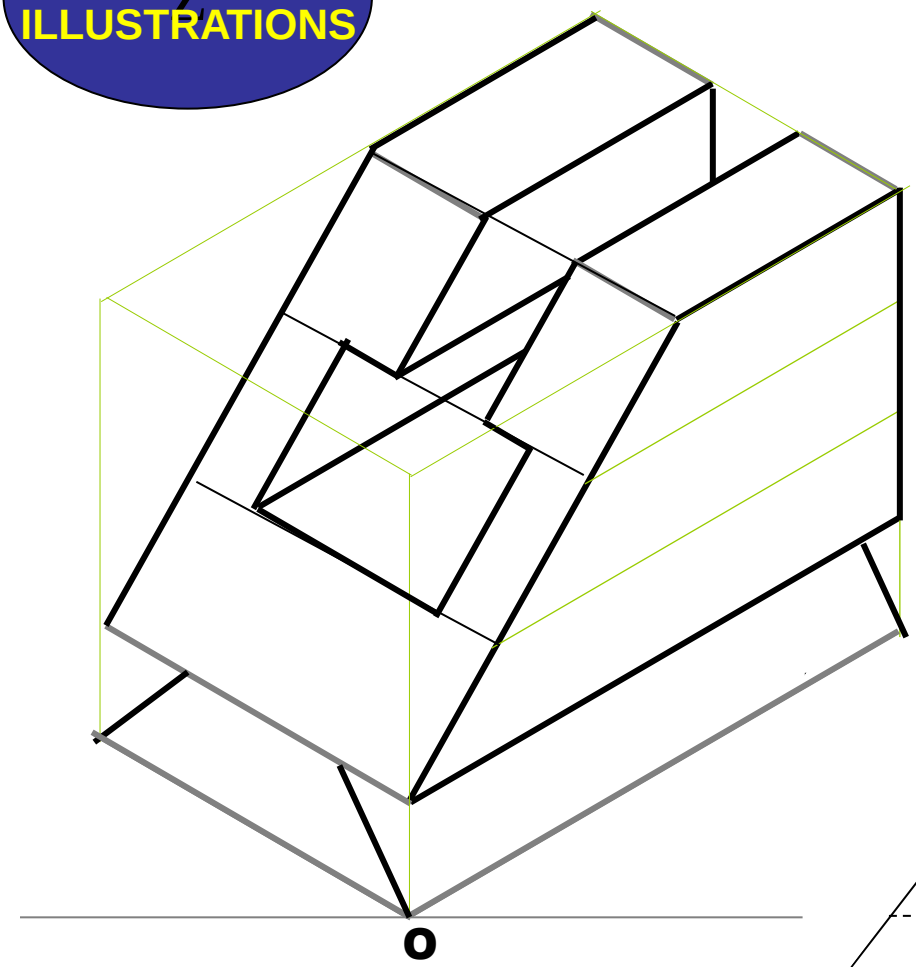


NOTE THE SMALL CHZNGE IN 2ND FV & SV.
DRAW ISOMETRIC ACCORDINGLY.

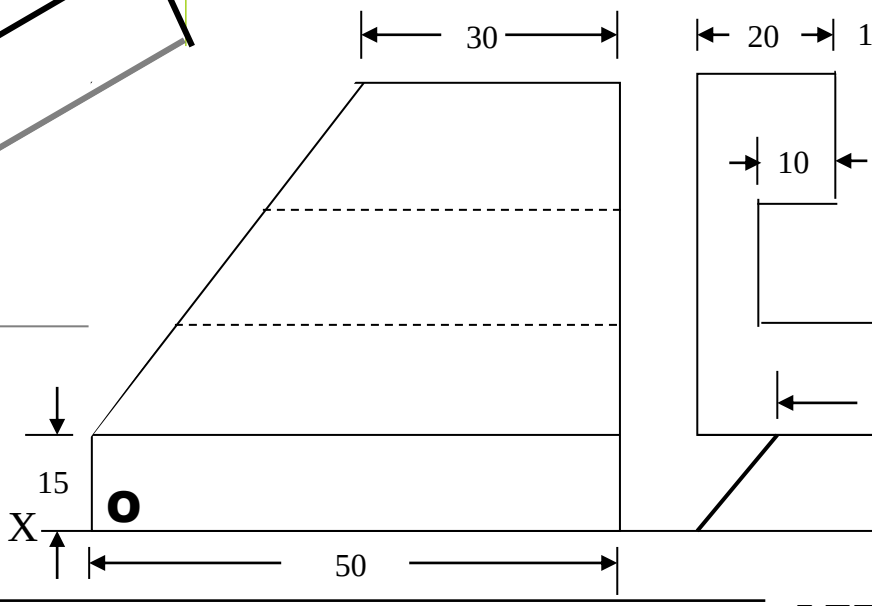




STUDY ILLUSTRATIONS



**F.V. and S.V.of an object
Draw it's isometric view.**

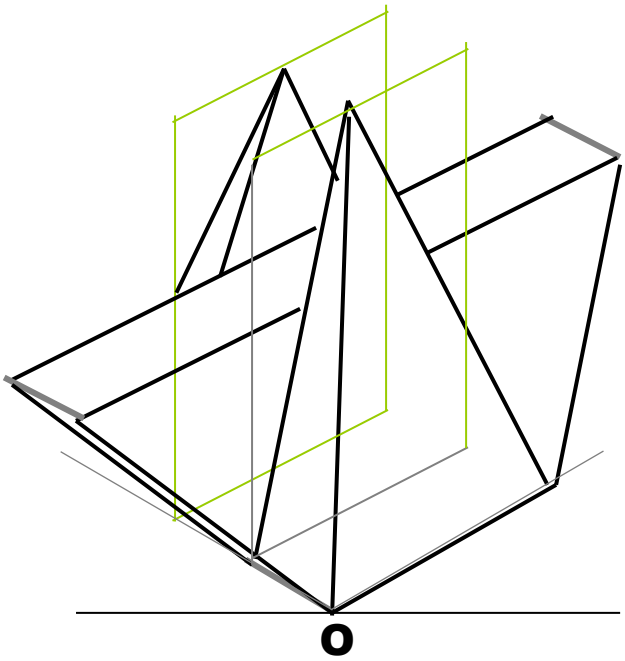


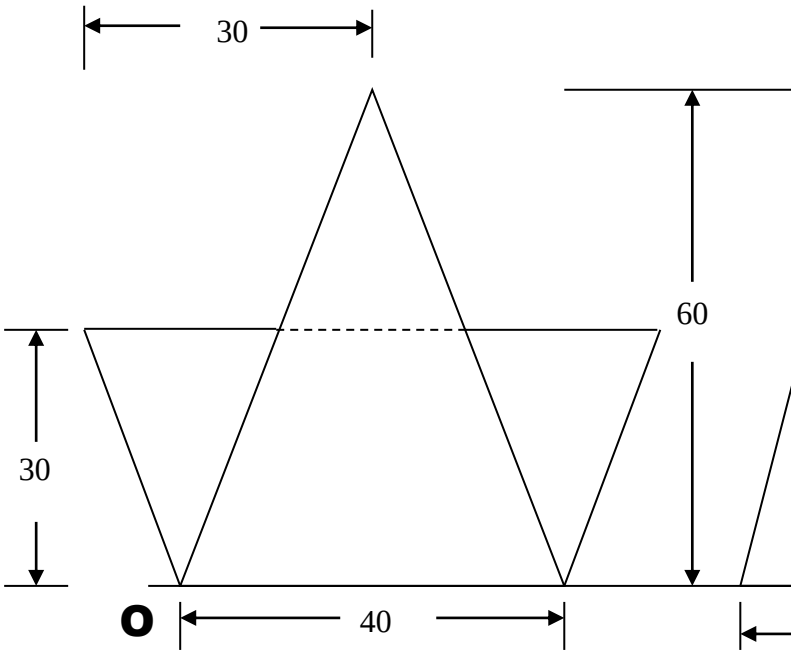
F.V.

LEF

STUDY ILLUSTRATIONS

F.V. and S.V.of an object are gi
Draw it's isometric view.





F.V.

University Question Papers

Subject Code: R13109/R13 **Set No - 1**

I B. Tech I Semester Regular/Supplementary Examinations Jan./Feb. - 2015

ENGINEERING DRAWING

(EEE)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**
*****

PART-A

1.(a) Draw the Isometric view assuming suitable data: fig.1

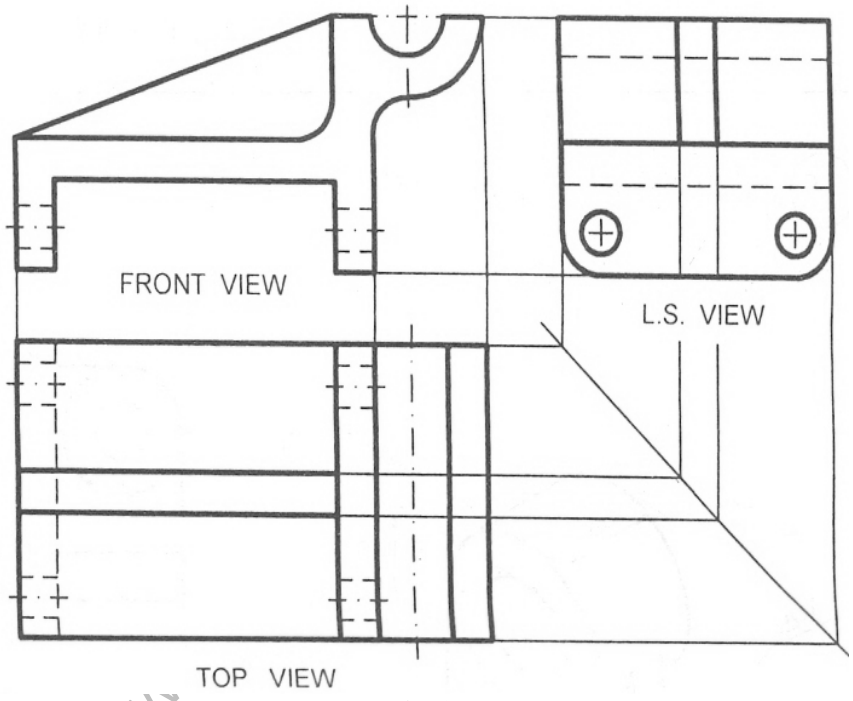


Fig.1

(b) A pentagonal prism is resting on a corner of its base on the ground with a longer edge containing that corner inclined at 450 to the HP and the vertical plane containing that edge and the axis inclined at 300 to the VP. Draw its projections. Base 40 mm side, height 65 mm.

[14+8]

PART-B

2.(a) Construct a regular hexagon of side 28 mm when one side is horizontal.

(b) An area of 144 sq cm on a map represents an area of 36 sq km on the field. Find the RF of the scale for this map and draw a diagonal scale to show kilometers, hectameters and decameters and to measure up to 10 km. Indicate on the scale a distance of 7 km, 5 hectameters and 6 decameters.

[8+8]

Subject Code: R13109/R13 **Set No - 1**

3.(a) The Top view of a 75 mm long line measures 55 mm. The line is in the VP, its one end being 25 mm above the HP. Draw its projections.

(b) Draw the projections of the following points on the same ground line, keeping the projectors 25 mm apart.
(i) 40 mm above the HP and 25 mm in front of the VP
(ii) In the VP and 40 mm above the HP
(iii) 15 mm above the HP and 50 mm behind the VP

[8+8]

4. The projectors drawn from the HT and the VT of a straight line AB are 80 mm apart while those drawn from its ends are 50 mm apart. The HT is 35 mm in front of the VP, the VT is 55 mm above the HP and the end A is 10 mm above the HP. Draw the projections of AB and determine its length and inclinations with the reference planes.

[16]

5. A semicircular plate of 80 mm diameter has its straight edge in the VP and inclined at 45^0 to the HP. The surface of the plate makes an angle of 30^0 with the VP. Draw its projections.

[16]

6. A square headed bolt 25 mm diameter, 125 mm long and having a square neck has its axis parallel to the ground and inclined at 45^0 to the VP.

[16]

7. Draw (i) Front View (ii) Top View (iii) Side View fig.2

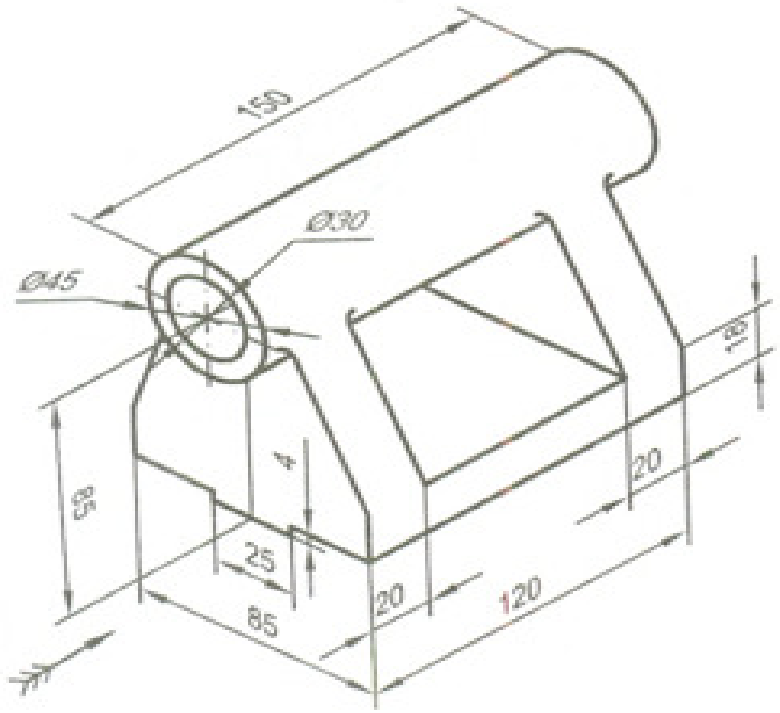


Fig.2

[16]

Subject Code: R13109/R13 **Set No - 2**

I B. Tech I Semester Regular/Supplementary Examinations Jan./Feb. - 2015

ENGINEERING DRAWING

(EEE)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**

*****

PART-A

1.(a) Draw (i) Front View (ii) Top View (iii) Left Hand Side View fig.1

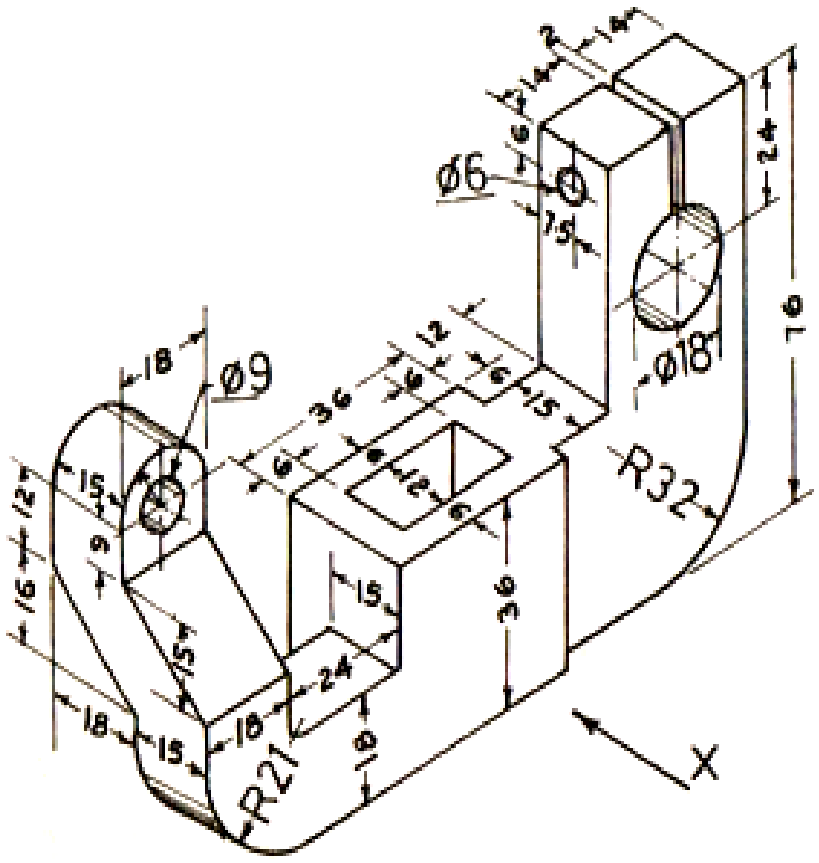


Fig.1

(b) A square pyramid, base 40 mm side and axis 90 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.

[14+8]

PART-B

2.(a) Construct a Vernier scale of RF=1/80 to read inches and to measure up to 15 yards.

(b) A car is running at a speed of 50 km/hour. Construct a diagonal scale to show 1 Kilometer by 3 cm and to measure up to 6 kilometers. Mark also on the scale the distance covered by the car in 5 minutes 28 seconds.

[8+8]

Subject Code: R13109/R13 **Set No - 2**

3.(a) Two points A and B are in the HP. The point A is 30 mm in front of the VP; While B is behind the VP. The distance between their projectors is 75 mm and the line joining their top views makes an angle of 45^0 with xy. Find the distance of the point B from the VP.

(b) A line AB 25 mm long is parallel to VP and perpendicular to HP. Point A is 35 mm above HP and 20 mm in front of VP. Point B is 10 mm above HP. Draw the projections of the line AB.

[8+8]

4. A line PQ 100 mm long is inclined at 30^0 to the HP and at 45^0 to the VP. Its midpoint is in the VP and 20 mm above the HP. Draw its projections, if its end P is in the third quadrant and Q in the first quadrant.

[16]

5. Draw an equilateral triangle of 75 mm side and inscribe a circle in it. Draw the projection of the figure, when its plane is vertical and inclined at 30^0 to the VP and one of the sides of the triangle is inclined at 45^0 to the HP.

[16]

6. Draw the projections of a cylinder, base 30 mm diameter and axis 40 mm long, resting with a point of its base circle on HP such that the axis is making an angle of 30^0 with HP and parallel to VP.

[16]

7. Draw the Isometric view: fig.2

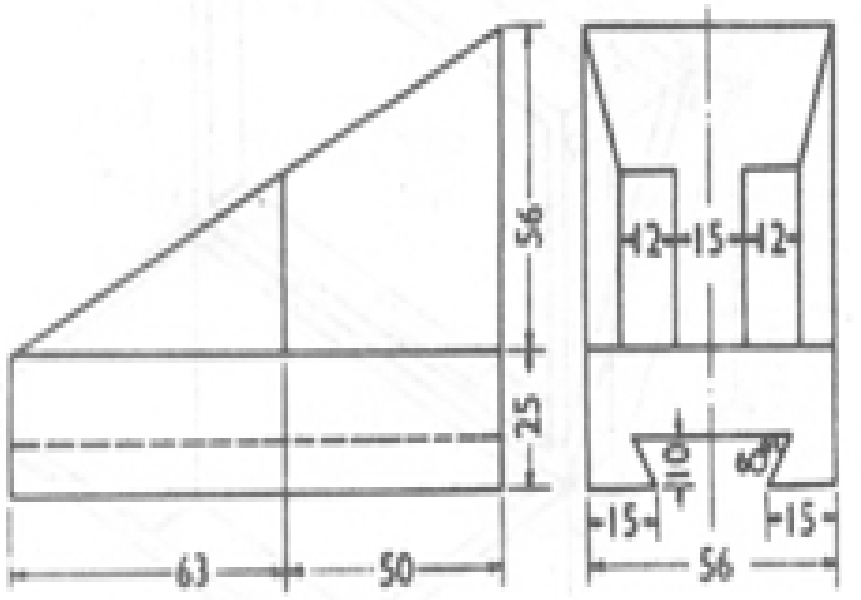


Fig.2

[16]

Subject Code: R13109/R13 **Set No - 3**

I B. Tech I Semester Regular/Supplementary Examinations Jan./Feb. - 2015

ENGINEERING DRAWING

(EEE)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**
*****

PART-A

1.(a) Draw the Isometric view: fig.1

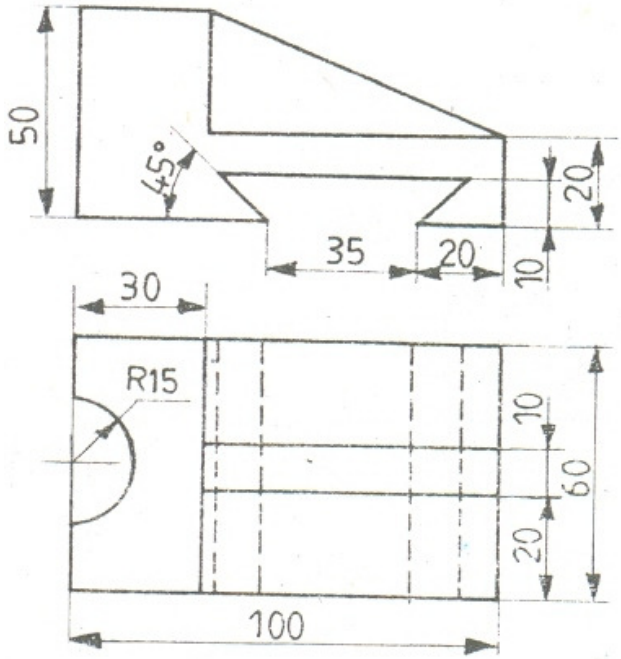


Fig.1

(b) A cylindrical block, 75 mm diameter and 25 mm thick, has a hexagonal hole of 25 mm side, cut centrally through its flat faces. Draw three views of the block when it has its flat faces vertical and inclined at 30^0 to the VP and two faces of the hole parallel to the HP.

[14+8]

PART-B

2.(a) Construct a regular polygon of any number of sides, given the length of its sides equal to 25 mm.

(b) The actual length of 500 m is represented by a line of 15 cm on a drawing. Construct a vernier scale to read upto 600 m. Mark on the scale a length of 549 m.

[8+8]

3.(a) A vertical line AB, 75mm long, has its end A in the HP and 25 mm in front of the VP. A line AC, 100 mm long, is in the HP and parallel to the VP. Draw the projections of the line joining B and C, and determine its inclination with the HP.

(b) A line CD 30 mm long is parallel to both the planes. The line is 40 mm above HP and 25 mm in front of VP. Draw its projections.

[8+8]

Subject Code: R13109/R13 **Set No - 3**

4. A line AB, 65 mm long, has its end A in the HP and 15 mm in front of the VP. The end B is in the third quadrant. The line is inclined at 35^0 to the HP and at 60^0 to the VP. Draw its projections.

[16]

5. A 60^0 Set-square of 125 mm longest side is so kept that the longest side is in the HP making an angle of 30^0 with the VP and set square itself inclined at 45^0 to the HP. Draw the projections of the Set-square.

[16]

6. A hexagonal pyramid, base 25mm side and axis 50mm long, has on edge of its base on the ground. Its axis is inclined at 30^0 to the ground and parallel to the VP. Draw its projections.

[16]

7. Draw (i) Front View (ii) Top View (iii) Side View fig.2

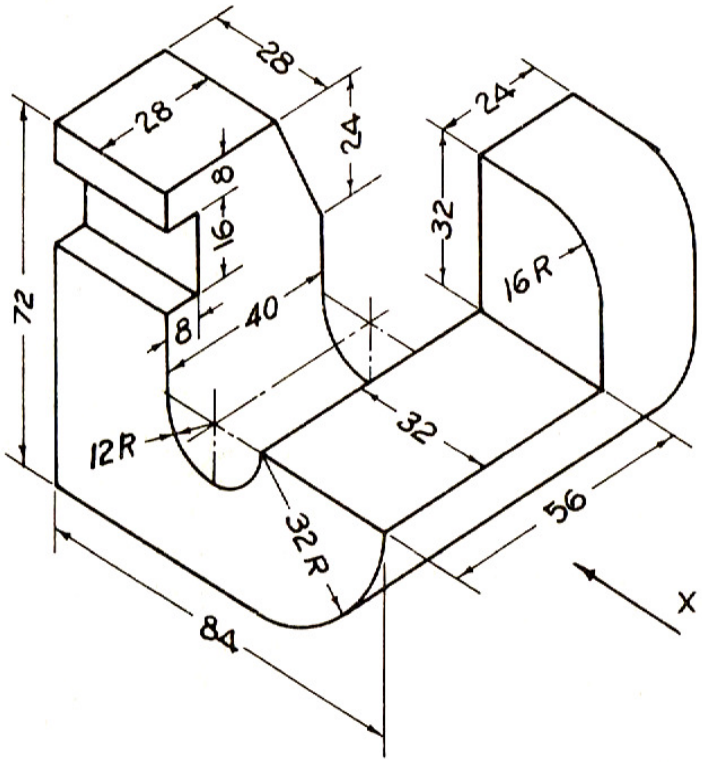


Fig.2

[16]

Subject Code: R13109/R13 **Set No - 4**

I B. Tech I Semester Regular/Supplementary Examinations Jan./Feb. - 2015

ENGINEERING DRAWING

(EEE)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**

*****

PART-A

1.(a) Draw (i) Front View (ii) Top View (iii) Left Hand Side View fig.1

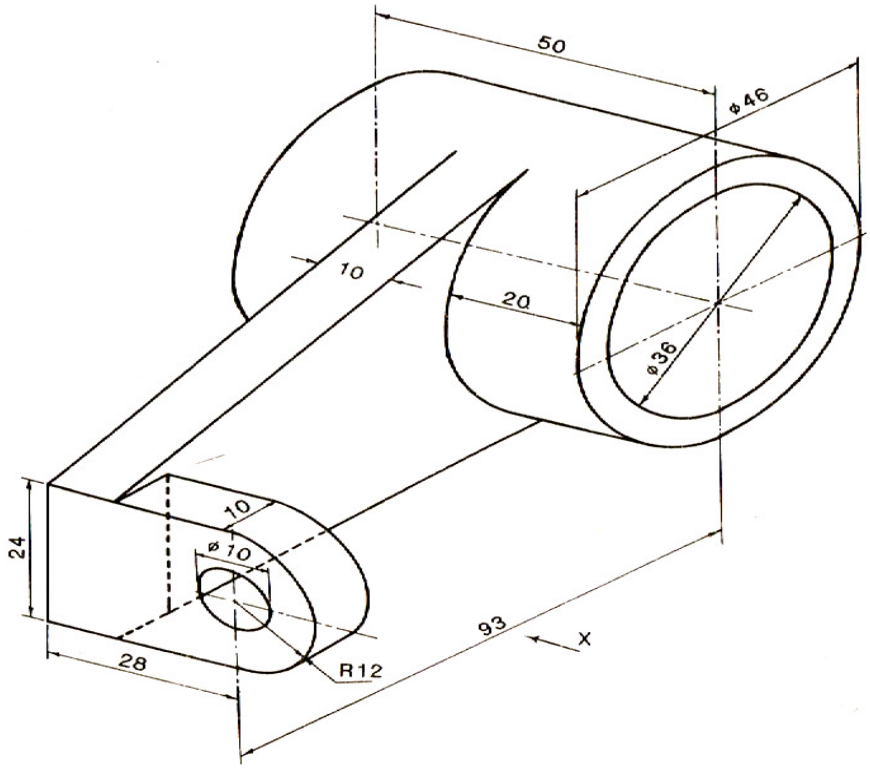


Fig.1

(b) The top view of a plate, the surface of which is perpendicular to the VP and inclined at 60^0 to the HP is a circle of 60 mm diameter. Draw its three views.

[14+8]

PART-B

2.(a) Draw an Octagon given the length of side 25 mm.

(b) The major axis of an ellipse is 100 mm and the minor axis 55 mm. Find the foci and construct the ellipse by Intersecting Arcs method.

[8+8]

3.(a) A point 30 mm above xy line is the plan view of two points P and Q. The elevation of P is 45 mm above the HP. While that of the point Q is 35 mm below the HP. Draw the projections of the points and state their position with reference to the principle planes and the quadrant in which they lie.

Subject Code: R13109/R13 **Set No - 4**

3.(b) A line PQ 40 mm long is parallel to VP and inclined at an angle of 30^0 to HP. The lower end P is 15 mm above HP and 20 mm in front of VP. Draw the projections of the line. [8+8]

4. The top view of a 75 mm long line AB measures 65 mm, while the length of its front view is 50 mm. It's one end A is in the HP and 12 mm in front of the VP. Draw the projections of the AB and determine its inclinations with the HP and the VP. [16]

5. A thin circular plate of 70 mm diameter is resting on its circumference such that its plane is inclined 600 to the HP and 300 to the VP. Draw the projections of the plane. [16]

6. A right circular cone of base diameter 50 mm and height 60 mm is placed such that one diameter AB of the base is inclined at 450 to HP and the other diameter CD of the base is parallel to both HP and VP. The diameters AB and CD are perpendicular to each other. Draw the projections of the cone. [16]

7. Draw the Isometric view: fig.2

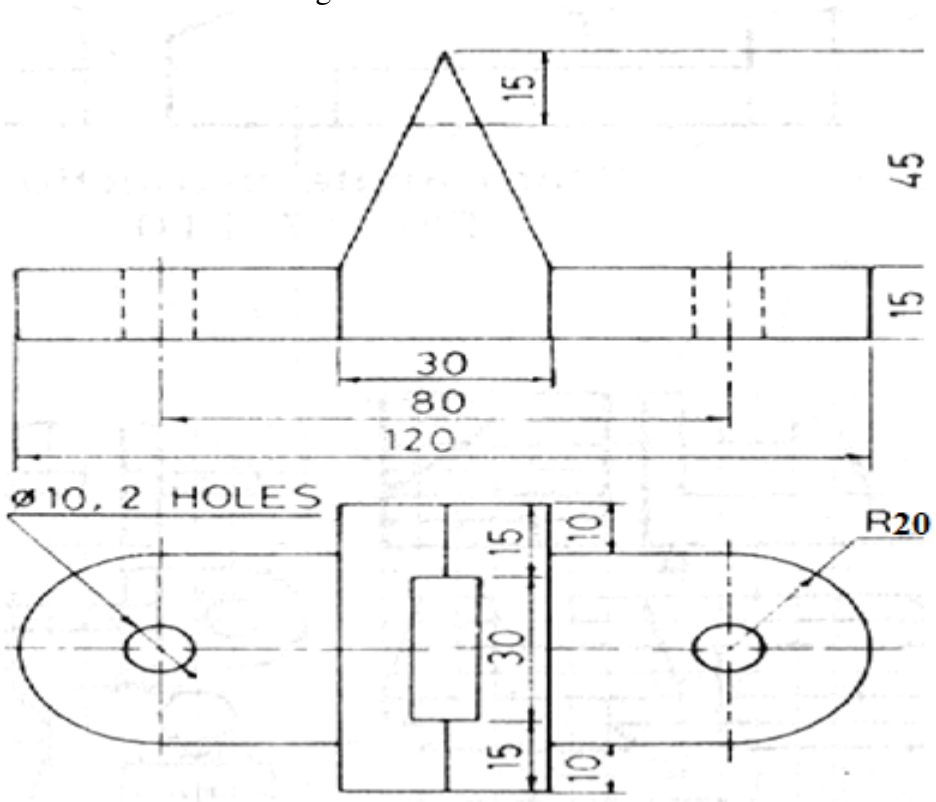


Fig.2

[16]

Subject Code: R13109/R13 **Set No - 1**

I B. Tech I Semester Regular/Supplementary Examinations Jan./Feb. - 2015

ENGINEERING DRAWING

(Common to ECE, EIE, Bio-Tech, EComE, Agri.E)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**
*****

PART-A

1.(a) Draw the Isometric view of fig.1:

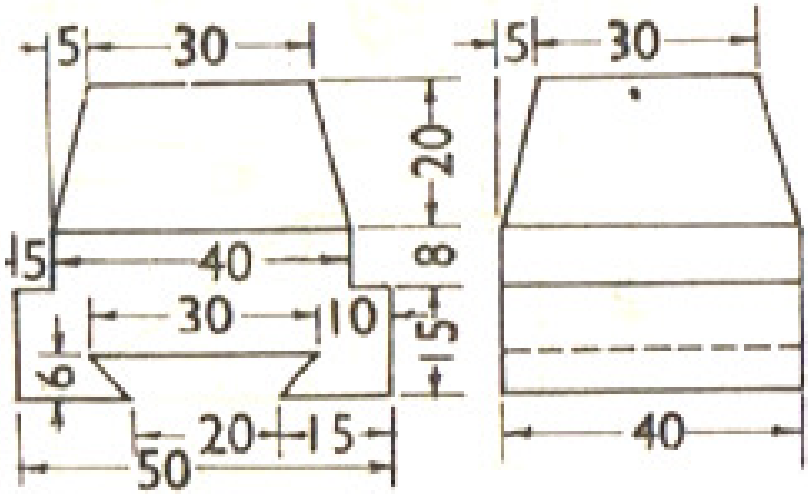


Fig.1

(b) Draw the projections of a circle of 50mm diameter resting in the HP on a point A on the circumference, its plane inclined at 45^0 to the HP and (i) the top view of the diameter AB making 30^0 angle with the VP (ii) the diameter AB making 30^0 angle with the VP.

[14+8]

PART-B

2.(a) Construct a regular pentagon of 30 mm side.

(b) The area of a field is 50,000 sq. m. The length and the breadth of the field, on the map are 10 cm and 8 cm respectively. Construct a diagonal scale which can read up to 1 m. Mark the length of 235 m on the scale. What is the RF of the scale?

[8+8]

3.(a) The front view of a line, inclined at 30^0 to the VP is 65mm long. Draw the projections of the line, when it is parallel to and 40 mm above the HP, its one end being 30 mm in front of the VP.

Subject Code: R13109/R13 **Set No - 1**

3.(b) Draw the projections of a straight line AB of 60mm long, in the following positions:
(i) Perpendicular to HP and in VP and one end on HP
(ii) Parallel to and 30 mm in front of VP and on HP
(iii) Inclined at 30^0 to VP, in HP and one end on VP

[8+8]

4. Two oranges on a tree are respectively 1.8 m and 3 m above the ground and, 1.2 m and 2.1 m from a 0.3 m thick wall, but on the opposite sides of it. The distance between the oranges, measured along the ground and parallel to the wall is 2.7 m. Determine the real distance between the oranges.

[16]

5. Draw the projections of a regular pentagonal of 40 mm side, having its surface inclined at 30^0 to the HP and a side parallel to the HP and inclined at an angle of 60^0 to the VP.

[16]

6. Draw the projections of a pentagonal prism, base 25 mm side and axis 50 mm long, resting on one of its rectangular faces on the ground with the axis inclined at 45^0 to the VP.

[16]

7. Draw fig.2 (i) Front View (ii) Top View (iii) Side View from the right

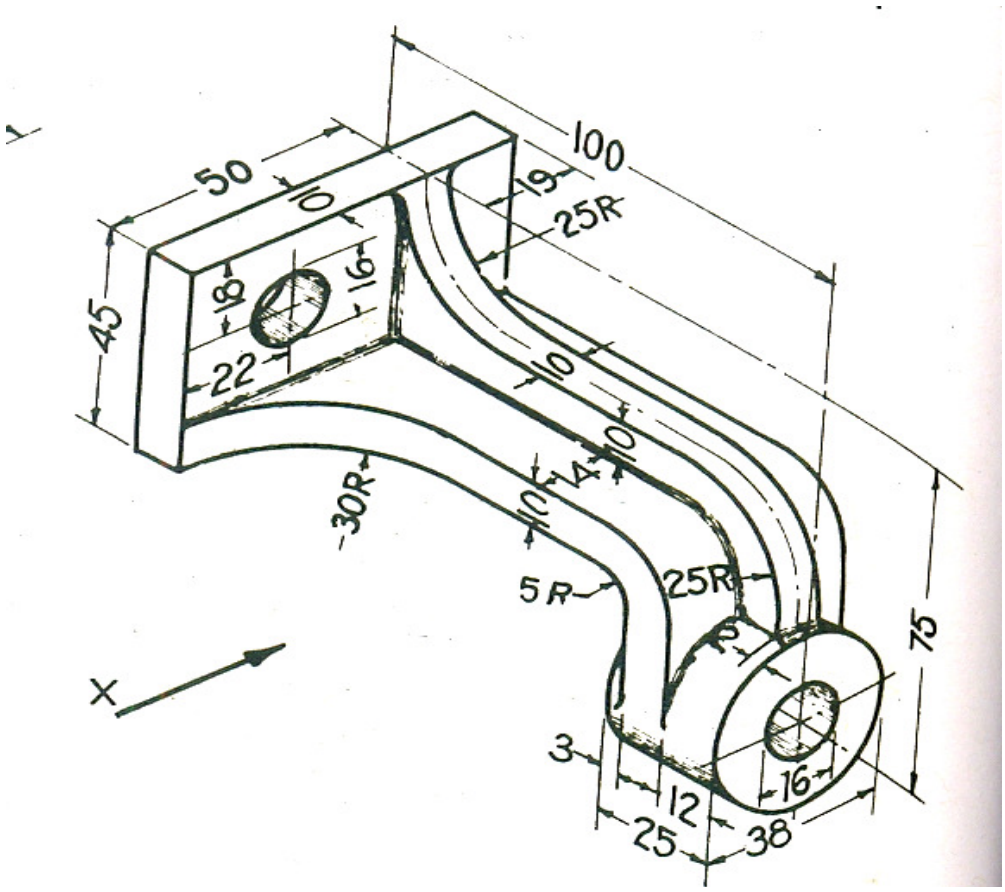


Fig.2

[16]

Subject Code: R13109/R13 **Set No - 2**

I B. Tech I Semester Regular/Supplementary Examinations Jan./Feb. - 2015

ENGINEERING DRAWING

(Common to ECE, EIE, Bio-Tech, EComE, Agri.E)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**
*****

PART-A

1.(a) Draw fig.1 (i) Front View (ii) Top View (iii) Side View

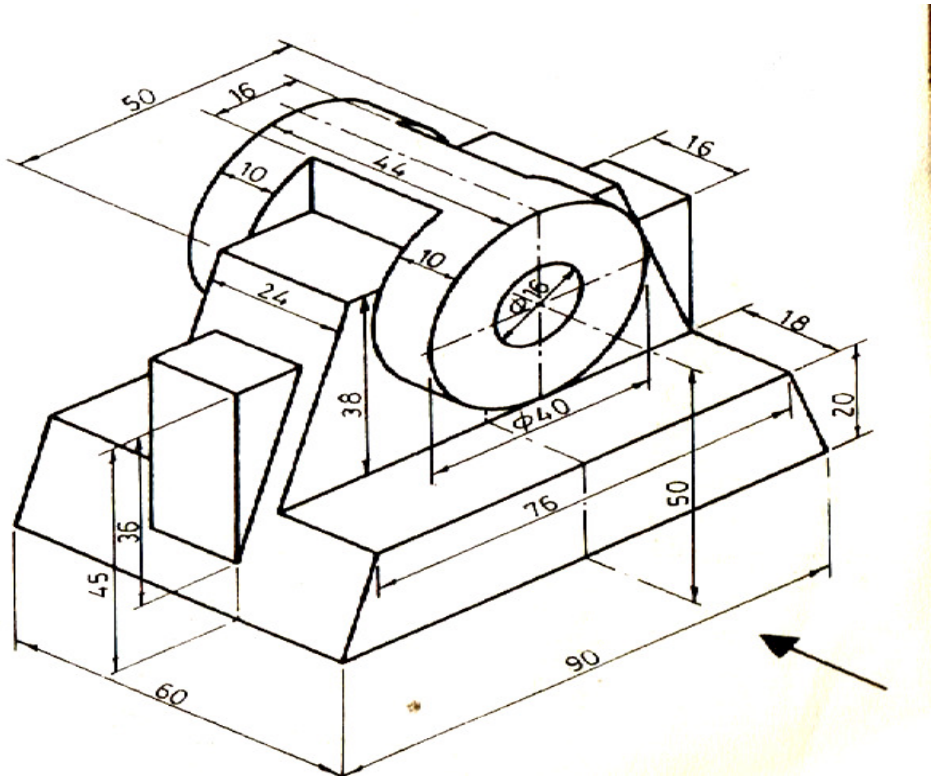


Fig.1

(b) A plate having shape of an isosceles triangle has base 50 mm long and altitude 70 mm. It is so placed that in the front view it is seen as an equilateral triangle of 50 mm sides and one side inclined at 45^0 to xy. Draw its top view.

[14+8]

PART-B

2.(a) The major axis of an ellipse is 150 mm long and the minor axis is 100 mm long. Find the foci and draw the ellipse by arcs of circle method. Draw a tangent to the ellipse at a point on it 25 mm above the major axis.

Subject Code: R13109/R13 **Set No - 2**

2.(b) Draw a Vernier scale of RF=1/25 to read centimeters up to 4metres and on it, shown lengths representing 2.39 m and 0.91 m.

[8+8]

3.(a) A point P is 20 mm below HP and lies in the third quadrant. Its shortest distance from xy is 40 mm. Draw its projections.

(b) A line AB which is perpendicular to HP and 80mm long has its end B, 20mm below HP and 30mm in front of VP. Another line AC, which is 60mm long, is parallel to both HP and VP. The midpoint D of the line AC is joined to B. Draw the projections and determine the inclination of the line BD with HP.

[8+8]

4. A line AB, inclined at 40^0 to the VP, has its ends 50 mm and 20 mm above the HP. The length of its front view is 65 mm and its VT is 10 mm above the HP. Determine the true length of AB, its inclination with the HP and its HT.

[16]

5. An hexagonal lamina of 20 mm side rests on one of its corners on HP. The diagonal passing through this corner is inclined at 45^0 to HP. The lamina is then rotated through 90^0 such that the top view of this diagonal is perpendicular to VP and the surface is still inclined at 45^0 to HP. Draw the projections of the lamina.

[16]

6. A tetrahedron of 40 mm side rests with one of its edges on HP and perpendicular to VP. The triangular face containing that edge is inclined at 30^0 to HP. Draw its projections.

[16]

7. Draw the Isometric view fig.2:

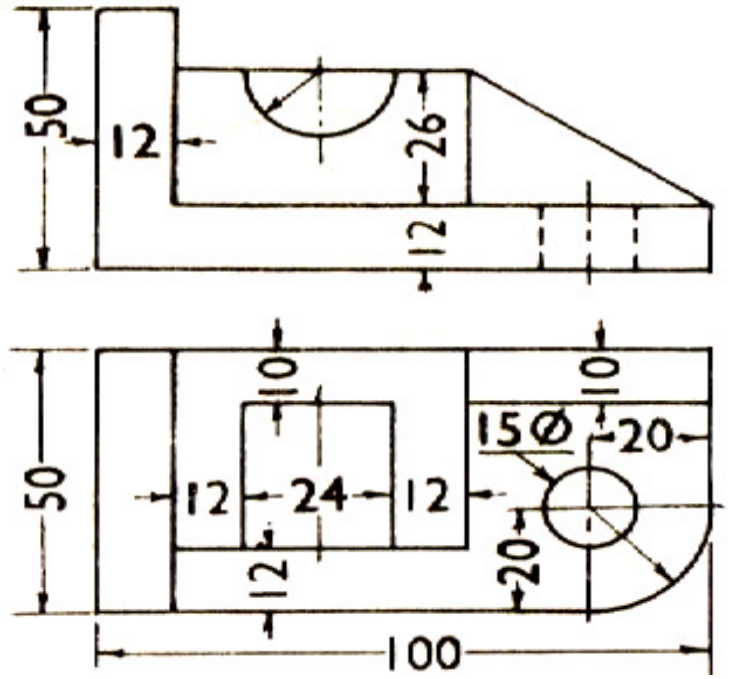


Fig.2

[16]

Subject Code: R13109/R13 **Set No - 3**

I B. Tech I Semester Regular/Supplementary Examinations Jan./Feb. - 2015

ENGINEERING DRAWING

(Common to ECE, EIE, Bio-Tech, EComE, Agri.E)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**

*****

PART-A

1.(a) Draw the Isometric view assuming suitable data: fig.1

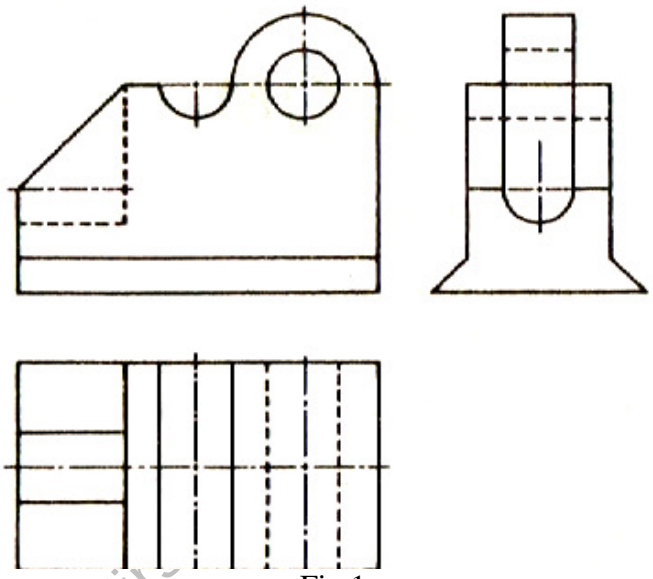


Fig.1

(b) A thin 30-60^0 set square has its longest edge in VP and inclined at 30^0 to HP. Its surface makes 45^0 with VP. Draw its projections.

[14+8]

PART-B

2.(a) An underpass of a flyover has a size of 270 m × 10 m × 10 m. It is represented on a model by a volume of 8 cu.cm. What is the R.F? Construct a diagonal scale to read up to 300 m. Mark the distances 199 m and 8 m on the scale.

(b) Construct an ellipse when the major axis is 120 mm and the distance between the foci is 108 mm. Determine the length of the minor axis.

[8+8]

3.(a) Two pegs fixed on a wall are 4.5 m apart. The distance between the pegs measured parallel to the floor is 3.6 m. If one peg is 1.5 m above the floor, find the height of the second peg and the inclination of the line joining the two pegs, with the floor.

(b) A point P is 50 mm from both the reference planes. Draw its projections in all possible positions.

[8+8]

Subject Code: R13109/R13 **Set No - 3**

4. The guy ropes of two poles 12 m apart, are attached to a point 15 m above the ground on the corner of a building. The points of attachment on the poles are 7.5 m and 4.5 m above the ground and the ropes make 45^0 and 30^0 respectively with the ground. Draw the projections and find the distance of the poles from the building and the lengths of the guy ropes.

[16]

5. Draw the projections of a circle of 75 mm diameter having the end A of the diameter AB in the HP, the end B in the VP, and the surface inclined at 30^0 to the HP and at 60^0 to the VP.

[16]

6. Draw the projection of a cone, base 75mm diameter and axis 100 mm long and lying on the ground on one of its generators with the axis parallel to the VP.

[16]

7. Draw fig.2 (i) Front View (ii) Top View (iii) Side View

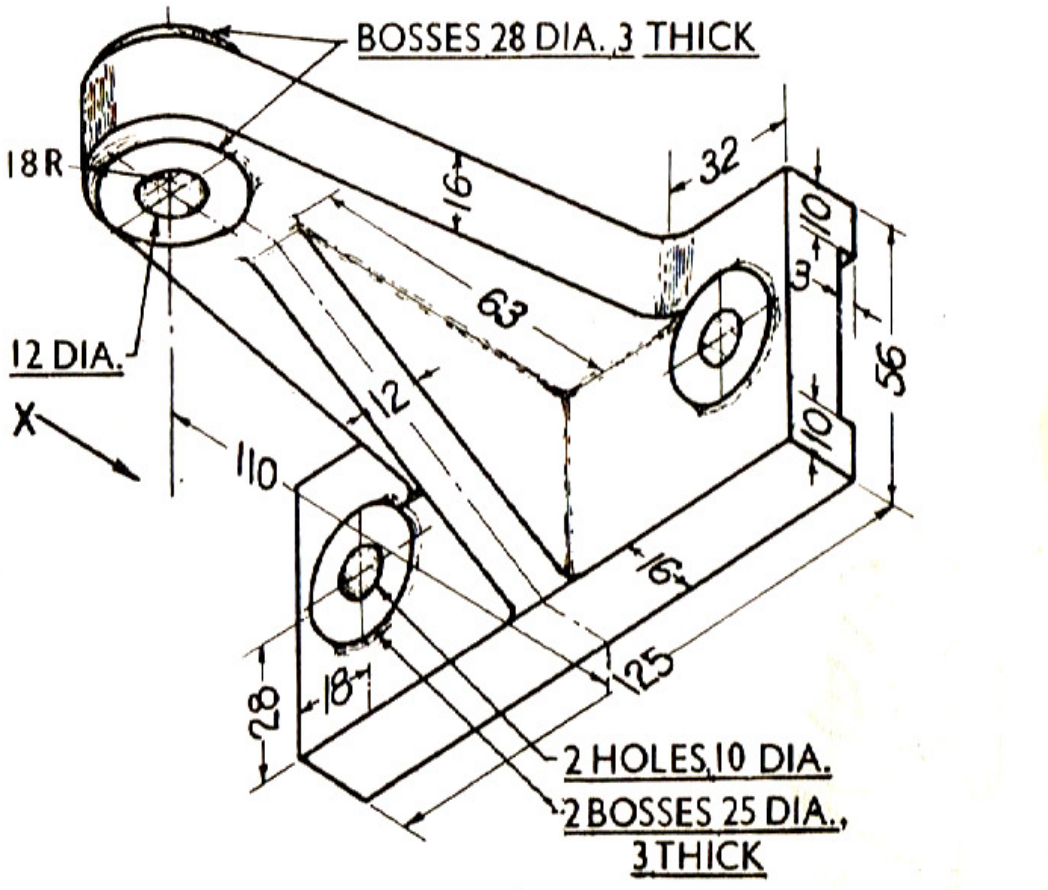


Fig.2

[16]

Subject Code: R13109/R13 **Set No - 4**

I B. Tech I Semester Regular/Supplementary Examinations Jan./Feb. - 2015

ENGINEERING DRAWING

(Common to ECE, EIE, Bio-Tech, EComE, Agri.E)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**

*****

PART-A

1.(a) Draw fig.1 (i) Front View (ii) Top View (iii) Both Side Views

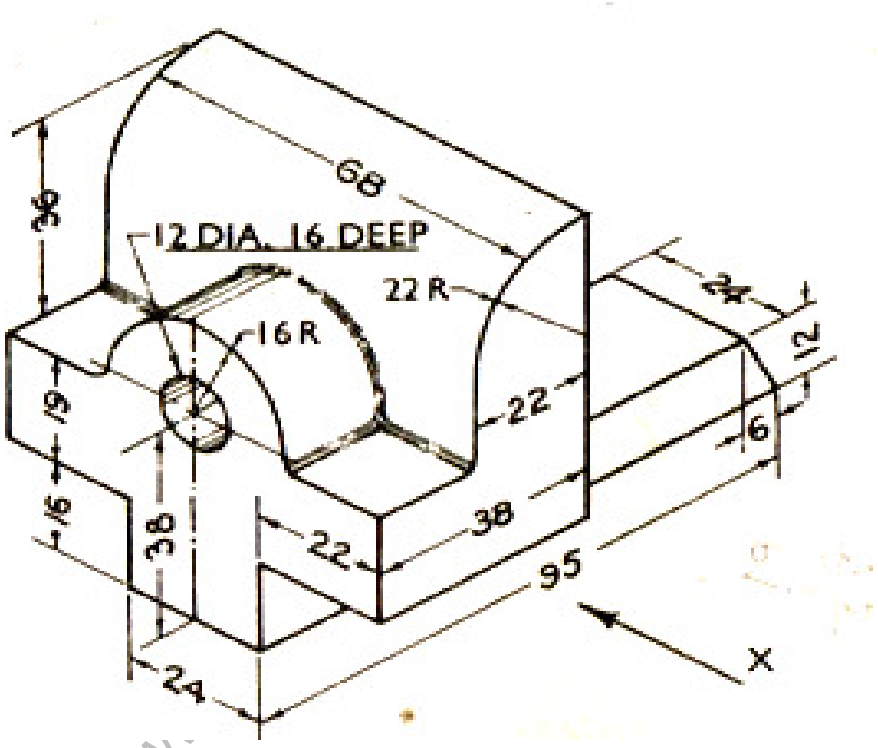


Fig.1

(b) A thin circular metal plate of 54mm diameter has a square hole of 27 mm side, cut centrally through it. Draw its projections when the plate is resting on HP with its surface inclined at 30^0 to HP and an edge of the square hole perpendicular to VP.

[14+8]

PART-B

2.(a) A plot of a ground is in the shape of a rectangle 110 m × 50 m. Inscribe an elliptical lawn in it. Take a suitable scale.

(b) Construct a diagonal scale of RF= 1: 32,00,000 to show kilometers and long enough to measure upto 400 kilometers. Show distance of 257 km and 333 km on your scale.

[8+8]

3.(a) A point A is situated in the first quadrant. Its shortest distance from the intersection point of HP, VP and auxiliary plane is 60 mm and it is equidistant from the principal planes. Draw the projections of the points and determine its distance from the principal planes.

Subject Code: R13109/R13 **Set No - 4**

3.(b) The length of the top view of a line parallel to the VP and inclined at 45^0 to the HP is 5 cm. One end of the line is 1.2 cm above the HP and 2.5 cm in front of the VP. Draw the projections of the line and determine its true length.

[8+8]

4. The projectors of the ends of a line AB are 5 cm apart. The end A is 2 cm above the HP and 3 cm in front of the VP. The end B is 1 cm below the HP and 4 cm behind the VP. Determine the true length and traces of AB, and its inclinations with the two planes.

[16]

5. A circular plate of negligible thickness and 50 mm diameter appears as an ellipse in the front view, having its major axis 50 mm long and minor axis 30 mm long. Draw its top view when the major axis of the ellipse is horizontal.

[16]

6. An hexagonal prism, side of base 25 mm and axis 50 mm long rests with one of its base corners on HP such that its base makes an angle of 60^0 to HP and its axis is parallel to VP. Draw its projections.

[16]

7. Draw the Isometric view fig.2:

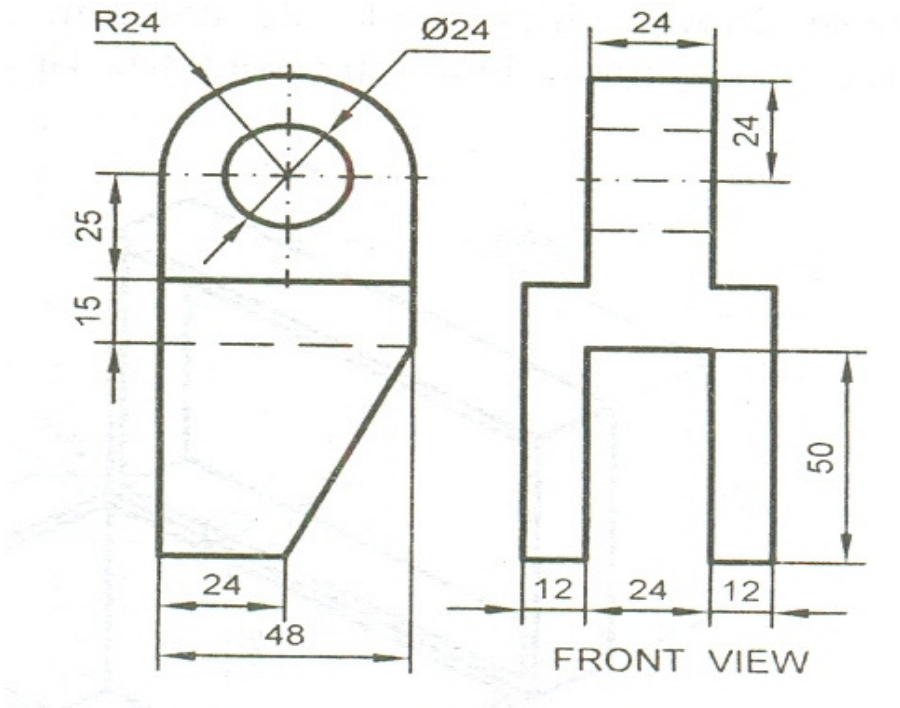


Fig.2

[16]

Subject Code: R13209/R13 **Set No - 1**

I B. Tech II Semester Regular Examinations August - 2014

ENGINEERING DRAWING

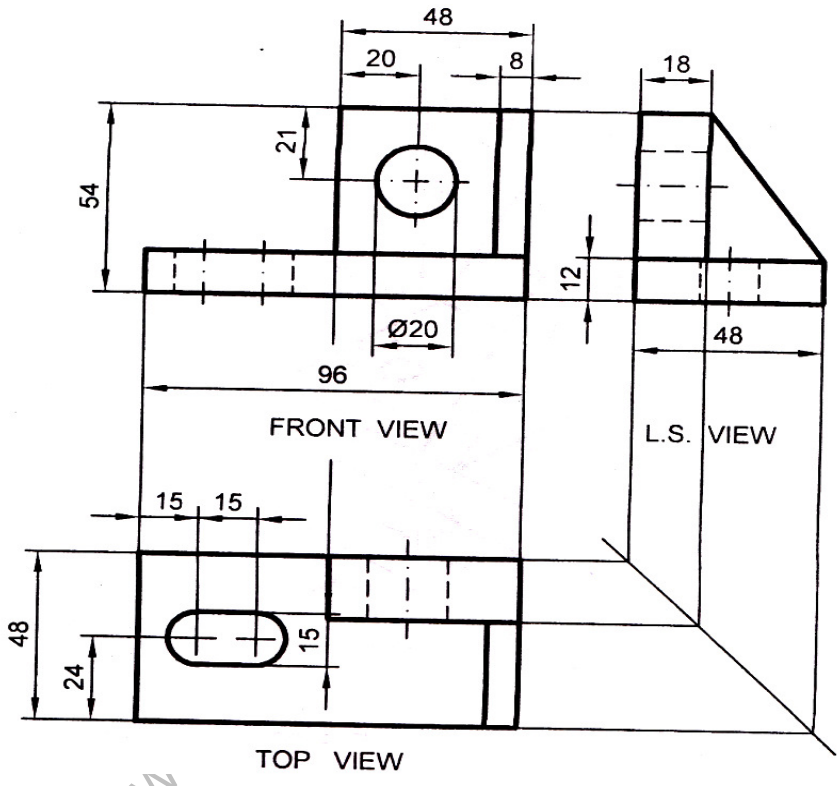
(Mechanical Engineering)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**
*****

PART-A

1.(a) Draw the isometric view of the following orthographic projections?



(b) A straight line AB, 60mm long, makes an angle of 30^0 to the HP and 60^0 to the VP. The end A is in the VP and 20mm above the HP. Draw the projections of the line AB?

[16+6]

PART-B

2.(a) Inscribe an ellipse in a parallelogram having sides 150mm and 100mm long and an included angle of 120^0?

(b) Draw a full size diagonal scale to show 0.1 millimeters long enough to measure up to 5 centimeters Show on this scale the following distances.
2.35 centimeters

[8+8]

Subject Code: R13209/R13 **Set No - 1**

3.(a) Draw the projections of a line EF 40mm long parallel to the HP and inclined at 35^0 to the VP. E is 20mm above the HP and 15mm in front of the VP?

(b) Draw the projections of a 60mm long straight line in the following positions:
(i) Parallel to both the HP and the VP and 25mm from each.
(ii) Perpendicular to the VP, 25mm above the HP and its one end in the VP.
(iii) Inclined at 45^0 to the VP, in the HP and its one end in the VP.

[10+6]

4. The end A of line AB is 10mm above the HP and 30mm in front of the VP. The end B is 50mm below the HP and 15mm behind the VP. The length of the line is 80mm. Draw the projection and locate the traces. What are the inclinations of the line with the reference planes?

[16]

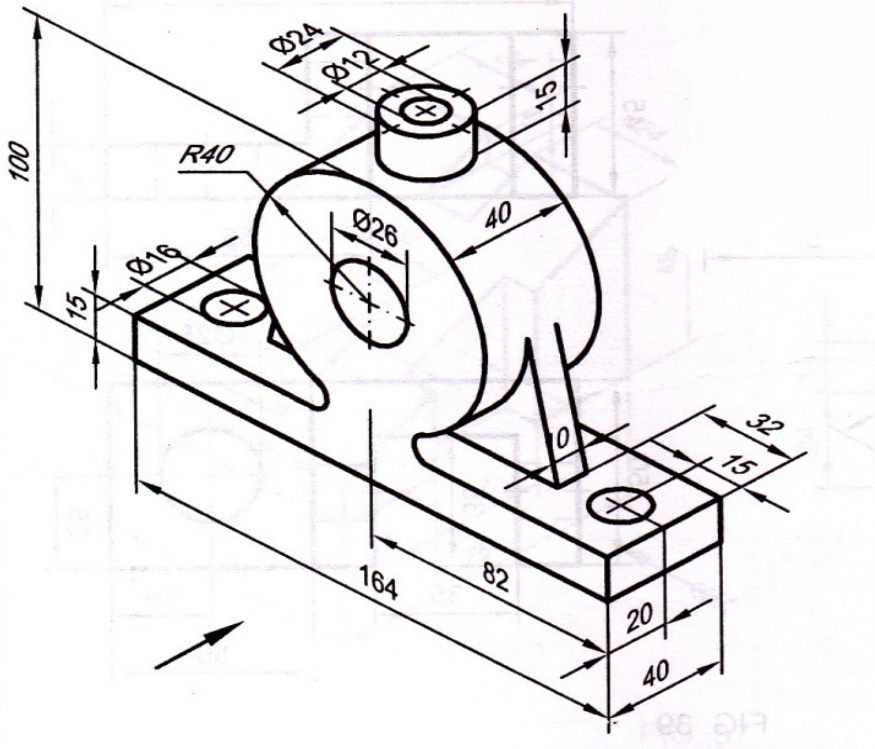
5. A thin hexagonal plate of 35mm side has a central equilateral hole of side equal to that of the plate. The plate is kept in such a way that one of its edges is parallel to the ground and inclined at 30^0 to the VP. The plate makes 45^0 with ground. Draw the projections of the plate and the hole. A side of the hole is parallel to the ground?

[16]

6. Draw the projection of a pentagonal prism, base 25 mm side and axis 50mm long, resting on one of its rectangular faces on the HP, with the axis inclined at 45^0 to the VP.

[16]

7. Draw (i) Front view (ii) Top view and (iii) Side view of the following pictorial projections?



[16]

Subject Code: R13209/R13 **Set No - 2**

I B. Tech II Semester Regular Examinations August - 2014

ENGINEERING DRAWING

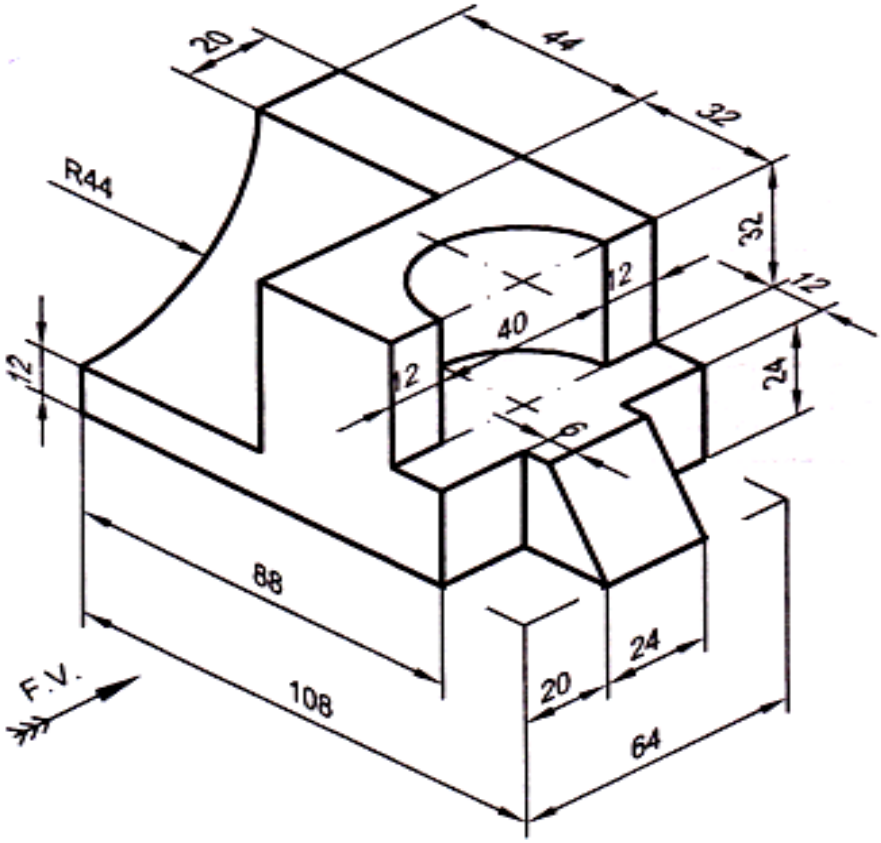
(Mechanical Engineering)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**
*****

PART-A

1.(a) Draw (i) Front view (ii) Top view and (iii) Side view of the pictorial drawing shown below?



(b) A circular plate of negligible thickness and 50mm diameter appears as an ellipse in the front view, having its major axis 50mm long and minor axis 30mm long. Draw its top view when the major axis of the ellipse is horizontal.

[16+6]

PART-B

2.(a) A plot of ground is in the shape of a rectangle 110m×50m. Inscribe an elliptical lawn in it. Take a suitable scale?

(b) Construct a regular hexagon of 40mm side. Using general method?

[8+8]

Subject Code: R13209/R13 **Set No - 2**

3.(a) Draw the FV, TV of the following points:
(i) Point P lies in the HP and 20mm behind the VP
(ii) Point Q lies in the VP and 30mm below the HP
(iii) Point R lies 35mm below the HP and 25mm behind the VP

(b) Two points M and N lie in the VP. The point M is above the HP and the point N is 40mm below the HP. The perpendicular distance between their projectors is 60mm. The line joining M and N makes 60^0 with XY. Draw the projections of the points. Find the height of point M from the HP?

[8+8]

4. FV of a line measures 70mm and makes an angle of 30^0 with XY. The end A is in the HP and the VT of the line is 10mm below XY. The line is inclined at 45^0 to the VP. Draw the projections of the line and find its TL and true inclinations with the HP and locate the HT?

[16]

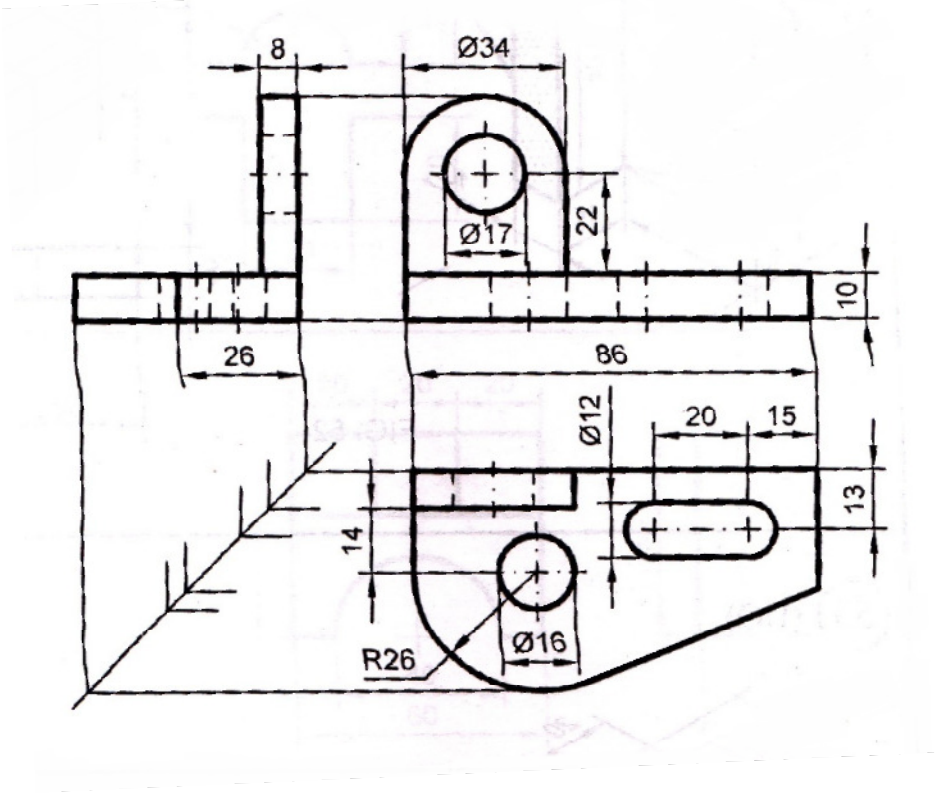
5. A regular pentagonal lamina of 30mm sides has one edge in the HP and inclined at an angle of 30^0 to the VP. Draw its projections when its surface is inclined at 45^0 to the HP?

[16]

6. A cone of diameter 60mm and height 60mm is resting on the HP on one of its generators. Draw its projections if its axis is parallel to the VP?

[16]

7. Draw the isometric view of the orthographic projections shown below?



[16]

Subject Code: R13209/R13 **Set No - 3**

I B. Tech II Semester Regular Examinations August - 2014

ENGINEERING DRAWING

(Mechanical Engineering)

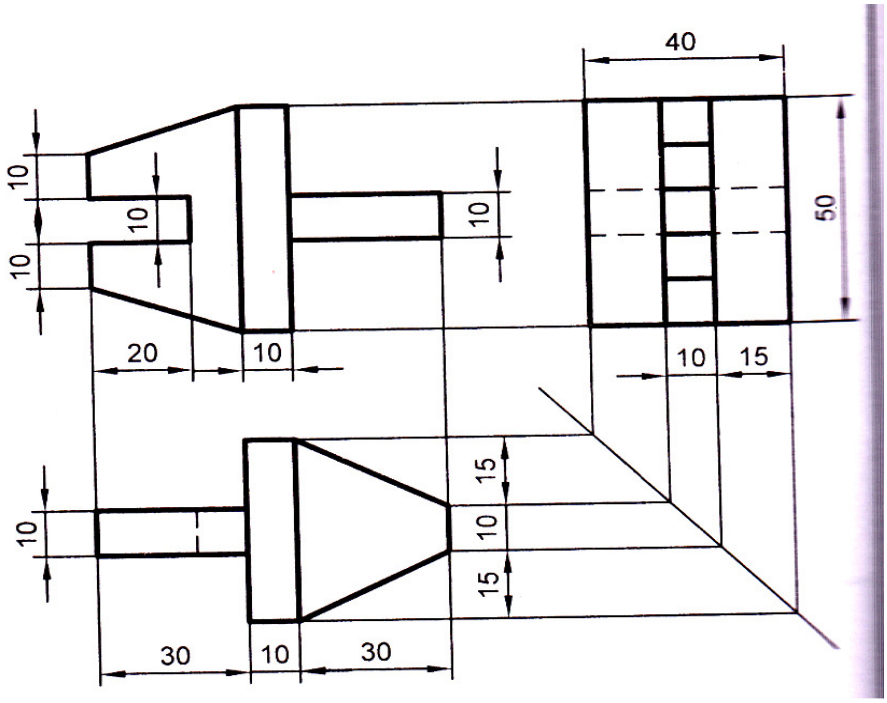
Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**

*****

PART-A

1.(a) Draw the isometric view of the following orthographic views?



(b) A plate having shape of an isosceles triangle has base 50mm long and altitude 70mm. It is so placed that in the front view it is seen as an equilateral triangle of 50mm sides and one side inclined at 45^0 to xy. Draw its top view?

[16+6]

PART-B

2.(a) On a map, the distance between two points is 14 cm. The real distance between them is 20 km. Draw a diagonal scale of this map to read kilometres and hectametres, and to measure up to 25km. Show a distance of 17.6 km on this scale?

(b) The major axis of an ellipse is 150mm long and the minor axis is 100mm long. Find the foci and draw the ellipse by Arcs of circles method. Draw a tangent to the ellipse at a point on it 25mm above the major axis?

[8+8]

Subject Code: R13209/R13 **Set No - 3**

3.(a) The front view of a line, inclined at 30^0 to the VP is 65mm long. Draw the projections of the line, when it is parallel to and 40mm above the HP, its one end being 30mm in front of the VP?

(b) A stick is struck in the ground making an angle of 30^0 to the ground. Draw the projections of the free end of the stick if the end of the stick above the ground is 1.5m and the distance of the end from a wall is 2.5m.?

[8+8]

4. The end P of a line PQ 130mm long is 55mm in front of the VP. The HT of the line is 40mm in front of the VP and the VT is 50mm above the HP. The distance between HT and VT is 110mm. Draw the projections of the line PQ and determine its angles with the HP and the VP.

[16]

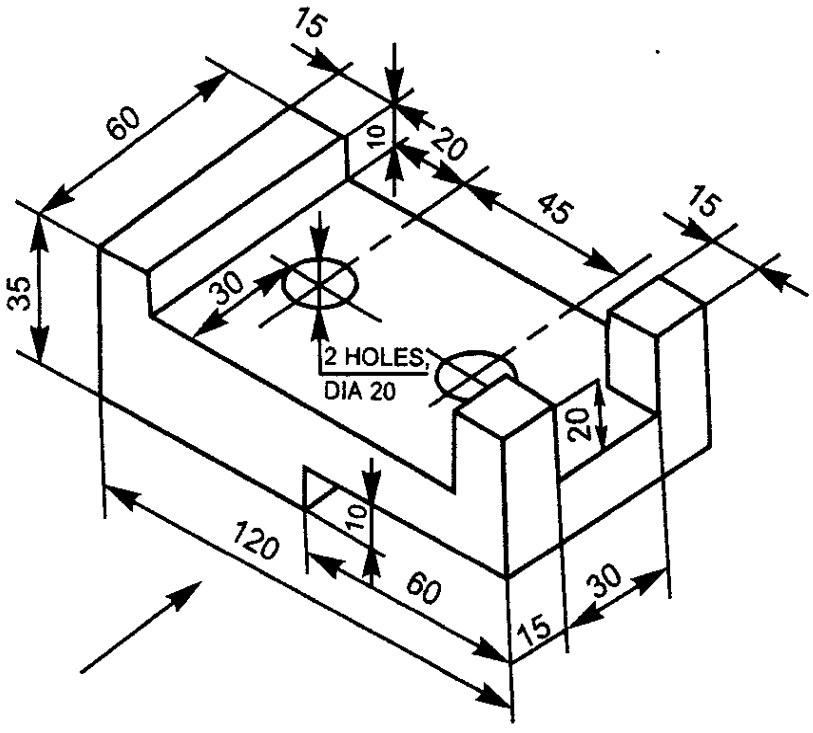
5. A triangular plane ABC has a 60mm long base AB and is on the ground inclined to the VP at 30^0. Its altitude length is 80mm. the plane is lifted on AB such that AC lies on a plane perpendicular to both the HP and the VP. Draw the projections of the plane. Find out the angles of inclination of the plane with the HP and the VP?

[16]

6. Draw the projection of a cylinder 75mm diameter and 100mm long, lying on one of its generator on the ground with its axis inclined at 30^0 to the VP and parallel to the ground.

[16]

7. Draw (i) Front view (ii) Top view and (iii) Side view of the pictorial projection shown below?



[16]

Subject Code: R13209/R13 **Set No - 4**

I B. Tech II Semester Regular Examinations August - 2014

ENGINEERING DRAWING

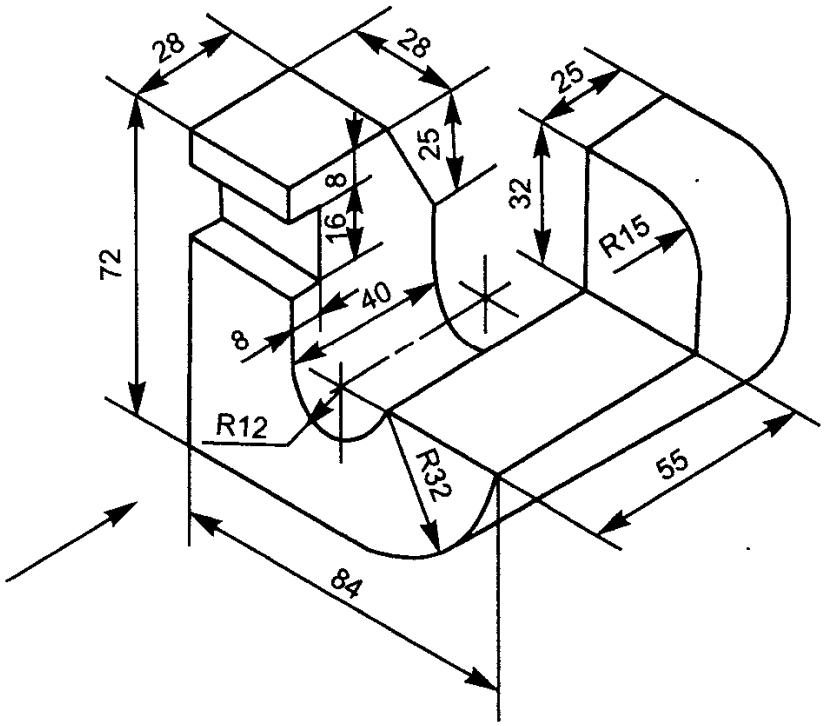
(Mechanical Engineering)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**
*****

PART-A

1.(a) Draw (i) Front view (ii) Top view and (iii) Side view of the pictorial projection shown below?



(b) A thin 30^0-60^0 set square has its longest edge in the VP and inclined at 30^0 to the HP. Its surface makes 45^0 with the VP. Draw its projections?

[16+6]

PART-B

2.(a) Construct a vernier scale of RF=2 to show cm,1/10th of cm and 1/100th of cm to read up to 9cm.Mark on the scale the lengths 7.02cm.?

(b) Inscribe a regular octagon in a circle of diameter 80mm.?

[10+6]

Subject Code: R13209/R13 **Set No - 4**

3.(a) A line GH 45mm long is in the HP and inclined to the VP. The end G is 15mm in front of the VP. Length of front view is 35mm. Draw the projections of the line. Determine its inclination with the VP?

(b) The electric pole is 10m height. A mighty storm bent it in such a way that its tip is now at a distance of half of its original distance from the ground. Draw the projections of the pole tip if it is 3m from a wall of a building?

[8+8]

4. The midpoint M of a straight line AB is 60mm above the HP and 50mm in front of the VP. The line measures 80mm long and inclined at an angle of 30^0 to the HP and 45^0 to the VP. Draw its projections?

[16]

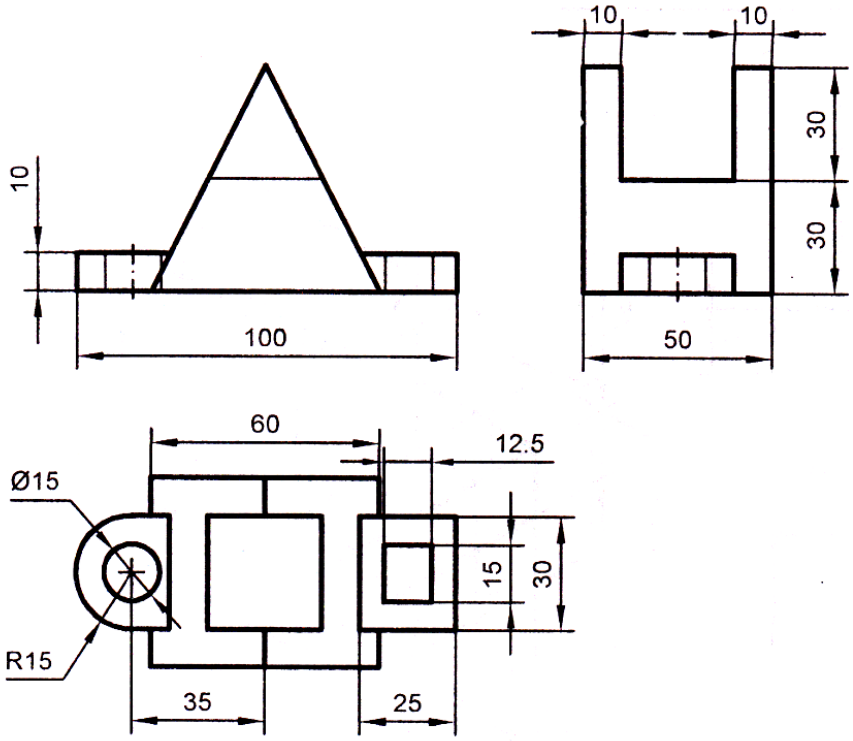
5. A rhombus having diagonals 150mm and 60mm is so placed that its smaller diagonal is parallel to both the reference planes and the larger diagonal is inclined at 40^0 to the HP. Draw its projections. Also, find the angles made by the plane with the HP and the VP?

[16]

6. A hexagonal pyramid, base 25mm side and axis 50mm long, has an edge of its base on the ground. Its axis is inclined at 30^0 to the ground and parallel to the VP. Draw its projections.

[16]

7. Draw the isometric view of the orthographic projections shown below?



[16]

Subject Code: R13209/R13 **Set No - 1**

I B. Tech II Semester Regular Examinations August - 2014

ENGINEERING DRAWING

(Computer Science Engineering)

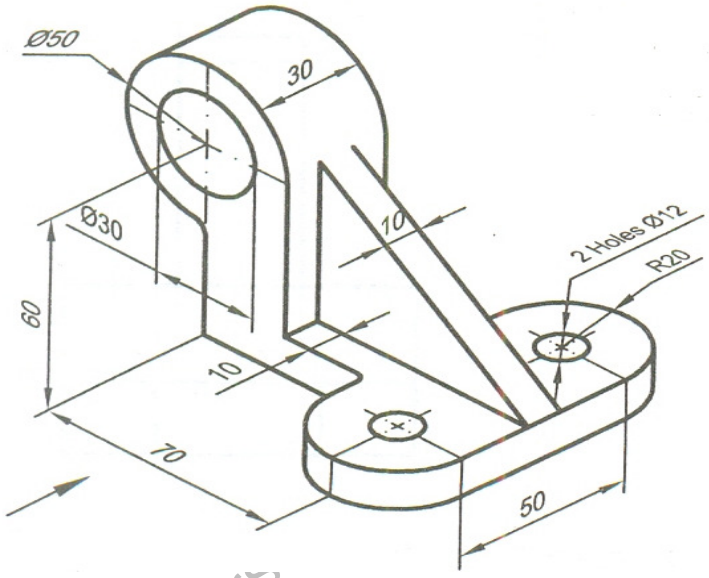
Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**

*****

PART-A

1.(a) Draw (i) Front view (ii) Top view (iii) Right side view of the following pictorial projection.



(b) The projections of a line AB are on the same projector. A is 10mm above the HP and 20mm in front of the VP. B is 35mm below the HP and 25 mm behind the VP. Draw the projections of the line AB and determine its true length, inclinations with the HP and the VP?

[16+6]

PART-B

2.(a) Construct an ellipse of 120 mm major axis and 80 mm minor axis using concentric circle methods?

(b) Draw an octagon given the length of side 25 mm. using general method?

[10+6]

3.(a) A line EF 40mm long is in the VP and inclined to the HP. The top view measures 30mm. The end E is 10mm above the HP. Draw the projections of the line. Determine its inclination with the HP?

(b) A line RS 40mm long is parallel to both the planes. It is 20 mm above the HP and 15mm in front of the VP. Draw the projections of the line?

[10+6]

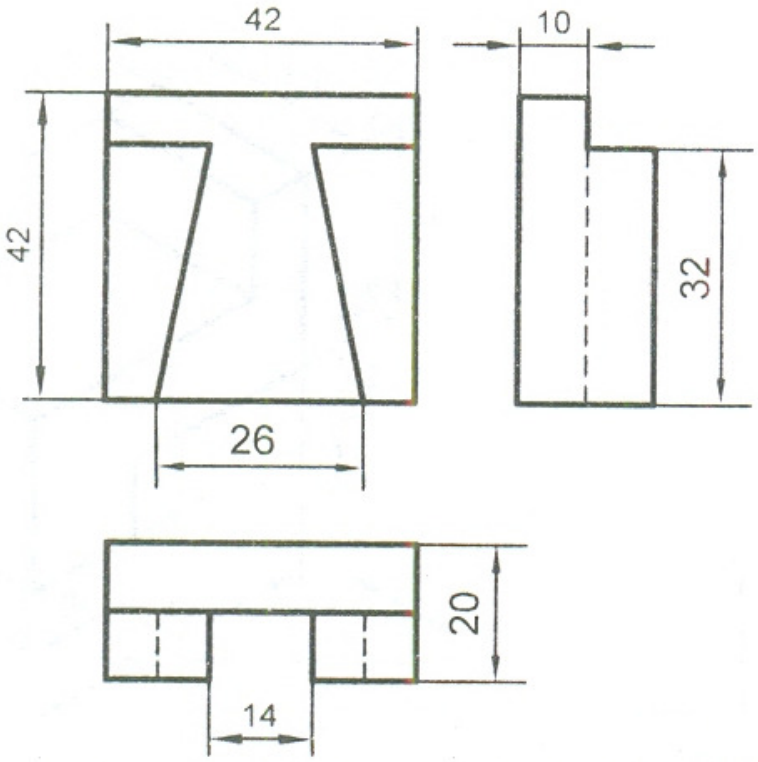
Subject Code: R13209/R13 **Set No - 1**

4. The front view of a line AB is 50mm long and it makes an angle of 35^0 with xy. The point A lies 10mm above the HP and 25mm behind the VP. The difference between the distance of A and B from the VP is 25mm.The line AB is in second quadrant. Draw the projections of the line; determine its true length and inclinations with the HP and the VP? [16]

5. An equilateral triangle ABC having side length as 50 mm is suspended from a point O on the side AB 15mm from A in such a way that the plane of the triangle makes an angle of 60^0 with the VP. The point O is 20 mm below the HP and 40 mm behind the VP. Draw the projections of the triangle? [16]

6. Draw the top and front view of the cone of base diameter 46mm and height 65mm lying with one of its generators on the HP. The axis is parallel to the VP? [16]

7. Draw the isometric view of orthographic drawing shown below ?



[16]

Subject Code: R13209/R13 **Set No - 2**

I B. Tech II Semester Regular Examinations August - 2014

ENGINEERING DRAWING

(Computer Science Engineering)

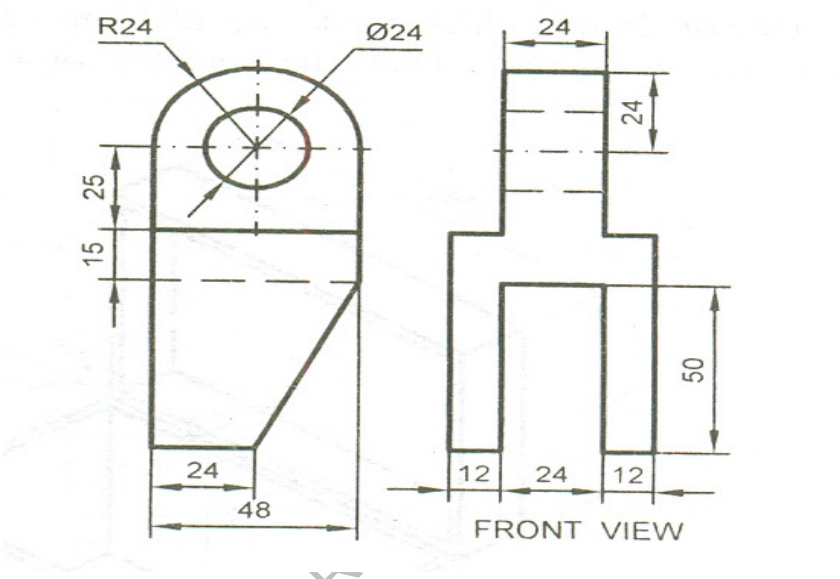
Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**

*****

PART-A

1.(a) Draw the isometric view of the following orthographic views ?



(b) A square prism of side of base 30 mm and axis 55 mm long lies on one of its generator in the HP and its faces equally inclined to the HP. Draw its projections when its axis is inclined at an angle of 60^0 to the VP?

[16+6]

PART-B

2.(a) Construct a regular hexagonal of side 25mm when one of its side is horizontal?

(b) A truck is moving at the rate of 1.2 km per min. Construct a diagonal scale with RF value of 1/25000, showing minutes and seconds. Mark the distance moved by the truck in 4 minutes and 27 seconds?

[6+10]

3.(a) Draw the projections of the following, keeping the distance between the projectors as 25mm on the same reference line:
(i) A- 25mm above HP and 50mm behind the VP
(ii) B- 40 mm below HP and 45mm in front of the VP
(iii) C- on HP and 25mm behind VP

(b) A line CD is parallel to the VP and inclined at 45^0 to the HP. C is in the HP and 25 mm in front of the VP. Top view is 50mm long. Find its true length?

[8+8]

Subject Code: R13209/R13 **Set No - 2**

4. A line AB inclined 30^0 to the VP, has its ends 50mm and 20mm above the HP. The length of its front view is 65mm and its VT is 10 mm above the HP. Determine the true length of AB, its inclination with the HP and its HT?

[16]

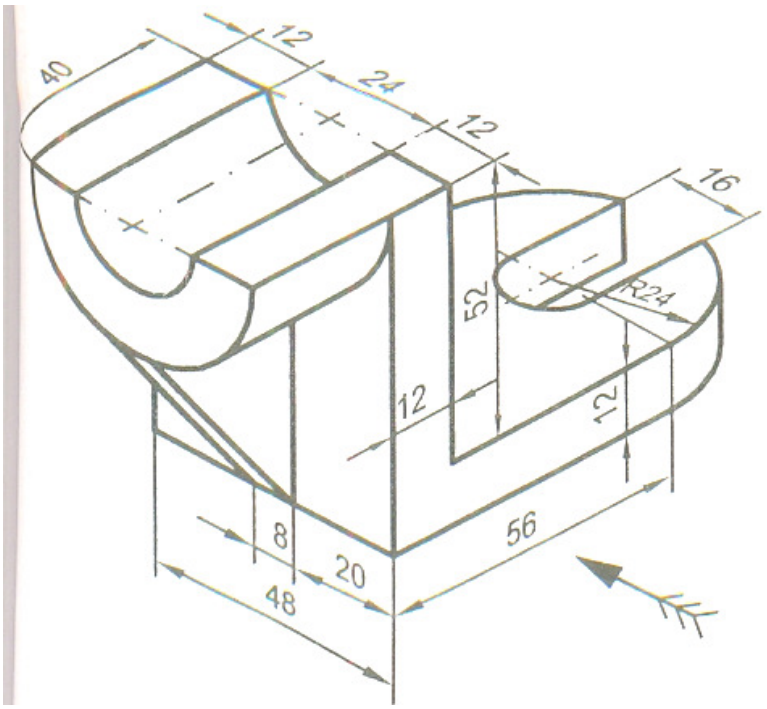
5. The circular plate of negligible thickness and 50 mm diameter appears as an ellipse in the front view, having its major axis 50mm long and minor axis 30 mm long. Draw its top view when the major axis of the ellipse is horizontal?

[16]

6. A equilateral triangle of 60mm side represents the front view of a cone standing on its base. It is tilted until its axis makes 30^0 with the HP and top view of the axis is parallel to the VP in this position. Draw the projections of cone?

[16]

7. Draw (i) Front view (ii) Top view (iii) Side view of the following pictorial projection?



[16]

Subject Code: R13209/R13 **Set No - 3**

I B. Tech II Semester Regular Examinations August - 2014

ENGINEERING DRAWING

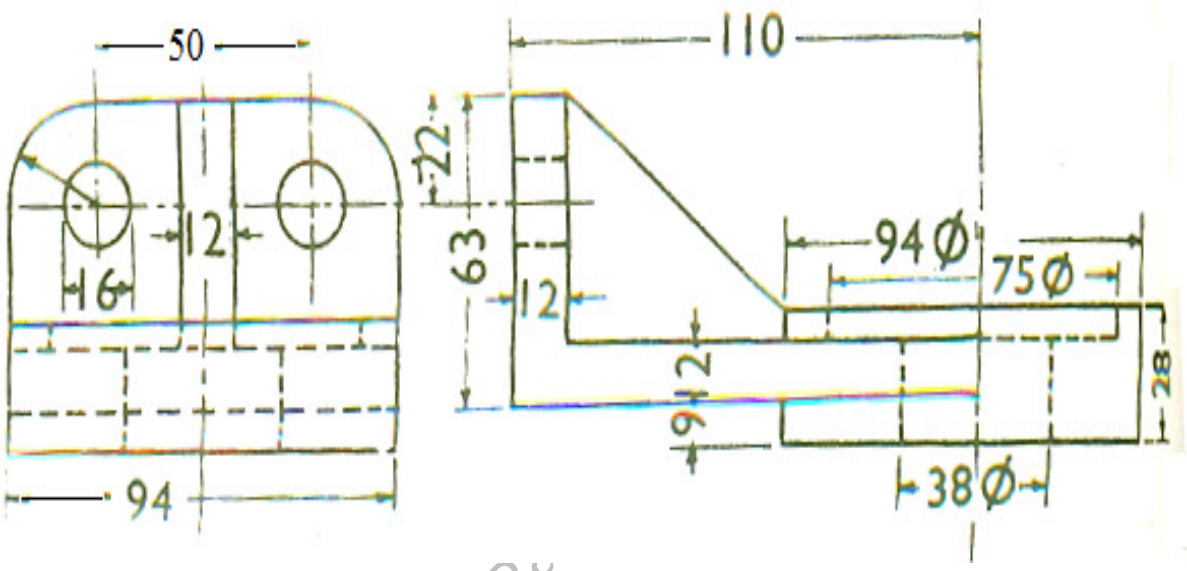
(Computer Science Engineering)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**
*****

PART-A

1.(a) Draw the isometric view of the following orthographic projections?



(b) A point A is 15mm above the HP and 20mm in front of the VP. Another point B is 25 mm behind the VP and 40mm below the HP. Draw the projections of A and B, keeping the distance between the projectors equal to 90mm. Draw straight lines joining (i) the top views (ii) the front views.

[16+6]

PART-B

2.(a) Inscribe a regular hexagon in a circle of diameter 80 mm.?
(b) Construct an ellipse of 120 mm major axis and 80 mm minor axis using arcs of circle method?

[6+10]

3.(a) A point A is 20mm above the HP and in the first quadrant. Its shortest distance from the reference line XY is 40mm. Draw the projections of the point and determine its distance from the VP.
(b) Draw the projections of line LM 40 mm long, parallel to the HP and inclined at 30^0 to the VP. The L is 20 mm above the HP and 15 mm in front of the VP. Find its traces.

[8+8]

Subject Code: R13209/R13 **Set No - 3**

4. A line AB, 65mm long, has its end A 20 mm above the HP and 25 mm in front of the VP. The end B is 40mm above the HP and 65mm in front of the VP. Draw the projections of AB and show its inclinations with the HP and the VP?

[16]

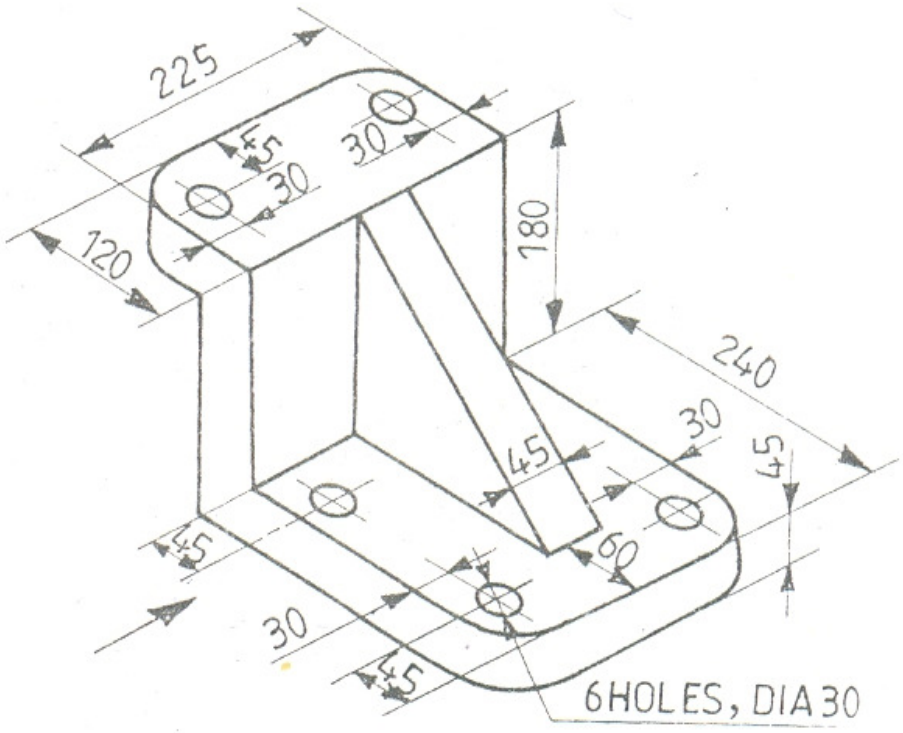
5. A 30^0-60^0 set square has its shortest side 50 mm long and is in the HP. The top view of the setsquare is an isosceles triangle. The hypotenuse of the set-square is inclined at an angle of 45^0 with the VP. Draw its projections Determine its inclination with the HP?

[16]

6. Draw the projections of a cylinder, base 30mm diameter and axis 50mm long, resting with a point on the peripheri of its base circle on the HP such that the axis is making an angle of 30^0 with the HP and parallel to the VP?

[16]

7. Draw (i) Front view (ii) Top view of the following pictorial view?



[16]

Subject Code: R13209/R13 **Set No - 4**

I B. Tech II Semester Regular Examinations August – 2014

ENGINEERING DRAWING

(Computer Science Engineering)

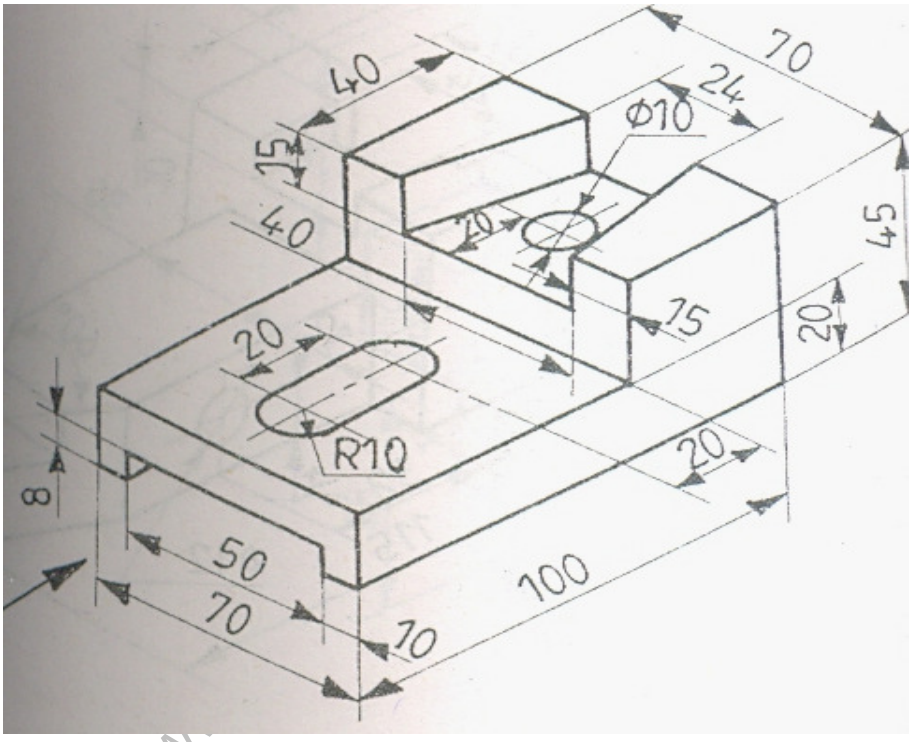
Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**

*****

PART-A

1.(a) Draw (i) Front view (ii) Top view (iii) Right side view of the pictorial view shown below?



(b) A mirror of size 560mm× 320 mm is fixed on a wall on one of its shorter edges. The mirror is so fixed that it appears as a square in the front view. Draw the projections of the mirror Find its inclinations with the wall and the ground?

[16+6]

PART-B

2.(a) Construct a Vernier scale of RF= 1: 25 to show decimeters, centimeters and millimeters. The scale should be capable of reading up to 4 decimeters. Mark on your scale the following distances: (a) 3.23 dm?

(b) Construct a hexagon of side 30 mm when one side is vertical?

[10+6]

Subject Code: R13209/R13 **Set No - 4**

3.(a) The top view of a 75mm long line measures 55 mm. The line is in the VP, its one end being 25 mm above the HP. Draw its projections?

(b) Mark the projections of the following points on a common reference line, keeping the projectors 35 mm apart.
(i) 25 mm above the HP and 40 mm behind the VP
(ii) 20 mm above the HP and on the VP
(iii) 30 mm below the HP and 45 mm in front of the VP

[8+8]

4. A line PQ 100mm long is inclined at 30^0 to the HP and at 45^0 to the VP. Its midpoint is in the VP and 20mm above the HP. Draw its projections, if its end P is in the third quadrant and Q is in the first quadrant.

[16]

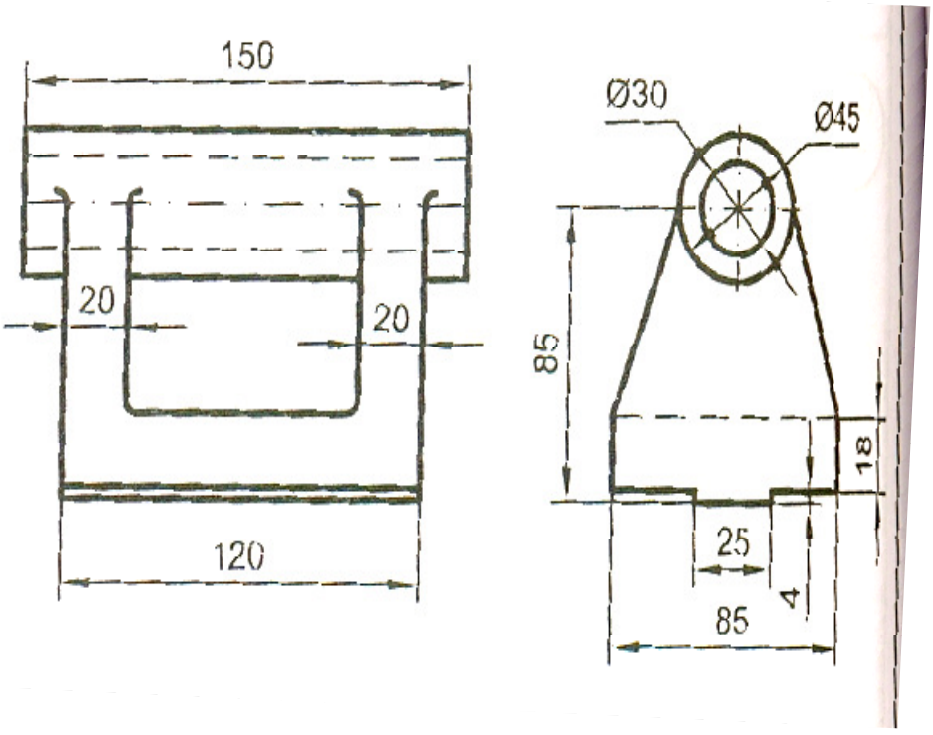
5. ABCD is a symmetrical trapezium with AB= 40mm and CD=64mm as its parallel sides are 50 mm height. The plane has its side AB in the VP and CD 25 mm away from it. The front view of BC makes an angle of 30^0 with the HP. Obtain the projections of the plane. Find its angle with the VP?

[16]

6. Draw the projections of a pentagonal prism of base side 30mm and axis length 60mm rests on the HP on one of the base corners with the base edges containing it being equally inclined to the HP. The axis is inclined at 45^0 to the HP and parallel to the VP?

[16]

7. Draw the isometric view of the following orthographic views?



[16]

Internal Question Papers

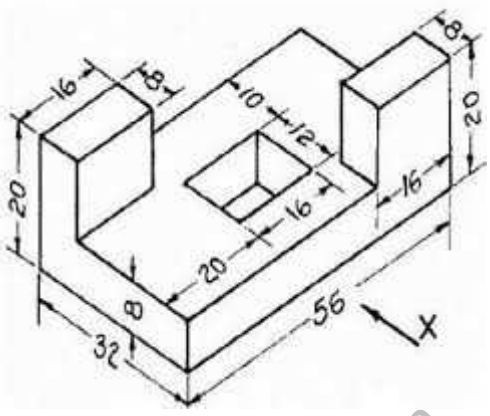
V.S.M. COLLEGE OF ENGINEERING, RAMACHANDRAPURAM
(AFFILIATED TO JNTU-K)
I/IV B.TECH. SEMESTER-II **MID-II**(Regular R-13)

SUBJECT: ENGINEERING DRAWING (Computer Science Engineering)

TIME: 1H. 30MIN. MARKS: 30

Answer all Questions 10 * 3 = 30

1. A circle of 50 mm diameter is resting on Hp on end A of it's diameter AC which is 30^0 inclined to Hp while it's Tv is 45^0 inclined to Vp. Draw it's projections. ?
2. Draw the projections of a pentagonal prism , base 25 mm side and axis 50 mm long, resting on one of its rectangular faces on the H.P. with the axis inclined at 45º to the V.P?
3. Draw the orthographic projections of the following structure



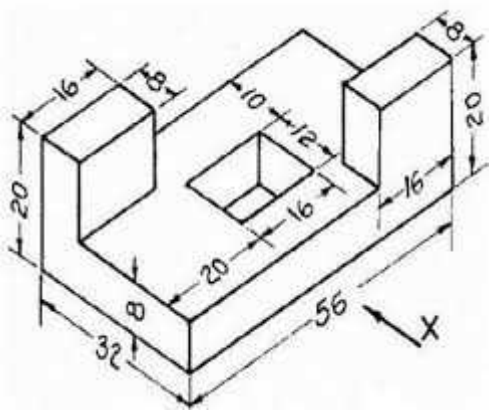
V.S.M. COLLEGE OF ENGINEERING, RAMACHANDRAPURAM
(AFFILIATED TO JNTU-K)
I/IV B.TECH. SEMESTER-II **MID-II**(Regular R-13)

SUBJECT: ENGINEERING DRAWING (Computer Science Engineering)

TIME: 1H. 30MIN. MARKS: 30

Answer all Questions 10 * 3 = 30

1. A circle of 50 mm diameter is resting on Hp on end A of it's diameter AC which is 30^0 inclined to Hp while it's Tv is 45^0 inclined to Vp. Draw it's projections. ?
2. Draw the projections of a pentagonal prism , base 25 mm side and axis 50 mm long, resting on one of its rectangular faces on the H.P. with the axis inclined at 45º to the V.P?
3. Draw the orthographic projections of the following structure



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INTERNAL ASSESSMENT TEST QUESTION PAPER **2015/DDD/TL/EVL/INT/IATQP**
DEPARTMENT :MECHANICAL ENGG. DATE:21-09-2015

IYEAR I SEMESTER I MID Academic Year: 2015-2016 Max. Time : 90 Min
Branch:ECE-B **Subject:** ENGG. DRAWING **Max. Marks : 30**

Answer all the following questions

1. The distance between Delhi and Agra is 200 km.In a railway map it is represented by a line 5 cm long. Find it's R.F.Draw a diagonal scale to show single km. And maximum 600 km. Indicate on it following distances. 1) 222 km 2) 336 km 3) 459 km 4) 569 km
2. A point P is 20mm below HP & lies in third quadrant.It's shortest distance from XY is 40mm.Draw its projections and find the distance of TV from XY line.
3. Line AB 75mm long makes 45^0 inclination with Vp while it's Fv makes 55^0.End A is 10 mm above Hp and 15 mm in front of Vp.If line is in 1^{st} quadrant draw it's projections and find it's inclination with Hp.

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Branch:EEE **Subject:** ENGG. DRAWING **Max. Marks : 30**

Answer all the following questions

1. Draw a Vernier scale of RF = 1 / 25 to read centimeters upto 4 meters and on it, show lengths 2.39 m and 0.91 m
2. Mark the projections of following points n a comman reference line,keeping the projections 35mm apart.
   i.A,25mm above HP and 35 mm in front of VP
   ii.B,25 mm below HP and 40mm behind VP
   iii.C,35mm below HP and on VP
   iv.D,20mm behind VP and on HP.
3. Line AB is 75 mm long and it is 30^0 & 40^0 Inclined to Hp & Vp respectively.End A is 12mm above Hp and 10 mm in front of Vp.Draw projections. Line is in 1^{st} quadrant.

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DEPARTMENT OF MECHANICAL ENGINEERING

I B.TECH II SEM MID-I EXAMINATIONS

SUBJECT: ENGINEERING DRAWING BRANCH: CSE DATE: 11/04/2015

ANSWER THE FOLLOWING QUESTIONS: **Max Marks: 30 Marks**

1) Draw a vernier scale of R.F = 1/25 to read centimeters up to 4 metres and on it, show lengths representing 2.39 m and 0.91 m.
2) a) Draw the projections of following points on the same ground line, keeping the projectors 25 mm apart.
   i) A, in the H.P and 25 mm in front of V.P
   ii) B, 40 mm above the H.P and 25 mm in front of the V.P
   iii) C, 25 mm below the H.P and 25 mm behind the V.P
   b) A point A is 20mm below HP and lies in third quadrant. It's shortest distance from XY is 40mm.Draw its projections?
3) A line AB, 75 mm long is inclined at 45 degrees to the H.P. and 30 to the V.P. its end B is in the H.P and 40 mm in front of the V.P. draw its projections?

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DEPARTMENT OF MECHANICAL ENGINEERING

I B.TECH II SEM MID-I EXAMINATIONS

SUBJECT: ENGINEERING DRAWING BRANCH: CSE DATE: 11/04/2015

ANSWER THE FOLLOWING QUESTIONS: **Max Marks: 30 Marks**

4) Draw a vernier scale of R.F = 1/25 to read centimeters up to 4 metres and on it, show lengths representing 2.39 m and 0.91 m.
5) a) Draw the projections of following points on the same ground line, keeping the projectors 25 mm apart.
   i) A, in the H.P and 25 mm in front of V.P
   ii) B, 40 mm above the H.P and 25 mm in front of the V.P
   iii) C, 25 mm below the H.P and 25 mm behind the V.P
   b) A point A is 20mm below HP and lies in third quadrant. It's shortest distance from XY is 40mm.Draw its projections?
6) A line AB, 75 mm long is inclined at 45 degrees to the H.P. and 30 to the V.P. its end B is in the H.P and 40 mm in front of the V.P. draw its projections?

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Branch: ECE -A **Subject:** ENGG. DRAWING **Max. Marks : 30**

Answer all the following questions

1. Construct a diagonal scale of R.F = 3 : 200, showing meters, decimeters and centimeters & to measure upto 6 meters.To show a distances of 1) 4.56 m 2) 2.24 m 3) 1.17m
2. Construct a regular polygon of any number of sides, given the length of its sides equal to 30 mm.
3. Mark the projections of the following points on a same reference line, keeping the projectors 35 mm apart.
   a) A, 25 mm above HP and 35 mm in front of VP
   b) B 25 mm below HP and 40 mm behind VP
   c) C, 30 mm above HP and 45 mm behind VP
   d) D, on the HP and 30 mm in front of VP
   e) E, 40 mm below HP and in the VP.

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   a) A, 25 mm above HP and 35 mm in front of VP
   b) B 25 mm below HP and 40 mm behind VP
   c) C, 30 mm above HP and 45 mm behind VP
   d) D, on the HP and 30 mm in front of VP
   e) E, 40 mm below HP and in the VP.