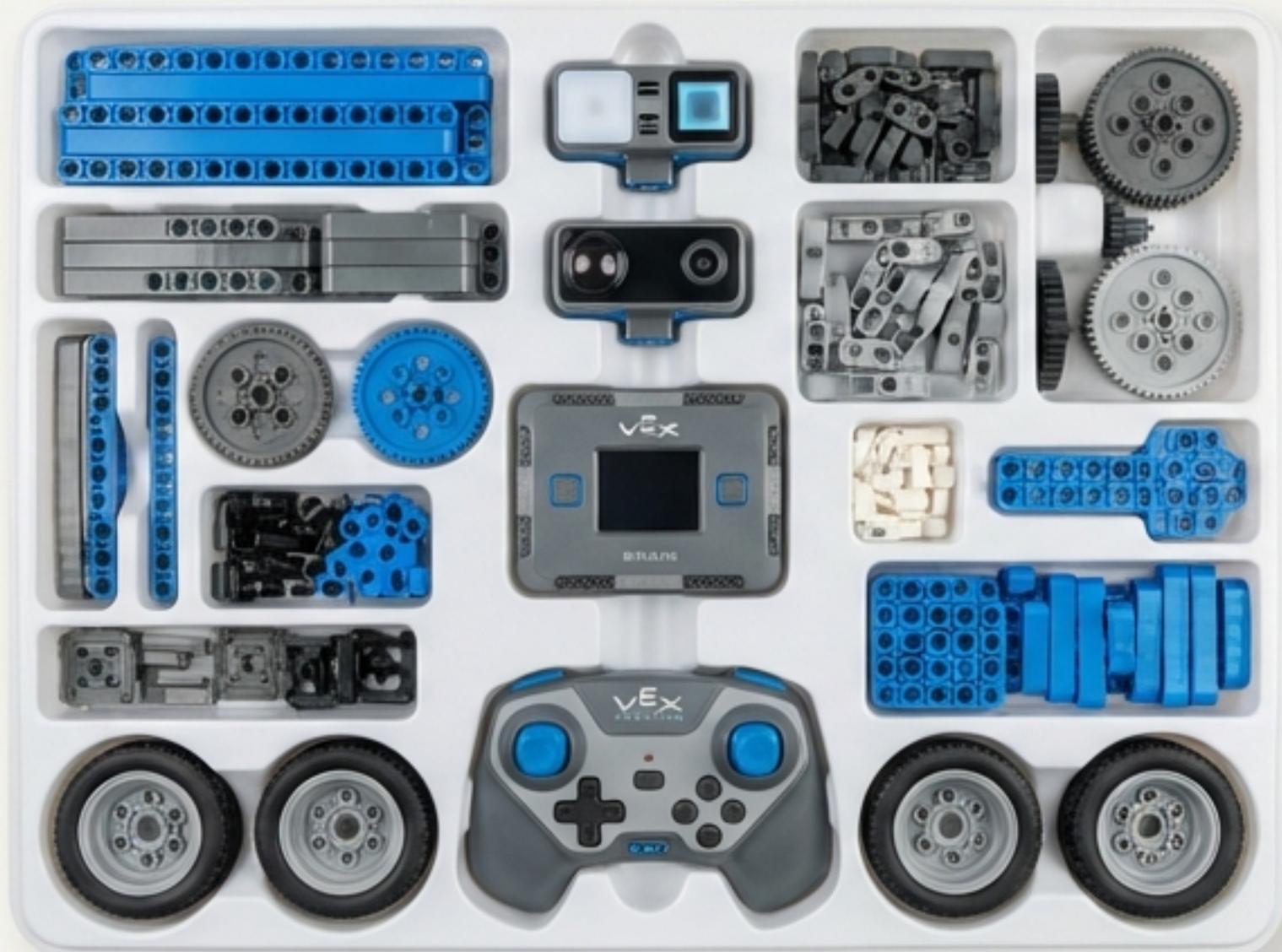


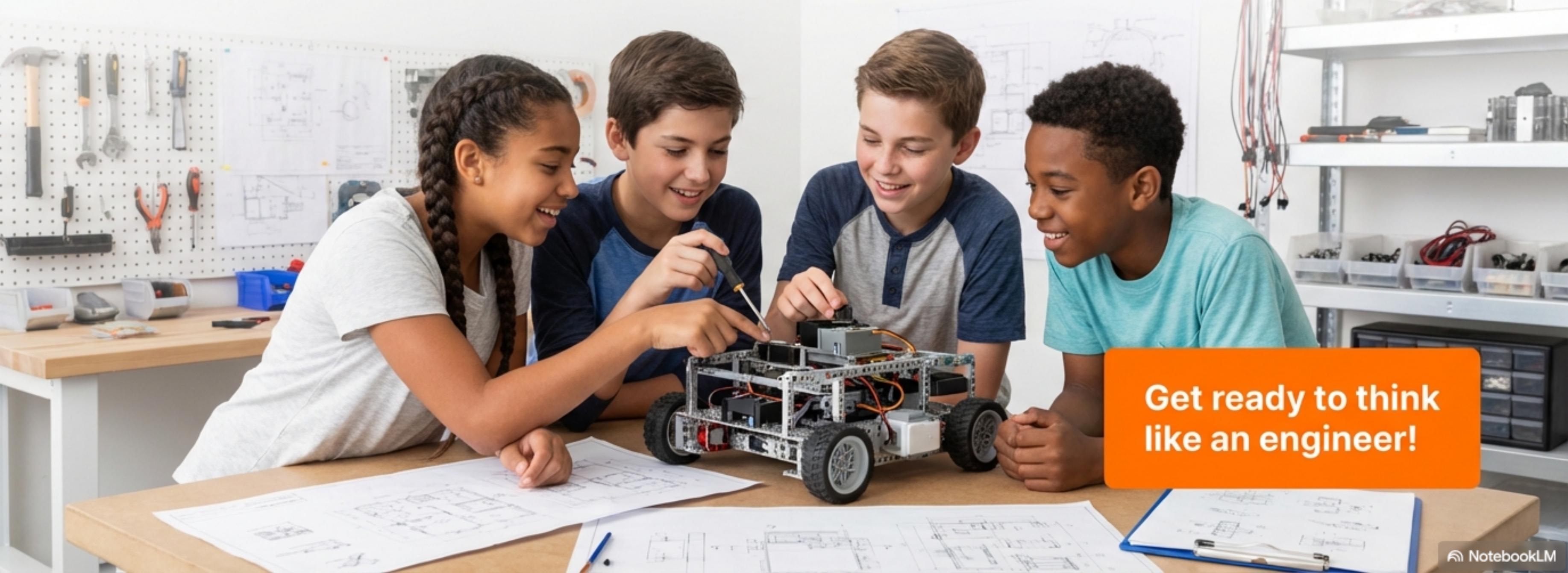
# Build Your First Robot

## From Parts to Motion



# Your Mission: Become a Robotics Engineer

Over the next 8 weeks, you won't just be a student—you'll be a designer, a builder, and a programmer. Your mission is to work with your team to bring a machine to life. You will design, build, and program a robot from scratch to complete a final challenge.



Get ready to think  
like an engineer!

# What IS a Robot, Really?



**SENSE**  
(Input)



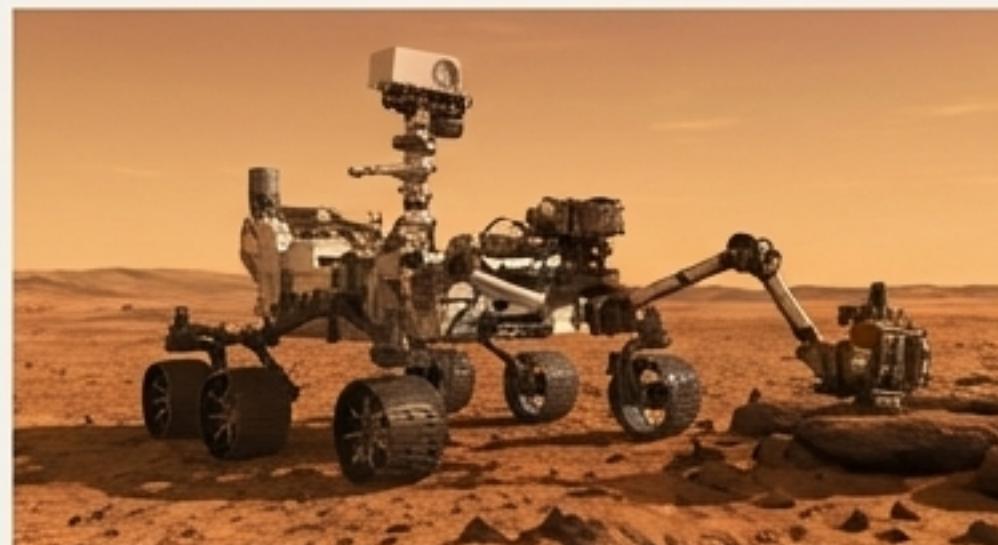
**THINK**  
(Process)



**ACT**  
(Output)

## The Senses

Sensors gather information about the world.



Senses rocks with its cameras, thinks about the best path, and acts by driving its wheels.

## The Brain

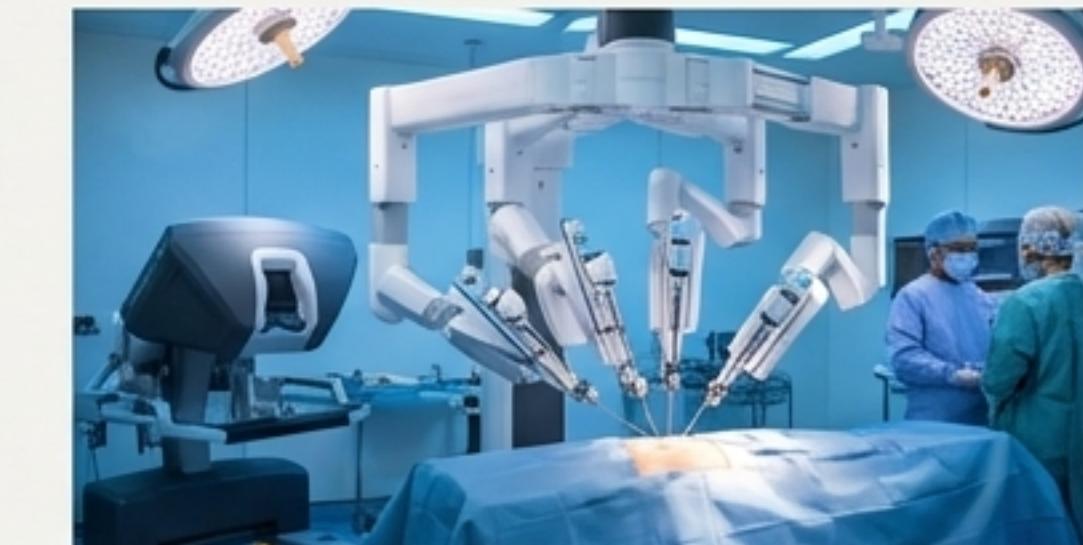
The controller (or “brain”) makes decisions based on the sensor information and its programming.



Senses a wall with its bumper, thinks “turn around,” and acts by changing motor direction.

## The Muscles

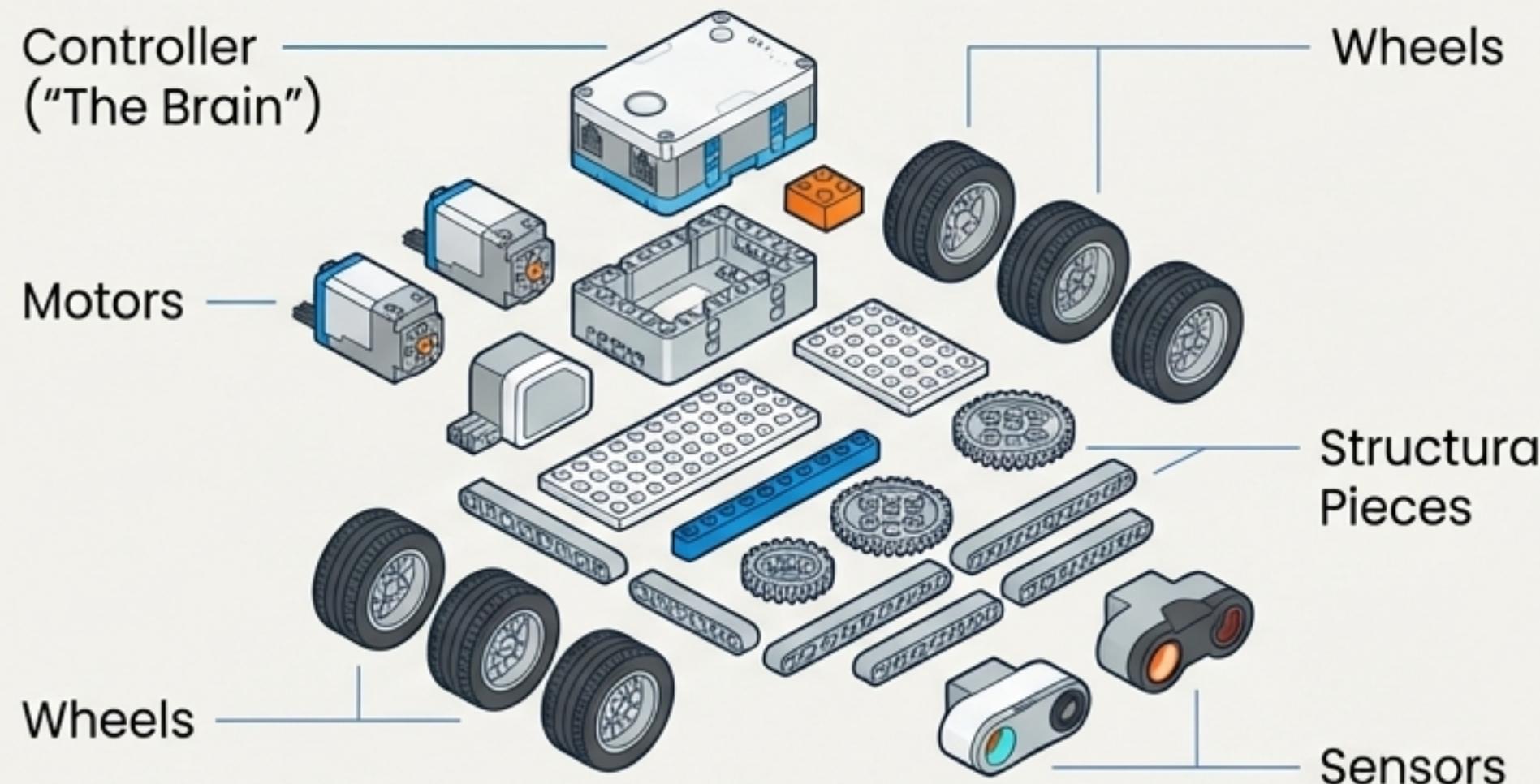
Actuators (like motors) carry out the brain’s commands to move or act.



Senses the surgeon’s hand movements, thinks by translating them into precise instructions, and acts by moving its surgical arms.

# Unboxing Your Engineer's Toolkit

## Your Robot Kit: High-Tech LEGOs



## Your Workspace



Safety first! Goggles on when building.



The right tool for the right job.

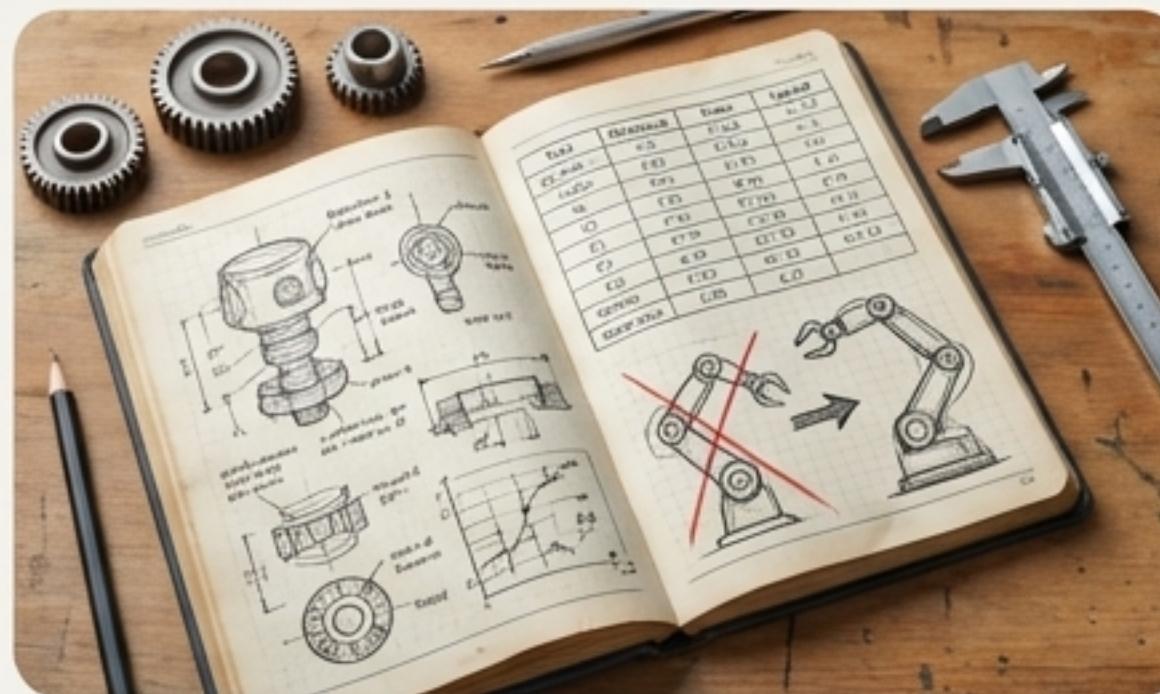


A clean workspace is a smart workspace. It saves time finding pieces.



**PRO-TIP:** Always wear closed-toe shoes in the workshop. Real engineering labs have strict safety rules, and so do we.

# The Engineer's Secret Weapon: The Design Process



Engineers almost never get it right on the first try.

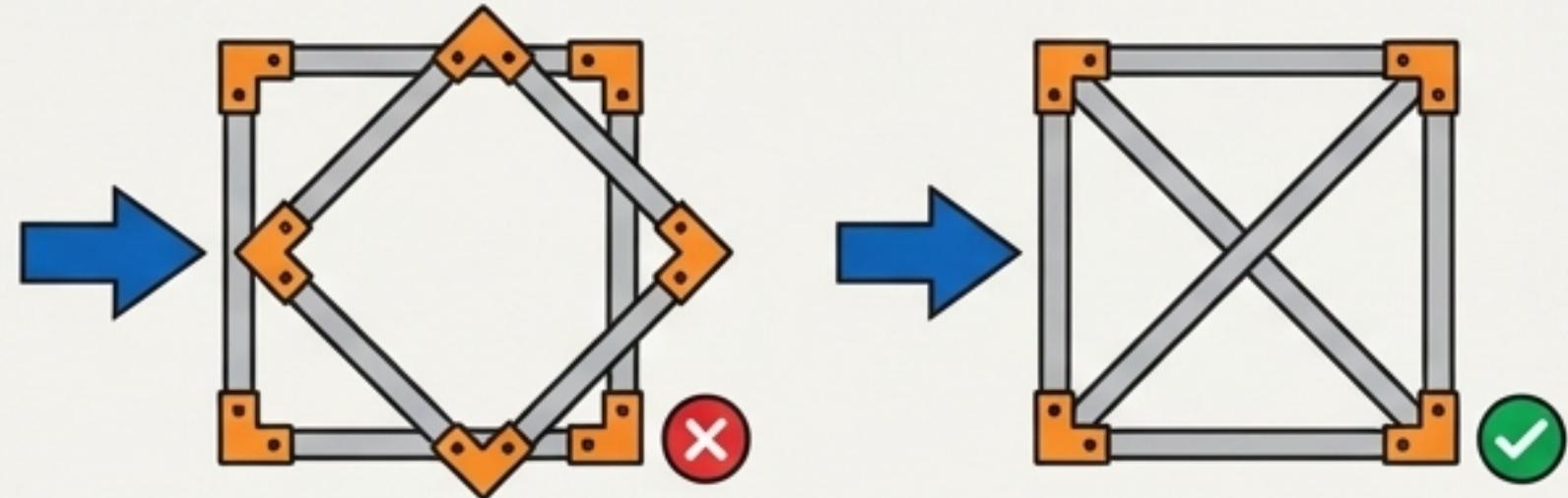
The goal is to design, build, test, and then improve your robot based on what you learn.

This cycle of improvement is the key to success.

Your most important tool is your **Engineering Notebook**. This is where you document everything: your ideas, your designs, your test results, and especially your failures. A good notebook tells the story of your robot's journey.

# Step 1: Building a Solid Foundation

The Chassis is Your Robot's Skeleton



## Structural Integrity

Build a strong frame that won't fall apart during a match. Triangles are your friend!



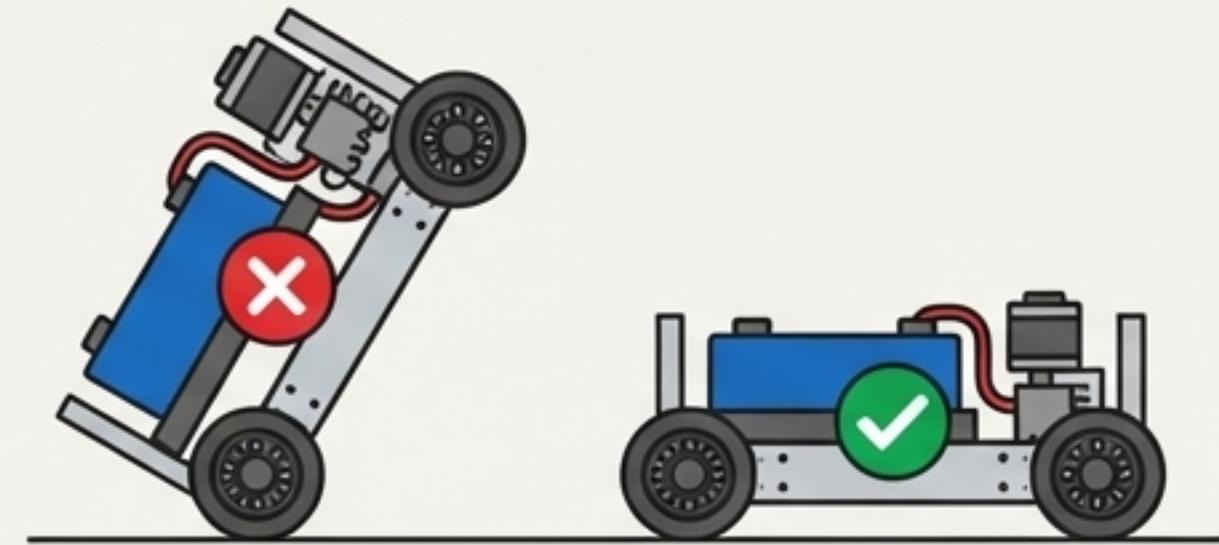
Standard 4-Wheel Drive



Lightweight 2-Wheel Drive



Advanced H-Drive



## Balance & Center of Gravity

A low center of gravity keeps your robot from tipping over. Keep heavy parts like batteries and motors low to the ground.



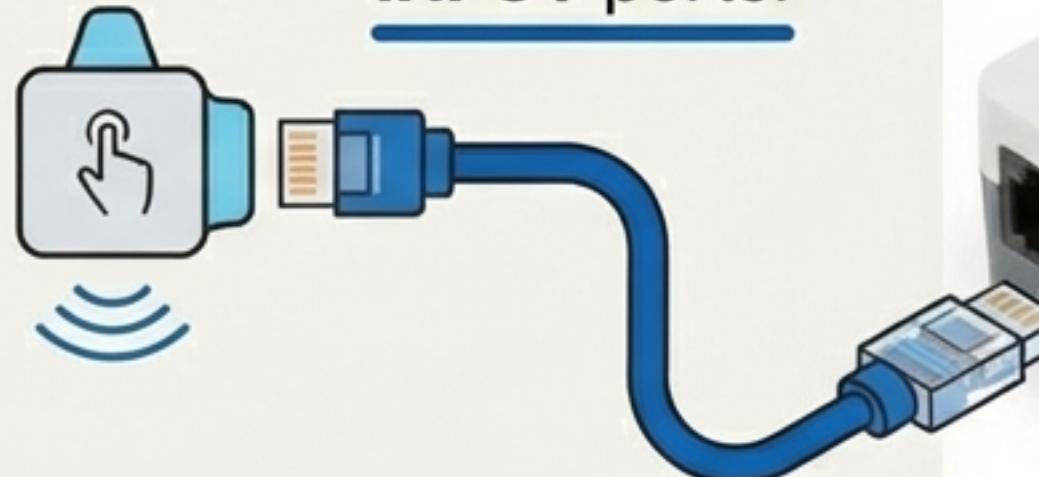
### HANDS-ON:

Assemble your robot's chassis. Test its strength. Can it support the brain and motors without bending?

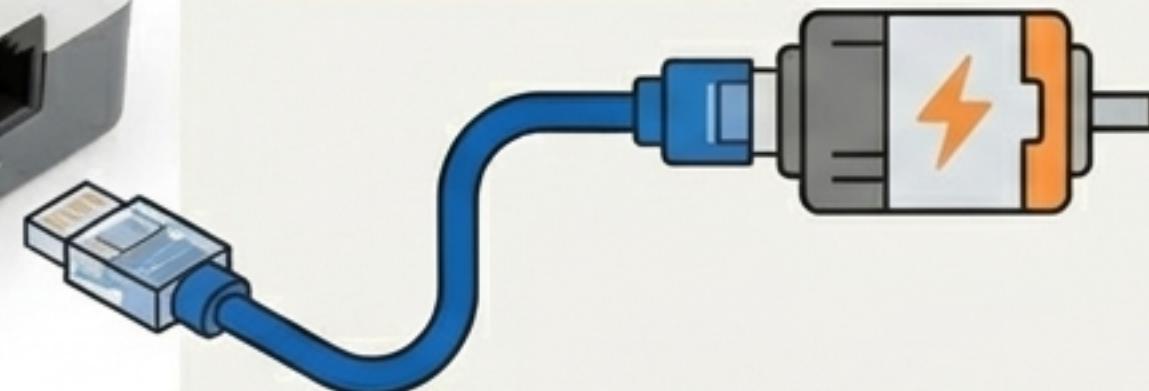
# Step 2: Giving Your Robot a Brain

The Controller is Your Command Center

Sensors plug into  
**INPUT** ports.



Motors plug into  
**OUTPUT** ports.



The controller is a powerful mini-computer. It runs your code, takes in information from sensors, and sends power and instructions to the motors. Every part of your robot plugs into the brain.

## HANDS-ON:

Mount the controller securely to your chassis and connect your drive motors to the correct ports.

# The Language of Robots: Learning to Code

## Start with Blocks



We start with block-based coding. You drag and drop blocks that represent commands. It's like putting puzzle pieces together to give your robot instructions. This lets you focus on the *logic* of your program without worrying about typos.

## Level Up to Text



translates to

`drivetrain.drive_for  
(FORWARD, 200, MM)`

As you advance, you can transition to text-based coding with languages like Python and C++. This gives you more power and flexibility. Professionals use text to build everything from self-driving cars to game engines.

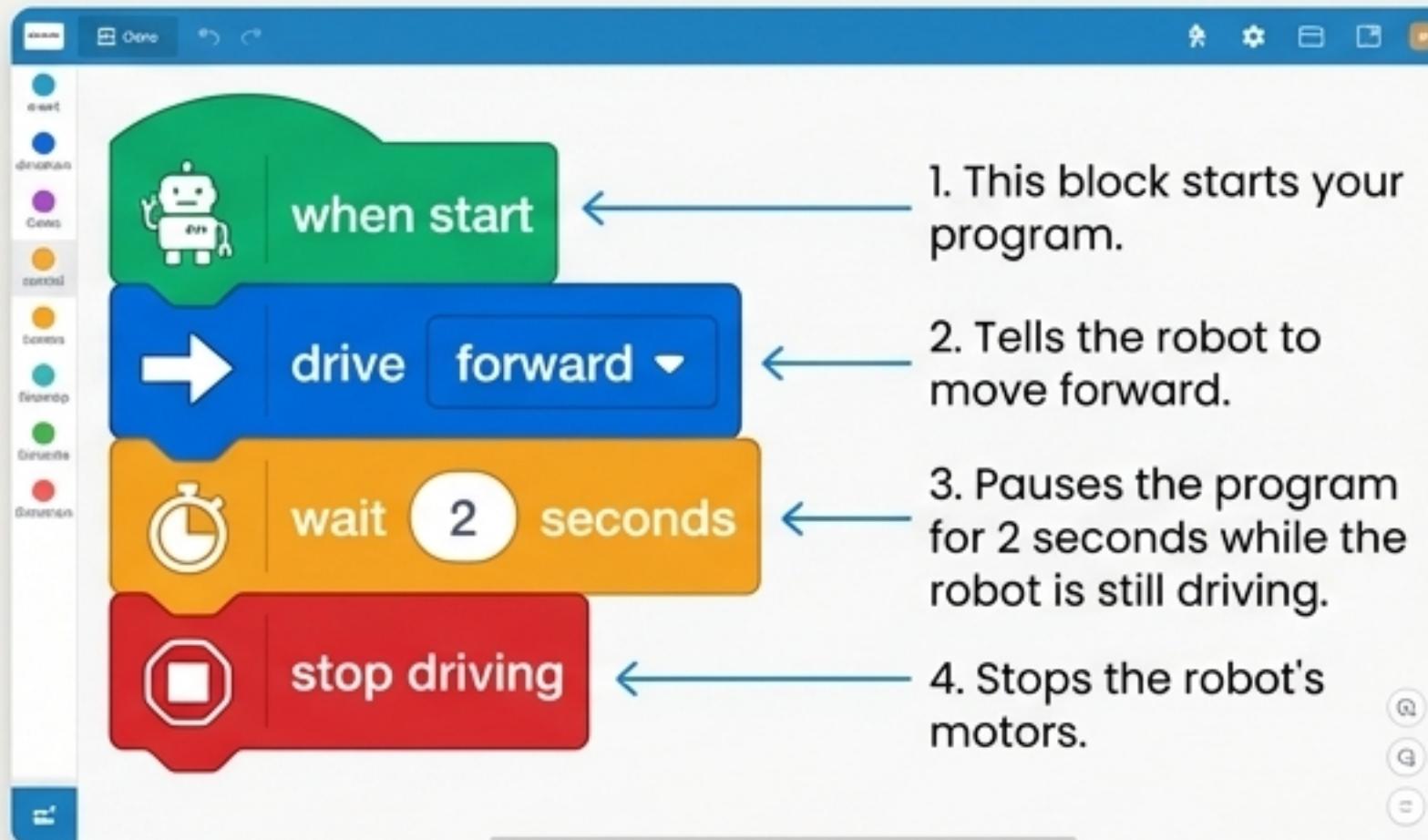


**PRO-TIP:** Think of Python as the language for high-level strategy (the 'intelligence') and C++ for fast, low-level reactions (the 'reflexes'). Both are powerful tools for a robotics engineer.

# Step 3: Let's Get Moving!

## Your First Program: The Two-Second Dash

**Your first mission:** Program your robot to drive forward for 2 seconds, then stop.



This simple sequence of commands tells the brain exactly what to do: when the program starts, turn the motors on, wait for two seconds, and then turn them off.

That's it—you've written your first autonomous program!



### HANDS-ON:

Write this code, download it to your robot's brain, and see it move for the first time!

# Step 4: Teaching Your Robot to Sense

## Using Sensors to Make Smart Decisions

### Your Senses



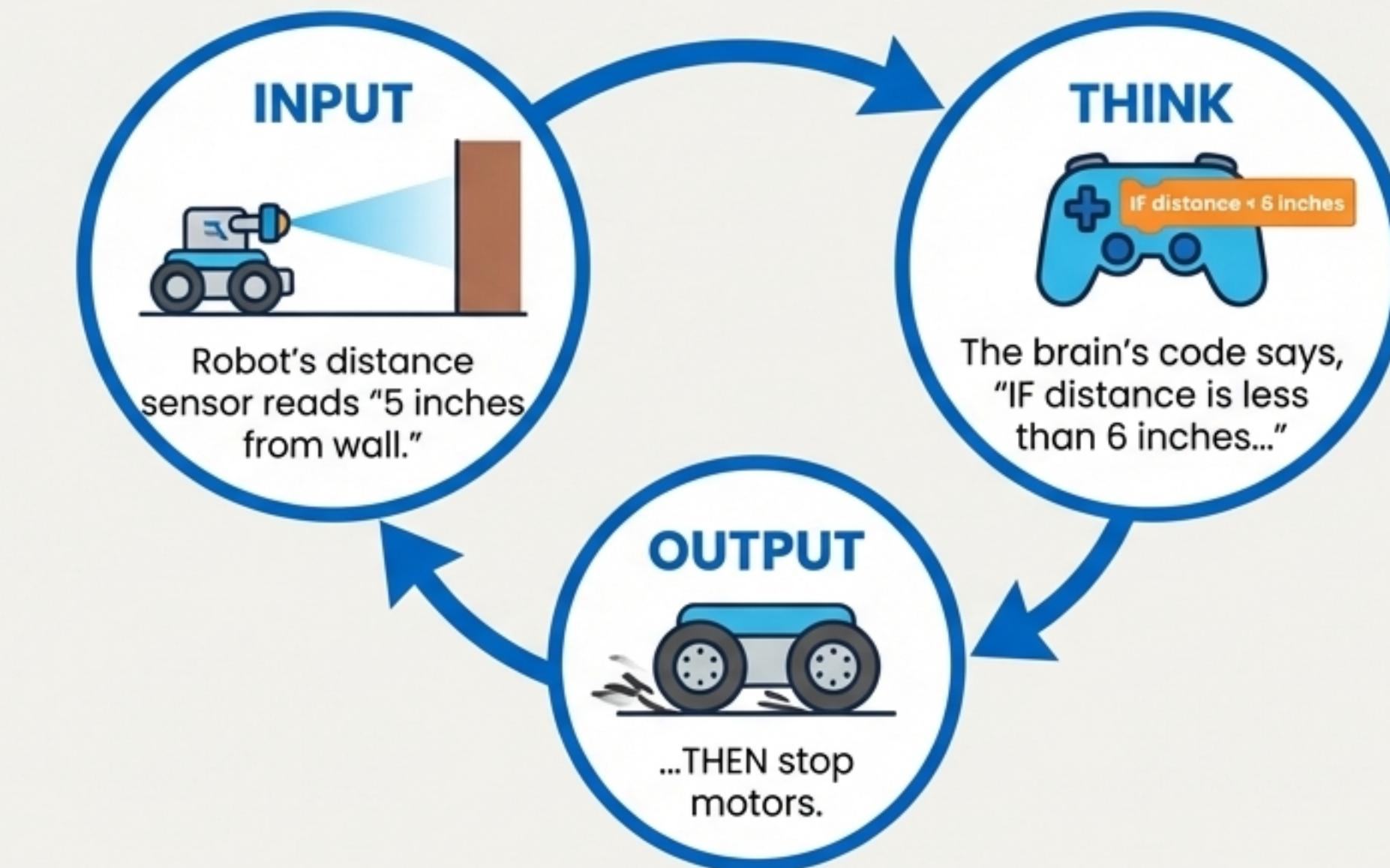
**Touch Sensor:** Feels when it bumps into something.



**Distance Sensor:** Sees how far away an object is using sound or light.



**Color Sensor:** Detects different colors on the ground.



### ACTIVITY:

Program your robot to drive forward until it senses a wall less than 6 inches away, and then stop on its own. This is the foundation of all autonomous robots!

# Your Superpower: Teamwork

No great robot was ever built by just one person. In engineering, collaboration is everything. Every successful team has members with different roles.



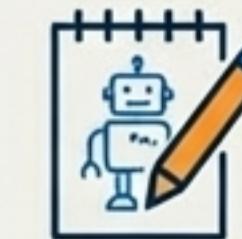
## Mechanical Lead

In charge of building the chassis and mechanisms.



## Programming Lead

Writes and tests the code that brings the robot to life.



## Designer

Sketches ideas and documents the process in the Engineering Notebook.



## Project Manager

Keeps the team on schedule and makes sure everyone is working together.



## Introducing Gracious Professionalism®

This is a core idea from FIRST Robotics: "It's about competing hard, but treating everyone with respect. You help other teams when they're in trouble, and they'll help you. It's how real pros work together to solve big problems."

# Your Final Challenge: Put Your Robot to the Test!

Choose one of the following missions for your team to conquer. Your goal is to design, build, and program your robot to successfully and repeatedly complete the task.



## Mission: Maze Runner

Can your robot autonomously find its way from start to finish?



## Mission: Line Follower

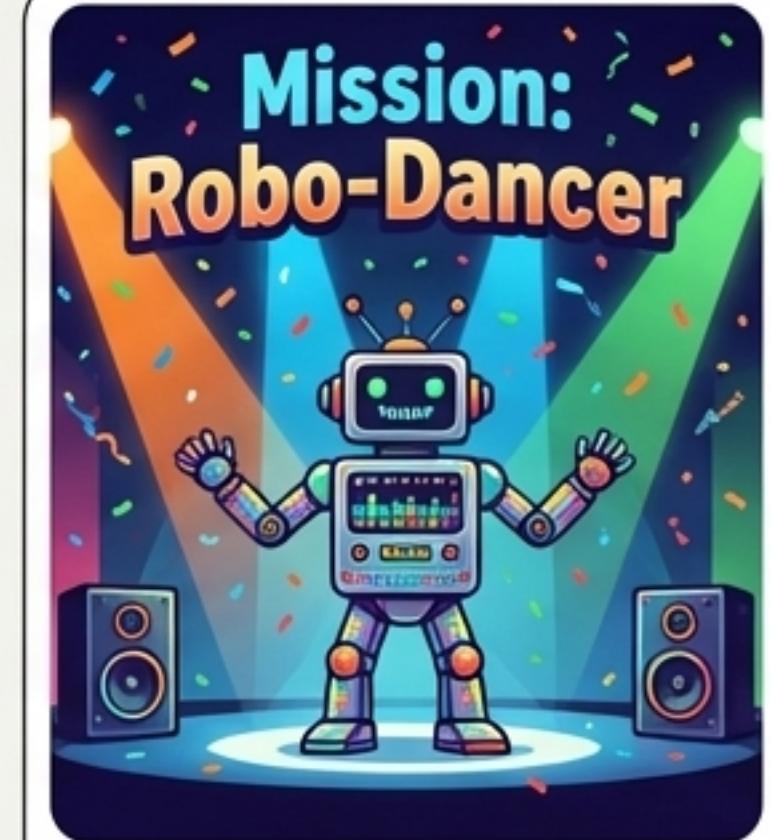
Program your robot to use its color sensor to follow a winding path.



## SUMO-BOT

## Mission: Sumo-Bot

Design a robot strong and smart enough to push another object out of a designated circle.



## Mission: Robo-Dancer

Program a synchronized routine to music. Show off your team's creativity and coding precision!

# Showcase Day: Present Your Creation

It's Time to Share Your Engineering Journey

On Showcase Day, Your Team Will:

- ✓ **Demonstrate:** Run your robot to complete its chosen mission for the class.
- ✓ **Present:** Use your Engineering Notebook to tell the story of your robot.
- ✓ **Explain:** Talk about your design choices. What was your biggest challenge? What part are you most proud of?
- ✓ **Reflect:** What would you do differently next time? What did you learn?

**"Celebrate the process, not just the product.  
Every team that designs, builds, and codes a working robot is a winner."**



# Your Engineering Journey is Just Beginning

## What's Next in School?



The skills you've learned are the foundation for high school robotics competitions. You can compete on teams that go to state, national, and even world championships!

## What's Next in a Career?



Robotics opens doors to incredible careers in engineering, artificial intelligence, video game design, and even space exploration.



## Explore More

Look into university programs like **Girls in STEM at Tulane (GiST)** or summer camps like the **MIT Women's Technology Program (WTP)** to take your skills to the next level.

**The robot you built today is your first step into a much larger world. Keep building. Keep learning. Keep creating.**