

# Lecture : Projection of Points

## POSITIONS OF A POINT

A point may be located in space in any one of the quadrants. It may also lie on any one of the reference planes or both the reference planes. There are following possible positions of the point in the various quadrants.

- |   |  |
|---|--|
| (i) In front of the V.P. and above the H.P. | (ii) In front of the V.P. and in the H.P.      |
| (iii) In the V.P. and above the H.P.        | (iv) Behind the V.P. and above the H.P.        |
| (v) Behind the V.P. and in the H.P.         | (vi) Behind the V.P. and below the H.P.        |
| (vii) In the V.P. and below the H.P.        | (viii) In front of the V.P. and below the H.P. |
| (ix) In the V.P. and in the H.P. etc.       |  |

It is possible to find out point's projection on the H.P. and on the V.P, by drawing projection lines perpendicular to both the planes. Projection obtained on the H.P. is called Top View (Plan) and Projection obtained on the V.P. is called Front View (Elevation).

## PROJECTIONS OF A POINT IN THE FIRST QUADRANT

### Example :

A point P is 30 mm in front of the Vertical Plane (V.P.), 50 mm above the Horizontal Plane (H.P.) and 20 mm in front of a profile plane (P.P.) which is on the right side of the observer. Draw the top view, front view and side view looking from the left

### Solution: Steps of construction are as follows:

- Locate the point in the first quadrant as per given coordinates.
- Draw  $XX'$  and  $YY'$  perpendicular to each other.

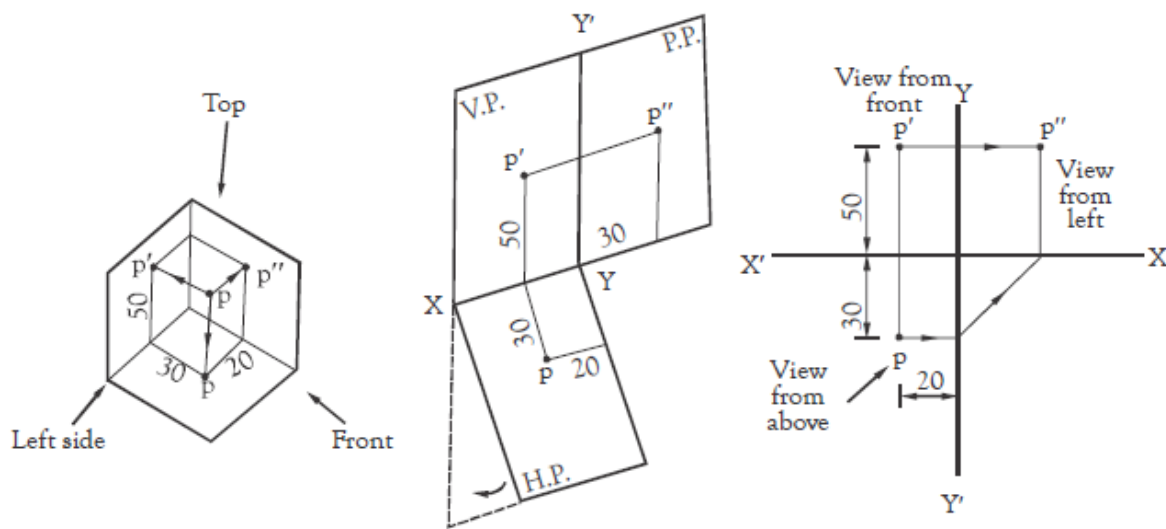


Figure 1: Solution Fig of above Example

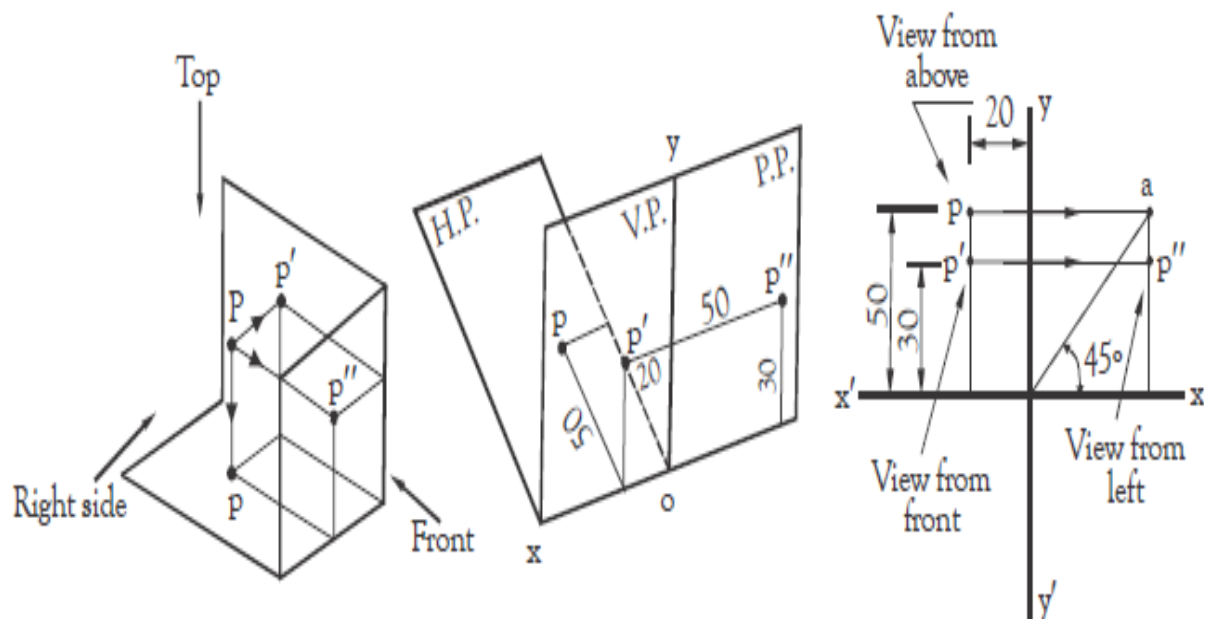
- (iii) The distance of a point from the V.P. is 30 mm, so draw  $P$ , 30 mm below the reference line  $XX'$  which is the top view of the point when seen from the top.
- (iv) The distance of a point above the H.P. is 50 mm, so draw  $P'$ , 50 mm above the reference line  $XX'$  which is the front view of the point when seen from the front.
- (v) The distance of a point from the P.P. is 20 mm, so draw  $P''$ , 20 mm away from the reference line  $YY''$  which is the side view of the point when seen from the left.

### PROJECTIONS OF A POINT IN THE SECOND QUADRANT:

**Example2:** A point is 50 mm behind the Vertical Plane (V.P.), 30 mm above the Horizontal Plane (H.P.) and 20 mm in front of a profile plane (P.P.) which is on the right side of the observer. Draw the top view, front view and side view.

**Solution:**

- (i) Locate the point in the first quadrant as per given coordinates.
- (ii) Draw  $XX'$  and  $YY'$  perpendicular to each other.
- (iii) The distance of a point  $P$  behind the V.P. is 50 mm, so draw  $P$ , 50 mm below the reference line  $XX$  then rotate the H.P. by  $90^\circ$  so top view will be above the front view.
- (iv) The distance of a point above the H.P. is 30 mm, so draw  $P$ , 30 mm above the reference line  $XX$  which is the front view of the point when seen from the front.
- (v) The distance of a point  $P$  from the P.P. is 20 mm, so draw  $P''$ , 20 mm away from the reference line  $YY''$  which is the side view of the point when seen from the left, then  $P''$  is drawn on the left side.



**Solution Fig of above Example**

## PROJECTIONS OF A POINT IN THE THIRD QUADRANT:

**Example3:** A point is 50 mm behind the Vertical Plane (V.P.), 30 mm below the Horizontal Plane (H.P.) and 20 mm in front of a profile plane (P.P.) which is on the right side of the observer. Draw the top view, front view and side view.

**Solution:**

- (i) Locate the point in the third quadrant as per given coordinates.
- (ii) Draw  $XX'$  and  $YY'$  perpendicular to each other.
- (iii) The distance of a point P behind the V.P. is 50 mm, so draw P, 50 mm below the reference line  $XX'$  then rotate the H.P. by  $90^\circ$  so top view will be above the front view.
- (iv) The distance of a point above the H.P. is 30 mm, so draw  $P'$ , 30 mm above the reference line  $XX'$  which is the front view of the point when seen from the front.
- (v) The distance of a point P from the P.P. is 20 mm, so draw  $P''$ , 20 mm away from the reference line  $YY''$  which is the side view of the point when seen from the left, then  $P''$  is drawn on the left side.

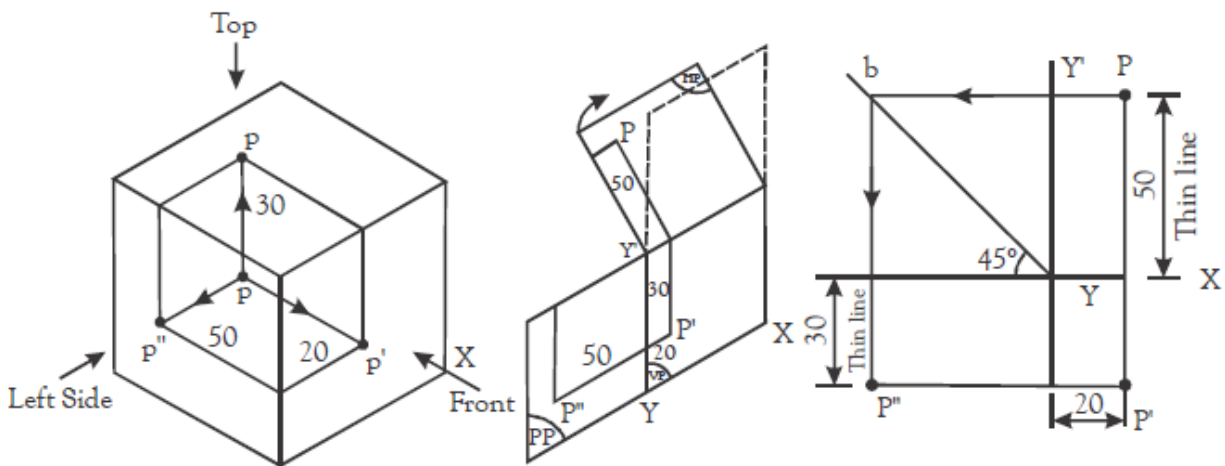


Figure 3: Solution of above Example

## PROJECTIONS OF A POINT IN THE FOURTH QUADRANT:

**Example4:** A point is 50 mm in front of the Vertical Plane (V.P.), 40 mm below the Horizontal Plane (H.P.) and 20 mm in front of a profile plane (P.P.) which is on the right side of the observer. Draw the front view, top view and side view.

### Solution:

- (i) Locate the point in the fourth quadrant as per given coordinates.
- (ii) Draw  $XX'$  and  $YY'$  reference lines perpendicular to each other.
- (iii) The distance of a point P in front of the V.P. is 50 mm, so draw P, 50 mm below the reference line  $XX'$  then rotate the H.P. by  $90^\circ$  so top view will be above the front view.
- (iv) The distance of a point above the H.P. is 40 mm, so draw  $P'$ , 40 mm above the reference line  $XX'$  which is the front view of the point when seen from the front.
- (v) The distance of a point P from the P.P. is 20 mm, so draw  $P''$ , 20 mm away from the reference line  $YY''$  which is the side view of the point when seen from the left, then  $P''$  is drawn on the left side.

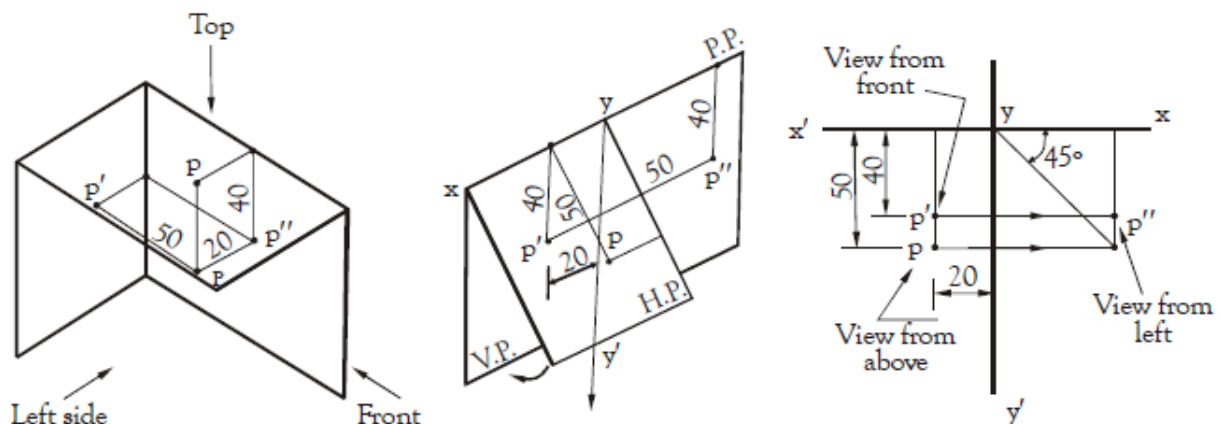


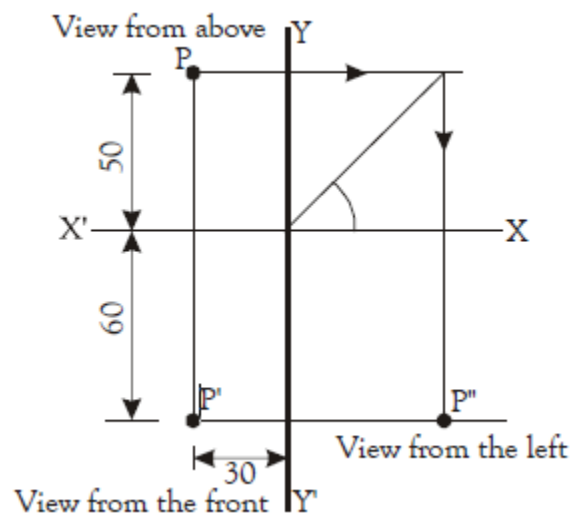
Figure 4: Solution of above Example

**EXAMPLE 5:** The Top view point P is 50 mm above the XY line, Front view 60 mm below the H.P.  
Draw its principal views.

**Solution:**

Since the point is behind the V.P. and above the H.P., the front view of the point P lie in the third quadrant and Top view will be 50 mm above reference line. Follow the following steps to draw the views:

- (i) Draw P' front view below on XX' reference line.
- (ii) Draw a projector through P' perpendicular to the XX' reference line. On this line, Mark point P, 50 mm above on XX' reference line. Then P is the required top view.
- (iii) Now draw the projectors through P and P' as shown in the following figure to get side view P'' as seen from the left.



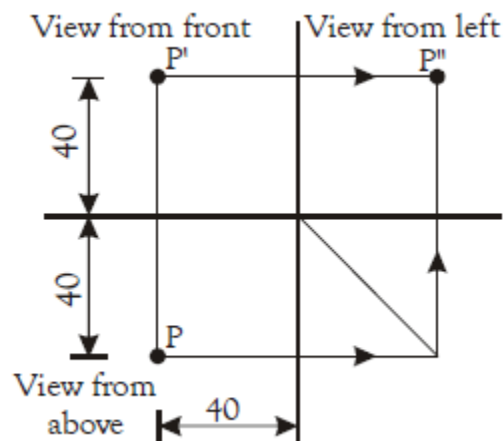
**Figure 5: Solution Fig of above Example**

**EXAMPLE 6:** A point P is equidistant ( Say 40 mm ) from the three reference planes; Top view is below XY and the Front view is above XY.

**Solution:**

Since the point is behind the V.P. and on the H.P., the front view of the point P lie on the reference line itself and Top view will be 40 mm above reference line. Follow the following steps to draw the views:

- (i) Draw P' front view on XX' reference line.
- (ii) Draw a projector through P' perpendicular to the XX' reference line. On this line, Mark point P, 40 mm above on XX' reference line. Then P is the required top view.
- (iii) Now draw the projectors through P and P' as shown in figure 8.6 to get side view P'' as seen from the left.



**Figure6: Solution of above Example**

## Sheet/Plate No. – 5: Projection of Points

- Q.1 Draw the projection of the following points on the same ground line, keeping the projectors 40 mm apart. Also give the dimensions.
- A. 50 mm above the H.P. and 30 mm in front of the V.P.
  - B. 25 mm below the H.P. and 45 mm behind the V.P.
  - C. 45 mm above the H.P. and 25 mm behind the V.P.
  - D. 40 mm below the H.P. and 20 mm in front of the V.P.
  - E. Is in the H.P. and 35 mm behind the V.P.
  - F. Is in the H.P. and 45 mm in front of the V.P.
  - G. Is in the V.P. and 30 mm above the H.P.
  - H. Is in the V.P. and 35 mm below the H.P.
  - I. Is in the Both H.P. and the H.P.
- Q.2 Projections of various points are given in the following fig.1. State the position of each point with respect to the planes of projection, given the distances in millimeters

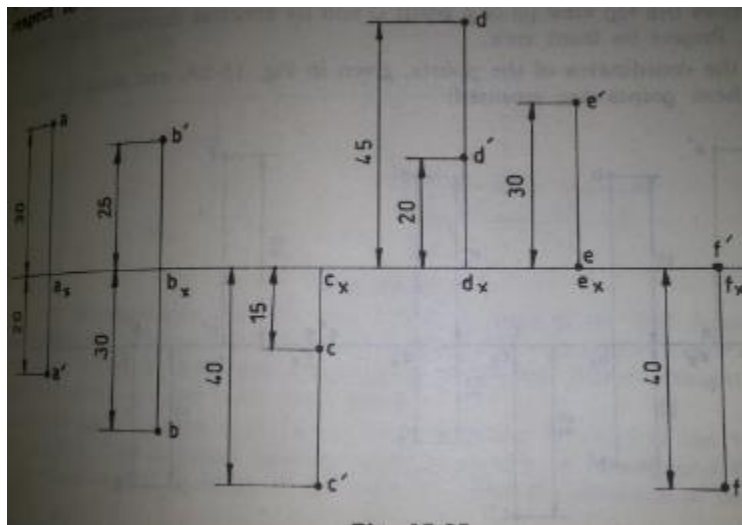


Figure 1: Projections of various points

- Q.3 State the quadrants in which the following points are situated:
- (a) A point P, its top view is 45 mm above OX; the front view is 20 mm below the top view.
  - (b) A point Q; its top view and front view lie below OX and at distances 35 mm and 50 mm respectively.
- Q.4 Following fig.2, shows the front view (p') of a point P and its shortest distance (OP''), 45 mm from the ground line. Project its top view.

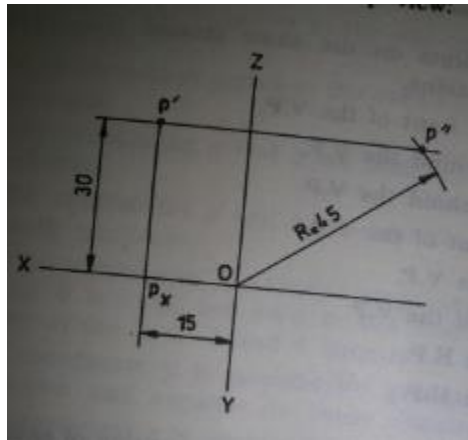


Figure 2 : front view ( $p'$ ) of a point P and its shortest distance ( $OP''$ )

- Q.5 Following fig.3, shows the Top view ( $q$ ) of a point Q and its shortest distance ( $Oq''$ ), 40 mm from the ground line. Project its front view.

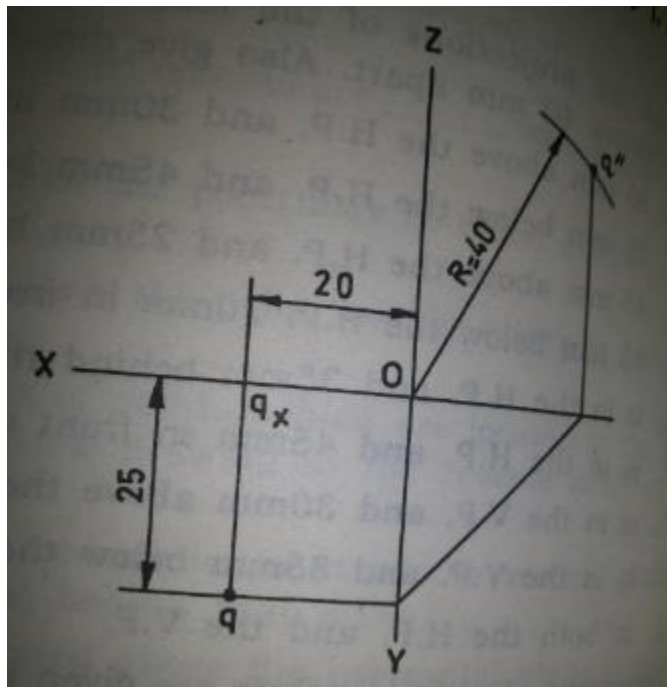


Figure 3 : Top view ( $q$ ) of a point Q and its shortest distance ( $Oq''$ )

**Reference : (i) Engineering Graphics By SC Sharma and Naveen Kumar : Exercise 15 : Q. 1, 2, 3, 4, 5**  
**(ii) Engineering Drawing by Roop Lal and Ramakant Rana**