# 2023 COACH TRAINING


# SESSION 1
# INTRO TO VEX IQ & CHALLENGE

# WHAT IS VEX IQ?

Your team of students will:

- Build a robot
- Program the robot
  - Robot driven via remote control in the Teamwork Challenge and Driver Skills Challenge
  - Robot operates autonomously in the Programming Skills Challenge
- Compete with and against other teams at one or more tournaments
- Demonstrate teamwork and Vex IQ values throughout!

# COMPETITION MATCHES

**Teamwork Challenge:** Form an alliance with another team and work together to earn points. Robot is driven manually

**Driver Skills Challenge:** One team, robot is driven manually

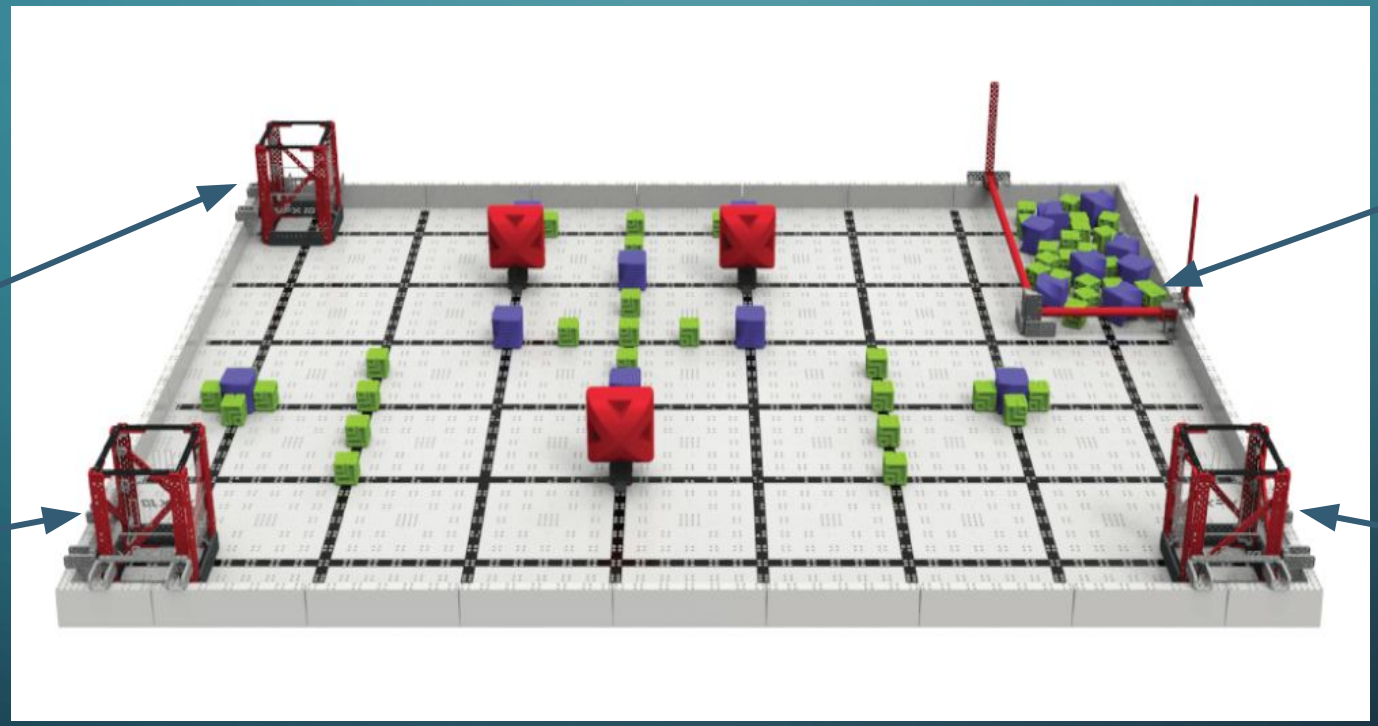
**Programming Skills Challenge:** One team, robot is driven autonomously

| Match Type | Participants | Autonomous Period (m:ss) | Driver Controlled Period (m:ss) |
|---|---|---|---|
| Teamwork Challenge | One *Alliance*, on one *Field*, made up of two *Teams*, each with one Robot | None | 1:00 |
| Driver Skills Challenge | One *Team*, with one *Robot* | None | 1:00 |
| Programming Skills Challenge | One *Team*, with one *Robot* | 1:00 | None |

# FULL VOLUME FIELD

8’

6’



Goal #3

Goal #2

Supply Zone
Parking Zone

Goal #1

# SCORING

- Scores tallied as a total of the items below in all types of competition matches
  - Both teams receive the same score in the Teamwork Competition

Each *Block Scored* in a *Goal - 1 Point*
Each *Uniform Goal - 10 Points*
*Height Bonus - 10 Points per Fill Level*
*Cleared Supply Zone - 20 Points*
Each Red *Block Removed* from *Starting Peg - 5 Points*
Each *Partially Parked Robot - 5 Points*
Each *Fully Parked Robot - 10 Points*
*Double Parked* Bonus - 10 Points

# Game Specific Definitions

Game Manual

- Cleared vs Uncleared Parking Zone
- Fill Levels
- Partially Parked vs Fully Parked
- Goal Scoring
- Uniform Goal Bonus

# PAPERWORK

As your team begins to meet, please take time to fill out all of the items listed in our coaches corner on the Caledonia VEX IQ website.

Coaches Checklist - paper copy in your coaches binder.

# DOCUMENTATION (DESIGN NOTEBOOK)

- Very important element in VEX IQ. Notebooks are the first thing that judges look through at competitions and a great notebook puts your team in the running for tournament awards.
- Sample Engineering Notebook
- Engineering Notebook template (copy also in coaches binder)
- REC Foundation Engineering Notebook Judging Guidelines

# ROBOT RULES

- Read the rules in the Game Manual for full details.
  - Cannot exceed 11” x 19” x 15” in all potential starting configurations and does not expand beyond 11” x 19” during the match.
  - Use only valid Vex components
  - Use no more than 6 motors
  - Do not modify components
  - Non-functional decorations are allowed
  - Include visible license plate with team number

# THE ROBOT & ROBOT TIPS

- VEX IQ Competition Kit - The competition kit contains all the team will need to construct a basic robot for the Full Volume game. Additional parts are available for teams looking for more advanced robots.  Each team is allotted $100 for parts purchases.
- Recommend to have your team start by building the standard base bot and then add more game specific elements from there.

# RECOMMENDATIONS FOR MEETINGS

- A majority of teams will meet once per week for one to two hours in the beginning but may add additional practices leading up to tournaments.
    - Younger teams generally met for around an hour
    - Some older teams practiced longer depending on team
- Suggestions for each meeting?
    - Team building activity
    - Build/Program/Test time
    - Documentation along the way and/or some time at the beginning and end to write in journal. Rotate who writes in the notebook each week.

# VEX IQ COMPETITION TIMELINE

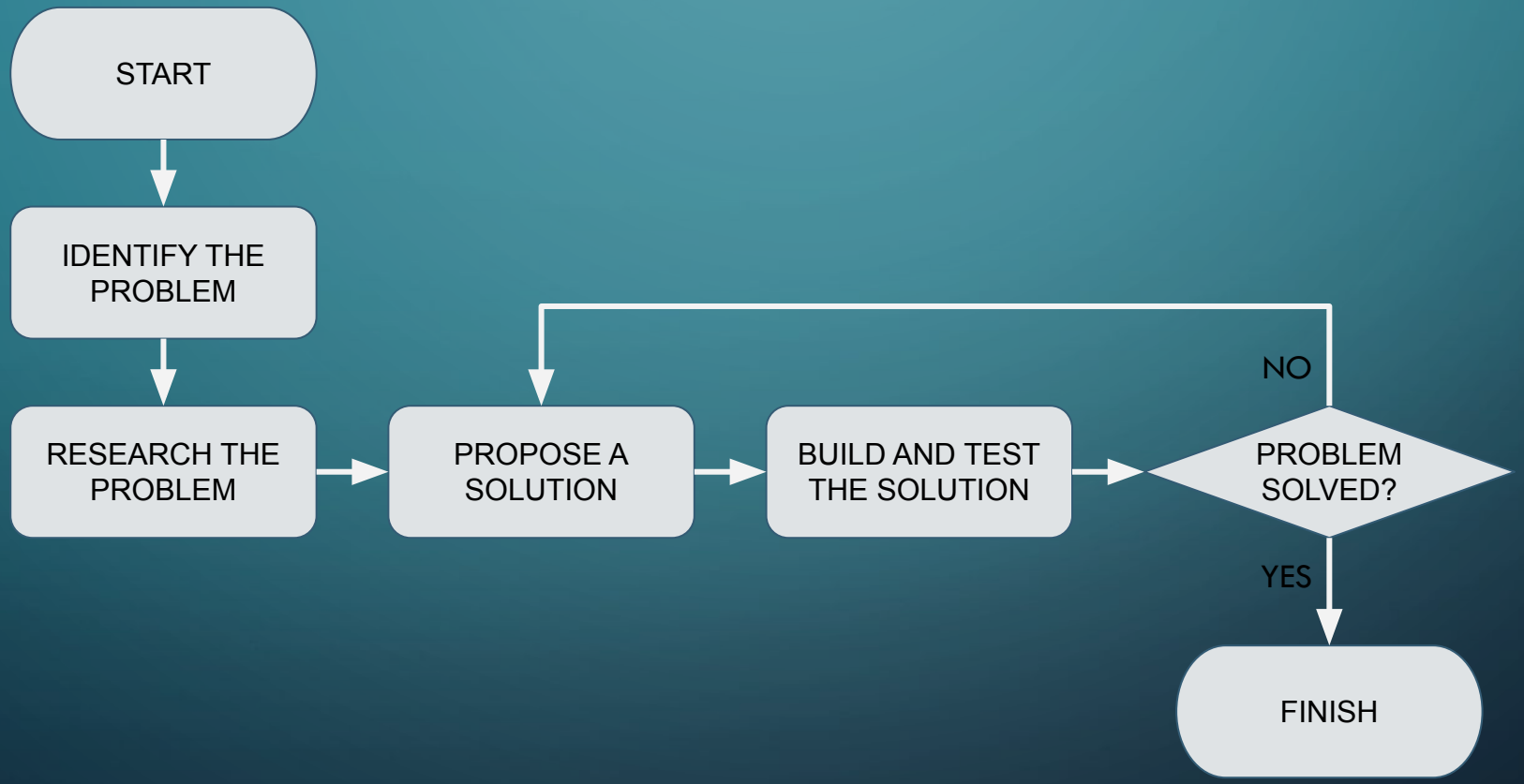
Leagues begin October 10, 2023, need at least a base bot to start league competition. Robot modifications can be done throughout, notebook presented final evening of league. Highly recommend getting your team into a league!

Tournaments begin early November, teams need to have a working robot, engineering notebook and possibly autonomous programming for skills.

Teams should begin meeting week of 8/28/2023. Reserve your spot - Tech Room Calendar

- Watch Full Volume video clip and identify how your team would like the robot to work
- Design the robot
- Test robot design, make modifications and retest
- Final fine-tuning, practice runs for competition, Caledonia Scrimmage

# ENGINEERING PROCESS (FOR KIDS)



# HELPFUL LINKS

calvexiq.weebly.com - links include

- Sample VEX IQ builds
- Firmware update instructions
- Coding tutorials
- Vex IQ basics

Full Volume Game Manual - pdf of game manual also on desktop of all laptops
REC Foundation Vex IQ Library

Laptop Password - CalVexIQ

# VEX IQ KIT CHECK

Please take a moment to look through your kit and make sure all items on the checklist are included.  Sign and turn in checklist once you have found all items.

Vex IQ Equipment

# SESSION 2
# INTRO TO PROGRAMMING

# WHAT DO YOU MEAN, PROGRAMMING?

- Programming refers to coding and downloading custom programs to the robot for driver OR autonomous modes.
- It is optional!
- Try it!  It's easier than you might think

# DO WE HAVE TO PROGRAM?

- IF you choose to compete in the Programming Skills Challenge (autonomous) then you MUST program
- Programming is NOT required for Teamwork Challenge or Driver Skills Challenge
  - Use programming to implement custom controls, custom functions, or adjust speed/torque from default values

# WANT TO SKIP PROGRAMMING?

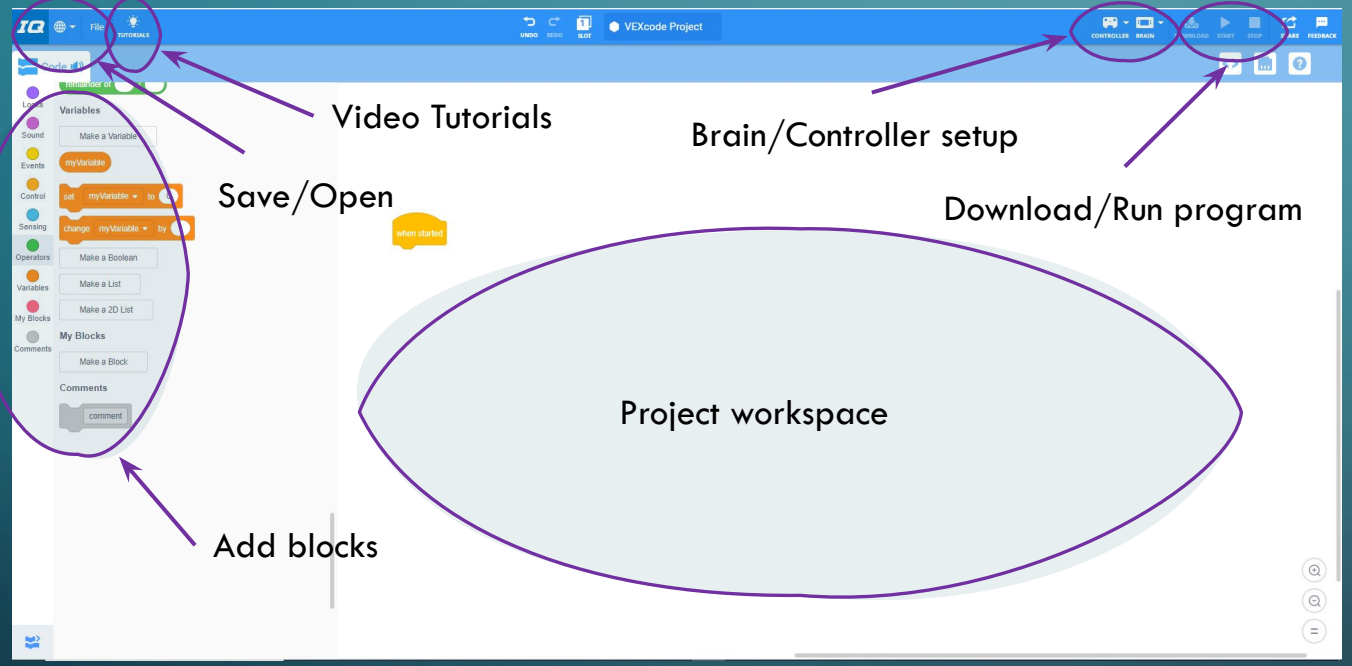
- Use “Driver Control” program preloaded on robot brains.
- Connect motors & sensors as desired in this table

| Port Number | Device Type | Functionality |
|---|---|---|
| 1 | Smart Motor | Turns using Joystick A |
| 2 | Bumper Switch | Stops R Down button from turning Smart Motor in Port 4 |
| 3 | Bumper Switch | Stops R Up button from turning Smart Motor in Port 4 |
| 4 | Smart Motor | Turns using R buttons |
| 5 | Smart Motor | Turns using F buttons |
| 6 | Smart Motor | Turns using Joystick D |
| 7 | Smart Motor | Turns using Joystick A |
| 8 | Bumper Switch | Stops L Down button from turning Smart Motor in Port 10 |
| 9 | Bumper Switch | Stops L Up button from turning Smart Motor in Port 10 |
| 10 | Smart Motor | Turns using L buttons |
| 11 | Smart Motor | Turns using E buttons |
| 12 | Smart Motor | Turns using Joystick D |

# PROGRAMMING WITH VEXcode IQ

- VEXcode IQ is a graphical programming environment (drag and drop blocks)
- Video tutorials & example projects are available inside VEXcode IQ software or by using the online version codeIQ.vex.com

# VEXcode IQ OVERVIEW



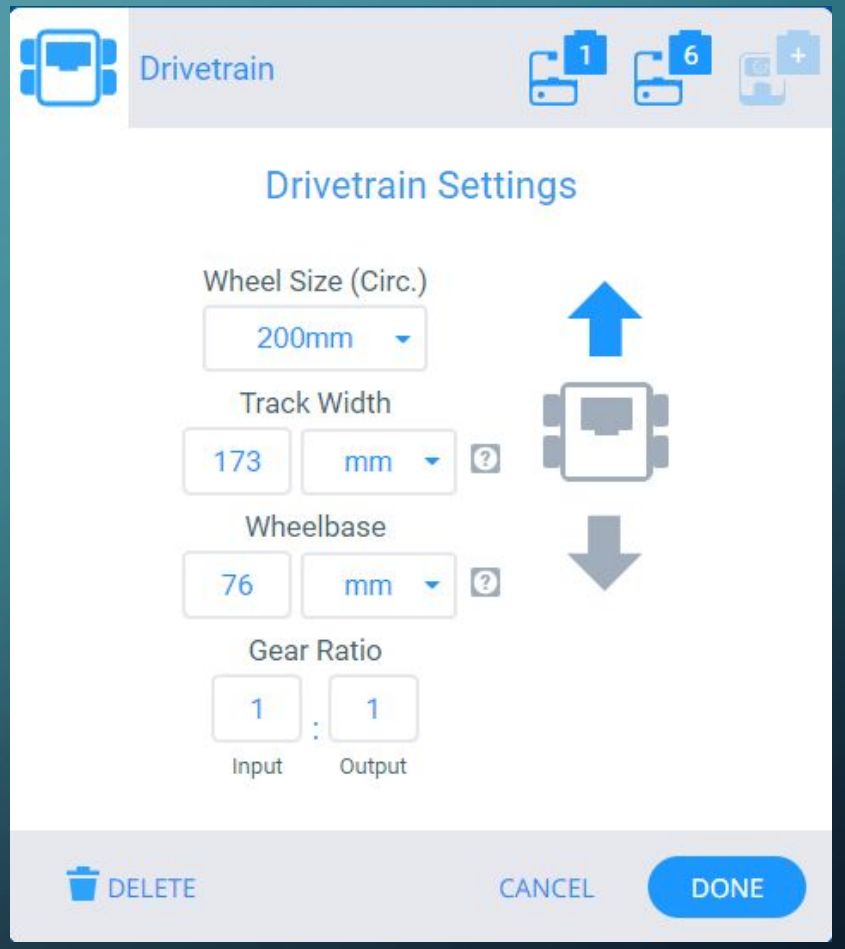

- Download or use the online version (download is on all Vex IQ laptops)
- Save often!
- Backup your program after each practice

# GETTING STARTED

1. Start with one of the example projects included in the VEXcode IQ
   a. Example projects are included for each of the robots listed here. Just add code!
2. Watch these tutorials!
   a. "Device Setup - Drivetrain"
      i. Includes setting up motors used for driving
   b. "Device Setup - Motors"
      i. Useful if you are adding a motor for controlling an arm, shooter, etc…
3. Browse example projects for code examples

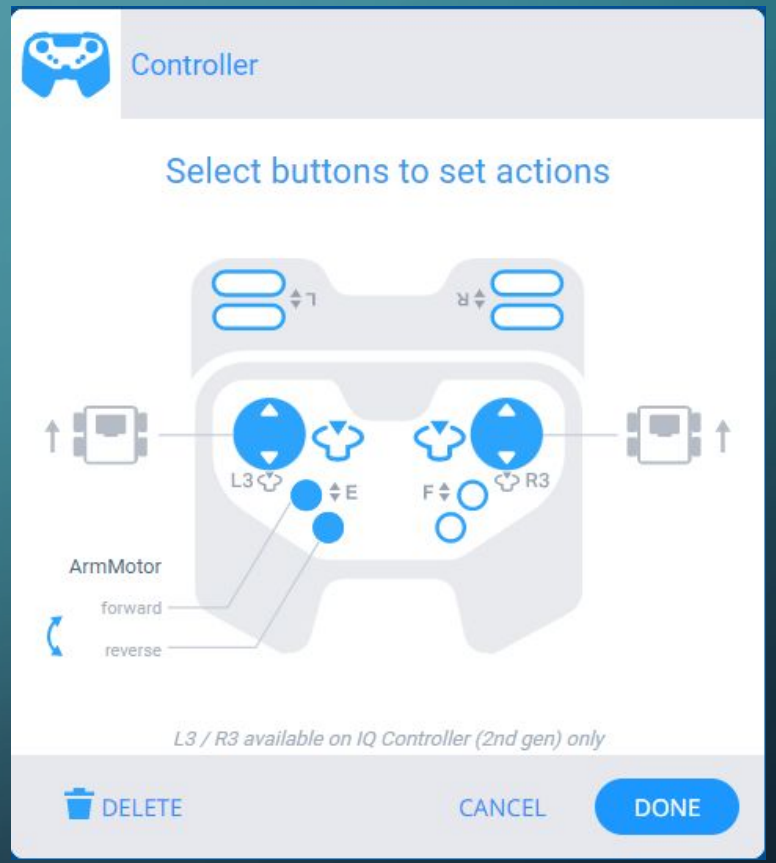
# DRIVETRAIN GUI

- 1st generation IQ Robot Brains
- Ports selection must match connections on robot!
- Can use with controller setup to implement custom controls without adding any code blocks
- Don’t forget to uncheck gyro if not using the gyro sensor



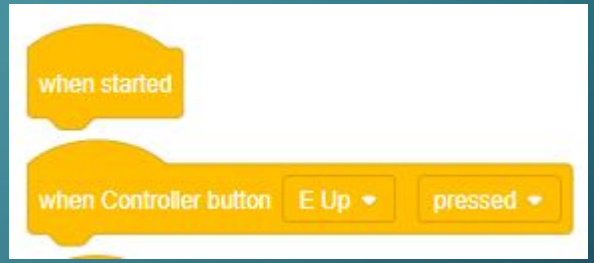
# CONTROLLER GUI

- Experiment with drive settings
  - 4 possible settings using the 1-2 joysticks
  - Do this early on so the kids have plenty of practice time
- Bind any other pair of buttons to other motors
  - Motors must be already added in order to bind to buttons
  - Motors do not have to be bound to buttons



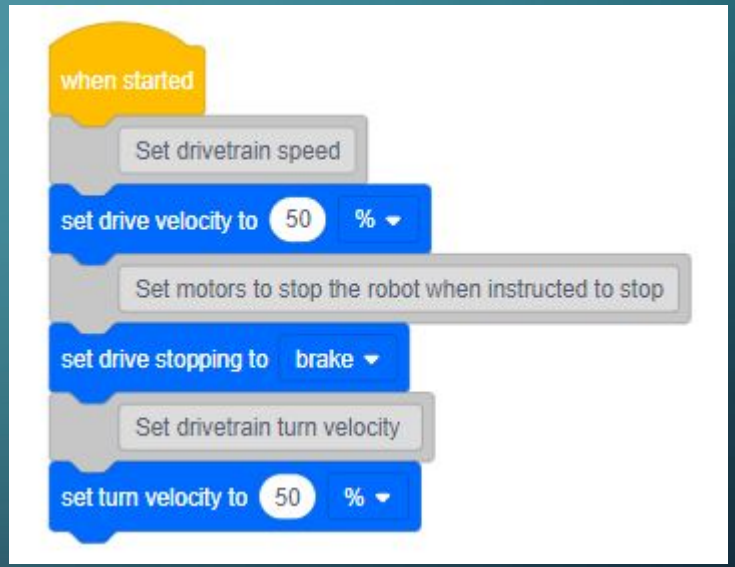
# PROGRAMMING FLOW

- Starts at the top with an event
  - "When Started" executes once when the program is started
  - Events also include button presses, message, and timers
- Code executes from top of stack to bottom
  - Control blocks can create loops, delays, or conditional code execution



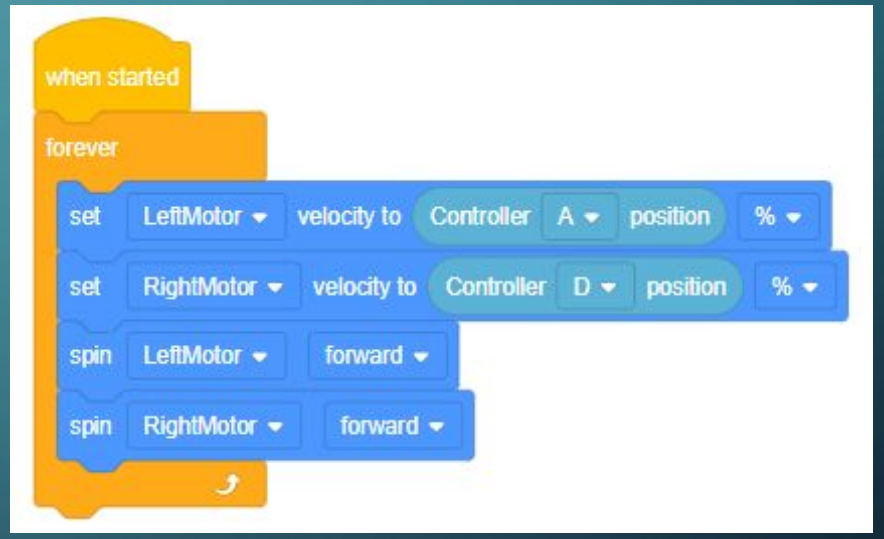

# DRIVETRAIN FIXED SPEED

- Can set velocity, stopping behavior, and turn velocity
  - Values shown in picture are default
- Use this with drivetrain setup on previous slide to set fixed speeds for driving and turning
- Grey blocks are plain text. Use these to explain what you're doing



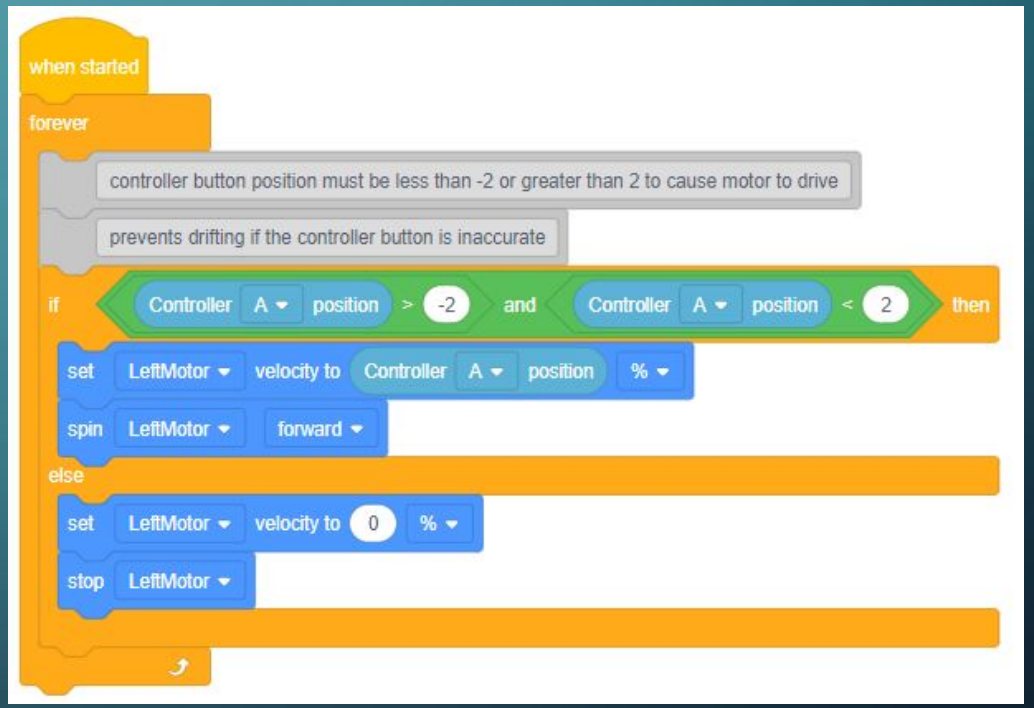
# DRIVETRAIN VARIABLE SPEED

- Taken from "Clawbot Controller with Events" example project
- Skip drivetrain setup and add drivetrain motors as you would add an arm motor
- Uses left and right joysticks to control robot speed & direction



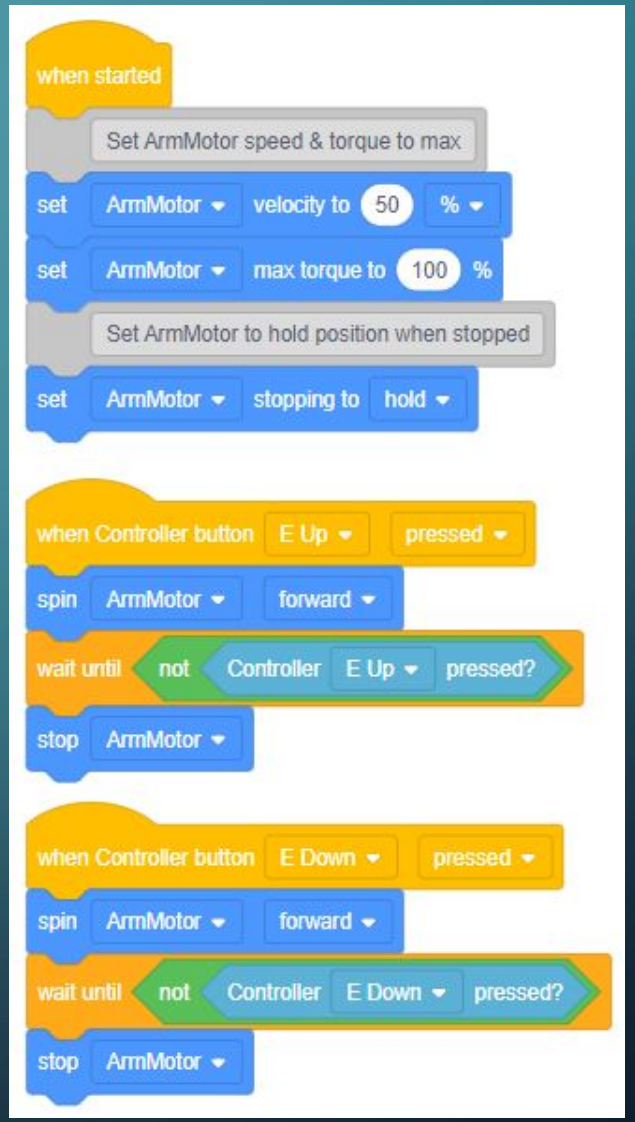
# DRIVETRAIN VARIABLE SPEED++

- This is untested, but may improve on example!
- Things wear out - like controller joysticks
- This code prevents the robot from drifting if the joystick is worn out and reading non-zero when untouched



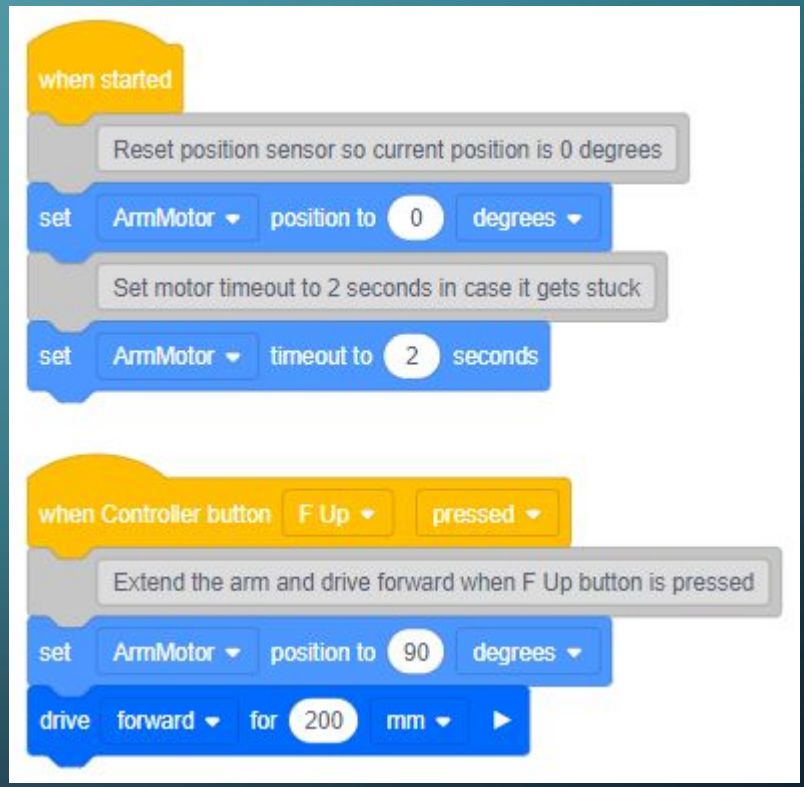
# MOTORS

- Same tips from drivetrain apply to motors
- Give the motor a meaningful name
- Must tell it what to do when the button is pressed AND when released
- Handle up & down buttons independently



# MOTOR POSITION SENSING

- Use timeouts if using position or distance for motor or drivetrain movements
- If the arm is stuck, i.e. against a wall, then it will never reach 90 degrees position
- The last "drive forward" block will not execute if arm is stuck



# OTHER PROGRAMMING TIPS

- Start small, one thing at a time
- When debugging, change one variable at a time, if possible
- Use a lot of comments to explain what you are doing
- Don’t forget to save and backup your code after each session!
- Use the tutorials and example code
- Ask questions…we might be able to help!