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### Module 10: Introduction to Fusion 360 Part II

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# Intro To Fusion 360 Part 2



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# Sketch Palette

The Sketch Palette is displayed when a sketch is active.

All 2D geometry can be moved or modified with dimensions or constraints.

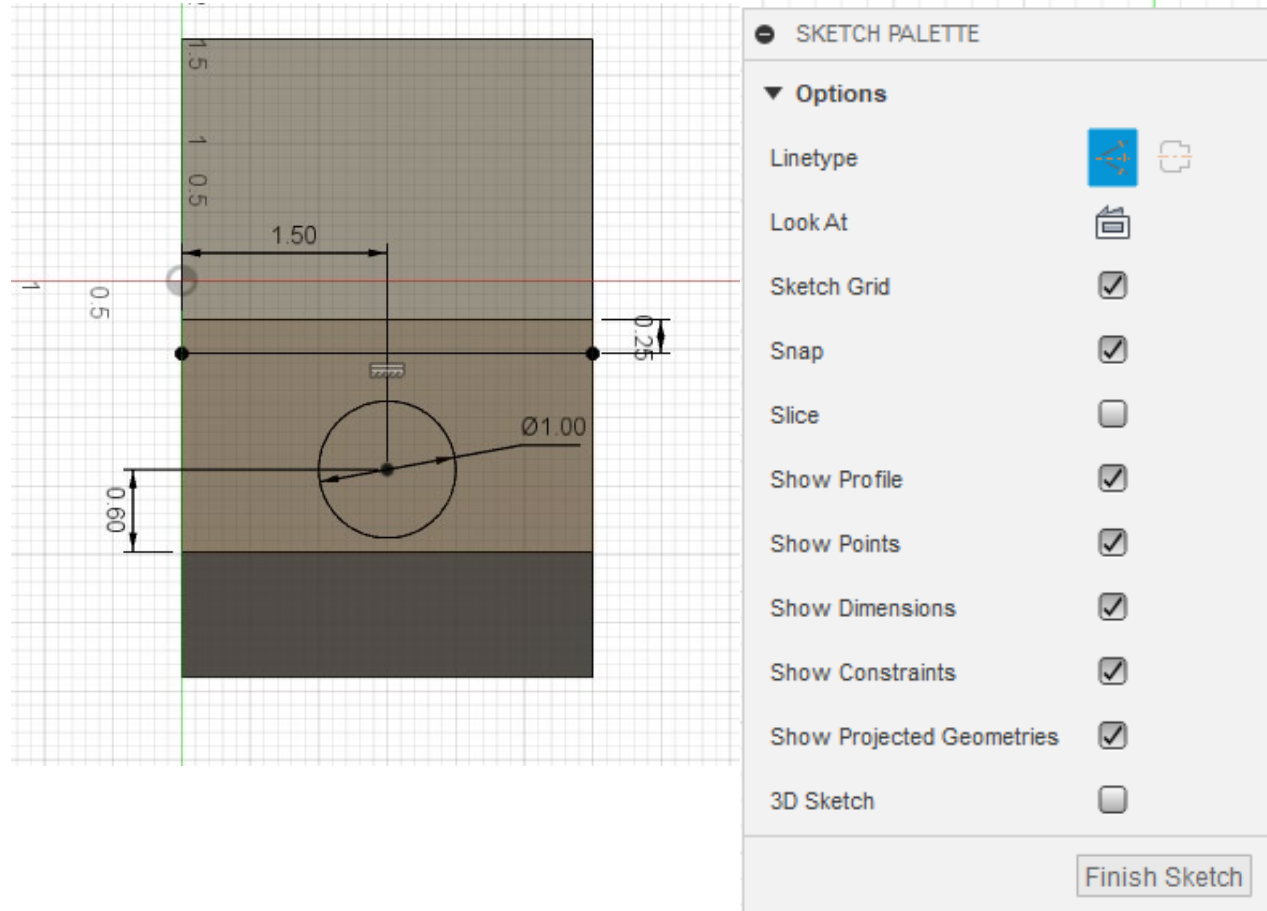
D:  is the dimension quick key.

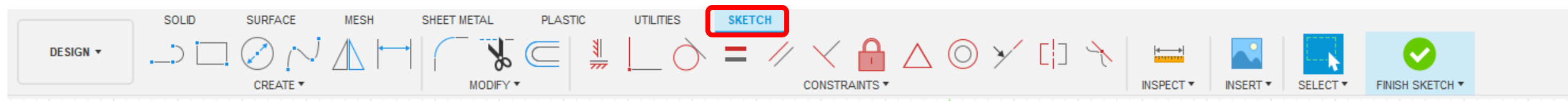
Clicking a line dimensions the length of the line.

Clicking 2 lines dimensions the angle between those lines.

Clicking a circle dimensions a diameter.

Clicking an arc dimensions a radius.





Sketch tab, only visible when sketch is open.

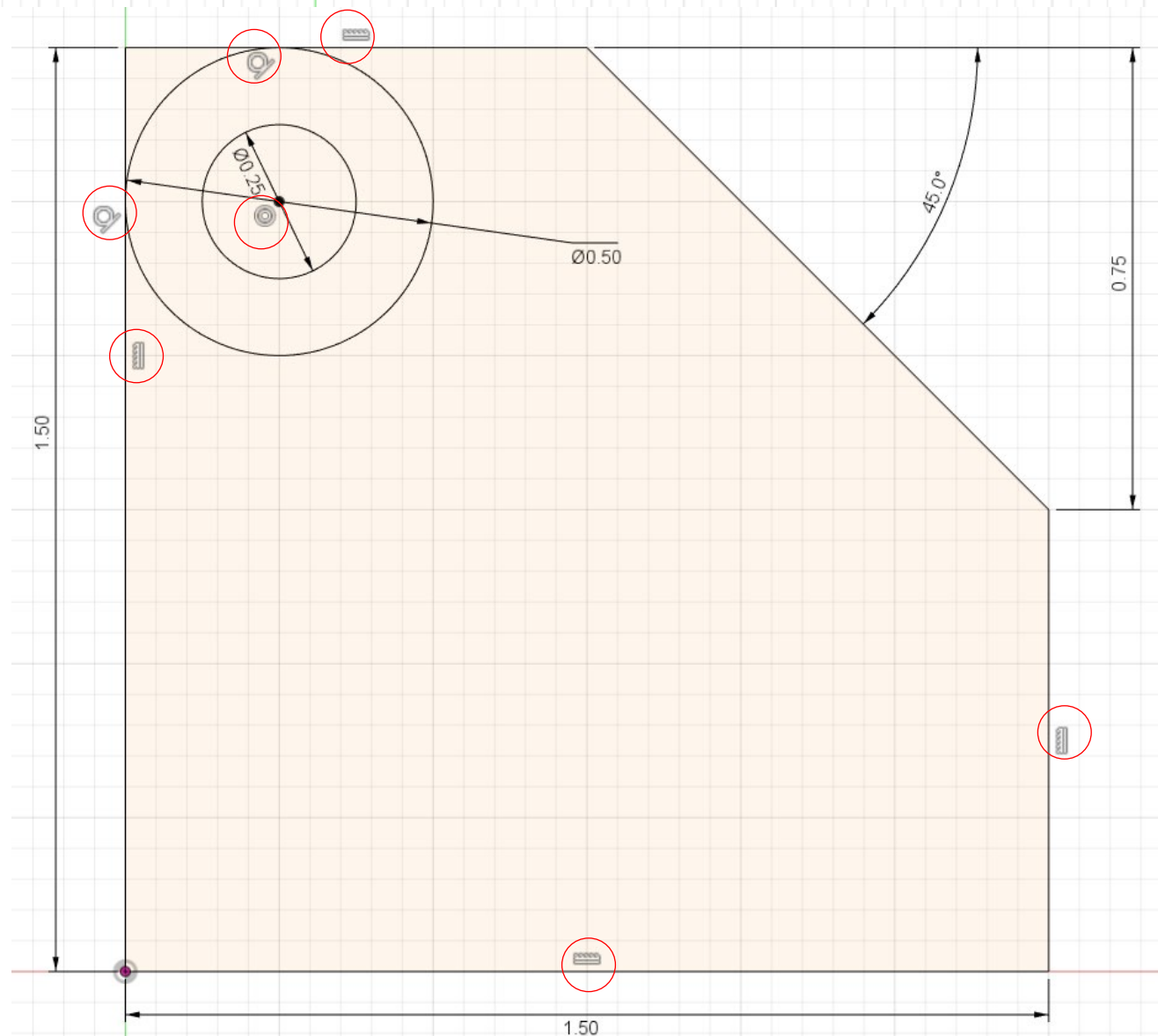
Constraints restrict basic geometrical relationships to force \_\_\_.

A line to be horizontal or vertical.

A circle or arc to be tangent to another line or circle.

Two lines to be parallel to one another.

Two circles to be concentric....etc

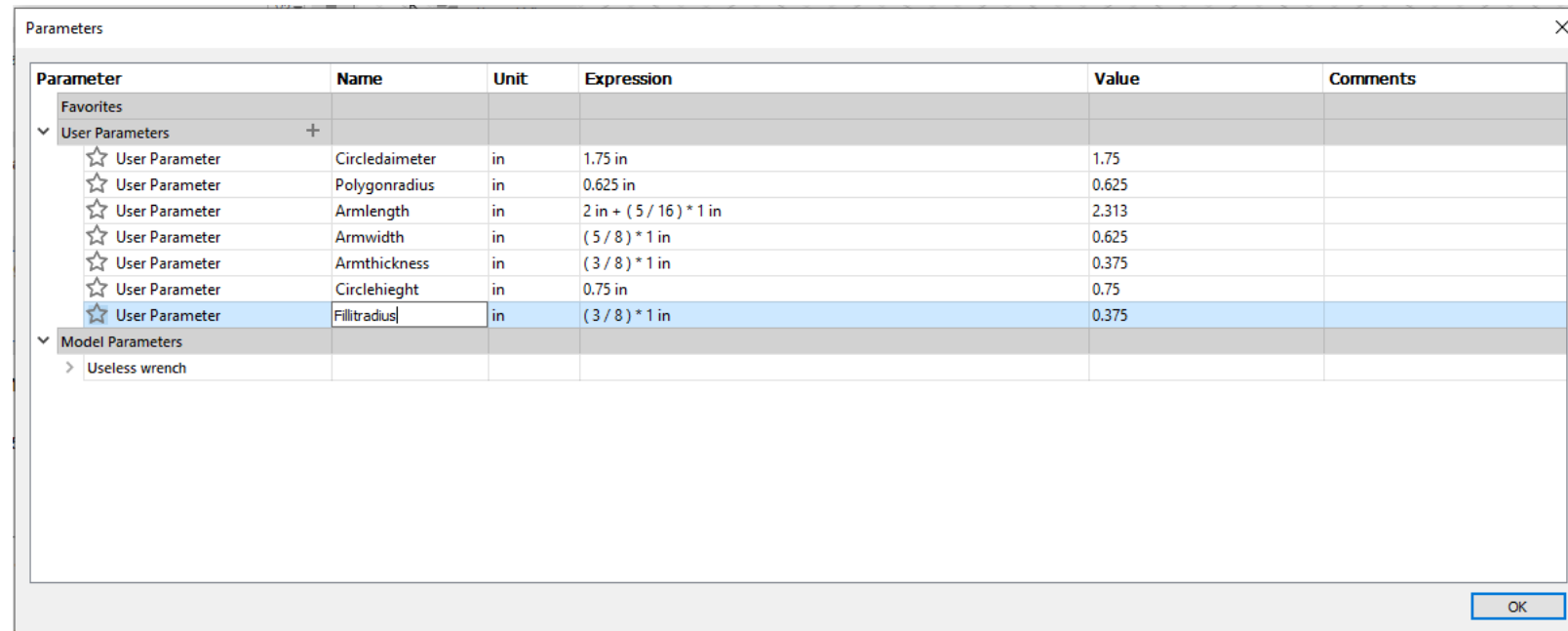


# Modify → fx Change Parameters

All dimensions (2D and 3D) are kept in spreadsheet format.

## Algebraic operators

- + addition
- - subtraction
- % floating point modulo
- \* multiplication
- / division
- ^ power
- ( expression delimiter
- ) expression delimiter
- ; delimiter for multiargument functions



Parameter	Name	Unit	Expression	Value	Comments
Favorites					
User Parameters +					
☆ User Parameter	Circlediameter	in	1.75 in	1.75	
☆ User Parameter	Polygonradius	in	0.625 in	0.625	
☆ User Parameter	Armlength	in	$2 \text{ in} + (5/16) * 1 \text{ in}$	2.313	
☆ User Parameter	Armwidth	in	$(5/8) * 1 \text{ in}$	0.625	
☆ User Parameter	Armthickness	in	$(3/8) * 1 \text{ in}$	0.375	
☆ User Parameter	Circleheight	in	0.75 in	0.75	
☆ User Parameter	Fillradius	in	$(3/8) * 1 \text{ in}$	0.375	
Model Parameters					
>	Useless wrench				

# Modify → fx Change Parameters

Each time you create a dimension  
Fusion names it starting with d1.

Any dimension and its values can be  
referenced to another  
dimension.

Example:

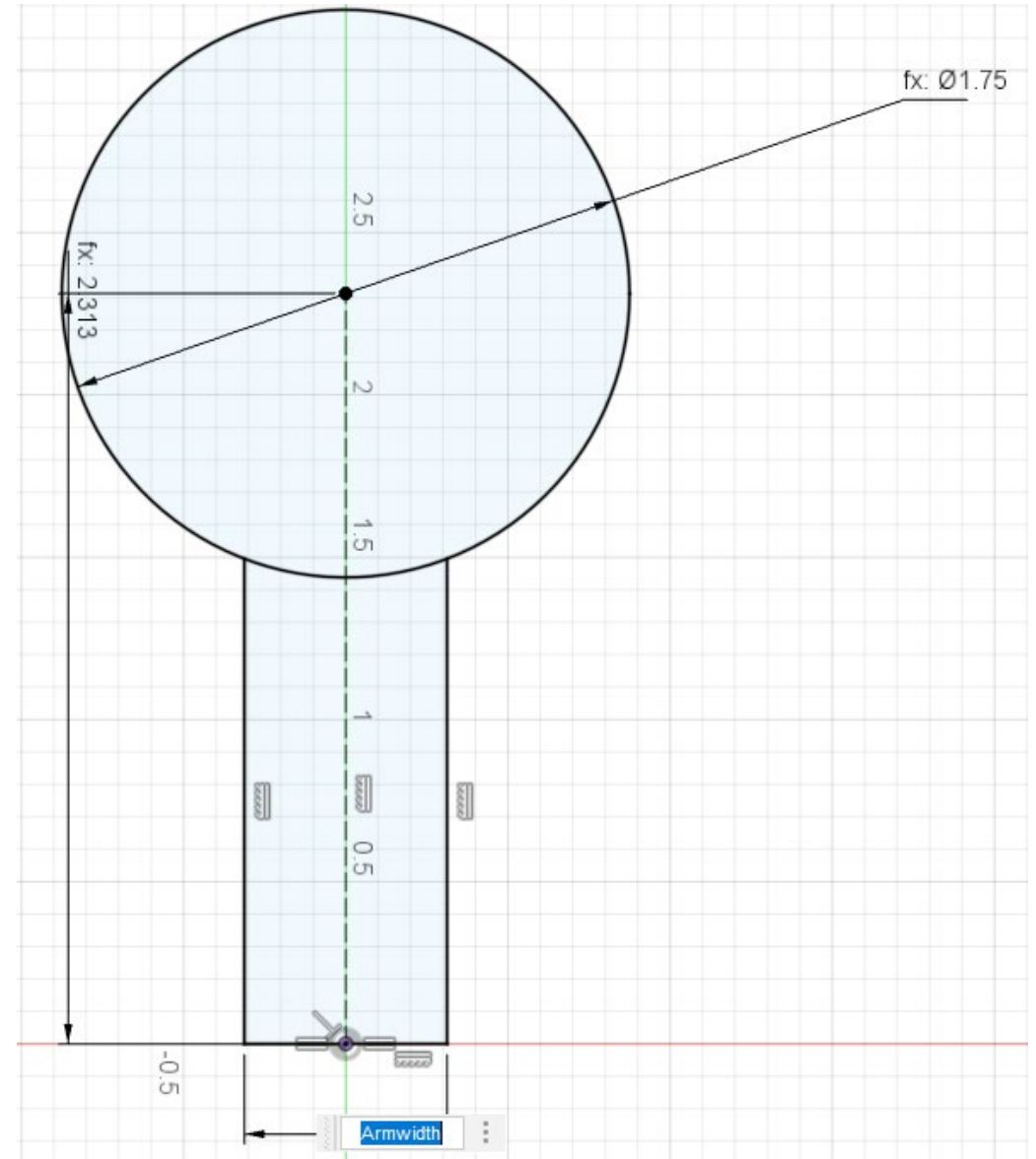
d1: 1.5

d2: 3

d3: d1+d2

Changing Either d1 or d2 will  
change d3.

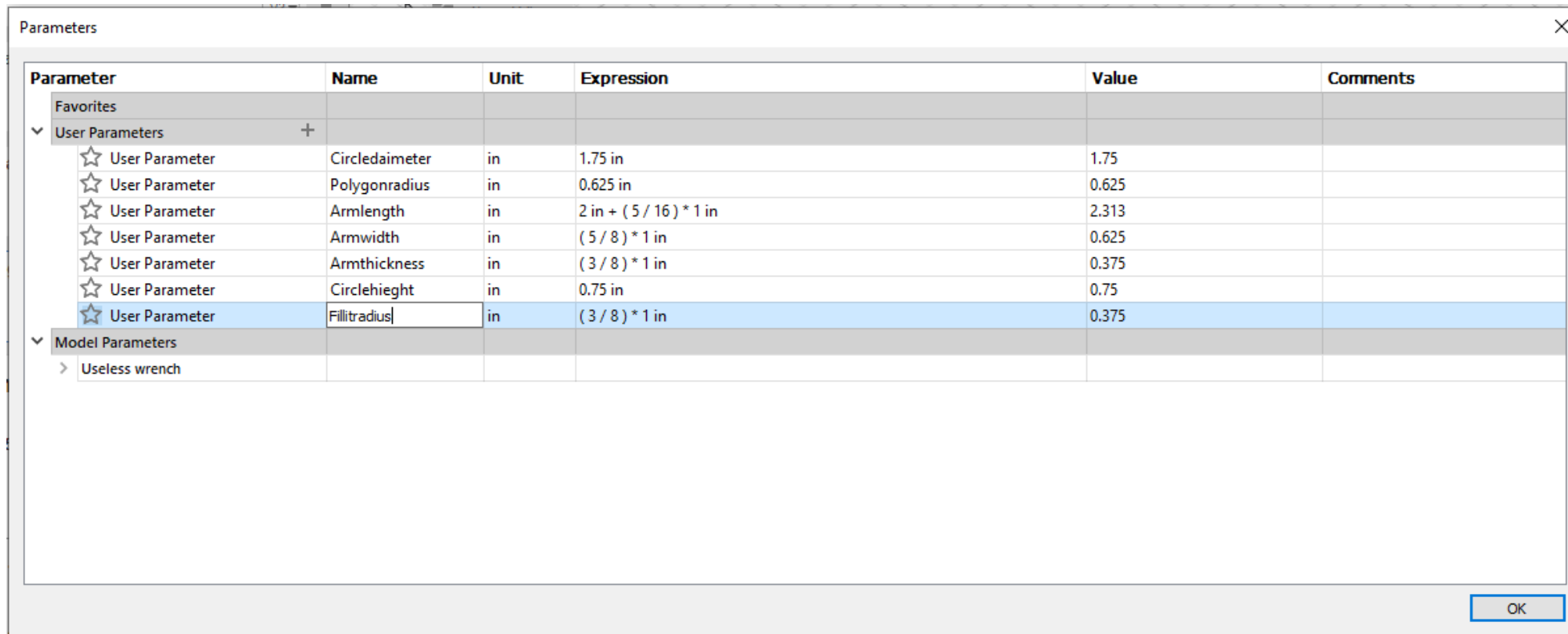
This ability is so powerful the  
circumference of a circle can  
be set to equal the length of a  
line!



# Modify → fx Change Parameters

Meaningfully name your dimensions for easy reference.

Any dimension changed here will automatically update on your model.



Parameter	Name	Unit	Expression	Value	Comments
Favorites					
▼ User Parameters					
☆ User Parameter	Circlediameter	in	1.75 in	1.75	
☆ User Parameter	Polygonradius	in	0.625 in	0.625	
☆ User Parameter	Armlength	in	$2 \text{ in} + (5 / 16) * 1 \text{ in}$	2.313	
☆ User Parameter	Armwidth	in	$(5 / 8) * 1 \text{ in}$	0.625	
☆ User Parameter	Armthickness	in	$(3 / 8) * 1 \text{ in}$	0.375	
☆ User Parameter	Circlehieght	in	0.75 in	0.75	
☆ User Parameter	Fillradius	in	$(3 / 8) * 1 \text{ in}$	0.375	
▼ Model Parameters					
> Useless wrench					

OK

# Sketching Best Practices

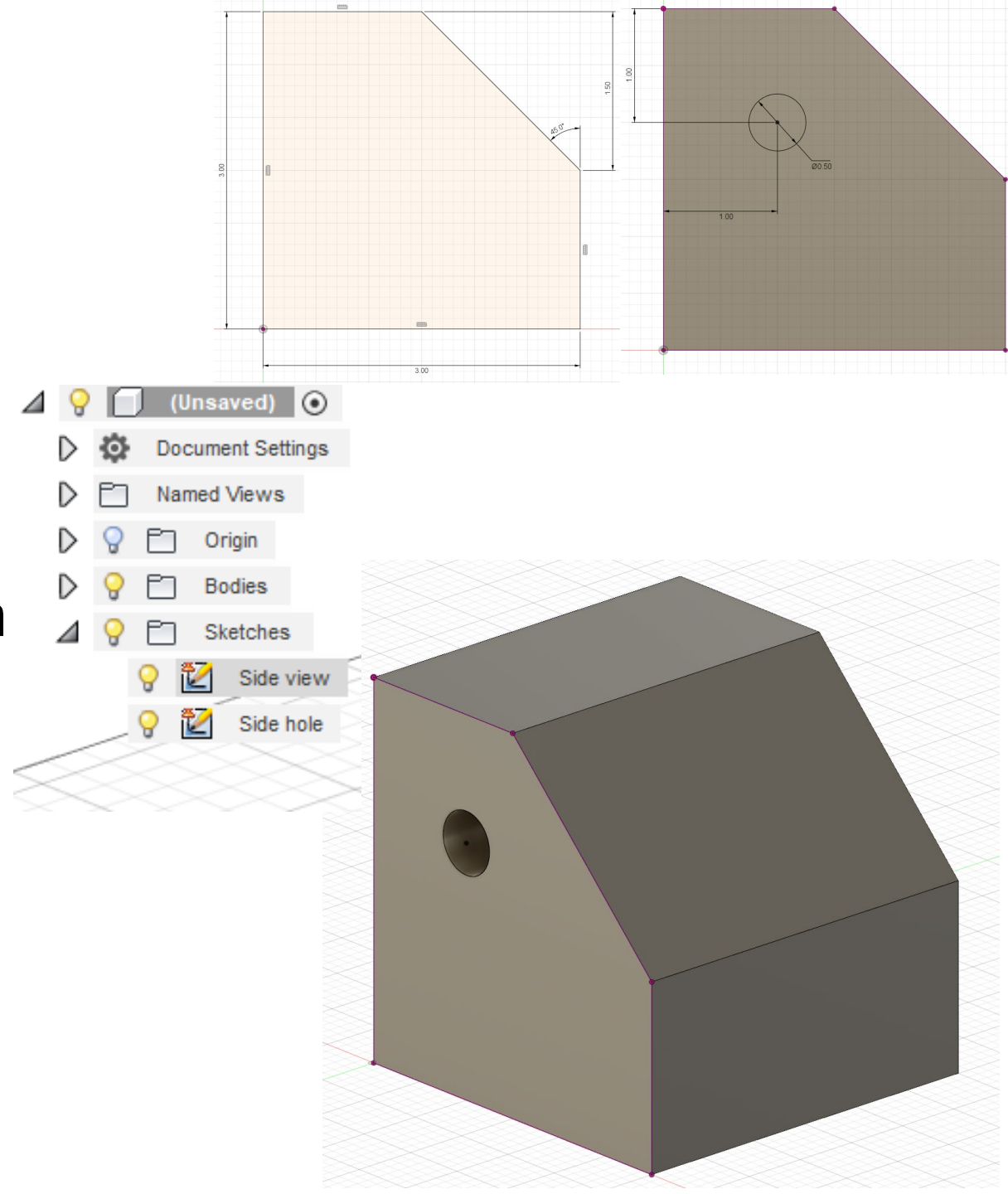
Name each sketch the feature it will be used to create.

Separate important features onto different sketches.

Simple sketches are much easier to constrain.

By keeping the data on each sketch minimal and well labeled it is easy to locate and edit values later.

- Base your sketches on the origin of a plane





# Sketching Best Practices

Rough out a very basic shape.

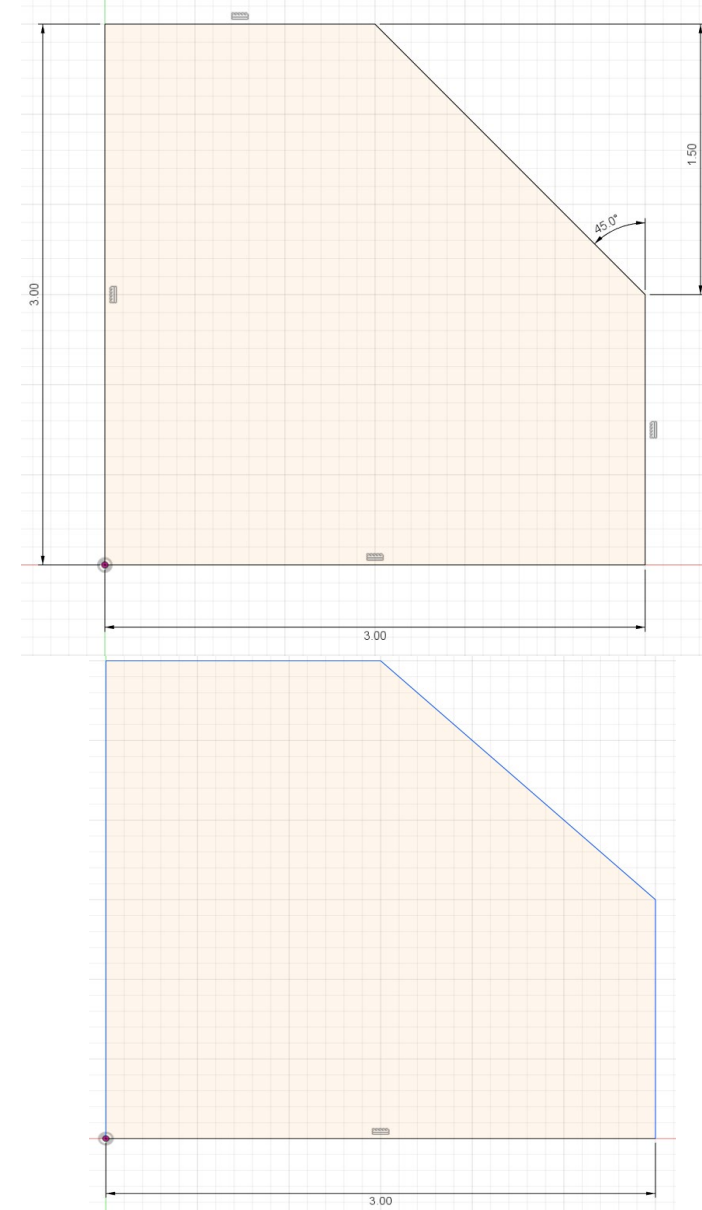
Dimension and Constrain your data as appropriate.

Relate dimensions to one another when possible.

IE: If  $d_3$  is equal to  $d_2$  then

Instead of dimensioning both the same value, set  $d_3: d_2$ .

This saves time and effort if a change is needed later.



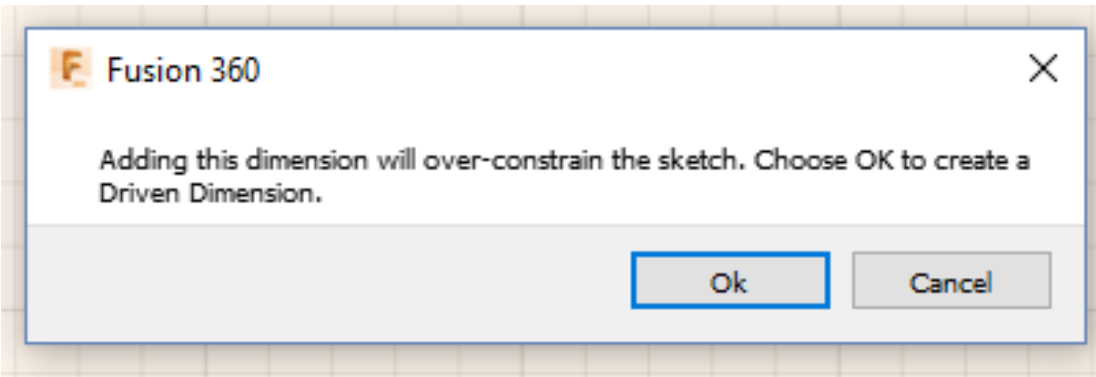
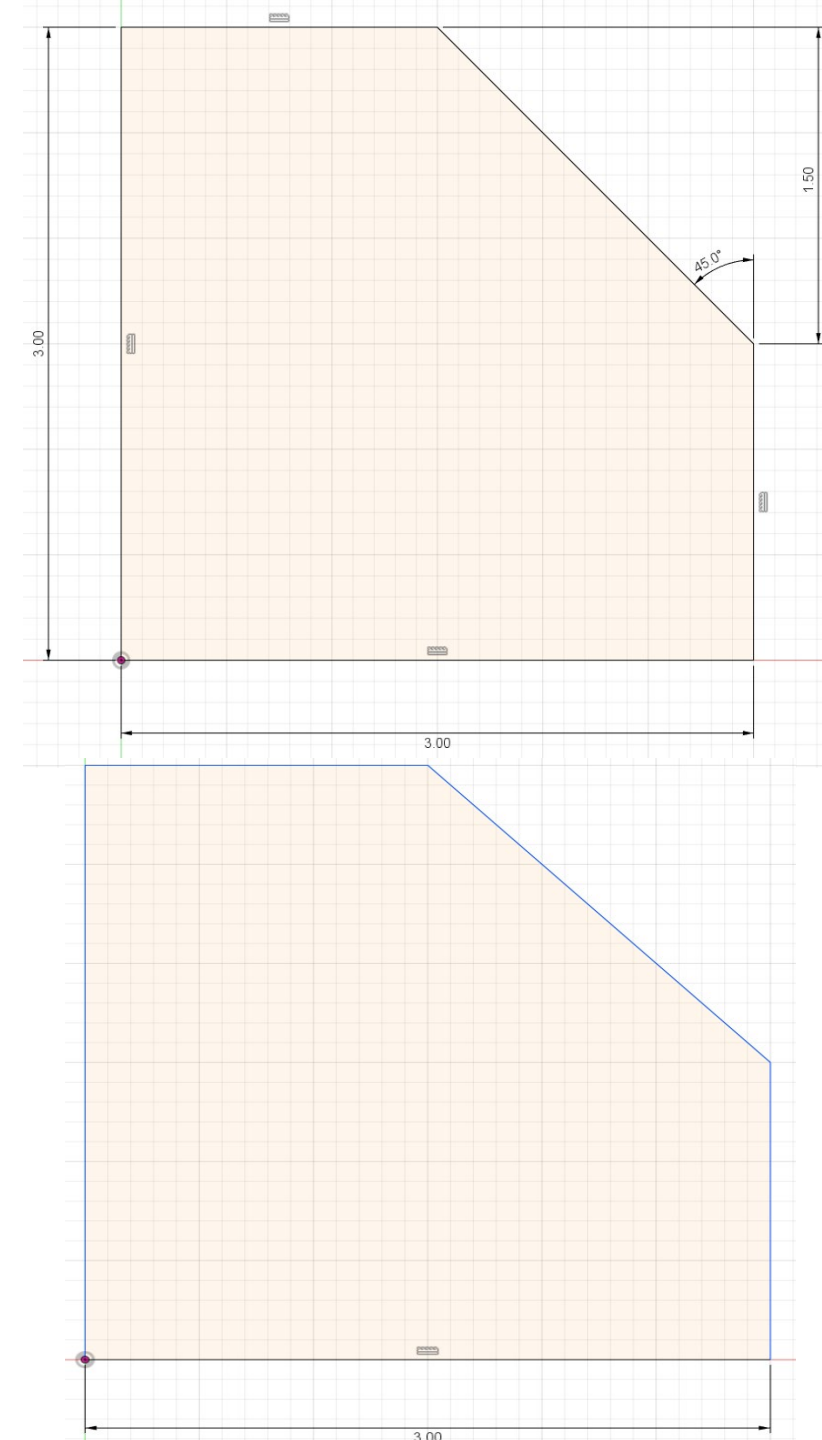
# Sketching Best Practices

Fully constrain each sketch

Black geometry is fully constrained.

Blue geometry is either unconstrained or only partially constrained.

Attempting to further constrain fully constrained geometry will result in an over-constrain error.

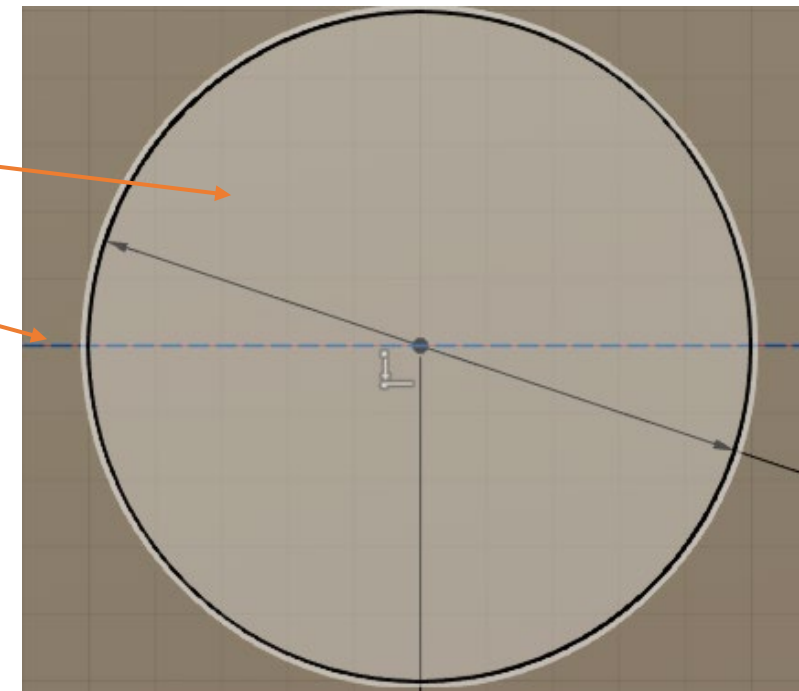
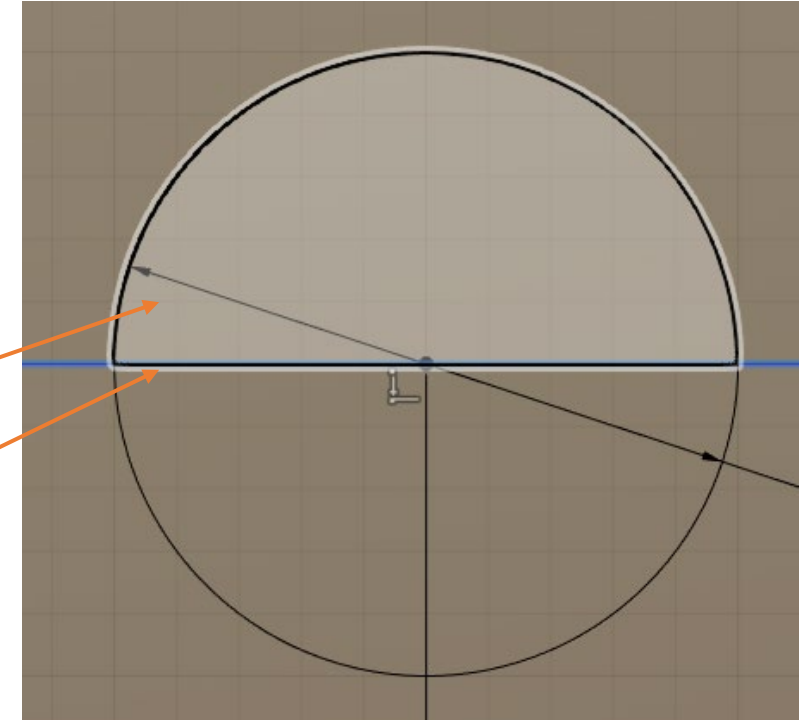


# Sketching Best Practices

Make use of construction lines when useful.

When closing off a section of an object, normal lines make enclosed areas selectable regions. When that is not desired, Changing to a Construction line will leave the object in one piece.

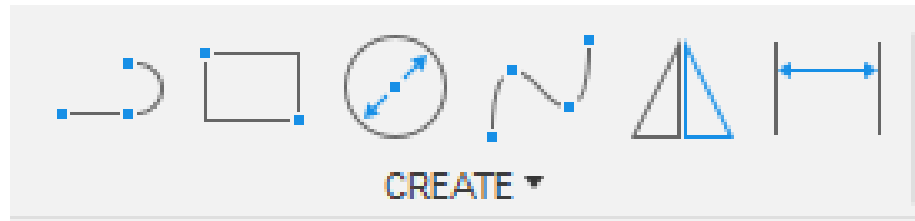
Any line can become a construction line by right clicking it and selecting “Make normal / construction” from the dropdown menu.



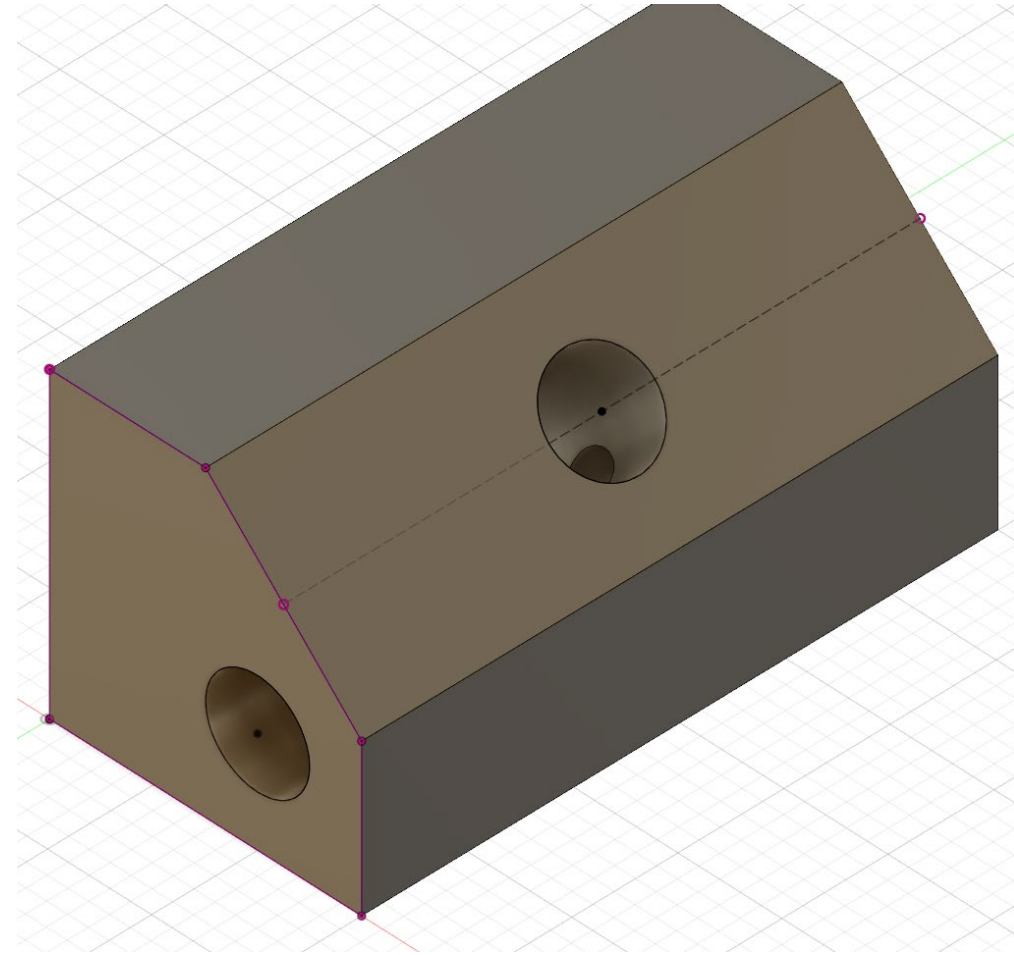
# Bodies

Bodies are solid 3D structures that are created from 2D data or other specialized tools.

Created with tools from the Create menu.

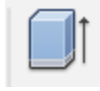


Modified with tools from the Modify Menu.



# Tools

Extrude



Quick Key: E

Create → Extrude

Pulls a 2D shape into a 3D object of designated length.

Options:

Start.

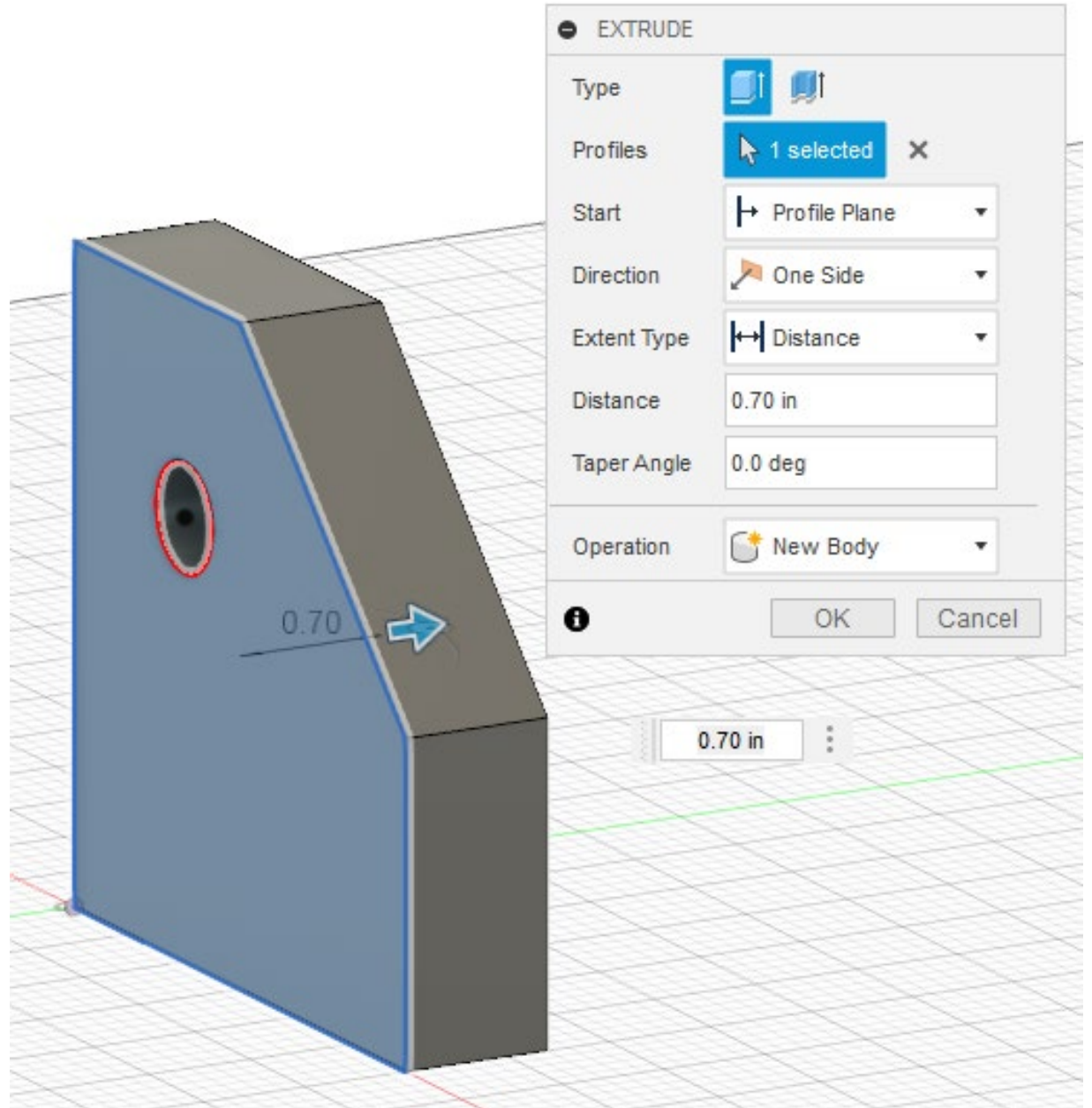
Direction.

Extent.

Distance.

Taper Angle.

Operation.



# Tools

Extrude



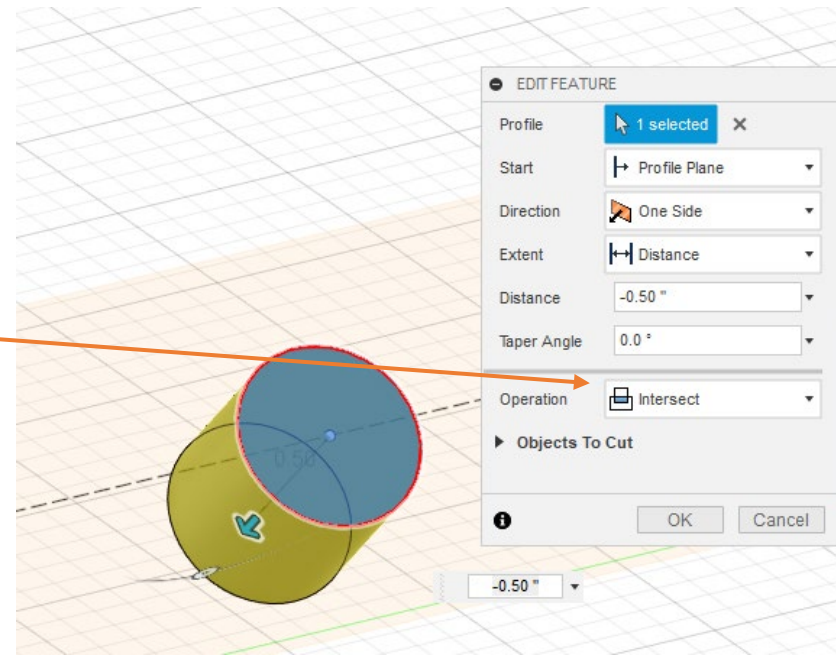
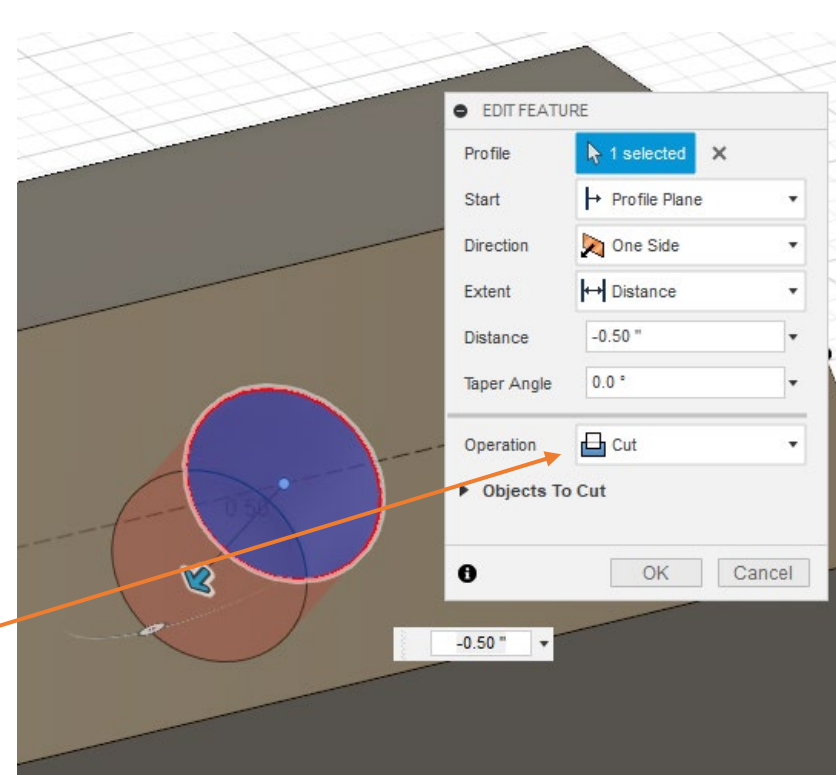
Extrude can be used to \_\_\_\_\_:

Make a new body.

Join existing bodies.

Cut existing bodies.

Intersect existing bodies.





# Tools

Fillet



Quick Key: F

Modify → Fillet

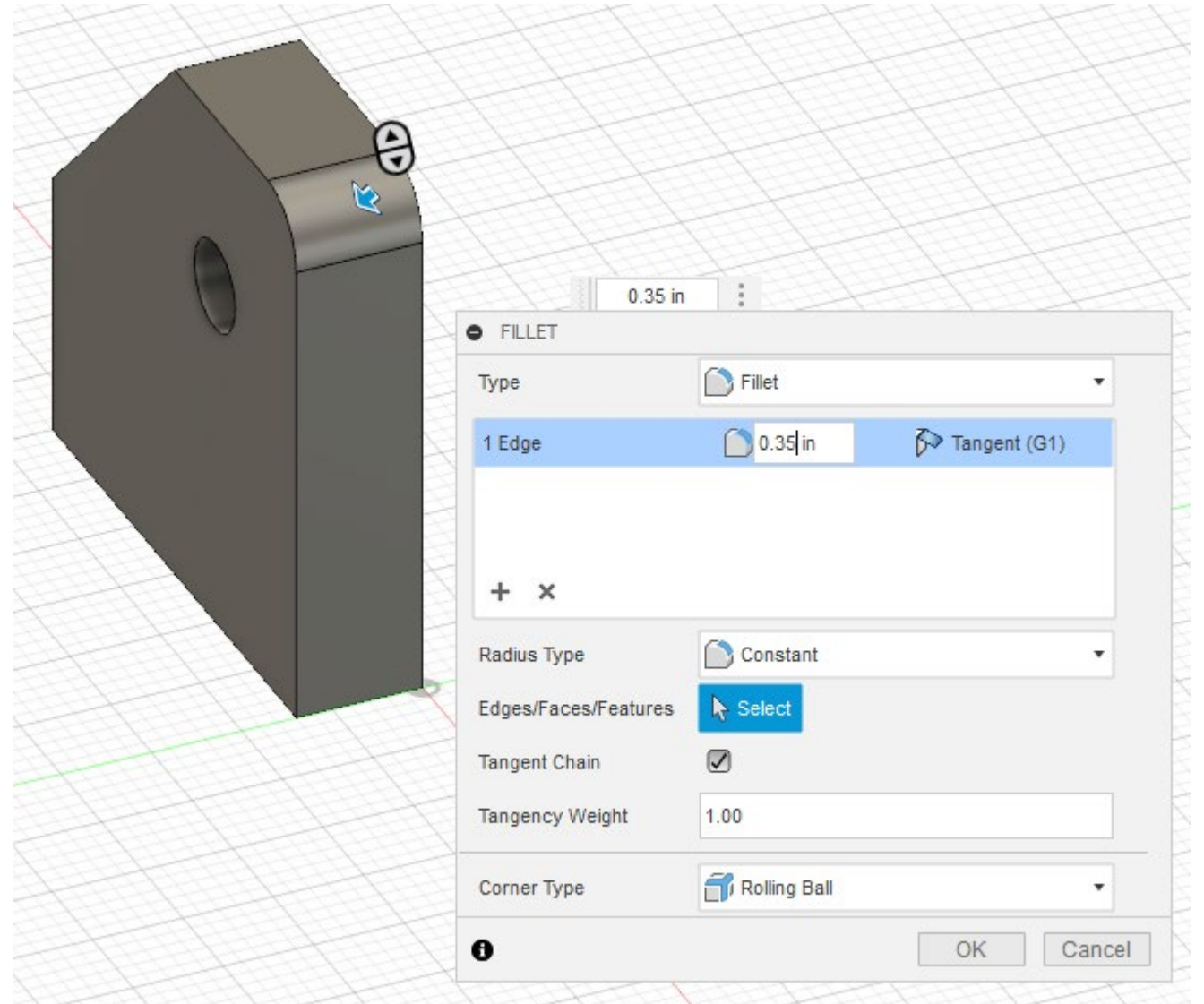
Fillet a 3D edge

Constant Radius

Chord Length

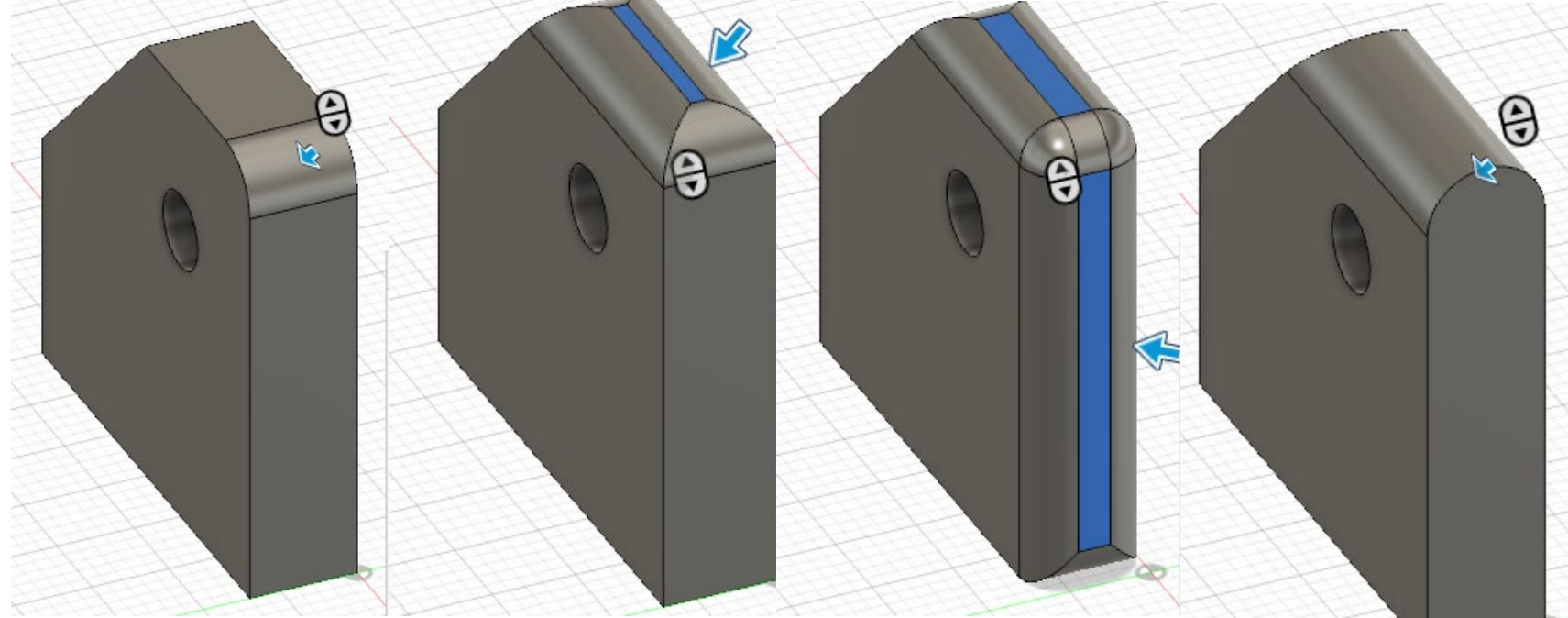
Variable Radius

How edges and faces are selected will allow easy manipulation of an object.

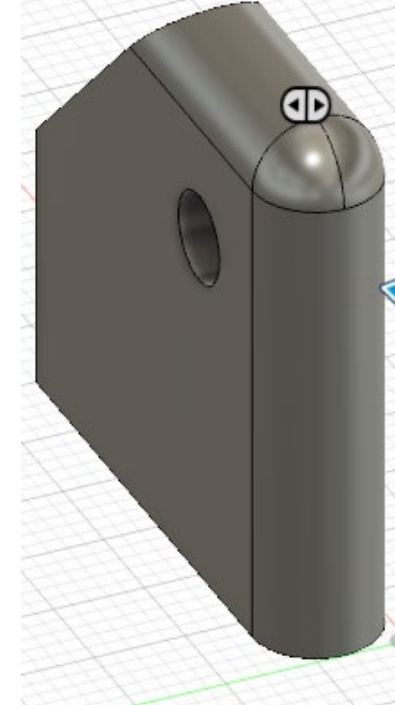
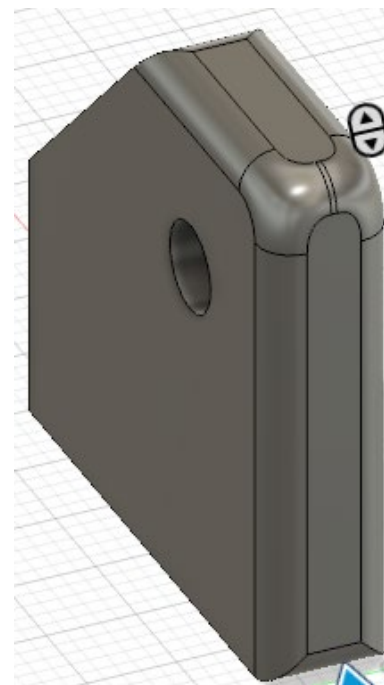


Fusion 3-D can easily manipulate geometry in 3-D using Fillets.

Fillets should never be applied in 2-D, it just makes the object more difficult to constrain.



These are the identical object with different Fillets applied.





# Tools

Chamfer



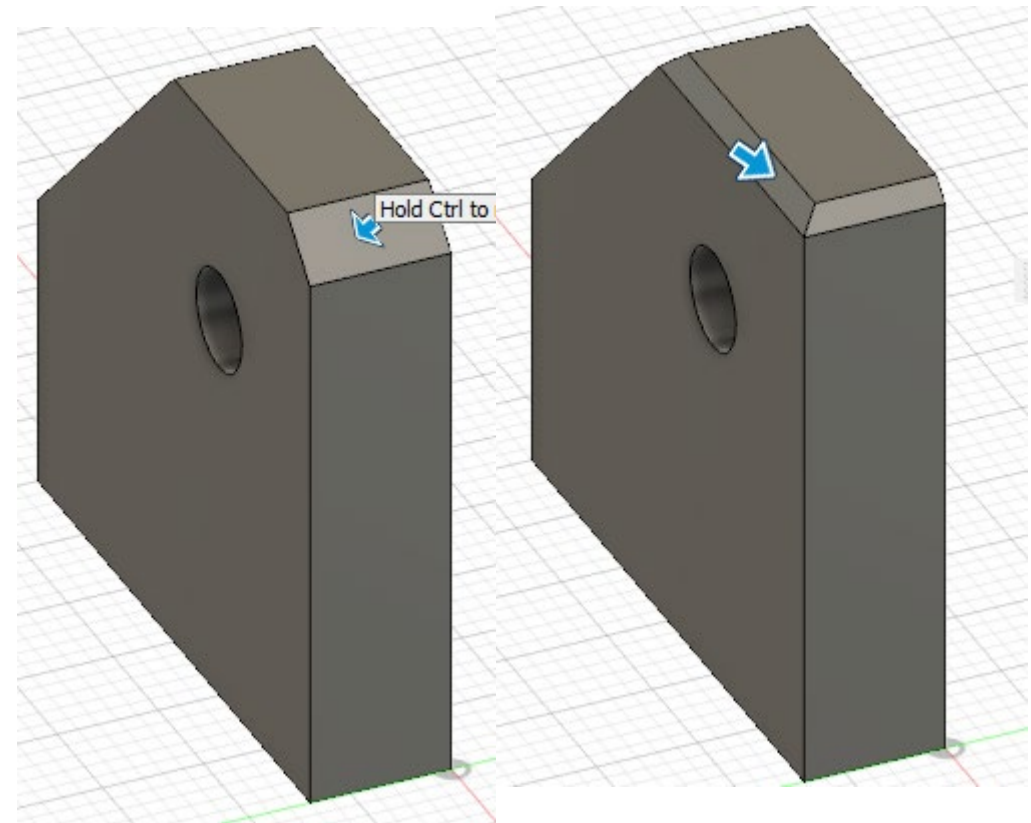
Modify → Chamfer

Chamfers a 3D edge.

Equal Distance-offsets an equal distance from each plane.

Two Distances-each plane is assigned an offset distance.

Distance and Angle-a value must be assigned to each. Tab between them.



# Tools

Fillets and Chamfers are incredibly powerful tools that allow easy modification of parts and the manipulation of the values in real time so the parts geometry can be viewed prior to accepting it.

# Timeline

All parametric features are captured on the Timeline as design history. Any feature can be named or modified or re-opened from the timeline. The timeline adds each feature as you create it. When a correction is needed the timeline allows you take the drawing back to before the unwanted feature was created.

Examples of features:

Fillet

Sketch

Extrude

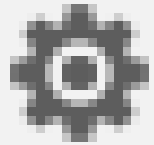
...etc



# Timeline

Understanding the Timeline will significantly improve your drawing abilities.

The timeline can be disabled by turning off capture design history. It will no longer behave parametrically.




Options menu is in the lower right-hand corner of the screen.

Features then behave similar to layers.

Capturing design history is required in this class due to the nature of the tools we are covering.

**DO NOT turn off design history** on any assignment you intend to turn in.

Major points will be deducted.

 Do not capture Design History

Component Color Swatch

Hide all inactive features

# Best Practices:

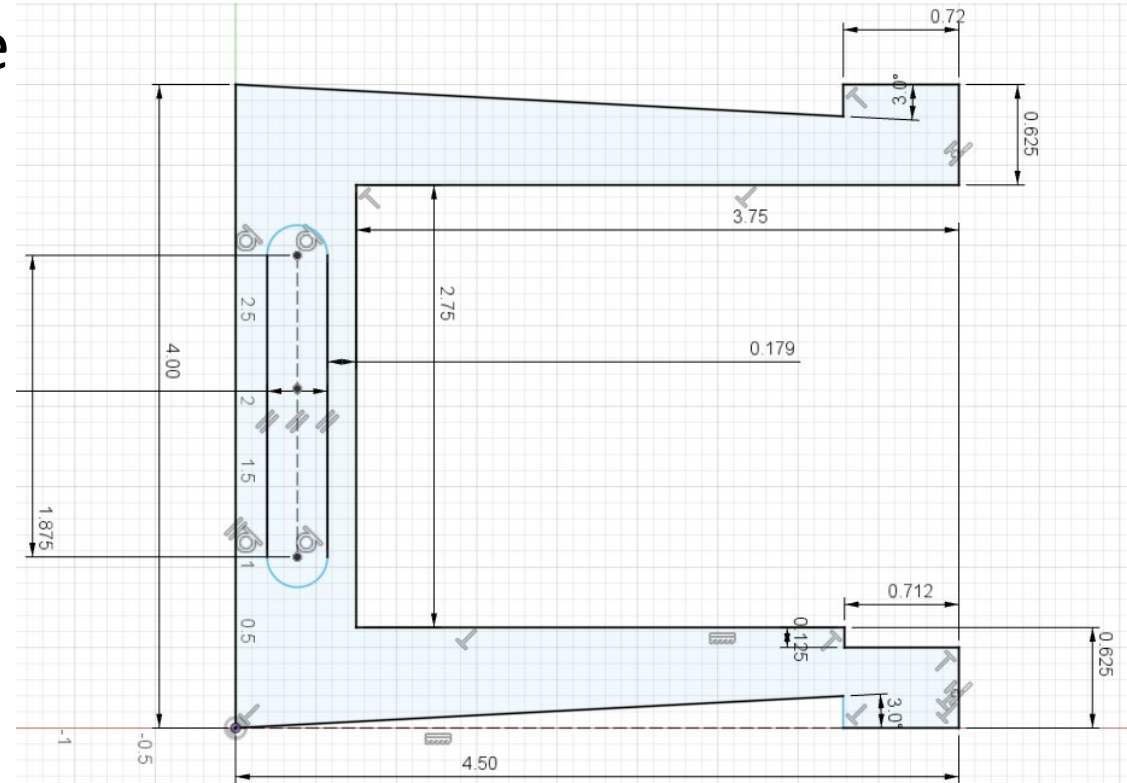
Simple 2-D geometry is easier to work with.

Only create aesthetic features towards the end of your timeline in 3-D.

Avoid 2-D fillets and Chamfers unless absolutely necessary.

2-D geometry can be difficult to constrain, fillets and chamfers can make a difficult to constrain object much more challenging.

3D chamfers and fillets can make multiple objects from the same part, depending on how they are applied.



Helpful website:

<http://help.autodesk.com/view/fusion360/ENU/>