LUKHDHIRJI ENGINEERING COLLEGE-MORBI

ENGINEERING GRAPHICS & DESIGN (3110013)

2022_23

LAB MANUAL

&

ASSIGNMENTS

STUDENT NAME :_____

ENROLL NO. :_____

BRANCH :_____

BATCH :_____

Vision: To deliver quality engineering education for Mechanical Engineers with Professional competency, Human values and Acceptability in the society.

Mission:

- To nurture engineers with basic and advance mechanical engineering concepts.
- To impart Techno-Managerial skill in students to meet global engineering challenges.
- To create ethical engineers who can contribute for sustainable development of society.

LUKHDHIRJI ENGINEERING COLLEGE-MORBI

Vision of the Institute

- To provide quality engineering education and transforming students into professionally competent and socially responsible human beings.

Mission of the Institute

- To provide a platform for basic and advanced engineering knowledge to meet global challenges.
- To impart state-of-art know- how with managerial and technical skills.
- To create a sustainable society through ethical and accountable engineering practices.

MECHANICAL ENGINEERING DEPARTMENT

Vision of the Department

- To deliver quality engineering education for Mechanical Engineers with Professional competency, Human values and Acceptability in the society.

Mission of the Department

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CERTIFICATE

This is to certify that Mr. / Ms. _____

Enrollment no. _____ of 1st / 2nd semester Bachelor of _____ Engineering has completed the term work satisfactorily in Engineering Graphics & Design (3110013) for the academic year _____ as prescribed in the GTU curriculum.

Place:_____ Date:_____

Subject faculty **Head of Department**

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List of Drawing Sheets

Sr. No.	Sheet Title	COs	POs	Start Date	End Date	Sign	Remark
1.	Introduction to EngineeringGraphics.	CO1	PO1				
2.	Plane Scale And Diagonal Scale	CO1	PO1				
3.	Loci of Points	CO2	PO1,PO2				
4.	Engineering Curves	CO2	PO1,PO2				
5.	Projection of Points And Line	CO3	PO1,PO2				
6.	Projection of Plane	CO3	PO1,PO2				
7.	Projection of Solid, Section of Solid And Development ofSurfaces	CO3	PO1,PO2				
8.	Orthographic Projection	CO4	PO2,PO5, PO10				
9.	Isometric Projection	CO4	PO2,PO5, PO10				
10.	Orthographic Drawing (Three Views) Using AutoCAD Commands.	CO4	PO2,PO5, PO10				

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Drawing Instruments (To purchase)

Sr. No.	Name of Instrument	Quantity
1.	Setsquare (45°, 30°- 60°)	01 set
2.	Lead Pencil (2H grade)	01
3.	Compass with attached lead pencil	01
4.	Circle master (Rectangle shape)	01
5.	Eraser (Non dust)	01
6.	Roller scale (30 cm length)	01
7.	Sketch books	02 + As required
8.	Sheets (A2 size)	09

Reference Books:

1. A Text Book of Engineering Graphics by P.J.Shah S.Chand & Company Ltd., New Delhi
2. Elementary Engineering Drawing by N.D.Bhatt Charotar Publishing House, Anand
3. A text book of Engineering Drawing by R.K.Dhawan, S.Chand & Company Ltd., New Delhi
4. A text book of Engineering Drawing by P.S.Gill, S.K.Kataria & sons, Delhi
5. Engineering Drawing by B. Agrawal and C M Agrawal, Tata McGraw Hill, New Delhi
6. Engineering Graphics By Arunoday Kumar, Tech – Max Publication, Pune.
7. Sham Tickoo, AutoCAD 2009, CENGAGE learning Indian Edition.
8. Engineering Drawing & Graphics using Auto CAD 2000 By T. Jeyapoovan, Vikas Publishing House Pvt. Ltd., New Delhi
9. Engineering Drawing with an Introduction to Auto CAD By D.A. Jolhe, Tata McGraw-Hill Publishing Co. Ltd., New Delhi.
10. A Bible on AutoCAD by Ellen Finkelstein, Wiley Publishing, Inc.

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LEARNING ASSIGNMENT

(To write in Drawing Sketch Book)

RECOMMENDED SCALES

CATEGORY			
ENLARGEMENT SCALES	50:1 5:1	20:1 2:1	10:1
FULL SIZE	1:1		
REDUCTION SCALES	1:2 1: 20 1: 200 1: 2000	1: 5 1:50 1:500 1: 5000	1:10 1:100 1:1000 1:10000

NOTE - IN EXCEPTIONAL CASES WHERE FOR FUNCTIONAL REASONS THE RECOMMENDED SCALES CANNOT BE APPLIED, INTERMEDIATE SCALES MAY BE CHOSEN.

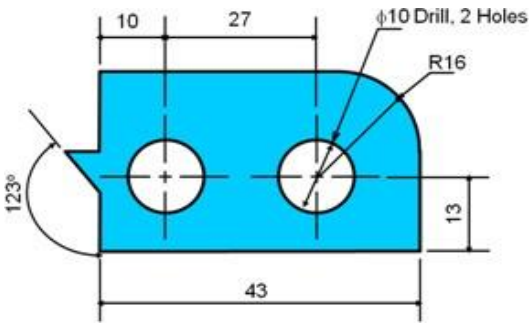
TYPES OF LINE AND THEIR APPLICATIONS IN MECHANICAL ENGINEERING DRAWINGS

TYPE	ILLUSTRATION	APPLICATION
A – Continuous Thick		Visible Outlines
B – Continuous Thin		Dimension Lines, Leader Lines, Extension Lines, Construction Lines of Adjacent Parts
C – Continuous Thin- Wavy		Irregular Boundary Lines, Short Break Lines
D – Short Dashes Medium		Hidden Outlines & Edges
E – Long Chain Thin		Centre Lines, Locus Lines, Extreme Positions of The Movable Parts Situated In Front of The Cutting Plants And Pitch Circles
F – Long Chain Line Thick at Ends & Thin Elsewhere		Cutting Plane Lines
G – Long Chain Thick		To Indicate Surfaces Which are to Receive Additional Treatment
H – Ruled Line & Short Zigzag Thin.		Long Break Lines

DIMENSIONING METHODS

Dimensioning components

1. Extension lines
2. Dimension lines with arrowheads
3. Leader lines
4. Dimension figures
5. Notes :
   - *General note*
   - *local note*

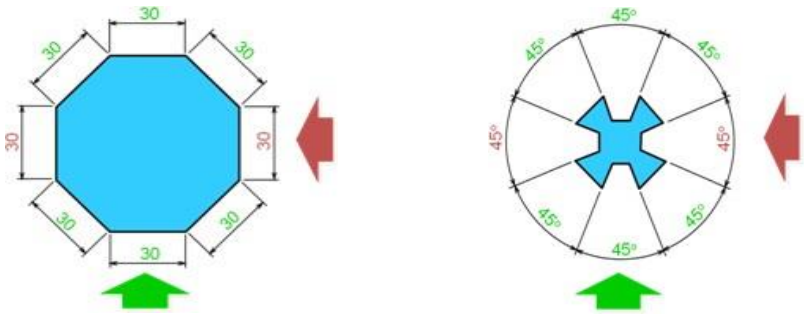


Dimensioning Methods

1. Aligned method

The dimension figures are placed so that they are readable from the **bottom** and **right side** of the drawing.

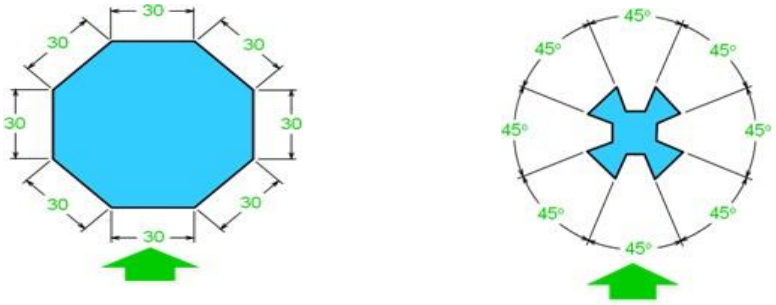
EXAMPLE: Dimension of ***length and angle*** using ***aligned*** method.



2. Unidirectional method

The dimension figures are placed so that they can be read from the **bottom** of the drawing.

EXAMPLE: Dimension of ***length*** and ***Angle*** using ***unidirectional*** method.



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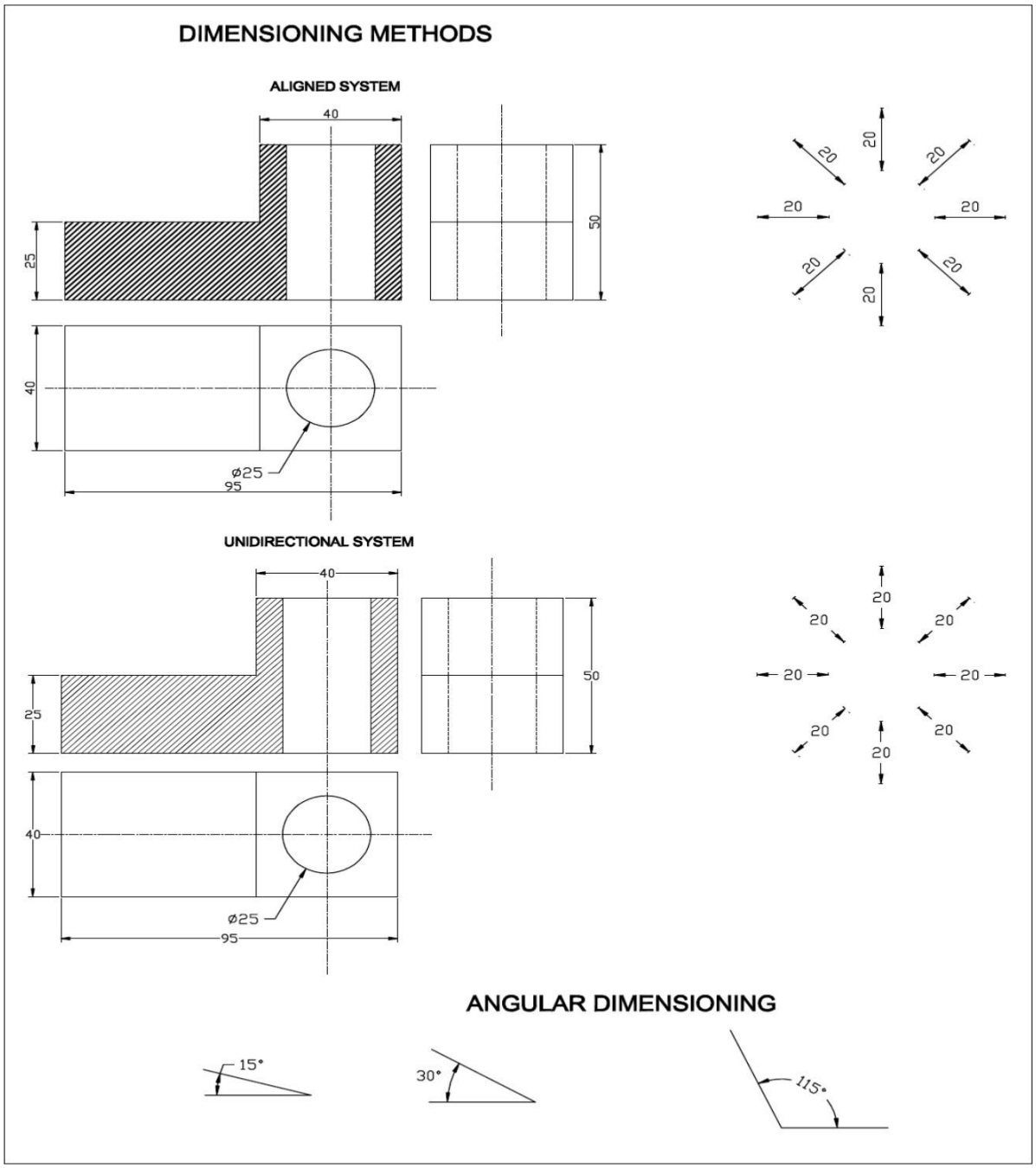

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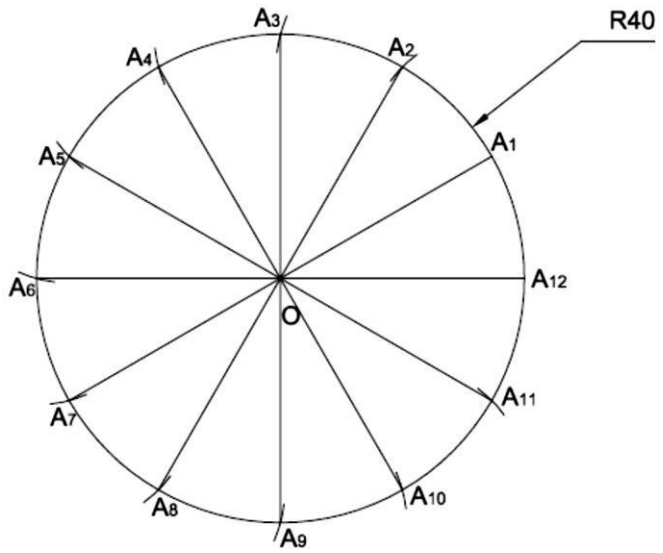
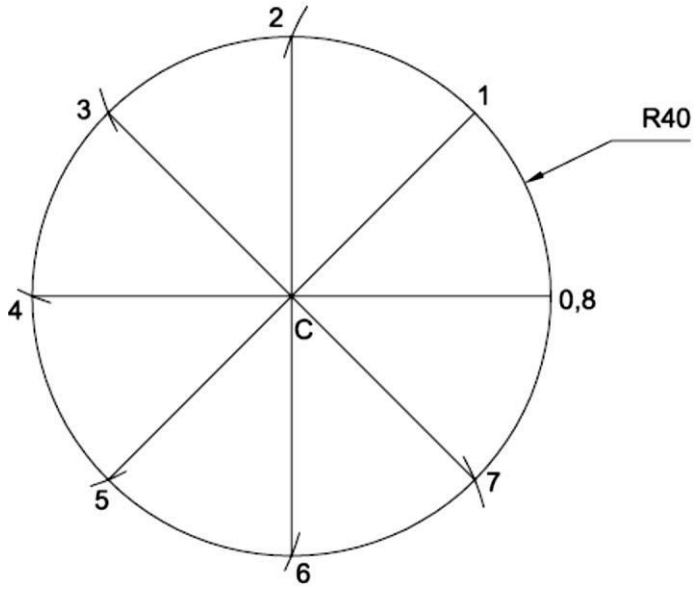
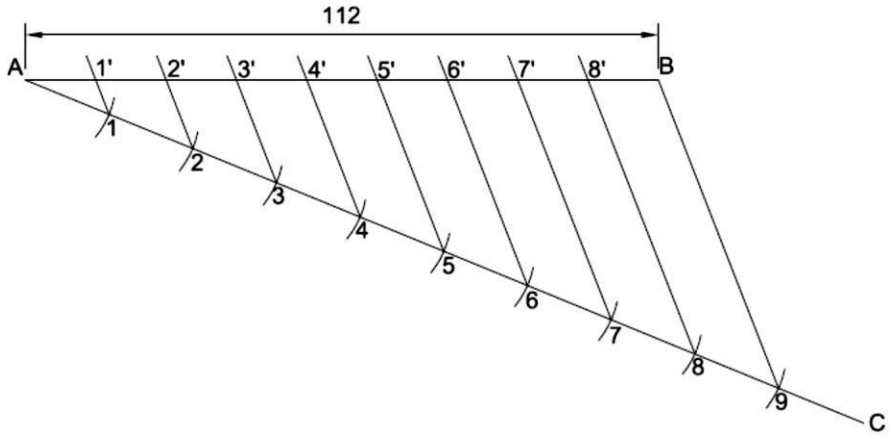
1.4 To make 12 equal parts of circle. Take Radius=40mm



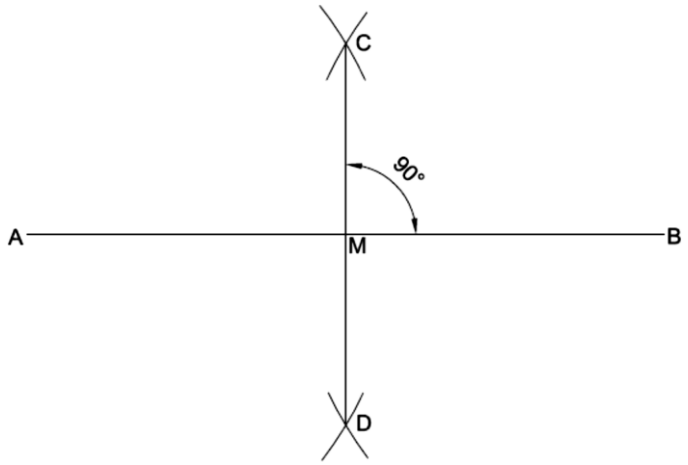
1.5 To make 08 equal parts of circle. Take Radius=40mm



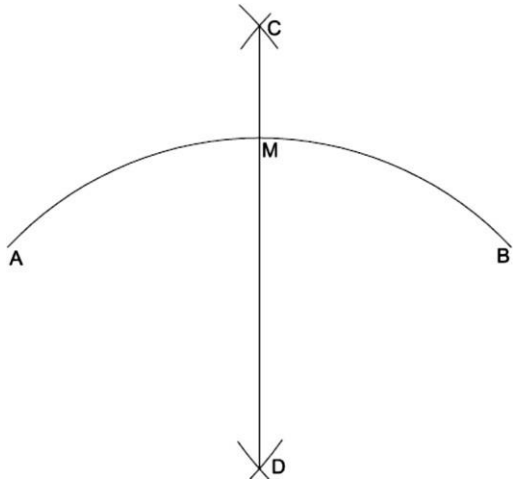
1.6 To make 9 equal parts of line. Length of line = 112 mm



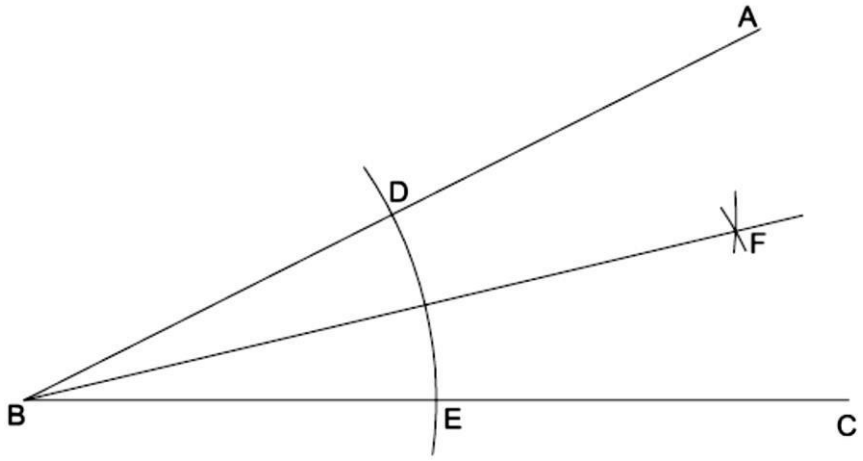
1.7 Bisect a line AB.



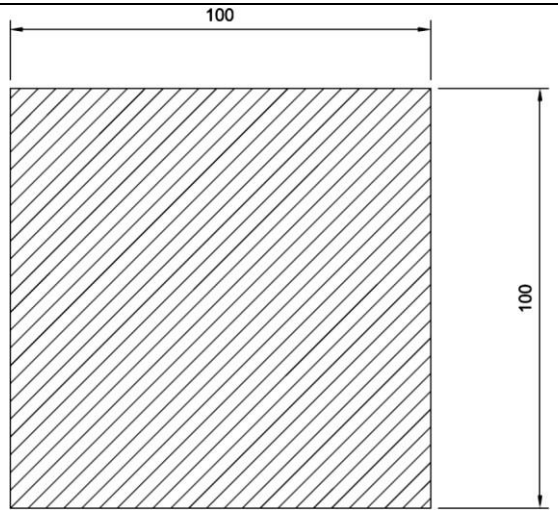
1.8 Bisect an arc AB



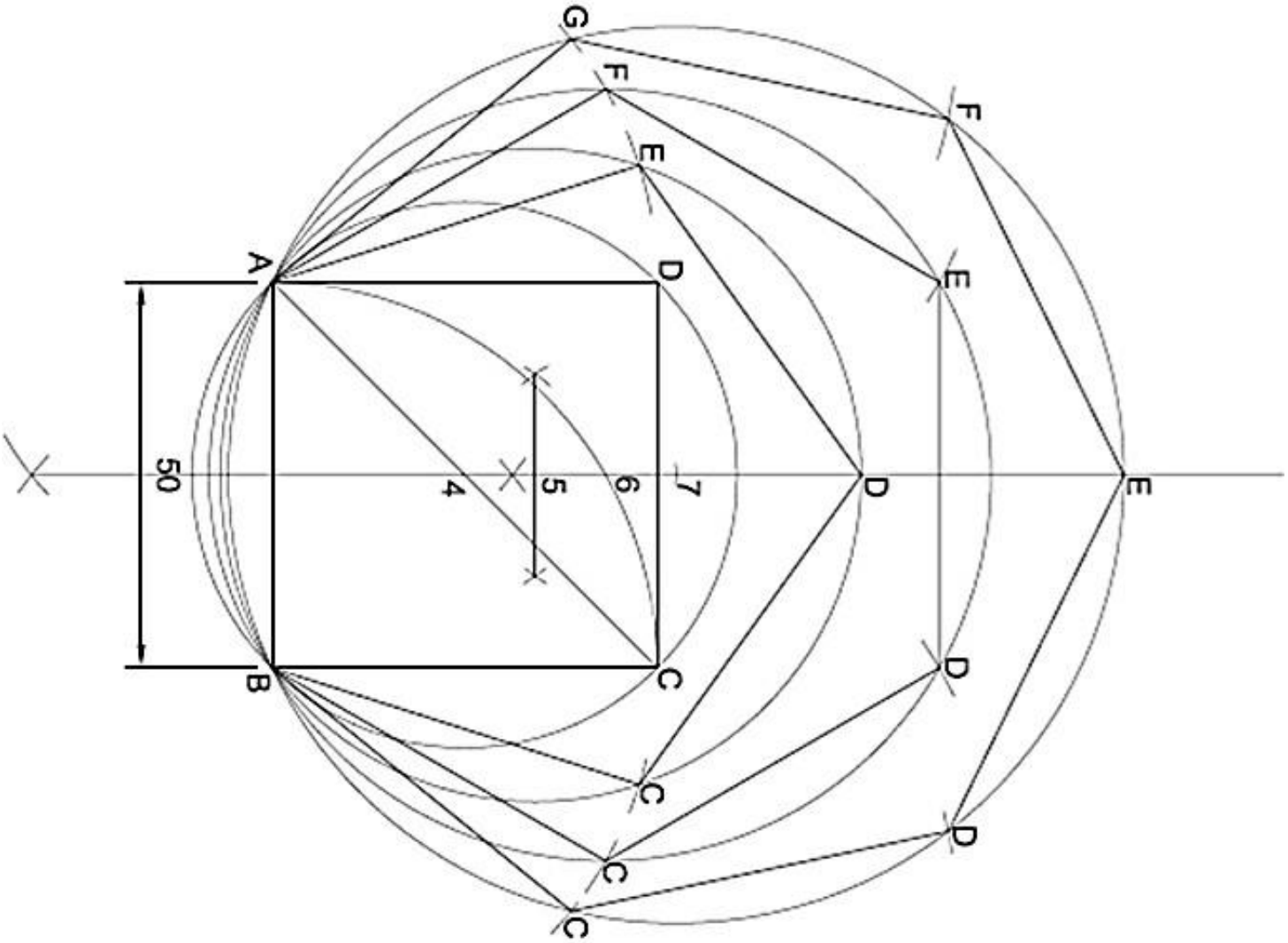
1.9 Bisect an angle



1.10 Draw section line, try to keep 2mm distance between two section line



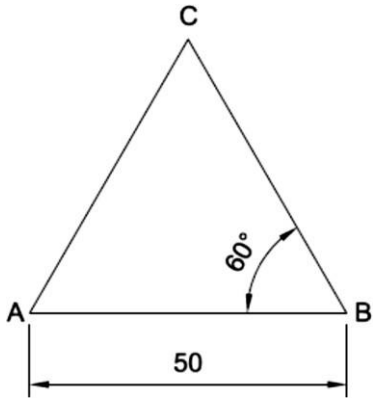
1.11 To draw polygons for given length of one side. Take length of side = 50 mm.



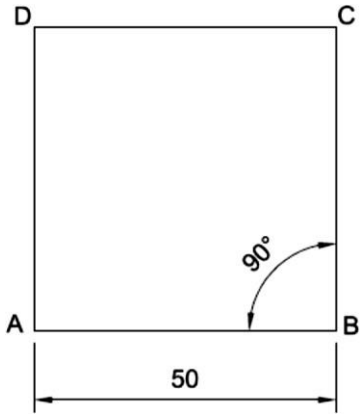
1.12 To draw polygons using protractor. Length of side = 50mm

$$REQUIRED\ ANGLE = \frac{(2N-4)90°}{N}$$

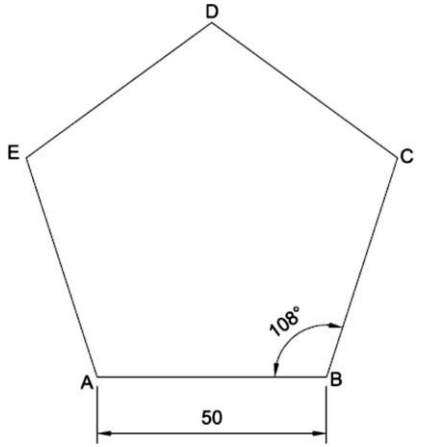
Triangle



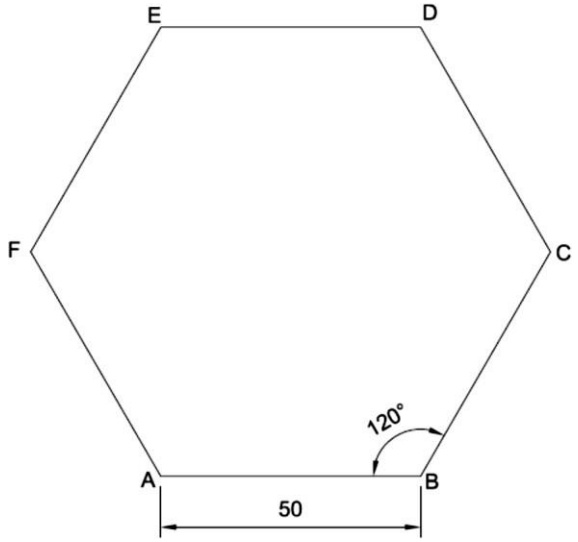
Square



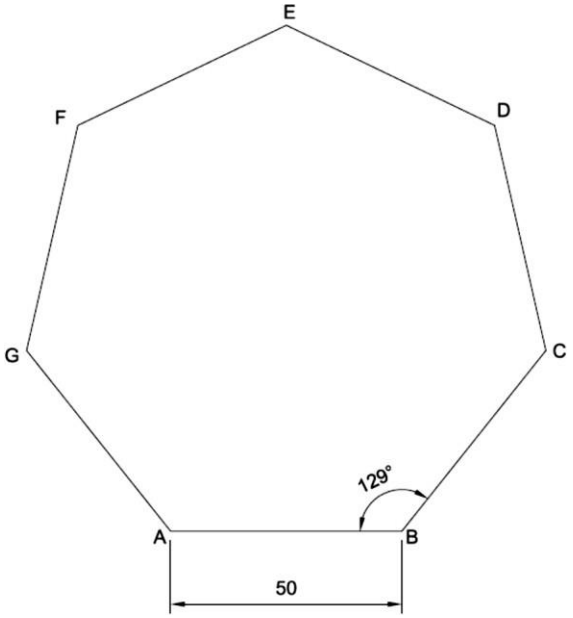
Pentagon



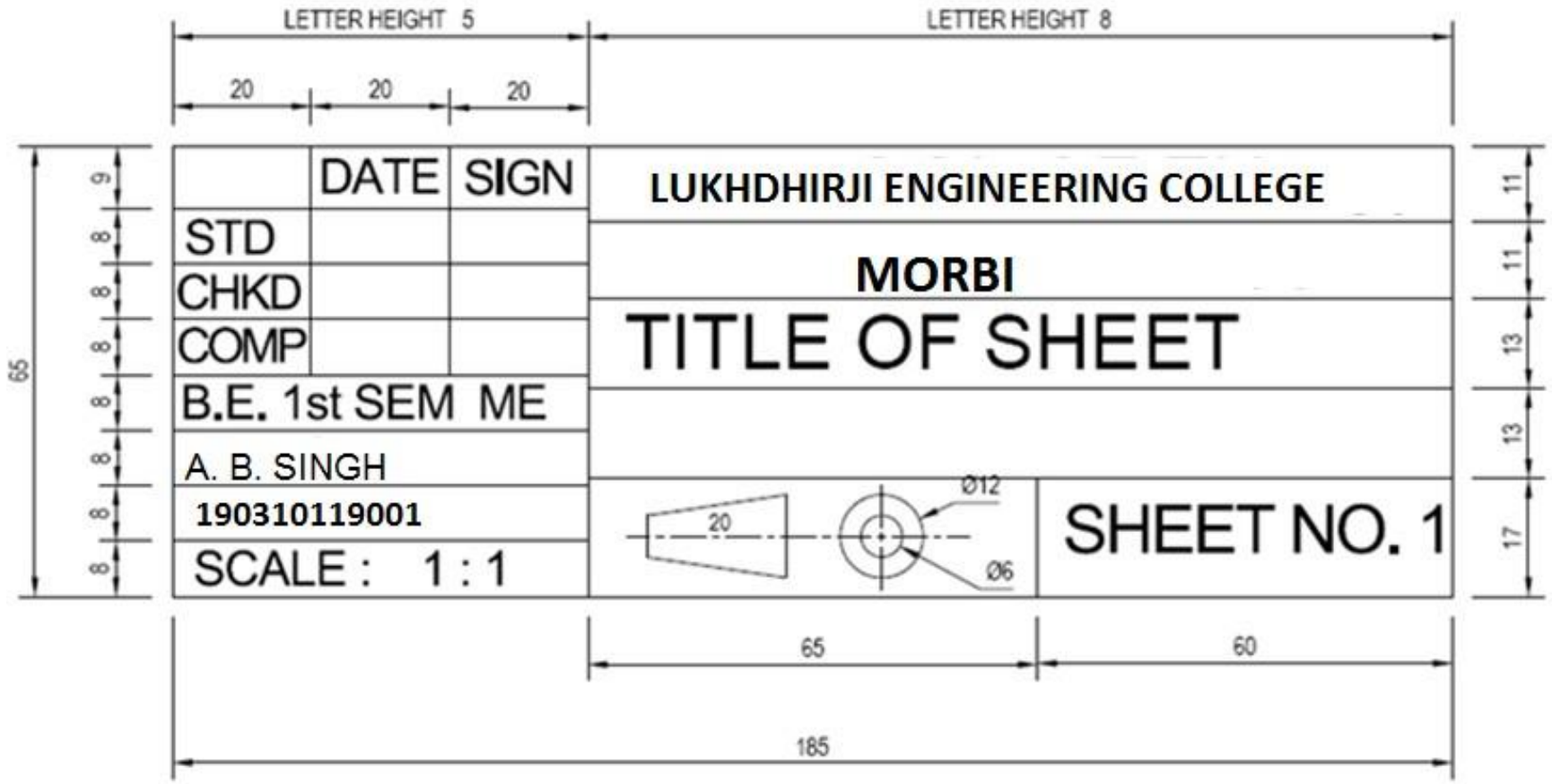
Hexagon



Heptagon



1.13 Title Block



ALL DIMENSIONS ARE IN MM

TYPES OF LINES

TYPE	ILLUSTRATION	APPLICATION
A - Continuous Thick		Visible Outlines
B - Continuous Thin		Dimension Lines, Leader Lines, Extension Lines, Construction Lines of Adjacent Parts
C - Continuous Thin- Wavy		Irregular Boundary Lines, Short Break Lines
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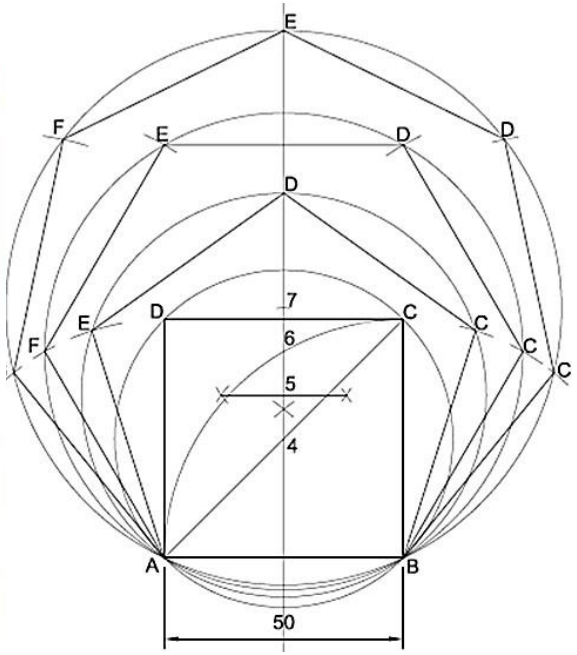
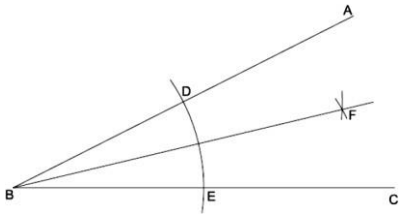
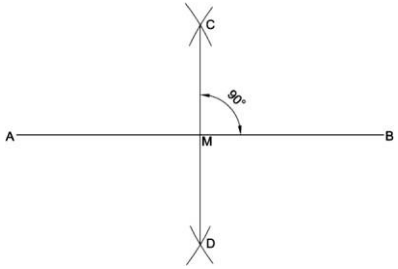


To construct a regular figure of given side length and of N sides

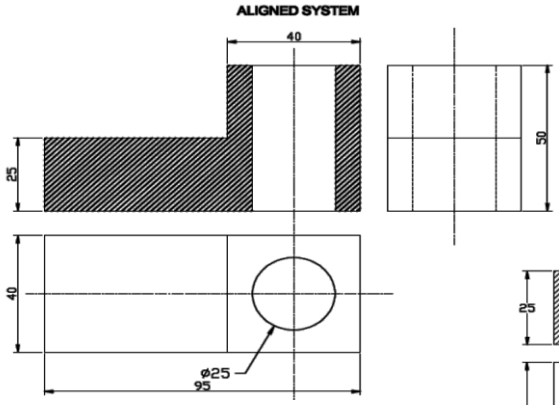


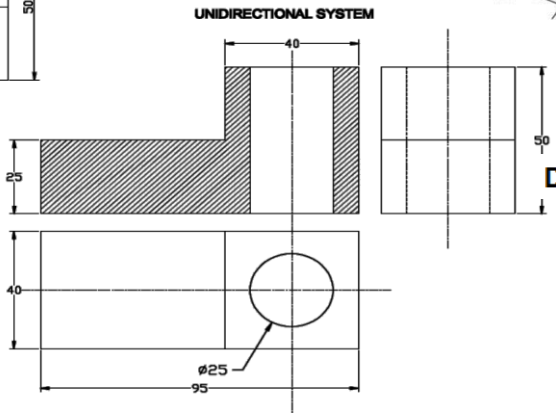
Bisect an angle

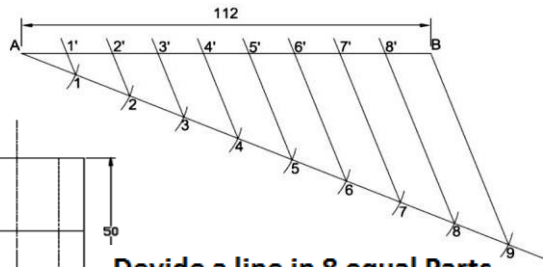


Bisect a line

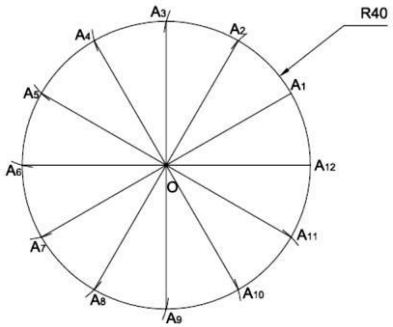
DIMENSIONING METHODS







Devide a line in 8 equal Parts



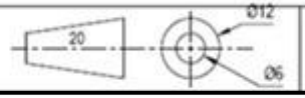
Devide a circle in 12 equal parts

	DATE	SIGN
STD		
CHKD		
COMP		
B.E. 1st SEM ME		
A. B. SINGH		
190310119001		
SCALE : 1 : 1		

LUKHDHIRJI ENGINEERING COLLEGE

MORBI

PRACTICE SHEET



SHEET NO. 1

ASSIGNMENT -1

INTRODUCTION TO ENGINEERING GRAPHICS

1. Write the importance of Engineering Drawing as per BIS SP 46.
2. Explain the uses of T Square, Mini Drafter, Compass and Set squares.
3. Differentiate between aligned system and unidirectional system of dimensioning with necessary diagram.
4. State the uses of continuous thin wavy and long chain thick lines with their drawings.
5. Write the applications of Centre lines and Hidden lines.
6. List the preferred sizes of drawing sheets with their dimensions in mm.

SHEET NO. 2

PLANE SCALE AND DIAGONAL SCALE

1. Draw a scale of 1:50 to show meters and decimeters and long enough to measure up to 6 meters. Show 3.7 m on it.
2. The distance between two places is 210 km and its equivalent distance on map measures 12 cm. Draw a plain scale to indicate 270 km and 120 km.
3. On a map, the distance of 11km is shown by a 22 cm long line. Find the RF. Construct plain scale of this RF and measure up to 4km. Also show the following distances on it.
   1) 0.40 km 2) 2.10km 3) 3.50 km
4. Draw a diagonal scale of R.F, 1:5 showing decimeters, centimeters and millimeters and long enough to measure up to 8 decimeters. Show a distance of 5.37 dm, 4.31 dm on it.
5. The length of the Khandala tunnel on the Mumbai Pune expressway is 350 m on the road map, it is shown by a 16.5 cm long line on map. Construct a scale to show meters and to measure up to 500m. Show the length of 389 meter long on it.

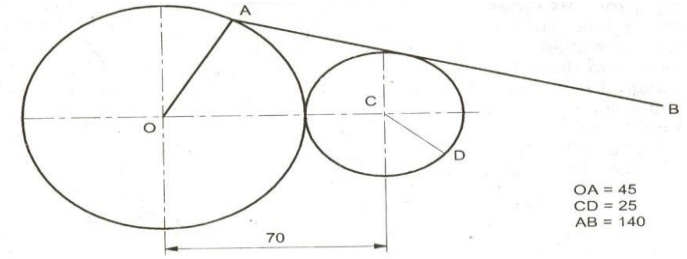
ASSIGNMENT - 2

PLANE SCALE AND DIAGONAL SCALE

1. Define Representation Factor. What is Difference between plain Scale and Diagonal Scale?
2. A distance of 1000 km is to be represented by a length of 200 mm. find the RF and length of scale.
3. Draw a plain scale of 5cm **:** 1 m to read in meters and decimeters and that is long enough to measure 3.8 m. Mark the following distances on the scale:
   1) 2 m and 6 decimeters
   2) 3 m and 8 decimeters
4. Construct a diagonal scale of representative fraction = (1/36) showing yard, foot and inch. Scale should be long enough to measure 5 yard. Measure 3 yard, 2 foot, and 9 inch.

SHEET NO. 3
LOCI OF POINTS

1. Consider OBA is an offset slider crank. Crank OB is 30 mm long and rotates in clockwise direction. Connecting rod AB is 128 mm long. Offset is 40 mm. Draw the loci of two points P which is midpoint of connecting road AB
2. O_1ABO_2 is a four bar chain with the link O_1O_2as a fixed link. O_1A and O_2 B are driver and driven crank respectively and link AB is a connecting link. Draw the locus of midpoint M of the link AB. Take: Driver and driven link = 30 mm, Connecting link AB = 90 mm and Distance between O1 and O2 = 90 mm.
3. In the mechanism shown in figure. crank OA rotates about O and rod AB is connected to crank at A. The rod AB slides on the curved surface of the roller in a actual plane. Trace the locus of end B. take OA = 45 mm, CD = 25 mm, and AB = 140 mm.



ASSIGNMENT – 3
LOCI OF POINTS

1. Find the locus of point P, moving in a plane, keeping its distances equal from a fixed straight line O_2O_3 and a fixed circle (O_1, 25).
2. OBA is a simple slider crank chain. OB is a crank of 30 mm length. BA is a connecting rod of 90 mm length. Slider A is sliding on straight path passing through point O. Draw the locus of the mid-point of the connecting rod AB for one complete revolution of the crank OB.
3. A circular disc of 72 mm diameter rotates about its centre in the clockwise direction. While the disc completes one revolution, an insect walks across the diameter of the disc. Plot the locus of the insect, assuming both the rotation of disc and movement of the insect as uniform.

SHEET NO. 4
ENGINEERING CURVE

1. The major axis and minor axis of the ellipse are 70 mm and 45 mm long respectively. Construct half ellipse by oblong method and other half by concentric circle method.
2. A triangle ABC has sides AB = 75 mm, BC = 60 mm and CA = 75 mm. Draw a parabola passing through points A, B and C when side BC is horizontal.
3. Draw an epicycloid with rolling circle diameter 50 mm and directing circle diameter 150 mm. Draw tangent and normal at a point on the curve 110 mm from the centre of the directing circle.
4. Construct an Archimedean spiral of one and half convolutions. The largest radius is 100 mm and smallest radius is 20 mm.
5. An inelastic string of 120 mm length is wound around a disc of 50 mm diameter. Trace the path of free end of a string.

ASSIGNMENT - 4
ENGINEERING CURVE

1. A circle of 40 mm diameter rolls along a straight line without slipping. Draw the curve traced out by a point P on the circumference, for a one complete revolution of the circle. Name the curve. Draw a tangent and normal to the curve.
2. Construct the ellipse if the distance between the focus and the directrix is 50 mm. the eccentricity is 2/3.
3. Draw a parabola of base 150 mm and axis 80 mm by tangent method

SHEET NO. 5

PROJECTION OF POINTS AND LINE

1. Draw the Projection of Following Points.
   a) A Point P is 15 mm above HP and 40 mm in front of VP.
   b) A point Q lying on HP and 35 mm behind of VP.
   c) A point R lying on VP and 60 mm above HP.
   d) A Point S is 25 mm below HP and 50 mm behind VP.
   e) A point T is 35 mm below HP and 20 mm in front of VP.

2. A line AB, 70 mm long is inclined at an angle of 45° to the HP and 30° to the VP. Its end point A is on the HP and 25 mm infront of the VP. Draw the projections of the line AB assuming it to be in the first quadrant.

3. Draw the projections of the line PQ when its end P is 20 mm above HP and 10 mm infront of VP, its end Q is 55 mm above the HP and 60 mm infront of the VP and distance between projectors of P and Q (measure parallel to the XY line) is 45 mm. Find TL, θ and ϕ of the line.

4. The front view of the line EF, 90 mm long, measures 65 mm. Front view is inclined to XY line by 45°. Point E is 20 mm below HP and on VP. Point F is in third quadrant. Draw the projections and find inclination of the line with HP and VP.

5. A line CD is 100 mm long. It is inclined at 40° to the HP and 30° to the VP. The end C is 10 mm above HP and 25 mm in front of VP. Assuming the end D in the first quadrant, draw the projections of the line CD.

ASSIGNMENT - 5

PROJECTION OF POINTS AND LINE

1. Draw the Projection of Following Points
   a) A point L is 15 mm below HP and 25 mm in front of VP.
   b) Point M is 40 mm above H.P and 30 mm on VP.
   c) Point N is 55 mm above H.P and 35 mm behind VP.
   d) Point O is 30 mm on H.P and 45 mm behind VP.
   e) Point P is 35 mm below H.P and 25 mm in behind VP.

2. A line AB 100 mm long is inclined to HP at 45° and inclined to VP at 30°. Draw the projections of the line and find the lengths of front and top views.
3. A line LM is 75 mm long, inclined at 45° to the HP and 30° to the VP. One of its end point L is in HP as well as VP. Draw the projections of the line and determine the apparent inclination with VP.
4. The end P of a line PQ 120 mm long is 30 mm above HP and 60 mm behind VP. The line is inclined at angle of 30° with the reference plans of the projection. The point Q is below HP and behind VP. Draw the projections of line PQ and locate the point Q.

SHEET NO. 6
PROJECTION OF PLANE

1. A 30° - 60° set-square has its longest edge in the VP. A plate is inclined at 60° to VP, perpendicular to HP. Draw its projections.

2. An isosceles triangular plate of 50 mm base and 75 mm altitude, appears as an equilateral triangle of 50 mm in top view. Draw the projections of a plate if its 50 mm long edge is on the HP and inclined at 45° to the VP. What is the inclination of the plate with the HP?

3. A regular hexagonal plate 40 mm side is resting on one of its corners in H.P. The diagonal through that corner is inclined at 30° to H.P and plate is perpendicular to VP. Draw its projections.

ASSIGNMENT – 6
PROJECTION OF PLANE

1. A thin rectangular plate of sides 60 mm x 30 mm has its shorter side in the V.P. Draw its Projection for its top view is a square of 30 mm long sides.
2. Draw the projections of a circle of 45 mm diameter resting on the H.P. on a point A of the circumference; its plane is inclined at 60° to the H.P and perpendicular to VP.
3. A thin triangular sheet PQR has its sides PQ = 75 mm, QR = 50 mm and RP = 40 mm. Draw its projections when it has its side PQ in VP and inclined at 30° to HP. Assume the corner P to be towards the HP and 25 mm above it.

SHEET NO. 7

PROJECTION OF SOLID, SECTION OF SOLID AND DEVELOPMENT OF SURFACES

1. A square prism side of base 40 mm and axis length 60 mm is kept on HP on one of its base edges in such a way that its axis making an angle of 45° to the HP. Draw the projections of prism when the side of base which is on the HP is making an angle of 30° with the VP.
2. A cylinder of base diameter 40 mm and axis length 60 mm is kept on VP on a point of its base circle such that its axis is inclined to VP at 30° and parallel to HP. Draw the projections of cylinder.
3. A Square pyramid, side of base 40 mm and axis length 70 mm is kept on the HP on one of its base edges in such a way that its axis makes an angle of 30^0 with the HP and parallel to VP. Draw the projections of the pyramid.
4. Draw the development of pentagonal prism of side 30mm and height 60mm, when one of the edges of the base is perpendicular to VP.

ASSIGNMENT – 7

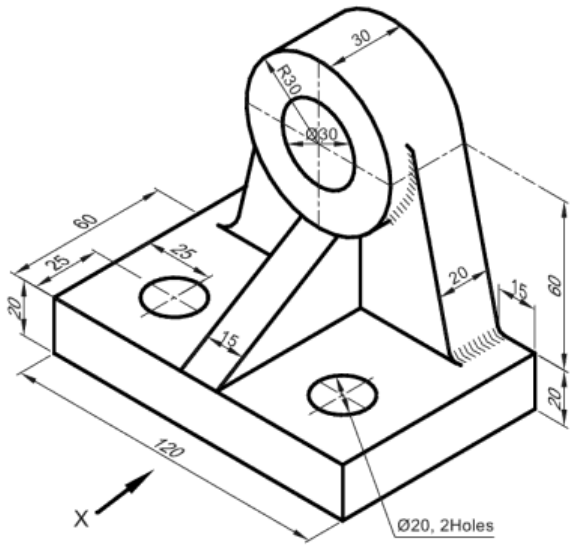
PROJECTION OF SOLID, SECTION OF SOLID AND DEVELOPMENT OF SURFACES

1. A pentagonal pyramid has a height of 60 mm and the side of a base 30 mm. The pyramid rests with one of the sides of a base on the H.P. such that the triangular face containing that side is perpendicular to the H.P. Draw its projections.
2. A cone, diameter of base 50 mm and height 65 mm, has one of its generators in H.P. Draw the projections of the cone when its axis is parallel to V.P.
3. A cylinder of base diameter 40 mm and axis length 50 mm is kept on the HP on its base. It is cut by an AIP inclined at 30° to the HP and bisecting the axis of the cylinder draw the front view and sectional top view and true shape of the section.
4. A square pyramid edge of base 40mm axis length 70 mm stands with its base on HP with the two sides of base parallel to VP. It is cut by an AIP inclined at 60° to the HP and passing through a point on axis 40mm from base. Draw the DLS of pyramid removing the portion containing Apex.

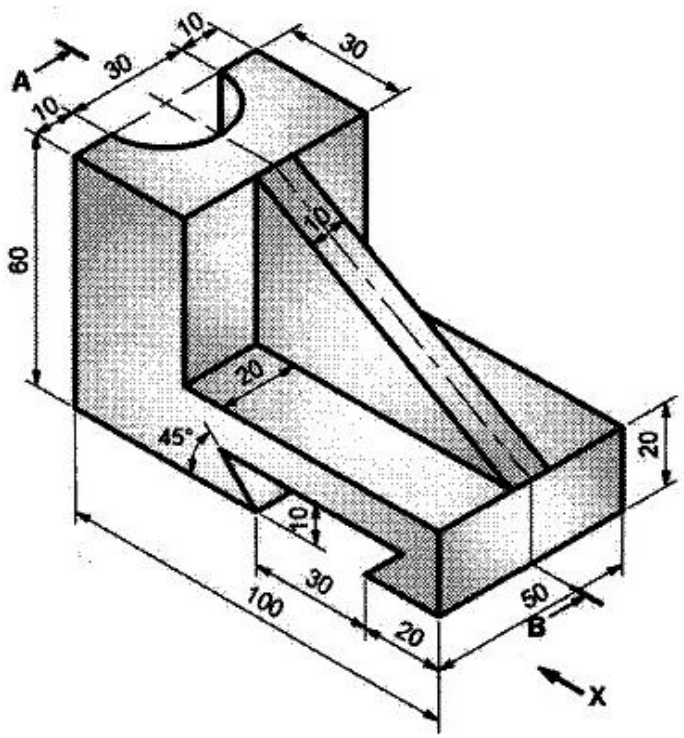
SHEET NO. 8

ORTHOGRAPHIC PROJECTION

1. Pictorial view of a machine component is shown in Fig.1 Draw: (1) F.V. From X (2) T.V. and (3) RHSV using 1st angle projection method.



2. Pictorial view of a machine component is shown in Fig Draw following: (1) F.V. From X (2) T.V. and (3) Sectional LHSV from AA using Third Angle System



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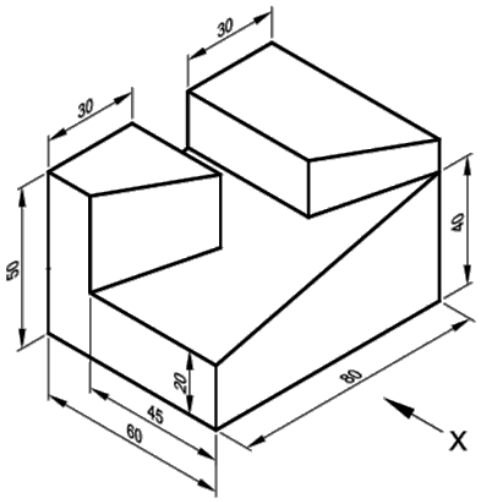
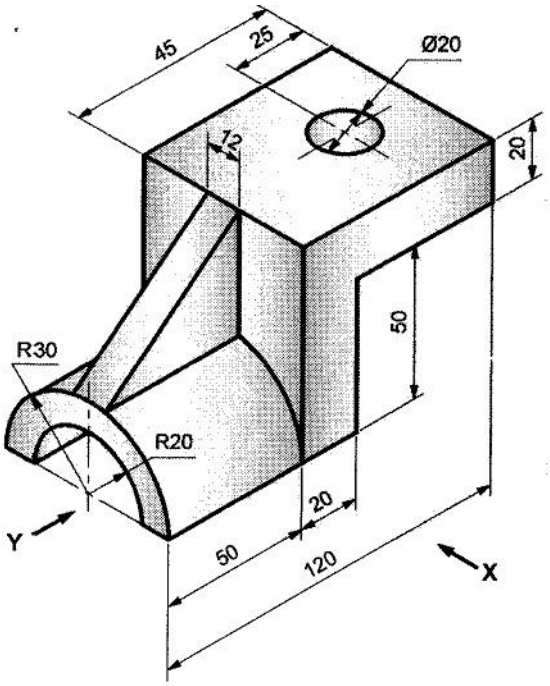
3. Pictorial view of a machine component is shown in Fig. Draw following: (1) F.V. (2) T.V. and (3) LHSV using Third Angle System



ASSIGNMENT – 8

ORTHOGRAPHIC PROJECTION

1. Pictorial view of a machine component is shown in Fig. Draw: (1) F.V. from X (2) T.V. & (3) LHSV from Y using 3rd angle projection method.



SHEET NO – 9
ISOMETRIC PROJECTION

1. Prepare isometric scale to measure 40mm and 74mm.
2. Fig.1 shows Front View and Top View of an object. Draw Isometric Projection.
3. Fig.2 shows Front View and Side View of an object. Draw Isometric View.

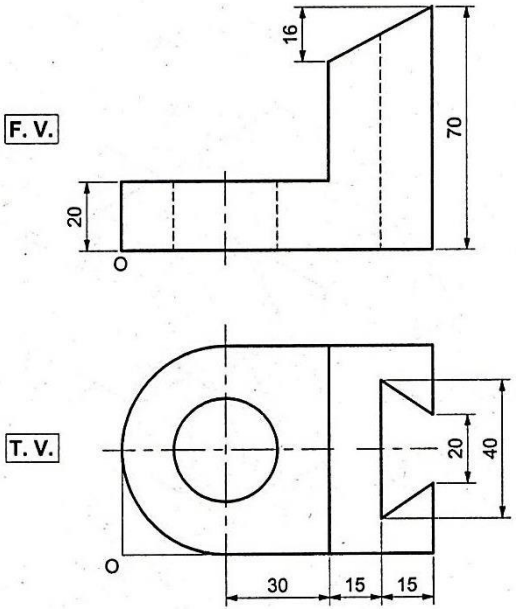


Fig.1

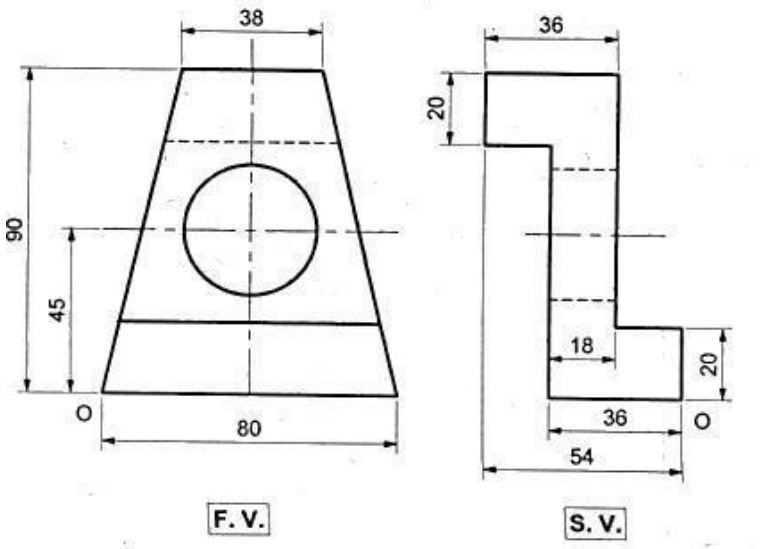


Fig.2

ASSIGNMENT – 9

ISOMETRIC PROJECTION

1. Draw an isometric scale of 120 mm length and show 55 mm length on the scale.
2. Fig.1 shows Front View and Top View of an object. Draw Isometric Projection.
3. Fig.2 shows Front View and Side View of an object. Draw Isometric View.

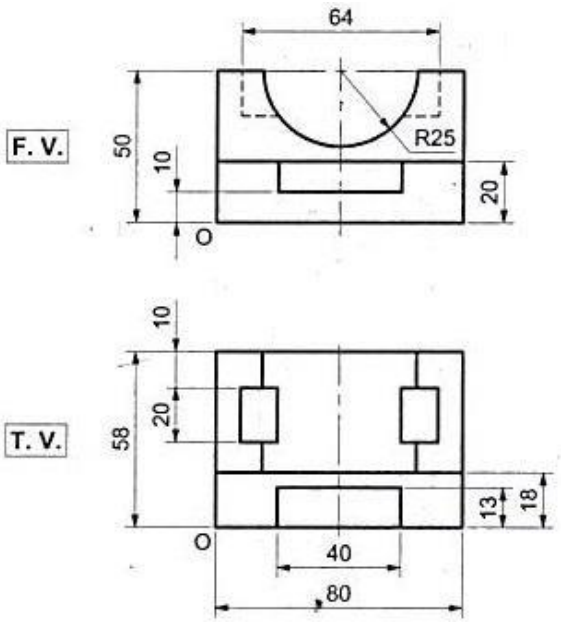


Fig. 1

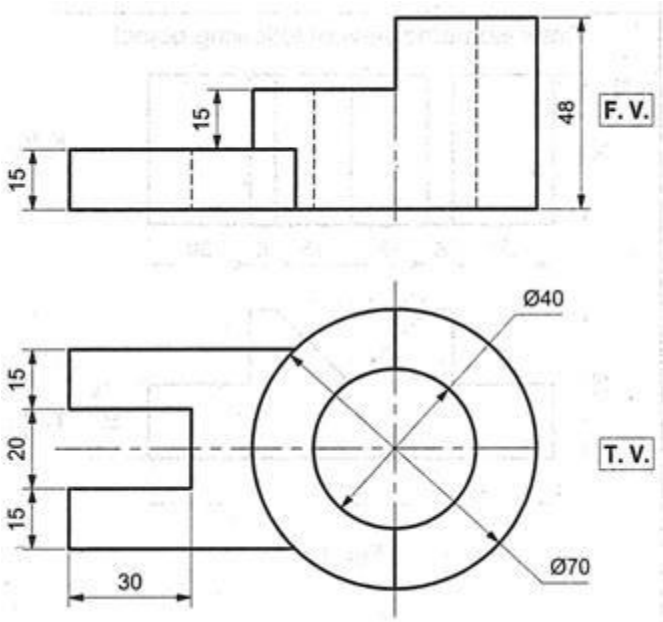
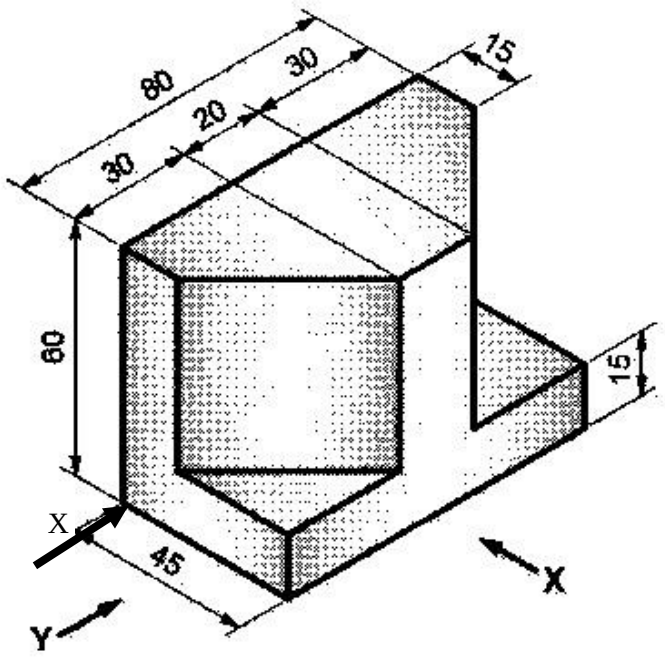


Fig. 2

SHEET NO – 10
COMPUTER AIDED DRAWING

Pictorial view of a machine component is shown in Fig given below; Draw orthographic drawing (TV, FV, RHSV) using AutoCAD commands.



ASSIGNMENT – 10
COMPUTER AIDED DRAWING

1. List and explain different methods to draw circle in AUTOCAD.
2. Why chamfer is done on work piece. Write the steps to create chamfer in AUTOCAD.
3. List and explain different methods to draw rectangle in AUTOCAD.
4. Explain the following Autocad commands : hatch, circle, array, mirror, trim, extend and fillet.
5. List and explain different methods to draw Polygon in AUTOCAD.
6. List the six essential commands of modify panel in AutoCAD.
7. Write difference between line, polyline and its uses in AUTOCAD.
8. List and explain different methods to draw arc in AUTOCAD.

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Practice Problems of Orthographic & Isometric Projection

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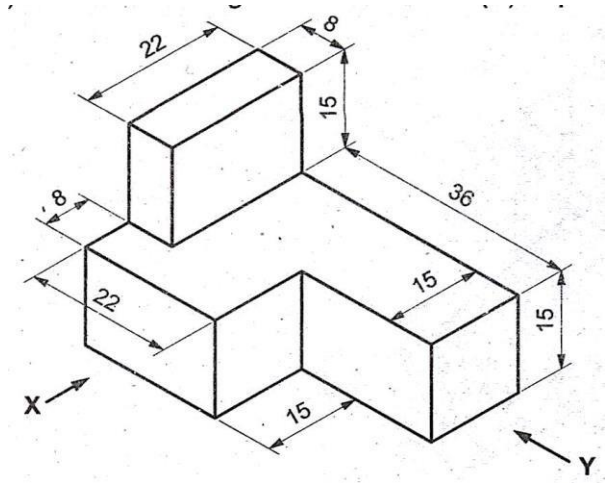
ORTHOGRAPHIC PROJECTION



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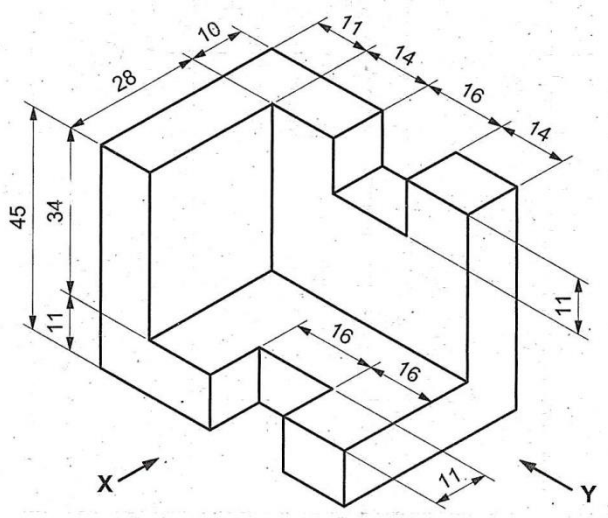

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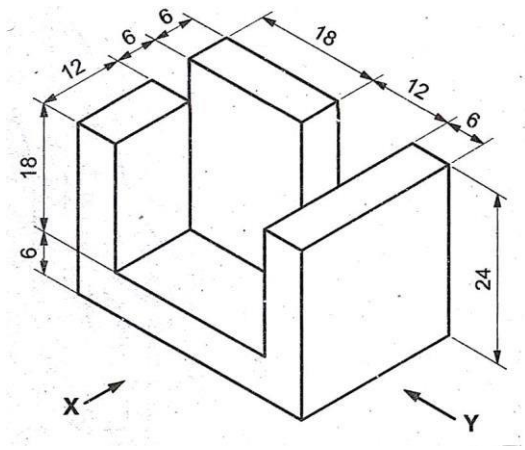

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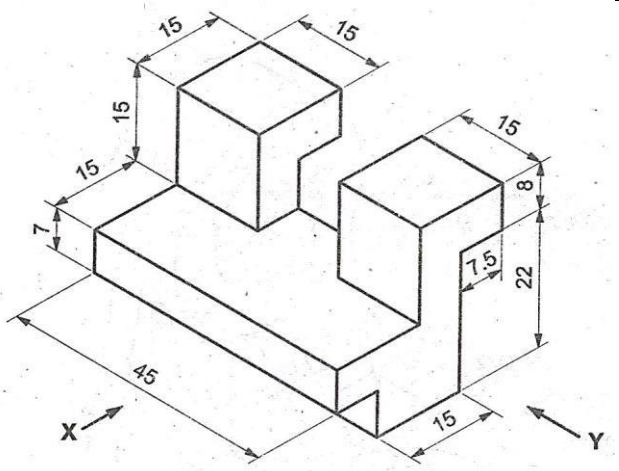

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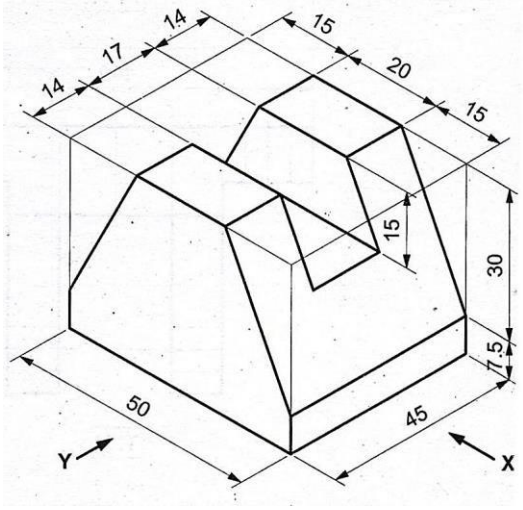

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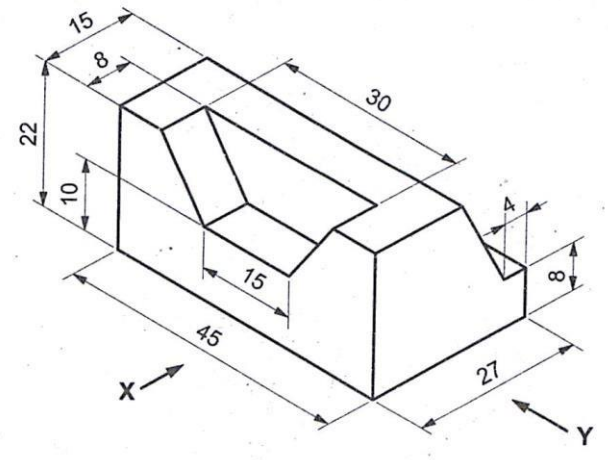

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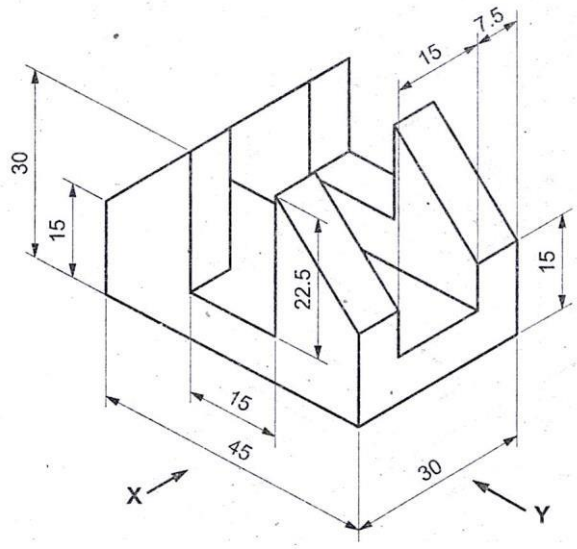
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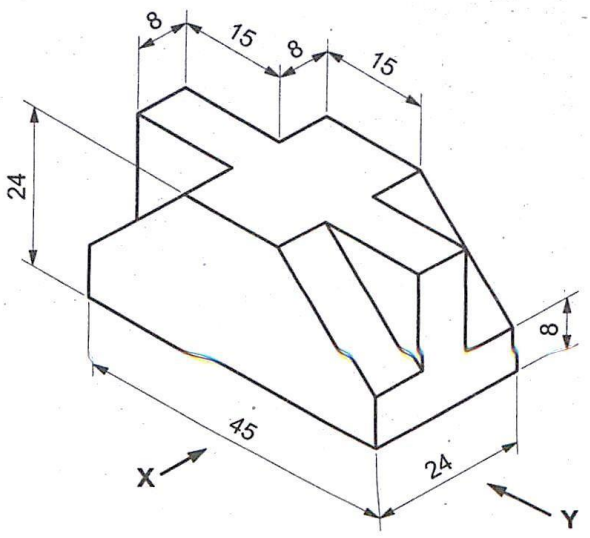
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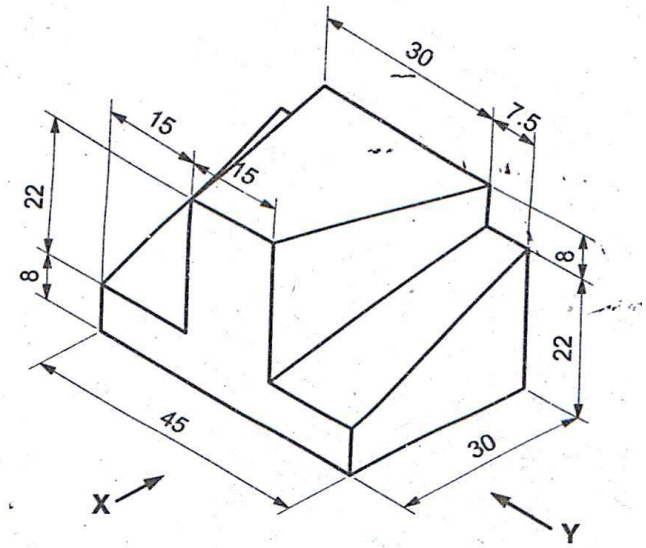
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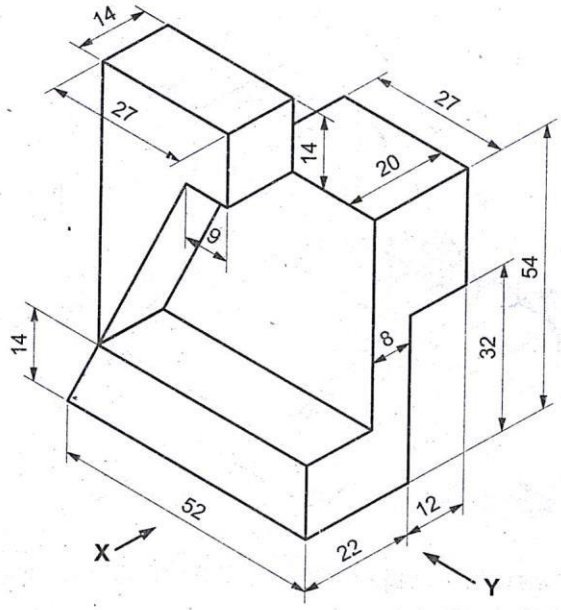
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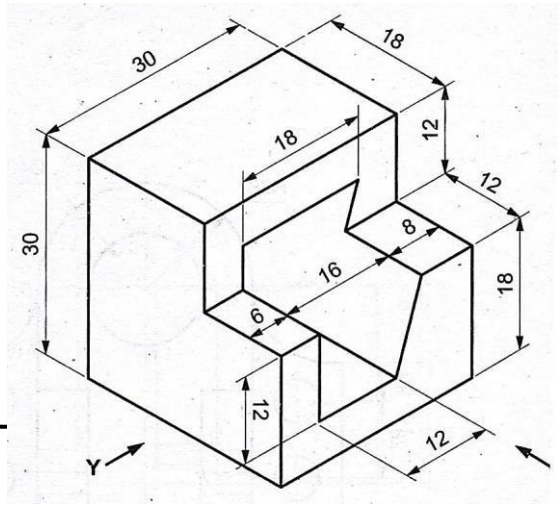
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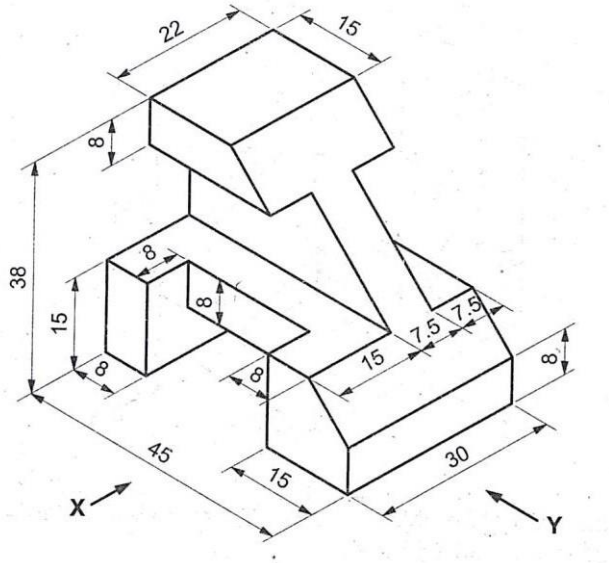
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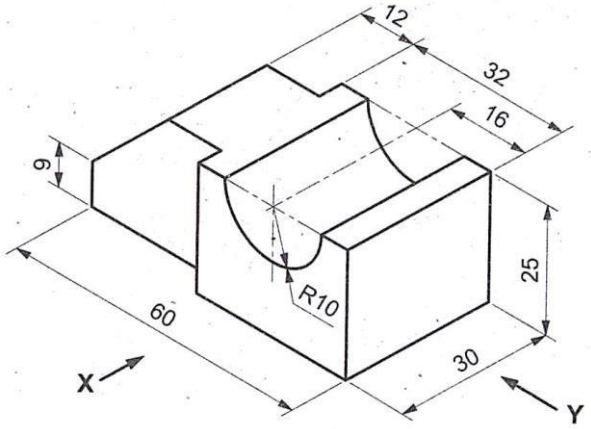
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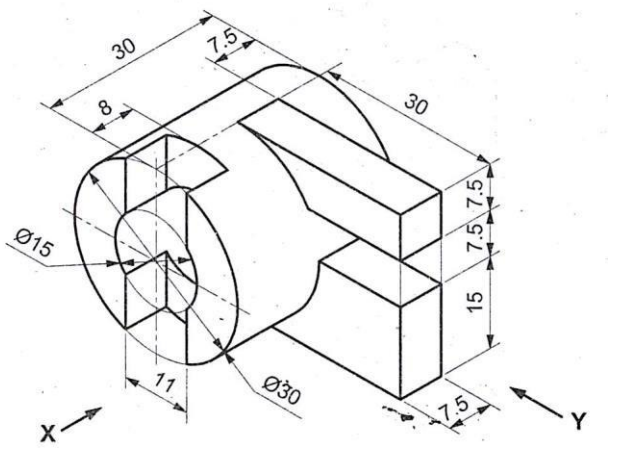
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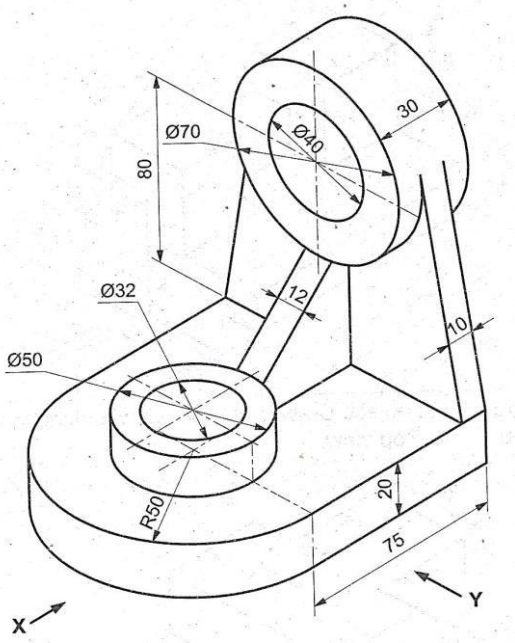
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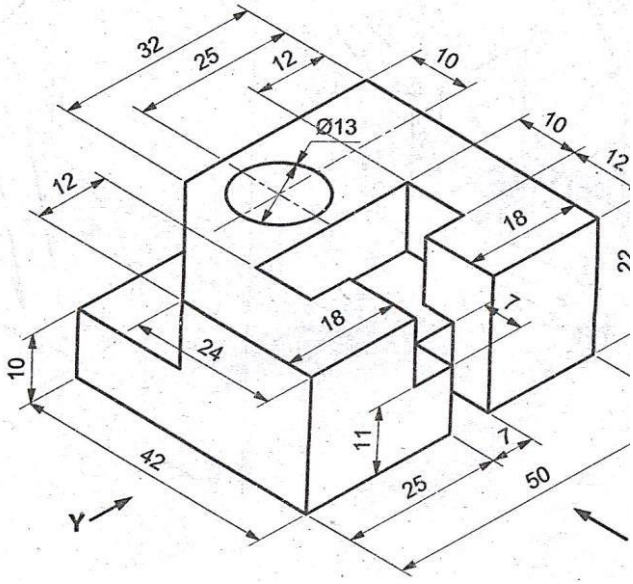
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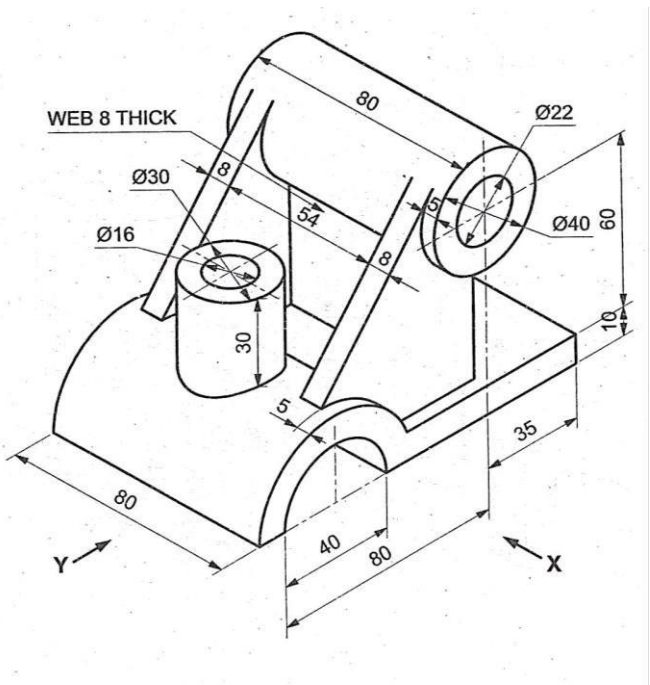
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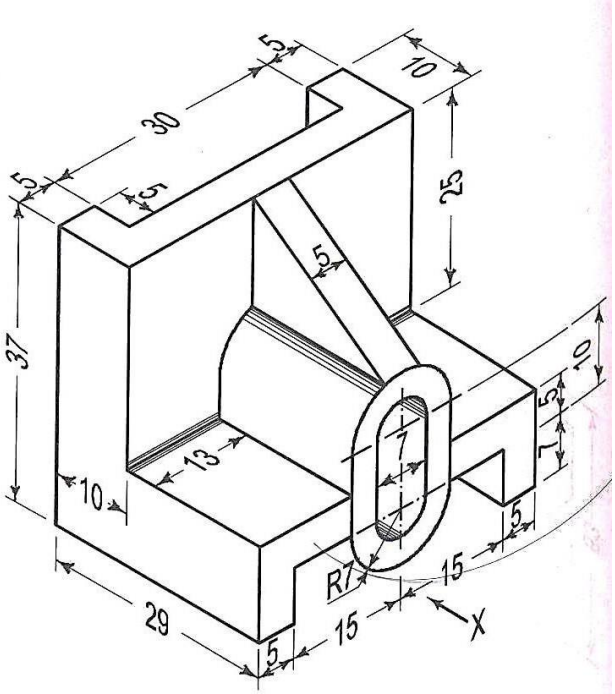
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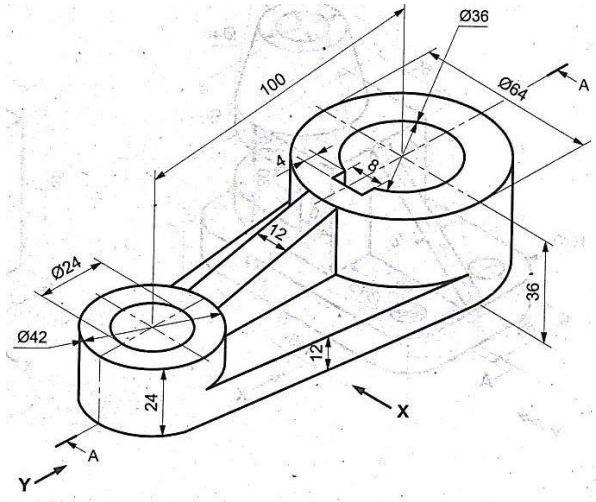
SECTIONAL ORTHOGRAPHIC



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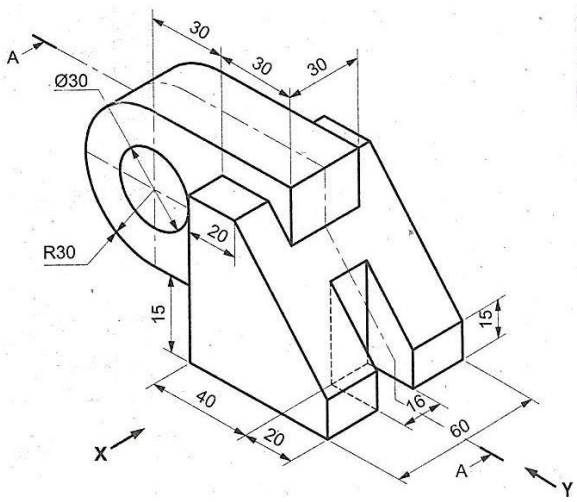

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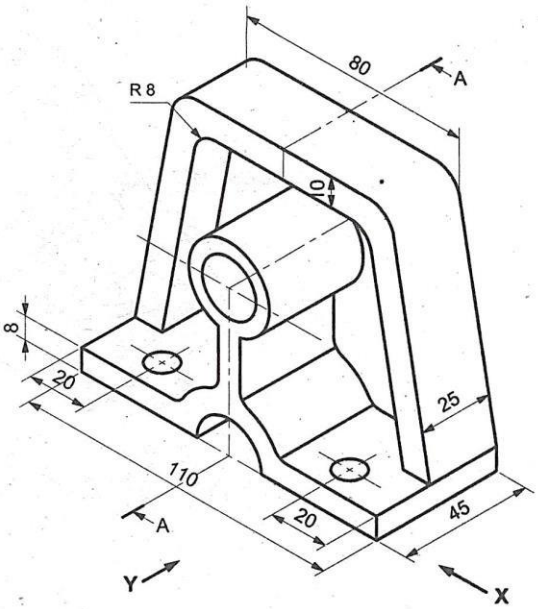

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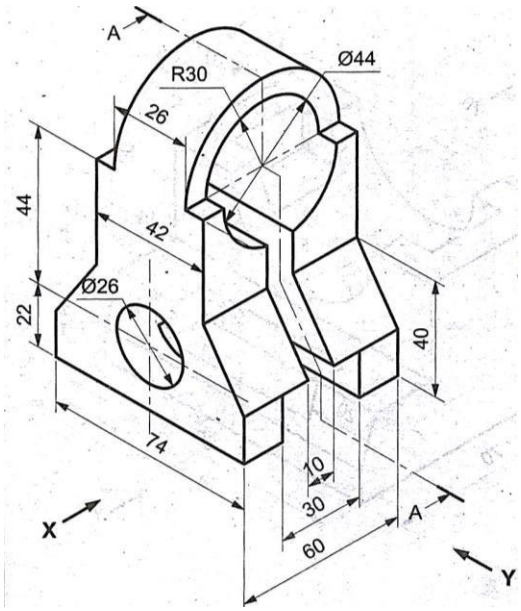

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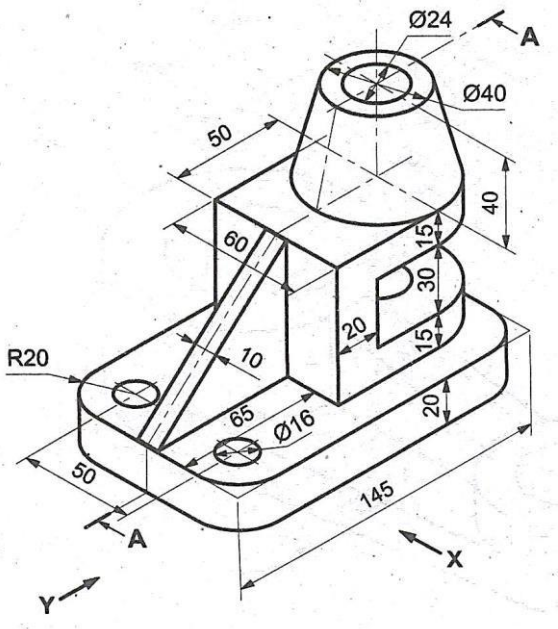

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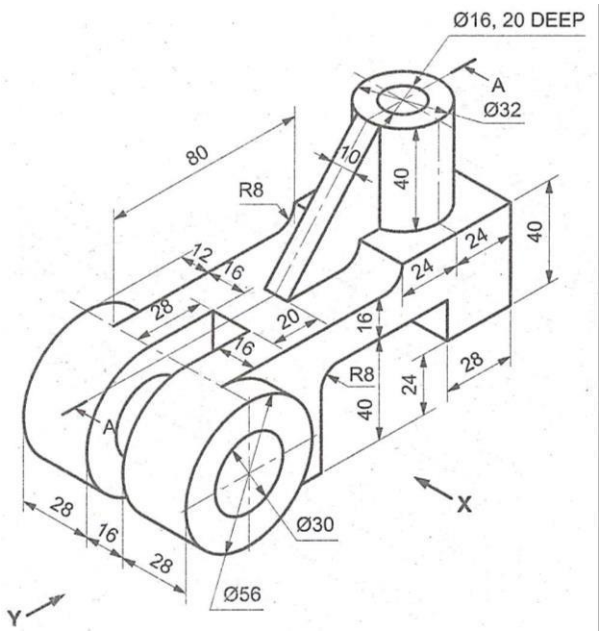

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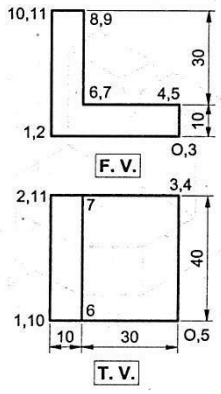
9. ISOMETRIC VIEW/PROJECTION



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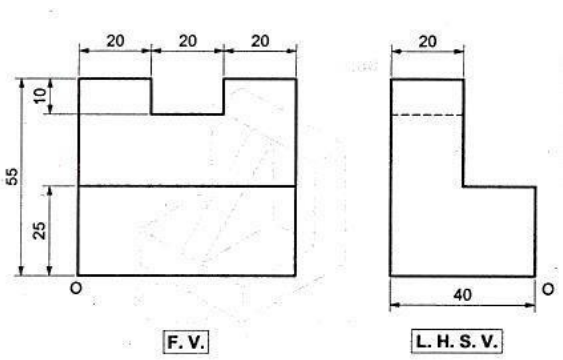

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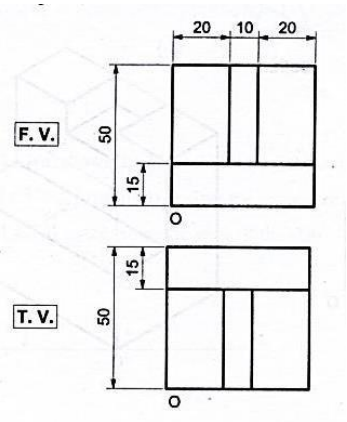

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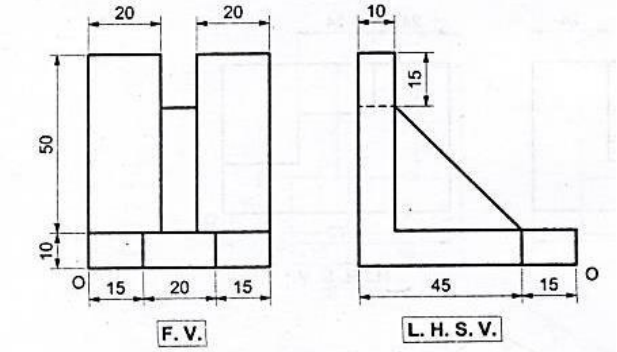

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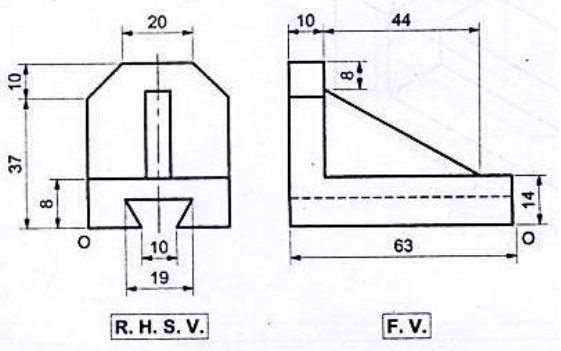

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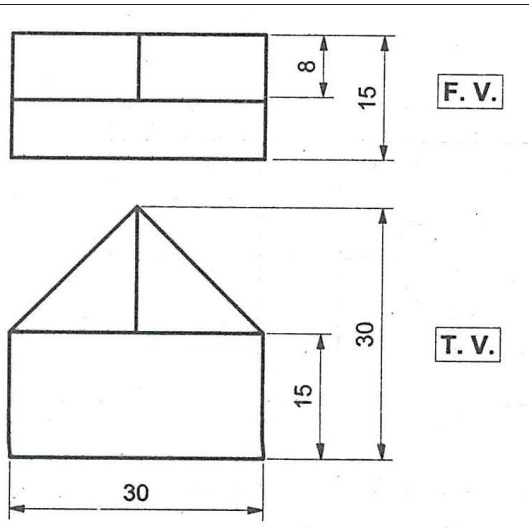

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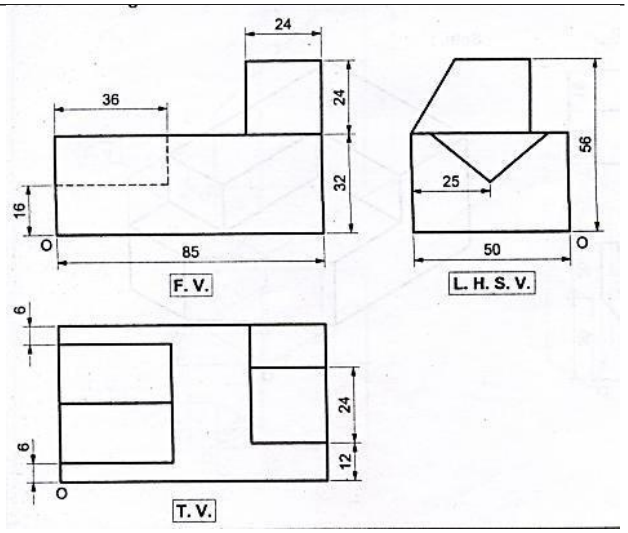

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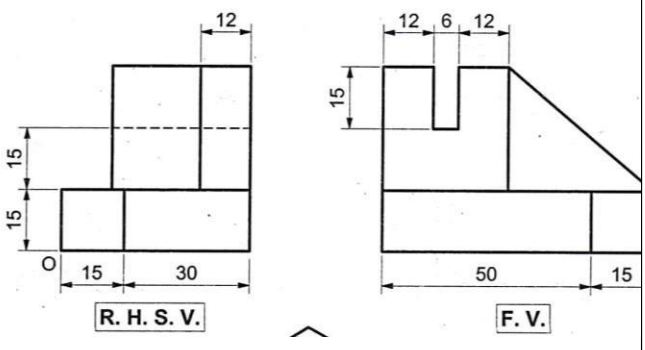

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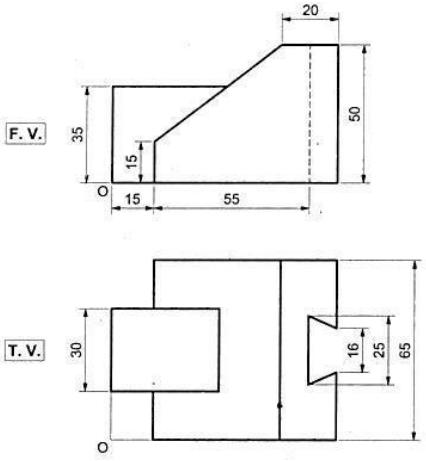

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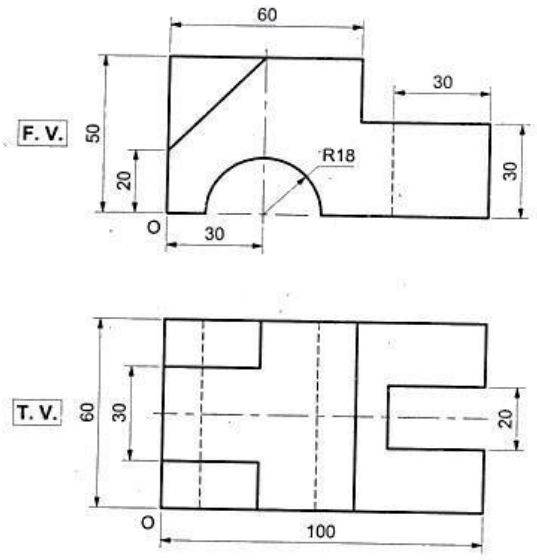
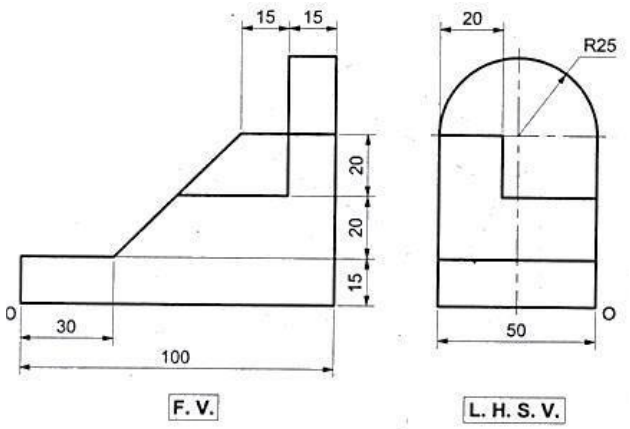
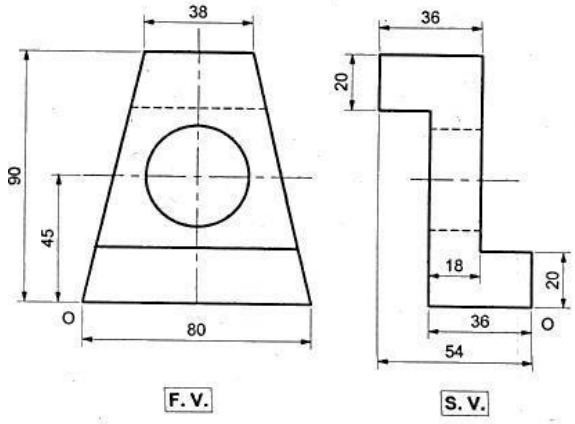

F. V.
T. V.
60
30
50
20
R18
30
30
60
30
20
100

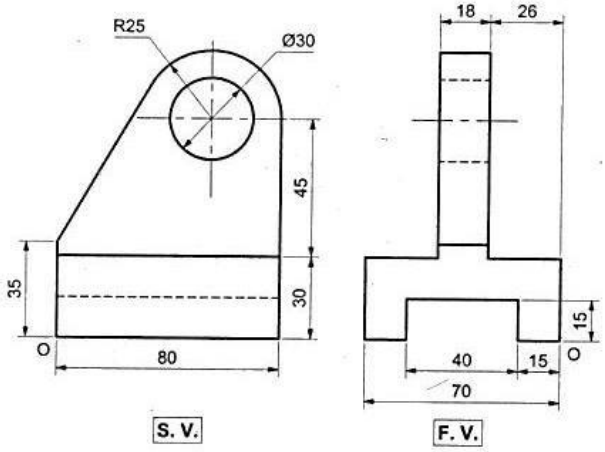
L


15
15
20
20
15
30
100
F. V.
20
R25
50
L. H. S. V.

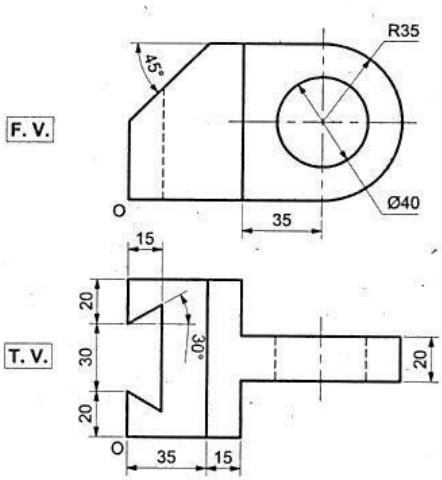
M


38
90
45
80
F. V.
36
20
18
20
36
54
S. V.

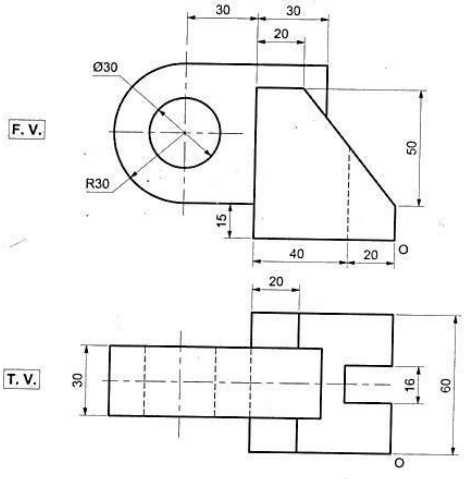
N


R25
Ø30
45
35
30
80
S. V.
18
26
15
40
15
70
F. V.

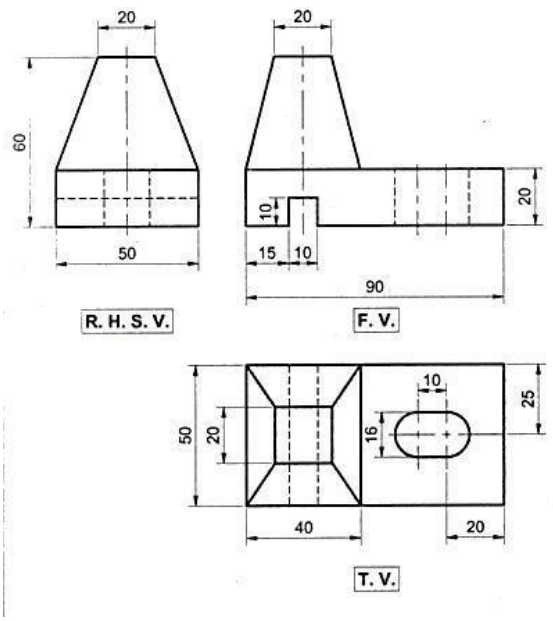
O


F. V.
R35
45°
Ø40
35
15
20
T. V.
30
30°
20
20
35
15

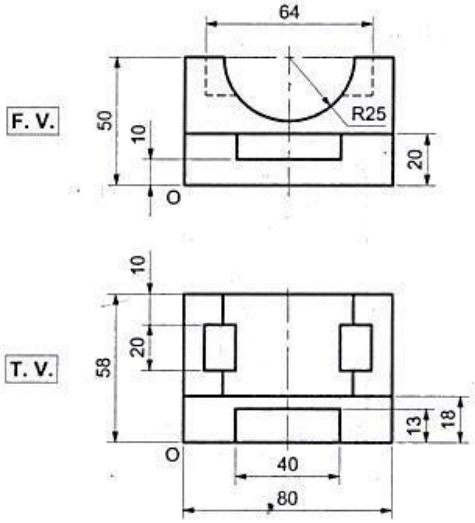
P


30
30
20
Ø30
F. V.
R30
50
15
40
20
20
T. V.
30
16
60

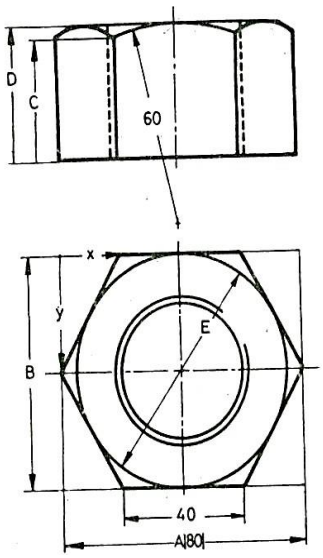
Q


20
20
60
10
20
50
15
10
90
R. H. S. V.
F. V.
10
25
50
20
16
40
20
T. V.

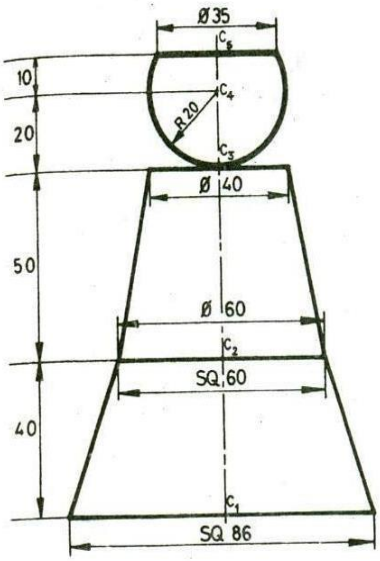
R


64
F. V.
50
10
R25
20
O
10
T. V.
58
20
13
18
O
40
80

S


D
C
60
x
y
E
B
40
A(80)

T


Ø35
C5
10
C4
R20
20
C3
Ø 40
50
Ø 60
C2
SQ. 60
40
C1
SQ 86

U