# PROCESS BOOK

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CHAIN REACTION PROJECT

AUTUMN 2023/ PD4043/ 13/09/2023

# TABLE OF CONTENT

# DETAILS

- Unpack and understand the brief. As a team discuss action and reaction, how to generate a chain-reaction and how to get the best out of the team look for inspiration.
- Understand energy potential.
- Explore themes
- Concept scoping

# CRITERIA

- Build on a wooden platform measuring 400x400xXmm.
- The start and exit size would measure 200mm, the start should also begin on the middle of one side of the platform.
- An agreed height must be selected between neighbours.
- A minimum of 2 mechanisms must be included, 4 considered for a more adventurous impact.
- The mechanism should be quickly refreshed and simple to use

# Capturing Week 1-2

# WINDOW SHOPPING

https://ulcampus-my.sharepoint.com/:f:/g/personal/22348204_studentmail_ul_ie/ErctVFExB8lMqQ34dhjYB8YB4hOefbQB1rFmtPF2Tv-Kdw?e=EyHdin

Idea scoping through sketches referring to window shopping

https://ulcampus-my.sharepoint.com/:f:/g/personal/22348204_studentmail_ul_ie/EoeZLKhwqRJHlaKmx8O058EBgark8TnB9hE3JQDqsRYfRw?e=Pv7KYK

# INSPIRATION

Potential energy and Kinetic energy

https://youtube.com/shorts/KxYoN9_-e5I?si=JKJNuUUWfnatq7v_

https://youtube.com/shorts/sTeBcnbwJkQ?si=CslKSWKGRMBLEzLa

https://youtube.com/shorts/LVshTQJbOyU?si=Rrca3JD375RQFmQs

https://youtu.be/I_97FoQHXzI?si=AVD9JQS6_4YfU3eI

https://youtube.com/shorts/ak3tH1ferbo?si=ilCk3HKBv-AN1rjC

https://youtu.be/ikacus_dJJo?si=jn3u7gGlncvOEyqX

https://youtu.be/TZSUKmRhtuI?feature=shared

Thermal and potential

https://youtube.com/shorts/4150ggVLWAQ?si=auvPsCcnMhxJ-i_m

https://youtu.be/_WVul2ij404?si=pq_Y8ymVbiN1j9WO

# INSPIRATION

Chemical Energy

https://youtu.be/nvQnQ2OjmRU?si=bj_y-uYCx8eLBxgs

https://youtube.com/shorts/MKNe5Lg-eBw?si=pTV_4rf9bYGKxLMA

Potential energy, mechanical energy causing chain reaction

https://youtube.com/shorts/97saIDPm_Ho?si=gL00xKZWKRyUGgyM

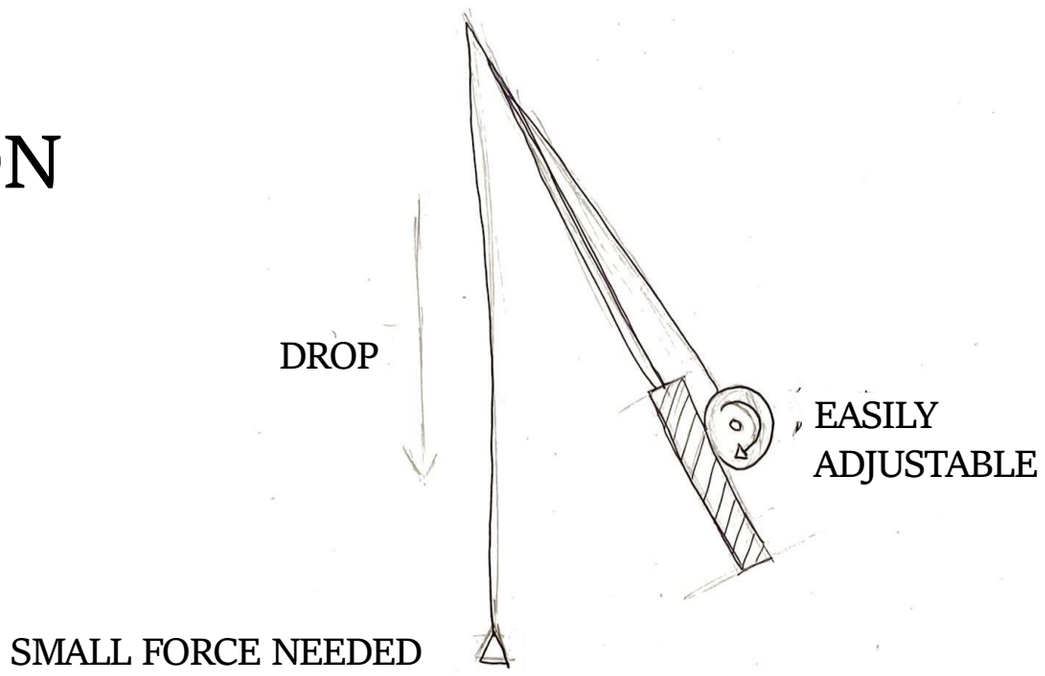
Sound energy

https://youtube.com/shorts/jwWk43196-w?si=nJwvu0jc4pKXM3Av

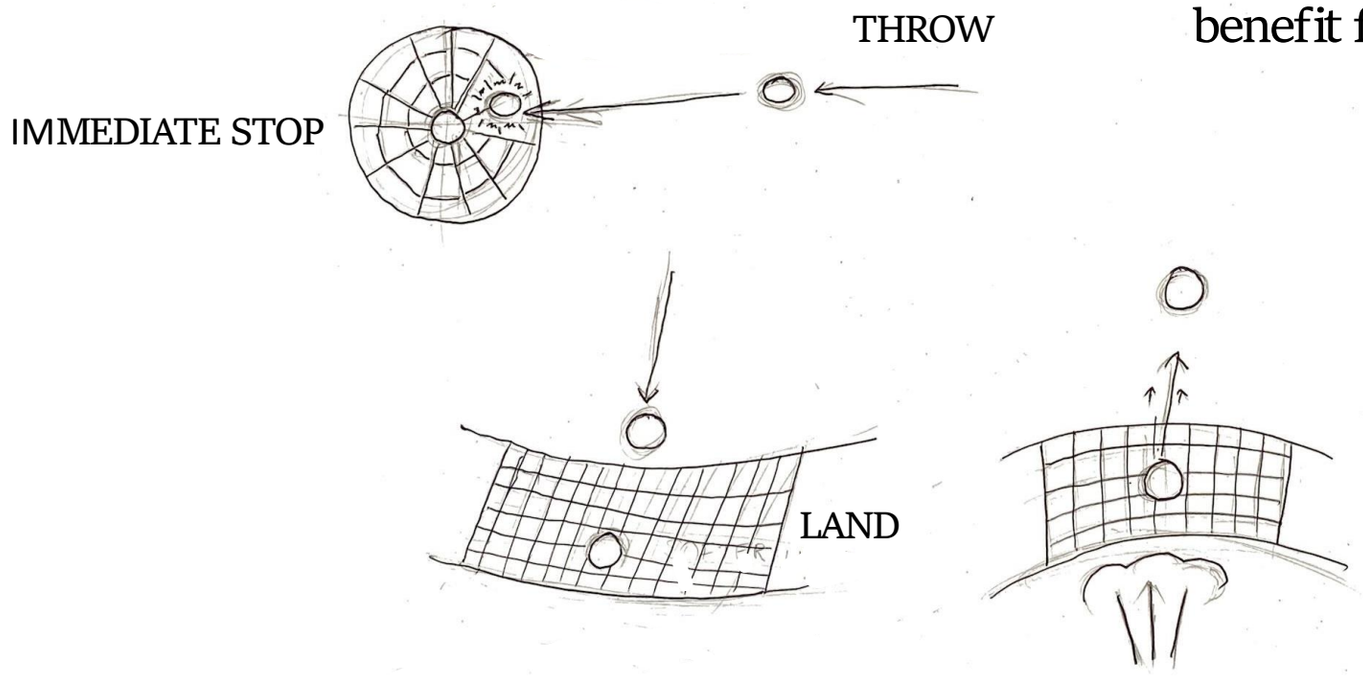
Potential energy, gravitational energy causing chain reaction

https://youtu.be/_dQJBBklpQQ?si=ZuZ9YSFV74vvzkg0

# IDEATION



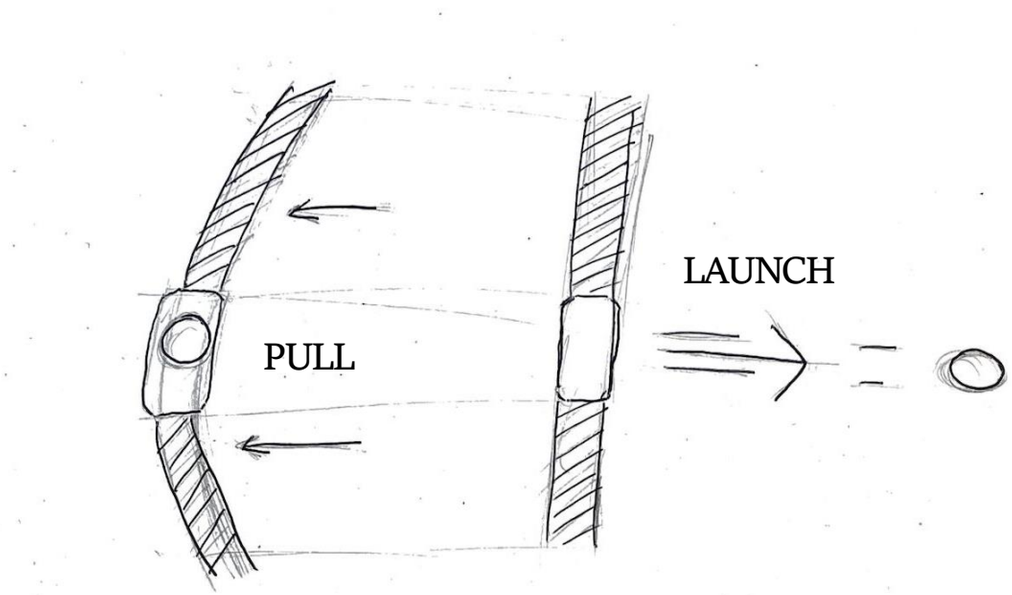

A similarity of pulley – a fishing rod, a ready equipment. Saves time and includes a reel that answers the addition of adaptation.

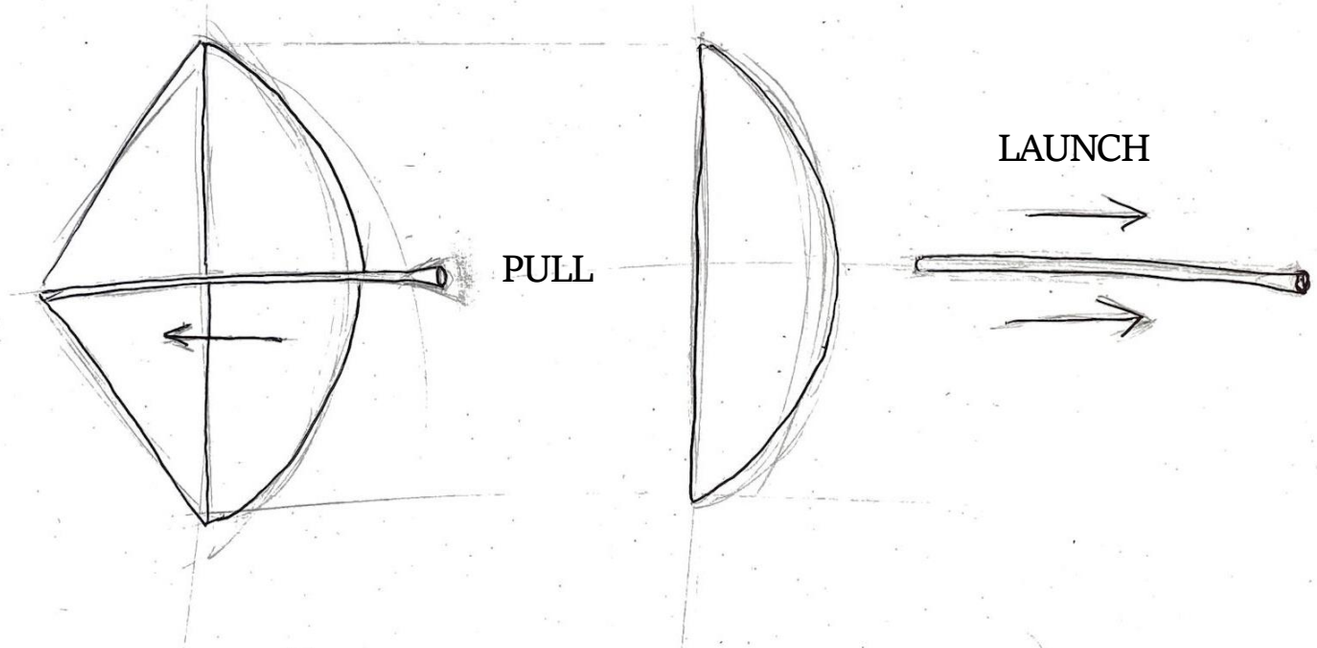



Velcro can cease a throw, would benefit for safety.

Nets have the potential for safe landing. A pull upwards would add to another energy as the object can be launched.

# IDEATION




Use of elasticity as a mechanism – A stretch identifies potential energy.

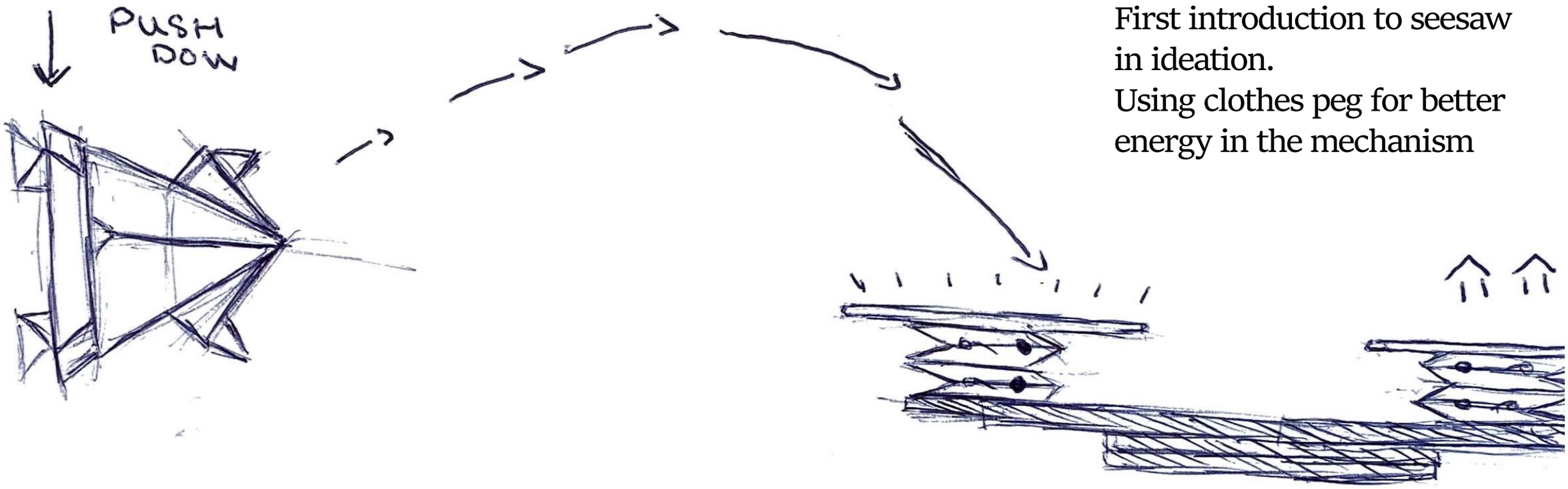
A placement upon the elastic and a launch allows a distance being travelled.

I identified two different methods of being able to go about the mechanism:
1. Elastic band with an area for placing the object.
2. A bow.

# IDEATION

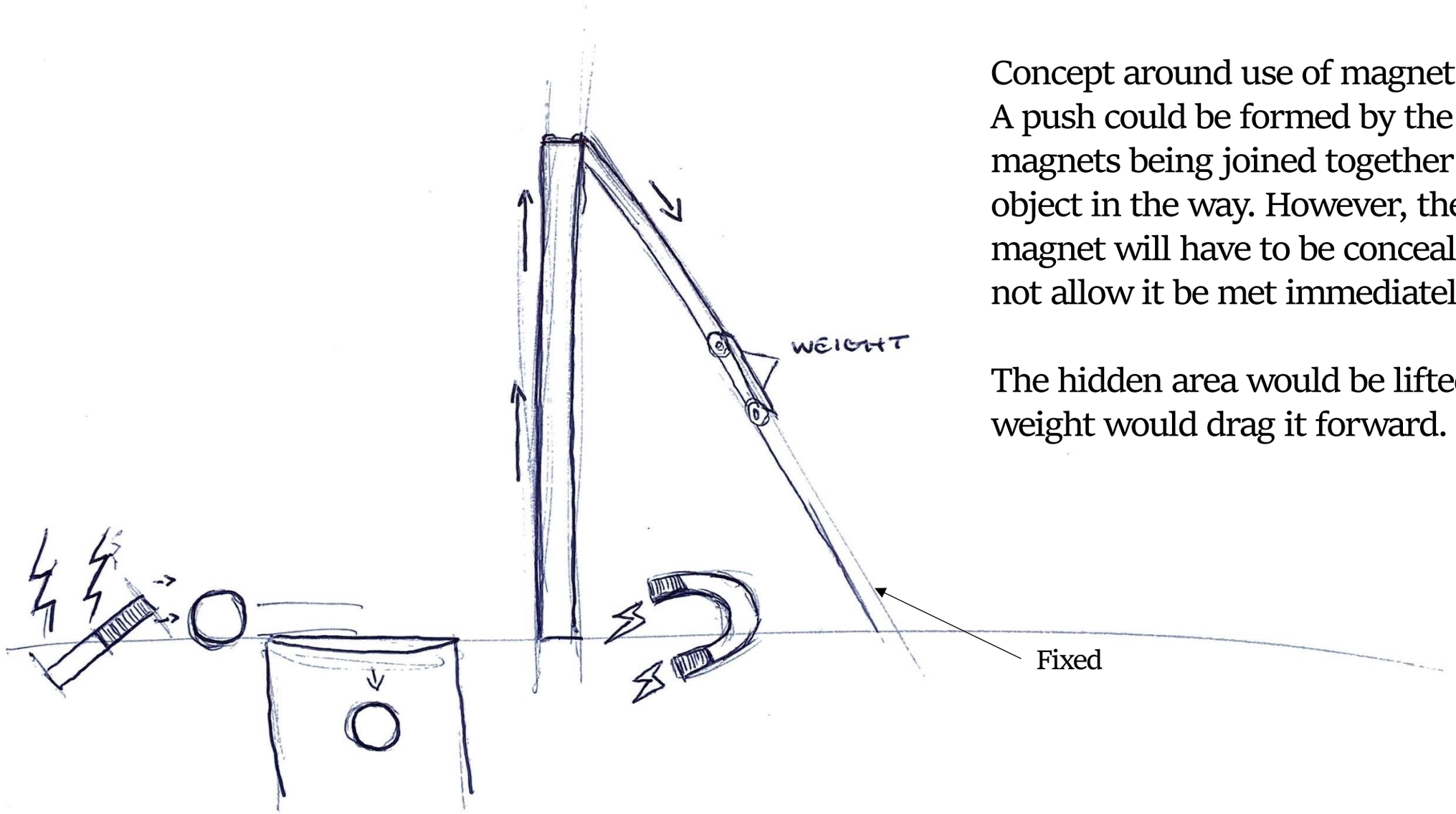
A simple origami frog that releases a jump, a distance travelled and a small force once the jump is completed.

The origami's distance ought to land on one side of the seesaw. The other side to motion upwards with another object of smaller weight.




First introduction to seesaw in ideation.
Using clothes peg for better energy in the mechanism

# IDEATION

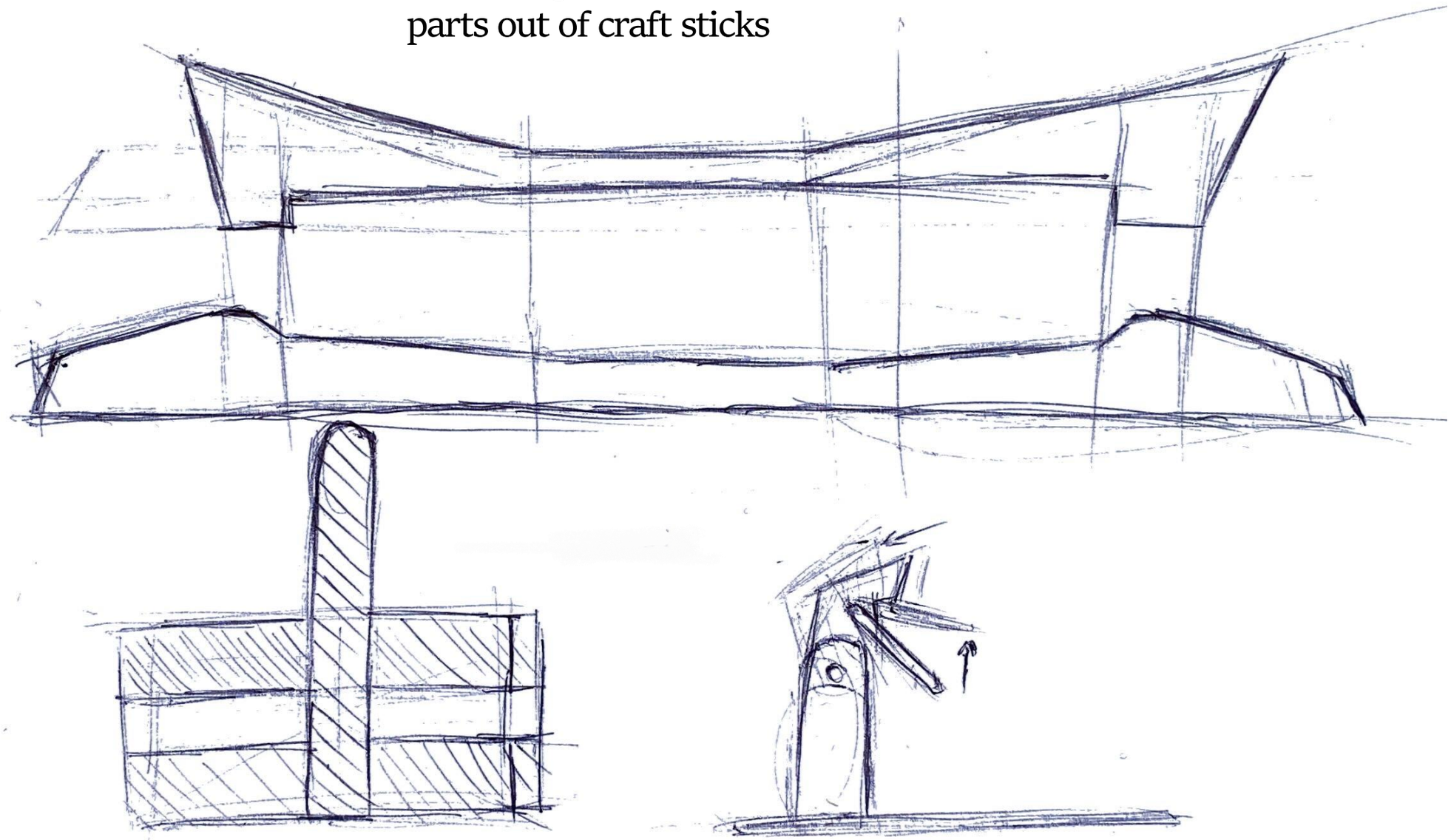



Concept around use of magnet.
A push could be formed by the magnets being joined together with an object in the way. However, the magnet will have to be concealed to not allow it be met immediately.

The hidden area would be lifted once a weight would drag it forward.

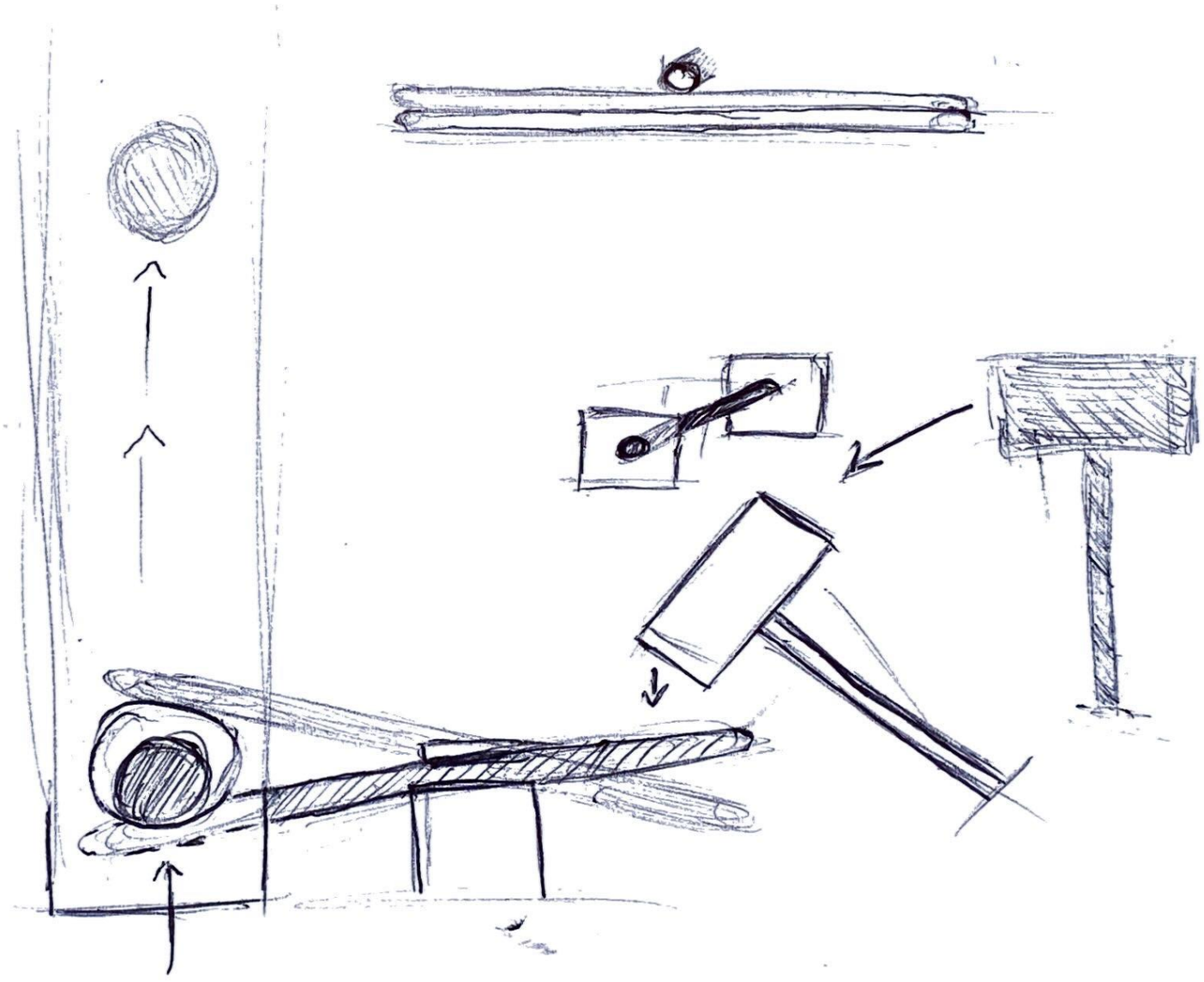
# IDEATION

Observation around making a unharmful  mouse trap with elastic bands. A guide of cut out, and needed parts out of craft sticks



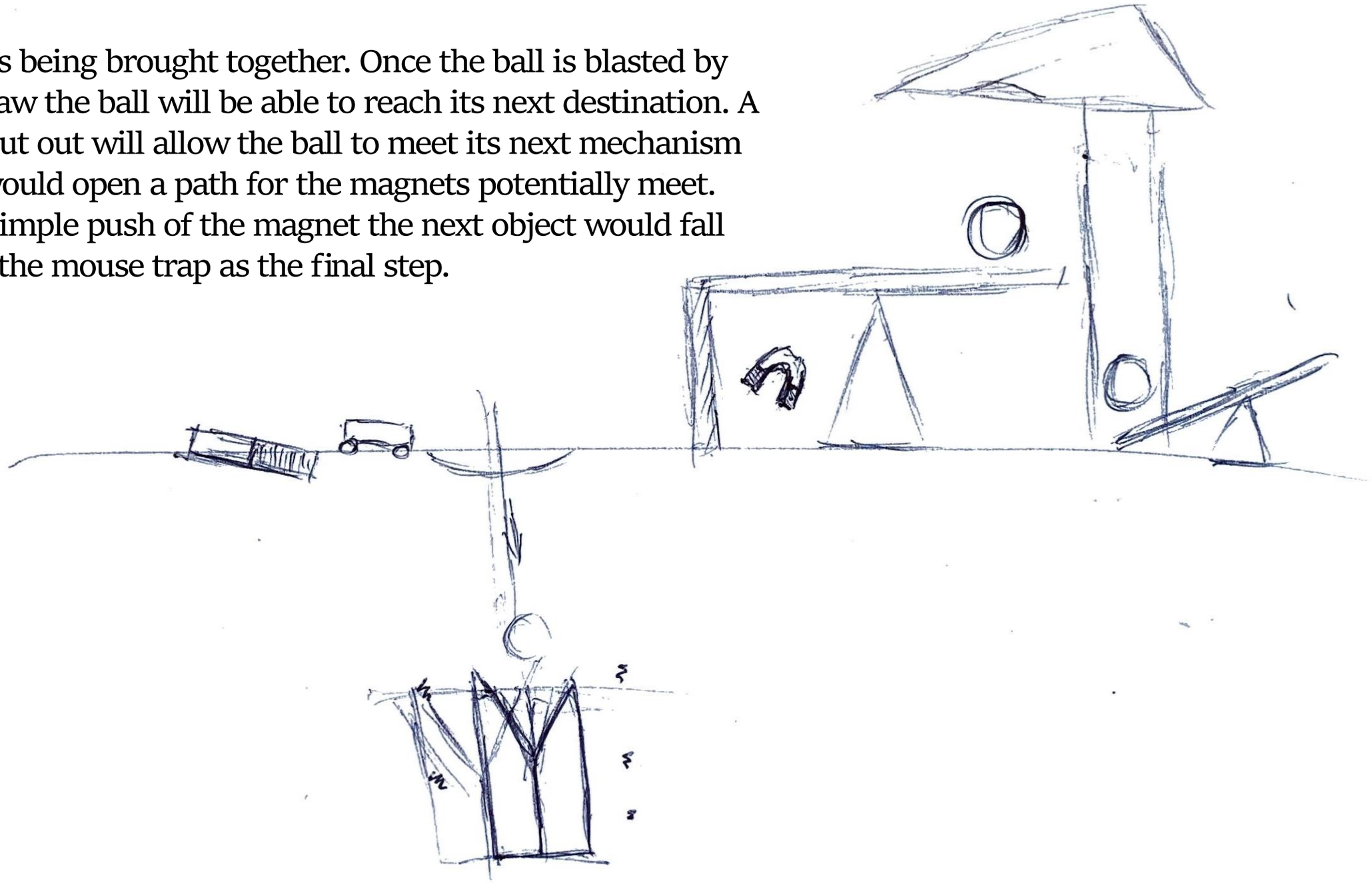
# IDEATION

Ideation around a ball being launched with an aid of a long cylinder. Once the ball is placed a heavier and a quick indication of force on the other of the seesaw allows the ball to fly up.



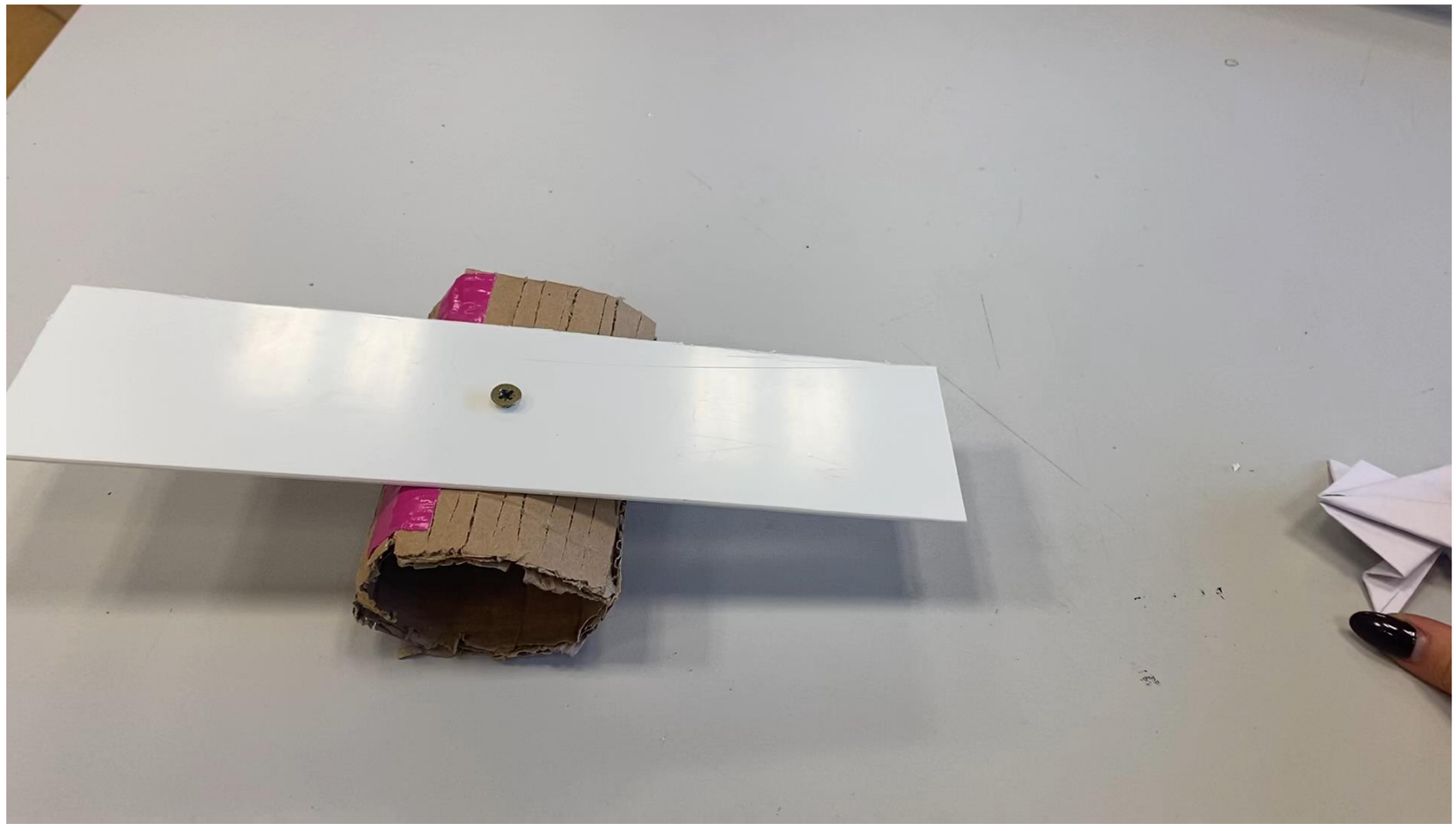
# IDEATION

Concepts being brought together. Once the ball is blasted by the seesaw the ball will be able to reach its next destination. A simple cut out will allow the ball to meet its next mechanism which would open a path for the magnets potentially meet. With a simple push of the magnet the next object would fall to meet the mouse trap as the final step.



# PROTOTYPE

Identifying if using concept using the origami frog could work. The simply was too light weight to create any type of impact upon anything laying on the other side. By itself it cause movement. However, its jumps would be hard to predict. As the placement was not enough, a specific force would have to be detected. I build the simple prototype of the seesaw out of a plastic plate with a cardboard cylinder.



# PROTOTYPE

Once deciding on taking the seesaw method of blasting a ball I constructed the rectangular shape out of pieces of thin wooden plates attached to the sides by a thicken piece of long wood. I left one of the sides empty. This helped me to decide open the heigh needed for the seesaw to not be affected by the construction and a simpler building.

When the seesaw was had its full potential and stability. I then was able to see how far I need to leave an opening. The seesaw was made from a plastic cylinder tube with a wooden stick through it which was then attached to each side of a wooden cube. The height of the cubes was important to have the best potential in shooting the ball. With the decided height of 650mm I was able to achieve that.

Instead of covering the entirety of the view I decided on using craft sticks this added the enthusiasm of seeing the ball travelling the cylinder. However, I discovered that at the beginning the ball was interacting with the gaps between the craft sticks. This was when I decided on a plate just at the beginning to stop that from happening.

# PROTOTYPE

There was so much importance in making the constructions stable. Like mentioning in the slide before the rectangle was supported with a thicker piece of wood. This did not fail the to support ever. I used nails to attached the plates to it. Although it could have possibly interacted with the ball, I had to make sure there was a distance between the walls and the seesaw.

The there was a slight area not covered by the plate in the inside of the rectangle. This was because I had to make sure there was enough place for both the seesaw and between the nail. I covered that area with two craft sticks which fit perfectly between the portion.

# PROTOTYPE

After deciding on shooting the ball it was obvious, I needed to add a trail. This trail would be able to add more distance travelled and simplify its reach to its next goal. I used the ball which I was confident I was using to measure out a corner pathed for it. To eliminate its height, I had to bring it down. This was possible once I identified the angle, I had to cut to let the new part of the trail connect while facing down. To attached the two parts together I used hot glue as I did not want the ball to catch on a nail.

Then I used a denser block of wood which I also had to cut out at an angle which the trails were now joining. This added stability. Although it was also attached with hot glue it was perfectly stable.

# PROTOTYPE

Because of their combined weight, I decided to use nails to join the rectangle and trail during construction instead of hot glue. After making sure everything was securely fastened and put together, I looked over the entire structure and soon found a problem at the start of the second trail section. There wasn't enough guidance for the ball, so it went off course and came out of the trail too soon.

In order to solve this issue, I placed a few chopsticks in the center at the trail's highest point. The barrier created would add supports  to prevent further detours from the intended course. I then covered parts of the trail with a net that connected the two sides, giving the appearance of a roof. This gave the ball another level of direction in addition to making my project's finished product look better.

# PROTOTYPE

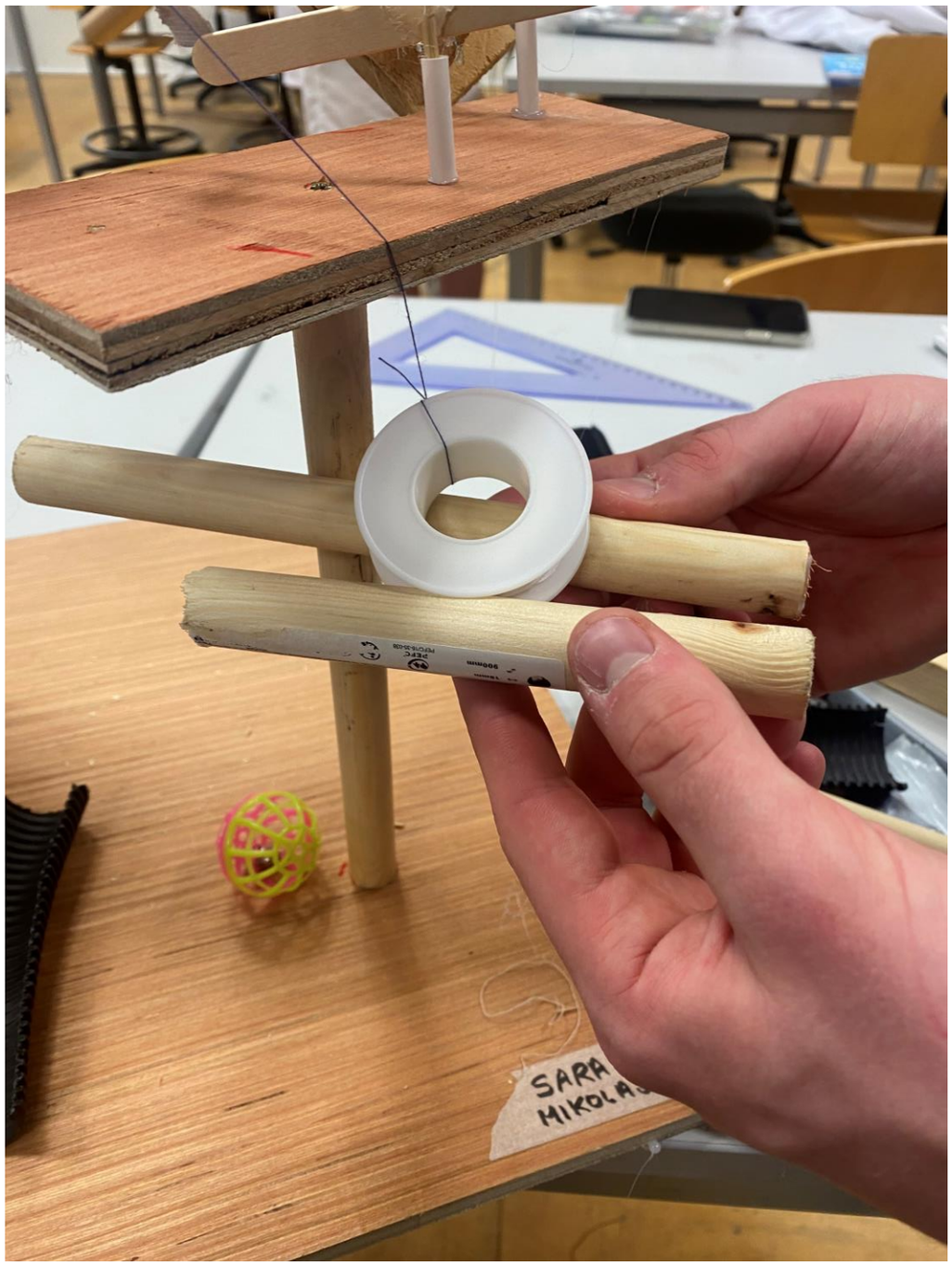
After having that completed, I decided to work on a next mechanism. I knew that forming two T shaped moving structures that would interact with each other could possibly drop an object at the end to set off the next mechanism.

This was difficult to work with as the weight of the ball I used for the other mechanisms would be too light. I decided upon a roll shape which worked well in some cases. I had to figure out the placement of the T's and the roll. The rolls weight worked with the ball, but it would constantly fall of the wooden plate due to its shape.

I decided to attach it to a spool of tread. This let the roll stay in its place without rolling off. I marked the placement with a red marker.

I began questioning the stability of the construction.

# PROTOTYPE



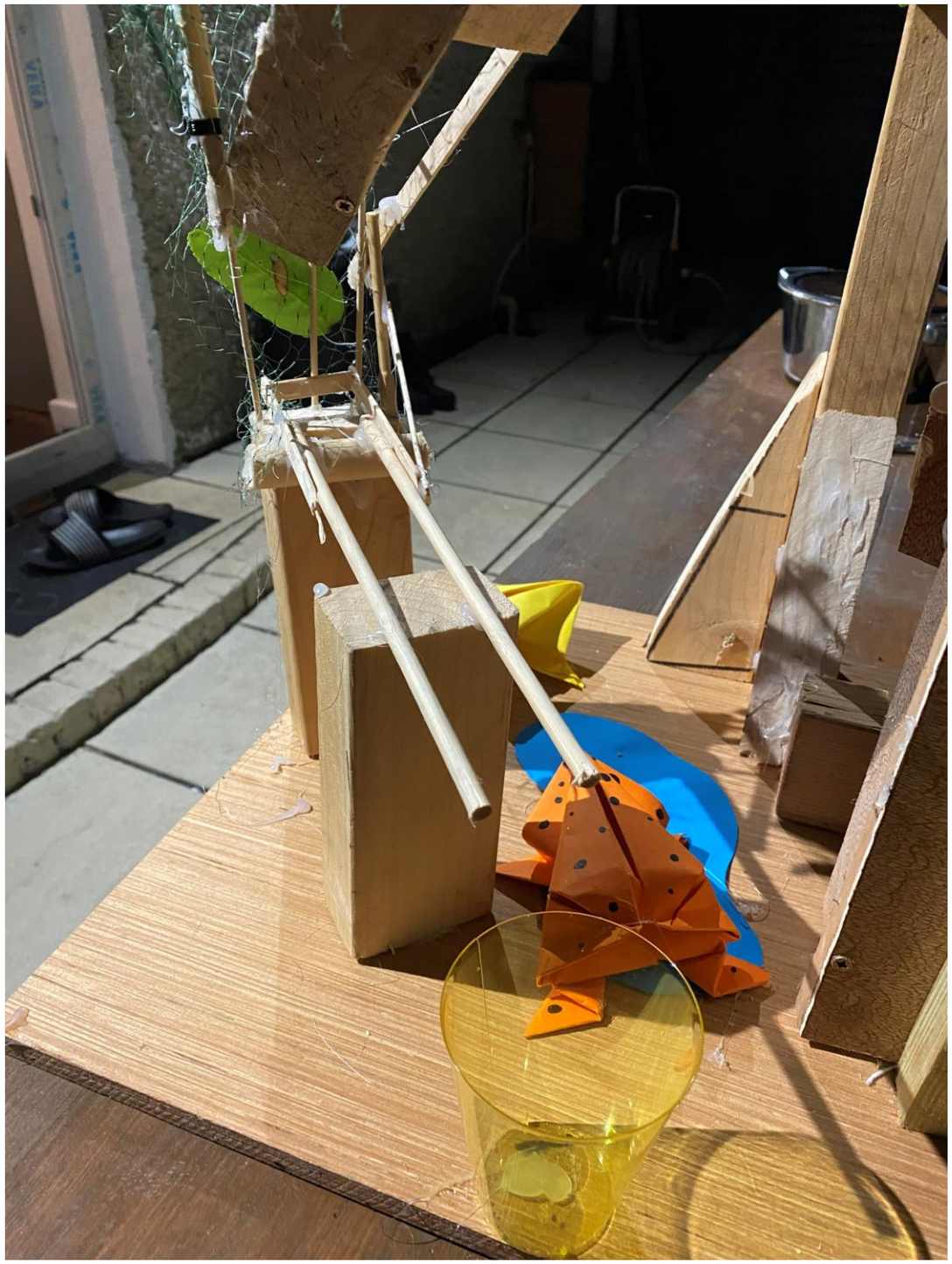

When I realized the roll could move another ball when it was pushed off the plate, I asked a classmate to hold two wooden cylinder pieces that would direct the roll and help it interact with the ball. To get the ball to move, precise placement was essential and needed to be done with extreme caution. I realized during this process that the wooden cylinders needed to be angled slightly so that the roll can transfer energy to the ball and eventually start it moving. Our careful attention to detail in determining the ideal angle and location of these guiding cylinders was crucial to the experiment's success.

# PROTOTYPE

The next stages of the mechanism would be to have the ball stay in place until the roll would hit it. Once placed upon the two cylinders the ball would immediately start moving. A flat surface would have to be included to not set it off by itself. During this phase I was trying to identify the correct height and angle for this to be possible. As you can see, I had to add a length to make it work better.

However, after some testing I identified a problem with the force id be using in the shooting of the ball. Each time force was used the roll would not stay in place.  As it was an interesting characteristic of my ideation. Trying to undergo this simple mechanism would have to have me exploit my earlier idea.

# PROTOTYPE

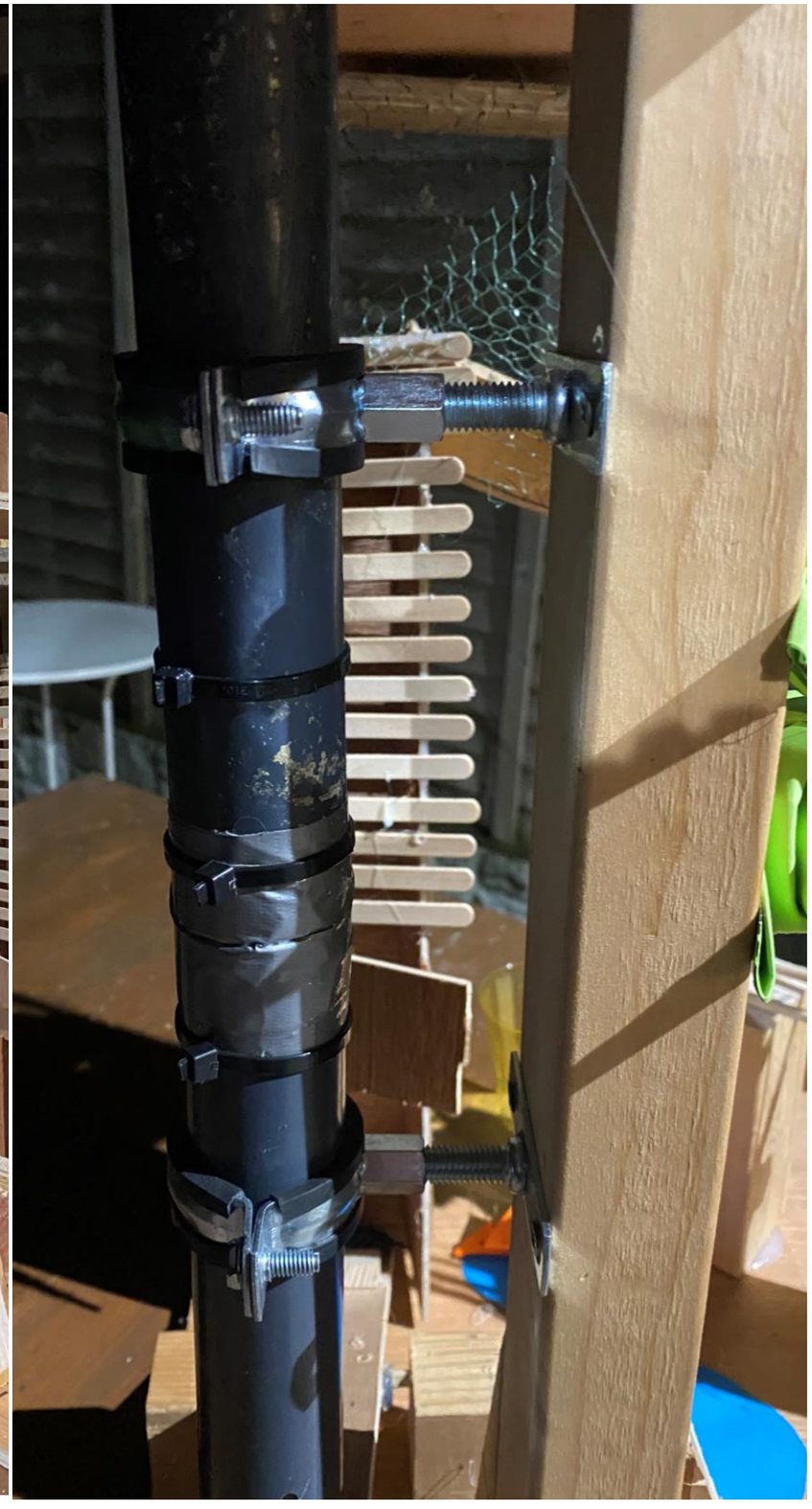


After disclosing the other idea. I acknowledged I would still be able to use my further though behind another ball being pushed. To be able to aid the ball to safety I decided to just attach a plastic cup to the end of it. Before the drop into the cup, it measured 200mm heigh which was disclosed in the brief.

# PROTOTYPE

To be able to launch the ball the force had to be dropped from a reasonable height for its best result. this was being tested in slide 16. I previously knew that a plastic tube would have to be involved to hit the seesaw at its best section. Which I identified to be at the very end of the plate.

The two tubes were attached using hot glue and duct tape. This kept them intact throughout the entire testing. It was important to not engage with the inside of the tubes. Formerly, I try using zip ties but they stability was not efficient. I decided to invest in clamps which made all the difference. I was able to attached the clamps to a lengthy wooden piece. I firmed it with two right angled triangular pieces of wood at two sides.



# PROTOTYPE

Realizing how useful a quick release knot is for performing a seamless drop, I looked into what knot would be most effective in terms of performance and ease of replication. I decided that a mooring hitch knot would be the best option after giving it some thought. But choosing the right equipment proved to be more difficult than expected. At first, I decided to buy rope, but I soon found out that its thickness was too large to use with the steel piece meant for the drop test. Although I was able to tie the mooring hitch knot once, I found it difficult to tie it again, so I looked into other knots. Sadly, none of them produced the expected outcomes, so I came to the conclusion that my original rope selection was ultimately unsuitable for the intended purpose.

# PROTOTYPE

My personal encounter with using a plastic tread revealed that it made an important improvement to the stability of steel object. One more advantage of this plastic tread was that it allowed me to suspend the objects, which made it easier and more certain for me to perform higher drops. But occasionally, the plastic tread would get jammed or stuck, which was inconvenient and started to show signs of wear and tear. This led me to conclude that there had to be a more dependable and effective substitute available to guarantee that carrying out these tasks repeatedly could be done so more easily and effectively.

# PROTOTYPE

While discussing with my neighbor, we got to talking about possible advancements and enhancements to an already-existing system. There was a little uncertainty during the conversation as we debated whether to implement a completely new strategy or make improvements to the one that was already in place. I proposed a new concept involving a car having the ability to pull a string in an attempt to stimulate ideas and investigate new approaches to solving issues. We were surprised to see that this concept showed promising results when tested with thread samples. As a result, it's possible that this recently discovered solution will be developed and put into use in the future.

# PROTOTYPE

I spent a lot of time trying to figure out how to secure the steel piece before I came up with the really clever idea to use an elastic band. This multipurpose, easily accessible tool was very helpful in keeping a tight hold on the steel and was also very easy to attach. I was able to give the object in question a firm grip by securely stretching it from the top and bottom. Test after test produced perfect results, with the elastic band holding firm without interfering with my ability to release it when needed. To fully declare my method a success, there was still one more thing to do: evaluate its results against my neighbor's mechanism. To find out if my elastic solution was really as reliable and effective as the other one, I had to carefully compare and contrast these two methods.

# PROTOTYPE

I only needed to make a few small modifications with my neighbor at this point. I had everything set up except for the last knot. Each interaction transitioned well into the next.

My neighbor's final suggestion was to install a pulley system, which would work perfectly to satisfy my particular need for the knot to be released with ease. At first, we both thought that this solution would work, but when we began experimenting with the suggested configuration, we discovered some major obstacles to its successful application. The main problem was that the pulley was too light, which meant that even with a heavier weight applied as a counterbalance, the motion would continue upward. We got back together as a team and ultimately chose to take a different route. We used two L-shaped steel tools to create a Z form for the weight. This new arrangement required another modification to guarantee that our idea to operate work as intended: the original elastic band had to be replaced. We were able to find an efficient approach that met our needs.

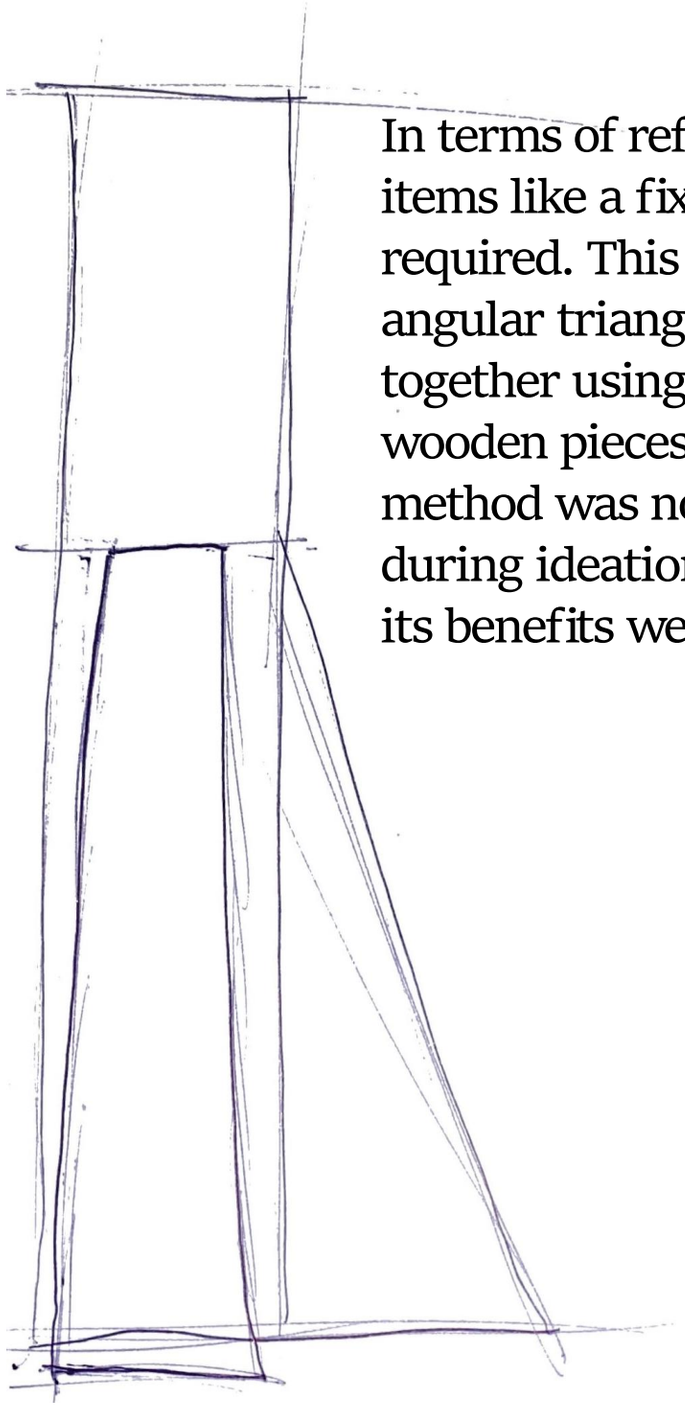
# PROTOTYPE

Eventually, my neighbor and I came to an agreement on the most effective way to tie the fast release knot after many tries and adjustments. Using only a tiny piece of elastic band, we came up with an innovative method to securely hold the steel in place. Then we used a plastic thread for the rest, which turned out to be the easiest material to use with the pulley system. We took care to extend the thread to its utmost potential to ensure best results on every try. We discovered that using tape to secure the string to the pulley offered both dependability and convenience, since it needs to be taken out and put back on for each demonstration. Together, with constant improvement, we created a system that consistently delivered.

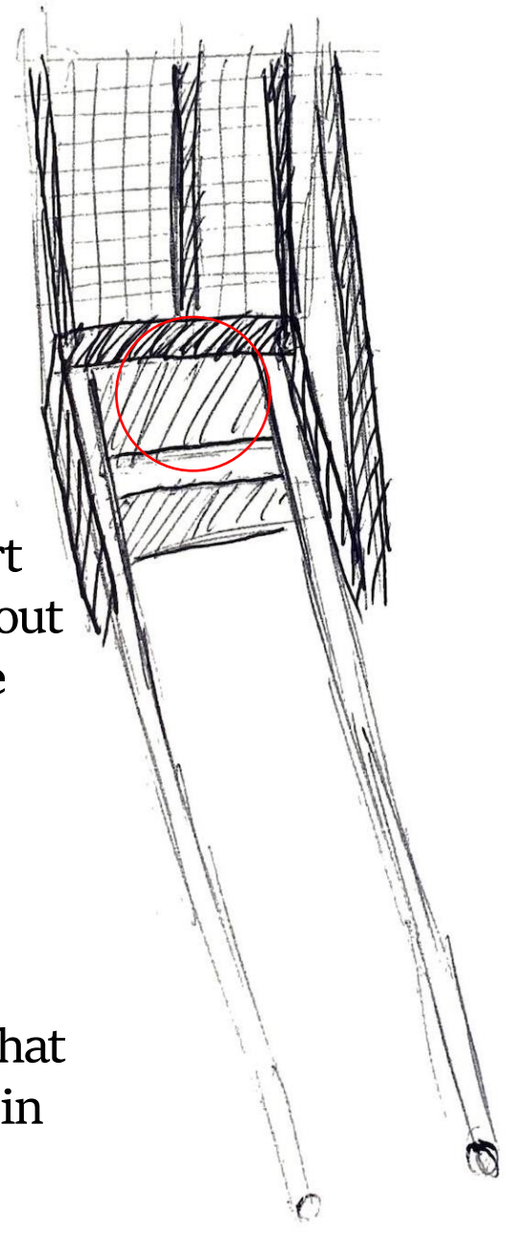
# PROTOTYPE

Upon closely examining the fast release knot, I was immediately struck by its efficiency and effectiveness compared to the other methods I had experimented with previously. The use of two materials boasts a quick and smooth release mechanism, which is crucial in situations that demand prompt action. It also performs better than conventional tying methods in terms of time efficiency and ease of use, making it incredibly useful for a wide range of applications. During my use of this incredible quick-release knot, I also noticed another significant benefit: the smooth incorporation of an elastic element attached to the string. This ingenious modification not only improved the knot's overall performance but also made it possible to reuse the elastic without sacrificing its integrity. This distinctive fast-release knot is truly unique among its counterparts due to its combination of speed, effectiveness, and reusability.

# IDEA REFINEMENT

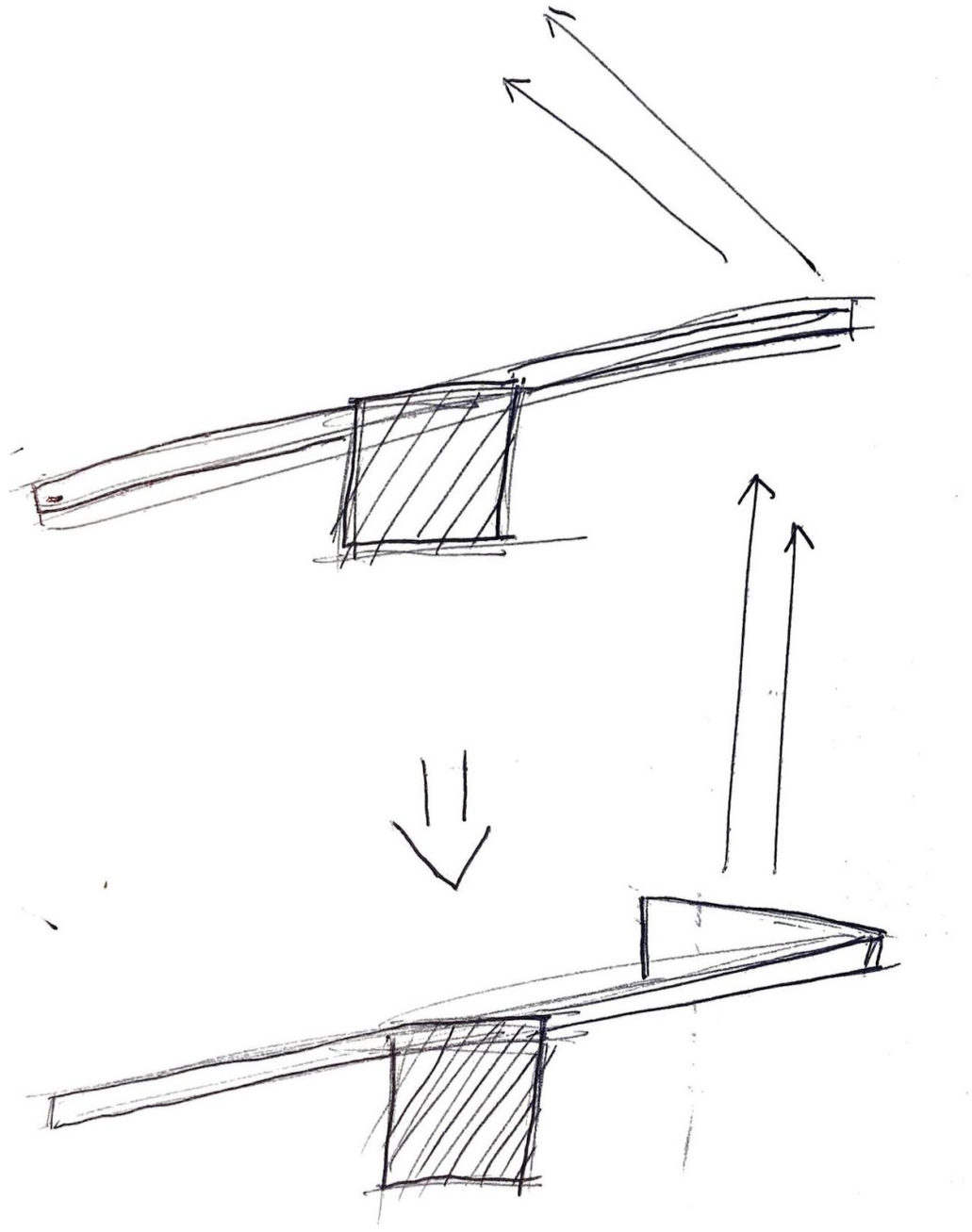


In terms of refinements, basic items like a fixed prototype were required. This particular right angular triangle was put together using numerous long wooden pieces. This particular method was not encountered during ideation. But once found, its benefits were flawless.



I was initially unaware of the support required for the final machine. Without additional supports, I  found that the push failed. This is the time that I enclosed the fall with a net. But surprisingly, this didn't work. In addition, I added "arm rests," which proved to be more effective than the net alone. Additionally, I concluded that the ball would have to be positioned in a small opening to inhibit its autonomous motion.

# IDEA REFINEMENT



My most significant improvement was an addition to the seesaw. This made it possible to shoot the final prototype more effectively. This was discovered at a later stage of the project.

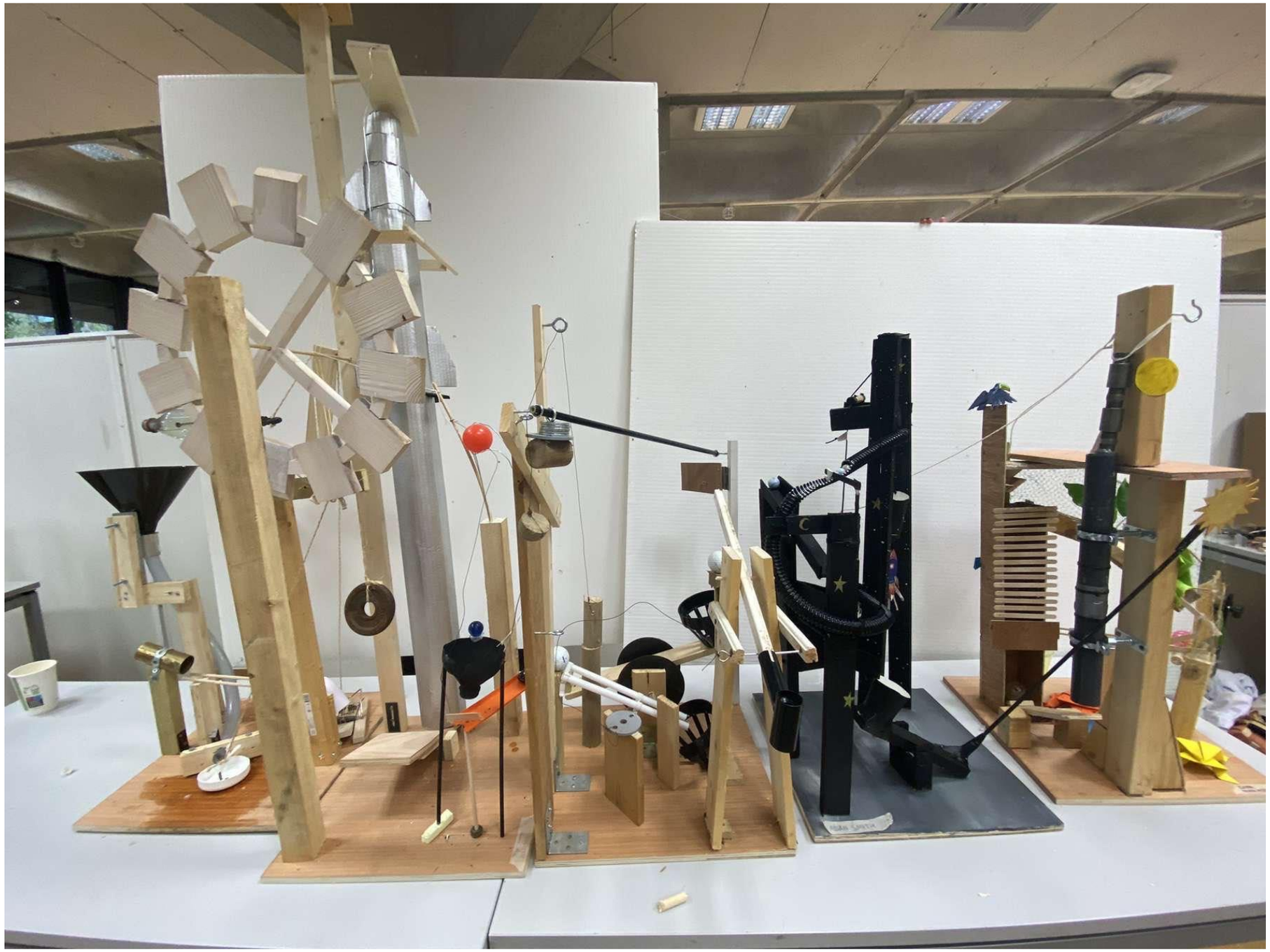
To stop it from shooting sideways, all I had to do was add a triangle with less volume at the edge. And this caused it to soar upward.

# GROUP CO-ORDINATION

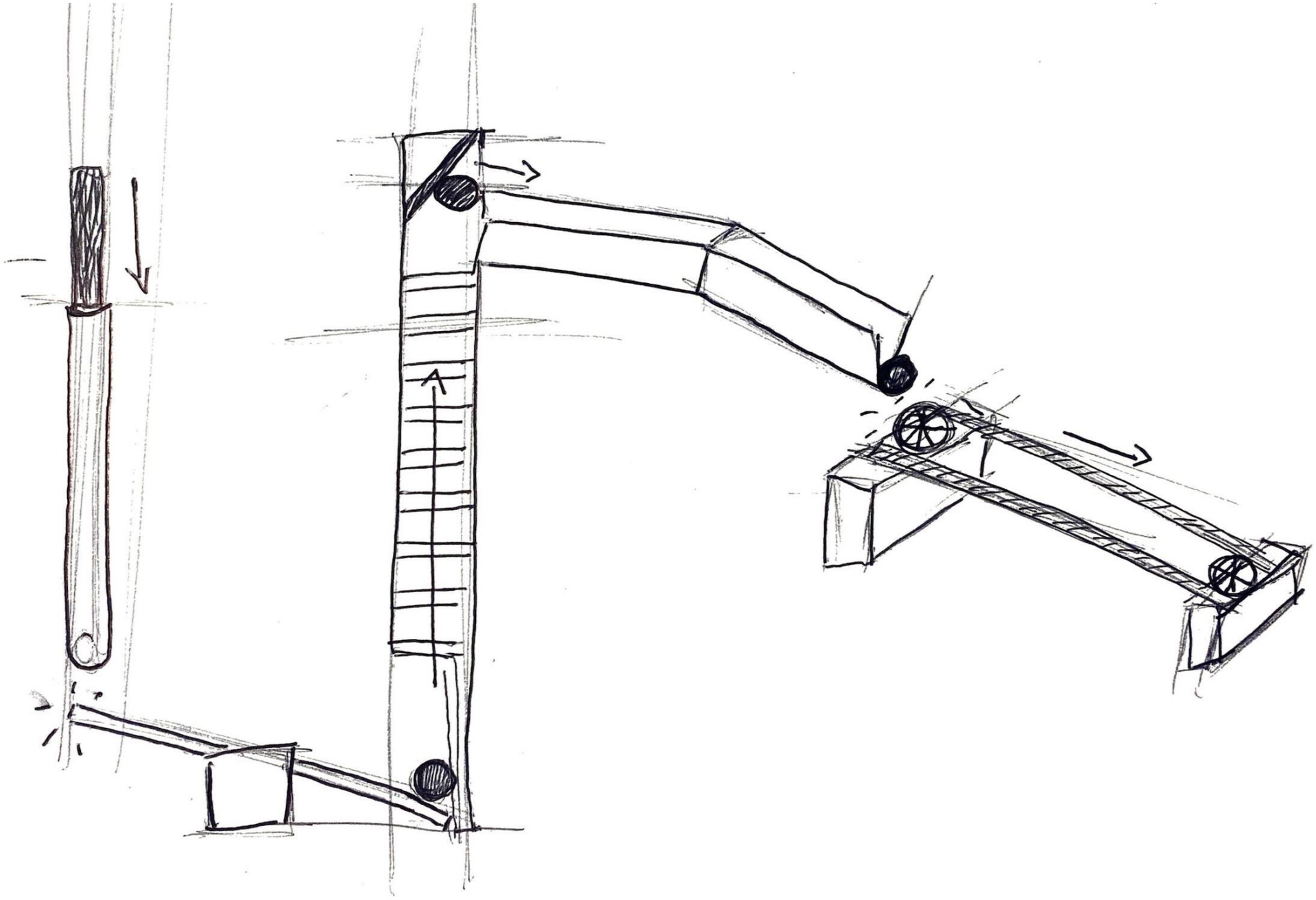
Early on, exchanging future-oriented ideas was enjoyable. Several of my ideas were refined thanks to feedback from others on my prototype. My teammates were able to provide assistance to me. We came to see how much more productive working together was than working alone; it would undoubtedly help you relax and come up with more ideas. My neighbour was the most significant person involved in this project. I thought that we communicated effectively, and our final assembly went smoothly. The stages this was important was during the final stages when we knew we are coming to end and needed it to work well together.

# GROUP CO-ORDINATION

From Oran's water approach to Jay's rocket, Eli's control center, Aidan's amazing painting of the moon and stars, and my planet filled with enormous frogs, our entire group combination had a spacey vibe.



# FINAL CONCEPT



# FINAL CONCEPT

# REFLECTION

My comprehension of planning and its impact played a pivotal role in the success of this project. Prior to diving into the actual prototyping phase, a well-thought-out strategy was crucial. I used sketching to shape my initial ideas, but it was during the prototyping phase that I encountered challenges and gained a deeper understanding of the processes necessary to bring the final concept to life.

Throughout this journey, my project was provoked by inspiration drawn from prior examples and objects in my surroundings. Crafting a fully functional mechanism throughout the project was both fulfilling and exciting.

Yet not every aspect of the creative process was unproblematic. Some of my ideation moments posed significant challenges during the prototyping stage. Regrettably, certain ideas remained unexplored due to the unavailability of essential materials or devices. For instance, I was not able to test out the idea behind the magnet as the sources were not available for me online or in stores available for me to reach.

Looking back, one aspect that was crucial was the distribution of weight throughout the entirety of the construction. Unfortunately, this pivotal element was not given the attention during the early stages of planning and prototyping. Realizing this oversight much later in the development process posed significant challenges, serving as a valuable lesson for future endeavors, highlighting the importance of meticulous planning and problem anticipation.