

TODO

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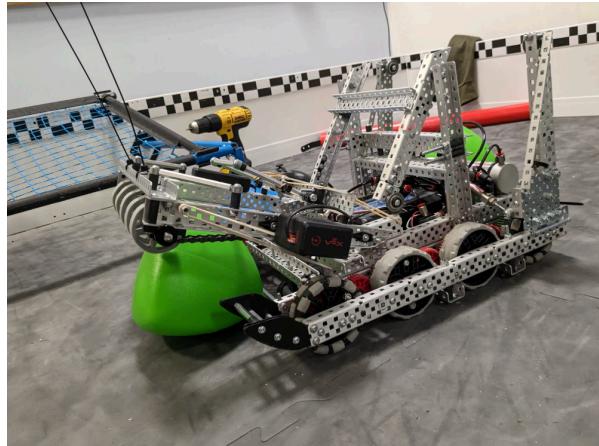
Team Introduction

Who are the Snowflakes?



Off the back of Over Under we have acquired some very important skills necessary for competitive representation on both a national and global scale such as good building and coding practices which we hope to utilise in order to become even more competitive in all aspects of the V5RC competition where we weren't last year. We are also moving to a smaller team size as some of our members are moving on. This will mean we may have to work harder but also means a larger range of experience in other areas.

We are the St Chris Snowflakes; we started out as a VRC team in september 2023, in our first season as a team in 'Over Under'. We set out to do our very best and we quickly found that we all loved the challenge of VEX and wanted to excell as far as we could; after a struggle, we qualified for UK nationals and siezed the opportunity to become the best we could. Our hard work payed off, and we went home with design award and a spot in the VEX World Championships; where we went in April and gained key experiance to start this season.



Team Introduction

The members



Jonah Fitchew

- Co-Head Builder
- Driveteam

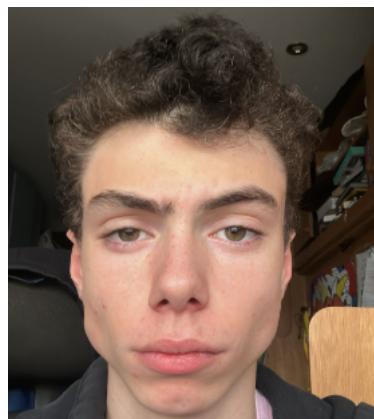
Hello I am Jonah Fitchew and my role within the team is the physical construction of the robot, documentation and assisting the driver during matches.



Aubert Seysess

- Co-Head Builder

Hello I am Aubert Seysses and my role within the team is to help design and virtually CAD the robot, also, I aid with the physical construction of the robot.



Daniel Dew

- Head Programmer
- Driveteam

My role within the team primarily resides in the programming of the robot's code including autonomous and driver control. I also aid with the design and CAD phases of building.



Daniel DaSilva

- Programmer

Hi I'm Daniel da Silva and my role within the team is to support the development of the robot's software and to help organise it into the logbook.

Team Introduction



Thomas Robb

- Head Tactics
- Driveteam

Thomas desc.

How To Use This Notebook

About this Notebook

TL;DR

For this season, we decided to deviate from the standard process for making engineering notebooks. We decided that, with the loss of our main logbooker we would have to share the notebooking duties; this meant that formatting could become inconsistent and we immediately found that it took too long to format everything to the desired (exceptional) standard. Therefore, to cut down on time and improve the notebook's readability and functionality, we decided to adopt the *Notebookinator* template, which is an extension of the *Typst* markup language.

Why Typst?

Several ways of creating notebooks for VEX exist, with most adopting visual editors such as google slides or hand writing their notebooks.

When deciding what we wanted to use for this season, we quickly ruled out hand writing the notebooks as mistakes could take valuable time to correct; neatness and clarity is often sacrificed; and the need for online collaboration is great. We previously used google slides with good results, however the formatting (e.g. colour coding, table of contents etc.) takes a significant amount of time to maintain and can be very difficult to keep consistent when we all share equal role in notebook creation (as opposed to 1 person overseeing all notebook formatting).

We then landed on the possibility of using a markup language; and with the lack of flexibility from LaTex, Typst seemed like the best option. We had also noted a few teams success with using Typst, especially when using Notebookinator alongside it - for example team 53E (also the creators of Notebookinator) had a great Over Under notebook¹ using Typst.

Features

- Uniform formatting
- Notebookinator template
 - Easy cohesion with engineering design process
 - Built in components i.e. pros/cons tables
- Code blocks
- Built in table of contents
- Fully Digital
 - Neatness
 - Modern tooling
 - Easy submission
 - Cohesion with version control

¹[Link to notebook](#)

The Snowflakes' Engineering Ethos

Our Engineering Ethos

At its core, VEX Robotics is nothing but an engineering problem. It provides a goal, and the materials to get there. We believe that the key to success in Robotics intrinsically lies in how you approach each problem; with open-mindness and the willingness to learn but most importantly the determination to find the best solution possible.

Engineering: The art of organizing and directing men, and of controlling the forces and materials of nature for the benefit of the human race.

— Henry Gordon Stott

Our Engineering Design Process

For every new problem, we try to stick to an engineering method (similar to a scientific method) where different phases are used to maintain organisation. The process applies to all forms of design, including programming and sometimes even tactics.

Phases of designs

For each of the phases in our EDP, a corresponding icon is provided, these are used throughout the notebook to label a phase.



Identify Problem¹

Each solution starts with a problem, this ranges drastically – for example, from 'We need a drivetrain' to 'this mechanism causes instability'. Problems can be raised by all members and, regardless of severity, it is something that must at least be addressed.



Brainstorm Solutions

Once the problem has been properly analysed, with root causes found, the team can move on to brainstorming solutions. Here, every team member can put forward possible solutions or fixes to the problem at hand, this is often accompanied with rough concept drawings. Additionally, finding use cases where each possible solution has been used effectively can be key to display a solution's viability.



Decide Solution

Once all possible solutions have been brought to the table, one possible solution is picked to move to the next phase; to ensure that the decision is definitely the best one available, additional processes can be used to decide the best (i.e. decision matrices). Ideally, all members offer their thoughts on the solutions.

The Snowflakes' Engineering Ethos

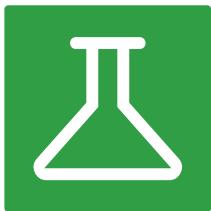


Implement Solution

With one solution in mind, the solution can be expanded, now taking into account the smaller details while creating a plan of action for the designing and implementation of the solution. The solution is then designed and built – either physically or as a program.

Note that both the build and program icons are used during this phase.

Test Solution



Once the solution has been implemented onto the robot, we can begin testing the solution to find out how effective it is. This is a key phase as it shows us how the solution up to different scenarios.

Depending on its effectiveness, the results of a test may prompt us to move back into the implement phase, as changes sometimes have to be made. This creates a feedback loop that iteratively improves the solution until it meets our desired standards.

For our robot, we decompose the larger problem into a set of smaller, approachable problems. From there, each and every problem is approached using this EDP; this allows us to stay organised and avoid decision paralysis.

¹Sometimes, if the problem is obvious (i.e. the need for a drivetrain), this phase is skipped due to mutual understanding.

Here's some content in this entry.

Here's an example of how you'd create a pro-con table:

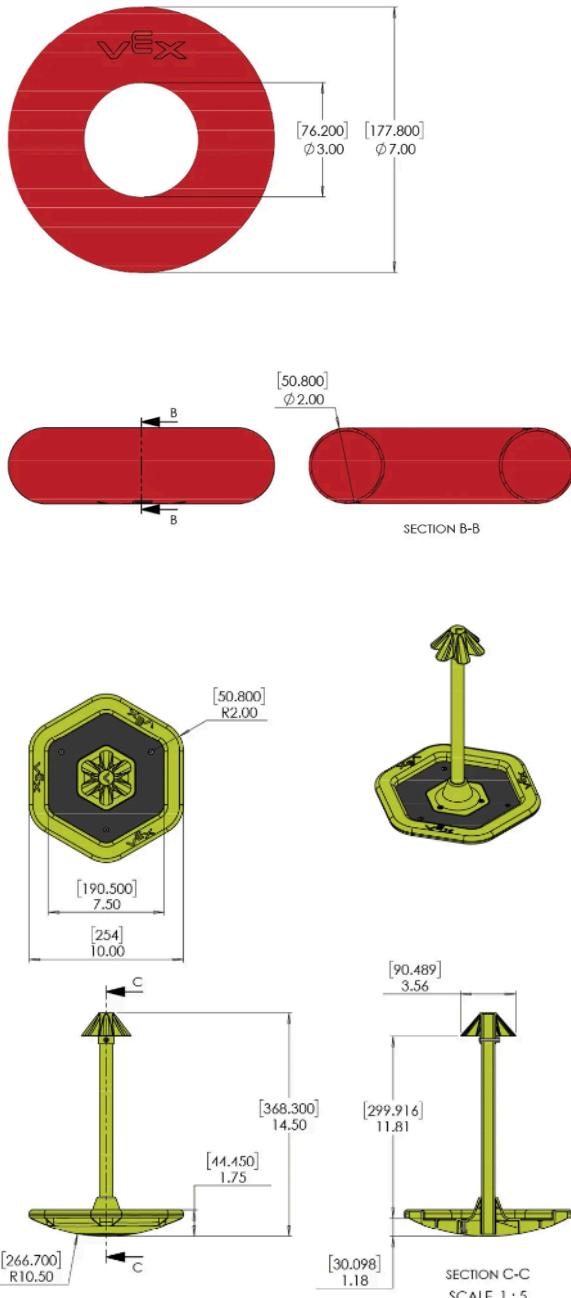
Pros	Cons
<ul style="list-style-type: none">• pro number 1• pro number 2• pro number 3	<ul style="list-style-type: none">• con number 1• con number 2• con number 3

Now we'll generate 50 words of filler text!

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliquam quaerat voluptatem. Ut enim aequo doleamus animo, cum corpore dolemus, fieri tamen permagna accessio potest, si aliquod aeternum et infinitum impendere malum nobis opinemur. Quod idem licet transferre in voluptatem, ut.

The Game

Scoring & Game Objectives



Game Elements: Rings

The majority of the scoring is done via these coloured rings.

- Outer diameter 7"
- Inner diameter 3"
- Height 2"

Potential Challenges

- Rings cannot roll on the floor, so manipulation is strictly contact based
- Large surface area in contact with floor so potential difficulty in manipulation

Scoring Object: Mobile Stakes/Goals

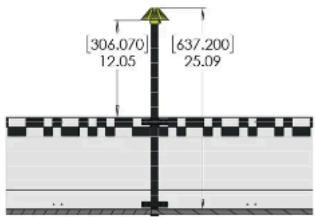
There are 5 mobile goals ('mogos') on the field, and they can be freely manipulated by teams.

- 10" diameter hexagonal bird's eye view profile
- 14.5" height
- Rubber cap to make descoring more difficult

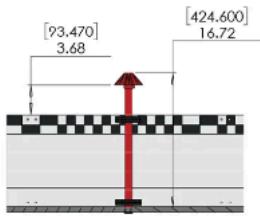
Potential Challenges

- Weighted bottom could make manipulation difficult
- Scoring would require an elevated mechanism.
- Rubber caps mean force must be required to score/descore

NEUTRAL STATIONARY GOALS:



ALLIANCE SPECIFIC STATIONARY GOALS:



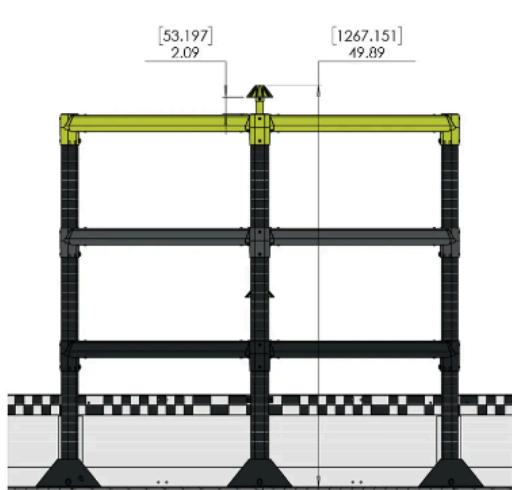
Elevated Stakes: Neutral and Alliance

There are 2 neutral stakes and 2 alliance stakes allowing for further scoring.

- Neutral stake 25.09" tall
- Alliance stake 16.72" tall
- Rubber caps (identical to mogo)
- Alliance stakes can only be scored by the corresponding alliance

Potential Challenges

- Stakes differ in height from each other (also from the mogo) meaning different or morphing mechanism to score on all.
- Placement (field perimeter) risks throwing rings out of the field (risking S1 infringement)
- Rubber caps mean force must be required to score/descore



High Stake and Ladder

In the center of the field, there is a 4' ladder that teams can climb in the endgame to gain extra points. It also has a stake that can fit 1 ring at the very top.

- 49.89" (4.165') tall
- 3 tiers/rungs
- 4 sides

Potential Challenges

- Climbing structures requires lots of power and/or time
- High Stake would require extreme precision

Scoring Takeaways

- All scoring requires vertical capability
- Employing multiple methods of scoring (mogo, neutral/alliance stake) would require a multiple – or one more complex, morphing – systems
- Emphasis must be put on precision and reliability as there is little room for error

Rules analysis

Format

To avoid simply regurgitating the rules (to people who already understand them), we are going to simply list some rules with a paraphrased description; then how it affects us; then potential solutions – if a rule presents no problem, we will not cover it.

e.g.

<RULE NUMBER>

- Paraphrased rule description

Problems

- This rule affects us like this
- It also affects us like this

Potential Solution

- This is one way we can mitigate the risk of infringement...
- This is another...

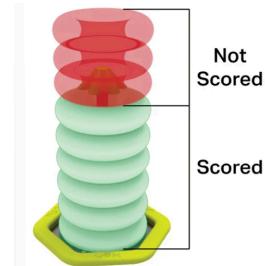
Note

Inspection, safety and general rules will not be covered, due to their relative simplicity.

Scoring rules

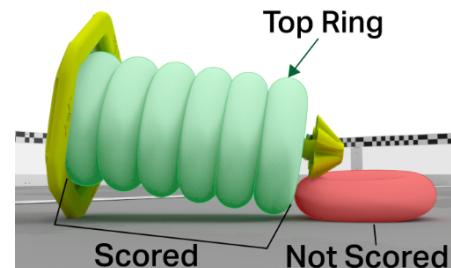
<SC3>

- To be considered scored on a stake, the ring must meet certain criteria:
 1. Ring must not be contacting robot of same alliance
 2. Ring is not contacting foam tile
 3. Ring is encircling the stake¹
 4. Total ring count must not exceed max ring count of the stake (mobile: 6, neutral & alliance: 2, high: 1)



Problems

- Neutral/alliance stakes can contain more than 2, despite only 2 being counted
- Mogos with our rings on can be tipped to effectively descore some rings



Potential Solutions

- Driver may have to take care when scoring on neutral/alliance stake
- Driver may have to guard or defend filled mogos

¹Long description omitted, see <https://www.vexrobotics.com/high-stakes-manual#sc3>

<SC5>

- A mobile goal is considered placed in a corner when it meets the following criteria:
 1. Mogo is contacting floor/foam tile
 2. Mogo is upright
 3. Contact with robot is irrelevant

Note

Only 1 mogo can be considered placed in each corner, even if 2 meet the requirements.

Problems

- Mogos can be knocked over do mitigate effect of corner

Potential Solutions

- Driver can guard/defend the corner, especially as robot contact is irrelevant.

Drivetrain Selection Process

The process of selecting a drivetrain is a team's first thoughts when considering the needs for a robot in any given VEX season. The benefits and drawbacks of all types of drivetrain are considered at this point of the design cycle, in the context of the current game of course, many different options are considered as the different parts that VEX provides can be combined in many different ways in order to give each drivetrain a different characteristic as it were.

Considerations for any given drivetrain

At the beginning of any season the needs of the three main aspects of a drivetrain are pitted against each other in the context of the needs of the current game, these three main features are:

- Torque
- Speed
- Size

Torque:

Torque is defined as the force that causes rotation, the more torque that a specific drivetrain has the more power it will exert onto something it is pushing against, the more we have of this on our drivetrain which can be altered by the **gear ratio** the higher amount of force we will be able to exert on another robot therefore being able to win pushing matches and achieve higher scores, the downside of having increased torque is the loss of speed as the relationship between the two is inversely proportional

Speed:

Speed is defined as the rate at which something moves or is able to move, as is quite obvious the higher speed that a drivetrain has the faster it will be able to move about the field, thereby increasing the rate at which we are able to score, however one of the drawbacks of increased speed is the relationship achievable with VEX parts of a manageable torque-speed relationship means that higher speeds where a significant edge is given in game also leads to a major drawback in the amount of torque exerted, therefore the tradeoff may not be worth it, also high amounts of speed can be difficult for the driver to control accurately

Size:

It is also necessary to consider the size of each drivetrain option when selecting as it can be the killing blow in relation to the rest of the mechanisms planned to be on the robot as the size of the drivetrain can affect the balance of the robot when it is completed, especially within this game where a good balance and centre of mass is necessary for efficient scoring and for a climb to be doable further down the line. However, a large drivetrain can affect the rest of the mechanisms through its own obstruction such as things like the intake which if forced to be too large can become jammed and remove the ultimate goal we have, scoring.

Glossary

Example word

This is an example word which will appear in the glossary.

