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Unit 6
Development of Lateral Surfaces

Title of Chapter : Development of Lateral Surfaces

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Contents

Introduction to development of lateral surfaces and its industrial applications. Draw the development of lateral surfaces for cut section of cone, pyramid, prism etc.

Unit Objectives

To imagine visualization of lateral development of solids

Unit outcomes: On completion the students will be able to :

Draw the development of lateral surfaces for cut section of geometrical solids.

Outcome Mapping: Mapping of PEO,PO, CO, PSO

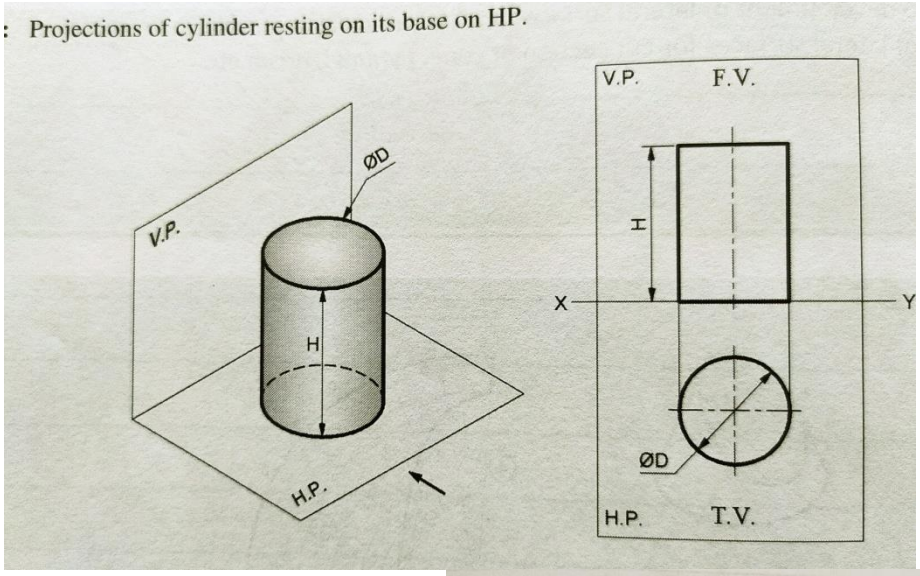
Books :

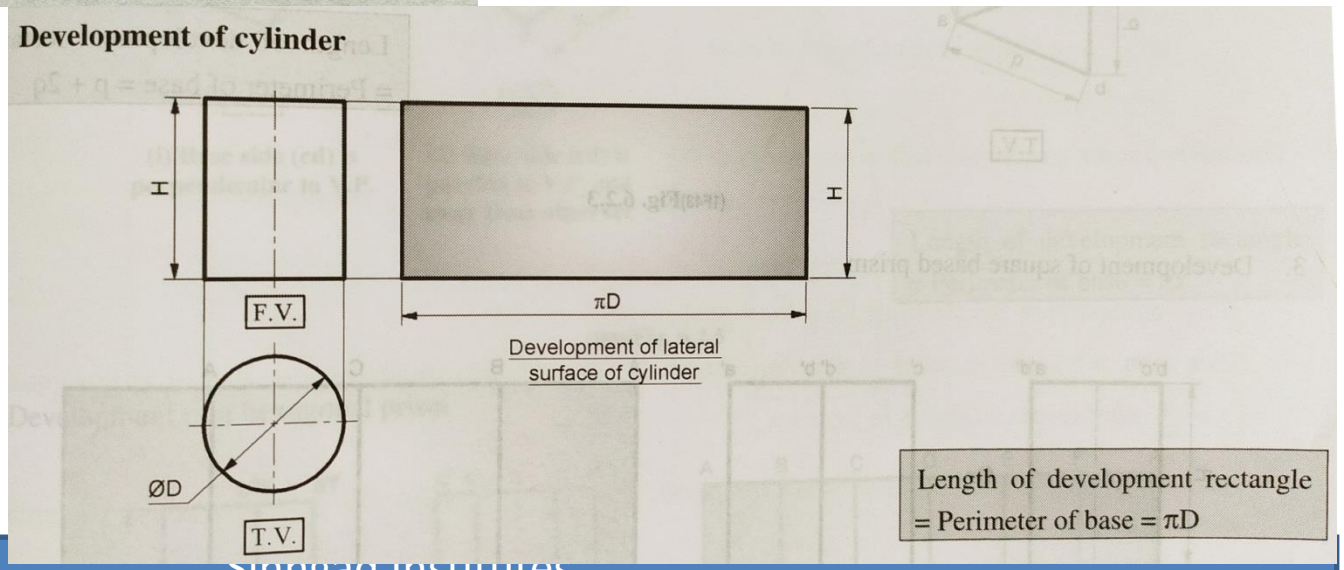
Bhatt, N. D., (2018), "Machine Drawing", Chartor Publishing house, Anand, India

Point of Syllabus

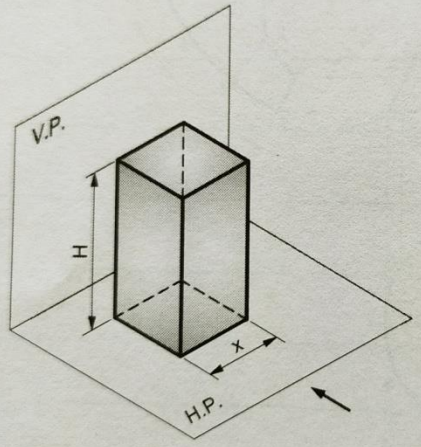
Introduction to development of lateral surfaces and its industrial applications. Draw the development of lateral surfaces for cut section of cone, pyramid, prism etc.

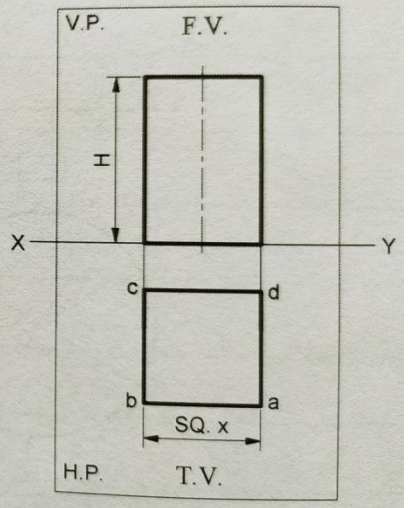
Development of lateral surfaces of solids



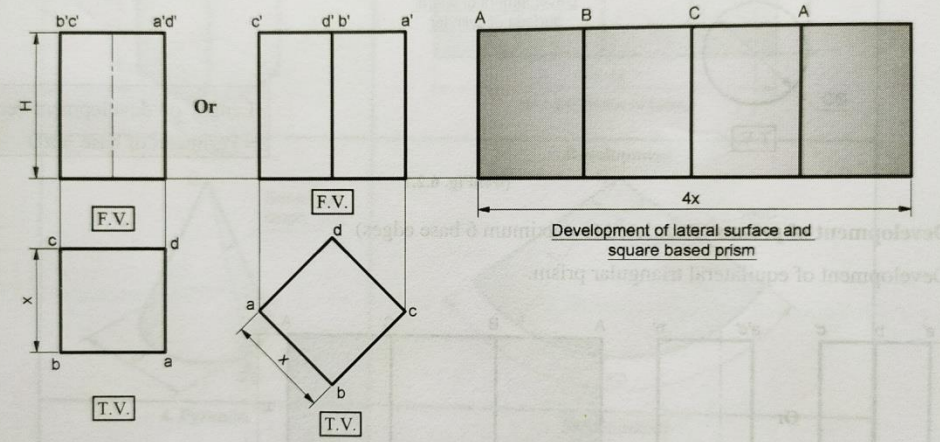


Square prism resting on its base on HP with a base side parallel to VP.





Development of square based prism



Length of development rectangle = Perimeter of base = 4x

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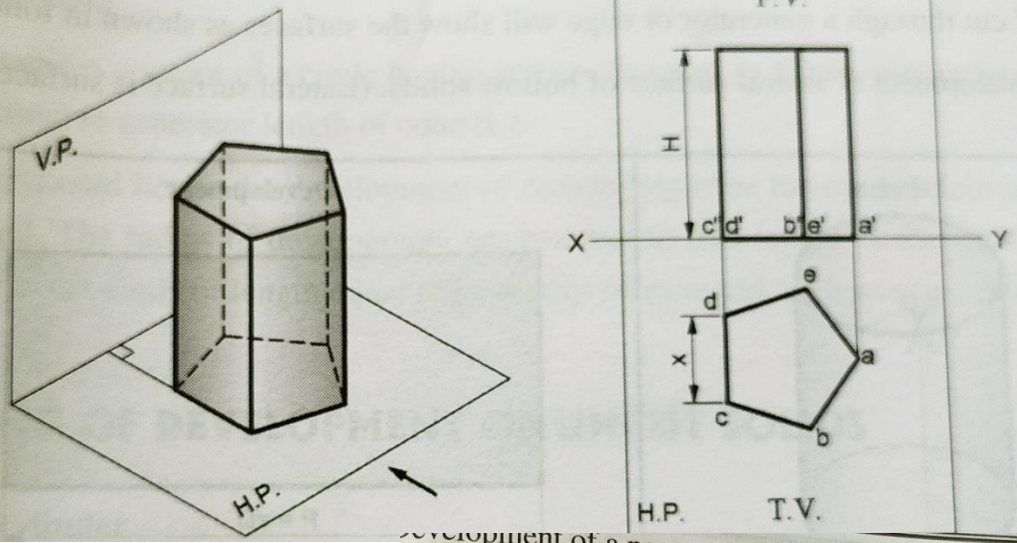
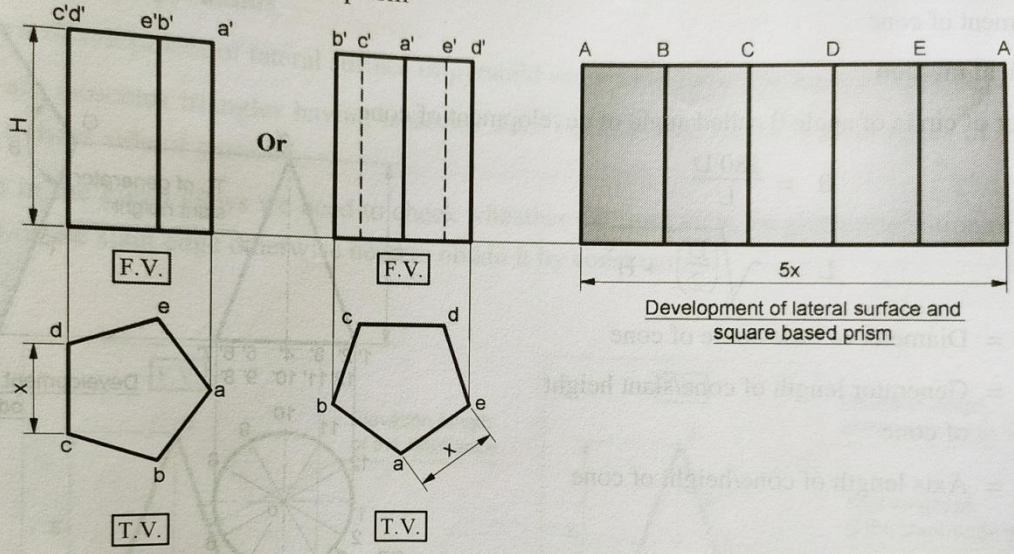
Pentagonal prism resting on its base on HP with a base side perpendicular to VP (cd in TV ⊥ XY).



Development of a pentagonal based prism

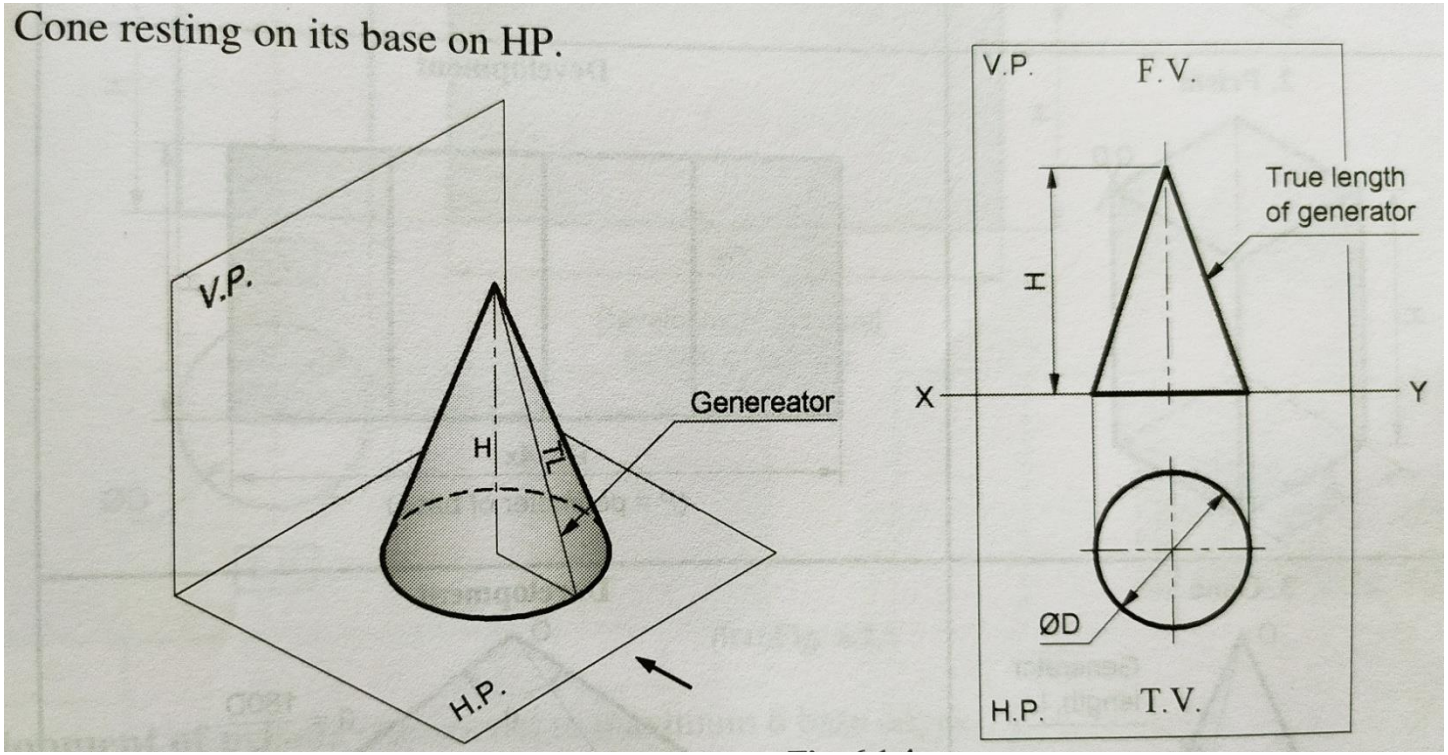


(i) Base side (cd) is perpendicular to V.P.

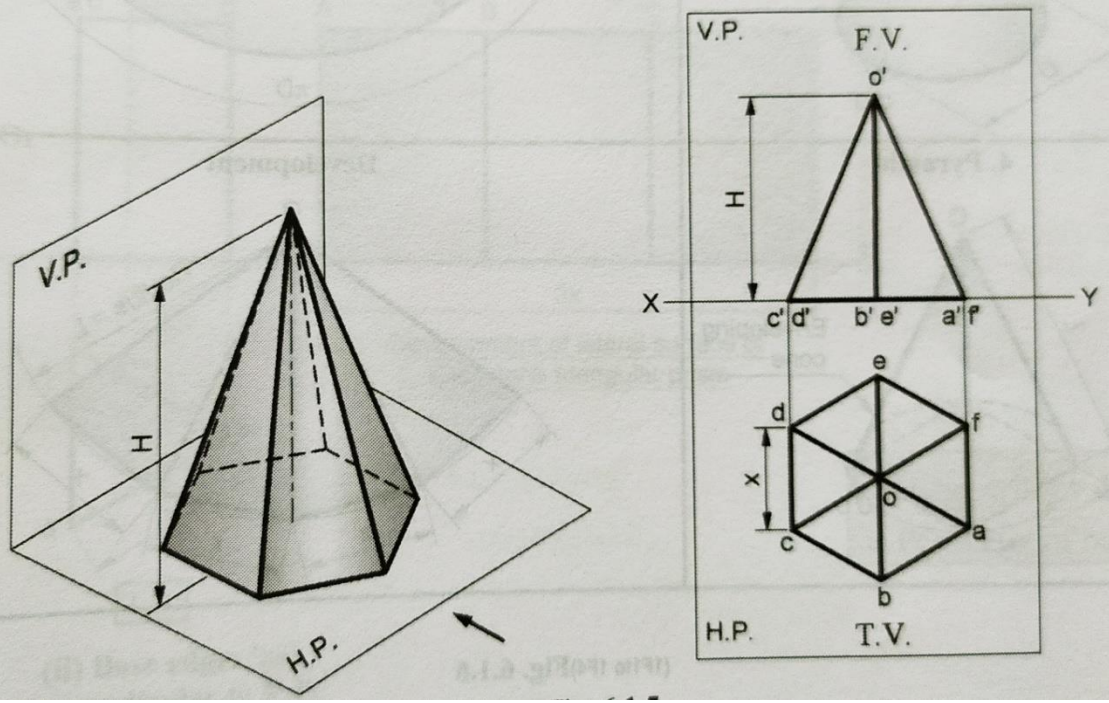
(ii) Base side (cd) is parallel to V.P. and away from observer

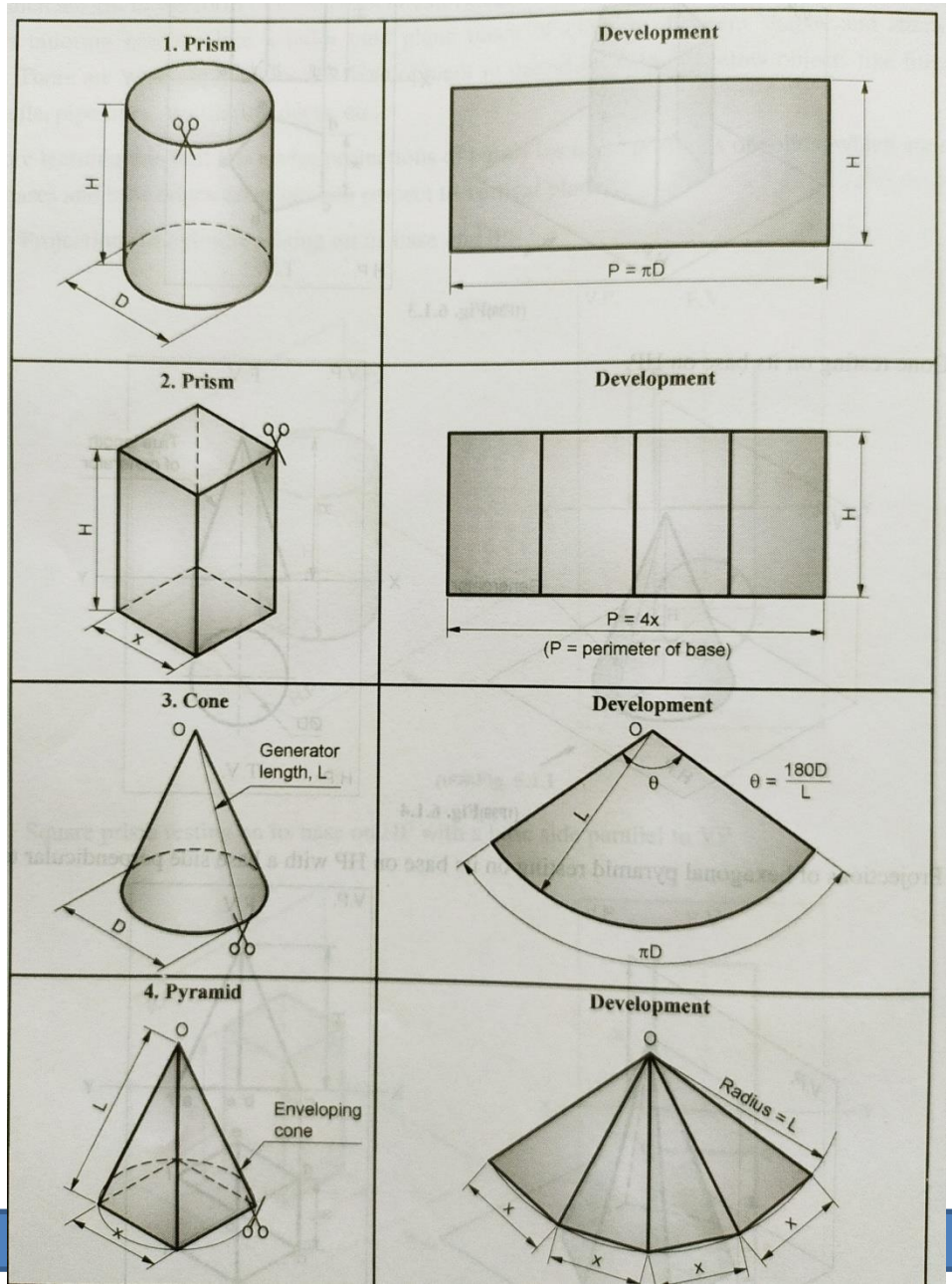
Length of development rectangle = Perimeter of base = πx

Cone resting on its base on HP.

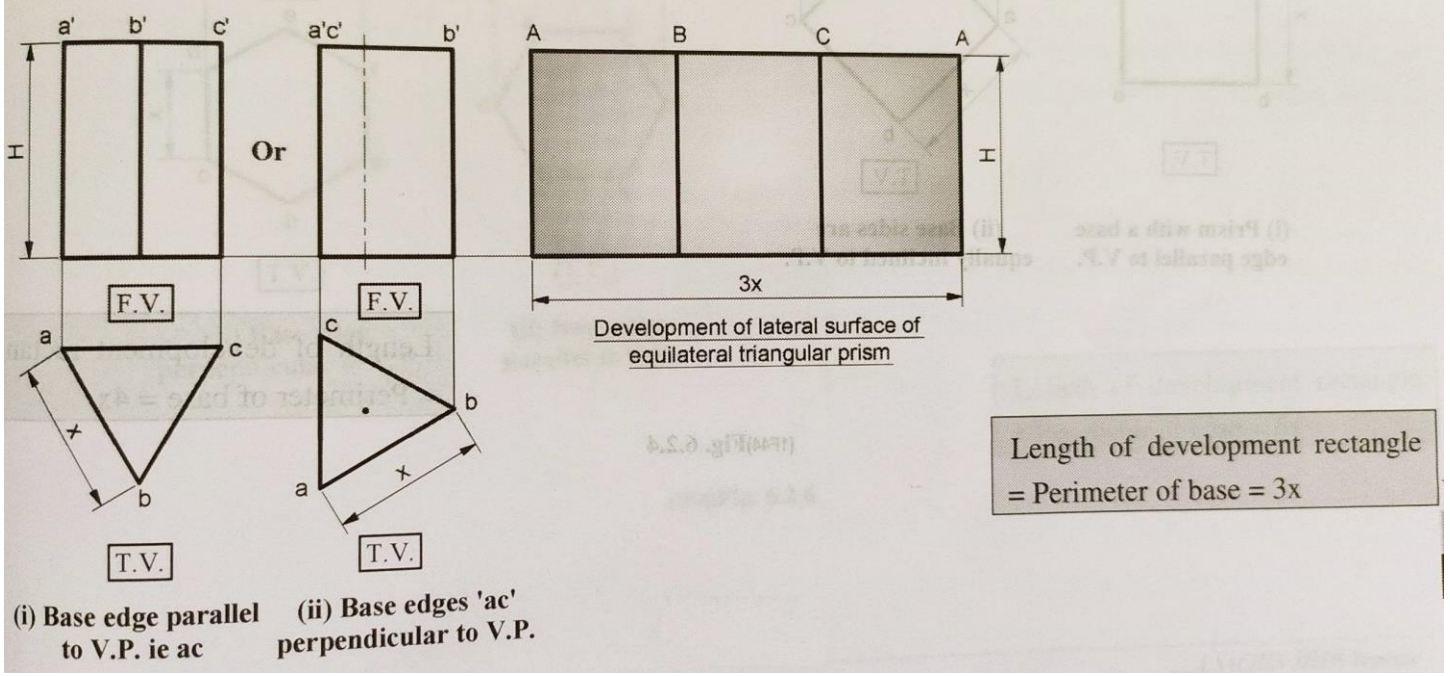


Projections of hexagonal pyramid resting on its base on HP with a base side perpendicular to VP.



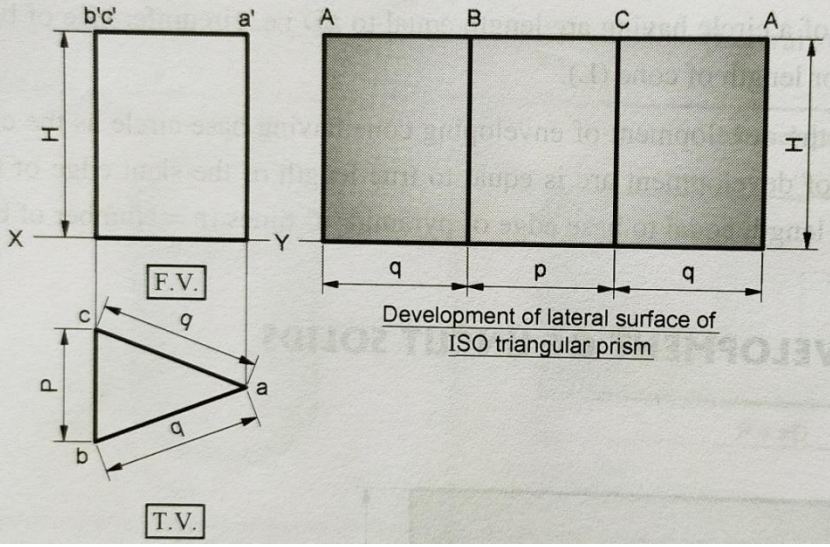

1. Prism
H
D
Development
H
P = πD
2. Prism
H
x
Development
H
P = 4x
(P = perimeter of base)
3. Cone
O
Generator length, L
D
Development
O
θ
L
θ = 180D / L
πD
4. Pyramid
O
L
Enveloping cone
x
Development
O
Radius = L
x
x
x

Development of equilateral triangular prism.



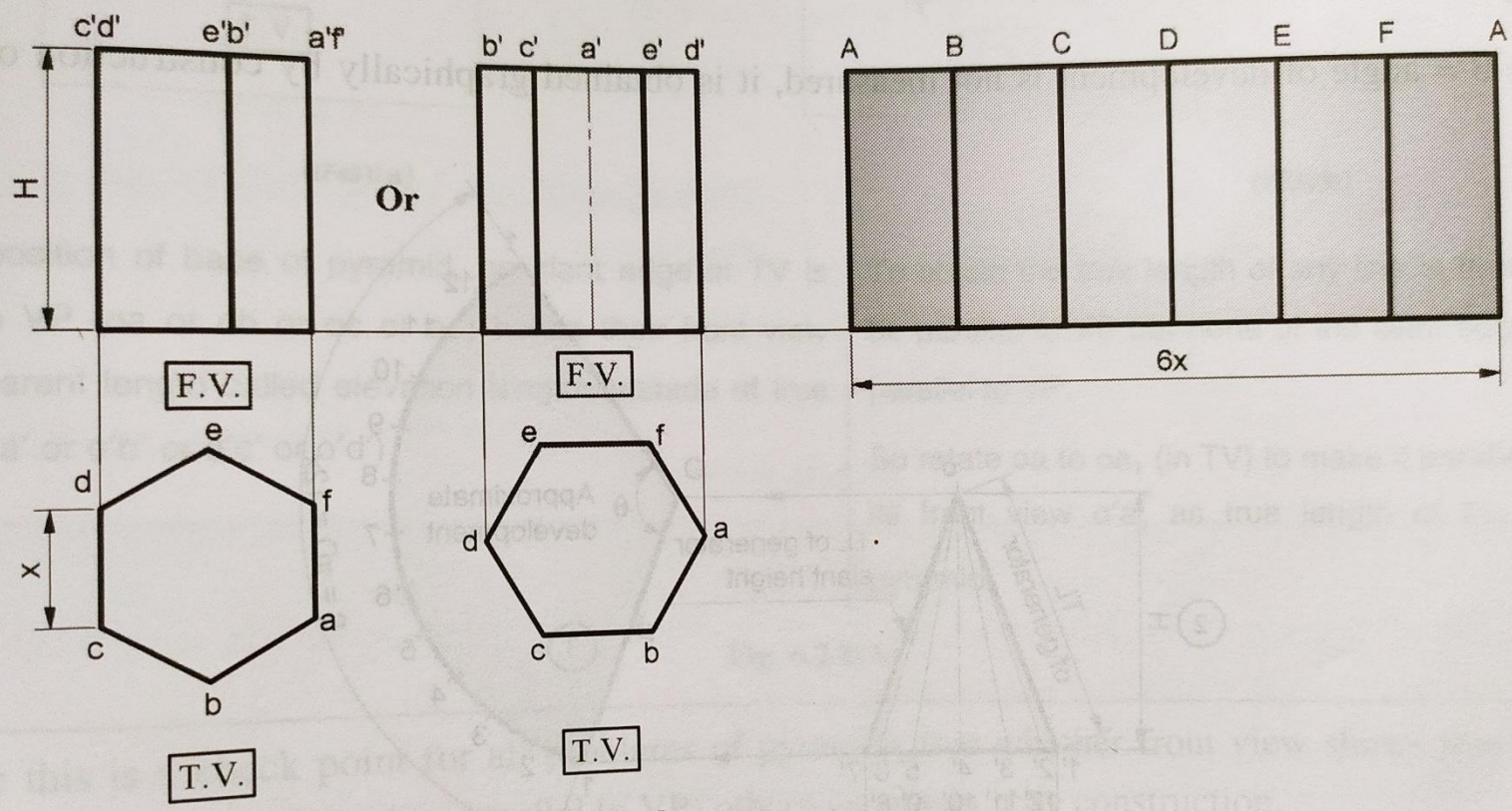
Length of development rectangle = Perimeter of base = 3x

Development of iso. triangular based prism



Length of development rectangle
= Perimeter of base = p + 2q

Development of a hexagonal prism



(i) Base edge perpendicular to V.P.

(ii) Base edge parallel to V.P.

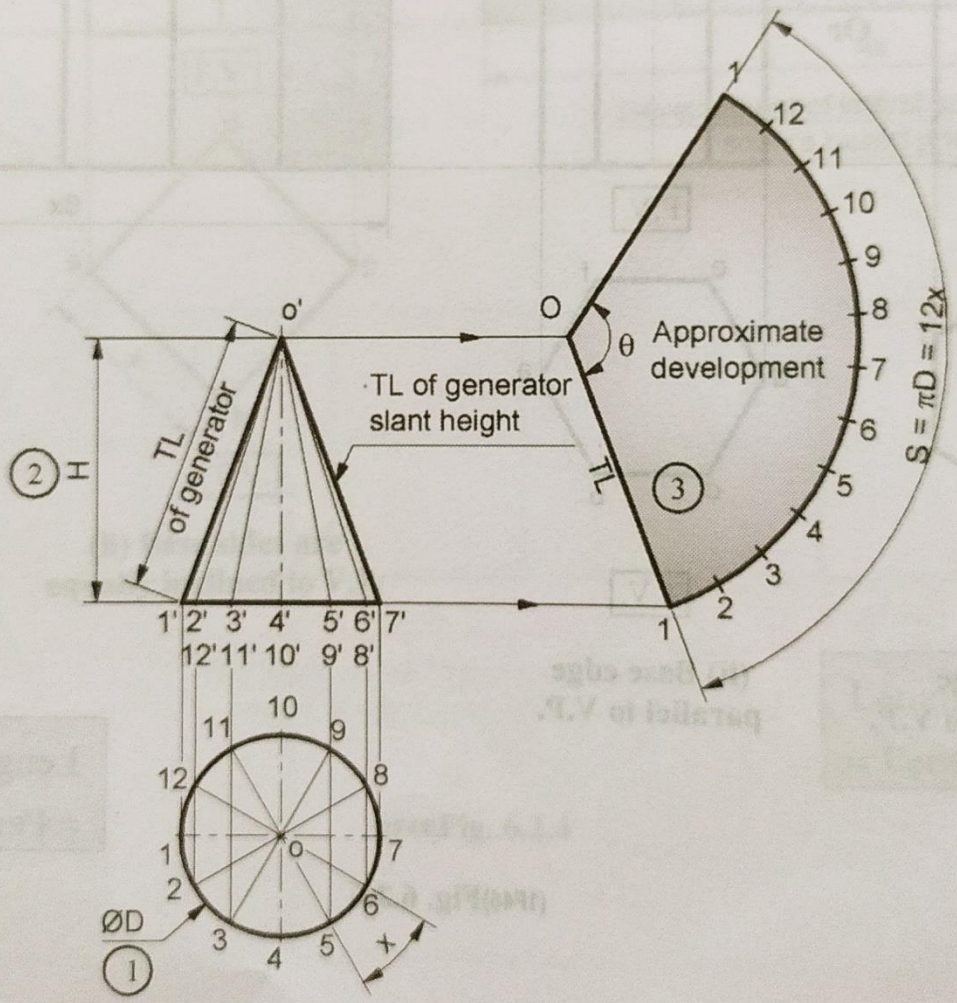
Length of development rectangle = Perimeter of base = 6x

Approximate method

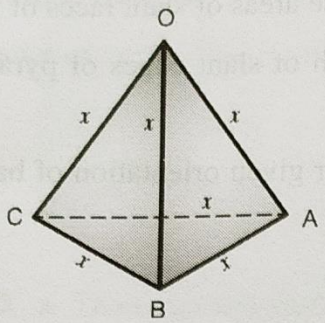
In this method draw top view and front view of the cone.

Then mark arc of radius equal to generator length of the cone and on this arc cut arcs of radius equal to x $\left(x = \frac{1}{12}^{th} \text{ cord length as shwon in top view}\right)$

[Hence θ = angle of development is not measured, it is obtained graphically by construction of cutting the arcs].



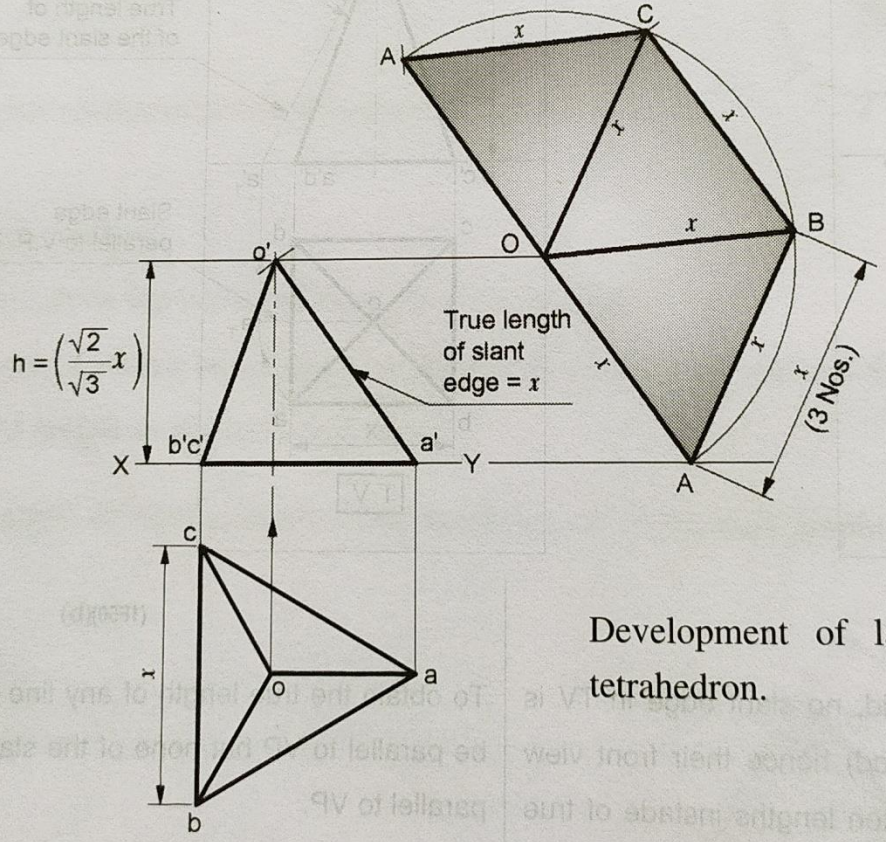
Development of tetrahedron of sides x.



(1F51)**Fig. 6.2.9**

Tetrahedron is equilateral triangular based pyramid having base side equal to slant sides.

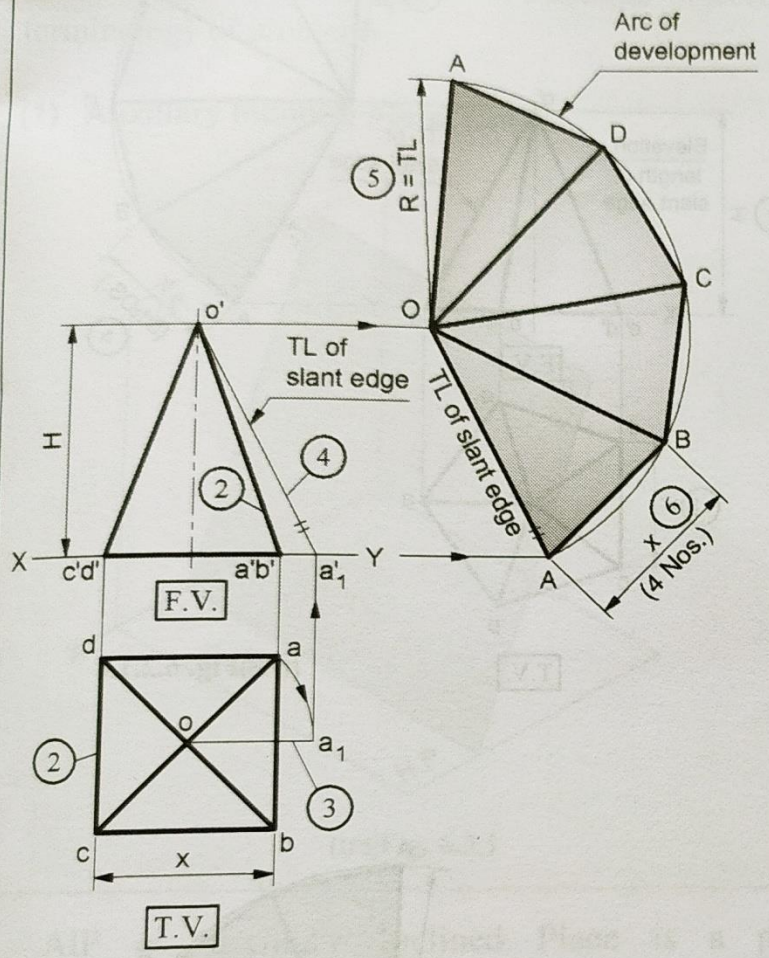
The height of tetrahedron is $\left(\frac{\sqrt{2}}{\sqrt{3}} \times \text{base side}\right)$.



Development of lateral surface of tetrahedron.

2. Development of square based pyramid.

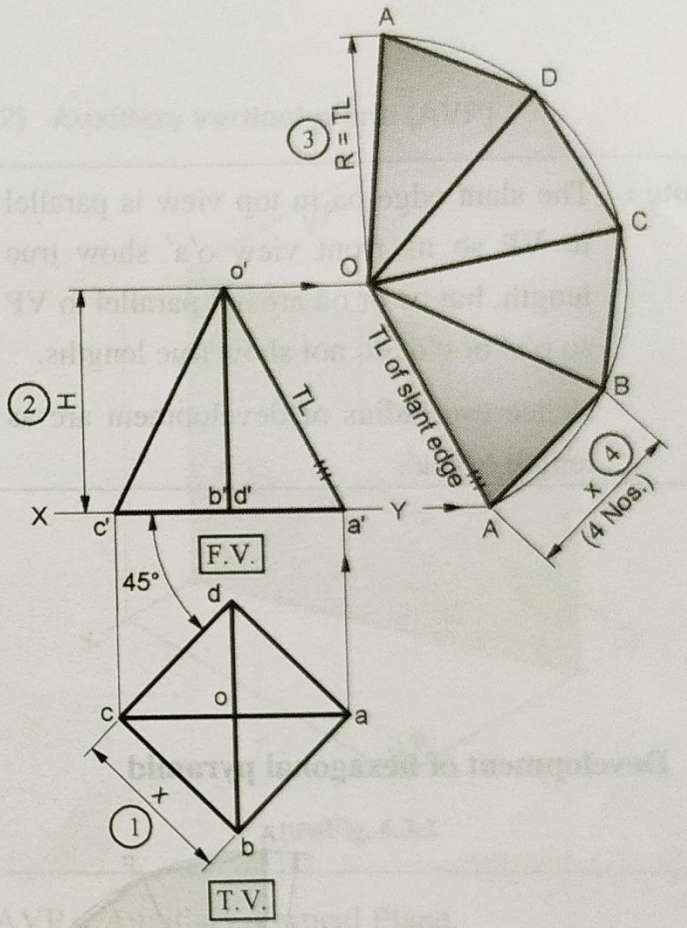
(i) When a base side is parallel to VP.



(1F53)**Fig. 6.2.11**

(Need to obtain the true length of slant edge in FV by construction)

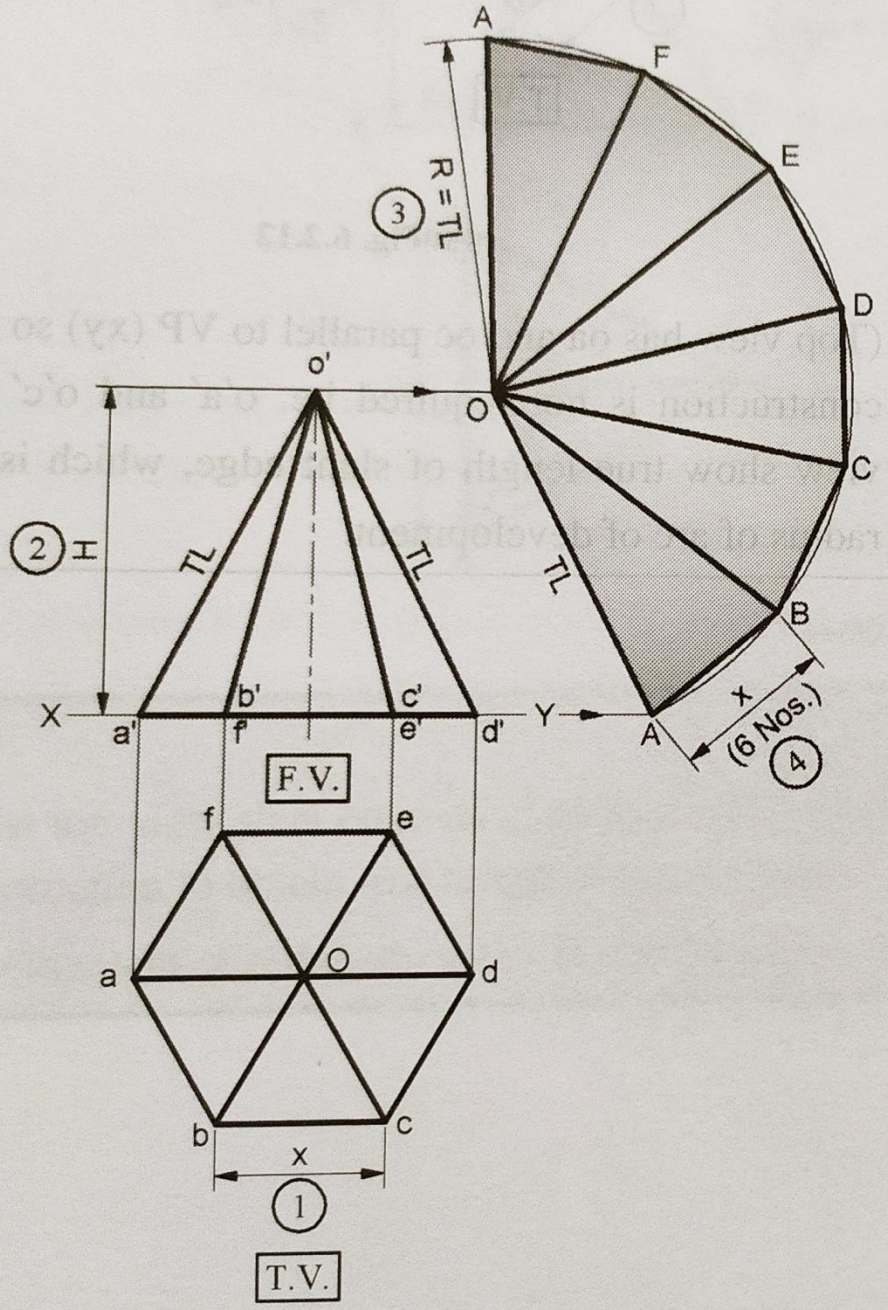
(ii) When base sides are equally inclined to VP.

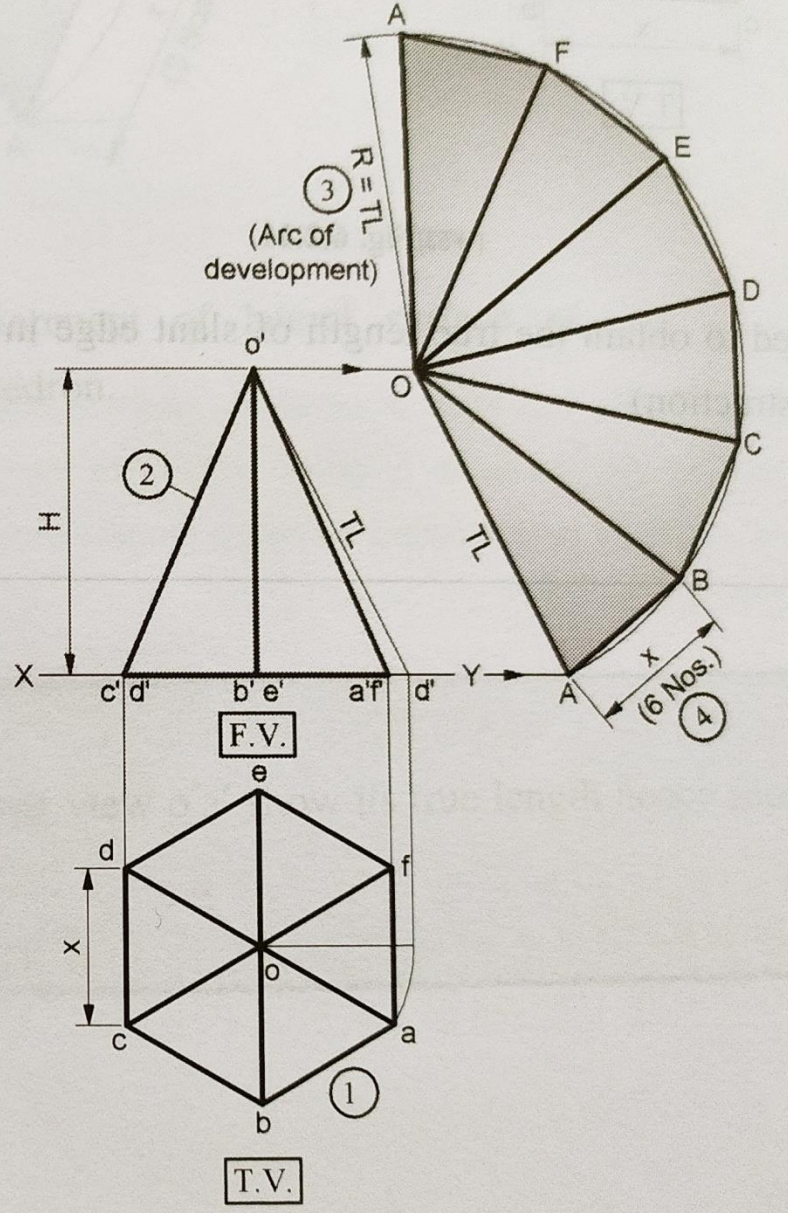


(1F54)**Fig. 6.2.12**

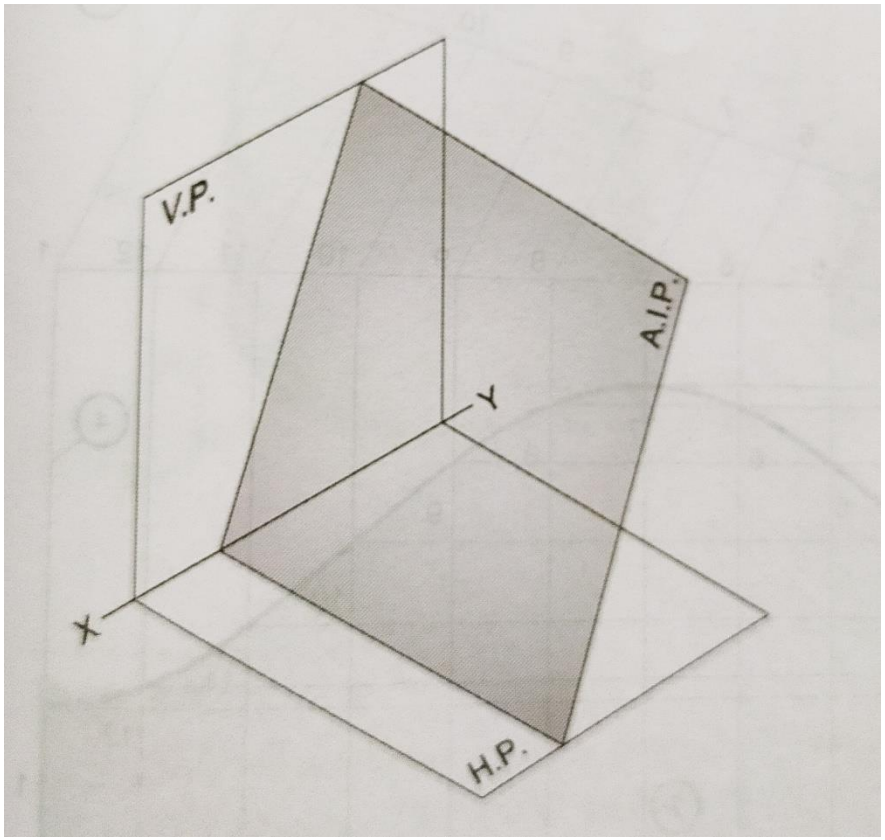
(Top view has oa and oc parallel to VP (xy) so separate construction is not required i.e. o′a′ and o′c′ in front view show true length of slant edge, which is used as radius of arc of development.

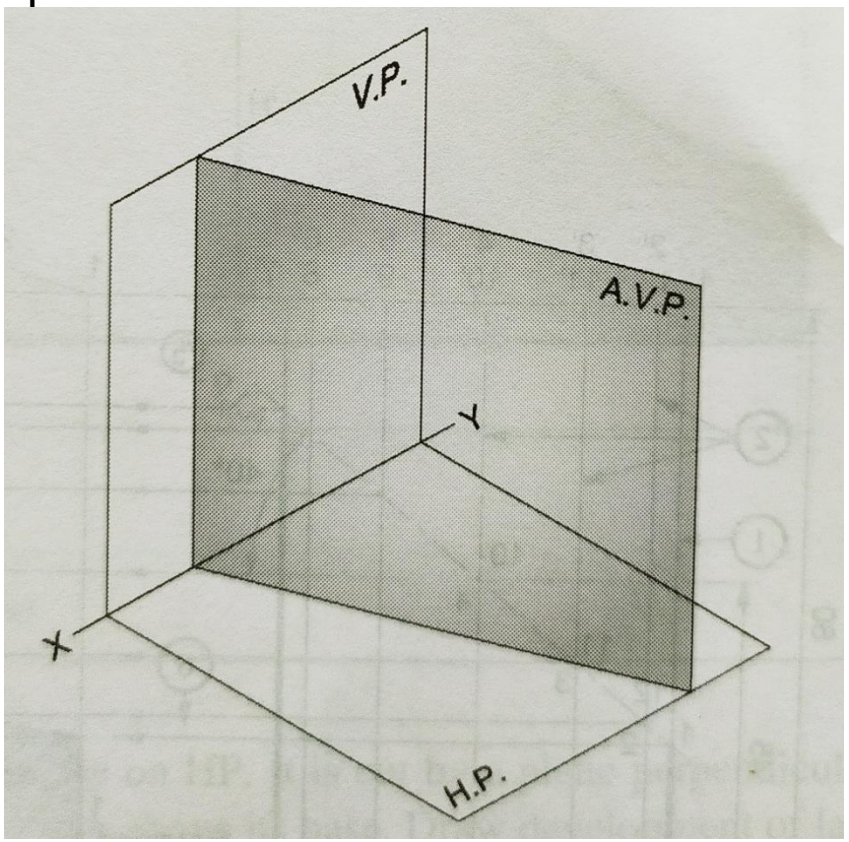
Development of hexagonal pyramid





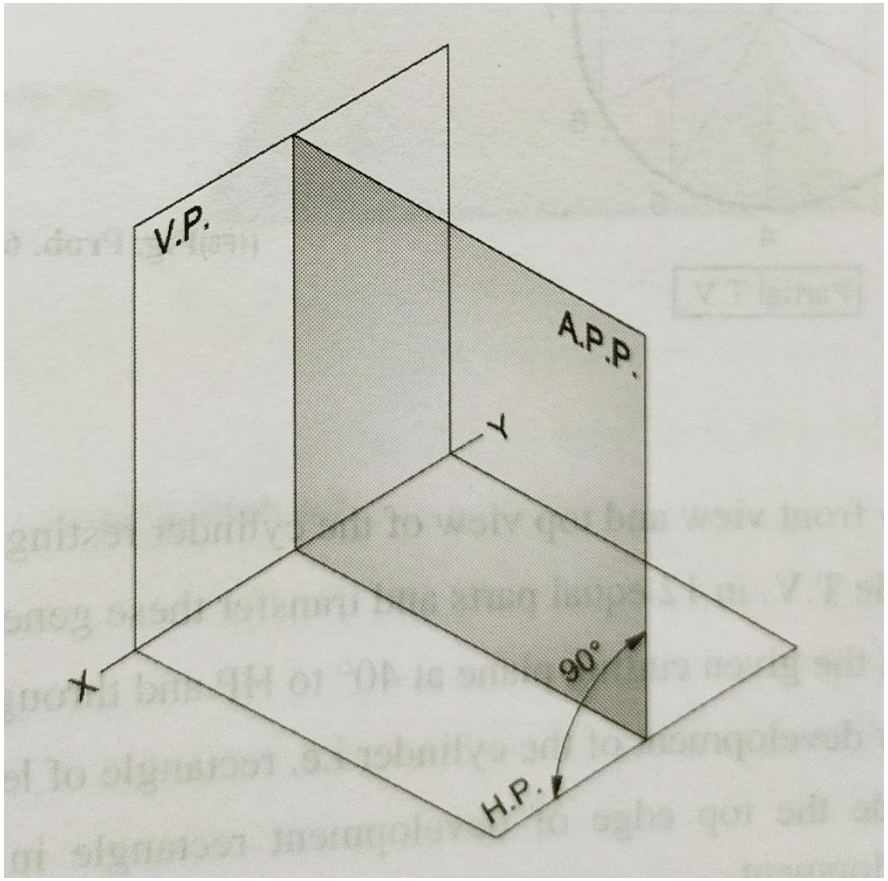
Development of solids cut by section planes





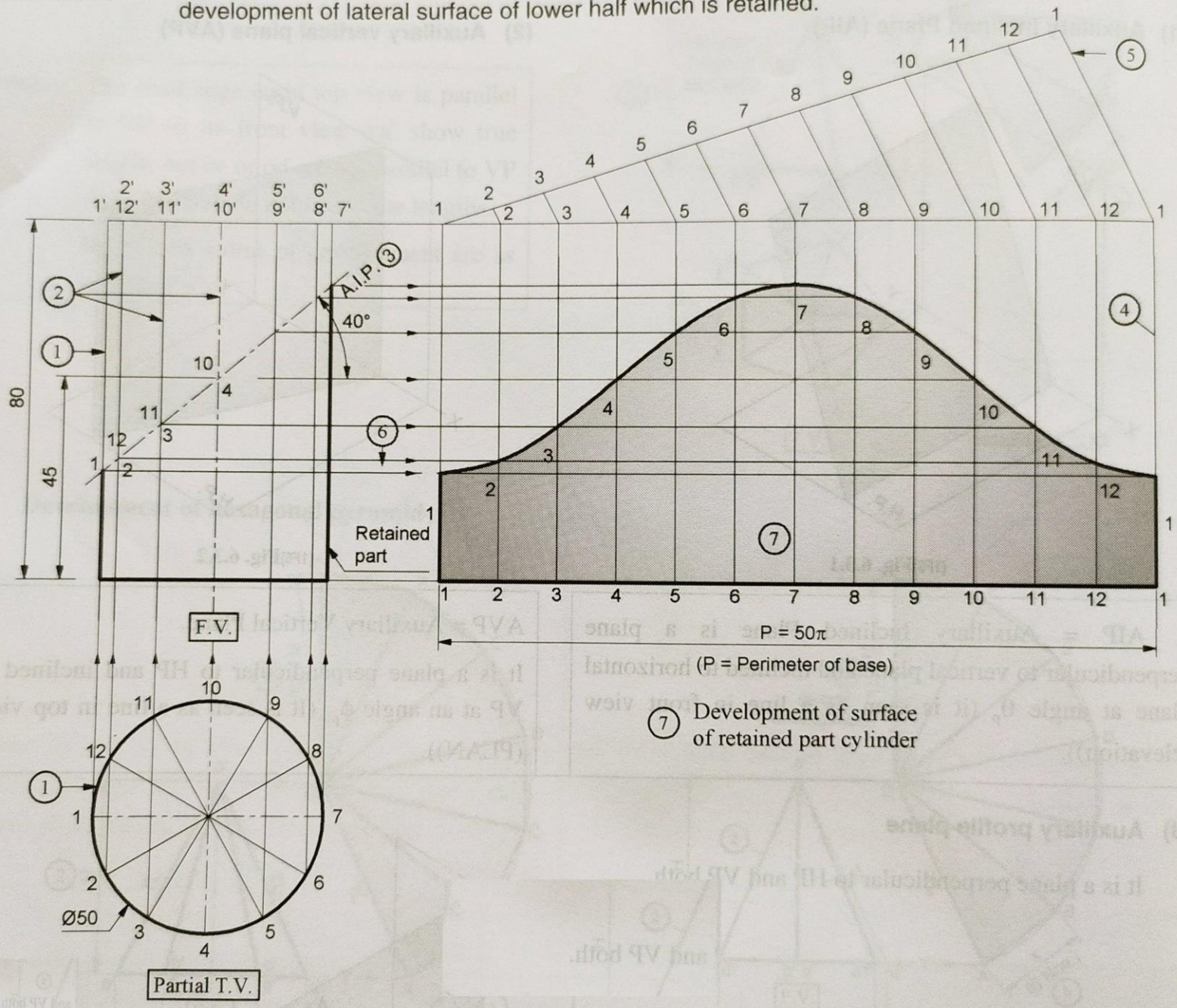
Auxiliary inclined plane (AIP)

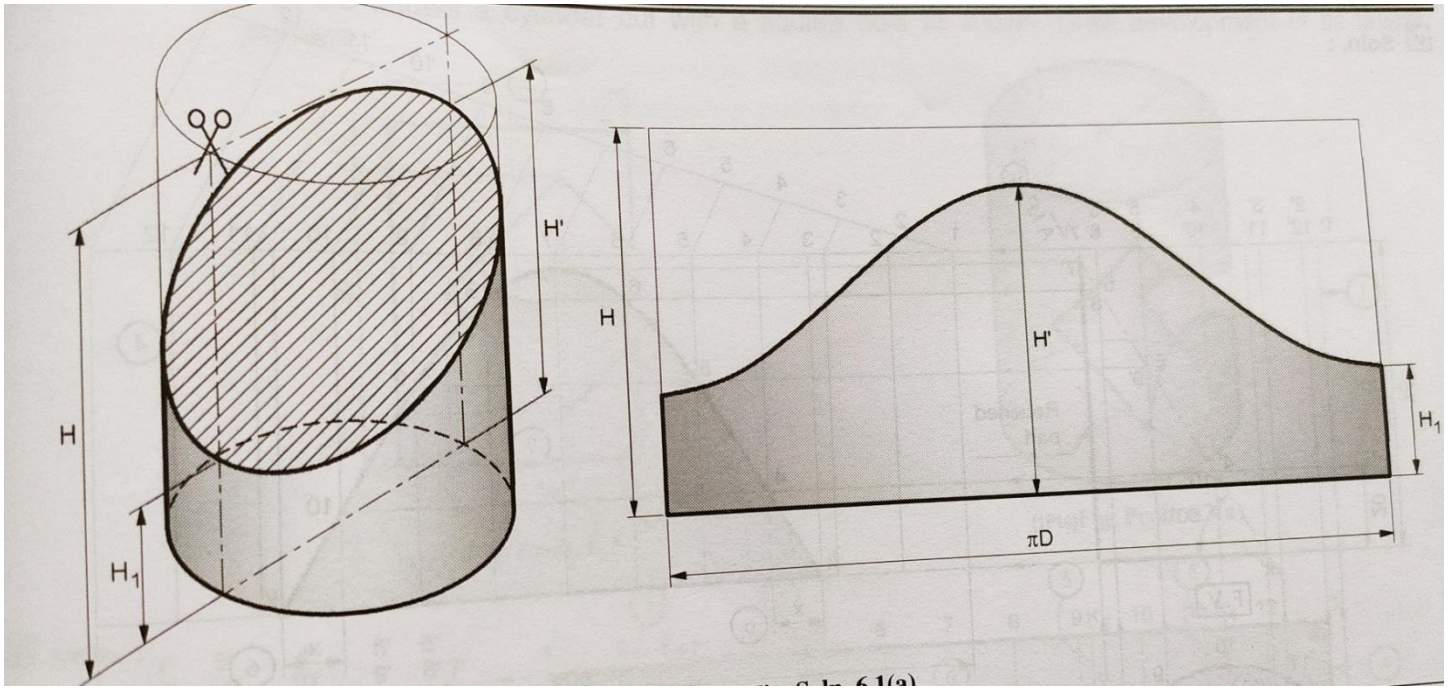
Auxiliary vertical plane (AVP)



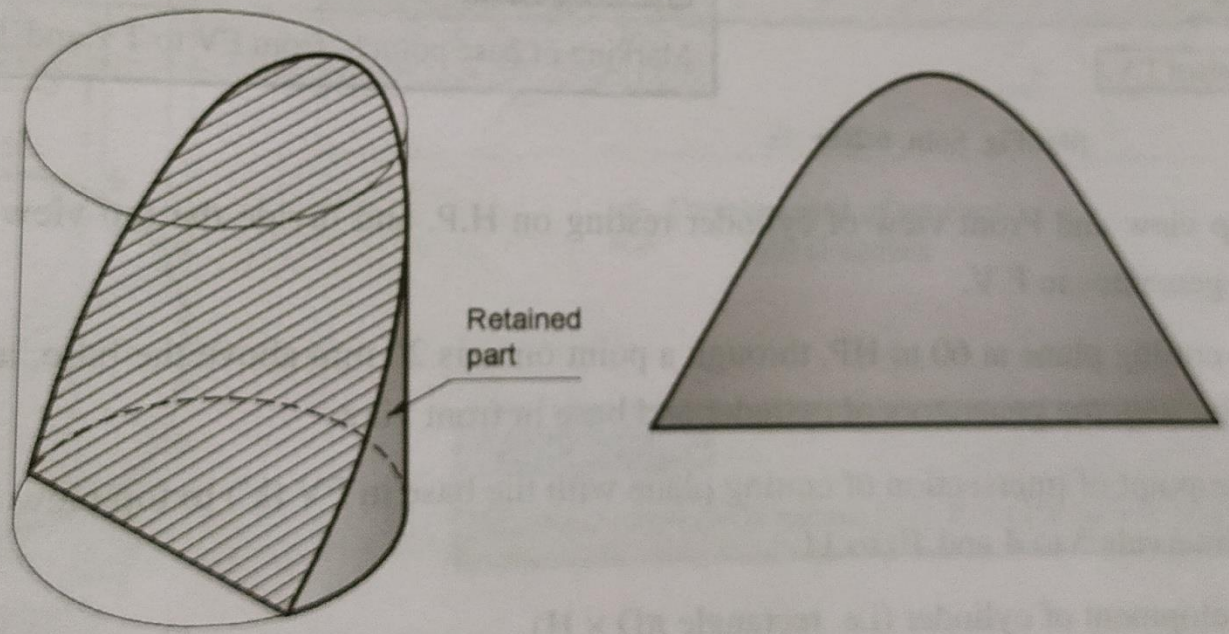
Auxiliary profile plane (APP)

A cylinder of diameter 50 and axis 80 mm is resting on its base on HP. It is cut by an auxillary inclined plane at 40° to HP passing through a point, on the axis 45 mm above base. Draw development of lateral surface of lower half which is retained.

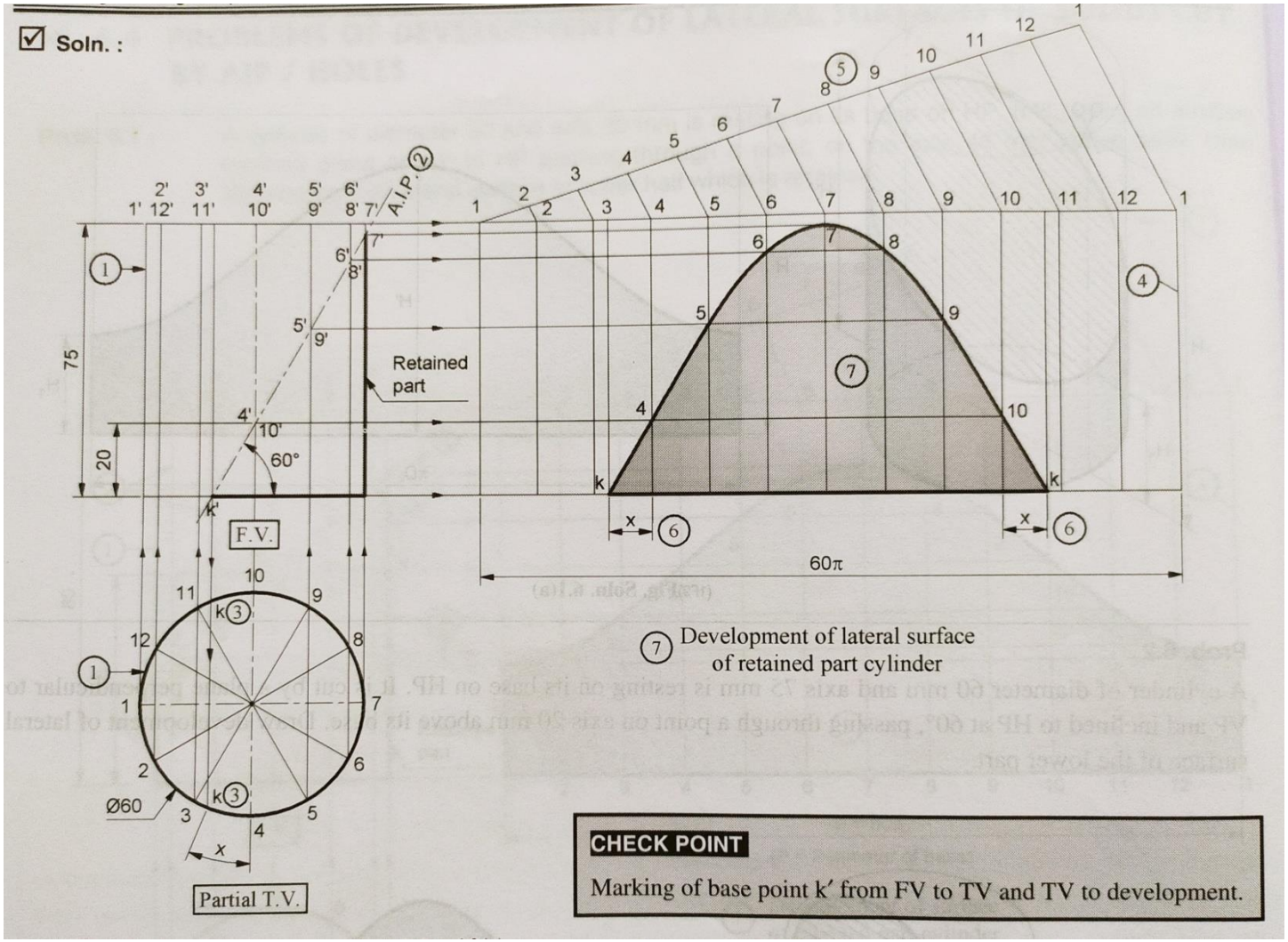



H
H'
H1
H
H'
H1
πD

A cylinder of diameter 60 mm and axis 75 mm is resting on its base on HP. It is cut by a plane perpendicular to VP and inclined to HP at 60°, passing through a point on axis 20 mm above its base. Draw development of lateral surface of the lower part.



☑ **Soln. :**

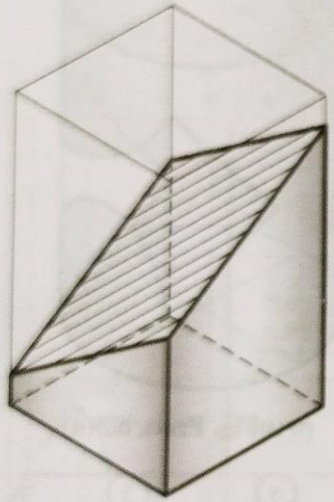


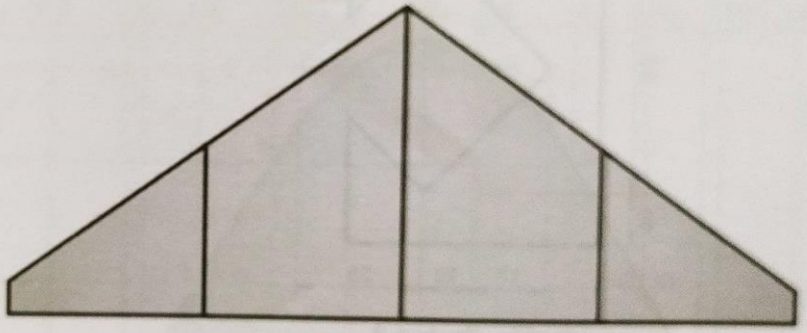
⑦ Development of lateral surface of retained part cylinder

CHECK POINT

Marking of base point k′ from FV to TV and TV to development.

A square prism of base sides 40 mm and axis 70 mm is resting on its base on H.P. with base sides equally inclined to V.P. it is cut by a plane perpendicular to V.P. and inclined to H.P. at 45° passing through mid-point of axis. Draw development of retained lateral surface of prism.





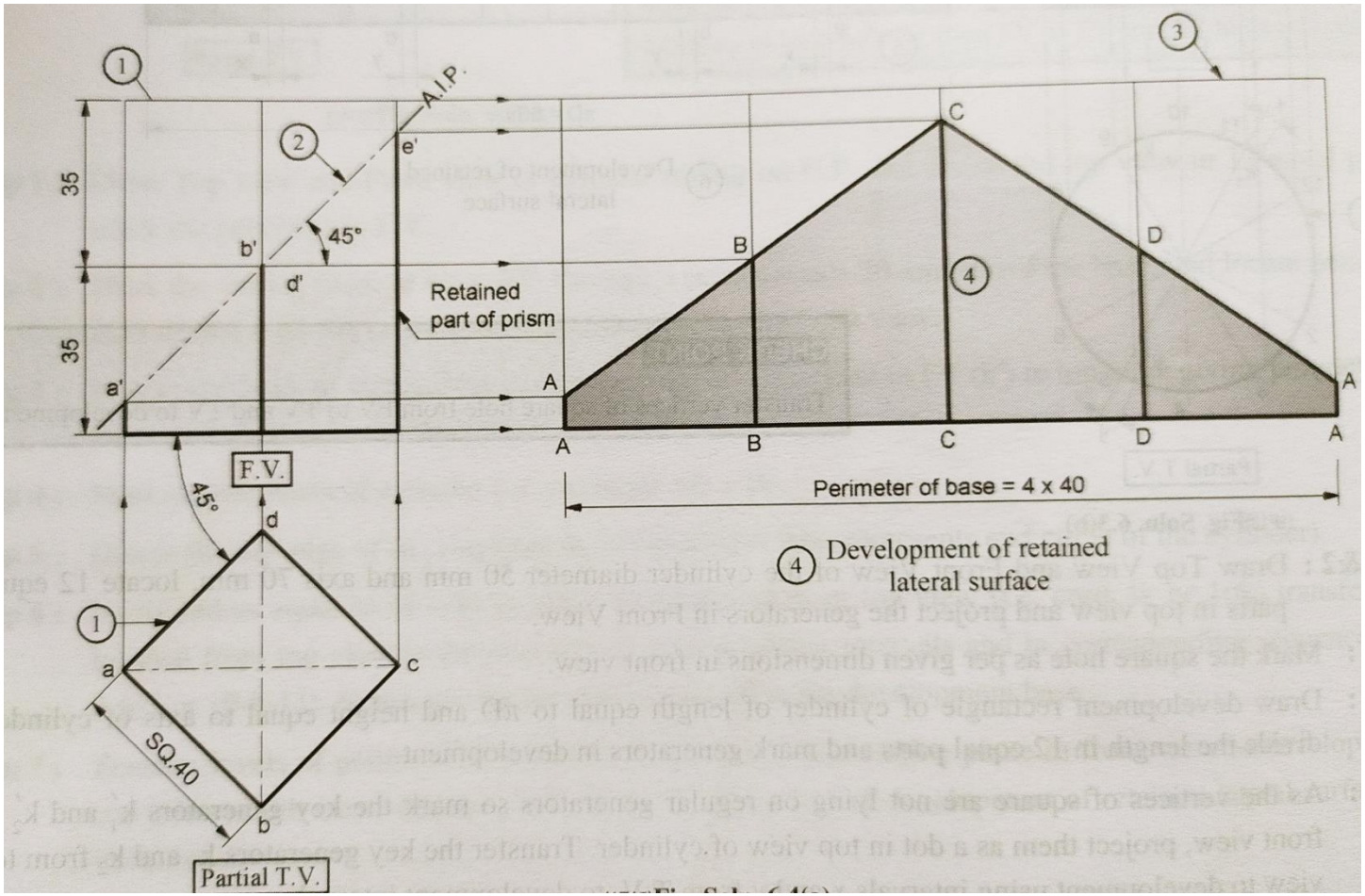
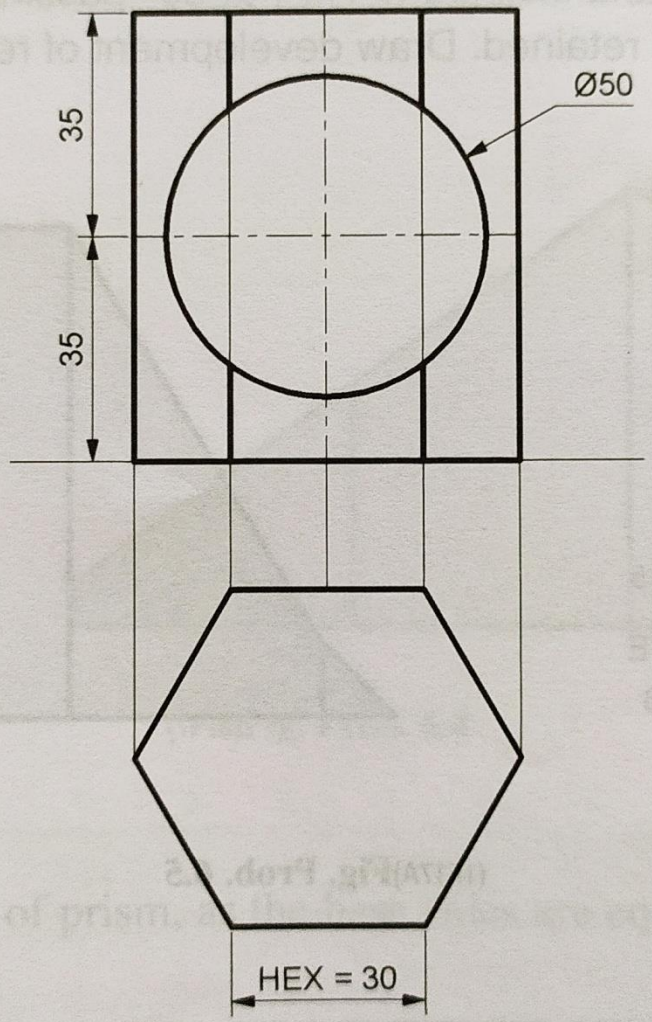
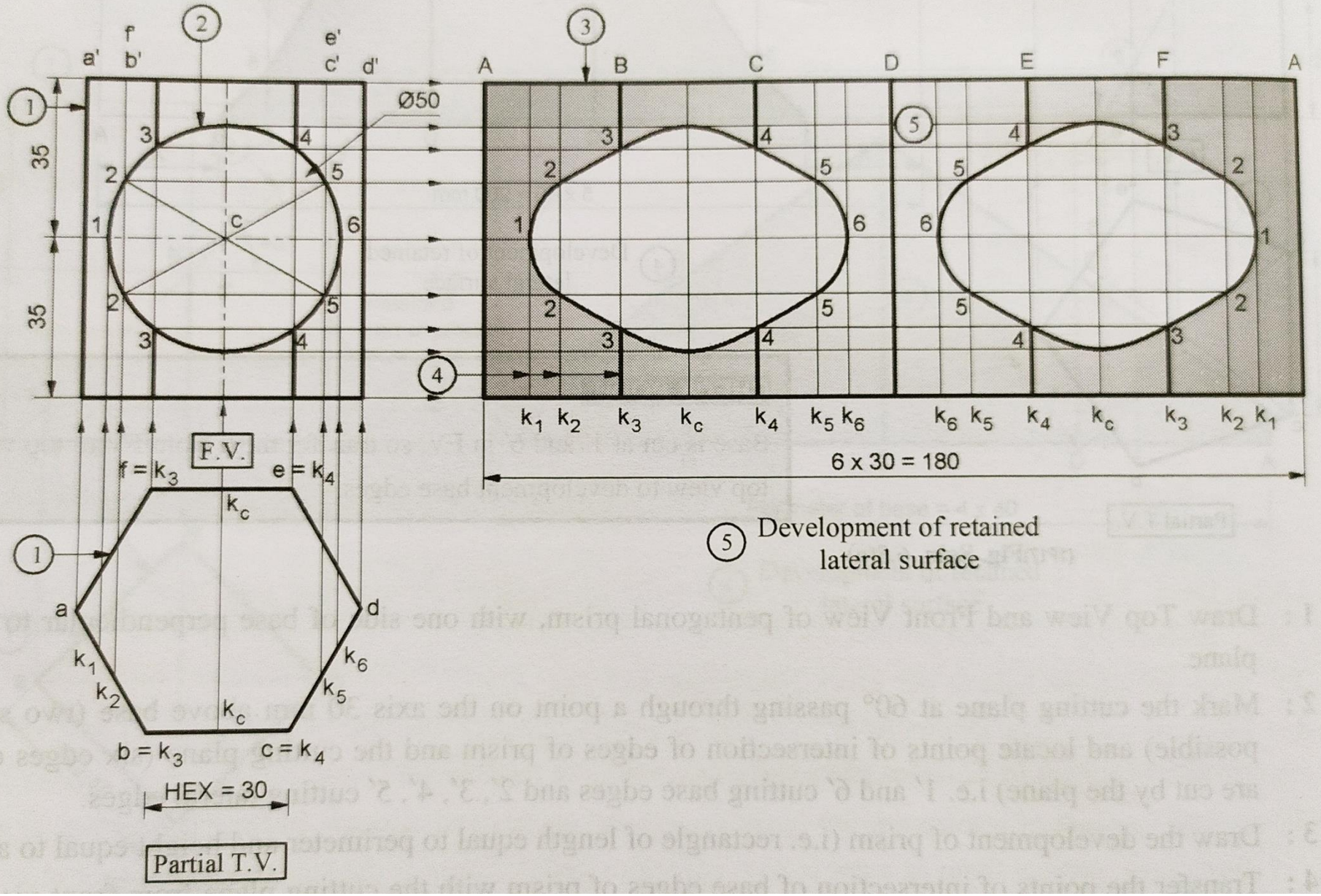

1
2
3
4
A.I.P.
e'
35
35
45°
b'
d'
a'
Retained
part of prism
A
B
C
D
A
F.V.
45°
d
a
c
b
SQ.40
Partial T.V.
Perimeter of base = 4 x 40
Development of retained
lateral surface

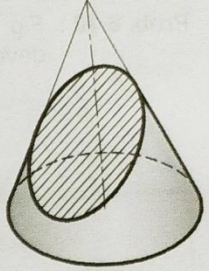
Fig. Prob. 6.6 shows a regular hexagonal prism having a circular hole drilled through it. Draw development of lateral surface of cylinder.



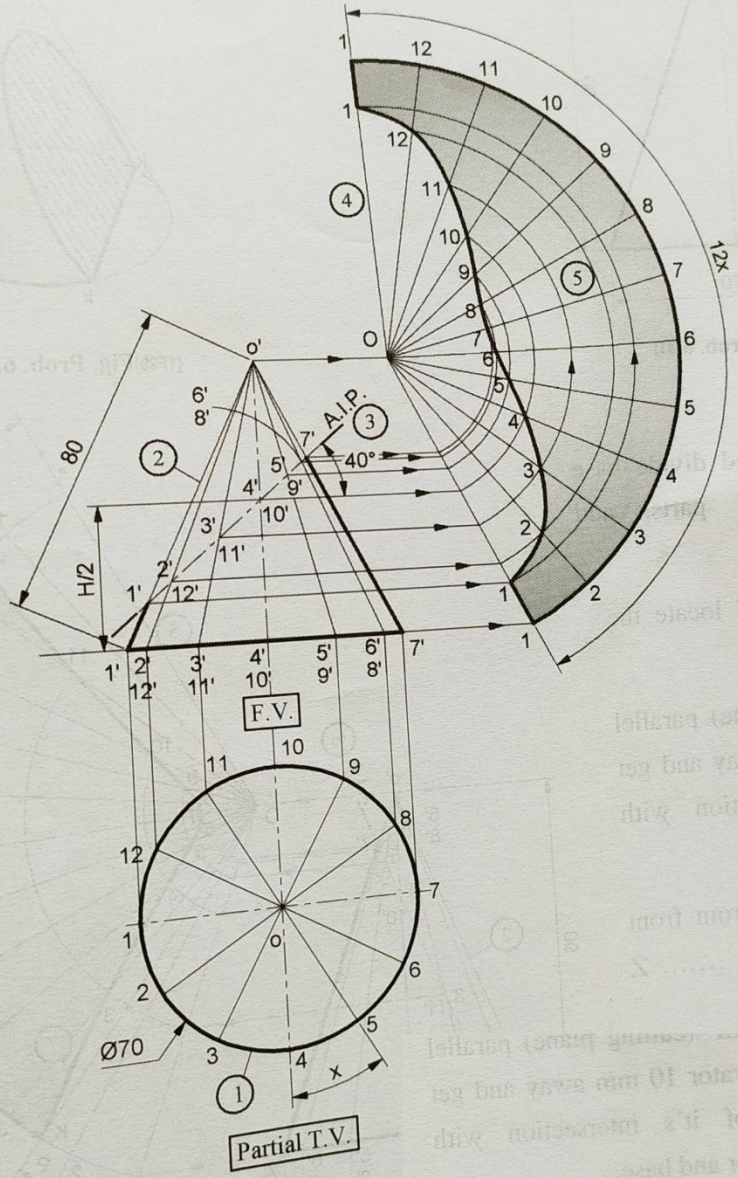


5 Development of retained lateral surface

A cone of base diameter 70 mm and generator length 80 mm is resting on its base on HP. It is cut by an AIP at 40° to HP passing through mid point of axis. Draw development of retained part of cone when apex is removed.



(1F26)Fig. Prob. 6.9



Thank You