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18MES101L – Engineering Graphics and Design

Week 5: Projection of Solids – I

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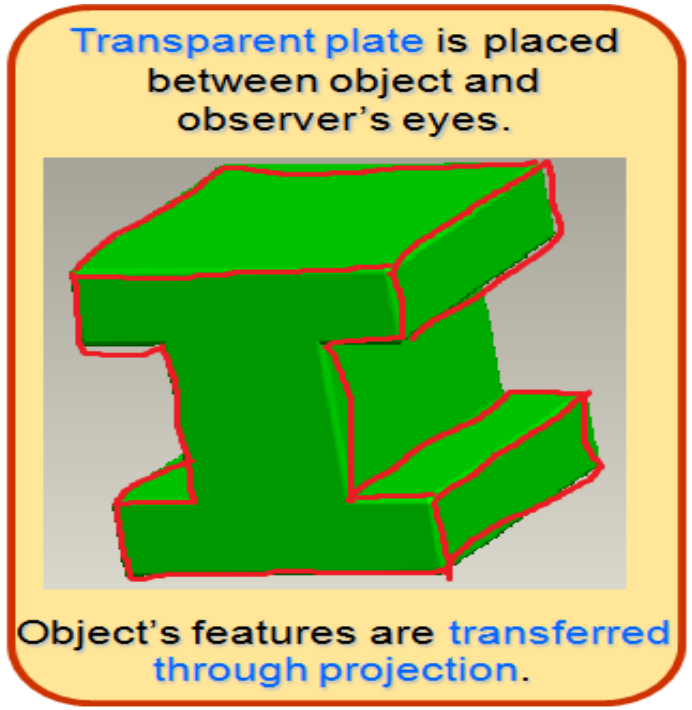
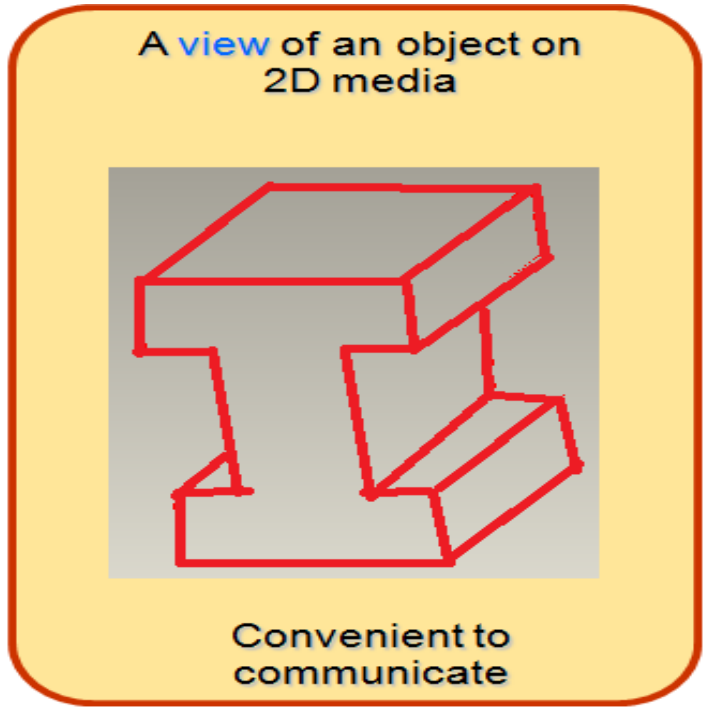
CONTENTS

- **Projection Theory**
- **Definition of Solid**
- **Classification of Solids**
- **Terms used in Projection of Solid**
- **Tetrahedron and Prism**

Projection Theory

- Purpose : To graphically represent a 3-D object on 2-D media (paper, screen etc.).





Concept

A projection theory is based on 2 variables:

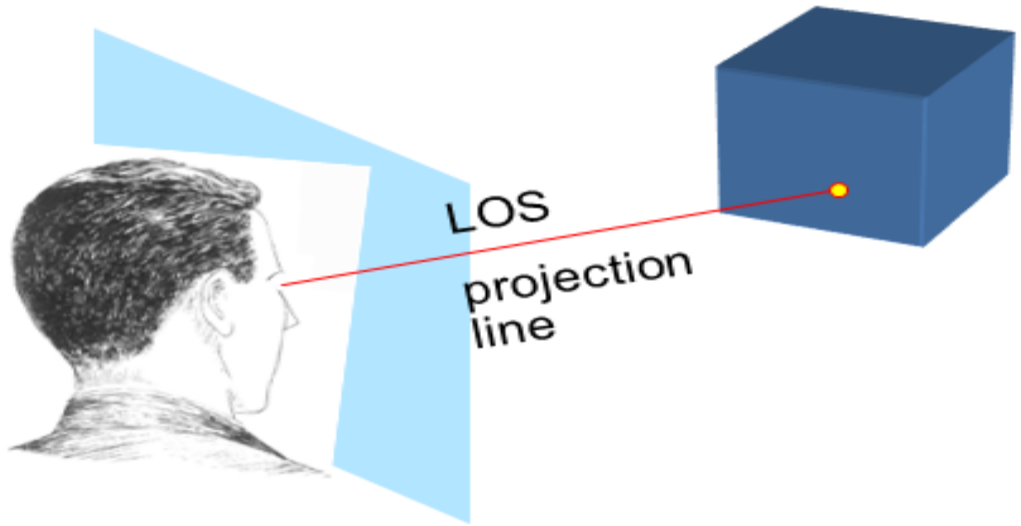
1) Line of sight 2) Plane of projection (image or picture plane)

Line of sight (LOS)

is an imaginary ray of light between an observer's Eye and an object.

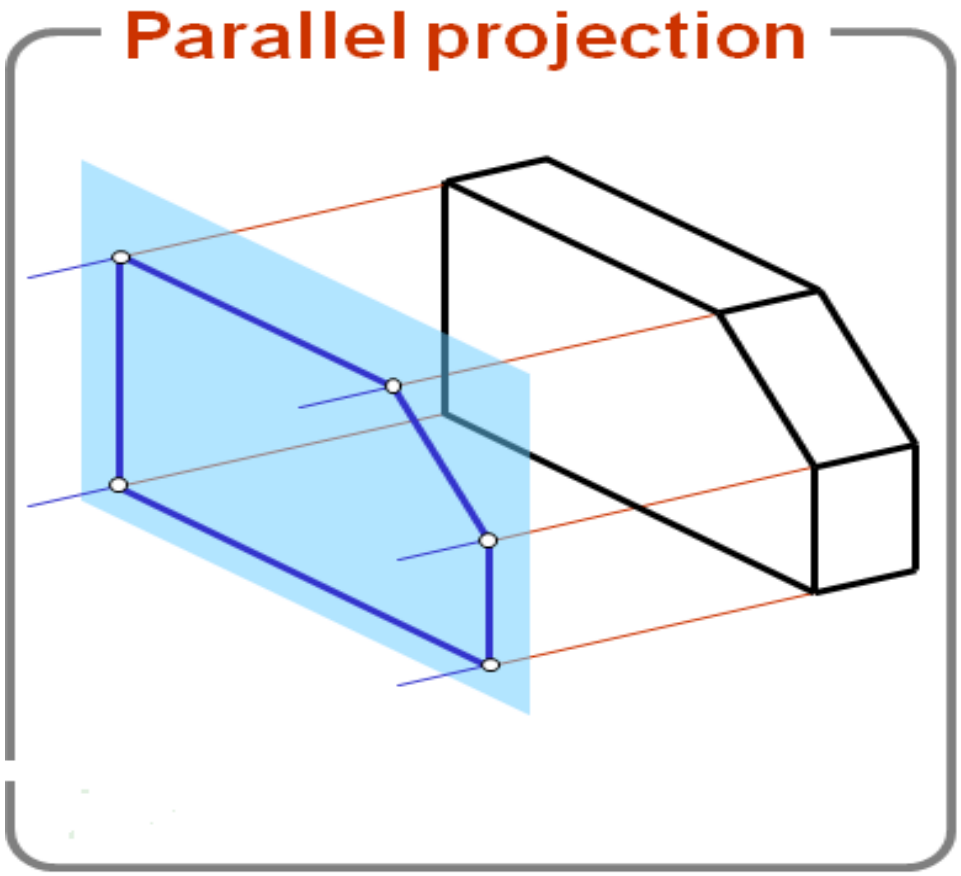
Plane of projection

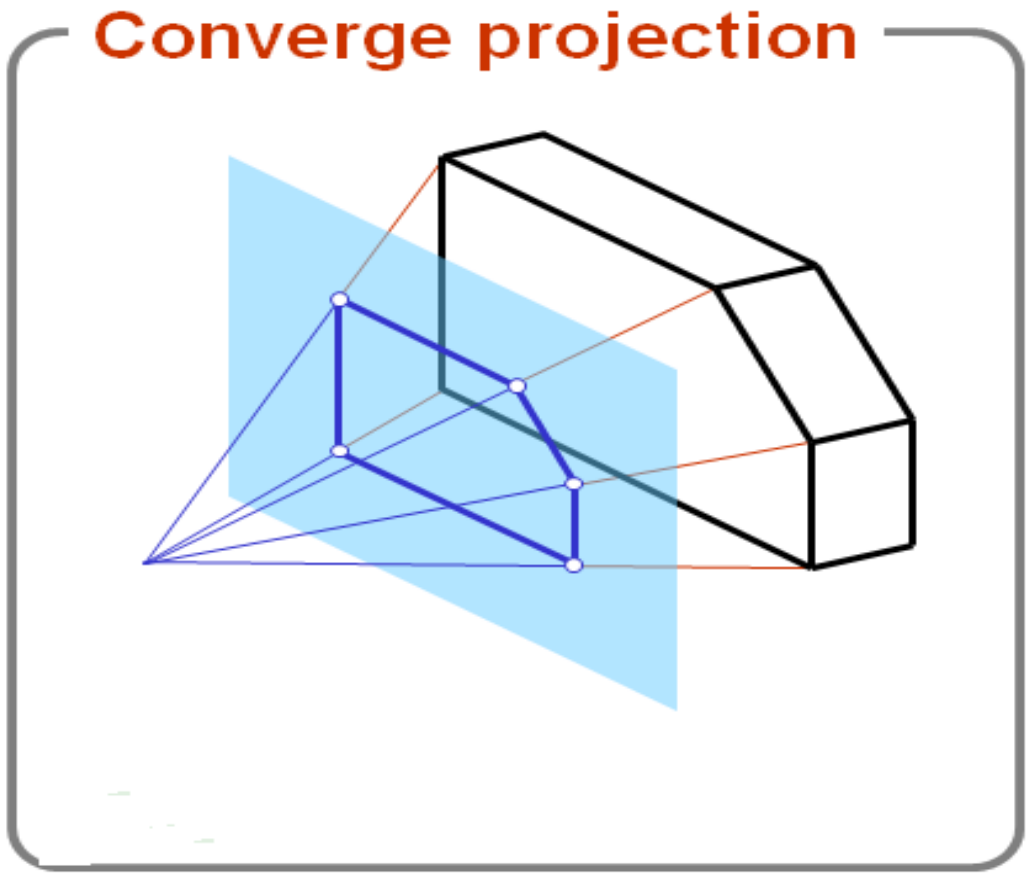
is an imaginary flat plane upon which the image created by the LOS is projected.



Line of sight

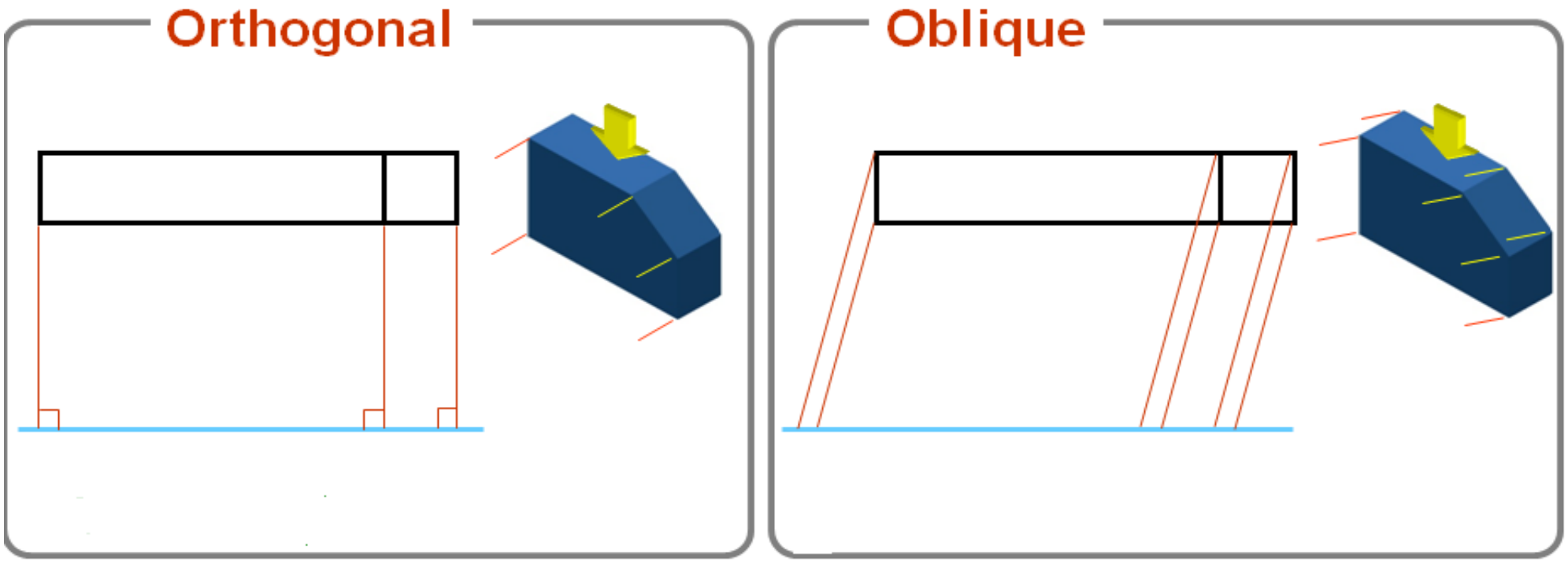
- Lines of sight can be **parallel** or **converge**.





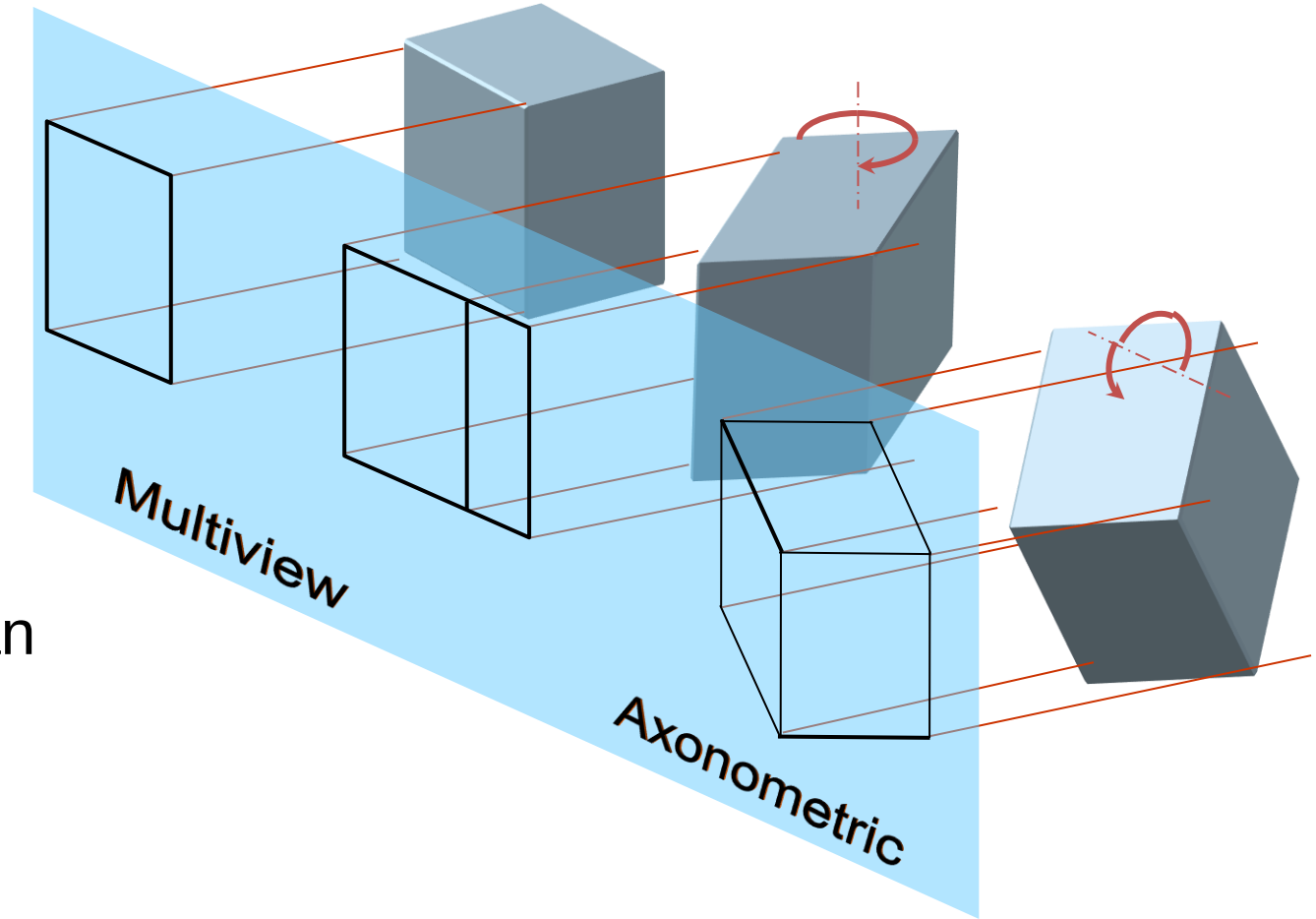
Line of sight

- The parallel projection lines can be **normal** (orthogonal) or **oblique** to the plane of projection.



View

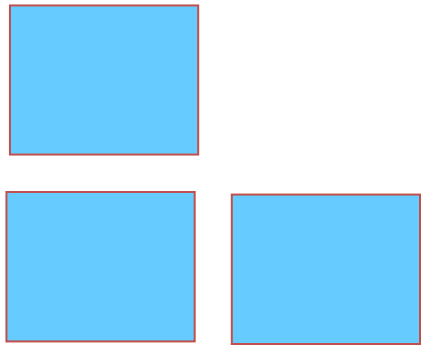
- Image on a projection plane.
- View depends on a relative orientation between an object and a plane.
- **Multiview drawing** shows a 2D view of an object.
- **Axonometric drawing** shows a virtual 3D view of an object.



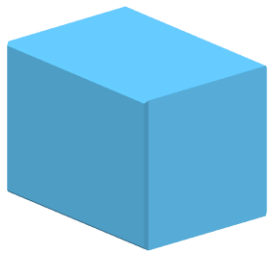
Types of views

- Projections
  - Parallel
    - Orthogonal
      - Multiview
      - Axonometric
    - Oblique
  - Converge

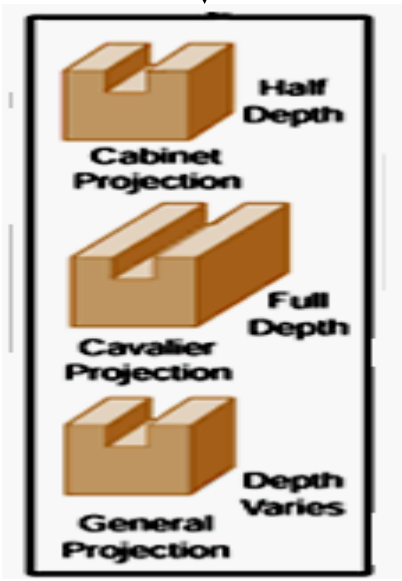
Perspective drawing

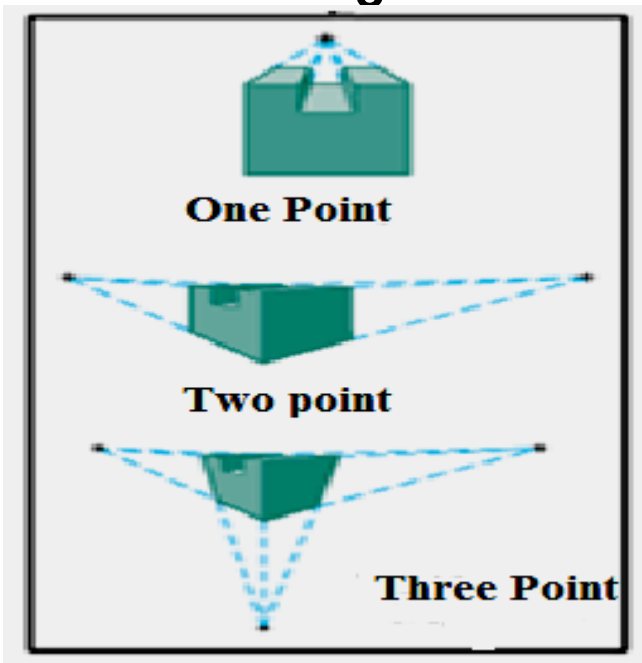


Multiview drawing



Pictorial drawing

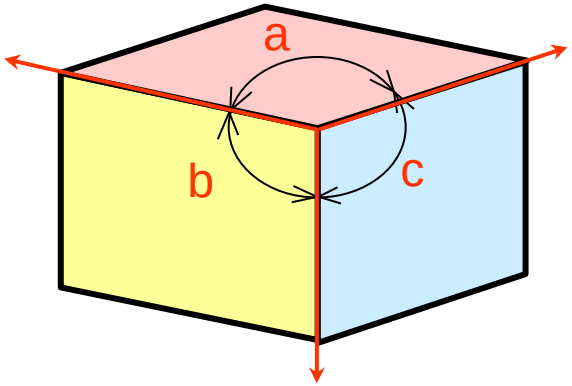




Type of an axonometric projection

1. Trimetric

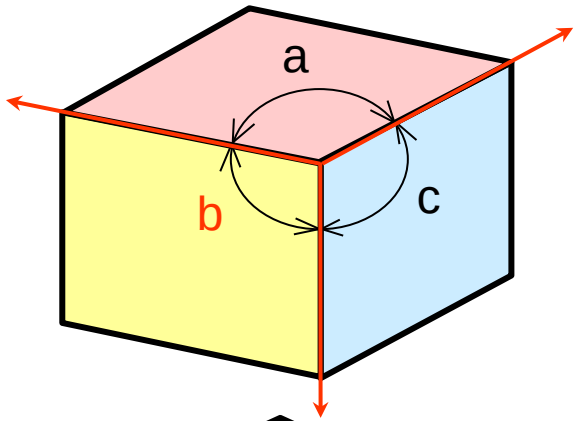
None of the angles are equal.

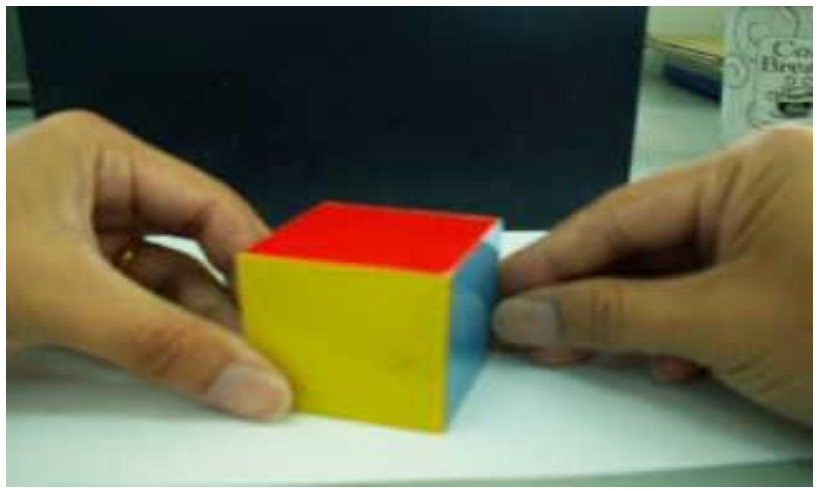


Axonometric axes

2. Dimetric

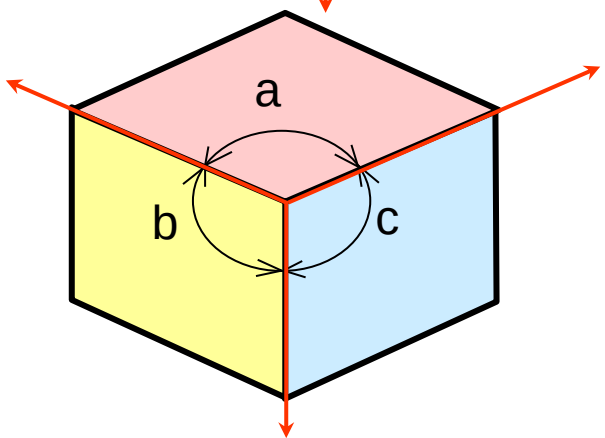
Two angles are equal.



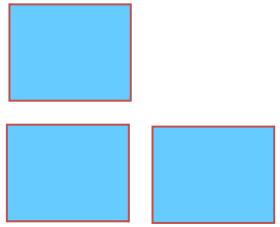
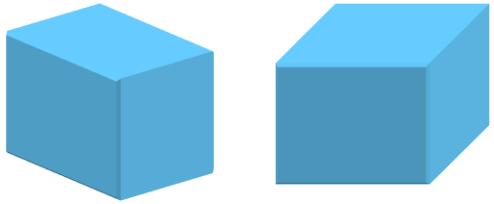
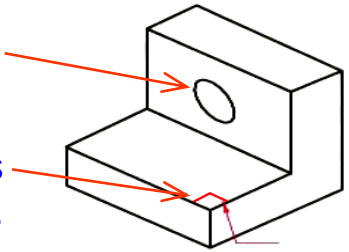
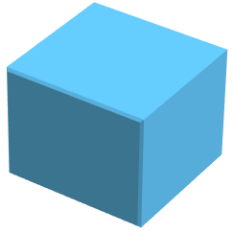
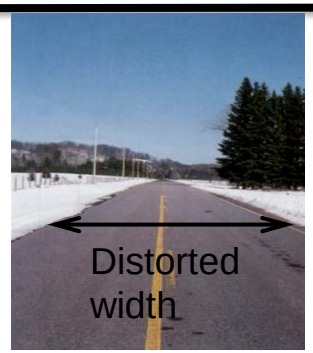


3. Isometric

All angles are equal.



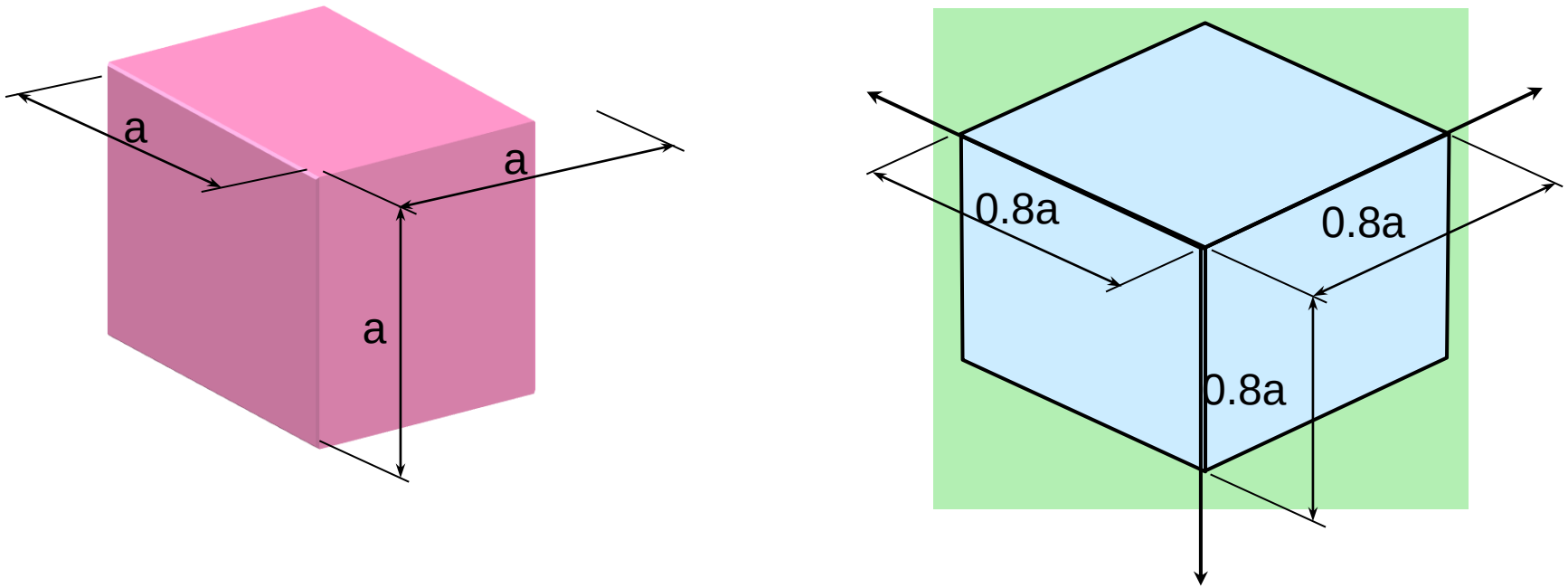
View Comparison

Type	Advantage	Disadvantage
Multiview drawing 	• Accurately presents object's details, i.e. size and shape.	• Require training to visualization.
Pictorial drawing 	• Easy to visualize.	• Shape and angle distortion 
Perspective drawing 	• Object looks more like what our eyes perceive.	• Difficult to create • Size and shape distortion 

Isometric projection

- The projected lengths of the edges parallel to the axonometric axes are approximately 81% of their true length.

3-D object (Cube) → **Isometric view**



Definition of Solid

- A solid is a three dimensional object having length, breadth and thickness. It is completely bounded by a surface or surfaces which may be curved or plane.
- The shape of the solid is described by drawing its two orthographic views usually on the two principle planes i.e. Vertical and Horizontal.
- For some complicated solids, in addition to the above principle views, side view and Sectional view is also required.

Classification of Solids

-Solids may be divided into two main groups

(A) Polyhedra

(B) Solids of revolution

(A) Polyhedra

- A Polyhedra is defined as a solid bounded by planes called faces which meet in straight lines called edges.

They are :

(i) Regular Polyhedra

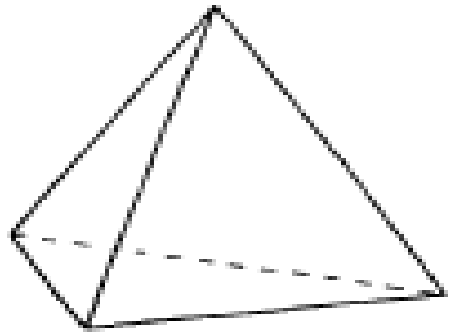
(ii) Prisms

(iii) Pyramids.

Polyhedra - (i) Regular Polyhedra

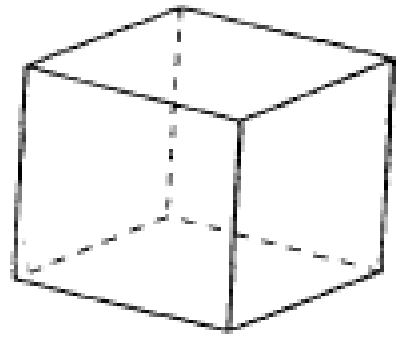
A polyhedron is said to be regular if its surfaces are **regular polygons**. The following are some of the regular Polyhedra.

(a) Tetrahedron: It consists of four equal faces, each one being a equilateral triangle



(a) Tetrahedron

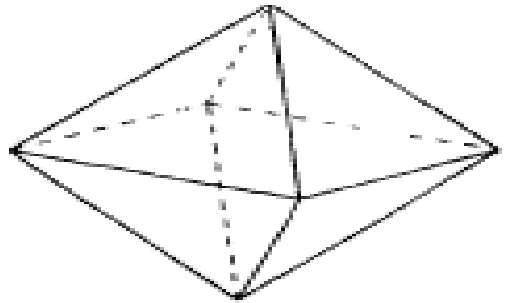
(b) Hexahedron(cube): It consists of six equal faces, each a square.



(b) Hexahedron(cube)

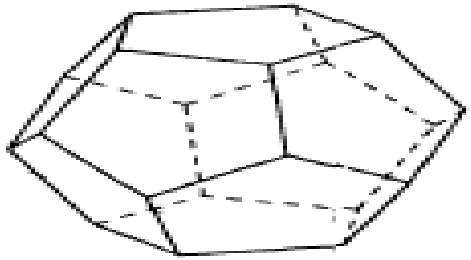
Polyhedra - (i) Regular Polyhedra

(c) Octahedron: It has eight equal faces, each an equilateral triangle.



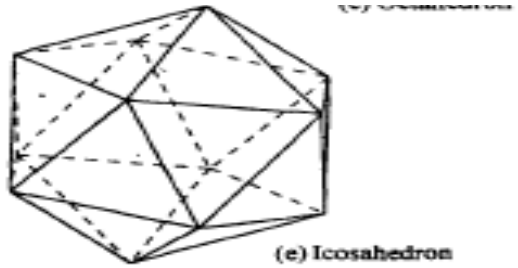
(c) Octahedron

(d) Dodecahedron: It has twelve regular and equal pentagonal faces.



(d) Dodecahedron

(e) Icosahedrons: It has twenty equal, equilateral triangular faces.



(e) Icosahedron

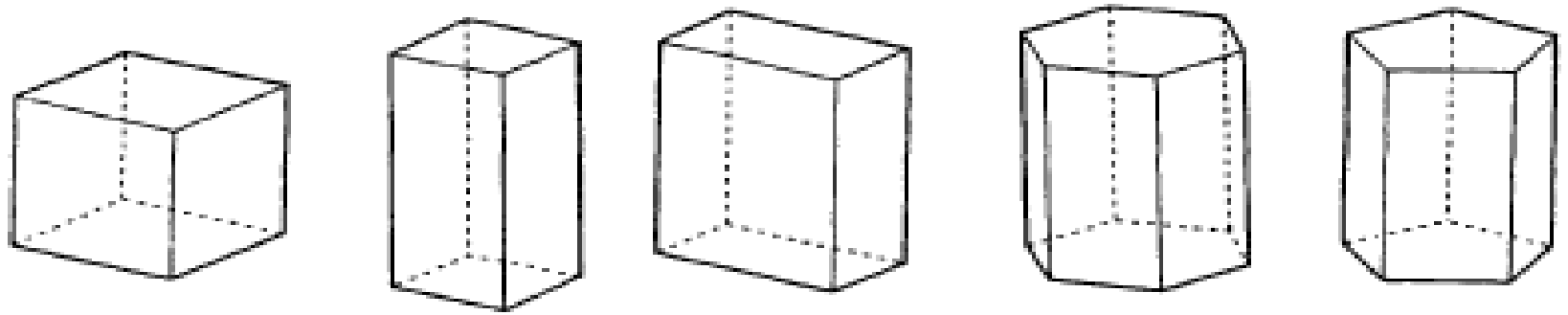
Polyhedra - (ii) Prisms

- A prism is a polyhedron having two equal ends called the bases parallel to each other.

- The two bases are joined by faces, which are rectangular in shape.

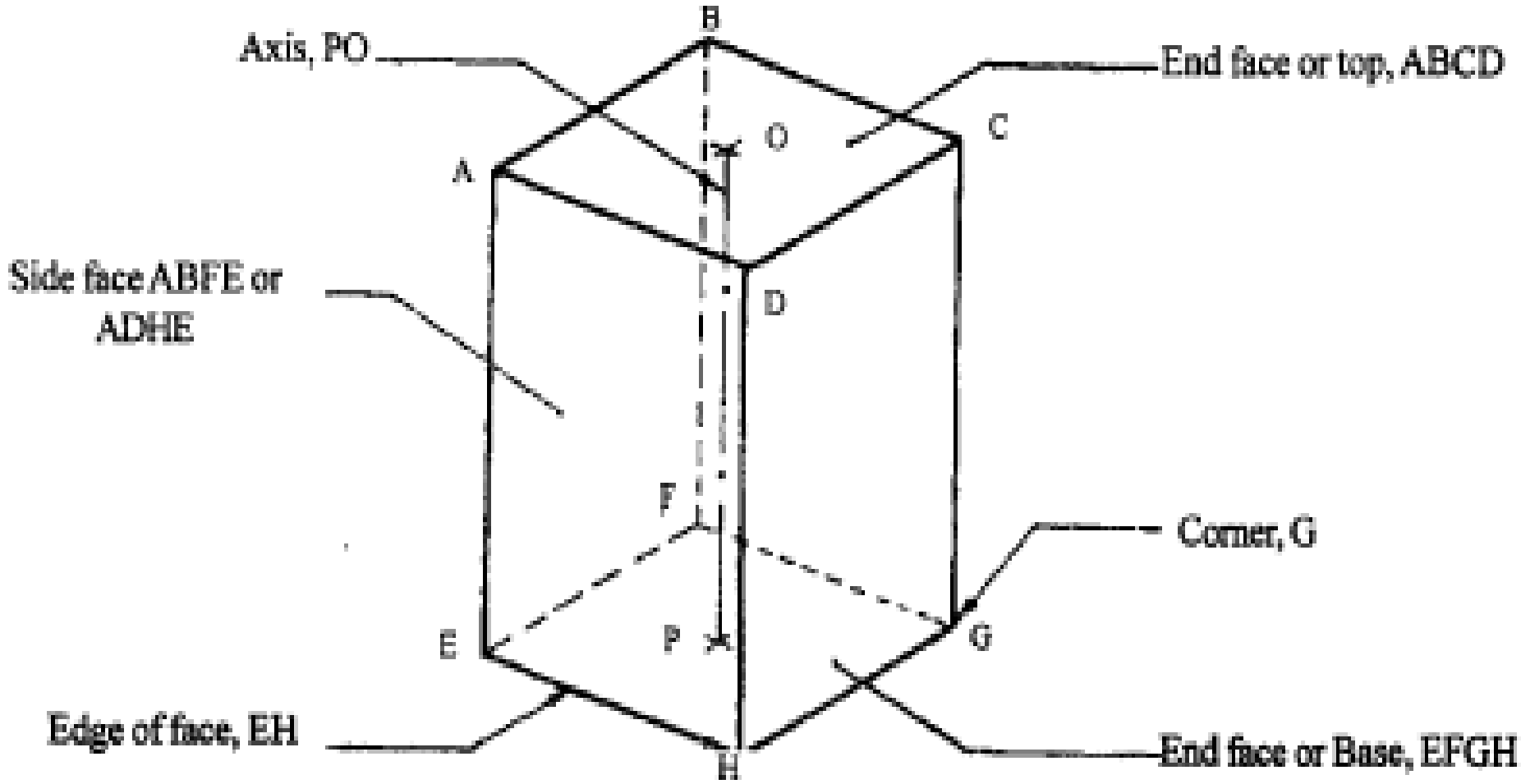
- The imaginary line passing through the centers of the bases is called the axis of the prism.

- A prism is named after the shape of its base. For example, a prism with square base is called a square prism, the one with a pentagonal base is called a pentagonal prism.



Cube | Right prism | Right rectangulr prism | Right pentagonal prism | Hexagonal prism

Polyhedra - (ii) Prisms



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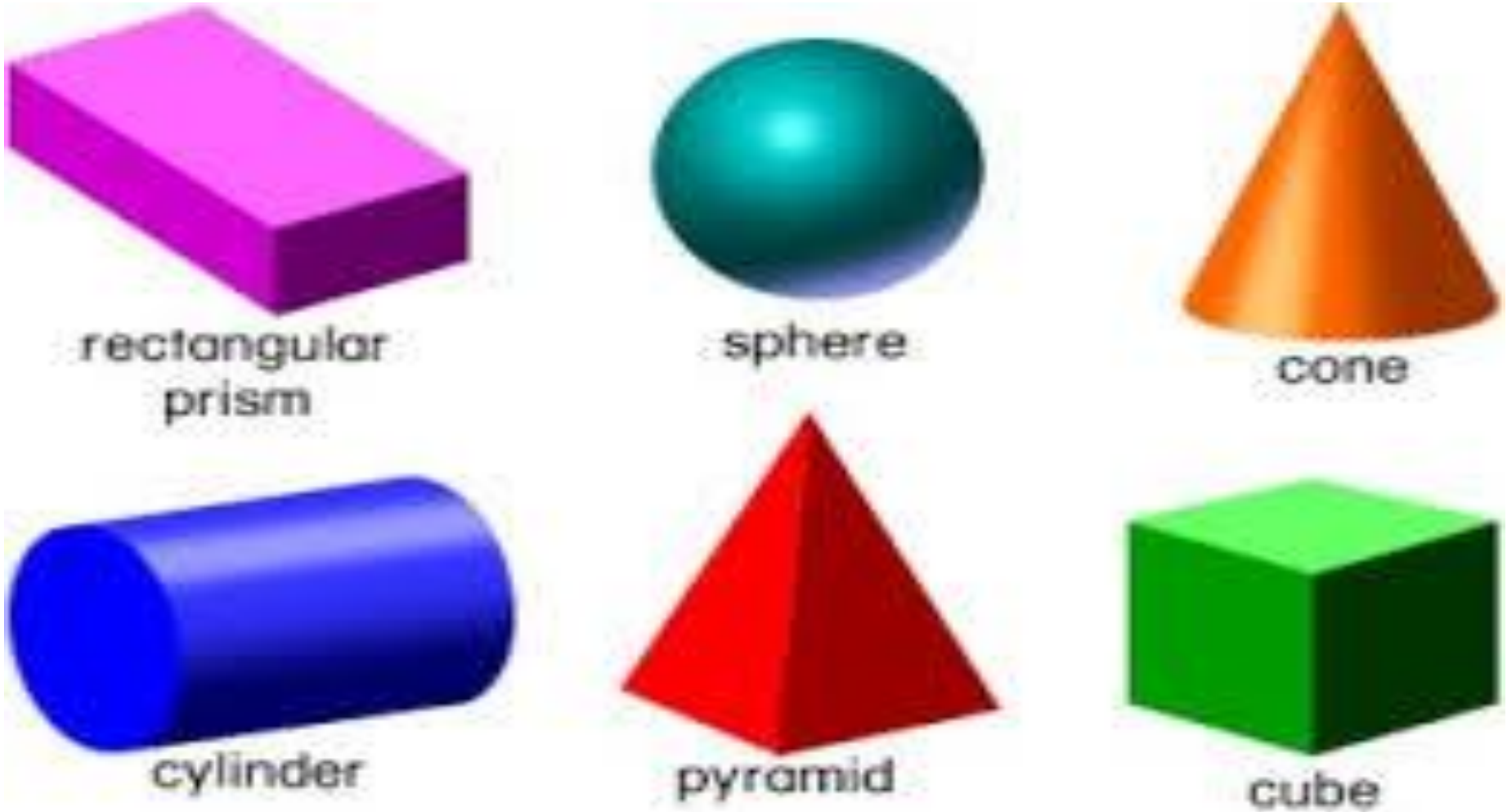
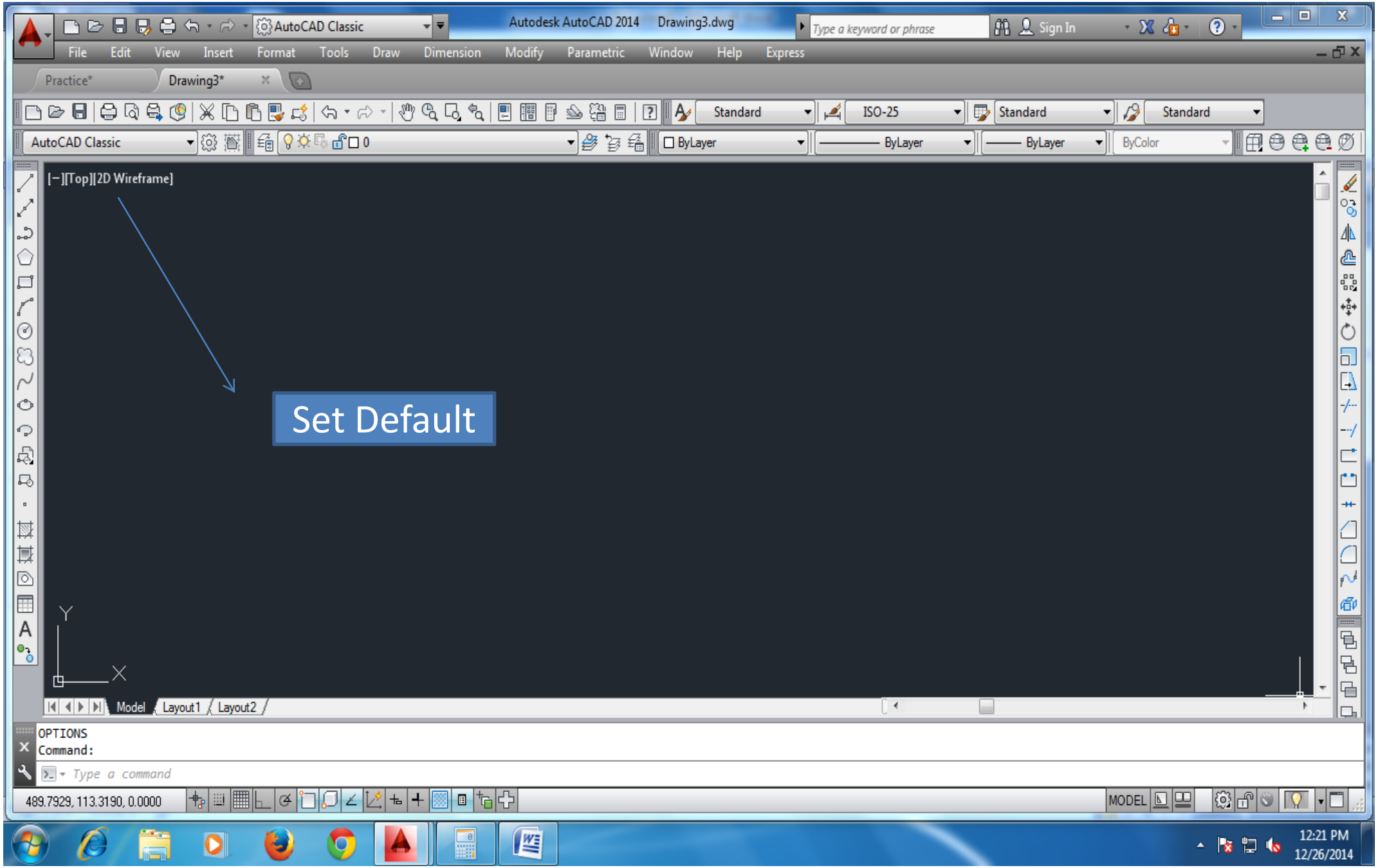
Solids

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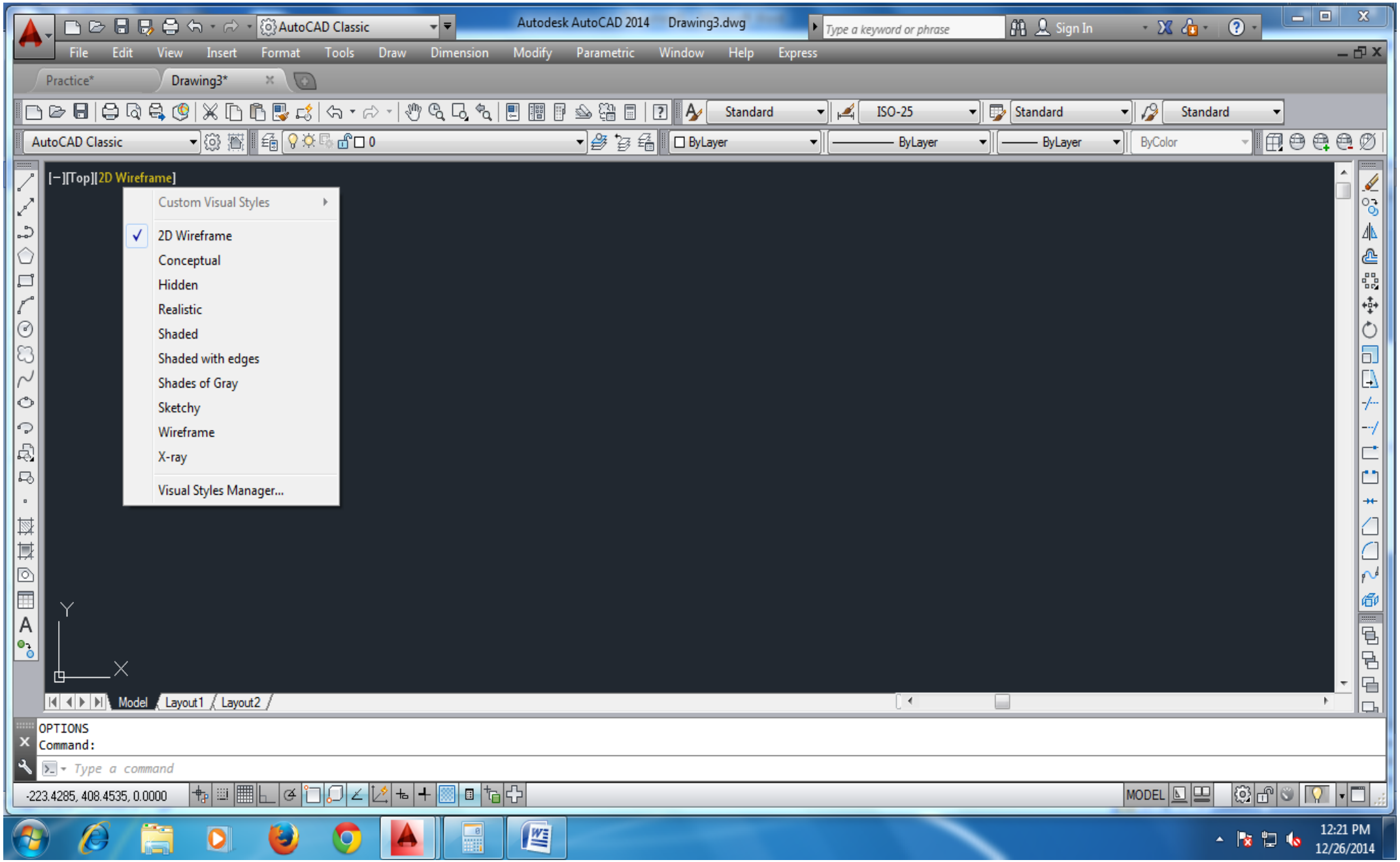
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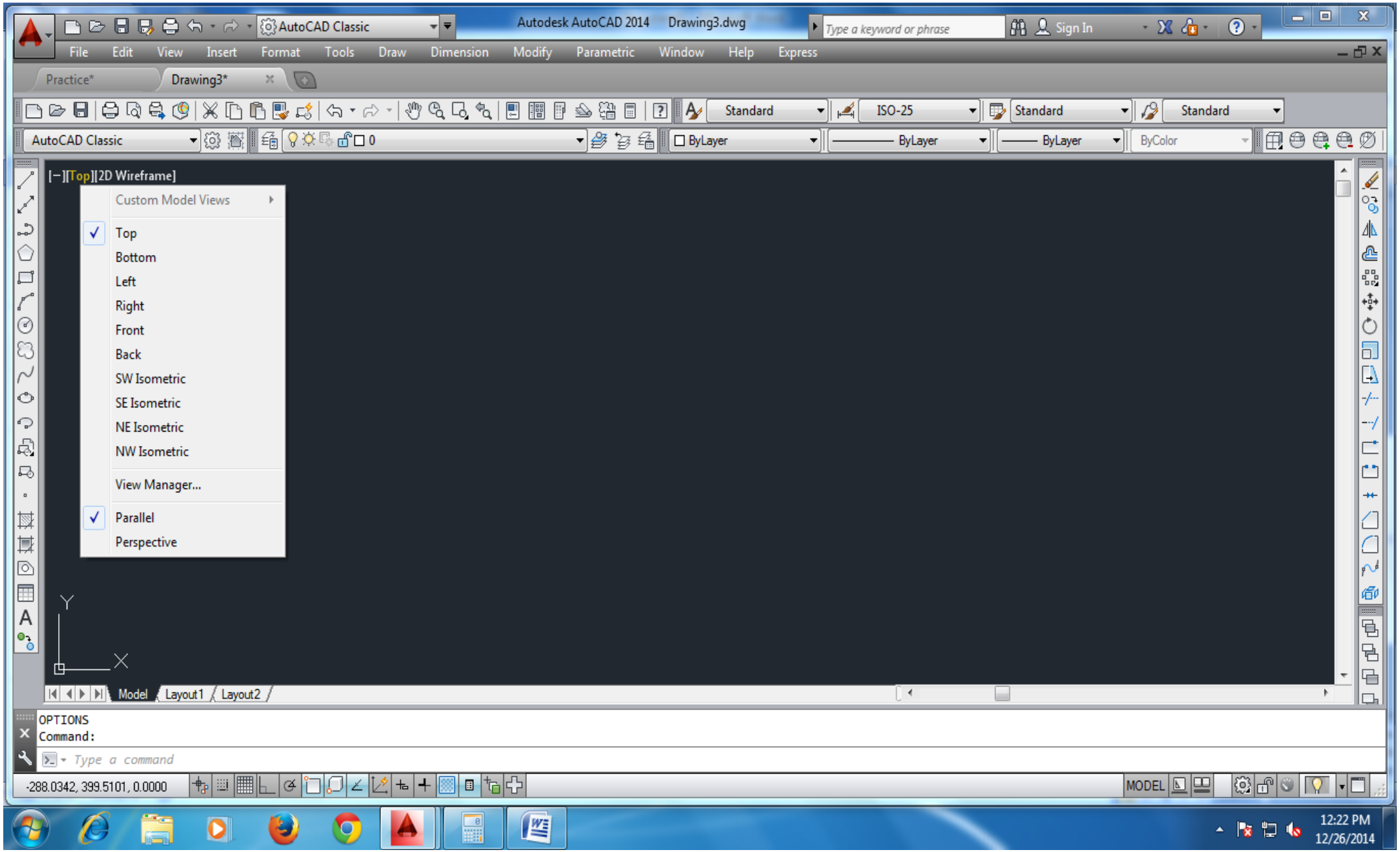
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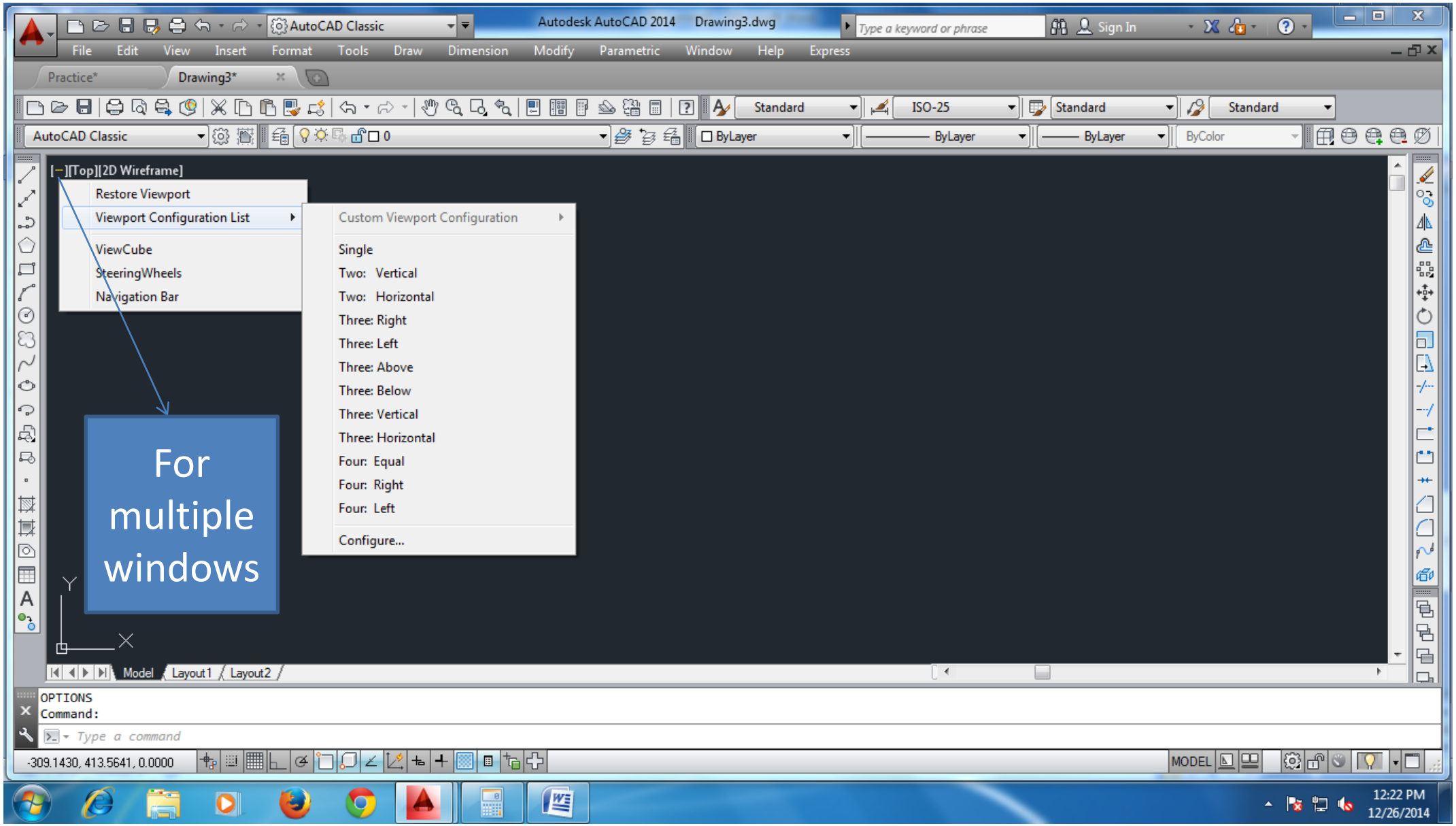
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Thank You