
pen+ GEAR™
COMPOSITION
90049B
100 SHEETS
College Ruled
Purple

900498

CLASS SCHEDULE	My Little Pony Fan Club							
Time:								
Monday								
Tuesday								
Wednesday								
Thursday								
Friday								
Saturday								

WEB REFERENCE

GENERAL REFERENCE & RESEARCH SITES

Central Intelligence Agency: www.odci.gov/cia/publications/factbook
Central Intelligence Agency (CIA) worldwide factbook containing in-depth data for over 200 countries around the globe.

CNN Student News: www.cnnfyi.com
U.S. and World news multimedia site tailored to the needs of students.

Conversion Tables: www.convert-me.com
Convert length, area, speed, temperature, etc., into different units and systems.

eLibrary Research: www.elibrary.com
Search any topic using a database of current newspapers, magazines, books and more.

Encyclopedia Britannica: www.britannica.com
Online version of one of the world's most trusted sources of information on every topic imaginable.

Fact Monster: www.factmonster.com
Designed for kids of all ages, this site offers an amazing array of facts and figures in addition to homework help, an almanac, dictionary and much more.

Gallup Organization: www.gallup.com
Search thousands of poll results, special reports, societal trends and social audits.

Hoovers Business Research: www.hoovers.com
Comprehensive index of over 45,000 leading U.S. private and public companies.

Information Please Almanac: www.infoplease.com
Online almanac offering millions of interesting and useful facts on a wide variety of subjects.

Internet Public Library: www.ipl.org
An exhaustive collection of over 20,000 titles.

iTools Research: www.itools.com
Collection of online research tools including dictionaries, translations, quotations and more.

Library of Congress: www.loc.gov
Easy to use reference catalog for accessing the collections of the Library of Congress.

National Archives: www.archives.gov
National Archives online directory of U.S. Federal records.

Smithsonian Institution: www.si.edu
User-friendly site from the world's largest museum complex and research organization.

U.S. Census Bureau: www.census.gov
A wealth of basic information about the U.S., broken down on a national, state and local level.

U.S. Department of Labor: http://stats.bls.gov
Bureau of Labor statistics site containing current labor statistics and links to hundreds of state and Federal agencies.

U.S. Federal Government: www.fedstats.gov
Statistical information from over 100 federal agencies.

Table of Contents

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[redacted] 9/24/21

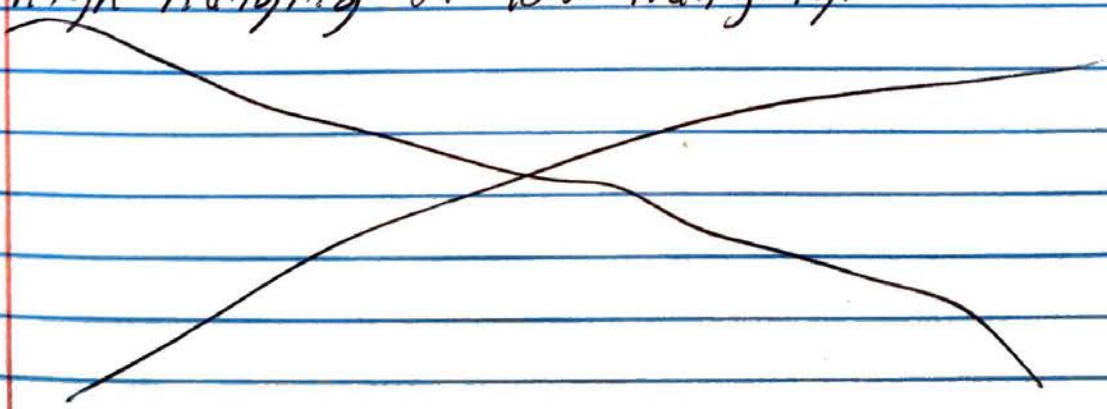
Game Description

·Matches are played on the feild shown on page 2. The skills challenge and teamwork challenge both use the board and are set up the same.

·Two teams work together in an alliance during a teamwork match to score as many points as they can.

·In the skills challenge, it is only your robot and you are trying to score the most amount of points you can. There are driver skills challenges and programming skills challenges.

·The goal of the game is to score the highest amount of points you can in 1 minute by scoring balls, clearing the corrals, and by either high hanging or low hanging.



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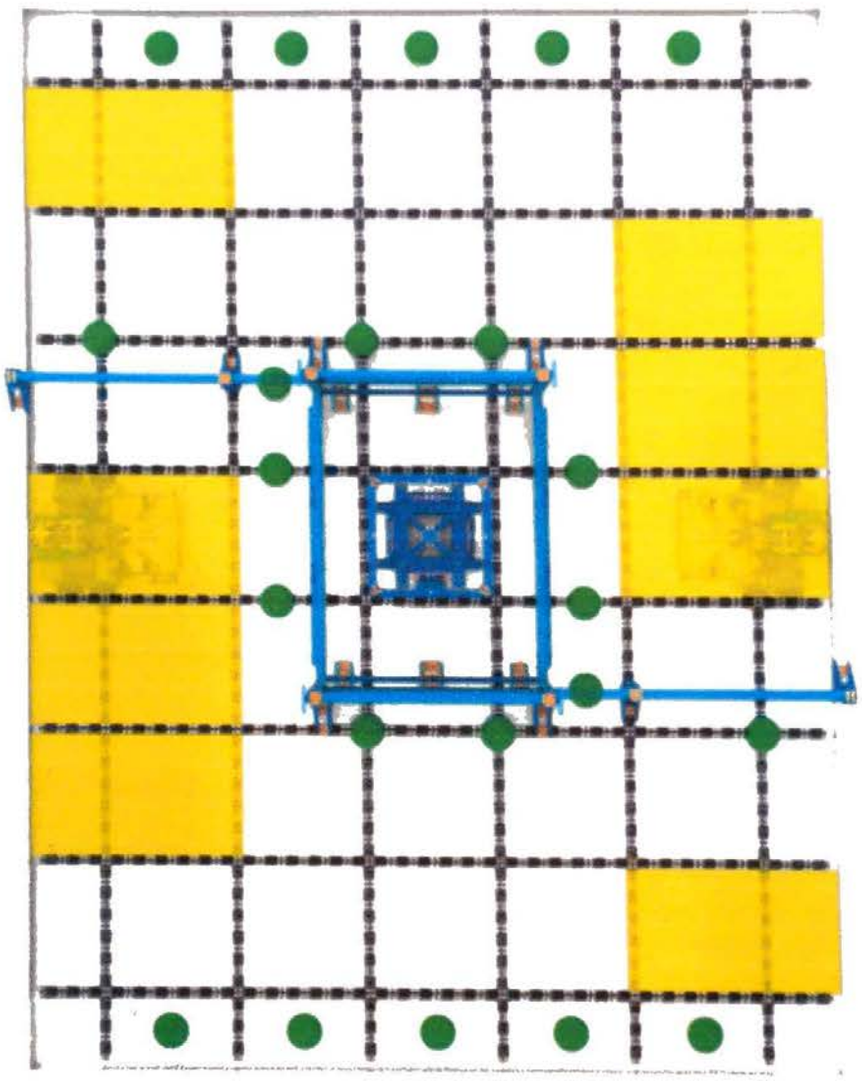
Feild Illustration



Kris

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Scoring and Feild Setup

·There are 22 balls on the Feild. There are 5balls lined up in each corral for a total of 10 balls. 10 more balls surround the central scoring area. The final two balls are located under their corresponding low hang bar.

·Corrals:

-The corrals are located on both of the shorter sides of the Feild. It covers the area from the wall to the First adjacent black line.

-A corral is considered cleared if there are no balls located on the Floor of the corral. IFa corral is cleared, it adds 5points to the total score. Having both corrals cleared can give you a total of 10 points.

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Scoring and feild Setup

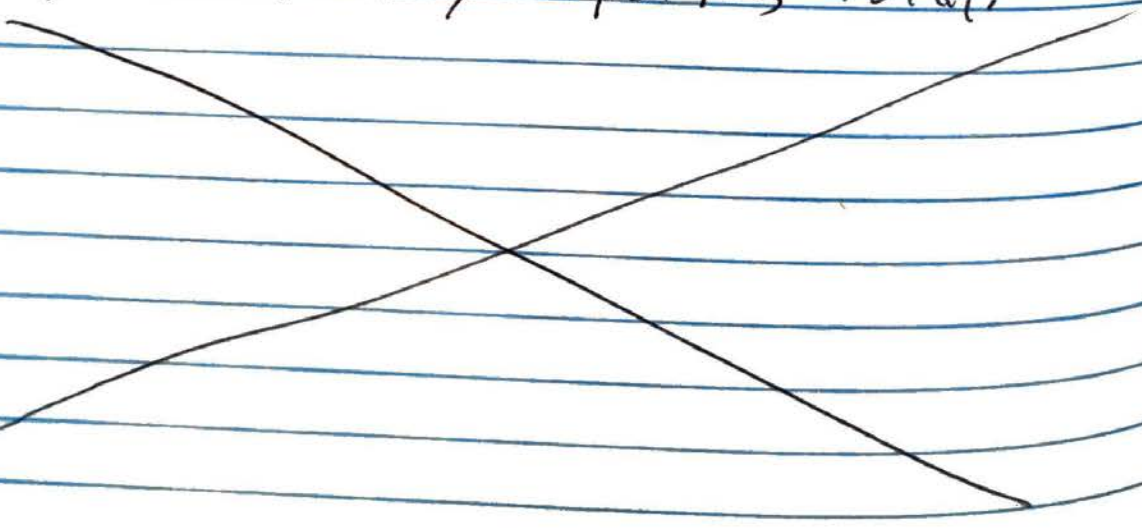
Hanging:

- A hanging bar is one of the PVC pipes that run parralel to the corrals. There are two hanging bars located on each side of the feild, A High hanging bar and low hanging bar.

- low hanging:

  - A robot is considered low hanging IF it isn't in contact with the ground and is in contact with the hanging bar. The robot also must not be supported by any balls.

- Each low hanging robot can get 6 points, 12 points total.



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Scoring and Field Setup

- High hanging:

- A robot is considered to be high hanging if it isn't in contact with the floor and is completly above the low hang bar. It also must not be supported by any balls.

- A high hanging robot can score 10 points per robot, 20 points total.

- Scoring Goals:

- low Goal:

  - The area in the center of the feild, surrounded by the high goal structure, and bound by clear plastic sheets on both sides, is the low goal.

  - Each ball in the low goal adds 2 points to the total score. The PVC pipes, plastic sheets, and VEX IQ pieces are all considered part of the low goal.

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Scoring and Field setup

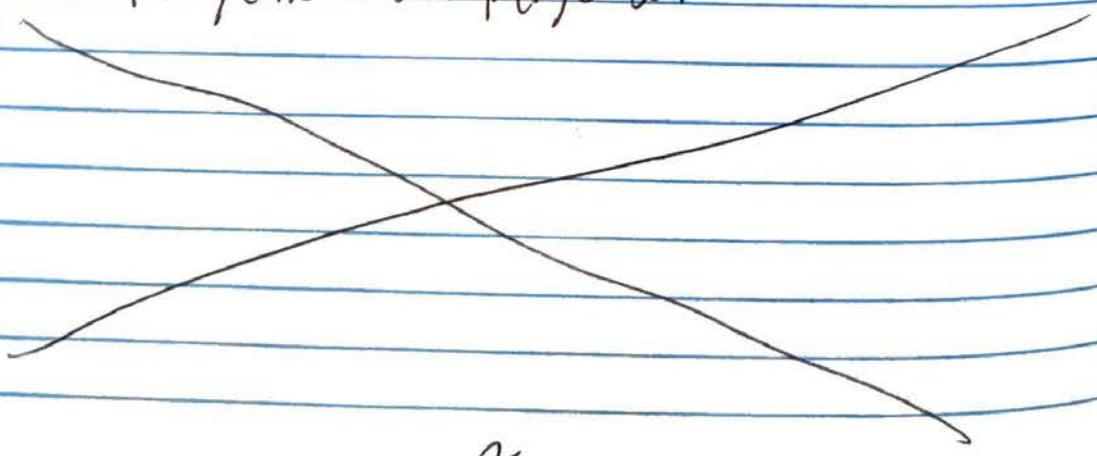
High Goal:

- The cube-shaped structure sitting above the low goal is the high goal. It is made with plastic sheets and VEX IQ parts. The supports used to elevate the goal above the low goal is not part of the high goal.

- Each ball stored in the high goal adds 6 points to the total score.

-Starting Positions:

- There are 8 starting positions for a robot to start in. Starting positions are bound by the inner edge of the black line. The starting positions are highlighted in yellow on page 2.



Kris

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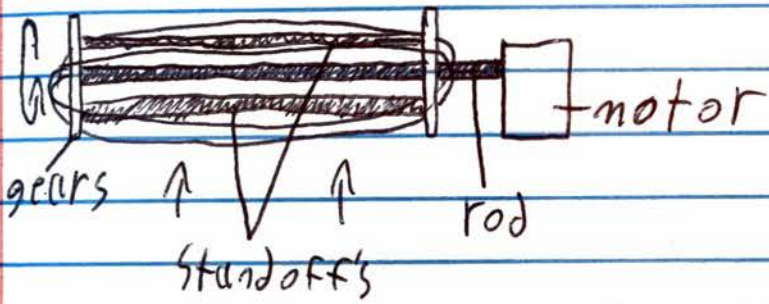
Robot Intake Designs

Our team was able to brainstorm 3 design that we could work as an Intake. Our first intake design was a rubberband intake. The second design was a conveyer type intake with a 2x4 pieces that helps push balls through. The third design is a rubberband goliath intake.

Design #1: rubberband intake



The first design uses two gears separated by stand-offs. It has a rod going through the middle that connects to the motor. It has three rubberbands that are equally spaced apart and go around the gears and sits in the grooves of the gears. While its spinning, it allows balls to be sucked up into the intake. The rubberbands compress and hold the balls in place in the intake.

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8 Robot Intake Designs.

Problems with design #1:

- This design requires that you have two motors connected to it for it to work effectively.

- When the balls exit the intake, they tend to bounce on top of it instead of going through to the rest of the robot.

Solutions for design #1:

- The intake needs two motors because it doesn't have enough torque to move the ball through the intake. This is because of the ball pressing against the rubber bands and creating a lot of tension. You could fix this by using a gear ratio, but it still wouldn't be as efficent.

- To stop the balls from bouncing, we changed the exit of the intake so that the ball either go down, or directly into the next part of the robot. Although this doesn't allow for storing balls.

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Robot Intake design

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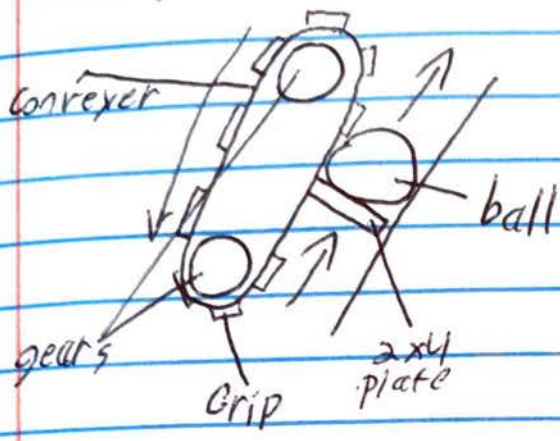
Design #2: Conveyer



The second intake uses a conveyer belt with a 2x4 plate to suck up the balls. the conveyer has gripping pads on it to help grab onto the balls. Once the grip pads start to pull the ball in, the plate goes around and pushes the ball up because the pads alone can't.

Problems with design:

- Each time you want to suck up a ball you have to wait for the plate to go all the way around again.
- It Generally just moves slower than the other designs shown.

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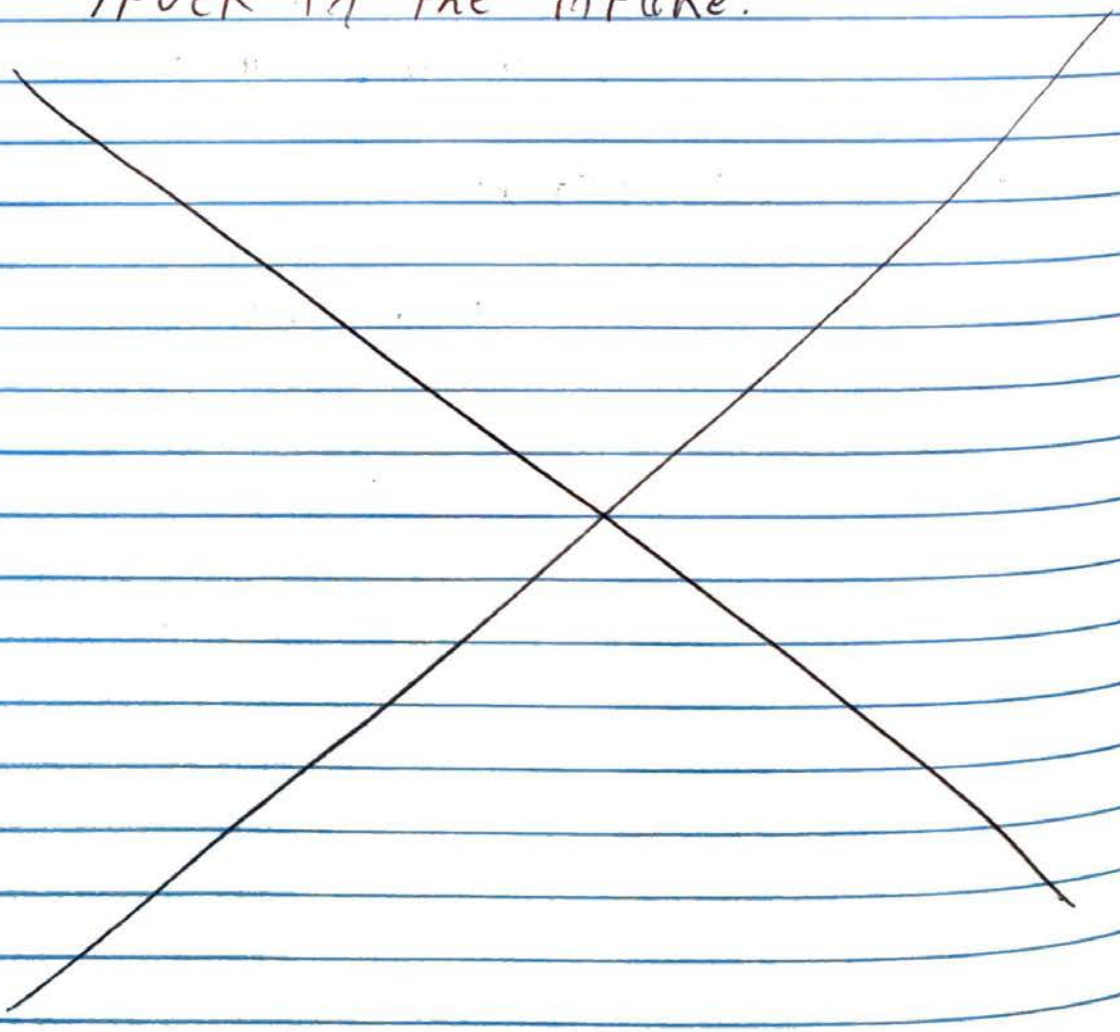
Robot Intake Design

Solutions for design #2:

- To make it go faster you can add a gear ratio to it and/or program the motors to go faster.

- Adding another plate to the intake could allow for it to suck up more balls. However, adding another plate gets the ball stuck in the intake.



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Robot Intake Design

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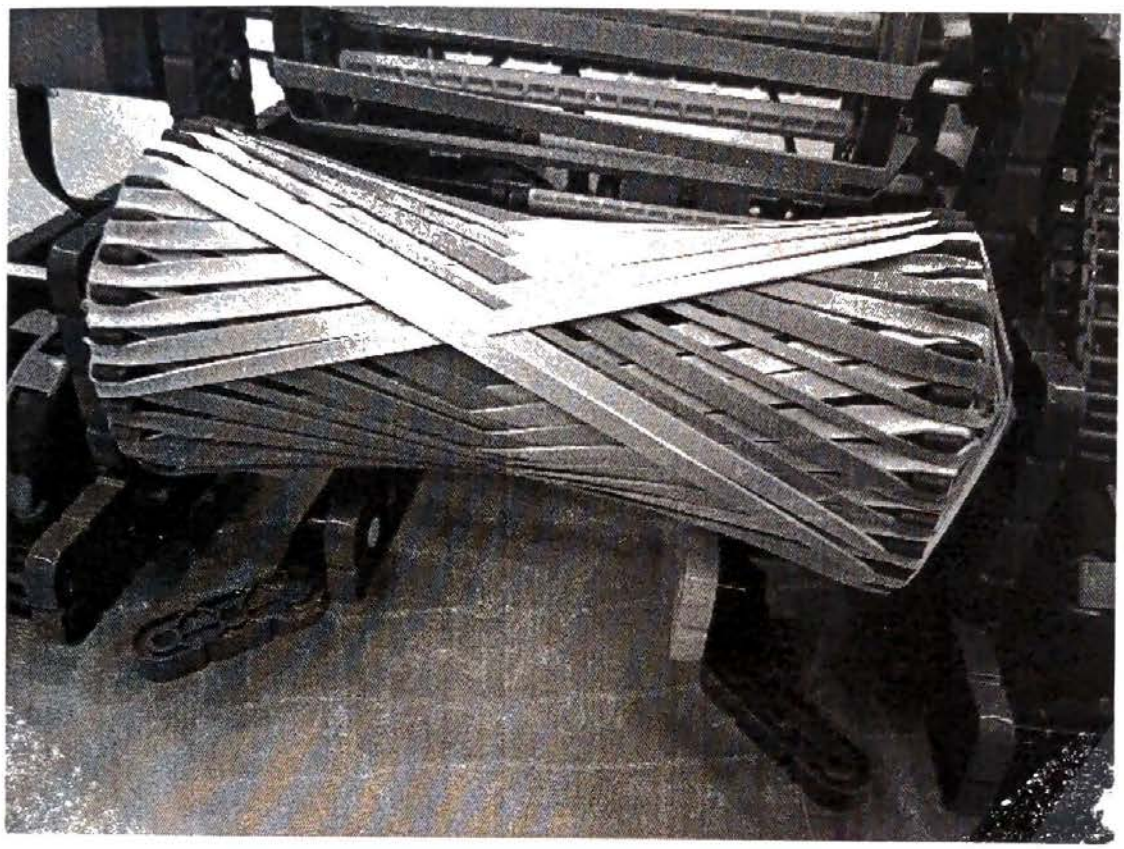
Design #3: Goliath Intake



The goliath intake is made the same as the first design, the rubberband intake, (see on page #7) the only difference is putting the rubberbands on. To put the rubberbands on, you put them on opposites of one gear and do the same on the other gear, but 90° to the right. Then you do it again on the other gear but twist it -90°. You repeat until it looks like the photo.

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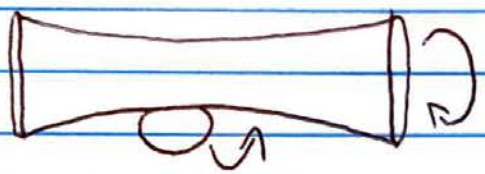
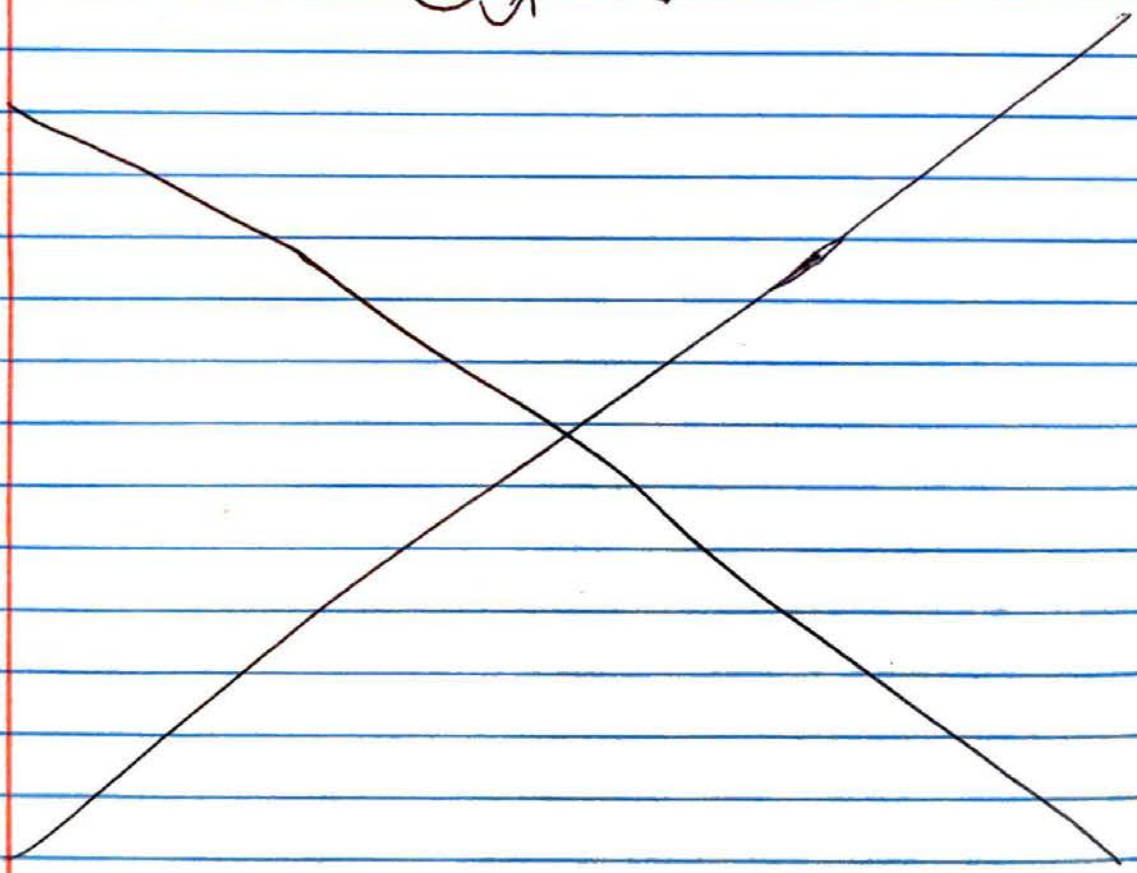
Robot Intake Designs

Problems with design #3:

- because of the way that intake is made, it filters the balls toward the middle. This, however, makes it so that the balls don't get sucked up. The compression on the rubberbands is higher in the middle causing it to curve (see the photo below). because of the curve, it doesn't pick up the balls.





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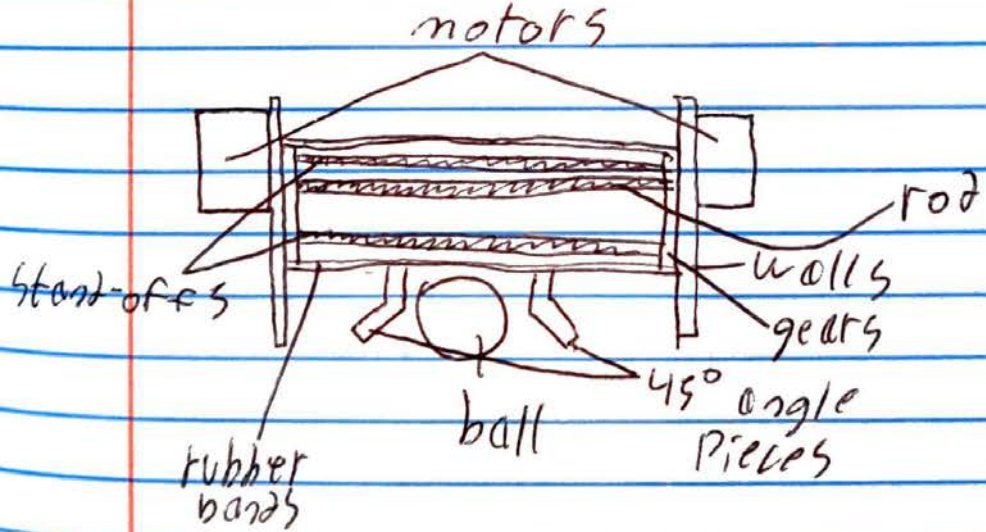
Robot Intake Design

Final Design Decision:

We decided that the best Intake for us too use would be the first one.

We choose this one because it isn't very hard to make, can be implemented easily, and has the least problems.

To implement this design, we will build some walls on the side of the robot to put it on. We add two motors on each side of it, and add a 45° angle piece on each side of the front of the robot to help filter balls to the center.



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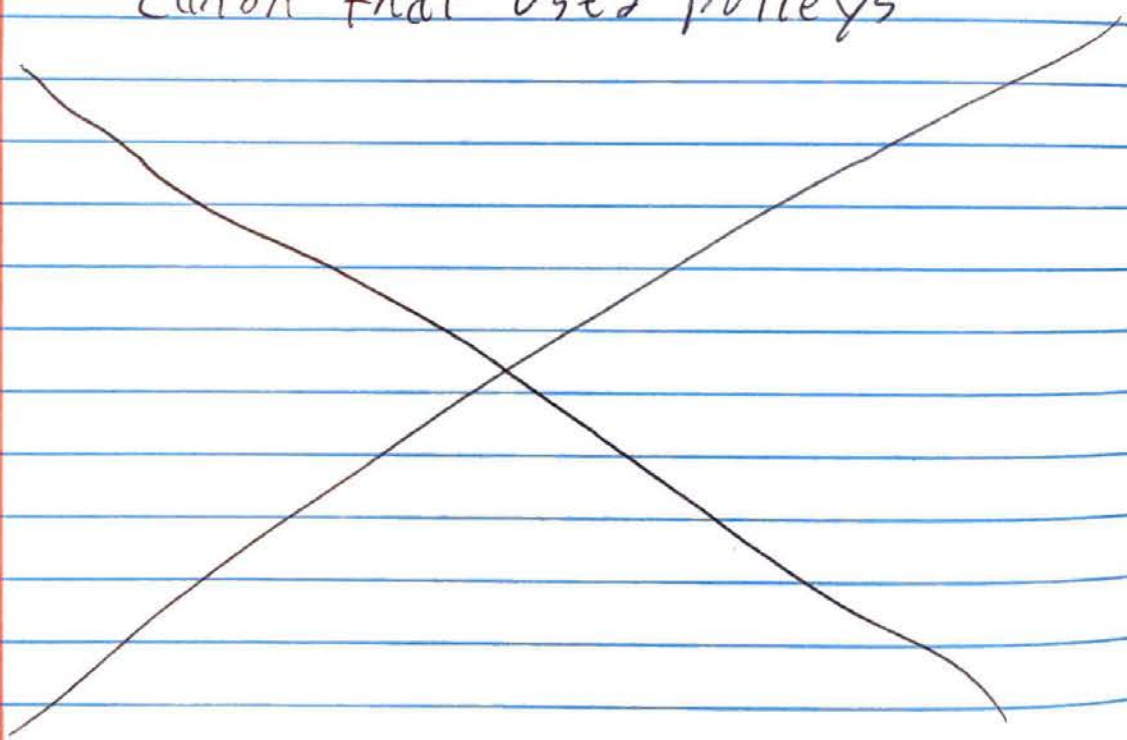
Canon Designing

As a team, we all agreed that our main goal with the robot would be to shoot balls into the top goal. We had seen some videos of canon spinners and decided to try that.

The main challenge we had seen with canons is getting them to go fast enough and be accurate. We came up with three ideas that we wanted to try, these were:

- Canon with a gear ratio
- Canon with a gear ratio that moved up and down
- Canon that used pulleys



Tim

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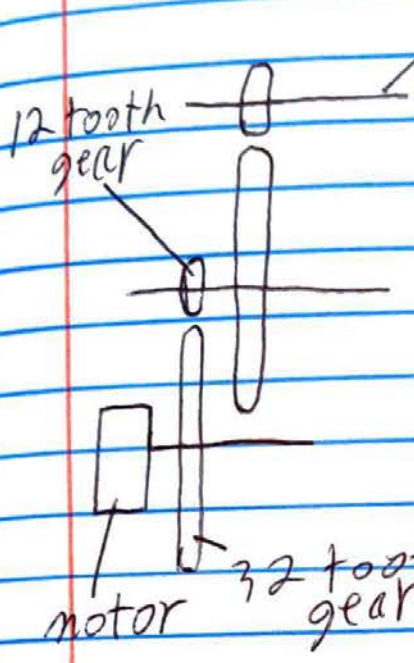
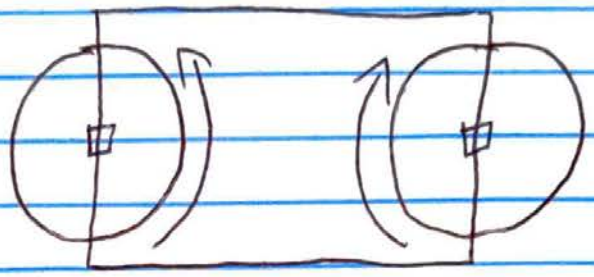
Canon Designing

Design #1: Gear ratio



1:15 ratio



For our first design that uses gear ratios, we went with a 1:15 gear ratio. (shown to the left) We made the gear ratio twice for each spinning wheel on the canon. The wheels went on a plate with enough room between them to fit a single ball.

After fitting every on the plate, we tested to see if it worked. It did work and was able to shoot balls. The only problems we had were the motors getting strained, and inconsistent shots.

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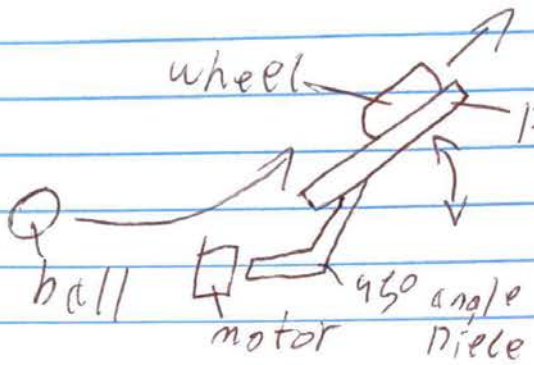
Canon Designing

Design #2: Gear ratio to up and down

This design, essentially, is the same as the first design but you can tilt the canon up and down.



The idea was to be able to adjust the aim depending on where you are at on the feild. but it ended up to be impractical and not worth trying to make.

Problems with this design:

- Impractical and hard to use and get used to.
- severly strained the motors from the weight of holding up the canon.

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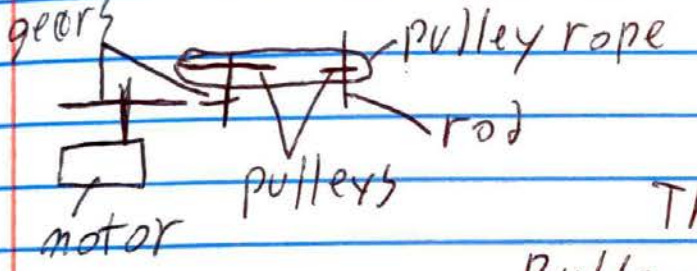
Canon Designing

·Would be difficult to build and implement to the robot.

·Wouldn't have enough avaliable motors to add it.

Design #3: pulleys

The third idea was to use pulleys if a gear ratio put too much stress on the motors.



The use of the pulleys was a success. It was able to spin fast enough to shoot the balls and was the most consistent out of the designs.

Problems with the design:

·Although the addition of pulleys to the design helped with the motor stress, it is still an issue.

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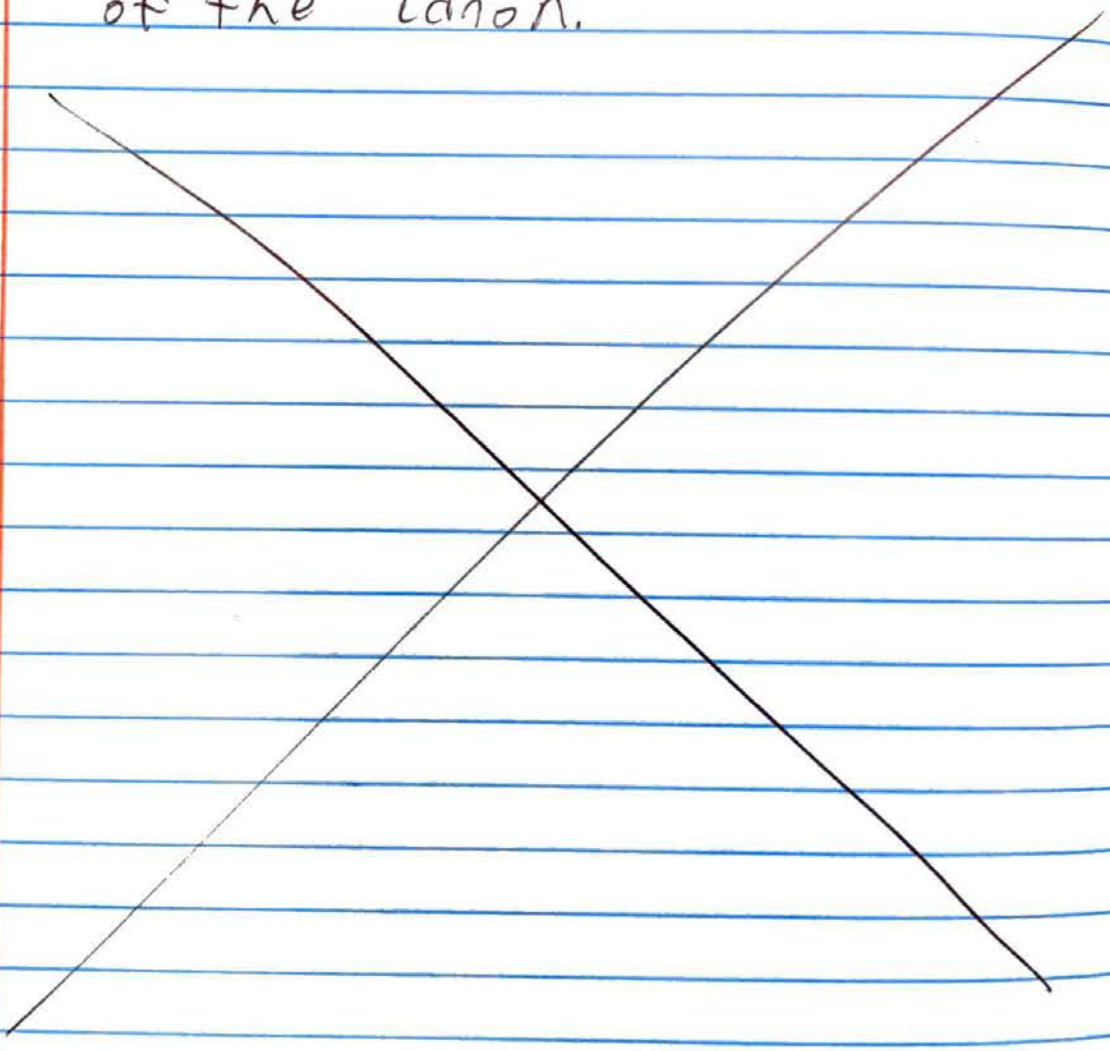
Canon Designing

- The pulleys would sometimes start slipping, but was easily fixed by wrapping rubberbands around the pulleys.

- Even though this design was the most consistent in where it shot, it still wasn't very accurate. We helped it shoot straighter by putting rubber bands around the wheels of the canon.



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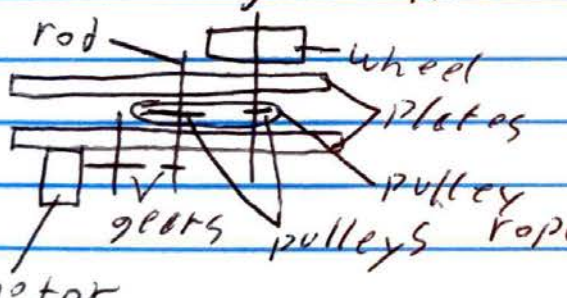
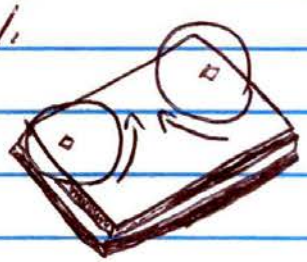
Canon Designing

Final Canon Design:

- For our final canon design we decided to go with the pulley system. We choose this because:
  - Its the most reliable out of the 3 designs.
  - It has the least amount of stress on the motors.

- To build this design, we got 2 plates of the same size and stacked them on top of each other. between the plates, you put part of the spinning mechanism. the rest of the spinning mechanism is under the bottom plate. The small pulley is connected to a rod that runs through the top plate, connecting to the wheel.





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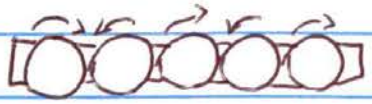
20 Drivetrain Design

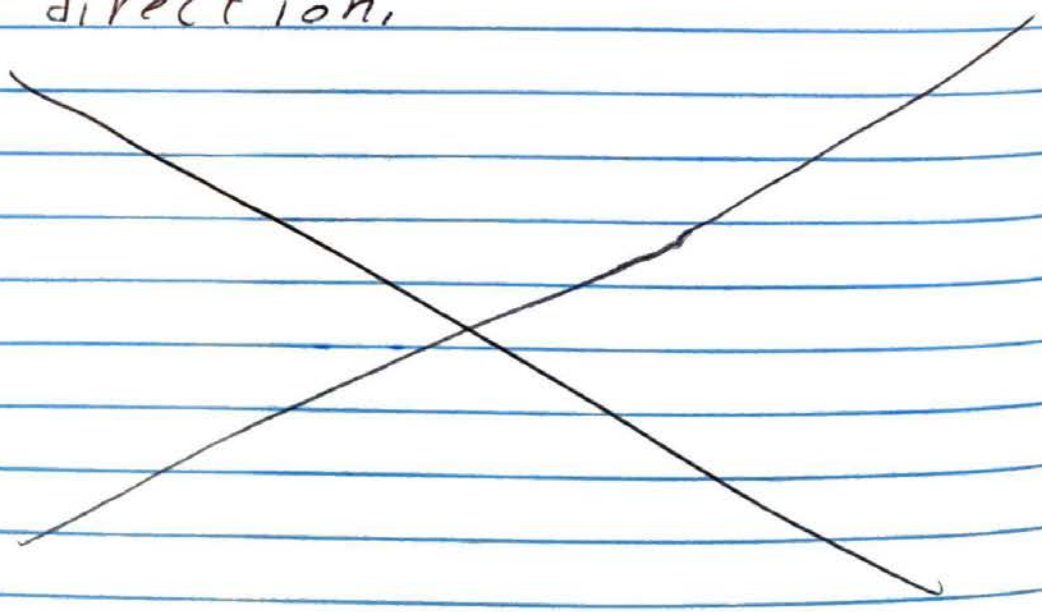
- To move the robot, we made a drivetrain design. Our design is a standard two motor gear drive.



- We used 5 32-tooth gear. The odd number of gears make the first and last gears spin the same way (see arrows in design above).

- We attach all the gears to a 2by piece. ~~that can~~

- You attach the wheels to the first and last gears so they spin in the same direction.



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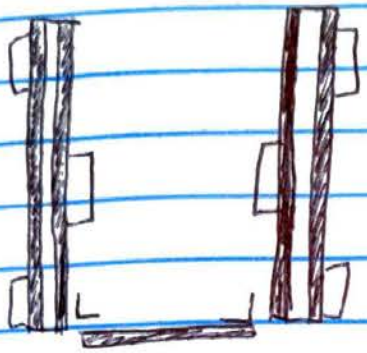
Drivetrain Design



- After building one side of the drivetrain, you build another for the other side.

- Once they're both built, you attach them on the back with a 2by beam.

- You attach the motors so they are connected to the middle gears on each side of the drivetrain. This help with an even distribution of energy throughout the drivetrain.

- In the code, we changed it by adding a drivetrain set velocity command. We set the drive train velocity at 80% to make it drive faster

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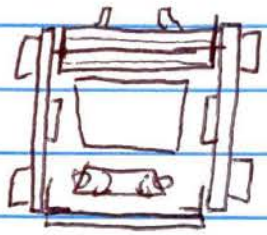
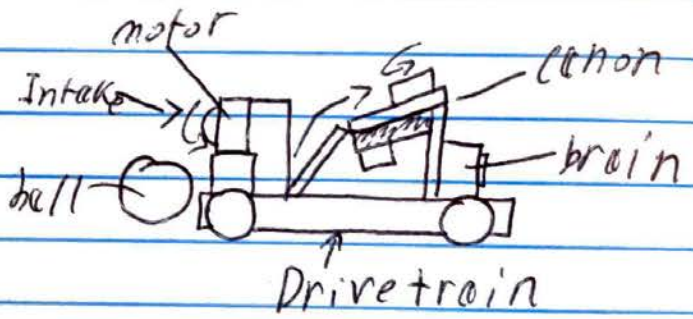
Final Robot Design

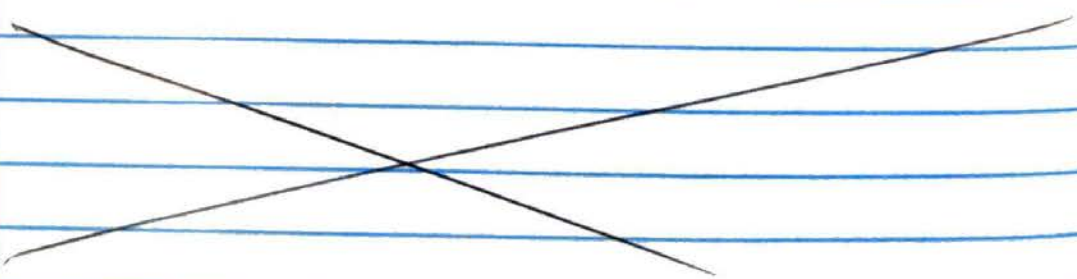
To build our final robot design, we put together every previously shown and choosen. This includes:

- The drivetrain (PG.20)
- The Intake (PG.7)
- The Canon (PG.14)





- There is a plate that goes up at ~60° angle after the Intake to push the balls up to the canon.



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Final Robot Design

- The canon is attached directly at the end of the plate after the intake.

Testing:

- After slightly adjusting the positions of a few things, we were able to get the ball to go through all the way to the canon.

- It was able to shoot balls and could shoot pretty far.

- problems:

  - The motors on the canon would still strain too much and burn out.

  - still shoot inconsistently.

  - Can only hold 2 balls at most.

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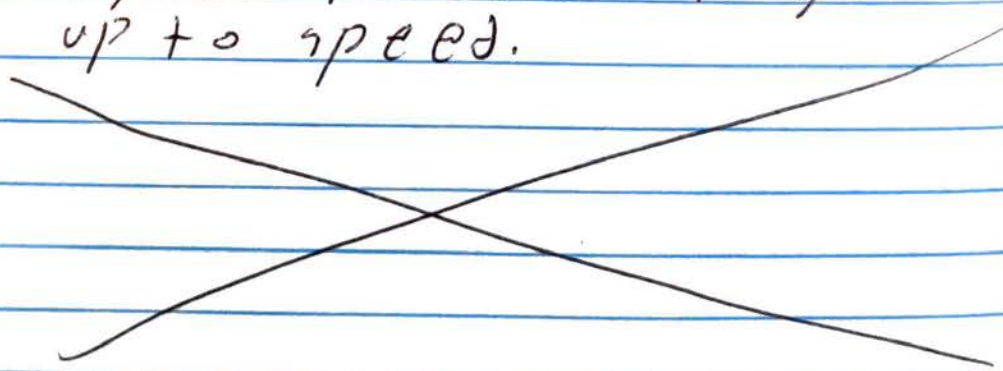
Final Robot Design

Solutions:

- Only way to hold more balls would be to rebuild the robot so we decided that we could make do with only holding 2 balls.

- To fix the problem with the motor straining and burning out, we made a program to gradually increase the speed of the motor to try to reduce strain.

- For the program, we made it so that the max velocity of the motor would start at ~30 rpm. Once the motor would reach that speed, we would increase the max velocity by 20 rpm until it got up to speed.



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Final Robot Design 25

-We also switched from using % for the max velocity to using rpm. This allows for easier understanding and more control on how fast the canon spins.

-We set the two motors for the canon to be in a motor group. We reversed one motor in the motor group to be able to shoot the ball.

-We added a touch-LED to the robot to indicate what speed the canon is at.

off	0 rpm
Red	1-19 rpm
orange	20-39 rpm
Green	60-70 rpm
blue	71-105 rpm
Purple	105+ rpm
Yellow	40-59 rpm

*Accidently skipped yellow in the middle.

-The ~~graph~~ table on the right shows what colors are shown at each set of speeds.

-When the touch-LED is green, it might be able to make a shot into the high goal. Blue and purple can almost always shot it far enough.

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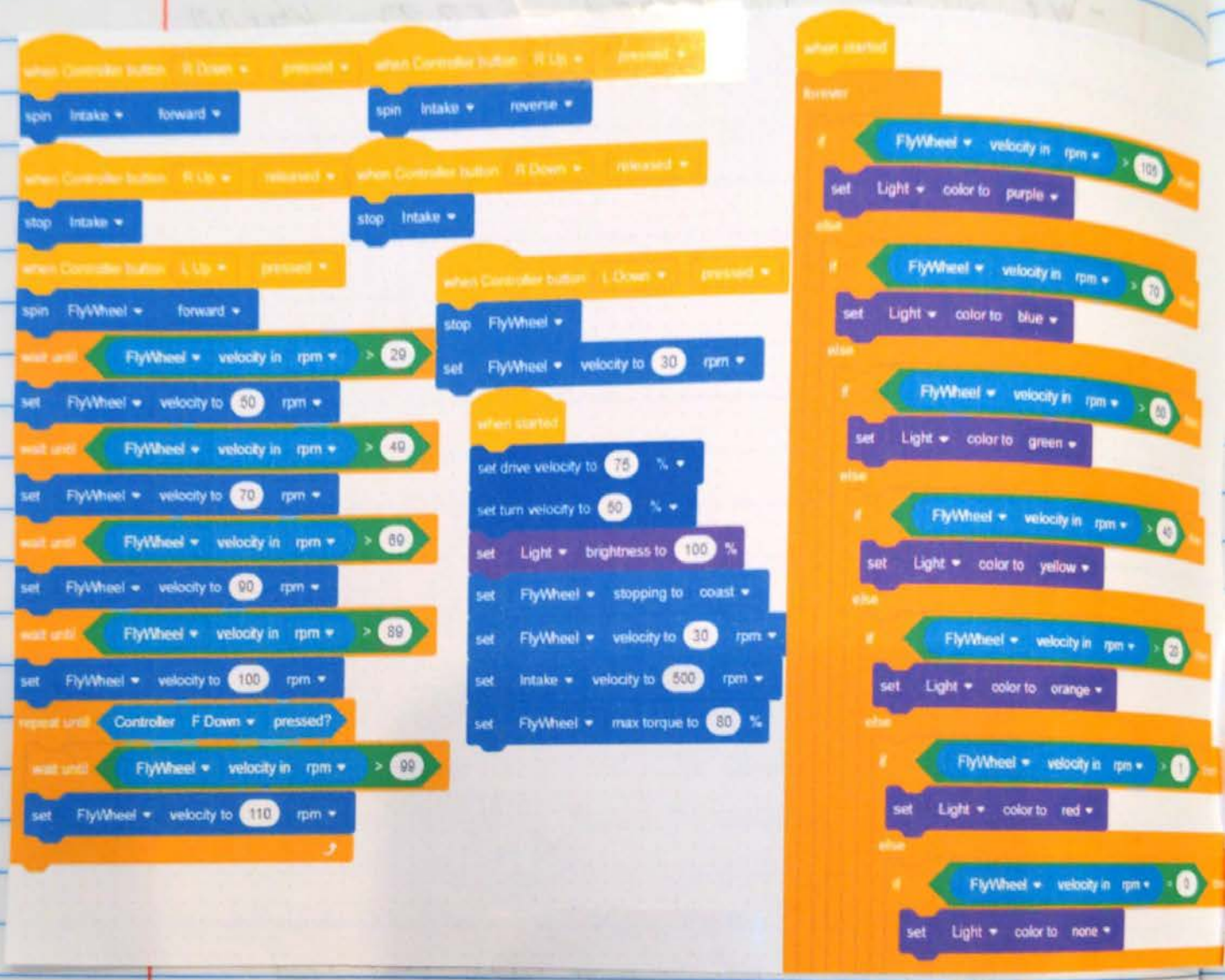
26 Touch-LED Color Code



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Practicing

- After spending some time practicing with our 90049W team, we were able to get an average of 82 points in teamwork challenge matches.

match #	Amount of points
#1	84 Points
#2	82 Points
#3	78 Points
#4	76 Points
#5	88 Points
AVG.	81.6 Points

Teamwork

- After spending some time to practice Driver skills, we were able to average a score of about 62.

match #	Amount of Points
#1	58 Points
#2	62 Points
#3	68 Points
#4	56 Points
#5	64 Points
Avg.	61.6 Points

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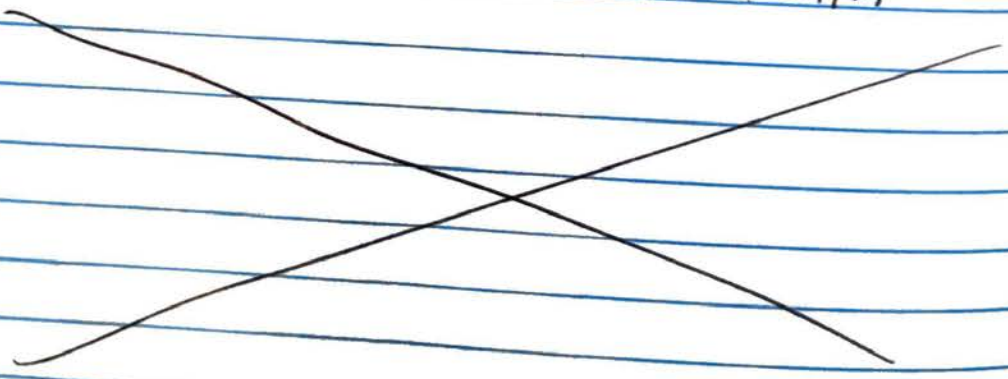
Programming Skills

- Since we now had a functioning robot, we wanted to create a code for programming skills

- While doing programming skills, you can turn off your program and reset the robot in a starting position, then start the program again.

- We used this rule to allow us to repeat our code on the opposite of the feild.

- You do this by starting your program on one side of the feild. Once its done, you reset the robot on the same starting spot, but on the other side of the feild.



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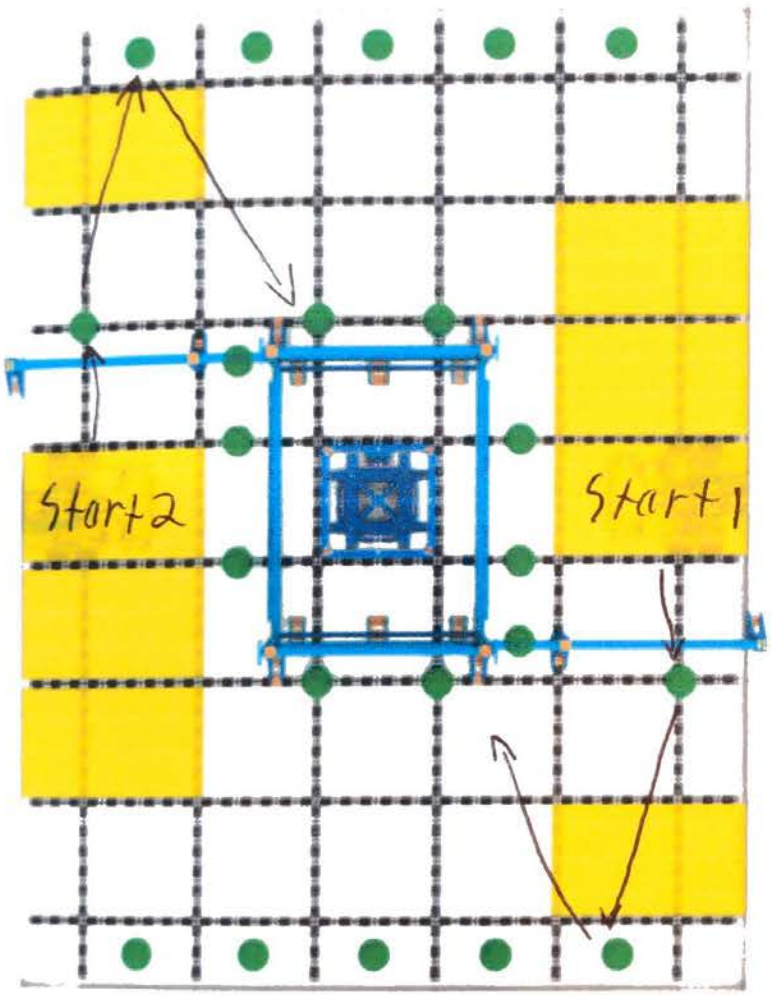
Programming Skills



Our program starts where it says start1 and turns left.

It picks up the ball in front of it then keeps going forward.

It picks up the first ball in the corral then goes toward the high scoring goal and shoots both of the balls.

Then you turn the robot's program off, reset it to the start2 position, then run the program again.

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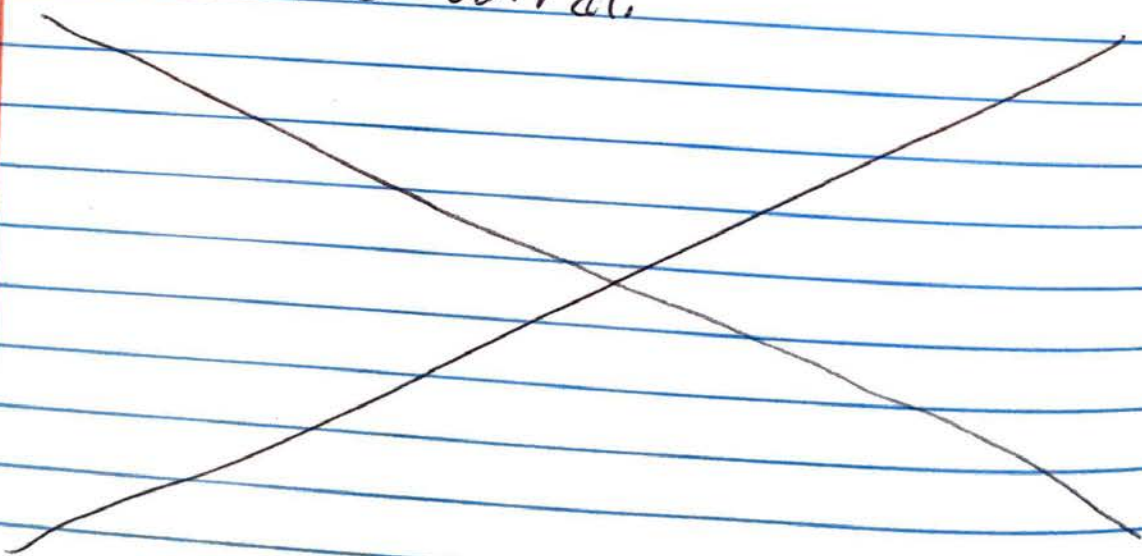
Programming Skills

- Because of the way that we did our program, it allowed for us to easily add on to our current code.

- Since we reset the code to do the other side, we can just continue the program from where we left off losing and it will do it on both sides, getting us double the points.

- Because of this is the reason why we start where we do. We are planning on continuing the code to make the robot clear the corral.

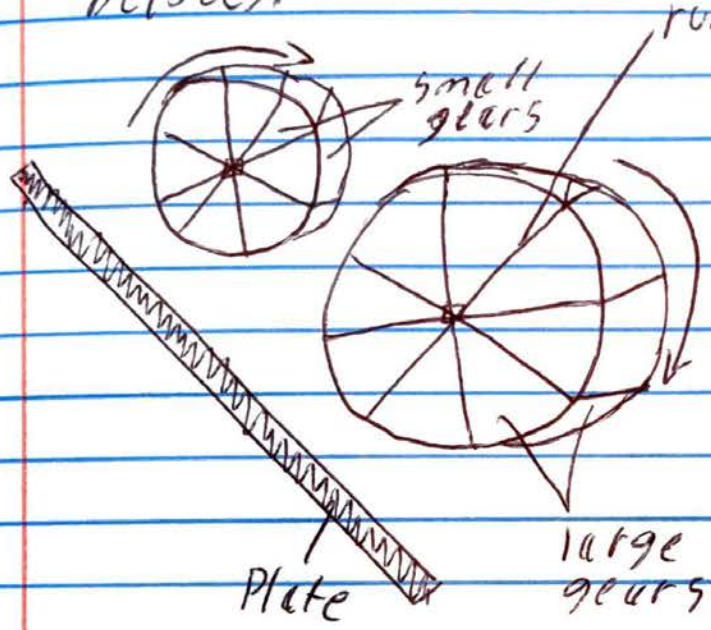


11/30/21

Robot Design Modifications

- Our robot was having some difficulty getting the balls all the way to the canon.

- to Fix this, we added another, smaller, intake ~~to~~ above the currently existing intake (shown below).



- This was able to really help with getting the balls all the way through the intake and into the canon.

- We originally had both parts of the intake using two separate motors. Later, we added small sprockets onto the gears and attached a chain, so they can both use a single motor.

12/12/21

32

H-Drive Concept

- As a team we disscused wheather or not the addition of an H-Drive would be benifical for us.

- An H-Drive is another wheel that goes perpindicular to the drivetrain. This allows for the robot to drive side-ways. For this design, you need omni-wheel, which are just wheels that are omni-directional.

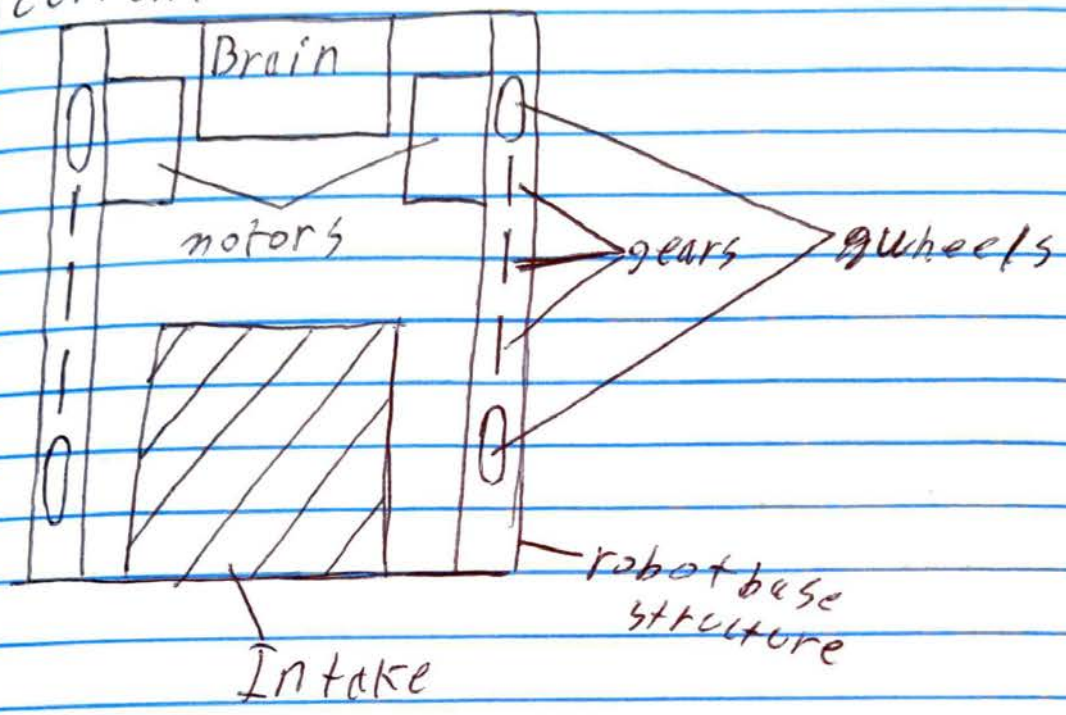
- The addition of an H-Drive would make it easier to do programming skills. It would allow us to move the robot without adjusting the direction that its aiming.

- It would also help in driver skills and team work matches by allowing us to line up for shooting easier.

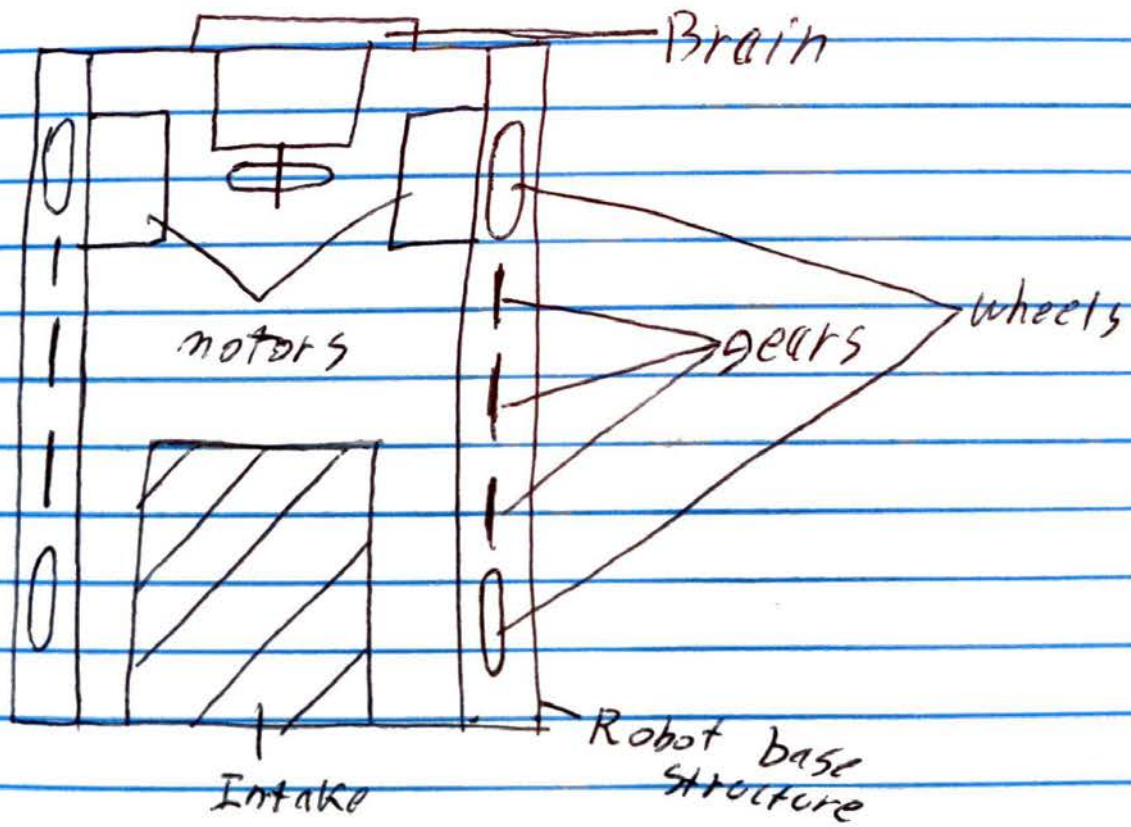
12/2/21

H-Drive Concept

~~Previous~~ current drivetrain design:



H-Drive Drivetrain Design:



Tejas

12/2/21

34

H-Drive Concept

Problems with this Design concept:

- The motor and wheel for the H-Drive don't fit any where else besides where the brain is located on our current Design. We tried moving the brain so it was vertical and attached to the robot, but the brain caused the robot to exceed the size requirements.

- Since the only area we would be able to put the H-Drive would be the back, it would cause the robot to move in a circle instead of sideways.

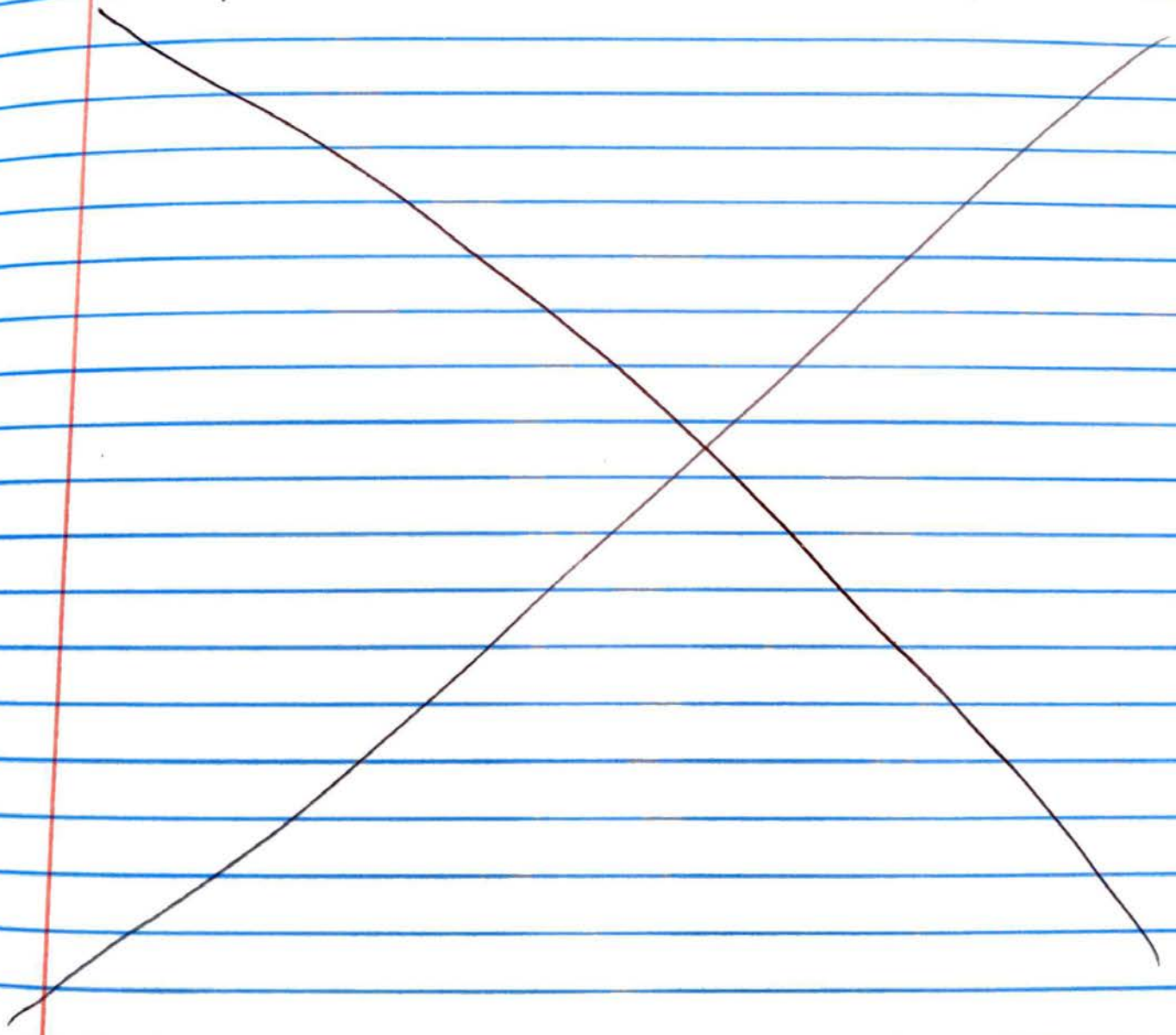
Because of these limitations, we decided to not use this design. As much as having an H-drive would help with driving and programming with some practice you can line up good enough.

12/9/21

Driving Stratagies

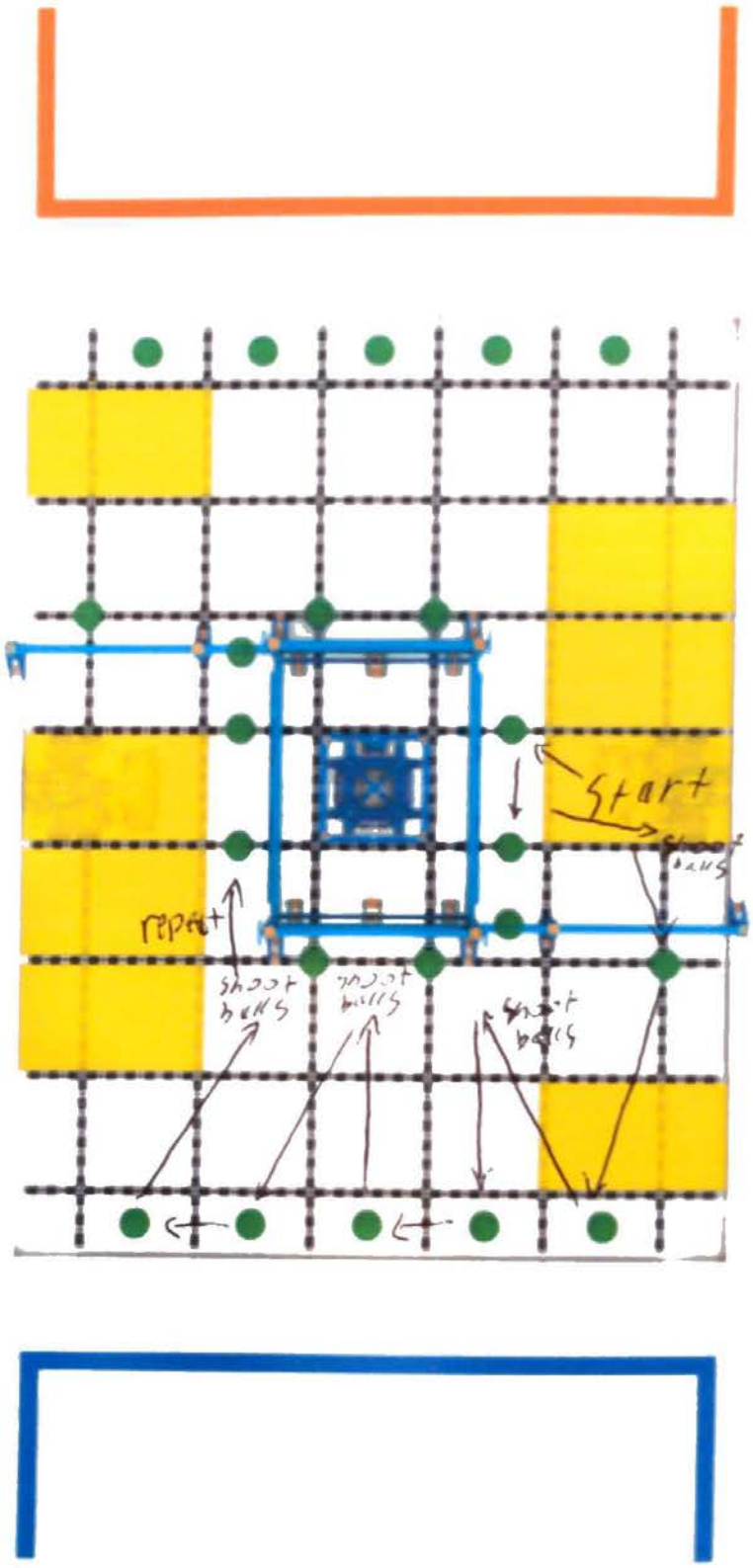
- Our team drivers were able to come up with 2 main stratagies for Driver skills and for teamwork matches.

- The following pages will show the stratagey on a map of the feild along with an explanation of the stratagey.



12/9/21

36 Driver Strategies



12/9/21

Driver Stratagies

Stratagy #1:

- We start at the starting position marked on the map. Then we pick up the 2 balls directly in front of us and shoot them.

- After, we pick up the ball ~~the~~ under the low hang bar and the first ball in the corral.

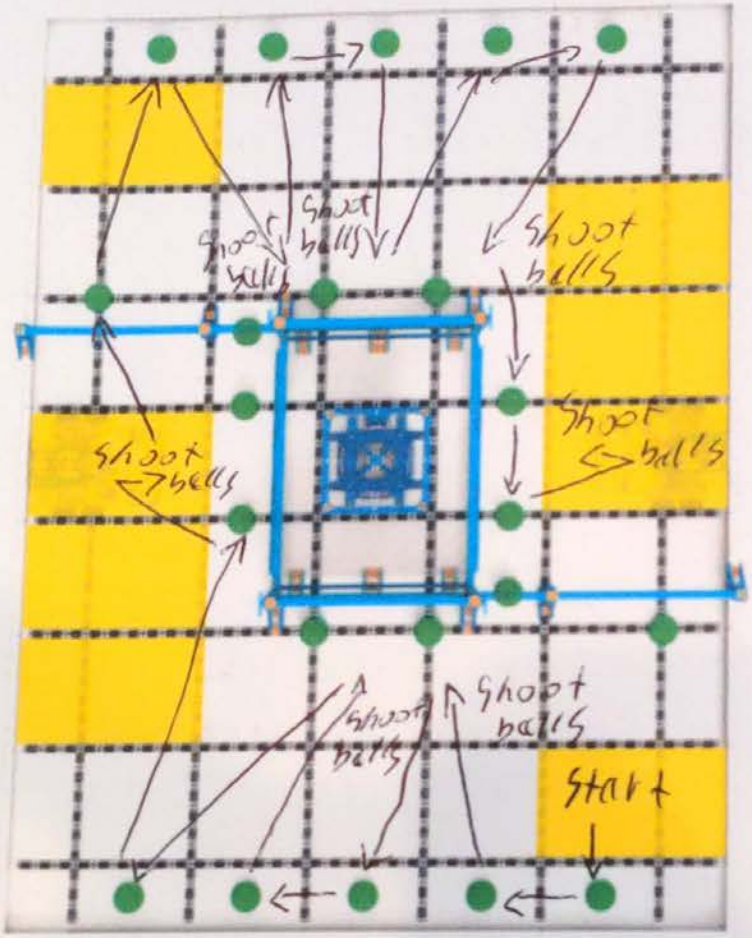
- We shoot those two balls, then pick up 2 more from the corral.

- We shoot those, then get the last two balls from the corral and shoot them.

- Then we restart and do it again on the other side and try to finish before the timer runs out.

12/9/21

38 Driver Strategies



12/9/21

Driver stratagies

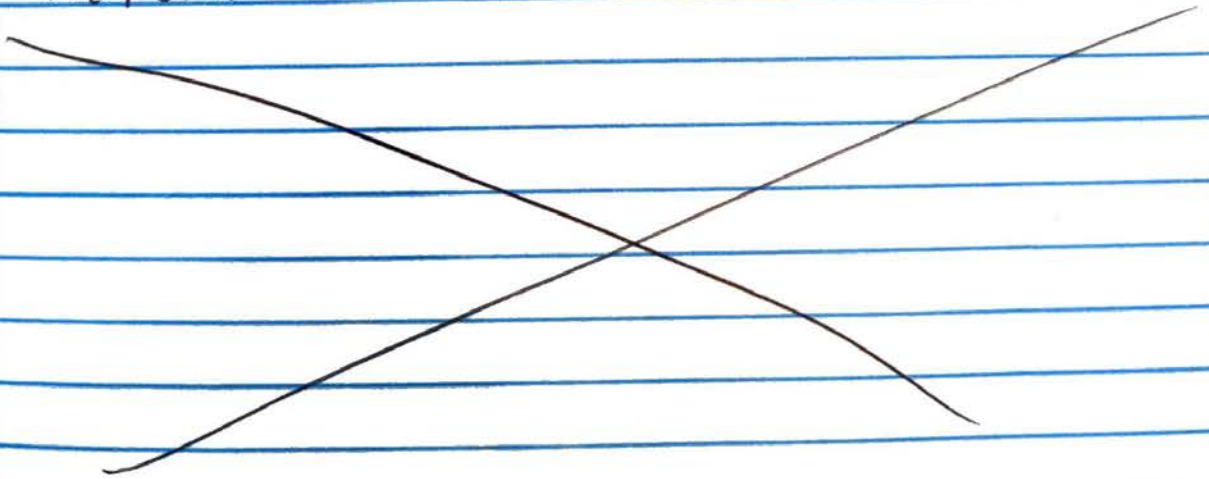
- For this stratagey, we start next to the corral. We pick up the two balls closest to the robot and shoot them.

- We pickup two more balls from the corral and shoot them.

- We pick up the last ball in the corral then one ball next to the low goal and shoot them.

- Then for the other side, we repeat the last stratagy starting at the ball under low hang bar.

- ~~Thi~~ we use this stratagy because it helps us save some time in the ~~begg~~ beggining of the match.



1/6/22

40

New Robot Design

After driving and practicing with our robot for some time, we had a few main problems:

- The canon is still too inconsistent to consistently get balls in the high goal.

- The motors still get too strained after using the robot for a while, which ~~is~~ ~~the~~ a problem during a tournament.

- The Touch-LED shows that the canon is getting up to speed, so we have shots that are inconsistent and/or too weak.

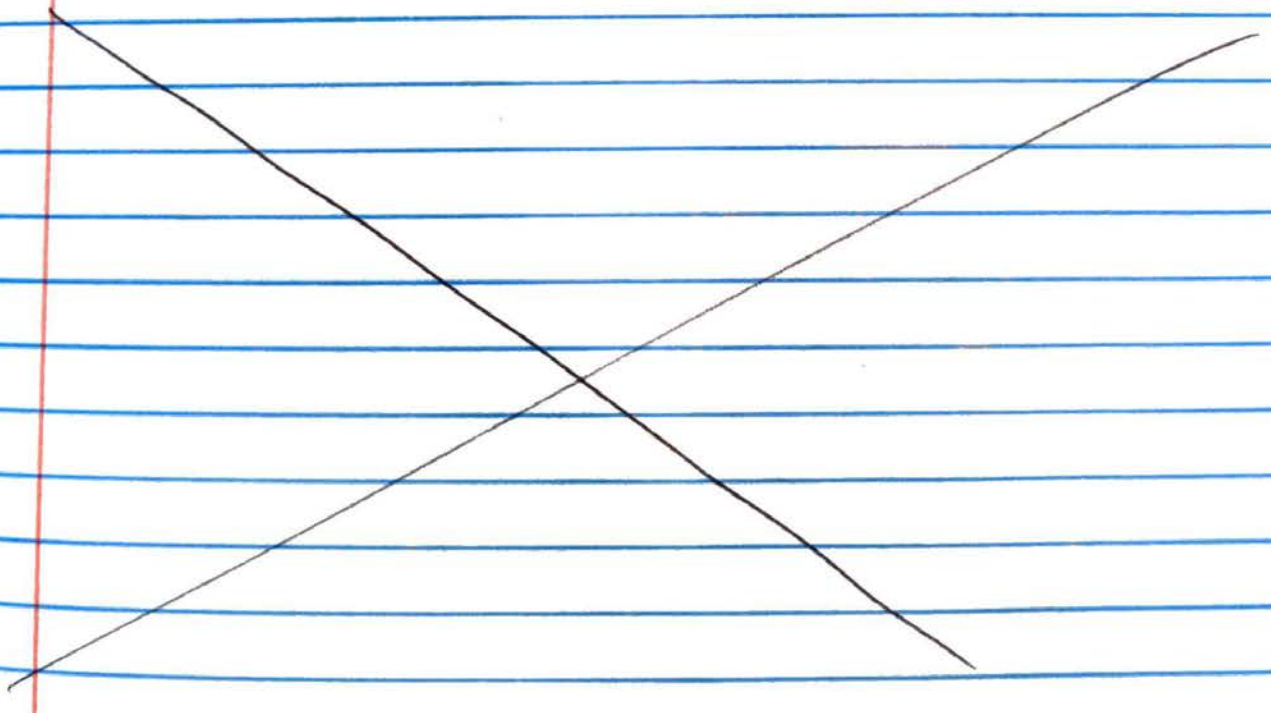
1/6/22

New Robot Design

- These problems were what caused us to Design a new robot because we weren't happy with how our robot was functioning.

- For our new robot we wanted to use a catapult design because they had a consistent shot and didn't put very much stress on the robots motors.

- We went with a robot design similar to the spit fire robot designs that we have seen online.



1/6/22

4/2 Robot Catapult Design.

- We started building our new robot by making the catapult. We had two catapult designs that we were considering:

  - A catapult that worked similarly to the VEX IQ Fling Bot, by flinging the balls into the air like a trebuchet.

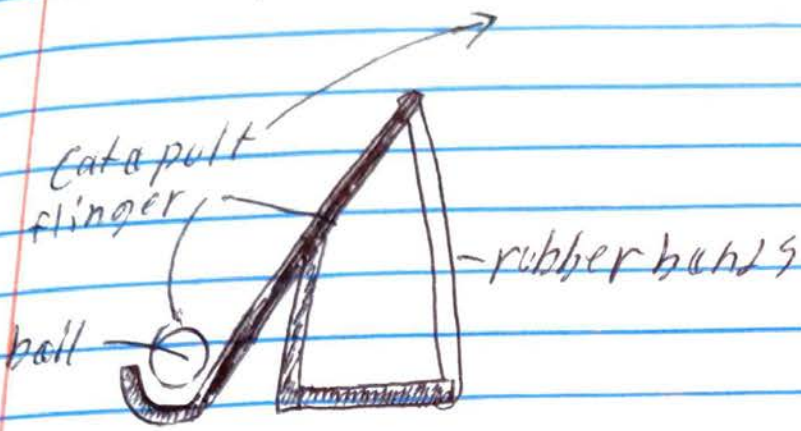
  - A catapult design that works similarly to the the spitfire robot.

- These are the two main designs that our team ~~have~~ has considered for our new robots catapult design.

1/6/22

Robot Catapult Design 43

Fling Design:



- This catapult design essentially functions as a large lever. The catapult goes back to shoot the ball and creates lots of tension in the rubberbands. Once the ball is loaded, you release the catapult and the ball gets flung into the air.

Problems with this design:

- The catapult can only shoot one ball at a time and takes longer to ~~ret~~ shoot.

1/11/22

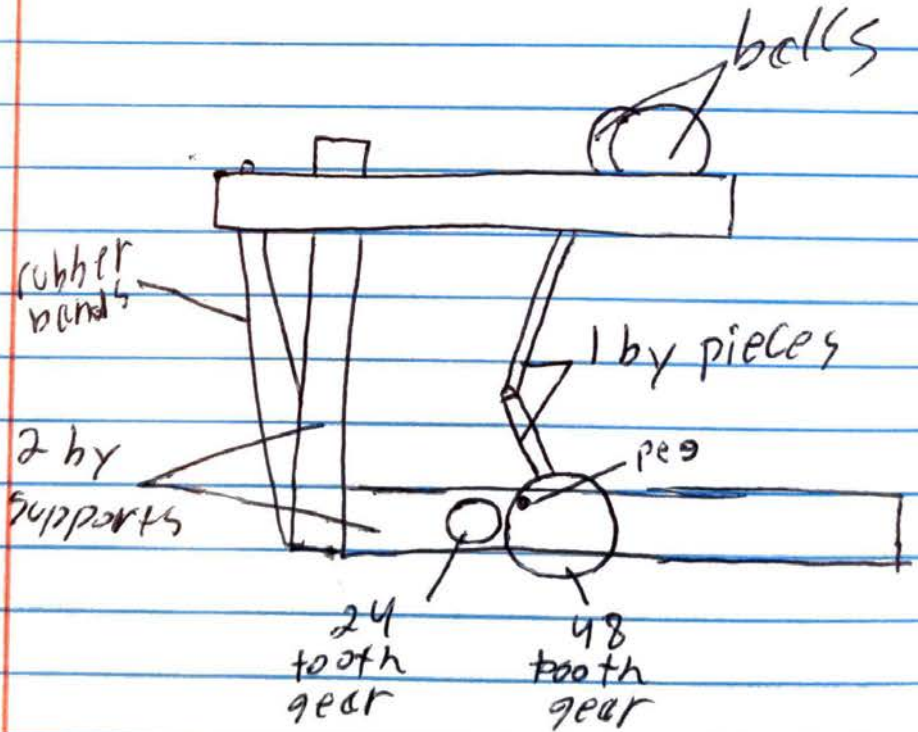
Robot Catapult Design

- It takes longer for this design to reload balls into the catapult because it takes longer for the catapult to go down.

Catapult Design #2:

- The second robot ~~design~~ catapult design is similar to the spitfire robot.

- It can shoot two balls at once into the high goal.



1 in

1/11/22

Robot catapult Design

- We use 2 torque ratio's for pulling the catapult down to launch.

- The 1by pieces connected to the gear ratio are for pulling the catapult down. The 1by pieces are connect by a joint in the middle. This allows for the catapult to fold in on its self and go lower down. There is apoint at which you turn it too much and it unfolds, that is how we shoot.

- When the catapult goes all the way down, it puts lots of tension on the rubber bands. When the catapult unfolds to shoot, The elastic potential energy from the rubber bands is converted to kinetic energy shooting the balls.

1/11/22

46 Robot Catapult Design

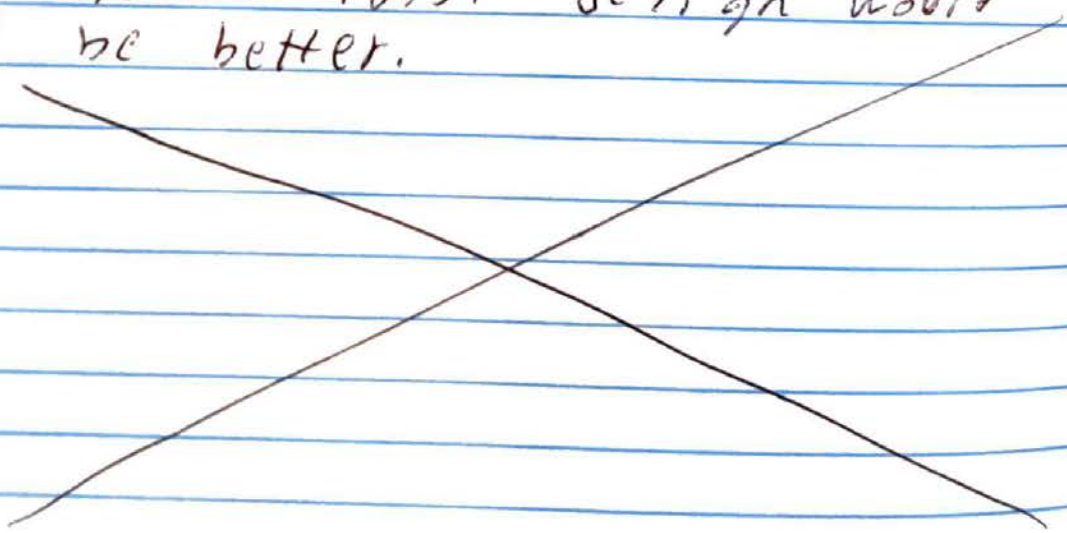
Problems with this design:

- It can be difficult sometimes to load balls into the catapult.

- The structure of the catapult bends which could lead to long term problems.

Final Catapult Design:

- After discussing the benefits and disadvantages of both designs, we were able to come to the conclusion that the second robot design would be better.



1/11/22

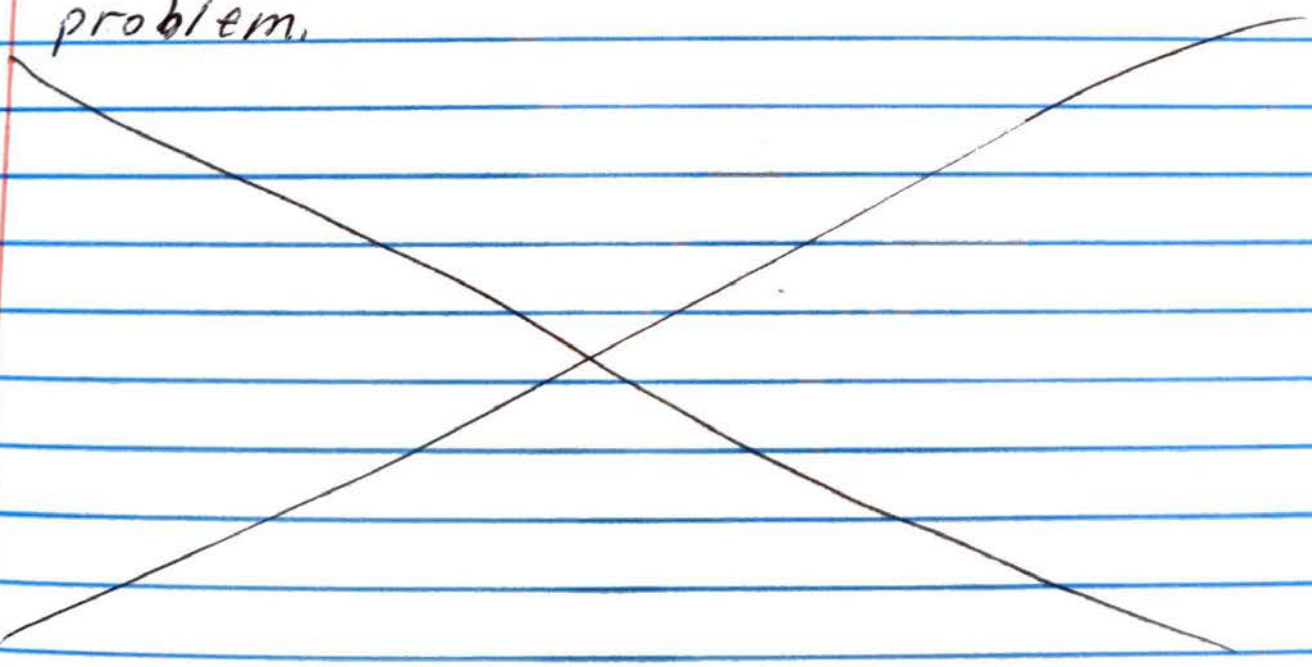
Robot Catapult Design

Reasons we choose this:

- Can shoot twice as many balls making it a lot more efficent than the first design.

- This design reloads and resets alot faster than the first design.

- Although it bends and can cause problems long term, after adjusting the amount of rubber bands, where the rubber bands are located, and adding in some extra supports, we were able to fix the problem.

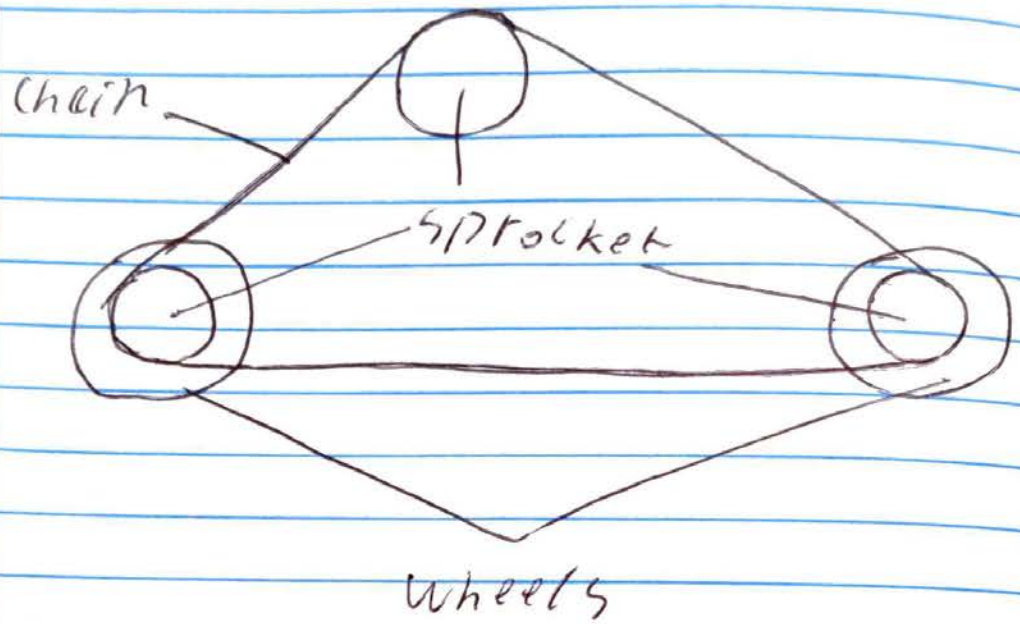


1/13/22

48

New Robot Drivetrain Design

- For our drivetrain design, we decided to use the chains.



- We made the design ~~it~~ into a triangle shape and attached the motor to the top sprocket.

- The sprockets are connected to the wheels directly with no gear ratios.

1/13/22

New Robot Drivetrain Design

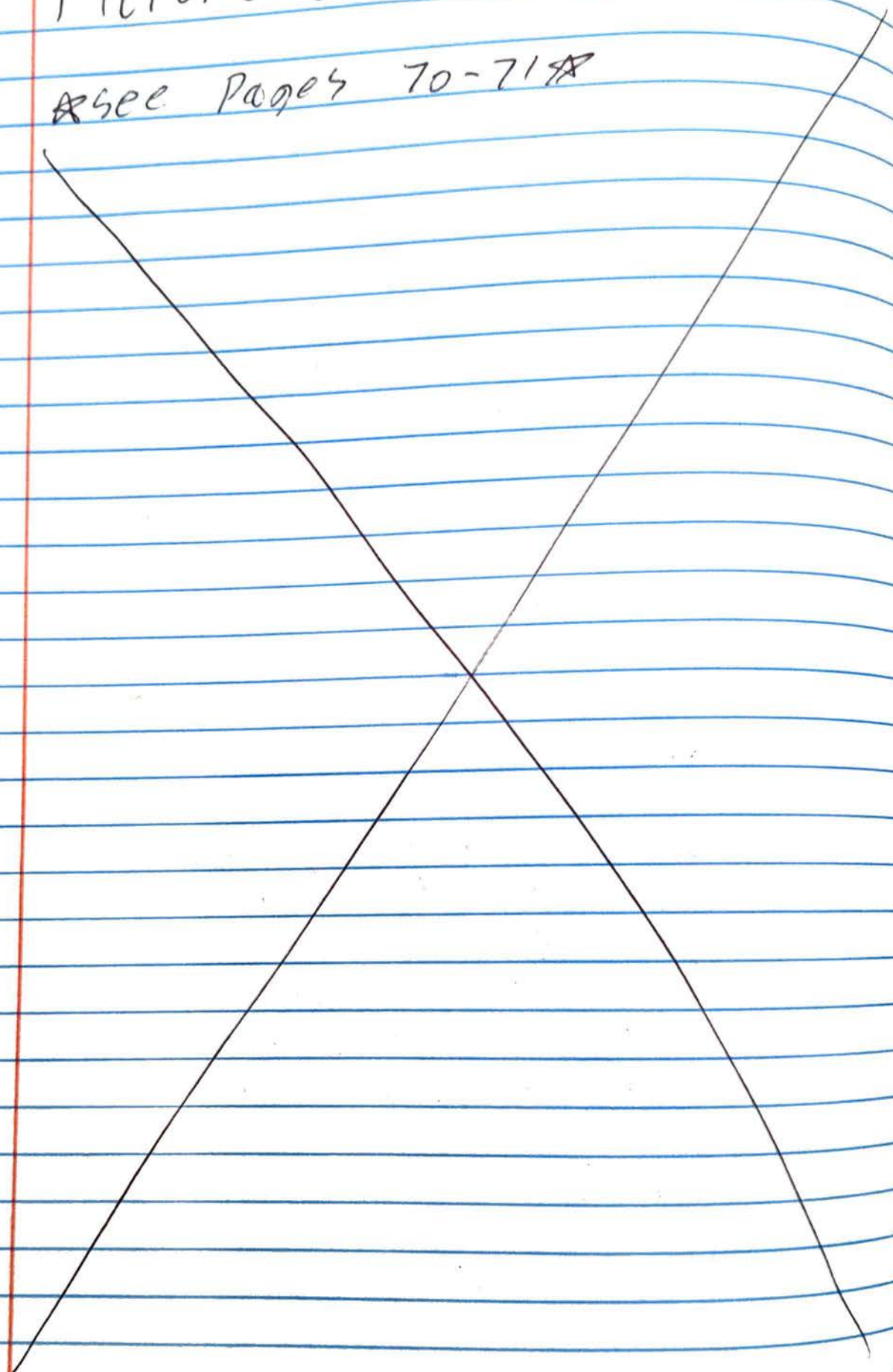
- There are two main reasons why we choose to make the drive train into a triangle.

- Because the catapult moves down, we needed to have space under the robot for the catapult to go into. This means that we can't put a motor down there because it would get in the way. The addition of chains also helps to save some space.

- By having the sprocket attached to the motor bigger than the sprockets attached to the wheels, it creates a speed ratio allowing us to drive faster and save some time during matches.

50 Picture of Drive train

see Pages 70-71



1/18/22

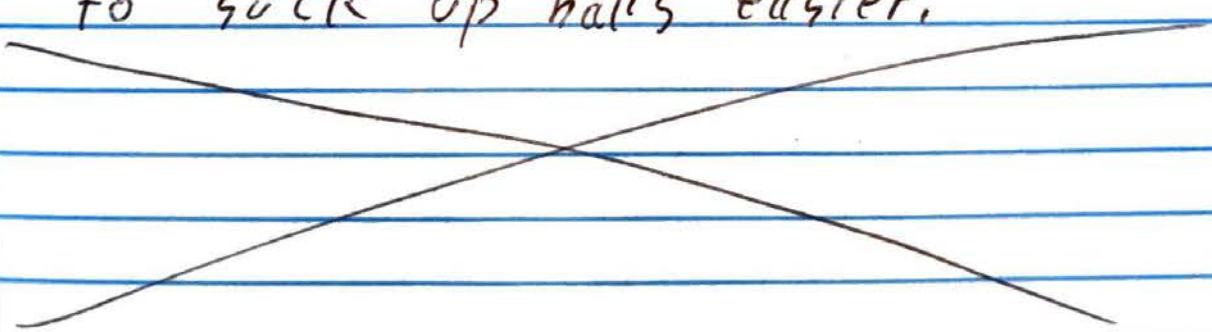
New Robot Intake Design

- For our new intake we kept the same design but added a few modifications.

- We got rid of the pieces that we used to filter the balls to the center of the intake so that we can pick up and load two balls at the same time.

- We are continuing to use two motors for the intake, but ~~4d~~ were also adding a gear ratio for torque on both motors to help with picking up balls and so they don't get stuck.

- We made the gears that hold the rubberbands larger to suck up balls easier.

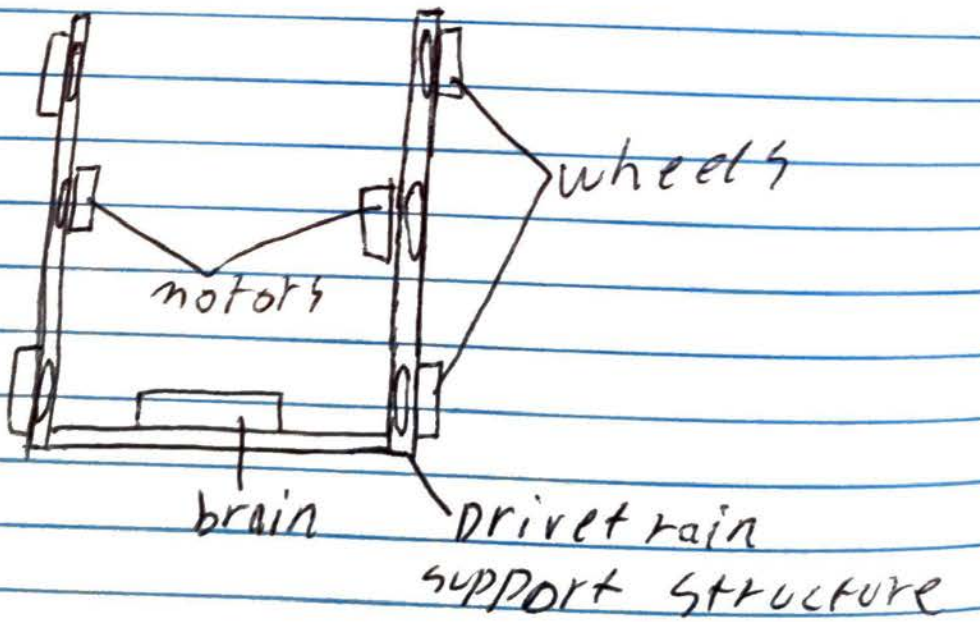


1/18/22

52

Final New Robot Design

- After designing the three main parts of our robot:
  - The Catapult
  - The Intake
  - The Drive train
- We started putting everything we had designed and made together into one robot.
- We started by putting the two halfs of the drive train together and attaching the brain.



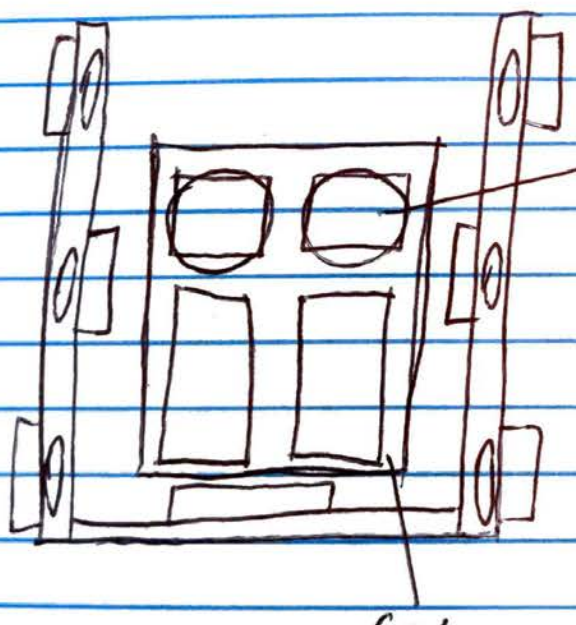
1/18/22

Final New Robot Design

- After we attached the the brain to the fully built drivetrain, we took it to the feild to test it.

- The robot was able to drive around and the design was a success.

- After making the drivetrain, we added the catapult.



- The balls sit in two holes so that they dont move around.

Jessie

1/18/22

54 Final New Robot Design

- After building the catapult and putting it on the robot we tried testing it.

- The catapult would start to tear the robot apart after firing it a few times.

- We fixed this problem by adding some plates and 2 by beams to the sides of the robot to hold everything together better.

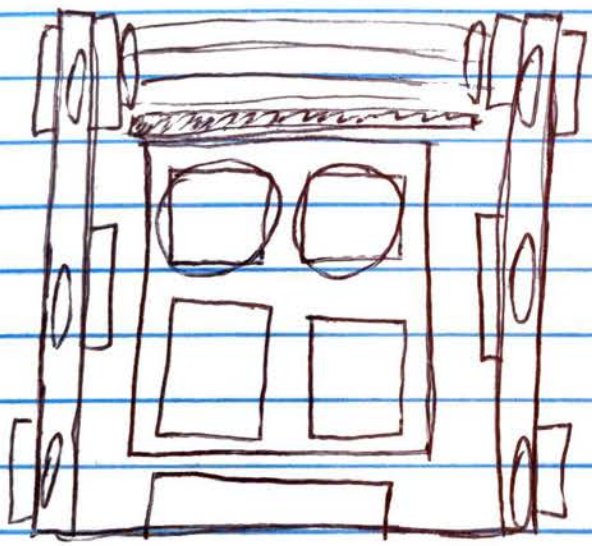
- After testing the catapult again after adding supports, the robot stopped braking and was able to consistently shoot balls in the right directions ~~and~~ and consistently the same amount of distance.

1/18/22

Final New Robot Design

- The last part of the robot we had to add was the intake.

- We added some rectangular plates to the front of the drive train on both sides. These were to add support to the intake and to put the gear ratio's on.



Finn

1/20/22

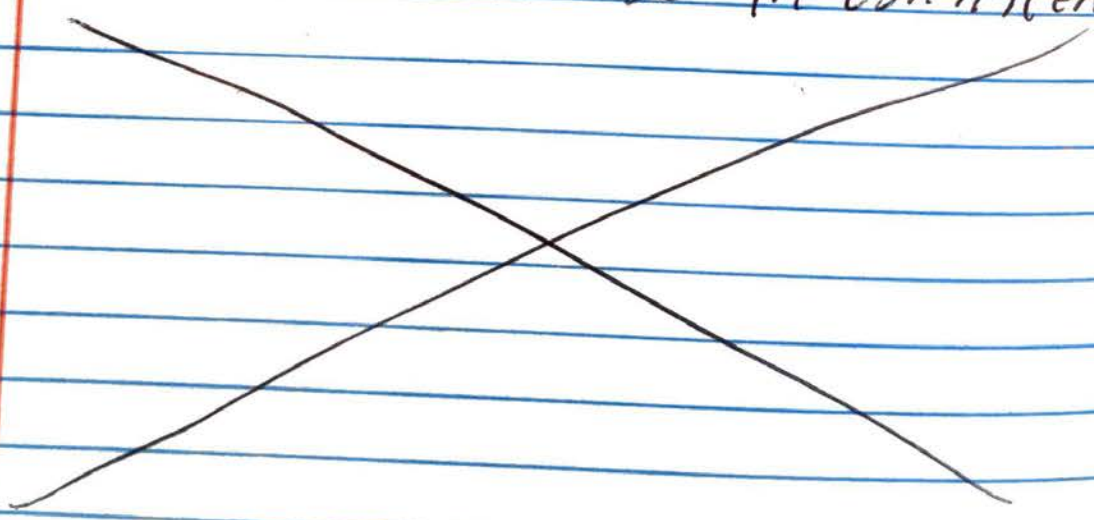
56 Robot Modifications

- After Driving and practicing for awhile, we found a few problems with the design:

  - While driving, sometimes the buttons on the brain would get pushed and turn off the program.

  - To load two balls into the catapult, you need to have two balls in the intake to push them into the catapult.

  - Sometimes when the balls get loaded into the catapult, they would go too far and not go into the spot they need to be in. This causes the shot to be inconsistent.

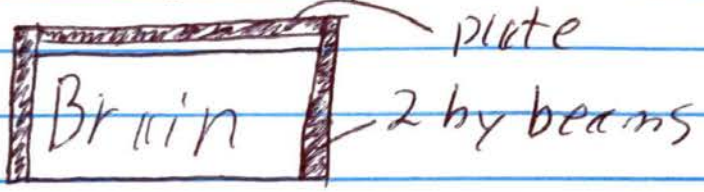


1/20/22

Robot Modifications

Solutions:

- We added two two by pieces to the sides of the brain. We attached a small plate to both of the beams. The plate covers the brain so the buttons can't get pushed.



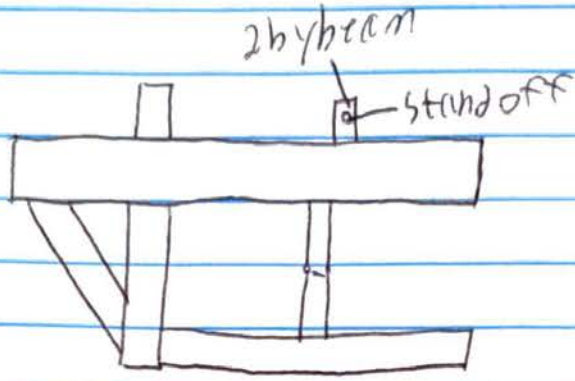
- This was able to stop the problem and the buttons no longer get accidently pressed.

- To stop the balls from going too far and not being in the right spot, we added two stand-offs to block the balls from going passed.

Tyler

1/29/22

58 Robot Modifications



- This addition blocked the balls from going to far and getting stuck. This also helped make the shots more consistent than before.

- To fix the problem of the balls needing to be pushed into the catapult with two other balls, we had to do lots of small adjustments to the intake.

Kim

1/25/22

Robot Modifications

Some of the small adjustments that we made were things like:

- Adding a rubber band going across the robot between the intake and the catapult. This helped boost the ball up slightly and stop it from rolling out.

- We moved the intake a little bit farthur ~~intake~~ into the robot so its a little bit closer to the catapult. This was able to make it easier for the balls to into the catapult.

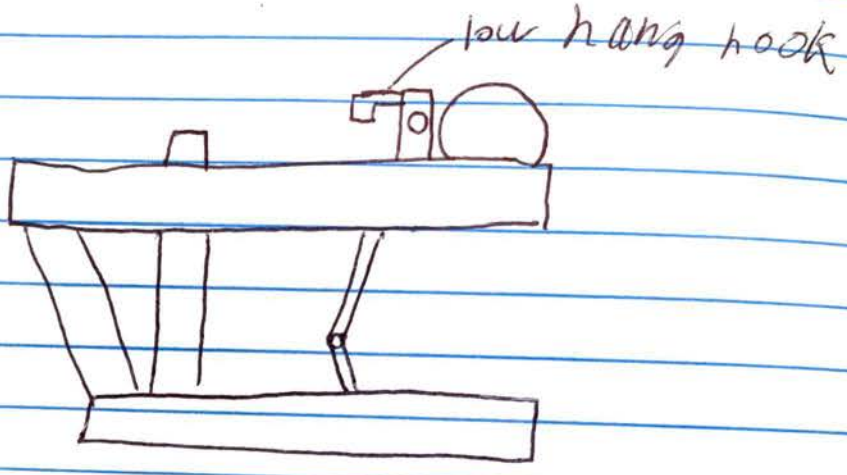
After these minor changes, we were able to make the balls go into the catapult without pushing them in with two other balls.

Eric

1/25/22

60 Robot Modifications

We learned that you could add a hook on the catapult to allow us to low hang. We attached it to the part of the catapult that has the standoffs to stop the balls from going too far forward



Adding this allowed for us to get clow hang during competitions and during practice matches

1/27/22

Robot Programming

For our robot to actually be able to work properly we needed a code.

The code we made puts the two motors for the catapult in a motor group together. We also reverse one of the motor so they spin in the same direction and in unison.

We programmed it so that pressing the R Bumper Up button on the controller would spin the catapult motors forward. By pressing the R Bumper Down button, it would spin the catapult motors in reverse.

The two intake motors were also put into a motor group. We also reversed one of the motors so they spun the same way.

1/27/22

62

Robot Programming

We programmed the L Bumper Up button to spin the intake forward, toward the catapult. And we programmed the L Bumper Down button to spin the intake in reverse.

The table below shows a list of which ports are used and which parts of the robot they control.

Port	Function
9	Drivetrain
3	Drivetrain
11	Intake
4	Intake
10	Catapult
5	Catapult

The last things we did in the code was set the drivetrain, intake, and catapult stopping to hold. And we set the velocity of the drivetrain, intake, and catapult to 100%.

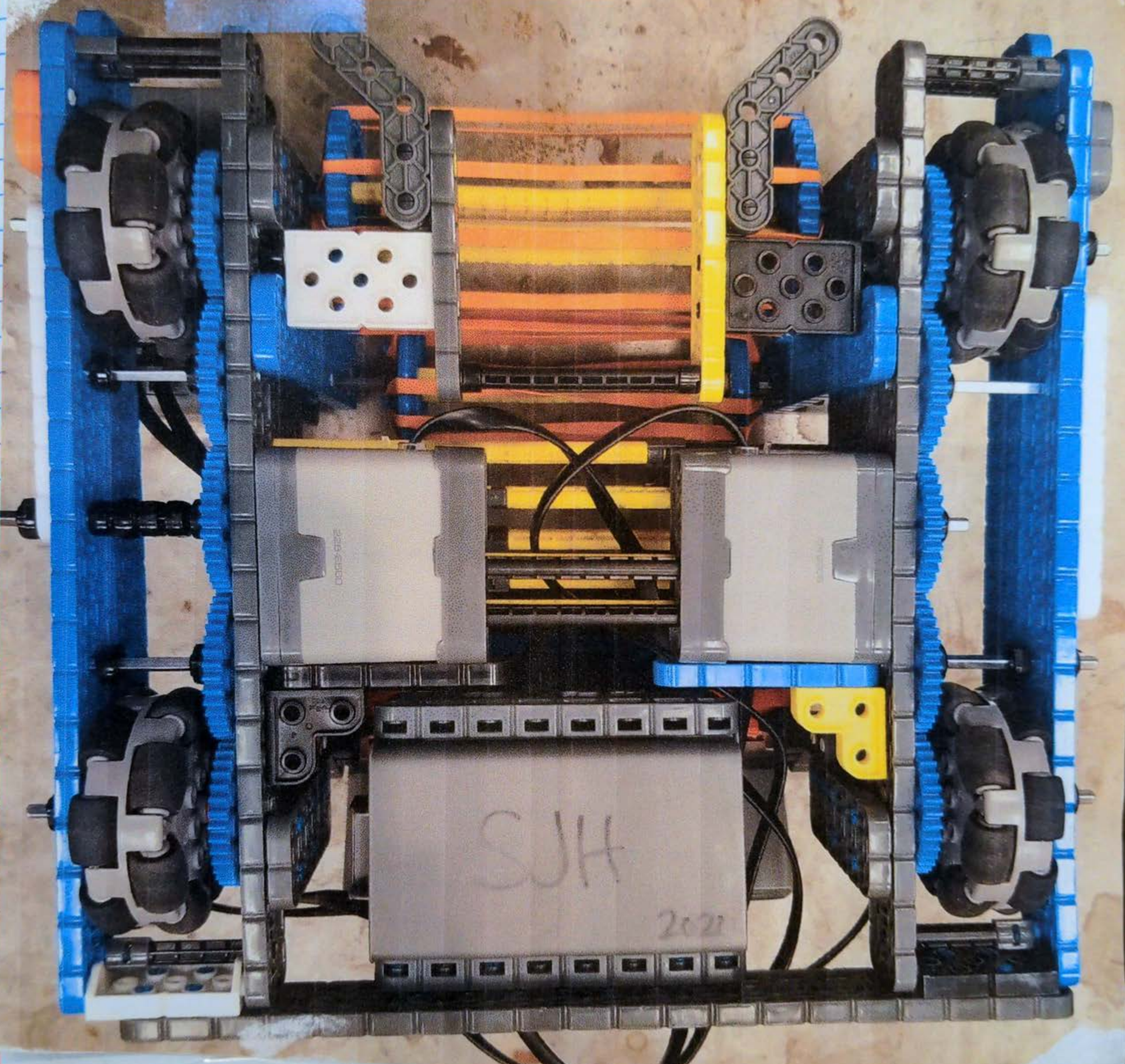
Jenin

2/1/22

Pictures of Robot's

~~Catapult~~ Robot Bottom View

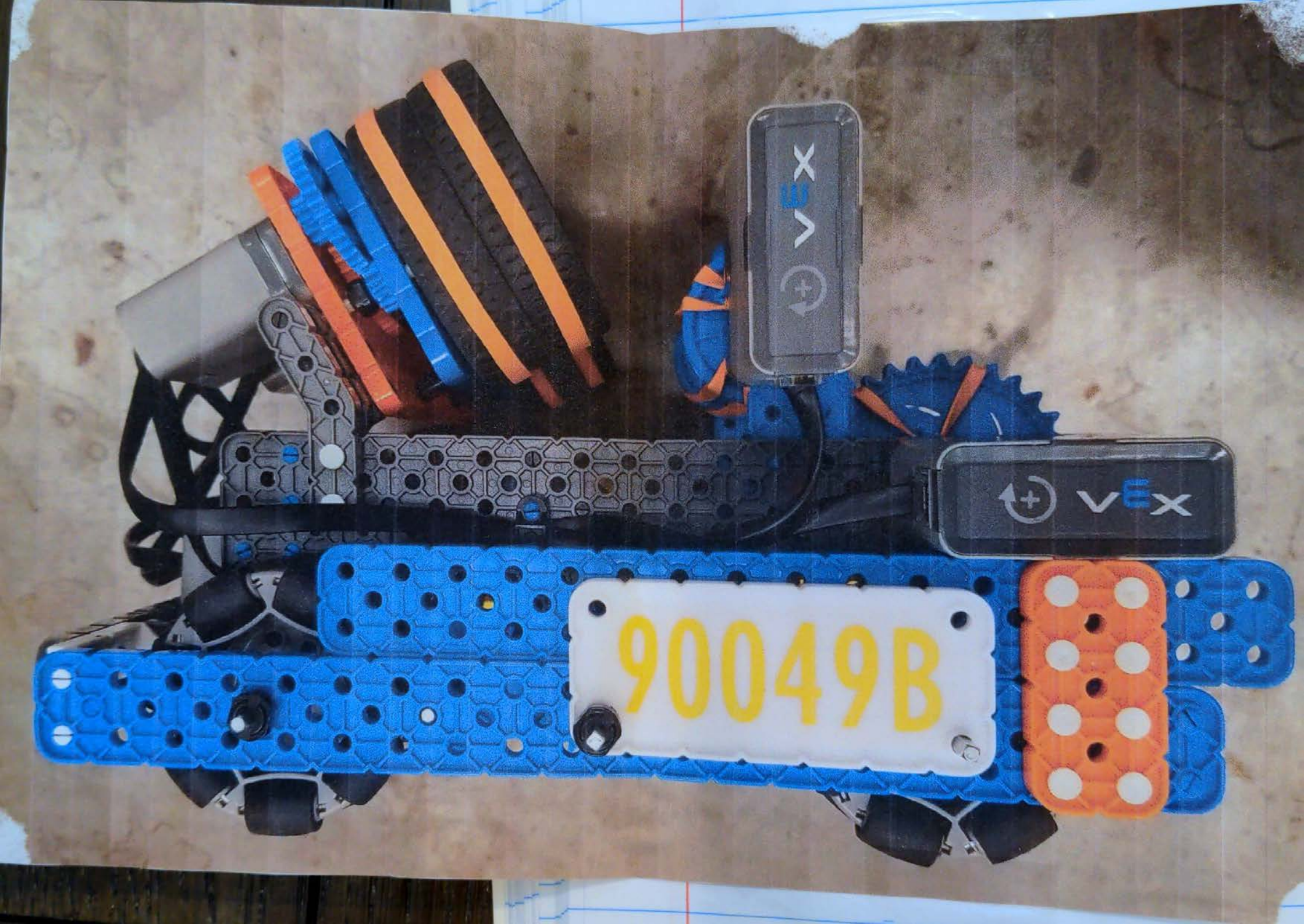
Canon


SJH
2021

2/1/22

64 Pictures of Robots

Canon Robot side view


VEX
VEX
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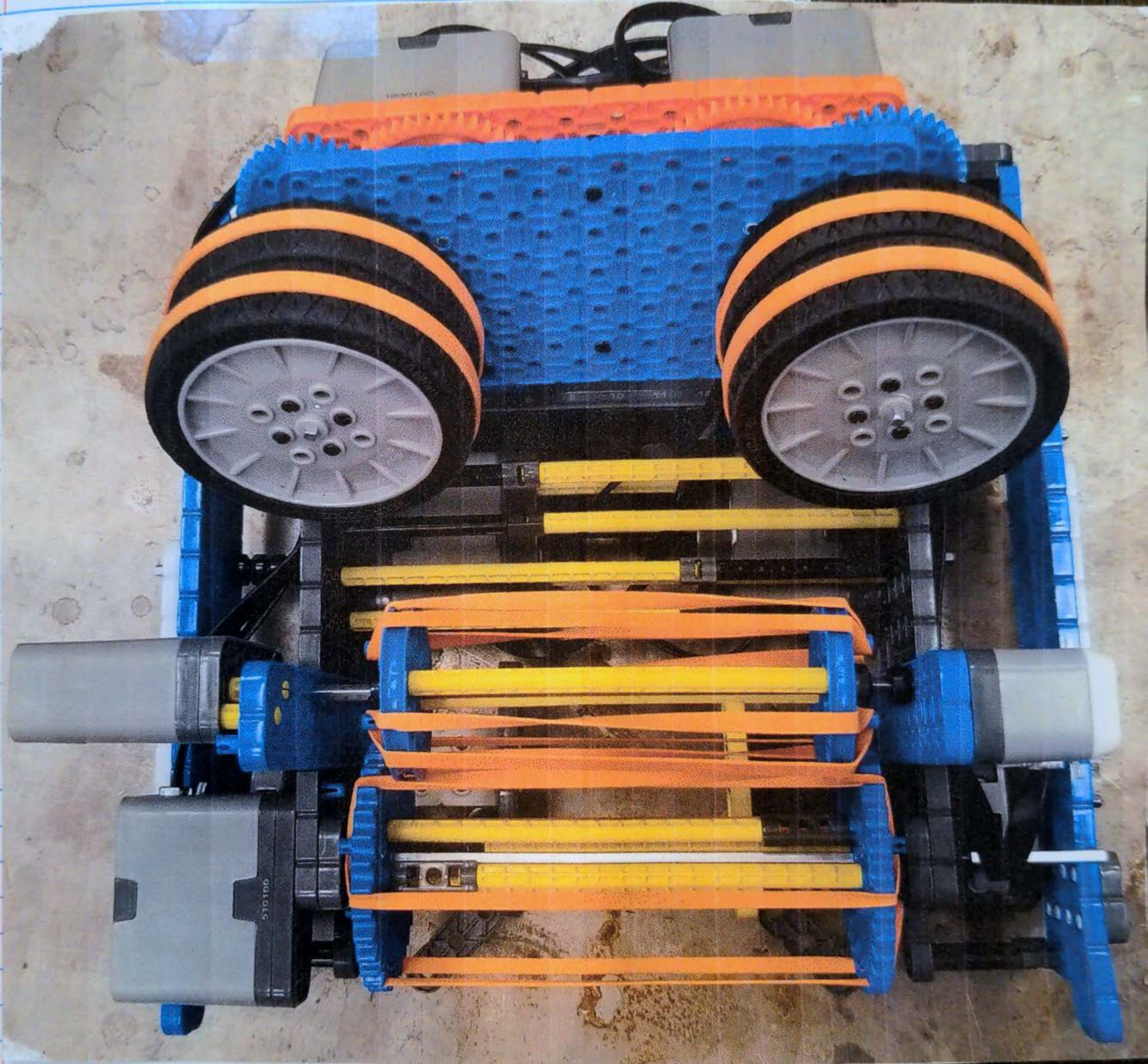
2/11/22

Pictures of Robots 65

Canon Robot Top view

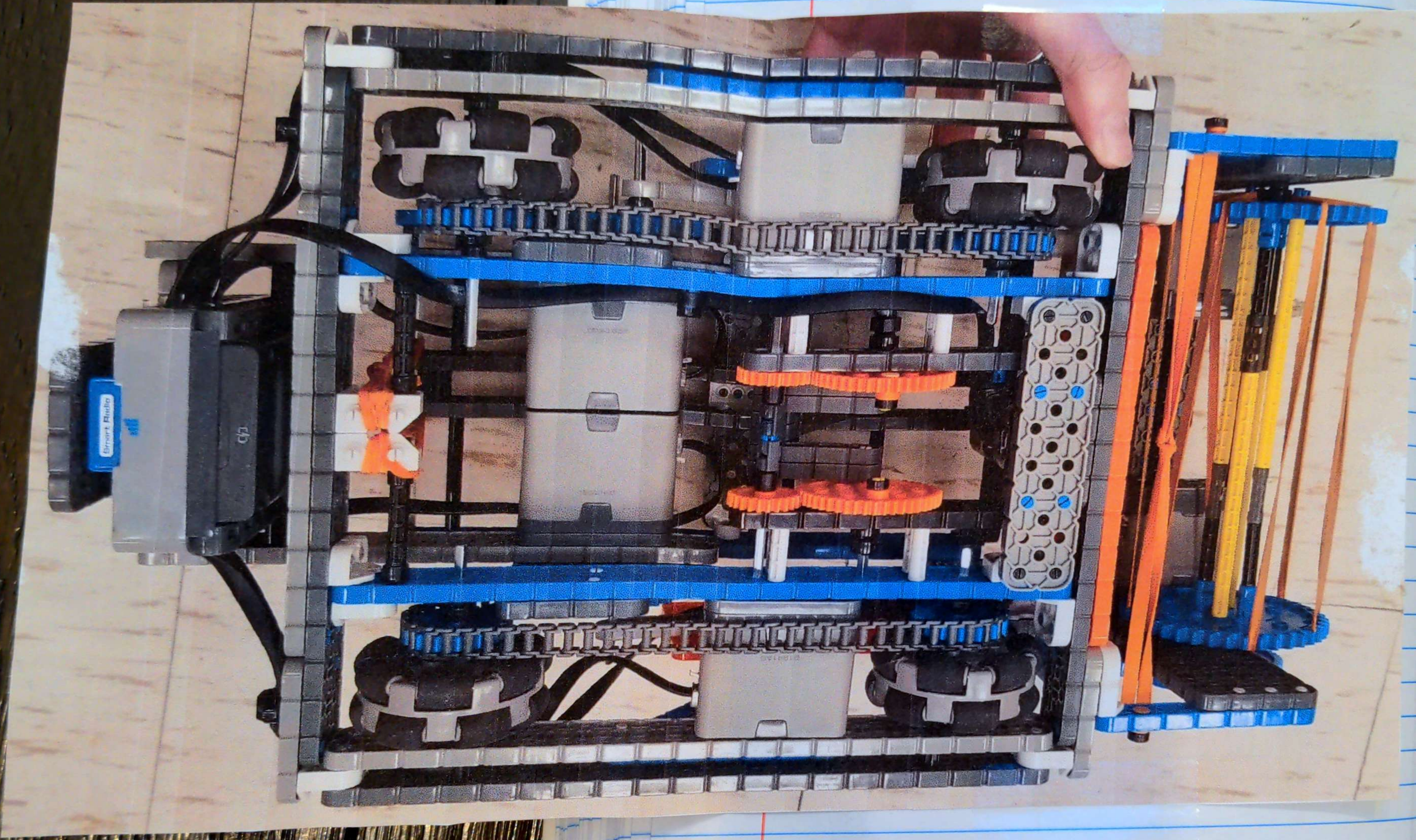


2/11/22

66 Pictures of Robots

Catapult Robot Bottom view

Kim



2/11/22

Pictures of Robots

Catapult Robot Back view

Pictures of R

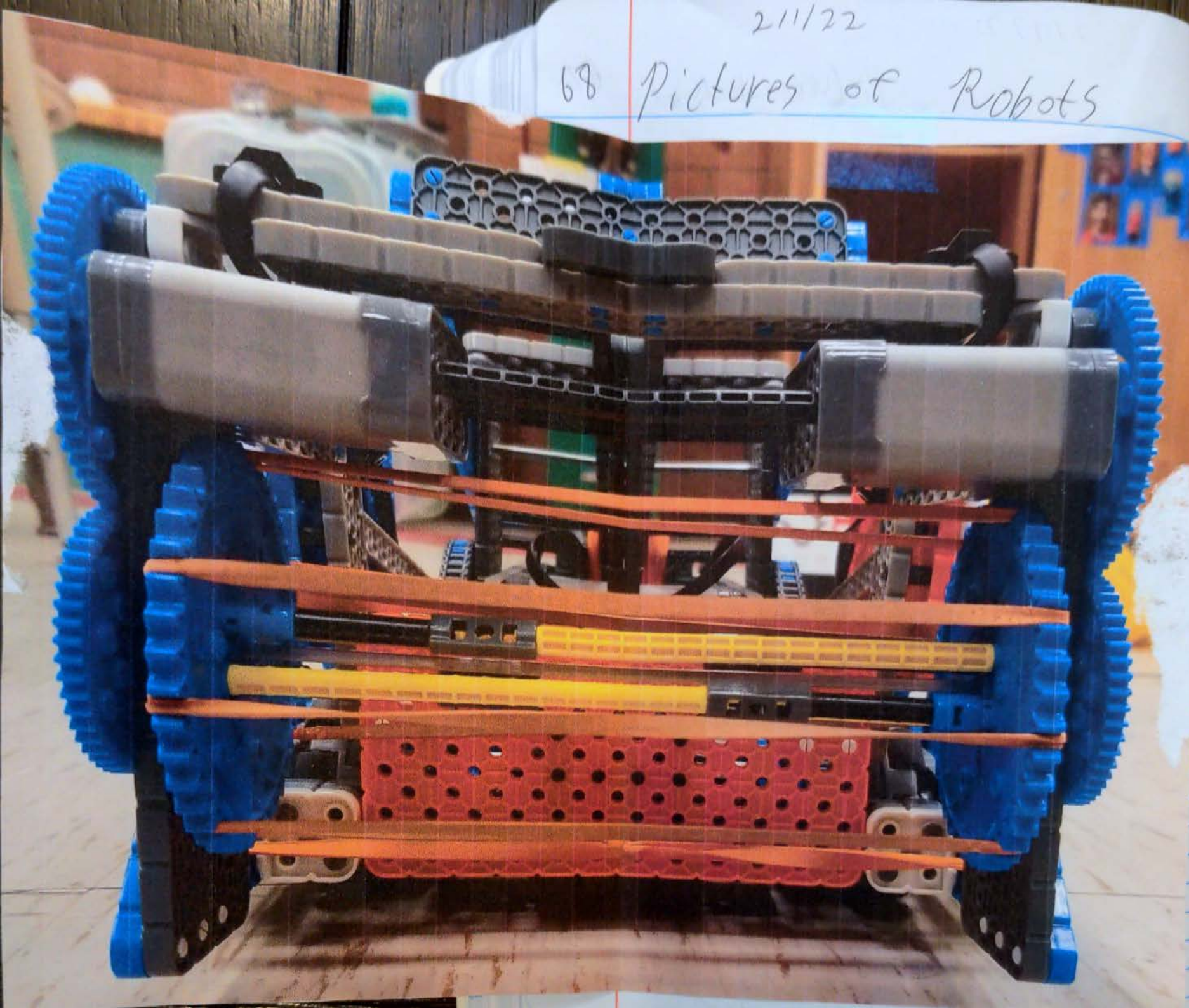
2/11/22

68 Pictures of Robots

Catapult Robot front view

2/11/22

68 Pictures of Robots



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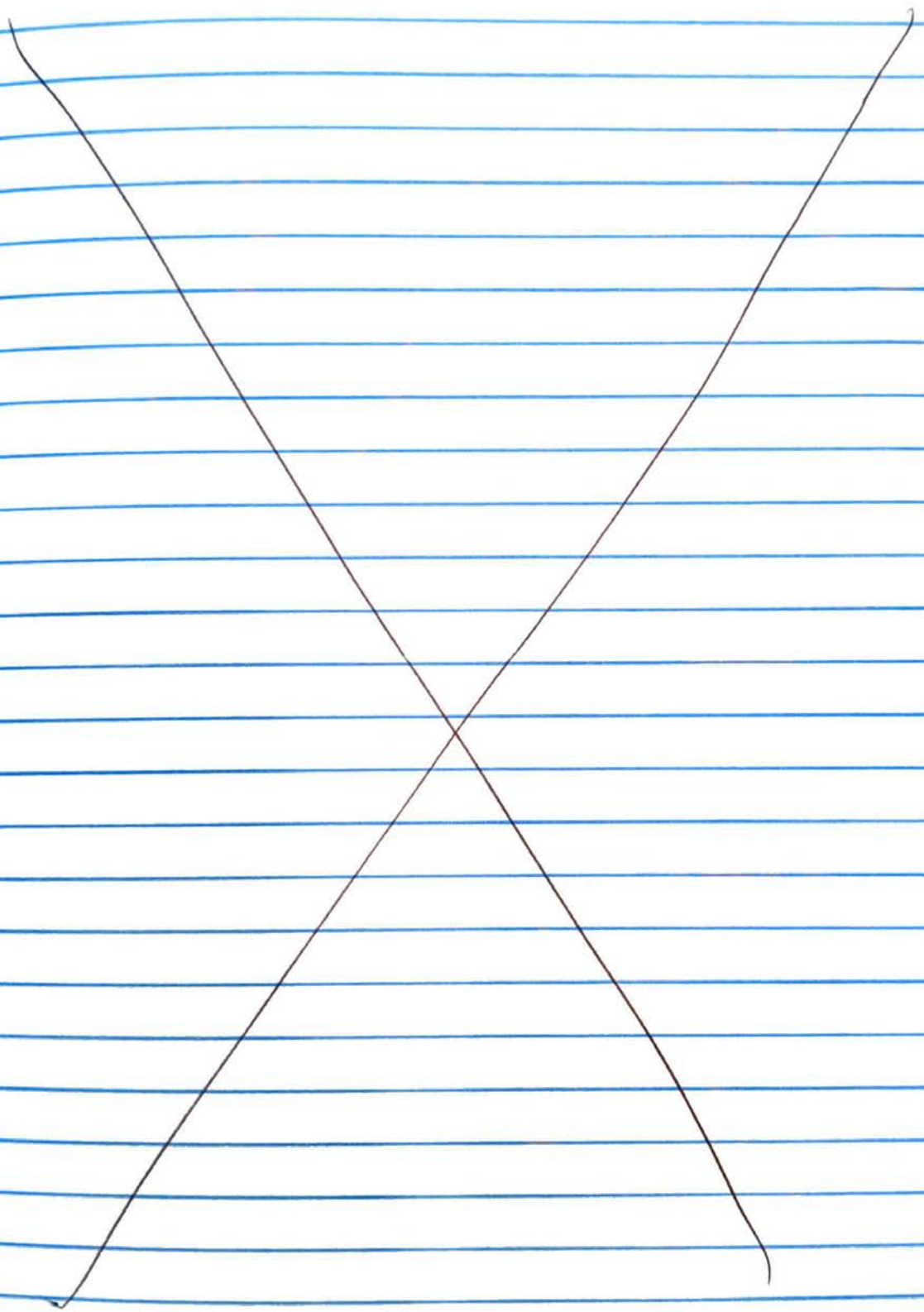


2/3/22

Pictures of Robots

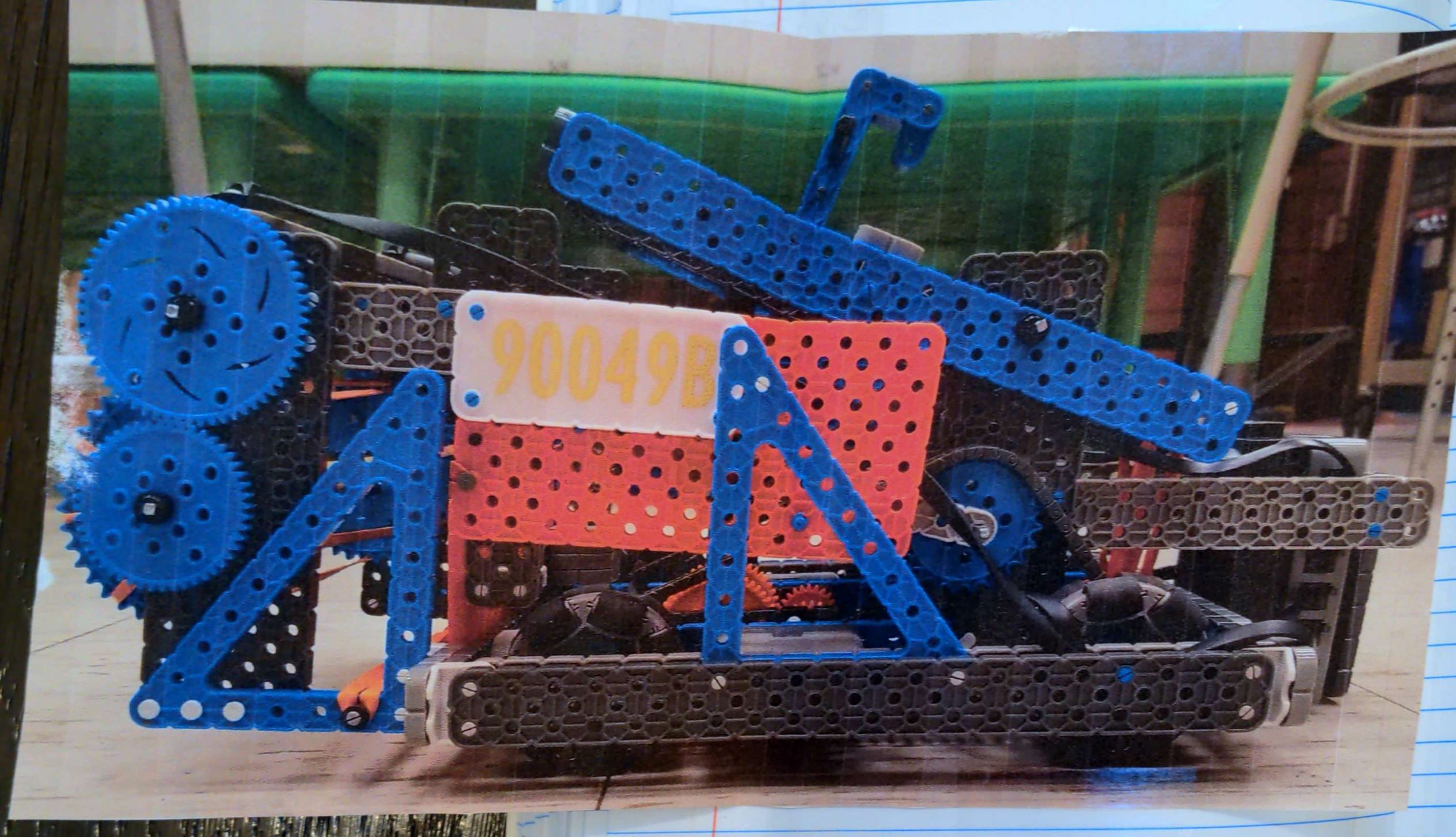
2/3/22

Pictures of Robots

2/13/22.

72 Pictures of Robots

Catapult Robot Side view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2/3/22

Pictures of Robots

Catapult Robot Top view

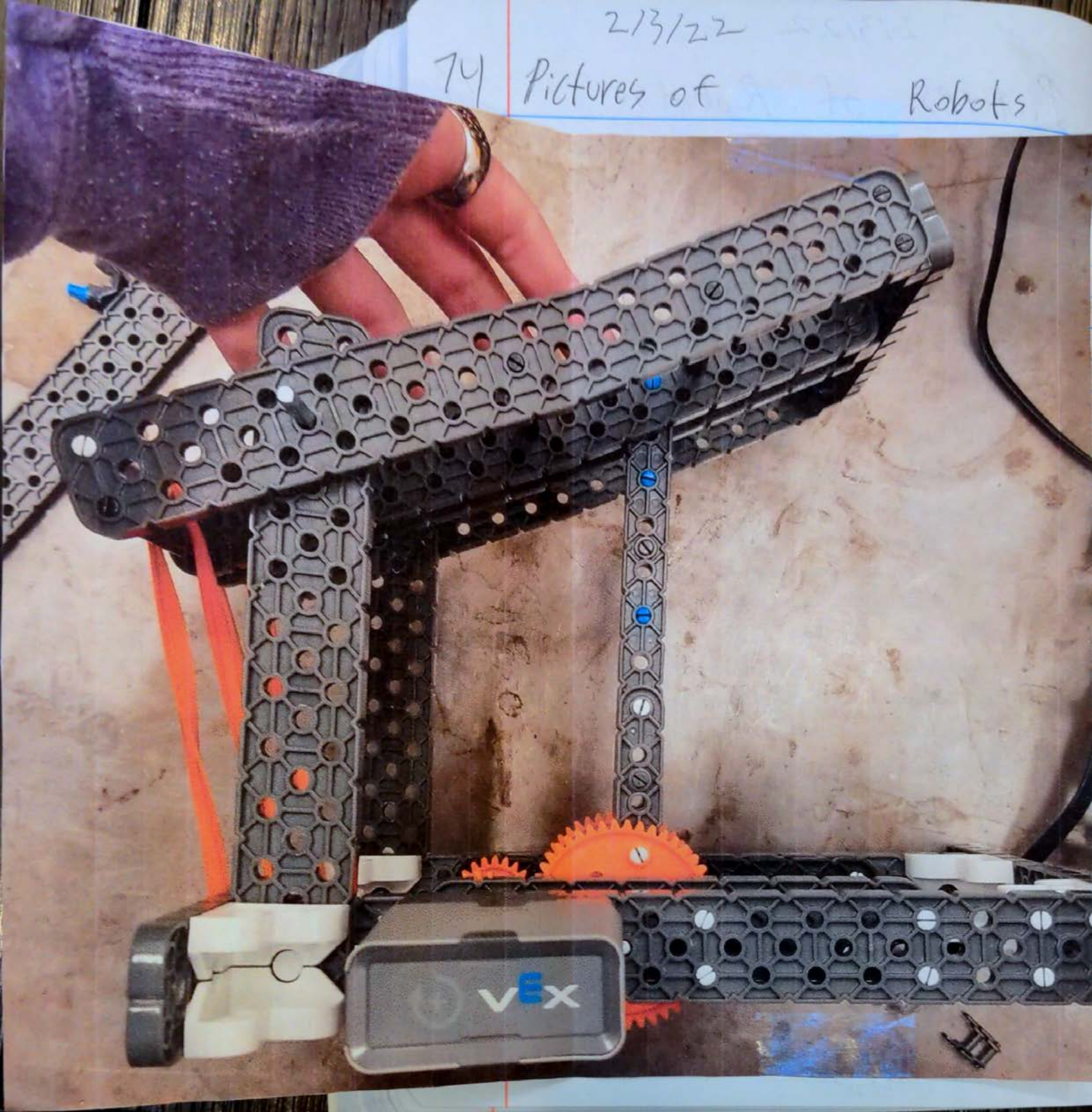
2/3/22

74 Pictures of Robots

catapult side view

2/3/22

74 Pictures of Robots

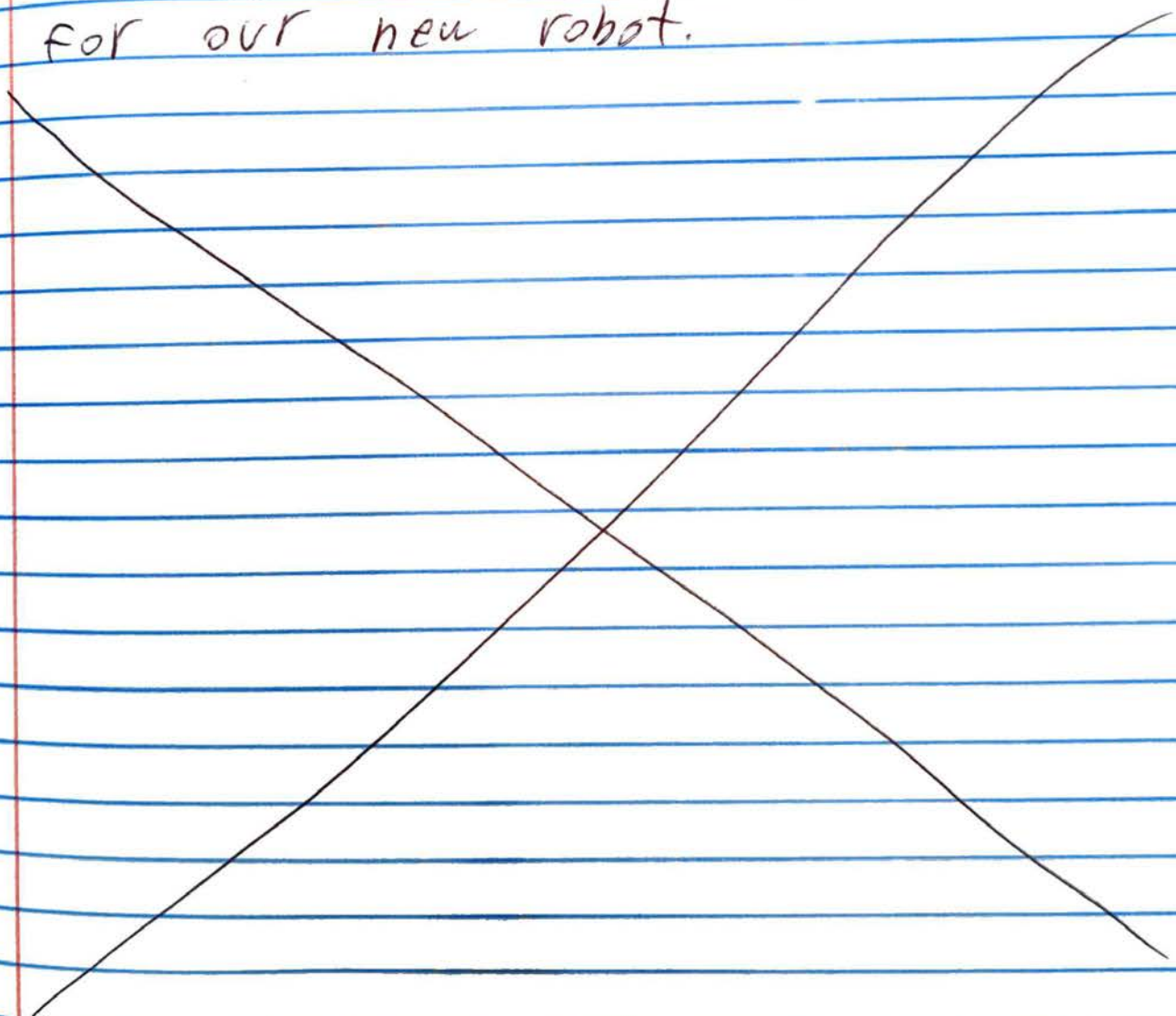


2/8/22

New Driver Stratagies

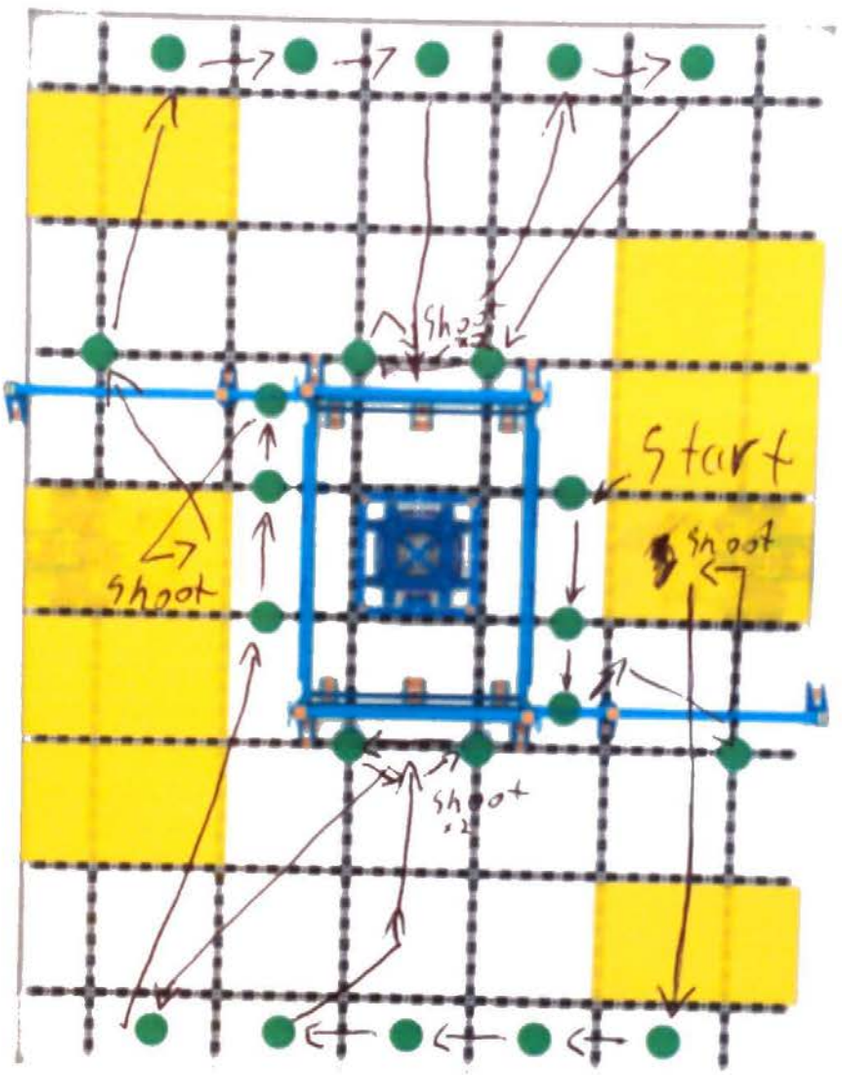
·With our new robot, we can now hold up to four balls easily. The robot is capable of holding 6 balls, but it doesn't keep the balls in the robot very well.

·We ~~starting~~ started coming up with some stratageys that are more effective and time efficent for our new robot.



2/8/22

76 New Driver Strategy



2/8/22

77

New Driver strategy

- We have one main strategy that we use for Driver skills and team work matches.

- We start in the starting position labeled and pick the three balls lined up next to the robot. Then go get the ball under the low hang pole.

- We go back over to the starting positions and shoot all four balls into the high goal.

- Then we go over to the corral to the left and get the first four balls and shoot them.

- We pick up the two balls next to the plastic shield for the low goal and shoot those two balls.

- Then we get the last ball from the corral and three balls lined up in the starting position opposite to where we started and shoot all four of those balls.

Erin

2/10/22

:78 New Driver Strategy

- Around the time we shoot those two balls is when the timer gets to 25 seconds and we switch drivers.

- Then we get the ball from under the low hang bar next to us and the first three balls in the ~~the~~ corral.

- We shoot those four balls, then get the last two balls in the corral.

- Depending on how much time is left, we either just shoot those two balls, or we get the last two balls next to the plastic sheild and shoot them.

- In the case there is any extra time left, we go to which ever low hang bar is closest and hang.

Fin

2/10/22

Auto Reset

- To make driving a little easier for the drivers, we added a mechanism that will automatically reset the catapult so you can load more balls to shoot.

- Previously, you would need to reset the catapult while ~~drive~~ driving. Having the auto catapult reset makes it easier for the drivers to fully focus on driving.

- To build this, we added a bumper switch under the catapult. we put it low enough that it could be pressed, but not stop the catapult from shooting and getting stuck.

- When the program was one, the program would check to see if the bumper was pressed. If it wasn't, then the catapult would spin until it was.

Kevin

2/10/22

i80 Auto Reset

- Once the catapult stops, all you have to do to shoot it is hold the button to spin it (R bumper up). once it shoots you don't have to do anything and it will reset.

- This worked very well and was able to help save some time.

Problems:

- Because we use the catapult to low hang, we need the catapult up all the way to be able to hook onto the low hang bar. And although you can shoot and with good timing hook onto the low hang bar, it wasn't very easy.

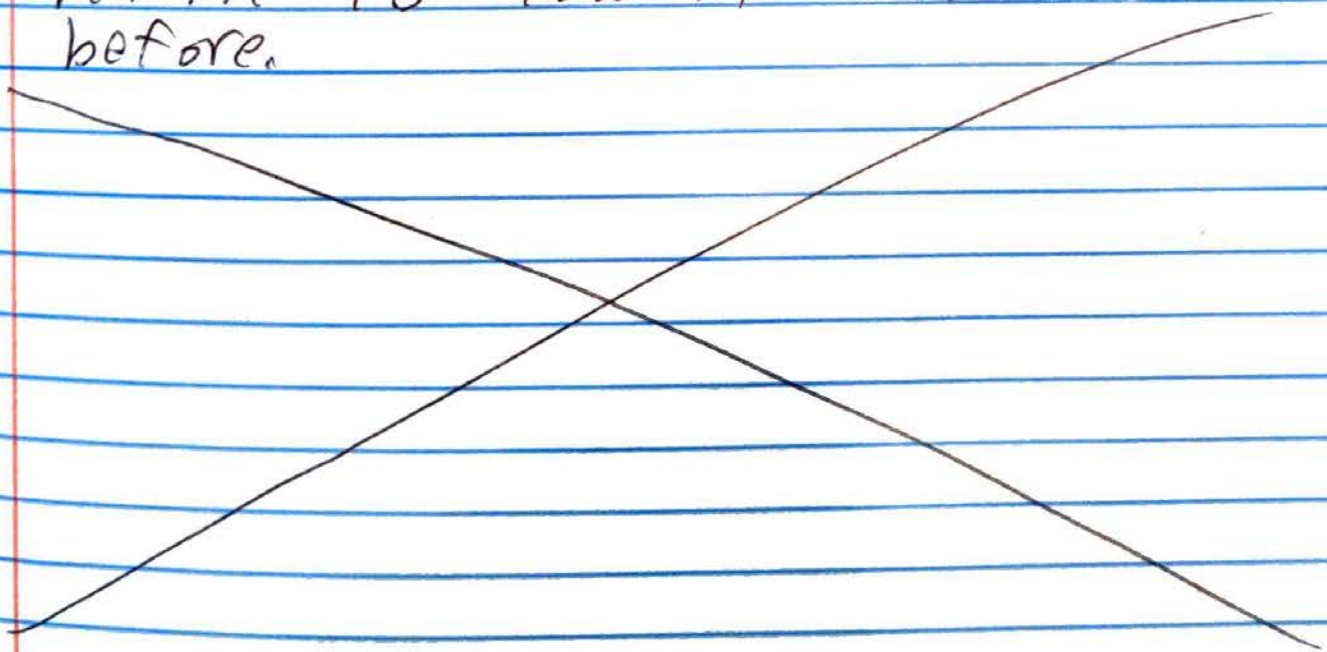
2/10/22

Auto Reset

- To fix this problem with the automatic reset, we added an on and off switch.

- When the program starts, the auto reset will be turned on. to turn it off, You press the F up button. This will allow you to move the catapult up and down normally with the R Bumper up and R Bumper down buttons.

- To turn the auto reset back on, you press the F Down button and it will return to how it was before.



Kevin

2/15/22

82 Auto Reset Code

2/17/22

Practicing and High Scores

- Since we had our new robot functioning well, ~~and~~ we had to practice.

- At first, our scores were only a little higher than what they were with our other robot.

Match #	Amount of Points
1	55
2	57
3	63
4	70
5	72
6	65
7	86
8	80
9	75
10	63
Avg.	68.6

2/17/22

Practicing and High Scores

- After spending a few weeks practicing with our new robot and getting better, we were able to get a lot more points. The table below shows our driver skills practice matches for today.

Match #	Amount of Points
1	85
2	96
3	112
4	72
5	106
6	82
Avg.	92.2

- We also did some teamwork matches with our 90049W team. They also have a robot with a catapult design. Together we are able to get lots of points

Erin

2/17/22

Practicing and High Scores

Match #	Amount of Points
1	104
2	111
3	114
4	124
5	114
Avg.	113.3

- After Practicing for a few monthes now and state being in a few weeks, we have gotten significantly better. We have been doing mostly driver skills recently and have been matching or almost matching our high score consistently. Our current high score is 138.

- We got our our high score by scoring 20 balls in the high goal, 1 ball in the low goal (from a missed shot), both cleared corrals, and a low hang.

2/17/22

86 Practicing and High Scores

- The graph below shows some of our recent practice graphs.

Match #	Amount of Points
1	130
2	136
3	125
4	131
5	136
6	138
7	136
8	130
Avg.	132.75

- While practicing in teamwork matches with our goalW team, we were able to get a high score of 154. This is the highest score you can get without high hanging. 22 balls in the high goal, both cleared corrals, and two low hangs.

Tzin

2/22/22

Past Tournament Scores

- This robotics season, we have gone to 6 tournaments. Not ~~including~~ including state in a week.

- These tournaments are:

  - 2021 ~~the~~ Shoreline VEX IQ Junior High Tournament.

  - SJH VEX IQ Pitching In January Tournament

  - SJH VEX IQ Pitching In Winter Tournament

  - South End Tournament at Millcreek Jr.

  - VEX IQ Pitching In Tournament Middle School - Heartbreak Tournament

  - VEX IQ Pitching In Tournament Middle School - Jack Frost Tournament

Kyrie

2/22/22

88 Past Tournament Scores

2021 VEX IQ Shoreline Junior High Tournament:

- The tables below show our scores in qualification and Finals matches

Match #	Amount of Points
Q-3	36
Q-17	44
Q-30	88
Q-39	29
Q-45	58
Q-54	21
Q-70	66
Q-75	54
~~F-4~~ Avg.	57.67
F-4	54

- This tournament was while we were using our first robot.

- We got two awards at this tournament:

  - Exellence Award
  - Robot Skills Champion Award

2/22/22

Past Tournament Scores

SJH VEX IQ Pitching In January Tournament:

Teamwork		Skills
Match #	# of points	Driver
Q-13	80	High score: 86
Q-23	78	Programming
Q-37	71	High score: 15
Q-58	90	Total: 101
Q-81	96	
Q-105	76	
Q-115	59	
AVG.	81.83	
F-9	108	

- This tournament was ~~a~~ with our new robot

- We got two awards at this tournament:

  - Excellence Award
  - Teamwork Champion Award

2/22/22

90 Past Tournament Scores

SJH VEX IQ Pitching In winter Tournament:

Match #	# of points	
Q-8	35	Driver Skills
Q-22	49	Highscore:
Q-43	56	36 Points
Q-51	80	
Q-67	38	Program Skills
Q-85	56	Highscore:
Q-		18 Points
AVG.	35.8	Total:
F-7	64	54 Points

*This was with our old robot.

*We did not get any awards at this tournament

2/24/22

Past Tournament Scores

South End Tournament at Millcreek JR.:

Match #	# of Points
Q-3	56
Q-25	34
Q-34	48
Q-42	19
Q-55	96
Q-73	54
AVG.	49.6
F-8	74

Driver Skills
Highscores:
33 Points

Programming Skills
Highscore:
0 Points

Total: 33 Points

- This tournament was with our old robot.

- At this tournament, we got one award:

- Teamwork Champion award

Finis

~~2/17/24~~ 2/24/22

92

Past Tournament Scores

VEX IQ Pitching In Tournament
Middle School - Heartbreak Tournament:

Match #	# of points	Driver Skills
Q-15	94	Highscore:
Q-36	74	100 Points
Q-52	128	
Q-64	79	Programming Skills
Q-82	90	Highscore:
Q-114	81	51 Points
AVG.	142	
F-9	140	Total:
F-144	144	151 Points

- This tournament was with our new robot

- We got one award at this tournament:

- Teamwork Champion Award

2/24/22

Past Tournament Scores

VEX IQ Pitching In Tournament
Middle School - Jack Frost Tournament:

Match #	# Points
Q-9	29
Q-19	36
Q-31	38
Q-42	44
Q-49	38
~~Q-~~	~~~~

Driver Skills
Highscore:
39 Points

Programming Skills
Highscore:
8 Points

Total: 47 Points

- This tournament was with our old robot.

- We did not get any awards at this tournament.

~~3/10~~ 3/11/22

94

Recording Program

- One of the team members on our team came up with the idea of recording the movements of a driver skills match and replaying it as programming skills.

- Our team thought this was a good idea, so, because I'm the programmer on the team, I started coming up with ways to do this.

- I came up with the idea of making a list that would have pairs of information. The first two numbers in the list would be for one thing. I did it so that when you click a button on the controller, it would add a number, 1-~~3~~ 12, to the list. each number would represent a different button. Once a button gets pushed it will start counting how long it was pressed for. When the button is released, it would add the ~~second~~ amount of time as the second part of the pair.

Jesse

3/1/22

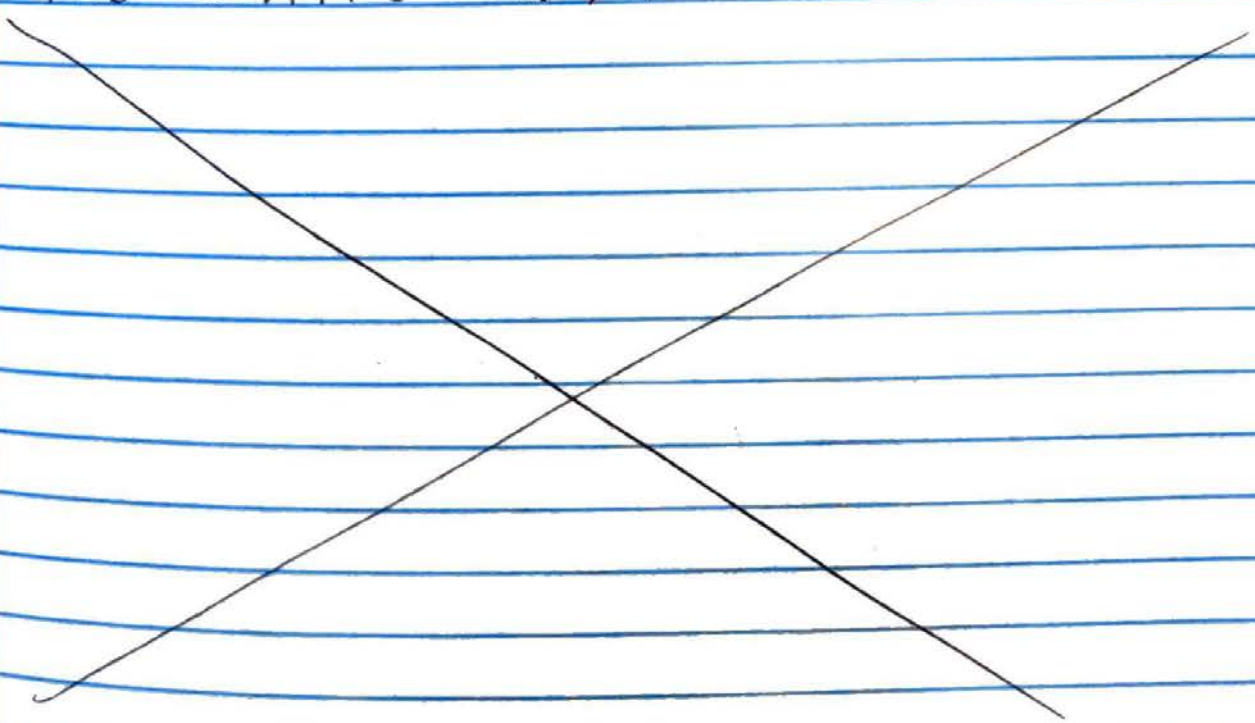
Recording Program

List = [1, 2.56, 4, 1.2, 3, 6.5]
Pair Pair Pair

- The first number represents the button and the second number is the time pushed.

- Because you can't save information to a gen I brain, we had to have a way to access the data in the list.

- I did this by printing each pair of information to the brain, until it got through the entire list.



3/1/22

96 Recording Program

- Below shows which numbers represented each button:

1-R Up
2-R Down
3-L Up
4-L Down
5-F up
6-F Down
7-E Up
8-E Down
9-Joystick Axis A Up
10-Joystick Axis A Down
11-Joystick Axis D up
12-Joystick Axis D Down.

Problems with this:

- Because it records one input at a time, you can only play back one input at a time. This is a problem because, while driving, you can be doing up to 3 inputs at once.

3/1/22

Recording Program

- The program can only record the amount of time a button is pressed for ~~the~~ one button at a time.

- ~~The brain gives an error saying "US~~

- The brain gives an error saying "User program has exceeded time limit of 3 seconds." After trying to find why this error was happening, I didn't really find any good answers. from what I found, I think Its caused from overloading the brain with too many functions at once.

- To make this program, I need to code it in C++ because it isn't possible to make with block coding. I don't know any C form of C coding. So as I'm making this, I am also learning the coding language.

3/1/22

Recording Program

Solutions:

- Even though I don't know C++, I know python and have learned a decent amount of javascript. Because of prior knowledge to coding, it isn't as hard to learn C++.

- Because I don't really know the cause of the brain error, the only thing I can think of doing to fix it is optimizing the code and making it more efficent.

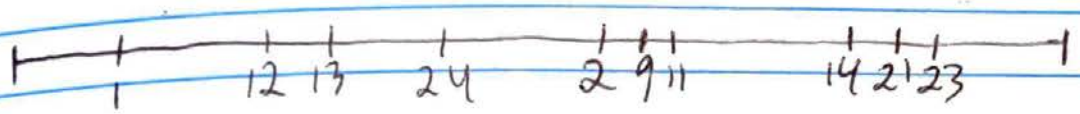
- To fix the problem of only being able to record and time one input at a time, I came up with a new way store the data. I'm still going to use the light to store data, but its going to work like a timeline instead of counting the amount of time a button was pressed for.

3/11/22

Recording Program

99

Program v.2:



·For the v.2 of this program, it works like a timeline. The Timeline starts when you push the button to start recording. When a button is pressed it adds the corresponding number to the list, and as the first number in the pair. The second number in the pair is the time that the button was pushed.

·To start the recording, you push the E Up Button and the E Down Button. To stop ~~the~~ or pause the recording, you press the E Up Button and the E Down Button.

PC Receive Program

The numbers below show each button input:

1 - R Up Button Pressed
2 - R Down Button Pressed
3 - L Up Button Pressed
4 - L Down Button Pressed
5 - E Up Button Pressed
6 - E Down Button Pressed
7 - E Up Button Pressed
8 - E Down Button Pressed
9 - Axis A Moving Up
10 - Axis A Moving Down
11 - Axis D Moving Up
12 - Axis D Moving Down
13 - R Up Button Released
14 - R Down Button Released
15 - L Up Button Released
16 - L Down Button Released
17 - E Up Button Released
18 - E Down Button Released
19 - E Up Button Released
20 - E Down Button Released
21 - Axis A Not Moving Up
22 - Axis A Not Moving Down
23 - Axis D Not Moving Up
24 - Axis D Not Moving Down

3/3/22

Recording Program

- When a button is pressed, it puts the corresponding number 1-12 on the timeline.

- When you release a button that you are pressing, it puts the corresponding number 13-24 on the timeline.

- by using this new system with pressed and released, it fixes the problem of counting how long a button is pressed for. It tells you exactly when its pressed and exactly when it is released.

~~Problems~~: Problems and Solutions:

- I used all the start functions and couldn't run parts of the code, I was able to fix this by optimizing the code and making it a little more efficent.

Fair

3/3/22

107

Recording Program

- I was continuing to get the error that said, "User program has exceed time limit of three seconds." I was able to find where in the code was causing the error.

- I found that there were three parts of the code causing the error:
  - The printing to the brain.
  - The start recording buttons
  - The part that adds the information to the list.

- I was able to fix the start buttons and printing by rewriting them and somewhat combining them. This was also able to fix the problem of not having enough start functions.

Fri

3/3/22

Recording Program

- I wasn't able to find a solution for adding information to the list. everything that I tried ended up crashing the brain and giving the error.

- Instead of saving the data to list, you save as a single number.

Program V.3:

- For V.3 of the program, we are replacing the list with a single number.

- The number starts out at 0. When a button is pushed or released it will add a certain number to the variable. Once a number is added, it ~~add~~ multiplies the number by 100, adding two more zeros at the end of the number.

Kai

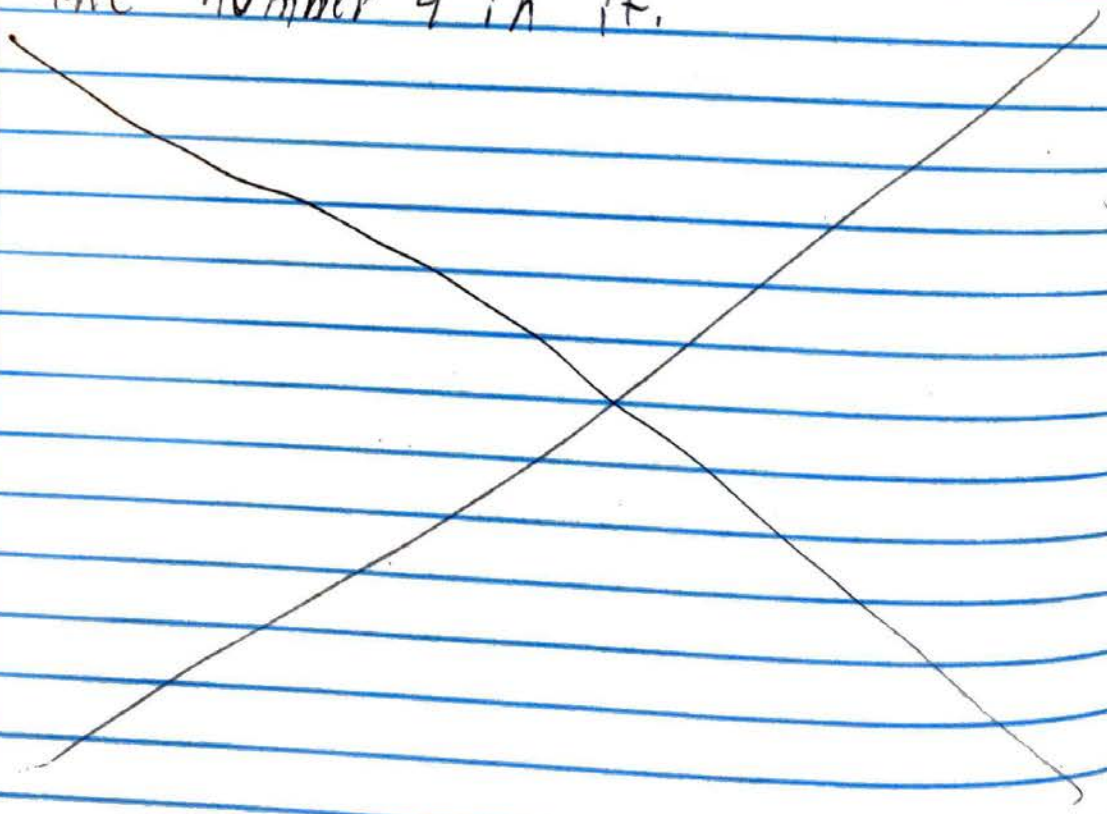
3/3/22

104 # Recording Program

- After ~~##~~ the two zeros are added at the end, it adds the number 99. 99 acts as basically a barrier between information to help when reading it out.

○ -> 1299 -> 12992499 -> 1299249927799 -> etc.

- Because we use 99 as a way of splitting up the information in the number, we can't use any numbers with the number 9 in it.



3/3/22

Recording Program

Below it shows which buttons correspond with which numbers:

10- R Up Pressed
11- R Up Released
12- R Down Pressed
13- R Down Released
14- L Up Pressed
15- L ~~Down~~ Up Released
16- L Down Pressed
17- L Down Released
20- F Up Pressed
21- F Up Released
22- F Down Pressed
23- F Down Released
24- E Up Pressed
25- E Up Released
26- E Down Pressed
27- E Down Released
30- Axis A Moving Up
31- Axis A Not Moving Up
32- Axis A Moving Down
33- Axis A Not Moving Down
34- Axis D Moving Up
35- Axis D Not Moving Up
36- Axis D Moving Down
37- Axis D Not Moving Down.
99- Split Number

Tzvi

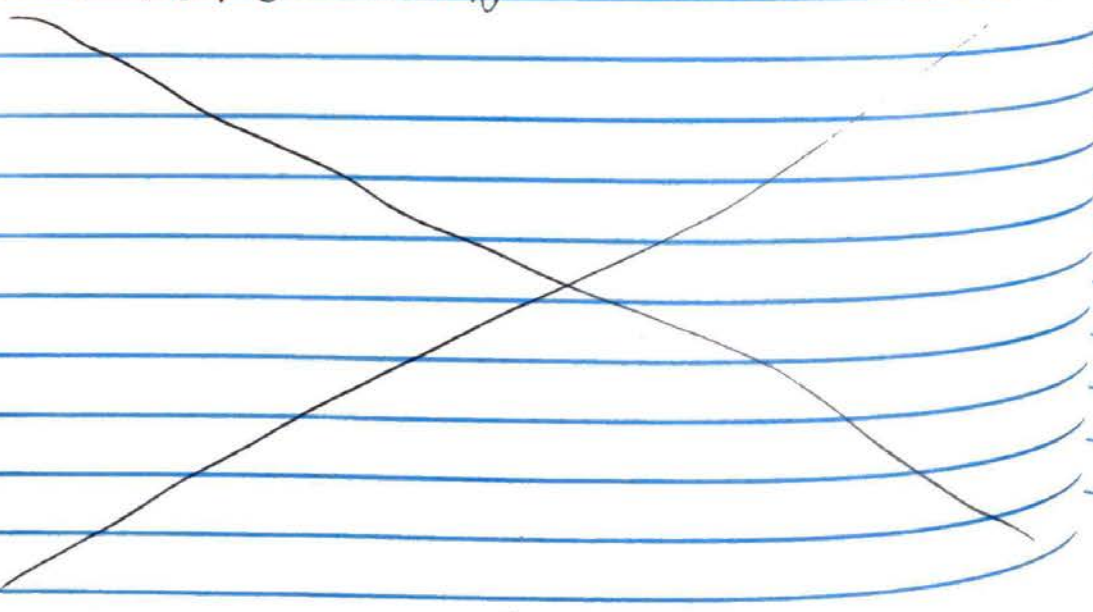
3/3/22

106 Recording Program

- To access the information from the brain, we print it out to the brain. The code goes through the info and prints all the numbers until it gets to 99. Then it does the same thing until its done. Each time, it starts off from the 99 it stopped at.

- In this version of the code, I also added in the auto catapult reset (PG. 79).

- This helps the program to feel and work the same as the normal driver program (PG. 61) we have would.



3/8/22

State Championship

On march 5th, we had the Utah state championship.

The table below shows the amount of points we got in all of our qualification matches and our finals match.

Match #	# of Points
Q-18	130
Q-36	97
Q-57	116
Q-78	114
Q-93	154
Q-117	150
Q-126	120
Q-147	142
Avg.	135.33
F-8	154

* The average is with the ~~two~~ ~~lose~~ two lowest scores dropped

We were able to get a state highscore of 154 twice in match 93 and in our finals match. We got both of these scores with the 44873 A, High Velocity, team.

3/8/22

108 State championship

Skills:

Driver skills: 103 points
Program skills: 53 points
Total: 156 points

- We were able to come 5th place in skills.

Awards:

Costume:

- Our team is The My Little Pony Fan Club, so for state each of us had a different color suit that matches one of the Ponies. There were purple, pink, green, and silver.

Teamwork 1st Place:

- We placed 1st place in qualifications and got matched up with the 44873A team who was in second. We matched the state high score we had gotten with that team earlier that day.

Fin

3/8/22

State Championship

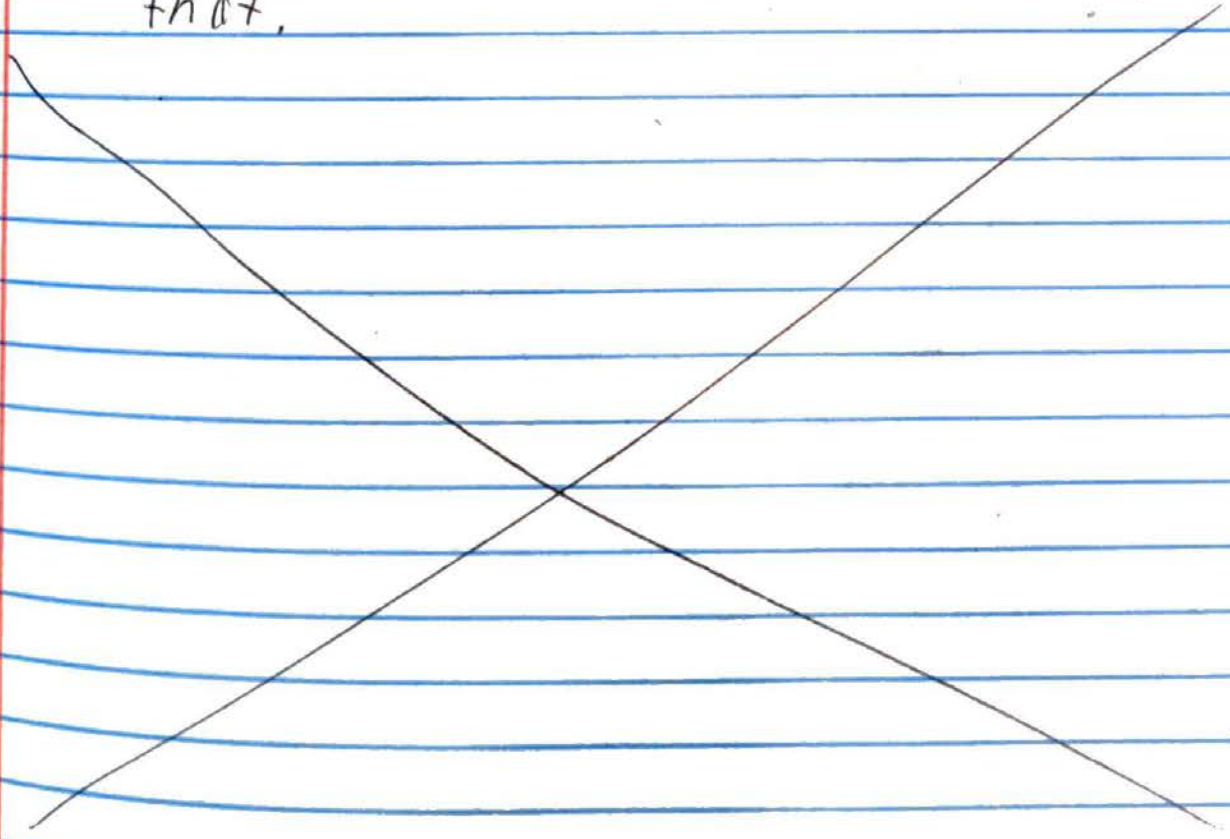
Excellence:

- There are three main things that got us excellence:

  - We placed first place in qualifications.

  - We were in the top 5 for skills

  - Our two judging interviews went very well along with our notebook to add onto that.



Iris

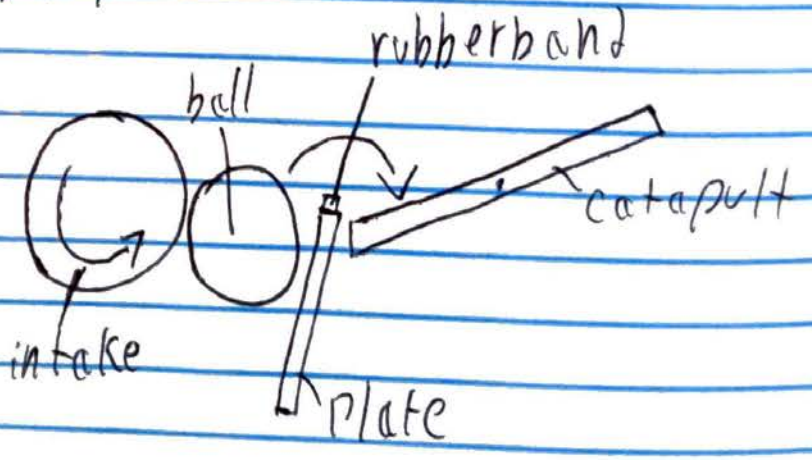
3/10/22

110

Robot Fixes

- There were a few problems with our robot that would effect our driving:
  - Bumper switch not stopping the catapult.
  - Balls sometimes falling out of the catapult back into the intake.
  - Drivetrain motors burning out.

- To fix the problem of the balls falling out of the intake, we moved the catapult down slightly.



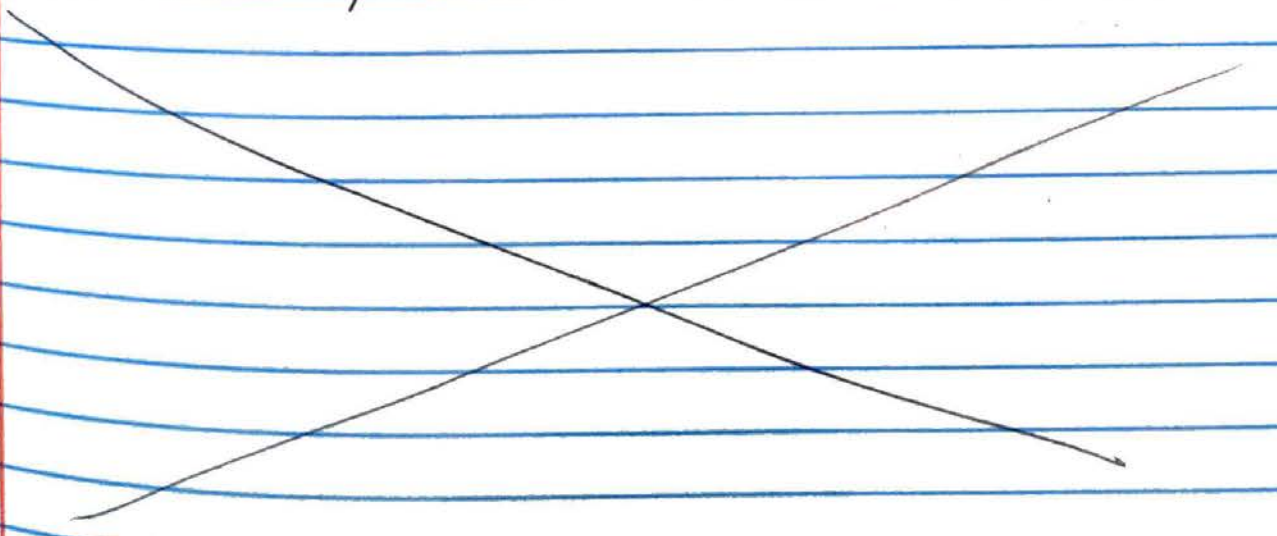
3/10/22

Robot Fixes

- By moving the catapult down, the balls can no longer fall out. This is because the balls fall down slightly to get into the catapult.

- The rubberband above the plate also makes it harder for a ball to fall out.

- Because we moved the entire catapult down, we had to move the bumper switch up so it wouldn't drag on the ground. By moving the bumper switch up and also replacing the old one with ~~th~~ a new one, it fixed the bumper switch problem.



3/10/22

112

Robot Fixes

- Our drive train motors started acting strange and not working correctly, and then they burned out.

- We were able to figure out that the motors burning out was because of the code.

- We had changed the drive train stopping from coast to hold. This allowed us to have faster stops and to stop more accurately.

- Because the motors were set to hold, it would put constint stress on the motors if the robot was on. This would, in turn, burn out the motors.

- To fix this, we just replaced the motors and set the drive train stopping back to coast.

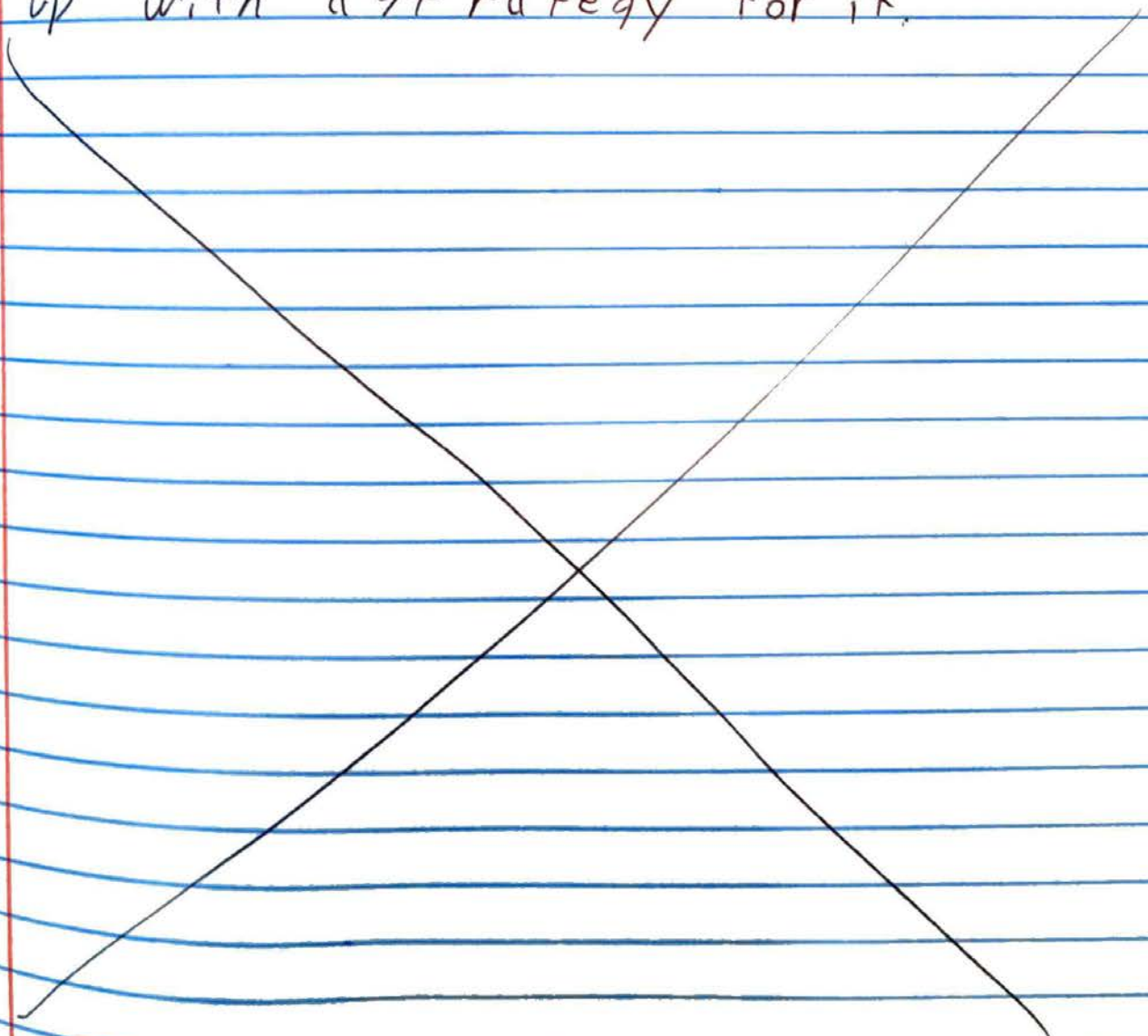
Finn

3/19/22

6 Ball Driver Strategy

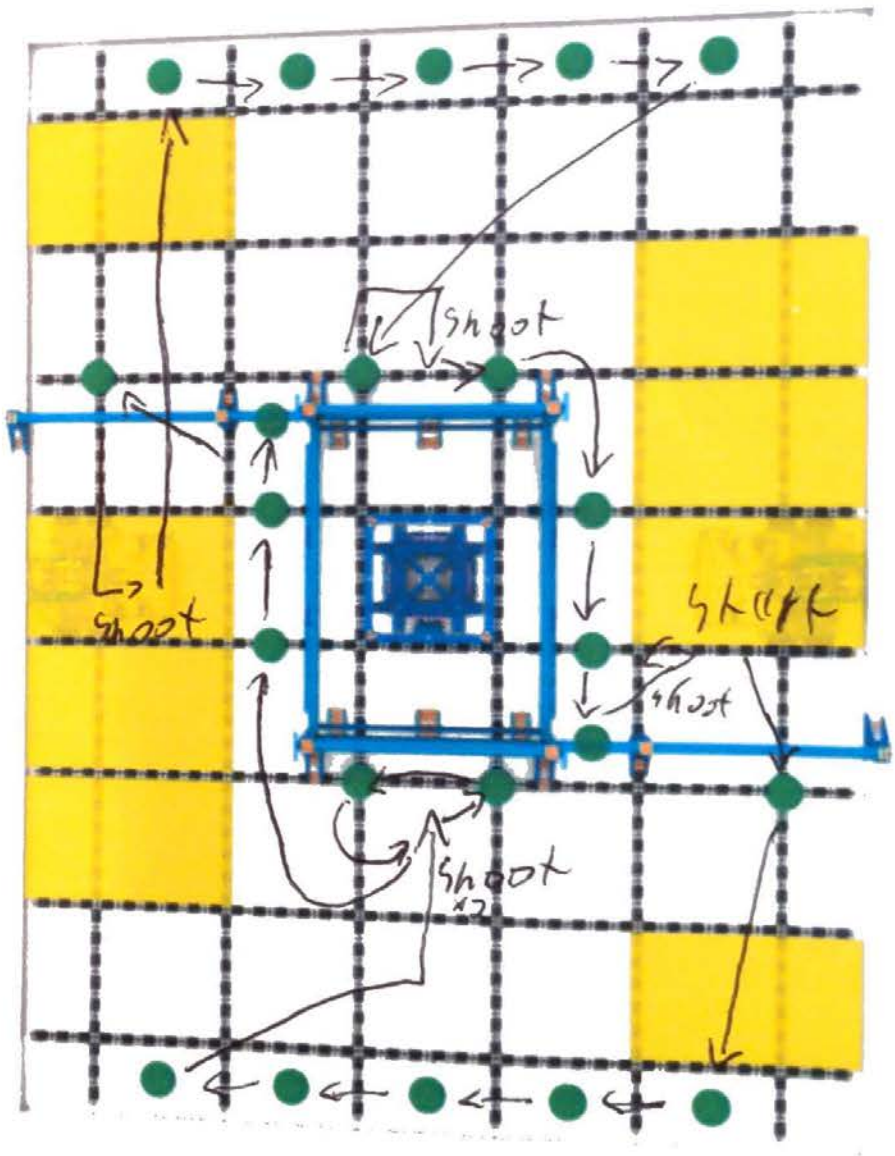
- Because of the modification of the robot were we moved the catapult down, it allows us to hold 6 balls in the robot.

- Once we figured out that we can hold 6 balls, we started coming up with a strategy for it.



3/15/22

114 6 ball driver strategy



3/19/22

6 ball driver strategy

- We start in the starting position labled and pick up the ball under the low hang bar. The we picki up all 5 of the balls in the corral.

- We shoot all 6 of those into the high goal.

- We pick up the two balls next to the plastic sheet, then shoot those as well.

- Then we pick up the 3 balls lined up next to the low goal and the ball under the low hang bar and shoot those.

- We go over to the second corral and and pick up all 5 balls plus one of the balls next to the plastic sheet.

3/15/22

1.116

6 ball driver strategy

- We shoot all 6 of those balls.

- Then we pick up the second ball next to the plastic sheet and the last 3 balls next to the low goal.

- Then we shoot those and go low hang if we have time.

- Using this strategy, we have been able to get a high score of 142. We scored all the balls in the high goal and cleared both of the corrals. We were not able to get the low hang.

- If we got the low hang, we would have been able to get a score of 148 points.