

# 2017-2018 Business Plan

Canyon Crest Academy  
San Diego, California



**3128** aluminum  
narwhals

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# 1. Executive Summary

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## Team Mission Statement

“ Our mission is to utilize teamwork to invigorate students' passions for innovation, creativity, and problem solving in science, technology, and engineering fields, and ultimately work towards creating a better tomorrow.

## Our Goal

The FIRST program strives to create a welcoming environment where students and engineers can work side-by-side. The goal is not simply to have students design and create a competitive robot in six weeks, but also to bring together students and professional engineers of all backgrounds in an environment of learning that allows students to build a passion for engineering. Since its establishment in 1992, FIRST has grown into an internationally renowned, prestigious competition.

The Aluminum Narwhals bases its objectives on the FIRST vision of creating a life-changing, career molding experience for our team members that is fun, safe, and embraces the true meaning of Gracious Professionalism and Coopertition. Following FIRST's values, our team teaches students indispensable skills for their future success in the world through the strong relationships we create between students, mentors, and sponsors. Our team's objectives include providing an inspirational learning environment, sharing valuable knowledge, providing for the application of business and STEM skills, and fostering the growth of STEM within our community.

## 2. Team Information



## 2.1 Team Summary

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Team 3128 Aluminum Narwhals was founded in September of 2009 at Canyon Crest Academy in San Diego, California, a school where math, science, and technology were valued, but hadn't found a way to be manifested just yet. A handful of students, one engineering mentor, and a computer programming teacher felt those values were important and thus, the Aluminum Narwhals was born. We have grown steadily over the last 9 years and have cultivated increasing support from sponsors and our community, allowing us to build upon our foundations and provide resources to expand our projects and goals. In our 2017-2018 season, we have continued to expand our well-acclaimed Robotics Summer Camp at Canyon Crest Academy, while furthermore engaging our community in STEM/robotics through student-designed curriculums taught at local library and afterschool programs. We also mentor several Jr. FLL, FLL, and FTC around our community, encouraging students to pursue a STEM-oriented passion at a young age.

## 2.2 Canyon Crest Academy

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Our home can be found within Canyon Crest Academy (CCA), a public high school of 1,991 students located in the neighborhood of Carmel Valley, a suburb of San Diego, California. CCA is a school of choice in the San Dieguito Union High School District with a curriculum that emphasizes the arts and technology. The students are on a 4x4 block schedule, taking only four classes each semester, but are able to study each subject at a deeper level. Since its establishment in 2004, CCA has quickly installed itself as a dominant force in the world of academics with students competing at the national level on math, science, and academic teams, scoring some of the highest collective AP scores in the country and scoring the highest in San Diego County on the API index.

We recently had the prestigious honor of ranking fourteenth among all high schools in California according to U.S. News and World Report. Students interested in robotics are supported by a vast collection of science and technology courses including multiple Advanced Placement classes in math, computer programming, and physics.

## 2.3 Basic Information

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**Rookie Year:** 2009

**Location:** San Diego, California

**School Affiliation:** Canyon Crest Academy

**Team Demographics (2017-2018):** 79 Students Total

- 26 girls and 54 boys
- 15 Seniors, 13 Juniors, 35 Sophomores, 16 Freshmen

**Mentors:** Current mentors include teachers, alumni, and past/present team parents.

Mentor professions include:

- 2 Teachers
- 2 Business Professionals
- 8 Technical Engineers
- 4 Alumni Members

**Sponsors:** DoDSTEM, C4SDK, HP Inc, Nordson Corporation, ViaSat, Leidos, Solidworks, Qualcomm, Canyon Crest Academy Foundation

**Website:** <http://team3128.org>

## 2.4 Our Growth

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### **Members, Mentors, and More**

In 2010, our team began with 15 active core members. We currently have 79 actively participating members, who take on complex projects, teach each other valuable skills, and contribute to the learning environment created by our team. The support from our community, parents, and school has risen immeasurably and has allowed us to grow in many different ways.

The recent expansion of the number of mentors has given us important guidance that allows our projects to come to fruition. One of these projects was an analog tachometer, where students worked with an electrical engineering mentor to gain a better understanding of basic circuitry and how to create feedback loops for robot control. Our mentors play a key part in teaching students the basis of technical knowledge they need to succeed in engineering, marketing, and pursuing their other interests.

Mentors and parent volunteers have also enabled us to provide a solid support structure for our team members. With their assistance and dedication, we've been able to put together carpools, team meals, and more to support our dedicated team members.

## 2.5 Team Accomplishments

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### 2010

#### San Diego Regional

Rookie All-Star Award

#### World Championships - Atlanta

Competed in Newton Division

### 2012

#### World Championships - St. Louis

Competed in Archimedes Division

### 2013

#### San Diego Regional

FIRST Dean's List Finalist - Soren Price

### 2014

#### San Diego Regional

FIRST Dean's List Finalist - Kian Sheik

Creativity Award sponsored by Xerox

### 2015

#### San Diego Regional

Entrepreneurship Award sponsored by Kleiner Perkins Caufield and Byers

### 2016

#### Las Vegas Regional

Engineering Inspiration Award

#### World Championships - St. Louis

Competed in Galileo Division



## 2.5 Team Accomplishments (con't)

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**2017**

**San Diego Regional**

Finalist

**World Championships - Houston**

Competed in Carver Division

**2018**

**San Diego Regional**

Finalist

Innovation in Controls Award sponsored by Rockwell Automation

**Idaho Regional**

FIRST Dean's List Finalist - Ronak Roy

**World Championships - Houston**

Newton Subdivision Finalist

# 3. Team Organization



## 3.1 Team Structure

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### Elected Officials

Our team is led by 2 elected officials throughout the entire school year. Anyone who has been on the team for at least one complete build season can self-nominate for an elected position, to which they will be either be voted on, or appointed to by the elected President. The President and Vice President are in charge of the general functioning of the team and are the lead representatives of our team within the school community.

### Head Positions

Appointed officers are in charge of specific parts of the team that leadership has deemed necessary. These officials are mainly responsible for communication and coordination within the different departments and support the President and Vice President in leadership decisions. The appointed officers of include: Head of Mechanical, Head of Controls, Head of Business, Head of Submissions, Head of Construction, and Head of Strategy.

General Elected Positions	
President	Vice President

Specialized Appointed Positions	
Head of Mechanical	Mechanical aspects of the robot, construction, CAD projects, pit design
Head of Controls	Common libraries and game-specific robot code, electronics, scouting app, website
Head of Business	Sponsor recognition, finance, grants & applications
Head of Marketing	Social Media, Spiritwear, website & blog
Head of Submissions	Chairman's and other awards, blog/press, team manager
Head of Construction	Works on structural models of game pieces to aid testing of the robot
Head of Strategy	Develops the strategy that our robot is centered around maximizing points

## 3.2 Seasonal Structure Changes

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### Off-Season

During the off-season our team breaks up into groups and takes on various projects, each of which has a Project Leader. This leader is responsible for managing the project and seeing it through to completion.

### Build Season

In preparation for build season, our team structure changes to accommodate the different roles required to complete the complex task of building a robot. We split into three different specialized teams, each with their own essential responsibilities. These positions only exist during build season, thus creating a less complicated team structure when unnecessary.

Our team structure changes throughout the year to accommodate the different projects that we are undertaking. The bulk of our projects take place during our build season in the six weeks after FIRST reveals its annual competition. During this time, our team is busy with the designing, planning, and construction of the the season's competition robot.

## 3.3 Human Resources

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### Training

In the fall, veteran students and mentors hold weekly workshops and group lessons to train new team members and introduce them to machinery, basic robot design, and the essentials of business. In 2015, we hosted our first set of workshops taught by visiting mentors (from other FRC teams), allowing members to get a personalized, hands-on experience with competition strategy, intro to Solidworks, etc. Hosting at least 1 workshop per week, we encourage all students to attend, regardless of their experience. This supports team bonding and growth within our team, and allows all members to maintain a basic knowledge of each department responsible for our success.

Our Training goal for the 2018-2019 season is to partner with Mira Costa College's Machinist training program to offer an intensive set of classes in lathe, CNC Router, milling machine, and other workshop tools we possess. Although students will not become certified machinists, they will have a much greater understanding of the safe and effective use of our tools, as we do manufacture most of the robot ourselves.

### Tools and Spaces

Over the years we have acquired new resources that let us be a more effective team. In our first years, our only meeting space was a teacher's classroom, which did not have enough room to accommodate a large number of people working with tools. There was little storage and no place to put larger, more permanent tools that we would use in our projects. Since

then we've worked with the school to move into a textbook storage room and office, which significantly improved our working environment and solved many of our storage and space problems. Besides that, it gave our team a place to call our own in our school, and established our identity amongst the rest of the programs. Recently, this establishment has since expanded to an even larger area, as our school was willing to remove some of these bookshelves, allowing for a safer working environment.

As our team has expanded, its access to tools has grown with it. A team member has brought in a 3D printer which allows us to quickly build prototype and print custom parts for our robots. Our lathe and mill enable us to create custom production quality parts that go onto our competition robots. Recently we've bought a CNC Router and CNC Lathe that allows us to cut certain parts for our robot as well as immensely expand our prototyping capabilities. In addition, we have acquired twenty VEX IQ sets and five VEX EDR sets which we use for prototyping mechanisms and for interactive demonstrations at elementary and middle schools.

## **Narwhal Intro Week**

The Narwhal Intro Week is an important team building and training event that is held in the fall and attended by all current team members, interested new students, and mentors. During Intro Week, which is the second week of school in the fall term, new students meet with the existing team to learn about FIRST robotics and how our team is organized, and explain the values that FIRST instills within our team. . Different divisions present what they work on and their plan for the current year, and invite new members to register.

"Narwhal Intro Day" was introduced in October 2016, and has since been expanded into a full week of afterschool events, with various activities to engage new Narwhals in the subdivisions they desire.

## **Safety**

Our team has revamped the way we treat safety this year, implementing a few procedures which team members must follow before using tools. It is critical that all students and mentors wear appropriate clothing, shoes, and safety goggles when working with a robot or power tool. To decrease the risks of accidents, mentors must always supervise students when working around machinery or power tools. Likewise, all students must undergo a special Safety Check during the beginning the year before being allowed to use any tools on their own, regardless of their experience within the team. By implementing this program, we can ensure that all team members are reminded how to use power tools properly, correct protocols for when someone gets hurt, where fire extinguishers/first aid is located, etc.

The future of the safety workshop program is to partner with professionals in the field to expand them such that they encompass a wide range of procedures and tools. The hope is to leave students with industry-level experience and a much more complete knowledge base, aiding them in the pursuit of future careers and projects.

## 3.4 Off-Season Events

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The Aluminum Narwhals typically participate in 2 off-season events: Battle of the Borders (scheduled for Oct 20 2018) and Del Mar Fair FRC Robotics Competition (which was unfortunately canceled for 2018). We participate in these competitions to allow team members to gain more experience and come up with strategies that can possibly be implemented during competition season. These competitions are held during the summer/fall, utilizing the past season game.

## 4. Outreach



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## 4.1 Community Outreach

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One of the most important goals we have as a team is to continuously increase the positive impact we have within our community. The results of this are shown through our school's adoption of a robotics course into the curriculum, which includes an in depth look at the yearly FTC game, and an opportunity for students to build and compete with their own robots.

As each year progresses, we have developed a complete marketing and community outreach plan that encompassed many of our original goals: building a thriving and energetic technology program at our high school, expanding to local middle schools and starting FLL teams, involving the community of San Diego, working with engineering mentors from our corporate sponsors, and emphasizing the importance of responsibility within the STEM community.

### **Team 3128: The Aluminum Narwhals Robotics Summer Camp**

Our robotics summer camp is one of our main ways that we are able to contribute back into the community. Through this 5 week camp, we bring students on campus for a week long course using the VEX IQ and VEX EDR kits to teach them basic principles of engineering and programming while sparking a future interest in robotics. By holding it at Canyon Crest Academy and inviting team members to be a part of it, we continued fostering a culture within our own team of spreading excitement about robotics and passing on what we've learned. Furthermore, by inviting campers year after year to bring their excitement and interest to our school we are building a reputation of actively encouraging the growth of young minds within our community.

Campers complete a series of tasks with their robots that walk them through programming basic motors and sensors, and all of these concepts culminate into one complex challenge that tests all of their newly acquired abilities at the end of the week. We do all of this in a fun camp environment where campers also take part in various recreational activities.

Not only do we engage the younger members of our community, by putting on these camps we also are able to help fund the academics at our school and allow our own team to expand. Last year's camps were so enormously successful that we are hoping to expand our total capacity next summer from 200 campers over four weeks to 1000 campers over five weeks. Along with this, we will be inviting 60 volunteers from our high school to participate in mentoring these campers, as well as hiring a full time set of staff members from team alumni and the surrounding community.

### **Library Workshops**

Our team has recently begun collaborating with nearby libraries and youth centers, creating a balanced curriculum to encourage our community's kids to pursue a passion for STEM. We currently plan to have a 6-month workshop at San Diego - Carmel Valley Library, led every



week by our own team members. Although we use a mix of VEX IQ kits and FRC KitBot parts to teach them the basics of robot design and programming, our main goal is to create a welcoming atmosphere for students who have never done anything STEM/robotics relate. Through these workshops, we can get directly involved in the community and spread awareness about FIRST.

### **Qualcomm QKids Presentations**

Qualcomm QKids is a yearly event that we began participating in July 2016. Every year, Qualcomm invites local STEM organizations to come and present in personalized booths while elementary-middle school students of Qualcomm's own employees are welcomed to tour around and get themselves involved. Held within Qualcomm's headquarters, children come piling in for a chance to view our latest robot and listen to the year's game task. Through this event, our team raises awareness of FIRST and promotes our annual robotics summer camp designed to get young children on track for a possible focus in robotics in high school.

### **Robot Demonstrations**

The Aluminum Narwhals go to different schools every year to present and demonstrate our robot to younger audiences. Through robot demos/presentations at local schools, this helps attract attention towards the FIRST program and the goals in which it pursues, encouraging schools to fund and support their own FIRST team. Likewise, interest in robotics at a young age draws attraction for students to enter our high school and because an FRC member, expanding the quality of our projects.

### **Mentoring and Assisting Other Teams**

Through our yearly robot presentations at elementary schools, these efforts have widely spread the influence of FIRST and eagerness for a program dedicated towards robotics. This year, we are currently helping Solana Ranch Elementary School form several Jr. FLL/FLL teams. Through our initiation of supporting local schools as they begin participating in FIRST competitions, we hope to instill a passion for STEM into young scientists and engineers at a younger age.

### **FIRST Community Support**

For the past two years our team has helped our school host the San Diego FTC Regional Event. This event acts is an opportunity for new individuals within our school and local community to experience FIRST competitions. For these event, our team provides a devoted set of volunteers, workshop space for all FTC teams, and any other help we can. In addition, our school's talented artists and performers will entertain during the event in a unique integration between robotics and the arts.

# 5. Operational Plan



## 5.1 Scheduling

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During the off-season, our robotics room is open to all members on Mondays, Wednesdays, and Fridays after school. These days are held for students to pursue build project tasks and build season planning. Our leadership team also meets once a week to discuss deadlines and current project statuses led by various project leads. During our 6-week build season, we convene 3-hour meetings every day after school along with Saturday sessions to execute the robot design and construction process. Likewise, we conduct strategy development sessions throughout the week to thoroughly analyze and plan our game plan.

## 5.2 Communications

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As each year progressed, we needed a way to maximize productivity and planning, especially as more and more students have joined the team. Since 2015, we have utilized Slack as our main form of communication. Slack is a cloud-based team collaboration platform that we use to integrate all our active tools (i.e. Google Drive, GitHub, Trello) into one place. It allows the entire team a transparent view of what's going on, along with direct planning of specialized projects. We also accomplish communication through bi-monthly team meetings led by our lead mentor and elected officials, sub-team meetings, weekly email updates, and our website.

## 5.3 Project Management

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Our efficient project management practices are what we mainly attribute to our success during our build season. Our team is able to effectively build two identical competition robots in the course of 6-weeks (one to bag & tag up, one for the drive team to use as a practice robot for training). As a result, we have developed a thorough management plan to ensure that the sub-teams are on schedule with their assignments. Our leadership team comes together once every week to review progress and manage our resources. Another important resource that our team uses to maintain an updated project profile is through Trello, a flexible web-based project management application. By maintaining project cards that are visible to all members, this application is another way to increase transparency in the tasks that people are assigned to, along with giving a place for the project leaders to display the status of their assignments.

## 6. Marketing Plan



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## 6.1 Target Audience

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### **Canyon Crest Academy**

We maintain strong connections with our school and its foundation to ensure continuous administration and faculty throughout the school year through focus presentations and conversations. We extend invitations to our student population and faculty to attend all of our local competitions.

We also market the value of our team's activity by emphasizing the importance of STEM and engineering to our school board. Our high school is a primarily arts-based school, with several conservatories (i.e. Video/Film, Dance, Visual Arts, Instrumental, Vocal, Humanities) designed to prepare students in the arts. Our team sought to resolve this by coordinating a meeting with our school's foundation board and presenting the possibilities and benefits that STEM/robotics may provide to students. We effectively convinced the board to designate a newly proposed school building to be dedicated to engineering and physics, along with creating a lasting relationship with our school board and community.

### **Parents and Sponsors**

There are many expenses and support involved in managing the team, so making sure that all our partners are caught up and updated is crucial to our development. Our partners provide financial backing, as well as transportation, and mentorship support. We target potential partners through monthly communications and presentations to maintain support and gain new partners. In the beginning of the year, we hold student-led night presentations to parents and new mentors to introduce them to the team, along with informing them the ways that they can help. Likewise, we offer our corporate sponsors a specialized presentation for corporate employees and their children.

## 6.2 Community Presence

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### **Touring Schools**

During the school year, we travel to various schools and events to demonstrate our robot's capabilities. We have presented to numerous elementary/middle schools, as well as corporate employee fairs, high school pep rallies, and several San Diego library branches. By bringing a few well-versed team members and our robot to locations around our community, we hope to inspire kids to get involved in various STEM programs that are available to them.

Our goal with this project is to spread the ideals of FIRST and encourage an interest in science and technology from a young age. Being exposed to intricate programs like FIRST and the incredible things that students can accomplish when they put their minds to it, like building a robot in six weeks, is very inspiring for students, especially of a young age. We want to contribute to that sense of awe and facilitate an interest in STEM early on.

### **San Diego Robotics Club**

Our presence isn't solely limited to the younger population in our community. We are also involved with the San Diego Robotics Club, an adult community that meets up weekly to discuss individual robot projects as well as highlight practical applications of robots and intelligent systems to upgrade their businesses/projects. Their meetings feature dedicated conference tracks and workshops to robot enthusiasts hoping to learn something new. Our team has created presentations to showcase our involvement in FIRST and the ways our team prolifically spreads the fields of STEM throughout San Diego. We have used this opportunity to gain new mentors and professional support from local engineers within our community.

## **6.3 Online Content and Media**

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### **Social Media**

We utilize a wide variety of social media outlets in our quest to spread useful information and be involved in our various communities. On our website team members, teams, and the general public can find information about us, tutorials on various pieces of knowledge we've acquired over time, regular updates about schedules and announcements, and other useful tidbits. Our team is all part of a large mailing list which we utilize to send out important information; we plan to link this to our website in the form of a regularly updated blog as emails are sent out. We also use Facebook to regularly update our community with events, photos, updates, and general happenings within our team. In addition, as time goes by, we plan to use Facebook to interact with other teams more to share knowledge, comments, and experience.

### **Open Source Material**

On our website, we plan to publish code components that can be reused and collaborated on by other teams. Our programmers have come up with documentation meant for teaching new members how to use their event system (the basis for our code); in this, they designed a program that takes people through exercises over time, demonstrating the various aspects of the code framework we already have to work with. We have placed these documents on our website for the use of the general public, in the hopes that it will be a useful reference for teams and anyone who simply wants to learn programming. In addition, we want our code to be open source; we're always open to hearing feedback from other teams who can

take what we have and make something new or better from it, as collaboration is the most efficient way to innovation, success, and learning new things. Just as other teams can learn from us, we can learn through other teams through facilitation of an open source environment.

### **Making Code Available Online**

We plan to have a regularly updated blog on our website that allows people to track our progress throughout build season. Part of this will include entries from our Code and Build journals online to give people an idea of how our team handles challenges and to allow people to learn from our mistakes. We also intend to further our online discussion during build season in a way that allows all members, even members not physically present, to engage in the conversation. In past years we have used an online forum to fulfill this purpose. In the next year we will be examining various options to make our build season more accessible to our team members as well as other teams. We truly value collaboration, as it helps us all push ourselves further.

### **Blog**

One new practice our team implemented in 2015 was a build season blog. Each of the team heads was responsible for posting a daily summary of what their team accomplished. Parents and team members who couldn't attend meetings could then view these posts and stay up to date with the workings of the team.

We'd like to implement this as a regular practice, even during off season, to document side projects and have a record of team activity.

# 7. Financial Plan



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# Sponsors

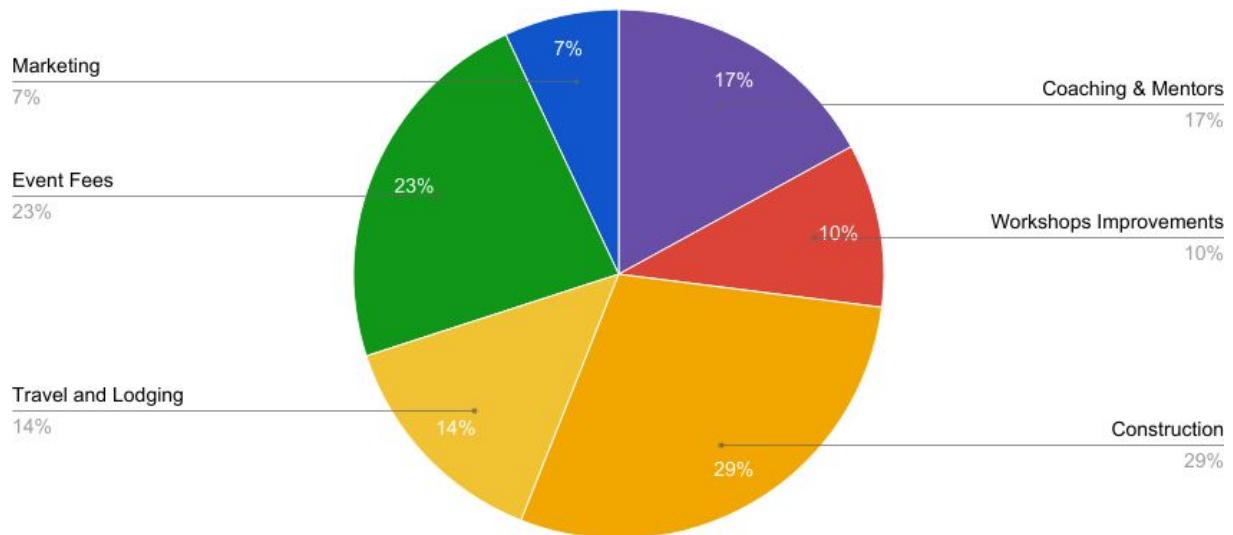
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An essential part of our team's operations is supported by our sponsors. We are regularly sponsored by an array of patrons who give generously year after year to our team. Nordson and Leidos' donations paid for the upgrades to our workshop, including an assortment of new tools, computers, and a mill. Qualcomm, a San Diego based company, has been especially helpful this year because in addition to sponsoring us financially, three members of the Qualcomm family have joined us as much needed mentors. Qualcomm has been crucial in enabling us to continuously improve both the design and quality of our robot. Additionally, we have mentors from Viasat, a regular and generous sponsor. Through all of our sponsors' efforts, we have been provided with opportunities to further the ideals of STEM within our school and community. Business' job is to maintain connections to all our corporate sponsors and to be sure that we can continue doing monthly build projects and events. We can gain sponsors through parental connections to corporate donors, yearly grant applications, and grant awards.

# Spending Budget

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## Overview



## Overall Spending Budget:

General		
	Coaching and Mentors	\$7,000
	Workshop Improvements	\$12,500
Construction		
	Build Season Robot	\$6,500
	Off-Season Robot	\$3,000
	Outreach Robot	\$1,072
Travel & Lodging		
	Travel Regional Travel and Lodging	\$10,500
Event Fees		
	Regional Competitions	\$9,000
	Off-Season Competitions	\$500
Marketing		
	Team Spirit Wear	\$2,500
	Miscellaneous	\$500
Total Expenses		\$79,000