PRINCETON INSTITUTE OF ENGINEERING & TECHNOLOGY FOR WOMEN

(Approved by AICTE New Delhi & Affiliated to JNTU Hyderabad)

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JNTUH Code (6M) CSE – CIVIL – ECE – EEE – CSM – CSC – CSD EAMCET Code– PETW

I - B.Tech I & II Semesters, R22- Regulation, Academic Year 2022-2023

NAME OF THE STUDENT:

HALL TICKET NUMBER:

BRANCH:

SECTION:

SEMESTER:

"COMPUTER AIDED ENGINEERING GRAPHICS"

NOTES PREPARED

By

A.NARESH BABU

PRINCETON INSTITUTE

"DO ALL THE GOOD YOU CAN, FOR ALL THE PEOPLE YOU CAN, IN ALL THE WAYS YOU CAN, AS LONG AS YOU CAN."

COMPUTER AIDED ENGINEERING GRAPHICS

B.Tech. I Year I Sem.

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Course Objectives:

- To develop the ability of visualization of different objects through technical drawings
- To acquire computer drafting skill for communication of concepts, ideas in the design of engineering products

Course Outcomes: At the end of the course, the student will be able to:

- Apply computer aided drafting tools to create 2D and 3D objects
- sketch conics and different types of solids
- Appreciate the need of Sectional views of solids and Development of surfaces of solids
- Read and interpret engineering drawings
- Conversion of orthographic projection into isometric view and vice versa manually and by using computer aided drafting

UNIT – I:

Introduction to Engineering Graphics: Principles of Engineering Graphics and their Significance, Scales – Plain & Diagonal, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, Introduction to Computer aided drafting – views, commands and conics

UNIT- II:

Orthographic Projections: Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures. Auxiliary Planes. Computer aided orthographic projections – points, lines and planes

UNIT – III:

Projections of Regular Solids – Auxiliary Views - Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views, Computer aided projections of solids – sectional views

UNIT – IV:

Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone, Development of surfaces using computer aided drafting

UNIT – V:

Isometric Projections: Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice-versa –Conventions. Conversion of orthographic projection into isometric view using computer aided drafting.

TEXT BOOKS:

1. Engineering Drawing N.D. Bhatt / Charotar
2. Engineering Drawing and graphics Using AutoCAD Third Edition, T. Jeyapoovan, Vikas: S. Chand and company Ltd.

REFERENCE BOOKS:

1. Engineering Drawing, Basant Agrawal and C M Agrawal, Third Edition McGraw Hill
2. Engineering Graphics and Design, WILEY, Edition 2020
3. Engineering Drawing, M. B. Shah, B.C. Rane / Pearson.
4. Engineering Drawing, N. S. Parthasarathy and Vela Murali, Oxford
5. Computer Aided Engineering Drawing – K Balaveera Reddy et al – CBS Publishers

Note: - External examination is conducted in conventional mode and internal evaluation to be done by both conventional as well as using computer aided drafting.

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What is DRAWING/GRAPHICS?

(A Graphical Representation)

Engineering Graphics is one of the most important Subjects in First Year Engineering Semesters & most of the syllabus of this subject remains the same across the universities Pan India.

If compared with Verbal or Written Description, Drawings offer far better idea about the Shape, Size & Appearance of any object or situation or location, that too in quite a less time. Hence it has become the Best Media of Communication not only in Engineering but in almost all Fields.

Engineering Graphics Syllabus covers below important topics:-

UNIT-I

Introduction to Engineering Graphics

(Engineering Curves & Engineering Scales)

UNIT-II

Orthographic Projections

(Projections of Points, Lines & Planes)

UNIT-III

Projection of Regular Solids

Sectional views of Right Regular Solids

(Prisms, Pyramids, Cone, Cylinder, Cube & etc)

UNIT-IV

Development of Surfaces of Right Regular Solids

(Prisms, Pyramids, Cone, Cylinder, Cube & etc)

UNIT-V

Isometric Projections

(Isometric view to Orthographic Projections [3D to 2D] &

Orthographic projections to Isometric view [2D to 3D])

But before we understand other complex modules or topics, we need to first understand the Basics of Engineering Graphics.

In this article, we are going to cover the introduction to engineering graphics, its importance for engineering students and how to score a good CGPA in semester exam.

INTRODUCTION

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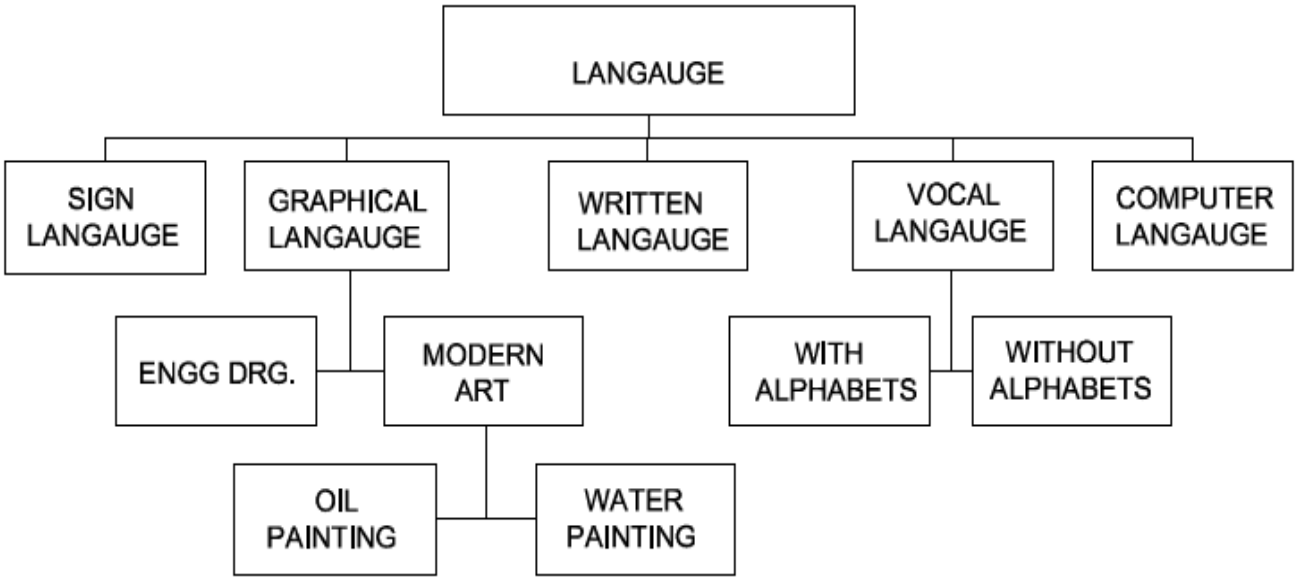
So Dear Students, Let's start with the basics first:–

What is Engineering Graphics?

Engineering Graphics is the universal language of all engineers around the world. It is the graphical solution for many engineering problems and is a communication language between the designer and maker of the object.

Language: It is the media of communication.



The economical success of any country is mainly depended on its industrial development. Due to the globalization any industry of our country expected to be of global market standard.

To produce a best standard product all the technical personnel (Engineers to Craftsman) in an industry must have a sound knowledge in engineering drawing because engineering drawing is the language of engineers. Engineering drawing is a universal language. Different types of lines are its alphabets. Technical personnel in any industry including craftsmen are expected to communicate anything concerning a part or a component by drawings involving lines, symbols, convention and abbreviations etc.

With our spoken languages it is impossible to express the details of a job or a product. Engineering drawing knowledge and practice are must for designing or producing a component or part. Even a small mistake in the drawing may reflect very badly in the product. Therefore reading and doing engineering drawing are very much essential for craftsmen and engineers.

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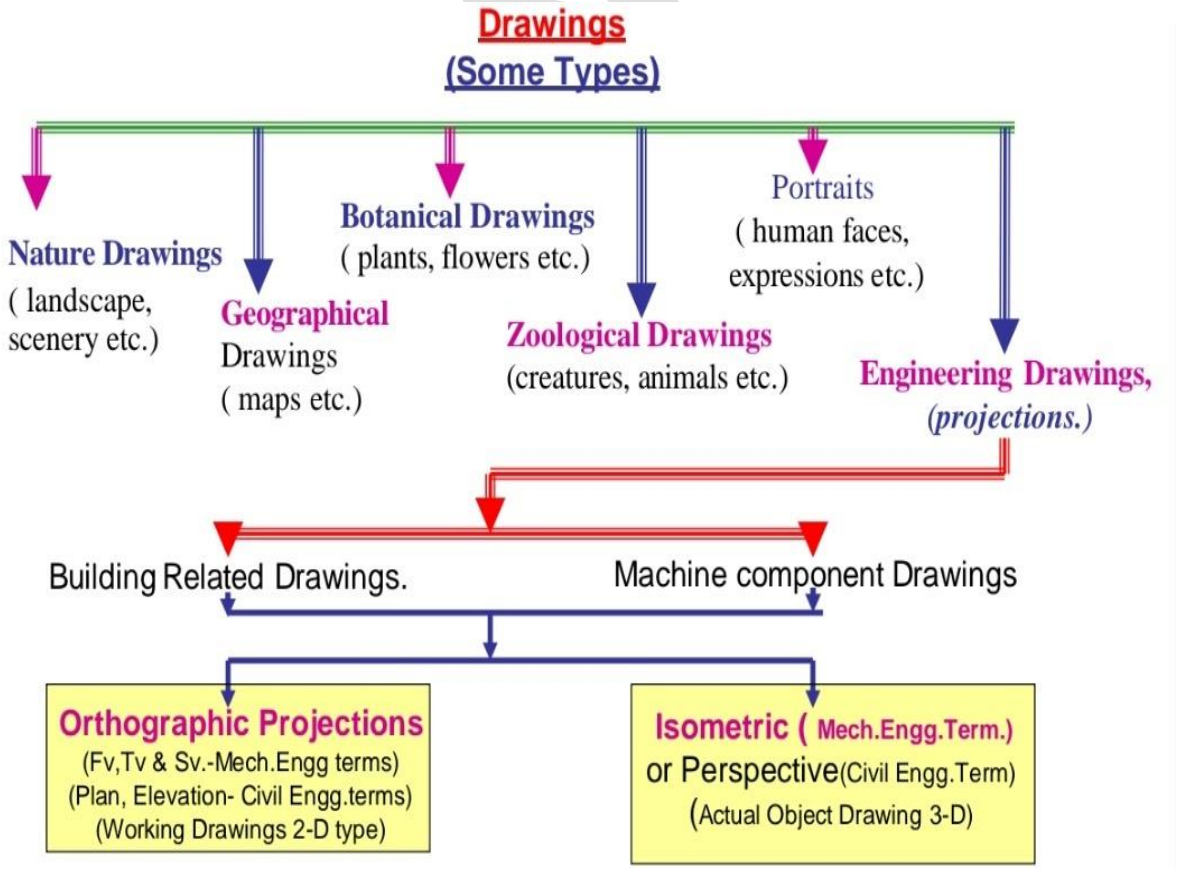
One picture worth one thousand words

A drawing is a graphical representation of an object, or part of it, and is the result of creative thought by an engineer or technician. When one person sketches a rough map in giving direction to another, this is graphic communication. Graphic communication involves using visual materials to relate ideas. Drawings, photographs, slides, transparencies, and sketches are all forms of graphic communication. Any medium that uses a graphic image to aid in conveying a message, instructions, or an idea is involved in graphic communication.

Purpose of studying engineering drawing:

I. To develop the ability to produce simple engineering drawing and sketches based on current practice.
II. To develop the skills to read manufacturing and construction drawings used in industry.
III. To develop a working knowledge of the layout of plant and equipment.
IV. To develop skills in abstracting information from calculation sheets and schematic diagrams to produce working drawings for manufacturers, installers and fabricators.



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In engineering drawing, engineering related objects like buildings, walls, electrical fittings, pipes, machines etc. are represented with specifications like size, shape, materials etc. Several engineering drawing software with more accuracy are available. But, drawing on paper is still being used in some areas and for small constructions.

Drawing plays vital role in the engineering and construction works. The drawing requires no language any one can read it. So, drawings of other countries structures can also be studied easily. The drawing improves the imagination and new inventions can be developed.

So, Dear Students, Learning this subject will help you to convey the detail graphical design information of the objects. It is an indispensable tool for every engineering student irrespective of different branches, not just for mechanical or civil engineering.

What is the Difference between Engineering Graphics & Engineering Drawings?

There is No difference between Engineering Graphics & Engineering Drawings. Some of the universities prefer to call it as an Engineering Graphics & some prefer to call it as an Engineering Drawings.

Why some of the students find Engineering Graphics difficult to learn?

Many of the students find Engineering Graphics difficult to understand due to 2 main reasons:-

(A) Difficulty to understand the fundamentals of Engineering Graphics

(B) Lack of imagination power of students

Hence Dear Students, Let's look at each difficulty one by one:-

(A) Difficulty to understand the fundamentals of Engineering Graphics

There are 2 ways by which students generally learn – either from their teacher or from the textbook.

Teachers are sometimes not able to give their 100% in teaching, since they have a whole syllabus to complete in the span of just 2-3 months. What happens then is, they end up focusing just on few topics which are important from exam point of view & then the students mug up the same in order to just pass the exam. But when it comes to solving difficult problems, students are not able to do it due to the lack of clarity of the basics.

To talk about learning from books, there are hundreds of Engineering Graphics Books available. But students are generally less interested to read the books which cover the basics of Engineering Graphics. Understanding the concepts in detail is necessary since the subject deals with 3D shapes. So self-learning from books becomes difficult for students.

(B) Lack of imagination power of students

Second reason why students find it difficult to learn Engineering Graphics is the lack of imagination. Imagination power varies from students to students and improving the same takes time.

But difficult doesn't always mean impossible. Students can overcome this difficulty with Practice i.e. solving more number of problems and more varieties of problems. By improving the imagination power, students can easily understand the shape and orientation of the object in the space.

Why is it important to learn Engineering Graphics in Semester with great attention?

Can you explain a car engine or IC diagram in any regular language such as English?

Just like in day to day life, a language is important to convey a message or explain your point to someone, learning engineering graphics will help you to explain 3D features of the object.

If you are an engineering student, you are a future engineer who is going to deal with many 3D shapes in the career. So in order to explain the 3D features of an object to others, you need to learn engineering graphics thoroughly. Also, as an engineer in future, you will need to prepare drawings in Design Process for better technology and knowledge transfer.

Without understanding this language of Engineering Graphics, engineers will find it difficult to compete in the engineering field. By learning this subject thoroughly, the self-learning of other subjects where the drawings and diagrams are involved becomes easy too.

How to score good grades in Engineering Graphics?

In Semester, each subject is given a weightage. Engineering Graphics, Engineering Maths & C Programming are given the highest weightage for Semester.

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In order to score good grades in Engineering Graphics, you need to focus on 3 things:–

1. Understanding - Understanding the subject properly
2. Imagination - Improving the imagination power
3. Expression - Learning to draw properly

With these 3 things done correctly, you can achieve great results in Engineering Graphics in Semester, which will improve your overall CGPA.
So if you are planning for masters in future, your CGPA will help you the most. Many universities also give you a scholarship based on your CGPA.

For placements, CGPA plays a Hugh role and even after getting the placement, you need to perform well in your job, so learning this subject with great understanding & attention is very important for engineering students.

LIST OF DRAWING INSTRUMENTS:

Basic Instruments

- Drawing board
- Drawing sheets
- *LONG WHITE NoteBook* (A4 size Drawing Notes only , Pure white Color)
- Drawing pencils HB,H & 2H (3 different grade Pencils)
- Drawing clips or pins or Adhesive Tapes
- Good Long Eraser
- Eraser shield
- Good Sharpener

Instruments for Drawing Straight Lines

- T- Square.
- Templates

Instruments for Drawing Curved Lines

- Large size compass
- Small bow compass
- French curve

Instruments for Measuring Distance:

- Large Scale
- Small Scale
- Roller Scale

Instruments for Measuring Angles

- Protractors (180°& 360°)
- Set-squares (Bigger size) (45°, 30° 60°)

Special Tool

- Good Mini drafter

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Various sizes of drawing sheets recommended by Indian standards are listed below.

Drawing Sheet Type	Dimensions (Length X Width) (mm)
A_0	841 X 1189
A_1	594 X 841
A_2	420 X 594
A_3	297 X 420
A_4	210 X 297
A_5	148 X 210

Drawing Boards & its Types:

Type of Drawing Board	Length X Width X Thickness (mm)
D_0	1500 X 1000 X 25
D_1	1000 X 700 X 25
D_2	700 X 500 X 15
D_3	500 X 350 X 15

Grade of Pencils – its hardness & Uses

Grade of Pencil	Hardness of Pencil
9H	Hardest
6H, 5H, 4H	Extremely Hard
3H	Very hard
2H	Hard
H	Moderately hard
F	Firm
HB	Medium hard
B	Moderately soft and black
2B	Soft and black
3B	Very soft and black
4B, 5B, 6B	Very soft and very black
7B	Softest

Grade of Pencil	Used to Draw
3H	Construction lines
2H	Dimension lines, center lines, sectional lines, hidden lines
H	Object lines, lettering
HB	Dimensioning, boundary lines

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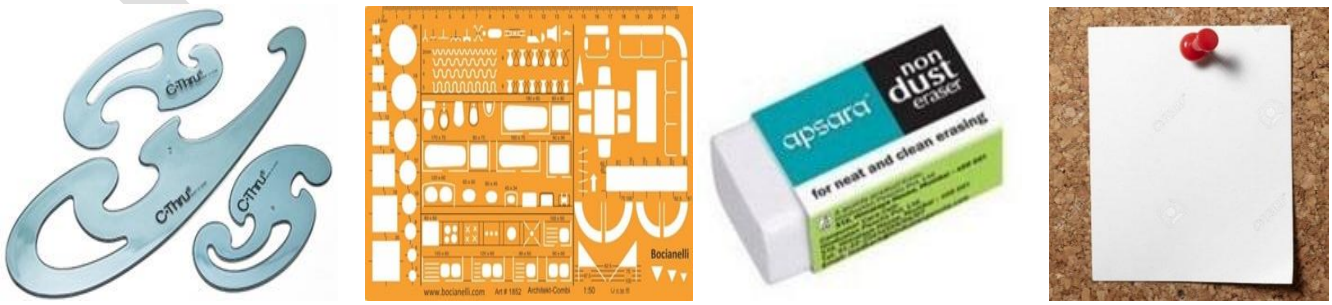
INTRODUCTION



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UNIT-I

Introduction to Engineering Graphics

(Engineering Curves & Engineering Scales)

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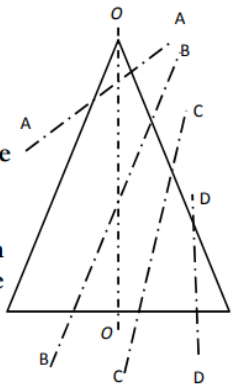
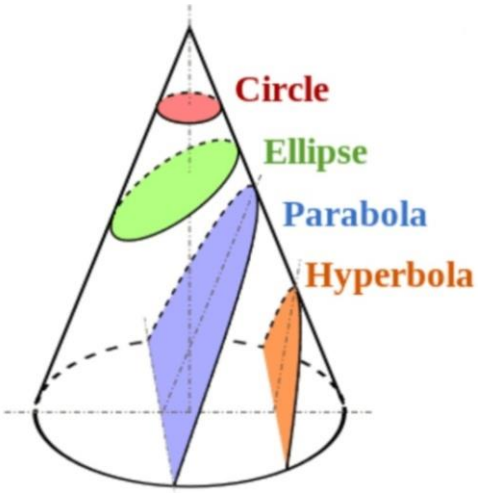
ENGINEERING CURVES (CONIC SECTIONS)

Conic Sections

- An *ellipse* is obtained when a section plane *A–A*, inclined to the axis cuts all the generators of the cone.
- A *parabola* is obtained when a section plane *B–B*, parallel to one of the generators cuts the cone. Obviously, the section plane will cut the base of the cone.
- A *hyperbola* is obtained when a section plane *C–C*, inclined to the axis cuts the cone on one side of the axis.
- A *rectangular hyperbola* is obtained when a section plane *D–D*, parallel to the axis cuts the cone.

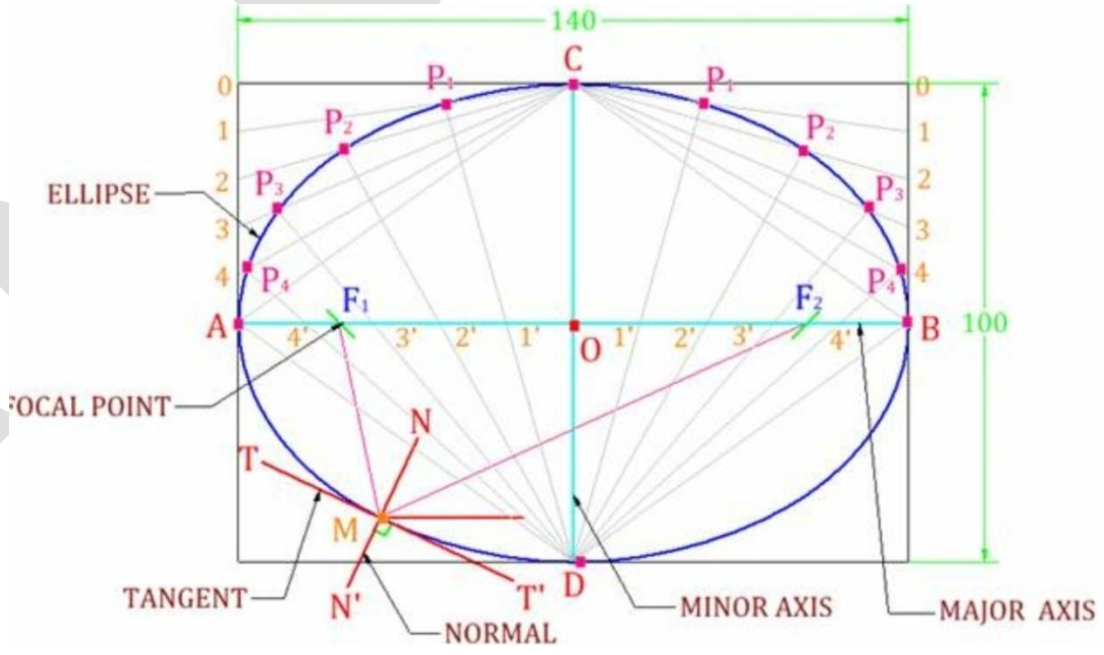




ELLIPSE	PARABOLA	HYPERBOLA
Rectangular Method (Oblique or Obolong)	Rectangular Method (Oblique)	Rectangular Hyperbola or Asymptotes Method
Parallelogram Method (Oblique or Obolong)	Parallelogram Method (Oblique)	Half Transverse axis Method
Concentric Circle Method	Tangent Method	Transverse axis Method
Intersecting arc Method		
Eccentricity Method	Eccentricity Method	Eccentricity Method

Oblong or Rectangle method:

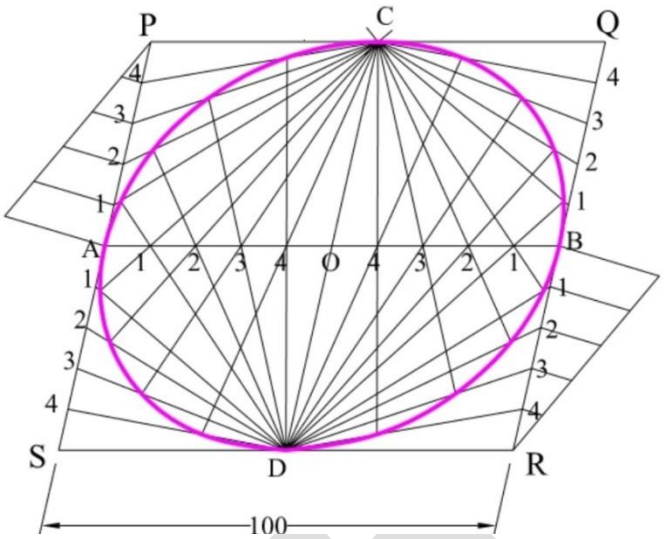
1. Inscribe an ellipse inside a rectangle of 140*100 mm and draw tangent at any point on the Ellipse? **(12 M, June-2022)**



2. Construct an ellipse of major axis 90 mm and minor axis 50 mm by using rectangle method. **(April, 2018, May 2019, A 2018)**

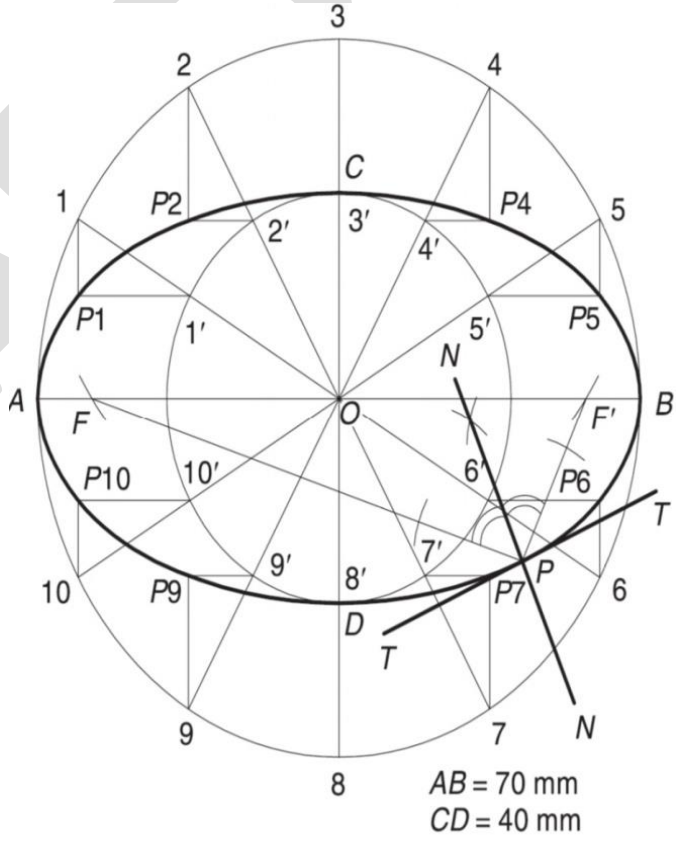
Parallelogram method:

3. Inscribe an ellipse in parallelogram of sides 100 mm and 60 mm and inclined at an angle of 60°. **(7 M, December 2017)**

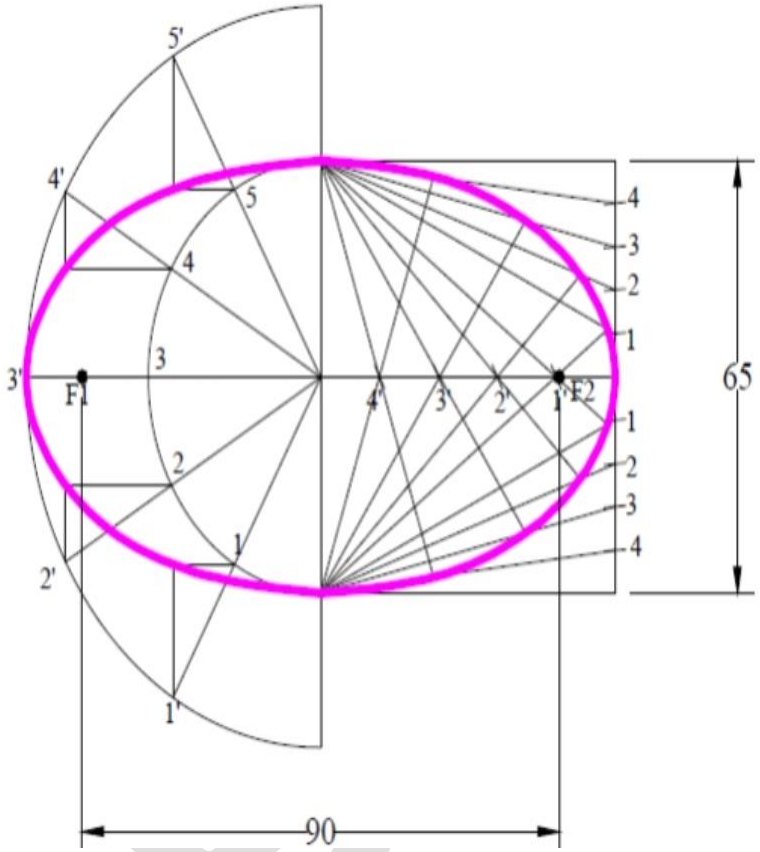


Concentric circles method:

4. Construct an ellipse by concentric circle method, whose major axis is 70 mm and minor axis is 40 mm and draw tangent at any point on the Curve? **(7 M, June 2017, 2019)**

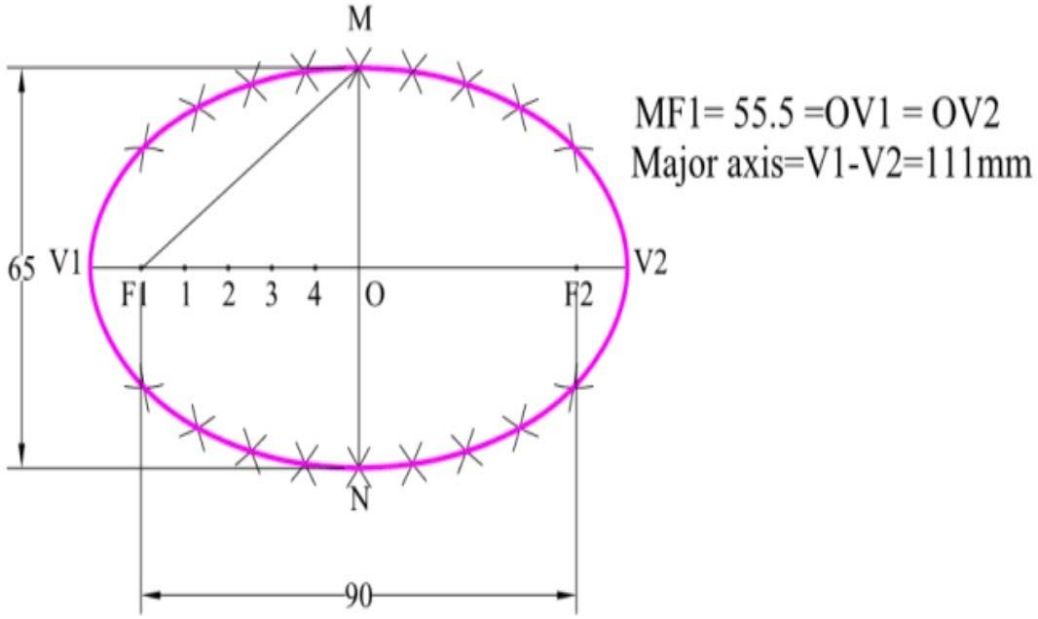


5. The foci of an ellipse are 90 mm apart and the minor axis is 65 mm long. Determine the length of the major axis and draw the ellipse, left half by concentric circles method and Right half by oblong method. **(December 2018)**



Intersecting arcs method:

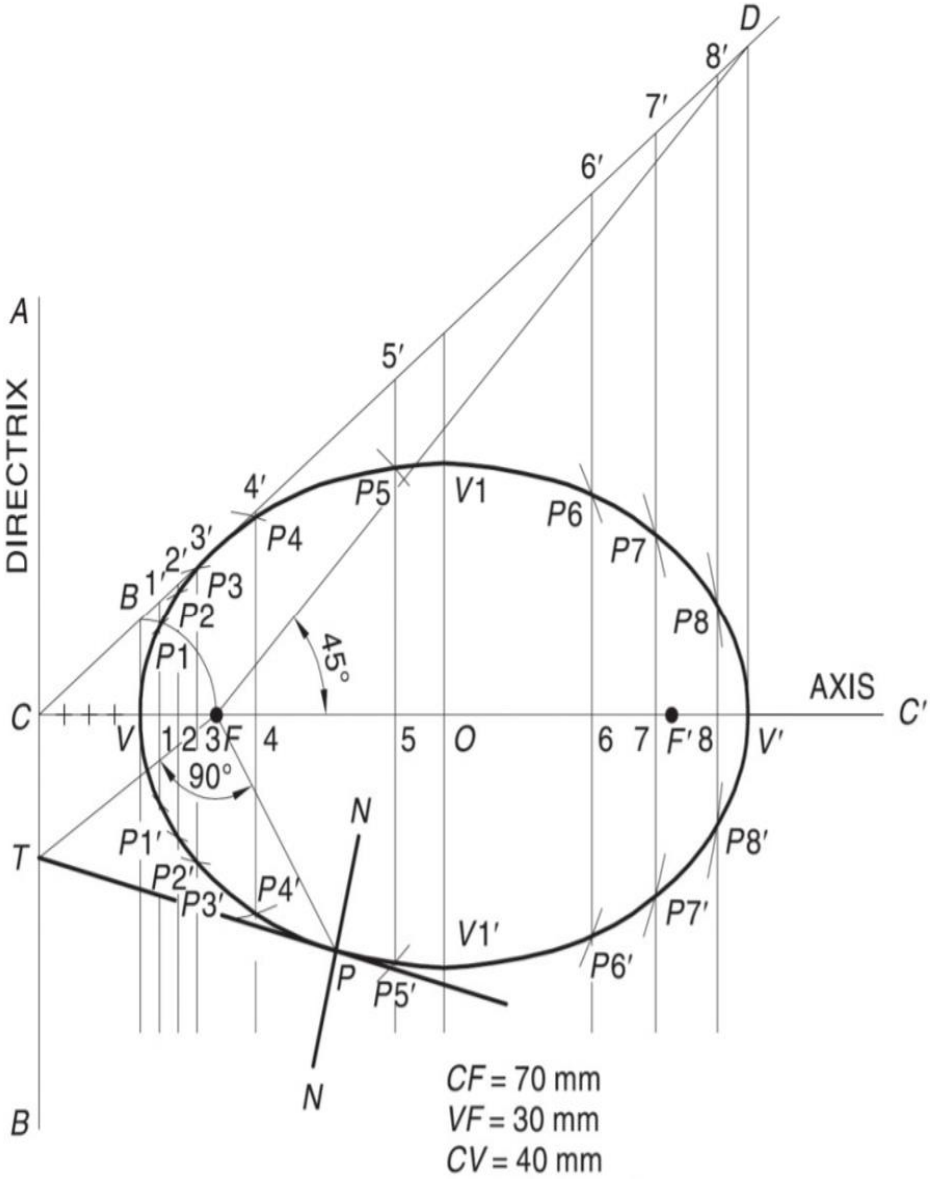
6. The foci of an ellipse are 90 mm apart and the minor axis is 65 mm long. Determine the length of major axis and draw the ellipse. **(8 M, May, 2019, December 2018)**



7. The major-axis AB of an ellipse is 140 mm long with P as its mid-point. The foci F1 and F2 of the ellipse are 48 mm away from the mid-point P. Draw the ellipse and find the length of the minor axis? **(10 M, June-2022)**
8. Construct an ellipse when the major axis is 120 mm and the distance between the foci is 108 mm. Determine the length of minor axis. **(8M, May, 2019)**
9. Two points are fixed and 100 mm apart. Draw the locus of a point in such a manner that the difference of its distance from the points is 75 mm. Name the curve. **(7 M, Jan 2020, Dec 2018)**

Eccentricity method:

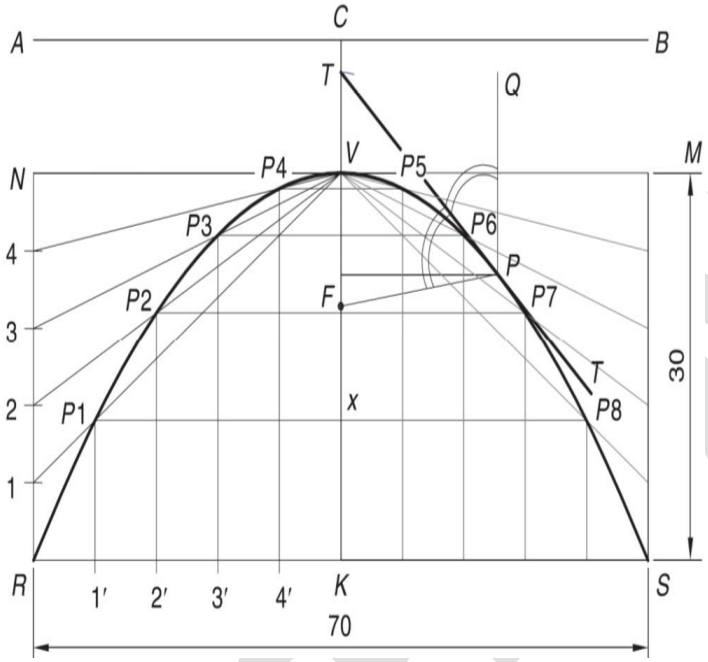
10. Construct an ellipse with the following data: (i) Eccentricity is 2/3. (ii) Distance of the focus from the directrix is 70 mm. (iii) Draw a tangent and normal at 90 mm from the directrix line?



PARABOLA

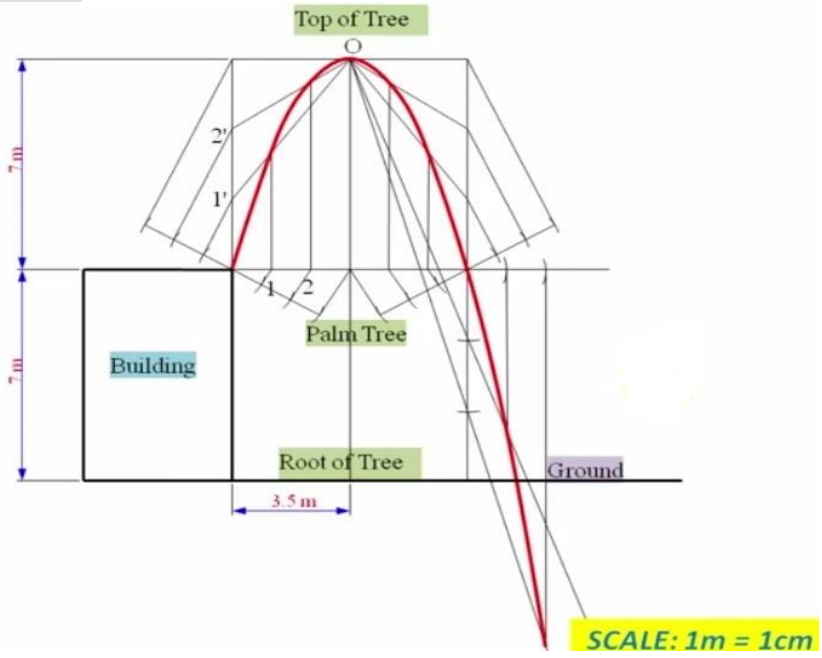
Rectangle method:

11. Two straight lines RN & RS are at right angles to each other. A point M is 30 mm from RS and 70 mm from RN. Draw a rectangular parabola? **(25 M, 2021, 2020, 2019, 2018)**



12. A Ball thrown up in the air reaches a maximum height of 45 meters and travels a horizontal distance of 75 meters. Trace the complete path of the ball, assuming it to be the parabolic; Find the direction of travel of the ball at a height of 15 meters from the ground (Scale 1:500). **(10 M, 5 times)**

13. A Stone is thrown from a building of 7m height and at its highest flight; the stone just crosses a palm tree of 14m height. Trace the path of the stone if the distance between the building and the tree is 3.5m



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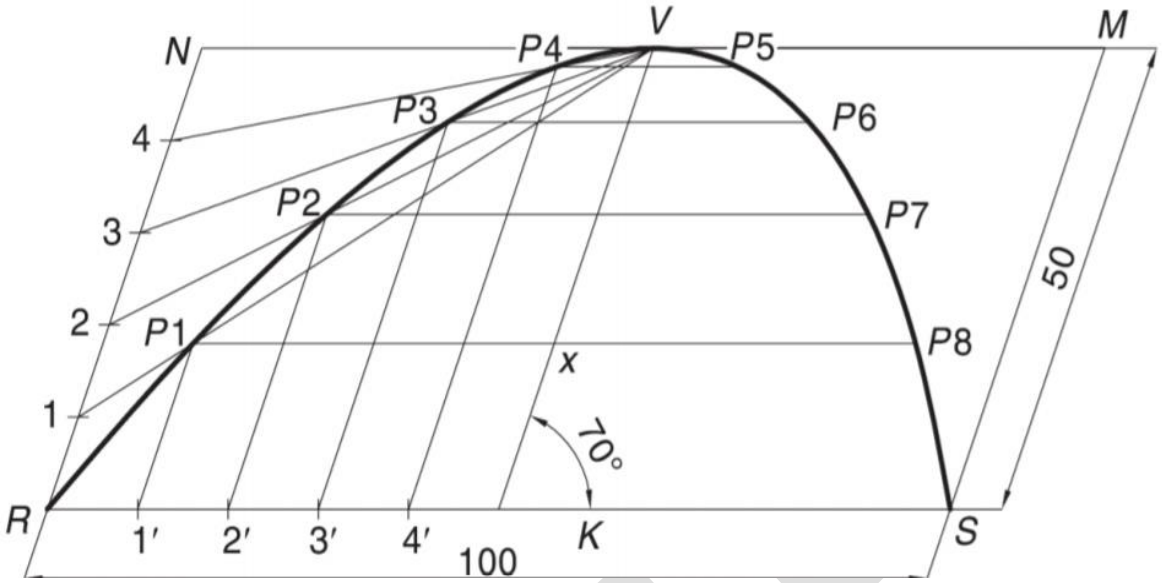
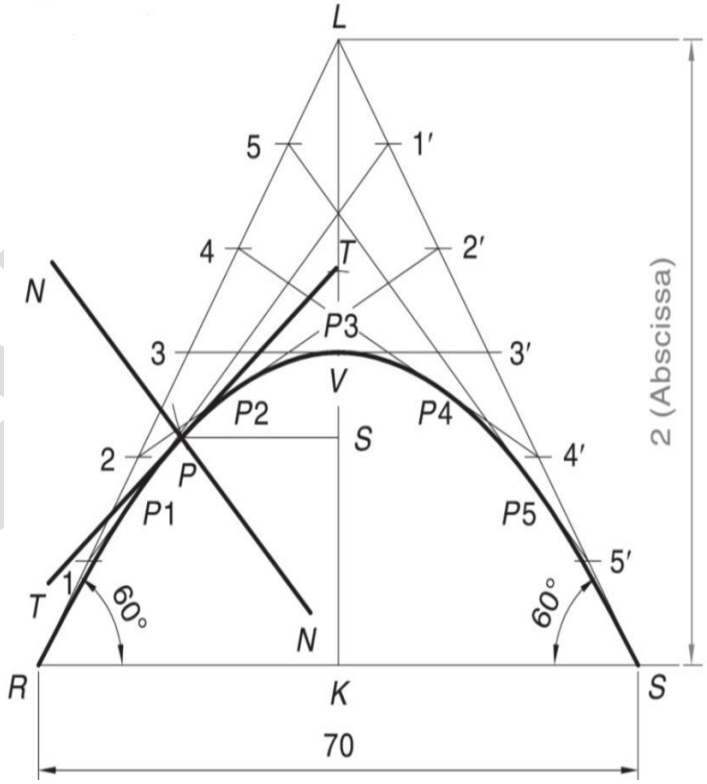
Parallelogram method:

14. Inscribe a parabola in a parallelogram of sides 100 mm and 50 mm and the angle between them is 70°. **(7M, December 2019)**



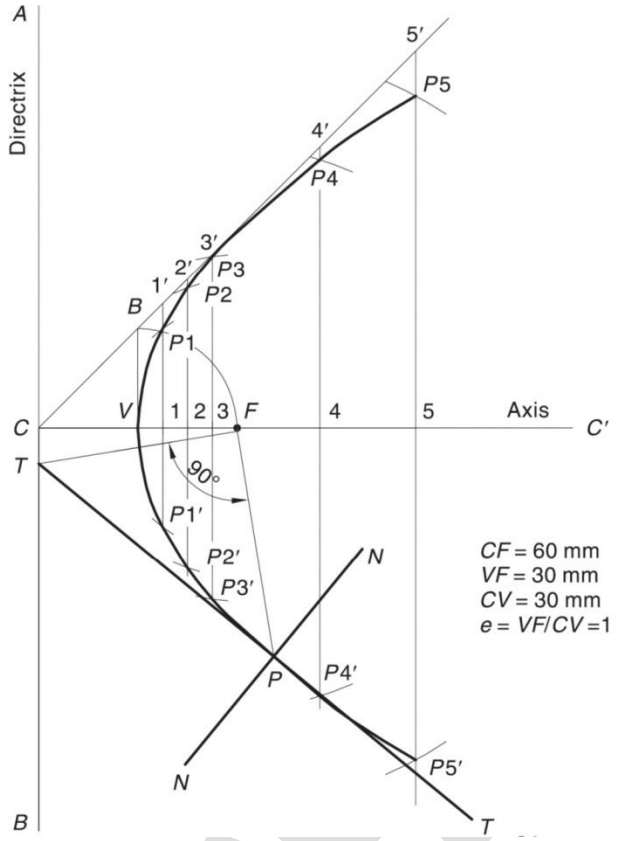
Tangent method:

15. Inscribe a parabola in a triangle of side is 70 mm and the angle between them is 60°.



Eccentricity method:

16. Construct a parabola whose focus is at a distance of 50 mm from the directrix. Draw a normal and tangent at a point on the parabola at 40 mm below the axis. **(9 M, Aug 19)**

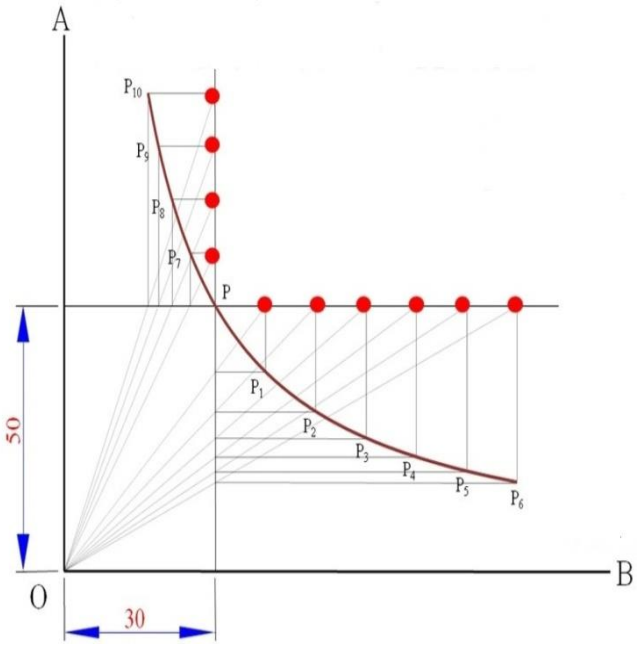


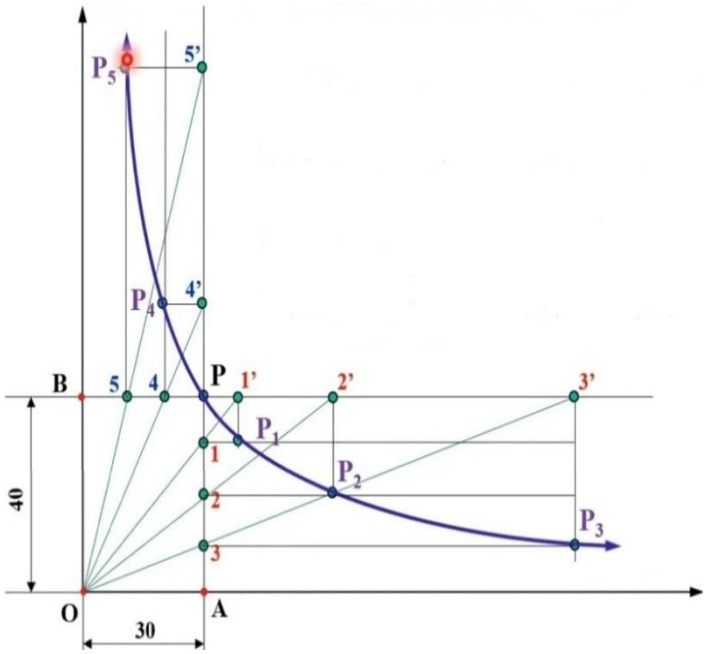
17. Draw a parabola if the distance of the focus from the directrix is 60mm? **(10 June 2022)**

HYPERBOLA

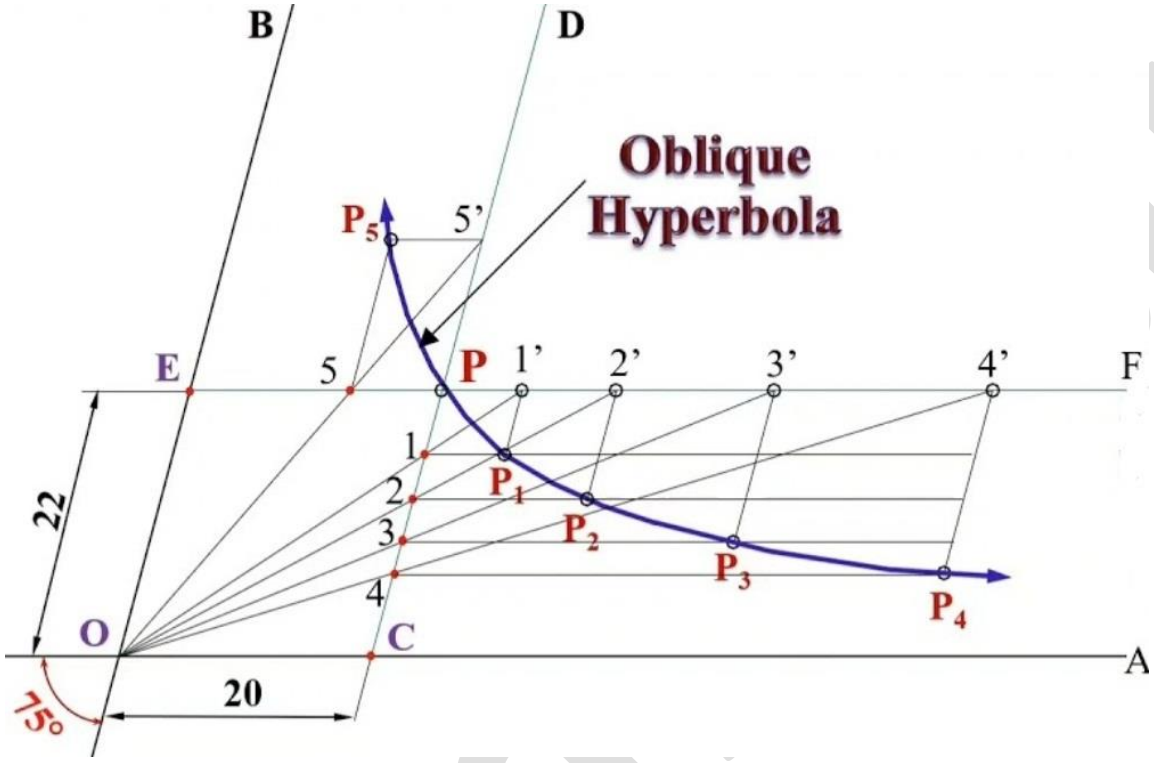
Asymptotes method or Rectangular Hyperbola:

18. Draw a hyperbola having its two asymptotes inclined at 90° to each other and passing through a point P at a distance of 30mm from one asymptote and 50mm from the other. Draw a normal and tangent at any convenient point? **(15M July 2021)**



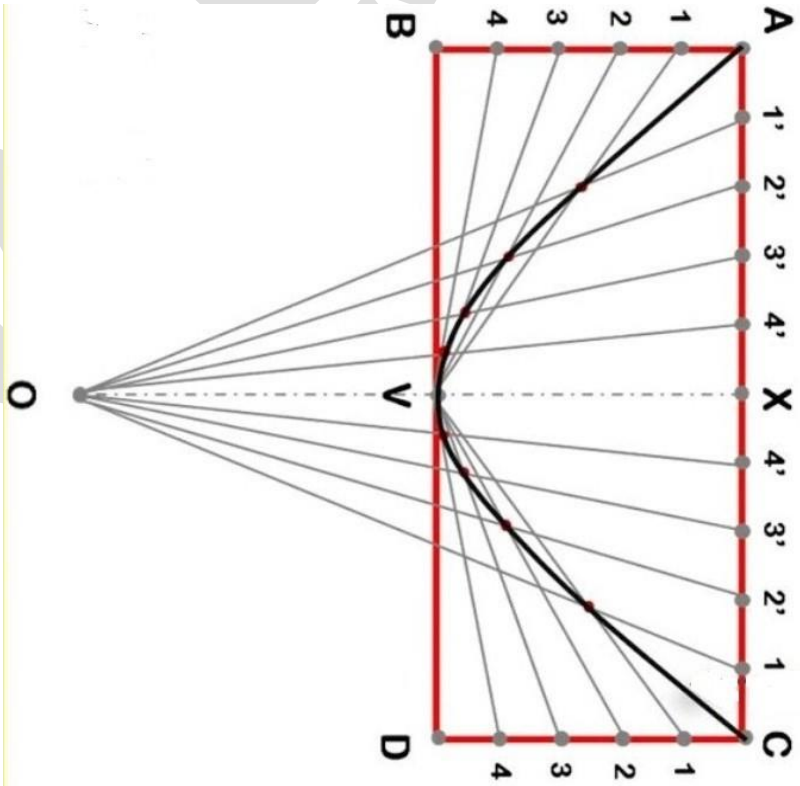


19. Construct a hyperbola through a point which is at a distance of 20 mm and 22 mm from two asymptotes which are inclined at 75°. **(10M, December 2019)**



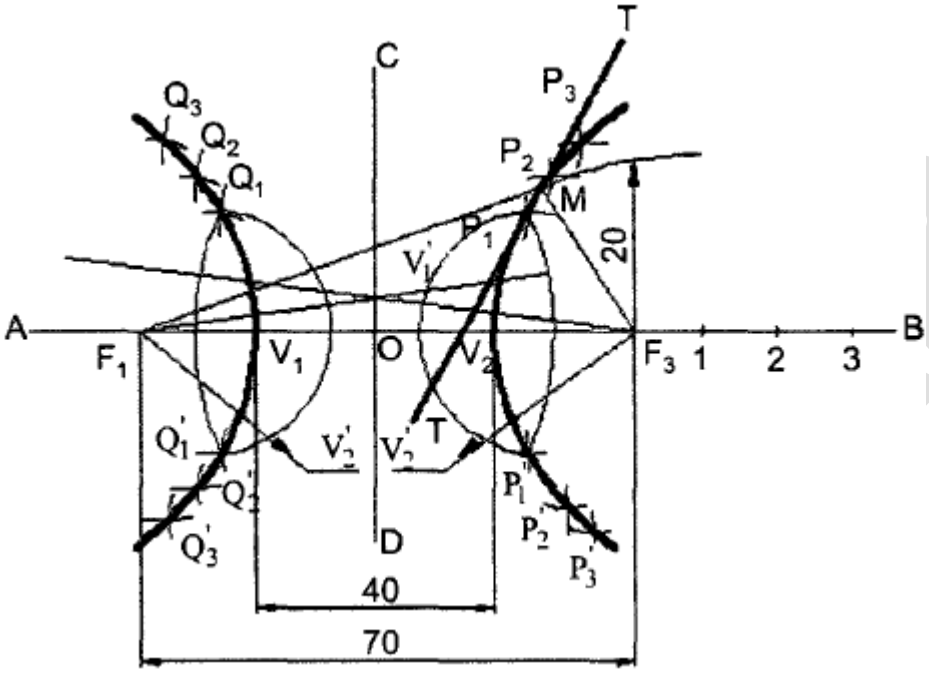
Half transverse axis method:

20. Construct a hyperbola with the following data. i) The transverse axis 80 mm. ii) Abscissa is 50 mm and double ordinate is 90 mm. **(10M July 2021)**



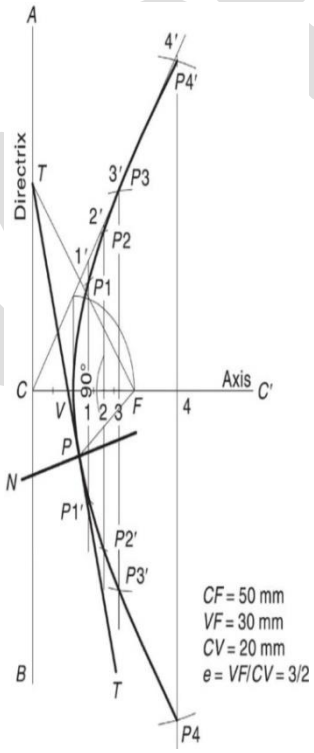
Transverse axis method:

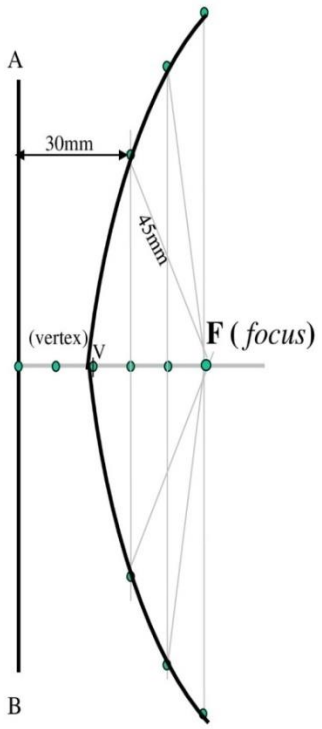
21. Construct a hyperbola with the following data. i) Distance between vertices is 40 mm, ii) Length of the transverse axis is 70 mm.



Eccentricity method:

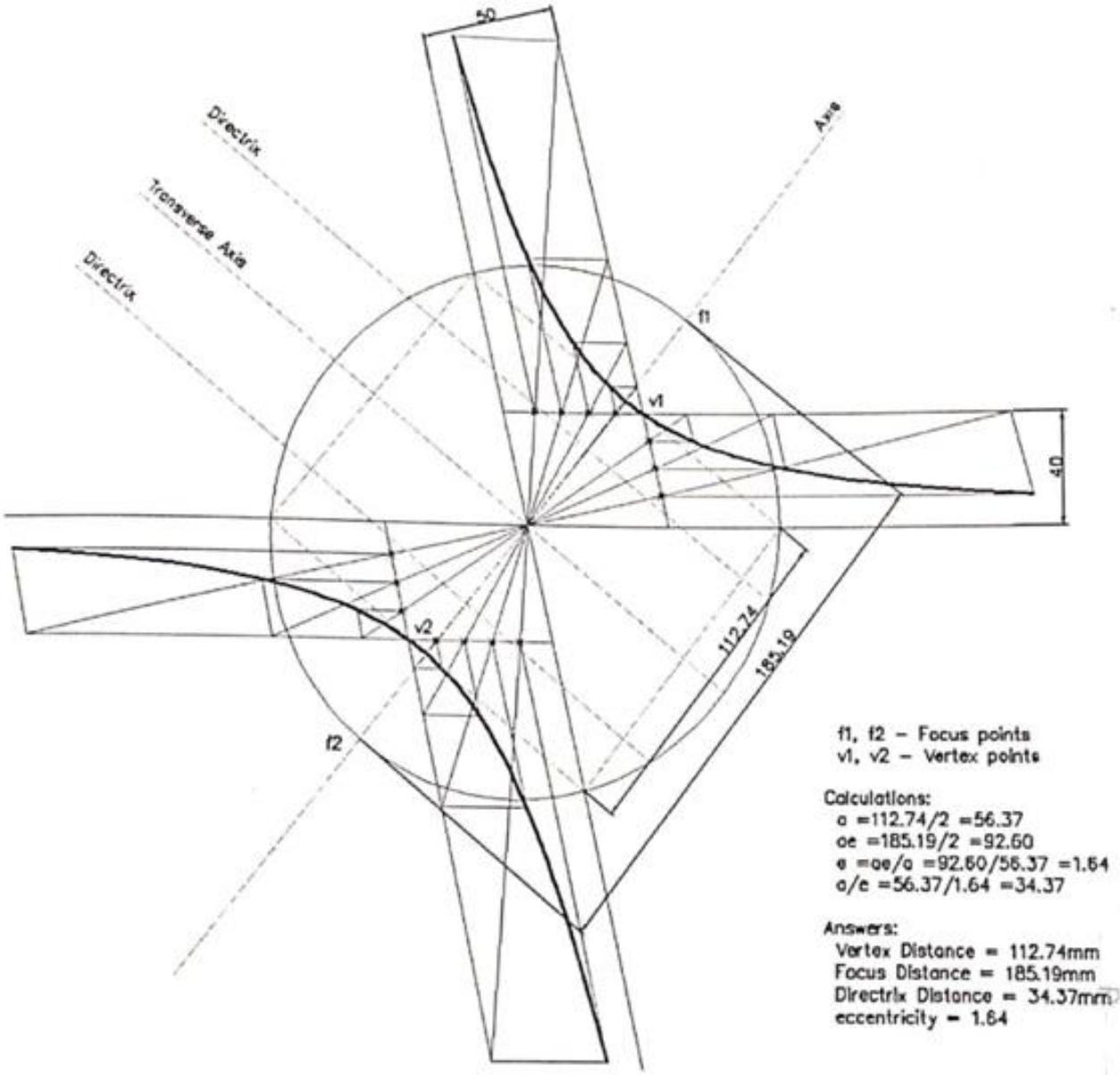
22. Draw a hyperbola when the eccentricity is 3/2 and the distance between focus and directrix is 50 mm. Also draw tangent and normal to the curve at a point 30 mm from focus. **(13M July 2021 25 M 2021 25 M,Dec-2020, 8M Jan 20, June 19, Aug 19)**





UNIT-I CURVES 2022 2023

23. Construct a hyperbola, when the distance of the focus from the directrix is 70mm and eccentricity is 4/3? **(15M July 2021)**
24. The vertex of hyperbola is 65mm from its focus. Draw the curve if the eccentricity is 3/2. Draw a normal & tangent at a point on the curve, 75mm from the directrix? **(10M July 21)**
25. The asymptotes of a hyperbola are inclined at 105° to each other. A Point P on the curve is 40mm and 50mm from the asymptotes respectively. Construct two branches of the hyperbola and determine distance b/w its vertices, distance b/w its directrices, distance b/w its foci and eccentricity. **(15M July 2021)**

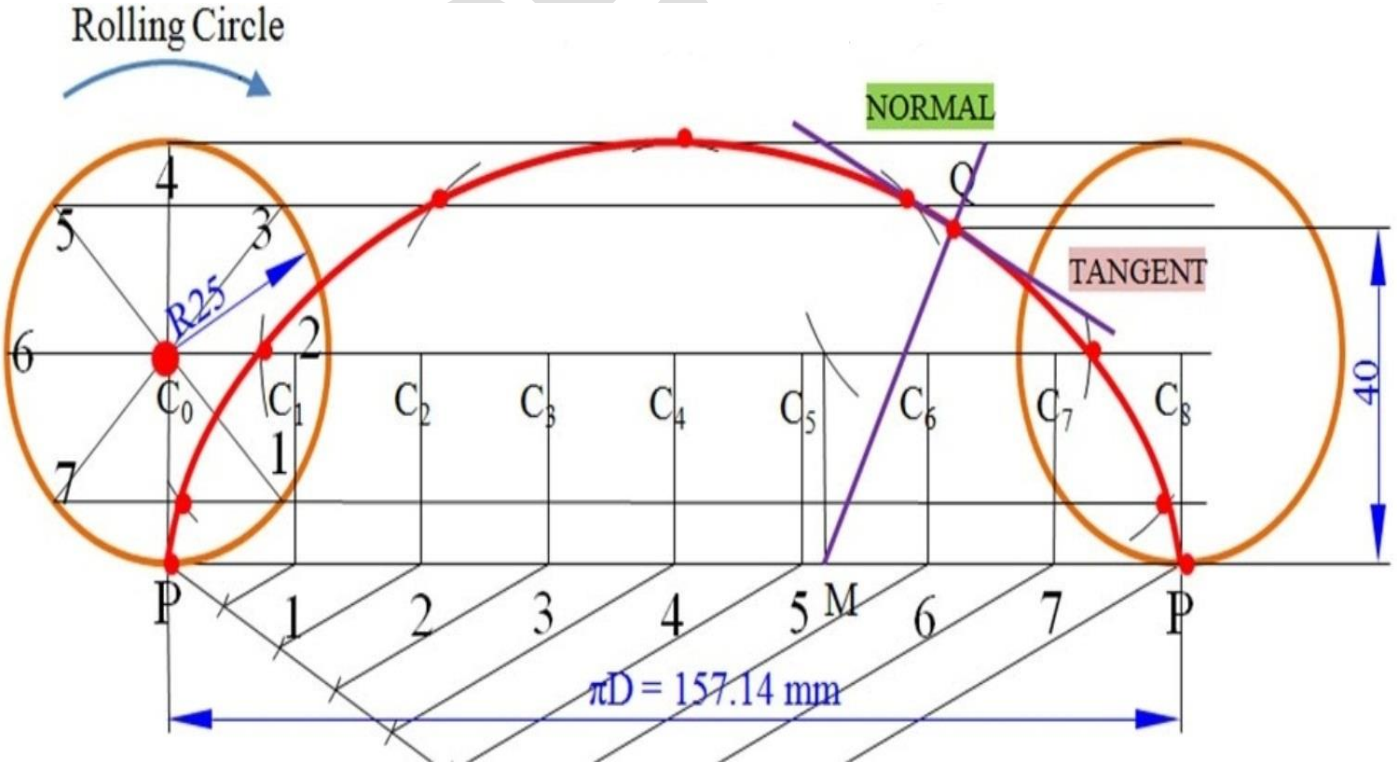


ENGINEERING CURVES (GENERAL CURVES)				
Cycloid	**Epicycloid**	**Hypocycloid**	**Involutes**	**Helix**
Definition: Generating Circle is rolling on a straight Line	Definition: Generating Circle rolling over the Directing Circle	Definition: Generating Circle is rolling inside of the Directing Circle	Definition: Wounding & Unwounding String	Definition: Helical Grooves
Cycloid-Straight (Horizontal)	Diameters of Generating Circle & Directing Circles are different	Diameters of Generating Circle & Directing Circles are different	Lines, Triangular Plane, Square Plane, Pentagonal Plane, Hexagonal Plane, Circular & Semi Circular Planes etc,.	Cylindrical Curve & Conical Curve
Cycloid-Inclined	Diameters of Generating Circle & Directing Circles are Same	Diameter of Directing Circle is twice of the Diameter of the Generating Circle		
Cycloid-Perpendicular (Vertical)		Diameter of Directing Circle is thrice of the Diameter of the Generating Circle		
Note: Generating Circle means Rolling Circle & Directing Circle means Base Circle				

CYCLOID:

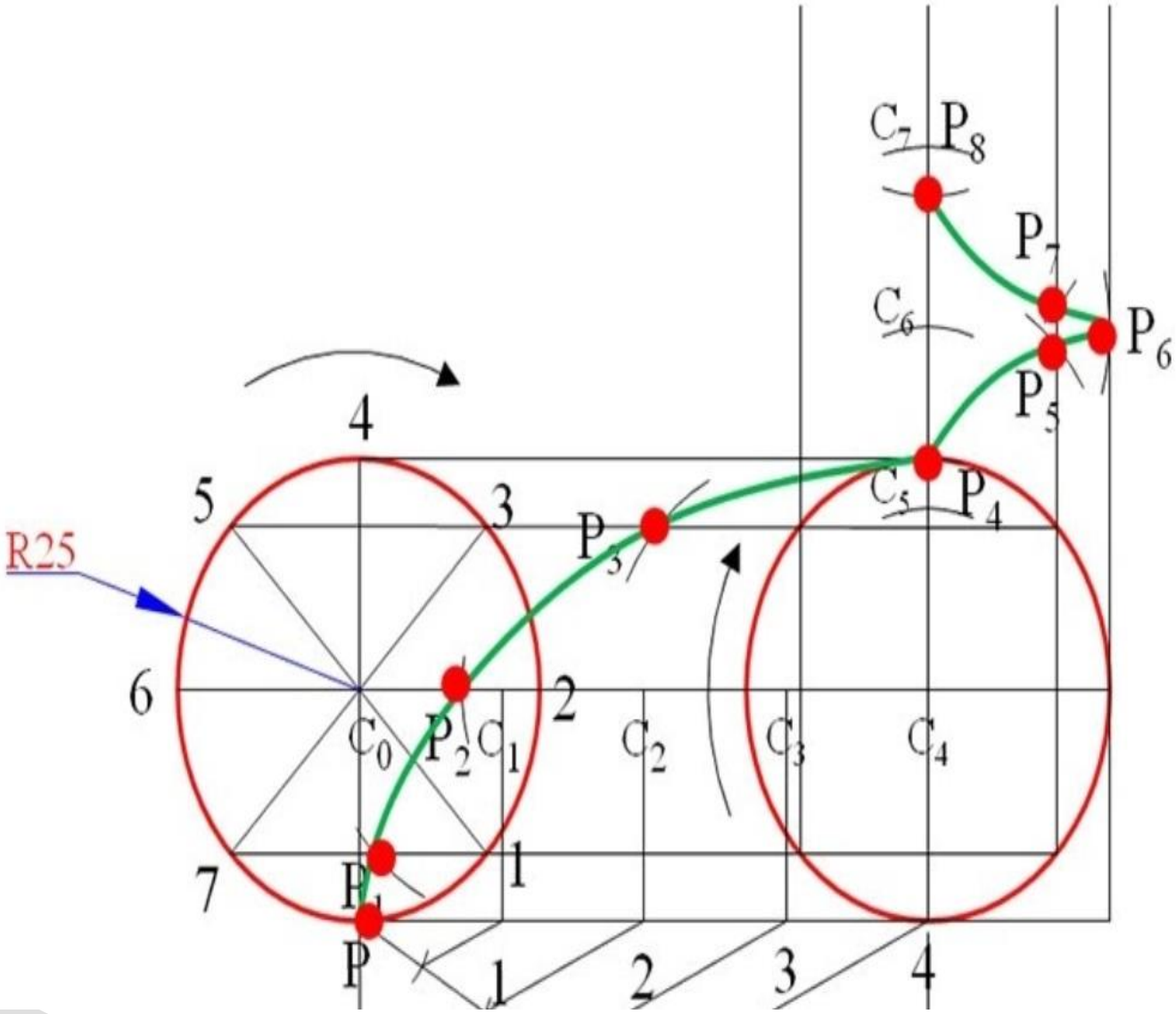
26. A Wheel of 25 mm radius rolls without slipping on a straight road surface. Trace the path of the point of contact for one complete revolution of the circle. Name the curve. Draw a normal and tangent to the curve at a point 40 mm from the straight line.

(25 M, 2021, 25 M, Dec-2020, 8 M, June 2019, Apr, 2018, Dec 16, Aug 19)



27. A Wheel of 50 mm diameter rolls without slipping on a straight road surface. Trace the path of the point of contact for one and half revolution of the circle. Name the curve. Draw a normal and tangent to the curve at a point 35 mm from the straight line.

28. A circle of 40 mm diameter rolls on a horizontal line for a half revolution and then on a vertical line for another half revolution. Draw the curve traced out by a point Q on the circumference of the circle. **(9 M, June 2019)**

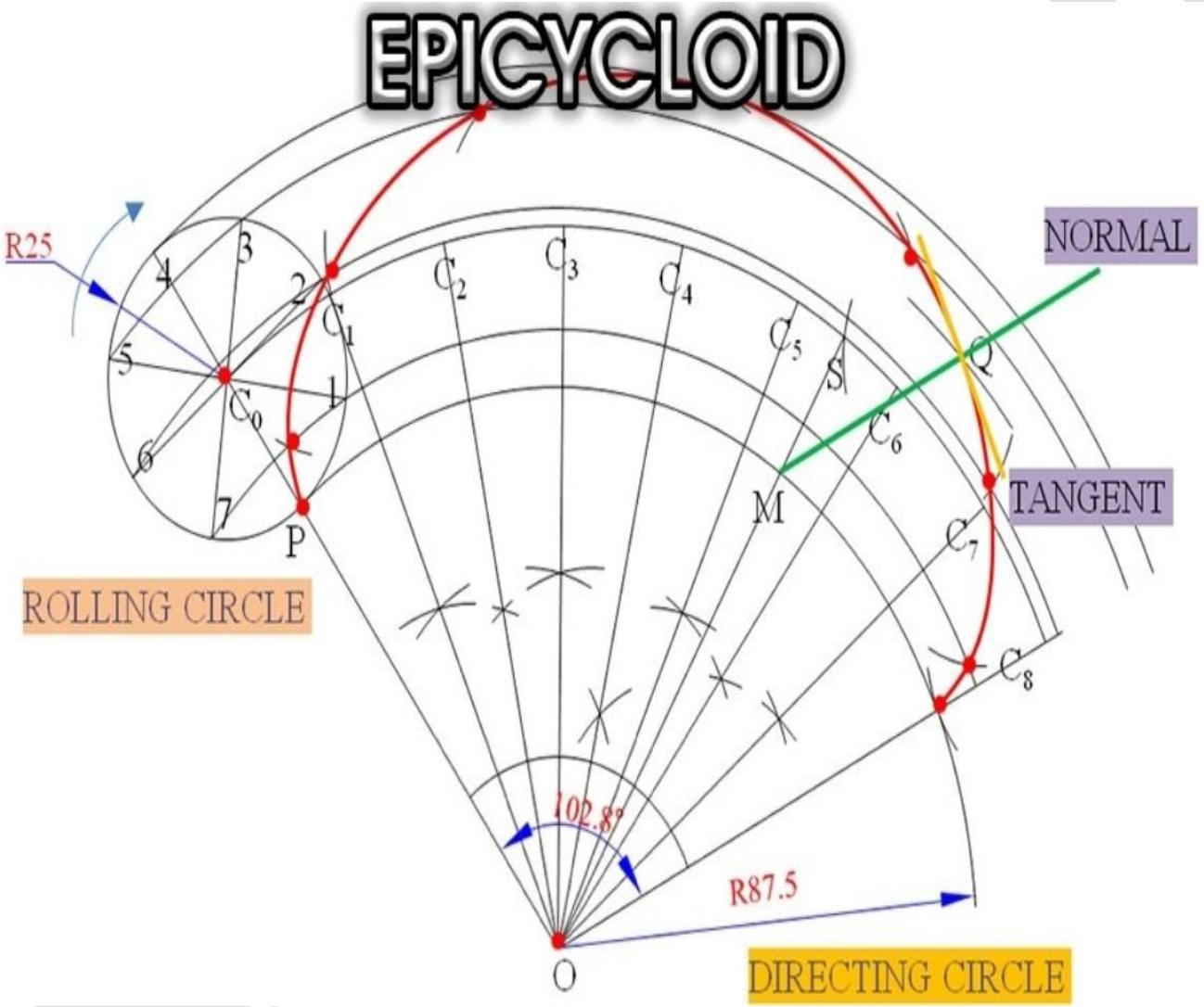


29. Trace the paths of the ends of a straight line AB 100 mm long when it rolls without slipping on a circle of 80 mm diameter. Name the curve. If the same circle rolls without slipping on the fixed straight line of the same length, what is the curve traced by a point on the circle? Draw the curve and name it. Assume the line AB to be the tangent to the circle. **(15 M, January 2020)**

EPICYCLOID:

30. Draw an epi-cycloid of a circle of 25 mm radius rolling outside a circle of diameter 175 mm diameters for one complete revolution. Draw tangent and normal to the curve at any point from the centre of directing circle.

(25 M, 2021, June 2020, June 2017, Aug & May 2019)



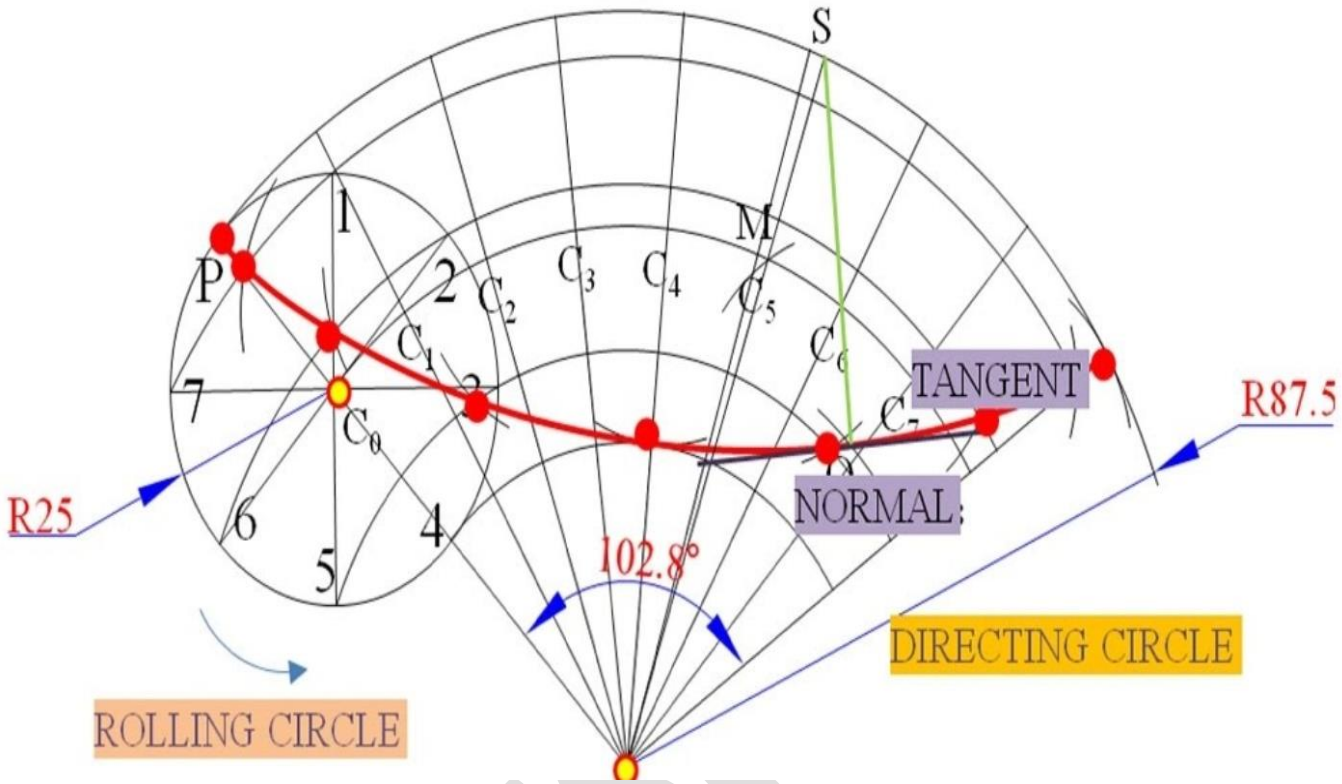
31. A Circle of diameter 50 mm is rolling on another circle of diameter 50 mm. Draw the path traced out by a point on the rolling circle for half revolution of the rolling circle.

(8 M, January 2020)

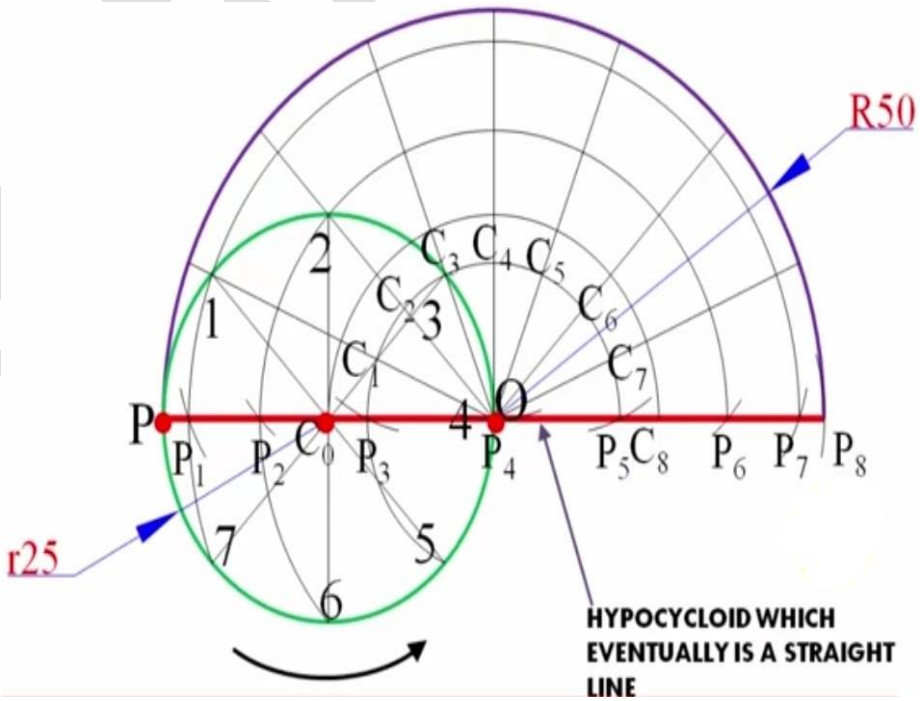
HYPOCYCLOID:

32. A Circle of diameter 40mm rolls inside another circle of radius 60mm. Draw the hypocycloid traced by a point on the rolling circle initially in contact with the directing circle for one revolution? Draw a tangent to it at any point from the centre of the directing circle.**(15M June 2022, 15M June 2022, 12M July 21 8M Jan 20, May 18)**

HYPOCYCLOID



33. Show by means of a drawing that when the diameter of the directing circle is twice that of the generating circle, the hypocycloid is a straight line. Take the diameter of the generating circle equal to 50 mm. **(25 M, 2021, May 2019, May 2018, Aug 2018)**



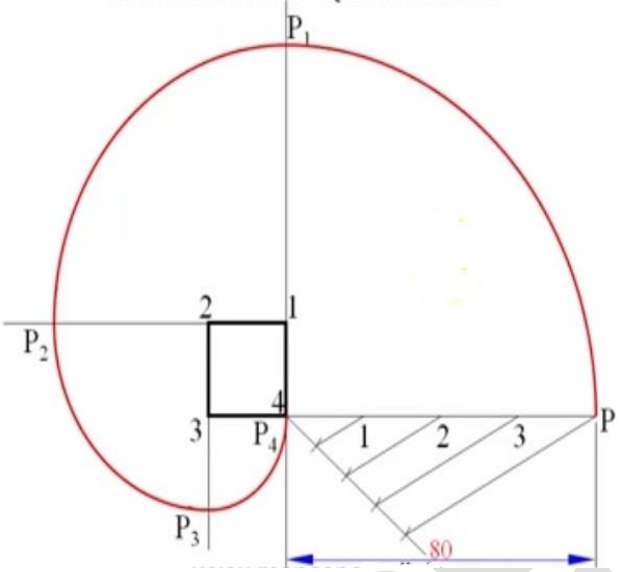
34. Draw a hypocycloid whose diameter of rolling circle is 60 mm and the diameter of the base circle is 180 mm. Draw a tangent and normal at any point on the curve. If the diameter of the base circle is reduced to 120 mm what will be the curve? Construct at least two points on the new curve. **(15 M, May 19)**

INVOLUTES:

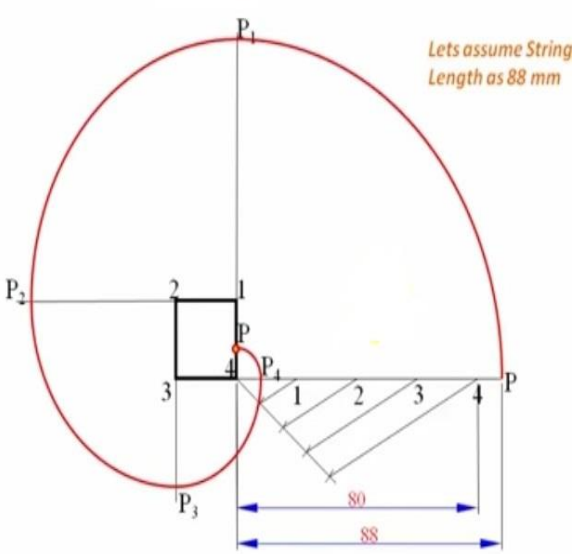
35. Draw the involute of a regular square of side 20 mm for three cases.
(December 16, Aug. 19 7M, Jan 2020, 2018, June 2017, 25 M, 2021, May 2019, May 2019)

Case (i) String length = Square's perimeter Case (ii) String length > Square's perimeter
Case (iii) String length < Square's perimeter

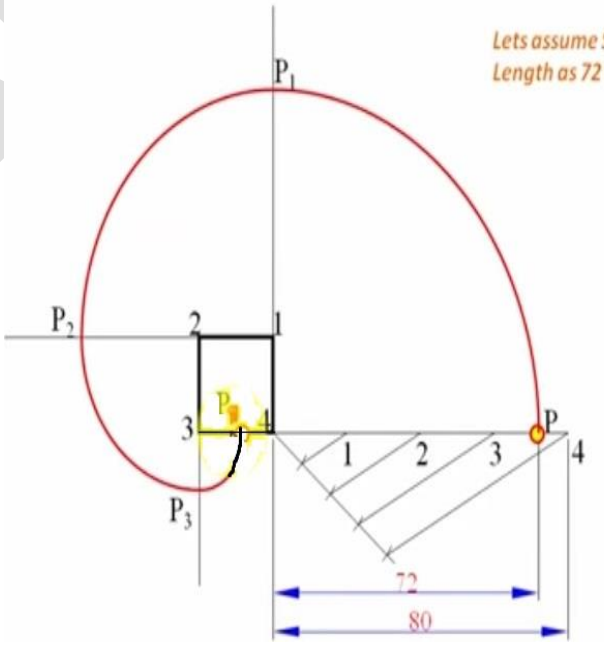
CASE I: STRING LENGTH = SQUARE'S PERIMETER



CASE II: STRING LENGTH > SQUARE'S PERIMETER



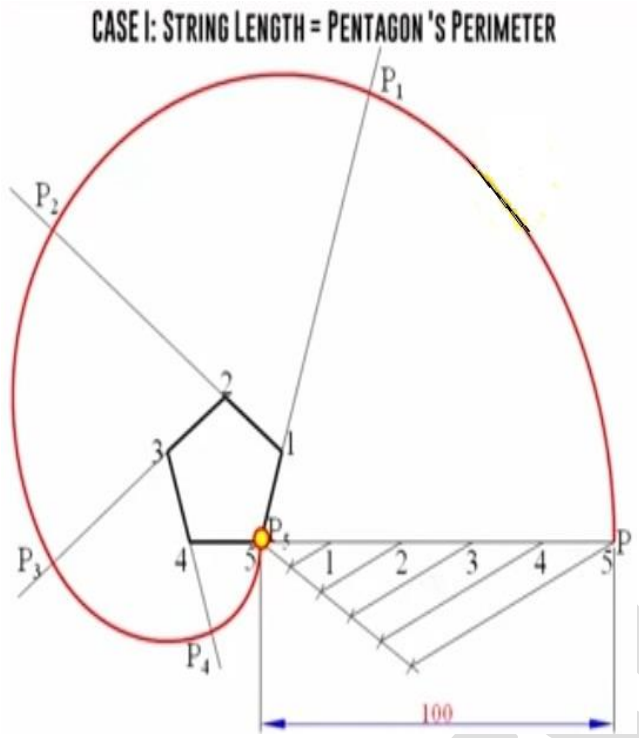
CASE III: STRING LENGTH < SQUARE'S PERIMETER

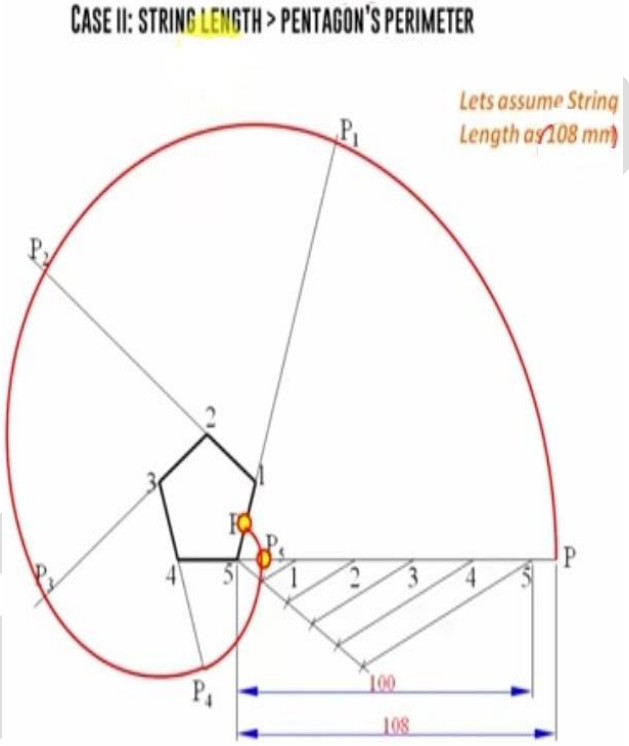


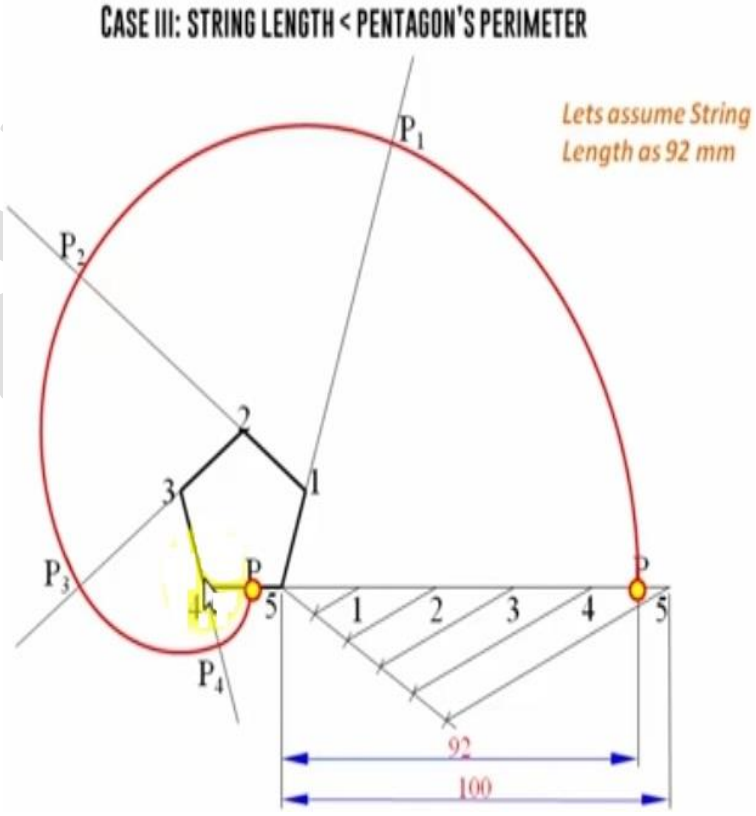
36. Draw the involute of a regular pentagon of side 20 mm for three cases.

(December 16, Aug. 19 7M, Jan 2020, 2018, June 2017)

Case (i) String length = Pentagon's perimeter
Case (ii) String length > Pentagon's perimeter
Case (iii) String length < Pentagon's perimeter



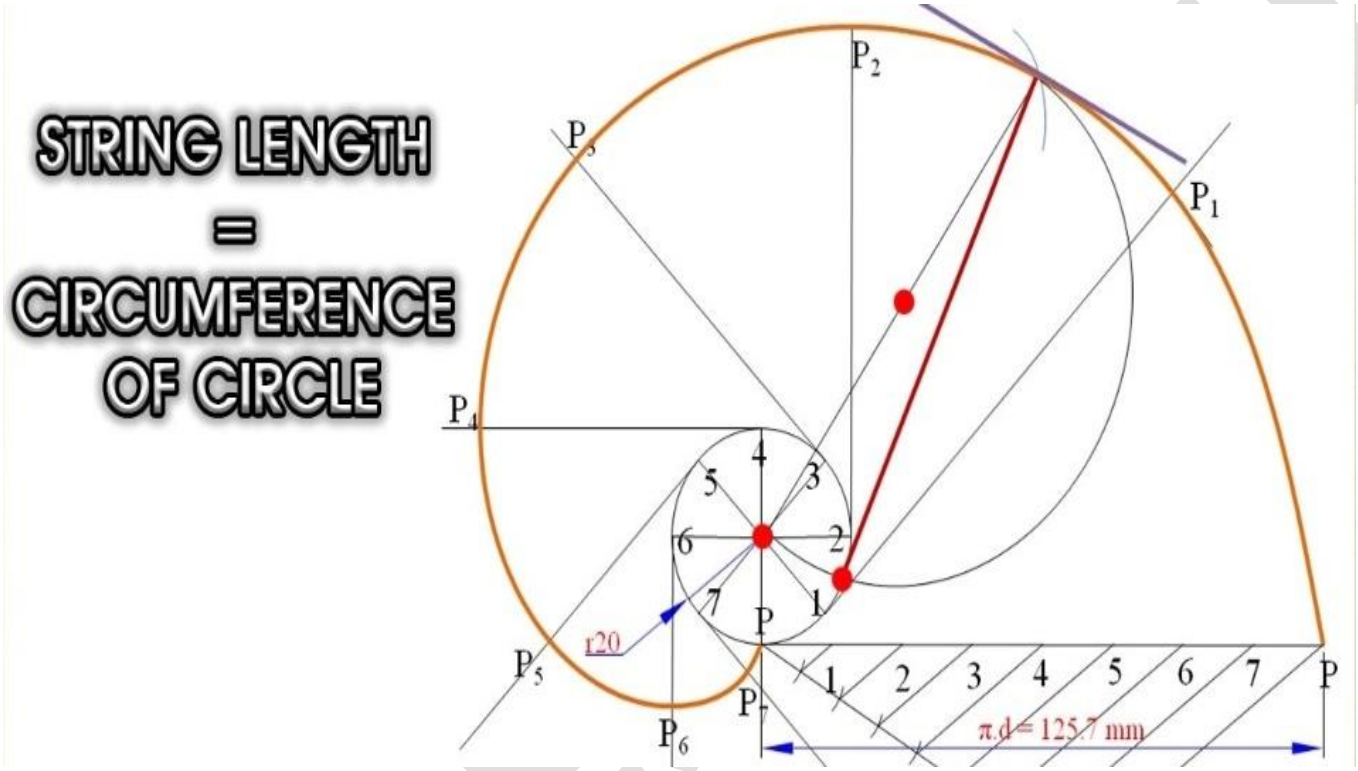


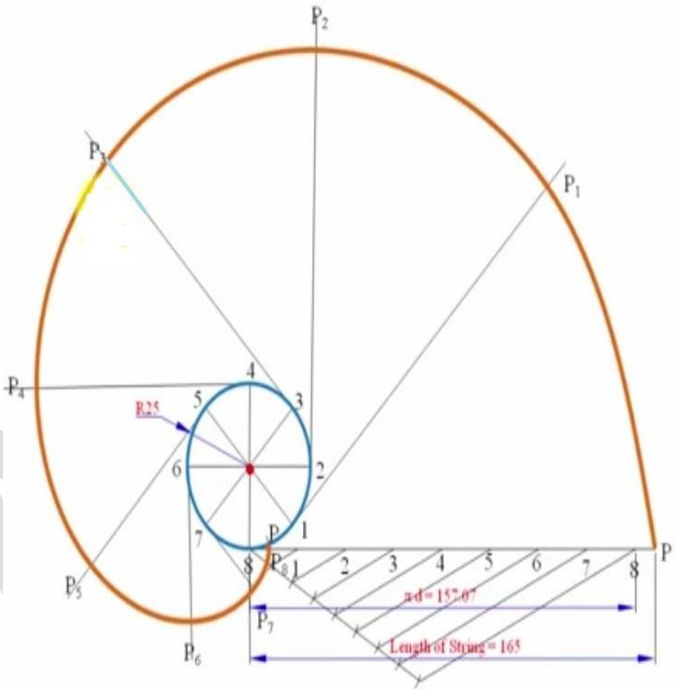


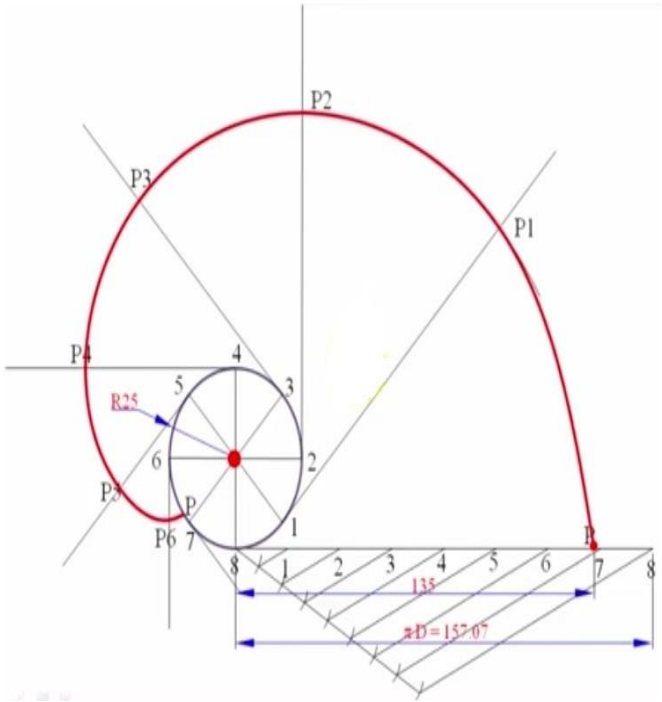
37. Draw the involute of a circle of radius 20 mm for three cases.

(Aug. 19 7M, Jan 2020, 2018, June 2017)

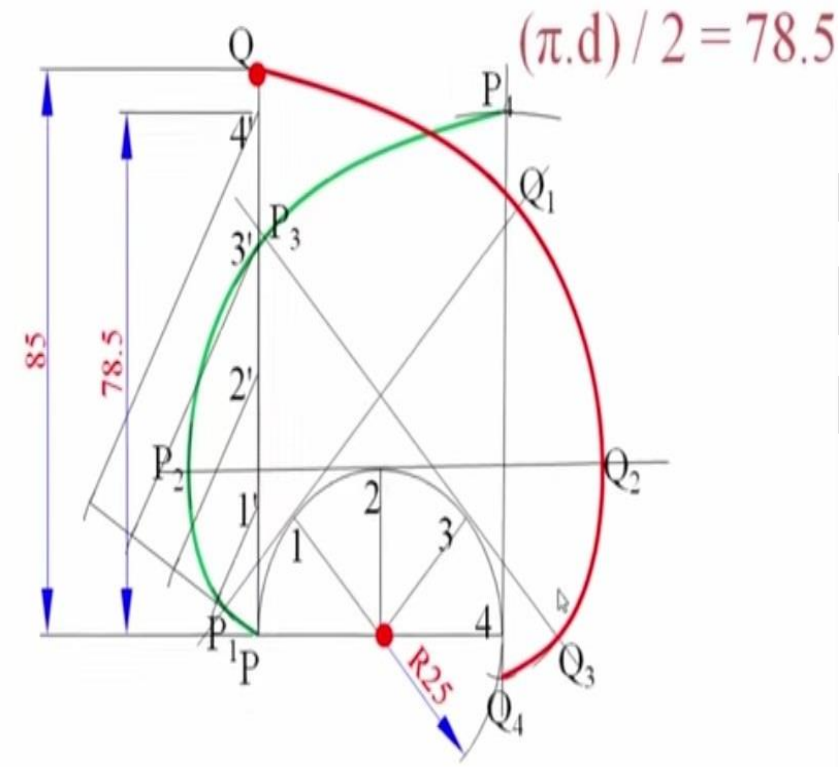
Case (i) String length = Circumference of the circle
Case (ii) String length > Circumference of the circle
Case (iii) String length < Circumference of the circle





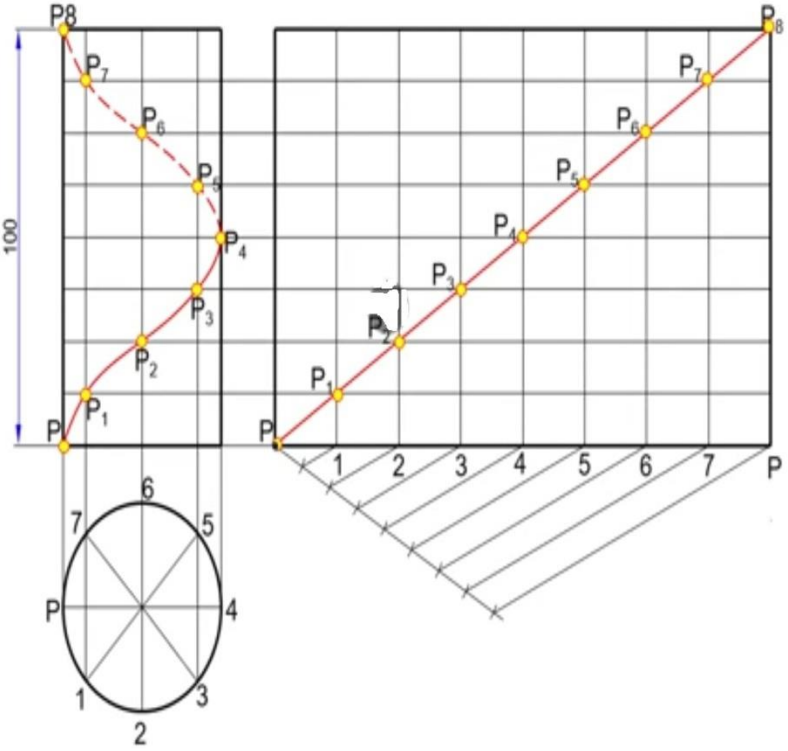


38. Trace the paths of the ends of a rod PQ, 85mm long, when it rolls, without slipping, on a semicircle having its diameter as 50mm long. (Assume the rod PQ to be tangent to the semicircle in the starting position)?



HELIX:

39. Draw a helix of pitch 100 mm and radius of the cylindrical surface is 25 mm. Also, draw a development of the helical curve.



ENGINEERING SCALES

A SCALE IS DEFINED AS THE RATIO OF THE LINEAR DIMENSIONS OF ELEMENT OF THE OBJECT AS REPRESENTED IN A DRAWING TO THE ACTUAL DIMENSIONS OF THE SAME ELEMENT OF THE OBJECT ITSELF.

The scales can be expressed in the following *three* ways:

(1) Scale: In this case, the relation between the dimension on the drawing and the actual dimension of the object is mentioned numerically in the style as 10 mm = 5 m etc.

(2) Graphical scale: The scale is drawn on the drawing itself. As the drawing becomes old, the engineer's scale may shrink and may not give accurate results. However, such is not the case with graphical scale because if the drawing shrinks, the scale will also shrink. Hence, the graphical scale is commonly used in survey maps.

(3) Representative fraction: The ratio of the length of the object represented on drawing to the actual length of the object represented is called the Representative Fraction (i.e. R.F).

$$\text{R.F.} = \frac{\text{Length of the drawing}}{\text{Actual length of object}}$$

To construct a scale the following information is essential:

Step-I: Given Data
Step-II: R.F of the Scale
Step-III: Length of the Scale

Length of the scale = R.F. x Maximum length required to be measured.

Note: If Maximum length is not given take greater than mark length.

Step-IV: Draw a given Scale

UNITS OF MEASUREMENT:

Metric system for linear measurement:

1 kilometer (km) =10 hectometers = 10^5 cm
1 hectometer (Hm) =10decameters = 10^4 cm
1 decameter (Dm or dam) =10metres = 10^3 cm
1 metre (m) =10 decimeters = 10^2 cm
1 decimeter (dm) =10^1 cm
1 centimeter (cm) = 10millimeters (mm)

British system for linear measurement:

1 league = 3miles
1 mile (mi) = 8furlongs
1 furlong (fur) = 10chains
1 chain (ch) = 22yards
1 yard (yd) = 3 feet
1 foot (ft) = 12inches
1 inch (in) = 2.54cm = 25.4mm

The following linear and area conversions is also useful in construction of scales.

Linear conversion:

1 mile =1.609 km
1 inches =25.4mm

Area conversion:

1 are (a) = 100m^2
1 hectare (ha) = 100 ares = 10000m^2
1 square mile = 640 acres
1 acre (ac) = 10 square chain
= 4840 square yards

Types of Scales:

The scales used in practice are classified as under:

1) Plain Scale (For Dimensions up to single decimal);
2) Diagonal Scale (For Dimensions up to two decimals)
3) Vernier Scale (For Dimensions up to three decimals)
4) Comparative scales
5) Scale of chords

Plain Scale (For Dimensions up to single decimal)

A plain scale consists of a line divided into suitable number of equal parts or units, the first of which is sub-divided into smaller parts. Plain scales represent either two units or a unit and its sub-division.

In every scale,

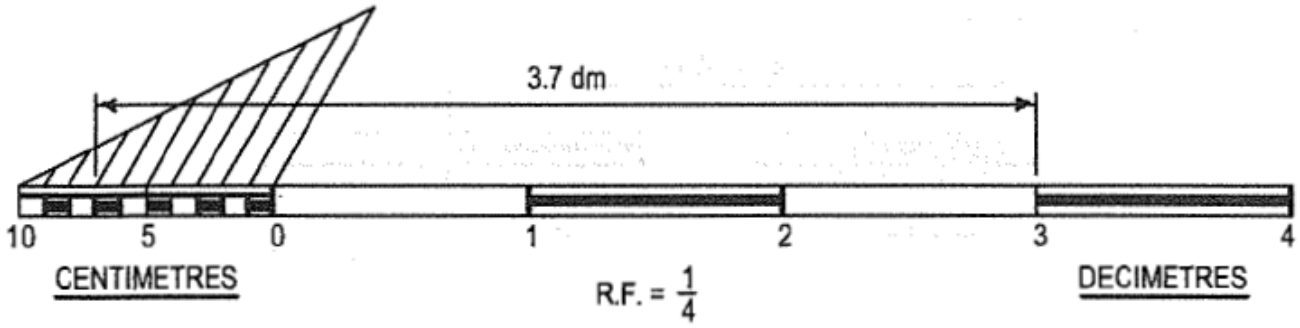
(i) The zero should be placed at the end of the first main division, i.e. between the unit and its sub-divisions.

(ii) From the zero mark, the units should be numbered to the right and its sub- divisions to the left.

(iii) The names of the units and the sub-divisions should be stated clearly below or at the respective ends.

(iv)The name of the scale (e.g. scale, 1:10) or its R.F. should be mentioned below the scale.

1. Construct a scale of 1: 4 to show centimetres and long enough to measure up to 5 decimetres. Show the 3.7 dm on the Scale?



(i) Determine R.F. of the scale. Here it is 1/4

(ii) Determine length of the scale.

Length of the scale=R.F. x maximum length in cm = 1/4 x 5 dm = 1/4 x 5 x 10 cm = 12.5 cm.

(iii) Draw a line 12.5 cm long and divide it into 5 equal divisions, each representing 1 dm.

(iv) Mark O at the end of the first division and 1, 2, 3 and 4 at the end of each subsequent division to its right.

(v) Divide the first division into 10 equal sub-divisions, each representing 1 cm.

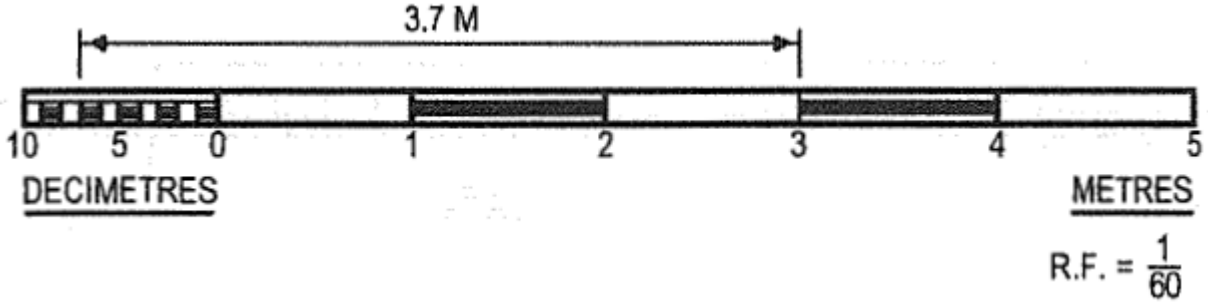
(vi) Mark cms to the left of O as shown in the figure.

To distinguish the divisions clearly, *show the scale as a rectangle of small width (about 3 mm) instead of only a line.*

Draw the division-lines showing decimeters throughout the width of the scale. Draw the lines for the sub-divisions slightly shorter as shown. Draw thick and dark horizontal lines in the middle of all alternate divisions and sub-divisions. This helps in taking measurements. Below the scale, print DECIMETRES on the right-hand side, CENTIMETRES on the left-hand side, and the R.F. in the middle.

To set-off any distance, say 3.7 dm, place one leg of the divider on 3 dm mark and the other on 7 cm mark. The distance between the ends of the two legs will represent 3.7 dm.

2. Draw a scale of 1: 60 to show metres and decimetres and long enough to measure up to 6 metres. Mark the 3.7 m on the Scale?



(i) Determine R.F. of the scale, here R.F=1/60

(ii) Determine length of the scale.

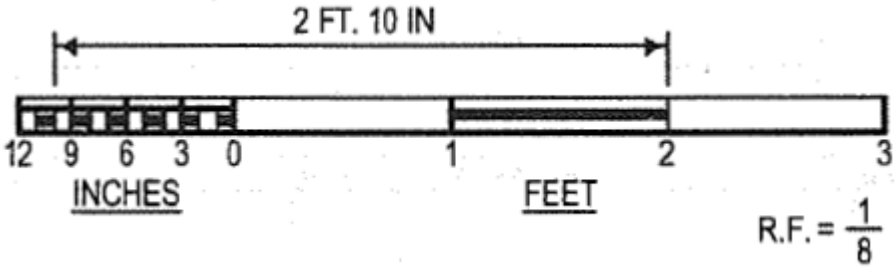
Length of the scale = R.F. x maximum length in cm = 1/60x 6 m = 1/10 m = 10 cm.

(iii) Draw a line 10 cm long and divide it into 6 equal parts.

(iv) Divide the first part into 10 equal divisions and complete the scale as shown.

The length 3.7 metre is shown on the scale.

3. Construct a scale of 1.5 inches = 1 foot to show inches and long enough to measure up to 4 feet. Mark the value of 2 feet 10 inches on the Scale.



(i) Determine R.F. of the scale.

$$\textbf{R.F.} = \frac{1.5 \text{ inches}}{1 \text{ foot}} = \frac{1.5 \text{ inches}}{1 \times 12 \text{ inches}} = \frac{1}{8}$$

(ii) Length of the scale = R.F. x maximum length in cm

= 1/8 x 4 feet

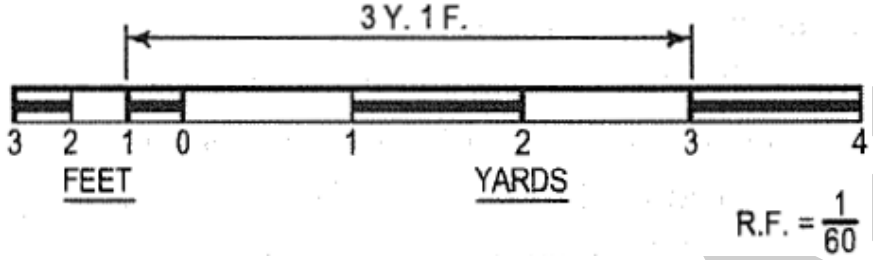
= 1/8 x 4 x 12 inches

= 1/8 x 4 x 12 x 2.54 cm

= 15.24 cm

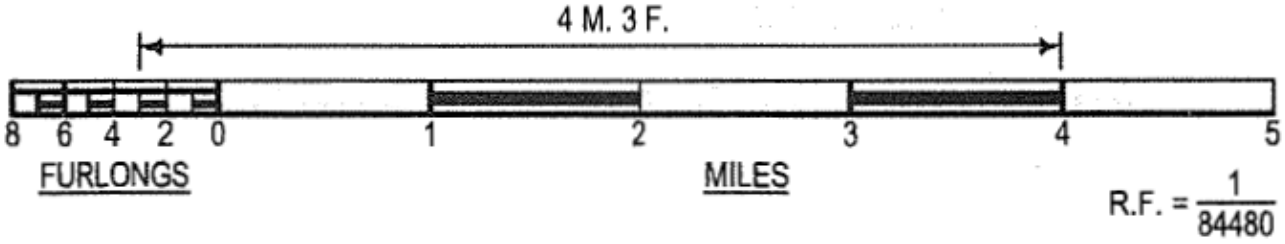
(iii) Draw a 5.24 cm line; divide it into four equal parts, each part representing one foot.
(iv) Divide the first division into 12 equal parts, each representing 1". Complete the scale as explained in above problems. The distance 2'-10" is shown measured in the figure.

4. Construct a scale of R.F=1/60 to read yards and feet, and long enough to measure up to 5 yards. Mark the 3 Yards and 1 foot on the Scale?



(i) Determine R.F. of the scale. Here it is 1/60
(ii) Determine the Length of the scale.
Length of the scale = R.F. x maximum length in cm
= 1/60 x 5 yards
= 1/12 yards
= 3 inches
= 7.62 cm [1 inch (in) = 25.4mm = 2.54cm]
(iii) Draw a line 7.62 cm long and divide it into 5 equal parts.
(iv) Divide the first part into 3 equal divisions and mark the scale as shown in the figure.

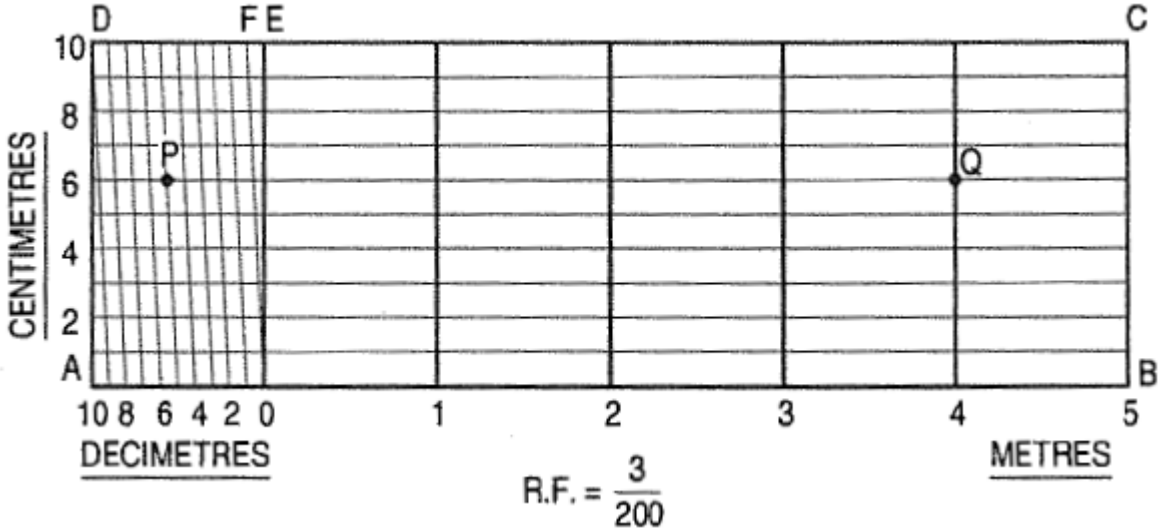
5. Construct a scale of R.F. = 1/84480 to show miles and furlongs and long enough to measure up to 6 miles. Show the distance of 4 miles and 3 furlongs



(i) Determine R.F. of the scale. Here it is 1/84480
(ii) Determine the Length of the scale.
Length of the scale = R.F. x maximum length
= 1/84480 x 6 miles
= 1/84480 x 6 x 8 furlongs
= 1/84480 x 6 x 8 x 10 chains
= 1/84480 x 6 x 8 x 10 x 22 yards
= 1/84480 x 6 x 8 x 10 x 22 x 3 feet
= 1/84480 x 6 x 8 x 10 x 22 x 3 x 12 inches
= 1/84480 x 6 x 8 x 10 x 22 x 3 x 12 x 2.54 cm
= 11.43 cm
(iii) Draw a line 11.43 cm long and divide it into 6 equal parts.
(iv) Divide the first part into 8 equal divisions and mark the scale as shown in the figure.

Diagonal Scale (For Dimensions up to two decimals)

6. Construct a diagonal scale of 3:200 showing meters, decimetres and centimetres and long enough to measure up to 6 meters. Show the distance of 4.56m on the Scale?



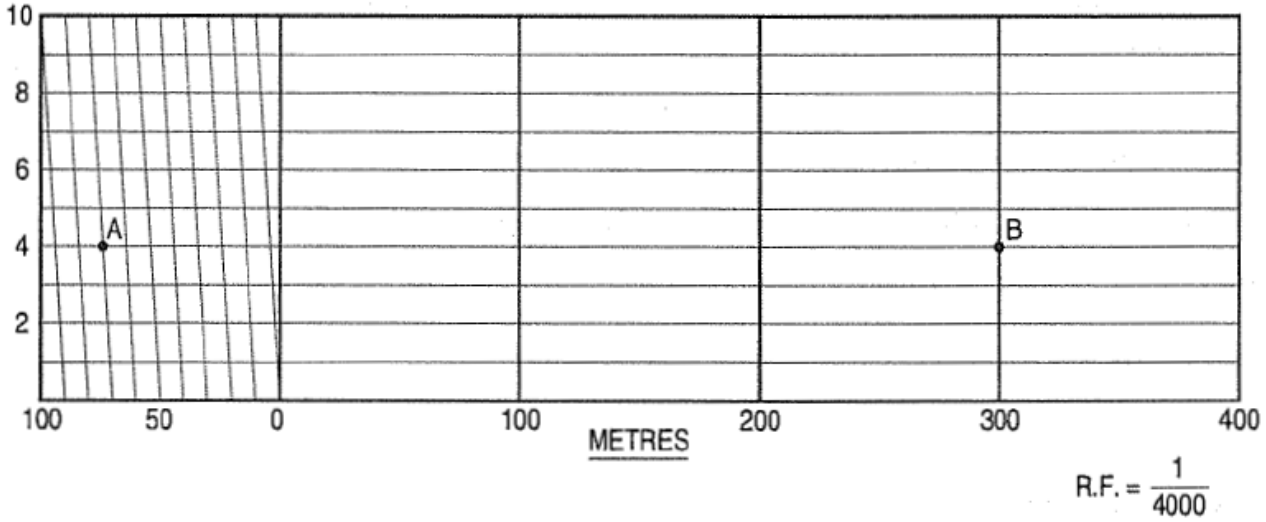
$$R.F. = \frac{3}{200}$$

(i) Determine R.F. of the scale. Here it is 3/200
(ii) Determine the Length of the scale.
Length of the scale = R.F. x maximum length in cm
= 3/200 x 6 meters
= 3/200 x 6 x 100 cm
= 9 cm
(iii) Draw a line *AB 9* cm long and divide it into 6 equal parts. Each part will show a metre.
(iv) Divide the first part *A0* into 10 equal divisions, each showing a decimeter or 0.1 m.
(v) At *A* erect a perpendicular and step-off along it, 10 equal divisions of any length, ending at *D.* Complete the rectangle *ABCD.*
(vi) Erect perpendiculars at metre-divisions 0, 1, 2, 3 and 4.
(vii) Draw horizontal lines through the division-points on *AD.*
(viii) Join *D* with the end of the first division along *A0,* viz. the point 9.
(ix) Through the remaining points i.e. 8, 7, 6 etc. draw lines parallel to *D9.*

In a triangle *OFE, FE* represents 1 dm or 0.1 m. Each horizontal line below *FE* progressively diminishes in length by 0.1 *FE.* Thus, the next line below *FE is* equal to *0.9 FE and* represents 0.9 A1 dm = 0.9 dm or 0.09 m or 9 cm.

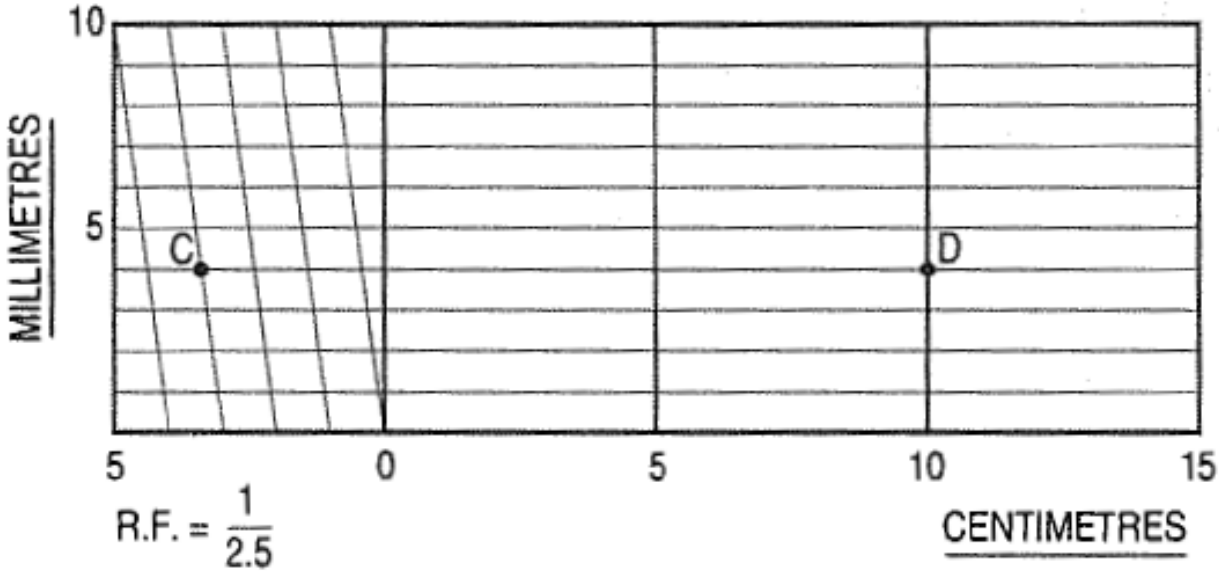
Any length between 1 cm or 0.01 m and 6 m can be measured from this scale. To show a distance of 4.56 metres, i.e. 4 m, 5 dm and 6 cm, place one leg of the divider at Q where the vertical through 4 m meets the horizontal through 6 cm and the other leg at *P* where the diagonal through 5 dm meets the same horizontal.

7. Construct a diagonal scale of R.F. = 1/4000 to show meters and long enough to measure up to 500 meters. Show the distance of 374 meters on the scale?



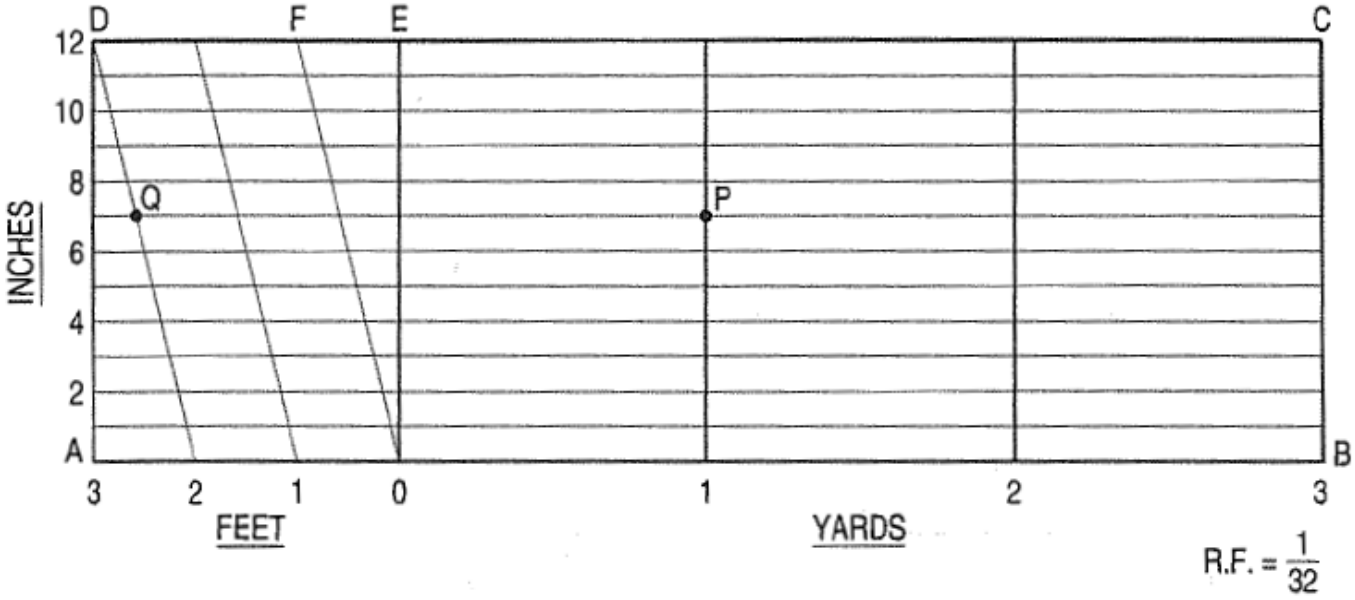
(i) Determine R.F. of the scale. Here it is 1/4000
(ii) Determine the Length of the scale.
Length of the scale = R.F. x maximum length in cm
= 1/4000 x 500 meters
= 1/4000 x 500 x 100 cm
= 12.5 cm
(iii) Draw a line 12.5 cm long and divide it into 5 equal parts. Each part will show 100 meters. Divide the first part into ten equal divisions. Each division will show 10 metres.
(iv) At the left-hand end, erect a perpendicular and on it, step-off 10 equal divisions of any length. Draw the rectangle and complete the scale as explained in above problems. The distance between points *A* and *B* shows 374 metres.

8. Draw a diagonal scale of 1: 2.5 showing centimetres and millimetres and long enough to measure up to 20 centimetres. Indicate the distance of 13.4 cm on the scale?



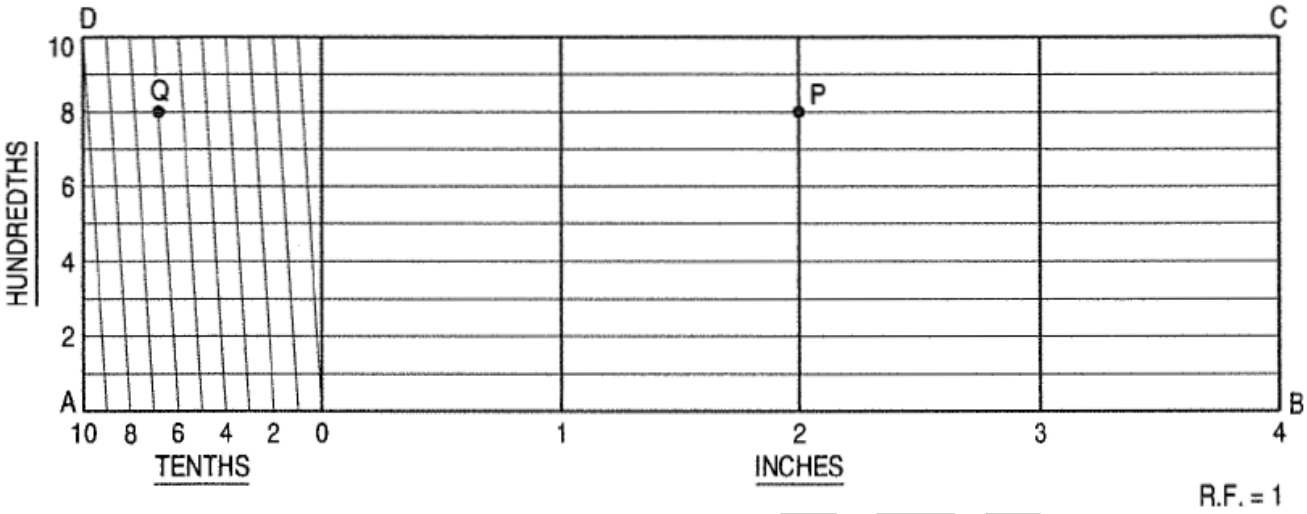
(i) Determine R.F. of the scale. Here it is 1/2.5
(ii) Determine the Length of the scale.
Length of the scale = R.F. x maximum length in cm
= 1/2.5 x 20 centimeters
= 8 cm
(iii) Draw a line 8 cm long and divide it into 4 equal parts. Each part will represent a length of 5 cm. Divide the first part into 5 equal divisions. Each division will show 1 cm.
(iii) At the left-hand end of the line, draw a vertical line and on it, step-off 10 equal divisions of any length.
(iv) Draw the rectangle and complete the scale as explained in above problems.
The distance between points *C* and *D shows* 13.4 centimeters.

9. Construct a diagonal scale of R.F. = 1/32 to showing yards, feet and inches and to measure up to 4 yards. Show a distance of 1 yard, 2 feet and 7 inches on the scale?



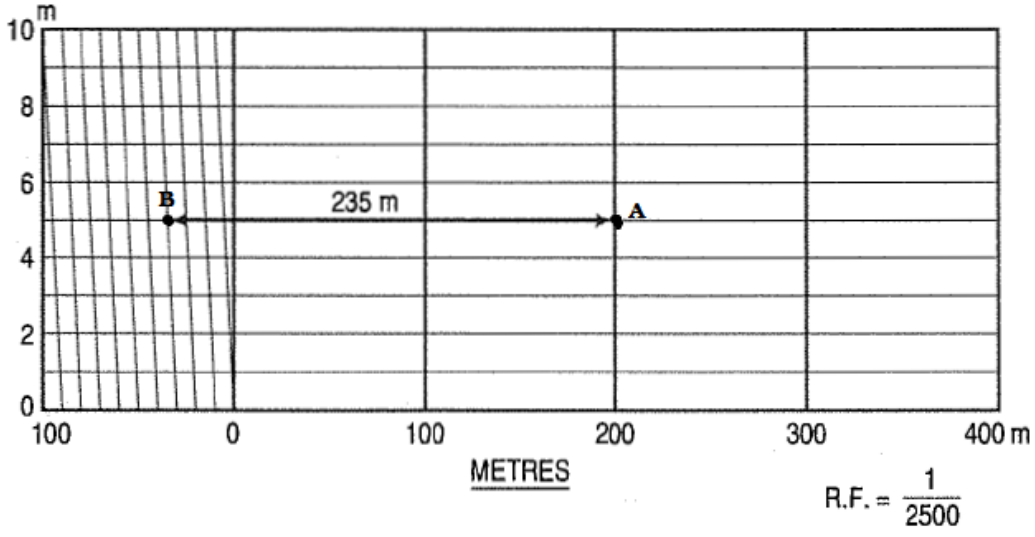
(i) Determine R.F. of the scale. Here it is 1/32
(ii) Determine the Length of the scale.
Length of the scale = R.F. x maximum length in cm
= 1/32 x 4 yards
= 1/32 x 4 x 3 feet
= 1/32 x 4 x 3 x 12 inches
= 1/32 x 4 x 3 x 12 x 2.54 cm
= 11.43 cm
(iii) Draw a line 11.43 cm long and divide it into 4 equal parts. Divide the first part into 3 equal divisions showing feet.
(iii) At the left-hand end of the line, draw a vertical line and on it, step-off 12 equal divisions of any length.
(iv) Draw the rectangle and complete the scale as explained in above problems.
The distance between points *P* and *Q shows* 1 yard, 2 feet and 7 inches.

10. Construct a scale of full size, showing 1/100 inch and to measure up to 5 inches. Mark a 2.68 inches on the scale?



(i) Determine R.F. of the scale. Here it is 1/100
(ii) Determine the Length of the scale.
Length of the scale = R.F. x maximum length in cm
= 1 x 5 inches
= 1 x 5 x 2.54 cm
= 12.7 cm
(iii) Draw a line 12.7 cm long and divide it into 5 equal parts. Each part will show one inch. Subdivide the first part into 10 equal divisions. Each division will measure 1/10 inch.
(iii) At A, draw a perpendicular to AB and on it, step-off 10 equal divisions of any length.
(iv) Draw the rectangle ABCD and complete the scale as explained in above problems.
The distance between points *QP shows* 2.68 inches.

11. 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 one metre. Mark the length of 235 metre on the scale. What is the R.F. of the scale?



The area of the field = 50,000 sq m = 50,000 m^2

The area of the field on the map = 10 cm x 8 cm = 80 cm^2

(i) Determine R.F. of the scale.

$$\textbf{R.F.} = \frac{\surd 80\ cm^2}{\surd 50{,}000\ m^2} = \frac{1\ cm}{25\ m} = \frac{1\ cm}{25 \times 100\ cm} = \frac{1}{2500}$$

(ii) Determine the Length of the scale.

Length of the scale = R.F. x maximum length in cm

= 1/2500 x 500 meters = 1/2500 x 500 x 100 cm = 20 cm

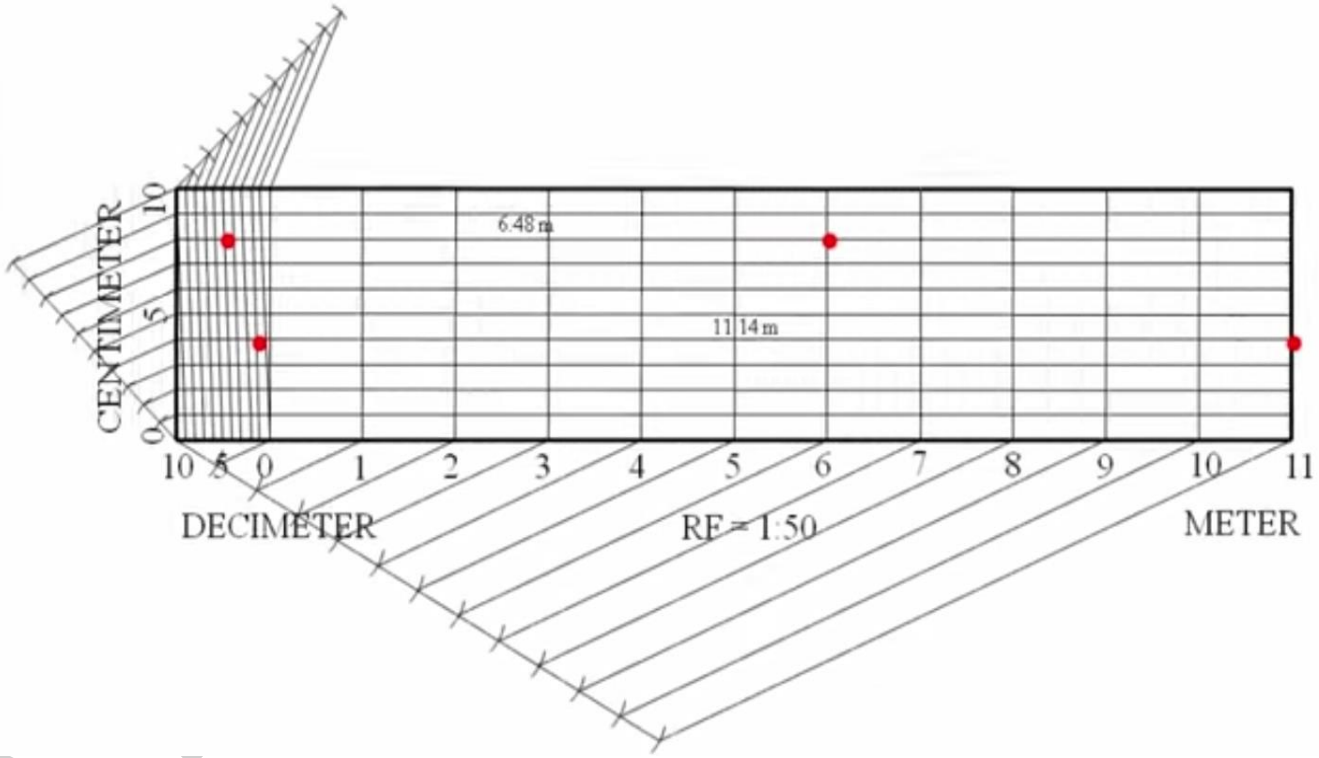
(iii) Draw a line 20 cm long and divide it into 5 equal parts. Each part will show 100 meters. Subdivide the first part into 10 equal divisions. Each division will measure 10 m.

(iii) At A, draw a perpendicular to AB and on it, step-off 10 equal divisions of any length.

(iv) Draw the rectangle ABCD and complete the scale as explained in above problems.

The distance between two points A and B is 235 meters.

12. On a Building Plan, a line 20cm long represents a distance of 10m. Draw a diagonal scale for the plan to read m, dm & cm. Show on your scale the lengths 6.48m and 11.14m?



(i) Determine R.F. of the scale. We will get R.F = 1:50

(ii) Determine the Length of the scale. We will get

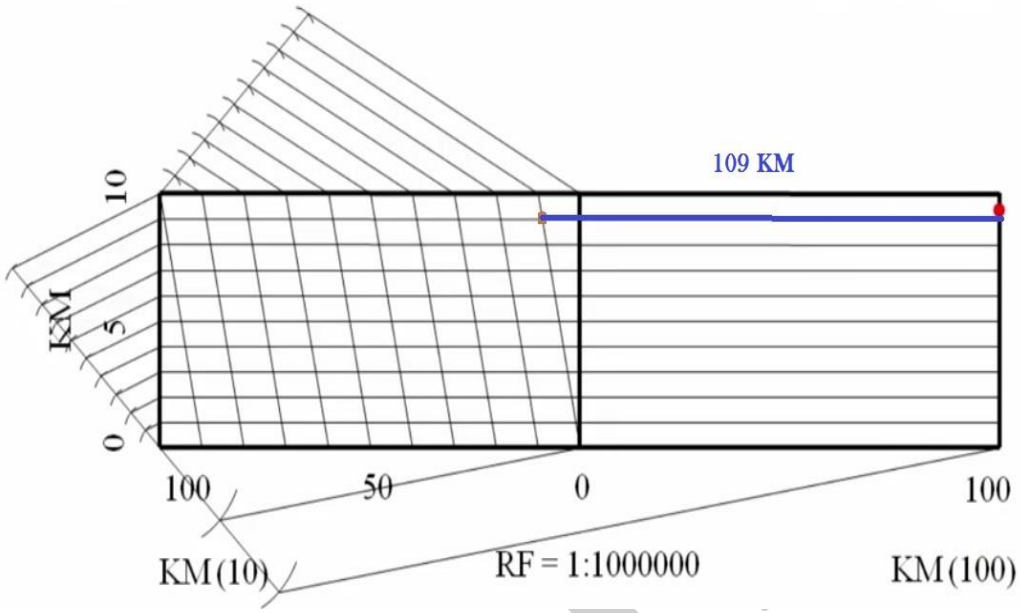
Length of the scale = R.F. x maximum length in cm = 24 cm

(iii) Draw a line 24 cm long and divide it into 12 equal parts. Each part will show one meter. Subdivide the first part into 10 equal divisions. Each division will measure 1 dm.

(iv) Do the same process what we did in above problems & complete the Scale.

(v) Mark the values of 6.48m & 11.14m.

13. The distance between Hyderabad and Vijayawada is 156 km. They are shown 156mm apart on a road map. What is R.F & Construct a diagonal scale to measure up to 200 km and show the distance of 109 km?



(i) Determine R.F. of the scale. We will get R.F = 1:1000000
(ii) Determine the Length of the scale. We will get
Length of the scale = R.F. x maximum length in cm = 20 cm
(iii) Draw a line 20 cm long and divide it into 2 equal parts. Each part will show 100 km. Sub divide the first part into 10 equal divisions. Each division will measure 10 km.
(iv)Do the same process what we did in above problems & complete the Scale.
(v) Marking the value of 109 km.

Vernier Scale (For Dimensions up to three decimals)

Vernier scales: Vernier scales, like diagonal scales, are used to read to a very small unit with great accuracy. A Vernier scale consists of two parts - a primary scale and a Vernier. The primary scale is a plain scale fully divided into minor divisions.

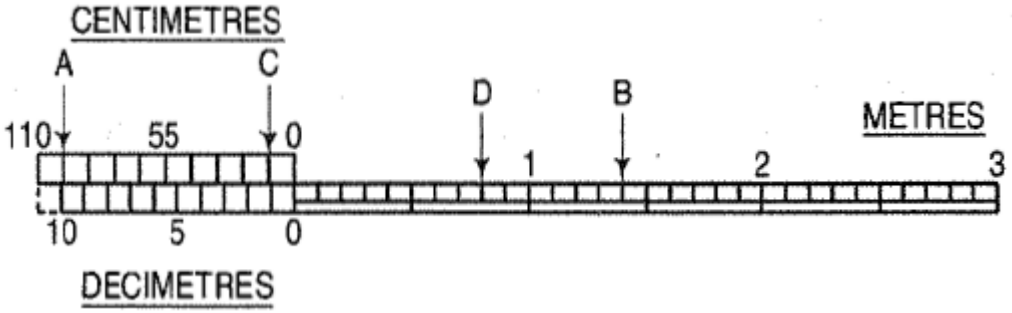
As it would be difficult to sub-divide the minor divisions in the ordinary way, it is done with the help of the Vernier. The graduations on the Vernier are derived from those on the primary scale.

The Vernier scales are classified as under:

(i) Forward Vernier: In this case, the length of one division of the Vernier scale is smaller than the length of one division of the primary scale. The Vernier divisions are marked in the same direction as that of the main scale.

(ii) Backward Vernier: The length of each division of Vernier scale is greater than the length of each division of the primary scale. The numbering is done in the opposite direction as that of the primary scale.

14. Draw a Vernier scale of R.F = 1:25 to read centimetres up to 4 metres and on it, show lengths representing 2.39 m and 0.91 m.



(i) Determine R.F. of the scale. Here it is 1/25

(ii) Determine the Length of the scale.

Length of the scale = R.F. x maximum length in cm

= 1/25 x 4 meters

= 1/25 x 4 x 100 cm

= 16 cm

(iii) Draw a line 16 cm long and divide it into 4 equal parts to show metres. Divide each of these parts into 10 equal parts to show decimeters.

(iv) To construct a Vernier, take 11 parts of dm length and divide it into 10 equal parts. Each of these parts will show a length of 1.1 dm or 11 cm.

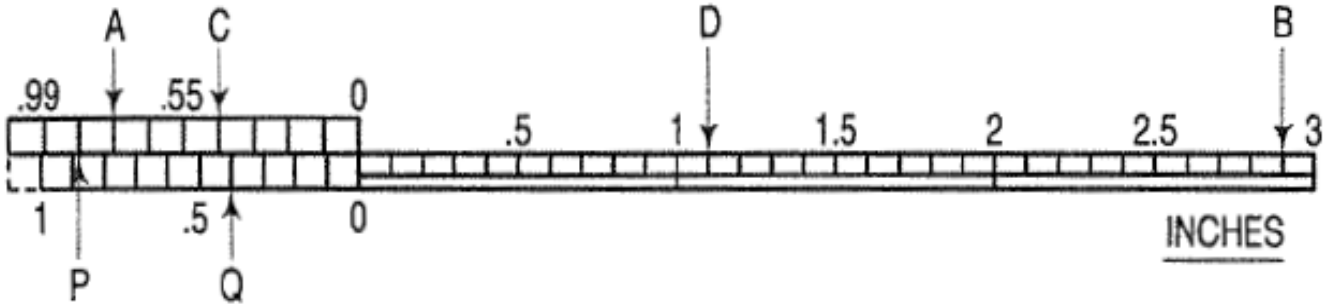
(v) To measure a length representing 2.39 m, place one leg of the divider at *A* on 99 cm mark and the other leg at *B* on 1.4 m mark.

The length *AB* will show 2.39 metres (0.99 + 1.4 = 2.39). Similarly,

The length, CO shows 0.91 metre (0.8 + 0.11 = 0.91).

The necessity of dividing the plain scale into minor divisions throughout its length is quite evident from the above measurements.

15. Construct a full-size Vernier scale of inches and show on it lengths 3.67", 1.54" and 0.48".

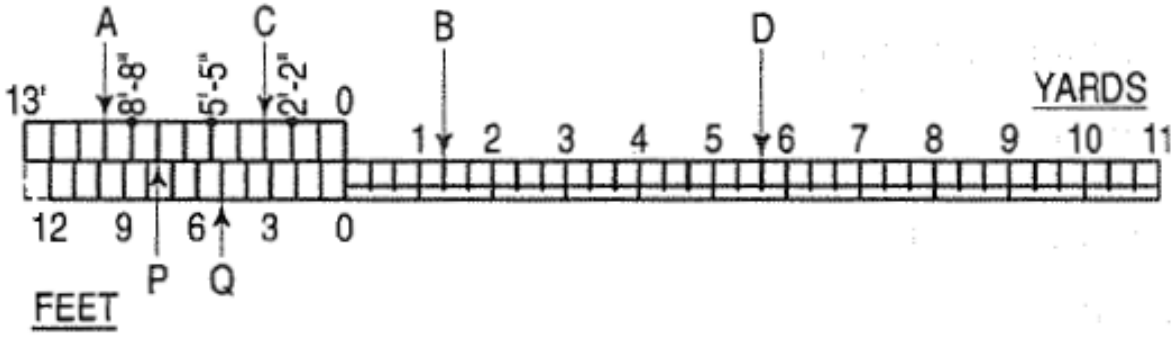


(i) Draw a plain full-size scale 4^{11} long and divide it fully to show 0.1" lengths.

(ii) Construct a Vernier of length equal to 10 + 1 = 11 parts and divide it into 10 equal parts. Each of these parts will be 0.11".

The line AB shows a length of 3.67" (0.77" + 2.9" = 3.67"). Similarly, lines CD and PQ show lengths of 1.54^{11} (0.44^{11} + 1.1" = 1.54") and 0.48" (0.88^{11} - 0.4" = 0.48") respectively.

16. Construct a Vernier scale of R.F. = 1/80 to read inches and to measure up to 15 yards.



i) Determine R.F. of the scale. Here it is 1/80

(ii) Determine the Length of the scale.

Length of the scale = R.F. x maximum length in cm

= 1/80 x 15 yards

= 1/80 x 15 x 3 x feet

= 1/80 x 15 x 3 x 12 inches

= 1/80 x 15 x 3 x 12 x 2.54 cm

= 17.145 cm

(iii) Draw the plain scale 17.145 cm long and divide it fully to show yards and feet.

(iv) To construct the Vernier, take a length of 12 + 1 = 13 feet-divisions and divide it into 12 equal parts. Each part will represent 13/12 ft or 1 '-1 ".

Lines *AB, CD* and *PQ* show respectively lengths representing 4 yd 1 ft 9 in (9' - 9^{11} + 4'), 6 yd 2 ft 3 in (3' - 3^{11} + 17') and 0 yd 2 ft 7 in (7' - 7^{11} - 5^{11}).

EXERCISE

17. Construct a plain scale of R.F is 1: 50,000 to show kilometres and hectometres and long enough to measure up to 7 kilometres. Measure a distance of 54 hectometres on your scale? **(13M July 2021 8M, April 2019)**

18. The distance between Hyderabad and Guntur is 130 km. A train covers this distance in 2.5 hours. Construct a *plain scale* to measure time up to a single minute. The R.F. of the scale is 1/260000. Find the distance covered by the train in 40 minutes. ? **(25 M, 2021, 7M, Jan 2020)**

19. The distance between two towns is 120 km. A passenger train covers this distance in 4 hours. Construct a *scale* to measure of the distance covered by the train in a single minute and up to one hour. The R.F. of the scale is 1/200000. Find the distance covered by the train in 36 minutes. ? **(15M, Jan2019)**

20. The distance between Hyderabad & Suryapet is 180 km. A Bus covers this distance in 6 hours. Construct a plain *scale* to time up to a single minute. The R.F. of the scale is 1/200000. Find the distance covered by the train in 36 minutes. ? **(25M, July 2021)**

21. The area of 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 one meter? **(10M, June 2022)**

22. On a map the distance between two points is 1 cm. The real distance between them is 20 km, draw a diagonal scale of this map to read kilometres and hectometres and to measure up to 25 km. Show a distance of 17.6 km on this scale **(25M, June-2022)**

23. Construct a Diagonal scale of RF = 3:200 showing meters, decimetres and centimetres. The scale should measure up to 6 meters. Show a distance of 4.56 meters. **(13M, June-2022)**

24. Construct a *diagonal scale* of 1:48 showing meters, decimetres and centimetres, to measure up to 6m length. Mark a length of 3.76 m on this. ? **(7M, Jan 2020)**

25. The distance between two stations is 120 km and on a map it is shown by 40 cm. draw a *diagonal scale* and indicates distances of 26.2 km and 22.4 km on it and it is measure up to 60 km? **(7M, Jan 2020, 3times)**

26. The distance between two stations by road is 400 km and it is represented on a certain map by a 10 cm long line. Find R.F and construct a *diagonal scale* showing single kilometres and long enough to measure up to 800 km. Mark on it a distance of 358 km. **(25 M, Dec-2021 & 15 M, Jan 2020)**

27. Construct a diagonal scale of RF = 1: 3200000 to show km and long enough to measure up to 400 kms. Show distances of 257 km and 333 km on your scale? **(10M July 21 25 M, Dec 20)**

28. Construct a *diagonal scale* of 1:2.5 showing centimetres and millimetres and long enough to measure up to 20 centimetres. Show 15.4 cm on it. ? **(7M, Jan 20, Apr 2019)**

29. An area of 144 square centimetres on a map represents an area of 36 square kilometres on the field. Find the RF of the scale, and draw a *diagonal scale* to show kilometres, hectometres and decametres and to measure up to 10 km. Mark a length of 7 km, 5 hm and 6 dm on the scale. ? **(15M July 2021 7M, Jan2020)**

30. The distance between two stations is 100km and on a road map, it is shown by 30cm. Draw a diagonal scale and indicate distances of 46.8 km, 71.9 km & 32.4 km on it. **(10M July 2021)**

31. Construct a diagonal scale of R.F = 1/ ($2.5*10^6$) to read up to a single kilometre and long enough to measure 400 km. Mark a length of 254 km on it?

32. On a map, the actual distance of 10m is represented by a line of 50mm long. Calculate the scale factor. Construct a diagonal scale, long enough to measure 30m and mark on it, a distance of 26.3m?

33. An area covered by a triangle of base 12 cm and altitude 24 cm, represents an area of 36 km^2. Find the scale factor and construct a diagonal scale to read kilometres, hectometres and decametres. Mark the distances of 1.05 km and 4.82 km on it?

34. A Block of ice-berg $1000m^3$ volumes is represented by a block of 27 cm^3 volume. Find the scale factor and construct a scale to measure up to 60m. Mark a distance of 42.5m on the scale?

35. The distance between Delhi and Agra is 200 km. In a railway map it is represented by a line 5 cm long. Find its 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

UNIT-II

Orthographic Projections

(Projections of Points, Lines & Planes)

"DO ALL THE GOOD YOU CAN, FOR ALL THE PEOPLE YOU CAN, IN ALL THE WAYS YOU CAN, AS LONG AS YOU CAN."

ORTHOGRAPHIC PROJECTIONS OF POINTS, LINES AND PLANES:-

To draw projections of any Object, One must have following information
A) OBJECT {with its description, well defined.}
B) OBSERVER {always observing perpendicular to respective reference planes.}
C) LOCATION OF OBJECT {means its position with reference to H.P. & V.P.}

Terms 'ABOVE' & 'BELOW' with respective to H.P. and terms 'INFRONT' & 'BEHIND' with respective to V.P form 4 Quadrants.
Objects can be placed in any one of these 4 QUADRANTS.

It is interesting to learn the effect on the positions of views (FV, TV) of the OBJECT with respect to X-Y Line, when places in different QUADRANTS.

Study illustrations given on next pages and note the results. To make it easy here a point A is taken as an Object. Because it's all views are just points.

NOTATIONS

Following notations should be followed while naming different views in Orthographic Projections.

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

Same System of Notations should be followed incase Numbers, like 1, 2, 3 are Used.

Basic concepts for drawing projection of point

FV & TV of a point always lie in the same vertical line
FV of a point 'P' is represented by p'. It shows position of the point with respect to HP.

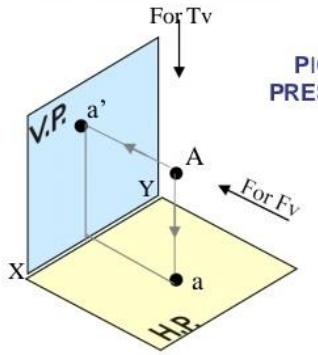
If the point lies above HP, p' lies above the XY line.
If the point lies in the HP, p' lies on the XY line.
If the point lies below the HP, p' lies below the XY line.

TV of a point 'P' is represented by p. It shows position of the point with respect to VP.

If the point lies in front of VP, p lies below the XY line.
If the point lies in the VP, p lies on the XY line.
If the point lies behind the VP, p lies above the XY line.

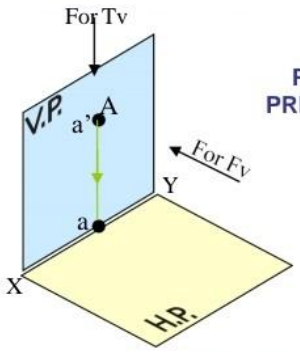
PROJECTIONS OF A POINT IN FIRST QUADRANT.

POINT A ABOVE HP & INFRONT OF VP



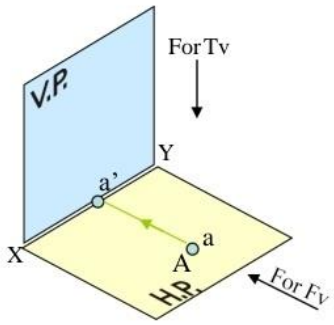
PICTORIAL PRESENTATION

POINT A ABOVE HP & IN VP



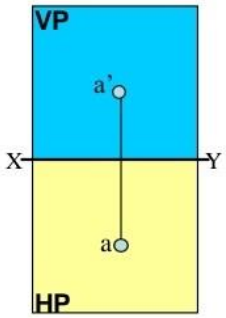
PICTORIAL PRESENTATION

POINT A IN HP & INFRONT OF VP

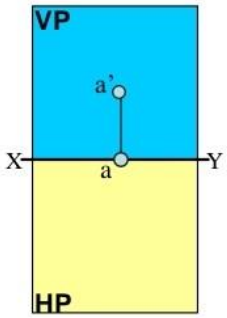


ORTHOGRAPHIC PRESENTATIONS OF ALL ABOVE CASES.

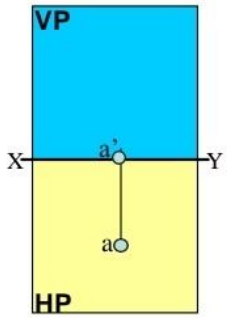
Fv above xy, Tv below xy.



Fv above xy, Tv on xy.



Fv on xy, Tv below xy.



PROJECTIONS OF STRAIGHT LINES:

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

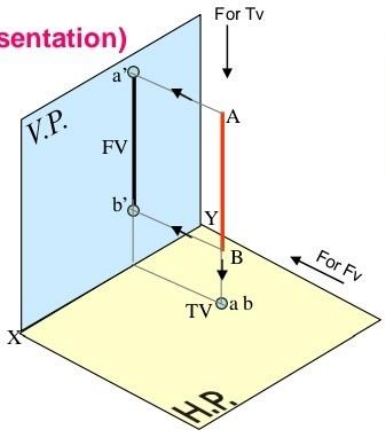
SIMPLE CASES OF THE LINE

1. A VERTICAL LINE (LINE PERPENDICULAR TO HP & // TO VP)
1. A HORIZONTAL LINE (LINE PERPENDICULAR TO VP & // 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 PAGE SHOWING CLEARLY THE NATURE OF FV & TV OF LINES LISTED ABOVE AND NOTE RESULTS.

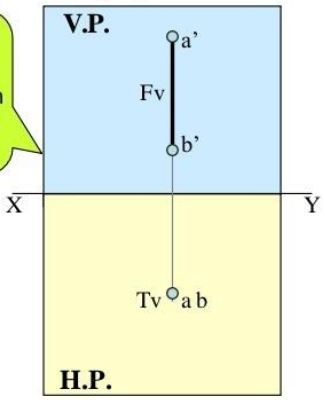
(Pictorial Presentation)

1. A Line perpendicular to Hp & // to Vp



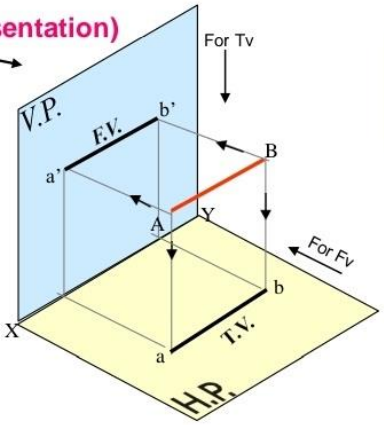
Orthographic Pattern

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



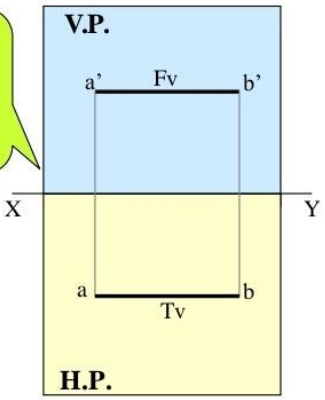
(Pictorial Presentation)

2. A Line // to Hp & // to Vp



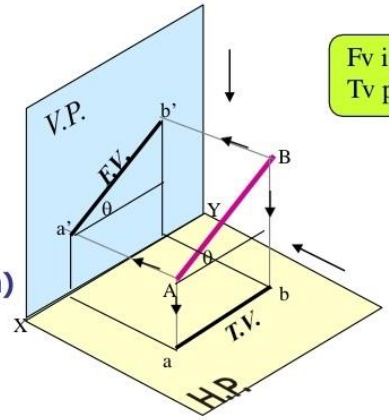
Orthographic Pattern

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

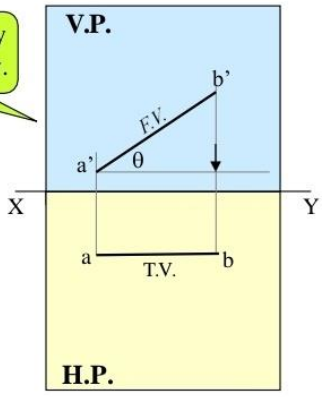


3. A Line inclined to Hp and parallel to Vp

(Pictorial presentation)



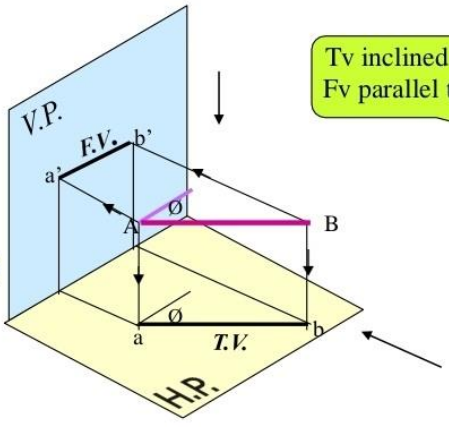
Fv inclined to xy
Tv parallel to xy.



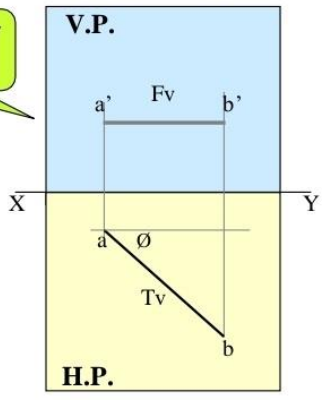
Orthographic Projections

4. A Line inclined to Vp and parallel to Hp

(Pictorial presentation)

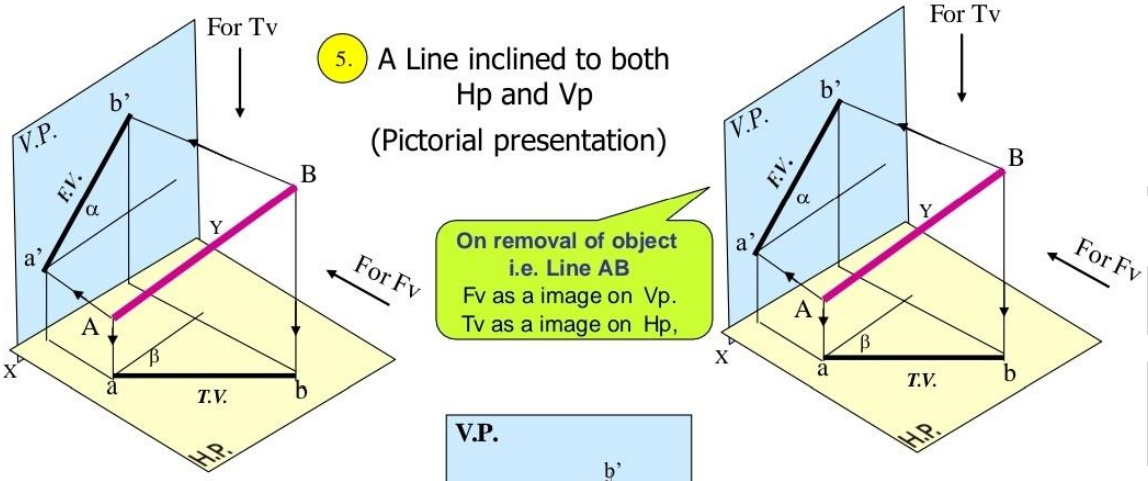


Tv inclined to xy
Fv parallel to xy.

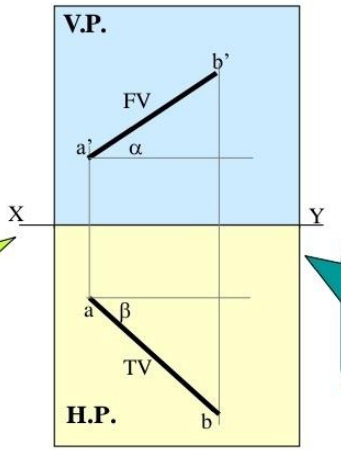


5. A Line inclined to both Hp and Vp

(Pictorial presentation)



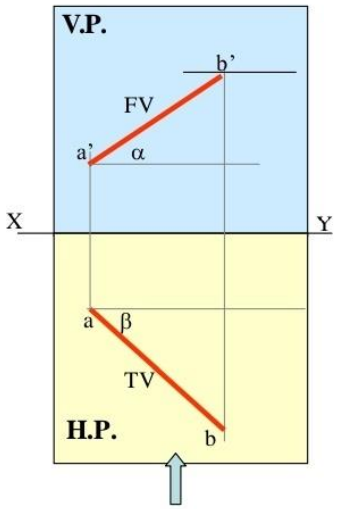
On removal of object i.e. Line AB
Fv as a image on Vp.
Tv as a image on Hp,



Orthographic Projections
Fv is seen on Vp clearly.
To see Tv clearly, HP is rotated 90^0 downwards,
Hence it comes below xy.

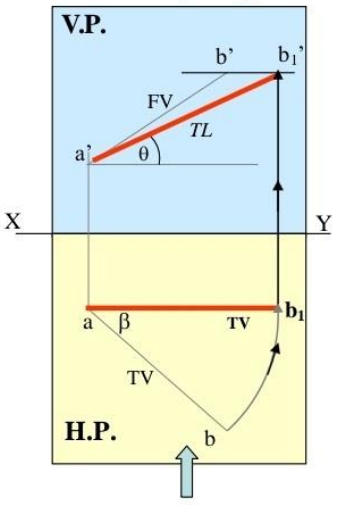
Note These Facts:-
Both Fv & Tv are inclined to xy.
(No view is parallel to xy)
Both Fv & Tv are reduced lengths.
(No view shows True Length)

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



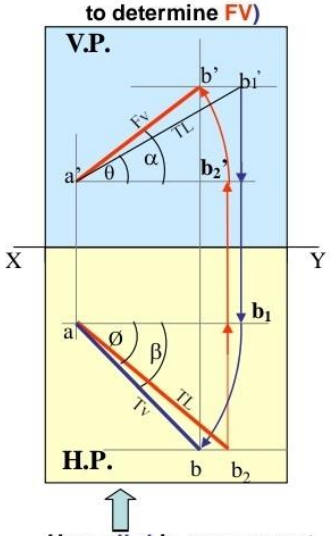
Here TV (ab) is not // to XY line Hence it's corresponding FV a' b' is not showing True Length & True Inclination with Hp.

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).



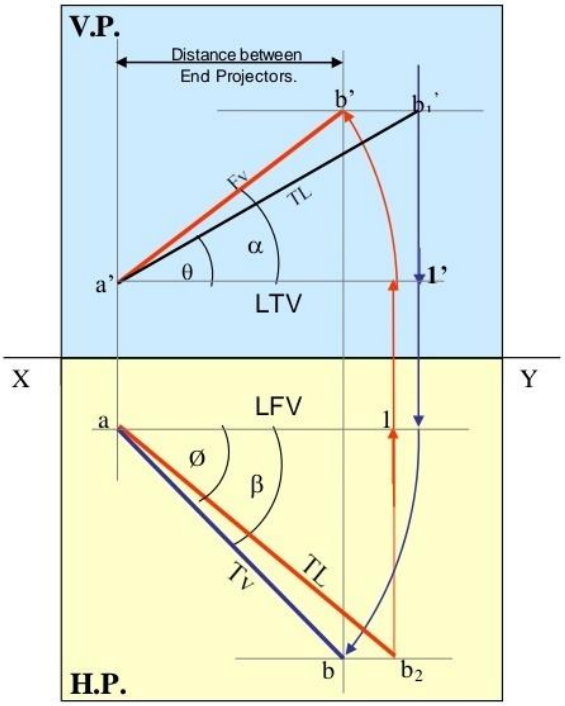
In this sketch, TV is rotated and made // to XY line. Hence it's corresponding FV a' b_1' Is showing True Length & True Inclination with Hp.

Note the procedure
When True Length is known, How to locate FV & TV. (Component a'b_2' of TL is drawn which is further rotated to determine FV)



Here a'b_1' is component of TL ab_1 gives length of FV. Hence it is brought Up to Locus of a' and further rotated to get point b'. a' b' will be Fv.
Similarly drawing component of other TL(a'b_1') TV can be drawn.

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



1) True Length (TL) – a' b_1' & a b_2
2) Angle of TL with Hp - θ
3) Angle of TL with Vp – $\emptyset$
4) Angle of FV with xy – α
5) Angle of TV with xy – β

Important TEN parameters to be remembered with Notations used here onward

6) LTV (length of FV) – Component **(a-1)**
7) LFV (length of TV) – Component **(a'-1')**
8) Position of A- **Distances of a & a' from xy**
9) Position of B- **Distances of b & b' from xy**
10) Distance between End Projectors

NOTE this

θ & α Construct with ***a'***
$\emptyset$ & β Construct with ***a***
b' & b_1' on same locus.
b & b_1 on same locus.

Also Remember

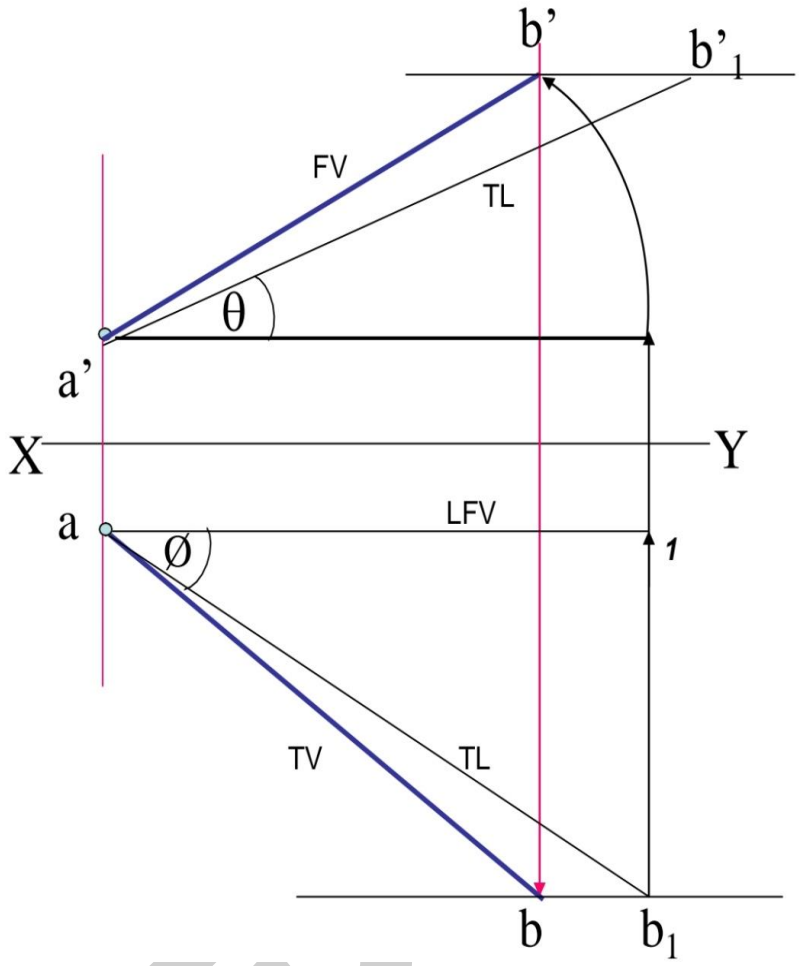
True Length is never rotated. It's horizontal component is drawn & it is further rotated to locate view.

Views are always rotated, made horizontal & further extended to locate TL, θ & Ø

1) Line AB is 75mm long and it is 30° & 40° inclined to HP & VP respectively. End A is 12mm above HP and 10mm in front of VP. Draw projections. Line is in first Quadrant?

SOLUTION STEPS:-

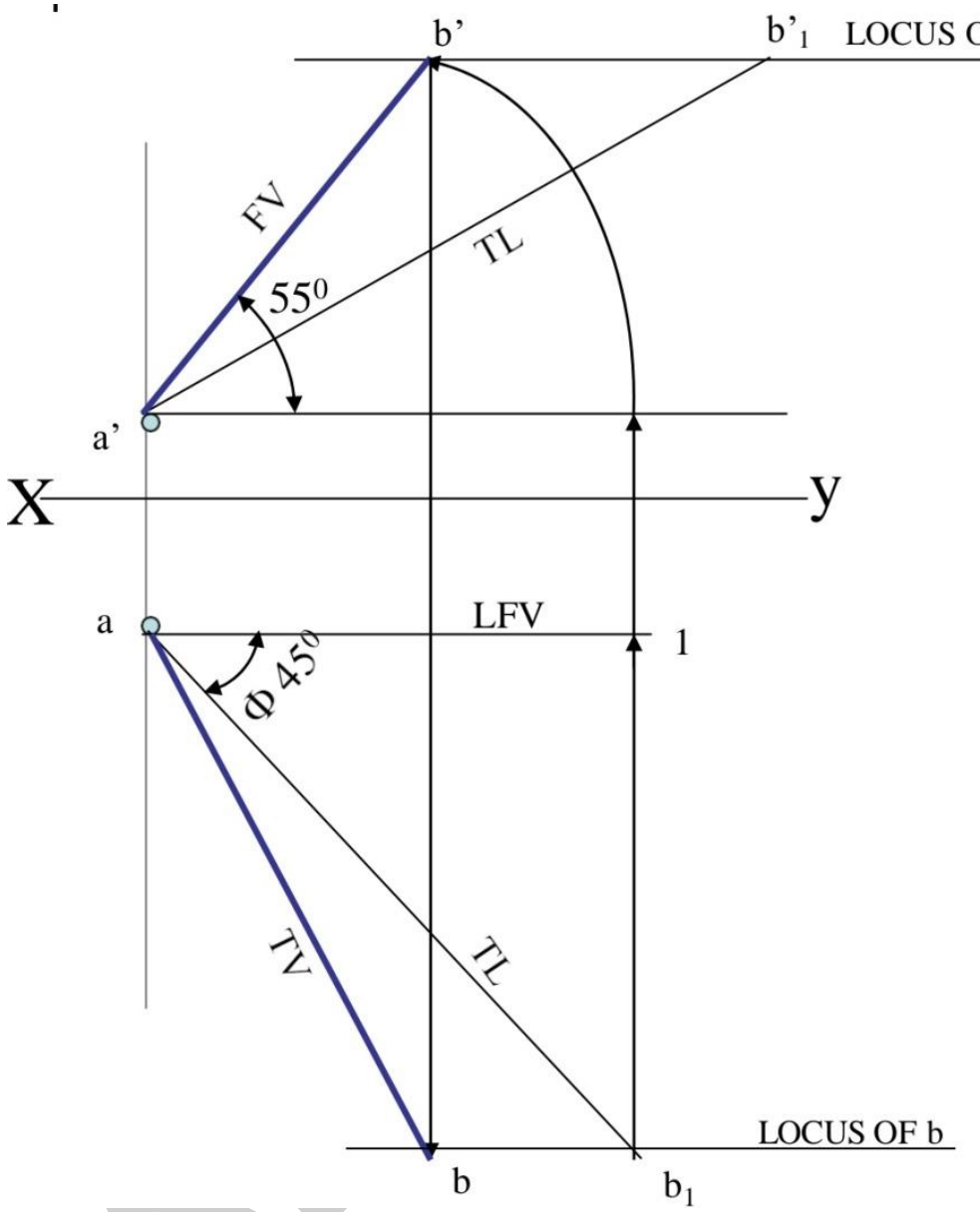
1) Draw xy line and one projector.
2) Locate a' 12mm above xy line & a 10mm below xy line.
3) Take 30° angle from a' & 40° from a and mark TL I.e. 75mm on both lines. Name those points b1' and b1 respectively.
4) Join both points with a' and a resp.
5) Draw horizontal lines (Locus) from both points.
6) Draw horizontal component of TL a b1 from point b1 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 downward & get point b. Join a & b i.e. TV.



2) Line AB 75mm long makes 45° inclinations with VP while its Fv makes 55°. End A is 10 mm above HP and 15 mm in front of VP. If line is in 1st quadrant draw its projections and find it's inclination with HP.

Solution Steps:-

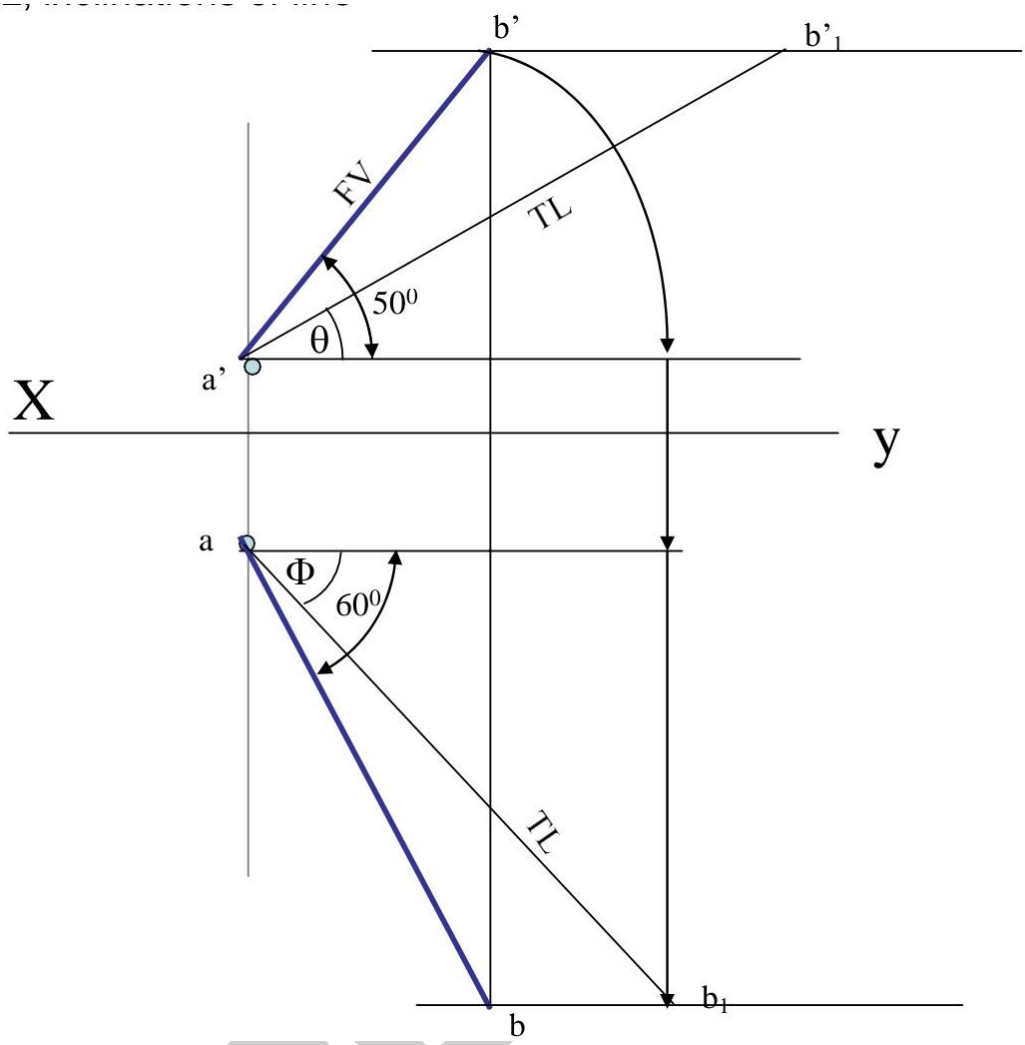
1. Draw x-y line.
2. Draw one projector for a' & a
3. Locate *a' 10mm* above x-y & TV *a* 15 mm below xy.
4. Draw a line 45° inclined to xy from point *a* and cut TL 75 mm on it and name that point *b1* Draw locus from point *b1*
5. Take 55° angle from *a'* for Fv above xy line.
6. Draw a vertical line from *b1* 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 *'b'* line is Fv.
8. Drop a projector from b' on locus from point *b1* 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 *b1'*
10. Join *a' b1'* as TL and measure its angle at *a'*. It will be true angle of line with HP.



3) Fv of line AB is 50° inclined to xy and measures 55 mm long while its TV is 60° inclined to xy line. If end A is 10 mm above HP and 15 mm in front of VP, draw its projections, find TL, inclinations of line with HP & VP.

SOLUTION STEPS:-

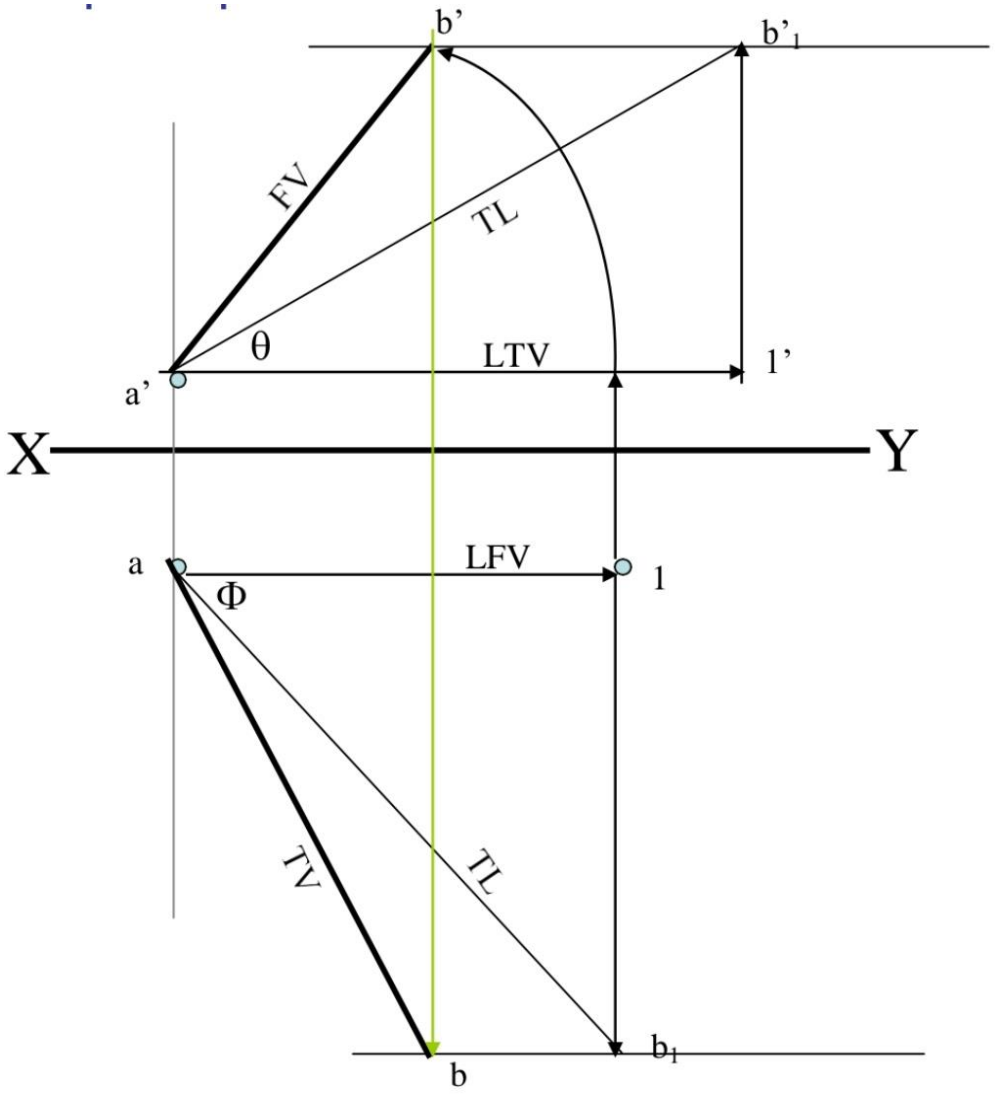
1. Draw xy line and one projector.
2. Locate a' 10 mm above xy and a 15 mm below xy line.
3. Draw locus from these points.
4. Draw Fv 50° to xy from a' and mark b' Cutting 55mm on it.
5. Similarly draw TV 60° to xy from a & drawing projector from b' Locate point b and join a b.
6. then rotating views as shown, locate True Lengths ab1 & a'b1' and their angles with HP and VP.



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 cut 50mm on X 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 b1 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



PROBLEMS INVOLVING TRACES OF THE LINE.

TRACES OF THE LINE:-

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

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

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

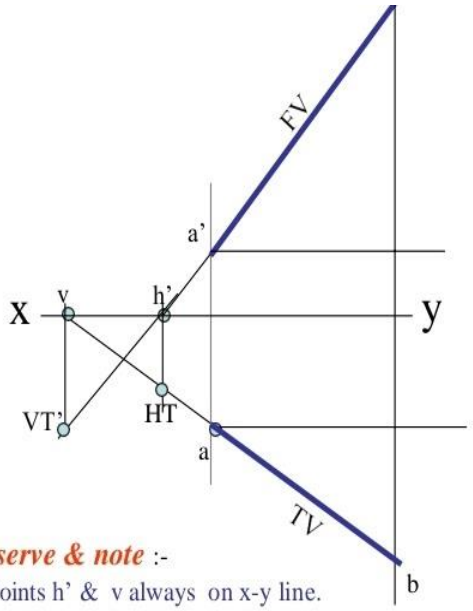
V.T.:- It is a point on VP.
Hence it is called *FV* of a point in VP.
Hence its *TV* comes on XY line. (Here onward named as v)
H.T.:- It is a point on HP.
Hence it is called *TV* of a point in HP.
Hence its *Fv* comes on XY line. (Here onward named as 'h')

STEPS TO LOCATE HT.
(WHEN PROJECTIONS ARE GIVEN.)

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

STEPS TO LOCATE VT.
(WHEN PROJECTIONS ARE GIVEN.)

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



Observe & note :-

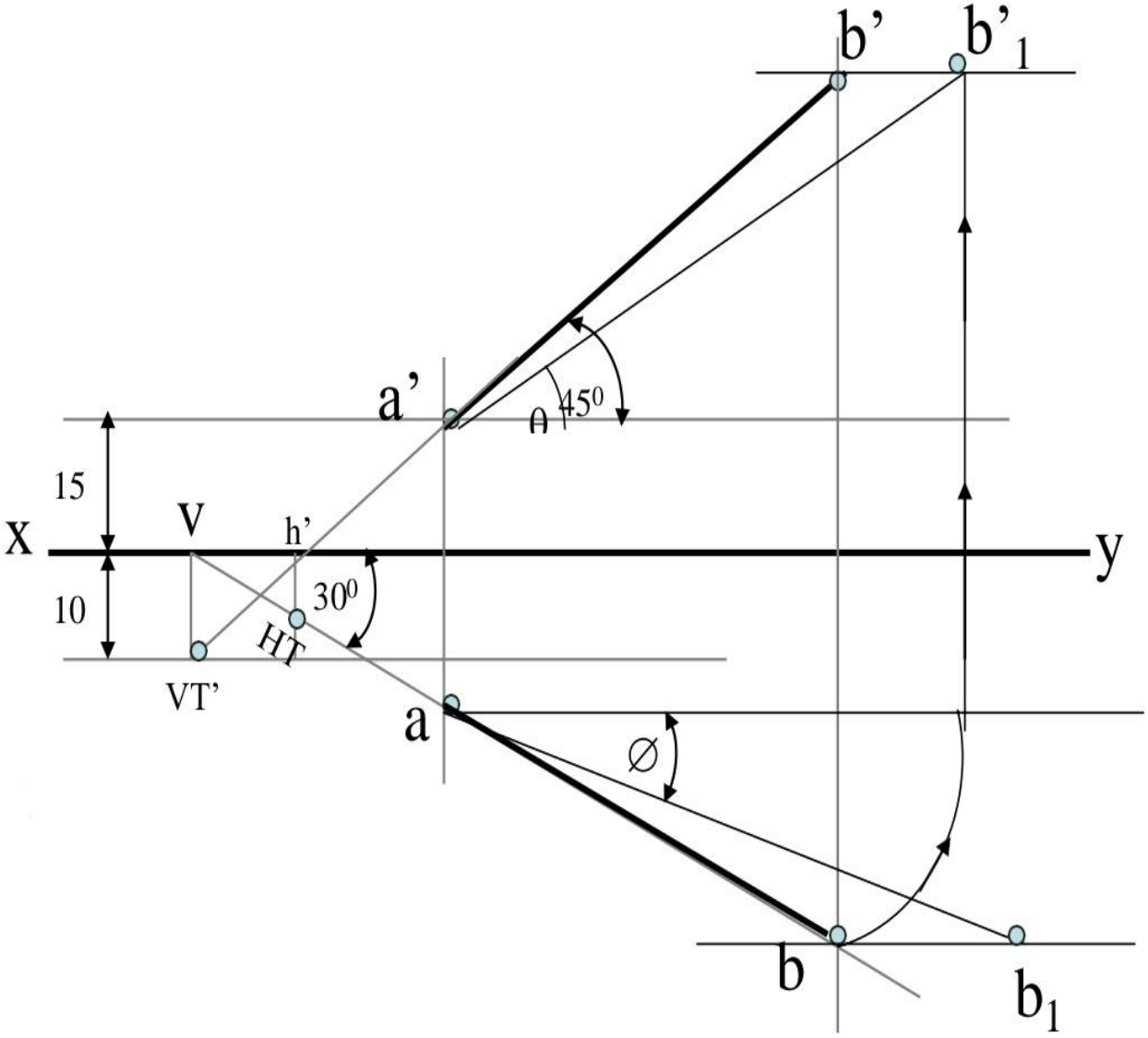
1. Points h' & v always on x-y line.
2. VT' & v always on one projector.
3. HT & h' always on one projector.
4. FV - h'- VT' always co-linear.
5. TV - v - HT always co-linear.

These points are used to solve next three problems.

5) Fv of line AB makes 45° with XY line and measures 60 mm. Line's TV makes 30° with XY line. End A is 15 mm above HP and its VT is 10 mm below HP. Draw projections of line AB, determine inclinations with HP & VP and locate HT, VT.

SOLUTION STEPS:-

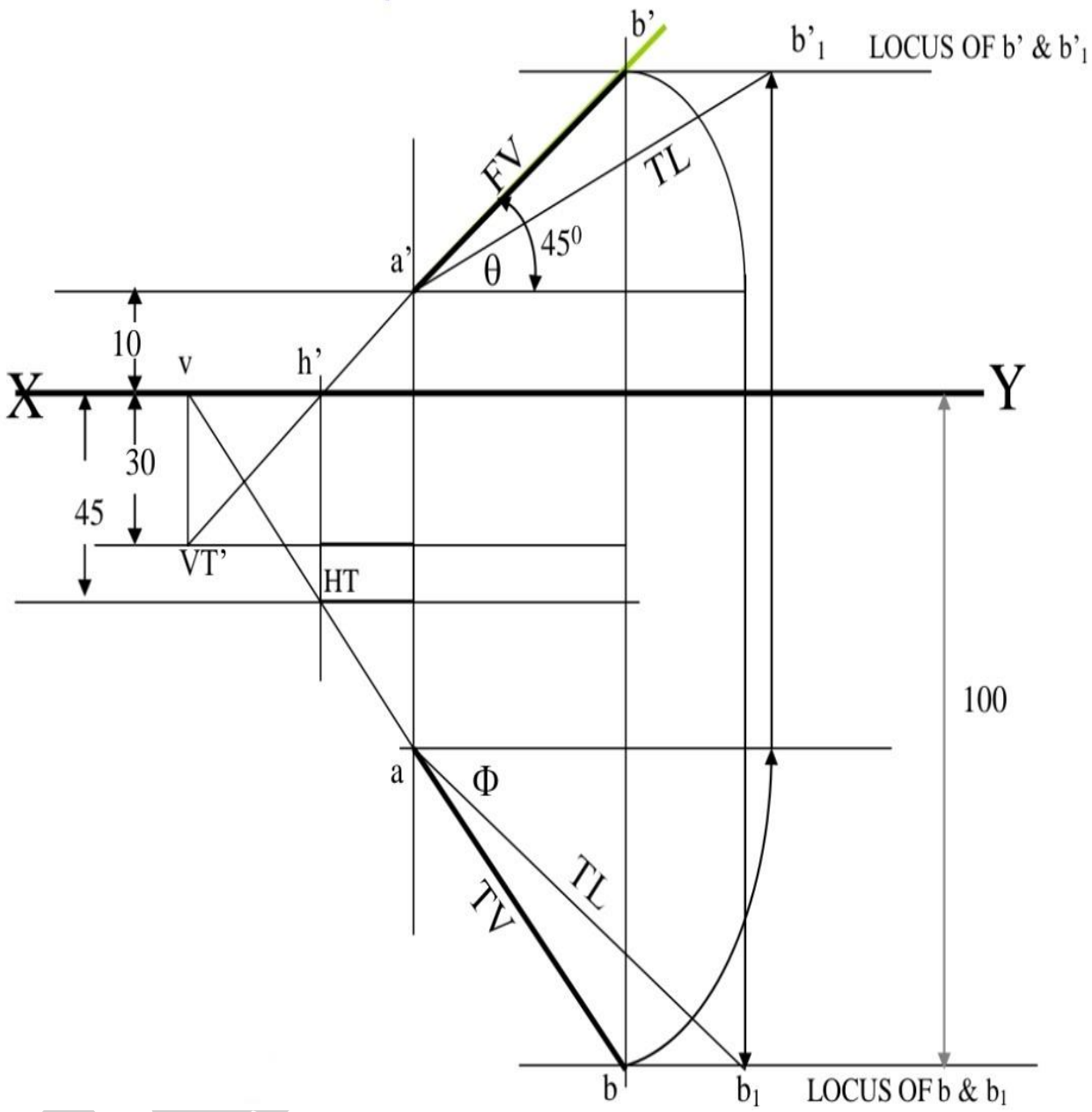
Draw xy line, one projector and locate fv a' 15 mm above xy.
Take 450 angle from a' and marking 60 mm on it locate point b'.
Draw locus of VT, 10 mm below xy & extending FV to this locus locate VT. as fv-h'-vt' lie on one straight line.
Draw projector from vt, locate v on xy. From v take 30° downward as TV and its inclination can begin with v.
Draw projector from b' and locate b i.e.TV point.
Now rotating views as usual TL and
Its inclinations can be found.
Name extension of Fv, touching xy as h' and below it, on extension of Tv, locate HT.



6) **One end of line AB is 10mm above Hp and other end is 100 mm in-front of VP. Its FV is 45^0 inclined to xy while its HT & VT are 45mm and 30 mm below xy respectively. Draw projections and find TL with its inclinations with HP & VP.**

SOLUTION STEPS:-

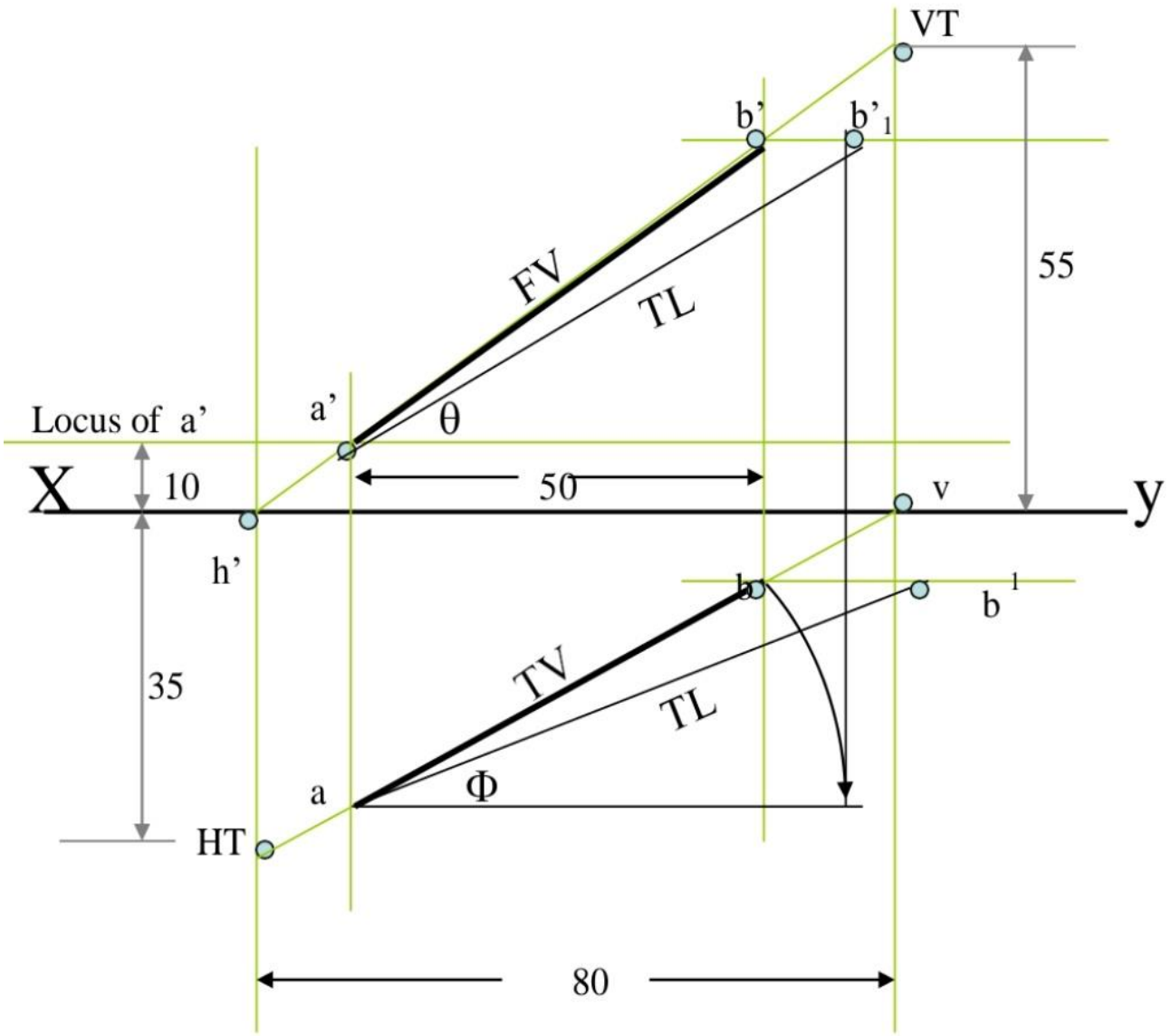
Draw xy line, one projector and locate a' 10 mm above xy.
Draw locus 100 mm below xy for points b & b1
Draw loci for VT and HT, 30 mm & 45 mm below xy respectively.
Take 45^0 angle from a' and extend that line backward to locate h' and VT, & Locate v on xy above VT. Locate HT below h' as shown.
Then 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 its inclinations.



7) Projectors drawn from HT and VT of a line AB are 80 mm apart and those drawn from its ends are 50 mm apart. End A is 10 mm above HP, VT is 35 mm below Hp while its 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, 35mm 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.



8) Line AB 100 mm long is 30° and 45° inclined to HP & VP respectively. End A is 10 mm above HP and its VT is 20 mm below HP. Draw projections of the line and it's HT.

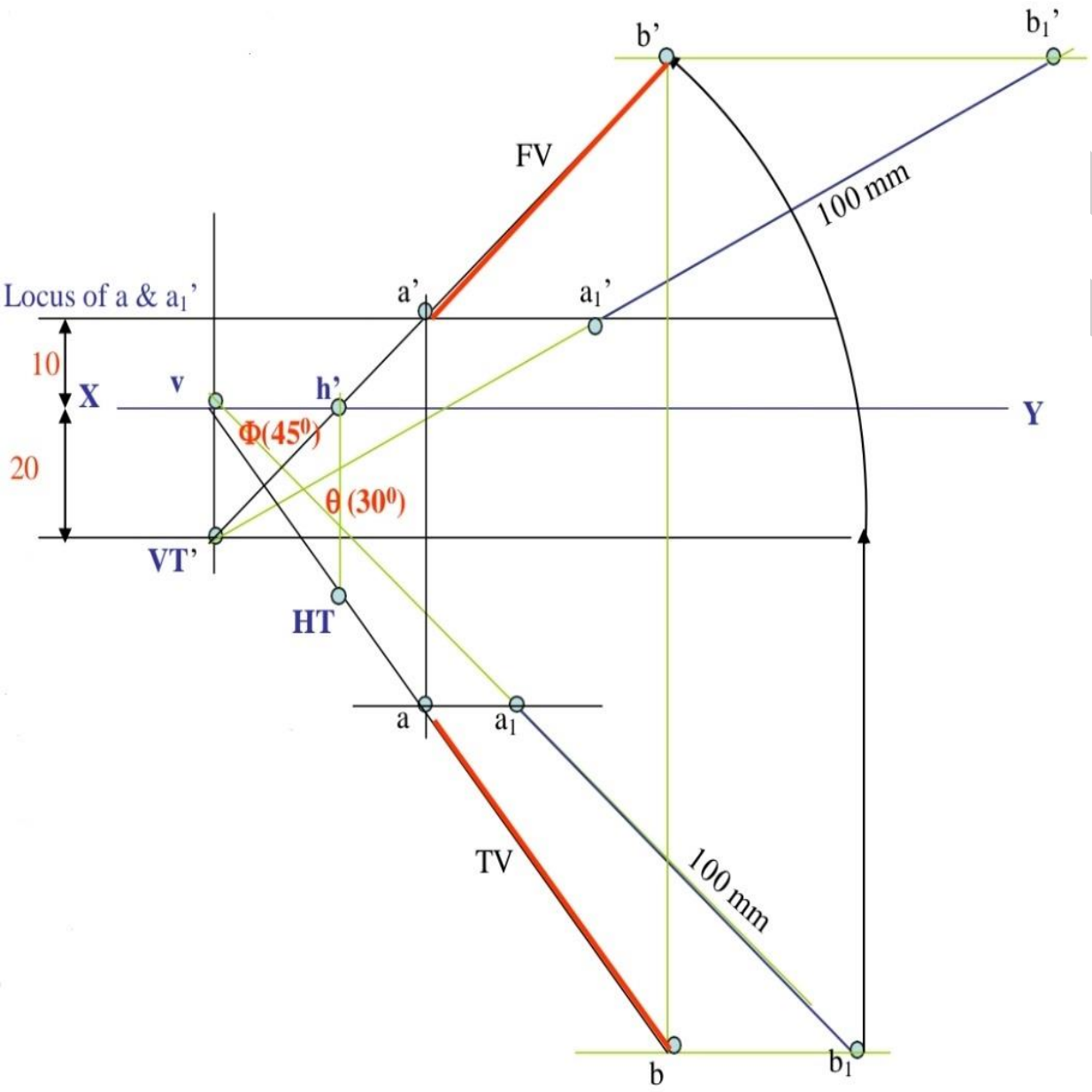
SOLUTION STEPS:-

Draw xy, one projector and locate on it VT and V.

Draw locus of a' 10 mm above xy. Take 30° 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° 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.

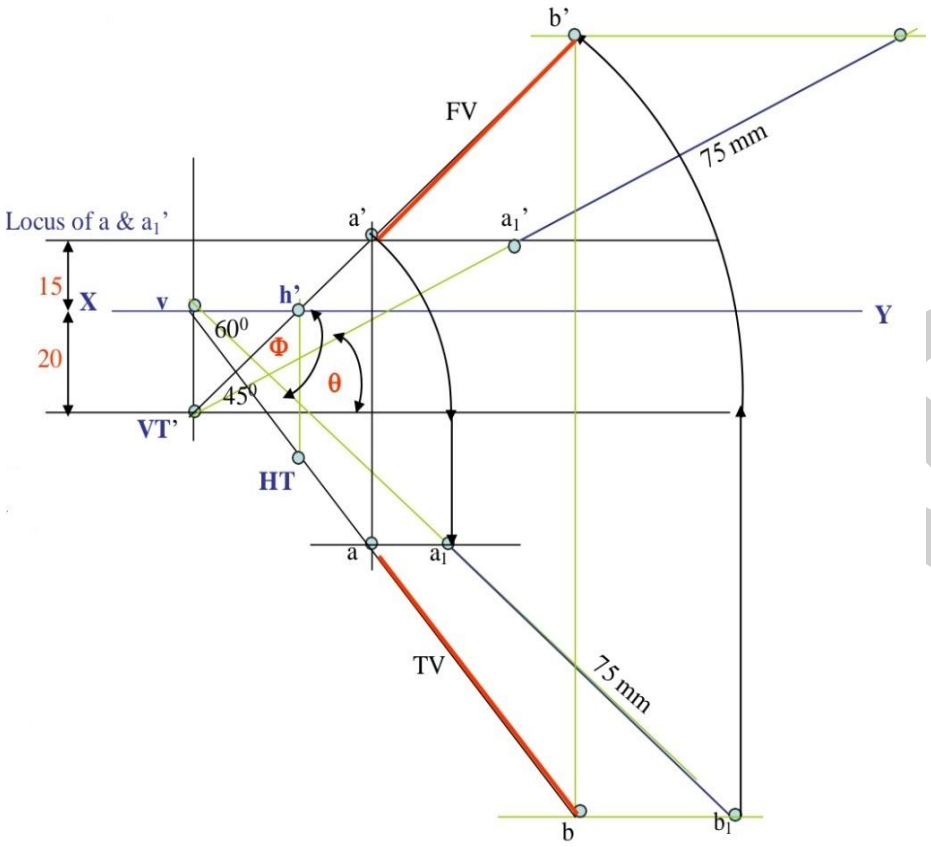
Draw its component on locus of VT' & further rotate to get other end of FV i.e.', Join it with VT' and mark intersection point (with locus of a_1') and name it a'. Now as usual locate points a and b and h' and HT.



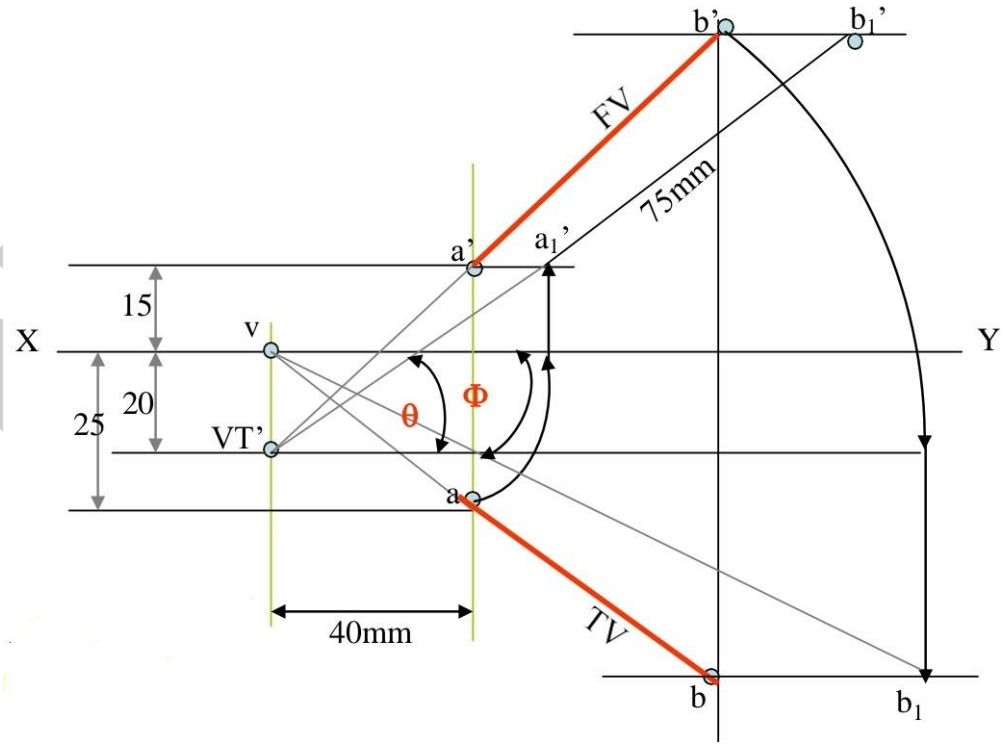
9) A line AB is 75 mm long. Its FV & TV make 45° and 60° inclinations with X-Y line respectively. End A is 15 mm above HP and VT is 20 mm below Xy line. Line is in first quadrant. Draw projections; find inclinations with HP & VP. Also locate HT.

SOLUTION STEPS:-

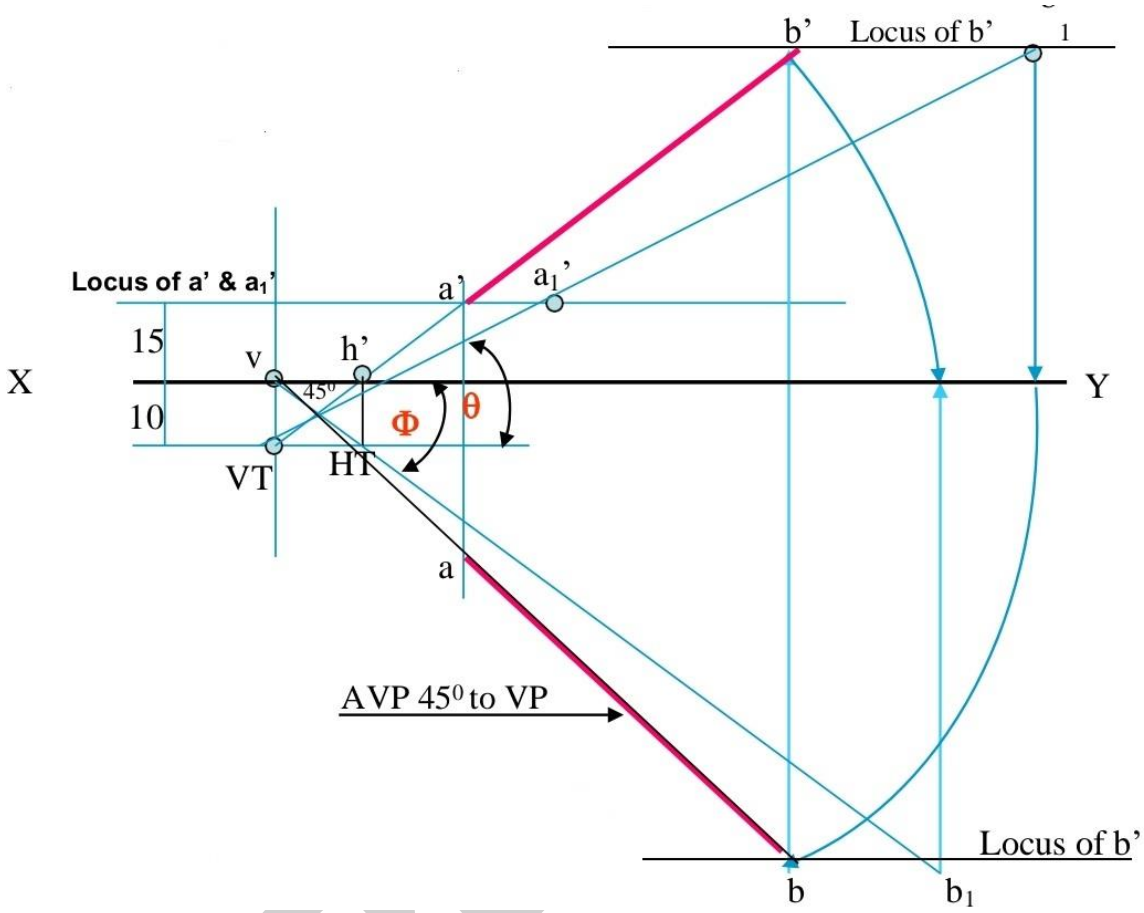
Similar to the previous only change is instead of line's inclinations, views inclinations are given. So first take those angles from VT & v properly, construct FV & TV of extension, then determine its TL (V-a1) and on its extension mark TL of line and proceed and complete it.



10) 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.



11) Line AB 80 mm long makes 30° angle with HP and lies in an Auxiliary Vertical Plane 45° 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.



12) A line AB, 75mm long, has one end A in VP. Other end B is 15 mm above HP and 50 mm in front of VP. Draw the projections of the line when sum of it's inclinations with HP & VP is 90°, means it is lying in a profile plane. Find true angles with reference planes and its traces.

SOLUTION STEPS:-

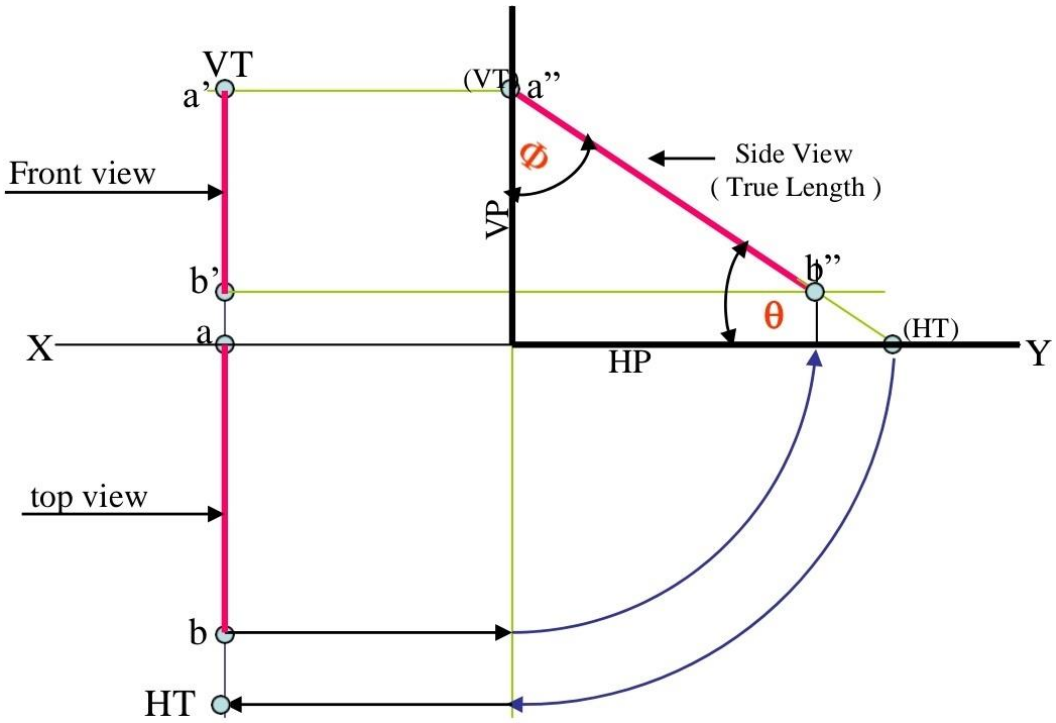
After drawing xy line and one projector Locate top view of A i.e. point a on xy as It is in VP,

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 as it is 50 mm in front of VP.

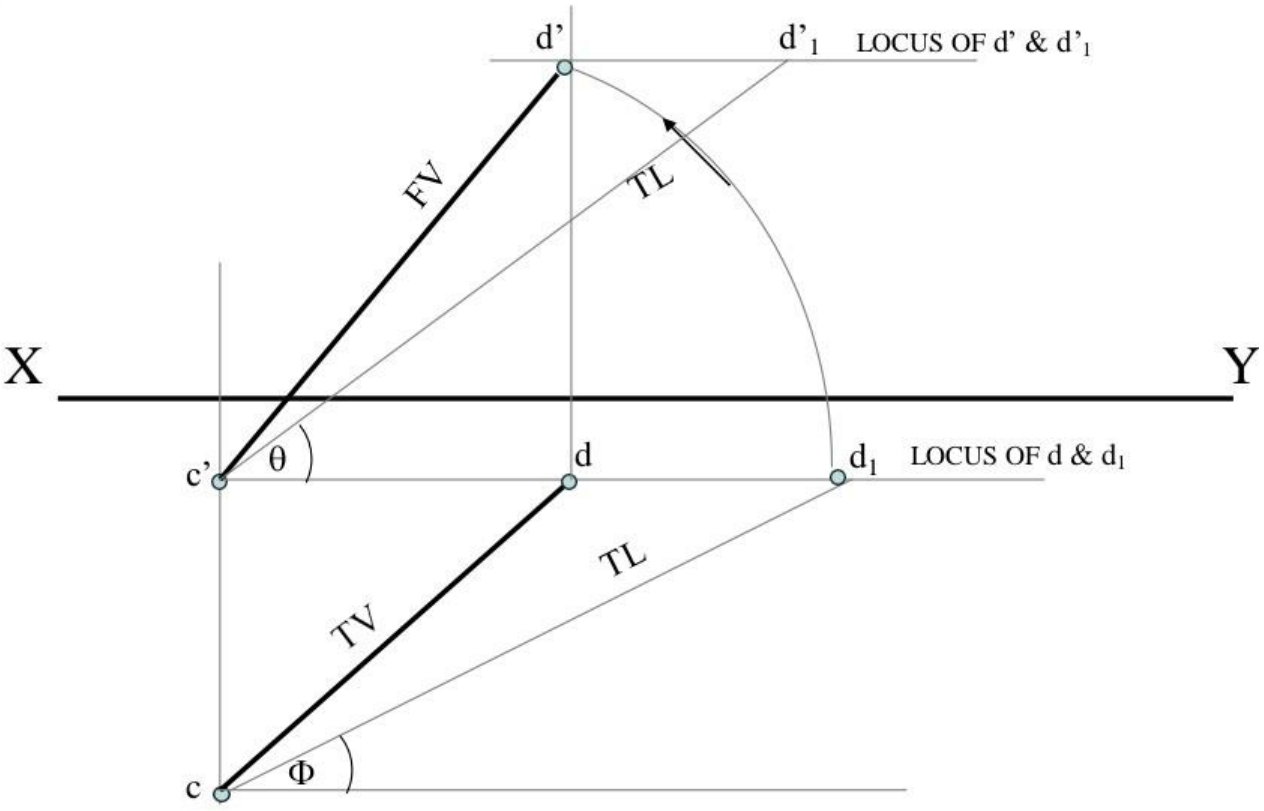
Draw side view structure of VP and HP and locate S.V. of point B i.e. b"

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.

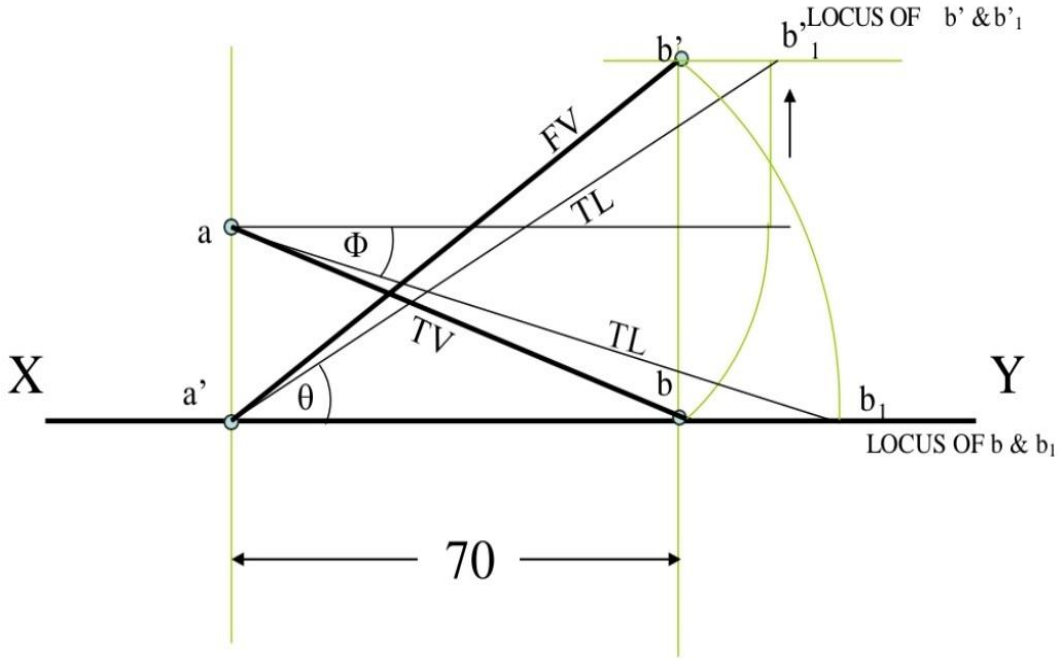
Now as discussed earlier SV gives TL of line and at the same time on extension up to HP & VP gives inclinations with those planes.



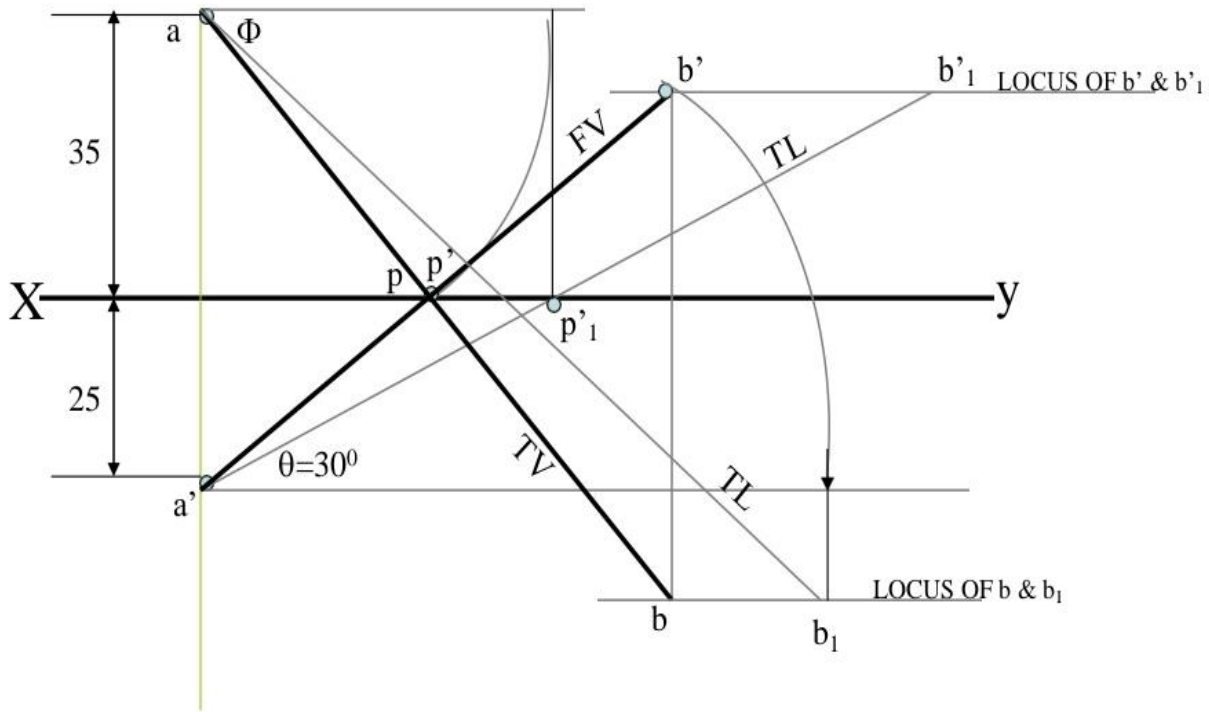
13) T.V. of a 75 mm long Line CD, measures 50 mm. End C is 15 mm below Hp and 50 mm in front of VP. End D is 15 mm in front of VP and it is above HP. Draw projections of CD and find angles with HP and VP.



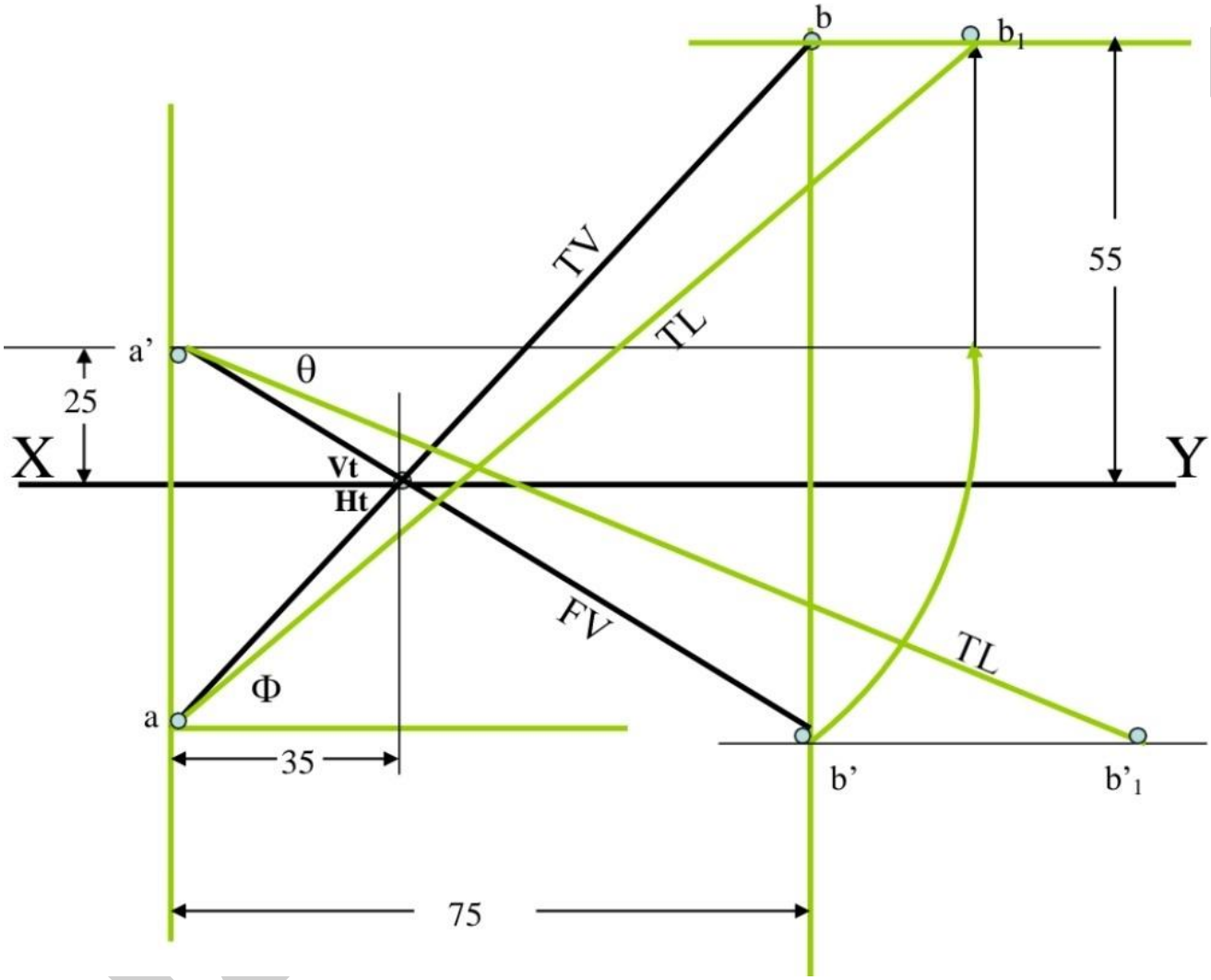
14) End A of line AB is in HP and 25 mm behind VP. End B in VP and 50mm above HP. Distance between projectors is 70mm. Draw projections and find it's inclinations with HT, VT.



15) End A of a line AB is 25mm below Hp and 35mm behind VP. Line is 30° inclined to HP. There is a point P on AB contained by both HP & VP. Draw projections; find inclination with VP and traces.



16) End A of a line AB is 25mm above HP and end B is 55mm behind VP. The distance between end projectors is 75mm. If both its HT & VT coincide on xy in a point, 35mm from projector of A and within two projectors, Draw projections, find TL and angles and HT, VT.



EXERCISE

17) Draw the projections of a line of 60 mm long is perpendicular to H.P. and parallel to V.P, one of its end is 15 mm above the H.P, 20 mm in front of V.P.

18) Draw the projections of a line of 60 mm long is perpendicular to V.P. and parallel to H.P, one of its end is 15 mm above the H.P, 20 mm in front of V.P.

19) A line AB of 50 mm long is parallel to both H.P and V.P. The line is 40 mm above H.P. an 30 mm in front of V.P. draw the projections of the line.

20) A line AB is 40 mm long and inclined at 30° to H.P and parallel to V.P. The end A of the line is 15 mm above H.P and 20 in front of V.P. Draw the projections of the line.

21) A line AB is 40 mm long and inclined at 30° to V.P. and parallel to H.P. The end A of the line is 15 mm above H.P and 20 mm in front of V.P. Draw its projections.

22)

1) Draw the Projections of the following points
(a) A point A is 20 above H.P and 30 in front of V.P.
(b) A point B is 20 above H.P and 30 behind V.P.
(c) A point C is 20 below H.P and 30 behind V.P.
(d) A point D is 20 below H.P and 30 in front of V.P.
(e) A point E is on H.P and 30 in front of V.P.
(f) A point F is on V.P and 20 above H.P.
(g) A point G is lying on both H.P and V.P.
2) Draw the Projections of the following points on the same ground line, keeping the projectors 25 mm apart. **(10 M. Sept/Oct 2021)**
A, in the H.P & 20 mm behind the V.P.
B, in the above the H.P. & 25 mm in front of the V.P.
C, in the V.P. & 40 mm above the H.P.
D, 25 mm below the H.P. & 25 mm behind the V.P.
E, 15 mm above the H.P. & 50 mm behind the V.P.
F, 40 mm below the H.P. & 25 mm in front of the V.P.
G, in both the H.P. & the V.P.

LINE INCLINED TO BOTH H.P & V.P (Θ, φ):

TYPE-1: TL given: TV & FV of one end point given: True inclination with (Θ) & (φ) given:

23) A straight line AB of 75 mm long is inclined at 30° to H.P. and 45° to V.P. The end A is 15 mm in fronts of V.P and 20 mm above H.P. Draw the projections of the line.

TYPE-2: True length of the line given: Top and front view of two end points; given:

24) A Straight line 85 mm long has one end 15 mm in front of V.P. and 10 mm above H.P., while the other end id 50 mm in front of V.P. and 45 mm above the H.P. Draw the plan and elevation of the line. Determine the inclinations of the line to H.P. and V.P. **(25M 21)**

TYPE-3: TL given: TV & FV of one end point given: another TV given: Length of the TV given:

25) A Line AB of 75 mm long has one of its ends 60 mm in front of V.P. and 20 mm above H.P. the other end is 20 mm in front of V.P. and is above H.P. The top of view of the line is 55 mm long. Draw the FV. **(15M Nov/Dec 2019)**

TYPE-4: TL of the line given: TV & FV of one end point given: another TV & FV length given:

26) A Line measuring 80 mm long has one of its ends 60 mm above H.P. and 20 mm in front of V.P. The other end is 15 mm above H.P. and in front of V.P. The FV of the line is 60 mm long. Draw the TV. **(15M. Dec 2020)**

TYPE-5: TL of the line given: TV & FV of one end point given: Length of final TV & FV given:

27) A Line PQ 60 mm long has its end P, 15 mm above H.P. and 20 mm in front of V.P. Its top view and front view measures 50 mm and 40 mm respectively. Draw its projections and determine the true inclinations with H.P and V.P.

25M. Oct/Nov 2020, 3 times)

TYPE-6: D/B end projectors given: Find TL and True inclinations with H.P. and V.P. (Θ, φ).

28) A line AB has its end A 15 mm above H.P. and 20 m in front of V.P. The end B is 60 mm above H.P. and the line is inclined at 30° to H.P. The distance between the end projectors of the line is 55 mm. Draw the projections and find its inclinations with V.P.

(12M Oct/Nov 2021)

29) DDDG End A of the line AB is 15 mm above H.P. and 20 mm in front of V.P. The other end is 50 mm above the H.P. and 65 mm in front of V.P. The distance between the end projectors is 50 mm. Draw the projections and find true inclinations and true length by the following two methods: (a) Rotating plane method (b) Trapezoidal plane method.

TYPE-7: MID Point problems:

30) The midpoint of a line AB 80 mm long is 30 mm above the H.P. and 45 mm in front of V.P. It is inclined at 30° to the H.P. and 50° to V.P. Draw its projections.

31) Draw the projections of a line AB, 90 mm long, it's midpoint M being 50 mm above the HP & 40 mm in front of the VP. The end A is 20 mm above the HP and 10 mm in front of the VP. Find inclinations of the line with the HP & VP? **(25M. July/Aug 2021)**

"Mistake increases your experience & experience decreases your mistakes. If you learn from your mistakes then others learn from your success."

→→→"MISTAKES MAKE YOU A **BETTER** PERSON.
PROBLEMS MAKE YOU **STRONGER**"→→→

→→→"TREAT EVERYONE WITH POLITENESS AND KINDNESS, NOT BECAUSE THEY ARE NICE, BUT BECAUSE YOU ARE."→→→

ORTHOGRAPHIC PROJECTIONS OF PLANES

In this topic various plane figures are the objects.

What is usually asked in the problem?

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

What will be given in the problem?

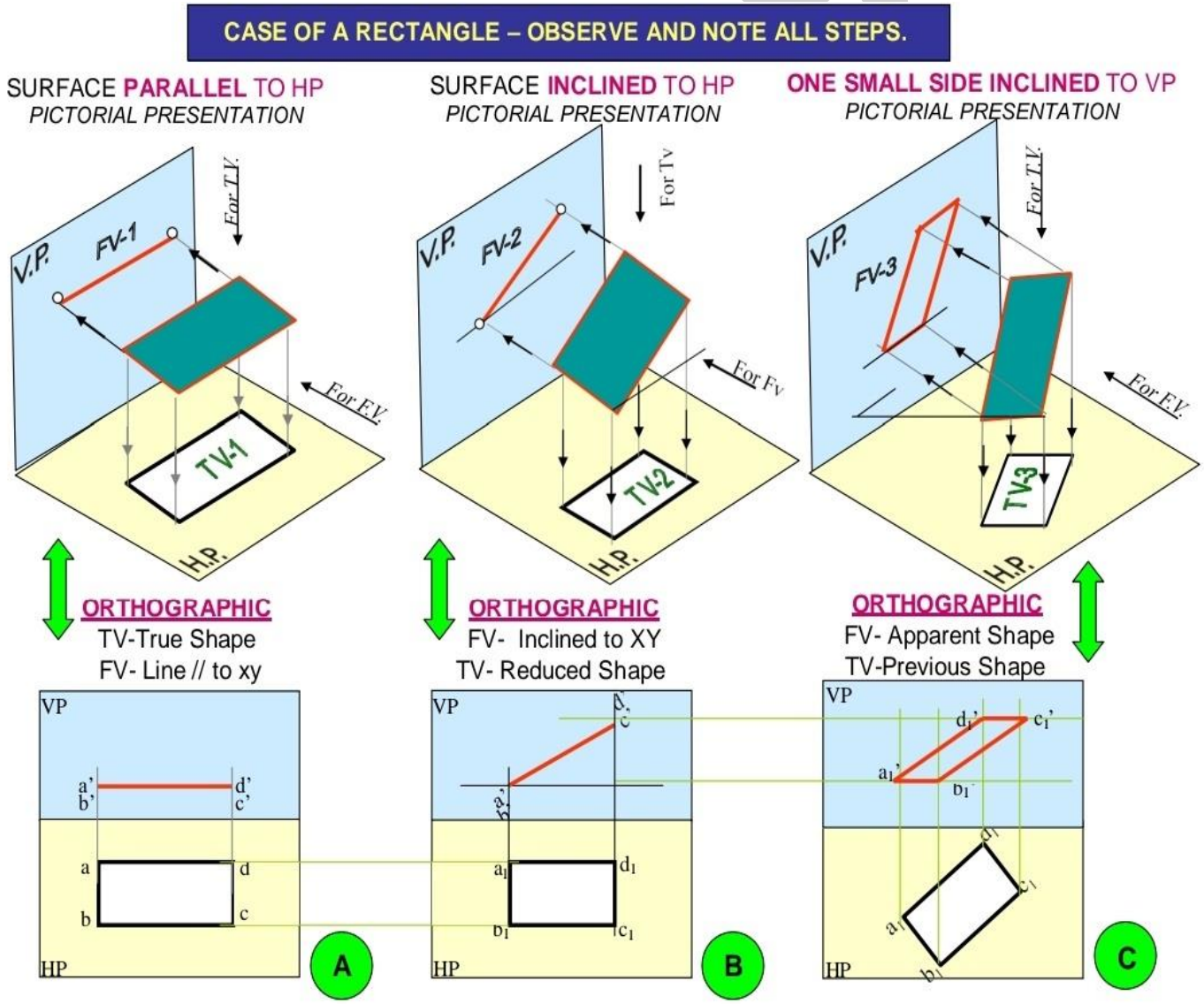
1. Description of the plane figure.
2. Its position with HP and VP.

In which manner its position with HP & VP will be described?

1. Inclination of its SURFACE with one of the reference planes will be given
2. Inclination of one of its EDGES with other reference plane will be given

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

Study the illustration showing surface & side inclination given in below.



PROCEDURE OF SOLVING THE PROBLEM:

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

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

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

STEP 3. After this,consider side/edge inclination and draw 3rd (final) Fv & Tv.

ASSUMPTIONS FOR INITIAL POSITION:

(Initial Position means assuming surface // to HP or VP)

1.If in problem surface is inclined to HP – assume it // HP

Or If surface is inclined to VP – assume it // to VP

2. Now if surface is assumed // to HP- It's TV will show True Shape.
And If surface is assumed // to VP – It's FV will show True Shape.

3. Hence begin with drawing TV or FV as True Shape.

4. While drawing this True Shape–
keep one side/edge (which is making inclination) perpendicular to xy line
(similar to pair no. A on previous page illustration).

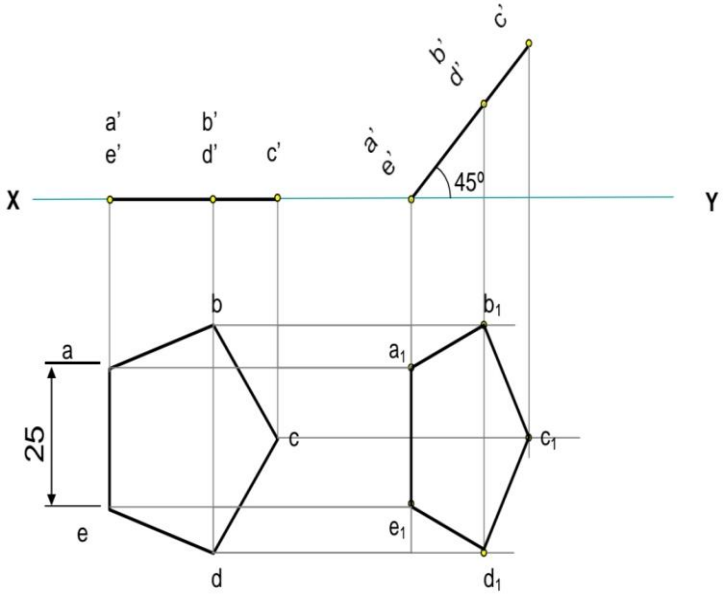
Now Complete STEP 2. By making surface inclined to the resp plane & project it's other view.
(Ref. 2nd pair B on previous page illustration)

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

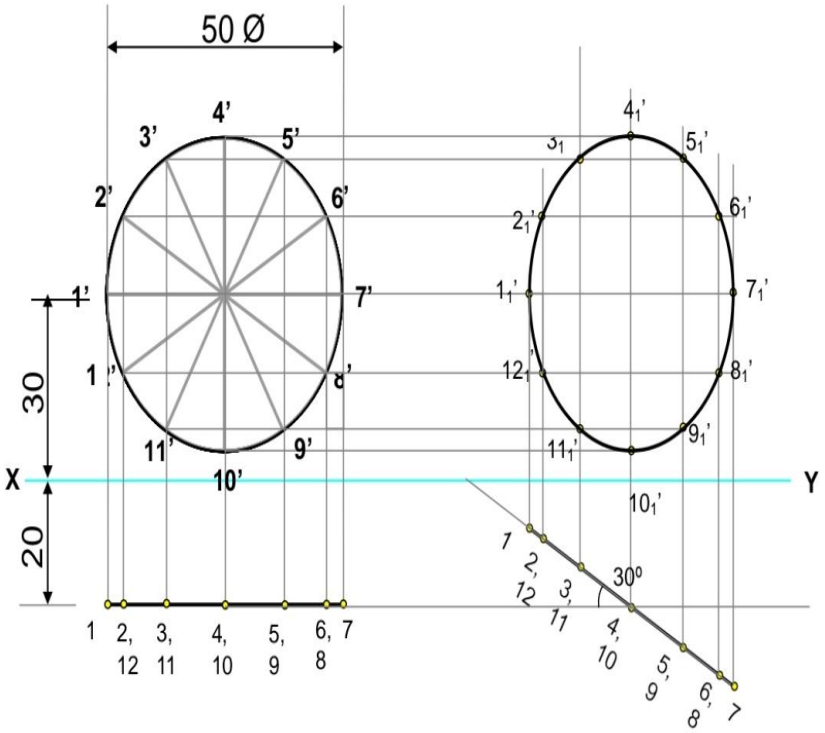
APPLY SAME STEPS TO SOLVE NEXT PROBLEMS

1. A regular pentagon of 25mm side has one side on the ground. Its plane is inclined at 45° to the HP and perpendicular to the VP. Draw its projections and show its traces?

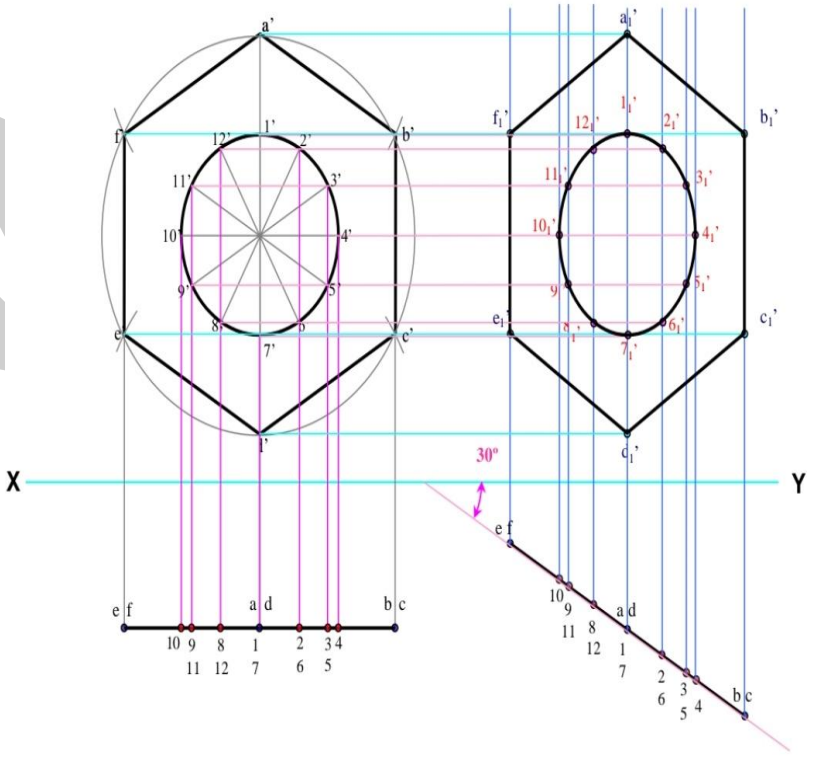
   Hint: As the plane is inclined to HP, it should be kept parallel to HP with one edge perpendicular to VP.



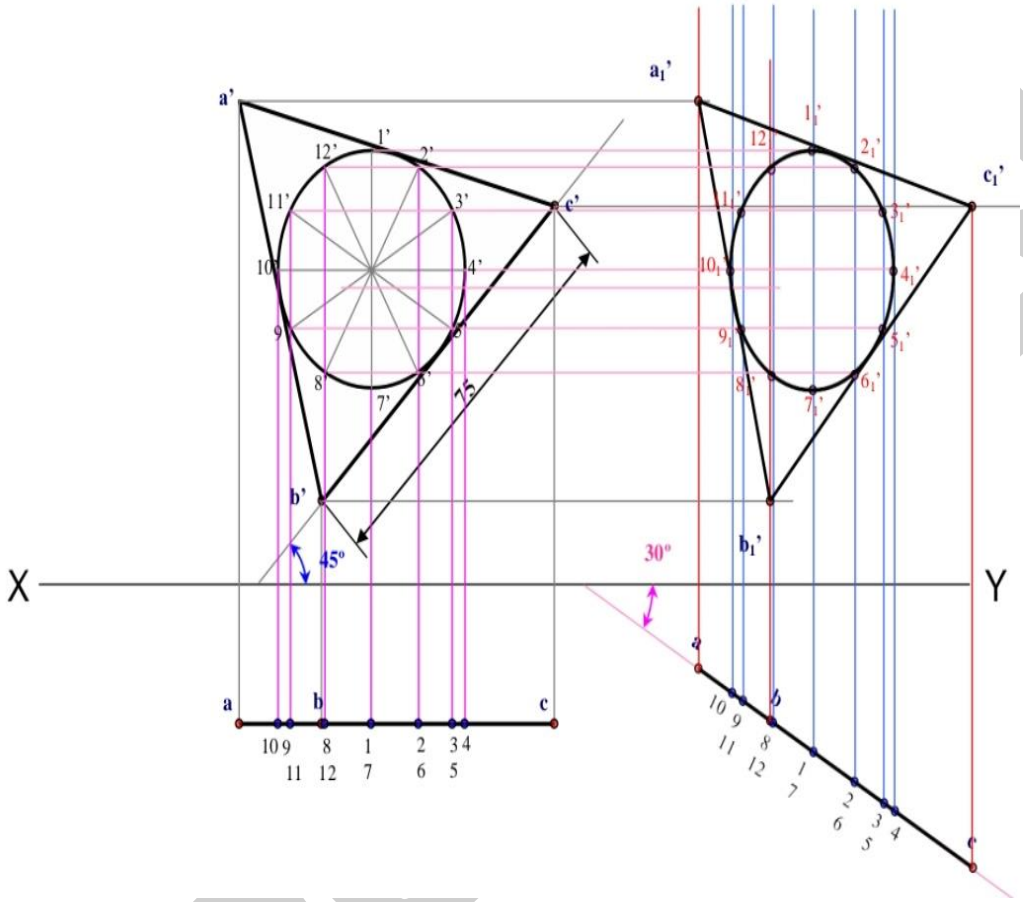
2. Draw the projections of a circle of 5 cm diameter having its plane vertical and inclined at 30° to the V.P. Its centre is 3cm above the H.P. and 2cm in front of the V.P. Show also its traces?



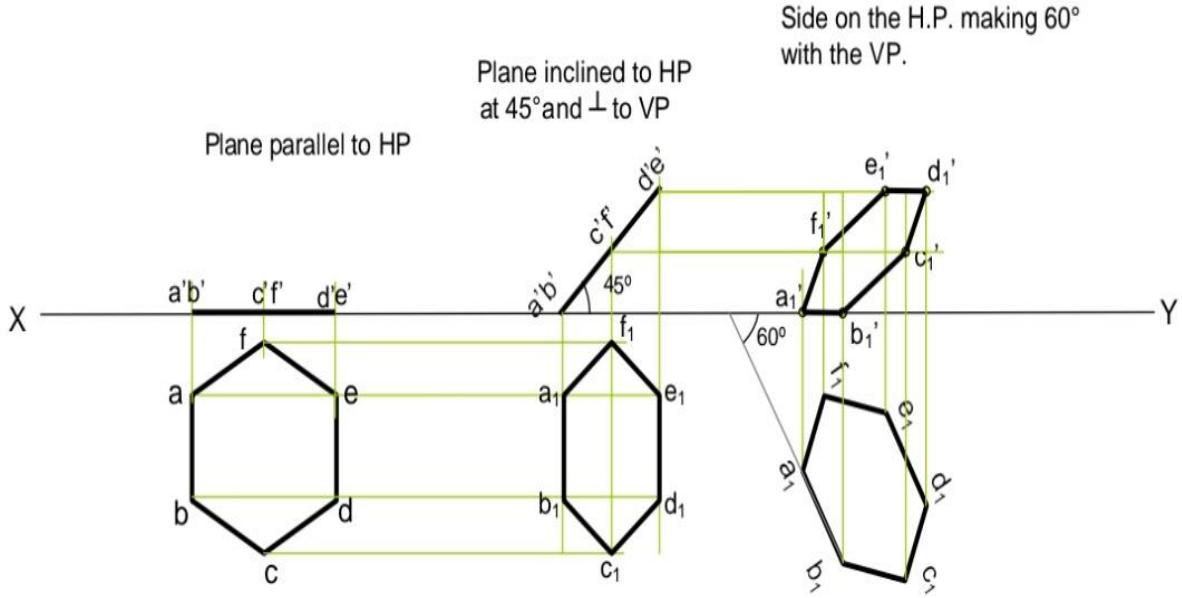
3. Draw a regular hexagon of 40 mm sides, with its two sides vertical. Draw a circle of 40 mm diameter in its centre. The figure represents a hexagonal plate with a hole in it and having its surface parallel to the VP. Draw its projections when the surface is vertical and inclined at 30° to the VP.



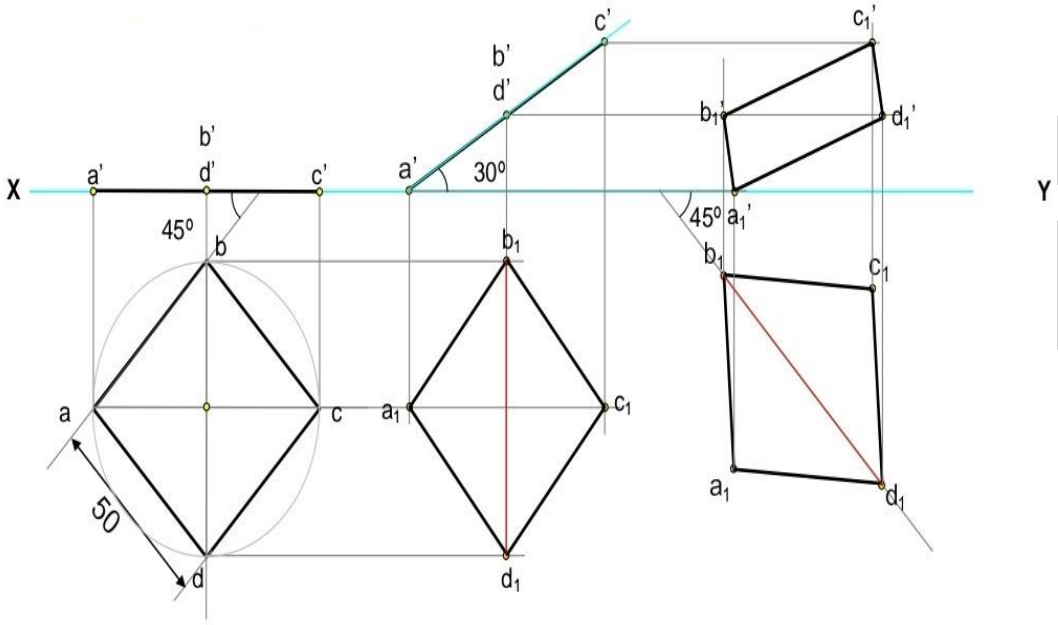
4. Draw an equilateral triangle of 75 mm sides and inscribe a circle in it. Draw the projections of the figure, when its plane is vertical and inclined at 30° to the VP and one of the sides of the triangle is inclined at 45° to the HP.



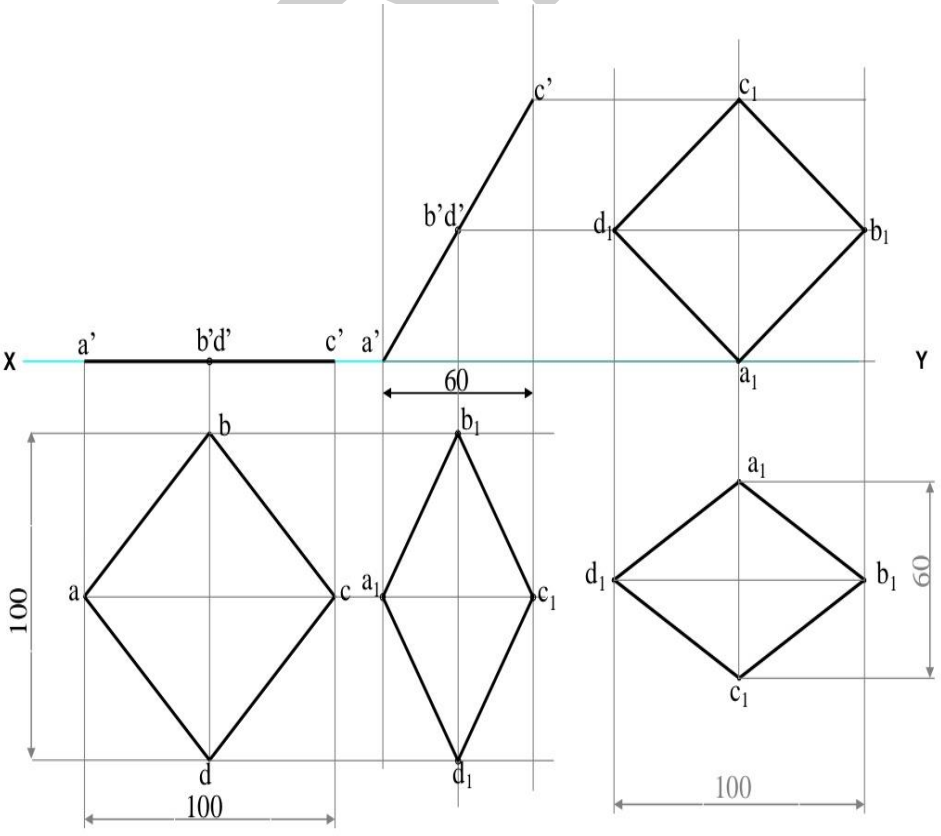
5. Draw the projections of a regular hexagon of 25mm sides, having one of its sides in the H.P. and inclined at 60° to the V.P. and its surface making an angle of 45° with the H.P.



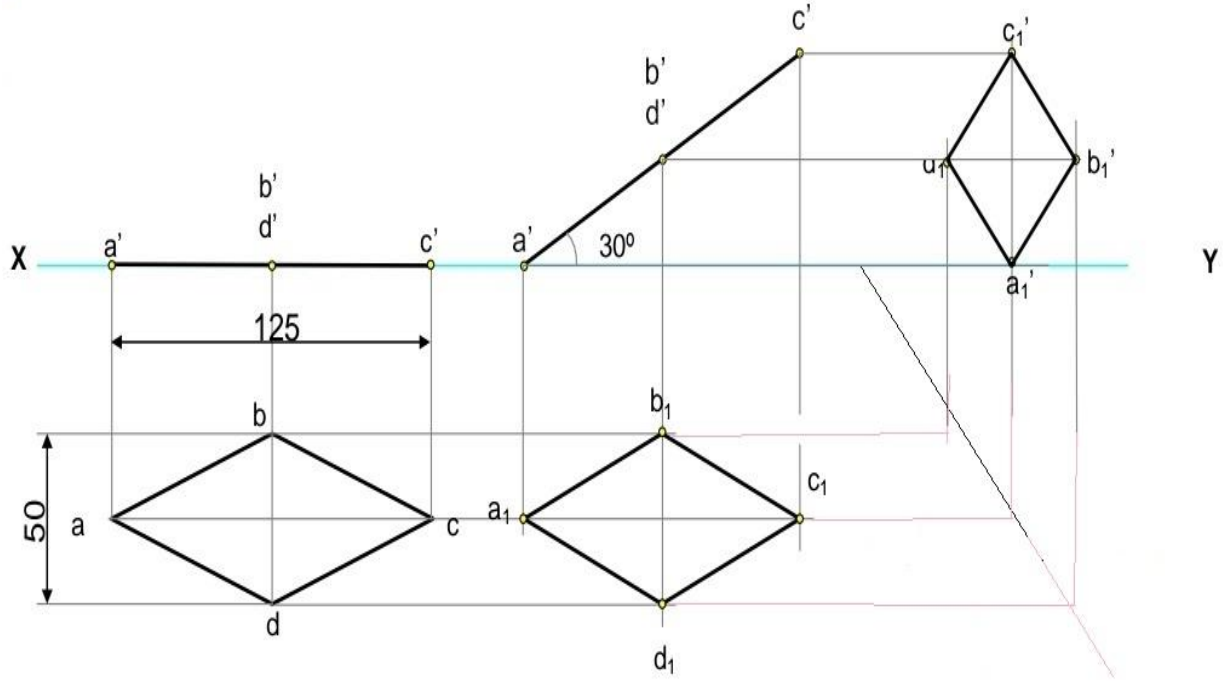
6. A square ABCD of 50 mm side has its corner A in the H.P., its diagonal AC inclined at 30° to the H.P. and the diagonal BD inclined at 45° to the V.P. and parallel to the H.P. Draw its projections.



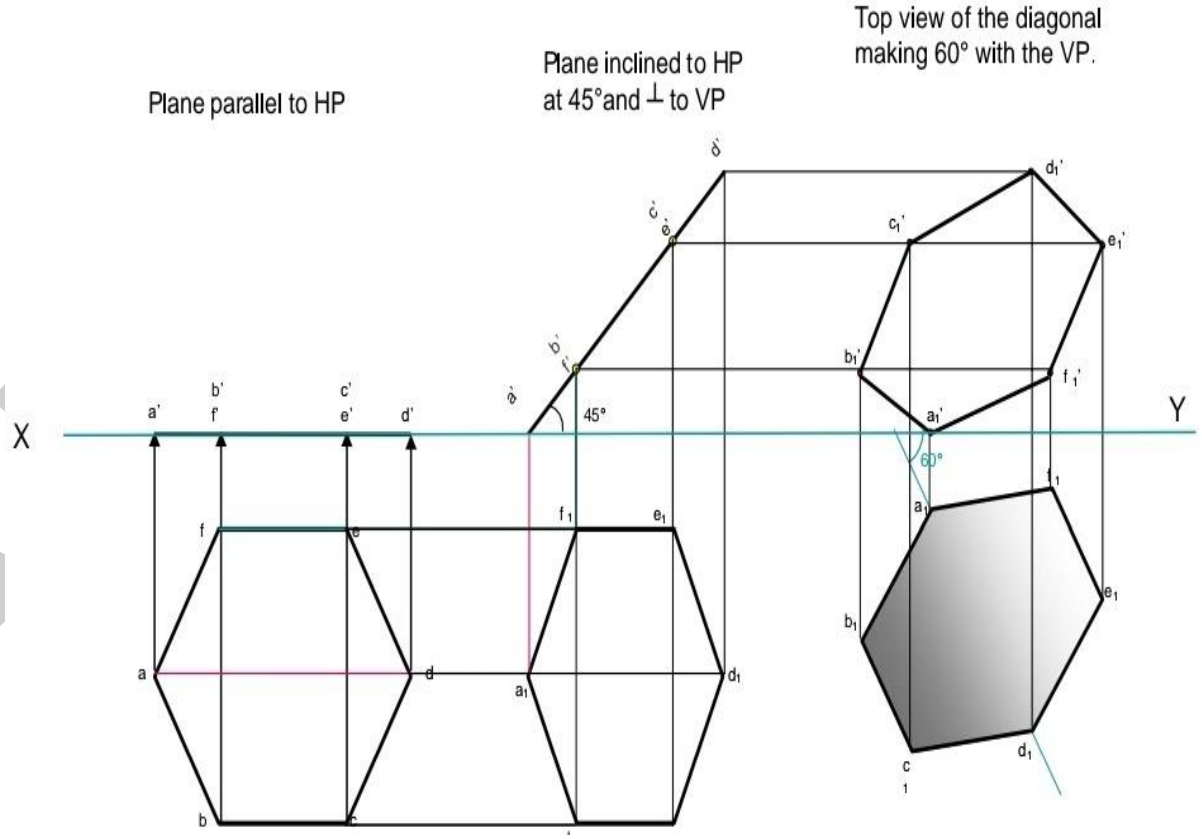
7. Draw a rhombus of 100 mm and 60 mm long diagonals with longer diagonal horizontal. The figure is the top view of a square having 100 mm long diagonals. Draw its front view.



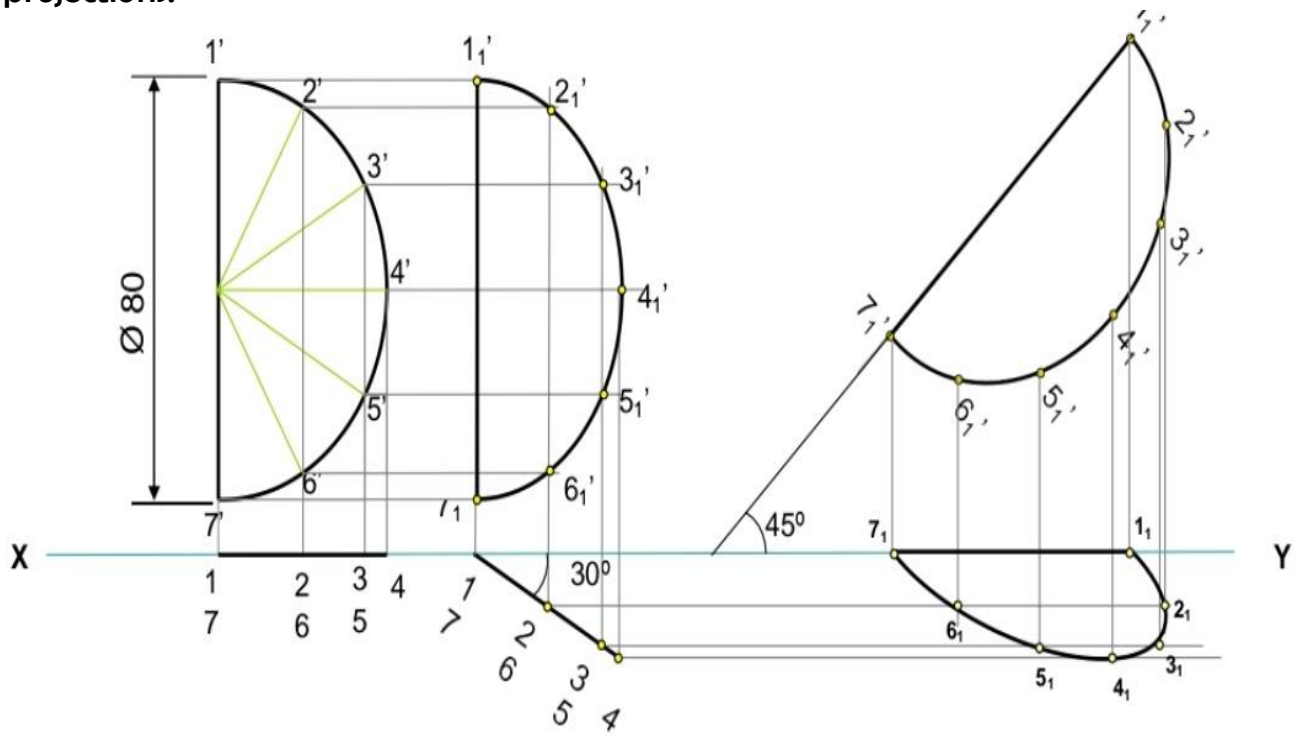
8. Draw projections of a rhombus having diagonals 125 mm and 50 mm long, the smaller diagonal of which is parallel to both the principal planes, while the other is inclined at 30° to the H.P.



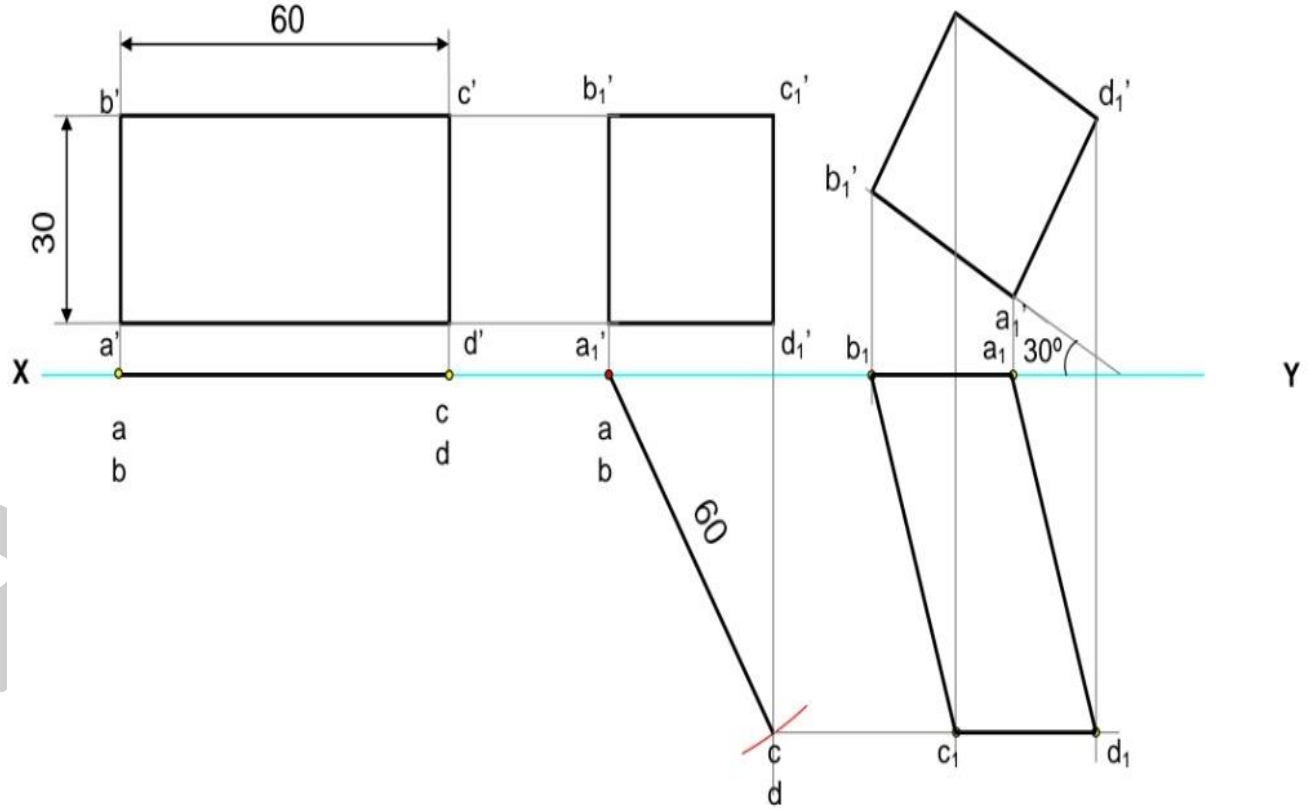
9. A regular hexagon of 40mm side has a corner in the HP. Its surface inclined at 45° to the HP and the top view of the diagonal through the corner which is in the HP makes an angle of 60° with the VP. Draw its projections.



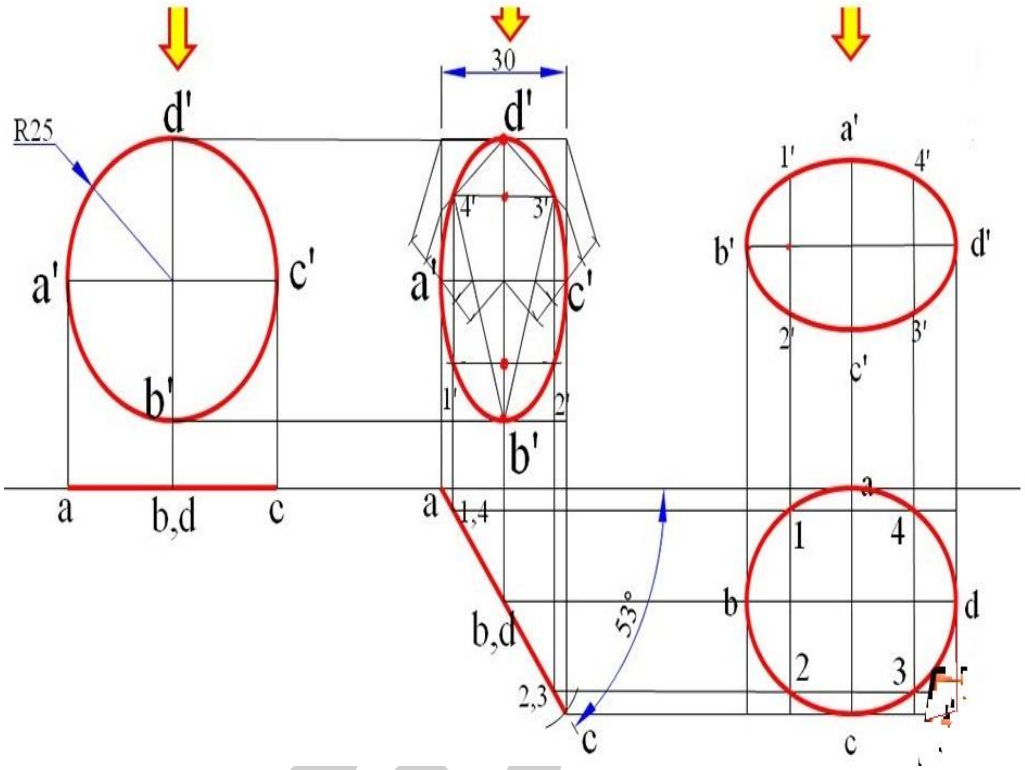
10. A semicircular plate of 80mm diameter has its straight edge in the VP and inclined at 45° to HP. The surface of the plate makes an angle of 30° with the VP. Draw its projections.



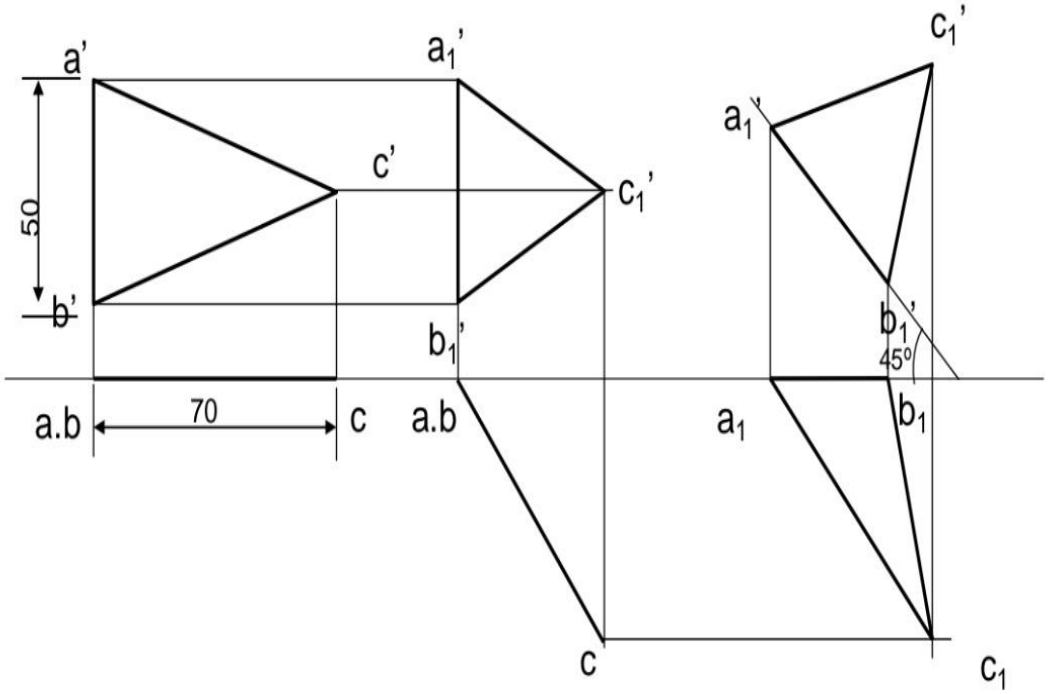
11. A thin rectangular plate of sides 60 mm X 30 mm has its shorter side in the V.P. and inclined at 30° to the H.P. Project its top view if its front view is a square of 30 mm long sides.



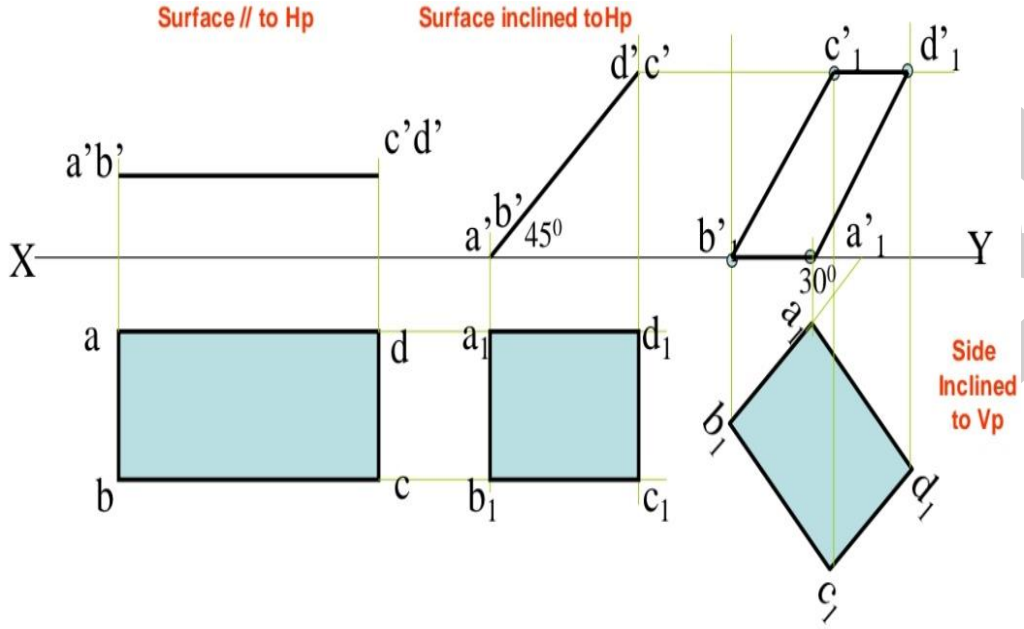
12. A circular plate of negligible thickness and 50 mm diameter appears as an ellipse in the front view, having its major axis 50 mm long and minor axis 30 mm long. Draw its top view when the major axis of the ellipse is horizontal.



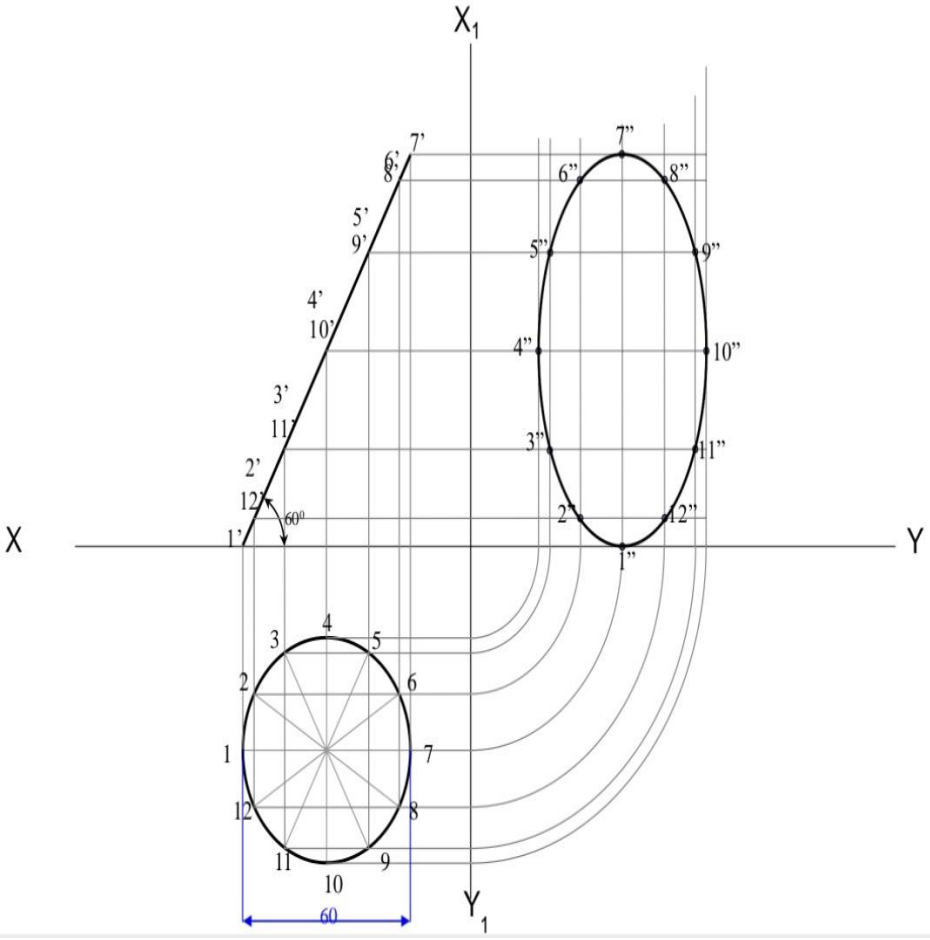
13. A plate having shape of an isosceles triangle has base 50 mm long and altitude 70 mm. It is so placed that in the front view it is seen as an equilateral triangle of 50 mm sides and one side inclined at 45° to xy. Draw its top view?



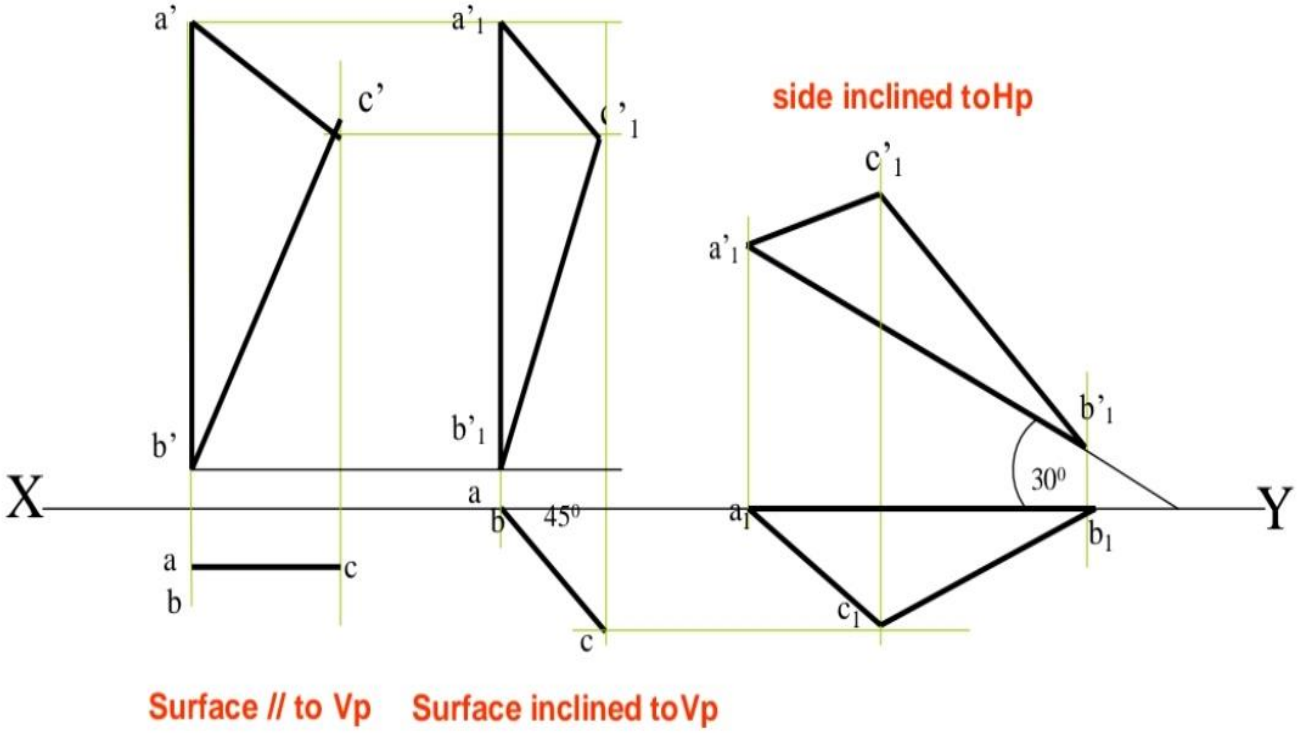
14. Rectangle 30mm and 50mm sides is resting on HP on one small side which is 30° inclined to VP, while the surface of the plane makes 45° inclination with HP. Draw it's projections.



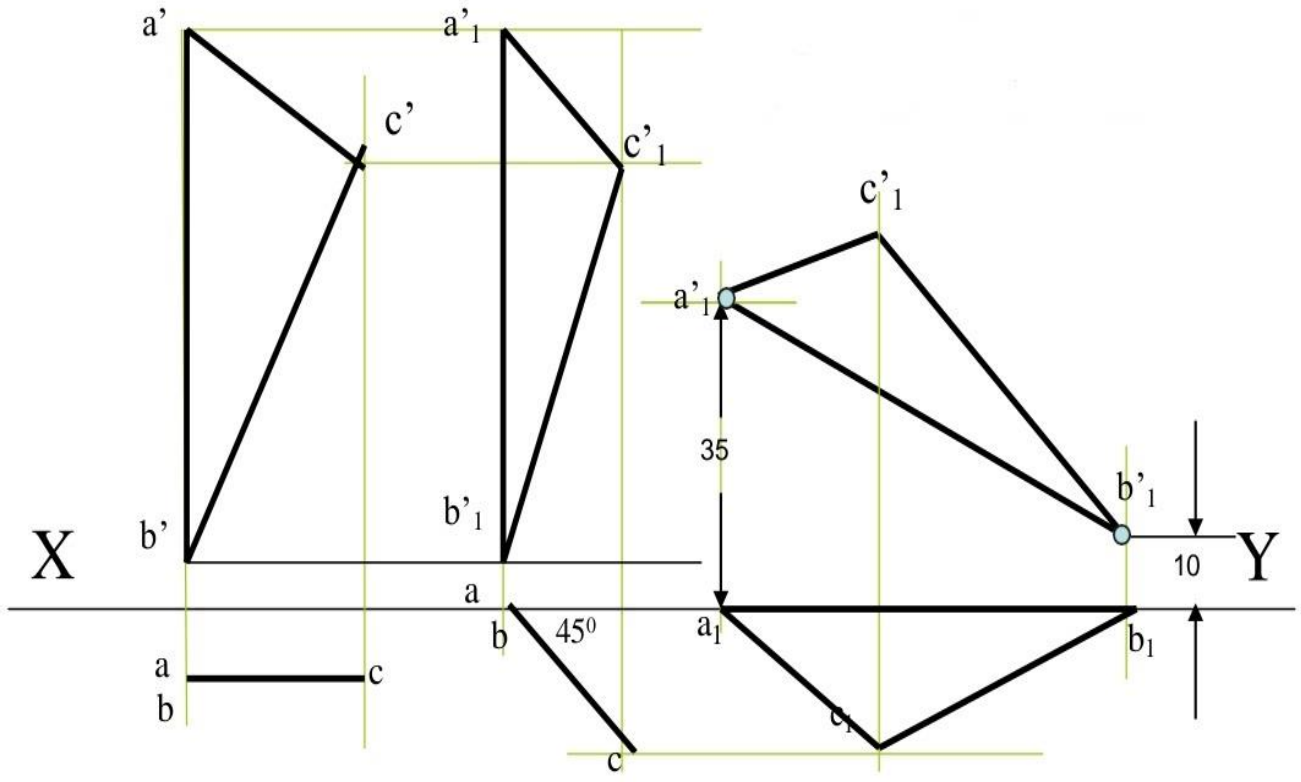
15. The top view of a plate, the surface of which is inclined at 60° to the HP is a circle of 60 mm diameter. Draw its three views.



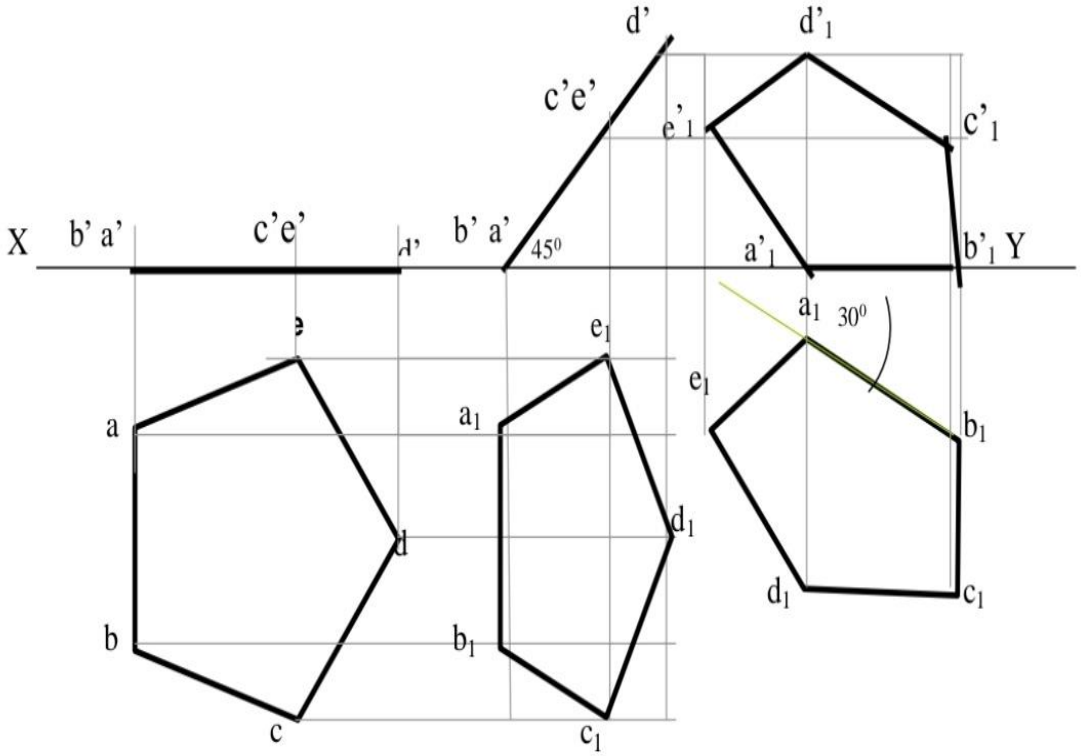
16. A 30° – 60° set square of longest side 100 mm long is in VP and 30° inclined to HP while it's surface is 45° inclined to VP. Draw its projections?



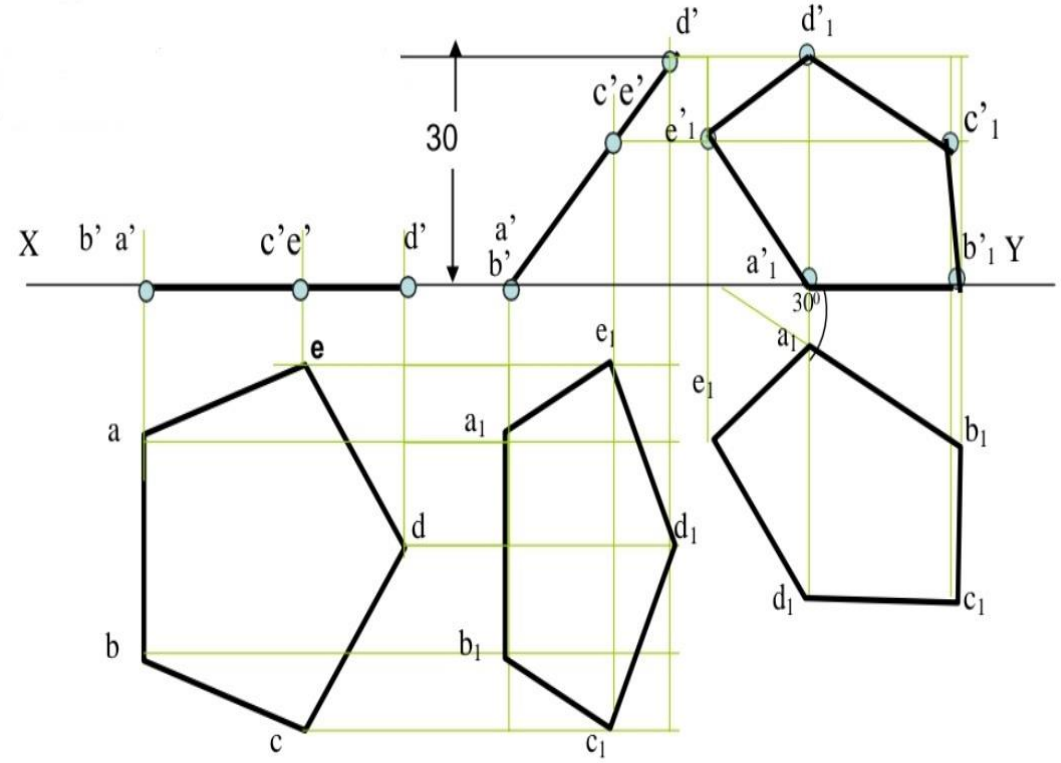
17. A 30° – 60° set square of longest side 100 mm long is in VP and its surface 45° inclined to VP. One end of longest side is 10 mm and other end is 35 mm above HP. Draw it's projections?



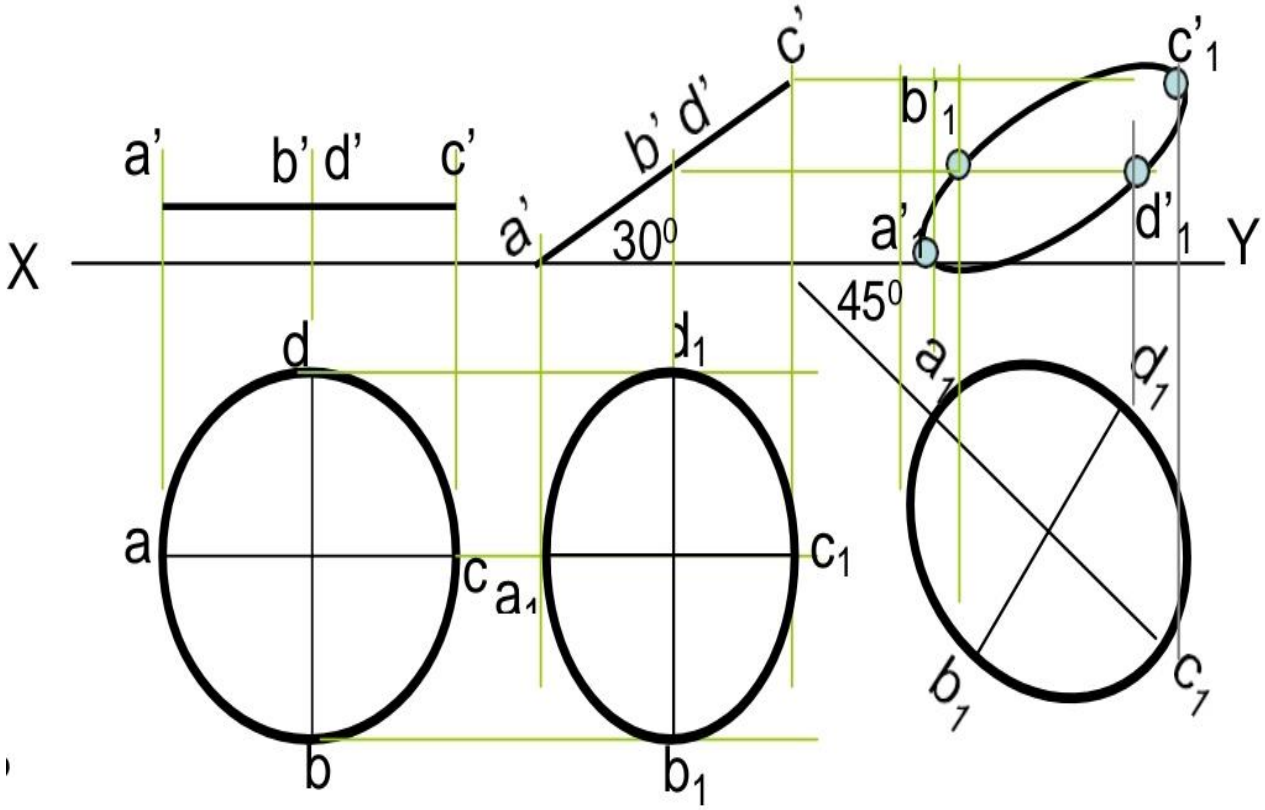
18. A regular pentagon of 30 mm sides is resting on HP on one of its sides with its surface 45° inclined to HP. Draw its projections when the side in HP makes 30° angles with VP?



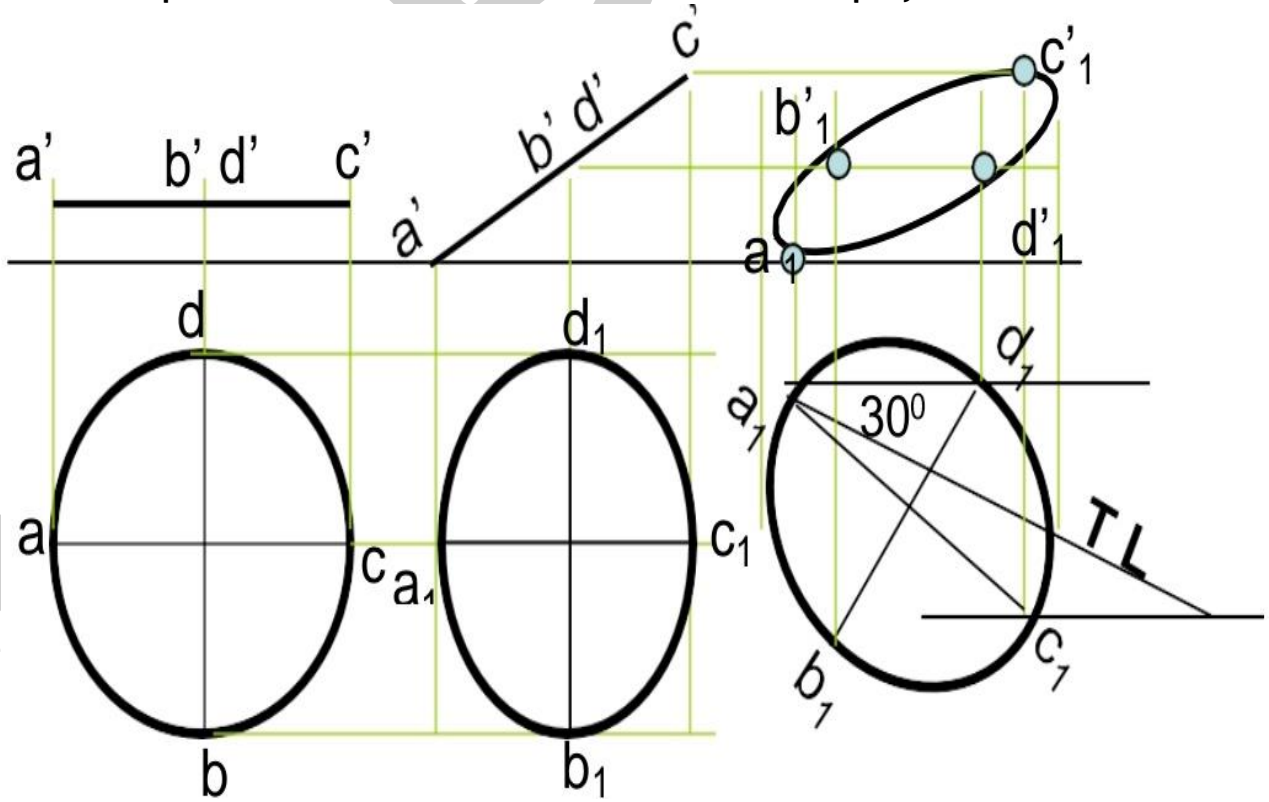
19. A regular pentagon of 30 mm sides is resting on HP on one of its sides while its opposite vertex (corner) is 30 mm above HP. Draw projections when side in HP is 30° inclined to VP.



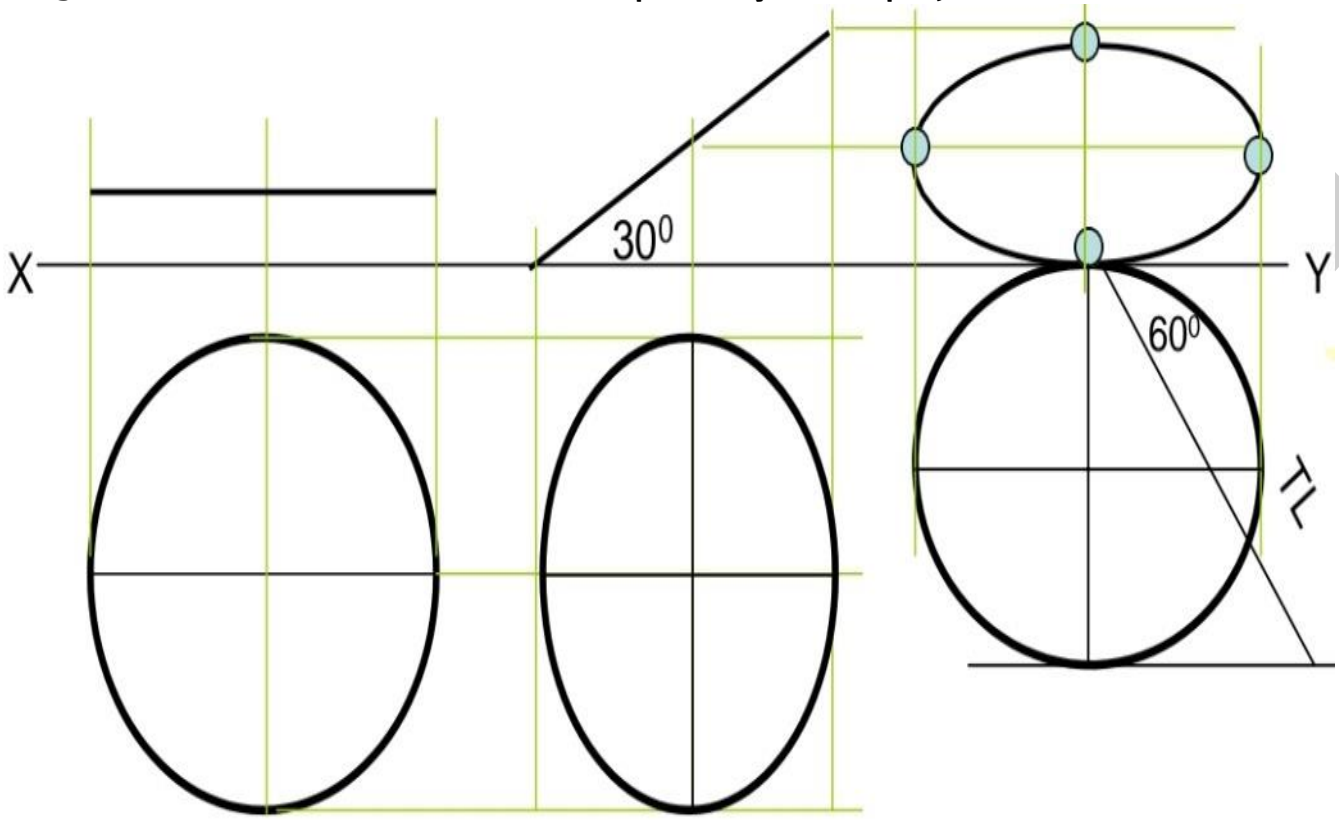
20. A circle of 50 mm diameter is resting on HP on end A of its diameter AC which is 30° inclined to HP while its TV is 45° inclined to VP .Draw its projections?



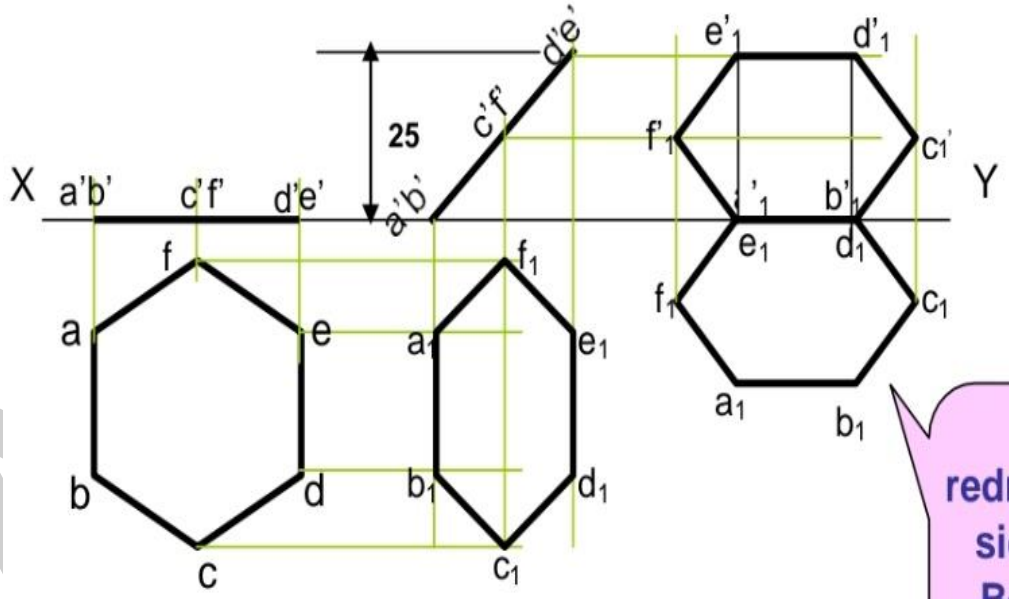
21. A circle of 50 mm diameter is resting on HP on end A of its diameter AC which is 30° inclined to Hp while it makes 45° inclined to VP. Draw its projections.



22. End A of diameter AB of a circle is in HP and end B is in VP. Diameter AB, 50 mm long is 30° & 60° inclined to HP & VP respectively. Draw projections of circle.

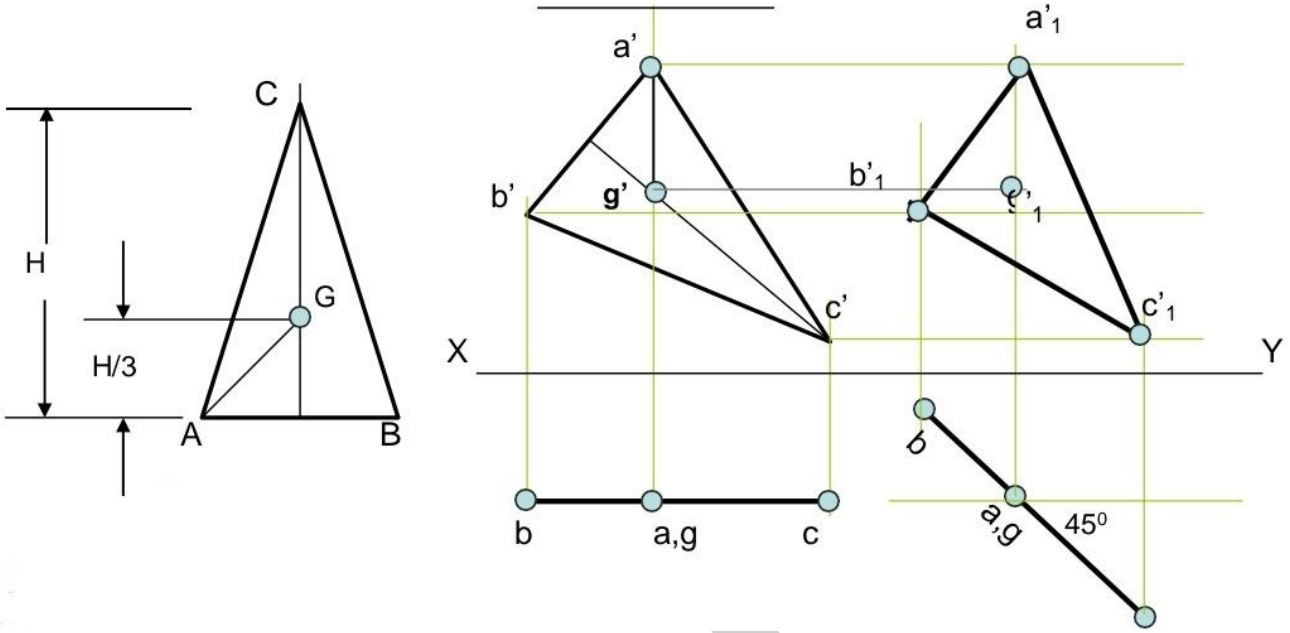


23. A hexagonal lamina has its one side in HP and its apposite parallel side is 25mm above HP and in VP. Draw it's projections. Take side of hexagon 30 mm long.

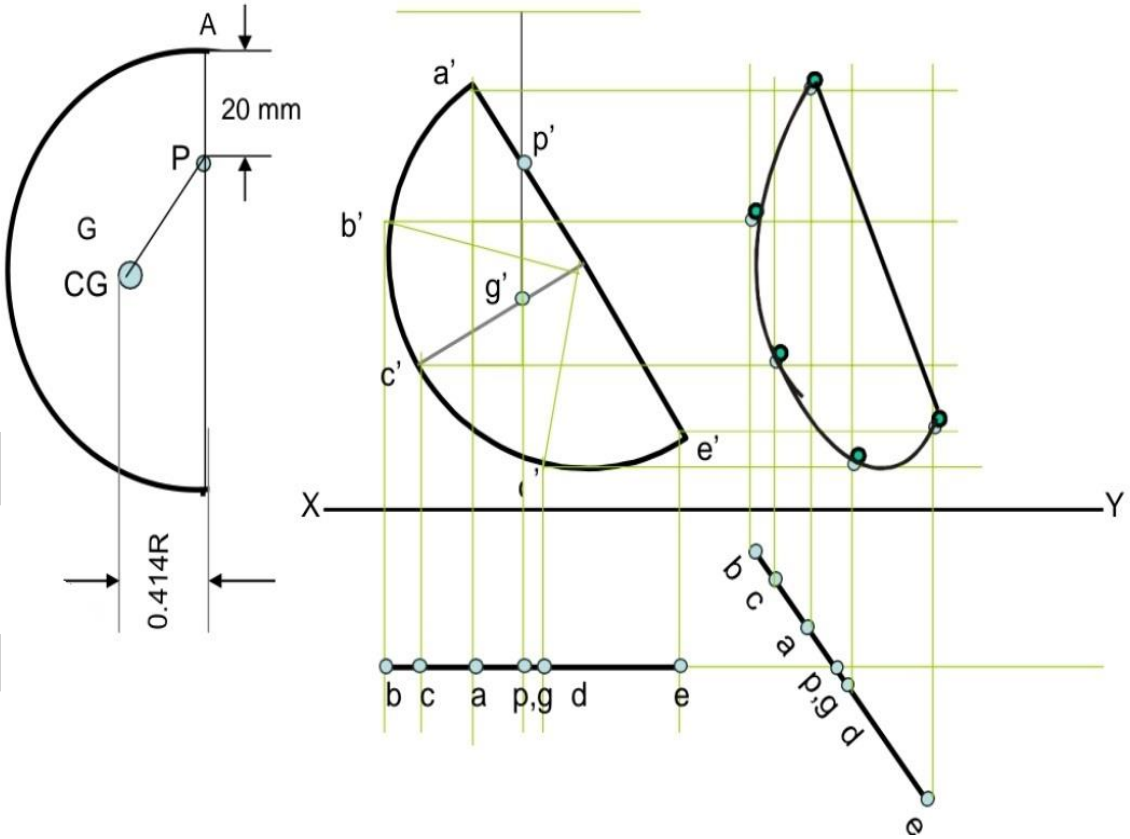


As 3rd step redraw 2nd Tv keeping side DE on xy line. Because it is in VP as said in problem.

24. An isosceles triangle of 40 mm long base side, 60 mm long altitude is freely suspended from one corner of base side. Its plane is 45° inclined to VP. Draw its projections.



25. 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° with VP. Draw its projections.



UNIT-III

Projection of Regular Solids

Sectional views of Right Regular Solids

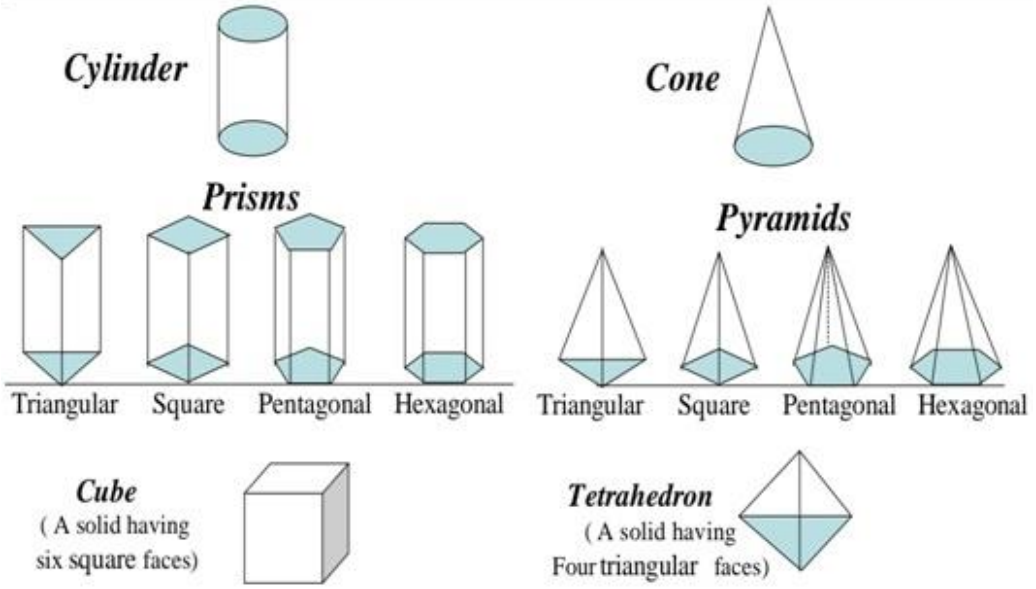
(Prisms, Pyramids, Cone, Cylinder, Cube & etc)

"DO ALL THE GOOD YOU CAN, FOR ALL THE PEOPLE YOU CAN, IN ALL THE WAYS YOU CAN, AS LONG AS YOU CAN."

PROJECTIONS OF SOLIDS
1. Projections of solids in simple position.
a) Axis perpendicular to the H.P. & parallel to the V.P.
b) Axis perpendicular to the V.P. & parallel to the H.P.
c) Axis parallel to both the planes.
2. Projections of solids with axes inclined to one of the RP and parallel to the other.
a) Axis inclined to the H.P. and parallel to the V.P.
b) Axis inclined to the V.P. and parallel to the H.P.
3. Projections of solids with axes inclined to both the H.P. and the V.P.

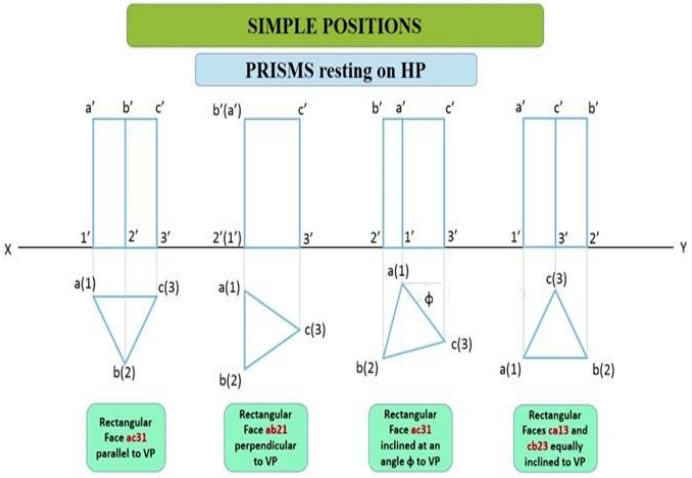
To understand and remember various solids in this subject properly, those are classified & arranged in to two major groups.

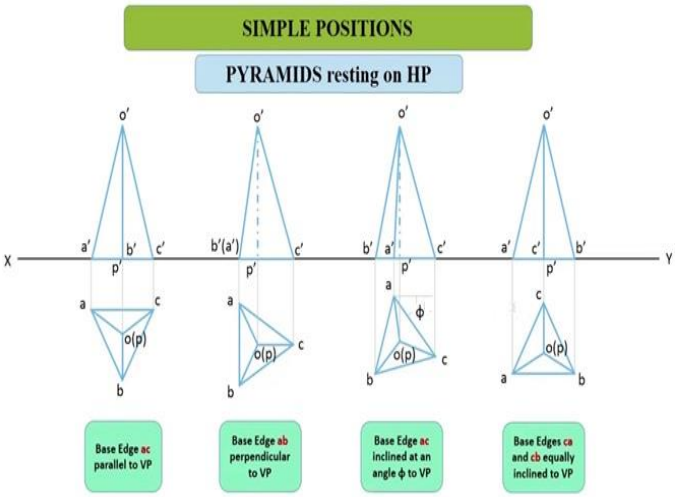
Group A	Group B
Solids having top and base of same shape	Solids having base of some shape and just a point as a top, called apex.

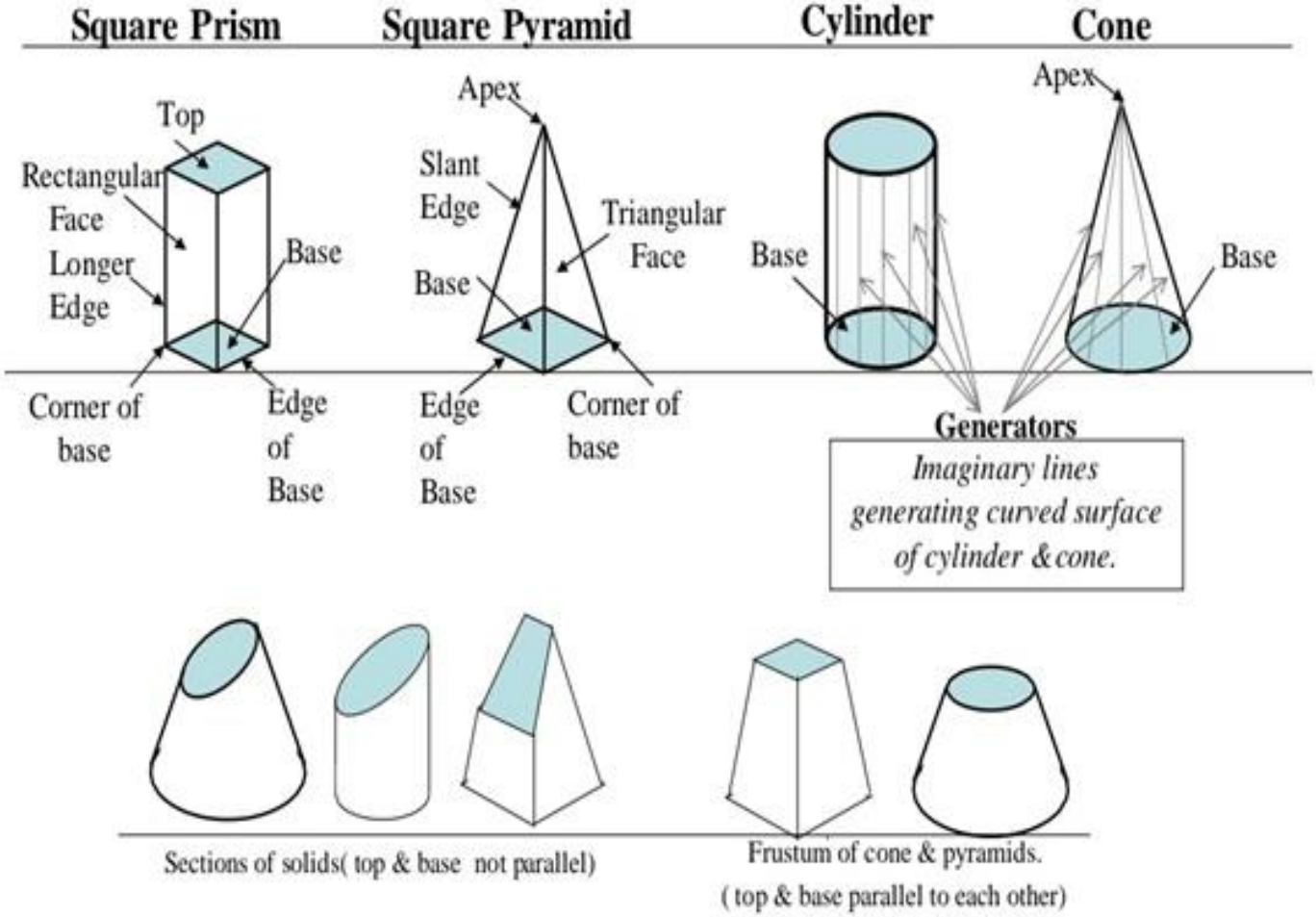


Cube (A solid having six square faces)

Tetrahedron (A solid having Four triangular faces)







STEPS TO SOLVE PROBLEMS IN SOLIDS

Problem is solved in three steps:

STEP 1:

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

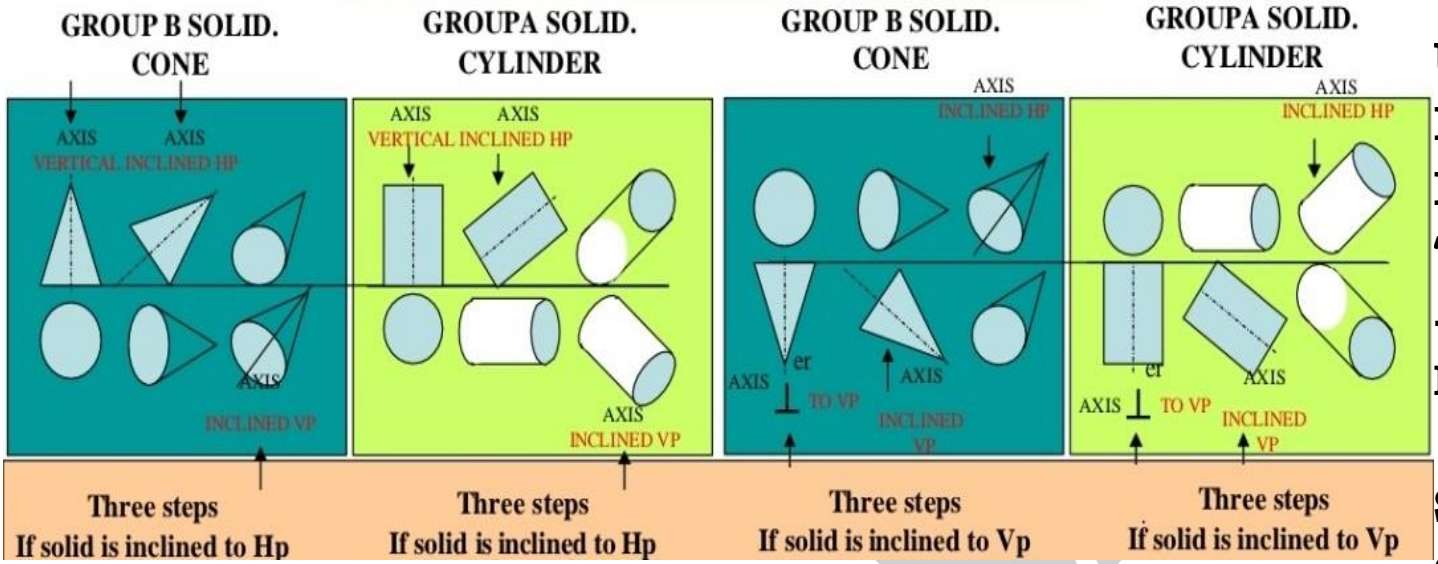
STEP 2:

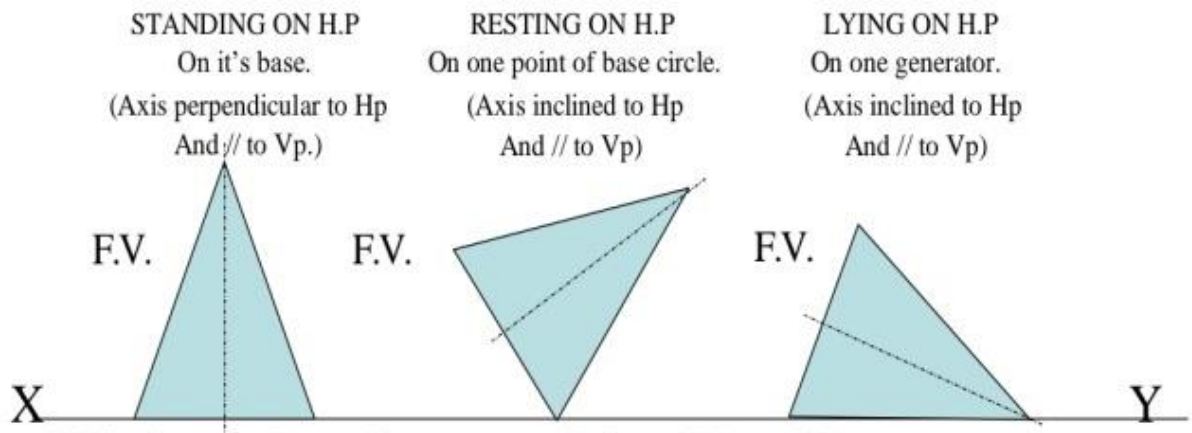
CONSIDERING SOLID'S INCLINATION (AXIS POSITION) DRAW IT'S FV & TV.

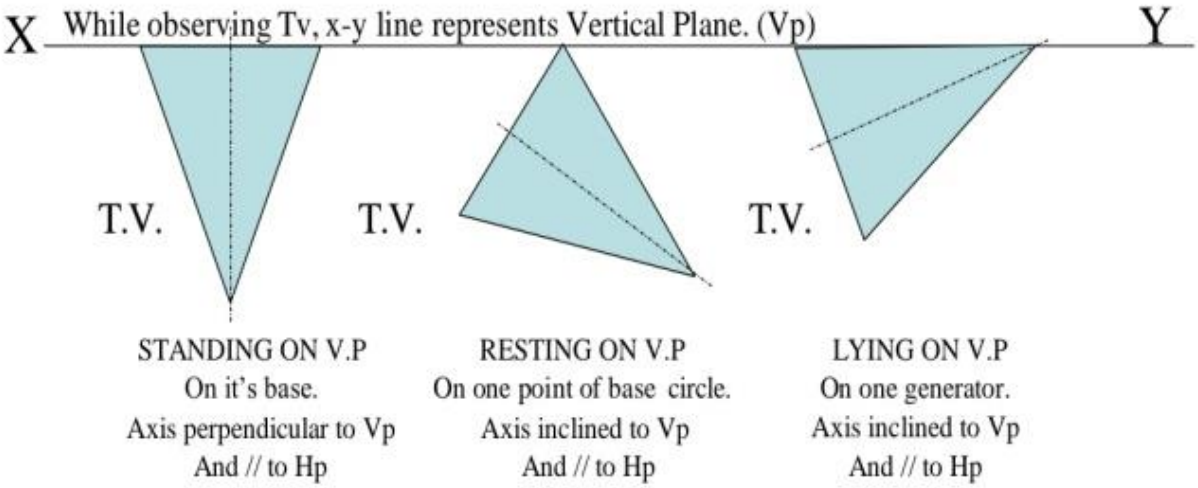
STEP 3:

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

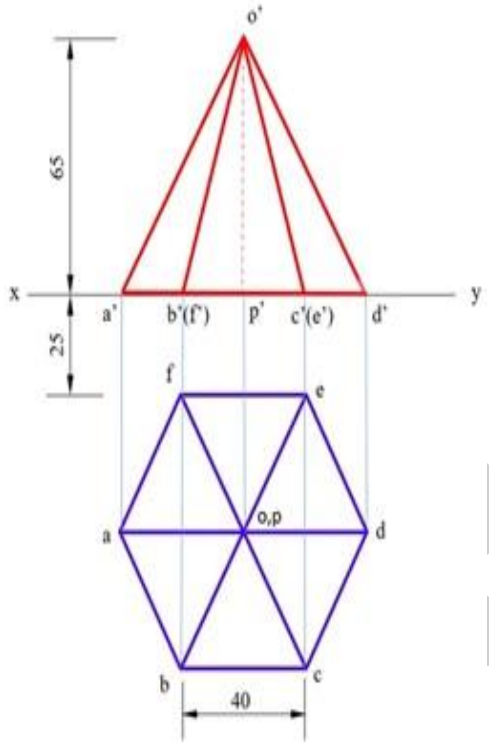
GENERAL PATTERN (THREE STEPS) OF SOLUTION:



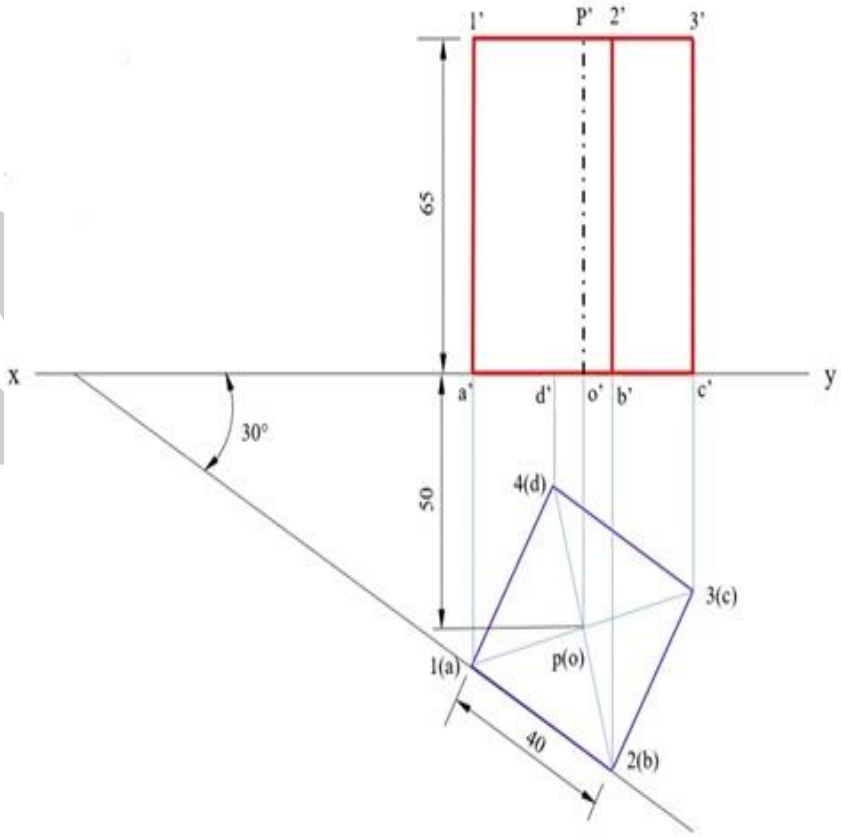




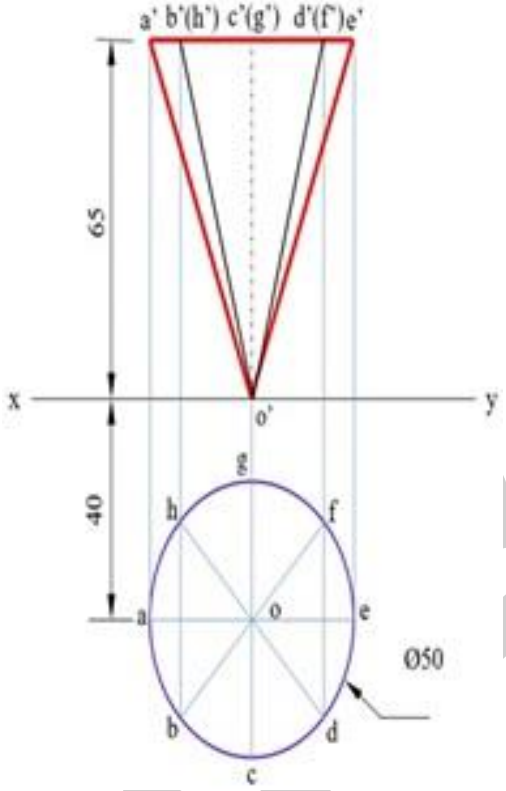
1. A Hexagonal Pyramid side of base 40mm and 65mm long is resting on its base on the H.P with one of its edge is parallel to V.P & 25mm in front of it?



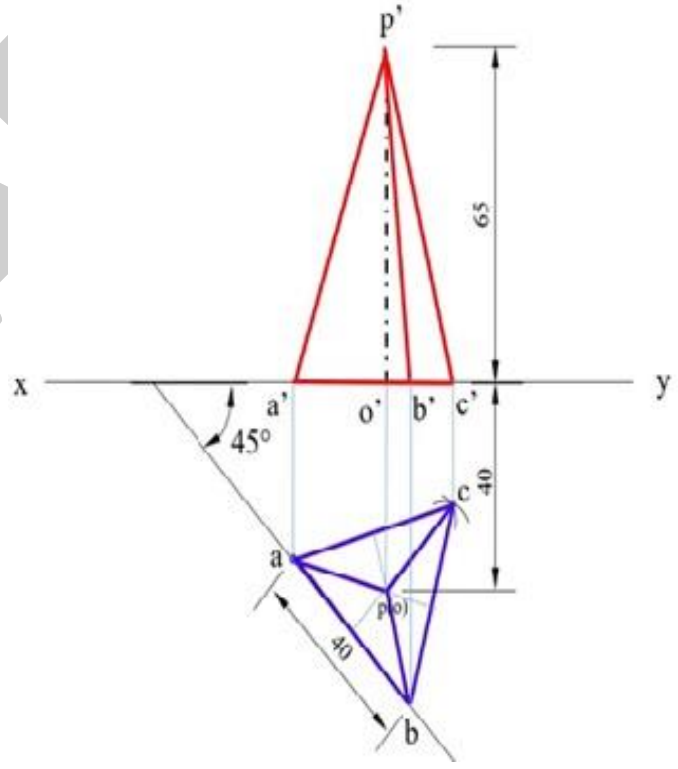
2. A Square Prisms of side of base 40mm and 65mm long is resting on its base on the H.P with one of its edge is 30° to V.P & its axis is 50mm in front of V.P?



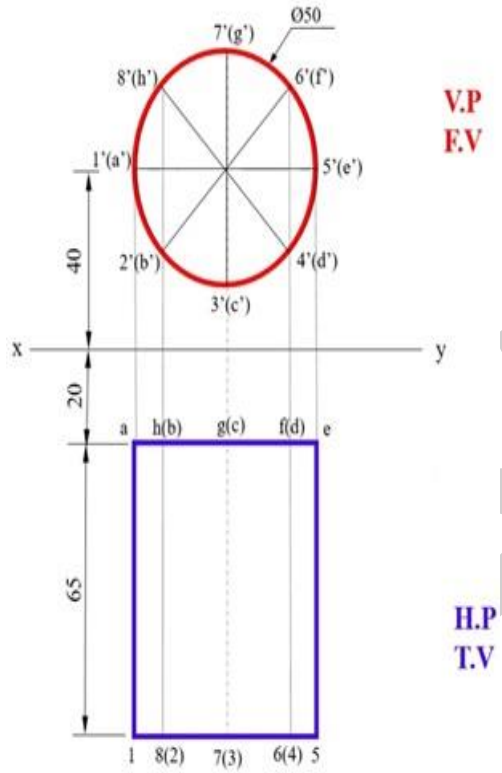
3. Draw the projections of a Cone of base diameter 50mm and height 65mm long is resting on its apex on the H.P. with the axis 40mm in front of the V.P.



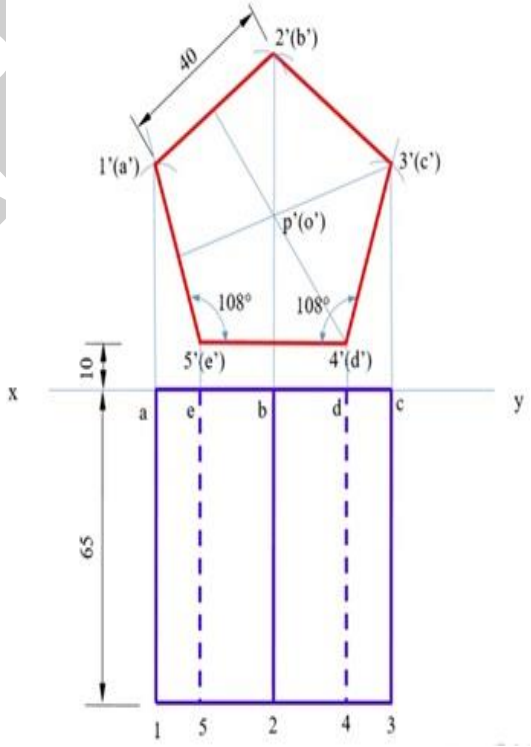
4. Draw the projections of a Triangular Pyramid of base side 40mm and height 65mm is resting on its base on the H.P. with one of its base edge is 45° to the V.P. and its axis is 40mm in front of the V.P?



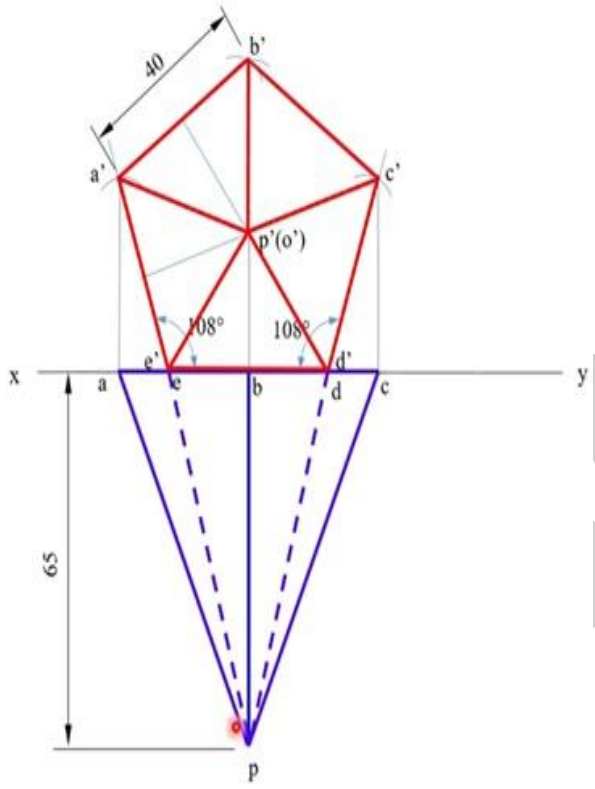
5. A Cylinder of base diameter 50mm, axis 65mm. The axis of the cylinder is perpendicular to the V.P. The center of the cylinder is 40mm above the H.P & 20mm in front of the V.P. Draw its Projections?



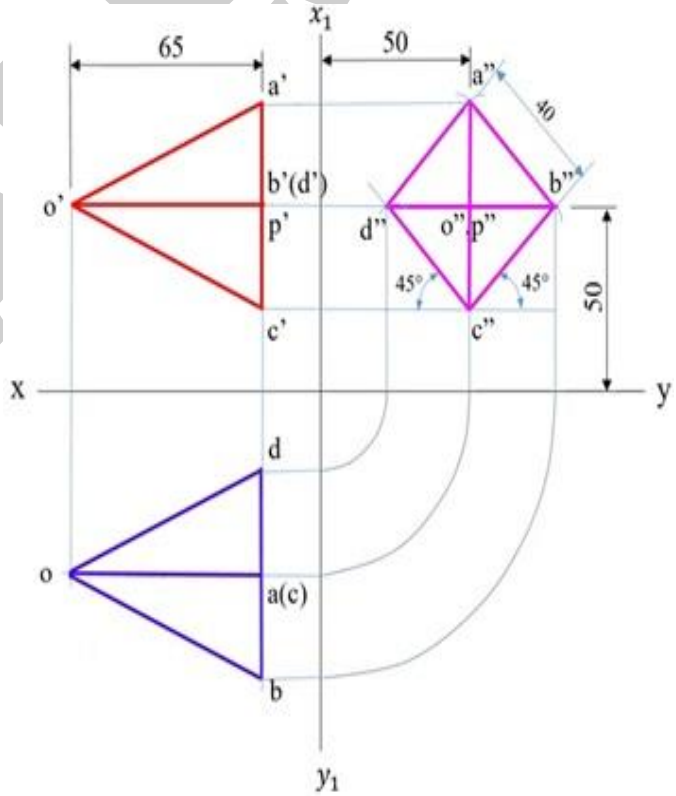
6. A Pentagonal Prism of base side 40mm and height 65mm is resting on its base on V.P. with one of its base edge is parallel to H.P & 10mm above the H.P? Draw its Projections?



7. A Pentagonal Pyramid of base side 40mm and height 65mm is resting on its base on V.P. with one of its base edge is on H.P. Draw its Projections?

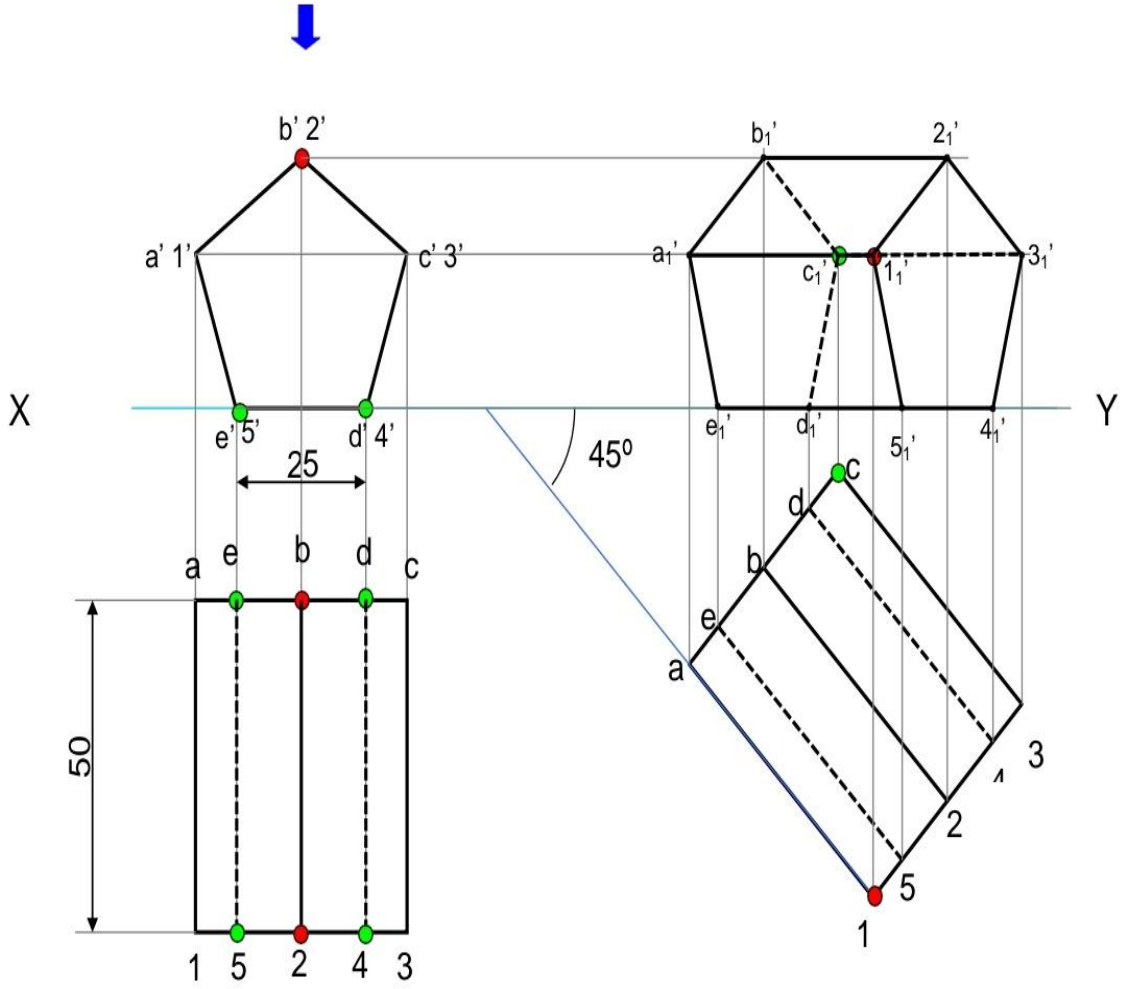


8. A Square Pyramid of base side 40mm and axis 65mm long. All edges of base are equally inclined to H.P. Its axis is parallel to & 50mm away from both H.P and V.P. Draw its Projections?



9. 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 45° to the V.P.

As the axis is to be inclined with the VP, in the first view it must be kept perpendicular to the VP i.e. true shape of the base will be drawn in the FV with one side on XY line.



10. Draw the projections of a cone, base 45 mm diameter and axis 50 mm long, when it is resting on the ground on a point on its base circle with **(a)** the axis making an angle of 30° with the HP and 45° with the VP **(b)** the axis making an angle of 30° with the HP and its top view making 45° with the VP?

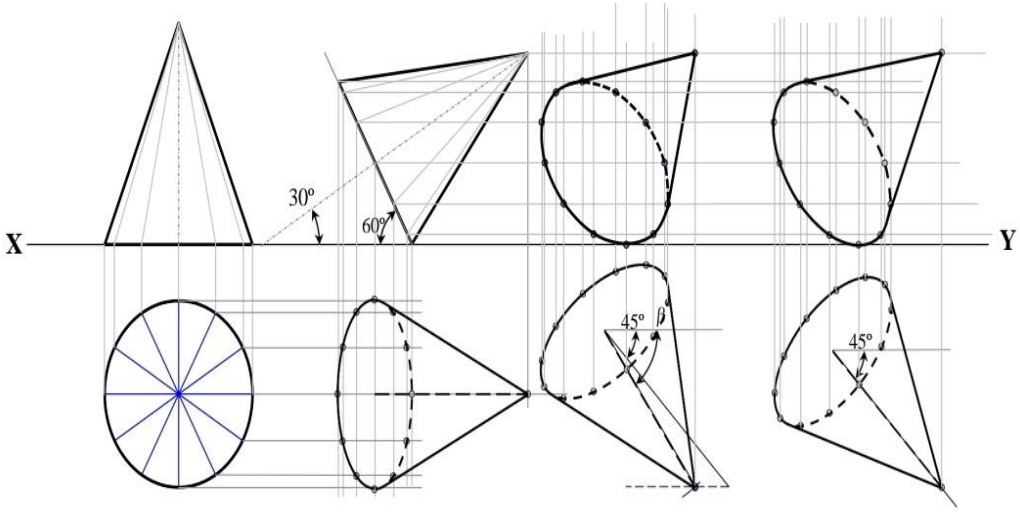
Steps

(1) Draw the TV & FV of the cone assuming its base on the HP

(2) To incline axis at 30° with the HP, incline the base at 60° with HP and draw the FV and then the TV.

(3) For part (a), to find β, draw a line at 45° with XY in the TV, of 50 mm length. Draw the locus of the end of axis. Then cut an arc of length equal to TV of the axis when it is inclined at 30° with HP. Then redraw the TV, keeping the axis at new position. Then draw the new FV

(4) For part (b), draw a line at 45° with XY in the TV. Then redraw the TV, keeping the axis at new position. Again draw the FV.

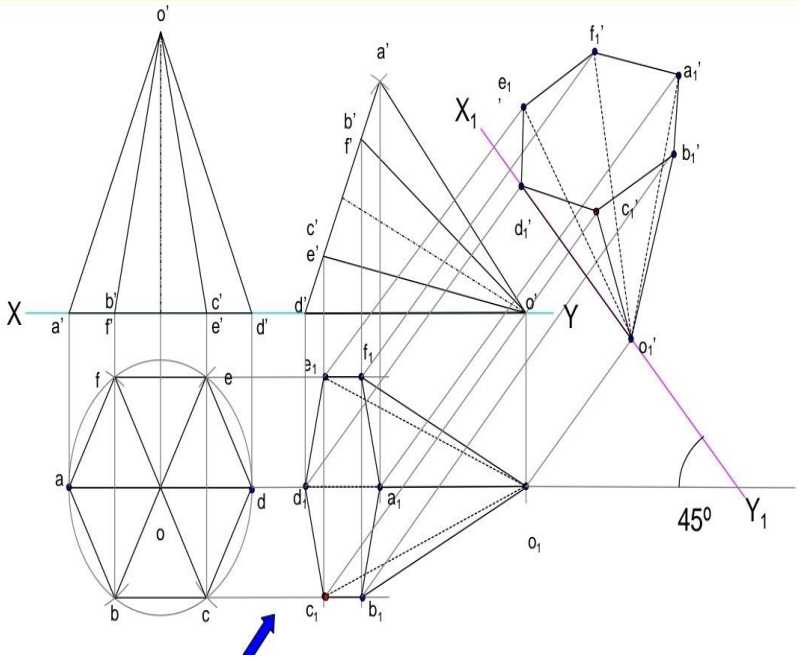


11. A hexagonal pyramid base 25 mm side and axis 55 mm long has one of its slant edge on the ground. A plane containing that edge and the axis is perpendicular to the H.P. and inclined at 45° to the V.P. Draw its projections when the apex is nearer to the V.P. than the base.

Steps:

The inclination of the axis is given indirectly in this problem. When the slant edge of a pyramid rests on the HP its axis is inclined with the HP so while deciding first view the axis of the solid must be kept perpendicular to HP i.e. true shape of the base will be seen in the TV. Secondly when drawing hexagon in the TV we have to keep the corners at the extreme ends.

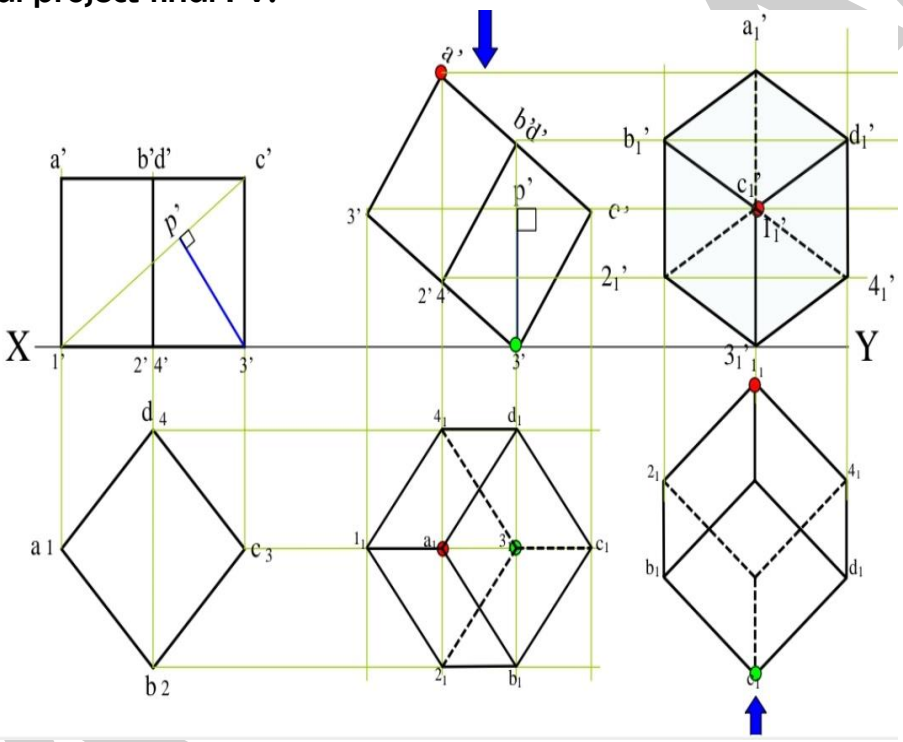
The vertical plane containing the slant edge on the HP and the axis is seen in the TV as o1d1 for drawing auxiliary FV draw an auxiliary plane X1Y1 at 45° from d1o1 extended. Then draw projectors from each point i.e. a1 to f1 perpendicular to X1Y1 and mark the points measuring their distances in the FV from old XY line.



12. 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 square with all sides equally inclined to XY. Project FV and name all points of FV & TV.
2. Draw a body-diagonal joining c' with 1'(This can become // to xy)
3. From 3' drop a perpendicular on this and name it p'
4. Draw 2nd Fv in which 3'p' line is vertical ***means*** c'-1' diagonal must be horizontal.
5. Now as usual project TV.
6. In final TV draw same diagonal is perpendicular to VP as said in problem. Then as usual project final FV.



13. 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° inclined to VP. Draw projections.

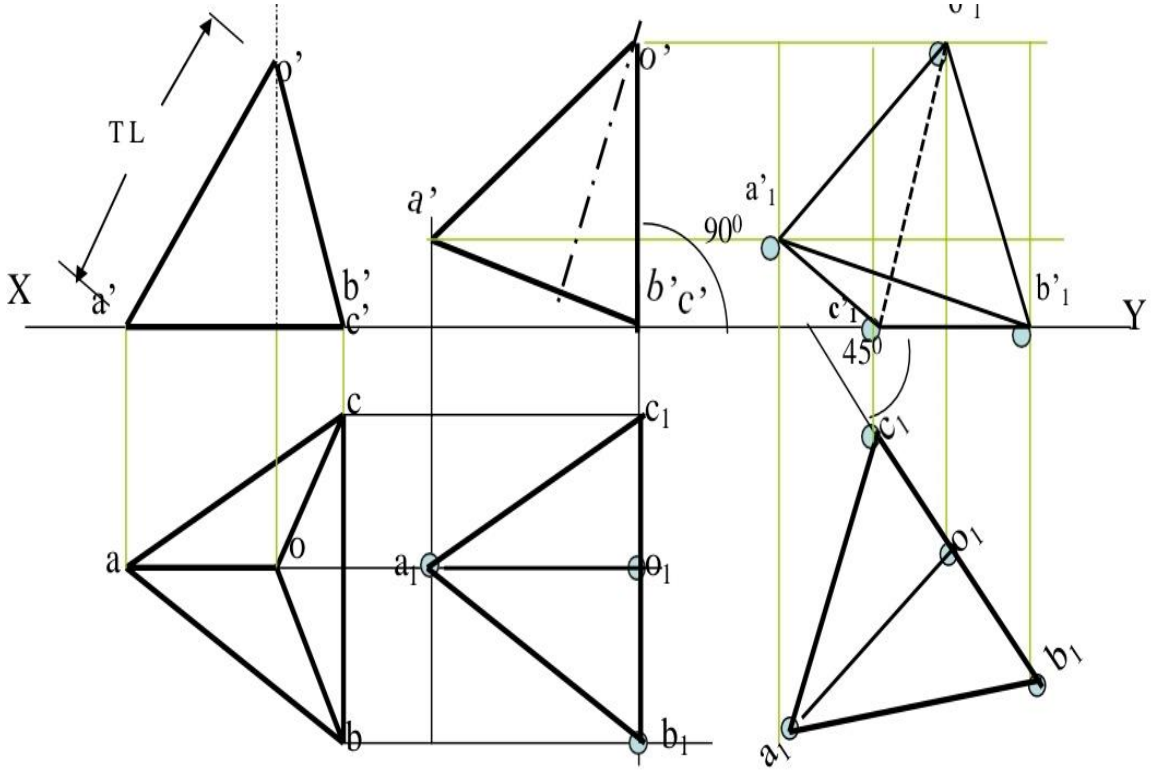
Important: Tetrahedron is a special type of triangular pyramid in which base sides & slant edges are equal in length. Solid of four faces. Like cube it is also described by one dimension only. Axis length generally not given.

Solution Steps

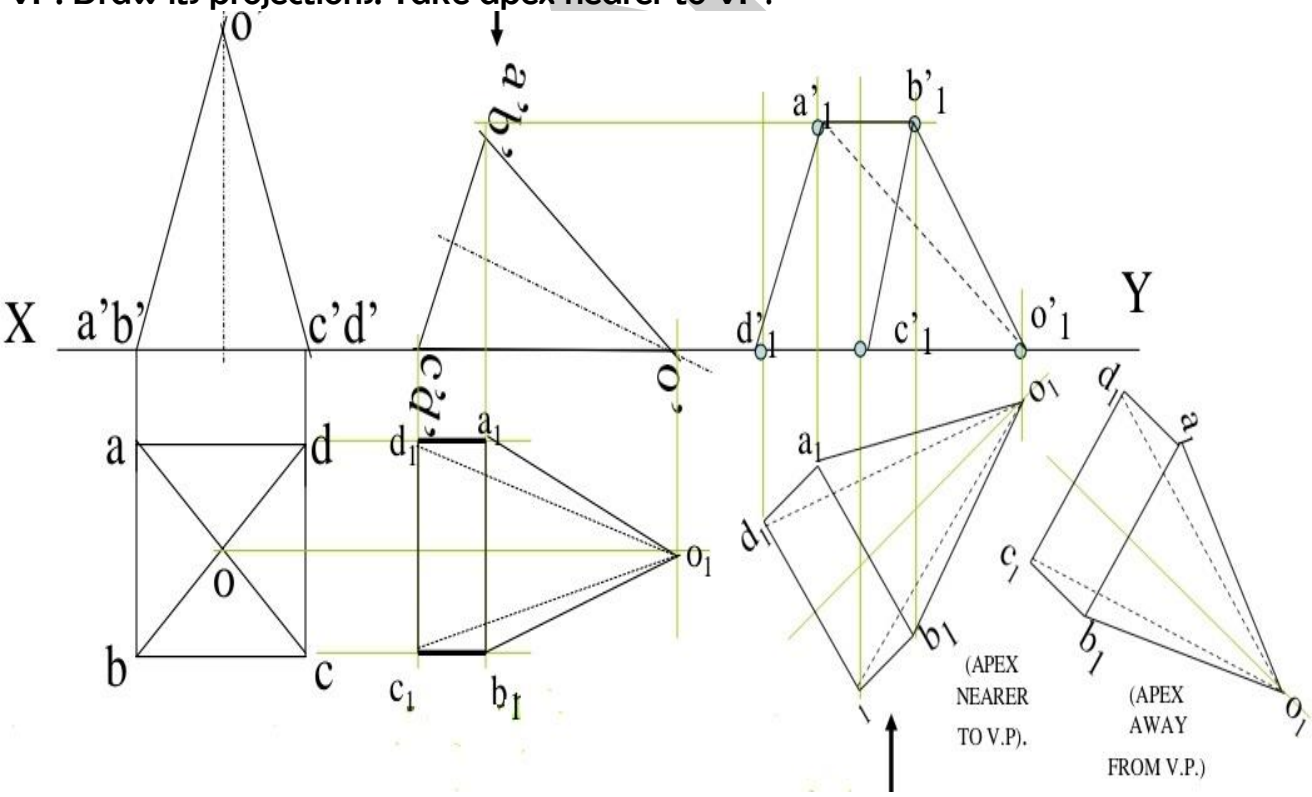
As it is resting assume it standing on HP.

Begin with TV, an equilateral triangle as side case as shown: First project base points of FV on xy, name those & axis line. From a' with TL of edge, 50 mm, cut on axis line & mark o' (as axis is not known, o' is finalized by slant edge length) Then complete FV.

In 2nd Fv make face o'b'c' vertical as said in problem. And like all previous problems solve completely.



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

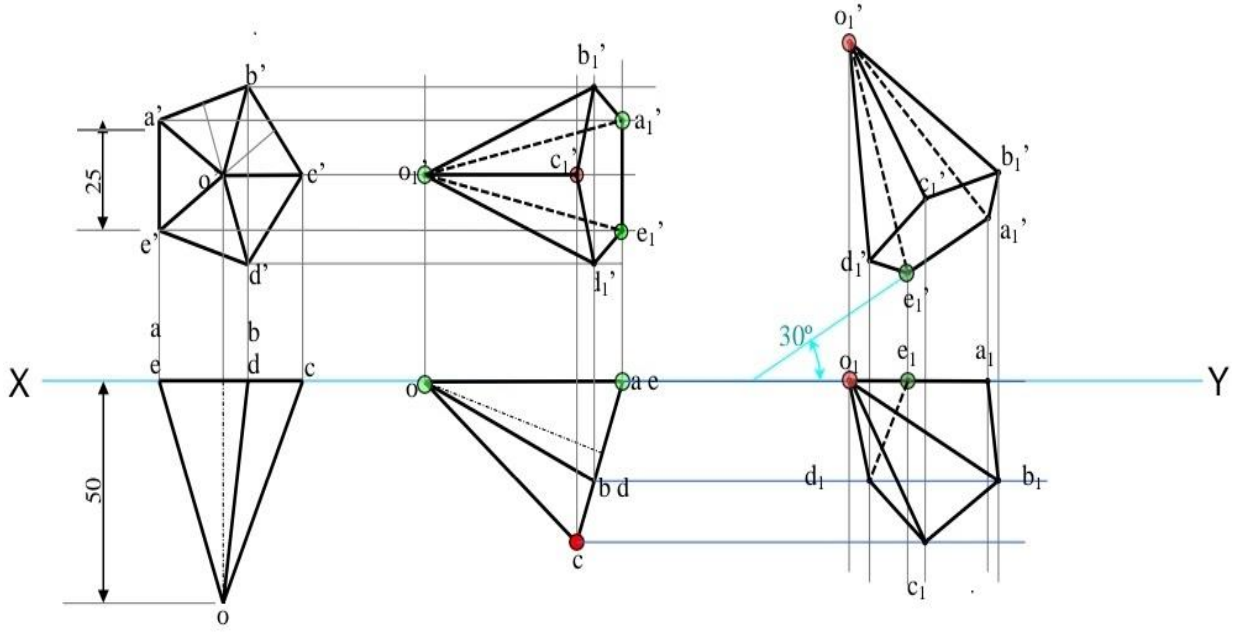


15. A pentagonal pyramid base 25 mm side and axis 50 mm long has one of its triangular faces in the VP and the edge of the base contained by that face makes an angle of 30° with the HP. Draw its projections.

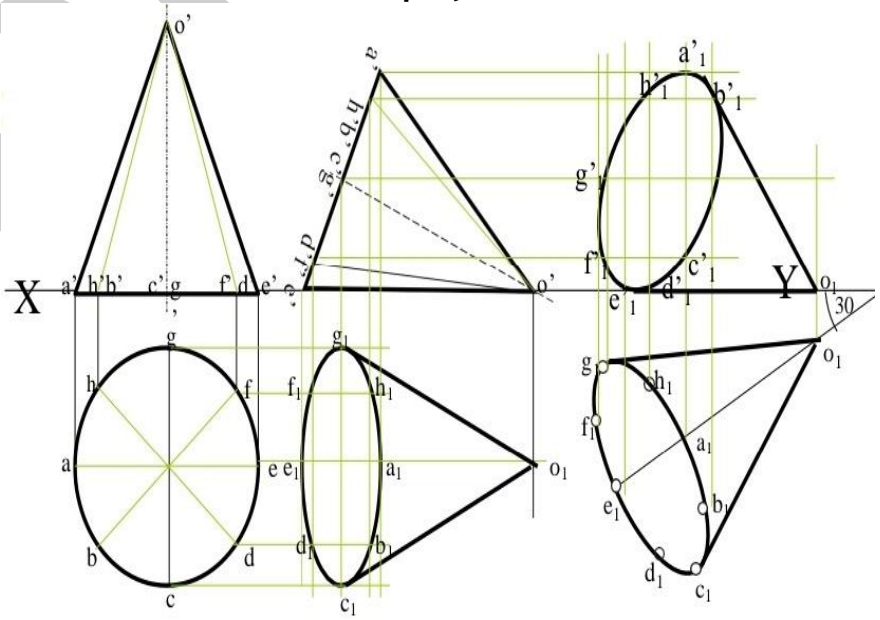
Step 1. Here the inclination of the axis is given indirectly. As one triangular face of the pyramid is in the VP its axis will be inclined with the VP. So for drawing the first view keep the axis perpendicular to the VP. So the true shape of the base will be seen in the FV. Secondly when drawing true shape of the base in the FV, one edge of the base (which is to be inclined with the HP) must be kept perpendicular to the HP.

Step 2. In the TV side aeo represents a triangular face. So for drawing the TV in the second stage, keep that face on XY so that the triangular face will lie on the VP and reproduce the TV. Then draw the new FV with help of TV.

Step 3. Now the edge of the base a1'e1' which is perpendicular to the HP must be in clined at 30° to the HP. That is incline the FV till a1'e1' is inclined at 30° with the HP. Then draw the TV.



16. A cone 40 mm diameter and 50 mm axis is resting on one generator on HP which makes 30° inclinations with VP Draw its projections.

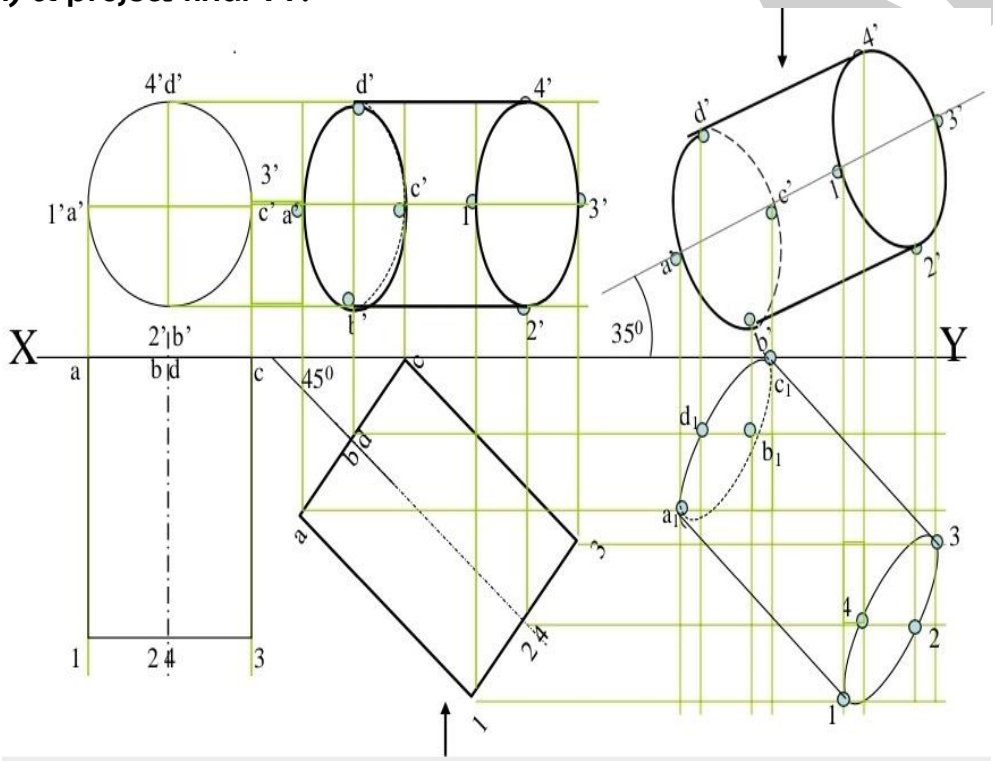


17. A cylinder 40 mm diameter and 50 mm axis is resting on one point of a base circle on VP while its axis makes 45° with VP and FV of the axis 35° with HP. Draw projections.

Solution Steps:

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

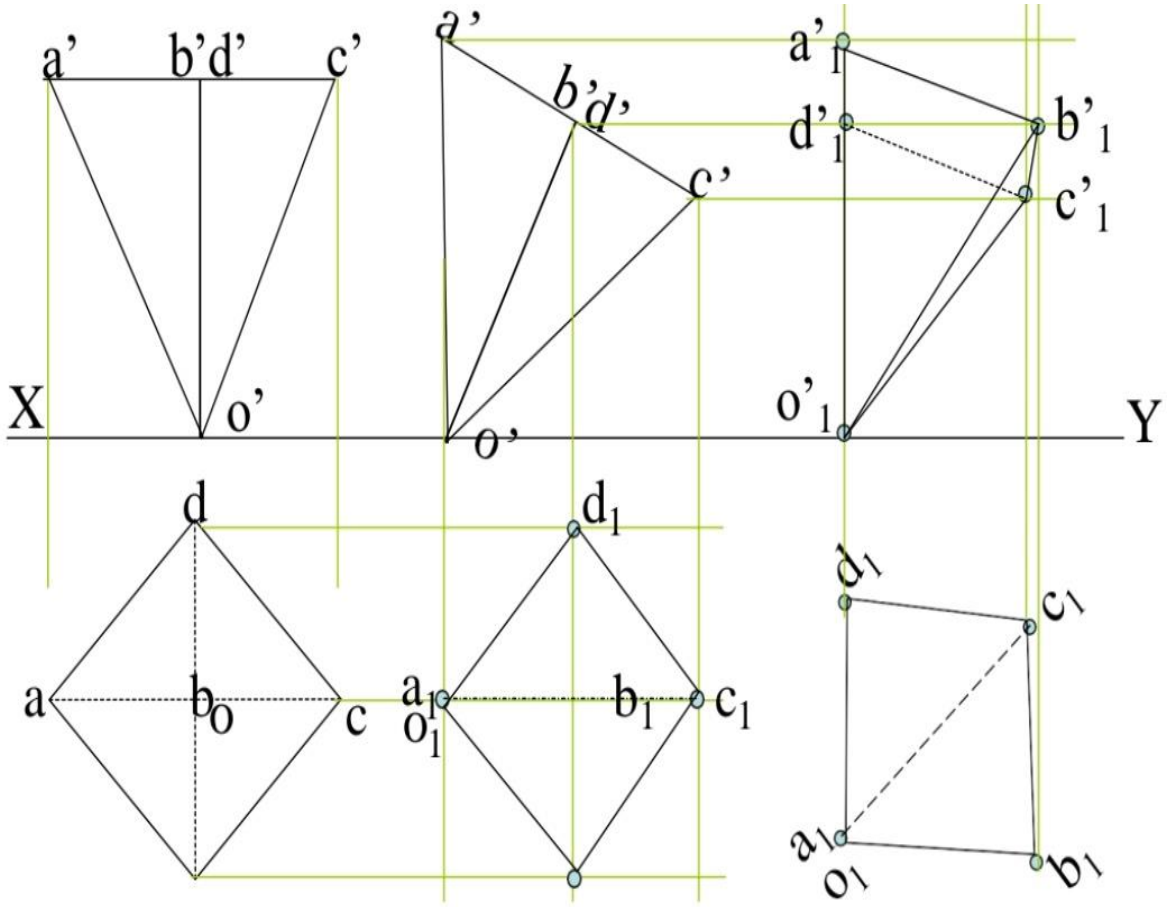
1. Assume it standing on VP
2. Its FV will show True Shape of base & top (circle)
3. Draw 40mm dia. Circle as FV & taking 50 mm axis project TV. (Rectangle)
4. Name all points as shown in illustration.
5. Draw 2nd TV making axis 45° to xy and project it's FV above xy.
6. Make visible lines dark and hidden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



18. A square pyramid 30 mm base side and 50 mm long axis is resting on its apex on HP, such that it's one slant edge is vertical and a triangular face through it is perpendicular to VP. Draw its projections.

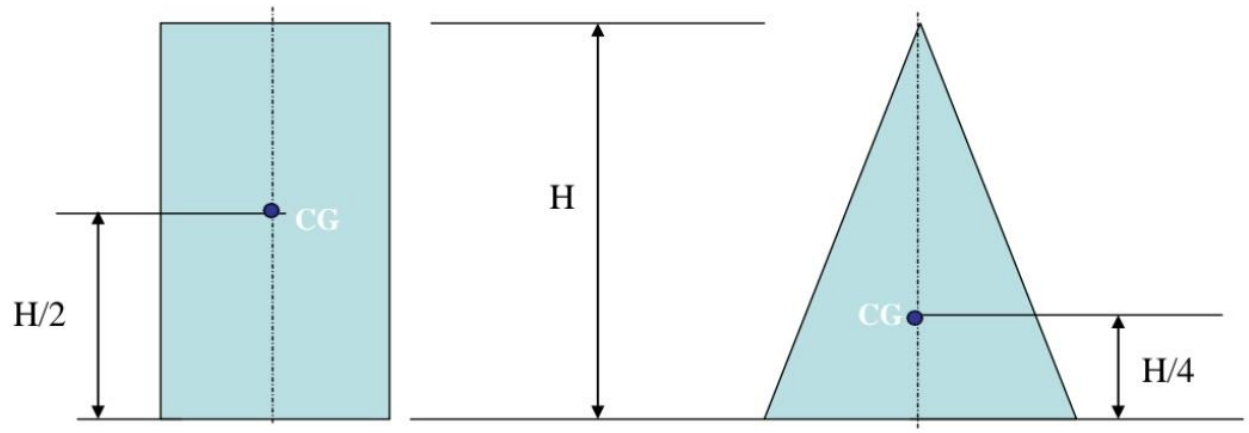
Solution Steps:

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



FREELY SUSPENDED SOLIDS:

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



GROUP A SOLIDS
(Cylinder & Prisms)

GROUPB SOLIDS
(Cone & Pyramids)

19. A pentagonal pyramid 30 mm base sides & 60 mm long axis is freely suspended from one corner of base so that a plane containing its axis remains parallel to VP. Draw its three views.

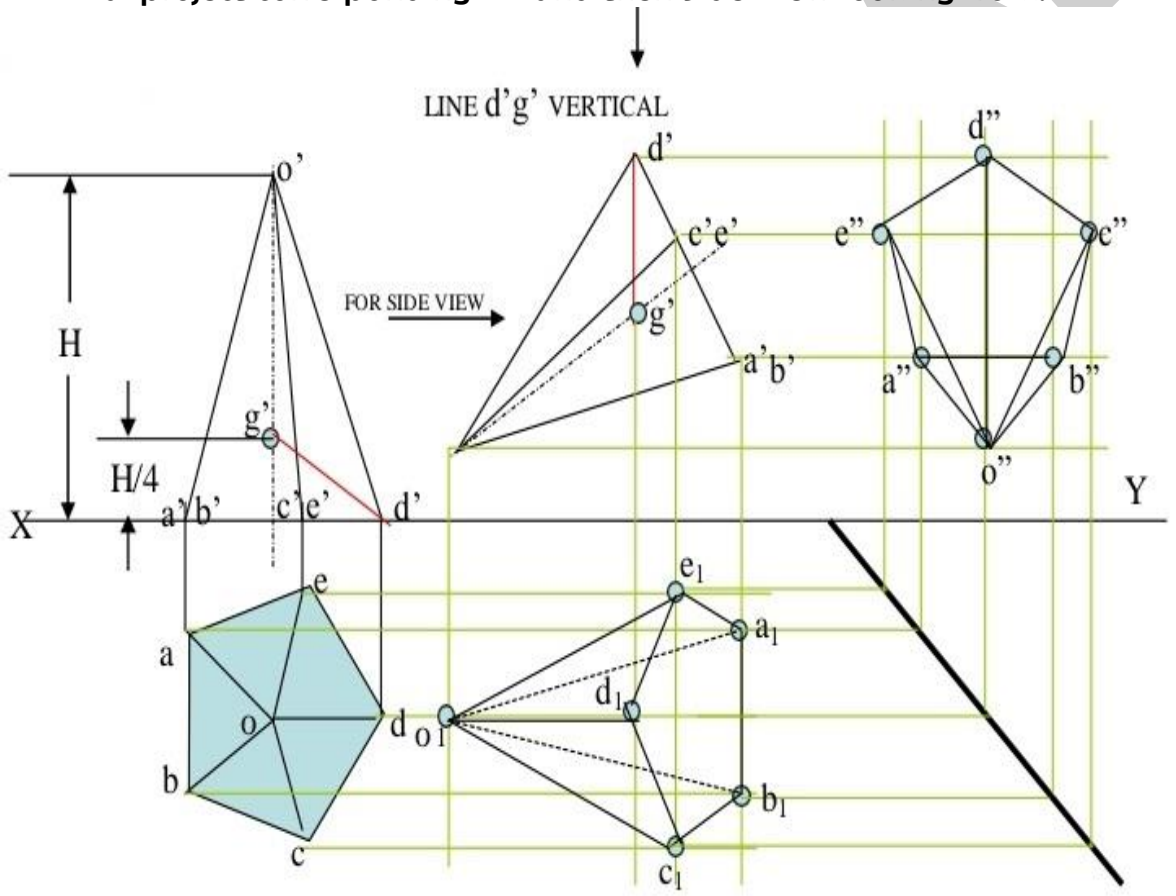
IMPORTANT:

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:

In all suspended cases axis shows inclination with HP.

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



20. A cube of 50 mm long edges is so placed on HP on one corner that a body diagonal through this corner is perpendicular to HP and parallel to VP. Draw its three views.

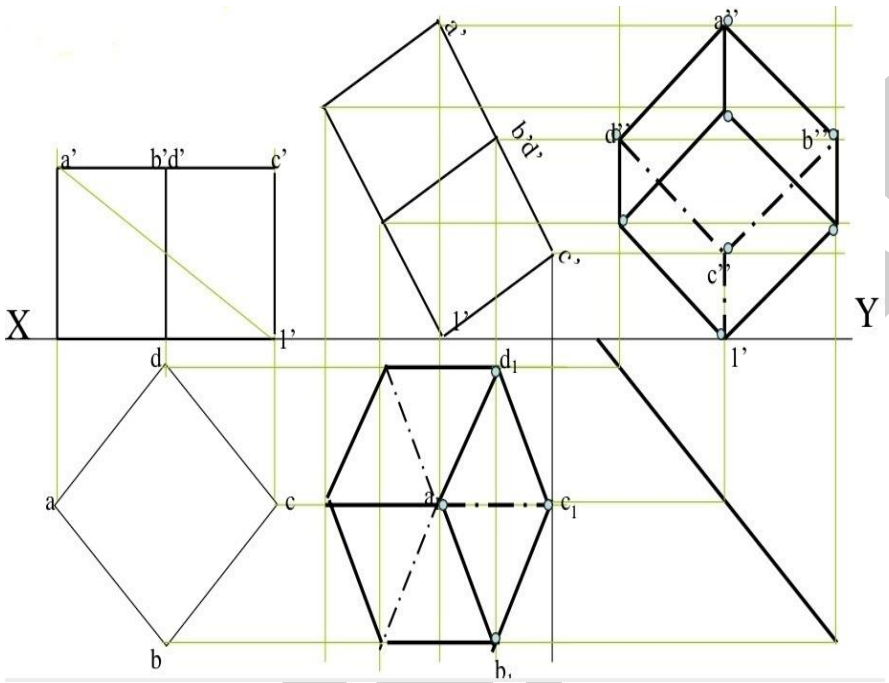
Solution Steps:

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 (l' on xy)
4. Project its TV drawing dark and dotted lines as per the procedure.
5. With standard method construct Left-hand side view.

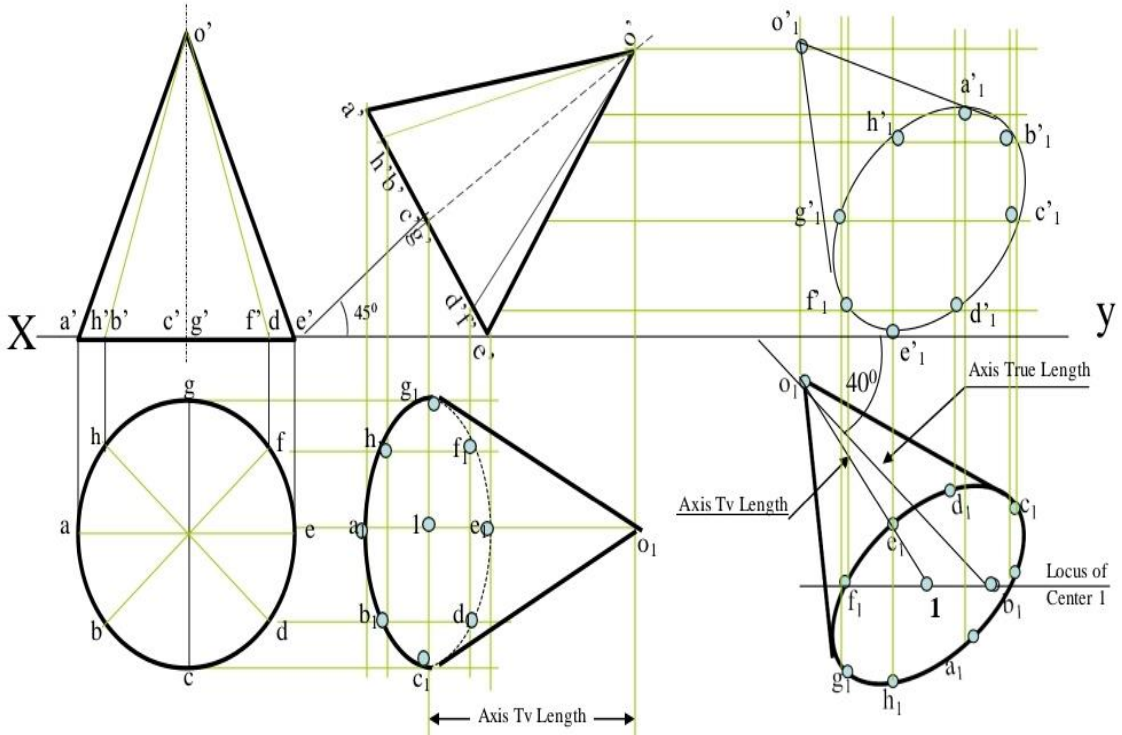
(Draw a 45° inclined Line in TV region (below xy).

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.



21. 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 its axis makes 45° inclinations with HP and 40° inclinations with VP. Draw its projections.



SECTIONAL VIEWS OF RIGHT REGULAR SOLIDS

ONE OF ENGINEERING APPLICATIONOF PROJECTION OF SOLIDS IS SECTION OF SOLIDS.

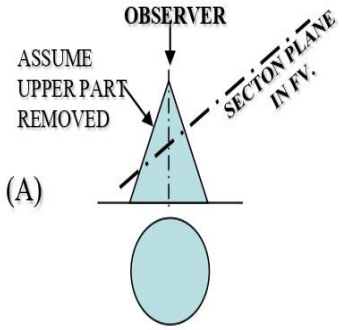
Hidden features of an object are shown using dotted lines in their projected views.
When there are too many hidden features, it becomes difficult to visualize the object.
In such cases one usually shows a sectioned view of the solid – the view obtained by virtually cutting the solid by a plane called the section (cutting) plane and removing the part between the observer and the plane.

SECTIONING A SOLID.
An object (here a solid) is cut by some imaginary cutting plane to understand internal details of that object.

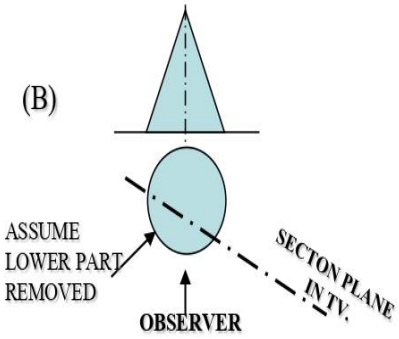
The action of cutting is called **SECTIONING** a solid
&
The plane of cutting is called **SECTION PLANE.**

Two cutting actions means section planes are recommended.

A) Section Plane perpendicular to Vp and inclined to Hp.
(This is a definition of an Aux. Inclined Plane i.e. A.I.P.)
NOTE:- This section plane appears as a straight line in FV.



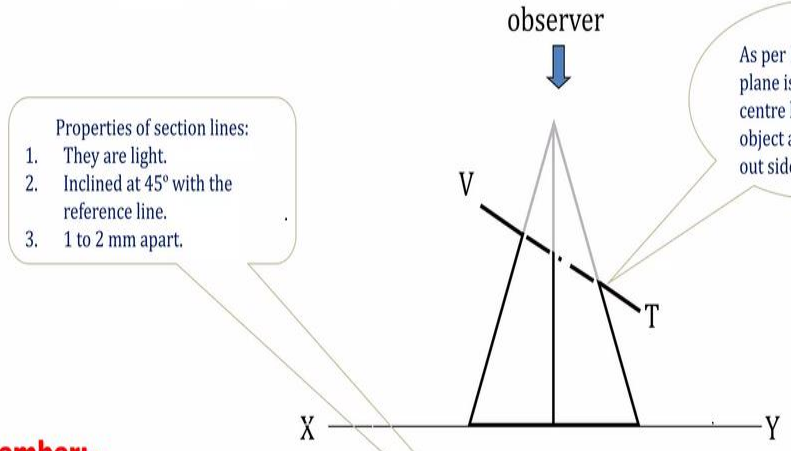
B) Section Plane perpendicular to Hp and inclined to Vp.
(This is a definition of an Aux. Vertical Plane i.e. A.V.P.)
NOTE:- This section plane appears as a straight line in TV.



Remember:-
1. After launching a section plane either in FV or TV, the part towards observer is assumed to be removed.
2. As far as possible the smaller part is assumed to be removed.

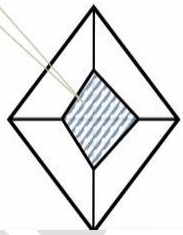
An A.I.P. appears as a straight line in its front view. The straight line is its V.T.

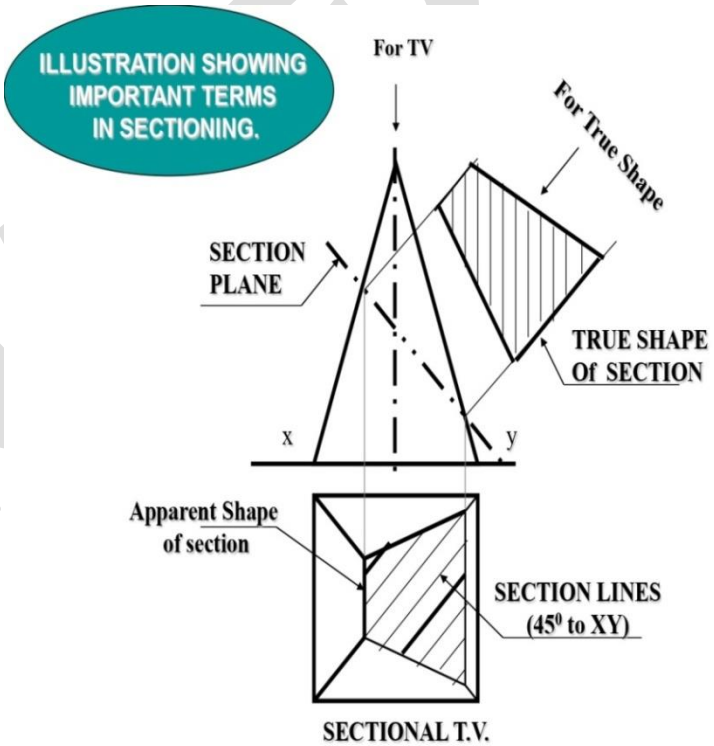
So an A.I.P. always cuts F.V. of a solid



Remember:-

1. After launching a section plane either in FV or TV, the part towards observer is assumed to be removed.
2. As far as possible the smaller part is assumed to be removed.

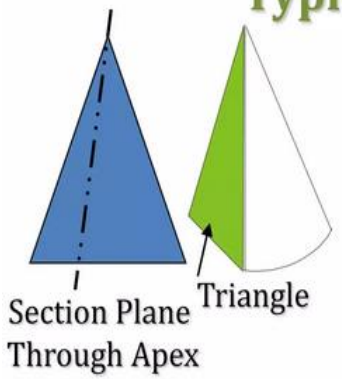




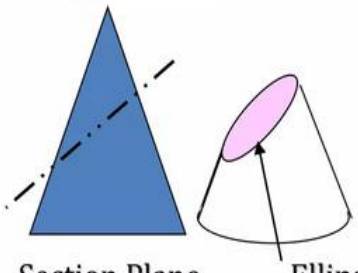
Typical Section Planes

&

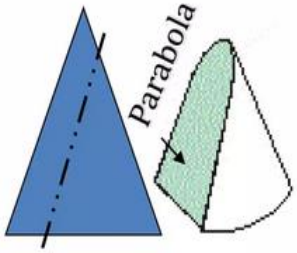
Typical Shapes of Sections.



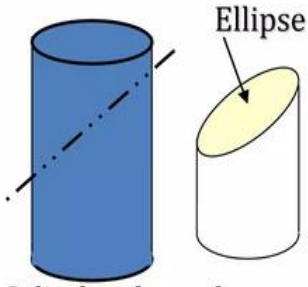
Section Plane Through Apex



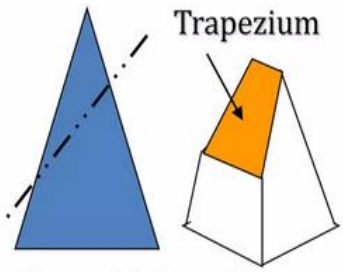
Section Plane Through Generators



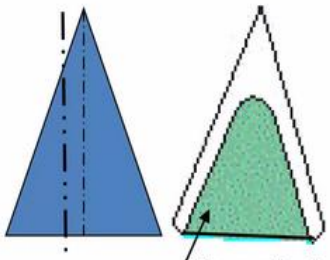
Section Plane Parallel to end generator.



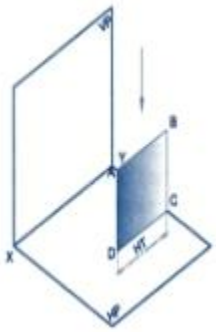
Cylinder through generators.



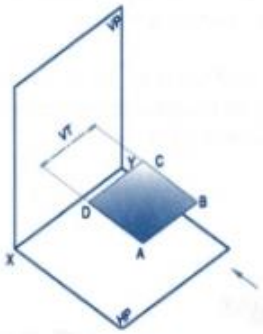
Sq. Pyramid through all slant edges



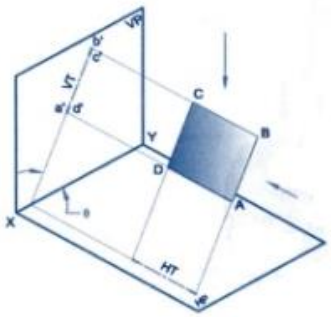
Section Plane Parallel to Axis.

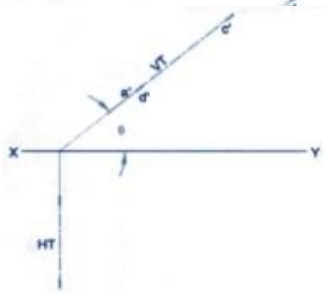


Cutting Plane Perpendicular to HP



Cutting Plane Perpendicular to VP

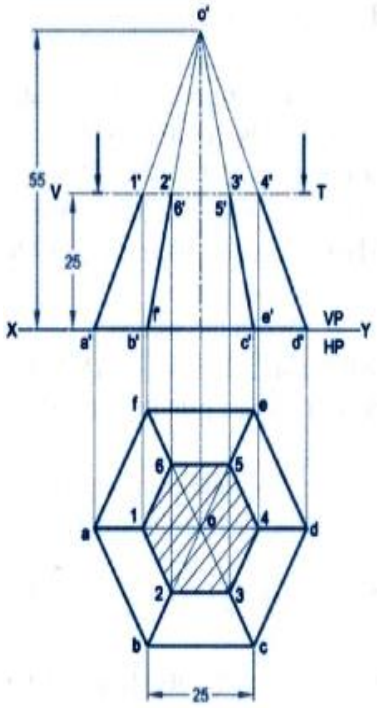




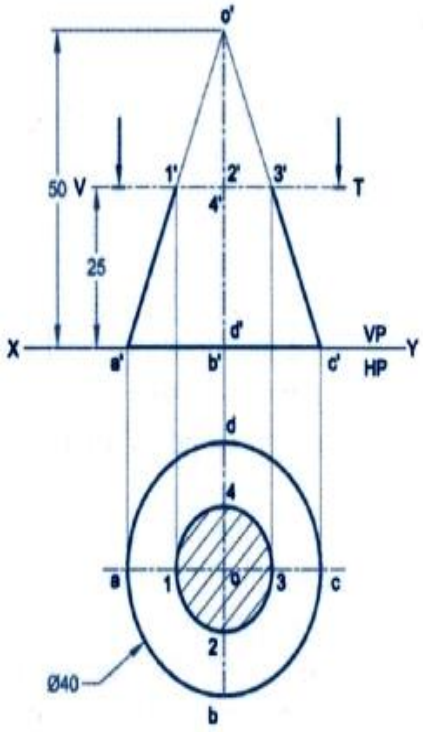
Cutting Plane inclined to HP

UNIT-III SECTIONS 2022 2023

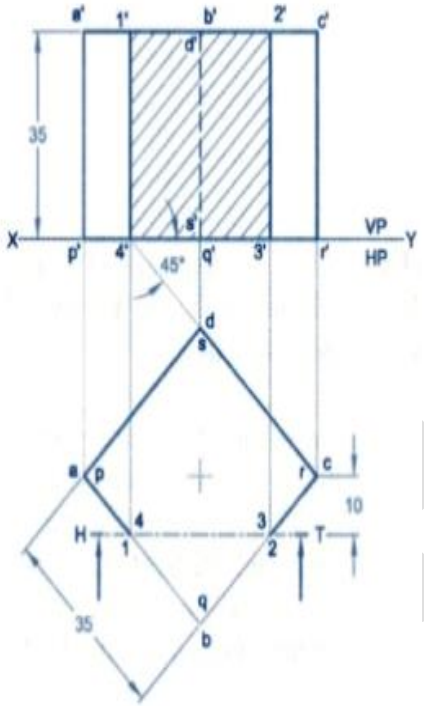
1. A hexagonal pyramid, base 25 mm side and axis 55 mm long is resting on its base on the HP, with two edges of the base parallel to the VP. It is cut by a Horizontal section plane intersecting the axis at a point 25 mm above the base. Draw the front view, sectional top view.



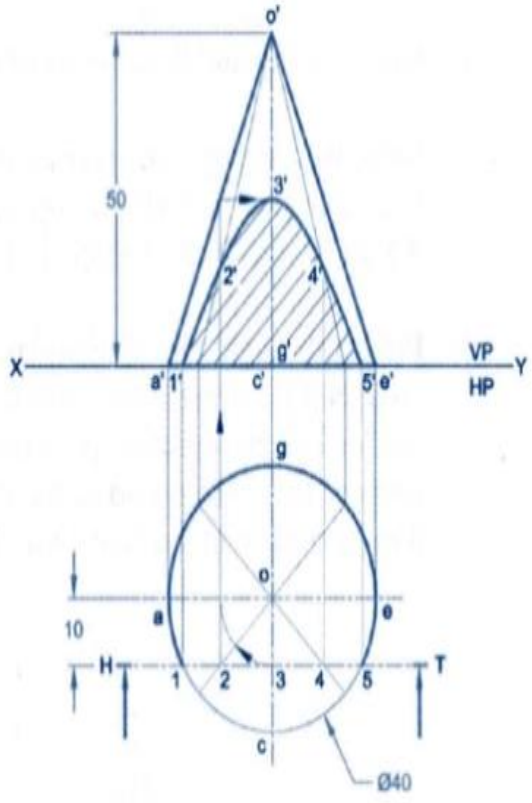
2. A Cone base 40 mm diameter and axis 50 mm long is resting on its base on H.P. It is cut by a section plane perpendicular to the V.P., parallel to the H.P. and cutting the axis at a point 25 mm from the bottom. Draw the front view, sectional top view.



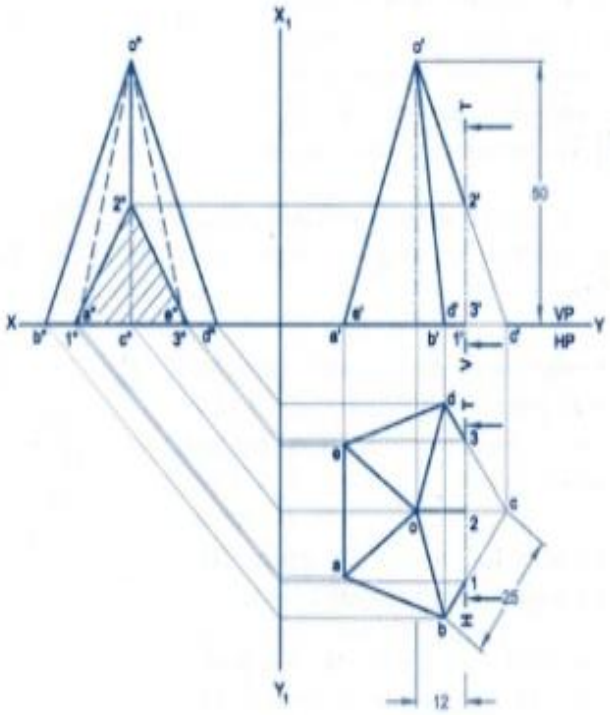
3. A Cube of 35mm edge of base has its base on the H.P. and its faces equally inclined to V.P. it is cut by a Vertical Section plane perpendicular to the H.P. and passing at a distance of 10 mm from the axis. Draw its top view & sectional front view?



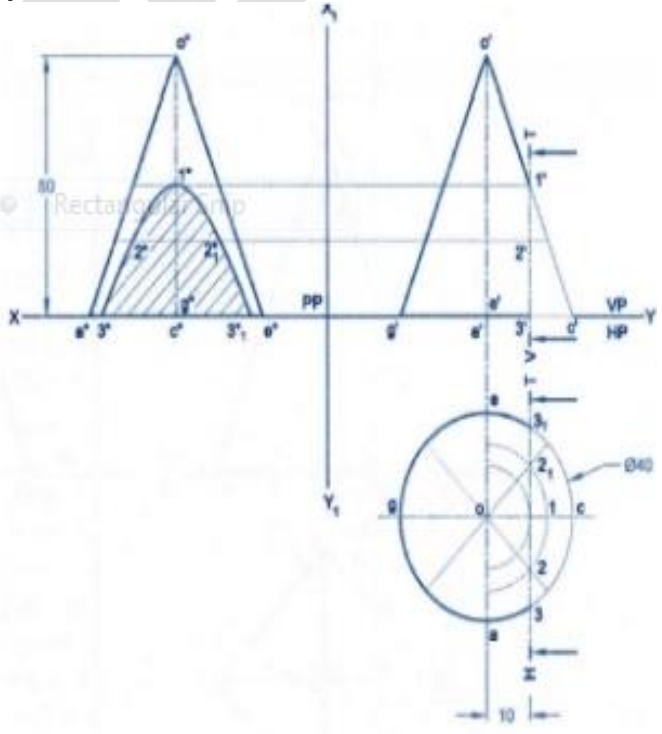
4. A Cone base 40 mm diameter and axis 50 mm long is resting on its base on H.P. It is cut by a section plane perpendicular to the H.P., Parallel to the V.P. and cutting the cone at a distance of 10mm from apex. Draw the top view, sectional front view.



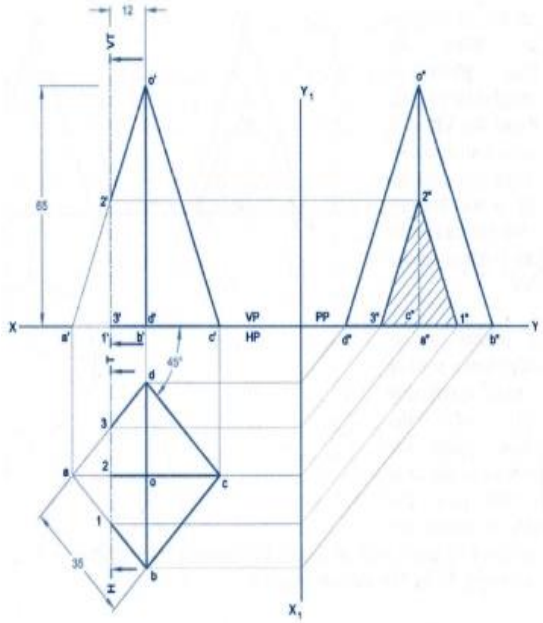
5. A Pentagonal Pyramid of base side 25mm and height 50mm is resting on its base on H.P with one of its edge of the base perpendicular to V.P. It is cut by a section plane perpendicular to both H.P & V.P. and 12mm away from the axis. Draw the plan, elevation and section side view.



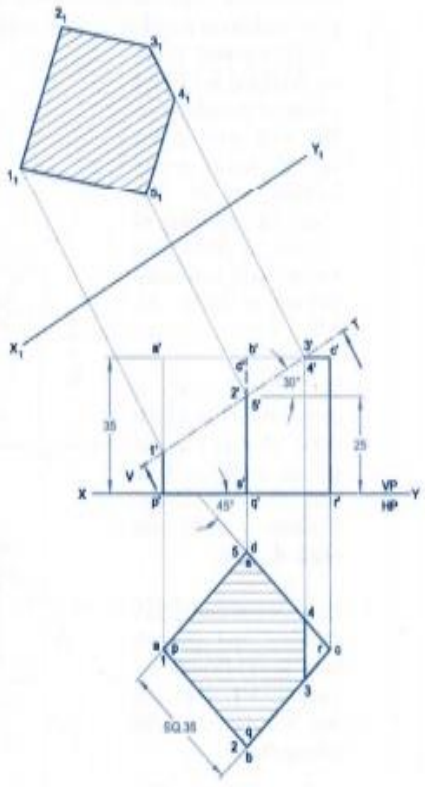
6. A Cone base 40 mm diameter and axis 50 mm long is resting on its base on H.P. It is cut by a section plane perpendicular to both H.P & V.P. and 10mm away from the axis. Draw the plan, elevation and section side view.



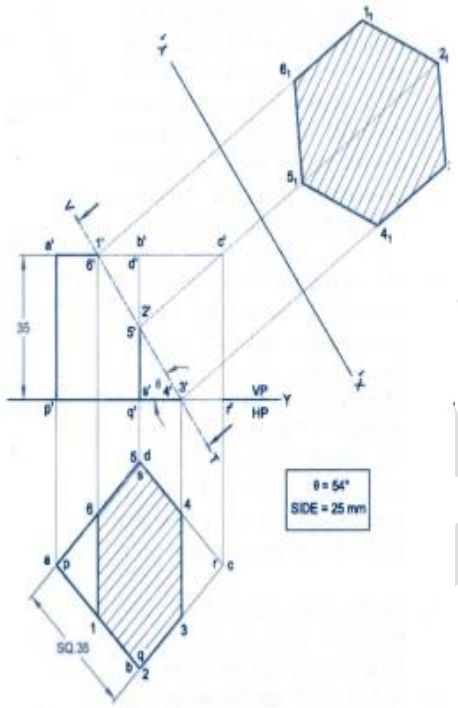
7. A Square Pyramid of base side 35mm and height 65mm is resting on its base on H.P with one of its edge of the base 45° to V.P. It is cut by a section plane perpendicular to both H.P & V.P. and 12mm away from the axis. Draw the plan, elevation and section side view.



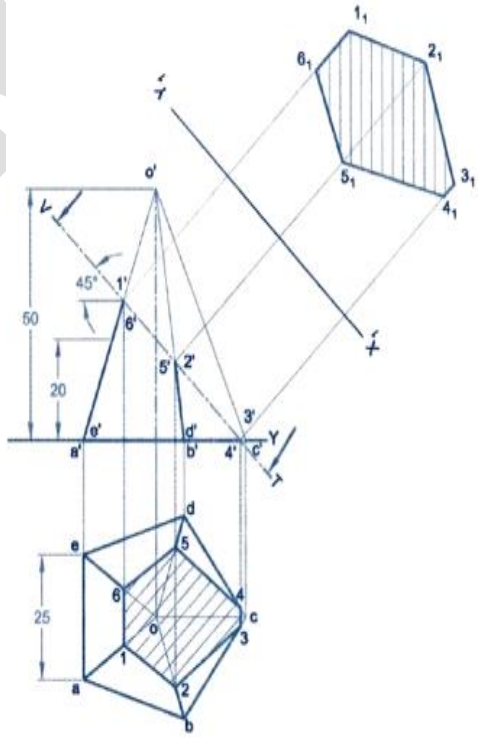
8. A Cube of base side 35mm is resting on its base on the H.P. and its face equally inclined to V.P. It is cut by a sectional plane perpendicular to V.P inclined at 30° to the H.P and passing through a point on the axis, 25mm above the H.P. Draw its front view, sectional top view and True Shape of the section?



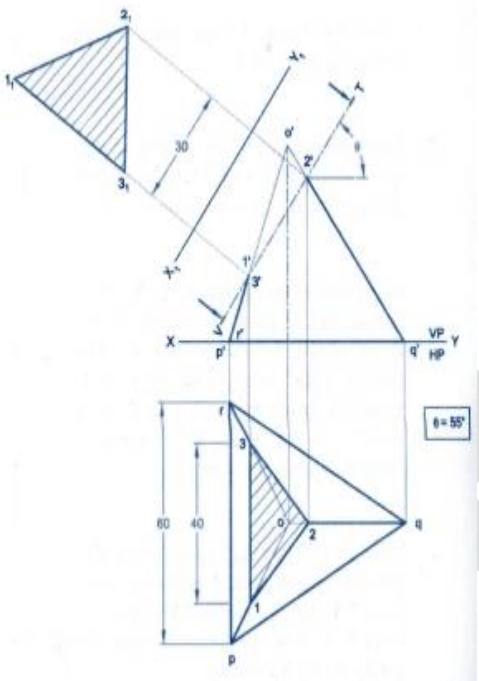
9. A Cube of base side 35mm is resting on its base on the H.P. and its face equally inclined to V.P. It is cut by an A.I.P so that the True shape of the section is a Hexagon of side 25mm. Find the angle inclined to H.P, draw its front view, sectional top view and True Shape of the section?



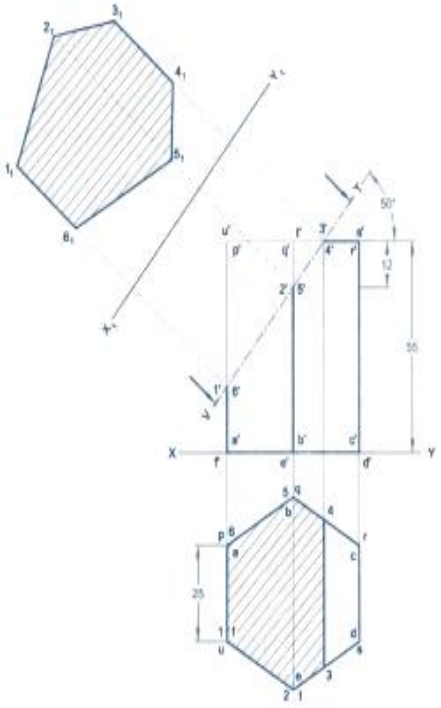
10. A pentagonal pyramid, base 25mm side and axis 50 mm long is resting on its base on HP with one of its edge is perpendicular to the VP. A Section plane inclined at an angle of 45° to the H.P. and cutting the axis at a height of 20mm from the base. Draw the Sectional top view, front view and true shape of the section.



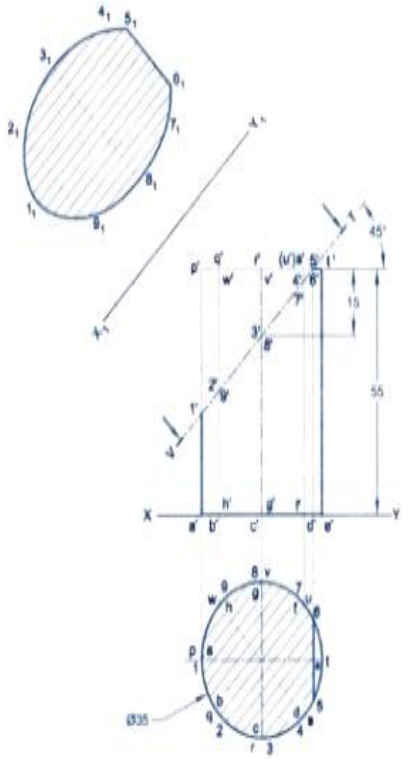
11. A Tetrahedron, having a 60 mm side, rests on its base on the H.P. with edge of the base perpendicular to the V.P. Find the angle, draw F.V, S.T.V and True shape of the section when it is cut by an A.I.P., such that the true shape of section is an Isosceles triangle with a 40 mm side & 30mm altitude.



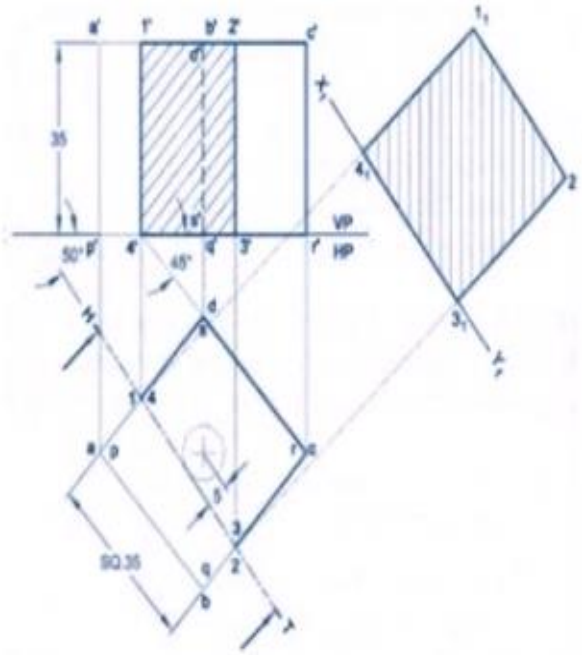
12. A Hexagonal prism of side of base 25 mm, height 55mm is resting on its base on H.P. and edge of the base perpendicular to V.P. It is cut by a Section plane inclined at an angle of 50° to the H.P passing at a point 12 mm from top face on the axis. Draw its front view sectional top view and the true shape of the section.



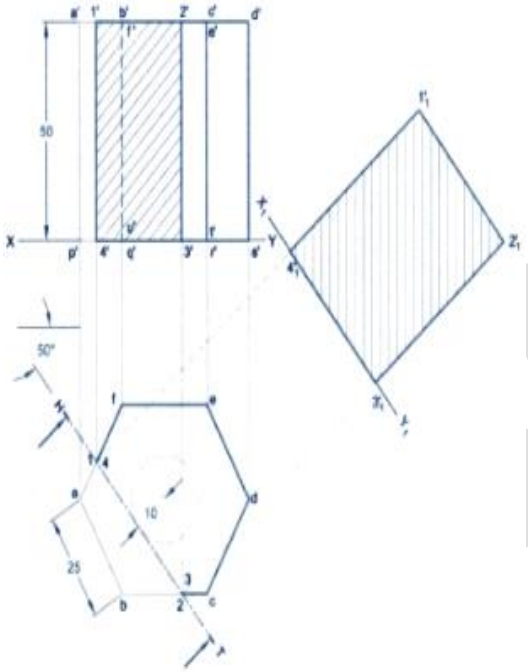
13. A Cylinder of 35mm diameter, 55mm height and having its axis is vertical, is cut by a section plane perpendicular to V.P., inclined at 45° to the H.P and intersecting the axis 15mm from top face of cylinder. Draw its front view, sectional top view and True shape of the section?



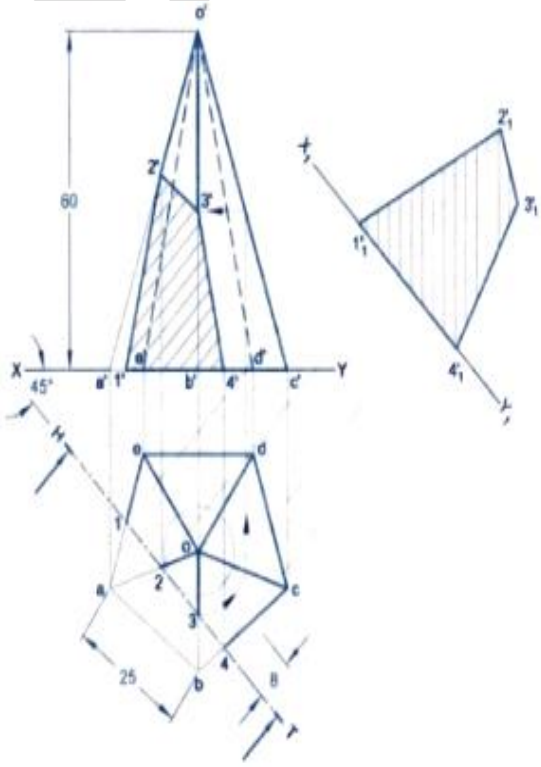
14. A Cube of base side 35mm is resting on its base on H.P. with one of its base side is 45° to VP. A section plane cuts the cube at a distance of 5mm from the axis at an angle of 50° to V.P. Draw its Sectional front view, top view and True Shape of the Section?



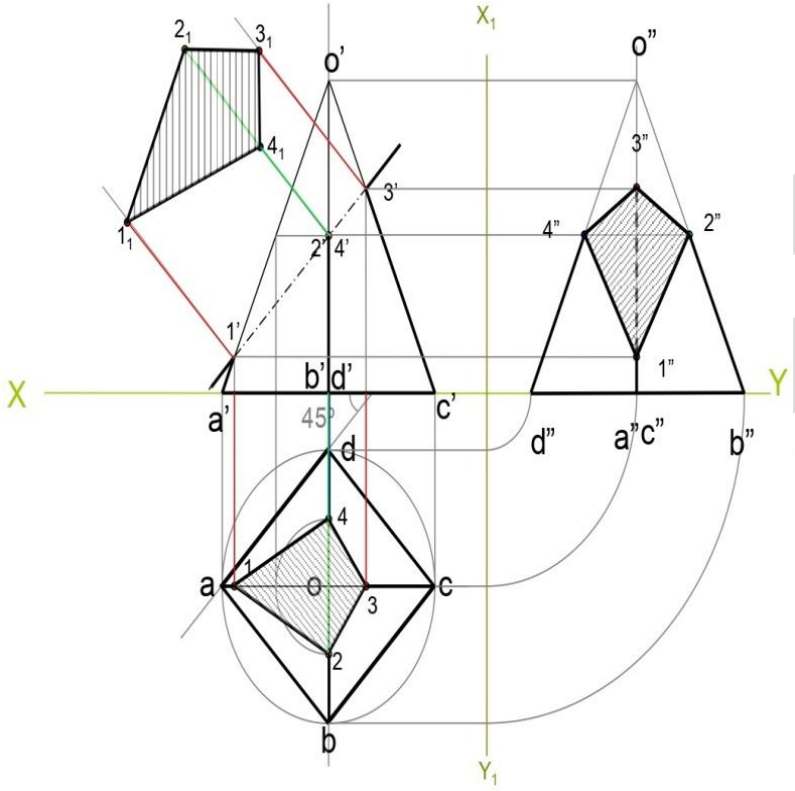
15. A Hexagonal prism of base side 25mm and height 50mm is resting on its base on H.P. with one of its base side is parallel to VP. A section plane cuts the prism at a distance of 10mm from the axis at an angle of 50° to V.P. Draw its Sectional front view, top view and True Shape of the Section?



16. A Pentagonal pyramid of base side 25mm and height 60mm is resting on its base on H.P. with one of its base side is parallel to VP. A section plane cuts the prism at a distance of 8mm from the apex at an angle of 45° to V.P. Draw its Sectional front view, top view and True Shape of the Section?



17. A square pyramid, base 40 mm side and axis 65 mm long, has its base on the HP and all the edges of the base equally inclined to the VP. It is cut by a section plane, perpendicular to the VP, inclined at 45° to the HP and bisecting the axis. Draw its sectional top view, sectional side view and true shape of the section.



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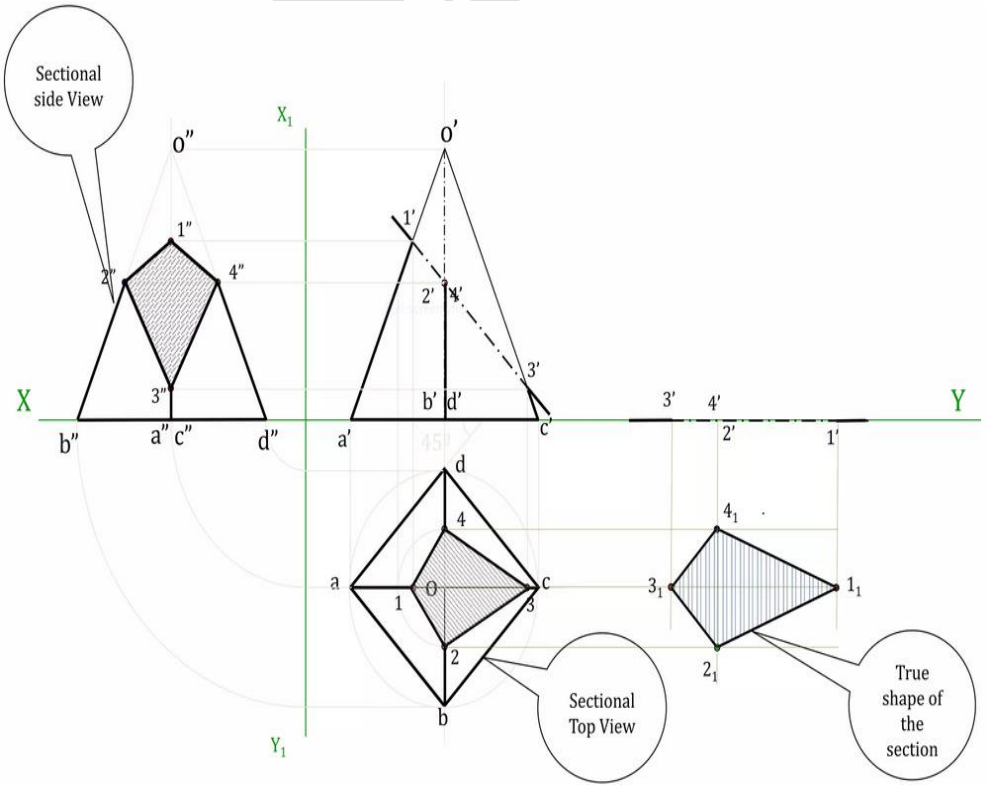
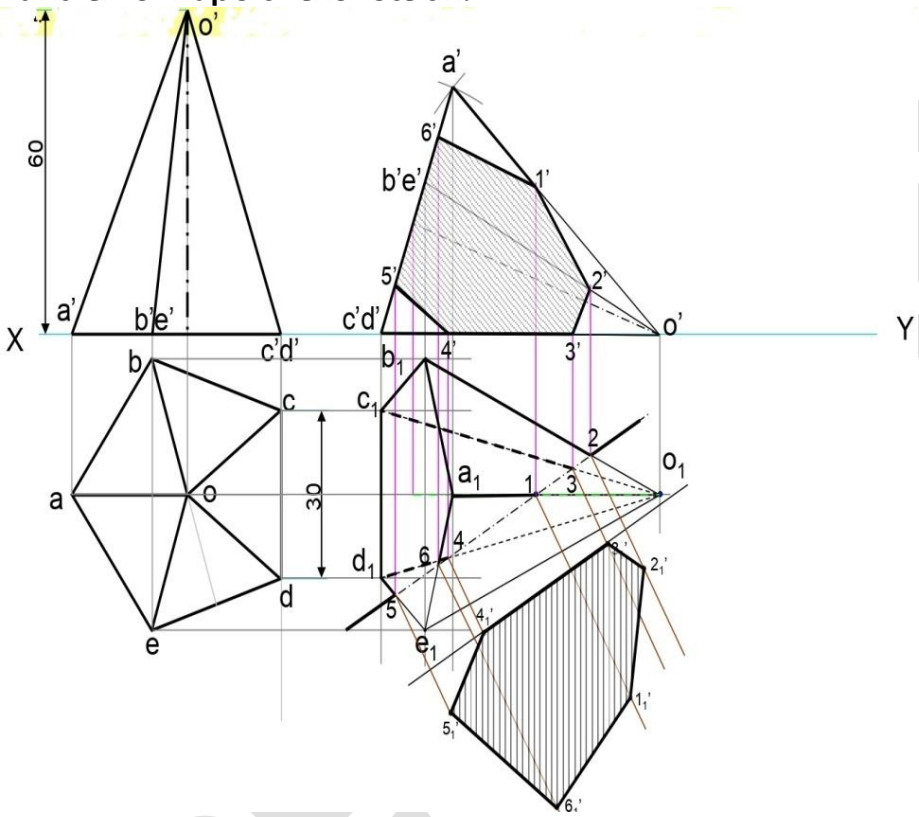


18. A pentagonal pyramid, base 30mm side and axis 60 mm long is lying on one of its triangular faces on the HP with the axis parallel to the VP. A vertical section plane, whose HT bisects the top view of the axis and makes an angle of 30° with the reference line, cuts the pyramid removing its top part. Draw the top view, sectional front view and true shape of the section.



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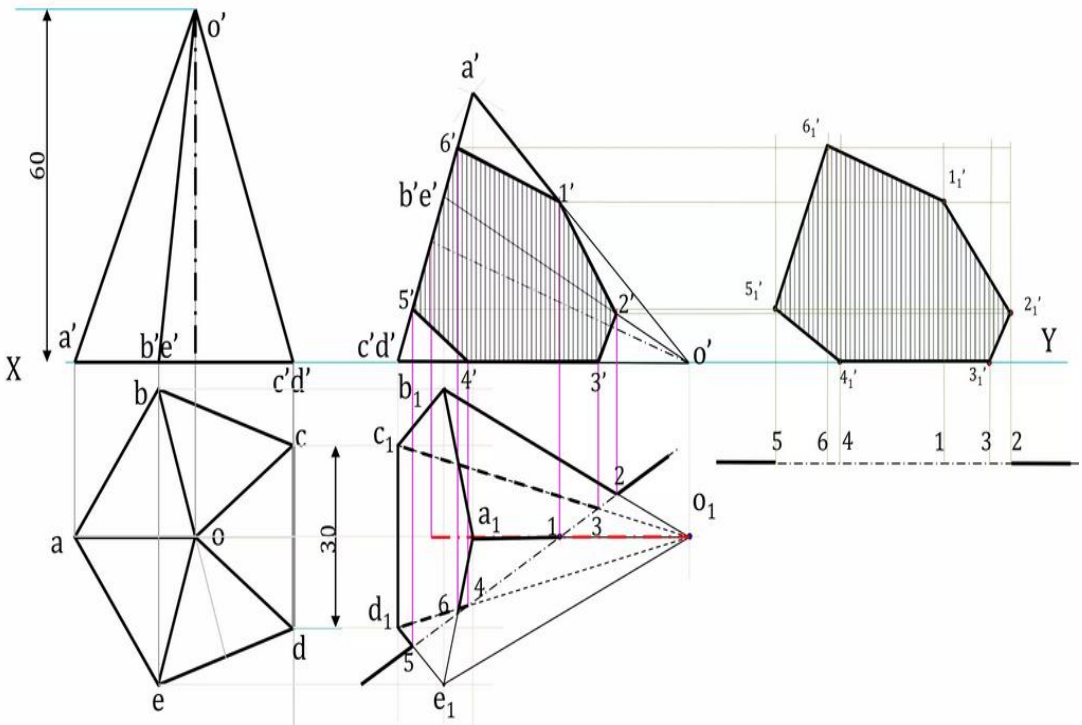
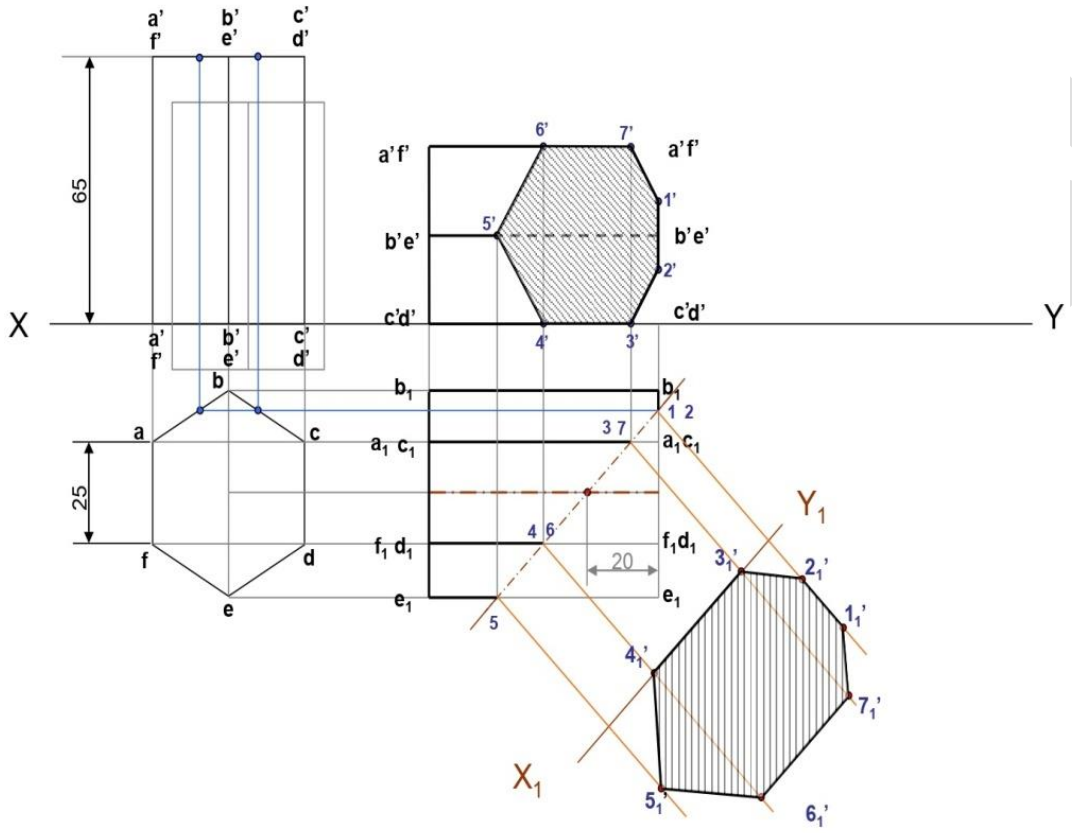


19. A Hexagonal prism has a face on the H.P. and the axis parallel to the V.P. It is cut by a vertical section plane the H.T. of which makes an angle of 45 with XY and which cuts the axis at a point 20 mm from one of its ends. Draw its sectional front view and the true shape of the section. Side of base 25 mm long height 65mm.



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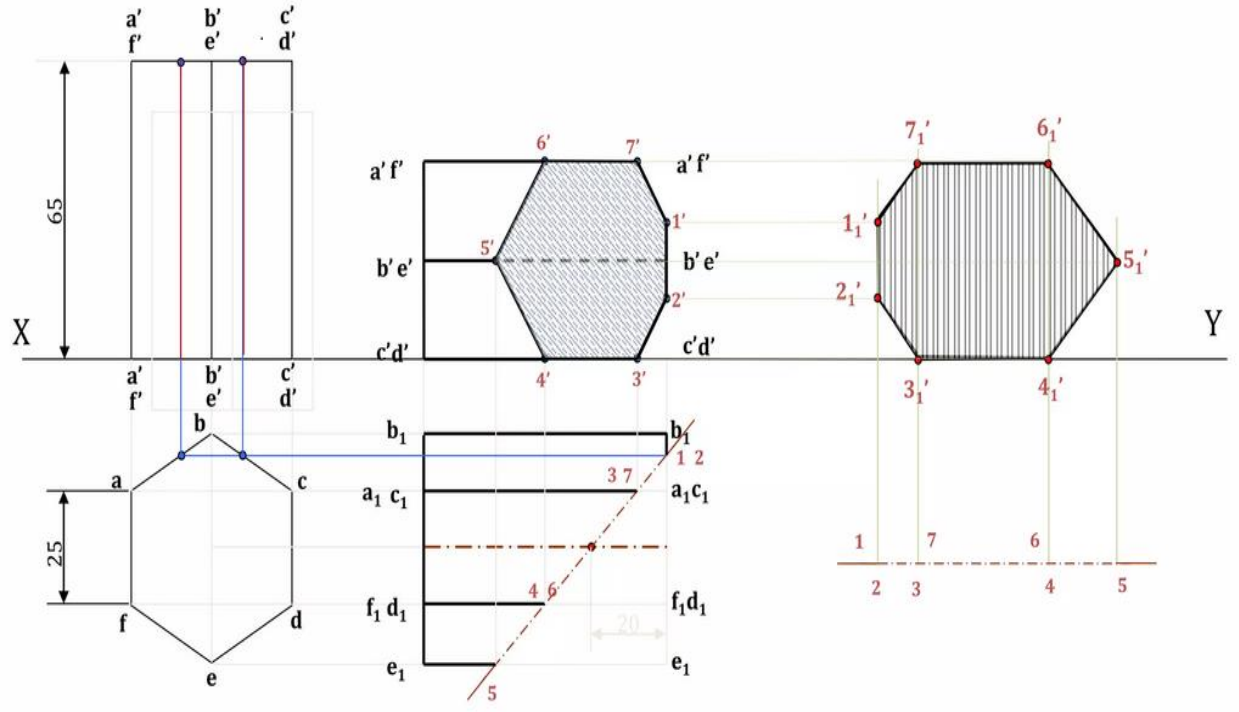
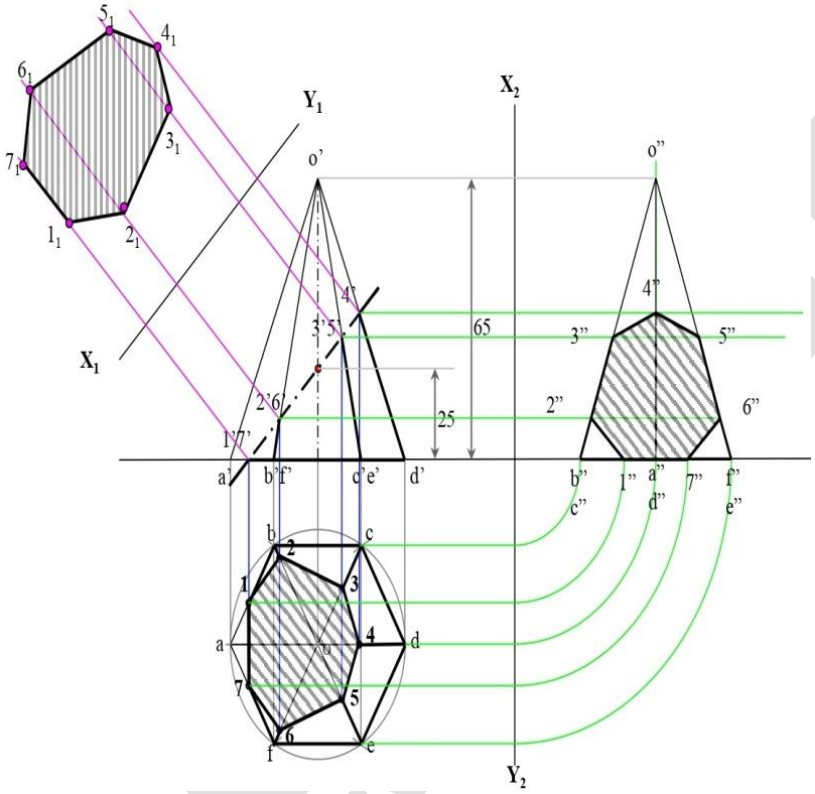


20. A hexagonal pyramid, base 30 mm side and axis 65 mm long is resting on its base on the HP, with two edges of the base parallel to the VP. It is cut by a section plane perpendicular to VP and inclined at 45° to the HP, intersecting the axis at a point 25 mm above the base. Draw the front view, sectional top view, sectional side view and true shape of the section.



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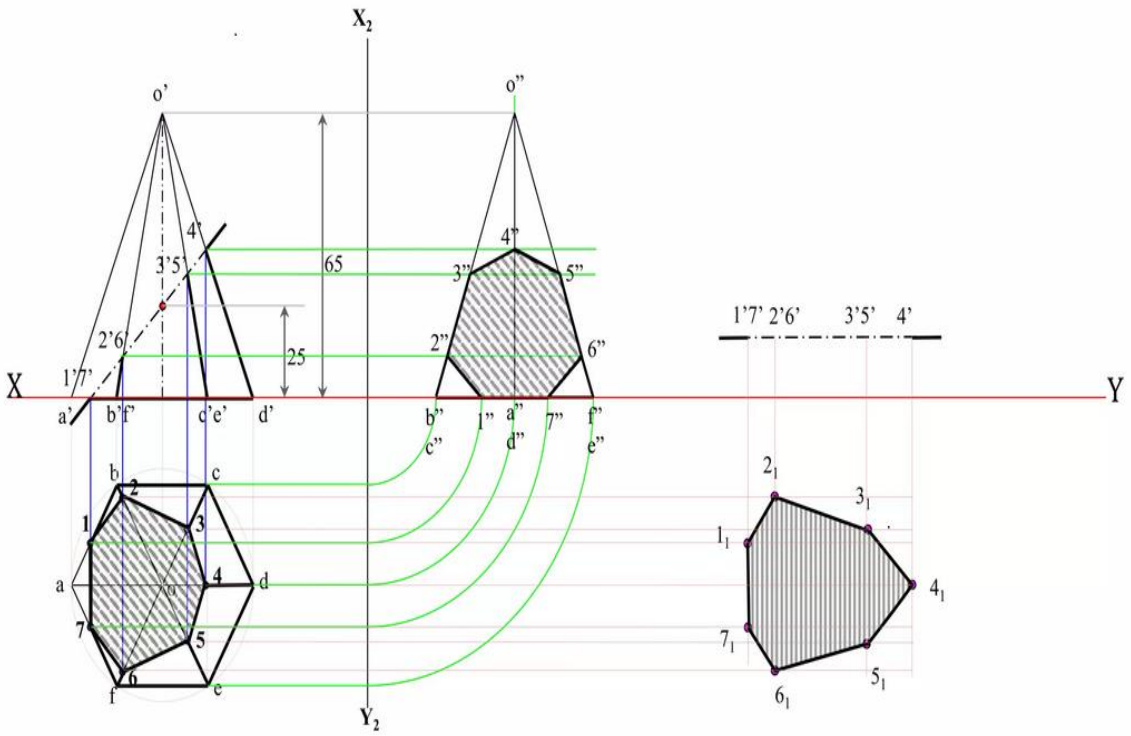
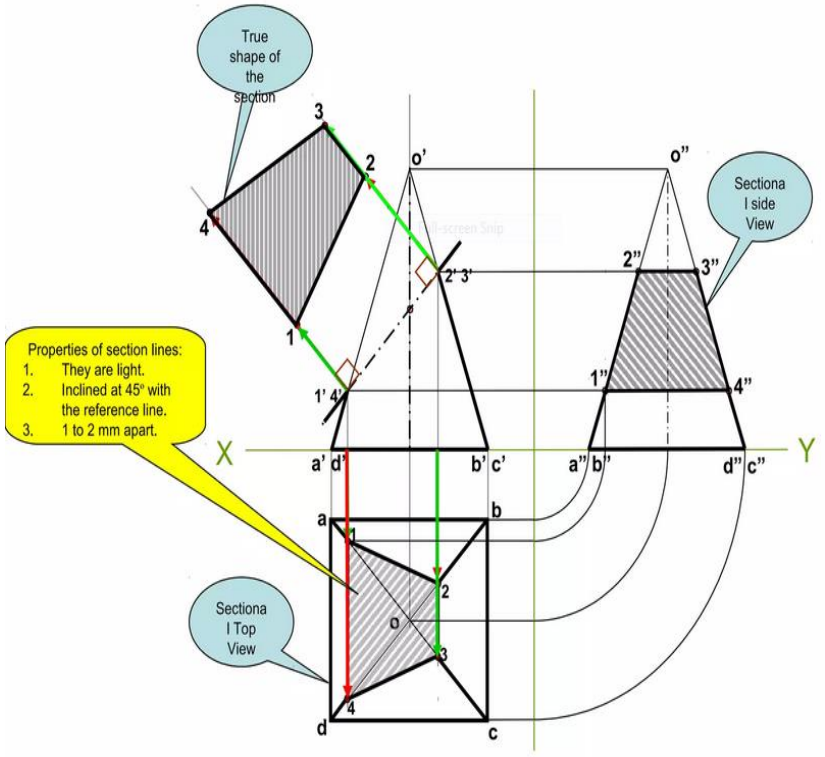


UNIT - III SECTIONS 2022 2023

21. A Square Pyramid, base 40mm side and axis 65mm long, has its base on the H.P. with two edges of base perpendicular to V.P. It is cut by a sectional plane perpendicular to the V.P & inclined at 45° to the H.P and bisecting the axis of the Pyramid. Draw its sectional top view, sectional side view & True Shape.



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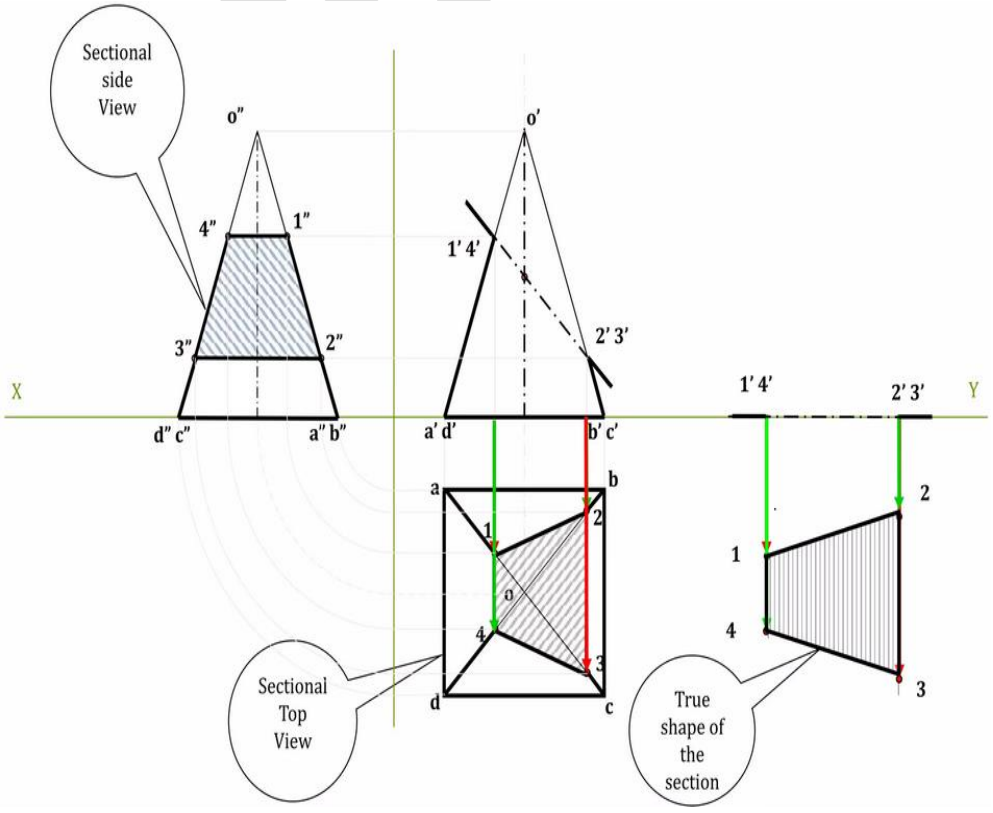
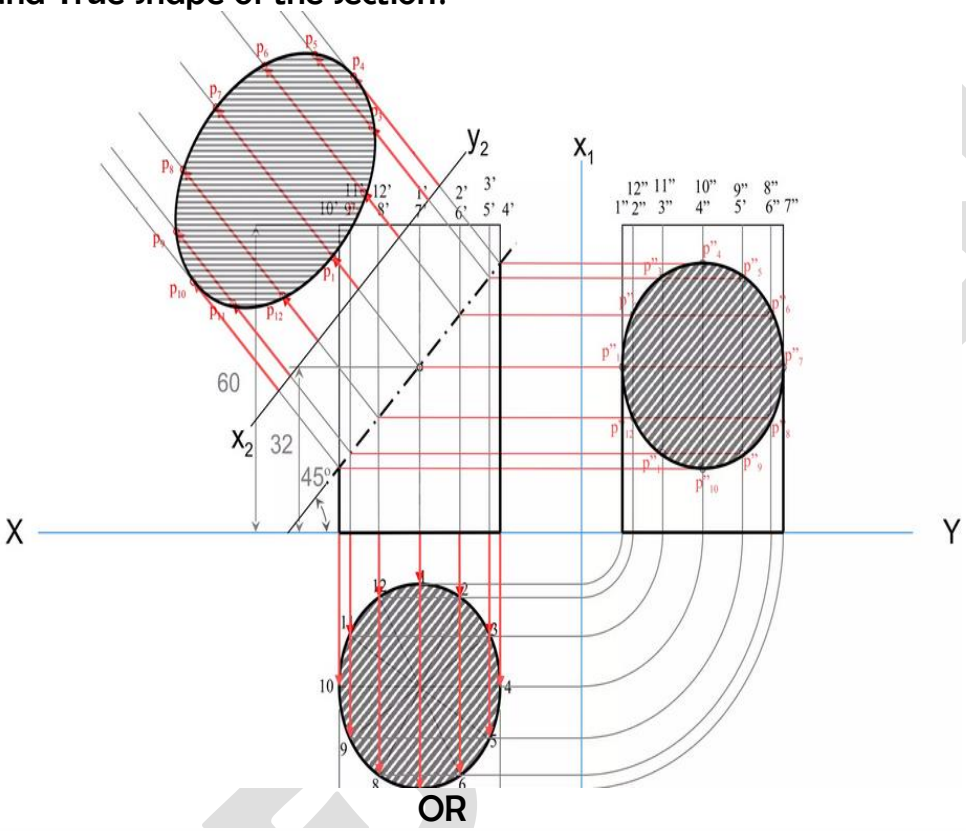


22. A Cylinder of 40mm diameter, 60mm height and having its axis is vertical, is cut by a section plane perpendicular to V.P., inclined at 45° to the H.P and intersecting the axis 32mm above the base. Draw its front view, sectional top view, sectional side view and True shape of the section?



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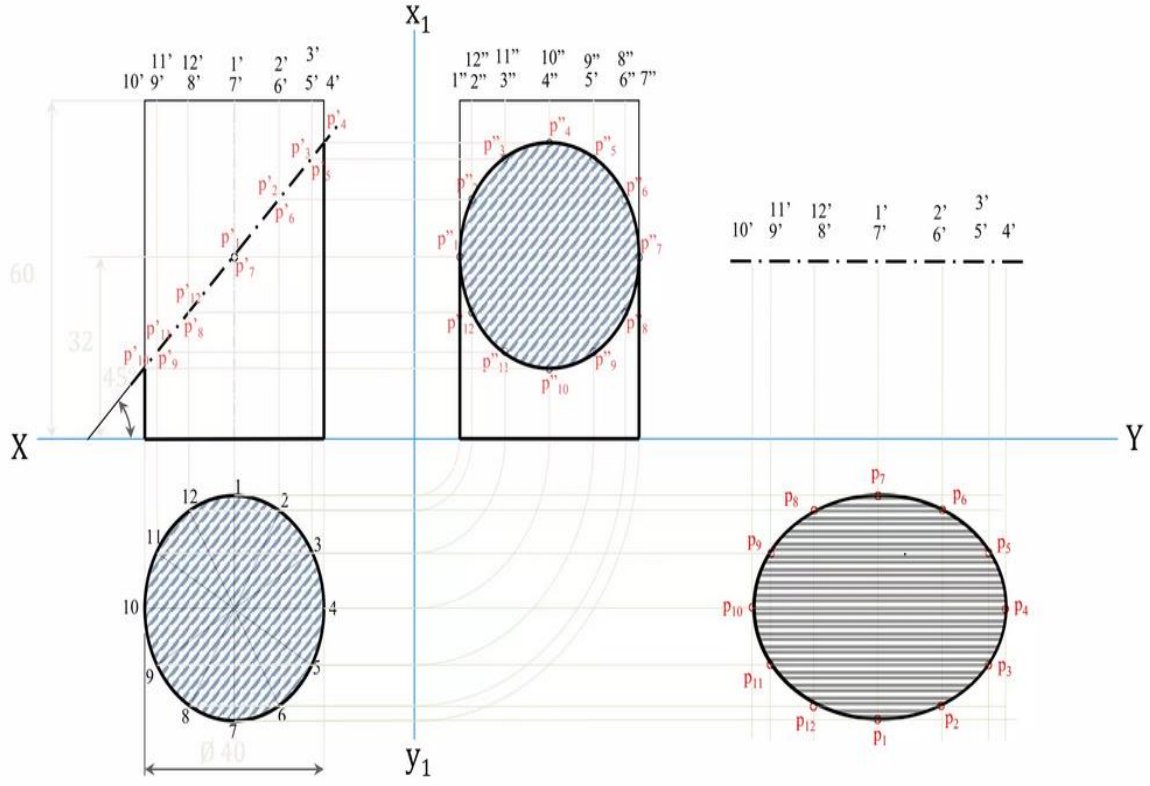
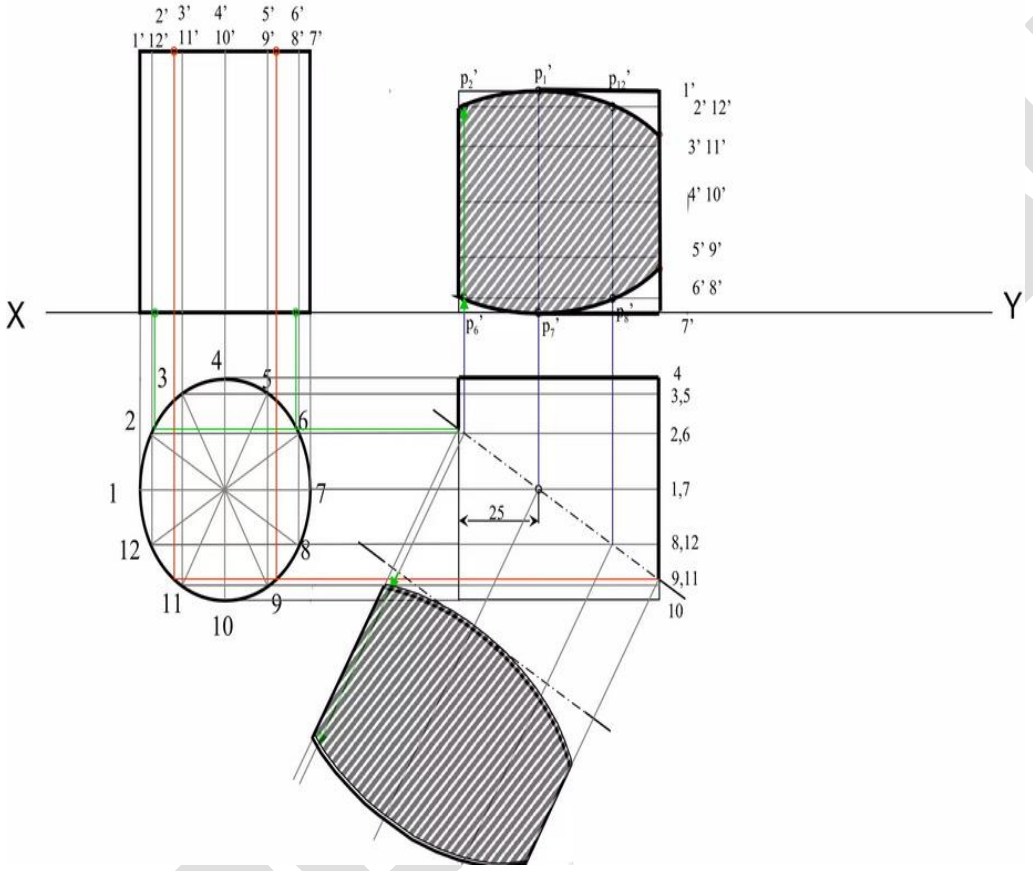


23. A Cylinder of 55mm diameter, 65mm height has its axis parallel to both H.P & V.P. it is cut by a Vertical Section plane inclined at 30° to the V.P so that axis is cut at a point 25mm from one of its ends and both the bases of cylinders are partly cut. Draw its sectional front view and True shape of the section?



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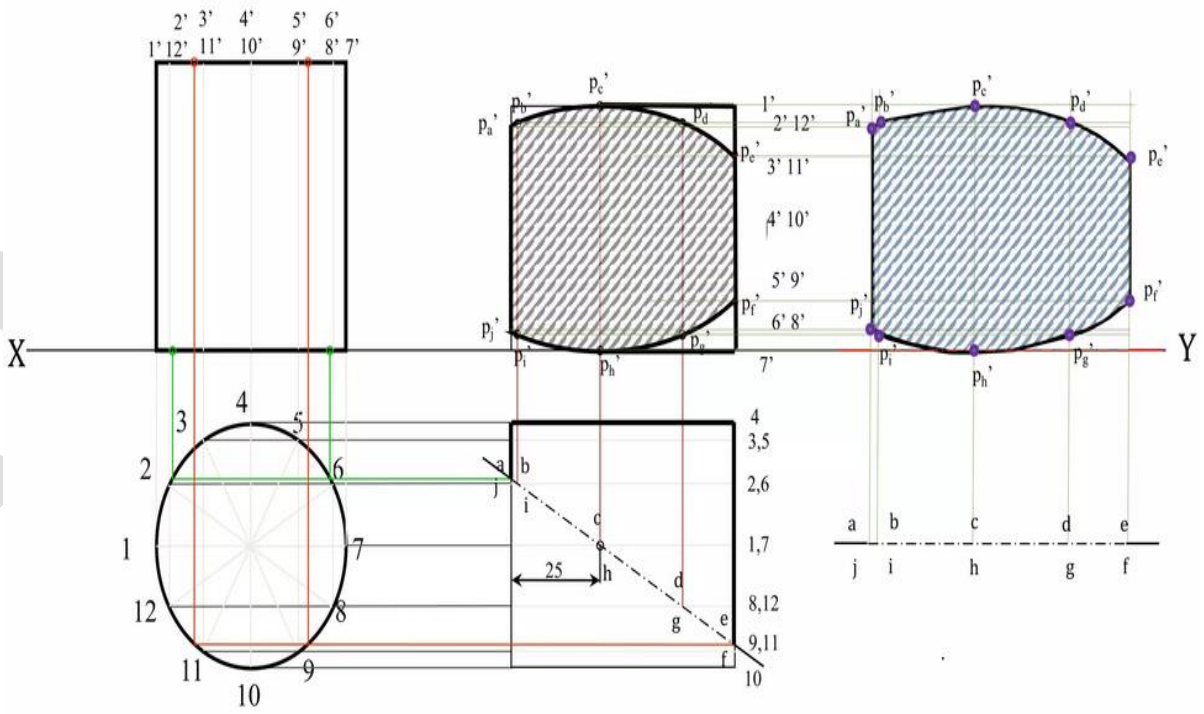
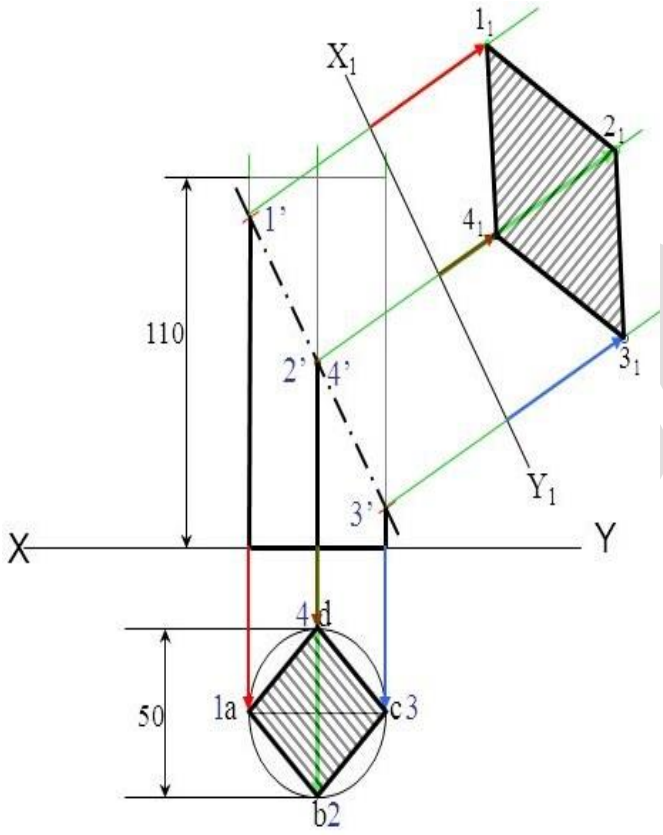


24. A Square Prism of base side 50mm, axis 110mm long, has its base on the H.P. and its face equally inclined to V.P. The prism is cut by an A.I.P passing through a Mid-Point of the axis, in such a way that the True shape of the section is a rhombus having diagonals of 100mm & 50mm. Draw projections and determine the inclinations of A.I.P with the H.P?



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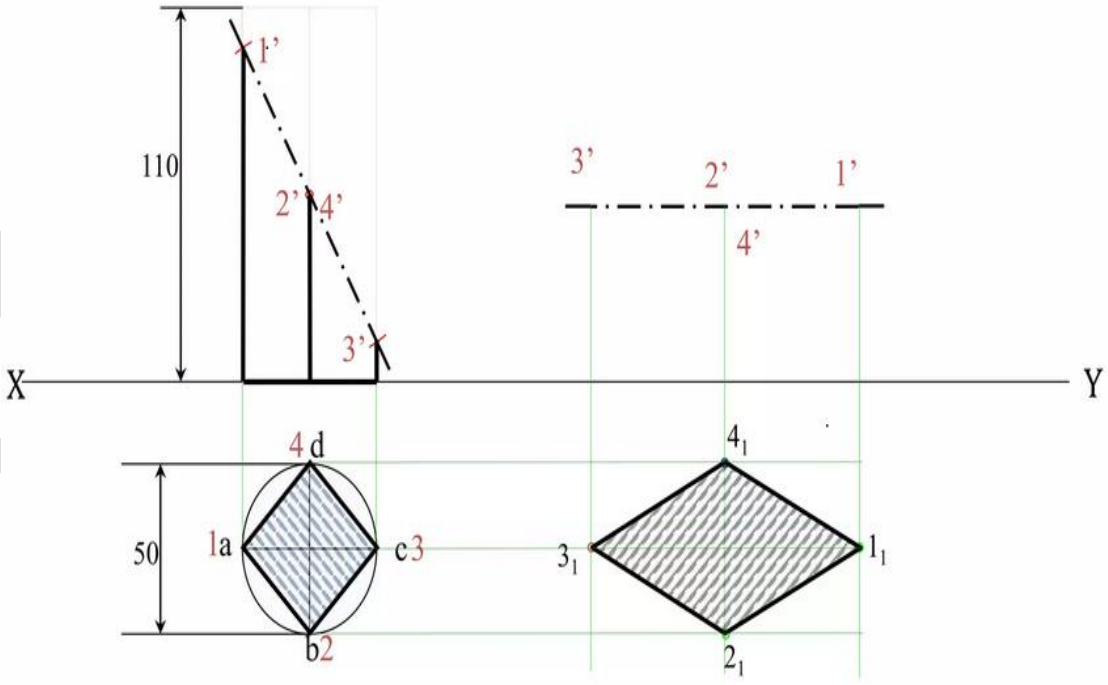
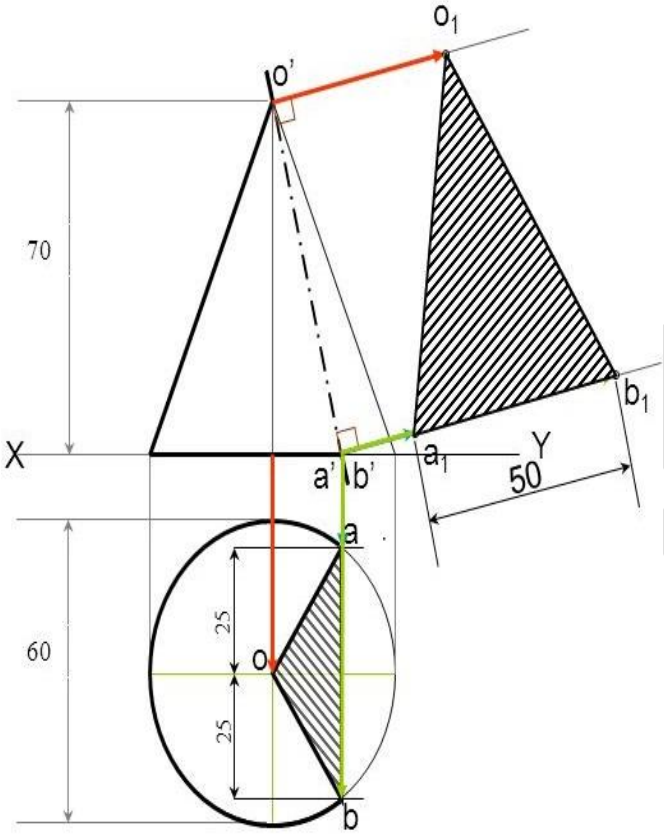


25. A Cone base 60 mm diameter and axis 70 mm long is resting on its base on H.P. The prism is cut by an A.I.P so that the True shape of the section is an isosceles triangle having 50mm base. Draw the plan, elevation and True shape.



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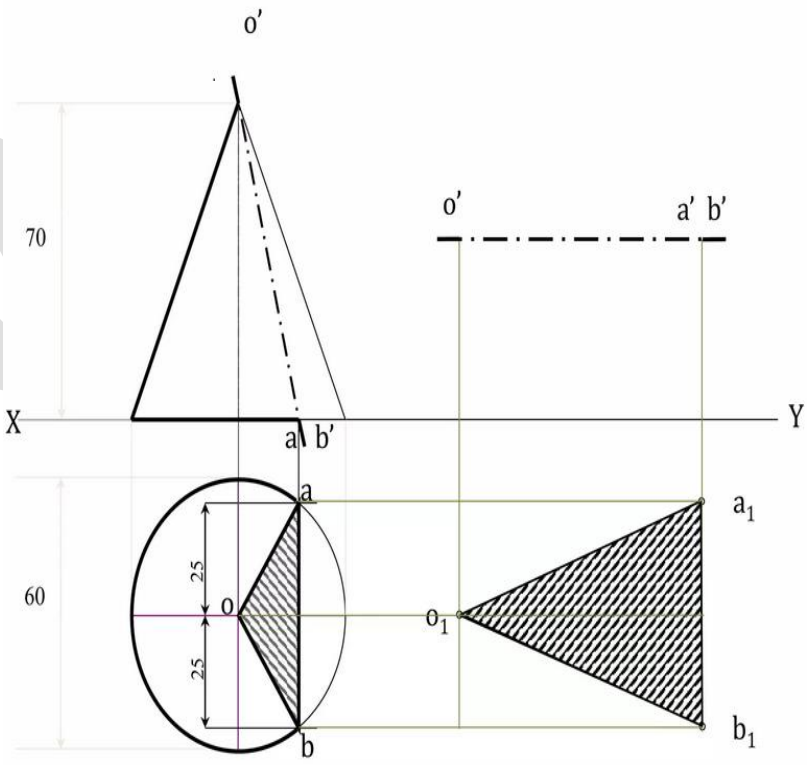
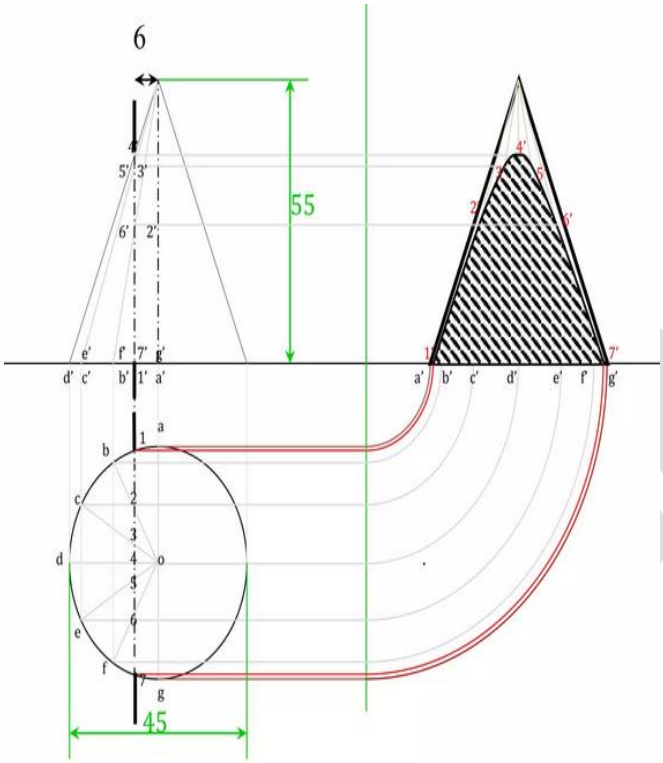
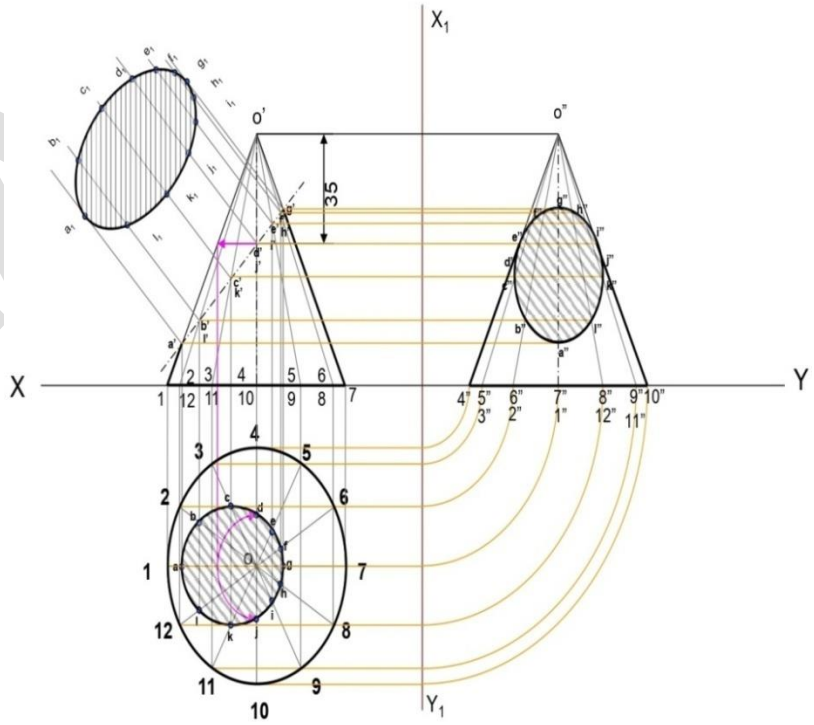


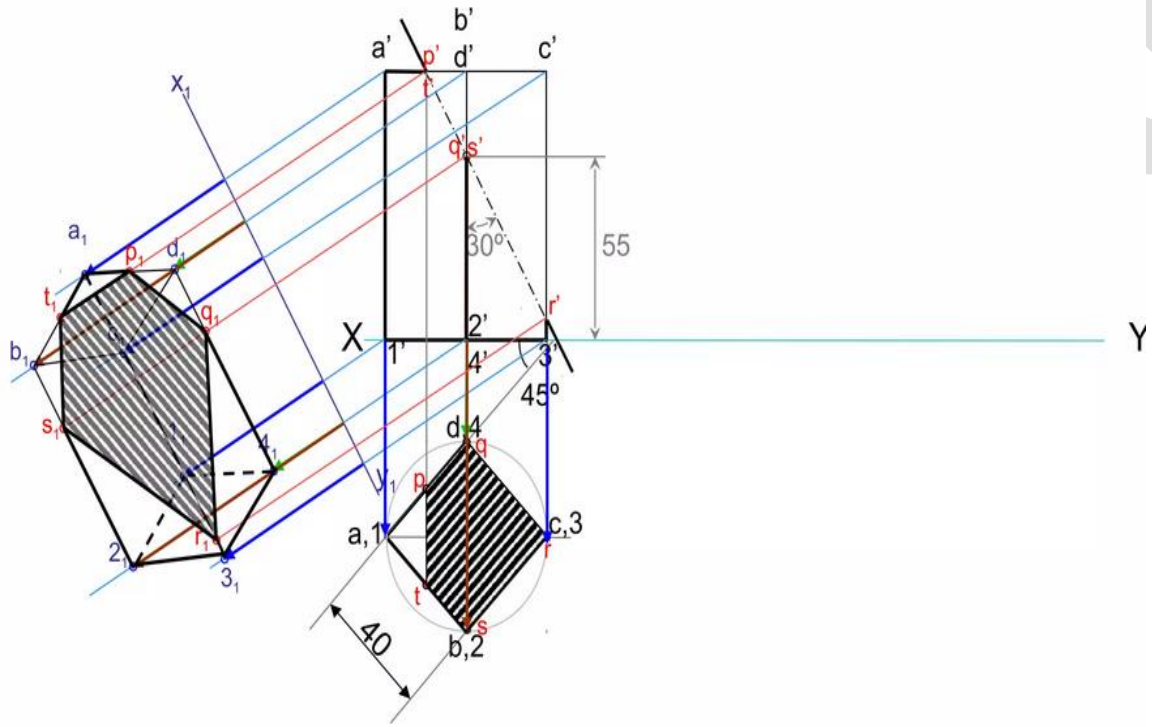
26. A Cone base 45 mm diameter and axis 55 mm long is resting on its base on H.P. It is cut by a section plane perpendicular to both H.P & V.P. and 6mm away from the axis. Draw the plan, elevation and section side view.



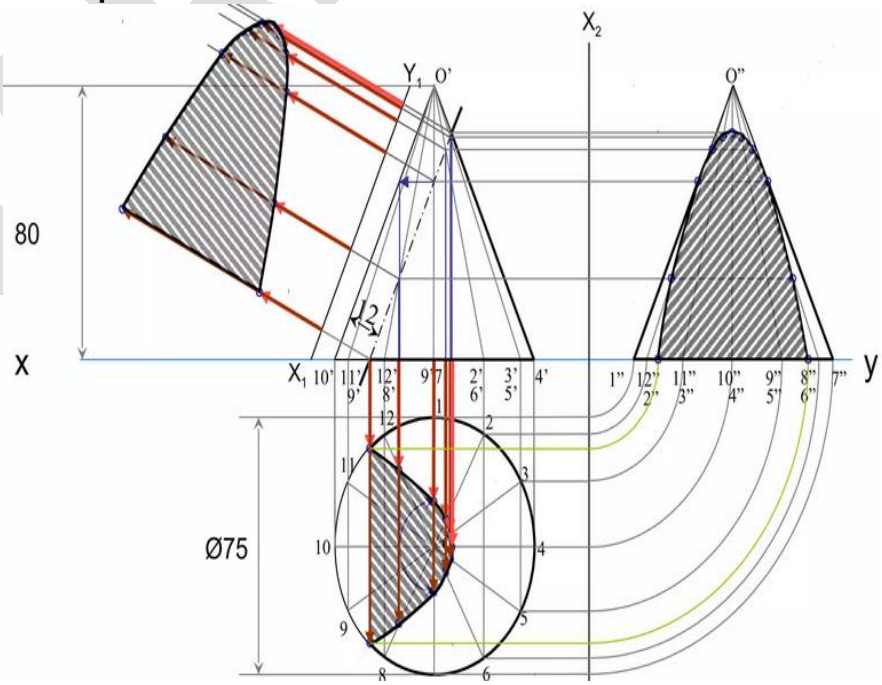
27. A Cone base 75 mm diameter and axis 80 mm long is resting on its base on H.P. It is cut by a section plane perpendicular to the V.P., inclined at 45° to the H.P. and cutting the axis at a point 35 mm from the apex. Draw the front view, sectional top view, sectional side view and true shape of the section.



28. A Square Prism of base side 40mm, axis 80mm long, has its base on the H.P. and its face equally inclined to V.P. It is cut by a sectional plane perpendicular to V.P inclined at 60° to the H.P and passing through a point on the axis, 55mm above the H.P. Draw its front view, sectional top view and another top view on an AIP, parallel to the Section Plane?



29. A Cone base 75 mm diameter and axis 80 mm long is resting on its base on H.P. It is cut by a section plane perpendicular to the V.P. and parallel to and 12mm away from one of its generators. Draw the front view, sectional top view, sectional side view and true shape of the section.



UNIT-IV

Development of Surfaces of Right Regular Solids

(Prisms, Pyramids, Cone, Cylinder, Cube & etc)

"DO ALL THE GOOD YOU CAN, FOR ALL THE PEOPLE YOU CAN, IN ALL THE WAYS YOU CAN, AS LONG AS YOU CAN."

DEVELOPMENT OF SURFACES OF RIGHT REGULAR SOLIDS

Development of surface: Development of surface of an object means the unrolling or unfolding of all surfaces of the object on a plane. In other words, a layout of the complete surface of an object is called the Development of surface.

Lateral surface: The layout of only the sides of the object without its top or bottom is called the Lateral surface.

Note: The development of any solid shows the true shape of all the surfaces of the solid.

The Imaginary plane is called a Section plane (S.P) or a Cutting plane (C.P).

The surface produced by cutting the object by the section plane is called the section. It is indicated by thin section lines uniformly spaced and inclined at 45°.

Sectioning: The imaginary process of cutting or sectioning the object is called Sectioning.

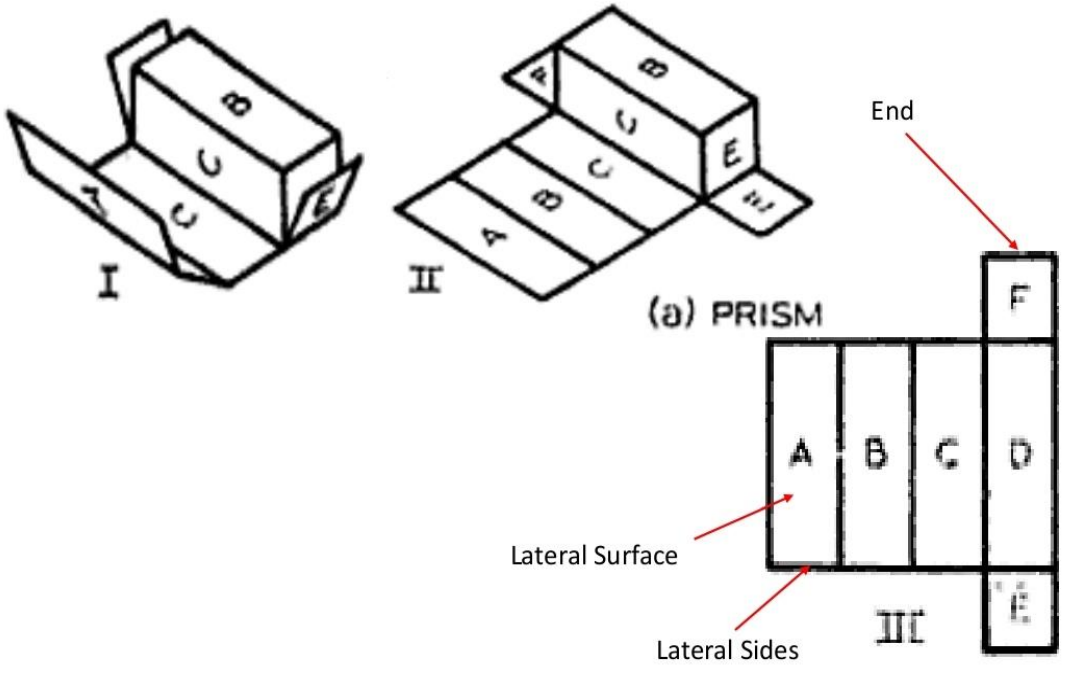
Cut Surface: The Surface obtained by cutting an object by a section plane is called Cut surface.

Methods of Development:-

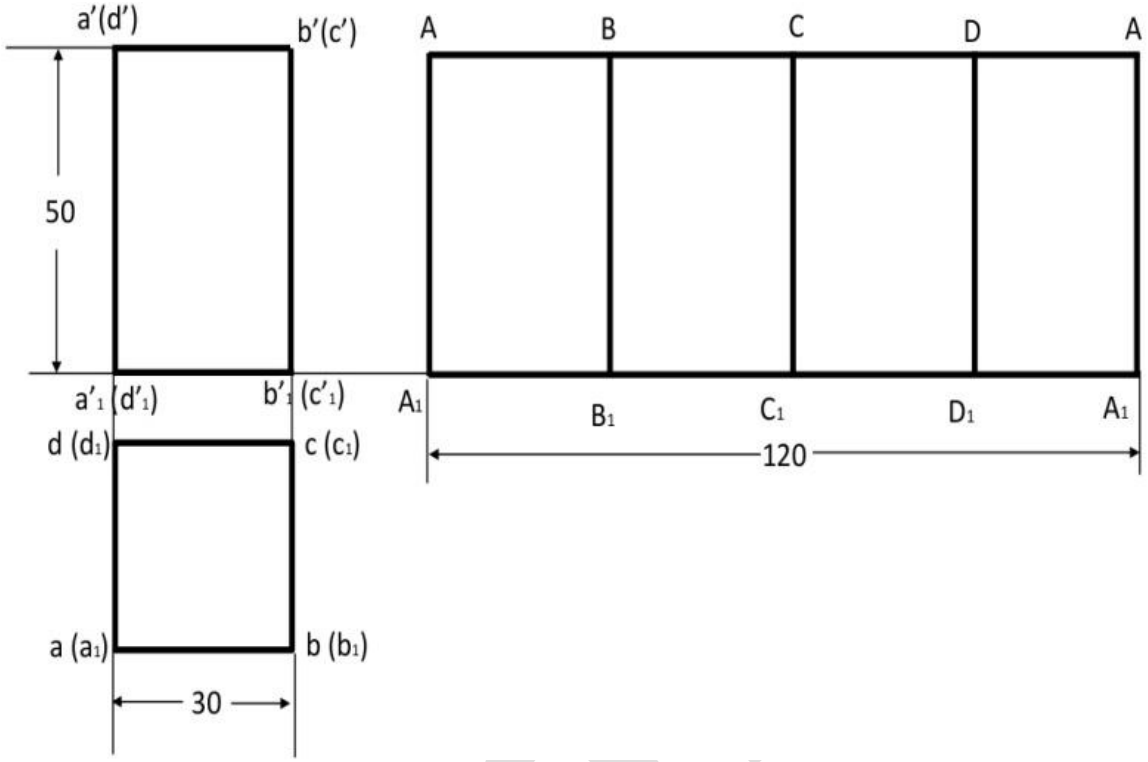
1. Parallel line method
2. Radial line method
3. Approximate method
4. Triangulation Development

DEVELOPMENT OF LATERAL SURFACES OF SIMPLE SOLIDS

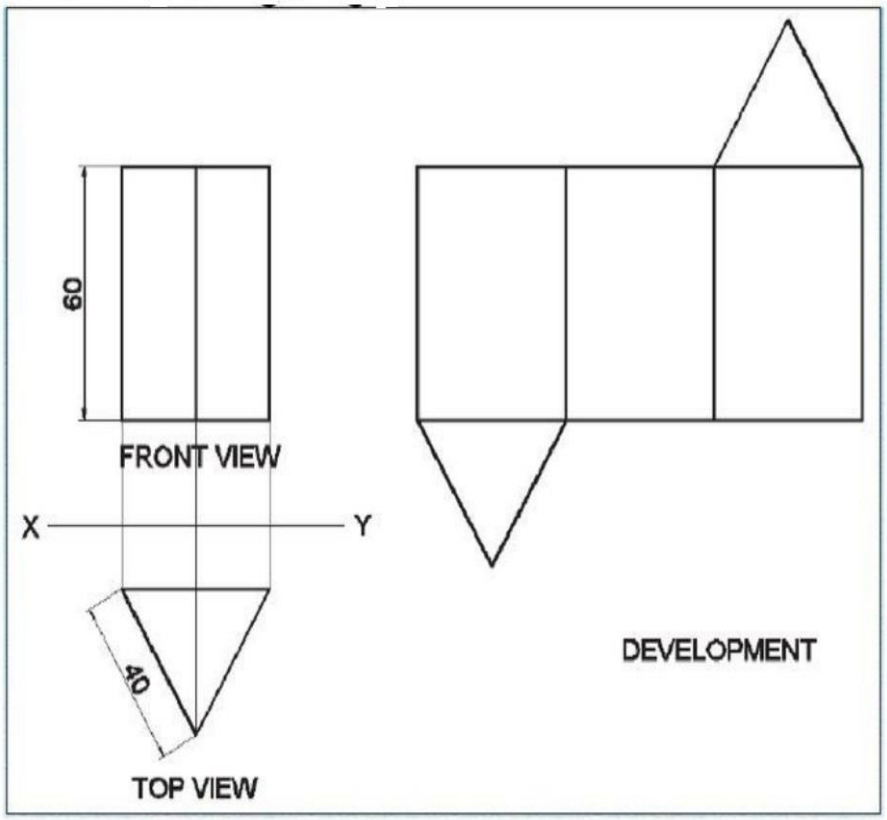
Development of Prism



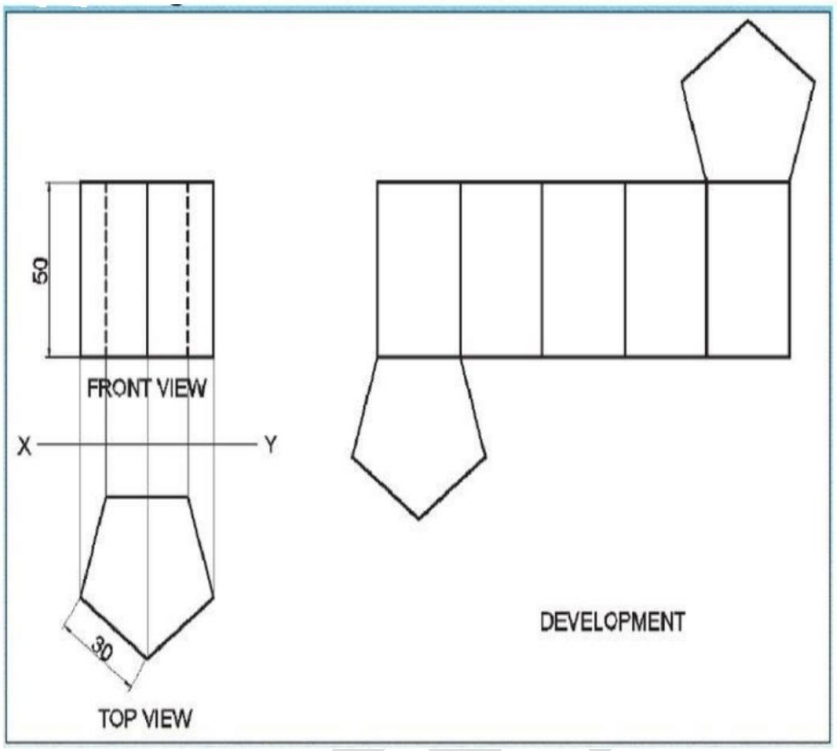
1. Draw the development of the lateral surfaces of a right Square prism of edge of base 30mm and axis 50mm long.



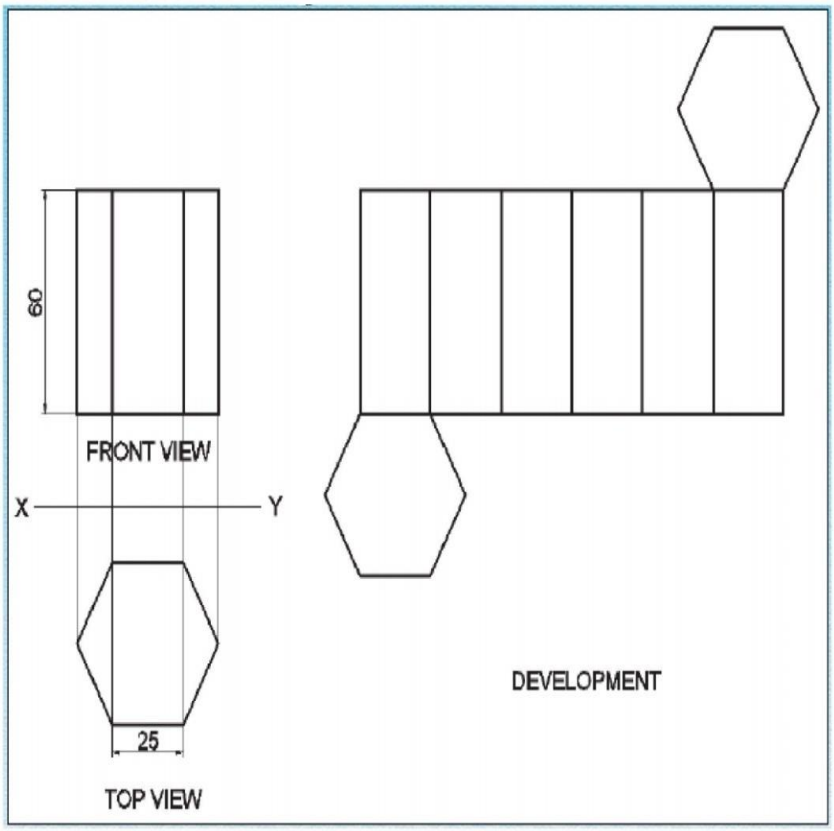
2. Draw the development of all the surfaces of a Triangular prism of edge of base 40mm and axis 60mm long.



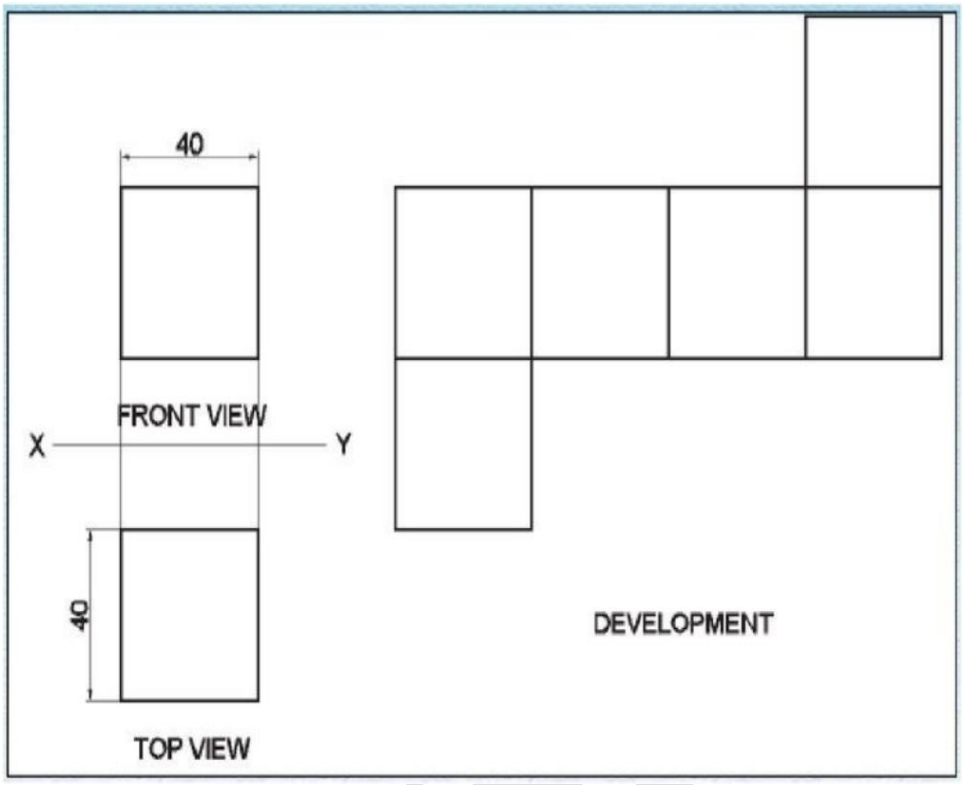
3. Draw the development of all the surfaces of a Pentagonal prism of edge of base 30mm and axis 50mm long.



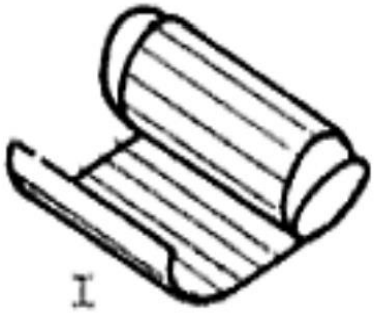
4. Draw the development of all the surfaces of a Hexagonal prism of edge of base 25mm and axis 60mm long.

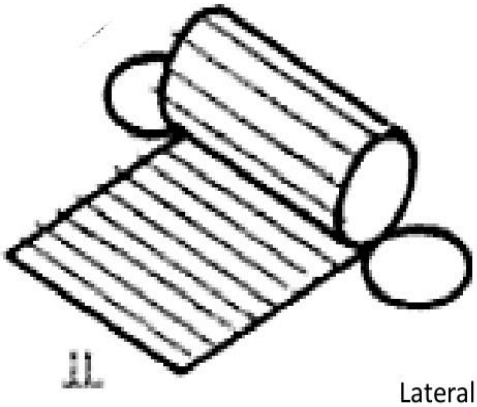


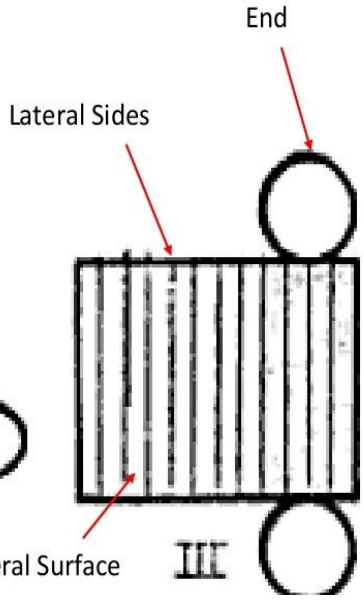
5. Draw the development of all the surfaces of a Cube of edge 40mm.

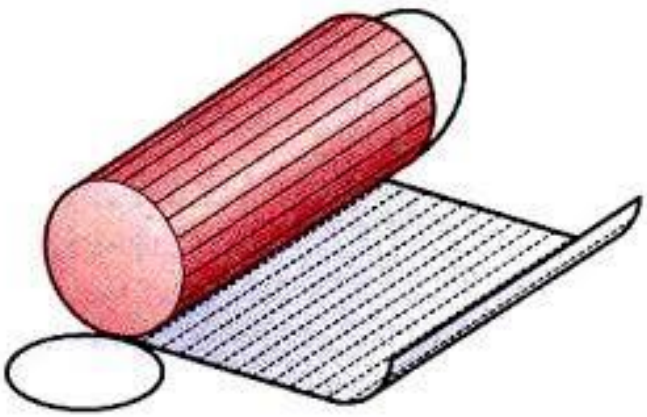


Development of Cylinder

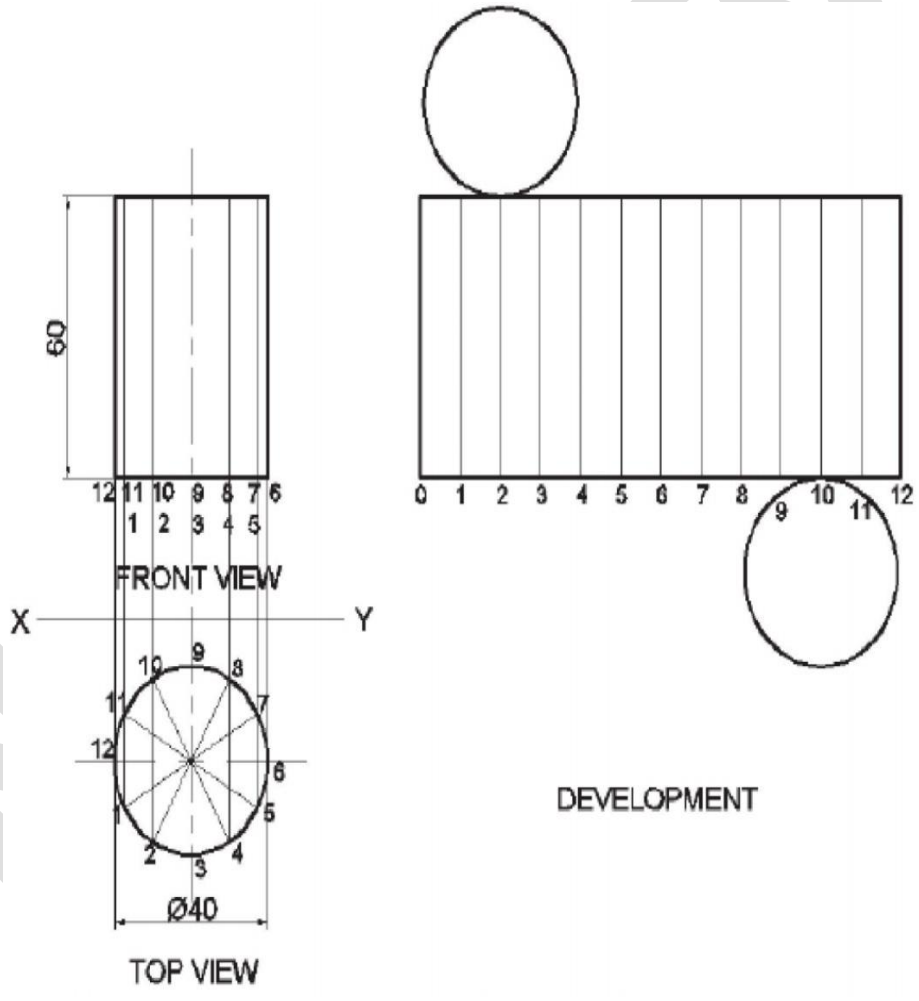








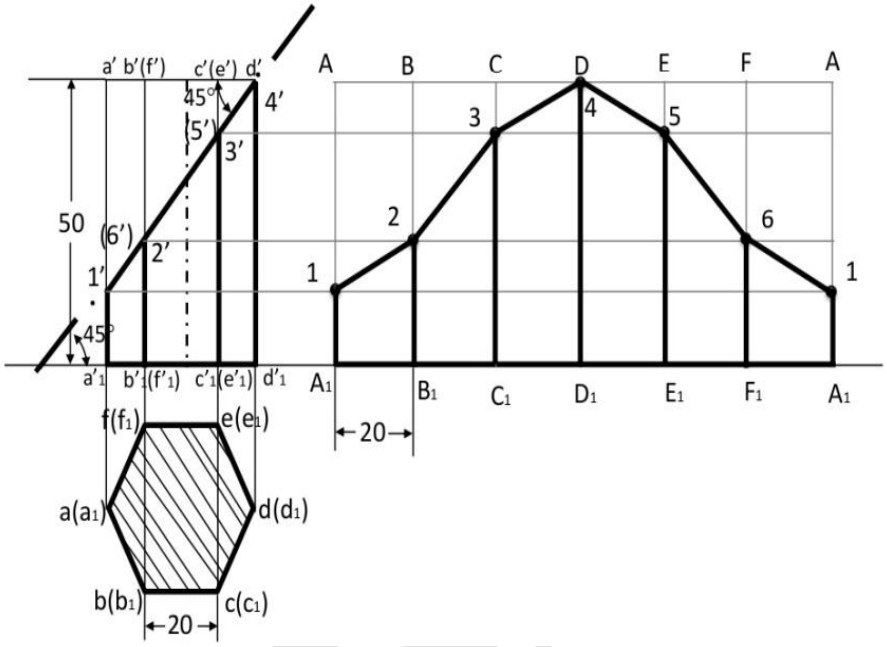
6. Draw the development of a cylindrical drum. Diameter is 40mm and height 60mm.



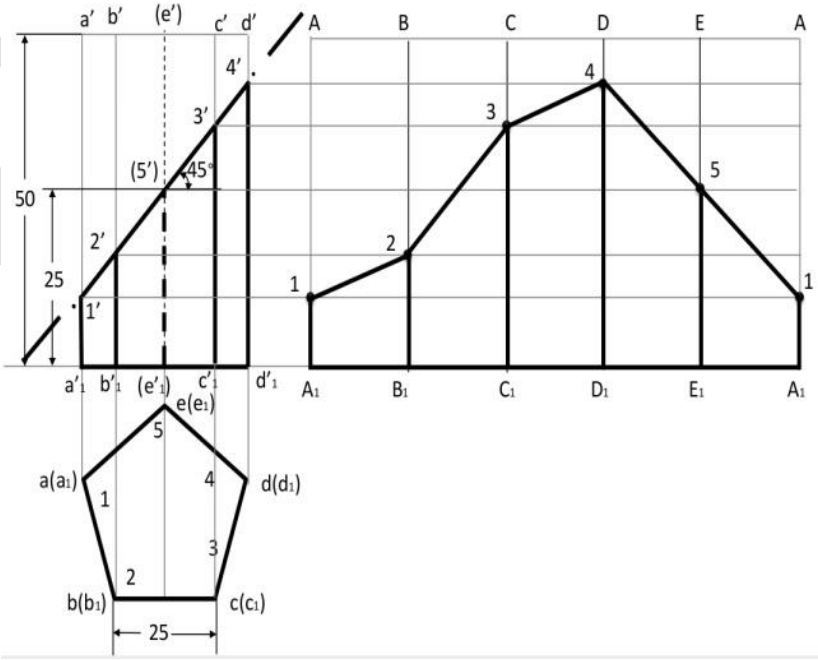
"Live as if you were to die tomorrow. Learn as if you were to live forever"

DEVELOPMENT OF LATERAL SURFACES OF SECTIONED SOLIDS

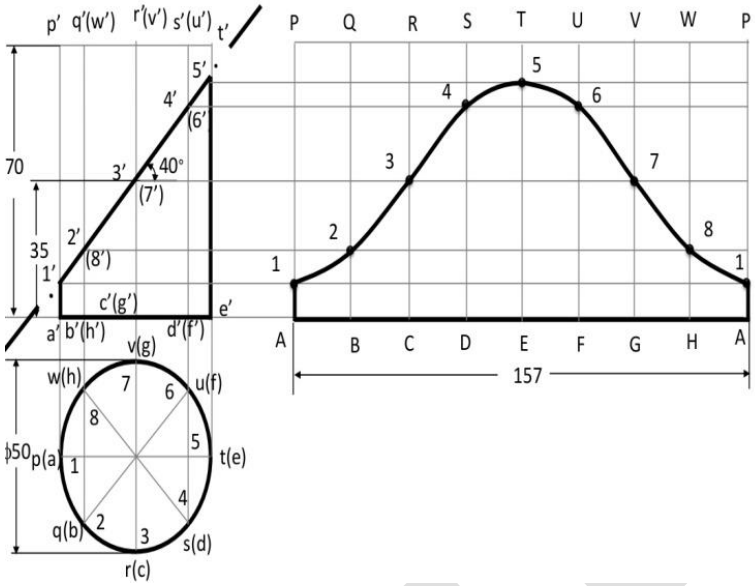
7. A hexagonal prism, edge of base 20mm and axis 50mm long, rests with its base on HP such that one of its rectangular faces is parallel to VP. It is cut by a plane perpendicular to VP, inclined at 45° to HP and passing through the right corner of the top face of the prism. (i) Draw the STV. (ii) Develop the lateral surfaces of the truncated prism.



8. A pentagonal prism, side of base 25mm and altitude 50mm, rests on its base on the HP such that an edge of the base is parallel to VP and nearer to the observer. It is cut by a plane inclined at 45° to HP, perpendicular to VP and passing through the centre of the axis. (i)Draw the development of the truncated prism.



9. Draw the development of the lateral surface of the lower portion of a cylinder of diameter 50mm and axis 70mm when sectioned by a plane inclined at 40° to HP and perpendicular to VP and bisecting axis.



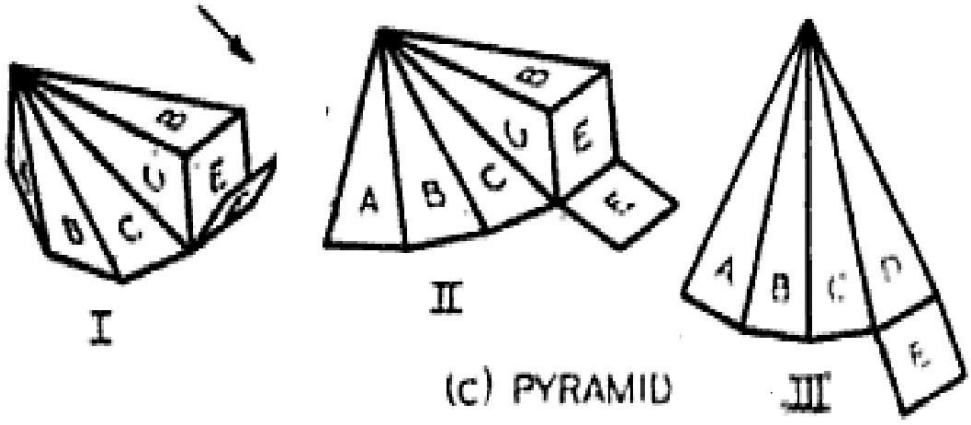
EXERCISE-I

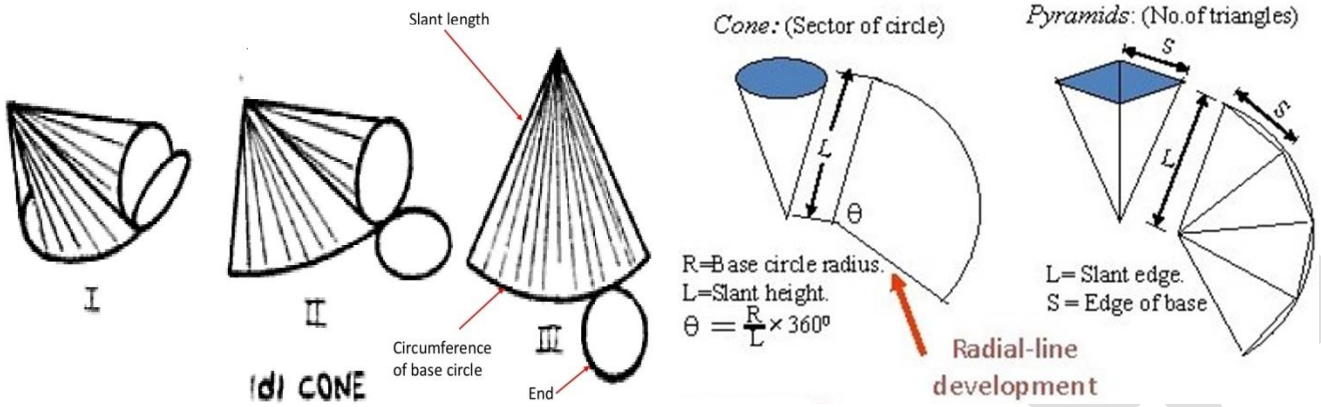
10. A pentagonal prism of side of base 30mm and altitude 60mm stands on its base on HP such that a vertical face is parallel to VP and away from observer. It is cut by a plane perpendicular to VP, inclined at an angle of 50° to HP and passing through the axis 35mm above the base. Draw the development of the lower portion of the prism.

11.A cylinder of diameter 40mm, height 75mm is cut by a plane perpendicular to VP and inclined at 55° to HP meeting the axis at top face. Draw the lateral development of the solid.

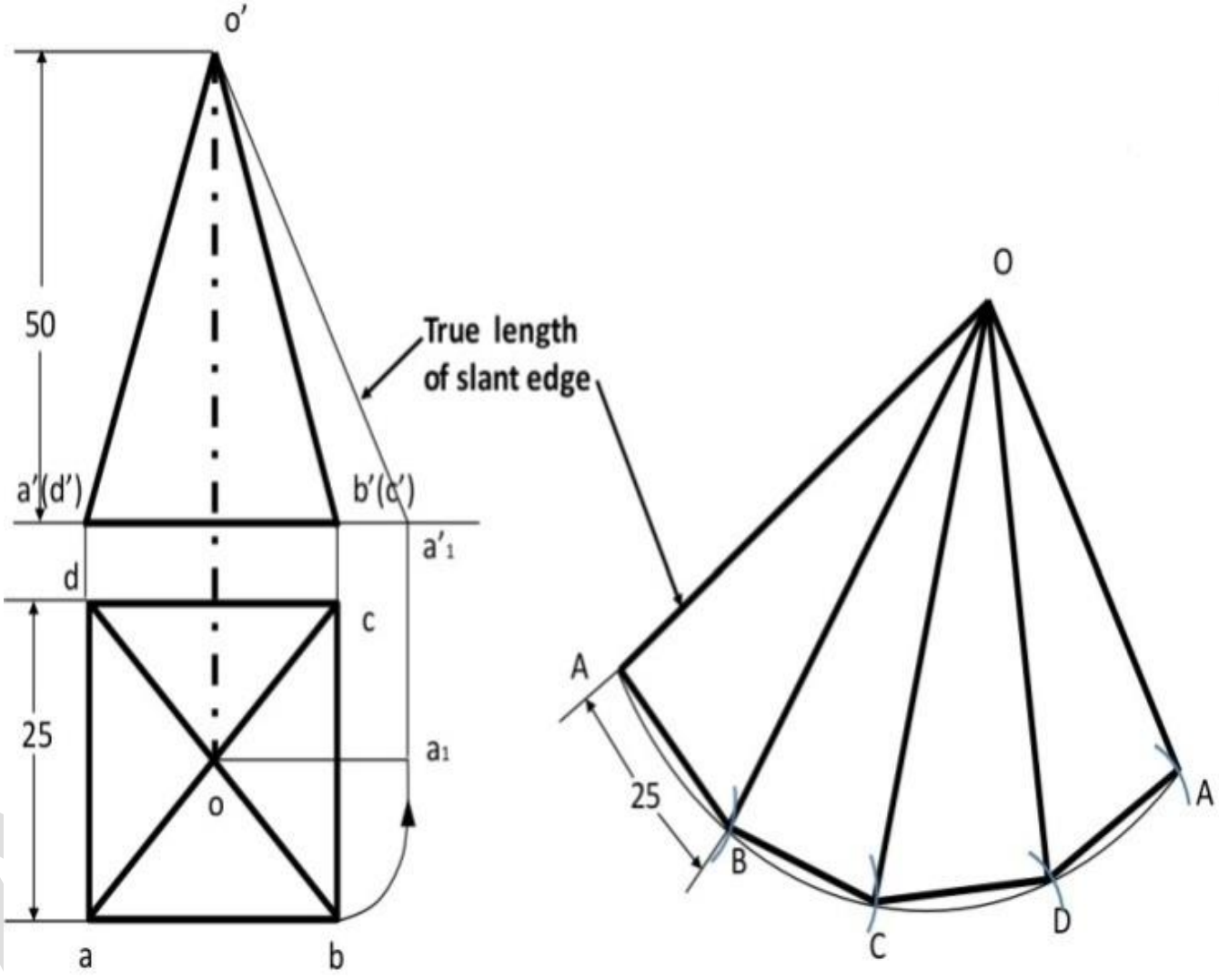
12.A Hexagonal Pyramid of base 25 mm side and 50 mm height stands with its base on the ground such that the rectangular face is parallel to V.P. It is cut by a S.P inclined at 60⁰ to HP & Perpendicular to V.P cuts the Pyramid at a distance of 25 mm from the base. Draw the S.T.V, TS and also development?

13.A Cylinder of base diameter 40 mm and 50 mm height stands with its base on the ground. It is cut by a S.P inclined at 60⁰ to HP & Perpendicular to V.P cuts the Cylinder at a distance of 25 mm from the Top. Draw the F.V, S.T.V & True shape of the section and also development the lower portion of the Truncated Cylinder?

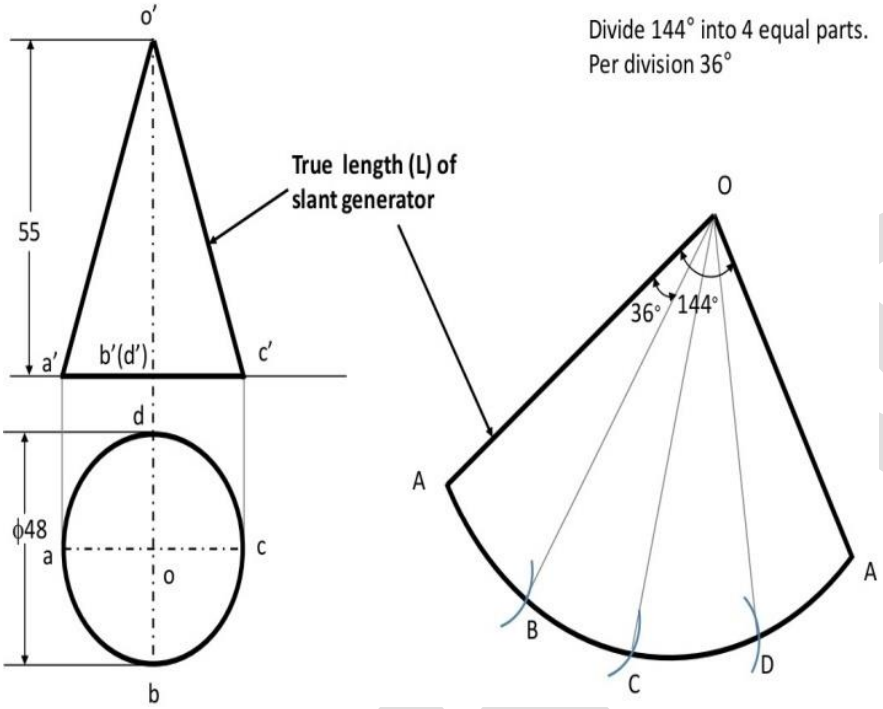




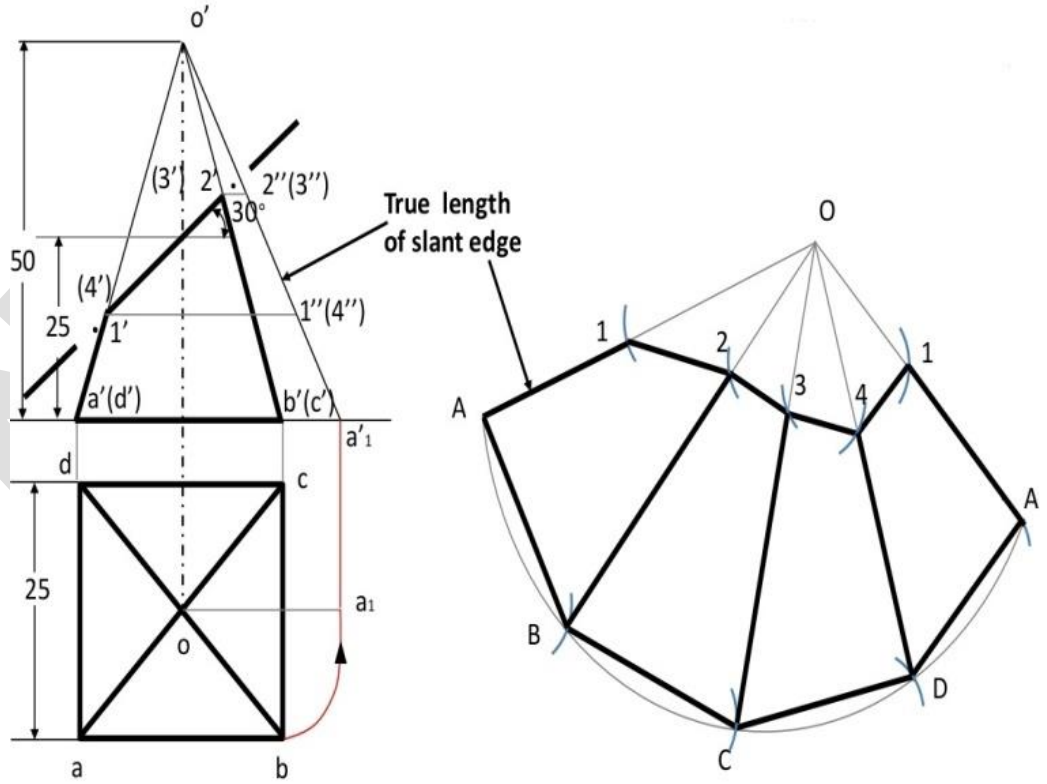
14. Draw the development of the lateral surfaces of a square pyramid, side of base 25mm and height 50mm, resting with its base on HP and an edge of the base parallel to VP.



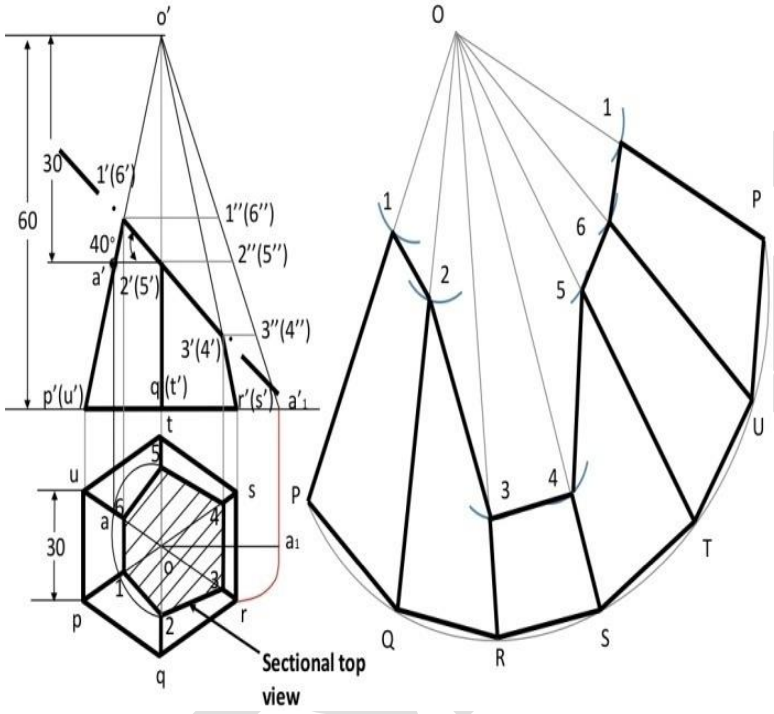
15. Draw the development of the lateral surface of a cone of base diameter 48mm and altitude 55mm.



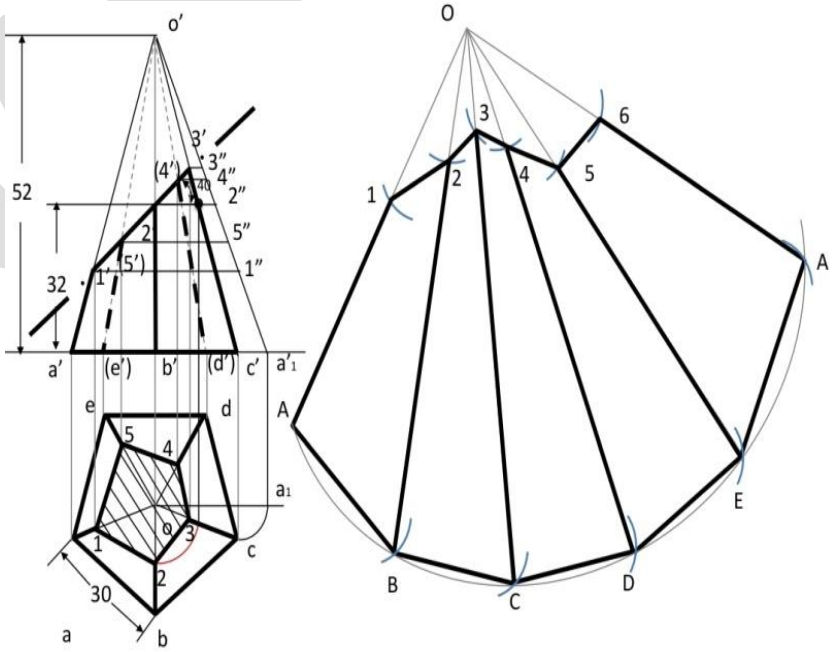
16. A square pyramid of base side 25mm and altitude 50mm rests on it base on the HP with two sides of the base parallel to the VP. It is cut by a plane bisecting the axis and inclined a 30° to the base. Draw the development of the lateral surfaces of the lower part of the cut pyramid.



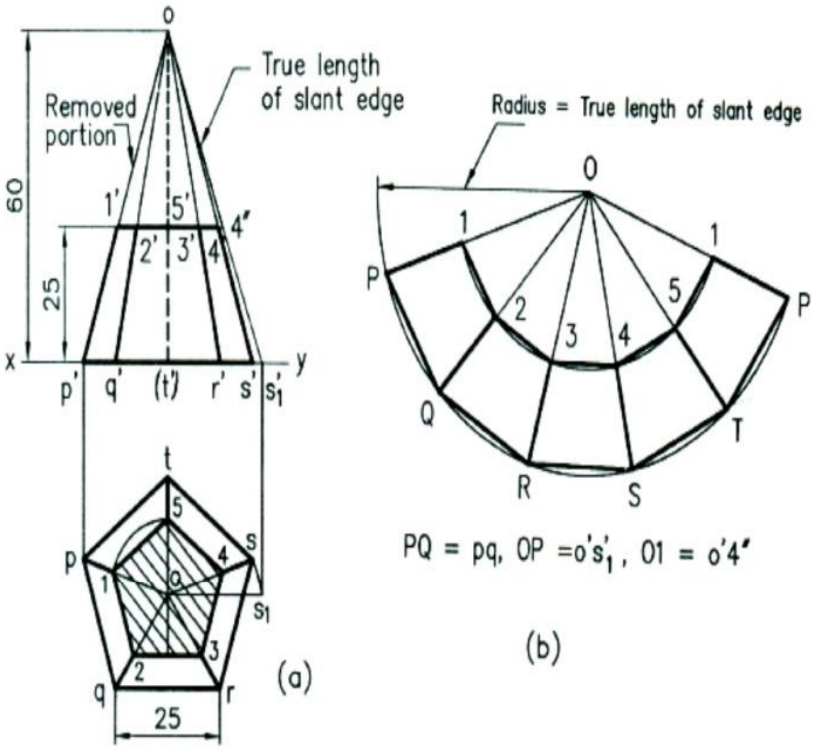
17. A regular hexagonal pyramid of side of base 30mm and height 60mm is resting vertically on its base on HP such that two of the sides of the base are perpendicular to VP. It is cut by a plane inclined at 40° to HP and perpendicular to VP. The cutting plane bisects the axis of the pyramid. Obtain the development of the lateral surface of the truncated pyramid.



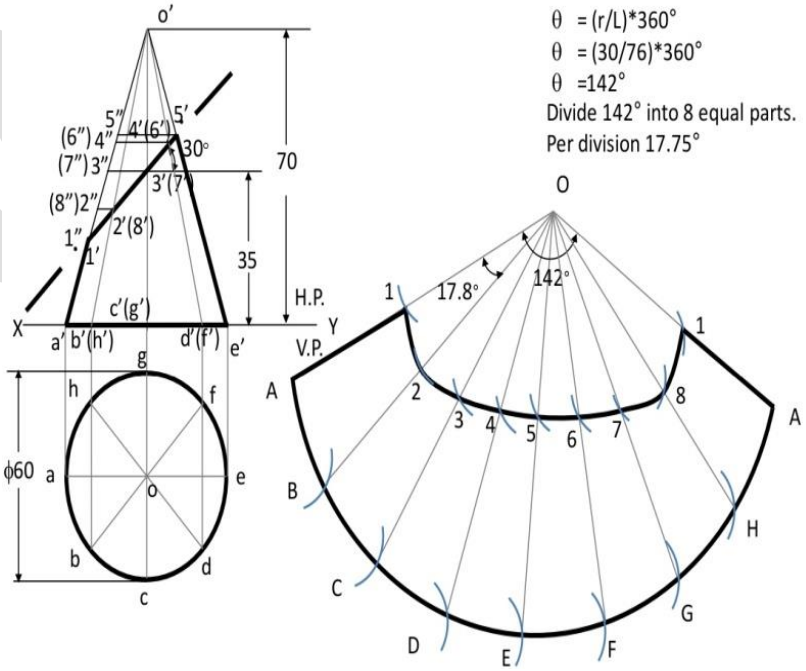
18. A pentagonal pyramid side of base 30mm and height 52mm stands with its base on HP and an edge of the base is parallel to VP and nearer to it. It is cut by a plane perpendicular to VP, inclined at 40° to HP and passing through a point on the axis 32mm above the base. Draw the sectional top view. Develop the lateral surface of the truncated pyramid.



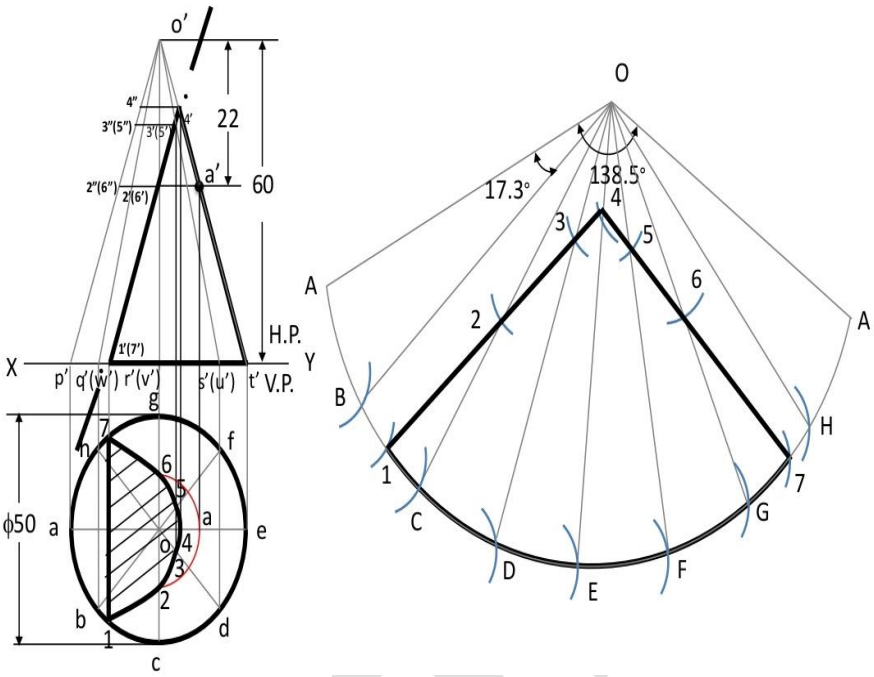
19. A pentagonal pyramid of base side 25mm and height 60mm is resting vertically on its base on the ground with one of the sides of the base parallel to the VP. It is cut by a plane perpendicular to the VP and parallel to the HP at a distance of 25mm above the base. Draw the development of the lateral surfaces of the frustum of the pyramid. Also show the top view of the cut surface.



20. A Cone of base diameter 60mm and height 70mm is resting on its base on HP. It is cut by a plane perpendicular to VP and inclined at 30° to HP. The plane bisects the axis of the cone. Draw the development of its lateral surface.

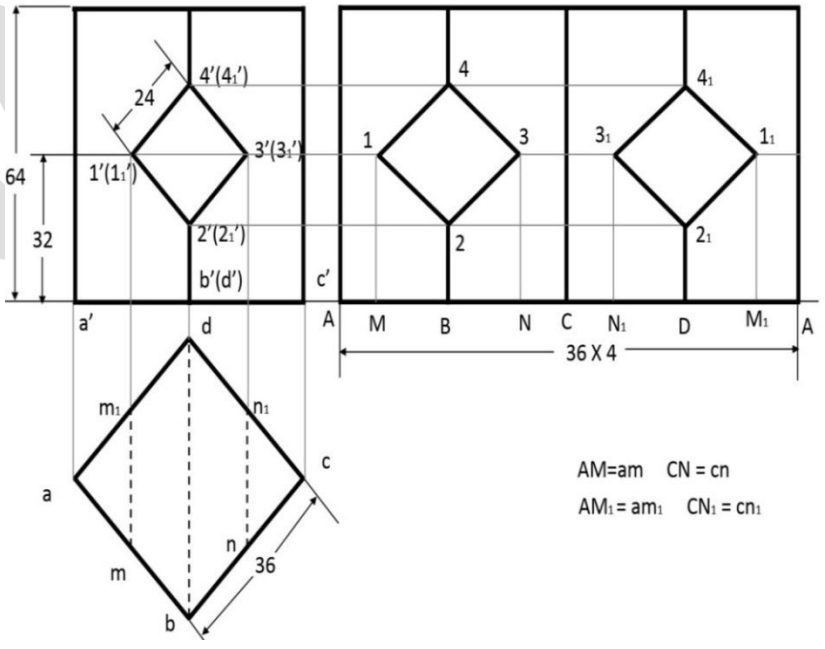


21. A Cone of base 50mm diameter and 60mm height rests with its base on HP. It is cut by a section plane perpendicular to VP, parallel to one of the generators and passing through a point on the axis at a distance of 22mm from the apex. Draw the sectional top view and develop the lateral surface of the remaining portion of the cone.

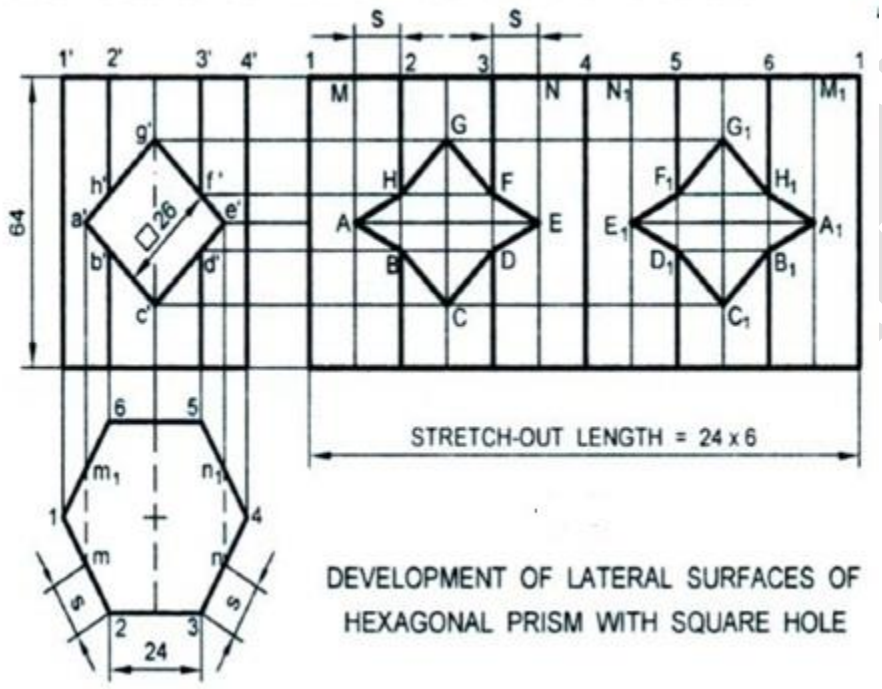


DEVELOPMENT OF LATERAL SURFACES OF SOLIDS WITH CUT-OUTS AND HOLES

22. A Square prism of 36 mm edge of base and 64mm height stands on HP with two of its base edges equally inclined to VP. It has a square hole of 24mm side centrally cut right through the prism such that its faces are equally inclined to HP. Axis of the hole is parallel to HP and perpendicular to VP. Draw the development of the lateral surfaces of the prism showing the true shape of the square cut out formed it.



23. A hexagonal prism of side of base 24mm and axis 64mm is on HP on one of its ends with a base edge parallel to VP. A square hole of side 26mm is drilled such that the axis of the hole is perpendicular to VP and bisects the axis of the prism with all the faces equally inclined to HP. Develop lateral surfaces.



DEVELOPMENT OF LATERAL SURFACES OF HEXAGONAL PRISM WITH SQUARE HOLE

24. A Pentagonal prism of side of base 25mm and axis 60mm is on HP on one of its ends with a base edge parallel to VP and nearer to it. A square hole of side 25mm is drilled such that axis of the hole is perpendicular to VP and bisects axis of the prism with all the faces equally inclined to HP. Draw the development of lateral surfaces of the prism showing true shape of the hole on it.

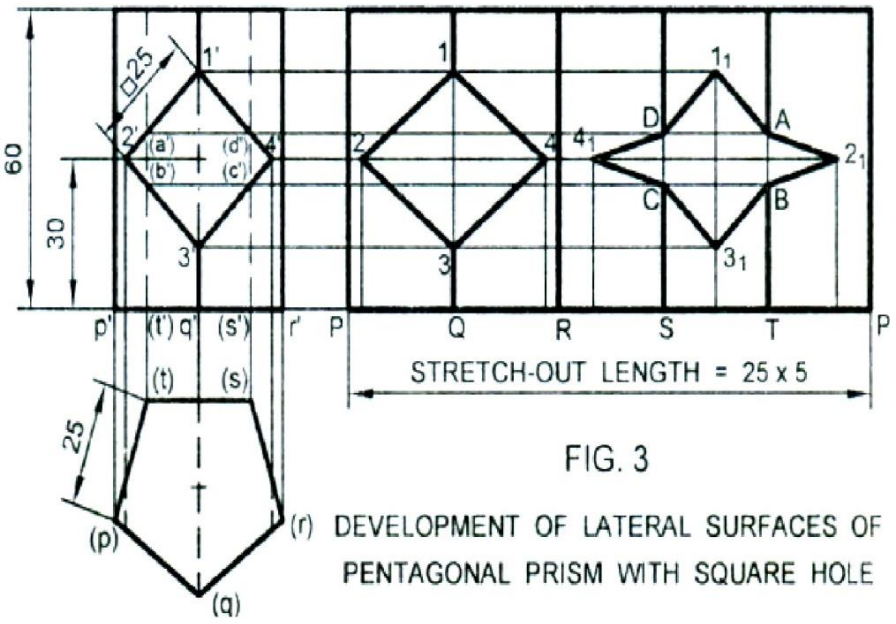


FIG. 3

DEVELOPMENT OF LATERAL SURFACES OF PENTAGONAL PRISM WITH SQUARE HOLE

25. A Cylinder of 50mm base diameter and axis 70mm long rests on its base on HP. A square cut out of 35mm side is drilled through the cylinder such that axis of cut out is perpendicular to the axis of the cylinder. The center of the cut out is 35mm above HP and 15mm away from the axis of cylinder. Two faces of the cut out are equally inclined to HP. Develop lateral surfaces.

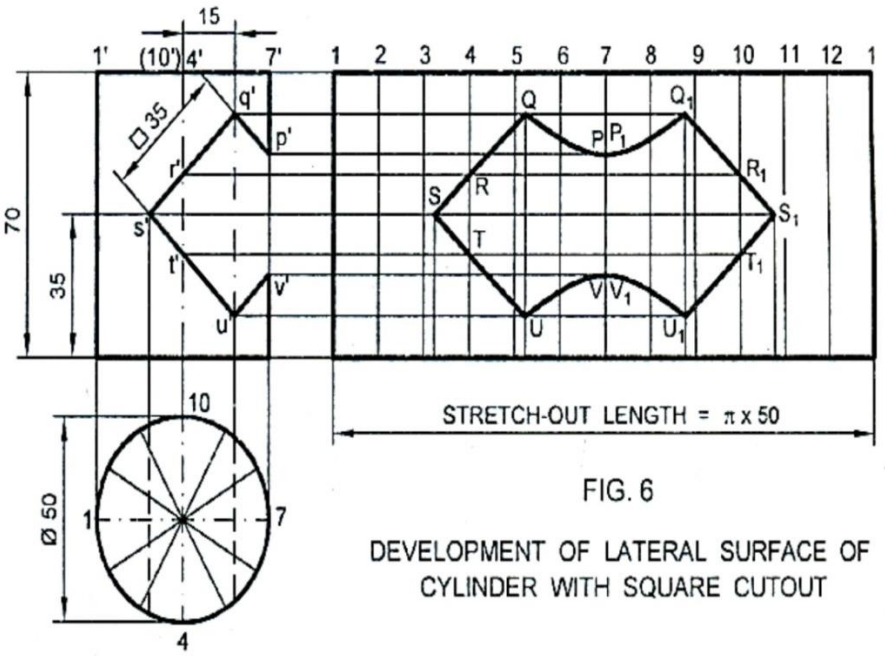
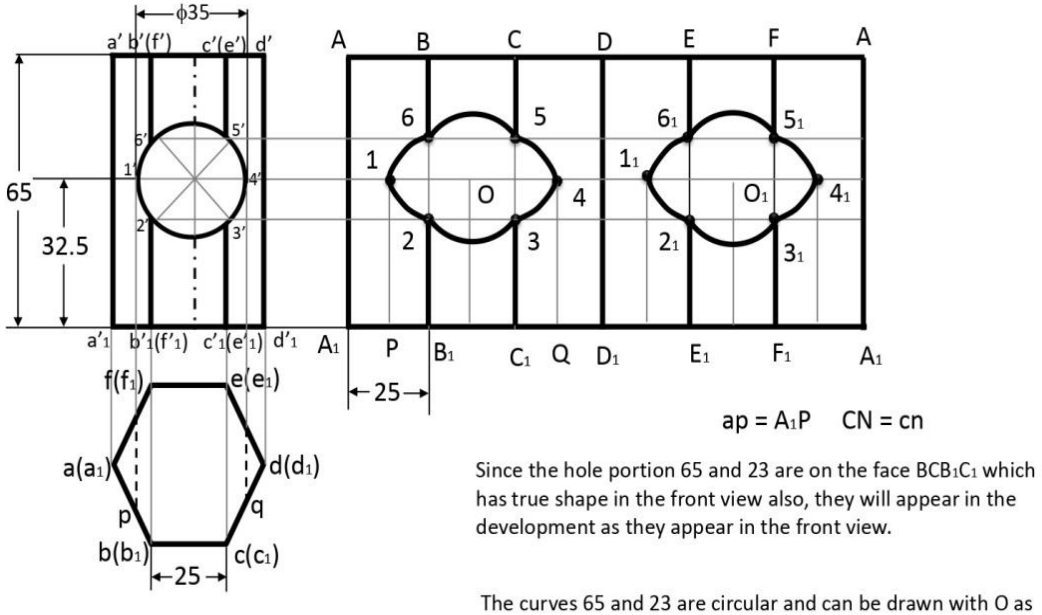


FIG. 6

DEVELOPMENT OF LATERAL SURFACE OF CYLINDER WITH SQUARE CUTOUT

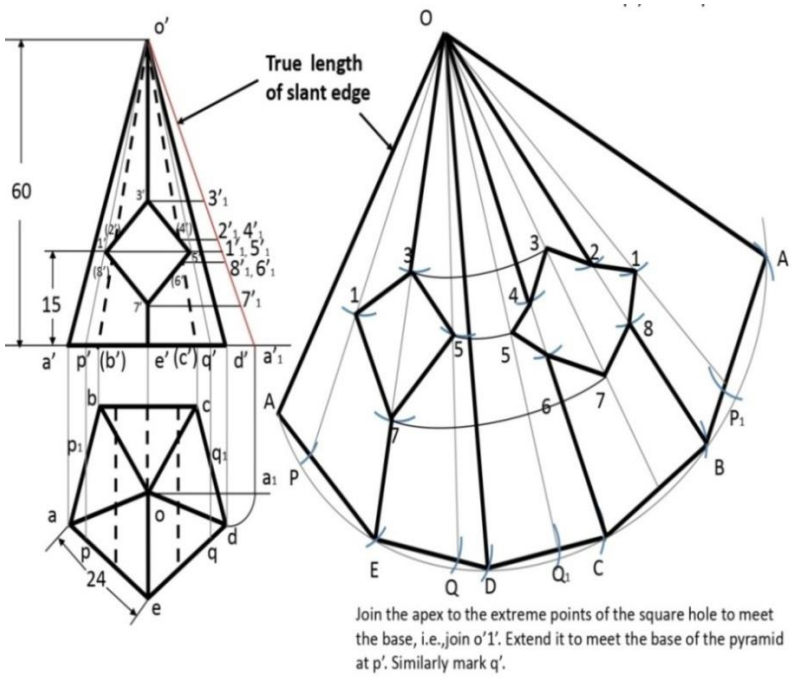
26. A hexagonal prism of side of base 25mm and altitude 65mm rests on its base on HP, having a rectangular face of the prism parallel to VP. A horizontal hole of 35mm diameter is centrally drilled in it, such that the axis of the hole is normal to VP. Develop the lateral surfaces of the prism with the shape of hole.



Since the hole portion 65 and 23 are on the face BCB_1C_1 which has true shape in the front view also, they will appear in the development as they appear in the front view.

The curves 65 and 23 are circular and can be drawn with O as centre and 17.5 mm as radius.

27. A pentagonal pyramid of side of base 24mm and axis 60mm long stands on its base on HP with a side of base parallel to VP and nearer to it. A square cut out of 15mm side is drilled through it such that its axis is parallel to HP and perpendicular to VP. Axis of cut out meets the axis of the pyramid 15mm from base. Faces of the cut out are equally inclined to HP. Develop the lateral surfaces.



Join the apex to the extreme points of the square hole to meet the base, i.e.,join o'1'. Extend it to meet the base of the pyramid at p'. Similarly mark q'.

EXERCISE-II

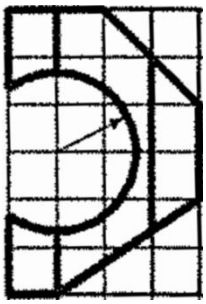
28. A Hexagonal prism of base side 25 mm and 70 mm height stands with its corner on the ground. Its axis is inclined at 60⁰ to H.P? It is cut by a Horizontal section Plane which divides the prism into two equal halves. Draw the S.T.V?

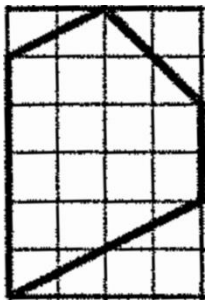
29. A Cone of base diameter 50 mm and 60 mm axis stands with its base on the ground. Draw the Projections, development of the cone and show on it, the shortest path traced by a point, starting from a point on the circumference of the base of the cone, moving around it and reaching the same point.

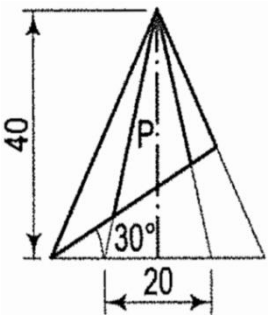
30. A Cylinder of base diameter 50 mm and 65 mm height stands with its base on the ground. Its axis is inclined at 30⁰ to the H.P. It is cut by a S.P 30⁰ to VP & Perpendicular to H.P passing through a point P on the axis 25 mm from the top end. Draw the T.S?

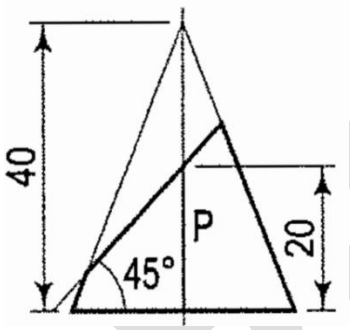
31. A Hexagonal Prism having a face parallel to V.P? Draw the Development?
32. Draw the Development of Cylinder?
33. Draw the Development of a hexagonal Pyramid if base edge parallel to the V.P?
34. Draw the Development of Square Pyramid of base edge 20 mm, equally inclined to V.P?
35. A Pentagonal Pyramid, one side of the base parallel to V.P?
36. A Square Pyramid, side of the base 20 mm, base edge 30⁰ to V.P?

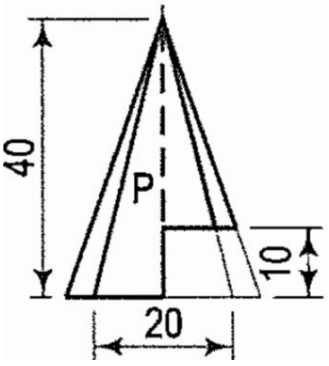
37. 38, 39,40 & 41 draw the Development for given figures?

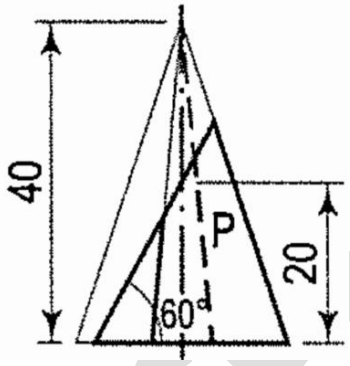


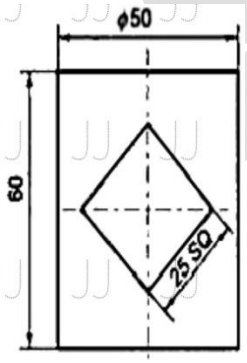


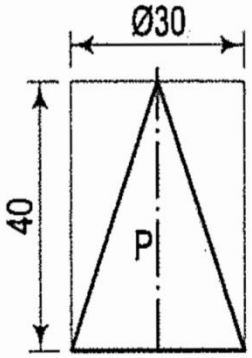


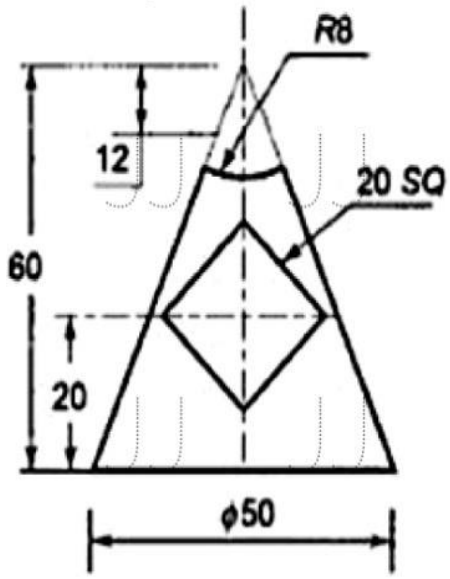


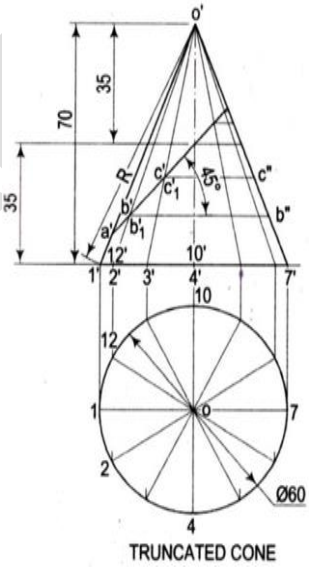


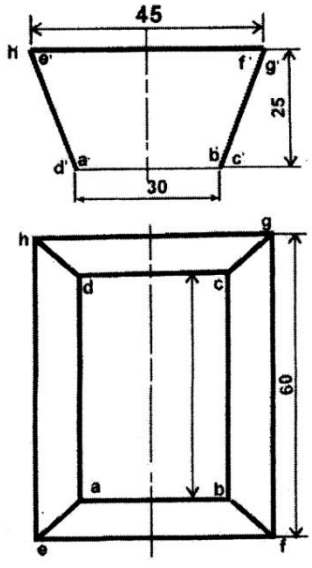










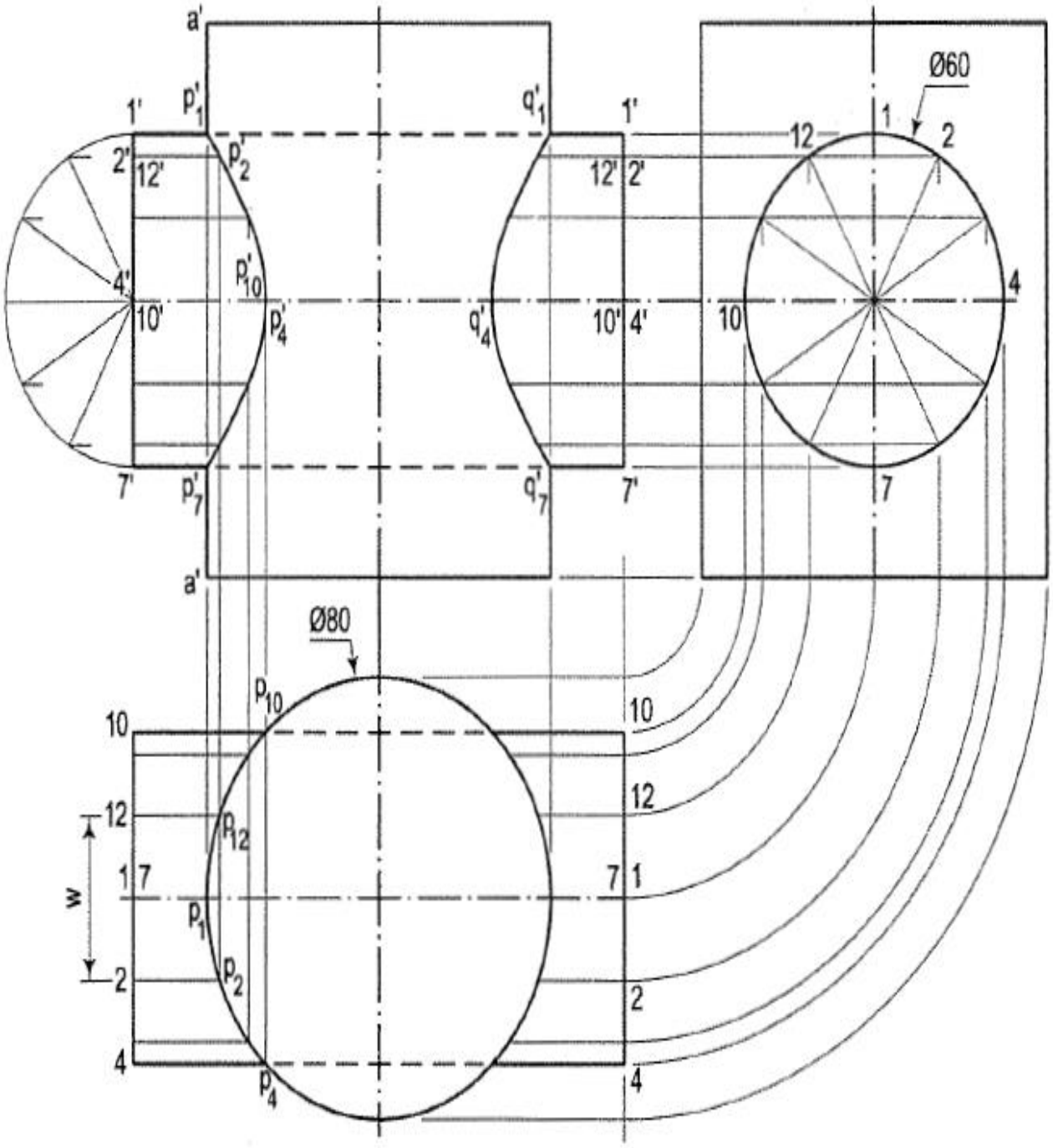


"The Greater Your Storm, the Brighter Your Rainbow"

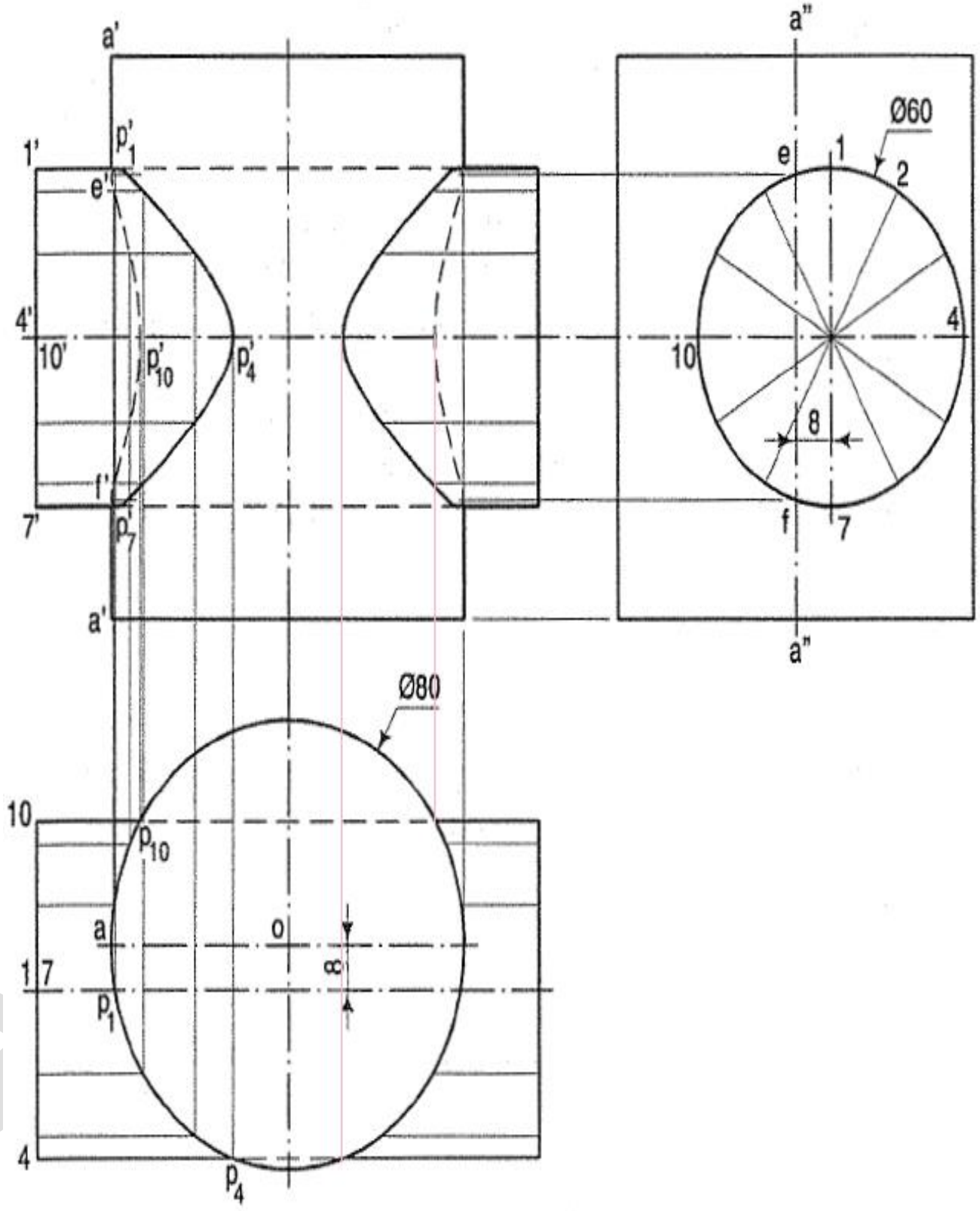
INTERPENETRATIONS OF THE RIGHT REGULAR SOLIDS

CYLINDER VERSES CYLINDER

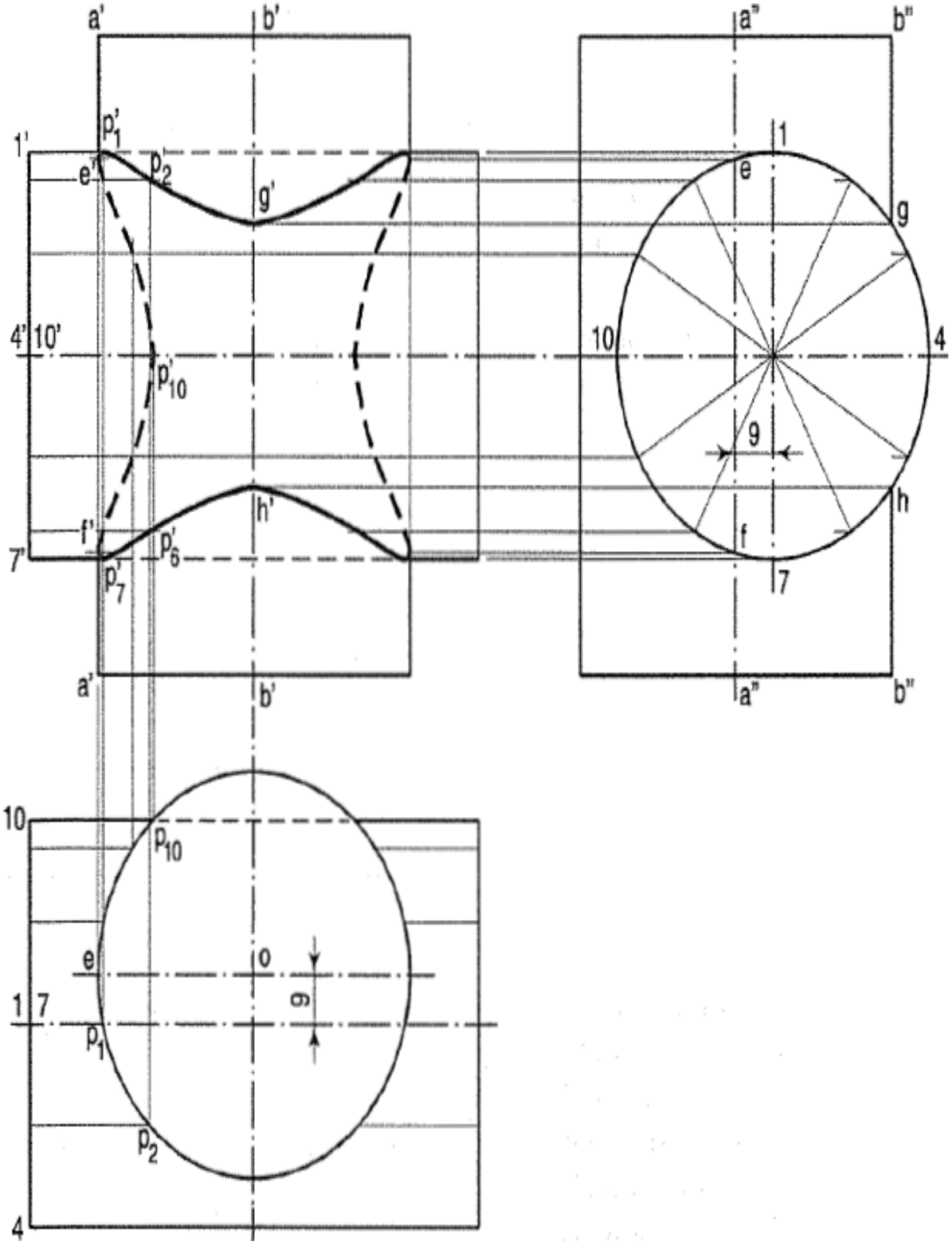
1. A Vertical cylinder 80mm diameter is completely penetrated by another cylinder of 60 mm diameter, their axes bisecting each other at right angles. Draw their projections showing curves of penetration, assuming the axis of penetrating cylinder to be parallel to the VP?



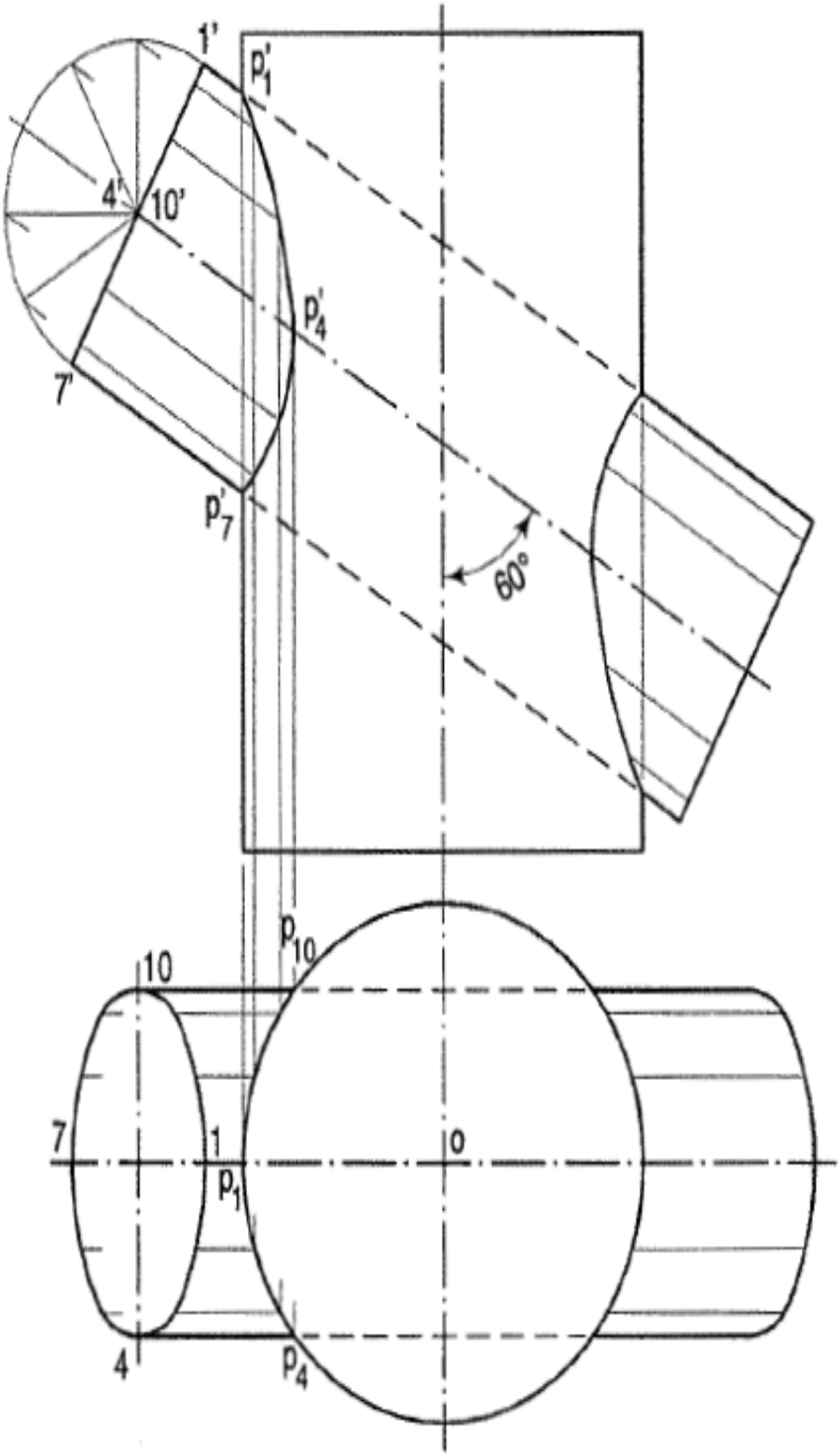
2. A Vertical cylinder 80mm diameter is penetrated by another cylinder of 60 mm diameter, the axis of which is parallel to both HP & the VP. The two axes are 8 mm apart. Draw the projections showing curves of intersections?



3. A Vertical cylinder 75mm diameter is completely penetrated by another cylinder of same size. The axis of the penetrating cylinder is parallel to both the HP and VP and is 9 mm away from the axis of the vertical cylinder. Draw the projections showing curves of intersection?

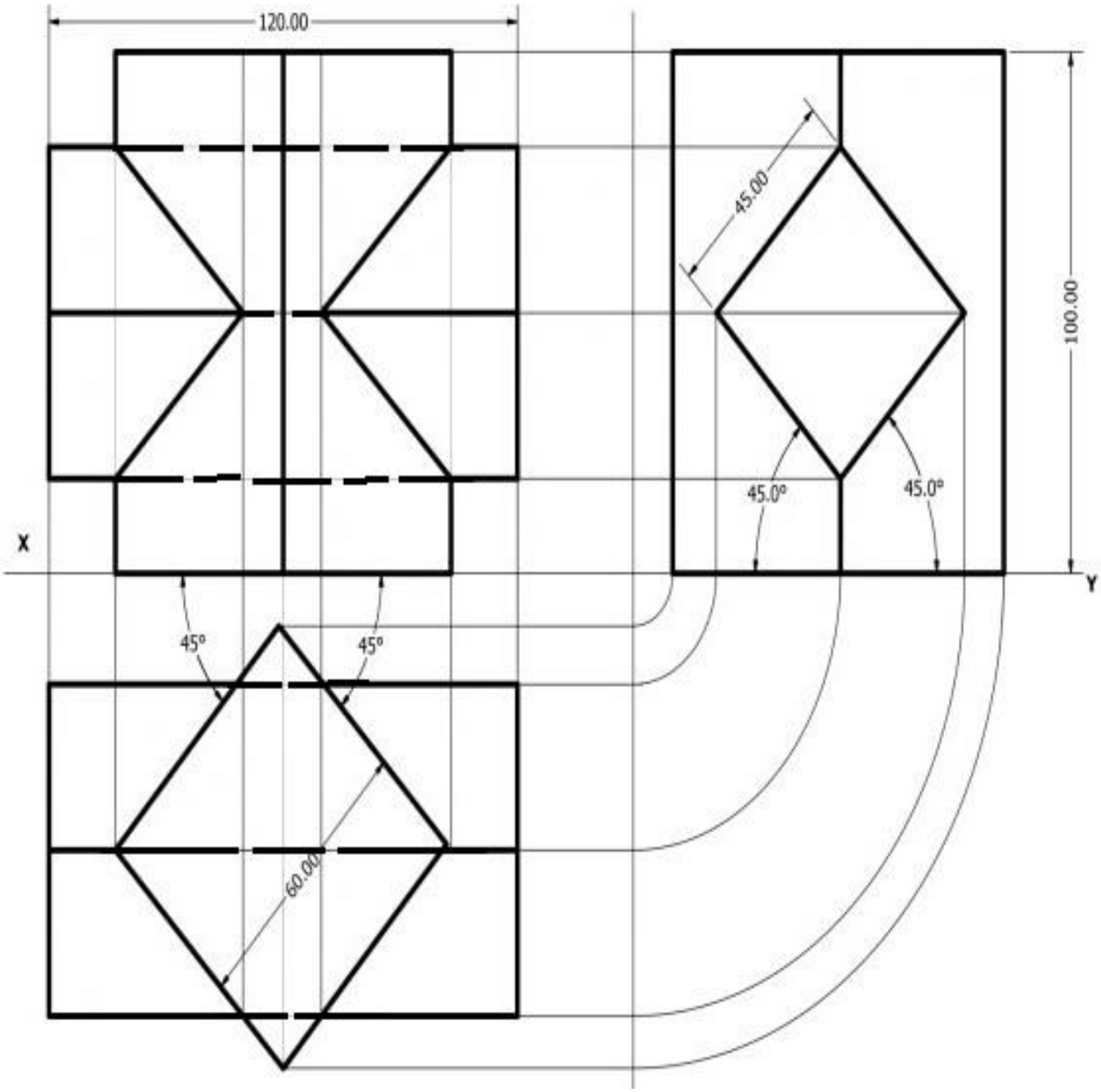


4.A cylinder of 60 mm diameter, having its axis vertical is penetrated by another cylinder of 40 mm diameter. The axis of the penetrating cylinder is parallel to the V.P. and bisects the axis of the vertical cylinder; making an angle of 60° with it. Draw the projections showing curves of intersection?

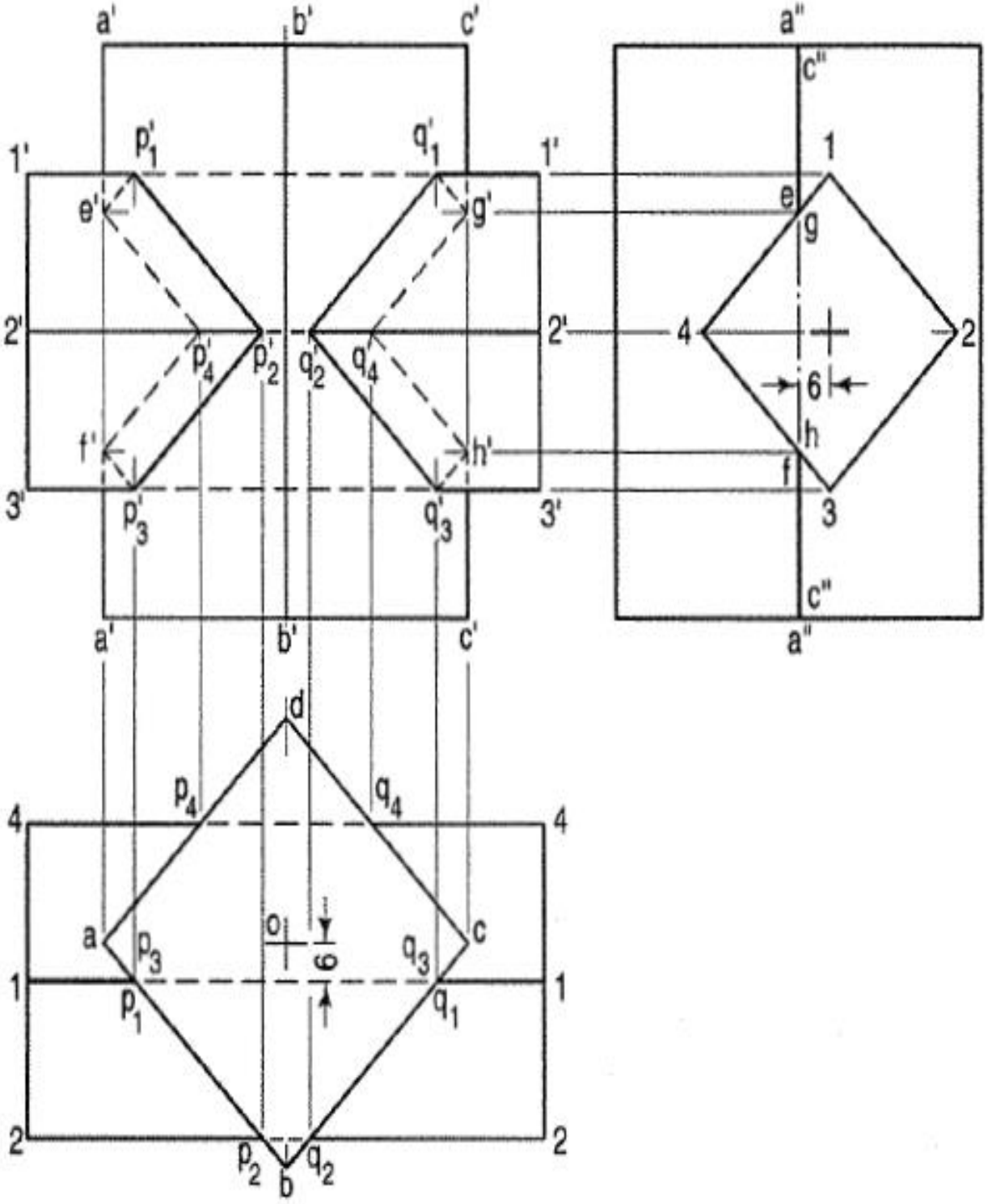


SQUARE PRISM VERSES SQUARE PRISM

5. A sq. prism 60 mm base sides and 100mm axis is completely penetrated by another square prism of 45 mm sides and 120mm axis, horizontally. Both axes intersect & bisect each other. All faces of prisms are equally inclined to VP. Draw projections showing curves of intersections.

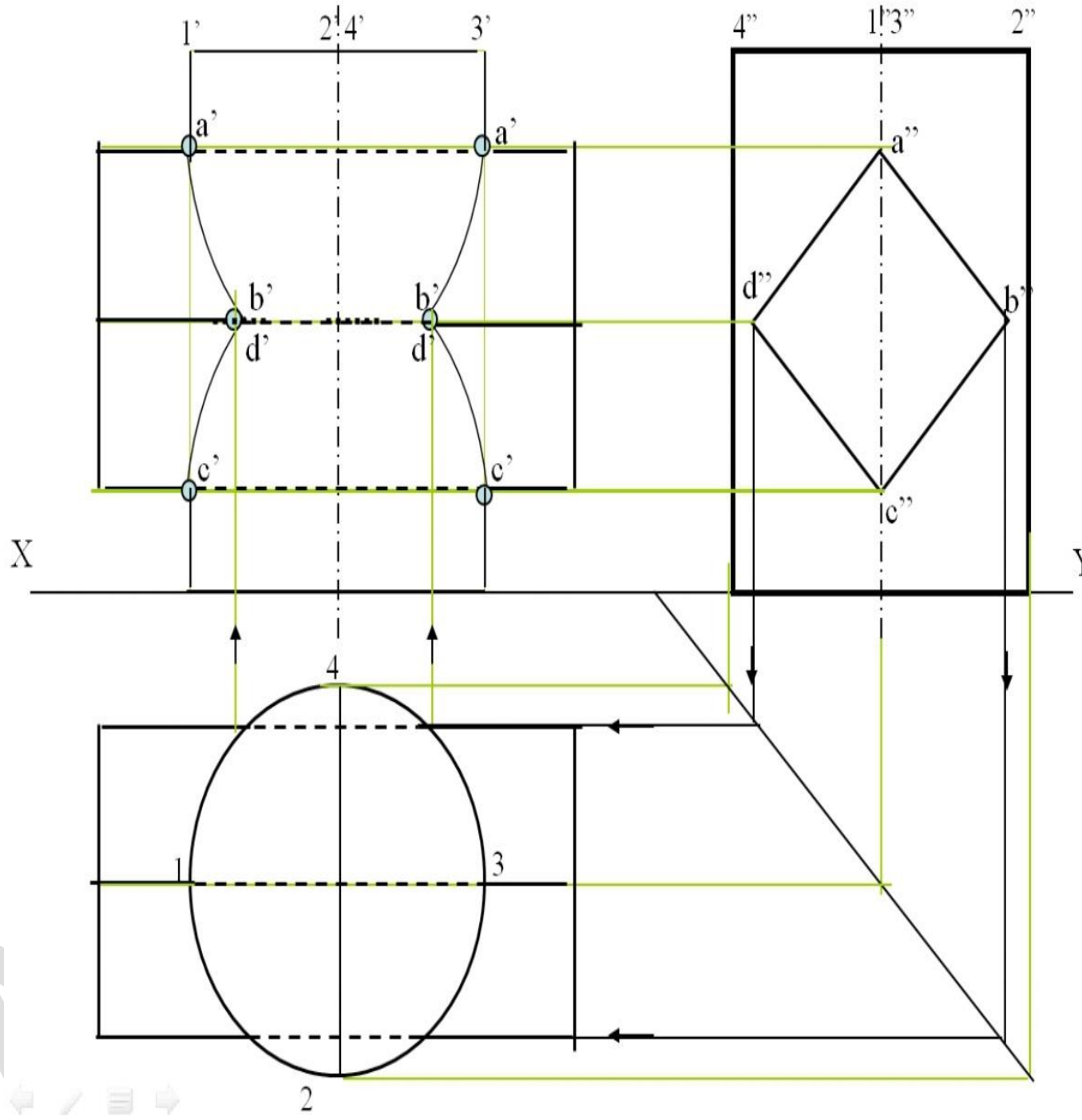


6. A Vertical square prism, base 50 mm side is completely penetrated by a horizontal square prism, base 35 mm side so that their axes are 6 mm apart. The axis of horizontal prism is parallel to the VP while the faces of both prisms are equally inclined to VP. Draw the projections of the prisms showing lines of intersection.

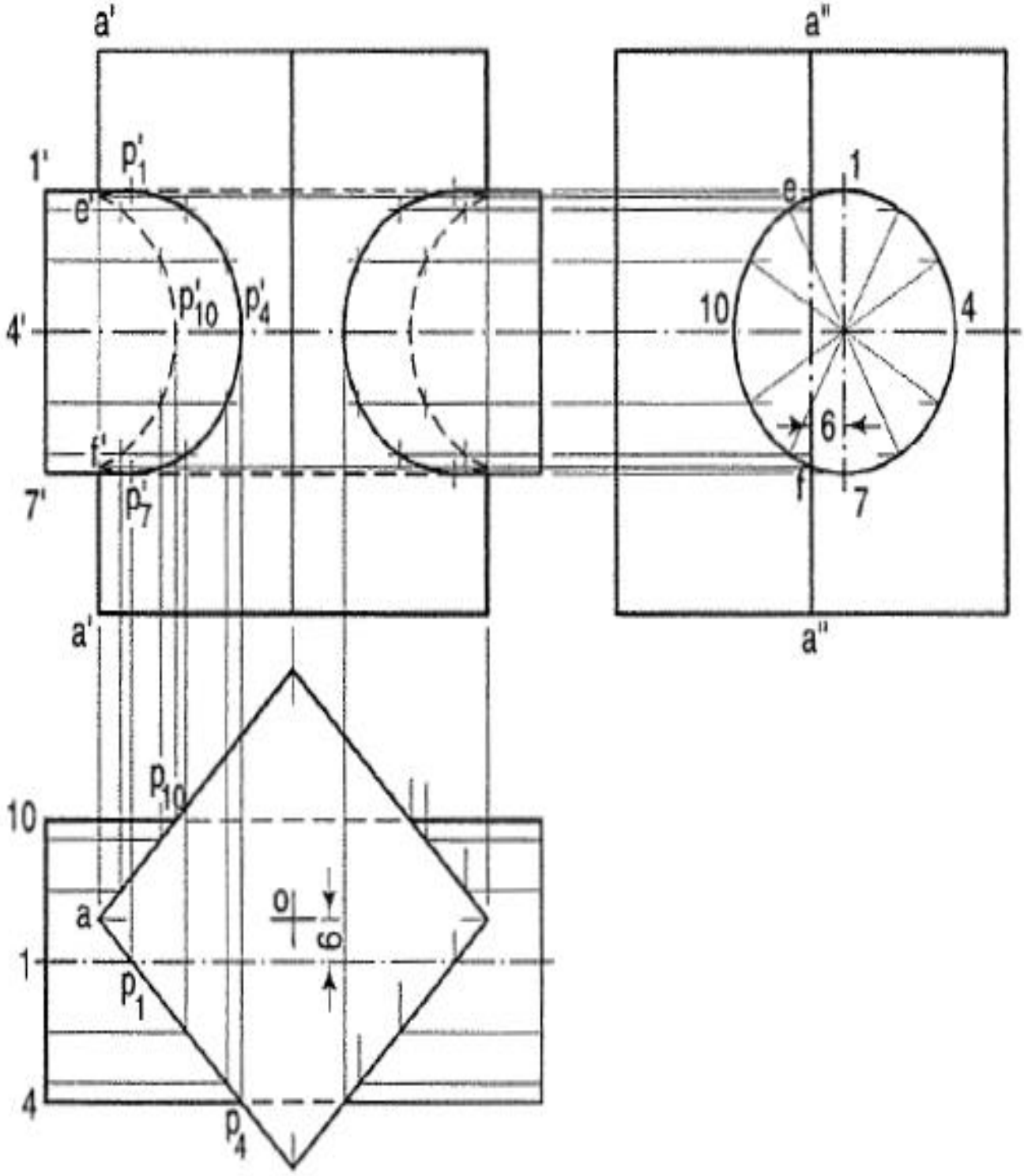


CYLINDER VERSES SQUARE PRISM

7. A cylinder 50mm dia. and 70mm axis is completely penetrated by a square prism of 25 mm sides and 70 mm axis, horizontally. Both axes intersect & bisect each other. All faces of prism are equally inclined to VP. Draw projections showing curves of intersections.



8. A vertical square prism having its equally inclined to the V.P. is completely penetrated by a horizontal cylinder, the axis of which is parallel to the V.P. and 6 mm away from that of the prism. Draw the projections of the solids showing curves of intersection. The length of the sides of the base of the prism is 50 mm and the diameter of the cylinder is 40 mm.



UNIT-V

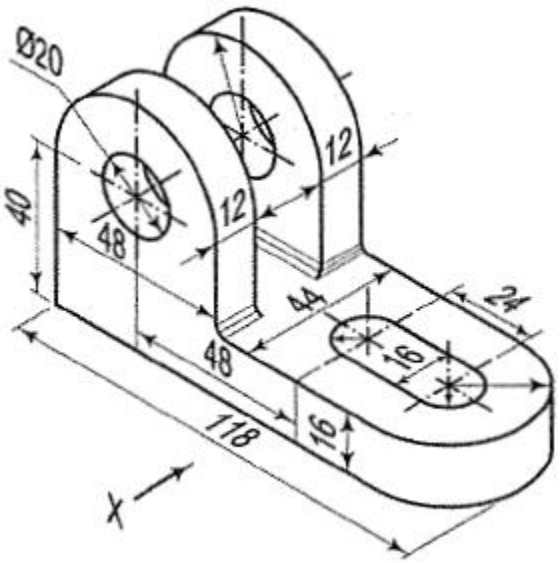
Isometric Projections

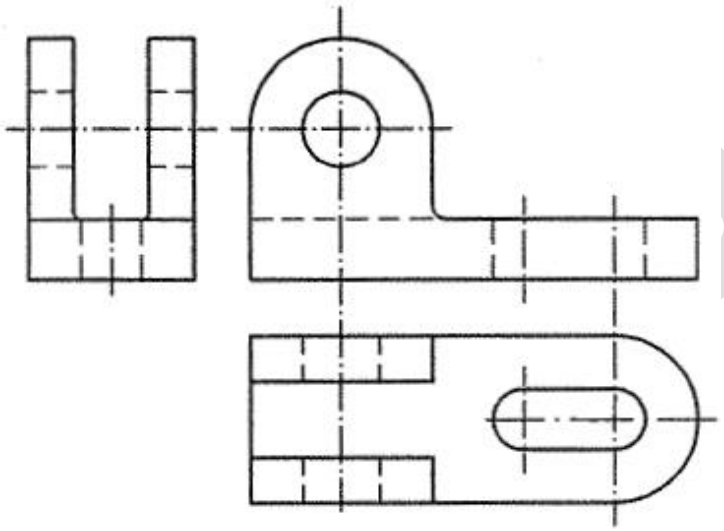
(Orthographic projections to Isometric view [2D to 3D] & Isometric view to Orthographic Projections [3D to 2D])

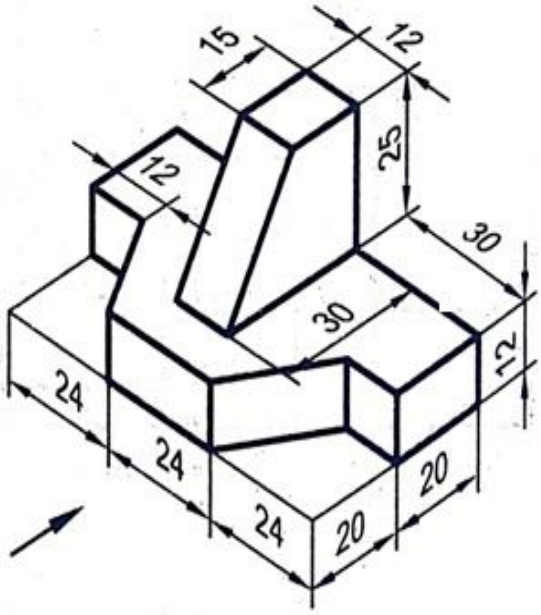
"DO ALL THE GOOD YOU CAN, FOR ALL THE PEOPLE YOU CAN, IN ALL THE WAYS YOU CAN, AS LONG AS YOU CAN."

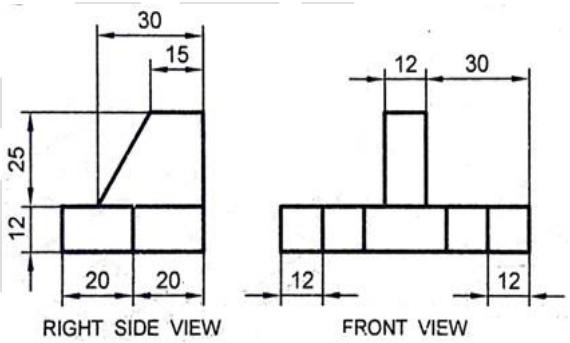
PRINCETON INSTITUTE OF ENGINEERING & TECHNOLOGY FOR WOMEN, PETW

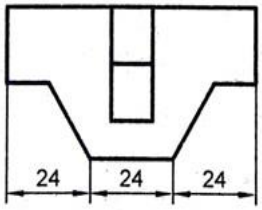
ISOMETRIC VIEW TO ORTHOGRAPHIC PROJECTIONS [3D to 2D]

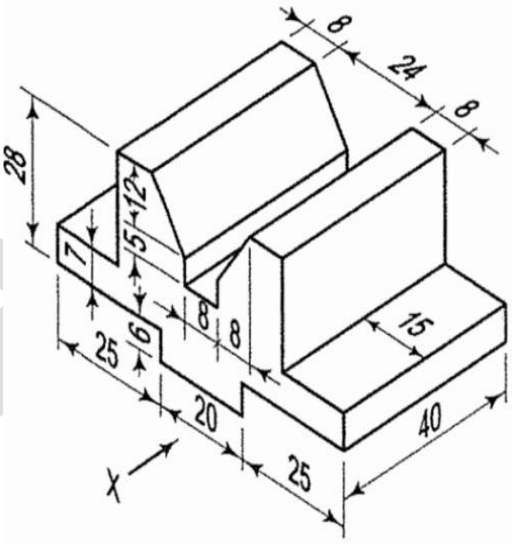


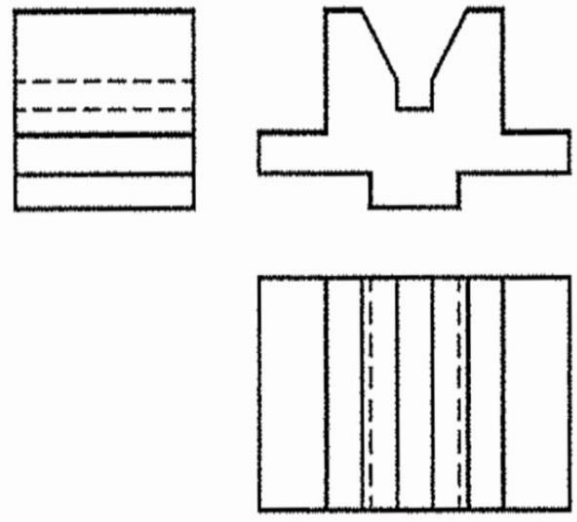












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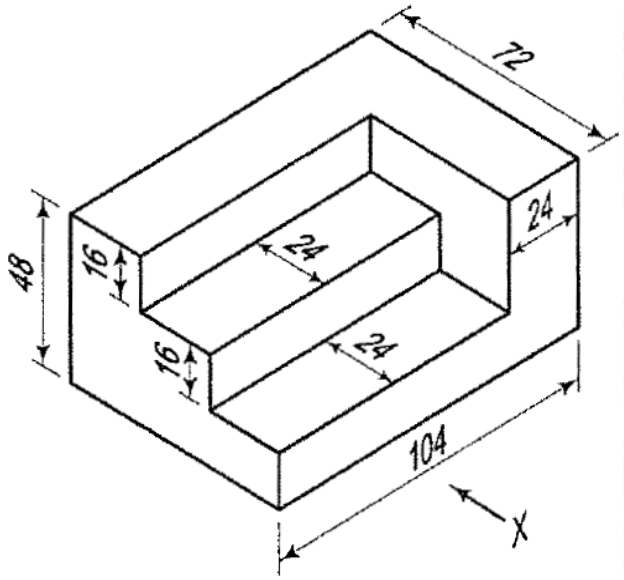

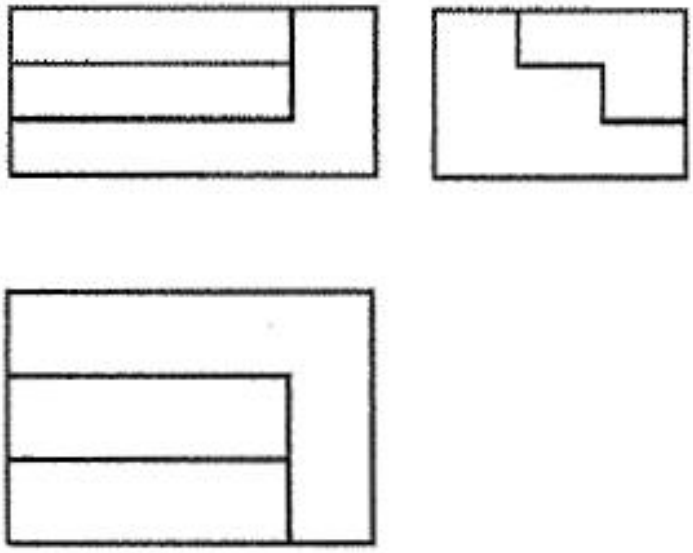

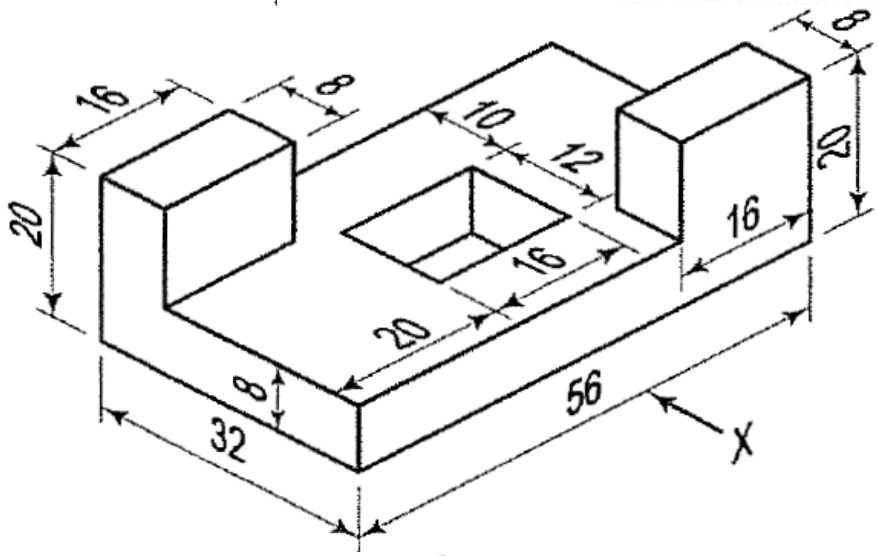

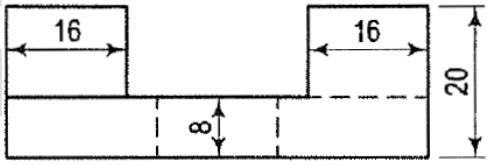

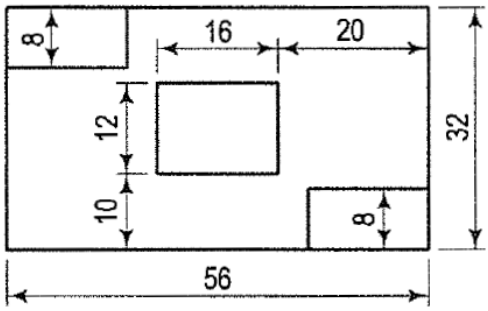

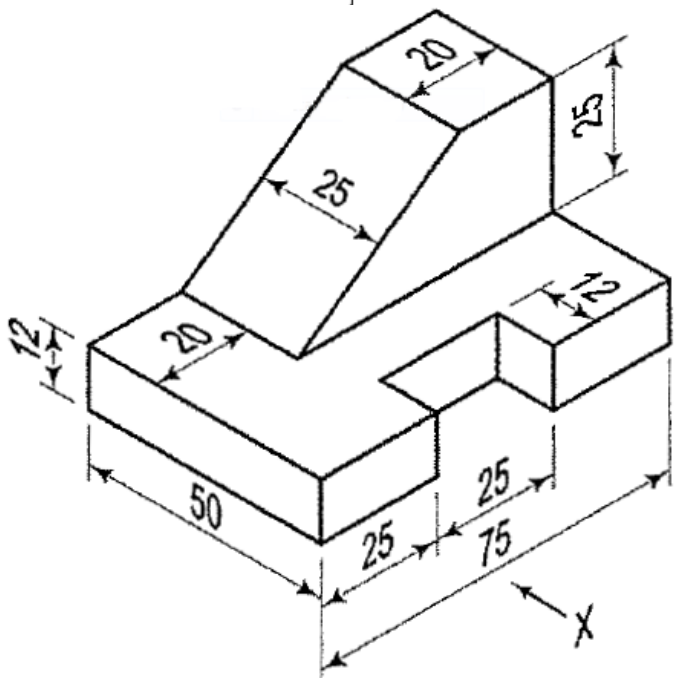

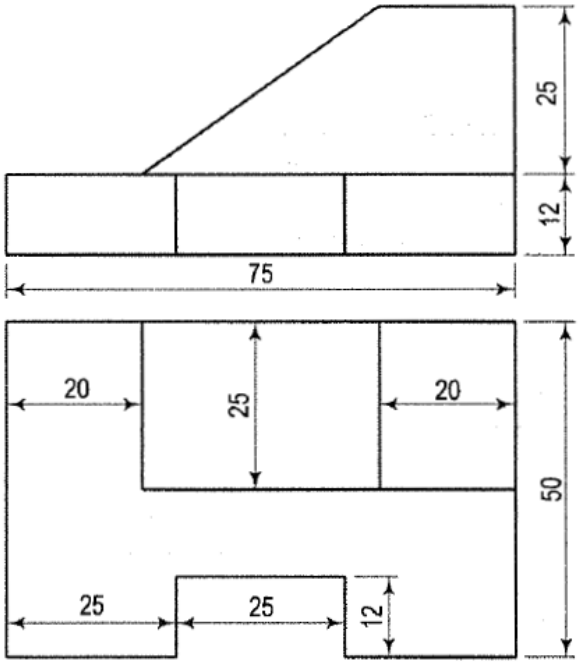

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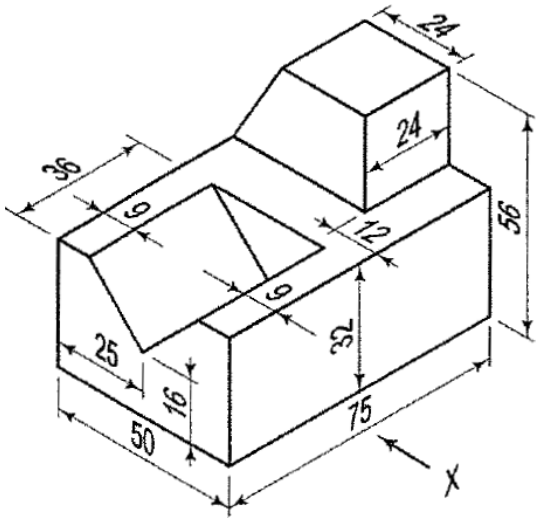
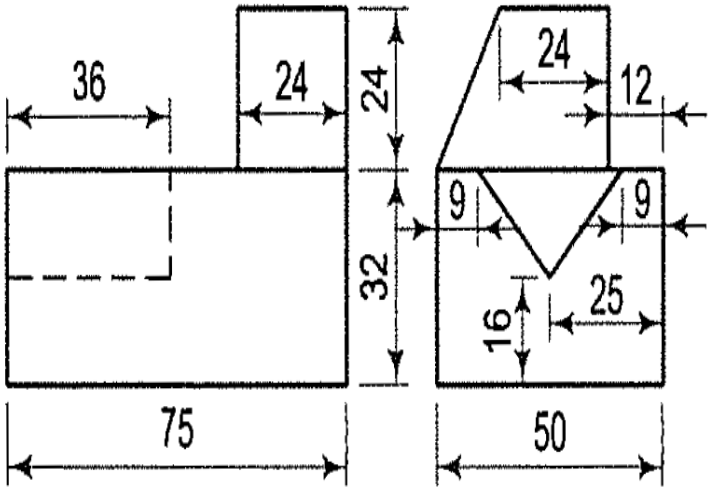
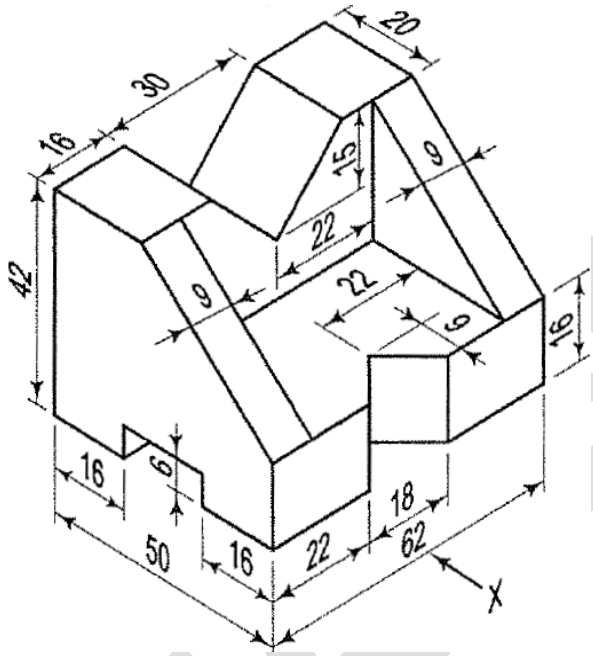
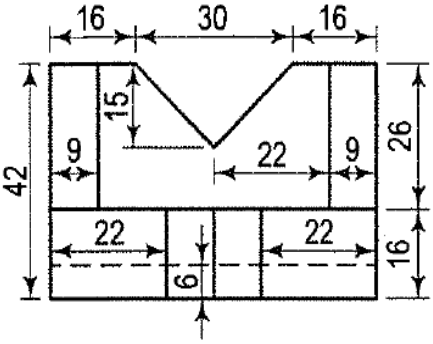
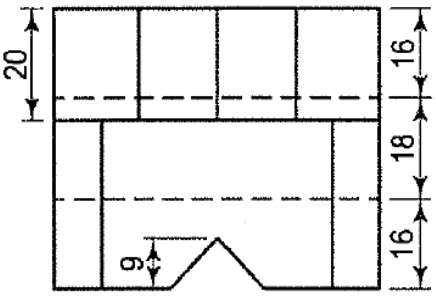
→"THE TASK OF THE MODERN EDUCATOR IS NOT TO CUT DOWN JUNGLES, BUT TO IRRIGATE DESERTS."→

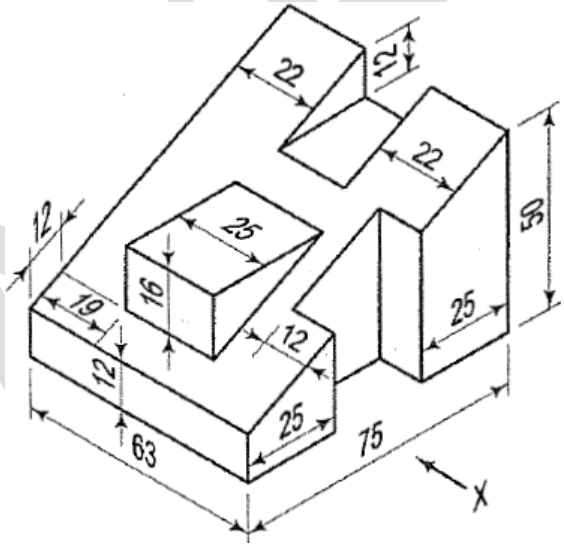


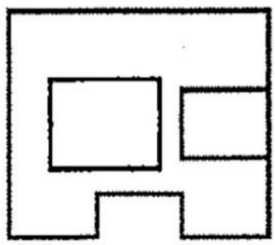




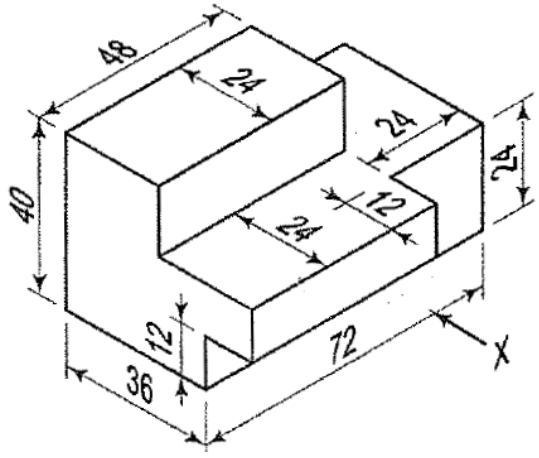


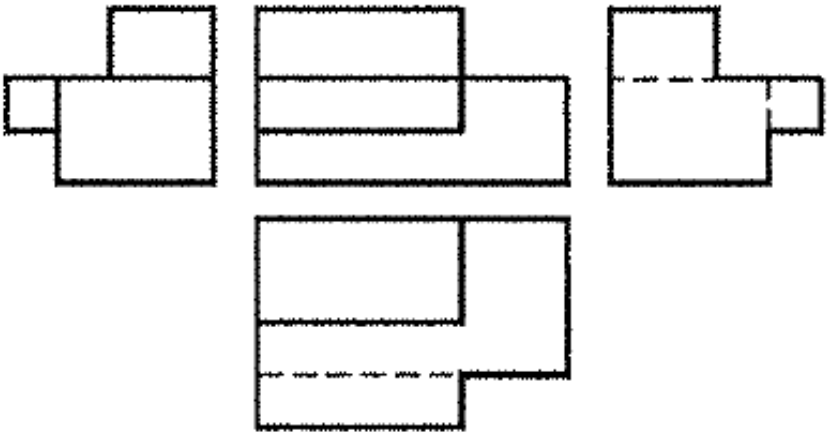


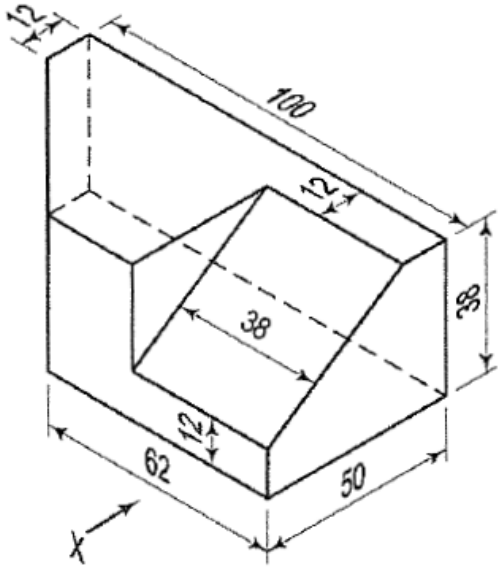


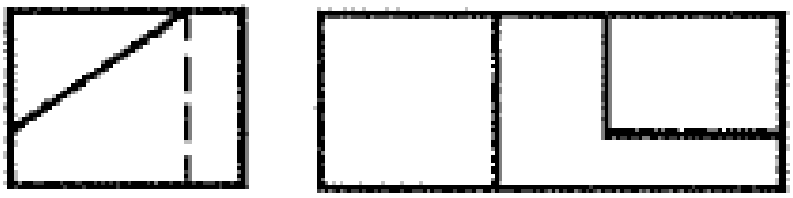


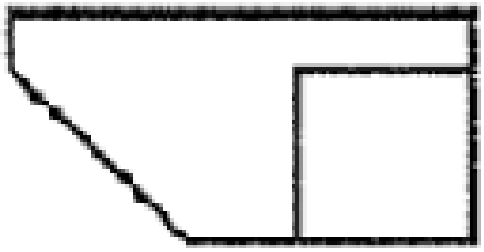
UNIT-V 3D TO 2D 2022 2023

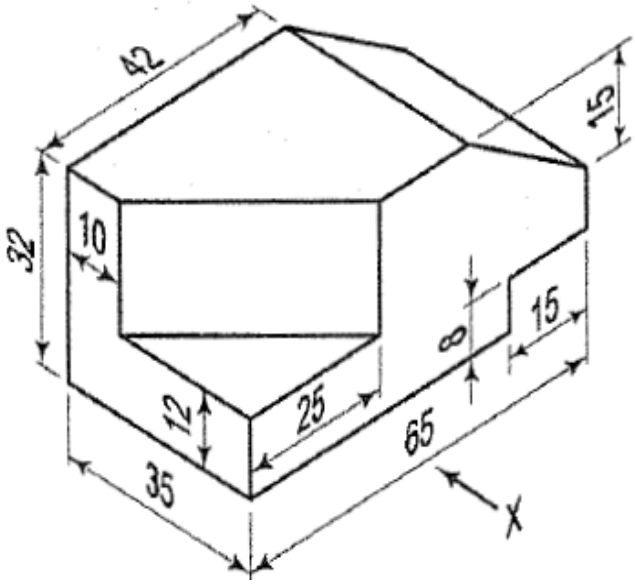


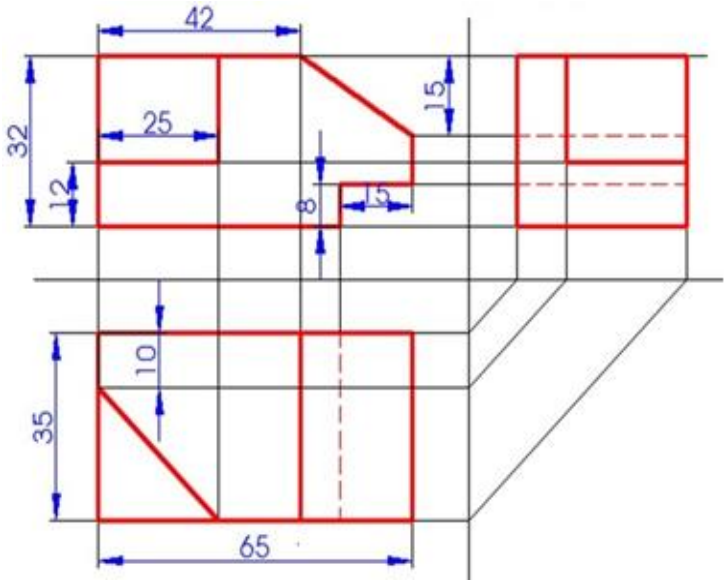




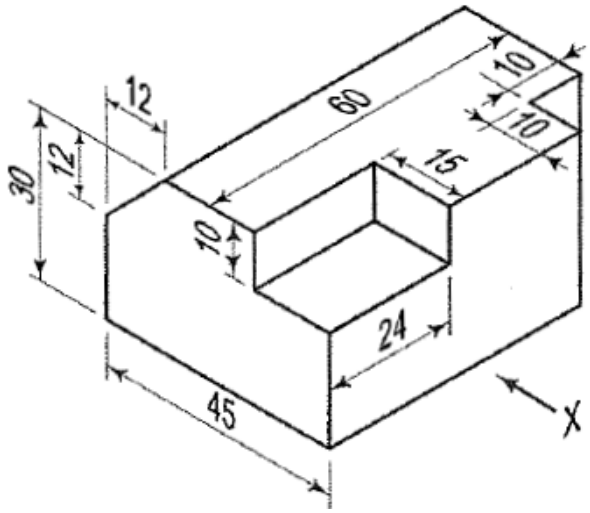


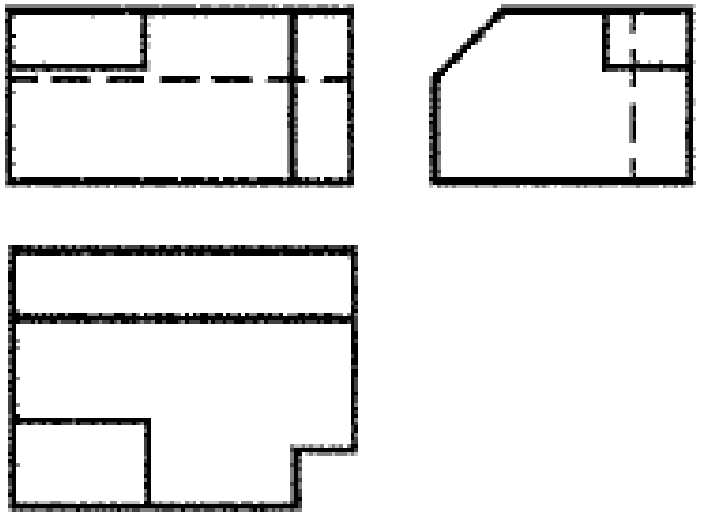


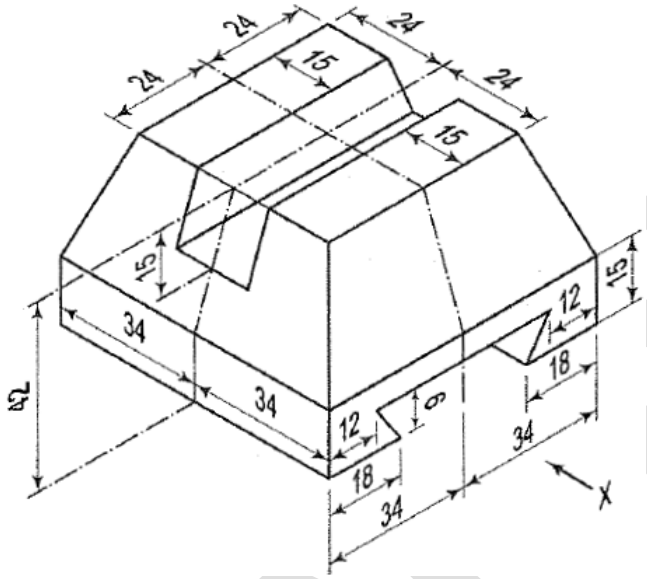


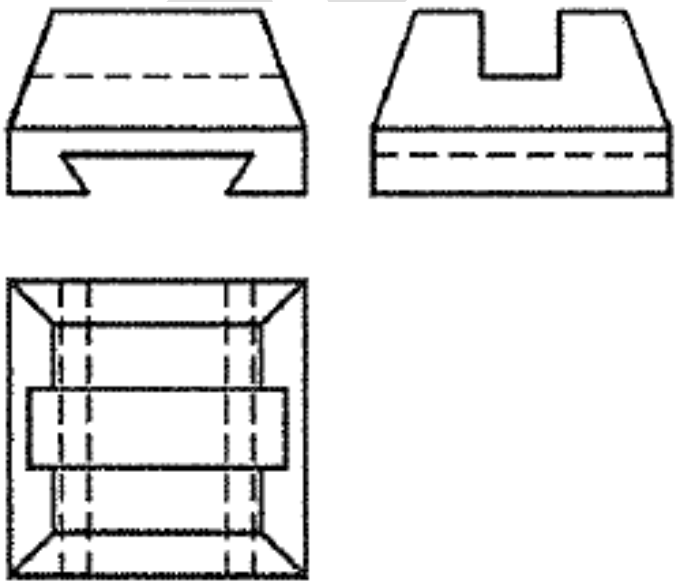


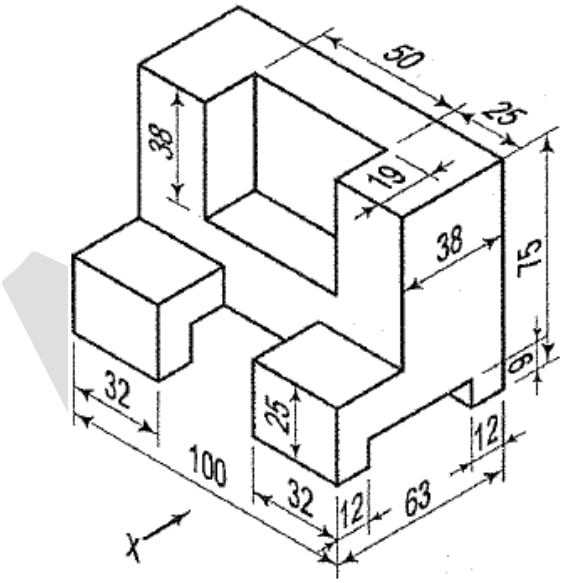
UNIT-V 3D TO 2D 2022 2023

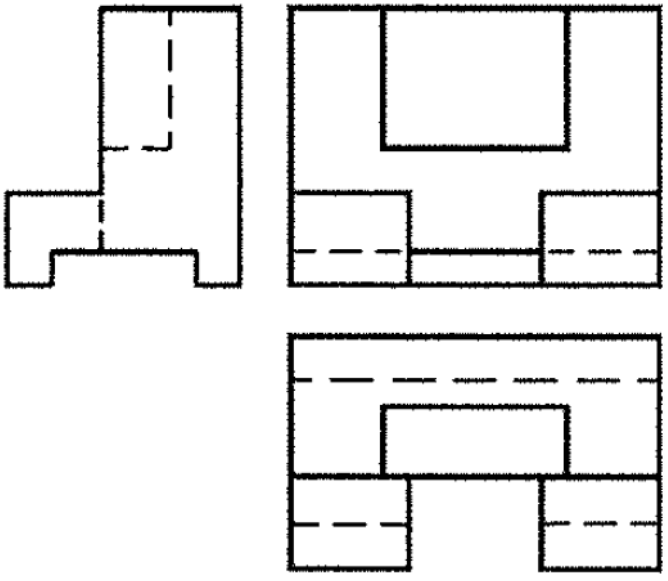






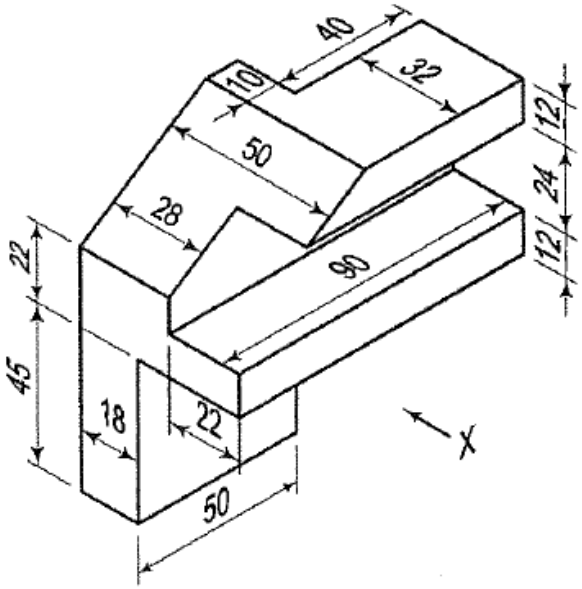


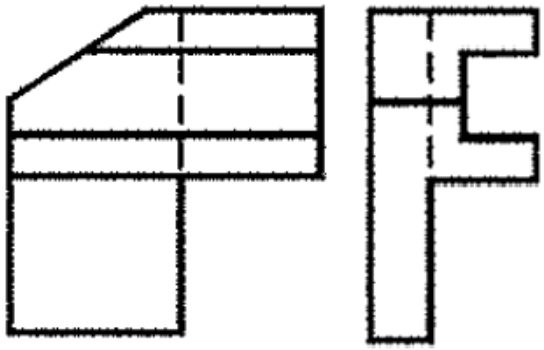


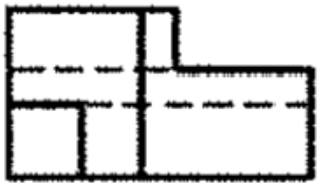


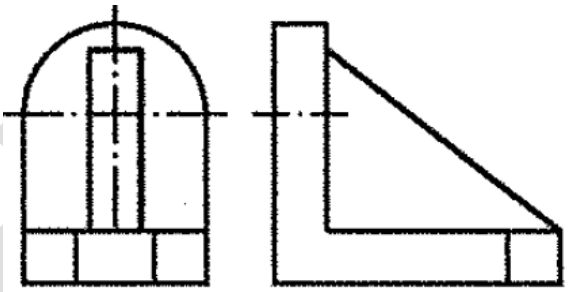
UNIT-V 3D TO 2D

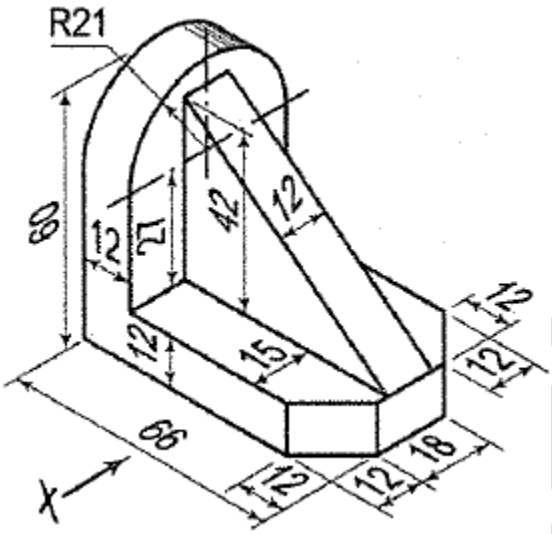
2022 2023

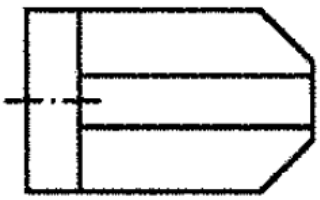


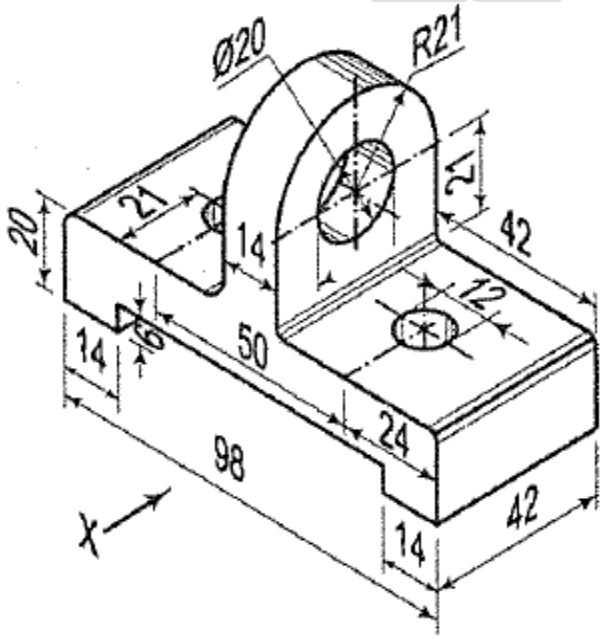


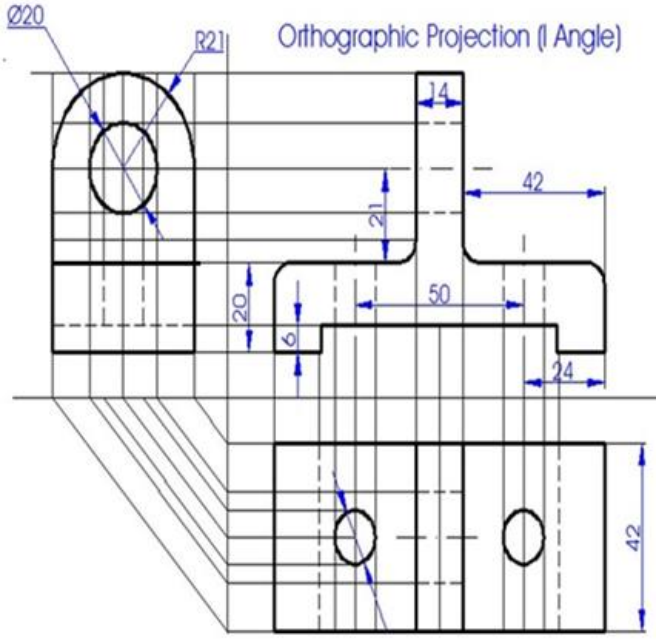




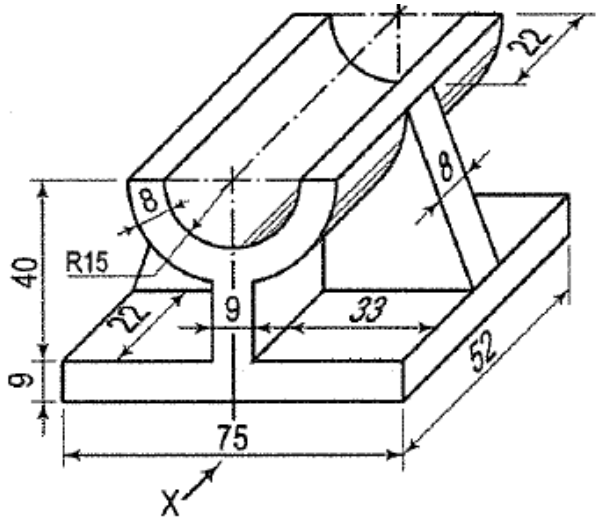


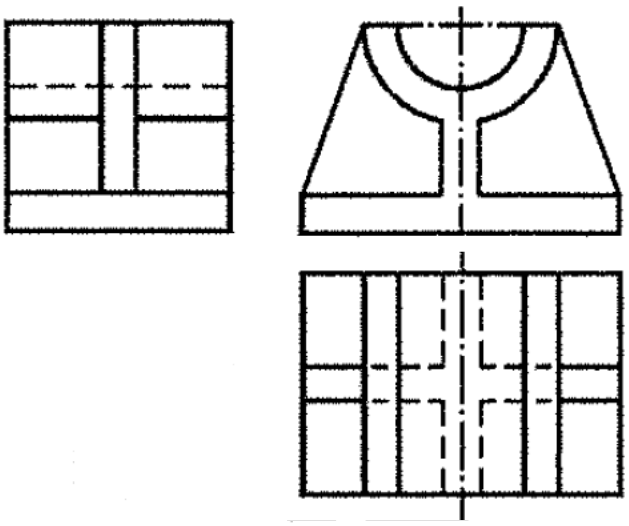


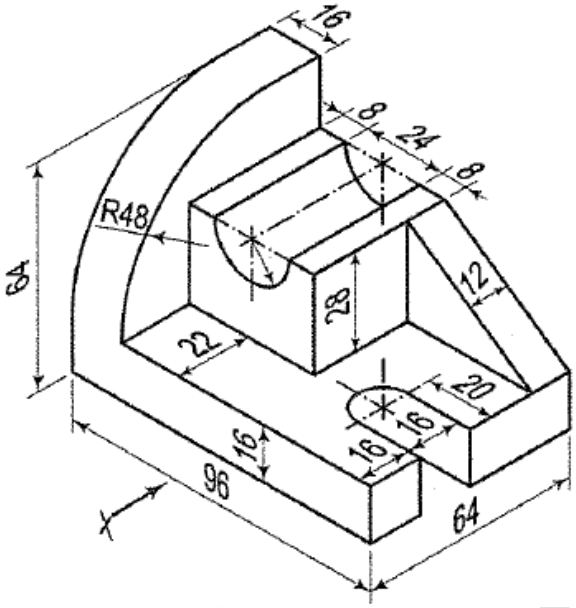


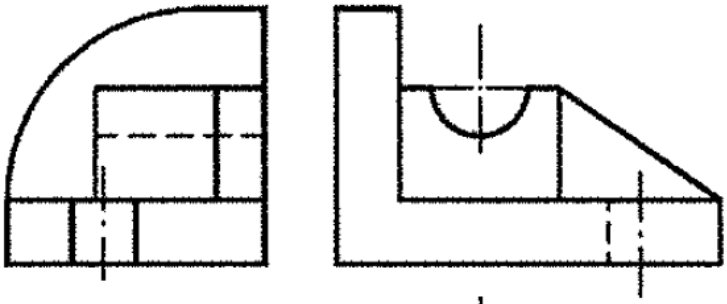


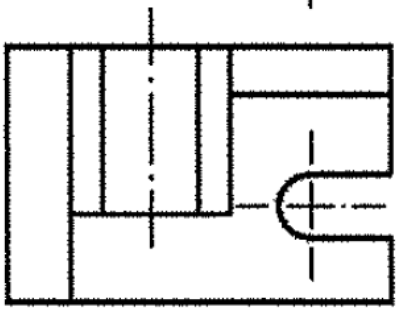
UNIT-V 3D TO 2D 2022 2023

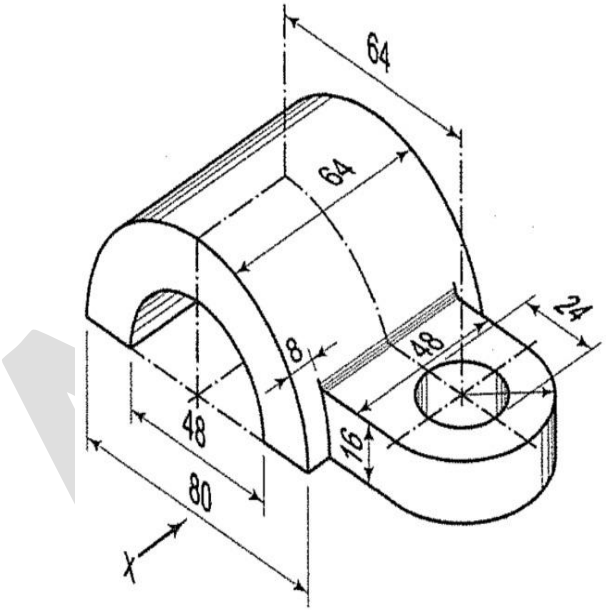


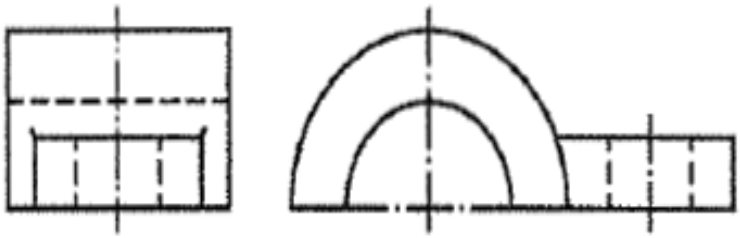


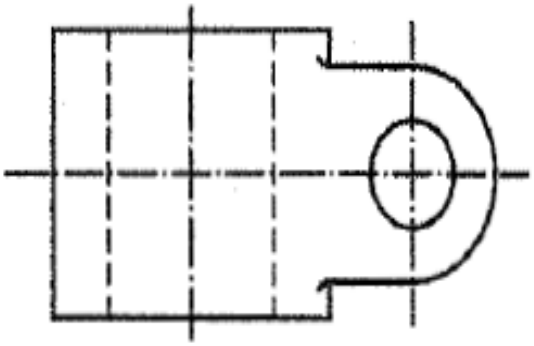




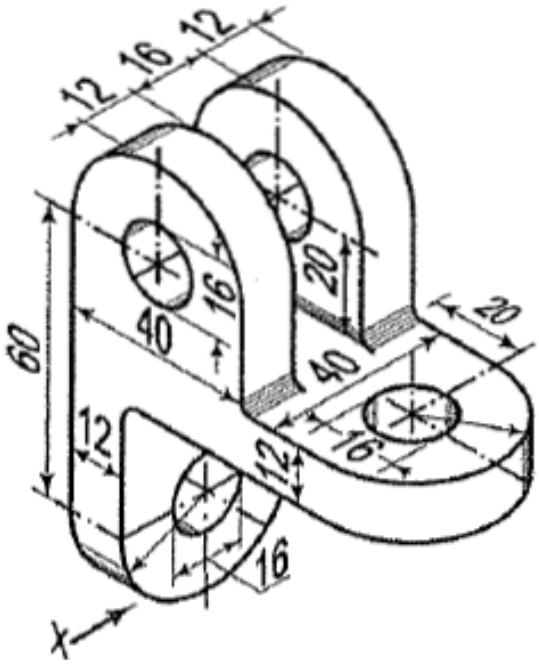


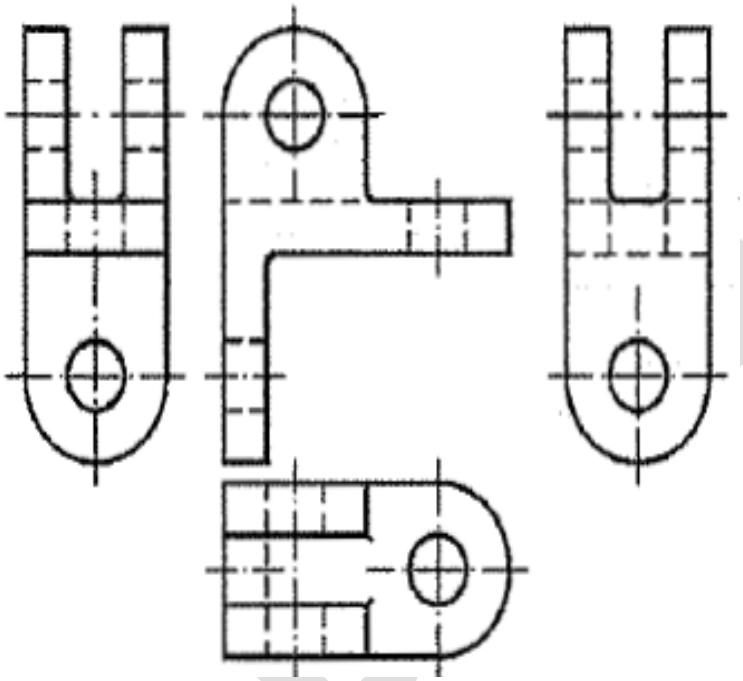




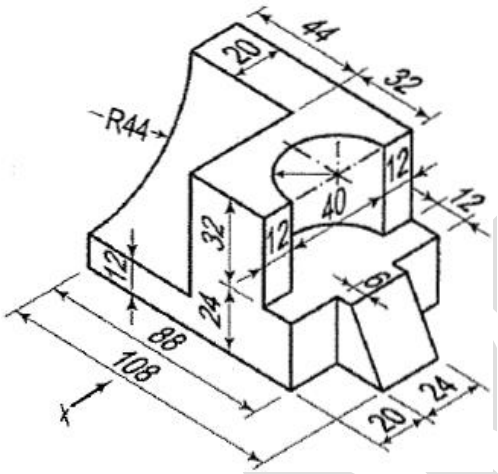


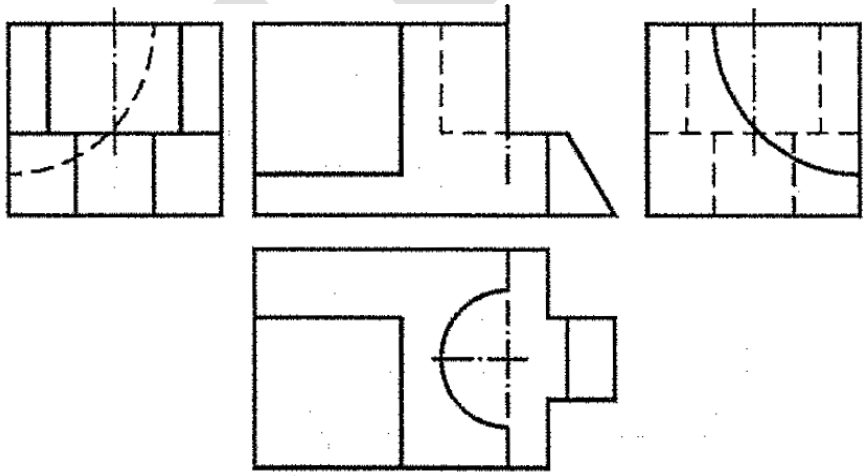
UNIT-V 3D TO 2D 2022 2023

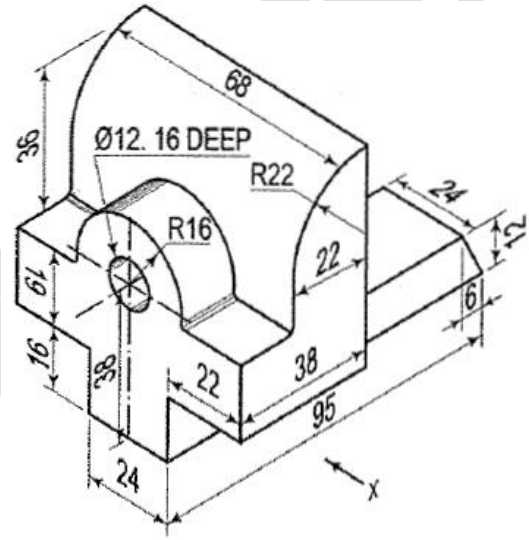


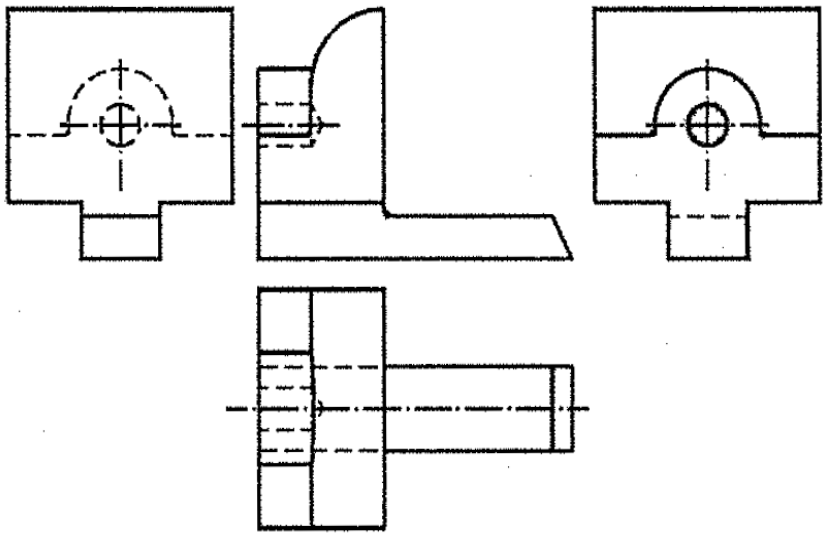


UNIT-V 3D TO 2D









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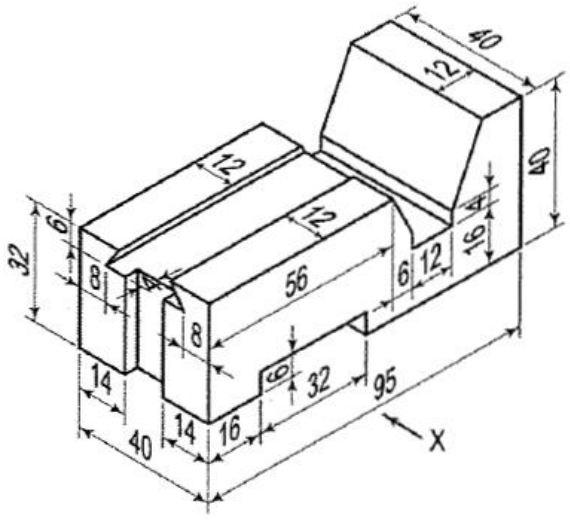
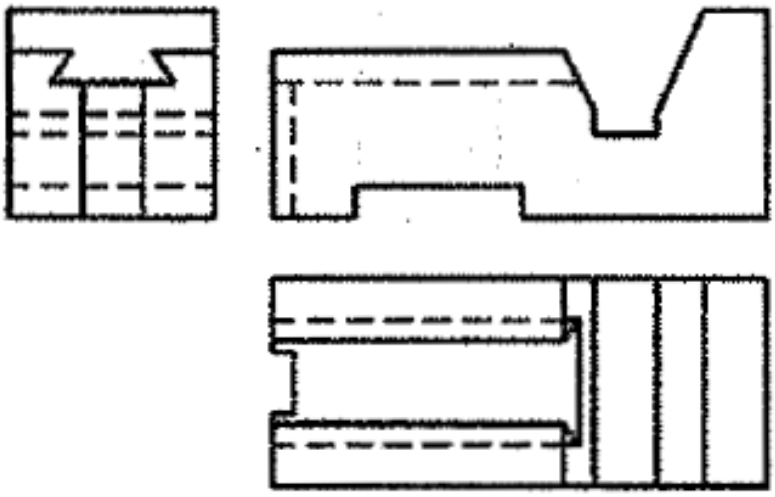
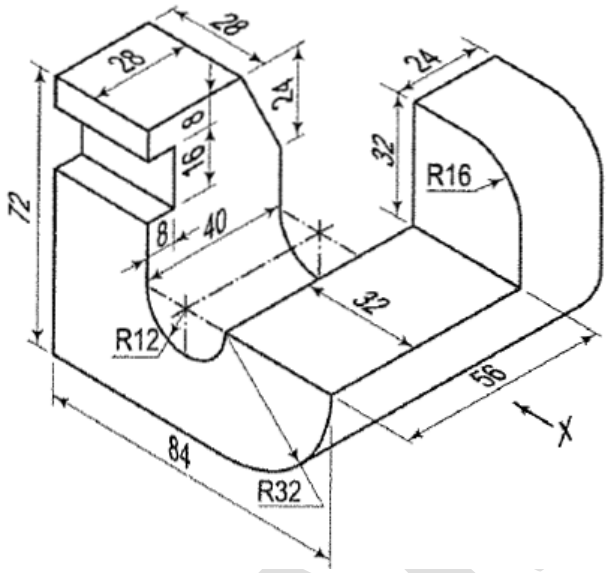
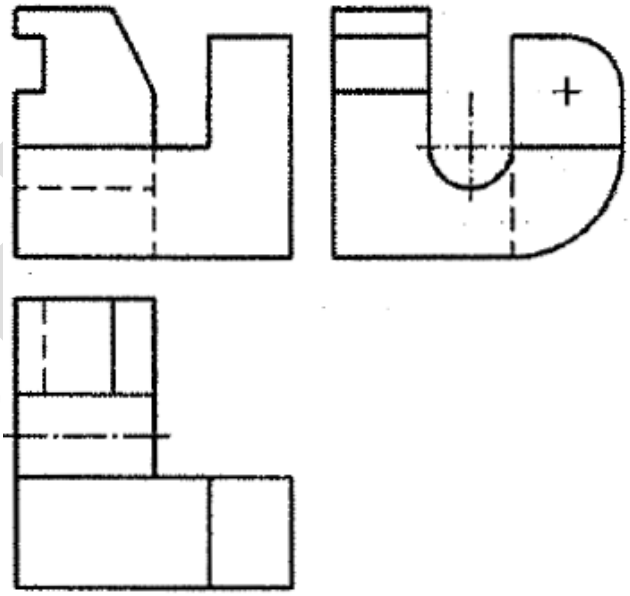
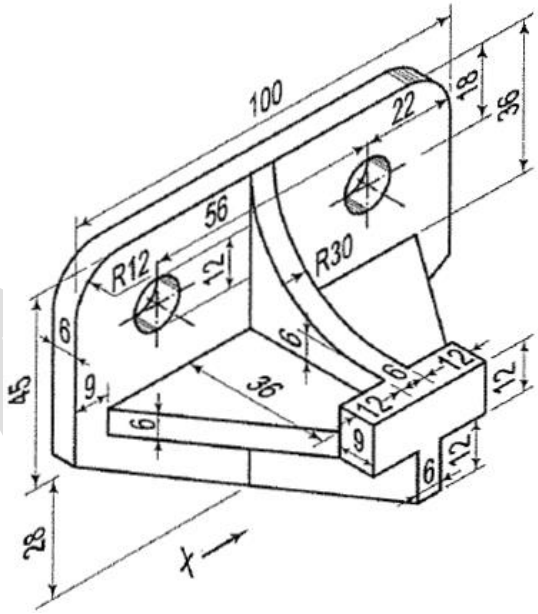
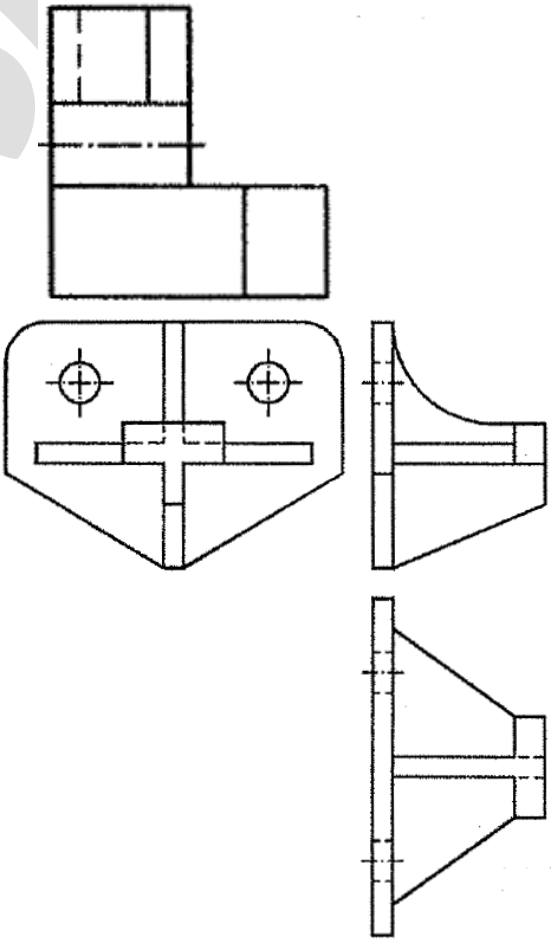








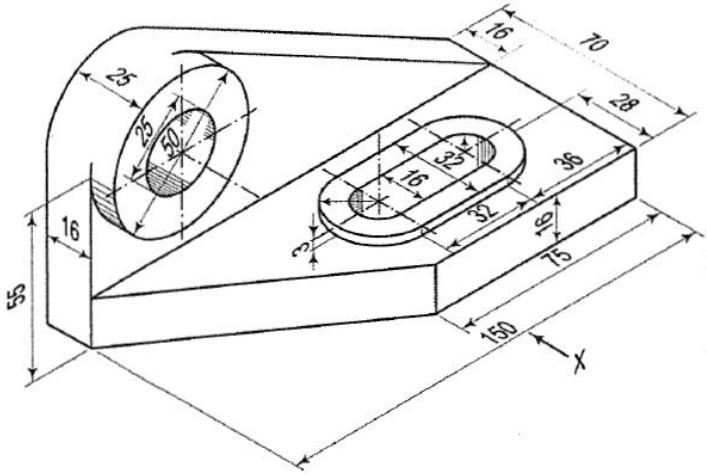


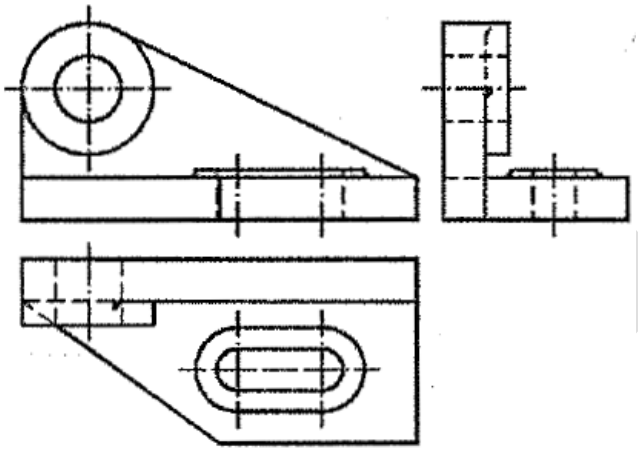


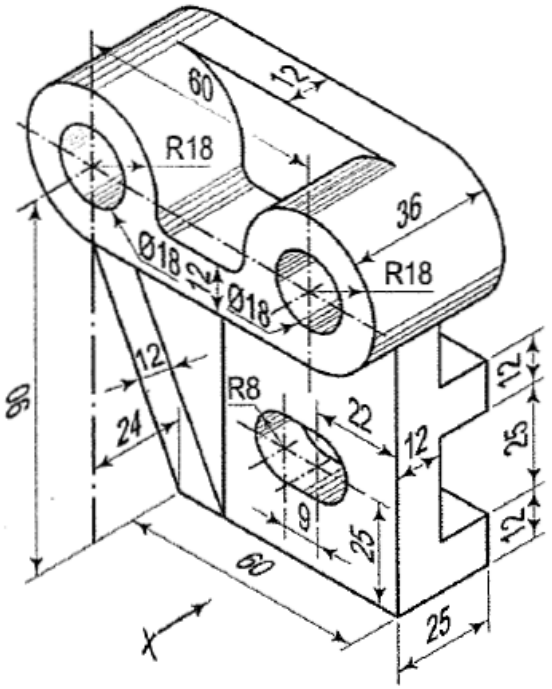
UNIT-V

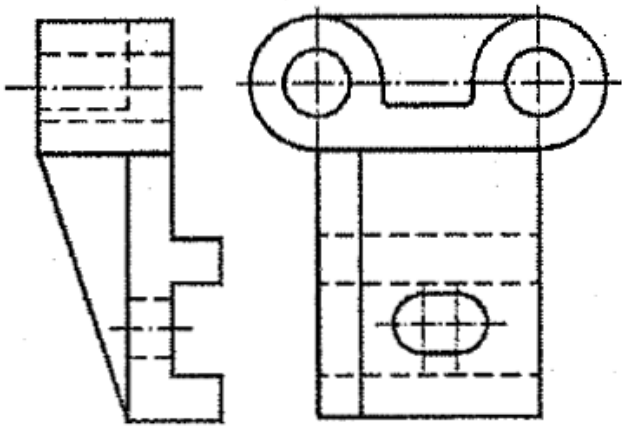
3D TO 2D

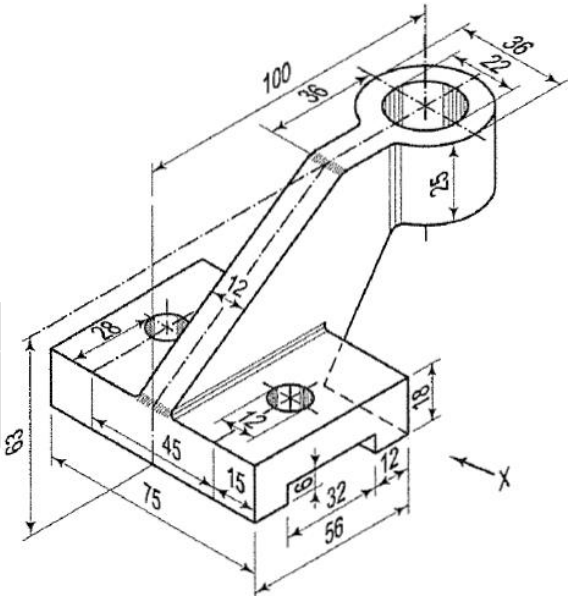
2022 2023

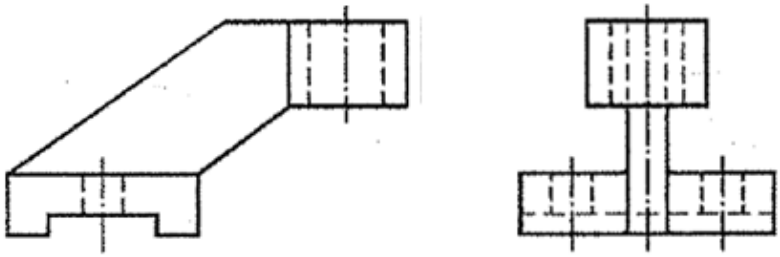


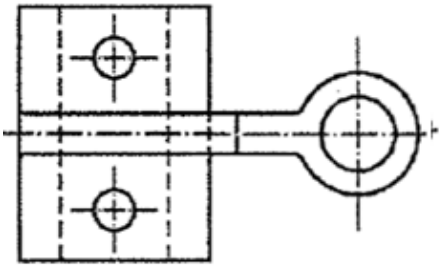




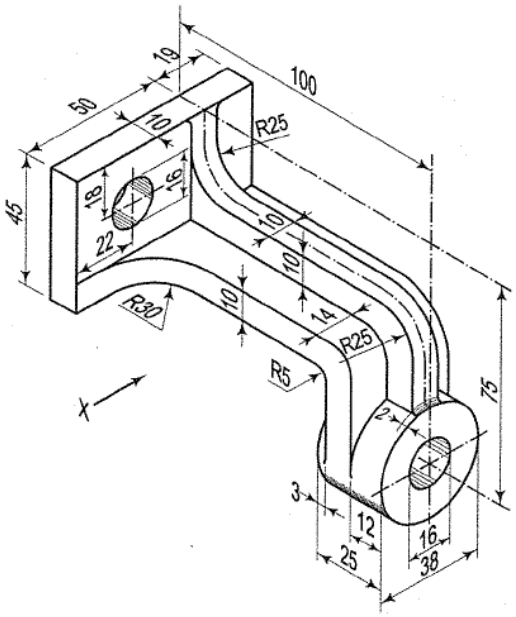


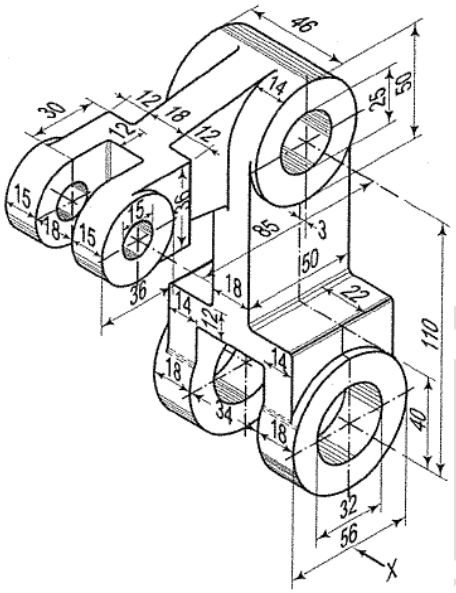


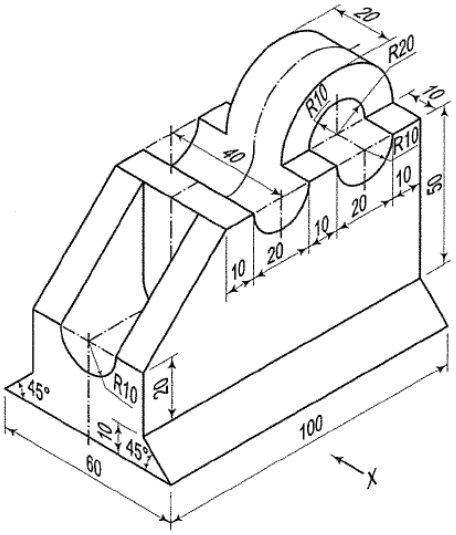


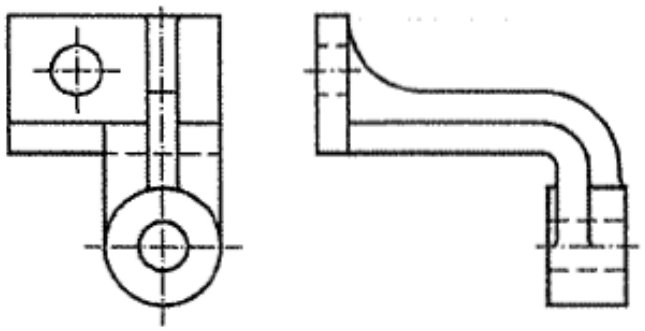


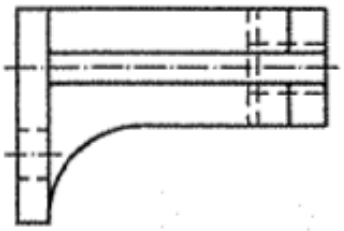
UNIT-V 3D TO 2D 2022 2023

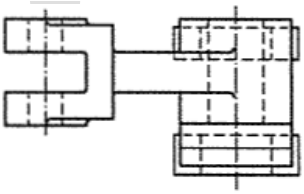


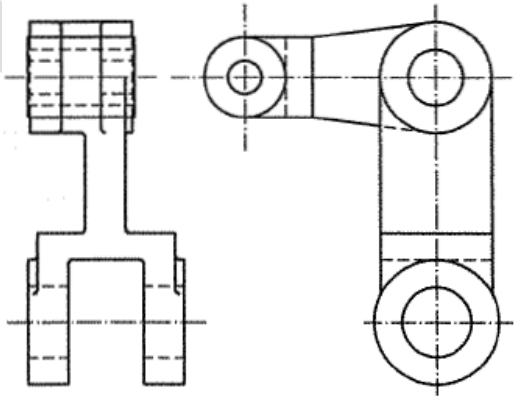


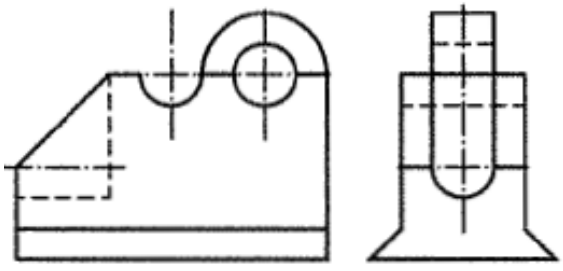


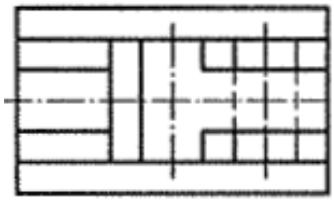




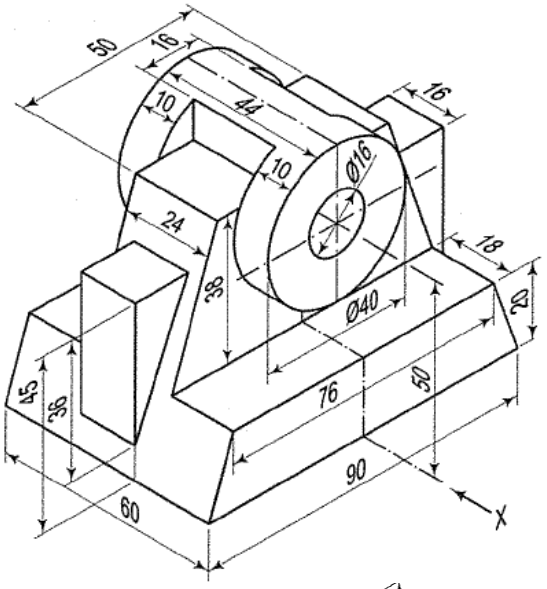


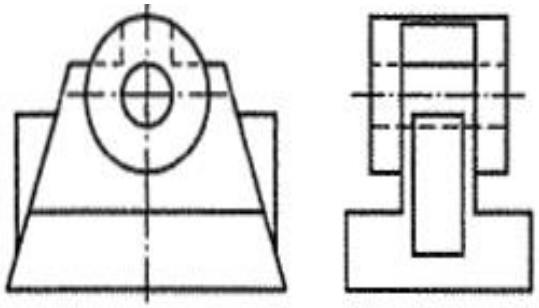


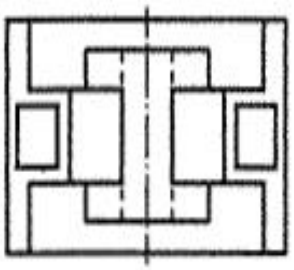


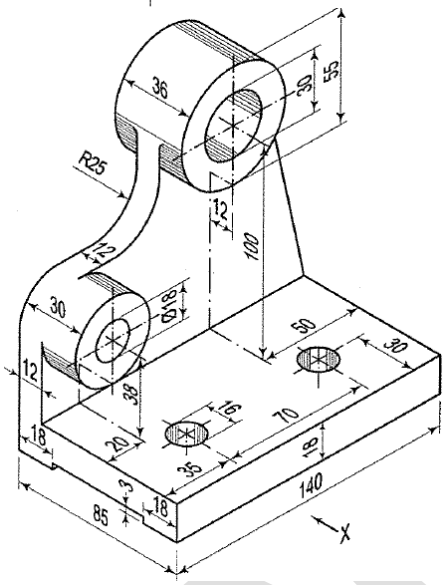


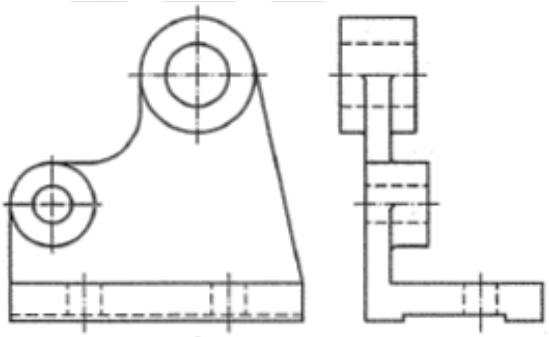
UNIT-V 3D TO 2D 2022 2023

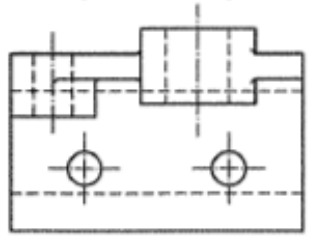


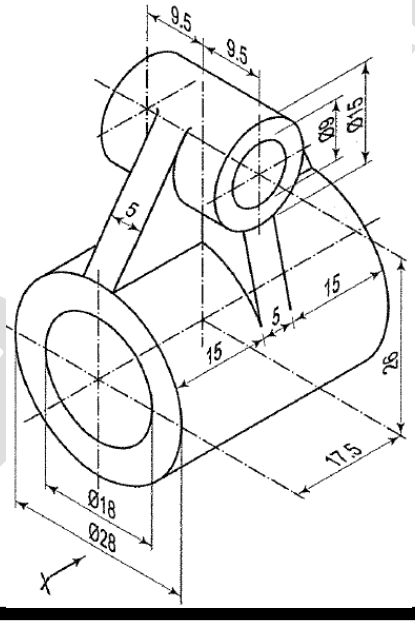


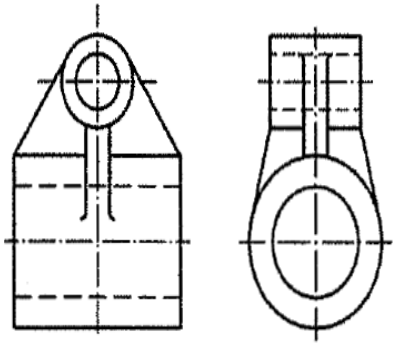


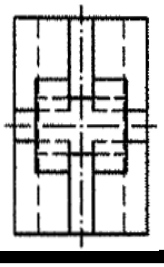




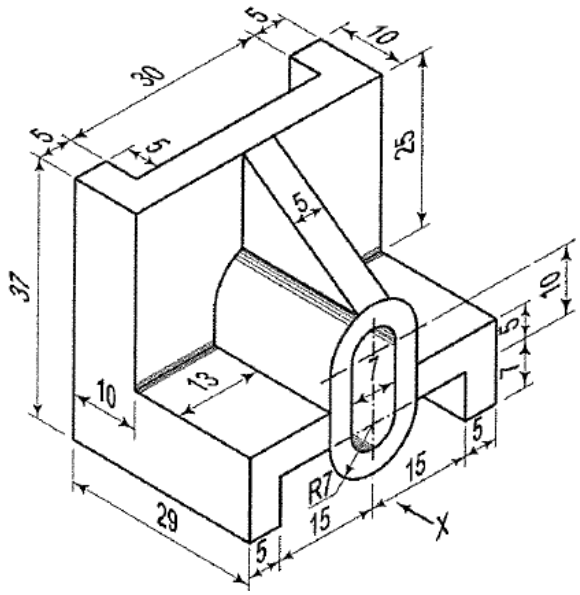


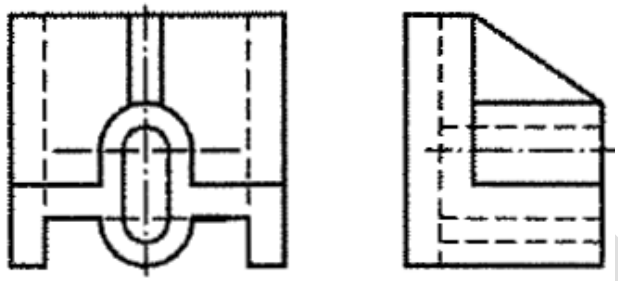


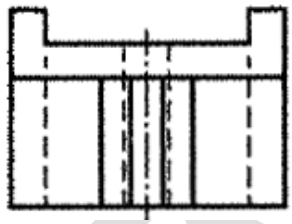


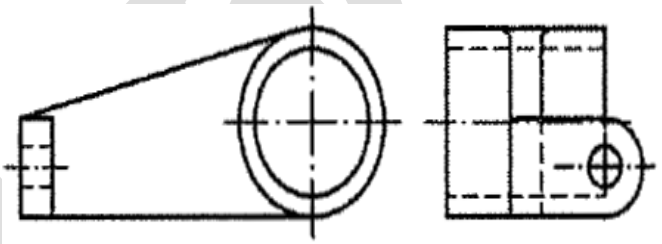


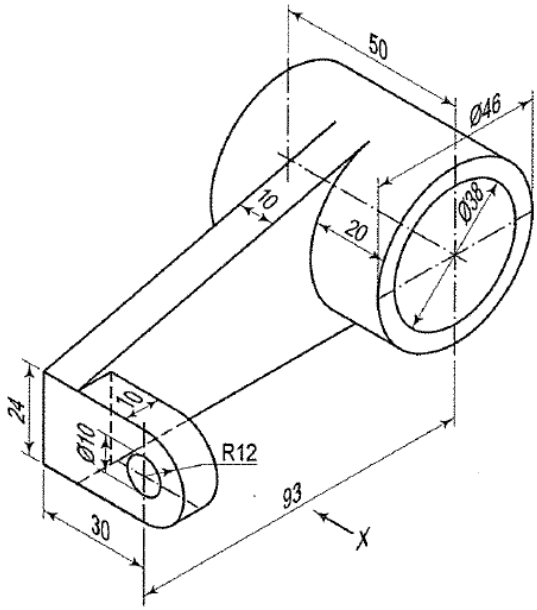
UNIT-V 3D TO 2D 2022 2023

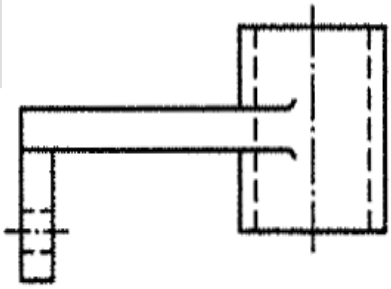


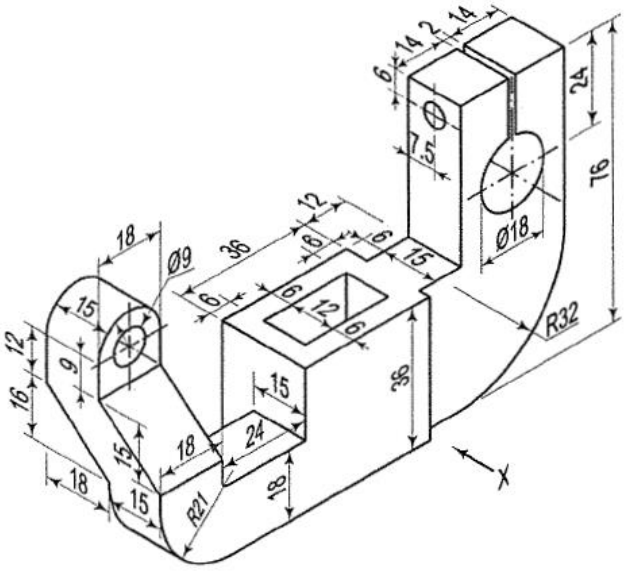


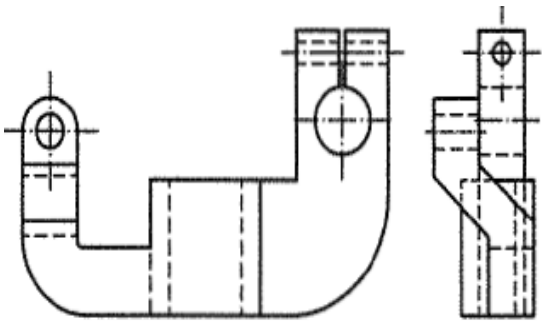


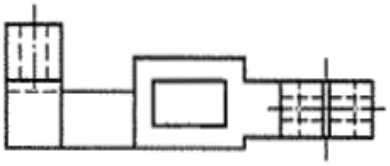




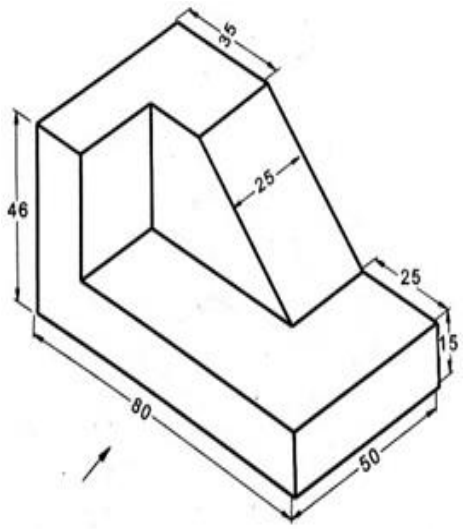


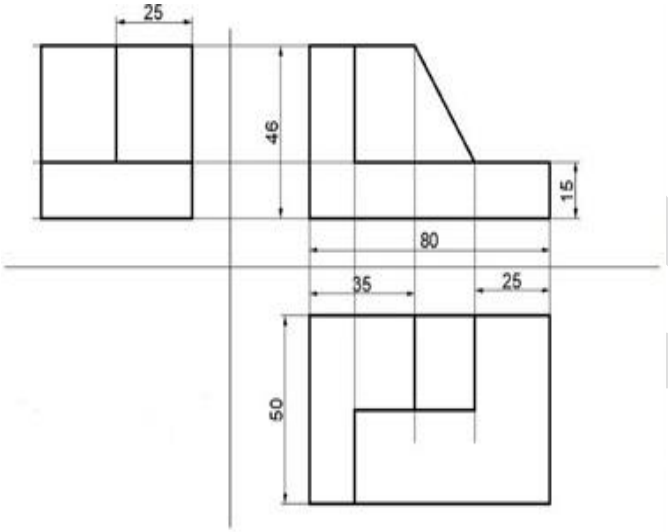






UNIT-V 3D TO 2D 2022 2023





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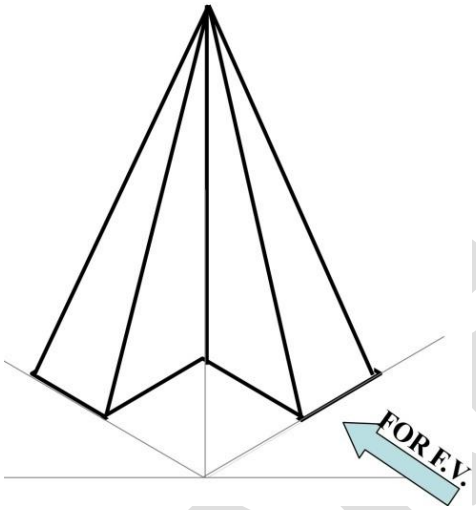
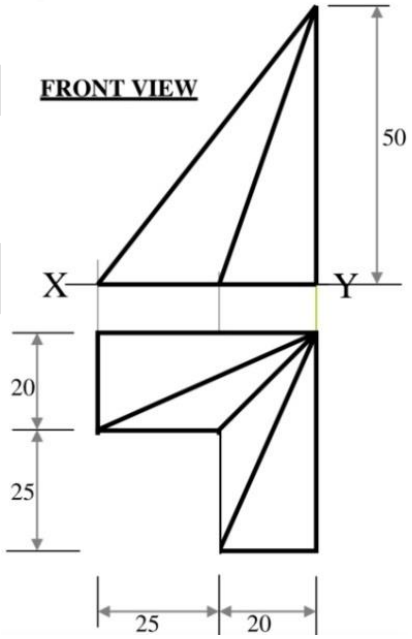
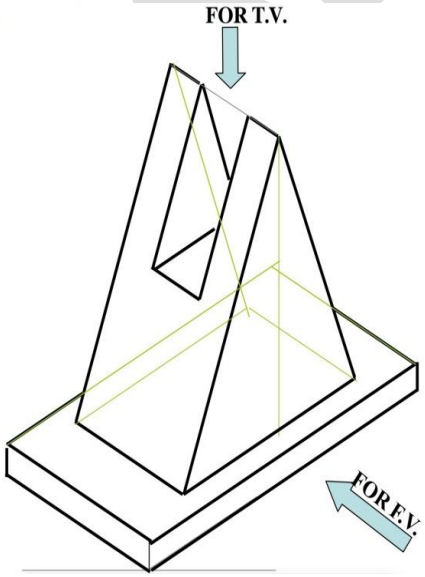
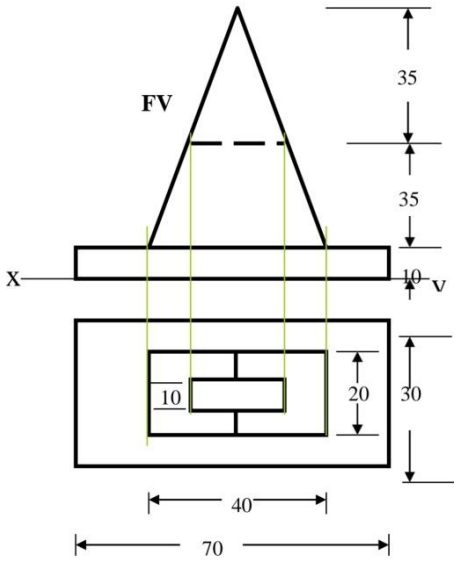
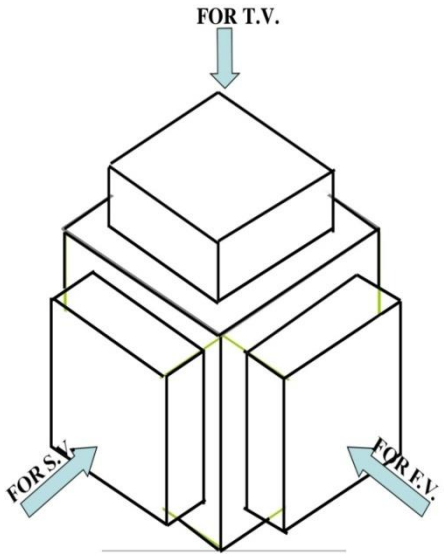


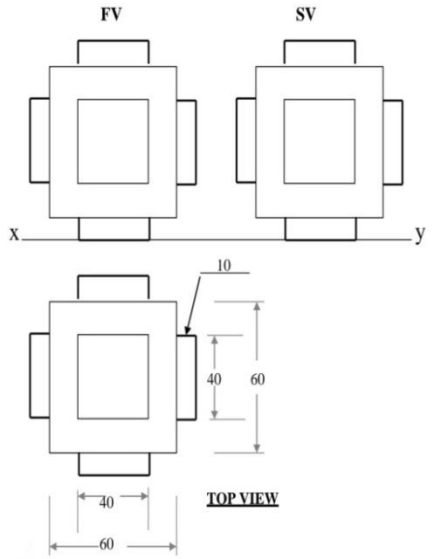




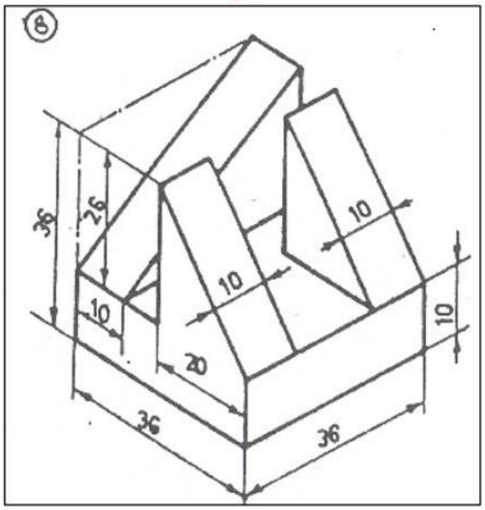


UNIT-V 3D TO 2D 2022 2023

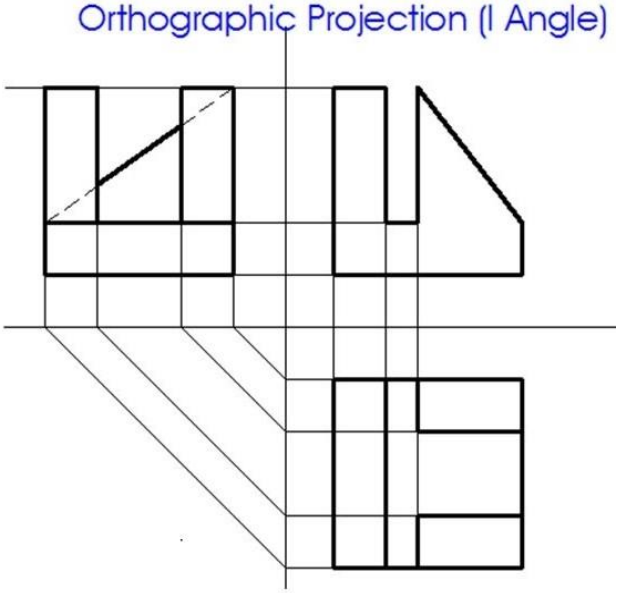


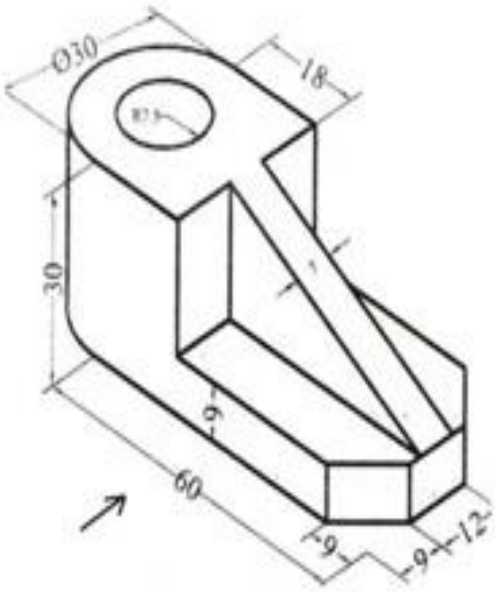


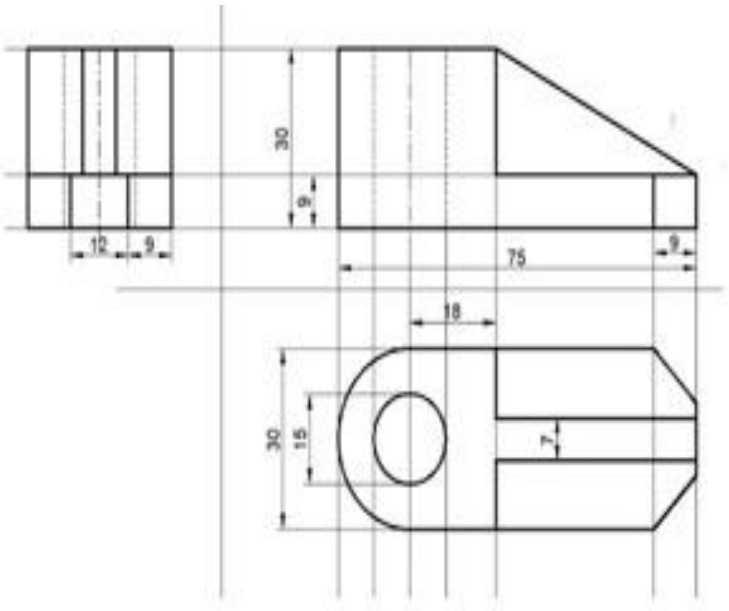
Pictorial Representation



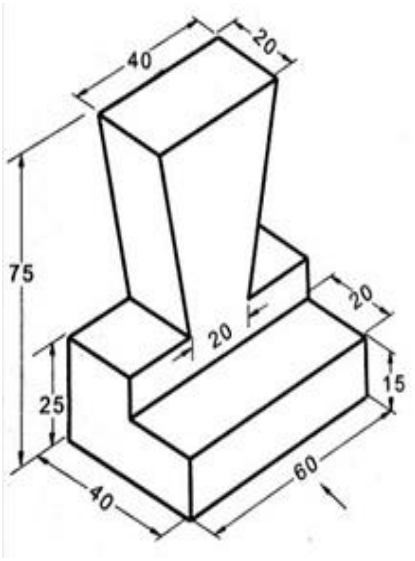
Orthographic Projection (I Angle)







UNIT-V 3D TO 2D 2022 2023



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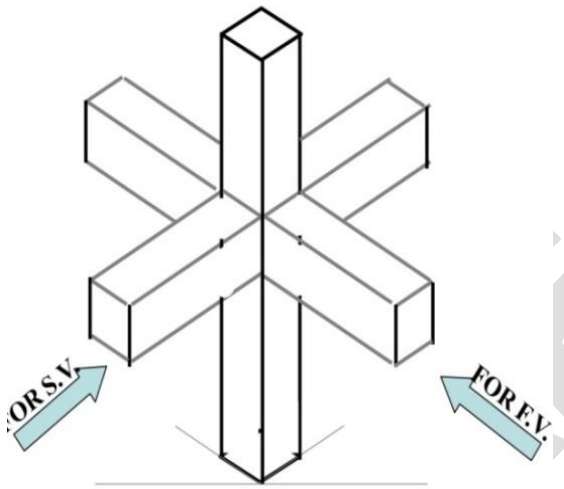
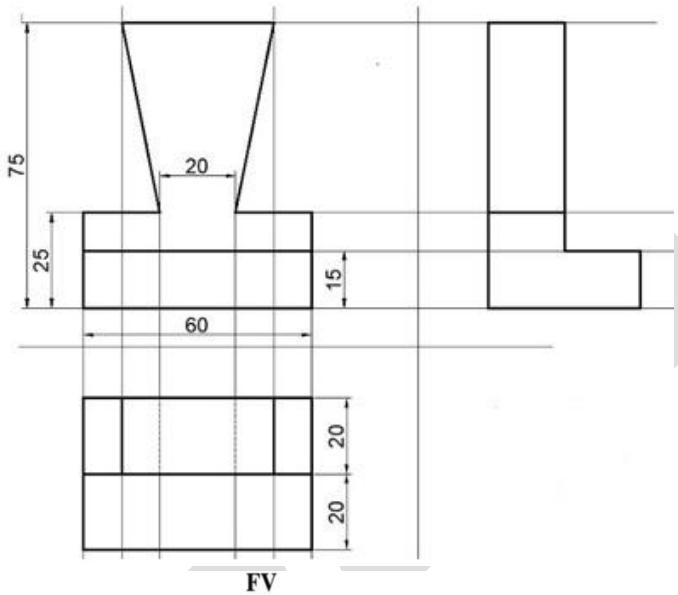
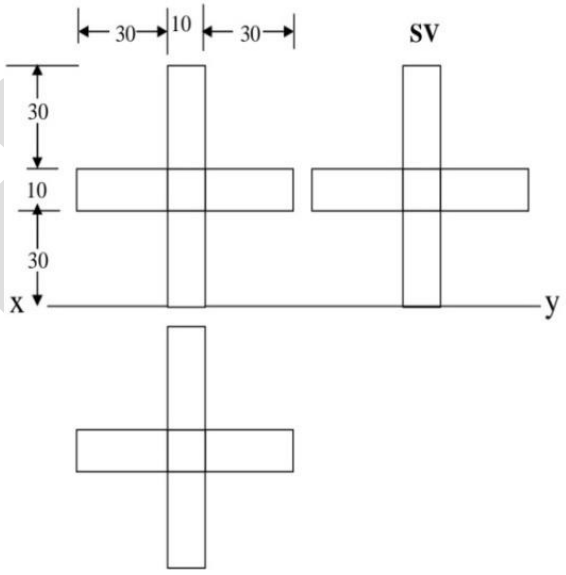




FV



UNIT-V 3D TO 2D

2022

2023

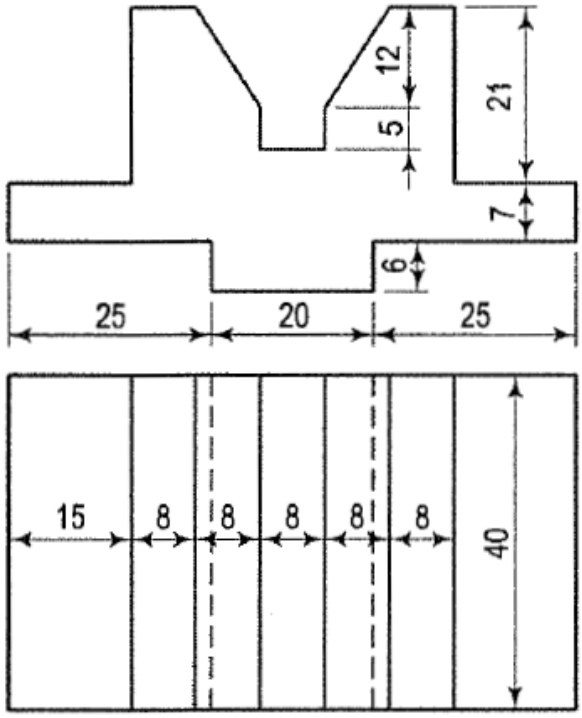
"IF YOU SPEND YOUR WHOLE LIFE WAITING FOR THE STORM, YOU'LL NEVER ENJOY THE SUNSHINE."

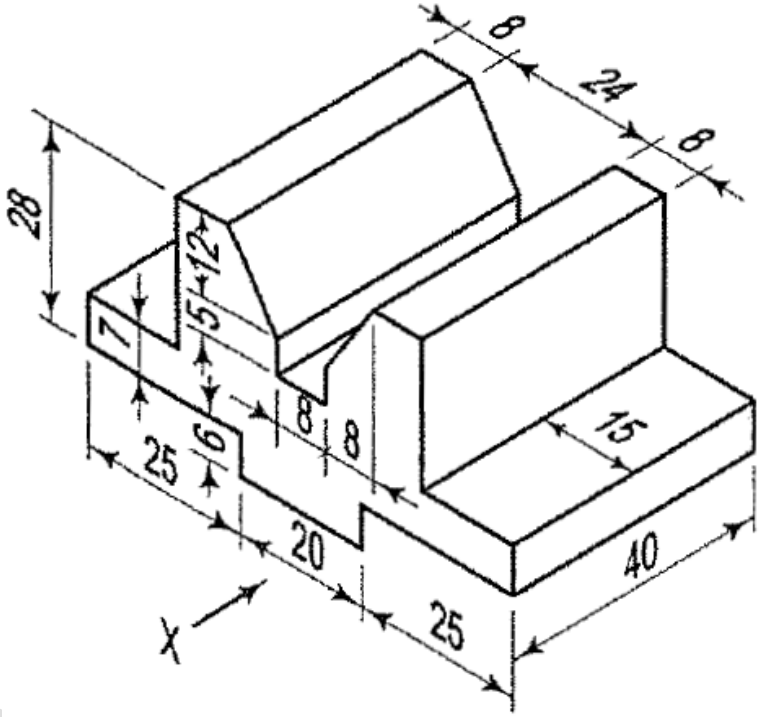
PRINCETON INSTITUTE OF ENGINEERING & TECHNOLOGY FOR WOMEN

ORTHOGRAPHIC PROJECTIONS TO ISOMETRIC VIEW [2D to 3D]

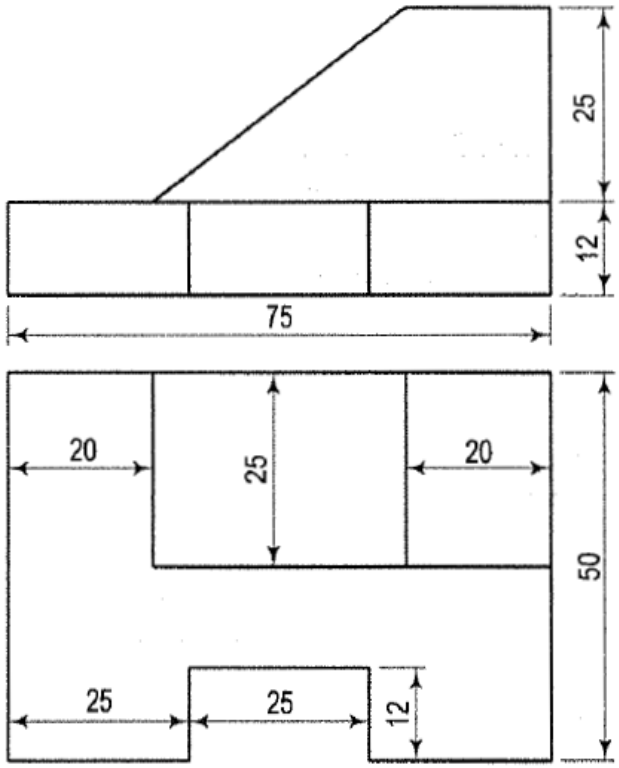
UNIT-V 2D TO 3D 2022 2023

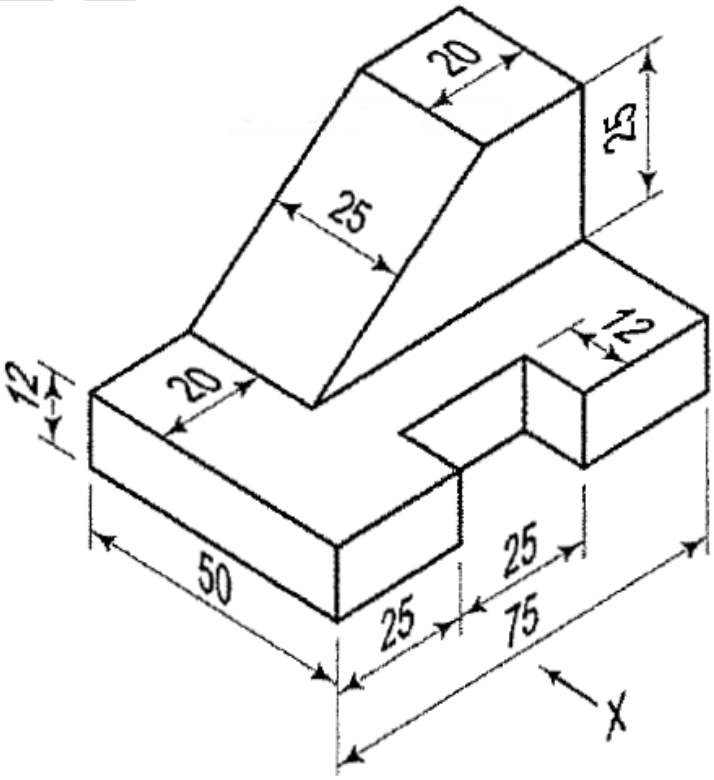
1. Draw the isometric view of given casting (i.e., Orthographic Projections)?



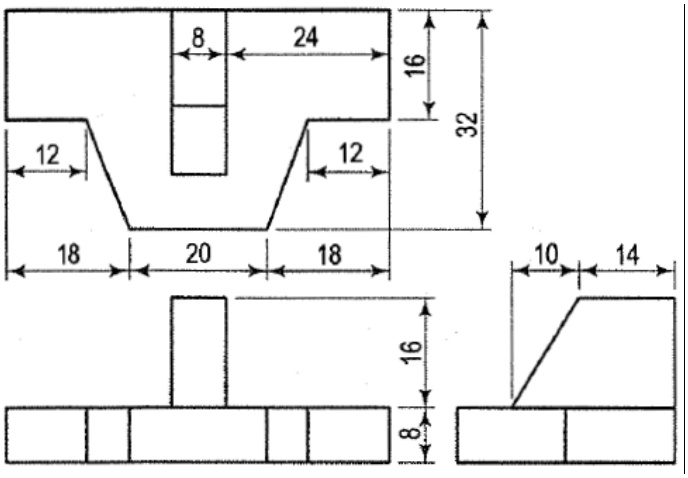


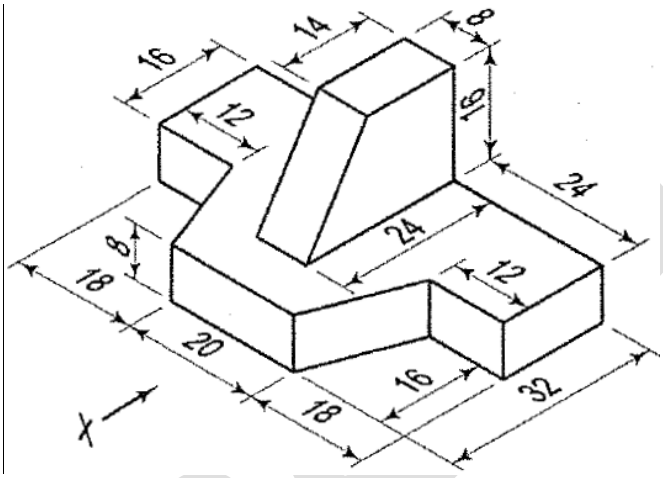
2. Draw the isometric view of given casting (i.e., Orthographic Projections)?



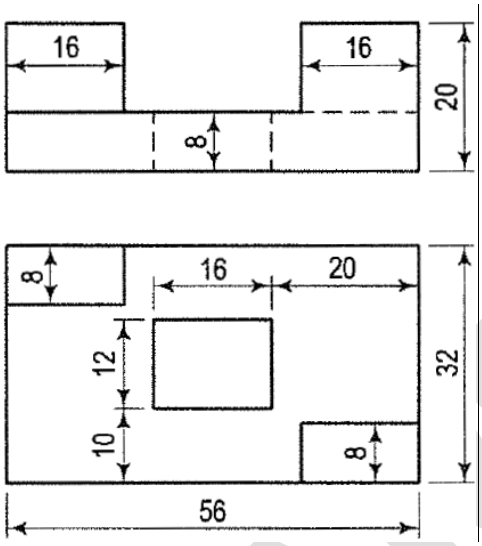


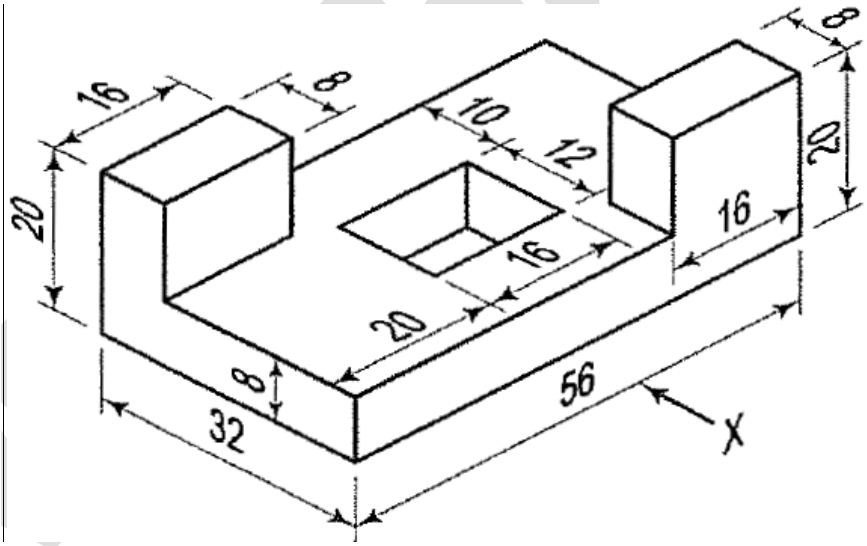
3. Draw the isometric view of given casting (i.e., Orthographic Projections)?



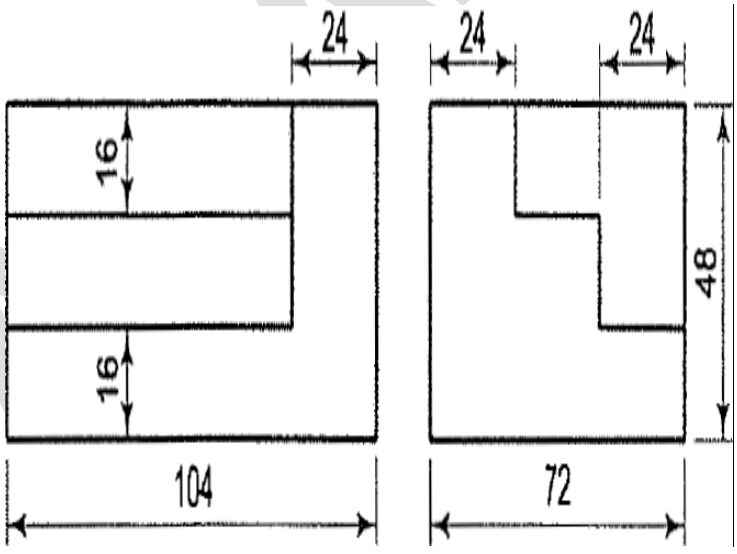


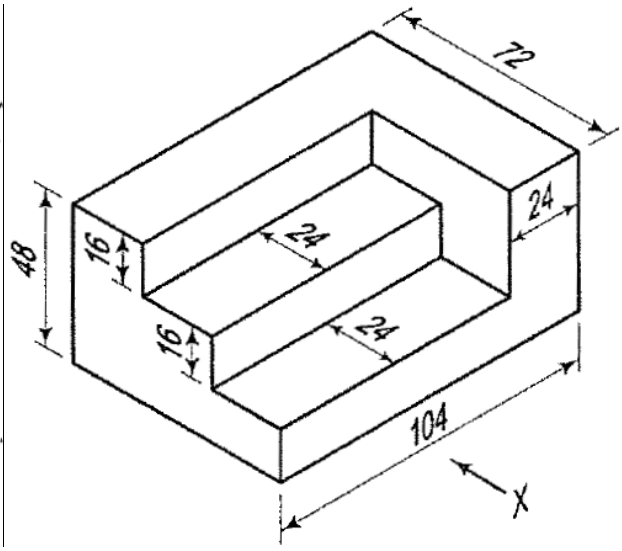
4. Draw the isometric view of given casting (i.e., Orthographic Projections)?



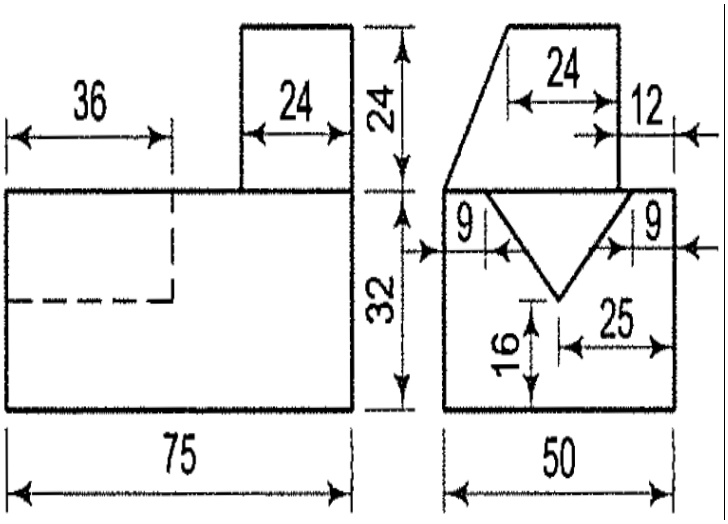


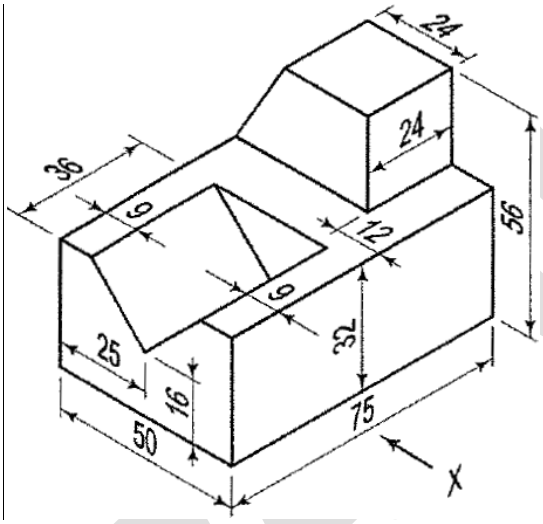
5. Draw the isometric view of given casting (i.e., Orthographic Projections)?



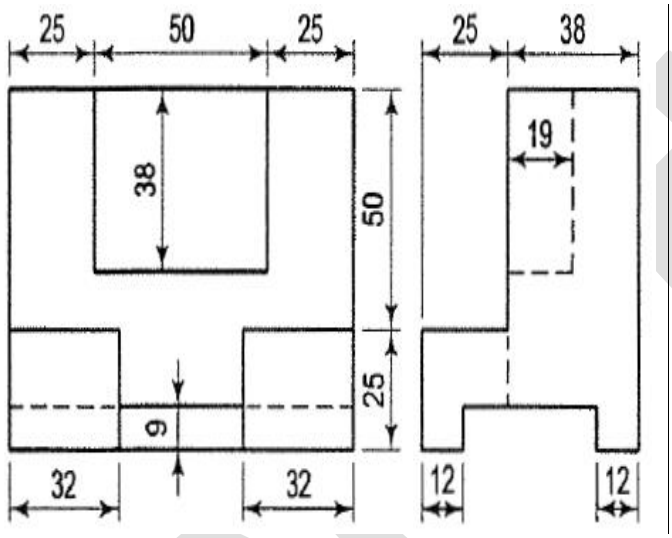


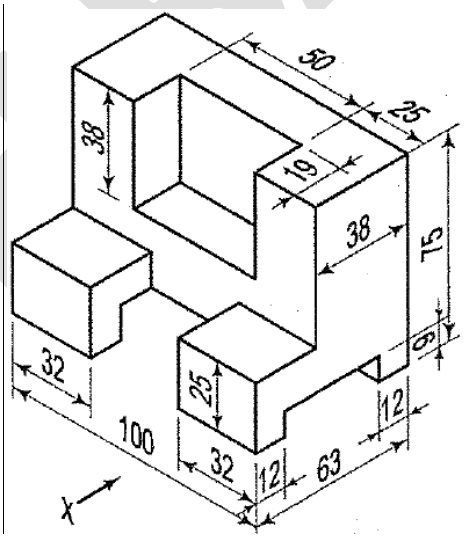
6. Draw the isometric view of given casting (i.e., Orthographic Projections)?



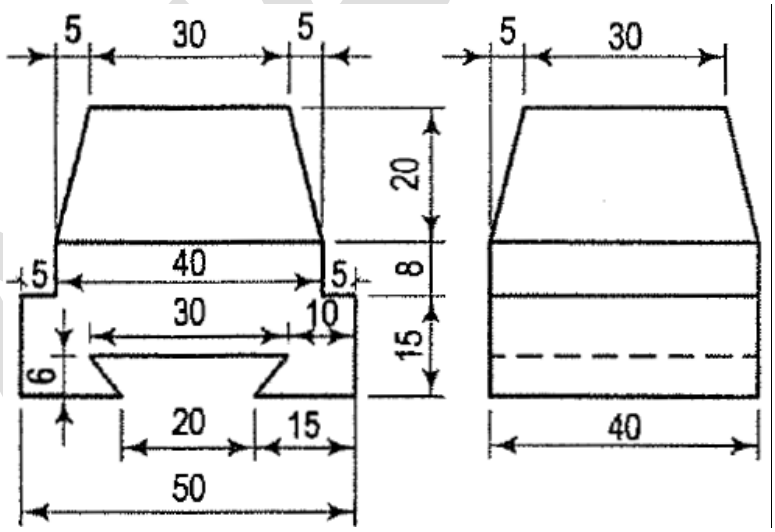


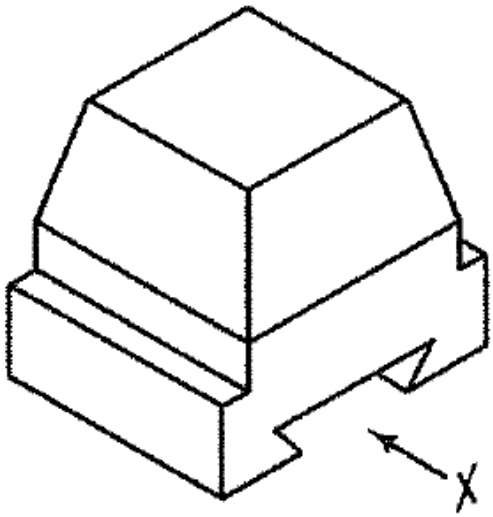
7. Draw the isometric view of given casting (i.e., Orthographic Projections)?



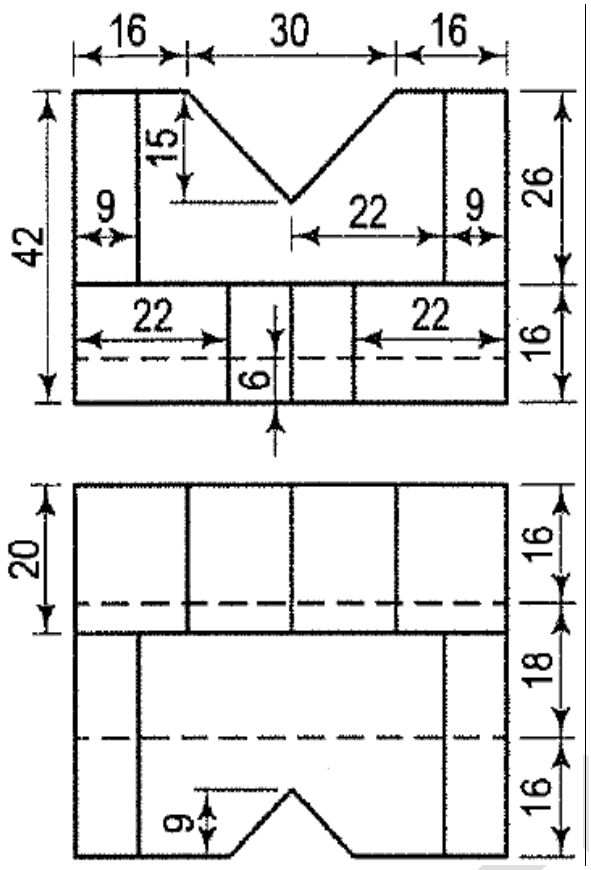


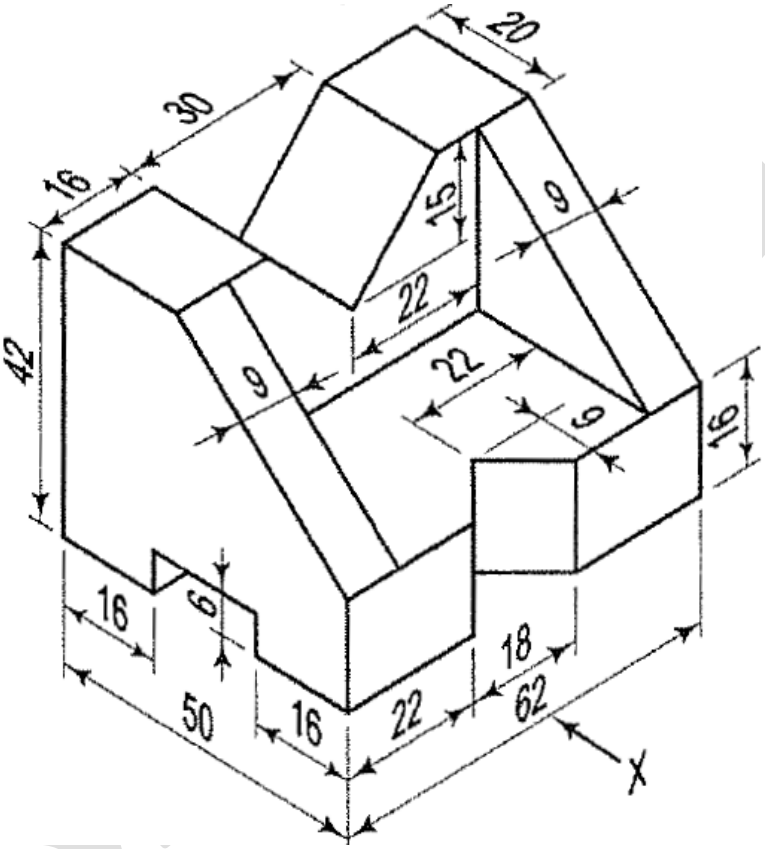
8. Draw the isometric view of given casting (i.e., Orthographic Projections)?



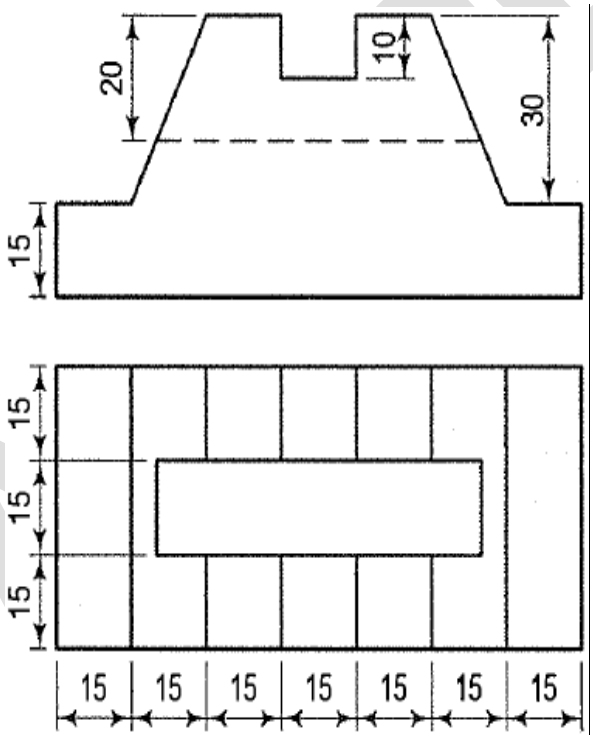


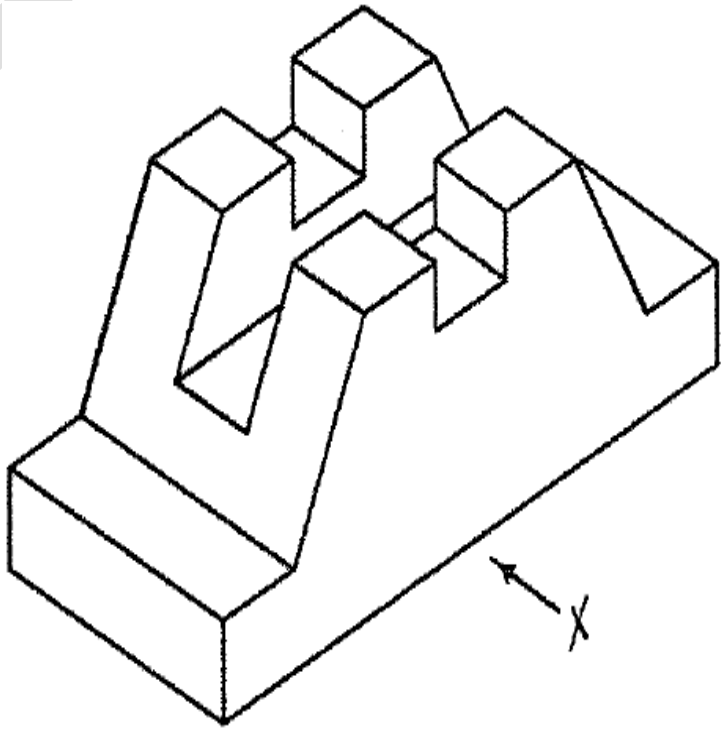
9. Draw the isometric view of given casting (i.e., Orthographic Projections)?





10. Draw the isometric view of given casting (i.e., Orthographic Projections)?

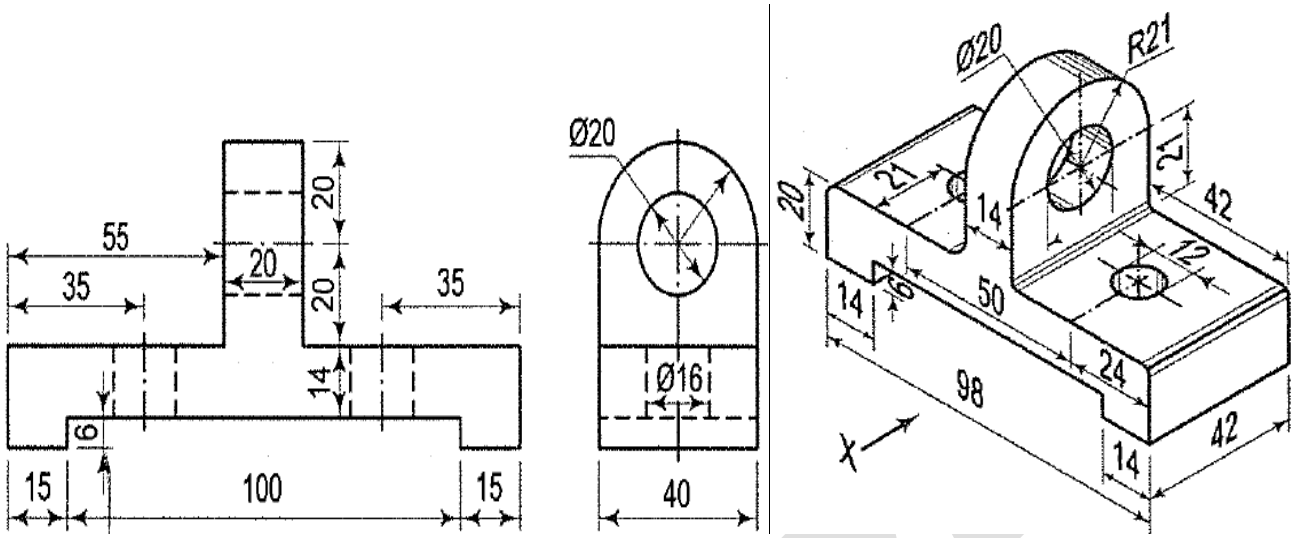




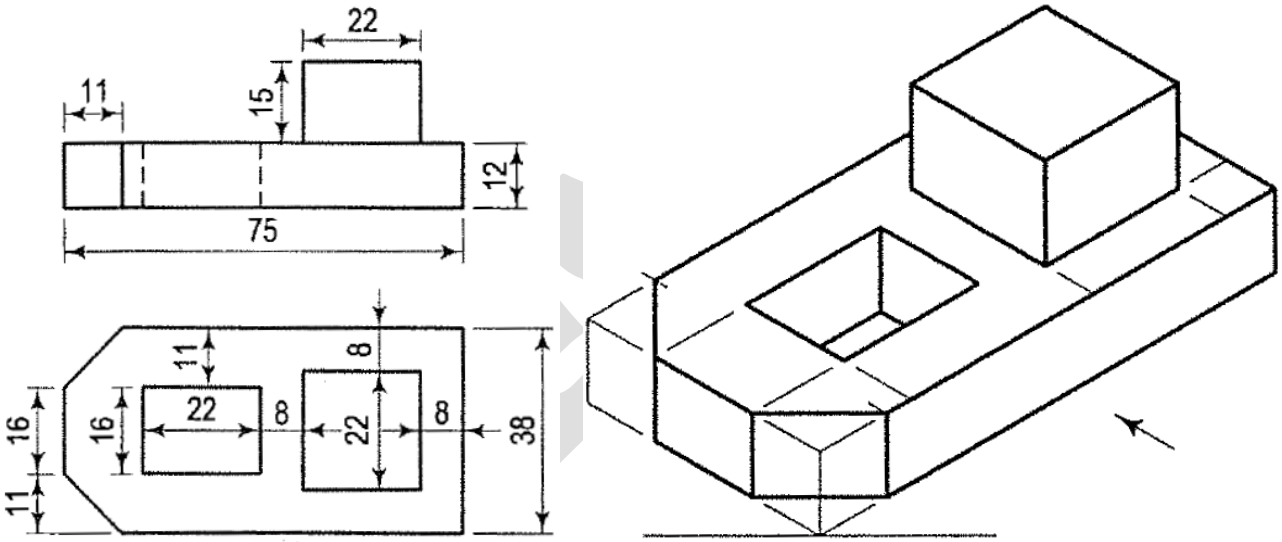
UNIT-V 2D TO 3D

2022 2023

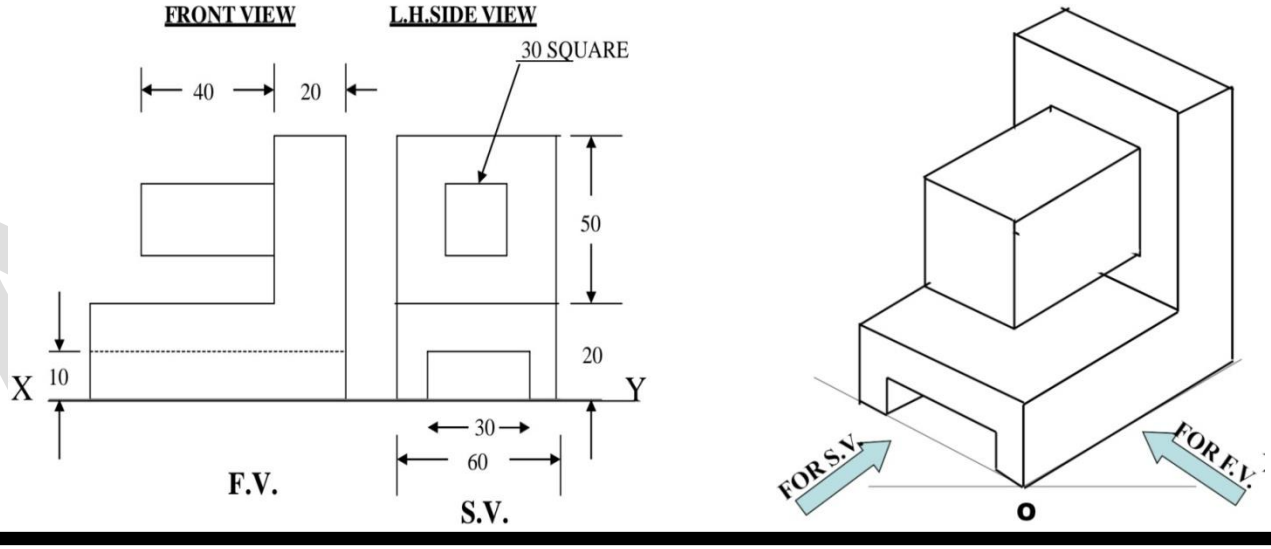
11. Draw the isometric view of given casting (i.e., Orthographic Projections)?



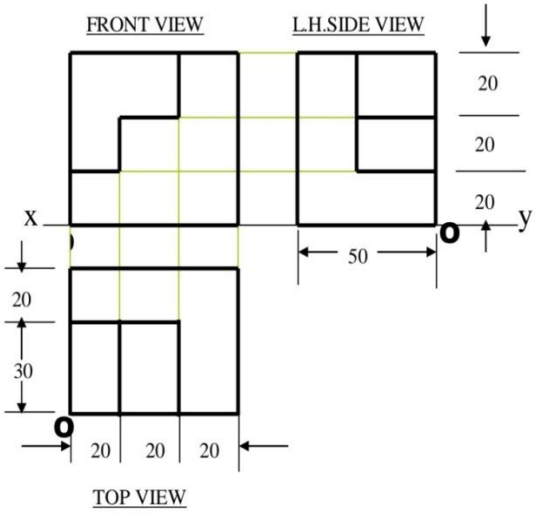
12. Draw the isometric view of given Orthographic Projections?

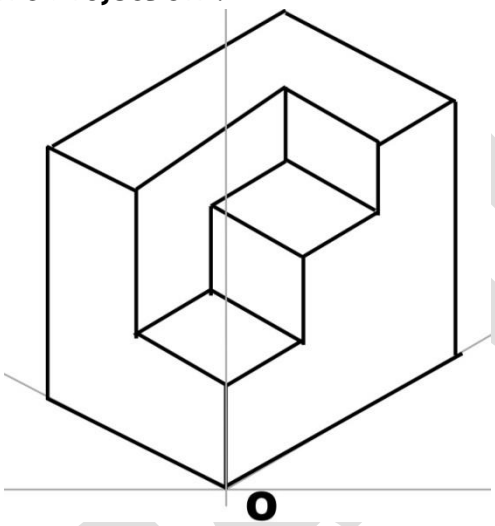


13. Draw the isometric view of given Orthographic Projections?

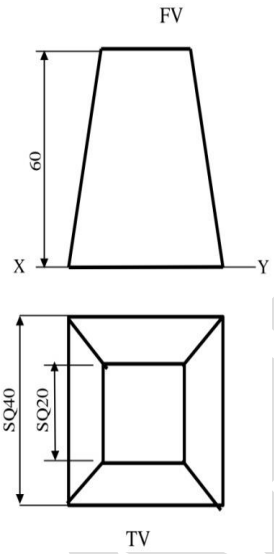


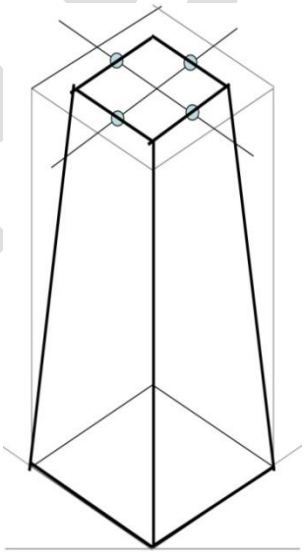
14. Draw the isometric view of given Orthographic Projections?



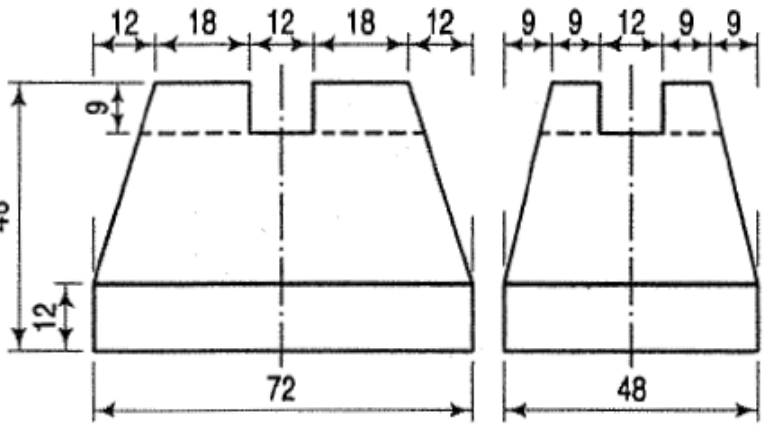


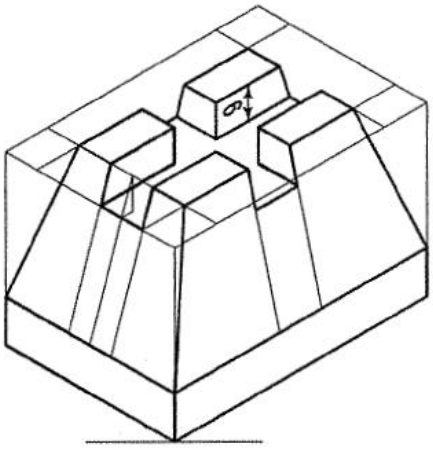
15. Draw the isometric view of given Orthographic Projections?

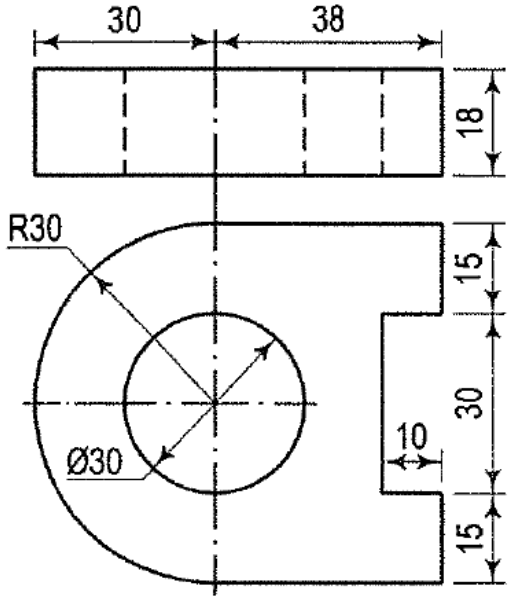


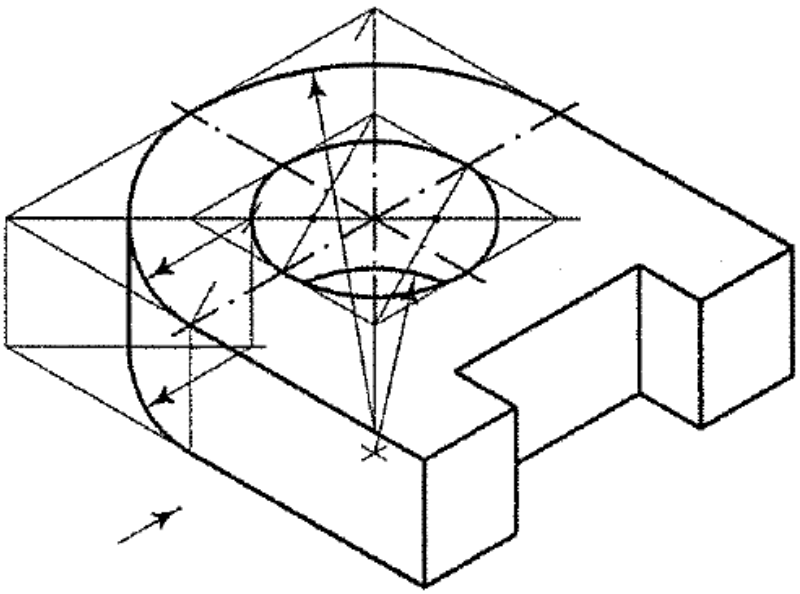


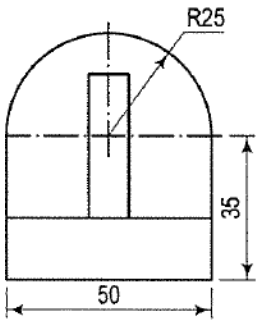
16. Draw the isometric view of given Orthographic Projections?

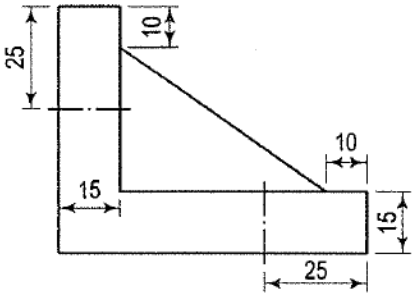


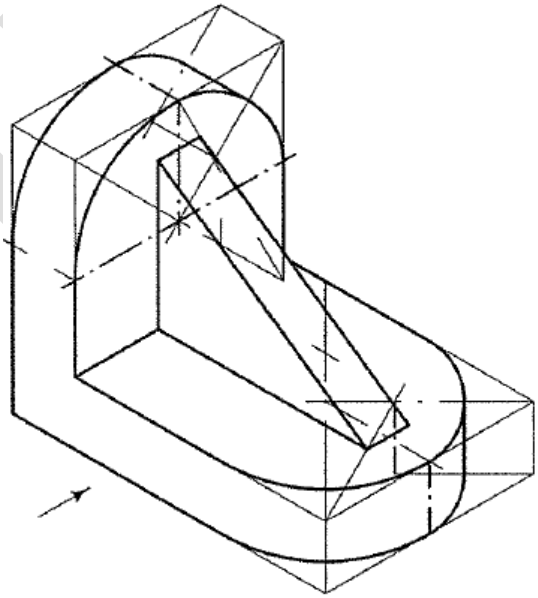


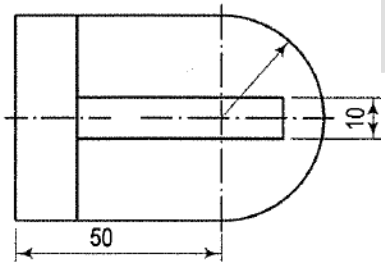


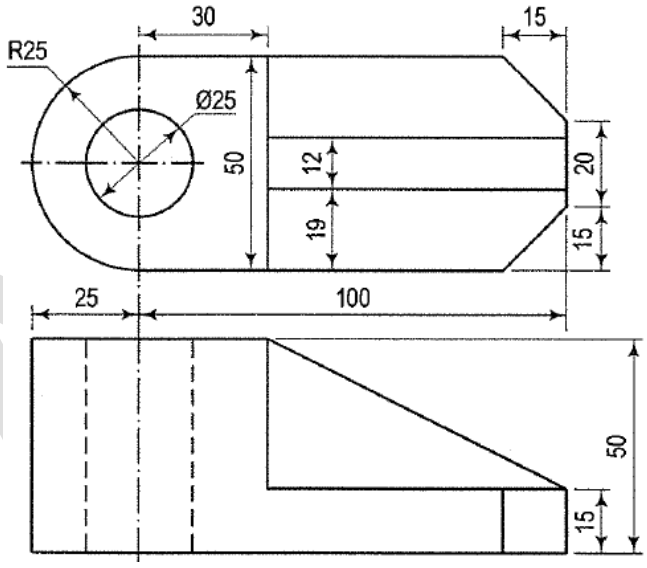


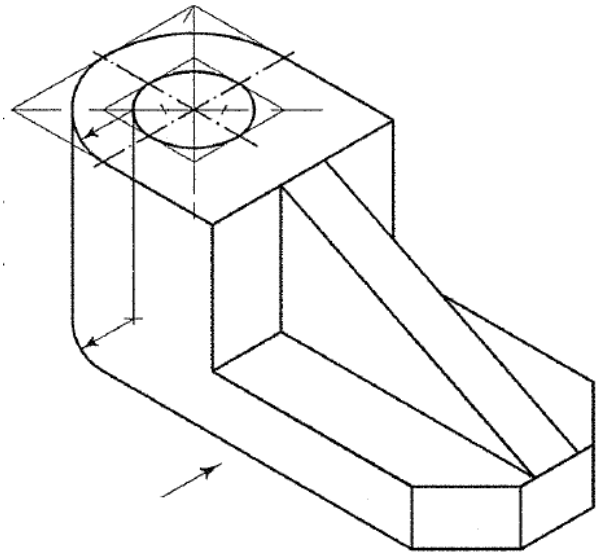






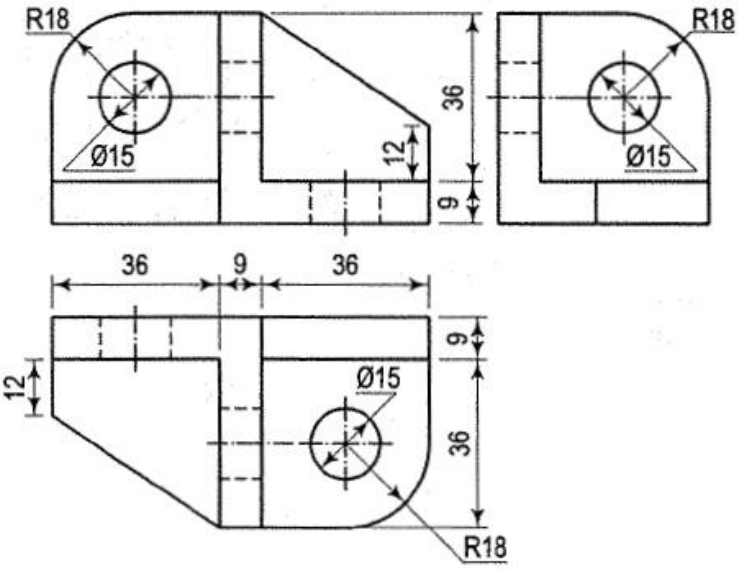


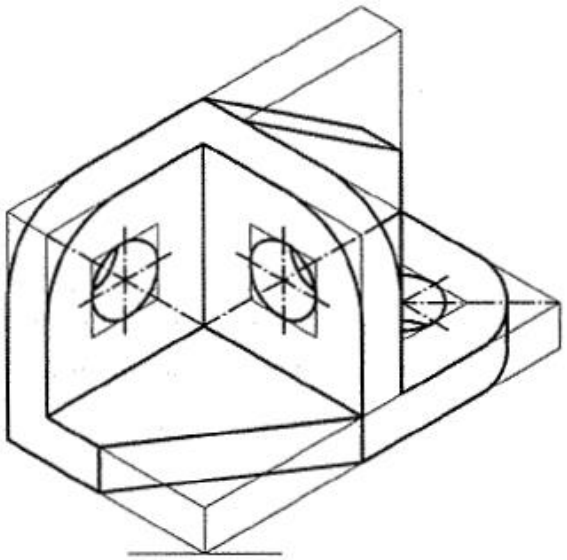


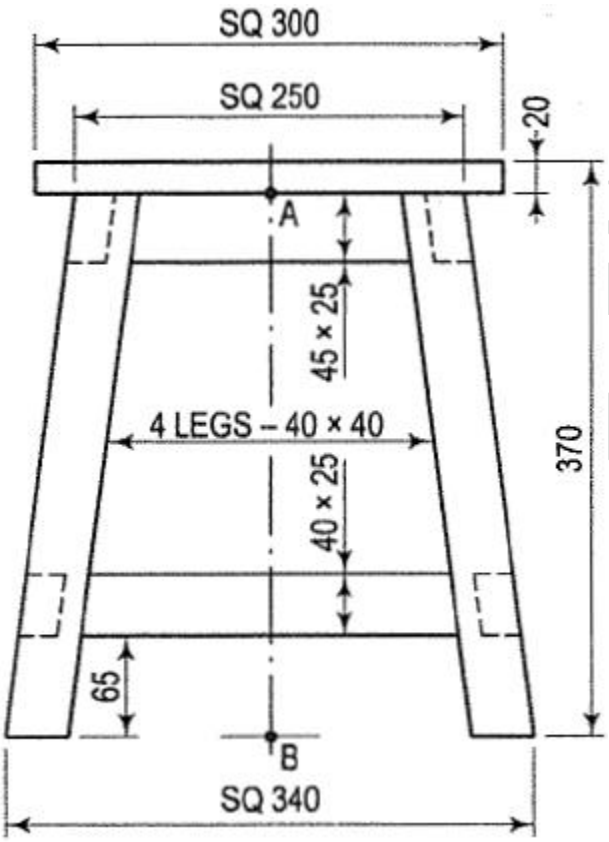


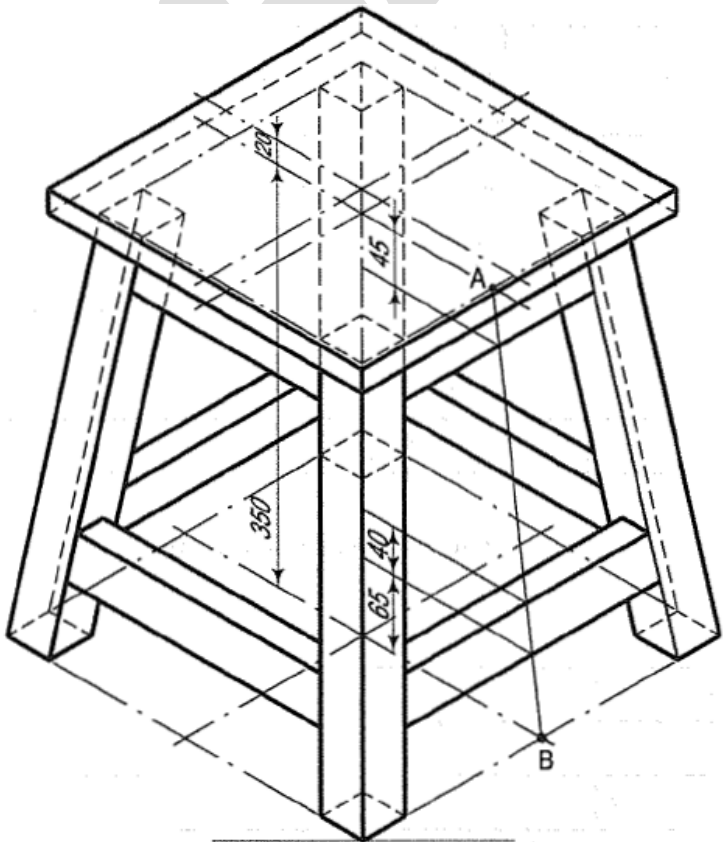
UNIT-V 2D TO 3D 2022 2023

→→→"YOU EDUCATE A MAN; YOU EDUCATE A MAN. YOU EDUCATE A WOMAN; YOU EDUCATE A GENERATION."→→→









UNIT-V 2D TO 3D

2022 2023

"NEVER STOP LEARNING,

BECAUSE

LIFE NEVER STOP TEACHING"

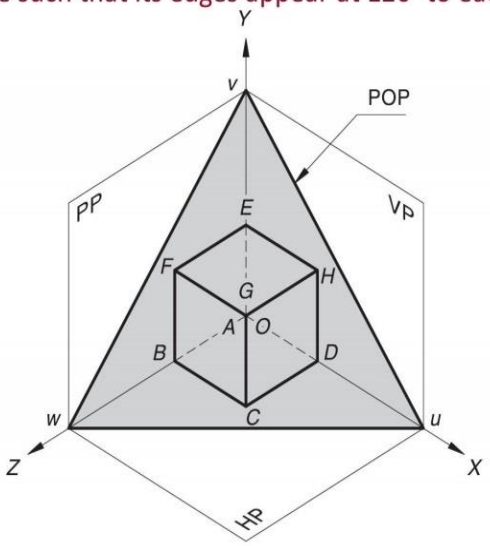
→→→"YOU EDUCATE A MAN; YOU EDUCATE A MAN. YOU EDUCATE A WOMAN; YOU EDUCATE A GENERATION."→→→

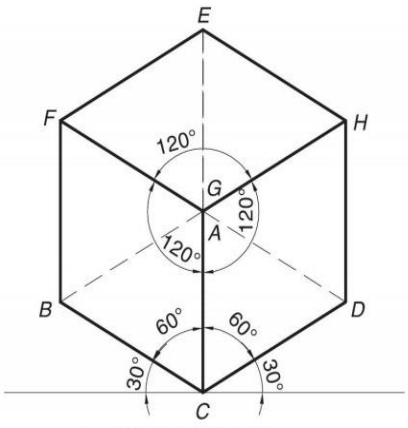
Isometric projection

Projection on a plane such that mutually perpendicular edges appear at 120° to each other.

Iso (same) angle between the axes.

Example shown for a cube tilted on its corner (like the photograph taken of the cube such that its edges appear at 120° to each other).





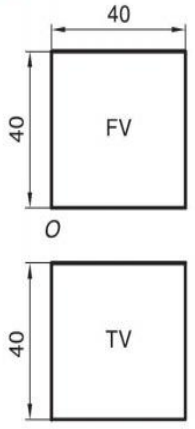
Isometric Projection of a Cube

Isometric projection is often constructed using isometric scale which gives dimensions smaller than the true dimensions.

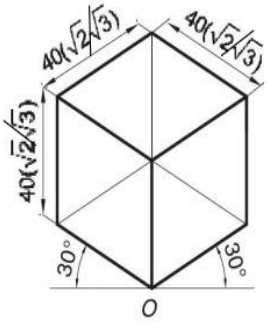
However, to obtain isometric lengths from the isometric scale is always a cumbersome task.

Therefore, the standard practice is to keep all dimensions as it is.

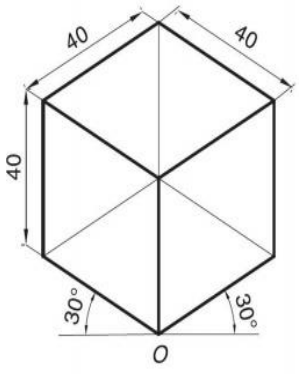
The view thus obtained is called *isometric view* or *isometric drawing*. As the isometric view utilizes actual dimensions, the isometric view of the object is seen larger than its isometric projection.



Orthographic Views



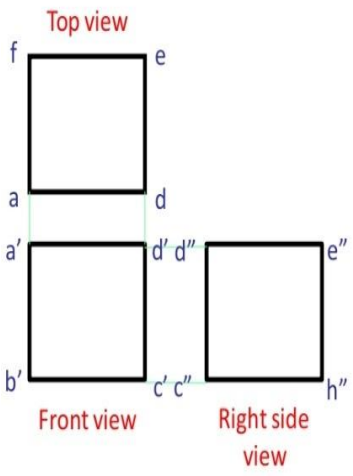
Isometric Projection
(Lengths taken from Isometric Scale)

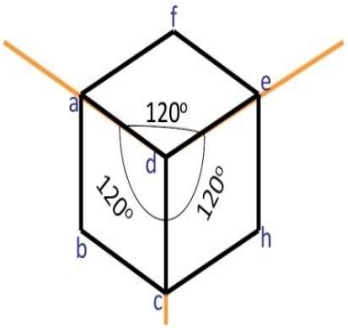


Isometric View

Isometric View

- It is a drawing showing the 3 dimensional view of an object.
- The perpendicular edges of an object are drawn on 3 axes at 120° to each other.
- ACTUAL distances are drawn on the axes.





- Actual distances are drawn for distances parallel to the axes
- Hidden lines are not shown

Isometric scale (not used except for spheres)

Earlier an isometric scale used to be used as shown below

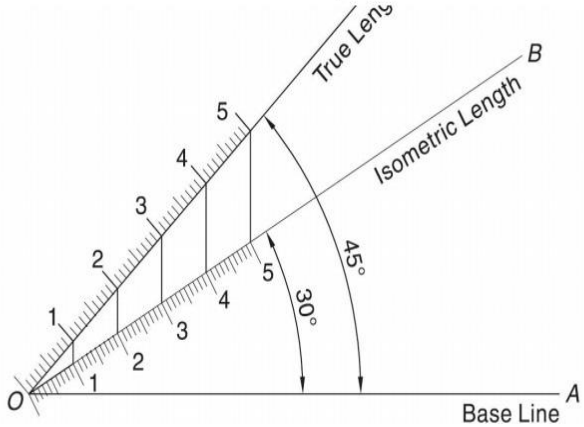
This is because the relative distances get shortened in the isometric projection

Now a days, TRUE LENGTHS are drawn on the axes

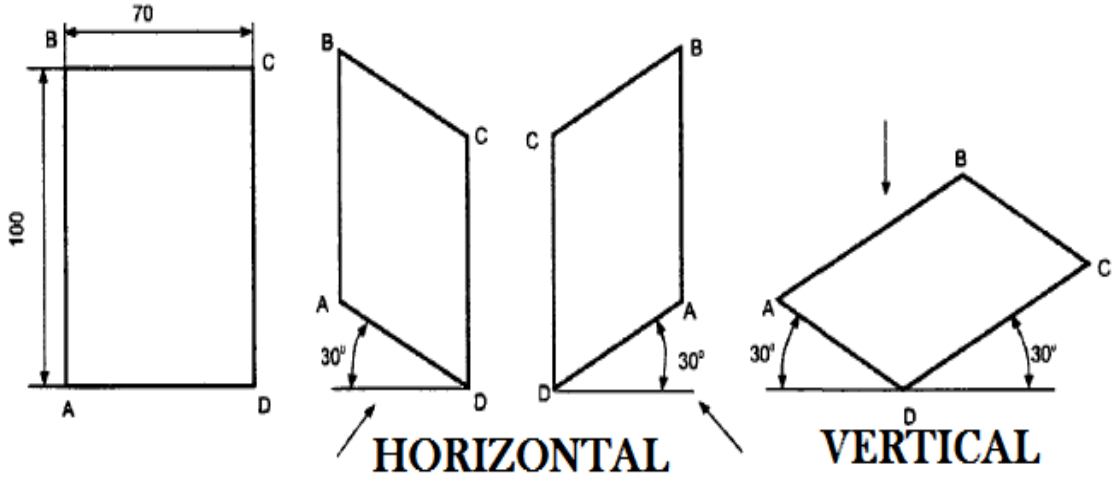
$$\text{Isometric scale} = (\text{Isometric length/True length}) = \frac{\cos 45^\circ}{\cos 30^\circ} = \frac{1}{\sqrt{2}} \div \frac{\sqrt{3}}{2} = \frac{\sqrt{2}}{\sqrt{3}} = 0.8165$$

$$= 82\% \text{ (approximately)}$$

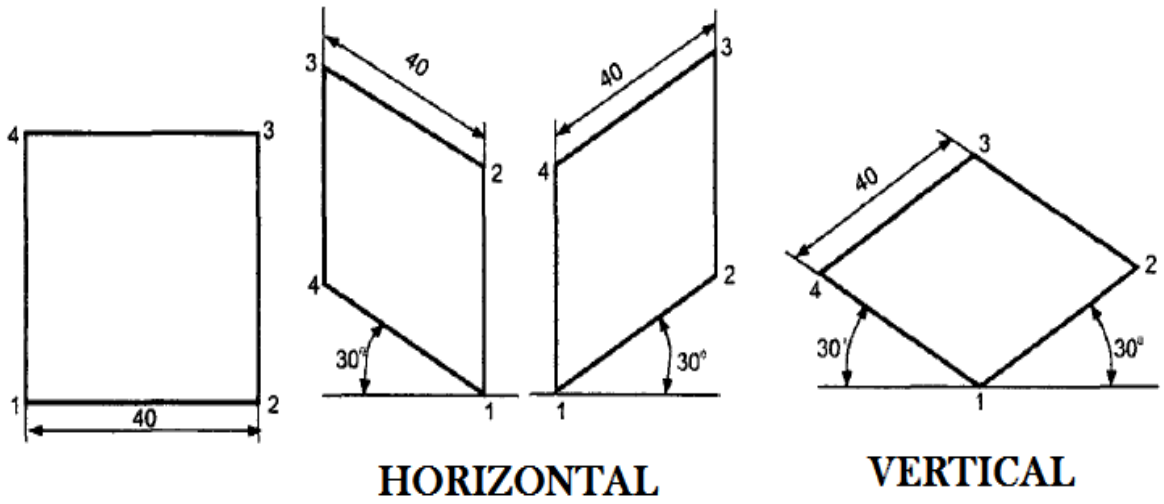
i.e., Isometric length = 0.82* True length



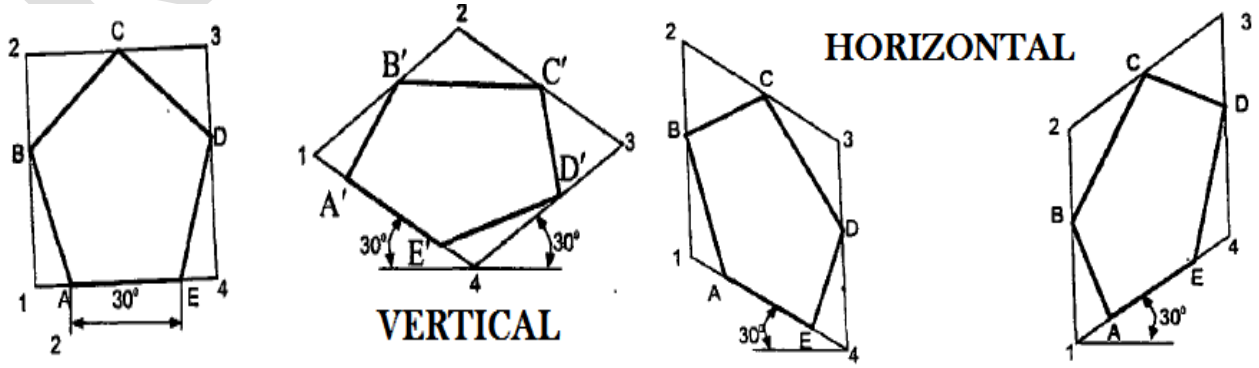
1) Draw the isometric projection of a rectangle of 100mm and 70mm sides if its plane is (a) Vertical and (b) Horizontal.



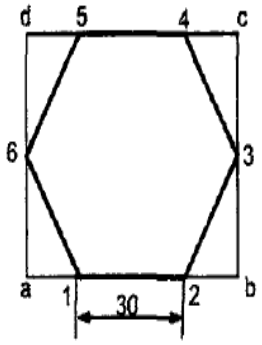
2) Draw the isometric projection of a Square of 40mm sides if its plane is (a) Vertical and (b) Horizontal.

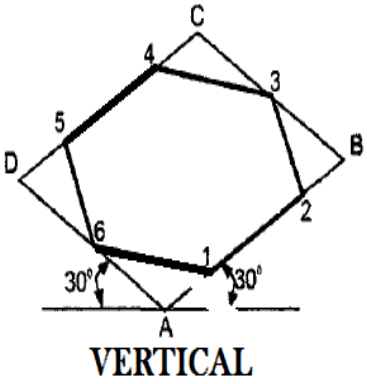


3) Figure shows the projection of a pentagonal plane. Draw the isometric drawing of the plane when the surface is parallel to H.P.

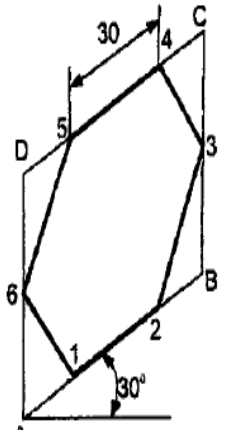


4) Figure shows the orthographic view of a hexagonal plane of side 30mm. Draw the isometric drawing (view) of the plane keeping it (a) horizontal and (b) vertical.



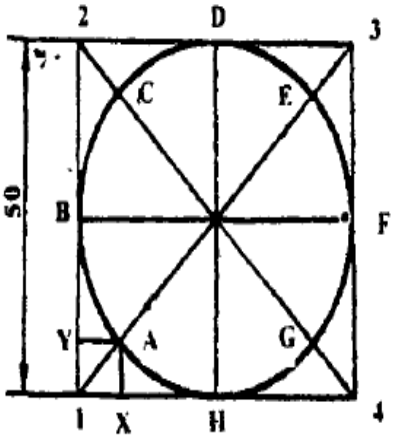


VERTICAL

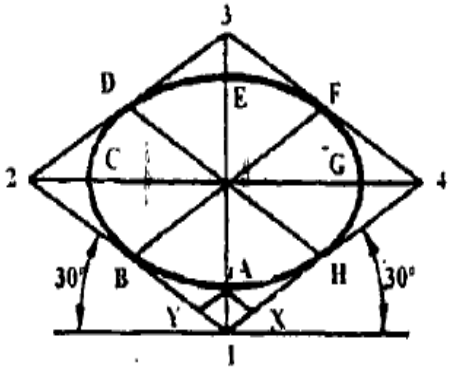


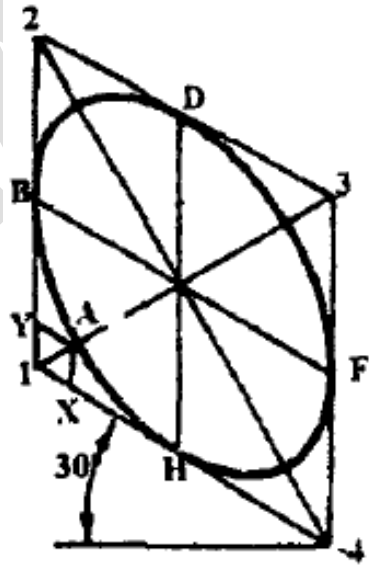
HORIZONTAL

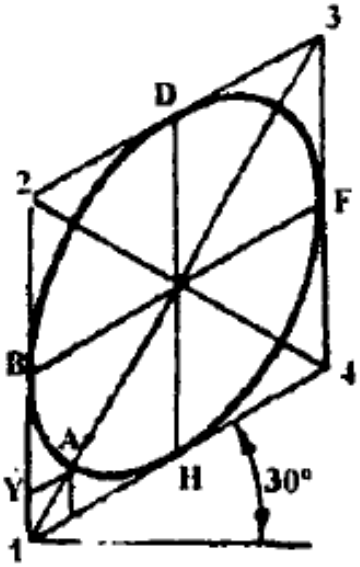
5) Draw the isometric view of a circular plane of diameter 60mm whose surface is (a) Horizontal, (b) Vertical.



VERTICAL

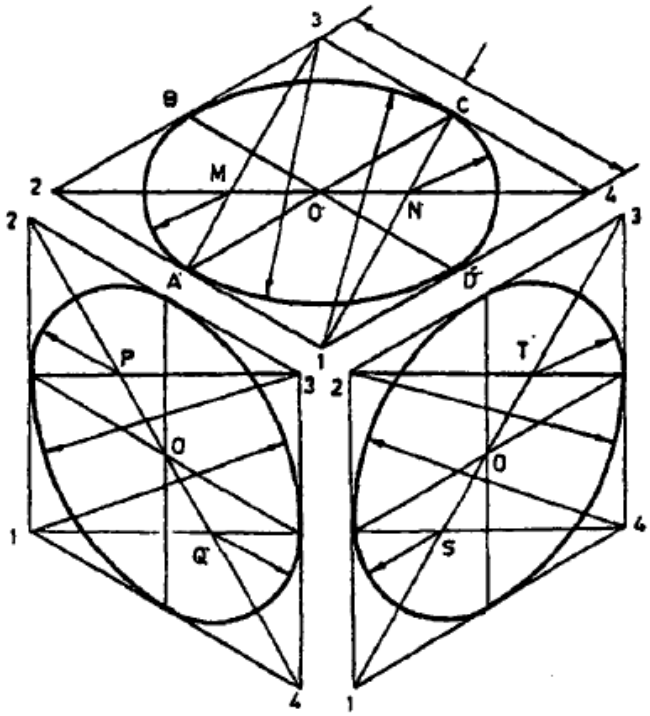




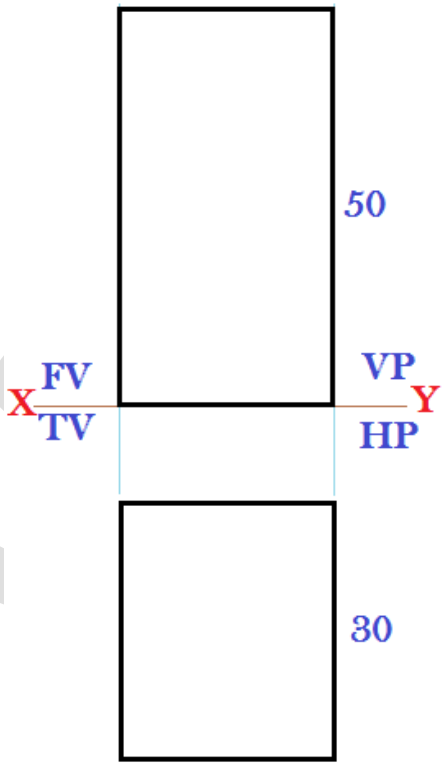


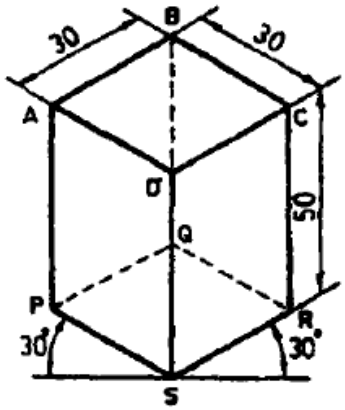
HORIZONTAL

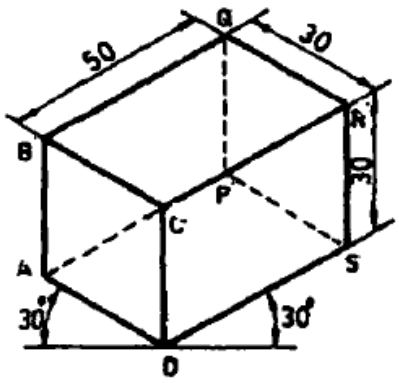
6) Draw the isometric projection of a circular plane of diameter 60mm whose surface is (a) Horizontal and (b) Vertical. Use Four-centre method?



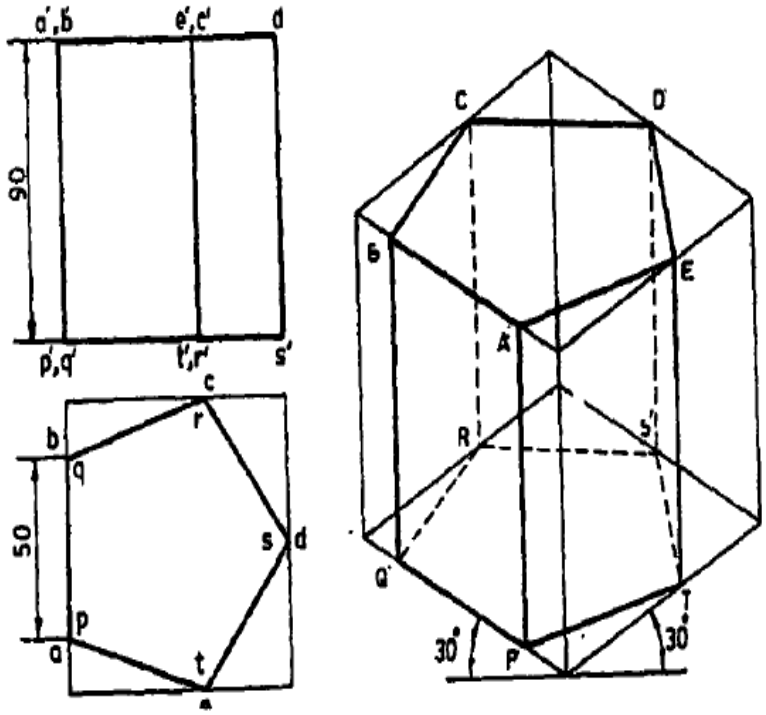
7) Draw the isometric view of square prism with a side of base 30mm and axis 50mm long when the axis is (a) vertical and (b) horizontal.



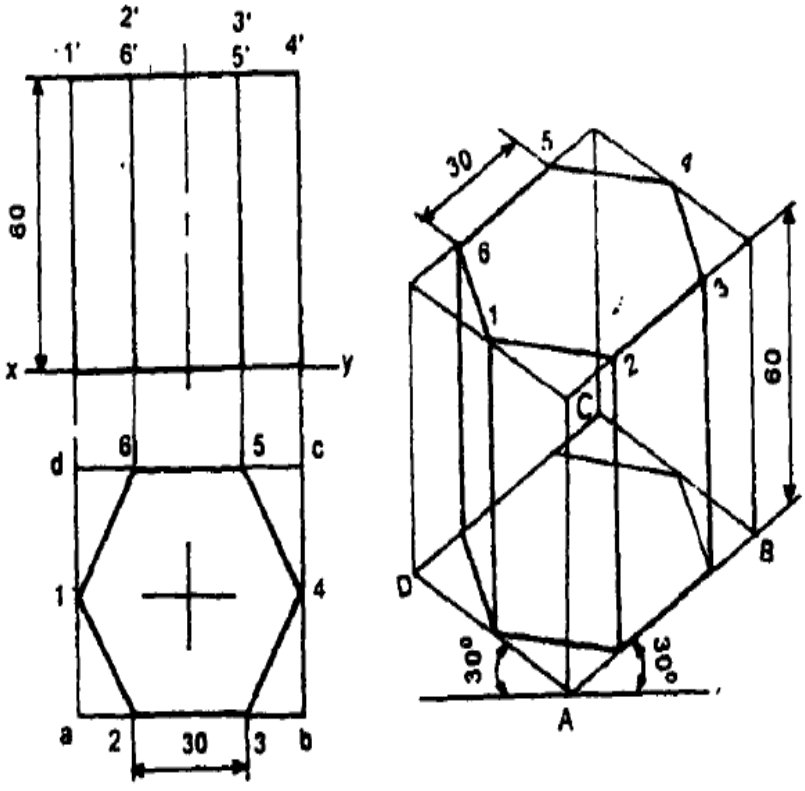




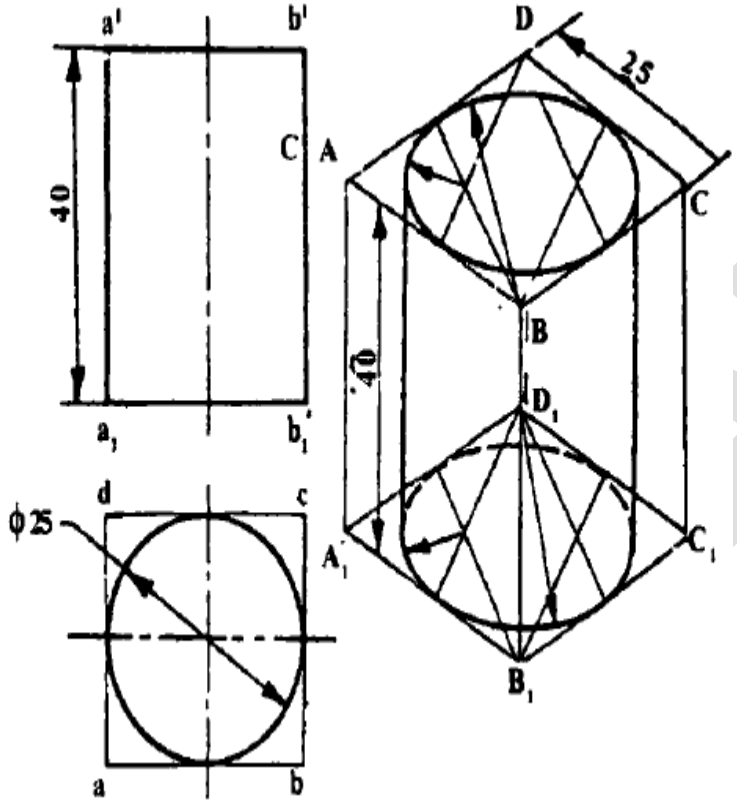
8) Draw the isometric view of a pentagonal prism of base 50mm side, axis 90 mm long and resting on its base with a vertical face perpendicular to V.P.



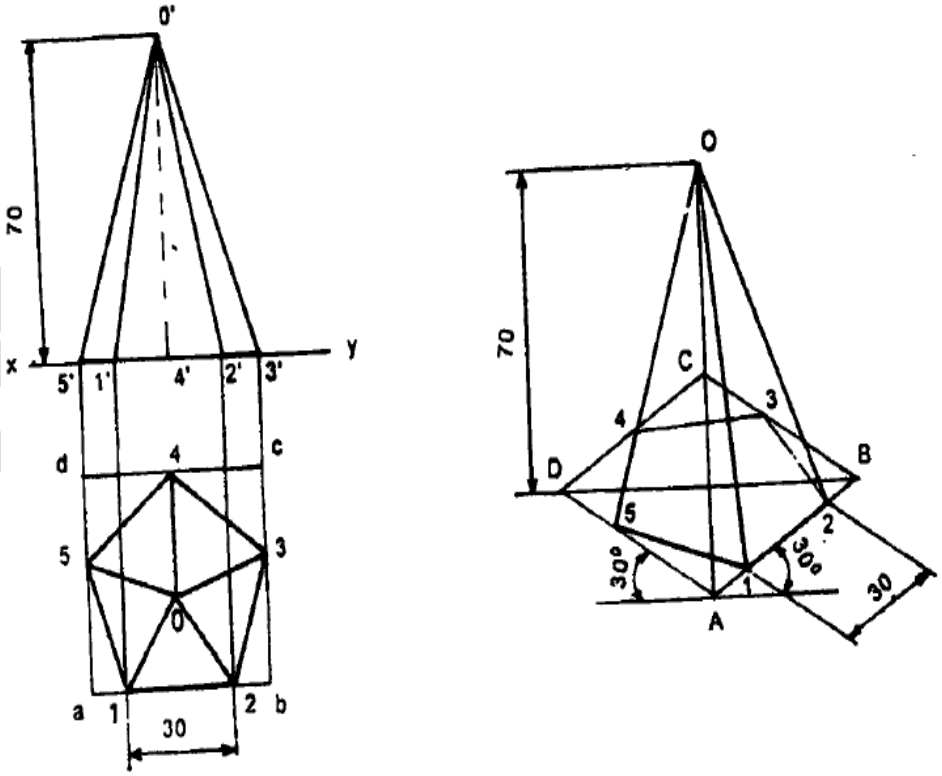
9) A hexagonal prism of base of side 30mm and height 60mm is resting on its base on H.P. Draw the isometric drawing of the prism.



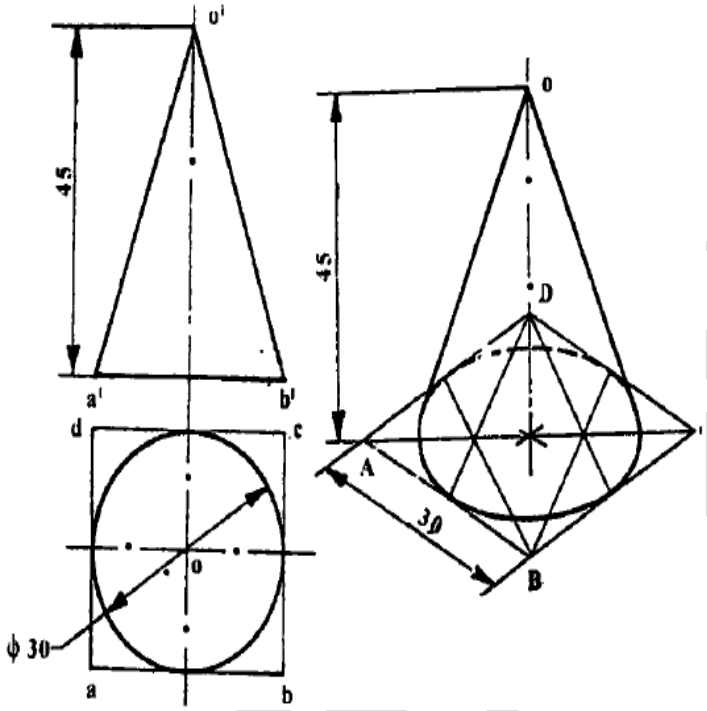
10) Make the isometric drawing of a cylinder of base diameter 20mm and axis 35mm long.



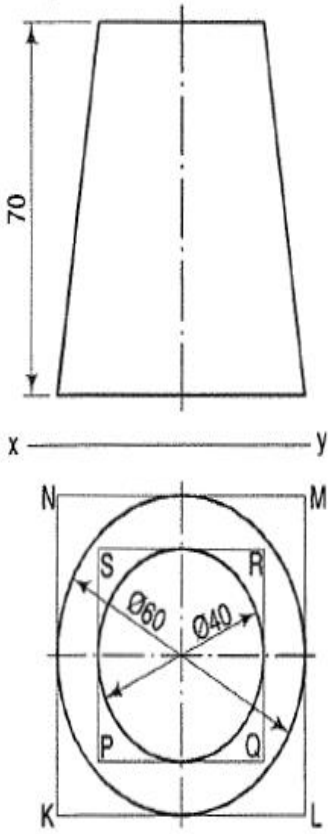
11) A pentagonal pyramid of side of base 30mm and height 70mm is resting with its base on H.P. Draw the isometric drawing of the pyramid.

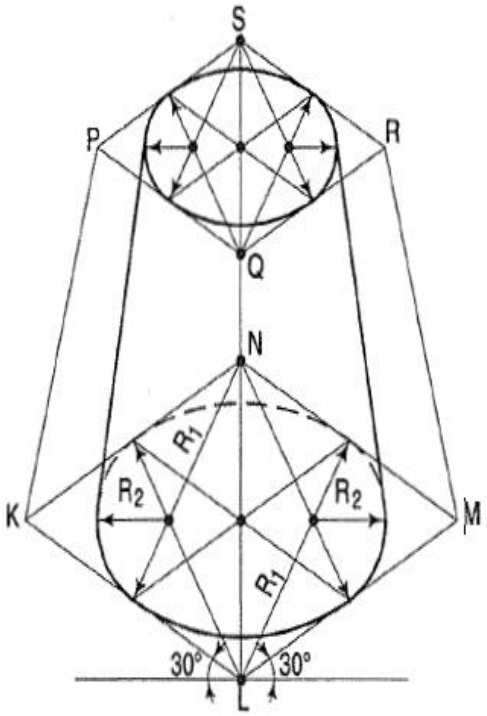


12) Draw the isometric drawing of a cone of base diameter 30mm and axis 50mm long.



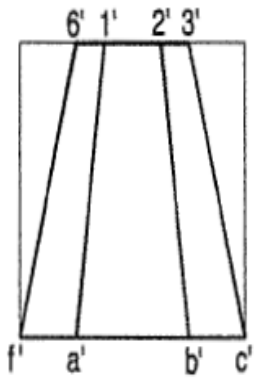
13) The projection of the frustum of the cone. Draw its isometric view.
Top Diameter = 40 mm, Bottom diameter = 60 mm & Height = 70mm

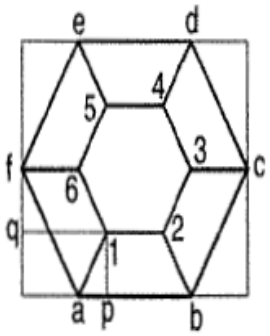


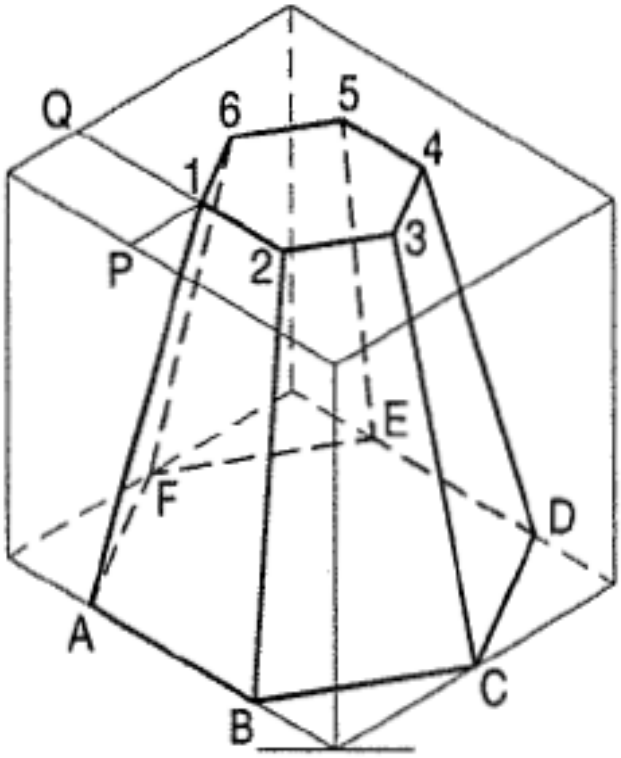


14) Draw the Isometric View of the Hexagonal Pyramid?

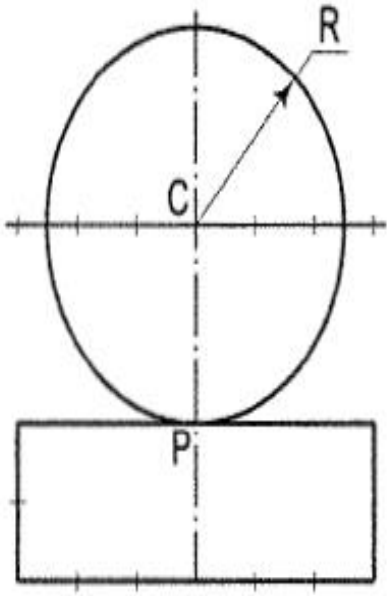
Top edge = 30 mm, Bottom edge = 50 mm & Height = 60mm

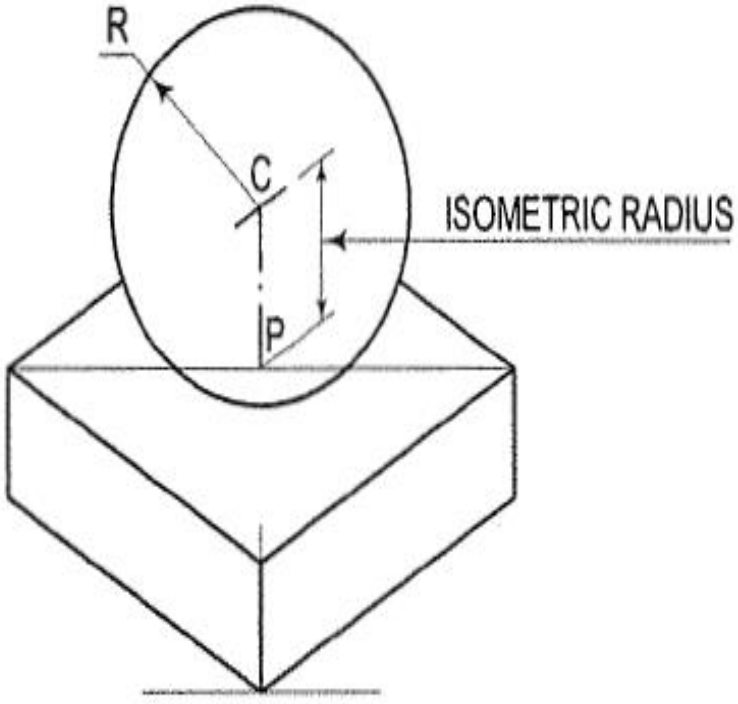




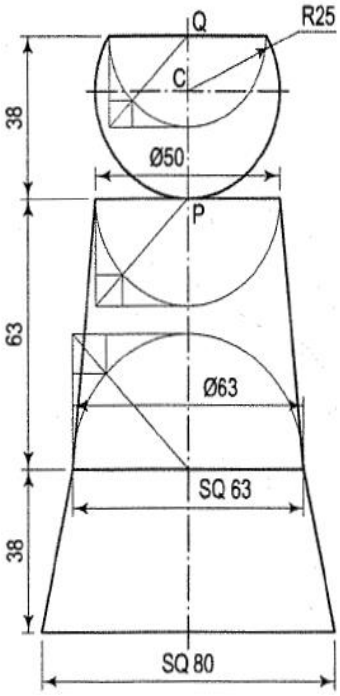


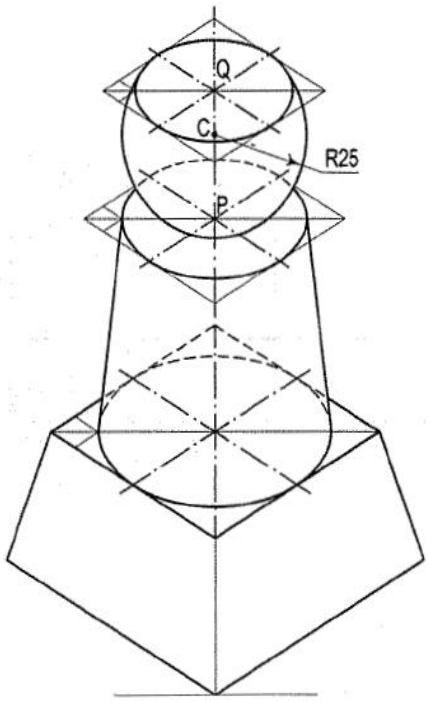
15) Draw the isometric projection of a sphere of radius 50mm resting centrally on the top of a square prism of base side 60mm and height 30mm, the front view of which is shown in below figure?



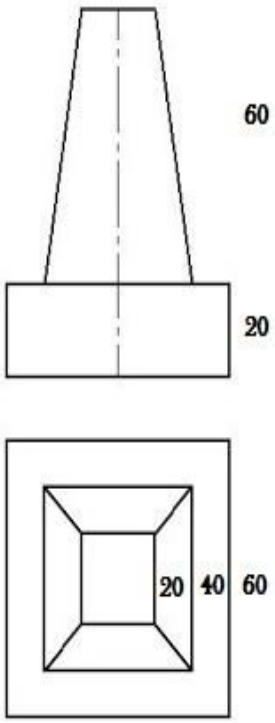


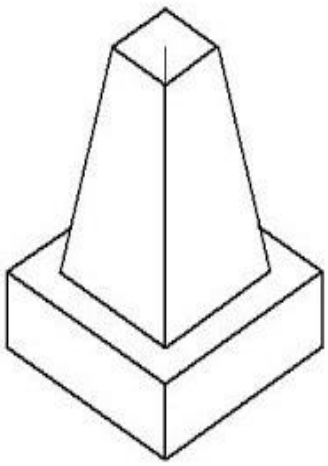
16) The front view of three solids placed one above the other, with their axes in a straight line is shown in below figure. Draw the isometric view of the arrangement.



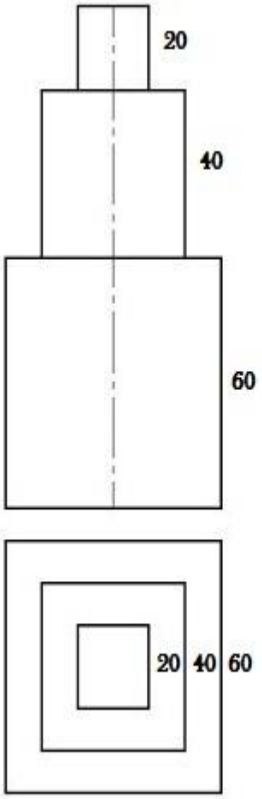


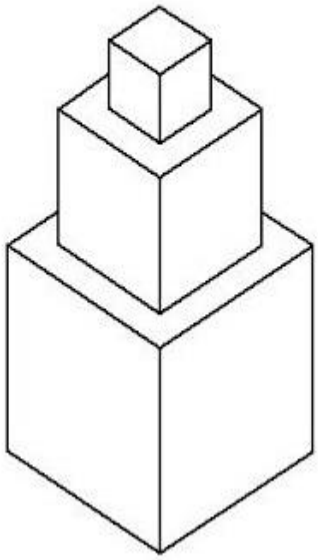
17) The frustum of a square pyramid of sides 40mm, top face 20mm and height 60mm rests on the center of a square block of side 60mm and height 20mm. The base edges of the pyramid are parallel to the top edges of the square block. Draw the isometric projections of the solids?



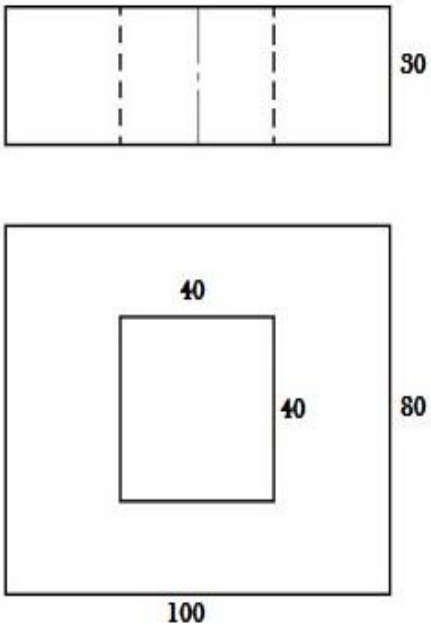


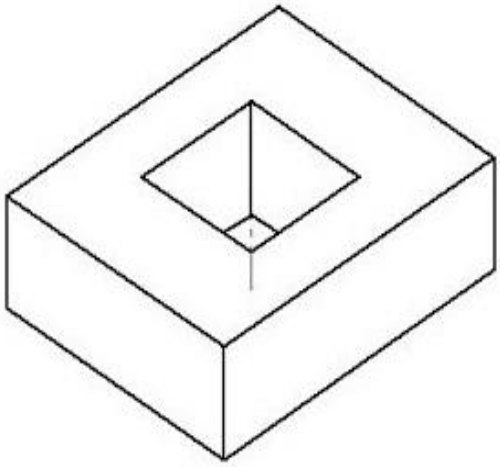
18) The Cubes of side 60mm, 40mm and 20mm are placed centrally one above the other in ascending order of their side. Draw the isometric projections of the solids?



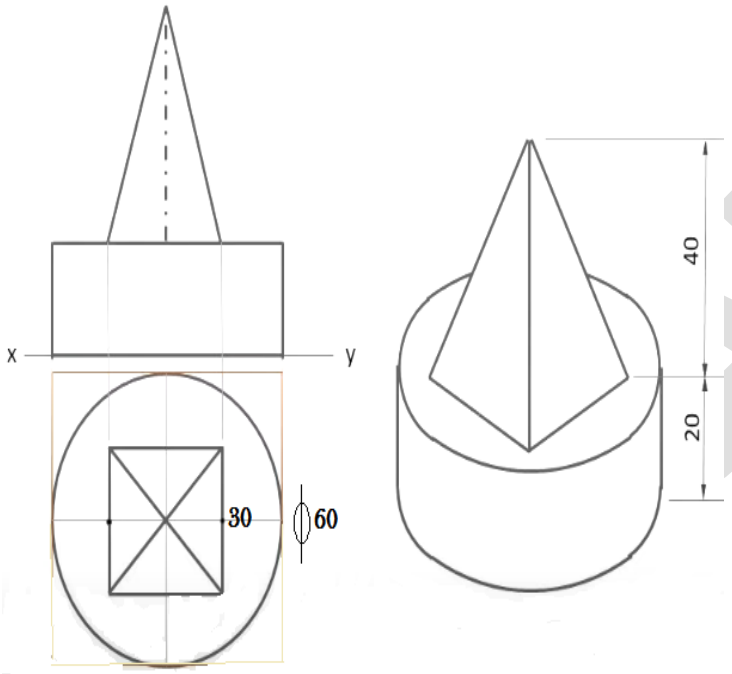


19) A Rectangular slab base 100mm*80mm and height 30mm has full depth co-axial square hole side 40mm, such that one of its sides of the square is parallel to one of the sides of the rectangle. Draw the isometric projections of the combinations of the solids?

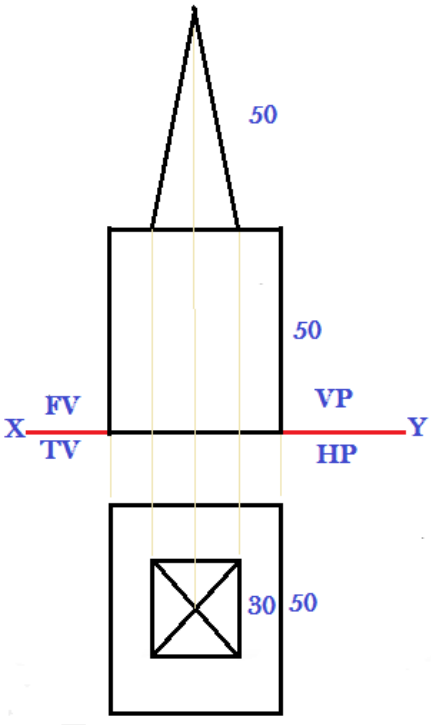


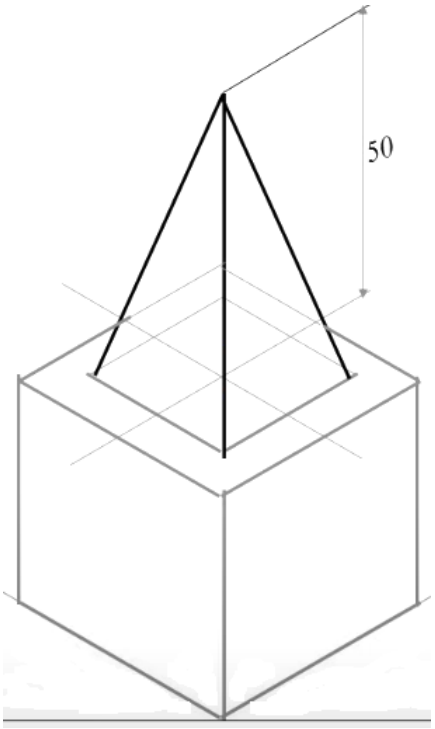


20) The square pyramid of side 30mm and height 40mm rests on the center of a cylinder block of diameter 60mm and height 20mm. Draw the isometric projections of the combinations of solids?



21) A Square pyramid of side 30mm base, 50mm long axis is centrally placed on the top of a cube of side of base 50mm long edge. Draw the isometric projections of the combination of the solids?





PRINCETON INSTITUTE OF ENGINEERING & TECHNOLOGY FOR WOMEN

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I - B.Tech I & II Semesters, R22- Regulation, Academic Year 2022-2023

→→

ENGINEERING GRAPHICS PREVIOUS SEMESTER QUESTION PAPERS

By

A.NARESH BABU

"DO ALL THE GOOD YOU CAN, FOR ALL THE PEOPLE YOU CAN, IN ALL THE WAYS YOU CAN, AS LONG AS YOU CAN."

Code No: 151AD **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year I Semester Examinations, July - 2021
ENGINEERING GRAPHICS
(Electronics and Communication Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any three questions
All questions carry equal marks

\- - -

1.a) Construct a hyperbola, when the distance of the focus from the directrix is 70 mm and eccentricity is 4/3.

b) Construct a diagonal scale of representative fraction of 1/32 showing yards, feet and inches and to measure up to 6 yards. [15+10]

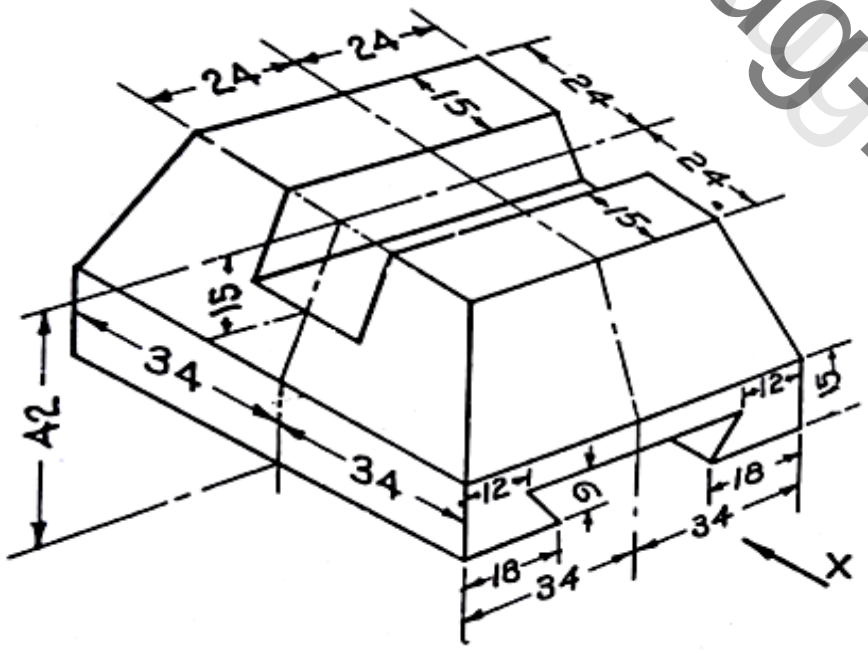
2. Construct a hypocycloid when the diameters of rolling and directing circles are 40 mm and 140 mm respectively. Draw a tangent to it at a point. [25]

3. A line PQ of 70 mm length is inclined at 30^0 to the horizontal plane and its end P is 10 mm above the horizontal plane and 15 mm in front of the vertical plane. When its front view measures 50 mm, determine its inclination with the vertical plane. [25]

4. A pentagonal prism of base 20 mm side and axis 50 mm long is resting on one of its rectangular faces on the ground. Draw its projections when the axis is inclined at 60^0 to the vertical plane. [25]

5. A circular hole of 25 mm diameter is cut through a vertical cylinder of 80 mm diameter such that the axis of the hole is horizontal and parallel to the vertical plane and 8 mm away from the axis of the cylinder. Draw the projections of the cylinder showing the holes in it. [25]

6. Draw the a) front view b) side view from left and c) top view to the full scale for the pictorial view shown in the figure. All dimensions are in mm. [25]



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Code No: 151AD **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year I Semester Examinations, October/November - 2020
ENGINEERING GRAPHICS
(Electronics and Communication Engineering)

Time: 2 hours **Max. Marks: 75**

Answer any three questions
All questions carry equal marks
- - -

1.a) Construct a diagonal scale of 1cm = 2.5 km. And mark the length of 26.4 km on it.
b) Draw one branch each of a hyperbola and conjugate hyperbola whose transverse and conjugate axes are 60 mm and 80 mm respectively. Also locate the foci. [10+15]

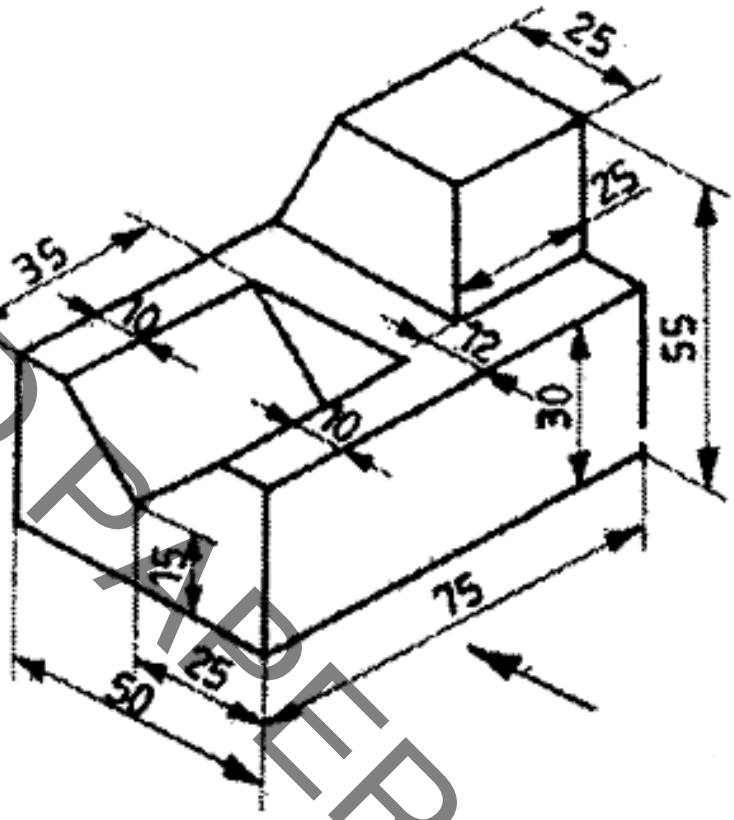
2. A circle of 50 mm diameter rolls along a straight line without slipping. Draw the curve traced out by a point P on the circumference, for one complete revolution of the circle. Name the curve. Draw a tangent to the curve at a point on it 40 mm from the line. [25]

3. ABCDE is a regular pentagonal plate of 40 mm side and has its corner A on the H.P. The plate is inclined to the H.P such that the top view length of edges AB and AE is each 35 mm. The side CD is parallel to both the reference planes. Draw the projections of the plate and find its inclination to the H.P. [25]

4. Draw the projections of a cone, base 50 mm diameter and axis 55 mm long, when it is resting on the V.P on a point on its base circle with the axis making an angle 30^0 with the V.P and 45^0 with the H.P. [25]

5. A cylinder of diameter 50 mm and height 75 mm is resting on the ground on its flat end. It is cut by a sectional plane inclined at 30^0 to the axis of the cylinder and passing through a point on the axis at height of 50 mm from the base. Draw the lateral surface of the bottom part. [25]

6. Draw the front view, both the side views and top view of the following block. (All dimensions are in mm) [25]



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Code No: 151AD **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year I Semester Examinations, September/October - 2021
ENGINEERING GRAPHICS
(Electronics and Communication Engineering)

Time: 3 Hours **Max. Marks: 75**

Answer any three questions
All questions carry equal marks

\- - -

1.a) Draw a hypocycloid of a circle of 40 mm diameter that rolls inside another circle of 200 mm diameter for one revolution. Draw tangent and Normal at any point on the curve.
b) Draw a diagonal scale of RF = 3/100, showing meters, decimeters and centimeters and to measure up to 5 meters. Show the length of 3.69 meters on it. [12+13]

2. A line AB is in the first quadrant. Its ends A and B are 20 mm and 60 mm in front of VP respectively. The distance between the end projectors is 75 mm. The line is inclined at 30^0 to the HP and its HT is 10 mm above XY. Draw the projections of AB and determine its true length and VT. [25]

3. A cone, of base 75 mm diameter and axis 100 mm long, has its base on the ground. A section plane, parallel to one of the end generators and perpendicular to VP, cuts the cone intersecting the axis at a point 75 mm from the base. Draw the sectional top view and true shape of the section. [25]

4. A regular hexagonal pyramid side of base 30 mm and height 60 mm is resting vertically on its base on HP, such that two of its sides of the base are perpendicular to VP. It is cut by a plane inclined at 40^0 to HP and perpendicular to VP. The cutting plane bisects the axis of the pyramid. Obtain the development of the lateral surface of the truncated pyramid. [25]

5. The isometric view of an object is shown in the figure 1. Draw the front view, top view and side view (looking in the direction of X). All dimensions are in mm. [25]

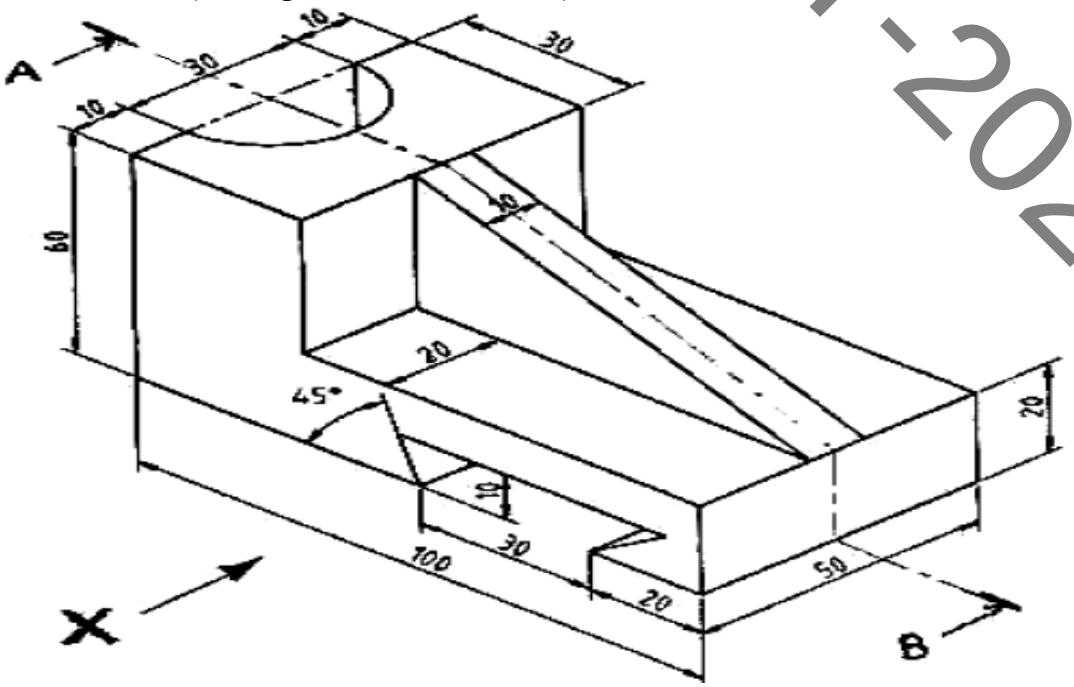

Figure: 1

6. Draw the isometric projection of the object from the views shown in figure 2. All dimensions are in mm. [25]

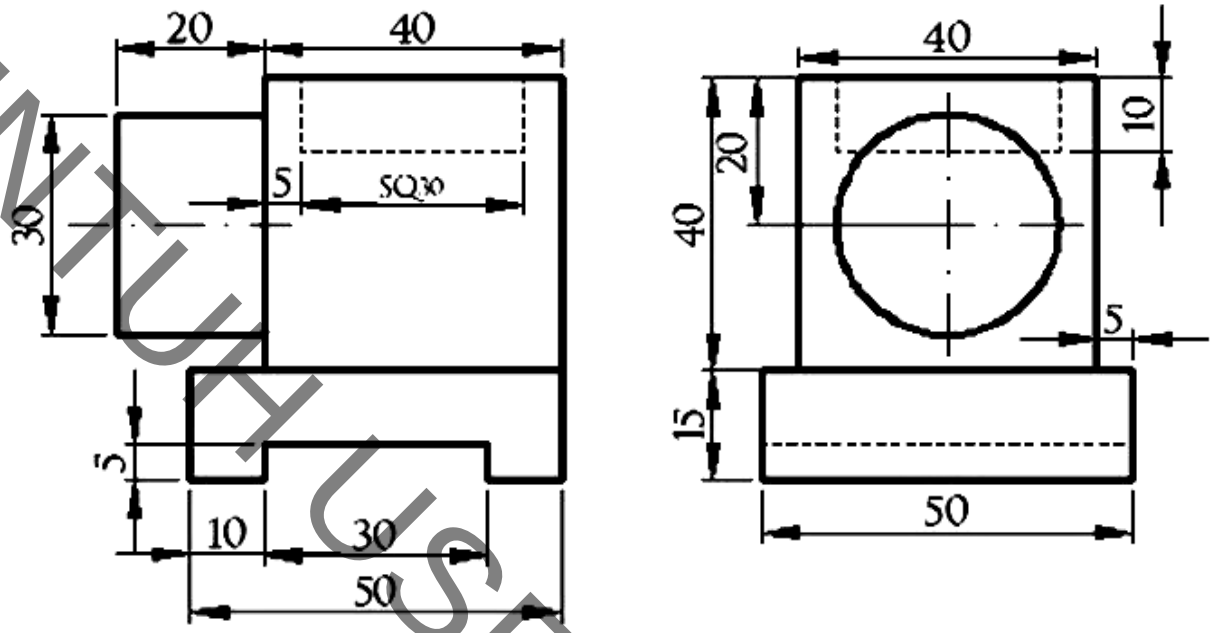

Figure: 2

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R18

Code No: 151AD

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year I Semester Examinations, July - 2021
ENGINEERING GRAPHICS
(Common to CE, ME, EIE, MCT, MMT, ECM, AE, MIE, PTM, CSBS, CSE(AIML), CSE(IOT))

Time: 3 hours **Max. Marks: 75**

Answer any three questions
All questions carry equal marks
- - -

1.a) The distance between two stations is 100 km and on a road map, it is shown by 30 cm. Draw a diagonal scale and indicate distances of 46.8 km, 71.9 km and 32.4 km on it.

b) The asymptotes of a hyperbola are inclined at 105^0 to each other. A point P on the curve is 40 mm and 50 mm from the asymptotes respectively. Construct two branches of the hyperbola and determine distance between its vertices, distance between its directrices, distance between its foci and eccentricity. [10+15]

2.a) Draw the projection of two points on the same reference line, point A being 20 mm above HP and 50 mm behind VP and point B being 25 mm below HP and 40 mm behind VP.

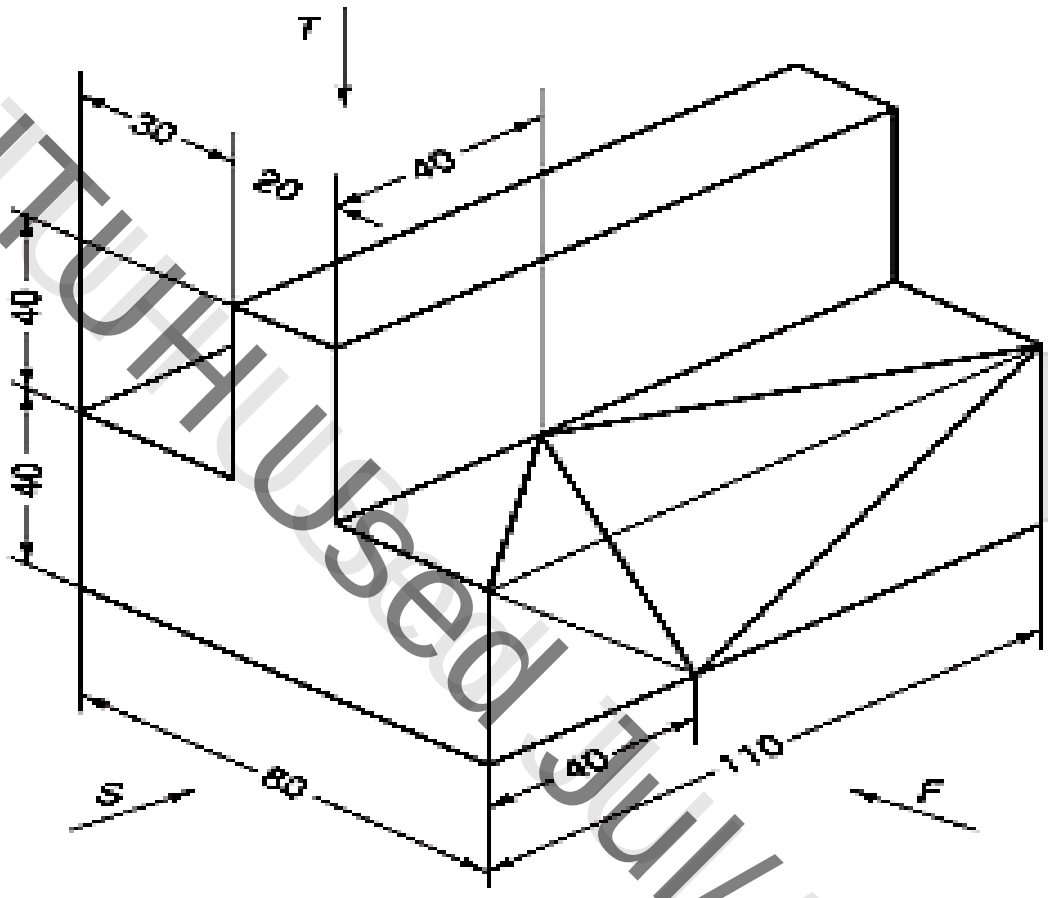
b) A line PQ inclined at 45^0 to the V.P. and has a 60 mm long front view. The end P is 10 mm from both the principal planes while end Q is 45 mm above HP. Draw the projections of the line and determine its true length and inclinations with the principal planes. [10+15]

3. An isosceles triangular plane ABC with a 70 mm base and altitude 80 mm has its base in the HP and inclined at 45^0 to the VP. The corners A and C are in the VP. Draw its projections and determine the inclination of the plane with HP. [25]

4. A cone with base 60 mm diameter and 70 mm long axis rests on one of its generators in the HP with its axis parallel to VP. It is cut by an AIP inclined at 60^0 to HP, bisecting the axis. Draw its sectional top view and true shape of the section. [25]

5. A cylinder with base circle diameter 50 mm and 60 mm height is resting on the base in HP. It is cut by a plane perpendicular to VP and 60 degrees inclined to HP and bisecting the axis of the solid. Draw development of lateral surface of the bottom part of the solid. [25]

6. Draw the orthographic projections of front view, top view and right side view in the first angle projection of the following solid as shown in figure. (All dimensions are in mm). [25]



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Code No: 151AD **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year I Semester Examinations, October/November - 2020
ENGINEERING GRAPHICS
(Common to CE, ME, EIE, MCT, MMT, AE, MIE, PTM)

Time: 2 hours **Max. Marks: 75**

Answer any three questions
All questions carry equal marks
- - -

1.a) Construct a diagonal scale of RF = (1/50), to read meters, decimeters and centimeters. Mark a distance of 4.35 km on it.
b) Draw an ellipse whose major and minor diameters are 150 mm and 100 mm respectively. [10+15]

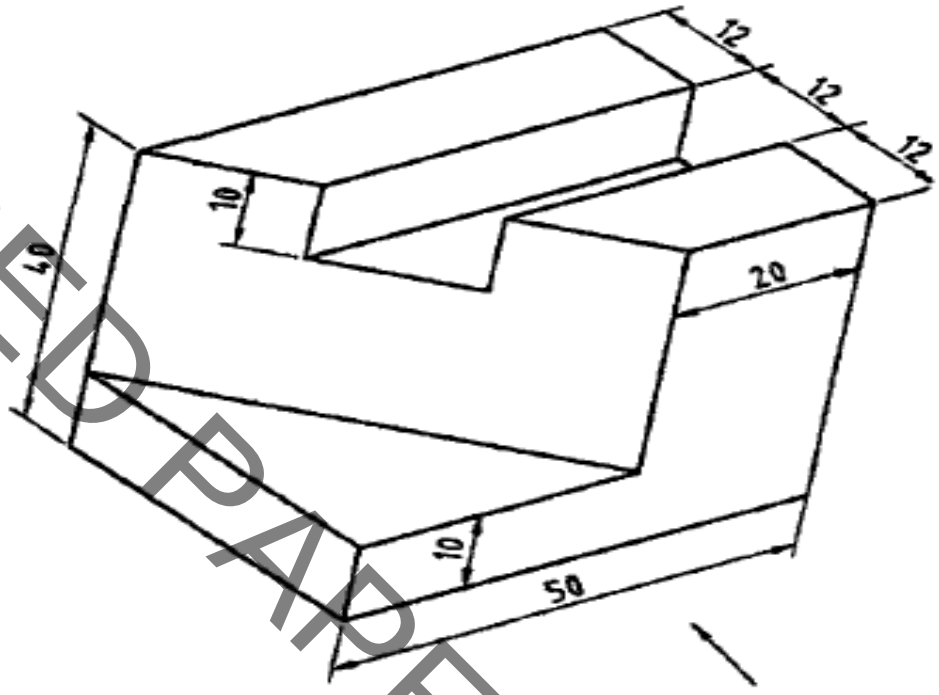
2.a) Draw a diagonal scale of 1:2.5 showing centimeters and millimeters and long enough to measure up to 20 centimeters. Show a distance of 13.4 cm on it.
b) Construct a parabola whose focus is at a distance of 40 mm from the directrix. Draw a tangent and normal to the parabola at a point 50 mm away from the principal axis. [10+15]

3. A line PQ 65 mm long has its end P, 15 mm above the HP and 15 mm in front of the VP. It is inclined at 55^0 to the HP and 35^0 to the VP. Draw its projections, and find its true length. [25]

4. A regular hexagon of side 20 mm has one of its sides inclined at 30^0 to VP. Its surface makes an angle of 60^0 with the ground. Draw its projections. [25]

5. Draw the projections of a square pyramid of base edges 30 mm and axis 54 mm, resting on its base on FIP with one base edge parallel to VP and axis perpendicular to the HP. [25]

6. Draw the front view, top view and left side view of the object shown in figure. All dimensions are in mm. [25]



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Code No: 151AD **R18**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year I Semester Examinations, September/October - 2021
ENGINEERING GRAPHICS
(Common to CE, ME, EIE, MCT, MMT, ECM, AE, MIE, CSBS, CSE(AI&ML), CSE(IOT))

Time: 3 Hours **Max. Marks: 75**

Answer any three questions
All questions carry equal marks
- - -

1.a) A circle of diameter 40mm is rolling on a straight line without slipping. Draw the path traced out by a point on the circle for its one complete rotation.
b) Construct a scale of 1:5 to show decimetres and centimeters and long enough to measure up to 1m. Show a distance of 6.3 dm on it. [12+13]

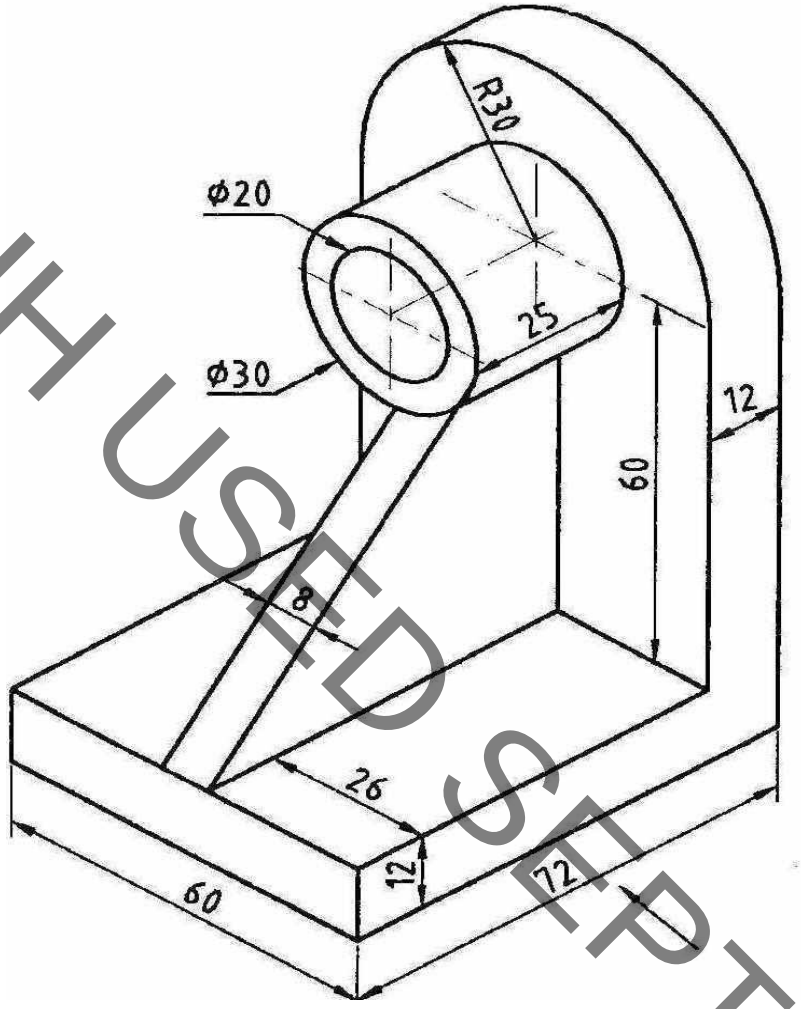
2.a) A line PQ, inclined at 45^0 to the V.P., has a 60 mm long front view. The end P is 10 mm from both the principal planes while the end Q is 45 mm above the H.P. Draw the projections of the line and determine its true length and inclinations with the principal planes.
b) A square lamina with a 40 mm side has its surface parallel to and 30 mm in front of the V.P. Draw the projections when one of its sides is inclined at 30^0 to the H.P. [12+13]

3. A hollow cylinder, with a 60 mm outside diameter, a 65 mm axis and 8 mm thickness, is resting on its base on the H.P. An A.I.P. inclined at 30^0 to the H.P., and passing through a point on the axis 12 mm from its top end, cuts the cylinder. Draw its sectional top view, sectional side view and true shape of the section. [25]

4. A vertical cylinder, 45 mm in diameter and 60 mm in length is completely penetrated by a horizontal cylinder 45 mm in diameter and 70 mm in length. The axis of the horizontal cylinder is parallel to the *VP*, 45 mm above the base of the vertical cylinder and 10 mm in front of the axis of the vertical cylinder. Draw their projections showing the curves of intersection. [25]

5. A cone of base circle diameter 40 and height 60 is resting on the ground on its base. It is cut by a section plane perpendicular to VP and inclined at an angle of 30^0 to HP. Section plane is passing through the axis a point 20 mm from the base of the cone. Draw the development of lateral surface of top part of the solid. [25]

6. Draw the elevation, top view and side view of the object shown in figure. All dimensions are in mm. [25]



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157

Code No: 151AD

R18

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year I Semester Examinations, June - 2022

ENGINEERING GRAPHICS

(Common to CE, ME, EIE, MCT, MMT, ECM, AE, MIE, PTM, CSBS, CSE(AI&ML), CSE(IOT))

Time: 3 Hours **Max. Marks: 75**

Answer any three questions
All questions carry equal marks

- - -

1. On a map the distance between two points is 1 cm. The real distance between them is 20 km, draw a diagonal scale of this map to read kilometers and hectometers and to measure up to 25 km. Show a distance of 17.6 km on this scale. [25]

2.a) The major-axis AB of an ellipse is 140 mm long with P as its mid-point. The foci F_1 and F_2 of the ellipse are 48 mm away from the mid-point P. Draw the ellipse and find the length of the minor axes.

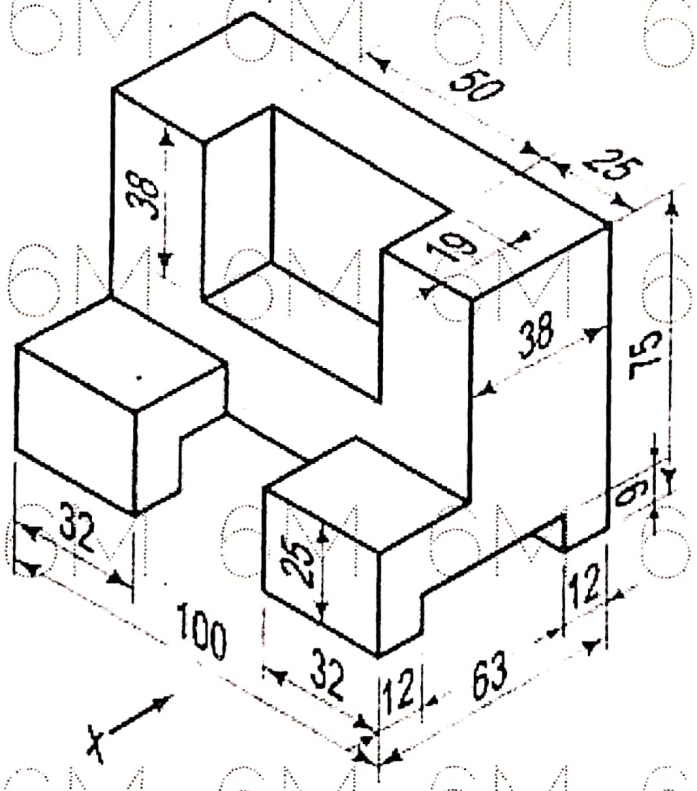
b) A point P is 15 mm above the H.P. and 20 mm in front of the V.P. Another point Q is 25 mm behind the V.P. and 40 mm below the H.P. Draw projections of P and Q keeping the distance between their projectors equal to 90 mm. Draw straight lines joining (i) their top views and (ii) their front views. [10+15]

3. Draw the projections of a regular hexagon of 25 mm side, having one of its sides in the H.P. and inclined at 60^0 to the V.P., and its surface making an angle of 45^0 with the H.P. [25]

4. A hexagonal prism, base 30 mm side and axis 75 mm long, has an edge of the base parallel to the H.P. and inclined at 45^0 to the V.P. Its axis makes an angle of 60^0 with the H.P. Draw its projections. [25]

5. A cube of 50 mm long edges is resting on the H.P. with a vertical face inclined at 30^0 to the V.P. It is cut by a section plane, perpendicular to the V.P., inclined at 30^0 to the H.P. and passing through a point on the axis, 38 mm above the H.P. Draw the sectional top view, true shape of the section and development of the surface of the remaining portion of the cube. [25]

6. Draw (a) front view (b) side view (c) top view of following casting. (All dimensions are in mm). [25]



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Code No: 151AD

R18

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech I Year I Semester Examinations, June - 2022
ENGINEERING GRAPHICS
(Common to ECE, TTE, AI&DS, AI&ML)

Time: 3 Hours **Max. Marks: 75**

Answer any three questions
All questions carry equal marks

1.a) Inscribe an ellipse inside a rectangle of 140 mm × 65 mm.
b) Construct a Diagonal scale of RF = 3:200 showing meters, decimeters and centimeters. The scale should measure up to 6 meters. Show a distance of 4.56 meters. [12+13]

2. A line RS having length 90 mm is inclined at 30^0 to HP and 45^0 to VP. The point R is 10 mm above HP and 15 mm in front of VP, and the end S is in second quadrant. Draw the projections of the line. [25]

3. Draw the projections of a cone, base 50 mm diameter and 75 mm long, lying on a generator on the ground with the top view of the axis making an angle of 45^0 with the HP. [25]

4. A hexagonal pyramid of base edge 20 mm and height 40 mm rests on one of the corners of the base in HP, with its axis is inclined at 30^0 to HP and parallel to VP. A vertical section plane inclined at 30^0 to VP cuts the pyramid removing 15 mm length of the axis from apex. Draw the projections of the pyramid and find the true shape of the section. [25]

5. A cube of 40 mm edge stands on one of its faces on HP with a vertical face making 45^0 to VP. A hole of 30 mm diameter and whose axis is perpendicular to VP and parallel to HP is drilled centrally through the cube such that the hole passes through the opposite vertical edges of the cube. Obtain the development of the lateral surface of the cube with the hole. [25]

6. A square pyramid with side of base 40 mm and height 60 mm is resting on a cube of sides 50 mm, the axes of the cube and the pyramid being in the same line. Two sides of the base of the pyramid are parallel to the edges of the cube. Draw the isometric view of the combined solid. [25]

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R18

Code No: 152AG

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year II Semester Examinations, June - 2022

ENGINEERING GRAPHICS

(Common to EEE, IT, CSIT, ITE, CE(SE), CSE(CS), CSE(DS), CSE(Networks))

Time: 3 Hours **Max. Marks: 75**

Answer any three questions

All questions carry equal marks

\- - -

1.a) The area of a field is 50,000 sq m. The length and the breadth of the field, on the map is 10 cm and 8 cm respectively. Construct a diagonal scale which can read up to one meter.

b) Construct a hypocycloid rolling circle 50 mm diameter and directing circle 175 mm diameter. Draw a tangent to it at a point 50 mm from the center of the directing circle. [10+15]

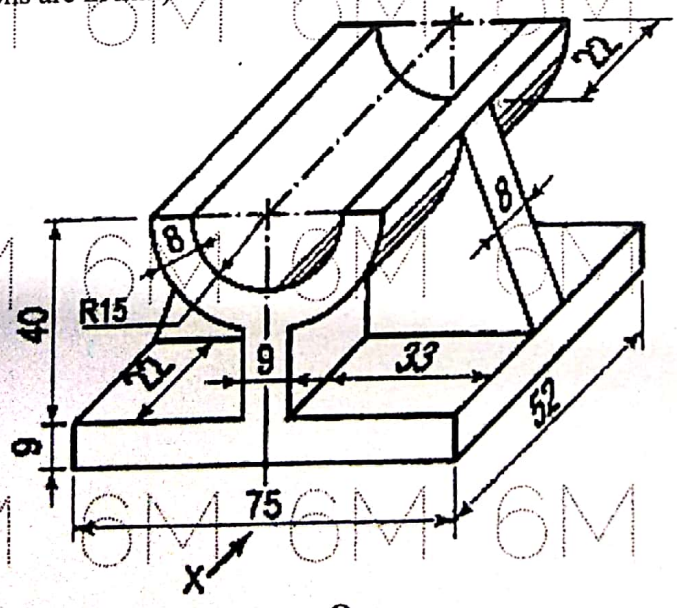
2. Two points A and B are in the H.P. The point A is 30 mm in front of the V.P., while B is behind the V.P. The distance between their projectors is 75 mm and the line joining their top views makes an angle of 45^0 with xy. Find the distance of the point B from the V.P. [25]

3. A line AB, 90 mm long, is inclined at 45^0 to the H.P. and its top view makes an angle of 60^0 with the V.P. The end A is in the H.P. and 12 mm in front of the V.P. Draw its front view and finds its true inclination with the V.P. [25]

4. 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. [25]

5. 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 V.P. Draw its projections. [25]

6. Draw (a) front view (b) side view from the right (c) top view of following casting. (All dimensions are in mm). [25]



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Code No: 152AG

R18

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech I Year II Semester Examinations, June - 2022

ENGINEERING GRAPHICS

(Computer Science and Engineering)

Time: 3 Hours **Max. Marks: 75**

Answer any three questions
All questions carry equal marks

- - -

1.a) Draw a parabola if the distance of the focus from the directrix is 60 mm.

b) A circle of diameter 40 mm rolls inside another circle of radius 60 mm. Draw the hypocycloid traced by a point on the rolling circle initially in contact with the directing circle for one revolution. [10+15]

2.a) A line AB, 50 mm long, has its end A at 40 mm above the HP and 20 mm in front of the VP. The end B is closer to the HP but away from the VP. Draw the projections of the line if it is inclined to the HP at 30^0 and to the VP at 45^0.

b) A rectangle ABCD of size 30 mm × 20 mm is inclined to the HP at 30^0. Its shorter side AB is parallel to the HP and inclined at 45^0 to the VP. Draw the projections of the rectangle. [10+15]

3.a) A triangular prism, 40 mm side of base and 60 mm length of axis, has its axis perpendicular to the VP. Draw the projections if one of the rectangular faces is parallel to the HP and 20 mm above the HP.

b) A cone of base 60 mm diameter and height 80 mm is resting on a point on the circumference of base on the HP with its apex 55 mm above the HP. Draw its projections if its axis is inclined at 45^0 to the VP. [10+15]

4. A vertical square prism with a 60 mm base side and an 80 mm axis length, is completely penetrated by a horizontal square prism with a 40 mm side base and a 100 mm axis length such that their axes bisect each other. The faces of both the prisms are equally inclined to the VP. Draw the three views of the solids showing LOI. [25]

Contd…

5. Draw (a) Front view (b) Top view and (c) side view of the isometric view given in the figure 1 (All dimensions are in mm). [25]

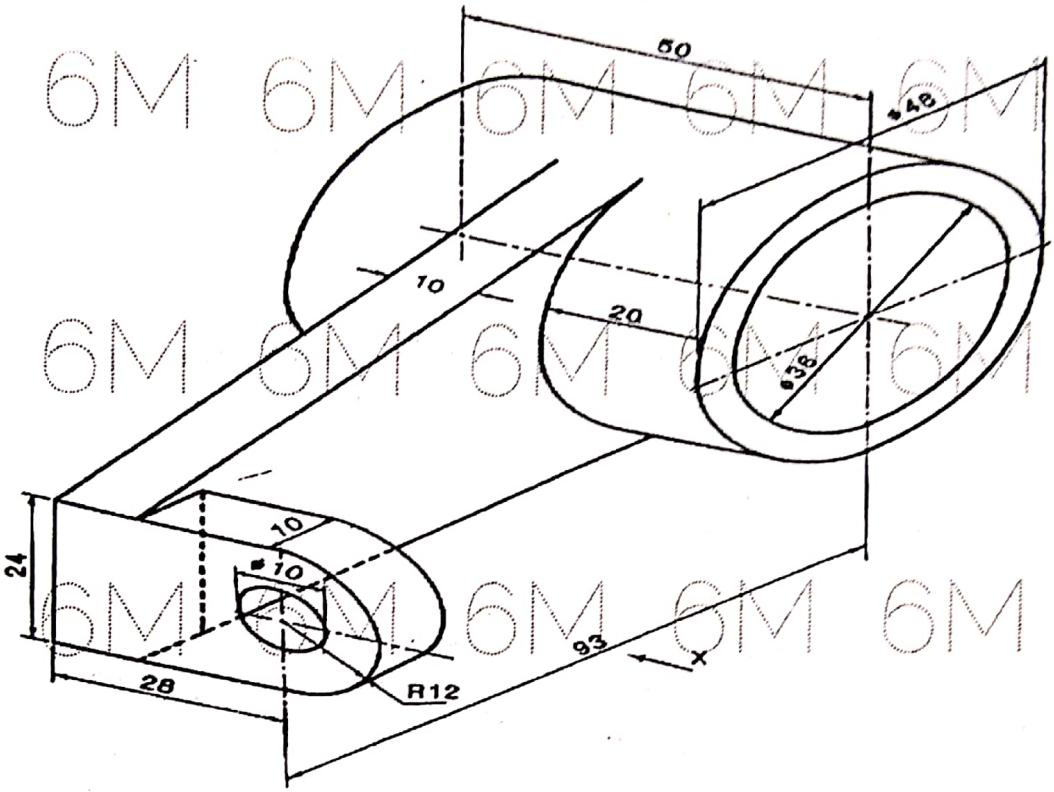

Figure 1

6. Figure 2 below shows the FV and TV of the object. Draw its isometric view. (All dimensions are in mm). [25]

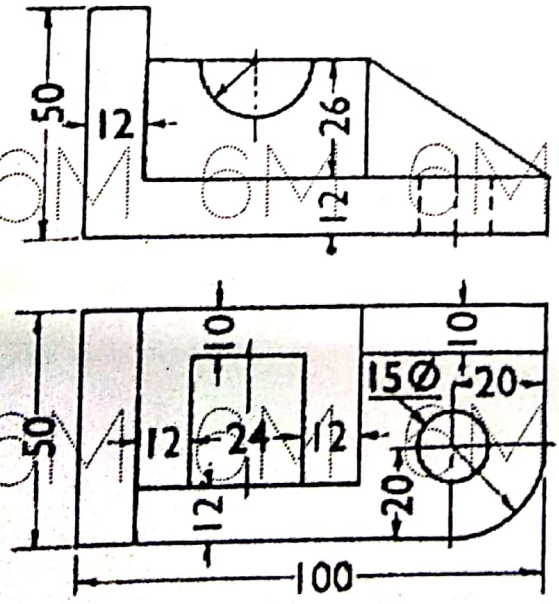

Figure 2

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THANK YOU ONE AND ALL

By

A.NARESH BABU

"DO ALL THE GOOD YOU CAN, FOR ALL THE PEOPLE YOU CAN, IN ALL THE WAYS YOU CAN, AS LONG AS YOU CAN."