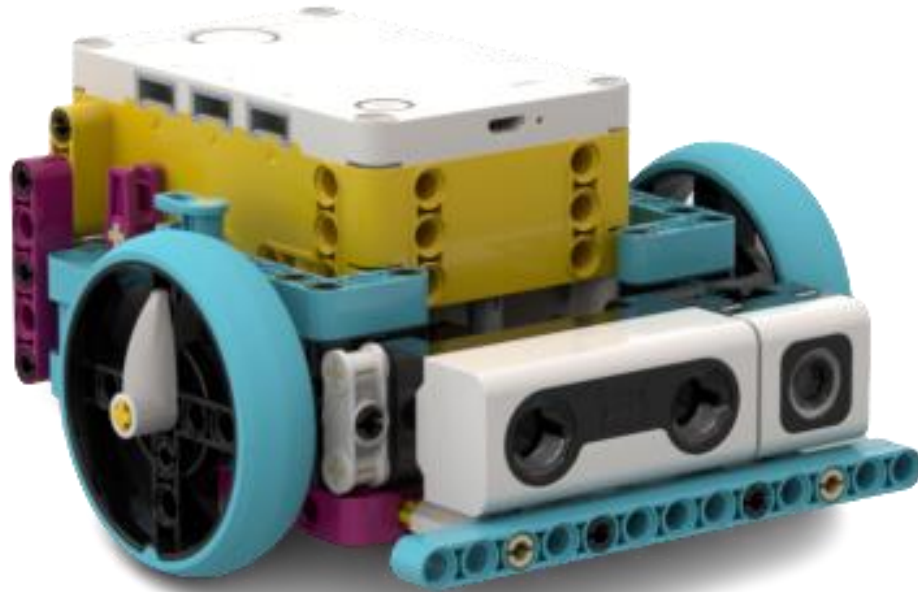


FORCE SENSOR



Learning Goals

- Build knowledge about coding and robotics by coding a sensor and making a robot move.
- Read, debug, and alter code featuring conditional statements to use sensor input to determine how a robot should move.
- Have FUN learning!



FORCE SENSOR

Do you need to review the Getting Started document?

Do you have the Robocar with Spike attached?
Is Spike turned on?

Is the LEGO Spike app open and on screen?
Is Spike connected and ready to use?

Do you know how to download programs to Spike and
select programs from Spike?

Do you know how to move and steer the Robocar?



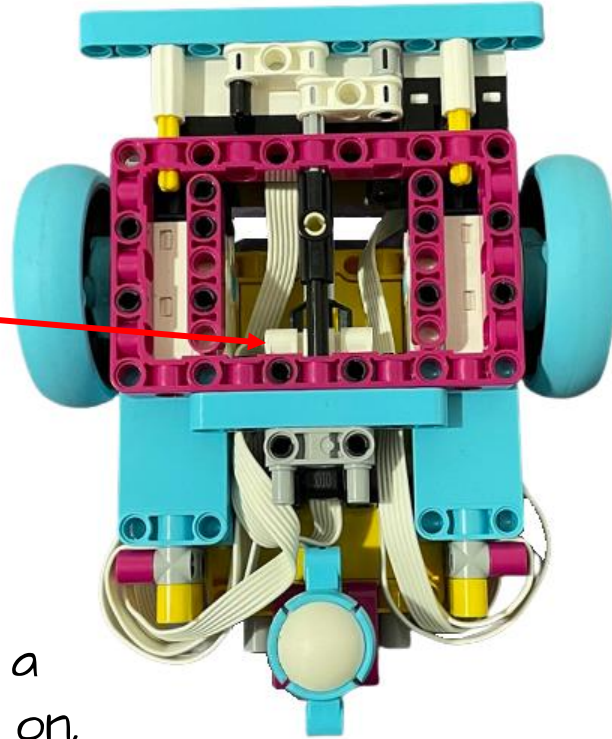
FORCE SENSOR

This is the LEGO Spike force sensor.



The force sensor is connected to the front bumper of the Robocar.

The force sensor is essentially a push button switch. Pushed it is on, released it is off. It can also measure force applied.



FORCE SENSOR

LEGO Education SPIKE - 2.0.6

File Help

×

- Home
- Start
- Units
- Build
- My Projects

?

Help

Settings

SPIKE Prime

Get started with SPIKE™ Prime

Learn to use SPIKE Prime in 6 easy steps!


START

Recent projects


+
New Project

← Click the New Project button.

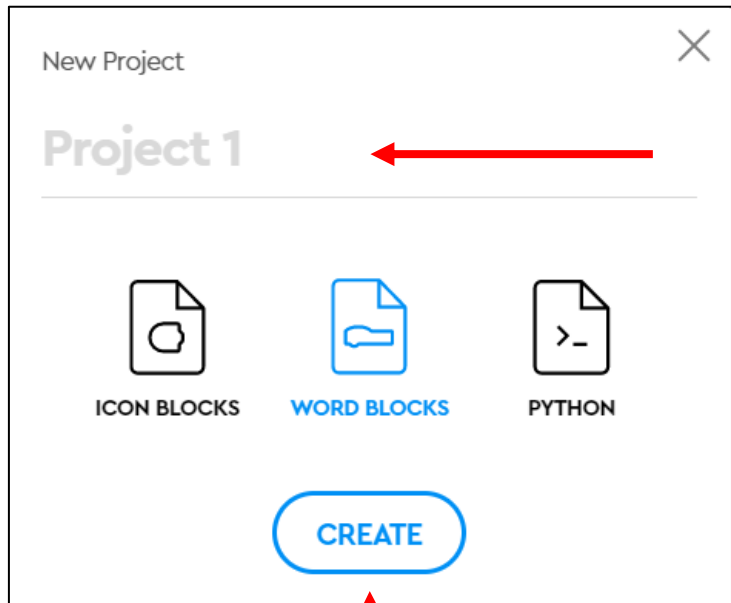
Unit Plans



Building Instructions



FORCE SENSOR



Click WORD BLOCKS and then the CREATE button.

OR



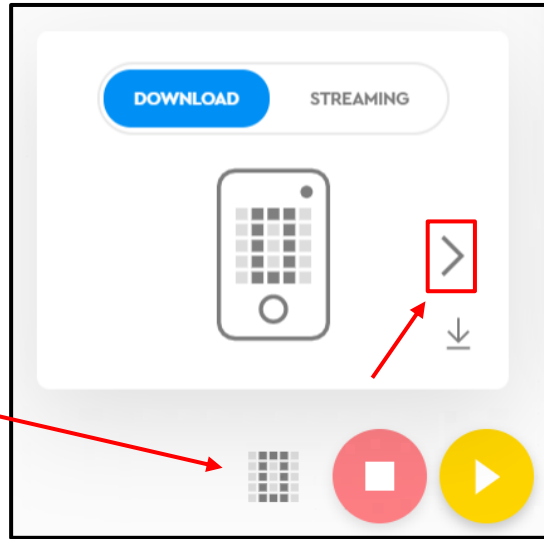
Name your program.

- Click the three dots
OR click in the
New Project window.
- Name your project:
Force-_____ *(your names)*.

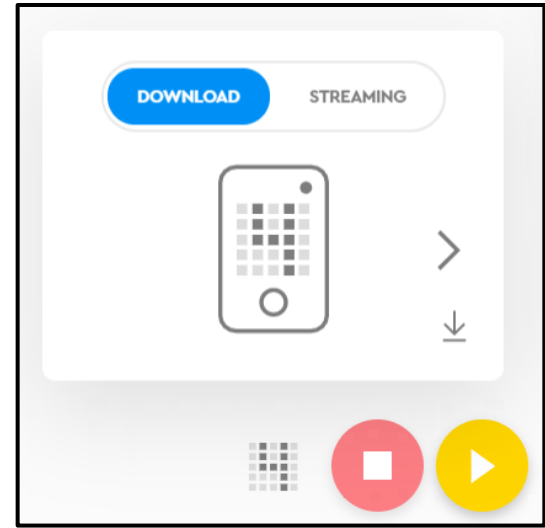


FORCE SENSOR

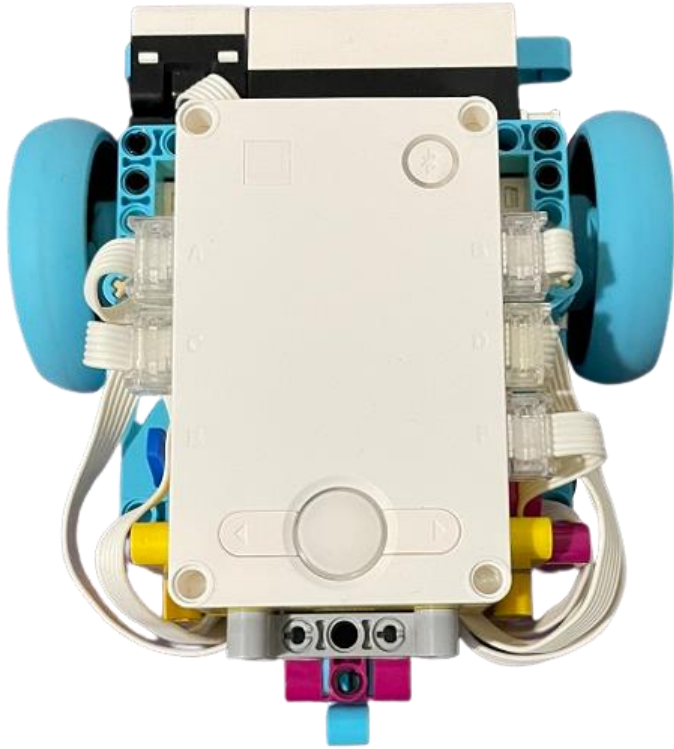
Click the program memory slot button.



Change the program memory slot to four.



FORCE SENSOR



The Robocar motors are connected to ports A and B and the force sensor is connected to port F.

If for some reason any of these devices are not connected to the proper ports, please let Mr. Desmond know.



FORCE SENSOR

Force Sensor - Exploration 1

Activity Goals

- 1) To explore how to use the force sensor to allow the robot to independently respond to environmental situations using input information from the sensor to direct robot actions.
- 2) To demonstrate precision of movement of the robot while using the force sensor.
- 3) To understand coding using the wait until conditional statement in combination with the force sensor.



FORCE SENSOR

Force Sensor - Exploration 1

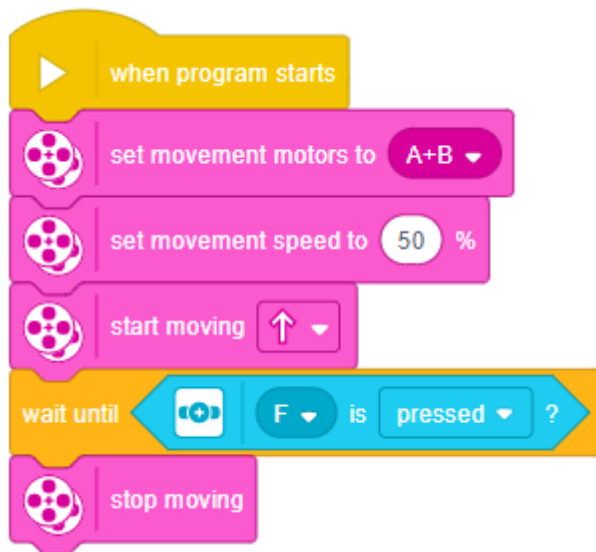
Activity Steps

- 1) Create the Go There code sequence to move the Robocar and test how the force sensor works. [Go There](#)
- 2) Learn about the wait until conditional statement. [Code Explained](#)
- 3) Create the Force and Turn code sequence. [Touch and Turn](#)
- 4) Answer questions and explain your ideas. [Explain](#)

FORCE SENSOR

Force Sensor - Exploration 1 - Go There

Create a code sequence to have the Robocar move toward a large wooden block and use the force sensor to stop the Robocar when the front bumper is pushed.



Ask for a large wooden block to use as your target object.

Go to the next page. 

FORCE SENSOR

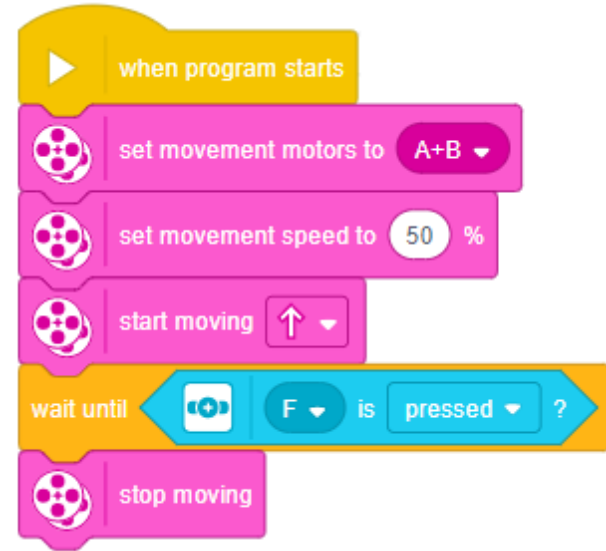
Force Sensor - Exploration 1 - Go There

Download the program to Spike.

Move to an appropriate test area.

Run the program from Spike.

Observe how the Robocar moves.

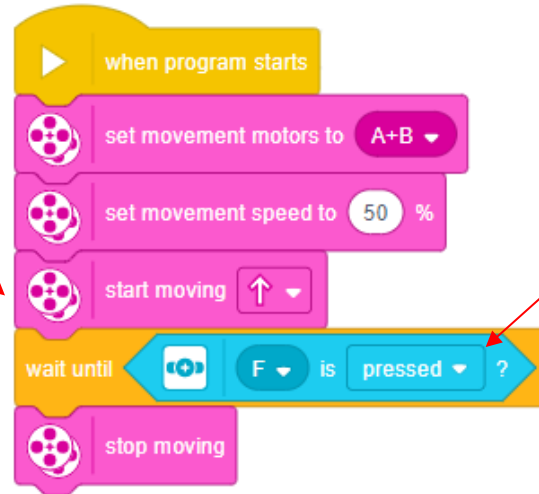


FORCE SENSOR

Force Sensor - Exploration 1

The "wait until" command is a conditional statement that basically monitors what the force sensor is doing. The "wait until" code block allows the commands prior to it to perform until the force sensor is pressed. Only then will the coding sequence continue.

This means move - the duration is not defined. The duration is unlimited: it could be any value above zero to infinity.



The "wait until" condition is equivalent to saying "always check to see if the force sensor has been pressed, if true then run the next command".



FORCE SENSOR

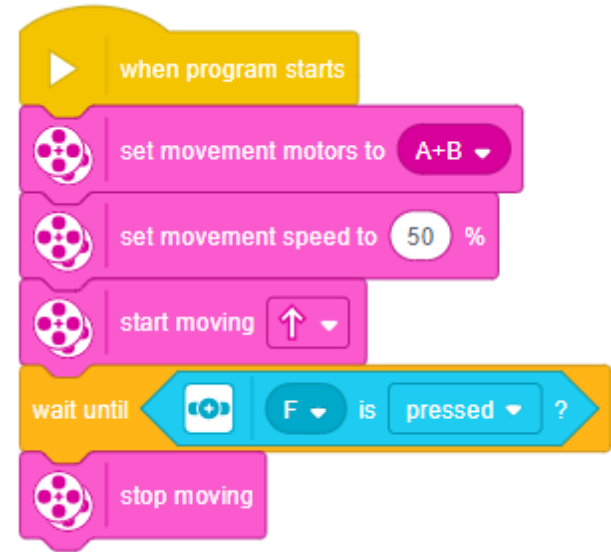
Force Sensor - Exploration 1

"Wait until" is a conditional statement. Without thinking about it you use it all the time.

I want to play my game. I must **wait until** it is loaded. Then I can play.

I want a slice of toast. I must **wait until** it is cooked. Then I can eat it.

In this code sequence the Robocar will move and **wait until** the force sensor is pressed. Only when the force sensor is pressed will the motors will stop moving.



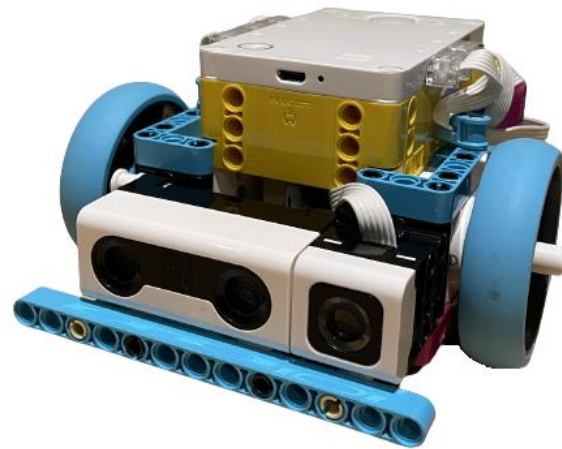
FORCE SENSOR

Force Sensor - Exploration 1 - Touch and Turn

Create a code sequence to have the Robocar move toward a large wooden block. Use the force sensor to stop upon contact with the block (when the front bumper is pushed), move backward, and then complete a 180° turn.

Download the program to Spike.

Run the program from Spike.



FORCE SENSOR

Force Sensor - Exploration 1

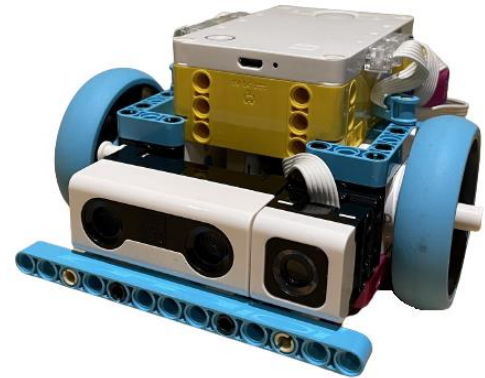
Think about it, discuss your ideas as a group, and then write down your answers on a sheet of paper.



- 1) Explain what the conditional statement "wait until" means and what it does.
- 2) What is the purpose of backing up prior to turning?

Show Mr. Desmond your Touch and Turn coding and the Robocar in action.

Be prepared to explain what is happening with the Robocar and the force sensor and why.



FORCE SENSOR

Force Sensor - Exploration 2

Activity Goals

- 1) To explore how to use the force sensor to allow the robot to independently respond to environmental situations using input information from the sensor to direct robot actions.
- 2) To demonstrate precision of movement of the robot while using the force sensor and a repeat block.
- 3) To deepen understanding of how to use the wait until conditional statement in combination with the force sensor.



FORCE SENSOR

Force Sensor - Exploration 2

Activity Steps

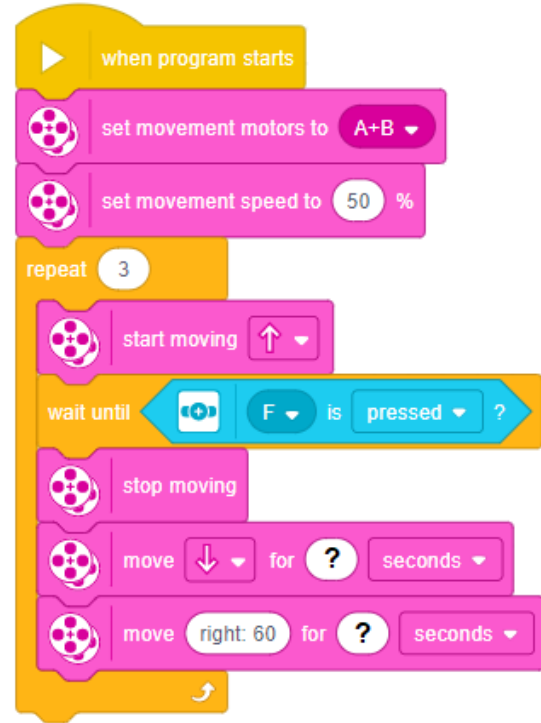
- 1) Create the Ping-Pong code sequence to move the Robocar and test how the force sensor works. [Ping-Pong](#)
- 2) Answer questions and explain your ideas. [Explain](#)

FORCE SENSOR

Force Sensor - Exploration 2 - Ping-Pong

Create a code sequence to have the Robocar go back forth between two wooden blocks repeatedly using input from the force sensor to determine when to turn around.

It is up to you to figure out how much time is necessary to move backward and how much time is necessary to turn. The turn may need to be a left turn or a right turn.



Do not download your code yet. Go to the next page.



FORCE SENSOR

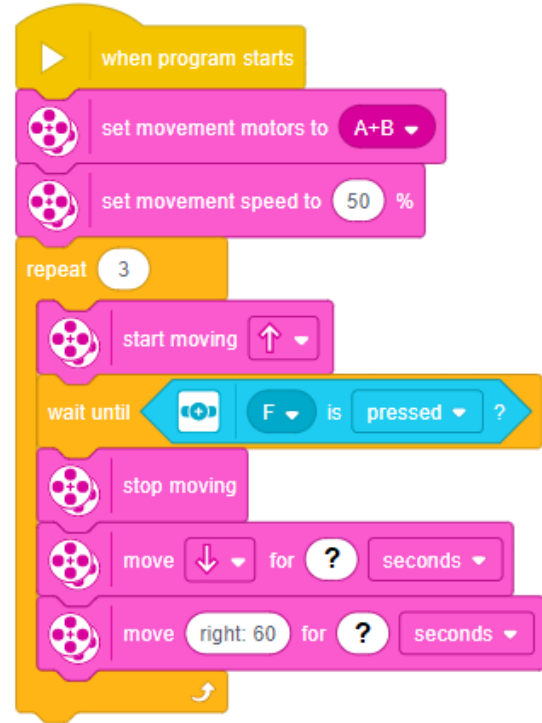
Force Sensor - Exploration 2 - Ping-Pong

Having the "wait until" command embedded within a repeat block will cause the "wait until" condition to happen multiple times as the Robocar "ping-pongs" back and forth between the two wooden blocks.

Keep the wood blocks about 50 cm apart.

Precision of movement is required to keep the Robocar as straight as possible and not veer in different directions after each turn.

Make sure your code is complete, then go to the next page. 



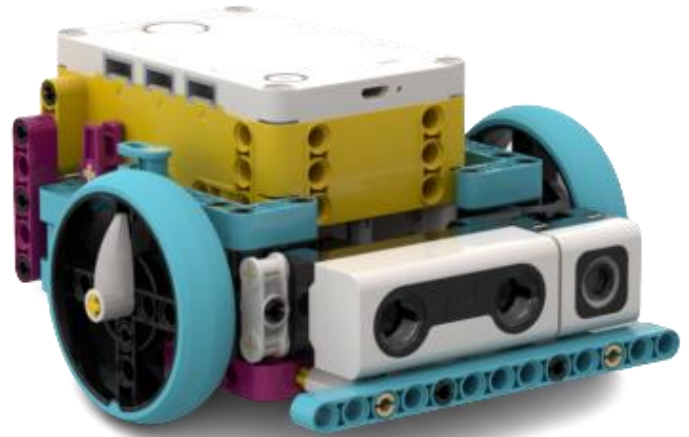
FORCE SENSOR

Force Sensor - Exploration 2 - Ping-Pong

Download the program to the Spike.

Run the program from the Spike.

Observe how the Robocar moves
and modify the program as needed.



FORCE SENSOR

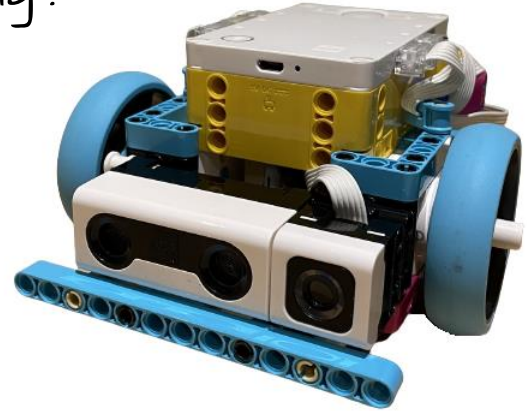
Force Sensor - Exploration 2

Think about it, discuss your ideas as a group, and then write down your answer on a sheet of paper.

1) Explain how the wait until and repeat blocks are working together to make the Robocar "ping-pong".

Show Mr. Desmond your Ping-Pong coding and the Robocar in action.

Be prepared to explain what is happening with the Robocar and the force sensor and why.



FORCE SENSOR

Force Sensor - Exploration 3

Activity Goals

- 1) To explore how to use the force sensor to allow the robot to independently respond to environmental situations using input information from the sensor to direct robot actions.
- 2) To understand coding using variables to collect data in conjunction with conditional statements and a sensor.



FORCE SENSOR

Force Sensor - Exploration 3

Activity Steps

- 1) Create the Ping-Pong Count code sequence to move the Robocar and count each time it contacts a block and the force sensor is pressed. [Ping-Pong Count](#)
- 2) Answer questions and explain your ideas. [Explain](#)

FORCE SENSOR

Force Sensor - Exploration 3 - Ping-Pong Count

Modify your repeated sequence code from Exploration 2.

Create a variable called count.

Have the Robocar count each time the force sensor is pressed.

Include the count as part of the conditional coding as the Robocar "ping-pongs" back and forth between the two wooden blocks.

Have the Robocar continue to move between the two wooden blocks until the count has reached seven.



FORCE SENSOR

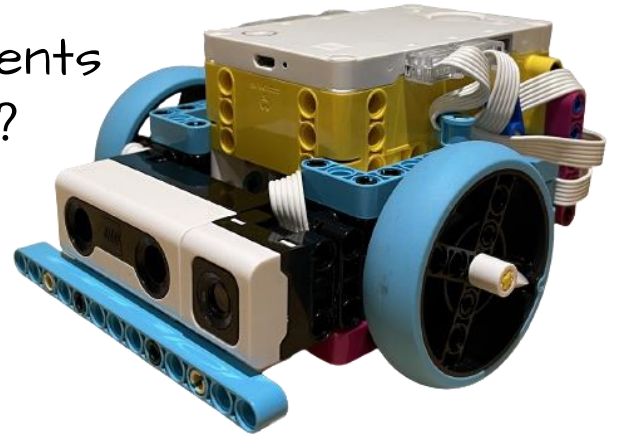
Force Sensor - Exploration 3

Think about it, discuss your ideas as a group, and then write down your answers on a sheet of paper.

- 1) What "repeat" block did you need to use to complete your program?
- 2) What other code blocks and code segments did you need to complete your program?




Show Mr. Desmond your coding using the count variable and the Robocar in action.

Be prepared to explain what is happening with the Robocar and the force sensor and why.



FORCE SENSOR CHALLENGE

Learning Goals

-  Build knowledge about coding and robotics by coding a sensor and making a robot move.
-  Independently create code featuring conditional statements to use sensor input to determine how a robot should move.
-  Have FUN learning!



FORCE SENSOR CHALLENGE

The Four Wall Challenge!

Create the code that will allow the Robocar to navigate around a walled area using the force sensor bumper to determine when to stop moving and turn.



The Robocar bumper must contact all four walls.



You are expected to demonstrate your success to Mr. Desmond. You will be asked to show both the Robocar in action and your code.