

# Retail Therapy

Tom Scotcher

PDE 4

Design and make an initial batch of 10 appropriate products to be offered for sale to the public.

The product will be sold at a sales event in early December.

# Retail Therapy

## Contents

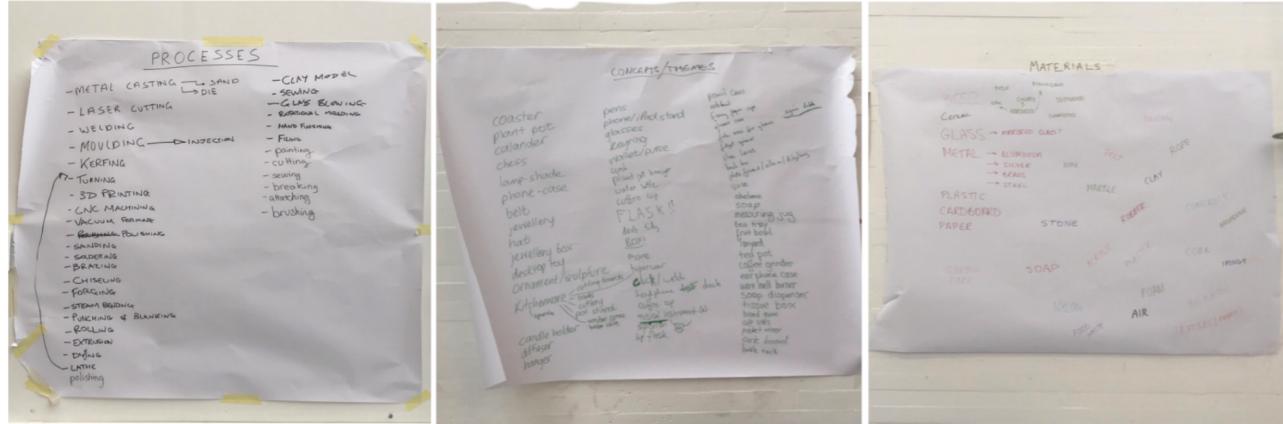
Page 1	Idea Generation
Page 3	Candle Holders
Page 4	Silicon Moulding Overview
Page 5	Initial Form Concepts
Page 6	Tutorial with Jen Stewart
	Visit to CCA shop
Page 7	Concrete Research
Page 8	Concrete Experiments
Page 10	Kast Concrete Basins
Page 11	Candle Research
Page 12	Form Concepts
Page 14	Form Development
Page 16	Air Bubble Removal
Page 18	Surface Details
Page 19	Colours
Page 20	Interim Review
	Form Refinements
Page 22	3D Prints Master Copies
Page 23	Colour Development
Page 24	Casting Process
Page 25	Casting Process Development
Page 30	Branding/Packaging
Page 31	Prototypes
Page 32	Casting Process Development
Page 33	Final Product
Page 34	Costing



# Idea Generation

10<sup>th</sup> October

As a class we noted down as many processes, concepts/theres, and materials as possible.



so naturally falling from this initial starting point are products for the home

From initial brainstorming, at this stage, I want to work with wood

Why Wood?

we will be selling these products in the winter christmas period.



My personal opinion is that wood has a particular quality that lends itself to a gift at this time of year.



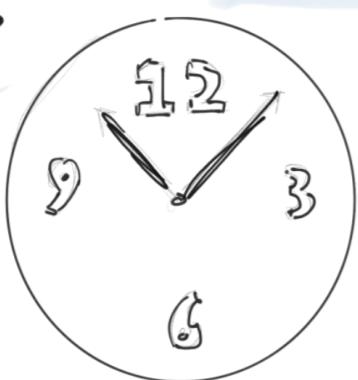
clocks  
kitchen appliances  
(coasters  
table mats  
table mats  
vase etc.



# IDEA GENERATION

10/01/2019

## Clocks



grains  
↳ rustic  
authentic



Random mismatch of  
wooden textures/aesthetics  
↳ doesn't have to  
be wooden  
↳ could be recycled  
materials?



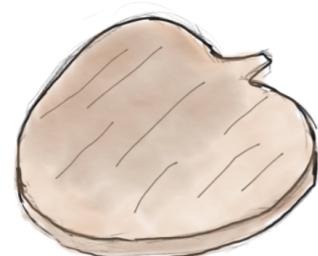
Much of what form  
this could take depends  
on the wood, aesthetics  
and where it's from.



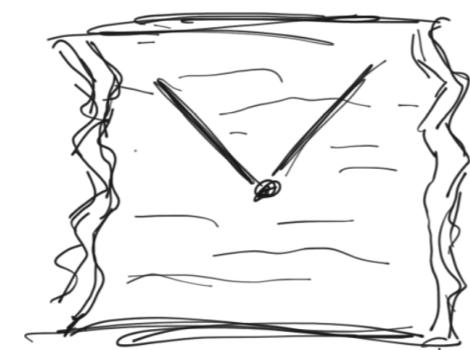
Does the wood have a  
particular story?

Is it from an old/favourite tree?  
has it been recycled?

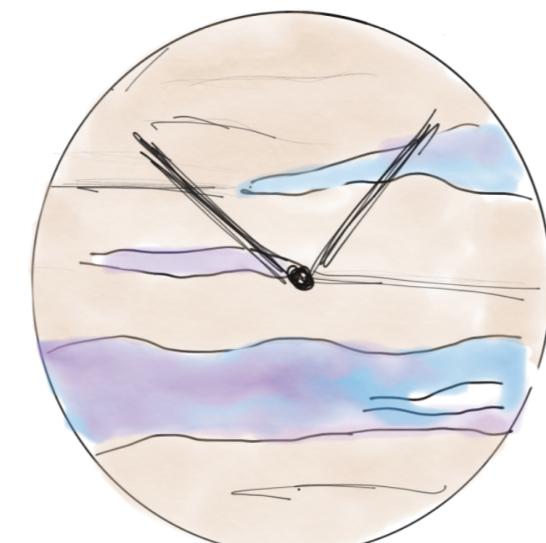
Can there be a link from  
its previous life in the form?



e.g. apple shaped  
coaster made  
from apple tree  
wood.

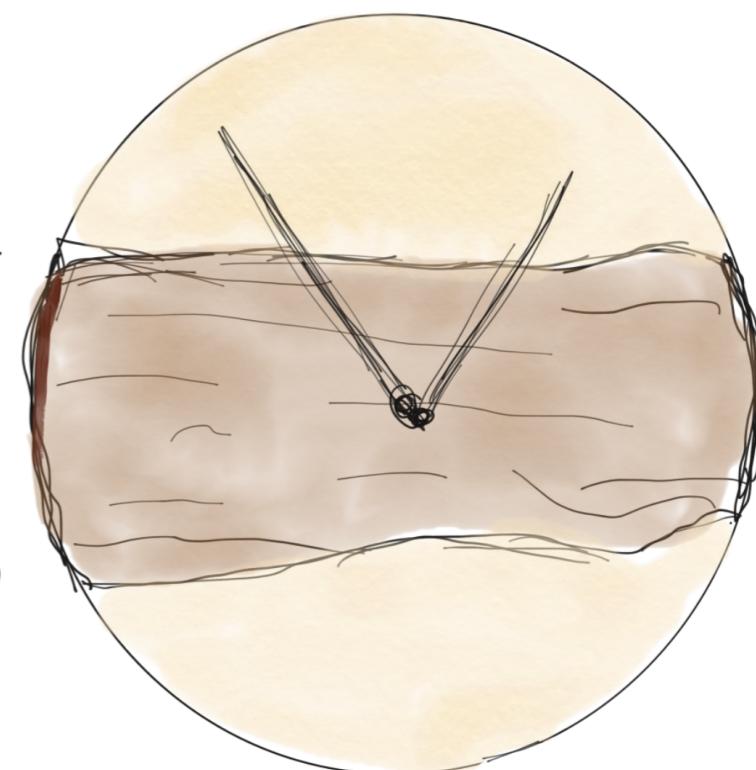


↳ laser cut out parts so achieve flush  
finish w/ board. Different woods.  
↳ some form of  
glasgow affiliation?



Resin inserts  
combination of  
materials

Jesmonite?



# Candle Holders

17<sup>th</sup> October

## Make a Decision

Following my tutorial with Hugh I have decided to change tack, and focus on candle holders. At this point in time I need to jump into a project and let the design process steer me.

I have also decided to move away from wood. I want to experiment and push boundaries in this project, so I have decided to use techniques and technologies that I have never used before.

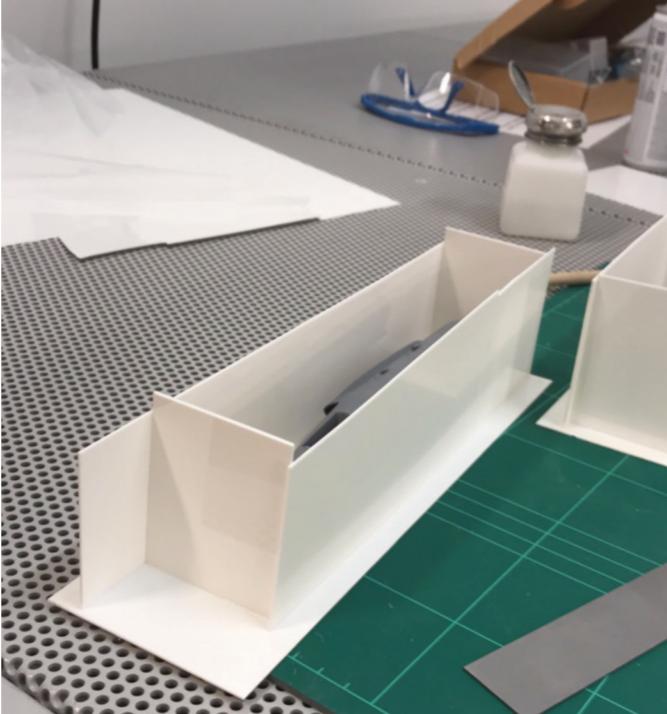
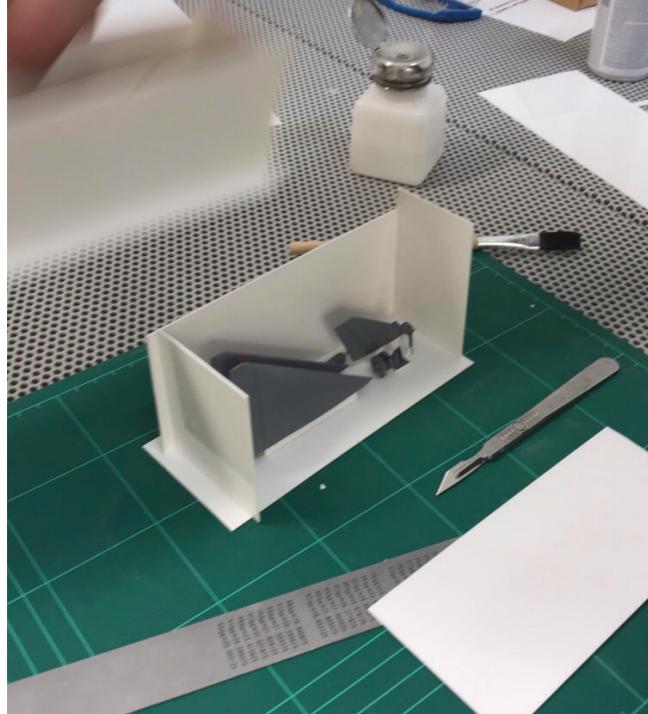
I am also keen to experiment with concrete. Concrete is a versatile material that, when dealt with properly, can produce interesting and refined results.



# Silicon Moulding and Casting with Resin

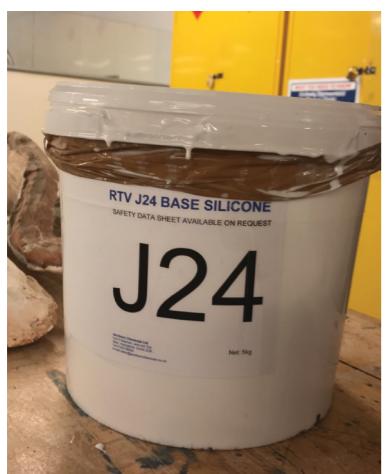
17<sup>th</sup> October

To learn more about moulding, I spoke to Joe in the workshop, and we went through the process of creating a silicon mould.



**Step one** - Create a box around the object that you want to mould, which in this case is some of Joe's model planes.

**Step two** - Make up the silicon mixture. Depending on which silicon catalyst you use, the mixture will take different times to set. You will get a better quality mould out of a slower setting silicon mixture, and it will last longer and hence produce more of your object. Pour this mixture into the box.



**Step three** - Make up the resin mixture. This is 50% of each part; A and B. In this case, part A has a yellow pigment, but you can customise your colour at this stage, or add other details.



**Step four** - Pour the mixture into the mould. We used an example of a mould that had been made earlier of a shark tooth fossil.

**Step five** - At this stage you can suck out the bubbles by using the vacuum chamber .

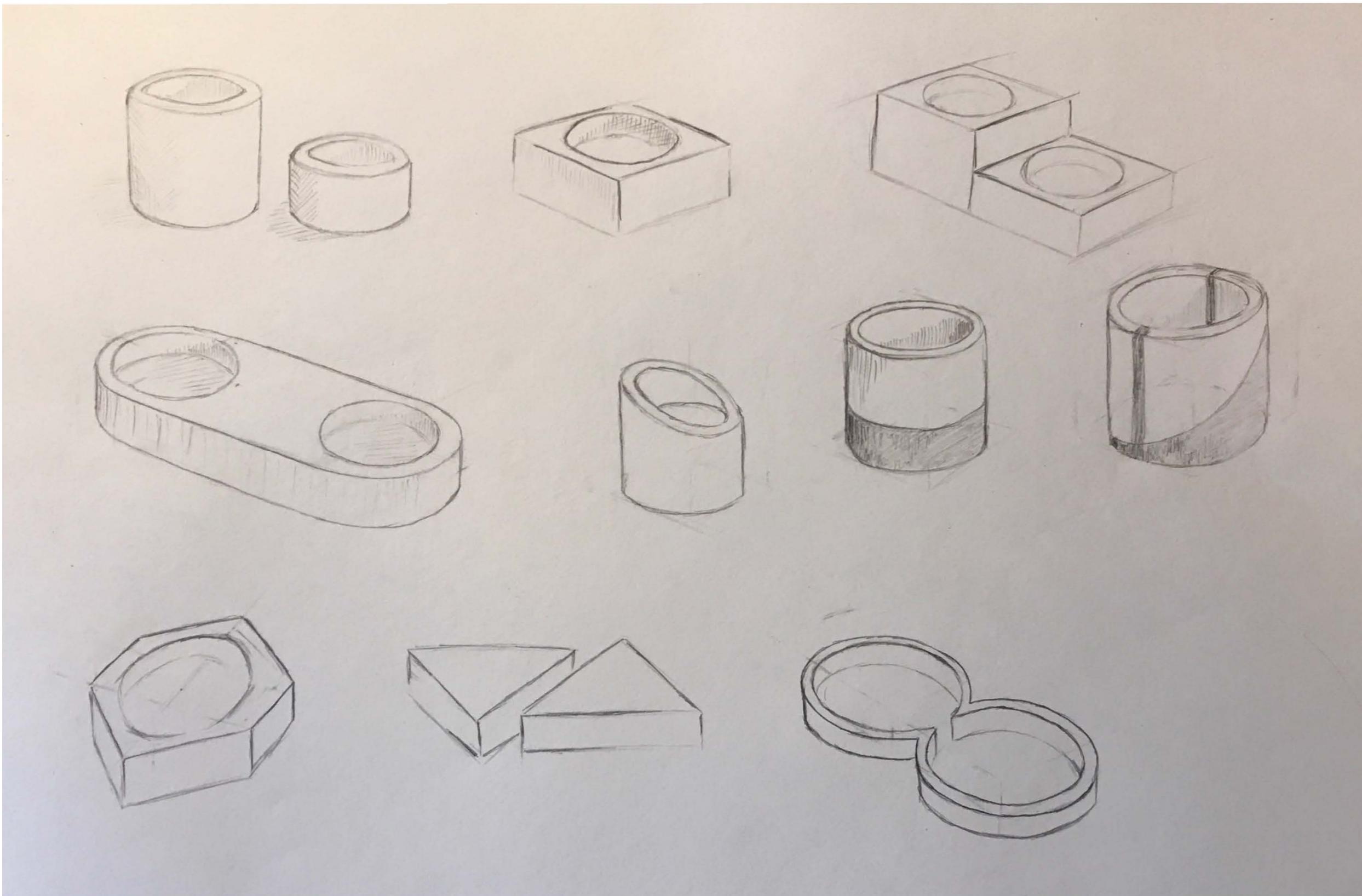
**Step six** - Wait until the resin has set and then remove it from the mould

For reference, a silicon mould of this size, would cost roughly £15-£20, so it is not something I can afford to do lots of experimenting with in this project. It should be used only when I have a solid concept of the form of my product.



# Candle Holder Form Concepts

18<sup>th</sup> October



Whilst being nice candle holders, there are too many similar products around. I need to push the design further and design something more unique and special.

# Tutorial with Jen Stewart

18<sup>th</sup> October

When I spoke to Jen about the concept of candle holders made from concrete she was positive about the idea.

The take home message was to get my hands on some concrete and start to play with it. I need to get a feel for how the material behaves.

How does concrete set? What is its composition and how does this affect the behaviour? How does it finish?

I should also research concrete as a material, as it has been used for centuries. What were its historical uses?



## Visit to CCA shop

18<sup>th</sup> October

We will be selling our products in December from the Welcome Home shop based in the Centre for Contemporary Arts (CCA) in Glasgow.

I visited the shop to get a feel of the space and the quality of products that they sell.

The products are all finished to an incredibly high standard, and have clearly been made with a huge amount of skill.

The presentation of the products is also impressive. The way that the various items have been exhibited, and the packaging that accompanies the product have all been produced with the finest detail in mind.

This is the standard that I must set myself for this product.



# Research into concrete

20<sup>th</sup> October

Concrete is made from three constituent parts; cement, aggregate (sand), and water. The aggregate commonly has small rocks and gravel within it, that give the concrete more strength.

It has been used as a material for millennia, with the earliest recordings of concrete structures dating back to 6500 BC in the Middle East. The Ancient Egyptians and the Ancient Romans used concrete in the majority of their major constructions. The duration and longevity of the material is evident from the fact that we can still see concrete structures built by the Romans 2000 years ago still standing proud today.

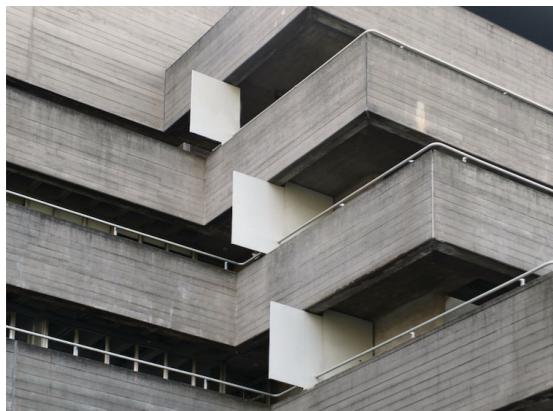
When reinforced concrete (usually steel bars imbedded within the concrete) was invented in 1849, the use of the material for large scale projects like dams and skyscrapers sky-rocketed. Concrete is very resistant, durable, low maintenance, and is very strong compressively, although not so strong in tension.

## Brutalism

Brutalist architecture is an architectural style that emerged in the mid-20<sup>th</sup> century, and was hugely popular in the 50s and 60s.

It is characterised by block-like, aggressive structures that are often manufactured out of bare building materials. Concrete was a common material choice for this architectural movement. Brutalism communicates strength, functionality and power through its bold and confrontational buildings.

I would like to incorporate the geometric, powerful shapes used in Brutalism as an indication of the historical use of Concrete.



# Concrete experiments

24<sup>th</sup> October

I needed some concrete, so I went to B&Q and bought some basic multipurpose Blue Circle concrete. I didn't realise until I had bought it quite how big the aggregate in this concrete mix is. I had to sieve out the pebbles and small rocks until I had a powder concrete mix.

I made up some basic shapes out of cardboard as temporary moulds. From a quick search on the internet, the recommended ratio of water to concrete mix is roughly 15-20% water.

These initial moulds were crude, but they were a useful starting point for working with concrete. I had no idea about setting times or the quality and finish that the mould would impose on the concrete. These moulds I left for roughly 24 hours before removing the cardboard and inspecting the material prototypes.



As you can see in the specimen (above on the left), there is a glossy surface finish on one of the sides. This is where there was tape on the inside of the mould. There are also air bubbles throughout the concrete. I think this is due to the inaccuracies of the mould, so I will be interested to see what happens when I have a higher standard of mould.

## Reflections

It was clear from these initial tests that the quality of the resulting product is hugely dependant on the quality of the mould. The concrete manages to reflect the surface texture of the mould. The quality of the mould and the quality of the casted object must be perfect.

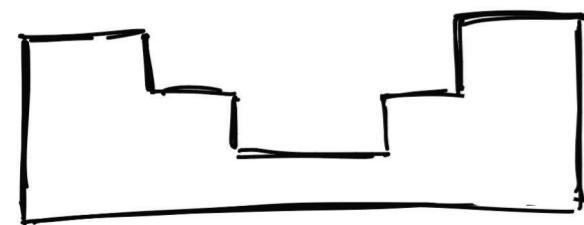
I do not like the grey finish, so I will try to find a way of making white or coloured concrete.

# Concrete experiments

27<sup>th</sup> October

I bought pre-mixed concrete from an online retailer that uses snowcrete (white cement), and white aggregate. Using this mix of of white concrete, I put together another mould from cardboard to try it out.

Whilst making this, I had the idea of making the mould compatible with multiple candles. In this case a tea-light and a classic taper candle. I am not sure whether this is something that I would like to pursue at this stage.



I needed to experiment further with the process that I imagine using for my candle holders later in the project, at this stage in the process. I borrowed an unused silicon mould from the workshop that was a somewhat similar shape to my initial prototypes and made up some concrete for it. The specimen on the right was made with a mixture of the two types of concrete; grey and white.



## Reflections

Once again this specimen showed the importance of the quality needed in the mould, but despite the irregularities caused by the cardboard and tape, I got a glimpse of what the concrete will offer as a material. One surface around the edge (as seen in the photo above on the left) was smooth but matte, and had a very satisfying quality.

## Points of note and user feedback

The finish can be a very high standard. Flatmates and colleagues seemed to prefer the smooth/matte finish.

The visible air bubbles look like chips so lower the visual quality.

The marble effect was very difficult to implement, so does not look particularly natural.

The specimen on the right lacks the quality of the pure white specimen. This could be due to the mixture of concretes, or because it was not left to cure sufficiently.

Moving forward, how can I remove air bubbles, and achieve a consistent surface quality?

# Kast Concrete Basins

28<sup>th</sup> October

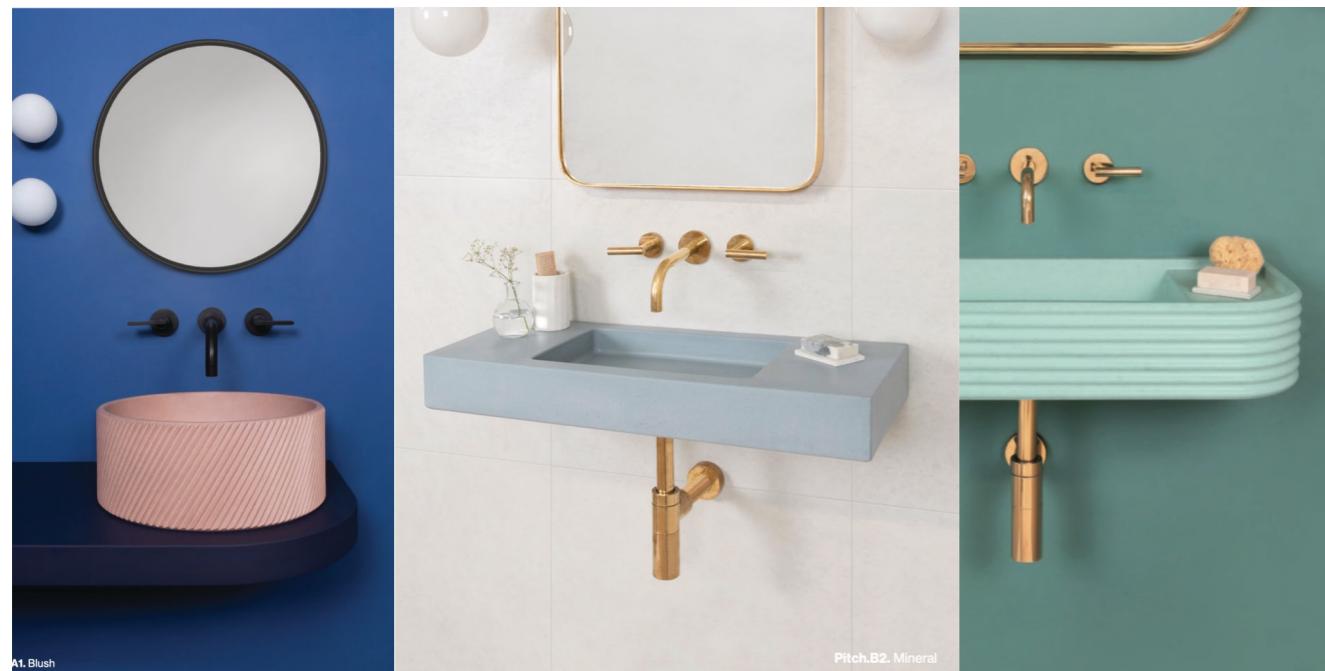
Hugh pointed me in the direction of Kast Concrete Basins. They are a company based in Nottingham that produce incredibly high quality basins made exclusively from “old school” concrete - portland cement and sand (however they are secretive about their exact mix).

They describe concrete as;

*“A material that combines the organic characteristics of natural stone with the ability to be cast into any shape.”*

Kast Concrete Basins utilise the organic variations in colour and surface texture to create the aesthetic of their products that reflects the character of the material.

I have been concentrating on achieving the perfect, uniform finish with my experimentation. Looking at Kast has reminded me that part of the magic of using concrete is due to the idiosyncrasies and variations that it creates.



Kast Concrete Basins also use strong colours, with an impeccable consistency throughout the product. They also introduce intricate patterns and designs into their products. The high level of design of their basins is reflected in the price, which can be upwards of £1000 for a single basin.

## Learning outcomes

To create a high quality concrete product, I should learn from Kast and design a well refined, highly considered product, but not be afraid of the idiosyncrasies that the material naturally creates. A highly refined product will raise the selling point of my product.

# Candle Research

28<sup>th</sup> October

I visited Tesco in Maryhill to do some research into candles. Candles are an integral part of my product so it is necessary that I understand what is out there and what I am designing for.

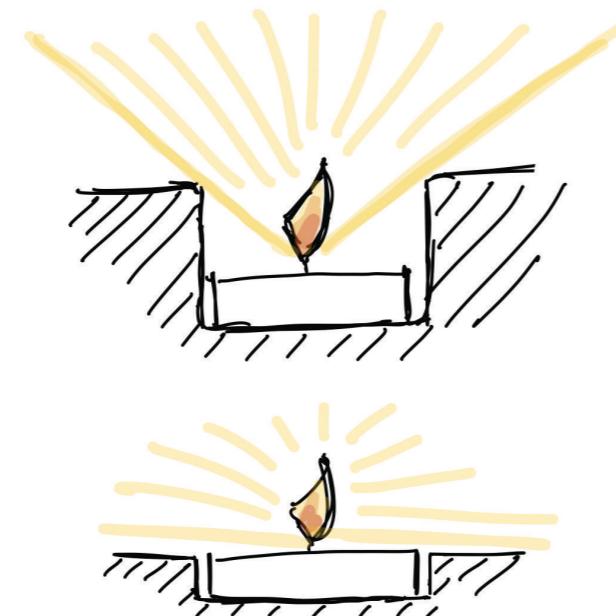
Up until this point in time I have been experimenting with tea-lights bought from the Co-op. I had imagined that tea-lights would be of a uniform shape and size, but it turns out that the tea-lights sold at Tesco are a different height and diameter than the Co-op variety.

It is also apparent that there is vast array of other types of candles available to buy. These include taper and pillar candles, both of which come in a selection of sizes.

**I have decided to focus on tea-lights.**  
Tea-lights have the least amount of variation between them, so it seems logical to design for them.

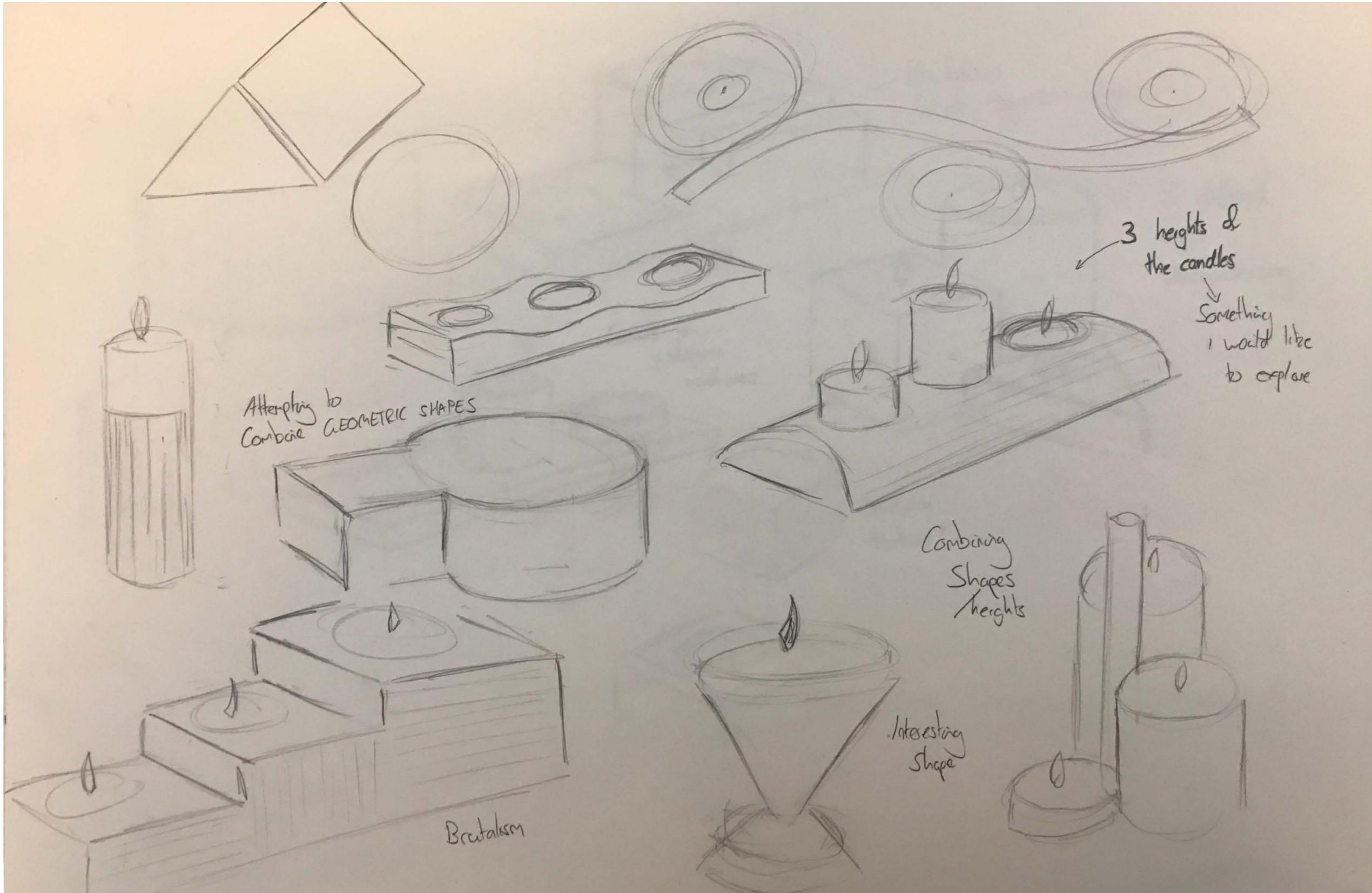
Tea-lights have problems though. The flame is much lower than on a taper or pillar candle. If the candle holder rises above the flame, it will throw shadows. This might be a design feature I want to include, but I am currently thinking I should reduce this effect.

I will need to take into consideration the different sizes of tea-lights.

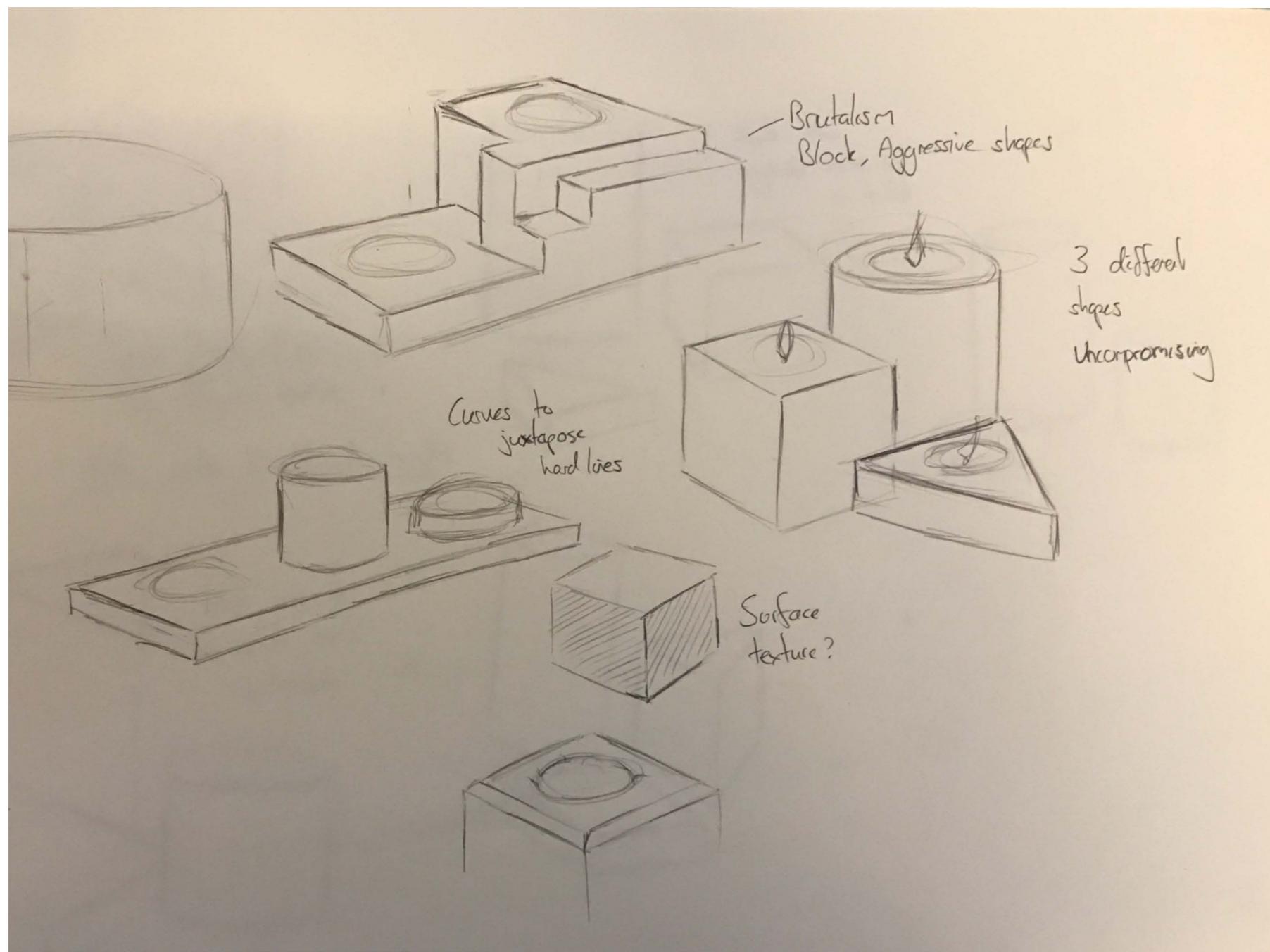


# Form Concepts

29<sup>th</sup> October



Taking inspiration from brutalist architecture, the concepts here are marrying bold, different geometric shapes. The theme of three candles in one unit is one I think I will explore further.



## Surface texture?

Inspired by Kast Concrete Basins

Kast utilise details and textures in their basins. This adds a sense of quality to their products.

## Chamfer or fillet

Similar to the surface texture, an extra design feature such as a fillet or chamfer, if executed well and correctly translated from the mould to the concrete, will induce a feeling of quality.

## Brutalism

According to RIBA (Royal Institute of British Architects), brutalist architecture can be identified by; **unusual shapes**, and **massive forms**, along with other more building specific details.

I feel that large, solid, heavy and bold shapes fit this criteria.

## Three different heights

Developing the theme of three candles. It offers contrast and variety within the product.

Are the candles all part of the same unit?

Can they be arranged together to form a shape?

Are they three independent shapes? If so, are they sold as a unit of three or individually?

## Going Forward

I am drawn to the concept sketch here with three shapes; the cylinder, cube and triangular prism. I will develop this concept further.

# Form Development

31<sup>st</sup> October

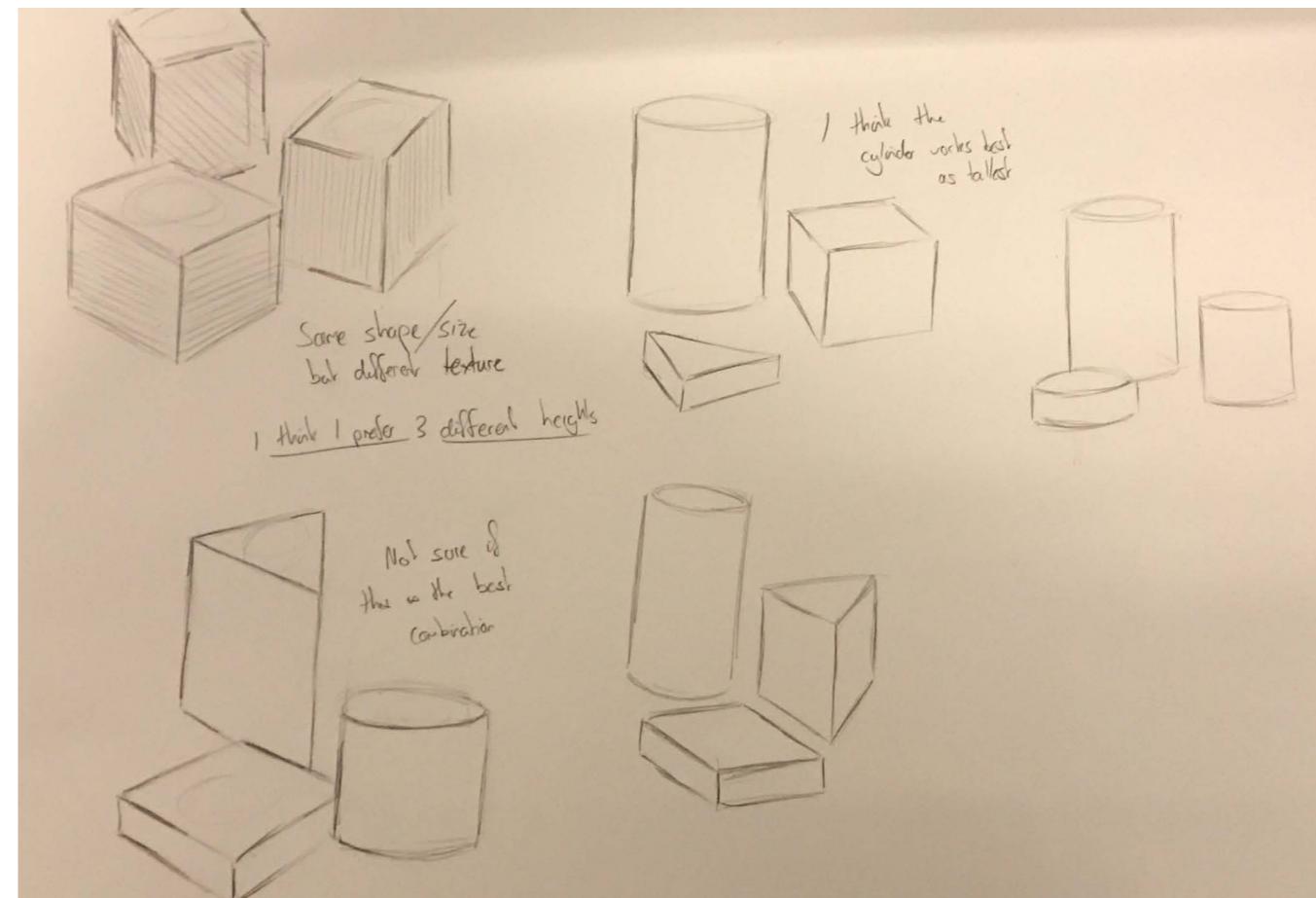
## Tutorial with Hugh

When discussing these forms with Hugh, he reminded me of the material and the process involved in making concrete. It takes 36-48 hours to cure concrete to a level where you can remove it from the mould.

Given the cost of silicon moulds and the timeframe involved, I should think carefully when it comes to deciding on the form of my candle holders.

If I am producing three candle holders, they should have a **degree of uniformity** between them. For example, three different shapes, three colours with the same texture, or three of the same shape with three colours and the same texture.

This will tie the candle holders together as a product, but also simplify the process and make it easier to reproduce high quality products.



## Decisions on shapes

To make decisions on the shapes and form within this theme of three candles, sketches do not give you enough information.

I made some foam prototypes of these shapes to better get a understanding of which combinations would work well together.

From my initial models it was clear that one model of each height would work well, and create a contrast within the set.





I made 3D foam prototypes of each shape; cylinder, cube and triangular prism, in each relative size (tall, medium and small).

The workshop has sheets of foam 5cm thick available. This naturally gave me a scale to work from. The medium models are 5cm tall, the tall models are double this at 10cm, and the small models are 2.5cm.

I presented the collection seen here to my peers and my flatmates for some feedback. I asked them to select three shapes, one from each row.

Everybody I showed them to chose the cube as the medium size shape, but they were less unanimous about the large and small shapes. People liked both the large triangular and cylindrical shape. I think that people are drawn to these strong, aggressive shapes.

**I chose the combination you can see here below.**

These options offer the most contrast within the set of three when you think of them as candle holders.



Compared to the small cylindrical shape of the tea-light that will be in each one, the triangle offers more of a contrast to this as the smallest shape.

The cylinder, which is obviously the most similar to the candle, is the tallest, so still provides a contrast to the shape and size of tea-light.

I still need to refine the dimensions and how the tea-light will sit in each shape.

# Air Bubble Removal

3<sup>rd</sup> November

In all of my concrete prototypes to date, air bubbles have been a significant problem, and have lowered the aesthetic and quality of the product.

This is a problem that presents itself to anyone that casts. As you pour your material into the mould, air gets trapped inside and is unable to escape.



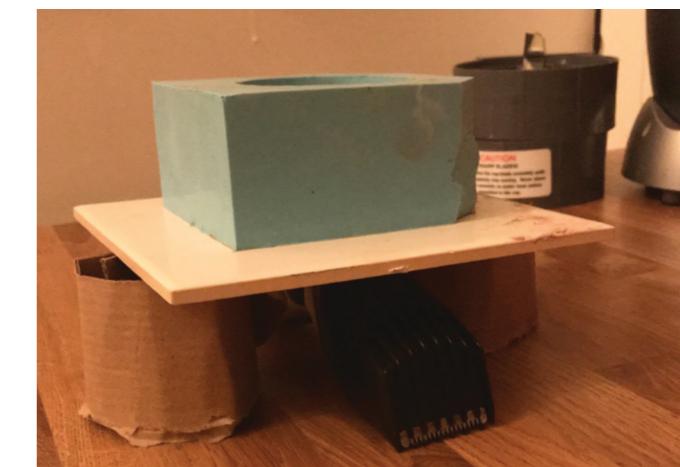
Everyone I spoke to or learnt from has a different method to avoid trapped air bubbles. I need to find a reproducible method to achieve this. In each of my prototypes I have been attempting to find the perfect method. I will summarise my experiments here.

One option to do this is to 'vibrate' the bubbles out. You can do this by tapping the sides of the mould or by tapping the mould on a table or surface.

I have found that this method is actually rather ineffective, as the air bubbles travel through the material in the direction toward the vibration, causing the bubbles to appear on the edge of the prototypes, which is where they are visible.

I spoke to Alistair Byars, who used concrete for this project last year. Alistair owned a palm sander, and by running this on the top surface of the mould he was able to draw the air out of the material.

I do not own a palm sander but tried to bodge together a similar set up using power tools and anything that vibrates that I have access to at home. I tried to use my power drill, and even my electric beard trimmer, to no avail. These products are engineered so that they do not vibrate in your hand, so they did not do very well at vibrating my moulds.



Another method is to use a vacuum to suck out the air. The workshop in the Reid building has a small vacuum chamber that would be perfect for this job.

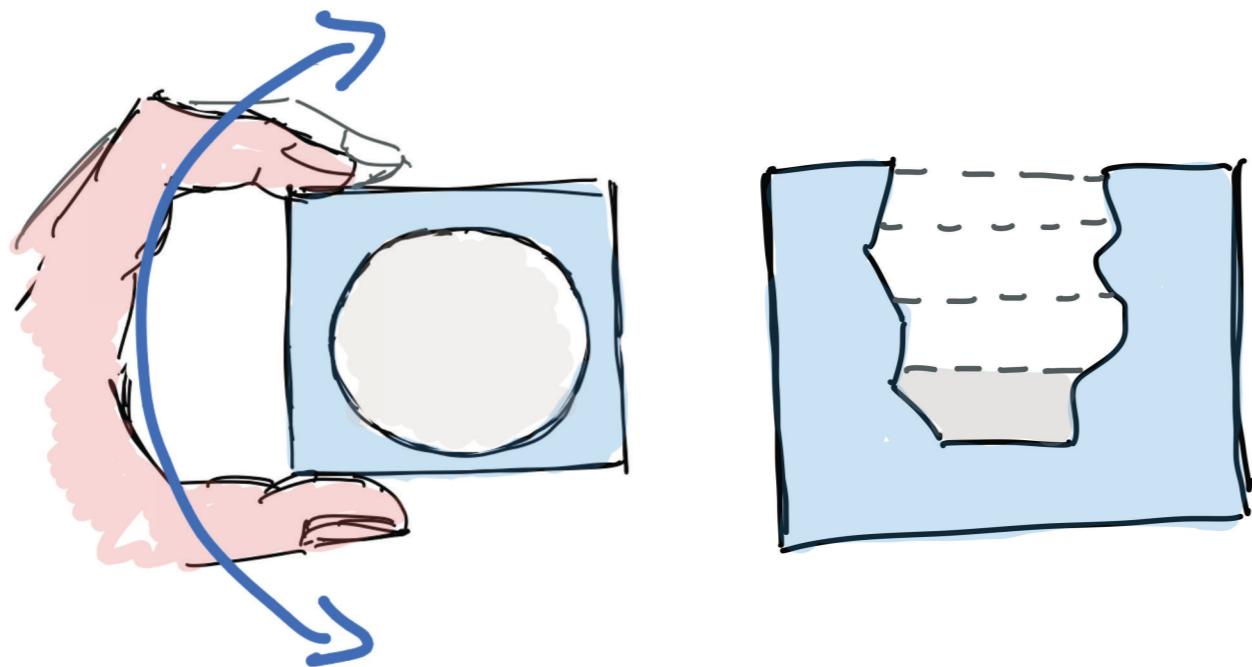
Due to doing my concrete manufacturing at home, I do not have regular access to this, so I attempted to create a similar system at home using my vacuum cleaner and a plastic bag. This was also a bit of a failure, and was much harder to do than I at first had imagined.



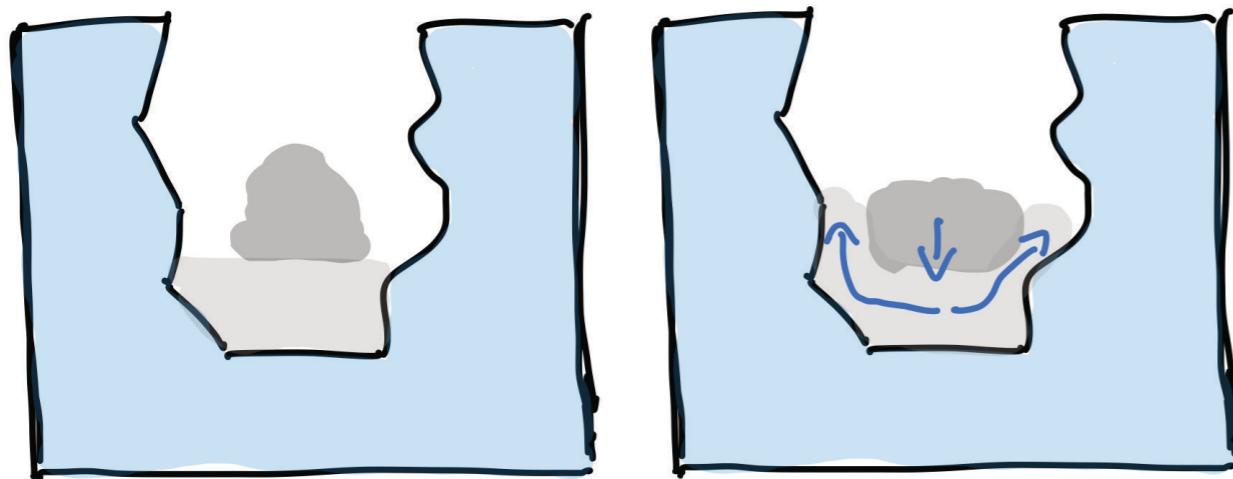
The method that I have found to be the most successful is also very simple and easy to perform regularly, but quite time consuming.

Rather than vibrating or tapping the concrete, **shaking** the material works the air up to the open surface. A twisting motion allows just enough movement in the material, but not enough that will open up new air gaps.

This works best if you pour the concrete in small increments, and shake out the air at each level.



By layering up the concrete, you can reduce how much air is allowed into the materials in the first place. If you place the new layer carefully in the centre, when you shake the mould, you can see the old, bubble free layer, moving up the sides of the mould as the new layer sinks into the mixture.



## Concrete Consistency

Part of making this process easier is getting the right consistency in the concrete. This can be altered by the amount of water you should have in your concrete.

There are hundreds of different opinions online about what is the optimum consistency for your concrete mix, so I have experimented and learnt what works well.

Too much water can make the concrete weak and crumbly when cured, but makes it very easy to pour, and not enough water does not allow the concrete to cure enough, also making it weak. I do not know the ratio of water to sand and cement, but I know the desired consistency when mixing it.

When you shake the concrete, it should settle and behave like a liquid, but when you move it, it will hold its new position.



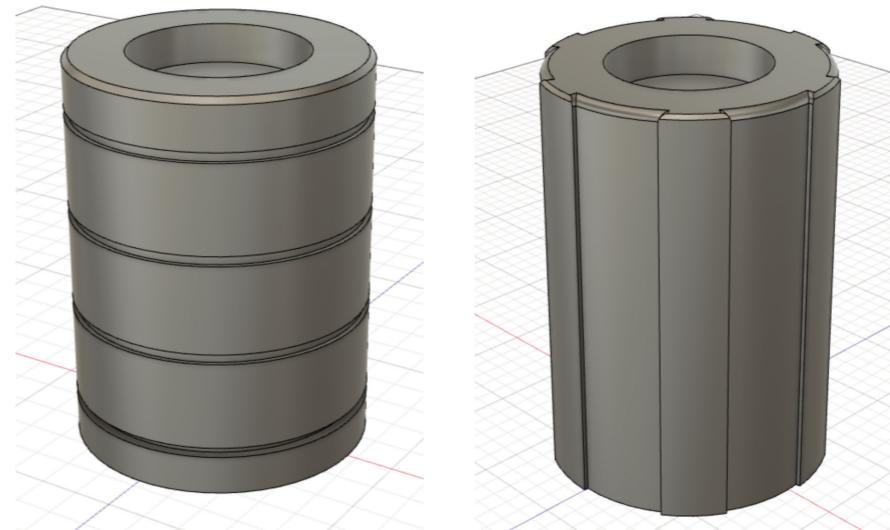
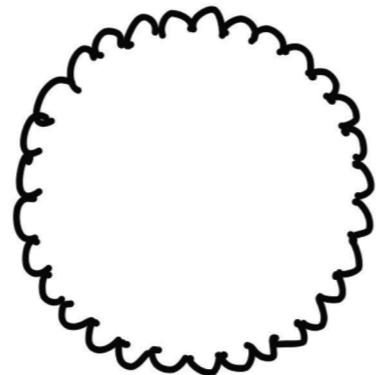
The example seen below is my first air bubble free prototype.



# Surface Details

4<sup>th</sup> November

To experiment with surface texture I drew up a CAD model of the surface texture I envisioned implementing on my candle holders - small vertical ribs, and 3D printed it. I wanted to silicon mould it to understand how the texture would come out when cast it as concrete.



The CAD images are concepts for the cylindrical candle holder. I need to be aware of how the cast will come out of the mould. If the texture involves horizontal details, this might make the casting process more problematic.



3D prints have a very obvious aesthetic. They have small ridges from each layer of the print. These would be reflected in the mould, so I attempted to finish the part to an acceptable standard. The ribs on the design were too close together and made it nearly impossible to sand away the 3D print ridges.

In order to achieve a satisfactory finish, the texture will need to be less intricate - something that can be finished easily.

I have started to re-think the texture by drawing up some quick CAD models hoping to find some inspiration.

I was remaking the foam prototypes to experiment with some of these concepts, and I accidentally moved the foam into the hot wire, creating a small indent running along the entire length of the prototype. I thought the groove created a nice effect, so I did the same to the rest of the set.

The majority of the surface in this design is flat, which makes it easy to finish to a high standard.

# Colours

5<sup>th</sup> November

There are a couple of options for colouring concrete. You can paint it, stain it, dye it, add a coloured sealer, or add a pigment.

I will be casting my concrete from silicon moulds. To achieve a perfect finish in my product I will be finishing my 'master' prototypes to the level of finish that I want to get from the mould. For this reason, I do not want to start painting or dyeing the surface of the concrete once out of the mould.

The logical way to colour the concrete is by using pigment, a cheap and very easy way to colour the concrete. Pigment colour affects the entire material from surface to surface.



I bought some concrete pigment from an online seller. It comes as a powder and you just add this to the concrete mix in the required quantity until you reach your desired colour.



# Interim review

7<sup>th</sup> November

I presented Hugh and Jen with my various concrete prototypes, my colour examples and my concept for the form of my candle holders.

The review gave me insight into some issues that I had not considered.

## Reflections after speaking to Hugh and Jen

The relation between the size of the tea-light and the thickness of the candle is not consistent between the different shapes. The triangular shape is probably too small.

The colours need to be carefully considered. Are they all the same colour? Are they the same colour but different tones?

I need to refine the chamfer on the top edge. How big is it? How does it lie with the design of the vertical grooves?

What happens on the bottom?



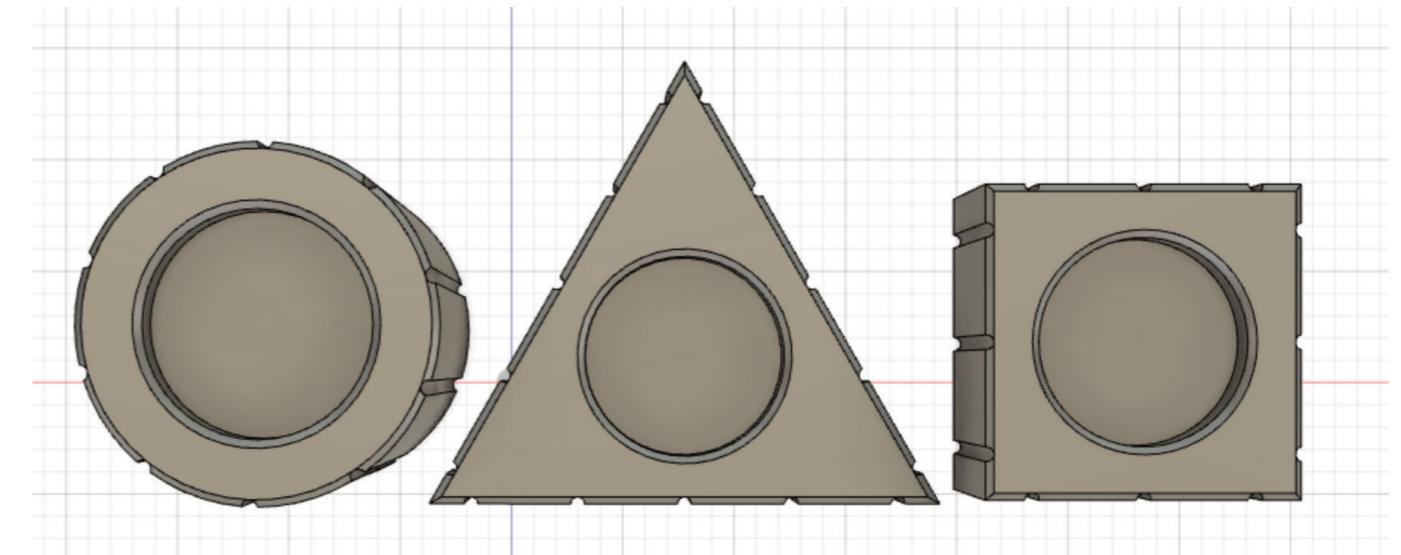
## Form Refinements

After it had been pointed out, it was obvious that the sizes of the candle holders needed to be refined. The distance between the edge of the candle holder and the tea-light is not consistent, and the candles do not seem to sit naturally together. This is particularly evident in the triangular candle.



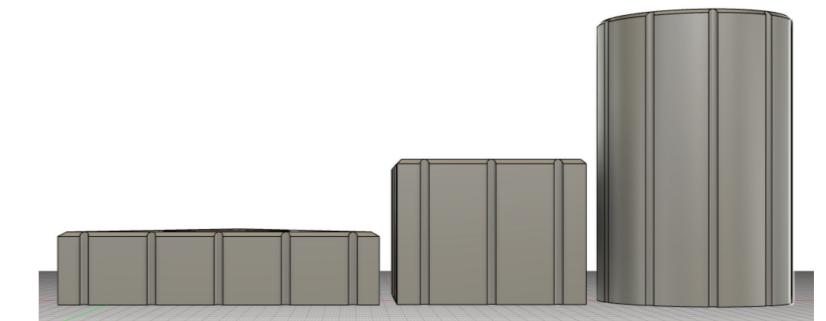
The triangle is too small, and the circle is too big.

The easiest way to fix this was to create CAD models, and play with the dimensions until they seem to be cohesive in their form, relative to one another.

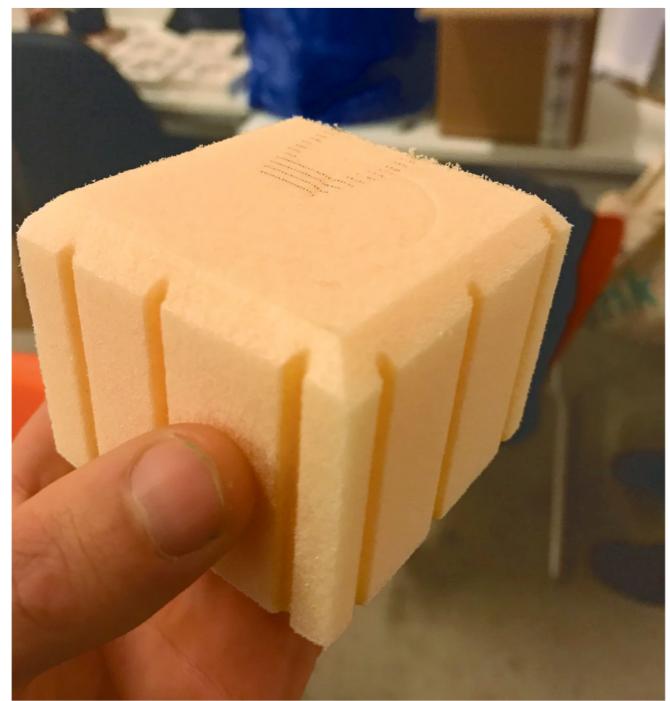


The heights of the candle holders will remain unchanged.

The ratio was created by the standard size of the foam available to me, but I like the way each shape doubles in size from the one before it.



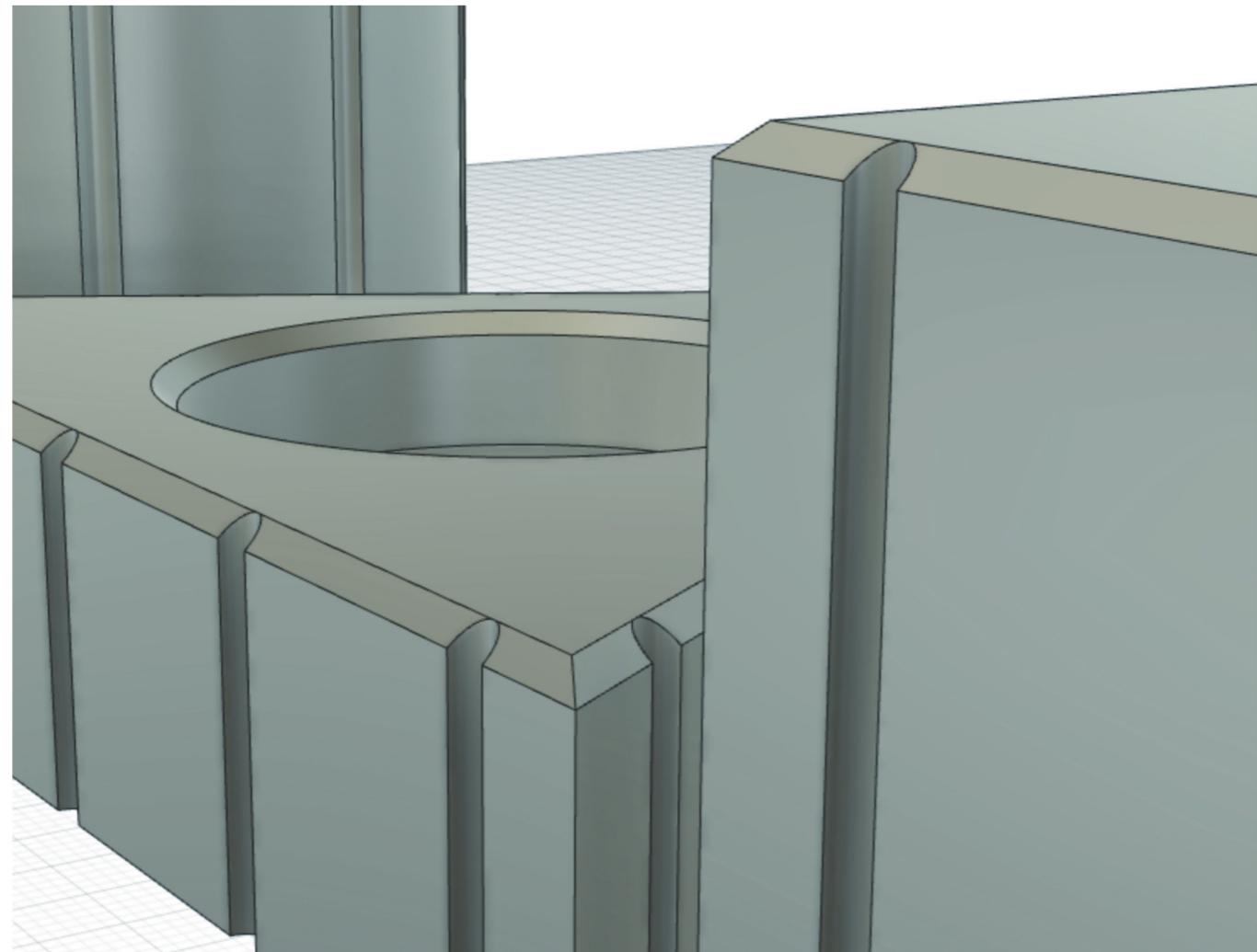
In my foam prototypes, the chamfer at the top edge was different in each model. On the cube prototype shown here, the chamfer is large, and dwarfs the vertical groove.



I think that it feels more cohesive between the chamfer and the groove, if they reach the top surface at exactly the same point.

I have also added a chamfer on the tea-light edge, as I felt it looked wrong having it in one place but not the other.

You can see these changes in the image below.

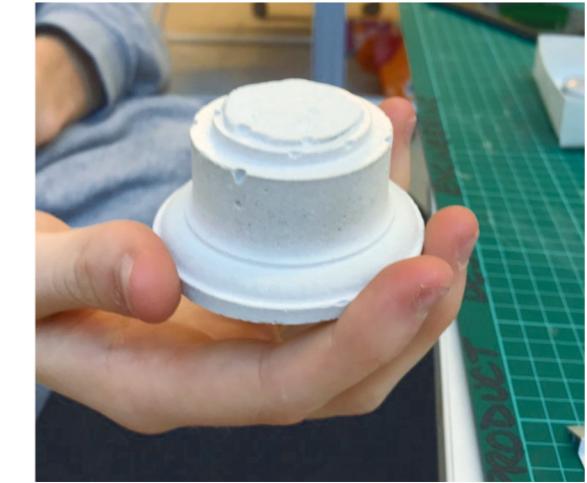


Part of the **joy** and **magic** of making products out of concrete is the **sensory experience** that you feel when holding and using the product. This comes from the weight of the product, the texture of the material, its smell and its sounds.

In my case, the weight of the product and the clunk that it makes as it hits the table adds to the experience, and the perception of quality in the product.

For this reason I think that the material should be left solid, to maximise the weight behind it. The material is cheap so this should not affect the cost of the project.

The bottoms of the concrete prototypes I have done so far have been untouched. They have been the surface of the material that is exposed to the air when being cast in the mould, so it is where the bubbles are drawn to.



As a result of this, they are rough and uneven, and do not sit well on a surface.

As it stands, I am going to leave the base of the candle holders as natural concrete, but I will sand them down so that they are a smooth, even finish.

I do not know yet if this will cause any issues, for example whether they will damage the surface that they sit on.



# 3D Prints and Prep for Casting

9<sup>th</sup> November

Before getting the candles 3D printed, I needed to be absolutely sure that the groove details in the side of the form would work when cast in concrete. I 3D printed a small section with the same details and spent some time finishing it to a level that I could create a mould from, without realising that the original had been 3D printed.

I finished each side of the rectangle in a slightly different manner. Using DCM (dichloromethane) to fuse the ridges of the print, and using fine sanding paper, I was able to create 4 different smooth textures on each side, so that when I cast concrete in the mould, I could decide which finish related to the best concrete finish.

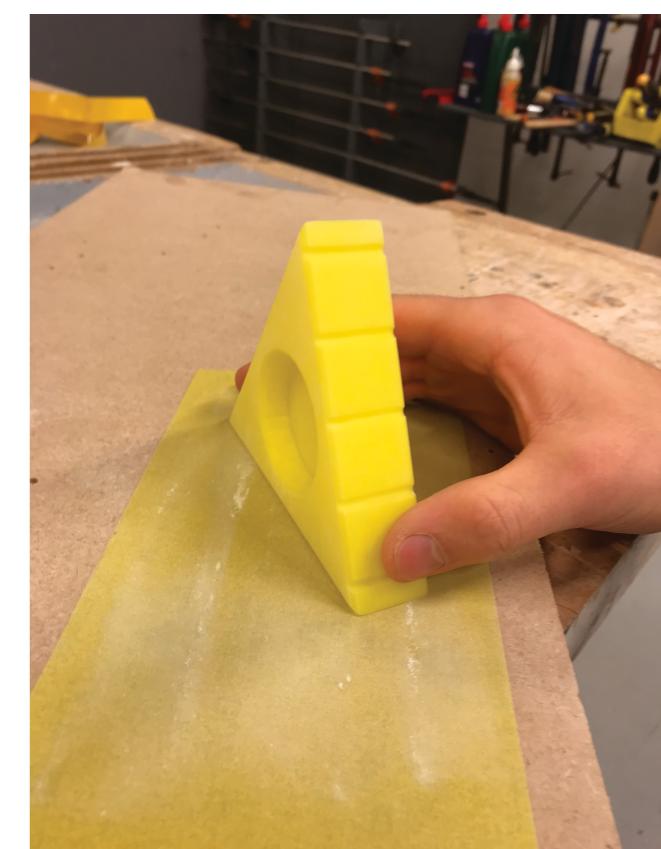
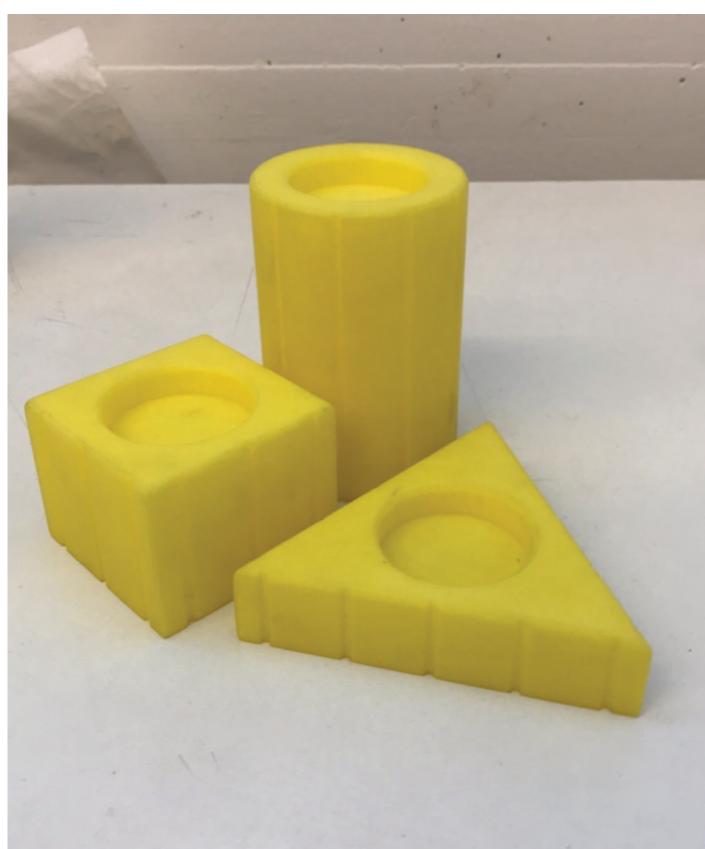
The best finish was the side that used both DCM and sanding.



To 3D print the parts, I asked Hugo Buchan (4<sup>th</sup> year PDE BEng) to print them on his printer. With the help of his knowledge, I was able to print the part to a much higher standard than I would have been able to do myself.

3D prints have a retraction point on each layer, where the nozzle lifts off the plastic before starting the new layer. This results in a thin but noticeable groove on the part. Hugo showed me how to hide this detail so that the groove was on the inside of the part. This ensures the exterior of the part is as perfect and refined as it could be out of the printer.

I spent a day finishing these prints using DCM and sand paper.



# Colour

15<sup>th</sup> November

Before I can go further with this product, I need to decide on the colour or colour schemes of the product.

I have considered making the candle holders in random colours, and letting the buyer decide the colours, but I feel that this would leave too much pressure on the buyer. If I provide a set colour scheme or two, it will appear a more considered product.

## Tutorial with Jen

Jen has advised me to try combining tones of colours within the set of three. By using the same or similar colours and introducing a different tone, you can bring variety into the set, whilst keeping the product cohesive.

From the colour specimens I had created from the pigment experiments, we identified six potential colour schemes that fit this ideology.



These are the two sets that I have narrowed them down to. They are only composed of three colours; red, blue and green, and within the two sets there is a strong and pastel version of each colour.

I thought about introducing the yellow colour instead of the pastel blue colour, but I decided that this is too warm, and the soft blue helps cool down and balance this colour scheme.



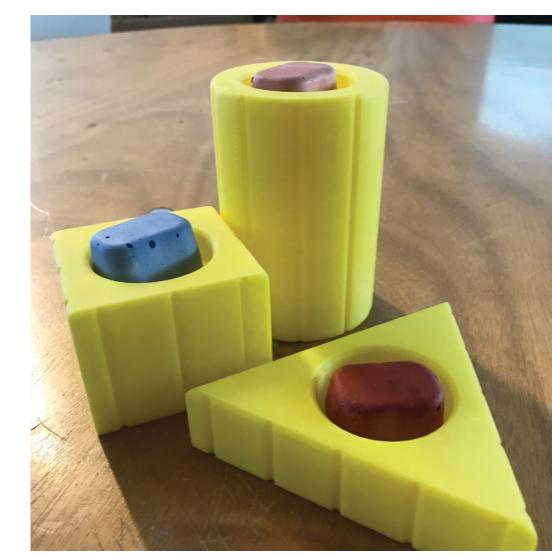
I think that the pastel blue in the red set needs to be slightly softer than shown here to match the tone of the other pastel colours.



## Assigning Colours to Shapes

The bold, vivid blue makes the most impact when used as the tall cylinder, and I think the dark green triangle helps ground the trio.

That leaves the cube as pastel green, which nicely splits up the two strong colours.



For this set, the cube has to be the pastel blue to split up the two red colours.

I think the vivid red works best as the triangle, for similar reasons to the other set.

# Casting process

16<sup>th</sup> November



I bought some J24 fast setting silicon to make moulds of my 3D printed parts. I made two complete sets of moulds. This has been limited to two due to the cost of the silicon.

The manufacturing process is going to take a long time if I allow the optimum 48 hours before removing the concrete from the moulds, and I don't have a huge amount of time. Two sets of moulds will double my production rate, but I will need to get casting as soon as possible to have enough products by the due date.

To make up the concrete, I use the snowcrete pre-made concrete mix that I have used in my prototypes so far, and add water and pigment until I reach the desired consistency and colour.

The concrete mix is then placed into the mould in layers as described before, and shaken to remove all the air bubbles.

They are then put aside for 48 hours to cure before they can be removed.



# Casting Process Development I

18<sup>th</sup> November

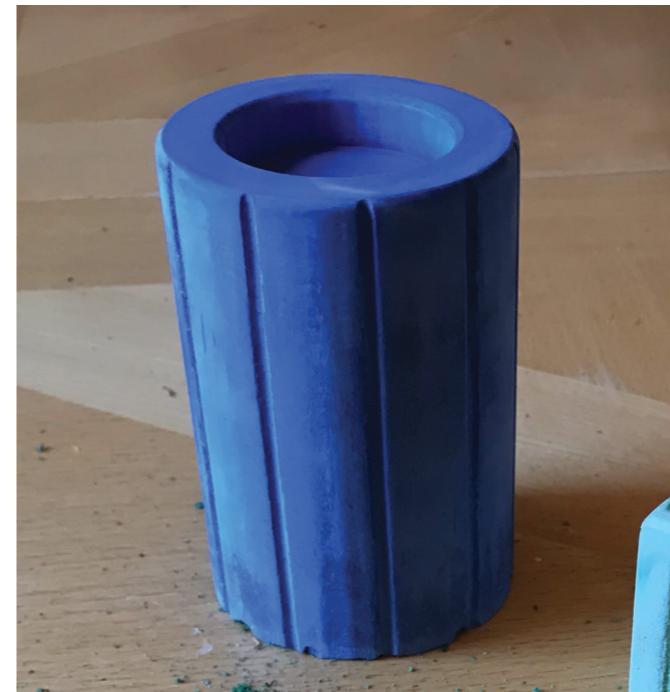


The first set to come out of the moulds was ok, however it was not the standard I was expecting, and the dark green colour concrete failed to cure and gain strength.

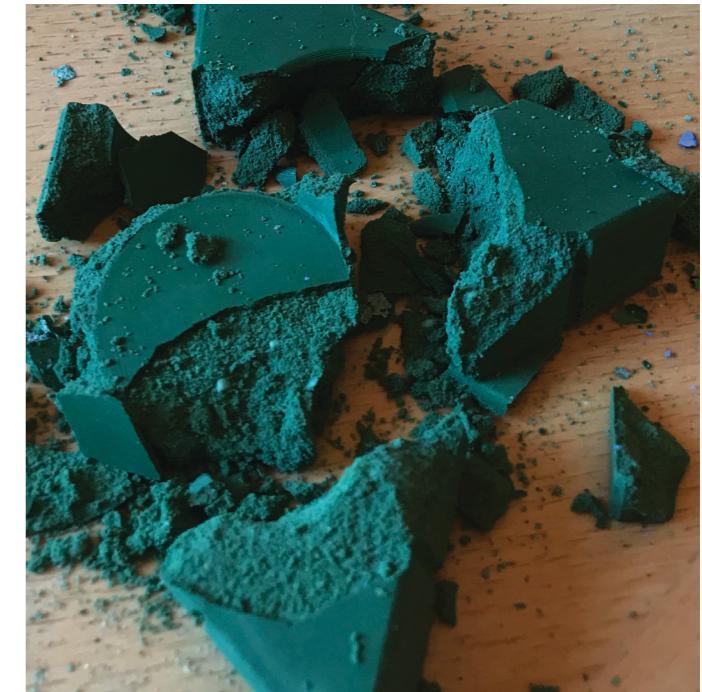
Other than the failed triangular candle holder, it raised a few problems that I will try to fix for the next attempt at casting the concrete.



There is a slight discolouring in this holder, caused by the pigment not being evenly distributed throughout the material as it is placed in the mould.



This attempt also suffers non-uniform colour pigment. The surface texture is also not as refined as I have achieved in the past, and that I know is possible.



This sample obviously broke. I am not certain at this stage as to why, so I will give it another go and see what happens. When prototypes have crumbled, it is usually due to the mix not being quite perfect, causing the concrete to be structurally weak.

## Possible solutions

Instead of mixing the pigment in the powder mix as before, I will mix it in water where the powder will dissolve, before it is added to the powder.

For the lack of strength in the material, I do not actually know what is causing the problem, so I will have another go to double check that it wasn't a mistake with my concrete ratio.

# Casting Process Development II

20<sup>th</sup> November



This next set has been an improvement. I used the same technique, other than mixing the pigment in water rather than straight into the powder.

The quality of the concrete finish on the whole is better, however there are still imperfections that need to be refined.

Once again the green triangular shape failed.



I am starting to think that the failure in these green attempts is being caused by too much pigment in the mix, and this is changing the composition of the material too much. Every dark green attempt has not worked properly.

If this fails again I will have to rethink my colour strategy.



This colour in this prototype is even further discoloured than the previous attempt. The texture is better however.

I spoke to Joe in the workshop, who told me that this white affect is called **bloom**, and is natural in concrete.

## Possible solutions

To get rid of the bloom, there are various expensive treatments, but another option is to use more pigment. This however, might make the strength issue even more prominent.

I will try again with less pigment, and hope the green concrete is more structurally sound.

The concrete might be not curing properly due to the lack of moisture in the mix. I will cover them next time in cling film to stop any evaporation.

I have ran out of my pre-made concrete mix of snowcrete and white aggregate.

Joe mentioned that he expected the colour discolourations, or bloom, might be accentuated due to the concrete mix I have been using.

I will buy some snowcrete and some silver sand (available in the Haldane) and see if this makes any difference.

This involves making the mix myself, however luckily for me, Pepa has been using this mix for her project, and has recommended a 1-1 ratio of sand to cement to save me time finding the correct balance.

# Casting Process Development III

22<sup>nd</sup> November



Much to my relief, this batch has been much more successful.

The green shape has held its integrity. I do not know whether this was due to the cling film or the reduced pigment. Either way, it worked, and I do not have enough time to keep experimenting, so I will reproduce this method in the future.



The quality of the surface texture and the level of accuracy in the details of the design is also far superior to my previous efforts.

The colour consistency is also much better. The natural blooming is still there, but it is consistent across the entire material, so is not as noticeable.

There are still a few refinements to make, but this batch is a high enough quality to be considered a final product.

## Refinements and Reflections

Does the material need to be finished or sealed?

Is there an easier way to remove the concrete from the mould?

Does the bottom of the candle holder need protection?

# Casting Process Development IV

22<sup>nd</sup> November

## Silicon mould problems and potential solutions

Due to the form of the candle holders, the cast prototypes have been very hard to remove from the moulds. The indented section for the tea-lights is causing a vacuum, and it normally requires a second pair of hands to remove the concrete.

Paul, from the workshop suggested to cut the moulds down one side. This will allow me more access to the part, aiding in its removal.

The mould will hold its shape when placed back together, and you should not be able to see the join on the material.



There have also been a couple of defects in the moulds, that reflect into the cast material.

These are 'negative' defects, so they result in unwanted extra material on the products. These are fairly easy to remove by sanding, and do not cause too much of a problem to the rest of the product.



## Bottom surface

I have decided not to add anything to the bottom, and to leave it as a natural concrete base.

The product is ornamental, and will not be subject to a great deal of movement, so it should be ok to leave it unchanged.

I will however sand the base to create a flat, smooth surface.



# Casting Process Development V

24<sup>th</sup> November

## Silicon mould faults

The recent adaptations to the silicon moulds did make it very easy to remove the concrete, however it raised another issue.

A small amount of concrete mix managed to leak through the cut in the mould, creating a large disfigurement in the concrete.



This can be resolved using tape and elastic bands to hold the mould in its shape as the concrete is placed into the mould.



## Sealant

In order to get a successful concrete consistency, I reduced the amount of pigment in the mix. This means that the resulting colour is less vivid than I had wanted initially. I think that the pastel colours are still effective.

Workshop Joe suggested that a sealant might help retain the colour, as well as protect the material.

You can buy concrete sealer for worktops and for outdoor use, but this is very expensive, and also gives the concrete a glossy finish that I do not want.

I used this failed attempt to experiment with using various other options to seal my concrete. Joe recommended paraffin wax, and normal cooking oil. I tried both.



## Reflections

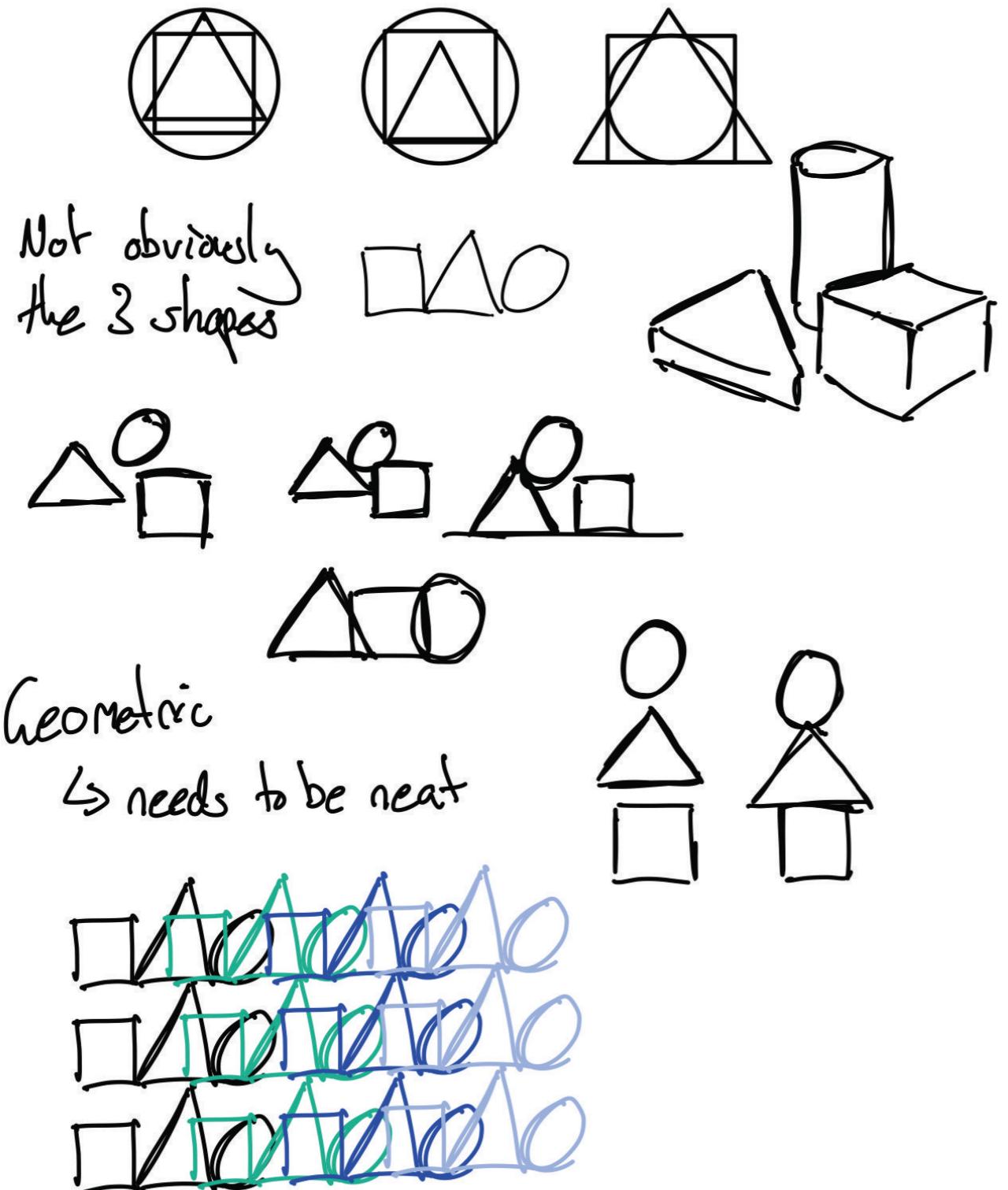
I have decided against using a sealant after doing these tests. The wax achieves a fairly nice smooth texture, but it is not the surface texture I want. It also leaves a very waxy smell on the concrete.

Neither the wax or the oil does much to help retain the colour.

# Branding/Packaging

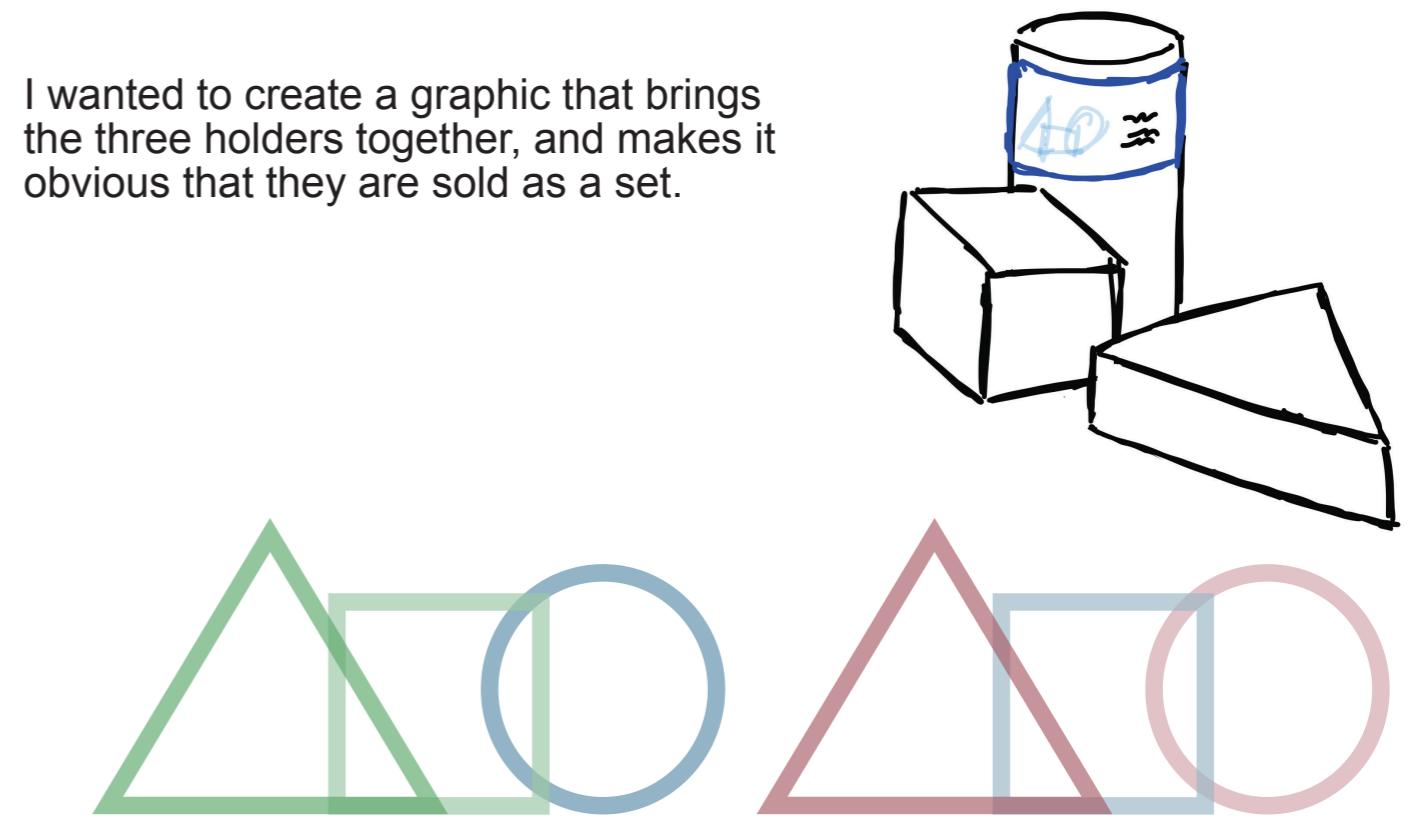
26<sup>th</sup> November

Products sold in the CCA do not generally have physical packaging, and are just sold as they are. They are prepared in bubble wrap by the shop.



I am not going to create packaging for my candle holders, but I will make a label with my branding and product details to wrap around the top half of the cylinder candle holder. From here it can be seen above the other two holders.

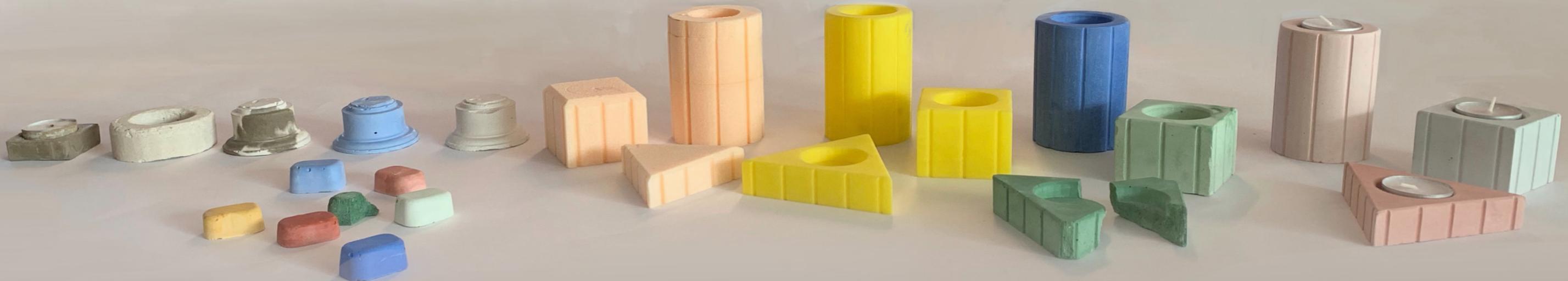
I wanted to create a graphic that brings the three holders together, and makes it obvious that they are sold as a set.



# Prototypes

29<sup>th</sup> November

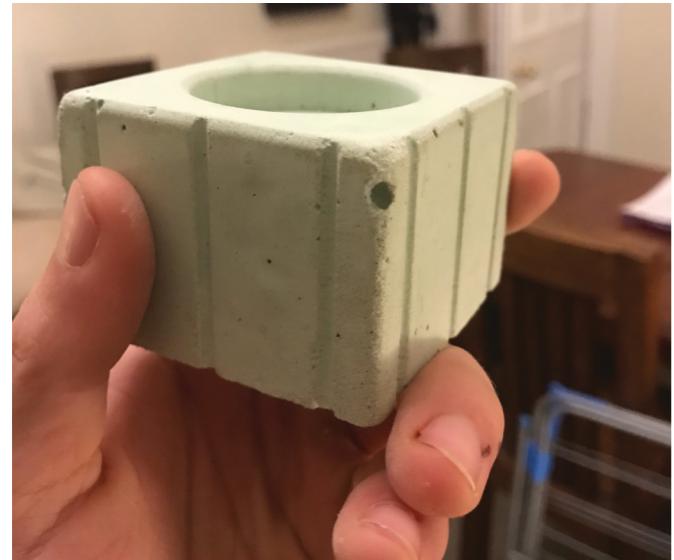
First concrete specimen  
Snowcrete multi-candle holder  
Silicon mould cast 'marble' prototype  
Colour introduction prototype  
First bubble-free casted concrete  
Foam prototypes of final form  
Finished 3D printed forms  
Failed cast in concrete with pigment  
Refined design - concrete candle holders with tea-lights



# Casting Process Development VI

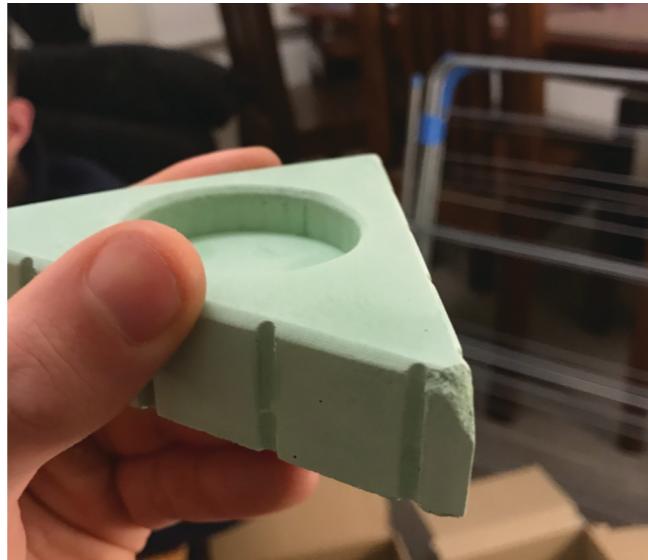
2<sup>nd</sup> December

By now I have the casting process pretty nailed down and I am able to reproduce high quality candle holders. There are still a number of defects that can creep in if I do something wrong when casting. I have learnt how to avoid these issues, but in an ideal world with more time in the project, a more foolproof system could be implemented.



## Bad quality concrete

Flakey concrete is caused by the wrong ratio of concrete mix. I have been weighing out the cement and the sand, but I have been adding the water by eye. The wrong quantity of water will affect the strength of the material.



## Leakage lines

Every now and then a small amount of concrete leaks through the cut in the mould, despite fixing the mould together with tape or a band.



## Shape Deformity

If the band holding the mould together is too tight, its shape changes, and the resulting concrete is deformed.

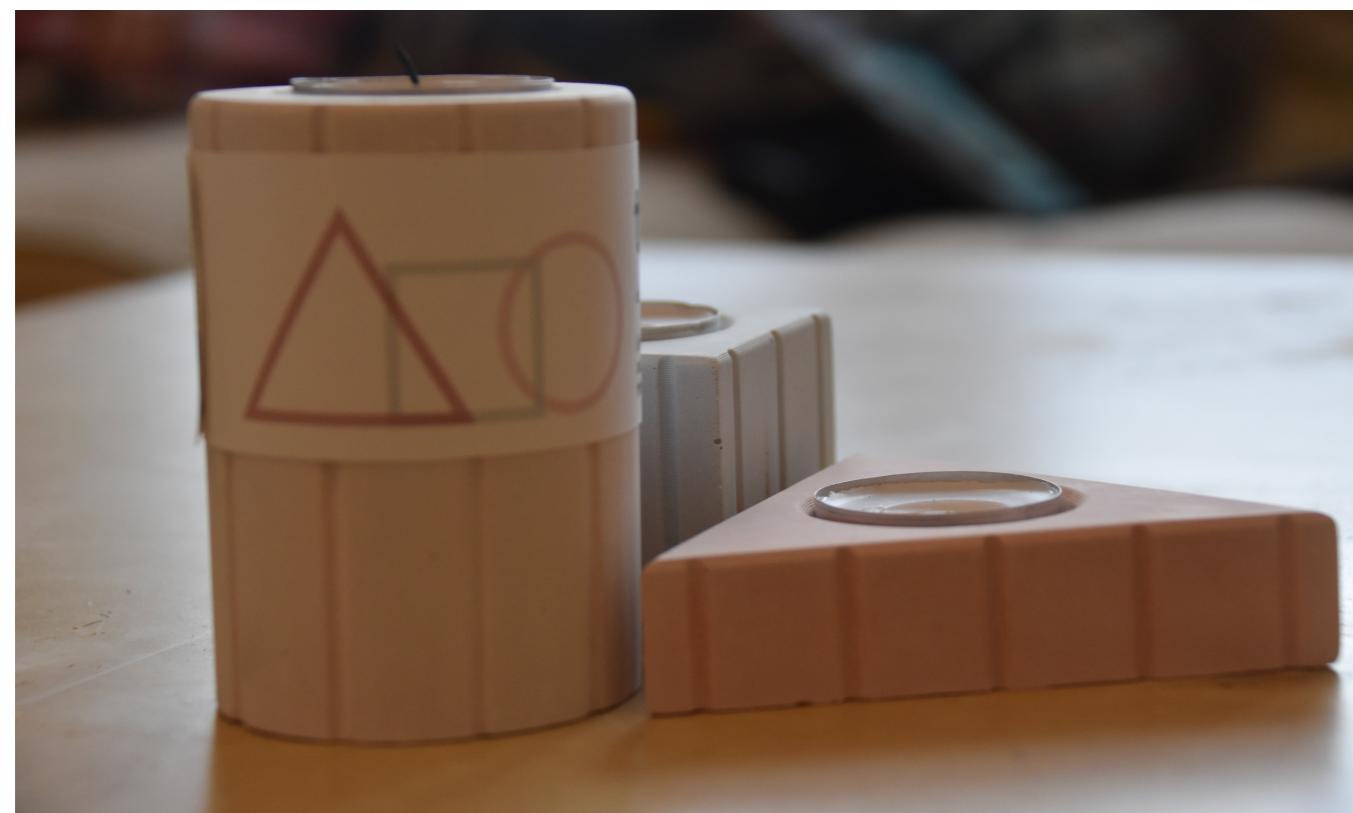
## Improvements for the future

A more reliable and efficient process would be to have exact quantities of water, sand, cement and pigment calculated for each type of candle holder. This would drastically decrease the amount of time that it takes to mix up the correct amount of concrete. At the moment I am guessing the quantity of the material, and judging the colour consistency by eye, which nearly always creates wasted, excess material.

Colour inconsistencies could also be reduced by using larger batch sizes. I am currently limited to two sets of silicon moulds, however with another couple of sets, I would not only be able to double my output, but the consistency between the sets would be much greater.

# Final product

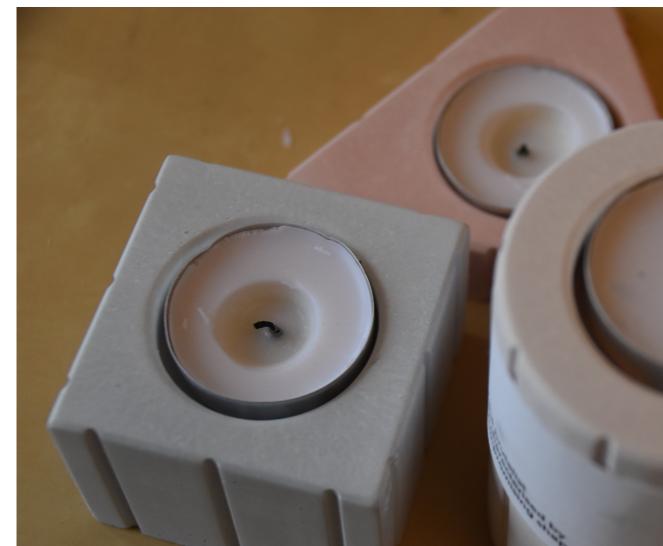
2<sup>nd</sup> December



The product will be sold as planned as a unit of three. I will provide the tea-lights as part of the product.

I have refined the label slightly, and no longer have different colour paper for the different sets. I am printing the label on higher quality printing card, that has an off white tint. I think that this looks more professional. The labels still have the colour logo that signifies that the product shall be sold as a set of three.

I will provide 10 units for the CCA shop, and this will consist of 5 of each colour set, with one set being given to the GSA.



# Costing

4<sup>th</sup> December

## COSTS

Material	Price
Blue circle multipurpose concrete (25kg)	£6.42
Snowcrete concrete mix (15kg)	£15
Colour pigments	£20.66
J24 silicon rubber (4kg)	£64
3D prints	£6
Bees Wax	£3.35
Silver sand (13kg)	£3.90
Snowcrete (11.3kg)	£5.65
Tea lights	£2.00
Double sided tape	£1.95
Quality paper (4 sheets)	£2.00
<b>TOTAL</b>	<b>£130.93</b>
GSA Budget	£50
Personal Investment	£80.93
Cost of Unit	£42
Units	10
Revenue	£420
CCA split	£210.00
My split	£210
<b>TOTAL PROFIT</b>	<b>£129.07</b>

Over the course of this project I have been recording my expenditure, which up to this point has entirely been put toward materials. My total expenditure has reached £130.93.

We have been provided with a £50 budget from the GSA for this project, which reduces my investments to £80.93.

During my presentation for our final product, we discussed the price point that my candle holders should be sold for in the CCA shop. Given the environment of the shop, and the other items they have, we decided on a selling price of £42 per unit.

There has been concern from the shop owner that the public may want to buy the candles individually, rather than as a set, and that a slightly lower price may increase the selling rate of the product. We decided to stick with the planned £42, with the plan of having a re-think after a few days if they are not selling at the rate we expect them to.

If all 10 units sell, the total revenue will be £420, of which the shop and I will split 50/50, leaving myself with a total profit of £129.07.

The lions share of the material costs are from the silicon for the moulds. The actual material costs for this product is extremely low. I have already made the silicon moulds, so if I were to continue to make and sell this product, it would have the scope to make a lot of profit.





# trio

Unique and hand made. Inspired by the brutalist architectural movement that has been characterised by the use of concrete and massive, uncompromising shapes.



designed by  
Tom Scotcher

# trio

Unique and hand made. Inspired by the brutalist architectural movement that has been characterised by the use of concrete and massive, uncompromising shapes.



designed by  
Tom Scotcher

