

PROJECTION OF LINES



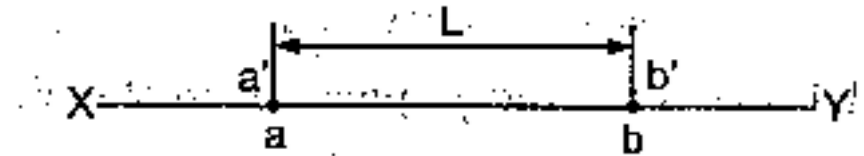
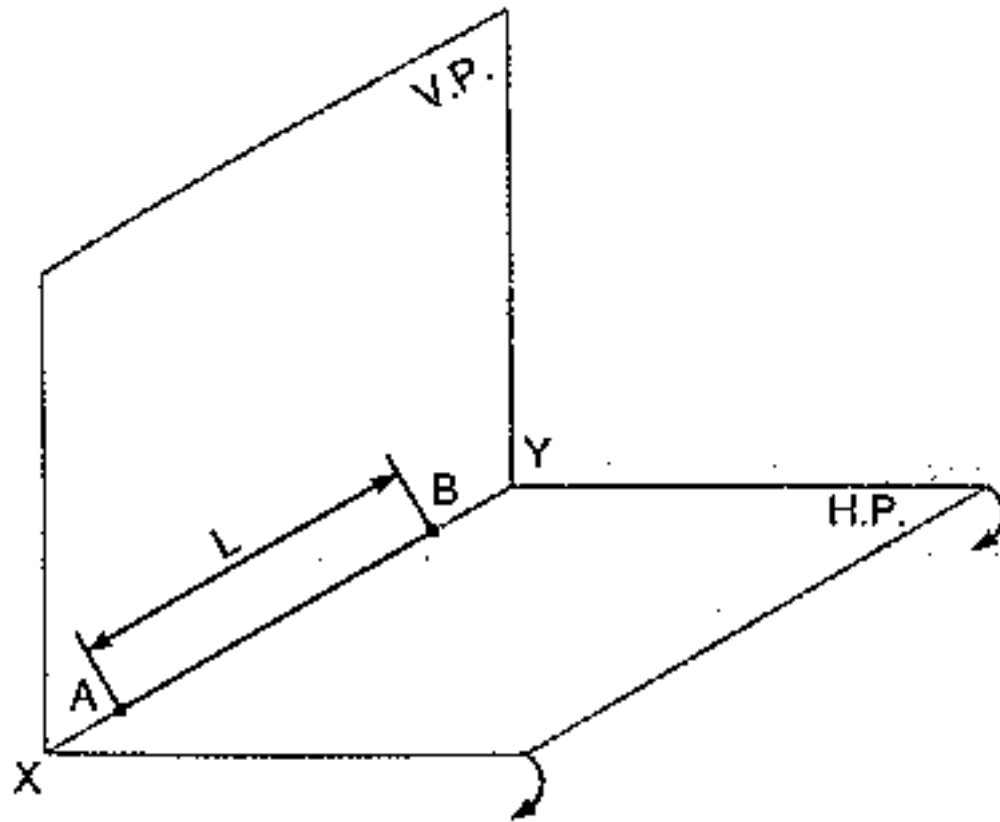
PROJECTION OF LINES

- A Line is a locus of a point moving linearly, “A straight line is the shortest distance between two points.”
- Hence, the projections of a straight line obtained by projecting its end points on planes of projections and then connecting the points of projections.
- Information regarding a line, means it's length, position of it's end points with HP & VP, it's inclinations with HP & VP, plan length and elevation length will be given.
- Our only aim is to draw it's projections - means FV & TV.

POSITION OF A LINE

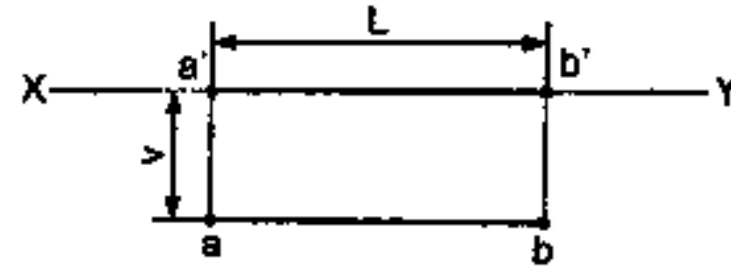
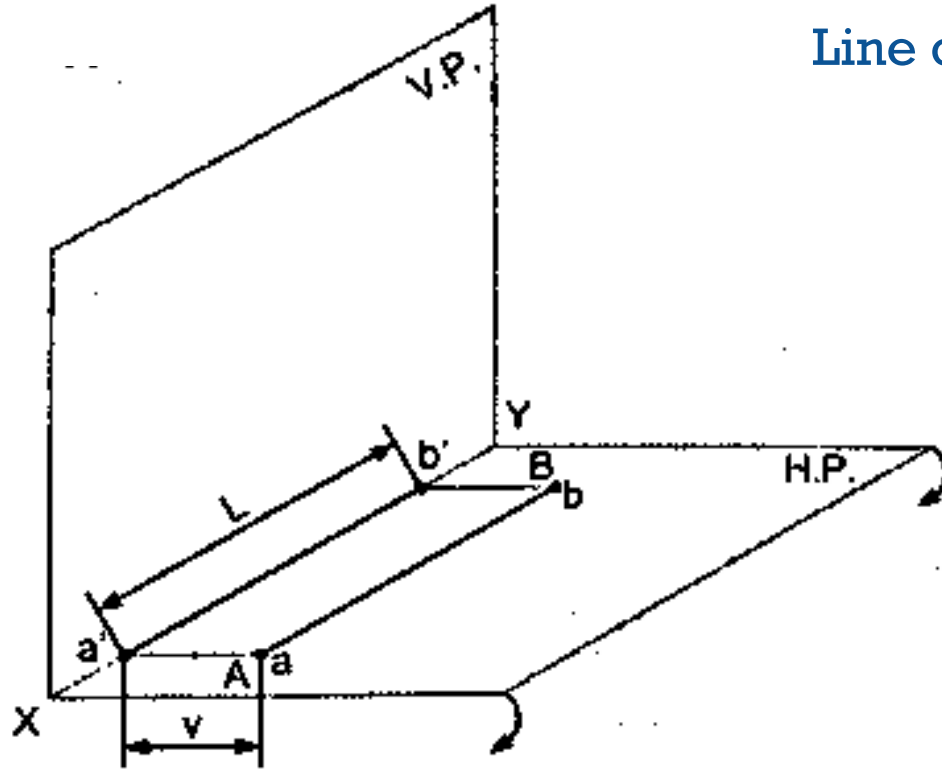
- Considering the two reference planes HP and VP, the line in space may have the following different positions.
1. Line contained by both planes.
 2. Line contained by one of planes and parallel to other plane.
 3. Line not contained by any plane and parallel to both planes
 4. Line contained by one of the plane and perpendicular to other plane.
 5. Line not contained by any plane and perpendicular to one of the planes.
 6. Line contained by one of planes and inclined to other plane.
 7. Line not contained by any plane but parallel to one of the plane and inclined to the other plane.
 8. Line inclined to both the planes.

LINE CONTAINED BY BOTH PLANES



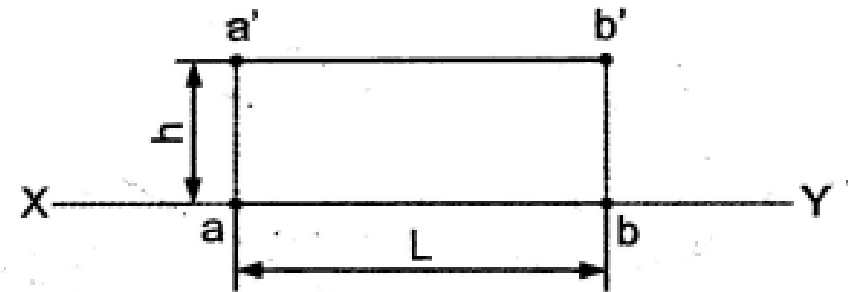
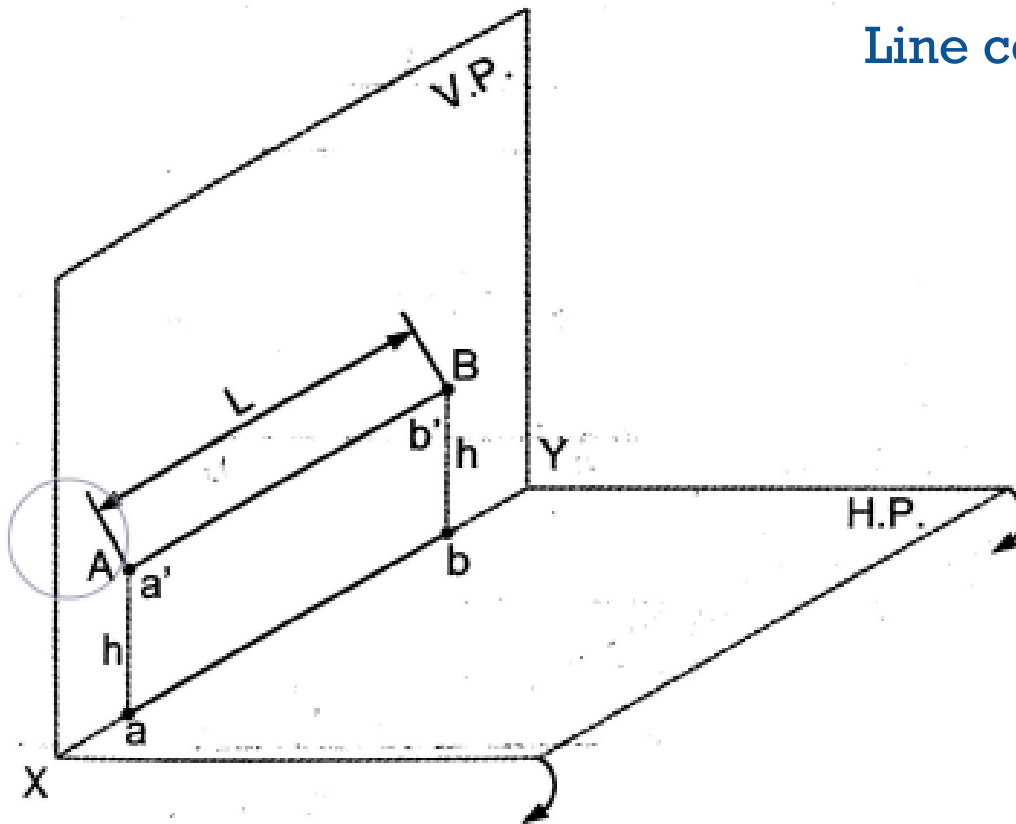
LINE CONTAINED BY ONE OF PLANES AND PARALLEL TO OTHER PLANE

Line contained by HP and parallel to VP



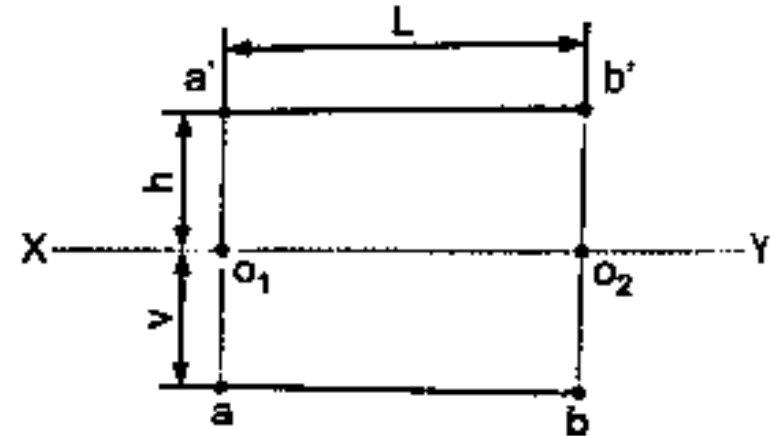
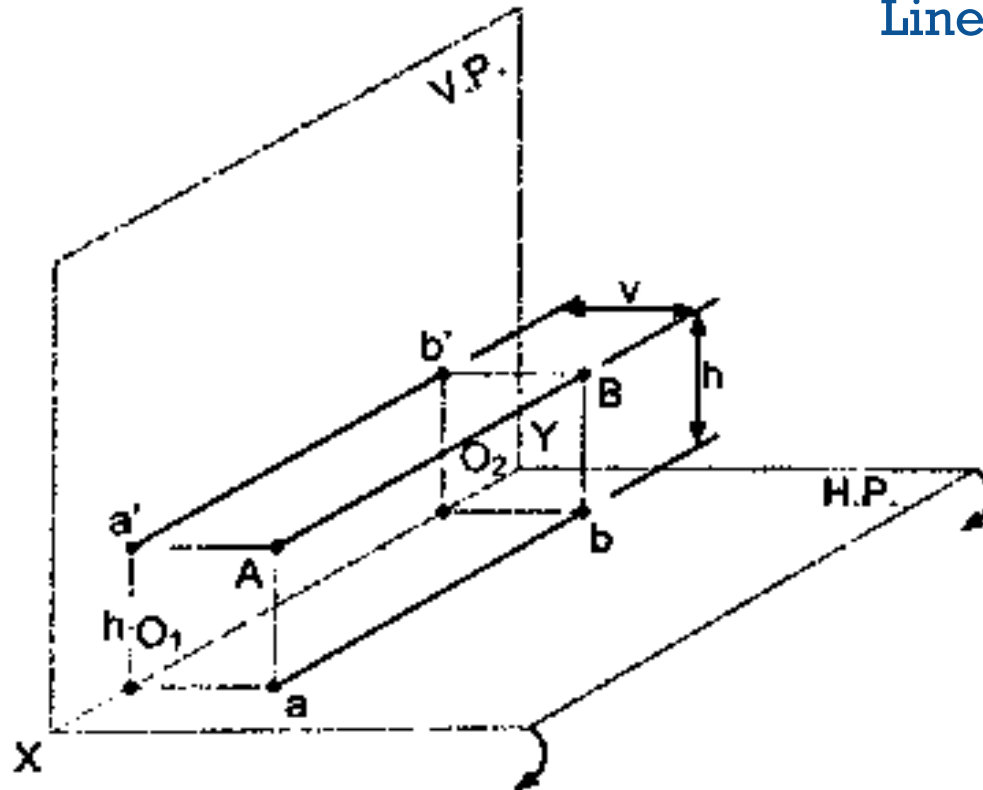
LINE CONTAINED BY ONE OF PLANES AND PARALLEL TO OTHER PLANE

Line contained by VP and parallel to HP



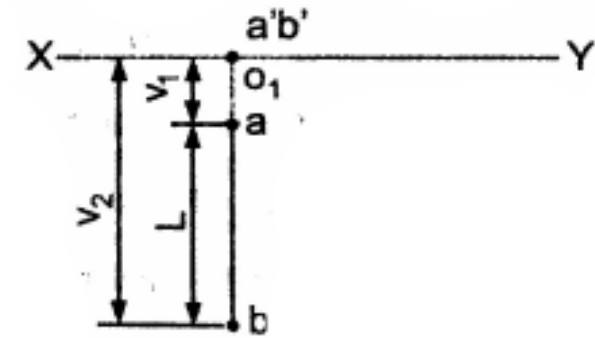
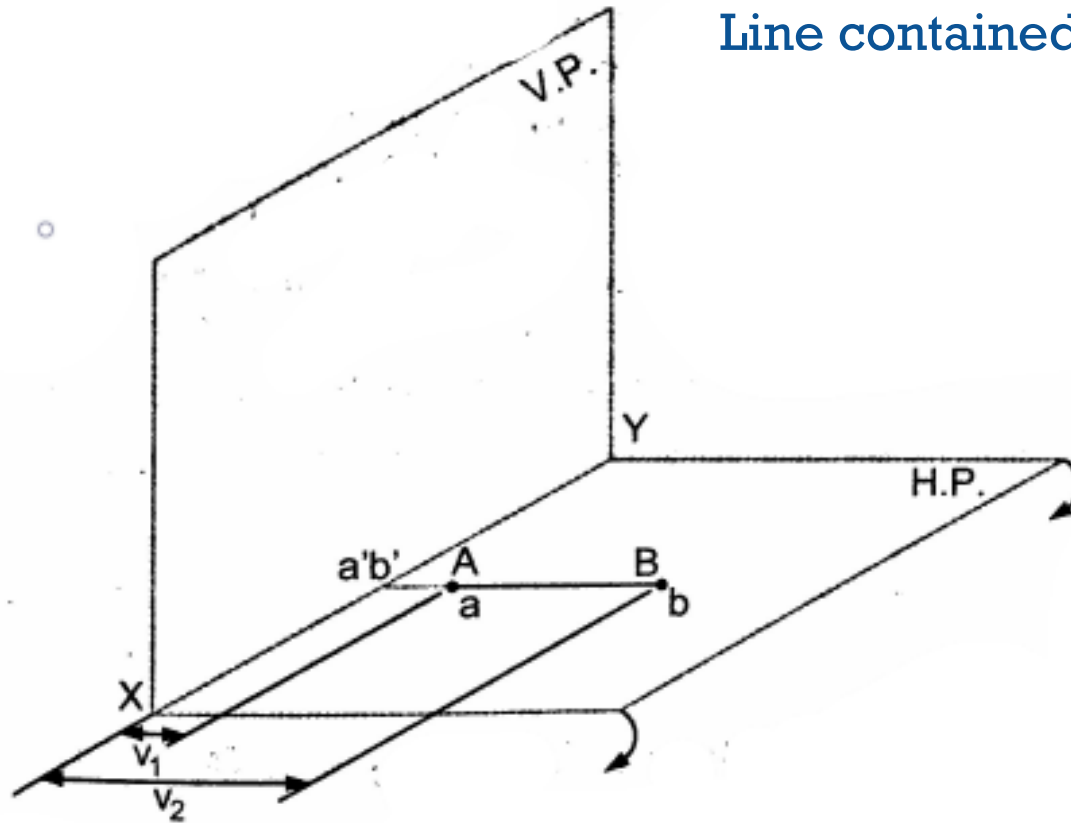
LINE NOT CONTAINED BY ANY PLANE AND PARALLEL TO BOTH PLANES

Line is parallel to both HP and VP



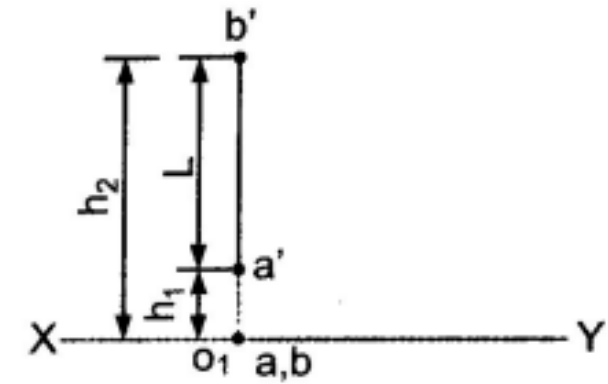
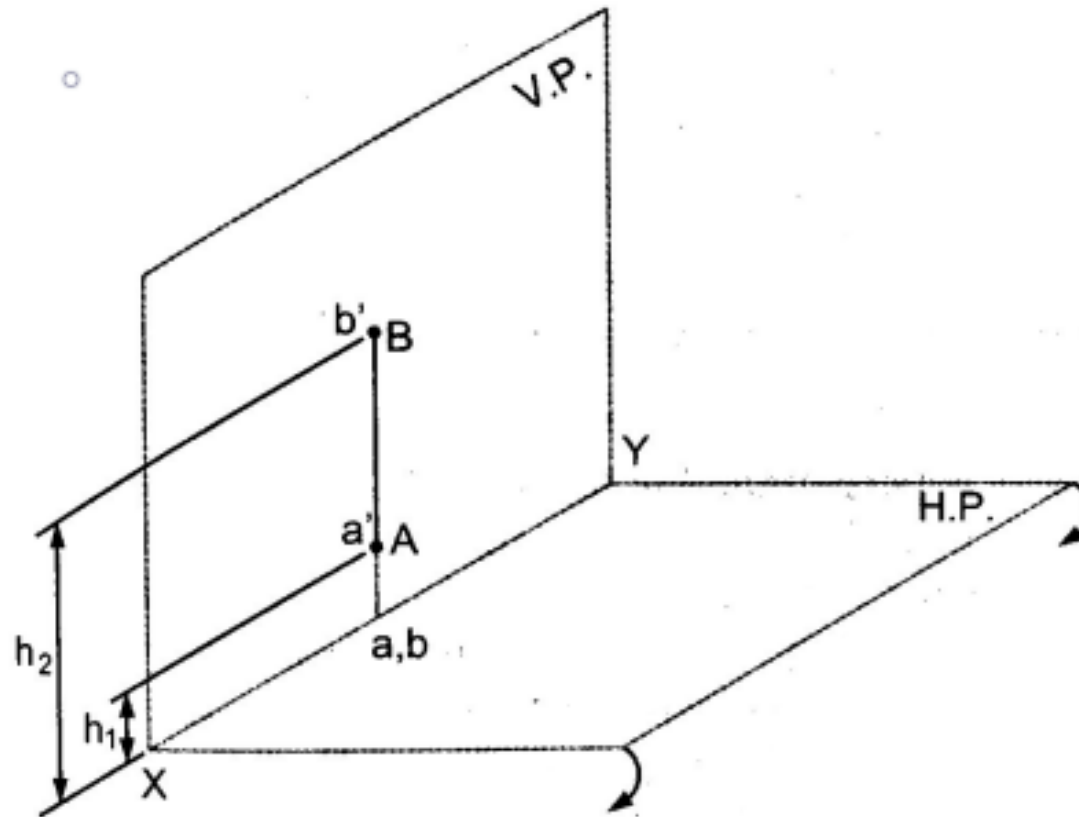
LINE CONTAINED BY ONE OF THE PLANE AND PERPENDICULAR TO OTHER PLANE

Line contained by HP and perpendicular to the VP

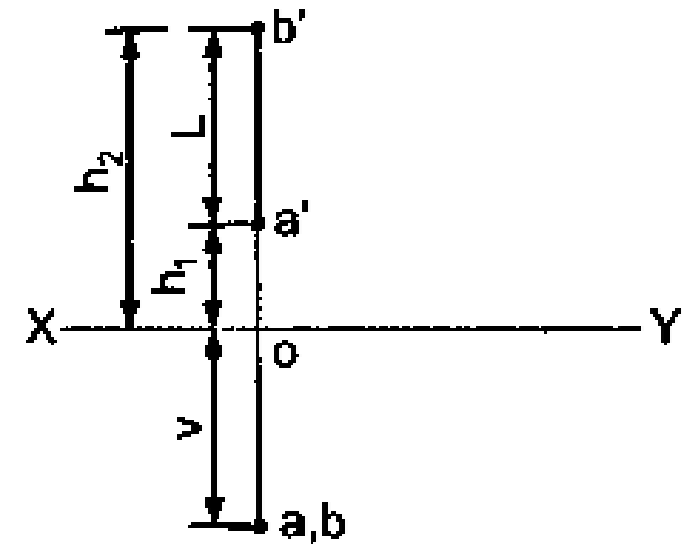
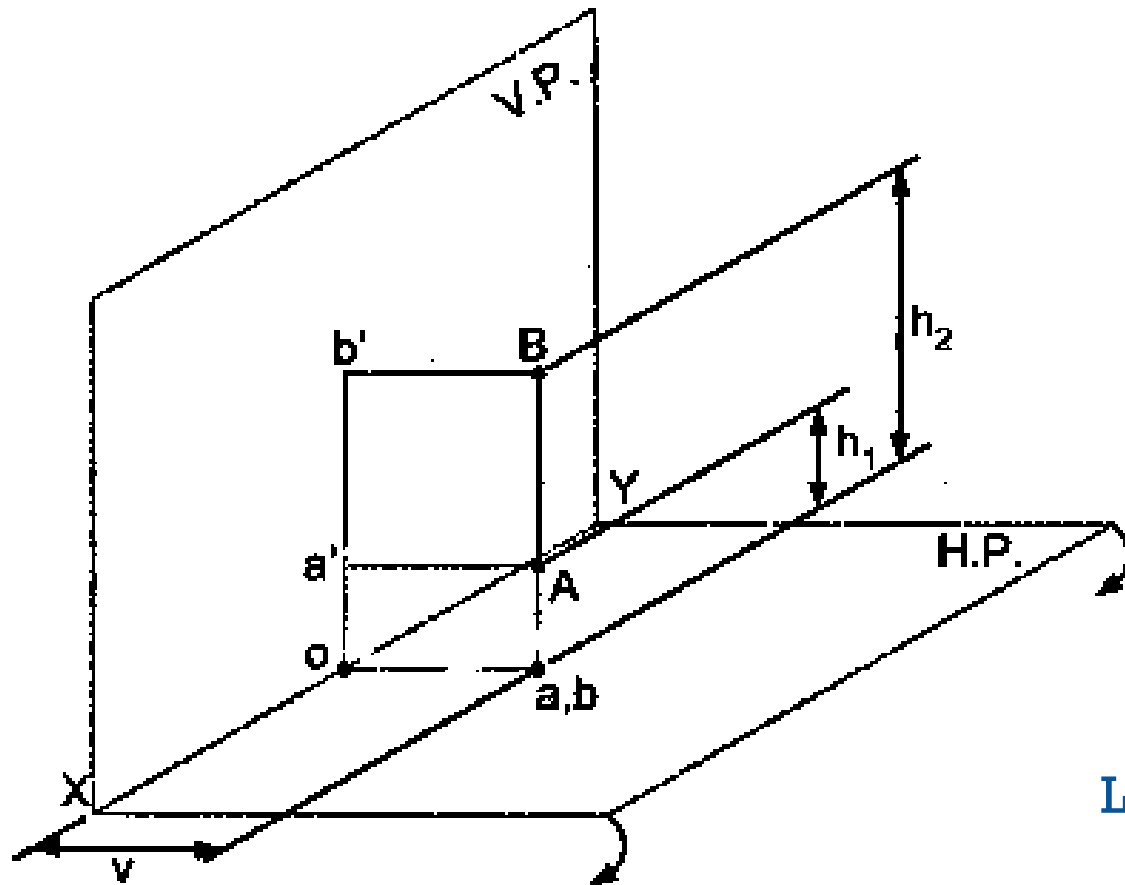


LINE CONTAINED BY ONE OF THE PLANE AND PERPENDICULAR TO OTHER PLANE

Line contained by VP and perpendicular to the HP

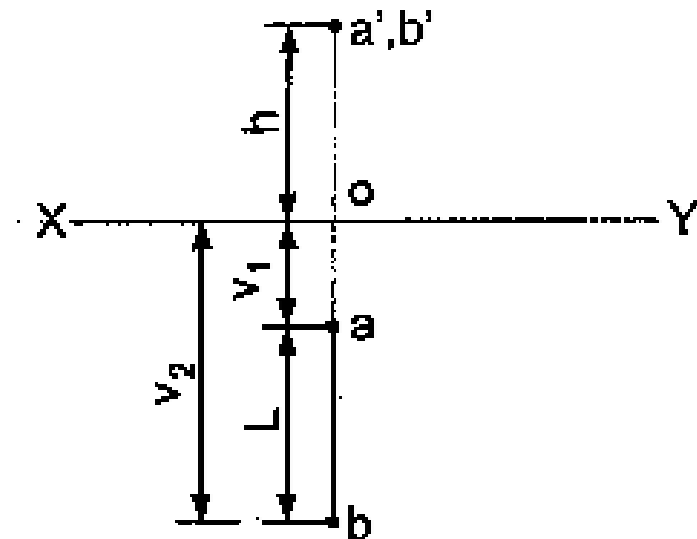
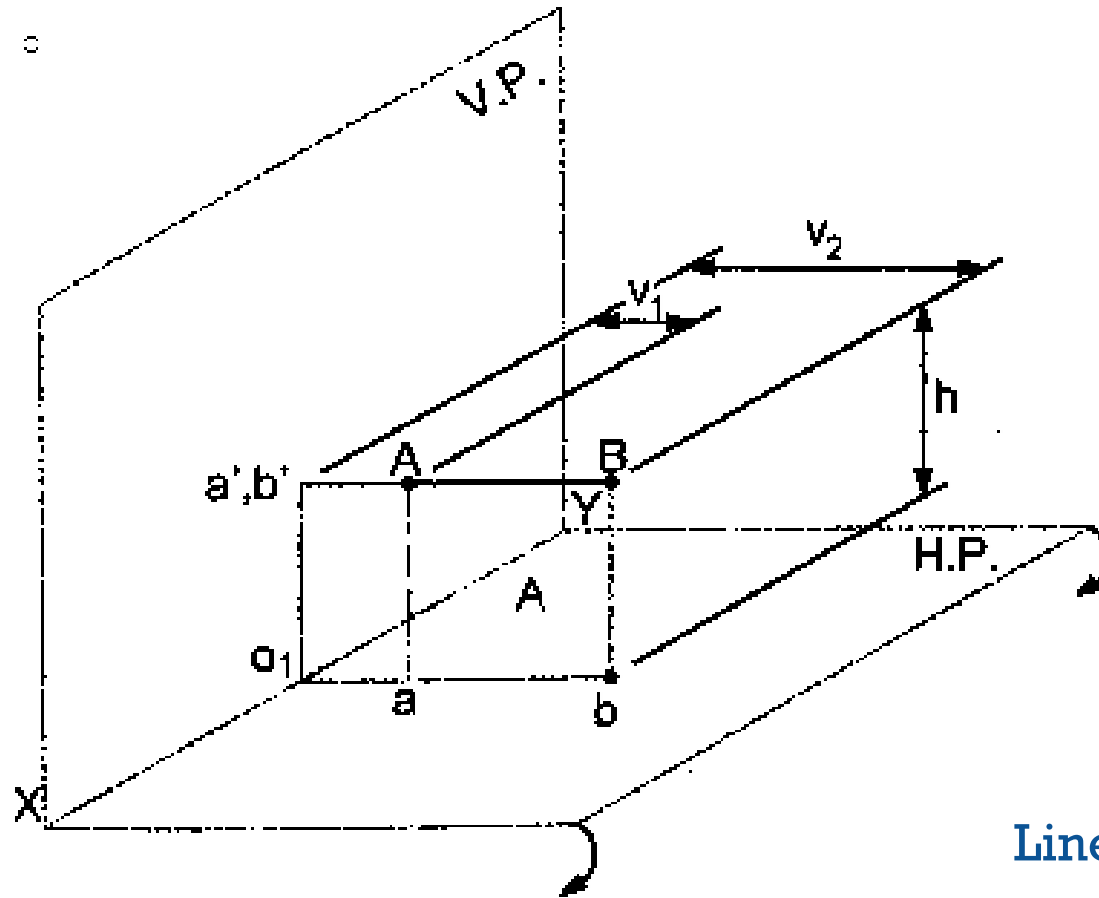


LINE NOT CONTAINED BY ANY PLANE AND PERPENDICULAR TO ONE OF THE PLANES



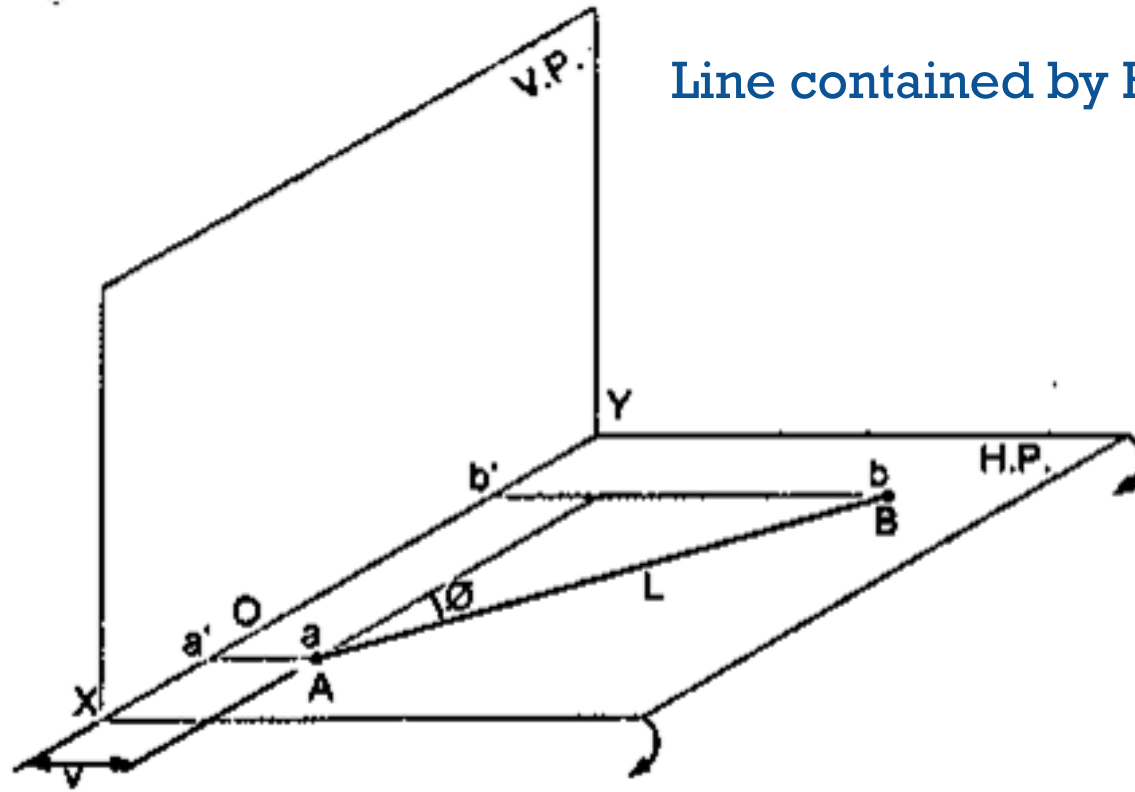
Line is perpendicular to the HP

LINE NOT CONTAINED BY ANY PLANE AND PERPENDICULAR TO ONE OF THE PLANES

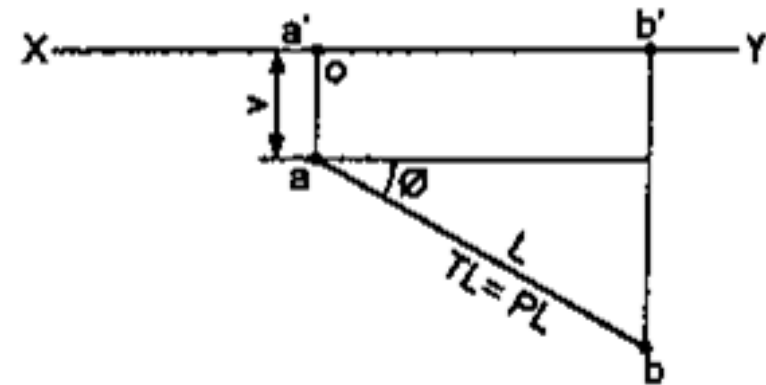


Line is perpendicular to the VP

LINE CONTAINED BY ONE OF PLANES AND INCLINED TO OTHER PLANE

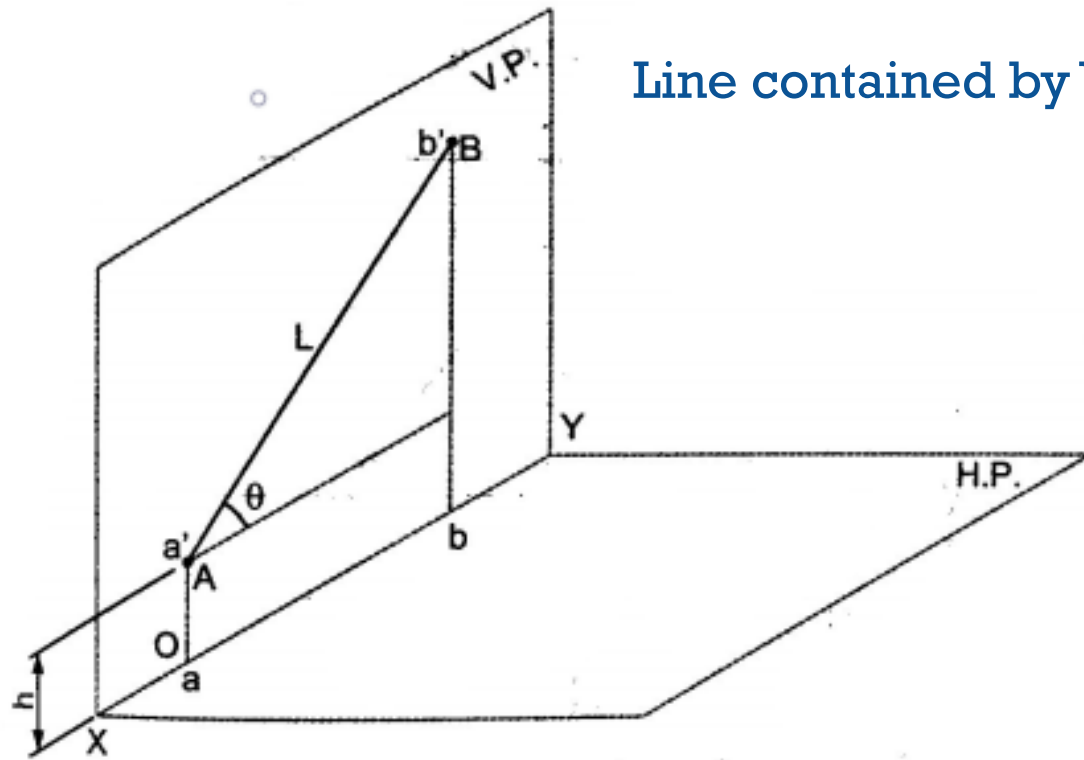


Line contained by HP and inclined to the VP at an angle θ

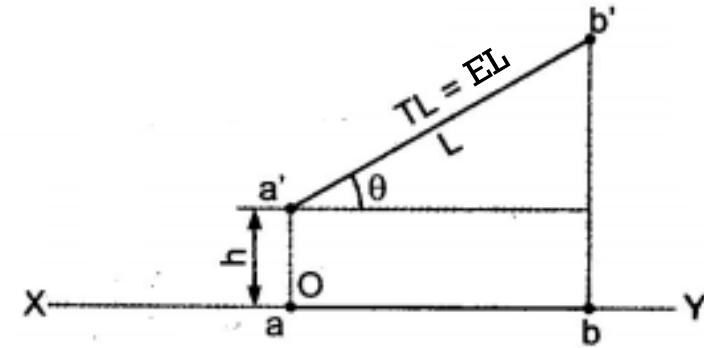


The top view or the plan of the line will be the true length of the line while the front view or elevation of the line will be shorter in the length than the true length of the line.

LINE CONTAINED BY ONE OF PLANES AND INCLINED TO OTHER PLANE



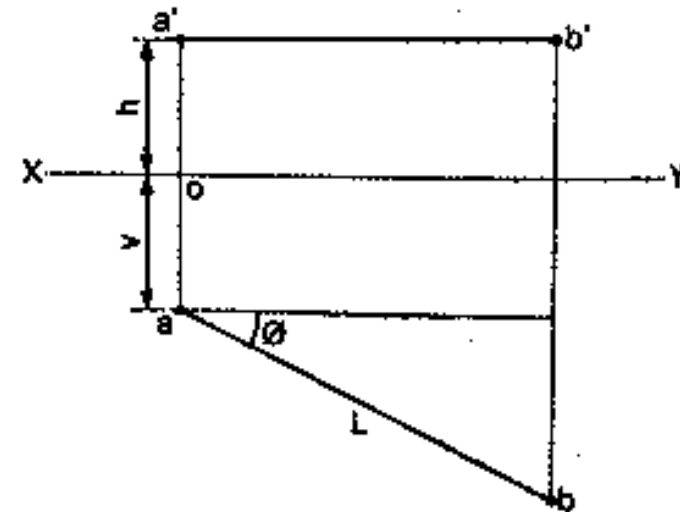
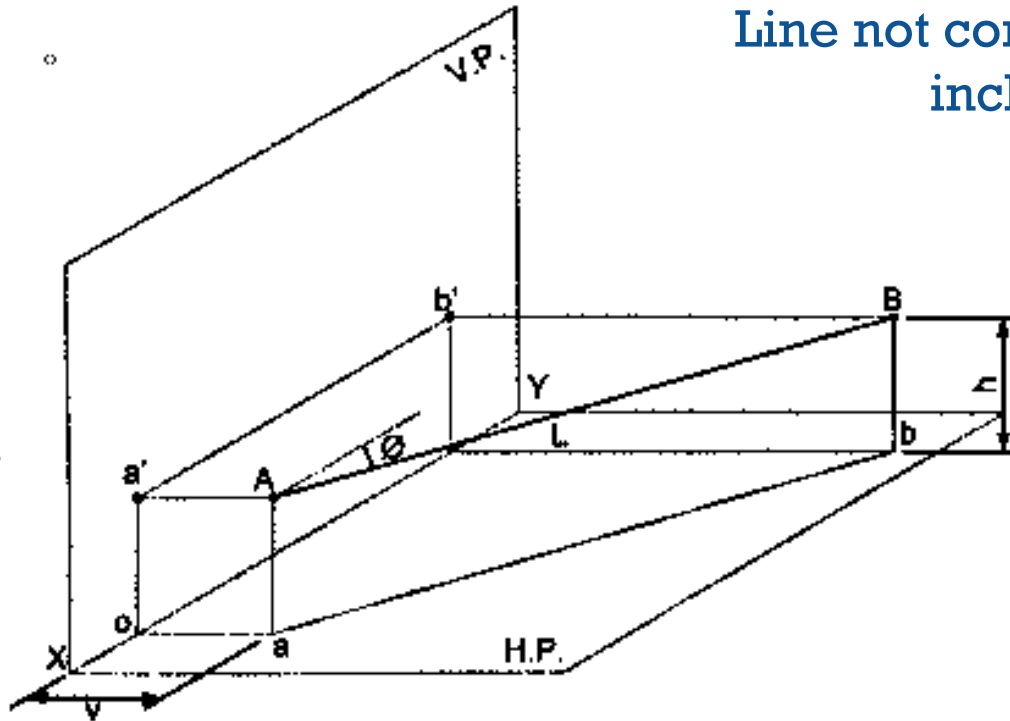
Line contained by VP and inclined to the HP at an angle θ



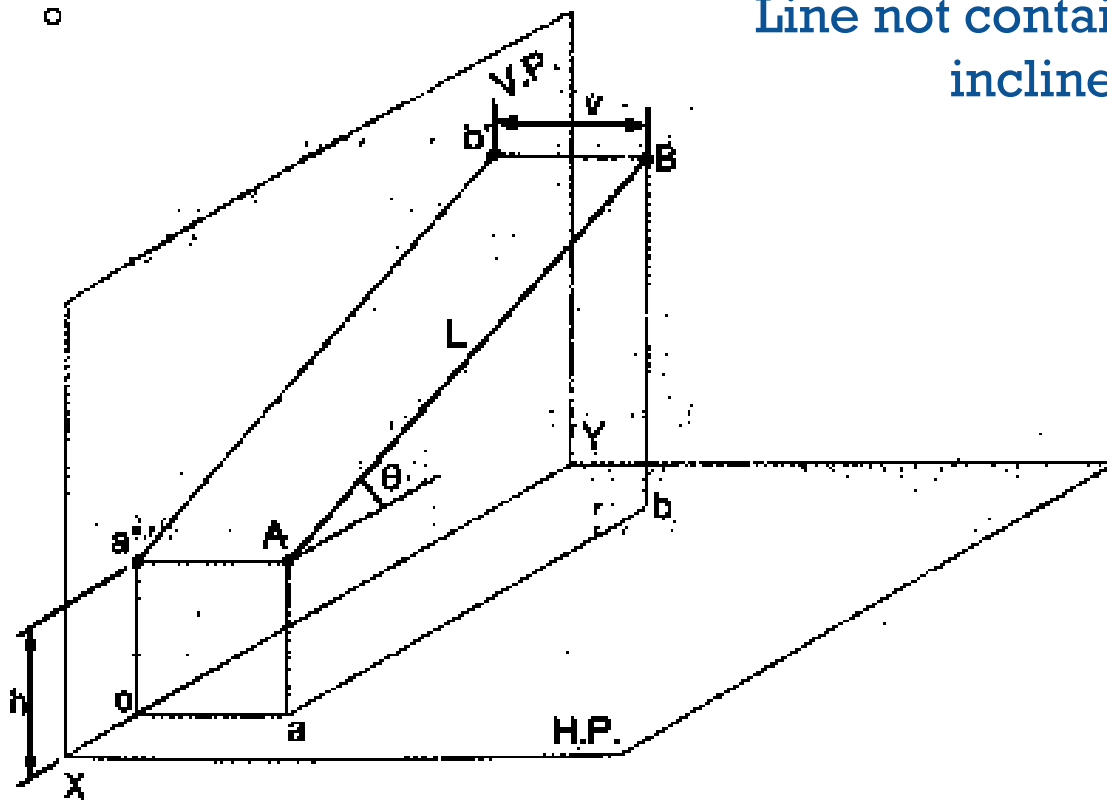
The front view or the elevation of the line will be the true length of the line while the top view or plan of the line will be shorter in the length than the true length of the line.

LINE NOT CONTAINED BY ANY PLANE BUT PARALLEL TO ONE OF THE PLANE AND INCLINED TO THE OTHER PLANE

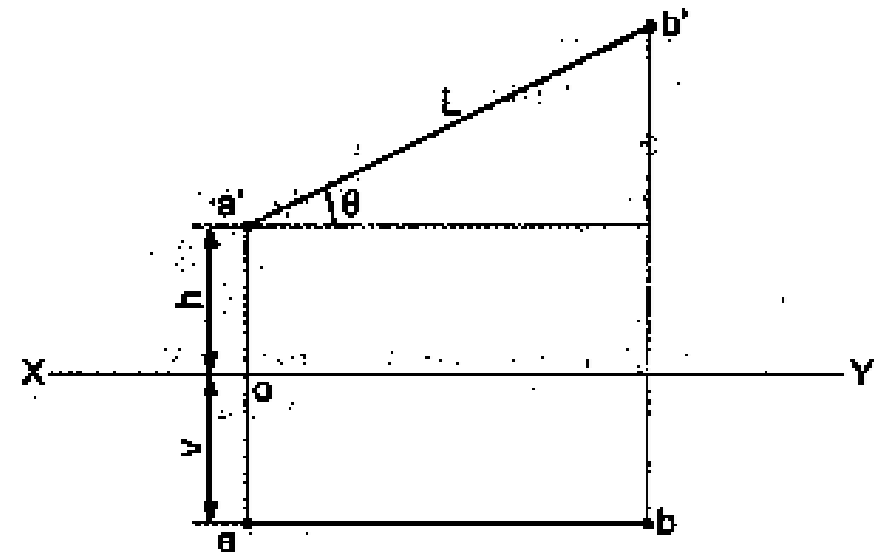
Line not contained by HP, but parallel to HP and
inclined to the VP at an angle θ



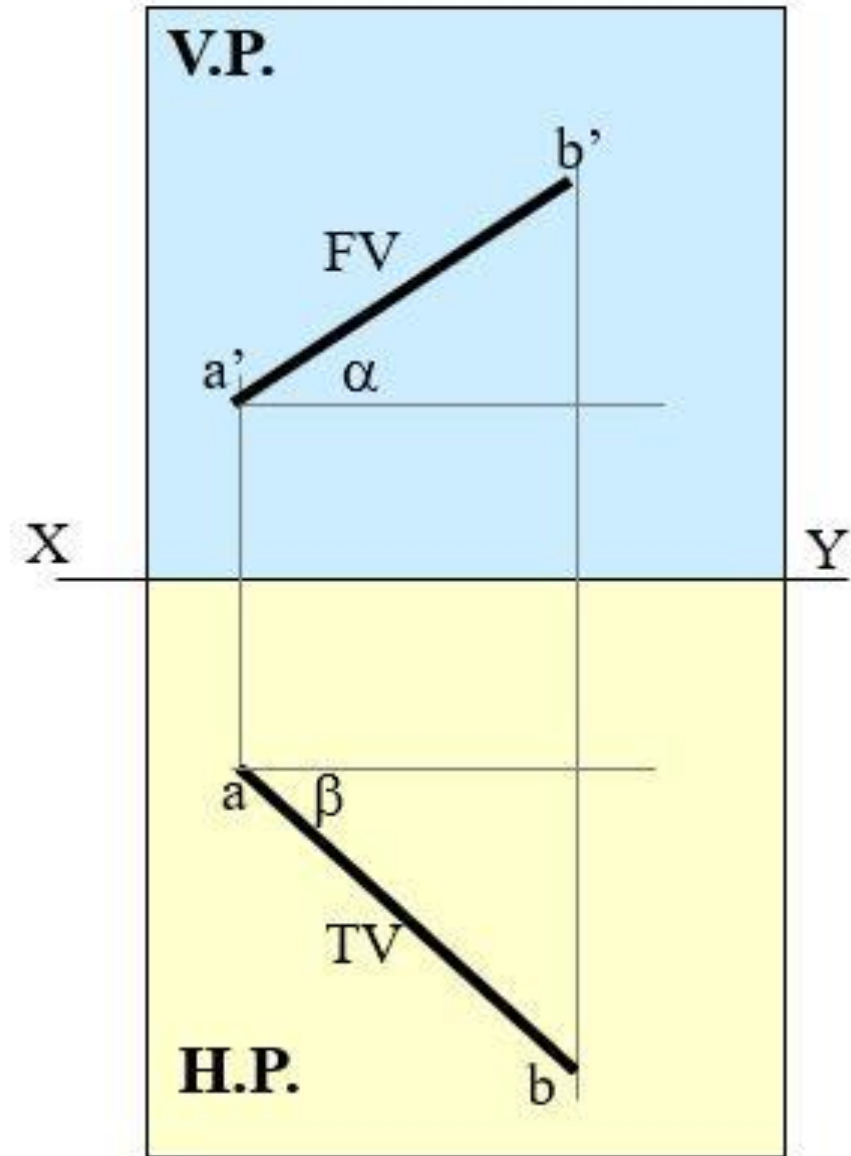
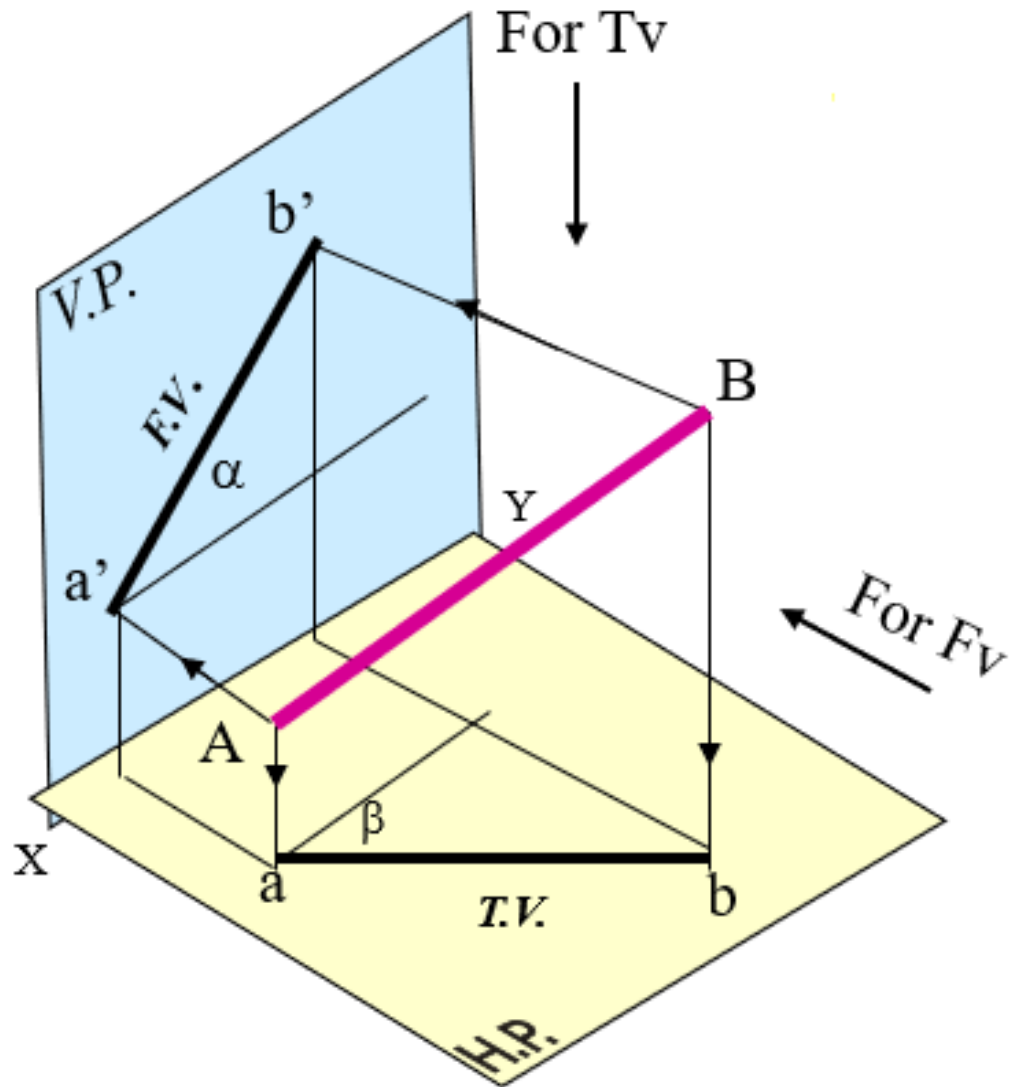
LINE NOT CONTAINED BY ANY PLANE BUT PARALLEL TO ONE OF THE PLANE AND INCLINED TO THE OTHER PLANE



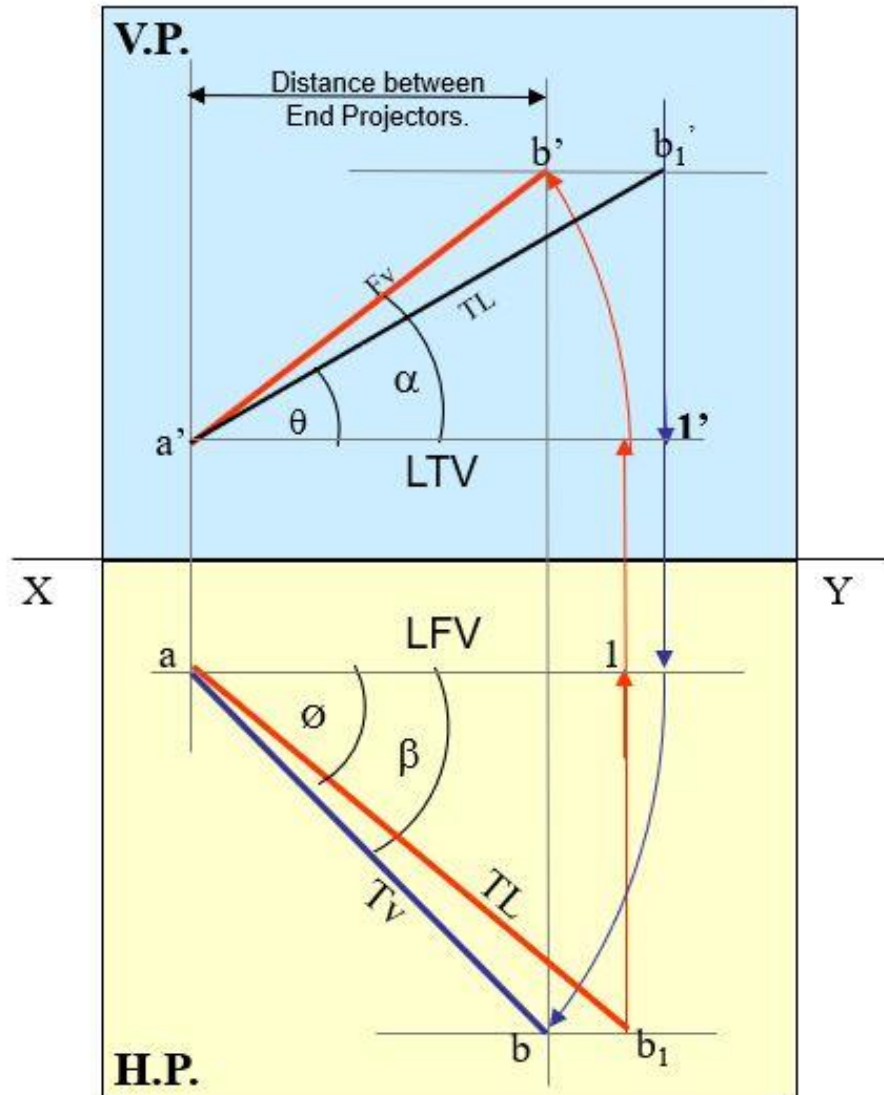
Line not contained by VP, but parallel to VP and inclined to the HP at an angle θ



LINE INCLINED TO BOTH THE PLANES



PROJECTION OF LINE



- True length (TL) – $a'b'l'$ and abl
- Angle of TL with HP – θ
- Angle of TL with VP – ϕ
- Angle of FV with xy – α
- Angle of TV with xy – β
- Elevation length (EL)
- Plan length (PL)
- Position of A
- Position of B
- Distance between End Projectors

IMPORTANT CONCLUSION

- If the line is parallel to the HP the front view or the elevation will be parallel to the reference line xy and if the line is parallel to VP the top view or the plan will be parallel to reference line xy .
- If the front or the elevation is parallel to the reference line xy then the line will be parallel to the HP and if the top view or the plan is parallel to the reference line xy then the line will be parallel to the VP.
- If the projection of the line is parallel to the reference line xy in one view, the length of the projection of the line in other view will equal to the true length of the line. The inclination between the projection line showing the true length and the reference line will be equal to angle of inclination. The true angle are generally denoted by θ and ϕ .
- If the line is parallel to any plane, the projections taken on that plane will give the true length of the line and the true angle of the inclination of the line. The projections taken on the other plane, to which it is inclined, will be shorter in length than the true length.

IMPORTANT CONCLUSION

- When the line is inclined to both the principal planes, it's called the inclined line. such lines are inclined to both HP and VP. The inclination of the line with the HP will be taken as θ and inclination of the line with the VP will be taken as ϕ .
- When the sum of the inclination of the line with the HP and VP is 90° the line will be parallel to or contained by the profile plane, PP (profile plane is the third principal plane).
- When the line is inclined to both plane the length of the line in the front view or in the elevation as well as in the top view or in the plan will be shorter than the actual length of the line. The length of the line in projection which is shorter in length than true length is known as apparent length of the line.
- In case of the inclined line, the line showing the front view of the elevation will be inclined at an angle α with the reference line xy the line showing the top view of the plan will be inclined at an angle β with the reference line xy. The angles α and β are called the apparent angles. The apparent angles will be always greater than or equal to the true angle.

IMPORTANT CONCLUSION

- The projections of the line, the front view or the elevation and the top view or the plan are drawn with thick dark line, while the projectors are drawn with light and thin line. The required dimensions should be given with light and thin lines.
- The distance between the projectors passing through the front view or the elevation points and the top view or the plan points is known as the distance between the end projectors of the line.
- For solving examples, True Length is never rotated. It's horizontal component is drawn & it is further rotated to locate view. And views are always rotated, made horizontal & further extended to locate TL, θ & ϕ .

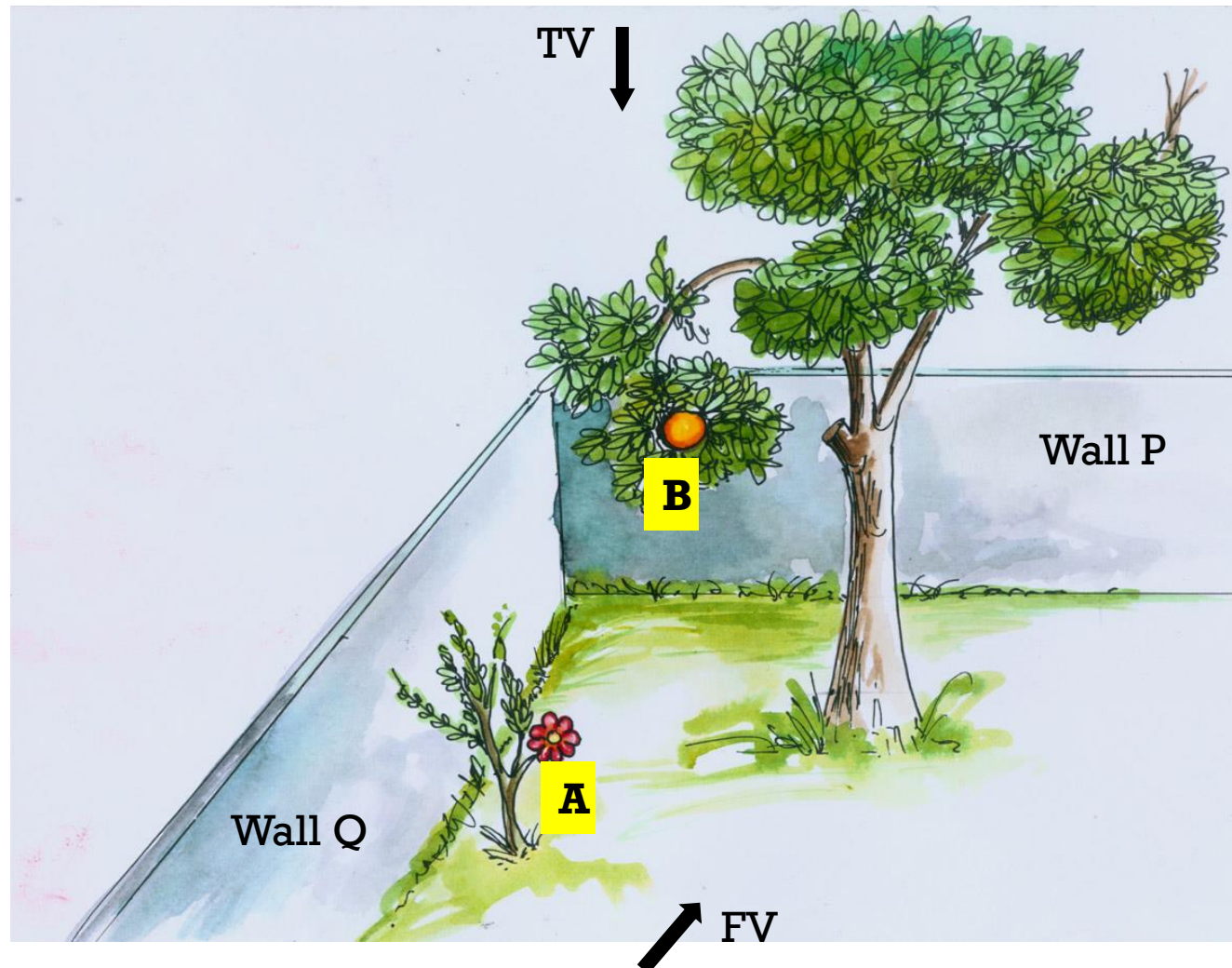
SUMMARY OF PROJECTION OF LINES

Sr. No.	POSITION OF LINE	FRONT VIEW	TOP VIEW
1	Line parallel to both VP and HP	Horizontal line parallel to xy	Horizontal line parallel to xy
2	Line perpendicular to HP and parallel to VP	Vertical line	Point
3	Line perpendicular to VP and parallel to HP	Point	Vertical line
4	Line parallel to HP and inclined to VP	Line parallel to xy with foreshortened length (EL)	Inclined line with true length
5	Line parallel to VP and inclined to HP	Inclined line with true length	Line parallel to xy with foreshortened length (PL)

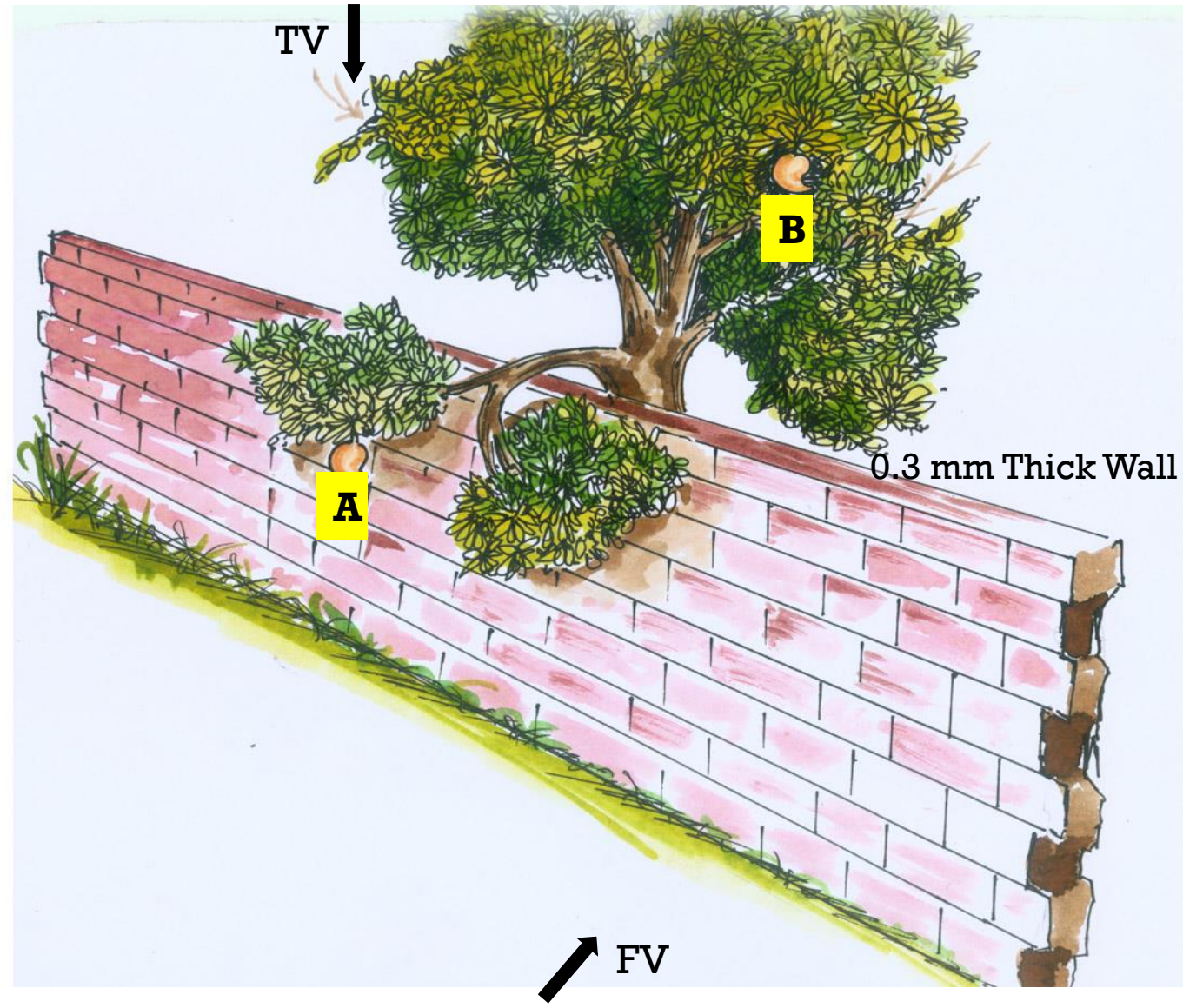
APPLICATION OF PROJECTION OF LINE

- In these types of problems some situation in the field or some object will be described .
- It's relation with Ground (HP) And a Wall or some vertical object (VP) will be given.
- Indirectly information regarding FV & TV of some line or lines, inclined to both reference Planes will be given and you are supposed to draw it's projections and further to determine it's true Length and it's inclinations with ground.

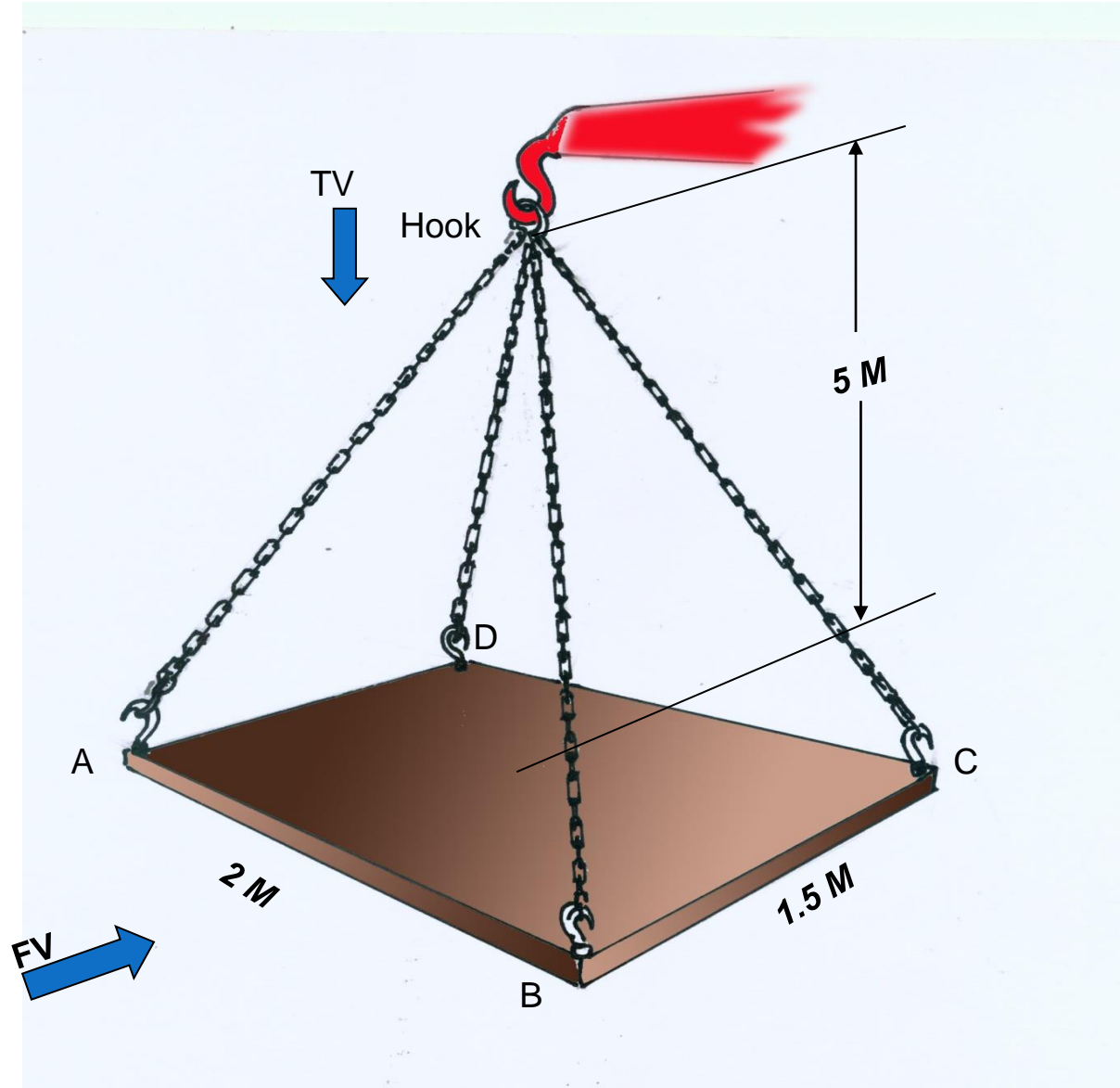
PROBLEM 1: Two objects, a flower (A) and an orange (B) are within a rectangular compound wall, whose P & Q are walls meeting at 90° . Flower A is 1.5 M & 1 M from walls P & Q respectively. Orange B is 3.5 M & 5.5M from walls P & Q respectively. Draw the projection, find distance between them. If flower is 1.5 M and orange is 3.5 M above the ground. Consider suitable scale.



- **PROBLEM 2:** Two mangos on a tree A & B are 1.5 m and 3.0 m above ground and those are 1.2 m & 1.5 m from a 0.3 m thick wall but on opposite sides of it. If the distance measured between them along the ground and parallel to wall is 2.6 m, Then find real distance between them by drawing their projections.



- **PROBLEM 3:** A horizontal wooden platform 2 M long and 1.5 M wide is supported by four chains from its corners and chains are attached to a hook 5 M above the center of the platform. Draw projections of the objects and determine length of each chain along with its inclination with ground.



THANK YOU