EEE 154

Computer Aided Drawing (CAD)
for Engineers

Course Instructor : Mansura Sharmin
Lecturer (Part Time), CEED
Room # SAC 1044 A

Email: mansura.sharmin@northsouth.edu

Lecture 3

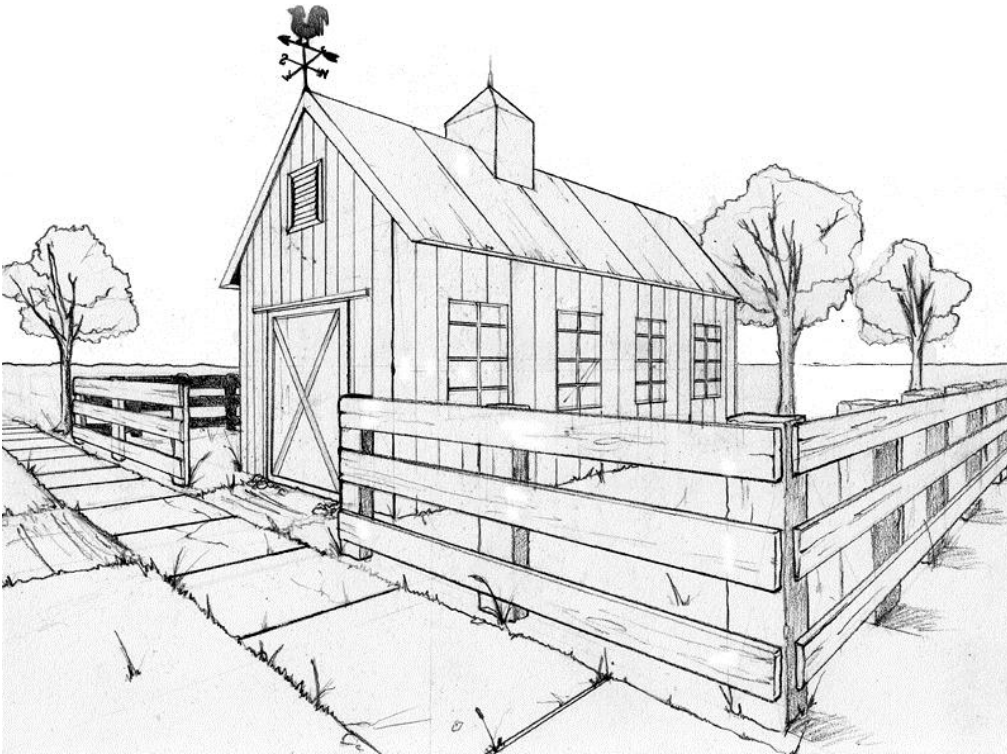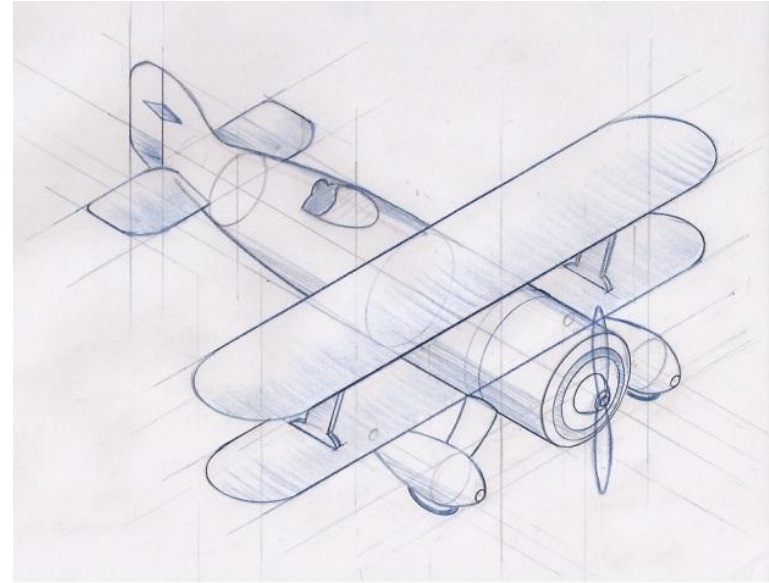**Part A – Pictorial Drawing**

Part B – Isometric Drawing

Part A

Pictorial Drawing

What is Pictorial Drawing

Pictorial Drawing/ Pictorial View is a **three dimensional** one, which is used to **visualize an object in one view.**

Pictorial view vs Orthographic view

Orthographic views such as, top view, front view, side view, etc. provides necessary information about dimensions, material, surface finish, etc. to manufacture the object.
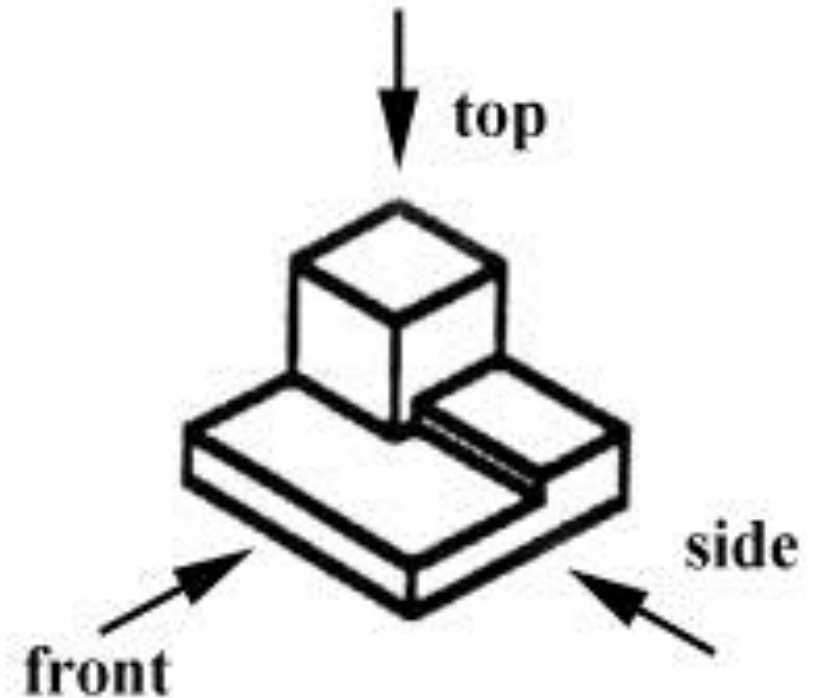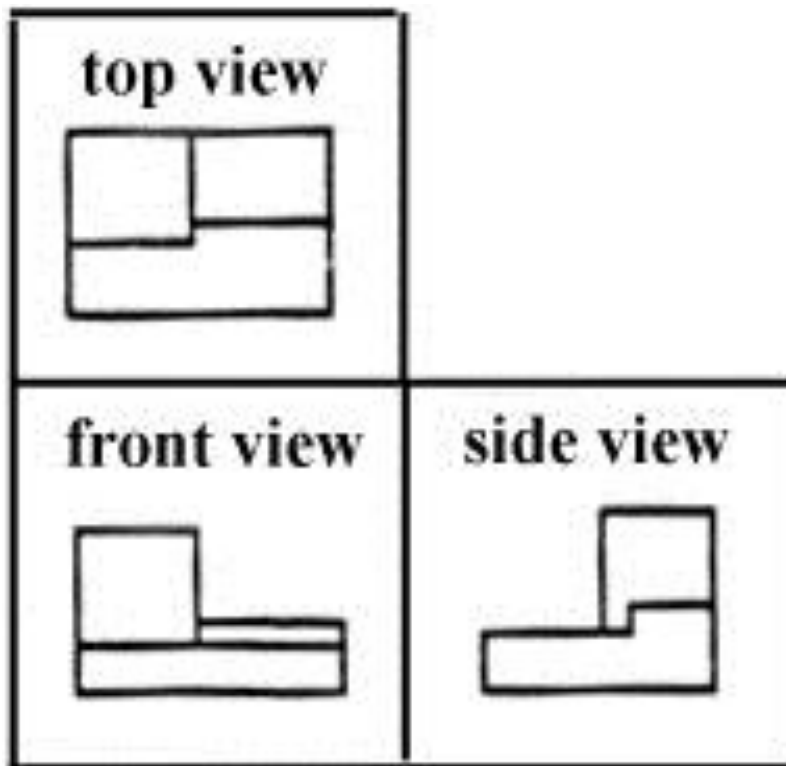
Pictorial view vs Orthographic view

Pictorial view helps to **communicate** with the non technical people who do not have sufficient training in understanding the orthographic views.
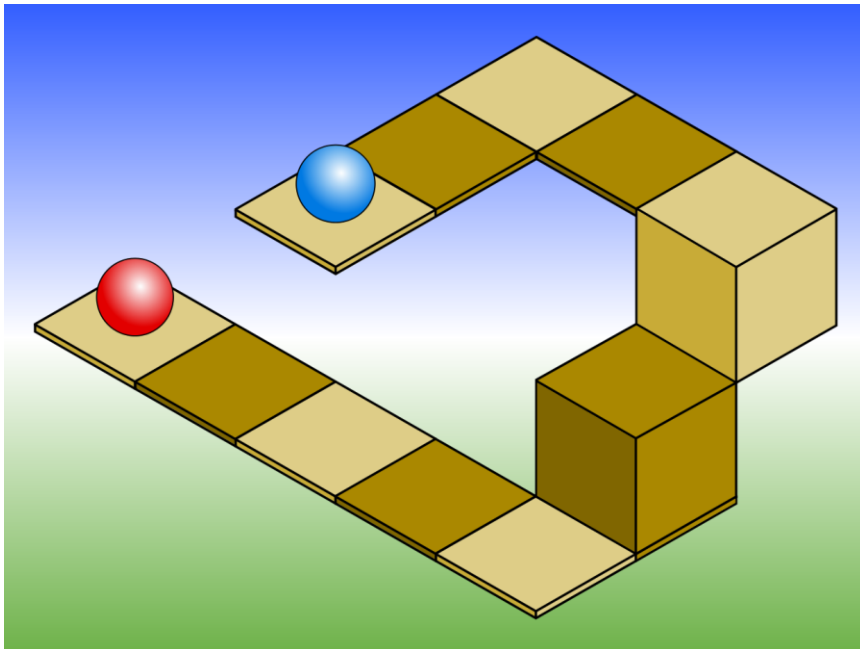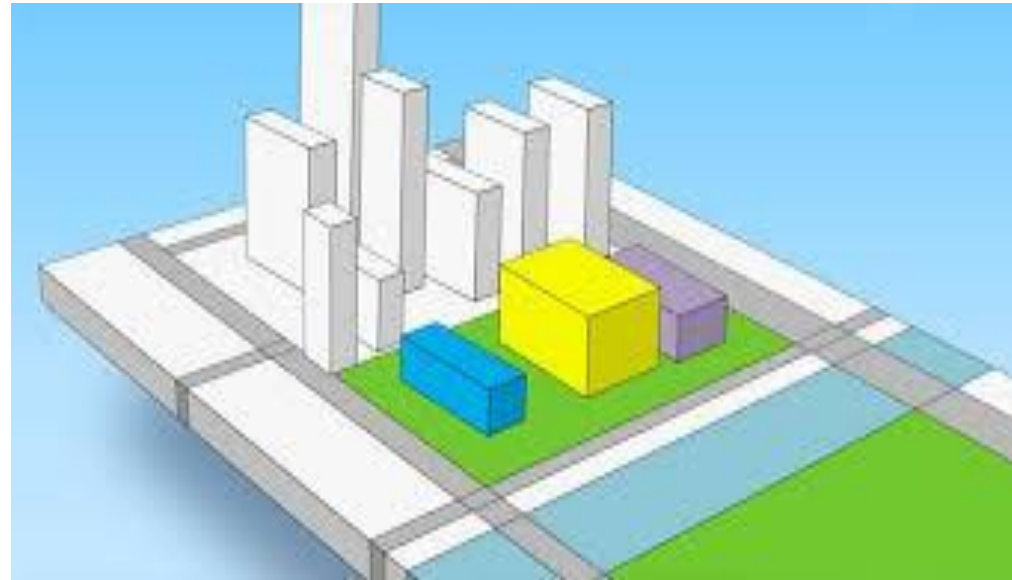
Pictorial View provides the **main dimension of the object** only.

It cannot be used as a working drawing. It is used only to visualize the object.

Pictorial view - Classification
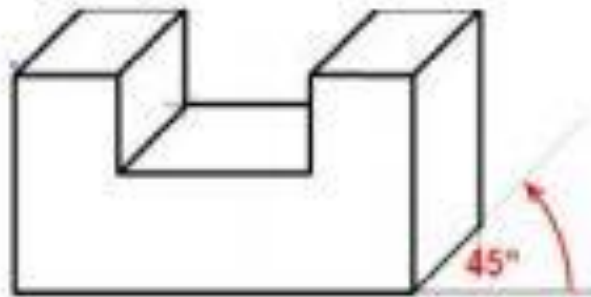
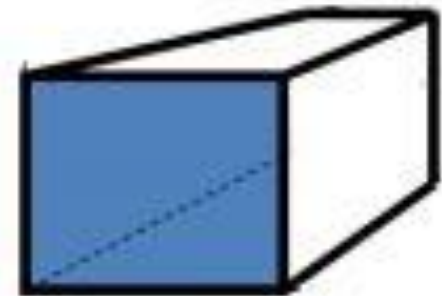There are three main types of pictorial view:

Perspective

Axonometric

Oblique

Axonometric **Oblique** **Perspective**
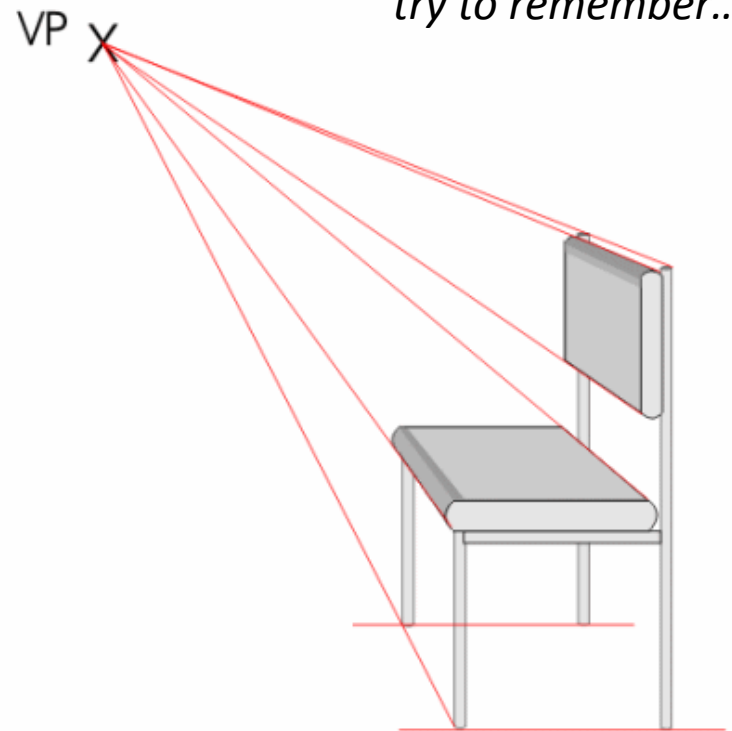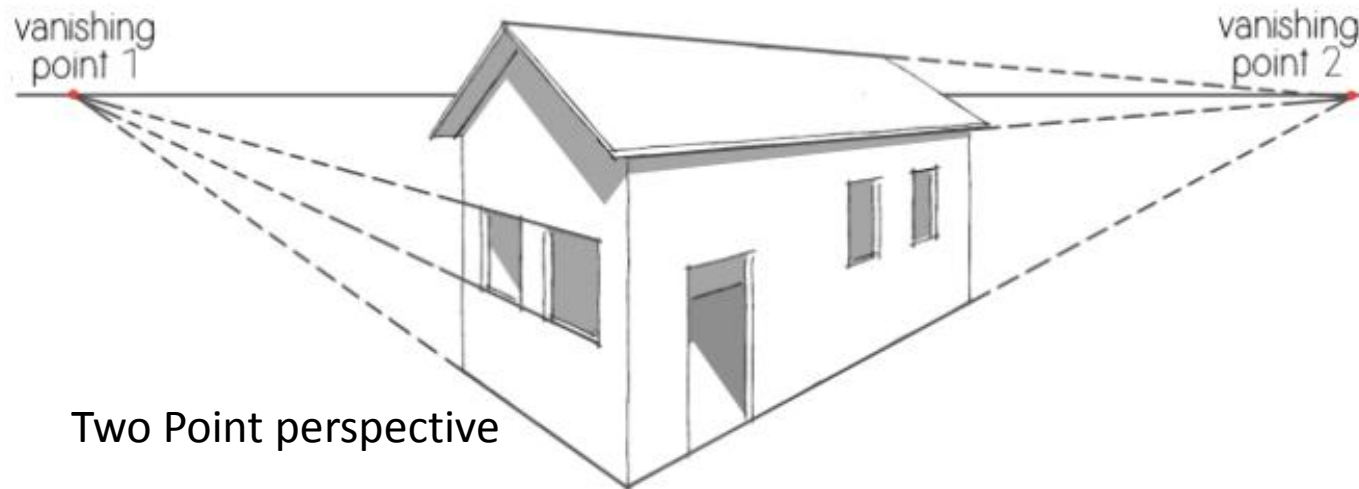
Perspective View

When we view large objects in a room or outdoors, we generally see them as a perspective view.

In a perspective drawing, objects are small as they get further away.
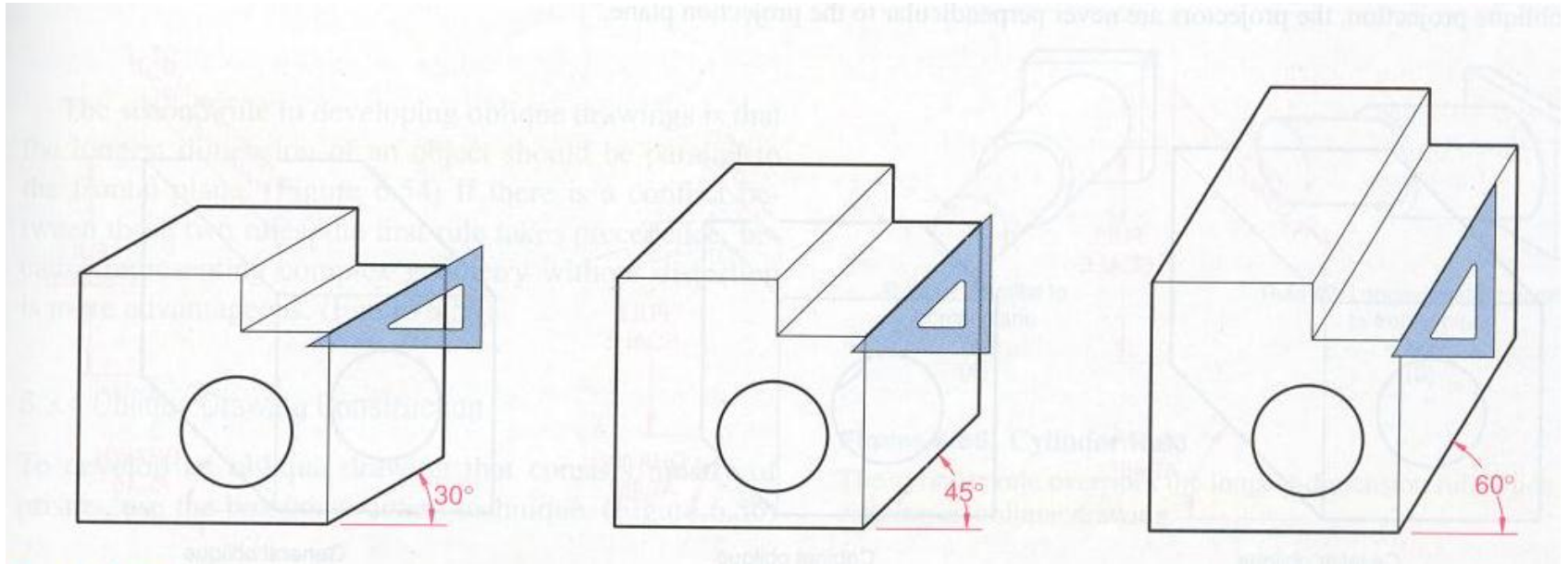
Used mainly by the Architects

VP X

One Point perspective

vanishing point 1

vanishing point 2
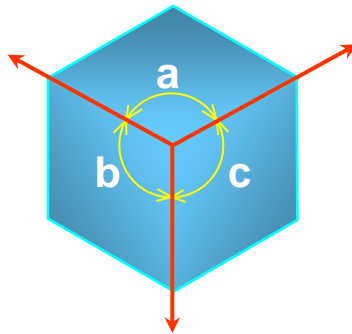
Two Point perspective

Oblique View

Common oblique angles

Axonometric View

A method/view in which a three dimensional object
is represented by a drawing**(axonometric drawing)** having all axes
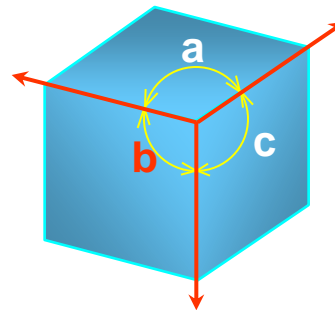drawn to exact scale, resulting in the optical distortion of diagonals.

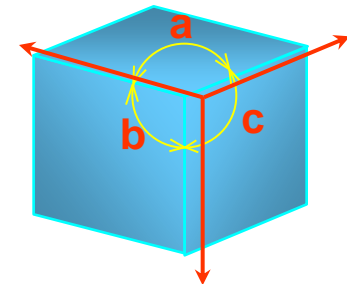## Type of axonometric drawing

1. Isometric

2. Dimetric

3. Trimetric

All angles are equal.

Two angles are equal.
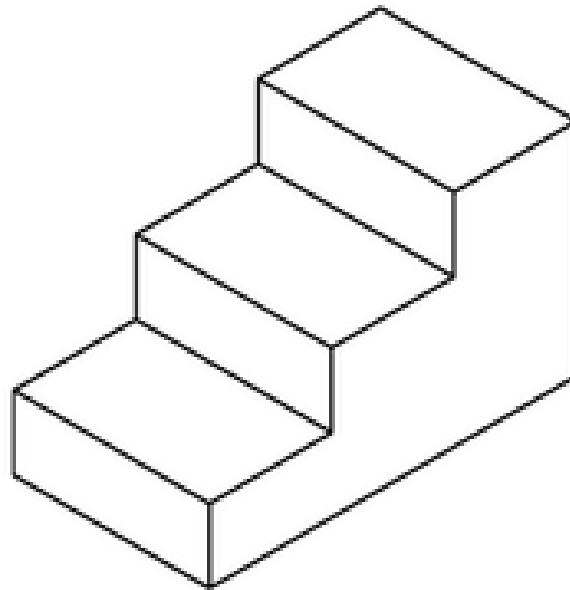
None of angles are equal.

Part B

Isometric Drawing

Isometric Drawing

'Iso' means **'equal'** and **'metric projection'** means **'a projection to a reduced measure'**.

An isometric projection is one type of **pictorial projection** in which the three dimensions of a solid are not only shown in one view, but also their dimension can be scaled from this drawing.
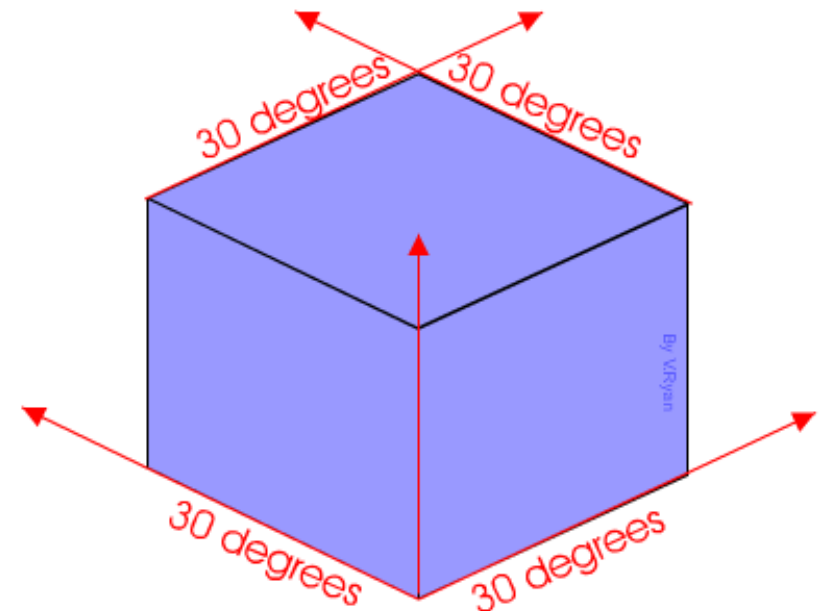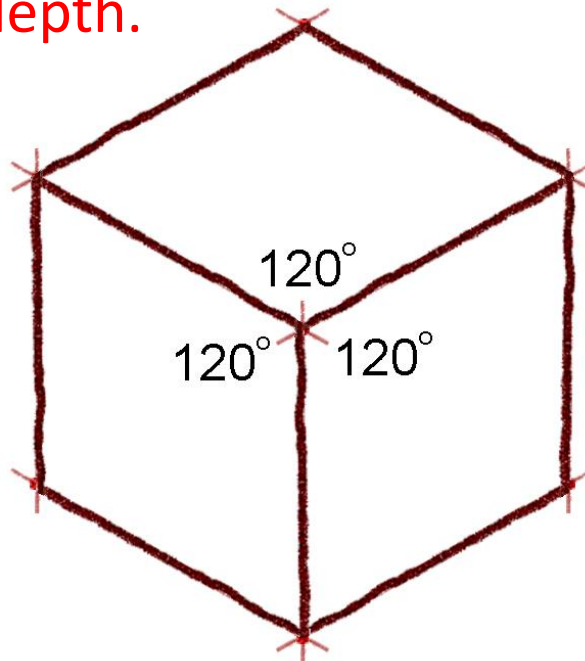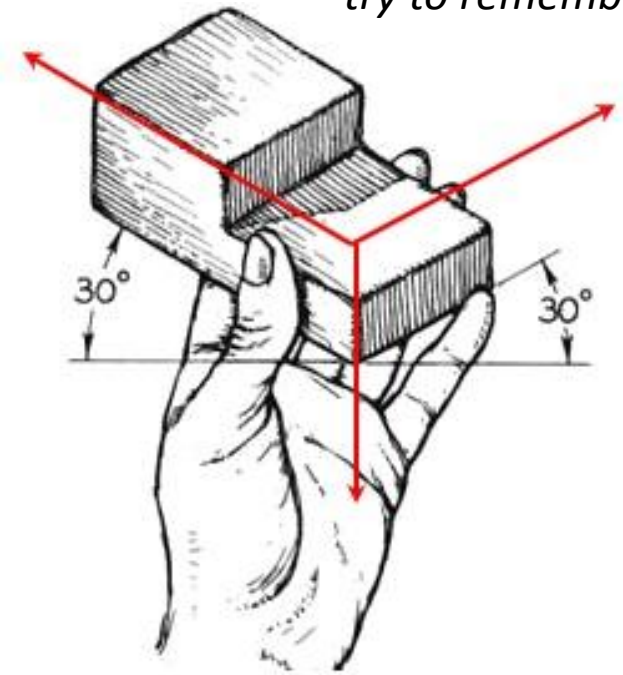
Isometric View

Isometric Drawing

Three adjacent faces on a cube will share a single point. The edges that converge at this point will appear as 120 degree angles or 30 degrees from the horizon line.

These three edges represent height, width, and depth.

30°   30°

120°

120°   120°

30 degrees   30 degrees

By VRyan

30 degrees   30 degrees

Isometric Drawing – Terms and Definitions

Isometric Axes : The lines AB, AD and AE meeting at a point A and making an angle of 120 degree with each other are termed as 'Isometric Axes'

Isometric Lines : The lines parallel to the isometric axes are termed 'Isometric Lines'. E.g. Lines CD, CB.

Non-isometric Lines : The lines which are not parallel to the isometric axes are non-isometric lines. E.g. BD
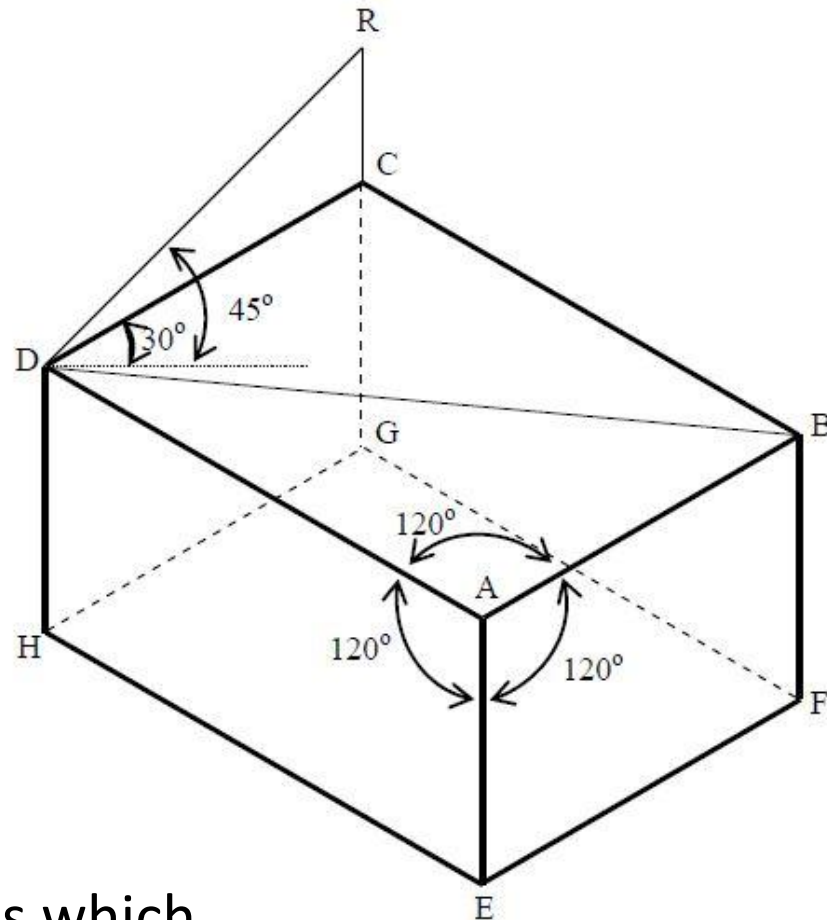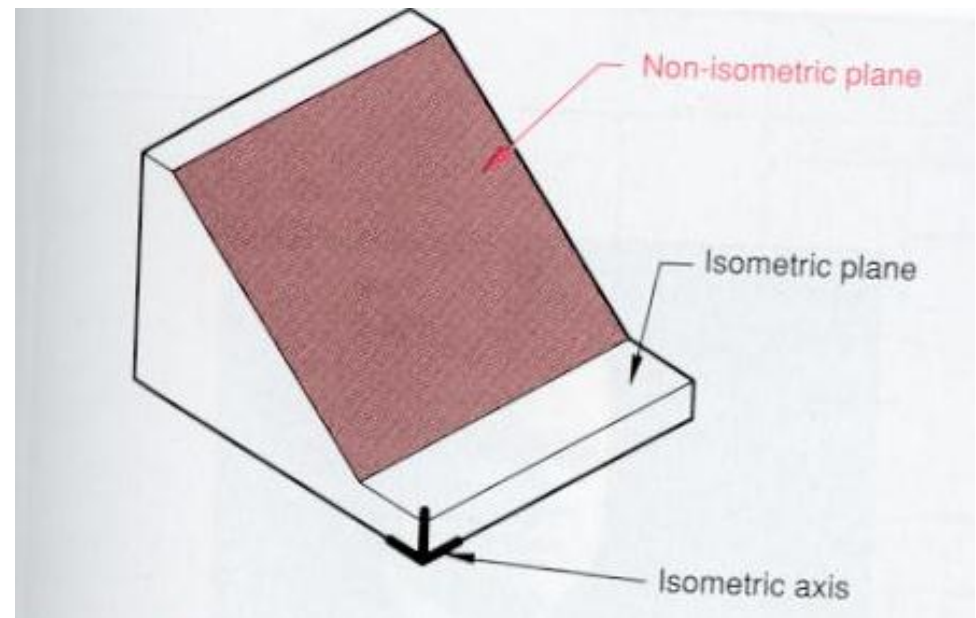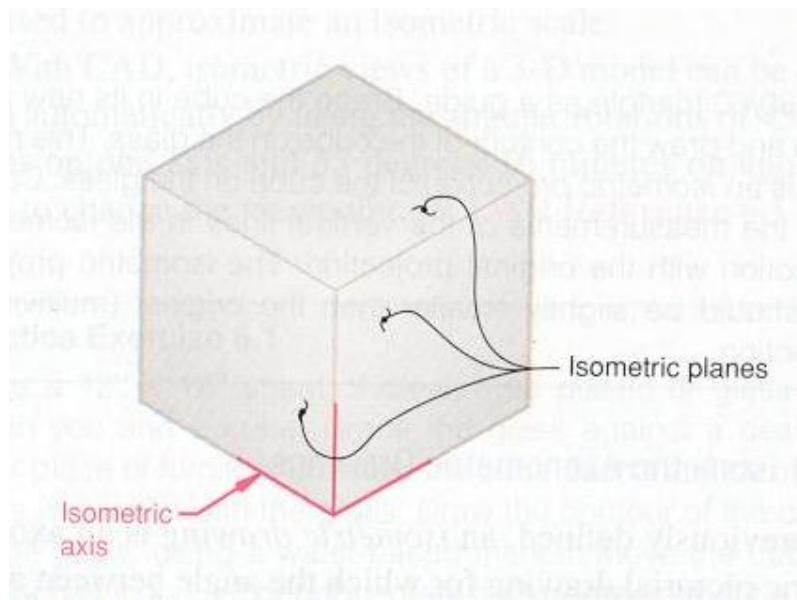
Isometric Drawing – Terms and Definitions

Isometric Planes : The planes representing the faces of the rectangular prism as well as other planes parallel to these planes are isometric planes.
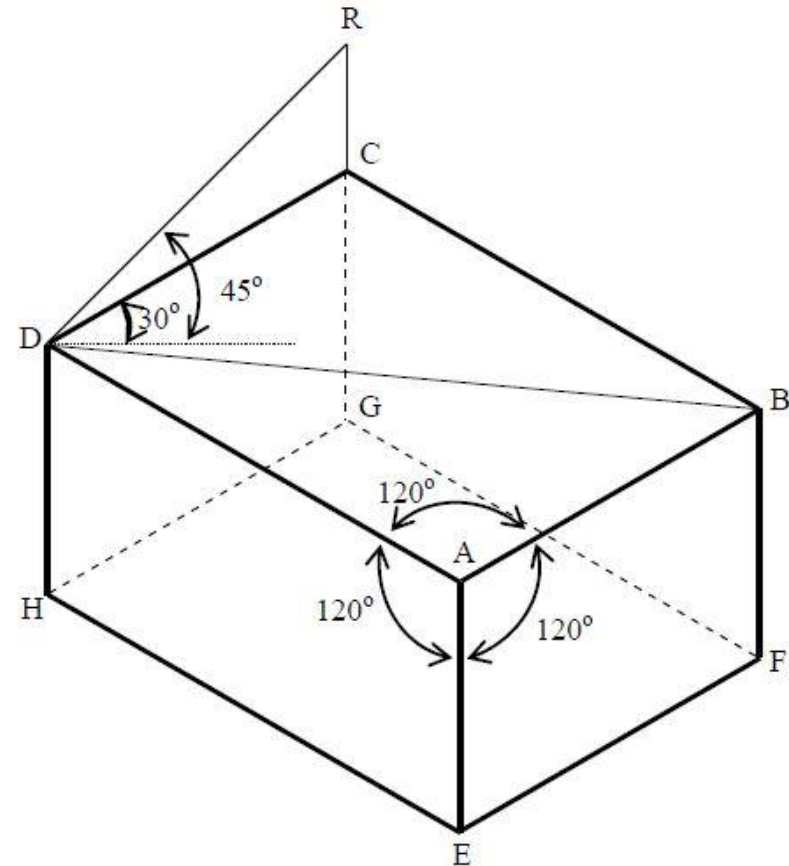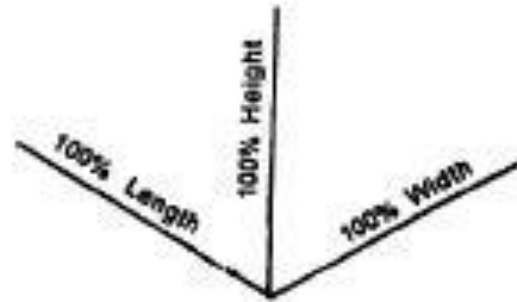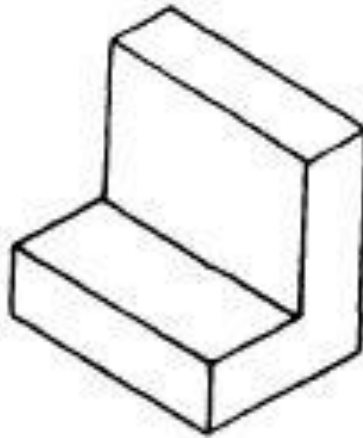
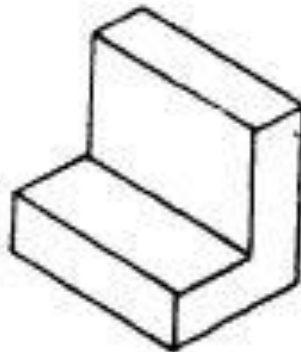# More about isometric and non-isometric lines and planes

Isometric Projection

Isometric Projection is drawn using isometric scale, which converts true lengths into isometric lengths.
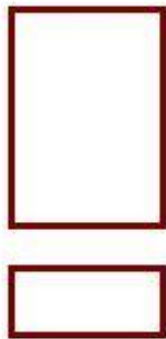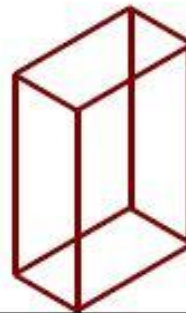

(a) Isometric Drawing

(b) Isometric Projection

# Isometric View vs Isometric Projection

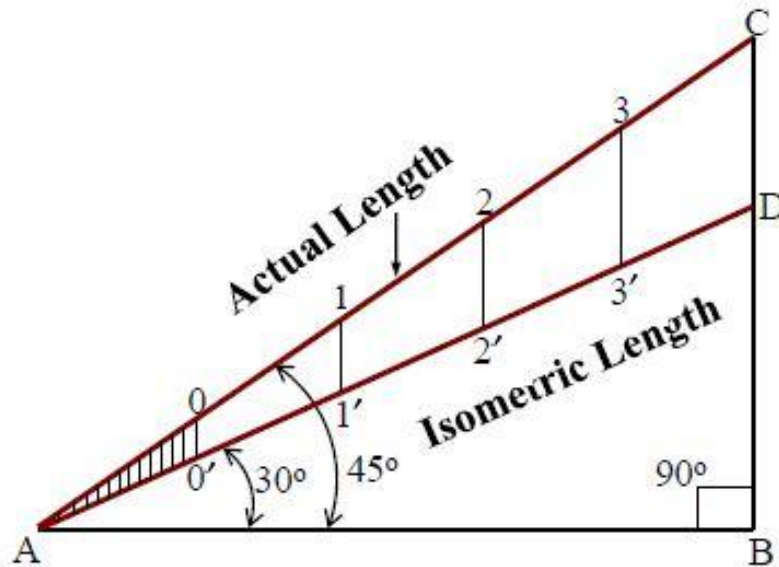| Isometric View	Isometric Projection
Drawn to actual scale	Drawn to isometric scale
When lines are drawn parallel to isometric axes, the true lengths are laid off.	When lines are drawn parallel to isometric axes, the lengths are foreshortened to 0.81 time the actual lengths.

ORTHOGRAPHIC
PROJECTION

ISOMETRIC
PROJECTION
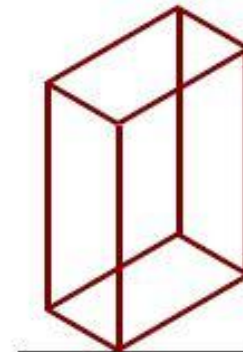
ISOMETRIC
VIEW

Isometric Scale

∴ Isometric Length = 0.81 × Actual Length

$$\frac{AB}{AC} = \cos 45° = \frac{1}{\sqrt{2}}$$

$$\frac{AB}{AD} = \cos 30° = \frac{\sqrt{3}}{2}$$

$$\therefore \quad \frac{AB}{AC} \div \frac{AB}{AD} = \frac{1}{\sqrt{2}} \div \frac{\sqrt{3}}{2}$$

$$\frac{AB}{AC} \times \frac{AD}{AB} = \frac{1}{\sqrt{2}} \times \frac{2}{\sqrt{3}}$$

$$\frac{AD}{AC} = \sqrt{\frac{2}{3}} = 0.81$$

$$\Rightarrow AD = 0.81 \times AC$$

Construction of Isometric Drawing

To prepare Isometric View

❑ **Box Method**
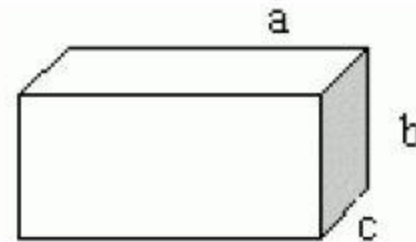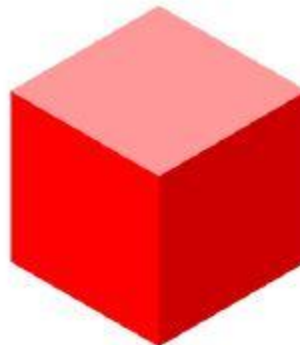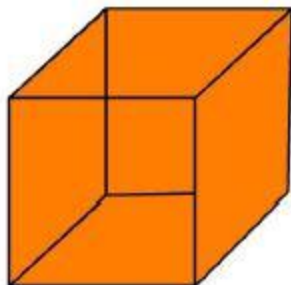
❑ **Co-ordinate or Offset Method**

Construction of Isometric Drawing

Box Method

The isometric drawing of solids like **cube, square, and rectangular** prisms are **drawn directly** when their edges are parallel to the three dimensional axes.

The isometric drawing of all other types of **prisms and cylinders** are drawn by **enclosing them in a rectangular box**.

This method is called Box Method.

Construction of Isometric Drawing

Co-ordinate or Offset Method

Off-set method of making an isometric drawing is performed when the object contains irregular curved surfaces.

The isometric drawing of **pyramids** and **cones** are generally drawn by this method.
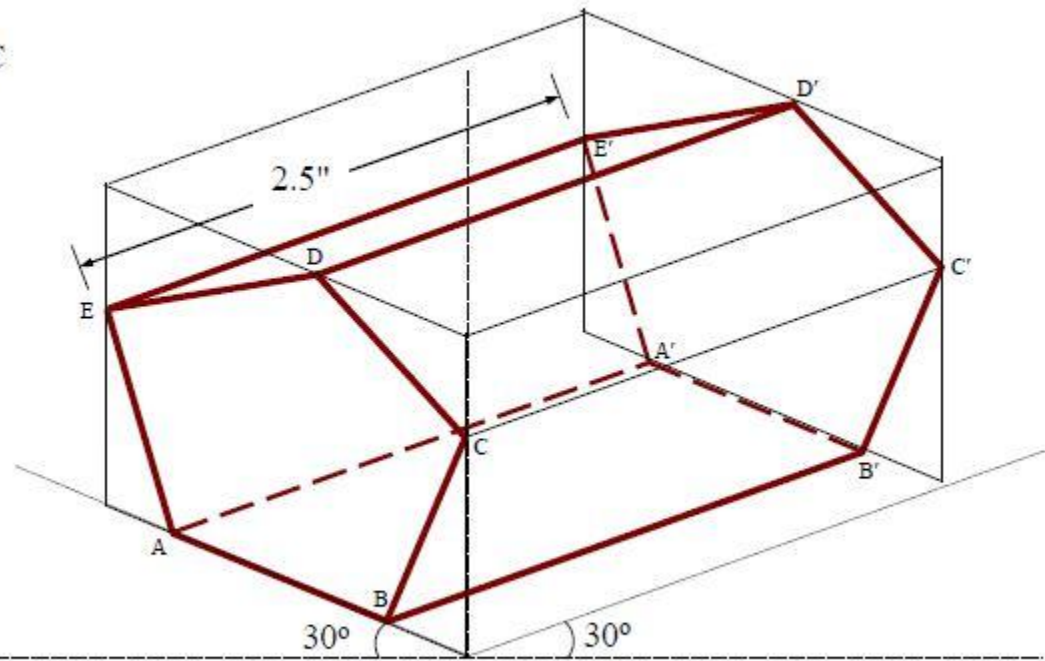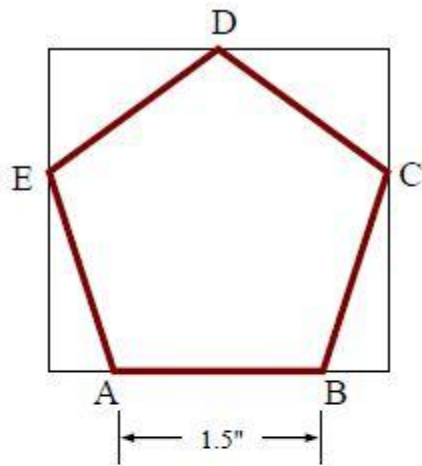
In this method, the curved feature may be obtained by plotting the points on the curve, located by the measurements along isometric lines.

Construction of Isometric Drawing

Example of Box Method

Isometric View of a regular Pentagonal Prism
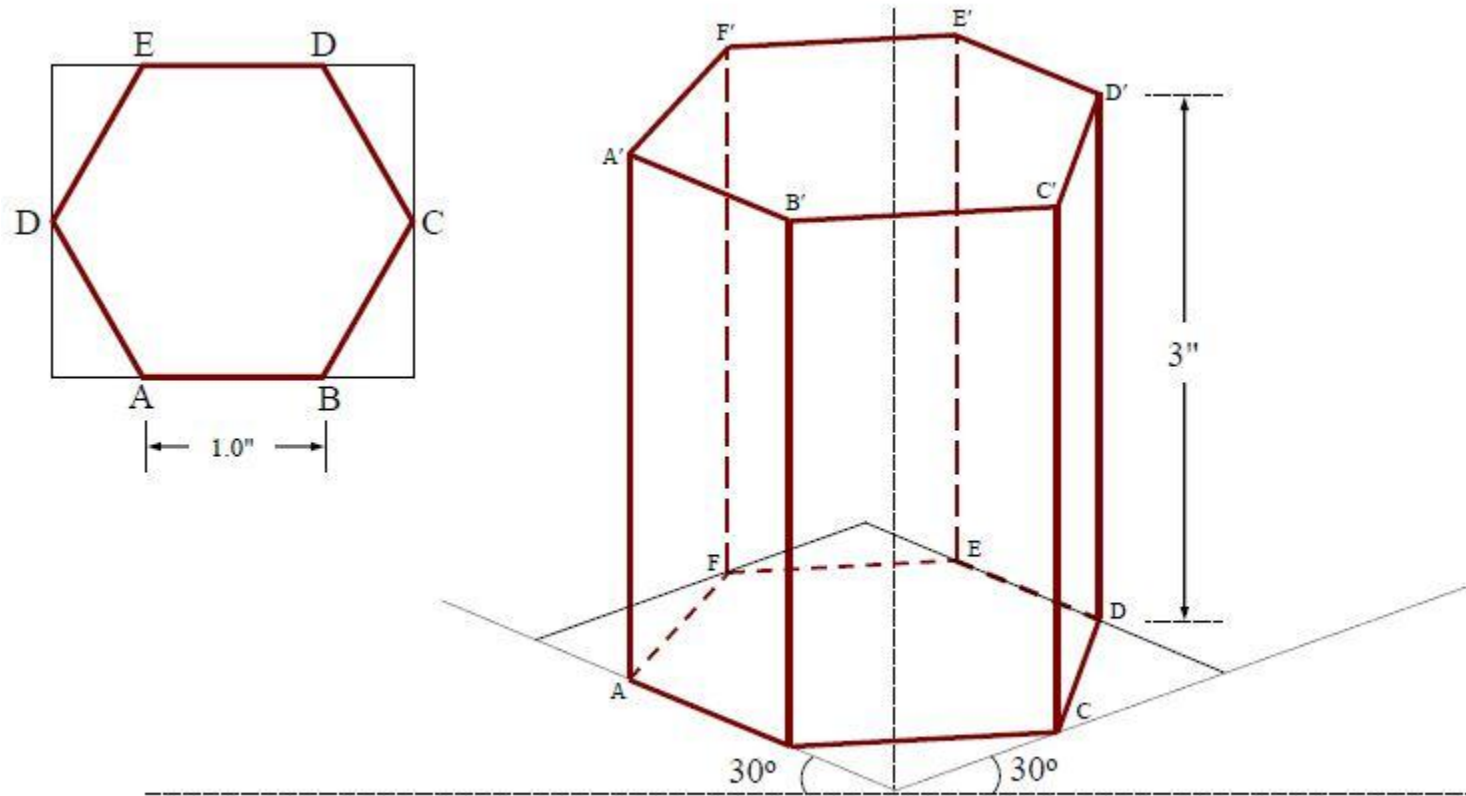(resting on one of its faces on H.P)

Construction of Isometric Drawing

Example of Box Method

Isometric View of a regular Hexagonal Prism

(resting on one of its faces on V.P)

Construction of Isometric Drawing

Example of Off-set Method

Isometric View of a regular Hexagonal Pyramid

Thank you