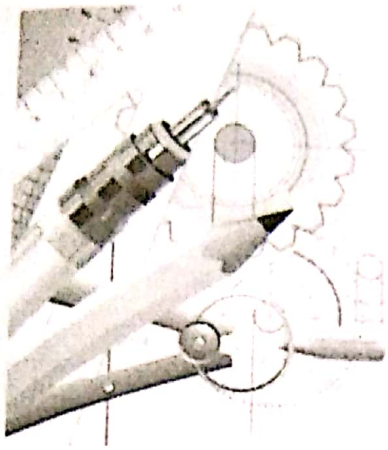


7

PROJECTIONS OF LINES

7.1. INTRODUCTION

A straight line is defined as the locus of a point which moves unidirectionally. It is also defined as the shortest distance between two point. The projections of straight lines can be drawn by joining the respective projections of its end points.

7.2. POSITION OF A LINE

A line may be in one of the following positions :

1. Line parallel to both the planes.
2. Line perpendicular to H.P. and parallel to V.P.
3. Line perpendicular to V.P. and parallel to H.P.
4. Line inclined to H.P. and parallel to V.P.
5. Line inclined to V.P. and parallel to H.P.
6. Line inclined to both the planes (*i.e.* H.P. and V.P.).

7.3. TRUE LENGTH OF A LINE

The actual length of the line is called true length. It is denoted by T.L. The projections of a line on H.P. and V.P. can be equal to or less than the actual length of the line. If the line is parallel to the plane of projection, then the view of the line will be equal to the actual length of the line, is called true length. If the line is not parallel to the plane of projection, then the view of the line will not be equal to the actual length rather it will be less than the actual length and will be called reduced length.

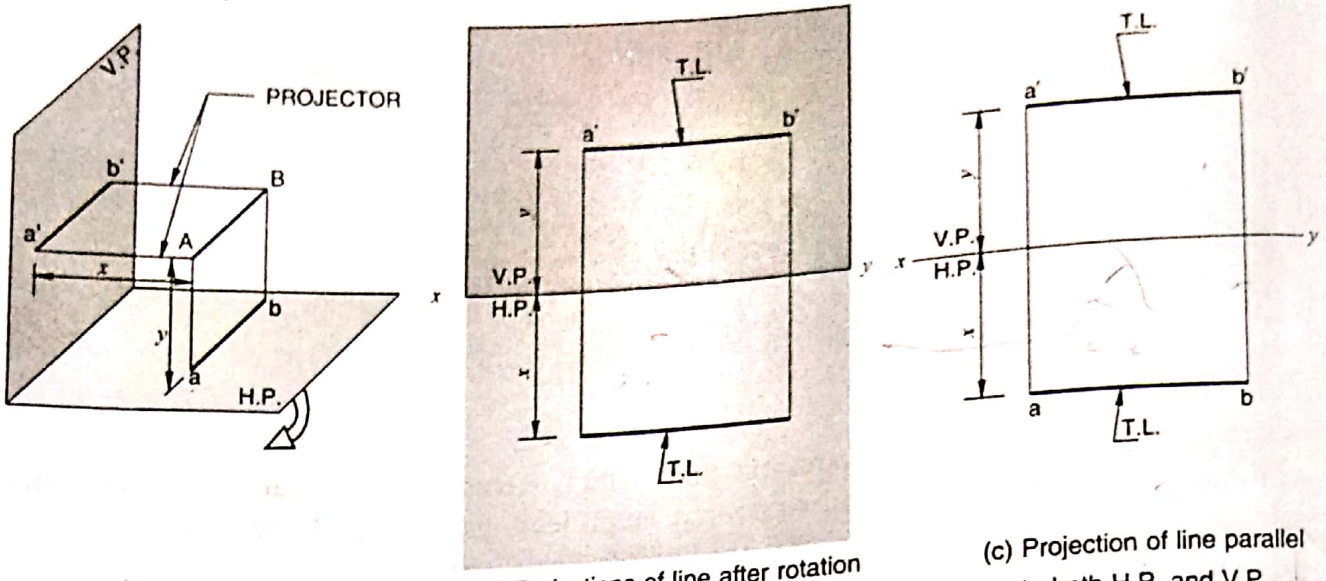
7.4. TRACES OF A LINE

Trace is a point in which the line or line produced, meets the plane of projection. If the line is parallel to a plane, trace is not possible on that plane. If the point of intersection with the H.P. is called the horizontal trace and is denoted by H.T. If the point of intersection with the V.P. is called the vertical trace and is noted by V.T.

7.5. LINE PARALLEL TO BOTH H.P. AND V.P.

Let line *AB* is parallel to both H.P. and V.P. as shown in Fig. 7.1 (*a*). The true length of the line

is seen in both the front view and the top view. The front view and the top view are parallel to the reference *xy* line.



(a) Line *AB* parallel to both H.P. and V.P.

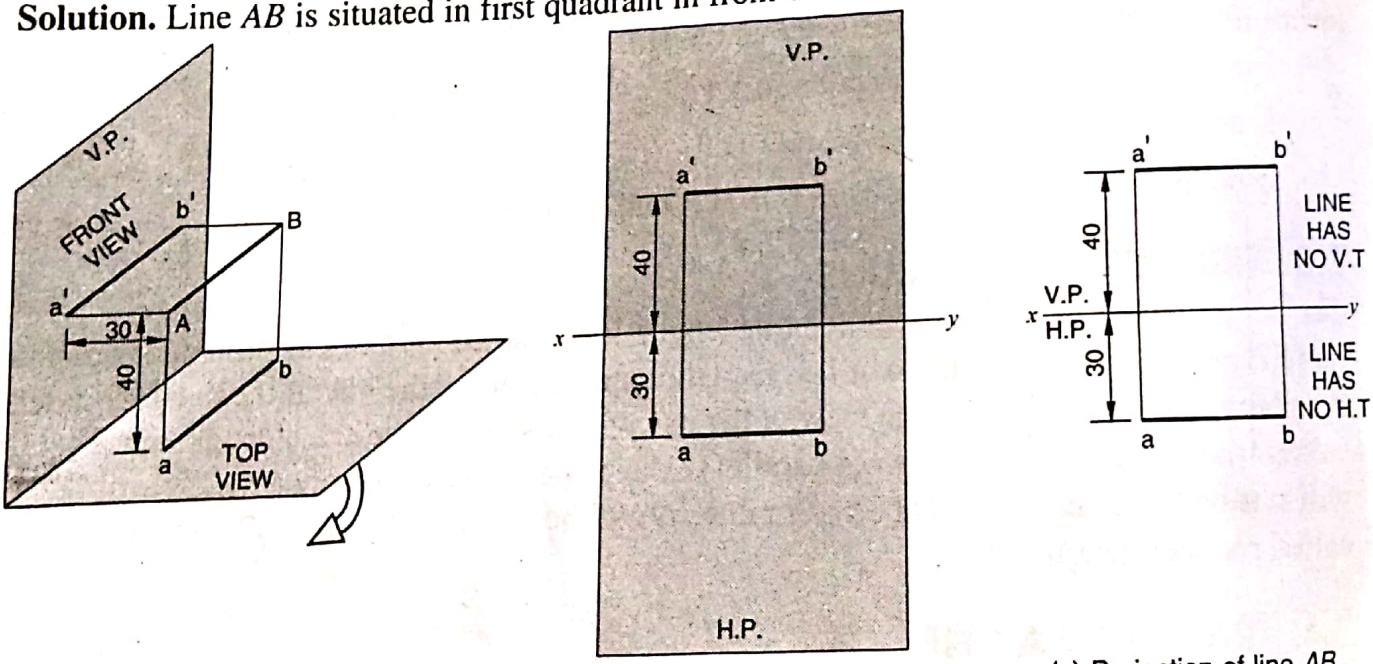
(b) Projections of line after rotation of H.P.

(c) Projection of line parallel to both H.P. and V.P.

Fig. 7.1. Line parallel to both H.P. and V.P.

Problem 7.1. A 60 mm long line *AB* is parallel to both the H.P. and the V.P. It is 30 mm in front of V.P. and 40 mm above the H.P. Draw its projections and determine the traces.

Solution. Line *AB* is situated in first quadrant in front of the V.P. and above the H.P.



(a) Line *AB* in first quadrant (Analyse the problem)

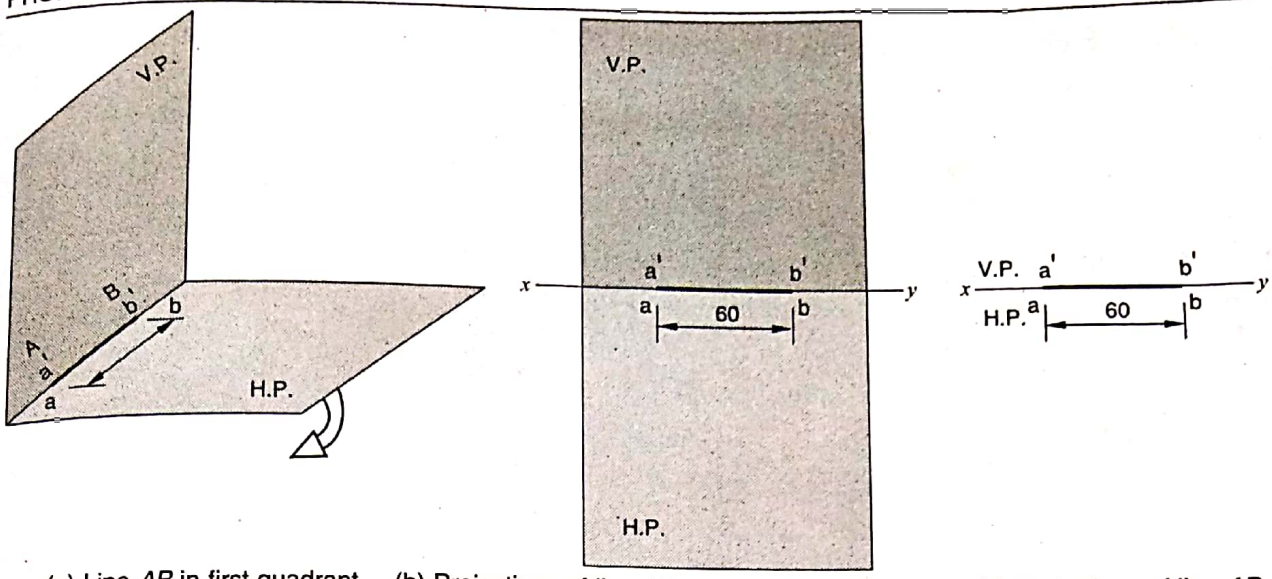
(b) Projections of line *AB* after rotation of the H.P. (Analyse the problem)

(c) Projection of line *AB* (Final drawing)

Fig. 7.2. Line *AB* is parallel to both the H.P. and the V.P.

Problem 7.2. Draw the projections of a 60 mm long line *AB* which is situated both on the H.P. and the V.P.

Solution. Line *AB* lying on the reference line. Hence, it is situated both on the H.P. and the V.P. The front and top views of the line *AB* are lie on reference line and show the true length.



(a) Line *AB* in first quadrant (Analyse the problem) (b) Projections of line *AB* after rotation of the H.P. (Analyse the problem) (c) Projections of line *AB* (Final drawing)

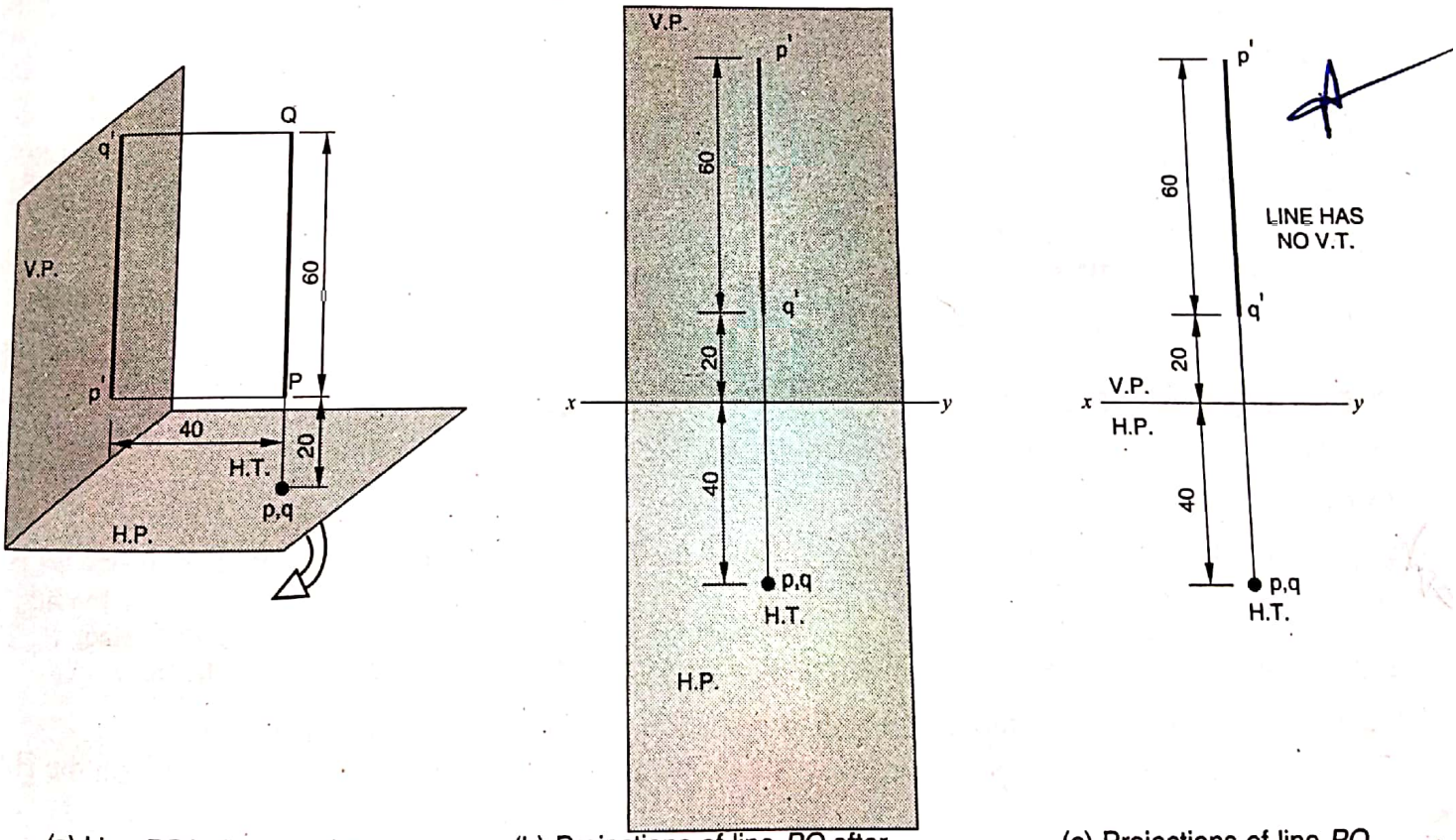
Fig. 7.3. Line *AB* is parallel to both the H.P. and V.P.

7.6. LINE PERPENDICULAR TO H.P. AND PARALLEL TO V.P.

A line perpendicular to the H.P. is always parallel to the V.P. The elevation will be of true length lying perpendicular to reference line *xy* where the plan will be a point.

Problem 7.3. A 60 mm long line *PQ* has its end *P* 20 mm above H.P. The line is perpendicular to the H.P. and 40 mm in front of the V.P. Draw its projections and locate the traces.

Solution. Line *PQ* is situated in first quadrant above the H.P. and in front of the V.P.



(a) Line *PQ* in first quadrant (Analyse the problem) (b) Projections of line *PQ* after rotation of the H.P. (Analyse the problem) (c) Projections of line *PQ* (Final drawing)

Fig. 7.4. Line *PQ* is perpendicular to the H.P. and parallel to the V.P.

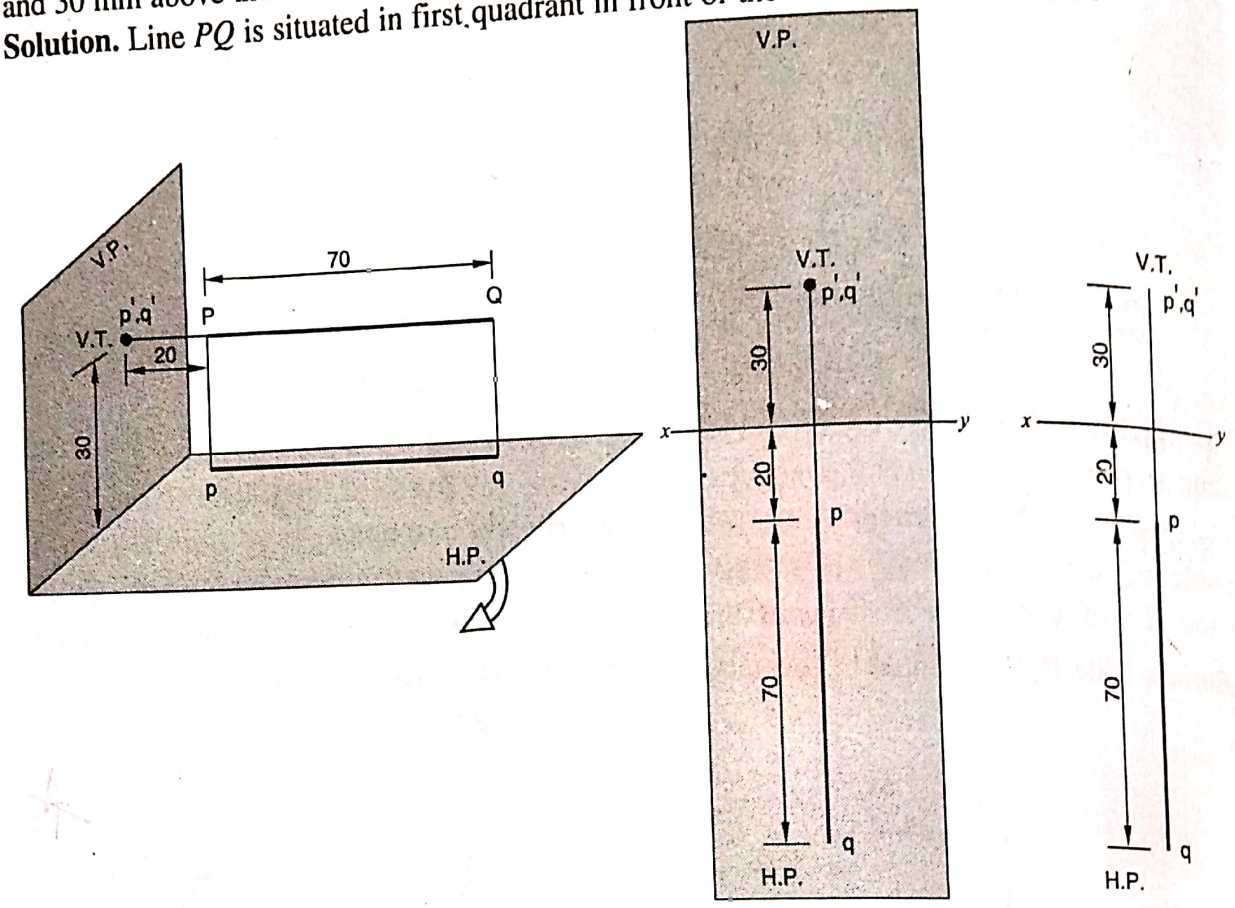
7.7. LINE PERPENDICULAR TO V.P. AND PARALLEL TO H.P.

A line perpendicular to the V.P. is always parallel to the H.P. The plan will be of true length laying perpendicular to reference line *xy* where the elevation will be a point.

Problem 7.4. A 70 mm long line *PQ* has its end *P* 20 mm in front of the V.P. The line is perpendicular to the V.P.

and 30 mm above the H.P. Draw the projections of the line and determine its traces.

Solution. Line *PQ* is situated in first quadrant in front of the V.P. and above the H.P.



(a) Line *PQ* in first quadrant (Analyse the problem)

(b) Projections of line *PQ* after rotation of the H.P. (Analyse the problem)

(c) Projections of line *PQ* (Final drawing)

Fig. 7.5. Line *PQ* is perpendicular to the V.P. and parallel to the H.P.

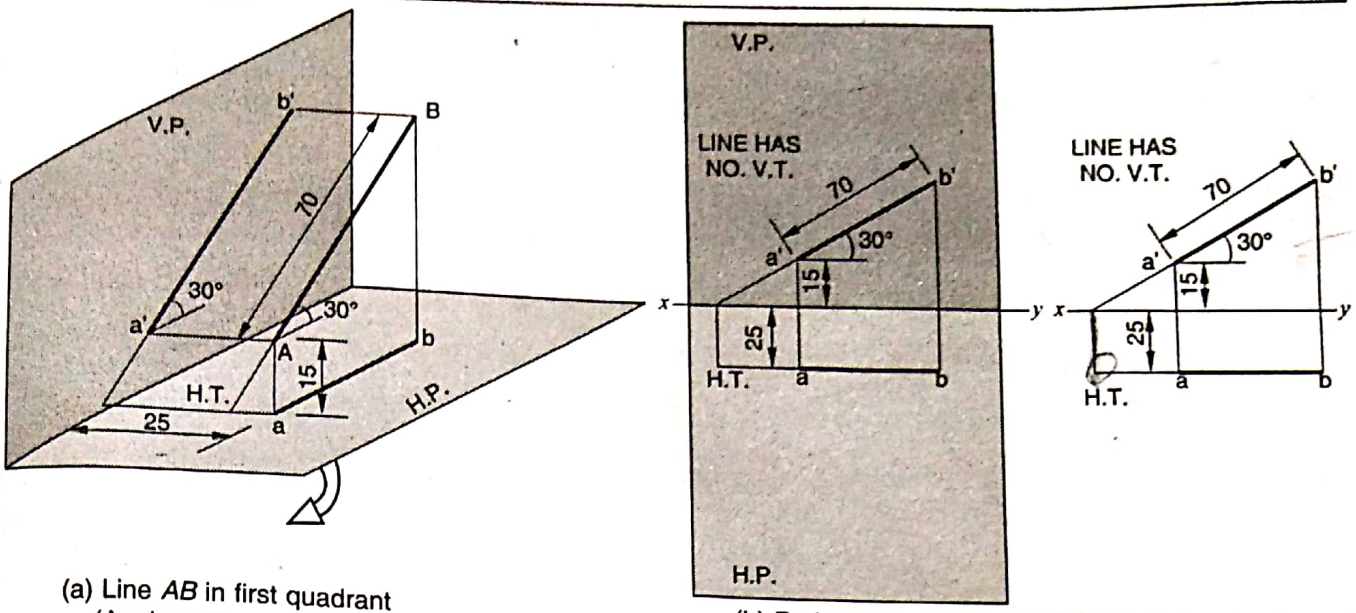
7.8. LINE INCLINED TO H.P. AND PARALLEL TO V.P.

When a line is inclined to H.P. and parallel to the V.P., its elevation will be a true length, inclined to reference line *xy*.

Problem 7.5. A line *AB*, 70 mm long, is parallel to V.P. and inclined at 30° to H.P. Its end *A* is 15 mm above H.P.

and 25 mm in front of V.P. Draw the projections of the line and determine its traces.

Solution. Line *AB* is situated in first quadrant above the H.P. and in front of V.P.



(a) Line *AB* in first quadrant (Analyse the problem)

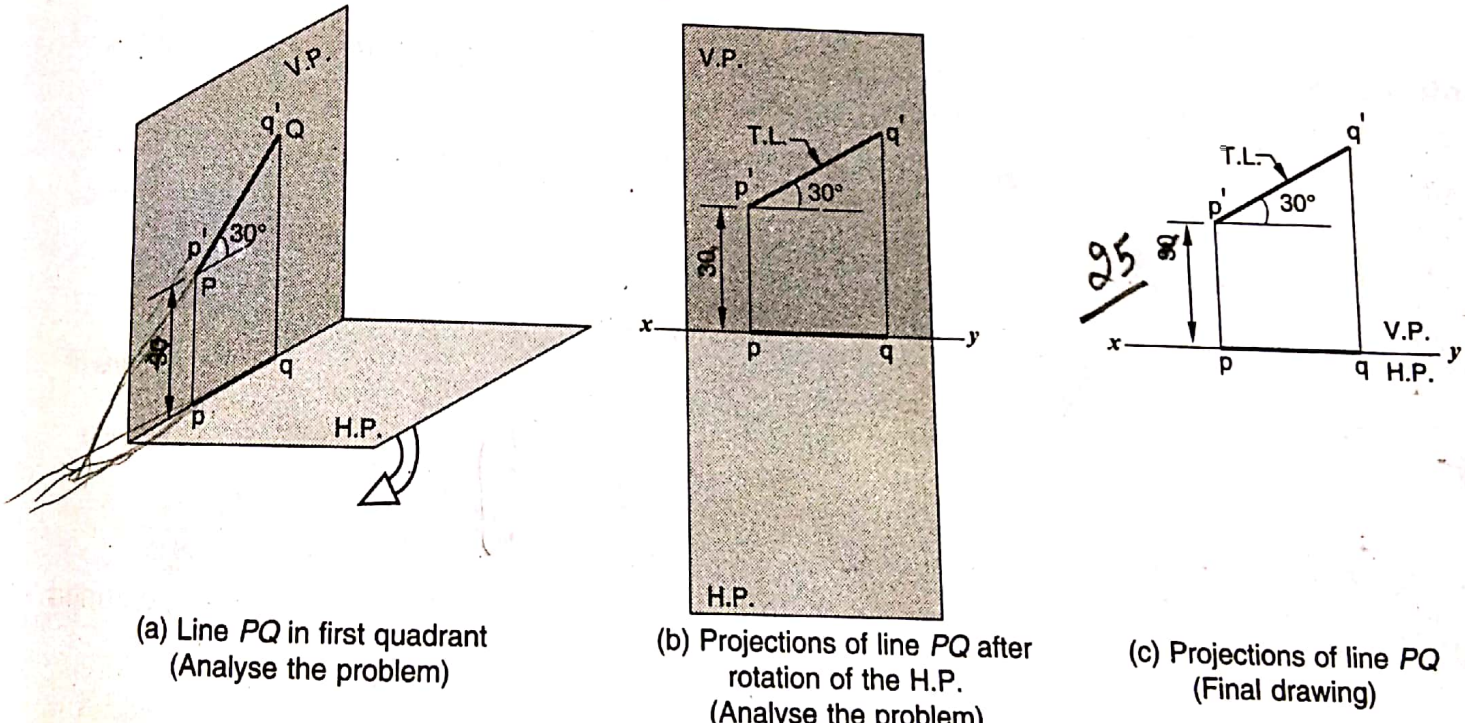
(b) Projections of line *AB* after rotation of the H.P. (Analyse the problem)

(c) Projections of line *AB* (Final drawing)

Fig. 7.6. Line *AB* is parallel to the V.P. and inclined to the H.P.

Problem 7.6. Draw the projection of a 70 mm long line *PQ*, situated in the V.P. and inclined at 30° to the H.P. The end *P* of the line is 25 mm above the H.P.

Solution. Line *PQ* is situated in first quadrant.



(a) Line *PQ* in first quadrant (Analyse the problem)

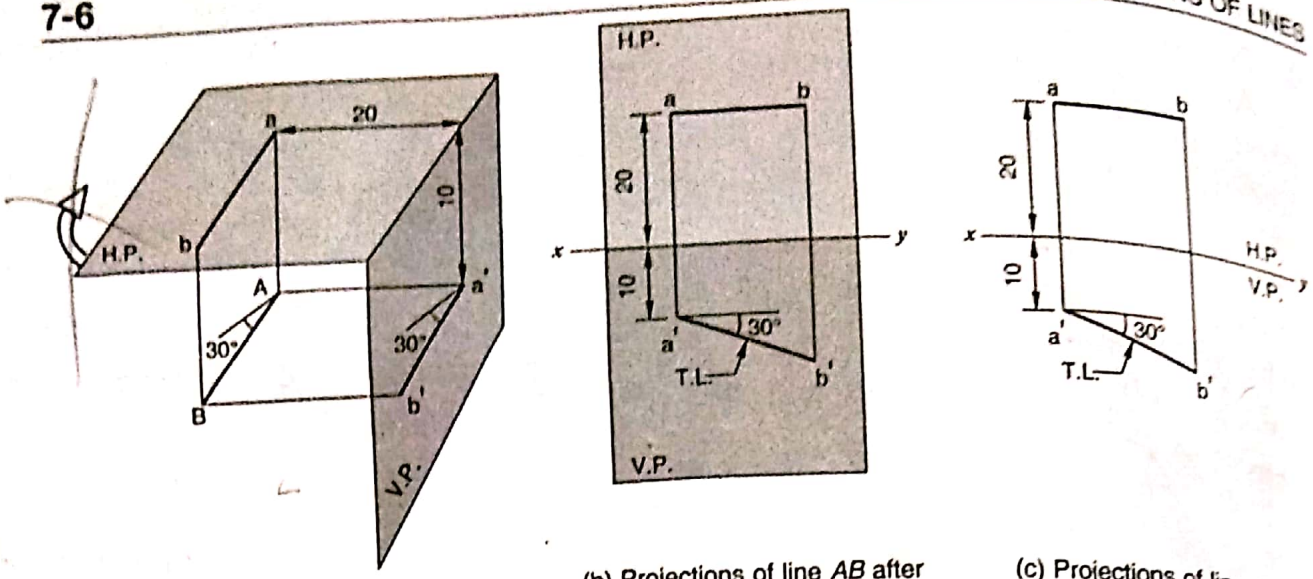
(b) Projections of line *PQ* after rotation of the H.P. (Analyse the problem)

(c) Projections of line *PQ* (Final drawing)

Fig. 7.7. Line *PQ* is inclined to the H.P. and parallel to the V.P.

Problem 7.7. A line *AB*, 60 mm long, is parallel to V.P. and inclined at 30° to H.P. Its end *A* is 10 mm below H.P. and 20 mm behind of V.P. Draw the projections of the line.

Solution. Line *AB* is situated in third quadrant below the H.P. and behind of the V.P.



(a) Line *AB* in third quadrant (Analyse the problem)

(b) Projections of line *AB* after rotation of the H.P. (Analyse the problem)

(c) Projections of line *AB* (Final drawing)

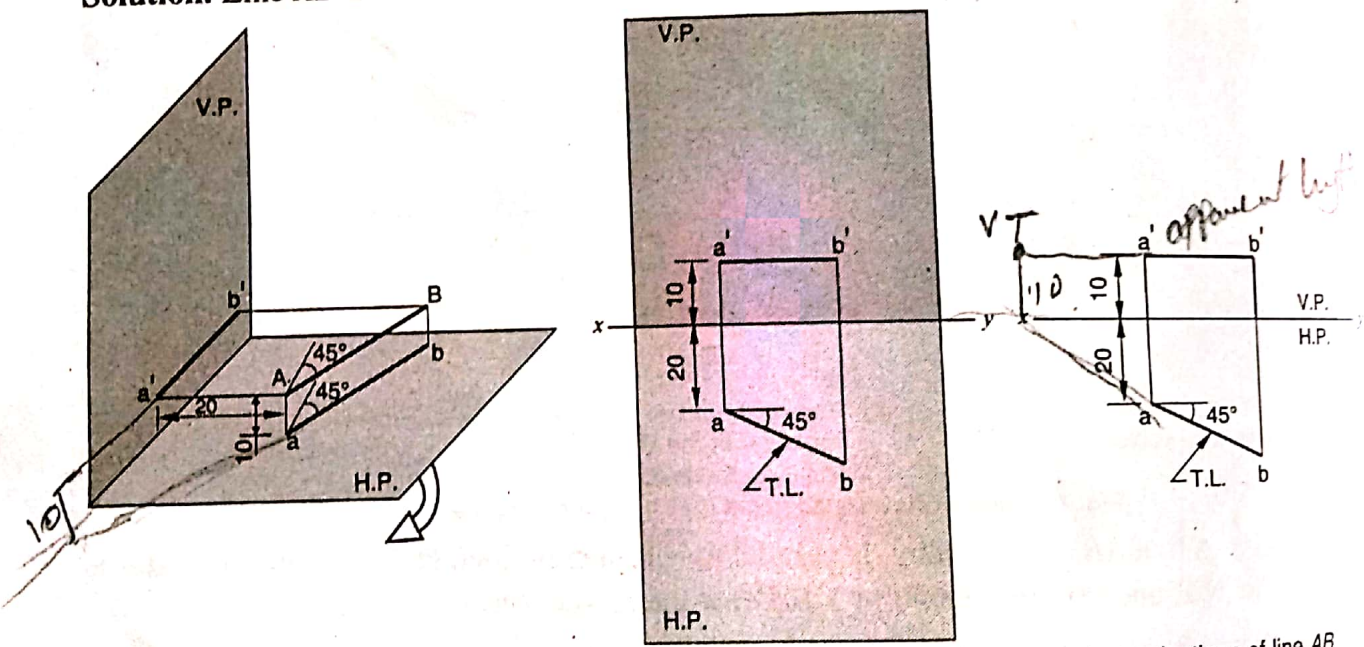
Fig. 7.8. Line *AB* is inclined to the H.P. and parallel to the V.P.

7.9. LINE INCLINED TO V.P. AND PARALLEL TO H.P.

When a line is inclined to V.P. and parallel to H.P., its plan will be a true length, inclined to reference line *xy*. The elevation will be of projected length (smaller than the true length) and lying parallel to reference line *xy*.

Problem 7.8. A line *AB*, 60 mm long, is inclined at 45° to V.P. and parallel to H.P. Its end *A* is 20 mm in front of V.P. and 10 mm above H.P. Draw the projections of the line.

Solution. Line *AB* is situated in first quadrant in front of the V.P. and above the H.P.



(a) Line *AB* in first quadrant (Analyse the problem)

(b) Projections of line *AB* after rotation of the H.P. (Analyse the problem)

(c) Projections of line *AB* (Final drawing)

Fig. 7.9. Line *AB* is inclined to the V.P. and parallel to the H.P.