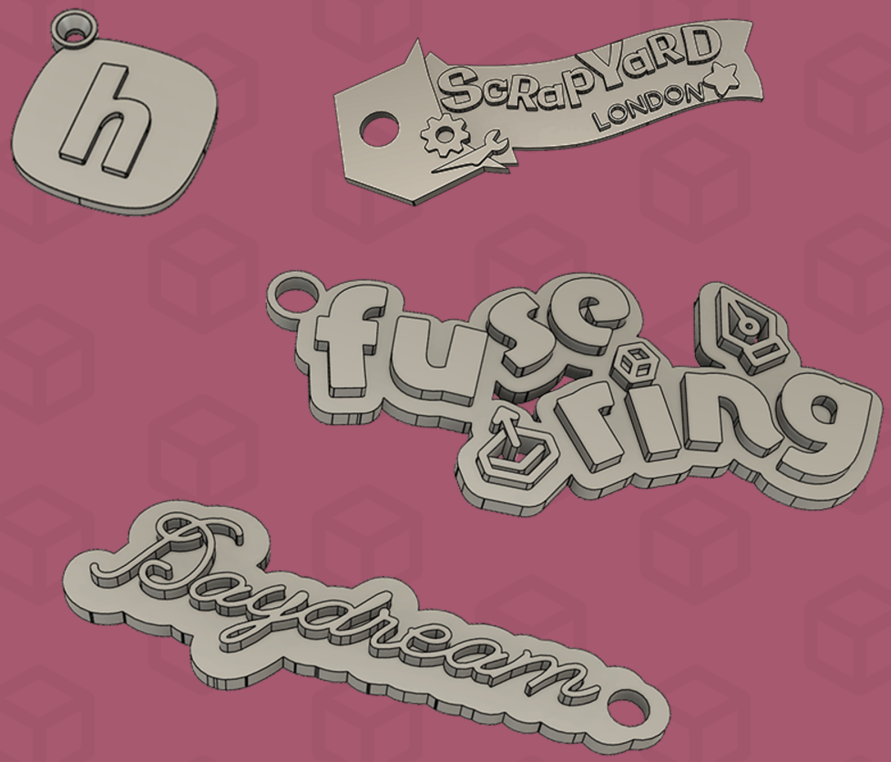
HACK CLUB



fusc ring

Design a keyring for your project in Fusion, get your keyrings made, with carabiners included!

By @David (Pixelglide)

Where is the proposal?

Hack Club believes in learning by doing, so let's make this pitch interactive by getting you to experience this YSWS from the perspective of a workshop attendee!

If you have any questions or feedback, please DM @David (Pixelglide) or send a message in #fusering on Slack.

The maximum material cost for a keyring made in Fusering will be ~15 cents. This puts Fusering closer to free stickers than Boba Drops in cost and significantly under the $5/hour rate for YSWS programs.

Depending on shipping costs, which could be reduced by recruiting volunteers from #print-legion to cover fulfilment using local shipping, Fusering could be one of the most cost effective YSWS programs.

As a potential expansion, Fusering could be offered as a perk for events listed on hackathons.hackclub.com or HCB orgs, making for a cost-effective way for organisers to make merch for their events.

This slide will not be present in final version

Fusering Guide

This guide is intended for Club Meetings and Hackathon workshops but is also useful for personal reference.

Start to finish, Fusering should take between 30-60 minutes depending on the skill levels of your attendees.

Made with <3 by David (Pixelglide)

Need this guide in a different format? Contact us at fusering@hackclub.com

Let’s get started!

You’ll need the following:

- Laptop or PC running:
    - Autodesk Fusion
    - Figma
- 3D Printer, filament and carabiners (optional)

Coming from anchor?

very wip logo!!

If you designed the logo for your project using anchor, then let's start by removing the mask and gradient layers in Figma.

Select the mask and any transparent layers. These are the layers used to make the gradient.

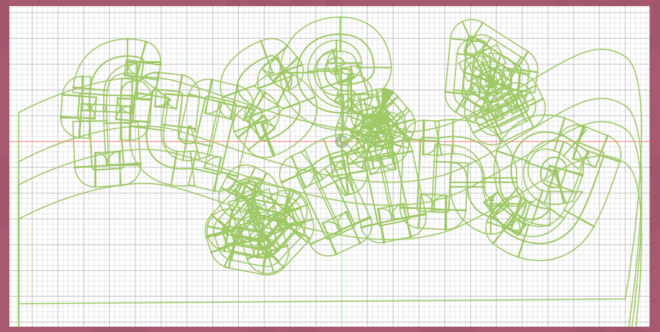
Remove the selected layers, then colour the outline black, and logo white.

But why delete the gradient?

When you make a shape in Figma, you're making a vector shape. All the shapes are defined by lines, even if you can't see them.

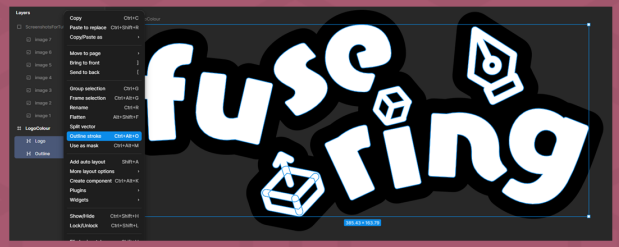
This includes the 25% opacity shapes you use to make up the gradient. While we can't see the lines on the finished product, Fusion can.

This chops up the surface, which we want to extrude, into many smaller pieces, making it nearly impossible to turn your keyring into a 3D object.



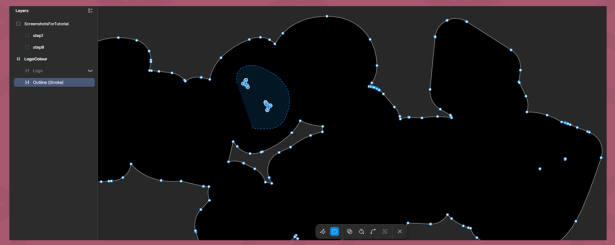
Step 1: Outline the logo

If we tried importing our logo into Fusion, now, there is a good chance the surface would still look chopped up. To fix this, we need to outline our logo, which removes the rest of the unwanted lines.



Select your outline layer, then right click and press “Outline stroke”. This will make a new shape with (outline) on the end of the name.

After this, delete the old outline shape as we don’t need it anymore.



Toggle off the white layer with the text. Then double click the outline layer in the canvas to edit the vector.

Using the lasso tool, select and delete any gaps or nodes in the middle of the shape that you don’t want in the final keyring.

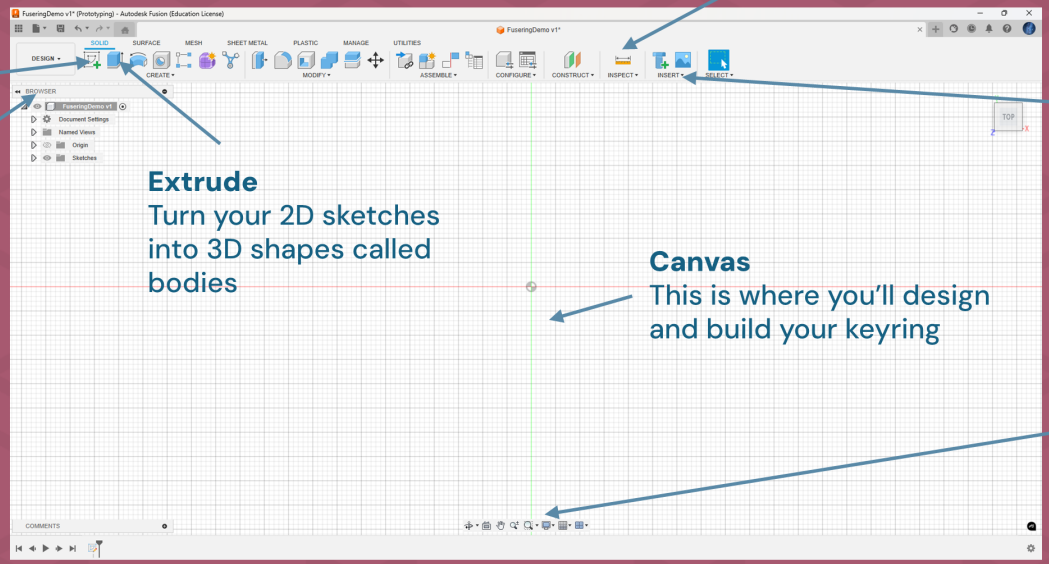
Toggle the text layer back on. Then export this simplified logo as a .SVG by clicking on the frame (# layer in the canvas), then click export, and change the dropdown to SVG.

Step 2: Importing into Fusion

But first, let's get to know the Fusion UI a little better

Measure Tool
Measure the distance between any two points or edges

New Sketch
We can use new sketch to create new shapes to add onto your keyring, such as the hole for the ring to pass through.



Insert Menu
In the insert dropdown menu, you can select "Insert SVG", where we can insert an SVG as a new sketch, such as your simplified logo

Browser
We will use this to toggle on and off different sketches and to export your finished keyring for printing.

Navigation Bar
Here you can select pan (move), orbit tools etc. We'll use keyboard shortcuts instead as they're easier to use!

How do I move around?

Being able to move, zoom and rotate your way around the canvas is the first step to turning your simplified logo into a 3D object! You *could* use the icons in the navigation bar, but using shortcuts is faster and more intuitive!

Orbit:
Rotate around your model

Shift + Scroll Button + Drag Mouse

Pan:
Move around your model

Scroll Button + Drag Mouse

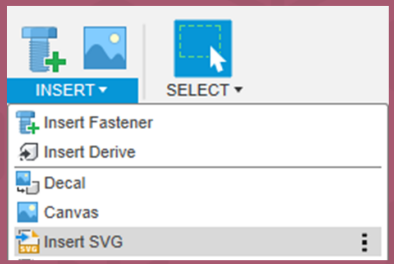
Zoom:
Zoom in or out

Scroll Wheel

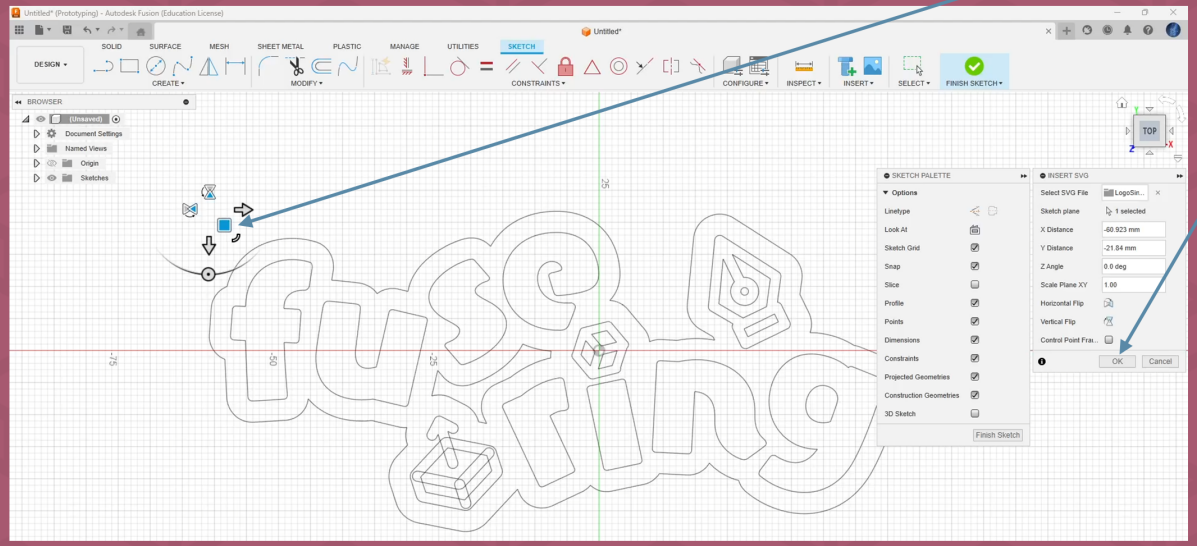
Importing your logo

A sketch is a 2D drawing in Fusion, that can be turned into a 3D object using a tool called the extrude tool, which “pulls up” your drawing into 3D.

When we import your logo as an SVG, the lines that make up your logo get turned into a sketch that we’ll use to make your keyring!



Click on the insert dropdown, then click on “Insert SVG”, then click on “Insert from Computer” and select the SVG file you exported earlier



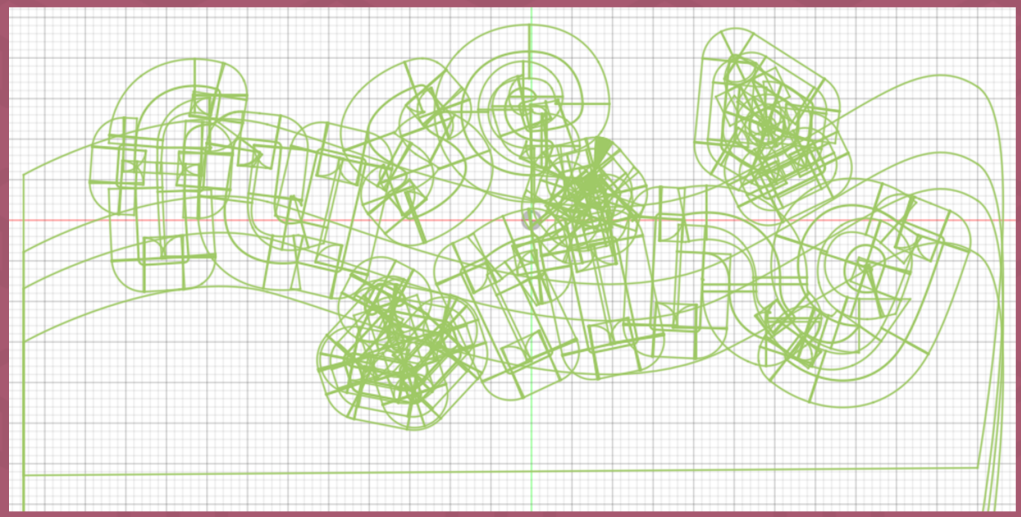
It’s always good practice to centre your object, so use the rectangle to drag the sketch to the middle of the canvas.

Then click “Ok”.

Congrats, you’ve just created your first sketch by importing an SVG!

Troubleshooting

Does your sketch look like this?



If it does, go back to Step 1, and check you have outlined the background of your logo, and deleted the old background.

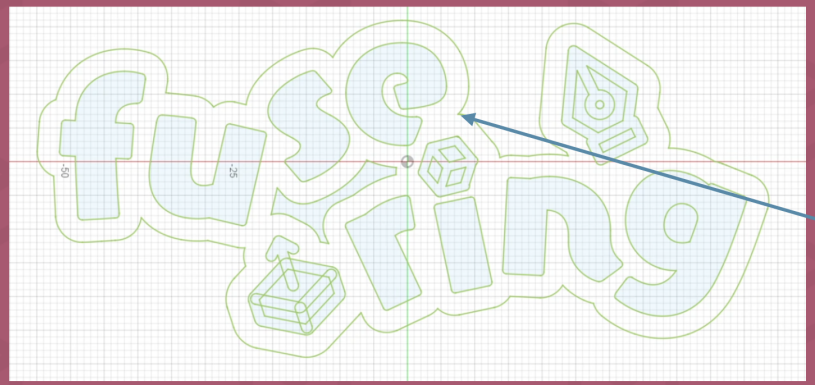
If your sketch looks fine, then we can move on to cleaning up any small errors in the sketch!

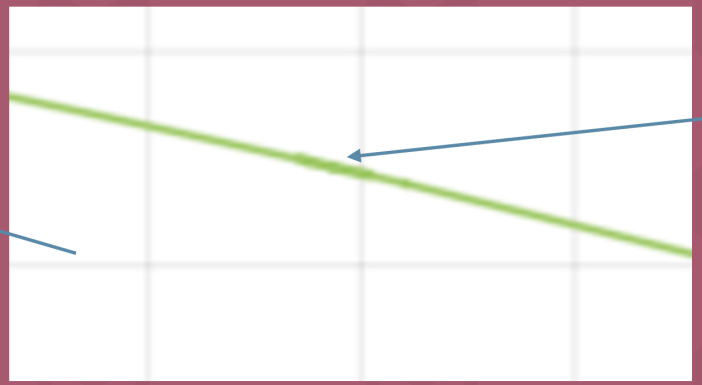
Ps: The old background is the one without (outline) in the name unless you renamed it

Cleaning up the Sketch

We can extrude different parts of the logo by different amounts. That's how we'll make the text more raised than the background. Only enclosed shapes can be extruded and will be coloured in light blue.

Occasionally, parts of the logo, such as the background can have broken lines when they are imported, which means they aren't extrudable, and will need to be fixed by hand.

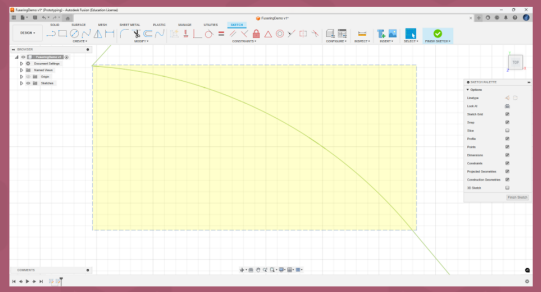




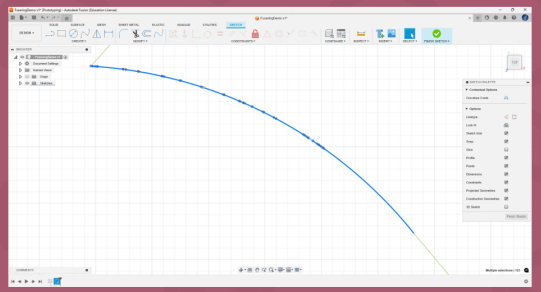
The line should be the same thickness all the way across. Zoom in and look for any line breaks, which look like small blobs when fully zoomed in

Cleaning up the Sketch

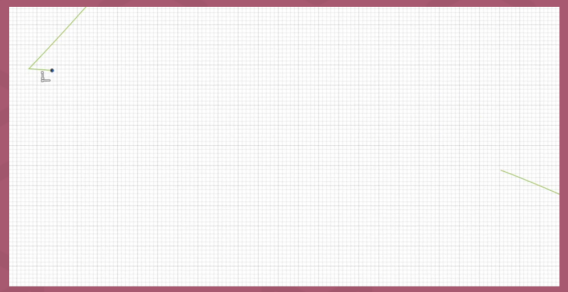
To clean up the sketch, we'll delete the portion of the line with the line breaks, then draw a new line to close the shape, which will make it extrudable.



Zoom into the line, and then click and drag to select the portion of the line that needs deleting



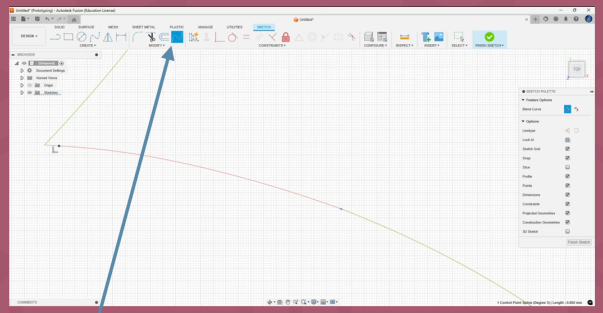
The part of the line that you've selected will be highlighted blue



Click the delete button on your keyboard to delete the selected portion of the line.

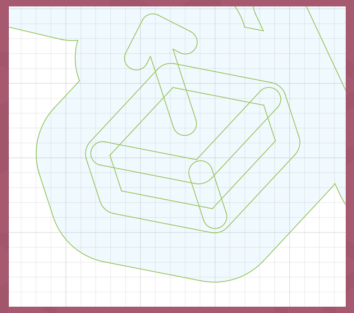
Cleaning up the Sketch

Now that we've removed the broken lines, let's redraw the line. After that, we can clean up any extra lines in the sketch so it's ready for the next step!

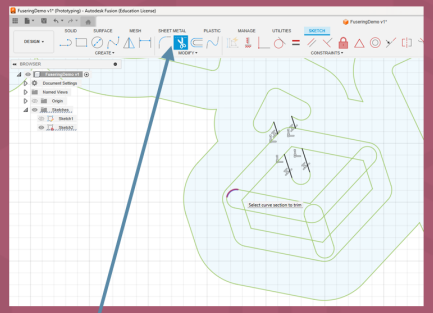


Click on the "Blend Curve" tool. This will let us redraw the curve as a single, unbroken line.

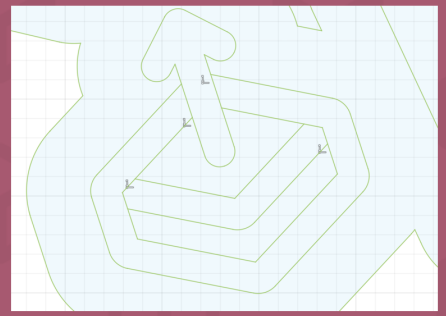
Click on one end of the gap, and then the other end, and a new line will be drawn.



In some cases, you may want to clean up some shapes to make them extrude as a single piece later. To do this, we'll use the "Trim tool"



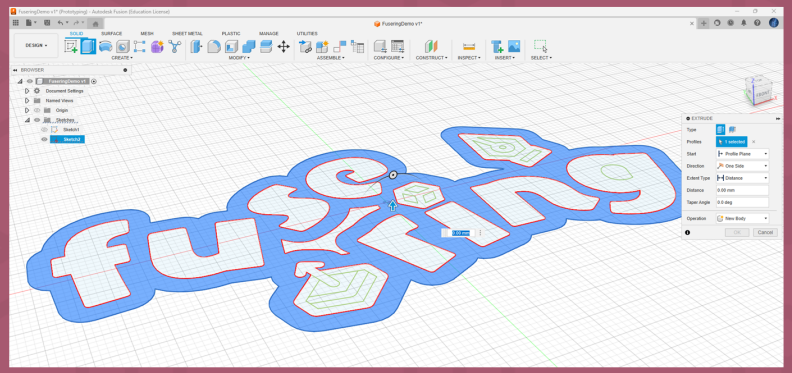
Select the trim tool, then click on each line you want to delete. You can also hold and drag with the tool. If you make a mistake, you can always undo.



You'll end up with a shape that has a cleaner look and is easier to work with later. Once you're happy, press "Finish Sketch"

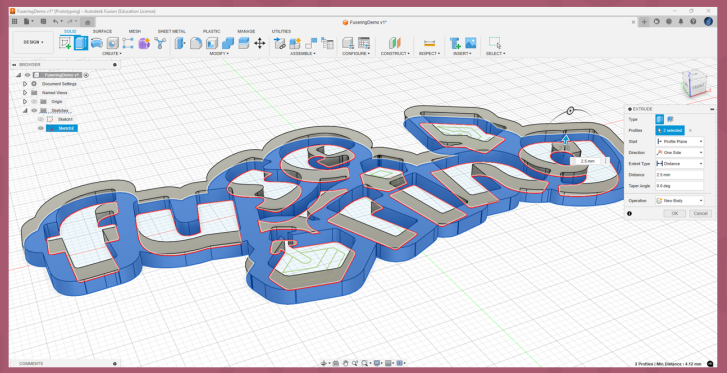
Step 3: Make your Sketch 3D

Now that we've imported the logo as a Sketch, and cleaned up any broken or extra lines, let's extrude the sketch to make your keyring 3D!



Hold Ctrl, then click any parts of the sketch you want to extrude. We call these Faces.

For now, let's extrude the outline, and extrude the letters later. Once you've selected the faces to extrude, press E or select the tool at the top.



You'll likely notice an arrow, and a box for measurements nearby. You can set the height to extrude by typing in a number or dragging the arrow.

Type 2.5mm into the box and hit enter!

Why 2.5mm?

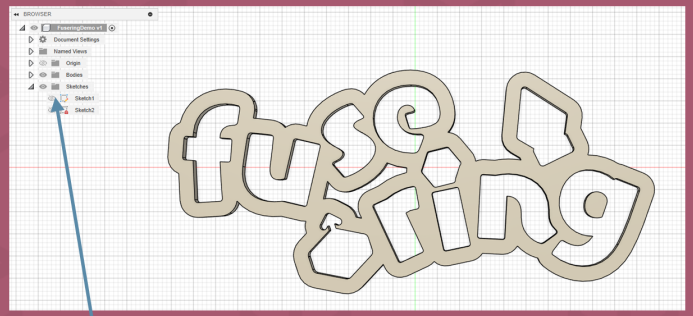
The part of the sketch that we have just extruded will be the thinnest part of the keyring, so will determine how durable the keyring is

Realistically, you can make the keyring any thickness within reason, but we recommend 2.5mm for durability!

For Scrapyard, we made keyrings that were 1mm at their thinnest point. Those keyrings were awesome, but there were some issues with durability.

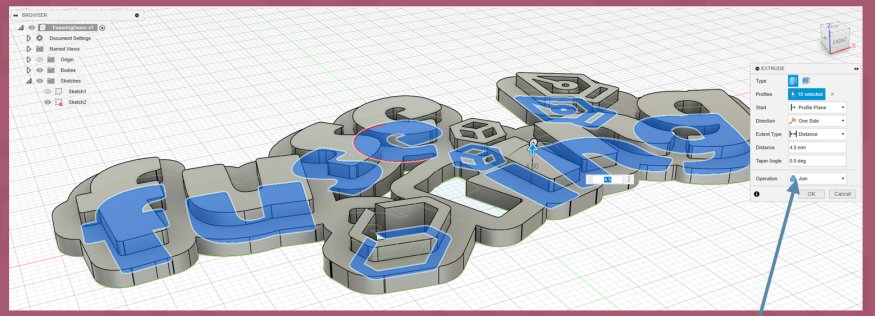
Let’s make the text raised

Let’s make our text raised so that it stands out clearly. If you wanted to, you could skip this step, depending on design you have in mind!



By default, after you extrude a sketch, Fusion will hide the sketch, so you don’t accidentally click on it again.

Go to the Browser, click on sketches, then click on the eye icon next to “Sketch1”



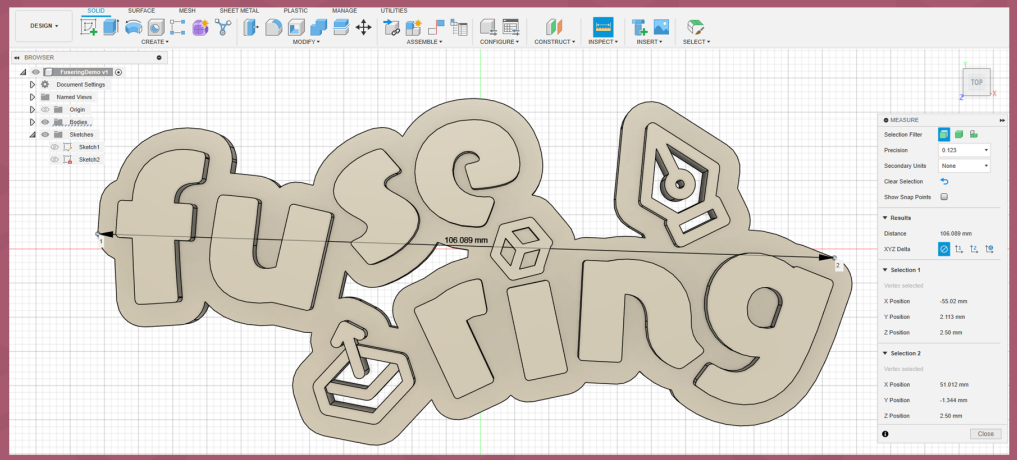
Hold Ctrl again and click on all the faces you want to be raised and enter a number that is higher than the rest of the keyring. 4.5mm is ideal.

If the preview looks red, then change operation type to “Join” in the dropdown menu, then hit enter

Repeat until you are happy with the result.

Step 4: Scaling your design

You might have realised by now that your keyring would be giant if we printed it at its current size. Let's scale down your design so it's small enough to fit on your keys! Let's start by measuring the current length



Click the "Measure" button, then click on the two furthest points along the edges of your keyring.

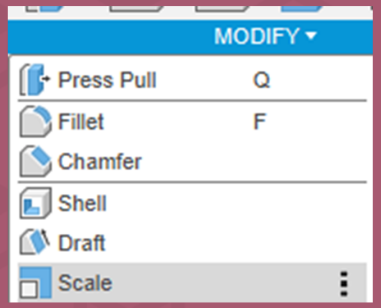
Write down the current length, as we'll need it for the next step.

We change the dimensions using scale factors, you might know how these work from Math classes.

New length / Current length = Scale Factor

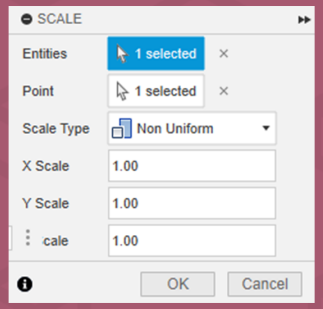
Step 4: Scaling your design

Now that you've worked out your scale factor, let's scale your design to the size that you want. For this example, we'll use a factor of 0.659 to get a final length of ~70mm.

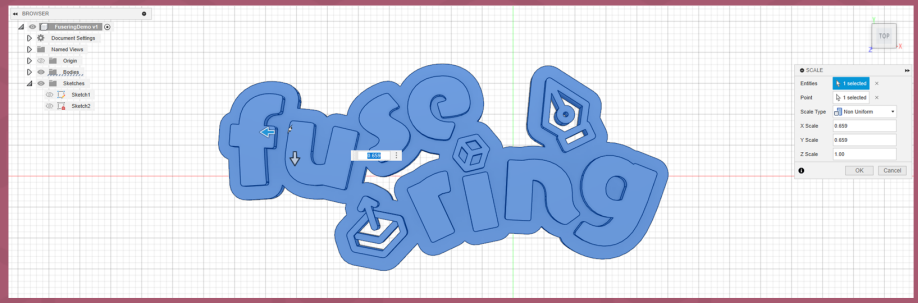


Click on the Modify dropdown, then click "Scale".

After this click on your keyring to select it.



Change Scale Type to "Non-Uniform" in the dropdown menu.



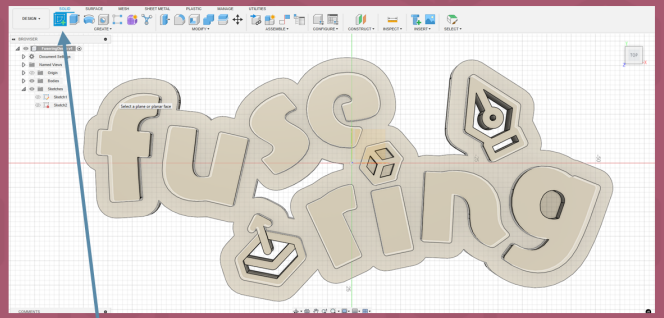
Change the X Scale and Y Scale to the scale factor that you worked out in the last step.

Leave the Z Scale as 1, as this makes sure that the thickness is the same.

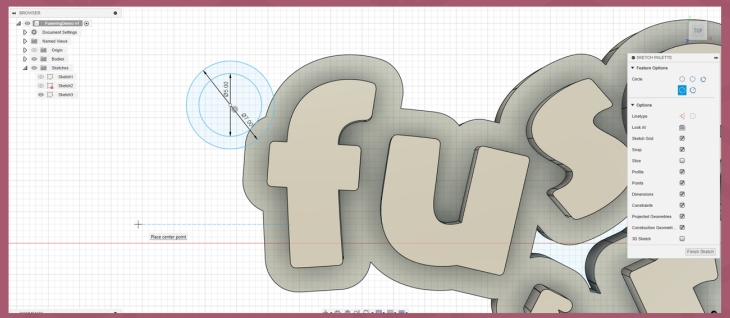
Once you're done, hit enter.

Step 5: Adding the carabiner

At this point, you've finish most of the steps needed to make your own keyring! Now let's add a hole for the carabiner to pass through

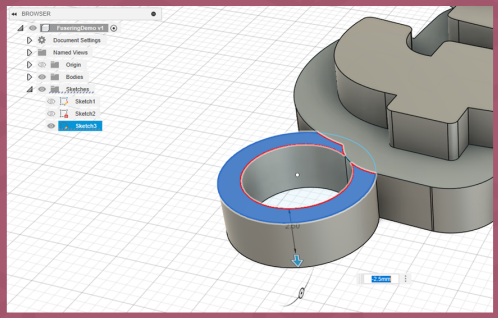


Click on "New Sketch", then click on the top face of the outline we extruded earlier.



Draw a large circle, roughly 7-8mm, that overlaps with the body of the keyring.

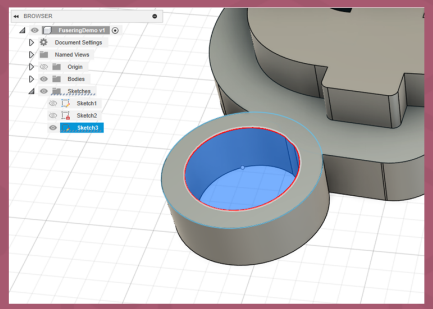
Then draw a smaller circle of diameter 5mm inside of that circle and hit enter



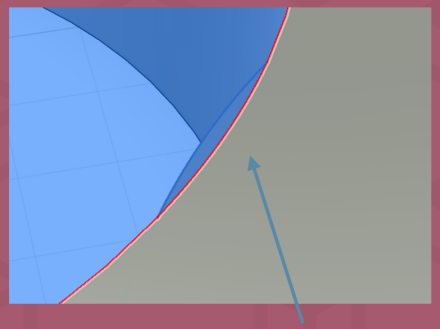
Select only the inner circle, and extrude downwards, in this example -2.5mm.

Step 5: Adding the carabiner

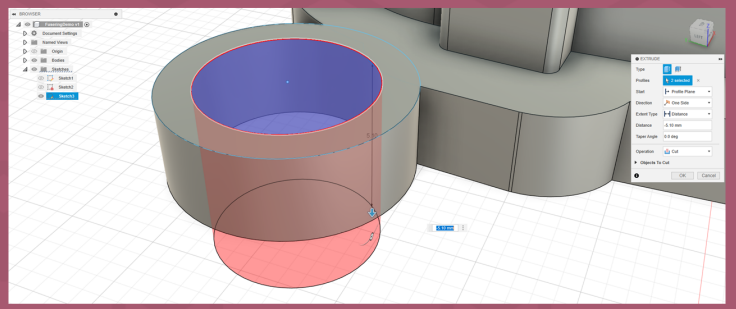
Depending on where you place the hole for your keyring, you might need to cut out the inner circle. If you have space, you can skip the outer circle entirely, for example to place the hole in the top corner.



In the Browser, toggle on the sketch that you made earlier, and select the inner hole



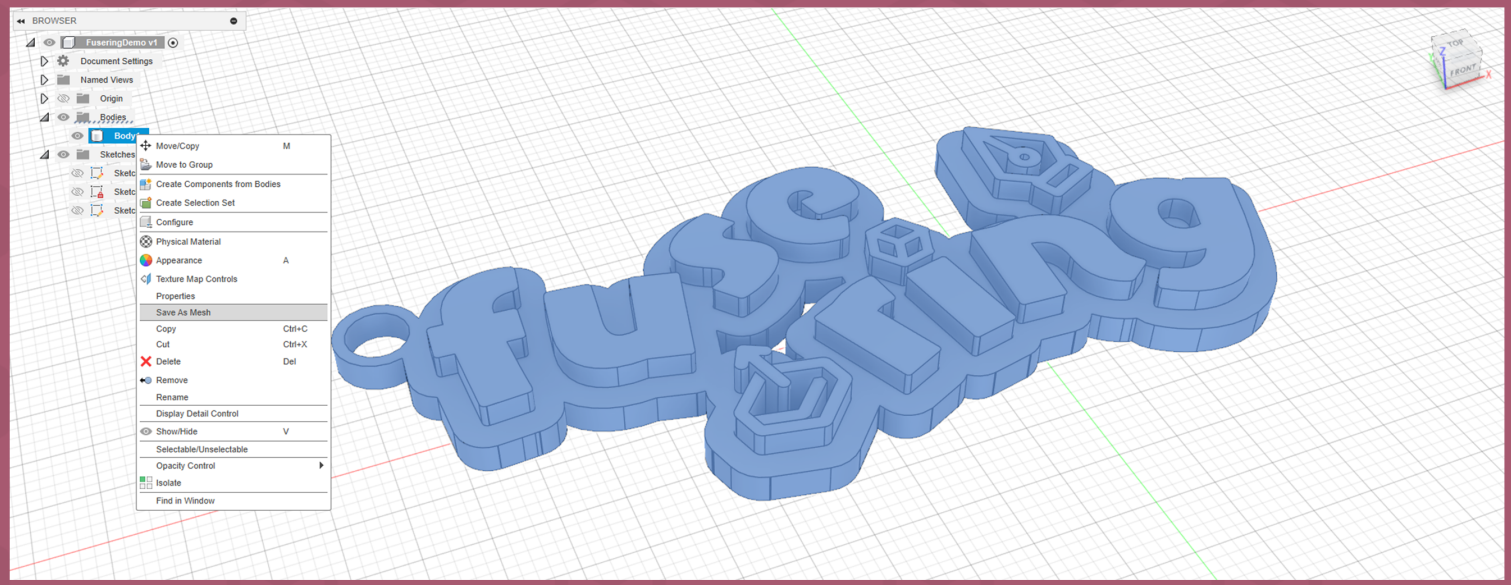
In some cases, you may need to also select the bit you want to cut away too.



Click E to extrude again, but this time, drag the arrow downwards to cut out the middle of the circle. Once your happy, hit enter!

Congrats!

That's it, you're all finished! Take a moment to appreciate the design that you've just made! All that you need to do now is right click the body in the Browser and click on Save As Mesh and follow the on-screen prompts!



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