I have now decided on what I'm trying to make, I want to create an inlay from rimu and tray from pine for dice. I had done research to determine which wood to use. Pine was a good colour to contrast with the rimu. It would make the design a bold statement piece. **(1)**

This will be a CNC task of a routed design, and then working around it to build a tray suitable for rolling dice. I would then probably apply a simple stain and possibly something like a felt bottom for the tray.

The first stage for this was ultimately choosing and making the design suitable for CNC methods. I found a good geometric outline that I wanted to use online, there was an issue with the font and the background not really being transparent, so I loaded the image into photoshop and refined design. I removed all the white parts and the number in the centre, and then found a better font. Finally I needed to get the image into a suitable dxf format, for this I used Inkscape. Unfortunately, this left two lines of points for each edge, so I had to load this new vector image up again using Onshape as it's easier and more intuitive to use and manually deleted all the points I didn't want to use. Once this was done, I was ready to begin the CNC processes.

I then began my attempt to try and create a CNC design for the first time. To do this, I used a program called F-Engrave. **(2)**



I followed the workshop safety rules for CNC and made sure some one was spotting me on my first trial. I also wore goggles and earmuffs.

There were several problems with this first attempt, including both in the setup, tool selection and routing process. One of the problems was I had set this to carve too small, leaving not enough of the details and several of the lines and corners too harsh. The initial V-Carve was fine, but I had set the cleanup tools diameter to 3mm. Also, this was printed incredibly slowly and on a low spindle speed.



Carve two also failed, I thought the cleanup tool this time was 2mm but didn't check and the student before me had done something weird to the machine. This was a total waste of my time. I finally got a small sample done at 2mm **(4)** and decided for future prints to increase both, along with increasing the size and decreasing the inputted size of the cleanup tool to 1.5mm



I set the diameter to 1.5 for carve three. It was working great but half of the way through the first carve a communication error occurred between the laptop running the routing software and the CNC machine. Normally when this happens the software manages to restart and simply continue from where it stopped. This time however, it didn't restart properly and instead moved to the wrong part of the print. I quickly shut it down to avoid mess and it compounds into bigger errors.



The fourth attempt worked perfectly. It finally had no errors, and the carve went smoothly and created a high quality finish. There was a section (The top of the leftmost triangle) where it cut off some of the wood which was meant to remain, but overall it exceeded my expectations and worked well.

I was now confident enough in my ability to take a piece of recycled wood and work the CNC router to create the fitting inlay piece. The tests I had done helped me to feel confident, but I didn't want to use my good timber and get it wrong, so I found a piece of rimu of which one side had obviously been ruined by someone's attempt at using the CNC router. I screwed this on to the CNC router and checked the file that had been generated before the holidays Z values and did a dry run to make sure it looked like it was carving it out properly. I also did one last check that the image had in fact been mirrored, as otherwise it would not fit, and this is a common mistake I had seen being made. This worked surprisingly well, it ultimately was not the smoothest carve but at this point I realised I had forgot to check the grain of the base bit of wood. The fitting piece had to have its grain perpendicular to the base.

I then went on to make the final design on my good timber and I made rough cuts around a piece of rimu and pine using the bandsaw (not the handsaw because it takes too long) to make them able to be glued together, this was not required to be fine cuts, which I decided I would do later when I had **(1)** decided on the exact dimensions of the finished piece. I then di both the cuts successfully and at this point, the part I was most worried about had to happen, fitting the two pieces together and gluing them in place. I knew I would be using wood glue, which is runny, so I made a jig and organised my clamps before I used the glue and then pressed them together, clamped them up and then left it overnight. **(1)**



As a whole class we did trialled how to separate the layers to get to the inlay and we had worked out the bandsaw was the best piece of equipment. It saved a large amount of time sanding. So I used the bandsaw to cut off most of the wood, leaving a smaller amount that would be reasonable to sand off carefully in the drum sander. We had tried different ways to sand the inlay in class and found out the belt sander was too rough. **(1)**

The finished product was good and while there were a few ugly gaps here and there, I simply used some wood shavings and wood glue to fill them in, this would mean it had to be sanded more later, to remove any glue which would block a stain, but ultimately it would result in a much cleaner looking outcome. After some cleaning up of these gaps and the outside edges, I began to consider the frame for the tray. Ultimately the best solution was to use some more of the smaller pieces of wood left over from other projects, bevelled joints were decided would look the best.





I had tried stains and varnish to see which was the nicest finish and decided the best option was to use some linseed oil for the stain, **(1)** and so I used this to check where it wouldn't stain and re-sanded it until the stain stuck. Eventually, it all worked, and I was left with this product. The only thing left to do was adding some felt underneath the base of the tray, to make it feel nicer to pick up and use and to make it stick to the table underneath better. The tray meets the specifications my stakeholder gave me.

**(3)**