DEVELOPMENT OF SURFACES

In industrial world, an engineer is frequently confronted with problems where the development of surfaces of an object has to be made to help him to go ahead with the design and manufacturing processes. For example, in sheet metal work, it plays a vital role, thus enabling a mechanic to cut proper size of the plate from the development and then to fold at proper places to form the desired objects, namely, boilers, boxes, buckets, packing boxes, chimneys, hoppers, air-conditioning ducts etc.

"**The development of surface of an object means the unrolling and unfolding of all surfaces of the object on a plane.**"

"If the surface of a solid is laid out on a plain surface, the shape thus obtained is called the development of that solid." In other words, the development of a solid is the shape of a plain sheet that by proper folding could be converted into the shape of the concerned solid.

Importance of Development:

Knowledge of development is very useful in **sheet metal work**, **construction of storage vessels**, **chemical vessels**, **boilers**, and **chimneys**. Such vessels are manufactured from plates that are cut according to these developments and then properly bend into desired shaped. The joints are then **welded or riveted**.

Principle of Development:

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

Methods of Development:

(a) Parallel-line development
(b) Radial-line development
(c) Triangulation development
(d) Approximate development

▪ Parallel-line Method:

It is used for developing prisms and single curved surfaces like cylinders, in which all the edges/generation of lateral surfaces are parallel in each other.

▪ Radial-line Method:

It is employed for pyramids and single curved surfaces like cones in which the apex is taken as centre and the slant edge or generator as radius of its development.

▪ Triangulation Method:

It is used for developing transition pieces.

▪ Approximate Method:

It is employed for double curved surfaces like spheres, as they are theoretically not possible to develop. The surface of the sphere is developed by approximate method. When the surface is cut by a series of cutting planes, the cut surfaces is called a zone.
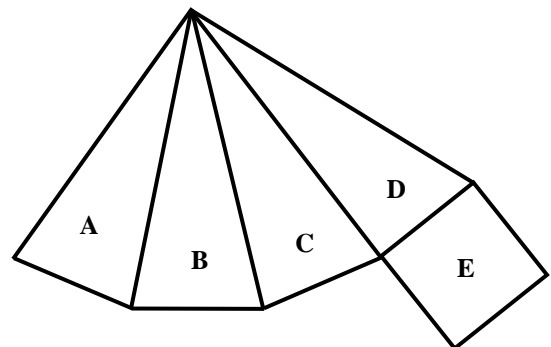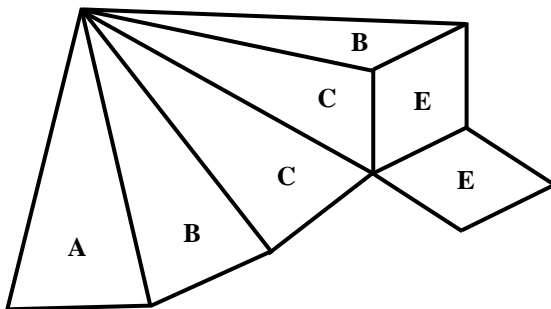
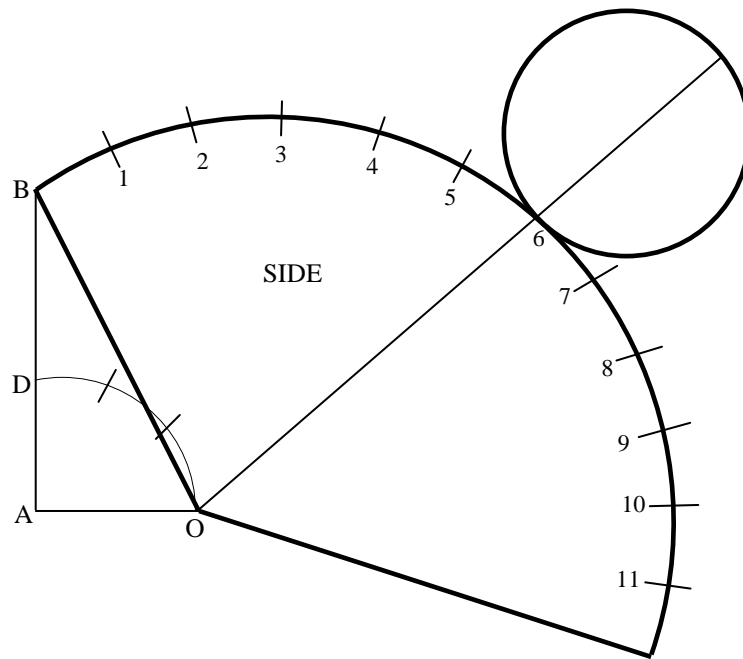# DEVELOPMENT OF SECTIONS

■ **Develop the surfaces of the cube of 1"**

1"

1"

| LEFT | BOTTOM | RIGHT | TOP |
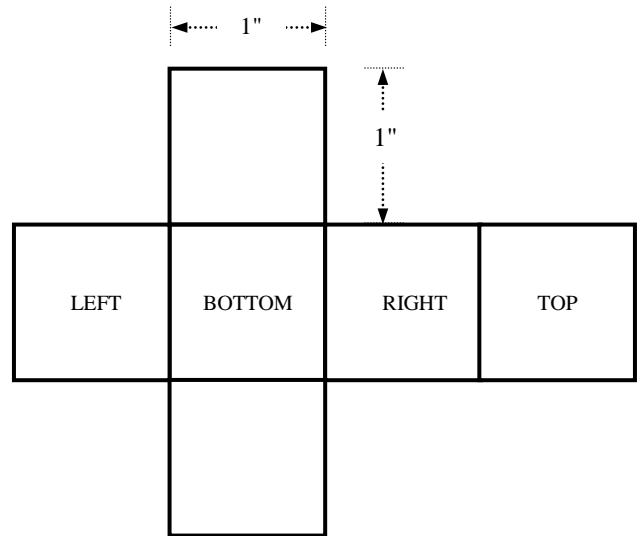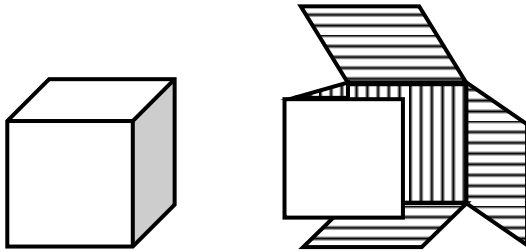
■ **Develop the surfaces of a triangular prism**

3"

1"

1"
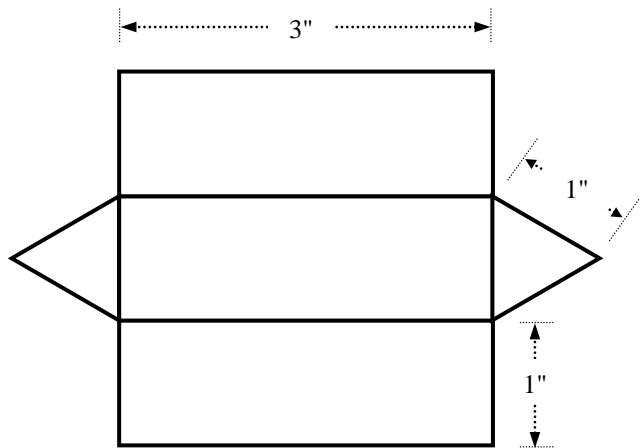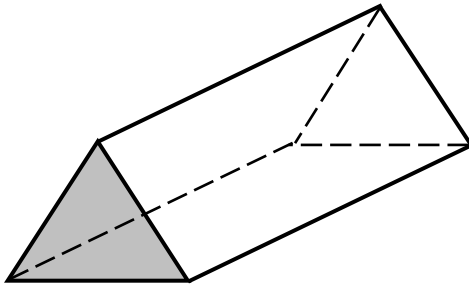
■ **Develop the surfaces of a pyramid**

B

C   E

C   E

A   B

A   B   C

D

E

Draw the development of a cone of diameter 1.5" and inclined height of 2"

B

SIDE

1   2   3   4
5
6
7
8
9
10
11

D

A   O

AO = Radius of the base = 3/4"
BO = Inclined height of cone = 2"

Draw the development of a square pyramid from its plan and front elevation which stands vertically on its base on H.P with one edge of the base parallel to V.P.

O

TRUE LENGTH

2"

AB   BC   E

D   C

O   E

A   B

1"

O′

A′

SIDE

SIDE

SIDE

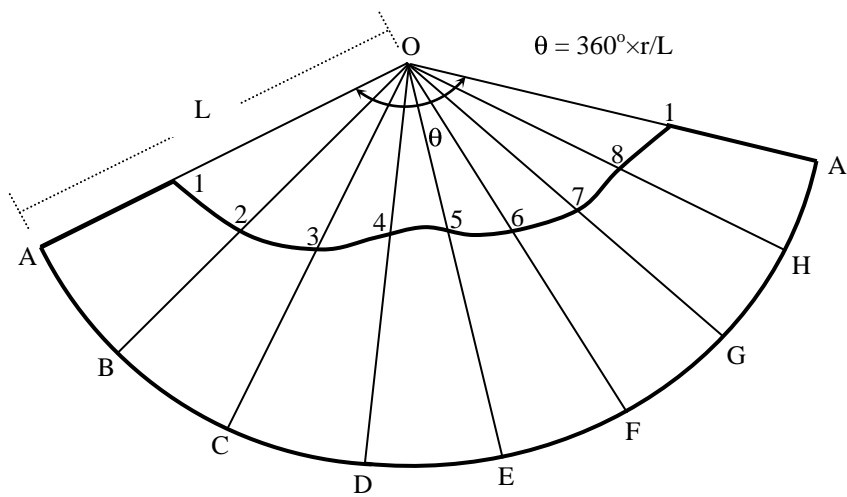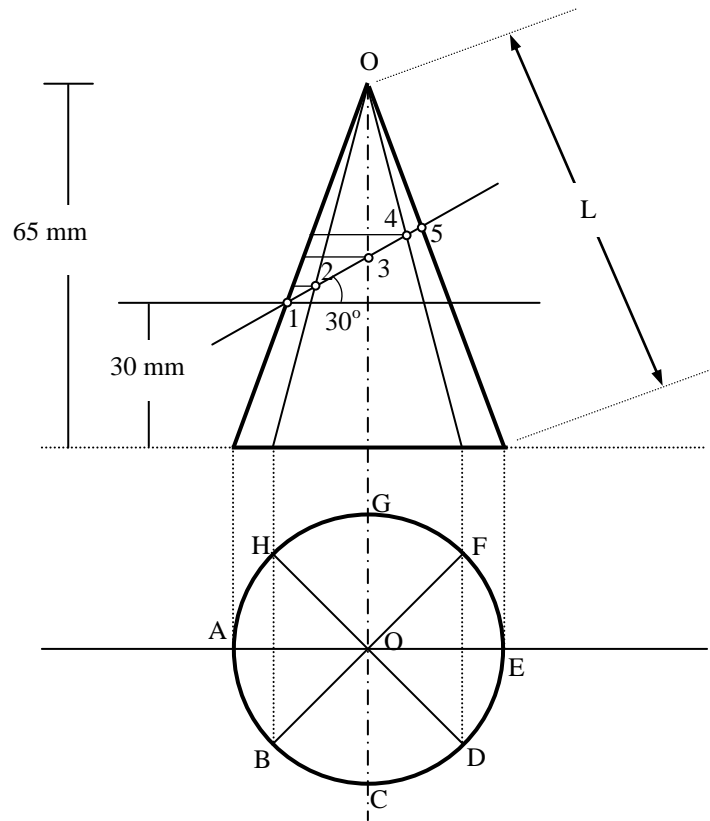SIDE
SIDE

O

B′   C′

D′

1"

3
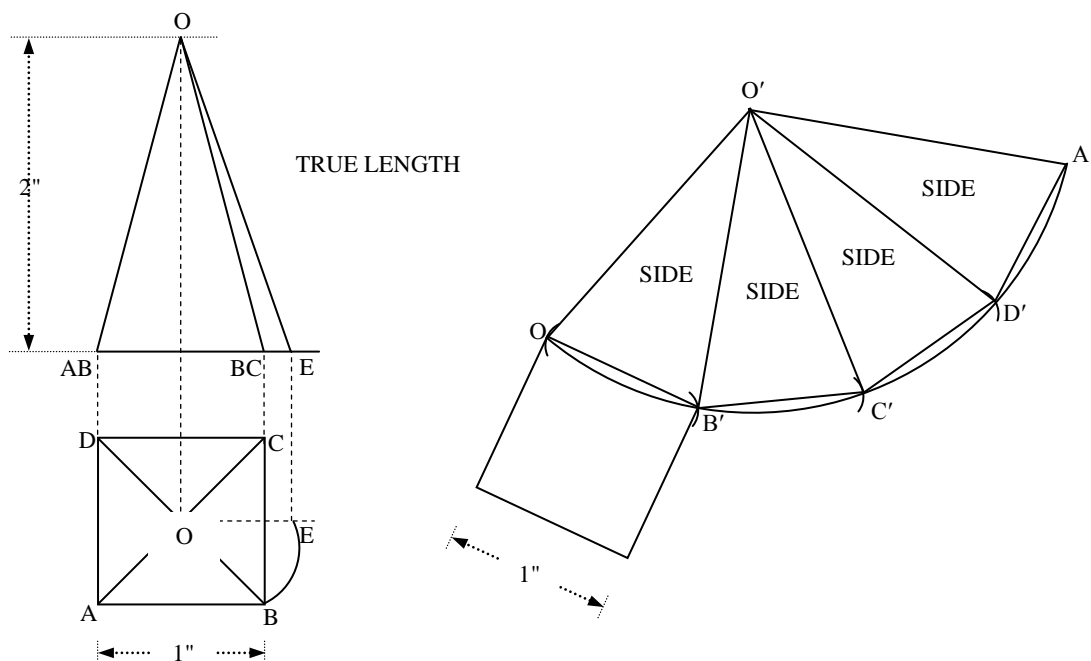
Problem:

A hexagonal prism, edge of base 20 mm and axis 50 mm long, 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.
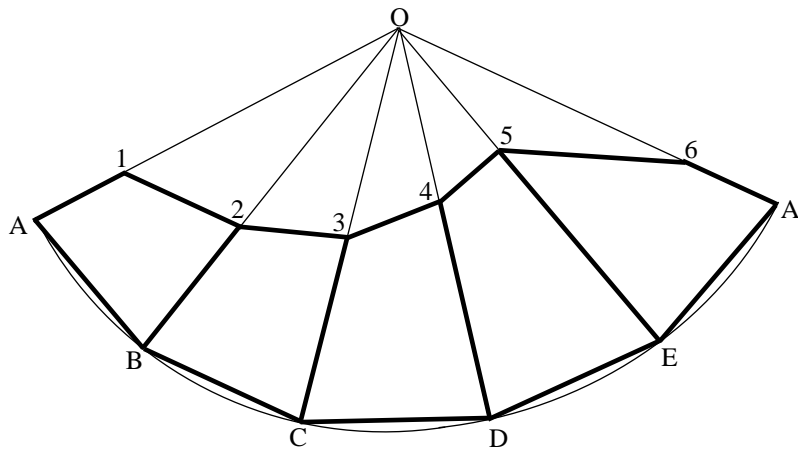
50 mm

45°

A B C D E F A

3 4 5

2 6

1   1

A_1 B_1 C_1 D_1 E_1 F_1 A_1

20 mm
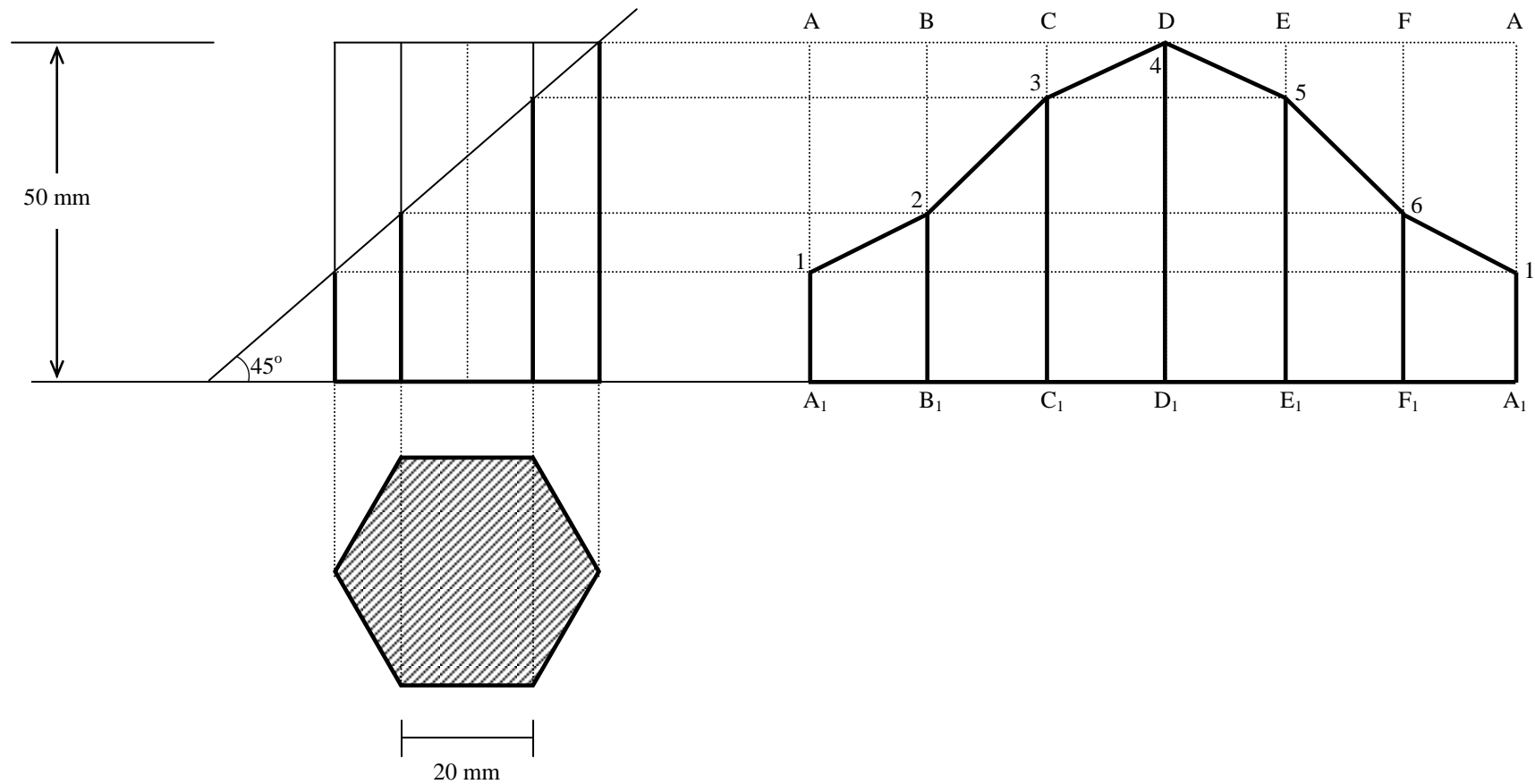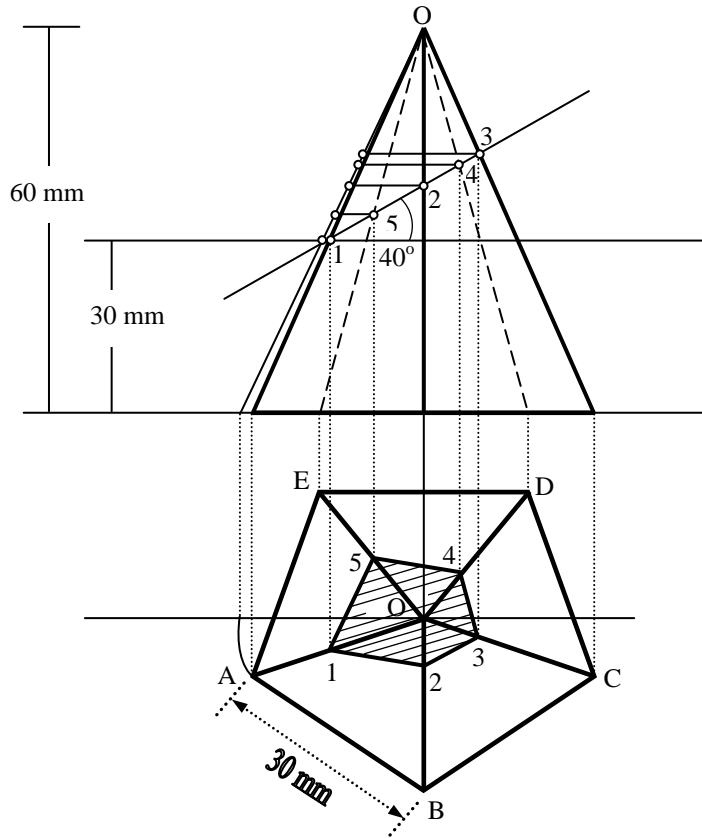
Problem:

A cone of base 50 mm diameter and height 65 mm rests with its base on H.P. A section plane perpendicular to V.P and inclined at 30° to H.P bisects the axis of the cone. Draw the development of the lateral surface of the truncated cone.
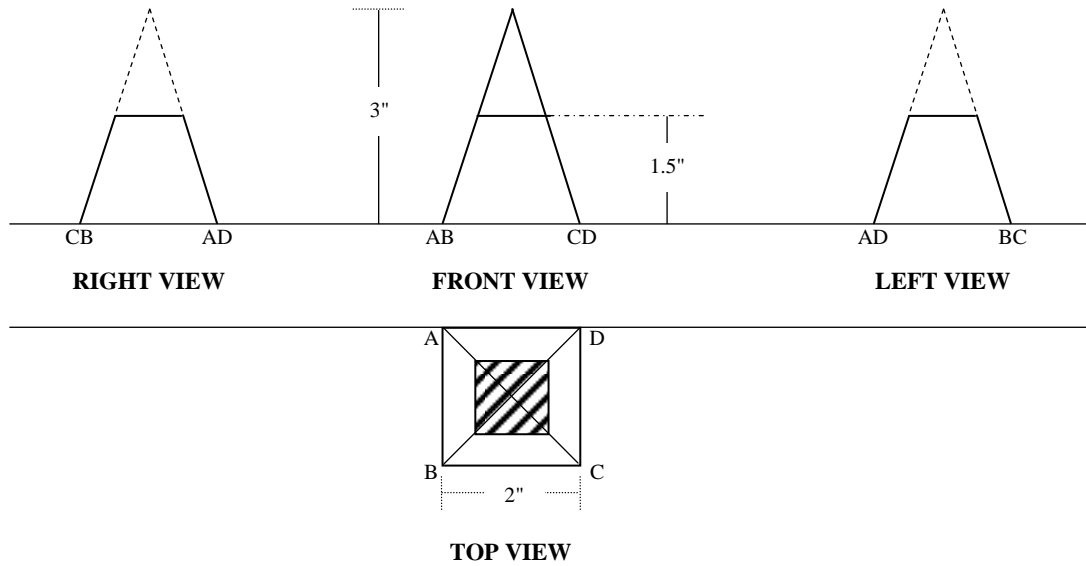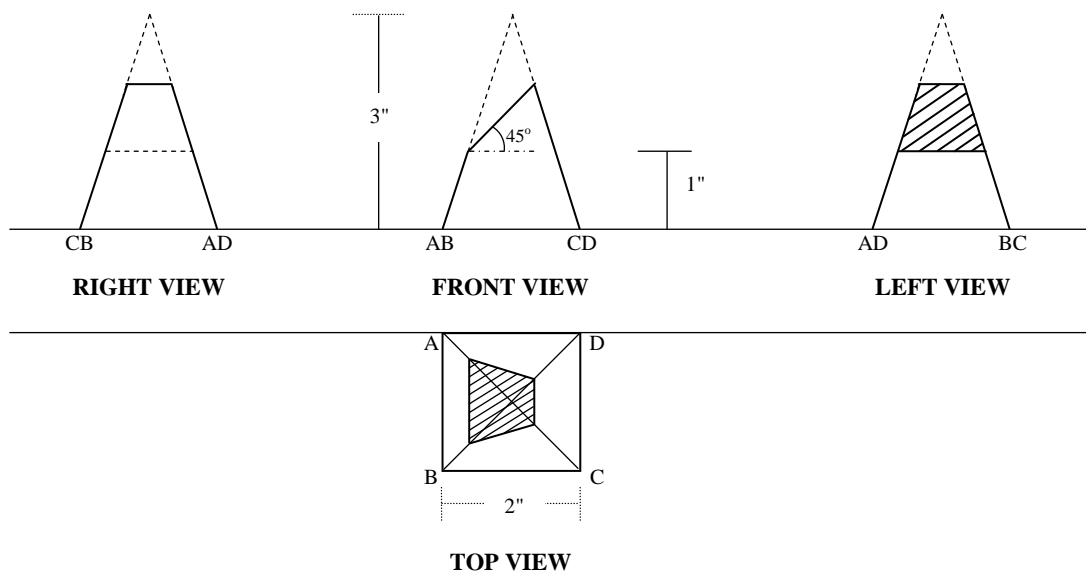
Problem:

A pentagonal pyramid, side of base 30 mm and height 60 mm, stands with its base on H.P and an edge of the base is parallel to V.P. It is cut by a plane perpendicular to V.P, inclined at 40° to H.P and passing through a point on the axis, 32 m above the base. Draw the sectional top view and develop the lateral surface of the truncated pyramid.

- Draw the development of a square pyramid from its plan and front elevation which stands vertically on its base on H.P with one edge of the base parallel to V.P.

3"

1.5"

CB   AD   AB   CD   AD   BC

RIGHT VIEW   **FRONT VIEW**   **LEFT VIEW**

A   D

B   C

2"

TOP VIEW

- Draw the development of a square pyramid from its plan and front elevation which stands vertically on its base on H.P with one edge of the base parallel to V.P.

3"

45°

1"

CB   AD   AB   CD   AD   BC

RIGHT VIEW   **FRONT VIEW**   **LEFT VIEW**

A   D

B   C

2"

TOP VIEW

■ Draw the development of a square pyramid from its plan and front elevation which stands vertically on its base on H.P with one edge of the base parallel to V.P.

3"

A   BD   C

FRONT VIEW

D

45°

A   C

2"

B

TOP VIEW