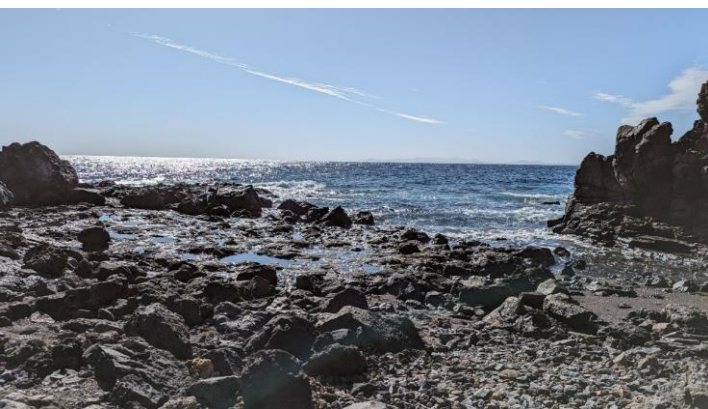
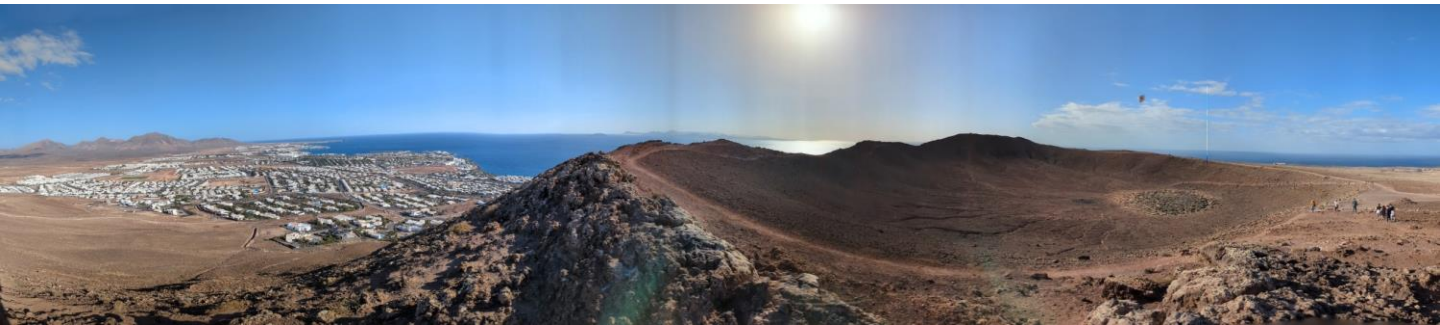


# Statement of Intent

- I love crazy golf; there is no doubt about it. Unfortunately, I don't happen to have the garden space to build a full-size game, so decided to make a micro scale one for indoor use instead! It's inspired by Lanzarote, as I love the dramatic lava-scapes, serene ocean views, and the very friendly camels!
- First, I will present first-hand photographs and research on Lanzarote. I will also explore how the work of talented architect César Manrique could influence my project.
- I will analyse pre-existing tabletop crazy golf games.
- Next, I will start building an initial map of the course.
- Commence production: obstacles, clubs, score cards, textiles, holes.
- I will finish with a reflection on how the project's turned out and my takeaways.

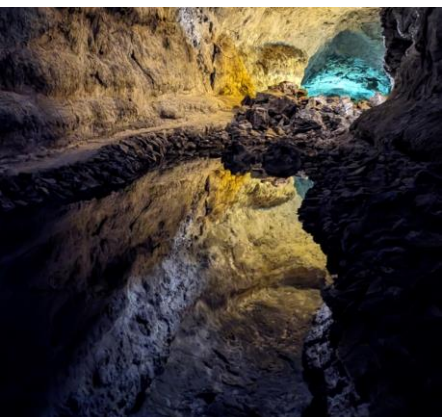


# Lanzarote- first hand photographs





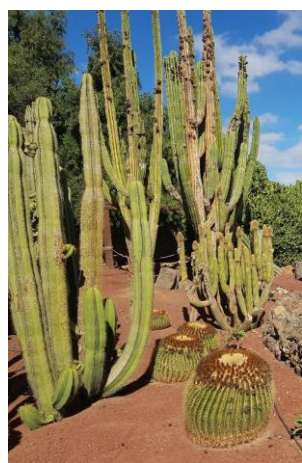
# Lanzarote- first hand photographs





# Lanzarote- first hand photographs

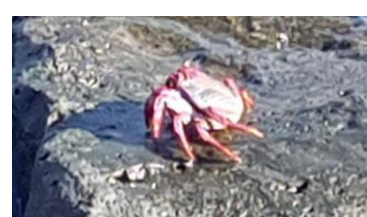
*Native flora*





# Lanzarote- first hand photographs

*Native fauna*





# Lanzarote research page



Lanzarote is made up of more than 300 volcanoes, one of which is still active: Timanfaya (last erupted in 1730). Many volcanic islands are rich in wildlife due to the high mineral and plant-nutrients content of the volcanic rock. However, Lanzarote is very barren due to its climate... It gets an average of 16 days of rain a year, mostly in winter. Daytime temperatures often reach higher than 30°C, with tropical nights.

Therefore, all vegetation must be drought-resistant, and able to live under intense heat without a drop of rain for weeks on end. Even cacti and palms must be provided with irrigation systems in order to thrive!

Lanzarote is a 845.9 km<sup>2</sup> volcanic island in Spanish territory, in the Atlantic ocean. It is one of 8 Canary Islands.

Although at a first glance Lanzarote may be a bare, lifeless lump of rock, it hides many beautiful and unique places to visit:



1. Playa Blanca village
2. Las Coloradas fort
3. Timanfaya National Park
4. Camel rides
5. Las Grietas (*canyons*)
6. El Molino de Tiagua (*windmill*)
7. Puente las Bolas (*drawbridge*)
8. Cactus garden
9. Cueva de los verdes & Jameos del Agua (*caves*)

*I will take inspiration from these locations to inspire my tabletop crazy minigolf.*

## A short history:

Lanzarote rose from the sea ~15 million years ago, and was inhabited in around 1000BC by indigenous tribes. However, in 1402, the land was conquered by the Spanish. Inhabitants of the island were forced to welcome them in the hope that they would protect them from the repeated pirate raids and seafaring slavers. The islanders hid inside caves while under attack.

However, life got even harder in 1730 when the small island experienced one of the largest volcanic eruptions on record; Timanfaya erupted continually for 6 years, blocking out the sun and destroying over a quarter of the island. No one was killed, but many villages were buried in the molten lava.

After the eruption life improved for the islanders because of the very fertile soil, nourished from the eruption, ideal for agriculture. But this pleasant spell was not to last; the climate was so hot and dry the farming industry could not be sustained, and fell into decline.

Now the primary industry in Lanzarote is tourism, and it welcomes 2.7 million visitors every year.

## How I will be inspired:

Lanzarote is like no other place on Earth. I want to design and make a unique and meaningful response to the “Places and Spaces” theme by involving the incredible scenery and places I have visited on the island. I will use first-hand photos to generate new ideas, and will also look into the designer of the traditional architecture of the island: César Manrique.



# César Manrique

*Architect*

César Manrique was the Lanzarote-born architect (1919-1992) responsible for the picturesque, whitewashed, single-storied buildings and their unusual style, found all over Lanzarote. However, he also designed and made many other landmarks found all over the island. He aimed to encourage tourists and inhabitants alike to reconsider the apparently bleak and lifeless island, presenting areas of natural beauty and adding his own artistic touch.

In 1963 César Manrique accepted an invitation to move to New York. This had a significant impact on him, forcing him to realise how much he missed the natural beauty of Lanzarote. Therefore, only 3 years later, he moved back. He was surprised to find that almost nothing had changed on the island since he had left, and that many of the buildings and technologies were outdated. He set about using his experience from New York to uplift the whole island.

His first project (1963) was carving out a series of pools from the volcanic rock of Jameos del Agua. He also built the world's first fully-furnished auditorium in the cave, which is still in use today.

César Manrique wanted to both modernise the island, and bring the beauty of rock to the eyes of its people. The problem was that it was a lifeless, infertile landscape which could not be used for much agriculture. He wanted to show them how "Lanzarote was a unique island in the world" because of its natural beauty found nowhere else.

Lanzarote's tourism industry was failing at the time, with only 100 beds for tourists and an airport that was barely used, but César Manrique was the first person to see how the island could be finally "brought to life". The island's true economic value would lay in its incredible volcanic landscape.

César Manrique's aim was to connect civilisation and nature through the means of art. He used natural materials he found around him (mainly volcanic rock and some metals).

To gain the support of the locals, he also made many public monuments, particularly thanking the farmers. Some of his monuments are pictured below.



*Jameos del Agua*



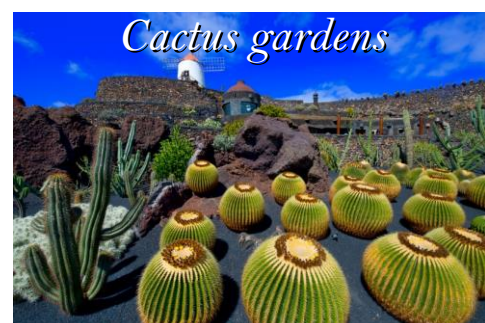
*Jameos del Agua auditorium*



*Mirador del Rio (river lookout)*



*Timanfaya El Diablo restaurant*



*Cactus gardens*





César Manrique was passionate about preserving the environment, so it could always be enjoyed –unspoiled by the often messy and unsightly buildings and development that exist in most countries.

He had seen Tenerife transform from a stunning, untouched beach, to a coastline piled with high-rise blocks when tourism began to grow. However, because tourism did not take off until 1966, César Manrique had just enough time to spread his (at first ignored) campaign across the island, to maintain the natural landscape instead of building monstrous resorts all over it.

In his mind, sustainable tourism was the only way forwards; building without thought would result in the permanent destruction of an incredible environment, but all the same, Lanzarote needed the money as tourism was its greatest source of income. Therefore, César Manrique lobbied for height restrictions and for only traditional white paint to be used on all buildings.

To this day, it is illegal to paint buildings any colour other than beige or white, and windows and doors must be green, blue, black or brown. The only building over a couple of stories high is the Grand Hotel in Arrecife (the capital), meaning that the beautiful, unspoiled and unpolluted landscape is preserved perfectly everywhere.

### César Manrique's other restoration and conservation projects:

- Mirador del Río
- Cueva de los Verdes
- Jameos del Agua
- Timanfaya National Park
- Monumento al Campesino
- Castillo de San José



**White buildings, a distinct feature of Lanzarote**



*César Manrique was responsible for many of the defining landmarks in Lanzarote, several of which I would like to include in my tabletop crazy golf Lanzarote-inspired course. I will include the following locations: Playa Blanca, Timanfaya National Park, Cactus gardens, Cueva de los Verdes & Jameos del Agua. I will research in greater depth each of these monuments – and a few others– to inspire my final product design. However, first, I will look into tabletop golf in general and complete ACCESSFM reviews.*



# Pre-existing products mood board



## Why I chose this product range:

Crazy golf is a leisure activity enjoyed by many people, young and old. I personally love it, but have often been dismayed to find that during the winter the course is often flooded or too wet to play on... so I wondered if it would be possible to make a small, indoor equivalent? I did some research and found tabletop crazy golf, which I immediately liked the look of. I would like to try to create my own tabletop crazy golf inspired by Lanzarote to solve the problem of the British weather clashing with my favourite 'sport'! I believe this project will provide me with enough room to explore Lanzarote in a creative and playable manor.

## A little bit about crazy golf:

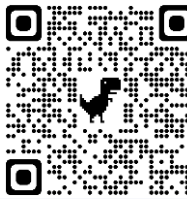
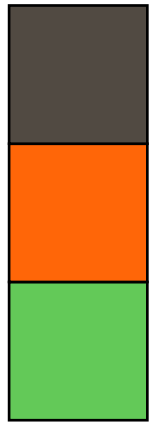
In essence, it is a smaller version of its larger counterpart, except this time it has been scaled down to fit on a tabletop. Each hole contains challenging obstacles to prevent getting that 'hole in one'!

## Challenges:

Next I will look at 3 pre-existing products in more detail to identify their strengths and weaknesses. I have discovered that good quality ones come with a heavy price tag of £50-£100, so I will try to make a high quality, cheaper product that is both fun and unique. I will experiment with different materials to make unusually-shaped elements such as clubs- I could use pewter casting in this case, which I have not done before. I could also use 3D printing, laser cutting, and hand tools.



# Pre-existing product ACCESSFM review



## Prestige Electronic Arcade Mini Golf

<b>Aesthetics</b>	Bright, lively, exciting, fun.
<b>Cost</b>	£51.90 + free postage from the UK.
<b>Customer</b>	Children because it is colourful, lively and robust. However it would not be suitable for very young children because it contains a lot of small parts.
<b>Environment</b>	Not all plastics can be recycled, and they take a lot of energy to produce, leading to climate change.
<b>Size</b>	66cm x 42cm (height not specified).
<b>Safety</b>	Batteries required, which could leak dangerous chemicals into the environment. Also, a player could catch their finger in moving parts.
<b>Function</b>	Electronic moving parts look fun and make the game more interesting, but may be more likely to break and less easy to fix.
<b>Material</b>	Plastic.
<b>What I like/dislike</b>	Electrical moving parts add additional interest. However they may be difficult to incorporate in my final product due to time and space restrictions.
<b>Inspirational ideas</b>	This model is very three-dimensional, which I like because it makes the game more interesting. I may include 3D into my final product.



# Pre-existing product ACCESSFM review



## Micro Mini Golf -Tabletop Golf Kit



<b>Aesthetics</b>	Simple, easy, plain.
<b>Cost</b>	\$59.99/£47.17 + \$21.12/£16.61 postage from the US.
<b>Customer</b>	Children and adults because it is simple.
<b>Environment</b>	The product looks flimsy and easily breakable. If it is thrown away after little use, it is wasting the Earth's resources, particularly in the metal and plastic, which both require lots of energy to produce.
<b>Size</b>	No size specified.
<b>Safety</b>	A kit might contain small parts like screws and nuts that could be lost or swallowed by young children.
<b>Function</b>	The customer might enjoy piecing together the DIY kit more than they would if it came fully-constructed. This also makes it more portable.
<b>Material</b>	Plastic, felt, metal.
<b>What I like/dislike</b>	Very basic. There is not a lot to it, and there is only one level. It would be preferable to have multiple levels.
<b>Inspirational ideas</b>	Felt floor means the ball rolls easily but there is still some friction. I will consider this in my final design.



# Pre-existing product ACCESSFM review



## WeyKick Table-Top Minigolf Game



<b>Aesthetics</b>	Enjoyable, high-quality, unusual, well-finished.
<b>Cost</b>	£97.99 + free delivery from the UK.
<b>Customer</b>	Adults because this is a simple design made of good quality materials, which young children may not appreciate.
<b>Environment</b>	Wood can be recycled and is a sustainable material.
<b>Size</b>	65cm x 52cm (height not specified).
<b>Safety</b>	If the walls around the edges of the courses are not high enough, the ball could fly out and hit somebody.
<b>Function</b>	A nice selection of obstacles that could be fun to navigate around.
<b>Material</b>	Wood, felt, metal.
<b>What I like/dislike</b>	The different shaped levels are more interesting, and the plain finish makes the design eye-catching.
<b>Inspirational ideas</b>	Shallow dips instead of holes for the balls to roll into so that the ball does not get stuck in the hole. This is a good design consideration to use.



# Minigolf obstacles mood board





# Minigolf obstacles first hand photographs

*In Lanzarote*

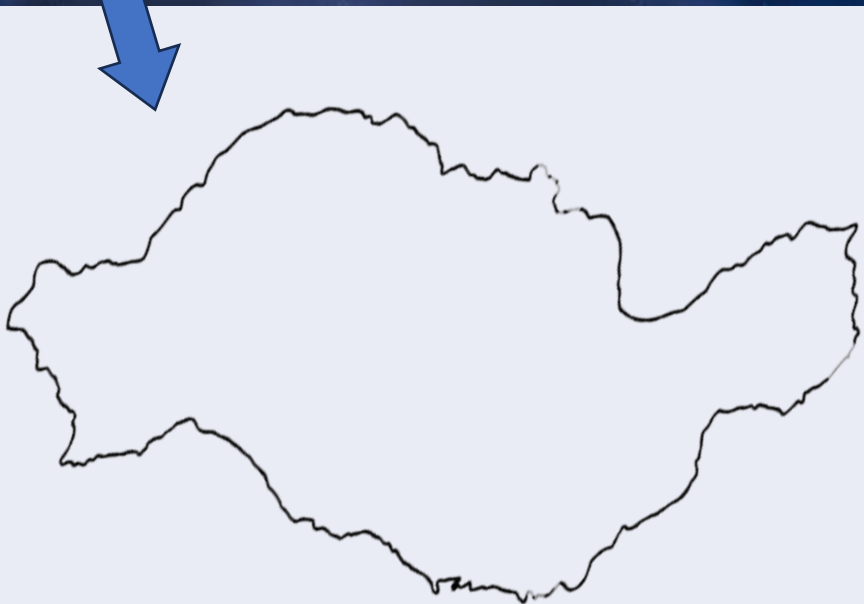
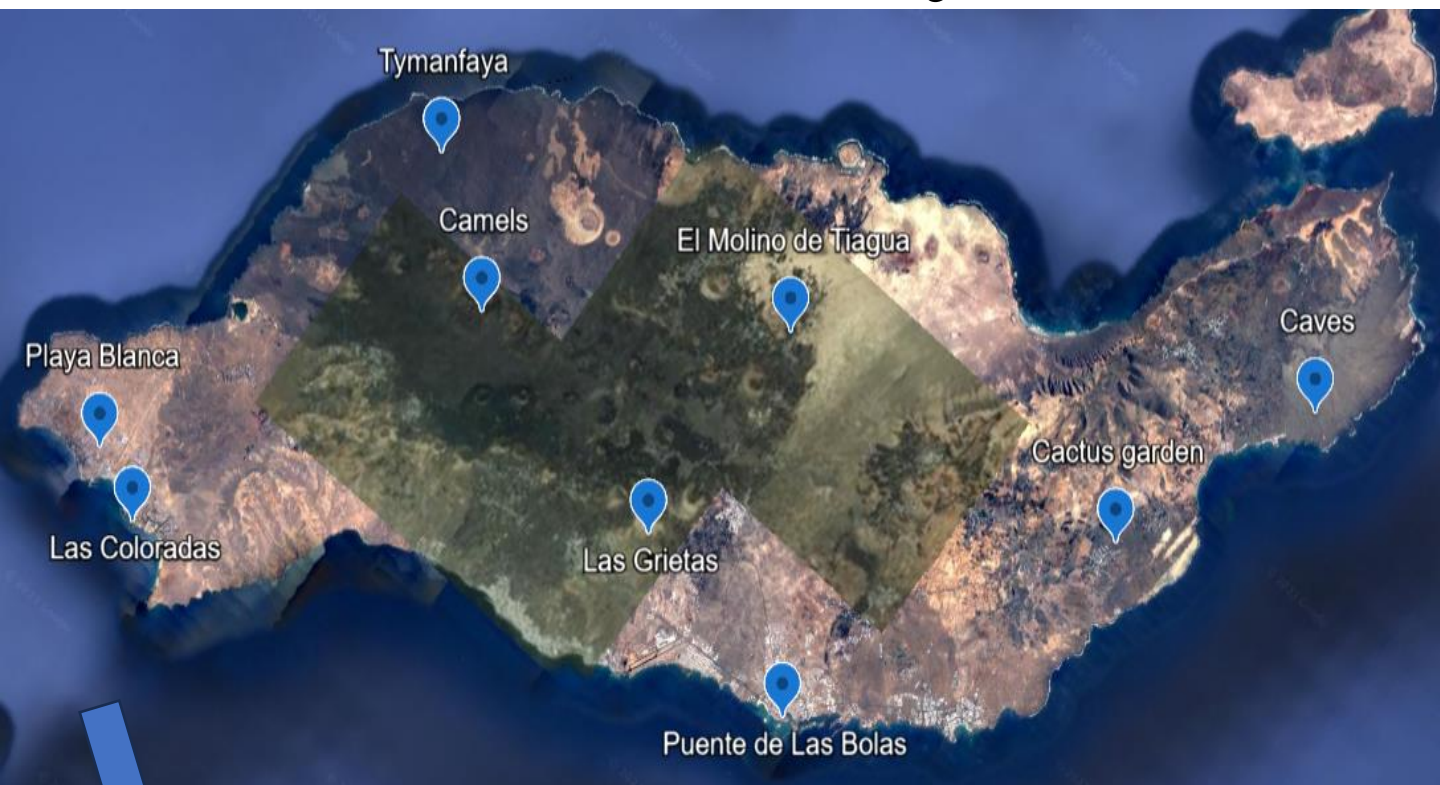


*Crazy golf obstacles come in a wide variety of themes, shapes and sizes. I want to replicate this in my own design to make the course as fun and playable as possible. I like the mixture of buildings, landmarks, and natural features having been turned into usable obstacles, adding interest to the game.*

*As for the crazy golf courses I photographed in Lanzarote, they all have green felt bases and whitewashed walls—much like the houses on the island. To make my course more authentic, I will replicate this green and white colour scheme.*



# Map and Layout
















I made a custom Google Earth map, labelling 9 locations of interest. I will design my course based around these sites, and the overall shape will be the island of Lanzarote. I have rotated the island in order for it to fit better in a rectangular shape base, in a 1:2 side length ratio.

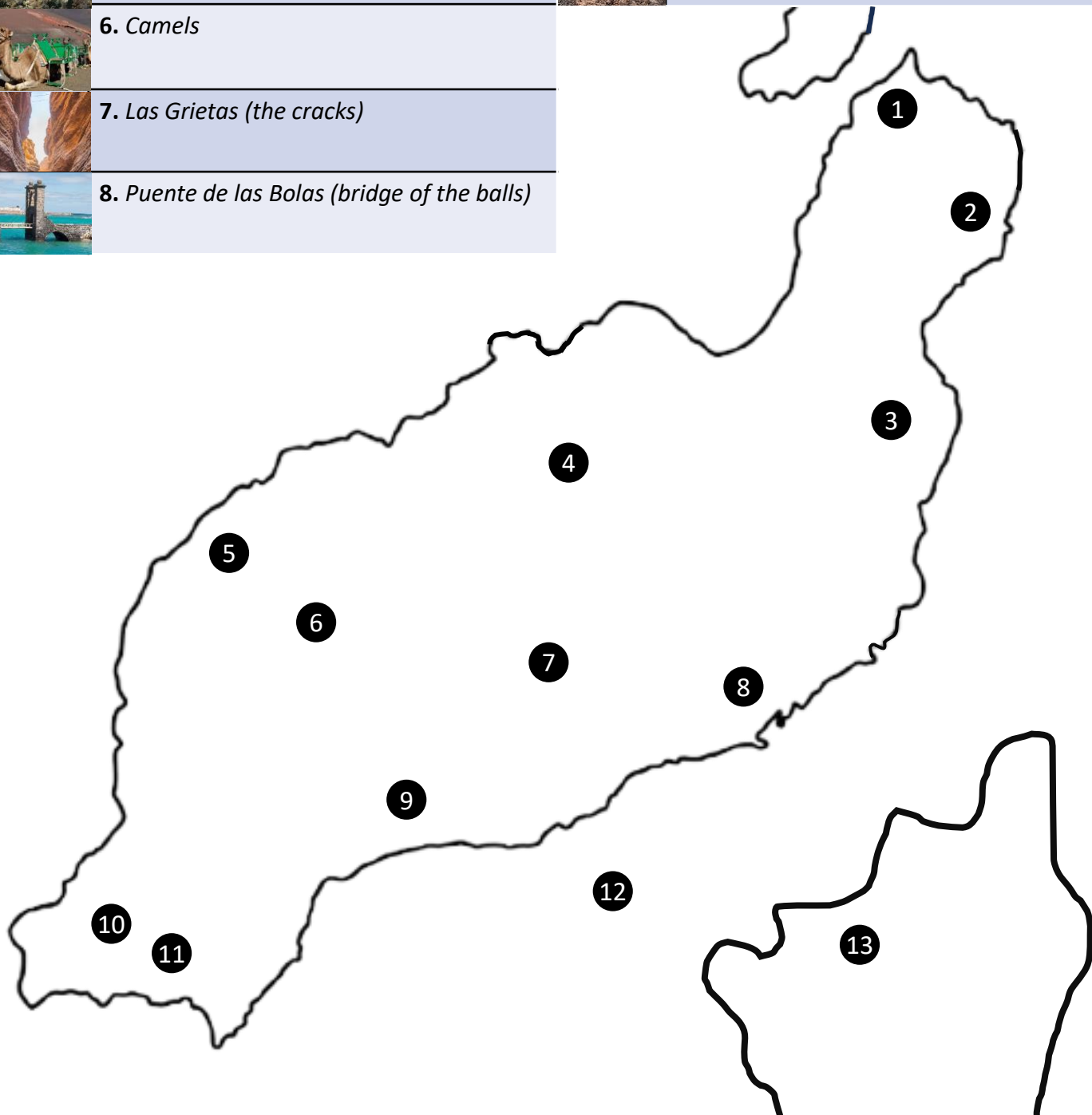
I plan to make my crazy golf inspired by the main attractions of Lanzarote. I will make 9 holes (this is the traditional number for crazy golf) each inspired by a different attraction, and they will all be positioned on a map of the island.

I chose the 9 locations labelled above because of their natural beauty, novelty, and potential to be developed into interesting and unusual crazy golf obstacles.

*First-hand photograph of the view from Mirador del Agua, Lanzarote*



	<b>1. Mirador del Rio (river viewpoint)</b>		<b>9. Glass bottomed boat</b>
	<b>2. Cueva de los Verdes (cave of the Green), and Jameos de el Agua</b>		<b>10. Playa Blanca town and port</b>
	<b>3. Cactus garden</b>		<b>11. Castillo de las Coloradas (castle of the Colorades)</b>
	<b>4. El Molino de Tiagua (the Tiagua mill)</b>		<b>12. Dolphins</b>
	<b>5. Tymanfaya volcano National Park</b>		<b>13. Montana de la Caldera Isla de Lobos (Caldera mountain of Lobos island)</b>
	<b>6. Camels</b>		
	<b>7. Las Grietas (the cracks)</b>		
	<b>8. Puente de las Bolas (bridge of the balls)</b>		





Final map design



**LANZAROTE**



# Obstacle designing- *Dolphins*



## Dolphins found on the coasts of Lanzarote include:

- Bottlenose dolphins



- Risso's dolphins



- Spotted dolphins



- Striped dolphins



- Common dolphins



- Rough-toothed dolphins



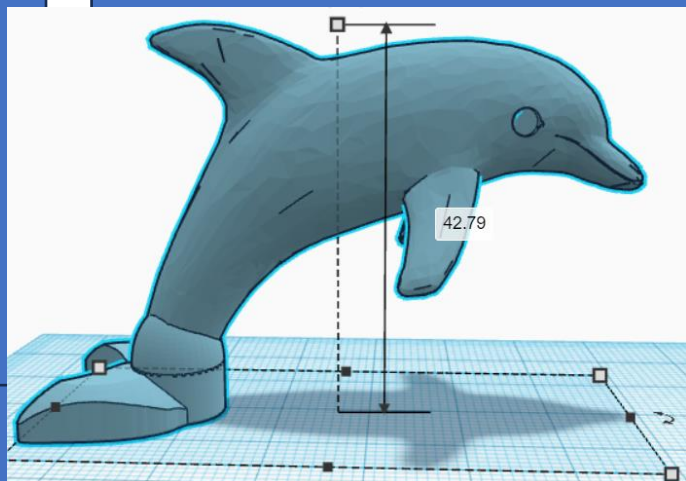
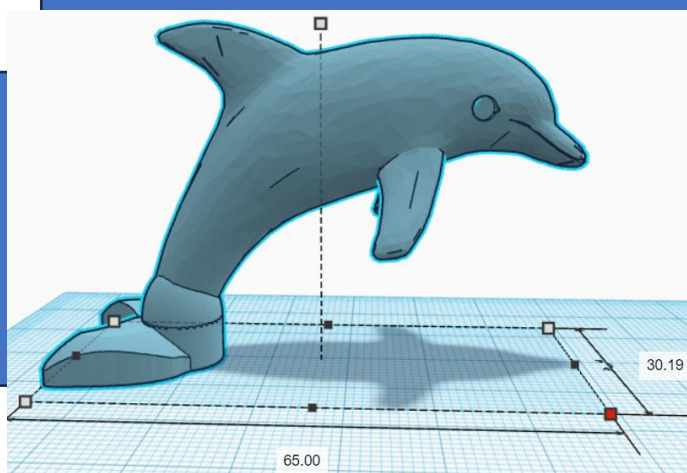
## Inspiration:

Isla de Lobos is a tiny, uninhabited 4.68km<sup>2</sup> volcanic island just off the coast of Lanzarote. Dolphins are found around all the Canary islands, but the best place to see them around Lanzarote is on the ferry to Isla de Lobos. On the way, there are plenty of opportunities to spot the dolphins and other amazing marine wildlife.

I will take inspiration from the incredible arching shapes dolphins create when leaping out of the water. I will design and 3D print miniature dolphins which the ball will roll under, the dolphins' curving bodies acting as archways.

Since bottlenose dolphins are the most commonly spotted around Lanzarote, I will decorate my printed dolphins with their colorings, grey-blue.



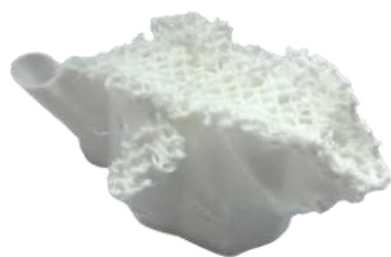


Once I had come up with my initial design for the dolphin, I did a scaled-down test print. From this I found that I would have to use supports for all of its underside and its top fin. I also did a separate experimental square print using the “ironing” Cura setting to see if I thought it would give the dolphins a smoother, sleeker appearance. However, I felt it would have a more natural appearance without this effect, so printed the real ones as usual, with a 20% infill density.



I melted new PLA over printing impurities using a pyrography pen, to make sure they would be smooth enough to paint. I also had to sand them down and treat them with two layers of primer before the top coat was applied (a grey-blue).

I used a tree support (0% infill) because it makes more efficient use of PLA and is quicker to print, but usually just as strong as a standard support.



Finally, to give them a more watery appearance, I treated them with gloss varnish.



# Obstacle designing- *El Castillo de Las Colorades*



*First-hand photograph*



*El Castillo de Las Colorades was designed by the engineer Claudio L'Isle in 1741 to defend the southern coast of Lanzarote from continual pirate attacks. The small fort had a drawbridge and lodgings for the troops. The bell on the bell tower was rung to warn inhabitants of an invasion before it came to land.*

## **Inspiration:**

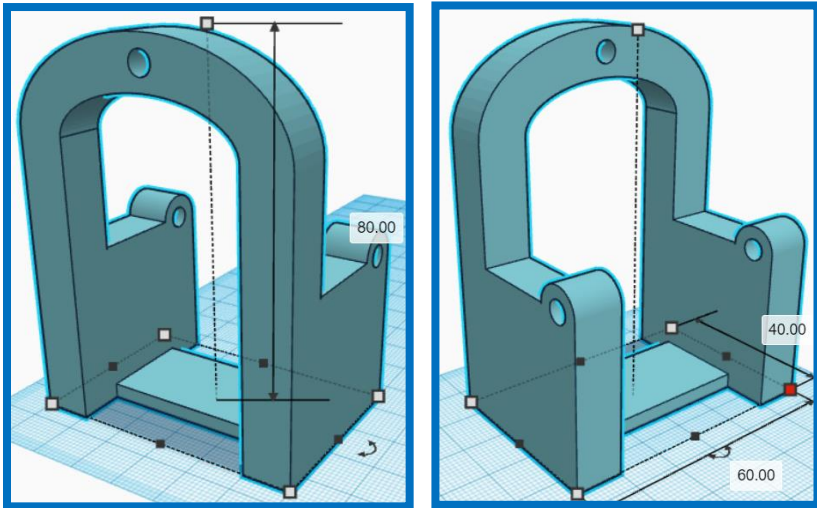
Lanzarote's history is rich in continual pirate raids and Spanish invasions, and El Castillo de Las Colorades was one of 4 defensive lookout castles. It is considered to be one of the best surviving examples of military architecture in the Canary Islands, and a notable site to visit while enjoying a long coastal walk. This is why I have chosen it as a landmark to include as a hole in my Lanzarote-inspired crazy golf course.

I will recreate the castle's rugged, stone appearance using grey/black clay tiles, and could either laser-cut or make by hand the entrance walkway.

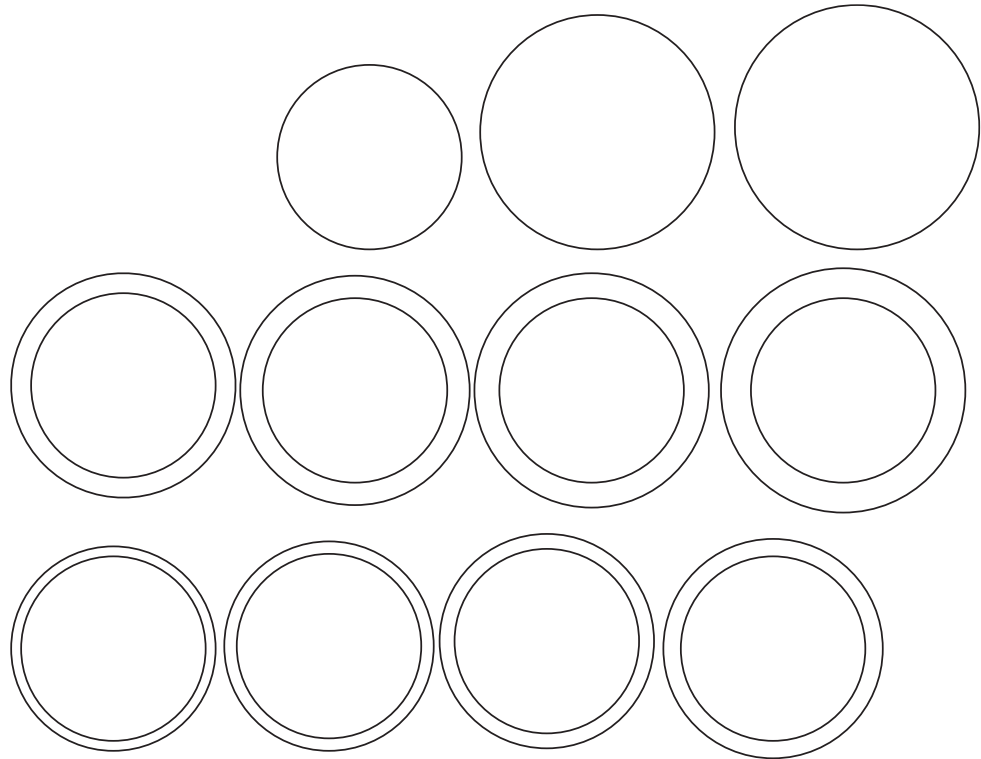
To turn this into a usable crazy golf obstacle I will have to flatten the steps up to the drawbridge and make sure there is a hole where the door would be, so the ball can go up the ramp, across the drawbridge, and into the fort. The ball will then roll down a slope inside, and emerge out the other side of the fort.

I will have to consider the slant height of the entrance so that it is easy enough to hit the ball up, but not too easy. I will also try to create a mechanism so that when the ball rolls down the slope inside the fort, it causes the bell on top to ring (see my initial design sketches to the right).





Above are screenshots of the 3D printed parts of this model -the mechanism- and to the right is a screenshot of the laser-cut rings I will make to stack around the outside, as a wall. All the rings are slightly different sizes (diameter increases by 2mm with each ring) so they should make a frustrum shape (sloping inwards) once complete.!



[CLICK for mechanism testing video](#)



The fort is one of my most complex obstacles just because it is made up of several different materials in several layers. First a 3D printed mechanism that holds the bell and the striker in place, so when the ball hits the end of the striker, the striker will hit the bell. Then a set of 7 laser cut rings on top of a laser cut base are stacked with an increasing diameter (by 2mm) as you go down. Thirdly is a thin layer of plaster bandage cloth to smooth out the jumps between the layers of laser ply. Finally, I added some grey-brown (supposed to be brick-like) tiles and grouting, and black paint onto the top.

I changed my design slightly to what I had originally planned, as it turned out that I wouldn't need a slope for the ball to roll down before it hit the striker- this would add unnecessary extra complexity, and it wouldn't look at good anyway.



3D printed mechanism and laser-cut rings.



Plaster bandage layer.

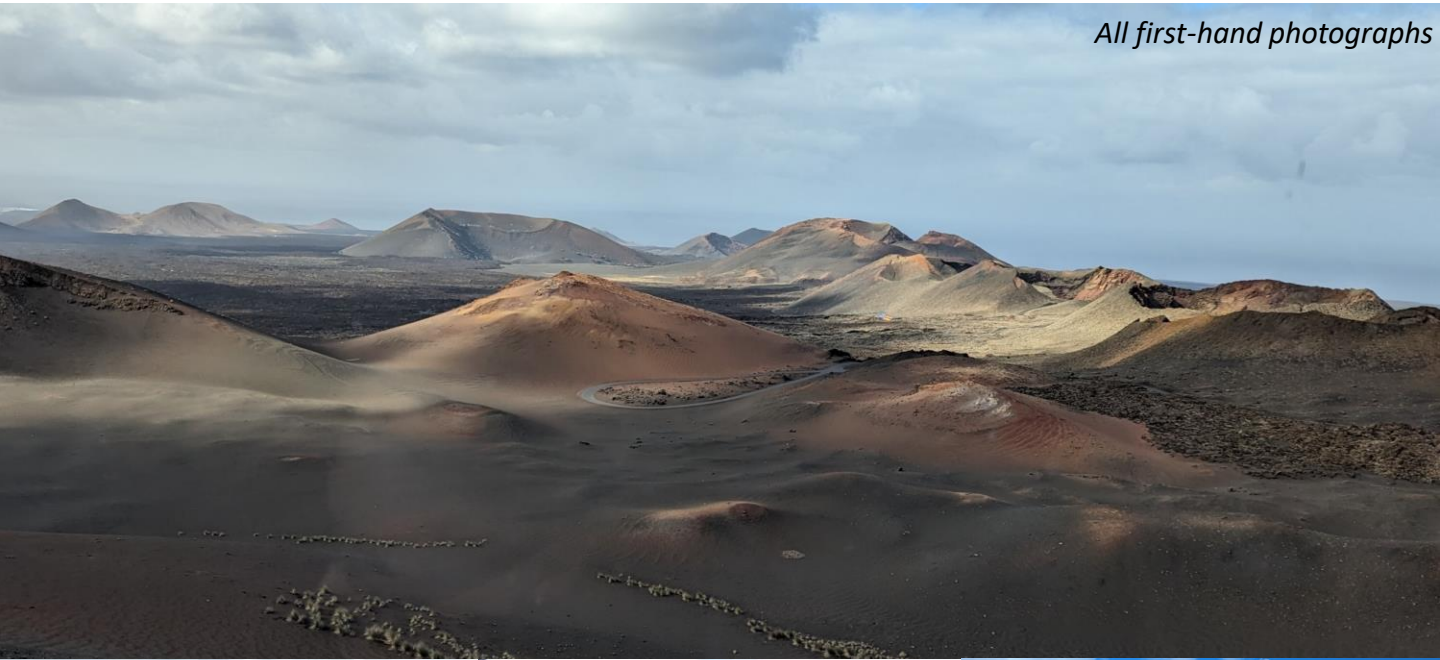


I also made a small wooden wedge to help the player hit the ball into the fort, as it is raised odd of the ground a little by the 6mm wooden base.



# Obstacle designing- *Tymanfaya*

All first-hand photographs



*forced to move away from the area, towards the coast. Playa Blanca developed as a small finishing town, which grew in size until the first tourists visited the area in 1970. Since then, the coastal community has grown to accommodate a higher level of tourism... now it is the island's 3<sup>rd</sup> most important tourist resort.*

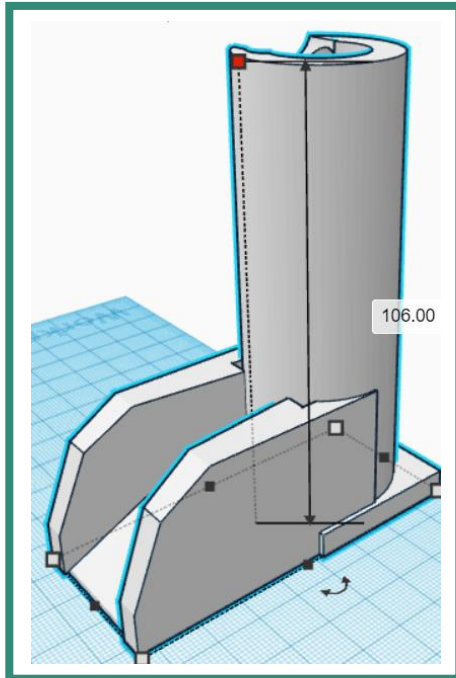
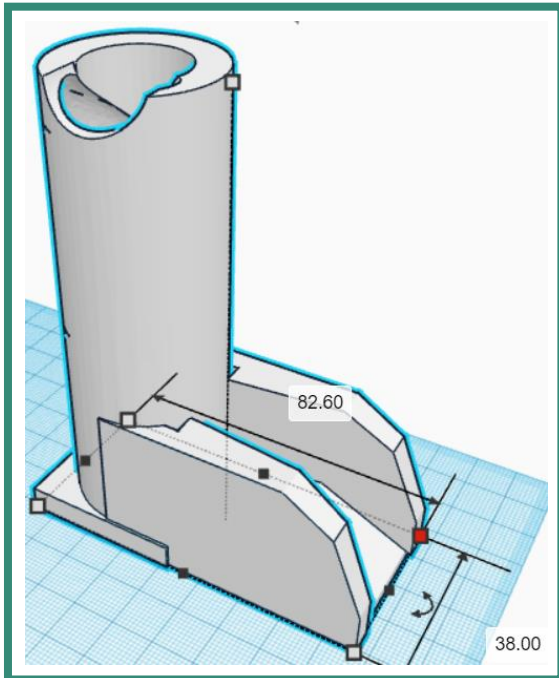
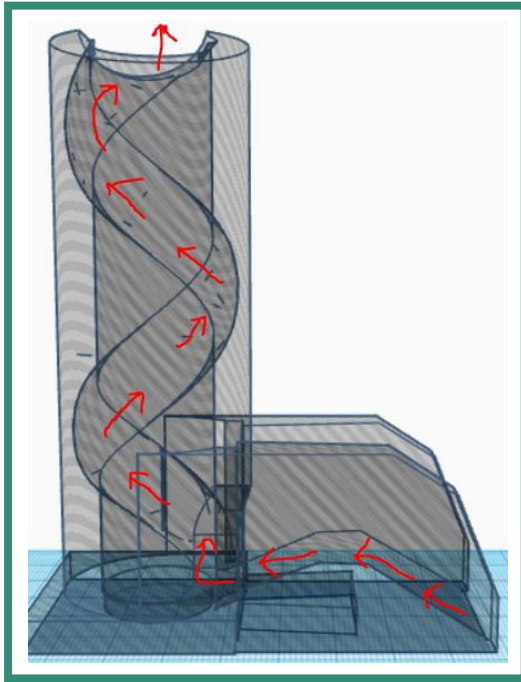
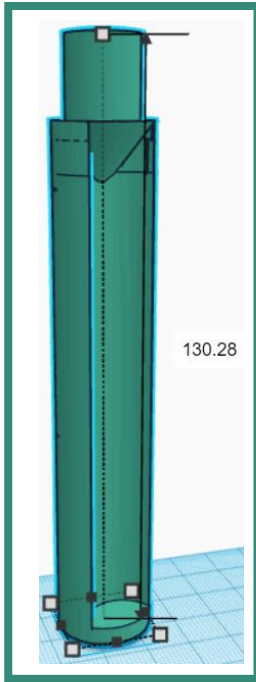
## **Inspiration:**

The architecture throughout Lanzarote is particularly unique and spectacular to look at, because of how beautifully colour-coordinated, tidy and organised it is! When I visited, I observed that this was particularly true for Playa Blanca, a sunny coastal village in the south of Lanzarote. I found it particularly amazing to look down upon the area from the top of the volcano Montana Roja, and see the rows of perfectly-white houses.

I have decided that Playa Blanca will not be designated a hole on my crazy golf course, as it is not so much of a landmark as a place. Instead I will combine it with the other landmarks in Lanzarote and spread it out across multiple holes, so it looks like the houses are spread all across the island.

I will design and 3D print miniature Playa Blanca-inspired houses, all white with green features. A lot of the buildings had balconies and private pools, so I will also attempt to make these.





This is my inverse auger mechanism to 3D print, designed in Tinkercad. It comes in two parts- the thread and the shaft.



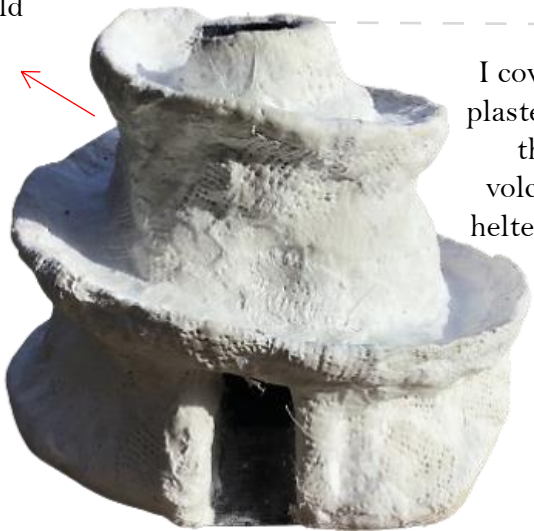


First, I designed and 3D printed the inverse auger mechanism.



Next, I cut a 6mm laser ply base, using the bandsaw. I then used a staple gun to attach some steel mesh in the rough shape I needed.

After waiting a few days for it to dry, I could set to work painting: two coats of white undercoat, two coats of black topcoat.



I covered the mesh frame in plaster bandage cloth to form the basic shape of the volcano, then added on the helter-skelter slide around it.

Finally, I painted on lava using yellow, red and gold acrylic paint, red glitter, and gloss varnish.

Now it was time to coat everything in PVA, and sprinkle on black volcanic sand that I collected myself from Lanzarote, to add a rough, volcanic rock texture.





# Obstacle designing- *Camels*



All first-hand photographs

*Being only 80 miles of the north coast of Africa, it is thought that camels were first brought to Lanzarote around 1400, tethered to the back of a conquest ship, floating all the way! They suited the harsh environment of Lanzarote perfectly, being able to eat thorny scrub and cacti, go 10 days without water, and having wide feet that would not sink into the sand. An adult camel could carry up to 450kg, meaning they were ideal for transporting people and goods, ploughing fields, delivering water, and even their fur could be sheared to make clothing. Nowadays camels are only used for tourism, however they remain an iconic symbol of Lanzarote, and play a large role in the island's history.*

## **Inspiration:**

The most obvious feature of a camel is their hump, used to store fat which can be broken down into water and nutrients when nourishment is scarce; the camels in Lanzarote are Dromedaries –meaning they only have one hump.

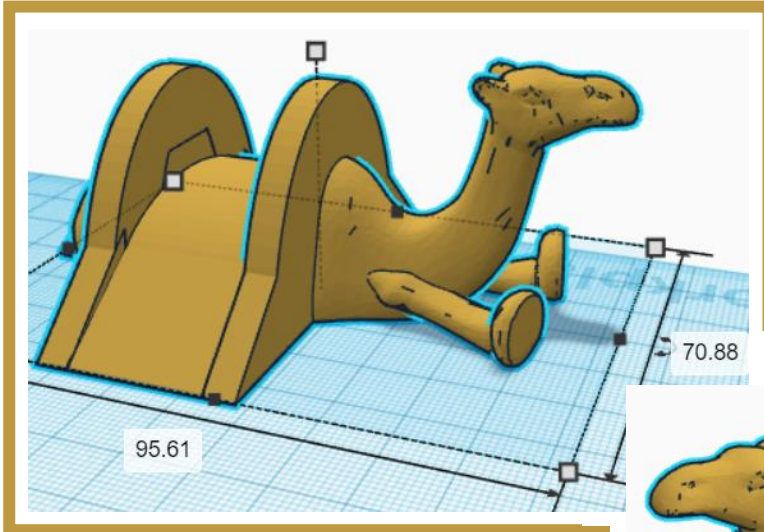
I plan to design and 3D print camels wearing saddles (similar to those in the pictures above) that go over the hump, acting as a bridge for the ball to travel over. I will use yellow-brown PLA to reflect the camel's fur colour, and will experiment with the "fuzzy edges" printer effect, to replicate their shaggy appearance.





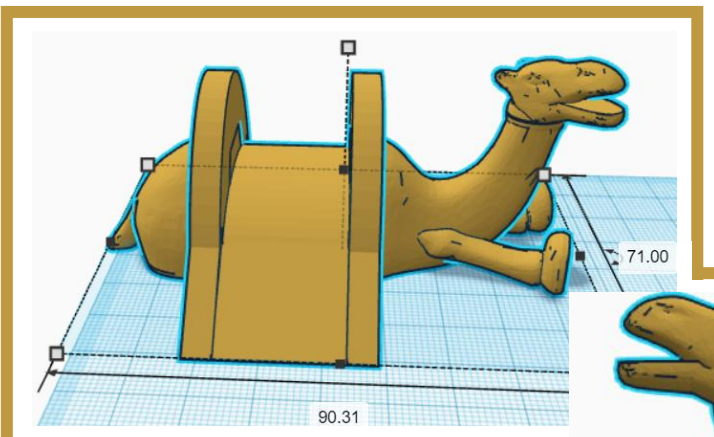
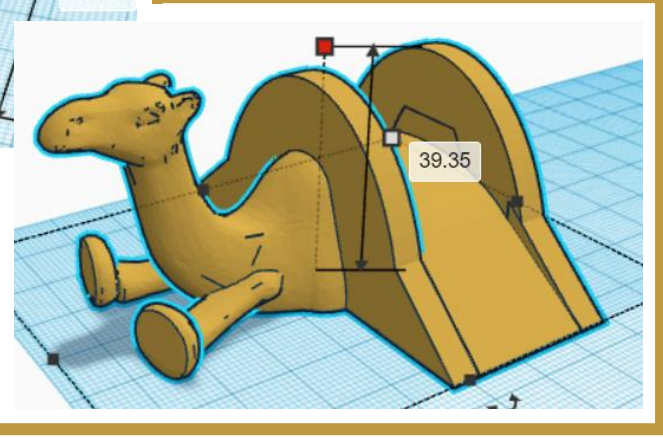
Before printing the real camels, I did a tiny test print to check that everything looked in proportion and to decide what supports would be needed. The main thing I learnt from this was that I needed to use supports for the neck and head, and also make the gradient of the hump less steep, so it was easier to hit the ball over.

I also tested using the “fuzzy edges” Cura setting to create a furry effect, but decided it didn’t quite suit a model of this scale.

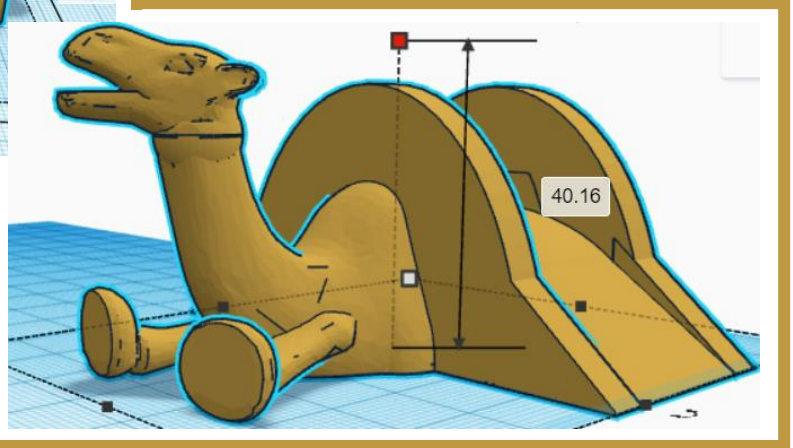


When designing the camels, I had to bear in mind that the slope on the saddle must not be too steep, or it would be too difficult to get the ball over it successfully.

I will print two of this camel design, which is my “standard”, compared to the variation below.



I will only print one of this camel; it is slightly different because it has its mouth open and head turned to one side, and will be facing the opposite way around on the course... This is going to be Saltina, the mischievous camel I rode!







I printed the final camels with an infill density of 20% to make sure that they would be strong when hit, but wouldn't take too long to print. I also used a tree support and brim to ensure suction on the plate was strong and that the model would not fall over, as each camel took 4 hours and 20 minutes to print, as well as time to paint two layers of undercoat and four coats of top coat (sandy-yellow for the bodies, and dark green for the saddles).





# Obstacle designing- *Windmill*



*El Molino de Tiagua (translating as “The windmill of Tiagua”) is a 19<sup>th</sup> century mill located in Tiagua, in the centre of Lanzarote. It is a two-story circular building with a conical roof, on a base walled with living stone (stone without mortar) taken from the surrounding volcanoes. It has stone and wooden, door frame and balcony features.*

*The blades rotate a toothed wheel inside, grinding wheat, rye, millet and other grains to make “gofio” –a kind of unsifted, roasted flour, traditionally used in baking or added to soups and stews in the Canary Islands.*

## **Inspiration:**

I plan to make a working miniature working model of El Molino de Tiagua, with blades that rotate on the front when a handle is turned at the back.

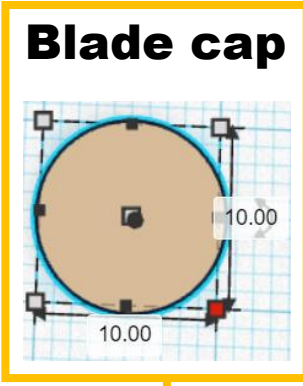
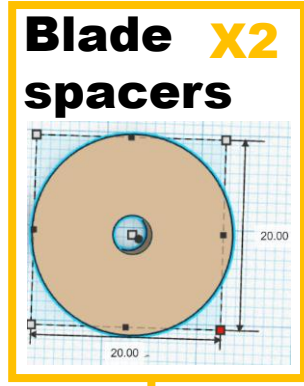
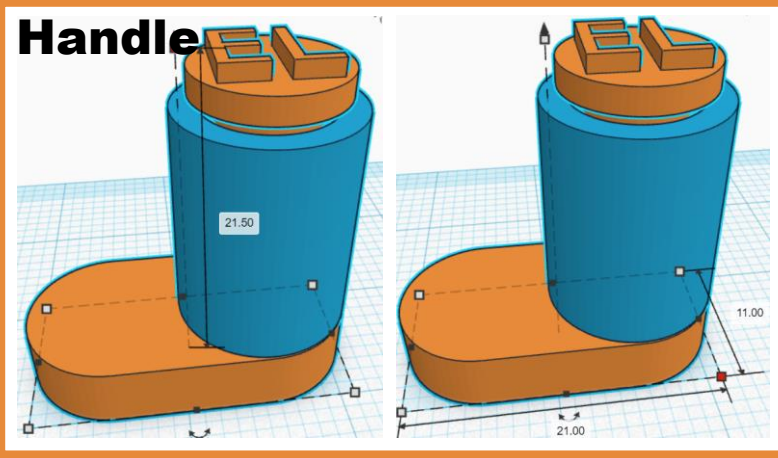
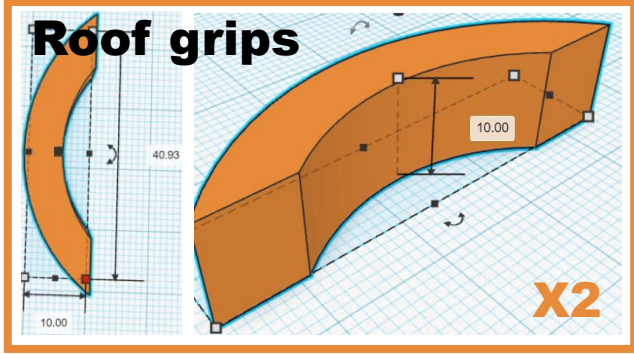
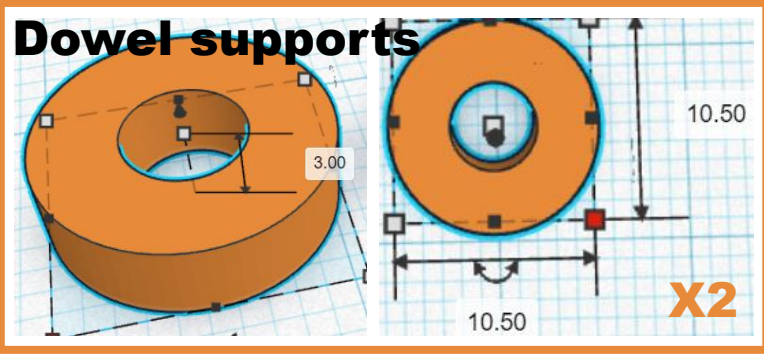
The player will hit the ball through the front entrance and out the other side, but they must try to avoid the rotating blades, which could block the ball’s entrance or knock it of course, making it more difficult.

I would like to use wood to make this model, and I will laser-cut the blades so I can more accurately achieve their detailed shapes.

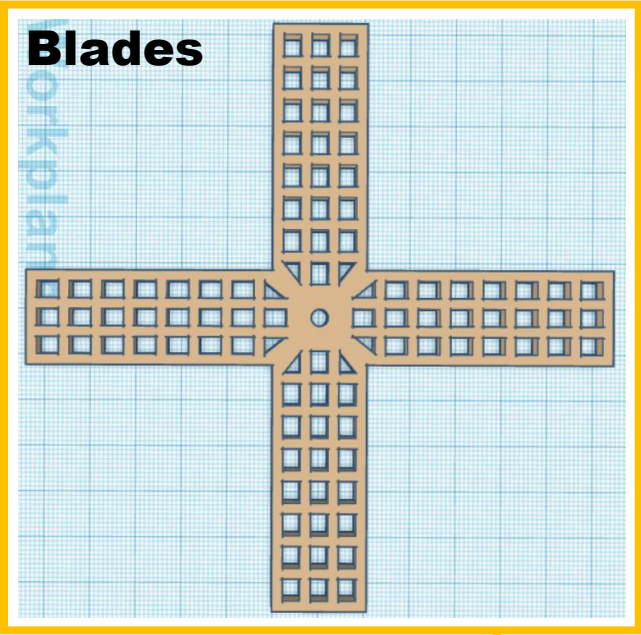
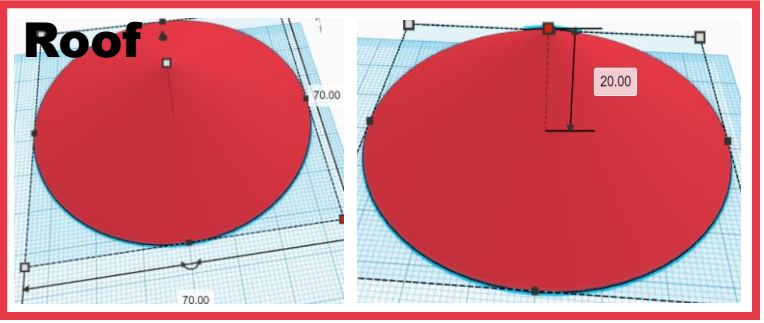
I will use two gears; a smaller one attached to the handle, and a larger one attached to the blades. This means that the blades and handle will turn in opposite directions, but also the blades will rotate more slowly than the rotating handle, to allow the ball time to go underneath. The strength of the blades’ rotation will also be increased so they are less likely to stop if hit by the ball (stepping down a gear decreases speed of rotation, but increases strength).



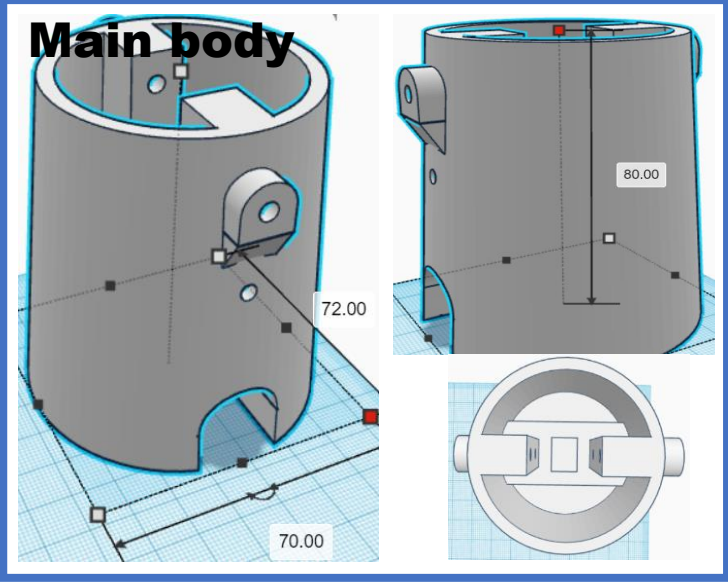
I originally planned on just have two gears in a stepping-down mechanism to reduce the speed of rotation of the blades, so that it wouldn't be too difficult to get the ball through. However, I decided that actually it would be better to have four gears: the original stepping-down mechanism, as well as two more gears to enable the handle to be higher up, therefore making it easier to turn, as it is not as near to the ground. Below is my 3D printable design for the body of the windmill, the handle, and also the laser-cut, rotating blades.



3mm laser ply



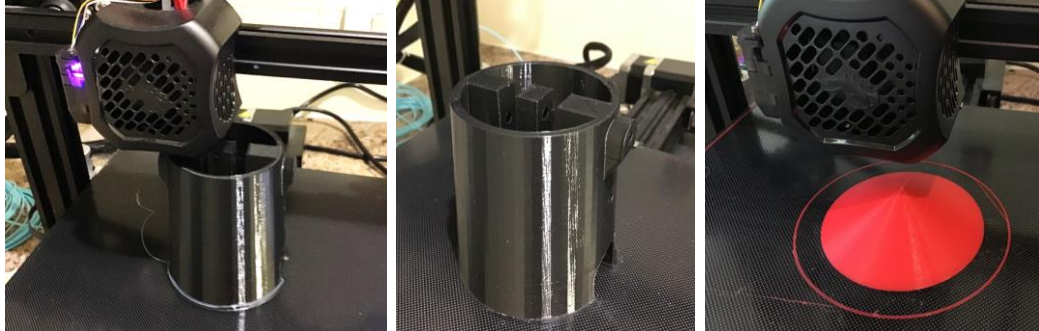
6mm laser ply



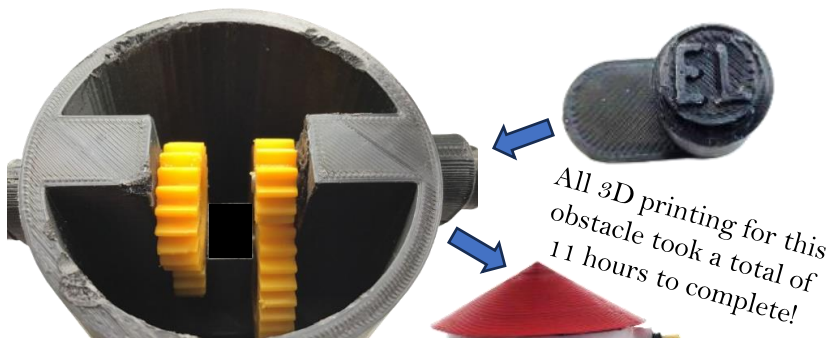
**[CLICK for mechanism testing video](#)**



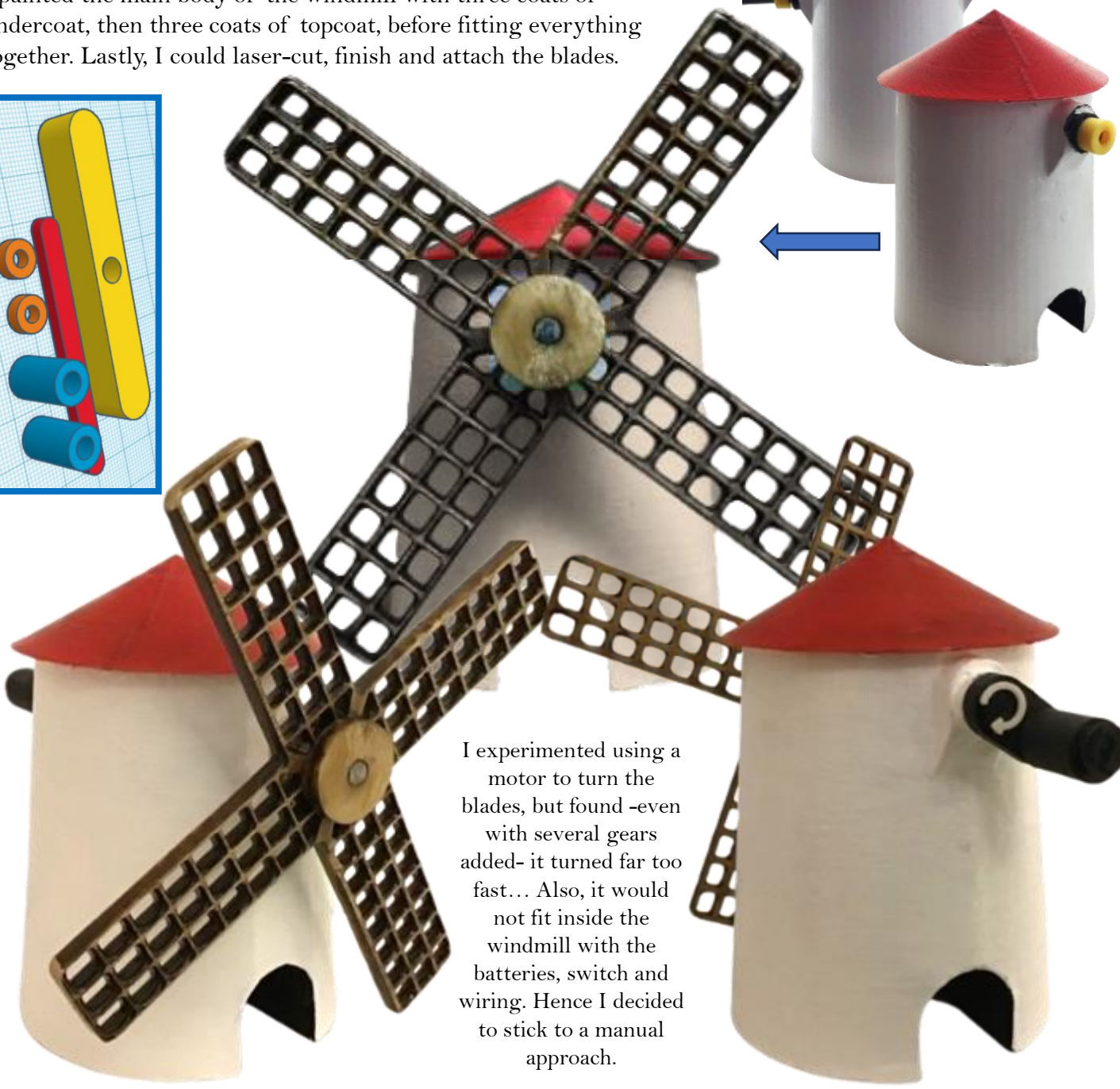
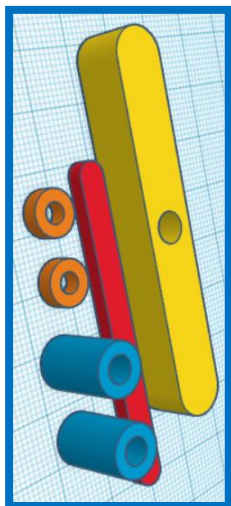
First, I 3D printed a frustrum (no supports, 1cm brim, and 20% infill) with a tunnel for the ball at the bottom, and holes inside where I could slot in the metal dowels and gears.



Next, I 3D printed a roof (in red) and two feet (black) to go underneath it, so that it could be easily removed from the model if I ever needed to access the gears inside. The last thing I designed and printed was a print-in-place handle to turn the smallest gear.



I painted the main body of the windmill with three coats of undercoat, then three coats of topcoat, before fitting everything together. Lastly, I could laser-cut, finish and attach the blades.



I experimented using a motor to turn the blades, but found -even with several gears added- it turned far too fast... Also, it would not fit inside the windmill with the batteries, switch and wiring. Hence I decided to stick to a manual approach.



# Obstacle designing- *Las Grietas*



*The unusual rock formation “Las Grietas” (translating literally as “the cracks”) formed as a result of intense volcanic activity on the island millions of years ago, which left behind numerous caves and tunnels such as these. Some parts of the network of channels are filled in with shallow seawater, fed by an underground river straight from the sea, but most of it is completely dry underfoot.*

## **Inspiration:**

In my opinion, the most interesting feature of this fascinating natural landform is the obvious stratification. The stratas consist of layers of solidified lava and ash, formed during the historic volcanic eruptions on the island.

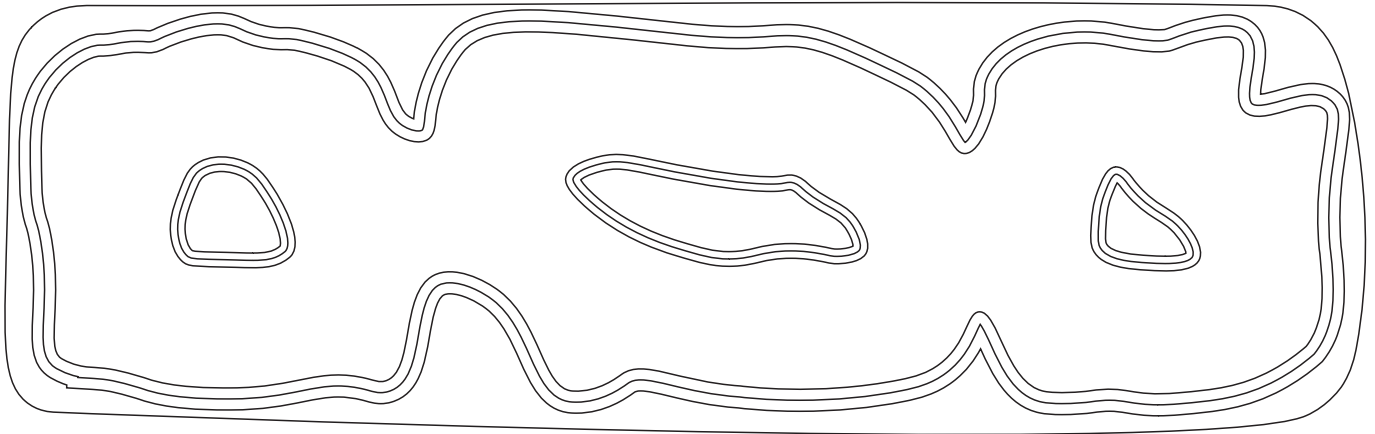
I plan to laser-cut a series of recessed channels, along which the player must hit the ball. I will layer laser ply cut to slightly different dimensions, in order to create the wobbly in-out rock strata effect.

I will have to make sure the channels are not too deep, or it will be too difficult to hit the ball- they just need to be deep enough to show they are representing the Las Grietas canyons. I will make multiple channels, therefore enabling the user to choose which way they want to hit their ball.

I could also cover the laser ply in sand I collected in Lanzarote, to give the model a more rocky appearance and texture, however this may cover up the strata effect I am trying to create by layering the shaped laser ply, so may not be suitable. I will have to test this out.



I initially made 3 potential layouts for the canyons, but decided to go for the one in the middle because I felt it looked most realistic and wouldn't be too difficult to design and produce. Below is my final design to laser-cut (from a bird's-eye view so that the stratas I aim to create are clearly visible).



The canyons are a relatively simple obstacle. I used adobe illustrator to draw the different layers to laser-cut into 3mm laser ply. I then staggered them in the pattern 'large, medium, small, medium' and finished them with varnish, before sticking them onto the hole.





# Obstacle designing- *Drawbridge*



*“Puente de las Bolas” translates literally as “Bridge of the Balls”- named after the two spherical balls on top of the central pillars that support the drawbridge chains. However, it is also thought that this name could have come from the fact the bridge was used to help defend against the pirates, who used cannonballs. It was built in the 16<sup>th</sup> century and spans 175m*

*between the coast of Arrecife and El Castillo de San Gabriel, a small wooden fortress built out to sea to help Lanzarote defend against continual pirate attacks.*

## **Inspiration:**

This historic stone landmark is an important place of interest in Lanzarote, and definitely worthy of its own hole on my crazy golf course. I will make the base out of Pine wood –this means it will be robust but not too heavy- and will decorate it with grey-brown clay tiles, similar to my El Castillo de Las Colorades obstacle design; this will create the rugged stone effect. I will make sure I include the two decorative feature arches either side of the drawbridge to make it a more accurate representation.

I will laser-cut the drawbridge, because it needs to be thinner than the rest of the structure, so normal wood will not be suitable. It will be connected to the two supporting pillars on top of the bridge by string.

For the player to complete this obstacle, they will have to knock down the drawbridge by hitting it with the ball and travel across to the other side, and down a wedge-like wooden slide into the finishing hole.



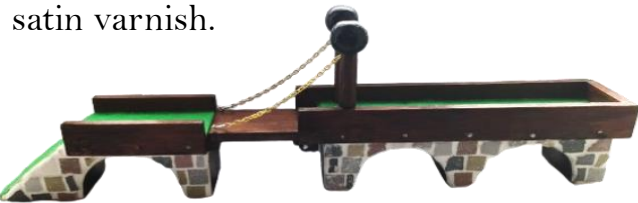
My first step was to cut the wood into two cuboids, then mark out and cut the arches using the band saw.

Next, I paused to varnish some wood for the sides, and while it was drying, lined the top of the bridge with green baize. I also had to paint the underside of the arches.

Now I attached the sides of the bridge with small nails, because I thought they looked more in-scale with the model than screws.

At last I could start tiling, and once the grouting had dried, I treated it with two layers of matt varnish to seal in the tiles.

Finally, I inserted the metal dowel and drawbridge, then glued on the posts and attached the chains to support the drawbridge. Once that had all set, I added the two black balls on top that I had made earlier, by coating some wooden beads with layers of undercoats and topcoats and a satin varnish.



**[CLICK for mechanism testing video](#)**



# Obstacle designing- *Caves*



All first-hand photographs

*I visited 2 caves in Lanzarote: Cueva de Los Verdes (Cave of the Greens) and Jameos del Agua. Cueva de Los Verdes ( “Los Verdes” were traditionally the family that owned the cave) was formed 5000 years ago due to the eruption of the La Corona volcano, creating a series of underground volcanic tunnels –some of the longest in the world. It is full of stalagmites and stalactites, and some areas are flooded with water –including the “bottomless cave”. Jameos del Agua was formed at the same time, and is most famously known for its unique, native blind crabs found nowhere else in the world. Cave wall colourings are all natural in both caves.*

## **Inspiration:**

I plan to make several caves using plaster moulding ribbon. I have never used this material before so it will require a bit of practice, but I think this material will allow me to make a suitably strong and durable shape that would be otherwise difficult to make. I could use air drying clay, but this would be liable to cracking when hit with by the golf clubs, so it would not be very practical.

I will make some of the caves with multiple entrances/exits to allow the player to choose which path they take to get to the hole.





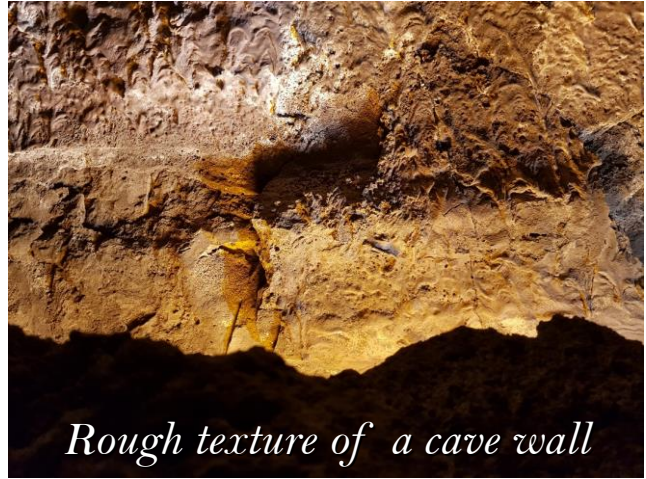
*Pool of tiny blind crabs*



*Pool in Jameos del Agua*

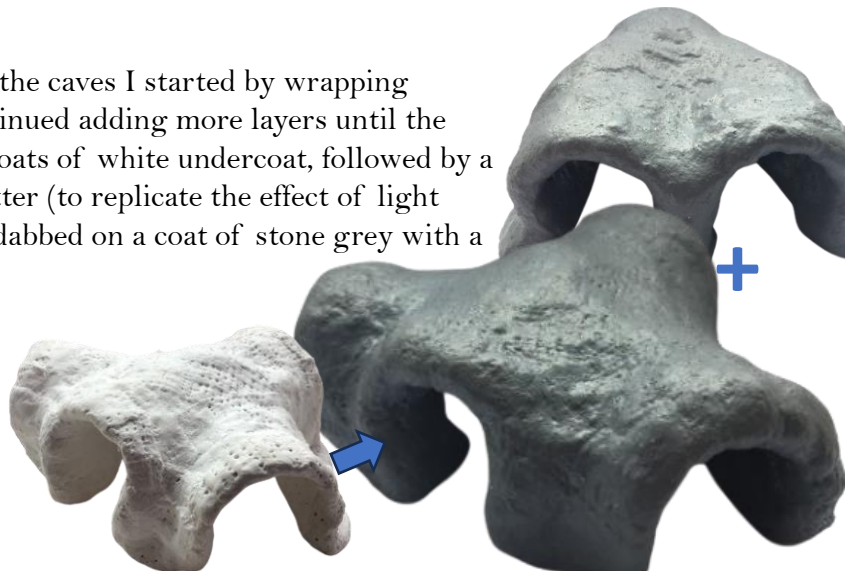


*Naturally formed lava channel*



*Rough texture of a cave wall*

To form the complex and rounded shapes of the caves I started by wrapping plaster bandage cloth around glue lids. I continued adding more layers until the two structures were rigid, then applied two coats of white undercoat, followed by a coat of hand-mixed blue-grey with silver glitter (to replicate the effect of light reflecting off of the walls). Finally, I lightly dabbed on a coat of stone grey with a sponge, so that the layer below would still show through slightly, to give the caves a bluish, slightly glittery tinge.





# Obstacle designing- *Ports*



Lanzarote has several ports including: Puerto del Carmen, Playa Blanca harbour, Marina

Rubicon, and Puerto Calero, but the largest and most historic is Arrecife, a natural port near the centre of the island. They were mainly used for trading with other islands in the Canaries.

## **Inspiration:**

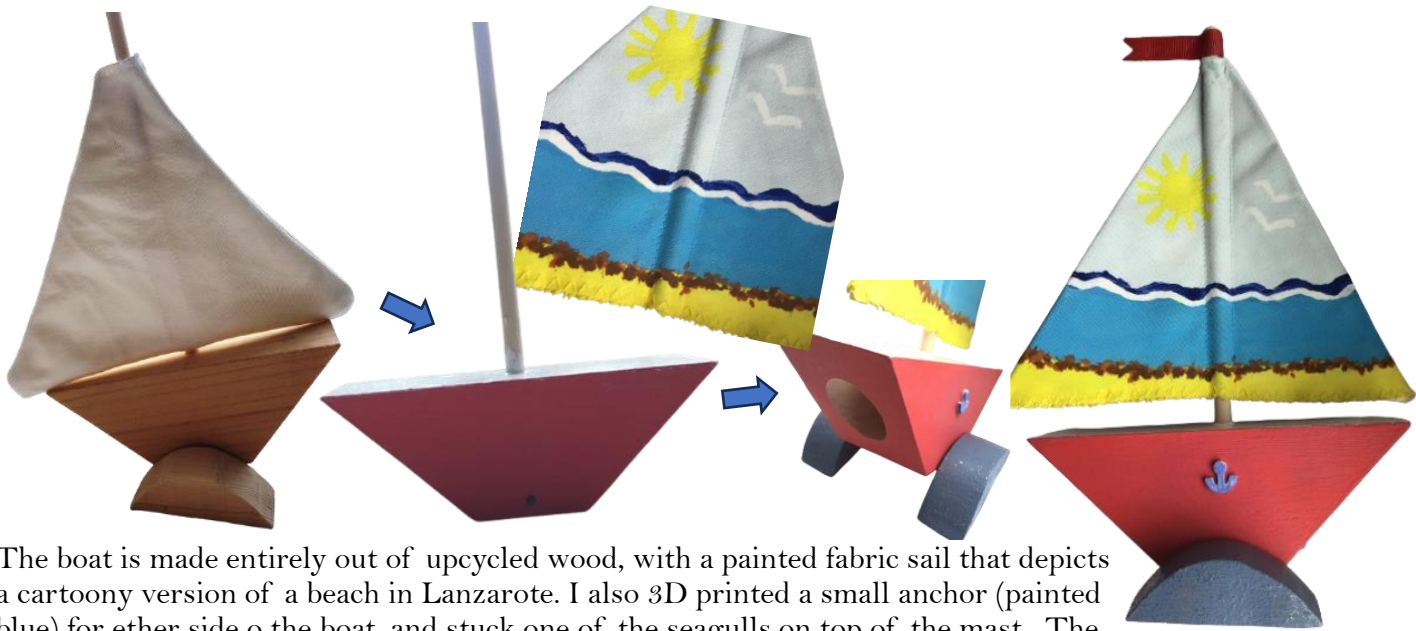
I will make this obstacle inspired by the sailing boats at the ports, which are known for their vibrant colours.

The hull of the boat will be wooden, with a horizontal hole all the way through it so the ball can be hit through, and out the other side. I will make a fabric sail, attached to a wooden dowl as the mast. The whole structure will be fixed with a pivot to supports either side, so that when the ball is hit through the boat, it rocks from one side to the other, as the ball comes out the other end.

See my working mechanism video for a demonstration.







The boat is made entirely out of upcycled wood, with a painted fabric sail that depicts a cartoony version of a beach in Lanzarote. I also 3D printed a small anchor (painted blue) for either side of the boat, and stuck one of the seagulls on top of the mast. The silver glitter on the supports that suspend the boat off of the ground (so it can rock) mimic the idea of sunlight reflecting off of the sea. The hardest part about this obstacle was managing to drill a straight hole through the middle of the boat, and sanding it to make it smooth inside!

[\*\*CLICK for mechanism testing video\*\*](#)



# Obstacle designing- *Cactus gardens*



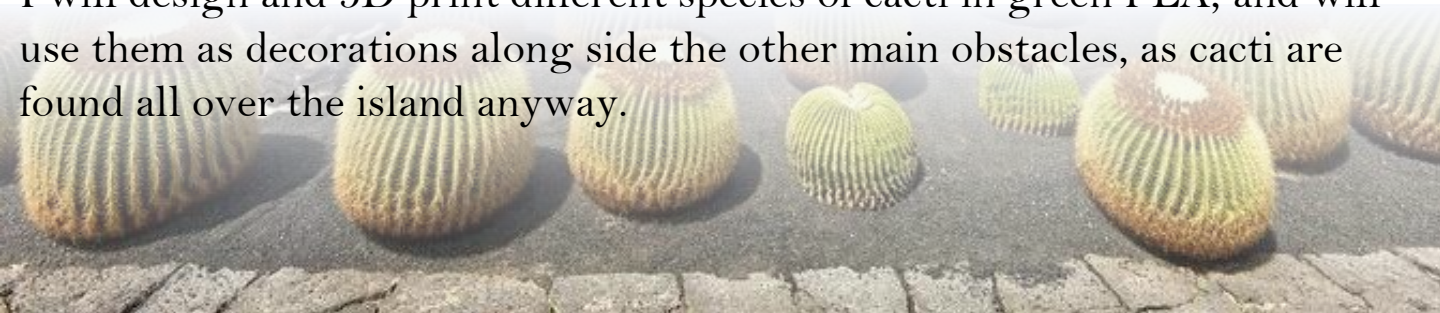
All first-hand photographs

*The Lanzarote cactus garden contains over 500 different species of cactus, and it is located in the abandoned volcanic basalt quarry (basalt is used in many traditional buildings in Lanzarote). The gardens were designed by the passionate architect César Manrique to showcase as many species as possible of the island's most iconic plant.*

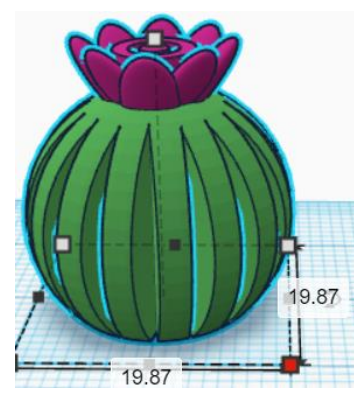
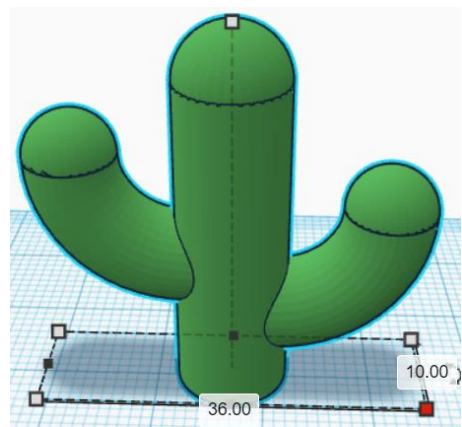
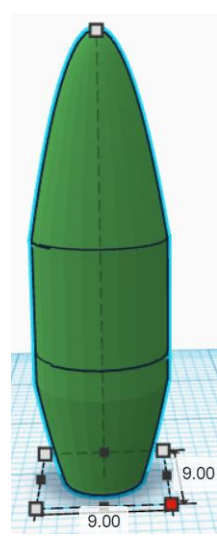
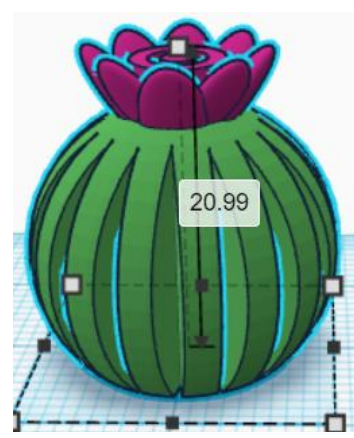
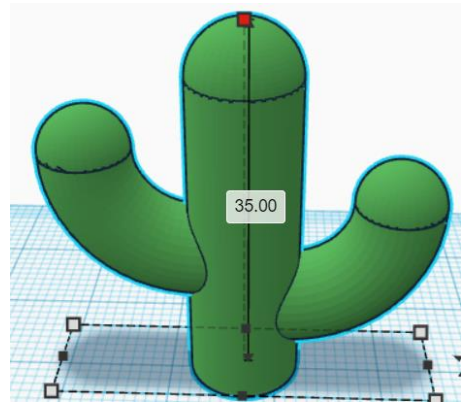
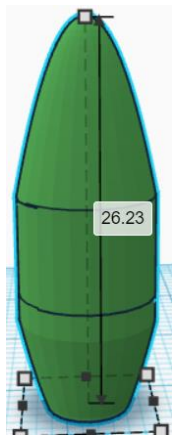
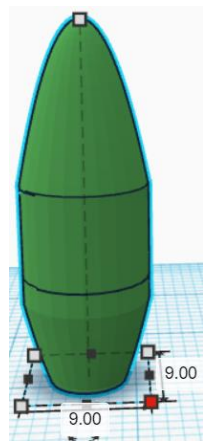
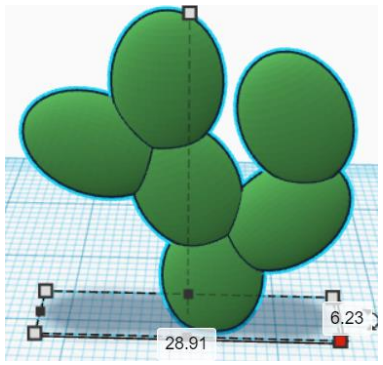
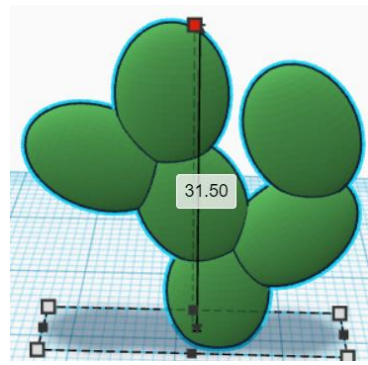
## **Inspiration:**

In my opinion, the cacti alone do not provide enough interest to be an obstacle on their own, but I think they would be much better as decorations to intermingle with other holes, similar to the Playa Blanca houses.

I will design and 3D print different species of cacti in green PLA, and will use them as decorations along side the other main obstacles, as cacti are found all over the island anyway.







I designed 5 different cacti: Prickly Pear, Columnar Cactus (small), Saguaro Cactus, Barrel Cactus, Columnar Cactus (large).

I made 5 different cacti inspired by those I saw in Lanzarote. Each took 20-40 minutes to print, and I printed 4 of each. However, some took more practice and tweaking to get right than others, for example the Barrel cacti (round with a flower on top) had to be printed at 50% speed with fan speed 250 in order to achieve the tidy folds in the stem, while the columnar cacti (tall and thin) had to be printed at 200% speed because they were so tall and round, to make sure the print wasn't all wobbly. The prickly pears (lots of different rounded segments) needed a support and brim system, and the saguaro cacti ('classic' cactus) needed two supports on either side, but no brim.





# Obstacle designing- *Fauna*

Among the main obstacles (eg Timanfaya) there will be small obstacles sticking out with small, decorative plants and animals native to Lanzarote, in order to make the course more challenging to complete. Bellow I have researched and presented my ideas on how I could make some of these animals.

*All first-hand photographs*



## Lizards:

Being cold-blooded, lizards can often be found basking in the intense heat. They can like to rest on the rocks –or up cacti- by the sea.

I will design and 3D print these lizards in green PLA, to make them more authentic.



## Crabs:

“Moorish crabs” are found around Puerto del Carmen, a port in SE Lanzarote. They are known for their vibrant red legs and darker bodies.

I will design and 3D print these crabs using dark red PLA, specifically to use in the ‘dolphin’ and ‘port’ holes.



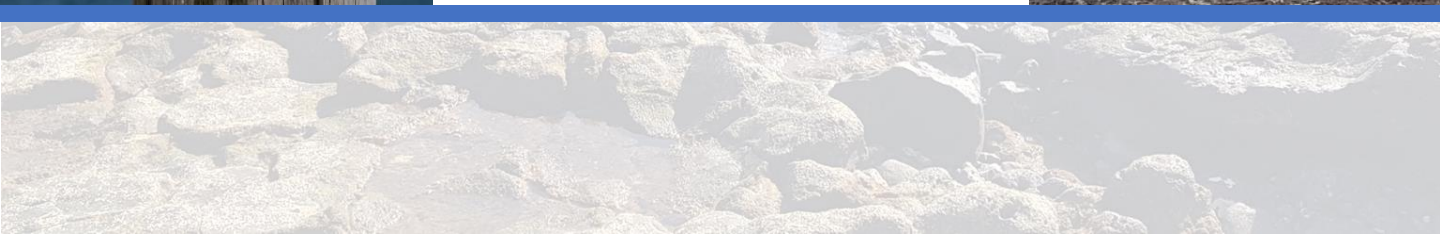
*All first-hand photographs*



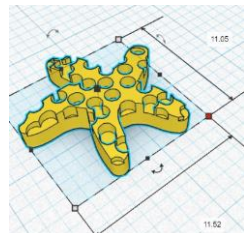
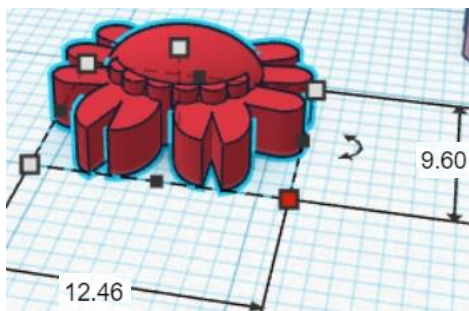
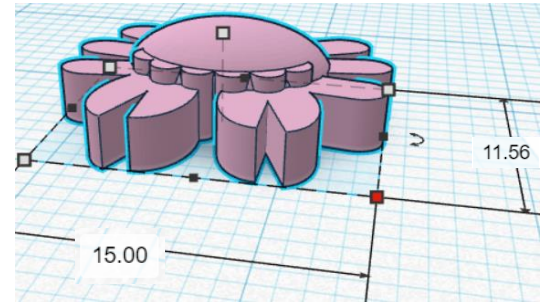
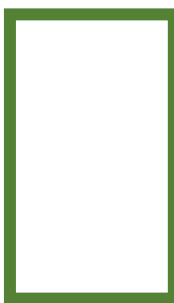
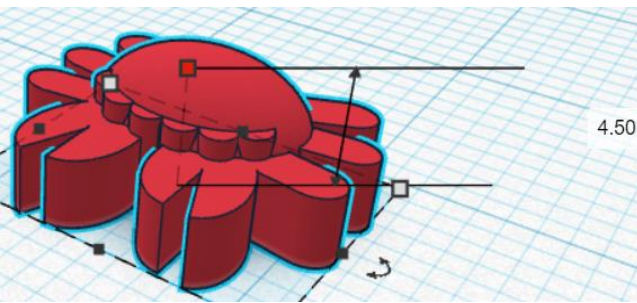
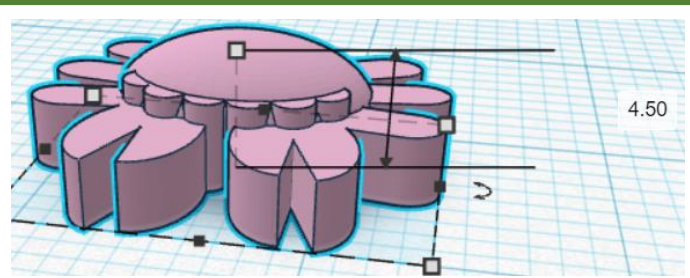
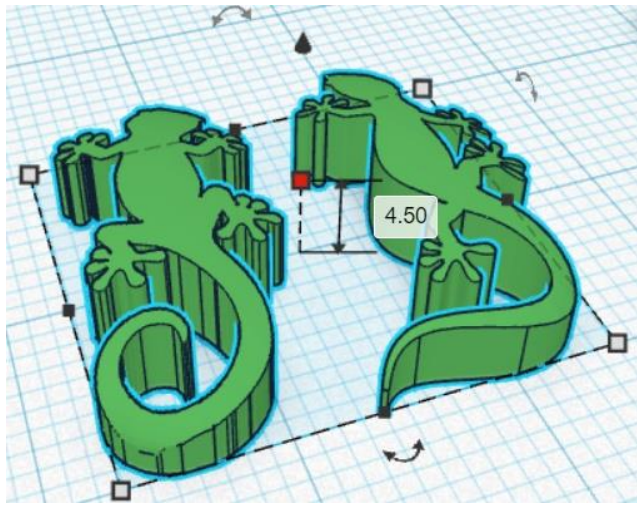
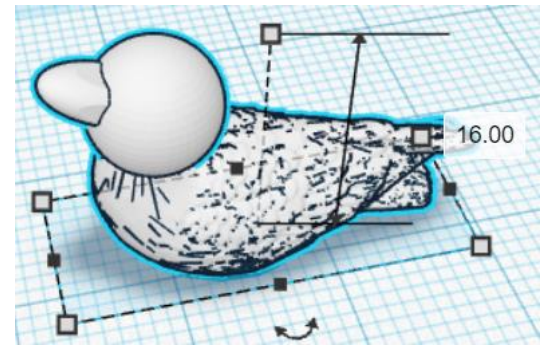
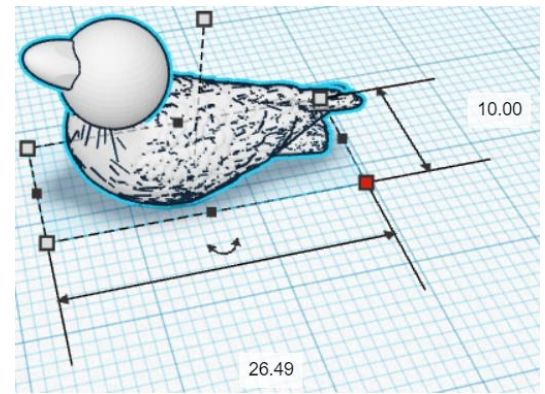
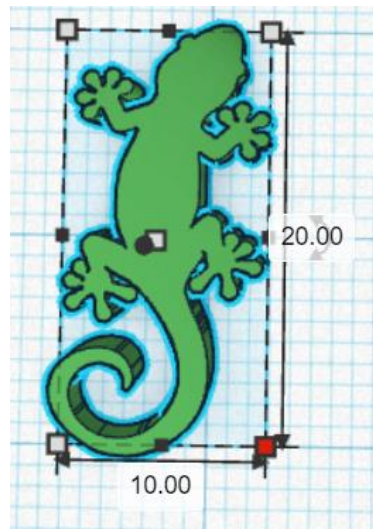
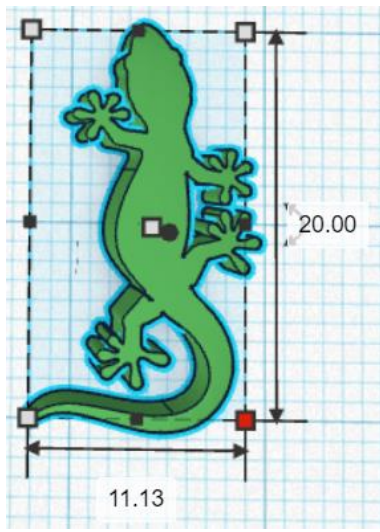
## Seagulls:

Lanzarote is the perfect place for seagulls, with plenty of fish in the surrounding sea, and the gentle breeze and sunny weather.

I will design and 3D print these in white PLA, so that I can paint on grey wings and a yellow beak.







I have designed these colourful, 3D-printable animals to use in decorating my crazy golf course: A "Moorish Crab" (a larger one in red and a smaller one in pink), two different green lizards, and some seagulls. When I print the lizards in bright green PLA, I will paint on dark green stripes and black eyes do add more detail. I will also paint on eyes for the crabs, printed in red and pink PLA. I will print the seagulls in white PLA, but paint on a yellow beak, grey wings, and black eyes.



I really enjoyed designing, printing and decorating all of the animals... although some were easier than others! The lizards were originally far too big and liney, so I had to use the Cura "ironing" setting to reduce this, as well as scale them down. It also took a while to find the correct shade of green to make them contrast against the rocks, but also so that they didn't look too ridiculous!



I also decided to print some small starfish with a rough, textured finish (painted yellow) and some small flowers, to dot around the place. I chose yellow because it is not a colour I have used much of so far., although did experiment with a bright pink, which I thought was too unnatural.

For the crabs, I used two different colours and two different sizes, to make a more interesting variety. These were the easiest of all the animals to design and get right, as they are really only a 2D outline of the legs and pincers with a dome on top, onto which the eyes were drawn with a permanent pen. At one point I tried exaggerating the eyes with a darker pink paint behind them, but I did not decided to continue with this idea.

*I also used one of these seagulls on top of the boat!*



The seagulls also took a lot of practice and refinement to get right- first I couldn't get their heads to print, then their beaks, then they were too small... But, eventually I came up with an accurate design to print several of, for decorating the golf course. I painted them using dark grey and yellow acrylic paints.



*9 test prints before making the final seagulls!*



# Obstacle designing- *Playa Blanca*

First-hand photograph



*When Tymanfaya erupted in 1730, many villages were destroyed and their inhabitants forced to move away from the area, towards the coast. Playa Blanca developed as a small finishing town, which grew in size until the first tourists visited the area in 1970. Since then, the coastal community has grown to accommodate a higher level of tourism... now it is the island's 3<sup>rd</sup> most important tourist resort.*

## **Inspiration:**

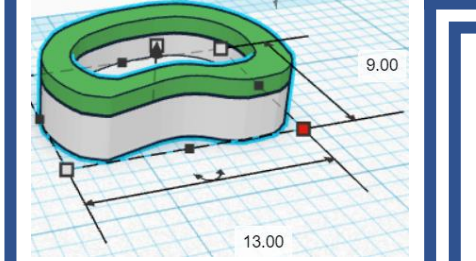
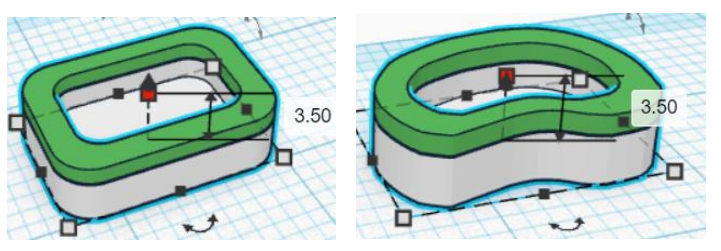
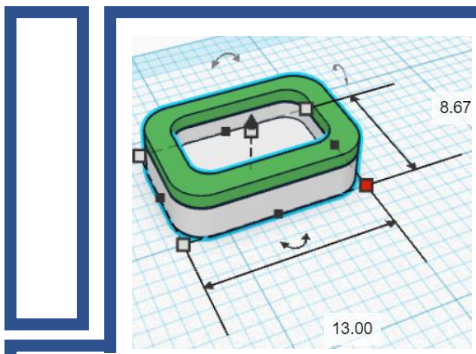
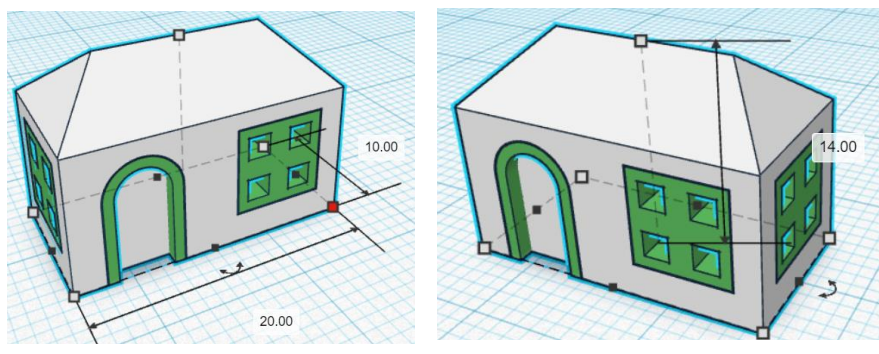
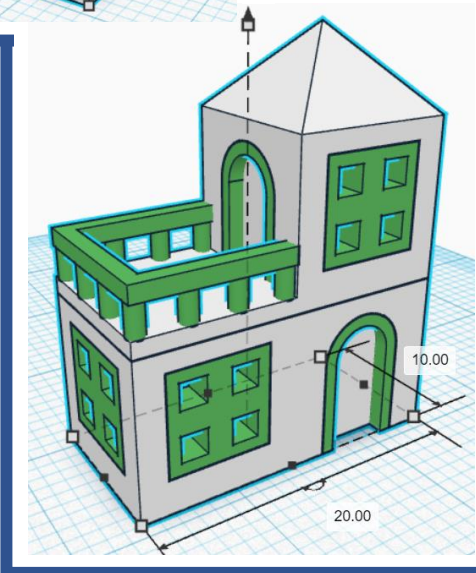
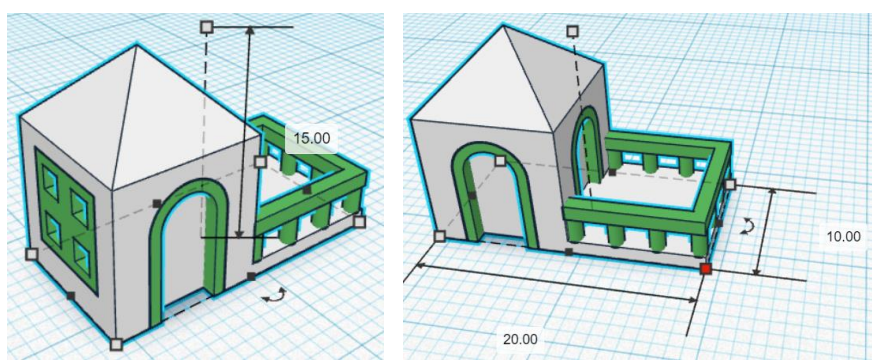
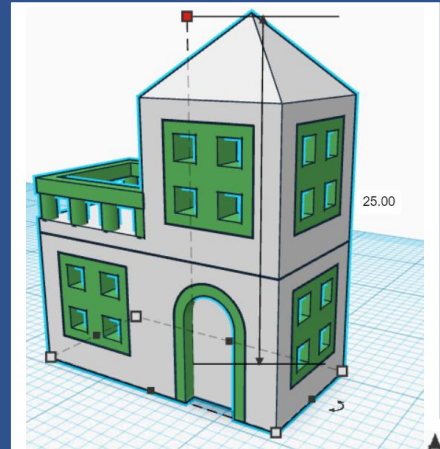
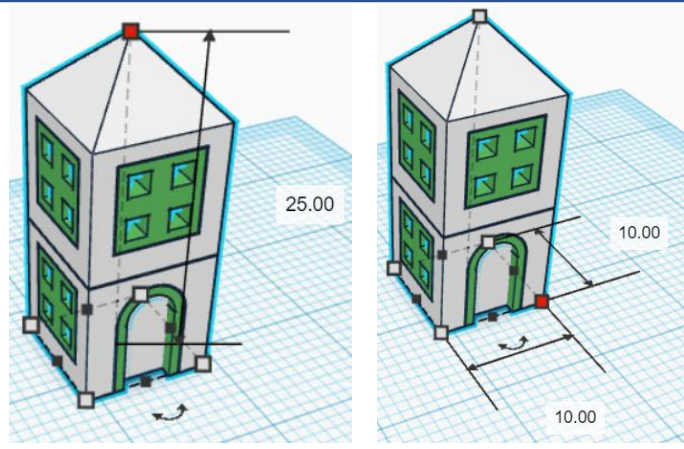
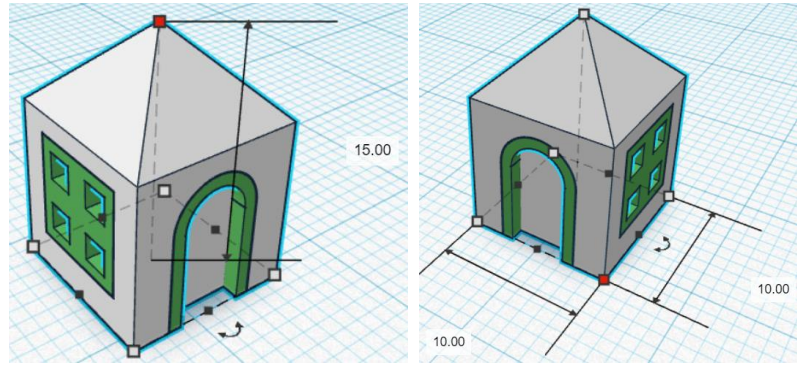
The architecture throughout Lanzarote is particularly unique and spectacular to look at, because of how beautifully colour-coordinated, tidy and organised it is! When I visited, I observed that this was particularly true for Playa Blanca, a sunny coastal village in the south of Lanzarote. I found it particularly amazing to look down upon the area from the top of the volcano Montana Roja, and see the rows of perfectly-white houses.

I have decided that Playa Blanca will not be designated a hole on my crazy golf course, as it is not so much of a landmark as a place. Instead I will combine it with the other landmarks in Lanzarote and spread it out across multiple holes, so it looks like the houses are spread all across the island.

I will design and 3D print miniature Playa Blanca-inspired houses, all white with green features. A lot of the buildings had balconies and private pools, so I will also attempt to make these.



I designed 5 different Lanzarote-inspired houses and 2 to-scale miniature pools to 3D print with dual-filament (in green and white). I will use resin dyed blue for the water in the pools.





# Lanzarote Crazy Golf: In The Making!



Before printing the final houses on the dual-filament printer, I tested my initial design in just white filament. One observation I made was that the 1mm overhanging roofs were not practical and looked messy without printing supports, which uses more filament and takes longer. I also thought the houses would look more authentic with balconies, so I adapted my design accordingly.

These are my final Playa Blanca 3d printed houses, done in dual filament to reflect the white and green of the traditional Lanzarote buildings. I plan to use them to decorate around the flat upper surfaces of the canyons.



# Golf Putter Designing



Golf clubs come in a range of different shapes and sizes, but for crazy golf, they tend to come with only one type of foot; the putter. In all the examples above, they have a metal handle and foot, although the foot is covered in a soft plastic or rubber casing to make them less hard, so they are less likely to be dangerous for young children.

For my golf clubs I plan to use a 1cm dowel for the handle, and will experiment with 2 different methods of making the foot: Pewter casting and 3D printing.

## Pewter:

I designed and laser-cut 2 moulds into which I poured the Pewter, one with a funnel lower down than the other, to see which method worked best.

Unfortunately I could only get one out of the mould, which I finished by filing down.

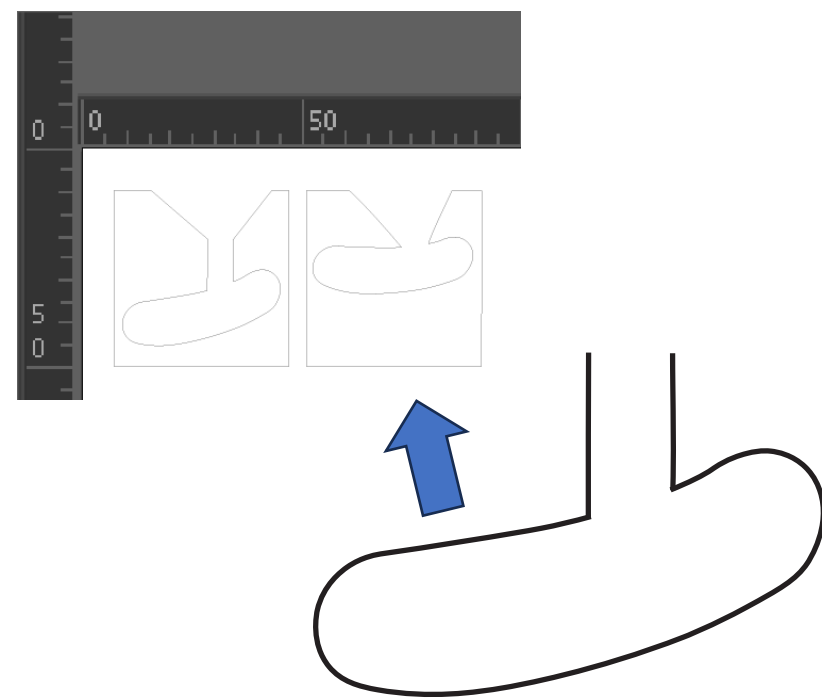
## 3D print:

I experimented with 2 different infill densities: 0% and 20%. Making the infill density setting too high would result in the foot being heavier and would also use more PLA, and also a lower infill could make it more light and bouncy when the ball hits it.



# Pewter Casting

The problem with this method was that the Pewter was very heavy, and so it would be easy to damage obstacles on the course by accident, when hitting the ball. Also, it would be difficult to attach securely to the end of the handle.

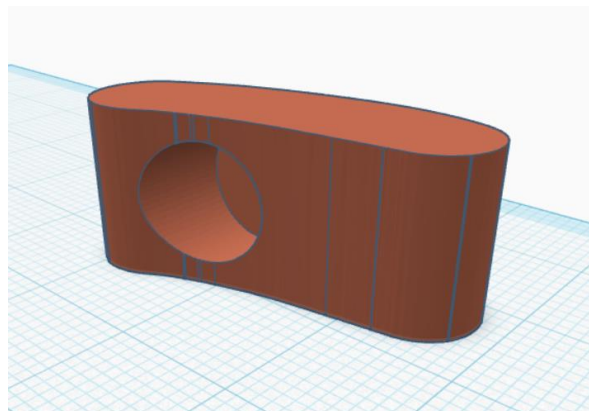


*Pewter casting at school*

---

# 3D Printing

What I liked about this method was that the result was lighter weight so less likely do cause damage to obstacles, and it could easily be adjusted to fit the handle. Also, I could make each foot a different colour for each of the four players, an extra “fun-factor” of the game.



Therefore, I will 3D print the golf club feet in four different colours: red, yellow, blue and green.



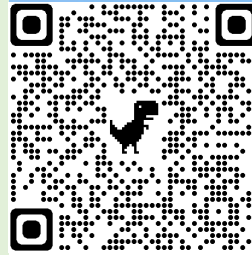
# Score cards

**CRAZEY GOLF SCORE CARD**

HOLE 1		HOLE 6	
HOLE 2		HOLE 7	
HOLE 3		HOLE 8	
HOLE 4		HOLE 9	
HOLE 5		TOTAL	

**CRAZEY GOLF SCORE CARD**

HOLE 1		HOLE 6	
HOLE 2		HOLE 7	
HOLE 3		HOLE 8	
HOLE 4		HOLE 9	
HOLE 5		TOTAL	



**SCAN TO  
DOWNLOAD!**

**CRAZEY GOLF SCORE CARD**

HOLE 1		HOLE 6	
HOLE 2		HOLE 7	
HOLE 3		HOLE 8	
HOLE 4		HOLE 9	
HOLE 5		TOTAL	

**CRAZEY GOLF SCORE CARD**

HOLE 1		HOLE 6	
HOLE 2		HOLE 7	
HOLE 3		HOLE 8	
HOLE 4		HOLE 9	
HOLE 5		TOTAL	

Because I am making a 4-player minigolf, I have designed 4 different score cards so players can distinguish them apart easily. The photos behind the boxes for the scores are first-hand photos of sites in Lanzarote, which are represented in my crazy golf as themed obstacles.

The photos are as follows, from left to right:

- Timanfaya National Park (the main volcanoes on Lanzarote)
- Playa Blanca beach
- Playa Blanca town (taken from the top of Montana Roja)
- Cueva de los Verdes (a natural cave)

I made a scannable QR code that leads to a downloadable file containing copies of the score cards to print off when more are needed.



# Spanish Tile Patterns

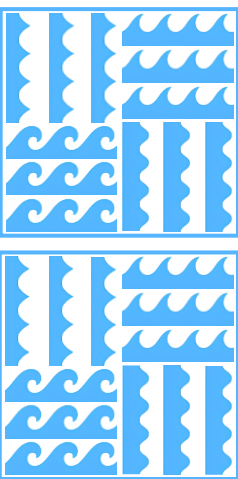
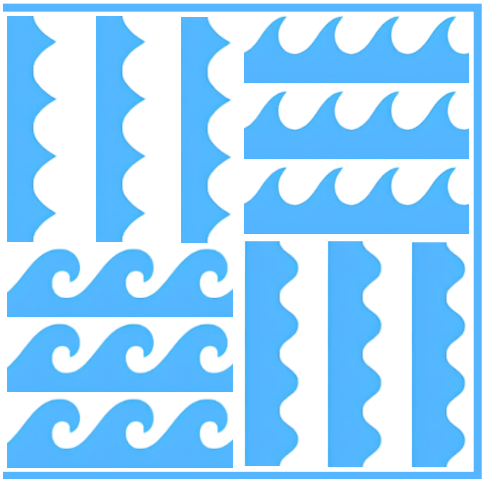
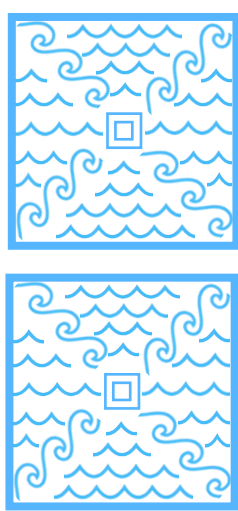
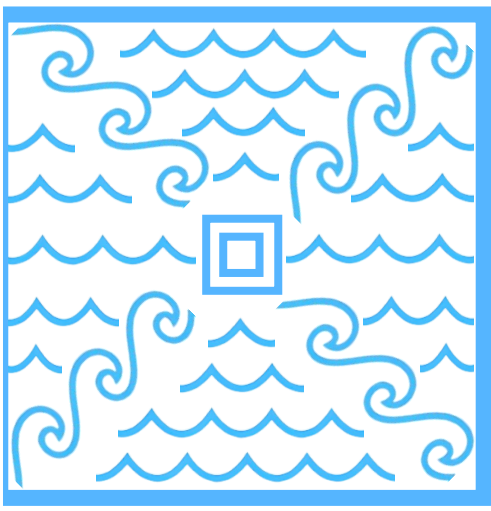
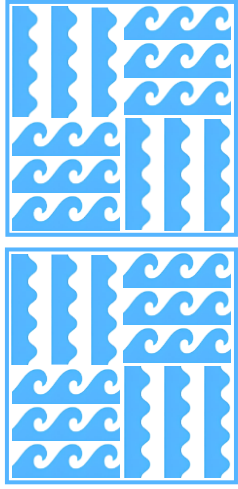
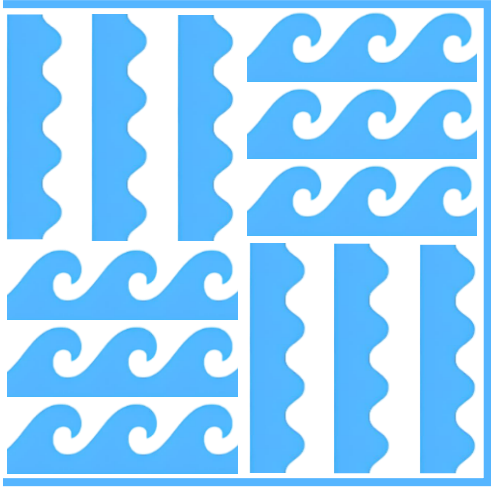
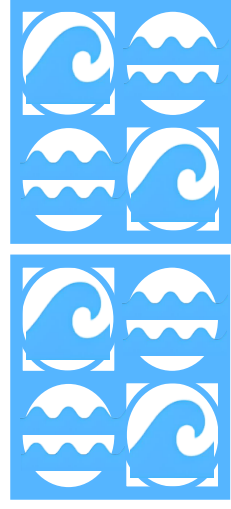
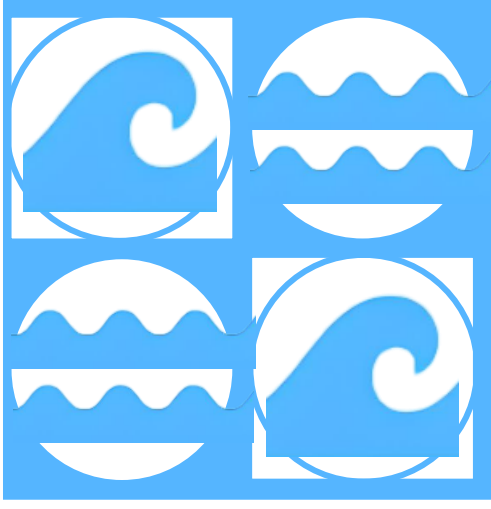
Spanish tiles are traditionally ceramic and use entirely vibrant natural pigments, in repetitive, concentric patterns. They are hand-made and painted, and many of the intricate designs are inspired by nature.

I will design and make my own Spanish, waves-inspired tile design to print around the edge of my fabric mat, to give it a more authentic Lanzarote feel.

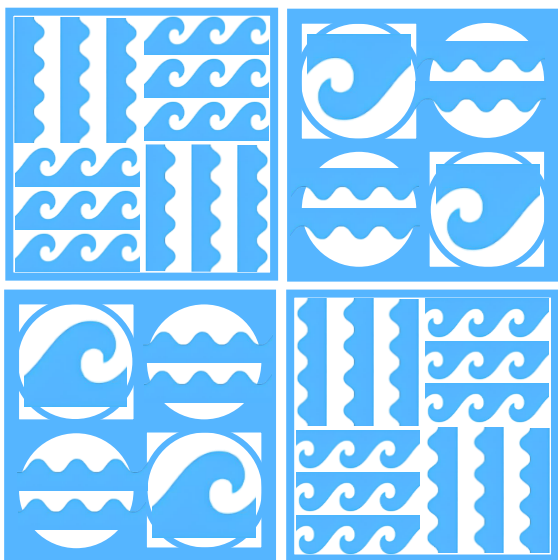
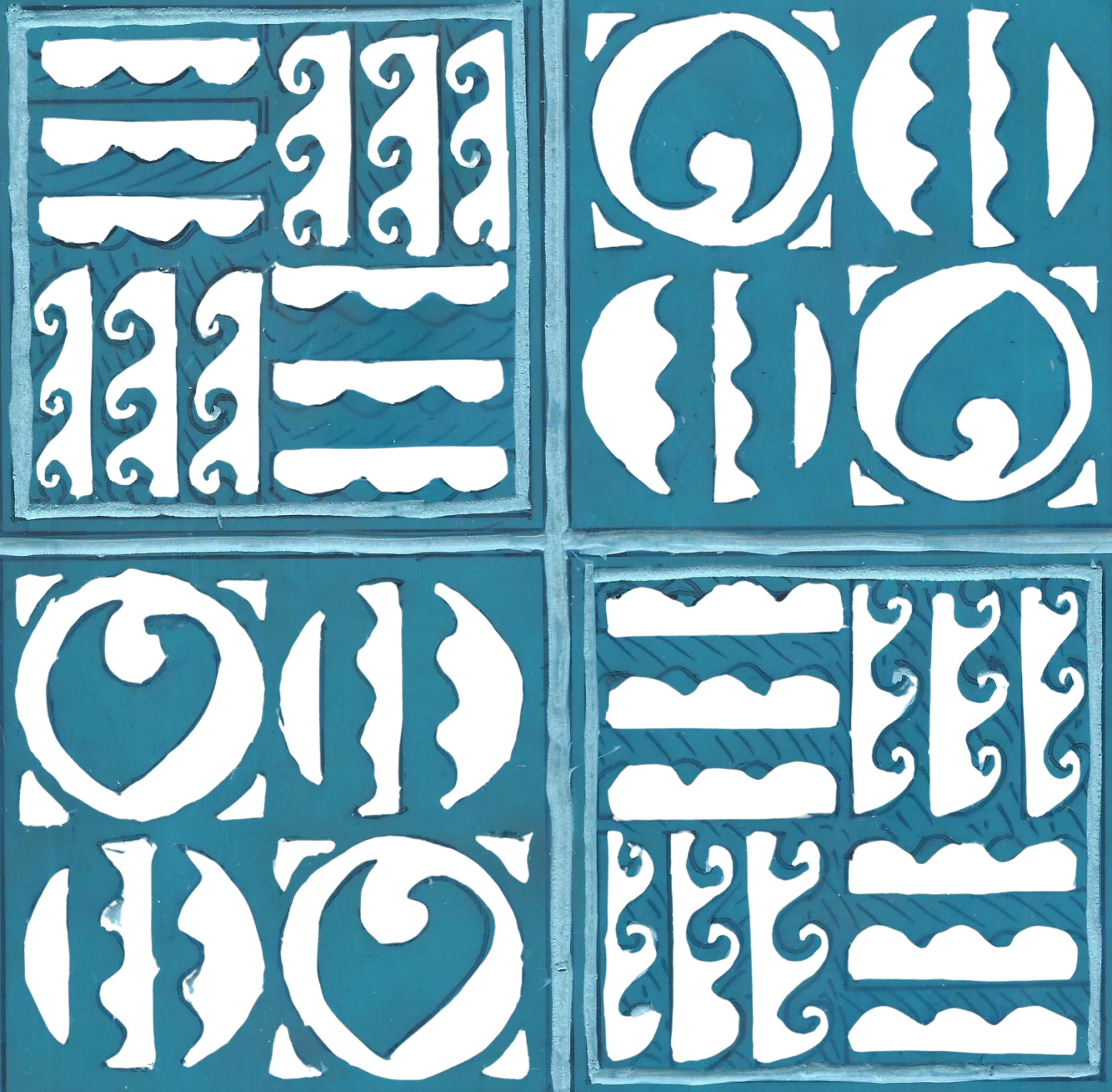




Tile designing  
inspired by  
waves...





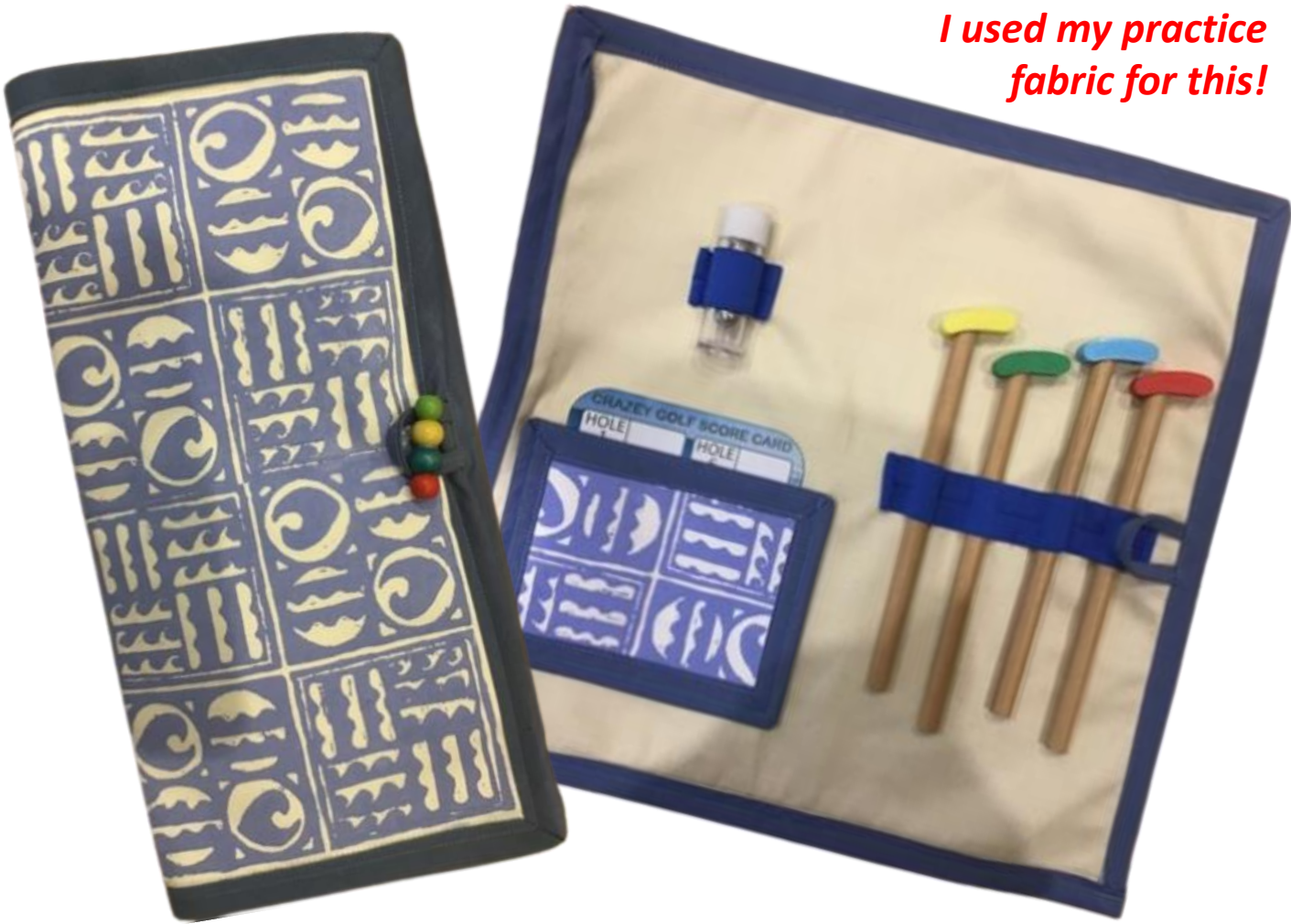


I drew out my chosen design on the lino, before carving it out and doing some test prints with blue acrylic lino paint.



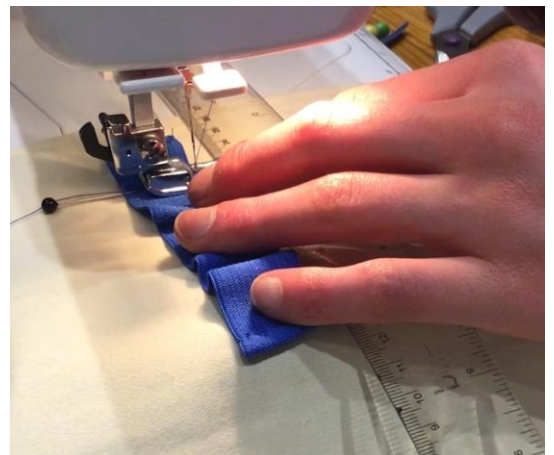
# Gold Club Holder

*I used my practice fabric for this!*



To keep the golf clubs, balls and score cards together, I decided to make a small gold club holder using a practice piece of fabric I had printed on before doing the map. I used bias binding to cover up the uneven edge (as it was on a scrap piece) and elastic to secure the items in place. I also made a toggle by glueing together 4 wooden beads painted with the same colours as the golf clubs!

I used the same bias binding on the fabric map mat surround, to make it clear they were a matching set.





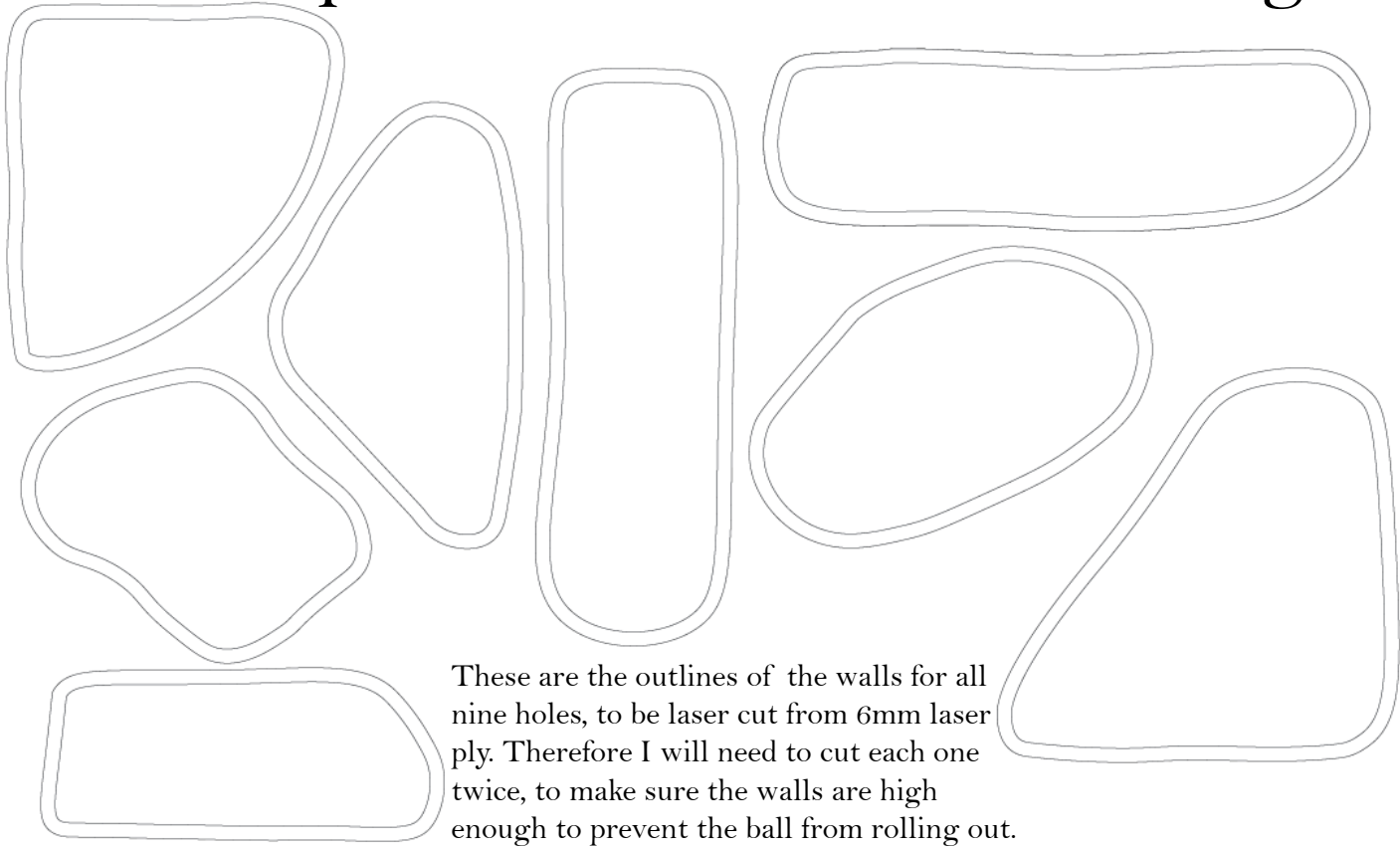


I printed the “sea” using my Lino stamp, and sponged on brown acrylic poster paint for the land. Applying darker and then lighter colours creates a depth/texture effect on the land!

Now I had a map to work off, I could design and laser cut individual hole shapes that would fit it perfectly.



# Hole Shapes- Adobe Illustrator Designs

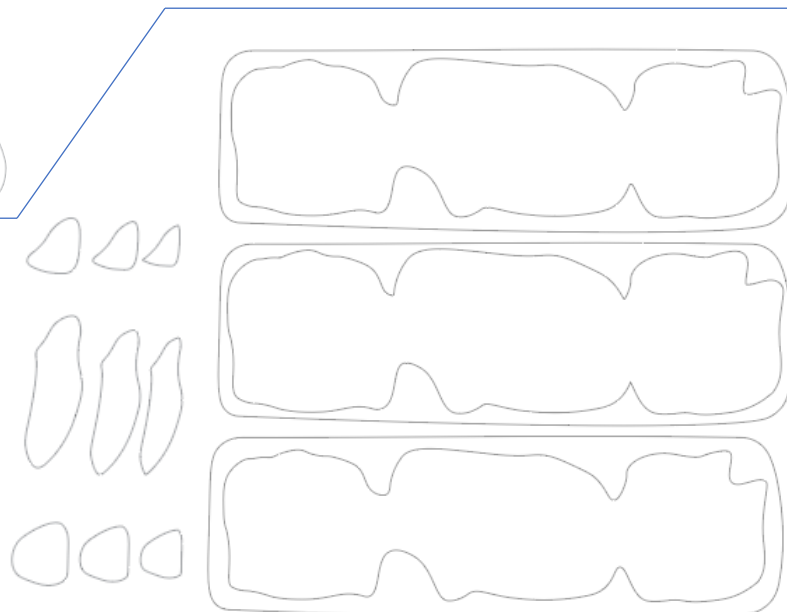


These are the outlines of the walls for all nine holes, to be laser cut from 6mm laser ply. Therefore I will need to cut each one twice, to make sure the walls are high enough to prevent the ball from rolling out.



These are the bases for each hole, and they will be engraved with numbers and the names (in both Spanish and English) of the obstacles on them, so that players know where to put them on the fabric map.

My design for the canyons is bit different to the rest of my obstacles- it is entirely laser-cut, with layers of 3mm ply stacked on top of each other to create a strata effect... Each layer is slightly different from the others. I will cut my design twice, to make lots of different layers of stratas. There are also small chunks of layered laser-cut "rocks" to dodge around, in the middle.

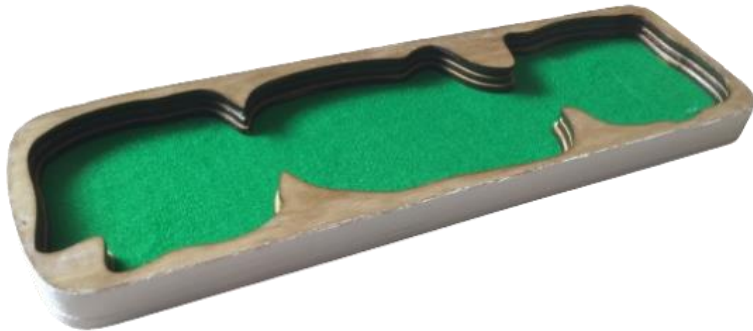
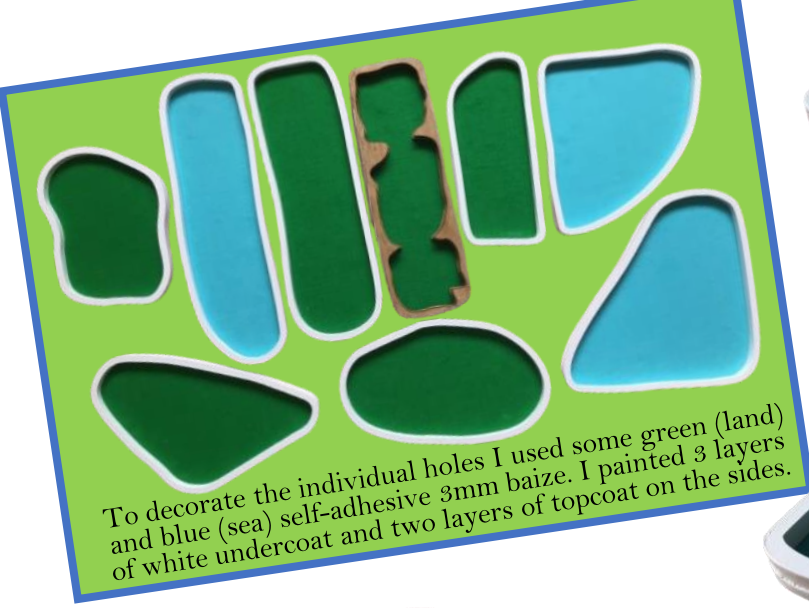




# Laser-cut Hole shapes







Now that the basic holes are cut and decorated as standard, I can start making the obstacles to go on top of them. Only once I have done that will I be able to make holes in the bases (into which the ball it hit) as I will not know exactly where to drill them before the obstacles have been stuck down. Also, some of the holes will be decorated with small pebbles or sand and shells I took from the Playa Blanca beach in Lanzarote, to add a sense of landscape and also direct the players to hit the ball through the obstacles, and not go around them!



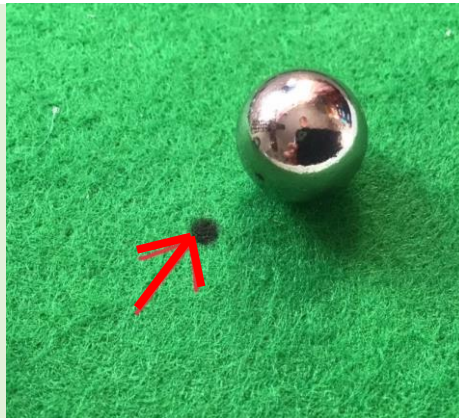
# The Finishing Touches

*At this point, I have the mat printed, all the holes painted and lined with Baize, and all the obstacles are made and decorated, so there are just a few finishing touches left to be completed:*

1. Drilling holes through the Baize-lined holes (to hit the ball into).
2. Marking the starting point on each hole with a permanent pen.
3. 3D printing hole numbers to stick on top of each hole (so players can easily see which hole is which number without needing to pick the hole up and turn it around to check what it says on the bottom).
4. Landscaping of holes (I am planning to use sand, volcanic rock, and shells I collected from Lanzarote during my trip, to landscape and decorate each hole).
5. Sticking on 3D printed plants and animals (e.g. cacti, crabs, starfish, seagulls, lizards ect).



1. Drilling holes



2. Marking start points



3. 3D printing hole numbers

## 4. Landscaping



I collected 3 different types of sand from 3 different beaches, and all the sand is natural.

**Sand**



**Volcanic rock**



**Shells**



# Score card design

**CRAZEY GOLF SCORE CARD**

HOLE 1		HOLE 6	
HOLE 2		HOLE 7	
HOLE 3		HOLE 8	
HOLE 4		HOLE 9	
HOLE 5		TOTAL	

**CRAZEY GOLF SCORE CARD**

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HOLE 3		HOLE 8	
HOLE 4		HOLE 9	
HOLE 5		TOTAL	

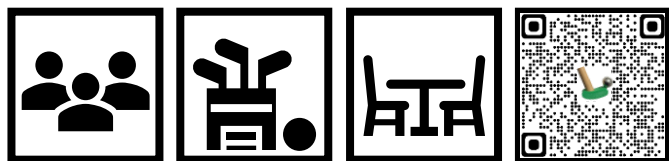
**CRAZEY GOLF SCORE CARD**

HOLE 1		HOLE 6	
HOLE 2		HOLE 7	
HOLE 3		HOLE 8	
HOLE 4		HOLE 9	
HOLE 5		TOTAL	



To finish off, I put my graphical design skills to the test, making a set of instructions and game layout map (to show players where they need to put the different holes on the map). I even wrote a cope of the instructions in Spanish (since the project was inspired by Lanzarote, afterall!), putting my limited language skills back into practice!

## Lanzarote Crazy Golf



1-4 players    Small parts. Ages 5+    Tabletop    Download score cards!

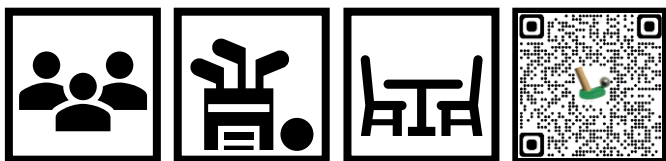
### Contents:

- Fabric golf club holder:
  1. Dolphins
  2. Fortress
  3. 4 golf clubs
  4. 4 metal balls
  5. Score cards
- Fabric map
- Laminated instructions, list of contents and map

### How To Play:

1. Make sure each player has their own golf club, ball, and score card.
2. The youngest player plays first, starting at hole 1 (dolphins). Work your way round the course in numerical order of the holes.
3. Each time a player hits their ball with their club, it counts as 1 point.
4. Points reset for every hole. Remember to write down your scores.
5. Add up your scores at the end, and the player with the lowest score is the winner.
6. Have fun!

## Lanzarote Minigolf



1-4 jugadores    Partes pequeñas. Edades 5+    Juego de mesa    ¡Descargar tarjetas de juego!

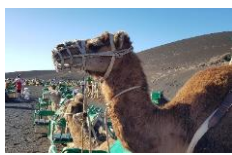
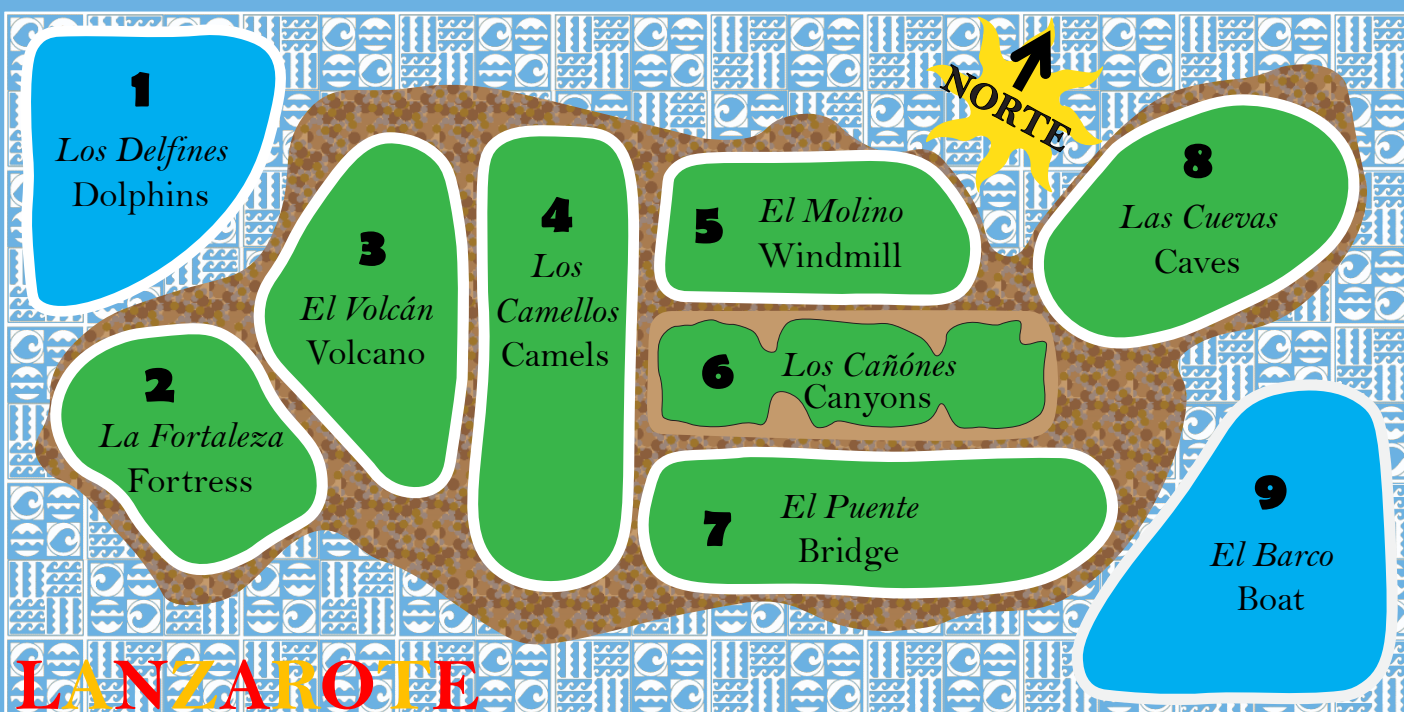
### Contenidos:

- Contenedor de tela para palos de golf:
  1. Los Delfines
  2. La Fortaleza
  3. El Volcán
  4. Los Camellos
  5. El Molino
  6. Los Cañones
  7. El Puente
  8. Las Cuevas
  9. El Barco
- 4 palos de golf
- 4 pelotas de metal
- Tarjetas de juego
- Mapa de tela
- Instrucciones laminadas, lista de contenidos y mapa

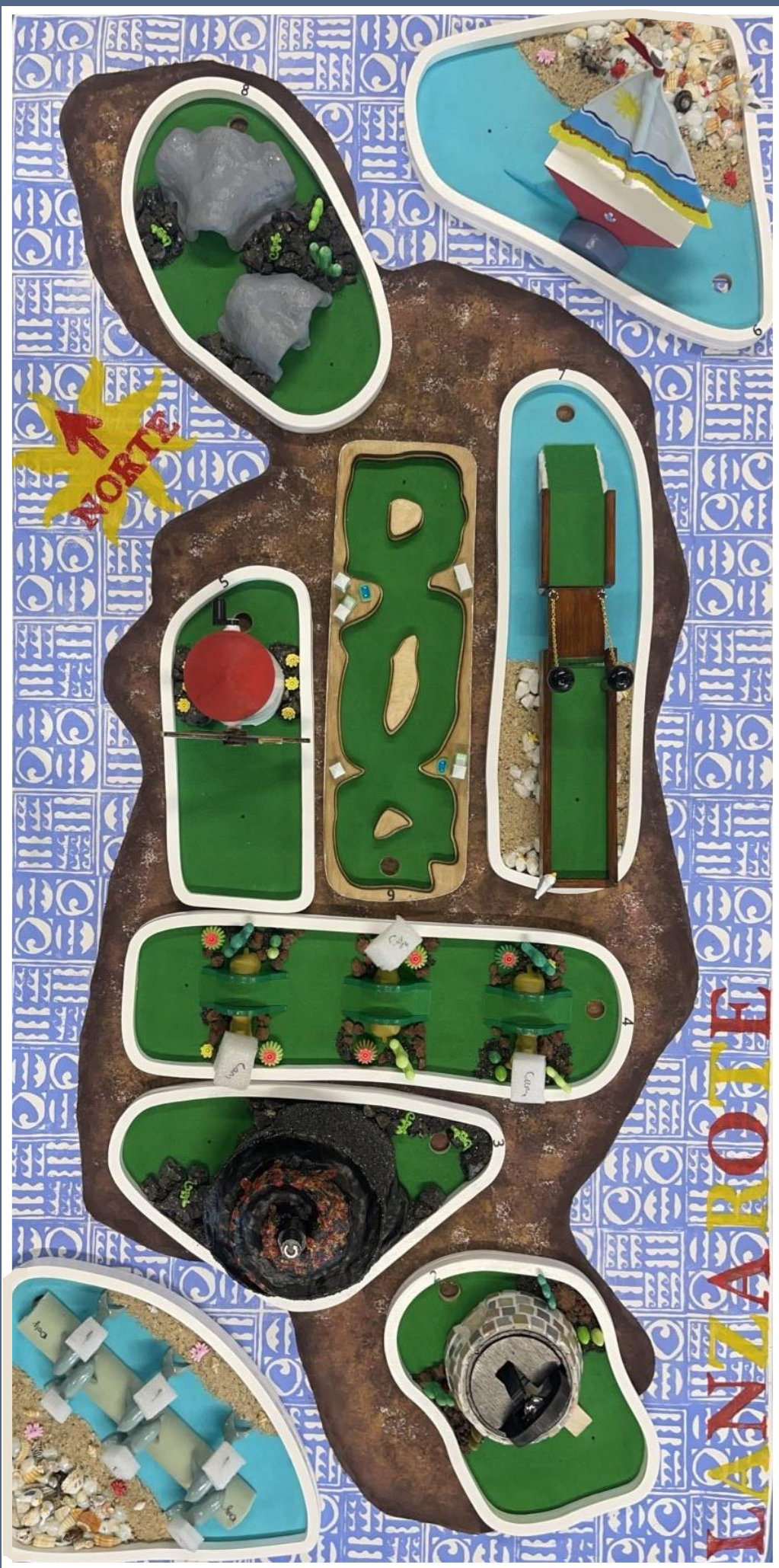
### Cómo Jugar:

1. Asegurase que cada jugador tiene un palo de golf, una pelota, y una tarjeta de juego.
2. El jugador más menor puede jugar primero, empezando con hoyo 1 (los delfines). Juegue el curso en el orden numérico de los hoyos.
3. Cada vez que un jugador golpa su pelota con su palo de golf, cuenta como un punto.
4. Sus puntos ponen a cero para cada hoyo. Recuerde escribir su marcador.
5. Sume sus marcadores al final, y el jugador con la marcador más pequeño es el ganador.
6. ¡Diviértase!

## Lanzarote Crazy Golf







HOLITE

HOLITE



# Reflection

*...And that's it! Project complete!*

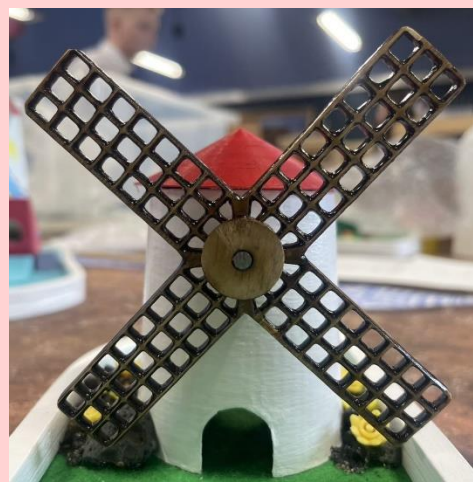
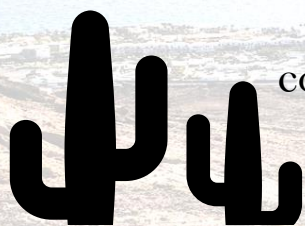
I found this project an exciting and adventurous new way to develop my digital design, 3D Printing, laser cutting skills, and much more! When I started out on this project, I wondered why there seemed so few similar products on the market... It has been a thoroughly enjoyable project although a lot of work, but fiddly at the best of times! At the end of the day, I now have a gorgeous, fully-functioning crazy golf course that I can play from the comfort of my living room table!

Please enjoy some pictures below of the finished masterpiece!

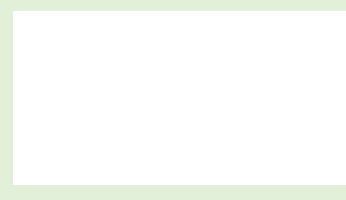
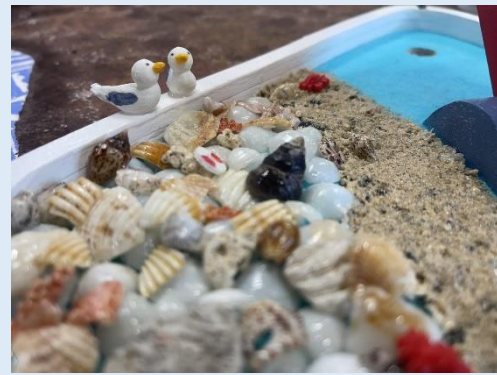


# Completed Golf Course!

Here are some pictures of my completed, Lanzarote-style Crazy-Golf course!







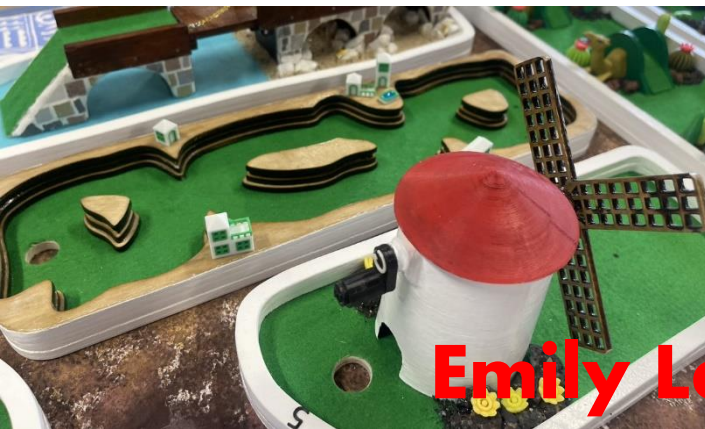












Emily Lakin 2024