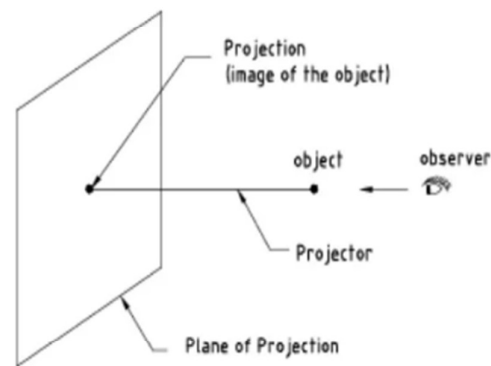# PROJECTION OF POINT AND LINE

Principle of Projection
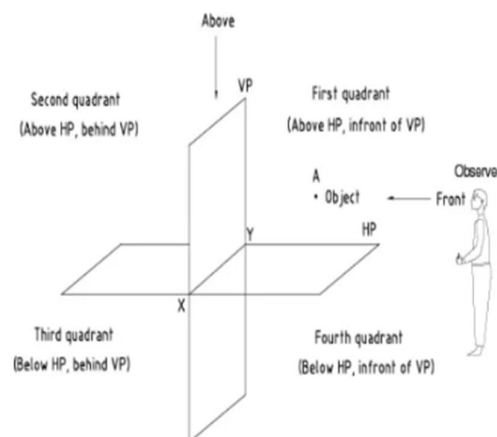
- Image(picture) of an object is projected onto a plane of projection as shown in Fig.

Projection Planes (VP & HP)

- Image of an object observed in front view (Elevation) is projected onto Vertical Plane (VP)
- Image of an object observed in top view (Plan) is projected onto Horizontal Plane (HP)
- Intersection line of VP & HP is the XY line

Understanding Projections

- Consider an object placed in first quadrant, its top & front view images are projected onto HP & VP as shown.

- HP is rotated clockwise for 90º, the top view goes below XY line but front view remain above XY.

- In your drawing sheet, draw XY line, then draw the front view above XY line and the top view below XY line.
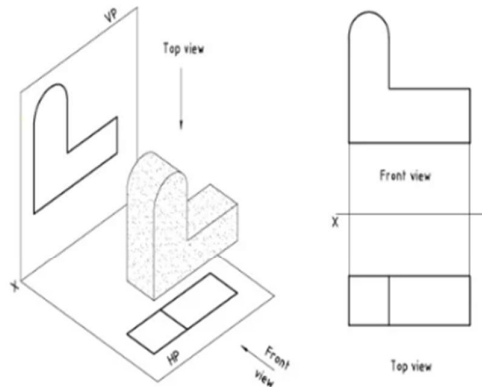
Drawing Projections of a Point

- Similar to the previous object, now a point is placed and its top & front view images are projected onto HP & VP.

- HP is rotated clockwise for 90º to get it below XY line.

- In your drawing sheet, draw XY line, then mark a point in front view, above XY line and top view, below XY line.
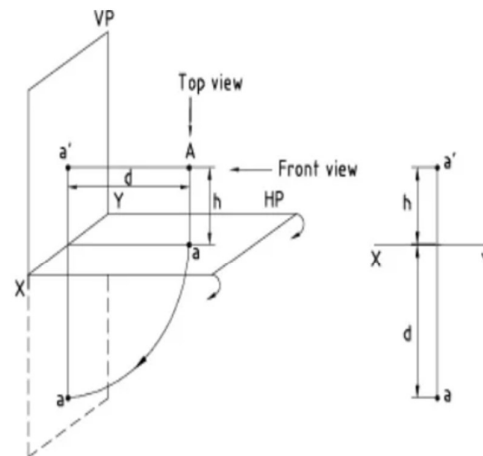
Example: A point A is 20mm above HP and 30mm in front of VP. Draw its projections.

- Follow the same procedure discussed earlier, project the top & front view images onto HP & VP.
- Rotate the HP in clockwise for 90º to get it below XY line.
- In your drawing sheet, draw XY line, mark a point in the front view, above XY line and the top view, below XY line.
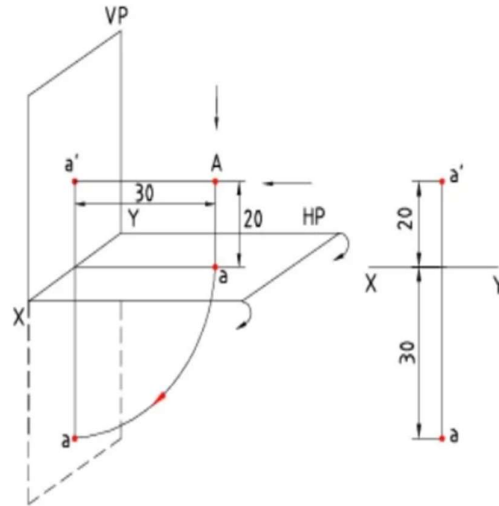
A Straight Line

- A straight line is the shortest route to join any two given points.
- Actual length of the line is called True Length (TL).
- A straight line can be placed in first quadrant with reference to VP and HP in six different positions and are discussed below
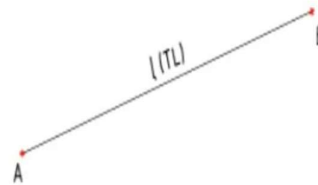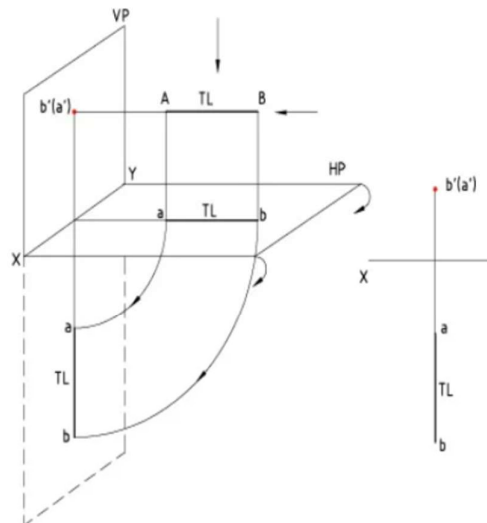
Projections of a Line kept perpendicular to HP and parallel to VP

- Similar to a point, now a straight LINE is placed as shown and its top & front view images are projected onto HP & VP.
- Front view is a vertical line having true length (TL).
- Top view is a point.
- Draw XY line, then draw a vertical line in front view above XY line and top view, a point, below XY line.
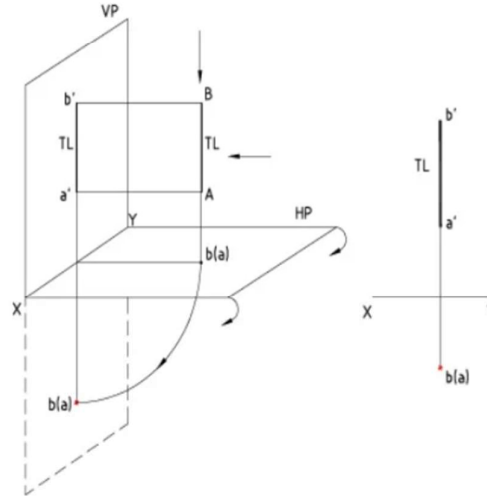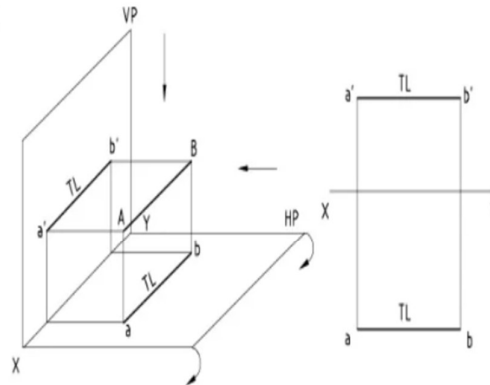
Projections of a Line kept perpendicular to VP and parallel to HP

- The LINE is placed as shown and its top and front view images are projected onto HP and VP.
- Top view is a line having true length (TL).
- Front view is a point.
- Draw XY line, then draw a line perpendicular to XY in top view, below XY line and front view, a point, above XY line.
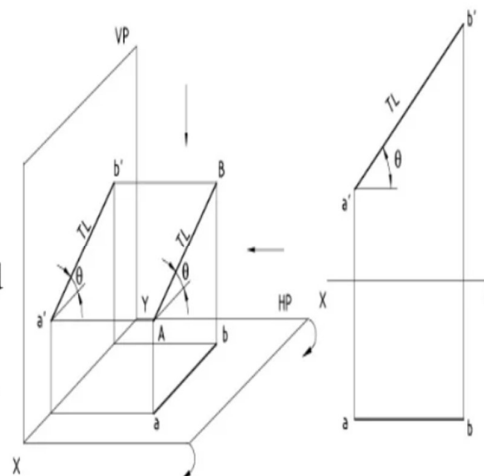
Projections of a Line kept parallel to both HP and VP

- The LINE is placed as shown, its top and front view images are projected onto HP and VP.
- Front view is a horizontal line having true length (TL).
- Top view is also a horizontal line having true length (TL).
- Draw XY line, then draw a line parallel to XY in top view, below XY line and the front view, parallel to and above XY line.

Projections of a Line kept inclined to HP and parallel to VP

- The LINE is placed as shown, its top and front view images are projected onto HP&VP.
- Front view is an inclined line at θ, having true length (TL).
- Top view is a horizontal line but smaller in size.
- Draw XY line, then draw an inclined line at given angle θ to XY in front view. Project the top view from the front view, parallel to and below XY line but its size is smaller than TL.

Projections of a Line kept inclined to VP and parallel to HP

- The LINE is placed as shown, its top and front view images are projected onto HP&VP.
- Top view is an inclined line at Φ, having true length (TL).
- Front view is a horizontal line but smaller in size.
- Draw XY line, then draw an inclined line at given angle Φ to XY in top view. Project the front view from top view, parallel to and above XY line but its size is smaller than TL.
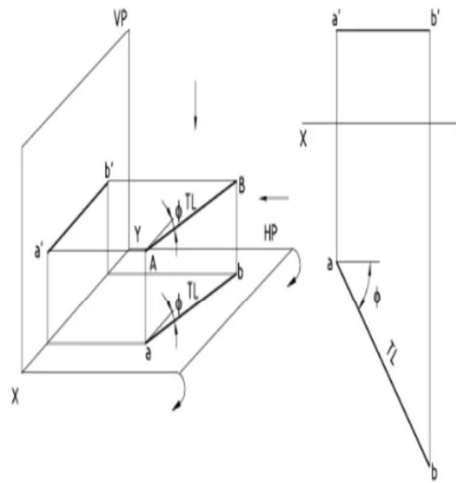

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Traces of a Straight Line

- The point of intersection of the line with the reference plane is called as trace of the line.
- Horizontal Trace or HT is the point of intersection of the line with HP.
- Vertical Trace or VT is the point of intersection of the line with VP.
- Note: Traces are marked in the following examples.

Example 1: A line AB 60mm long has its end A 20mm above HP and 30mm in front of VP. The line is kept perpendicular to HP and parallel to VP. Draw its projections. Also mark the traces.

- Draw the XY line and mark the projections of the end A of the line.
- Draw the front view as a vertical line of 60mm long.
- Draw and complete the top view as a point.
- Since the line is kept parallel to VP, no VT and the HT coincides with top view of the line.
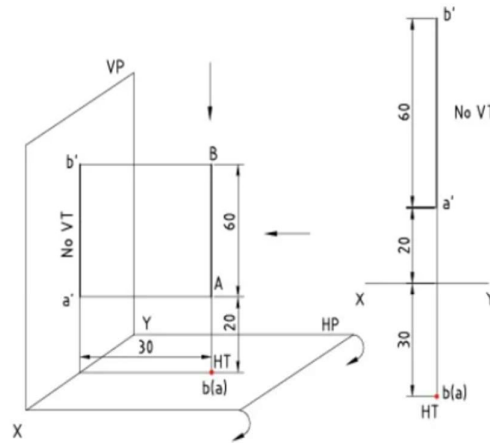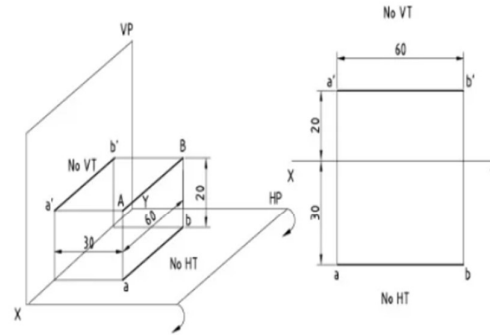
Example 2: A line AB 60mm long has its end A 20mm above HP and 30mm in front of VP. The line is kept perpendicular to VP and parallel to HP. Draw its projections. Also mark the traces.

- Draw the XY line and mark the projections of the end A of the line.
- Draw the top view as a line perpendicular to XY of 60mm long.
- Draw and complete the front view as a point.
- Since the line is kept parallel to HP, no HT and the VT coincides with front view of the line.
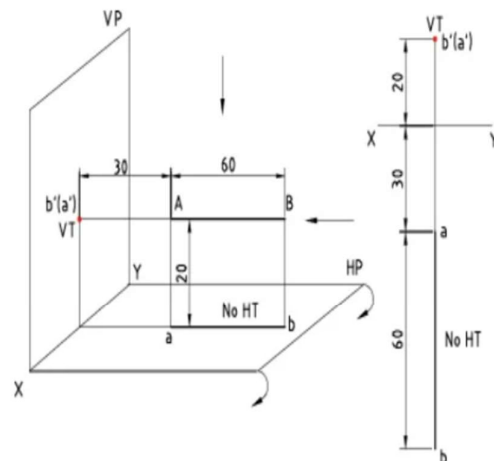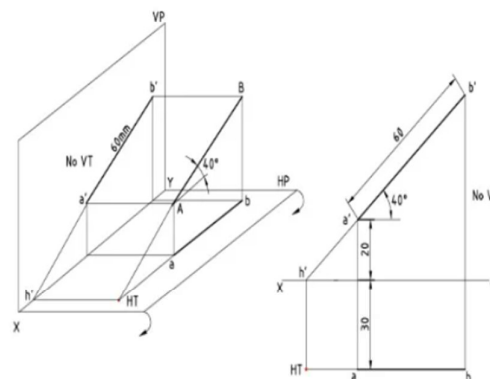
Example 3: A line AB 60mm long has its end A 20mm above HP and 30mm in front of VP. The line is kept parallel to both HP and VP. Draw its projections. Also mark the traces.

- Draw the XY line and mark the projections of the end A of the line.

- Draw the top view as a line parallel to XY of 60mm long.

- Draw and complete the front view also a line of 60mm long.

- Since the line parallel to HP and VP, no HT and VT.

Example 4: A line AB 60mm long has its end A 20mm above HP and 30mm in front of VP. The line is kept incline at 40° to HP and parallel VP. Draw its projections. Also mark the traces.

- Draw the XY line and mark the projections of the end A of the line.

- Draw the front view as an inclined line at 40° to XY of 60mm long.

- Draw the top view as a line parallel to XY line by drawing the projector (vertical line) from b'.

- Since the line parallel to VP, no VT and HT is marked as shown in fig.

Example 5: A line AB 60mm long has its end A 20mm above HP and 30mm in front of VP. The line is kept incline at 40° to VP and parallel HP. Draw its projections. Also mark the traces.

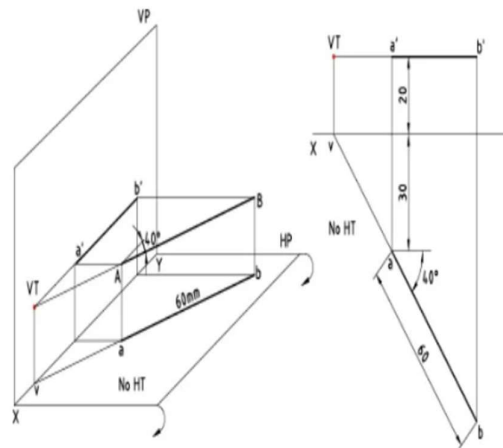- Draw the XY line and mark the projections of the end A of the line.
- Draw the top view as an inclined line at 40° to XY of 60mm long.
- Draw the front view as a line parallel to XY by drawing the projector (vertical line) from b.
- Since the line parallel to HP, no HT and VT is marked as shown in fig.

Tips to solve problems

- When a LINE is kept in one of the first three positions, either the front view or top view is drawn first and the other view is projected.
- When the line is kept inclined to HP and parallel to VP, two of the three variable (TL, θ or TV) will be given. Draw either the top view or front view, then complete the other view.
- When the line is kept inclined to VP and parallel to HP, two of the three variable (TL, Φ or FV) will be given. Draw either the top view or front view, then complete the other view.

Projections of a Line kept inclined to both HP and VP

- In this position both the top view (TV) and front view (FV) are smaller than true length (TL), so one of the following methods is used to draw the projections.
  - Rotating Line Method
  - Rotating Trapezoidal Plane Method
  - Auxiliary Plane Method