Test for Parallelism and Perpendicularity

Cover 4 types of tests for lines:

1. Test for parallelism
2. Test for perpendicularity
3. Test for Intersection
4. Test for perpendicularity to a plane

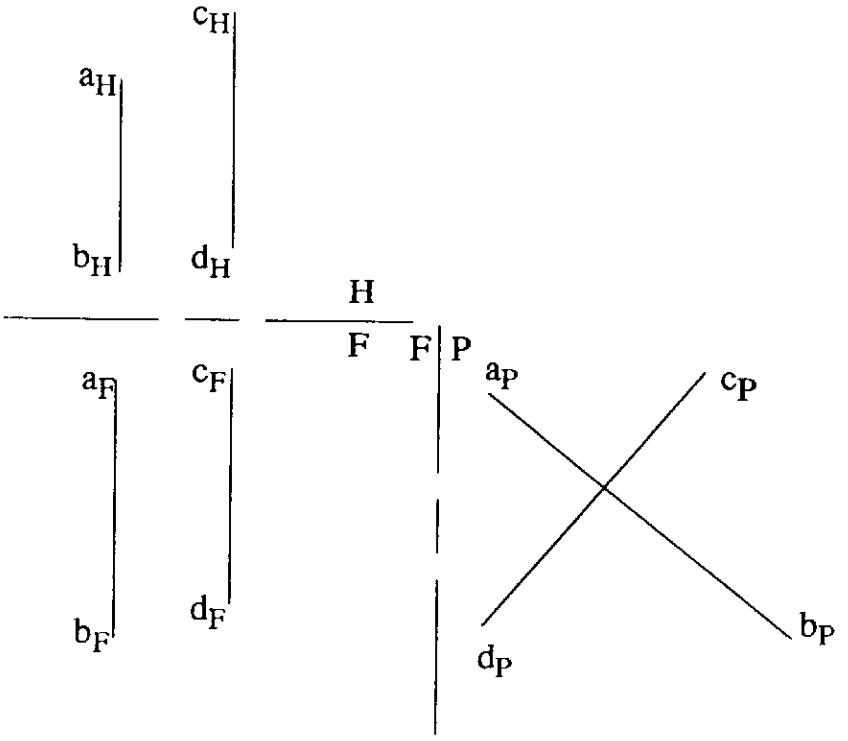
1. Test for parallelism of lines

- Truly parallel lines will remain parallel in all views.

Two cases:

1. Principle lines - must be checked in F, H, and P views.
2. Oblique lines - must checked in two adjacent views.

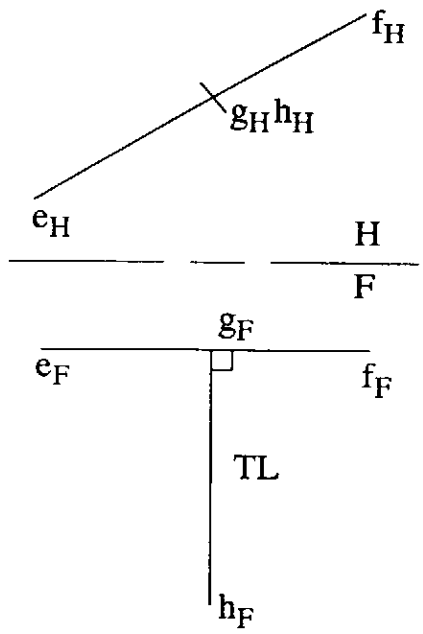
Ex.



2. Test for perpendicularity of lines

- Two line are perpendicular if there is a 90° angle between them **and** at least one line is TL.

Ex.

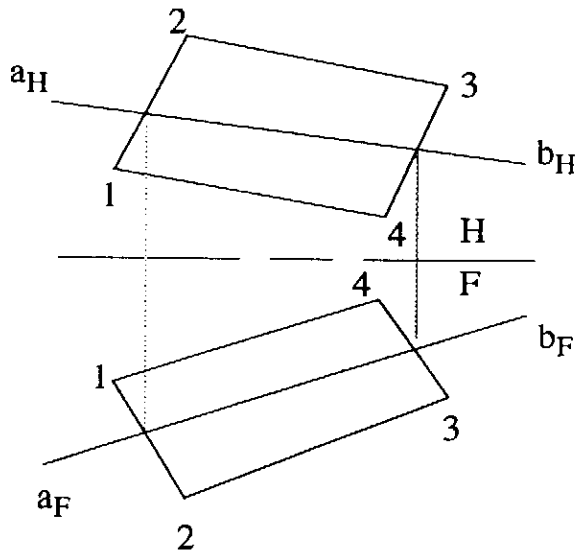


- What if neither line is TL?
  - Construct an auxiliary view to show one line TL. If lines are 90° apart in the auxiliary view they are perpendicular.

3. Test for intersection of lines

- The point of intersection of 2 lines must stay aligned in all views.

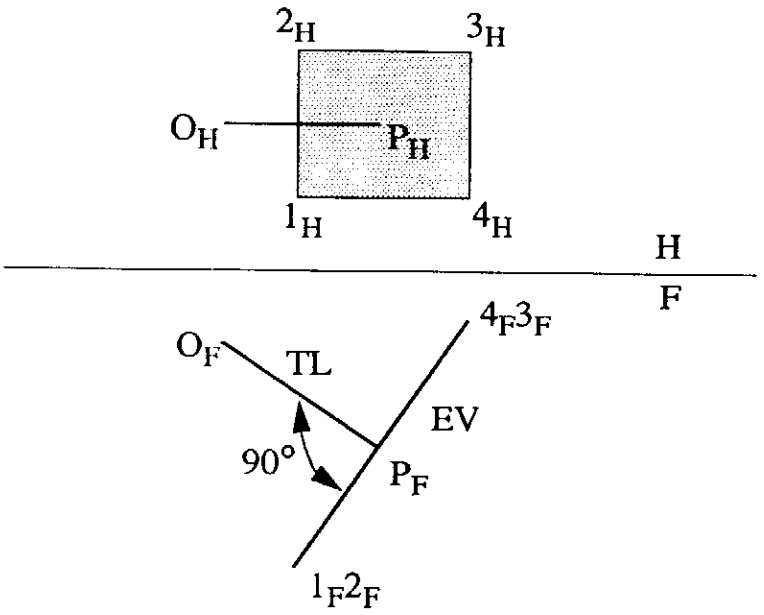
Using this, how do we test if a line is in a plane?



- Check to see that intersection point are in alignment in any 2 views.

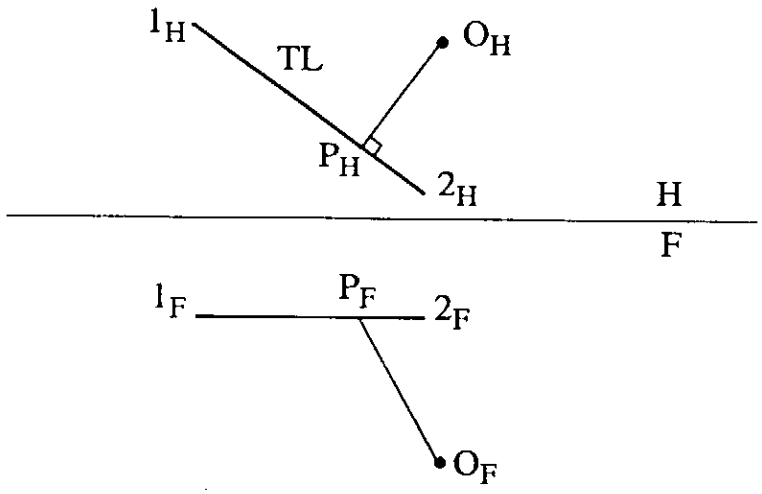
4. Test for line perpendicular to a Plane

- To prove, we need a TL line at 90° to the EV of a plane.
- Note: the **true angle** between a line and a plane shows in the view where the plane is EV and the line is TL.



Shortest Distance from a point to a line

- Shortest distance from a point to a line is a perpendicular from the TL view of the line to the point.



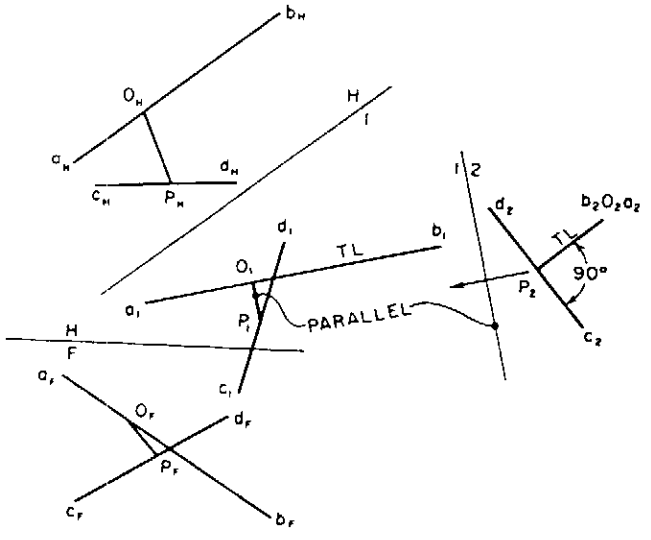
- May need to generate the TL view of the line before constructing the perpendicular to the point.
- To measure shortest distance, must construct a TL view of the OP line (i.e. a TL view of the perpendicular connector)

Shortest Distance from a line to a line

- Concerned with **skew** lines (lines that do not intersect and are not parallel)
- The shortest distance between two skew lines is the connector that is perpendicular to each line.
- This connector shows TL when on of the original lines is shown PV

Steps in finding the shortest connector:

1. Make one of the skew lines TL (need auxiliary view)
2. Make TL skew line PV (need second auxiliary view)
3. Draw perpendicular connector between PV skew line and the other line (which has been carried into the two auxiliary views)
   - This connector will show TL since one of the skew line is PV.
4. Project the connector back into the other views.



Exercises: #72, #74

Constructing a Line Perpendicular to a Plane

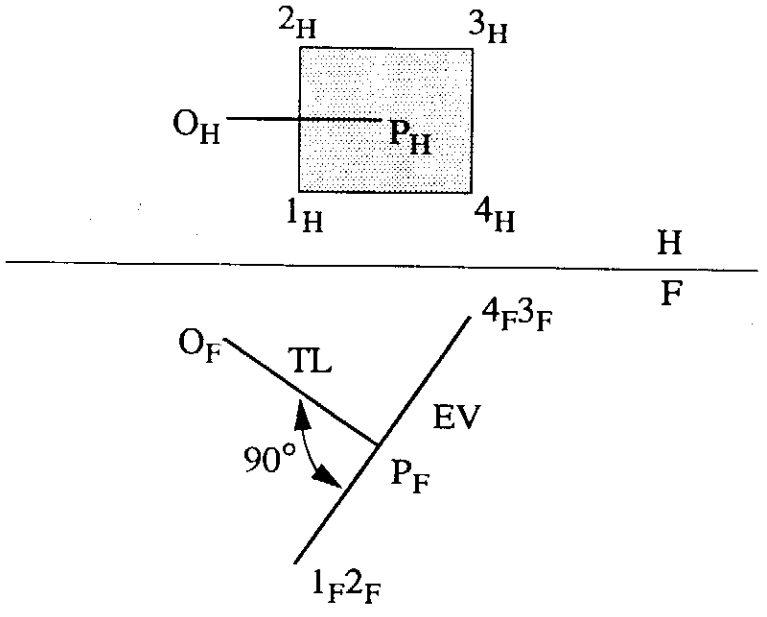
1. Constructing a Perpendicular to a plane
2. Visibility of line and plane w.r.t. each other.

From last class:

The **true angle** between a line and a plane shows in the **view** where:

j) the **plane is EV**

k) and the **line is TL.**



Question: How do we construct a line that is perpendicular to a given plane?

Steps in the Construction:

Given: a point O and principle projections of the plane

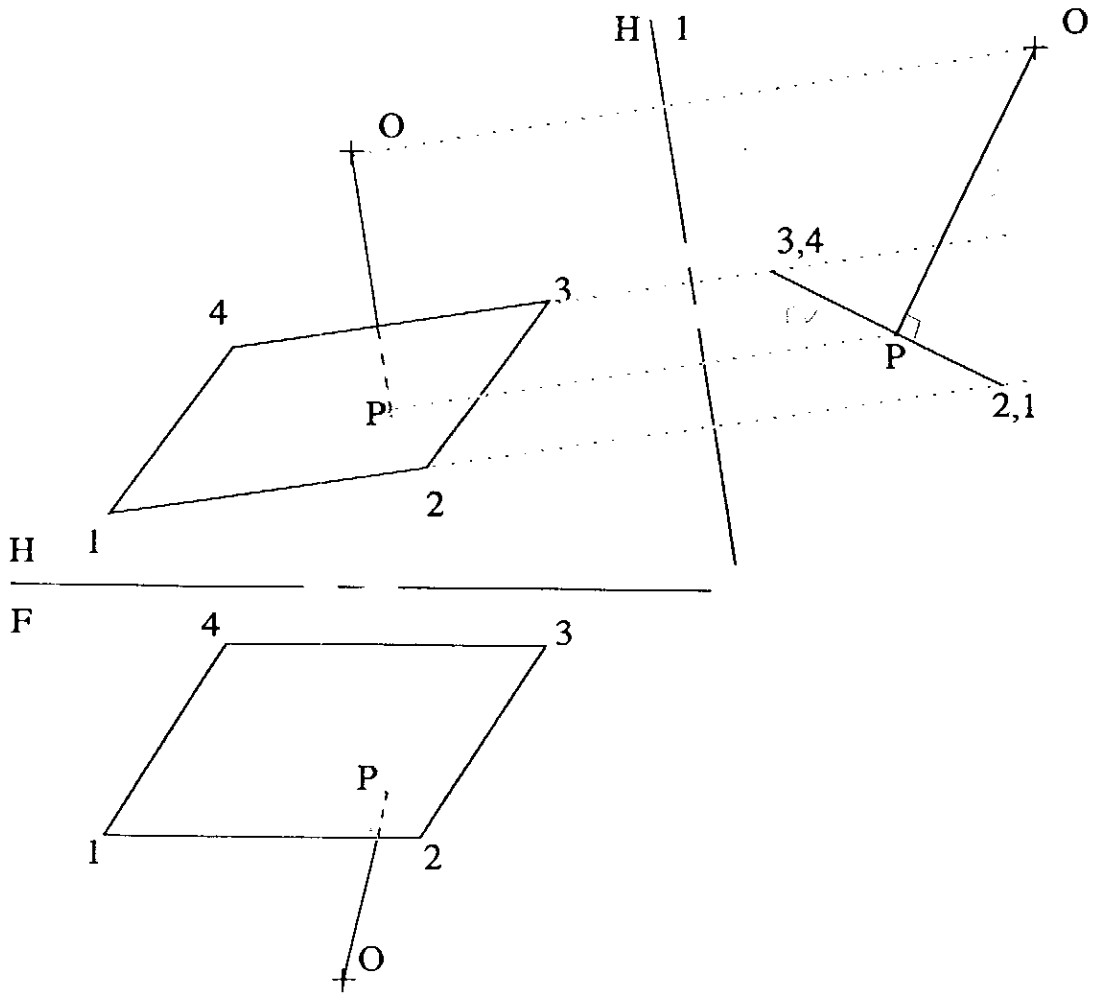
1. Construct an auxiliary view to get the plane in edge view (EV)
2. Transfer point O to the auxiliary view
3. Draw a perpendicular from point O to the EV of the plane

Ques.: Why is the perpendicular TL in the auxiliary view?

4. Project point P back into the H view

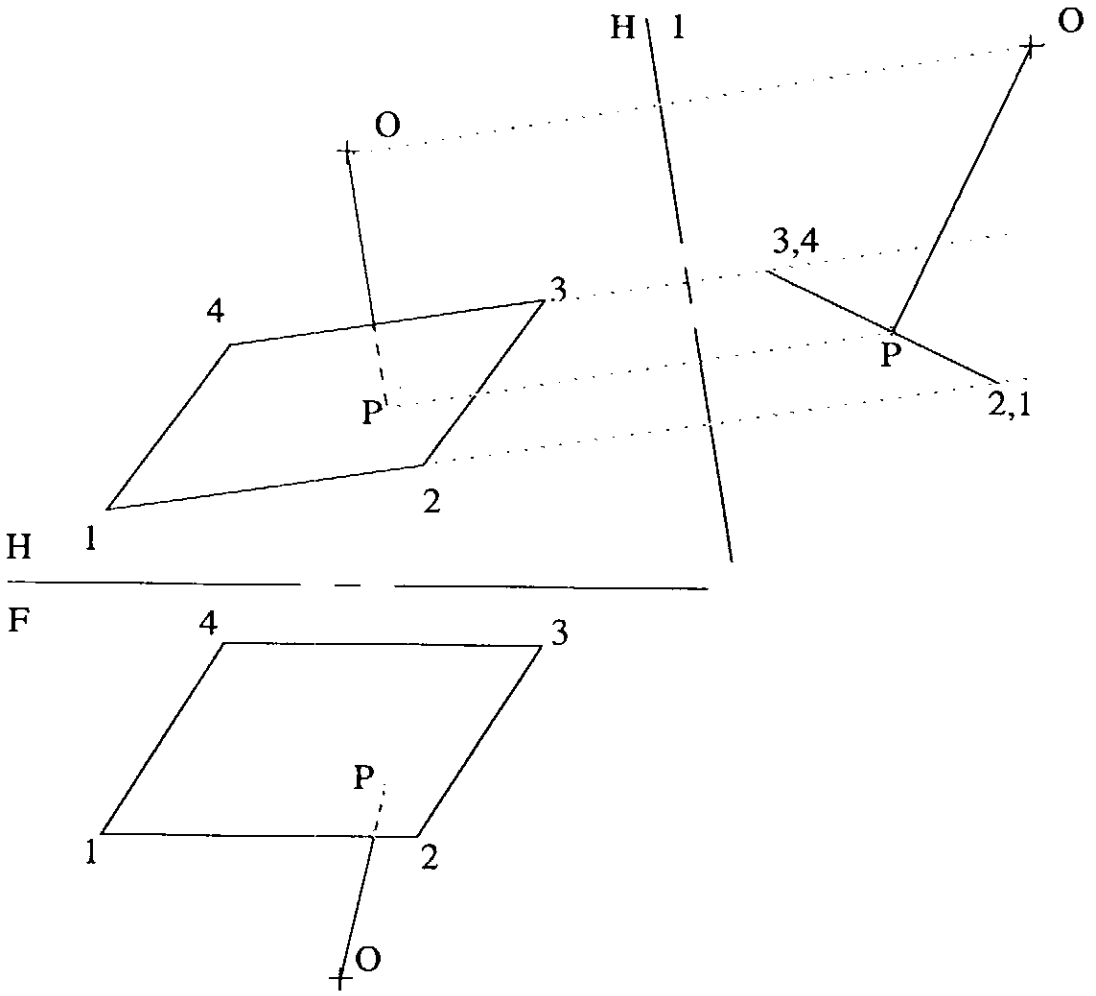
Ques.: In the H view, the OP line will be parallel to the H1 fold line. Why?

5. We must now determine the visibility of the line w.r.t. the plane.



Visibility:

1. In one view find the intersection point of the two lines.
2. Project the intersection point into and adjacent view and determine which line is seen first.
3. The line that is seen first will be visible in the starting view.

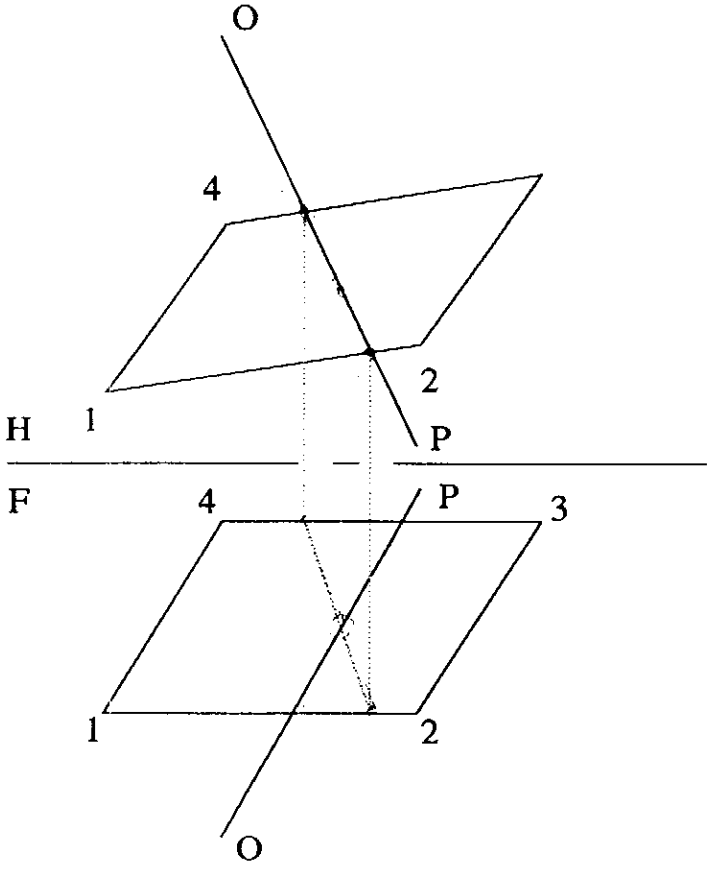


Cutting Plane Method:

- Method for determining instructions point **without** generating an edge view.

Steps in finding intersection point between line and plane using cutting plane method:

1. Locate the crossing points between the line and plane in one of the views.
2. Project these crossing points into the adjacent view.
3. Draw a line connecting these two projected crossing points.
4. The intersection of this new line and the original line is the point where the line and the plane intersect.
5. Project this intersection point back into the original view.



Exercises: #73, handout (angle between line and plane)