

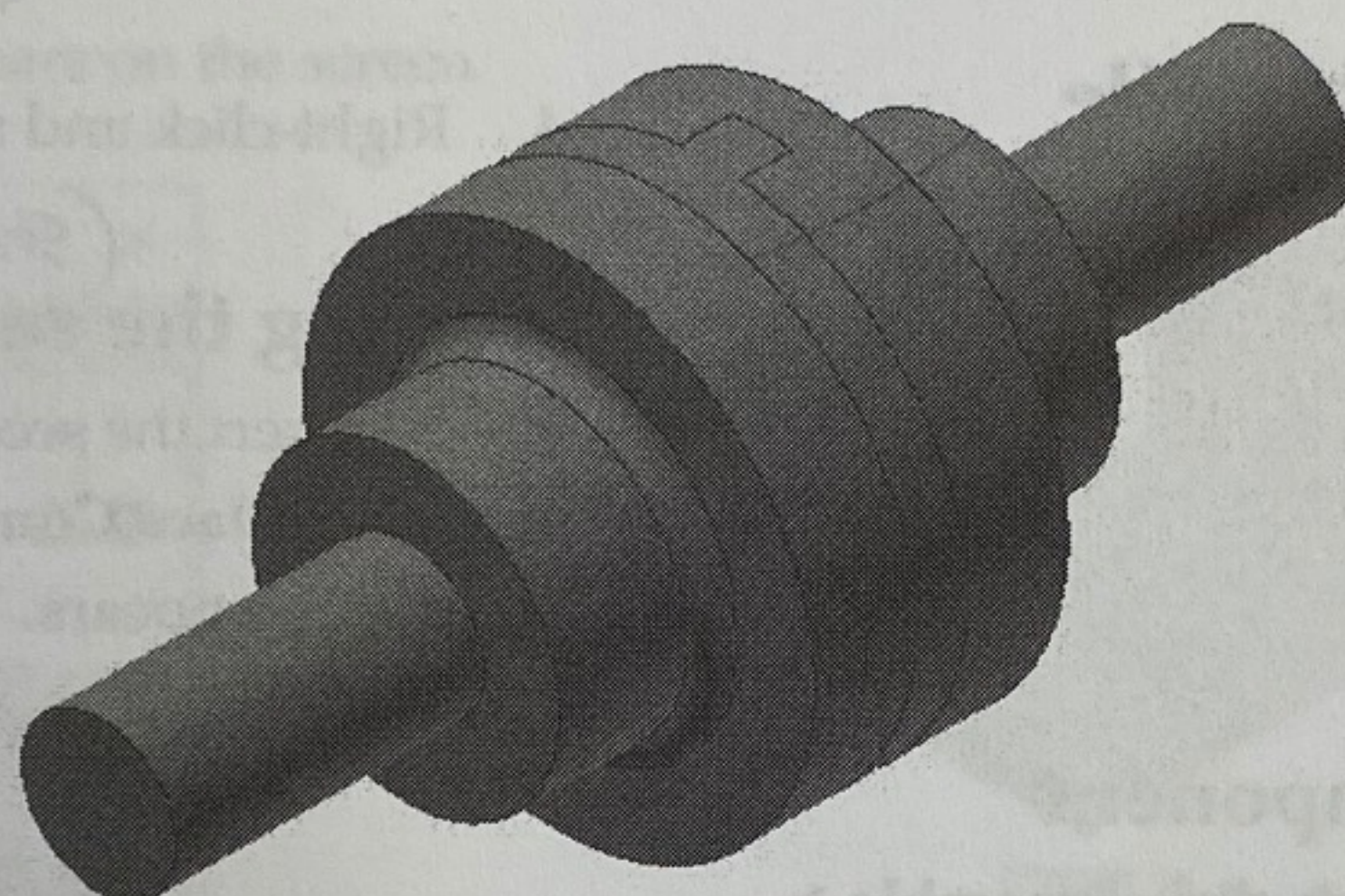
Chapter 3: Assembly Basics

In this chapter, you will:

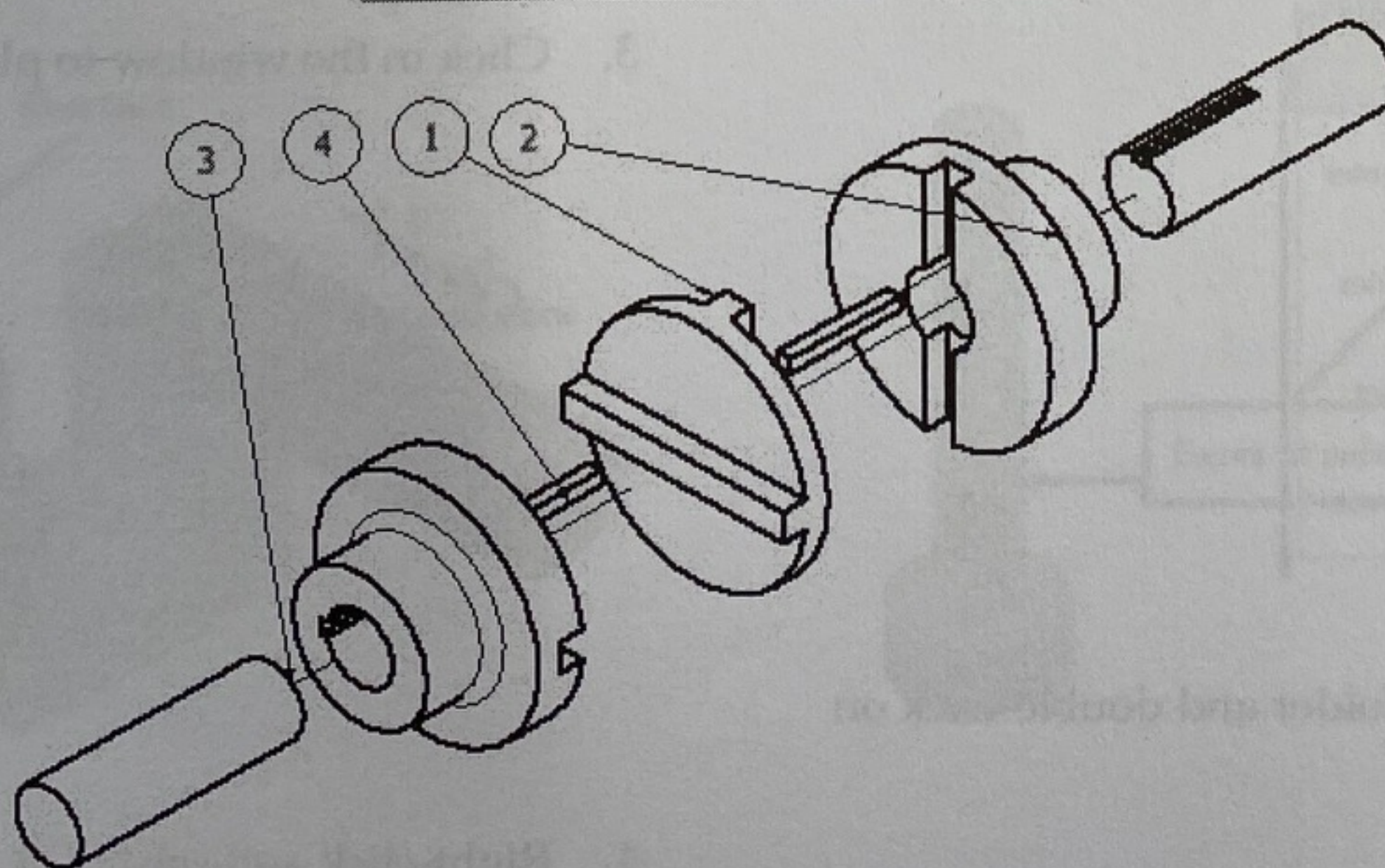
- Add Components to assembly
- Apply constraints between components
- Check Degrees of Freedom
- Check Interference
- Create an exploded view of the assembly

TUTORIAL 1

This tutorial takes you through the creation of your first assembly. You create the Oldham coupling assembly:



PARTS LIST		
ITEM	PART NUMBER	QTY
1	Disc	1
2	Flange	2
3	Shaft	2
4	Key	2



There are two ways of creating an assembly model.

- Top-Down Approach
- Bottom-Up Approach



Top-Down Approach

The assembly file is created first, and components are created in that file.

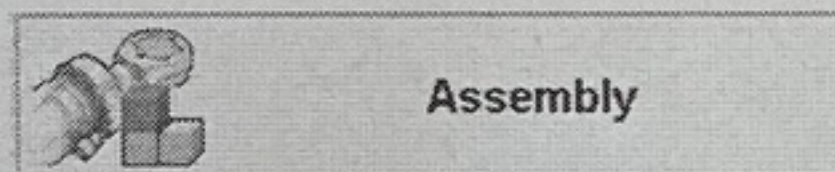


Bottom-Up Approach

The components are created first and then added to the assembly file. In this tutorial, you will create the assembly using this approach. *← this one*

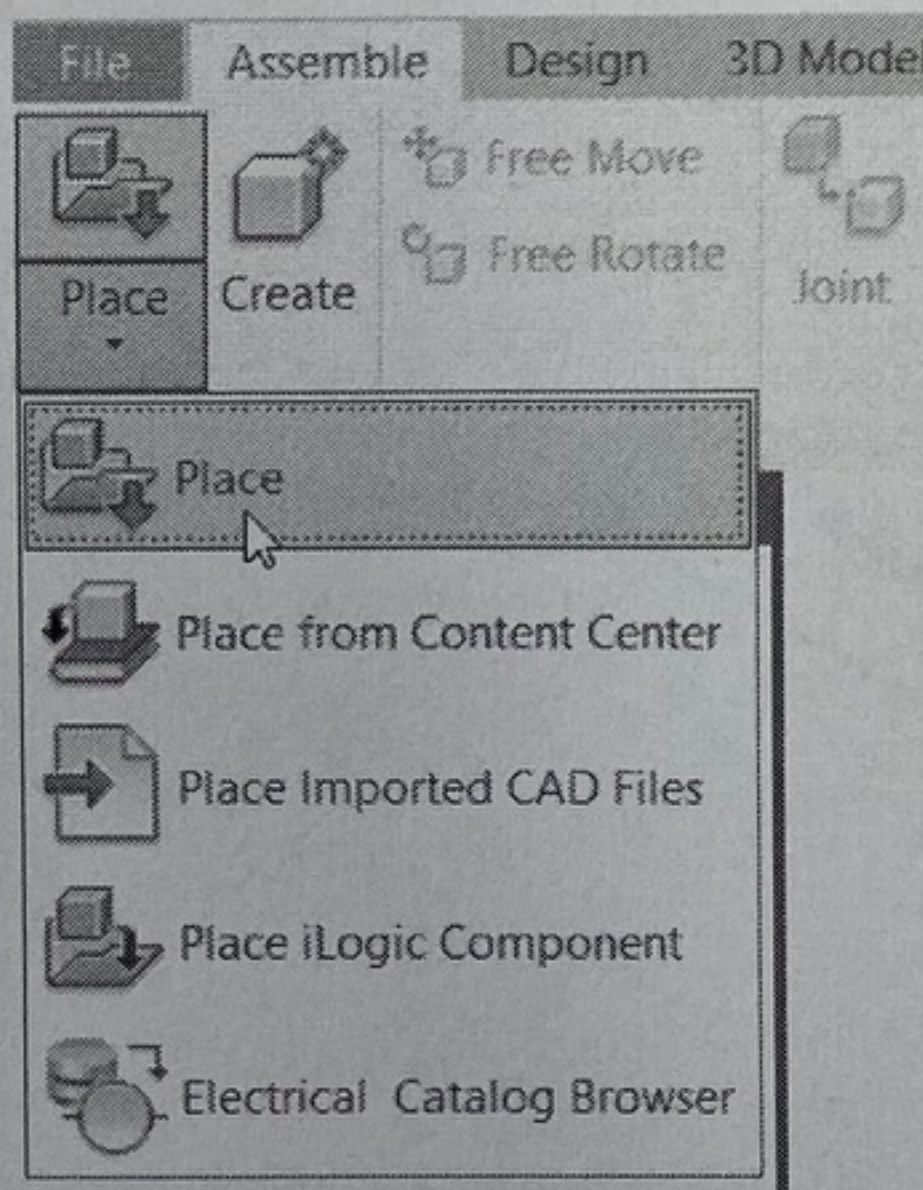
Starting a New Assembly File

1. To start a new assembly file, click the Assembly icon on the Home screen.



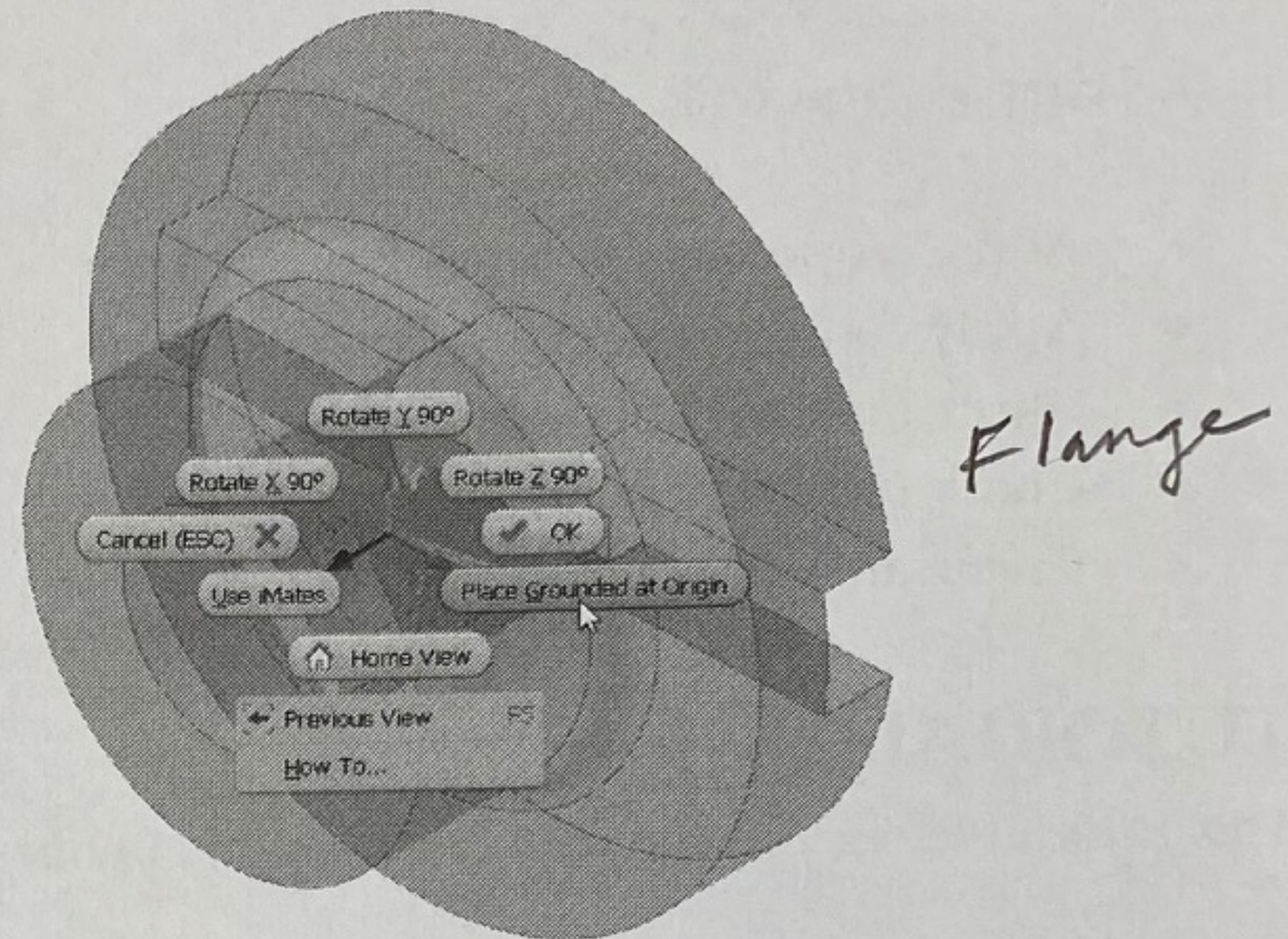
Inserting the Base Component

1. To insert the base component, click **Assemble > Component > Place from Content Center > Place** on the ribbon. *(Flange)*



2. Browse to the project folder and double-click on **Flange.ipt**.

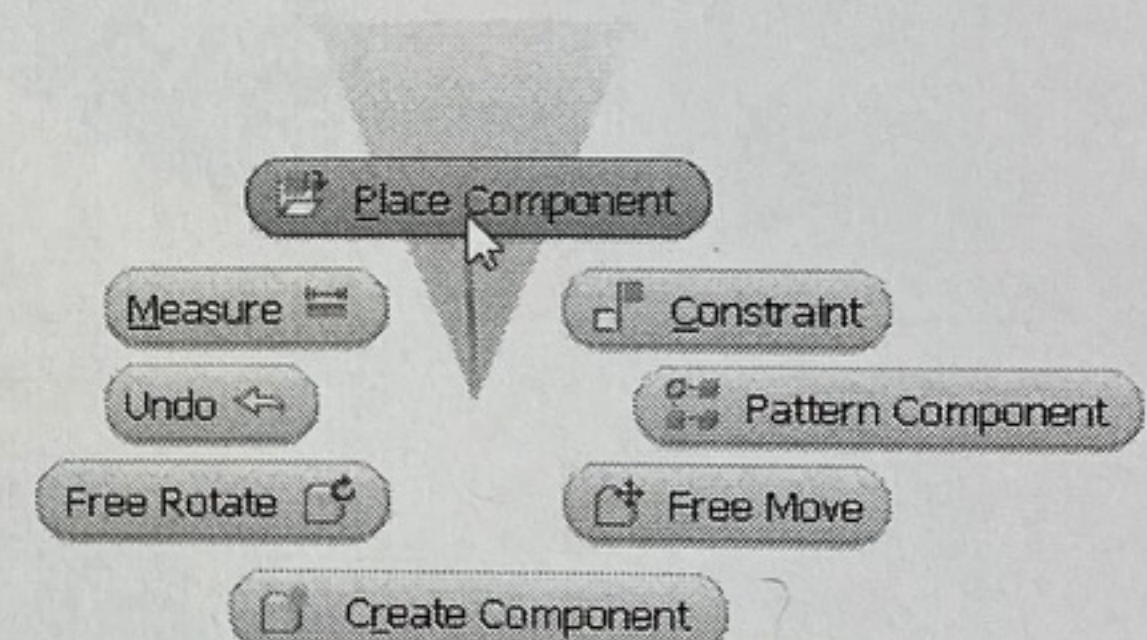
3. Right-click and select **Place Grounded at Origin**; the component is placed at the origin.



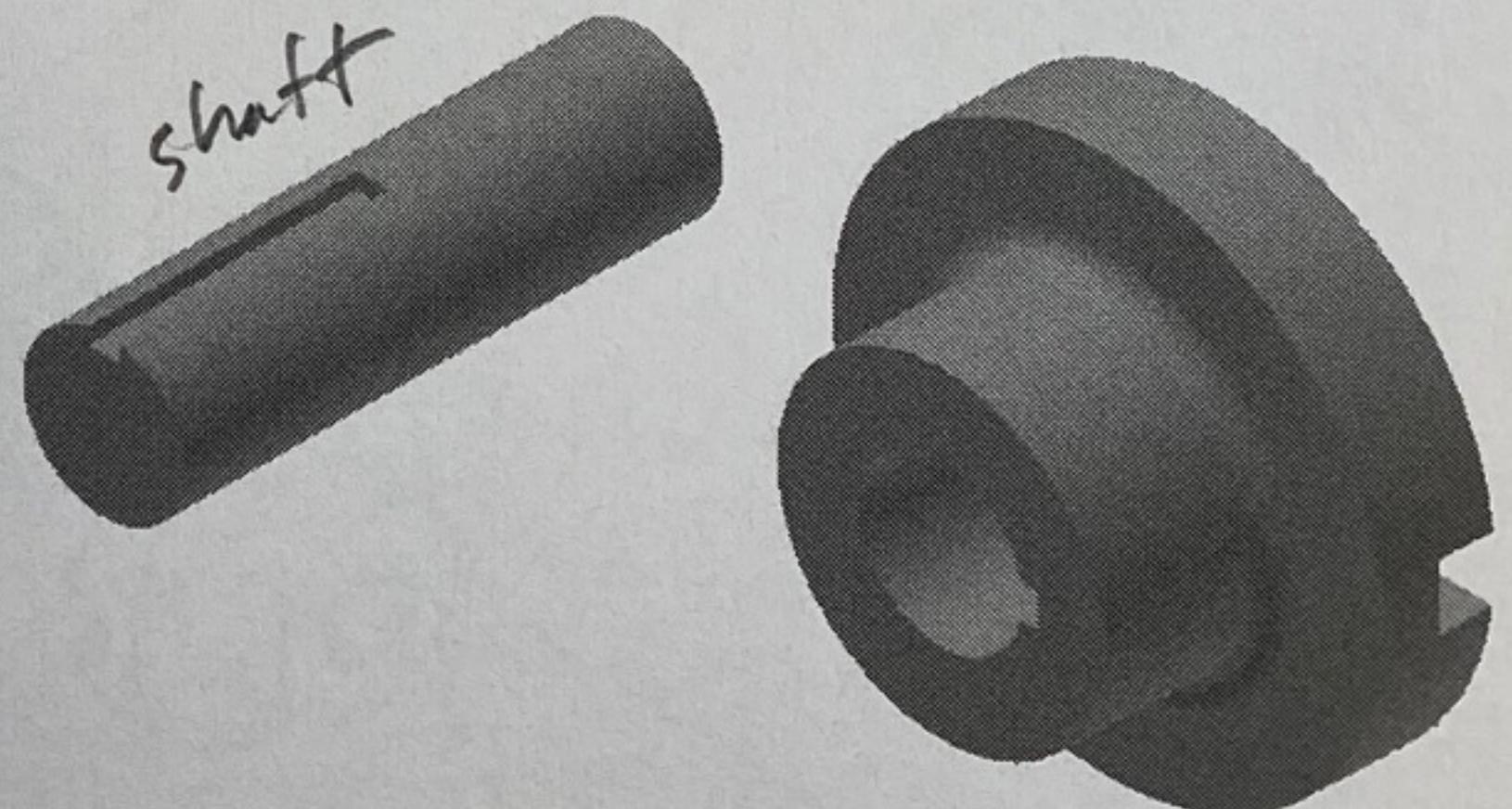
4. Right-click and select **OK**.

Adding the second component

1. To insert the second component, right-click and select **Place Component**; the **Place Component** dialog appears. *(Shaft)*



2. Browse to the project folder and double-click on **Shaft.ipt**.
3. Click in the window to place the component.

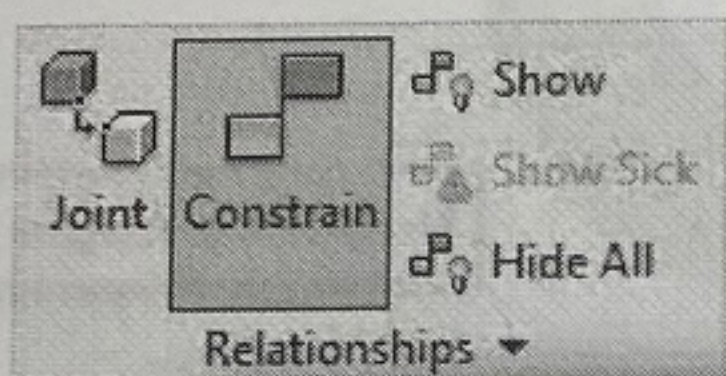


4. Right-click and select **OK**.

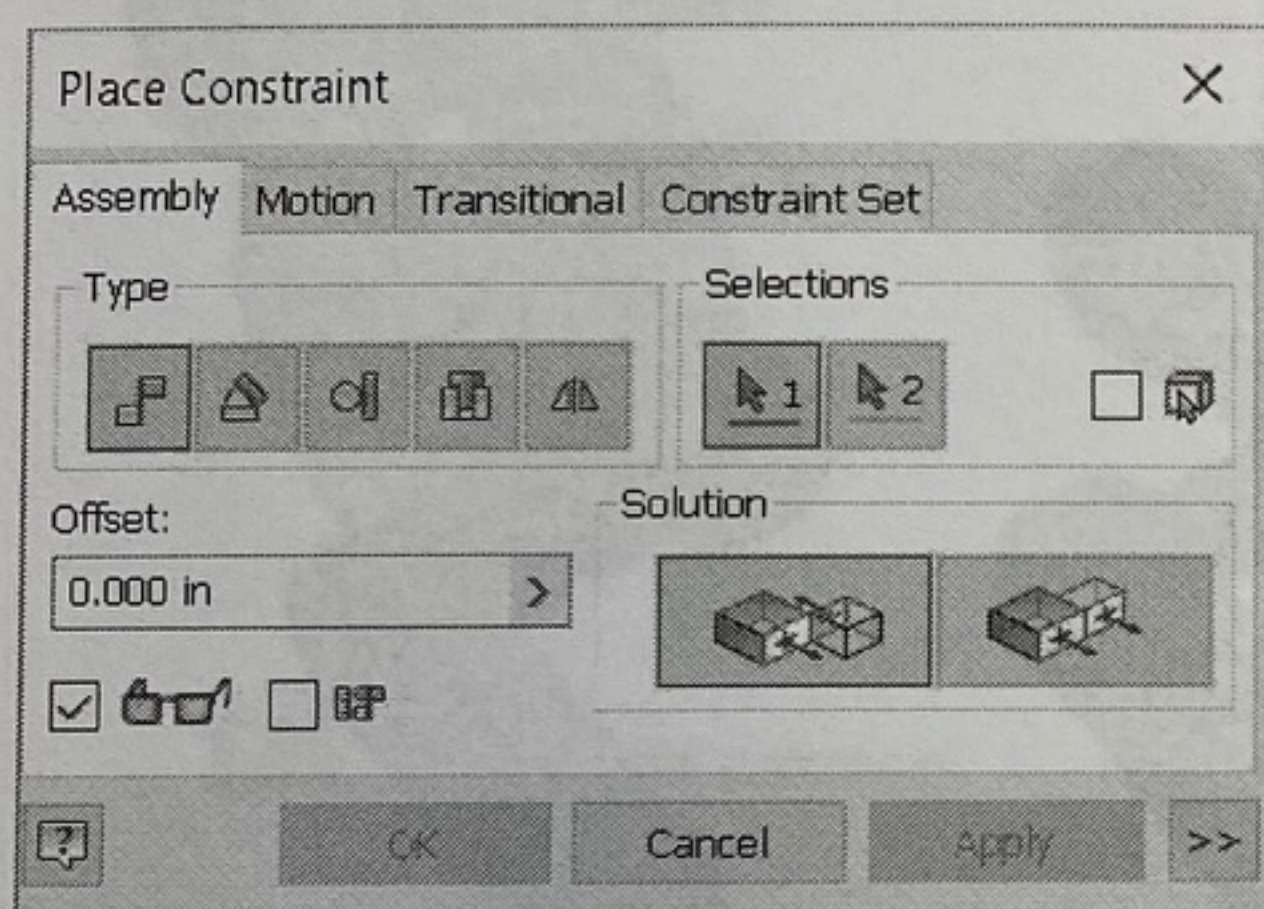
Applying Constraints

After adding the components to the assembly environment, you need to apply constraints between them. By applying constraints, you establish relationships between components.

1. To apply constraints, click **Assemble > Relationships > Constrain** on the ribbon.

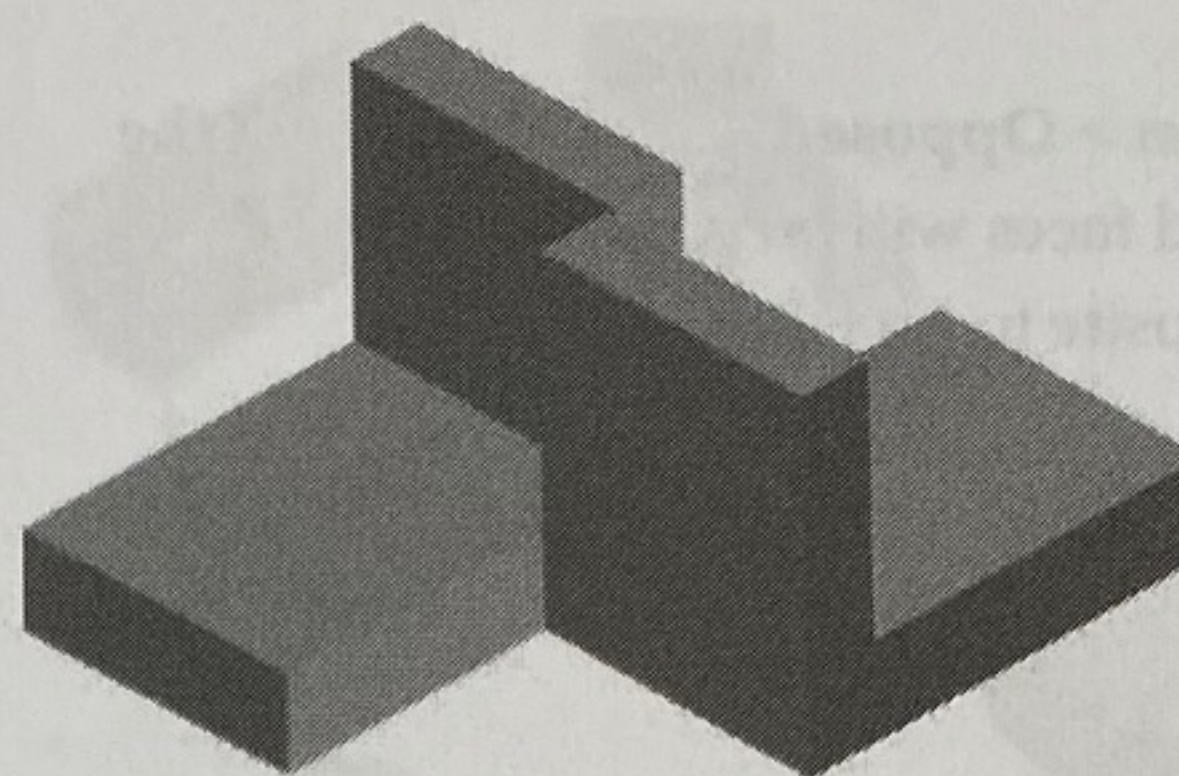
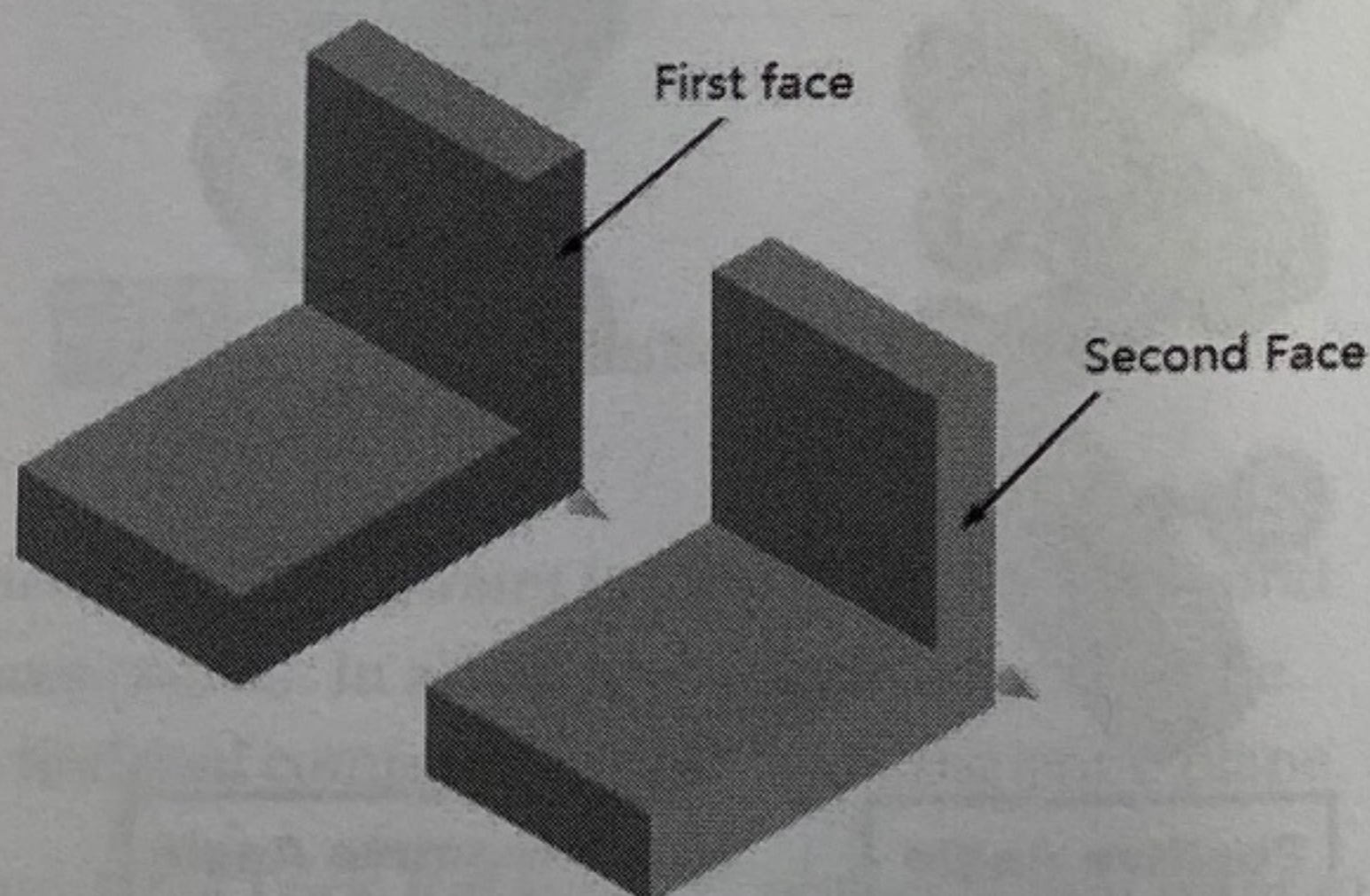


The **Place Constraint** dialog appears on the screen.



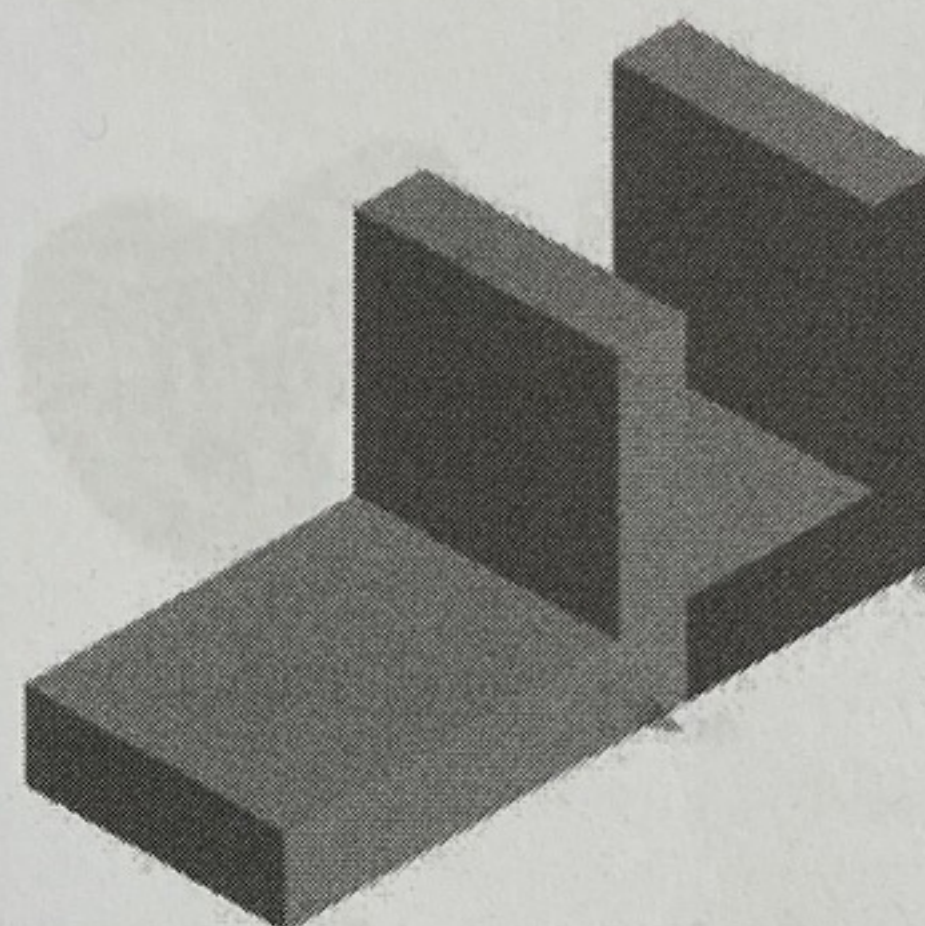
Different assembly constraints that can be applied using this dialog are given next.

Mate: Using this constraint, you can make two planar faces coplanar to each other.



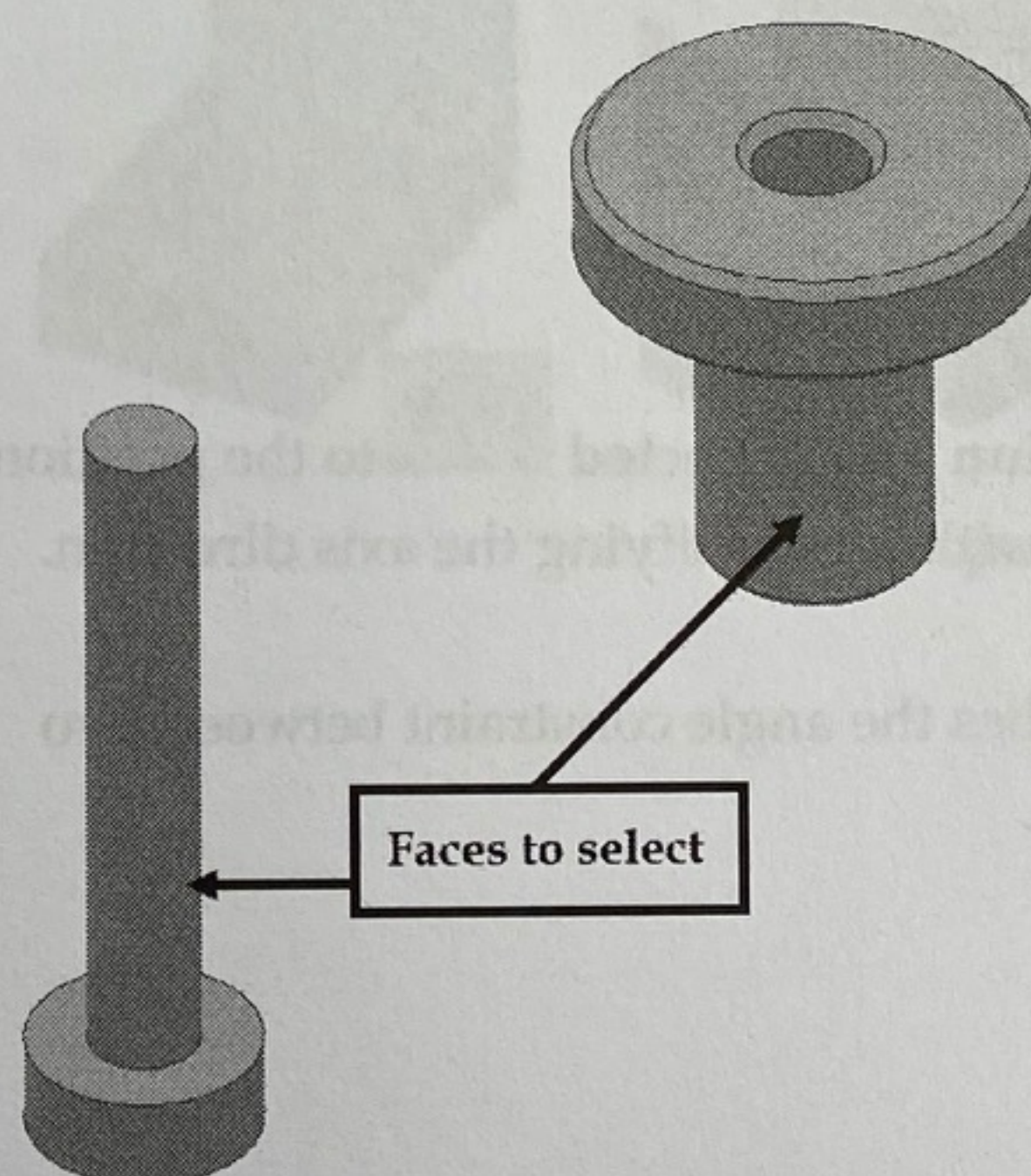
Mate Solution

Note that if you set the **Solution** to **Flush**, the faces will point in the same direction.

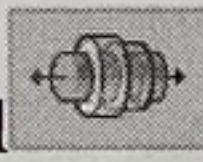


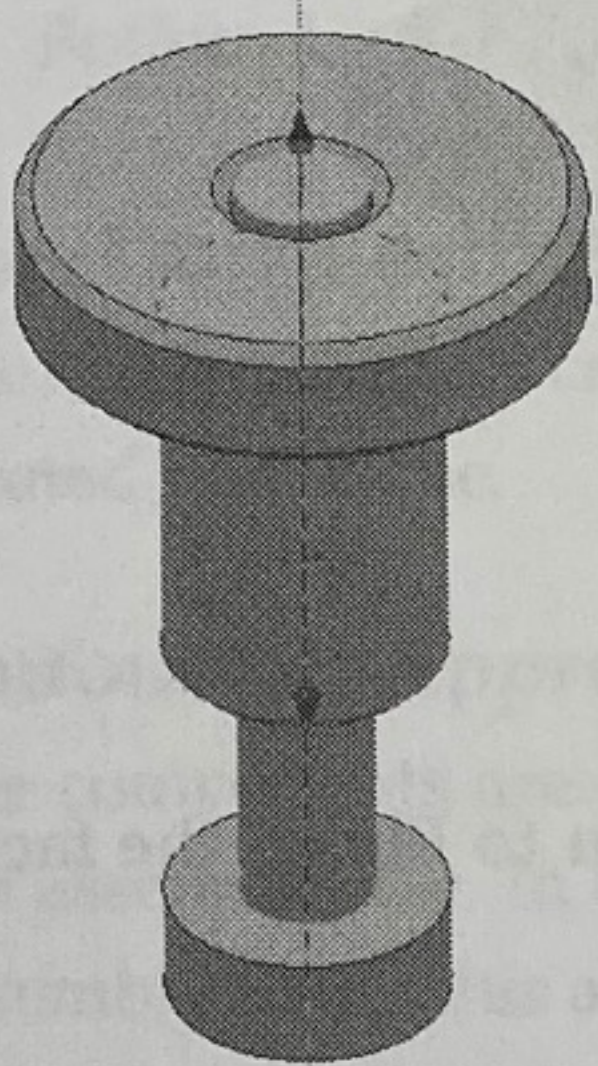
Flush Solution

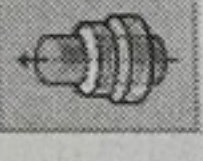
You can also align the centerlines of the round faces. Select the two cylindrical faces to be aligned.

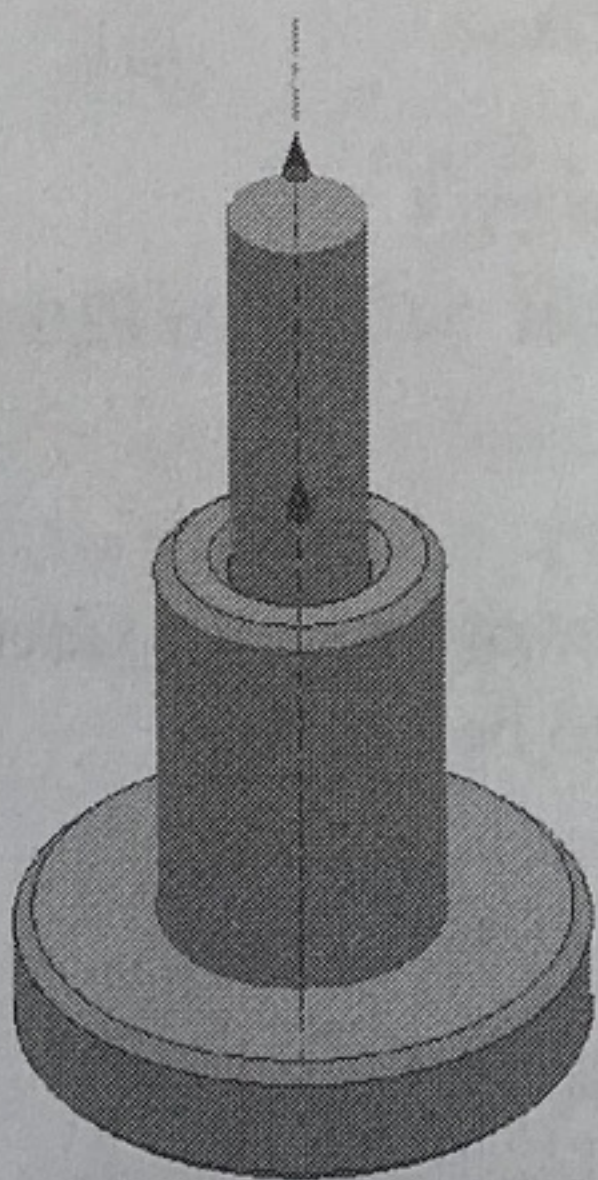


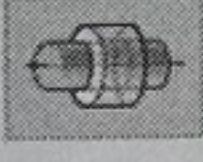
Assembly Basics

Select **Solution > Opposed** ; the axes of the selected round faces will be positioned in the direction opposite to each other.



Select **Solution > Aligned** ; the axes of the selected round faces will be positioned in the same direction.



Select **Solution > Undirected**  to the position component without specifying the axis direction.

Angle: Applies the angle constraint between two components.

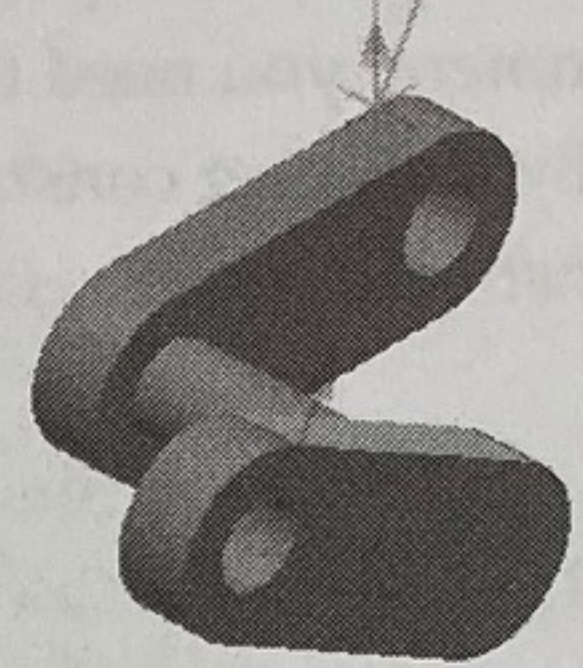


30.00 deg



Positive Angle

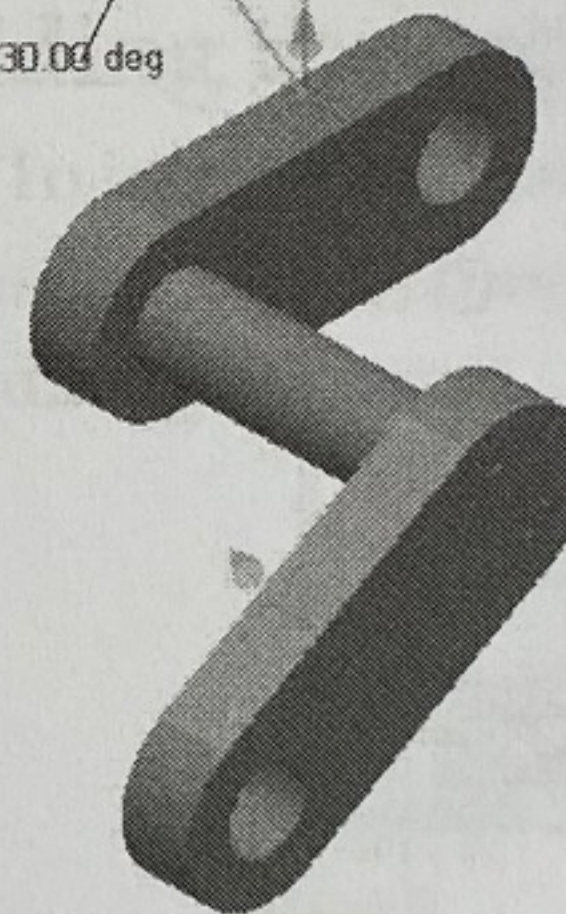
30.00 deg



Negative Angle

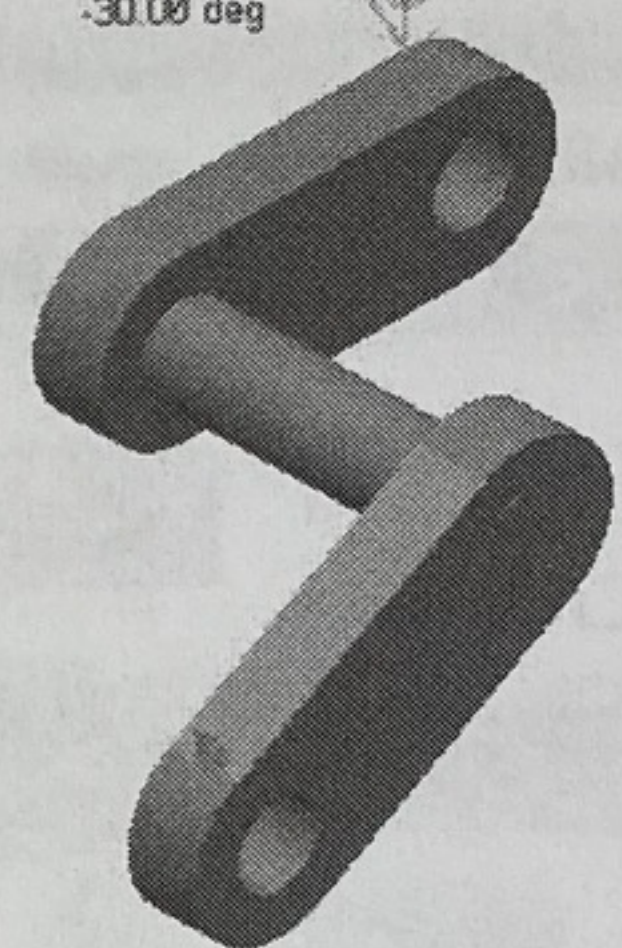


30.00 deg

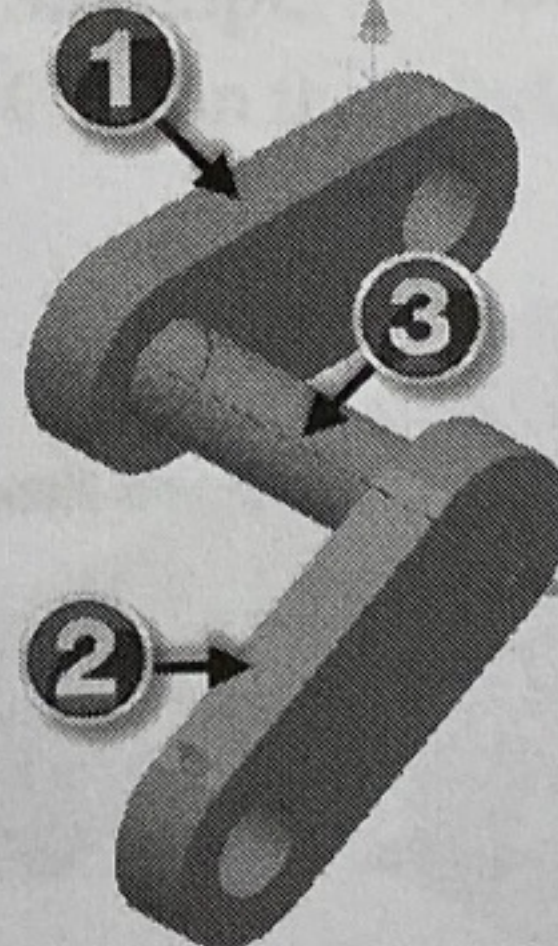


Positive Angle

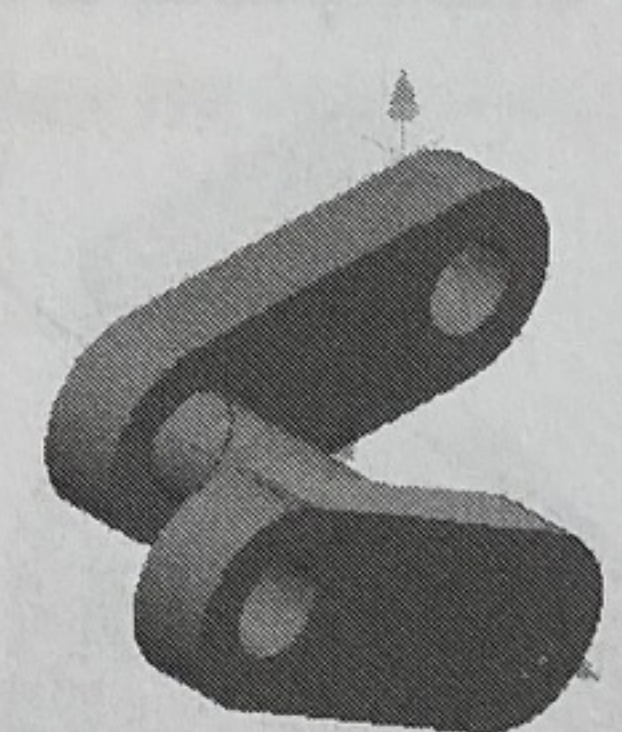
30.00 deg



Negative Angle



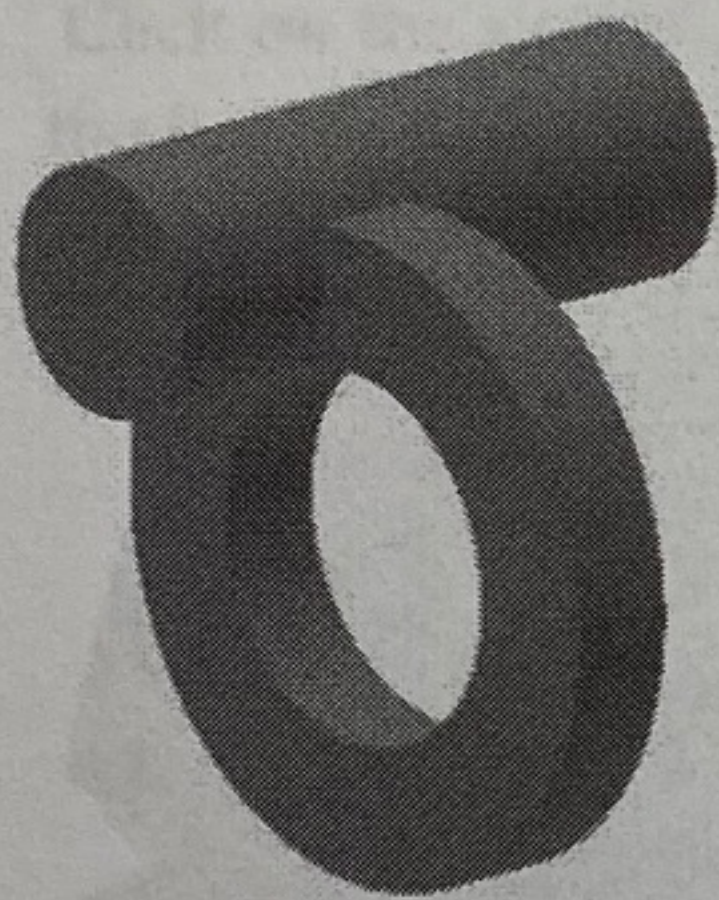
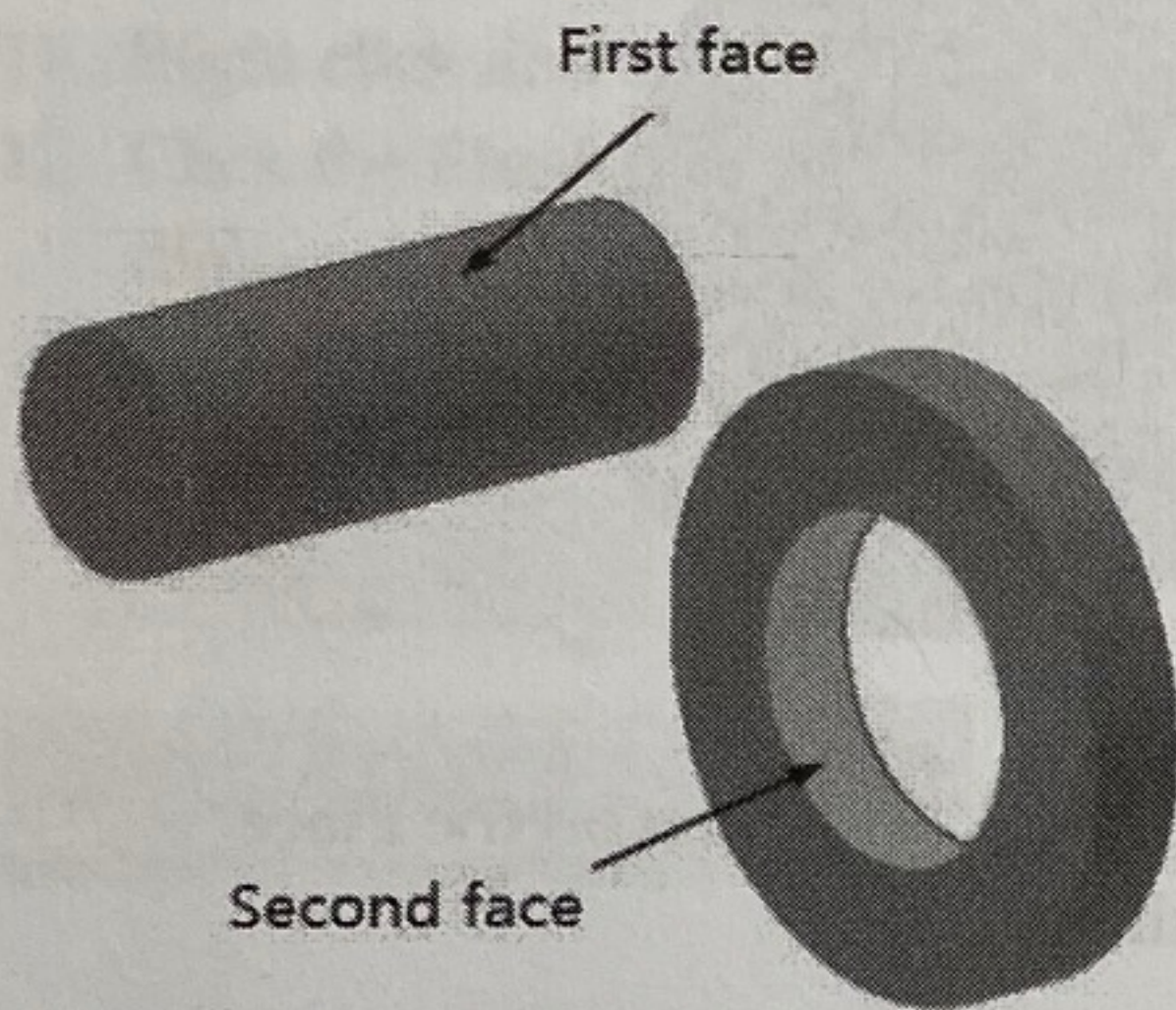
Positive Angle



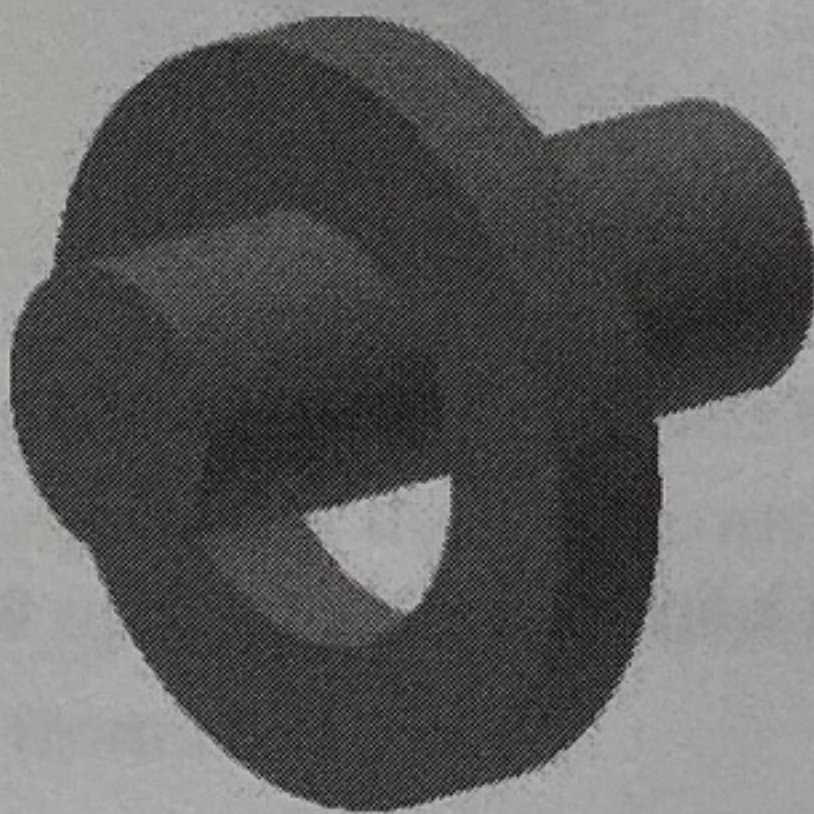
Negative Angle

Assembly Basics

Tangent: This constraint is used to apply a tangent relation between two faces.




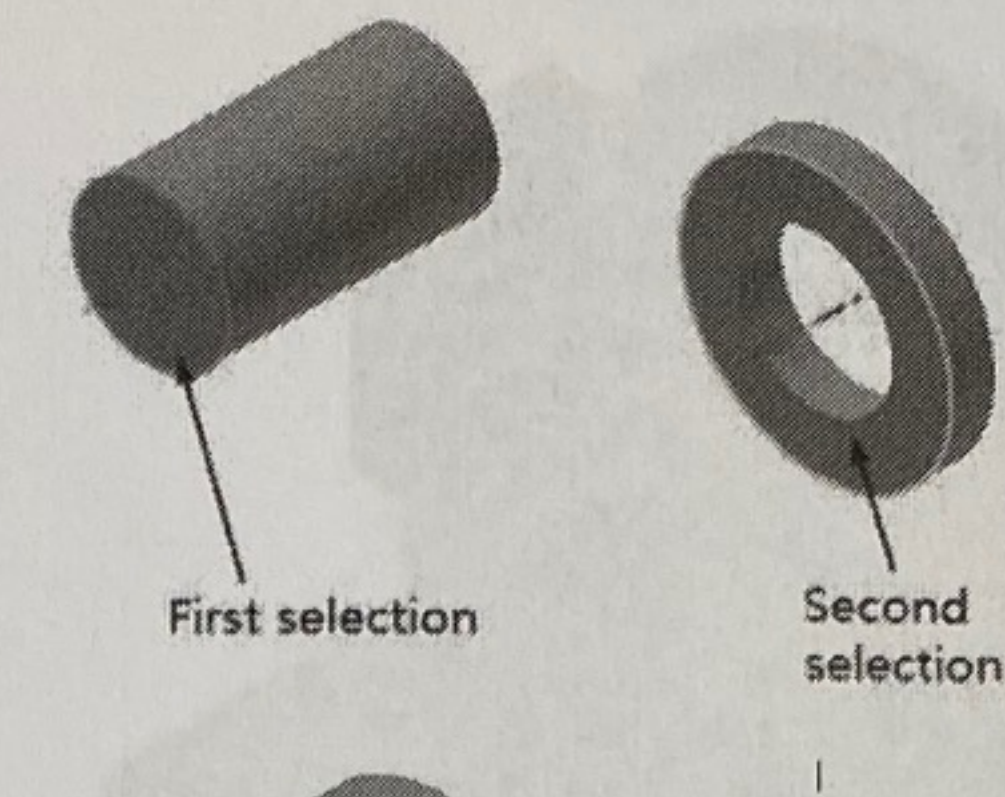
Outside solution



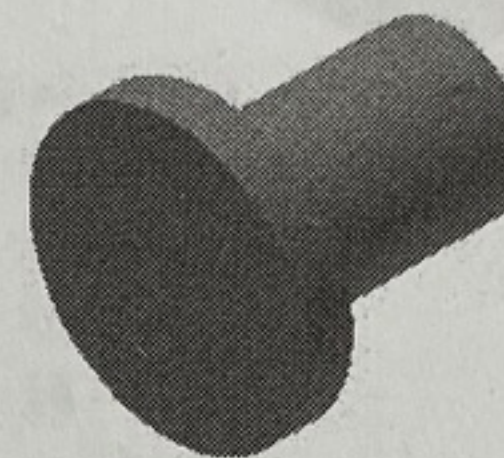
Inside Solution

Insert: This constraint is used to make two round faces coaxial. In addition, the planar faces of the cylindrical components will be on the same plane.

Check the **Lock Rotation**  option, if you want to lock the rotation of the component.

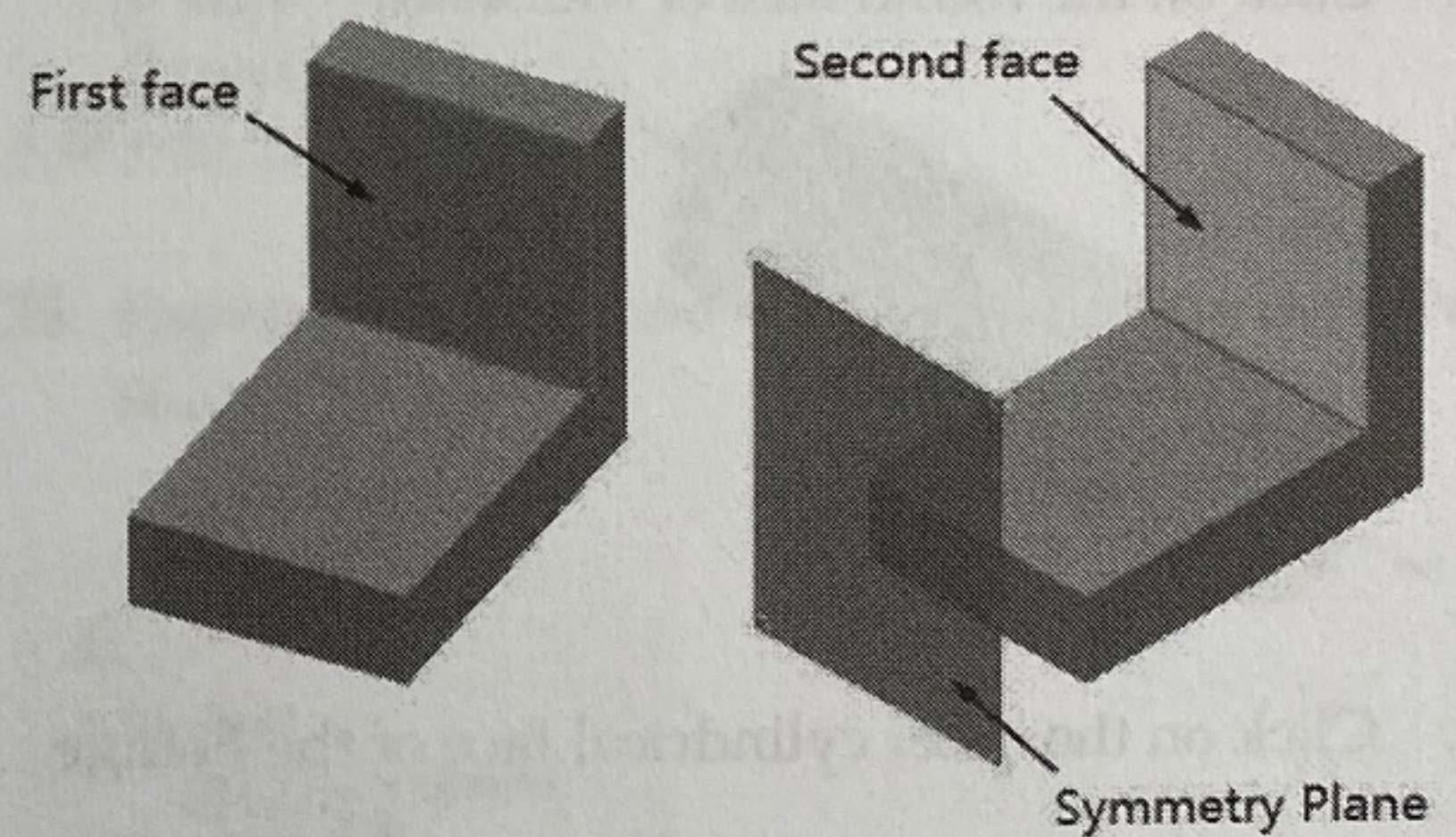


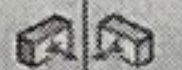
Opposed solution

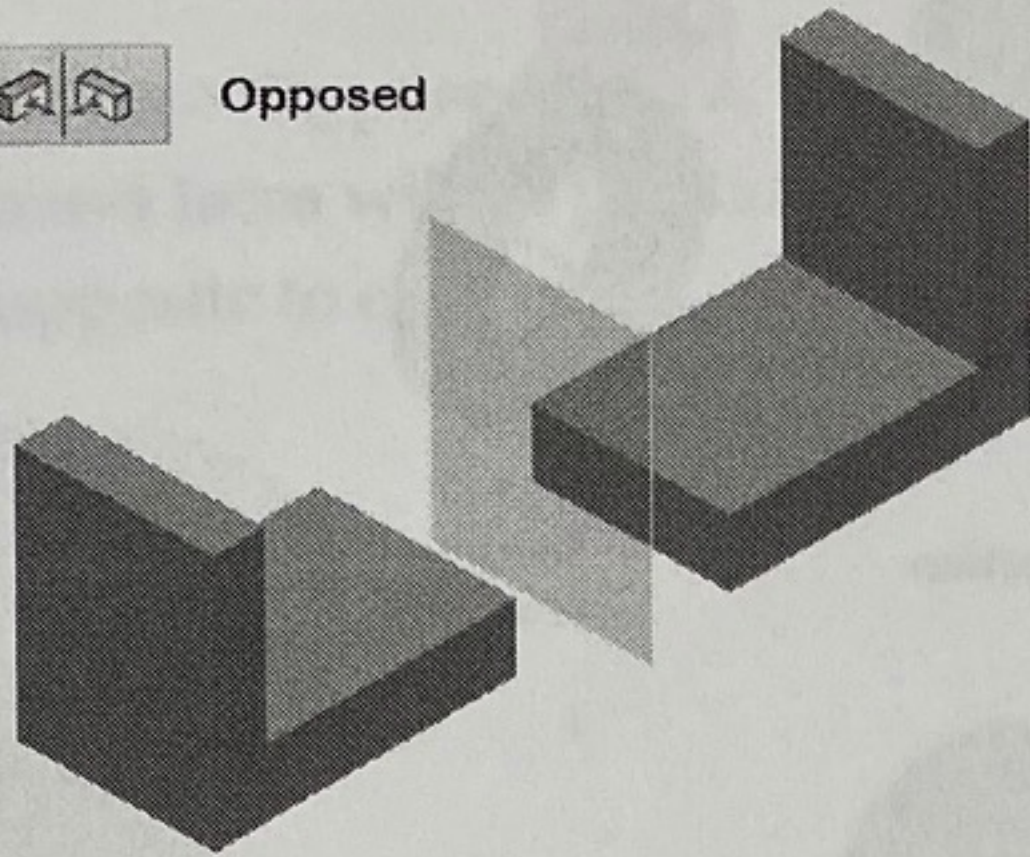



Aligned solution

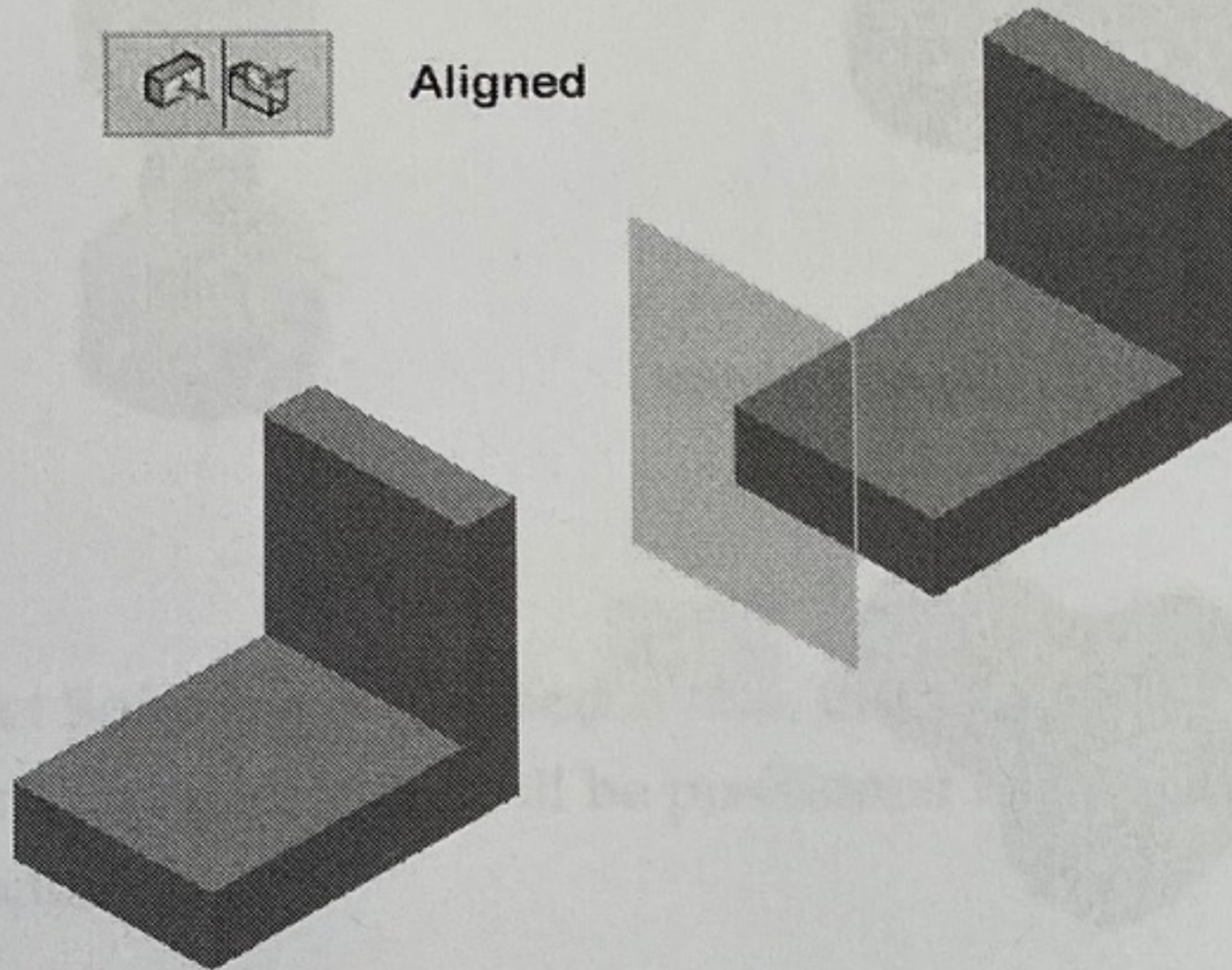
Symmetry: This constraint is used to position the two components symmetrically about a plane.

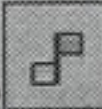


 Opposed

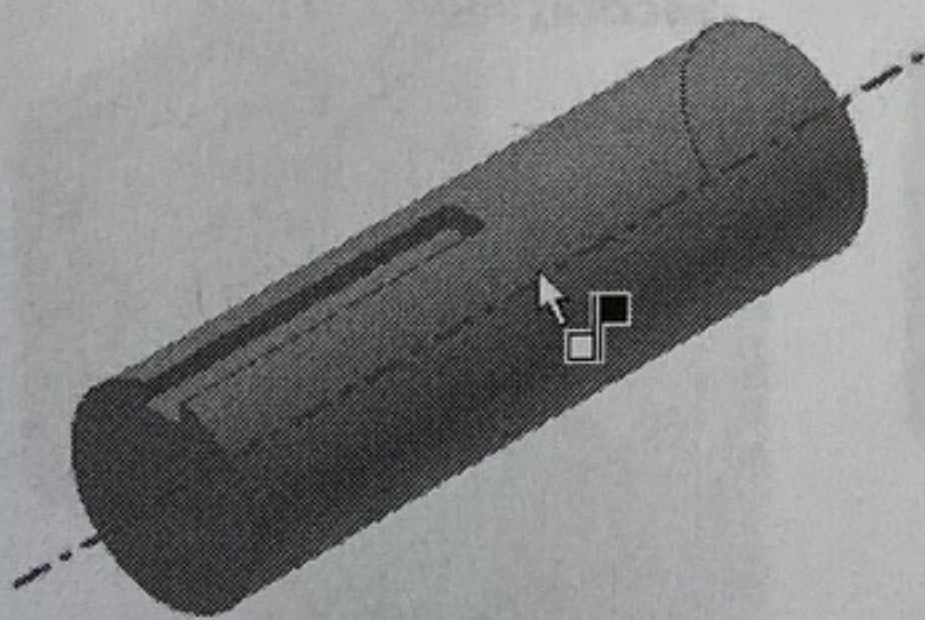


 Aligned

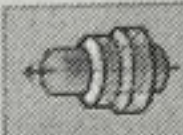


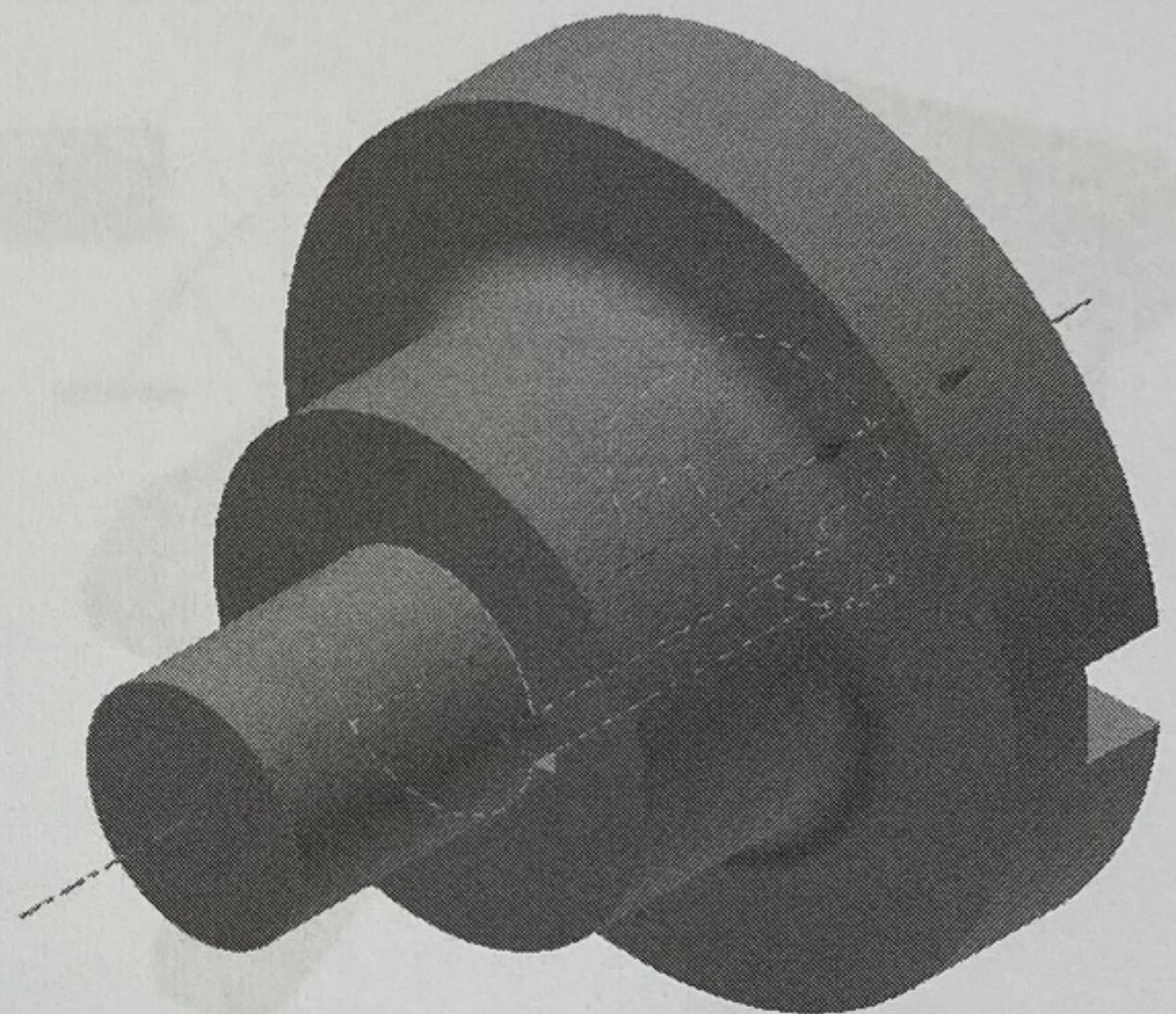
2. On the **Place Constraint** dialog, under the **Type** group, click the **Mate**  icon.

3. Click on the round face of the Shaft.

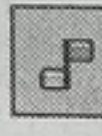


4. Click on the inner cylindrical face of the **Flange**.

5. Click the **Aligned**  icon on the **Place Constraint** dialog.



6. Click the **Apply** button.

7. Ensure that the **Mate**  icon is selected in the **Type** group.

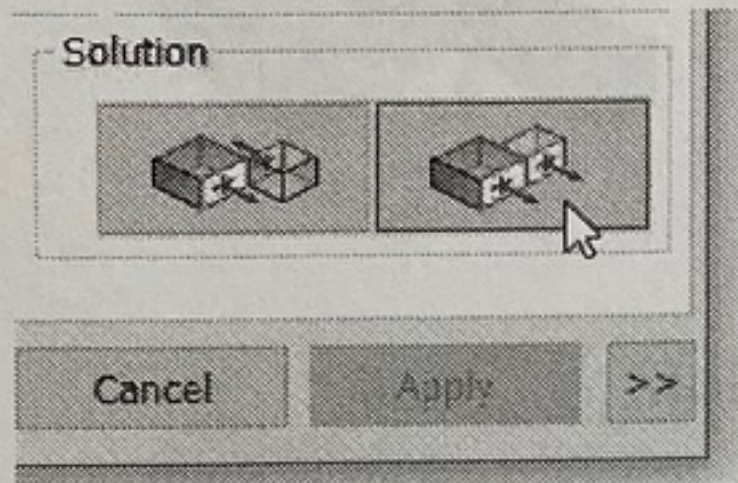
8. Click the **Free Orbit** icon on the Navigation Bar.



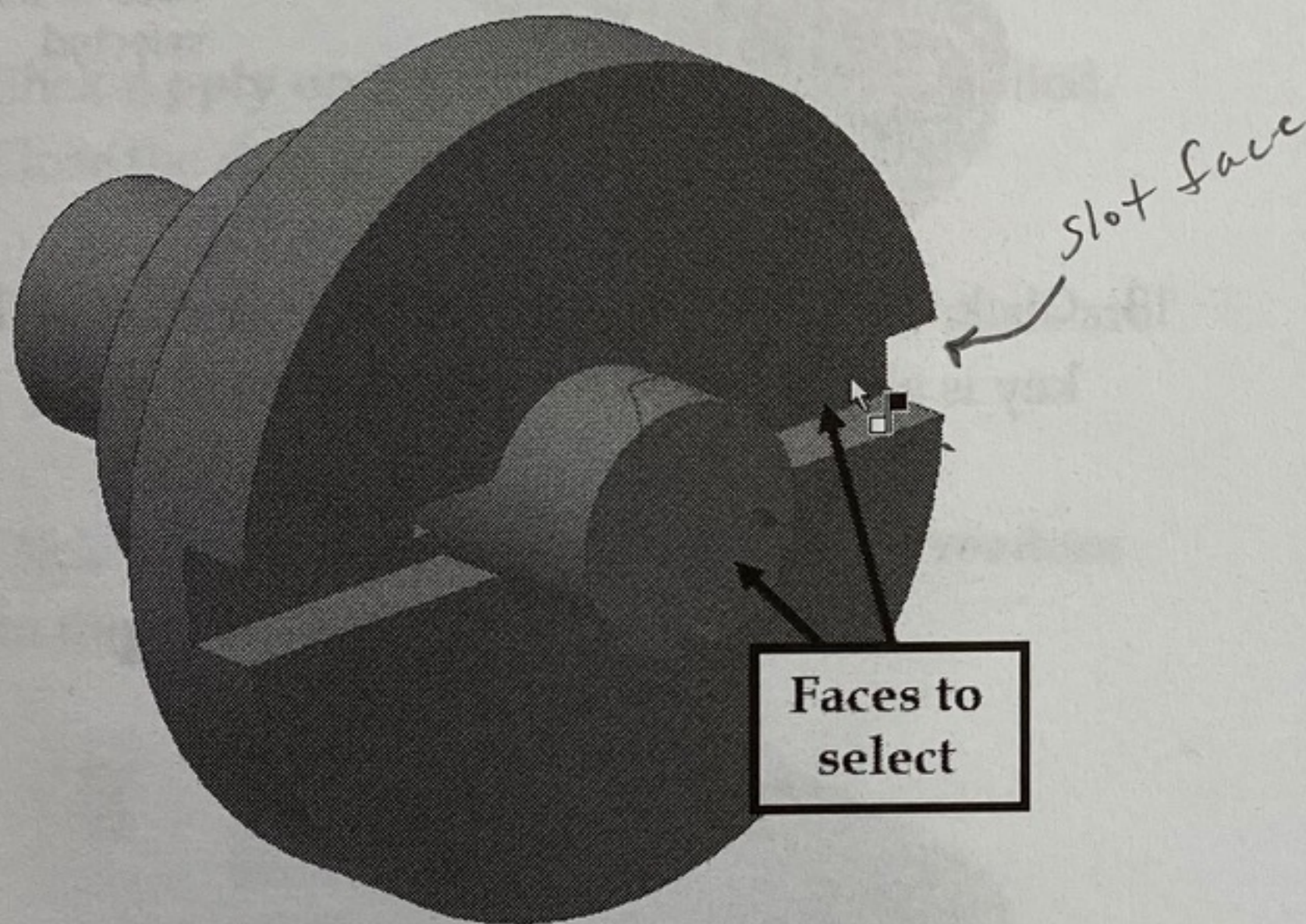
9. Move the pointer and place it on the model.

Assembly Basics

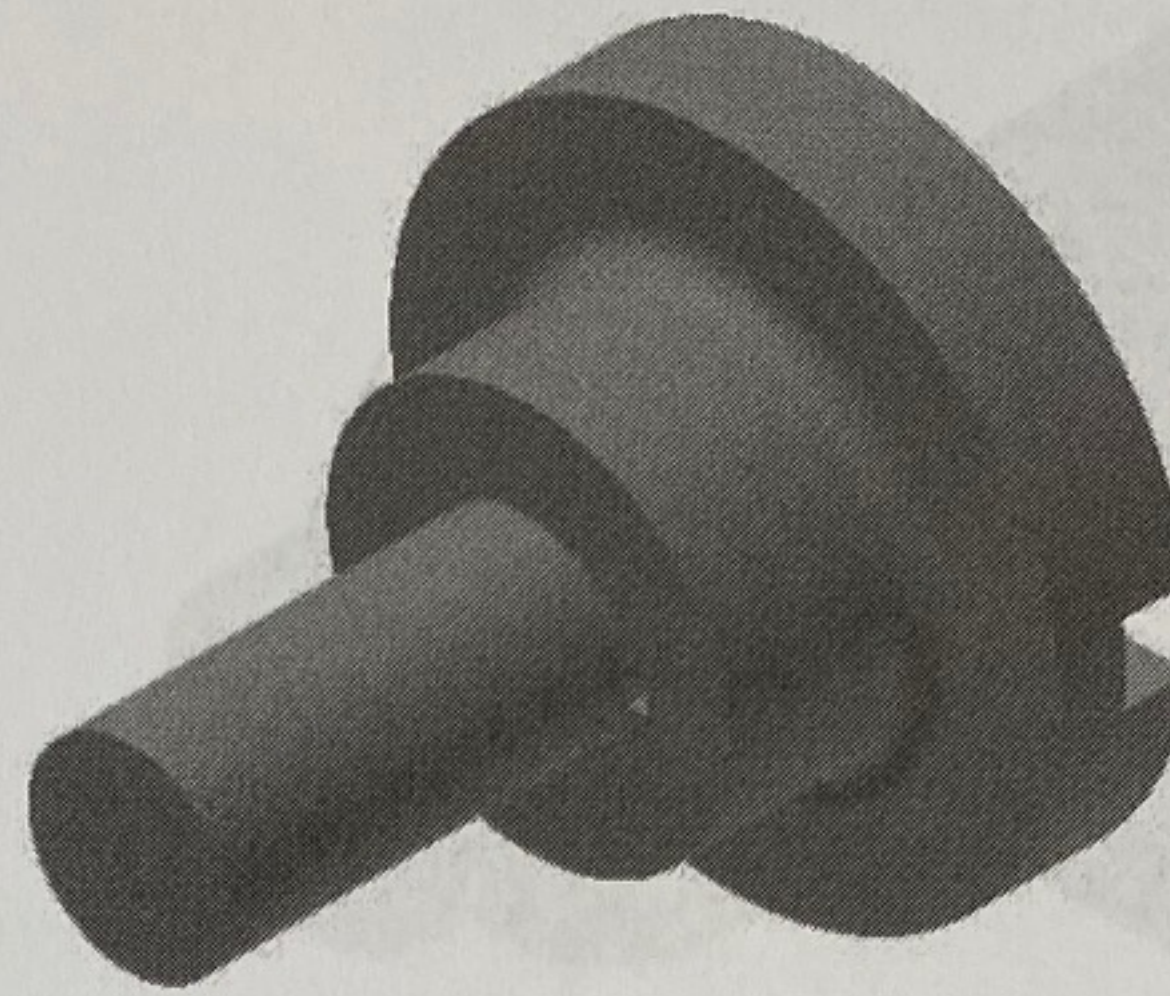
10. Click and drag the left mouse button toward left; the model is rotated such that the back side is displayed.
11. Right click and select **OK**.
12. Click the **Flush** button on the **Place Constraint** dialog.



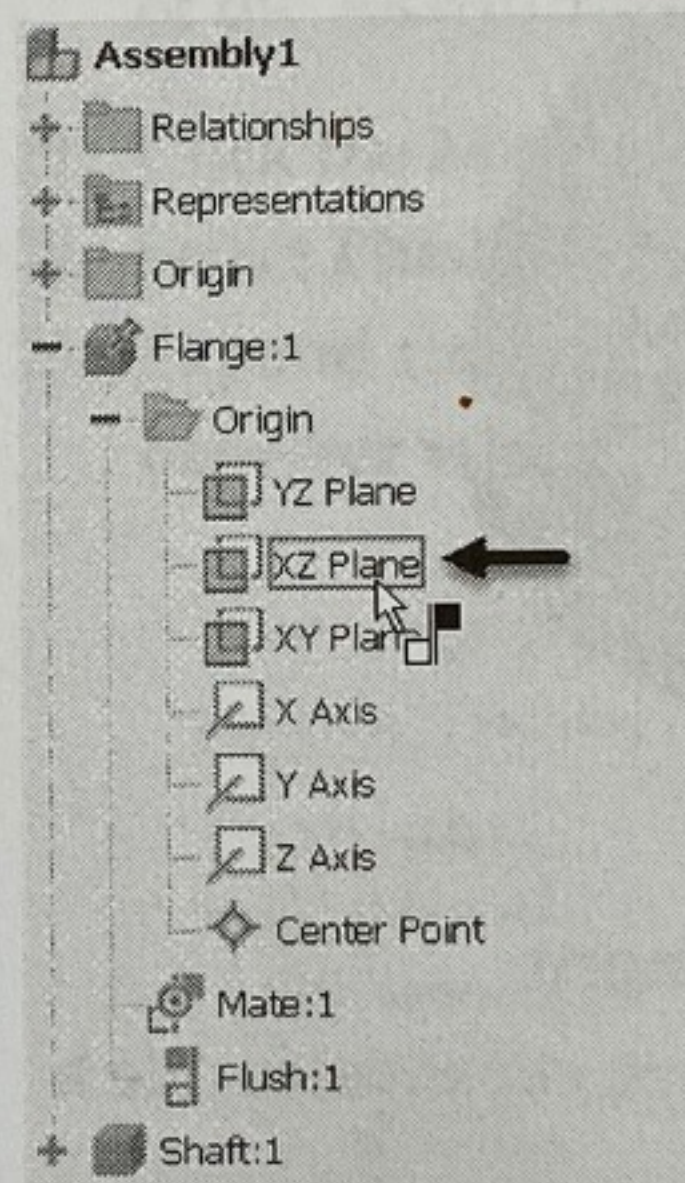
13. Click on the front face of the shaft.
14. Click on the slot face of the flange, as shown in the figure.



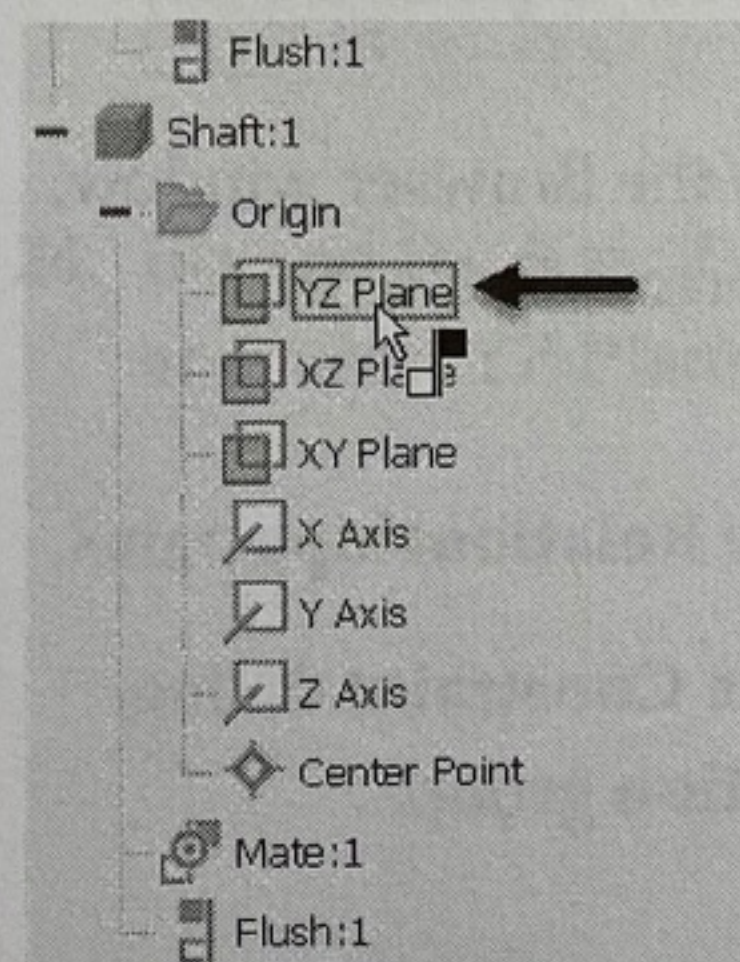
15. Click **Apply**. The front face of the Shaft and the slot face of the Flange are aligned.
16. Right click in the graphics window and select **Home View**.



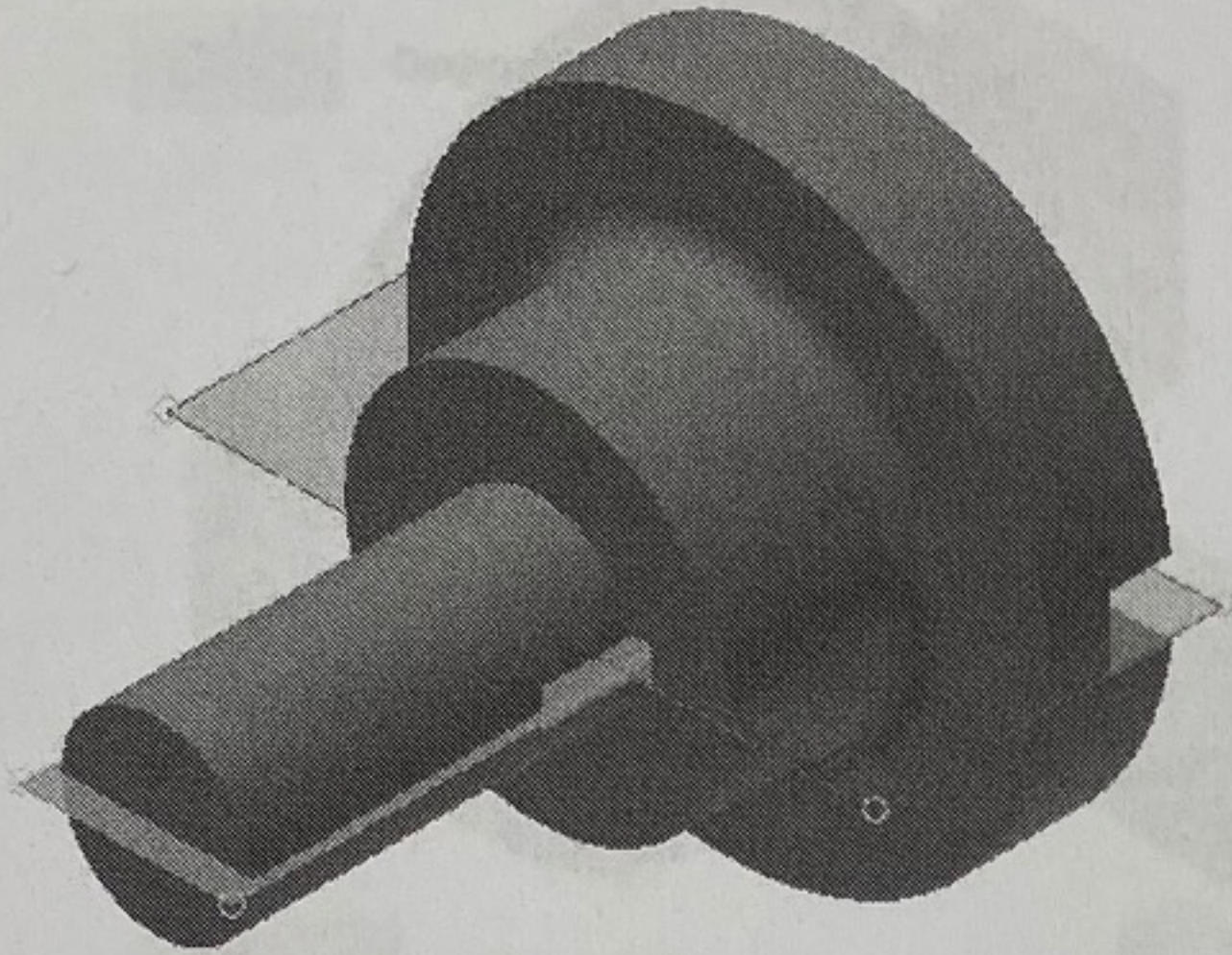
17. Ensure that the **Mate** button is selected in the **Type** group.
18. Expand **Flange: 1** in the Browser window.
19. Select the XZ Plane of the Flange.



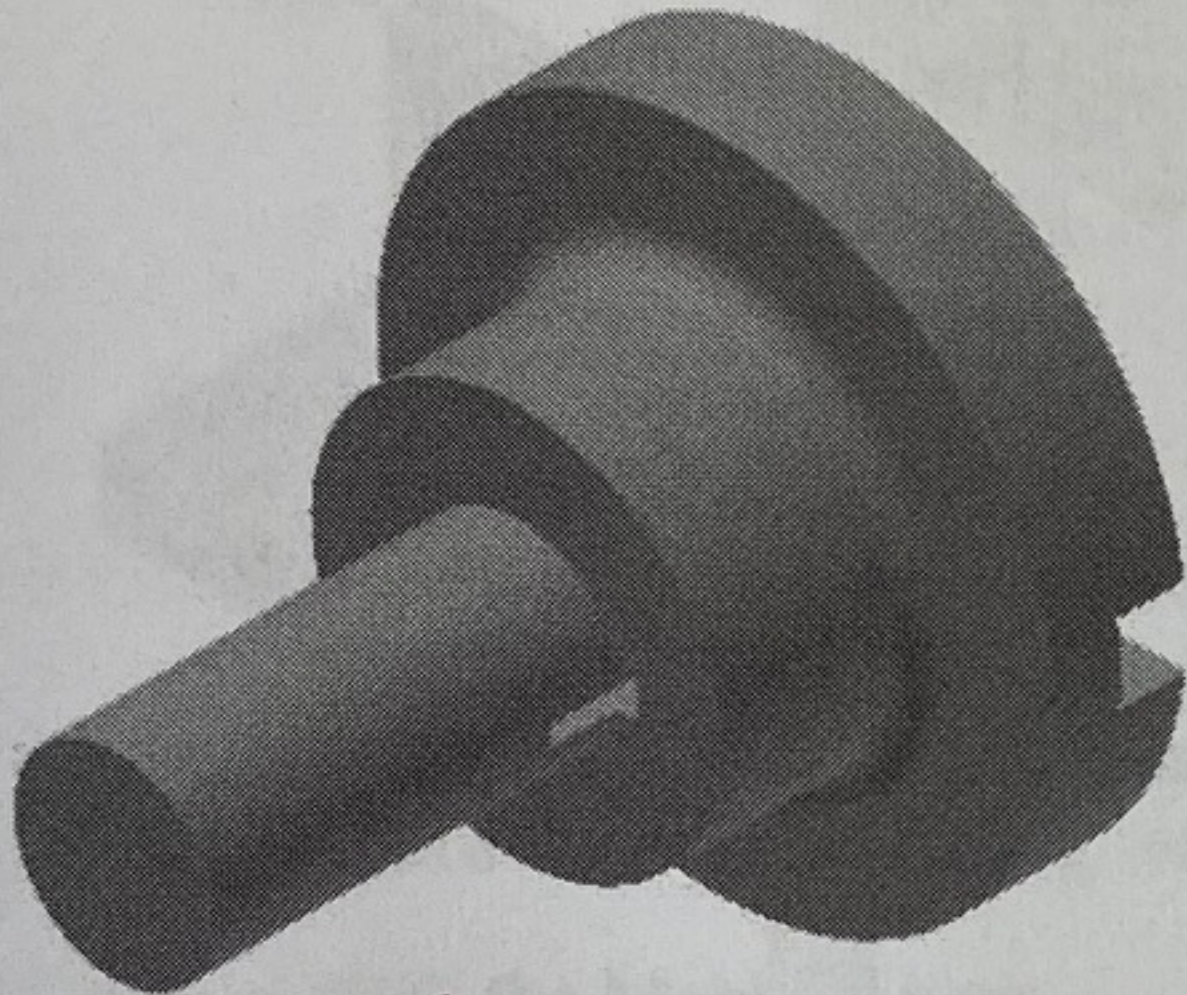
20. Expand **Shaft: 1** and select the YZ plane of the Shaft.



21. Click the **Flush** button on the **Place Constraint** dialog.

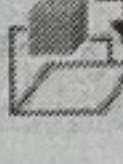
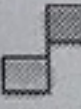



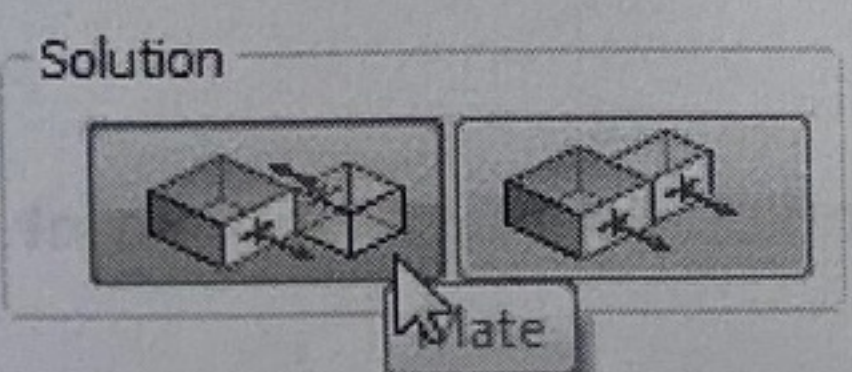
22. Click **OK** to assemble the components.



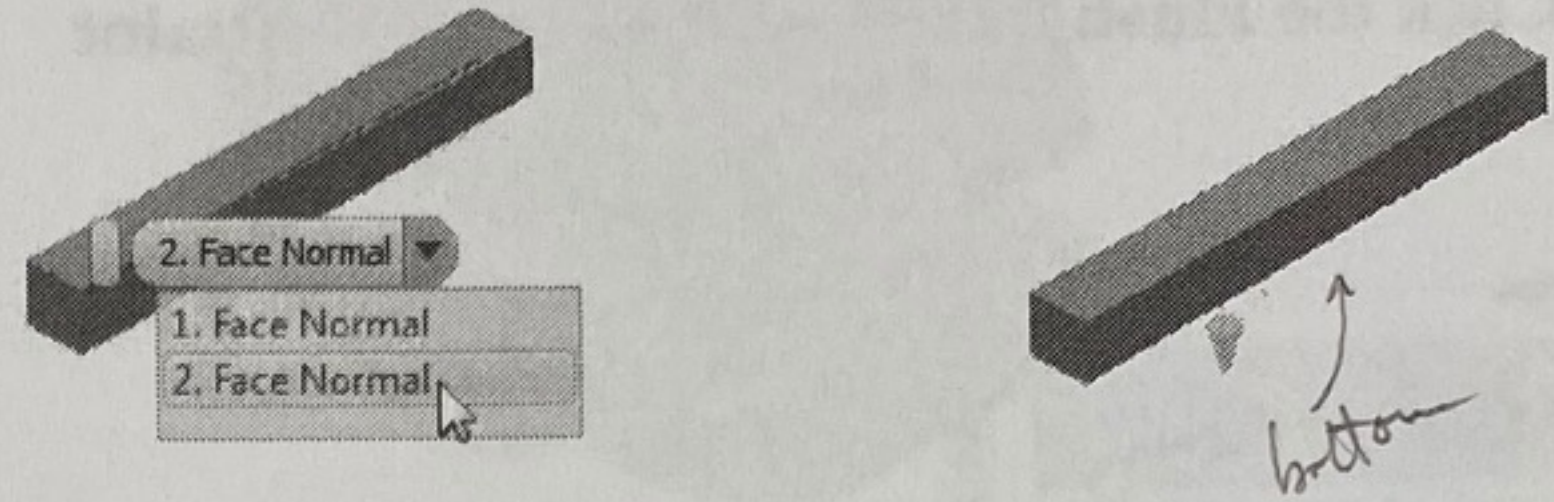
(Key)

Adding the Third Component

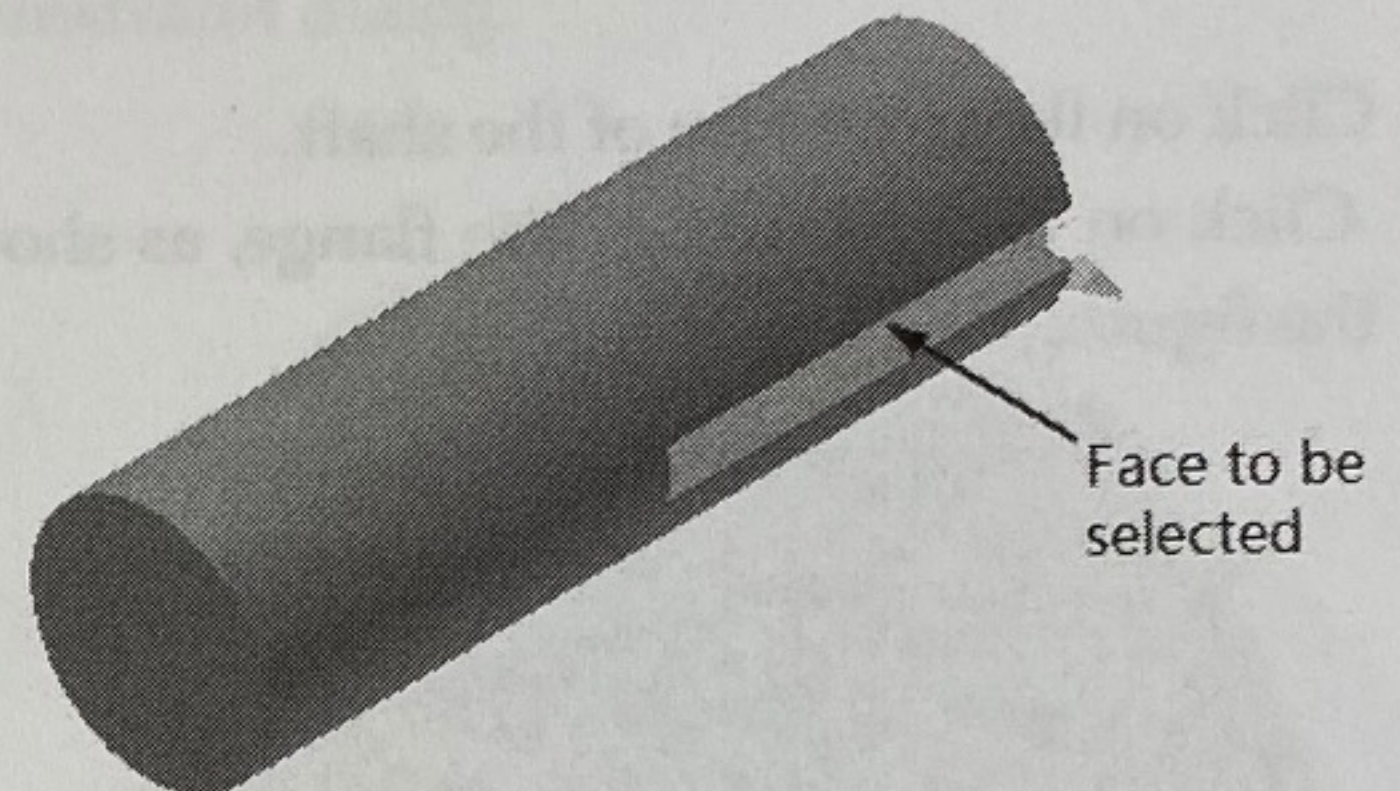
1. To insert the third component, click **Assemble > Component > Place**  on the ribbon.
2. Go to the project folder and double-click on **Key.ipt**.
3. Click in the graphics window to place the key.
4. Right-click and click **OK**.
5. Right-click on **Flange: 1** in the Browser window.
6. Click **Visibility** on the shortcut menu; the Flange is hidden.
7. Click **Constrain**  on the **Relationships** panel.
8. Click **Mate**  on the **Place Constraint** dialog.
9. Select **Mate** from the **Solution** group.



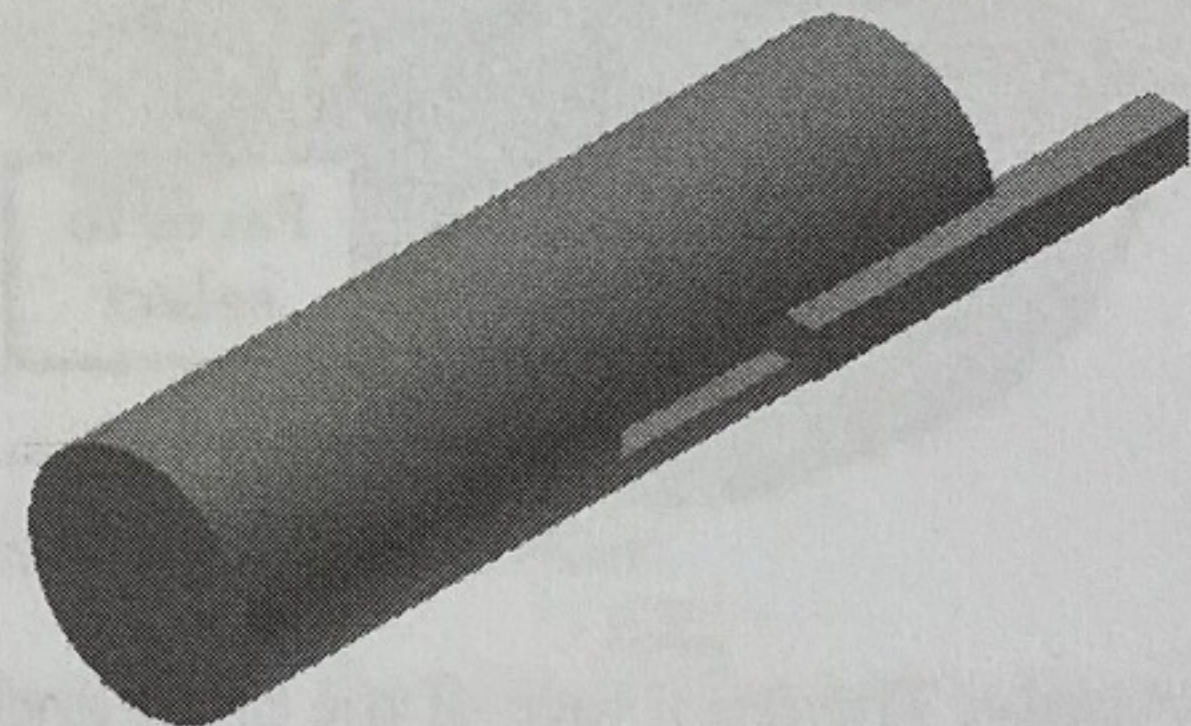
10. Click the right mouse button on the side face of the key and click **Select Other** on the shortcut menu.
11. Select the bottom face of the Key from the flyout.




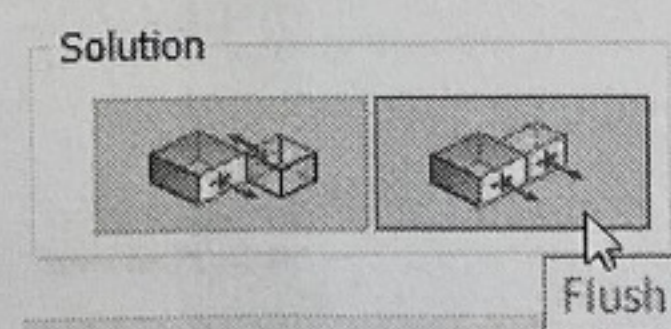
12. Select the flat face of the slot.



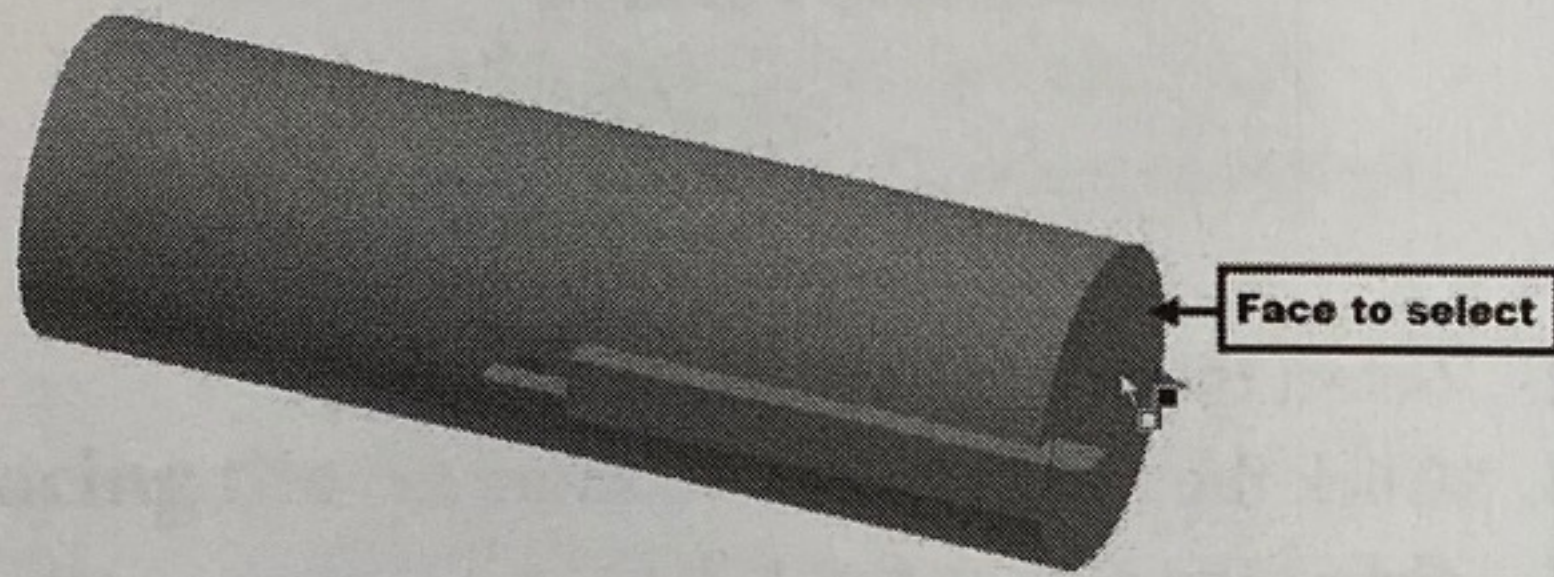
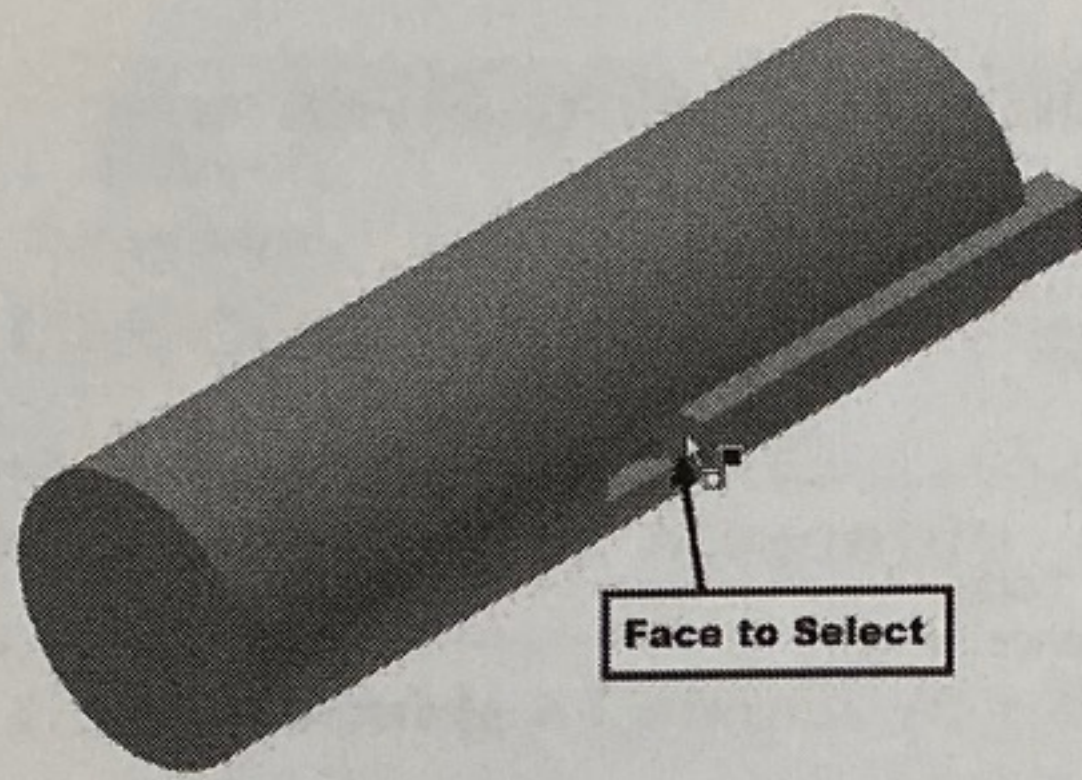
13. Click the **Apply** button. The bottom face of the key is aligned with the flat face of the slot.



14. Click the **Mate**  icon on the **Place Constraint** dialog.
15. Select **Flush** from the **Solution** group.



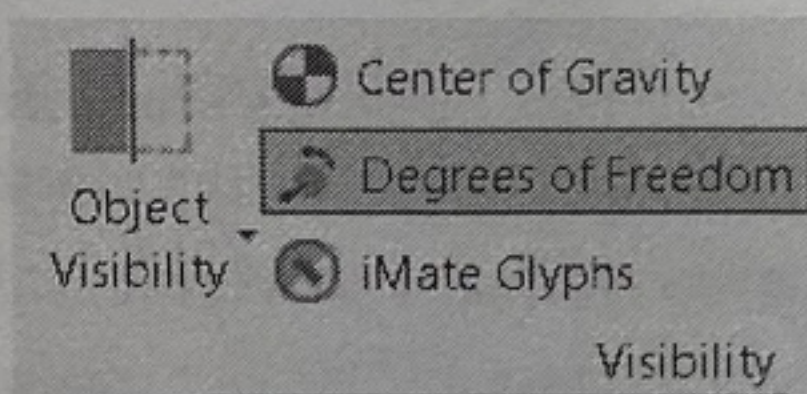
16. Select the front face of the Key and back face of the Shaft, as shown.



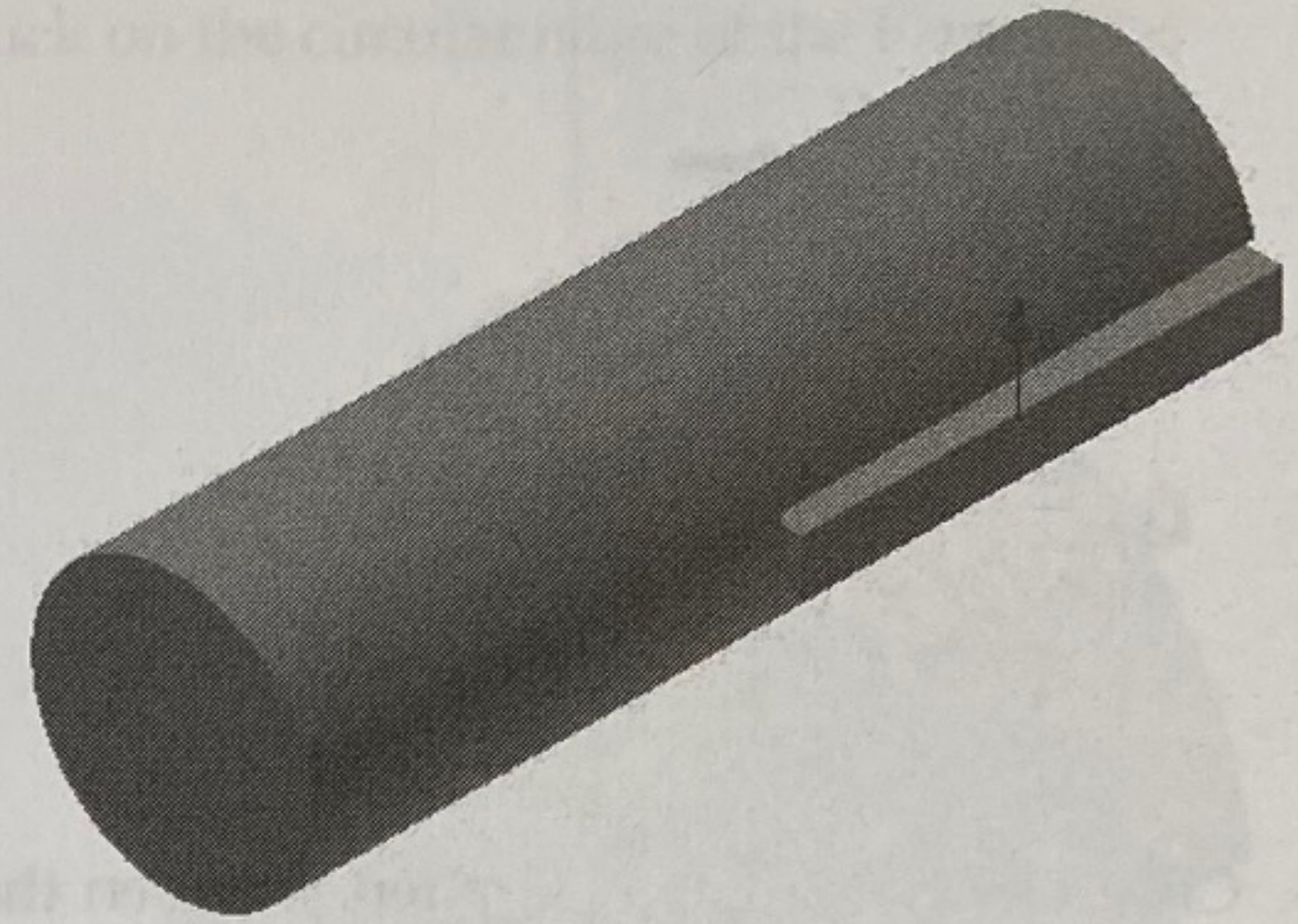
17. Click **Apply** on the dialog; the mate is applied.
18. Close the dialog.

Now, you need to check whether the parts are fully constrained or not.



19. Click **View > Visibility > Degrees of Freedom** on the ribbon.

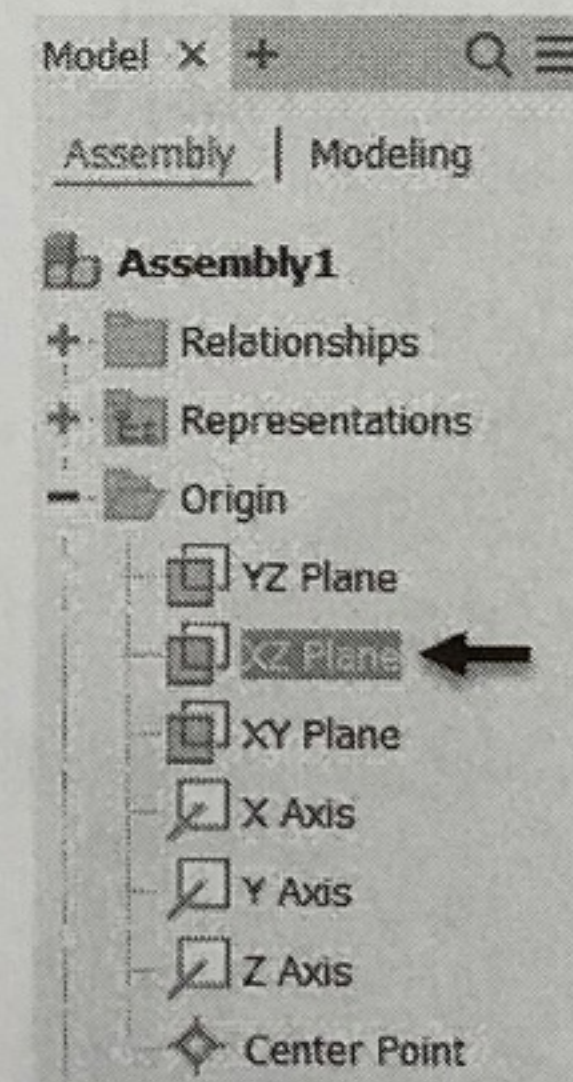


You will notice that an arrow appears pointing in the upward (or downward) direction. This means that the Key is not constrained in the Z-direction.



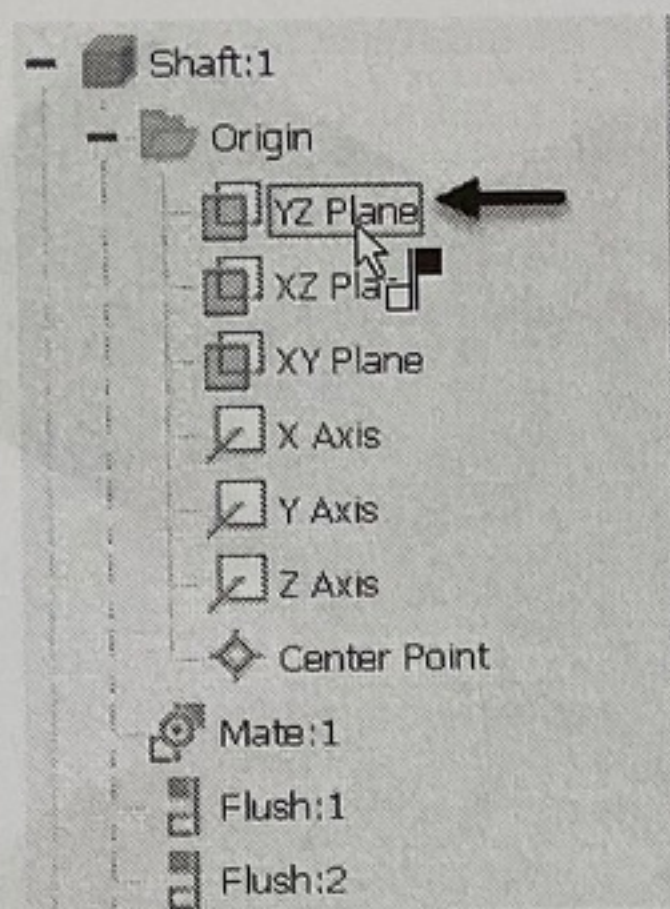
You must apply one more constraint to constrain the key.

20. Click **Constrain**  on the **Relationships** panel of the **Assemble** ribbon tab.
21. Click the **Mate**  icon the dialog.
22. Select **Flush** from the **Solution** group.
23. Expand the **Origin** node of the **Assembly** in the **Browser window** and select **XZ Plane**.

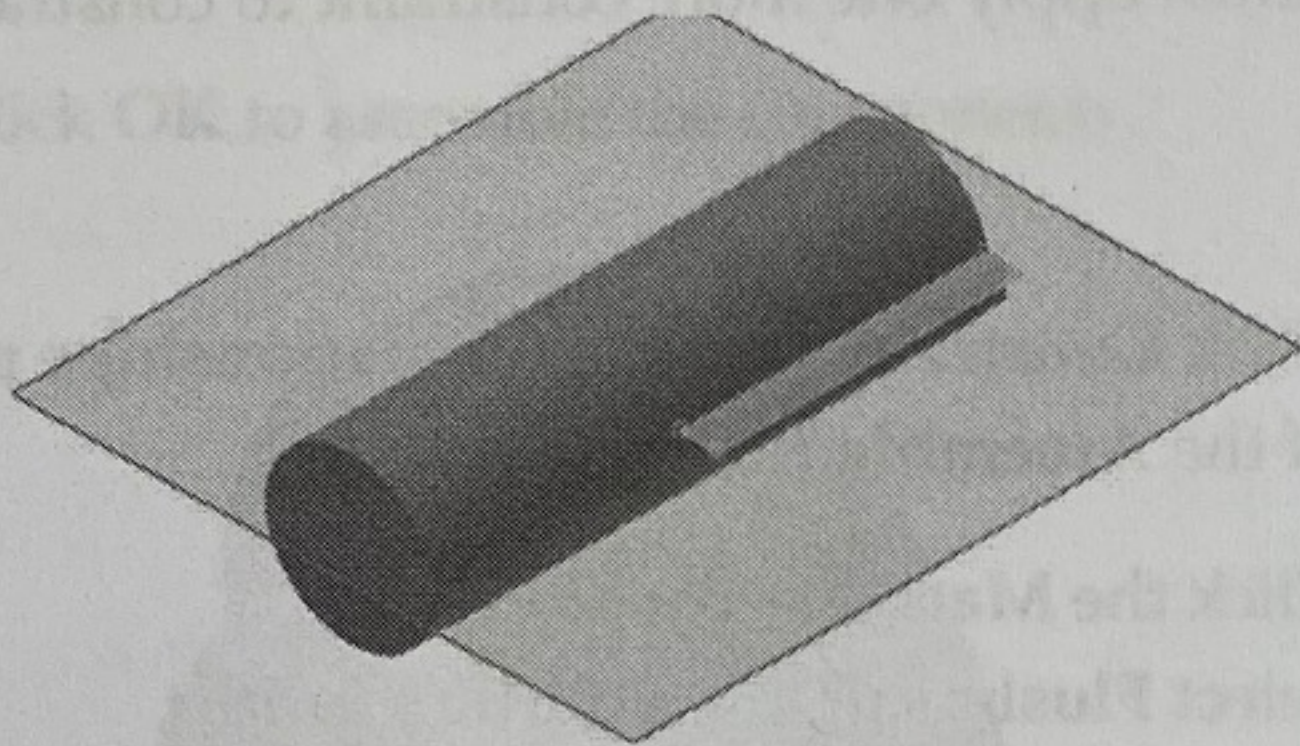


24. Expand the **Key: 1** node in the **Browser window** and select **YZ Plane**.

Assembly Basics

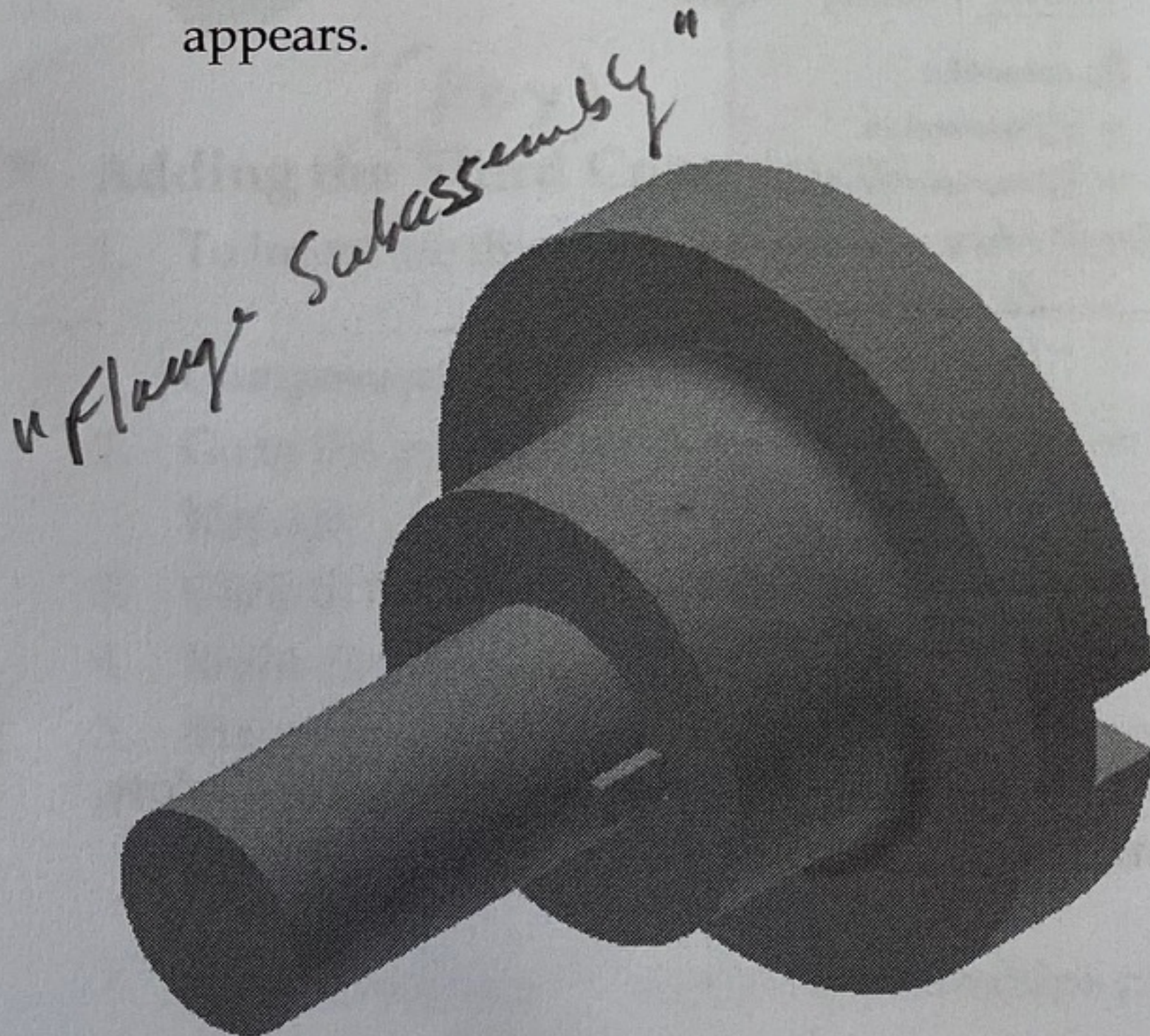


25. Click **OK**. The mate is applied between the two planes.



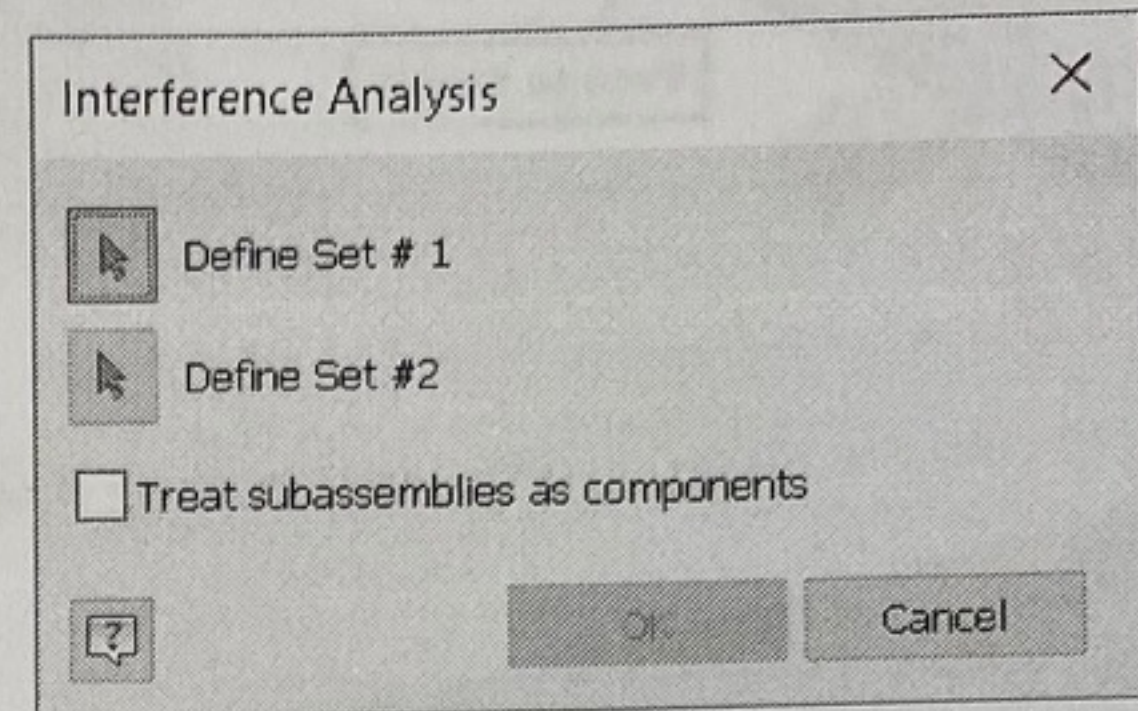
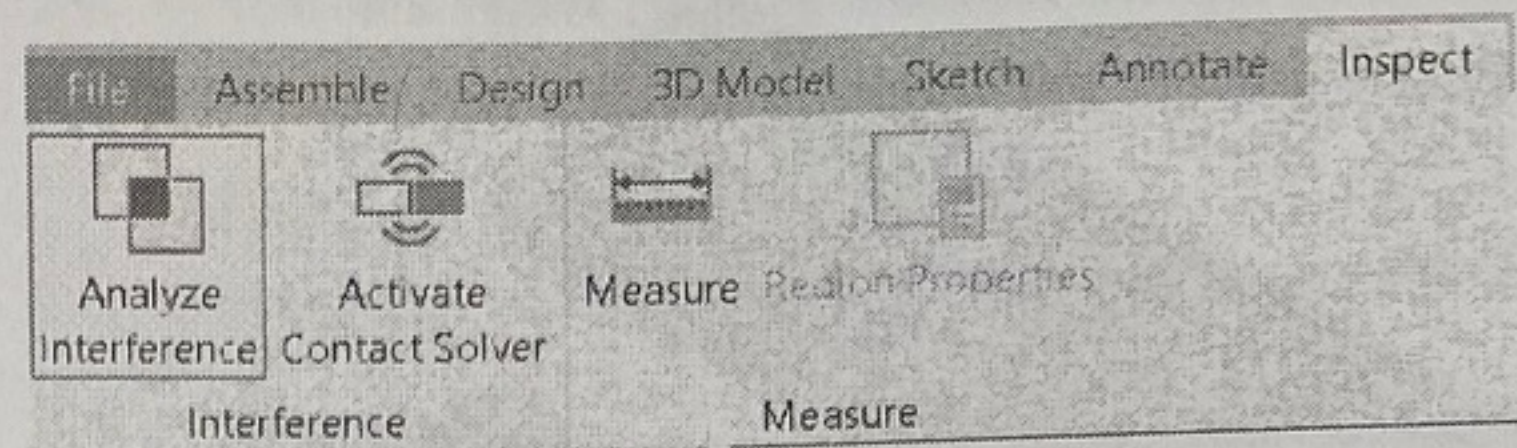
Now, you need to turn on the display of the Flange.

26. Right-click on the **Flange** in the **Browser window** and select **Visibility**; the **Flange** appears.

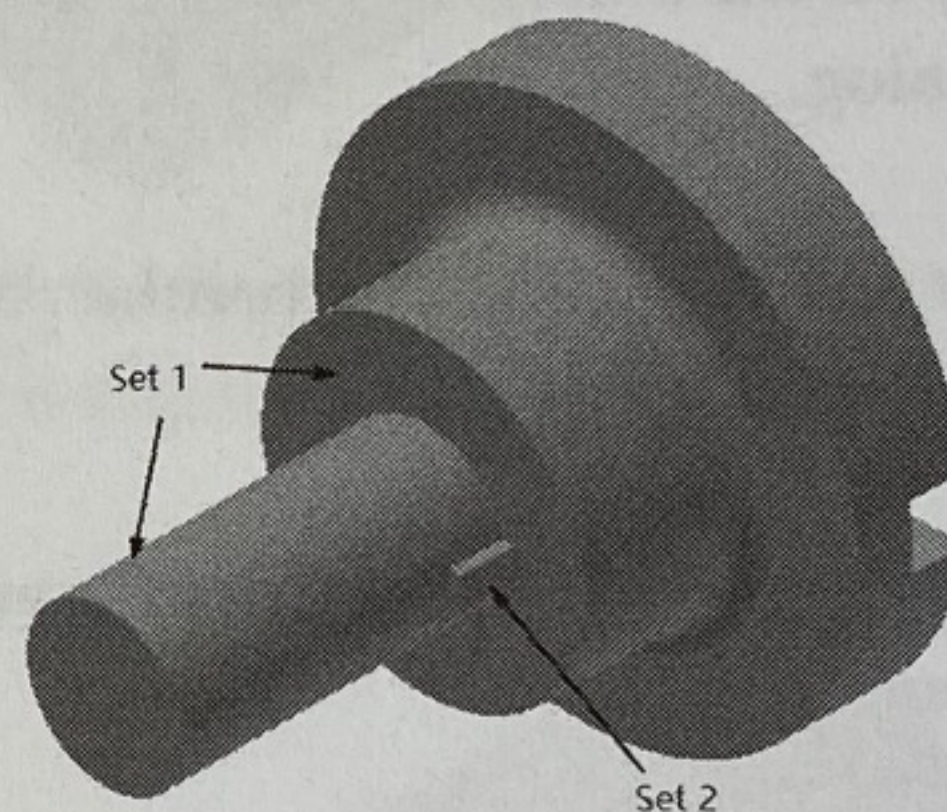


Checking the Interference

1. Click **Inspect > Interference > Analyze Interference** on the Ribbon. The **Interference Analysis** dialog appears.



2. Select the **Flange** and **Shaft** as **Set #1**.
3. Click the **Define Set #2** button.
4. Select the **Key** as **Set #2**.



5. Click **OK**; the message box appears showing that there are no interferences.
6. Click **OK**.

Saving the Assembly

1. Click **Save** on the **Quick Access Toolbar**; the **Save As** dialog appears.
2. Type-in **Flange_subassembly** in the **File name** box.
3. Go to the project folder.
4. Click **Save** to save the file.
5. Click **File Menu > Close**.

Starting the Main assembly

1. On the ribbon, click **Get Started > Launch > New**.
2. On the **Create New File** dialog, click the **Standard.iam** icon.



- Click **Create** to start a new assembly.

Adding Disc to the Assembly

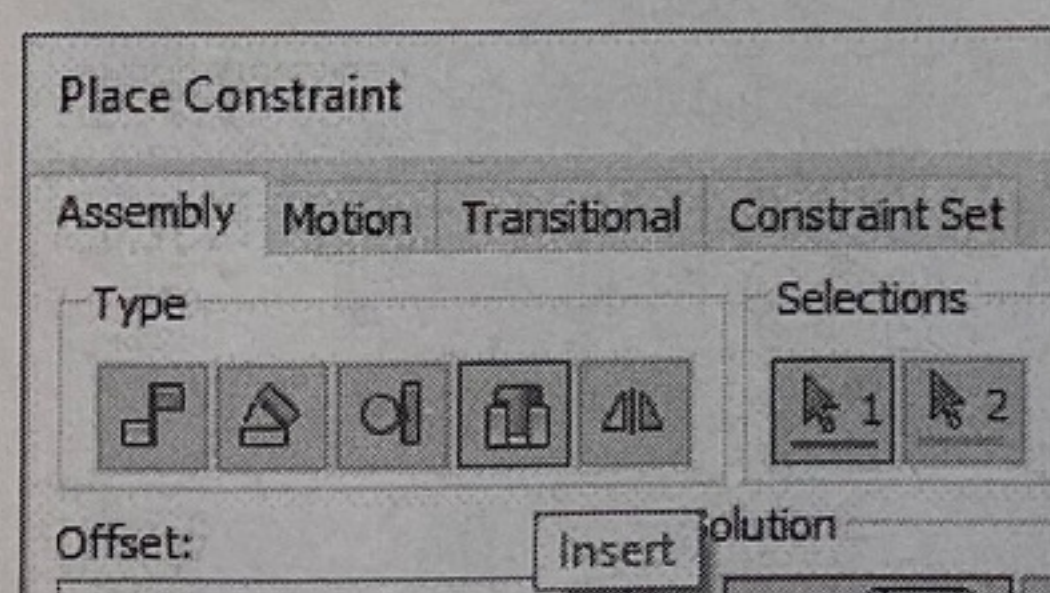
- Click **Assemble > Component > Place** on the ribbon.
- Go to the project folder and double-click on **Disc.ipt**.
- Right-click and select **Place Grounded at Origin**; the component is placed at the origin.
- Right-click and select **OK**.

Placing the Sub-assembly to the disc

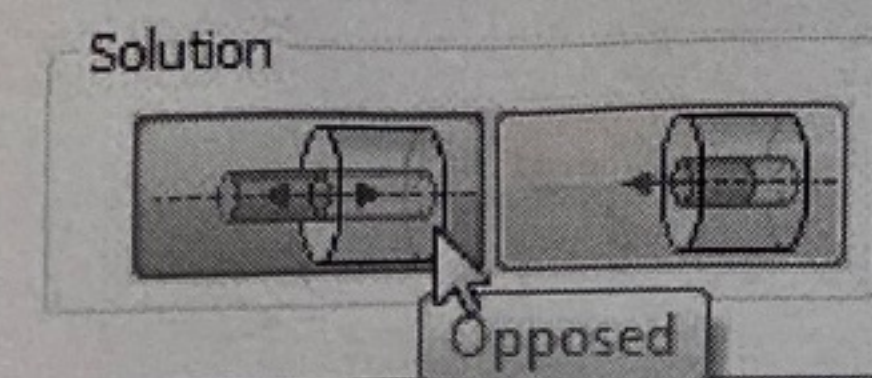
- To insert the sub-assembly, click the **Place** button on the **Component** panel of the ribbon.
- Go to the project folder and double-click on **Flange_subassembly.iam**.
- Click in the window to place the flange subassembly.
- Right-click and click **OK**.

Adding Constraints

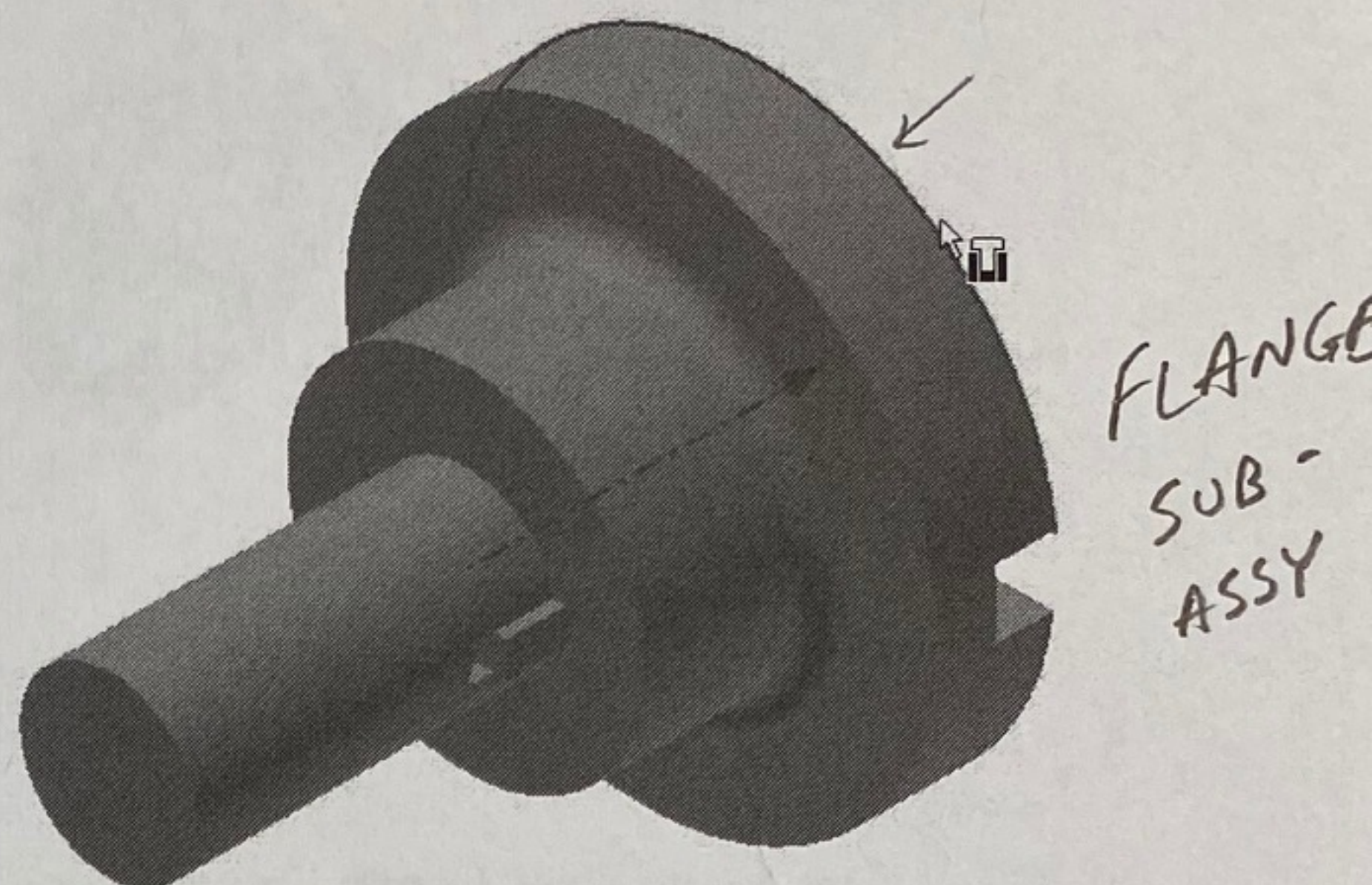
- Click **Constrain** on the **Relationships** panel of the **Assemble** ribbon.
- Click the **Insert** button on the **Place Constraint** dialog.



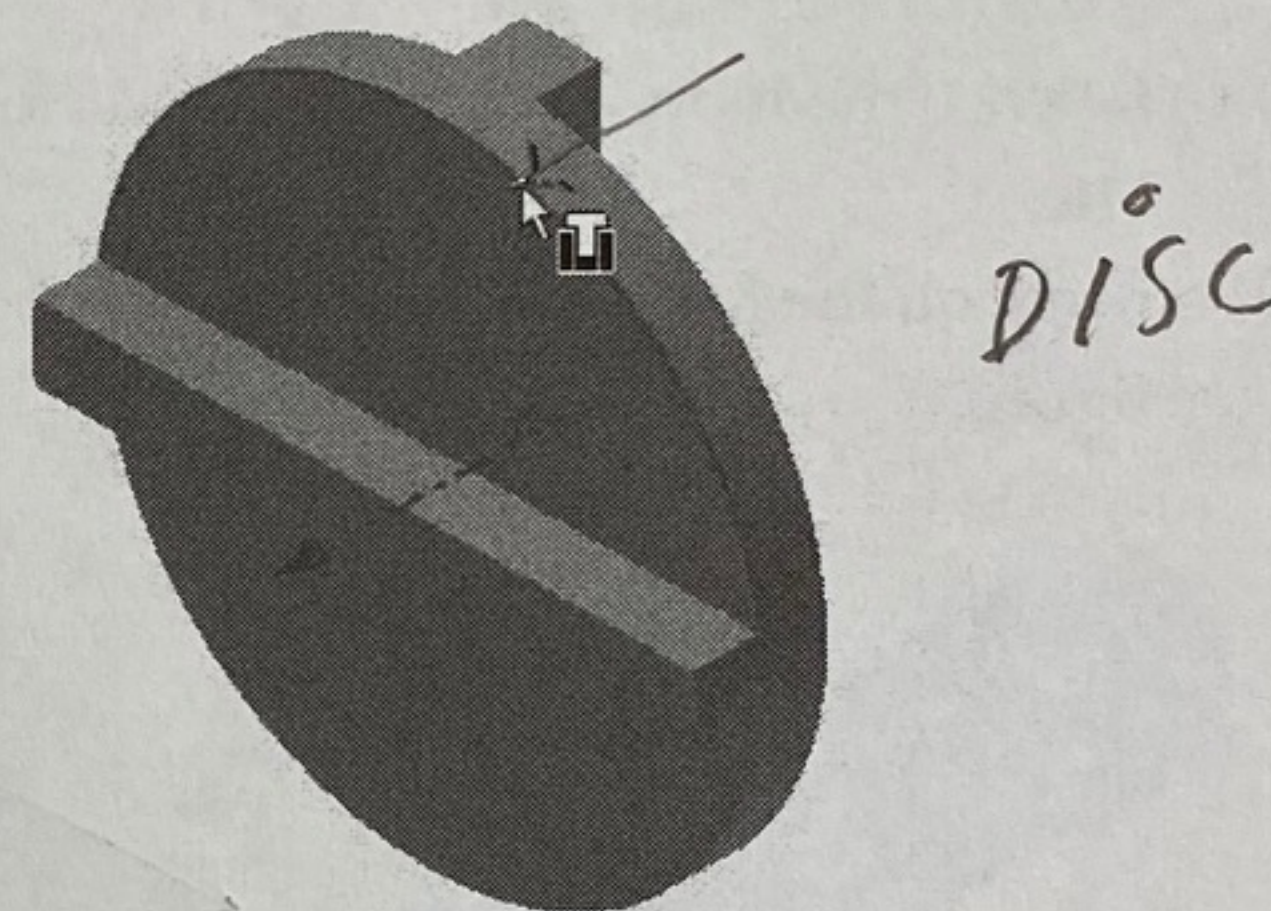
- Select **Opposed** from the **Solution** group.



- Click on the circular edge of the Flange.



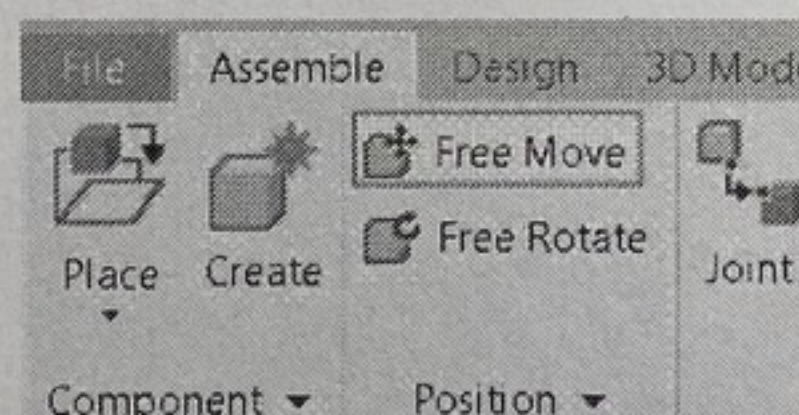
- Click on the circular edge of the Disc.



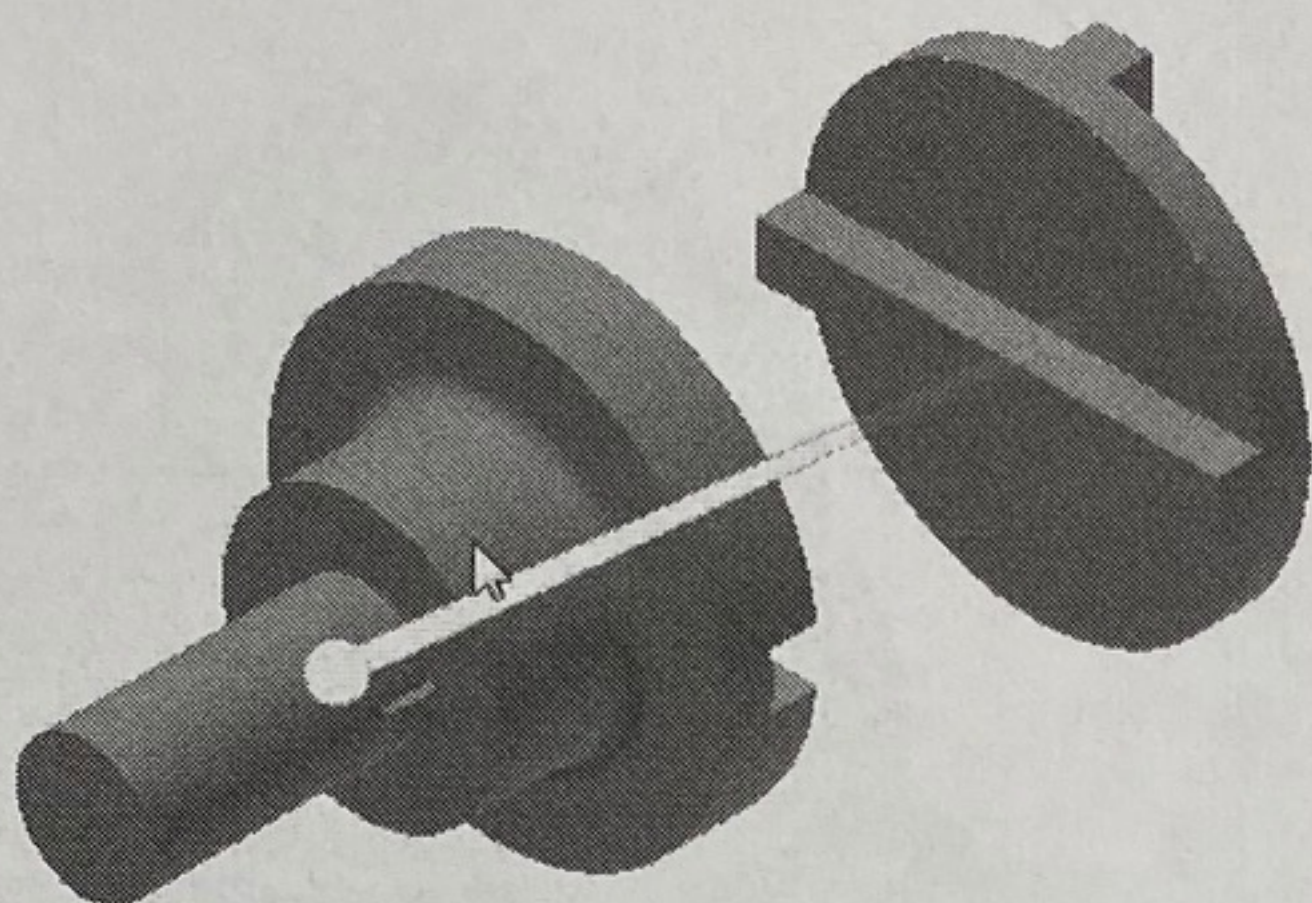
- Click **OK** on the dialog.

Next, you have to move the subassembly away from the Disc to apply other constraints.

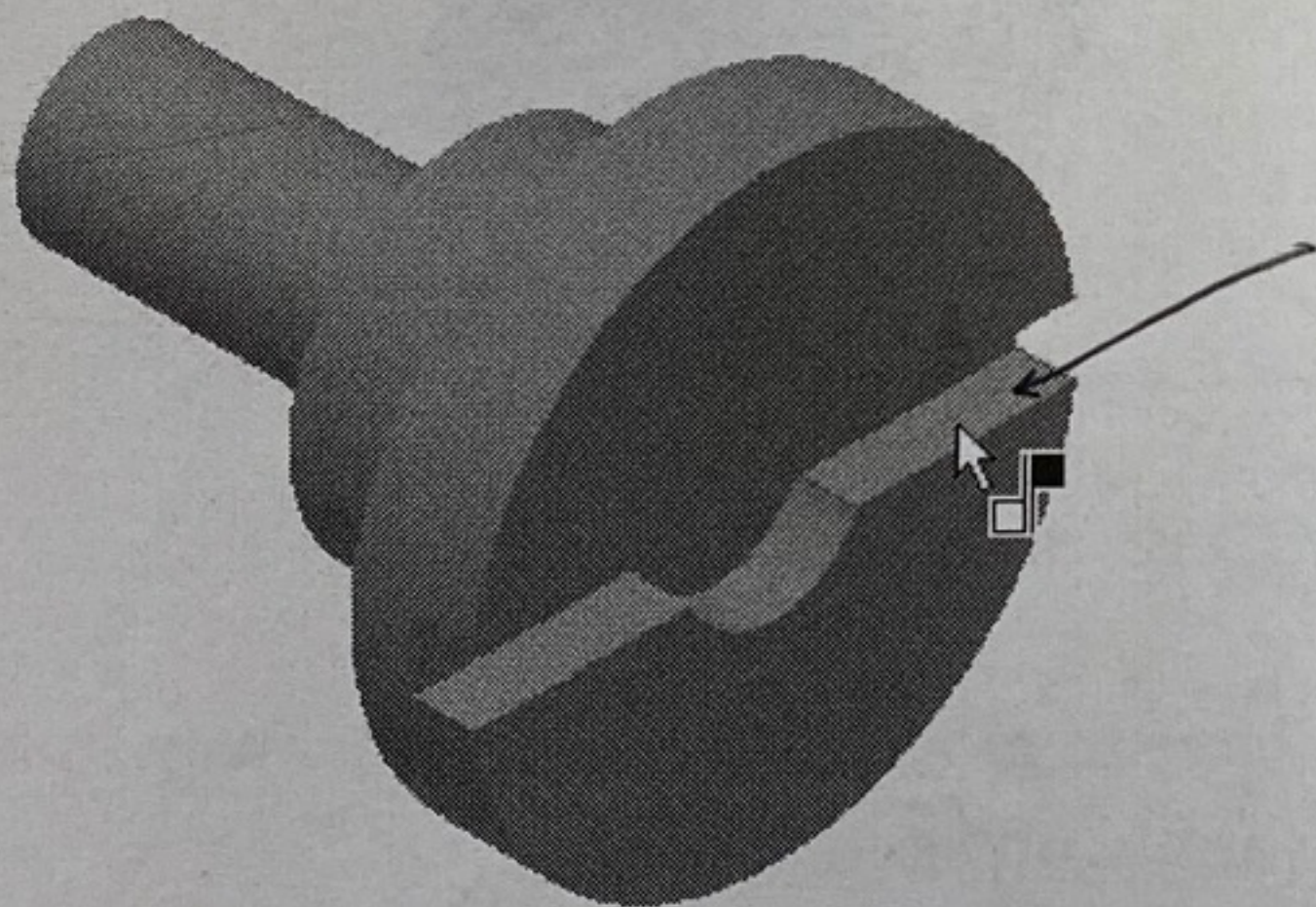
- Click **Free Move** on the **Position** panel.



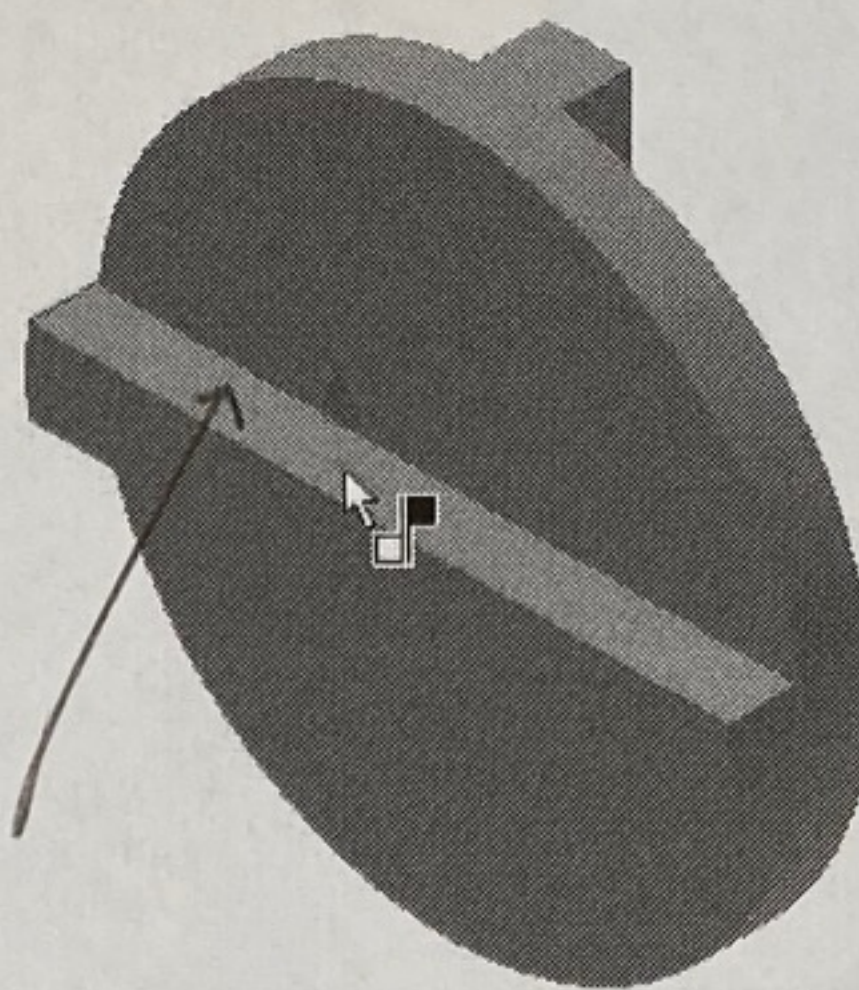
- Select the flange subassembly and move it.



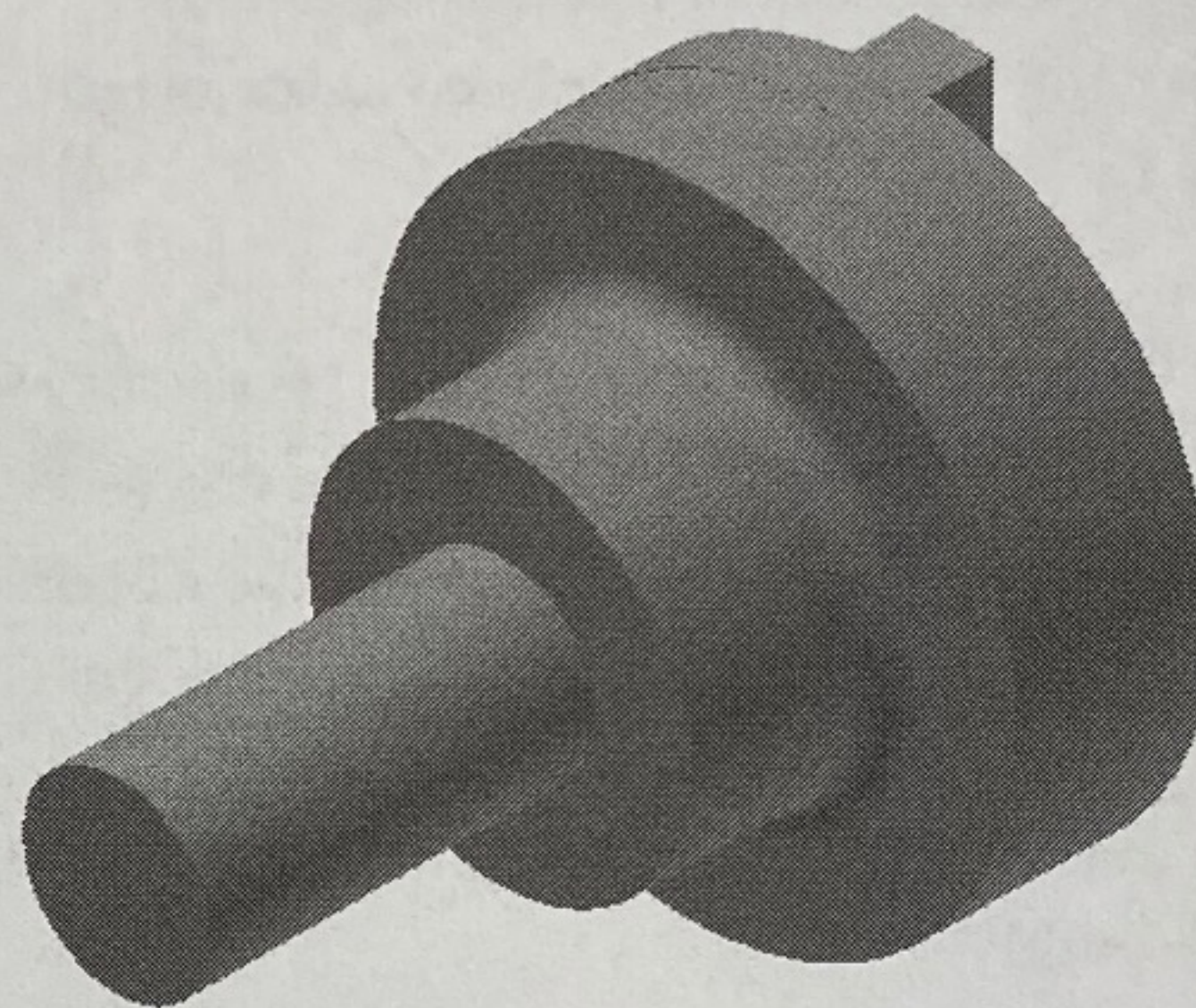
9. Click the **Constrain** button on the **Relationships** panel.
10. Click **Mate** on the **Place Constraints** dialog.
11. Select **Mate** from the **Solution** group.
12. Click the **View > Navigate > Orbit** on the ribbon.
13. Press and hold the left mouse button and drag the cursor toward left.
14. Release the mouse button, right click, and select **OK**.
15. Click on the face on the Flange, as shown in the figure.



16. Click on the face on the Disc, as shown in the figure.

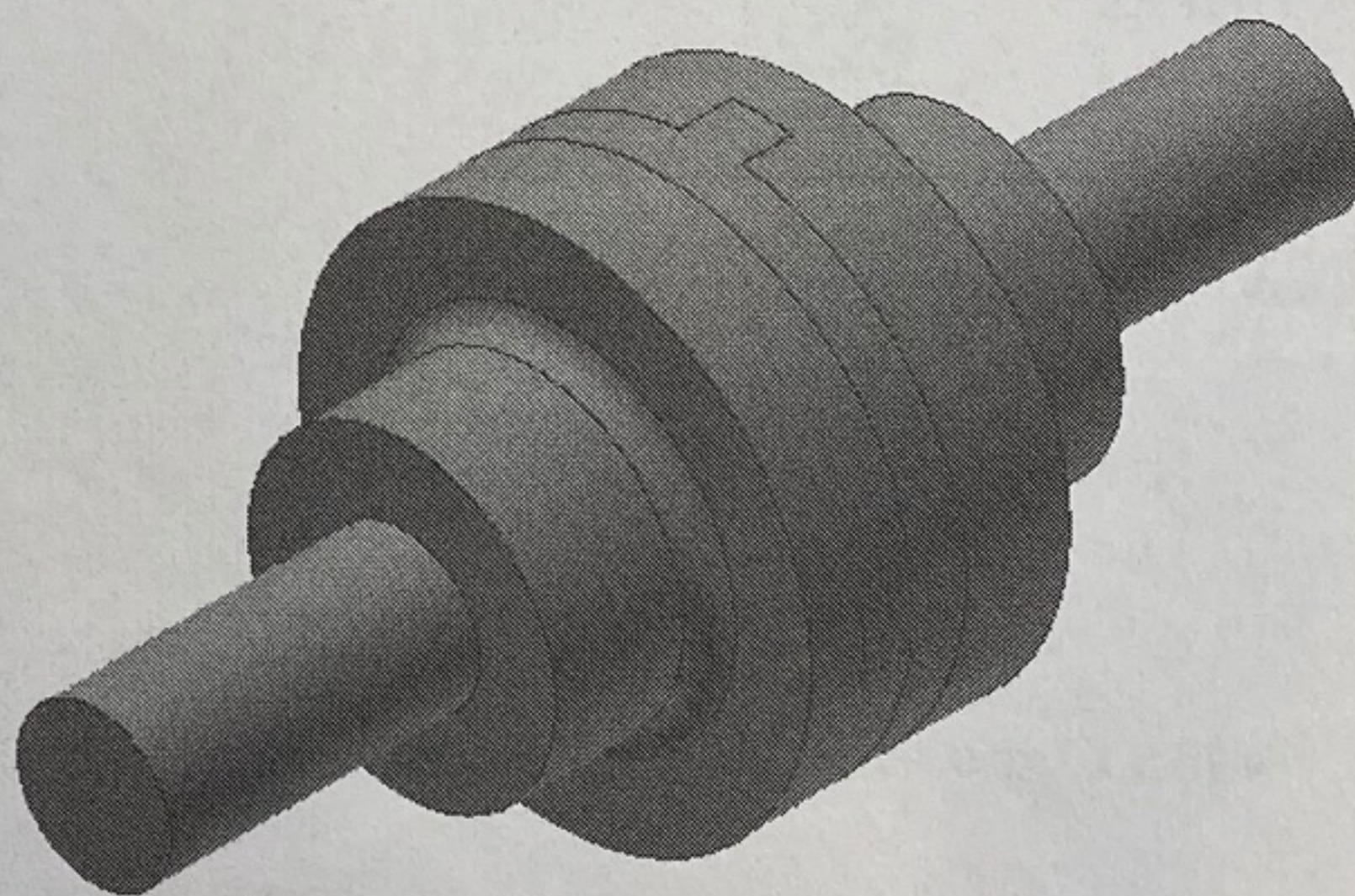


17. Click **OK** on the dialog.



Placing the second instance of the Sub-assembly

1. Insert another instance of the Flange subassembly. ✓
2. Apply the **Insert** and **Mate** constraints. ✓



Saving the Assembly

1. Click **Save** on the **Quick Access Toolbar**; the **Save As** dialog appears.
2. Type-in **Oldham coupling** in the **File name** box.

44 3. Click "save"
4. Close the file