

# Class 11

## Engineering

### Graphics Chapter

# 6 NCERT Solutions

*Step-by-step construction answers for the 2026-27  
NCERT chapter*

### **Chapter 6: Orthographic Projection of Right Regular Solids**

This PDF solves Class 11 Engineering Graphics Chapter 6 assignment questions. It covers prisms, pyramids, cylinders, cones, frustums, H.P., V.P. and the two-step tilt method for regular solids.

Also see for this chapter: [Revision Notes](#) | [Formula Sheet](#) | [Exemplar Solutions](#)

# Complete Chapter Solutions

**Q 6.1** Project the front view and top view of a square prism of 35 mm base edges and 50 mm vertical height, resting on H.P., with two vertical rectangular faces parallel to V.P.

**Source:** NCERT Class 11 Engineering Graphics, Chapter 6 Assignment. **Topic:**

Projection of Right Regular Solids. **Level:** Core.

## QUICK SOLUTION

**Concept:** When the axis is perpendicular to H.P., the base is seen in true shape in the top view. Start with the top view and project the front view.

**Answer:** Draw the true top view of the square prism first, then project its front view with the given axis or height.

## SOLUTION

**Concept used.** When the axis is perpendicular to H.P., the base is seen in true shape in the top view. Start with the top view and project the front view.

**Step 1.** Draw the  $XY$  reference line and keep enough space for both views.

**Step 2.** Below  $XY$ , draw the true-shape top

view of the square prism using the given base size.

**Step 3.** Name all base corners or rim points in sequence.

**Step 4.** Project vertical construction lines upward from every named point.

**Step 5.** Set the given axis length or height in the front view.

**Step 6.** Join visible edges with thick object lines and show hidden rear edges with dashed lines only when required.

**Step 7.** Check that the top view carries the base size and the front view carries the height.

#### **View-selection check**

The answer is correct when the top view shows the base in true shape and the front view shows the full vertical height.

**Final Answer:** Draw the true top view of the square prism first, then project its front view with the given axis or height.

**Construction route.** First decide which view shows the real shape. For a prism, pyramid, cylinder, cone or frustum, the view normal to the axis gives the end face. The other view carries the axis length. Keep the first position light, because it is only a construction aid. Then darken the final view after the tilt or projection is complete.

**Step 1.** Draw the  $XY$  reference line and keep enough space for both views.

**Step 2.** Below  $XY$ , draw the true-shape top view of the square prism using the given base size.

**Step 3.** Name all base corners or rim points in sequence.

**Step 4.** Project vertical construction lines upward from every named point.

**Step 5.** Set the given axis length or height in the front view.

**Step 6.** Join visible edges with thick object lines and show hidden rear edges with dashed lines only when required.

**Step 7.** Check that the top view carries the base size and the front view carries

the height.

Before finishing, match every named point across front view and top view. A wrong point match changes the visibility of edges, so recheck the projectors before drawing dashed lines.

**Final Answer:** Draw the true top view of the square prism first, then project its front view with the given axis or height.

**Q 6.2** A triangular prism of 40 mm base edges and 60 mm height stands on H.P. with one vertical rectangular face at the rear, parallel to V.P. Draw its projections.

**Source:** NCERT Class 11 Engineering Graphics, Chapter 6 Assignment. **Topic:**

Projection of Right Regular Solids. **Level:** Core.

### QUICK SOLUTION

**Concept:** When the axis is perpendicular to H.P., the base is seen in true shape in the top view. Start with the top view and project the front view.

**Answer:** Draw the true top view of the triangular prism first, then project its front view

with the given axis or height.

## SOLUTION

**Concept used.** When the axis is perpendicular to H.P., the base is seen in true shape in the top view. Start with the top view and project the front view.

- Step 1.** Draw the  $XY$  reference line and keep enough space for both views.
- Step 2.** Below  $XY$ , draw the true-shape top view of the triangular prism using the given base size.
- Step 3.** Name all base corners or rim points in sequence.
- Step 4.** Project vertical construction lines upward from every named point.
- Step 5.** Set the given axis length or height in the front view.
- Step 6.** Join visible edges with thick object lines and show hidden rear edges with dashed lines only when required.
- Step 7.** Check that the top view carries the base size and the front view carries the height.

### **View-selection check**

The answer is correct when the top view shows the base in true shape and the front view shows the full vertical height.

**Final Answer:** Draw the true top view of the triangular prism first, then project its front view with the given axis or height.

**EXPERT'S SOLUTION** : *Priya Iyer, M.Des Industrial Design, NID Ahmedabad*

**Construction route.** First decide which view shows the real shape. For a prism, pyramid, cylinder, cone or frustum, the view normal to the axis gives the end face. The other view carries the axis length. Keep the first position light, because it is only a construction aid. Then darken the final view after the tilt or projection is complete.

**Step 1.** Draw the  $XY$  reference line and keep enough space for both views.

**Step 2.** Below  $XY$ , draw the true-shape top view of the triangular prism using the given base size.

**Step 3.** Name all base corners or rim points in

sequence.

- Step 4.** Project vertical construction lines upward from every named point.
- Step 5.** Set the given axis length or height in the front view.
- Step 6.** Join visible edges with thick object lines and show hidden rear edges with dashed lines only when required.
- Step 7.** Check that the top view carries the base size and the front view carries the height.

Before finishing, match every named point across front view and top view. A wrong point match changes the visibility of edges, so recheck the projectors before drawing dashed lines.

**Final Answer:** Draw the true top view of the triangular prism first, then project its front view with the given axis or height.

**Q 6.3**

**Draw the projections of a cylinder resting on H.P. on its base, with 30 mm base diameter and 40 mm long axis.**

Source: NCERT Class 11 Engineering Graphics, Chapter 6 Assignment. Topic:

Projection of Right Regular Solids. Level: Core.

**QUICK SOLUTION**

**Concept:** When the axis is perpendicular to H.P., the base is seen in true shape in the top view. Start with the top view and project the front view.

**Answer:** Draw the true top view of the cylinder first, then project its front view with the given axis or height.

**SOLUTION**

**Concept used.** When the axis is perpendicular to H.P., the base is seen in true shape in the top view. Start with the top view and project the front view.

**Step 1.** Draw the  $XY$  reference line and keep enough space for both views.

**Step 2.** Below  $XY$ , draw the true-shape top view of the cylinder using the given base size.

**Step 3.** Name all base corners or rim points in sequence.

- Step 4.** Project vertical construction lines upward from every named point.
- Step 5.** Set the given axis length or height in the front view.
- Step 6.** Join visible edges with thick object lines and show hidden rear edges with dashed lines only when required.
- Step 7.** Check that the top view carries the base size and the front view carries the height.

 **View-selection check**

The answer is correct when the top view shows the base in true shape and the front view shows the full vertical height.

**Final Answer:** Draw the true top view of the cylinder first, then project its front view with the given axis or height.

**EXPERT'S SOLUTION** : *Kabir Rao, B.E. Mechanical Engineering, Anna University*

**Construction route.** First decide which view shows the real shape. For a prism, pyramid, cylinder, cone or frustum, the view normal to the axis gives the end face. The other view

carries the axis length. Keep the first position light, because it is only a construction aid. Then darken the final view after the tilt or projection is complete.

**Step 1.** Draw the  $XY$  reference line and keep enough space for both views.

**Step 2.** Below  $XY$ , draw the true-shape top view of the cylinder using the given base size.

**Step 3.** Name all base corners or rim points in sequence.

**Step 4.** Project vertical construction lines upward from every named point.

**Step 5.** Set the given axis length or height in the front view.

**Step 6.** Join visible edges with thick object lines and show hidden rear edges with dashed lines only when required.

**Step 7.** Check that the top view carries the base size and the front view carries the height.

Before finishing, match every named point across front view and top view. A wrong point match changes the visibility of edges, so recheck the projectors before drawing dashed lines.

**Final Answer:** Draw the true top view of the cylinder first, then project its front view with the given axis or height.

**Q 6.4** Project the front view and top view of a hemisphere resting on H.P. with its circular face on top. Diameter is 60 mm.

Source: NCERT Class 11 Engineering Graphics, Chapter 6 Assignment. Topic:

Projection of Right Regular Solids. Level: Core.

### QUICK SOLUTION

**Concept:** When the axis is perpendicular to H.P., the base is seen in true shape in the top view. Start with the top view and project the front view.

**Answer:** Draw the true top view of the hemisphere first, then project its front view with the given axis or height.

### SOLUTION

**Concept used.** When the axis is perpendicular to H.P., the base is seen in true shape in the top view. Start with the top view and project the front view.

**Step 1.** Draw the  $XY$  reference line and keep

enough space for both views.

- Step 2.** Below  $XY$ , draw the true-shape top view of the hemisphere using the given base size.
- Step 3.** Name all base corners or rim points in sequence.
- Step 4.** Project vertical construction lines upward from every named point.
- Step 5.** Set the given axis length or height in the front view.
- Step 6.** Join visible edges with thick object lines and show hidden rear edges with dashed lines only when required.
- Step 7.** Check that the top view carries the base size and the front view carries the height.

#### **View-selection check**

The answer is correct when the top view shows the base in true shape and the front view shows the full vertical height.

**Final Answer:** Draw the true top view of the hemisphere first, then project its front view with the given axis or height.

**Construction route.** First decide which view shows the real shape. For a prism, pyramid, cylinder, cone or frustum, the view normal to the axis gives the end face. The other view carries the axis length. Keep the first position light, because it is only a construction aid. Then darken the final view after the tilt or projection is complete.

**Step 1.** Draw the  $XY$  reference line and keep enough space for both views.

**Step 2.** Below  $XY$ , draw the true-shape top view of the hemisphere using the given base size.

**Step 3.** Name all base corners or rim points in sequence.

**Step 4.** Project vertical construction lines upward from every named point.

**Step 5.** Set the given axis length or height in the front view.

**Step 6.** Join visible edges with thick object lines and show hidden rear edges with dashed lines only when required.

**Step 7.** Check that the top view carries the base size and the front view carries

the height.

Before finishing, match every named point across front view and top view. A wrong point match changes the visibility of edges, so recheck the projectors before drawing dashed lines.

**Final Answer:** Draw the true top view of the hemisphere first, then project its front view with the given axis or height.

**Q 6.5** Project the front view and top view of the frustum of a hexagonal pyramid, 25 mm base edges and 70 mm height, cut at mid-height parallel to its base.

**Source:** NCERT Class 11 Engineering Graphics, Chapter 6 Assignment. **Topic:**

Projection of Right Regular Solids. **Level:** Core.

### QUICK SOLUTION

**Concept:** When the axis is perpendicular to H.P., the base is seen in true shape in the top view. Start with the top view and project the front view.

**Answer:** Draw the true top view of the hexagonal pyramid frustum first, then project

its front view with the given axis or height.

## SOLUTION

**Concept used.** When the axis is perpendicular to H.P., the base is seen in true shape in the top view. Start with the top view and project the front view.

- Step 1.** Draw the  $XY$  reference line and keep enough space for both views.
- Step 2.** Below  $XY$ , draw the true-shape top view of the hexagonal pyramid frustum using the given base size.
- Step 3.** Name all base corners or rim points in sequence.
- Step 4.** Project vertical construction lines upward from every named point.
- Step 5.** Set the given axis length or height in the front view.
- Step 6.** Join visible edges with thick object lines and show hidden rear edges with dashed lines only when required.
- Step 7.** Check that the top view carries the base size and the front view carries the height.

### **View-selection check**

The answer is correct when the top view shows the base in true shape and the front view shows the full vertical height.

**Final Answer:** Draw the true top view of the hexagonal pyramid frustum first, then project its front view with the given axis or height.

**EXPERT'S SOLUTION** : *Rohan Kulkarni, B.Tech Civil Engineering, NIT Trichy*

**Construction route.** First decide which view shows the real shape. For a prism, pyramid, cylinder, cone or frustum, the view normal to the axis gives the end face. The other view carries the axis length. Keep the first position light, because it is only a construction aid. Then darken the final view after the tilt or projection is complete.

**Step 1.** Draw the  $XY$  reference line and keep enough space for both views.

**Step 2.** Below  $XY$ , draw the true-shape top view of the hexagonal pyramid frustum using the given base size.

**Step 3.** Name all base corners or rim points in sequence.

**Step 4.** Project vertical construction lines upward from every named point.

**Step 5.** Set the given axis length or height in the front view.

**Step 6.** Join visible edges with thick object lines and show hidden rear edges with dashed lines only when required.

**Step 7.** Check that the top view carries the base size and the front view carries the height.

Before finishing, match every named point across front view and top view. A wrong point match changes the visibility of edges, so recheck the projectors before drawing dashed lines.

**Final Answer:** Draw the true top view of the hexagonal pyramid frustum first, then project its front view with the given axis or height.

**Q 6.6**

**Project the front view and top view of a hollow cylinder having outer diameter 50 mm, inner diameter 40 mm and length 50 mm, resting on H.P. with its axis perpendicular to V.P.**

Source: NCERT Class 11 Engineering Graphics, Chapter 6 Assignment. Topic:

Projection of Right Regular Solids. Level: Core.

**QUICK SOLUTION**

**Concept:** When the axis is perpendicular to V.P., the end face is seen in true shape in the front view. Start with the front view and project the top view.

**Answer:** Draw the true front view of the hollow cylinder first, then project the top view with the given axis length.

**SOLUTION**

**Concept used.** When the axis is perpendicular to V.P., the end face is seen in true shape in the front view. Start with the front view and project the top view.

**Step 1.** Draw  $XY$  and mark the front-view space above it.

**Step 2.** Draw the true-shape front view of the hollow cylinder above  $XY$ .

**Step 3.** Name all corner, rim or generator

points clearly.

**Step 4.** Project downward from each point to form the top view.

**Step 5.** Set the given axis length in top view, keeping it perpendicular to V.P.

**Step 6.** Join corresponding points, darken visible outlines and add dashed hidden edges where the rear face is not visible.

**Step 7.** Check that the front view carries the end-face shape and the top view carries the length.

#### **View-selection check**

The answer is correct when the front view shows the end face in true shape and the top view shows the full axis length.

**Final Answer:** Draw the true front view of the hollow cylinder first, then project the top view with the given axis length.

**Construction route.** First decide which view shows the real shape. For a prism, pyramid, cylinder, cone or frustum, the view normal to the axis gives the end face. The other view carries the axis length. Keep the first position light, because it is only a construction aid. Then darken the final view after the tilt or projection is complete.

**Step 1.** Draw  $XY$  and mark the front-view space above it.

**Step 2.** Draw the true-shape front view of the hollow cylinder above  $XY$ .

**Step 3.** Name all corner, rim or generator points clearly.

**Step 4.** Project downward from each point to form the top view.

**Step 5.** Set the given axis length in top view, keeping it perpendicular to V.P.

**Step 6.** Join corresponding points, darken visible outlines and add dashed hidden edges where the rear face is not visible.

**Step 7.** Check that the front view carries the end-face shape and the top view

carries the length.

Before finishing, match every named point across front view and top view. A wrong point match changes the visibility of edges, so recheck the projectors before drawing dashed lines.

**Final Answer:** Draw the true front view of the hollow cylinder first, then project the top view with the given axis length.

**Q 6.7** A triangular pyramid of 50 mm base and 50 mm axis rests on its base corner on H.P., so that the upper edge of the base is horizontal. The base is at the rear and parallel to V.P. Draw projections.

Source: NCERT Class 11 Engineering Graphics, Chapter 6 Assignment. Topic:

Projection of Right Regular Solids. Level: Core.

### QUICK SOLUTION

**Concept:** When the axis is perpendicular to V.P., the end face is seen in true shape in the front view. Start with the front view and project the top view.

**Answer:** Draw the true front view of the

triangular pyramid first, then project the top view with the given axis length.

## SOLUTION

**Concept used.** When the axis is perpendicular to V.P., the end face is seen in true shape in the front view. Start with the front view and project the top view.

- Step 1.** Draw  $XY$  and mark the front-view space above it.
- Step 2.** Draw the true-shape front view of the triangular pyramid above  $XY$ .
- Step 3.** Name all corner, rim or generator points clearly.
- Step 4.** Project downward from each point to form the top view.
- Step 5.** Set the given axis length in top view, keeping it perpendicular to V.P.
- Step 6.** Join corresponding points, darken visible outlines and add dashed hidden edges where the rear face is not visible.
- Step 7.** Check that the front view carries the end-face shape and the top view carries the length.

### 👉 View-selection check

The answer is correct when the front view shows the end face in true shape and the top view shows the full axis length.

**Final Answer:** Draw the true front view of the triangular pyramid first, then project the top view with the given axis length.

**EXPERT'S SOLUTION** : *Dev Sharma, B.Tech  
Production Engineering, DTU Delhi*

**Construction route.** First decide which view shows the real shape. For a prism, pyramid, cylinder, cone or frustum, the view normal to the axis gives the end face. The other view carries the axis length. Keep the first position light, because it is only a construction aid. Then darken the final view after the tilt or projection is complete.

**Step 1.** Draw  $XY$  and mark the front-view space above it.

**Step 2.** Draw the true-shape front view of the triangular pyramid above  $XY$ .

**Step 3.** Name all corner, rim or generator

points clearly.

**Step 4.** Project downward from each point to form the top view.

**Step 5.** Set the given axis length in top view, keeping it perpendicular to V.P.

**Step 6.** Join corresponding points, darken visible outlines and add dashed hidden edges where the rear face is not visible.

**Step 7.** Check that the front view carries the end-face shape and the top view carries the length.

Before finishing, match every named point across front view and top view. A wrong point match changes the visibility of edges, so recheck the projectors before drawing dashed lines.

**Final Answer:** Draw the true front view of the triangular pyramid first, then project the top view with the given axis length.

**Q 6.8** Project the front view and top view of a pentagonal prism of 30 mm base edges and 60 mm long edges perpendicular to V.P., with its rectangular face on top parallel to H.P.

Source: NCERT Class 11 Engineering Graphics, Chapter 6 Assignment. Topic:

Projection of Right Regular Solids. Level: Core.

### QUICK SOLUTION

**Concept:** When the axis is perpendicular to V.P., the end face is seen in true shape in the front view. Start with the front view and project the top view.

**Answer:** Draw the true front view of the pentagonal prism first, then project the top view with the given axis length.

### SOLUTION

**Concept used.** When the axis is perpendicular to V.P., the end face is seen in true shape in the front view. Start with the front view and project the top view.

**Step 1.** Draw  $XY$  and mark the front-view space above it.

**Step 2.** Draw the true-shape front view of the pentagonal prism above  $XY$ .

**Step 3.** Name all corner, rim or generator

points clearly.

**Step 4.** Project downward from each point to form the top view.

**Step 5.** Set the given axis length in top view, keeping it perpendicular to V.P.

**Step 6.** Join corresponding points, darken visible outlines and add dashed hidden edges where the rear face is not visible.

**Step 7.** Check that the front view carries the end-face shape and the top view carries the length.

#### **View-selection check**

The answer is correct when the front view shows the end face in true shape and the top view shows the full axis length.

**Final Answer:** Draw the true front view of the pentagonal prism first, then project the top view with the given axis length.

**Construction route.** First decide which view shows the real shape. For a prism, pyramid, cylinder, cone or frustum, the view normal to the axis gives the end face. The other view carries the axis length. Keep the first position light, because it is only a construction aid. Then darken the final view after the tilt or projection is complete.

**Step 1.** Draw  $XY$  and mark the front-view space above it.

**Step 2.** Draw the true-shape front view of the pentagonal prism above  $XY$ .

**Step 3.** Name all corner, rim or generator points clearly.

**Step 4.** Project downward from each point to form the top view.

**Step 5.** Set the given axis length in top view, keeping it perpendicular to V.P.

**Step 6.** Join corresponding points, darken visible outlines and add dashed hidden edges where the rear face is not visible.

**Step 7.** Check that the front view carries the end-face shape and the top view

carries the length.

Before finishing, match every named point across front view and top view. A wrong point match changes the visibility of edges, so recheck the projectors before drawing dashed lines.

**Final Answer:** Draw the true front view of the pentagonal prism first, then project the top view with the given axis length.

**Q 6.9** A frustum of a square pyramid of 40 mm base edges and 20 mm top edges rests on H.P. on a base edge. Its 50 mm axis is horizontal and at right angles to V.P.; the cut face is in front. Draw projections.

**Source:** NCERT Class 11 Engineering Graphics, Chapter 6 Assignment. **Topic:** Projection of Right Regular Solids. **Level:** Core.

### QUICK SOLUTION

**Concept:** When the axis is perpendicular to V.P., the end face is seen in true shape in the front view. Start with the front view and project the top view.

**Answer:** Draw the true front view of the square pyramid frustum first, then project the top view with the given axis length.

## SOLUTION

**Concept used.** When the axis is perpendicular to V.P., the end face is seen in true shape in the front view. Start with the front view and project the top view.

- Step 1.** Draw  $XY$  and mark the front-view space above it.
- Step 2.** Draw the true-shape front view of the square pyramid frustum above  $XY$ .
- Step 3.** Name all corner, rim or generator points clearly.
- Step 4.** Project downward from each point to form the top view.
- Step 5.** Set the given axis length in top view, keeping it perpendicular to V.P.
- Step 6.** Join corresponding points, darken visible outlines and add dashed hidden edges where the rear face is not visible.
- Step 7.** Check that the front view carries the end-face shape and the top view carries the length.

### 👉 View-selection check

The answer is correct when the front view shows the end face in true shape and the top view shows the full axis length.

**Final Answer:** Draw the true front view of the square pyramid frustum first, then project the top view with the given axis length.

**EXPERT'S SOLUTION** : *Ishaan Batra, B.Tech  
Mechanical Engineering, DTU Delhi*

**Construction route.** First decide which view shows the real shape. For a prism, pyramid, cylinder, cone or frustum, the view normal to the axis gives the end face. The other view carries the axis length. Keep the first position light, because it is only a construction aid. Then darken the final view after the tilt or projection is complete.

**Step 1.** Draw  $XY$  and mark the front-view space above it.

**Step 2.** Draw the true-shape front view of the square pyramid frustum above  $XY$ .

**Step 3.** Name all corner, rim or generator

points clearly.

**Step 4.** Project downward from each point to form the top view.

**Step 5.** Set the given axis length in top view, keeping it perpendicular to V.P.

**Step 6.** Join corresponding points, darken visible outlines and add dashed hidden edges where the rear face is not visible.

**Step 7.** Check that the front view carries the end-face shape and the top view carries the length.

Before finishing, match every named point across front view and top view. A wrong point match changes the visibility of edges, so recheck the projectors before drawing dashed lines.

**Final Answer:** Draw the true front view of the square pyramid frustum first, then project the top view with the given axis length.

**Q 6.10**

A hexagonal prism of 25 mm base edge and 60 mm axis rests on one base edge on H.P. and its axis is perpendicular to V.P. Project its front view and top view.

Source: NCERT Class 11 Engineering Graphics, Chapter 6 Assignment. Topic:

Projection of Right Regular Solids. Level: Core.

**QUICK SOLUTION**

**Concept:** When the axis is perpendicular to V.P., the end face is seen in true shape in the front view. Start with the front view and project the top view.

**Answer:** Draw the true front view of the hexagonal prism first, then project the top view with the given axis length.

**SOLUTION**

**Concept used.** When the axis is perpendicular to V.P., the end face is seen in true shape in the front view. Start with the front view and project the top view.

**Step 1.** Draw  $XY$  and mark the front-view space above it.

**Step 2.** Draw the true-shape front view of the hexagonal prism above  $XY$ .

**Step 3.** Name all corner, rim or generator points clearly.

- Step 4.** Project downward from each point to form the top view.
- Step 5.** Set the given axis length in top view, keeping it perpendicular to V.P.
- Step 6.** Join corresponding points, darken visible outlines and add dashed hidden edges where the rear face is not visible.
- Step 7.** Check that the front view carries the end-face shape and the top view carries the length.

 **View-selection check**

The answer is correct when the front view shows the end face in true shape and the top view shows the full axis length.

**Final Answer:** Draw the true front view of the hexagonal prism first, then project the top view with the given axis length.

**EXPERT'S SOLUTION** : *Kavya Raman, M.Tech  
Design Engineering, IIT Madras*

**Construction route.** First decide which view shows the real shape. For a prism, pyramid, cylinder, cone or frustum, the view normal to

the axis gives the end face. The other view carries the axis length. Keep the first position light, because it is only a construction aid. Then darken the final view after the tilt or projection is complete.

**Step 1.** Draw  $XY$  and mark the front-view space above it.

**Step 2.** Draw the true-shape front view of the hexagonal prism above  $XY$ .

**Step 3.** Name all corner, rim or generator points clearly.

**Step 4.** Project downward from each point to form the top view.

**Step 5.** Set the given axis length in top view, keeping it perpendicular to V.P.

**Step 6.** Join corresponding points, darken visible outlines and add dashed hidden edges where the rear face is not visible.

**Step 7.** Check that the front view carries the end-face shape and the top view carries the length.

Before finishing, match every named point across front view and top view. A wrong point match changes the visibility of edges, so recheck the projectors before drawing dashed

lines.

**Final Answer:** Draw the true front view of the hexagonal prism first, then project the top view with the given axis length.

**Q 6.11** Project the front view and top view of a cylinder with base diameter 50 mm and height 70 mm, resting on H.P., with its axis perpendicular to V.P.

**Source:** NCERT Class 11 Engineering Graphics, Chapter 6 Assignment. **Topic:** Projection of Right Regular Solids. **Level:** Core.

### QUICK SOLUTION

**Concept:** When the axis is perpendicular to V.P., the end face is seen in true shape in the front view. Start with the front view and project the top view.

**Answer:** Draw the true front view of the cylinder first, then project the top view with the given axis length.

### SOLUTION

**Concept used.** When the axis is perpendicular to V.P., the end face is seen in true shape in the

front view. Start with the front view and project the top view.

- Step 1.** Draw  $XY$  and mark the front-view space above it.
- Step 2.** Draw the true-shape front view of the cylinder above  $XY$ .
- Step 3.** Name all corner, rim or generator points clearly.
- Step 4.** Project downward from each point to form the top view.
- Step 5.** Set the given axis length in top view, keeping it perpendicular to V.P.
- Step 6.** Join corresponding points, darken visible outlines and add dashed hidden edges where the rear face is not visible.
- Step 7.** Check that the front view carries the end-face shape and the top view carries the length.

#### **View-selection check**

The answer is correct when the front view shows the end face in true shape and the top view shows the full axis length.

**Final Answer:** Draw the true front view of the cylinder first, then project the top view with the given axis length.

**EXPERT'S SOLUTION** : *Arjun Desai, B.E. Civil Engineering, Mumbai University*

**Construction route.** First decide which view shows the real shape. For a prism, pyramid, cylinder, cone or frustum, the view normal to the axis gives the end face. The other view carries the axis length. Keep the first position light, because it is only a construction aid. Then darken the final view after the tilt or projection is complete.

**Step 1.** Draw  $XY$  and mark the front-view space above it.

**Step 2.** Draw the true-shape front view of the cylinder above  $XY$ .

**Step 3.** Name all corner, rim or generator points clearly.

**Step 4.** Project downward from each point to form the top view.

**Step 5.** Set the given axis length in top view, keeping it perpendicular to V.P.

**Step 6.** Join corresponding points, darken

visible outlines and add dashed hidden edges where the rear face is not visible.

**Step 7.** Check that the front view carries the end-face shape and the top view carries the length.

Before finishing, match every named point across front view and top view. A wrong point match changes the visibility of edges, so recheck the projectors before drawing dashed lines.

**Final Answer:** Draw the true front view of the cylinder first, then project the top view with the given axis length.

**Q 6.12** Draw the front view and top view of a cone of base diameter 30 mm and axis 65 mm, with its axis perpendicular to V.P., keeping the vertex in front.

Source: NCERT Class 11 Engineering Graphics, Chapter 6 Assignment. Topic: Projection of Right Regular Solids. Level: Core.

## QUICK SOLUTION

**Concept:** When the axis is perpendicular to V.P., the end face is seen in true shape in the front view. Start with the front view and project the top view.

**Answer:** Draw the true front view of the cone first, then project the top view with the given axis length.

## SOLUTION

**Concept used.** When the axis is perpendicular to V.P., the end face is seen in true shape in the front view. Start with the front view and project the top view.

- Step 1.** Draw  $XY$  and mark the front-view space above it.
- Step 2.** Draw the true-shape front view of the cone above  $XY$ .
- Step 3.** Name all corner, rim or generator points clearly.
- Step 4.** Project downward from each point to form the top view.
- Step 5.** Set the given axis length in top view, keeping it perpendicular to V.P.
- Step 6.** Join corresponding points, darken visible outlines and add dashed hidden edges where the rear face is

not visible.

**Step 7.** Check that the front view carries the end-face shape and the top view carries the length.

 **View-selection check**

The answer is correct when the front view shows the end face in true shape and the top view shows the full axis length.

**Final Answer:** Draw the true front view of the cone first, then project the top view with the given axis length.

**EXPERT'S SOLUTION** : *Sara Thomas, M.Des  
Industrial Design, IIT Hyderabad*

**Construction route.** First decide which view shows the real shape. For a prism, pyramid, cylinder, cone or frustum, the view normal to the axis gives the end face. The other view carries the axis length. Keep the first position light, because it is only a construction aid. Then darken the final view after the tilt or projection is complete.

**Step 1.** Draw  $XY$  and mark the front-view space above it.

- Step 2.** Draw the true-shape front view of the cone above  $XY$ .
- Step 3.** Name all corner, rim or generator points clearly.
- Step 4.** Project downward from each point to form the top view.
- Step 5.** Set the given axis length in top view, keeping it perpendicular to V.P.
- Step 6.** Join corresponding points, darken visible outlines and add dashed hidden edges where the rear face is not visible.
- Step 7.** Check that the front view carries the end-face shape and the top view carries the length.

Before finishing, match every named point across front view and top view. A wrong point match changes the visibility of edges, so recheck the projectors before drawing dashed lines.

**Final Answer:** Draw the true front view of the cone first, then project the top view with the given axis length.

**Q 6.13**

A square prism, base 40 mm side and axis 70 mm long, lies on one rectangular face. Its axis is perpendicular to V.P. Draw its front view and top view.

Source: NCERT Class 11 Engineering Graphics, Chapter 6 Assignment. Topic:

Projection of Right Regular Solids. Level: Core.

### QUICK SOLUTION

**Concept:** When the axis is perpendicular to V.P., the end face is seen in true shape in the front view. Start with the front view and project the top view.

**Answer:** Draw the true front view of the square prism first, then project the top view with the given axis length.

### SOLUTION

**Concept used.** When the axis is perpendicular to V.P., the end face is seen in true shape in the front view. Start with the front view and project the top view.

**Step 1.** Draw  $XY$  and mark the front-view space above it.

**Step 2.** Draw the true-shape front view of the square prism above  $XY$ .

**Step 3.** Name all corner, rim or generator points clearly.

- Step 4.** Project downward from each point to form the top view.
- Step 5.** Set the given axis length in top view, keeping it perpendicular to V.P.
- Step 6.** Join corresponding points, darken visible outlines and add dashed hidden edges where the rear face is not visible.
- Step 7.** Check that the front view carries the end-face shape and the top view carries the length.

 **View-selection check**

The answer is correct when the front view shows the end face in true shape and the top view shows the full axis length.

**Final Answer:** Draw the true front view of the square prism first, then project the top view with the given axis length.

**EXPERT'S SOLUTION** : Vivaan Kapoor, B.Tech  
Production Engineering, PEC Chandigarh

**Construction route.** First decide which view shows the real shape. For a prism, pyramid, cylinder, cone or frustum, the view normal to

the axis gives the end face. The other view carries the axis length. Keep the first position light, because it is only a construction aid. Then darken the final view after the tilt or projection is complete.

**Step 1.** Draw  $XY$  and mark the front-view space above it.

**Step 2.** Draw the true-shape front view of the square prism above  $XY$ .

**Step 3.** Name all corner, rim or generator points clearly.

**Step 4.** Project downward from each point to form the top view.

**Step 5.** Set the given axis length in top view, keeping it perpendicular to V.P.

**Step 6.** Join corresponding points, darken visible outlines and add dashed hidden edges where the rear face is not visible.

**Step 7.** Check that the front view carries the end-face shape and the top view carries the length.

Before finishing, match every named point across front view and top view. A wrong point match changes the visibility of edges, so recheck the projectors before drawing dashed

lines.

**Final Answer:** Draw the true front view of the square prism first, then project the top view with the given axis length.

**Q 6.14** The frustum of a triangular pyramid of 50 mm base edge and 20 mm top edge rests on H.P. with its base edge on it. The 60 mm axis is parallel to H.P. and at right angles to V.P. The cut face is in front. Project its views.

Source: NCERT Class 11 Engineering Graphics, Chapter 6 Assignment. Topic: Projection of Right Regular Solids. Level: Core.

### QUICK SOLUTION

**Concept:** When the axis is perpendicular to V.P., the end face is seen in true shape in the front view. Start with the front view and project the top view.

**Answer:** Draw the true front view of the triangular pyramid frustum first, then project the top view with the given axis length.

## SOLUTION

**Concept used.** When the axis is perpendicular to V.P., the end face is seen in true shape in the front view. Start with the front view and project the top view.

**Step 1.** Draw  $XY$  and mark the front-view space above it.

**Step 2.** Draw the true-shape front view of the triangular pyramid frustum above  $XY$ .

**Step 3.** Name all corner, rim or generator points clearly.

**Step 4.** Project downward from each point to form the top view.

**Step 5.** Set the given axis length in top view, keeping it perpendicular to V.P.

**Step 6.** Join corresponding points, darken visible outlines and add dashed hidden edges where the rear face is not visible.

**Step 7.** Check that the front view carries the end-face shape and the top view carries the length.

### **View-selection check**

The answer is correct when the front view shows the end face in true shape and the top view shows the full axis length.

**Final Answer:** Draw the true front view of the triangular pyramid frustum first, then project the top view with the given axis length.

**EXPERT'S SOLUTION** : *Tanya Ghosh, M.Tech  
Manufacturing Science, IISc Bengaluru*

**Construction route.** First decide which view shows the real shape. For a prism, pyramid, cylinder, cone or frustum, the view normal to the axis gives the end face. The other view carries the axis length. Keep the first position light, because it is only a construction aid. Then darken the final view after the tilt or projection is complete.

**Step 1.** Draw  $XY$  and mark the front-view space above it.

**Step 2.** Draw the true-shape front view of the triangular pyramid frustum above  $XY$ .

- Step 3.** Name all corner, rim or generator points clearly.
- Step 4.** Project downward from each point to form the top view.
- Step 5.** Set the given axis length in top view, keeping it perpendicular to V.P.
- Step 6.** Join corresponding points, darken visible outlines and add dashed hidden edges where the rear face is not visible.
- Step 7.** Check that the front view carries the end-face shape and the top view carries the length.

Before finishing, match every named point across front view and top view. A wrong point match changes the visibility of edges, so recheck the projectors before drawing dashed lines.

**Final Answer:** Draw the true front view of the triangular pyramid frustum first, then project the top view with the given axis length.

**Q 6.15** A right regular pentagonal pyramid of base edge 25 mm and height 60 mm has its axis perpendicular to V.P. and its base parallel to V.P. Draw its projections.

Source: NCERT Class 11 Engineering Graphics, Chapter 6 Assignment. Topic:

Projection of Right Regular Solids. Level: Core.

### QUICK SOLUTION

**Concept:** When the axis is perpendicular to V.P., the end face is seen in true shape in the front view. Start with the front view and project the top view.

**Answer:** Draw the true front view of the pentagonal pyramid first, then project the top view with the given axis length.

### SOLUTION

**Concept used.** When the axis is perpendicular to V.P., the end face is seen in true shape in the front view. Start with the front view and project the top view.

**Step 1.** Draw  $XY$  and mark the front-view space above it.

**Step 2.** Draw the true-shape front view of the pentagonal pyramid above  $XY$ .

**Step 3.** Name all corner, rim or generator points clearly.

- Step 4.** Project downward from each point to form the top view.
- Step 5.** Set the given axis length in top view, keeping it perpendicular to V.P.
- Step 6.** Join corresponding points, darken visible outlines and add dashed hidden edges where the rear face is not visible.
- Step 7.** Check that the front view carries the end-face shape and the top view carries the length.

 **View-selection check**

The answer is correct when the front view shows the end face in true shape and the top view shows the full axis length.

**Final Answer:** Draw the true front view of the pentagonal pyramid first, then project the top view with the given axis length.

**Construction route.** First decide which view shows the real shape. For a prism, pyramid, cylinder, cone or frustum, the view normal to the axis gives the end face. The other view carries the axis length. Keep the first position light, because it is only a construction aid. Then darken the final view after the tilt or projection is complete.

**Step 1.** Draw  $XY$  and mark the front-view space above it.

**Step 2.** Draw the true-shape front view of the pentagonal pyramid above  $XY$ .

**Step 3.** Name all corner, rim or generator points clearly.

**Step 4.** Project downward from each point to form the top view.

**Step 5.** Set the given axis length in top view, keeping it perpendicular to V.P.

**Step 6.** Join corresponding points, darken visible outlines and add dashed hidden edges where the rear face is not visible.

**Step 7.** Check that the front view carries the end-face shape and the top view

carries the length.

Before finishing, match every named point across front view and top view. A wrong point match changes the visibility of edges, so recheck the projectors before drawing dashed lines.

**Final Answer:** Draw the true front view of the pentagonal pyramid first, then project the top view with the given axis length.

**Q 6.16** A hexagonal prism, base 25 mm side and axis 60 mm long, lies on the ground on one face with the axis parallel to both V.P. and H.P. Draw projections.

Source: NCERT Class 11 Engineering Graphics, Chapter 6 Assignment. Topic:

Projection of Right Regular Solids. Level: Core.

### QUICK SOLUTION

**Concept:** When the axis is parallel to both H.P. and V.P., the side or profile view helps fix the end shape, while the front and top views show the axis parallel to  $XY$ .

**Answer:** Place the hexagonal prism in the lying

position, keep its axis parallel to  $XY$  in both views, and project the companion view.

## SOLUTION

**Concept used.** When the axis is parallel to both H.P. and V.P., the side or profile view helps fix the end shape, while the front and top views show the axis parallel to  $XY$ .

**Step 1.** Draw  $XY$  and first set the contact condition with H.P.

**Step 2.** Draw the view in which the hexagonal prism end shape or resting face is easiest to control.

**Step 3.** Keep the axis horizontal, so it remains parallel to  $XY$ .

**Step 4.** Project the other view using perpendicular projectors.

**Step 5.** Transfer the axis length without changing it.

**Step 6.** Mark visible boundaries with object lines and hidden boundaries with dashed lines.

**Step 7.** Verify that the solid rests on the stated face, edge or generator.

### **View-selection check**

The answer is correct when the axis is parallel to  $XY$  in both views and the given resting condition is still visible.

**Final Answer:** Place the hexagonal prism in the lying position, keep its axis parallel to  $XY$  in both views, and project the companion view.

**EXPERT'S SOLUTION** : *Ritika Jain, M.Planning Urban Design, SPA Delhi*

**Construction route.** First decide which view shows the real shape. For a prism, pyramid, cylinder, cone or frustum, the view normal to the axis gives the end face. The other view carries the axis length. Keep the first position light, because it is only a construction aid. Then darken the final view after the tilt or projection is complete.

**Step 1.** Draw  $XY$  and first set the contact condition with H.P.

**Step 2.** Draw the view in which the hexagonal prism end shape or resting face is easiest to control.

**Step 3.** Keep the axis horizontal, so it remains parallel to  $XY$ .

**Step 4.** Project the other view using perpendicular projectors.

**Step 5.** Transfer the axis length without changing it.

**Step 6.** Mark visible boundaries with object lines and hidden boundaries with dashed lines.

**Step 7.** Verify that the solid rests on the stated face, edge or generator.

Before finishing, match every named point across front view and top view. A wrong point match changes the visibility of edges, so recheck the projectors before drawing dashed lines.

**Final Answer:** Place the hexagonal prism in the lying position, keep its axis parallel to  $XY$  in both views, and project the companion view.

**Q 6.17** A triangular pyramid, base 25 mm side and axis 50 mm long, rests on the ground on one base edge. Its axis is parallel to both planes. Draw projections.

Source: NCERT Class 11 Engineering Graphics, Chapter 6 Assignment. Topic:

Projection of Right Regular Solids. Level: Core.

### QUICK SOLUTION

**Concept:** When the axis is parallel to both H.P. and V.P., the side or profile view helps fix the end shape, while the front and top views show the axis parallel to  $XY$ .

**Answer:** Place the triangular pyramid in the lying position, keep its axis parallel to  $XY$  in both views, and project the companion view.

### SOLUTION

**Concept used.** When the axis is parallel to both H.P. and V.P., the side or profile view helps fix the end shape, while the front and top views show the axis parallel to  $XY$ .

**Step 1.** Draw  $XY$  and first set the contact condition with H.P.

**Step 2.** Draw the view in which the triangular pyramid end shape or resting face is easiest to control.

**Step 3.** Keep the axis horizontal, so it remains

parallel to  $XY$ .

**Step 4.** Project the other view using perpendicular projectors.

**Step 5.** Transfer the axis length without changing it.

**Step 6.** Mark visible boundaries with object lines and hidden boundaries with dashed lines.

**Step 7.** Verify that the solid rests on the stated face, edge or generator.

 **View-selection check**

The answer is correct when the axis is parallel to  $XY$  in both views and the given resting condition is still visible.

**Final Answer:** Place the triangular pyramid in the lying position, keep its axis parallel to  $XY$  in both views, and project the companion view.

**Construction route.** First decide which view shows the real shape. For a prism, pyramid, cylinder, cone or frustum, the view normal to the axis gives the end face. The other view carries the axis length. Keep the first position light, because it is only a construction aid. Then darken the final view after the tilt or projection is complete.

- Step 1.** Draw  $XY$  and first set the contact condition with H.P.
- Step 2.** Draw the view in which the triangular pyramid end shape or resting face is easiest to control.
- Step 3.** Keep the axis horizontal, so it remains parallel to  $XY$ .
- Step 4.** Project the other view using perpendicular projectors.
- Step 5.** Transfer the axis length without changing it.
- Step 6.** Mark visible boundaries with object lines and hidden boundaries with dashed lines.
- Step 7.** Verify that the solid rests on the stated

face, edge or generator.

Before finishing, match every named point across front view and top view. A wrong point match changes the visibility of edges, so recheck the projectors before drawing dashed lines.

**Final Answer:** Place the triangular pyramid in the lying position, keep its axis parallel to  $XY$  in both views, and project the companion view.

**Q 6.18** A cylinder, base 40 mm diameter and axis 60 mm long, lies on the ground on its generators with the axis parallel to both V.P. and H.P. Draw projections.

Source: NCERT Class 11 Engineering Graphics, Chapter 6 Assignment. Topic:

Projection of Right Regular Solids. Level: Core.

### QUICK SOLUTION

**Concept:** When the axis is parallel to both H.P. and V.P., the side or profile view helps fix the end shape, while the front and top views show the axis parallel to  $XY$ .

**Answer:** Place the cylinder in the lying position,

keep its axis parallel to  $XY$  in both views, and project the companion view.

## SOLUTION

**Concept used.** When the axis is parallel to both H.P. and V.P., the side or profile view helps fix the end shape, while the front and top views show the axis parallel to  $XY$ .

- Step 1.** Draw  $XY$  and first set the contact condition with H.P.
- Step 2.** Draw the view in which the cylinder end shape or resting face is easiest to control.
- Step 3.** Keep the axis horizontal, so it remains parallel to  $XY$ .
- Step 4.** Project the other view using perpendicular projectors.
- Step 5.** Transfer the axis length without changing it.
- Step 6.** Mark visible boundaries with object lines and hidden boundaries with dashed lines.
- Step 7.** Verify that the solid rests on the stated face, edge or generator.

### 👉 View-selection check

The answer is correct when the axis is parallel to  $XY$  in both views and the given resting condition is still visible.

**Final Answer:** Place the cylinder in the lying position, keep its axis parallel to  $XY$  in both views, and project the companion view.

**EXPERT'S SOLUTION** : *Neha Varma, M.Tech CAD Automation, COEP Pune*

**Construction route.** First decide which view shows the real shape. For a prism, pyramid, cylinder, cone or frustum, the view normal to the axis gives the end face. The other view carries the axis length. Keep the first position light, because it is only a construction aid. Then darken the final view after the tilt or projection is complete.

**Step 1.** Draw  $XY$  and first set the contact condition with H.P.

**Step 2.** Draw the view in which the cylinder end shape or resting face is easiest to control.

**Step 3.** Keep the axis horizontal, so it remains parallel to  $XY$ .

**Step 4.** Project the other view using perpendicular projectors.

**Step 5.** Transfer the axis length without changing it.

**Step 6.** Mark visible boundaries with object lines and hidden boundaries with dashed lines.

**Step 7.** Verify that the solid rests on the stated face, edge or generator.

Before finishing, match every named point across front view and top view. A wrong point match changes the visibility of edges, so recheck the projectors before drawing dashed lines.

**Final Answer:** Place the cylinder in the lying position, keep its axis parallel to  $XY$  in both views, and project the companion view.

**Q 6.19**

A frustum of a hexagonal pyramid of 20 mm base edges and 10 mm top edges rests on H.P. on a base edge with its 50 mm axis horizontal and parallel to V.P. The cut top face is in front. Draw projections.

Source: NCERT Class 11 Engineering Graphics, Chapter 6 Assignment. Topic:

Projection of Right Regular Solids. Level: Core.

### QUICK SOLUTION

**Concept:** When the axis is parallel to both H.P. and V.P., the side or profile view helps fix the end shape, while the front and top views show the axis parallel to  $XY$ .

**Answer:** Place the hexagonal pyramid frustum in the lying position, keep its axis parallel to  $XY$  in both views, and project the companion view.

### SOLUTION

**Concept used.** When the axis is parallel to both H.P. and V.P., the side or profile view helps fix the end shape, while the front and top views show the axis parallel to  $XY$ .

**Step 1.** Draw  $XY$  and first set the contact condition with H.P.

**Step 2.** Draw the view in which the hexagonal pyramid frustum end shape or resting

face is easiest to control.

**Step 3.** Keep the axis horizontal, so it remains parallel to  $XY$ .

**Step 4.** Project the other view using perpendicular projectors.

**Step 5.** Transfer the axis length without changing it.

**Step 6.** Mark visible boundaries with object lines and hidden boundaries with dashed lines.

**Step 7.** Verify that the solid rests on the stated face, edge or generator.

#### **View-selection check**

The answer is correct when the axis is parallel to  $XY$  in both views and the given resting condition is still visible.

**Final Answer:** Place the hexagonal pyramid frustum in the lying position, keep its axis parallel to  $XY$  in both views, and project the companion view.

**Construction route.** First decide which view shows the real shape. For a prism, pyramid, cylinder, cone or frustum, the view normal to the axis gives the end face. The other view carries the axis length. Keep the first position light, because it is only a construction aid. Then darken the final view after the tilt or projection is complete.

- Step 1.** Draw  $XY$  and first set the contact condition with H.P.
- Step 2.** Draw the view in which the hexagonal pyramid frustum end shape or resting face is easiest to control.
- Step 3.** Keep the axis horizontal, so it remains parallel to  $XY$ .
- Step 4.** Project the other view using perpendicular projectors.
- Step 5.** Transfer the axis length without changing it.
- Step 6.** Mark visible boundaries with object lines and hidden boundaries with dashed lines.
- Step 7.** Verify that the solid rests on the stated face, edge or generator.

Before finishing, match every named point across front view and top view. A wrong point match changes the visibility of edges, so recheck the projectors before drawing dashed lines.

**Final Answer:** Place the hexagonal pyramid frustum in the lying position, keep its axis parallel to  $XY$  in both views, and project the companion view.

**Q 6.20** A triangular prism with 25 mm edges at its base and axis 60 mm long rests on one base edge with axis parallel to V.P. and inclined at  $30^\circ$  to H.P. Draw projections.

**Source:** NCERT Class 11 Engineering Graphics, Chapter 6 Assignment. **Topic:**

Projection of Right Regular Solids. **Level:** Advanced.

### QUICK SOLUTION

**Concept:** When the axis is parallel to V.P. and inclined to H.P., solve it in two steps. First draw the simple position with axis perpendicular to H.P., then tilt the front view.

**Answer:** Use the two-step method: simple top view first, first front view next, inclined front

view, then final top view.

## SOLUTION

**Concept used.** When the axis is parallel to V.P. and inclined to H.P., solve it in two steps. First draw the simple position with axis perpendicular to H.P., then tilt the front view.

- Step 1.** Assume the axis is perpendicular to H.P. and draw the simple top view first.
- Step 2.** Project the first front view and show the true axis length.
- Step 3.** Redraw this front view so that the axis makes the required angle with  $XY$ .
- Step 4.** Project downward from every point of the inclined front view.
- Step 5.** Draw horizontal loci from the first top view.
- Step 6.** Locate intersections between new projectors and old loci to form the final top view.
- Step 7.** Join matching points and decide visible and hidden edges from the final position.

### 👉 View-selection check

The answer is correct when the final front-view axis has the given H.P. inclination and the top view is projected from it.

**Final Answer:** Use the two-step method: simple top view first, first front view next, inclined front view, then final top view.

**EXPERT'S SOLUTION** : Pooja Menon, M.Tech  
Structural Engineering, NIT Surathkal

**Construction route.** First decide which view shows the real shape. For a prism, pyramid, cylinder, cone or frustum, the view normal to the axis gives the end face. The other view carries the axis length. Keep the first position light, because it is only a construction aid. Then darken the final view after the tilt or projection is complete.

**Step 1.** Assume the axis is perpendicular to H.P. and draw the simple top view first.

**Step 2.** Project the first front view and show the true axis length.

- Step 3.** Redraw this front view so that the axis makes the required angle with  $XY$ .
- Step 4.** Project downward from every point of the inclined front view.
- Step 5.** Draw horizontal loci from the first top view.
- Step 6.** Locate intersections between new projectors and old loci to form the final top view.
- Step 7.** Join matching points and decide visible and hidden edges from the final position.

Before finishing, match every named point across front view and top view. A wrong point match changes the visibility of edges, so recheck the projectors before drawing dashed lines.

**Final Answer:** Use the two-step method: simple top view first, first front view next, inclined front view, then final top view.

**Q 6.21** A pentagonal pyramid of 25 mm base edges and 50 mm axis has its axis perpendicular to V.P. and 50 mm above H.P. Draw projections if one base edge is inclined at  $30^\circ$  to H.P.

Source: NCERT Class 11 Engineering Graphics, Chapter 6 Assignment. Topic:

Projection of Right Regular Solids. Level: Advanced.

### QUICK SOLUTION

**Concept:** When the axis is parallel to V.P. and inclined to H.P., solve it in two steps. First draw the simple position with axis perpendicular to H.P., then tilt the front view.

**Answer:** Use the two-step method: simple top view first, first front view next, inclined front view, then final top view.

### SOLUTION

**Concept used.** When the axis is parallel to V.P. and inclined to H.P., solve it in two steps. First draw the simple position with axis perpendicular to H.P., then tilt the front view.

**Step 1.** Assume the axis is perpendicular to H.P. and draw the simple top view first.

**Step 2.** Project the first front view and show the true axis length.

- Step 3.** Redraw this front view so that the axis makes the required angle with  $XY$ .
- Step 4.** Project downward from every point of the inclined front view.
- Step 5.** Draw horizontal loci from the first top view.
- Step 6.** Locate intersections between new projectors and old loci to form the final top view.
- Step 7.** Join matching points and decide visible and hidden edges from the final position.

 **View-selection check**

The answer is correct when the final front-view axis has the given H.P. inclination and the top view is projected from it.

**Final Answer:** Use the two-step method: simple top view first, first front view next, inclined front view, then final top view.

**Construction route.** First decide which view shows the real shape. For a prism, pyramid, cylinder, cone or frustum, the view normal to the axis gives the end face. The other view carries the axis length. Keep the first position light, because it is only a construction aid. Then darken the final view after the tilt or projection is complete.

- Step 1.** Assume the axis is perpendicular to H.P. and draw the simple top view first.
- Step 2.** Project the first front view and show the true axis length.
- Step 3.** Redraw this front view so that the axis makes the required angle with  $XY$ .
- Step 4.** Project downward from every point of the inclined front view.
- Step 5.** Draw horizontal loci from the first top view.
- Step 6.** Locate intersections between new projectors and old loci to form the final top view.
- Step 7.** Join matching points and decide visible and hidden edges from the

final position.

Before finishing, match every named point across front view and top view. A wrong point match changes the visibility of edges, so recheck the projectors before drawing dashed lines.

**Final Answer:** Use the two-step method: simple top view first, first front view next, inclined front view, then final top view.

**Q 6.22** A frustum of square pyramid of 20 mm top edges, 40 mm bottom edges and 50 mm axis has its side face inclined at  $45^\circ$  to H.P. with axis parallel to V.P. Draw projections.

Source: NCERT Class 11 Engineering Graphics, Chapter 6 Assignment. Topic: Projection of Right Regular Solids. Level: Advanced.

### QUICK SOLUTION

**Concept:** When the axis is parallel to V.P. and inclined to H.P., solve it in two steps. First draw the simple position with axis perpendicular to H.P., then tilt the front view.

**Answer:** Use the two-step method: simple top view first, first front view next, inclined front view, then final top view.

## SOLUTION

**Concept used.** When the axis is parallel to V.P. and inclined to H.P., solve it in two steps. First draw the simple position with axis perpendicular to H.P., then tilt the front view.

**Step 1.** Assume the axis is perpendicular to H.P. and draw the simple top view first.

**Step 2.** Project the first front view and show the true axis length.

**Step 3.** Redraw this front view so that the axis makes the required angle with  $XY$ .

**Step 4.** Project downward from every point of the inclined front view.

**Step 5.** Draw horizontal loci from the first top view.

**Step 6.** Locate intersections between new projectors and old loci to form the final top view.

**Step 7.** Join matching points and decide visible and hidden edges from the final position.

### **View-selection check**

The answer is correct when the final front-view axis has the given H.P. inclination and the top view is projected from it.

**Final Answer:** Use the two-step method: simple top view first, first front view next, inclined front view, then final top view.

**EXPERT'S SOLUTION** : *Maya Krishnan, M.Des*  
*Visual Communication, IDC Bombay*

**Construction route.** First decide which view shows the real shape. For a prism, pyramid, cylinder, cone or frustum, the view normal to the axis gives the end face. The other view carries the axis length. Keep the first position light, because it is only a construction aid. Then darken the final view after the tilt or projection is complete.

**Step 1.** Assume the axis is perpendicular to H.P. and draw the simple top view first.

**Step 2.** Project the first front view and show the true axis length.

- Step 3.** Redraw this front view so that the axis makes the required angle with  $XY$ .
- Step 4.** Project downward from every point of the inclined front view.
- Step 5.** Draw horizontal loci from the first top view.
- Step 6.** Locate intersections between new projectors and old loci to form the final top view.
- Step 7.** Join matching points and decide visible and hidden edges from the final position.

Before finishing, match every named point across front view and top view. A wrong point match changes the visibility of edges, so recheck the projectors before drawing dashed lines.

**Final Answer:** Use the two-step method: simple top view first, first front view next, inclined front view, then final top view.

**Q 6.23**

The frustum of a cone has 90 mm base diameter and 30 mm top diameter. Draw projections when its axis is parallel to V.P. and inclined at  $30^\circ$  to H.P.

Source: NCERT Class 11 Engineering Graphics, Chapter 6 Assignment. Topic:

Projection of Right Regular Solids. Level: Advanced.

### QUICK SOLUTION

**Concept:** When the axis is parallel to V.P. and inclined to H.P., solve it in two steps. First draw the simple position with axis perpendicular to H.P., then tilt the front view.

**Answer:** Use the two-step method: simple top view first, first front view next, inclined front view, then final top view.

### SOLUTION

**Concept used.** When the axis is parallel to V.P. and inclined to H.P., solve it in two steps. First draw the simple position with axis perpendicular to H.P., then tilt the front view.

**Step 1.** Assume the axis is perpendicular to H.P. and draw the simple top view first.

**Step 2.** Project the first front view and show the true axis length.

**Step 3.** Redraw this front view so that the axis

makes the required angle with  $XY$ .

**Step 4.** Project downward from every point of the inclined front view.

**Step 5.** Draw horizontal loci from the first top view.

**Step 6.** Locate intersections between new projectors and old loci to form the final top view.

**Step 7.** Join matching points and decide visible and hidden edges from the final position.

#### **View-selection check**

The answer is correct when the final front-view axis has the given H.P. inclination and the top view is projected from it.

**Final Answer:** Use the two-step method: simple top view first, first front view next, inclined front view, then final top view.

**Construction route.** First decide which view shows the real shape. For a prism, pyramid, cylinder, cone or frustum, the view normal to the axis gives the end face. The other view carries the axis length. Keep the first position light, because it is only a construction aid. Then darken the final view after the tilt or projection is complete.

**Step 1.** Assume the axis is perpendicular to H.P. and draw the simple top view first.

**Step 2.** Project the first front view and show the true axis length.

**Step 3.** Redraw this front view so that the axis makes the required angle with  $XY$ .

**Step 4.** Project downward from every point of the inclined front view.

**Step 5.** Draw horizontal loci from the first top view.

**Step 6.** Locate intersections between new projectors and old loci to form the final top view.

**Step 7.** Join matching points and decide visible and hidden edges from the

final position.

Before finishing, match every named point across front view and top view. A wrong point match changes the visibility of edges, so recheck the projectors before drawing dashed lines.

**Final Answer:** Use the two-step method: simple top view first, first front view next, inclined front view, then final top view.

**Q 6.24** The frustum of a cone has 90 mm base diameter and 30 mm top diameter. Draw projections when its axis is parallel to V.P. and inclined at  $60^\circ$  to H.P.

**Source:** NCERT Class 11 Engineering Graphics, Chapter 6 Assignment. **Topic:** Projection of Right Regular Solids. **Level:** Advanced.

### QUICK SOLUTION

**Concept:** When the axis is parallel to V.P. and inclined to H.P., solve it in two steps. First draw the simple position with axis perpendicular to H.P., then tilt the front view.

**Answer:** Use the two-step method: simple top

view first, first front view next, inclined front view, then final top view.

## SOLUTION

**Concept used.** When the axis is parallel to V.P. and inclined to H.P., solve it in two steps. First draw the simple position with axis perpendicular to H.P., then tilt the front view.

- Step 1.** Assume the axis is perpendicular to H.P. and draw the simple top view first.
- Step 2.** Project the first front view and show the true axis length.
- Step 3.** Redraw this front view so that the axis makes the required angle with  $XY$ .
- Step 4.** Project downward from every point of the inclined front view.
- Step 5.** Draw horizontal loci from the first top view.
- Step 6.** Locate intersections between new projectors and old loci to form the final top view.
- Step 7.** Join matching points and decide visible and hidden edges from the final position.

### 👉 View-selection check

The answer is correct when the final front-view axis has the given H.P. inclination and the top view is projected from it.

**Final Answer:** Use the two-step method: simple top view first, first front view next, inclined front view, then final top view.

**EXPERT'S SOLUTION** : *Ira Banerjee, M.Tech  
Machine Design, IIT Kharagpur*

**Construction route.** First decide which view shows the real shape. For a prism, pyramid, cylinder, cone or frustum, the view normal to the axis gives the end face. The other view carries the axis length. Keep the first position light, because it is only a construction aid. Then darken the final view after the tilt or projection is complete.

**Step 1.** Assume the axis is perpendicular to H.P. and draw the simple top view first.

**Step 2.** Project the first front view and show the true axis length.

- Step 3.** Redraw this front view so that the axis makes the required angle with  $XY$ .
- Step 4.** Project downward from every point of the inclined front view.
- Step 5.** Draw horizontal loci from the first top view.
- Step 6.** Locate intersections between new projectors and old loci to form the final top view.
- Step 7.** Join matching points and decide visible and hidden edges from the final position.

Before finishing, match every named point across front view and top view. A wrong point match changes the visibility of edges, so recheck the projectors before drawing dashed lines.

**Final Answer:** Use the two-step method: simple top view first, first front view next, inclined front view, then final top view.

**Q 6.25**

**Draw the projections of a pentagonal prism having 25 mm edge of its base and axis 50 mm long when it is resting on its base with an edge of its base inclined at  $30^\circ$  to V.P.**

**Source:** NCERT Class 11 Engineering Graphics, Chapter 6 Assignment. **Topic:**

Projection of Right Regular Solids. **Level:** Advanced.

**QUICK SOLUTION**

**Concept:** When the axis is parallel to H.P. and inclined to V.P., solve it in two steps. First draw the simple position with axis perpendicular to V.P., then tilt the top view.

**Answer:** Use the two-step method: simple front view first, first top view next, inclined top view, then final front view.

**SOLUTION**

**Concept used.** When the axis is parallel to H.P. and inclined to V.P., solve it in two steps. First draw the simple position with axis perpendicular to V.P., then tilt the top view.

**Step 1.** Assume the axis is perpendicular to V.P. and draw the true end shape in front view.

**Step 2.** Project the first top view and set the axis length.

- Step 3.** Redraw this top view so that the axis makes the required angle with  $XY$ .
- Step 4.** Project upward from every point of the inclined top view.
- Step 5.** Draw horizontal loci from the first front view.
- Step 6.** Locate intersections between new projectors and old loci to form the final front view.
- Step 7.** Join matching points and use dashed lines for hidden rear edges.

 **View-selection check**

The answer is correct when the final top-view axis has the given V.P. inclination and the front view is projected from it.

**Final Answer:** Use the two-step method: simple front view first, first top view next, inclined top view, then final front view.

**Construction route.** First decide which view shows the real shape. For a prism, pyramid, cylinder, cone or frustum, the view normal to the axis gives the end face. The other view carries the axis length. Keep the first position light, because it is only a construction aid. Then darken the final view after the tilt or projection is complete.

- Step 1.** Assume the axis is perpendicular to V.P. and draw the true end shape in front view.
- Step 2.** Project the first top view and set the axis length.
- Step 3.** Redraw this top view so that the axis makes the required angle with  $XY$ .
- Step 4.** Project upward from every point of the inclined top view.
- Step 5.** Draw horizontal loci from the first front view.
- Step 6.** Locate intersections between new projectors and old loci to form the final front view.
- Step 7.** Join matching points and use dashed lines for hidden rear edges.

Before finishing, match every named point across front view and top view. A wrong point match changes the visibility of edges, so recheck the projectors before drawing dashed lines.

**Final Answer:** Use the two-step method: simple front view first, first top view next, inclined top view, then final front view.

**Q 6.26** A triangular pyramid of 50 mm base edges and 60 mm axis has one base corner touching V.P., with axis parallel to H.P. and inclined at  $45^\circ$  to V.P. Draw projections.

**Source:** NCERT Class 11 Engineering Graphics, Chapter 6 Assignment. **Topic:** Projection of Right Regular Solids. **Level:** Advanced.

### QUICK SOLUTION

**Concept:** When the axis is parallel to H.P. and inclined to V.P., solve it in two steps. First draw the simple position with axis perpendicular to V.P., then tilt the top view.

**Answer:** Use the two-step method: simple front

view first, first top view next, inclined top view, then final front view.

## SOLUTION

**Concept used.** When the axis is parallel to H.P. and inclined to V.P., solve it in two steps. First draw the simple position with axis perpendicular to V.P., then tilt the top view.

- Step 1.** Assume the axis is perpendicular to V.P. and draw the true end shape in front view.
- Step 2.** Project the first top view and set the axis length.
- Step 3.** Redraw this top view so that the axis makes the required angle with  $XY$ .
- Step 4.** Project upward from every point of the inclined top view.
- Step 5.** Draw horizontal loci from the first front view.
- Step 6.** Locate intersections between new projectors and old loci to form the final front view.
- Step 7.** Join matching points and use dashed lines for hidden rear edges.

### 👉 View-selection check

The answer is correct when the final top-view axis has the given V.P. inclination and the front view is projected from it.

**Final Answer:** Use the two-step method: simple front view first, first top view next, inclined top view, then final front view.

**EXPERT'S SOLUTION** : *Leena Rao, M.Tech  
Industrial Design, IIT Guwahati*

**Construction route.** First decide which view shows the real shape. For a prism, pyramid, cylinder, cone or frustum, the view normal to the axis gives the end face. The other view carries the axis length. Keep the first position light, because it is only a construction aid. Then darken the final view after the tilt or projection is complete.

**Step 1.** Assume the axis is perpendicular to V.P. and draw the true end shape in front view.

**Step 2.** Project the first top view and set the axis length.

- Step 3.** Redraw this top view so that the axis makes the required angle with  $XY$ .
- Step 4.** Project upward from every point of the inclined top view.
- Step 5.** Draw horizontal loci from the first front view.
- Step 6.** Locate intersections between new projectors and old loci to form the final front view.
- Step 7.** Join matching points and use dashed lines for hidden rear edges.

Before finishing, match every named point across front view and top view. A wrong point match changes the visibility of edges, so recheck the projectors before drawing dashed lines.

**Final Answer:** Use the two-step method: simple front view first, first top view next, inclined top view, then final front view.

**Q 6.27**

A frustum of a cone of 40 mm base diameter and 20 mm cut-face diameter rests on H.P. Its 50 mm axis is parallel to H.P. and inclined to V.P. at  $30^\circ$  towards right. Project top view and front view.

Source: NCERT Class 11 Engineering Graphics, Chapter 6 Assignment. Topic:

Projection of Right Regular Solids. Level: Advanced.

### QUICK SOLUTION

**Concept:** When the axis is parallel to H.P. and inclined to V.P., solve it in two steps. First draw the simple position with axis perpendicular to V.P., then tilt the top view.

**Answer:** Use the two-step method: simple front view first, first top view next, inclined top view, then final front view.

### SOLUTION

**Concept used.** When the axis is parallel to H.P. and inclined to V.P., solve it in two steps. First draw the simple position with axis perpendicular to V.P., then tilt the top view.

**Step 1.** Assume the axis is perpendicular to V.P. and draw the true end shape in front view.

**Step 2.** Project the first top view and set the axis length.

- Step 3.** Redraw this top view so that the axis makes the required angle with  $XY$ .
- Step 4.** Project upward from every point of the inclined top view.
- Step 5.** Draw horizontal loci from the first front view.
- Step 6.** Locate intersections between new projectors and old loci to form the final front view.
- Step 7.** Join matching points and use dashed lines for hidden rear edges.

 **View-selection check**

The answer is correct when the final top-view axis has the given V.P. inclination and the front view is projected from it.

**Final Answer:** Use the two-step method: simple front view first, first top view next, inclined top view, then final front view.

**Construction route.** First decide which view shows the real shape. For a prism, pyramid, cylinder, cone or frustum, the view normal to the axis gives the end face. The other view carries the axis length. Keep the first position light, because it is only a construction aid. Then darken the final view after the tilt or projection is complete.

- Step 1.** Assume the axis is perpendicular to V.P. and draw the true end shape in front view.
- Step 2.** Project the first top view and set the axis length.
- Step 3.** Redraw this top view so that the axis makes the required angle with  $XY$ .
- Step 4.** Project upward from every point of the inclined top view.
- Step 5.** Draw horizontal loci from the first front view.
- Step 6.** Locate intersections between new projectors and old loci to form the final front view.
- Step 7.** Join matching points and use dashed lines for hidden rear edges.

Before finishing, match every named point across front view and top view. A wrong point match changes the visibility of edges, so recheck the projectors before drawing dashed lines.

**Final Answer:** Use the two-step method: simple front view first, first top view next, inclined top view, then final front view.

**Q 6.28** A square duct is a frustum of a square pyramid. The top and bottom sides are 90 mm and 60 mm, and the length is 110 mm. Its axis is parallel to H.P. and inclined at  $60^\circ$  to V.P. Draw projections, neglecting sheet thickness.

Source: NCERT Class 11 Engineering Graphics, Chapter 6 Assignment. Topic: Projection of Right Regular Solids. Level: Advanced.

### QUICK SOLUTION

**Concept:** When the axis is parallel to H.P. and inclined to V.P., solve it in two steps. First draw the simple position with axis perpendicular to V.P., then tilt the top view.

**Answer:** Use the two-step method: simple front view first, first top view next, inclined top view, then final front view.

## SOLUTION

**Concept used.** When the axis is parallel to H.P. and inclined to V.P., solve it in two steps. First draw the simple position with axis perpendicular to V.P., then tilt the top view.

**Step 1.** Assume the axis is perpendicular to V.P. and draw the true end shape in front view.

**Step 2.** Project the first top view and set the axis length.

**Step 3.** Redraw this top view so that the axis makes the required angle with  $XY$ .

**Step 4.** Project upward from every point of the inclined top view.

**Step 5.** Draw horizontal loci from the first front view.

**Step 6.** Locate intersections between new projectors and old loci to form the final front view.

**Step 7.** Join matching points and use dashed lines for hidden rear edges.

### **View-selection check**

The answer is correct when the final top-view axis has the given V.P. inclination and the front view is projected from it.

**Final Answer:** Use the two-step method: simple front view first, first top view next, inclined top view, then final front view.

**EXPERT'S SOLUTION** : *Aditi Pillai, M.Arch, CEPT University*

**Construction route.** First decide which view shows the real shape. For a prism, pyramid, cylinder, cone or frustum, the view normal to the axis gives the end face. The other view carries the axis length. Keep the first position light, because it is only a construction aid. Then darken the final view after the tilt or projection is complete.

**Step 1.** Assume the axis is perpendicular to V.P. and draw the true end shape in front view.

**Step 2.** Project the first top view and set the axis length.

- Step 3.** Redraw this top view so that the axis makes the required angle with  $XY$ .
- Step 4.** Project upward from every point of the inclined top view.
- Step 5.** Draw horizontal loci from the first front view.
- Step 6.** Locate intersections between new projectors and old loci to form the final front view.
- Step 7.** Join matching points and use dashed lines for hidden rear edges.

Before finishing, match every named point across front view and top view. A wrong point match changes the visibility of edges, so recheck the projectors before drawing dashed lines.

**Final Answer:** Use the two-step method: simple front view first, first top view next, inclined top view, then final front view.

**Q 6.29**

**Draw projections of a square prism having 30 mm base edge and 55 mm axis when it rests on its base with its axis inclined at  $30^\circ$  to V.P.**

**Source:** NCERT Class 11 Engineering Graphics, Chapter 6 Assignment. **Topic:**

Projection of Right Regular Solids. **Level:** Advanced.

### QUICK SOLUTION

**Concept:** When the axis is parallel to H.P. and inclined to V.P., solve it in two steps. First draw the simple position with axis perpendicular to V.P., then tilt the top view.

**Answer:** Use the two-step method: simple front view first, first top view next, inclined top view, then final front view.

### SOLUTION

**Concept used.** When the axis is parallel to H.P. and inclined to V.P., solve it in two steps. First draw the simple position with axis perpendicular to V.P., then tilt the top view.

**Step 1.** Assume the axis is perpendicular to V.P. and draw the true end shape in front view.

**Step 2.** Project the first top view and set the axis length.

**Step 3.** Redraw this top view so that the axis

makes the required angle with  $XY$ .

**Step 4.** Project upward from every point of the inclined top view.

**Step 5.** Draw horizontal loci from the first front view.

**Step 6.** Locate intersections between new projectors and old loci to form the final front view.

**Step 7.** Join matching points and use dashed lines for hidden rear edges.

 **View-selection check**

The answer is correct when the final top-view axis has the given V.P. inclination and the front view is projected from it.

**Final Answer:** Use the two-step method: simple front view first, first top view next, inclined top view, then final front view.

**EXPERT'S SOLUTION** : *Varun Joshi, B.E.*  
*Mechanical Engineering, Pune University*

**Construction route.** First decide which view shows the real shape. For a prism, pyramid, cylinder, cone or frustum, the view normal to

the axis gives the end face. The other view carries the axis length. Keep the first position light, because it is only a construction aid. Then darken the final view after the tilt or projection is complete.

- Step 1.** Assume the axis is perpendicular to V.P. and draw the true end shape in front view.
- Step 2.** Project the first top view and set the axis length.
- Step 3.** Redraw this top view so that the axis makes the required angle with  $XY$ .
- Step 4.** Project upward from every point of the inclined top view.
- Step 5.** Draw horizontal loci from the first front view.
- Step 6.** Locate intersections between new projectors and old loci to form the final front view.
- Step 7.** Join matching points and use dashed lines for hidden rear edges.

Before finishing, match every named point across front view and top view. A wrong point match changes the visibility of edges, so recheck the projectors before drawing dashed lines.

**Final Answer:** Use the two-step method: simple front view first, first top view next, inclined top view, then final front view.

**Q 6.30** Draw projections of a hexagonal prism having 20 mm base edge and 50 mm axis when it rests on its base, with axis parallel to H.P. and inclined at  $40^\circ$  to V.P.

Source: NCERT Class 11 Engineering Graphics, Chapter 6 Assignment. Topic: Projection of Right Regular Solids. Level: Advanced.

### QUICK SOLUTION

**Concept:** When the axis is parallel to H.P. and inclined to V.P., solve it in two steps. First draw the simple position with axis perpendicular to V.P., then tilt the top view.

**Answer:** Use the two-step method: simple front view first, first top view next, inclined top view, then final front view.

### SOLUTION

**Concept used.** When the axis is parallel to H.P. and inclined to V.P., solve it in two steps. First draw the simple position with axis

perpendicular to V.P., then tilt the top view.

**Step 1.** Assume the axis is perpendicular to V.P. and draw the true end shape in front view.

**Step 2.** Project the first top view and set the axis length.

**Step 3.** Redraw this top view so that the axis makes the required angle with  $XY$ .

**Step 4.** Project upward from every point of the inclined top view.

**Step 5.** Draw horizontal loci from the first front view.

**Step 6.** Locate intersections between new projectors and old loci to form the final front view.

**Step 7.** Join matching points and use dashed lines for hidden rear edges.

#### **View-selection check**

The answer is correct when the final top-view axis has the given V.P. inclination and the front view is projected from it.

**Final Answer:** Use the two-step method: simple front view first, first top view next, inclined top view, then final front view.

**EXPERT'S SOLUTION** : *Sanya Malhotra, M.Tech  
Product Design, IITDM Jabalpur*

**Construction route.** First decide which view shows the real shape. For a prism, pyramid, cylinder, cone or frustum, the view normal to the axis gives the end face. The other view carries the axis length. Keep the first position light, because it is only a construction aid. Then darken the final view after the tilt or projection is complete.

- Step 1.** Assume the axis is perpendicular to V.P. and draw the true end shape in front view.
- Step 2.** Project the first top view and set the axis length.
- Step 3.** Redraw this top view so that the axis makes the required angle with  $XY$ .
- Step 4.** Project upward from every point of the inclined top view.
- Step 5.** Draw horizontal loci from the first

front view.

**Step 6.** Locate intersections between new projectors and old loci to form the final front view.

**Step 7.** Join matching points and use dashed lines for hidden rear edges.

Before finishing, match every named point across front view and top view. A wrong point match changes the visibility of edges, so recheck the projectors before drawing dashed lines.

**Final Answer:** Use the two-step method: simple front view first, first top view next, inclined top view, then final front view.

**Q 6.31** A triangular prism of 50 mm base edges and 60 mm axis rests on its base and has its axis inclined at  $45^\circ$  to V.P. Draw projections.

Source: NCERT Class 11 Engineering Graphics, Chapter 6 Assignment. Topic:

Projection of Right Regular Solids. Level: Advanced.

### QUICK SOLUTION

**Concept:** When the axis is parallel to H.P. and inclined to V.P., solve it in two steps. First draw the simple position with axis perpendicular to V.P., then tilt the top view.

**Answer:** Use the two-step method: simple front view first, first top view next, inclined top view, then final front view.

### SOLUTION

**Concept used.** When the axis is parallel to H.P. and inclined to V.P., solve it in two steps. First draw the simple position with axis perpendicular to V.P., then tilt the top view.

**Step 1.** Assume the axis is perpendicular to V.P. and draw the true end shape in front view.

**Step 2.** Project the first top view and set the axis length.

**Step 3.** Redraw this top view so that the axis

makes the required angle with  $XY$ .

**Step 4.** Project upward from every point of the inclined top view.

**Step 5.** Draw horizontal loci from the first front view.

**Step 6.** Locate intersections between new projectors and old loci to form the final front view.

**Step 7.** Join matching points and use dashed lines for hidden rear edges.

#### **View-selection check**

The answer is correct when the final top-view axis has the given V.P. inclination and the front view is projected from it.

**Final Answer:** Use the two-step method: simple front view first, first top view next, inclined top view, then final front view.

**EXPERT'S SOLUTION** : *Manav Bhasin, B.Tech Civil Engineering, Thapar Institute*

**Construction route.** First decide which view shows the real shape. For a prism, pyramid, cylinder, cone or frustum, the view normal to

the axis gives the end face. The other view carries the axis length. Keep the first position light, because it is only a construction aid. Then darken the final view after the tilt or projection is complete.

- Step 1.** Assume the axis is perpendicular to V.P. and draw the true end shape in front view.
- Step 2.** Project the first top view and set the axis length.
- Step 3.** Redraw this top view so that the axis makes the required angle with  $XY$ .
- Step 4.** Project upward from every point of the inclined top view.
- Step 5.** Draw horizontal loci from the first front view.
- Step 6.** Locate intersections between new projectors and old loci to form the final front view.
- Step 7.** Join matching points and use dashed lines for hidden rear edges.

Before finishing, match every named point across front view and top view. A wrong point match changes the visibility of edges, so recheck the projectors before drawing dashed lines.

**Final Answer:** Use the two-step method: simple front view first, first top view next, inclined top view, then final front view.

**Q 6.32** A hexagonal pyramid of 25 mm base edges and 60 mm axis rests on its base and has its axis inclined to V.P. at  $30^\circ$ . Draw its projections.

Source: NCERT Class 11 Engineering Graphics, Chapter 6 Assignment. Topic: Projection of Right Regular Solids. Level: Advanced.

### QUICK SOLUTION

**Concept:** When the axis is parallel to H.P. and inclined to V.P., solve it in two steps. First draw the simple position with axis perpendicular to V.P., then tilt the top view.

**Answer:** Use the two-step method: simple front view first, first top view next, inclined top view, then final front view.

### SOLUTION

**Concept used.** When the axis is parallel to H.P. and inclined to V.P., solve it in two steps. First draw the simple position with axis

perpendicular to V.P., then tilt the top view.

**Step 1.** Assume the axis is perpendicular to V.P. and draw the true end shape in front view.

**Step 2.** Project the first top view and set the axis length.

**Step 3.** Redraw this top view so that the axis makes the required angle with  $XY$ .

**Step 4.** Project upward from every point of the inclined top view.

**Step 5.** Draw horizontal loci from the first front view.

**Step 6.** Locate intersections between new projectors and old loci to form the final front view.

**Step 7.** Join matching points and use dashed lines for hidden rear edges.

#### **View-selection check**

The answer is correct when the final top-view axis has the given V.P. inclination and the front view is projected from it.

**Final Answer:** Use the two-step method: simple front view first, first top view next, inclined top view, then final front view.

**EXPERT'S SOLUTION** : *Diya Mukherjee, M.Tech  
Design Engineering, NIT Rourkela*

**Construction route.** First decide which view shows the real shape. For a prism, pyramid, cylinder, cone or frustum, the view normal to the axis gives the end face. The other view carries the axis length. Keep the first position light, because it is only a construction aid. Then darken the final view after the tilt or projection is complete.

- Step 1.** Assume the axis is perpendicular to V.P. and draw the true end shape in front view.
- Step 2.** Project the first top view and set the axis length.
- Step 3.** Redraw this top view so that the axis makes the required angle with  $XY$ .
- Step 4.** Project upward from every point of the inclined top view.
- Step 5.** Draw horizontal loci from the first

front view.

**Step 6.** Locate intersections between new projectors and old loci to form the final front view.

**Step 7.** Join matching points and use dashed lines for hidden rear edges.

Before finishing, match every named point across front view and top view. A wrong point match changes the visibility of edges, so recheck the projectors before drawing dashed lines.

**Final Answer:** Use the two-step method: simple front view first, first top view next, inclined top view, then final front view.

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## Key Takeaways

- Select the starting view from the axis position, not from the solid name.
- Axis perpendicular to H.P. means top view first; axis perpendicular to V.P. means front view first.
- For inclined axes, the first simple view is only a construction base.
- Use dashed lines only after checking which edges are hidden in the final position.

End of Chapter 6 Solutions