Welcome to Code Crunch!

C12 | Crunch 3D: CAD & Modeling

[Tues 4-5PM] Weekly | Spring 2025

Attendance

Earn a Certificate of Completion by attending at least 70% of the workshops

CODECRUNCH.CS.FIU



Unit #4

Topic: Assemblies & Mating Constraints

C12 | Crunch 3D: CAD & Modeling

Key Dates and Structure
C12 - Crunch 3D: CAD & Modeling

- **Week 1: Introduction to OnShape, Sketching Fundamentals, & 2D Constraints**

  Learning what On-Shape is and how to properly sketch on OnShape.

- **Week 2: 3D Part Modeling**

  Learning how to use extrude, remove, fillet, chamfer, revolve, shell, and loft functions for 3D models.

- **Week 3: 3D Part Modeling Continued**

  Learning how to use draft, mirror, and sweep functions for 3D models.

- **Week 4: Assemblies & Mating Constraints**

  Learning how to create assemblies through mates and constraints.

- **Week 5: Final Project - Real-World Design Challenge**

  Applying all concepts to design a functional product.

- **Week 6: Final Project Showcase**

  Presenting your final project, sharing your experience, and receiving feedback.

Assembly Definitions

- **Assembly**: Allows to combine parts in different ways based on your needs.

- **Mate Connectors**: To make an assembly in OnShape, we use mate connectors. They are on the faces and edges of the parts, and we use them to connect the part we are working with.

Types of Mates

- **Fastened**: Combines the Mate Connectors and locks them in place. 
- **Revolute**: Combines the Mate Connectors and only allows rotation about the Z-axis. 
- **Slider Mate**: Combines the Mate Connectors and only allows motion about the Z-axis. 
- **Planar Mate**: Combines the Mate Connectors and only allows motion about X and Y-axis and rotation about Z-axis. 

Types of Mates

- **Cylindrical Mate**: Combines the Mate Connectors and allows motion and rotation about the Z-axis. 
- **Pin Slot Mate**: Combines the Mate Connectors and allows motion about the X-axis and rotation about the Z-axis. 
- **Ball Mate**: Combines the Mate Connectors and allows rotation about the X, Y, and Z-axis. 
- **Parallel Mate**: Keeps the Mate Connectors parallel to each other. 
- **Tangent Mate**: Keeps the mate connectors tangent to each other. 

Session Overview

In this session we will be creating a **link assembly** to practice the different **mates**.

To make this assembly, we are going to need **two 3D models** of links. We will denote them as **Part 1** and **Part 2**. Then, we will put the models together through the **assembly**.

Time for…

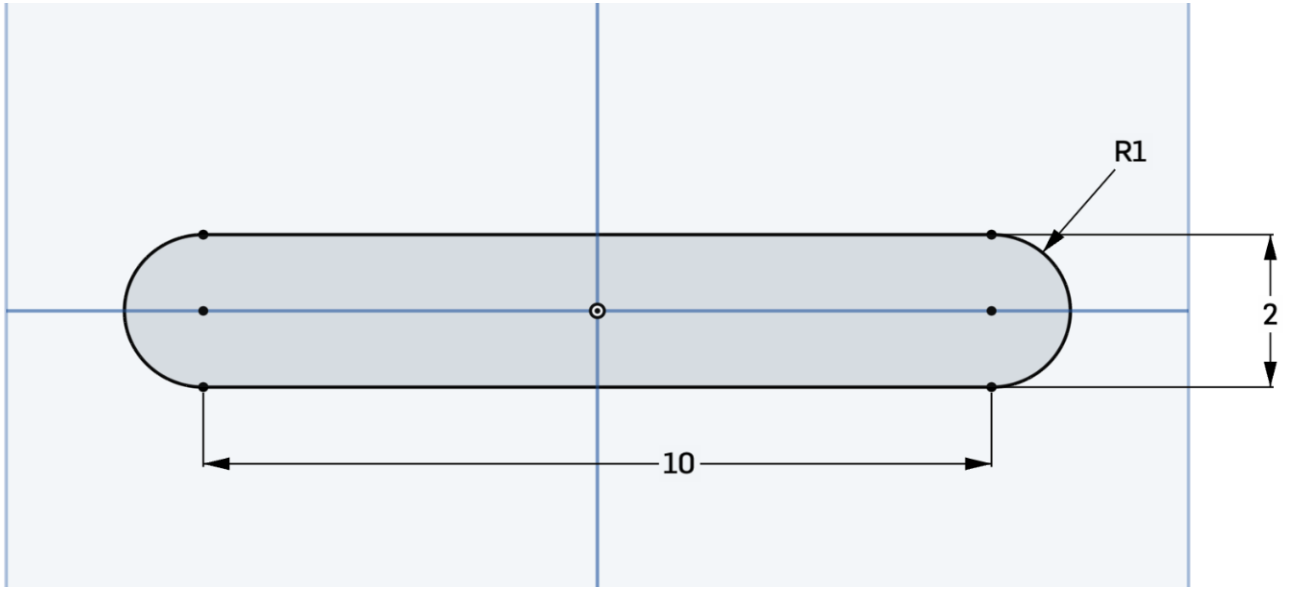


Part 1!

Part 1: Sketch 1

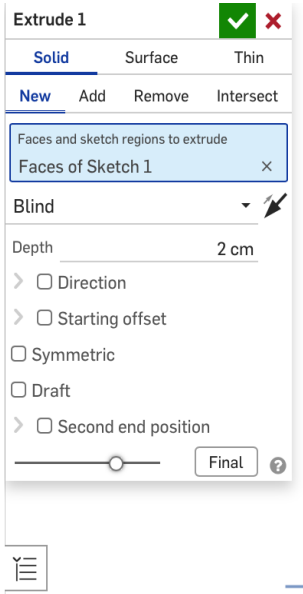
On the **Front Plane**, make a **Center Rectangle** with a **Tangent Arc** in each side.

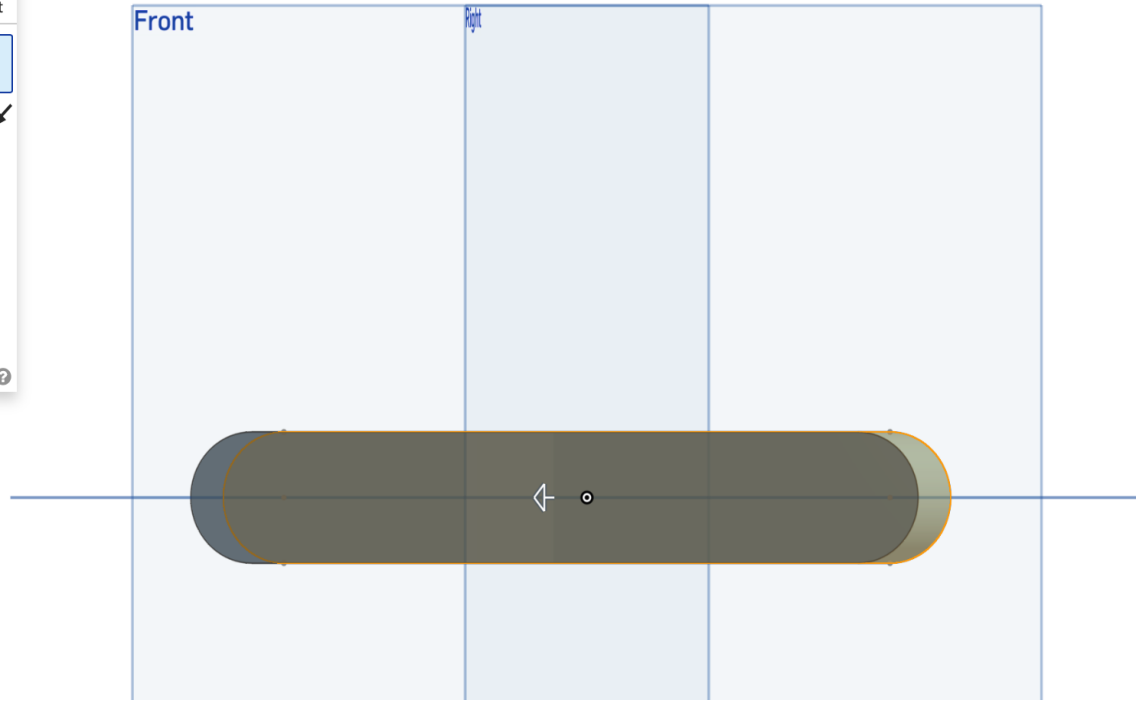
The rectangle has a length 10 cm and the arcs with a radius of 1 cm.



Part 1: Extrude Base

Make an **Extrude** of **Sketch 1** of 2 cm.

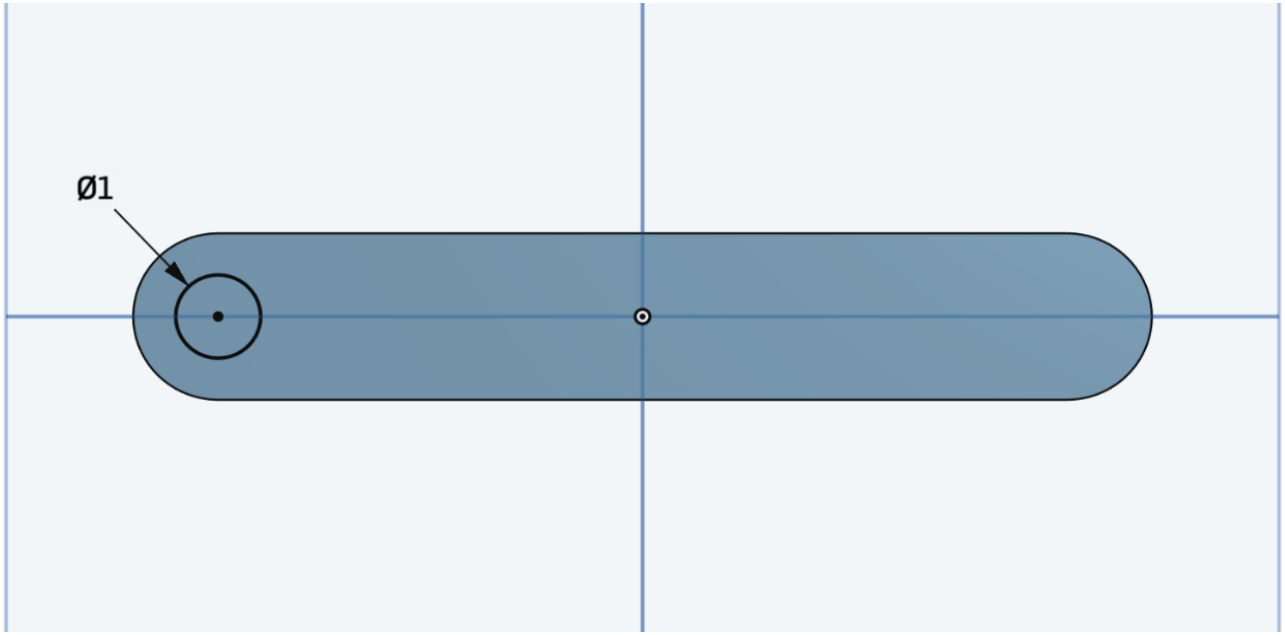




Part 1: Sketch 2

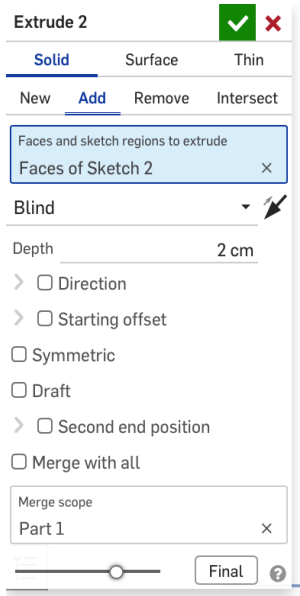
On the **Front Face** of the part, make a **Sketch**.

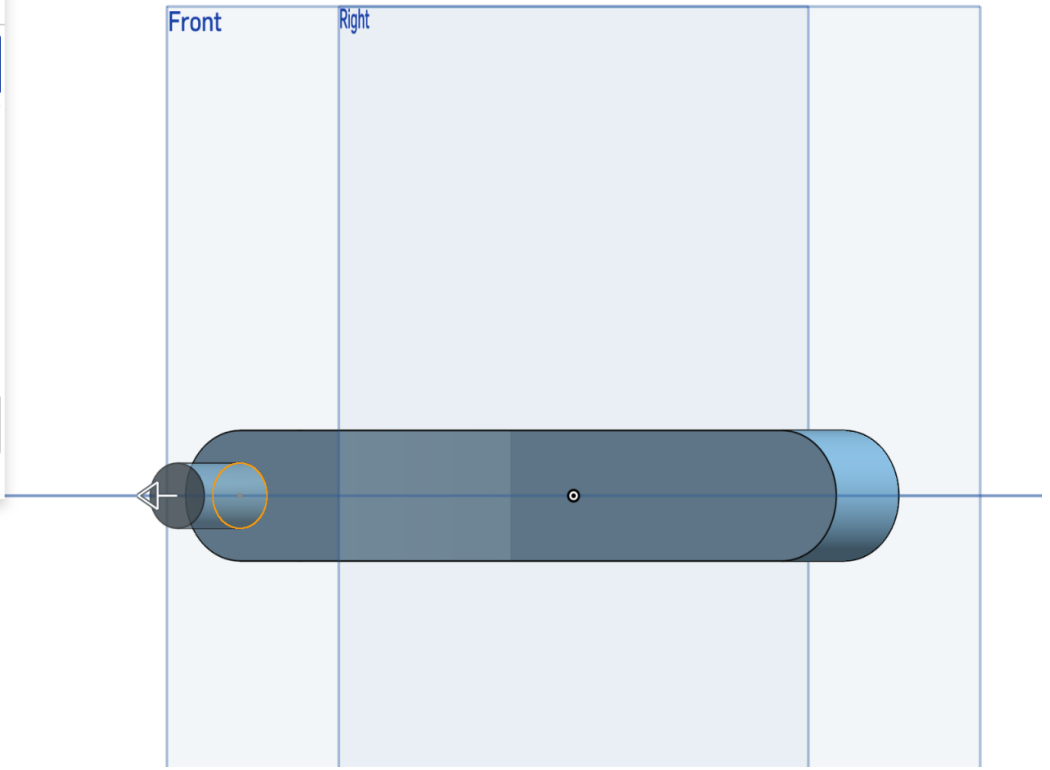
Draw a **Center Point Circle** on the center of the left arc of the model with a diameter of 1 cm.



Part 1: Extrude Boss

Make a **Extrude** of **Sketch 2** of 2 cm.

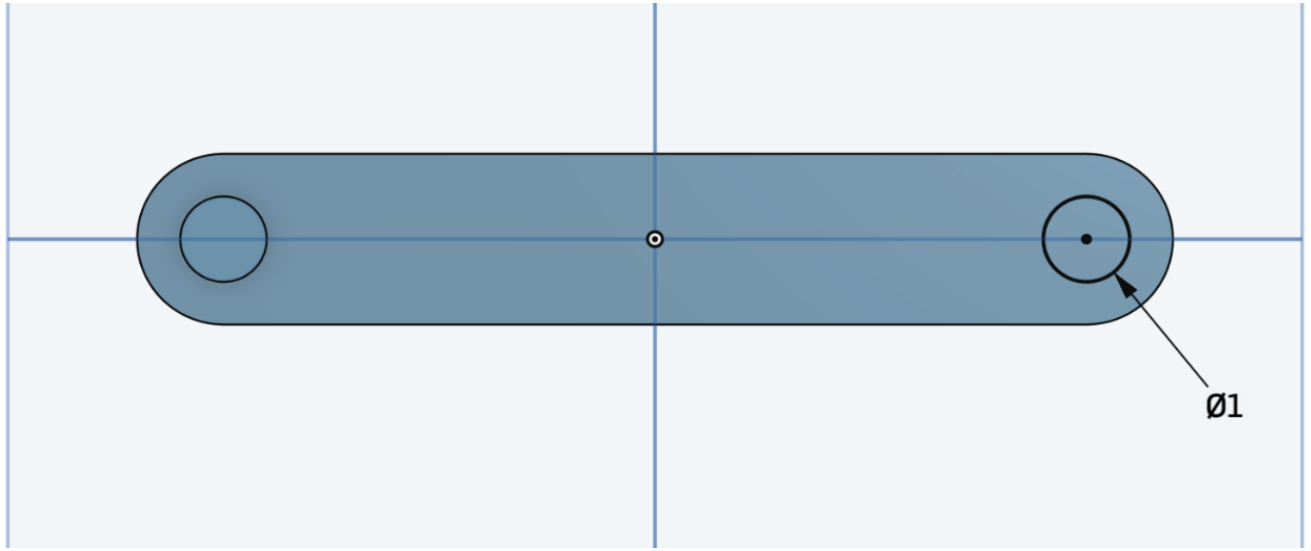




Part 1: Sketch 3

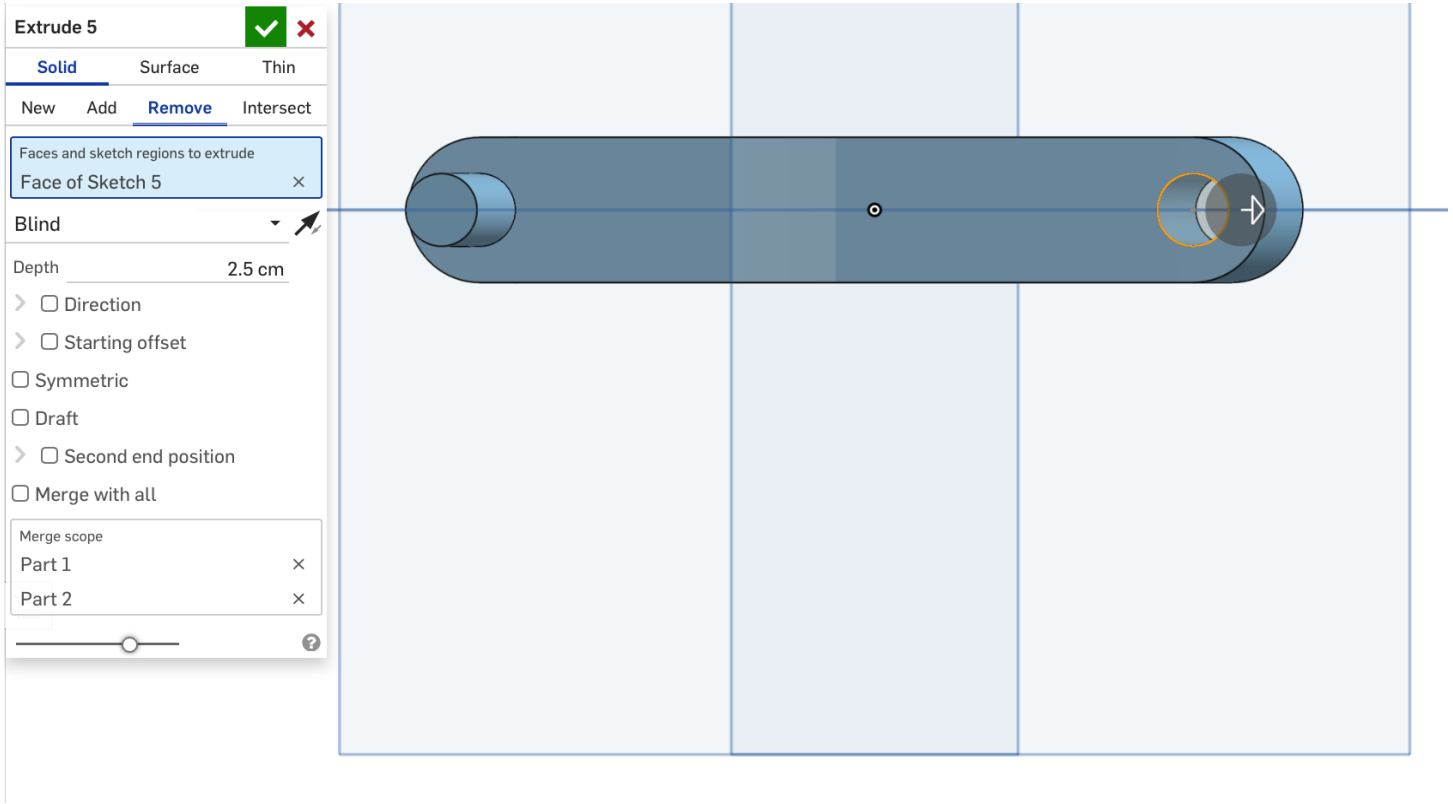
On the **Front Face** of the part, make a **Sketch**.

Draw a **Center Point Circle** on the center of the right arc of the model, with a diameter of 1 cm.



Part 1: Remove

Make a **Extrude**, **removing** area, of **Sketch 3**, making a hole on the part.



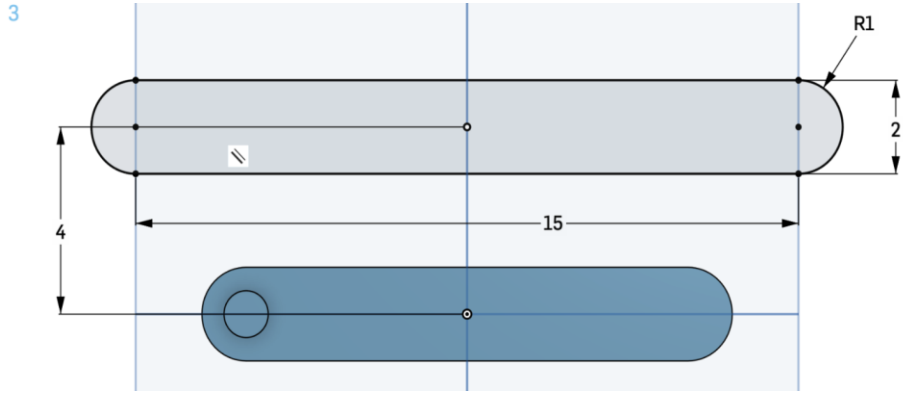
Time for…



Part 2!

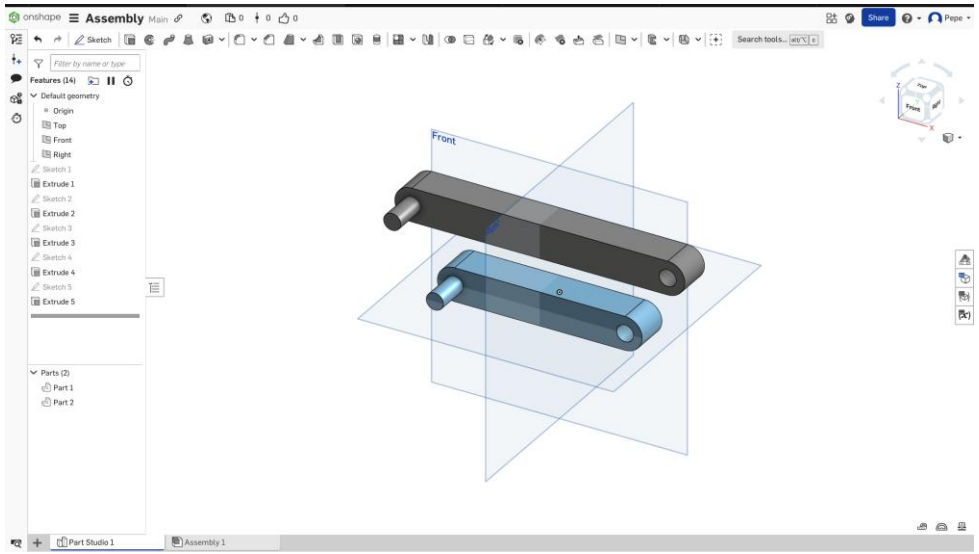
Part 2

OnShape allows the creation of multiple parts in one document or “**Part Studio**” tab by separating the parts.



To make **Part 2**:

- Create another **Sketch** in the **Front Plane**.
- Make the **center** of the Sketch above the **center** of the **Front Plane**. For the final sketch to be **fully defined**, make the distance 4 cm. This allows the new sketch to be separate from Part 1.
- Follow the same procedure as **Part 1**, but change the **length** of **Sketch 1** from 10 cm to 15 cm.

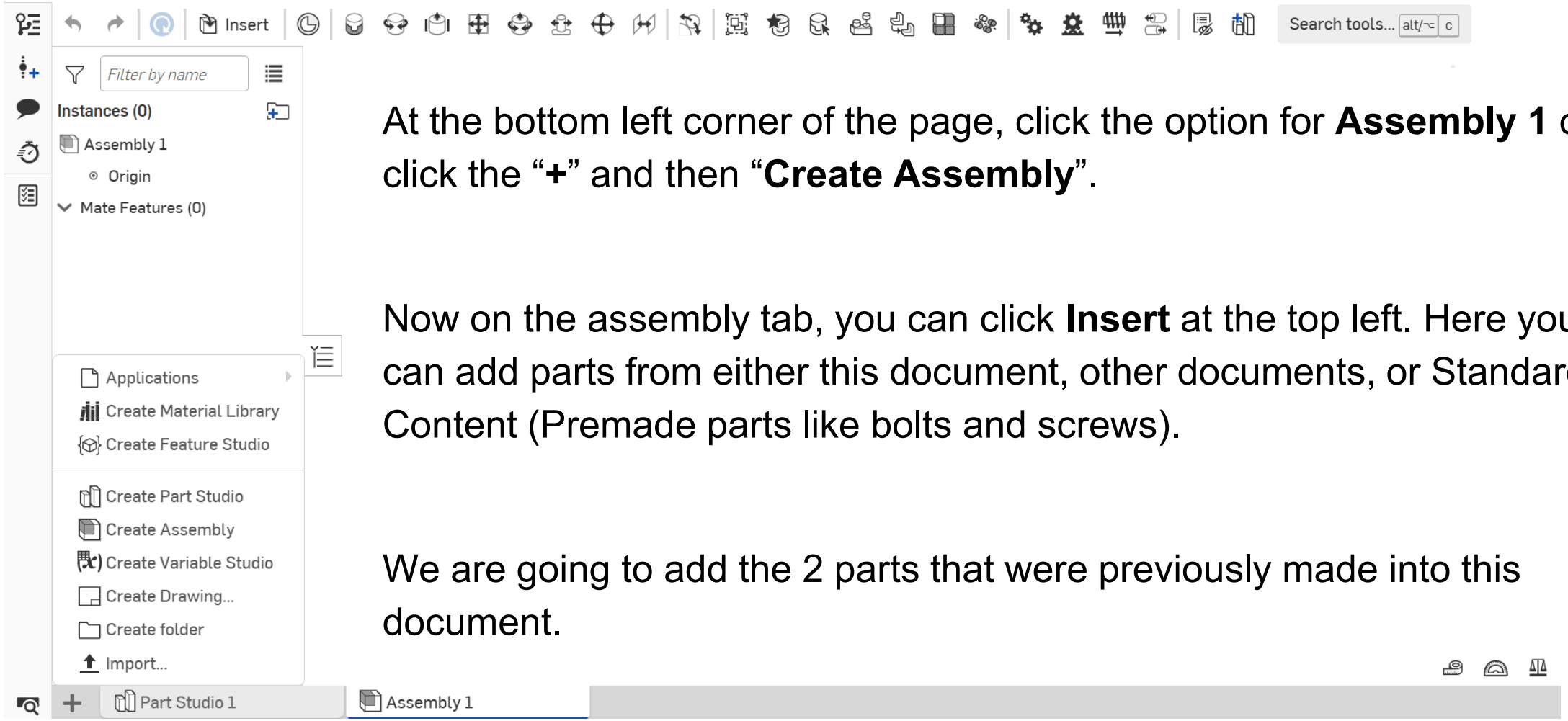


Time for the…



Link Assembly!

Assembly



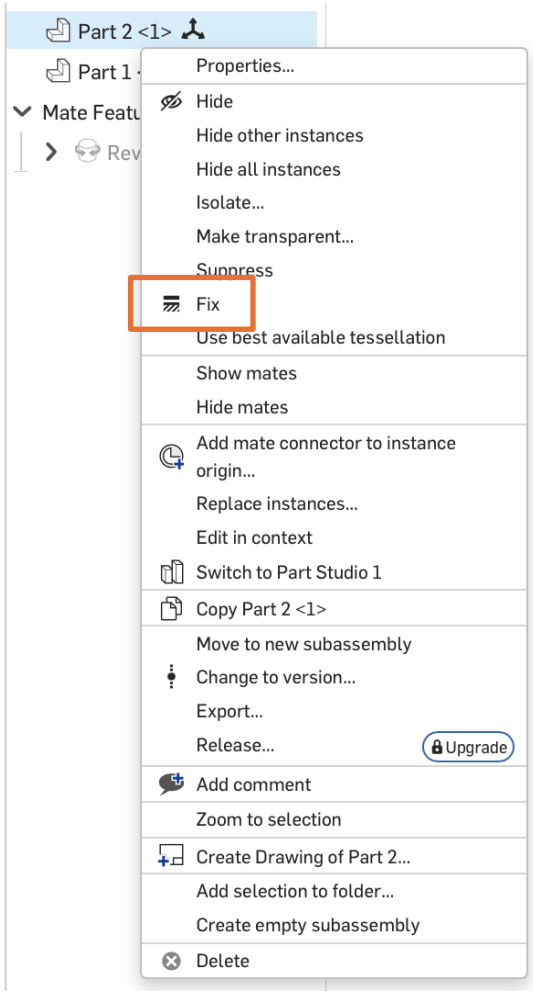
At the bottom left corner of the page, click the option for **Assembly 1** or click the "**+**" and then "**Create Assembly**".

Now on the assembly tab, you can click **Insert** at the top left. Here you can add parts from either this document, other documents, or Standard Content (Premade parts like bolts and screws).

We are going to add the 2 parts that were previously made into this document.

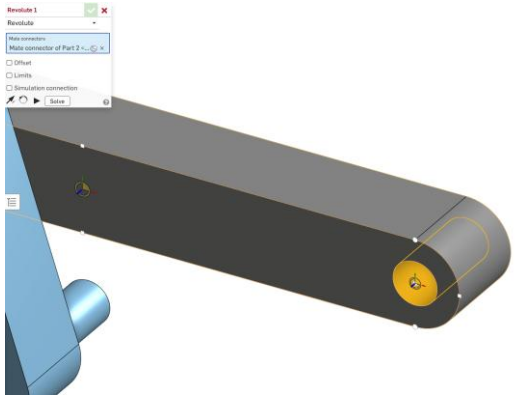
Links: Assembly

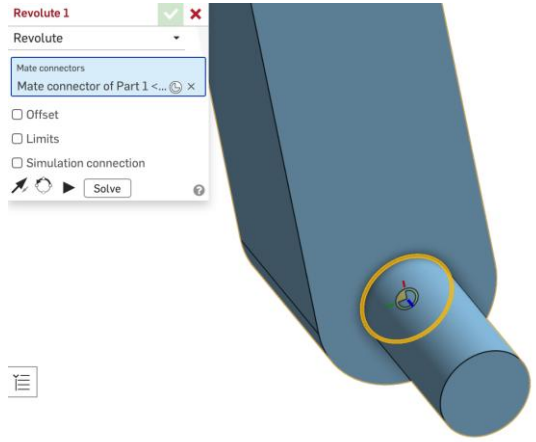
To make the **Assembly**, it is easier to have one piece as a “**base**”, meaning it **does not move**. To do this right click **Part 2** and select **Fix.**



Links: Assembly

To **combine** these parts, we are going to use a **Revolute Mate**, allowing the links to **connect and rotate**. Combine the **Mate Connector** of the hole of **Part 2** with the **Mate Connector** at the bottom of the pin of **Part 1**.





Q&A Session

Attendance

Join us for the upcoming weekly sessions this Spring 2025!
(Jan 6 - Apr 4, 2025)

Monday: C5 1PM
Tuesdays: C7 1PM / **C11** 3PM
Wednesdays: C5 12:30 PM / **C9** 1:30 PM (Varies)
C1 2:30PM / **C2** 3:30PM / **C13** 5:30PM
Thursdays: C6 1PM / **C8** 3PM
Friday: C9 2PM (Varies) / **C10** 3PM/ **C11** 4PM

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