



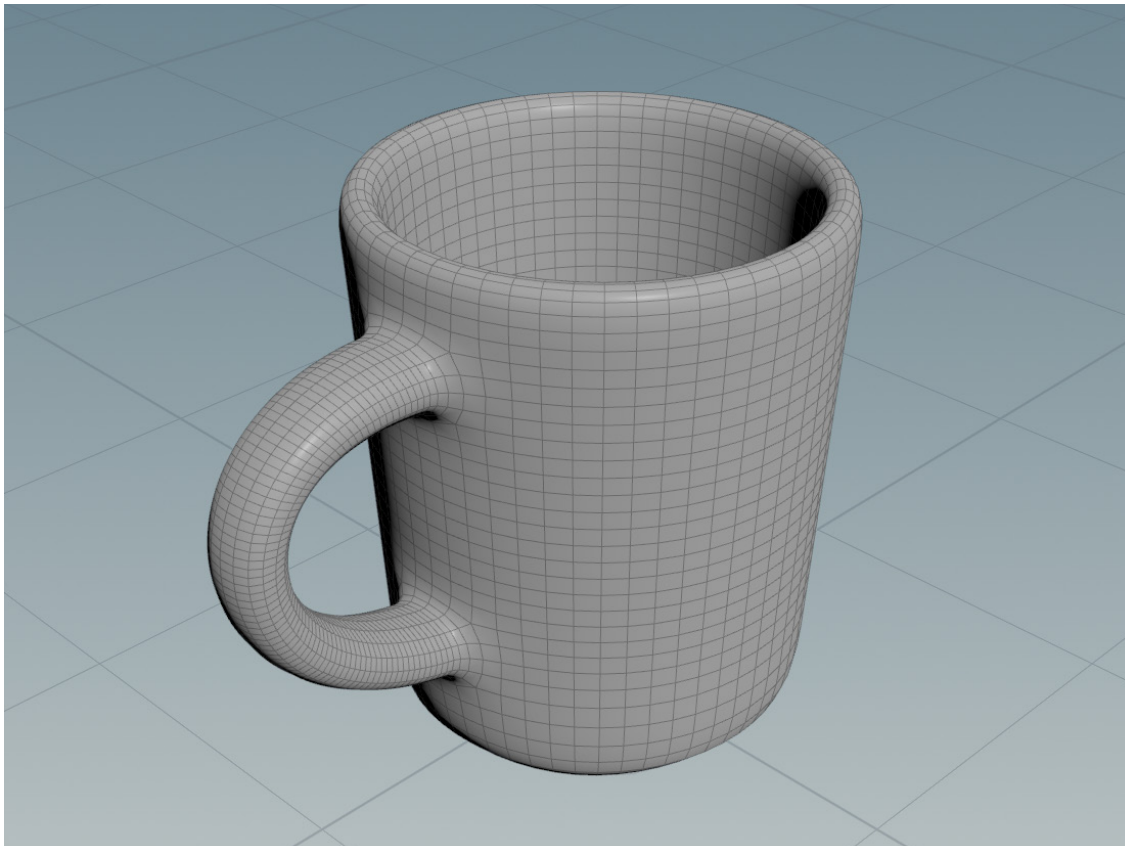
Curriculum-in-a-Box | Lesson 2 | Guided Work

MODELING A COFFEE CUP

Students are now asked to follow-along with the teacher as they build something in Houdini. For this lesson, students will learn general modeling techniques. This specific example will build a model of a coffee cup. To achieve this, you will learn how to use the “Poly” tools to create things like extrusions, and to fill holes. There will also be several different types of selections that you will use in the Scene View. These are all fundamental concepts for working with geometry in Houdini, and students will have a much deeper understanding of these concepts after this guided work exercise.

WHAT STUDENTS WILL LEARN

- How to work with the Houdini modeling tools
- How to use the PolyExtrude SOP
- How to make geometry selections in the Scene View
- How to fill polygon holes with the PolyFill SOP
- How to add subdivisions to increase the number of polygons and smooth them



PART ONE

Coffee Cup Body

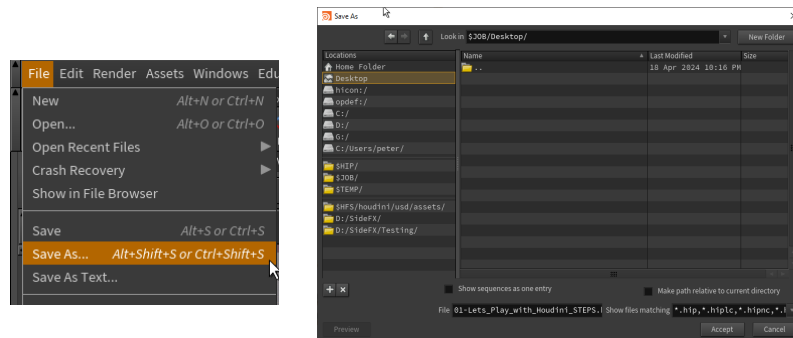
In this first section of the assignment you will show your students how to set up their project, and begin to make the rough shape of the main part of the cup.

1. Set up your Project Directory

- **Download** the *CIB_Lesson02.zip* file and unzip it, then place it in the *documents>HoudiniProjects* directory.
- **Open** Houdini and from the **File** menu, choose **Set Project**.
- Navigate to the *CIB_Lesson02* directory and click **Accept**.

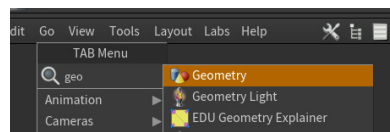
2. Save your Scene File

- From the File menu, choose **Save As**.
- Make sure you are in the *CIB_Lesson02* directory, give the **File** a name and click **Accept**.

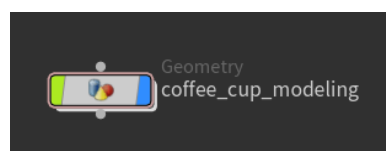


3. Set up the Geometry Network

- Press Tab in the Network view, start typing *geo*, and then select **Geometry**.

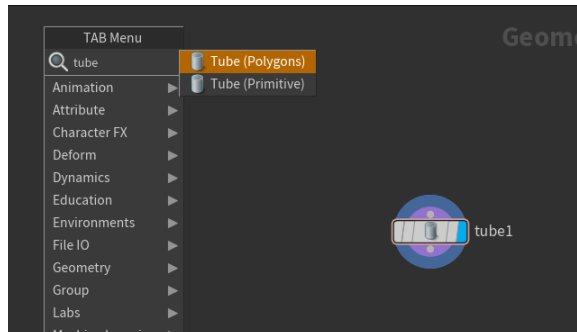


- Click in the Network View to place the node.
- Double-click the *geo1* name and change it to something like *coffee_cup_modeling*.
 - This will be a container for the geometry you create.

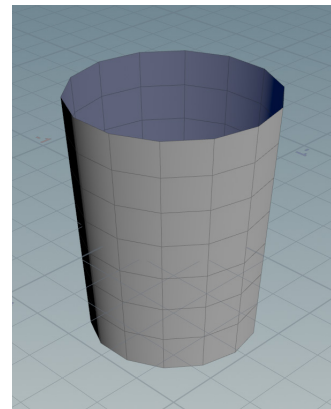
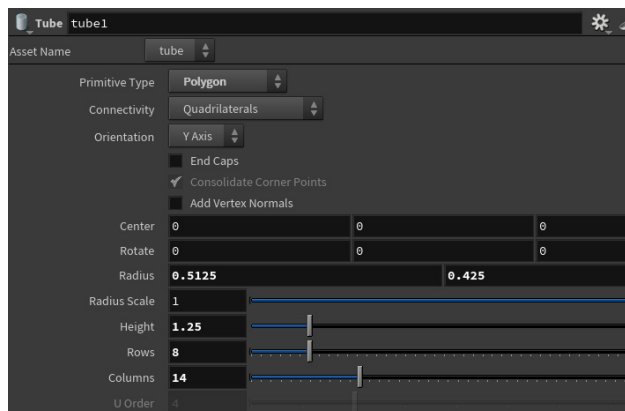


4. Add a tube to the scene

- Double-click on the *coffee_cup_modeling* node to dive inside of it.
- Press Tab in the Network view, type *tube*, and then select **Tube**.
- Click to place the node.

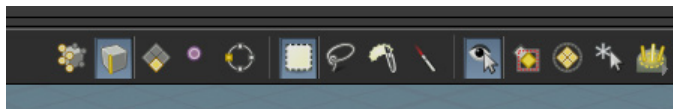


- In the Parameter Pane, set the **Radius** to **0.5125** and **0.425**. These two radii will set the radius of both the top and bottom of the tube. Also, set the **Height** to **1.25**, **Rows** to **8**, and **Columns** to **14**.

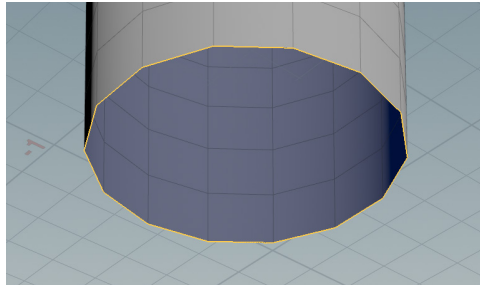


5. Fill in the bottom of the tube with polygons

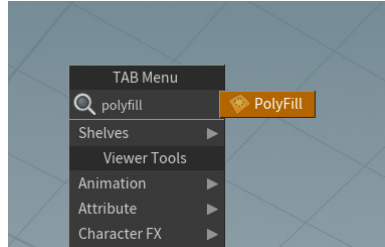
- Press **S** and **3** in the Scene View to enter the edge selection mode.
- In the controls above the Scene View, press the **Brush Select** button and the **Select Visible Geometry Only** button.



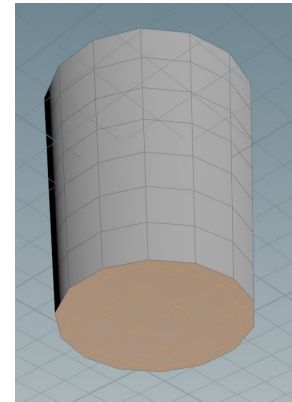
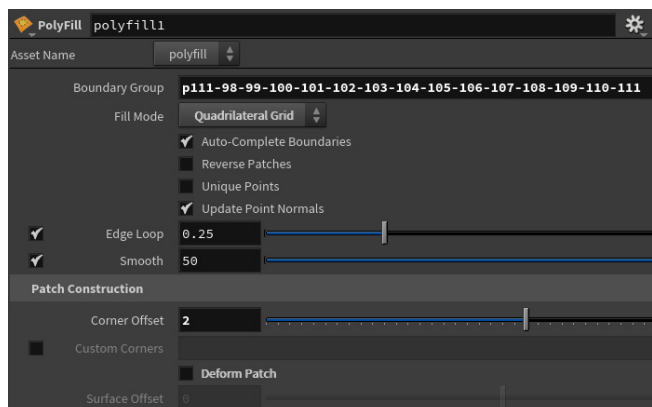
- Hold **A**, and then **Middle-click** while dragging your mouse over two of the edges that make up the bottom opening of the tube. You should have a ring of edges selected.



- Press **Tab** in the Scene View, type *polyfill*, and press **Enter**.

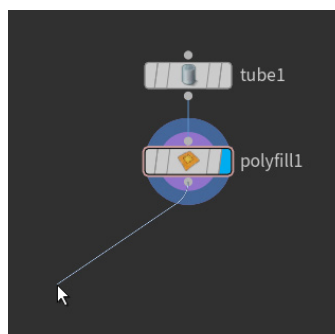


- In the Parameter Pane, change the **Fill Mode** drop-down to **Quadrilateral Grid**.
- Check the box before the **Edge Loop** parameter.
- Change the **Corner Offset** to **2**, and uncheck the **Deform Patch** parameter.

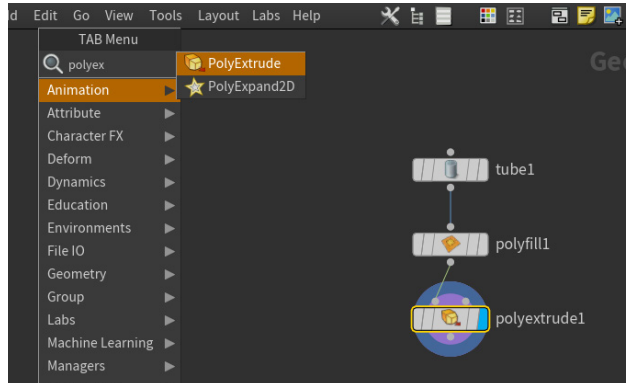


6. Add thickness to the cup

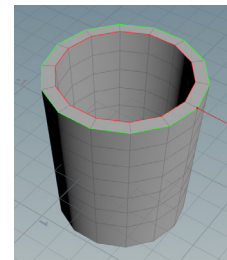
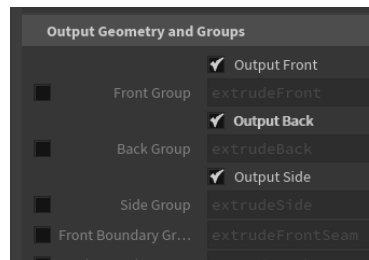
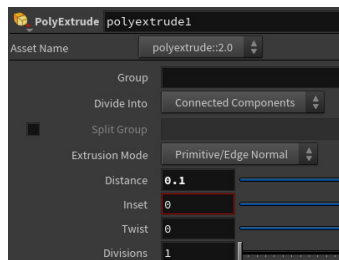
- Left-Click on the *PolyFill* node's output dot.
 - You will now have a wire that follows your cursor and is connected to the output dot.



- Press **Tab** in the Network View, type *polyex*, and press **ENTER**.

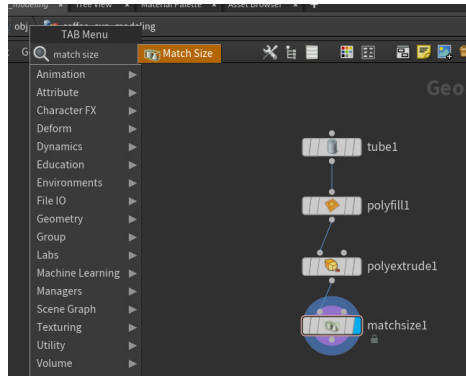


- A new *PolyExtrude* node will be placed in your Network View and will be connected to the *PolyFill* node.
- You can move the new node in order to keep your network organized. You should see the node snap into alignment with the positions of the other nodes that are already in the network.
- Click the right-most section of the *PolyExtrude* node to move the blue Display Flag.
 - This allows us to visualize what the *PolyExtrude* node is doing. The Display Flag is a cornerstone of using Houdini because it lets you visualize the result of all nodes that were placed before the one with the Display Flag.
 - If your *PolyExtrude* node isn't highlighted in yellow, click on the center of it in the Network View.
- In the Parameter Pane, change the **Distance** to **0.1**.
- Scroll down to the **Output Geometry and Groups** section, and turn on **Output Back**.

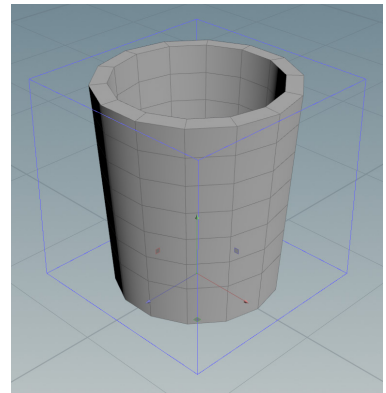
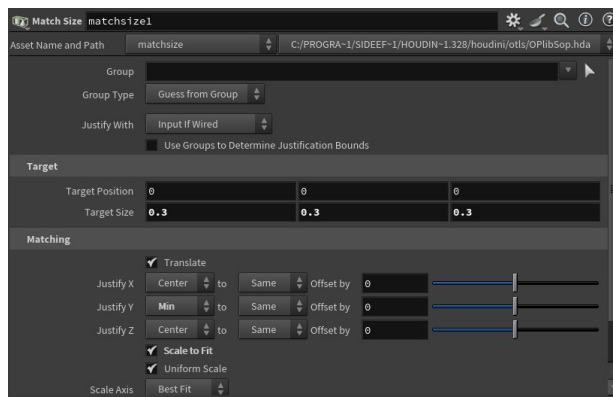


7. Scale and center the model on the XZ plane

- In the Network View, click the output dot of our *polyextrude1* node.
- Press **Tab**, type *match size*, and press **Enter**.



- In the Parameter Pane, set the **Target Size** to **0.3, 0.3, and 0.3**.
- Set the **Justify Y** drop-down to **Min**, and check the box next to **Scale to Fit**.



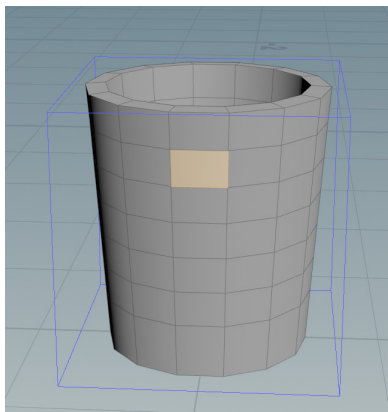
PART TWO

Make a Handle for the Cup

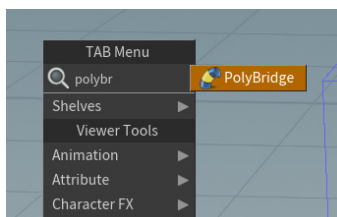
The next step in this exercise will be for your students to add a handle to the body of the cup that you made in step one. You will primarily accomplish this with the PolyBridge tool. Finally, you will end off the exercise with adding subdivisions to smooth out the geometry of the coffee cup.

1. Bridge two polygons to make a handle

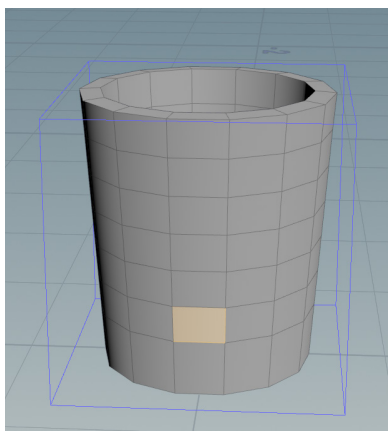
- Press **S** and **4** in the Scene View to enter the polygon selection mode.
- **Left-click** to select this polygon that is located along the Z axis of the model.



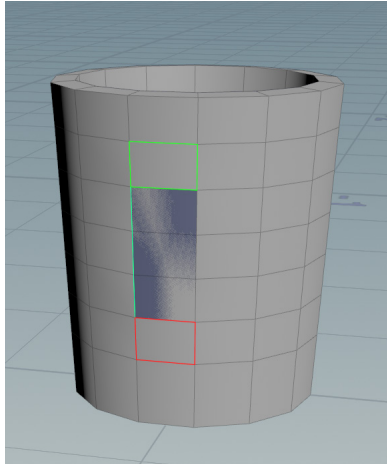
- Press **Tab** in the Scene View, type *polybr*, and press **Enter**.



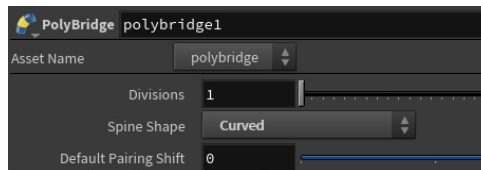
- **Left-click** to select this polygon that is below the originally-selected polygon.



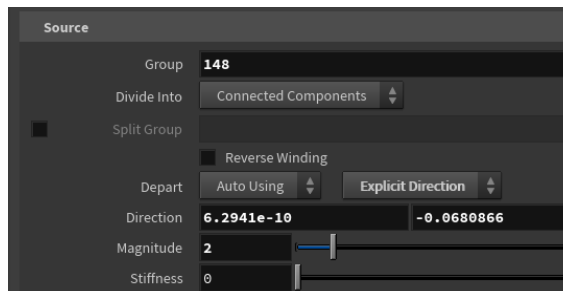
- Press **Enter** in the Scene View.
 - You should now see this odd visualization in the Scene View. You will fix this in the coming steps.



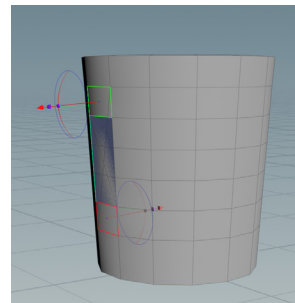
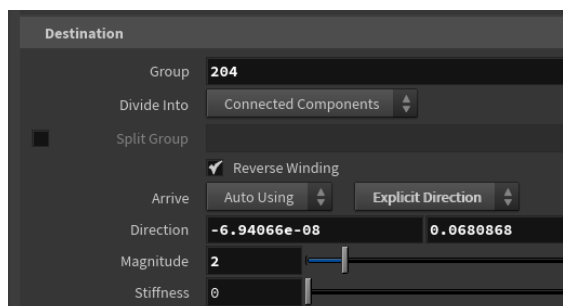
- In the Parameter Pane, change the **Spine Shape** drop-down to **Curved**.



- Scroll down to the **Source** section, change the second **Depart** drop-down to **Explicit Direction**, and change the **Magnitude** to 2.

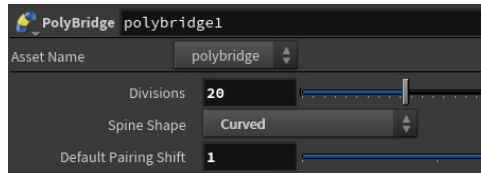


- Scroll down and repeat the last step for the **Destination** section.

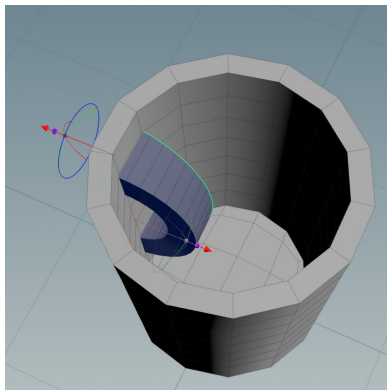


2. Create geometry between the polygons

- In the Parameter Pane, change the **Divisions** to 20.
- Also, change the **Default Pairing Shift** to 1.

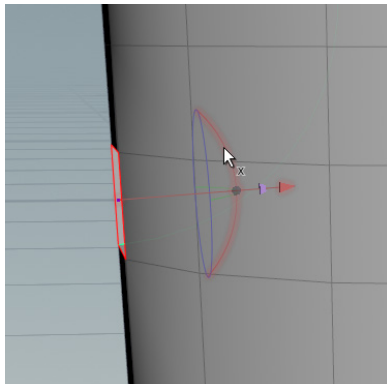


- If you notice that the handle is twisted in later steps, you may need to revisit this **Default Pairing Shift** parameter and change it until the handle isn't twisted any more.
- Your cup should now have a handle, but it is placed incorrectly, inside the cup.

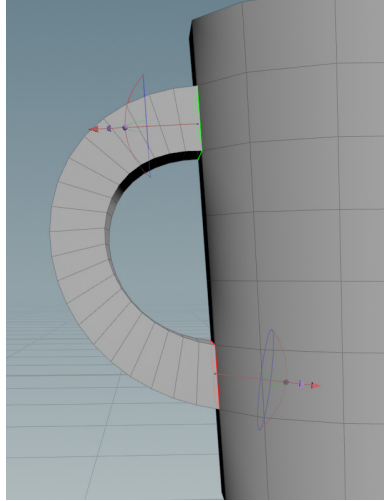


3. Manipulate the tool's handles in the Scene View

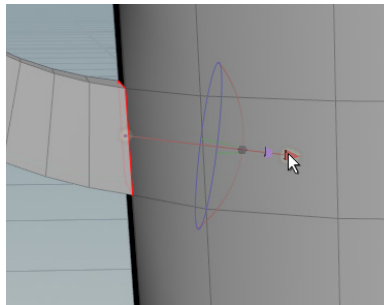
- In the Scene View, hover over the red **X-axis** curve of the lower handle.



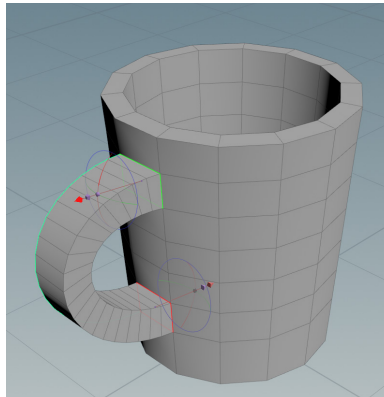
- **Left-click** and drag until the arrow is pointing slightly downwards.



- To adjust the cup's handle to your liking, **Left-click** and drag on the arrow tips to change the corresponding **Magnitude** parameter in the Parameter Pane.

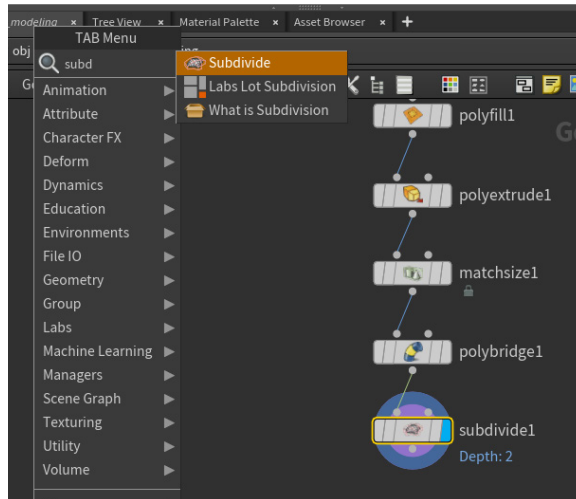


- You can also change the angle of the cup's handle slightly by adjusting the x-axis of either handle, like you did in the steps above.
- You should now have the basic shape of a cup.

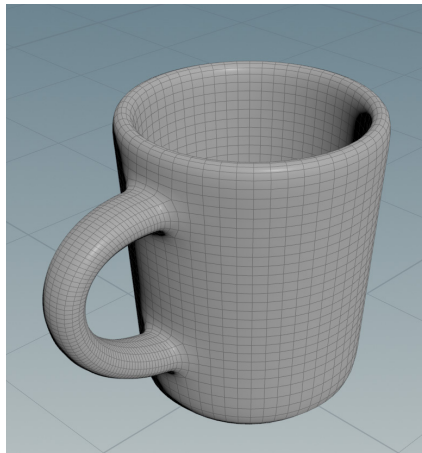
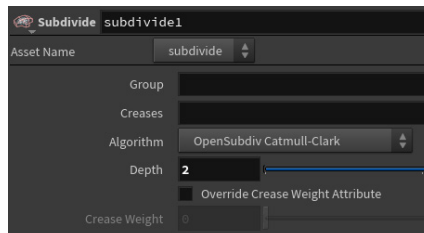


4. Smooth out the cup with Subdivision

- Left-click the output dot of the *polybridge1* node.
- Press **Tab** in the Network View, type *subd*, and press **ENTER**.



- In the Parameter Pane, change the **Depth** to 2.
 - This will smooth and divide your geometry so that the sharp edges are smoothed out.



CONGRATULATIONS

You have now completed your Coffee Cup Modeling exercise. This has taken you through a project that began with a simple polygon tube, and ended with the creation of a coffee cup, by using the PolyExtrude, PolyFill, and PolyBridge tools.