

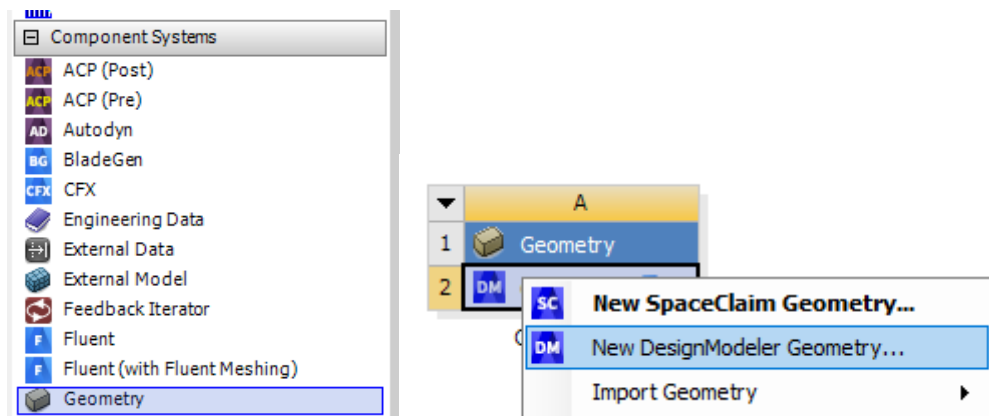
ENGSCI 344 Tutorial 2: Geometry

Objective:

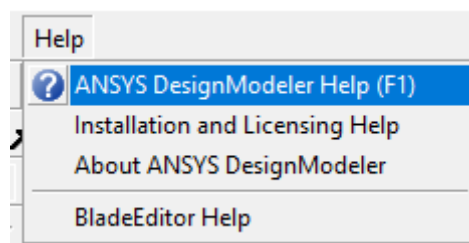
A triangular plate needs to be created with the dimensions specified in the document. Gain experience in basics of geometry generation and import/modification.

Part 1: Geometry Generation

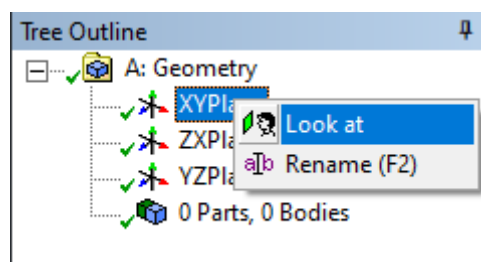
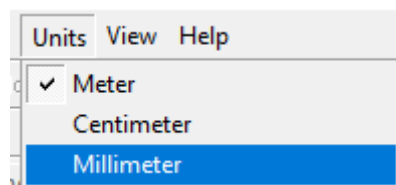
1. Open ANSYS Workbench and start Design Modeller. This can be done by double-clicking on the Geometry tab from Component Systems in the toolbox window.



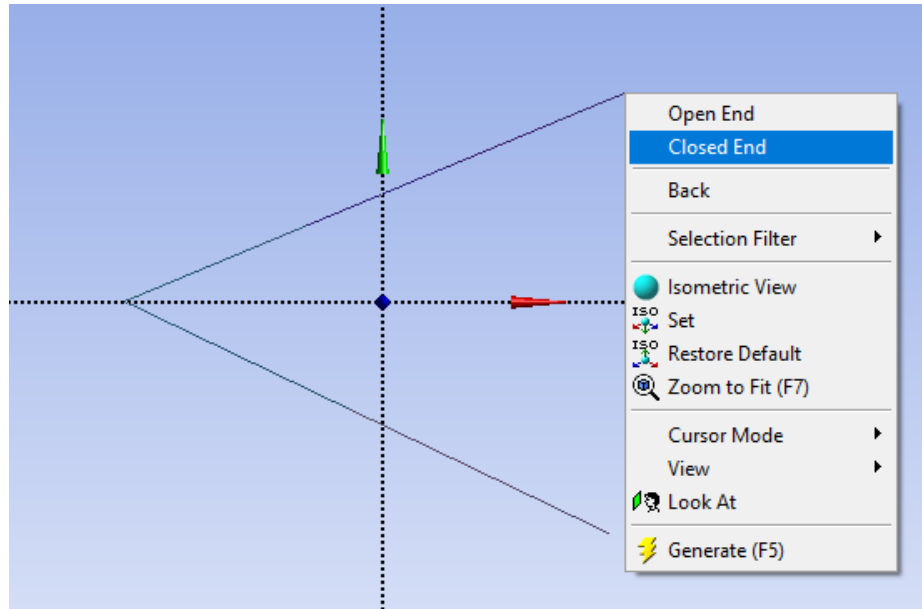
2. Check out DesignModeler help. This is an excellent resource to refer to if you are stuck.



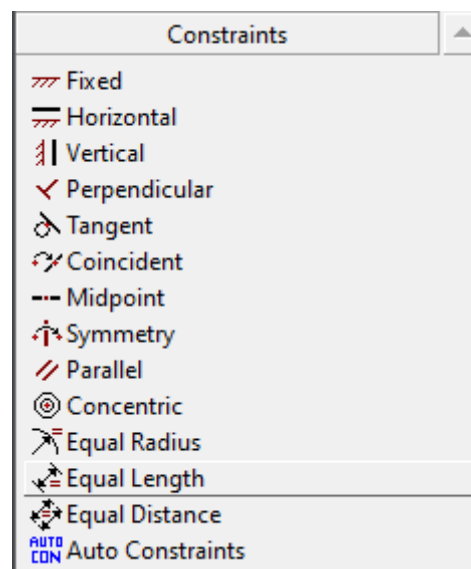
3. Change units to millimetres and look at the XY plane.



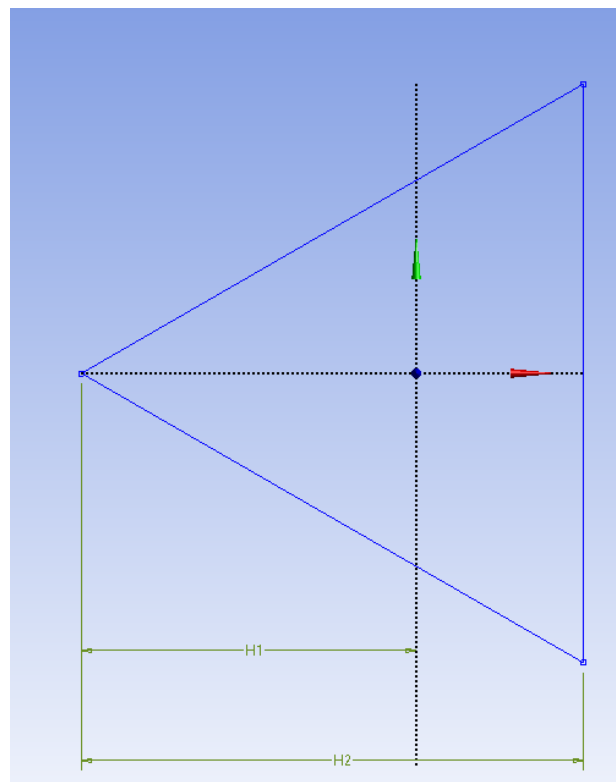
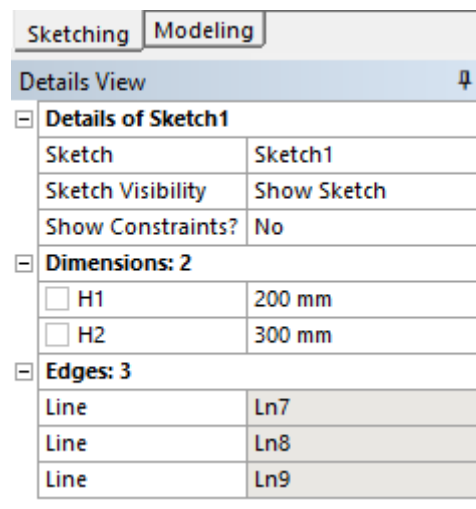
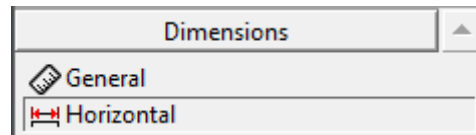
4. Select Sketching mode and draw a triangle using polyline. First, click at a point somewhere below in the x-axis ($x > 0$), place the second point on the x-axis and the third point above the x-axis. Right-click and click Closed End to complete the triangle.



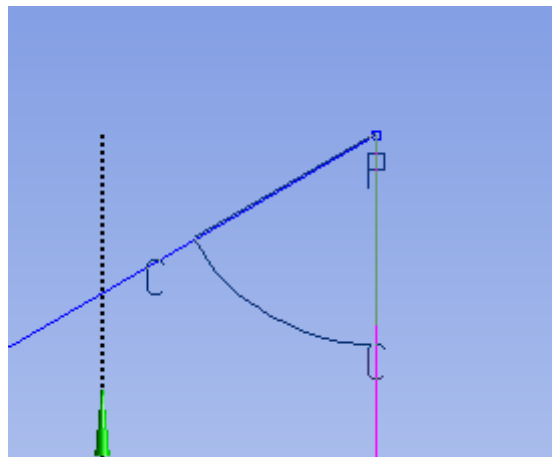
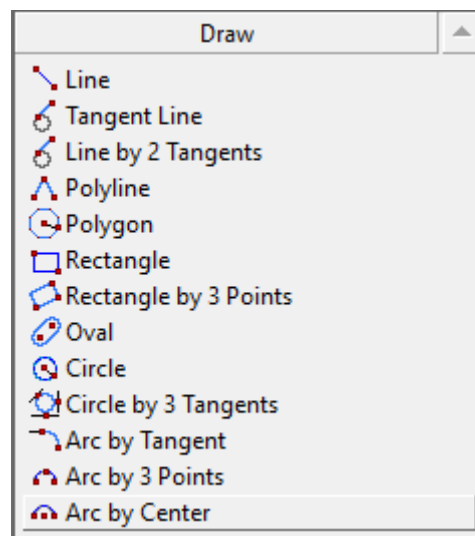
5. Use the constrains tool and make the two line-segments above and below the x-axis as equal length. Click on the option and then click the two lines. Make the line on the right vertical (use the vertical constraint). Apply a equal length on the vertical line using any other line.



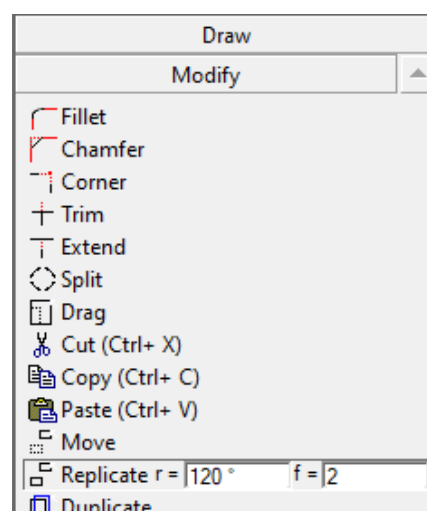
6. Specify dimensions. Click on the Dimensions tab and select 'Horizontal.' Click on the vertex on the x-axis (left of the figure) and the y-axis and specify 200mm. Similarly, specify a horizontal dimension of 300mm between the left and the right-bottom vertex. The dimension values can be set in Details view.



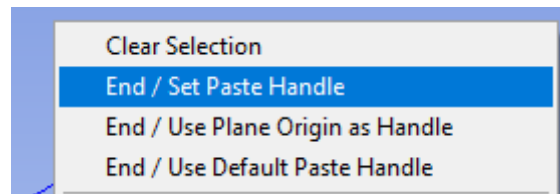
7. Draw an arc using the Arc by Center option. Click the top vertex as the arc center and click the second point on the top line (ensure that **C** constraint is seen before clicking the point). Click the third point on the vertical line.



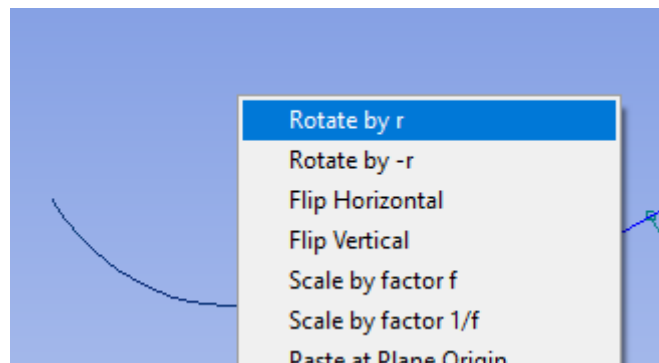
8. Replicate the arc using the Modify toolbox on the right. Set the values to the ones shown below.



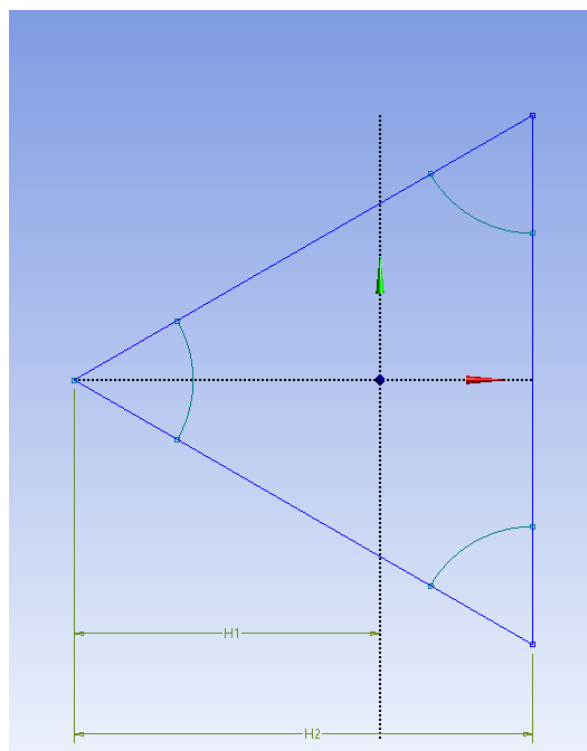
9. Select the arc. Right-click and select End/Set Paste Handle. Click on the top vertex to set the paste handle.



10. Right-click again and click rotate by r.

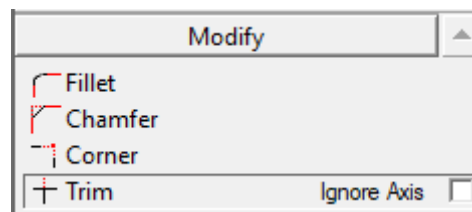


11. Click on the left vertex to place the arc. Similarly paste the arc on the bottom vertex. The end result should look like the figure below. While clicking on the vertices, ensure that you see the **P** option while placing the arc. This ensures that the arc is placed exactly on the vertex.

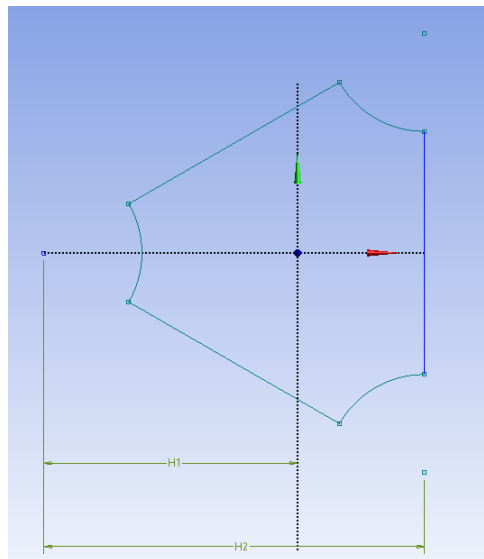


12. Once done, right-click and click on End to exit from the replicate option.

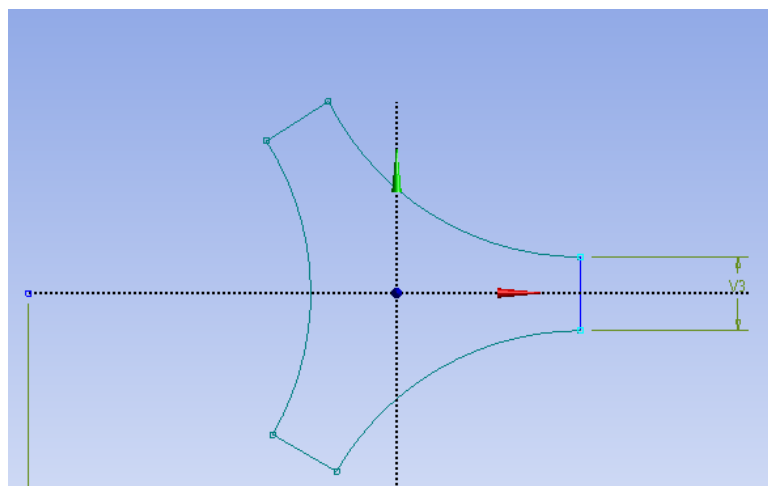
13. Trim the unwanted segments using the Trim command in the Modify tab.



14. Click on the line segments next to the arcs to trim them. The end result should look like this.

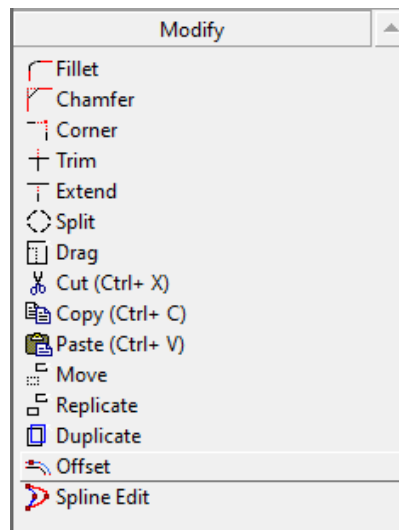


15. Apply an equal length constraint on all the line segments. Then, set the length of the vertical line segment to 40mm.

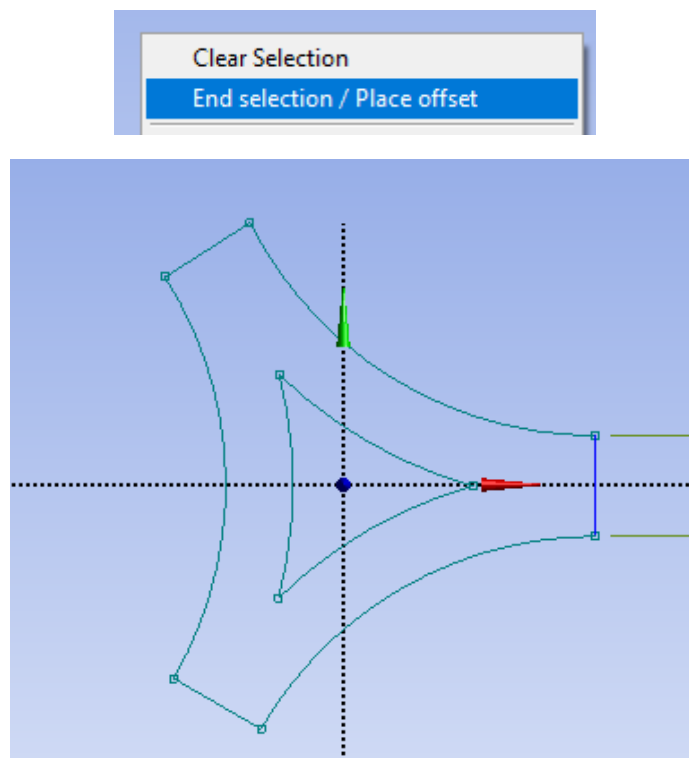


Details View	
Details of Sketch1	
Sketch	Sketch1
Sketch Visibility	Show Sketch
Show Constraints?	No
Dimensions: 3	
H1	200 mm
H2	300 mm
V3	40 mm

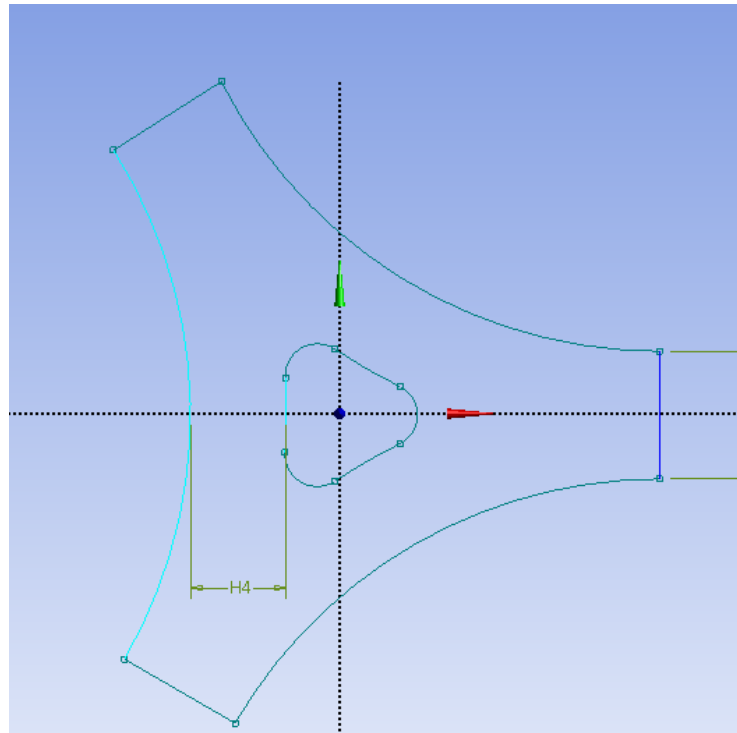
16. Create Offset. In the Modify toolbox, select Offset and select the entire sketch. This can be done by clicking on all the arcs/line-segments while holding the control key.



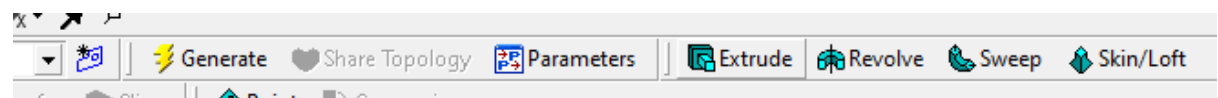
17. Right-click and End selection. Place the offset as shown below. Right-click and click on end after placing the offset to exit the offset option.



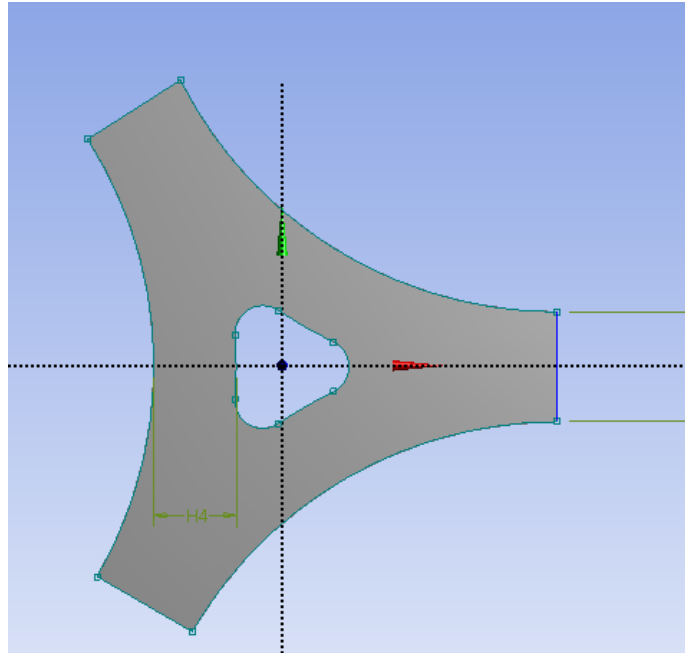
18. Create a fillet of 10mm on all the edges of the inner sketch. Select Fillet from the Modify toolbox, specify the radius as 10mm and select all the edges. Then, place a horizontal dimension of 30mm between the vertical line of the inner sketch and the left arc.



19. Extrude the sketch by 10mm to create the solid. Use the Extrude option in the top menu. Specify the depth in the details view.



Details View	
Details of Extrude1	
Extrude	Extrude1
Geometry	Sketch1
Operation	Add Material
Direction Vector	None (Normal)
Direction	Normal
Extent Type	Fixed
<input checked="" type="checkbox"/> FD1, Depth (>0)	10 mm
As Thin/Surface?	No
Merge Topology?	Yes
Geometry Selection: 1	
Sketch	Sketch1



20. Design Modeler might view this sketch as unconstrained (A dark blue sketch is fully constrained while a teal-coloured sketch is not fully constrained). What changes can you make to fully constrain the sketch without changing the shape of the triangular plate? **Hint: Add new dimensional constraints.**