

TOUCH 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!



TOUCH SENSOR

Do you need to review the Getting Started document?

Do you have the Robocar with the EV3 attached?

Is the EV3 turned on?

Is the LEGO EV3 Classroom app open and on screen?

Is the EV3 connected and ready to use?

Do you know how to download programs to the EV3 and select programs from the EV3?

Do you know how to move and steer the Robocar?



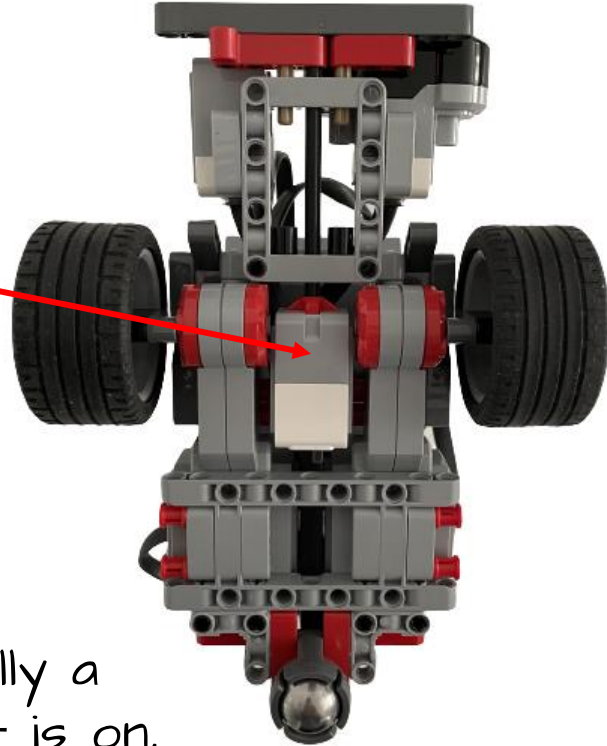
TOUCH SENSOR

This is the LEGO EV3 touch sensor.

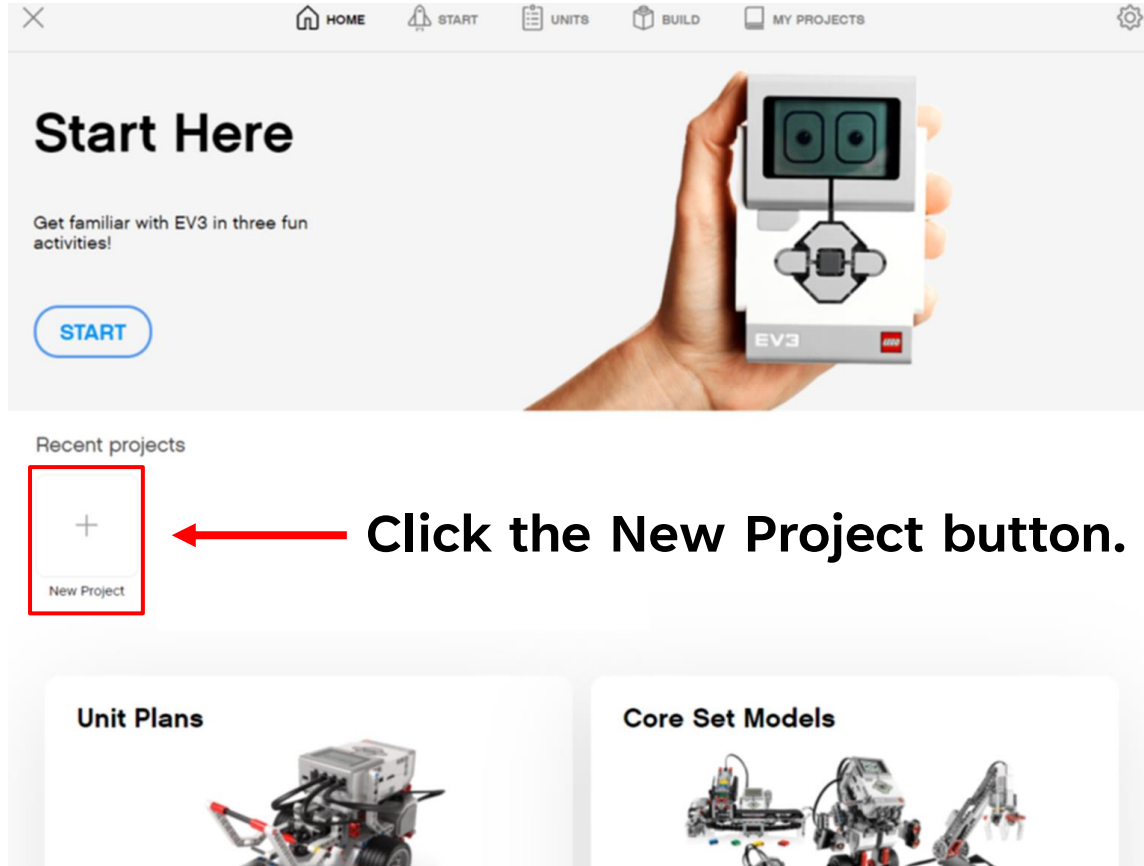


The touch sensor is connected to the front bumper of the Robocar.

The touch sensor is essentially a push button switch. Pushed it is on, released it is off.



TOUCH SENSOR



The screenshot shows the LEGO EV3 software interface. At the top, there is a navigation bar with icons for HOME, START, UNITS, BUILD, and MY PROJECTS, along with a settings gear icon. The main content area features a large image of a hand holding the EV3 brick. Below this, the text "Start Here" is displayed, followed by "Get familiar with EV3 in three fun activities!" and a blue "START" button. Underneath, the "Recent projects" section contains a "New Project" button, which is a square with a plus sign and the text "New Project" below it. A red arrow points to this button from the text "Click the New Project button." Below the "Recent projects" section, there are two categories: "Unit Plans" with a small image of a robot, and "Core Set Models" with a larger image of a robot.

Start Here

Get familiar with EV3 in three fun activities!

START

Recent projects

+

New Project

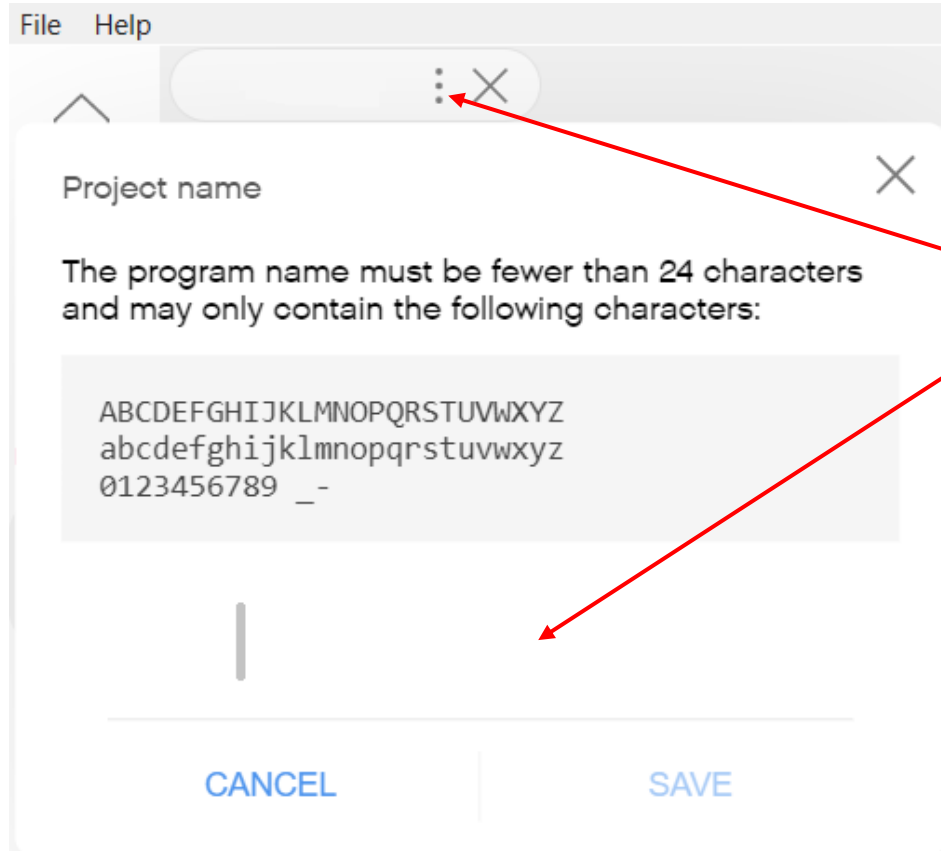
Click the New Project button.

Unit Plans

Core Set Models



TOUCH SENSOR



Name your program.

- Click the three dots.
- In the project name window type:

Touch-_____ *(your names)*.



TOUCH SENSOR



The Robocar motors are connected to ports B and C and the touch sensor is connected to port 1.

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



TOUCH SENSOR

Touch Sensor - Exploration 1

Activity Goals

- 1) To explore how to use the touch 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 touch sensor.
- 3) To understand coding using the wait until conditional statement in combination with the touch sensor.



TOUCH SENSOR

Touch Sensor - Exploration 1

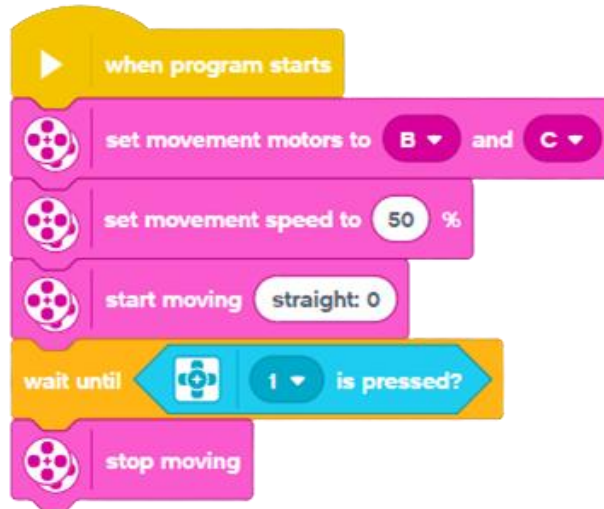
Activity Steps

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

TOUCH SENSOR

Touch Sensor - Exploration 1 - Go There

Create a code sequence to have the Robocar move toward a large wooden block and use the touch 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. 

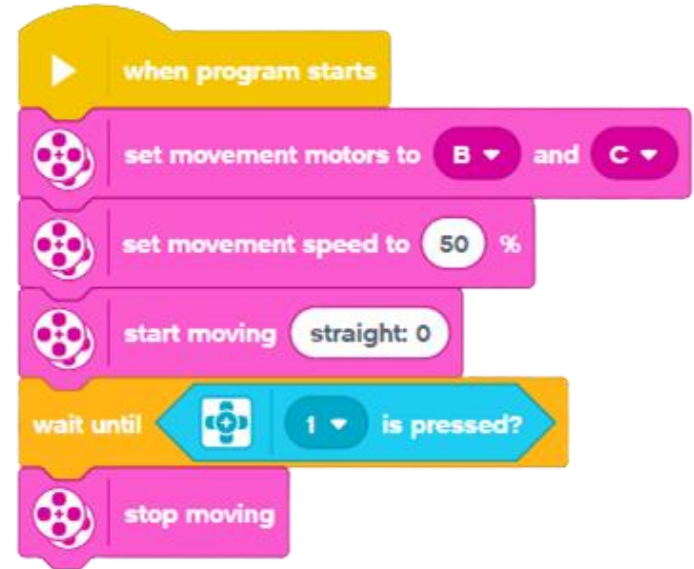
TOUCH SENSOR

Touch Sensor - Exploration 1 - Go There

Download the program to the EV3.

Run the program from the EV3.

Observe how the Robocar moves.

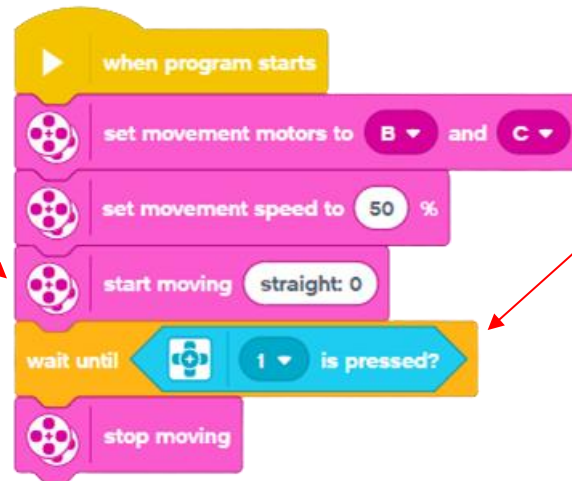


TOUCH SENSOR

Touch Sensor - Exploration 1

The "wait until" command is a conditional statement that basically monitors what the touch sensor is doing. The "wait until" code block allows the commands prior to it to perform until the touch 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 touch sensor has been pressed, if true then run the next command".



TOUCH SENSOR

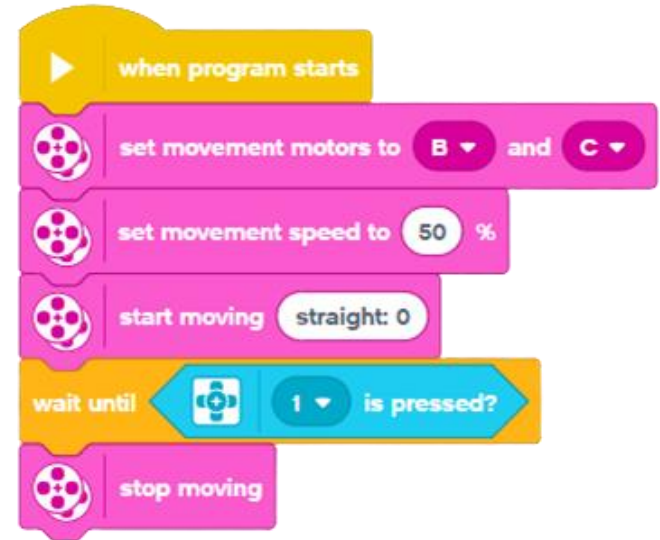
Touch Sensor - Exploration 1

"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 touch sensor is pressed. Only when the touch sensor is pressed will the motors will stop moving.



TOUCH SENSOR

Touch Sensor - Exploration 1 - Touch and Turn

Create a code sequence to have the Robocar move toward a large wooden block. Use the touch 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 the EV3.

Run the program from the EV3.



TOUCH SENSOR

Touch Sensor - Exploration 1

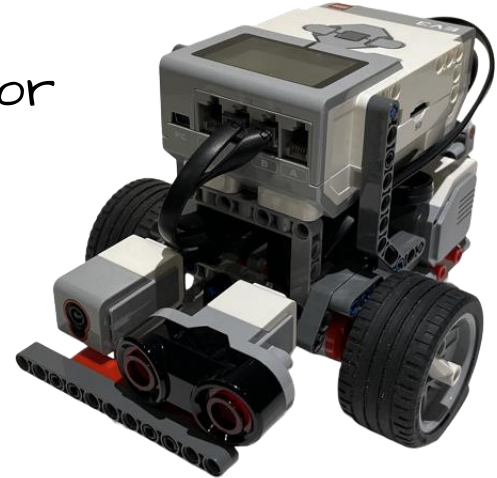
Think about it, discuss your ideas as a group, and then write down your answers on a sheet of paper.



- 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 touch sensor and why.



TOUCH SENSOR

Touch Sensor - Exploration 2

Activity Goals

- 1) To explore how to use the touch 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 touch sensor and a repeat block.
- 3) To deepen understanding of how to use the wait until condition in combination with the touch sensor.



TOUCH SENSOR

Touch Sensor - Exploration 2

Activity Steps

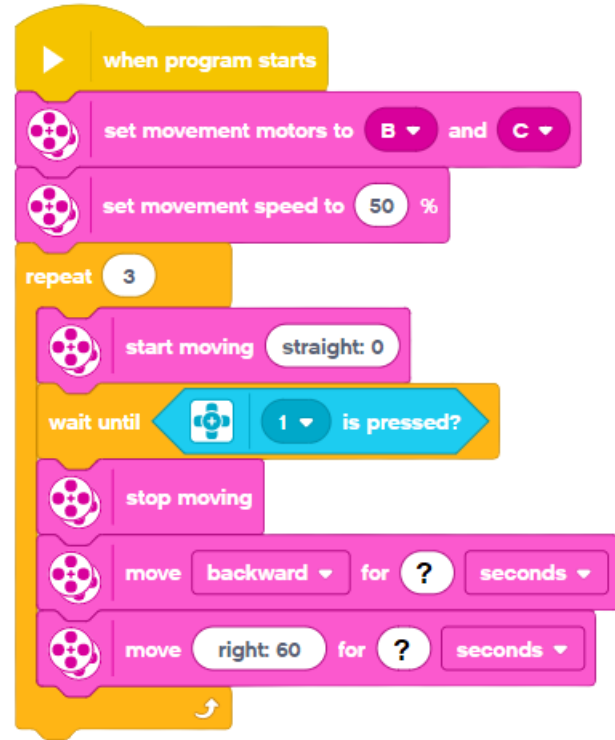
- 1) Create the Ping-Pong code sequence to move the Robocar and test how the touch sensor works. [Ping-Pong](#)
- 2) Answer questions and explain your ideas. [Explain](#)

TOUCH SENSOR

Touch 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 touch 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.



TOUCH SENSOR

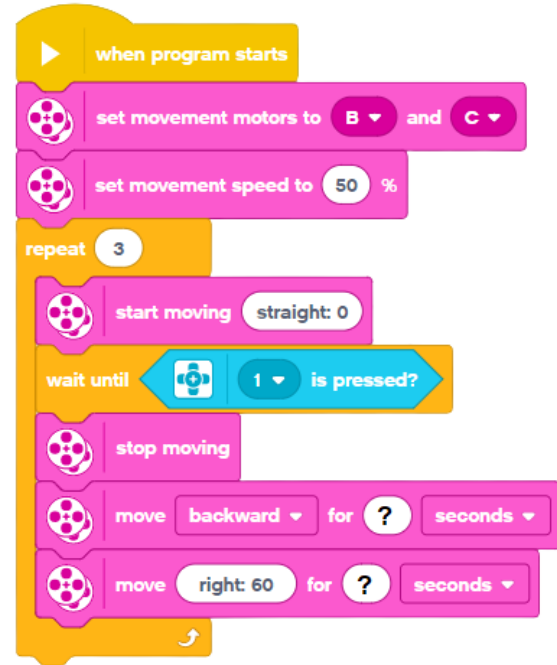
Touch Sensor - Exploration 2 - Ping-Pong

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. 



TOUCH SENSOR

Touch Sensor - Exploration 2 - Ping-Pong

Download the program to the EV3.

Run the program from the EV3.

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



TOUCH SENSOR

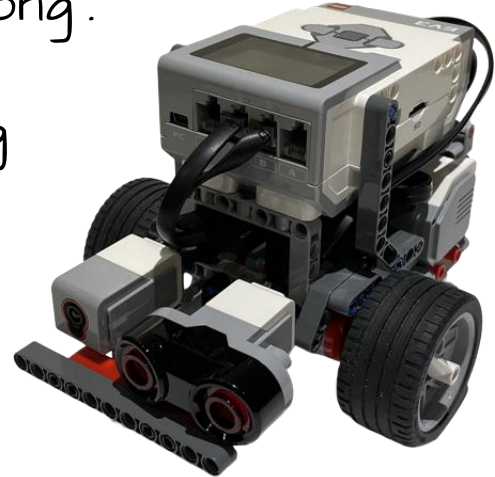
Touch Sensor - Exploration 2

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 touch sensor and why.



TOUCH SENSOR

Touch Sensor - Exploration 3

Activity Goals

- 1) To explore how to use the touch 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 combination with conditional statements and a sensor.



TOUCH SENSOR

Touch 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 touch sensor is pressed. [Ping-Pong Count](#)
- 2) Answer questions and explain your ideas. [Explain](#)

TOUCH SENSOR

Touch 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 touch 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.



TOUCH SENSOR

Touch Sensor - Exploration 3

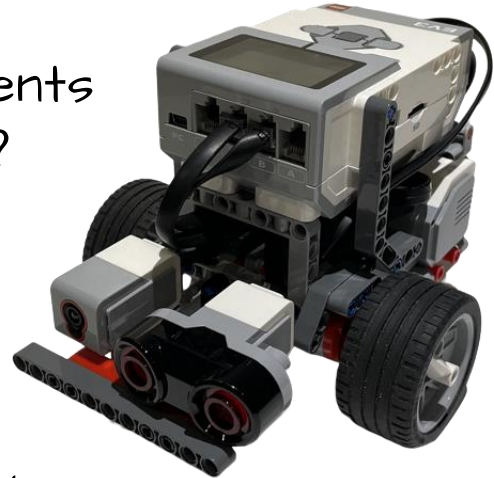
Think about it, discuss your ideas as a group, and then write down your answers on a sheet of paper.



- 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 touch sensor and why.



TOUCH 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!



TOUCH SENSOR CHALLENGE

The Four Wall Challenge!

Create the code that will allow the Robocar to navigate around a walled area using the touch 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.