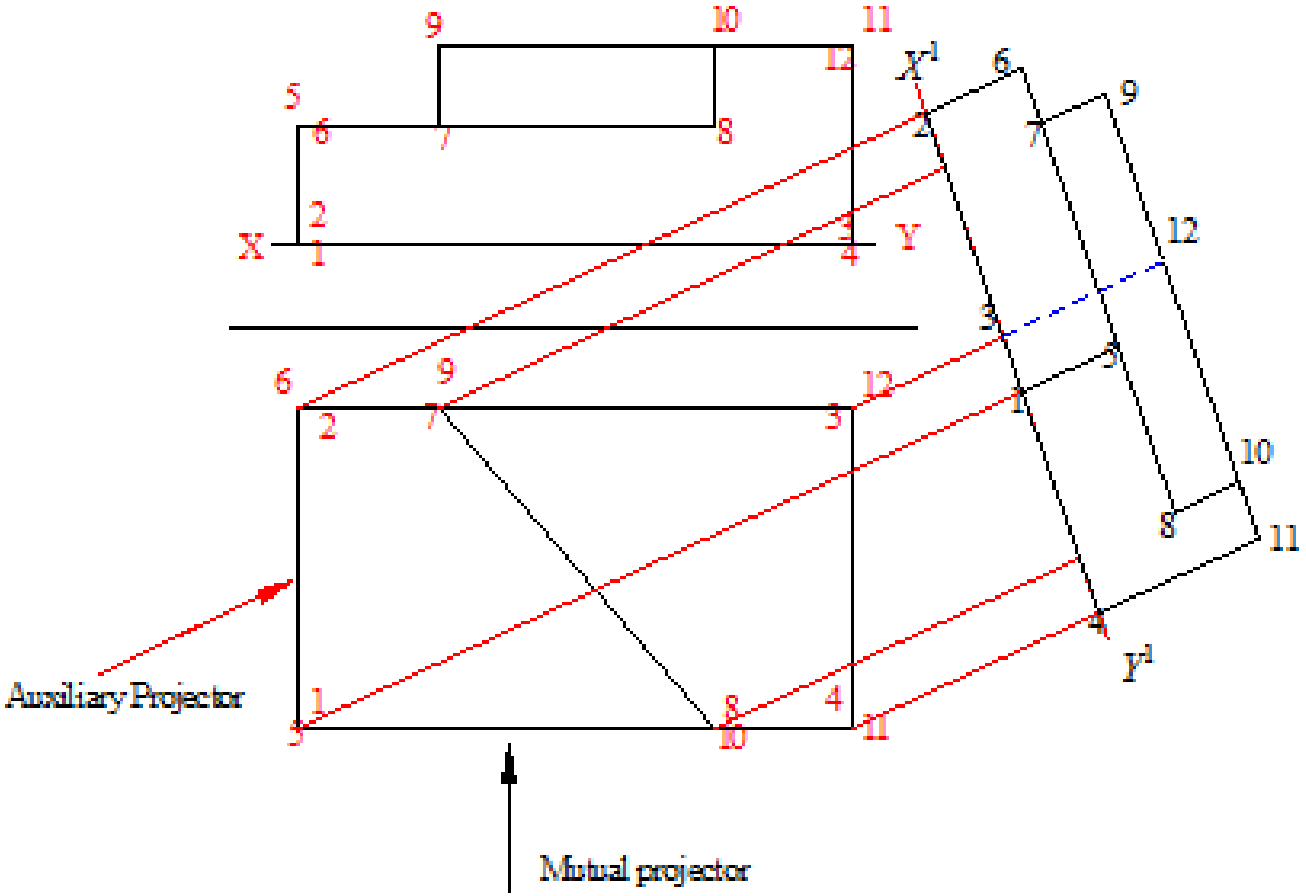
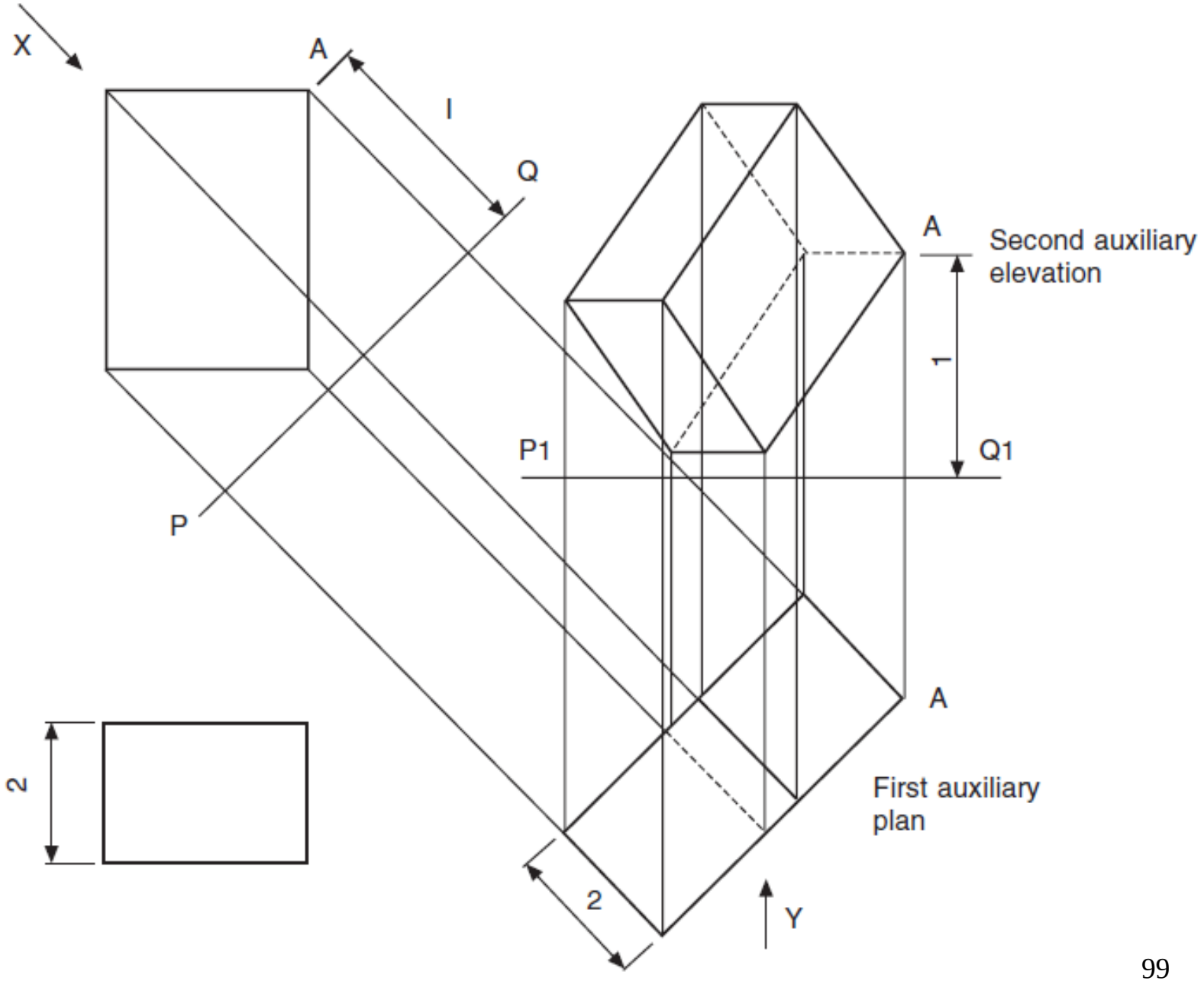
Development from Sheet Material

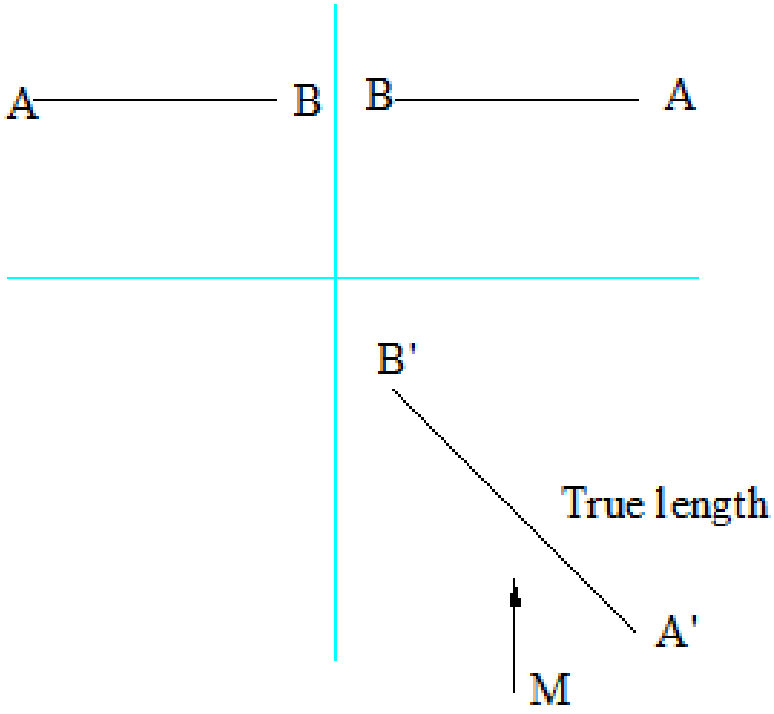
- Art of creating a 3-dimensional object from a 2-dimensional material
- Application
  - Sheet metal works (e.g. Air conditioning ducts)
  - Pipe fittings,
  - Boiler fittings,
  - Aeroplane construction (e.g. wings of the plane)
  - Automobile layout and
  - Chemical Engineering plant installations, etc..

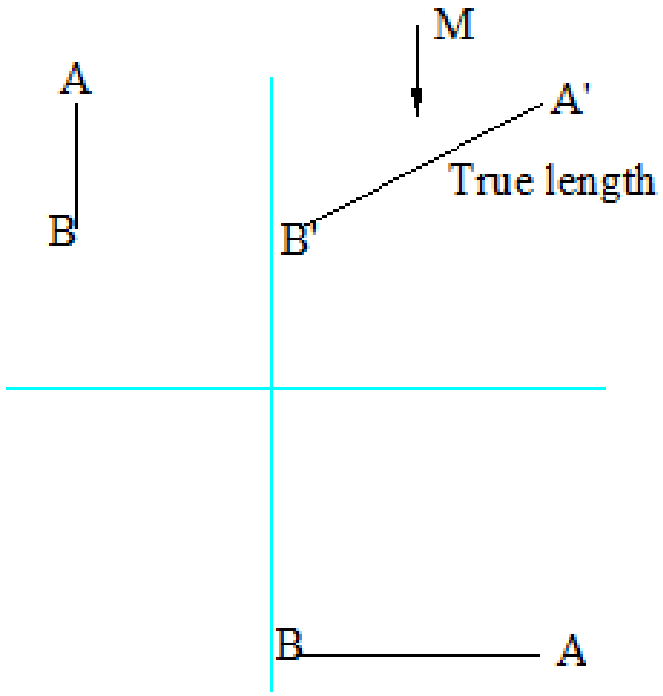
AUXILIARY PROJECTION

- Auxiliary Views
  - planes that are inclined to the principal vertical and horizontal planes

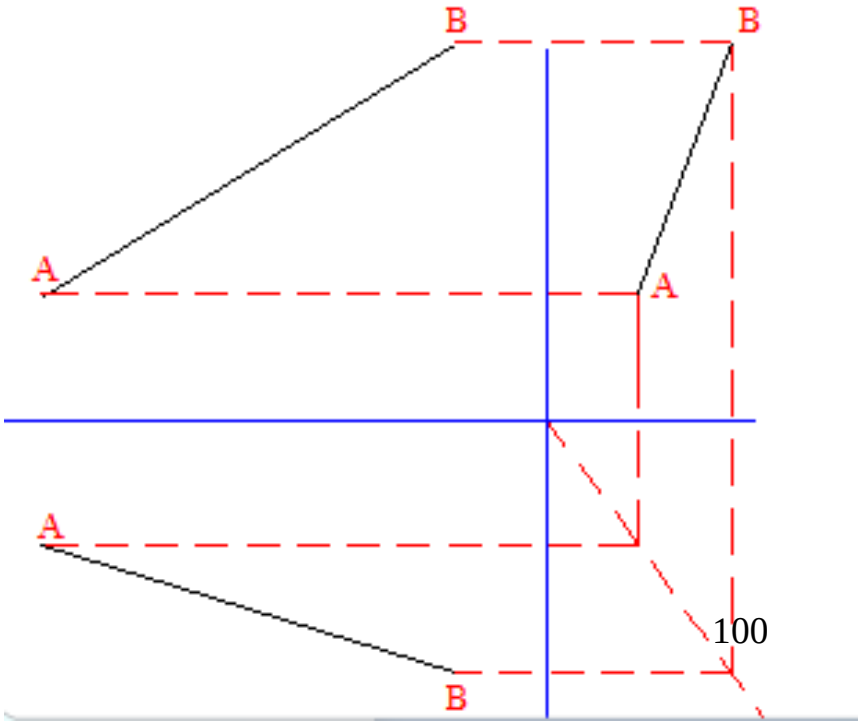



X
A
l
Q
P
A
Second auxiliary
elevation
1
P1
Q1
A
First auxiliary
plan
2
2
Y



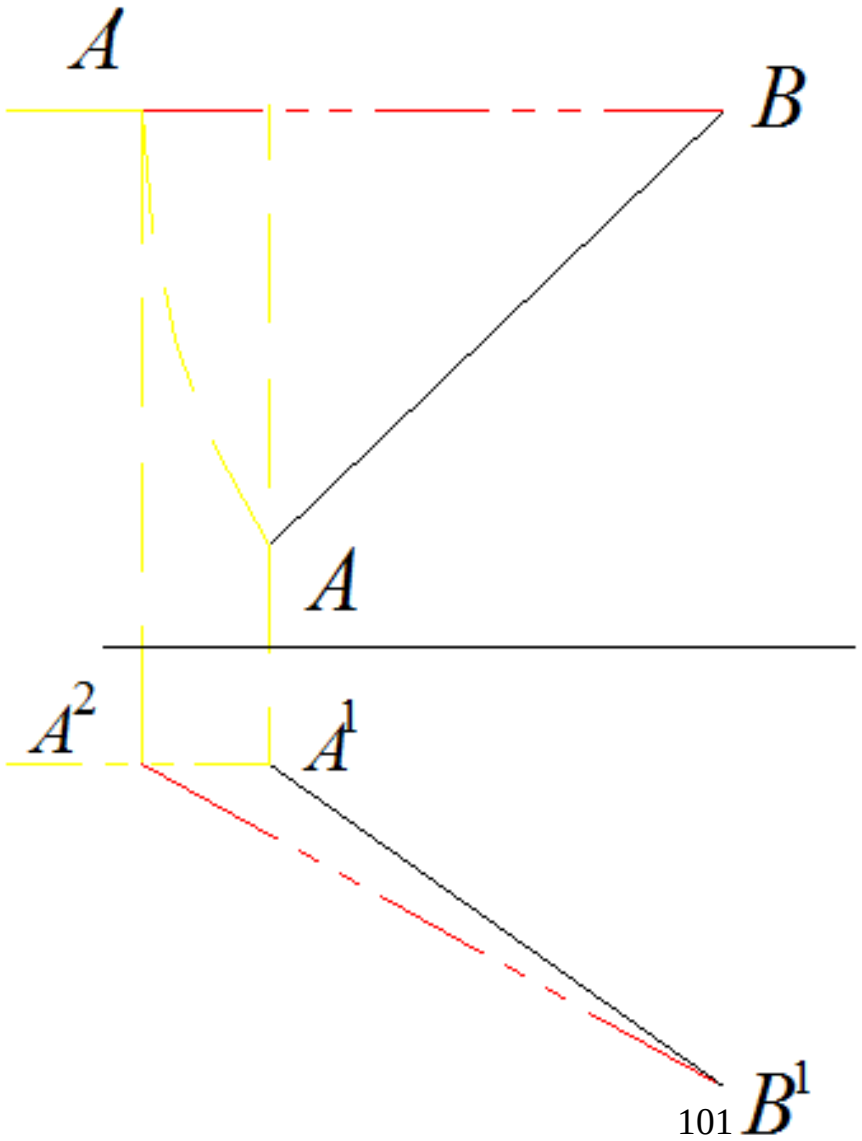


True Length



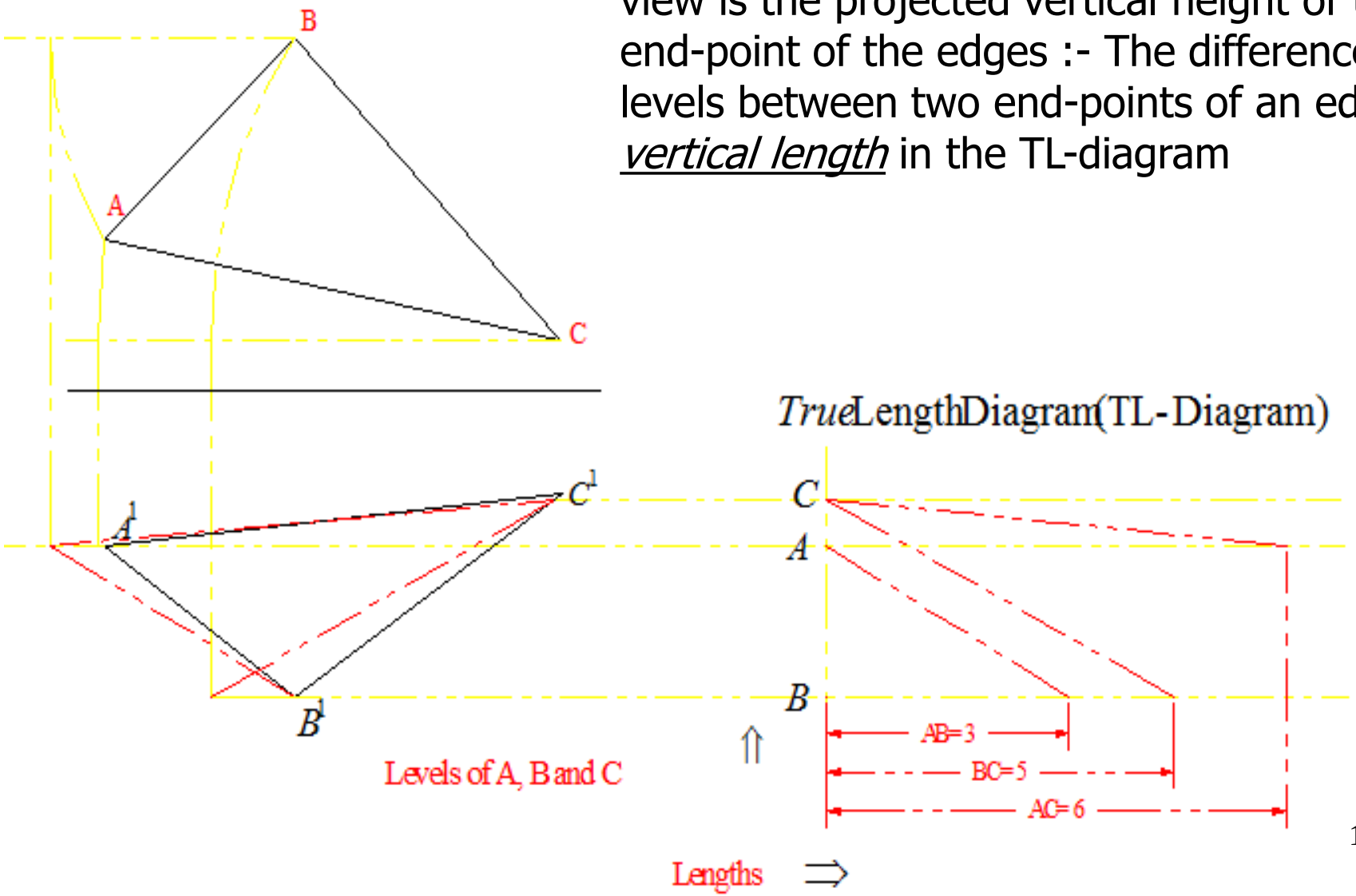
TRUE LENGTH DETERMINATION BY RABATMENT

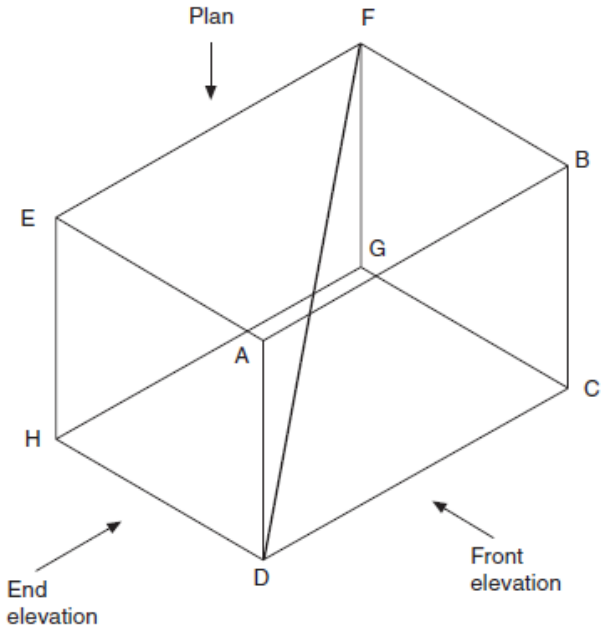
- Select two mutual views of the line (e.g. elevation and plan),
- Select one view as a fixed view (Elevation),
- Fix one end (B) of the line within the fixed view and rotate the free end (A) about the fixed point onto a horizontal line through the fixed point to obtain point A'.
- Project the new point A' vertically onto a horizontal line through its image (A^1) on the other view (plan) to obtain A^2.
- The true length of

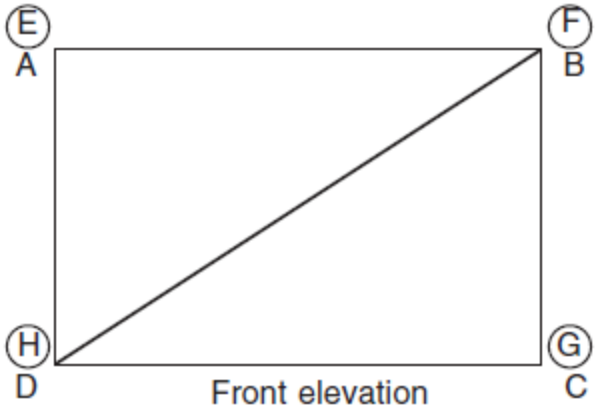


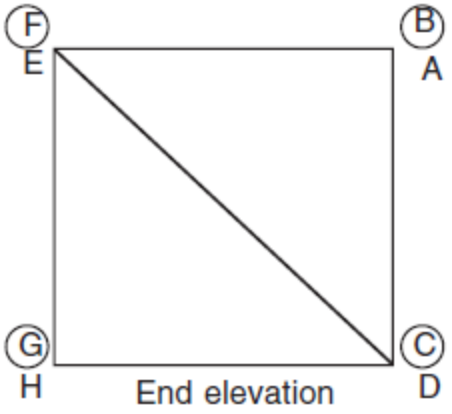
•Important dimension within the fixed view is the length of the edge (line) = *horizontal length* in the TL-Diagram.

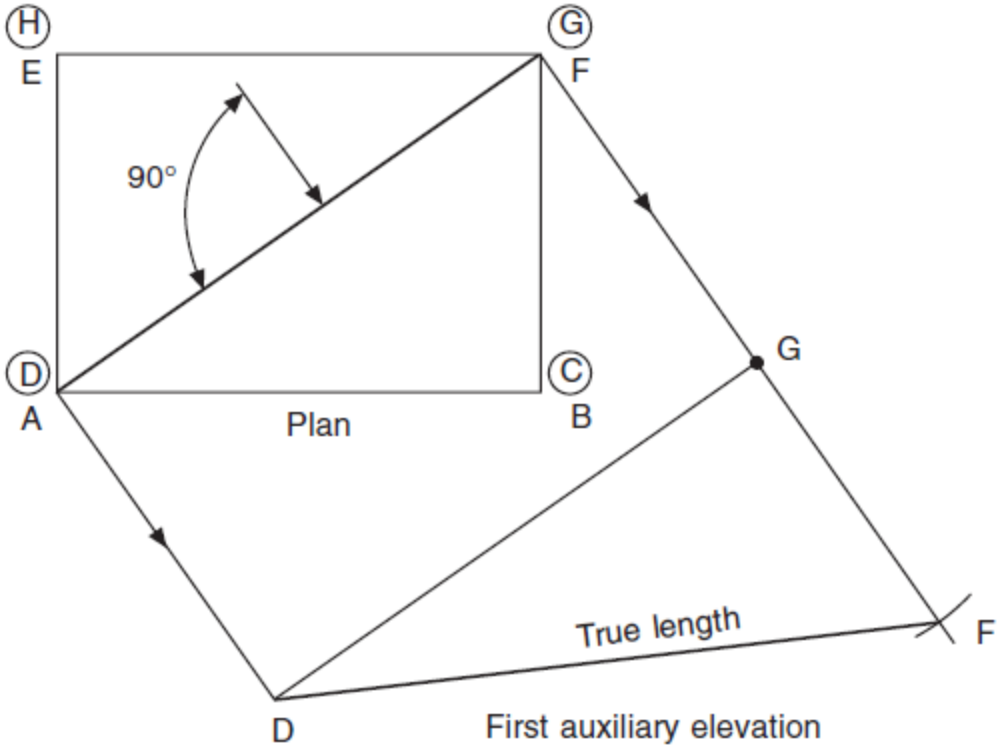
•The important dimension within the other view is the projected vertical height of the end-point of the edges :- The difference in levels between two end-points of an edge = *vertical length* in the TL-diagram

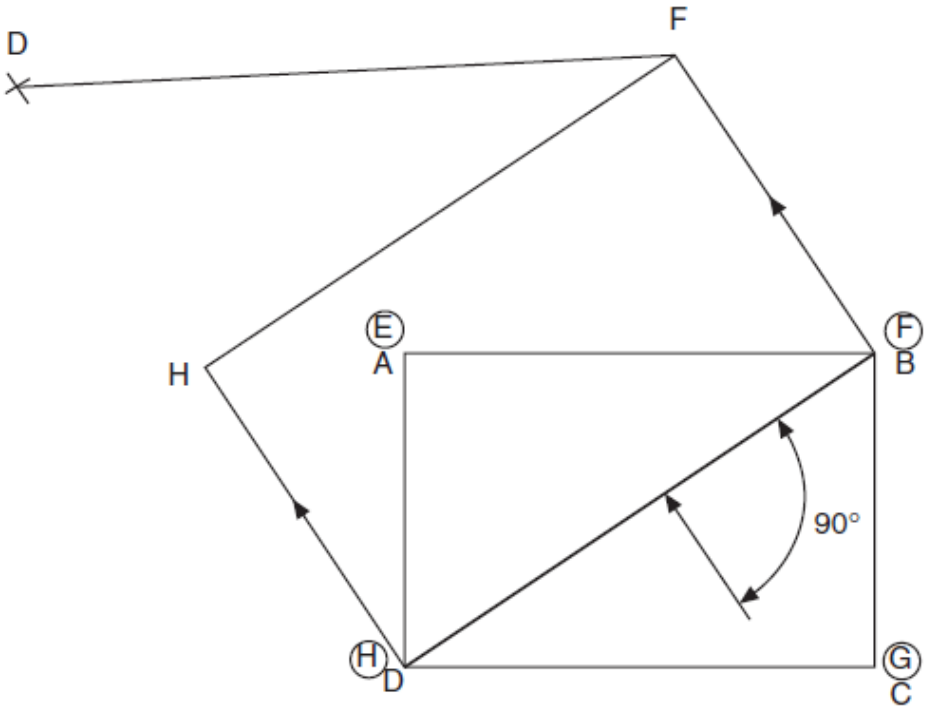


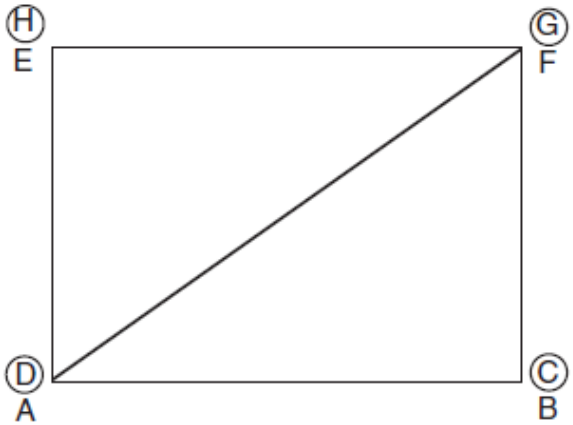

Plan
F
B
E
G
A
H
C
D
End
elevation
Front
elevation

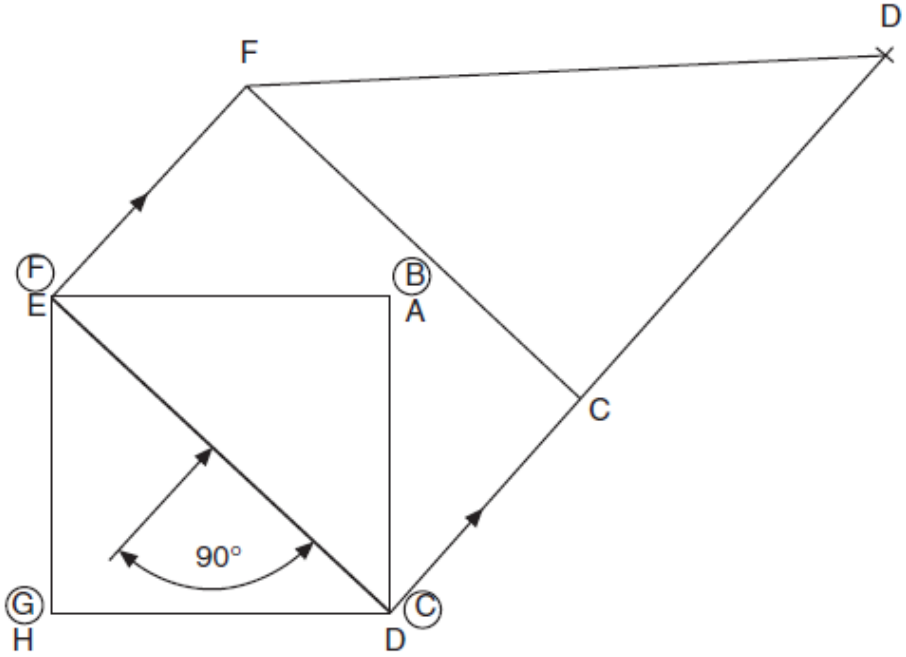

E
F
A
B
H
G
D
C
Front elevation


F
B
E
A
G
C
H
D
End elevation

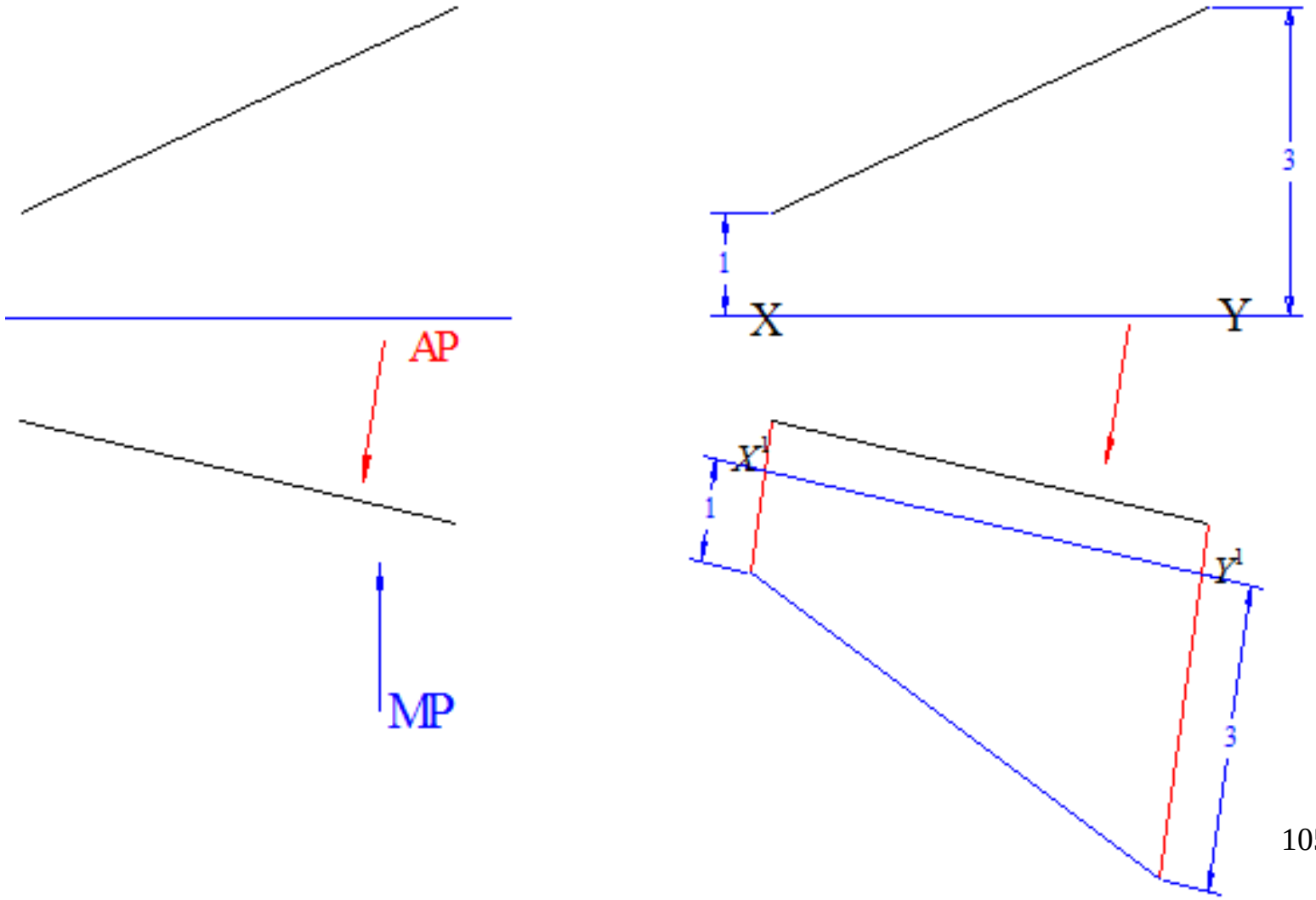

H
G
E
F
90°
D
C
A
B
Plan
G
True length
F
D
First auxiliary elevation


D
F
H
E
A
F
B
90°
H
D
G
C


H
E
G
F
D
A
C
B

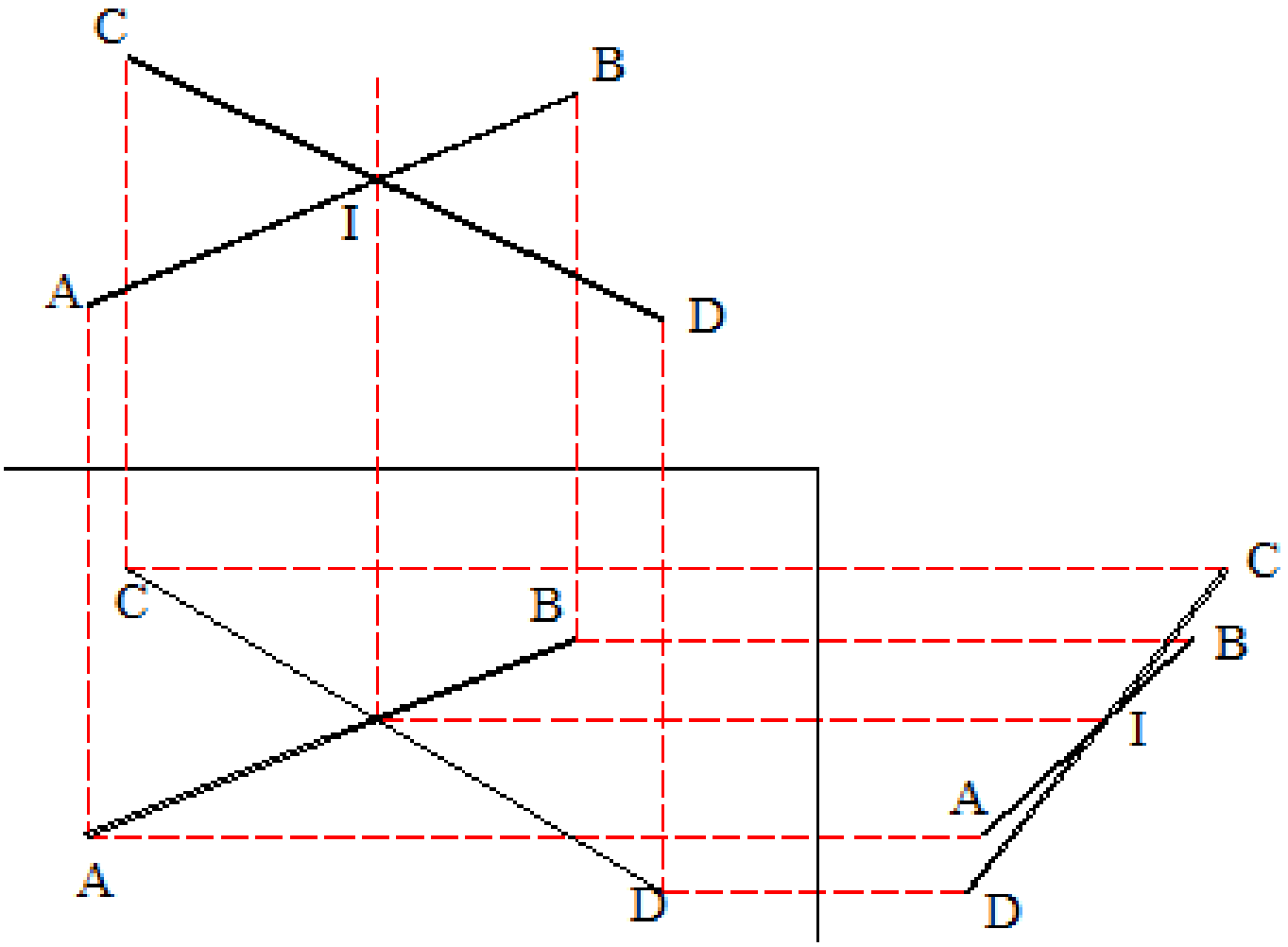

D
F
F
E
B
A
C
90°
G
H
C
D

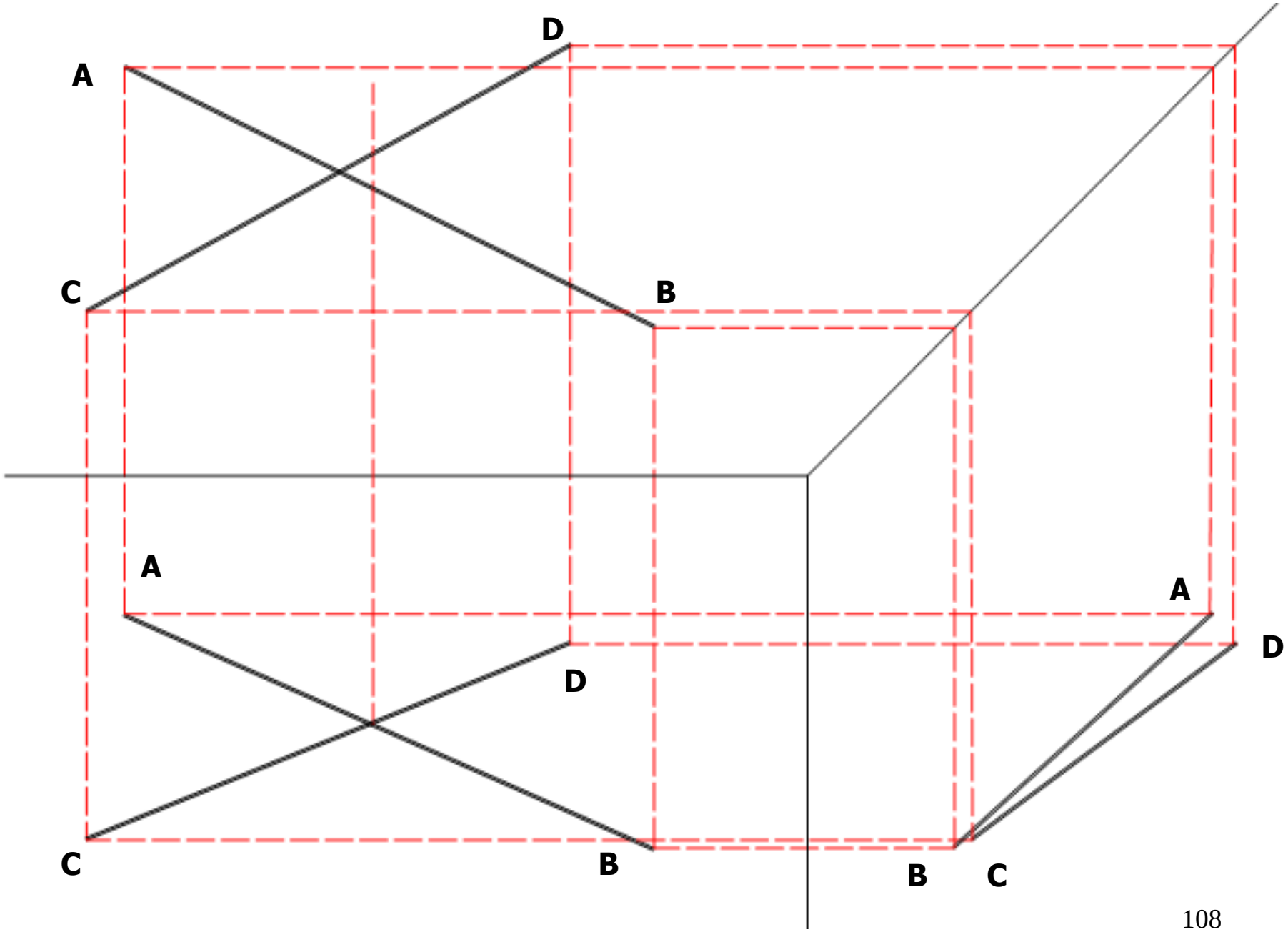
TRUE LENGTH DETERMINATION BY AUXILIARY PROJECTION



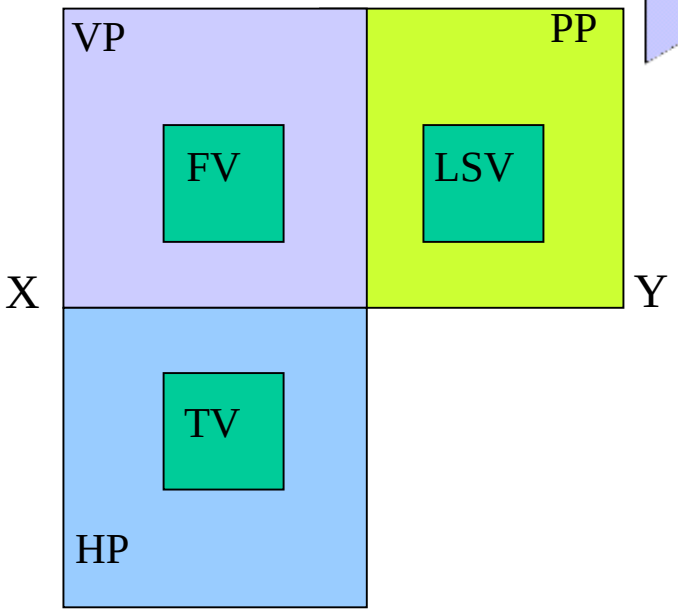
INTERSECTION

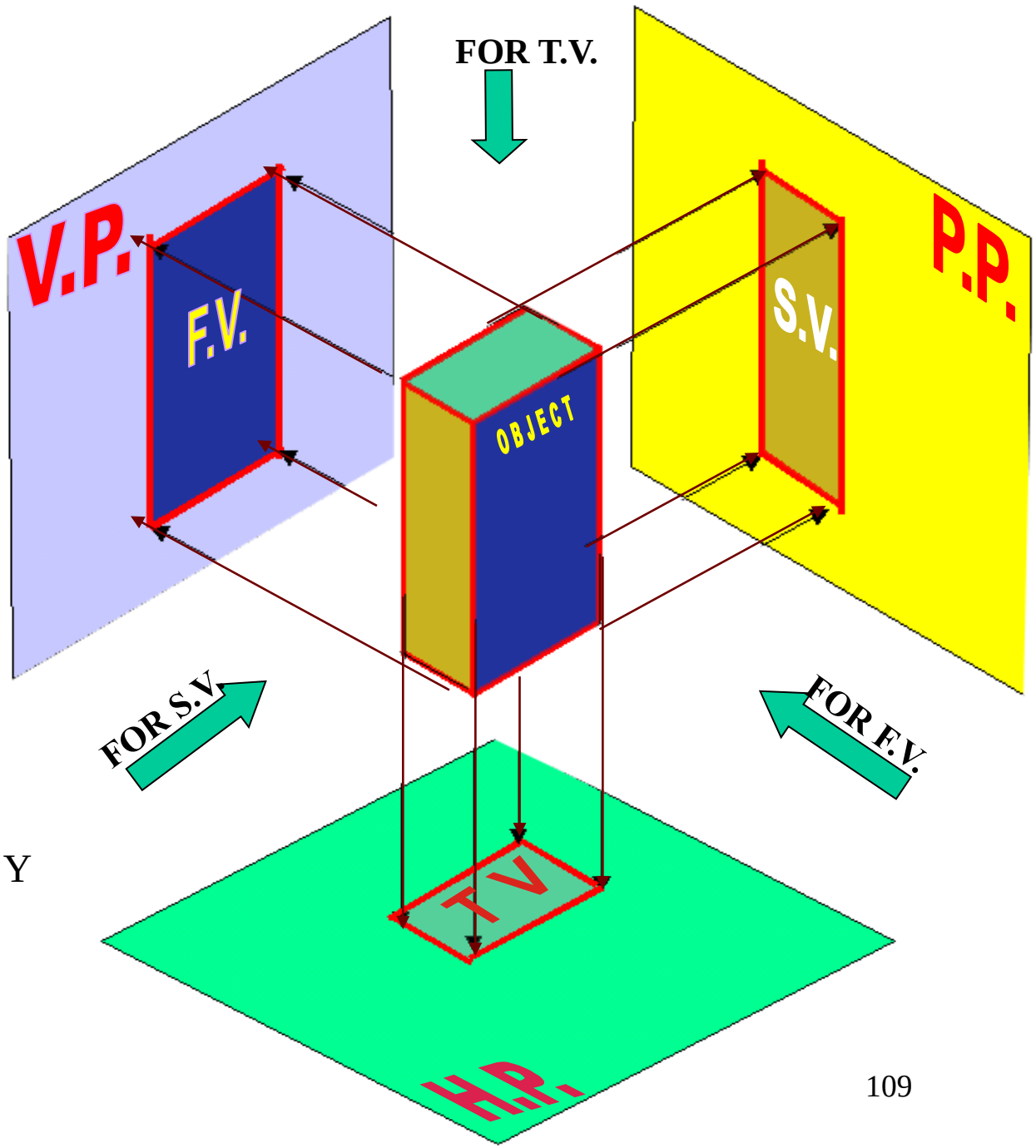
- Intersection of two lines




D
A
C
B
A
D
A
D
C
B
B
C

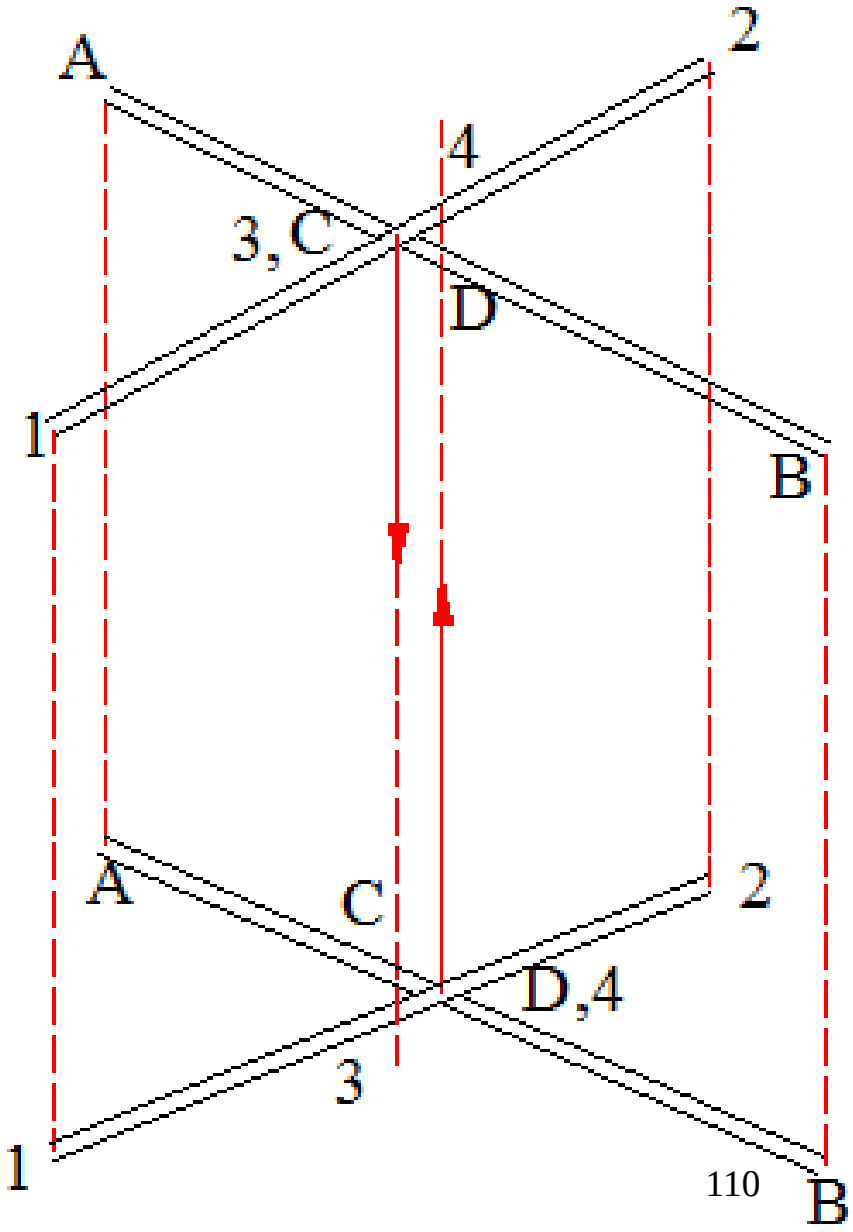
FIRST ANGLE PROJECTION



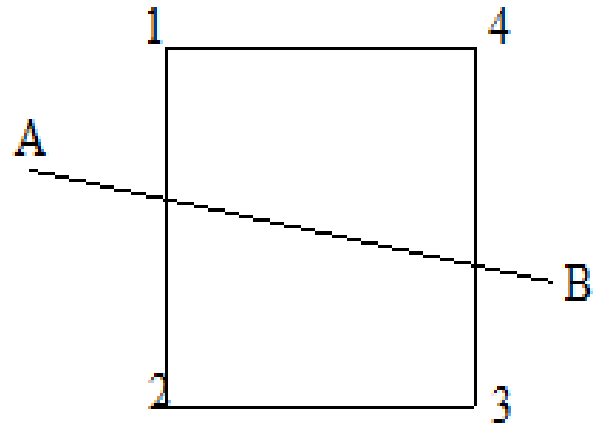


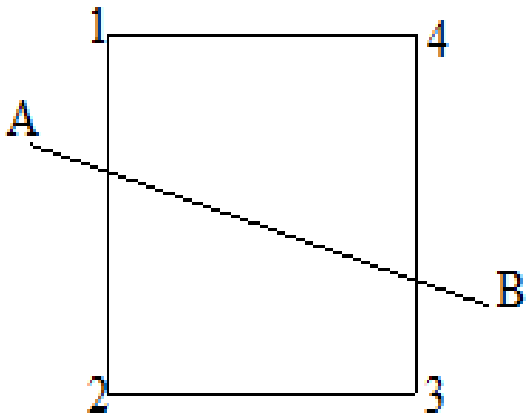
Visibility

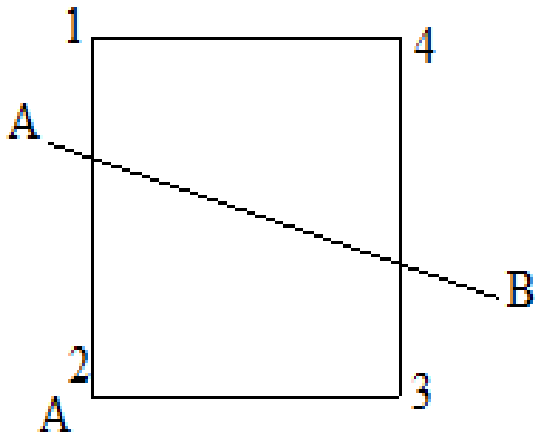
- Projecting in the "apparent" view from the apparent intersection onto its mutual view, the first point encountered will be obscured in the "apparent" view

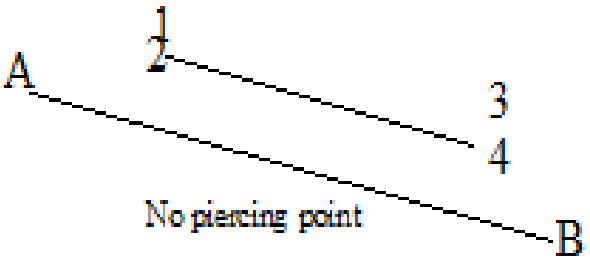


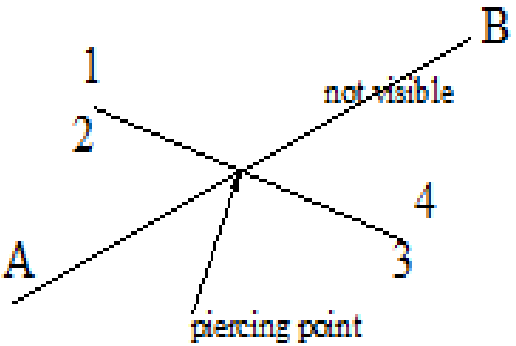
Piercing Point of a line with a Plane

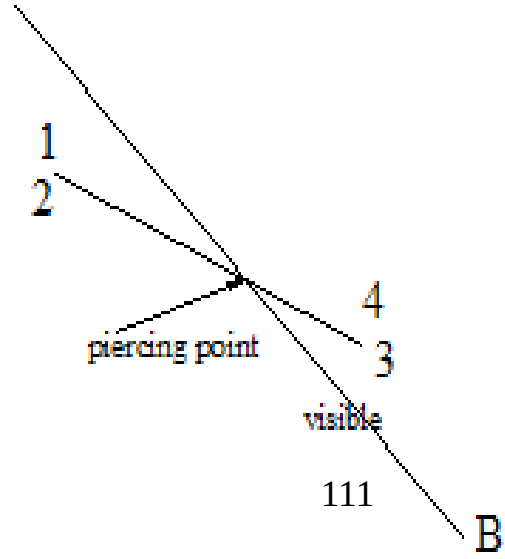


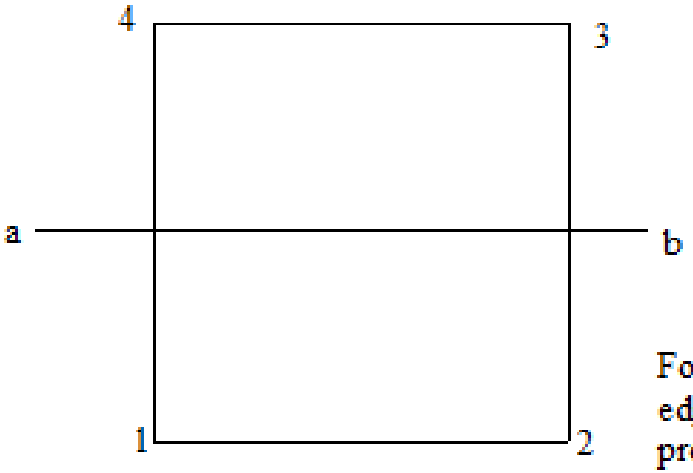


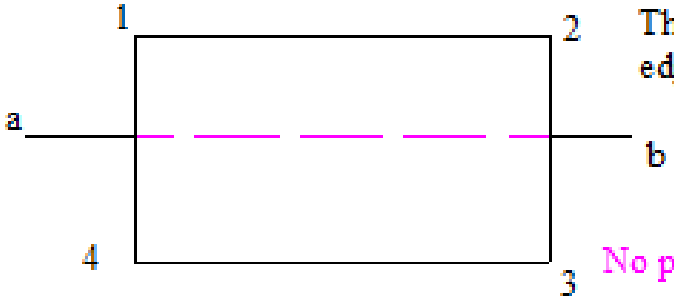






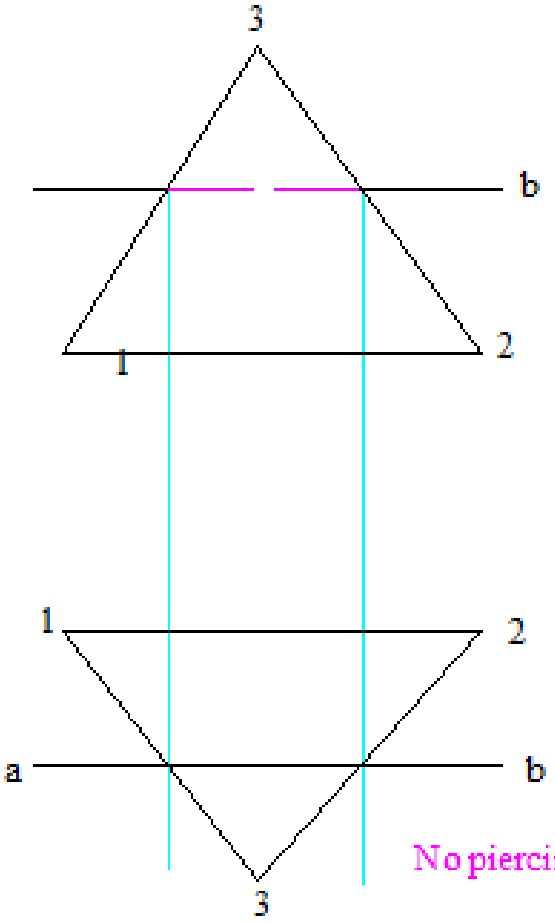






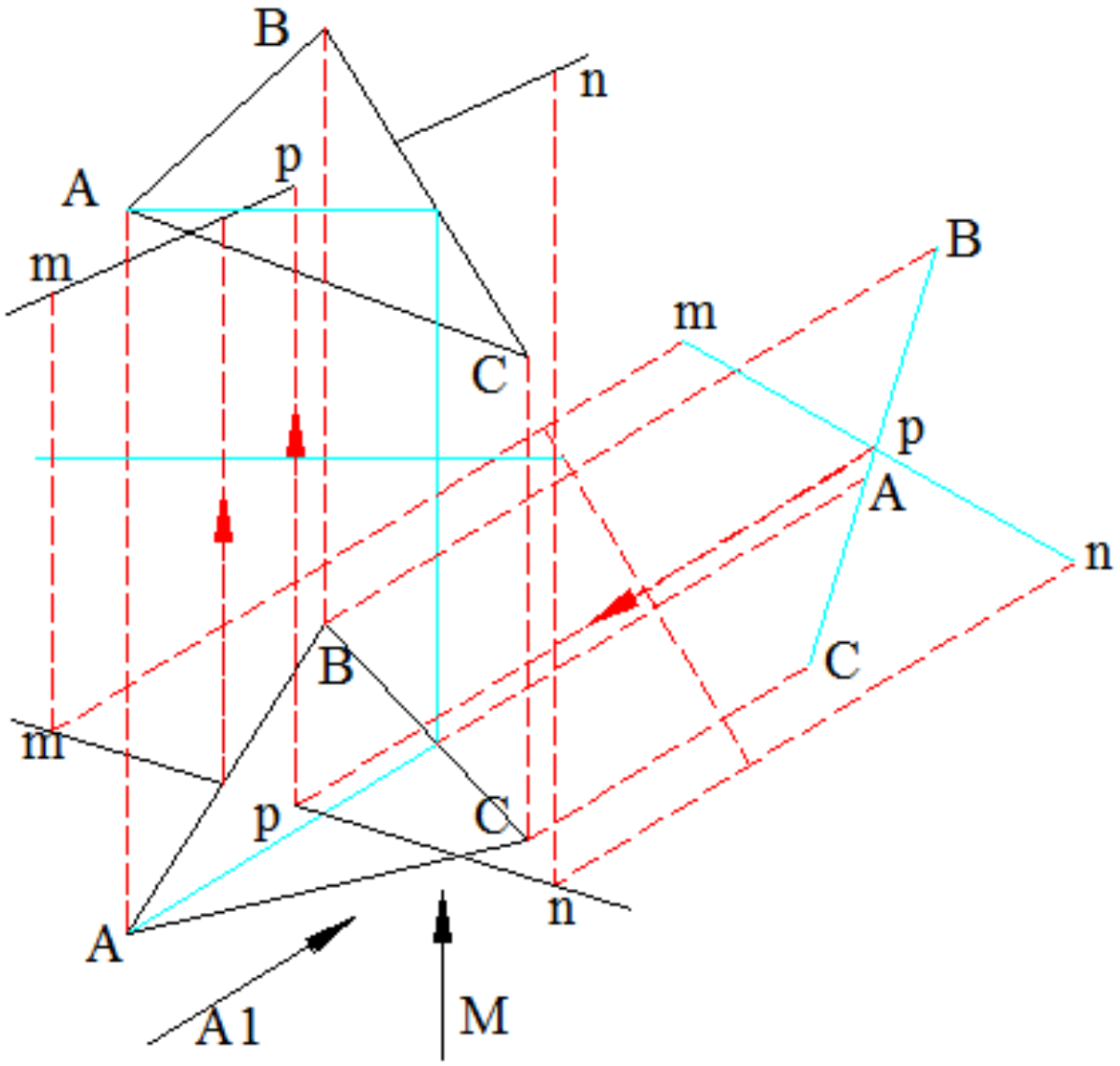
For parallel vertical edges there is a problem, because the projection of the points are difficult to locate. Therefore, a slanting edge is usefull.

No piercing point

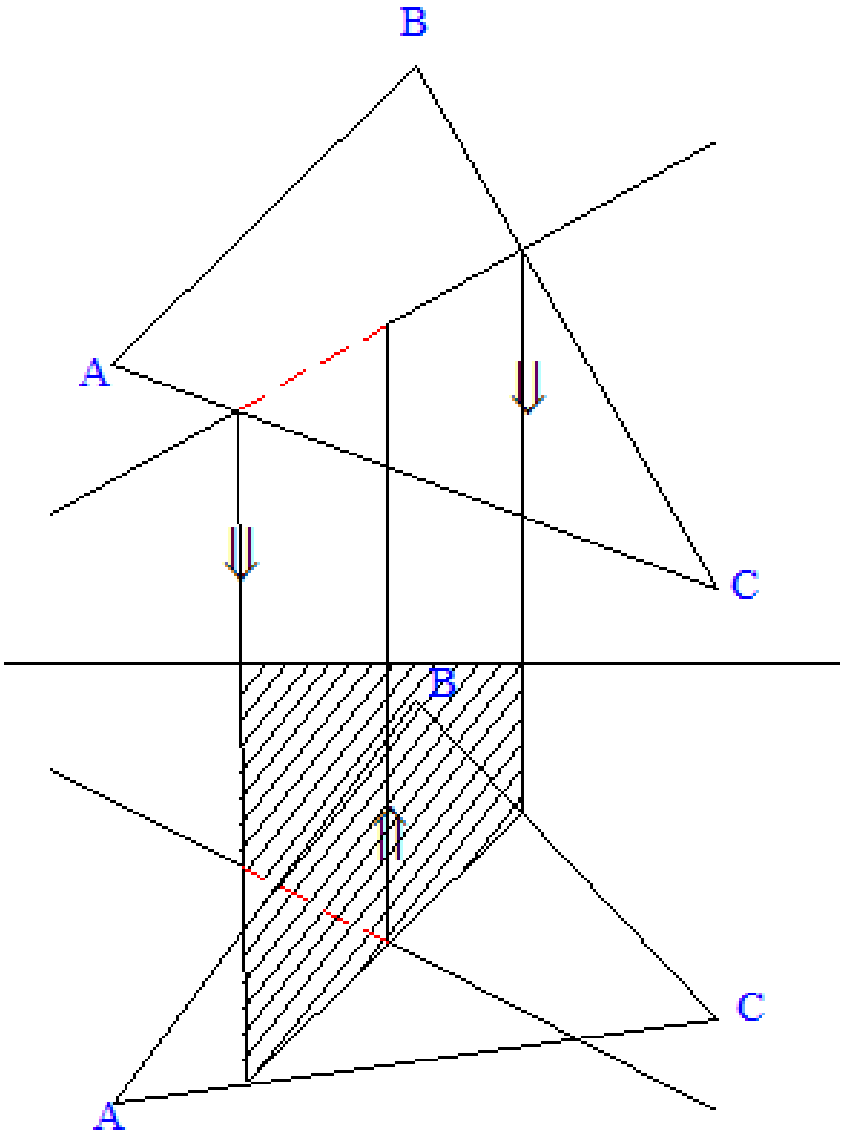


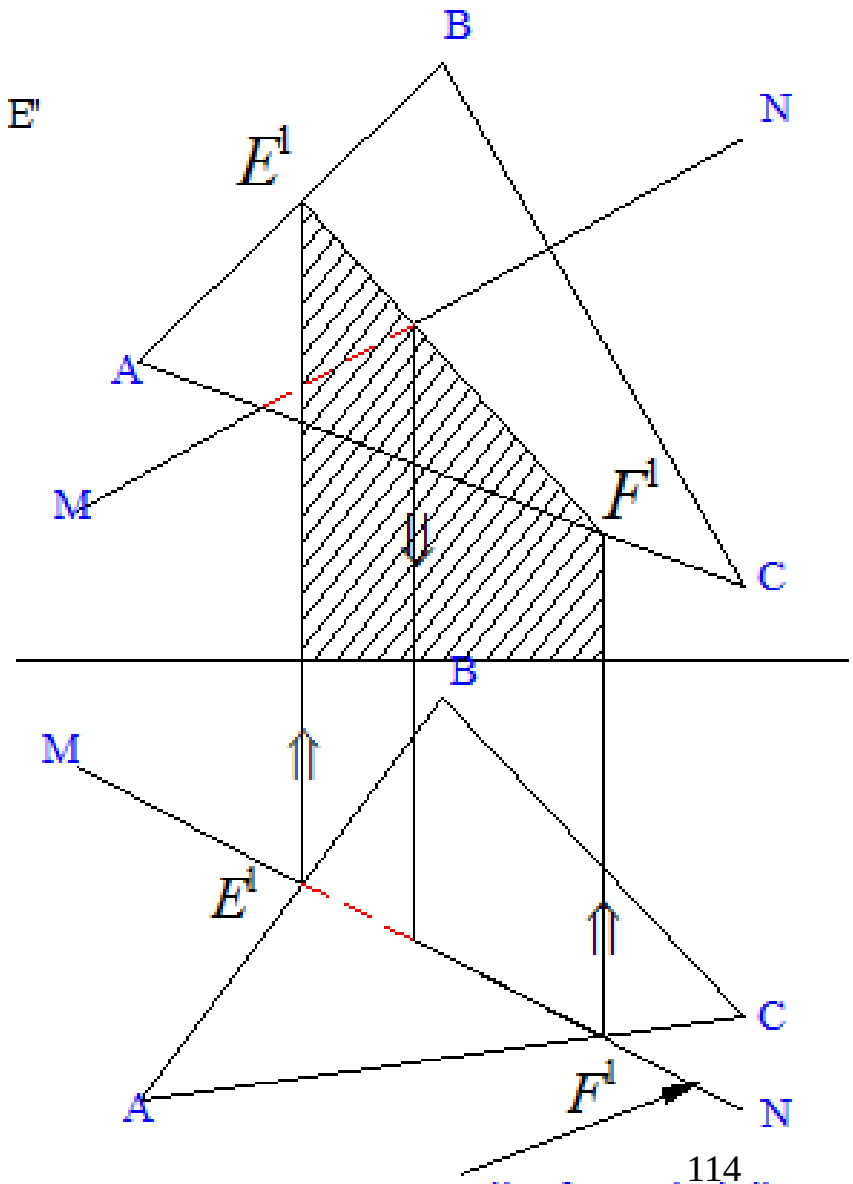
No piercing point

Piercing Point by Auxiliary Projection



Cutting Plane Method





Edge-view of auxiliary cutting plane and line form a single line.

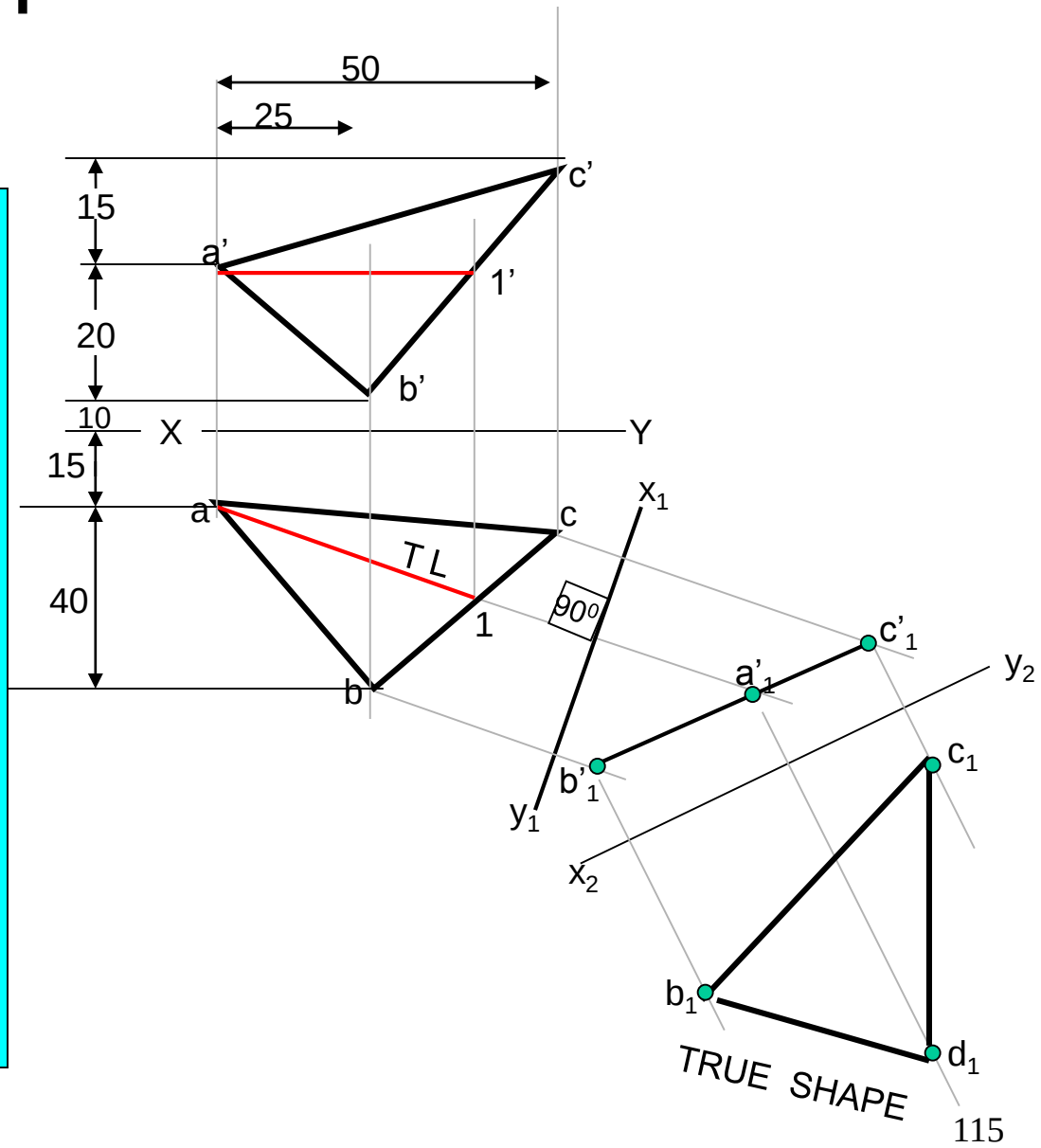
True shape

NO LINE IS // TO XY IN ANY VIEW.
MEANS NO TL IS AVAILABLE.

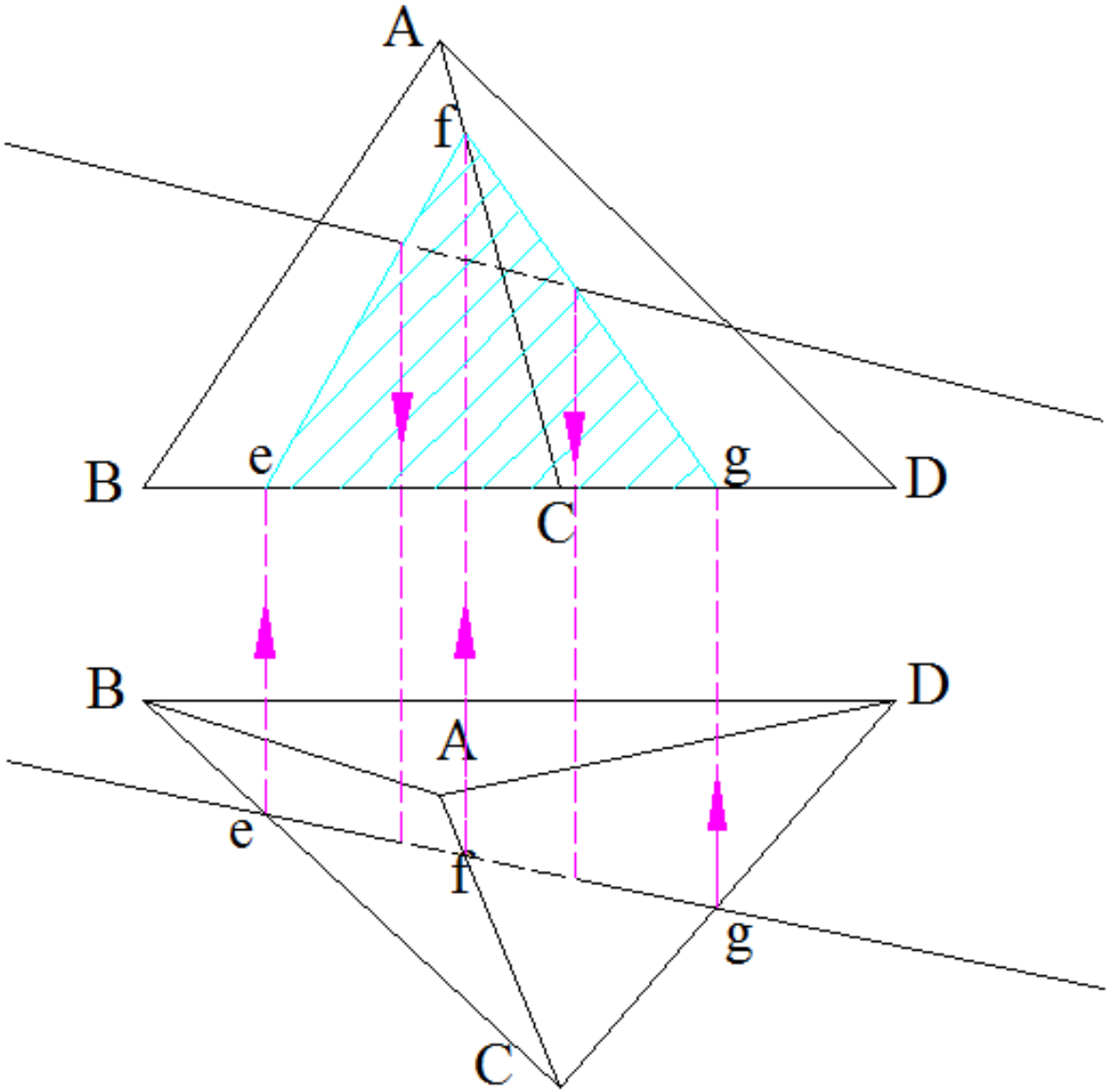
DRAW ONE LINE // TO XY IN ANY VIEW & IT'S OTHER
VIEW CAN BE CONSIDERED AS TL FOR THE PURPOSE.

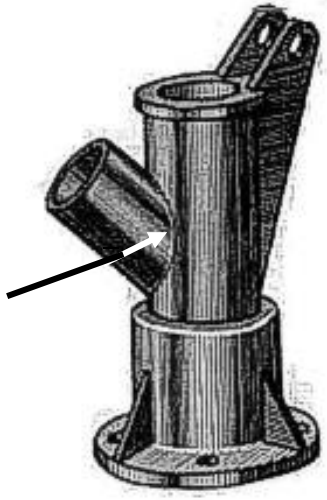
HERE a' 1' line in Fv is drawn // to xy.
HENCE it's Tv a-1 becomes TL.

THEN FOLLOW SAME STEPS AND DETERMINE TRUE SHAPE.
(STUDY THE ILLUSTRATION)

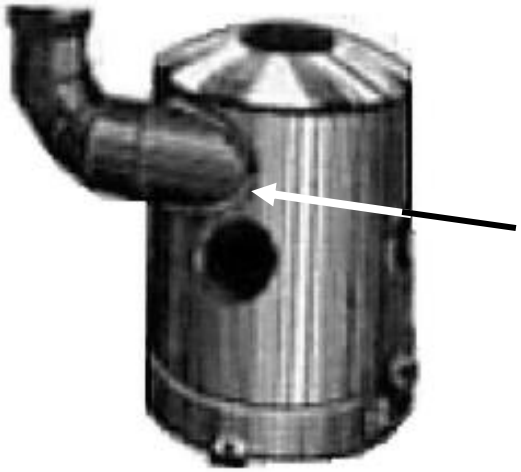


Intersection of a Line And a Solid by Cutting Plane Method

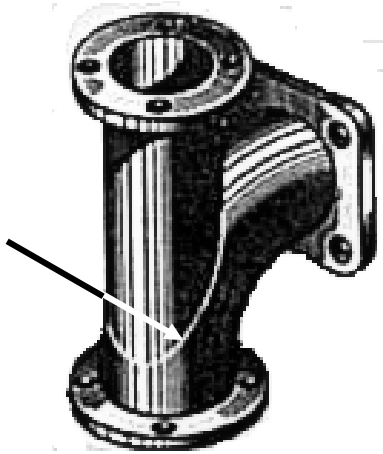




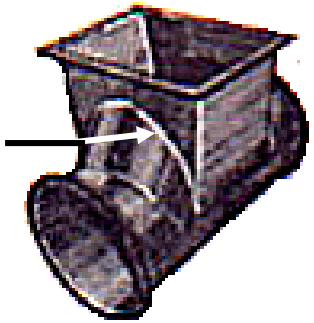
A machine component having two intersecting cylindrical surfaces with the axis at acute angle to each other.



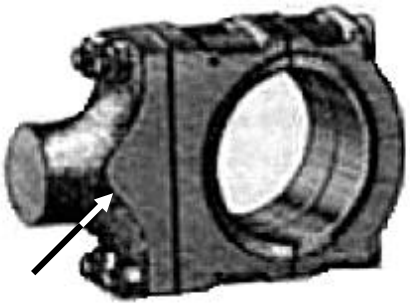
An Industrial Dust collector.
Intersection of two cylinders.



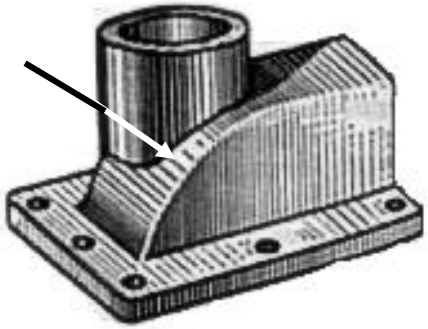
Intersection of a Cylindrical main and Branch Pipe.



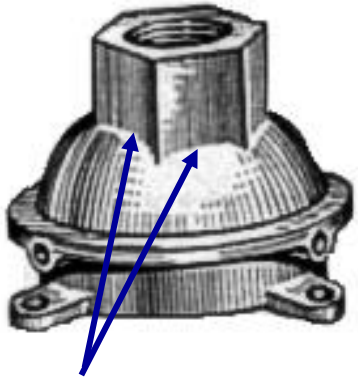
A Feeding Hopper
In industry.



Forged End of a
Connecting Rod.



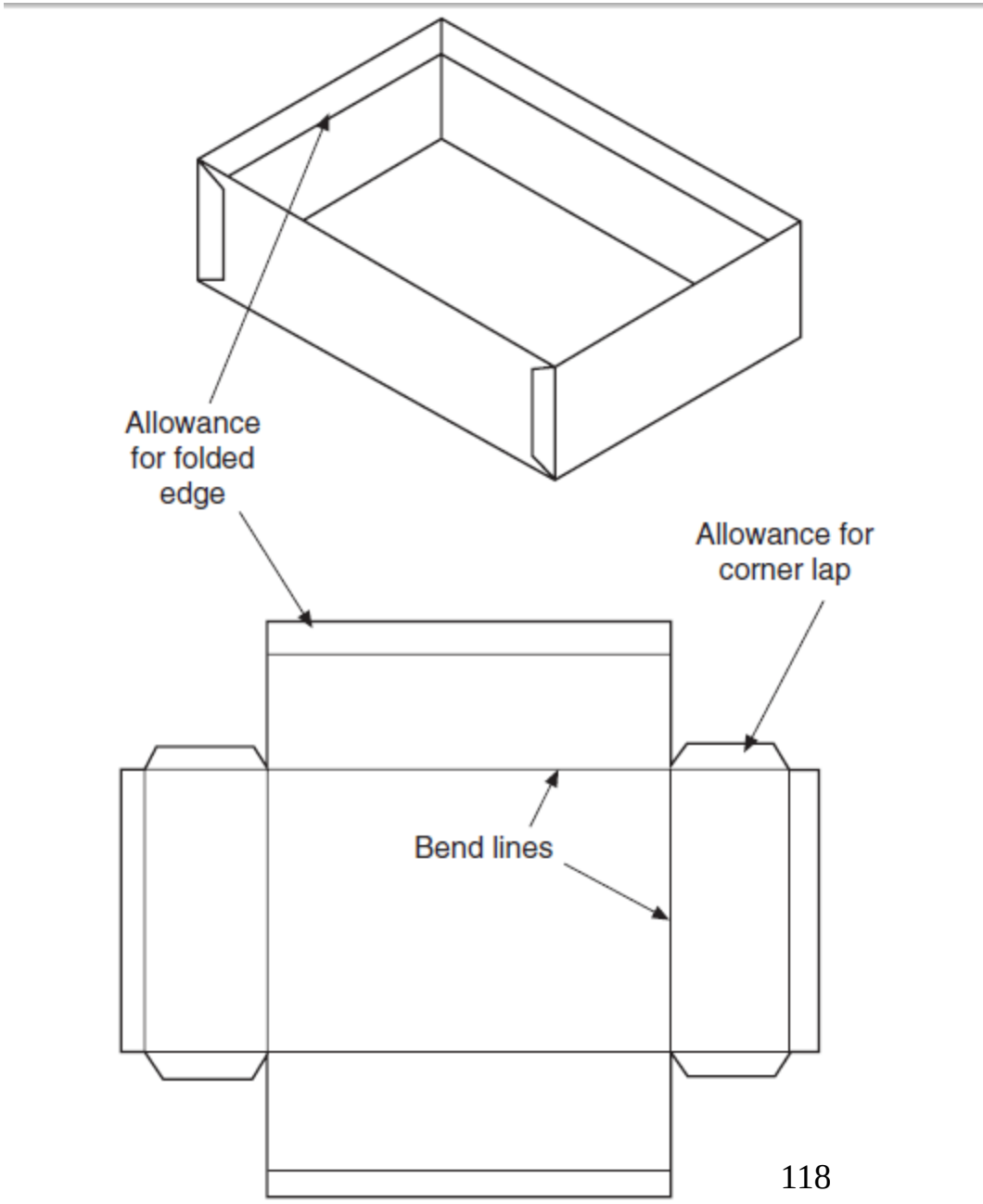
Two Cylindrical
surfaces.



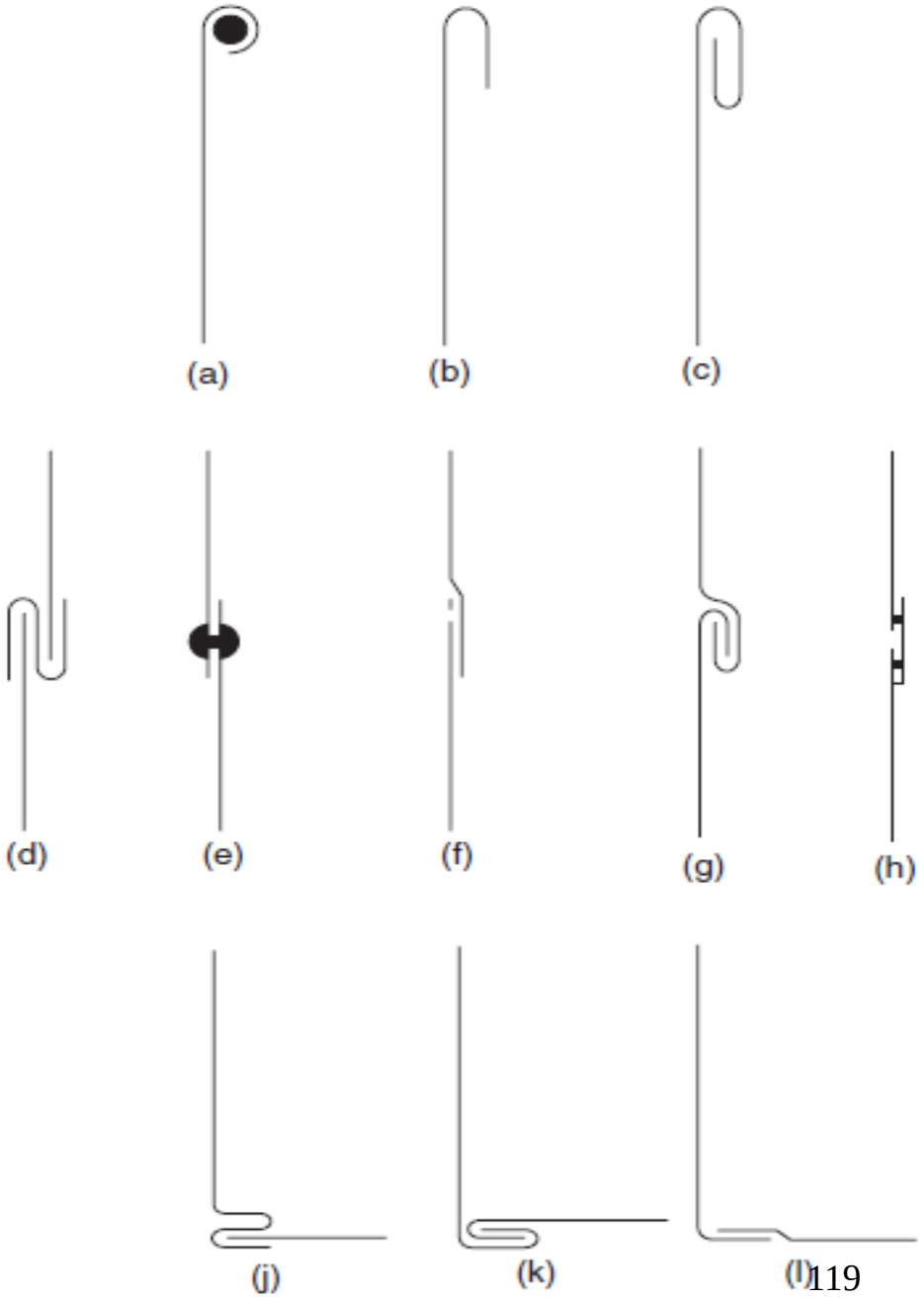
Pump lid having shape of a hexagonal Prism and Hemi-sphere intersecting each other.

Development

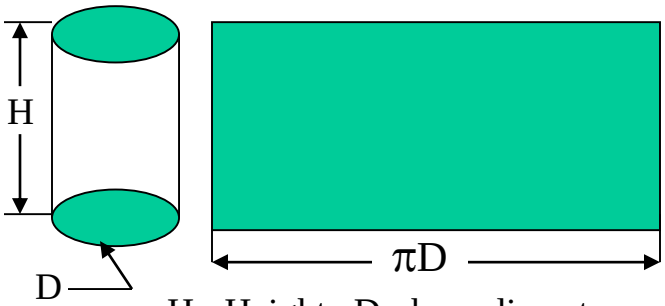
- Many articles such as cans, pipes, elbows, boxes, ducting, hoppers, etc.



Exposed edges which may be dangerous can be wired or folded, and these processes also give added strength

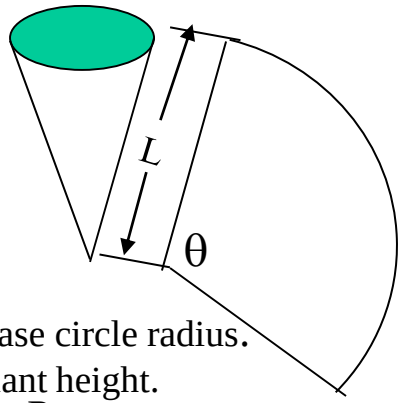


Cylinder: A Rectangle



H= Height D= base diameter

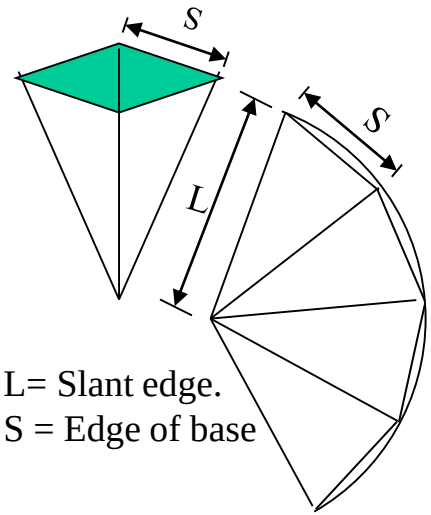
Cone: (Sector of circle)



R=Base circle radius.
L=Slant height.

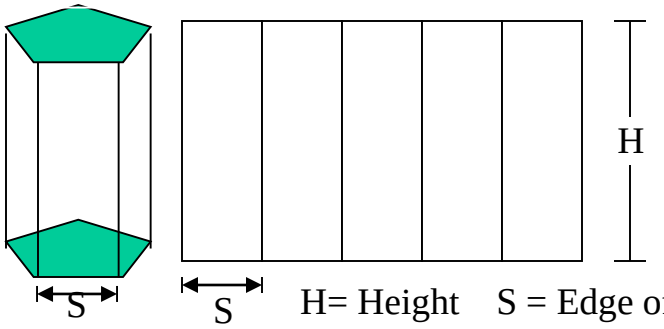
$$\theta = \frac{R}{L} \times 360^0$$

Pyramids: (No.of triangles)



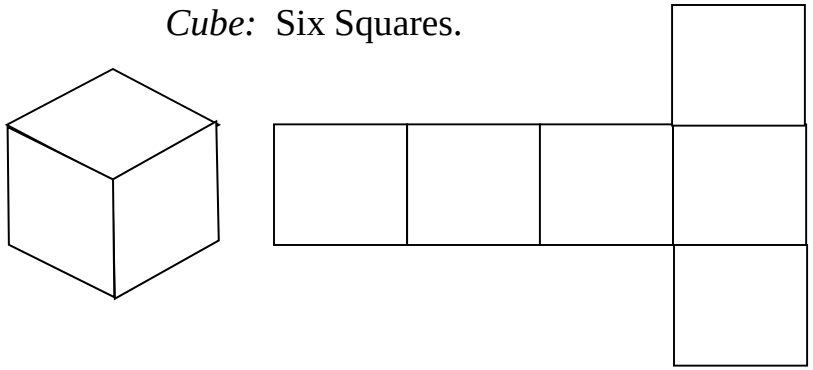
L= Slant edge.
S = Edge of base

Prisms: No.of Rectangles

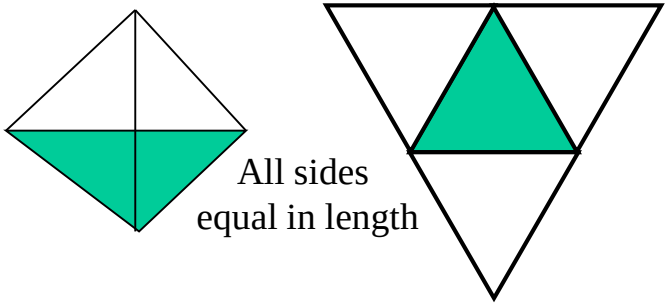


H= Height S = Edge of base

Cube: Six Squares.



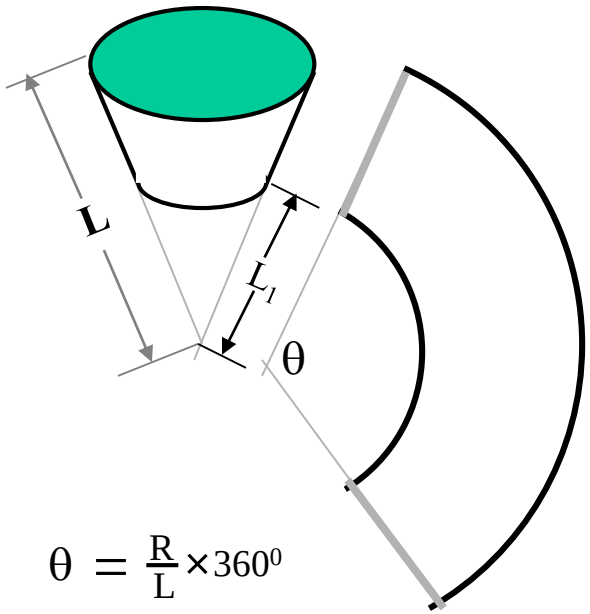
Tetrahedron: Four Equilateral Triangles



All sides
equal in length

FRUSTUMS

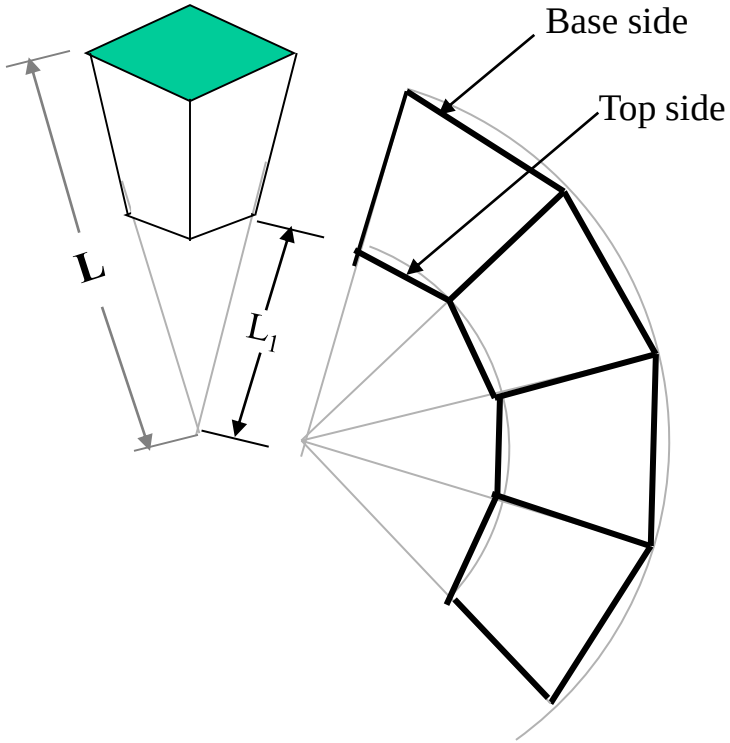
DEVELOPMENT OF
FRUSTUM OF CONE



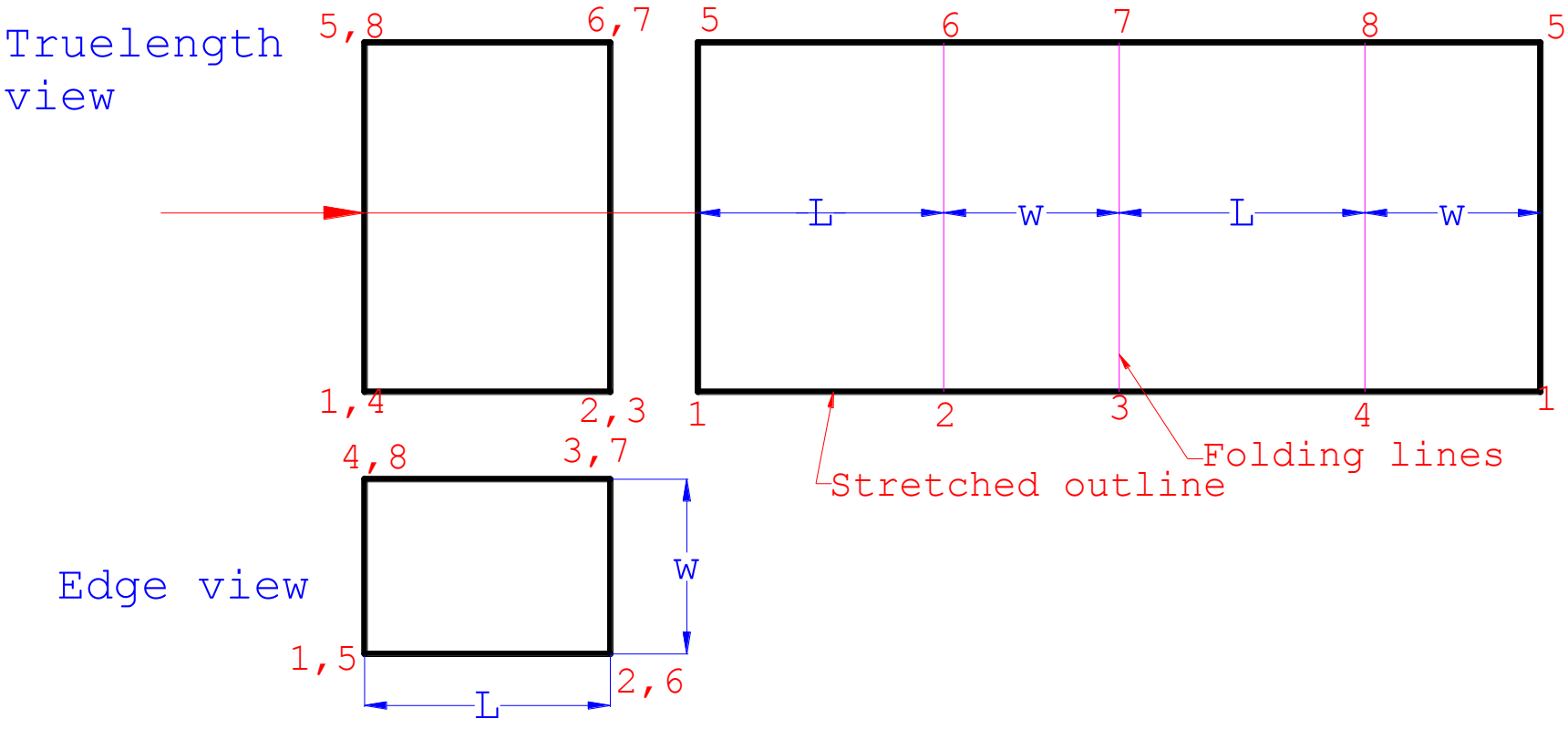
$$\theta = \frac{R}{L} \times 360^0$$

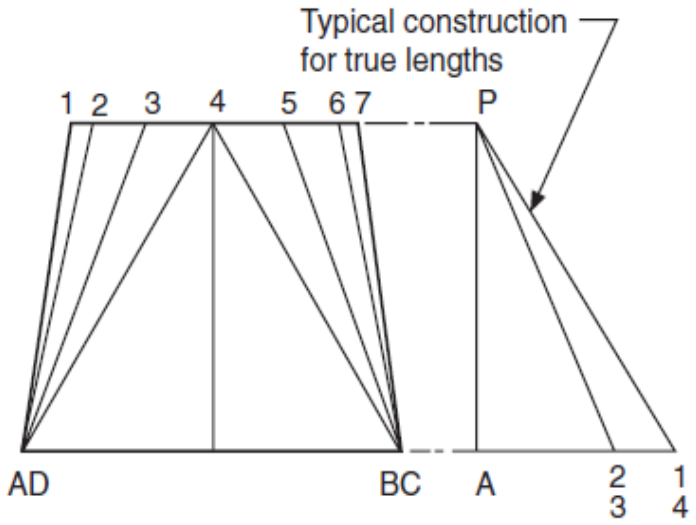
R= Base circle radius of cone
L= Slant height of cone
L_1 = Slant height of cut part.

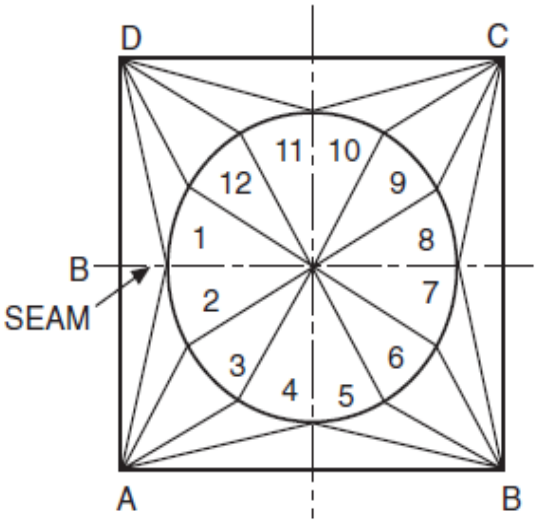
DEVELOPMENT OF
FRUSTUM OF SQUARE PYRAMID

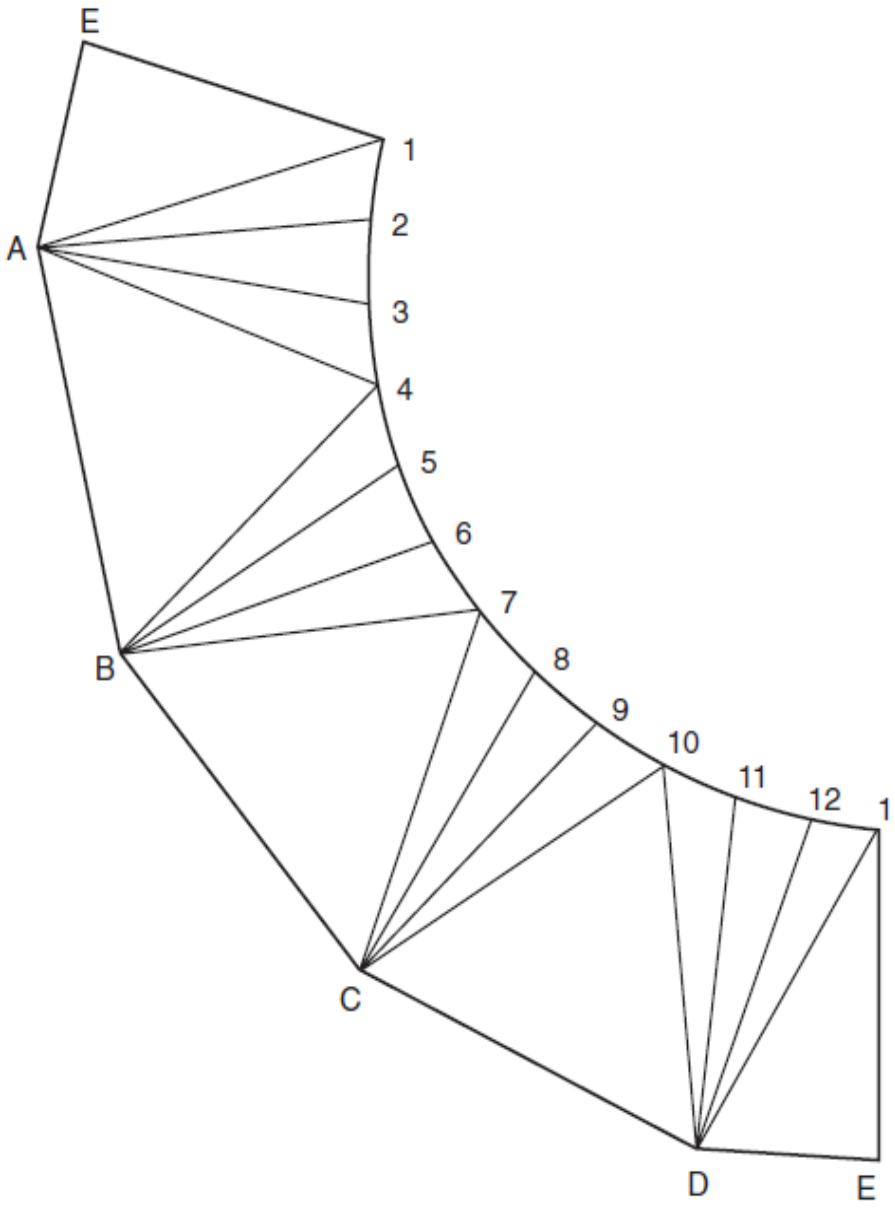


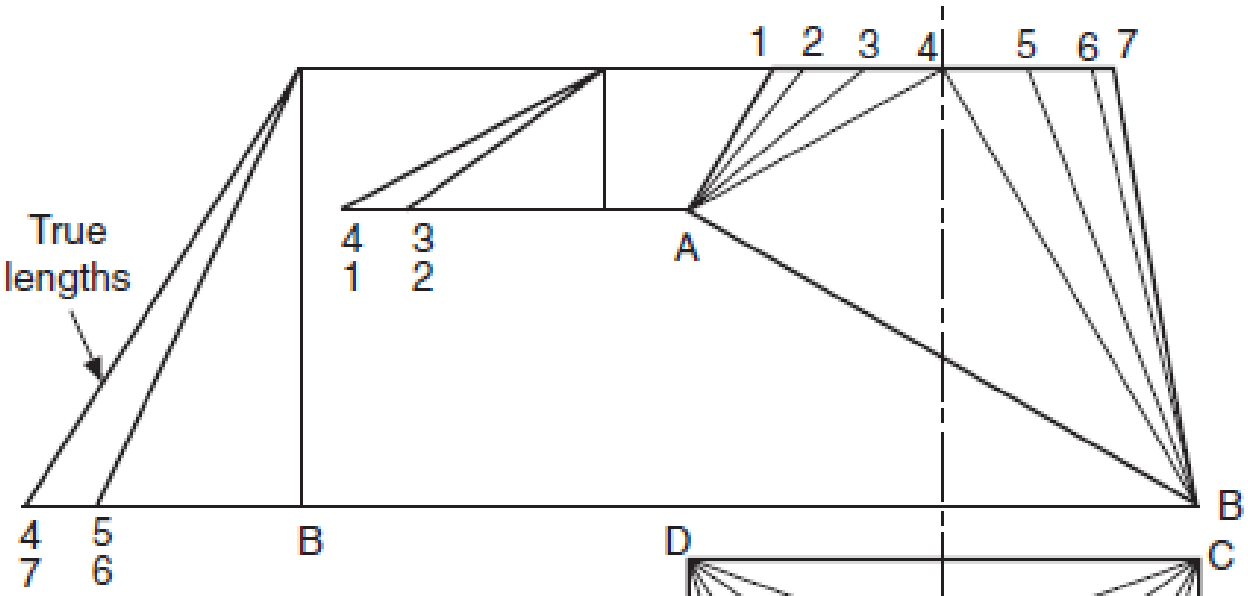
L= Slant edge of pyramid
L_1 = Slant edge of cut part.

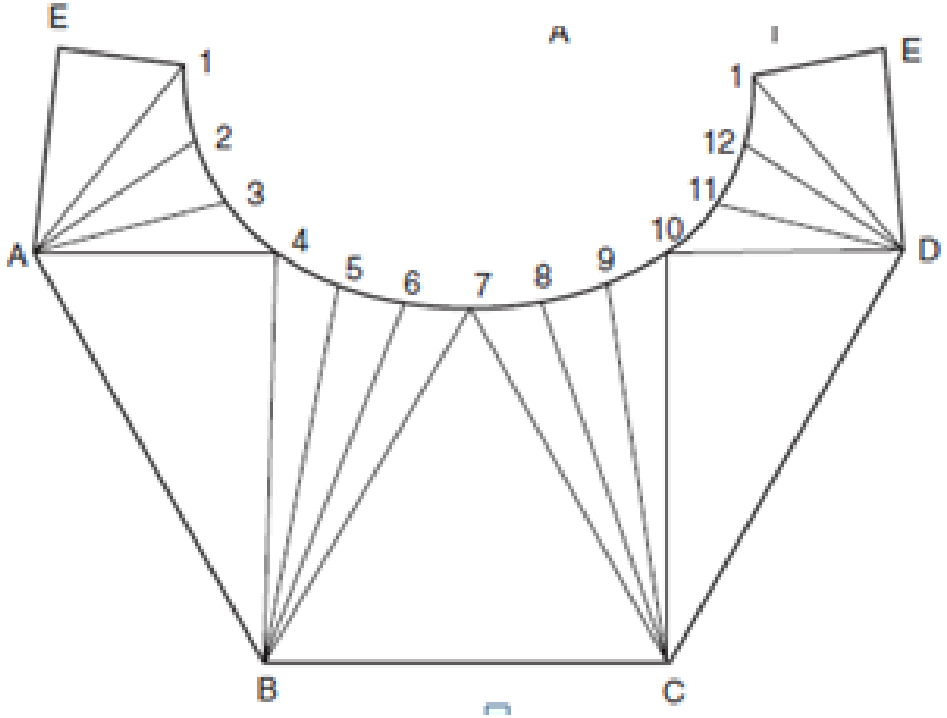

Truelength view
5,8
6,7
5
6
7
8
5
L
W
L
W
1,4
2,3
1
2
3
4
1
Folding lines
Stretched outline
4,8
3,7
W
Edge view
1,5
2,6
L

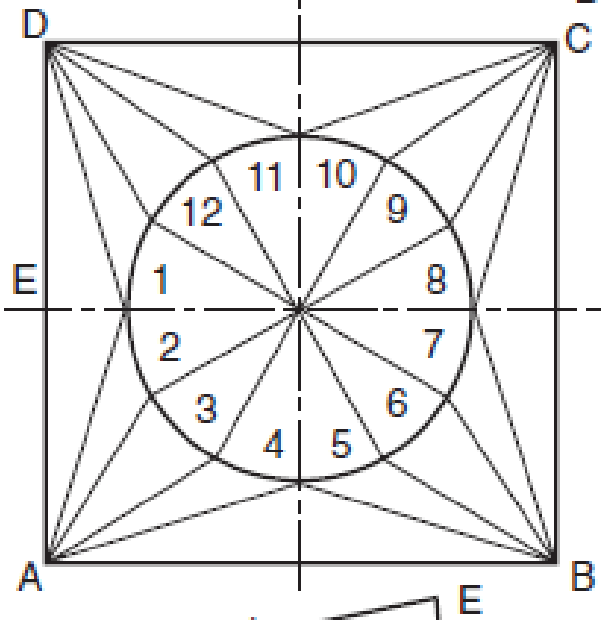

Typical construction
for true lengths
1 2 3 4 5 6 7
P
AD
BC
A
2
3
1
4

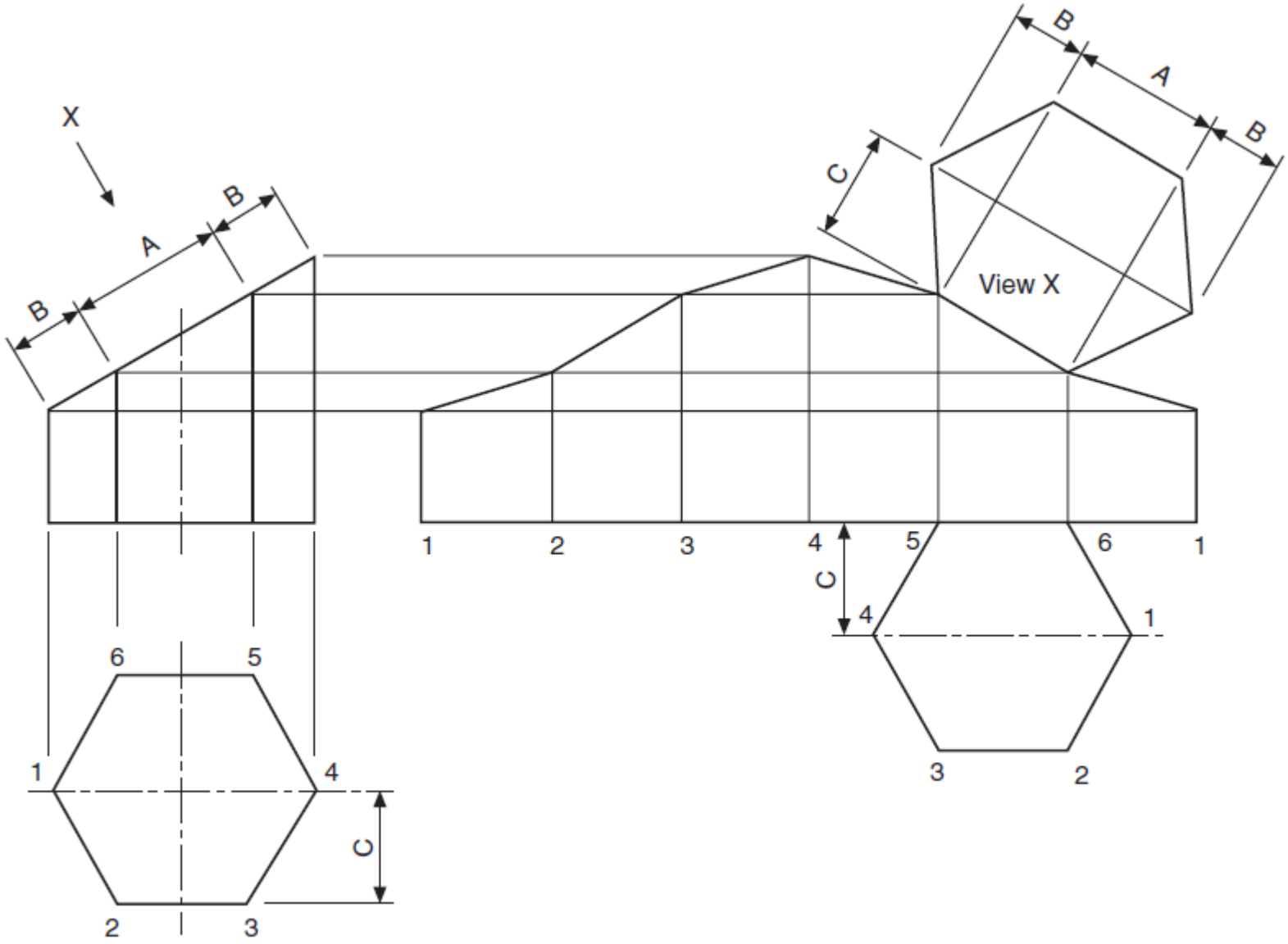

D
C
11
10
12
9
1
8
B
2
7
SEAM
3
6
4
5
A
B

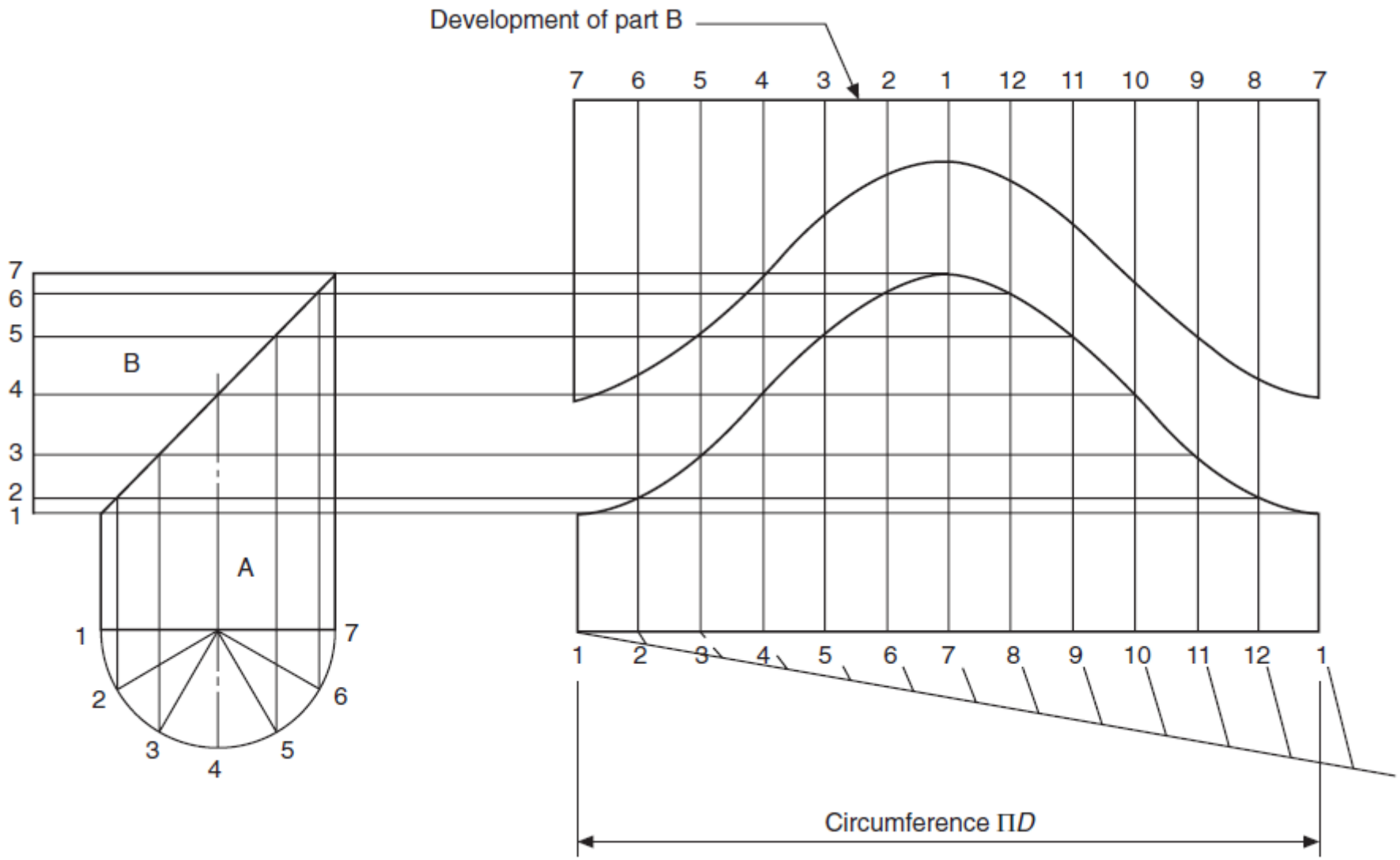

E
1
A
2
3
4
5
6
7
8
9
10
11
12
1
B
C
D
E

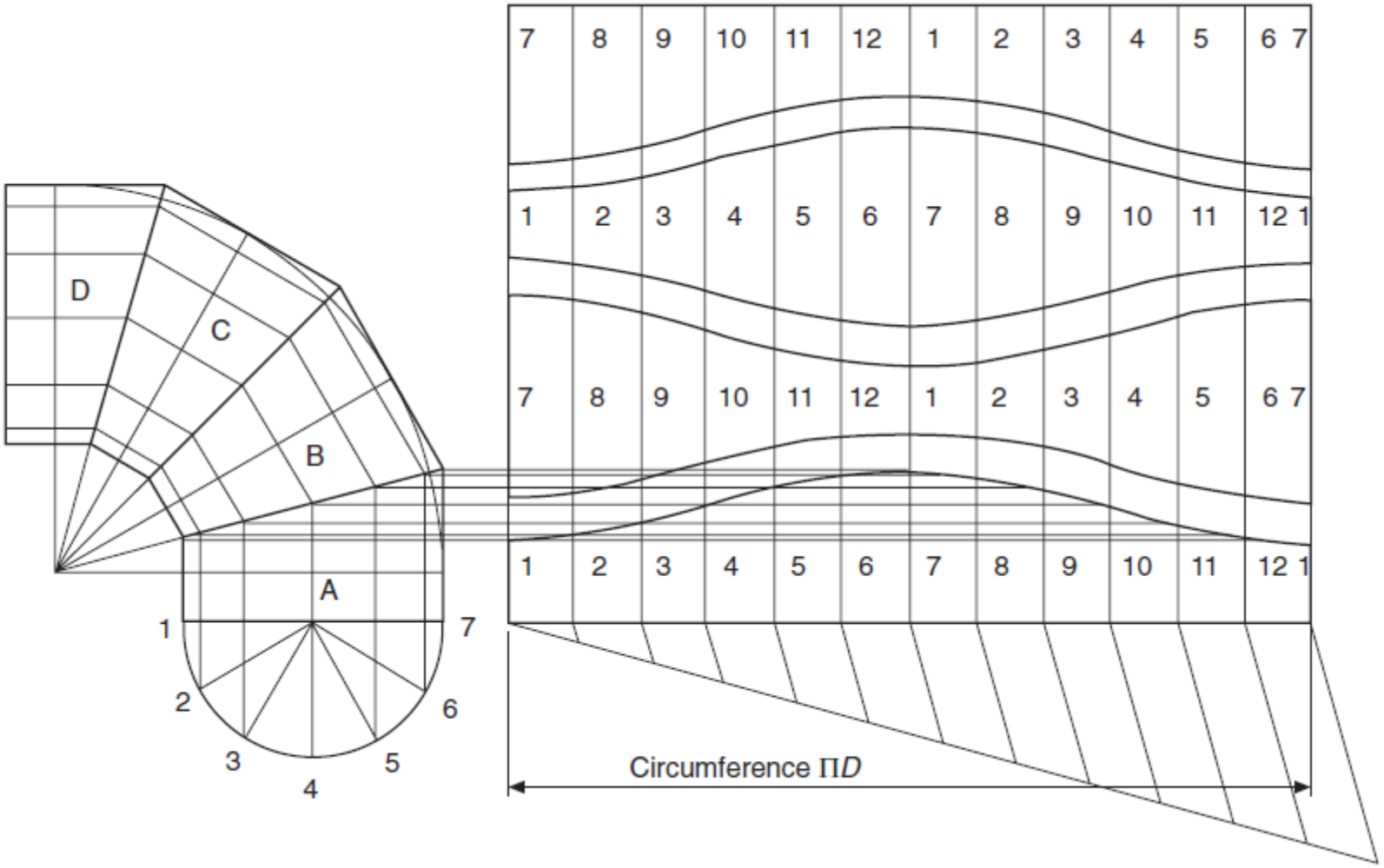

1 2 3 4 5 6 7
True lengths
4 3
1 2
A
4 5
7 6
B
B

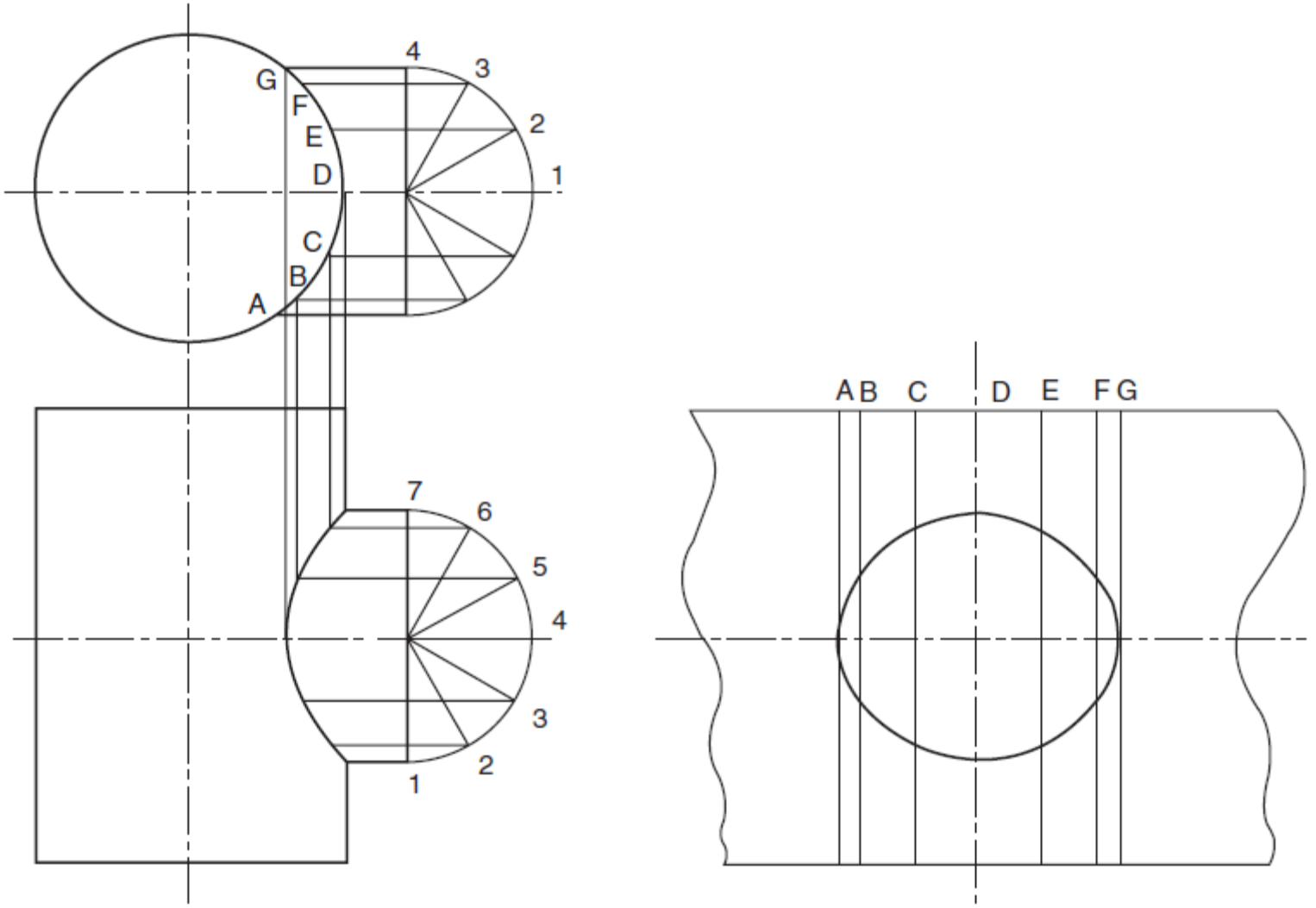

E
1
2
3
4
5
6
7
8
9
10
11
12
A
E
D
B
C

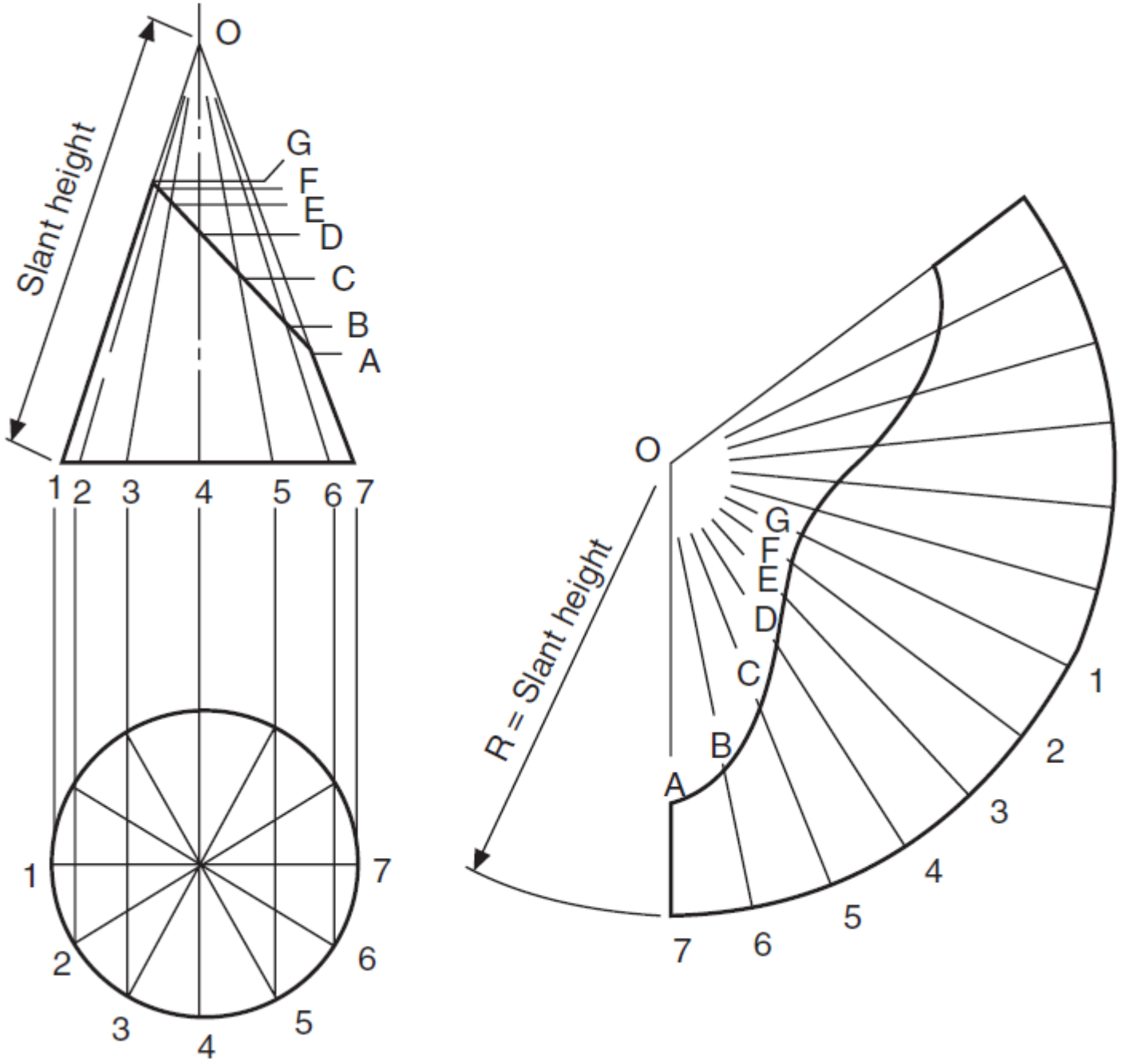

D
C
E
1
2
3
4
5
6
7
8
9
10
11
12
A
B
E

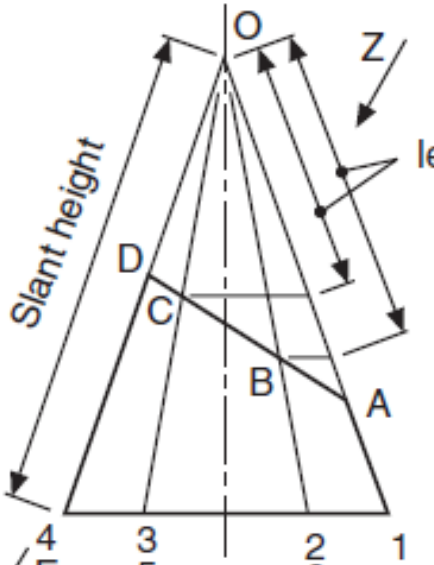

X
B
A
B
B
A
B
C
View X
1
2
3
4
5
6
1
C
4
1
3
2
6
5
1
4
C
2
3

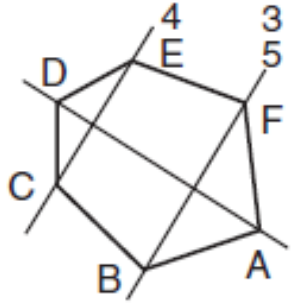

Development of part B
7 6 5 4 3 2 1 12 11 10 9 8 7
7
6
5
4
3
2
1
B
A
1 7
2 6
3 5
4
1 2 3 4 5 6 7 8 9 10 11 12 1
Circumference ΠD


7 8 9 10 11 12 1 2 3 4 5 6 7
1 2 3 4 5 6 7 8 9 10 11 12 1
7 8 9 10 11 12 1 2 3 4 5 6 7
1 2 3 4 5 6 7 8 9 10 11 12 1
D
C
B
A
1
2
3
4
5
6
7
Circumference ΠD

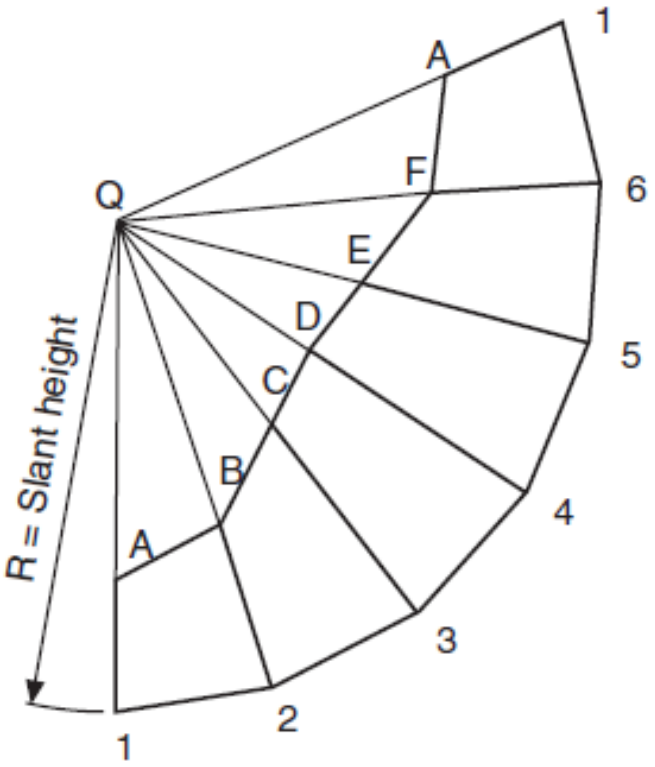

4
3
2
1
G
F
E
D
C
B
A
7
6
5
4
3
2
1
A B C D E F G

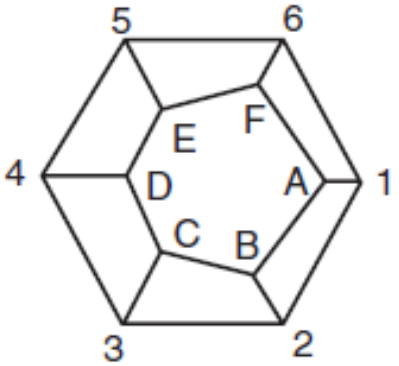

O
Slant height
G
F
E
D
C
B
A
1 2 3 4 5 6 7
1
2
3
4
5
6
7
R = Slant height
O
G
F
E
D
C
B
A
1
2
3
4
5
6
7



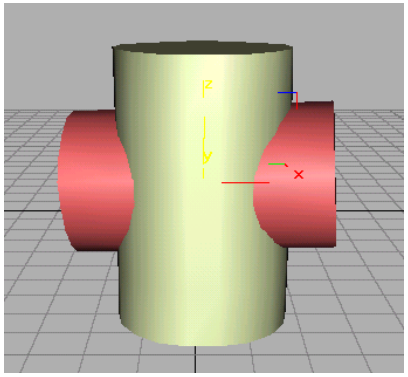


True view in direction
of arrow z

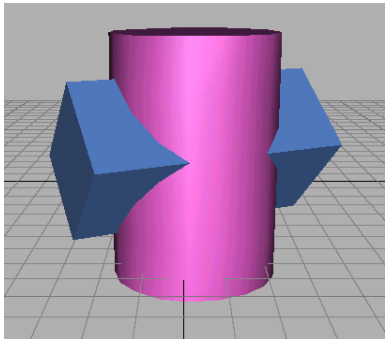




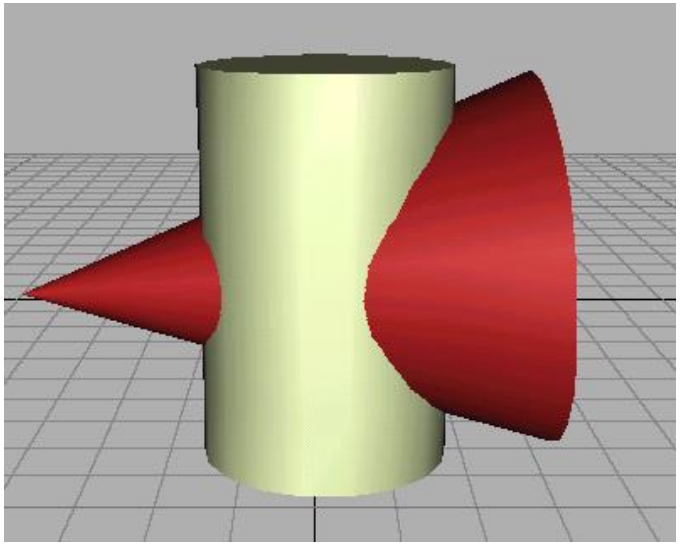
CYLINDER STANDING & CYLINDER PENETRATING

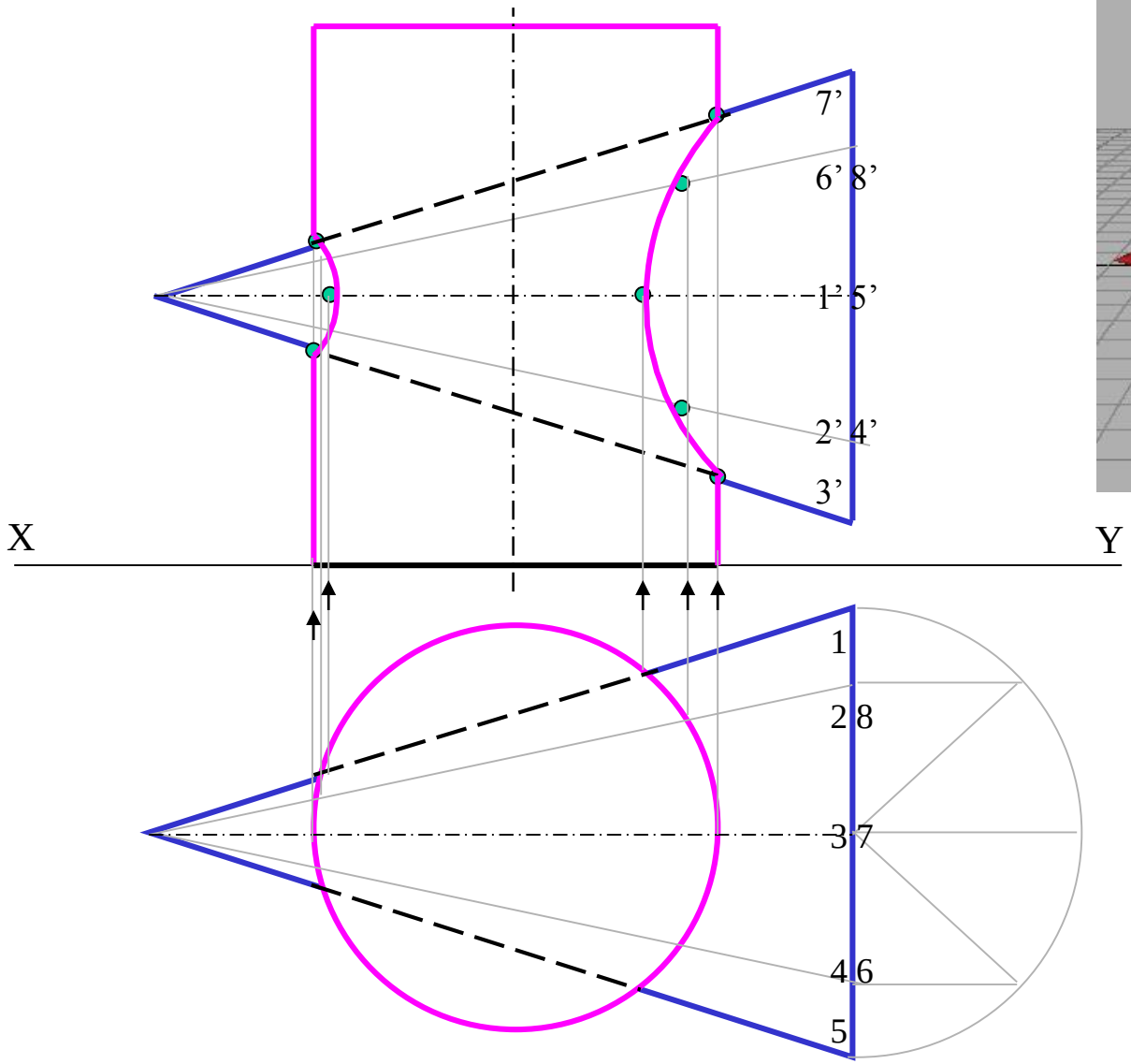


CYLINDER STANDING & SQ. PRISM PENETRATING

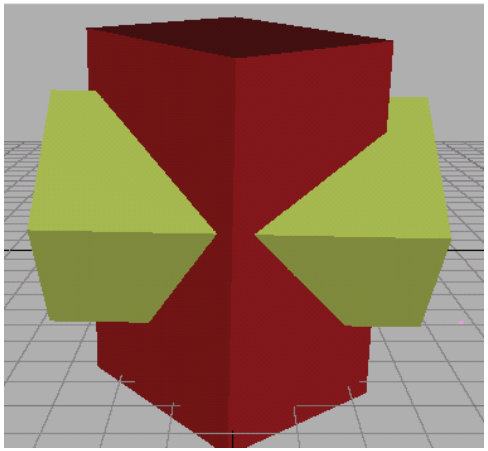


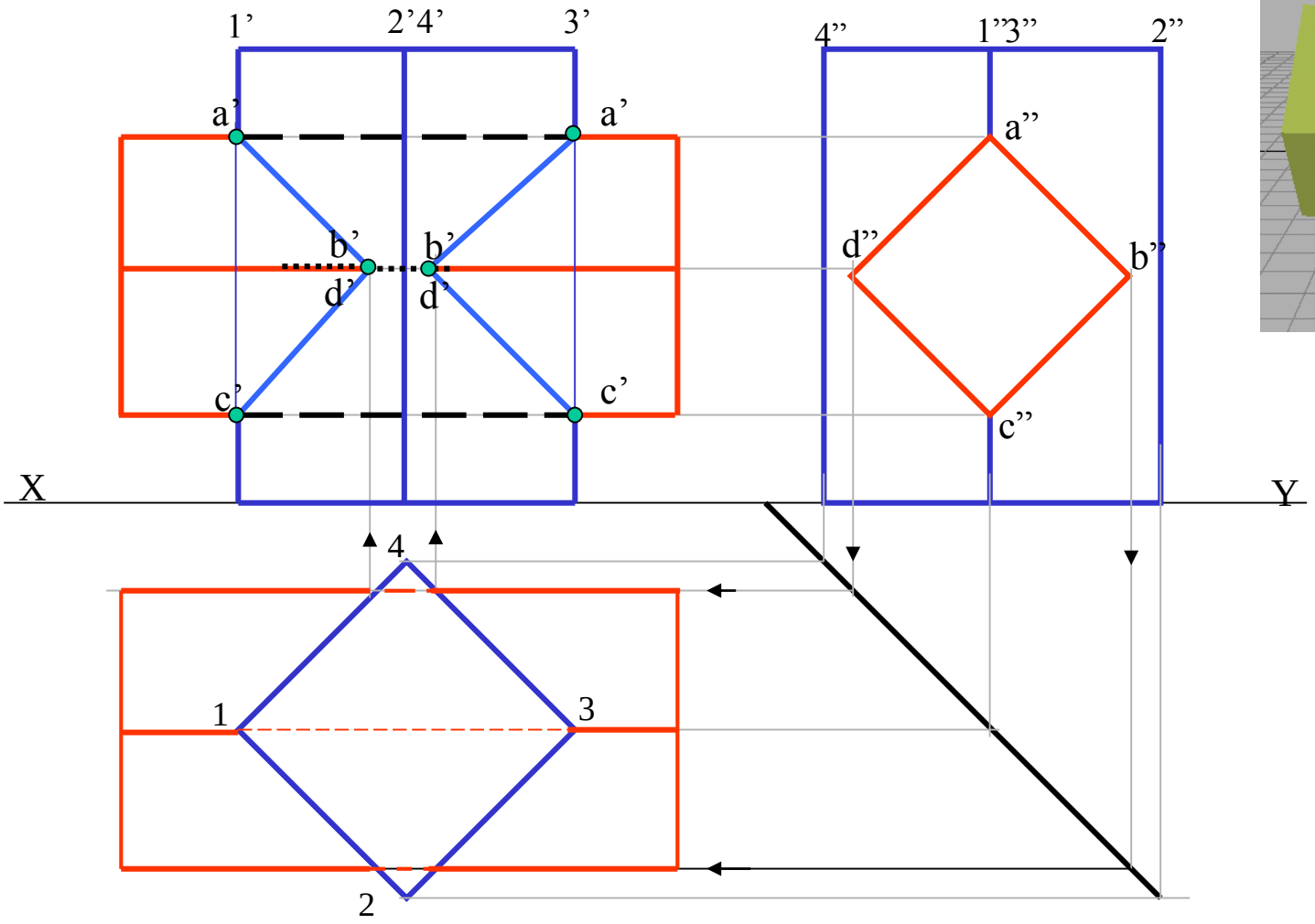
CYLINDER STANDING & CONE PENETRATING



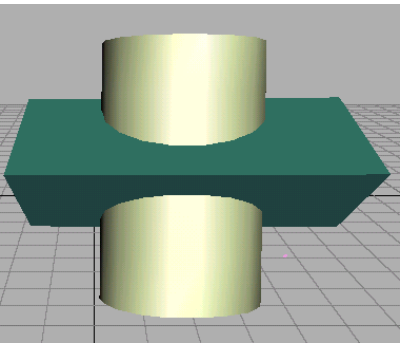


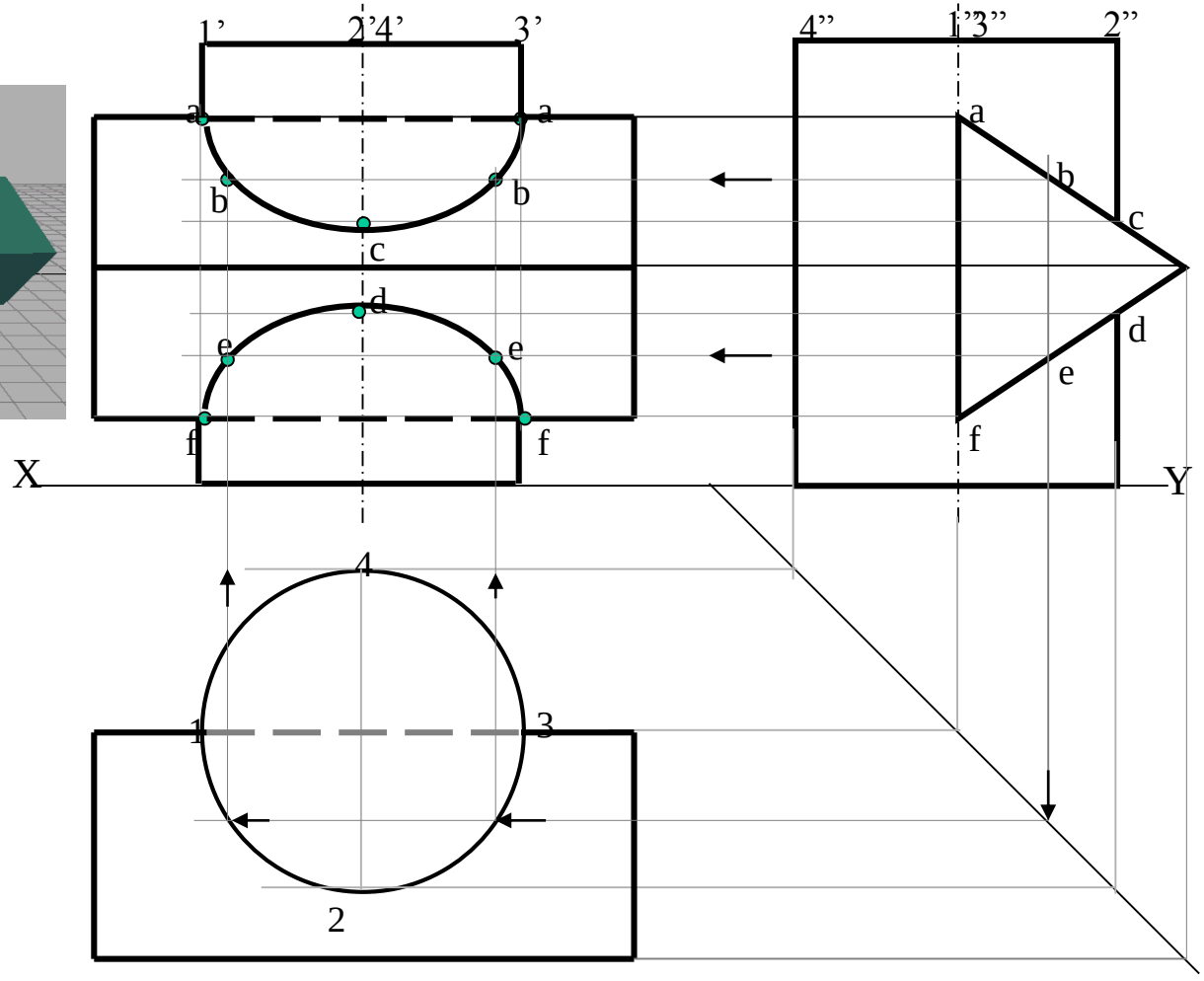
SQ.PRISM STANDING & SQ.PRISM PENETRATING

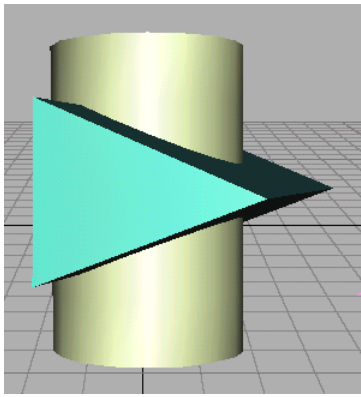




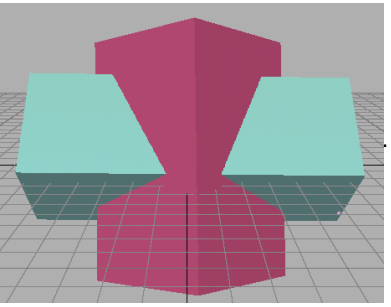
CYLINDER STANDING & TRIANGULAR PRISM PENETRATING

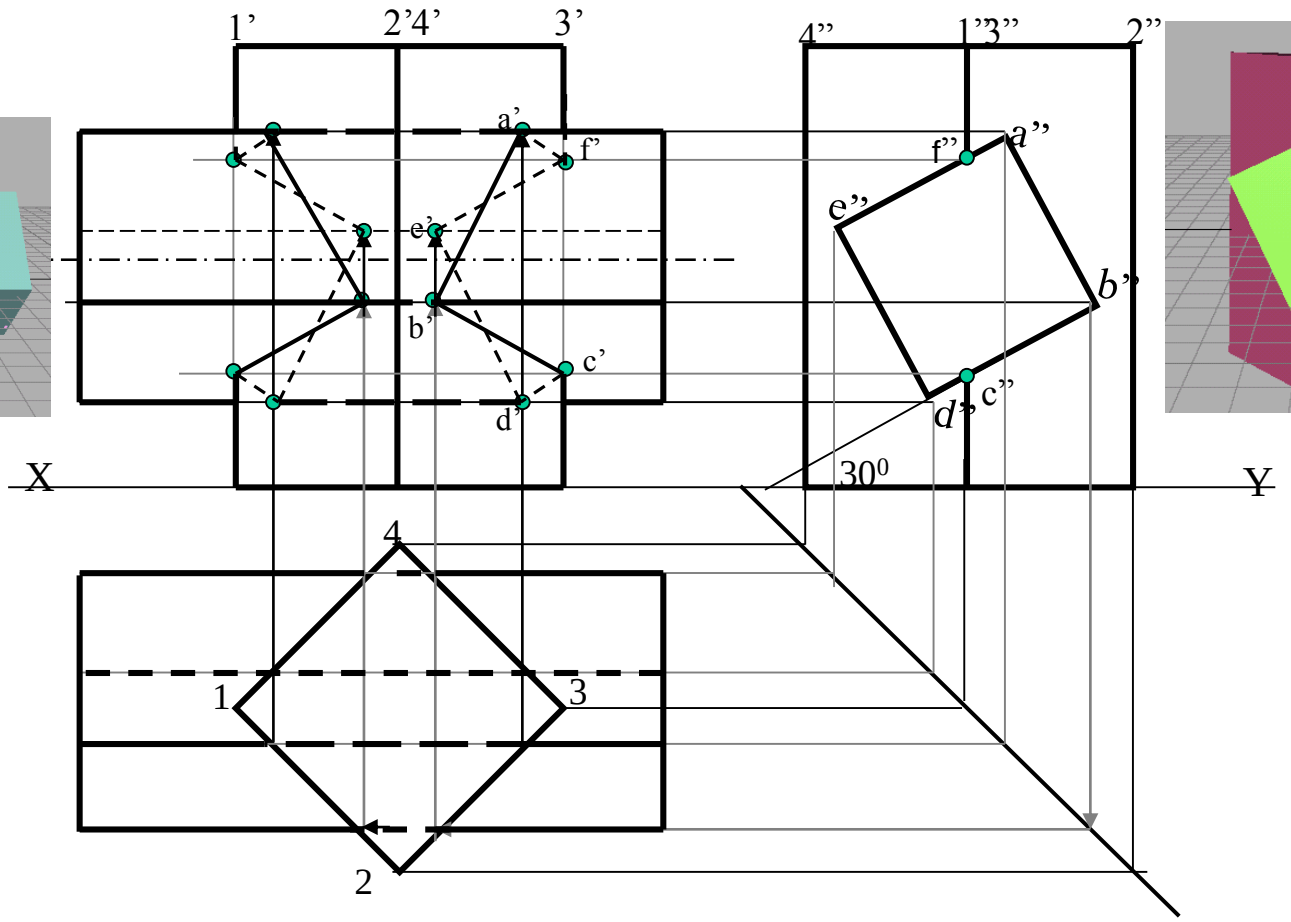


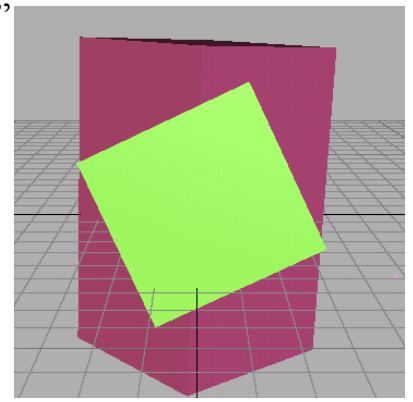




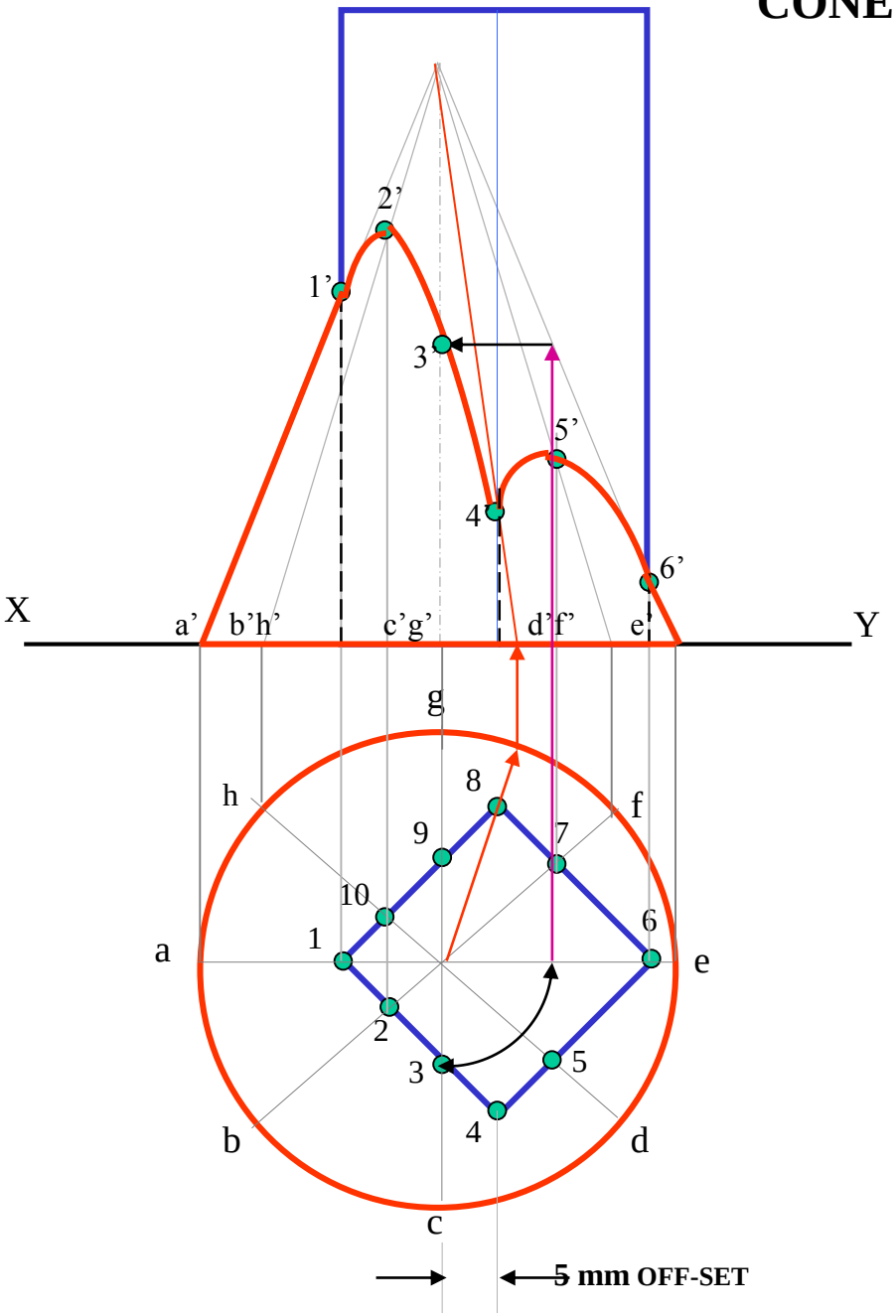
SQ. PRISM STANDING & SQ. PRISM PENETRATING (30^0 SKEW POSITION)

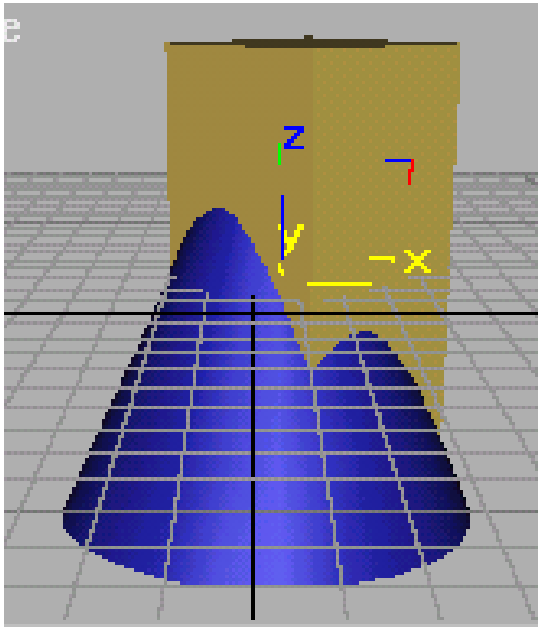






CONE STANDING & SQ.PRISM PENETRATING (BOTH AXES VERTICAL)





CONE STANDING
&
CYLINDER PENETRATING