

Inventor Sketching: Beyond the Basics

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About the speaker

Mike Thomas

I am the Technical Services Manager at Prairie Machine, a mining equipment manufacturer. Reporting to the general manager, I am responsible for overseeing the company's technical operations and the strategic technical growth.

I have been using AutoCAD since r13, I cut my solid modeling teeth on Mechanical Desktop, and have been using Inventor since inception.

Sketching

Sketch /skeCH/ - make a rough drawing of; draw; depict; portray; represent; give a brief account or general outline of something

Most 3D models start from a **sketch**, then further defined through **sketched** and **placed** features. Sketches contain 2D or 3D objects. Use the Inventor Sketch environment to sketch, constrain, and dimension 2D geometry.

Sketching is the foundation for most of the components modeled. So it is important to have strong sketching skills and to build proper sketches

Sketching

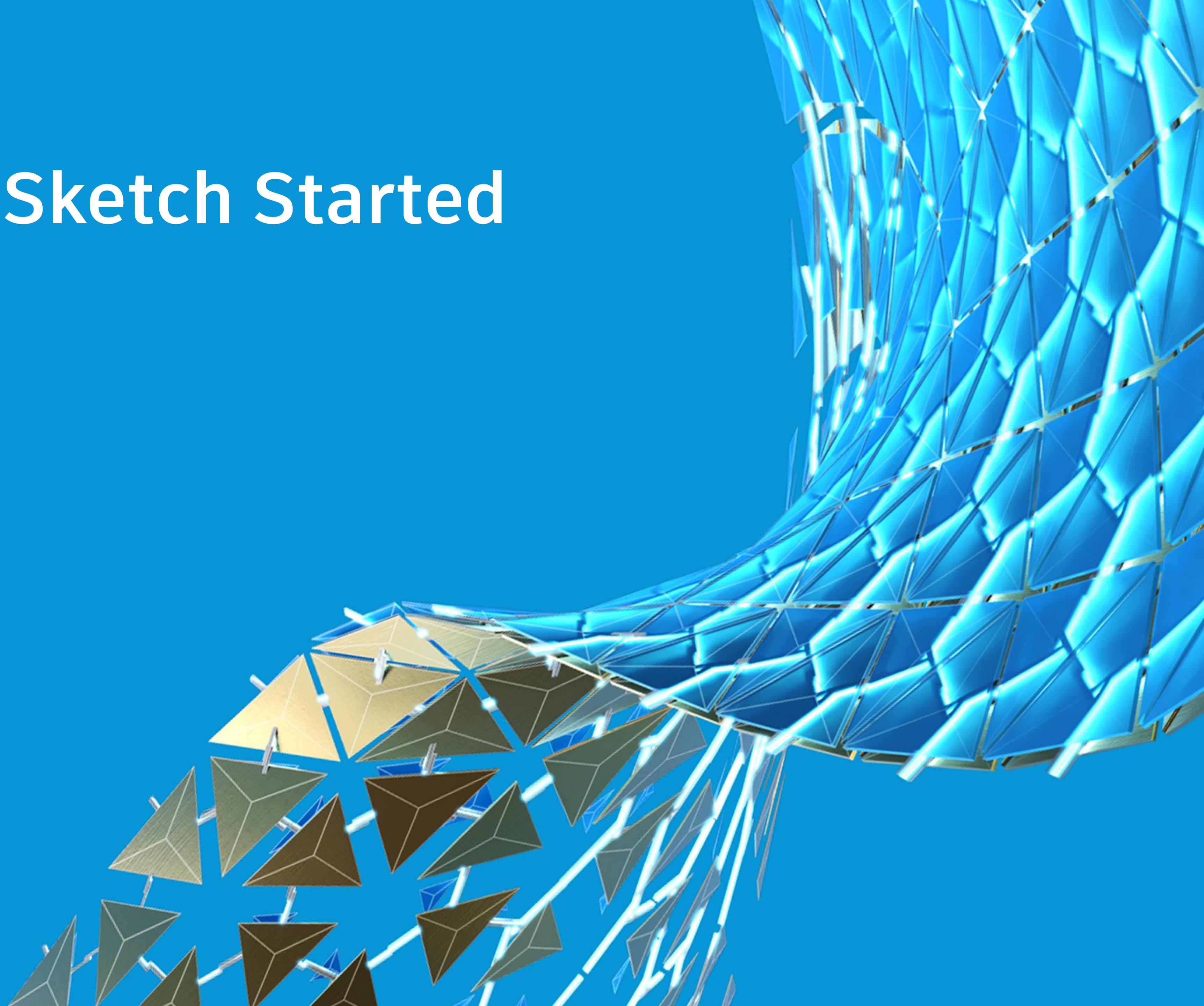
From Inventor's help...

Part models created in Autodesk Inventor start with sketches, which you create by drawing geometric elements such as points, lines, shapes, and arcs. The sketch becomes the basis for sketched features, such as extrusions, revolutions, lofts, coils, or sweeps, which add volume to the sketched part.

When starting a sketch, you can specify a planar face, work plane, or sketch curve.

A sketch profile is a closed loop defined by sketched or reference geometry that represents a cross-section of a feature. An open profile defined by sketched segments, arcs, or splines can define a surface shape or extend to boundaries to close a region.

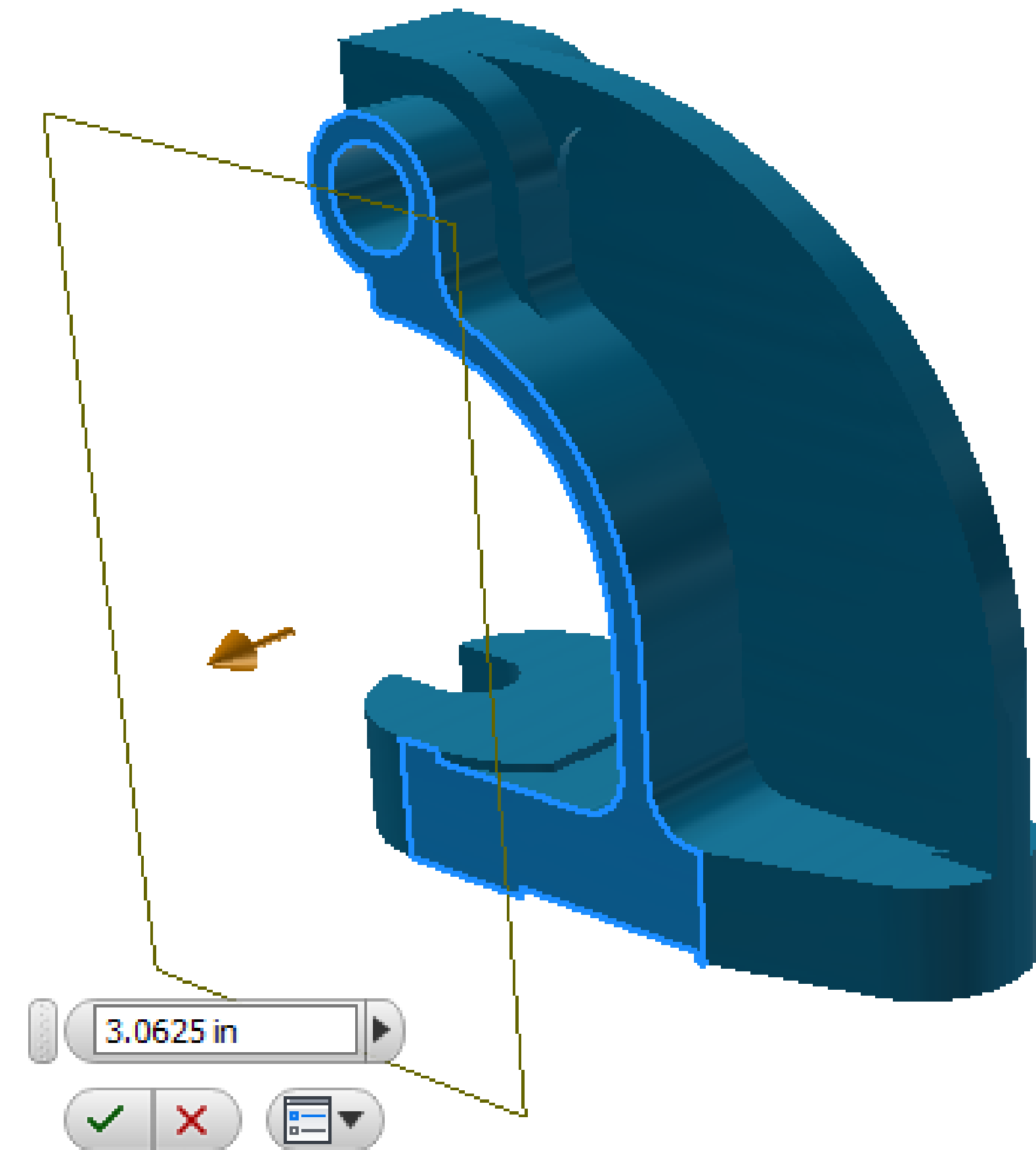
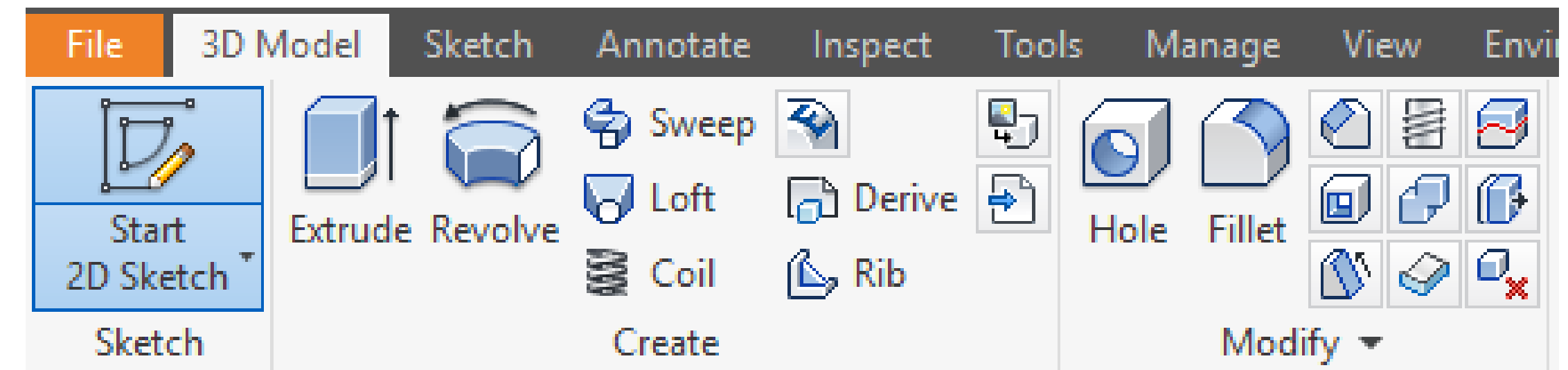
Getting Your Sketch Started



Workplanes with Sketches

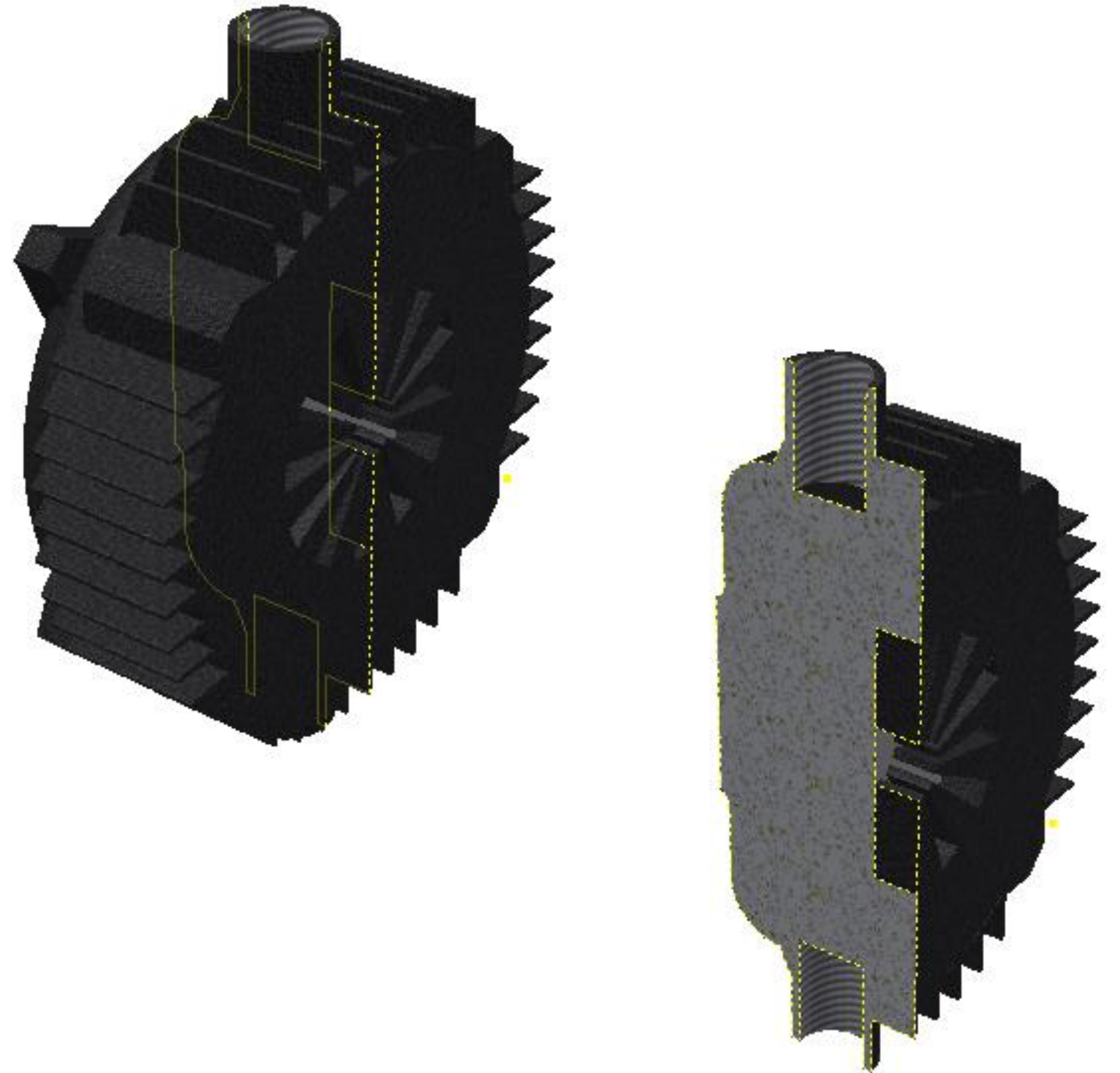
Generate offset workplanes with a sketch by dragging off the face with the create sketch command

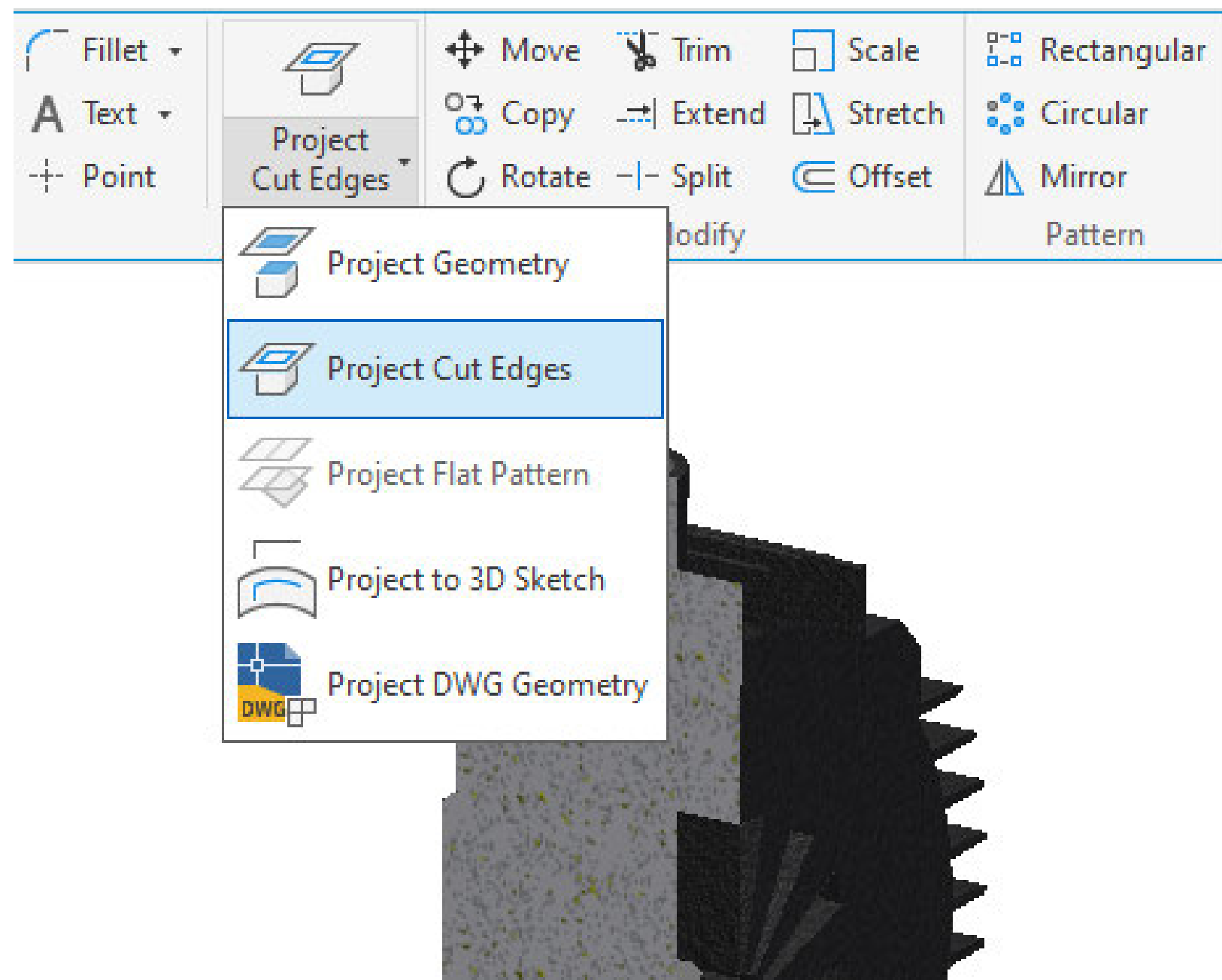
Use sketch geometry to define difficult to locate work features



Slice Graphics

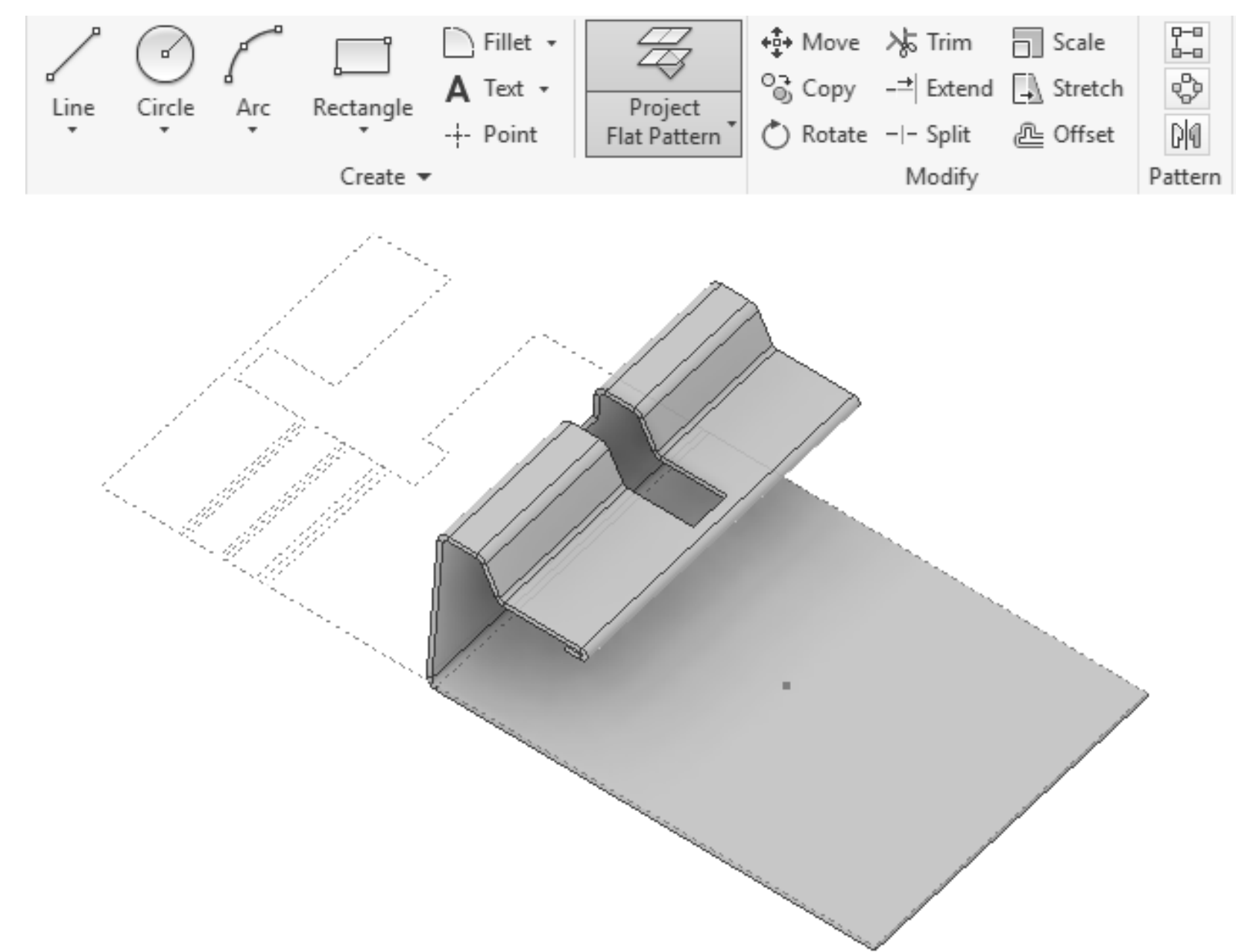
“Slice Graphics slices away (temporarily) the portion of the model that obscures the plane”





Project Cut Edges

Associatively projects edges of the model that intersect with the sketching plane



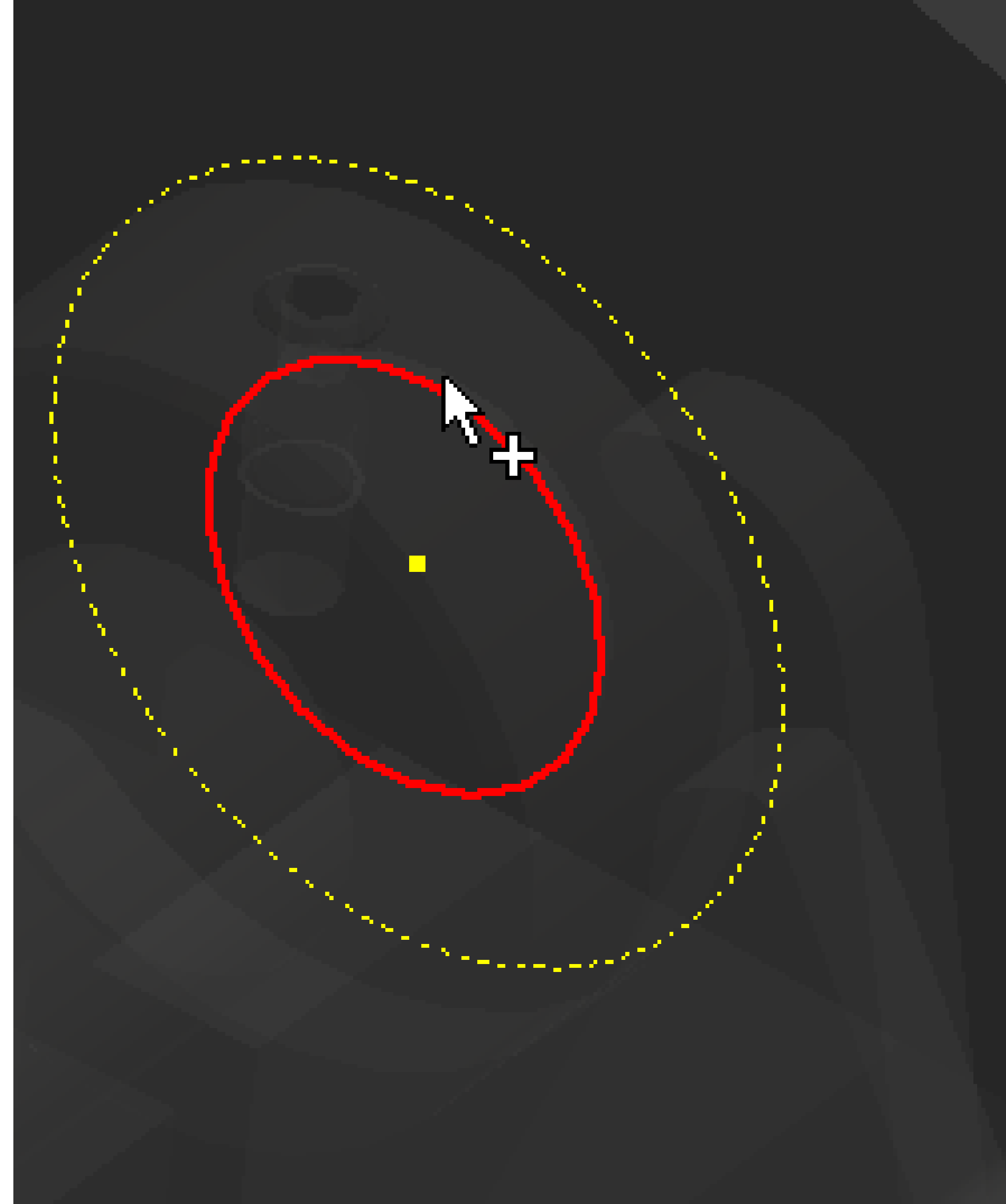
Project Flat Pattern

Unfolds a disjointed face or faces into the sketch plane

Cross-Part Associativity

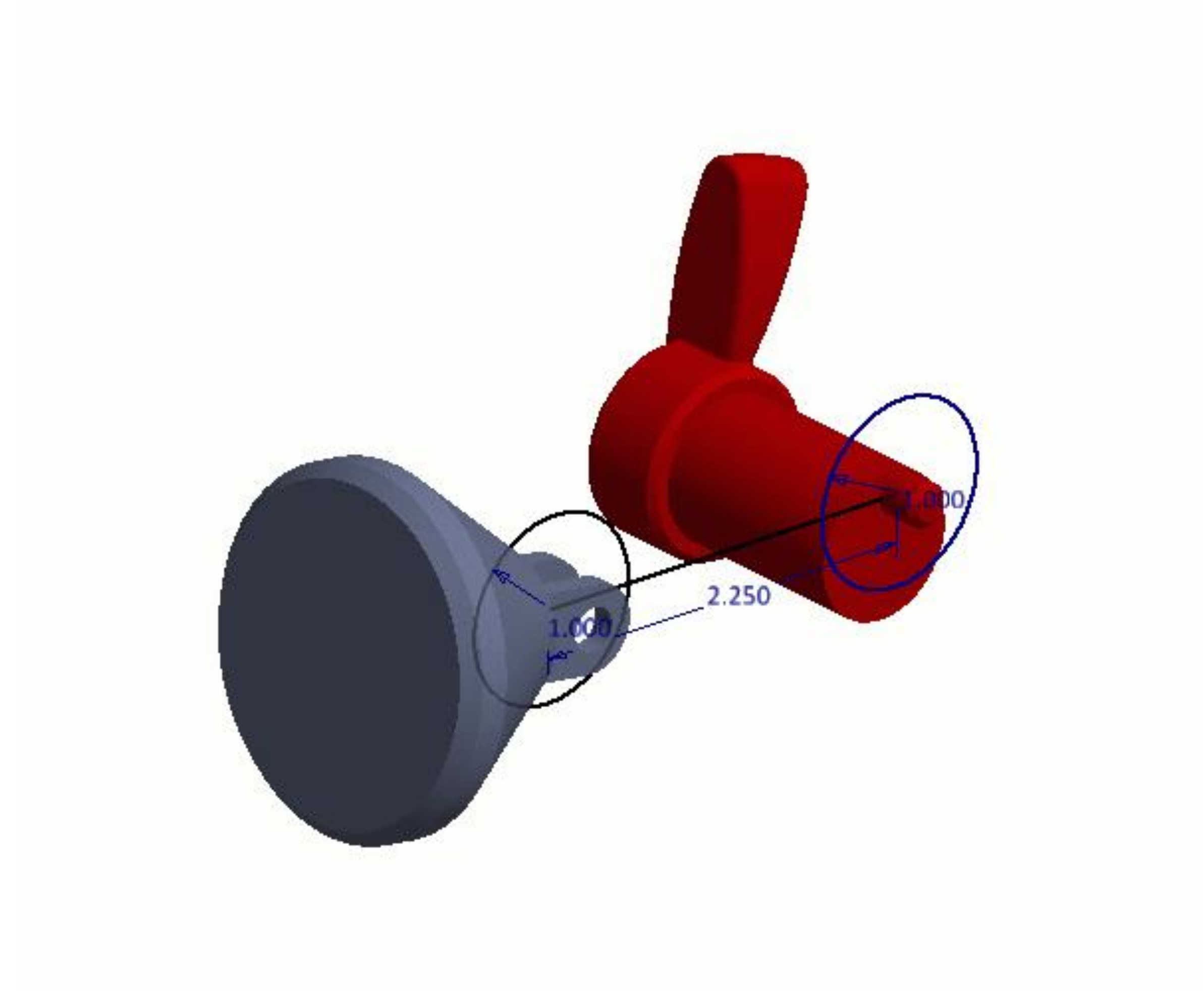
Projecting from one part into another creates a cross-part associative relationship (by default)

- You can override this by holding CTRL... yet still get the geometry
- Want this to be the default behaviour, its in the Application Options



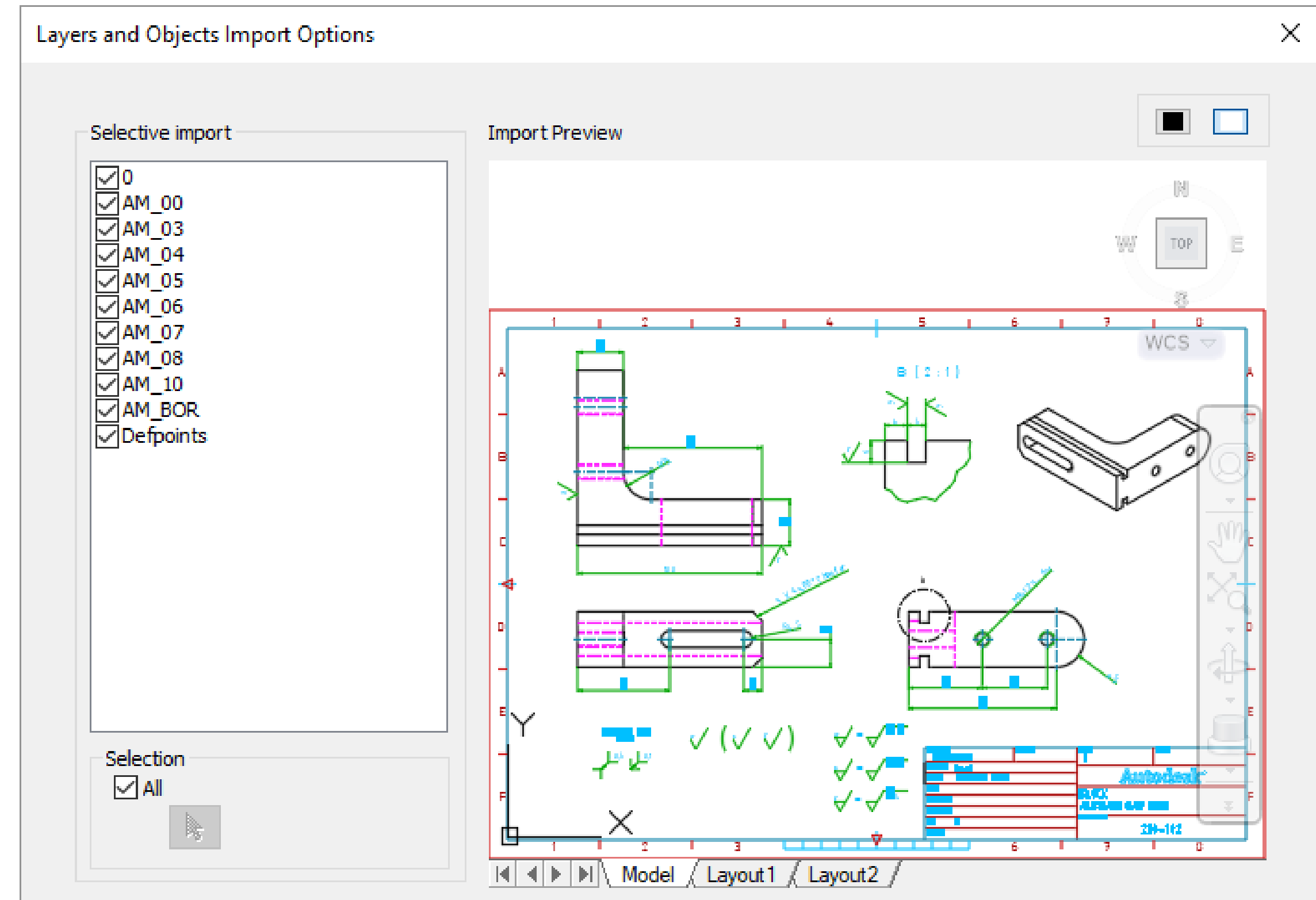
Use It as a Part

Inventor treats 2D geometry the same as 3D geometry for applying relationships in the assembly. Use this to test function before building the form



AutoCAD Geometry

- Utilize **AnyCAD** to associatively insert AutoCAD drawings into your models and utilize **Project DWG Geometry** to use the AutoCAD objects in your sketches
- Use the **Import Wizard** to convert the geometry
- Want to bypass the wizard... **copy & paste!**

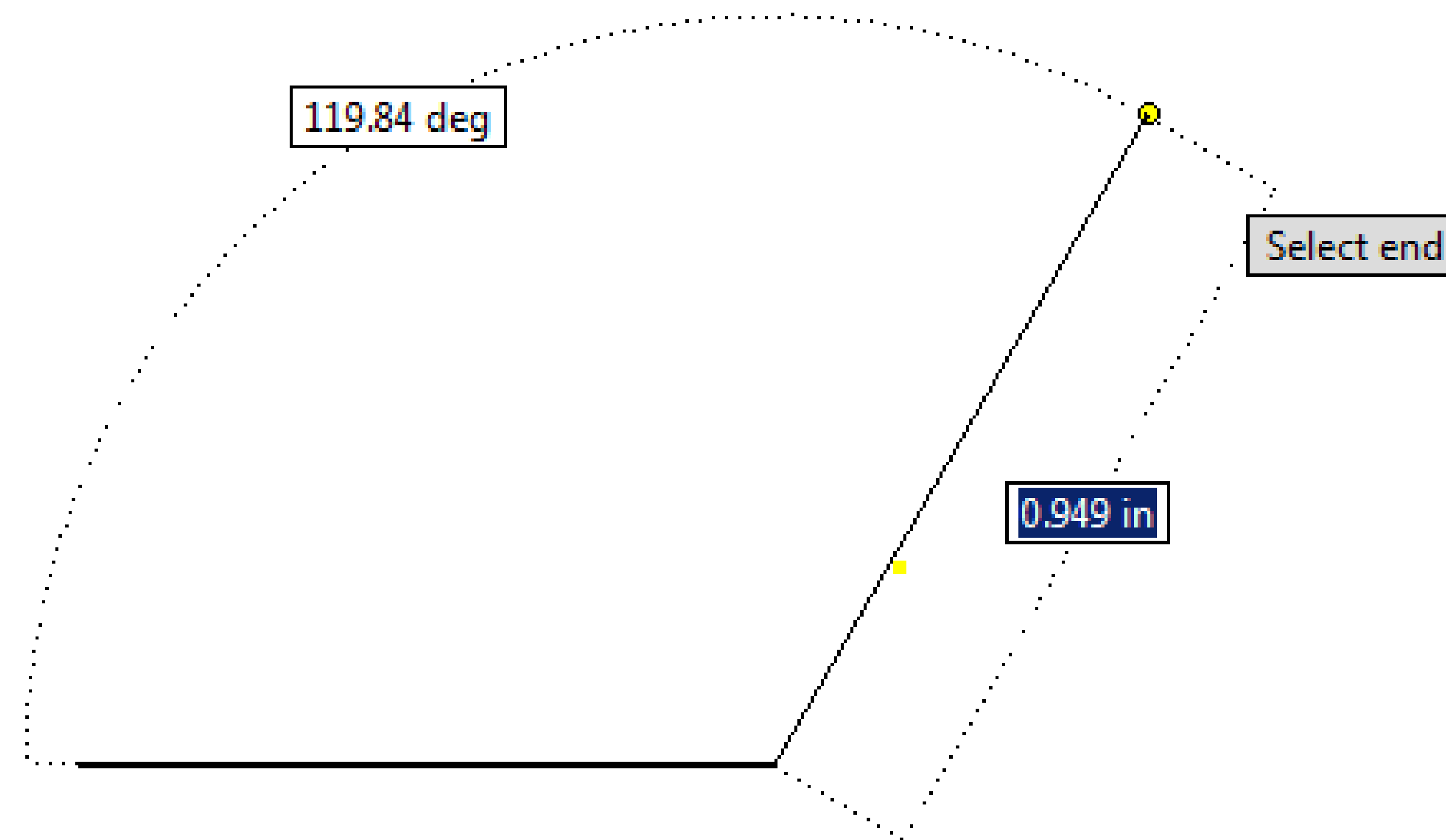


Creating Geometry



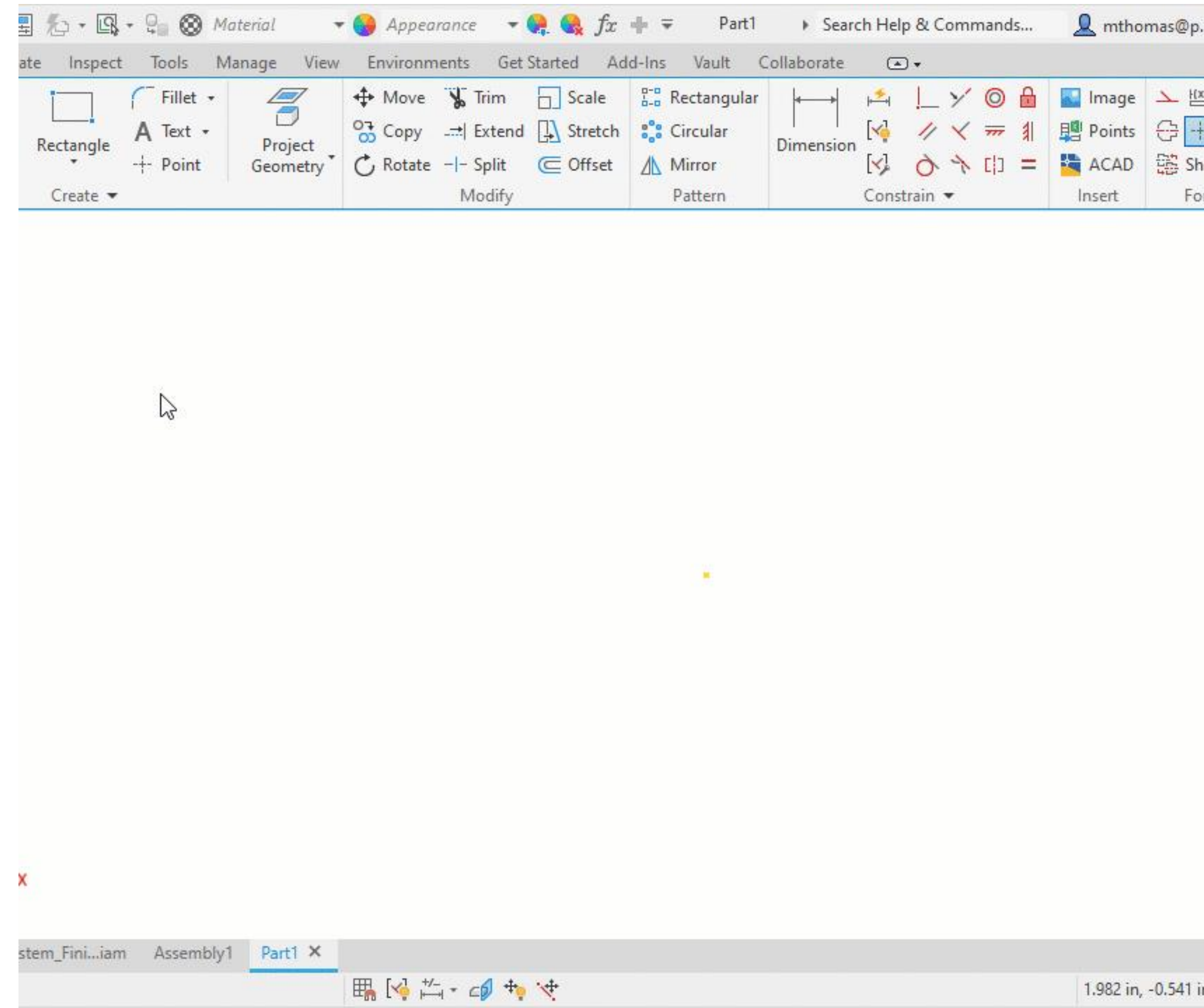
Dynamic Input

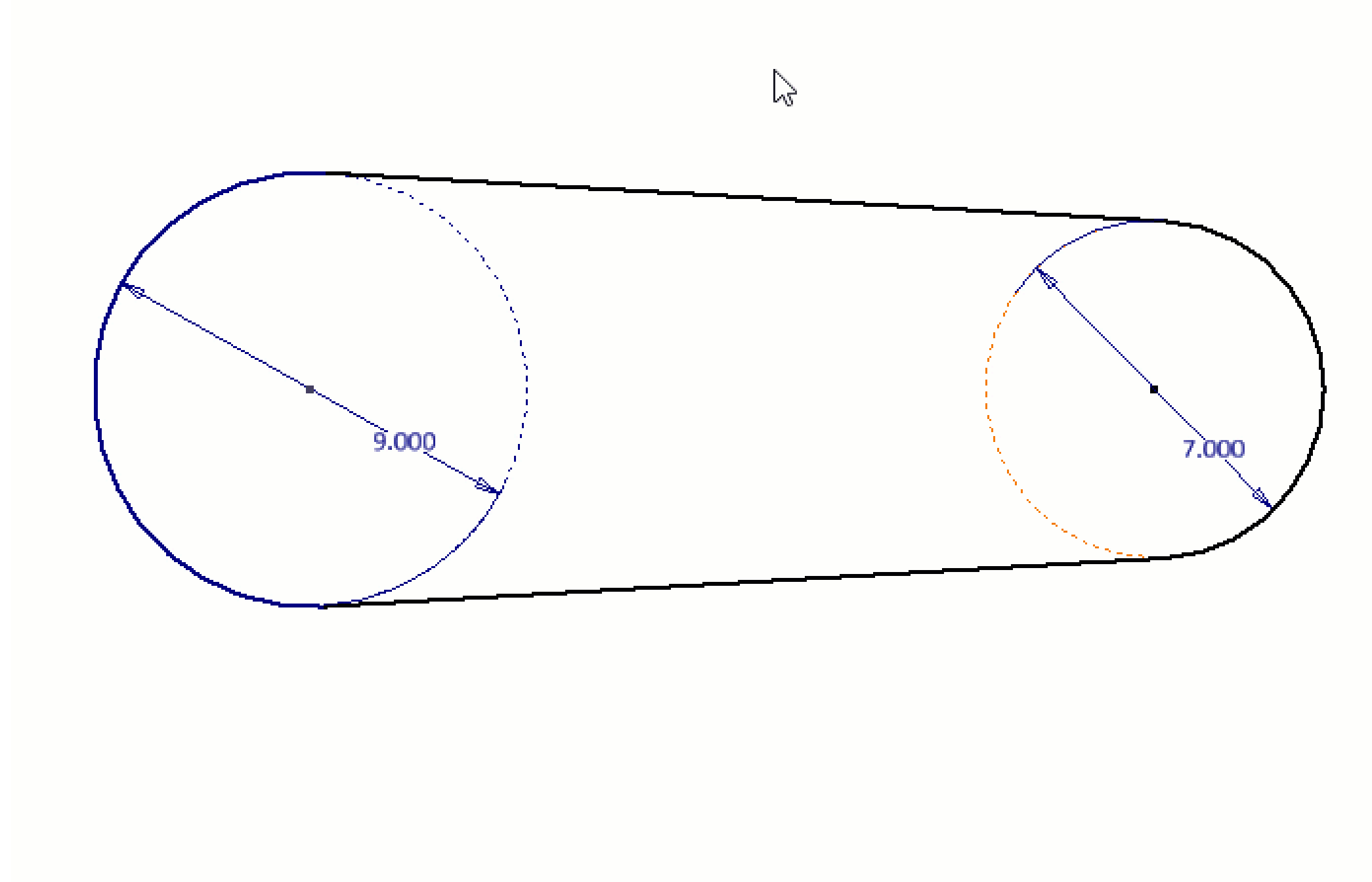
- Provides a **Heads-Up Display (HUD)** near the cursor to aid in keeping your focus in the sketching area.
- Define sizes with the textboxes
- Use TAB to toggle between the dimensions > ENTER to accept the sizes
- Entered values become dimensions



What about other shapes?

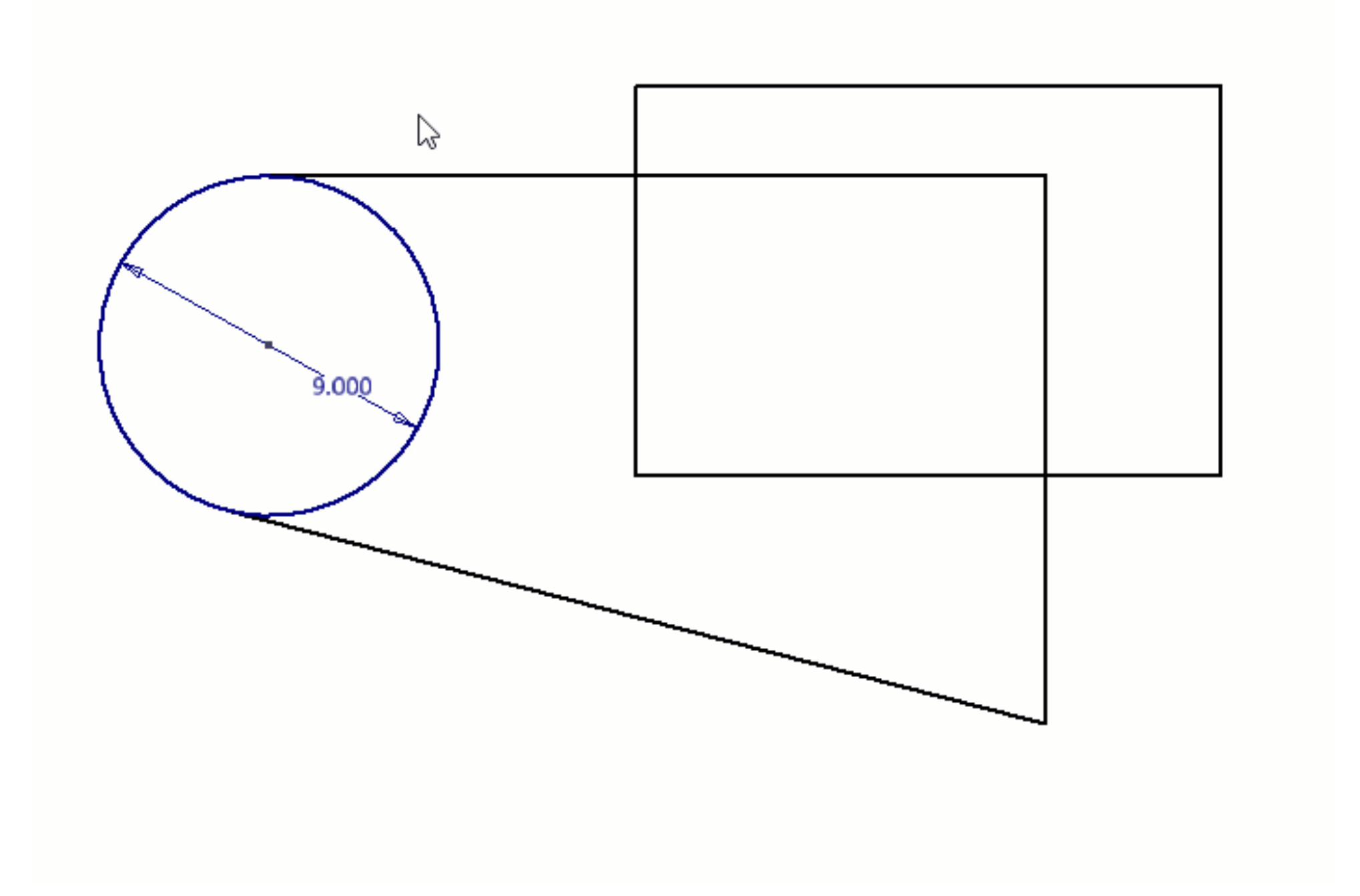
- Multiple methods of creating *rectangles* and *slots* - **always use the option that creates the easiest method to create a smartly constrained object!**
- *Splines* – three methods of creation
- Text... yes text





Offsetting

Offset creates geometry by *offsetting (copying)* existing edges. Use the **right-click menu options** to your advantage

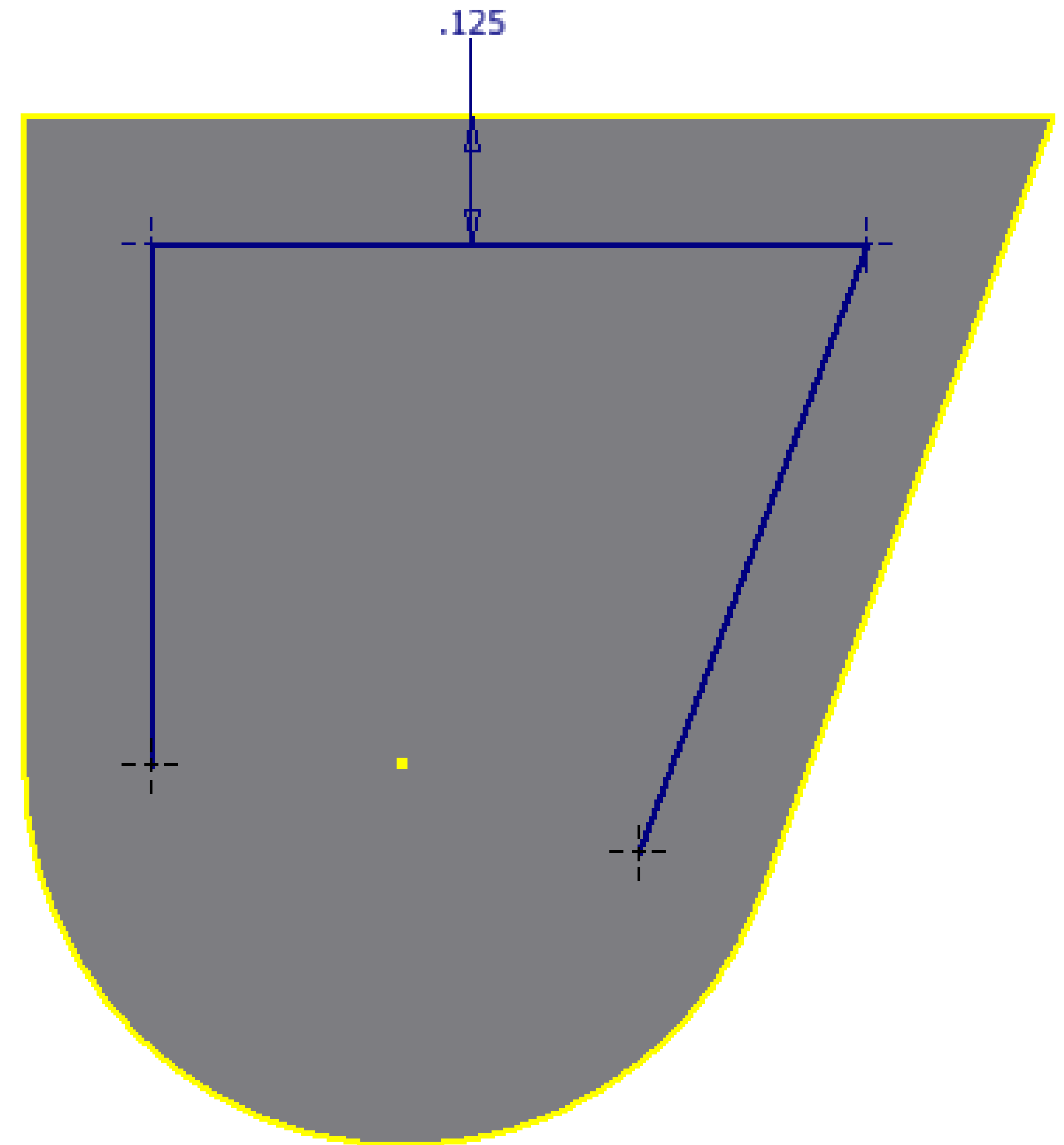


Splitting

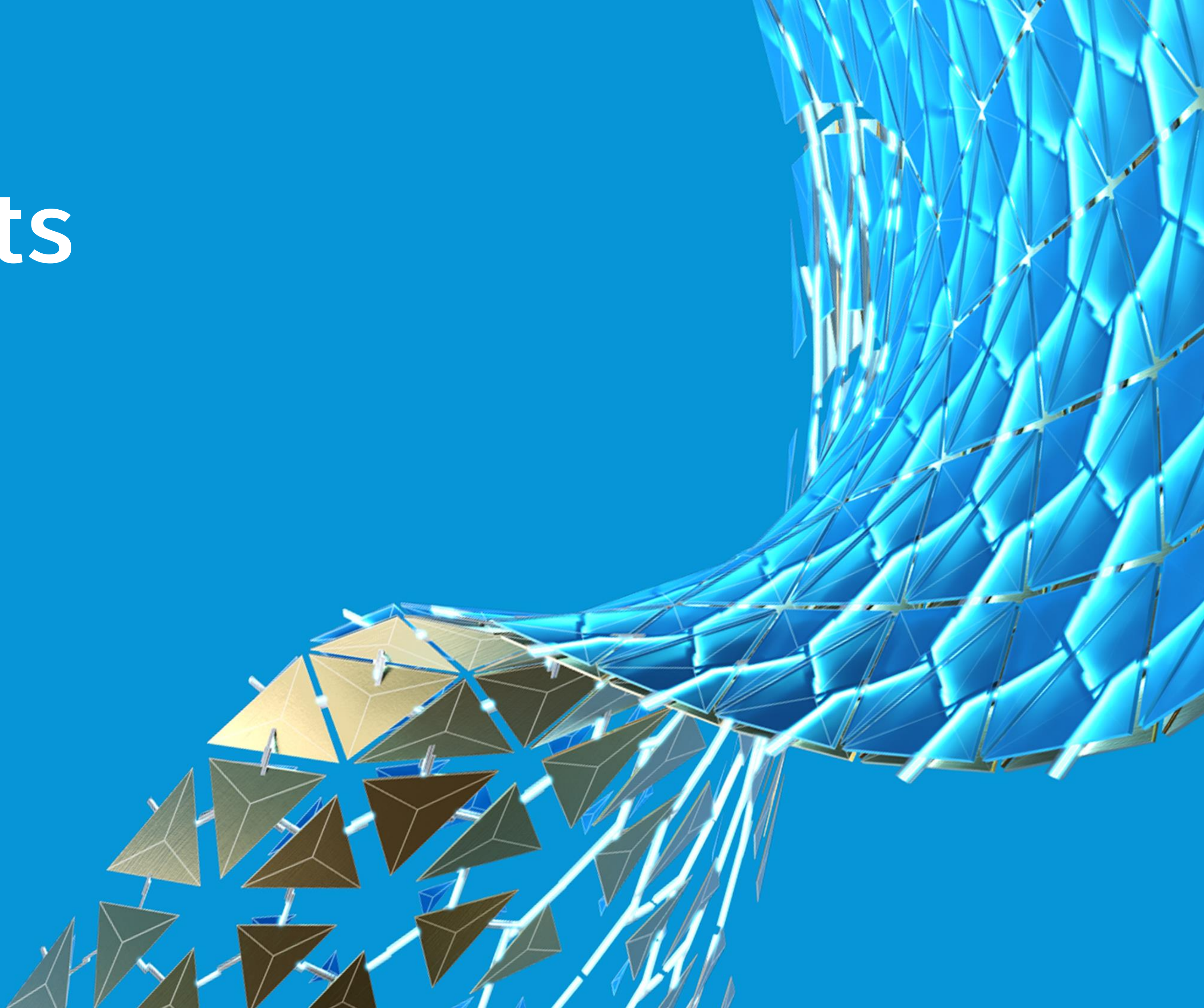
When geometry is broken apart using the Split feature the geometry remains constrained meaning it is a great method to generate construction geometry or to create points to snap

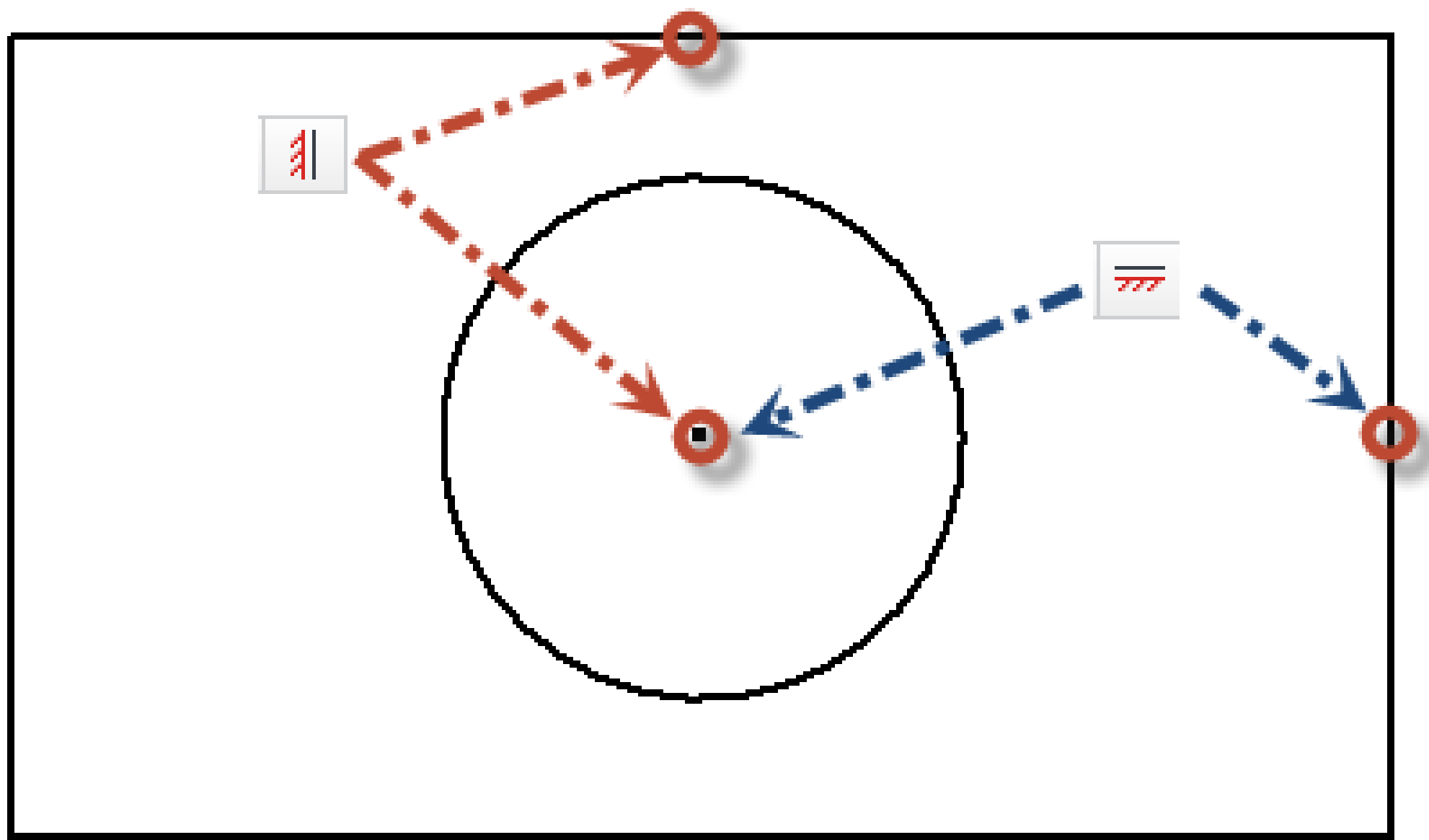
Hole Patterns

- Any point in the sketch can be used as a hole center (not just hole centers)
- quickly change points to hole centers via a selection
- Use rectangles, polygons, and offset to create the basis of non-rectangular and non-circular patterns



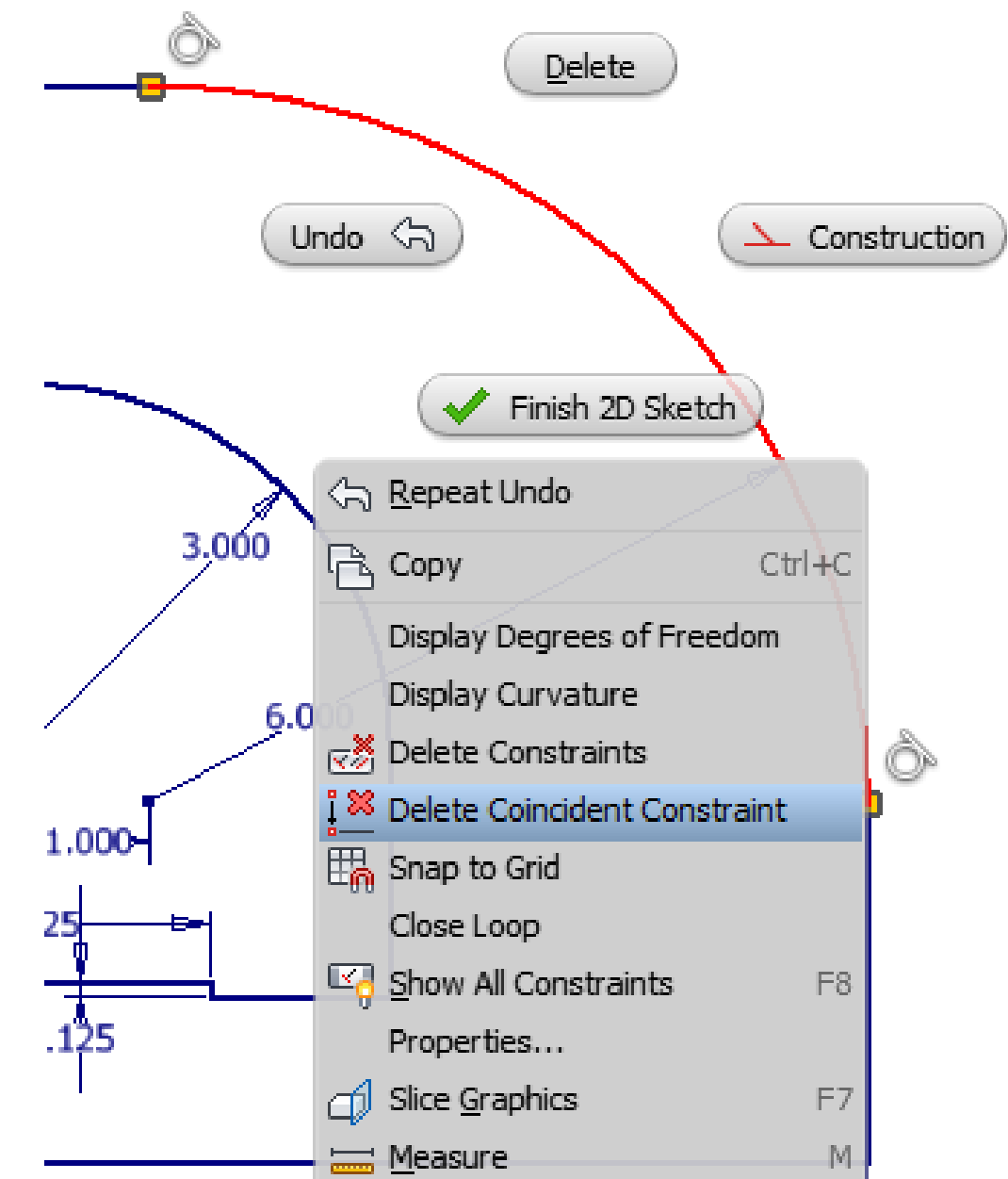
Constraints





Horizontal & Vertical Alignment

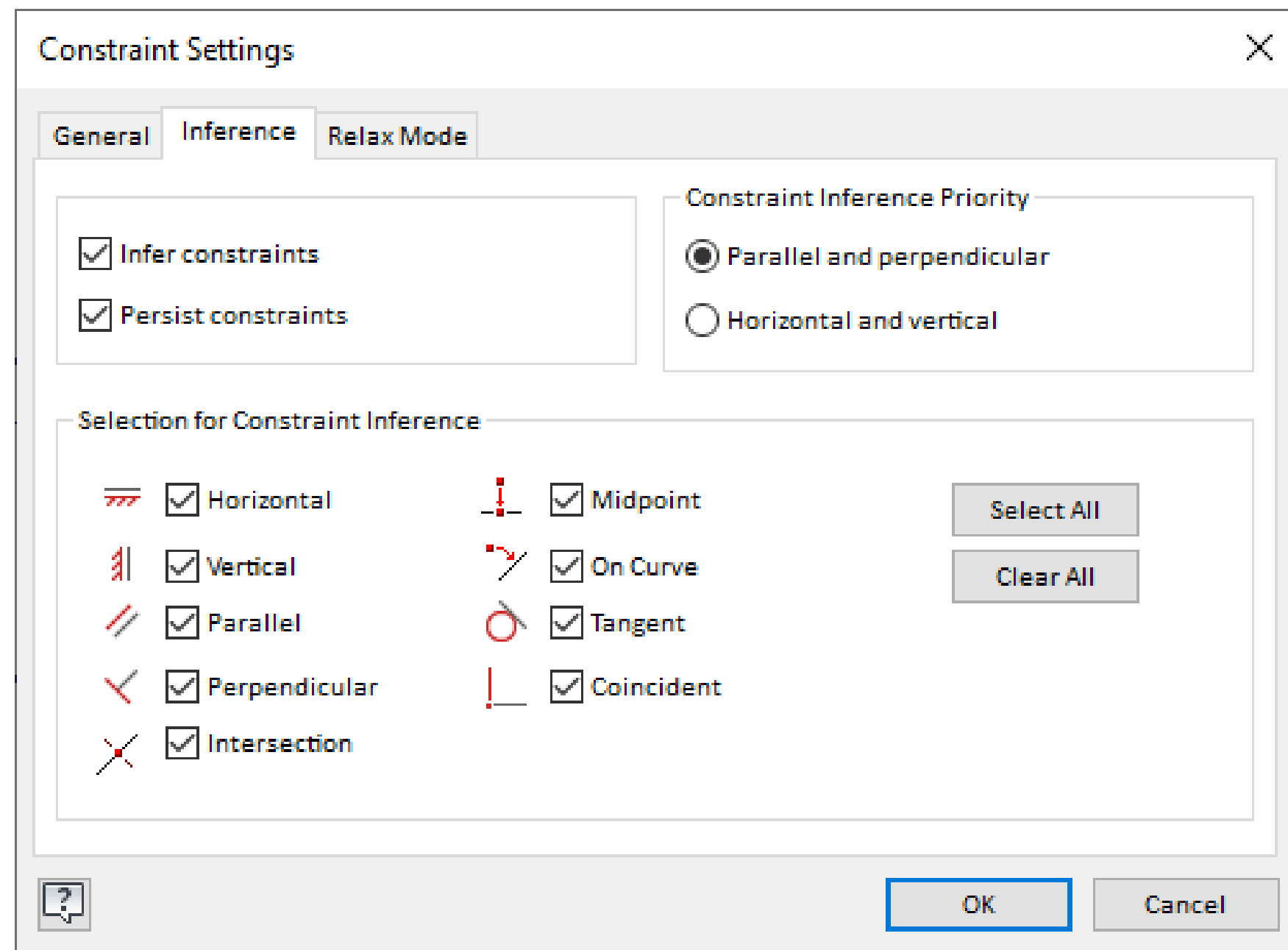
Horizontal & Vertical apply more than to just lines



When Delete is More

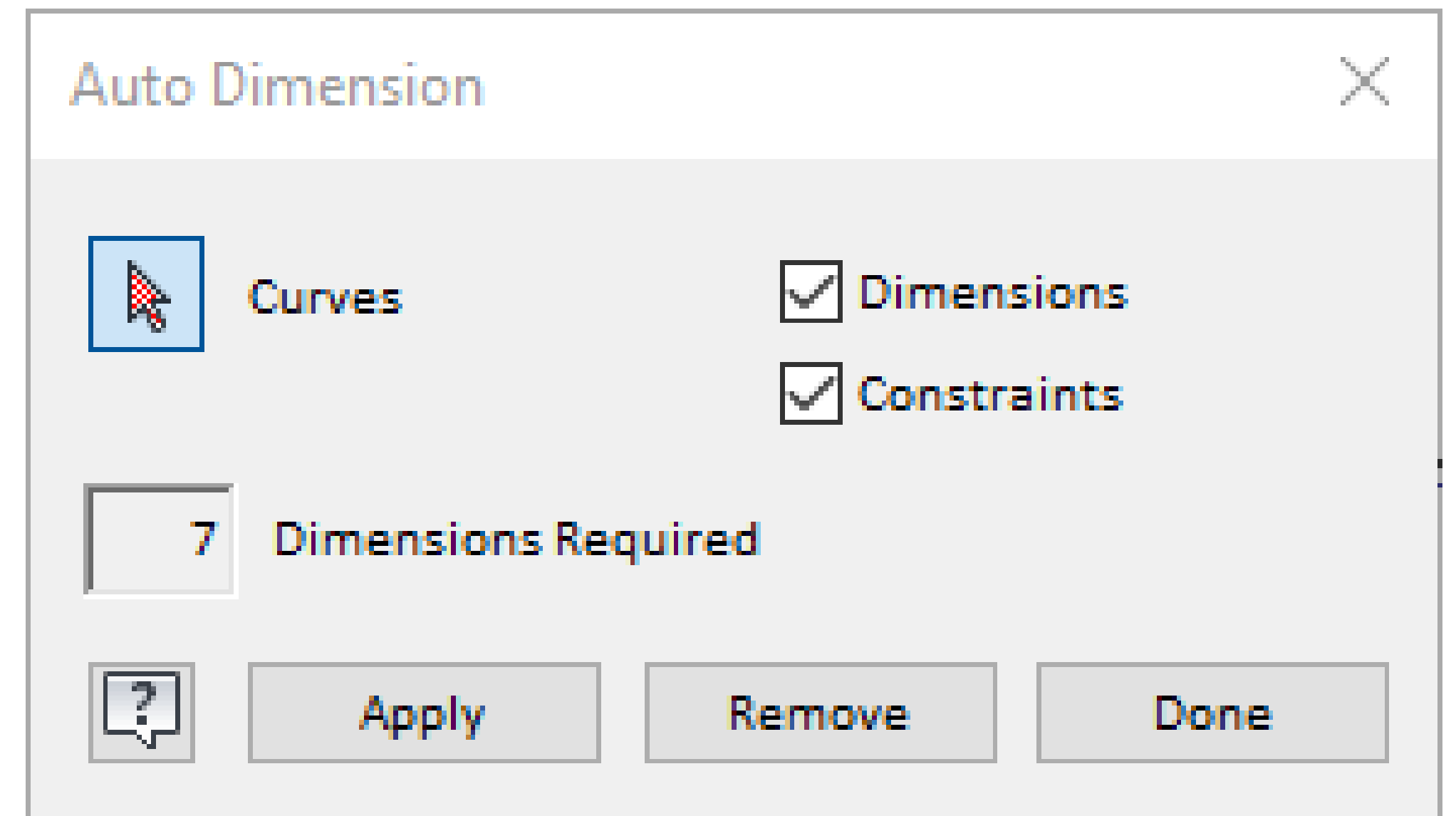
Delete Constraints

Delete Coincident Constraint



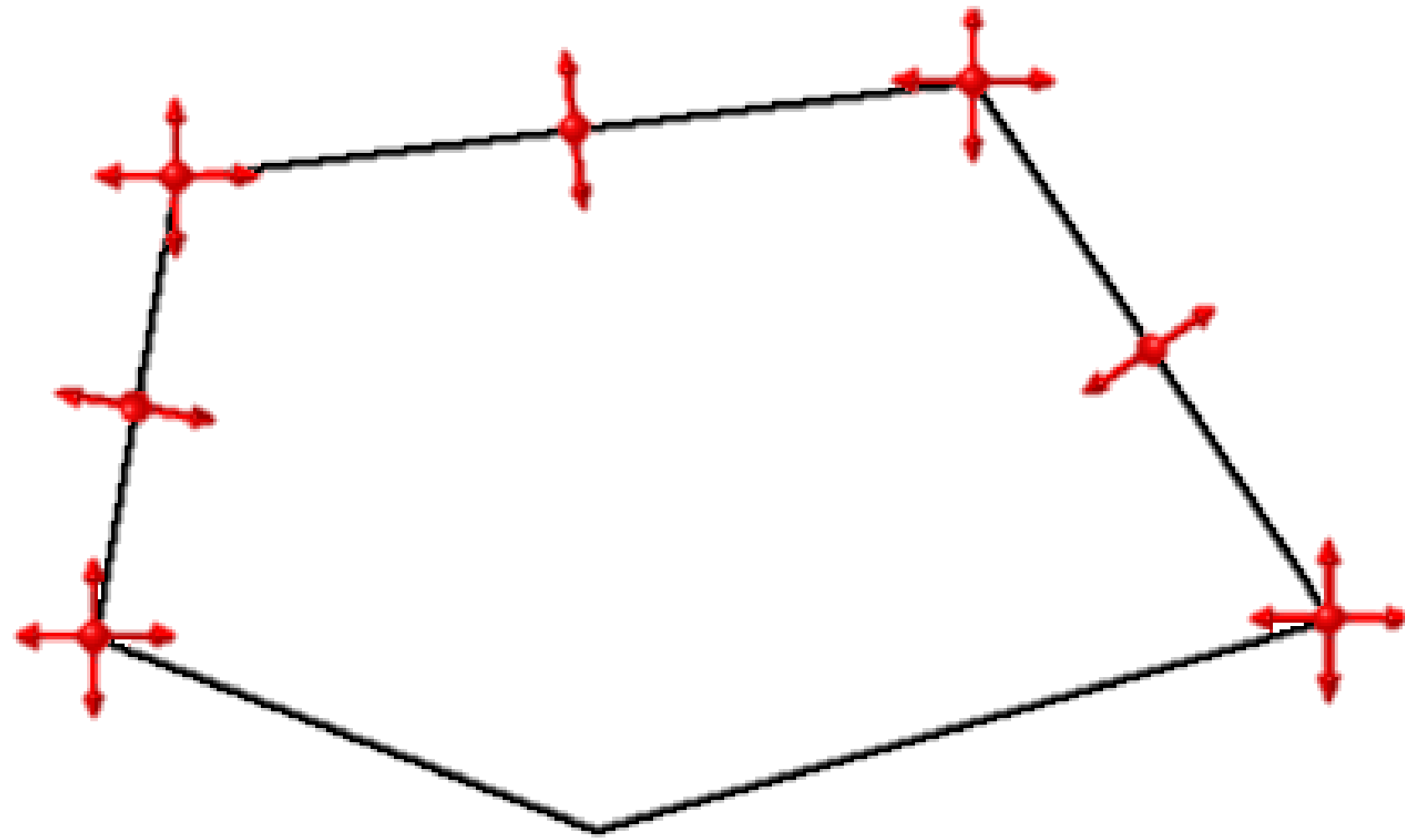
Inferred Constraints

Constraints are automatically applied as you sketch but you can make this work in your favour.



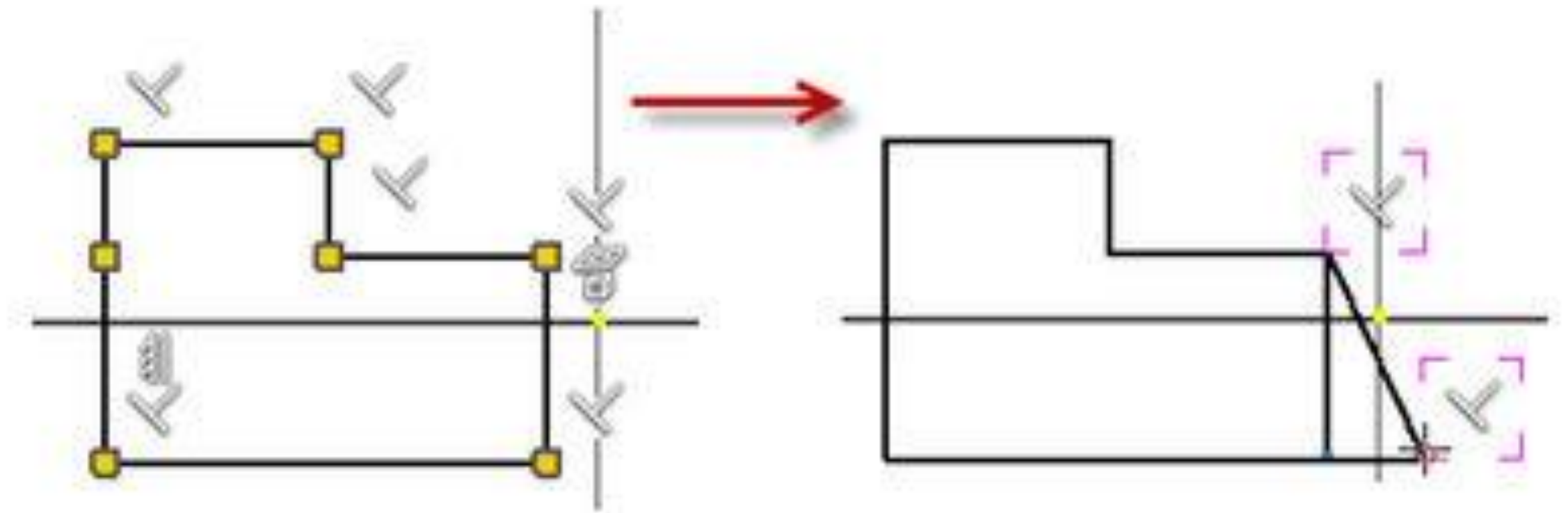
Auto Dimensioning

Use Auto-dimensioning to quickly find missing constraints



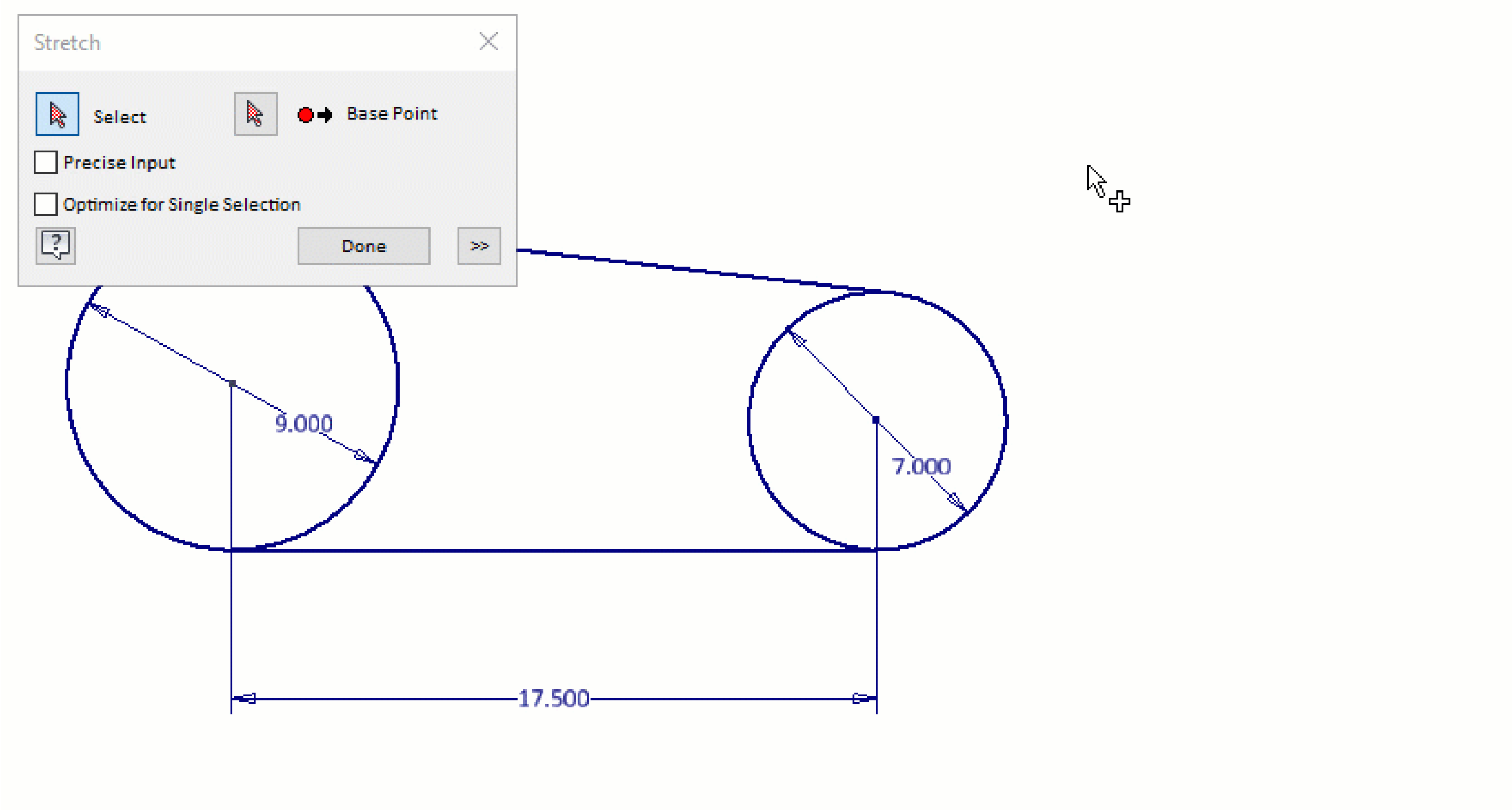
Degrees of Freedom

Use Degree of Freedom to help find unconstrained, partially constrained or fully constrained geometry



Relax Mode

Use Relax Mode to modify constrained objects and apply new constraints. Conflicting constraints are removed

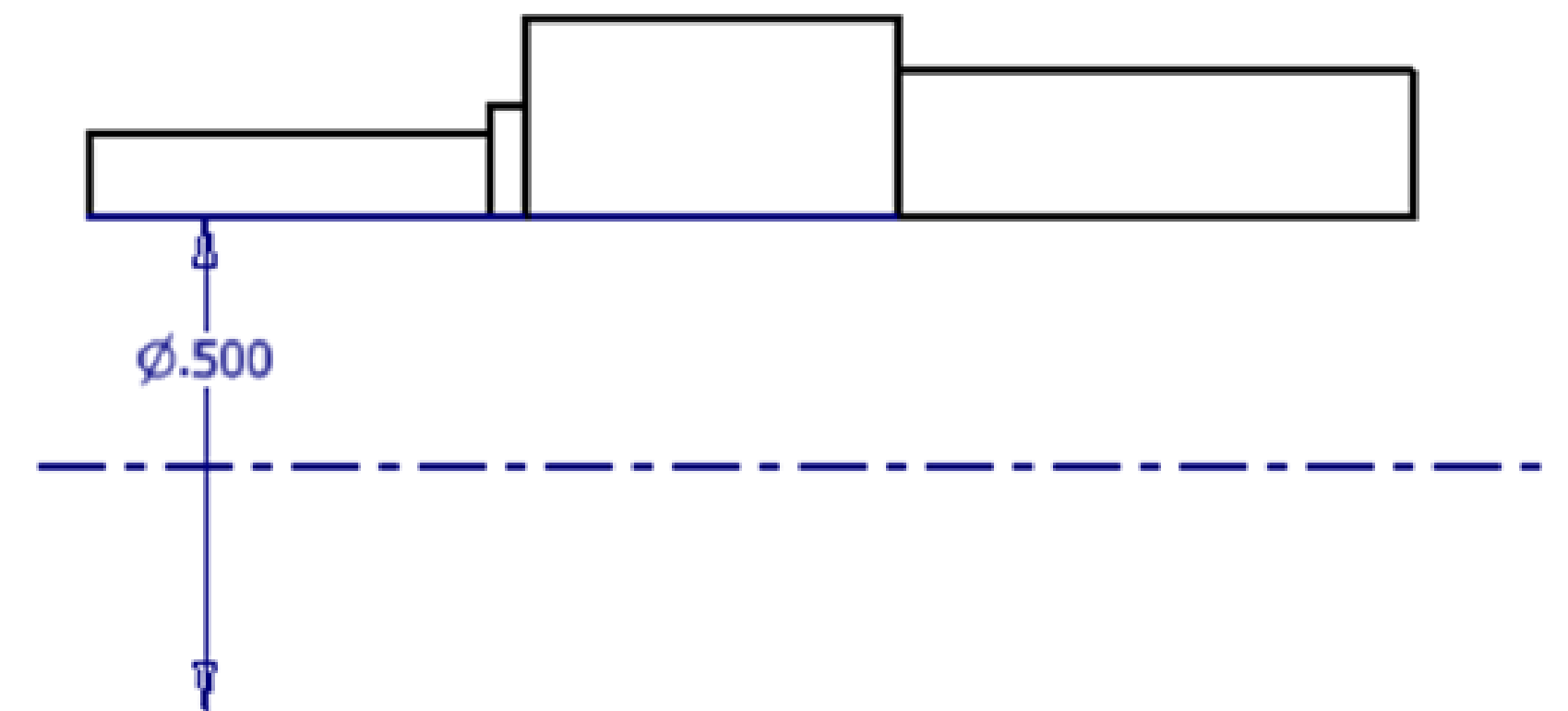
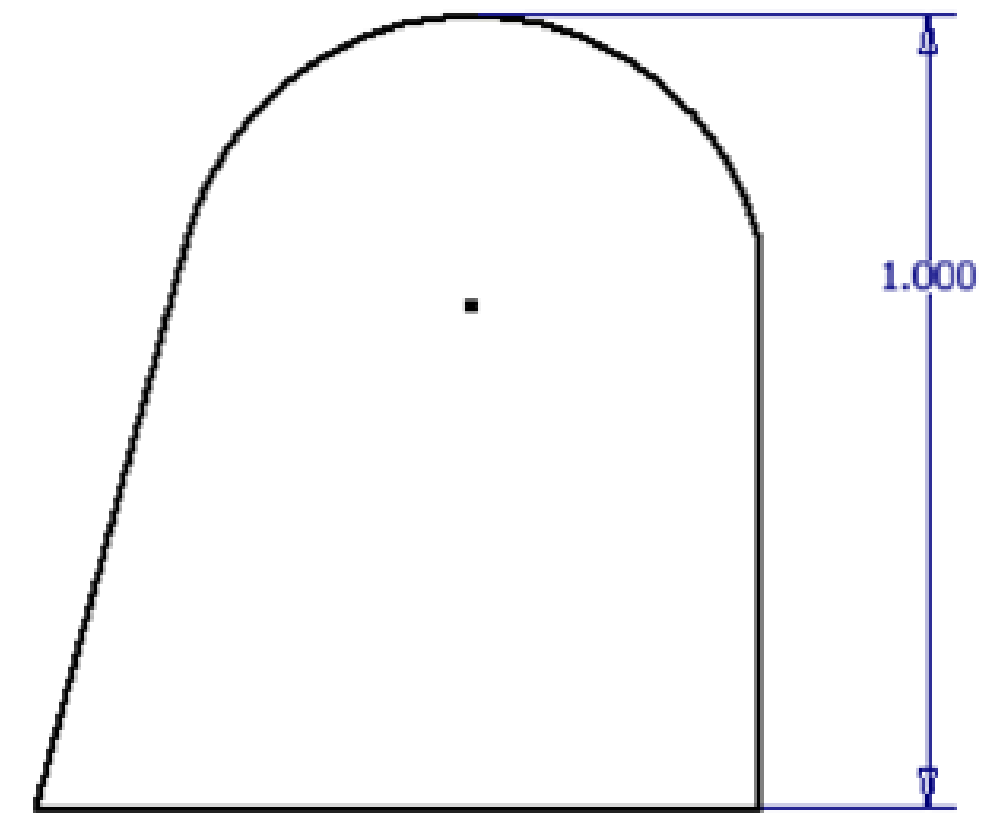


Override Constraints

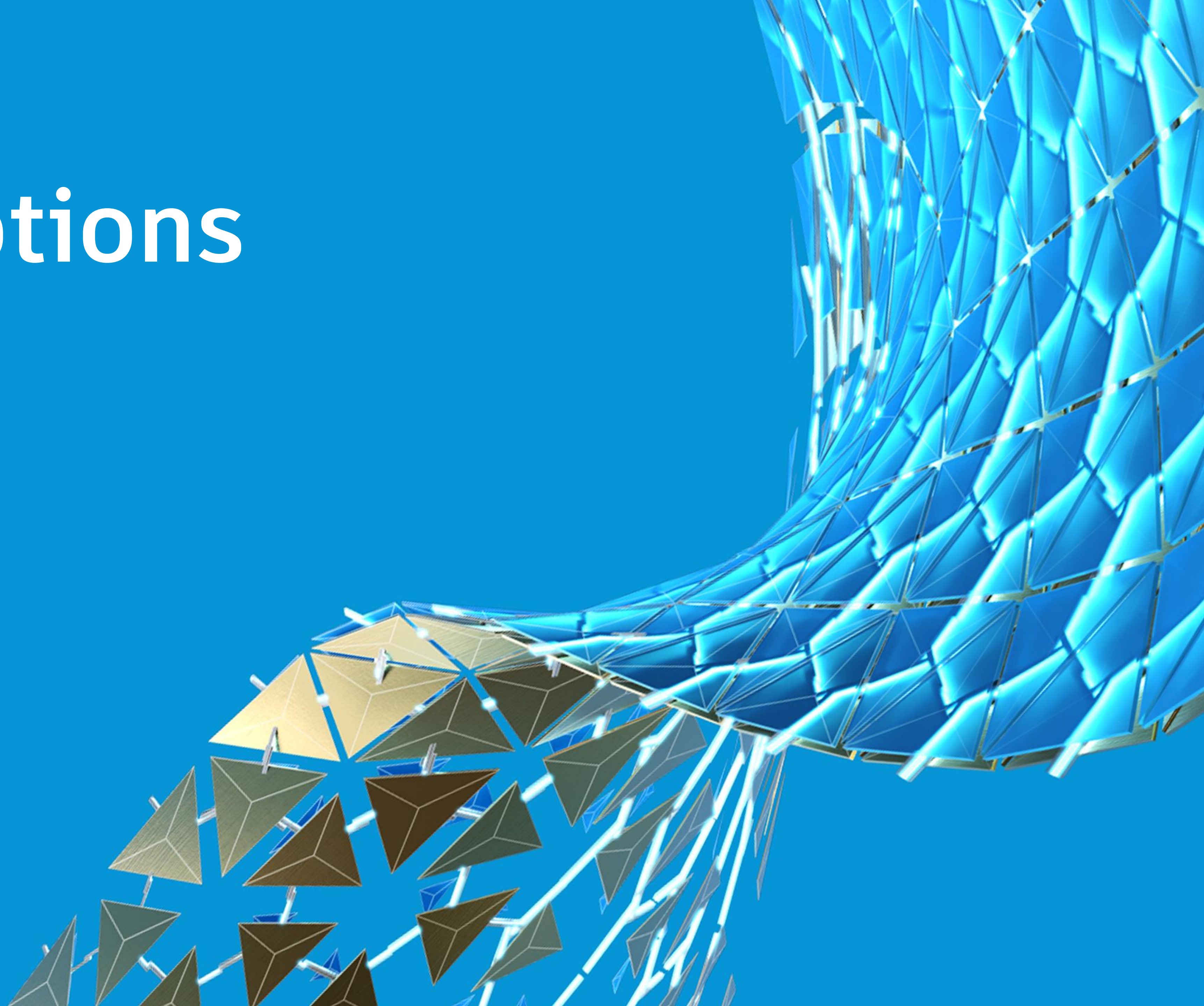
Override constrained geometry with stretch, move, and rotate

Dimension Smartly

- Use Center lines to create Revolved Sketch Dimensions
- Create tangent dimensions (if you know where to pick)
- Build more intelligence by naming your parameters on the fly
- Utilize Dimension Properties (tolerances too!)
- Angular dimensioning can be created via 3-points



Sketch Options



Sketch Options

A must...

- **Autoproject part origin on sketch create**
- **Point alignment**
- **Auto-scale sketch geometries on initial dimension**

A strong consideration...

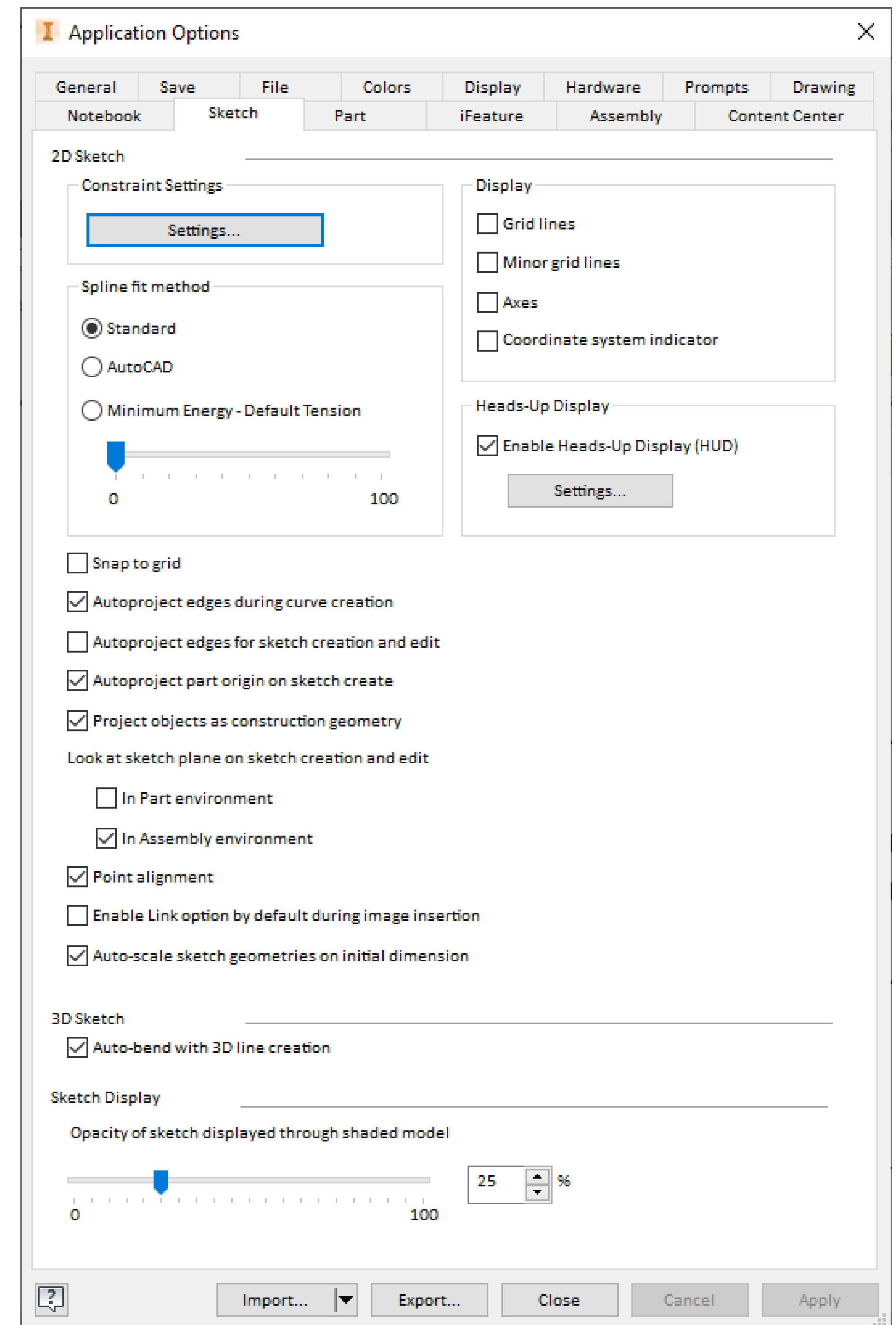
- **Autoproject edges during curve creation**

Depends on the situation...

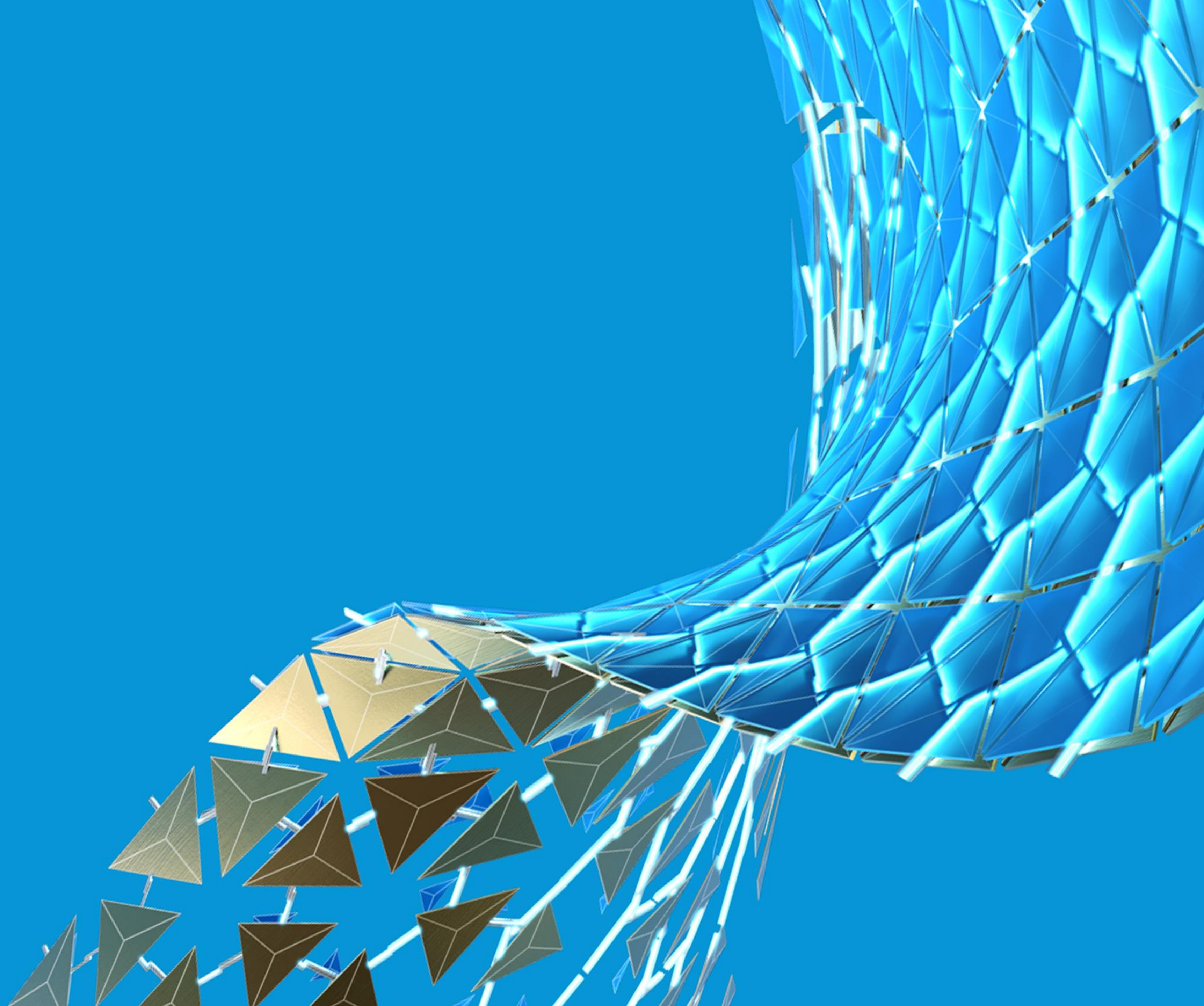
- **Project objects as construction geometry**

Love it!

- **Sketch Display Opacity**



Drawings



Sketches in Drawings

IMPORTANT

Sketches within drawings are very important

Sketches serve as key components for certain views like sections

Additionally, sketches are useful to add drawing elements not defined properly within the model

SELECT THE VIEW FIRST

A key step to creating sketches within the drawing, is first selecting the view

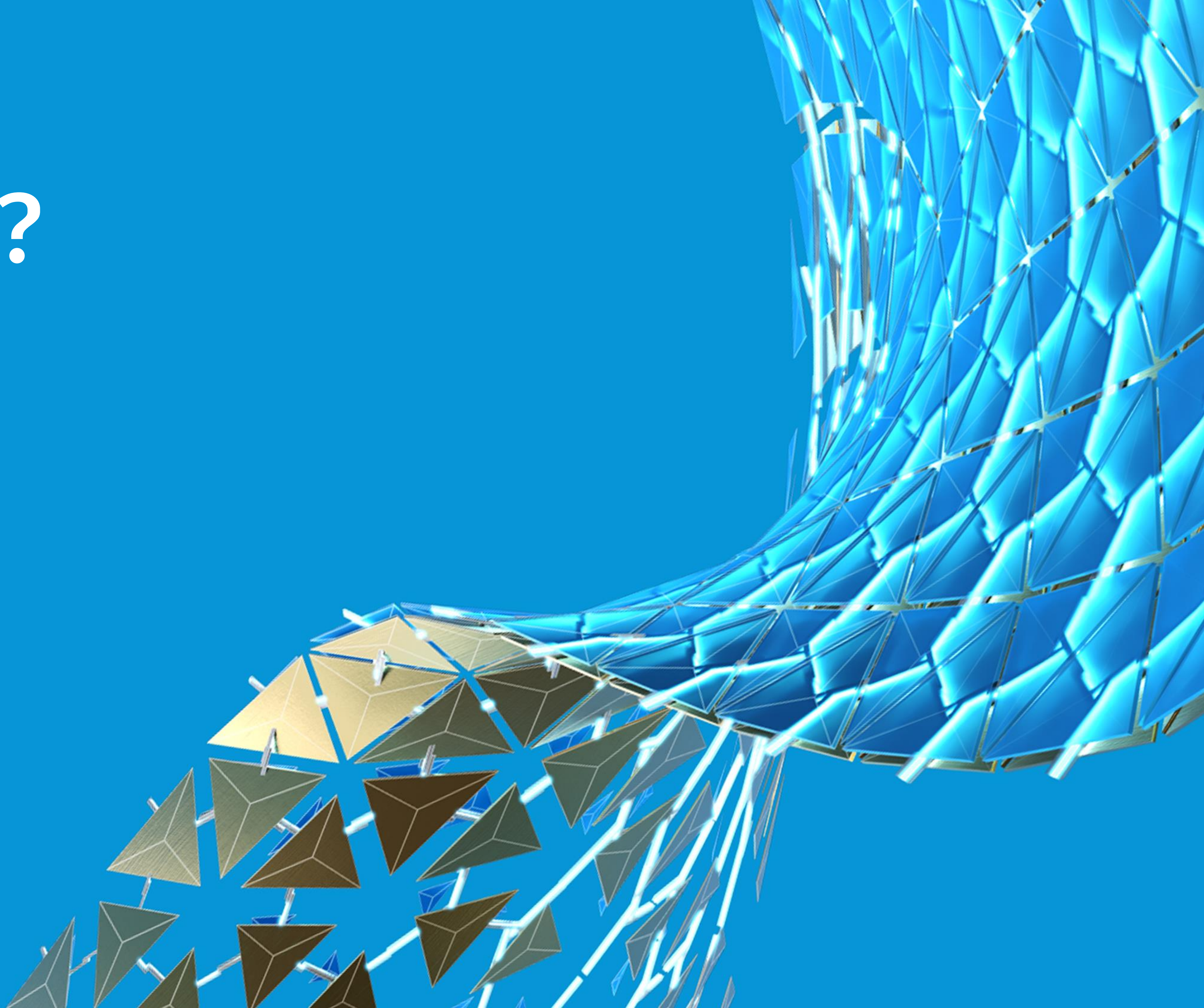
SKETCHED SYMBOLS

Sketches define custom borders, title blocks, and the symbols you insert

PROJECT GEOMETRY

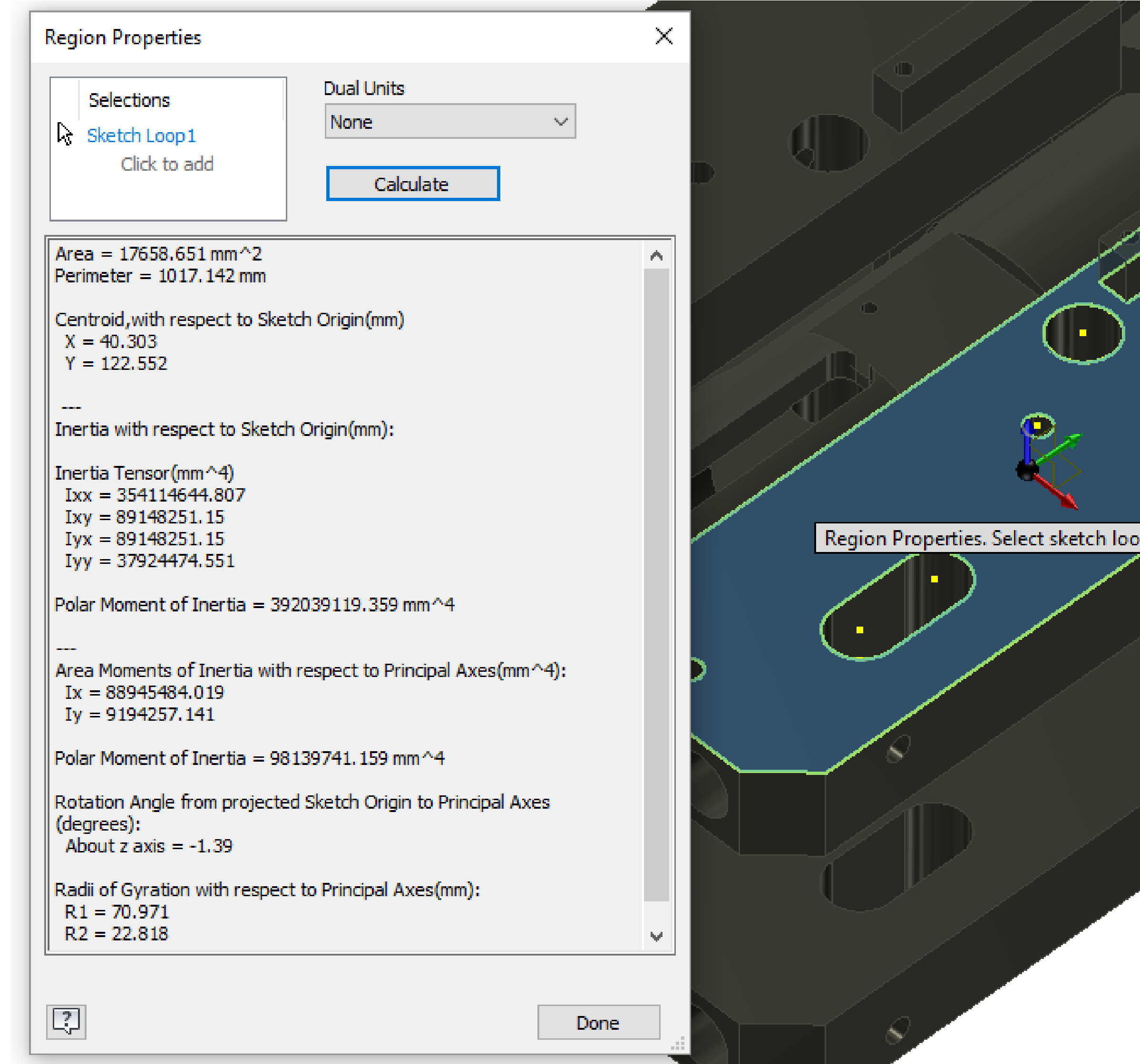
Just like within the model, use Project Geometry to copy edges from the view for use in your sketch

What Else?



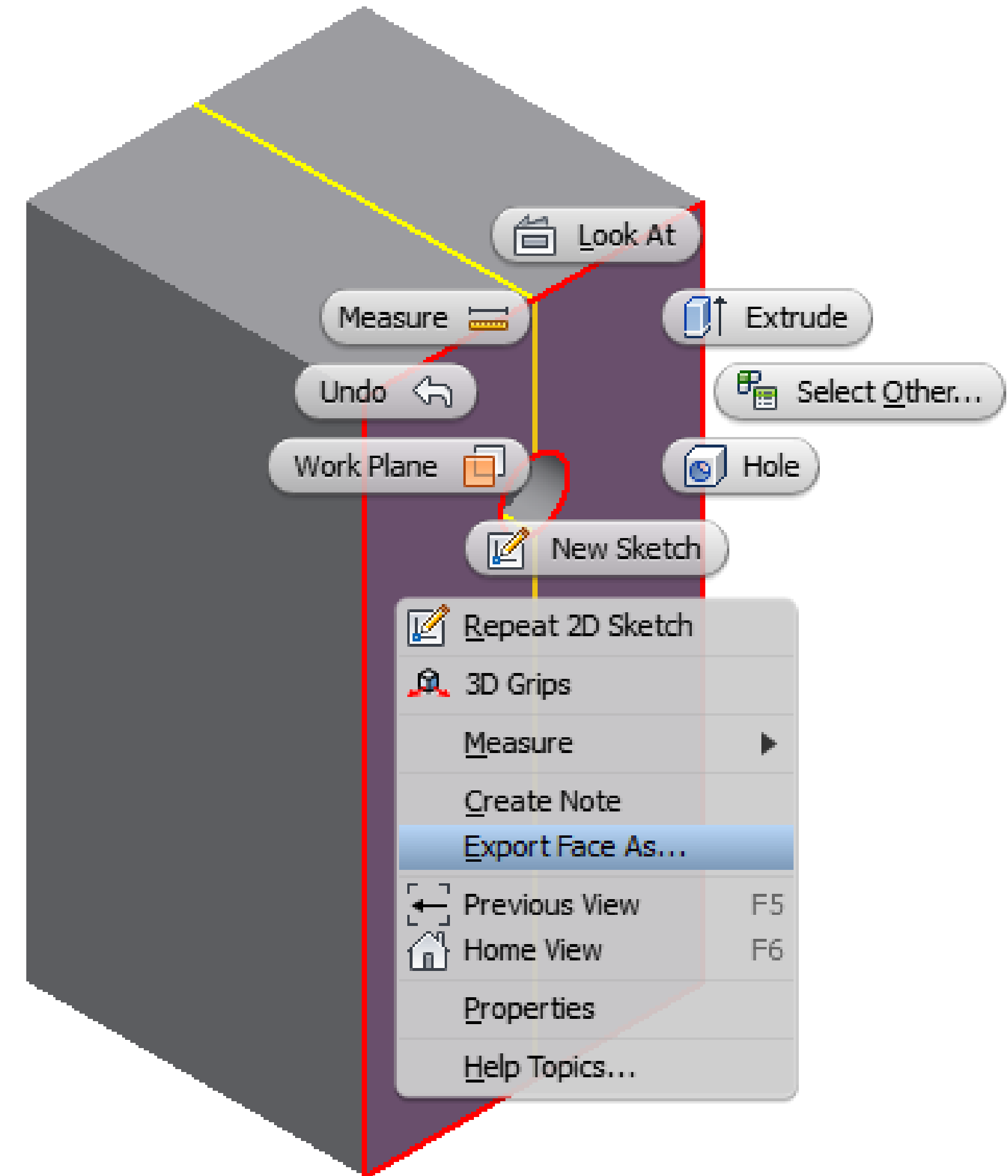
Region Properties

A sketch only tool for the calculation of typical mechanical properties



Export Faces

- Any face in the model or any flat pattern can be exported to DWG or DXF avoiding the need for a drawing



Sketch Blocks

WHAT ARE THEY?

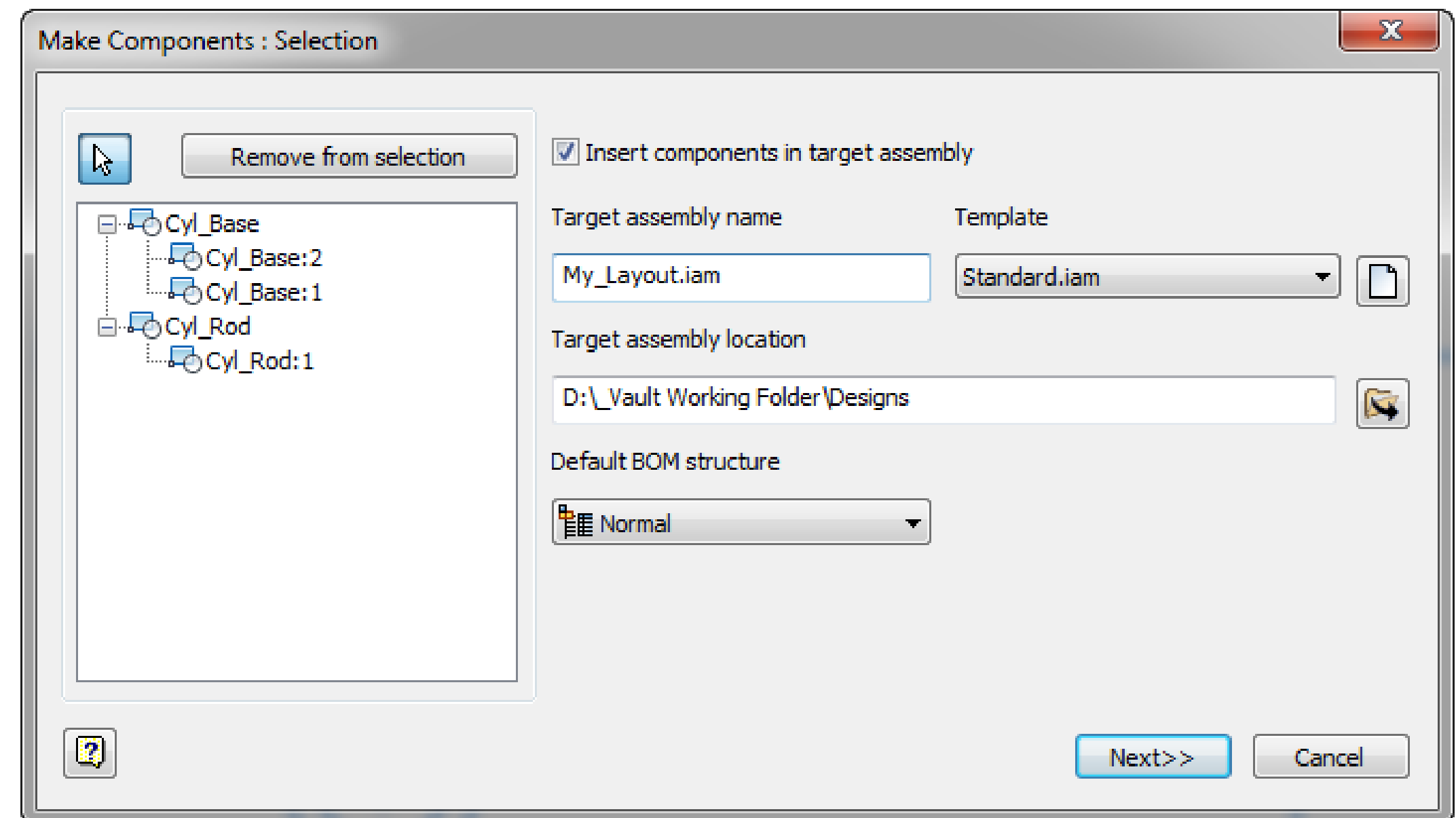
Like AutoCAD Blocks they allow for the grouping of objects into a single rigid-shape

WHY USE THEM?

- Easier to move and rotate portions or the entire sketch
- Great mechanism to test function before fit and form, even using the part sketch in an assembly
- Sketch blocks are the basis for the Layout feature to generate an assembly and parts

Layouts

- A Top-down design tool where the sketch is used as the “root” of the design, with the 2D sketch objects representations of the desired components.
- Use the layout to position components and test design feasibility.
- The layout (with sketch blocks) are derived into part and assembly models





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