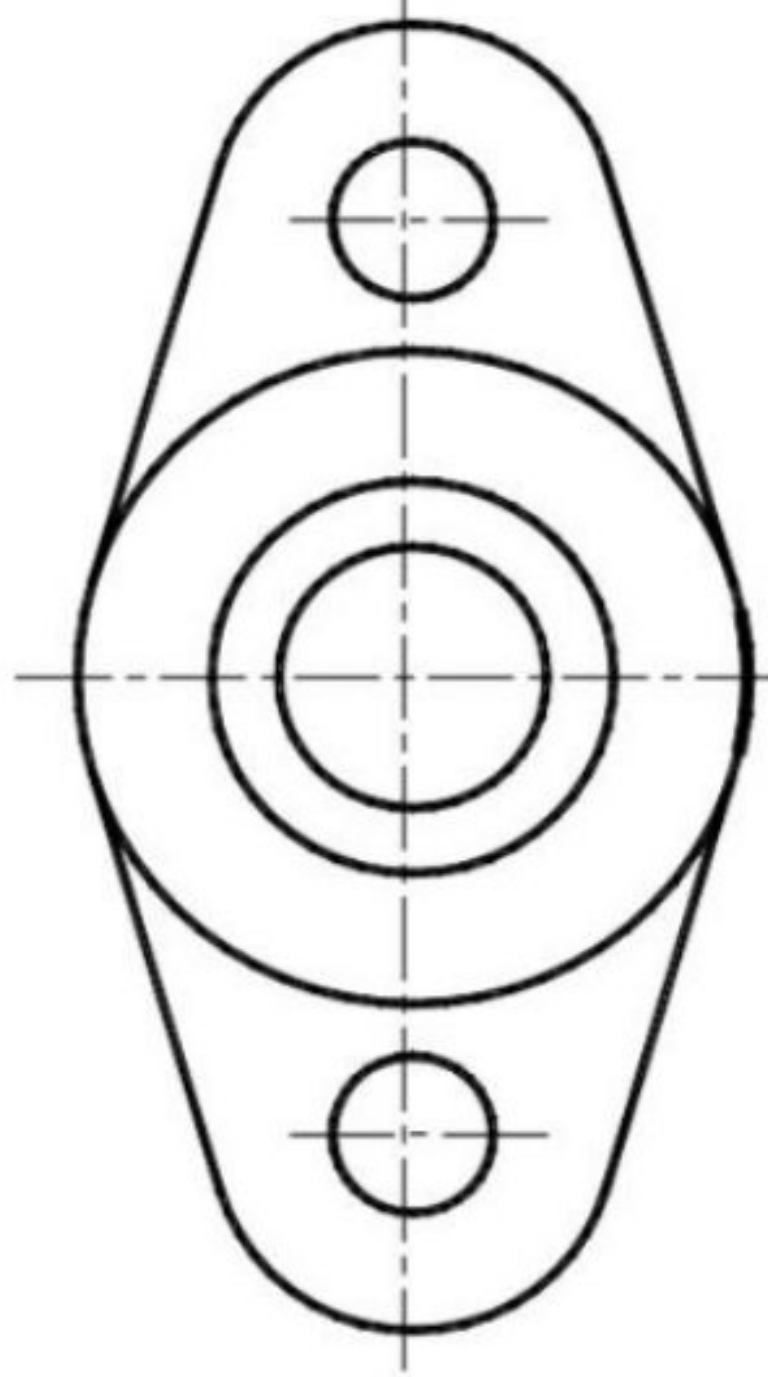


**POKHARA UNIVERSITY**  
**Faculty of Science and Technology**  
**School of Engineering**

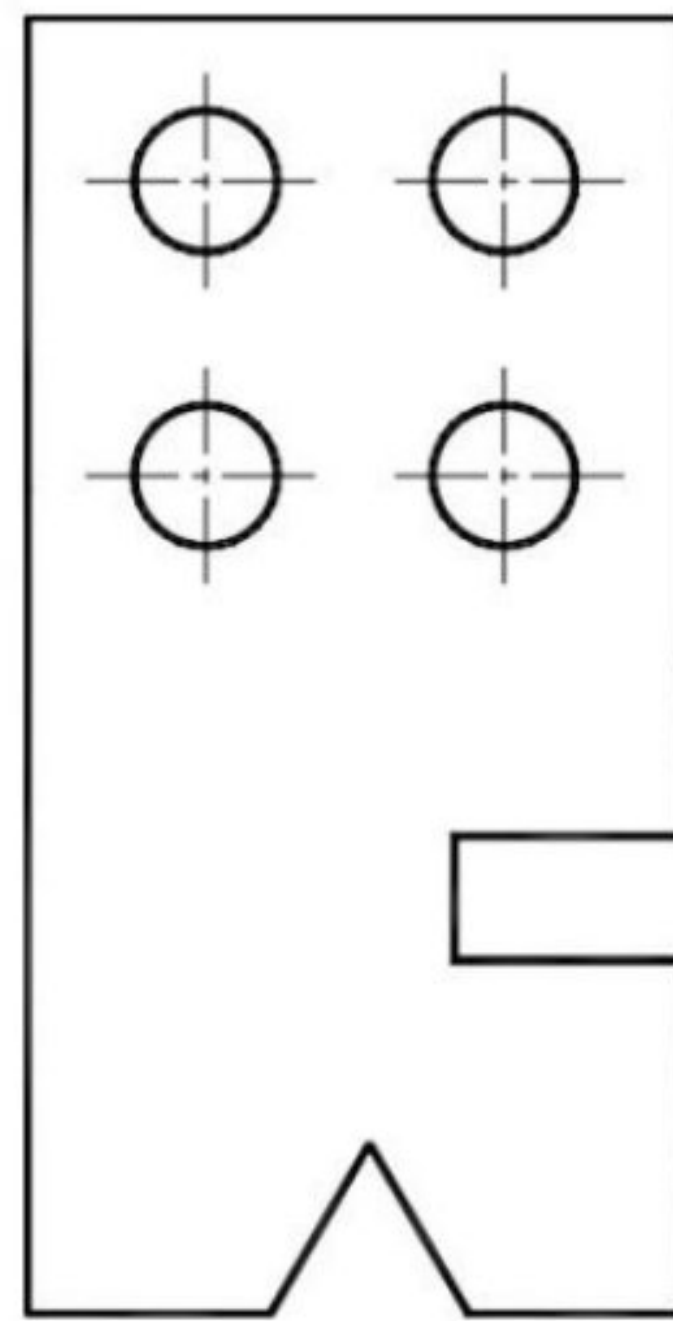
**ENGINEERING DRAWING**  
**TUTORIAL SHEETS**  
**for all BE**

**SHEET NO: 1**  
**TECHNICAL LETTERING AND DIMENSIONING**

1. Write down alphabets (A to Z) of different size using drawing tools in
  - a) Vertical capital
  - b) Inclined capital
  - c) Vertical small, and
  - d) Inclined small letters
2. Write down vertical and inclined numerals (0 to 9) and fractions different size.
3. Draw the following lines with 150 mm length
  - a) Visible outline
  - b) Hidden
  - c) Center
  - d) Projection
  - e) Cutting plane
  - f) Break
4. Dimension the following figures. Size may be obtained by measuring the drawing.



**Figure T1.4 (a)**

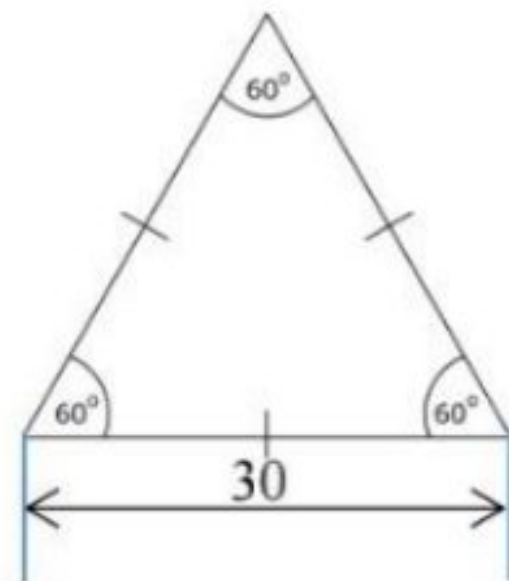


**Figure T1.4 (b)**

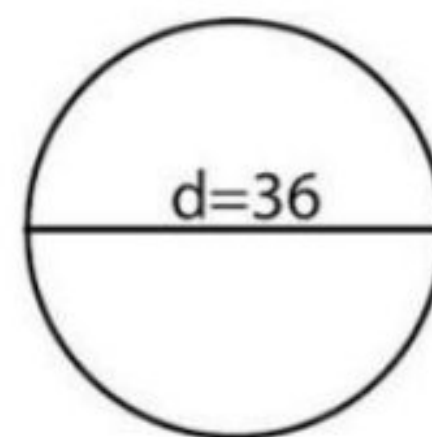


**SHEET NO: 2**  
**GEOMETRIC CONSTRUCTION**

1. Draw a line 90 mm long and trisect it.
2. Draw a line 110 mm long and divide it into 12 equal parts.
3. Draw a line 80 mm long and divide it in the proportion of 1:2:3.
4. Draw a regular pentagon with each side 30 mm long.
5. Draw a regular hexagon on a circumscribing circle of 90 mm diameter.
6. Draw a regular octagon inscribed on a circle of 76 mm diameter.
7. Construct a regular hexagon with 68 mm distance across flats.
8. Construct a regular octagon with 76 mm distance across corners.
9. Draw two circles with radii 30 mm and 40 mm respectively with their centers lying on a horizontal line and 90 mm apart. Draw internal and external line tangents to the circles.
10. Construct an ellipse when the distance of the focus from its Directrix is equal to 50 mm and eccentricity is  $\frac{2}{3}$ .
11. Draw an ellipse with major and minor axes of 90 mm and 60 mm respectively by using
  - a) Concentric circle method
  - b) Four center method
12. Construct a parabola when the distance of the focus from the Directrix is equal to 50 mm.
13. Draw a parabola with axis length of 60 mm and double ordinate of 80 mm using
  - a) Rectangle method
  - b) Tangent method
14. Construct a hyperbola when the distance of the focus from the directrix is equal to 50 mm and eccentricity is  $\frac{3}{2}$ .
15. Draw an involute of a hexagon of side 25 mm.
16. Draw an involute of a circle of 40 mm diameter. Also draw a normal and tangent to the point 100 mm from the centre of the circle.
17. Draw the involutes of the plane figures shown in **Figure T2.17**.



**Figure T2.17 (a)**



**Figure T2.17 (b)**

18. 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. The curve is Cycloid.
19. Construct an Archimedean spiral for convolution with a pitch of 40 mm.
20. Draw a helix for one convolution on a cylinder of 50 mm diameter and 100 mm pitch.



## SHEET NO: 5

### MULTI-VIEW DRAWINGS

The figures for Problems T5.1 to T5.12 contain a number of pictorial views of various shapes. Translated them into three-view orthographic drawing.

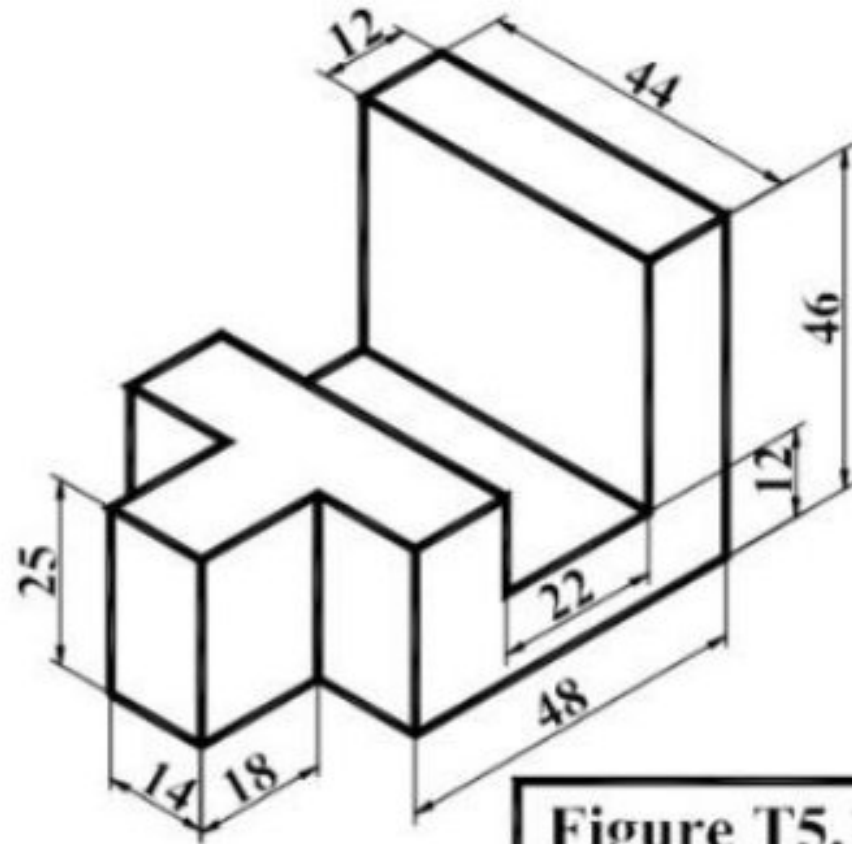


Figure T5.1

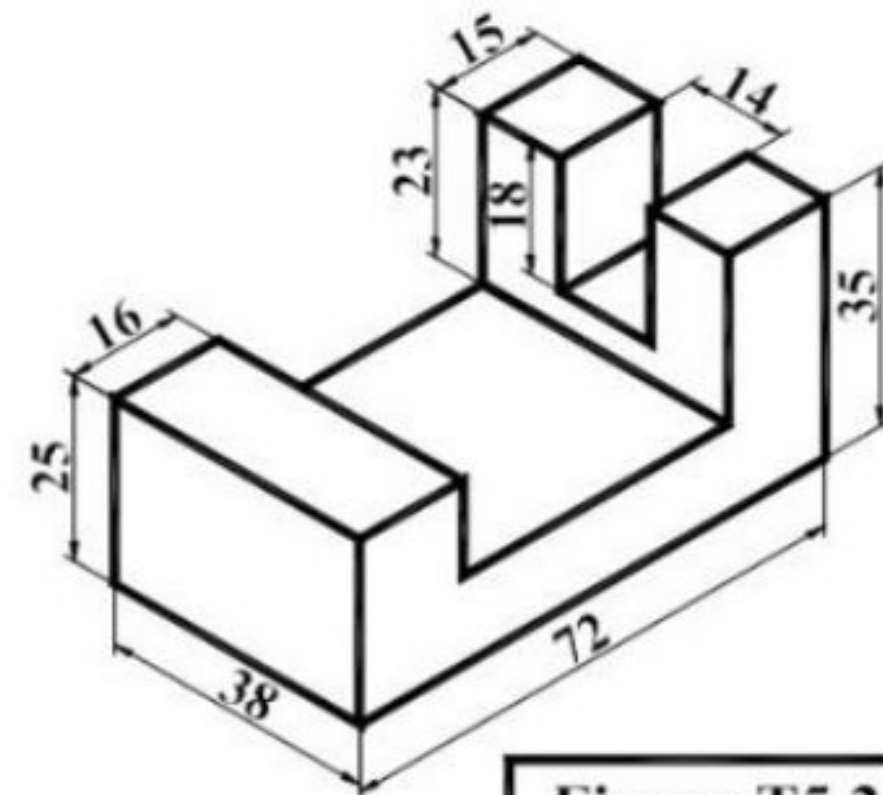


Figure T5.2

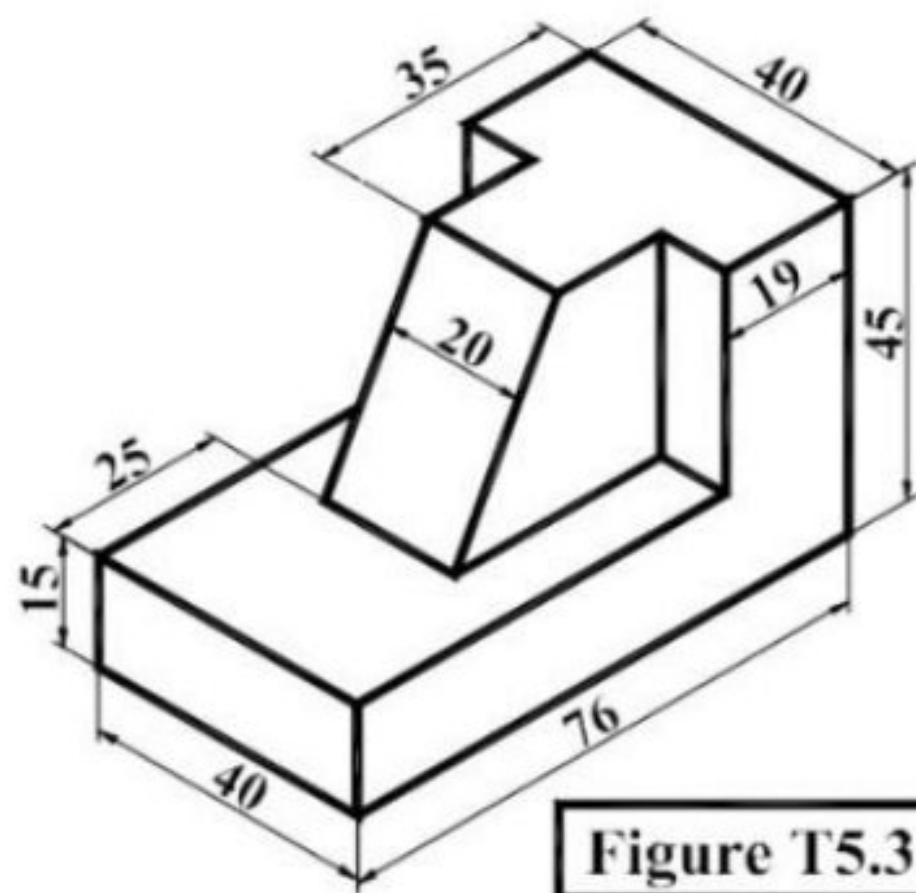


Figure T5.3

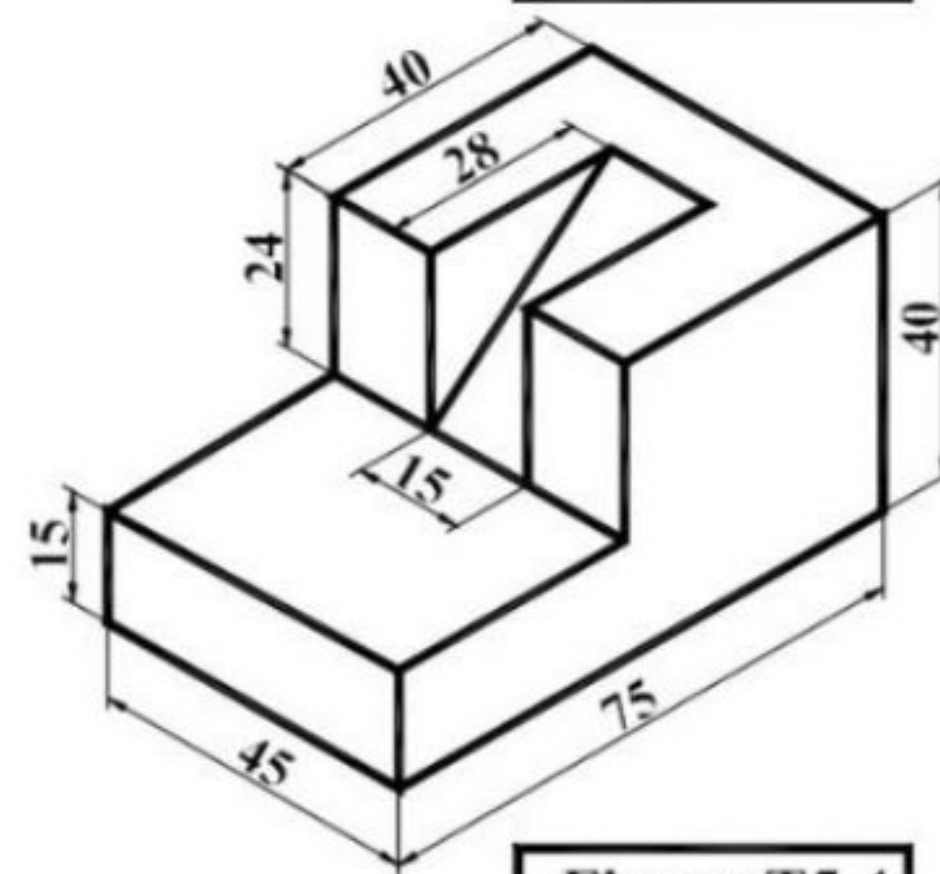


Figure T5.4

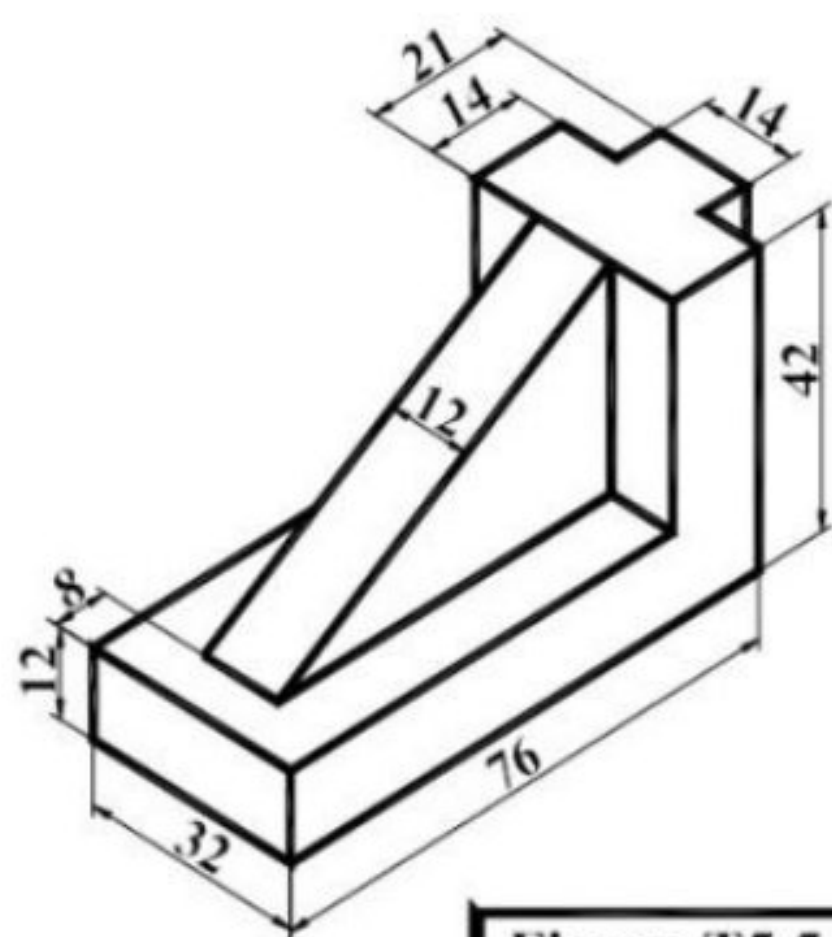


Figure T5.5

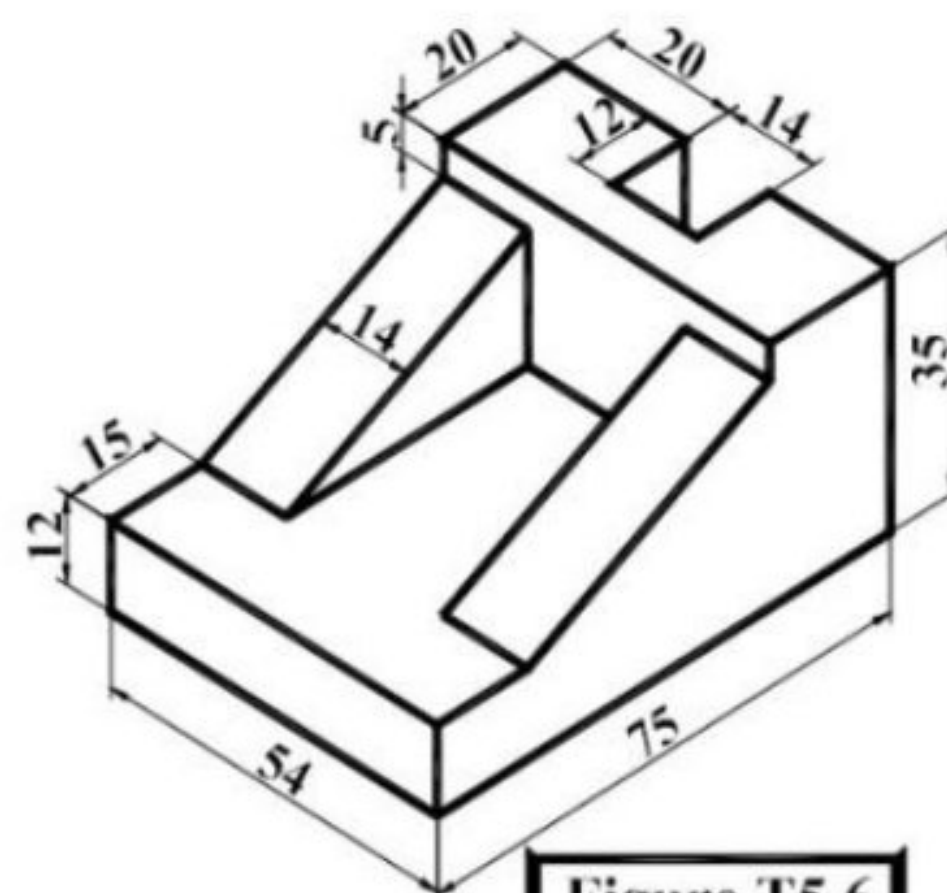


Figure T5.6



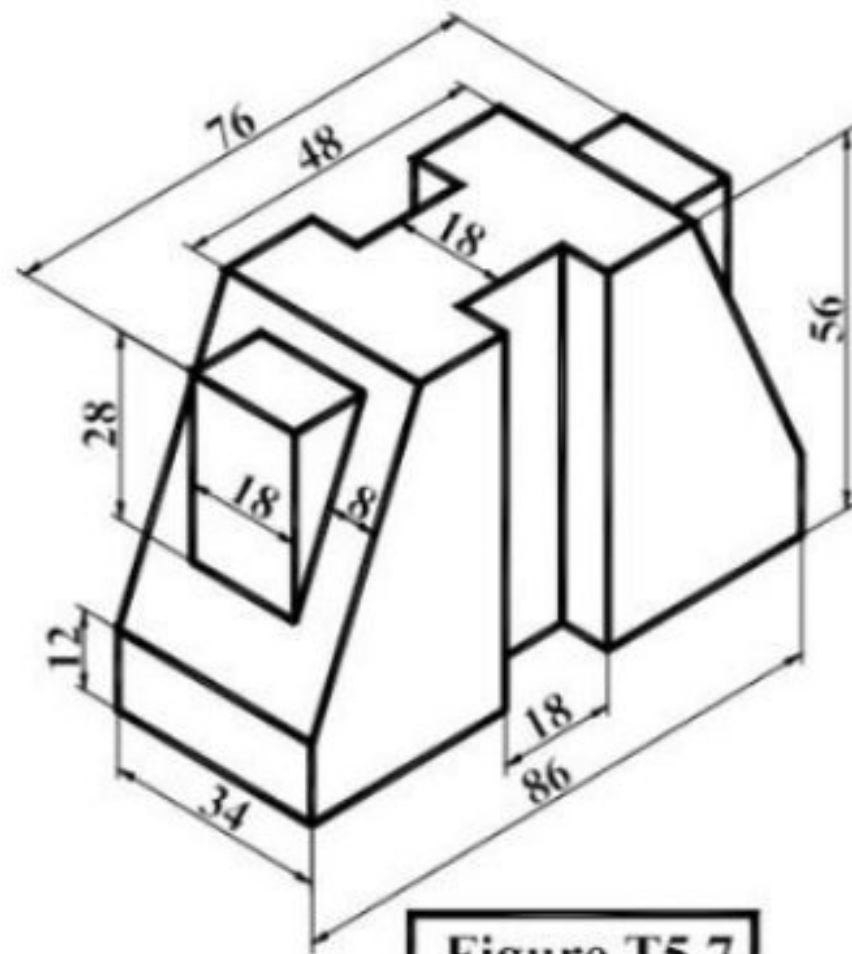


Figure T5.7

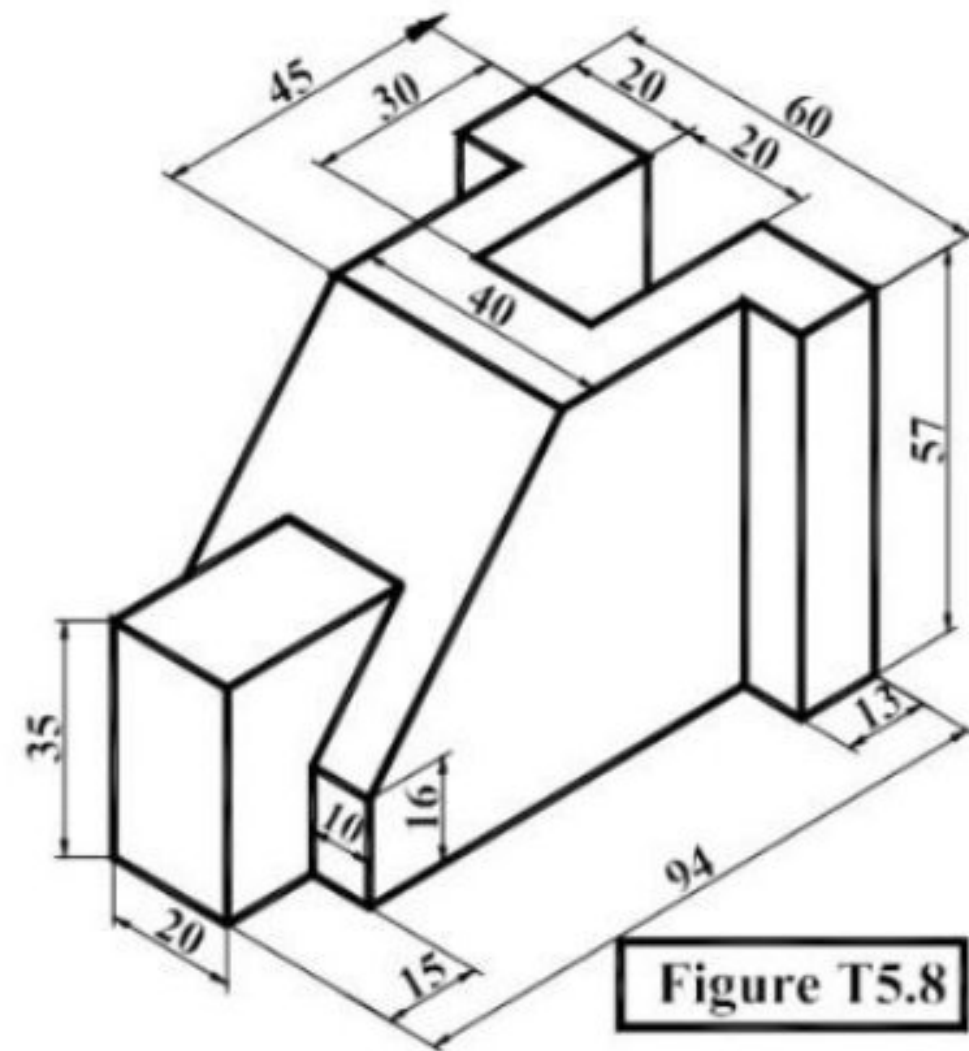


Figure T5.8

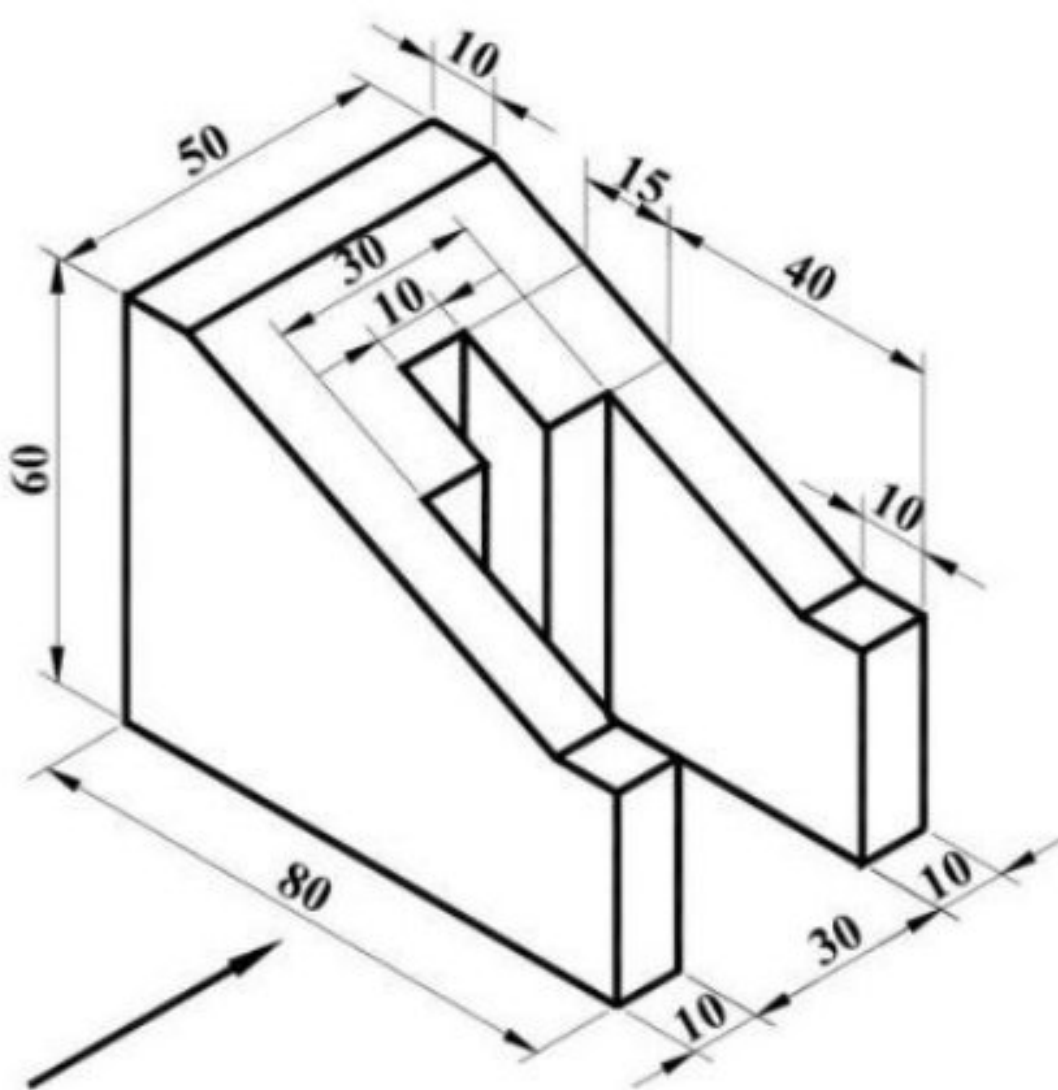


Figure T5.9

Through Hole 10 Dia.

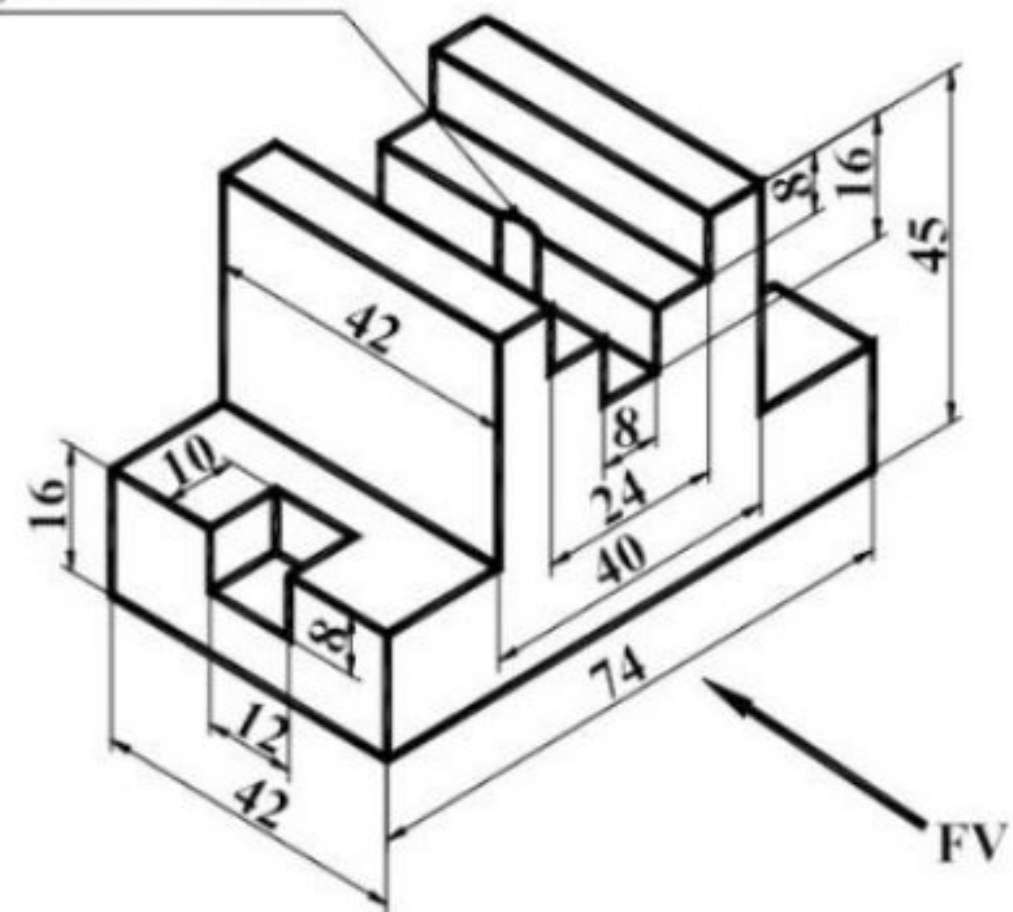


Figure T5.10

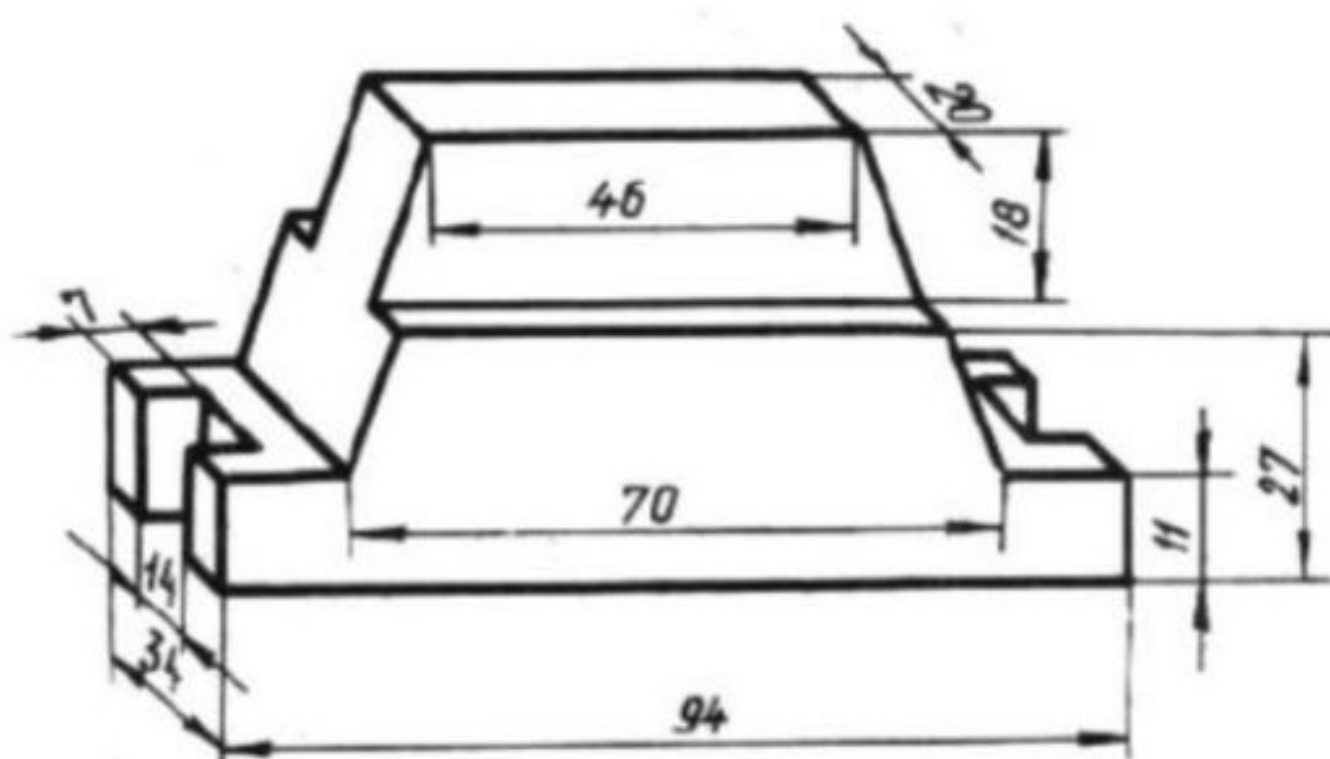


Figure T5.11

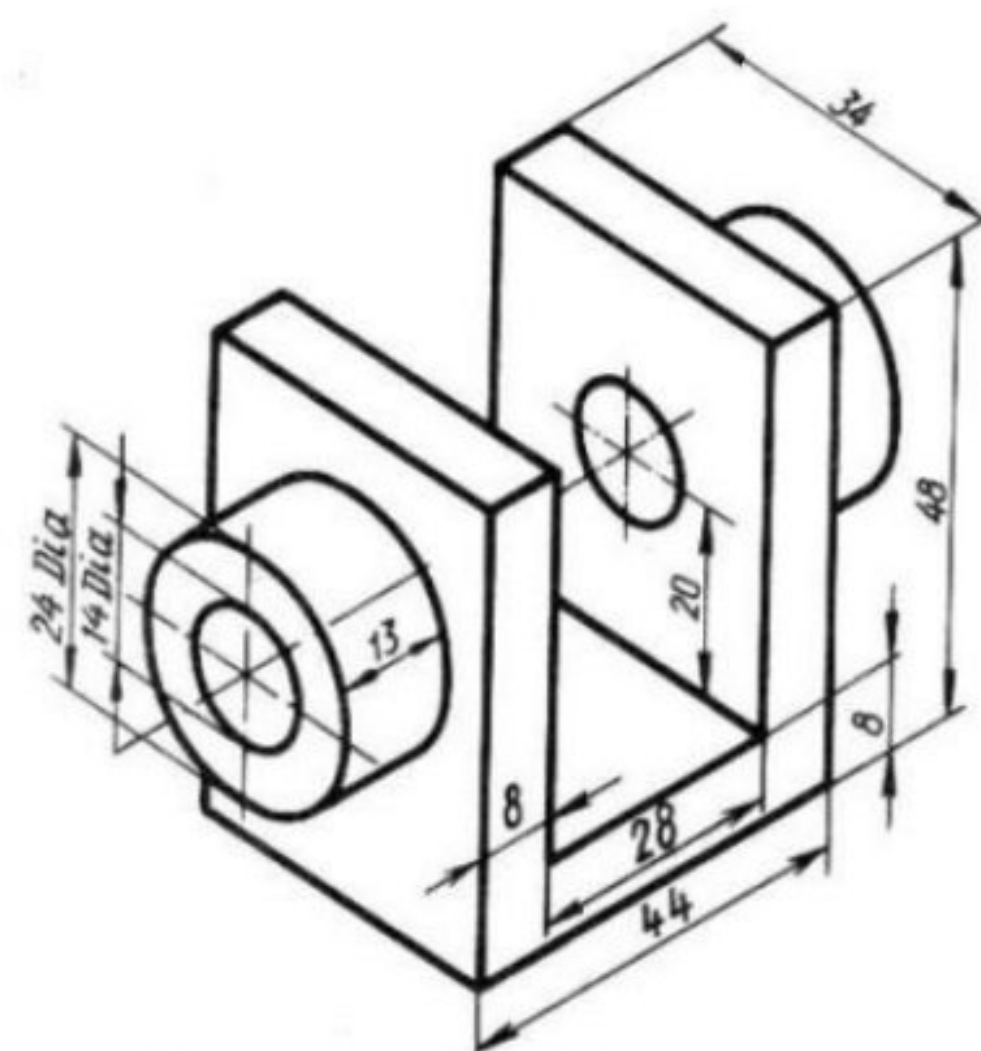


Figure T5.12



## MULTI-VIEW DRAWINGS AND SECTIONAL VIEWS

Make a complete orthographic drawing with full sectional front view (with necessary number of projections) of each model and dimension it.

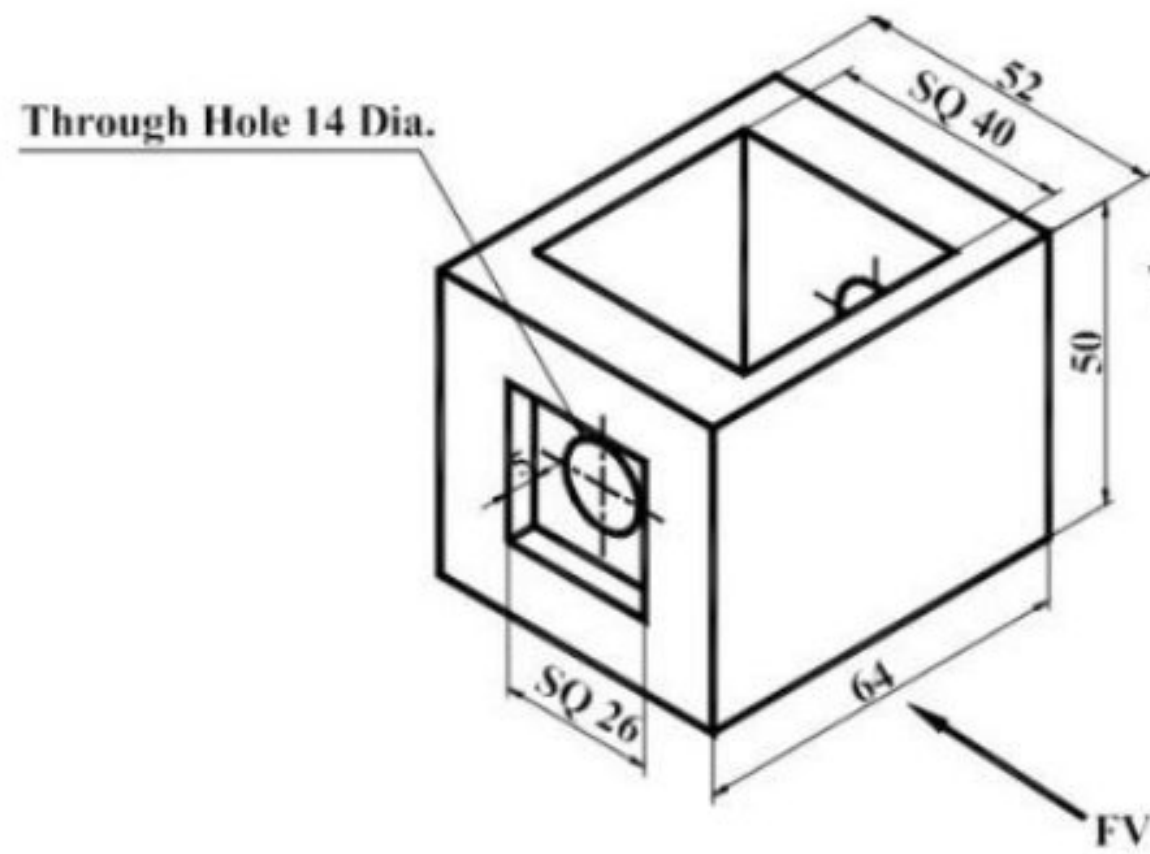


Figure T6.1

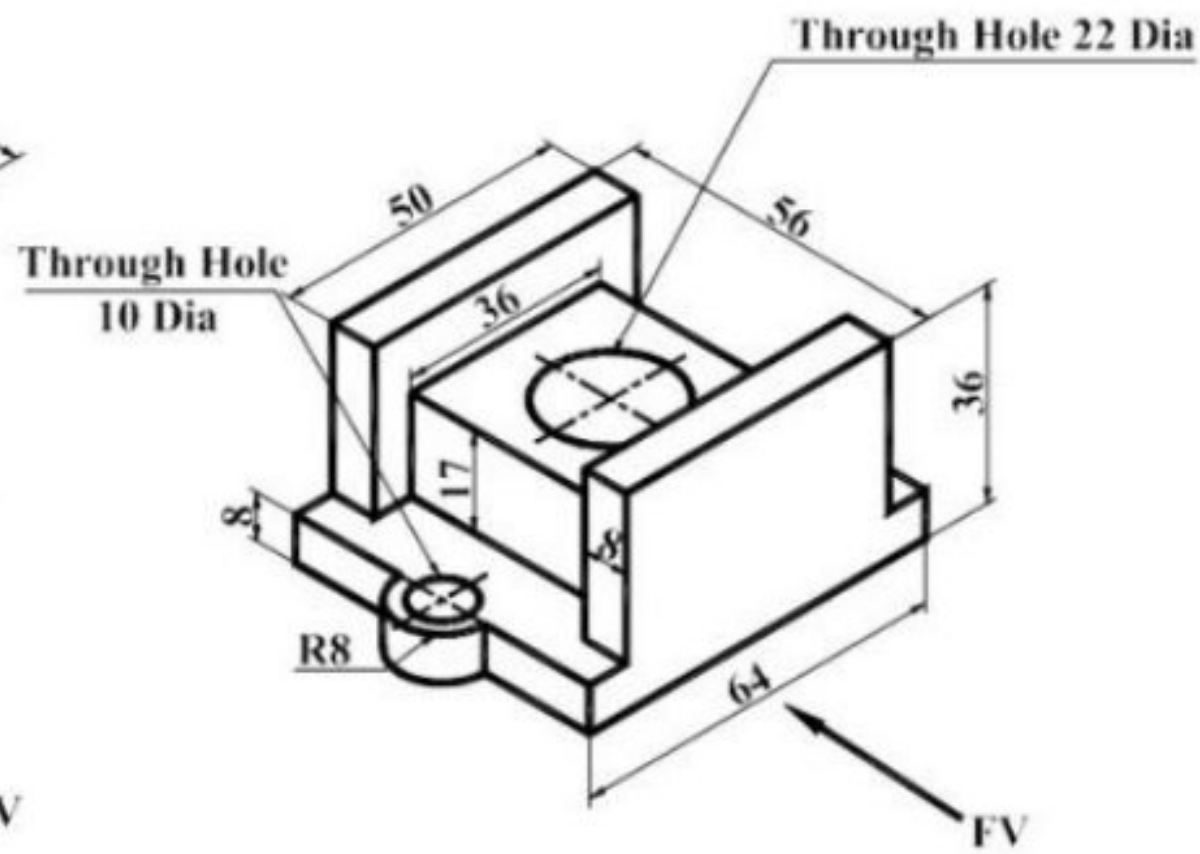


Figure T6.2

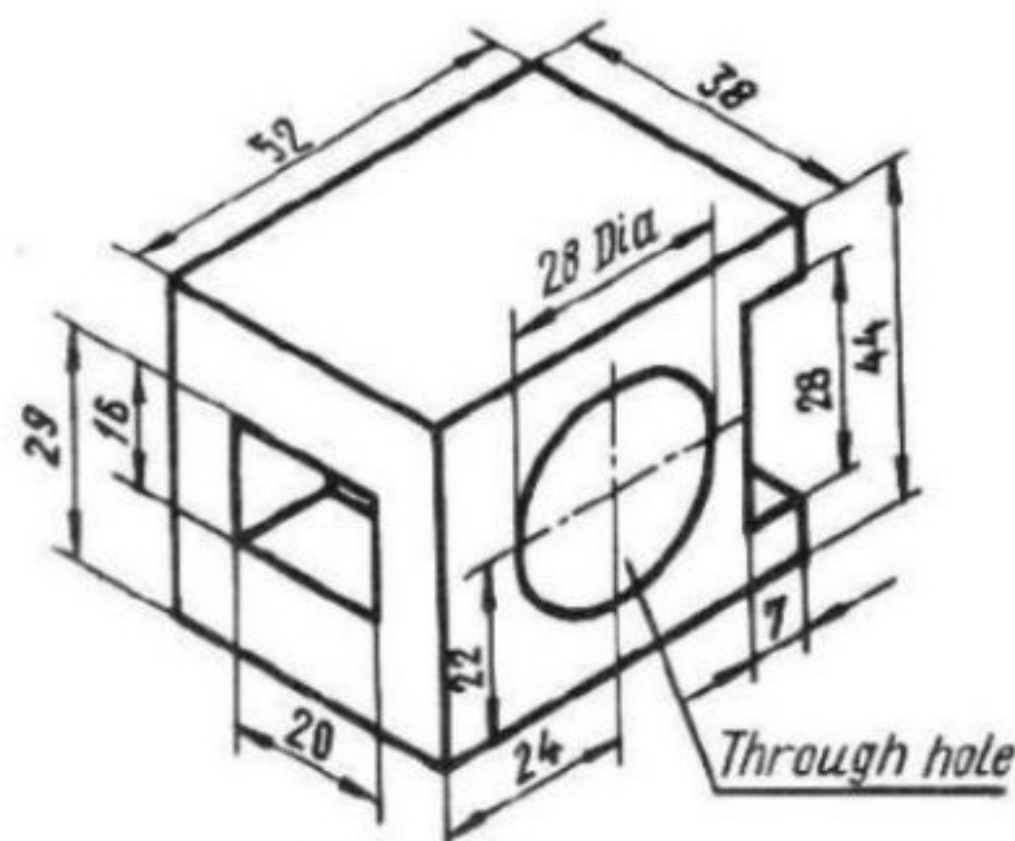


Figure T6.3

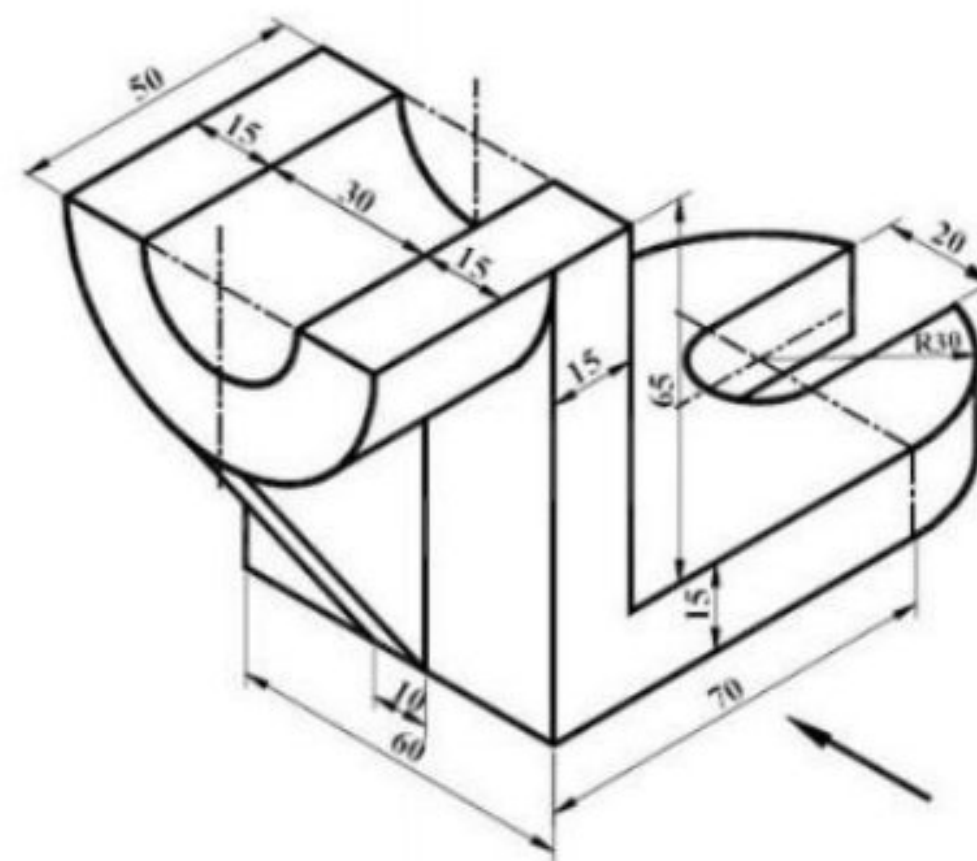


Figure T6.4

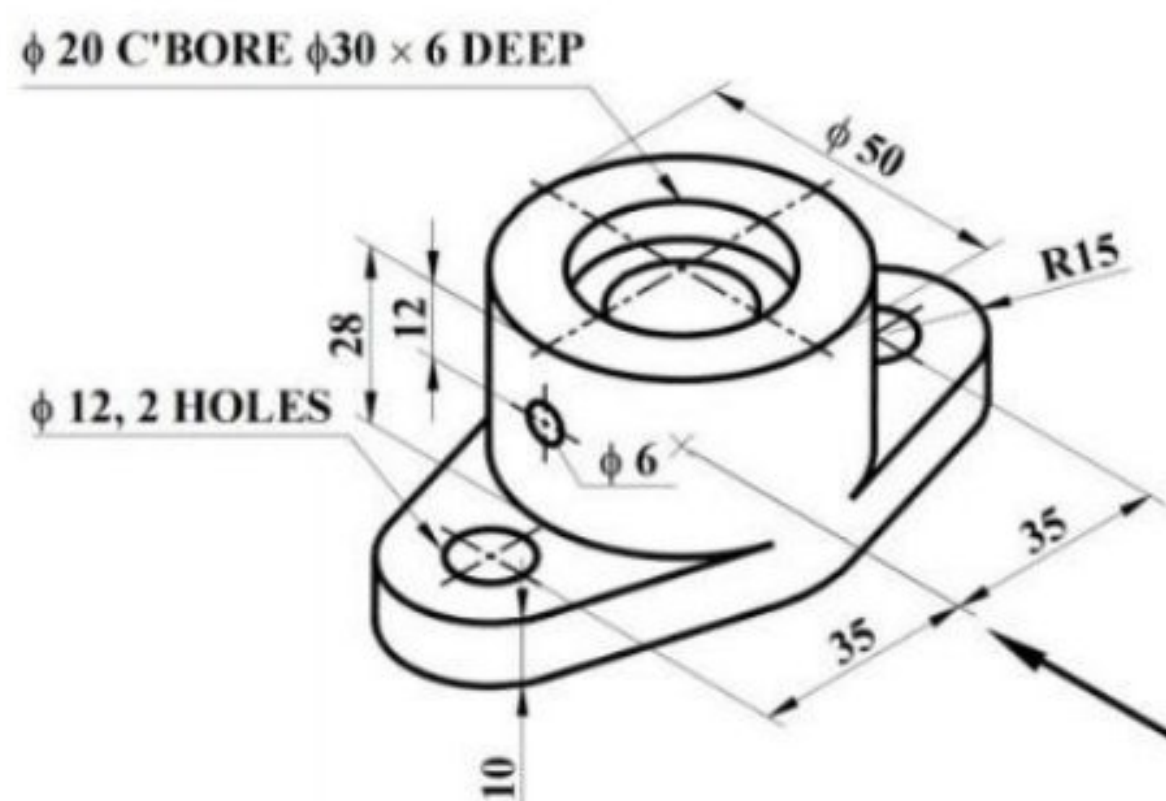


Figure T6.5

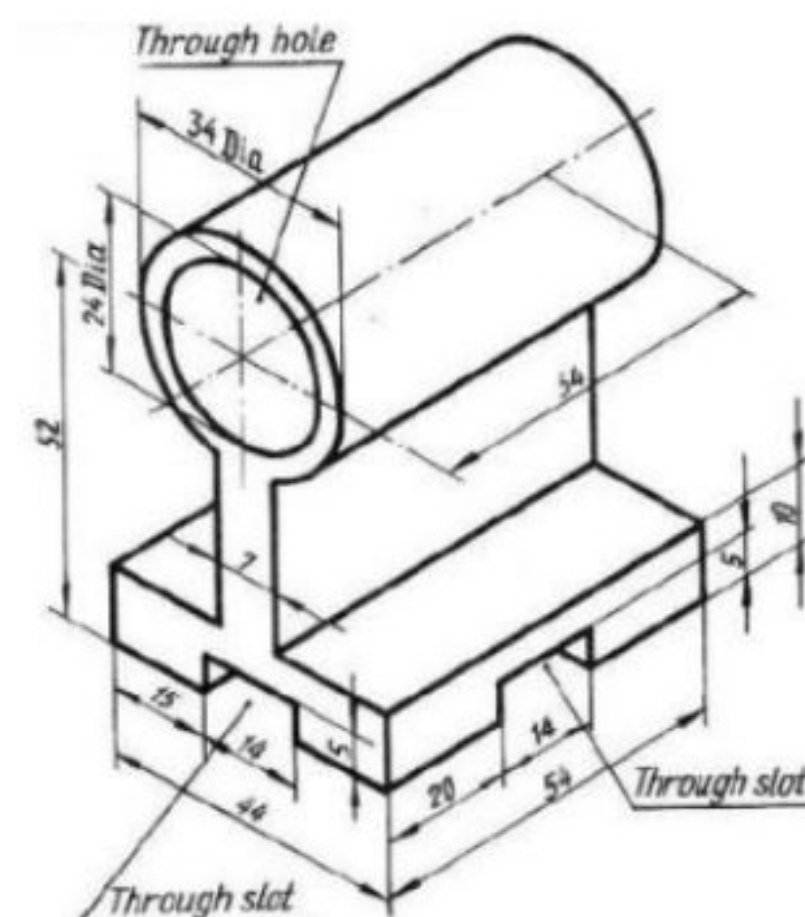


Figure T6.6



## SHEET NO: 7

### DEVELOPMENT OF SURFACES

Make a complete orthographic drawing of a geometrical solid cut by a plane. Find the true shape of the section. Construct the development of the surface of the solid.

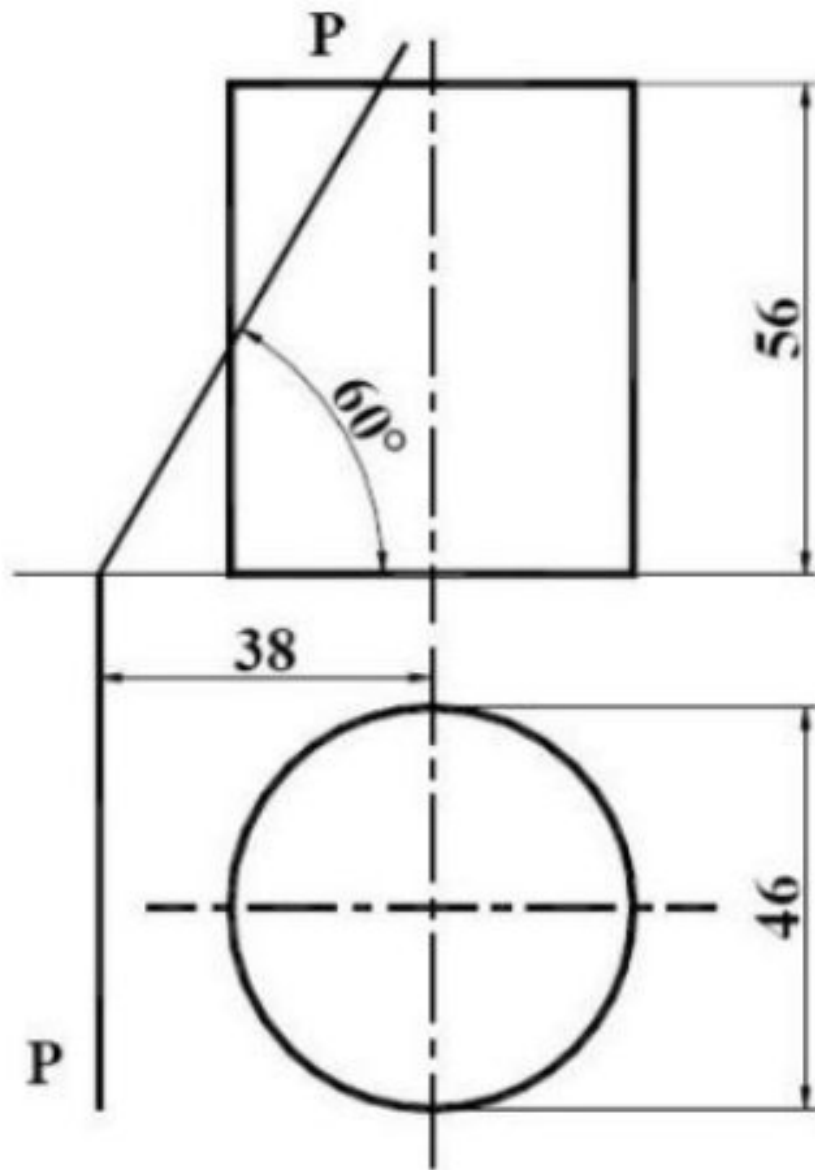


Figure T7.1

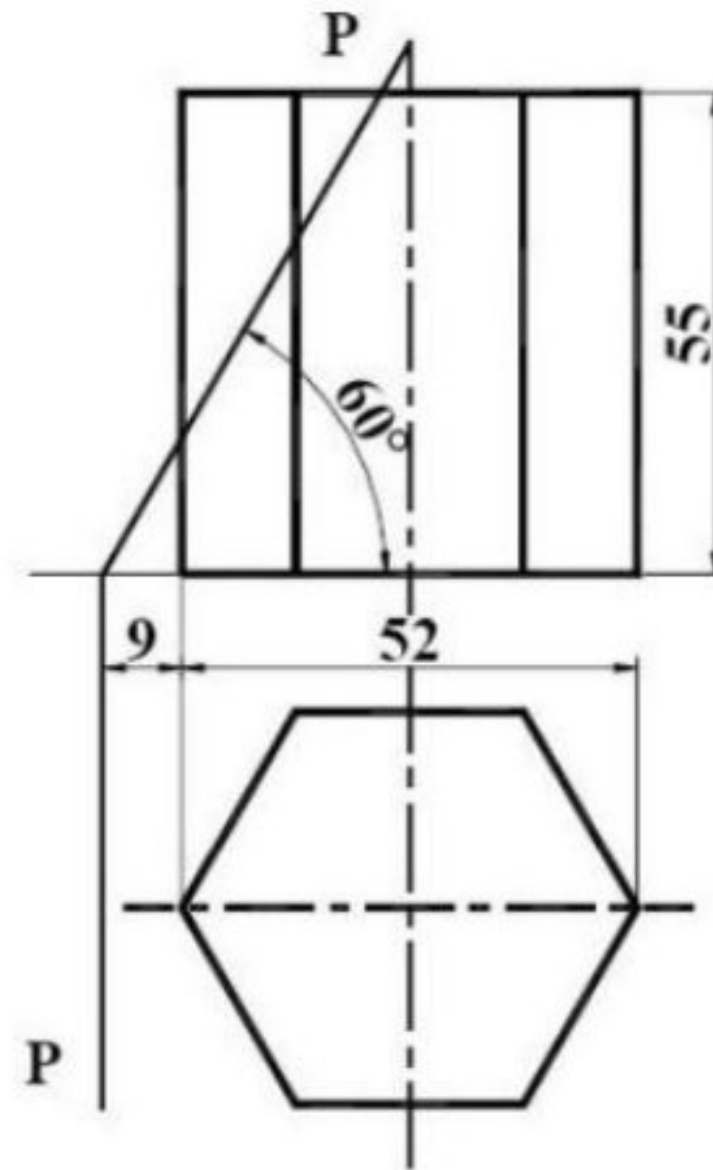


Figure T7.2

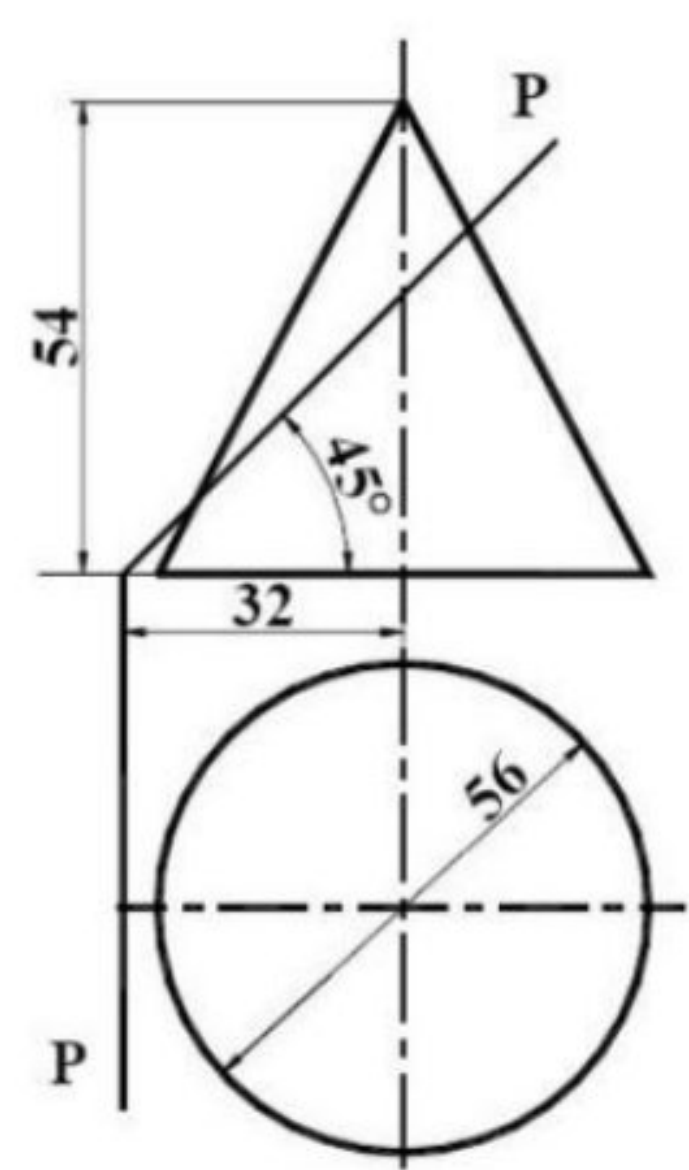


Figure T7.3

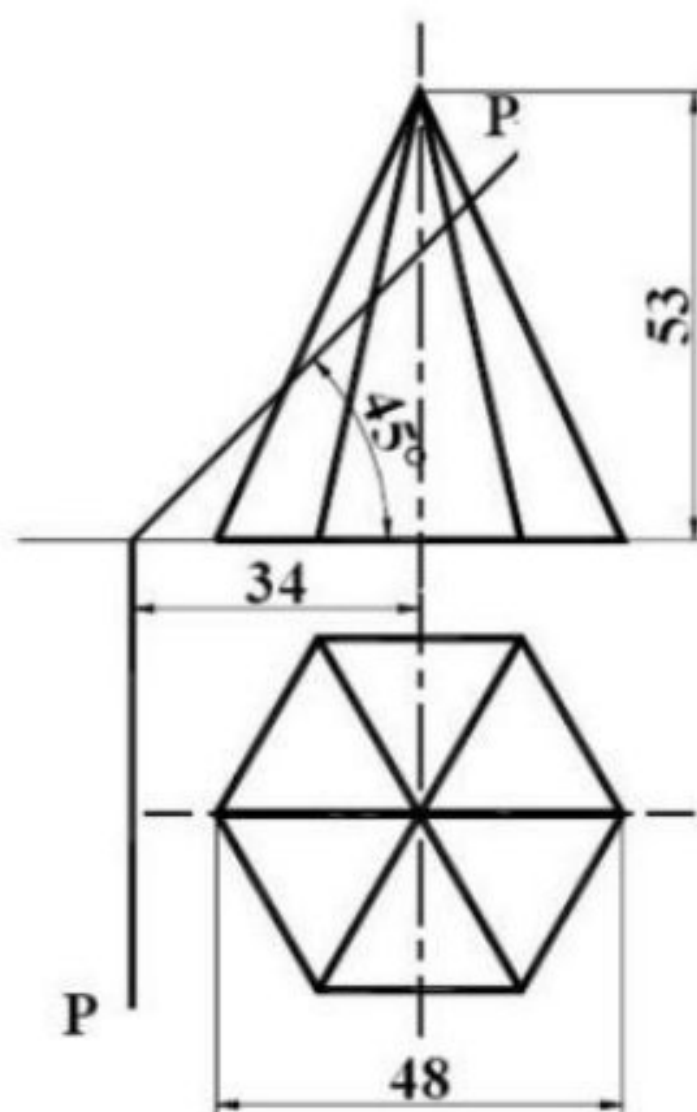


Figure T7.4

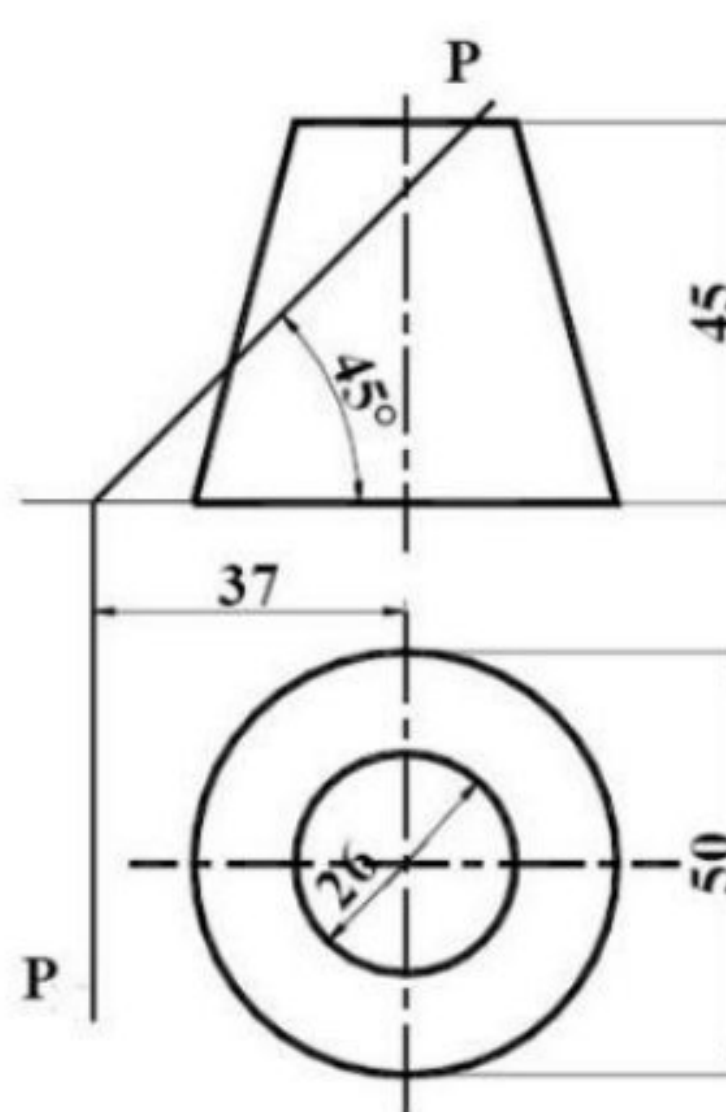


Figure T7.5

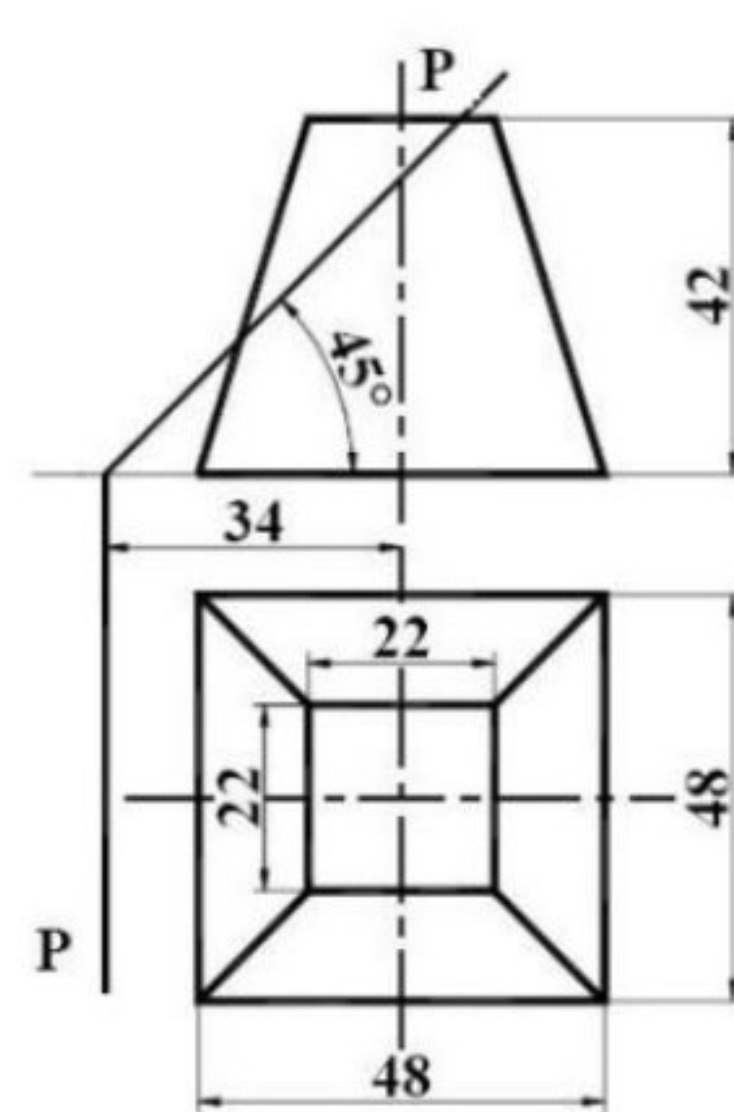
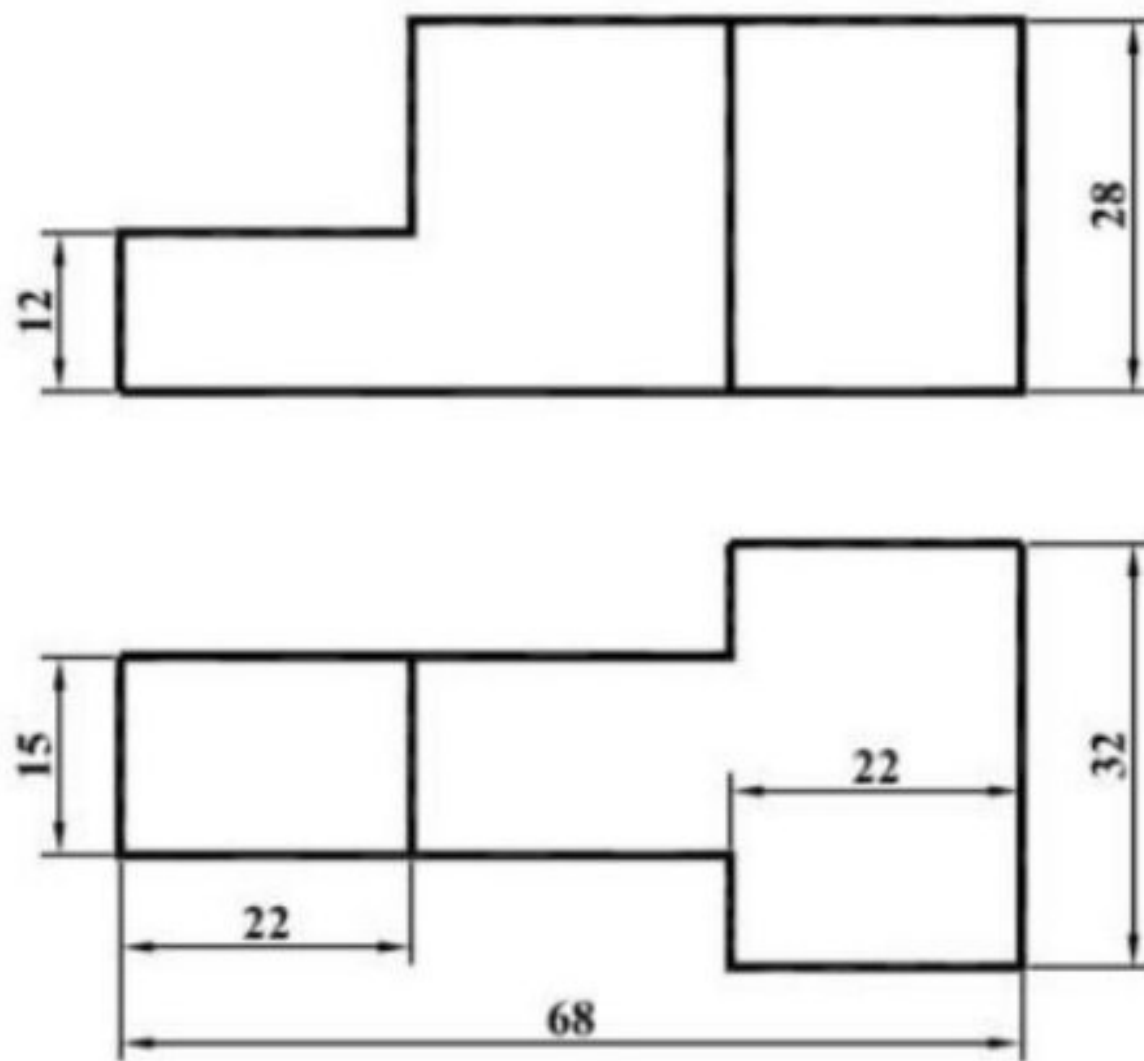


Figure T7.6

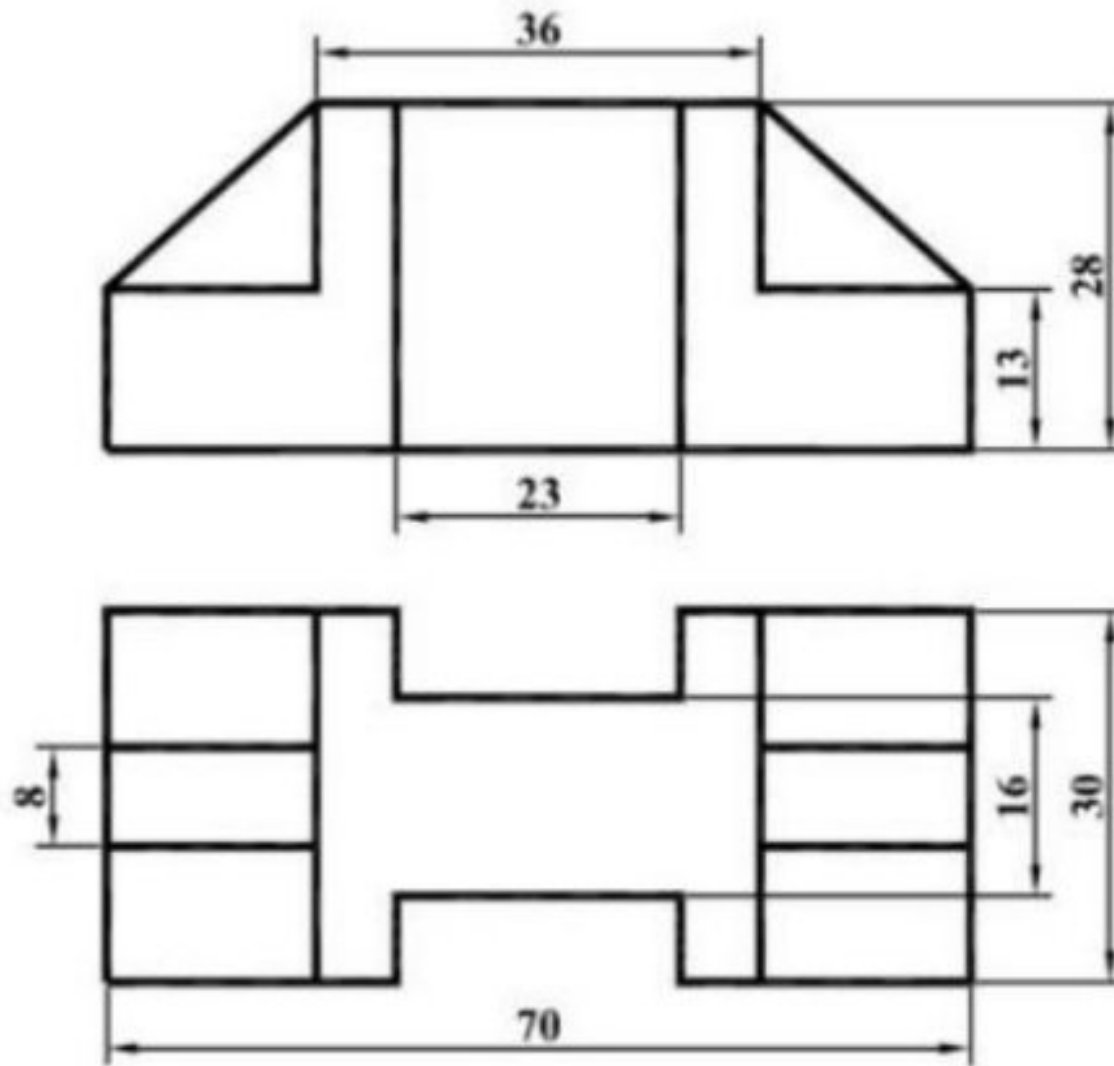
## SHEET NO: 9

### ISOMETRIC DRAWINGS

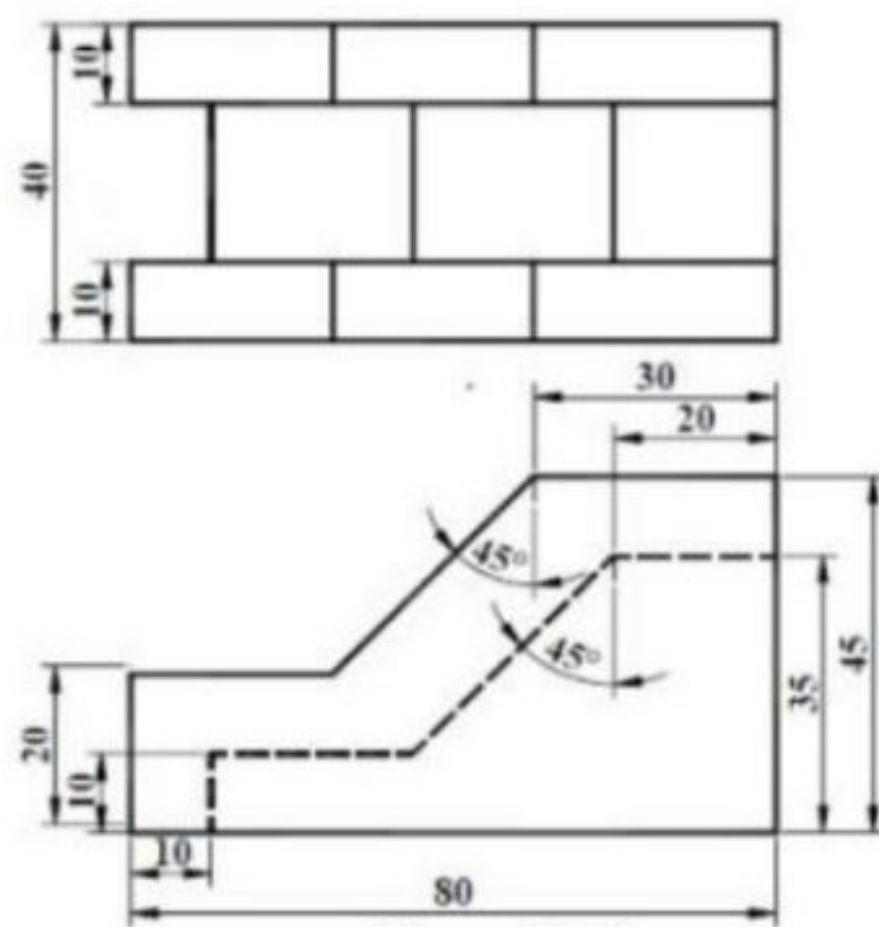
Draw an isometric Drawing of the following orthographic drawing.



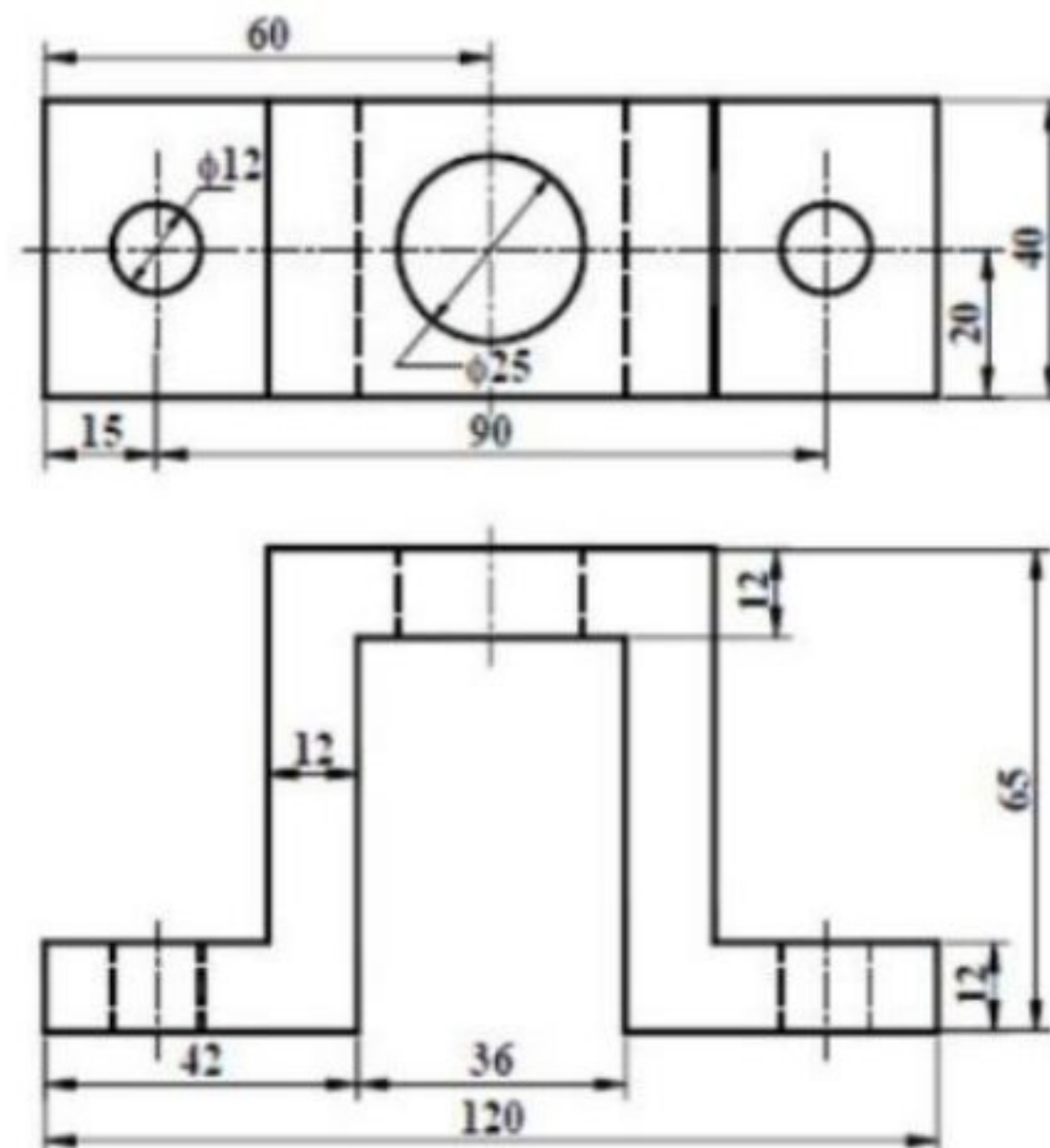
**Figure T9.1**



**Figure T9.2**



**Figure T9.3**



**Figure T9.4**



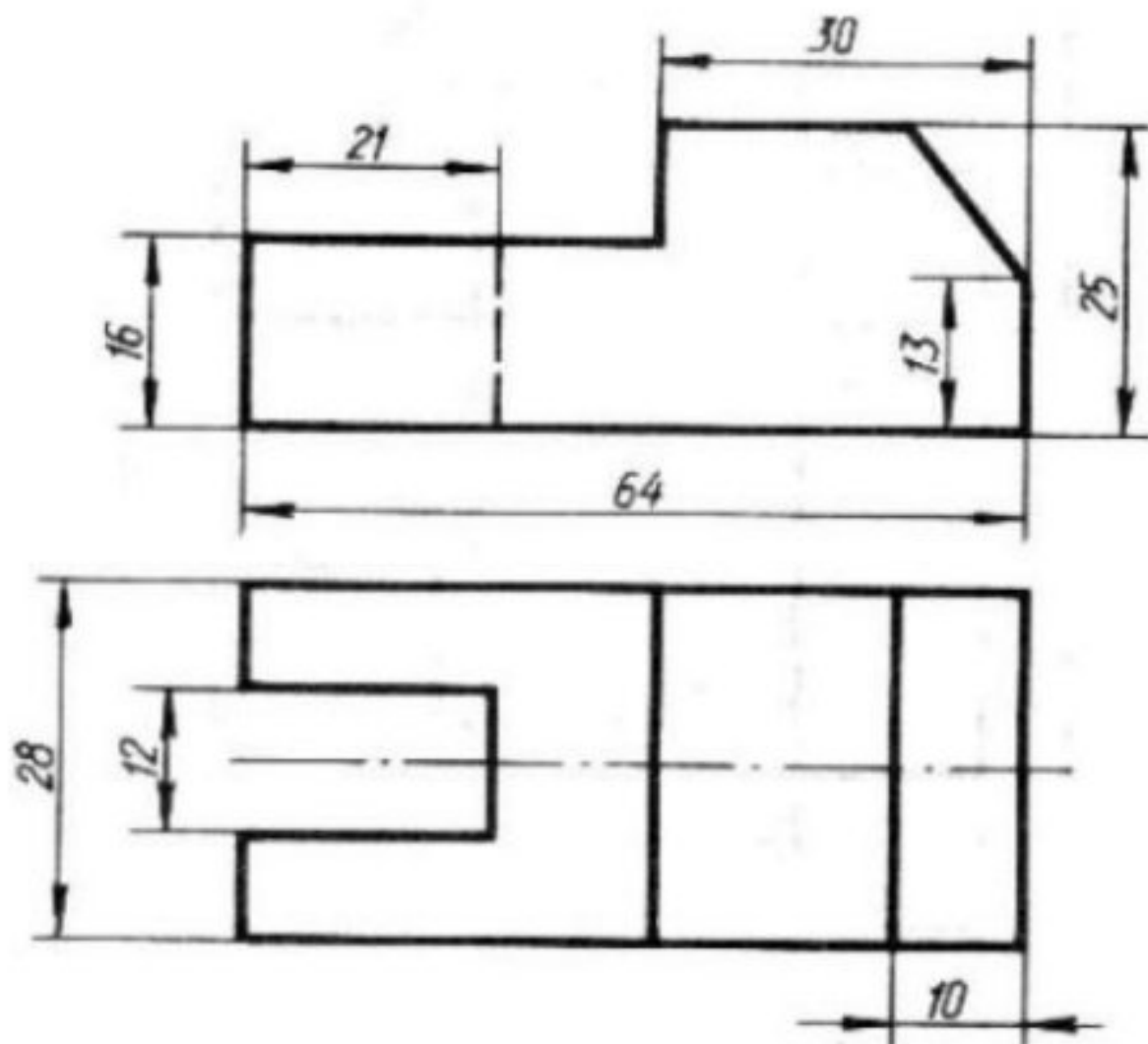


Figure T9.5

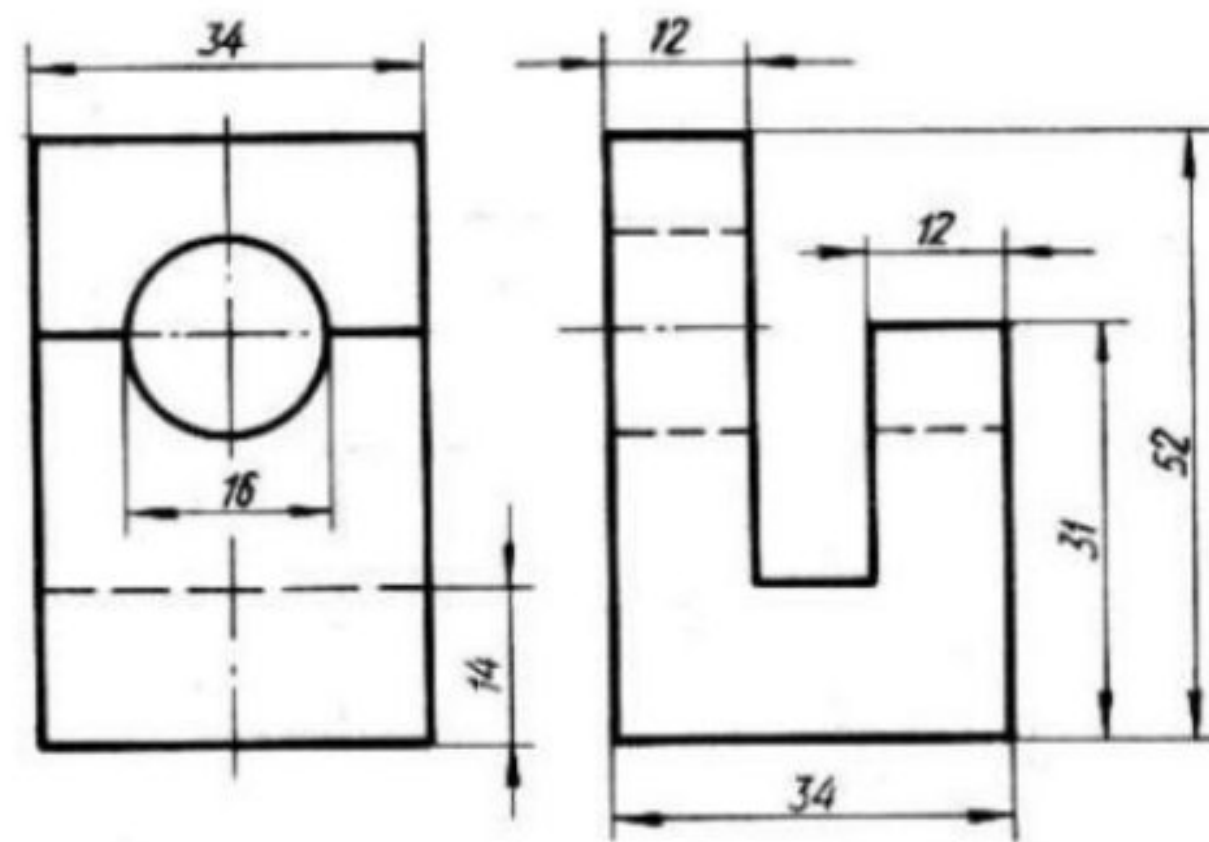


Figure T9.6

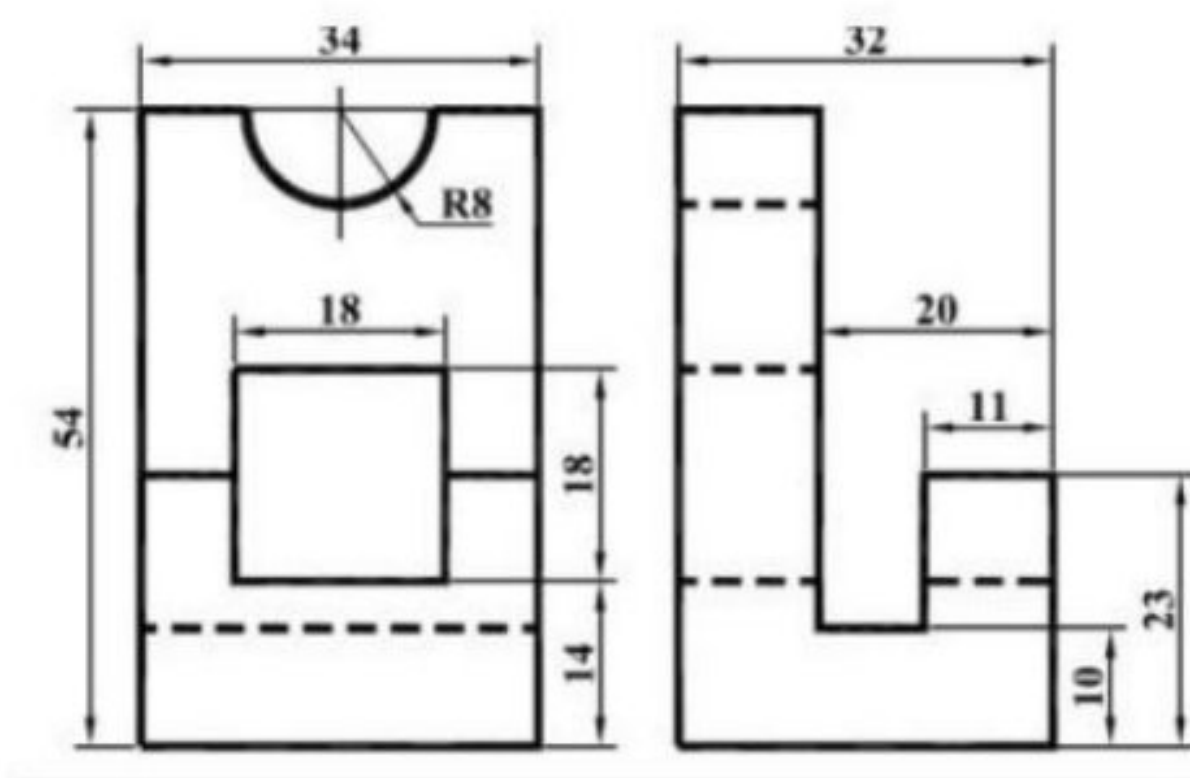


Figure T9.7

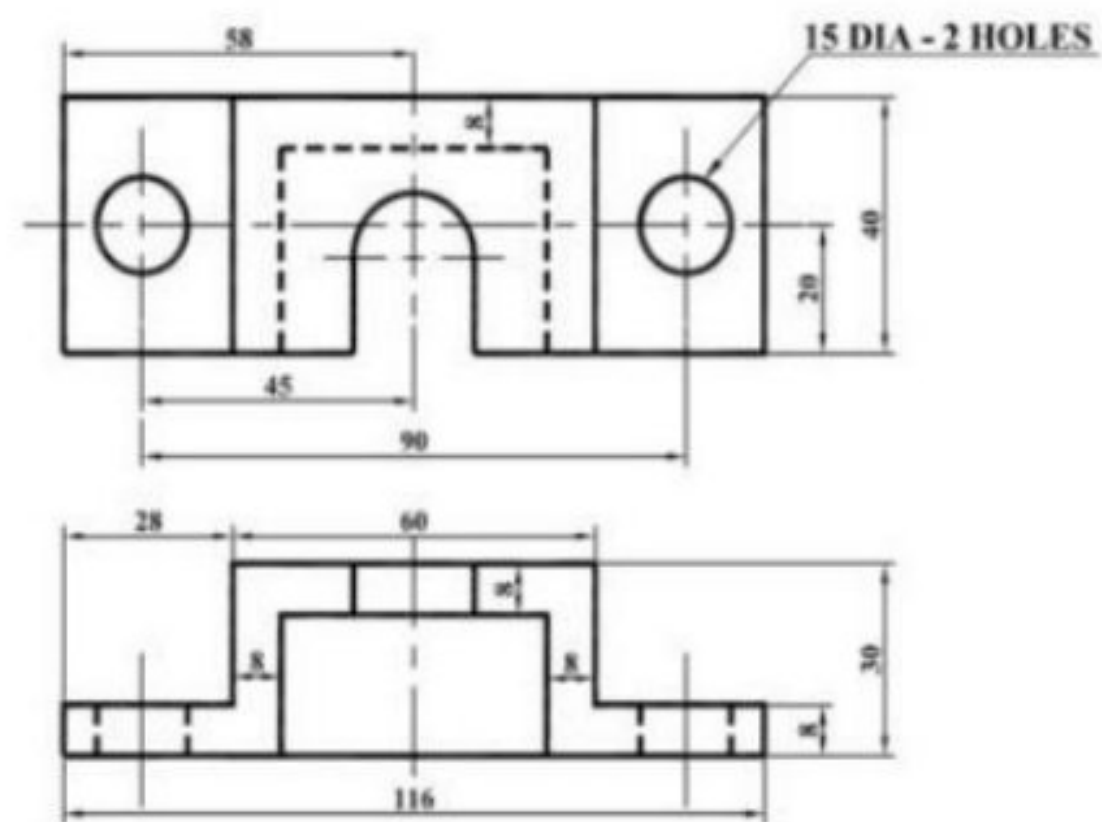


Figure T9.8

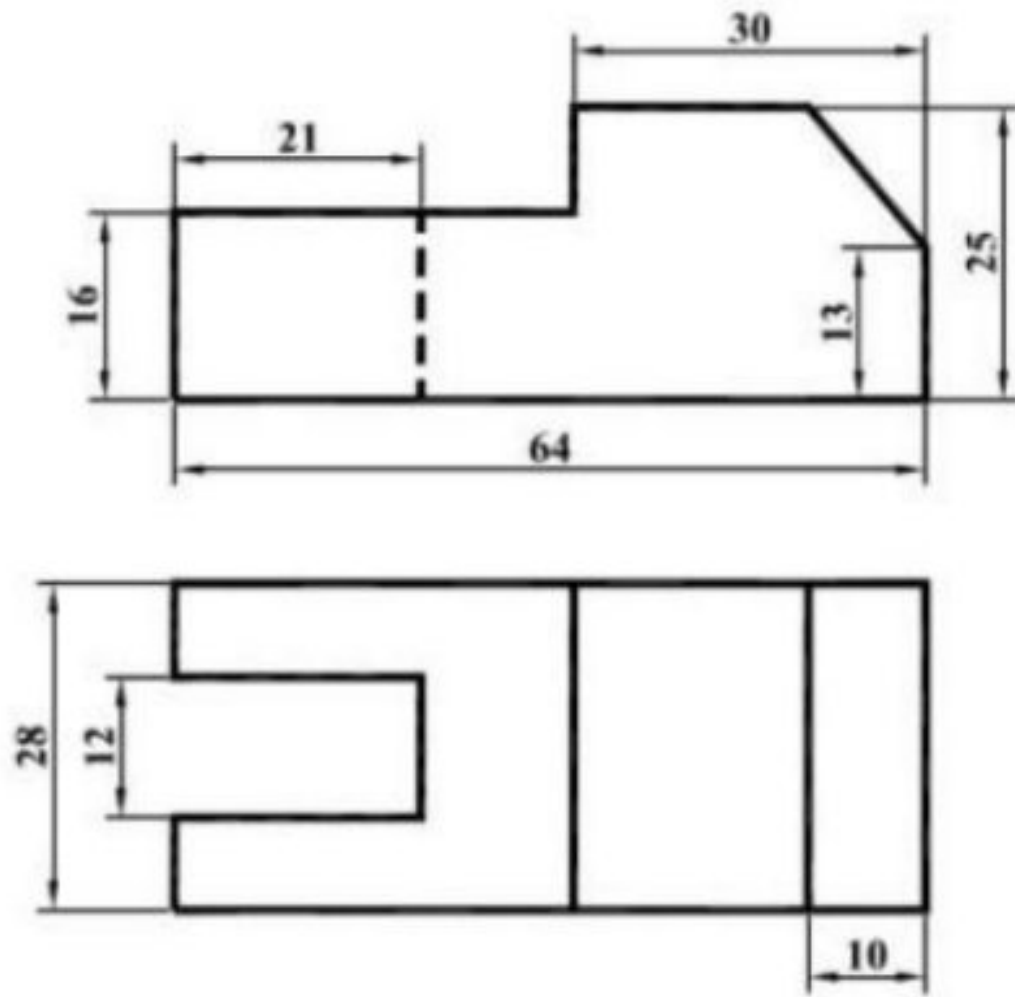
#### Exercise:

1. A cylindrical slab having 60 mm as diameter and 40 mm thickness is surmounted by a cube of edge 40 mm. On the top of the cube rests a square pyramid of altitude 40 mm and side of base 25 mm. The axes of the solids are in the same straight line. Draw the isometric view of the combination of these solids.
2. A sphere of diameter 45 mm rests centrally over a frustum of cone of base diameter 60 mm, top diameter 40 mm and height 60 mm. Draw isometric projections of the combination of solids.
3. A cylindrical slab of 70 mm as diameter and 40 mm thickness is surmounted by a frustum of a square pyramid of base side 45 mm, top base side 25 mm and height 50 mm. The axes of the two solids are on a common straight line. A sphere hemisphere of diameter 40 mm is centrally placed on top of the frustum. Draw the isometric view of the solids.
4. A cube of sides 60 mm is resting on the ground. A cylinder of base diameter 50 mm and height 60 mm is kept over that. On top of the cylinder, a hexagonal pyramid of side of base 20 mm and altitude 40 mm is kept. The axis of the three solids lies in the same vertical line. Draw the isometric view.

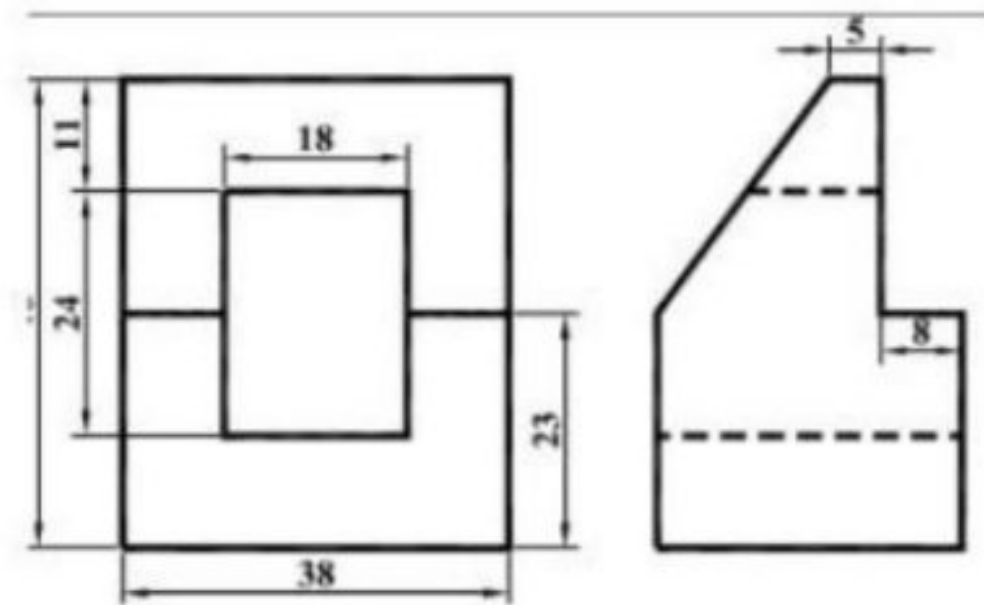


**SHEET NO: 10**  
**OBLIQUE DRAWINGS**

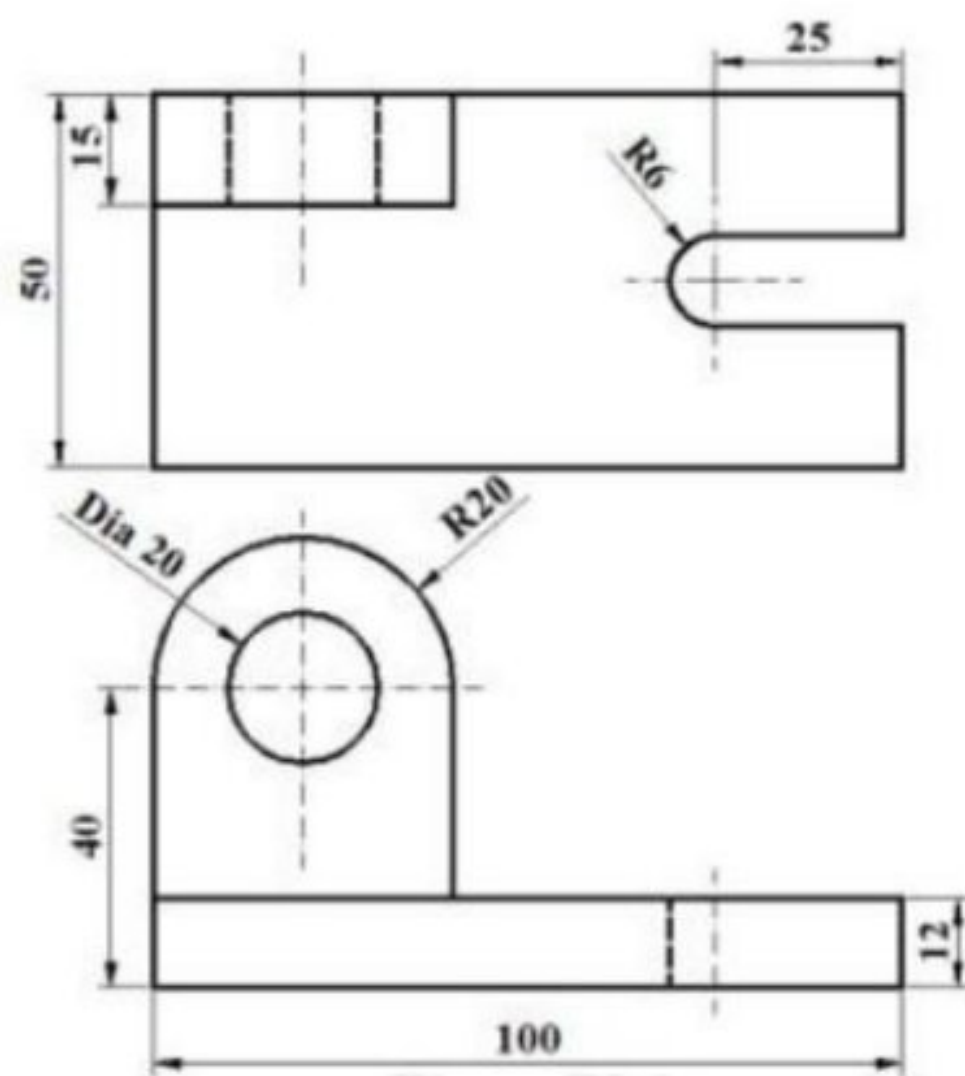
Draw the Oblique Drawing of the following orthographic Drawings



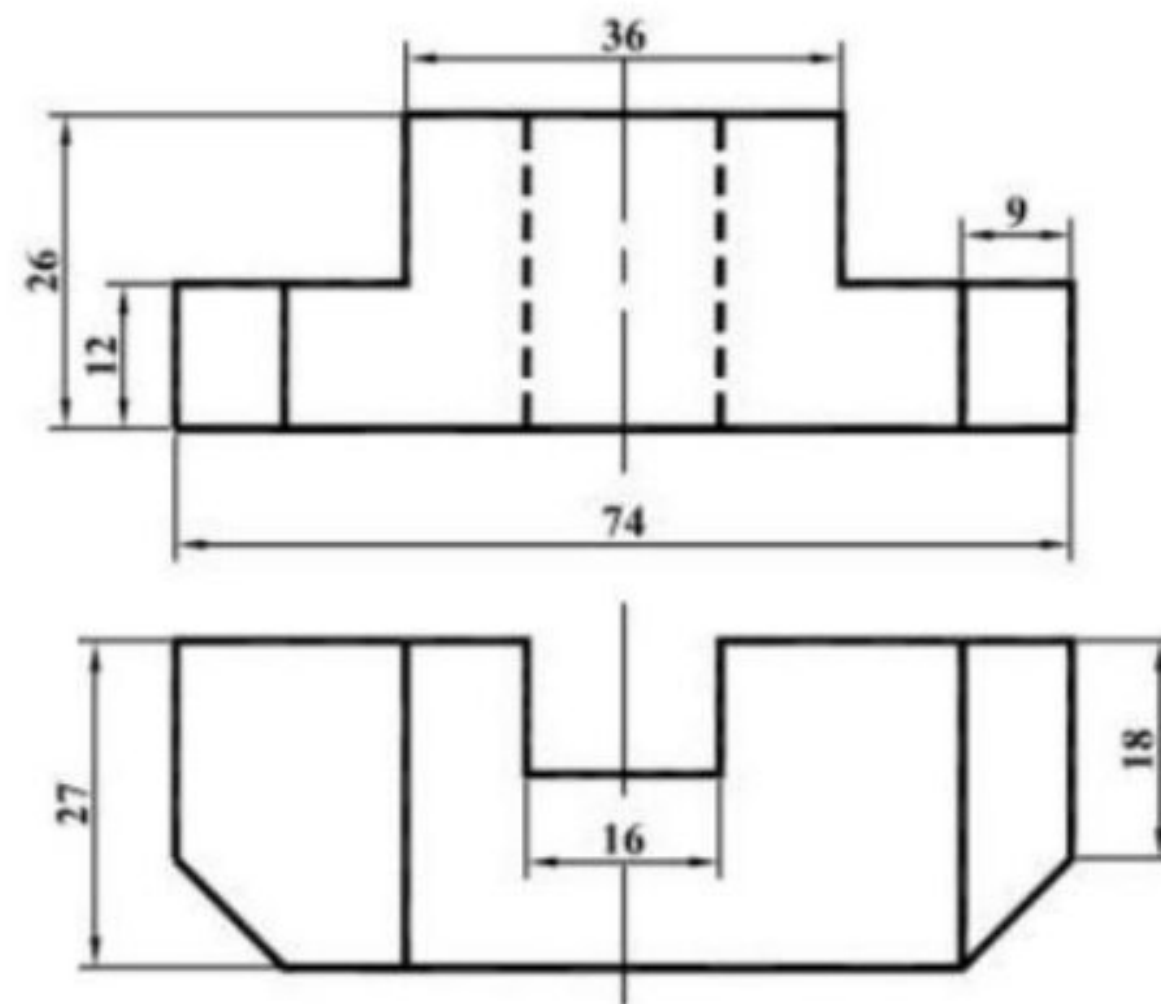
**Figure T10.1**



**Figure T10.2**



**Figure T10.3**



**Figure T10.4**



## SHEET NO: 11

### PERSPECTIVES DRAWINGS

Draw the Parallel perspective projection from the given orthographic views.

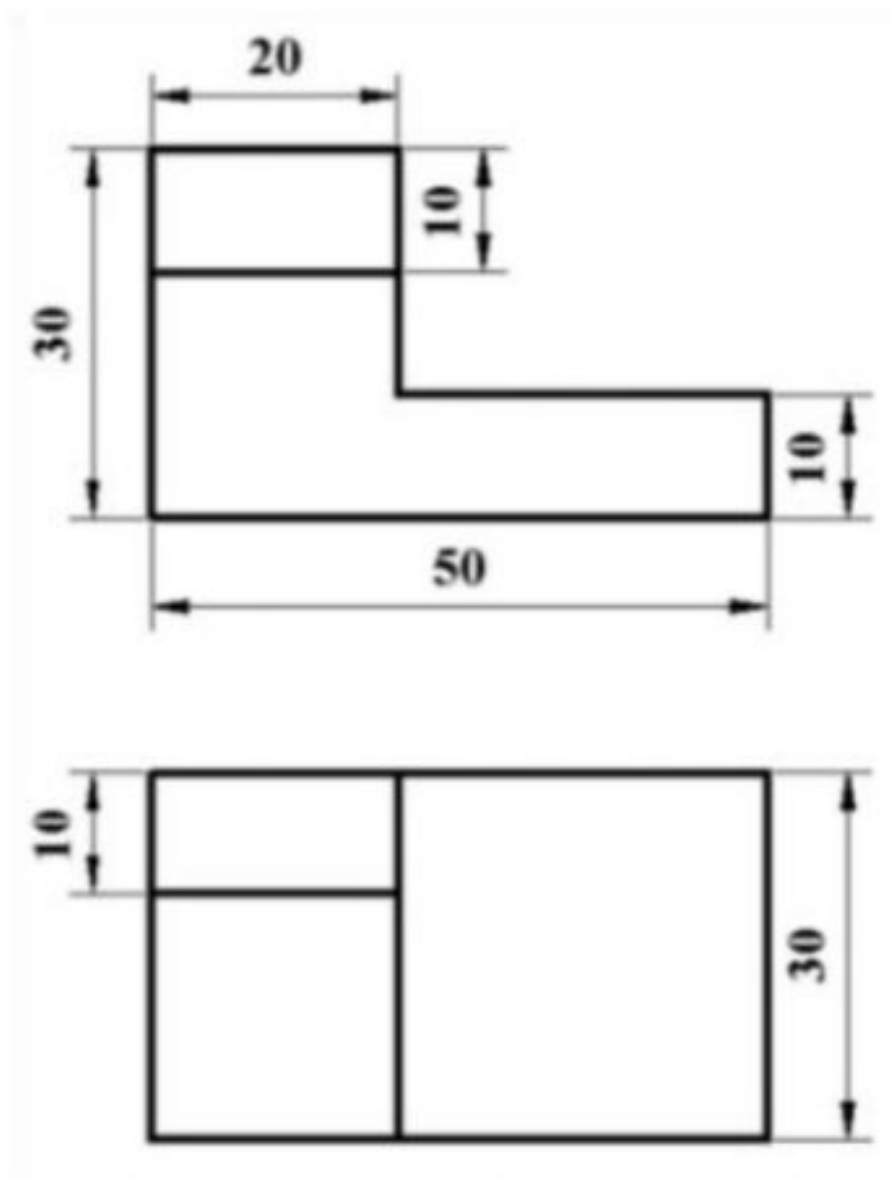


Figure T11.1

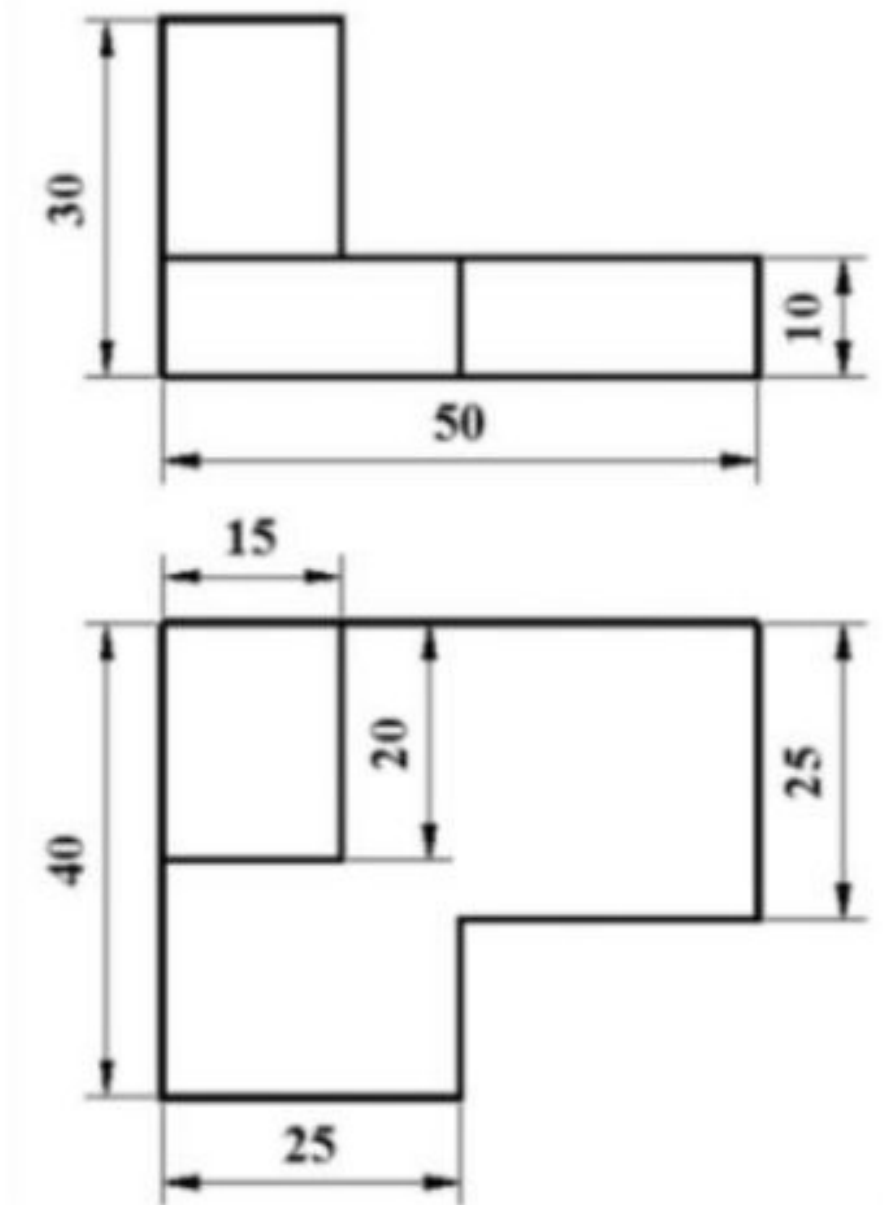


Figure T11.2

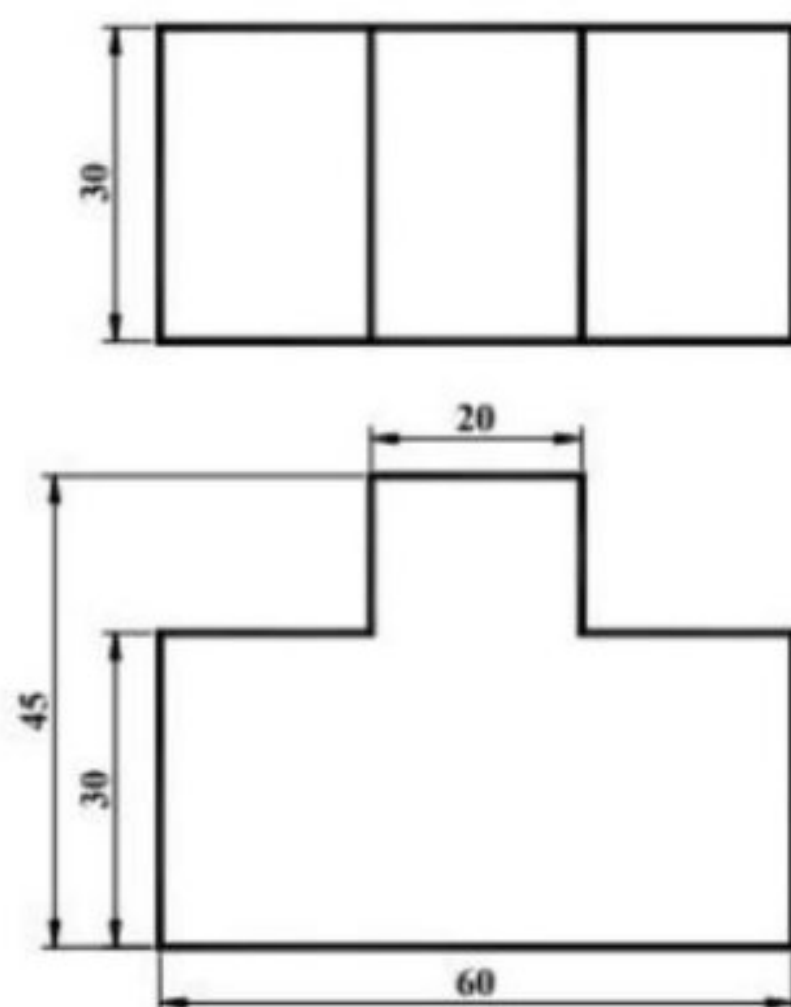


Figure T11.3

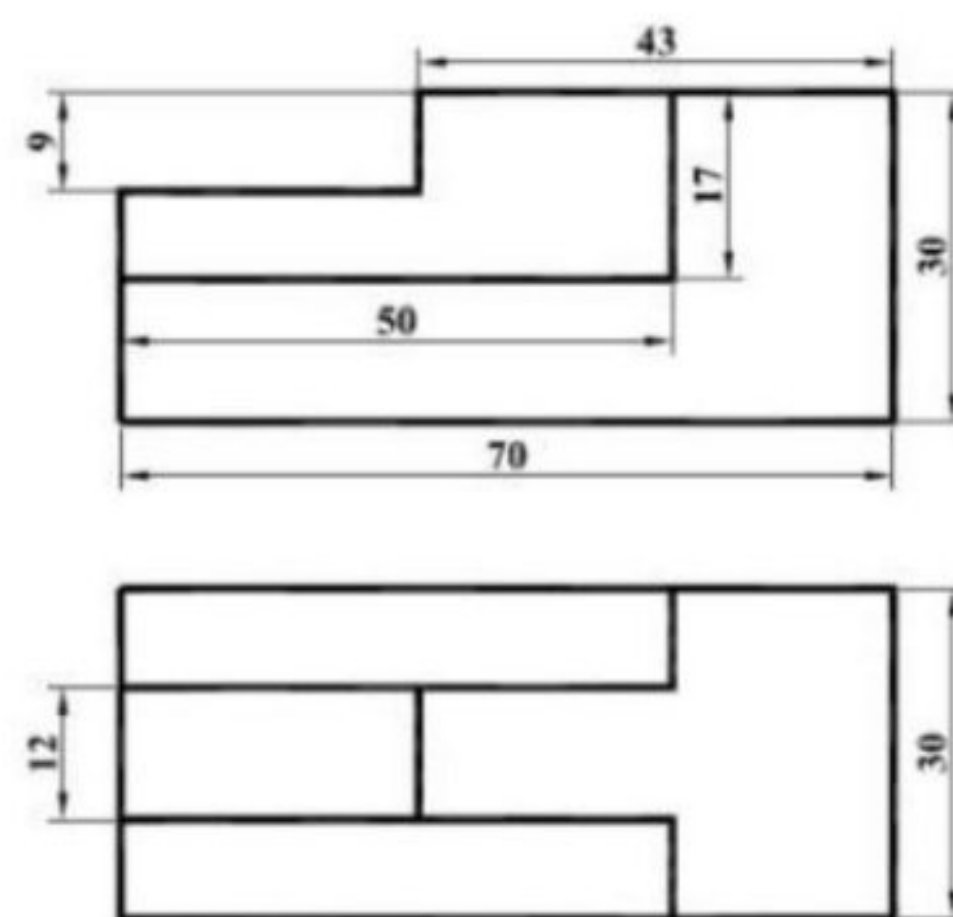
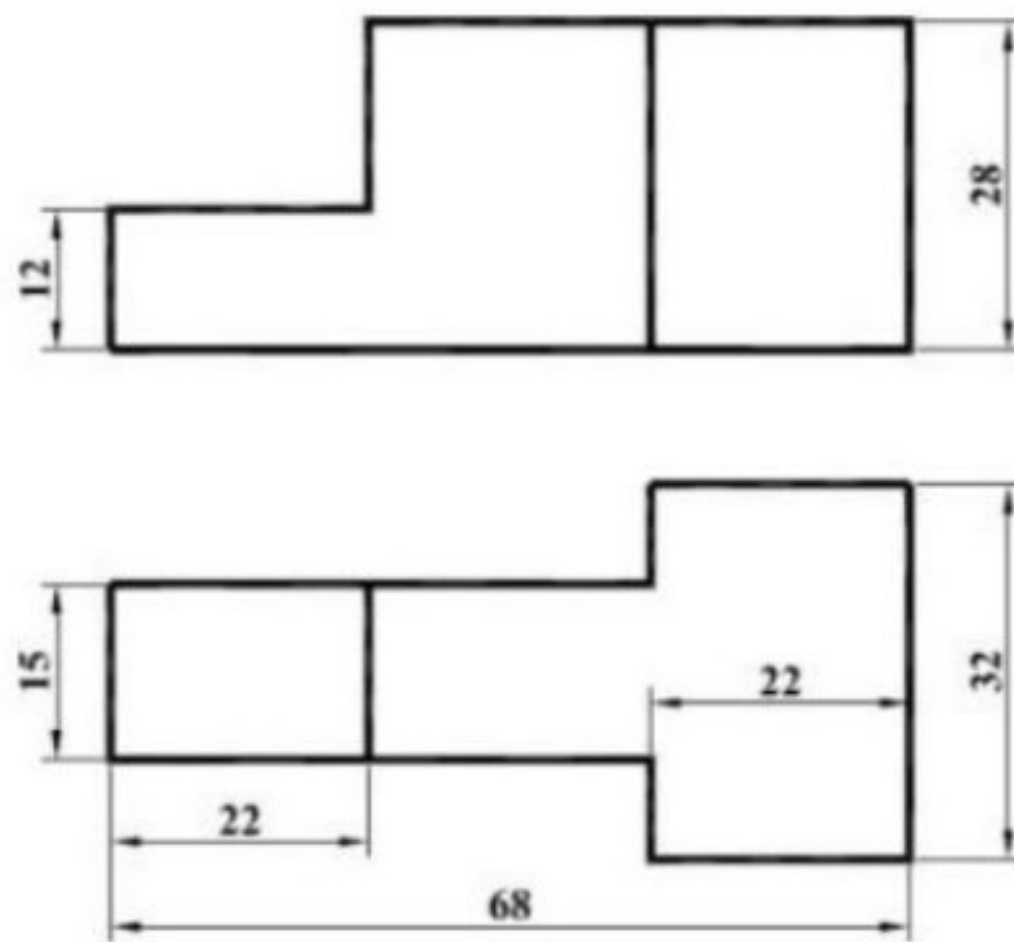
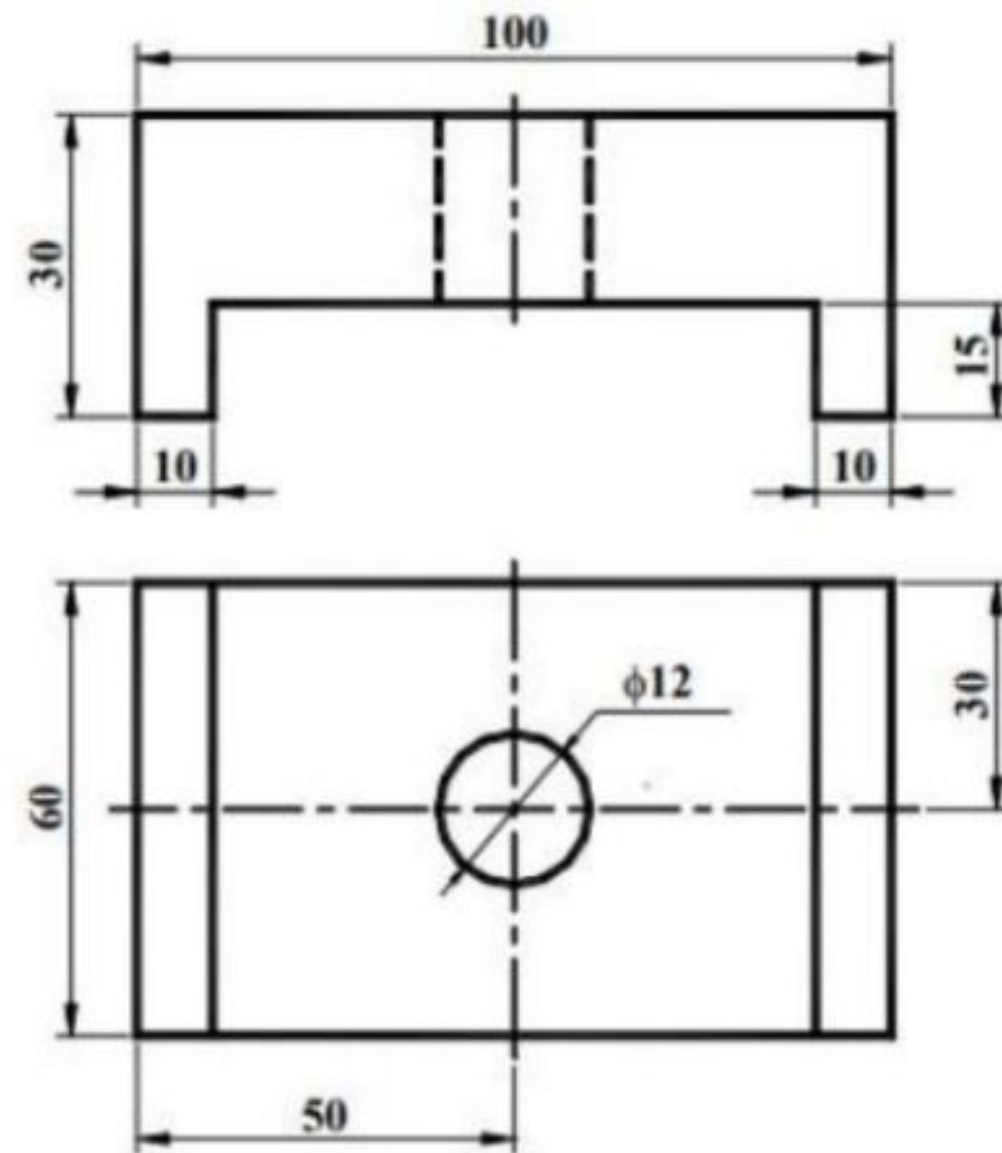


Figure T11.4





**Figure T11.5**



**Figure T11.6**

**Exercise :**

1. A cube of side base 30 mm rests with its base on the ground and one of the faces inclined at 45 degree to the picture plane. The nearest vertical edge touches the PP. The station point is 50 mm in front of the PP, 60 mm above the ground and opposite to the nearest vertical edge that touches the PP. Draw the perspective view.
2. Draw the perspective view of a cube of 25 mm edge, resting on ground with one of its faces. It has one of its nearest vertical edges is 10 mm behind the picture plane and all its vertical faces are equally inclined to the picture plane. The station point is 55 mm in front of the picture plane, 40 mm above the ground and lies in the central plane, which is 10 mm right of the center of the cube.
3. A model of steps has 3 steps of 15 mm tread and rise 10 mm. The steps measure 50 mm wide. The vertical edge of bottom steps, which is nearer to the picture plane, is 25 mm behind PP and the width of steps recede to the left at an angle of 30 degree to PP. The station point is 100 mm in front of PP and 60 mm above the ground plane and 30 mm to the right of the vertical edge, which is nearest to PP. Draw the perspective view of the model.



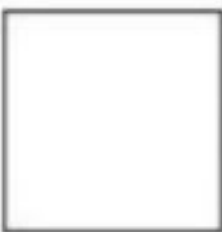
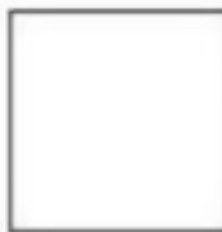


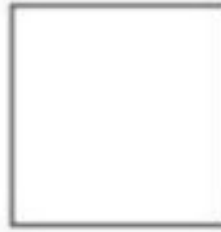
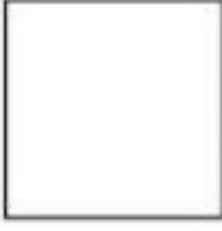





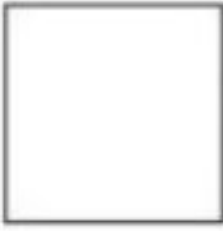
**SHEET NO: 13**  
**GRAPHICAL SYMBOLS**

Sketch freehand the graphical symbols for the following welding items.

Lap Weld	<div></div>	Fillet	<div></div>
Square Butt	<div></div>	Single V-Butt	<div></div>
Double V-Butt	<div></div>	Single U-Butt	<div></div>
Double U- Butt	<div></div>	Single J-Butt	<div></div>
Single Bevel Butt	<div></div>	Double Bevel Butt	<div></div>
Double J-Butt	<div></div>	Spot Weld	<div></div>
Bead or Edge Weld	<div></div>	Seam Weld	<div></div>
Field Weld	<div></div>	Weld all around	<div></div>
Fillet Weld on own side of joints	<div></div>	Fillet weld on opposite side of joint	<div></div>
Fillet weld on both sides of joint	<div></div>		

Sketch free hand the graphical symbols for the following Engineering items.

### Electronics and Electrical

Amplifier		Antenna		Arrester		Battery	
Circuit Breaker		Capacitor		Coil		Connector	
Electric Contact		Core		Fuse		Directional Coupler	
Ground		Handset		Rectifier		Visual Signaling device	
Receiver		Repeater		Ground		Handset	
Thermocouple		Inductor Winding		Incandescent Lamp		Ballast Lamp	
Transformer		Switch		Resistor		Transmission Path	
Generator		Motor		Solenoid		Thermostat	
Thermistor		Variable Resistor		Voltmeter		NPN-type Transistor	
PNP-type Transistor		Direct Current		Alternating Current		Power Frequency	
Apparatus & Machine suitable for DC or AC		Half-wave Rectifier		Line or Cable existing		Line or Cable planned	
Controlled Rectifier		Power Line		Underground Cable		Overhead Line	



## Electronics and Electrical

Conductors or a group of Conductors		Flexible Conductors		Two Conductors		Three Conductors	
Four Conductors		Junction of Conductors		Crossing without Electrical Connection		Crossing and Connecting Conductors	
Frame and Chassis Connection		Fault		Fault to Frame		Earth Fault	
Mechanically Coupled Machine		DC Generator		AC Generator		DC Motor	
AC Motor Single Phase		Three Phase Motor		Three Phase Motor in Delta Connection		One Way Switch (Single Pole Switch)	
Two Pole Switch		Three Pole Switch		Two Way Switch		Intermediate Switch	
Push Button Switch		Socket Outlets		Socket Outlets, 5A		Socket Outlets, 5A with Switch	
Socket Outlets, 15A with Switch		Lamp mounted on ceiling		Group of 3, 40 Watt Lamp		Lamp mounted on wall	
Fluorescent Lamp		Ceiling Fan		Wall mounted Fan		Exhaust Fan	
Fan Regulator		Bell		Pickup		Buzzer	
Siren		Public addressing System		Diode with Filament		Telephone-Telegraph Line	

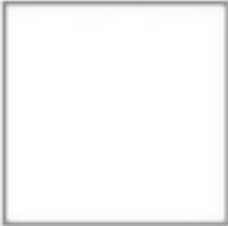
### Structural Items

Plate	<input type="text"/>	Angle	<input type="text"/>	Channel	<input type="text"/>	I-beam	<input type="text"/>
H-beam Tee	<input type="text"/>	Round Solid Bar	<input type="text"/>	Square Bar	<input type="text"/>	Flat Bar	<input type="text"/>
Circular Tube	<input type="text"/>	Square Tube	<input type="text"/>	Rectangular Tube	<input type="text"/>	Unequal Angle	<input type="text"/>
Equal Angle	<input type="text"/>						

### Other Engineering – Architecture, Civil, Agriculture, Topographic, etc.

School	<input type="text"/>	Church	<input type="text"/>	House	<input type="text"/>	City or Town	<input type="text"/>
Cemetery	<input type="text"/>	Building any kind	<input type="text"/>	Temple	<input type="text"/>	<u>Gumba</u>	<input type="text"/>
Mosque	<input type="text"/>	Unimproved Highway	<input type="text"/>	Improved Highway	<input type="text"/>	Trail	<input type="text"/>
Single Track	<input type="text"/>	Double Track	<input type="text"/>	Electrical Railroad	<input type="text"/>	Ferry	<input type="text"/>
Highway Bridge	<input type="text"/>	Railroad Bridge	<input type="text"/>	Ford	<input type="text"/>	Dam	<input type="text"/>
State Line	<input type="text"/>	Country Line	<input type="text"/>	Township Line	<input type="text"/>	City or Village Line	<input type="text"/>
Mine Quarry	<input type="text"/>	Oil or Gas wells	<input type="text"/>	Tanks	<input type="text"/>	Embankment	<input type="text"/>
Cut	<input type="text"/>	Levees	<input type="text"/>	Tunnel	<input type="text"/>	Fence (any kind)	<input type="text"/>



Rail Fence		Barbed Wire Fence		Smooth Wire Fence		Stone Fence	
Hedge Fence		Contours		Depression Contours		Hill Contours	
Hachures		Bluffs		Sand		Sand Dunes	
Glaciers		Stream		River		Lake	
Rapids		Tidal Swamp		Cypress Swamp		Fresh Water Swamp	
Salt Water Swamp		Trees Deciduous		Trees Coniferous		Willows	
Orchard		Meadow		Cultivated		Corn	
Cotton							

## SHEET NO: 14

### COMPUTER AIDED DRAWINGS

- Introduction to AutoCAD,
- Basic commands for 2D drawing like: Line, Circle, Polyline, Rectangle, Hatch, Fillet, Chamfer, Trim, Extend, Offset, Dim style, etc.
- Basics of 3D drawings