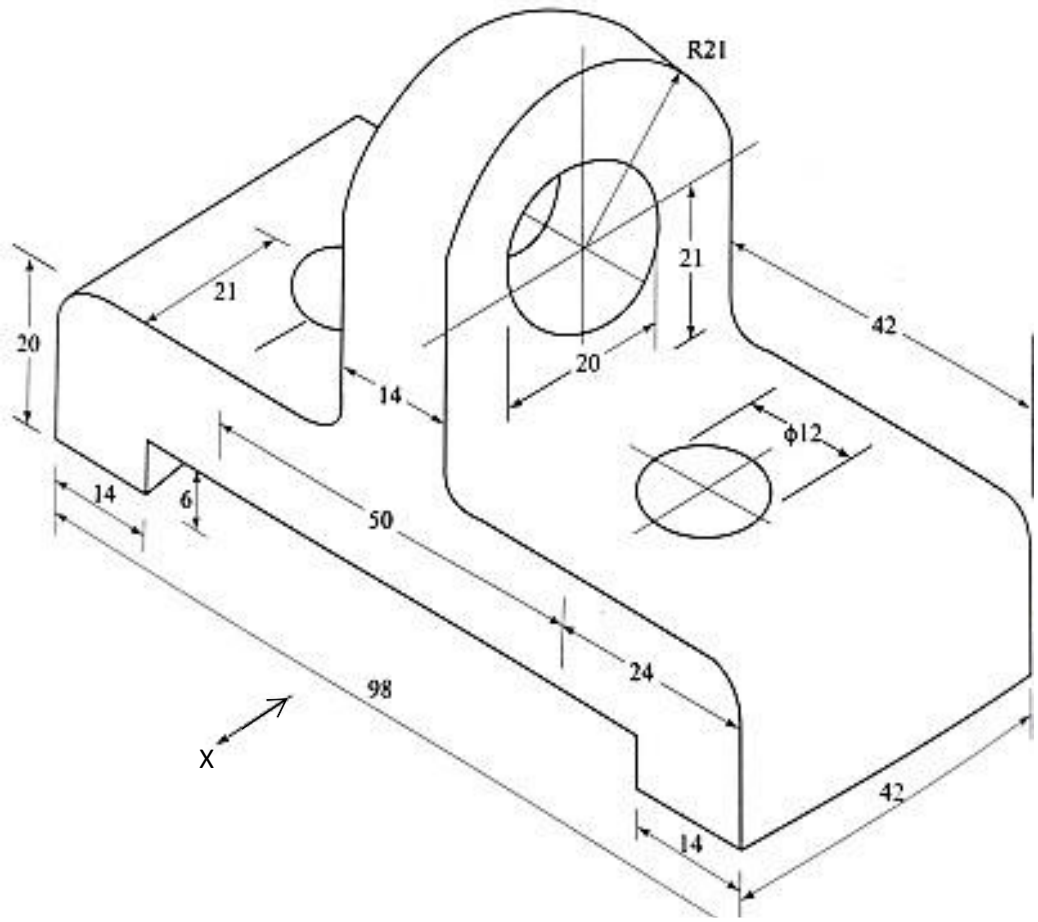
Engineering Drawing

Booklet

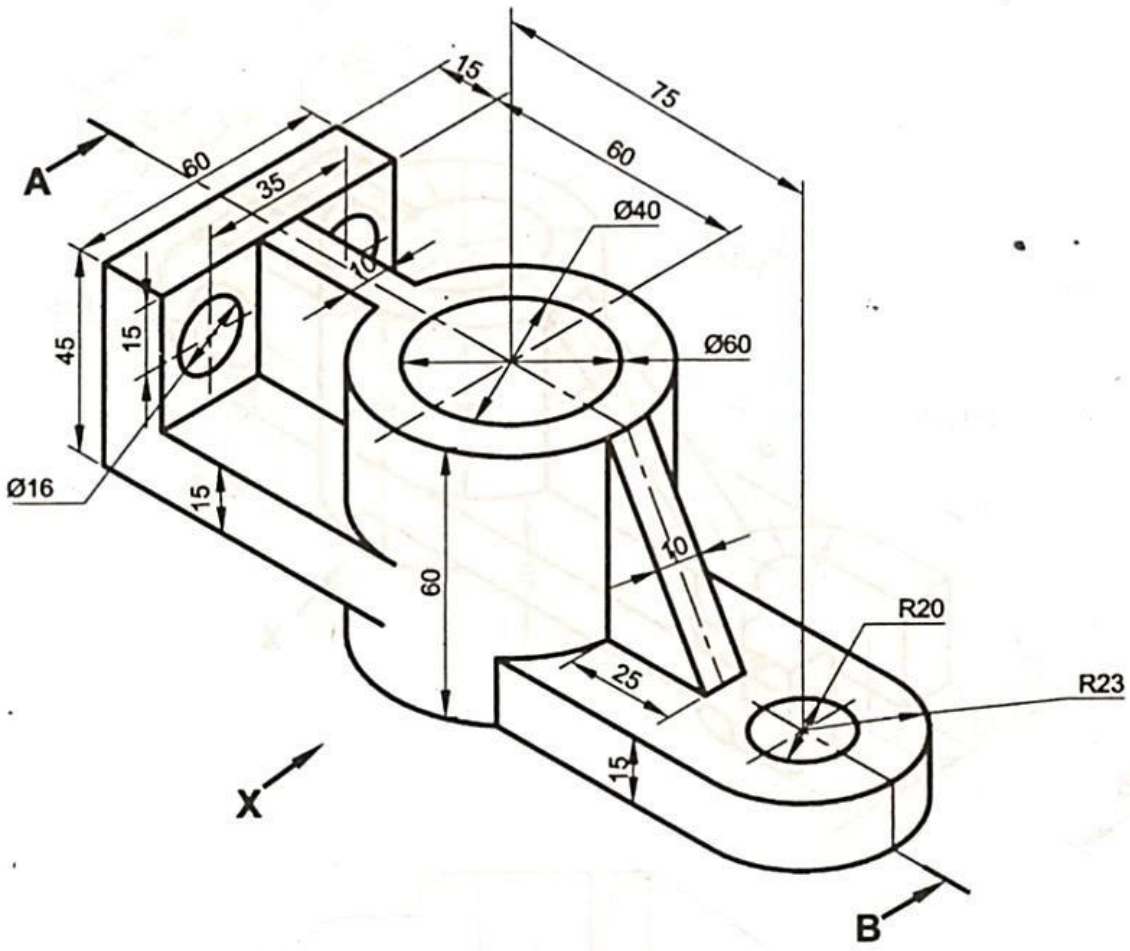
AY 2025-2026

Orthographic Projection

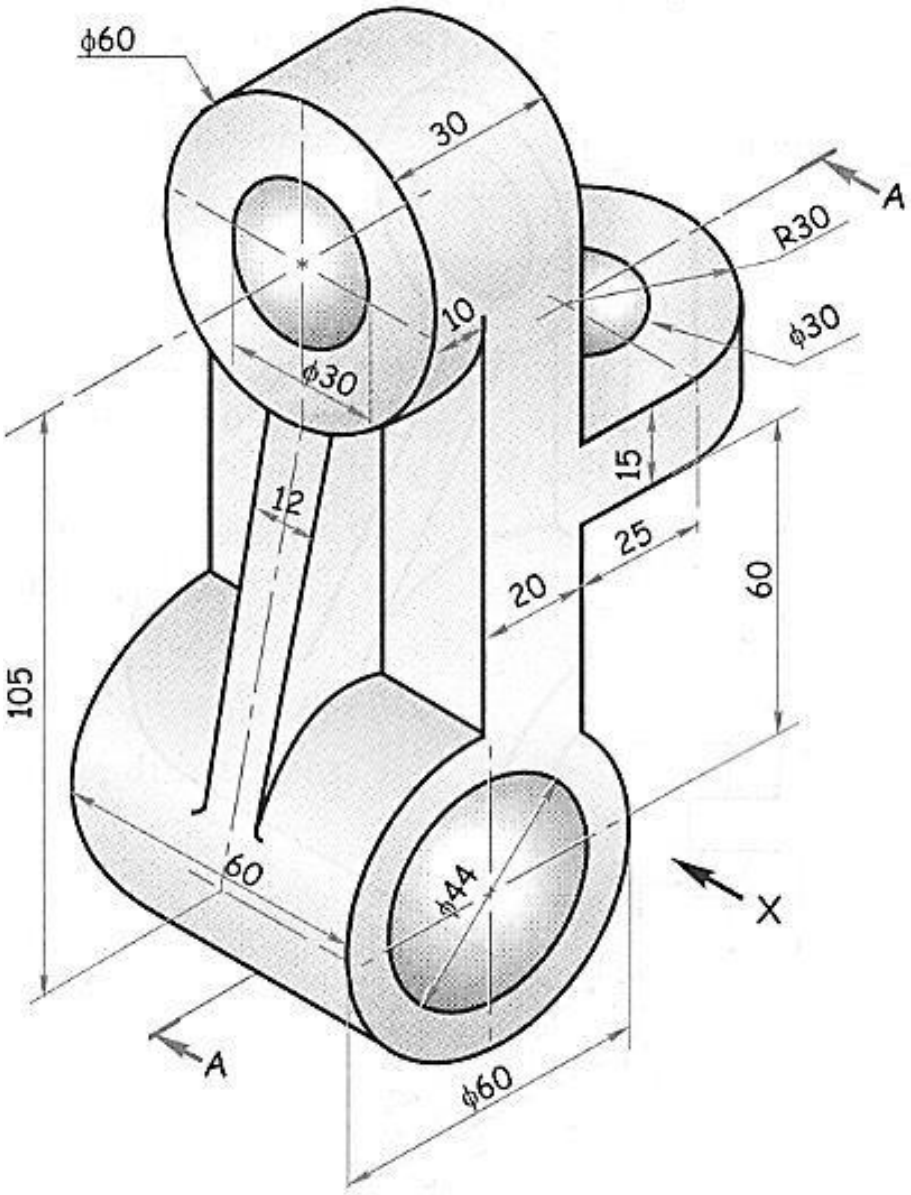
Draw FV along X, TV and RHSV



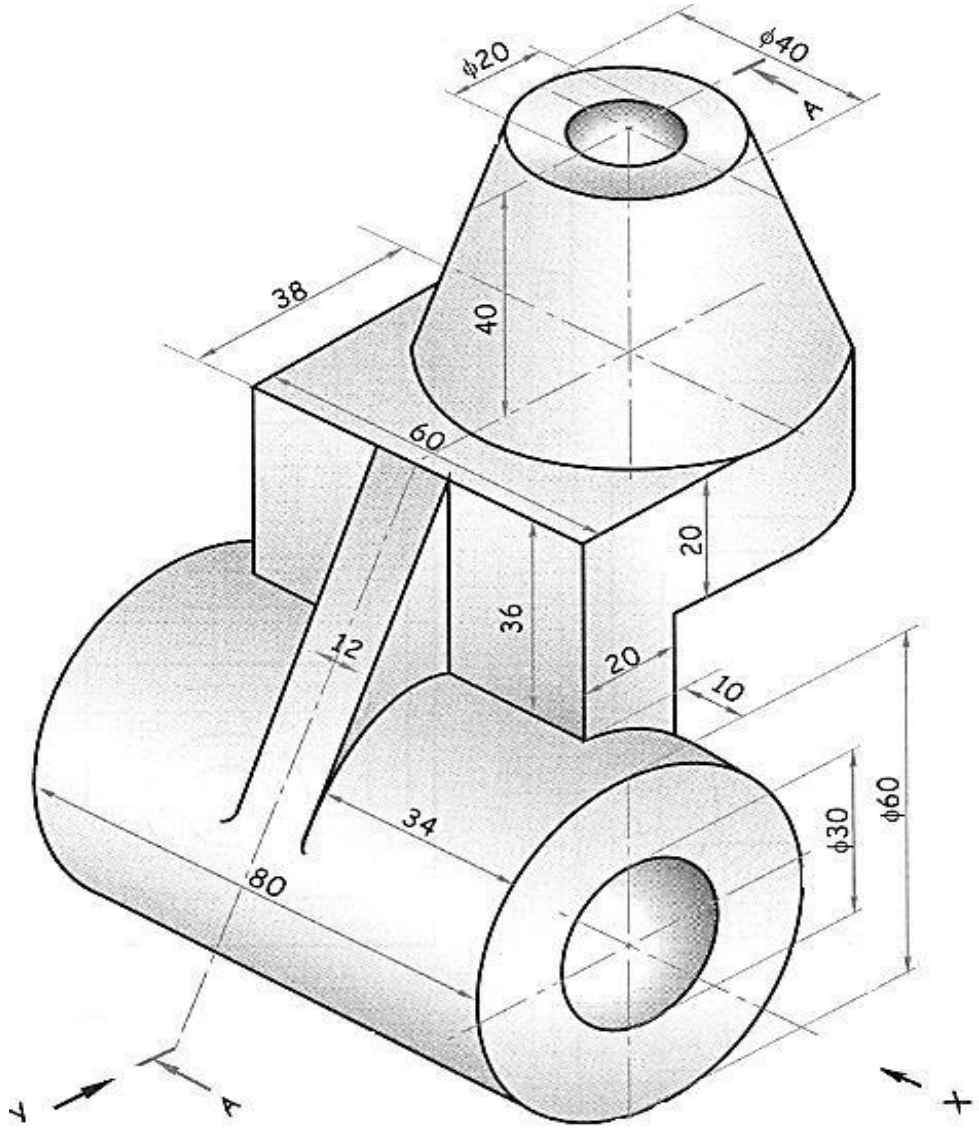
Draw FV along X, TV and RHSV



Draw Sectional FV along A-A, TV and LHSV



Draw Sectional FV along A-A, TV and LHSV



Projection of Lines

1. A line AB 70mm long is inclined at 30^o to HP and 45^o to VP. Point A is 10mm above HP and 20mm in front of VP. Draw projections of line AB. Point B is in first quadrant.

2. A line AB70mm long measures 50mm and 60mm in front view and top view respectively. Point A is 15mm above HP and 25mm in front of VP. Point B is in first quadrant. Draw projections of line AB and find its inclination with HP and VP.

3. The top view and the front view of a line AB measure 70mm and 58mm respectively. The line AB is inclined at an angle of 35° to the HP. The end A is 15mm above the HP and 12mm in front of the VP. The other end B is also in the first quadrant. Draw the projections of line AB and find its true length and true inclination with VP.

4. A line AB 70mm long is inclined at an angle of 40˚ to HP and 30˚ to VP. The end A is in VP and 20mm above HP. Draw the projections of the line if point B is in 1st quadrant.

5. The distance between the projectors of two ends of a straight line is 40mm. One end is15mm above HP and 10mm in front of VP. The other end is 40mm above HP and 40mm in front of VP. Find the true length and true inclinations of the line.

6. A line AB 100mm long has its front view inclined at an angle of 45˚ to XY. The point A is in the VP and 25mm above HP. The length of the front view is 60mm. Draw the top view of the line and measure its length. Also find the inclinations of the line AB to HP and VP.

7. A straight line PQ 100mm makes 45˚ to HP and 30˚ to VP. The end P is 36mm above HP and 40mm in front of VP. Draw the top and front views of the line. Measure the distance between the projectors of the line.

Projection of Planes

1. A rectangular plate 50 mm x 70 mm stands on one of its shorter edges in H.P. and is raised about this edge so that the plan becomes a square of 50mm. Draw the projections of the plate and fine inclination with HP.

2. A regular pentagon of side 30mm is resting on one of its sides with the surface making an angle of 45° to H.P. Draw the projections of pentagon.

3. One side of regular Hexagonal plane of 30mm side is in V.P. while the opposite side is 45mm in front of V.P. Draw the projection and find the inclination of plane with V.P.

4. A pentagonal plane lamina of side 30mm is resting on H.P. on one of its corners so that the surface makes an angle of 60° with H.P. draw Front & Top views.

5. A regular hexagon of 40mm side has a corner in the H.P. Its surface inclined at 45° to the H.P Draw its projections.

6. A circle of 50mm diameter appears as an ellipse in the front view, having its major axis 50 mm long and minor axis 30 mm long. Draw its views.

7. A circular plate of 60mm diameter and negligible thickness. The plate is resting on the VP on point A on its rim with its surface inclined at 30° to the VP. Draw the projection plate.

Projection of Solids

1. A square prism, side of base 35mm and height 50mm rests with its base on HP, such that one of its rectangular faces is inclined at an angle of 30˚ to HP. Draw its projections.

2. A square pyramid, side of base 30mm and axis 50mm long rests with its base on HP, such that one of its edges of the base is parallel to and 10mm in front of VP. Draw its projections if its axis is inclined at 30^0 to HP.

3. Draw the projections of a cylinder, having base 30mm diameter and axis 40mm long, resting with a point of its base circle on HP. Draw the projections of cylinder if its axis is making an angle of 60˚ with HP.

4. A cone of base diameter 60mm and length of axis 80mm is placed with its apex in VP Draw the projections of cone if its axis is inclined at 60° to VP.

5. A pentagonal prism, side of base 40mm and length of axis 70mm, has an edge of its base in the VP. Draw the projections of prism if its axis is making an angle of 55° with the VP.

6. A hexagonal pyramid, base 30mm side and axis 65mm long is resting on an edge of its base on the H.P. The triangular face, containing that edge, is perpendicular to H.P. Draw the projections.

Section of solids and development

1. A square pyramid 30mm edge of base, 50mm axis length rests vertically on its base with adjacent edges of base equally inclined to VP. It is cut by a cutting plane perpendicular to VP and inclined at 45˚ to HP, such that it bisects the axis. Draw FV, sectional TV and true shape of section. Also draw the development of lateral surface of pyramid.

2. A hexagonal prism, side of base 30mm and axis length 70mm is resting on one of its corners on HP. The prism is cut by a plane perpendicular to the VP and inclined at 45˚ to the HP meeting the axis at a distance of 34mm from the top end. Draw the FV, sectional TV and the true shape of the section. Also draw the development of the retained part.

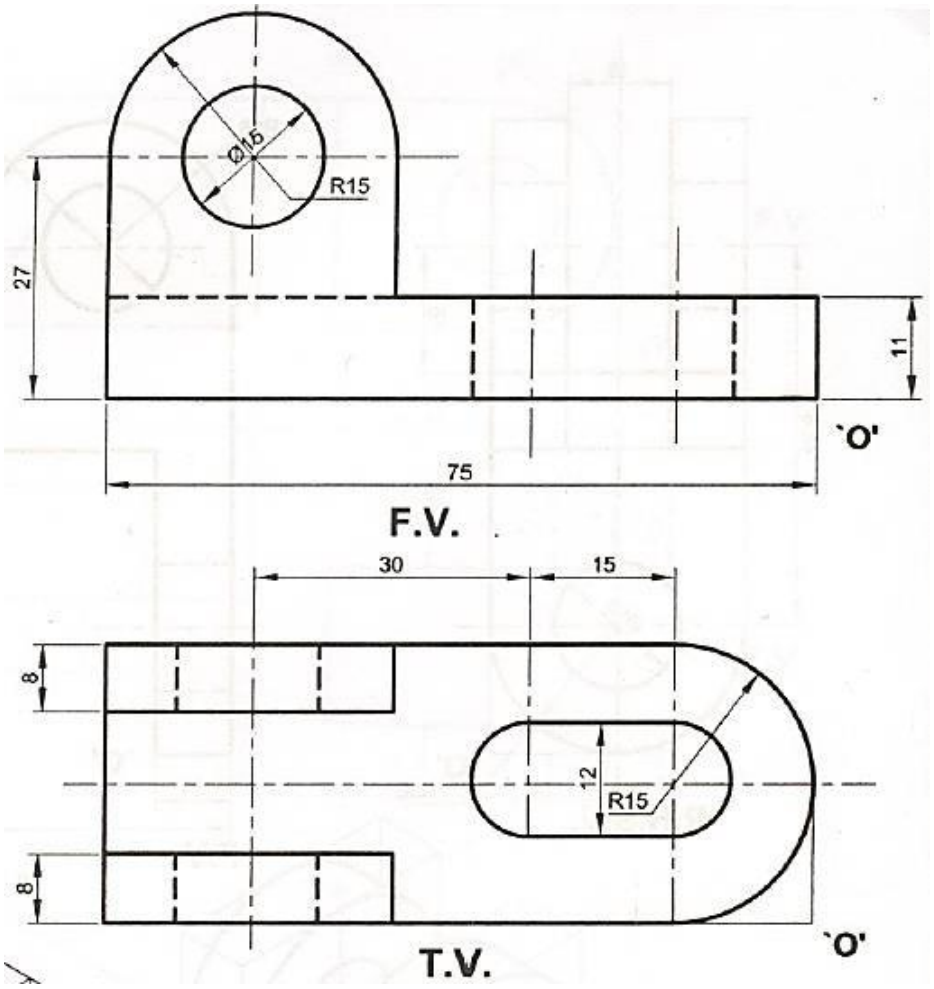
3. A cone, base 50mm diameter and height 75mm stands on HP with its circular base. A section plane inclined at 45˚ to HP bisects the axis of the cone. Draw FV, sectional TV and true shape of section. Also draw the development of the retained part.

4. A solid cylinder with 40mm diameter of base and 80 mm height is resting on its base on HP. It is cut by an AIP bisecting the axis such that the true shape of the section is an ellipse of the major axis 70mm and minor axis 40mm. Draw the FV, sectional TV and true shape of the section. Also draw the development of the retained part.

5. A pentagonal prism of base side 40mm and axis length 80mm is resting on one of its base edges on the HP It is cut by a plane perpendicular to the VP and inclined at 30˚ to the HP. The cutting plane meets the axis at 30mm from the top end. Draw the front view, sectional top view and the true shape of the section. Also draw the development of the retained part.

Isometric Drawing

1.



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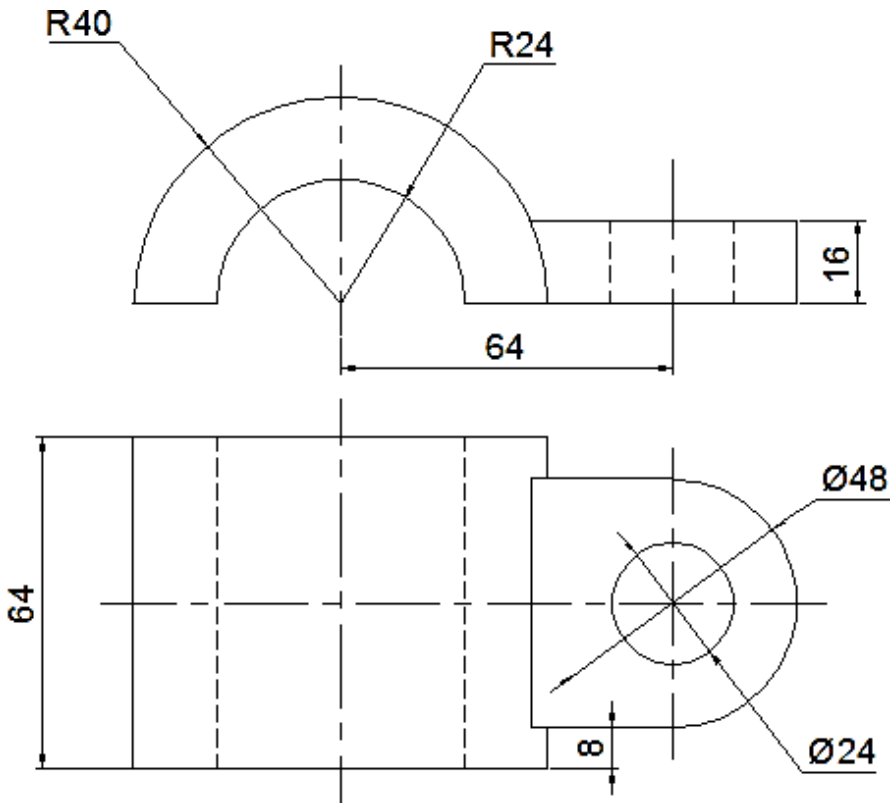

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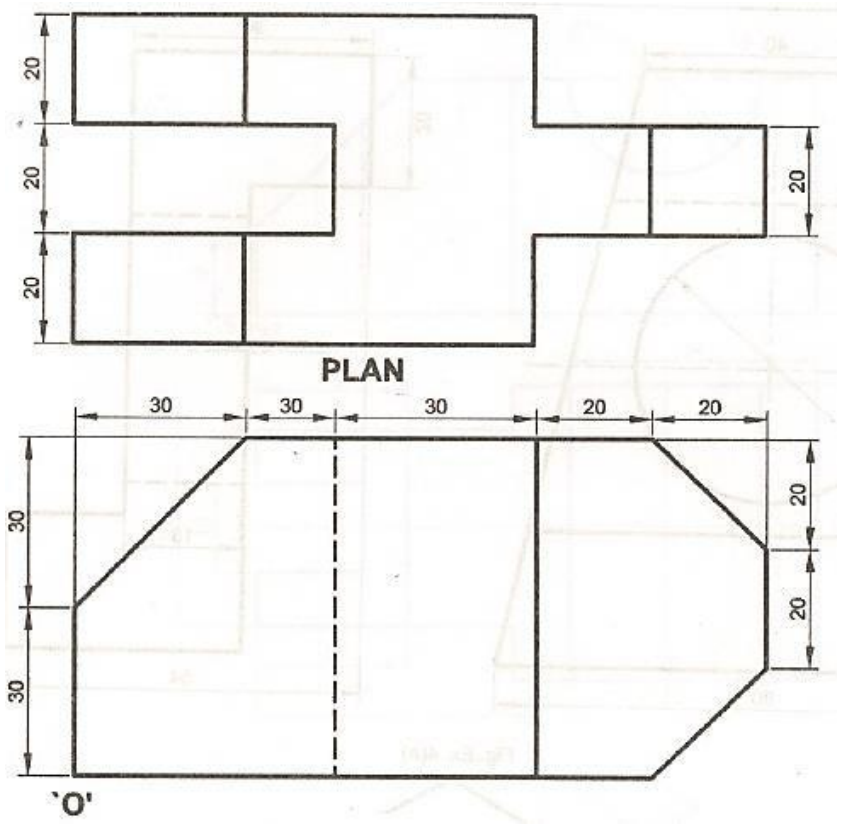

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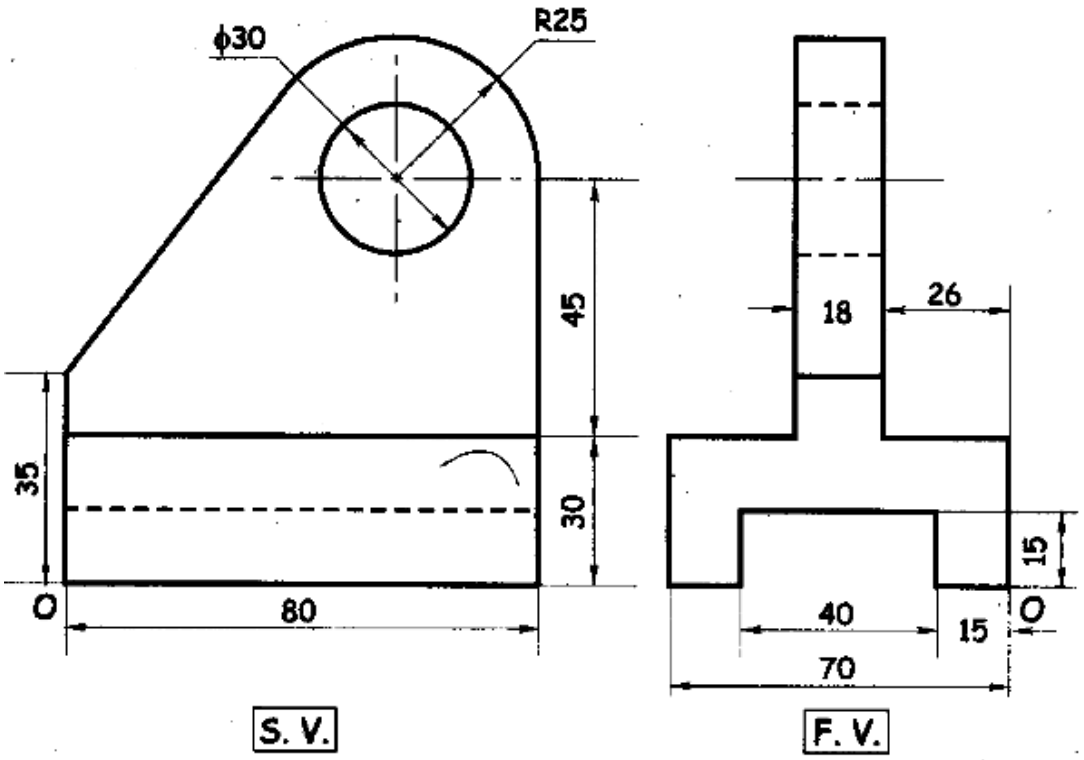

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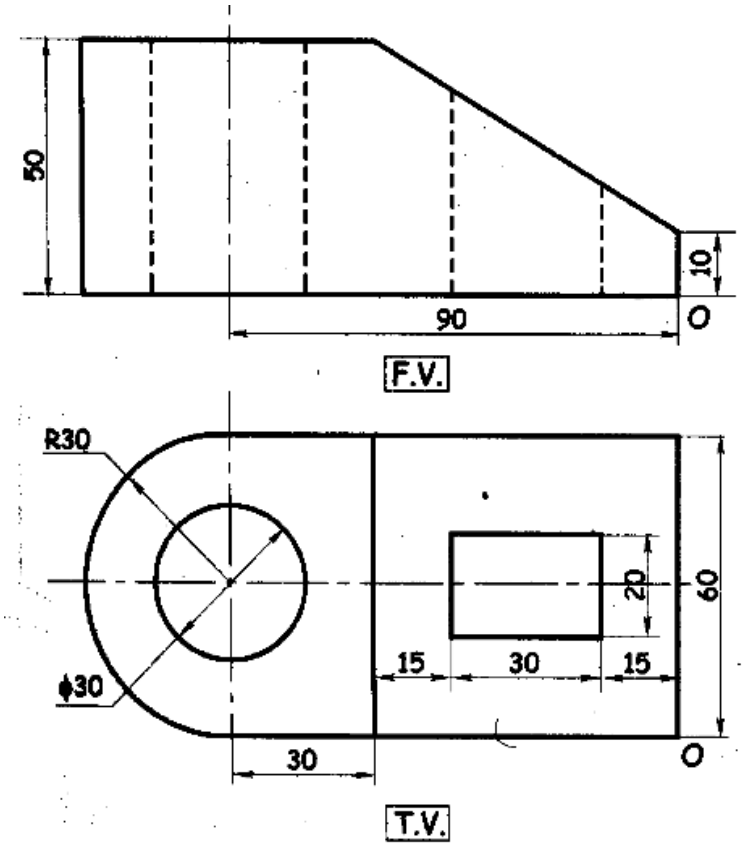

Key Points for Projection of Lines

Line Inclined to Both Reference Planes (HP and VP)

- A line inclined to HP with its true length and true inclination ($a'b_1'$) will be seen parallel to VP with its plan length (ab_1). So project true length from FV to TV and rotate this plan length with 'a' as centre on locus of b to get TV of line.
- A line inclined to VP with its true length and true inclination (ab_2) will be seen parallel to HP with its elevation length ($a'b_2'$). So project true length from TV to FV and rotate this elevation length with a' as centre on locus of b' to get FV of line.

Always project true length from one view to another. Always rotate Plan length on locus of b & elevation length on locus of b'.

- True length in FV ($a'b_1'$) makes an angle Θ with HP while FV of line makes an angle α
- True length in TV (ab_2) makes an angle Φ with VP while TV of line makes an angle β
- Front view length Or Elevation length = a'b' = $a'b_2'$ with (points a', b_2' on same horizontal line)
- Top view length Or plan length = ab = ab_1 with (points a, b_1 on same horizontal line)
- **All FV points with dash and TV points without dash**

Actual Line	AB
F.V. of line	a'b'
T.V. of line	ab
Line assumed parallel to V. P.	AB_1
Corresponding true length of assumed line AB_1	$a'b_1'$
Corresponding plan length of assumed line AB_1	ab_1
Line assumed parallel to H. P.	AB_2
Corresponding true length of assumed line AB_2	ab_2
Corresponding plan length of assumed line AB_2	$a'b_2'$
True inclination of line with HP	Θ
True inclination of line with VP	Φ
Apparent inclination of FV of line with XY	α
Apparent inclination of TV of line with XY	β

Key points for Projection of planes

Projection of planes inclined to one reference plane only

Projections of such planes are drawn in two stages.

- **When plane is in HP**

- In first or initial stage when the plane is in HP the top view will be true shape and size and front view will be an edge view, i.e. a straight line.
- In second stage, tilt the FV of first stage so that it makes given angle with HP. Take vertical projection from this FV and horizontal projection from first stage TV to complete the TV of second stage.

- **When plane is in VP**

- In first or initial stage when the plane is in VP the front view will be true shape and size and top view will be an edge view, i.e. a straight line.
- In second stage, tilt the TV of first stage so that it makes given angle with VP. Take projection from this TV vertically upward and horizontal projection from first stage FV to complete the FV of second stage.

Always make sure that the condition specified about the plane (i. e. plane resting on its side or plane resting on one of its corner, while drawing first stage) should come on your left side. So when you rotate the line view that specified side or corner will retain on XY line.

All FV points with dash and TV points without dash.

Key points for Projection of solids

Projection of solids inclined to one reference plane only

Projections of such solids are drawn in two stages.

- For prism and cylinder rectangular surface is to drawn
- For pyramid and cone triangular surface is to drawn

For any given solid the first stage is required to be drawn as per given condition, with that condition always to your Right Side (so that when you tilt the solid the edge, corner etc retains on XY i.e. on HP/VP).

➢ When solid is resting in HP

- In the first or initial stage when the solid is resting in/on HP the top view will be the true shape and size of solid base and front view will be a **rectangle** for **prism, and cylinder**, **triangle** for **pyramid, cone**.
- In second stage, tilt the FV of first stage so that it makes given angle with HP. Draw vertical projection lines from this FV and horizontal projections from the first stage TV to complete the second stage TV.

➢ When solid is resting in VP

- In the first or initial stage when the solid is resting in/on VP the front view will be true shape and size solid base and top view will be a **rectangle** for **prism, and cylinder**, **triangle** for **pyramid, cone**.
- In second stage, tilt the TV of first stage so that it makes given angle with VP. Draw vertical projection lines from this TV and horizontal projections from first stage FV to complete the second stage FV.

- **Always make sure that the condition specified about the solid (while drawing first stage) should come on your right.**
- **All FV points with dash and TV points without dash.**

Key points for Section of solids

- For prism and cylinder rectangular surface is to drawn
- For pyramid and cone triangular surface is to drawn

In section of solids follow the steps

- Draw first stage of solid as per given condition.
- Mark the cutting plane line/ section plane line as per given location and angle
- Mark the points of intersection of cutting plane line with the vertical edges, slant edges, base edges of the solid
- Project those points on respective vertical edges, slant edges , base edges in another view to get the sectional view
- As the plane is inclined section view is not the true shape so draw cutting plane line parallel to XY line and mark all intersection points on it. Take vertical projections from these points and horizontal projections from sectional view to mark the points to draw **true shape of section.**

Key points for Development of solids

Prism and cylinder comes under parallel line development as the vertical edges of prism and generators of cylinder are parallel to each other.

Pyramid and cone comes under radial line development as the slant edges of pyramid and generators of cone are radiates from apex.

- **For prism development**

- Draw a rectangle of length equal to perimeter of base and width equal to height of prism.
- Project points of intersection of cutting plane with vertical and base edges of prism on respective vertical and base edges of prism drawn in development.
- Join all the points with straight lines

➢ **For cylinder development**

- Draw a rectangle of length equal to circumference of base circle and width equal to height of cylinder.
- Project points of intersection of cutting plane with generators of cylinder on respective generators of cylinder drawn in development.
- Join all the points with curved lines.

➢ **For pyramid development**

- Draw a circular arc of radius equal to the **TL of slant edge** of pyramid. (if not TL do construction for it)
- Mark the base edge length on this arc equal in number of edges of base polygon.
- Project points of intersection of cutting plane with slant and base edges of pyramid on respective slant and base edges of pyramid drawn in development.
- Join all the points with straight lines.

➢ **For cone development**

- Draw a circular arc of radius equal to the length of generator of cone.
- Calculate angle [$\theta = (r/R)*360^0$]
  where r= radius of base circle, R= length of generator.
- Project points of intersection of cutting plane with generators of cone on respective generators of cone drawn in development.
- Join all the points with curved lines.

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