ENGINEERING DRAWING Lecture 5
DESCRIPTIVE GEOMETRY

What is Descriptive Geometry?" Very briefly, Descriptive Geometry is the graphical solution of point, line and plane problems in space. These solutions are accomplished by means of the same principles of orthographic drawing which are involved in making a simple three-view drawing of an object. Descriptive Geometry is the graphical solution of the more advanced problems of Engineering Drawing; and both phases utilize the principles of orthographic drawing.

Definitions:

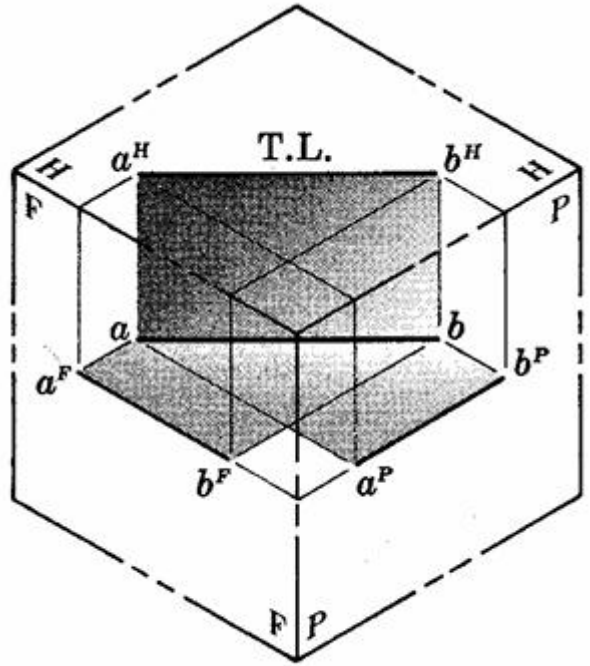
The following terms are used repeatedly throughout and therefore a thorough understanding of their meaning is imperative for the proper study of Descriptive Geometry.

1-Line - the path of a moving point.

2-Straight Line - the path of a moving point proceeding constantly in the same direction.

A line having a definite length is determined by its extremities. However, any two points on the line may be chosen for the purpose of locating the entire line in another view. The end view of a line is a point which represents all points on the line.

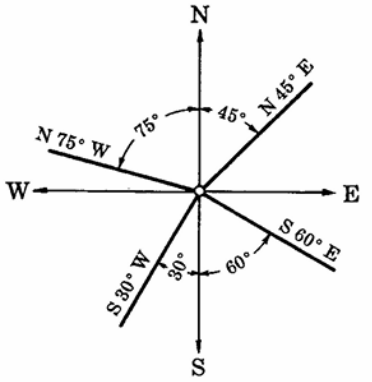
3-Level Line - a line which is parallel to the horizontal image plane and which therefore has all points on the line at the same elevation. It will appear in its true length in the plan view.



(a) Level Line

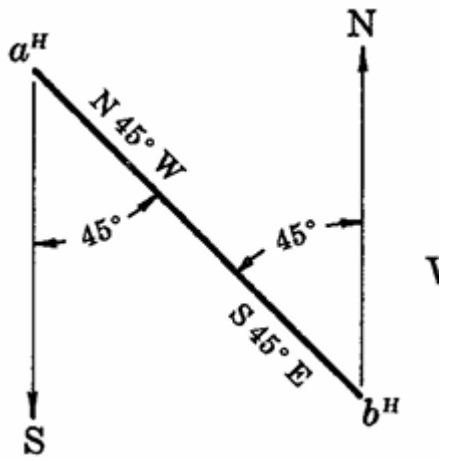
4- Folding line or Reference Plane Line - the line made by the intersection of two image planes. It is designated as a long line, two short dashes and then another long line.

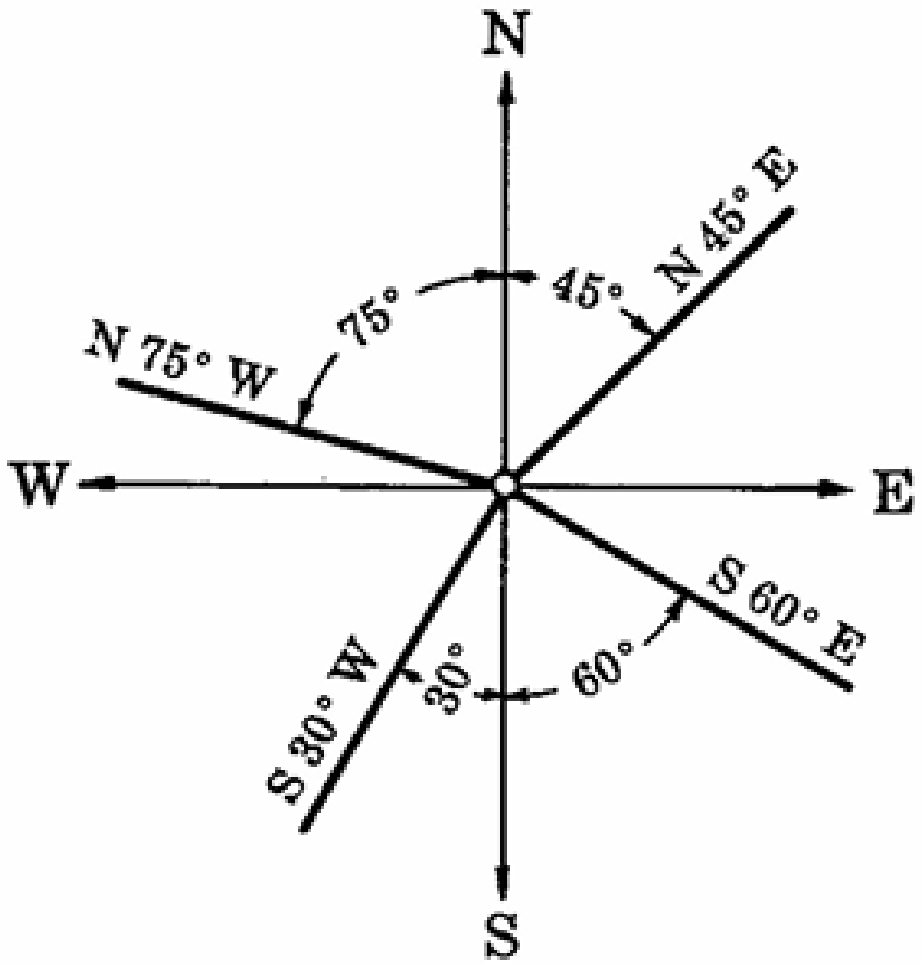
5 - Inclined View - any orthographic view for which the lines of sight are neither horizontal nor vertical. It may be projected from an elevation view or other inclined views, but never from a plan view

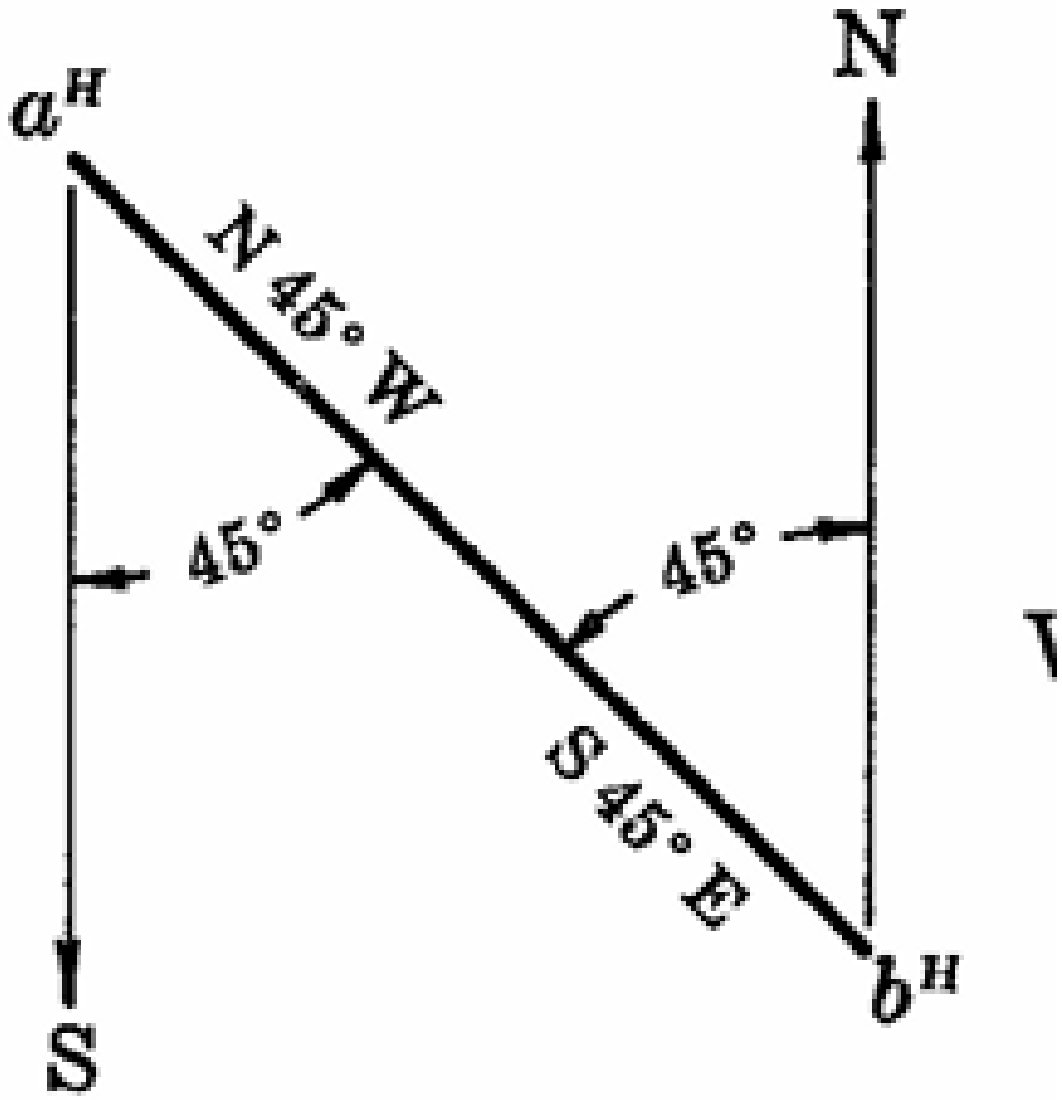


6 - Bearing - the angle between the plan view of a line and a line running due north and south. North is always asumed to be at the top of the drawing

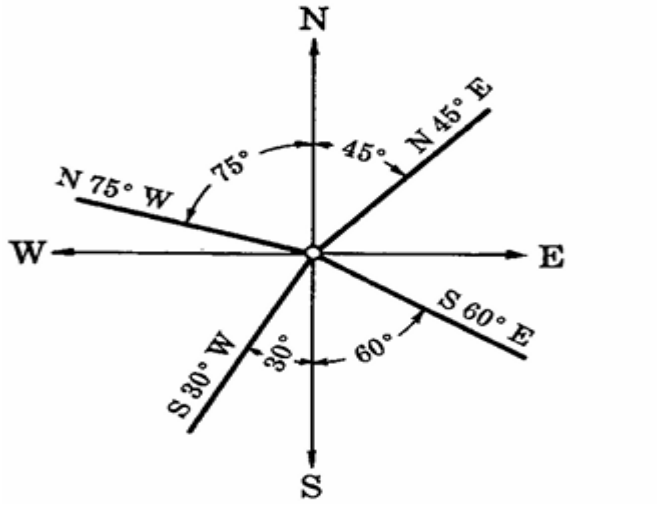
In Fig. the line AB has a bearing of S 45° E. This means that the line is located 45° east of the south line. If the bearing is taken from B to A, then it would be expressed as N 45° W.




N
W
E
S
N 75° W
75°
45°
N 45° E
S 30° W
30°
60°
S 60° E

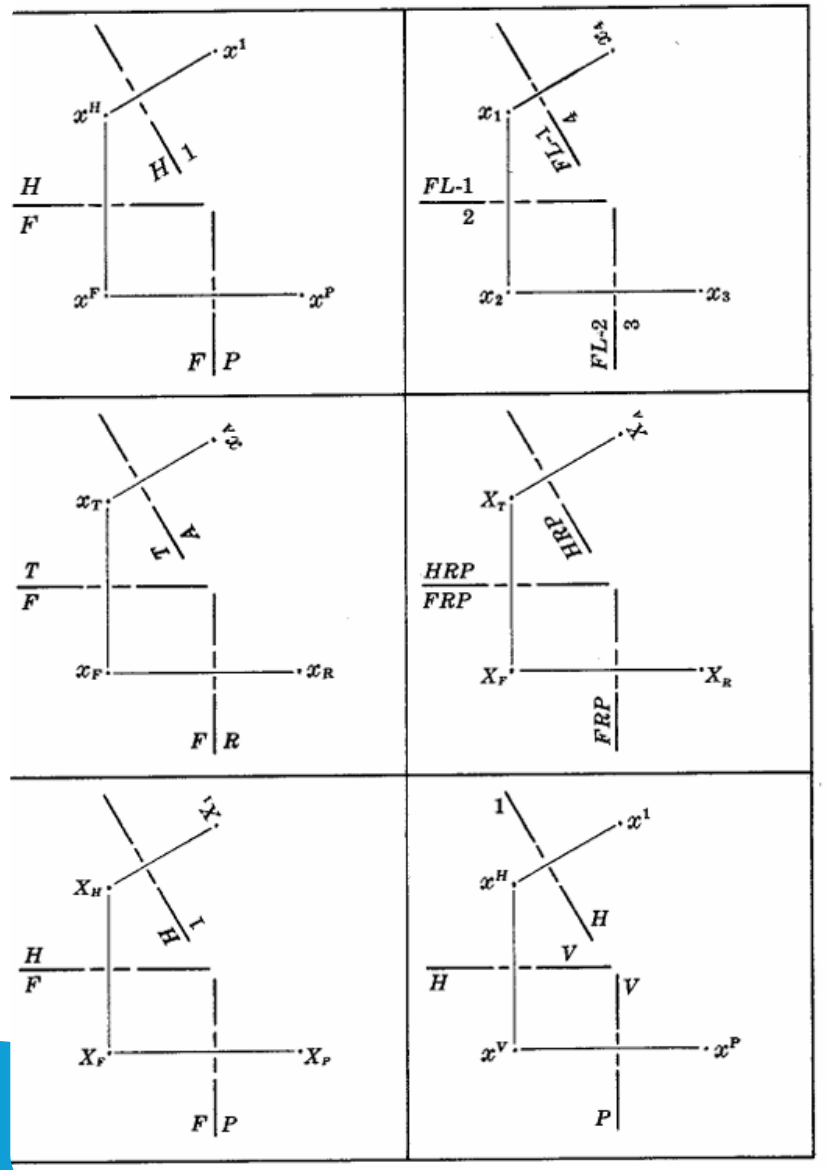

N
S
a H
b H
N 45° W
S 45° E
45°
45°

The bearing can only be found on the plan view, and furthermore, it is not affected in any way by the fact that the line may be level or inclined. Fig. shows some sample bearings.



7 - Normal View of a Line or Plane -the view which shows the true length of the line or the true size of the plane. A normal view of a plane shows the true size of any angle on the plane and the true length of any line which lies on the plane.

8 - **Slope of a Line - tangent of the angle that the line makes with a horizontal plane. Two conditions must be met in order to determine the slope of a line. First, the line must be shown in an elevation view; secondly, the line must appear in its true length in this elevation view. Note: An inclined view may show the true length of a line but it cannot show the true slope of the line because a horizontal plane does not appear as an edge in an inclined view.**



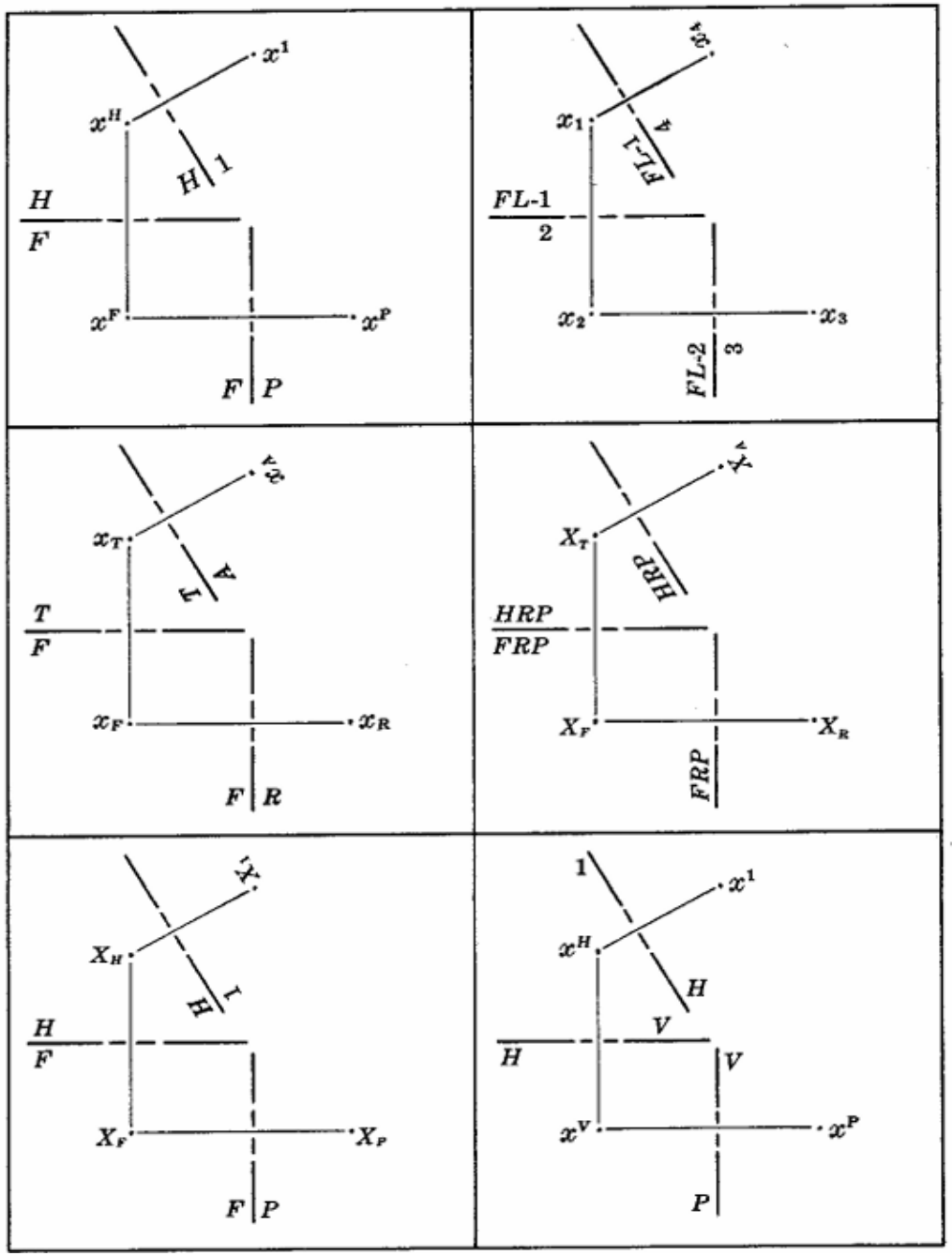
Notation:

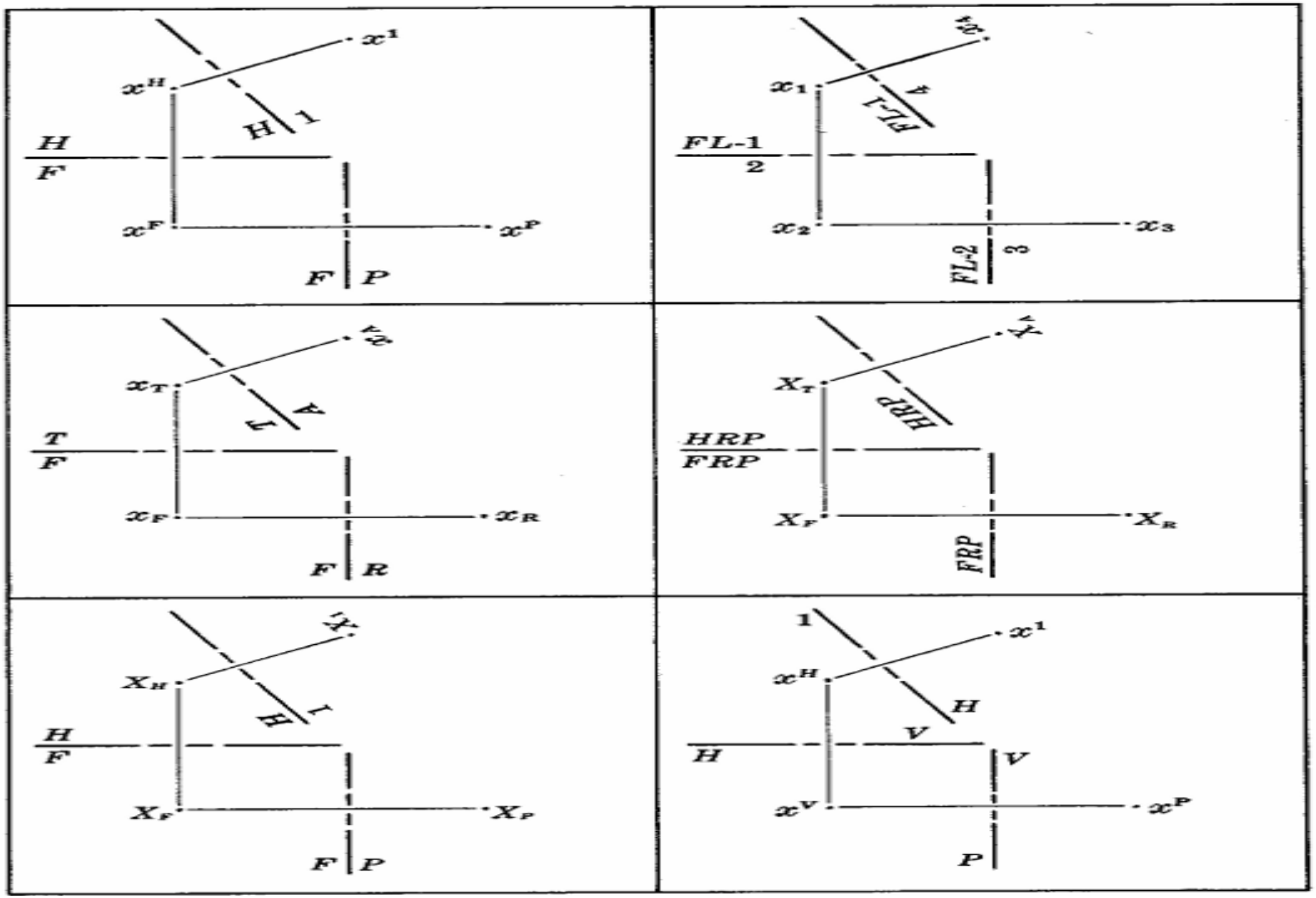
The Fig. shows several notation methods which are recommended .However, even though the notation systems may vary, the methods of problem solving are all based on the same basic principles.

the horizontal and frontal image planes are designated by placing the letter H on the side which shows the plan view, and the

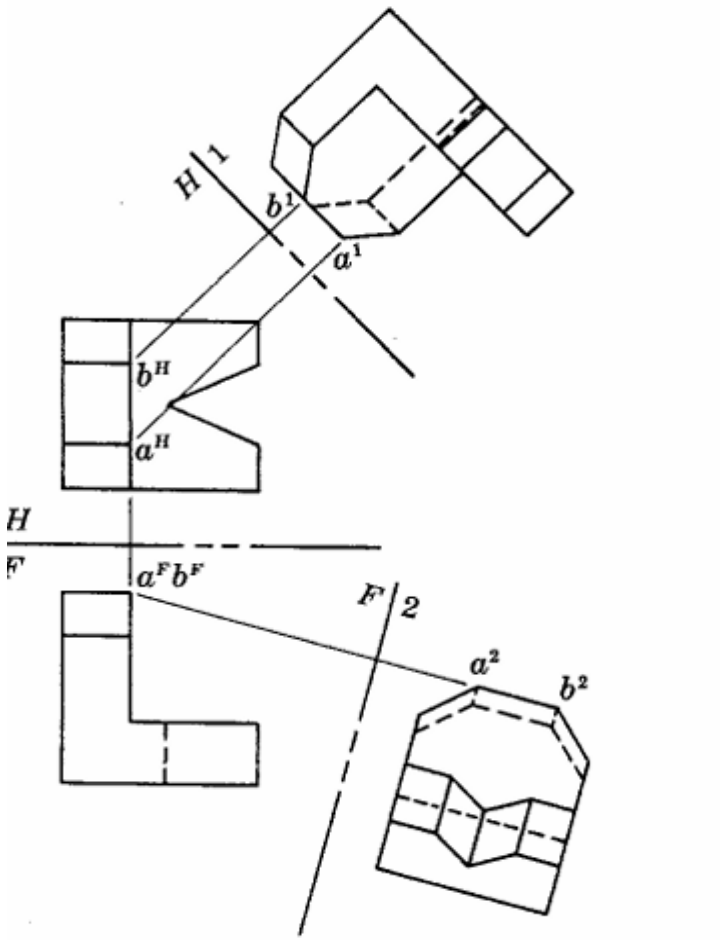
Letter F is placed on the side which gives us the front view.

Similarly, the intersection of the plan and profile views is designated by placing the letter H on the plan side of the reference line and the letter P is located on the profile side of the intersection. If the profile view is projected from the front view, then the letter F is placed on the frontal plane side of the intersection line, and the letter P would be located on the profile side




x^1
x^H
H 1
H
F
x^F
x^P
F P
x_4
x_1
FL-1 4
FL-1
2
x_2
x_3
FL-2
3
x_R
x_T
T
F
x_F
x_R
F R
X_4
X_T
HRP
HRP
FRP
X_F
X_R
FRP
X_1
X_H
H 1
H
F
X_F
X_P
F P
1
x^1
x^H
H
V
H
V
x^V
x^P
P

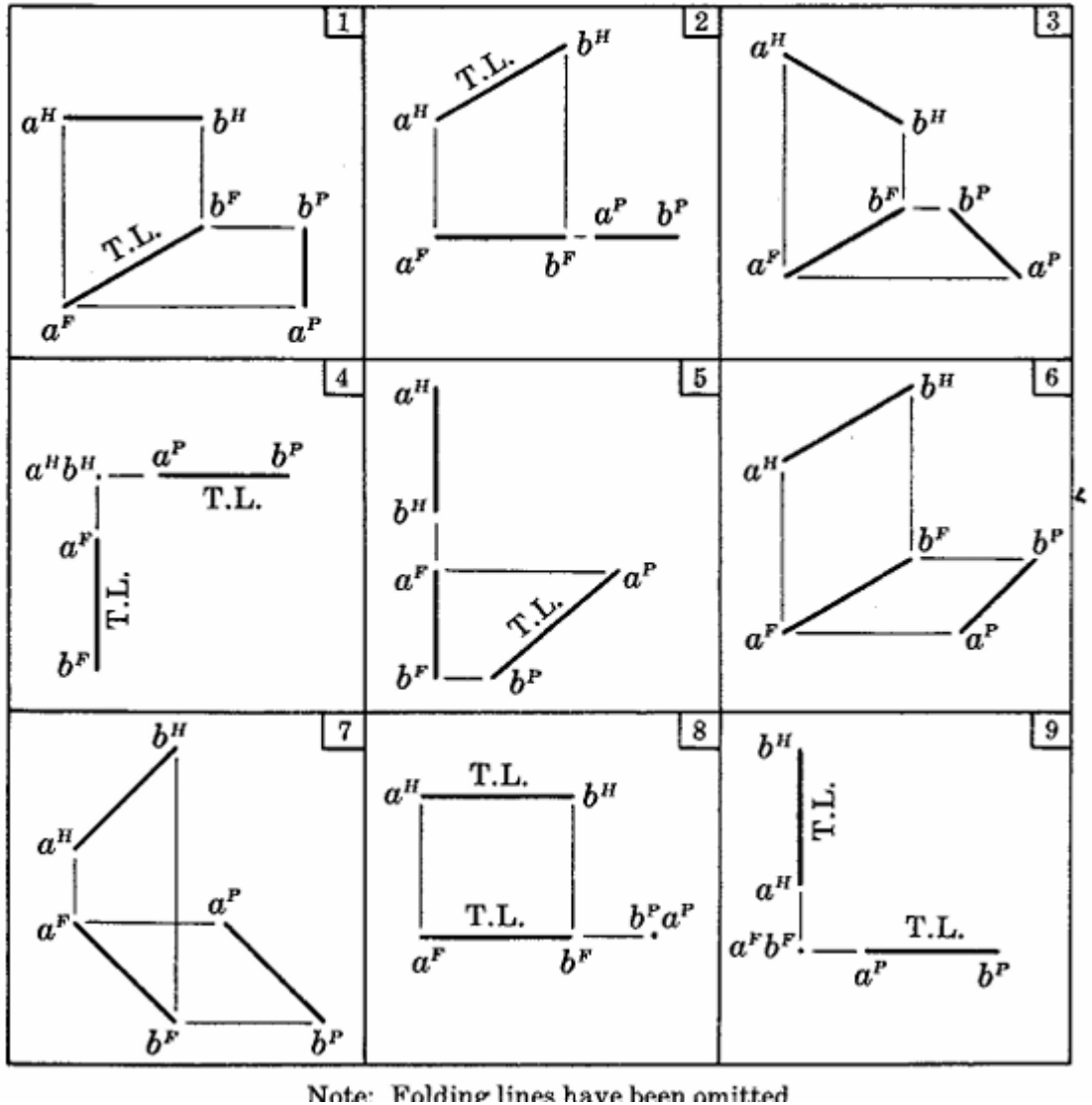
Since most Descriptive Geometry problems require views which are projected on planes other than the three principal planes (H, F, P), it becomes necessary to label these additional plane intersection lines by some logical system. It is suggested that to use numbers to designate these additional image planes. In Fig., we have this system demonstrated. The auxiliary elevation view projected from the plan view is designated view 1, and the folding line between the two views is labeled H-l. An inclined view is projected from the front elevation view, and this inclined view is designated view 2 with the folding line between the two views being labeled F-2. This system offers a logical system for anyone who is desirous of know ing the exact procedure which was followed.in the attempt as solution.



visualization :

LINES. As far as direction is concerned, straight lines may be classified as vertical, horizontal, or inclined the Fig. shows several position of lines in space

. At (1) we have shown an inclined Frontal line which appears in its true length in the front elevation view.



At (2) the horizontal line appears in its true length in the plan view. The oblique line at (3) does not appear in its

true length in any of the principal views. At (4) the vertical line will appear as a point in

the plan view, and in its true length in both the front elevation and profile views. The

profile line at (5) will appear in its true length

In the profile view. In both (6) and (7) the

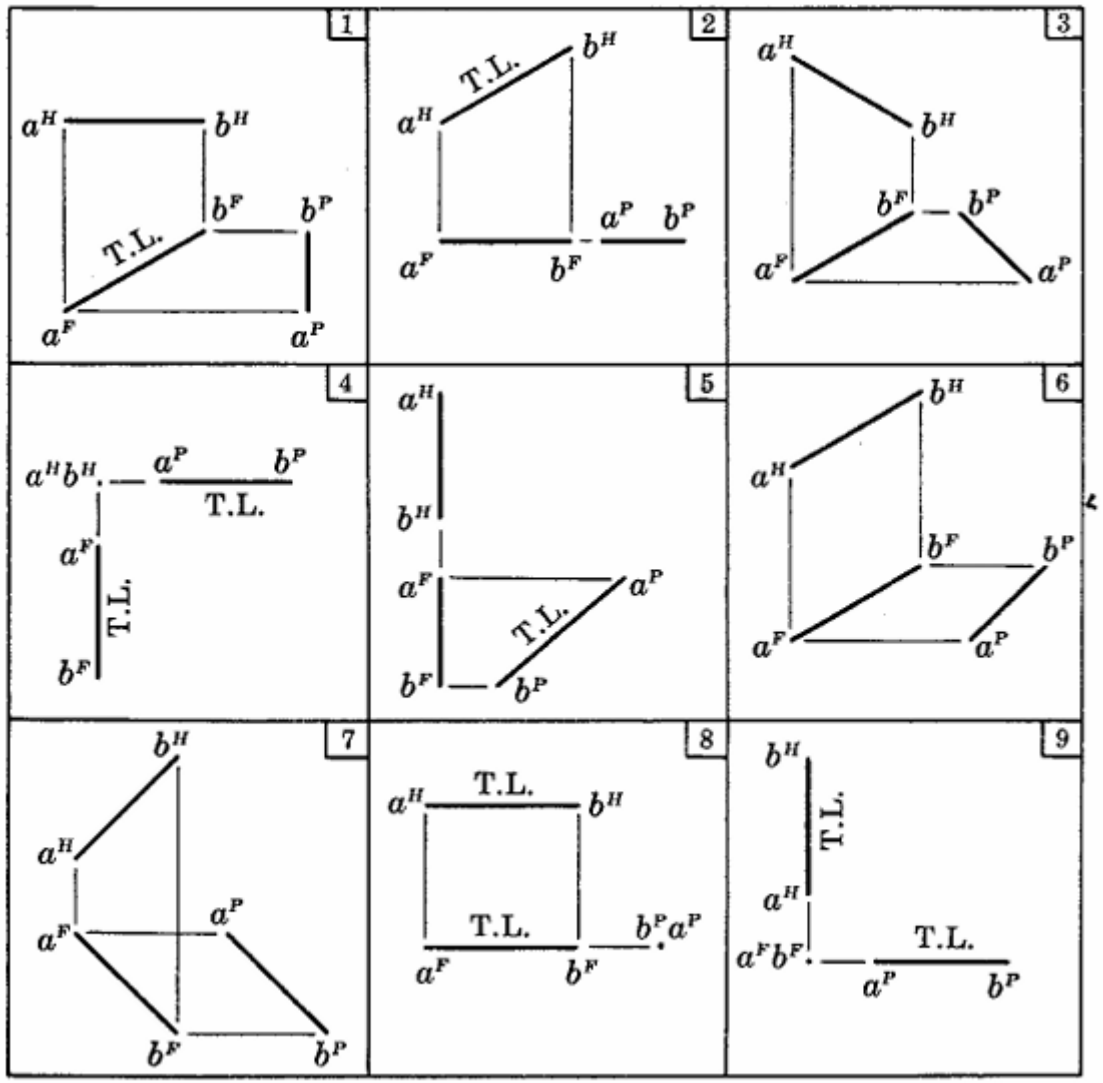
oblique line does not appear in its true length in any of the three given views. At (8)

The horizontal-frontal line appears in its true length in both the plan and front elevation

views.

The horizontal line at (9) appears as a point in the front view and in its true length in both

The plan and profile views.



Note: Folding lines have been omitted

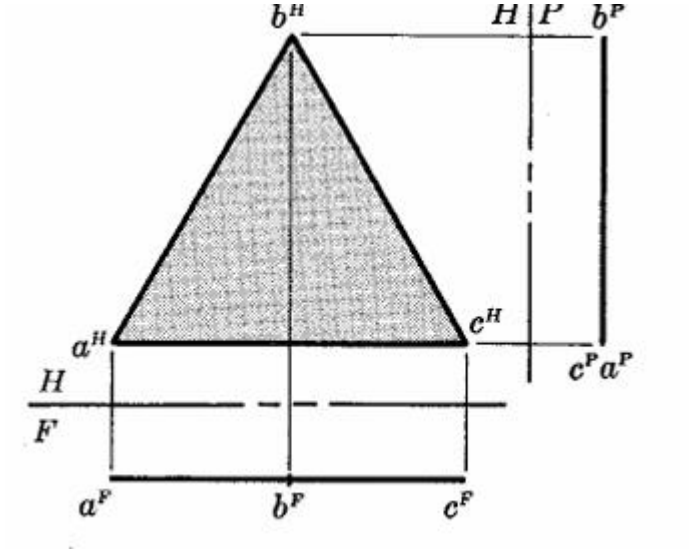
Planes:

As far as visualization is concerned, planes may be classified as horizontal, vertical, or inclined.

It should be made clear that every plane surface must appear either as an edge or as a plane of similar configuration. In other words, a triangular surface will always appear as an edge (a line) or as triangle . Likewise , a square – shaped plane must always appear as an edge or as four – sided plane. This four- sided plane will either be a square , a rectangle, a parrelogram

In the Fig. we have three principal views of a horizontal plane . The plane appears as an edge in both the front and profile views

whereas the true size of any horizontal plane will appear in the plan view.



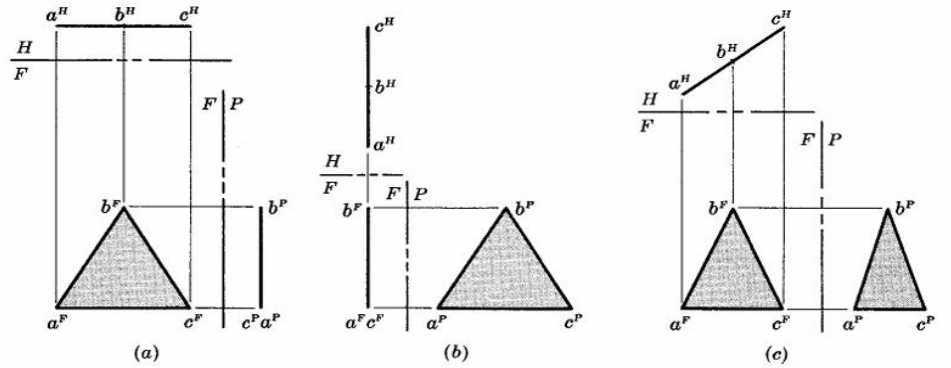
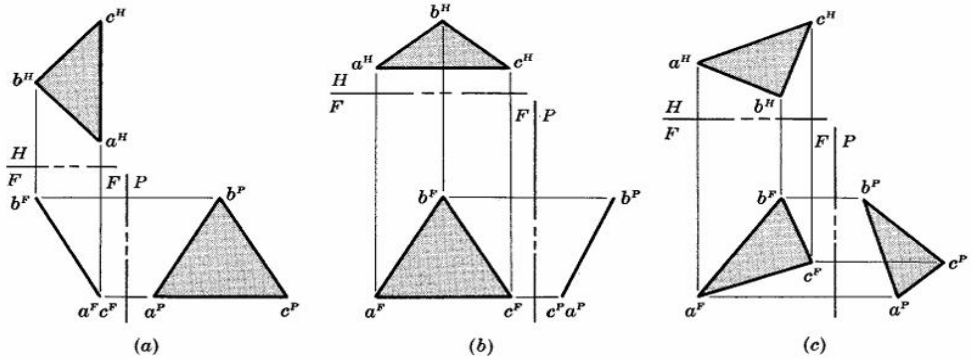


Fig. 1-15. Vertical Planes



The Fig. shows three possible positions for a vertical plane. At (a) we have a

vertical plane which is parallel to the frontal image plane; it is therefore in its true size in the front view.

It is represented as an edge in both the plan and profile views.

The vertical plane at (b) is shown parallel to the profile image plane, thus being represented

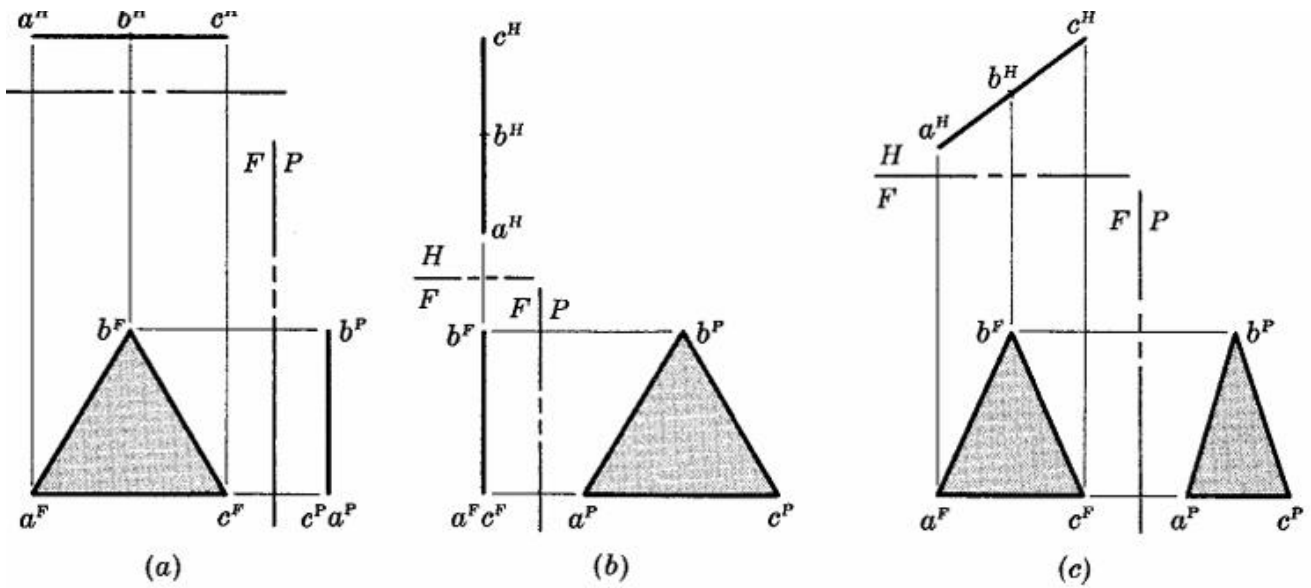
as an edge in both the plan and front views. The true size of the plane appears in the profile views

. At (c) the vertical plane is inclined to both the

frontal and profile image planes; there fore the

plan view shows the plane as an edge and the true

size of the plane is not shown in the given views.



Inclined Planes:

In Fig . we have some typical positions of an inclined plane.

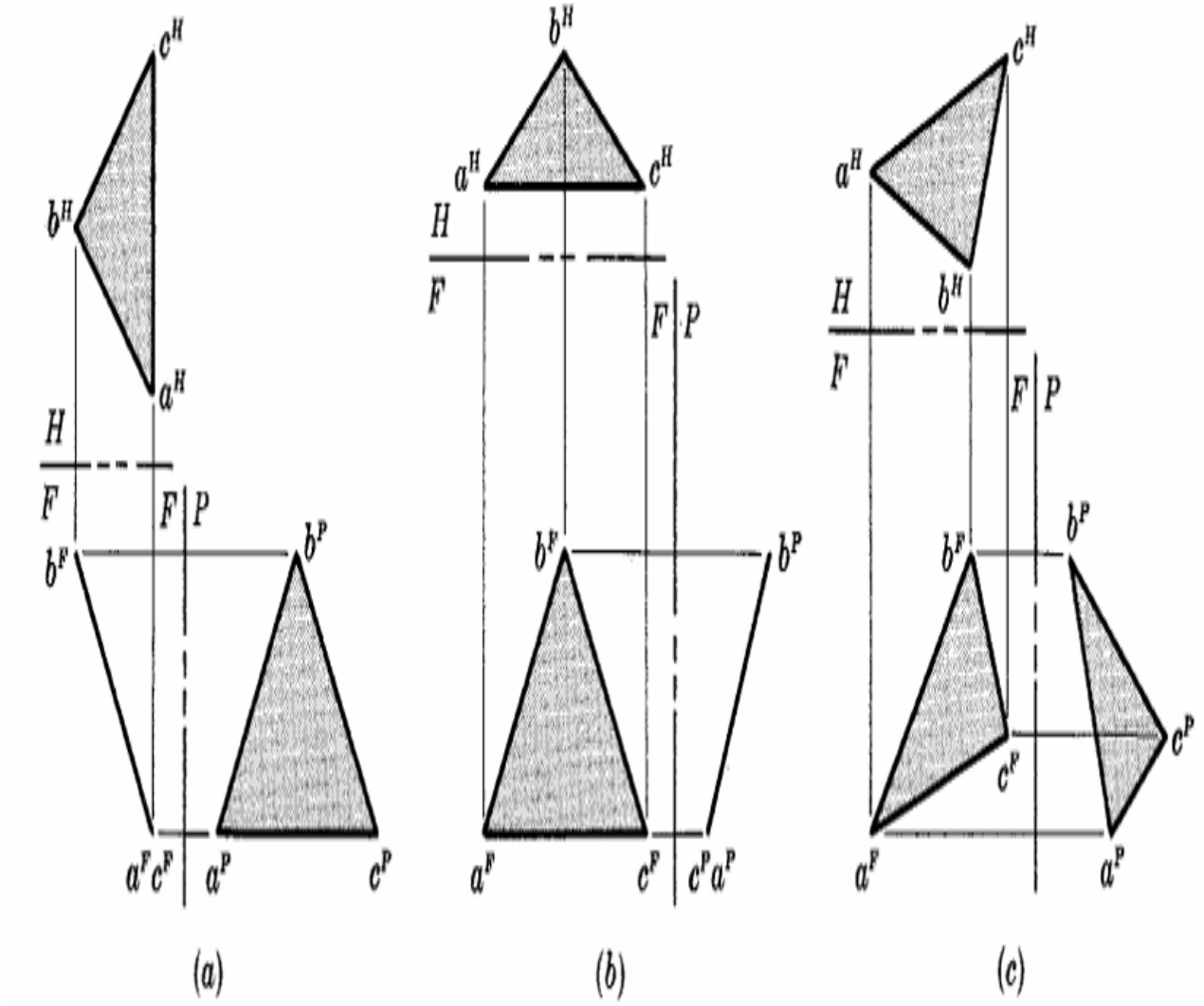
An inclined plane is one which is neither vertical nor horizontal. It cannot appear in its true size in

any of the three basic views - plan, front, or profile. It may appear as an edge in the front view (a)

or in the profile view (b), but it cannot appear as an edge in the plan view.

At (c) we have the inclined plane in its most common position, that of being Inclined to allthree principal planes of projection. In this case, it will not appear as an edge in any of

the three principal views. It is usually referred to as an oblique plane.



Problem Layout:

In this system the relationship

between points is given by direction and elevation. Thus, in Fig. .

(b) Line AB bears N 30° E, and B is 100' map distance from(A) and 40' below(A) At (c)'the following information

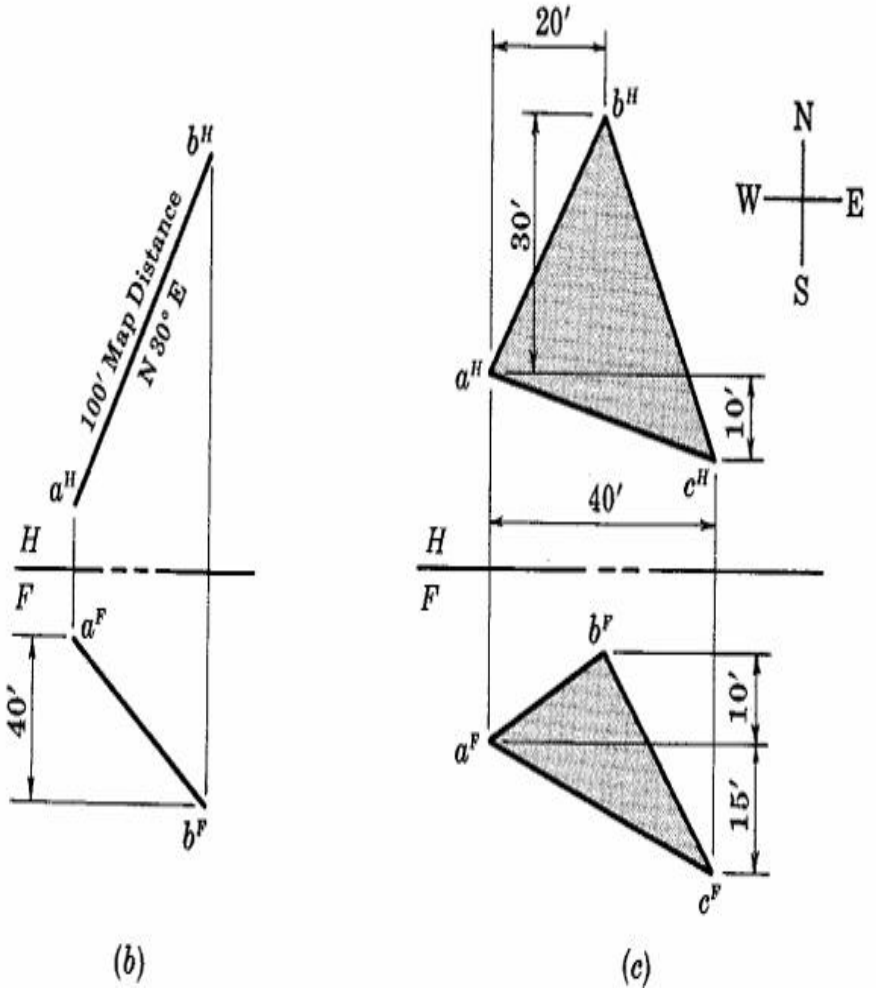
is given about plane ABC: (B)is 20' east, 30' north of(A) and 10' above (A)

Point(c) is 40 east, 10' south of(A) and 15' below (A). Point(A) should be located at suitable position on the paper and then step off

the distance 20' east and 30' north of(A); this establishes poin(B) in the plan view.

Point(B) in the front view would be projected directly below its location in the plan view and at an elevation of 10 above point (A),

which has also been projected directly from the plan view. Point (C) would be located in a similar manner.



Another method is to locate points according to coordinates (x,y,z)

e.g. line AB its coordinates as follows : A ((15,20,10). B(40,50,20)

The origin or zero point is the startof folding line from left.

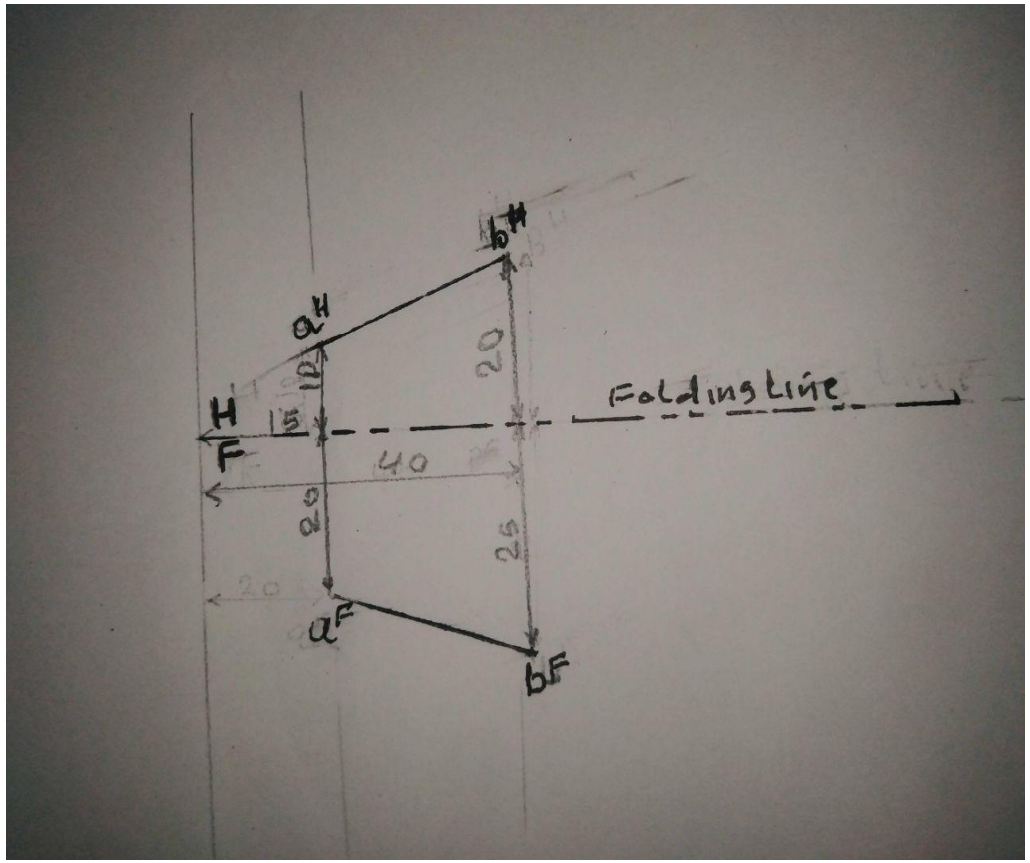
For point (a)measure 15 from left to right along folding line

Then measure downwords 20to locate point (b^H).

Ffrom folding line measure upwords 10 to locate point (a^H)

Repeat the same procedure to locate points (b)

Then join ab at both (Front) and (Plan view).



Thank You