The Ultimate Picture Frame Instruction Guide: Pro CAD Edition

Thank you for buying the Ultimate Picture Frame! May you never need to buy another picture frame ever again!

Within this guide you will find instructions on how to:

- Plan your frame
- Customise the pieces for your printer
- Print your frame for an optimal fit
- Assemble your frame
- Troubleshoot potential issues

If you have any questions that this guide cannot answer, you can reach me at **hello@katzcreates.com** and I'll do my best to assist!

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Step One: Planning Your Frame

Before you can get making your frame, you need to figure out what size frame you'll be making. The different versions of the frame will determine the sizing options available. The Ultimate Picture Frame can accommodate the following without alteration:

Inches:	A Sizes:	B Sizes:	Metric:
All standard sizes above 8"x8", including Letter Any configuration that can be made from the following measurements: 4 inches, 3 inches, and 2 inches	All standard sizes between A6 and 4A0 Larger sizes can be created following the same sizing convention at your own risk!	All standard sizes between B6 and 4B0 Larger sizes can be created following the same sizing convention at your own risk!	All standard sizes above 20cm x 20cm Any configuration that can be made from the following measurements: 10 cm, 5 cm, 4 cm

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All of the STL files have the size of the piece listed in the name. If you are not using the Frame Planning tool and doing your own maths, you should be able to determine the pieces required according to the lengths mentioned in the file names.

Please note that the sizes listed with the A and B sized pieces are more precise to create the necessary sizes. The number you get may be up to 1mm larger than official sizes; this is normal.
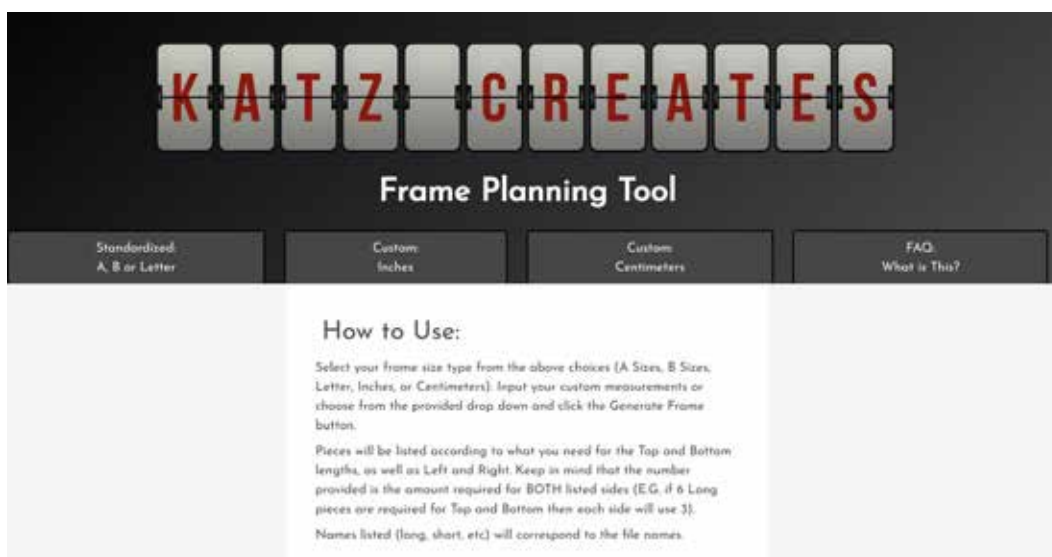
If you are using the *Frame Planning Tool*, then choose your frame type, put in your desired frame measurements (or choose from the drop down) and the tool will tell you exactly how many of each piece you will need to print. There are further instructions on the page.

The frame is designed to be able to fit additional mounting, thicker pieces of art, as well as a pane of glass or acrylic. **The front slot can accommodate up to 4mm, the back slot can take up to 7mm. Please plan accordingly.**


Along with your frame pieces, you will also need either **M3x10** screws to secure the backing pieces, or some 3D print friendly glue **only** if you want to make the frame permanent.

Consider how you want to display the frame as well! The frames stand independently or can be hung with either a bit of **1mm** wire or **8 gauge/4.5mm** wall screws.

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Step Two: Tolerance Testing
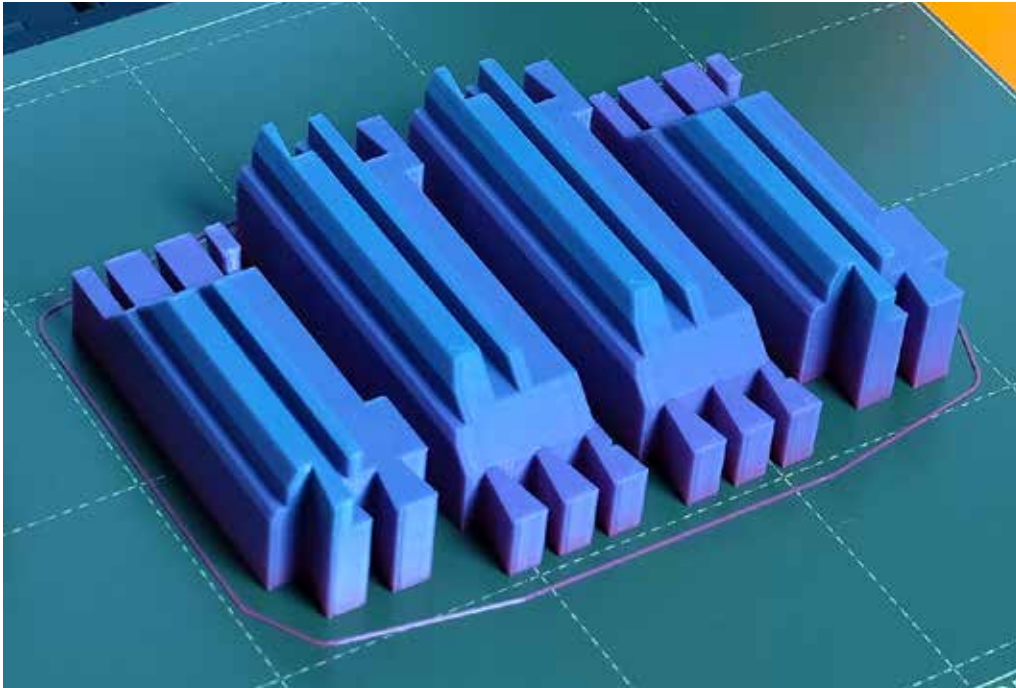
For your frame to function as intended, it is very important that the printed pieces have a good, tight fit when slotted together, which requires having the right tolerances for your printer. You may wish to jump straight into customisation if you already know your printer's capabilities, however there are test pieces provided to assist in figuring this out. See Figure 2.1 for an example piece.
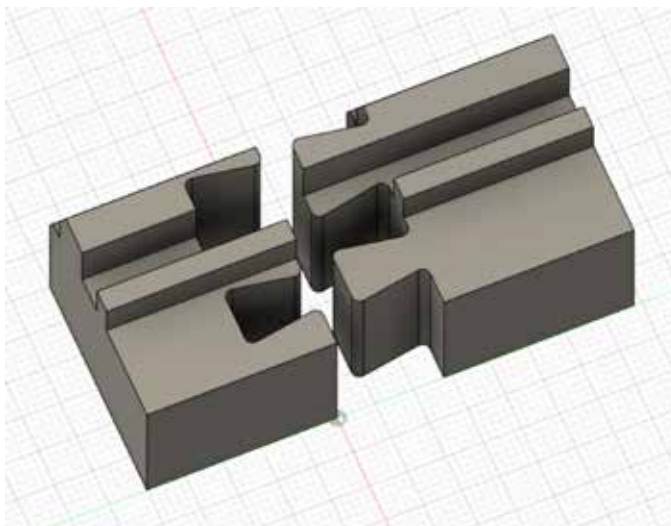

Figure 2.1

There are four sets of test pieces, identified with Sizes 1-4. The size of each piece is marked with a number on the bottom of the print. The space between the pieces is .06mm, .1mm, .14mm and .18mm respectively.

These can all be printed at the same time with the same settings (these settings are for **FDM only**, see next page for resin):

- Nozzle Size: .4mm
- Layer Height: .2mm
- Top Layers: 5
- Bottom Layers: 5

You are welcome to add variation around infill and wall thickness; I recommend **10-15% grid** and **2 perimeters**. No supports or rafts are required. **These settings can be applied to all frame prints.**

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Once you've got the pieces printed, slot them together as seen in Figure 2.2. The pieces should require a small amount of force to get them to fit, then sit snuggly with little to no wobble. In an ideal fit you should be able to pry them back apart with a bit of force. If you require great force to slide them together and they become stuck, the size is too small. If they wobble or slide apart, the size is too big. **Choose the size that is closest to described above, erring on the side of too tight.**
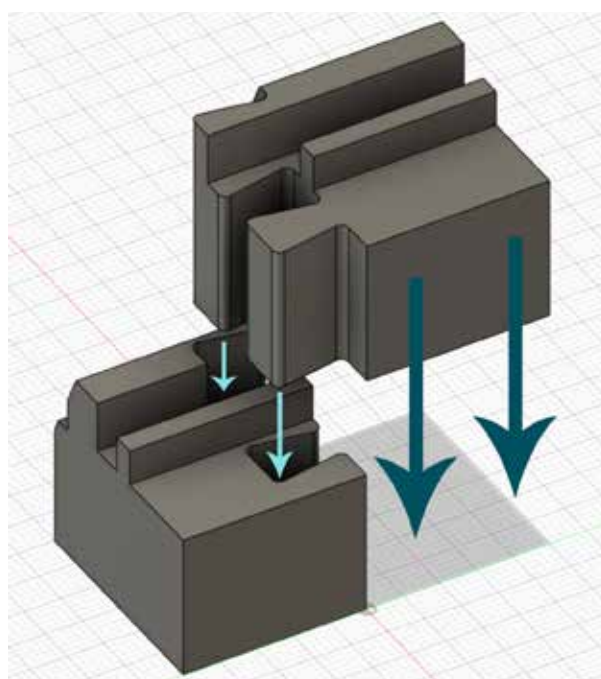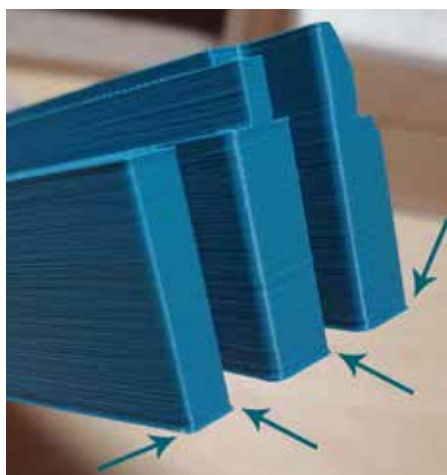

Figure 2.2

Top Tips!

Figure 2.3

If you find yourself struggling to fit the pieces together, check the print for elephant foot, as seen in Figure 2.3. Elephant foot can be removed after the fact with a blade or deburring tool, however it is better to factor for it before you print your final pieces. Many slicers include a setting that allows you to compensate for elephant footing, or you can adjust your nozzle height until the first layer is less squished.

If you're happy with one of the pre-made Size options, you are welcome to jump right into printing! If you want a custom tolerance size or to customise your own frame pieces, please continue on to the next optional step.
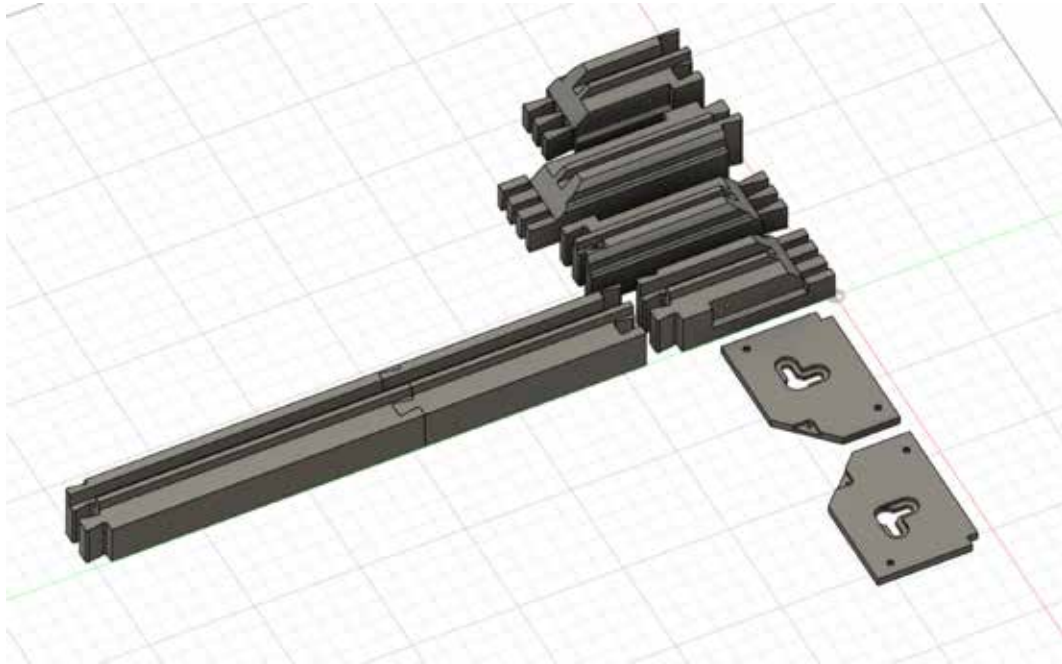
Important Notes!

These settings are for FDM style printing ONLY. If you are printing in resin, default settings should be fine, but some post processing (sanding) may be required.

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Optional Step: Custom Alterations

Included in the Pro CAD Edition of are two different CAD files; an .F3D file and a .STEP file. Both require a basic knowledge of CAD software to use. **This guide will NOT teach you how to use Fusion 360 or any other CAD software and it is advised that you are proficient in your software of choice before altering the design files.** Misuse of the files may result in non-functional prints.

Top Tips!

If you have access to and knowledge of Fusion 360 it is highly recommended to use the .F3D file over the .STEP as it comes with pre-made Parameters to alter the tolerances between the pieces. You should also be able to move through the Design History to change the orientation of the pieces in the Fusion 360 file.

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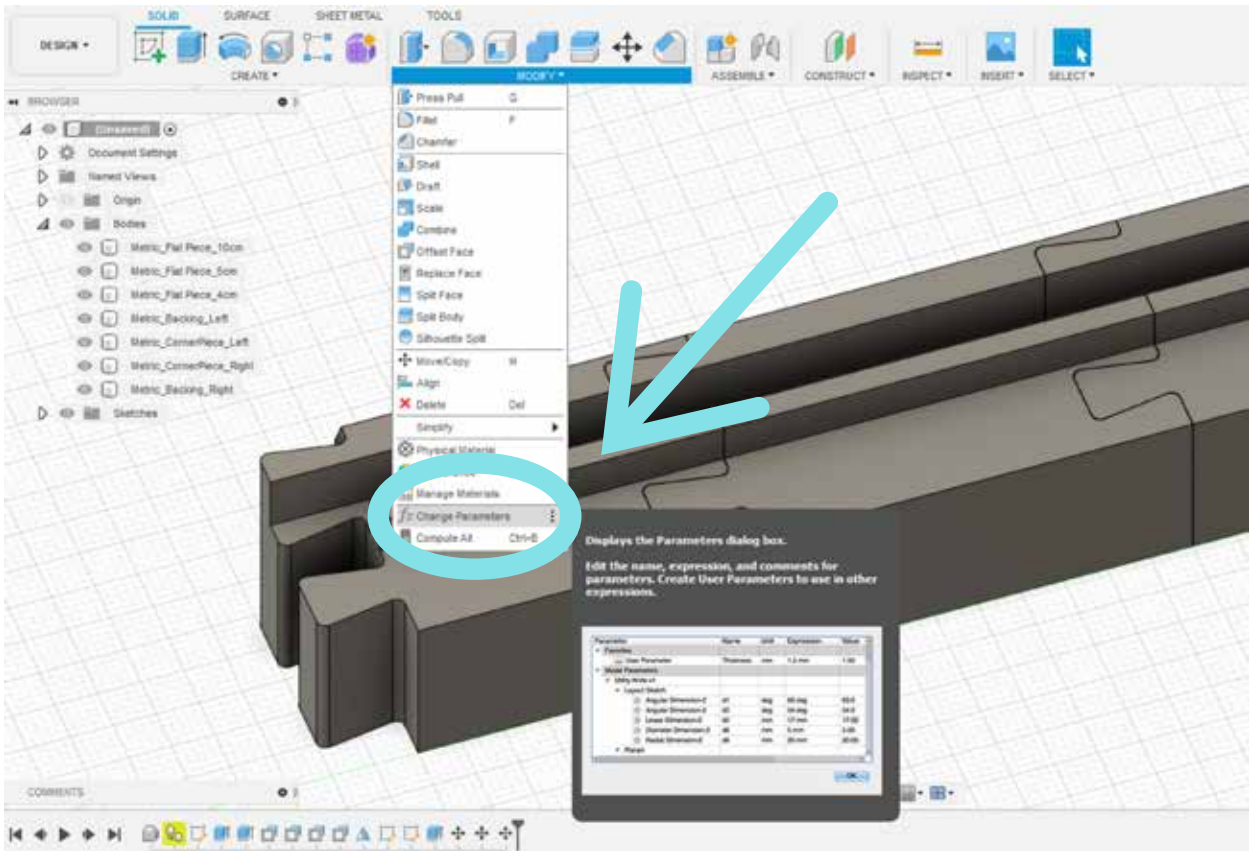
Altering Length Tolerances

Figure O.1

If you are using Fusion 360, altering the tolerances for the pieces is incredibly simple, as files come with built in Parameters for changing the space between the pieces safely. **If you are still unsure what tolerances you need after printing the included Test Pieces, it is highly recommended to alter the tolerances on the Test Piece file until you find your best fit.** The Parameters window can be found under the Modify menu, as seen in Figure O.1. Once open, you will see the available options for your frame size. The Lengths Edge Tolerance controls the tolerance between flat connections (Figure O.3). The Corner Edge Tolerance is for the 90 degree angle corner connections (Figures O.4 and O.5). The Backing Tolerance is for the space on the underside of the Corner Pieces, where the Back Plates attach (Figure O.6). The Test Piece will only will have Length Edge Tolerance.
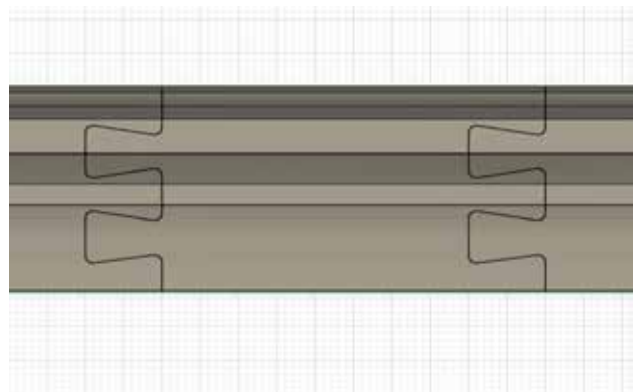

Figure O.2

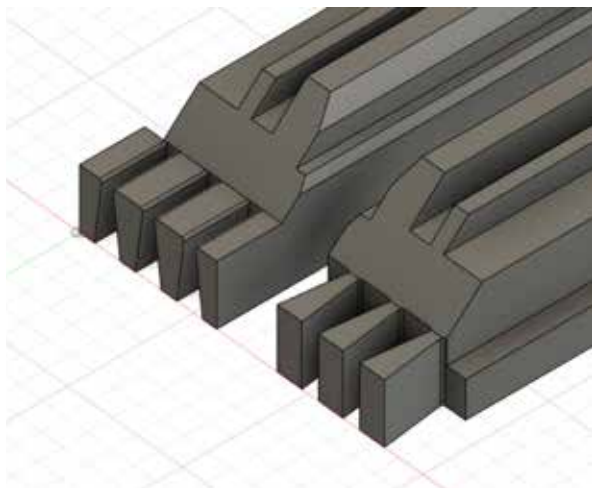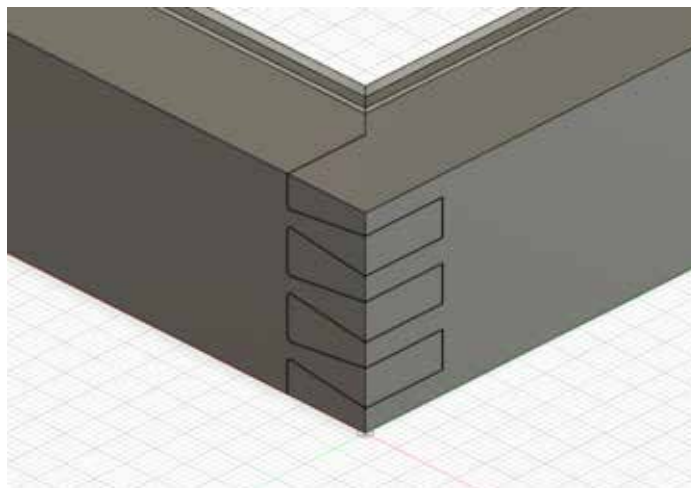*Figure O.3*

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Figure O.4

Figure O.5

All pieces come with the Size 1 tolerances as default (.06mm on Lengths, .05mm on Corners, and .1mm on Backing). If your Test Pieces (Figure 2.1) revealed Size 1 to be too loose, adding a positive value number (e.g. .01mm) to the Parameter Expression will create a tighter fit. To create a looser fit, adding a negative value number (e.g. –.03mm) will create a looser fit.
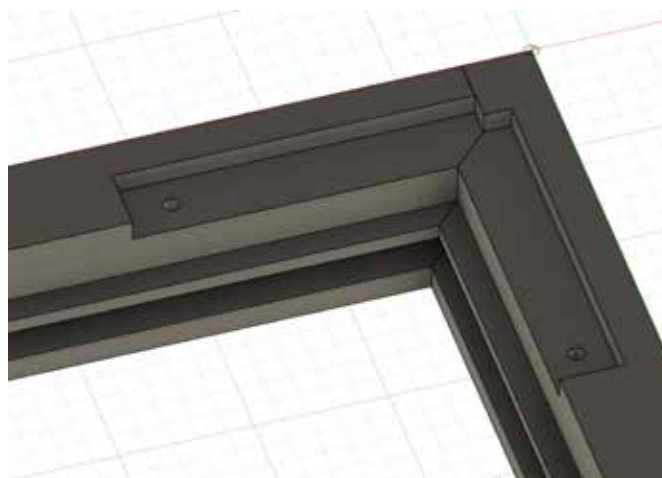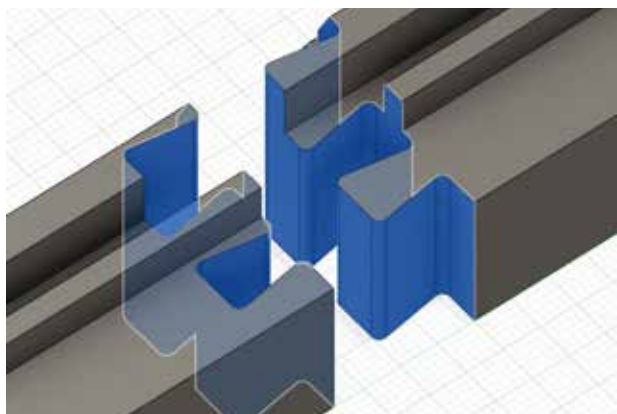

Figure O.6

Figure O.7

If you do not have or use Fusion 360 and instead prefer an alternate CAD program, STEP files have also been provided for all sizes, including the Test Pieces. As STEP files do not export with Parameters or Design History, any alterations to the design will have to be done manually.

This can be achieved by selecting the faces between pieces and applying an Offset to either expand or contract the space between as needed. For the Length Tolerances to be altered, all faces within the flat dovetail join must be selected (see Figure O.7) and Offset. For Corner Tolerances, all inner faces must be selected in the corner dovetail join (while leaving outer faces untouched, see Figures O.8 and O.9) and Offset.
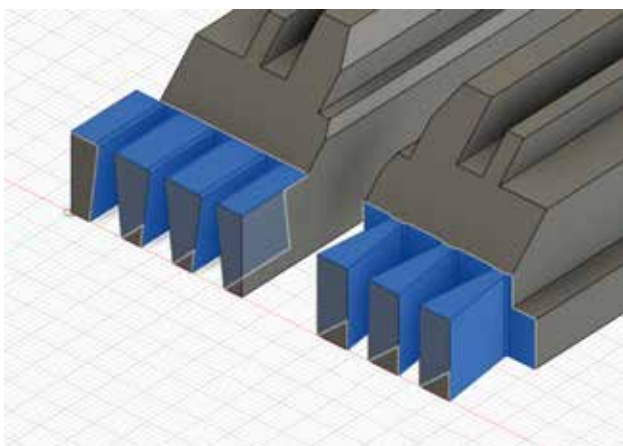
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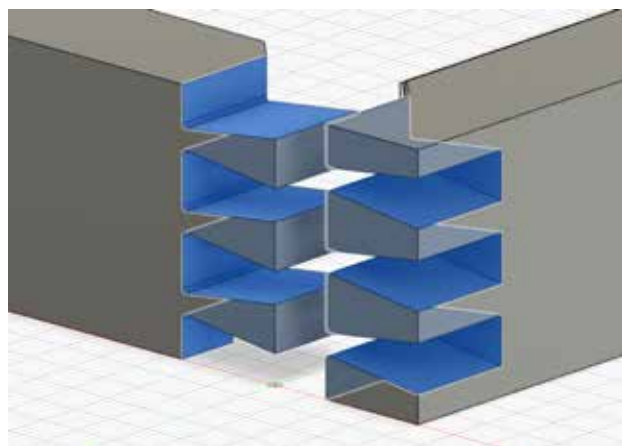
Figure O.8

Figure O.9

To alter the tolerances on the Back Plate pieces, select all the outside faces on the plates themselves EXCEPT the angled side, as seen in Figure O.10. As mentioned previously, a positive value in the Offset should tighten the fit, and a negative value should loosen it, but your program may function differently. It is advised to test as needed.

Figure O.10

Creating Custom Sized Lengths

Figure O.11

Although the Ultimate Frame is already built to accommodate almost all standard frame sizes, you can still take it a step further and create truly custom lengths with the provided CAD files should you wish. **Please note however that this is an advanced use of the design and alterations are done at your own risk.**

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Figure O.12

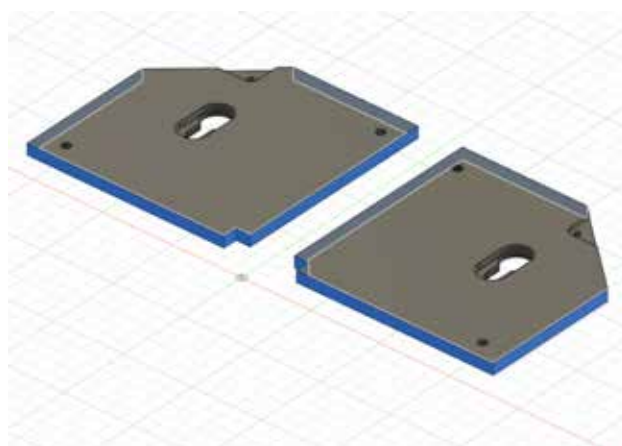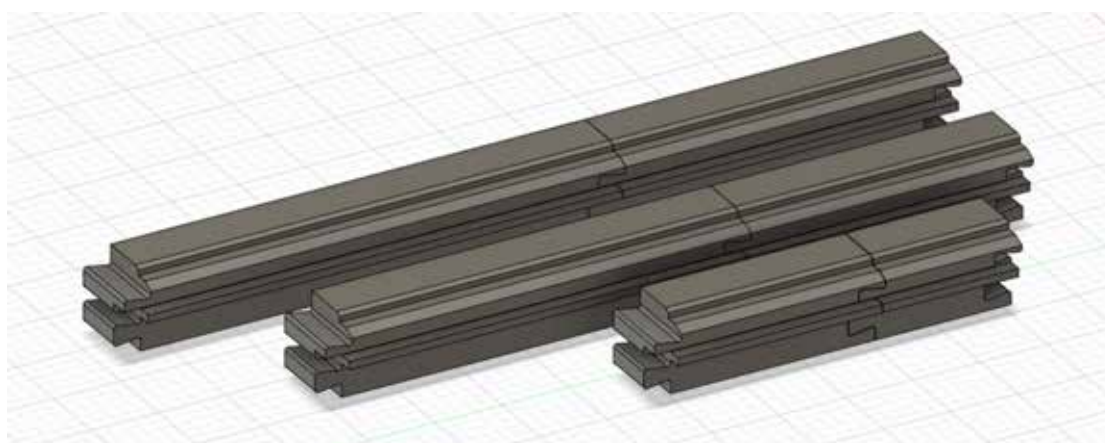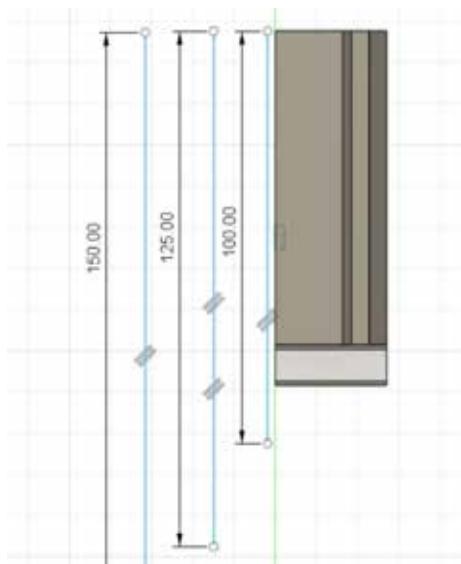Plan out the lengths that you will need for all of your pieces in advance to make sure that they will create the final size you need when assembled. Take advantage of the 2D Sketch Tool to create a precise measurement to line the model up with. Accuracy is key here; if you don't resize the model accurately to its new size, you may end up with a frame that won't fit your art correctly.

Top Tips!
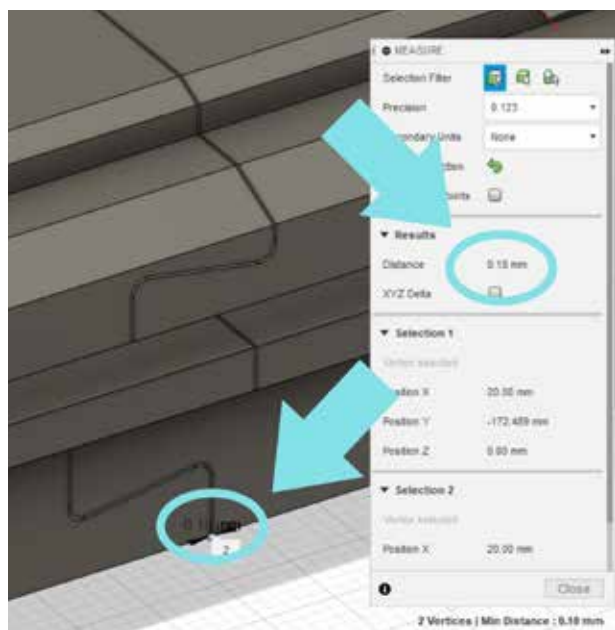
Figure O.13

If you want to make sure that the frame size is spot on, then don't forget to factor the gap between pieces into your total measurements! This number will depend on the tolerance settings you found to be best for your printer. Not including this into your measurements may result in a frame that is slightly too big, depending on the overall size of the frame and how many pieces it has.

Changing the lengths of individual pieces can be done through selecting the faces on the flat dovetail (highlighted in blue) join (see Figure O.14 or O.7) and applying a Move function to relocate the frame edge. The overall shape of the frame should not change if done correctly.

Figure O.14

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Figure O.15

Length adaptations can be applied to both straight and corner pieces in the same way, as both types of pieces have a flat dovetail join that can be used to alter the size of the piece. (See Figure O.15) If maintaining a frame shape with 90 degree corners, there is no need to alter the corner connections.

Creating Major Design Alterations

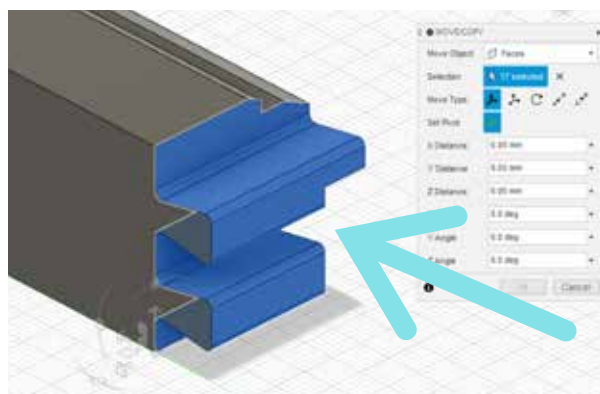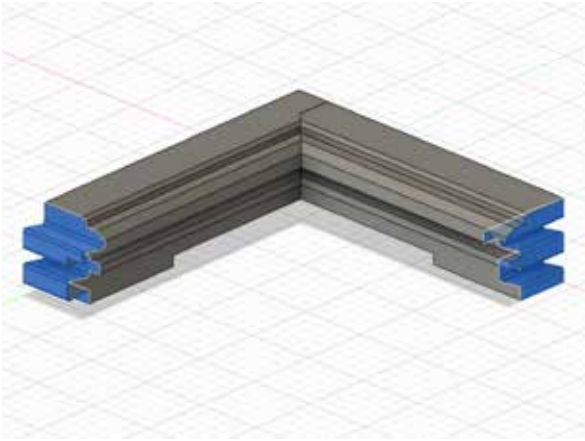Part of the beauty of having access to a CAD file is the ability to adapt a design in a more seamless fashion and produce better results. If you wish to take the **Ultimate Picture Frame** to the next level with heavier alterations, you are welcome to do so! The sky is the limit with what you do with it, so feel free to have fun! **Please note that I will not be able to assist with changes made beyond those outlined in this guide, and further alterations are made at your own risk.**

Important Notes!

Whilst you are free to make your own version of the **Ultimate Picture Frame** for personal use, **sharing remixes and personal adaptations is <u>strictly disallowed</u>.** You are encouraged to share photographs of your creations on social media and the like, but **distribution of STL or CAD files is in violation of the personal use license** included with this purchase and will result in a take down request. With that said, **add-ons** and **extras** may be shared freely and without restriction.

The **Ultimate Picture Frame** design is protected by international copyright and not included in the Creative Commons.

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Step Three: Frame Assembly

To prepare for assembly, gather up all of your printed pieces, as well as your chosen method of attaching the backing (screws or glue). If you are using a piece of glass or perspex in the frame, you'll also need that to hand, as well as what you are framing.

If at any point something doesn't appear to be working as stated, please check the Troubleshooting Section at the end of this guide for help.
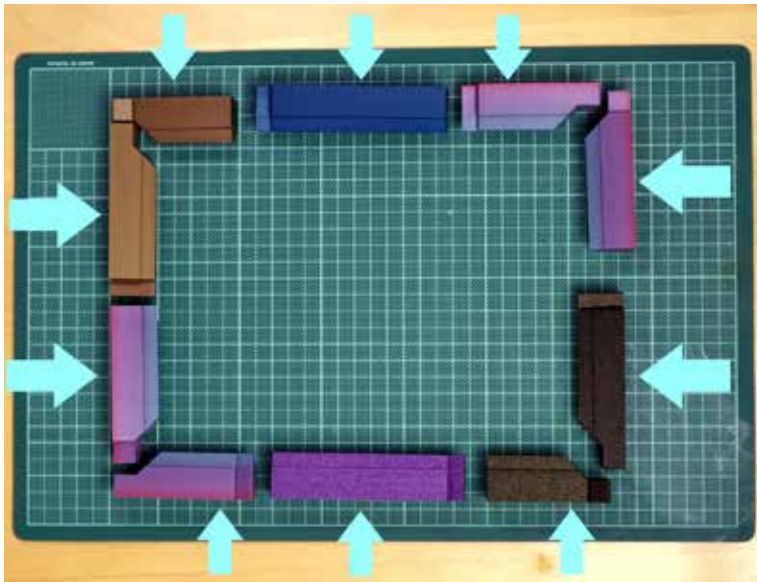
Figure 3.1

To get started, arrange your pieces in the general shape of the final frame to make sure you have all the pieces you need, with the backs on the table and the front of the frame facing up, as seen in Figure 3.1. Become familiar with the direction in which the pieces will slide together as **the order in which you connect them will be important!**

Top Tips!

Be aware that corner pieces only slot together in one direction!

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Figures 3.2–3.6

Start the assembly with the corners at one end of the frame, putting each corner together as seen above before adding any length pieces or attaching the corners to each other. The corner and lengths come together the same way as the test pieces (see Figure 2.2). You'll finish with one side complete.

Figures 3.7–3.9

From there, add length pieces (as seen in Figures 3.10 and 3.11) until you have three sides of the frame assembled. Leave off the remaining corners and fourth side for now.
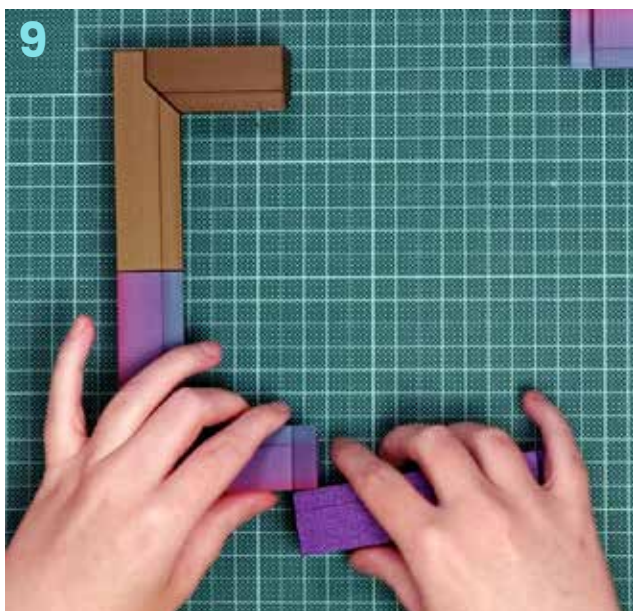

Figure 3.10
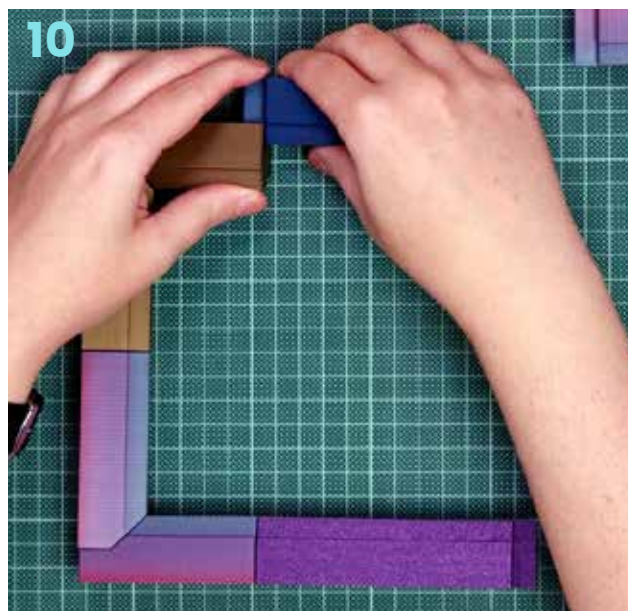
Figure 3.11

Check and make sure everything is fitting together nicely so far. You should be able to give the assembled pieces a bit of a tug and not have it wiggle or rattle about much. If any pieces are not fitting together well, a bit of clean up with a knife/deburring tool should help.

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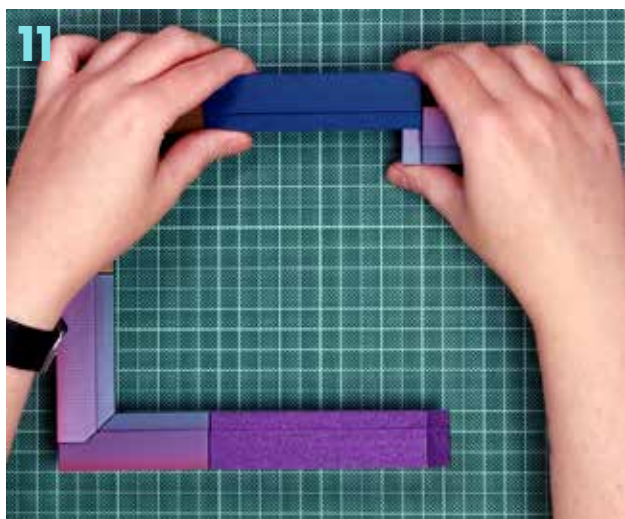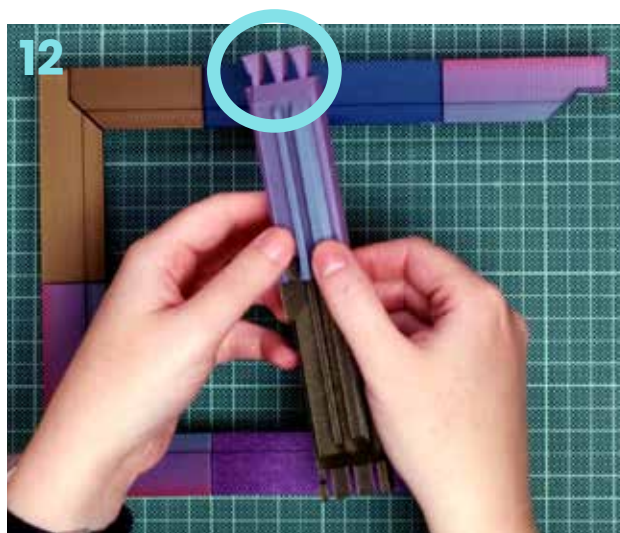
Figure 3.12

Figure 3.13

Instead of fitting the remaining corner pieces together (as seen in Figures 3.2-3.6), slot onto the main body of the frame the side of the corner that is the 'receiving' piece, or the piece that will be slid **into**. (See Figure 3.12) It should look like the corner piece with slots, instead of the piece with triangular extensions (see Figure 3.13). Prepare the last side of the frame, but do not attach it. There should also be one last corner piece, completely unattached (Figure 3.14).

Figure 3.14

Your frame **will** look a bit different due to the sheer variation of size possibilities, but your frame should be looking somewhat like the photo above. Time to grab your glass/art!

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Top Tips!
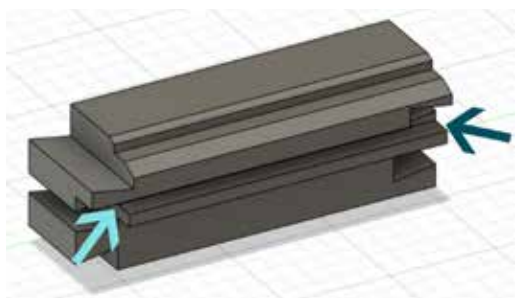
Figure 3.15

Before you start inserting anything into the frame, make sure to properly identify the front slot in the frame. It sits right behind the front facade of the frame, with a small lip separating it from the back slot. See Figure 3.15 if you are unsure!

Figure 3.16

Carefully insert the art into the front slot if you are not using any clear front piece, or insert your glass/acrylic if you are. There is space in the back of the frame for the art if you are using the front slot for glass/acrylic, or simply prefer to place the art in the back. Make sure that the edges of whatever you are inserting are straight and square, or you may find the frame bending a bit to accommodate it! If you are having trouble with this, please refer to the Troubleshooting section at the end of this guide for more help.

Figure 3.17

Once you've got the art or glass slid fully into the front slot of the frame, or if you are only placing art in the back, attach the fourth side of the frame at the corner where you already have the first corner half.

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Figure 3.18

Figure 3.19

Once you've got the fourth side on, it's time for the final piece. This will likely be the most stubborn to attach, but if you put it together in the right order, both the length and corner fit should go in the same direction, allowing you to slide the final piece on. Don't be afraid to use a little force to squeeze together any remaining gaps!
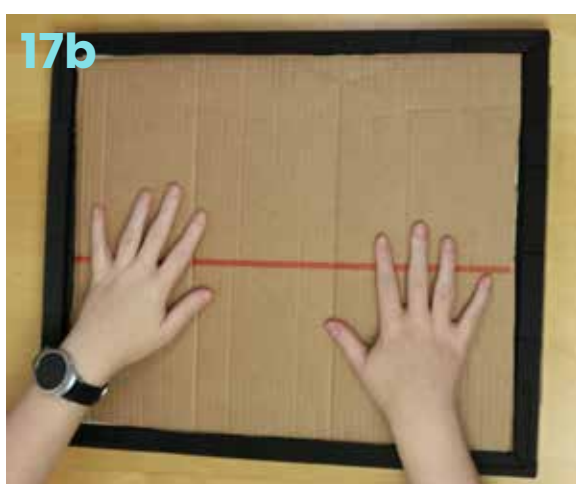
Figure 3.20

If you're placing art or anything in the back slot of the frame, flip the frame over and gently place it in after giving your glass/perspex a wipe to clean it of any debris. If your art is thin, a piece of cardboard should be placed behind for support, as seen in Figure 3.20. From there you are ready to attach the back plates.

Keeping your hanging orientation and direction of the art in mind, place your back plate pieces in the slots on the back of the frame. Make sure you place them with the slots for the screw heads facing out, and the indentations for the hanging screws facing in. You may need to clear loose plastic from the screw holes to get a clear path.

Figure 3.21

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Figure 3.22

Figure 3.23

Secure the back plates to the frame with the **M3x10** screws, or with a bit of glue if you prefer. Check that they are secure.

Top Tips!

Even if you aren't placing anything in the back, or choosing to hang the frame, you should still secure at least two back plates for stability. Also, **your back plates may look different as some sizes come with an L-shaped screw mounting hole.**

Flip it back over and admire your new frame, because it's complete! Find a good place to display it, then get started on the next one!

Please be sure to share photos of your frame on social media and tag me in the results so I can see and share it! **#UltimateFrame**
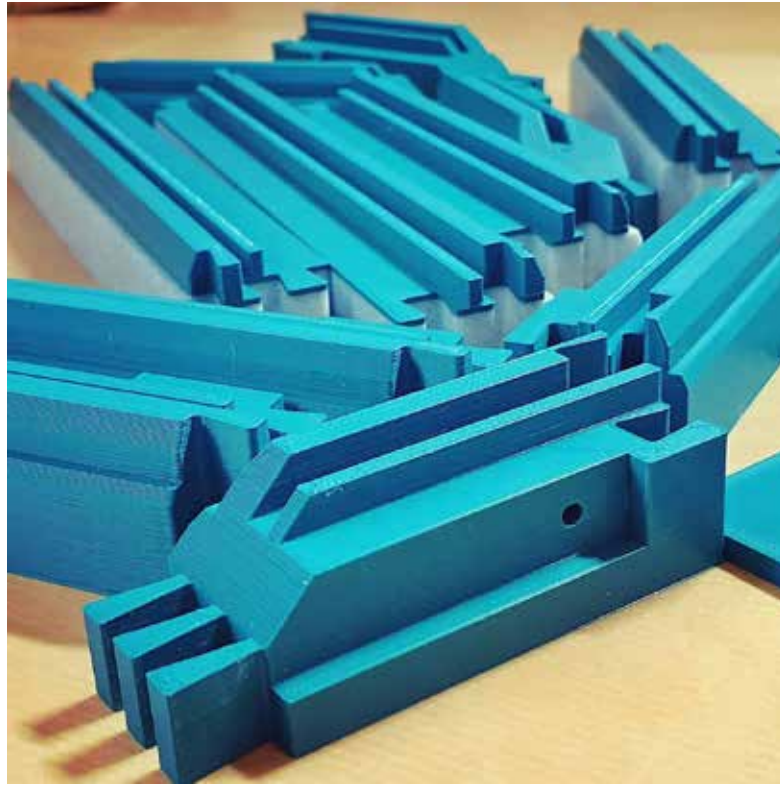
@KatzCreates

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FAQ/Troubleshooting

I've printed the test pieces and none of them fit together right; help!

- First of all, double check that you are testing the correct pieces together; a Test Piece 1 and a Test Piece 2 won't fit together correctly! If none of them are even close to fitting, it is recommended to take a second look at your printer settings and make sure you're not getting over or under-extrusion. You may also just need to set a custom tolerance with the CAD files provided.

How do I get a multi-coloured frame like in the photos?

- If you just want different pieces in different colours (like the frame in Part 3) you simply need to print each set of pieces separately to make them different. If you want more than one colour in a single piece (as seen in the cover photo) then you can add a pause in the print where you want the change and swap filaments then. Your individual slicer should have more information on how to do this online.

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Why does my CAD file not have the built in Parameters displayed in the guide?

- Only the .F3D files haves the built in Parameters; unfortunately .STEP files cannot carry over this information into other software packages. If you are using Fusion 360 and do not see the built in Parameters, make sure you did not open the .STEP file by accident; Fusion 360 can open both types of files.

The straight length pieces fit together well but the corner pieces are a bit wobbly, how do I fix this?

- If there is just a bit of wobble at the corners, this will be stabilised when the frame is fully assembled and is completely normal. If the pieces are sliding apart (but the lengths are stable) then double check and make sure that you haven't printed pieces from two different size sets. If you are still having trouble, the Corner Edge Tolerances can be adjusted individually in the CAD files for a custom fit.

I'm struggling with the assembly of the frame; are there more visuals of the process I can see?

- Yes! There is a video showing the entire build process on my website. You can find it through the shop, or navigate there directly via the QR code below.

SCAN ME

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Can I glue the frame pieces together to improve the stability of the frame?

- You can glue it if you really want to, but it is not recommended as it will make the frame permanent and potentially make it impossible to get your art back out. If the frame is unstable without it then a smaller size of tolerance should be used until the frame is stable on its own. If Size 1 is still too loose, decrease the space between pieces in the CAD files in **very tiny increments** until you have a good fit.

My screws aren't tightening all the way when I attach the backing?

- The holes for the screws may not print perfectly due to being on their side, so the screws may not stop rotating or grip at the end. This is okay so long as the backing plate is secure, so just give it a little tug to double check! Feel free to try M3x12 screws as well, though they may not sink in fully.

My glass/perspex is flexing the frame a bit and not fitting quite right?

- Double check that the piece is completely square! Acrylic and Perspex are often cut quite imprecisely and may not have completely straight edges. A bit of sanding may help even it up, otherwise building the frame 'around' it a bit more instead of sliding it into a mostly complete frame may help. Don't be afraid to get a bit forceful screwing in the backing; it will help the frame hold its shape. The black frame to the left had imperfect Perspex but a little elbow grease got it to work!

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Is there a limit to how many frames I can make with one purchase?

- Nope! The joy of this design is that you aren't limited in the kinds of frames you can make, and you are encouraged to fill your house with Ultimate Picture Frames! You are also welcome to make and give them as gifts!

Can I print and sell frames to other people?

- No, as the files were purchased with a personal use license **only**. If you are interested in selling prints of the frame then you must contact me directly to reach an arrangement and be granted a commercial license. **The sharing or reselling of digital files is strictly prohibited.** Evidence of either without written permission will result in legal action.

How do I make an Inches/Metric/etc. sized frame if I purchased a different size?

- Each unique Size Group can only make frames in that unit of measurement, meaning trying to make a Metric frame with an Inches set of files isn't going to yield the results you want. If you want to make frames in other sizes then the one you purchased you will have to go back and purchase the additional size you need, or adjust all the pieces manually in the provided CAD file.

Thank you so much for purchasing the Ultimate Picture Frame!

Like it? Love it? Wanna shout about it? Please share your thoughts and reviews online and tag them with #UltimateFrame.

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