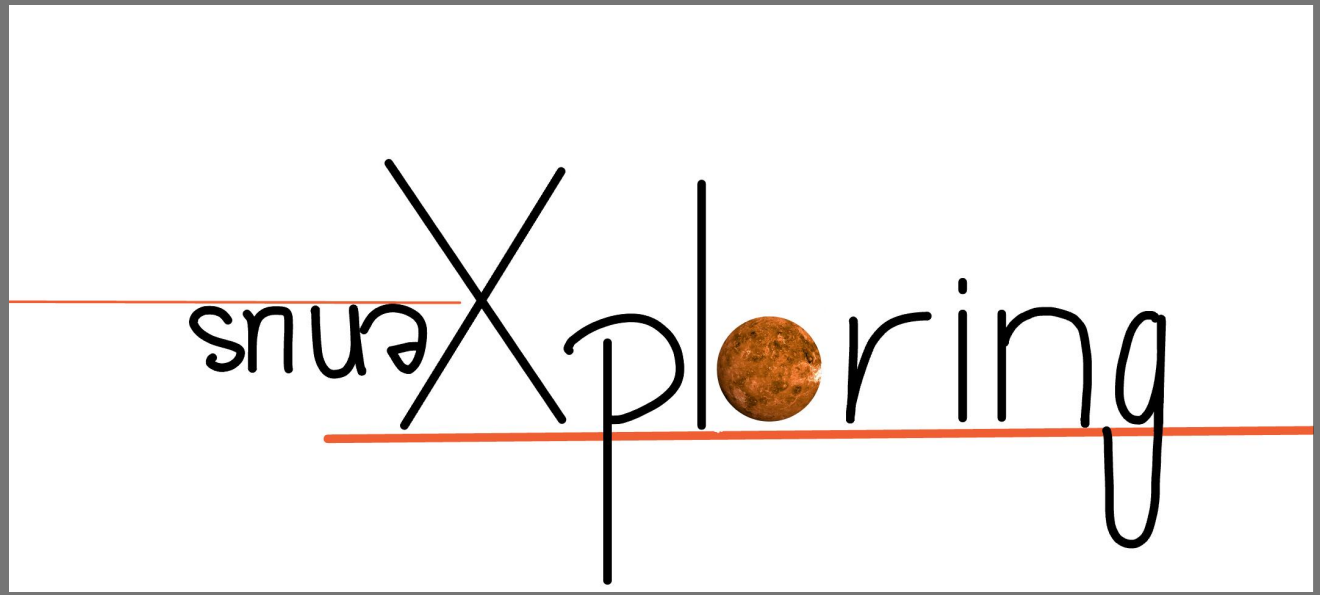
Blessed Maria Assunta Pallotta Engineering Project 2023

Our Theme:
X-PLORING VENUS



Team Members

Mentors and Coaches

- Mrs. Miller
- Mrs. Bailey

Student Team

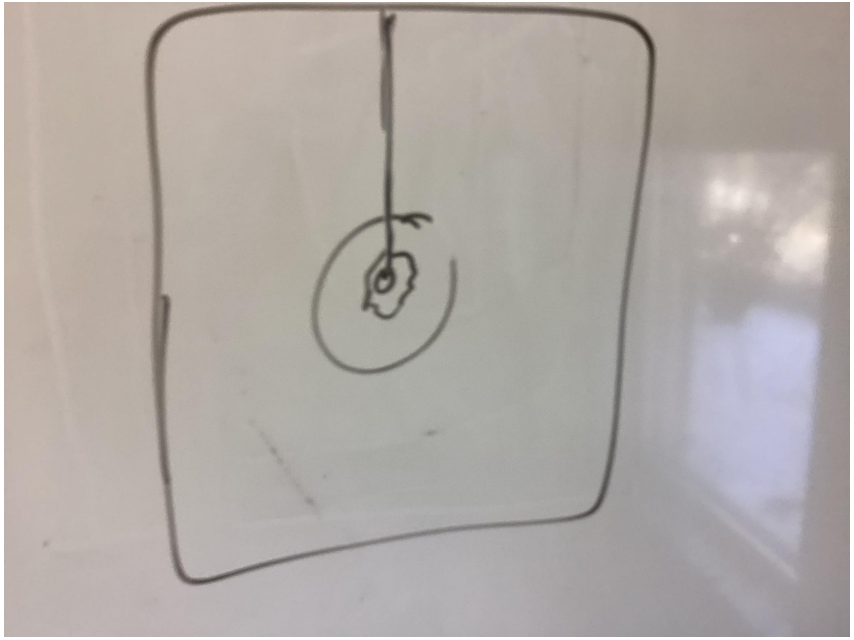
- Anna Feldmann
- Loral Peters
- Sofia Park

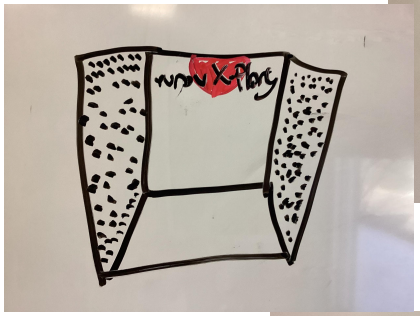
Unable to attend

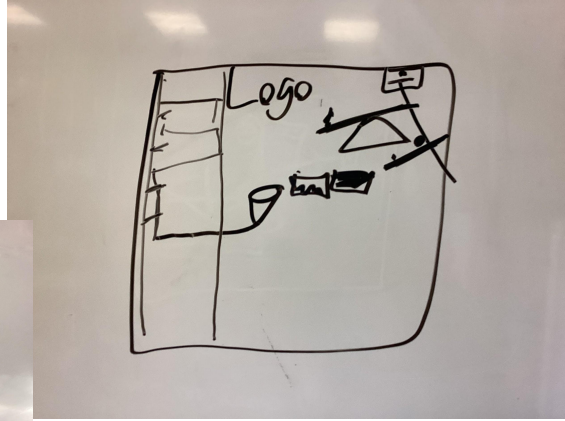
- Amy Tran
- Ben Feldmann

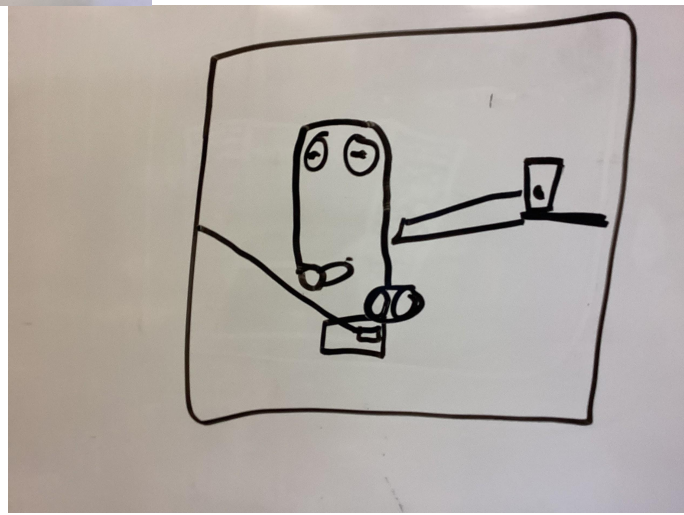
Background Information

Machine Sketch Before Construction

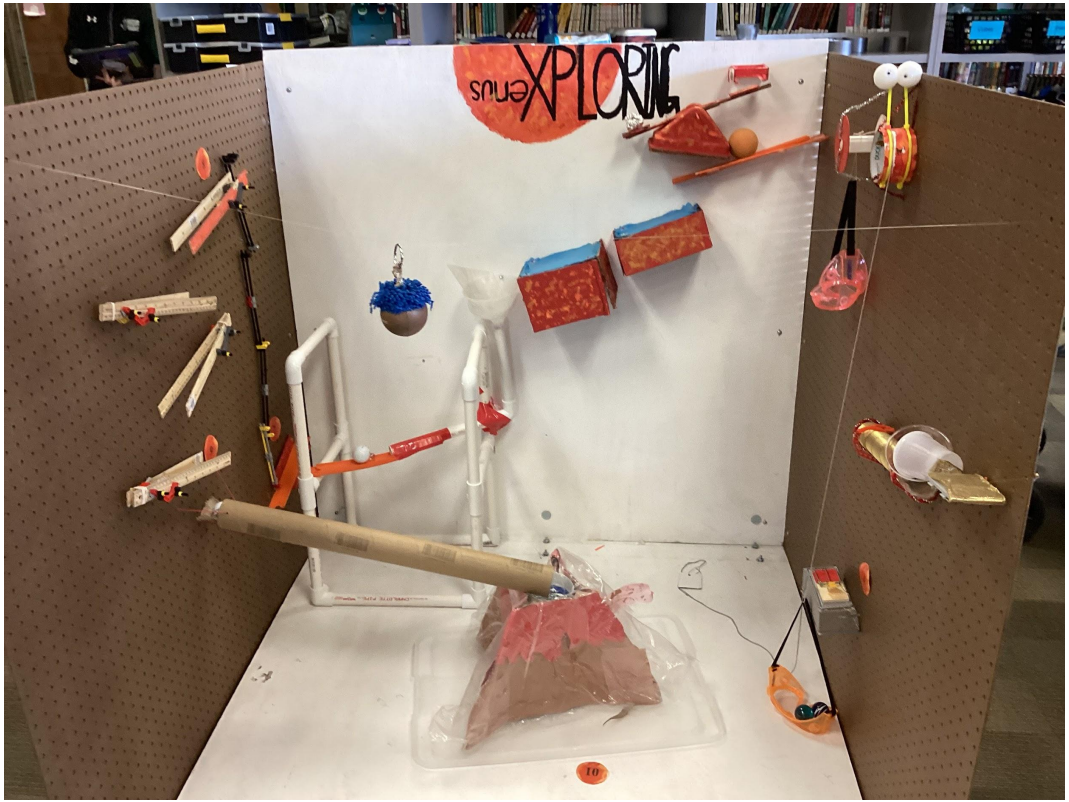








Final Machine



Full Material List

Recycled Material

- Whiteboard Eraser
- Fishing line
- Rope
- Empty duct tape
- Empty Ribbon
- Binder Clip
- Ribbon
- Plastic Cup
- Large Marble
- Small Marble
- Pipe cleaners
- Zip ties
- Old paper towel rolls
- Legos
- Safety Glasses
- Funnels
-

- Plastic Gloves
- Washers
- Skewers
- Hot wheel track
- Cardboard
- Yarn
- Hot Wheel Car
- Thumbtack
- Styrofoam
- Popsicle Sticks
- Mouse trap
- Pcp PIpes
- Old wipes container

Purchased Material

- 4’X8’ Pegboard: $21.99
- 4’X8’ Wooden Boar: $39.90
- Washers: $1.89
- Nuts: $1.18
- Elevator Bolts: $7.59
- Corner Brace: $5.37

Total:$77.92

Total with Taxes: $83.37

Bibliography

https://solarsystem.nasa.gov/planets/venus/overview/

https://www.britannica.com/place/Venus-planet

https://airandspace.si.edu/exhibitions/exploring-the-planets/online/solar-system/venus/

https://www.rmg.co.uk/stories/topics/interesting-facts-about-venus

Reflection

We started this project by figuring out the story we wanted our machine to tell, while also making sure to incorporate this year's theme “Into Orbit”. When we were thinking about the storyline, we were also looking at many different Rube Goldberg machines for inspiration. We picked our favorite components and thought about what materials we had available that we could use to make something similar. We determined that we wanted to focus on the planets in our solar system, and approached it as if we were in the future exploring that planet. We eliminated the four planets farthest from the sun because it's impossible to land on a gas planet. That left us with three options, Mercury, Venus, and Mars. One of our team members wanted a volcano for our final step, so we went with the only other planet besides Earth to have active volcanoes, Earth's sister planet Venus. We researched Venus after we decided to base our machine on it. We didn’t have a lot of knowledge about this planet prior to this project. We learned that Venus was the hottest planet, had a lower amount of gravity than Earth, and many other things.

Reflection

While a few people were researching, most of us were brainstorming our steps, and also making our logo. We were trying to find a cool way to display our theme and we landed on a play of words, our theme is X-ploring Venus. We then found ways to show the orbit of Venus, the gravity, the volcanos, and the rare occasions asteroids hit Venus. When we figured out the basics of what we wanted our machine to have we started figuring out what we wanted as our structure. We had to make it easy to completely take apart and put together because of transportation. We also wanted easier ways to secure our steps to the wall besides just screwing them to the wall. Then someone thought of a peg board. We still wanted to incorporate wood to make it sturdy, so we landed on the idea of a cube with one open side and no top. The bottom and middle walls were made out of wood and the sides were made of peg boards. Then half of us planned out where the steps were and what we wanted them to be made out of and the other started to construct and paint the structure.

Reflection

For the first step, we want to show us starting our exploration by landing/ crashing on Venus. To start our machine we have a whiteboard eraser that symbolizes us being pushed down a zipline , this is showing our astronauts crash landing. Once we landed, we decided that we wanted to explore the tunnels. The tunnels were Lava tubes! Exploring the tunnels is represented by the marble going through the tube. Lava tubes are a natural tunnel within a solidified lava flow, formerly occupied by flowing molten lava. When exploring the tunnels we needed to stay safe, and goggles would be an obvious eye safety choice, evidenced in our third action. The next step is activating the mousetrap. This is showing how fragile the mission is and that everything has to go right to have a complete mission. The mousetrap then pulls a piece of white cardboard, this symbolizes us going back to our ship, contacting Earth of our whereabouts, and then leaving the ship again. When the mousetrap pulls the cardboard it makes the “asteroid” fall. Asteroids are rare on Venus but they have occurred.

Reflection

When the asteroid falls it causes a weighted lever to go down on one side, causing it to hit a ball that then hits a marble. This symbolizes us walking on Venus. While we were walking, we discovered that Venus has less gravitational force than Earth does. We made trampolines to symbolize the difference in gravity. Venus has a lower gravitational pull than earth does, so you'd be able to jump higher there, like how the marble does on the trampoline. Once we're past the trampolines, our next action is the marble hitting the ladder. Venus has a mountainous and rocky terrain, and we wanted to showcase that by moving up in our machine. After climbing the hills, we had to find a safe way to get back down to the ground. We can jump down the hill and cover ground faster than we would on earth, again because of the difference in gravity. Once we'd successfully gotten down the hill, we set up a rover that we were going to send to collect data on a nearby volcano. Venus is the only other main planet in our solar system with active volcanoes, and we wanted to see what differences it might have. When the rover entered the volcano, it set off an eruption.

Reflection

One of our struggles was taking too long during the brainstorming process and starting the building so late. Our consistency on this project was also a huge struggle. When we only had about 25 minutes every time we met, we couldn't get much done. Additionally, everyone on this team was either in the First Lego League competition, the VEX IQ competition, and/or in sports, which took up a lot of time and energy. All of these issues we solved by organizing our tasks and assigning them to different people. We started staying after school and focusing more on building instead of trying to come up with more ideas. It also became easier when people found what they were good at and we were able to have a plan that allowed everyone to do what they were best at.

One of our major successes is our ability to work as a team. We worked together very well even though before this some of us have never worked with each other before, and hadn't spoken before this project. Another success is our actions and how they work with the storyline. We have very creative minds and when we put them together we think of great ideas.

This connects to our future because it shows us what it's like to be engineers, and gives us a taste of what it might be like if we were to pursue it as a career. This project helps us to learn what to prioritize, helps us work with others better, and how to recognize their individual talents and skills.

Reflection- After Regionals

When we came back to this project after regionals, we reviewed our machine and began making changes to steps we felt could improve. To determine what needed to be fixed we combed through our design and pinpointed places, that based on previous runs, did not perform consistently. We noticed very early on that one of the compounding features that was hindering the second half of our project was the trampolines. To amend the issue, we reconfigured the dimensions of the existing trampolines, remade them, and replaced our original model. After repairing the trampolines, we noticed that once we were no longer the ones triggering the ladder, it didn't complete its function consistently. We ran it several times to get to the root of the issue, and after lots of trial and error, ended up altering the width of the ladder, and using a new source of energy. The parallel bars were something we thought would be a considerable challenge, but after some experimenting, we discovered that they simply had to be tightened. The final thing we had to fix was the ramp leading up to the volcano. Our preliminary design was something we put together later than we anticipated, and thus we didn't have time to properly test it. Our end result was of a similar structure, but a different material that fortified the overall model.

Word Count: 1,292/ 1,500

Concepts and Ideas

When we began brainstorming, our initial ideas were very different to what we have now. Many things evolved over time, some things were scrapped completely, and others were added on the more we worked and thought about what would flow best. One of the biggest things we didn't consider in the beginning before our structure was built was how to attach things securely to the walls. Many ideas like a pair of scissors cutting a string to set off a pulley were just not attainable, and replaced by things like our seesaw and mouse trap. We also made sure every step would be able to fit into our story of exploring Venus, and it was a key part of deciding on our steps.

Actions List

- Crash on Venus
- Navigating the Tunnels
- Protecting the Eyes
- Mission Control
- Asteroids!
- Walking on Venus
- Climbing the Hills
- A Safe Walk Down
- Setting Up The Rover
- Volcano Research

Venus Quick Facts

- It takes Venus longer to rotate once on its axis than to complete one orbit of the Sun.
- Venus is hotter than Mercury
  - Its mean temperature is 462°C.
- Has high concentration of carbon dioxide in the atmosphere
- Unlike the other planets in our solar system, Venus spins clockwise on its axis
- The clouds of sulphuric acid in Venus' atmosphere make it reflective and shiny. The brightness makes it visible even during the day
- A day on Venus lasts 243 Earth days
- A year on Venus lasts 225 Earth days
- Venus doesn't have any moons
- Is the hottest planet in our solar system
- Small and rocky
- Has an active surface, including volcanoes

Actions

1. Landing On Venus

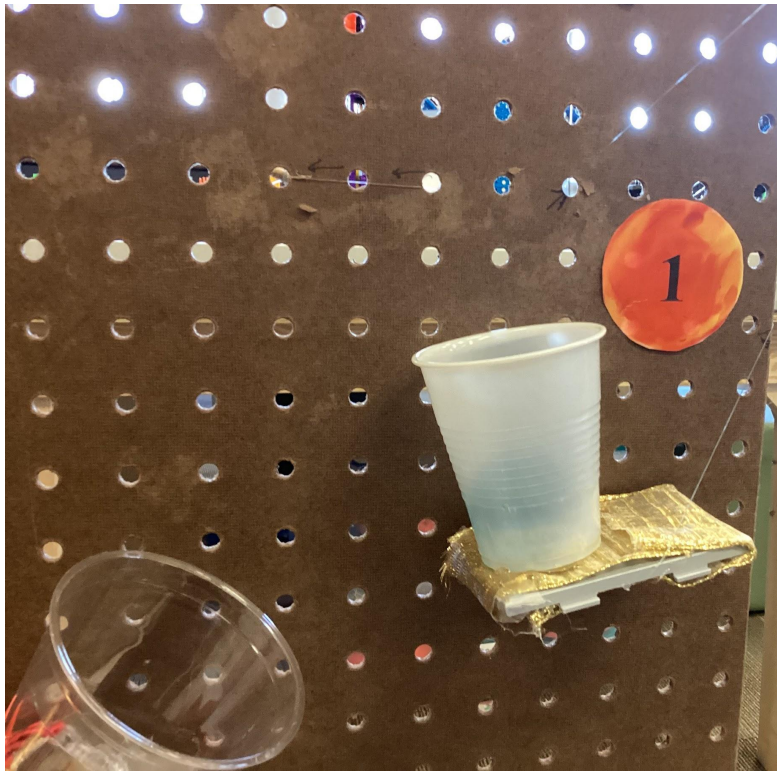
Our Struggles:

It took some time to find material for the line that would be strong enough to not snap or sag, smooth enough to allow the ring to pass over it easily, and that we had a good amount of. This reminded us of the long process to making an effective, efficient spaceship and the different models and prototypes they go through.

What we used:

- Fishing wire
- Wood skewer sticks

1. Landing On Venus



2. Navigating the Tunnels

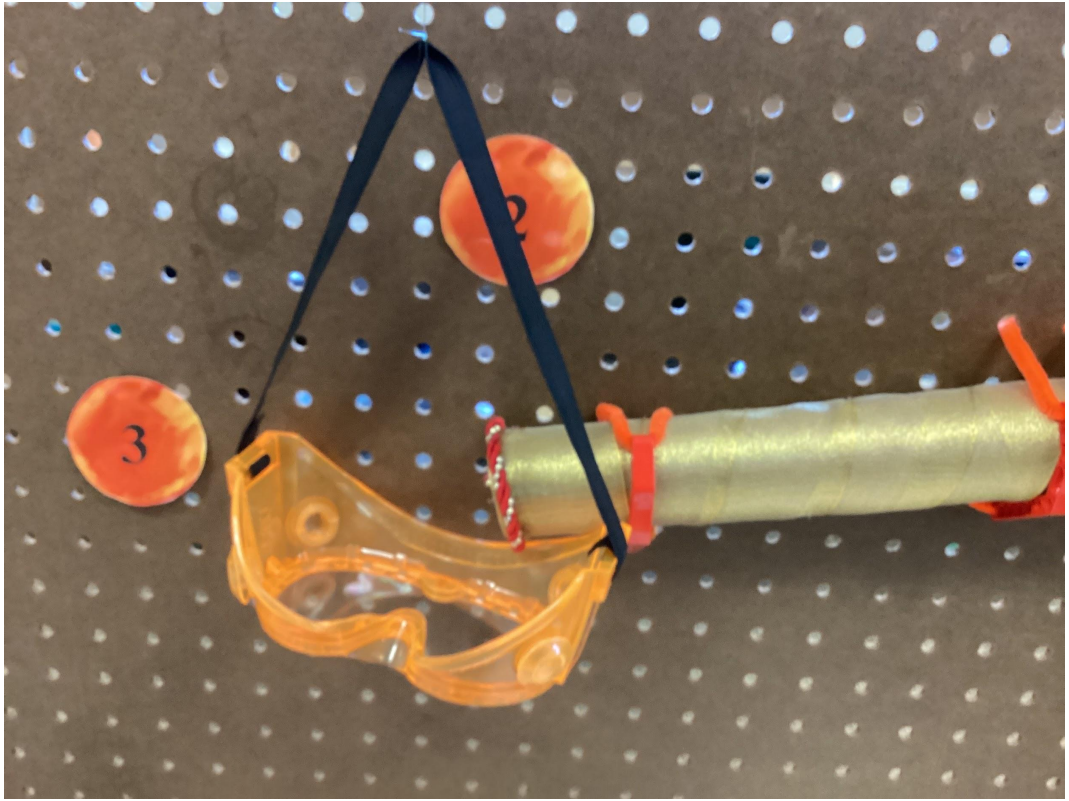
Our Struggles:

We made many different versions of this step because of a few factors. The first was finding materials that weren't to heavy, easily attachable, and that we could decorate well. The second was placement and making sure it properly lined up with our astronaut coming down the Zipline. The third was trying to find a way to securely attach it to the peg board without being in the way of the falling cup. By solving our first problem, we were eventually able to solve the two after it as things fell into place. This is especially relevant to this step, as it's showing our astronaut fall out of his spaceship.

What we used:

- Cup
- Decorated tube
- Decorated plastic ledge
- Fish wire
- Cut wooden sticks
- Marble

2. Navigating the Tunnels



3. Protecting the Eyes

Our Struggles:

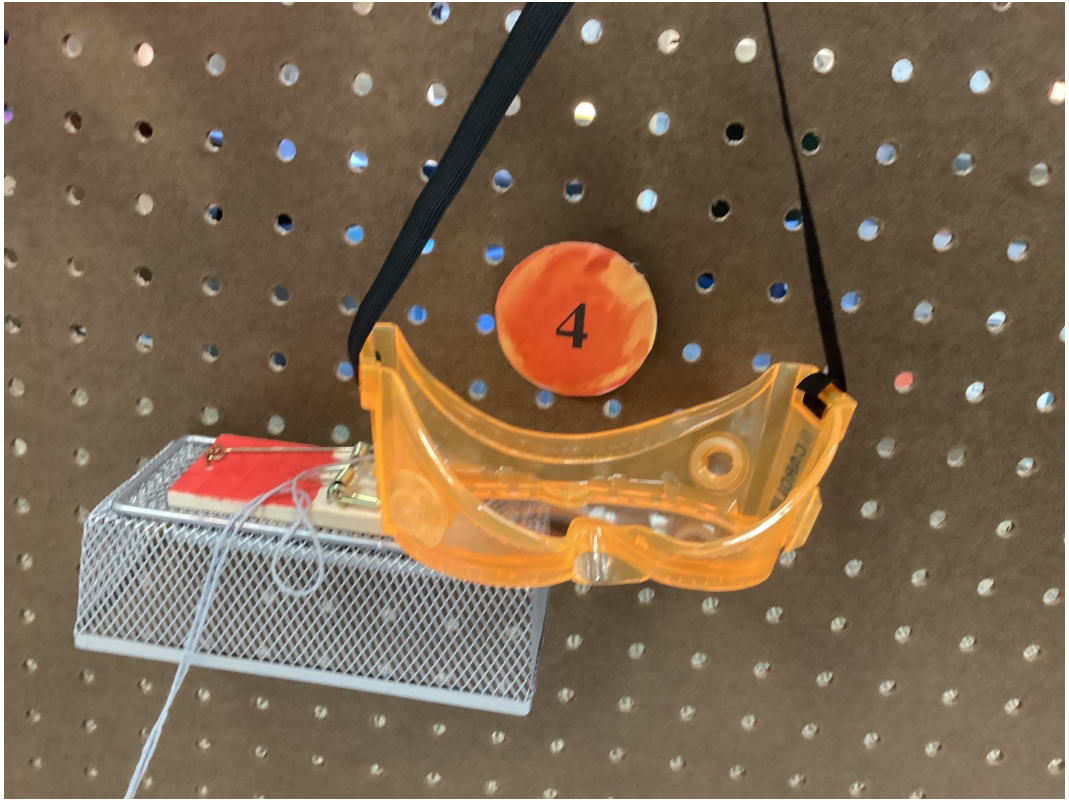
The biggest challenge with this step was finding something that not only was balanced enough to be used for a pulley system and hit the mouse trap evenly, we were also considering how it would be related to Venus. We decided on goggles because they're something that would be used on a mission to Venus, and filled all our requirements engineering wise.

Our Final Product

What we used:

- Goggles
- String
- Zip ties
- Marble

3. Protecting the Eyes



4. Mission Control

Our Struggles:

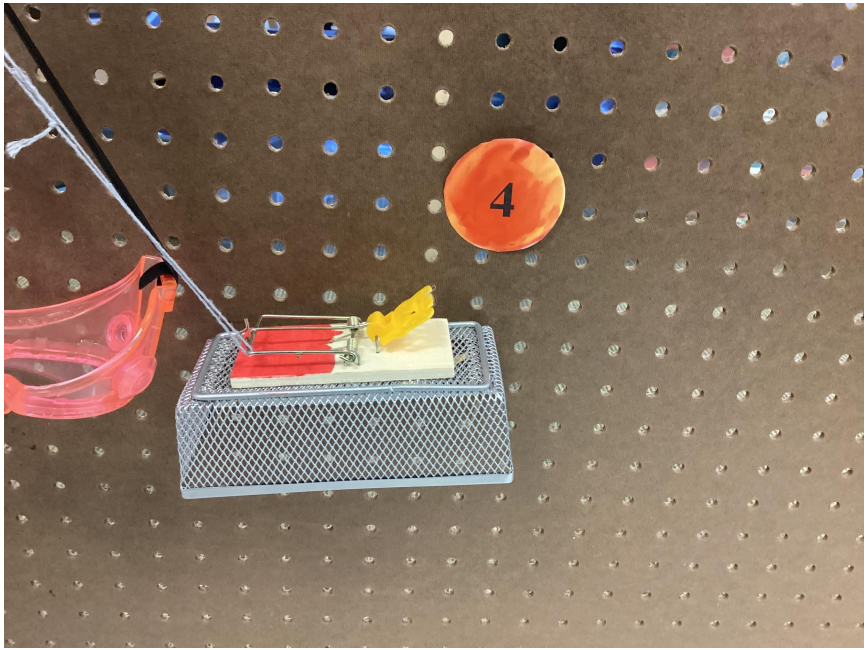
This step was one of the hardest to perfect because of its sensitivity and the specific things that needed to happen for it to work properly. The success of this step depended on the one before it, much like how a space mission would depend on everything going correctly on earth.

What we used:

- Mouse trap
- Upside mesh container
- String
- Weighted washers, decorated to look like asteroids

Our Final Product

4. Mission Control



5. Asteroids!

Our Struggles:

As our machine evolved, so did this step. It began as being much closer to the mouse trap and did not include the falling asteroid. The more we worked and found new materials, the more we realized we could do with this step. Originally this step was going to exemplify the pull of gravity on Venus, but ended up showing the asteroids that occasionally land on Venus' surface and rocky terrain.

Our Final Product

What we used:

- Paint
- Decorated cardboard
- Wooden sticks
- Weighted Washers

5. Asteroids!

6. Walking on Venus

Our Struggles:

An important part of this step that was difficult to pull off was the spacing. Too much space and our astronaut (marble) might fly too far, too little and it would roll off the side and miss the funnel. After a bit of trial and error, some educated guesses, and experimentation, we found the perfect distance to simulate jumping on Venus, which doesn't have as much gravity as earth.

What we used:

- Rubber Gloves
- Styrofoam
- Needles
- Velcro
- Cardboard

Our Final Product

6. Walking on Venus

7. Climbing the Hills

Our Struggles:

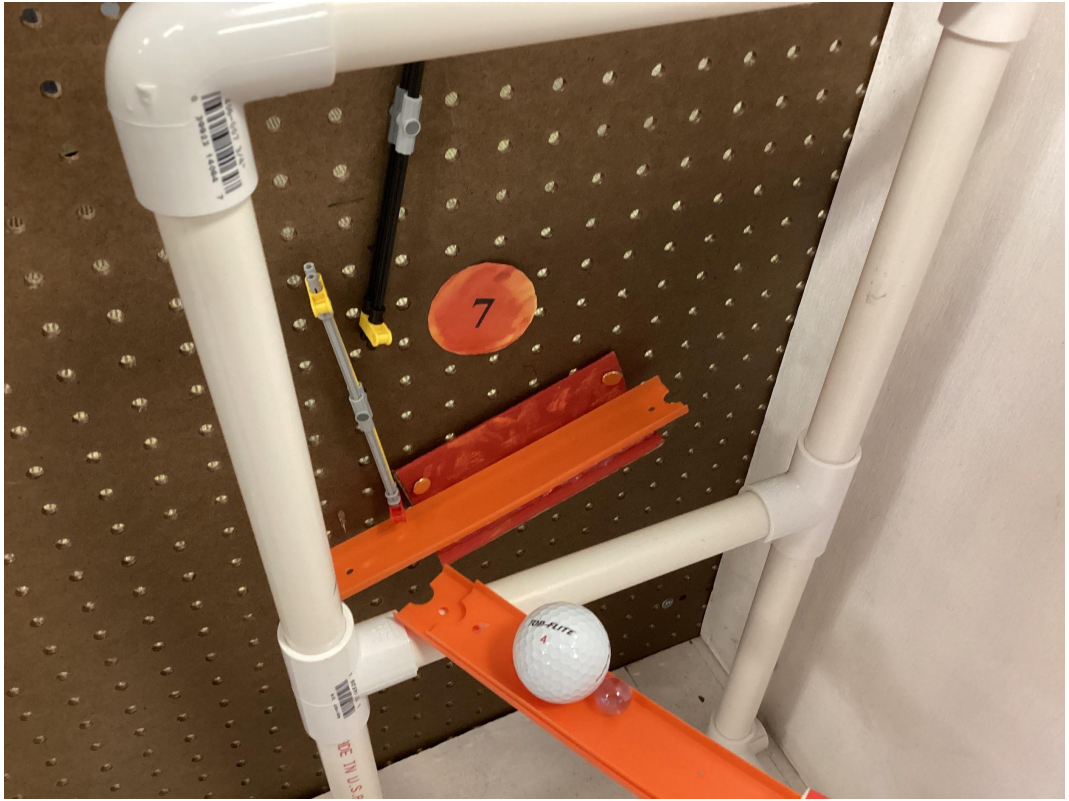
There were two things that made this step a particular challenge. The first was how to support it, in a way that was both supportive of the design and wouldn't take too long to build and take apart. Once that was finished, the second challenge was much easier to problem solve. That second challenge was how to position the beams used to knock the next object so the ladder could continue. This is both an example of the challenges that would be posed when exploring another planet, as well as the mountainous and rocky terrain of Venus.

Our Final Product

What we used:

- Legos

7. Climbing The Hills



8. A Safe Trip Down

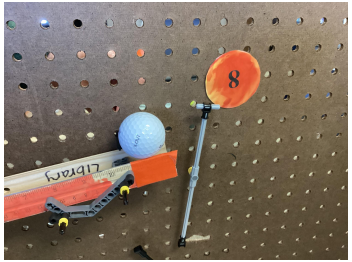
Our Struggles:

A struggle we had during this step wasn't necessarily the building, but figuring out how to space them out properly so that it had the best visible affect. We did this with lots of trial and error, moving them little spaces at a time before we decided where we wanted them to go.

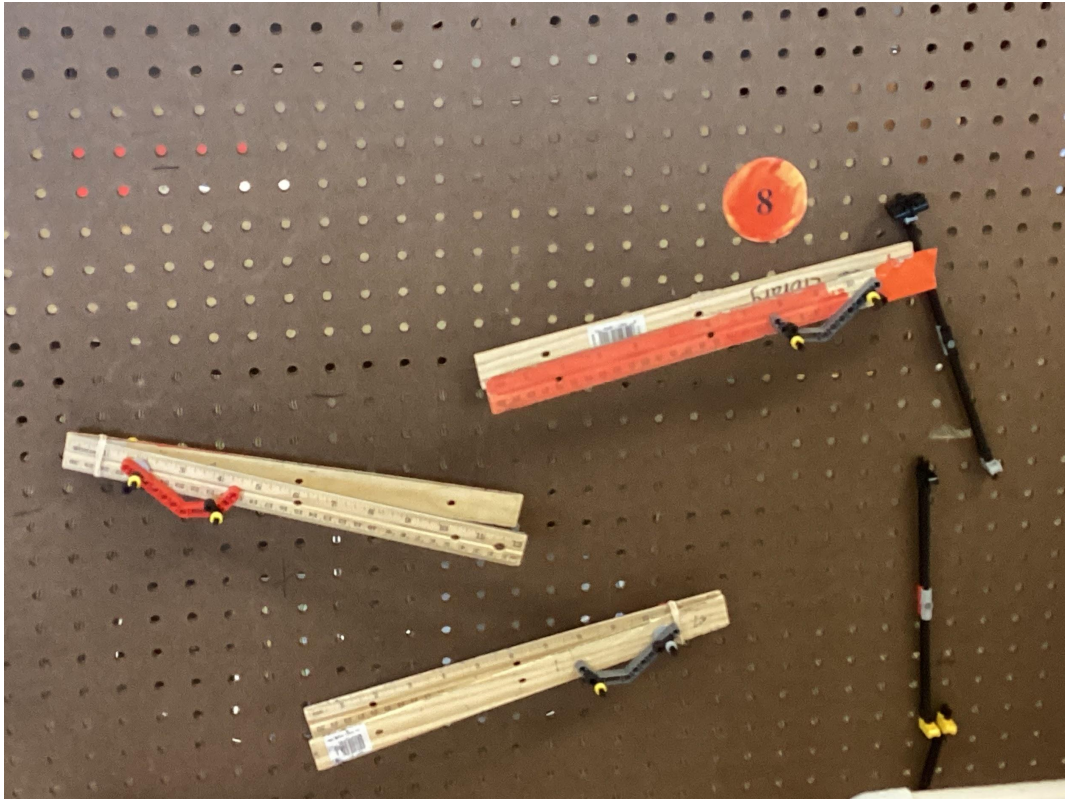
Our Final Product

What we used:

- Rulers
- Legos
- Rubber Bands



8. A Safe Trip Down



9. Setting Up The Rover

Our Struggles:

We had some issues making sure the rover stayed on the correct track instead of veering off the side, and solved that by changing the material we used from a cardboard ramp to headphone cases that we connected. This made a much more direct track that we could use. We also had to make sure the angle of it was steep enough that when the rover reached the balloon, the rover had enough momentum to ensure that it could pop it.

Our Final Product

What we used:

- Headphone cases
- PVC Pipes

9. Setting Up The Rover

10. Volcano Research

Our Struggles:

The volcano was one of the things we knew we wanted right away, because it's a feature that is unique to Venus and Earth and unites us as sister planets. Since we are the only two main planets to have volcanoes, we thought it would be only natural we'd want to learn more about Venus' volcanoes, which is why or machine ends with sending a rover into one. In creating the volcano we had to face the issues of creating the right ratio of baking soda to vinegar, and creating a structure that was both volcano like and wouldn't be damaged by the chemical reaction.

What we used:

- Recycled Cardboard
- Recycled Paper
- Empty Lysol Container
- Plastic Cover
- 3D Printed Base (Scrapped Designs)

Our Final Product

10. Volcano Research

Biographies

Our Team

We are a team of 8th and 7th grade engineers from Blessed Maria Assunta Pallotta Catholic Middle School. There are seven of us on this team, and everyone contributes in their own way. In the beginning stages, we divided the work so some people brainstormed ideas, others researched Venus, as mentioned in our reflection. During the construction stage, some people were excellent at making prototypes, others were more skilled at perfecting the engineering and functionality on the scale of our actual machine, and we had a couple people who were incredible at cleaning things up to make them look more professional.

Anna Feldmann

My name is Anna and I enjoyed being on this team because I love working in teams and going through the engineering design process. I love learning new things and applying them in my day to day life. This is my second year on this team and really enjoyed the competition last year so I am very excited to be on this team again. This competition has made me realized that in the future I want to do do something in the field of engineering. My favorite things to do in my free time are volleyball, puzzles, reading, and hanging out with my friends.

Loral Peters

My name is Loral Peters and I am an 8th grader at Blessed Maria Assunta Pallotta. I joined this team because I wanted to enjoy life with doing something I loved to do. I love to be creative and to physically build things. I was on the Engineering team last year, and I loved it so I wanted to give it another try. My favorite hobbies in my free time are volleyball, creating art, camping, hunting, fishing, and to build different things like robots and prototypes of cool machines. I really love being on this engineering team and can't wait to see what I do in the future.

Sofia Park

My name is Sofia Park and I'm a 7th grader. In my free time I like to draw, play volleyball, and cook with my family. What I liked most about being on this team was learning from the people I was working with, and collaborating with them to make the best possible project. I joined to learn more about the engineering and design process and see if it's something I might be interested in as a future career. After spending some time doing it, engineering is definitely a path I would consider as I go through middle and high school. This is my first year on the team, and I'd love to be able to come back and participate again next year as an eighth grader.

Amy Tran- Unable to Attend

My name is Amy Tran and I’m an 8th grader. The thing I enjoyed the most about being in the Engineering team was that I was able to work together with my teammates and design amazing things. This is my first year in engineering and I joined it because I wanted to learn and discover new ways to create and designs some amazing creation. Some of my favorite things that I enjoy the most is listening to music, reading, sleeping, and mostly being on my phone.

Ben Feldmann- Unable to Attend

My name is Ben and I am a 7th grader at BMAP. I like to play video games and hang out with my friends and family. I like this team because I enjoy making things and contributing to a big project. At first i struggled with it because it was kind of out of my comfort zone. After a few days I started to get the hang of it and now I really enjoy doing different small thing to make our project.

More extra pictures

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After Regionals

After Regionals