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PRACTICE PROBLEMS FOR ENGINEERING DRAWING I

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PRACTICE PROBLEMS FOR ENGINEERING DRAWING I

Exercise Sheets

Mahesh Chandra Luintel

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PRACTICE PROBLEMS FOR ENGINEERING DRAWING I

EXERCISE 1

TECHNICAL LETTERING

1. Draw the following patterns shown in **Figure P1.1** using T-square and set-square or drafter.

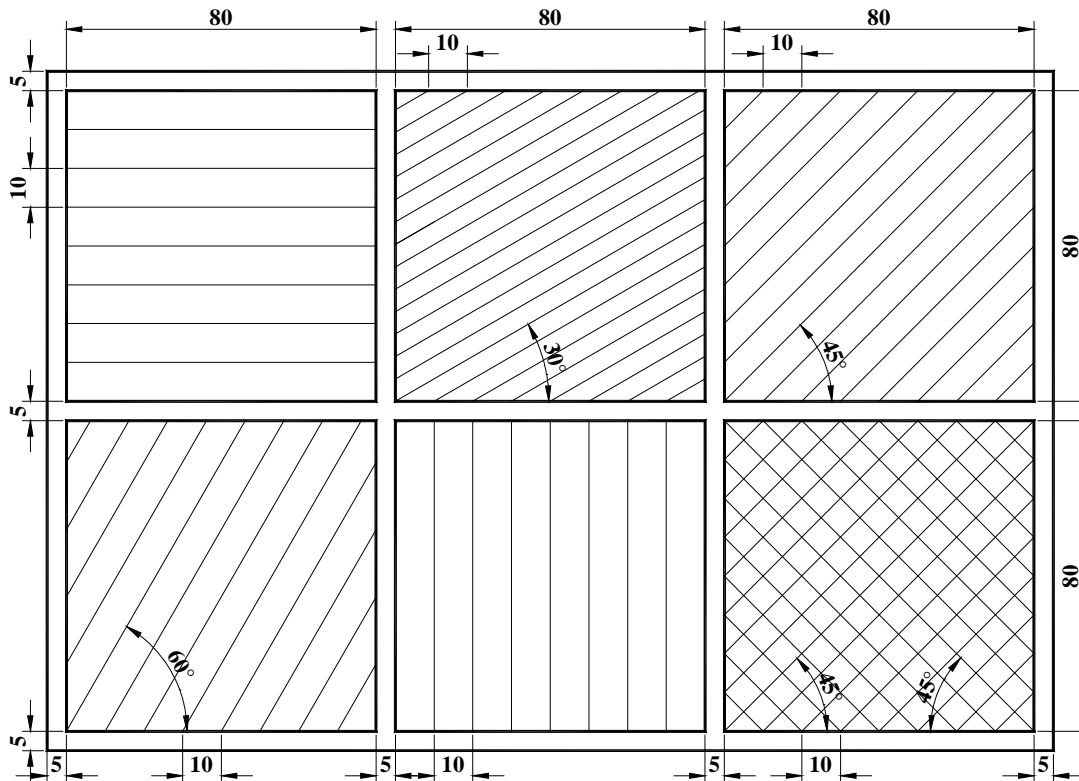


Figure P1.1

2. Write down freehand single stroke alphabets (A to Z) of different size using guidelines in
 - Vertical capital
 - Inclined capital
 - Vertical small, and
 - Inclined small letters.
3. Write down freehand single stroke vertical and inclined numerals (0 to 9) and fractions different size using guidelines.
4. Write the following sentence in freehand, single stroke vertical and inclined uppercase letters in 6 mm height.

ENGINEERING DRAWING IS THE FOUNDATION OF ALL ENGINEERING DISCIPLINES.
5. Draw the following lines with 100 mm length

- Visible outline
- Hidden
- Center
- Projection
- Cutting plane
- Break

6. Dimension the plane figures shown in **Figure P1.6**. Size may be obtained by measuring the drawing.

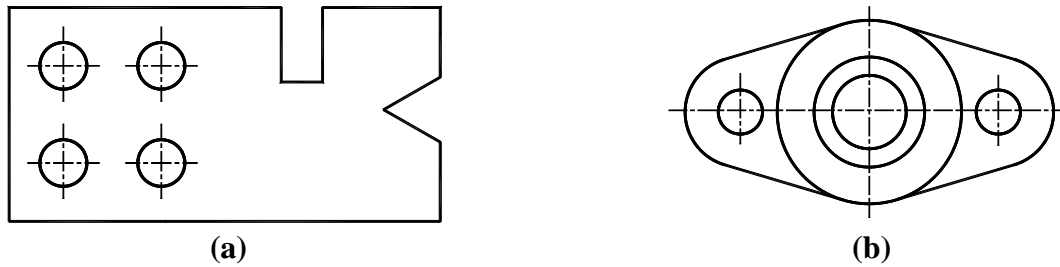


Figure 1.6

	20	60	10	25	25
5	S. N.	DESCRIPTION	QTY.	MATERIAL	REMARK
5	DRAWN BY		NAME OF THE INSTITUTE		
5	ROLL NO				
5	CHKD BY				
10	TITLE				
5	SCALE		DRG SHEET NO.		
5	DATE				
5	METRIC SYSTEM				

PRACTICE PROBLEMS FOR ENGINEERING DRAWING I

EXERCISE 2

PLANE GEOMETRICAL CONSTRUCTION

1. (a) Draw a line 70 mm long and trisect it.
(b) Draw an angle of 65° with the help of a protector and trisect it.
(c) Draw a line 60 mm long and divide it into 7 equal parts.
(d) Draw a line 80 mm long and divide it in the proportion of 1:2:3.
2. (a) Draw a regular pentagon inscribed on a circle of 60 mm diameter.
(b) Draw a regular hexagon with a distance of 60 mm across its corners.
(c) Draw a regular octagon with a distance of 66 mm across its flats.
3. Draw an arc of radius 20 mm tangent to two given lines inclined at (a) 60° , (b) 90° , and (c) 120° .
4. **Figure P2.4** shows a straight line and a circle.
(a) Draw an arc of radius 18 mm tangent to both the given line and circle and outside to the given circle.
(b) Draw an arc of radius 30 mm tangent to both the given line and circle and including the given circle.

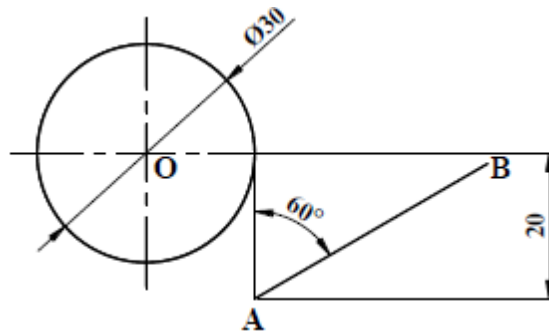


Figure P2.4

5. Draw two circles with radii 15 mm and 20 mm respectively with their centers lying on a horizontal line and 60 mm apart.
(a) Draw an arc tangent of radius 40 mm outside to both the circles.
(b) Draw an arc tangent of radius 50 mm including the circle with radius 15 mm.
(c) Draw an arc tangent of radius 55 mm including the circle with radius 20 mm.
(d) Draw an arc tangent of radius 60 mm including both the circles.
6. Draw two circles with radii 20 mm and 30 mm respectively with their centers lying on a horizontal line and 60 mm apart. Draw internal and external line tangents to the circles.
7. Draw a reverse curve (ogee curve) between the given lines AB and CD shown in **Figure P2.7**.

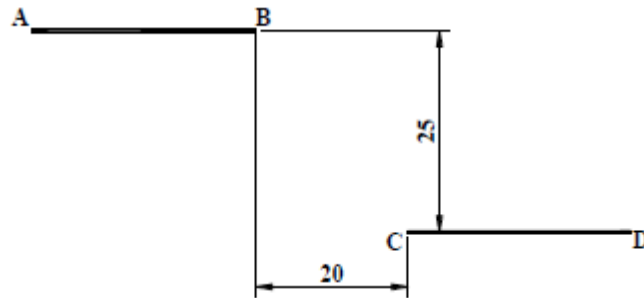
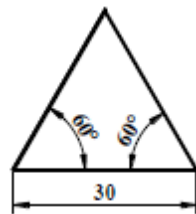
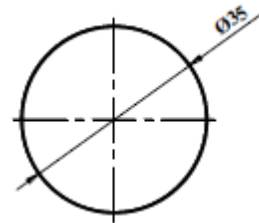


Figure P2.7

8. Draw a parabola with axis length of 60 mm and double ordinate of 80 mm using rectangle method
9. Draw an ellipse with major and minor axes of 80 mm and 60 mm respectively by using
 - (a) concentric circle method, and
 - (b) four center method.
10. Draw a hyperbola with the distance across foci of 60 mm and transverse axis distance of 40 mm.
11. Draw the involutes of the plane figures shown in **Figure P2.11**.



(a)



(b)

Figure P2.11

12. A circle of 50 mm diameter rolls on a horizontal surface. Draw the locus of a fixed point on the circumference of the circle for one complete revolution. Name the curve.
13. Draw an Archimedean Spiral for 1.5 convolutions with pitch equal to 40 mm.
14. Draw helix for having a pitch of 50 mm on a cylinder with the diameter of 40 mm and height of 65 mm.

PRACTICE PROBLEMS FOR ENGINEERING DRAWING I

EXERCISE 3

DESCRIPTIVE GEOMETRY I

1. Draw the projections of the following points.
 - (a) Point **A** 20 mm above the HP and 15 mm in front of the VP.
 - (b) Point **B** 25 mm above the HP and 10 mm behind the VP.
 - (c) Point **C** 15 mm below the HP and 25 mm behind the VP.
 - (d) Point **D** 10 mm below the HP and 15 mm in front of the VP.
 - (e) Point **E** in the HP and 15 mm in front of the VP.
 - (f) Point **F** 20 mm above the HP and in the VP.
 - (g) Point **G** in the HP and 25 mm behind the VP.
 - (h) Point **H** 10 mm below the HP and in the VP.
 - (i) Point **I** in the HP and in the VP.
2. Draw the projections of the following straight lines.
 - (a) Straight line **AB** 20 mm long parallel to both the VP and HP. and lying 10 mm above the HP and 15 mm in front of the VP.
 - (b) Straight line **CD** 25 mm long perpendicular to the HP and 20 mm in front of the VP with its lower end 10 mm above the HP.
 - (c) Straight line **EF** 30 mm long perpendicular to the VP and 15 mm above the HP and its end nearer to the VP is 10 mm in front of it.
 - (d) Straight line **GH** 25 mm long parallel to the VP and inclined to the HP at 30° . One of its ends is 12 mm above the HP and 18 mm in front of the VP.
 - (e) Straight line **IJ** 20 mm long parallel to the HP and 15 mm above the HP and inclined at 45° to the VP. Its end nearer to the VP is 10 mm in front of it.
 - (f) Straight line **PQ** 25 mm long contained on the HP and perpendicular to the VP with its end nearer to the VP is 15 mm in front of it.
 - (g) Straight line **RS** 30 mm long contained on the VP and inclined to the HP at 60° with its end nearer to the HP 10 mm above the HP.
 - (h) Straight line **UV** 25 mm long contained on both VP and HP.
3. A straight line 50 mm long is parallel to the VP and inclined to the HP at 60° . Draw its projections when its lower end is in the HP and 20 mm in front of the VP.
4. Top view of a straight line 50 mm long measures 40 mm. The line is on the VP with its lower end 12 mm above the HP. Draw its projections and determine its inclination with the HP.
5. A straight line **GH** 60 mm long has its end **G** 10 mm above the HP and 12 mm in front of the VP. Draw its projections when it is inclined to the HP and VP at 45° and 30° respectively.

6. Top view and front view of a straight line **MN** 60 mm long measures 50 mm and 40 mm respectively. One of its ends is 15 mm above the HP and 10 mm in front of the VP. Draw its projections and determine its true inclination with the VP and HP.
7. A square **ABCD** of 20 mm side is parallel to the VP and 15 mm in front of it. Draw its projections when its edge nearer to the HP is parallel to it and 10 mm above it.
8. A square **ABCD** of 25 mm side is parallel to the HP and 18 mm above it. Draw its projections when its edge nearer to the VP is parallel to the VP and 12 mm in front of it.
9. A regular hexagon **ABCDEF** of side 20 mm is parallel to the HP and 15 mm above it. Draw its projections when its corner **A** nearer to the VP is 16 mm in front of the VP and edge **AB** is inclined at 45^0 to the VP.
10. A rectangle **ABCD** of 60 mm \times 40 mm is perpendicular to the HP and inclined to the VP at 45^0 . It is resting on its longer edge on the HP. Draw its projections when its edge nearer to the VP is parallel to the VP and 16 mm in front of it.
11. A regular pentagonal plane **ABCDE** of 20 mm side has its edge **BC** resting on the HP. Its plane is perpendicular to the HP and inclined to the VP at 45^0 . Draw its projections when its corner nearer to the VP is 18 mm in front of the VP.
12. A regular hexagon **ABCDEF** of 25 mm side rests on one of its edge on the HP. Its plane is perpendicular to the VP and inclined to the HP at 30^0 . Draw its projections when its corner nearer to the VP is 15 mm in front of it.
13. A circle of 40 mm diameter is held in such a way that it is perpendicular to the HP and inclined to the VP at 45^0 . Draw its projections when a point on its circumference is nearer to the VP is 25 mm above the HP and 10 mm in front of the VP.

PRACTICE PROBLEMS FOR ENGINEERING DRAWING I

EXERCISE 4

DESCRIPTIVE GEOMETRY II

1. Orthographic projection of a line is given in **Figure P4.1**. Determine their true lengths and inclinations with the HP using
 - (a) revolution method and
 - (b) Auxiliary view method.
2. Orthographic projection of a line is given in **Figure P4.2**. Determine their true lengths and inclinations with the VP using
 - (a) revolution method and
 - (b) auxiliary view method.

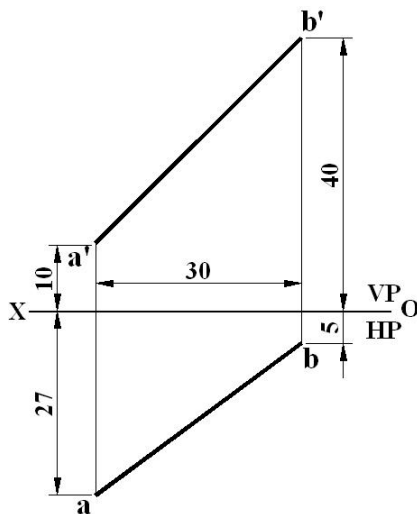


Figure P4.1

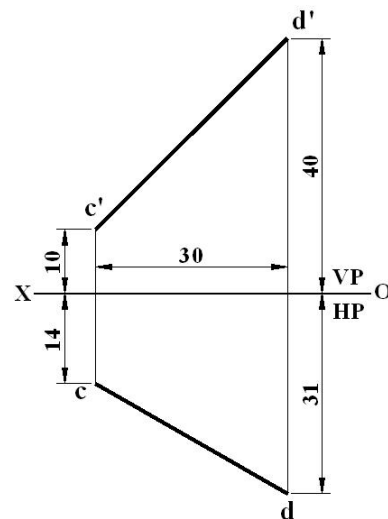


Figure P4.2

3. A line **AB** has its end **A** 15 mm above the HP and 10 mm in front of the VP and its end **B** 40 mm above the HP and 35 mm in front of the VP. The distance between its end projectors is 45 mm. Draw the projections of the line and determine its true length and inclination with the HP and VP.
4. **Figure P4.4** shows projections of the axis **CD** of a cylinder and point **P** lying on the surface of the cylinder. Determine the radius of the cylinder.
5. Determine the true shape of the triangular plane **ABC** shown in **Figure P4.5** and its inclination with the HP. Also draw its true shape.
6. Determine the true shape of the triangular plane **ABC** shown in **Figure P4.6** and its inclination with the VP. Also draw its true shape.
7. Complete the orthographic projections a point **P** lying on a triangular plane **ABC** shown in **Figure P4.7**.

8. Determine the intersection of the triangle **EFG** and a line **JK** as shown in **Figure P4.8**. Also show the visibility.

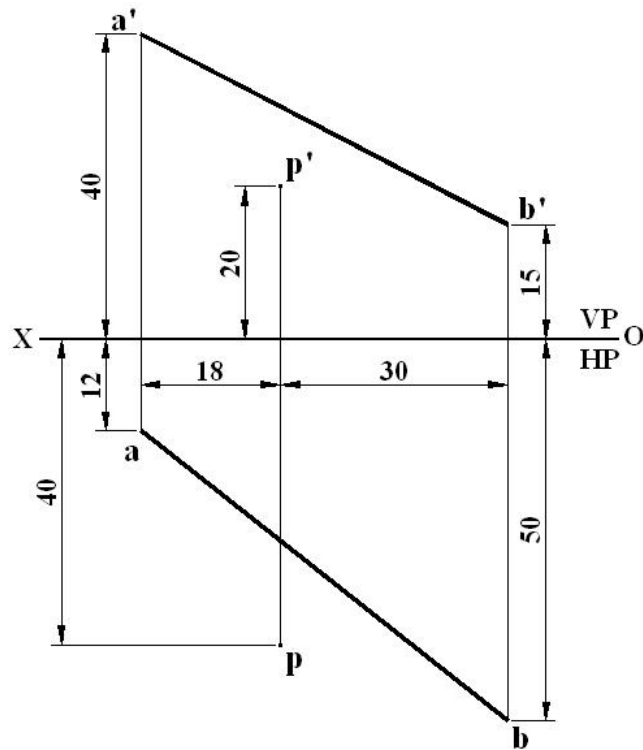


Figure P4.4

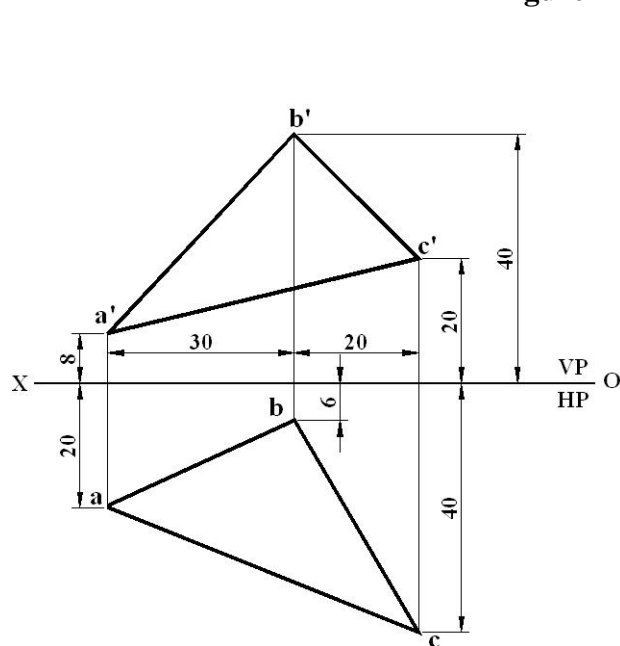


Figure P4.5

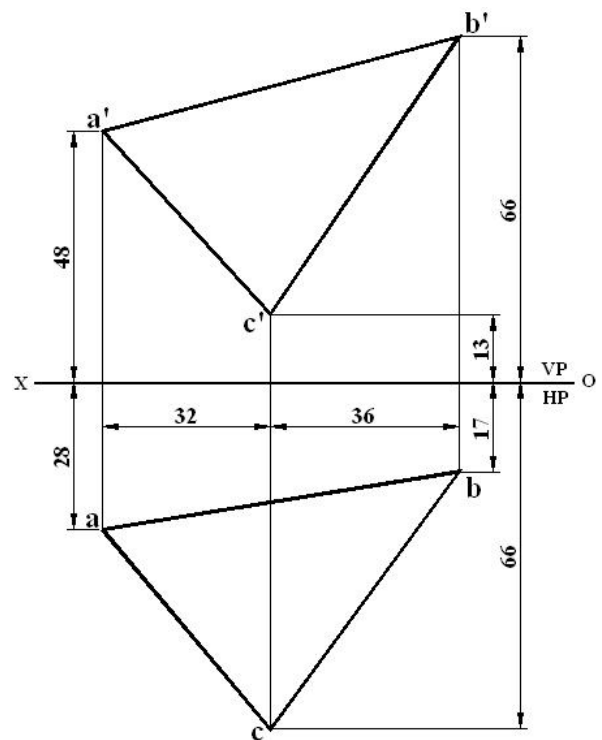


Figure P4.6

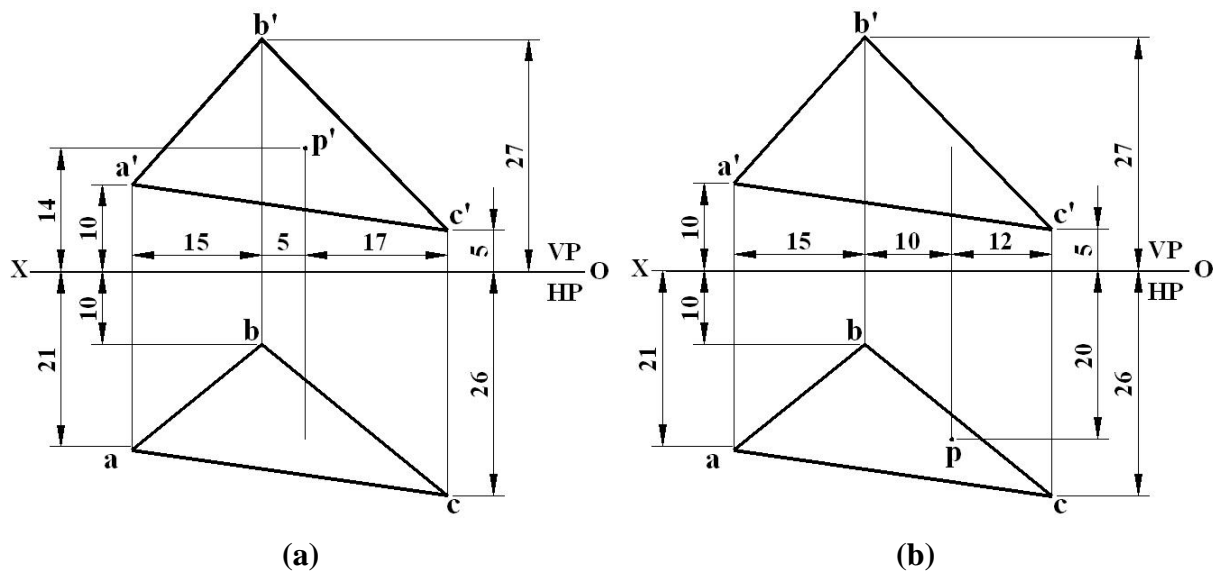


Figure P4.7

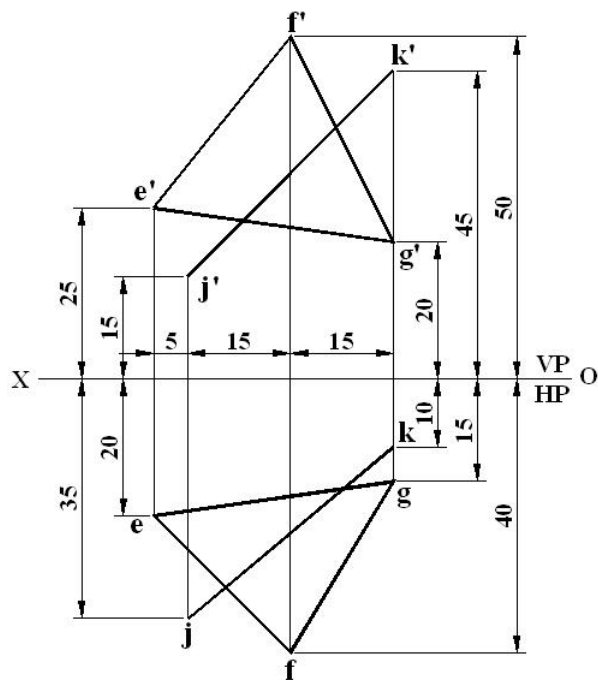


Figure P4.8

9. Determine the true size of the angle formed by the planes **ABC** and **BCD** shown in **Figure P4.9**.

10. Determine the shortest distance between the skew lines **AB** and **CD** shown in **Figure P4.10**. Also determine true apparent angle between them.

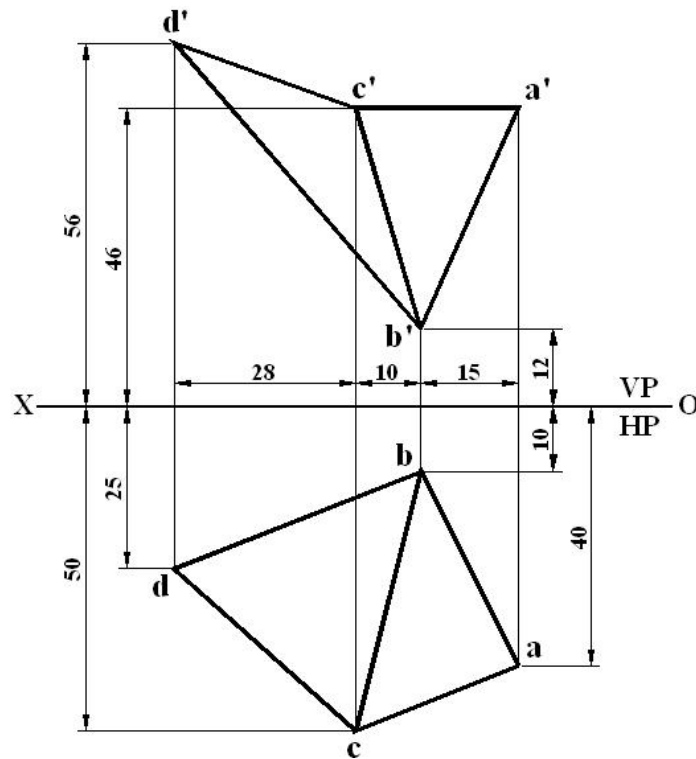


Figure P4.9

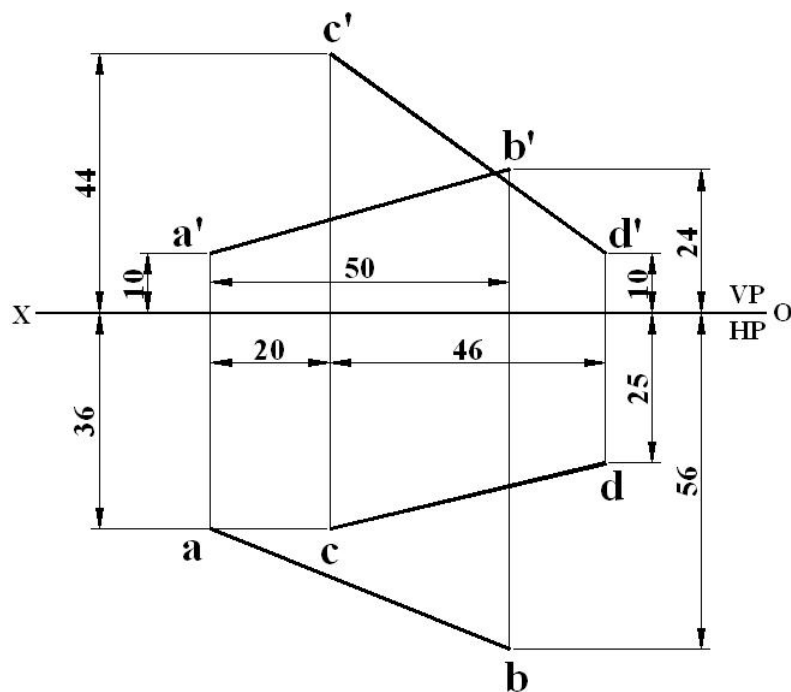


Figure P4.10

PRACTICE PROBLEMS FOR ENGINEERING DRAWING I

EXERCISE 5

ORTHOGRAPHIC DRAWINGS I

The figures for Problems **T5.1** to **T5.12** contain a number of pictorial views of pieces of various shapes. Translate them into three-view orthographic drawings. Use first angle projection for odd number problems and third angle projection for even number problems.

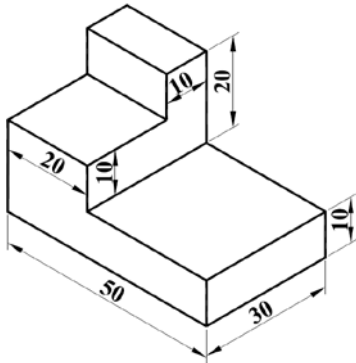


Figure P5.1

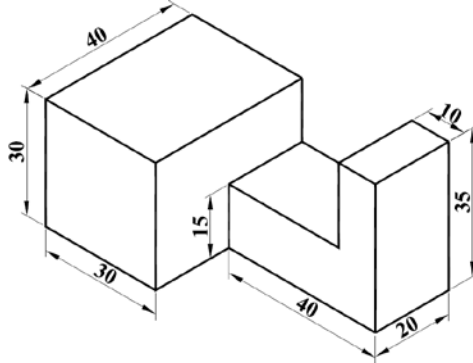


Figure P5.2

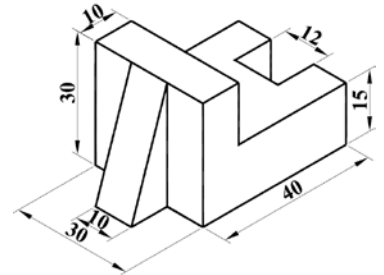


Figure P5.3

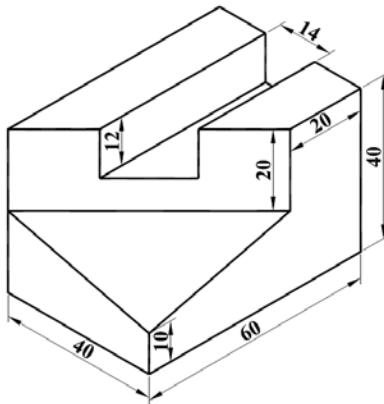


Figure P5.4

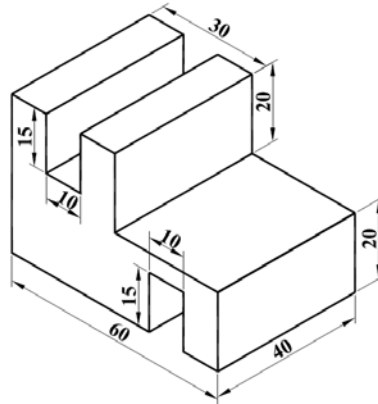


Figure P5.5

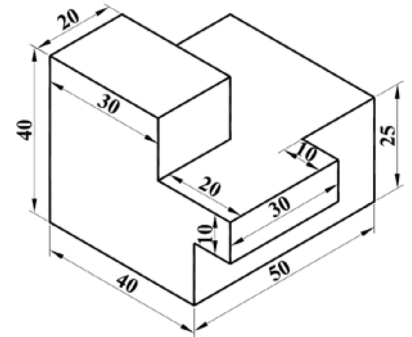


Figure P5.6

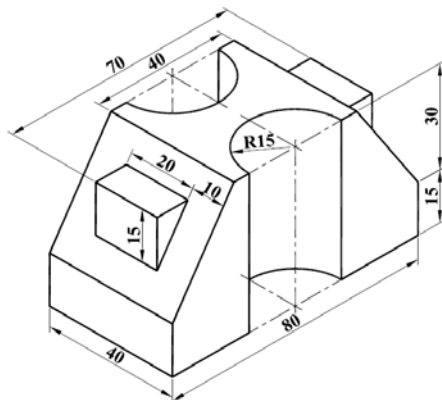


Figure P5.7

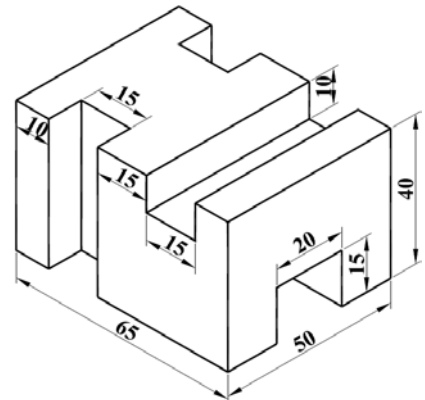


Figure P5.8

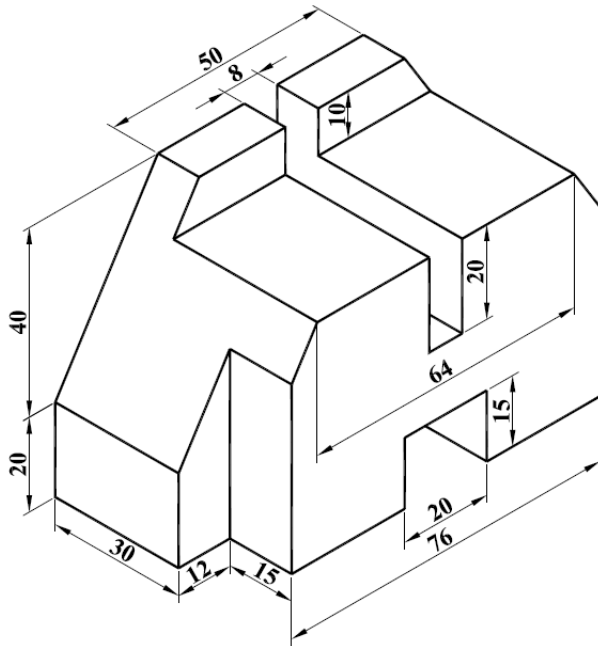


Figure P5.9

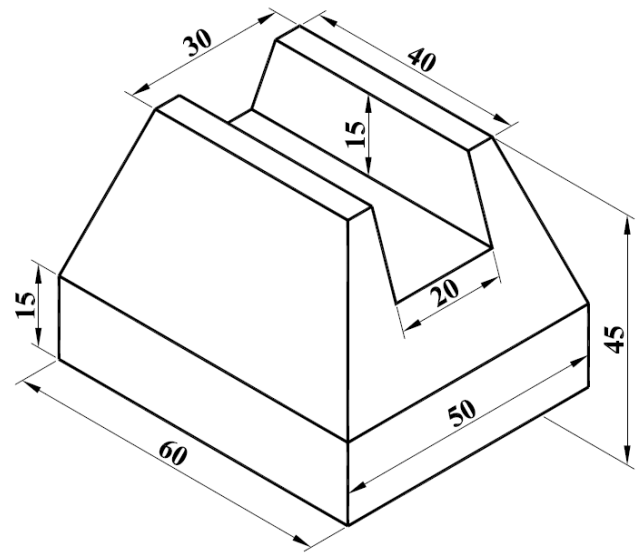


Figure P5.10

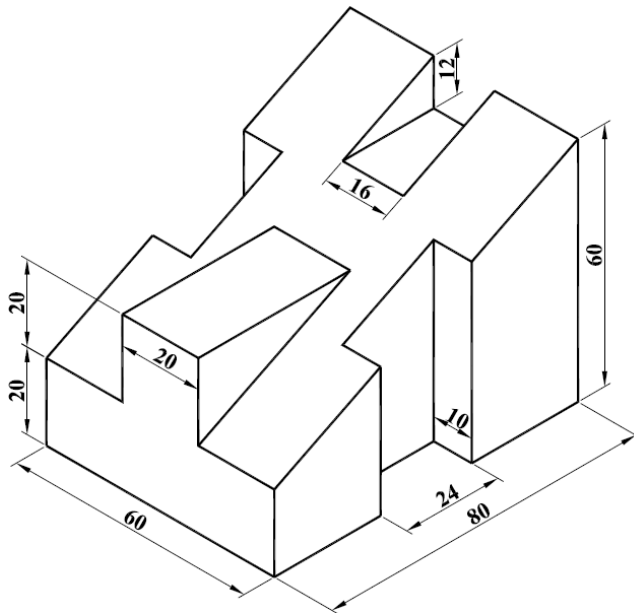


Figure P5.11

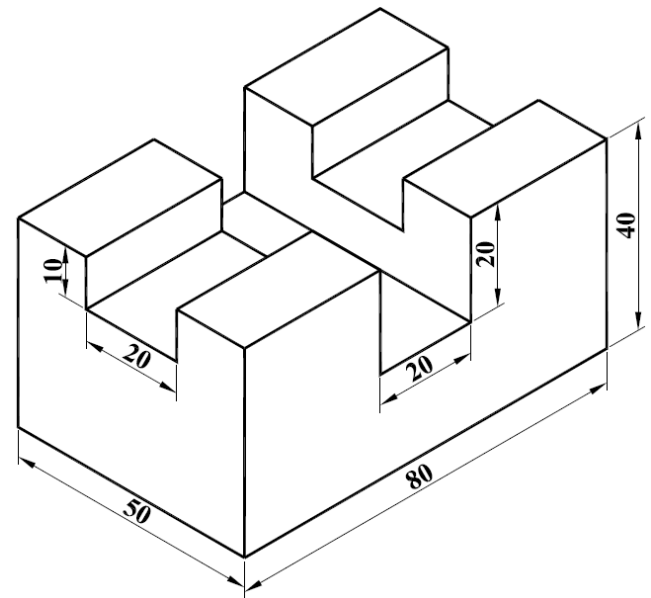


Figure P5.12

PRACTICE PROBLEMS FOR ENGINEERING DRAWING I

EXERCISE 6

ORTHOGRAPHIC DRAWINGS II

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

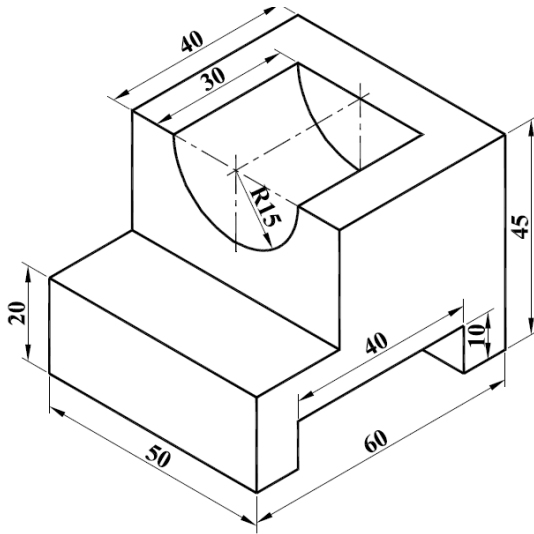


Figure P6.1

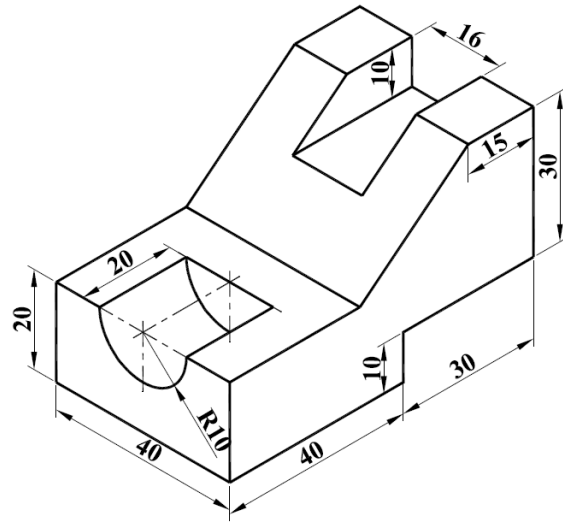


Figure P6.2

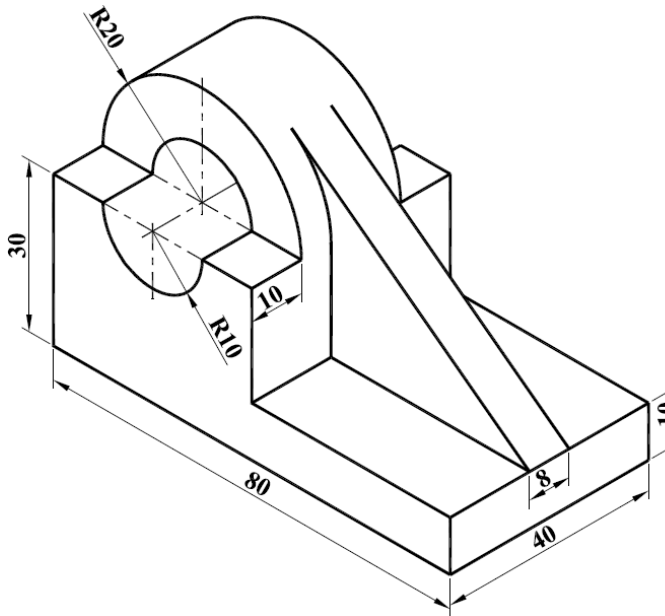


Figure P6.3

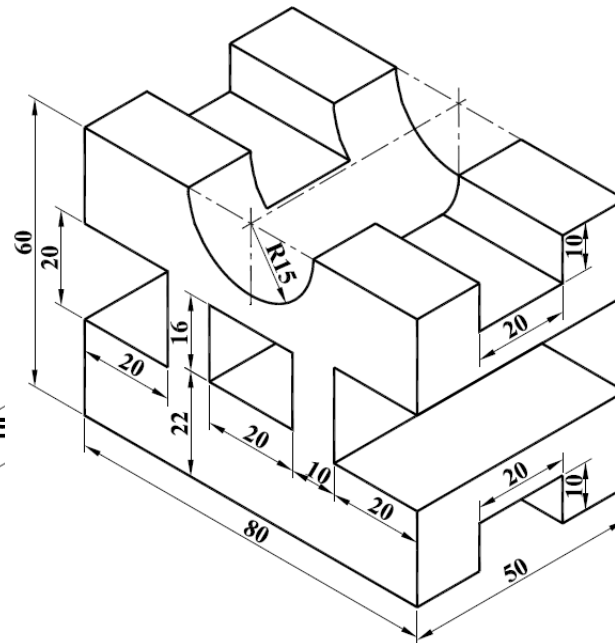


Figure P6.4

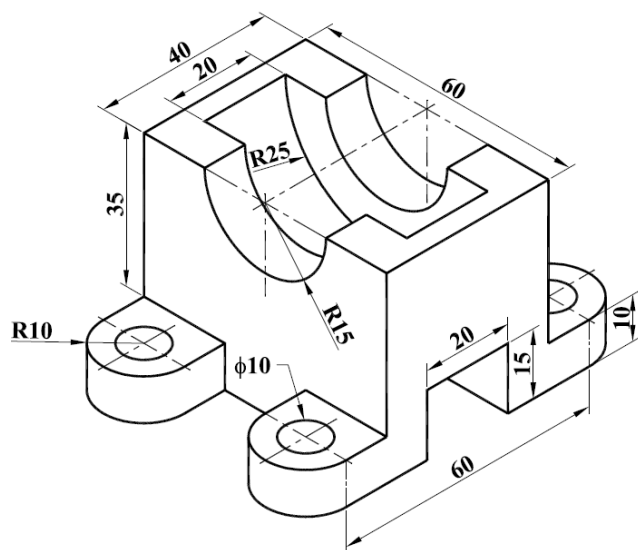


Figure P6.5

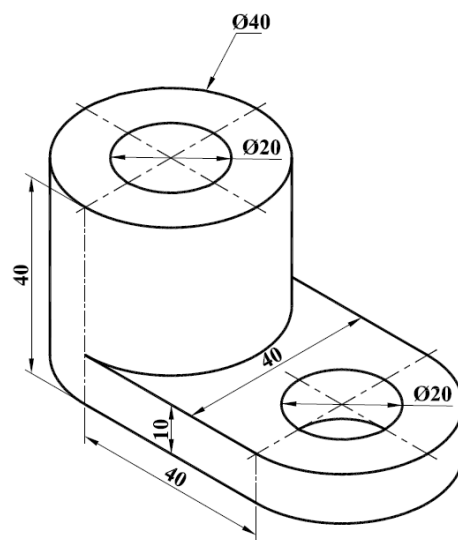


Figure P6.6

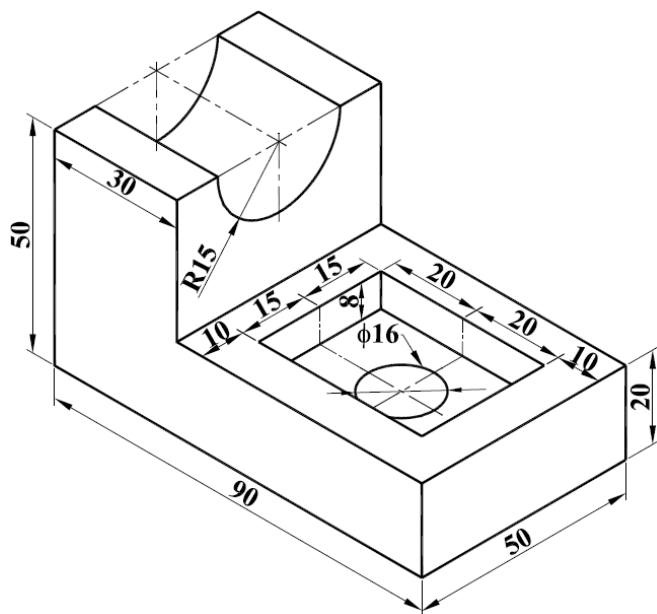


Figure P6.7

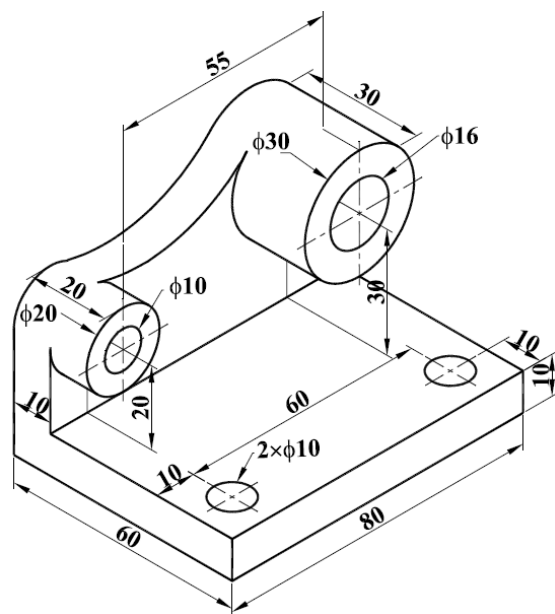


Figure P6.8

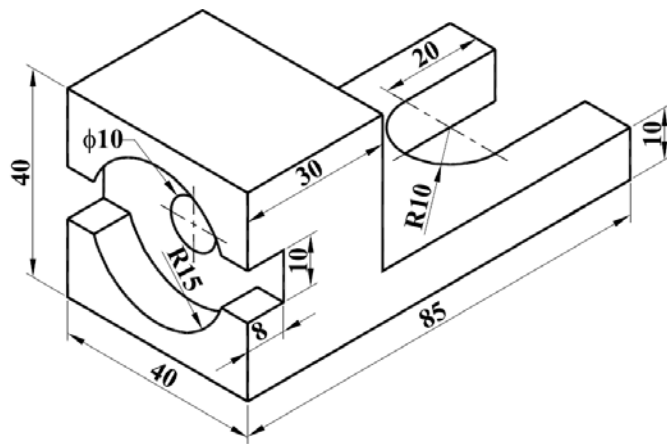


Figure P6.9

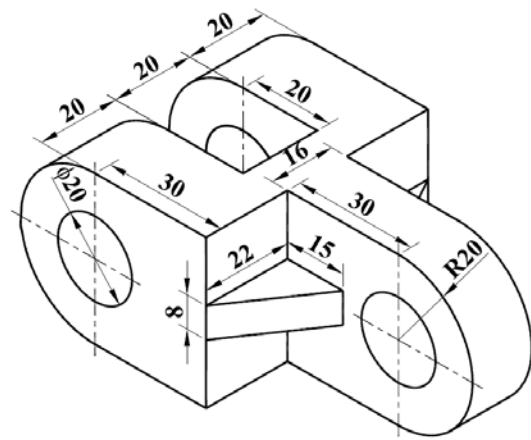


Figure P6.10

PRACTICE PROBLEMS FOR ENGINEERING DRAWING I

EXERCISE 7

SECTIONAL AND AUXILIARY VIEWS

1. Draw orthographic views of the objects shown in **Figure P6.1** with full sectional front view. The arrowheads indicate the direction for the front view.

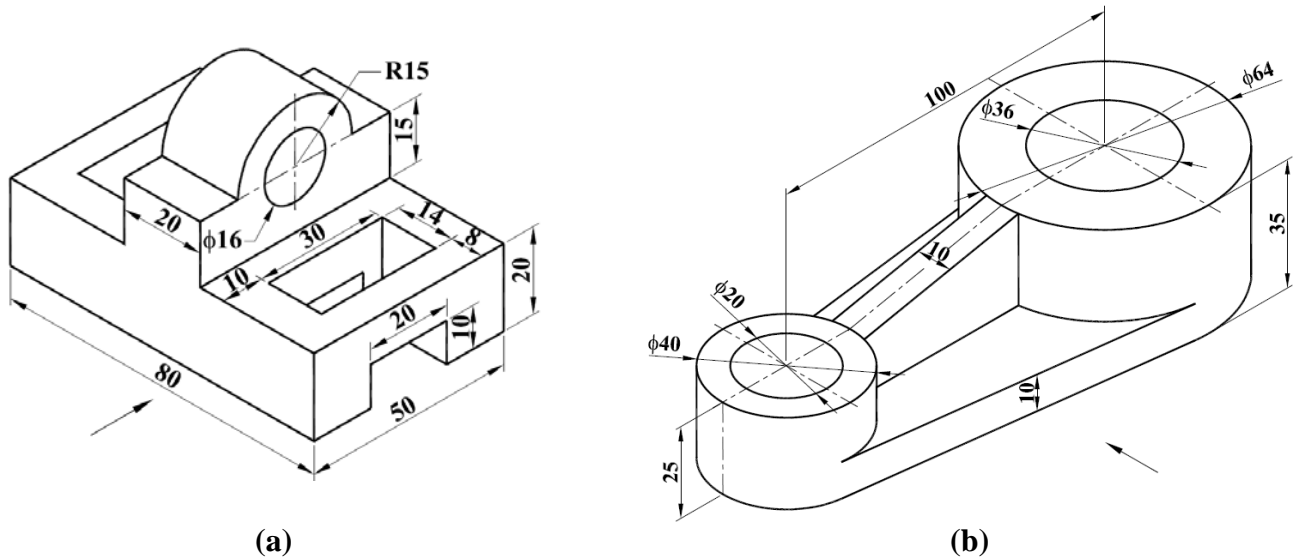


Figure P6.1

2. Draw orthographic views of the objects shown in **Figure P6.2** with full sectional side view. The arrowheads indicate the direction for the front view.

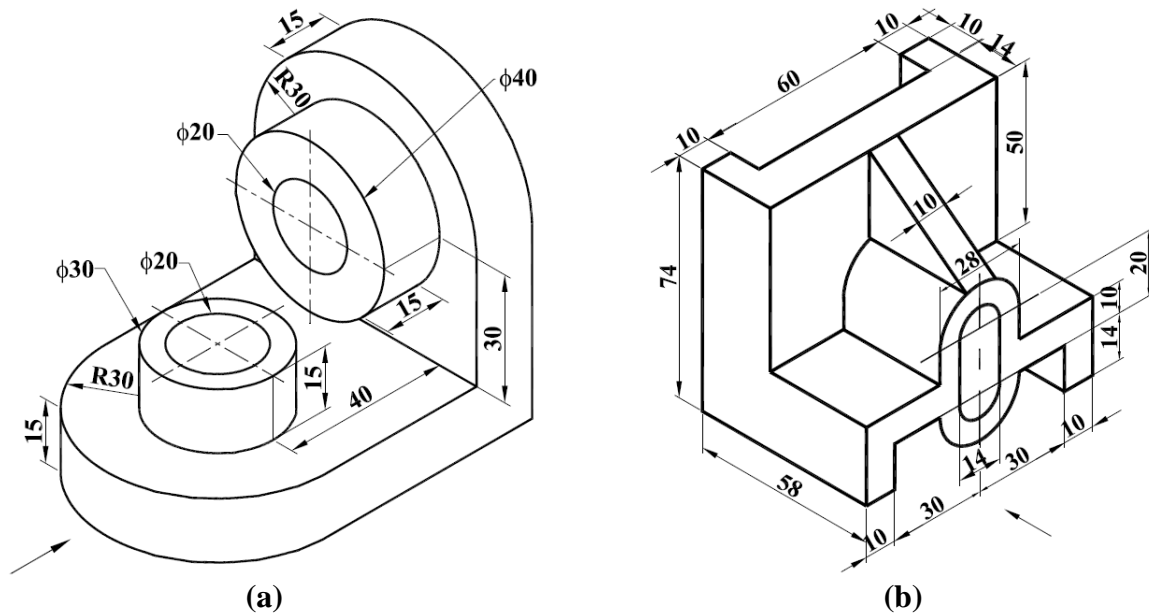


Figure P6.2

3. Draw orthographic views of the objects shown in **Figure P6.3** with full sectional front view and full sectional side view.

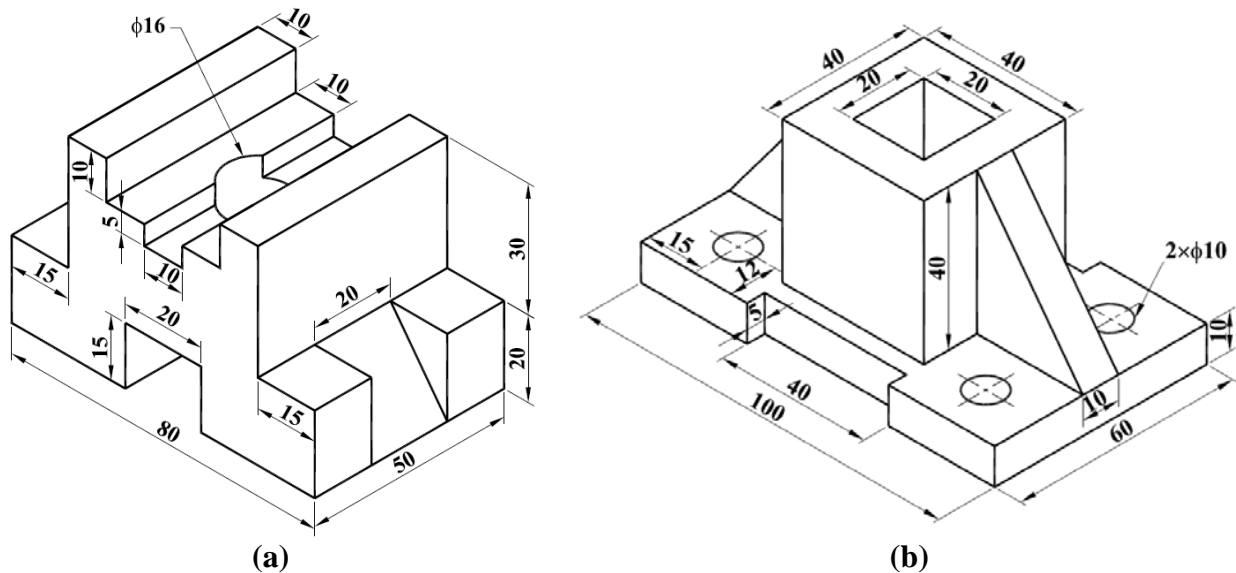


Figure P6.3

4. Draw orthographic views of the objects shown in **Figure P6.4** with full sectional front view and full sectional top view.

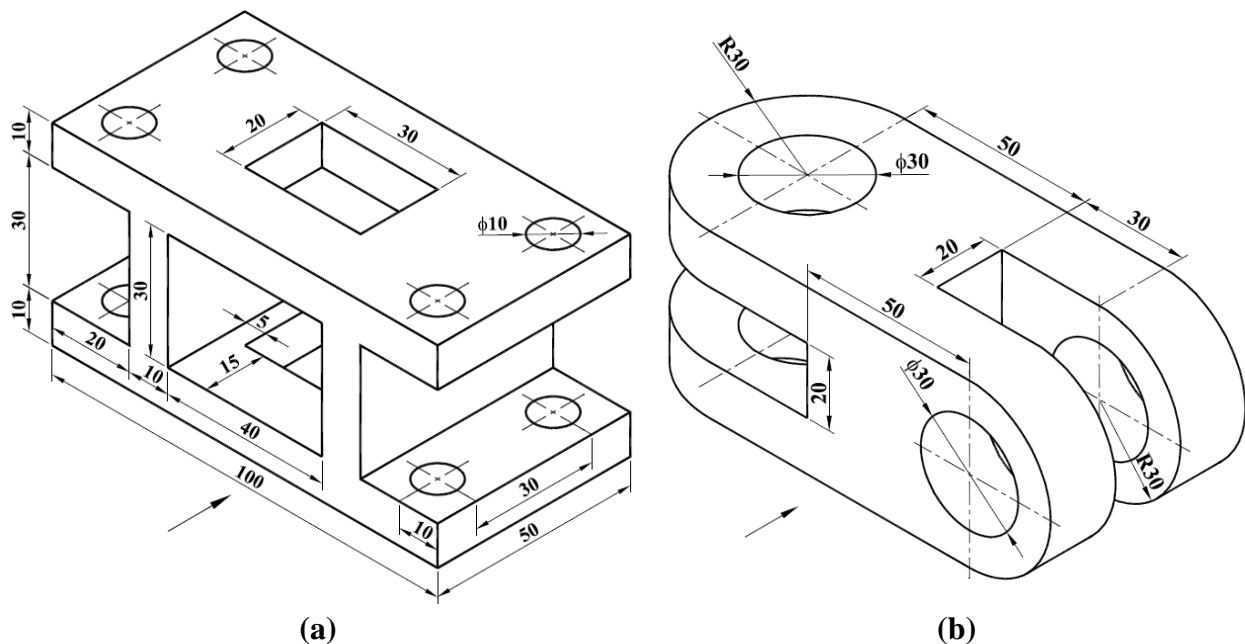


Figure P6.4

5. Draw orthographic views of the objects shown in **Figure P6.5** with half sectional front view and half sectional side view.
6. Draw orthographic views of the object shown in **Figure P6.6** with offset sectional front view.
7. Draw orthographic views of the object shown in **Figure P6.7**. Also draw an auxiliary view of the inclined section.

8. Complete orthographic views of the object shown in **Figure P6.8** with the help of auxiliary views.

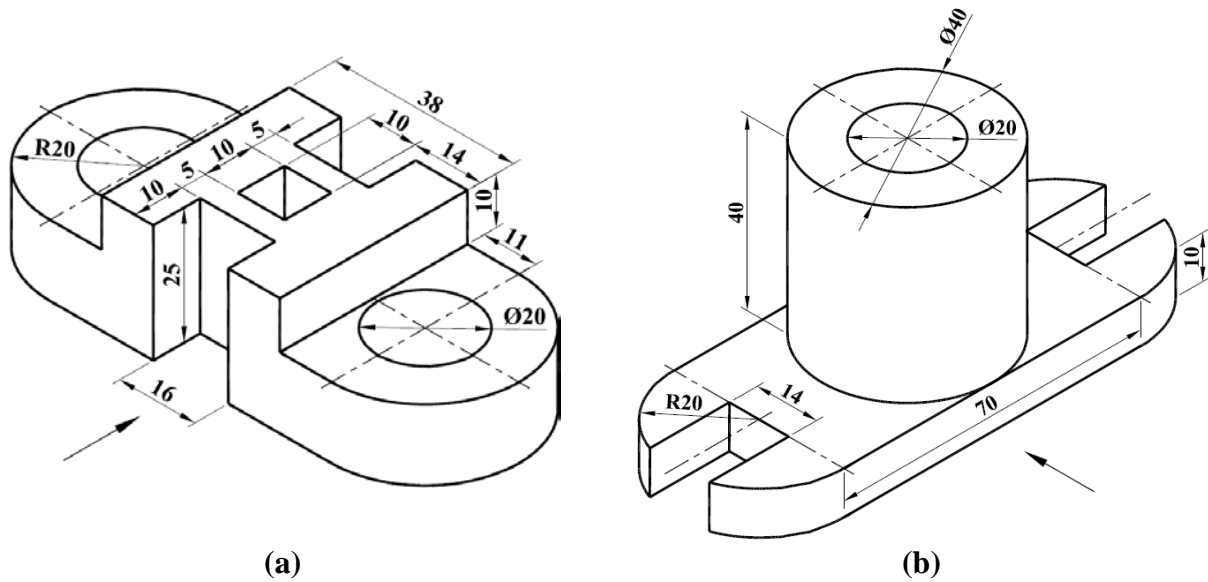


Figure P6.5

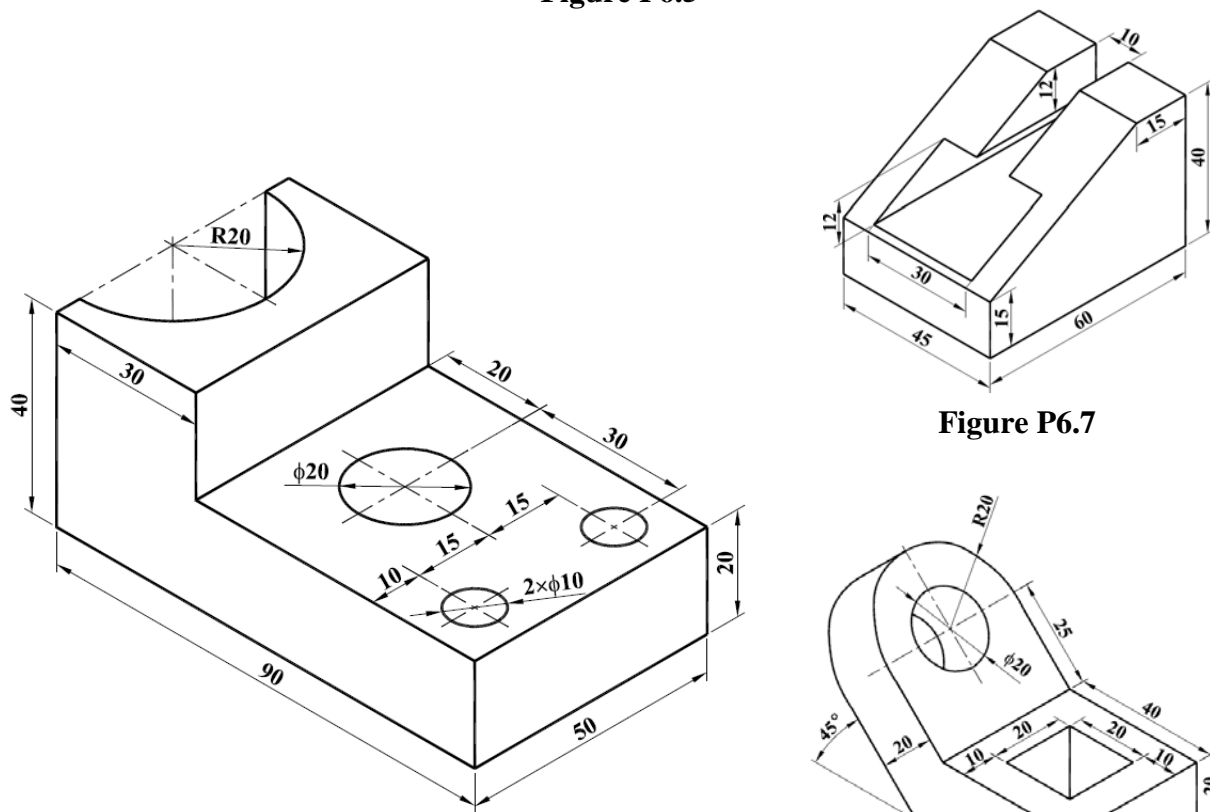


Figure P6.7

Figure P6.6

Figure P6.8

PRACTICE PROBLEMS FOR ENGINEERING DRAWING I

EXERCISE 8

DEVELOPMENT OF SURFACES I

1. Draw a complete orthographic drawing of the right solids shown in **Figure P8.1** cut by the planes. Find the true shape of the section. Then draw development of the solid.

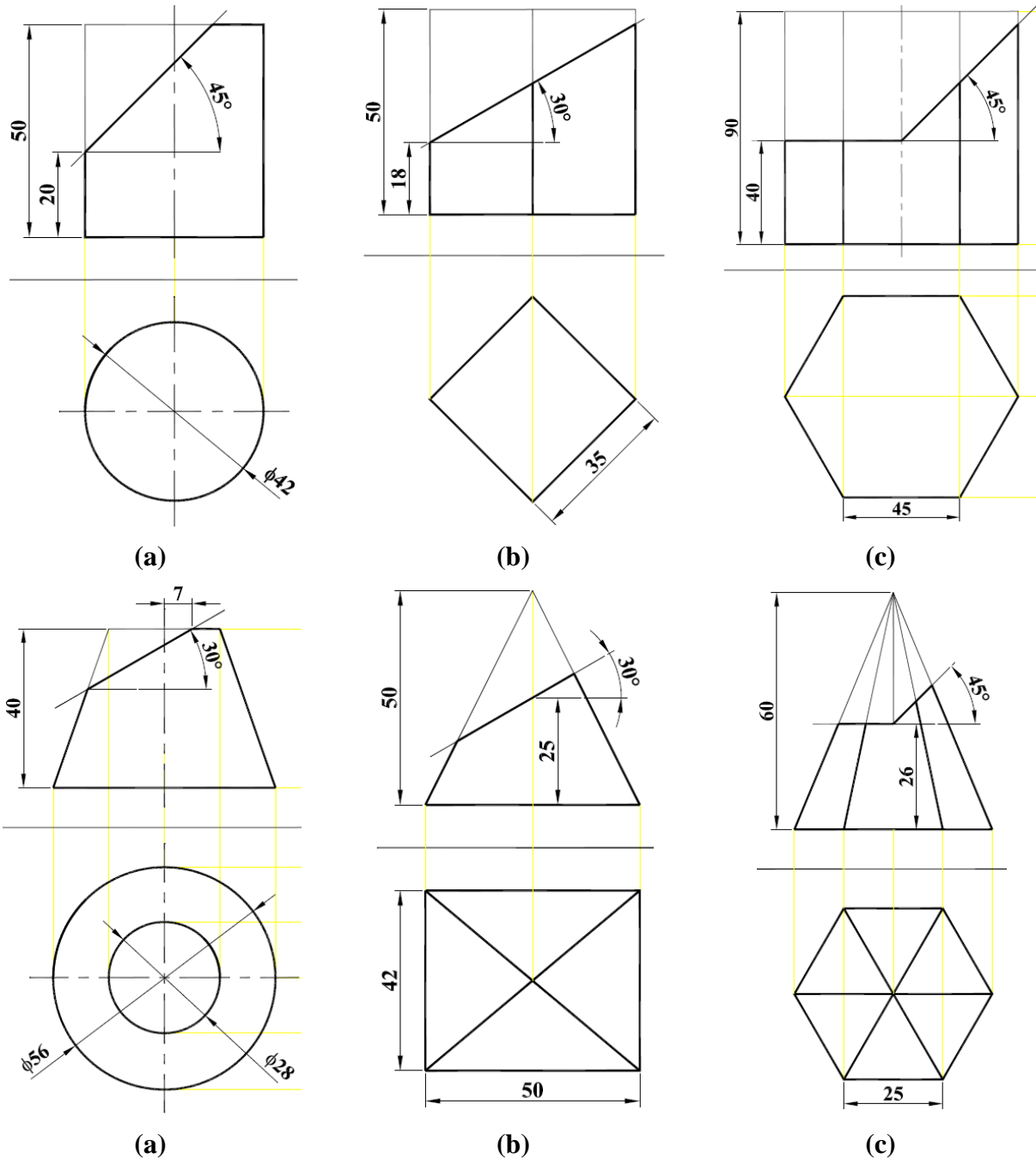


Figure P8.1

2. Draw lateral surface development of the remaining portion of the right solids shown in **Figure 8.2**.

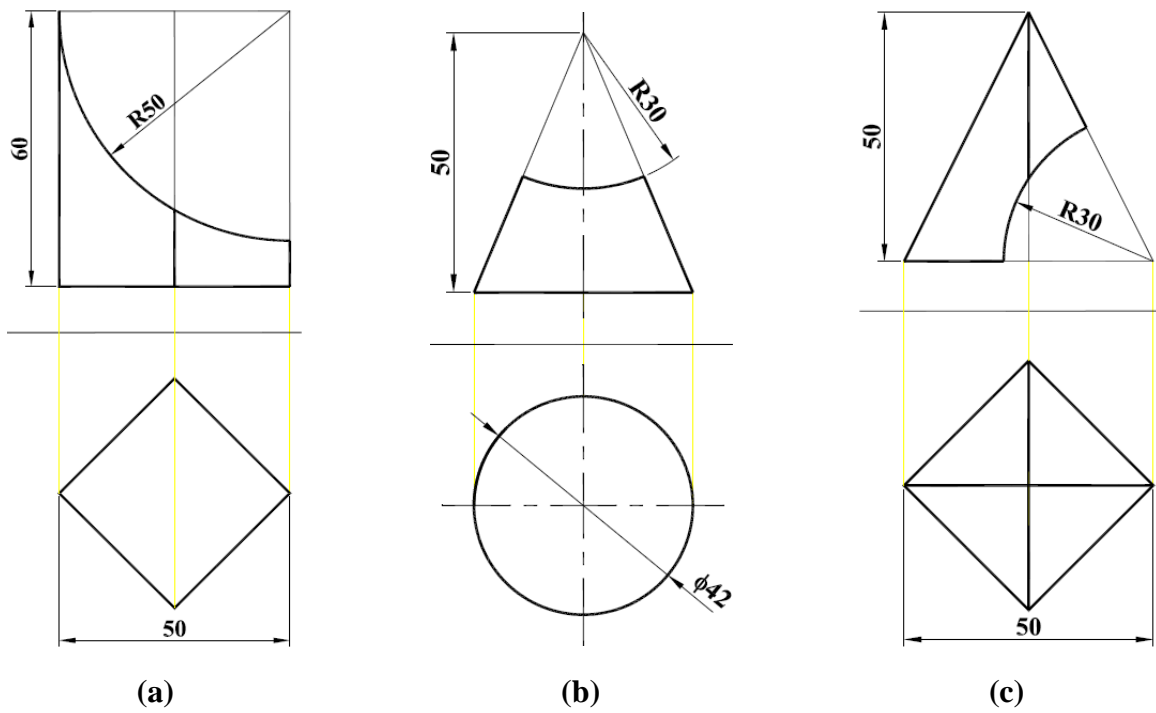


Figure 8.2

PRACTICE PROBLEMS FOR ENGINEERING DRAWING I

EXERCISE 9

DEVELOPMENT OF SURFACES II

3. Draw a complete orthographic drawing of the oblique solids shown in **Figure P9.1** cut by the planes. Find the true shape of the section. Then draw development of the solid.

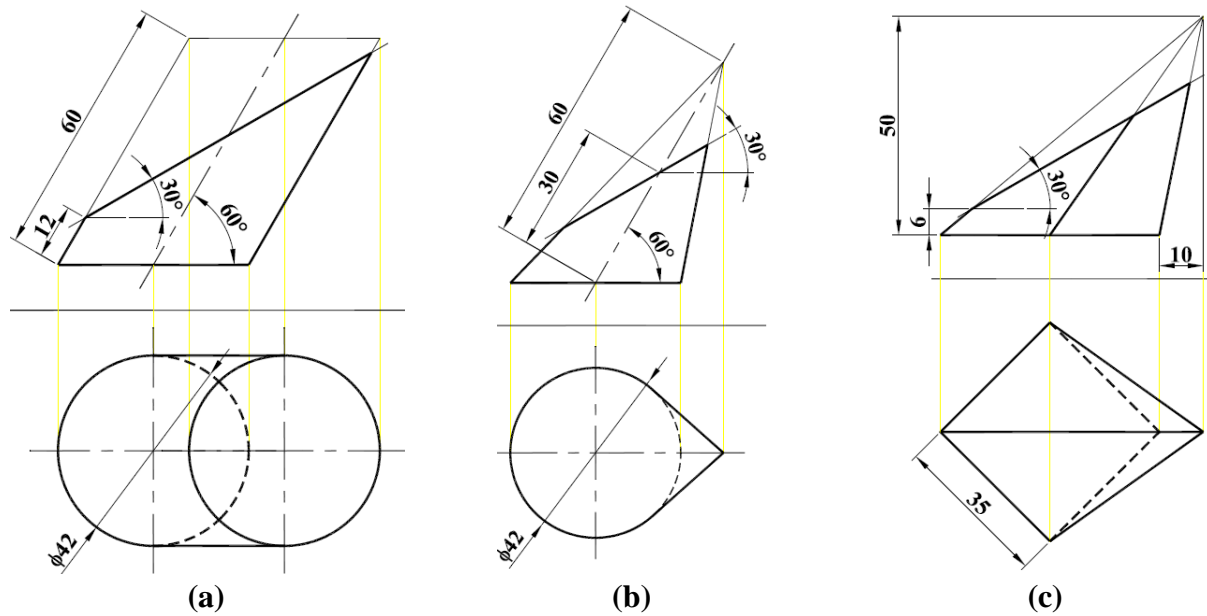


Figure P9.1

4. Draw lateral surface development of the remaining portion of the oblique solids shown in **Figure P9.2**.

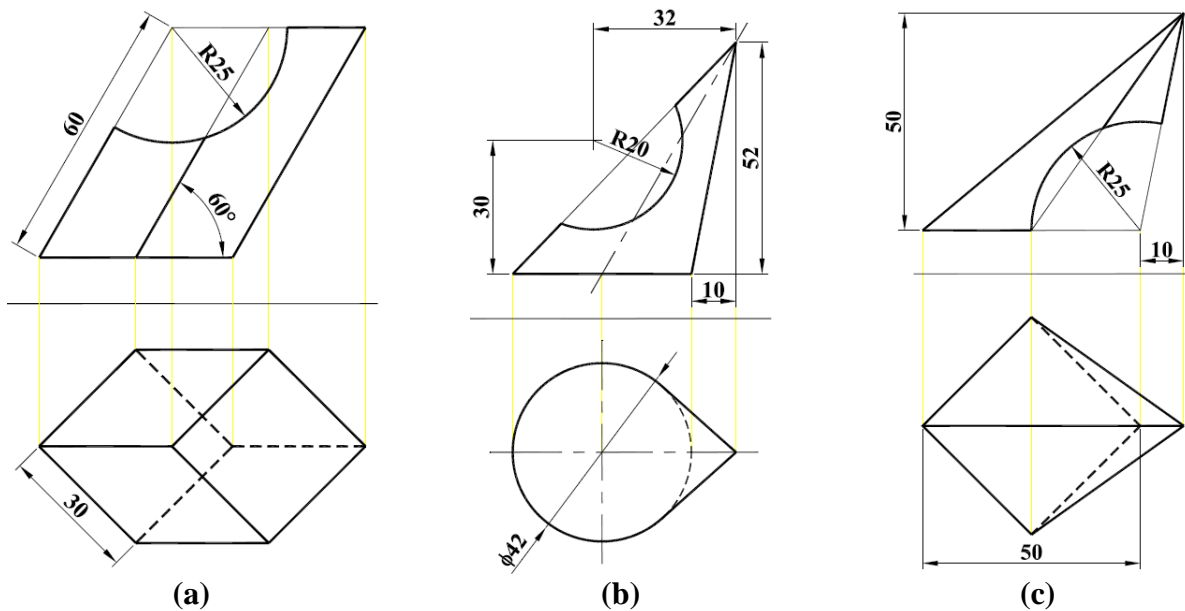


Figure P9.2

PRACTICE PROBLEMS FOR ENGINEERING DRAWING I

EXERCISE 10

INTERSECTION OF SOLIDS

Complete the intersection between the given solids and develop the surfaces of both solids.

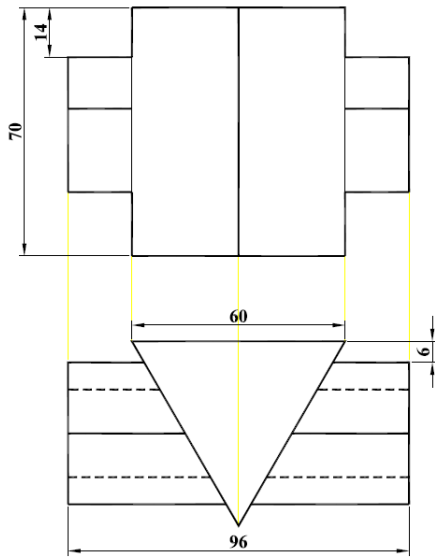


Figure P10.1

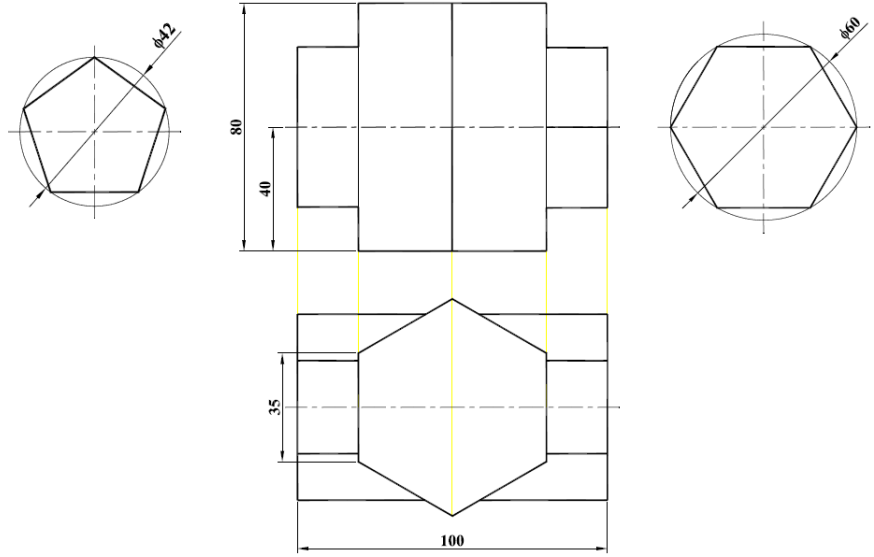


Figure P10.2

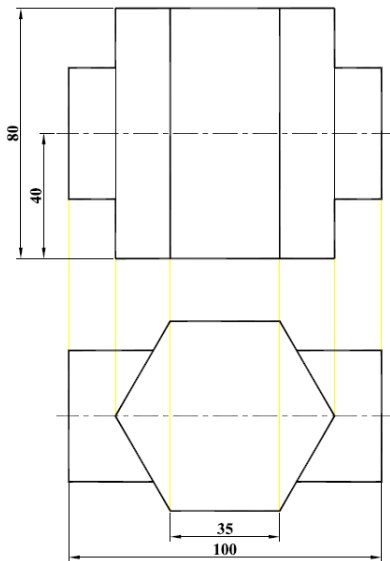


Figure P10.3

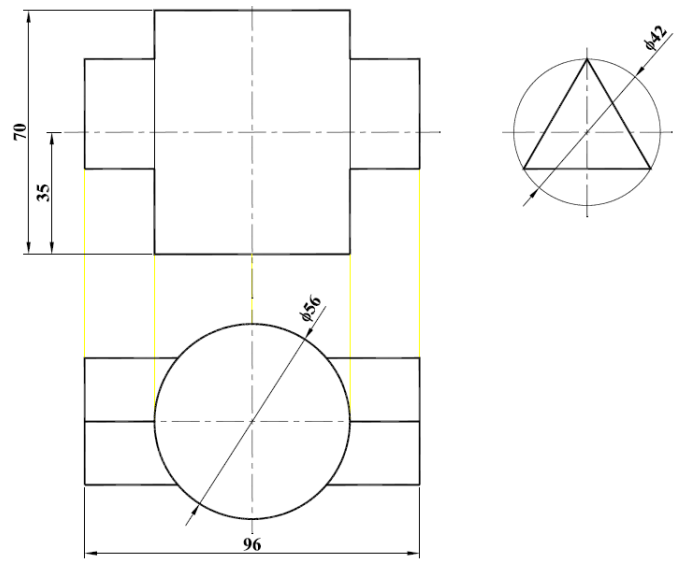


Figure P10.4

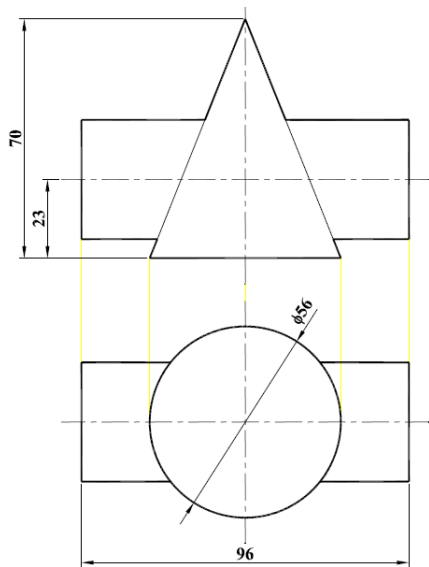


Figure P10.5

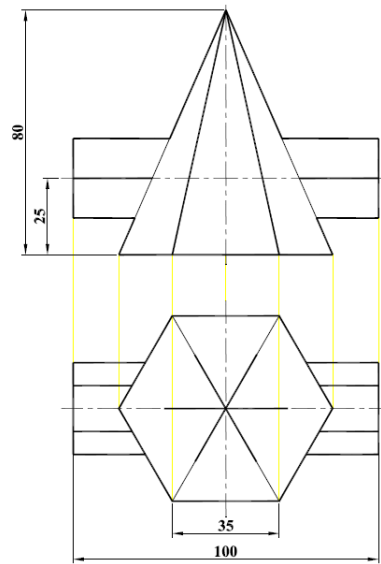
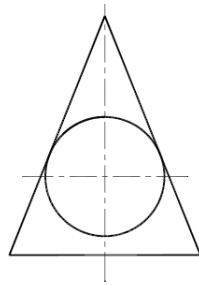


Figure P10.6

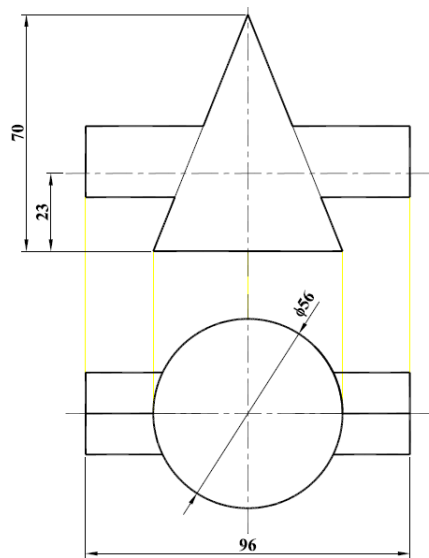
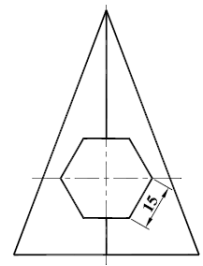


Figure P10.7

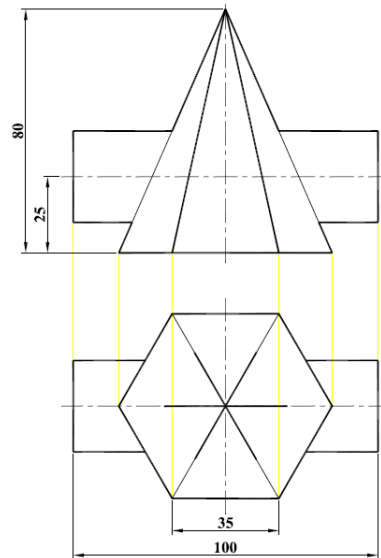
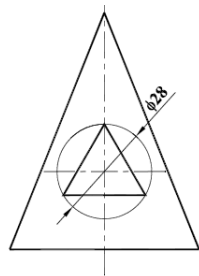
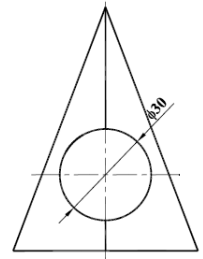


Figure P10.8



PRACTICE PROBLEMS FOR ENGINEERING DRAWING I

EXERCISE 11

ORTHOGRAPHIC AND SECTIONAL VIEWS

1. Draw complete orthographic drawing of the objects shown in **Figure P11.1** with full sectional front view. Also show the effect of intersection(s).

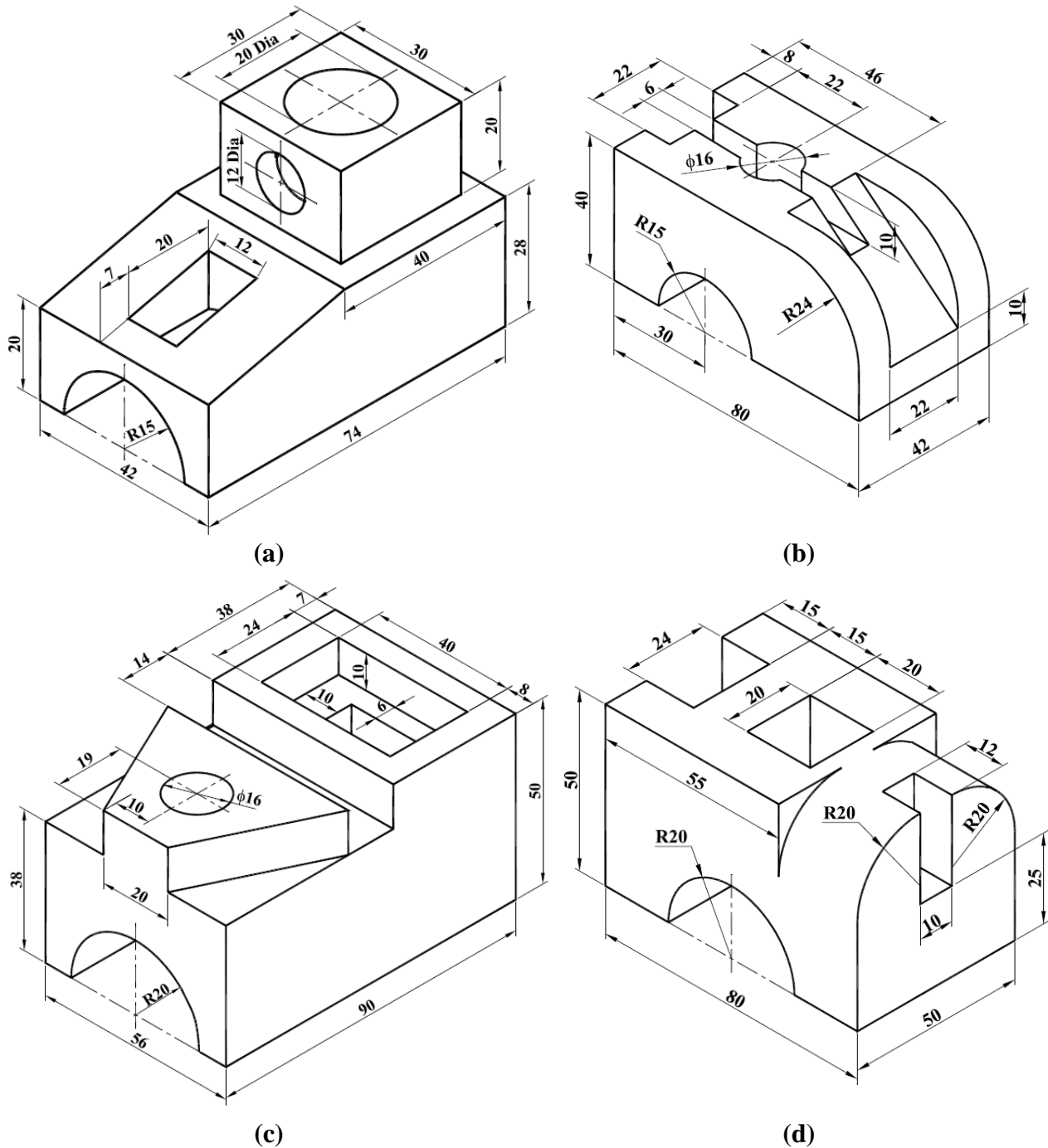
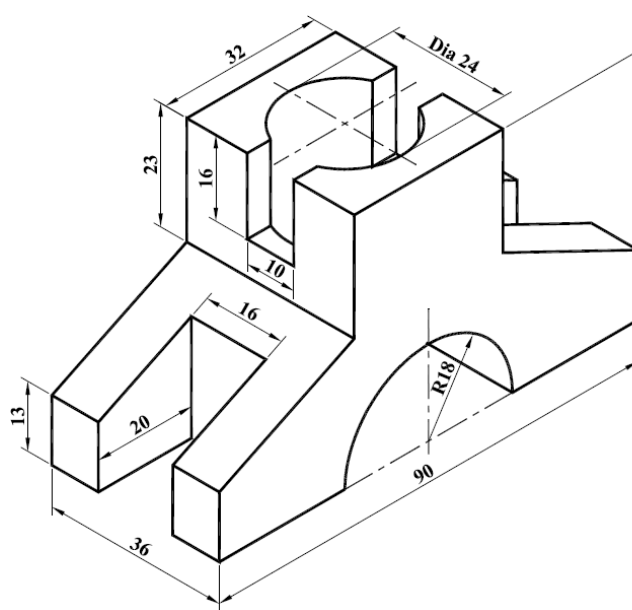
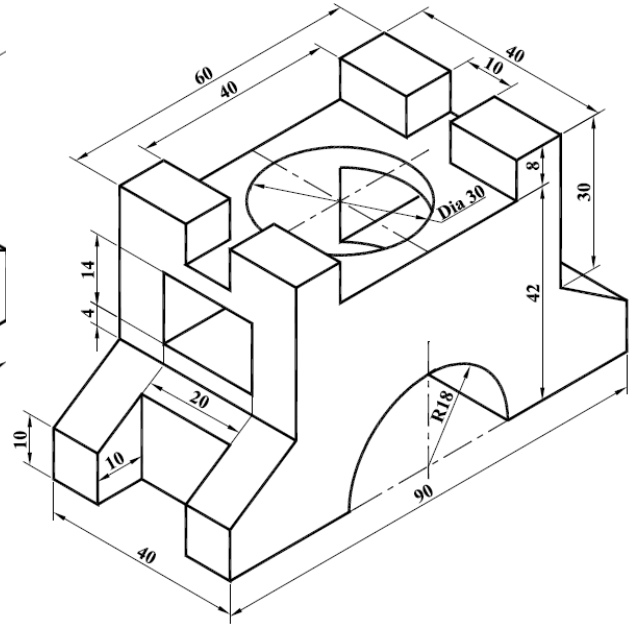


Figure P11.1

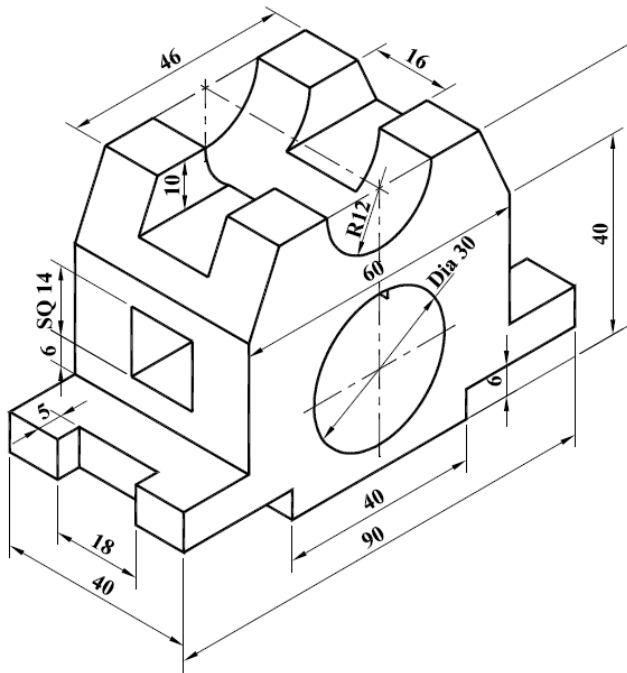
2. Draw complete orthographic drawing of the objects shown in **Figure P11.2** with full sectional front view and full sectional side view. Also show the effect of intersection(s).



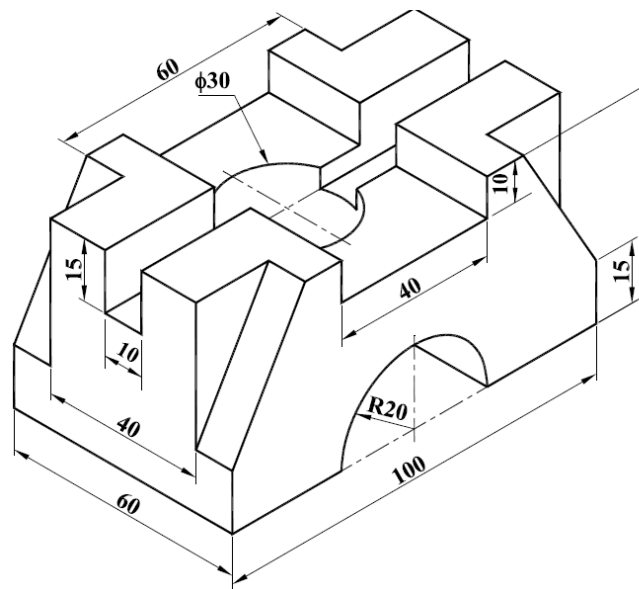
(a)



(b)



(c)



(d)

Figure P11.2