# FIRST Lego League Minicamp

Lesson 1

# Today's Goal

In today's class, we will look through the basics of the robot, and its' software.

# Downloading the Software

- If you have already downloaded the software, awesome!
- If not, please go to this link, and download the software: **https://education.lego.com/en-us/downloads/mindstorms-ev3/software**
  - If you can not download the software at this moment, don't worry! Please just make sure you have the software downloaded by next session, where we will ramp up our coding.

# Robot Essentials

# Robot Essentials

- **The Brick**
  - Ports
    - What is a port?
    - Types of ports
      - Motor Ports: A, B, C, D
      - Sensor Ports: 1, 2, 3, 4
- **Sensors**
  - What is a sensor?
  - Types of sensors
- **Motors**
  - What is a motor?

# Software Basics

# Software Basics

- What does the software look like?
  - Block programming
    - Types of blocks
  - Managing projects
  - Viewing sensor values

# FIRST Lego League Minicamp

Lesson 2

## Today's Goal

In today's class, we will look through the basics of movement with the robot. We will also look at some good practices while coding.

# Downloading the Software (From Last Time)

- If you have already downloaded the software, awesome!
- If not, please go to this link, and download the software: **https://education.lego.com/en-us/downloads/mindstorms-ev3/software**

# Software Good Practices

## Software Good Practices

# What is a good practice?

# Software Good Practices

- Some examples may be waking up early, making your bed, or exercising
- Doing all of these activities will probably improve your mood, and overall improve your quality of life.
- Similarly in coding, there are steps we can take to make our lives easier in the long run, and improve the quality of our code.

## Software Good Practices

1. Pseudocode
2. Commenting Code

# Introduction to Movement

# Introduction to Movement

What are the different ways that a car moves?

# Introduction to Movement

- Though there are many ways that a car moves, it boils down to turning, and moving straight.
- This is the exact same for our robot as well, but unlike a car, there are many different ways we can code this movement.

# FIRST Lego League Minicamp

Lesson 3

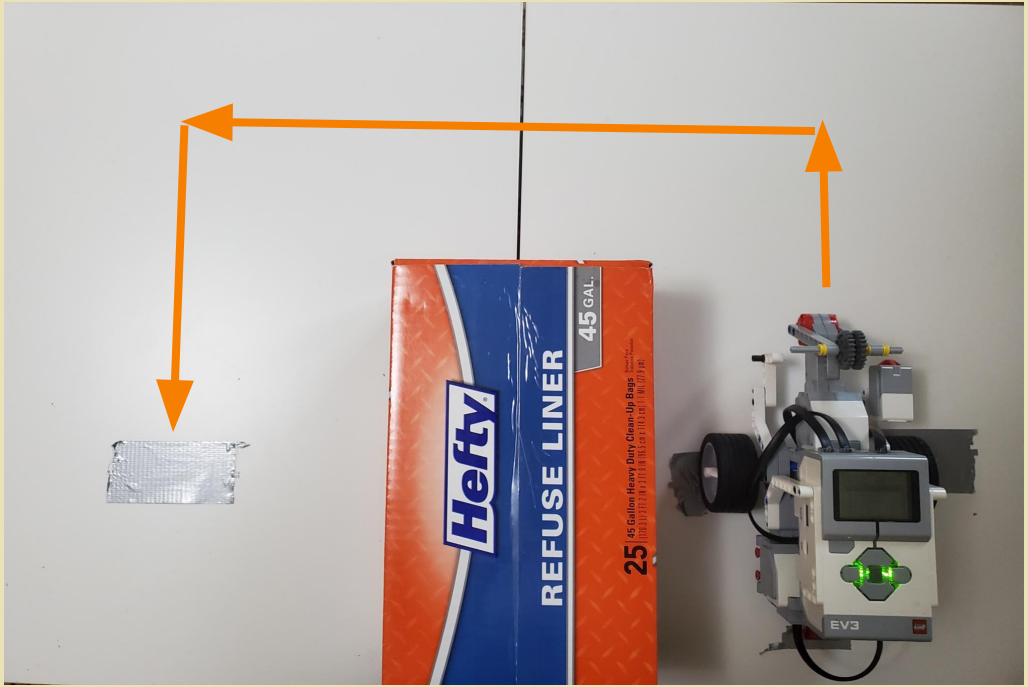
# Today's Goal

In today's class, we will use the basics of movement to program our robot to complete a challenge.

# Review

We will review the main blocks that we have used, and learned in the last two classes.

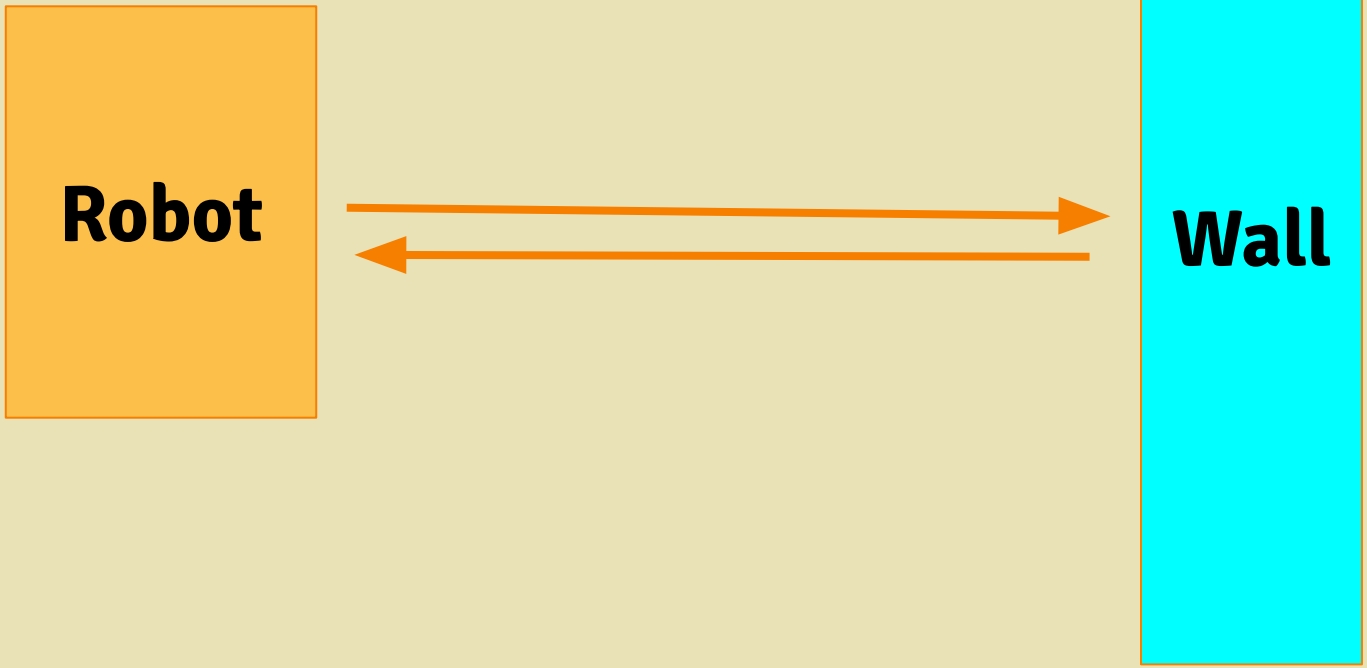
# The Challenge

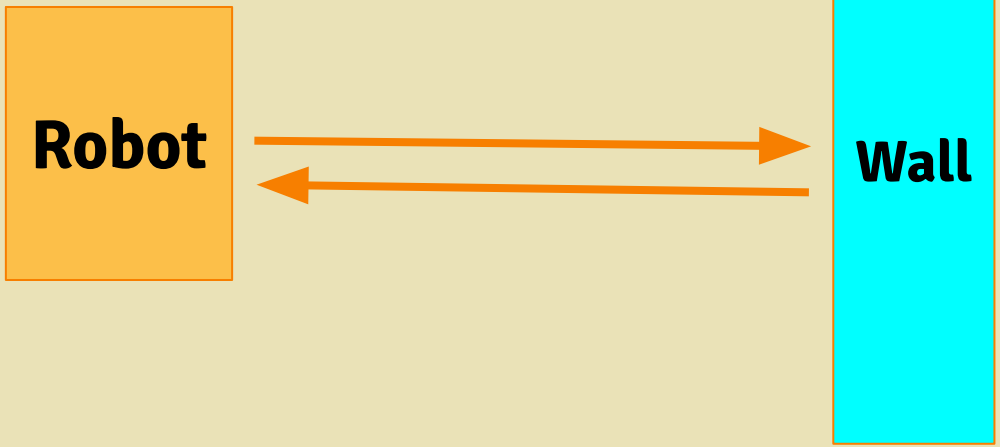


# First, let's write some pseudocode!

# What is pseudcode?

It is a set of instructions, usually written in english, which describes what our code needs to do.

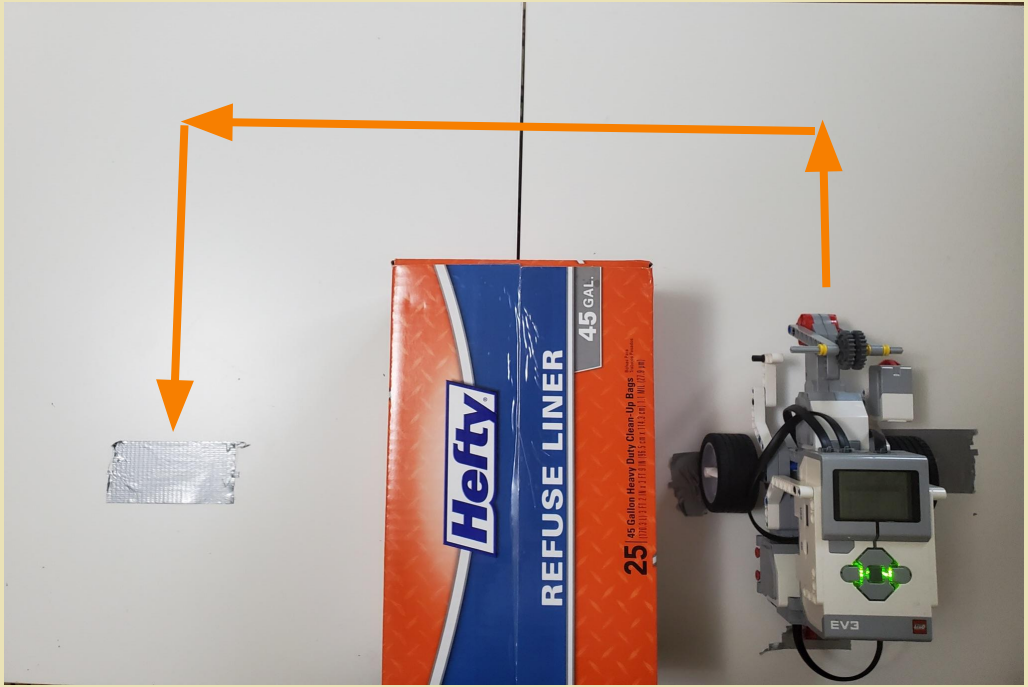

Robot
Wall




## Example

The robot needs to go forward until it hits the wall, turn 180 degrees, and then go forward the exact same amount of rotations to return to its starting location.

# Pseudocode



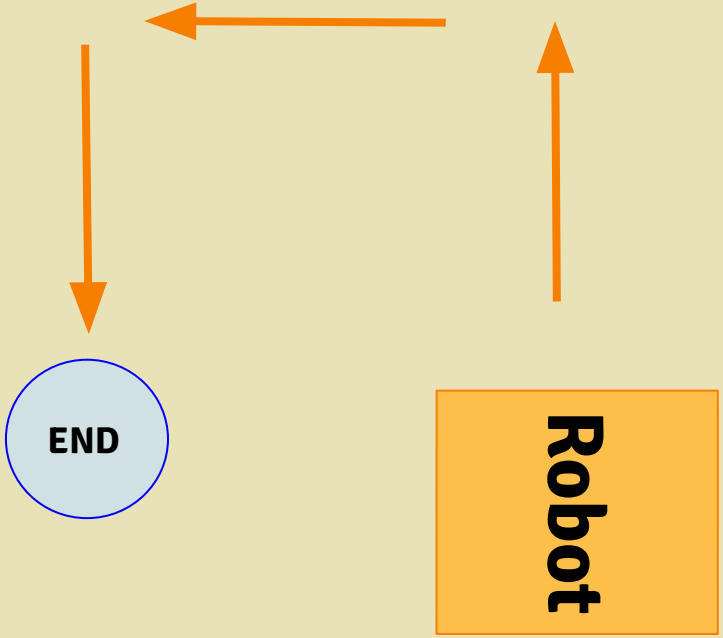
# FIRST Lego League Minicamp

Lesson 4

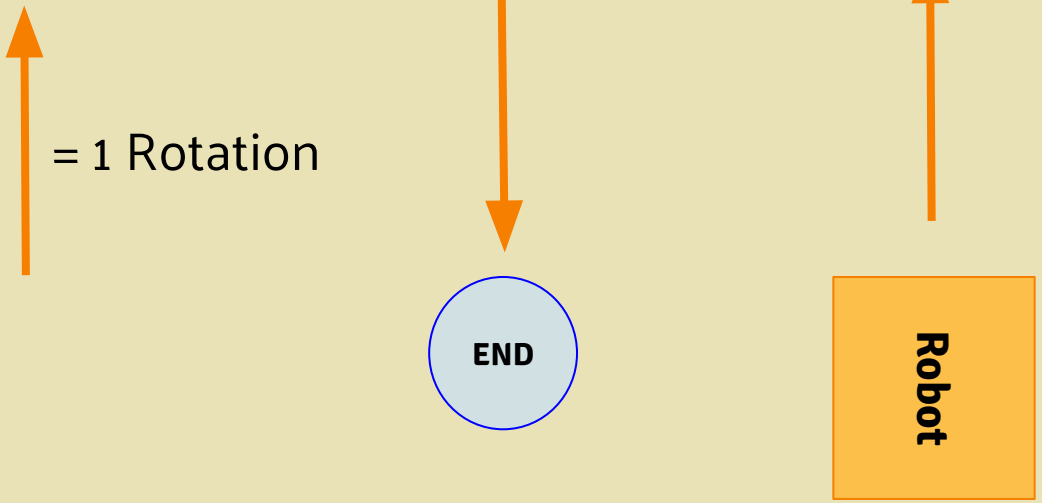
## Today's Goal

In today's class, we will learn about loops, and conditionals/switches, and use them by programming our robot to complete tasks.

= 1 Rotation



# What would be our pseudocode for this challenge?



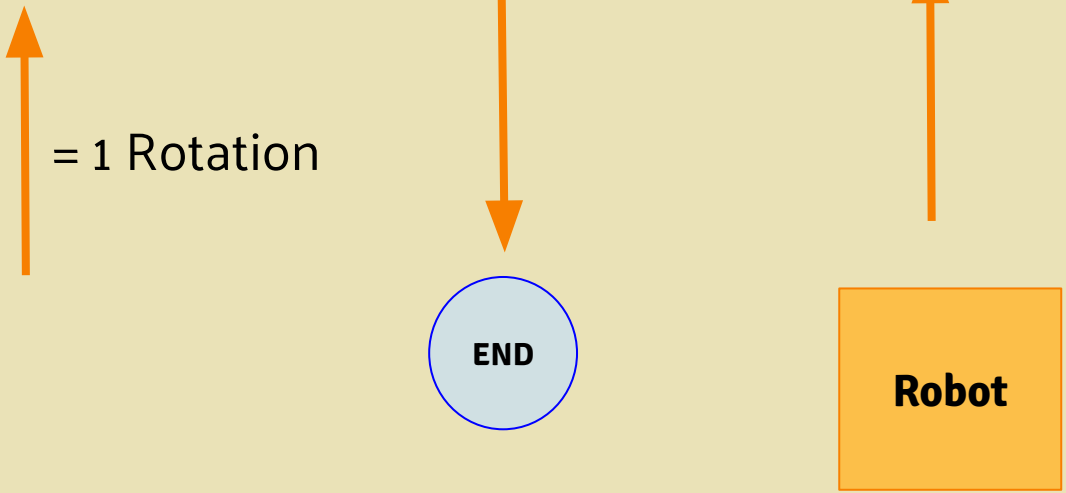

## Example

The robot needs to turn left 90 degrees, go forward one rotation, turn left 90 degrees, go forward one rotation, turn left 90 degrees, and then go forward one rotation.

**It's really messy, and complicated!**

# How can we make this simpler?

# Loops!




## Example

Step 1: Go forward 1 rotation, and then turn left
Step 2: Do Step 1 two more times

**This allows our code to be shorter, and simpler.**

# Let’s try it on the robot!

# Conditionals

# What is a condition?

“If you do your homework, I will give you ice cream after dinner.”

# Conditionals in EV3

- If block
  - If a condition is met, the robot will follow the code given
- If else block
  - If a condition is met, the robot will follow the code given, and if it isn't met, the robot will follow another set of code which is given

# FIRST Lego League Minicamp

Lesson 5

# Today's Goal

In today's class, we will discuss the basics of sensors, starting with touch, and light sensors.

# Firstly, what is a sensor?

## Sensors

A sensor is something that detects, or measures something, and allows you to respond to those findings.

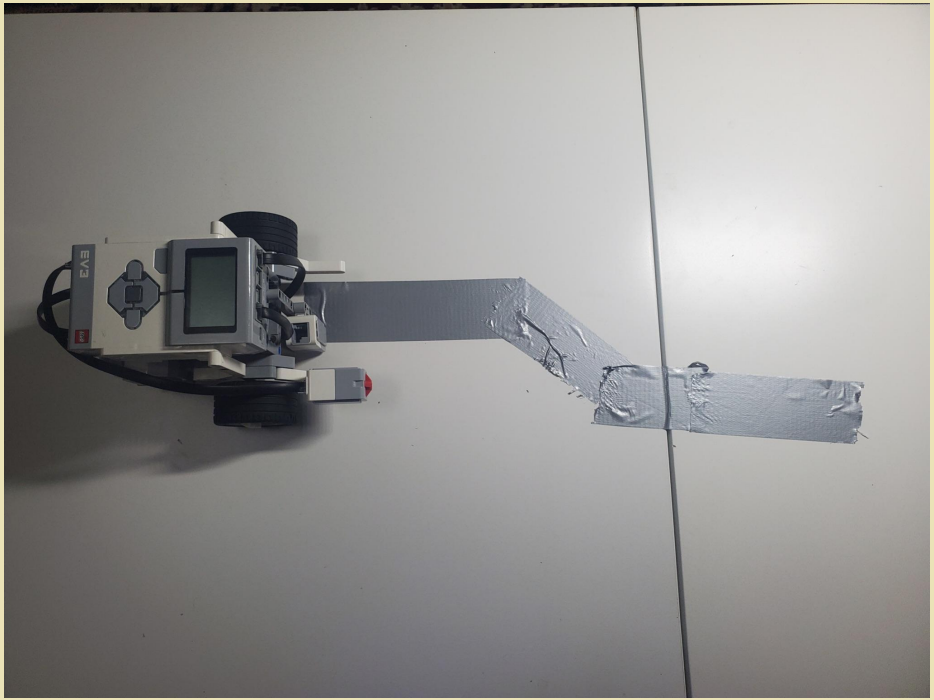
In First Lego League, we have many different types of sensors.

Today, we will be focusing on two sensors. Light, and Touch.

# Usages for the Light Sensor

- One of the main usages of the light sensor is to detect lines, we can do so by measuring the reflected light intensity.
  - This measures how much light is bouncing back up into the sensor
    - For example black reflects little light, so the value (a percentage) would be low, such as 10 to 20 percent. White reflects more light, so the value should be higher, ideally close to 100%.
- By setting a threshold value, like 50%, and having a black line, and a white table, we can tell the robot to go towards the table if it sees the line, and go towards the line if it sees the table
  - This way we can make small errors, and then correct them, allowing us to follow the edge of the line.

# Usages for the Light Sensor



# Usages for the Touch Sensor

- With the touch sensor, we can detect two states, 0 if the touch sensor not pressed, and 1 if it is pressed
  - With this information, we can orient our robot along walls, or stop us from running into objects
  - In the code to the right, we go forward until the touch sensor touches the wall, and then the robot moves backwards 2 rotations.

# FIRST Lego League Minicamp

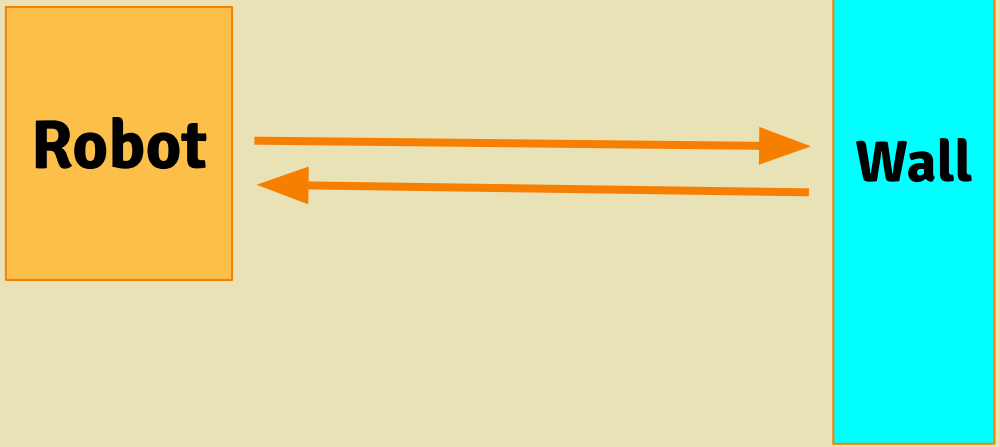
Lesson 6

# Today's Goal

In today's class, we will use everything we have learned from the minicamp to successfully complete a challenge.

# The Challenge

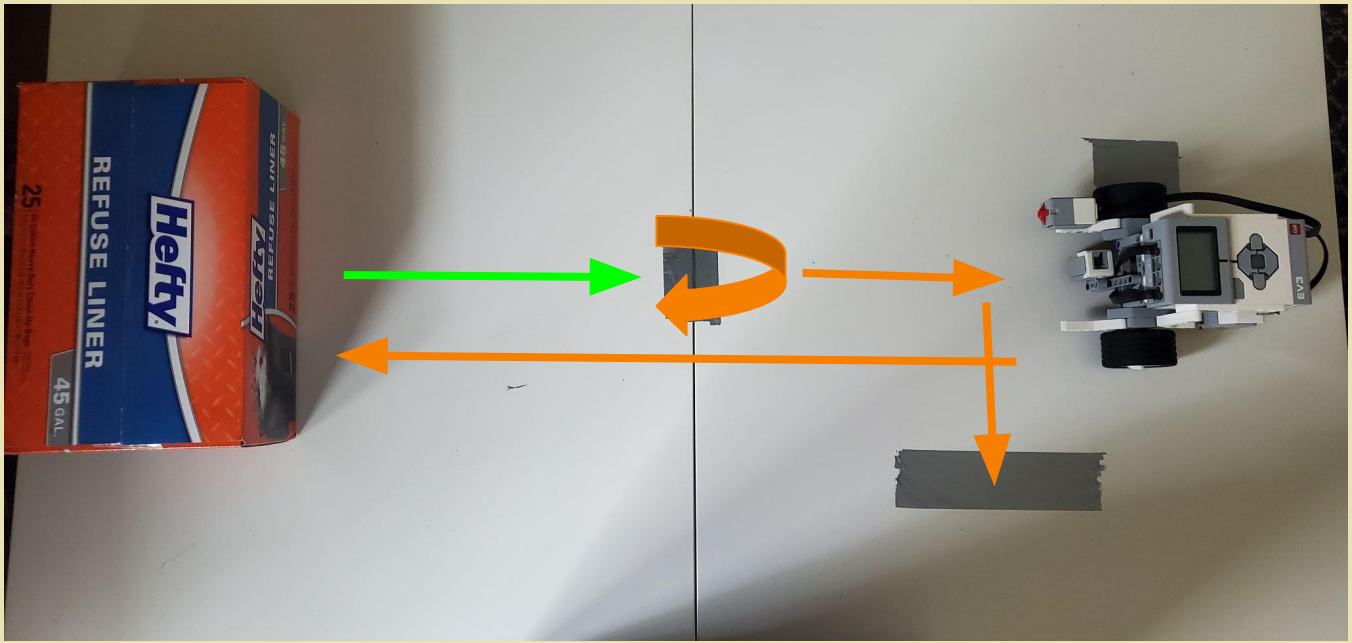
# First, let's write some pseudocode!




## Example

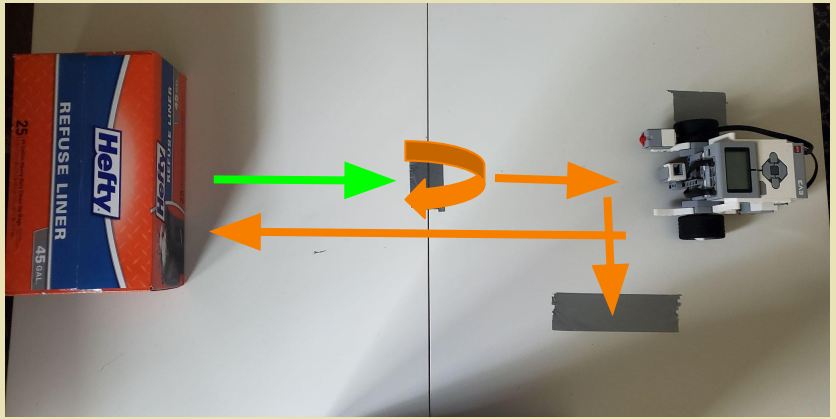
The robot needs to go forward until it hits the wall, turn 180 degrees, and then go forward the exact same amount of rotations to return to its starting location.

# The Challenge: Pseudocode



# The Challenge

Once you have written the pseudocode, you can begin to write the actual code for the robot! After you complete the challenge, you have successfully completed this introductory tutorial!




**Congratulations!!!**