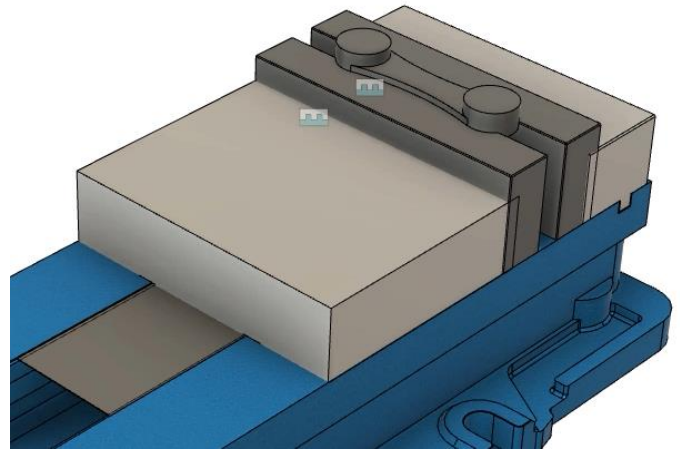


Create soft jaws

In this module, you'll create custom soft jaw geometry for holding a tricky part while it is machined.

Learning objectives:

- Identify appropriate part holding surfaces.
- Import soft jaw and vise model.
- Break design links.
- Use projected geometry to create a soft jaw.



The completed exercise

1. Open a new untitled document in Fusion 360 and change the file's units to inches if the file is not already in inches.

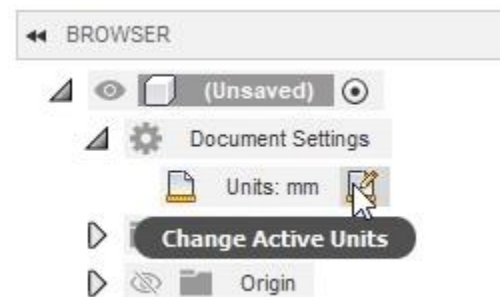


Figure 1. Open a new document

2. Create a new sketch on the XY or top plane.

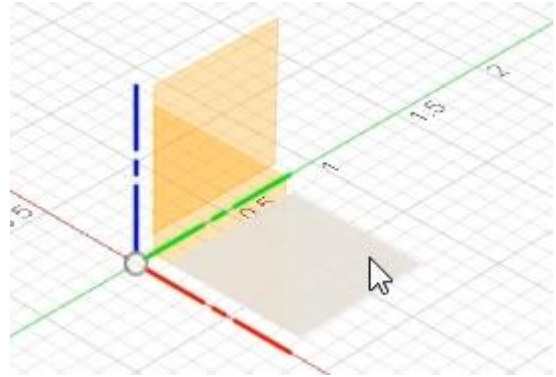


Figure 2. Create a new sketch

3. Open the Circle tool and draw a 1-inch diameter circle roughly 1.5 inches to the left of the sketch's origin.

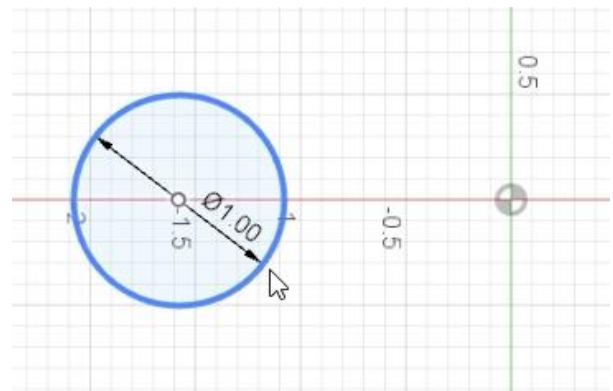


Figure 3. Draw a circle

4. Press L to open the Line tool and draw a vertical line beginning at the sketch's origin. Press Esc to leave the Line tool, select the line, then press X to convert it to construction geometry.

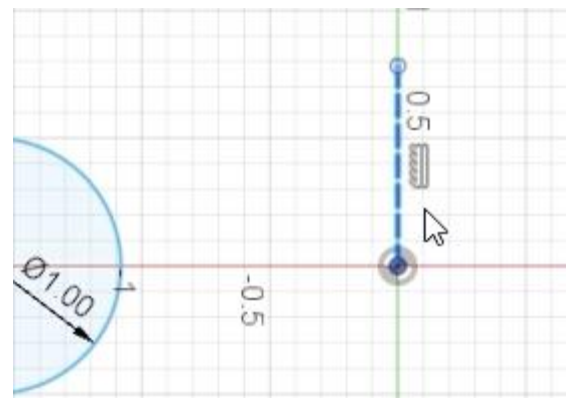


Figure 4. Draw a vertical line

5. Press D to open the Dimension tool and add a dimension of 1.5 inches between the circle's center and the sketch's origin. Click Constraints> Horizontal/Vertical and add a Horizontal constraint between the circle's center and the sketch's origin. The circle will turn black to indicate that it is fully defined.

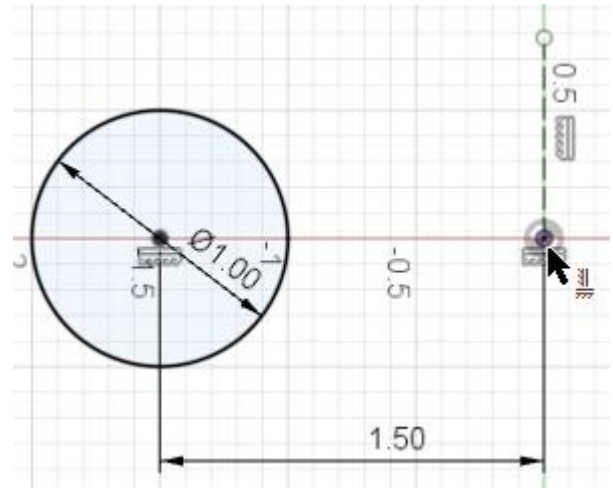


Figure 5. Fully define the circle

6. Click Create> Mirror, then select the circle.

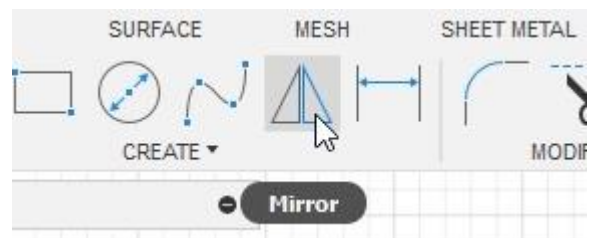


Figure 6. Open the Mirror tool

7. For the dialog's Mirror Line selection, choose the vertical construction line.

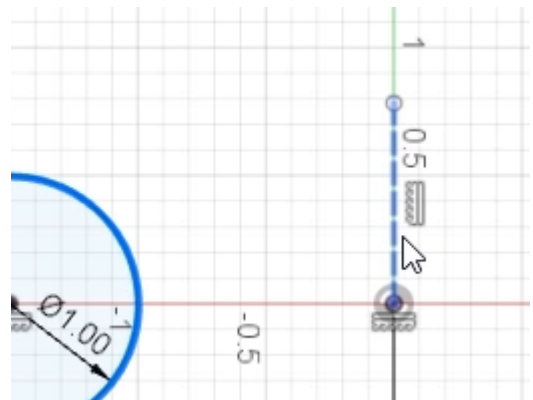


Figure 7. Choose the mirror line

8. OK the dialog to mirror the selected geometry around the mirror line.



Figure 8. Mirror the geometry

9. Click Create> Arc> 3-Point Arc. This tool will draw an arc between three points you select.

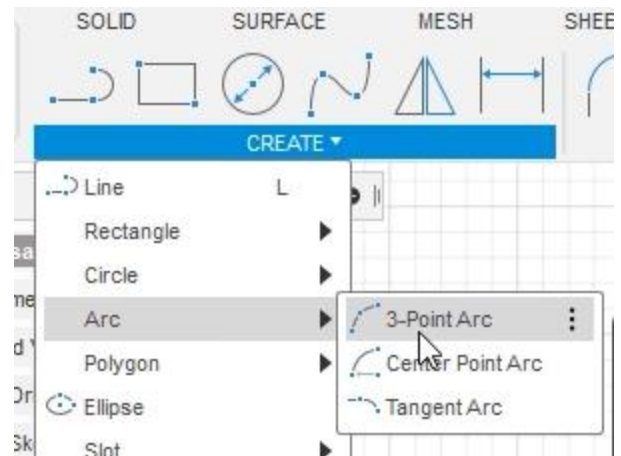


Figure 9. Open the 3-Point Arc tool

10. First click on the left circle, next click on the right circle, then click on the vertical construction line. An arc is drawn through these three points.

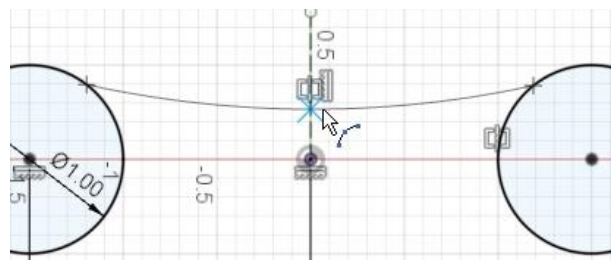


Figure 10. Choose three points

- 11.** Open the Horizontal/Vertical constraint tool and add a horizontal constraint between the two endpoints that attach to the two circles. Apply a Tangent constraint between one of the arc's ends and the circle it attaches to. Open the Dimension tool and add a dimension of 5.25 inches to the arc's radius. The arc is now fully defined.

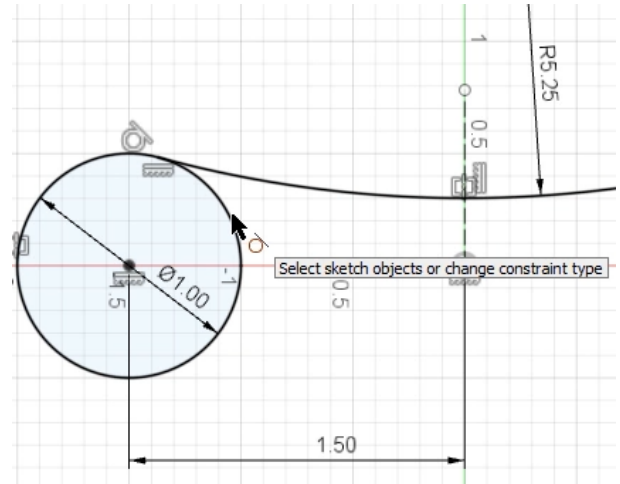


Figure 11. Fully define the arc

- 12.** Open the Line tool and draw a horizontal line beginning at the sketch's origin. Convert this line to construction geometry by selecting it and pressing X.

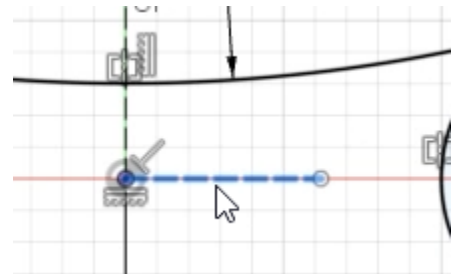


Figure 12. Draw a horizontal construction line

- 13.** Mirror the arc by selecting it and clicking Create> Mirror. Choose the horizontal construction line as the dialog's Mirror Line selection. OK the dialog, then finish the sketch. This geometry is very difficult to hold in a vise because it does not have any flat edges.

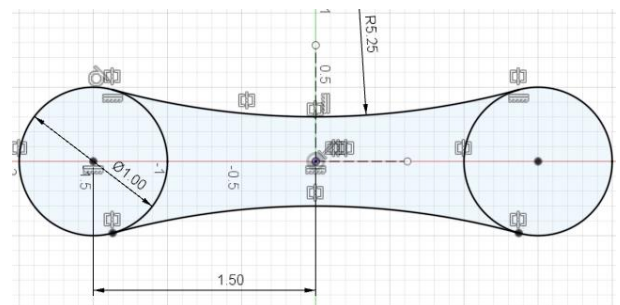


Figure 13. Mirror the arc

- 14.** Open the Extrude tool, select the three regions, then extrude the geometry upwards 0.25 inches.

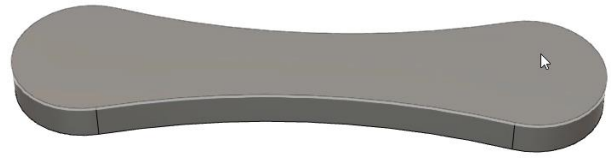


Figure 14. Extrude the sketch into a solid

- 15.** Use the Browser to turn the visibility for Sketch1.

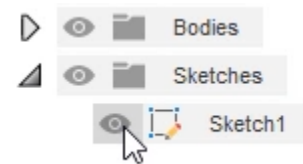


Figure 15. Show Sketch1

- 16.** Open the Extrude tool and select the two circular regions upwards 0.5 inches. Be sure to change the dialog's Operation type to Join. Use the Browser to hide Sketch1.

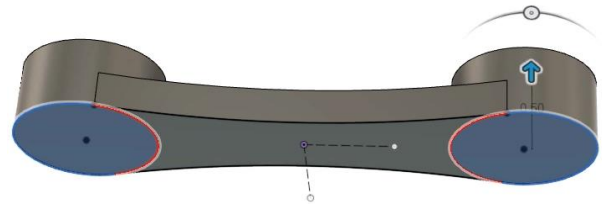


Figure 16. Extrude the two circular regions

17. Save the file and name it **Soft Jaw Part**.

Save

Name:

Soft Jaw Part

Location:

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Figure 17. Save the file

18. Upload the supplied *Generic Vise w Parallels.f3d*, then locate it in the Data Panel.

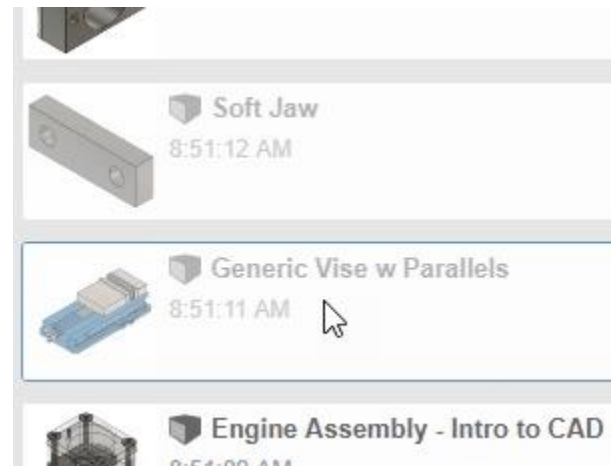


Figure 18. Locate the supplied file

- 19.** Drag and drop the *Generic Vise w Parallels* file into the Canvas area.

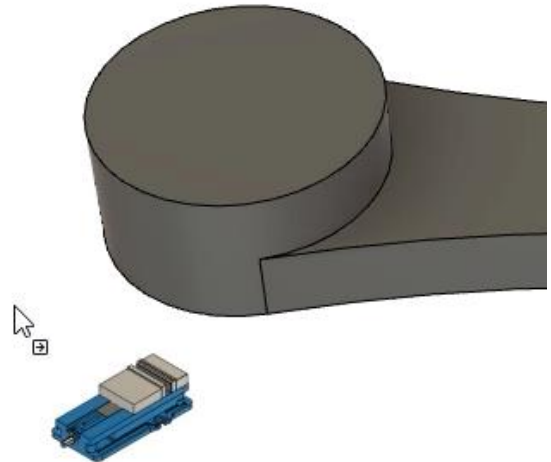


Figure 19. Drag and drop the file into the Canvas area

- 20.** Use the on-screen manipulator to position the vise in roughly the correct position. OK the dialog.

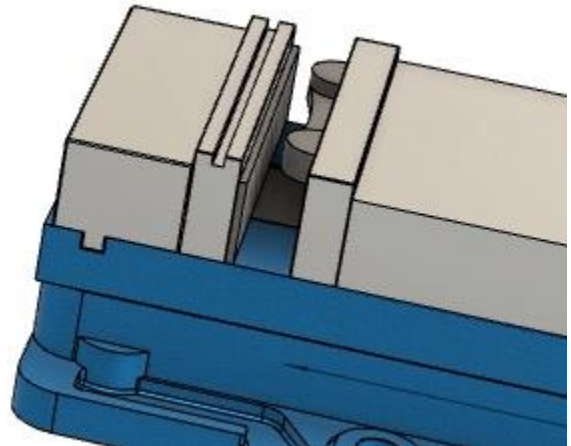


Figure 20. Position the vise

- 21.** The chain-link icon next to the Browser's component indicates that this component is linked to an external file. To break the link between this vise and the external file, right-click the component and choose Break Link from the menu.



Figure 21. Break the link to the external file

- 22.** Drag the supplied *Soft Jaw.f3d* file from the Data Panel and drop it into the Canvas area. Use the on-screen manipulator to drag the component out of the way, then OK the Move/Copy dialog.

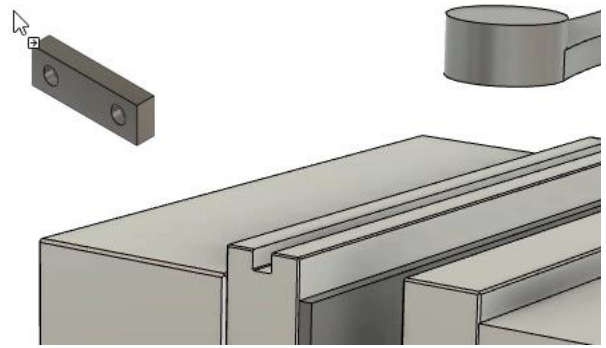


Figure 22. Insert the supplied file

- 23.** Right-click the Browser's Soft Jaw component and break the link to the external file.



Figure 23. Break the link to the external file

- 24.** Typically turn off the visibility for Body1 inside the top level's Bodies folder. This is the body that you drew earlier in this module.



Figure 24. Hide Body1

25. The vise you inserted does not have soft jaws so the original jaws need to be replaced. Expand the Generic Vise w Parallels component, expand the Rear Jaw component, then expand the Body's folder. Turn off the visibility for Body1.

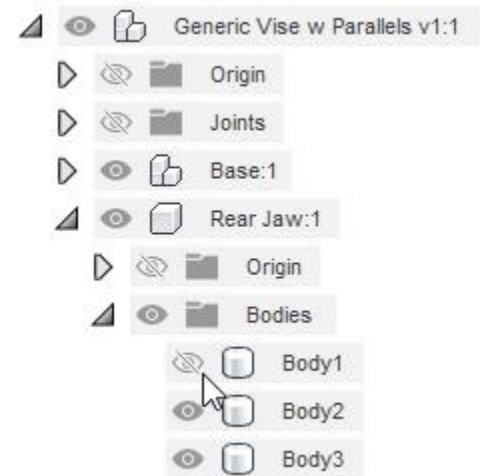


Figure 25. Hide Body1

26. Expand the Front component, then turn off the visibility for Body2.

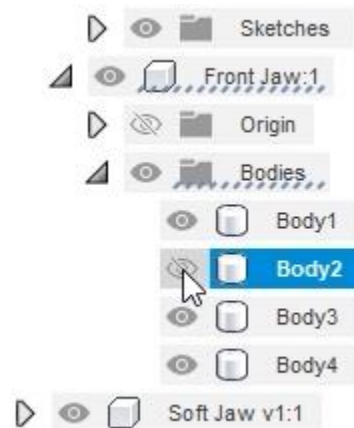


Figure 26. Hide Body2

27. Select the Browser's Soft Jaw component, right-click it, then choose Copy from the menu.

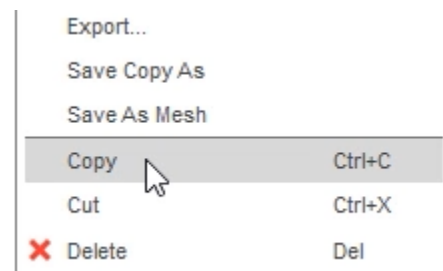


Figure 27. Copy the Soft Jaw component

- 28.** Right-click the Browser's top level, then choose Paste New.

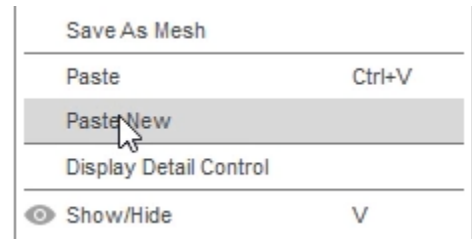


Figure 28. Paste the copied component as a new component

- 29.** Use the on-screen manipulator to drag the copied soft jaw to a new location, then use the on-screen manipulator's rotation handle to rotate it 180°. Activate the dialog's Capture Position option, then OK the Move/Copy dialog.

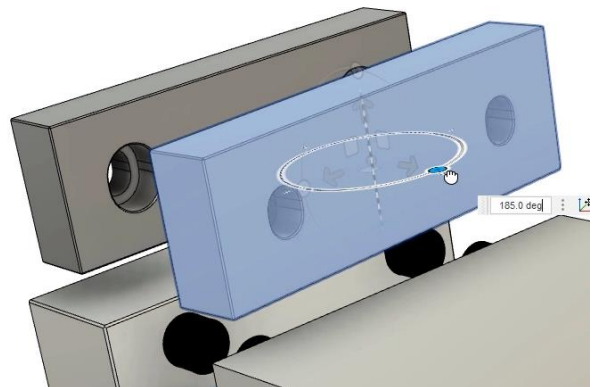


Figure 29. Reposition the soft jaw

- 30.** Expand the Generic Vise w Parallels component select the Base component, right-click it, then choose Ground from the menu. Now that this component is grounded, it cannot move.



Figure 30. Ground the Base component

31. Click Assemble> Joint.



Figure 31. Open the Joint tool

32. Navigate to the dialog's Motion tab and make sure the Rigid option is selected in the Type section.



Figure 32. Choose the Rigid type

33. For the dialog's Component 1 selection, hover your cursor over the Soft Jaw component's face shown in the image on the right. Hold Ctrl (Windows) or Command (MacOS), then select the top plus icon.

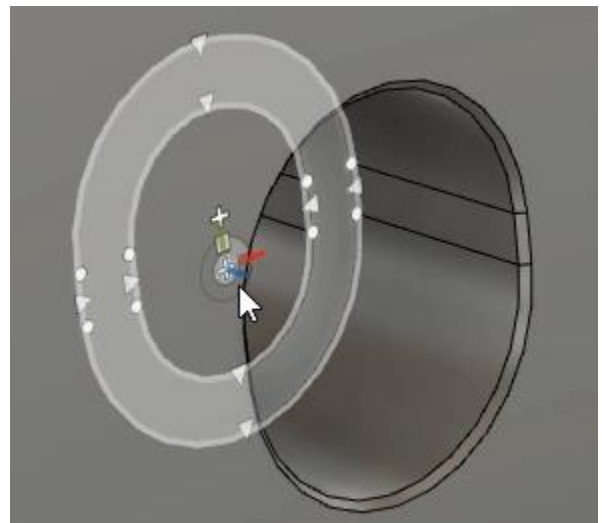


Figure 33. Select the Component 1 Snap location

- 34.** For the dialog's Component 2 Snap selection, choose the fastener's back edge shown in the image on right. After making the selection, the soft jaw will move into the appropriate location.

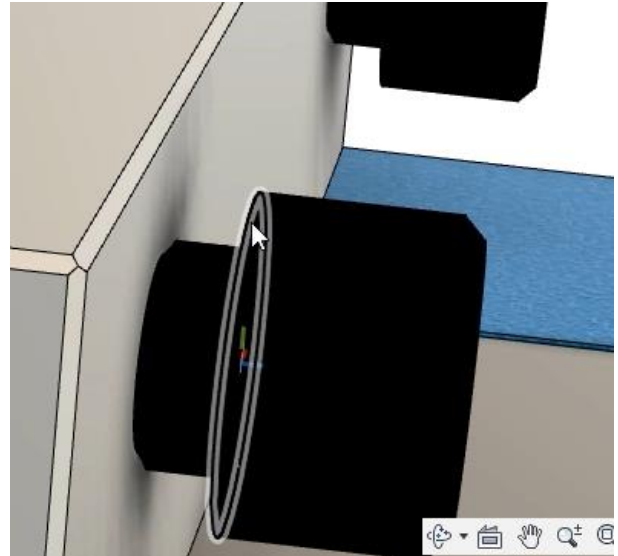


Figure 34. Select the Component 2 Snap location

- 35.** Inspect the result to make sure the soft jaw is in the correct position, then OK the dialog.



Figure 35. Inspect the result

- 36.** Repeat Steps 31 through 35 two apply a Rigid joint between the other soft jaw and the vise's jaw. Because of the Rigid joint, the soft jaw will move appropriately as the vise's sliding jaw moves.

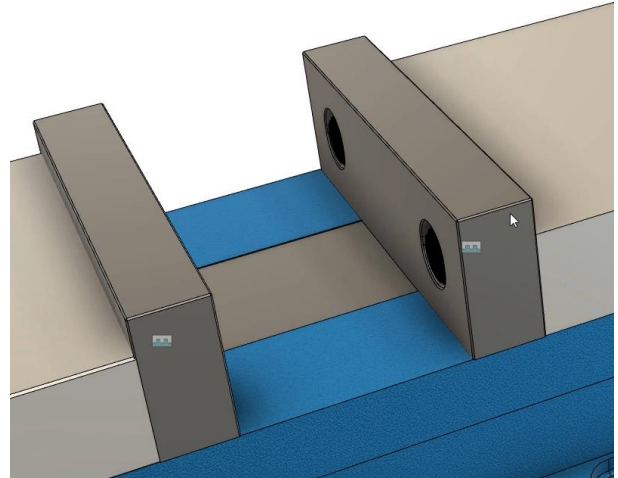


Figure 36. Add a joint between the second soft jaw and the vise's jaw

- 37.** To revert the vise's jaw to its original position, click Position> Revert Position.

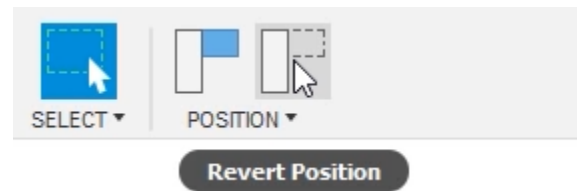


Figure 37. Revert the jaw's position if you move it

- 38.** Right-click the Generic Vise w Parallels's Base component, then choose Unground from the menu. Use the Browser to turn on the visibility for the Body1 that you drew at the beginning of this module.

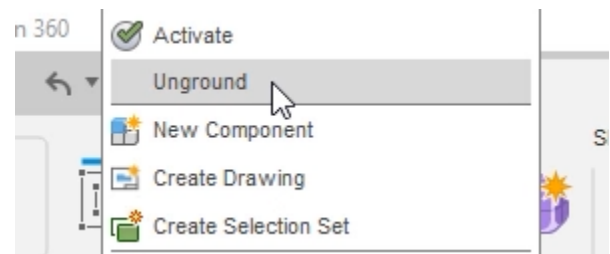


Figure 38. Unground the Base component

39. Click Modify> Align.

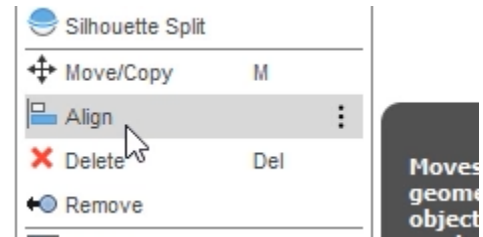


Figure 39. Open the Align tool

40. For the dialog's From selection, choose Body1's bottom face.

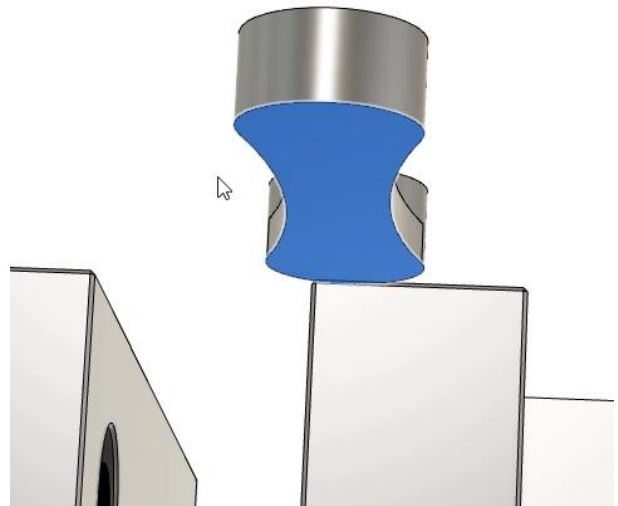


Figure 40. Choose the From selection

41. For the To selection, choose the soft jaw's top face but do not click on any of the white box icons.



Figure 41. Choose the To location

- 42.** Activate the dialog's Capture Position option, then OK the dialog.

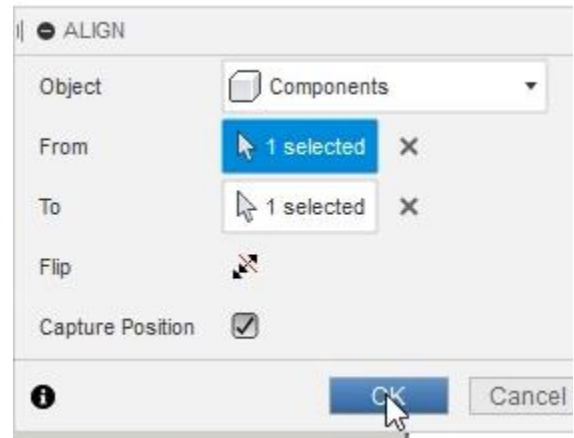


Figure 42. Accept the new alignment

- 43.** In the Browser, select the Generic Vise w Parallels component. Click Modify> Move/Copy.

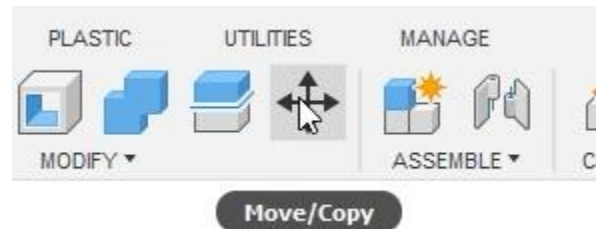


Figure 43. Open the Move/Copy tool

- 44.** Select the on-screen manipulator's vertical arrow.

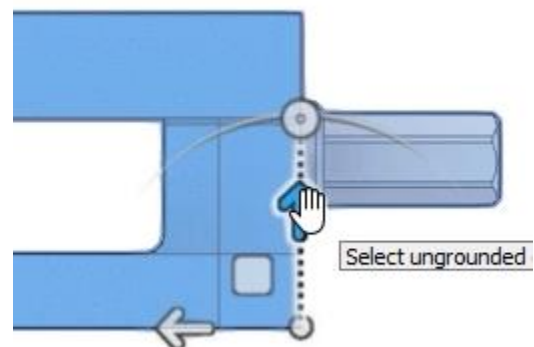


Figure 44. Select the direction for the component to move

- 45.** Enter **0.125 inches** into the dialog's Z Distance box to move the vise upwards 0.125 inches.

Set Pivot	
X Distance	0.00 in
Y Distance	0.00 in
Z Distance	0.125 in
X Angle	0.0 deg

Figure 45. Move the vise upwards

- 46.** Also enter a value into the dialog's Y Distance box so that Body1 slightly overlaps the vise's fixed soft jaw. Activate the Capture Position option, then OK the dialog.

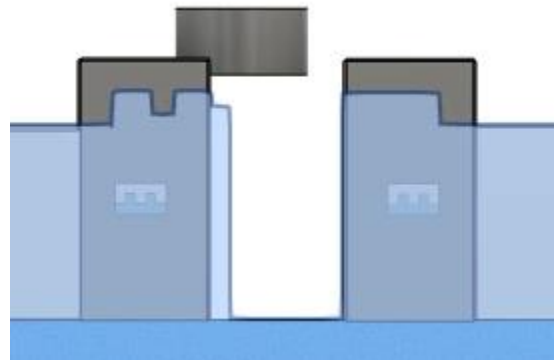


Figure 46. Align the vise on the Y axis

- 47.** Drag the vise's sliding jaw until it touches the fixed jaw.



Figure 47. Reposition the sliding jaw

- 48.** Click Position> Capture Position.

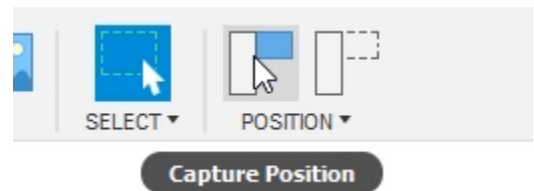


Figure 48. Capture the jaw's new position

- 49.** Click Modify> Move/Copy and choose the Components option from the dialog's Move Object menu.

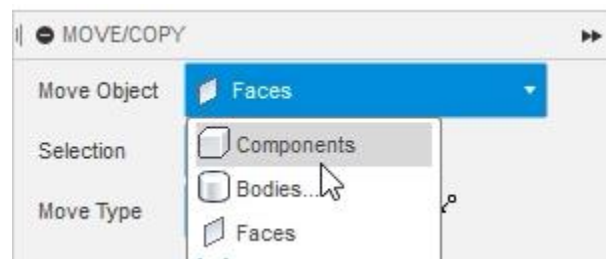


Figure 49. Open the Move/Copy tool

- 50.** Drag the on-screen manipulator and move the sliding jaw 0.5 inches. Activate the dialog's Capture Position option, then OK the dialog.



Figure 50. Move the sliding jaw

- 51.** Click Modify> Combine.



Figure 51. Open the Combine tool

- 52.** For the dialog process Target Body selection, choose the Soft Jaw component. For the Tool Bodies selection, choose Body1.

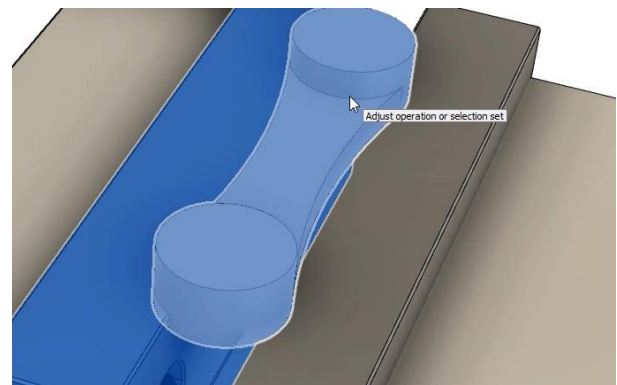


Figure 52. Choose the Target and Tool bodies

- 53.** Choose the Cut option from the dialog's Operation section, then activate the Keep Tools option. OK the dialog.

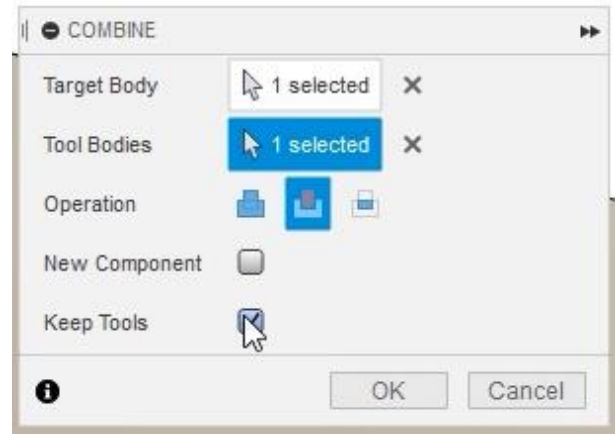


Figure 53. Choose the operation type

- 54.** Hide Body1 and notice that the soft jaw now has a perfectly shaped recess for Body1.

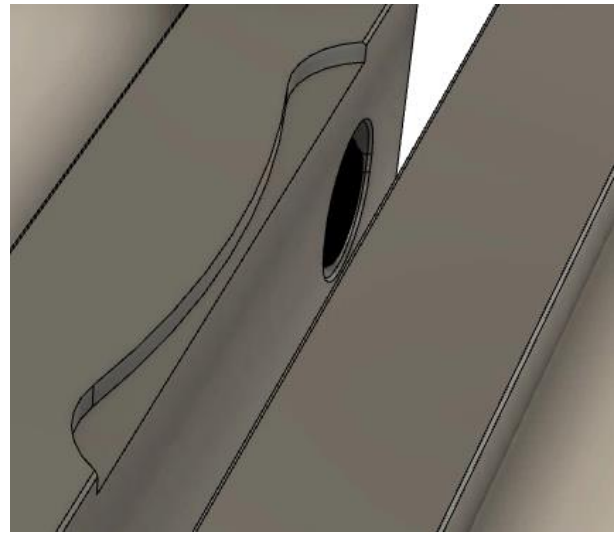


Figure 54. Inspect the result

- 55.** Repeat this process to remove material from the sliding Soft Jaw component. The soft jaws are now modified and can hold Body1's rounded geometry perfectly. Save the file and continue to the next module.

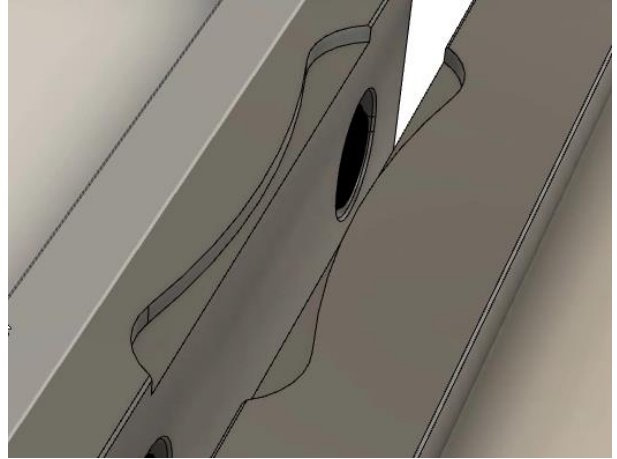


Figure 55. Remove material from the sliding Soft Jaw component