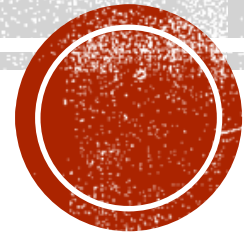


# CAD

(Computer Aided Design)



# WHAT IS CAD

- Computer Aided Design
  - Used in the creation, modification, analysis, or optimization of a **design**
  - Used primarily by Architects, Industrial Designers, graphic designers and Engineers creating mechanical parts or structures
- Why we learned it:
  - Nearly all engineers or anyone working in a technical company will likely encounter CAD in some manner

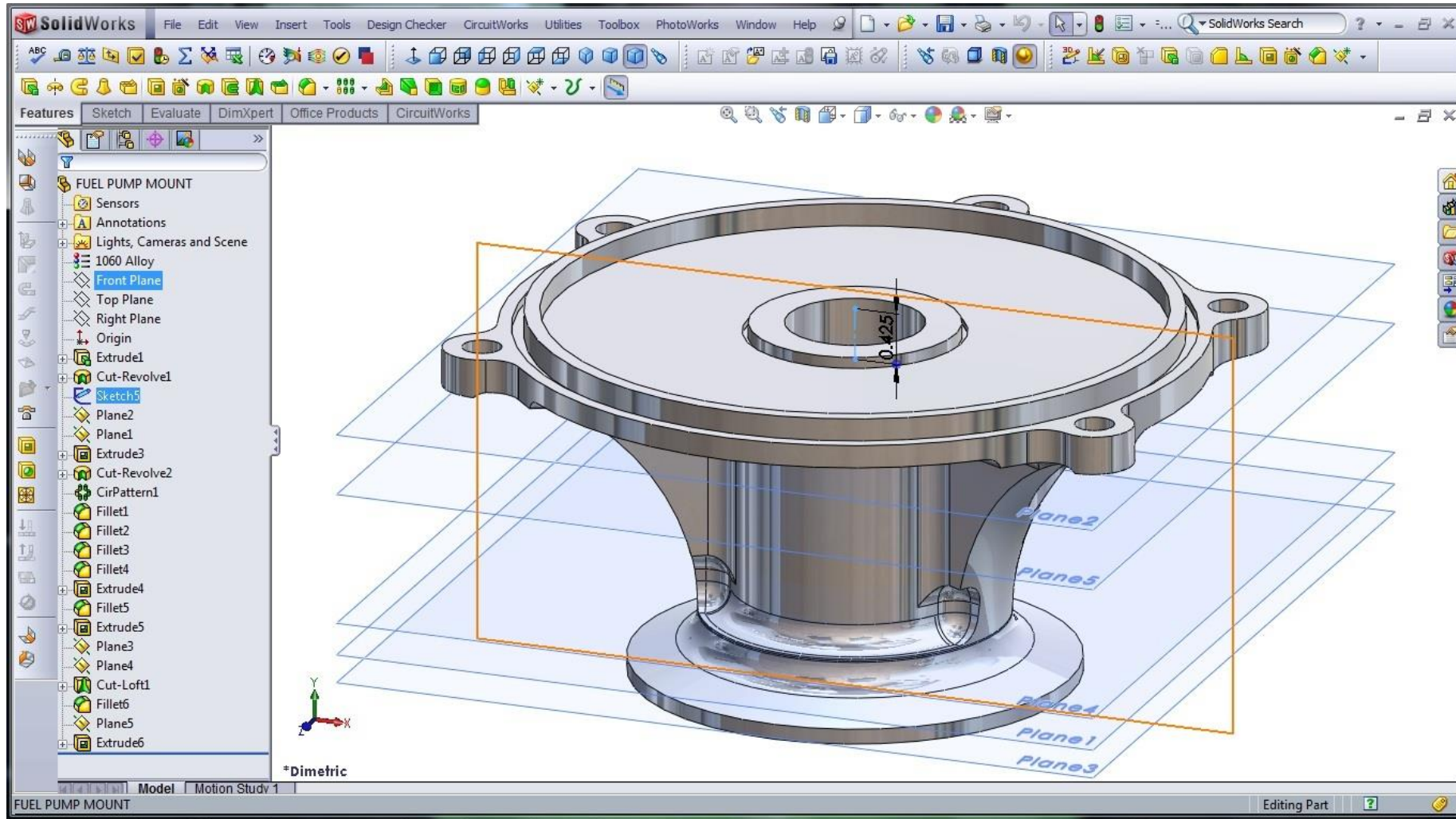


# SOME COMMON CAD SOFTWARE

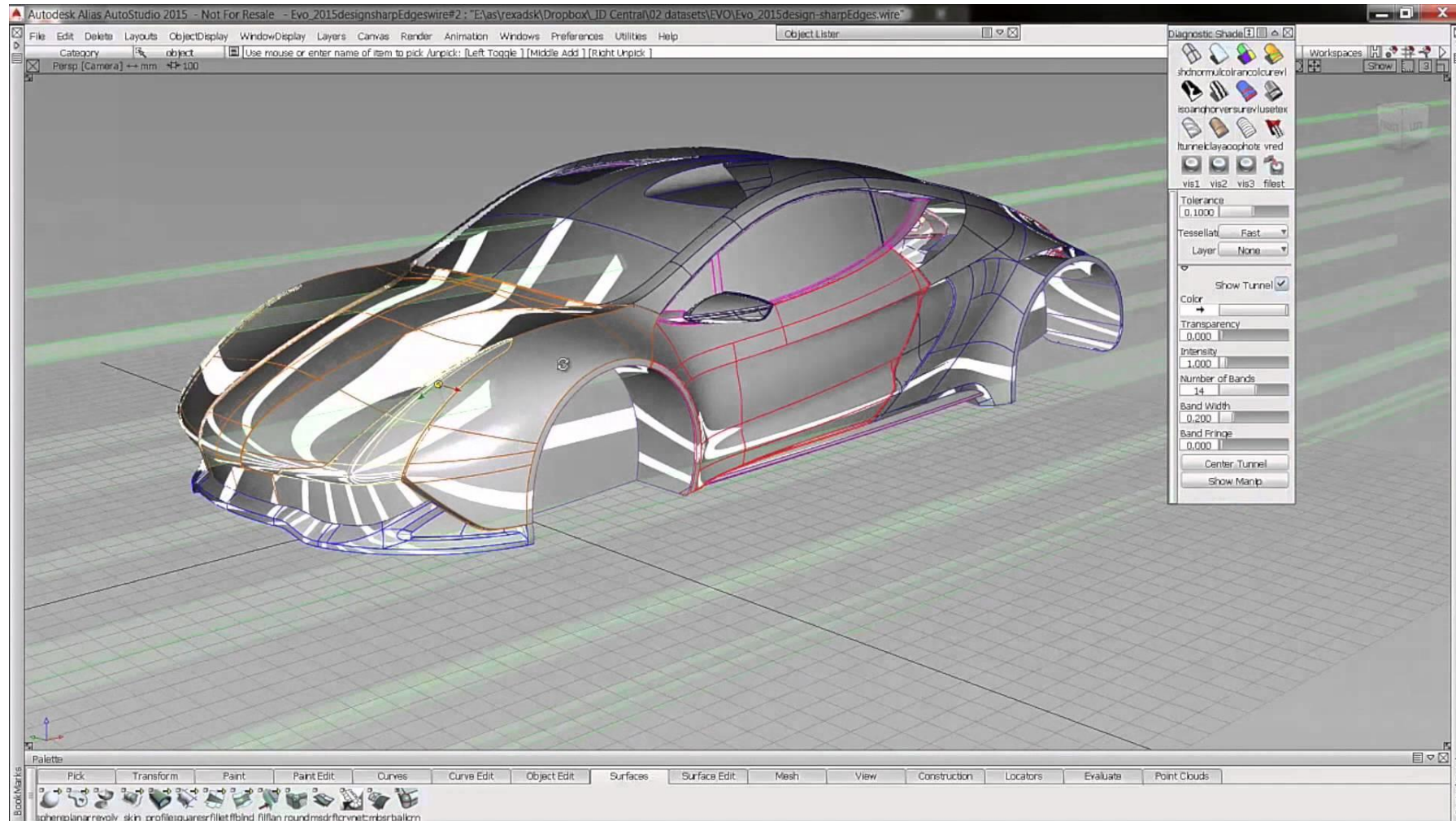
- CAD Software for Mechanical Design
  - SolidWorks
  - AutoCAD
  - Fusion
  - Inventor
  
- Other types
  - CAD for Electrical design
    - Eagle



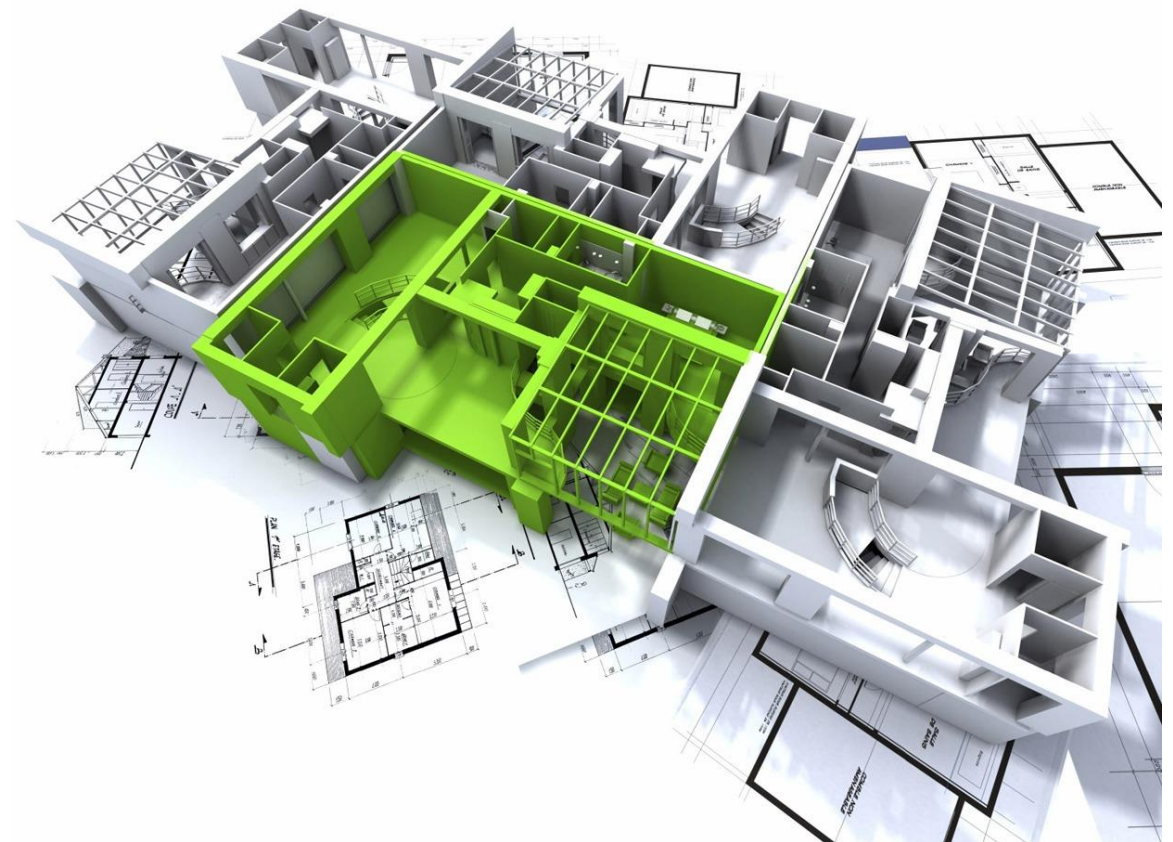
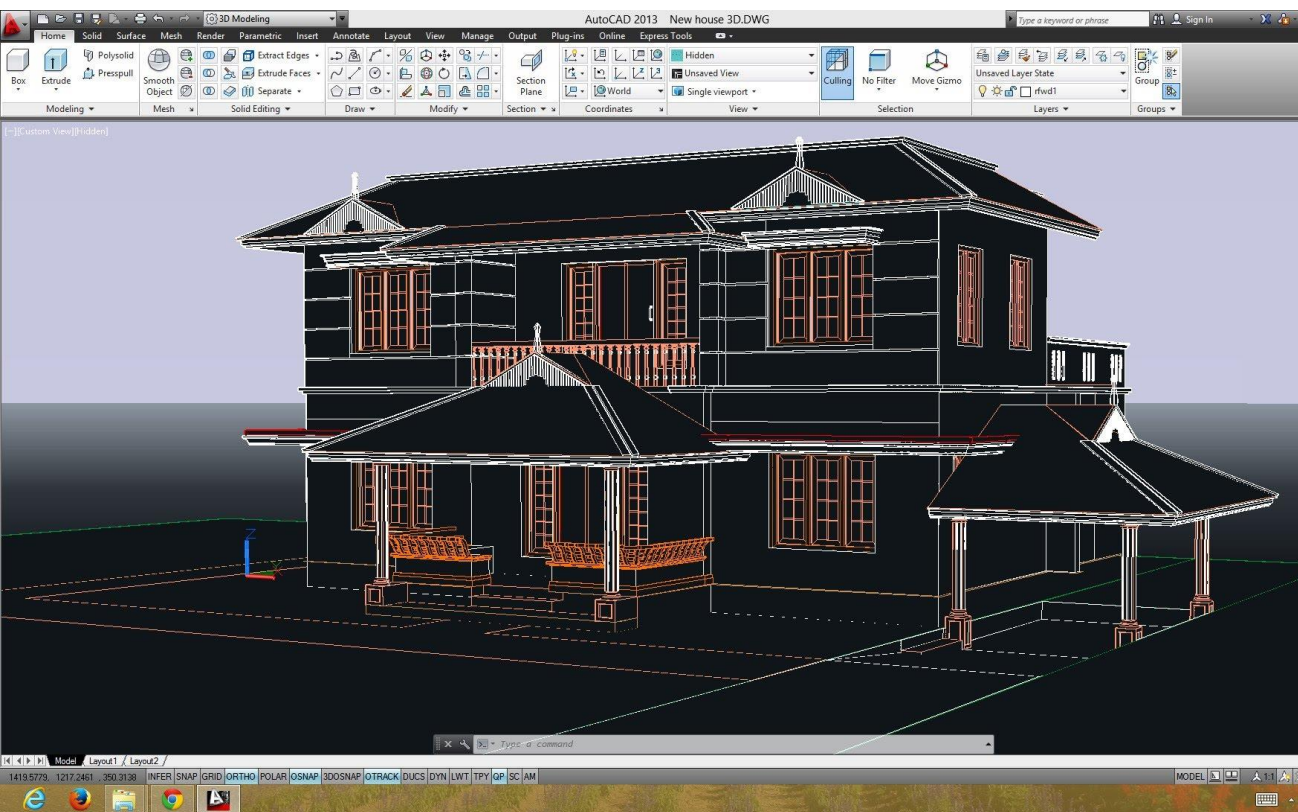
# SOME EXAMPLES OF CAD PROJECTS – COMPLEX PARTS



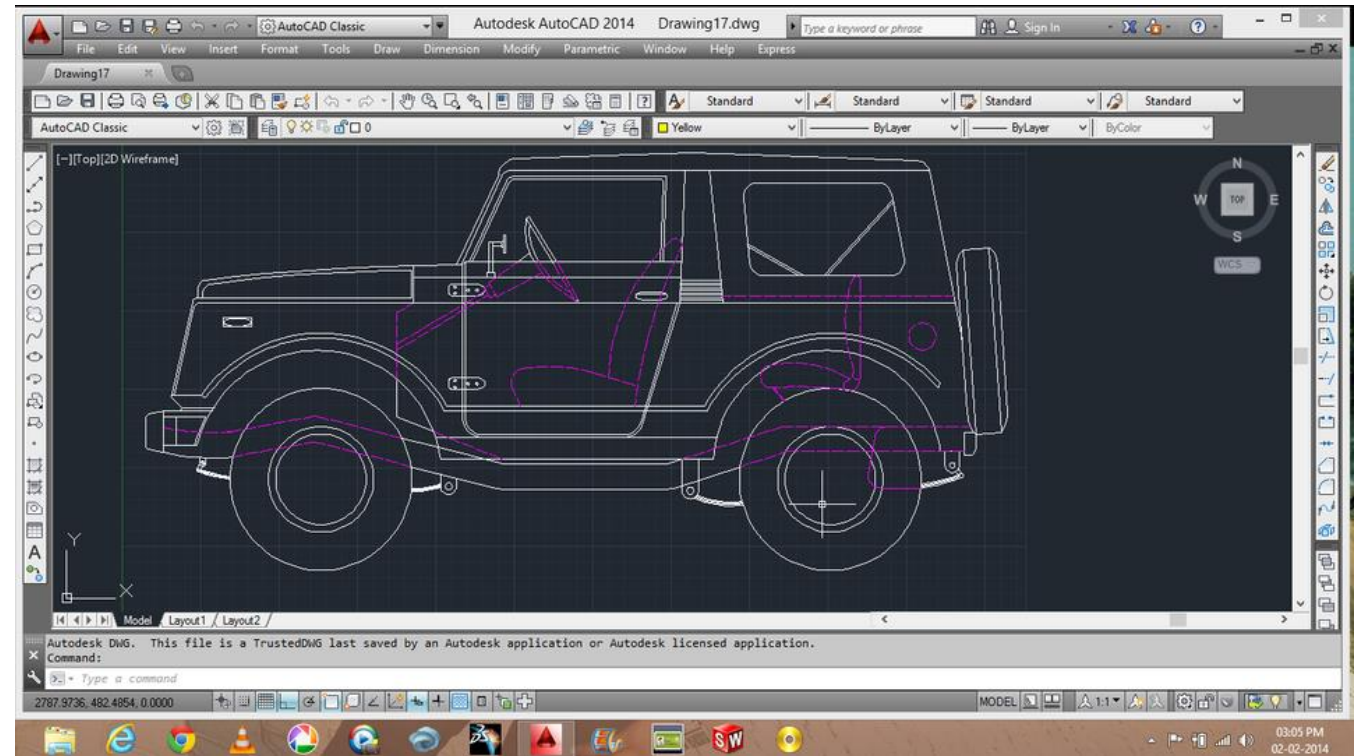
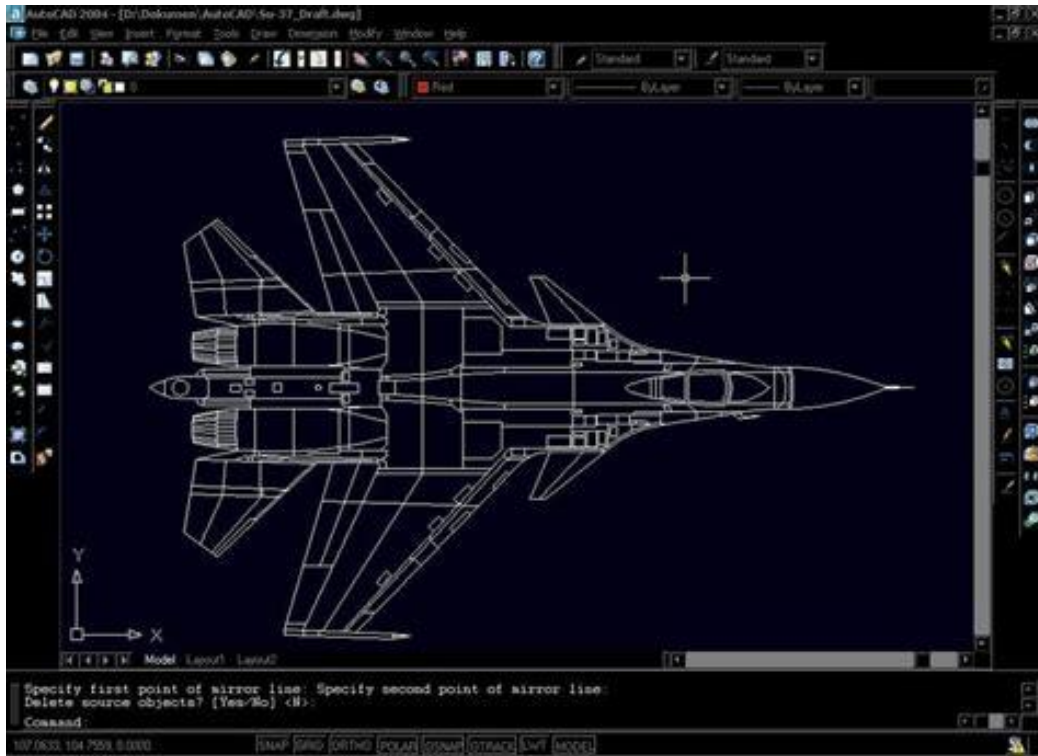
# MORE EXAMPLES — A CAR!



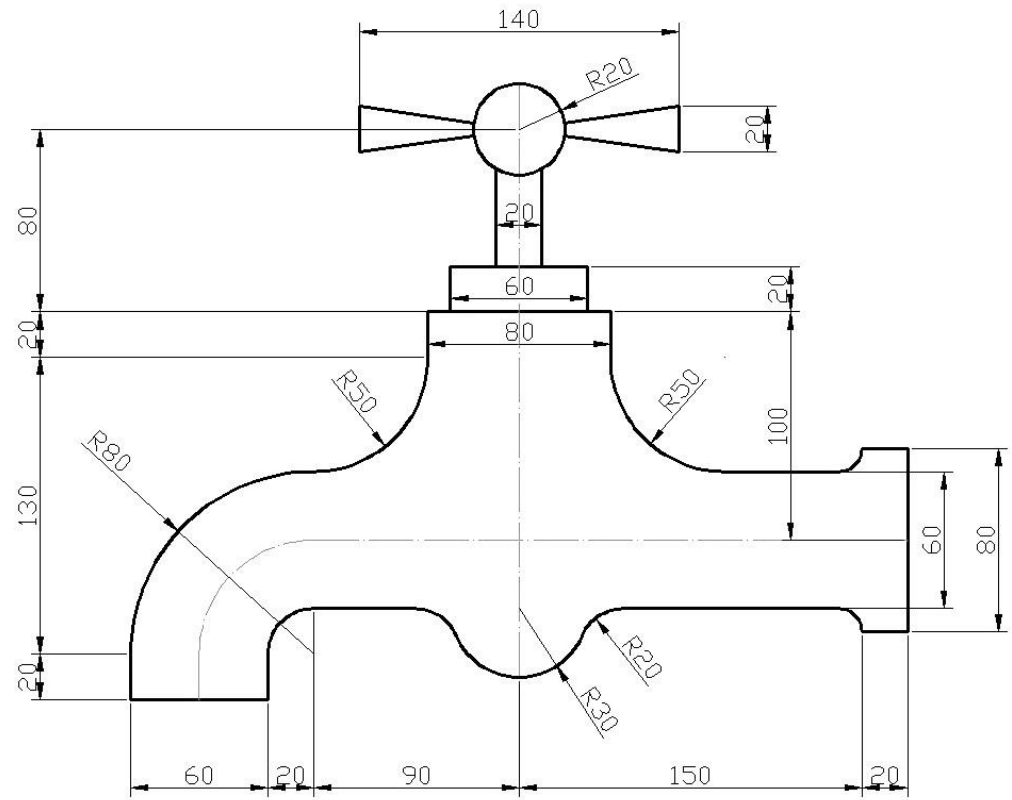
# LIVE IN YOUR VERY OWN VIRTUAL HOUSE



# 2D NOW



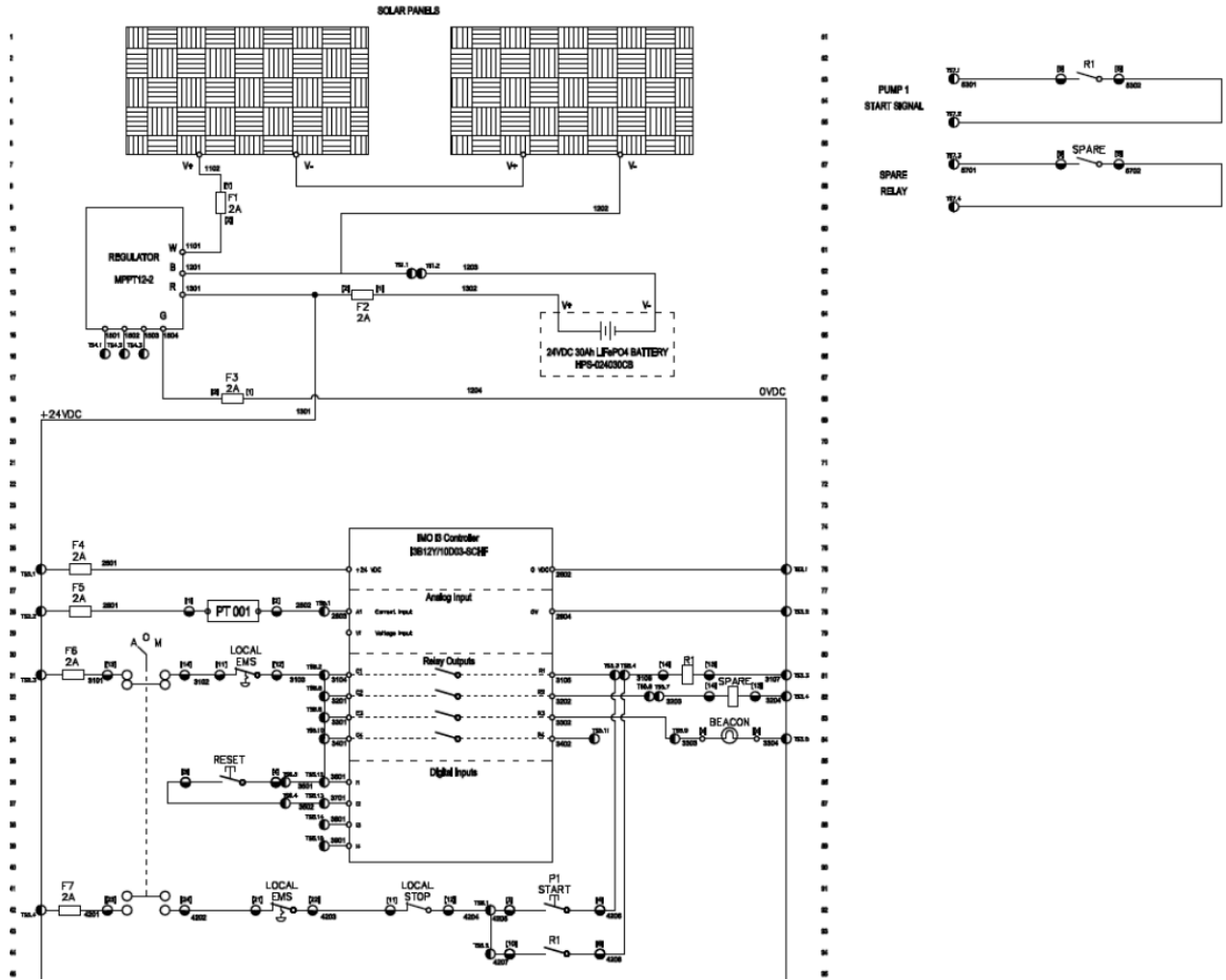
# WHAT A BEAUTIFUL FAUCET





# NOT JUST MECHANICAL DESIGNS!

## EXHIBIT 1: MAKING A SCHEMATIC (~ELECTRICAL DRAWING)



# KEY TAKEAWAYS FROM SOLIDWORKS

- Features and basic structure in forming a SolidWorks (or other) part
- Assemblies and drawings
- Views

## Parts

sketch/2D

Extrude/3D

Edges

## Finishing

Assembly

Drawing

## Views

Isometric

Orthographic

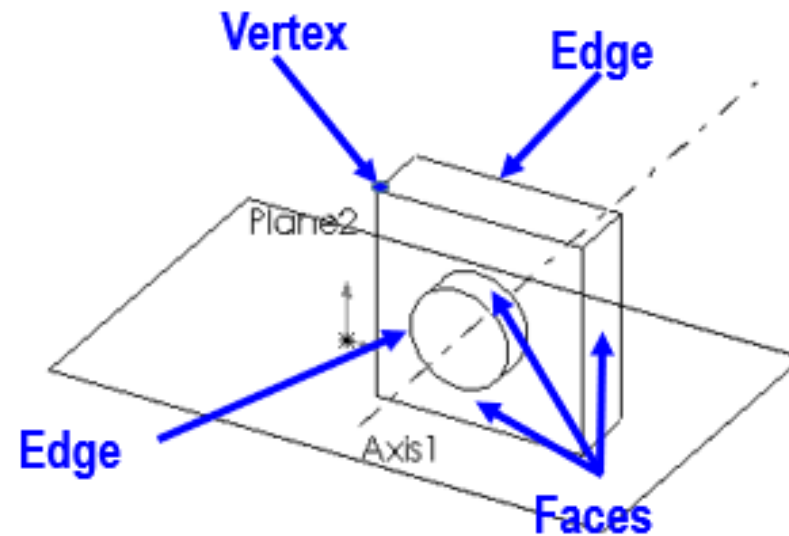
Oblique

Perspective



# SKETCHING & BASIC TERMS

- Sketch: Forms the basis of all extruded features
  - Shapes/commands
    - Rectangle
    - Circle
    - Arc
    - Line
- Vertex: Corner where two edges meet
- Face: forms the outside surface of a part
- Edge: boundary of a face



Parts
<b>sketch/2D</b>
Extrude/3D
Edges
<b>Finishing</b>
Assembly
Drawing
<b>Views</b>
Isometric
Orthographic
Oblique
Perspective



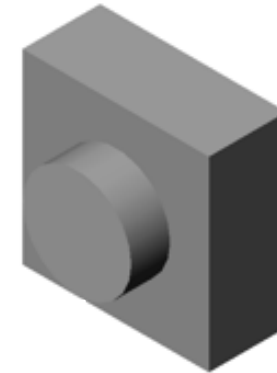
# FEATURES — EXTRUSIONS AND CUTS

- **Extrusion:**
  - Base extrude: creates “depth” to a sketch
  - Boss extrude: adding to an extruded part
  - Cut extrude: cutting from an extruded part
  
- **Cut:** removes material from a part
- **Shell:** hollows a part

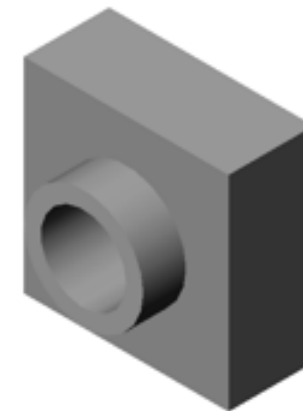
1. Base Extrude



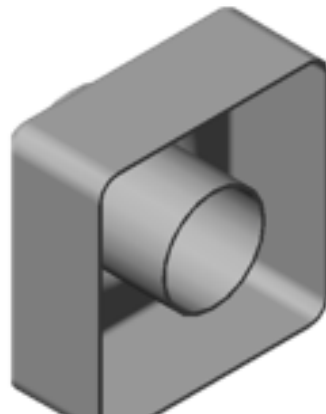
2. Boss Extrude



3. Cut Extrude



.Shell

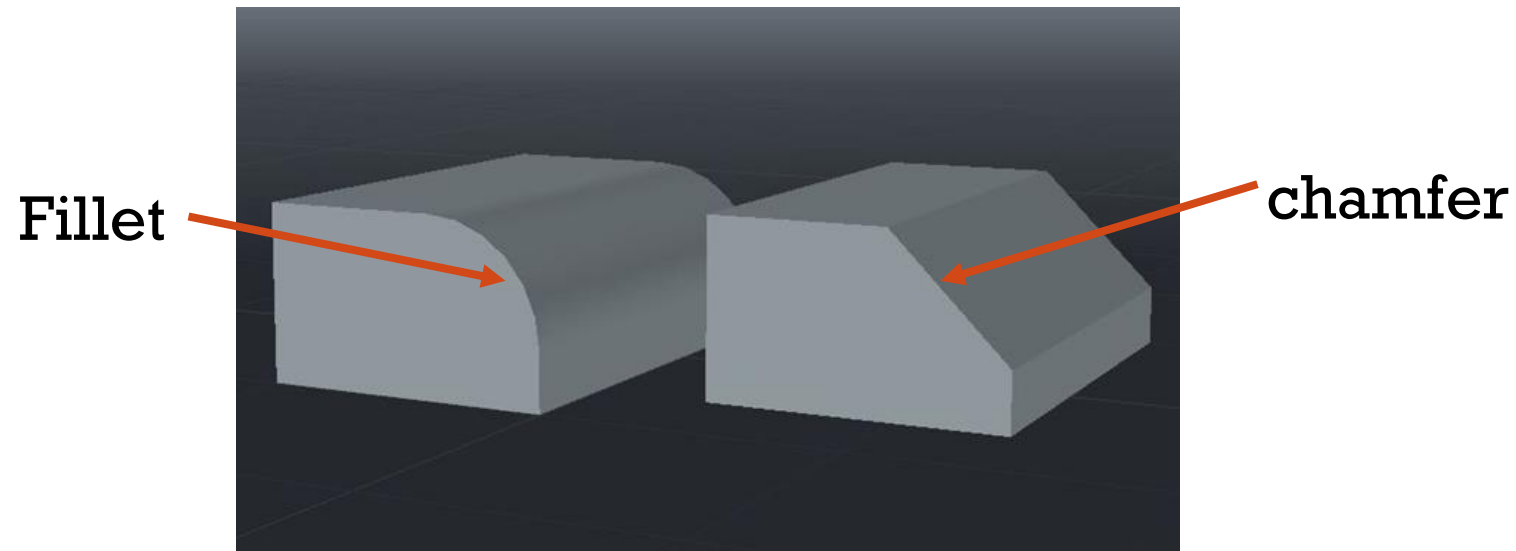


Parts
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# FEATURES - EDGES

- Fillet: rounds an edge to make it smoother
- Chamfer: bevels an edge (not smooth)

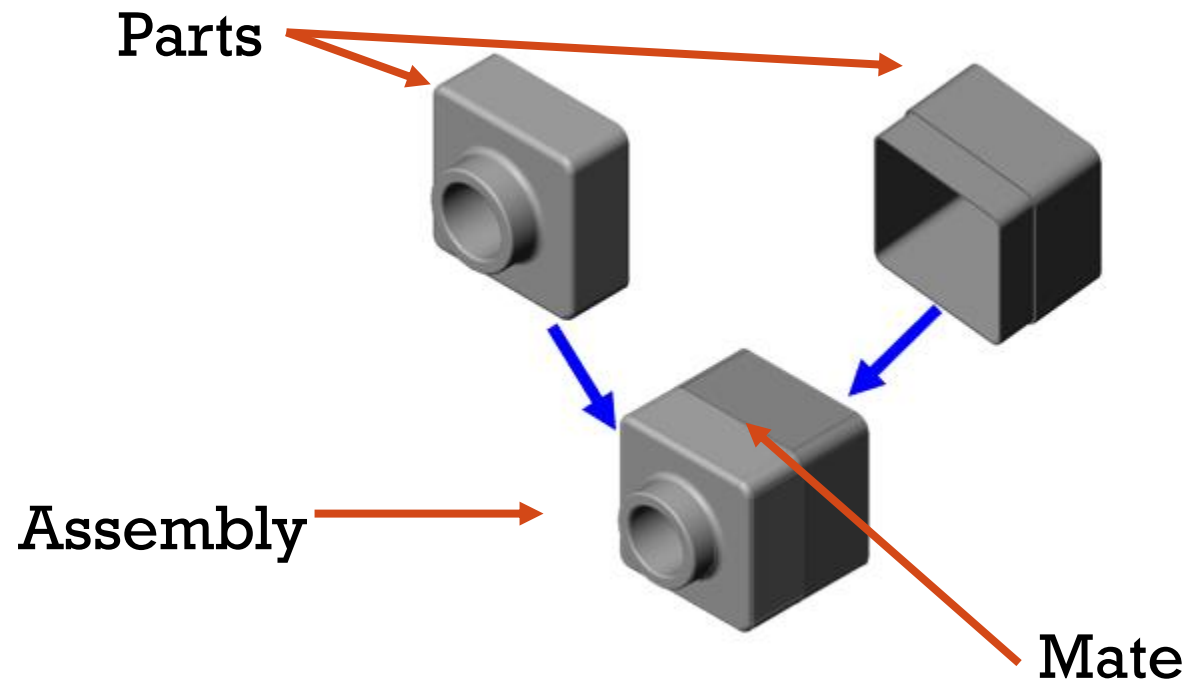


<b>Parts</b>
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# ASSEMBLY

- Assembly: A composition of multiple parts
- Mate: relationships that align and fit parts together

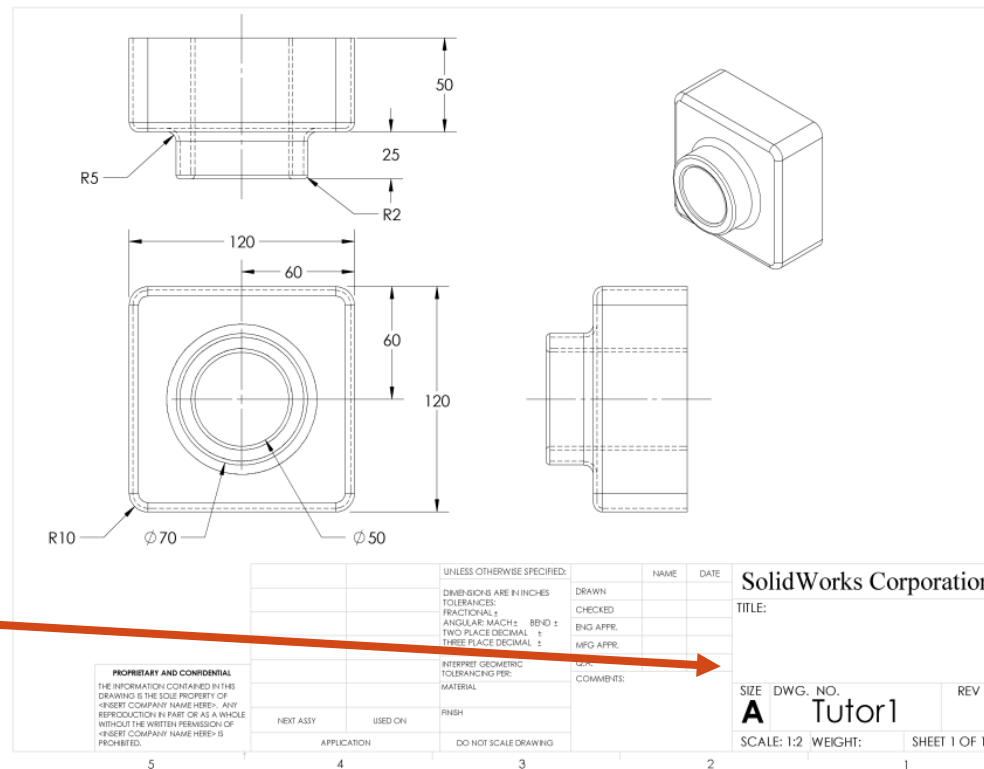


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# DRAWING

- Drawing Formal way of showing a part or assembly
  - Should communicate shape, size and vital info
- Title block: label on a drawing (usually has part name, version and company/designer info)



Title block

Parts

sketch/2D

Extrude/3D

Edges

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Views

Isometric

Orthographic

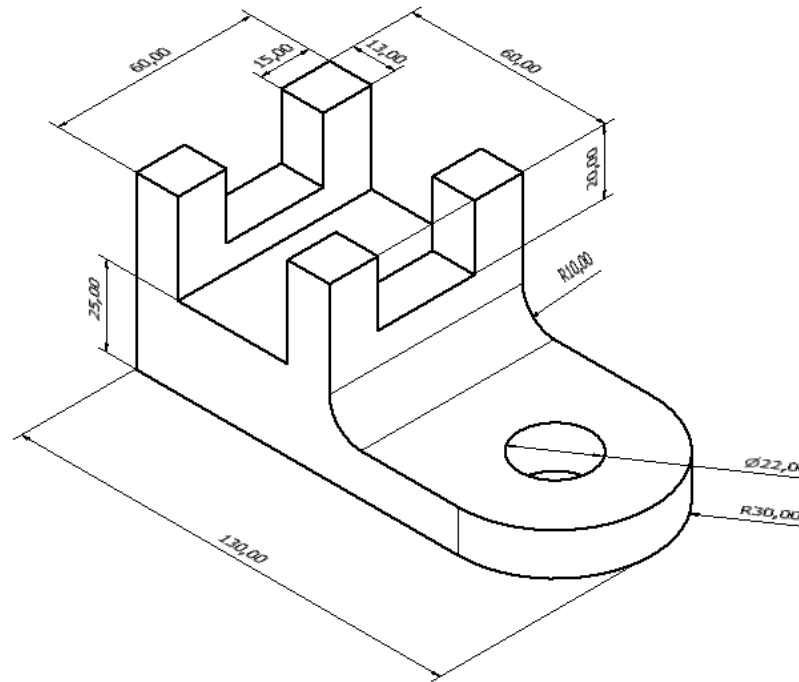
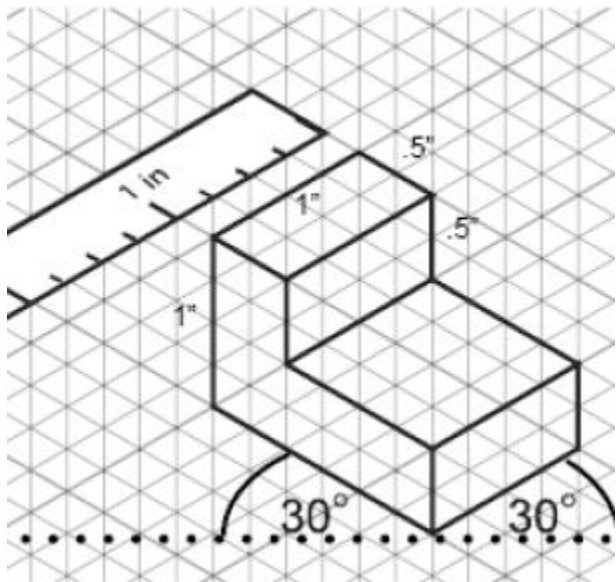
Oblique

Perspective



# VIEWS - ISOMETRIC

- “Normal” view you saw in SolidWorks
- Drawn to scale
- Edges usually slanting at 30°



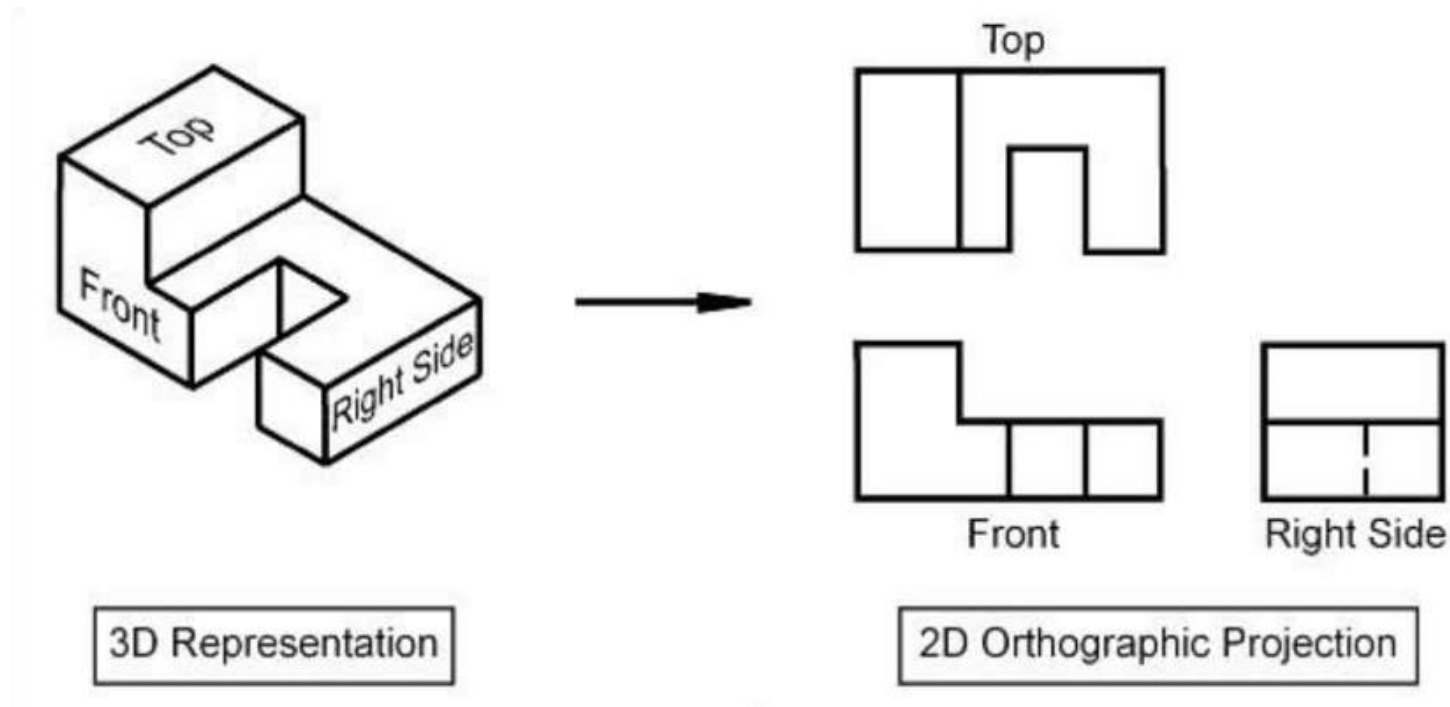
<b>Parts</b>
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# VIEWS - ORTHOGRAPHIC

- 2D projection of a 3D object
- Shows the front, side and top of an object

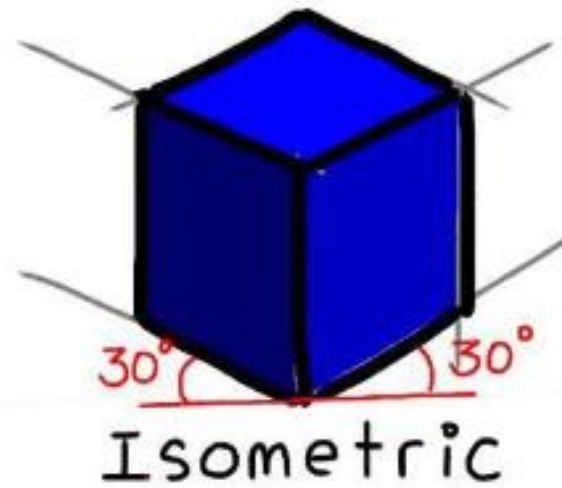
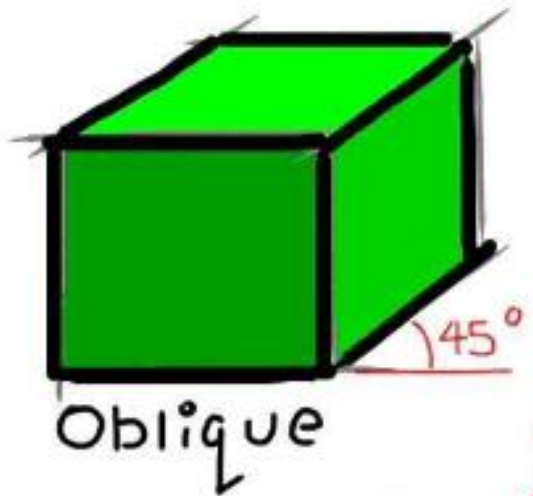


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# VIEWS - OBLIQUE

- Similar to isometric, except focus is on face of an object
- Front even to plane and side at  $45^\circ$
- NOT TO SCALE

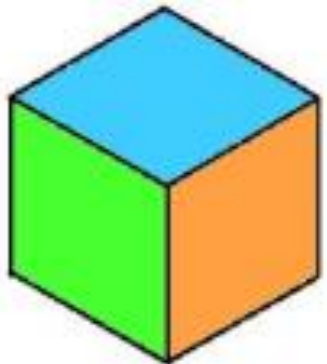


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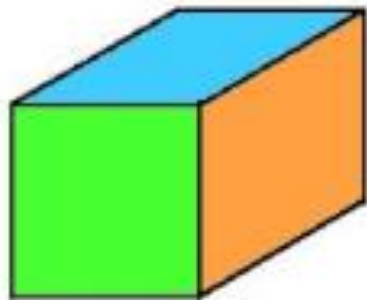


# VIEWS - PERSPECTIVE

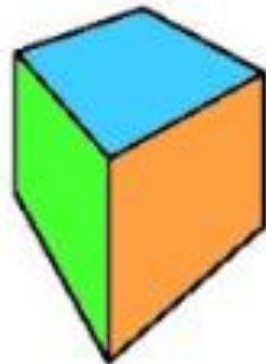
- Similar to isometric/orthographic, except it accounts for perspective i.e. things that are further away appear smaller



Isometric



Oblique



Perspective



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# TO DO TODAY

- To finish the Mechanical Engineering unit, I want us to have a formal recap of key takeaways. To do this, you will create notes over these slides, and basic material machining (we'll discuss this one tomorrow).
- To work on today: (one formative grade in gradebook)
  - create notes over the material in these slides (template on my blog if you want it)OR
  - At the end of class today take a brief quiz (you can use **your** notes for this)
  - If time: Learn to weld in groups of ~3 at a time

