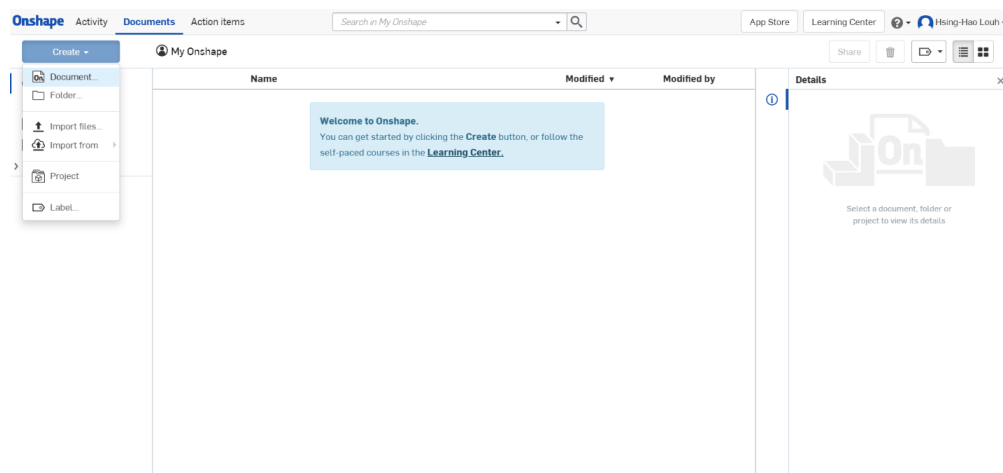



ECE 230L

MASK DESIGN INSTRUCTIONS

1 Creating your workspace

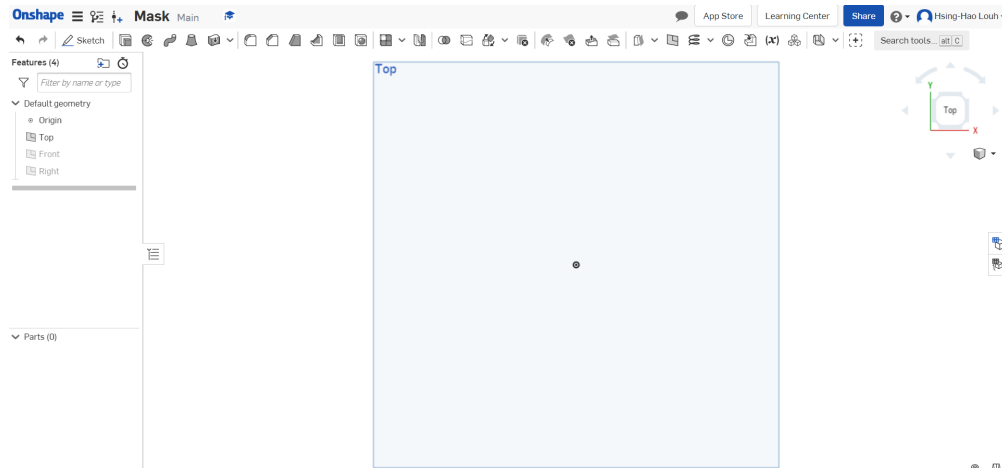
1. Go to duke.onshape.com and sign in
2. Select the **Documents** tab on the top left and then click **Create** → **Document**






3. Click on the menu button  on the top left and select **Workspace units**. Change the **Default length unit** to Millimeter.

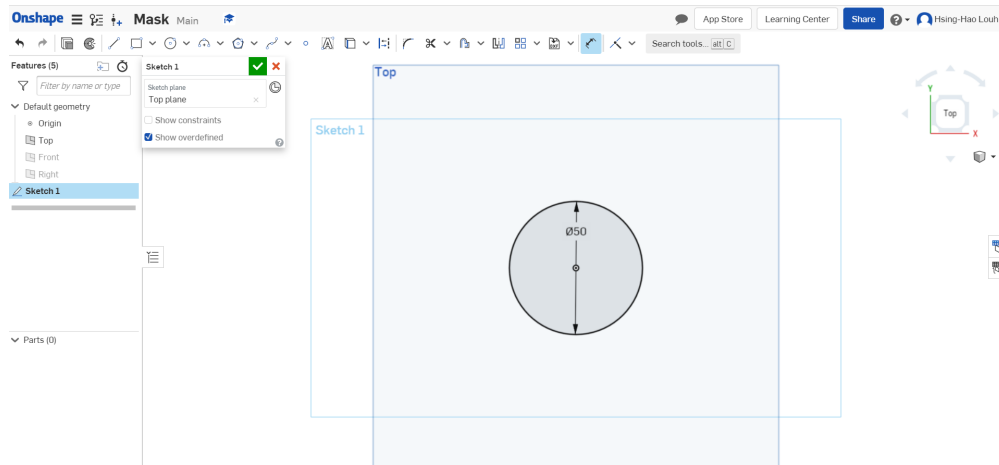
2 Creating your mask







4. On the cube in the top right, click on the surface that says **Top**. This is the plane we will be working on. Right click on the Top plane and select **Hide other planes**. Your screen should look like this:

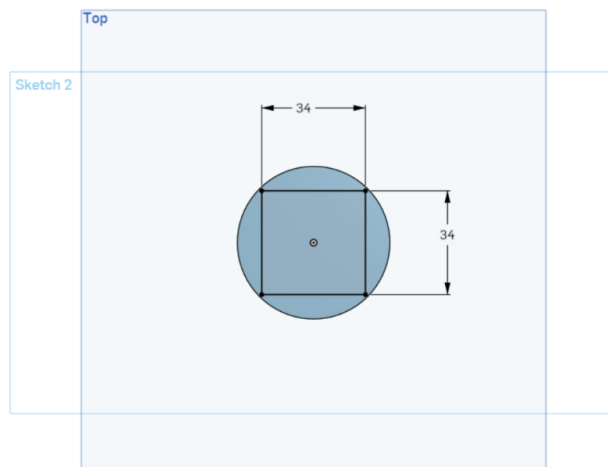


5. To put our sketch on the **Top** plane, click on  **Sketch** in the top left and select the **Top** plane.
6. To draw a **circle**, select  for the mask. Left click on the origin and drag out some distance away and left click again. We will change the dimensions next.







7. On the toolbar, click the **dimension** button  and left click anywhere on the circumference of the circle and left click again in the inside of the circle. Set the diameter to be **50mm**. This tool will help you dimension your drawings. Your screen should look like this:

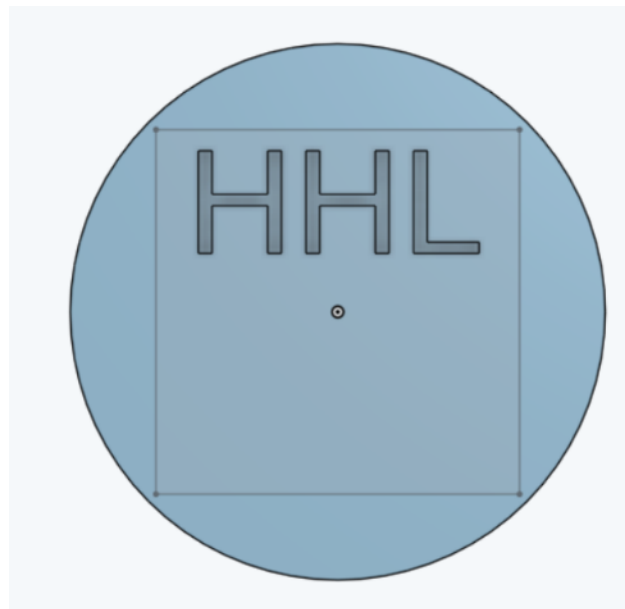


8. On the top left click **extrude** . If the circle is not already highlighted, click on it. Select **Solid**, **New**, **Blind** (with the darker arrow pointing to the bottom left), and set the depth to be **-5mm** and click the green checkmark .
9. Now we will create a new sketch for a square where your designs will go in. Click  **Sketch**, select the top plane, and click on the little arrow to the right of the rectangle in the toolbar and select **Center point** rectangle . Click on the origin and drag out to anywhere inside the circle. Use the dimension tool  to set the length of the sides to create a **34mm x 34mm** square. Your figure should now look as shown below. Keep all your designs within this square. Click .



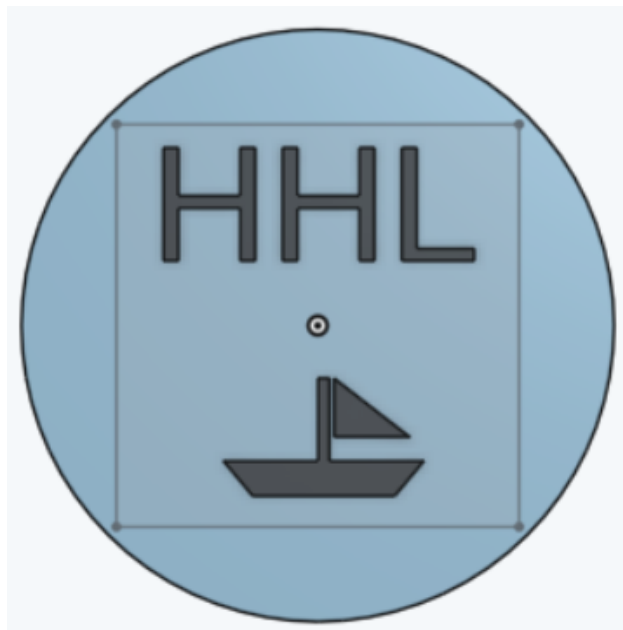
3 Adding your initials


10. To add your initials, click **sketch**  **Sketch** and select the **Face of your mask**. Click on the **text** button  on the toolbar. And click on the top half of the square to temporarily create the area your letters will go in. This can be moved later. Type your initials and select **Arimo** for the font. To center your initials, click on the little arrow to the right of the **Coincident** button   and select **vertical** . Click on the midpoint of the bottom line of text box and then click on the origin and your initials should be centered. Click on vertical again to deselect this feature.
11. To engrave your initials, click on **extrude**  and select the text. Select **Solid**, **Remove**, and **Blind** with the darker arrow pointing to the top right. Set the depth to **2.5mm**. Your mask should look like the image below:




4 Adding your design

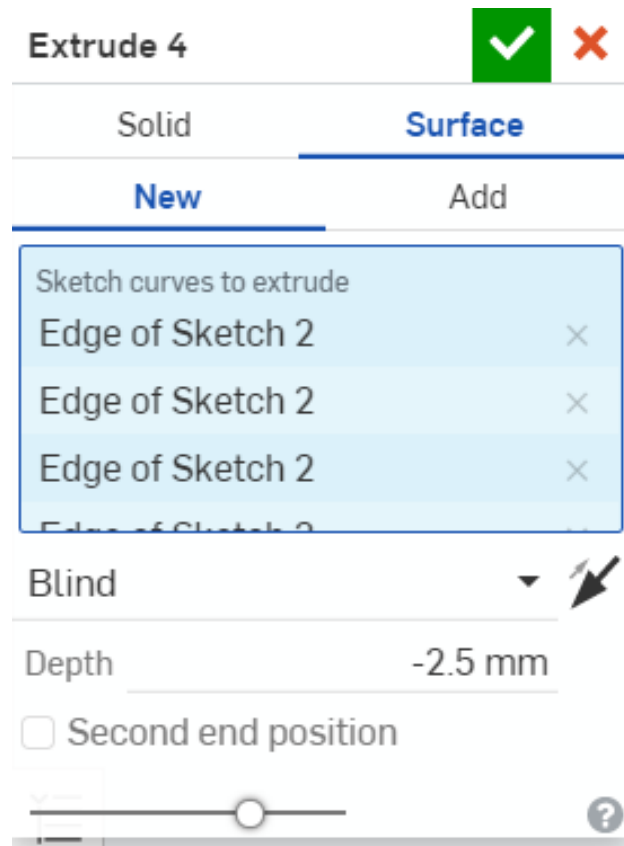
12. Create new sketches to create new designs and engrave them onto your mask. Be sure to select the face of mask when you create a new sketch. Play with the various features on the toolbar to help you create your design and use the **dimension** tool  to size your design. Make sure to keep your designs within the square.
13. Engrave your final design into your mask by selecting the design (you can click and drag to highlight your entire design or click on individual components) and follow the instructions on step 11. **Only engraved parts will appear on the mask.** This means lines will not appear on the mask. The design below was created with only the **Line**  and **dimension**  features!





14. Highlight your engraved design by clicking and dragging. Right click on the highlighted area and select **Add appearance to _ faces** at the very bottom (the number in _ depends on your sketch). Select black and click on the green checkmark . **Only use black, do not use any other colors**

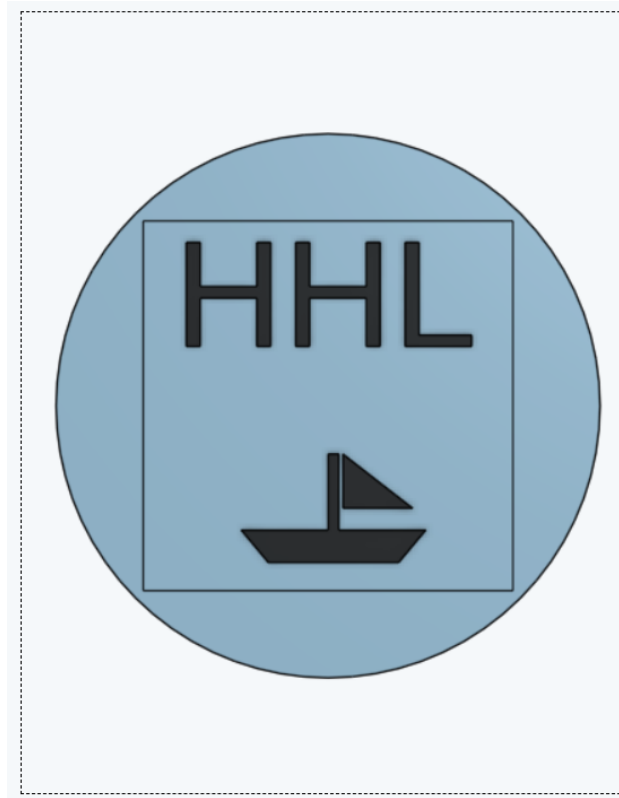
5 Sharing and Printing


- On the left panel, right click on **Sketch 2** (the square should be highlighted) and click **Edit**. Click **extrude** . Individually select each edge of the square and set the parameters as seen below. Note **Surface** is selected, not Solid, the arrow next to **Blind** is pointing to the bottom left, and the depth is **-2.5mm** not 2.5mm. Click on the green checkmark.



- On the left panel, move your mouse over Sketch 2, and click on the eye  to hide the sketch. **Do the same for the origin and any sketches so the only features not hidden are the extrudes and the top plane.**
- Check your mask to make sure the initials, design, and box are **engraved**, not protruding, from the mask. You can rotate your mask by holding down right click and dragging or clicking on the arrows next to the little cube in the top right. Additionally, make sure the engraved features are **black**, not any other colors.

18. Save a PNG of your design by clicking on the three lines  on the top left and selecting **Print**. Set the paper to **Letter** and **Portrait**. A dotted area should appear on your screen to designate what will be downloaded. Try to make the mask as big as possible without touching the dotted area, as shown on the image below. Click **download image** and email it to your TA and the head TA Jerry Louh (hl295@duke.edu). Include in your email your TA and lab section.



19. After your TA approves your design, **share** your design with Jerry's email using  on the top right. Make sure he can edit.
20. Congratulations, you have designed a mask! If you have both **emailed a PNG of your mask to both your TA and Jerry** and **shared your mask with Jerry through OnShape**, you are done with the lab.