How to design, model, and print a Phone Stand in SILab

Objective:
This guide will show you how to design, model, and print a 3D printed phone stand. This guide is meant to serve as an introduction to 3D modeling using CAD software, namely Onshape, and to demonstrate some design considerations when fabricating using a 3D printer.

Materials:

- 3D Printer Filament (PLA)

Tools:

- Caliper
- CAD Software (Onshape, SolidWorks, etc.)
- 3D Printer

Design Considerations for 3D printing

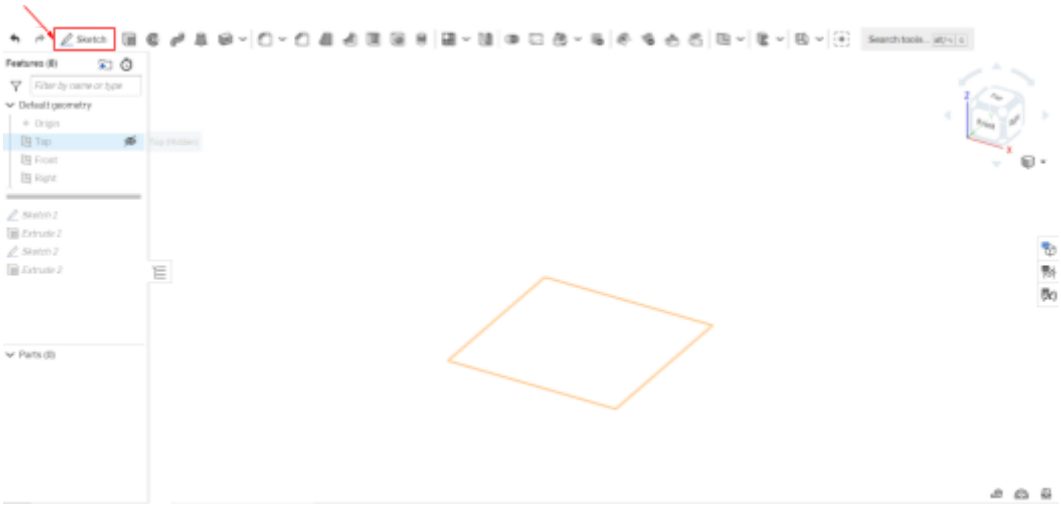
- Avoid bridges and cantilevered edges (part of the object hanging with no support beneath it)
    - When creating an unsupported part, maintain a maximum angle of 60 degrees from the surface of the build plate
- Very large or wide objects (>6”) can cause warping, and the bottom surface of the part will not be flat
- Parts will shrink between 2%-5% after printing

Measuring the phone

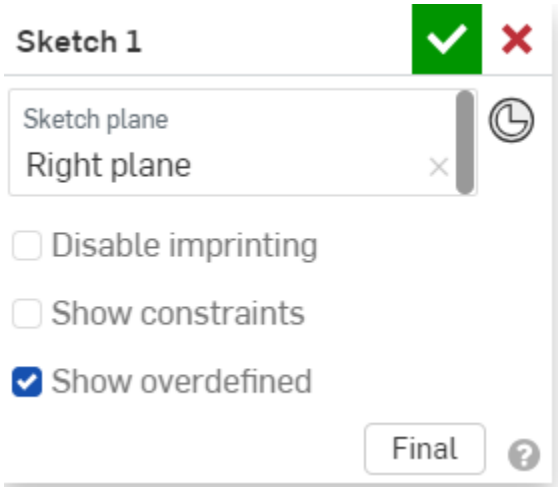
- To get started, measure the phone you would like to build your phone stand for using the calipers, most importantly the length, width and height. You may want to account for a charging cord in your design, so measuring the cord here may be helpful. If you are unsure how to use calipers, the SILab Staff can help you out!
- Record these measurements for later use. It may be helpful to create a simple hand-drawn sketch of your phone to keep track of all your measurements.

Creating a digital sketch (Onshape)

- First we will sketch out the side profile of your phone stand
- Once you have completed your measurements, you can begin the process of modeling your design on CAD. This part of the guide will focus solely on Onshape.
- First, open a new document and create a new sketch using the tool highlighted below

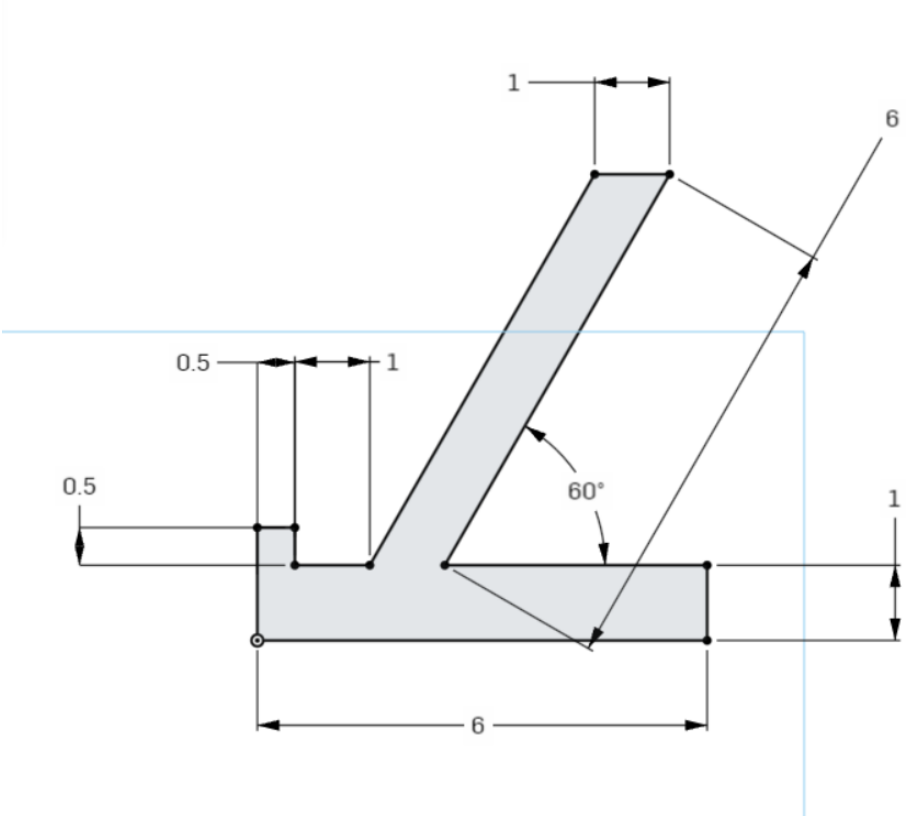


- When prompted to select a sketch plane, select Right Plane



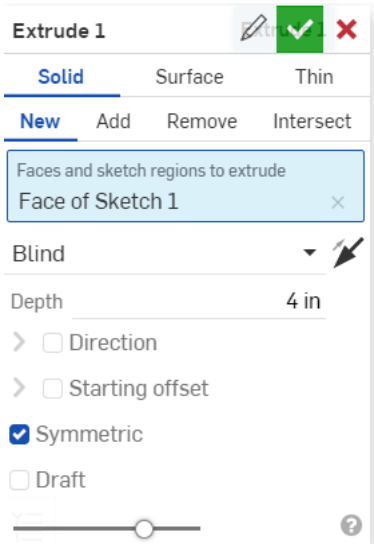
- Next, draw out the side profile of your phone stand using the line tool, starting from the origin dot. The shape does not necessarily need to be proportional but the general shape should be recognizable.

- Add dimensions to each part of the sketch until the all blue lines are black and the object can no longer be moved by clicking and dragging. The default units are inches but can be checked by clicking on the three bars in the top left next to the Onshape logo and clicking document properties. An example sketch is shown below.



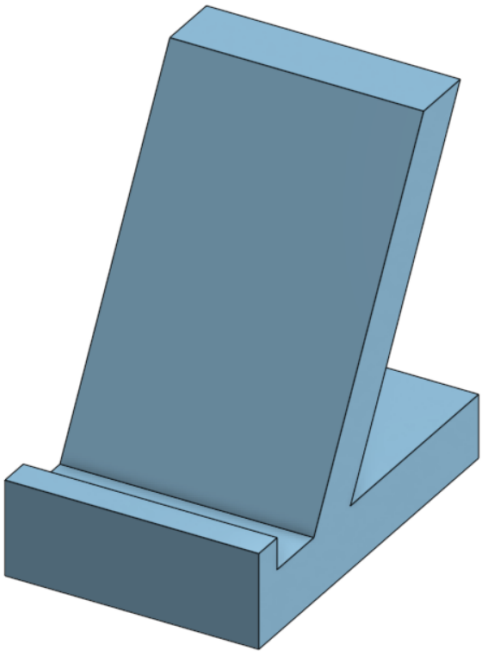
Creating a 3D object

- Now we will turn your 2D sketch into a 3D object
- Make sure you have clicked the green check on the sketch window to save changes to your sketch
- Click on the Extrude Icon indicated below, which should bring up a menu like the one pictured



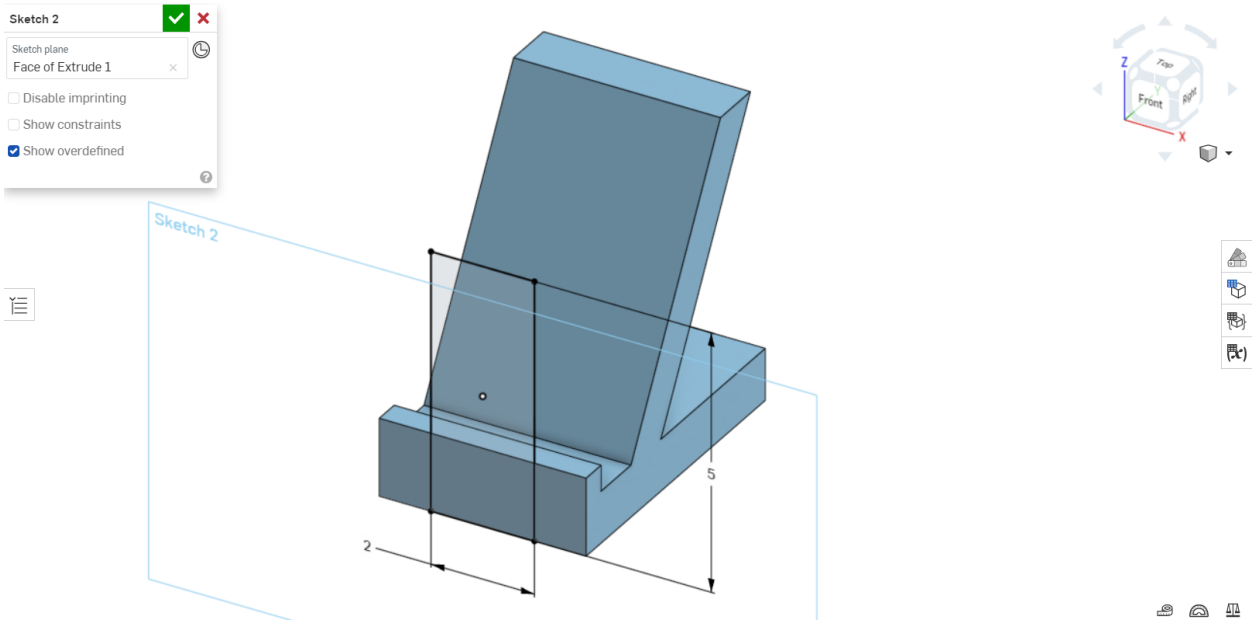
- Select your sketch as the region to extrude by either clicking on the object in the graphics area or by clicking on “Sketch 1” in the left side bar
- Determine your overall width of your phone stand and input it into the depth quantity

- Click the green check to confirm your changes. An example object is shown below

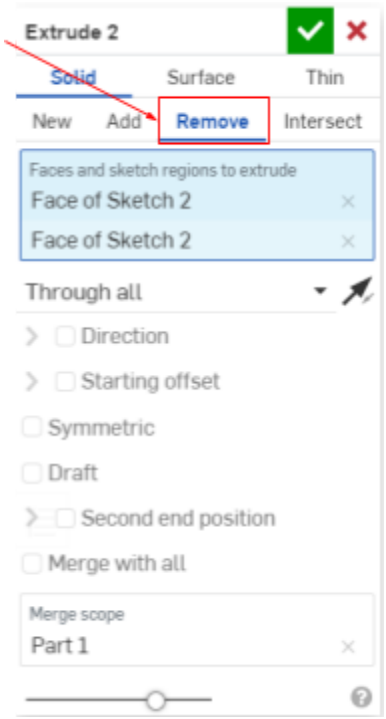


Creating Cuts in the 3D object

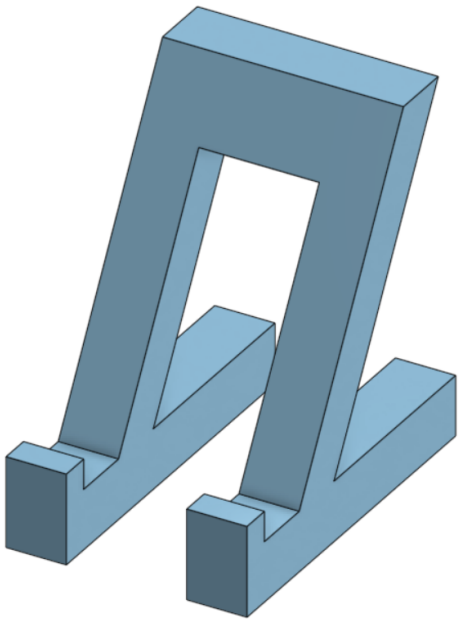
- Now we will add detail to your 3D object by making cutouts into the shape
- First create a new sketch and select one of the faces on your object. The program will cut into the object perpendicular to the sketch plane an example is shown below



- Next, select the Extrude feature and select the remove option
- Select the sketch you created above as the region to extrude
- Input your desired cut depth or select through all if you wish to cut through the entire part

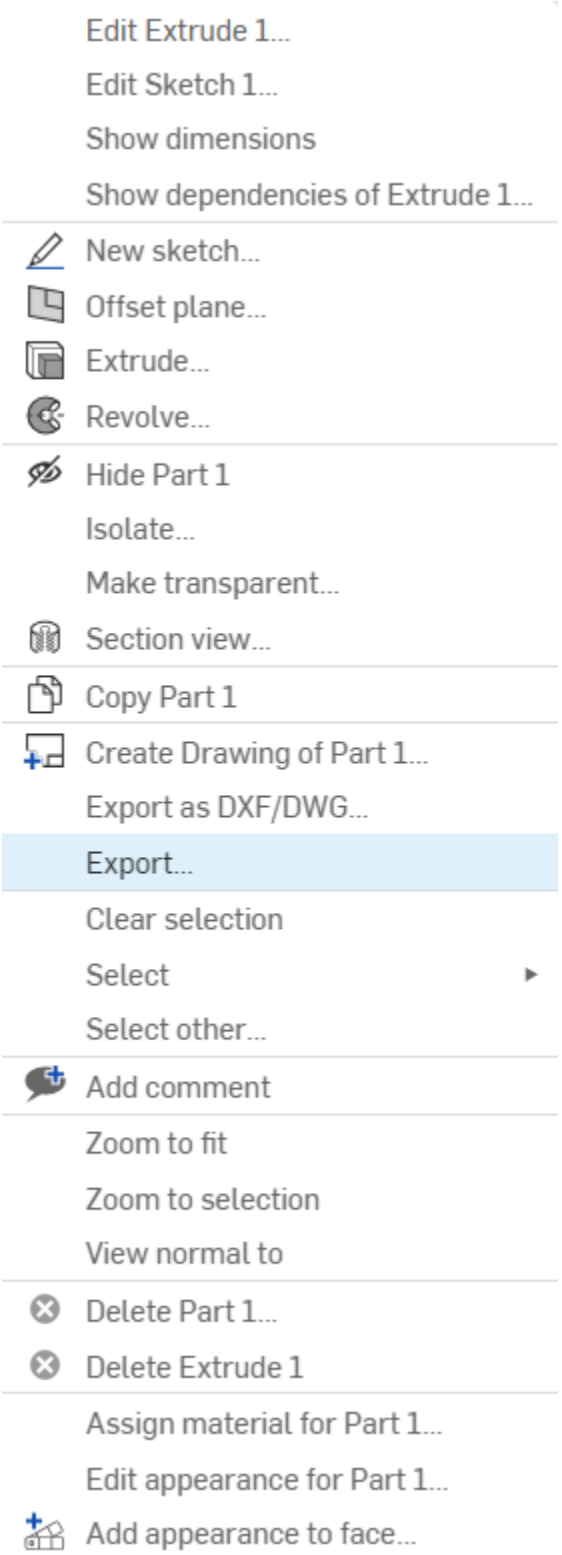


- An example of a cut part is shown below
- Continue to build or cut away from your design until you have your desired object

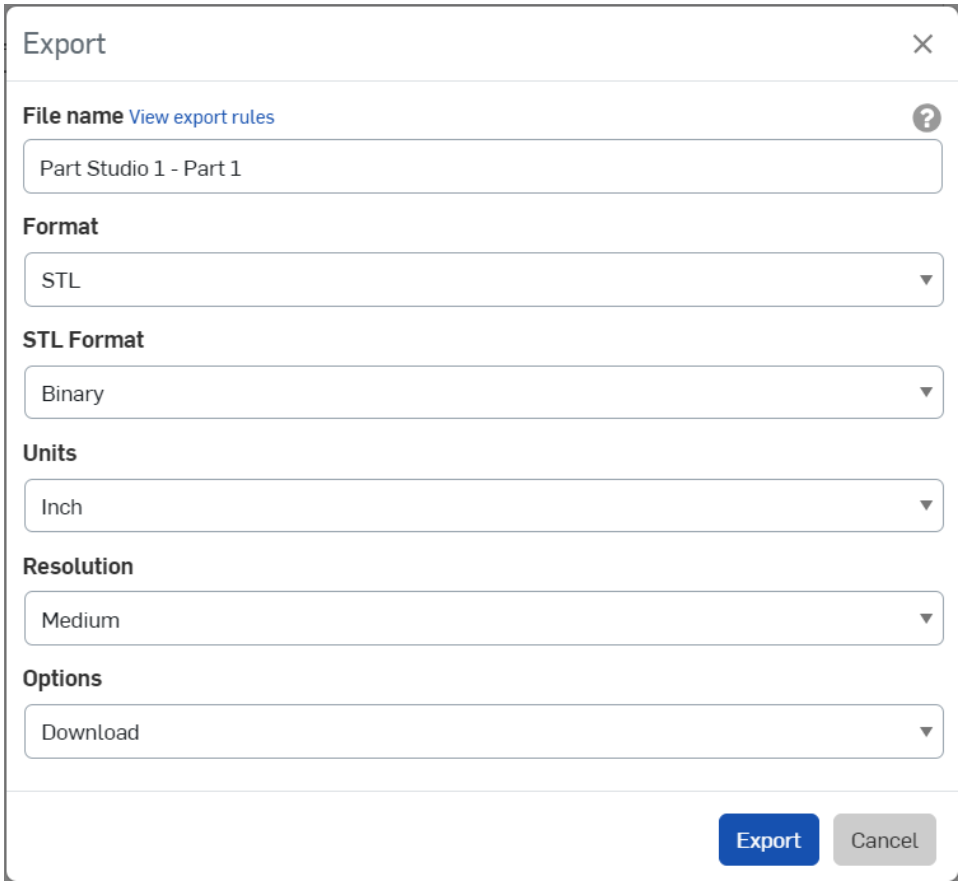


Exporting the print file

- Now you will export the file to be printed
- Right click on the part and the following menu will appear



- Select export as highlighted in the image above and the menu pictured below will appear



- Select your file format as STL and rename your file
- Ensure your units are listed correctly
- Click export and the file will be downloaded to your computer
- Upload the file on to the SILab 3D printer form
- You will receive and email when your part is ready to be picked up
- Congratulations! You have successfully designed a phone stand
- If you want to learn more about 3D printing, talk to a member of the the SILab Staff