**TEAM #6: THE AWESOME ALL GRADERS**

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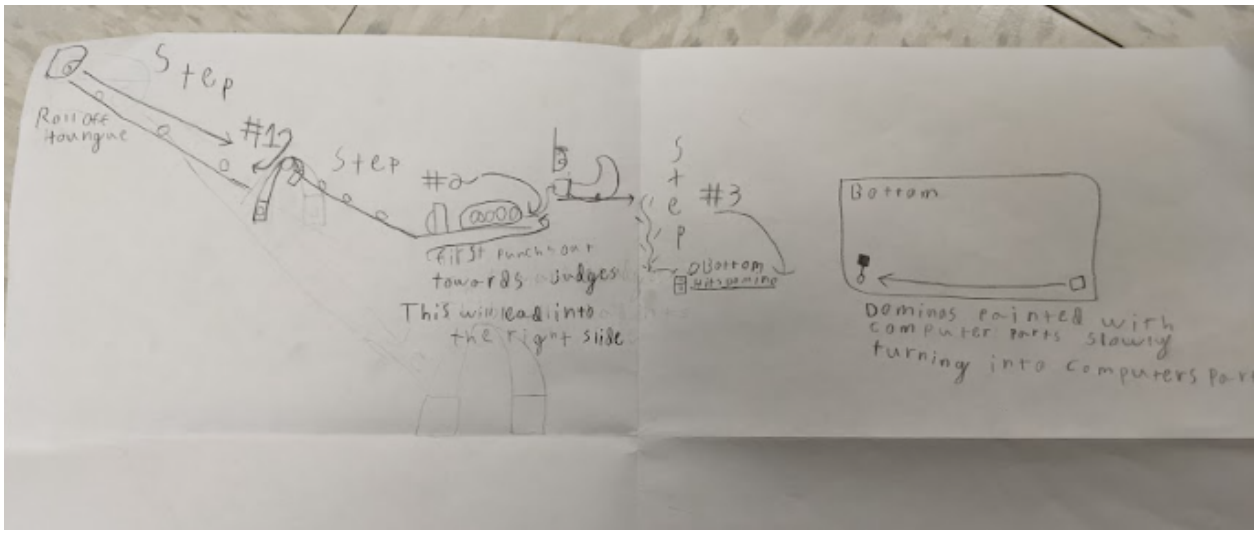
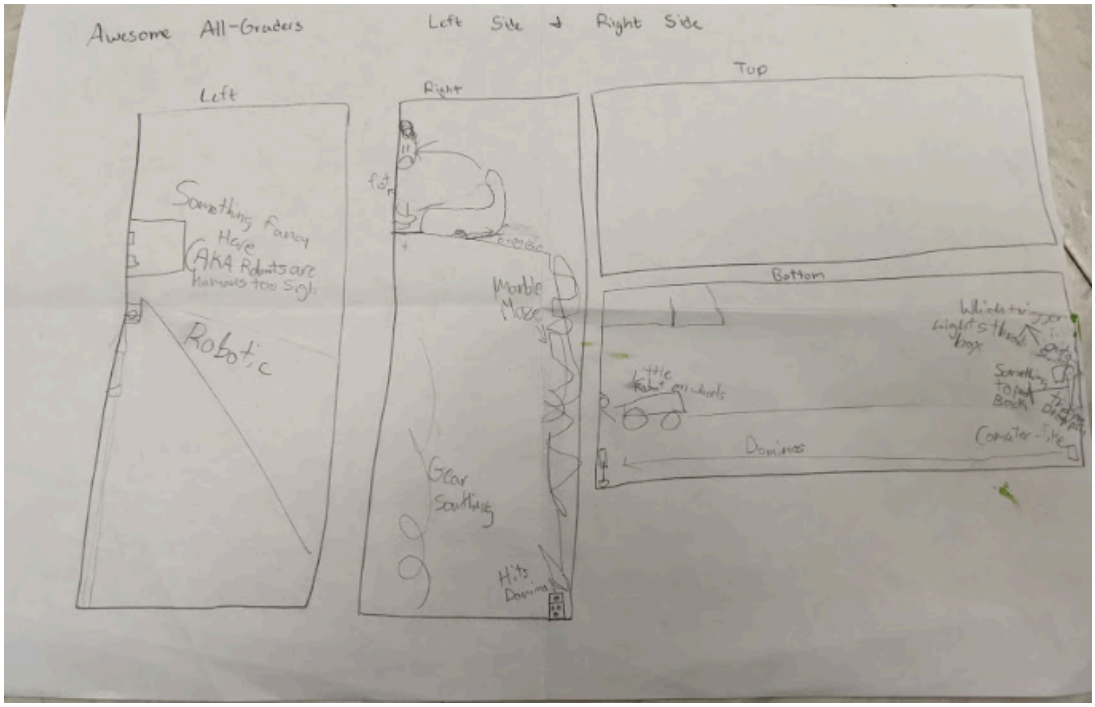
# Machine Design Sketch






## Final machine design


## List of machine steps

1. The Ledge and Tube
2. The Perfect Pulley Prelude (Green Pulley)
3. The Giant Dominoes
4. We've Lost Our Marbles (Marble Jar)
5. The Amazing tube
6. Lost in the Labyrinth (Marble Maze)
7. A Healthy Dose of Dominos (Domino Line)
8. Domino Switch
9. Robot on the Road (Bot Box)
10. The Grand Finale (Drop Pin and Lights)

# Machine cost and recycled amount

Almost all materials that were used were leftovers and scrap materials that were found by our coach.
The Box itself was made through a grant, to be reused.

The Plywood was about $50, the castor wheels were scavenged and reused, so they were about $5, and screws were about $5.
The materials used inside the box were scavenged and brought in from scrap bins and team member's homes.
We bought our green lights off Amazon for $10.

# Reflection

Creating this machine was a lot of work, but also lots of fun! It tested our limits as individuals and as a team. We had some bumps but it all worked out in the end and we are pretty proud of ourselves! Our box definitely has some flaws but that's a part of design and creation too.

We had some struggles working as a team, getting everyone all on the same page was strenuous, because we all had our own great ideas for what might come next. Assigning parts was a hard job, as no one knew exactly what they were supposed to be doing. This is something we can work on in the coming years.

Our Final design is very different from our original concept because we kept thinking of newer and better designs to sub out, and better ways to make the same connection. The Robot that triggers the lights was something we kept redesigning, along with the marble maze. I think we could have been more creative and innovative if given more time, but then again this *is* our first year. All in all, we did our best, and that's what matters.

Our Robot Car was originally meant to roll down the ramp, with the higher end of the ramp angling towards the drop pin, when the car rolled down the ramp, the drop pin would be pulled, and so on. Our next idea was to make the car roll on its own, after the dominoes pushed a button on its back. We were planning to attach a simple engine to the car, but when we were unsure how we would turn the car off we went back to the drawing board and decided once again to just have the car roll across the floor, and pull the drop pin out using gravity.

As the Competition grew closer, we began rushing more and more. As we worked on the machine, we devoted lots of time and attention to small steps like the dominoes and the tube that leads to the marble maze, instead of backing up and seeing the big picture. If we had done this, we may have done better with time management, and we would not have had to rush to include extra steps at the very end, or to try and squeeze

them in at the beginning. This is something that we will try to work on next year, but since this was our first year, I cannot blame us. We were excited to be building, and we wanted to make every little thing perfect, but that was a mistake.

Our Team is a Wacky-Smorgasbord of people across all grades and experience levels, from 8th grade, to 6th grade. If you were to take 8 different random people, I'm sure you would understand they might have some trouble working together in the beginning. We certainly had our fair share of team troubles, but we all found out what we like to do in team settings and that is very important for aspiring engineers and entrepreneurs. The ups and downs included debates over how we should design a certain step, or who should get to design the next one, but in the end we always compromised and that's what's important.

# Bibliography

Work Cited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# Documentation

## The Ledge and Tube

Description: To begin our machine, we drop a ball down a ledge, and it travels from one side of the wall to the other and rolls into a tube which will drop it into the pulley.

Materials: Cardboard

## The Perfect Pulley Prelude

Description:

Something heavy is dropped into the cup on one side of the pulley, this triggers the entire machine. The Second cup has some weight, but less weight in it, so it flies up and knocks over some giant dominoes.

Materials:

The Pulley is a filament roll; painted green to match our box, and red ropes with painted dixie cups.

## The Giant Dominoes

Description:

3 Giant Dominoes Painted with an Explosion, a Gear, and our Logo respectively are knocked over by the pulley. They then tip the container of marbles.

Material:

The “Dominoes" are 6”x6”x0.5” blocks of wood, painted with acrylic paint.


## Trial and Error: Domino Edition

**An entry by Claire**

**We had some problems with our dominos. We thought that the problem was the dominos themselves, but after some trial and error, we realized that it was quite the contrary. Sure the dominos were a little**

**unsteady, but we took care of it fast and realized it was the trigger. The problem was how, yes the domino was unsteady, but it was because the cardboard on the shelf was making it. We changed it up after a lot of trial and error, and are now perfectly satisfied with the new product!**

**Initial Design:**

**Final Design:**

## We've Lost Our Marbles…

Description:

The Dominoes tip over a container of green and blue marbles, and they spill over the ledge and empty into the tube.

Materials: Plastic Tub, Door Hinge, Marbles, Cardboard, Wood.
This step was made out of Cardboard, Wood, and plastic tubes.

## The Amazing Tube

Description: The Marbles fall through this tube to reach the marble maze.

Materials: Flexible Corrugated Tubing, Hot Glue

## Lost in the Labyrinth

Description:
The Marbles from the container go through a marble maze and trigger the Dominos.

Materials:
The Maze is made of cardboard, popsicle sticks, and hot glue.

Design Evolution:
We originally made the maze too big and had to cut it down and adjust some of the sticks.

Initial Design:

Final Design:

## A Healthy Dose of Dominos

Description: Dominoes ranging from Normal to Extra-Large (insert dimensions) are lined up on the bottom of the machine, they trigger each other while building up size, until they trigger the robot car.

Materials: Wood

## Domino Switch

Description: Instead of having a switch, we took the positive side of the wire, and attached it to a domino while leaving the negative side on the ground.

Materials: Washers, 2x4's, Dominoes, Screws, Wires, Batteries, and Motor.

## BOT BOX

Description:

A robot riding in a truck rolls across the floor after being triggered. This represents the shift from human to robot transfer in a literal way as the robot is now moving on its own. This robot will pull the pin out of the drop pin and trigger the lights.

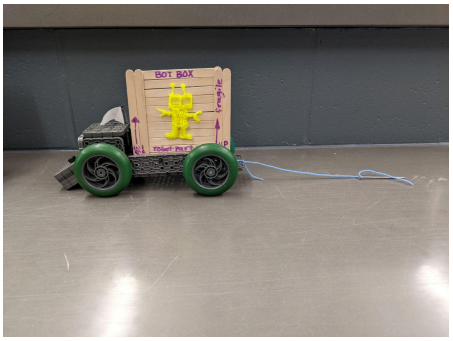
Materials:

The car is created from engineering pieces, and rollerblade wheels with a sign made out of popsicle sticks and a robot from a 3d printer pen. Tied to the back of the robot is a piece of string, which is tied to a nail that acts as the string that we pull.

Design Evolution:

The Bot Box was originally designed to be pulled across the ramp with a string tied to its front but we decided that would be too hard to trigger the lights with. We kept redesigning, first it was meant to roll on a ramp that was painted to look like a robot and a normal road transitioning, then it was going to be pulled, then it was gonna be pushed by something, and we eventually ended on a design where the robot gets knocked and rolls forward across the ground and pulls the drop pin using a motor.

Unused:




## The Grand Finale- Lights/Sign/Drop Pin

Design Evolution:

**FIRST IDEA**

Confetti Popping out with a sign?
Light up Sign showcasing:

- EDMC MN 2023 logo
- Robots are Humans Too
- Robot Silhouette
- Awesome All Graders

**SECOND IDEA**

Description:

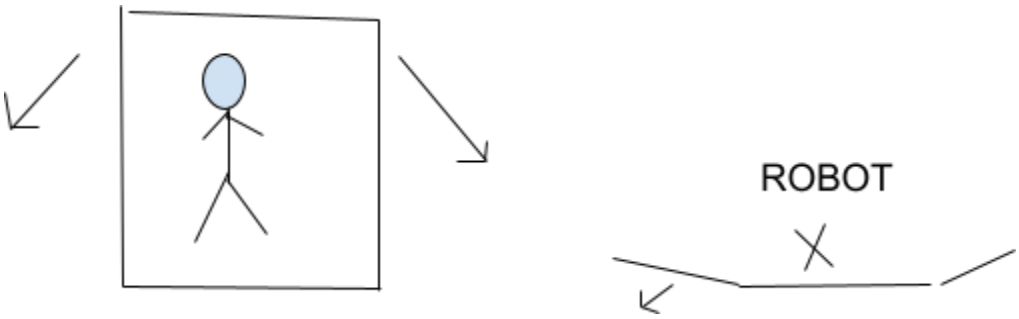
Our Last Hurrah is a hand covering the spring, then something like the last robot is finally removing the last trace of humans. It removes the hand, and then the spring springs up with a little robot guy, the robots have finally taken over.

**THIRD IDEA**

Description:

There is a box, and on the front there is a human.
Ball comes crashing down and makes the four walls fall down. Inside there is a robot, as if he is trying to hide and pretend to be a human, but now robots have taken over the world so there is no need to hide.

**SKETCH**

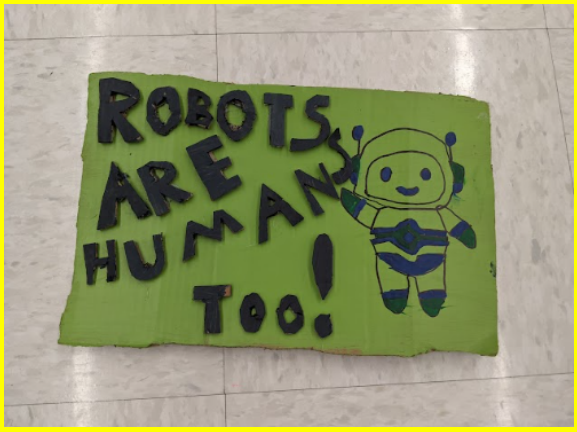



**FOURTH IDEA (FINAL IDEA)**

**Description:**
Green Lights rimming the entire machine, and wrap around a sign saying; "*ROBOTS ARE HUMANS TOO!*" that will be triggered at the very end with a drop pin.

Materials:
The Drop pin is a pvc tube, and the pin is a bolt with multiple nuts on it for weight**.** Underneath the pvc tube, is the button to the lights. The sign is all cardboard.

**RESULTS:**




## Team links - Idea starter document

Example Machines |||| Phone Folders ||| Instructions Document ||||| Team Spreadsheet|| **Jamboard** || 3D Print