

# Rookie Training 2021

Team 9721

# Rookie Season

- Orientation to FTC
- Optimizing the Robot
  - Driving the Robot
  - Programming the Robot
  - Modifying the Robot
  - Human Users-Spatial Awareness
  - Scrimmage Work
    - Meet and Greet other teams
    - Work on Field
- Awards
- Engineering Notebook
- Robot Presentation

# FTC Orientation (normal)

- Teams must have their robot inspected and make their robot presentation before the preliminary rounds begin. The robot inspection will be a piece of cake. The robot presentation is often lots of fun. The judges are super supportive and want each team member to “pro” with robotics and become engineers of one kind or another. Many of the judges are engineering professors at local colleges.
- Teams compete in 5 preliminary rounds with a partner team, or Alliance.
- Each round runs for 2.5 minutes with 30 seconds of autonomous, 1.5 minutes of teleOp and 30 seconds of end game. Teams can score points in different ways during each session.
- The alliance with the most points wins. You get everything or nothing.
- The highest (4) teams (based on alliance scoring) automatically advance to the semi-finals as Alliance Captains. They their alliance partners using data from the preliminary rounds. These new alliances compete until there is a winning alliance.
- There are FIRST specific scholarships for kids at many local colleges. Umass Lowell event has a full scholarship program for their robotics team, like a sports team! (Vermont considers FTC a sport)



<https://youtu.be/H3V3A7CgwPU>

# FTC this year...

- Competition is virtual, so teams will submit videos and participate in zoom interviews
- Teams will make competition videos using whatever materials they have but the focus is on half fields of one color
- There will still be an Autonomous, TeleOp and End Game for robots to score points.
- Rookie teams will move the wobble goal onto the start line. This earns 5 points.



# Specifically, for you...

- You need to place a line on a flat floor, such as a kitchen floor (tape is best)
- The tape should be 2 feet long.
- You will place the wobble goal at the top of the tape to start the match
- You will place your robot on the starting line to start the match.
- Once the match has started, you will drive your robot and use it to push the wobble goal so that it touches the starting line.
- You can then park your robot and stop.

# Drive the Demo Robot

- Turn on the phone holding the right side button down for a few seconds. Check the charge on the phone. If it is too low, say below 10%, charge the phone before proceeding. Should not take too long.
- Launch the robot driver station app.
- Connect the battery to the switch. (The switch is already connected to the robot controller) and turn on the robot. Wait for the LED on the robot controller to turn green.
- Connect the phone to the robot controller through the Driver Station app by hitting the three dots on the top right. Then select settings. Then select Pair with Robot Controller. Then select WiFi settings. Select the network with your team number –RC, For example 18561-RC. Once you are connected, hit the triangle on the lower left to return to the main menu.
- You should now see a display with a green battery for the robot power. If the power is too low, say below 12V, charge the battery and return once it is charged.
- Connect the gamepad to the phone using the usb micro adaptor. You will only need a single controller so you can plug directly into the adaptor.
- Press the start and the A button at the game time to mark your gamepad and gamepad1. This is important because the program has commands for gamepad1 only. You will see the gamepad1 icon appear on the top of the screen if you are successful. If you are not, keep trying until you succeed.
- Press the down triangle on the left of the screen and select the RookieDriveTest opmode.
- Press the init icon on the center of the screen.
- Press the play icon on the center of the screen,



<https://youtu.be/EOflidiymGJU>

# Driving the Robot

- Drive the robot for a little while. Guess which buttons you need to hit. You cannot hurt the robot. The initial driving commands were designed to be intuitive. Did it take long to find the driving commands?
- The opMode will time out so you will need to re-launch it periodically. You can also turn the timer off so that you can operate it for longer than 30 seconds at a time.
- You are currently beta-testing your robot. Do you like how it drives? Did you discover any problems? Have any ideas to improve its performance?

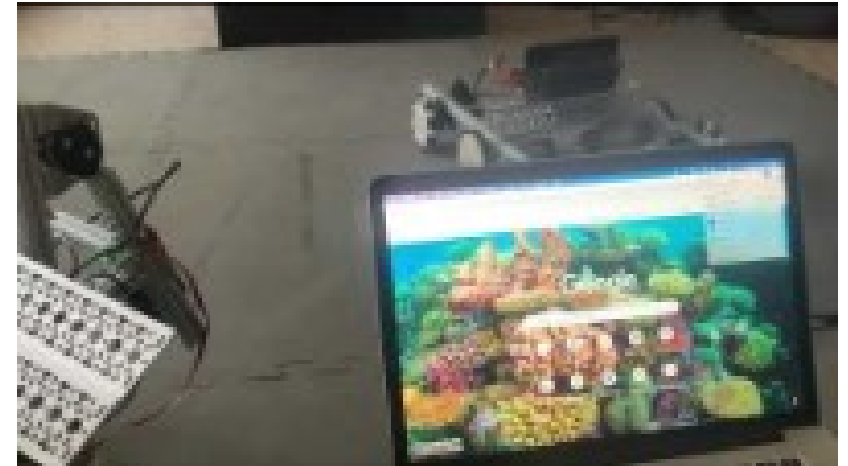


# Robot Optimization

- As a rule, there are three ways to improve your robot. You can make changes to the software, hardware or users.
- If the robot feels too fast or too slow, you can change the speed inside the program itself. Programming is intuitive. Seriously. I'll bet you can find the variable you need to change to control the speed. I'll also bet you can make a guess about how to change the number to make it easier to control. The hard part of programming is connecting everything to Android Studio and then uploading the code to the robot.

# Programming the Robot

- There are loads of ways to program in Java. We wanted you to be the most successful so we'll start with the basics.
- Let's assume that you have a computer ready to use for programming. If so, please connect it to the wifi network that is being used by the robot controller. For example, 15583-RC the password is password. (if you don't know the password, you can access it through the driver station in the program and manage)
- Once you are connected, please enter the IP address of the robot controller.  
<http://192.168.43.1:8080/>
- Select the OnBot java program from the center of the screen.
- Select the RookieDriveTest program form the menu. This was created for you!
- Go ahead and open the program.
- Find and adjust the power to drive the robot. Make a course for your self-for example, make a few loops around a table. Time yourself with 2-3 different speeds and see if there is an optimum speed for your robot based on your drive skills.
- Save your results to share with the judges during your robot presentation.



<https://youtu.be/Mz92gxldEk>

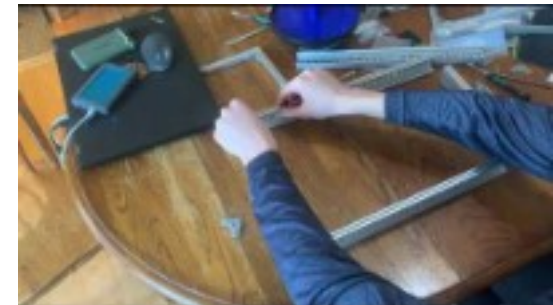
# Robot Assembly

- I made a series of tutorial videos for you to guide you through the process of assembling the robot. You should watch the videos in their entirety before you attempt to disassemble the robot. Within each video is a series of tips to help you avoid frustration and to work productively.
- Your robot's design was taken from the REV website. REV is one of several prominent robot materials manufacturers. This particular robot appears to have been inspired by the popular TileRunner series of robots from AndyMark, another robot materials manufacturer.
- The elements of these designs are as follows:
  - the wheels are housed in protective wings to prevent objects from getting stuck in the wheels and to keep the moving parts of the wheels away from the robot's wiring and electronics
  - The motors are mounted to the wings to reduce the center of gravity
  - There are interior spaces to place a floor in order to hold electronics
  - The wings have places to add structures for other active collection systems.
- You also have a robot kit, that includes numerous connectors, tools and raw materials.

REV Brackets and Fasteners <https://youtu.be/ZAHqZFTkYdM>



REV C Channel Frame <https://youtu.be/86kGiE2FH6o>



REV 15 MM Channel Frame <https://youtu.be/fLVKlCdGym4>



# Robot Modification (1 of several)

- Drive the robot while pushing the wobble goal and the donuts. You will probably have trouble with both. The donuts tend to be a little low and the robot can get stuck on them. Similarly, the wobble goal can be difficult to direct because you are not actively holding onto it. That would be a goal for next year.
- You may want to make some custom bumpers for your robot to keep it from getting struck. These bumpers can be made from plastic, cardboard and other Off The Shelf (OTS) materials such as duck tape and so on.
- Many robot materials are easy to shape using simple hand and power tools. For example, the 15 mm extrusions and axles are often cut to size. I generally cut the 15 mm extrusions with a mitre saw using a special aluminum cutting blade. I cut the axles using a hack saw and several clamps. Plastic is easy to cut using a jig saw and a drill press can drill into all of these materials. It is vital to use safety gear when modifying these materials so check with me to be sure you have the things you need. You can drop by my house and use my tools and safety gear after school if you don't have everything you need at home. My tools are in the garage, which is a free-standing building.
- You will want to make and mount a custom sign for your robot that has your team number. Eventually, you will know your team number cold because it identifies your team. Sharon, MA is team #1. The team has been in operation since the late 90's. Our varsity team is 9721 and your teams are 1600+, which means your team is one of thousands from across the globe. The signs have to be visible to the judges from a distance (the letters should be 3", give or take). You can make these signs using cardboard, plastic and so on. These signs can be mounted using REV screws and so on.

# Robot Modification (2 of several)

- There are some obvious ways you can try to optimize your robot. The first optimization would be for the wheels and wings. The drive wheels are friction wheels and the castor wheels are omni wheels. You could reverse them to see if it effects how the robot drives. You could also drive an all omni wheel or all friction wheel set-up to see if the wheels matter.
- You could switch the motor position with the castor wheel position. The central position of the wheels places the weight from the motors in the middle of the robot. This also makes the smallest footprint when the robot is turning. Your robot might drive better if these were reversed. Only one way to find out.
- Your motors are geared at roughly, 20:1. These motors are very fast. You could slow them down by reducing the power in the software. You could also slow them down by gearing them down further, say 60:1. This also makes your motors larger and they might not fit nicely inside the chassis. You might have to make some other modifications to the robot to fit the motors inside. Likewise, you might feel that your robot is not fast enough. You could increase the gearing and make it 5:1 by removing the 4:1 gear reduction. This will also create space inside the robot. This will make the robot much faster but it might be hard to control.

# Users

- The human operators of the robot are vital to the performance of the robot during teleOp. In many cases, the human operator can improve the performance of the robot if they practice operating the robot.
- Spatial Awareness Courses can assist a human operator of the robot. There is nothing quite so challenging as trying to determine how to control the robot when you and it are not oriented in the same way. This type of spatial reasoning can be easy to develop with a little practice and it can make loads of difference.

# Scrimmages

- We will scrimmage a couple of times, hopefully. This will allow you to work with another group and develop your skills so the competition won't be so intimidating.
- Meet and Greet-Many teams will want to meet you in the pit during the morning session. They will want to know your capabilities and they will want you to know their own capabilities.
- As a rookie team, you will want to explain that you are willing to move the goal, bring them donuts and play defense or just get out of the way. Many varsity teams get stuck during the competition so a rookie team can save them by pushing them out of an obstacle.
- You will want to take turns driving the robot in competition. It is exhilarating and we want to build your experience. As you gain more experience, you might specialize as a driver, operator or captain.
- After a practice run, you will want to de-brief about what worked or did not work. You might want to modify your code or add or remove materials from your robot. I will have extra materials for almost all eventualities including failed motors and batteries.

# Awards

- FTC Champion
- Core Values
- Think
- Design
- Outreach
- Autonomous Control Award



# Engineering Notebook

- The judges will want to see your thinking in the engineering notebook. They will be looking to understand “why” you made certain design choices.
- Section A-About the team, team bios
- Section B-Final Robot Designs with Drawings (pictures are fine! and Rationales)
- Section C-Team log-contains information on who met, when you met and what you accomplished. Include photos and videos of your team working-the judges love that stuff!