

A Quick Start into AutoCAD 3D Solid Modeling

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Class summary

Learn the basics of 3D solid modeling using only ten commands. Become familiar with practical tips, techniques, and caveats with real-life models.



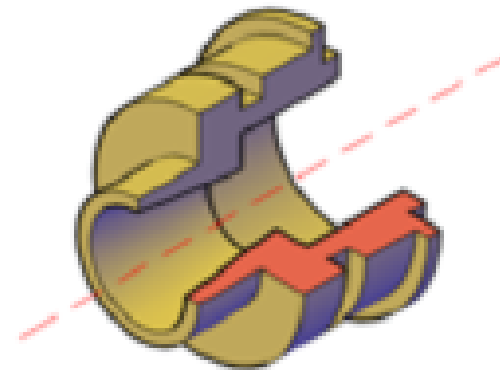
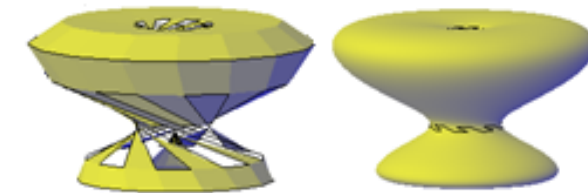
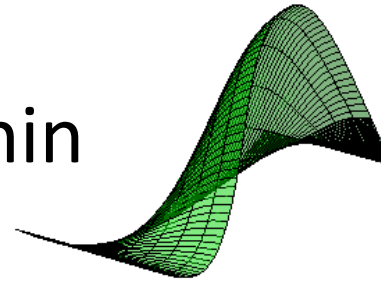
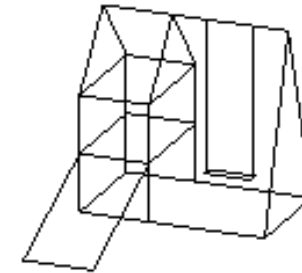
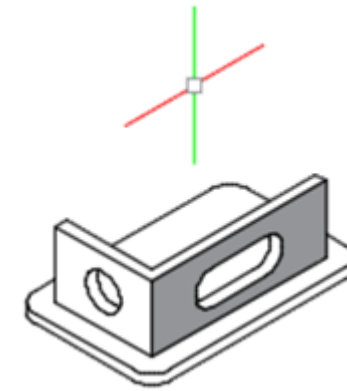
Objectives

- Learn how to use the basic 3D solid modeling commands
- Learn how to apply practical, 3D solid modeling techniques
- Learn how to avoid common pitfalls
- Learn the next steps for becoming proficient in 3D solid modeling



Definitions for context

- Isometric drafting – illustrations in flat “2½ D”
- Wireframe modeling – pipe cleaners
- Surface modeling – paper thin
- Mesh modeling – sculpting, smoothing chicken wire
- **Solid modeling – volume and mass**



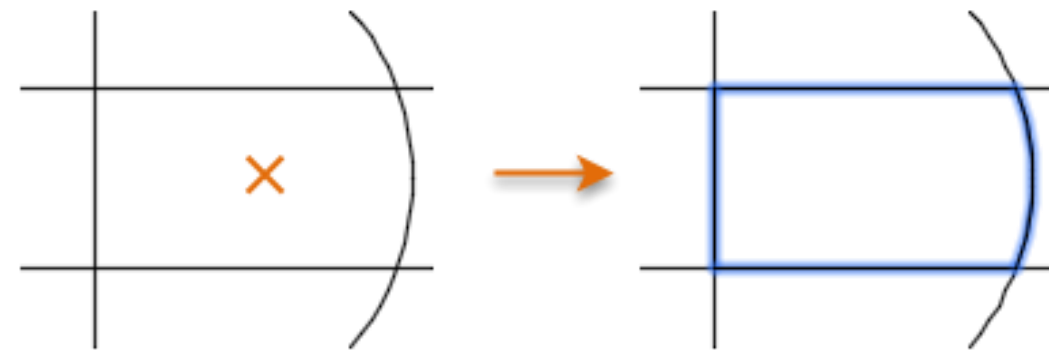
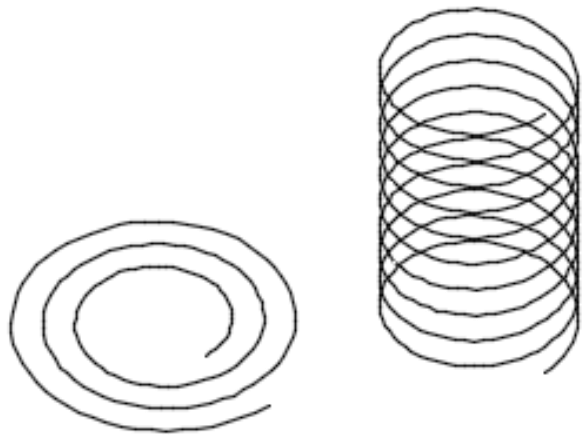
Topics

- 2D Commands Used with 3D Solids
- Viewing in 3D
- The User Coordinate System
- Profile Operations
- Boolean Operations
- Best Practices and Advice
- Next Steps

2D Geometry Commands

Used in 3D modeling

- MOVE, COPY, ROTATE, MIRROR, ERASE, PEDIT, FILLET
- Ortho mode and direct distance entry
- PLINE, RECTANG, CIRCLE
- ★ ■ BOUNDARY
- HELIX (spirals, springs, threads)



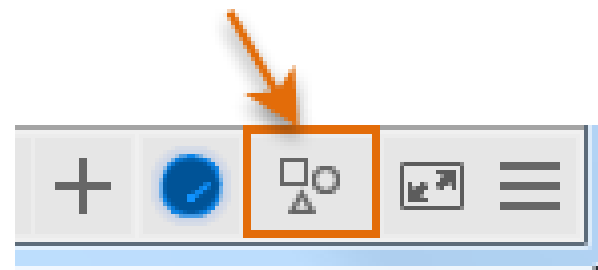
Tip: Boundary errors

- Not closed
- Off screen
- Super complex

2D Inquiry, Visibility, and Controls

Used in 3D modeling

- ★ ■ ID, MEASUREGEOM, PROPERTIES
- GROUP, UNGROUP for assemblies
- ★ ■ Isolate and Hide objects on the status bar



Topics

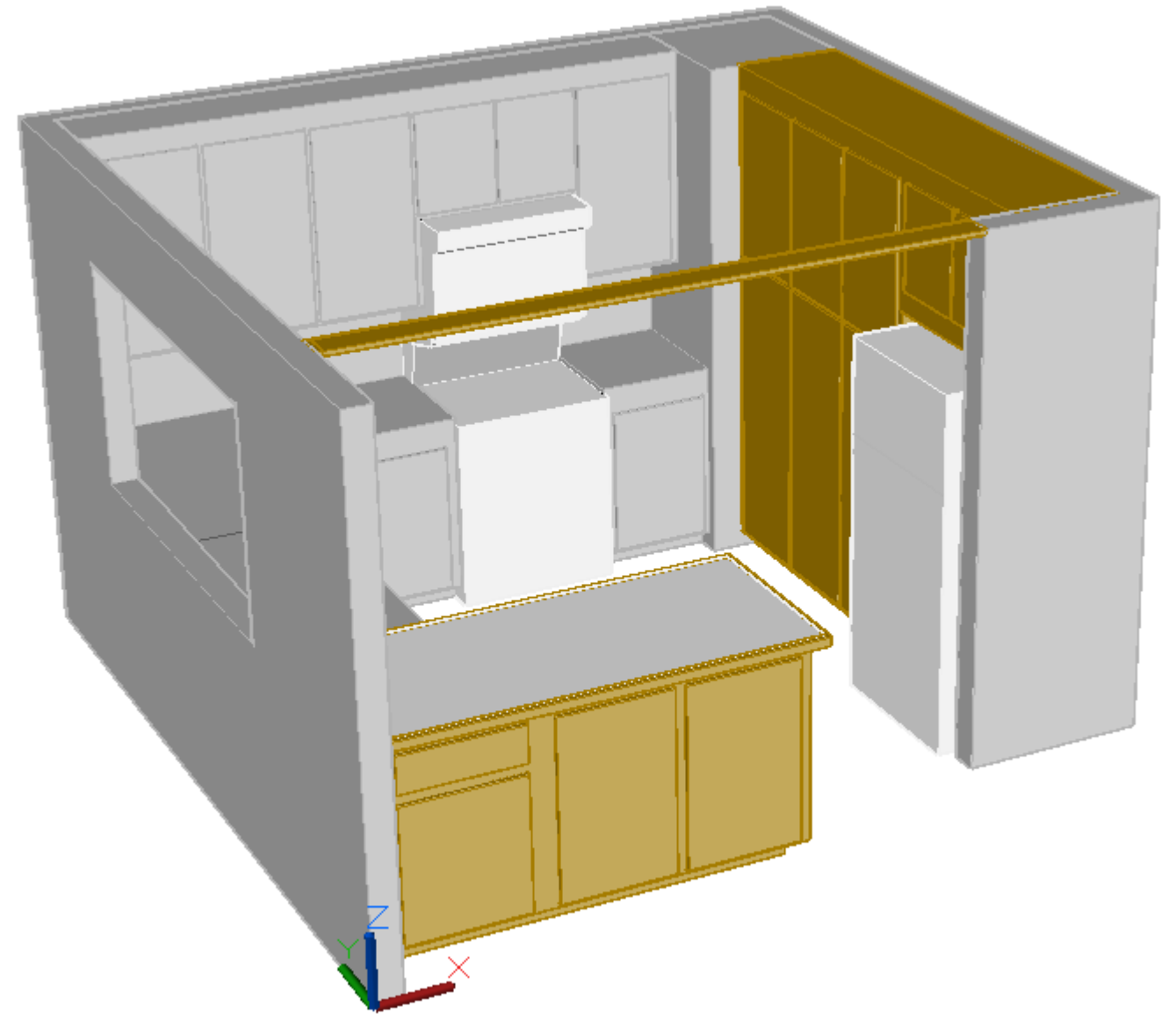
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Viewing in 3D



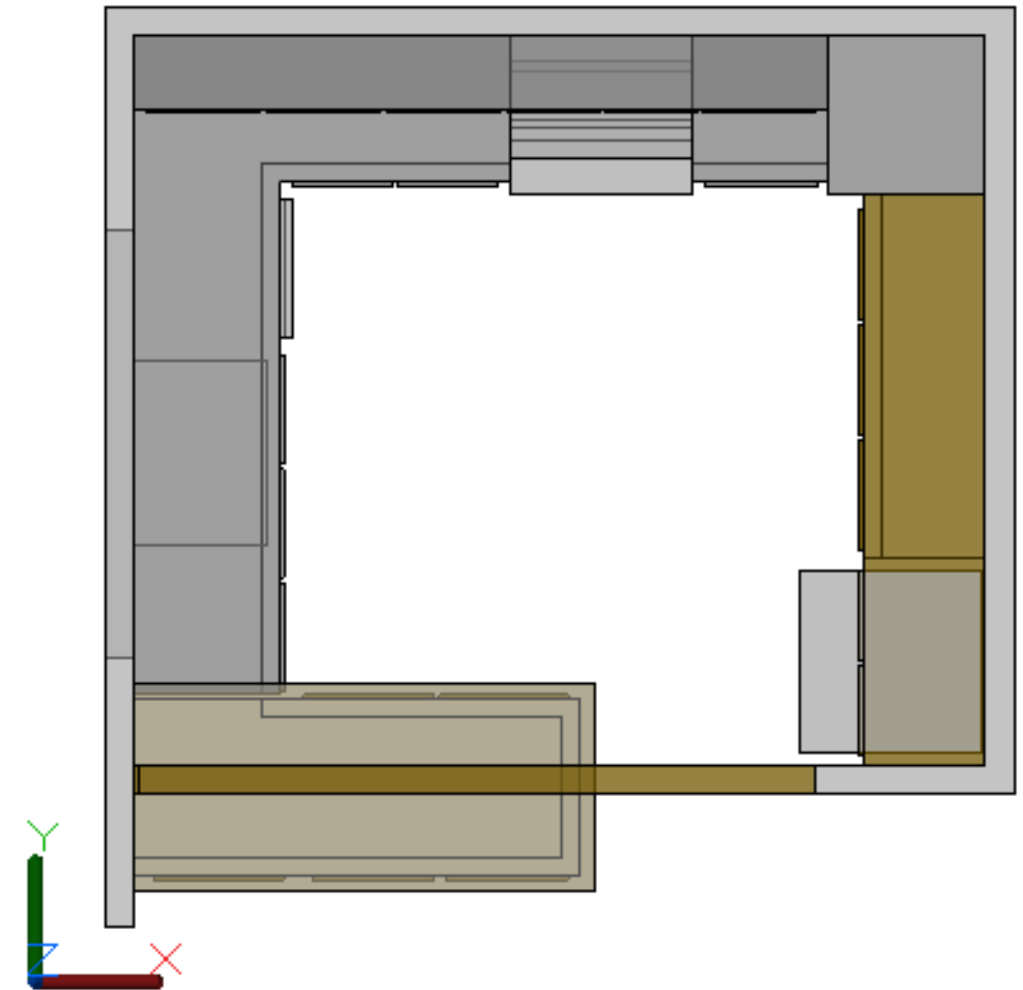
■ 3DORBIT (3DO)

- Perspective vs. orthographic
- Visual styles (VS)
- Options > Display tab > Colors
- Quick: Shift + press mouse wheel



Viewing in 3D

- ★ ■ 3DORBIT (3DO)
- ★ ■ PLAN
 - XY plane of the current UCS
 - Mechanical Design vs. Architectural conventions



Topics

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The User Coordinate System

- What is it?



The User Coordinate System

- What is it?
- What's it for?



The User Coordinate System

- What is it?
- What's it for?
 - Orientation - Construction plane for creating 2D objects



The User Coordinate System

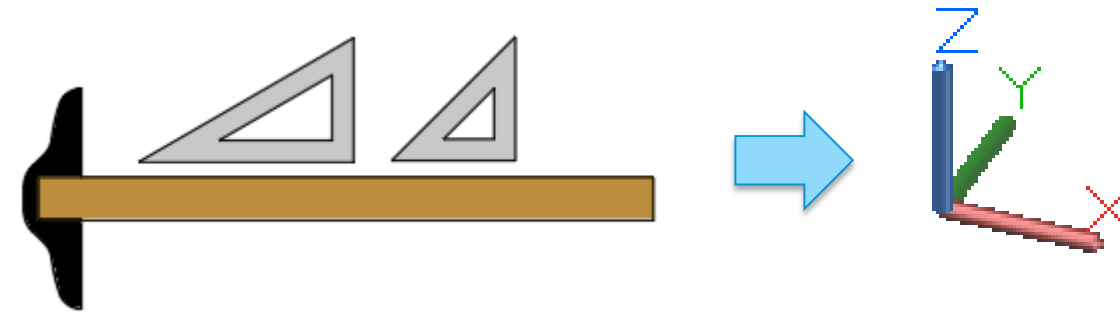
- What is it?



- What's it for?
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 - Orthogonal directions - X, Y, Z for direct distance entry, Ortho mode

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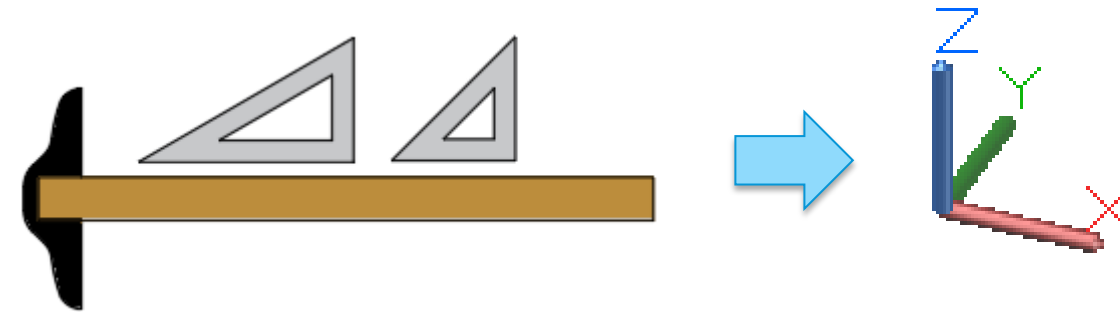
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 - Rotation axis - The Z axis is the “hinge” for rotation, right-hand rule

The User Coordinate System

- What is it?



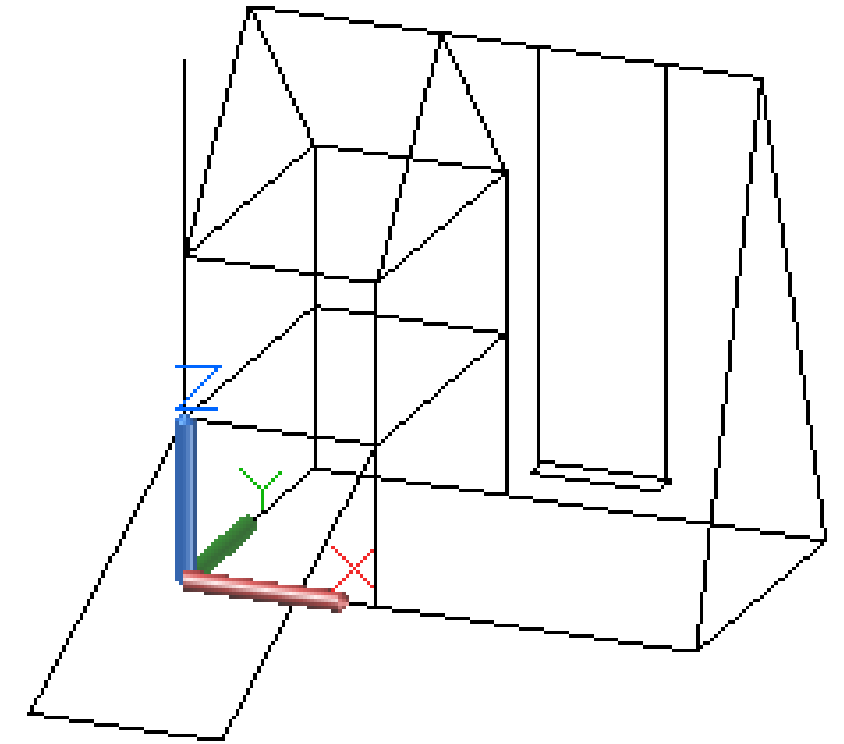
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Tip: Turn off dynamic UCS by setting UCSDETECT = 0 [F6]

The User Coordinate System

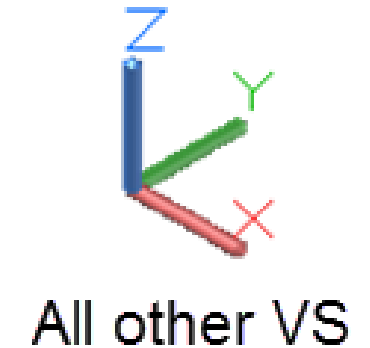
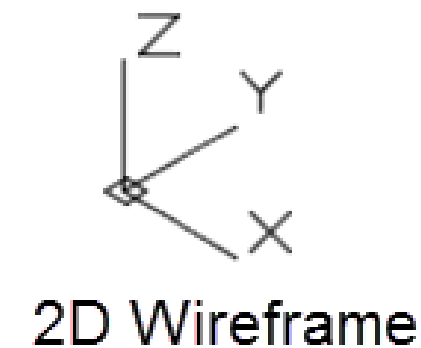
- What is it?
- What's it for?
- ★ ■ UCS – The essential options
 - UCS **3P** – Locating the XY plane for 2D geometry, Ortho
 - UCS **ZA** – Specifying the Z Axis direction for rotating
 - UCS **W**orld – Returning the UCS to its default position

Tip: Enter UCS directly at the Command prompt



The User Coordinate System

- What is it?
- What's it for?
- ★ ■ UCS – The essential options
- UCSICON – Controls the display of the UCS icon
 - **Off** for screenshots
 - **On** + **Origin** for modeling



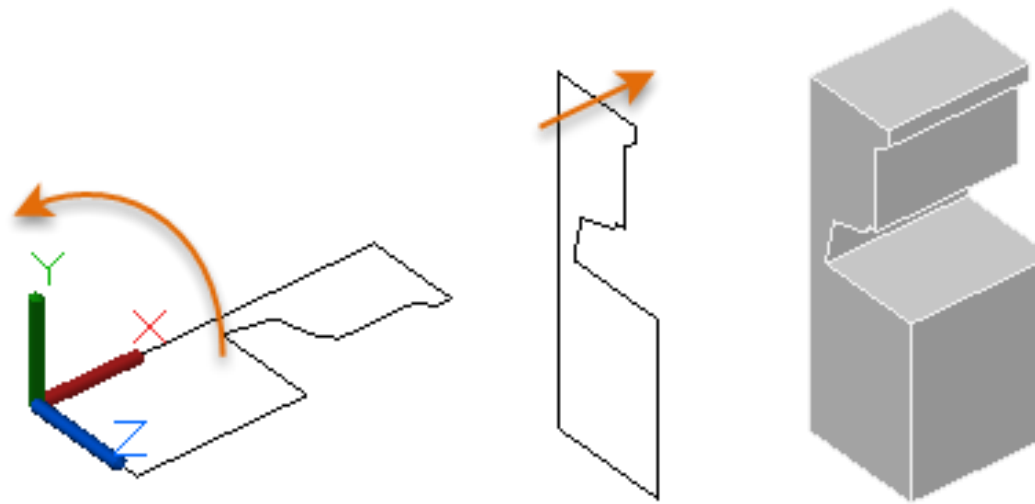
Note: UCS display for 2D wireframe , other visual styles

Topics

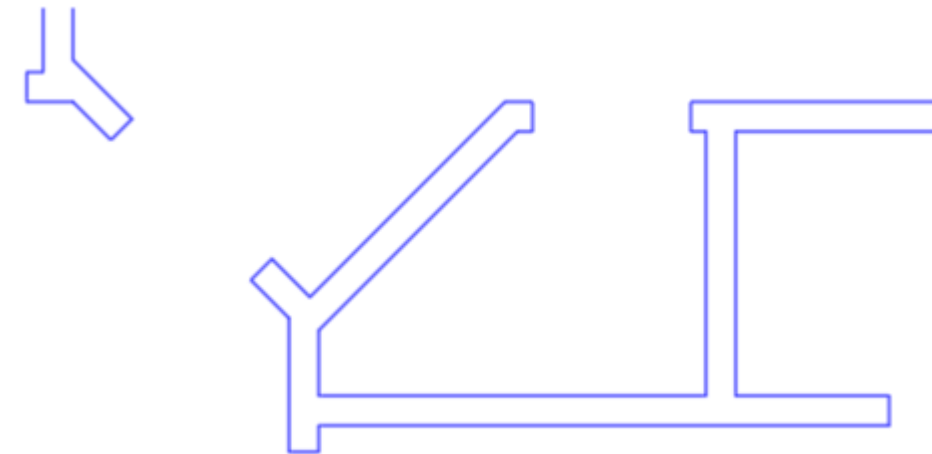
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Profile operations

- ★ ■ EXTRUDE (direction)
- REVOLVE (axis)
- SWEEP (path)

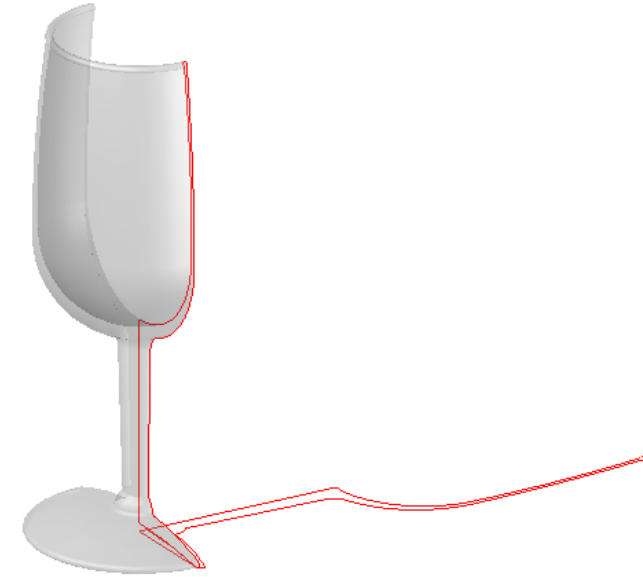
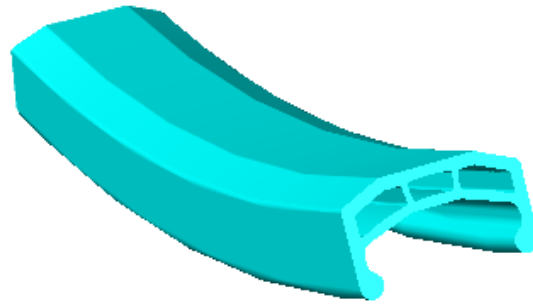
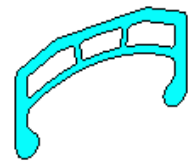


Tip: Work in isometric views



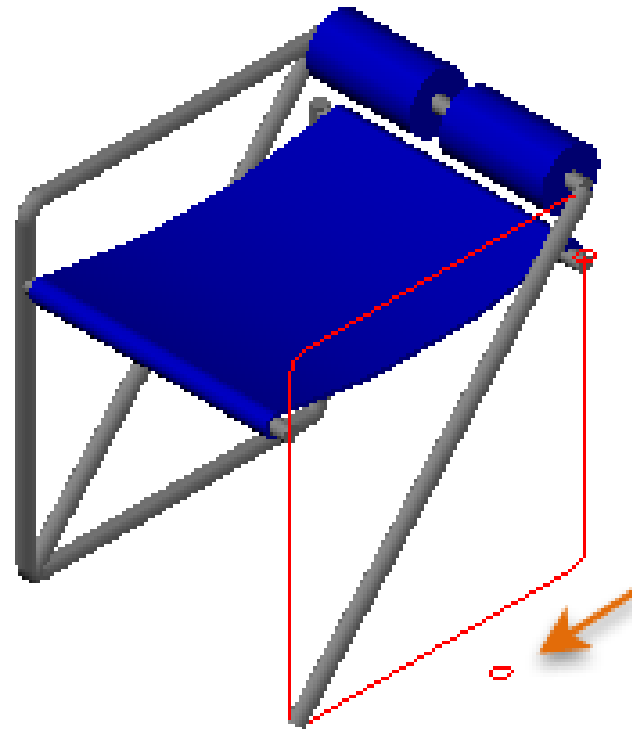
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Profile operations

- ★ ■ EXTRUDE (direction)
- REVOLVE (axis)
- SWEEP (path)
 - 2D polyline paths
 - Profiles to sweep



Profile operations

- ★ ■ EXTRUDE (direction)
- REVOLVE (axis)
- SWEEP (path)
- ★ Tip: Set DELOBJ = 0 to retain profile geometry
 - Why? Revise and reference
 - Keep on separate Reference layers
 - Choose a distinctive color

Topics

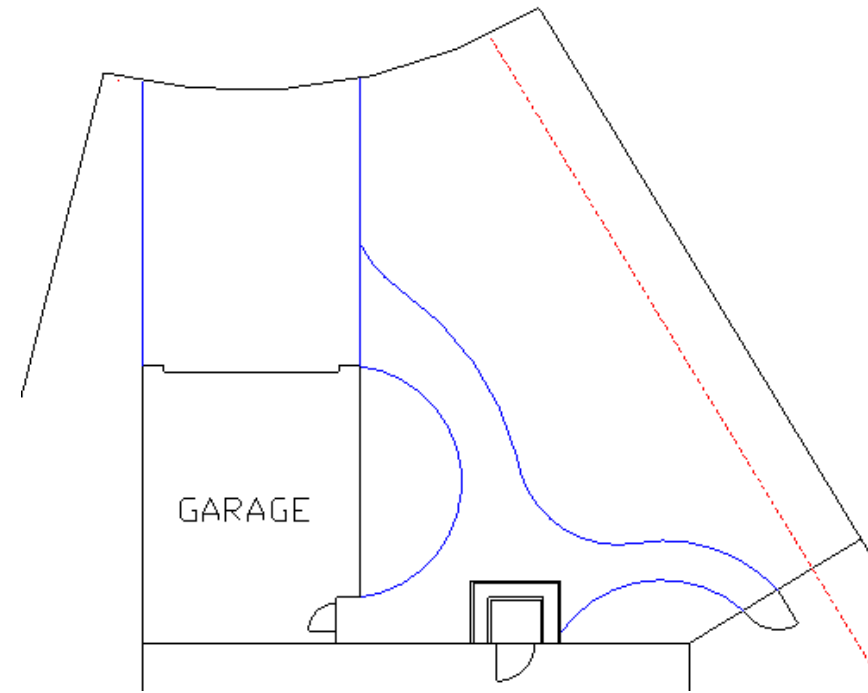
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Boolean operations

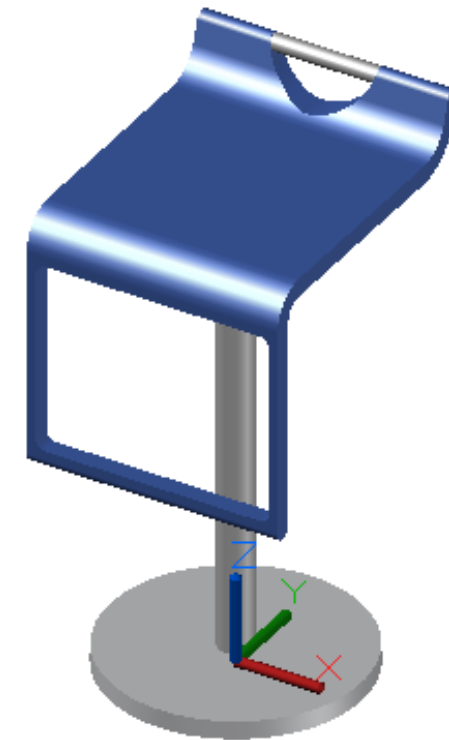
- UNION

- ★ ■ SUBTRACT

- ★ ■ INTERSECT



EXTRUDE, UNION, MASSPROP



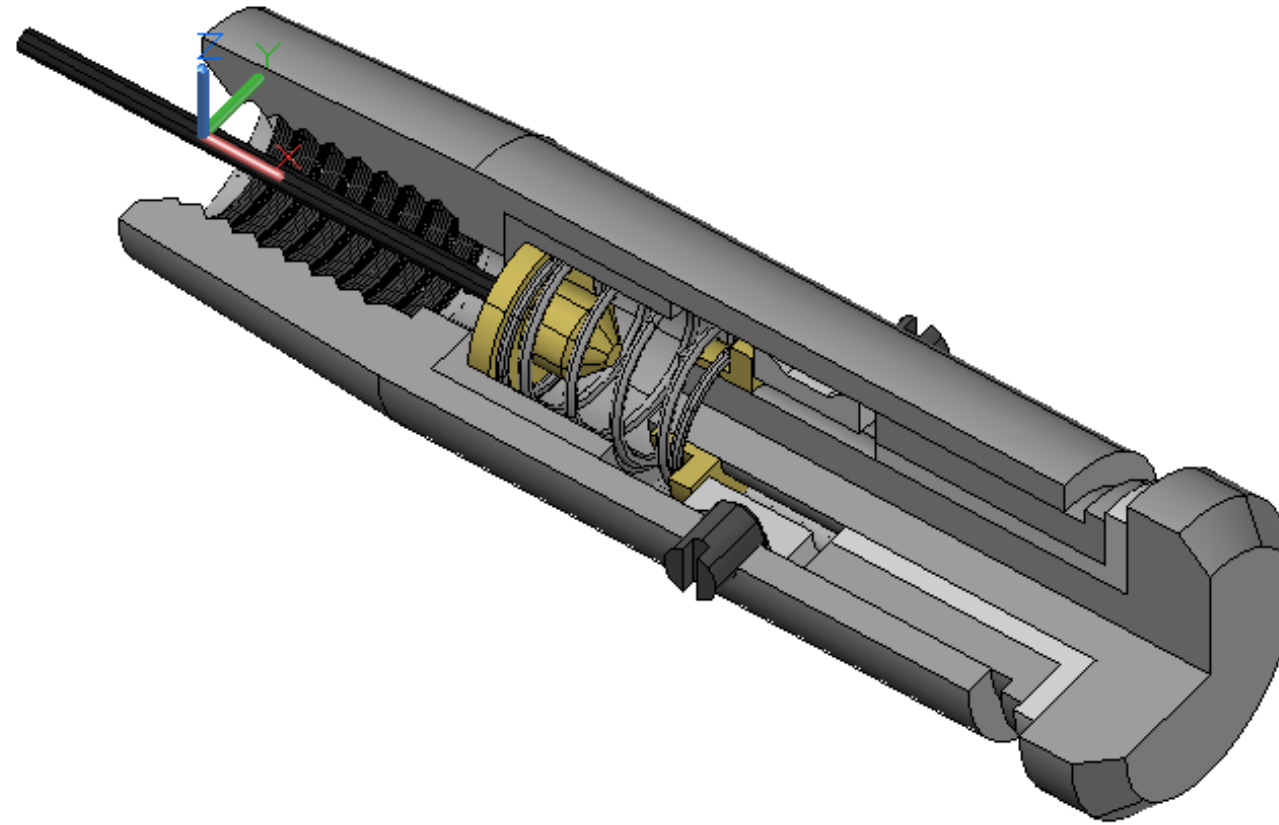
EXTRUDE, UNION, SUBTRACT

Boolean operations

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- ★ ■ SUBTRACT

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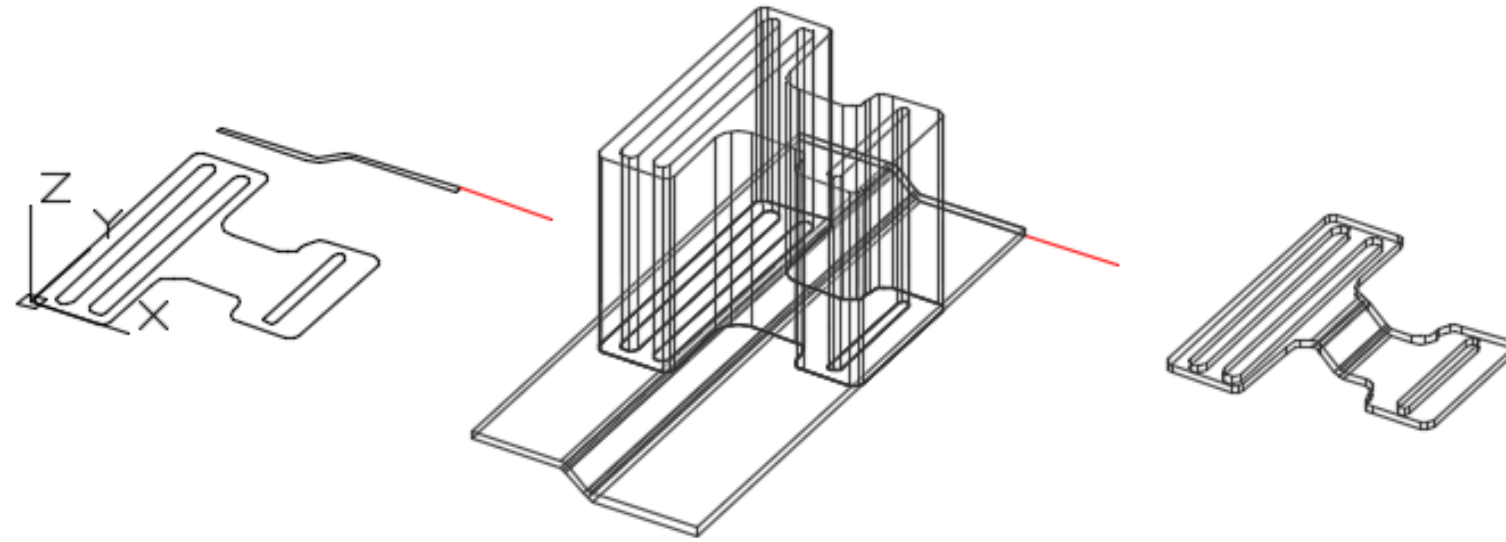


Boolean operations

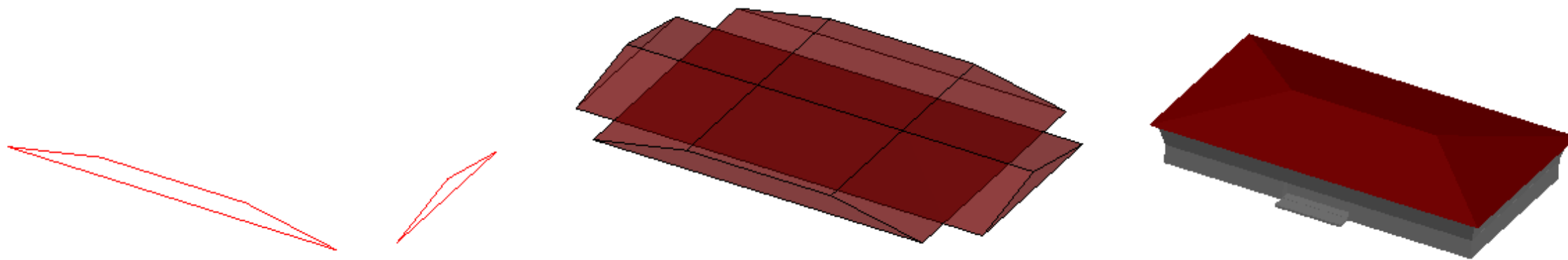
- UNION

- ★ ■ SUBTRACT

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UCS ZA, ROTATE, EXTRUDE, INTERSECT



Quick review

- Viewing commands
- UCS commands
- Profile Operations
- Boolean operations

Quick review

- Viewing commands – 3DORBIT, PLAN
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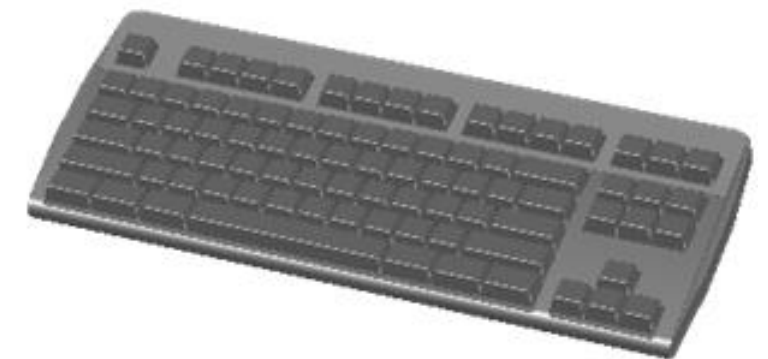
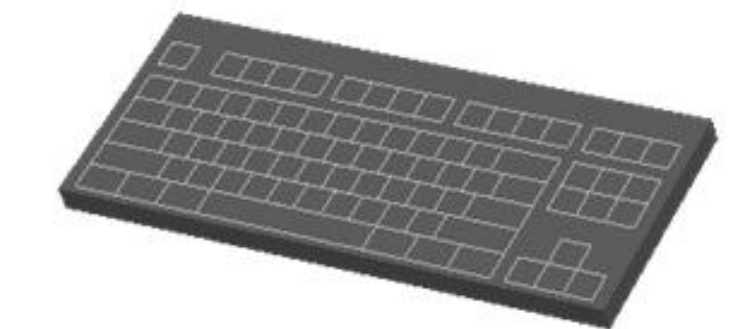
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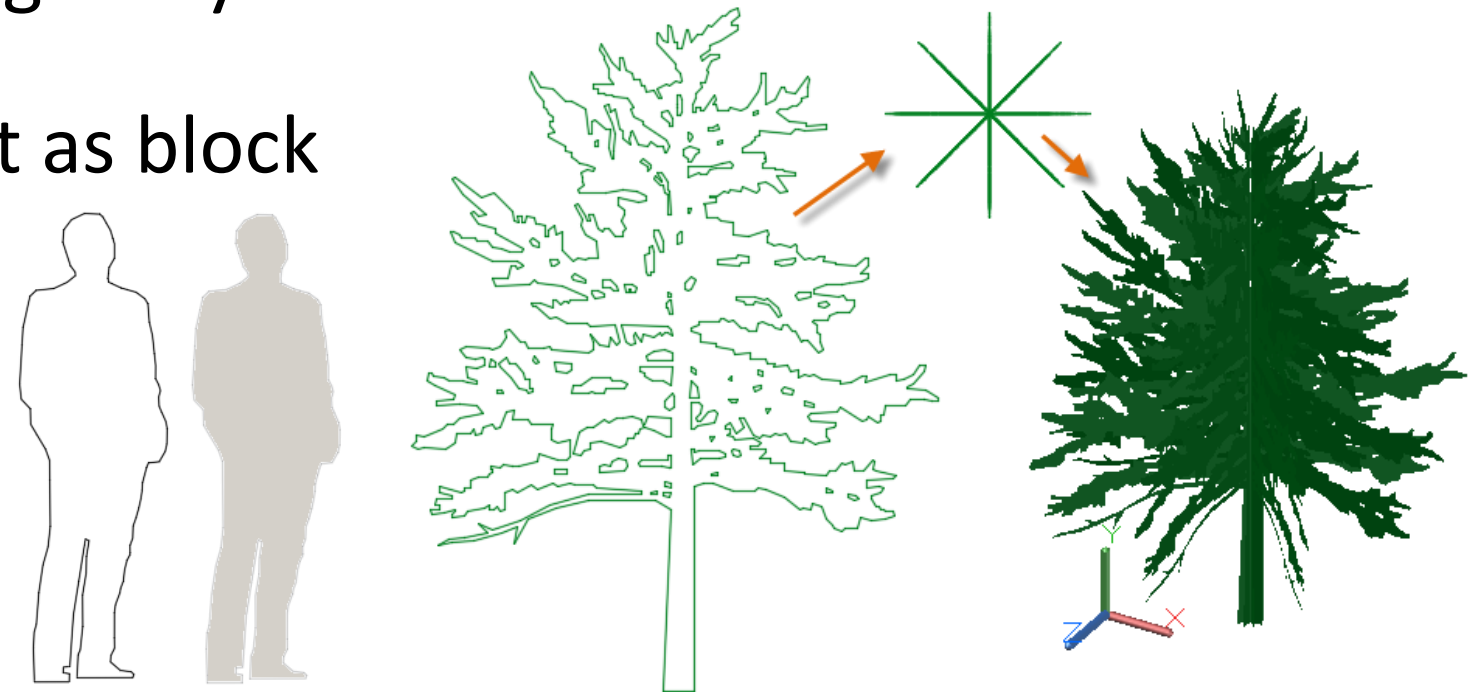
Best practices and advice

- Learn using simple models, become comfortable with the commands
- Use layers to manage visual complexity
- Create 2D profiles first (polylines and circles)
- Move and rotate 2D profiles and 3D objects into place
- Create and keep profile geometry (set DELOBJ to 0)
- Check and recheck distances and dimensions
- Limit the detail to what is justified for your goals



Best practices and advice

- Delay filleting to preserve sharp corners for measuring and locating
- Use GROUP to associate objects that you don't want to UNION
- Create blocks from repetitive objects to reduce DWG size
- Save a version of a model at each stage so you can revert
- 3D landscaping – purchase and insert as block
- People – Use transparent extrusion



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Next steps



- Download the class presentation, notes, and drawing files
- Review the presentation
- Create some simple models, try things with the 24 class models
- Review the Further Study section in the class handout
- Explore the 3D Basics workspace
- Experiment and have fun!
- Questions?



