

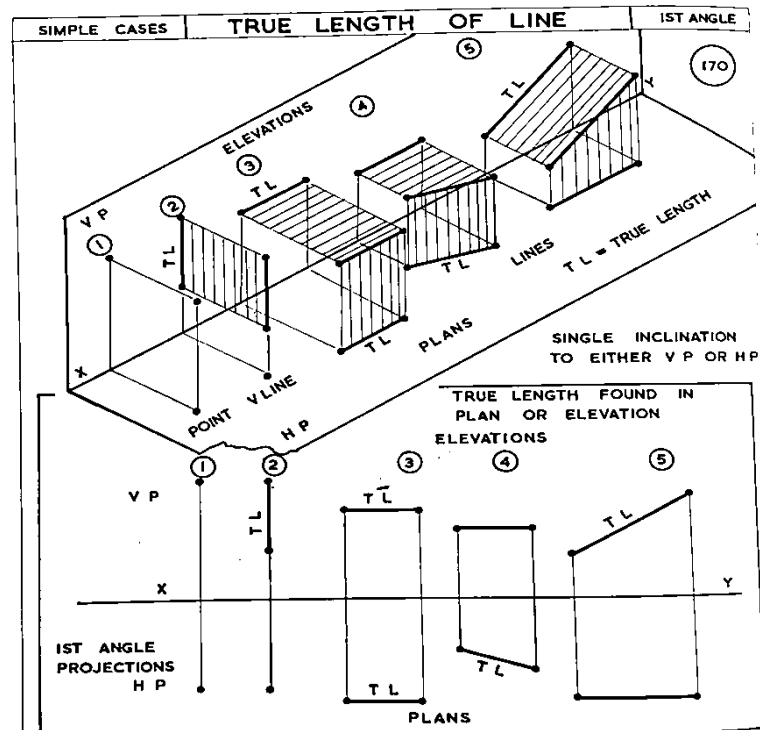
Strand	TD11.1. GEOMETRY
Sub - Strand	TD11.1.4 SOLID GEOMETRY & SURFACE DEVELOPMENT
Content Learning Outcome	TD11.1.4.1 Draw the auxiliary views of truncated solids and identify and develop skills in constructing developments of interpenetration of prisms and cylinders.

SOLID GEOMETRY AND SURFACE DEVELOPMENT

- Surface development is a process of revealing the true shape of a flat surface which is in two dimensional shapes.
- The surface to be developed may be flattened or rolled out without tearing or folding in order to get an exact development.
- Knowledge of development is very useful in sheet metal work, construction of storage vessels, chemical vessels, boilers, chimneys, etc.
- Such articles are manufactured from plates that are cut according to these developments and then properly bent into the desired shaped.
- The joints are then welded, glued or riveted.

TRUE LENGTH RULES

A true length in one of the orthographic planes is obtained when its adjacent view is parallel to the reference line. In cases, where true length is not given, we will use graphical technique to obtain the true length and subsequently the true shape.



METHOD 2

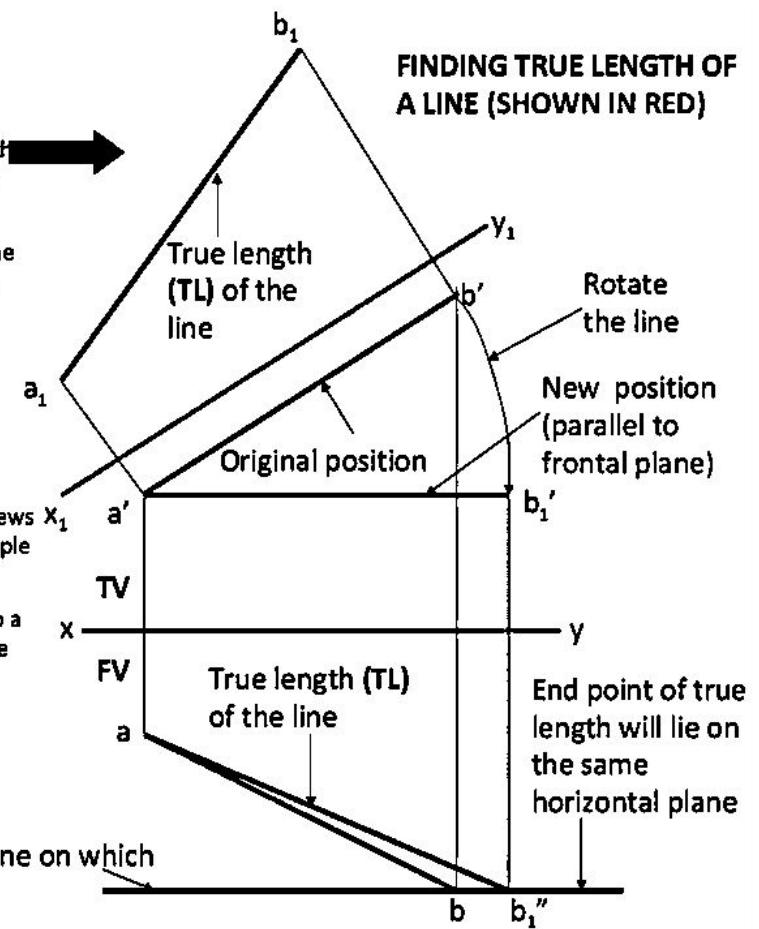
Auxiliary view method:

Draw an auxiliary view of the line with the reference line parallel to the line in one of the principle planes
The length of the auxiliary view of the line gives the True Length (TL) of the line

METHOD 1

Rotation method:

Rotate the line in one of the principle views such that it is parallel to the other principle planes
Project the new position of the line onto a straight line through the end point of the original line in the other view
The length of the projection is the True Length (TL)



PRINCIPLES OF SURFACE DEVELOPMENT

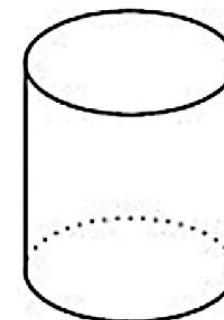
Every line on the development should show the true length of the corresponding line on the surface which is developed.

METHODS OF DEVELOPMENT

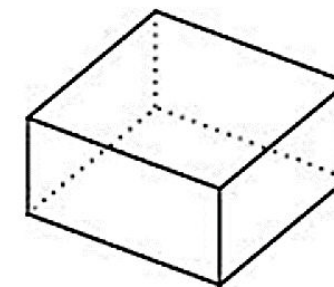
1. Parallel line development
2. Radial line development
3. Development by Triangulation

1. PARALLEL-LINE DEVELOPMENT

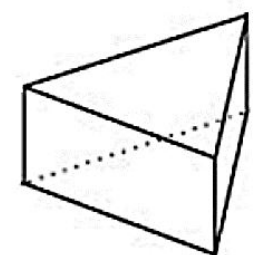
This method of surface development is used for Cylinders and Prisms. It uses the stretch out principle whereby the object is rolled out on a flat surface. All the generators are parallel to each other which give the name of the method of development. Given below is a cylinder, square prism and triangular prism.



Cylinder



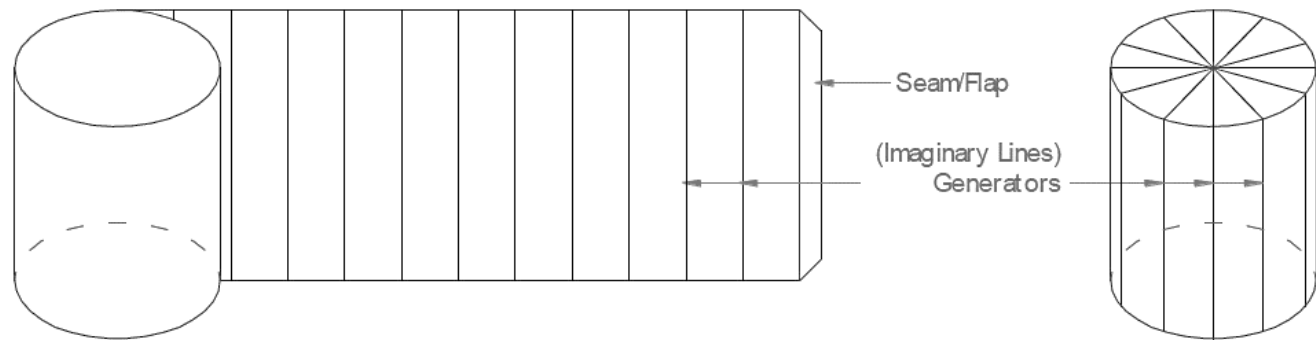
Square Prism



Triangular Prism

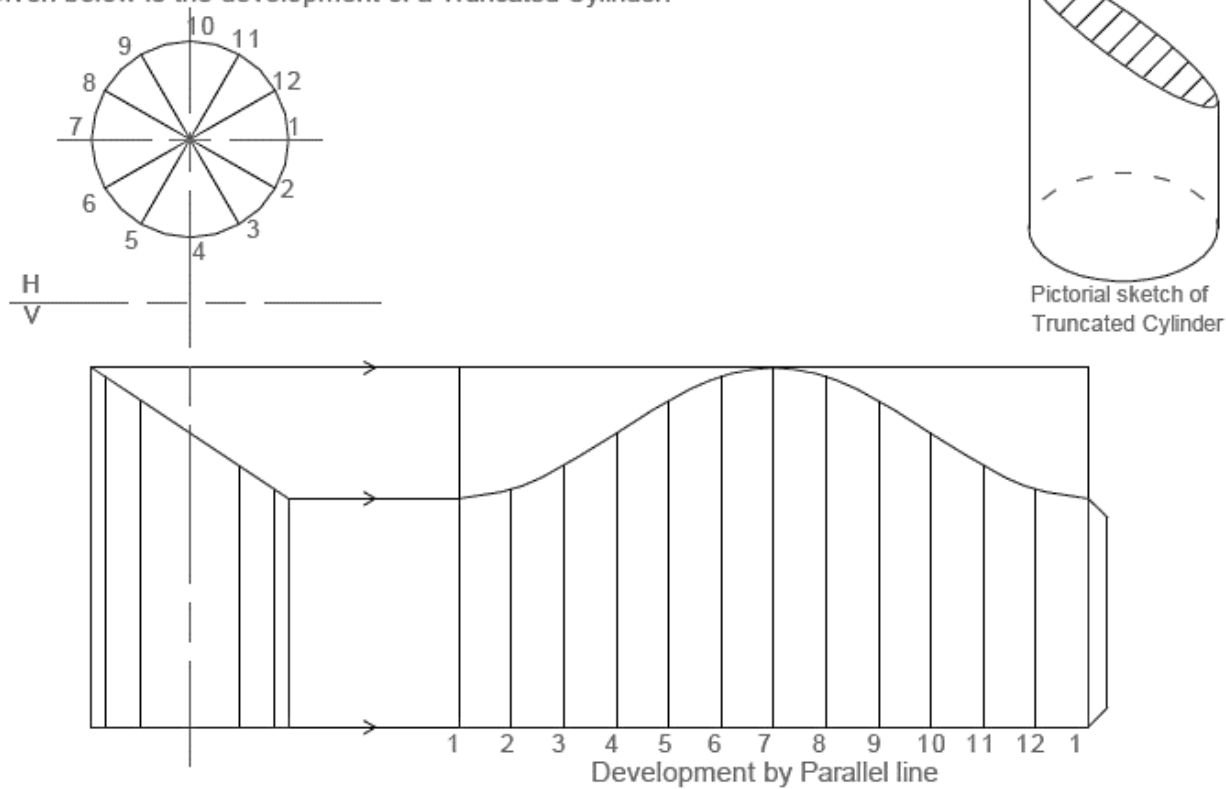
EXAMPLE OF A PARALLEL-LINE DEVELOPMENT OF A CYLINDER AND PRISM.

Given below is a stretch out of a cylinder

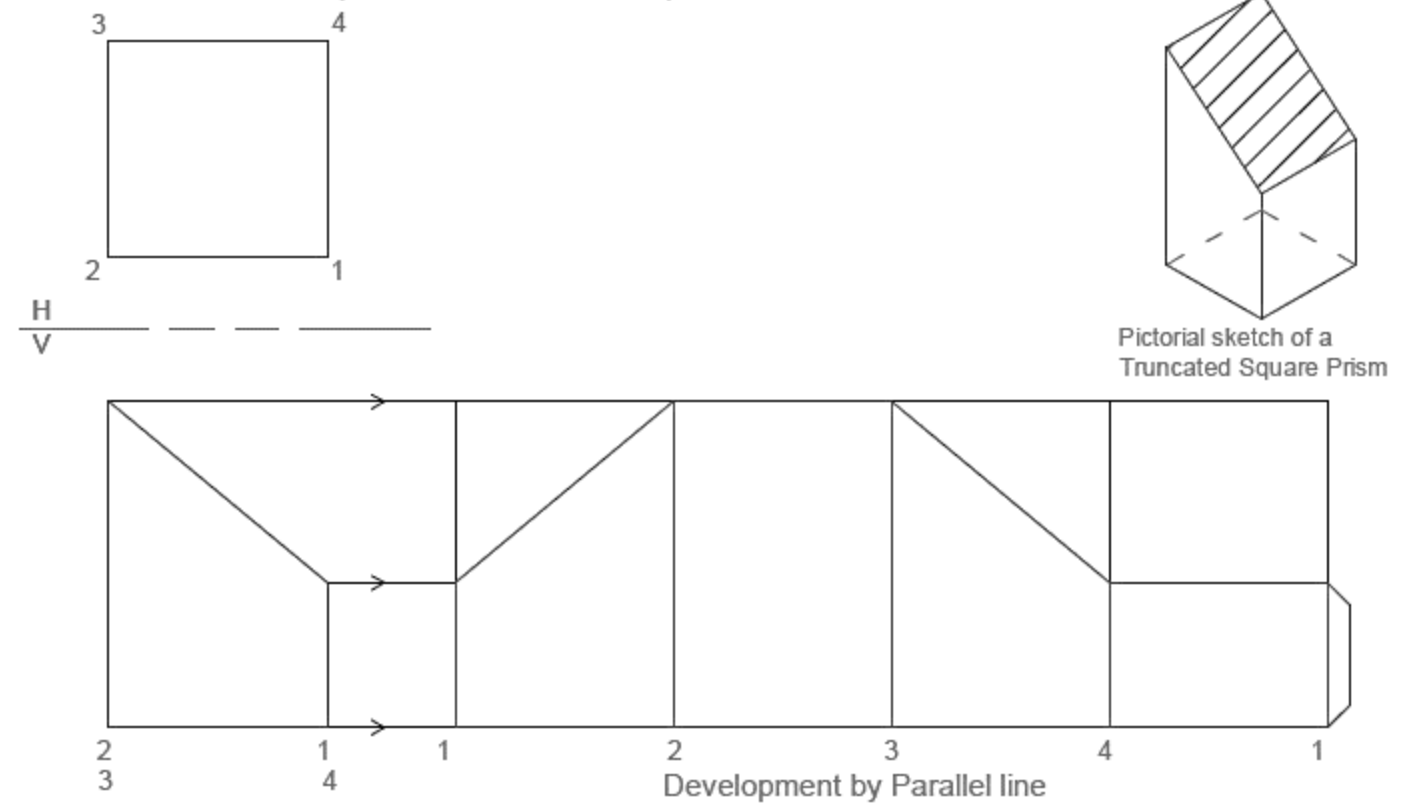


WORKED EXAMPLE

Example 1
Given below is the development of a Truncated Cylinder.

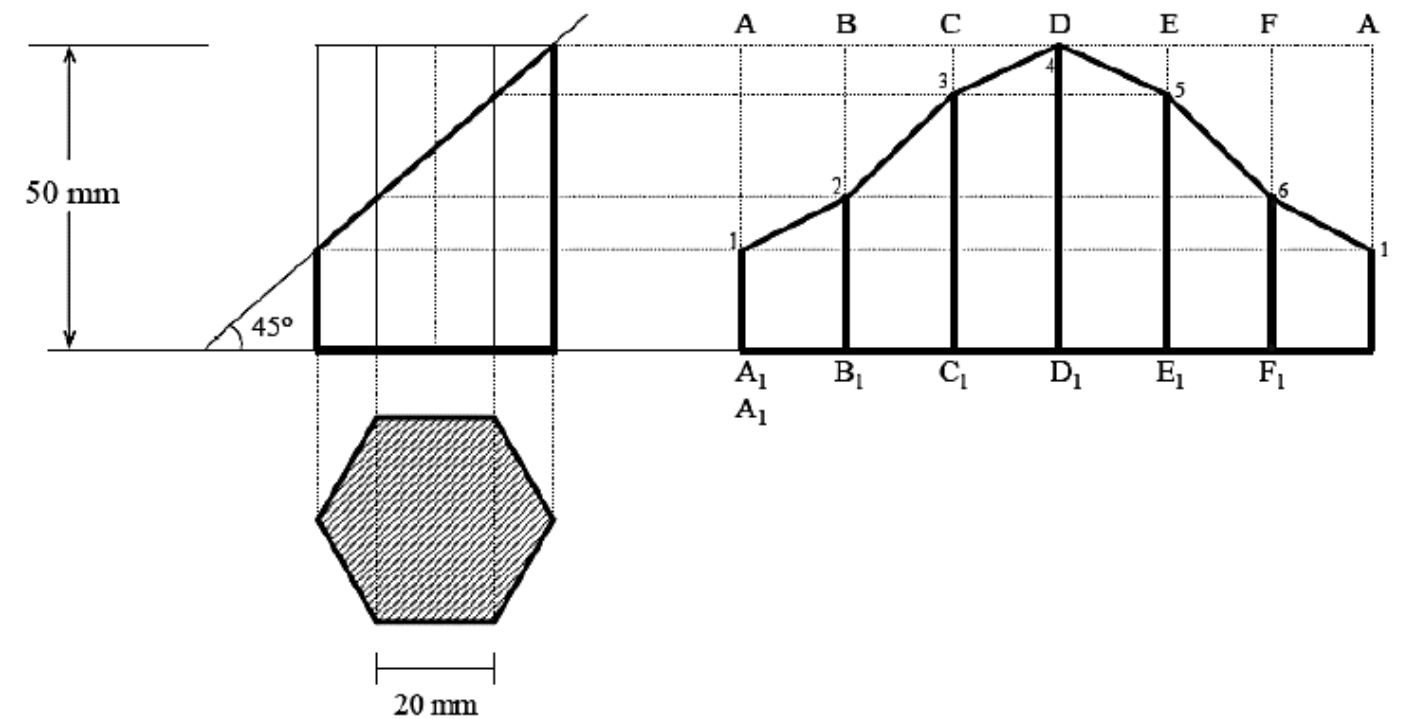


Example 2
Given below is the development of a Truncated Square Prism.



WORKED EXAMPLE 3

A regular hexagonal prism with 20 mm sides and 50mm axis rests with its base on H.P such that one of its rectangular faces is parallel to V.P. It is cut by a plane perpendicular to V.P, inclined at 45° to H.P and passing through the right corner of the top face of the prism. Draw the sectional top view and develop the lateral surface of the truncated prism.



2. RADIAL-LINE DEVELOPMENT

This method of surface development is used for Cones and Pyramids. The two common types of cones and pyramids are right and oblique. The centre line for a right cone/pyramid will meet the base at 90° whereas the oblique cone/pyramid will meet at an angle other than 90°. Finding the true length is very important for cones/pyramids for drawing the development.

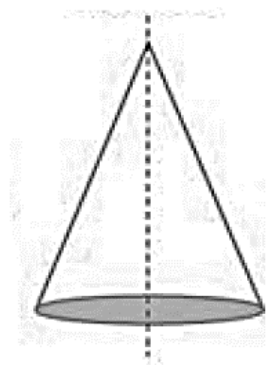
TWO BASIC RULES FOR FINDING THE TRUE LENGTH ARE:

1. If a line appears as a point in one view, then the same line will be the true length in the next view.
2. If a line is parallel to the reference line in one view, then the same line will appear as the true length in the next view.

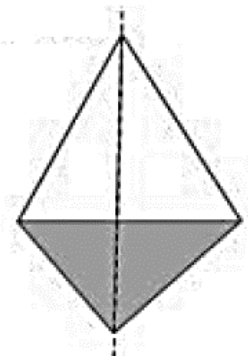
EXAMPLE OF RADIAL-LINE DEVELOPMENT OF CONE AND PYRAMIDS

Given below is a stretch out of a cone.

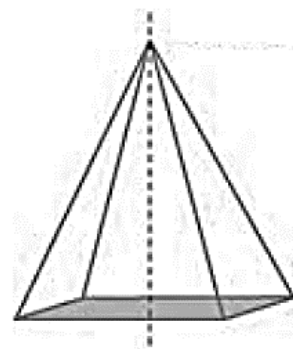
Given below is a cone, triangular pyramid and rectangular pyramid.



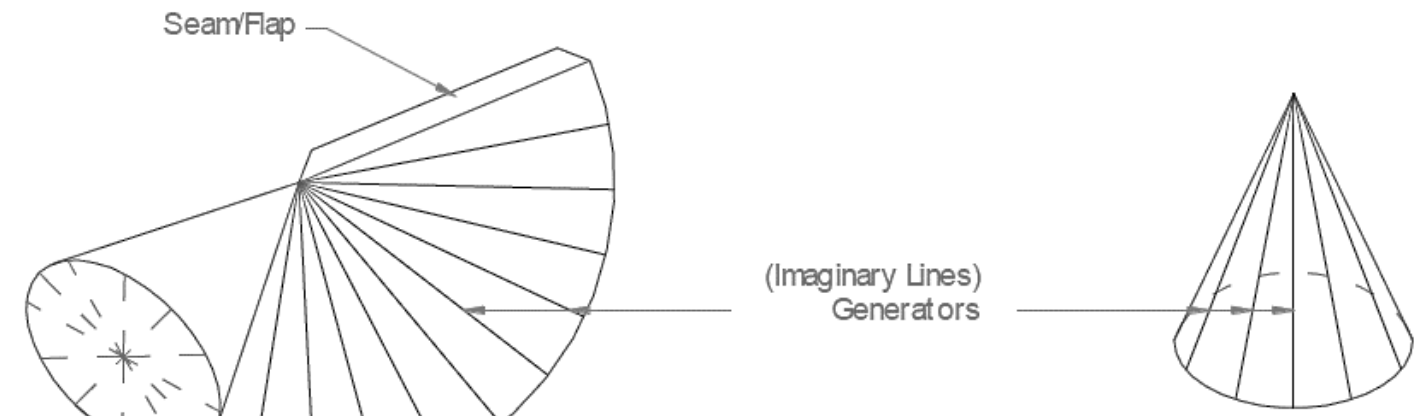
Cone



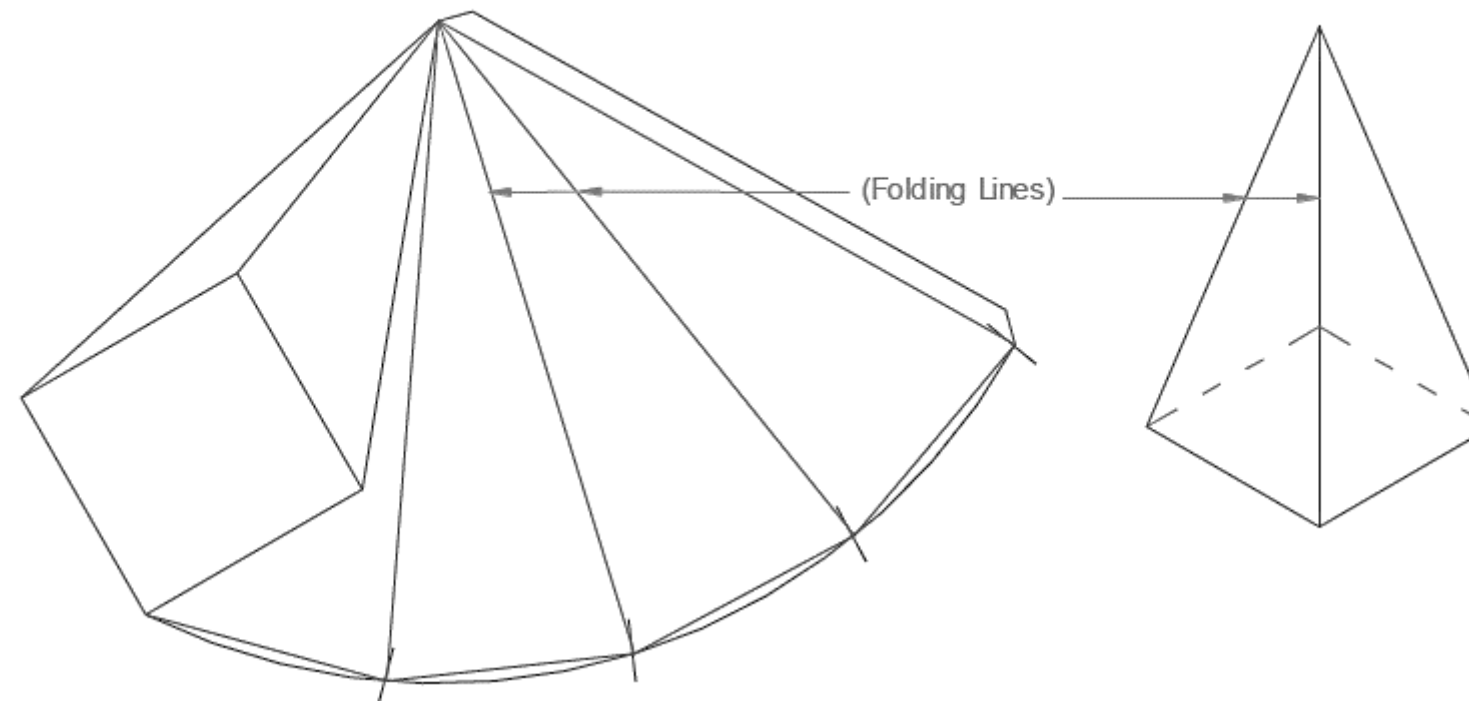
Triangular Pyramid



Rectangular Pyramid

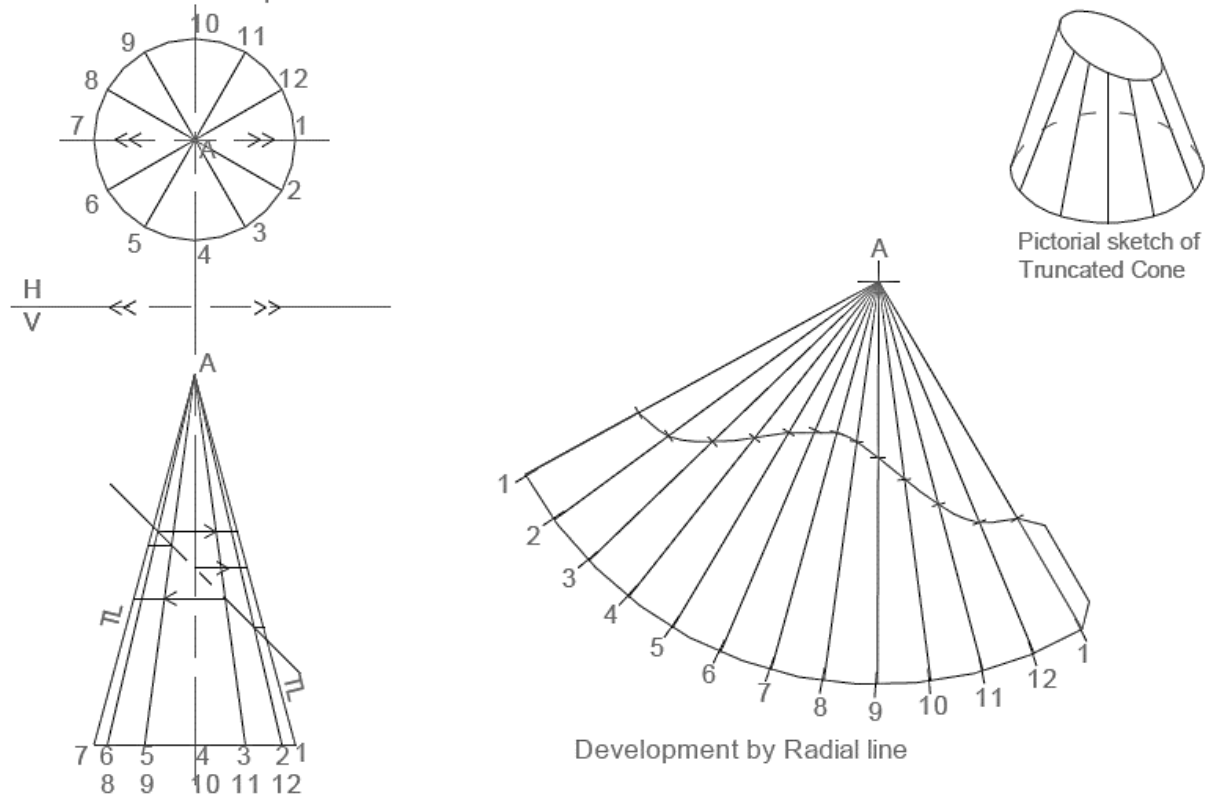


Given below is a stretch out of a square pyramid.



Example 1

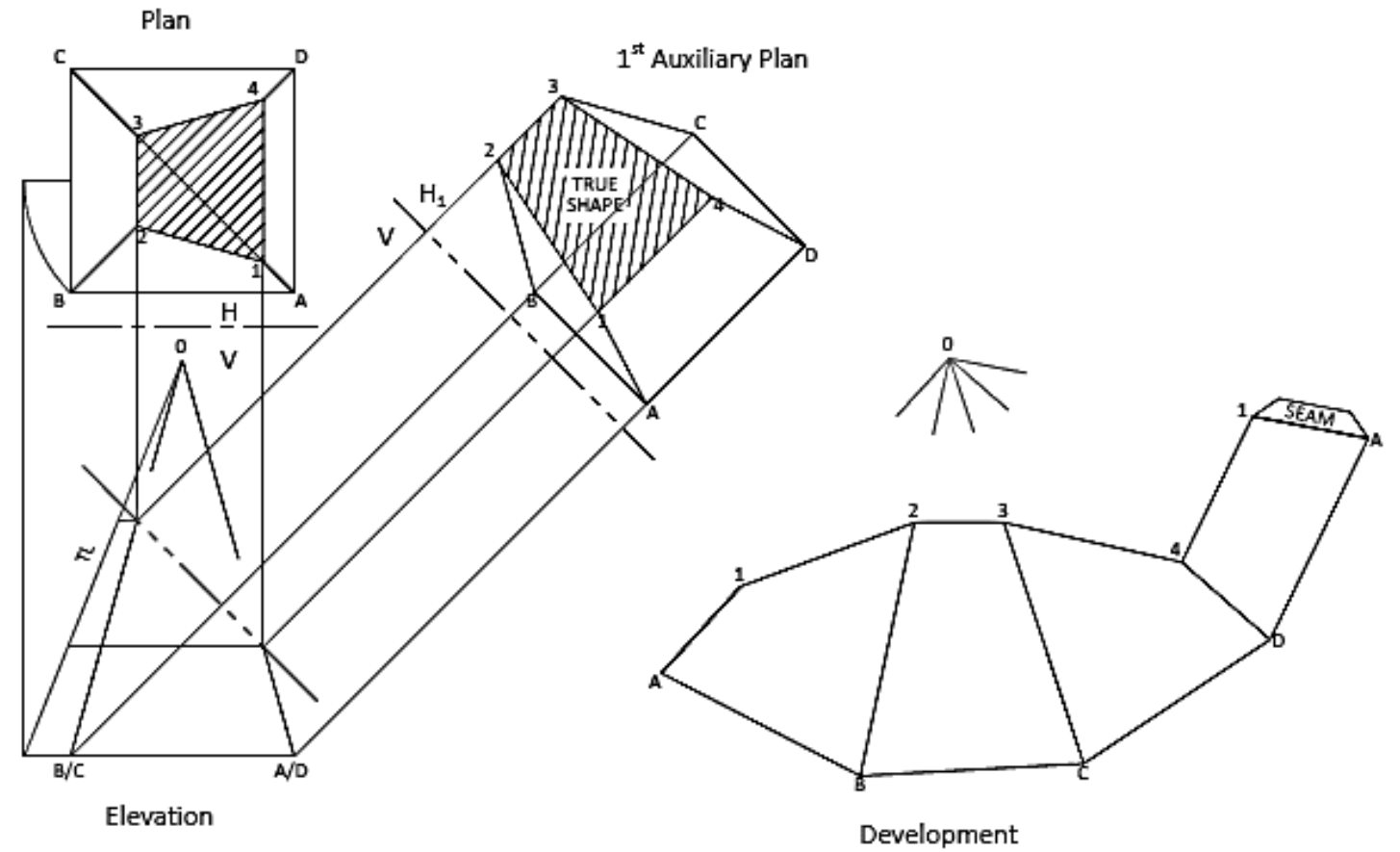
Given below is the development of a Truncated Cone.



WORKED EXAMPLE

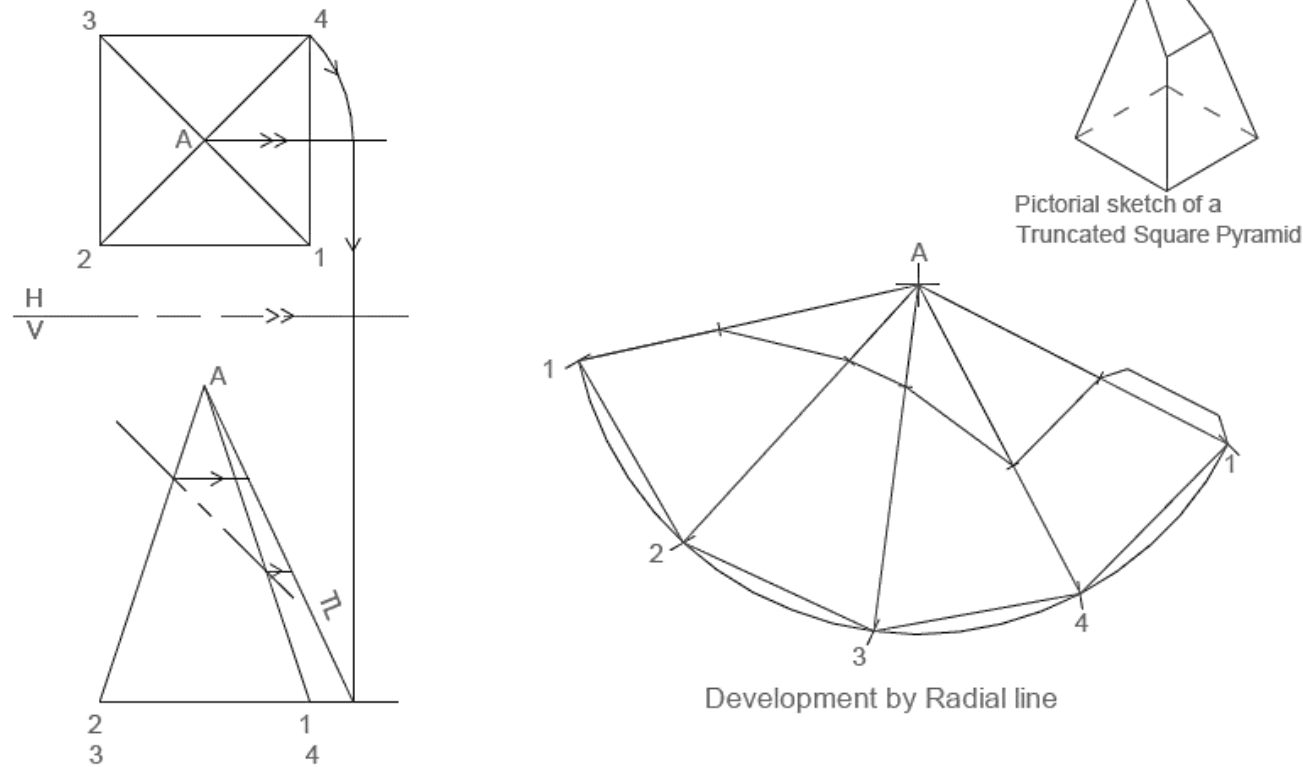
Given: Two views of a truncated square pyramid.

- Required:
- Complete the plan.
 - Project the auxiliary view of the truncated pyramid showing the true shape.
 - Draw the surface development of the truncated pyramid.



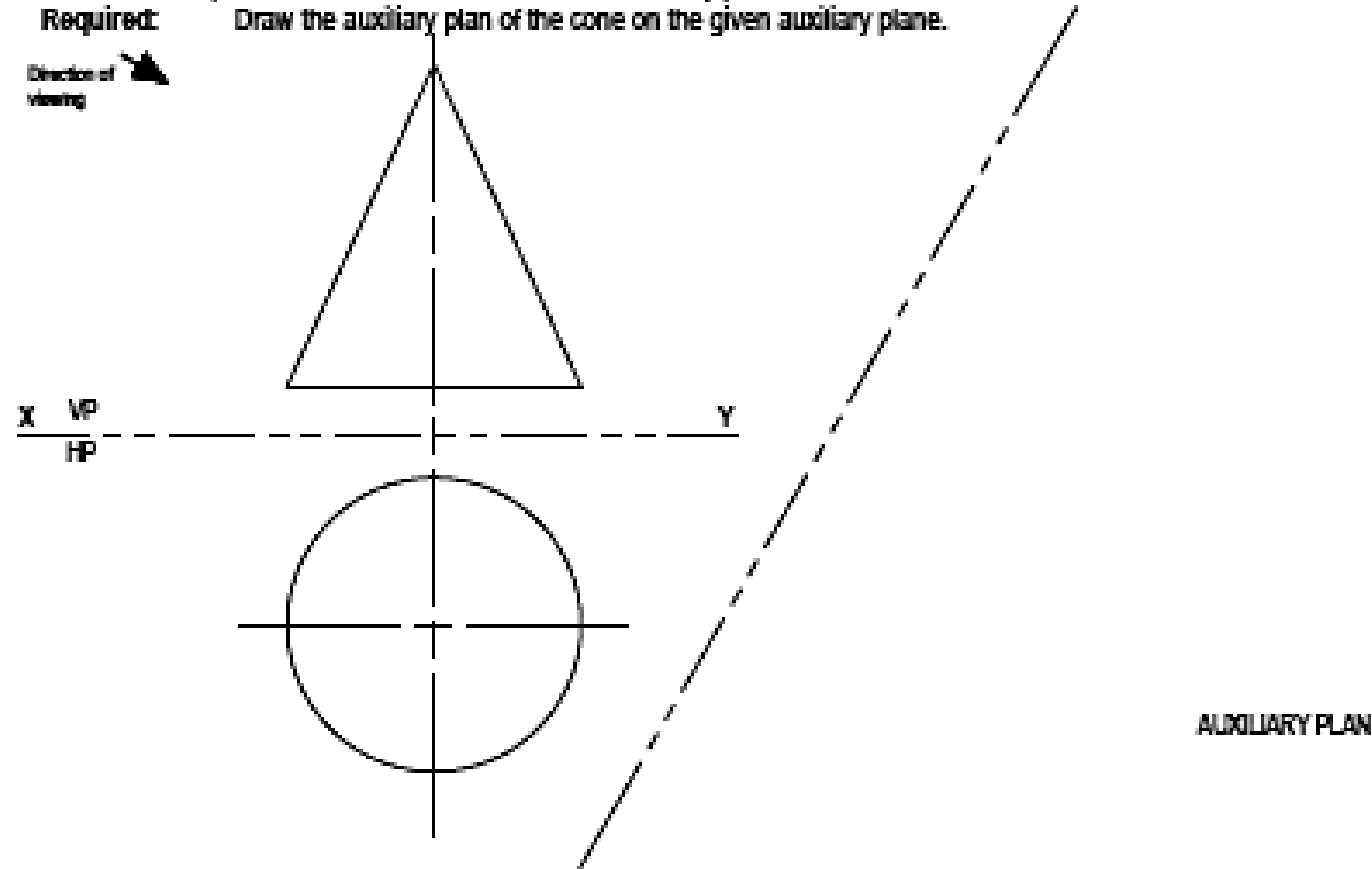
Example 2

Given below is the development of a Truncated Square Pyramid.



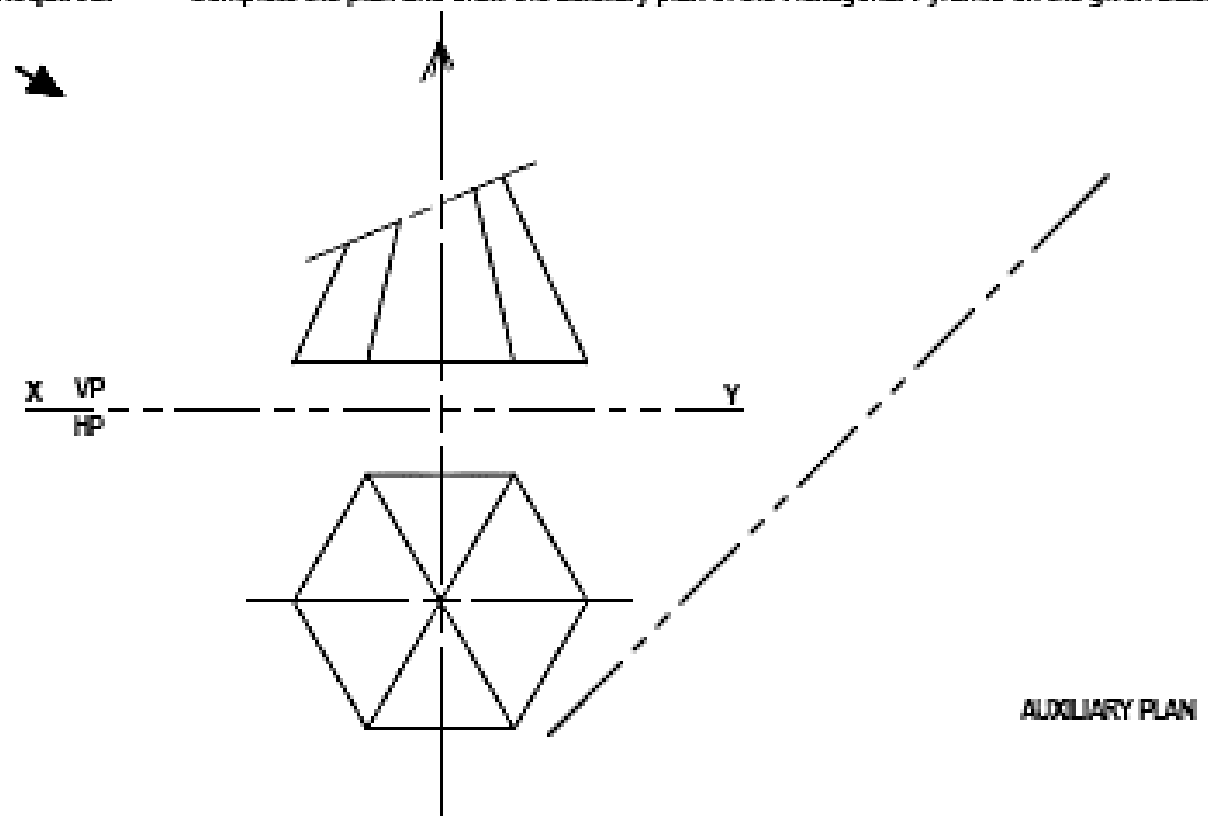
Given: The plan and elevation of a cone and an auxiliary plane at 60°.
 Required: Draw the auxiliary plan of the cone on the given auxiliary plane.

Direction of viewing

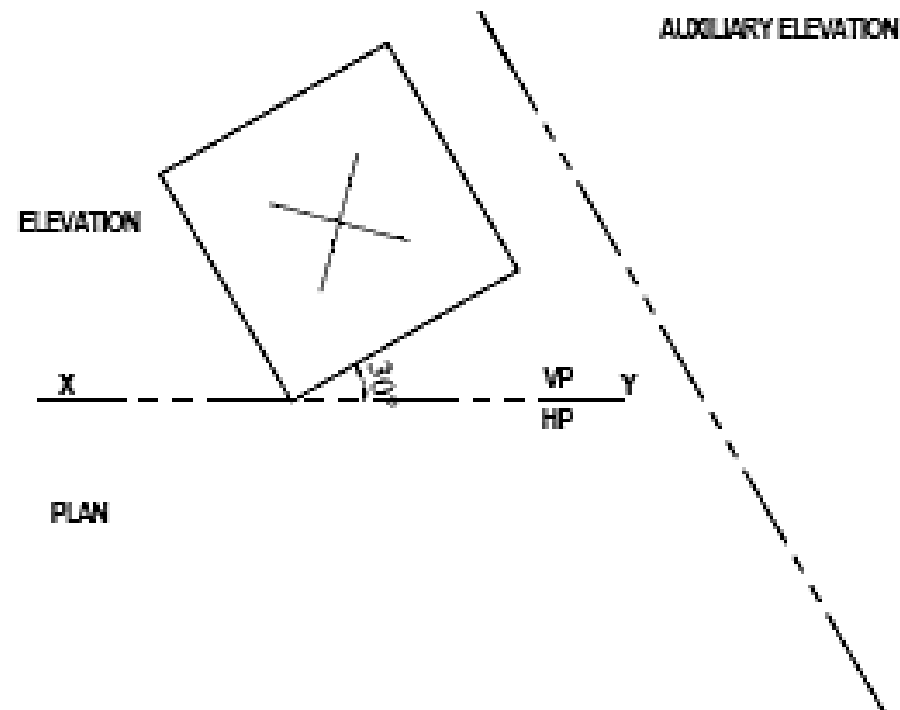


Given: The incomplete plan and elevation of a Hexagonal Pyramid and an auxiliary plane at 45°.
 Required: Complete the plan and draw the auxiliary plan of the Hexagonal Pyramid on the given auxiliary plane.

Direction of viewing



Given: The elevation of a Cube and an auxiliary plane at 60°.
 Required: Draw the plan of the Cube 5mm away from the VP.
 Draw the auxiliary elevation on the given auxiliary plane.



Given: The elevation of a Square Pyramid, base inclined at 30° to the HP. An auxiliary plane at 45°.
 Required: Draw the plan of the Pyramid.
 Draw and label the auxiliary elevation on the given auxiliary plane.

