Guide to using the notebook (for team, omit page when submitting for tournament)

Rules:

1. Only new pages will be printed as proof of not editing old ones, so DO NOT edit older pages in any circumstances.
2. When making a new page, copy and paste slide 2 into the latest end of the notebook and then edit it accordingly (title, what you did, date you wrote it, who contributed to it, and page number at the bottom)
3. Do not add anything that would get you or us in trouble with the school or with vex
4. Remember to log new entries (pages) in the table of contents.
5. Ask ------ if you have any questions

Slide Template (Title Here)

High Stakes Digital Notebook

Team 6978B - Roger66

Members: ------- -------, ------- -------, ------- -------, ------- -------, ------- -------

Start Date: 6/8/2024 - Format made by ------- Z.

Important Information

This is the first digital notebook for team 6978B - Roger66

This team is part of Highland High School's VEX Robotics Program. If the binder/book containing these pages is found, find an official of HHS or a team member of 6978 to return it.

Other information:

VexForum account (run by ------- -------) - @soritarian1

Third-Year VEX team

Format used created by ------- ------- and team 6978

Ask ------ in person or on the Forum if you want to use the format

How To Read the Book

Titles are put in Bold Roboto Condensed, size 43

Regular text is usually put in Roboto Condensed, size 24 (occasionally 29 for pages like this one)

`Table of contents is put in Roboto Mono, size 22`

`Info at the bottom of pages is put in Roboto Mono, size 17`

Captions for images are put in Alegreya, size 18

We understand that using certain text sizes

(11, 12, 18, 24) is generally seen as more professional, but as you can see in scale, this makes text seem far too small, and when typing, it makes things difficult to read and see, especially at the lower sizes. We have also seen examples of successful teams using font sizes similar to ours, so we understand that provided it has a reason and the content is good, this can be made up for.

Table of Contents: Pre-Season

Table of Contents: Early Season

Table of Contents

Introduction to The Notebook

Welcome to 6978B - Roger66's VRC Digital notebook for the VEX Robotics 2024-2025 season, High Stakes.

Some important things to note before continuing:

1. This notebook was made with its own format. We decided that using our own template that we have created (rather than an official or community one) would fit our interests best by allowing us to display and communicate what we need to in a more streamlined and efficient fashion.

2. This notebook will not have pages edited after previous submission (Example: Once this has been page has been turned in at a competition, it will be turned in exactly the same at the next.

3. In most cases, this notebook will probably be printed out and put in a binder, page by page. This makes it easier to carry around and submit, and also provides proof of honesty in terms of not changing things about pages. (Explained on page 3)

Notebook Organization PT. 1

We plan to organize the notebook and how we make entries, developments, and such in certain ways. We want to make sure that the development of the book, the team, and the robot are all as clear as possible and qualifying well under the Notebook Judging Criteria (See pg. 4).

How will we do this? Well, we will try to make entries consistent and as detailed as possible, while still being readable and making it clear what was done and what the goal of the entry is. This is my (------, notebook lead)'s third year of being a team notebook lead, but first year of doing a digital one, and with the digital notebook it opens more opportunities for more frequent entries and easier ways to collaborate with teammates so everyone has more say and gets to put more of their insights and projects into the book.

The reasons why we chose to use a digital book and how we will keep it trustworthy will be on the next pages.

Notebook Organization PT. 2

There are several reasons why we decided to choose a digital notebook, rather than a physical notebook like had used previously. There are some huge benefits:

1. Faster to Create
   - Digital notebooks are much easier to edit and add on to on the fly
   - Much faster and easier (in most cases) to type rather than write

2. Naturally Neater / Better Formatted
   - Due to being typed instead of written, digital notebooks are naturally far neater
   - Using all the available tools, it is much easier to format the book how we want it and get our points across in a nicer, better organized fashion

3. Easier to collaborate
   - It is easier for any member to work on the book at any time, even at the same time, due to it not being physical.

Notebook Organization PT. 3

Some do believe that using a digital notebook can be less trustworthy or genuine than a physical notebook, for several reasons. Despite this, we decided to do a digital notebook, because those problems can be solved.

Issue 1: How can you know if the book has been edited to correct previous mistakes or imperfections?

We have a school rule that means after we have printed out pages, they are final and we may not reprint those pages. This means you will always get pages as they were made the first time.

Issue 2: How can you know that the content of the book was not stolen or copied from other sources?

We will quote and link to where we have taken unofficial content from (with permission) if we do. Part of why we have our own template is so that it does not look like we could have just taken someone else's book and called it our own.

Introduction to The Team

Originally made on 6/8/24 - Rewritten and reformatted to give more details about the team alongside pages 6 and 7 which were added alongside the change on 6/21/2024.

About the team: We are all 14 years old, and third-year VEX players, with two years in the MS leagues and this being our first in HS. We are all from Highland High School. -------, -------, -------, and ------- shared a team for those two years alongside another member who no longer participates in VEX. ------- joined the team this year, though he has been in sister teams before.

------- ------- - Programmer - Notebook Lead

------- ------- has been at Highland his entire life, from preschool to the present. Alongside -------, -------, and -------, as well as another student named -------, he made it to States in 7th and 8th grade in the MS VRC leagues, both times narrowly missing a Worlds qualification. He hopes to make it to States and possibly Worlds this year.

Introduction to The Team

------- ------- - Builder, Utilitarian, Design

------- ------- has been in robotics for two years, since 7th grade. He has also been to states twice in that time, barely worlds both times. He has been on the same basic team since 7th grade and is planning to stick with them the rest of high school.

Introduction to The Team

Date of Writing: 9/21/2024

Contributors: -------

Continued on: -------

The Notebook Judging Rubric

VEX Engineering Notebooks are generally judged off of the official rubric, which is below. We will follow it as best as we can, in order to improve our documentation.

CRITERIA	PROFICIENCY LEVEL		
ENGINEERING DESIGN PROCESS	**EXPERT** (4-5 POINTS)	**PROFICIENT** (2-3 POINTS)	**EMERGING** (0-1 POINTS)
IDENTIFY THE PROBLEM	Identifies the game and robot design challenges in detail at the start of each design process cycle with words and pictures. States the goals for accomplishing the challenge.	Identifies the challenge at the start of each design cycle. Lacking details in words, pictures, or goals.	Does not identify the challenge at the start of each design cycle.
BRAINSTORM, DIAGRAM, OR PROTOTYPE SOLUTIONS	Lists three or more possible solutions to the challenge with labeled diagrams. Citations provided for ideas that came from outside sources such as online videos or other teams.	Lists one or two possible solutions to the challenge. Citations provided for ideas that came from outside sources.	Does not list any solutions to the challenge.
SELECT BEST SOLUTION AND PLAN	Explains why the solution was selected through testing and/or a decision matrix. Fully describes the plan to implement the solution.	Explains why the solution was selected. Mentions the plan.	Does not explain any plan or why the solution or plan was selected.
BUILD AND PROGRAM THE SOLUTION	Records the steps to build and program the solution. Includes enough detail that the reader can follow the logic used by the team to develop their robot design, as well as recreate the robot design from the documentation.	Records the key steps to build and program the solution. Lacks sufficient detail for the reader to follow the design process.	Does not record the key steps to build and program the solution.
TEST SOLUTION	Records all the steps to test the solution, including test results.	Records the key steps to test the solution.	Does not record steps to test the solution.
REPEAT DESIGN PROCESS	Shows that the design process is repeated multiple times to improve performance on a design goal, or robot/game performance.	Design process is not often repeated for design goals or robot/game performance.	Does not show that the design process is repeated.
INNOVATION/ ORIGINALITY	Team shows evidence of independent inquiry from the beginning stages of their design process	Team shows evidence of independent inquiry for some elements of their design process	Team shows little to no evidence of independent inquiry in their design process
USEABILITY AND COMPLETENESS	Records the entire design and development process in such clarity and detail that the reader could recreate the project's history.	Records the design and development process completely but lacks sufficient detail	Lacks sufficient detail to understand the design process.
RECORD OF TEAM AND PROJECT MANAGEMENT	Provides a complete record of team and project assignments; team meeting notes including goals, decisions, and building/programming accomplishments; Design cycles are easily identified. Resource constraints including time and materials are noted throughout.	Records most of the information listed at the left. Level of detail is inconsistent, or some aspects are missing.	Does not record most of the information listed at the left. Not organized.
NOTEBOOK FORMAT	Five (5) points if the notebook has evidence that documentation was done in sequence with the design process. This can take the form of dated entries with the names of contributing students included and an overall system of organization. For example, numbered pages and a table of contents with entries organized for future reference.		ZERO POINTS (DOES NOT MEET CRITERIA) If awarding zero points, please include details in the "NOTES" area below.

The Engineering Notebook Judges' Rubric

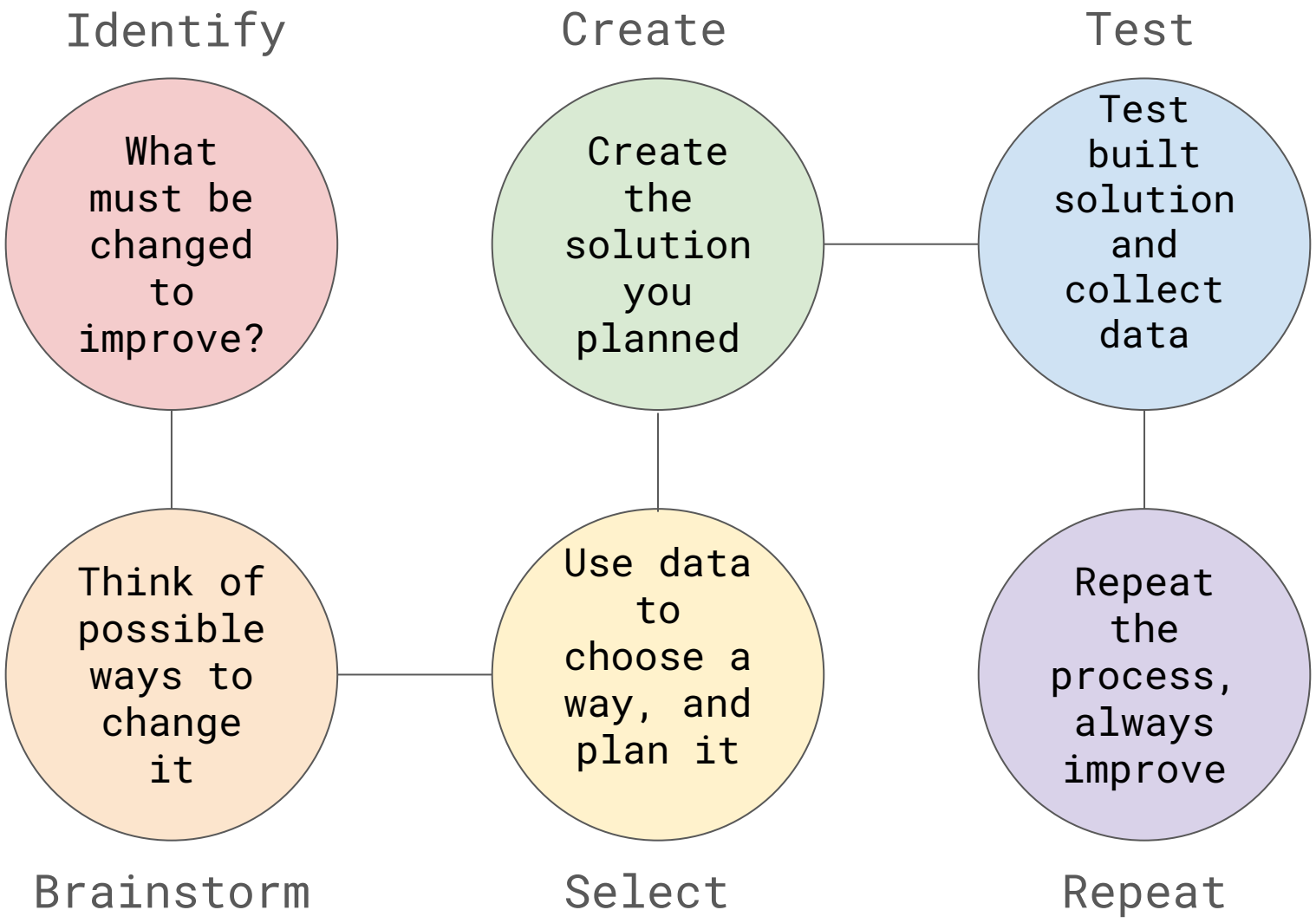
Date of Writing: 6/8/2024

Contributors: -------

Continued on:

The Engineering Design Process

An extremely important part of designing, improving, and learning about things, especially in engineering and in VEX, is understanding and implementing the Engineering Design Process.



We will use the engineering design process throughout the season, to help us create and improve an effective robot.

Date of Writing: 6/8/2024

Contributors: ------- -------

Continued on: Pages 10-15

The Engineering Design Process

Identify

The first step in the 6-step variant of the Engineering Design process is generally Identify.

This means you need to identify a problem or area of the design (in this case, the robot/program) that could be improved.

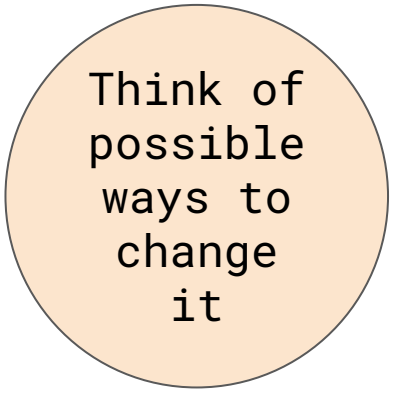
As the first step in the process, it is arguably the most important, because there's always something in the design that can be improved. You just need to figure out what it is, then you can perform the rest of the process, and continue improving the performance of your design.

Examples:

- You realize that your lift is quite slow, and this is an issue
- You realize that your robot doesn't turn consistently during autonomous, and is messing it up

The Engineering Design Process

Brainstorm



The second step in the 6-step variant of the Engineering Design process is generally Brainstorm.

This means you need to take the problem or improvable area you have identified and think of ways to fix/improve it.

As the second step in the process, it directly follows the first. After identifying the issue, you need to think of ways to fix it. The rest of the process is built off of using these ideas you have come up with.

Examples:

- You think about how you could change the motor on your lift to make it faster, or make it lighter
- You learn about sensors and PID, Odometry, and other loops, and think you could use those to improve your turning consistency

Date of Writing:
6/8/2024

Contributors:
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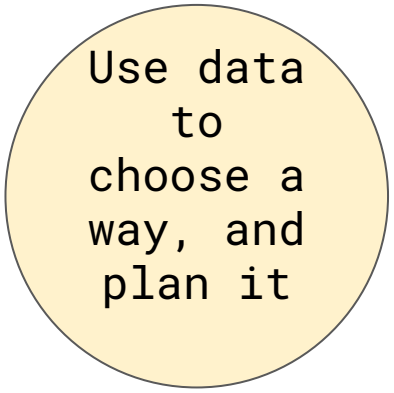
Continued on:
Pages 12-15

The Engineering Design Process

Select



The third step in the 6-step variant of the Engineering Design process is generally Select.

This means you need to choose one or more of the solutions or improvements you brainstormed, and maybe test them to find the best.

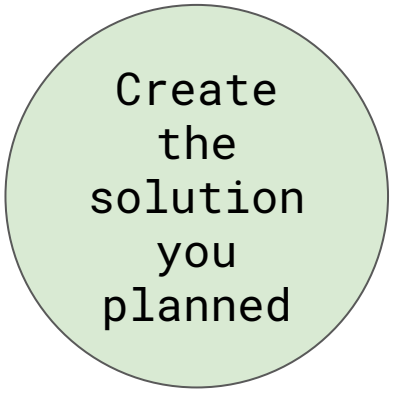
The third step of the process, it marks the halfway point. Once you have brainstormed ideas, you need to systematically test and choose one or more, and figure out which is best for your situation.

Examples:

- You decide to make your lift lighter because it had better results and is more versatile
- You decide to make a PID loop with a sensor because it is simpler, easier, and more fitting for your situation than something like an odometry loop.

The Engineering Design Process

Create



The fourth step in the 6-step variant of the Engineering Design process is generally Create.

This means you need to build or create the solution(s) that you brainstormed and chose for the issue or imperfection you identified.

As the fourth step in the process, it is very important as you must actually create what you have been planning throughout the process, and finally begin to improve your design with it.

Examples:

- You remove/replace some of the metal on your lift to make it lighter as you had planned
- You add a sensor to your robot, then code each part of the PID loop you had planned to make your autonomous turning and movement consistent

The Engineering Design Process

Test

The fifth step in the 6-step variant of the Engineering Design process is generally Test.

This means you need to test your creation that you made with the rest of the process, and see how well it works, and how it compares to the previous.

As the fifth step in the process, it is the final part of a cycle before it starts again. It means actually putting what you've made with the process in action, seeing if your creation works well, if it is better than it was previously, and if it was truly the best option.

Examples:

- You see that your lift is much faster now that it is lighter and not bogged down.
- With the loop implemented, your robot now turns much more consistently and has been improved.

The Engineering Design Process

Repeat

The sixth and final step in the 6-step variant of the Engineering Design process is generally Repeat.

This means you need to repeat the process, which you should always do. You can always improve anything, even in the slightest. It's never perfect.

As the sixth and final step in the process, it is maybe the most important because it makes sure the cycle keeps going. You should always repeat the Engineering Design Process, always improving, always making things better. There will always be something to fix or change.

Examples:

- You realize that your robot might not be strong enough, so you begin the process again
- You realize that the code for your motors sometimes stops during a match, so you begin the process again

Documenting With The EDP

Documenting alongside the Engineering Design Process is important, so we can show that we have gone through these design cycles. The Notebook Judging Rubric (See pg.6) emphasizes this, saying that we have to show evidence that our design and documentation were made alongside the EDP.

How will we do this? Well, when we go through a cycle, we will explain what we did for each part with a page or part of a page. We will color code parts of pages/full pages that go over each part of a cycle, using the colors in pages 7-13 (see the colored bars at the top of those pages). For example, if we are making a page about how we are brainstorming solutions to inefficient drive-base design, it will be color coded as orange.

Documenting and designing using the EDP isn't just for points on the rubric, as it is a tried-and-true method of efficiently improving your design, and it is always good to have old data and information to fall back on later, so that you know exactly how you did something and why.

High Stakes: The Game

The game of High Stakes is interesting and intricate, and is unique especially to the games our team has participated in previously. (Spin Up and Over Under)

In the case that this is being viewed digitally, the link to the High Stakes game reveal video is here. This video explains the basics of the game, with some specifics on dimensions of certain parts and how to score points.

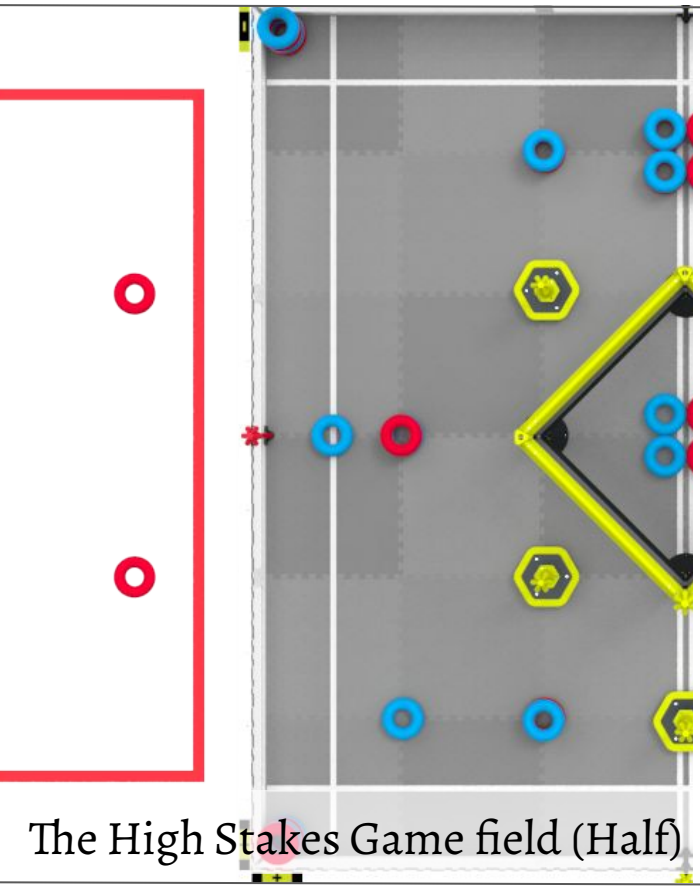
All the specifics, rules, and other important details like how to score Autonomous Win Points are explained in the Game Manual. We will go over parts of the game, especially rules and details from the manual, in the following pages.

According to the Game Manual, “The object of the game is to attain a higher score than the opposing Alliance by Scoring Rings on Stakes, Placing Mobile Goals, and Climbing at the end of the Match.”

We will go over the game in multiple parts.

High Stakes: The Field

For space sake, I have taken half of the field as an image (below) rather than the whole field. The field is "mirrored" on each side, so this is fine and should get the point across. The half shown is the "red" side, containing half of everything.



The High Stakes Game field (Half)

According to the official Game manual, the field includes the following:

- 5 Mobile Goals, 1 Stake each
- 4 Wall Stakes, 2 Allied, 1 not
- 1 Ladder with 3 levels and one High Stake
- 48 rings, 24 of each color
- 4 Special Corners, 2 being Positive Corners, the other 2 being Negative Corners

As for scoring, there is the following:

- 6 point Autonomous bonus
- 1 point per ring scored on stake (3 if it is the Top Ring)
- Climbs grant 3 points at level 1, 6 at level 2, 12 at level 3
- Rings on stakes in the corner will have new values (pg.17)

High Stakes: The Field Pt.2

An important part of the field is the corners. There are Positive Corners and Negative corners. If a mobile goal carrying rings is placed onto a Positive corner, the point values for all rings on it will double. If it is placed on a Negative Corner, all rings on it will have opposite scoring, or will have their score multiplied by -1.

It is impossible within VEX rules to have negative points, so rings scored on a goal in the corner will be counted as 0, and will rather *take away* their original point values from your total score. While they are scored as 0, they have a net value of the opposite of what they were before. (Note that if you have 0 points, yet have rings on a Negative goal, you will remain at 0 points rather than going into a negative point range.)

Another thing to note about the field (specifically the stakes) is that each stake can only legally fit a certain number of rings. Mobile goal stakes can hold a total of 6 rings each. Wall stakes can hold a total of 2 rings each. The High Stake can only hold 1 ring. If additional rings are somehow squeezed on or set on top of a stake, they will not count.

High Stakes: Measurements

It is important to know the specific measurements of game elements so that the robot can be created to interact with them accurately.

A High Stakes Ring

The “rings” used in the game all have the following measurements:

- 7 inch outer diameter
- 3 inch diameter of “hole”in middle
- 2 inch thickness

A Mobile Goal

The mobile goals in the game all have the following measures:

- 10 inch maximal diameter (hexagonal)
- 14.5 inch total height (base & stake)

No other measurements are explicitly listed in the manual, but will be tested later.

The Ladder

The “ladder” in the center is a 36x36x46 inch structure with rungs at 18, 32, and 46 inches respectively. No other measures for rungs or the High Stake are explicitly given, will be tested later.

Date of Writing: 6/10/2024

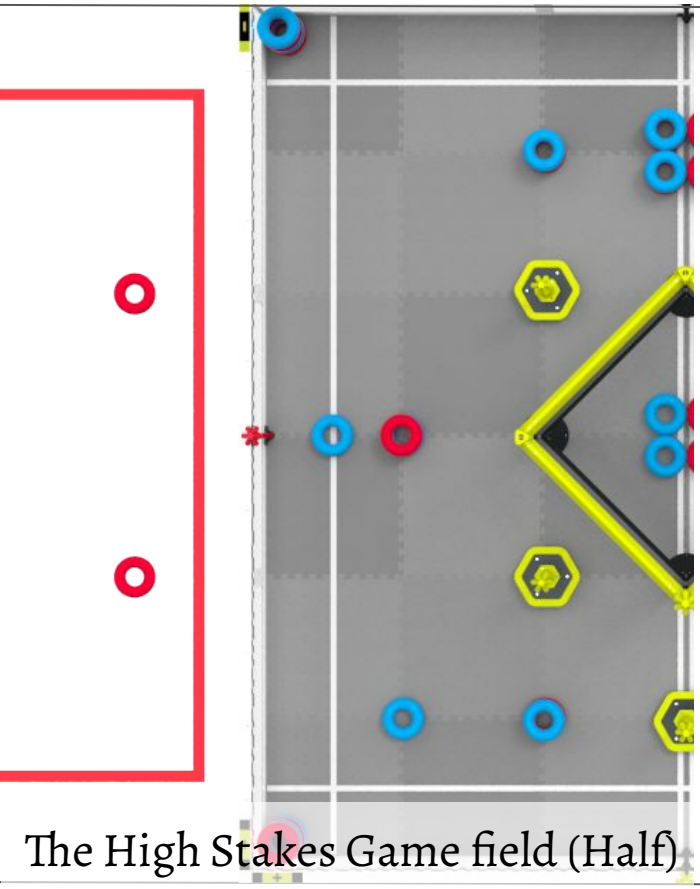
Contributors: -------

Continued on: 20

High Stakes: Autonomous PT. 1

The autonomous period is an important part of the game. It occurs within the first 15 seconds of the match, and consists of completely autonomous movement, the robots moving purely from code and not from a controller. In High Stakes, there are many rules about Autonomous, unique parts of it, and a new Autonomous Win Point. I am using the half-field picture again to help explain autonomous plans, and how it works.

Also, to note, in High Stakes, the winning alliance of the autonomous period is granted 6 points. (In a tie, both get 3.)



The High Stakes Game field (Half)

All regular game rules apply during the autonomous period, but there is also a rule against crossing the Autonomous line, which is a pair of tape lines across the middle of the field. Any robot crossing it (touching any of the field on the other side of it) will result in that alliance's immediate loss. If both alliances do this, it will result in an autonomous tie.

High Stakes: Autonomous PT. 2

During the Autonomous period, you can score an Autonomous Win Point, which is functionally the same as a Win Point. (See pg.

To score an Autonomous Win Point in High Stakes, your alliance must complete all four of the following tasks during the Autonomous Period. The tasks are:

1. Score at least three (3) rings
   - Place them on stakes

2. Have a minimum of two (2) stakes that have at least one (1) rings scored on them

3. Neither robot contacting/crossing/breaking the plane of the Starting Line

4. Complete the Autonomous period with at least one robot in contact with the Ladder

You must additionally not break any autonomous rules.

Date of Writing: 6/12/2024

Contributors: -------

Continued on: 22

High Stakes: General Rules PT. 1

Within VEX, each game usually has a similar variation of the General Rules set. This is true for High Stakes as well. Here is part of the list general rules from the Game Manual:

G1 - Treat everyone with respect.
It's common courtesy. Don't be rude, don't be mean.

G2 - V5RC is a student-centered program.
Don't ask your teachers or parents to do everything.

G3 - Use Common Sense.
People can make mistakes. Don't take them literally.

G4 - The robot must represent the skill level of the team.
No student can be effectively on two teams at once.

G5 - Robots begin the match in the starting volume.
Each robot must be smaller than 18"x18"x18" at the start.

G6 - Keep your robots together.
No intentional detachment/leaving on field of objects.

High Stakes: General Rules PT. 2

Within VEX, each game usually has a similar variation of the General Rules set. This is true for High Stakes as well. Here is part of the list general rules from the Game Manual:

G7 - Don’t clamp your robot to the Field.
No intentional attaching/grasping of non-ladder field parts.

G8 - Only 3 Drive Team Members, only in Alliance Station.
Maximum of 3 Drive Team Members, do not exit station.

G9 - Hands out of the Field.
No making contact with field with body during a match.

G10 - Controllers must stay connected to the Field.
Connect controller to Field control system, do not unplug.

G11 - Autonomous means “no humans.”
Do not interact with the robot during Autonomous.

G12 - All rules still apply in the Autonomous Period.
Breaking rules during Autonomous will mean a loss of it.

High Stakes: General Rules PT. 3

Within VEX, each game usually has a similar variation of the General Rules set. This is true for High Stakes as well. Here is part of the list general rules from the Game Manual:

G13 - Don’t destroy other robots.
No intentional destruction/damage/tipping over of robots.

G14 - Offensive robots get the “benefit of the doubt.”
Unclear calls are decided in the favor of the “offender.”

G15 - You can’t force an opponent into a penalty.
No intentionally causing an opponent to break a rule.

G16 - No holding for more than a 5-count.
No intentionally trapping the opponent for over 5 seconds.

G17 - Use Scoring Objects to play the game.
Scoring Objects cannot be used to break rules that apply to robots. (Clamping, trapping, etc.)

Next, we will go over the ten (10) Game Specific Rules.

High Stakes: Game Rules PT. 1

While there are the general rules that apply to each game, each game has its own rules, including High Stakes. There are the Specific Game Rules, the Robot Rules, and the Skills Rules which are varied between each game. This and the next page will go over the Specific Game Rules.

SG1 - Starting A Match.

Robot must be placed before the match so that it is not touching any other robot, not touching scoring objects other than preloads, not touching or breaking the plane of their alliance's starting line, and not in motion.

SG2 - Horizontal expansion is limited.

The robot may not expand past 18"x24" during the match.

SG3 - Vertical expansion is limited.

The robot must never break the plane of more than 2 levels of the ladder at once, including the floor, no matter where it is.

SG4 - Keep Scoring Objects in the field.

No intentional removal of Scoring Objects from the field.

High Stakes: Game Rules PT. 2

SG5 - Each Robot gets one Ring as a preload.
Each robot gets one ring, and it cannot touch another robot.

SG6 - Possession is limited to 2 Rings and 1 Mobile Goal.
A robot may not intentionally have possession of more than 2 rings and/or 1 mobile goal.

SG7 - Don’t cross the Autonomous Line.
Robot may not break the plane of the Autonomous Line.

SG8 - Engage with the Autonomous Line at your own risk.
Be prepared for the event that opponents break rule SG7.

SG9 - Don’t remove opponents from the Ladder.
Do not intentionally remove opponents from the Ladder.

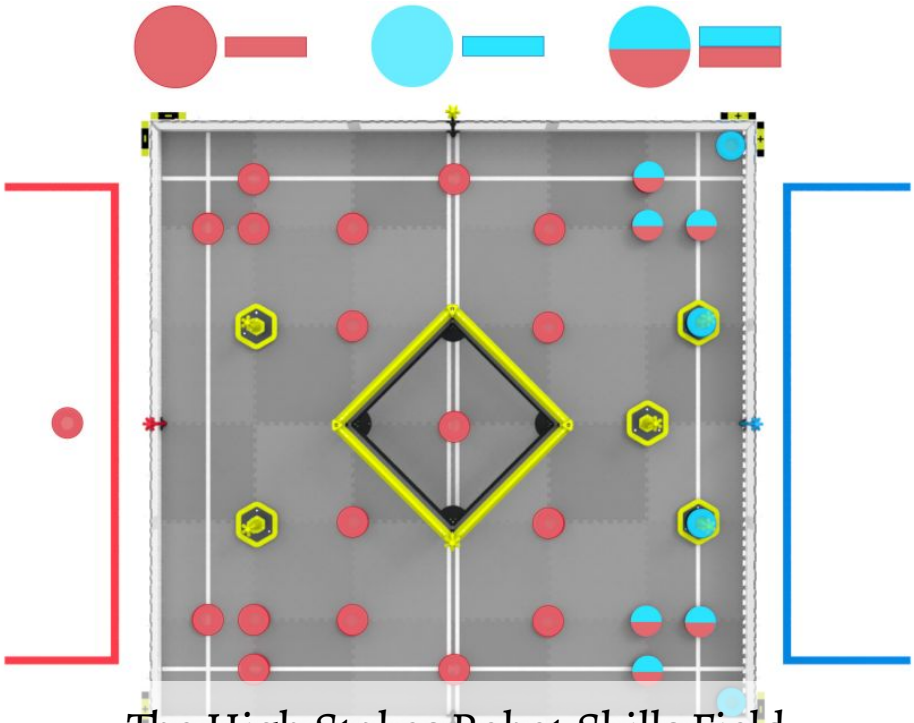
SG10 - Alliance Wall Stakes are protected.
No intentional interaction with other Alliance’s Wall Stake.

The only remaining rules to go over are the Skills and Tournament rules. We have deemed the latter irrelevant, but the Skills rules will be gone over alongside Skills itself.

Date of Writing: 6/13/2024
Contributors: -------
Continued on: 27

High Stakes Skills: Explanation

Each game has the Skills challenge, in which a robot is in the field on its own and must score as many points as it can within a minute while under a slightly altered ruleset. There is Driver Skills, in which the robot is driven throughout the duration, and Autonomous Skills, in which the robot is controlled entirely by a program.



The High Stakes Robot Skills Field

The Skills field is arranged like this, with an altered amount of rings and a rearranged set of field elements. Skills strategies need to be unique and efficient to score well with this new field.

There are some other intricacies such as teams being able to decide to stop early, by showing a Skills Stop Time. This does not alter scoring, but serves as a tiebreaker if needed. Otherwise, the run will be cut off immediately after one minute.

High Stakes Skills: Rules PT. 1

Skills has a special set of rules that make it work differently from a regular match. Here are the eight rules:

RSC1 - All regular rules apply unless stated otherwise.
Unless another rule says otherwise, all regular rules apply.

RSC2 - When you get to run Skills is determined by when you got into the line. Each team gets 3 Driver and 3 Autonomous runs.

RSC3 - Robots must start in a Red Alliance legal position.
Robots must start in a position legal to rule SG1.

RSC4 - Blue rings only score points if they are Top Rings, are the only Blue ring on the stake, and all Red rings are scored.

RSC5 - Any Red Ring scored above a Blue Ring has no value.
Any red ring scored above a Blue Ring on the same stake has no point value.

RSC6 - No ring gets Top Ring scoring if a ring on the stake has no value according to RSC4 or RSC5

High Stakes Skills: Rules PT. 2

RSC7 - No Corner Modifiers.

In Robot Skills, there are no modifiers for putting mobile goals in Positive or Negative corners.

RSC8 - Skills Fields are not required to have the same modifications as Competition fields.

If Competition Fields are modified, Skills Fields don't have to be, but participants should be informed, and, when possible, given access to Competition Fields for Skills if they would rather use those.

Those are the main eight rules for VEX: High Stakes' Robot Skills Challenge. They are scored like this:

- Each Ring scored on a Stake - 1 Point (see rules)
- Each Top Ring scored on a stake - 3 Points (see rules)
- Climb - Level 1 - 3 Points
- Climb - Level 2 - 6 Points
- Climb - Level 3 - 12 Points
- Mobile Goal Placed in a Corner - 5 Points (5 points are added to the score instead of modifiers in Skills.)

How a Tournament Works

A standard VEX tournament works as such.

Qualifier Matches:

There is a scoreboard ranking every team present on their performance in Qualifier matches, based on scored points, win points, and other details. The amount of matches is unclear, but they always have the standard of a 15 second autonomous period and a minute and 45 second driver control period.

Alliance Selection:

All teams present send a representative (the Captain) to line up first to last according to the team's ranking on the leaderboard. The top 16 teams may each choose another team to be their Alliance partner for the rest of the tournament. If a top 16 team chooses another top 16 team, the next team moves up and will be able to choose a partner.

The Tournament:

All 16 alliances that come out of the selection are put in a single-elimination bracket and all games are played until the finals. The winner wins the tournament. At certain large events, the Finals are a best of 3, rather than a single game.

Tournament Awards PT.1

Most VEX tournaments will offer several awards for the teams participating. Earning some awards is purely just for the honor, but some can qualify for state/regional events, and at some signature events and at state/regional events, they can qualify a team for Worlds. The main awards are as follows:

Excellence - Usually Qualifying

This award is granted to the top all around team in the event, in terms of both performance and judging.

Tournament Champions (2 recipients) - Usually Qualifying

This award is granted to the two teams who won the tournament finals.

Design - Usually Qualifying

This award is granted to the team that has been judged as having the most effective and efficient design process.

Robot Skills Champion - Usually Qualifying

This award is granted to the team that had the highest overall Robot Skills Challenge score.

Tournament Awards PT.2

Continuing from the last page, the final “standard” award that will usually be present at all tournaments is:

Judges Award - Usually Not Qualifying

This award is granted to a team that the Judges have decided deserves special recognition.

There are some other performance awards that are common but do not appear at all events:

Tournament Finalist (2 Recipients) - Usually Not Qualifying

This award is granted to the teams that made it to the Finals, but lost.

Robot Skills 2nd and 3rd Place - Usually Not Qualifying

These awards are granted to the teams that had the second and third highest Skills scores respectively.

Tournament Semifinalist (4 Recipients) - Usually Not Qualifying

This award is granted to the teams that made it to the Semifinals, but lost.

Tournament Awards PT.3

The remaining awards are the Technical Judged Awards and the Other Judged Awards. The Other Judged Awards represent qualities of the team such as Sportsmanship, Energy, and Service, and while we will work to get them as well, they do not fit this list. The Technical Judged Awards are as follows:

Amaze - Usually Not Qualifying
This award is granted to a team with a top performing robot.

Think - Usually Not Qualifying
This award is granted to a team with impressive and effective autonomous programming.

Innovate - Usually Not Qualifying
This award is granted to a team with an innovative design.

Build - Usually Not Qualifying
This award is granted to a team with a well-crafted robot.

Create - Usually Not Qualifying
This award is granted to a team with a creative engineering solution.

VexForum and its Usage

There is an official VEX website, VexForum, in which people can ask questions and discuss things regarding rules, team establishment, ref calls, favorite moments, building strategies, and more. It is useful for many reasons and is also a way to connect with the VEX community.

We plan to be somewhat active within the VexForum via ------- -------'s account @soritarian1. This will allow us to learn many things, get strategies, understand rules and game components better, help others, and be a bigger part in the VEX community as a whole.

I (------- Z.) have already made quite a few posts, either asking questions or answering them, and it has helped a lot. It has solved inexplicable code errors, clarified rules, shown us some strategies and cool robot showcases, and we've even seen other teams that we have met in person on there.

We understand that using it may seem like we're going to copy other people on it, but we won't. We need to have a unique robot to follow the rules, learn, progress, and, in the sense of the game, maybe perform better than the rest.

Individual Studies: Build

Some of the most important parts of a robot and its' build are the drive-base, intake/collection system, and lift. Since our team has not gotten together yet (or been fully decided - our coach technically picks the teams) I wish to do an individual study with the knowledge I have and my experiences.

As a standard, I will go over as many regular designs as there are that I would find applicable and appropriate for this season, go over pros and cons, and decide which one I believe would theoretically work the best.

These "statistics", ideas, and decisions are not reflective of the team's efforts, as that is not possible at the moment, and tests are also not being actively taken for similar reasons. When our team is together, we will most likely do these studies again, but with input from all members, more information, and the possibility of running tests.

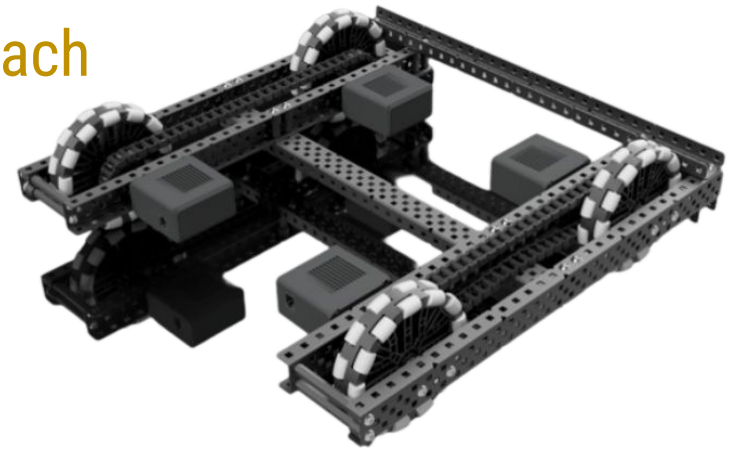
It is also important to note that I (at this point) have no direct experience with some of the build ideas that will be gone over, and will be using what I have witnessed in person and seen online.

Individual Studies: Drive-Base

The first set of possible choices I will go over are the options for our Drive-Base, or where our wheels and chassis go.

Option One: Standard “Tank Drive” (Omni-Wheels)

- Most common drive-base, often most reliable
- Versatile
- Two wheels on left and right each
- 2 way movement
- Decent turning
- Moderate strength
- Easy to push from the side



Option Two: Standard “Tank Drive” (Friction + Omni Wheels)

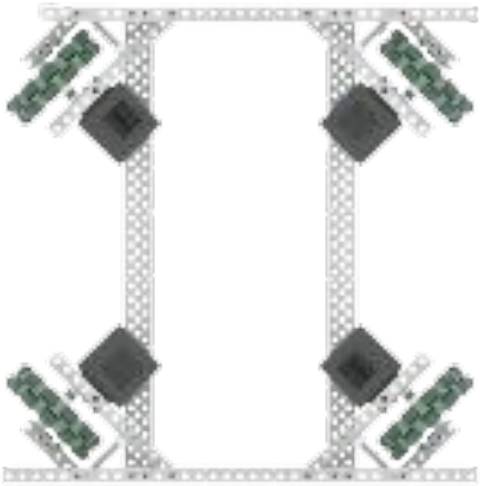
- Almost as common, reliable
- Versatile
- Two wheels on left and right each
- 2 way movement
- Moderate strength
- Rather bad turning

Individual Studies: Drive-Base

The first set of possible choices I will go over are the options for our Drive-Base, or where our wheels and chassis go.

Option Three: “X-Drive” (Omni Wheels)

- 8-directional drive
- Great turning
- 4 wheels arranged on opposing sides of an octagonal base
- Weak, but hard to push
- Low strength
- Less versatile



Option Four: Mecanum Drive (Mecanum Wheels)

- Versatile
- 4-directional drive
- Hard to push
- Two wheels on left and right each
- 2 way movement
- Moderate strength
- Not that reliable
- Huge, clunky wheels

Date of Writing: 7/21/2024

Contributors: -------

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Season Updates: School Starts

My season has not officially started yet but our engineering and planning class and school has. Our team is pretty much together, and we can start planning and such. Our practices will start in a couple of weeks, and we can plan, test code, and maybe start building, so that we are ready for competitions in November or maybe December.

We're learning/relearning some stuff first, and I will probably go over some of this here, as the whole team will be getting this information at the same time.

From now on, "Individual Studies" will no longer be fully individual and will have some input from other team members, as to provide a wider view of some concepts and ideas, and to get an idea we all agree on, at least to start.

The first practice is on 9/17/24. Teams will (probably) be selected, as well as names, letters, and more, if possible. Let it be known that we are working in a room alongside several sophomores, juniors and seniors (we are freshmen.) We will not be "cross-teaming" during practices (as in making other teams help us.)

SEASON BEGINS (Practices)

Our season practices have begun. Our team is not fully clear, but as of now it will include myself (------- -------) as chief programmer and notebook lead, as well as ------- ------- as a designer and builder, ------- ------- as a builder and scout, and ------- ------- as a builder, utilitarian, and pit team. We may include a fifth member, though we are unsure at the moment. They will participate in the notebook, and they will be added to our team introduction page very soon.

Our practices are 2:30-6:30 PM on Tuesdays and Thursdays, with the first hour being not so much a practice as a planning period/free period, to make sure it is fair for the students who share our high school and the local community college, Tri-Rivers, who won't arrive until 3:30.

I will go into more detail about this as we go on, and I will get the team to make pages about themselves and some of their plans very soon. As of now, we are expected to go to 6 tournaments (excluding State and World, if applicable), with our home HS tournament and our home Blended tournament being guaranteed. We will also likely go to the Mount Vernon HS tournament, and a couple of others.

Season Beginning: Details PT.1

As stated, we will have practices every Tuesday and Thursday when possible from 3:30-6:30, with a 1-hour period beforehand for some planning and organization when needed.

We will also occasionally have Saturday practices at much longer times, but those will probably be smaller. I will not be present for the Thursday practice this week.

Our “guaranteed” tournament appearances are linked (from robotevents.com, a useful resource) if this is viewed digitally:

Highland Holiday Blended Qualifier
Highland HS Qualifier
Mt. Vernon HS Qualifier

A list of possible tournaments we may go to:
Dan Spak @ Firestone - Kennedy Group @ Brecksville-Broadview - West Holmes - Motion Control @ TSCC (Fremont) - Roller Coast RoboClash @ Cedar Point - Pioneer Blended @ Elyria - Marion Harding - Kalahari HS Open - Barnesville Blended - Washington CH Blended

Season Beginning: Details PT.2

Most likely we will go to these additional tournaments:

Kalahari HS Open
Link here
Link here

Our plan is, for the start, to have the whole team (primarily the builders) working on a starting robot design so we have something to begin building off of, while I record it in the notebook and collect some of their views and opinions of it. After a little bit, we'll start doing Engineering Design Process slides like previously, and at any practice I have a goal of 3 pages in the notebook, not including those from teammates. I will be doing most of it, being notebook lead.

Once there are enough parts of the robot set up, I will begin coding the parts/electronics of it and begin all the loops/functions/callbacks for driver control, and develop that as we go through. Once we have the robot fully set up, or at least a base, I will begin autonomous programming with a goal of winning an autonomous win point over else unless a better option suddenly comes up.

Post-Practice Notes 9/17/24

Our first practice was completed last night, and here are some notes and plans regarding the outcome of the practice and what will happen now:

- ------- ------- most likely joining team
  ------- will be an assistant builder and designer, and most likely will work as a scout, and if applicable, match loader. He will have notebook input as will the rest of the team. However, as teams have not been finalized, there is a chance he does not join us.

- I will not be present next practice.
  I may have the rest of the team fill in for notebook duty during it, and finalize their pages later so that we can get a view of everything I may have missed.

- Robot designing has begun.
  All we have so far is a rough sketch of half of our drivebase, and we will go into much more detail based on our research/tests/results and also probably insert photos of our first sketches.

Post-Practice Notes 9/19/24

I was not present for the 9/20/24 practice, and my teammates were unable to work on the notebook due to other circumstances, and have asked me to make this summary.

We drew up and tried to submit multiple designs and strategies to our coach, but they were denied and we were sent back to the drawing board. A full design has not yet been made because of this, and we will work on it at the next practice, which is one of few Saturday practices and will take place on 9/21/2024, where we may also start building. I will document this process as well as I can, and maybe start documenting an Engineering Design Process design cycle.

We're using inspiration for a clamp from a robot reveal video on YouTube, and we may use others for inspiration for other parts, but we will have our robot be unique and we aren't going to simply copy another robot.

We've decided on an 8-wheel, 6 motor drive with 360 rpm geared motors. This will mean a very strong, large base, which will be hard to push, and will have mobility and strength advantage over most opponents.

Date of Writing: 9/20/2024

Contributors: -------

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Practice Goals/Plan: 9/21/2024

For today's practice, we have the following goals:

- Get an approved design with our coach
- If the above goal is fulfilled, begin building
- Finish an Engineering Design Process cycle
- Document the cycle

We will also have finally submitted our finalized tournament list, as some things have changed outside of our control. This includes not being able to attend Kalahari US Open due to other Highland teams taking up our slots for it, which we could not apply for as ------- was not a finalized member of the team yet. (But now that he is, we can get spots for other ones.)

Since today's practice is a 4 hour morning practice, things will probably go differently, but the plan is to finish a basic sketch design, submit it, and then we can create it and test it, then repeat the design process for each part of the robot. I will try to fully document this process as best I can whenever it happens, with the proper color codes I set up previously.

At the time of writing, the practice has literally just started, and only ------- has gotten here, so I am just writing this for now.

Updated About Us Pages

We have made more, and more detailed About Us pages, editing the original 6/8/24 Page 5 and adding a new page 6 and 7, changing every single page number in the corners, “continued on” bits, and the entire table of contents, so that it can be shown towards the start of the book as many are, so that one can understand our individual experiences in robotics and some other aspects. This proved an organizational challenge, but it has worked, and now the notebook is better for it.

At the time of writing this, only ------- and ------- have written their parts, but the others will come soon, and will almost certainly be there by the time anyone is reading this.

Additionally, some starting pages have been reformatted and edited to more fit the organization and style of the rest of the book, and to be more clear and efficient at conveying the necessary information, while also looking cleaner and more uniform both in general and to the rest of the book.

More of these changes will likely be made soon, and they will be mentioned when they are, to improve overall clarity.

Beginning Process Summary

Our initial first run of the Engineering Design Process was not fully documented, but it was shorter than usual due to the circumstances of starting the season. As a summary:

- Identify

Our problem was that we had no robot, and we needed an effective robot to play High Stakes, but to do that first we needed a drive base.

- Brainstorm

Together the team brainstormed different ideas and potential drive base ideas, even incorporating the Individual Studies, and we narrowed it down to a 6-wheel omni drive, an 8 wheel (6 motor) omni drive, and a 4-wheel mecanum drive.

- Select

After thinking about and discussing all the pros and cons, we eventually decided on an 8 wheel, 6 motor omni-wheel drive, with blue motors (600 rpm) geared down to 360 rpm to guarantee maximum strength, as well as a decent amount of speed.

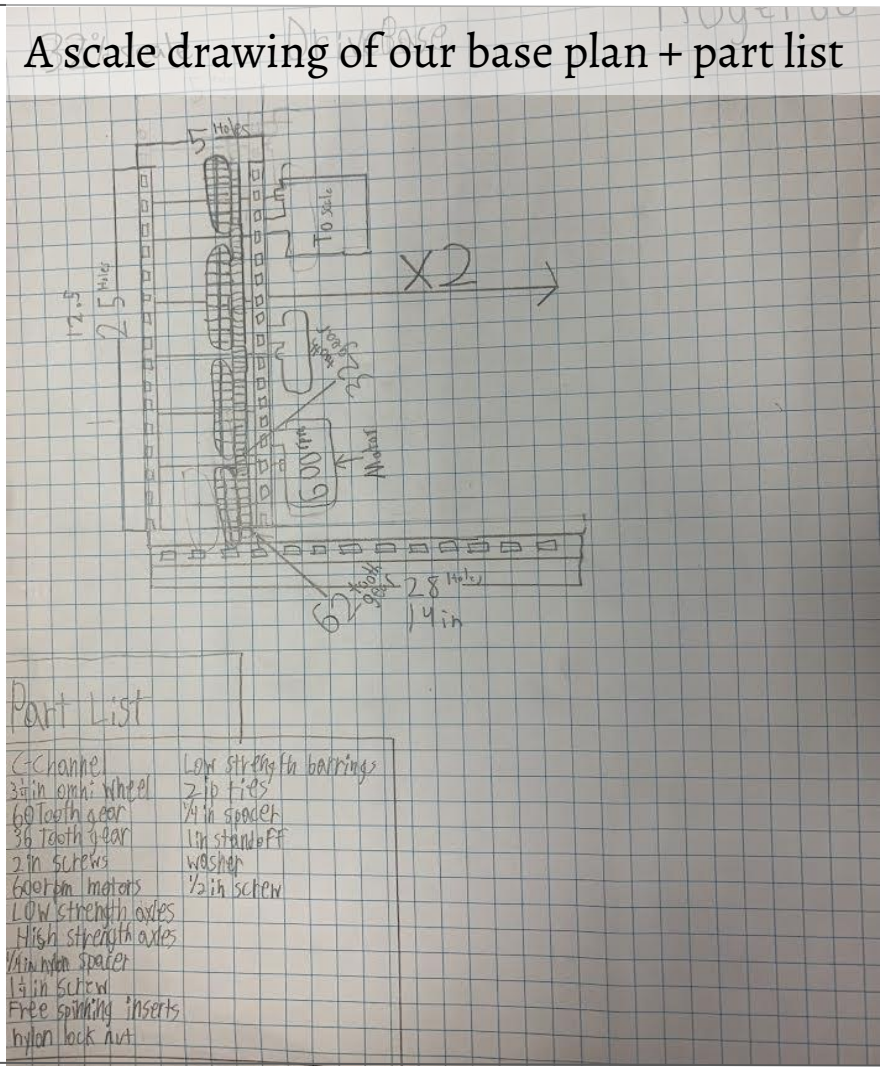
On the next pages we will go over the rest of the process in more detail, as it is active. We are building as I write this.

Drive-Base Initial - Create/Build

As the first parts of the Drive Base design process were summarized in the last page, it is now time to document the Create part of the process, where we build the first base.

Pictured here is the first design sketch of the drive base, showing some details as well as a parts list we will use to build. First, we prepared the wheels by screwing gears to them so that they can be geared up more accurately and easily once they are on the base itself. Then, we fitted the wheels to the metal base halves, evenly spaced.

A scale drawing of our base plan + part list



For attaching the wheels to the base, we used bearings with zip-ties (see why on page 49) and then we started making the connections for the base that goes around the wheels go.

Date of Writing: 9/21/2024

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The Zip-Tie Attachment Method

When attaching wheels and gears and such on driveshafts to our base, we, instead of the standard 3-hole bearing with a screw and nut in each of the empty holes alongside the driveshaft hole, we put in zip-ties.

We have done this previously, and have discovered multiple reasons why it works, and in experience, it definitely has.

- Lighter Robot

  Even if the amount is tiny, this lowers the weight of the robot and drivebase, making it just that slightest bit faster.

- Easier to work with

  Zip-ties are much easier to work with in this case, because they are faster to put in, and, when deconstructing so that the robot can be worked with, or destroyed post-season, instead of going through all the unscrewing, you can just clip the ties.

- Sturdiness

  Zip-ties are far more sturdy than they seem, and are more consistent than screws, as they can't fall out, can't unscrew themselves, and are simpler.

- Budget

  Simple. Zip-ties are far cheaper than screws + nuts.

Beginning Coding Process

I've also begun the basic coding process - I'm new to V5 Pro, and have been learning some of it on the spot, but it is working. The image at the bottom does not include everything, of course, just the declarations of our electronics. We are taught to do them directly like this, typing them out manually, rather than through the electronics menu. This gives us more customization, and also helps teach us code for the future.

The rest of the code is in the competition format, and all the includes and such are there, as well as code for controller axes, and at the moment, running this code would allow a robot of our planned size with our planned 6 motor base, to drive and turn with a split arcade controller drive, just as intended.

```
brain Brain;
controller Controller;
motor LF = motor(PORT13, ratio6_1, true);
motor LM = motor(PORT2, ratio6_1, true);
motor LB = motor(PORT14, ratio6_1, true);
motor RF = motor(PORT18, ratio6_1);
motor RM = motor(PORT5, ratio6_1);
motor RB = motor(PORT19, ratio6_1);
digital_out clamp = digital_out(Brain.ThreeWirePort.A);
motor_group LeftDrive = motor_group (LF, LM, LB);
motor_group RightDrive = motor_group (RF, RM, RB);
drivetrain Drivetrain = drivetrain(LeftDrive, RightDrive, 10.21017, 14, 15, inches, 0.6);
competition Competition;
```

The current declarations in our code for High Stakes on VEX V5 Pro.

Date of Writing: 9/21/2024

Contributors: -------

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