Microbit Robotics Advanced Level 3

Lesson 6

Advanced Remote Control

Presented by Advanced Superlogic Team

Today's Topic

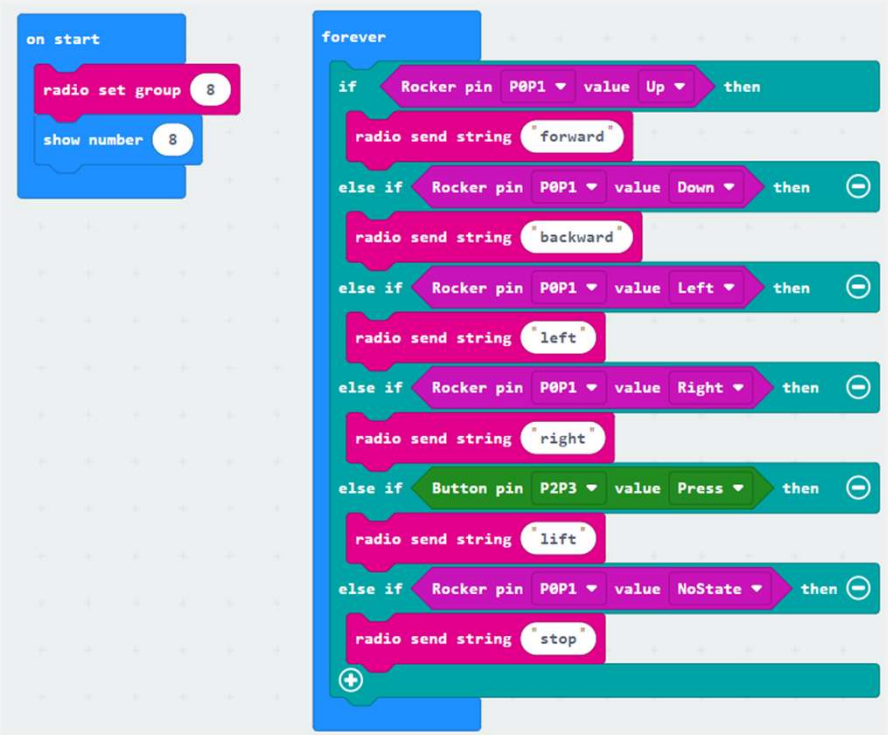
1. Doing 2 actions at once
2. Message Chain
3. Advanced Remote Control Programming
4. Game Challenge

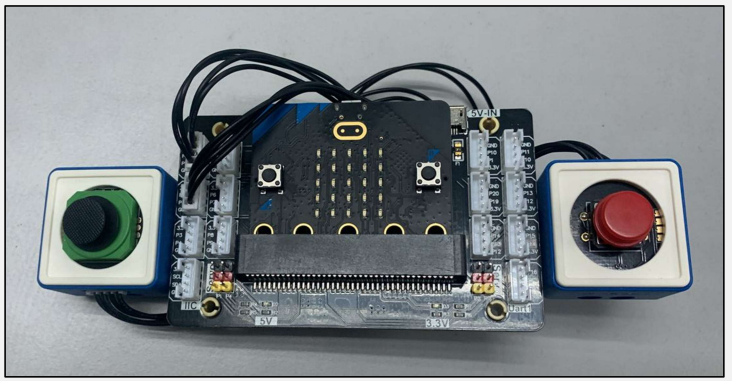
Learning Outcome

1. Able to understand how to perform 2 actions with 1 message
2. Able to program message sending with message chain
3. Able to decode the message on Superbit

Can your Skip Car move and eject?

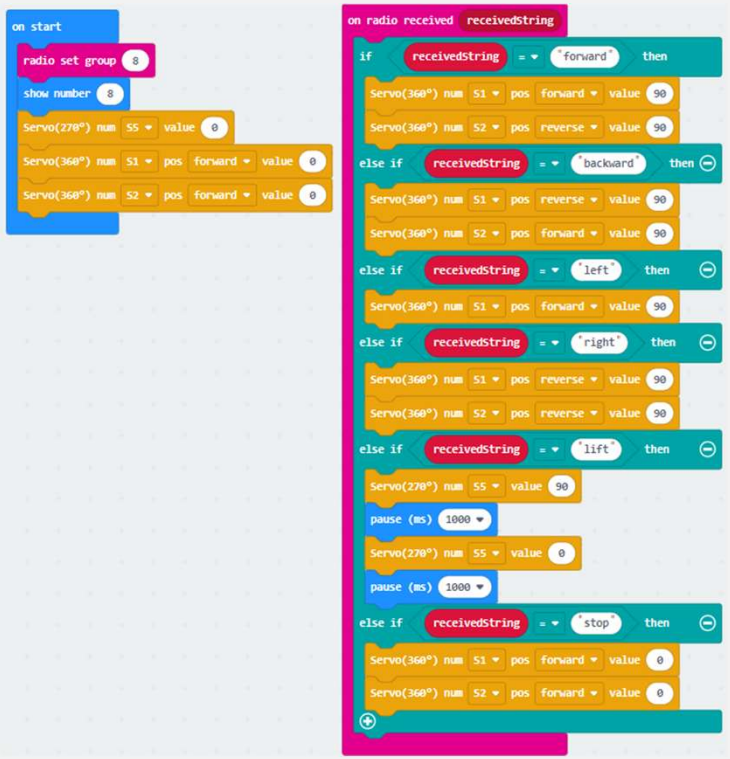
Remote Controller Program

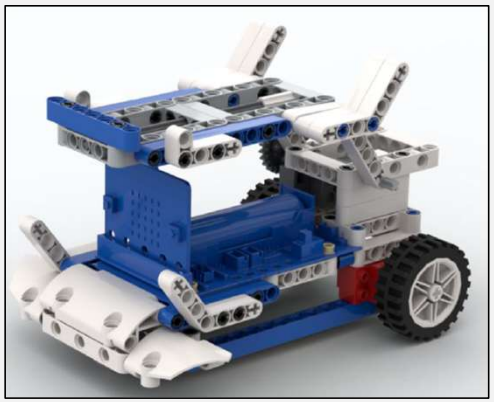




This is your remote controller program, where I didn't put "button release" as lower down the carrier.

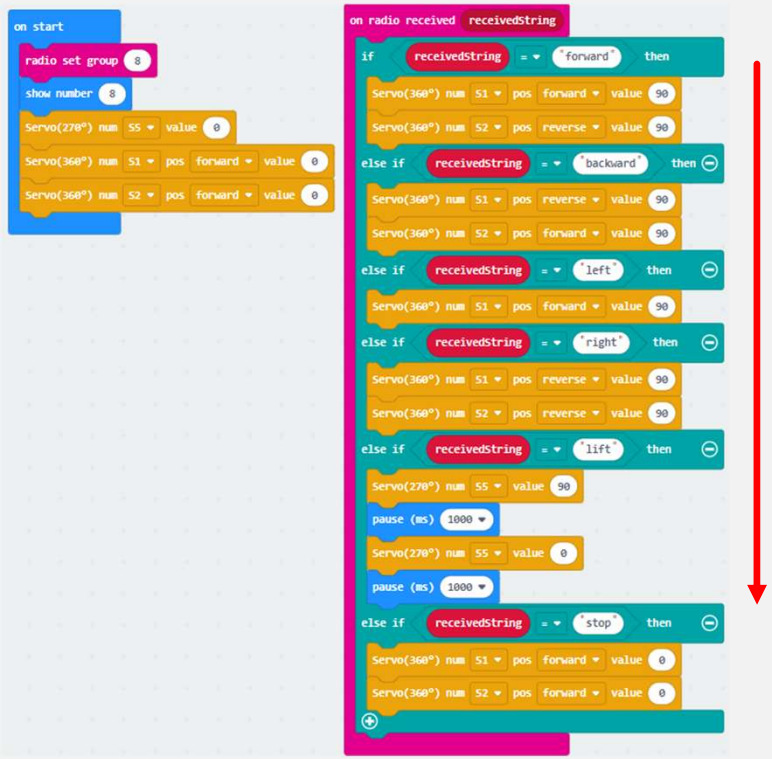
Skip Car Program





With this program, you would find out that your robot sometimes cannot stop when you press the button.

Skip Car Program



As we are using “if then, else if” conditional statement here, it is going to check the condition from top to bottom.

In this case, if “forward” is not received, it will skip the forward action and proceed to check if “backward” is receive. If the “backward” message is received, then it will not proceed to check further.

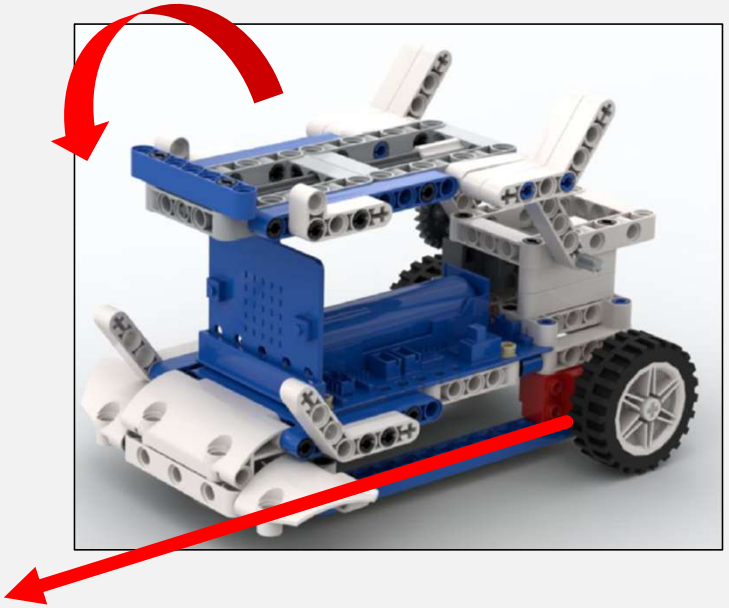
Therefore, in this case, only 1 of the actions can be executed, like first true first execute basis.

Doing 2 Actions at Once

Doing 2 Actions at Once

Since some of our actions might happened at once, for instance, I want to eject my load while I'm moving forward to get some momentum while unloading the trash, instead of just staying there and unload.

Here we need "forward" and "lift" actions to be done together.



Doing 2 Actions at Once

Unfortunately, we are only allowed to send 1 message every time, so do the receiver.

With just 1 action per message, it's hardly done to make our robot to listen to 2 actions.

And our robot will only choose 1 action to perform.

Message Chain

Message Chain

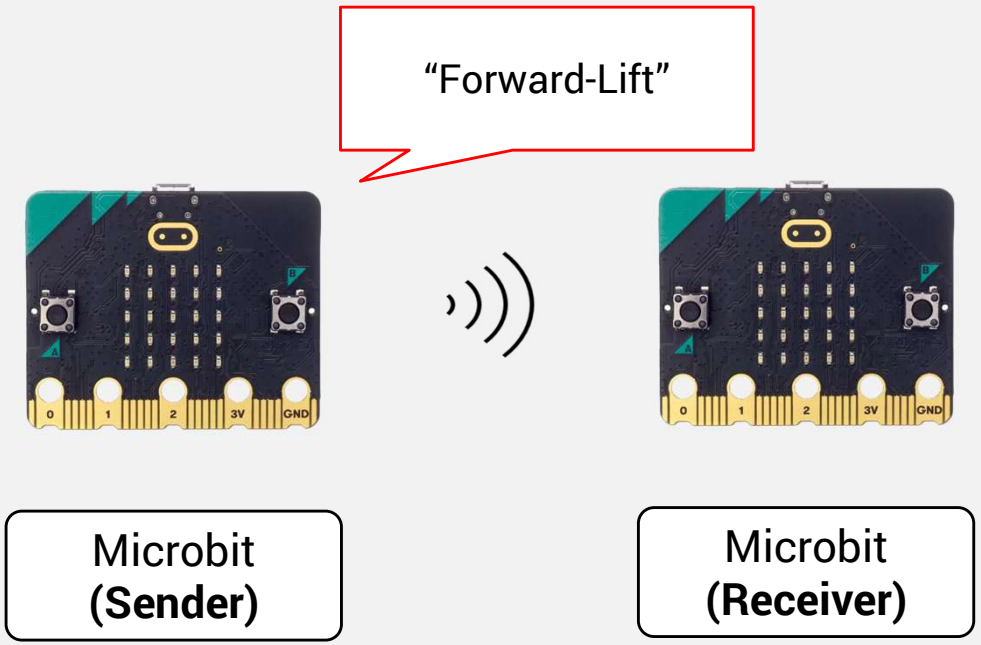
Microbit **(Sender)**

Microbit **(Receiver)**

Every time we interact with our rocker module and button, it will trigger microbit (sender) to send a message.

As we are only allowed to send a message each time we interact, to make the superbit to react with 2 actions, we can send a message with the information of 2 actions.

Message Chain

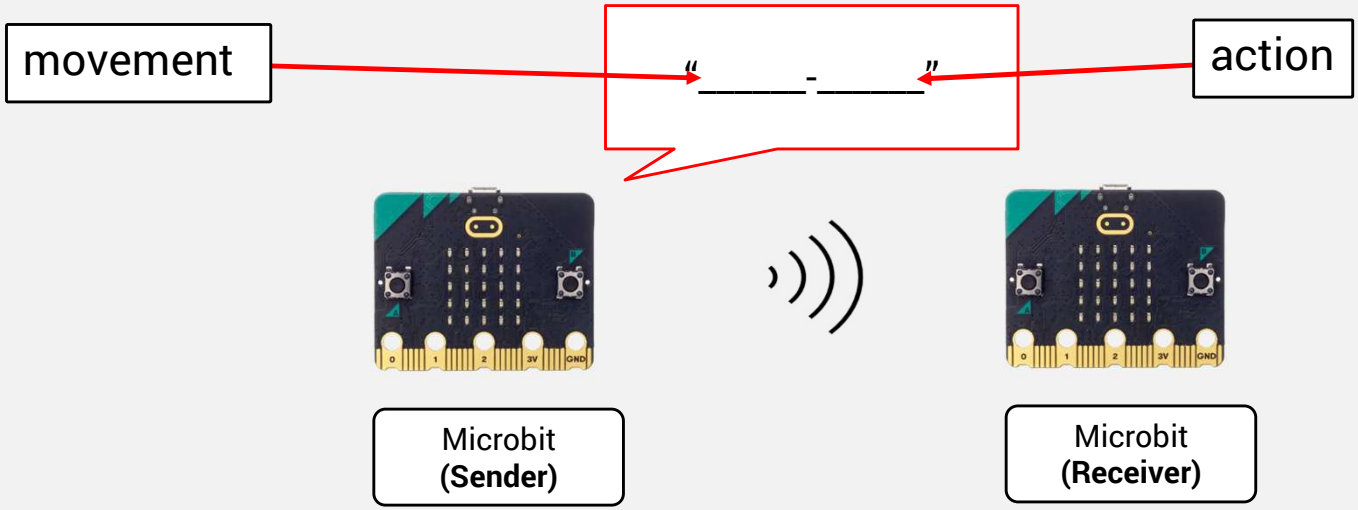


We have 2 separate actions, which is movement and action:

Movement:
1. Forward
2. Backward
3. Left
4. Right
5. Stop

Action:
1. Lift
2. Lower

Message Chain



We can compile the movement and action into a message with the “-” as a separator.

Then we use our receiver to split the message into 2 actions (movement and action).

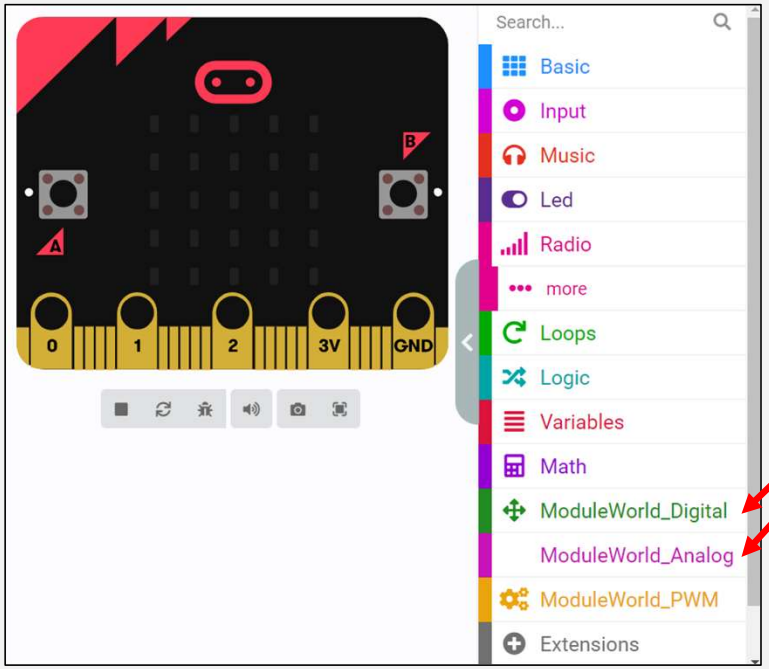
Let's code the message chain for our Remote Controller

First, we need to connect the micro:bit to the computer by USB cable. The computer will pop up a USB flash drive and click on the URL in the USB flash drive: http://microbit.org/ to enter the programming interface.

And add the **World of Module Extension.**

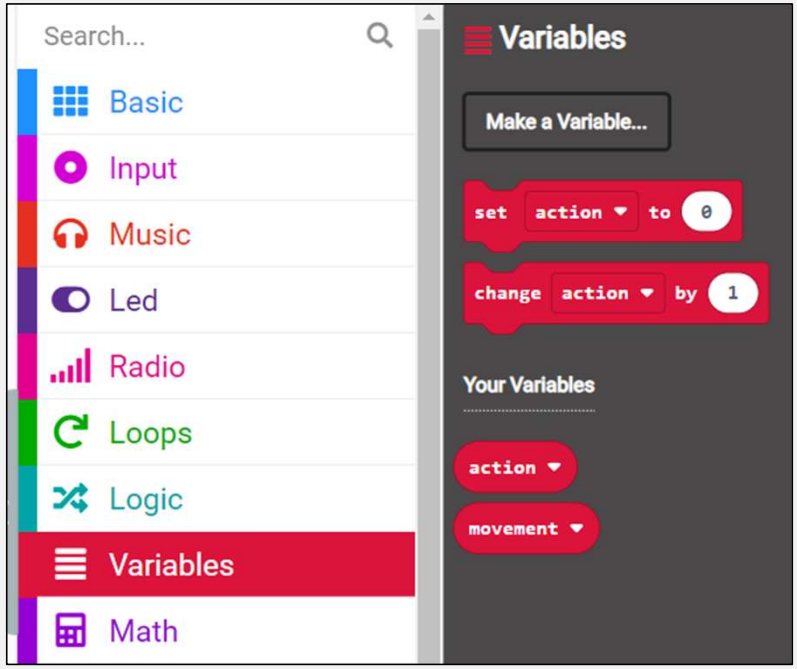
Search **yahboomtechnology/module-world** in the Microbit extension.

WOM Extension



We are going to use the digital blocks for **button** interaction and analog blocks for **rocker module**.

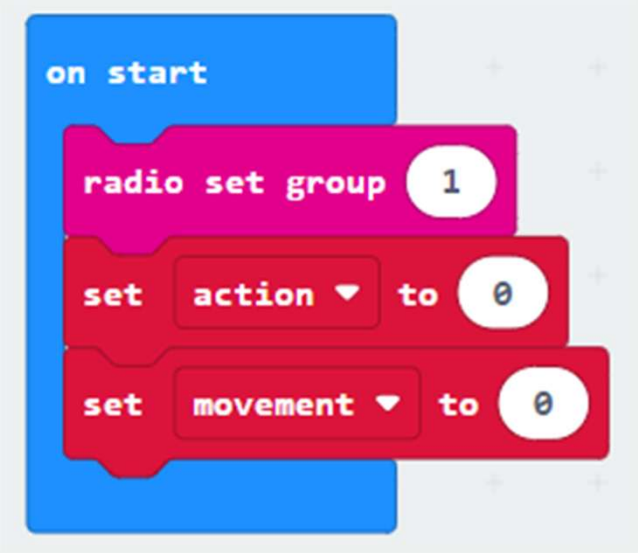
Set Radio Group & Set up Variable



We want to add 2 variables:

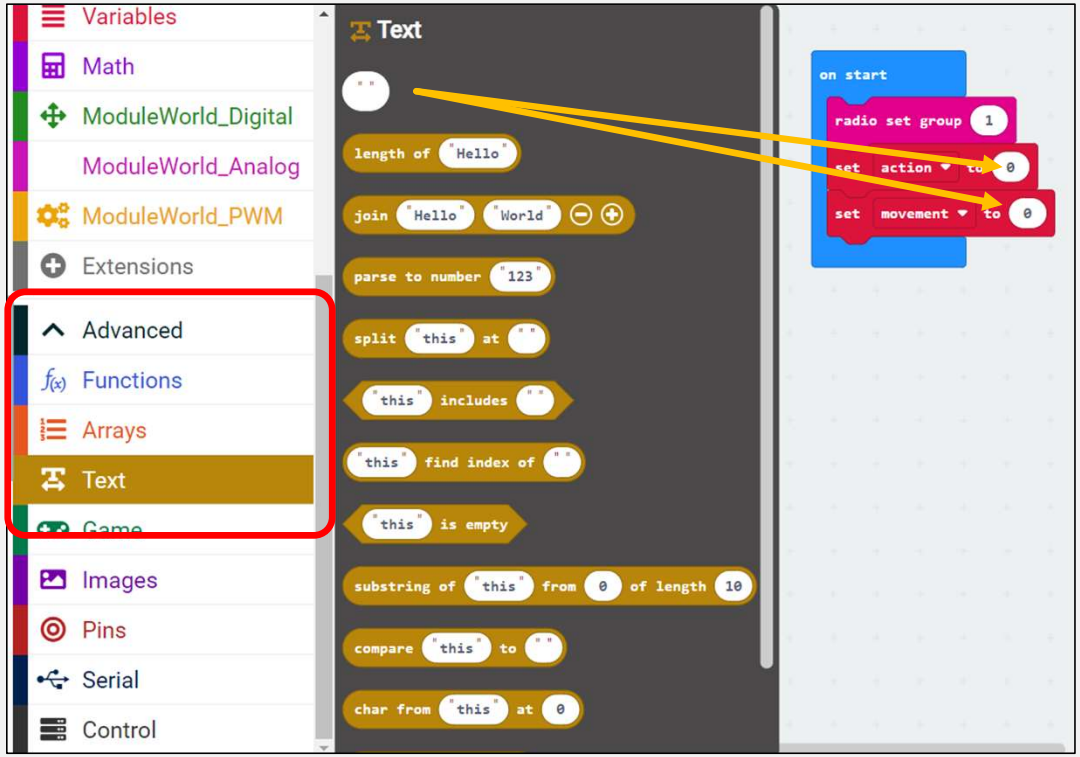
action & **movement**.

On Start – Variable as Text



As we want our action and movement to be sent as text, we need to make it to text (string) variable.

On Start – Variable as Text

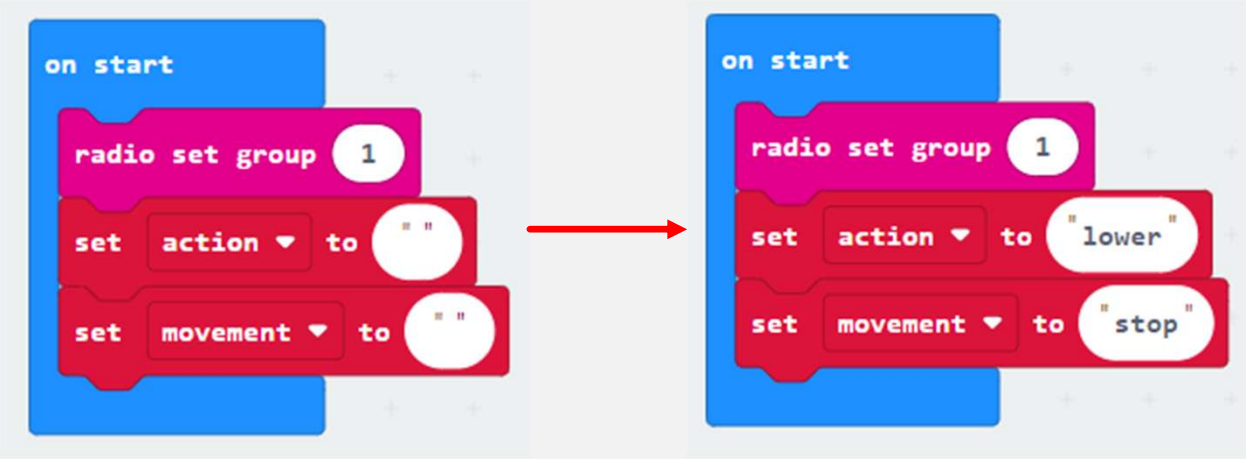


Now navigate to the Advanced block and click the advanced block category.

Select the Text category.

Pick the first block and put it in the action and movement variables.

On Start – Variable as Text



Now you should be able to type word in the variable as we have set the variables as text.

We will set “lower” in action and “stop” in movement as our default.

Forever – Variable changed based on Rocker state

Let's set the movement variable with the rocker condition first.

We have 5 possible action for the movement:

forward
backward
left
right
stop

Forever – Variable changed based on Button

Now is to add in the button state for action.

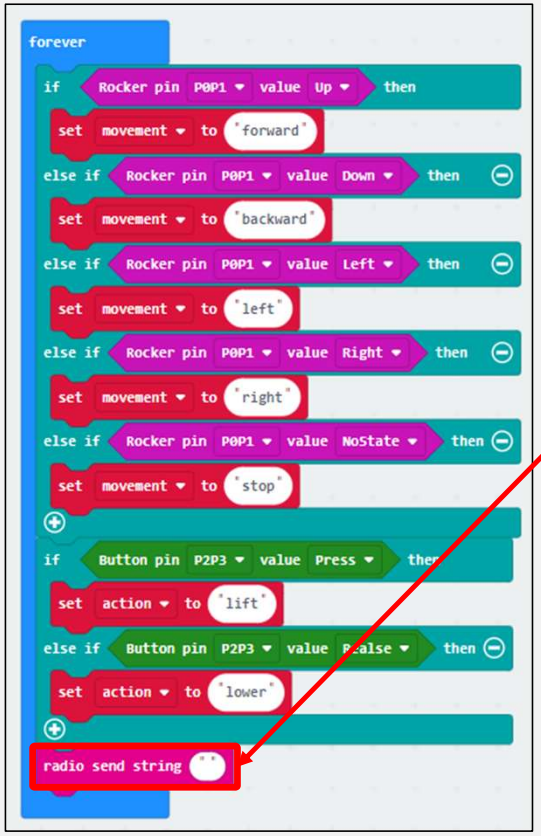
We have 2 possible actions:

lift
lower

In this case, the action is to be added with another if else block after the movement.

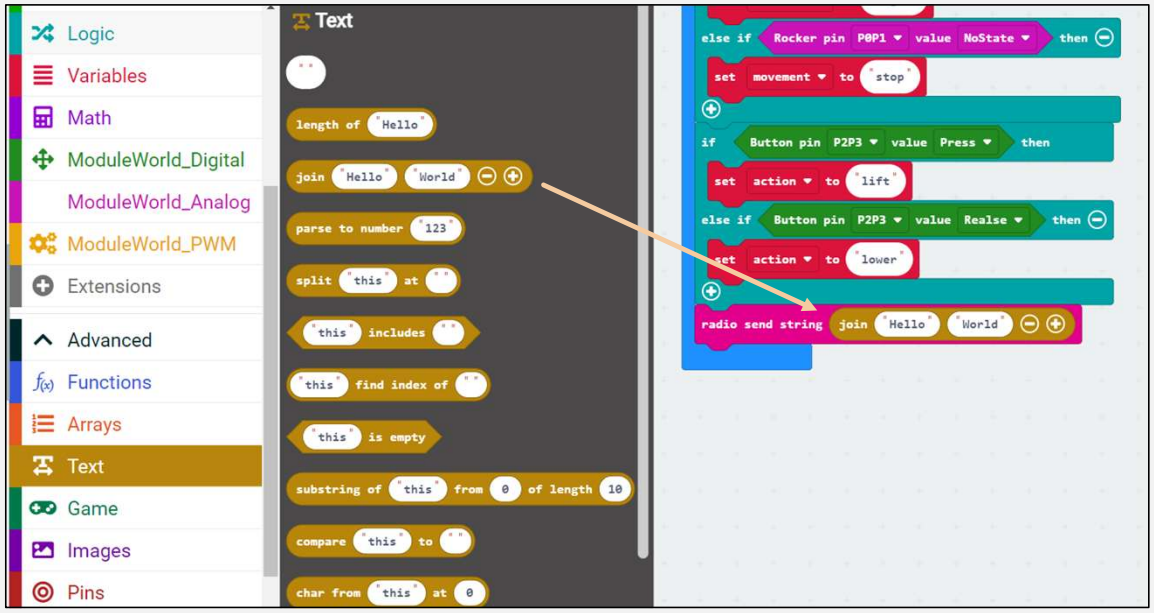
** Do not add the else if condition after the rocker module. As we want both to be able to happened at the same time.

Forever – Send string through radio



In the end of the button state condition, we want to add in the radio send string action.

Send the strings

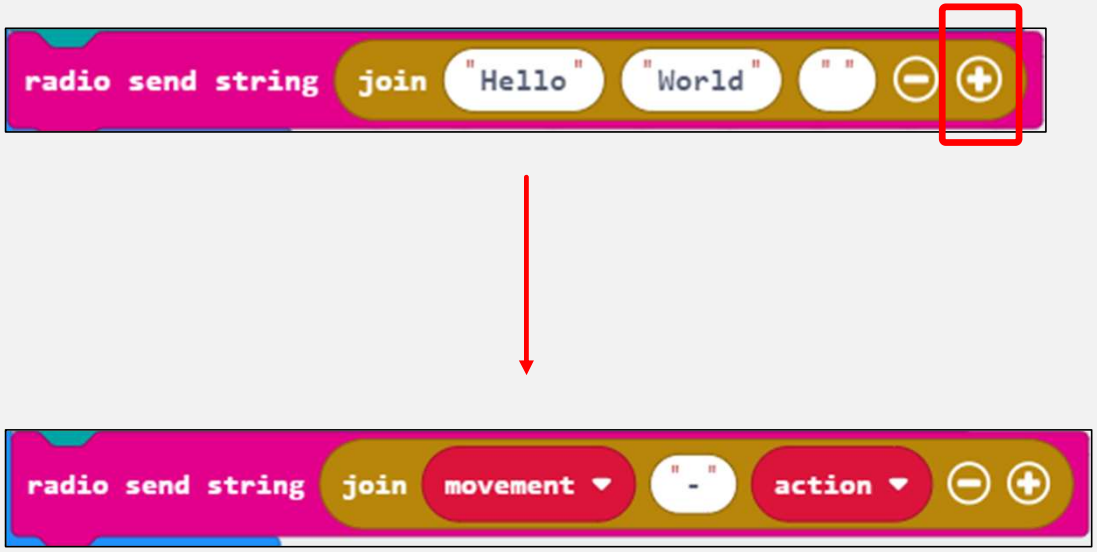


Then we want to send a message chain which holds 2 information separated by “-”.

So, we need to join the 2 variables together and make a “-” in between.

We can use “join string” block from the Text block category.

Radio send String



You can click the “+” button to add 1 more column for the string.

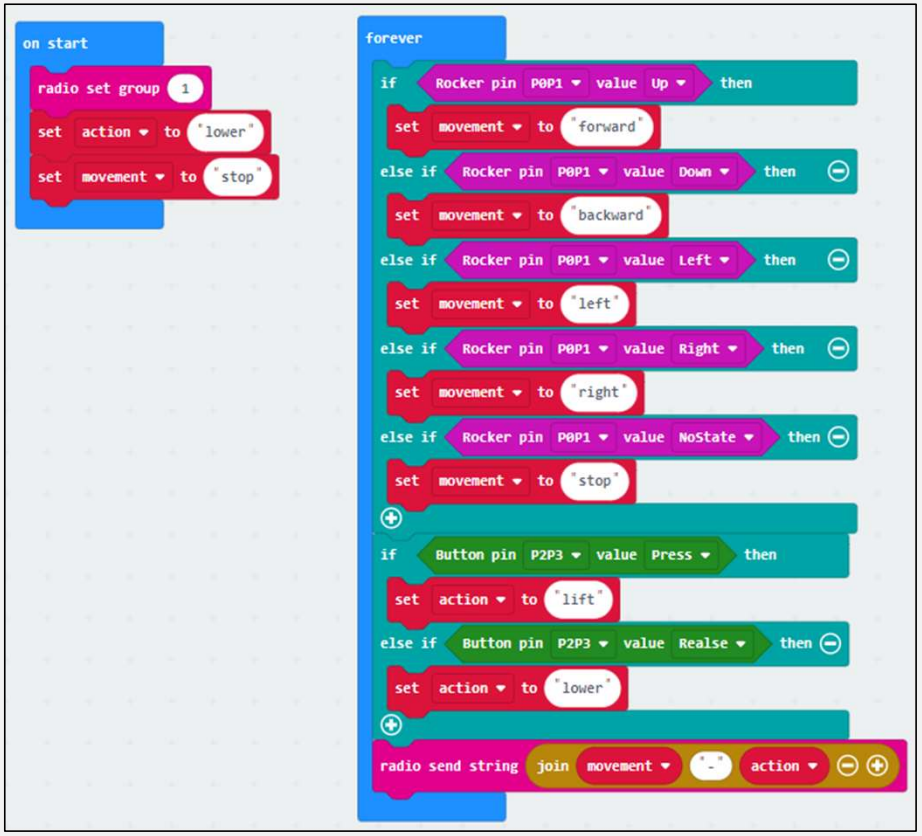
Then we will join the movement and the action with the “-” in between.

Drag your “movement” variable to the first block (replace the “Hello”).

Then replace “-” with “World”.

And drag the “action” variable to the last block.

Remote Controller Codes



Now your Remote Controller coding will be like this.

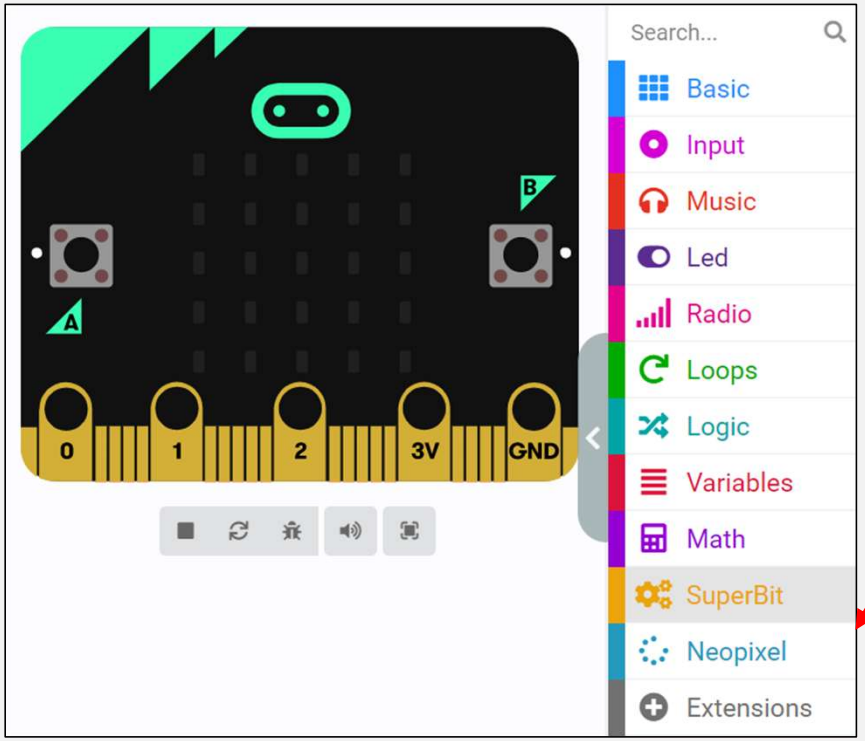
Unpack the Message Chain

Let's code your Skip Car (Required Superbit Extension)

First, we need to connect the micro:bit to the computer by USB cable. The computer will pop up a USB flash drive and click on the URL in the USB flash drive: http://microbit.org/ to enter the programming interface.

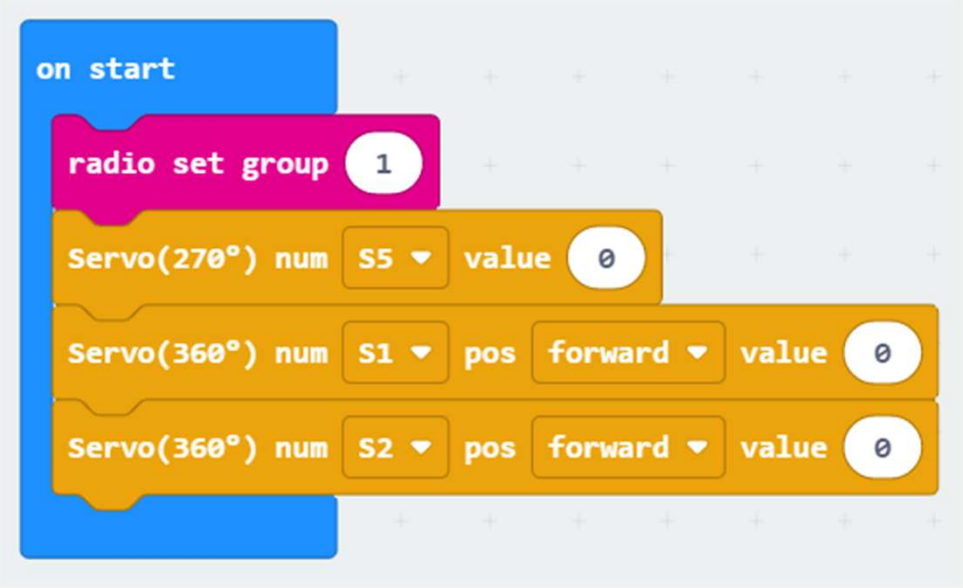
Search lzty634158/SuperBit in the Microbit extension.

Superbit Extension



After importing the superbit extension, you will see **SuperBit** and **Neopixel** in your coding blocks.

MakeCode Programming

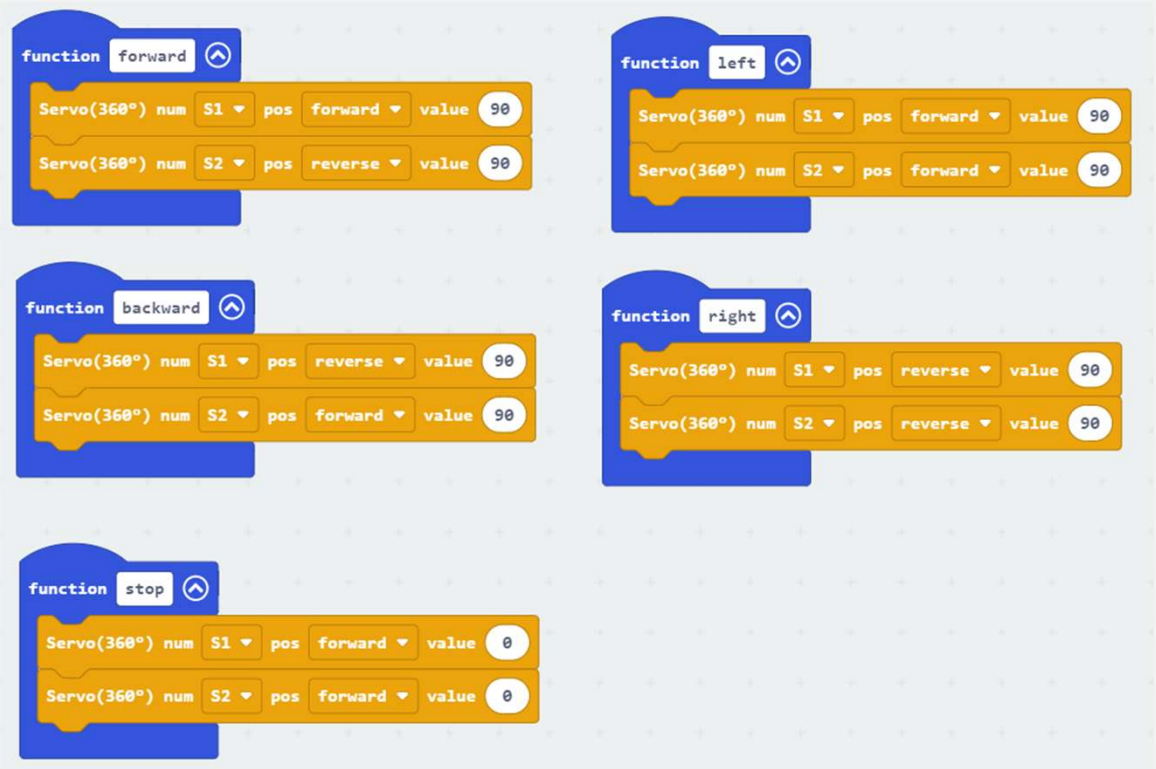


Program our starting state of our servos. And also set the radio group to the group that you set on your remote controller.

**You can use your last lesson's program.

**We just need to add the actions for received signals from the remote controller.

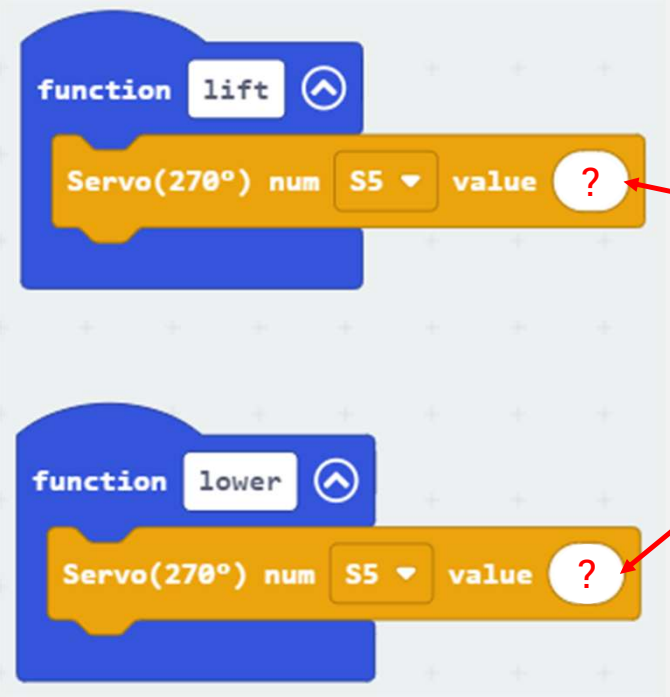
Make all movement functions



Use the function method to create all movement functions, including:

forward
backward
left
right
stop

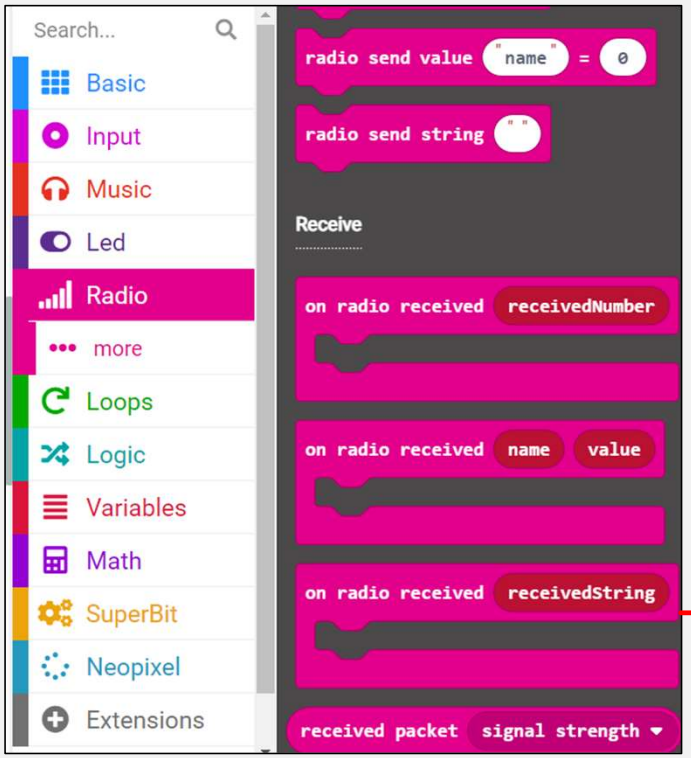
Make functions for your actions



Add in the lift and lower actions for your skip car.

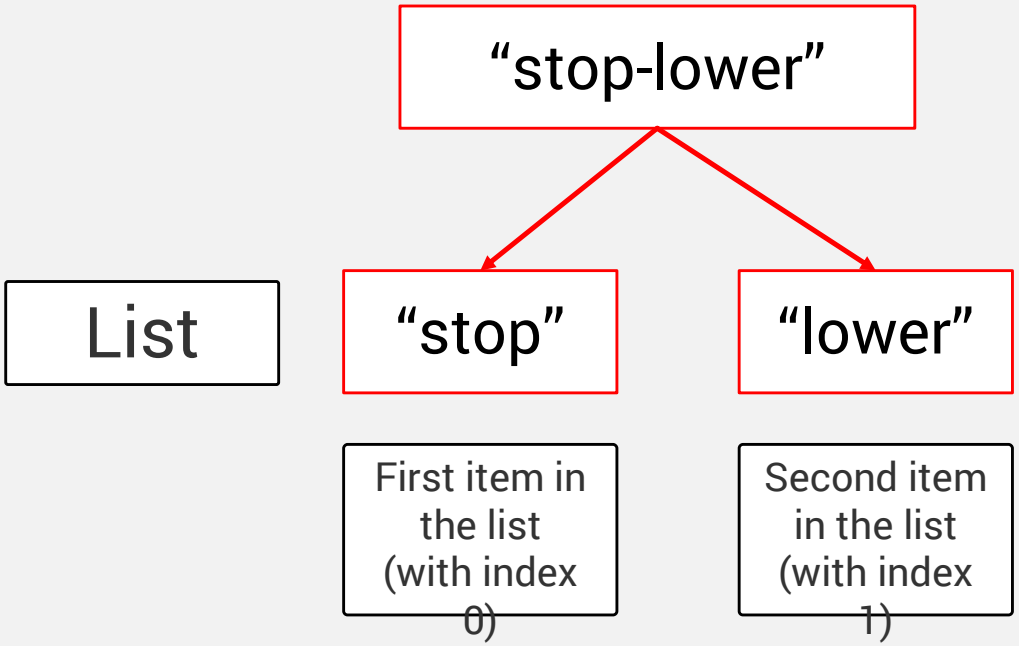
Here you need to test the value for your skip car, you can trial and error to see which values are best for your S5.

Code your Skip Car's actions



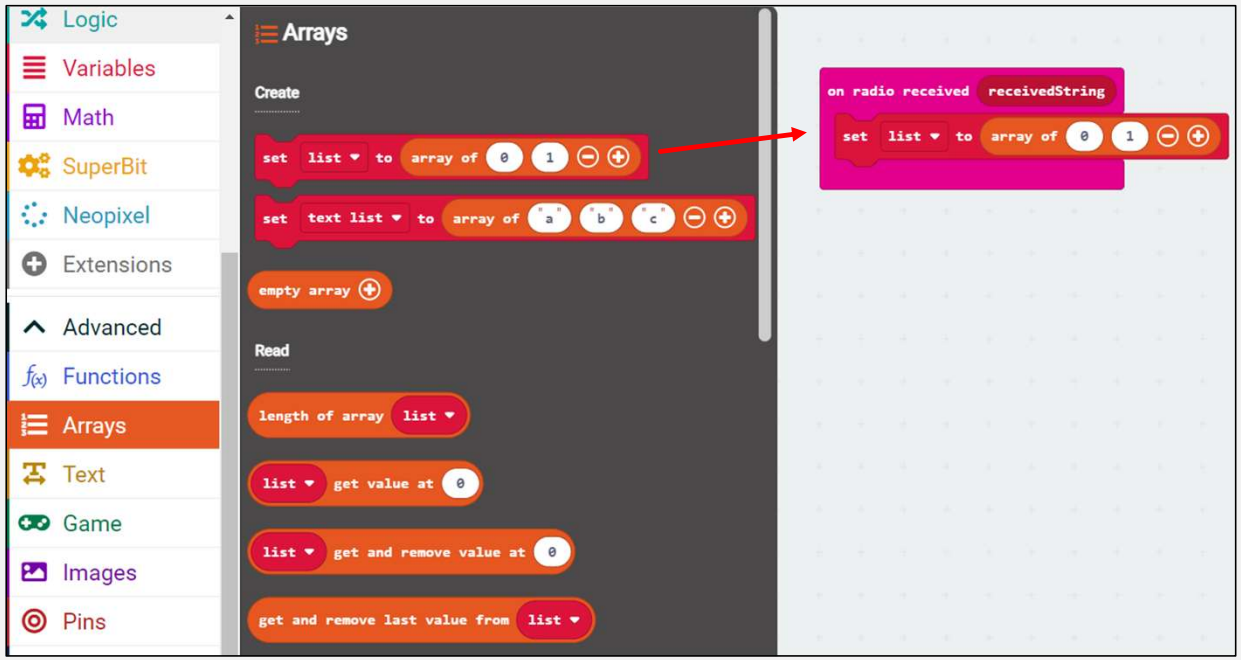
Let's take the block "**on radio received '**receivedString**'**" for the actions when received the signals from other microbit.

Unpack the message to list



Now we want to split the message into 2 values and make it in a list. We will base on the "-" as the separator to split the message. This process is called unpacking.

Unpack Message

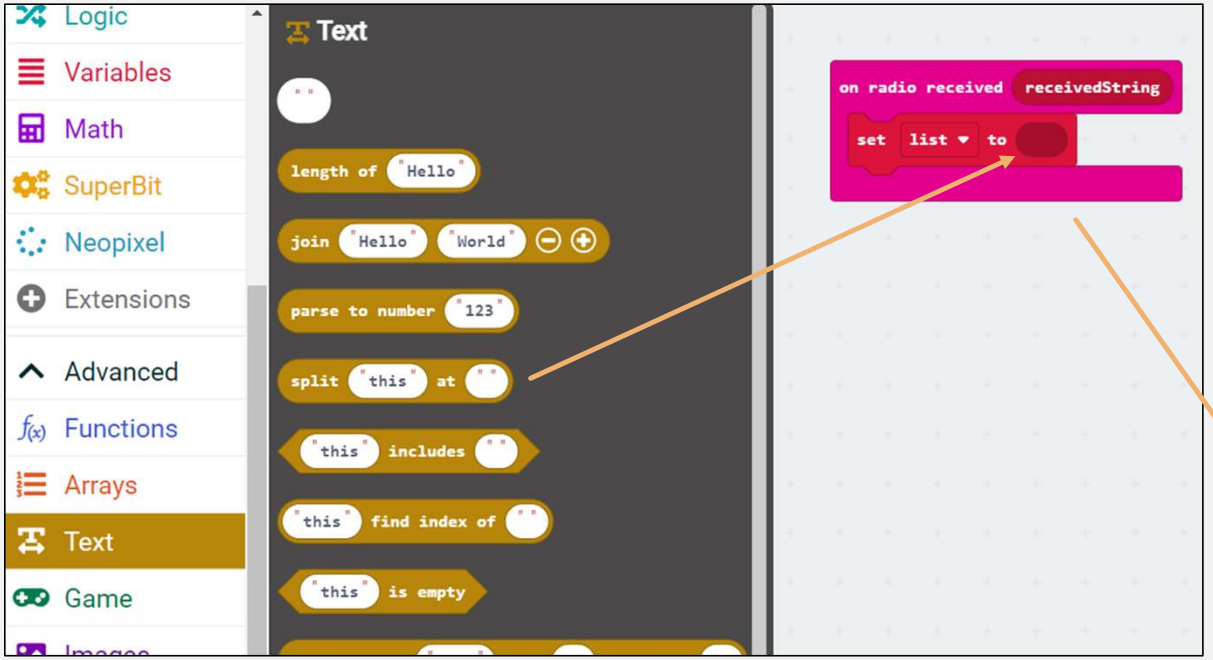


To unpack the message, we need to know where to put the message.

As we are separating with the "-", we will store it temporary into a list.

You can find the set list in the Arrays block category.

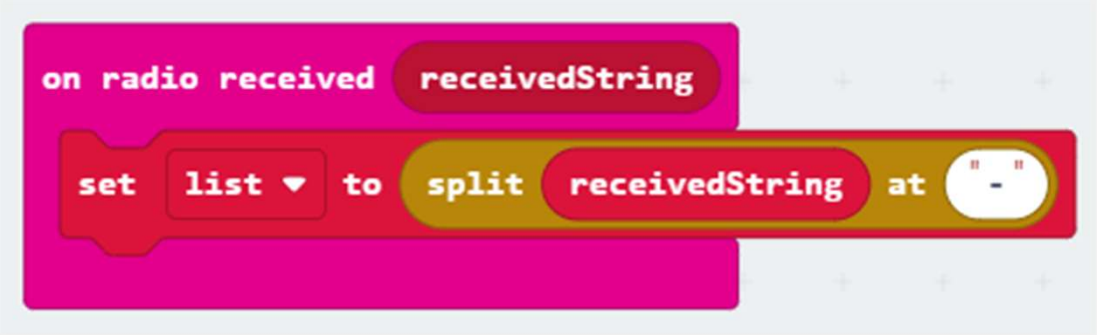
Unpack Message



Remove the array in the list, then go to "Text" block category.

Find the split "this" at "" block and put into the set list block.

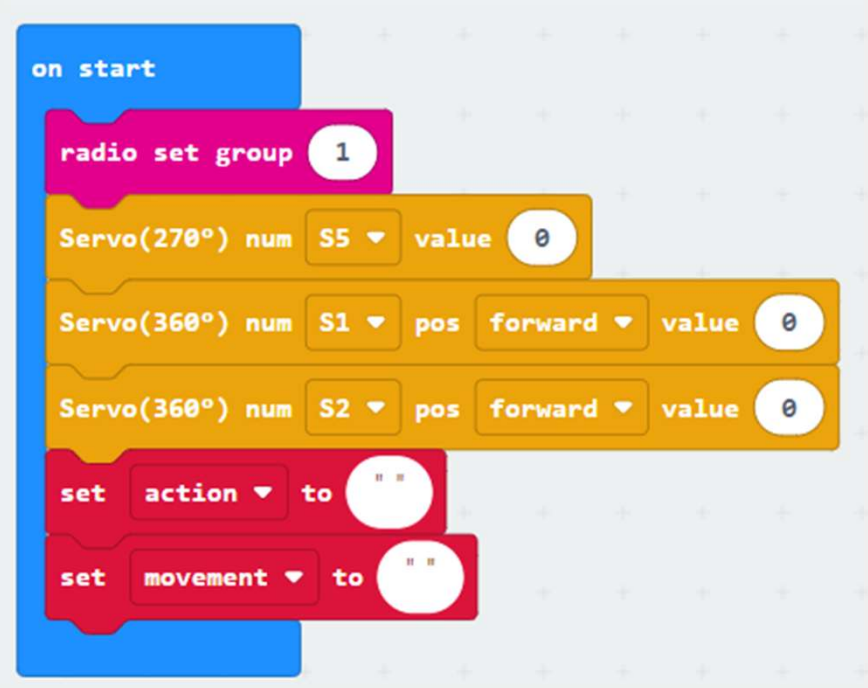
Unpack Message



We want to split the receivedString at “-”, arrange your block as shown in the left.

Now your string should have 2 values in it with index 0 and 1.

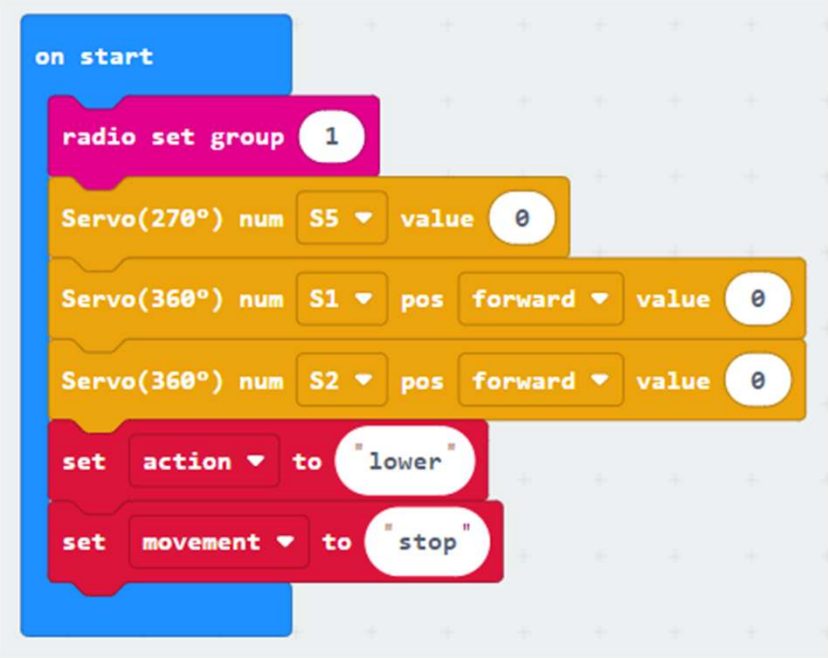
Setup the variables for movement and action



Now we need to create variable for action and movement.

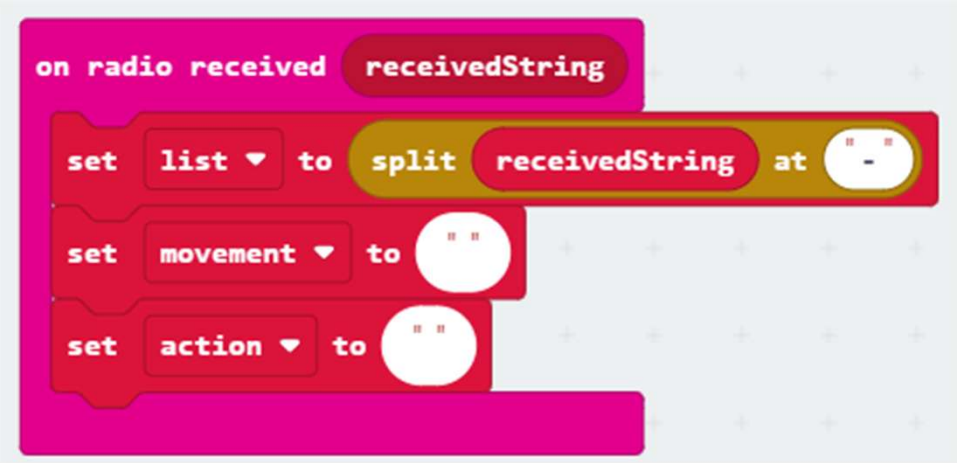
Do it as same as how you did with the remote controller.

Setup the variables for movement and action



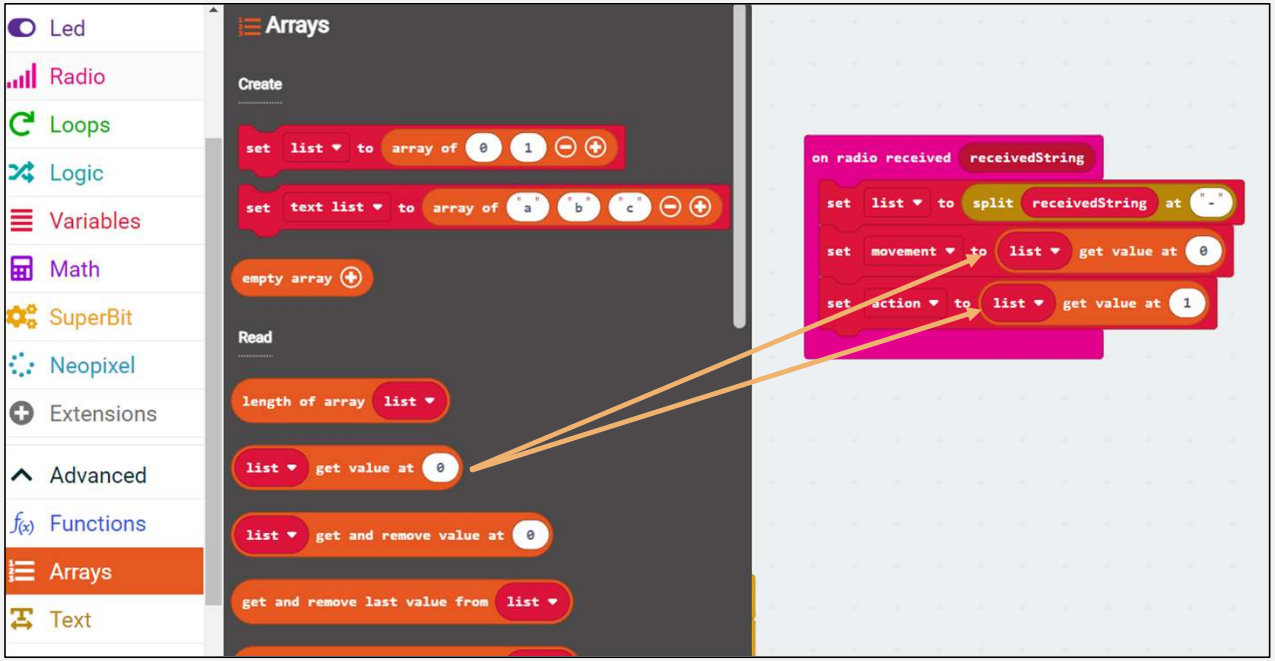
And we will give a default value with “lower” in action, and “stop” in movement variables.

Split the list and change the variables



Now we have 2 values in the list. We want to assign them to the action and movement accordingly.

Split the list and change the variables

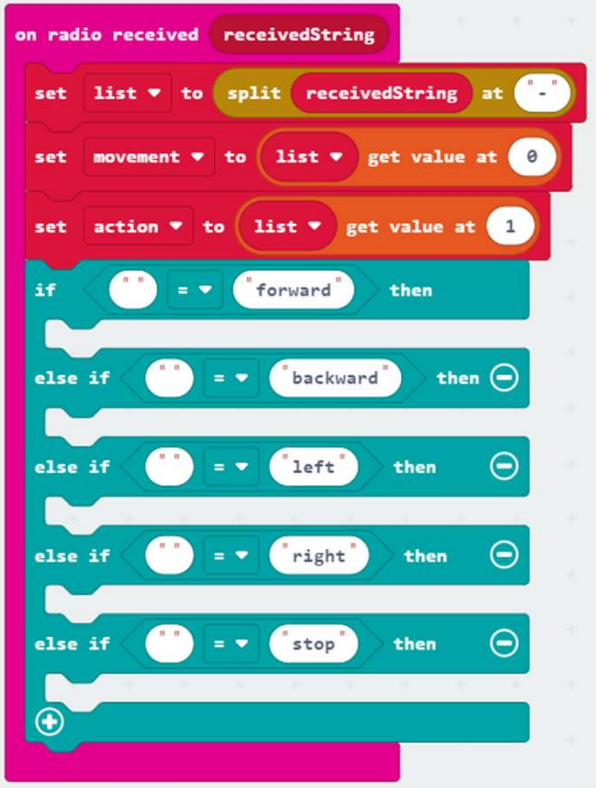


In the Arrays block, we can read the value from the list using the "list" get value at 0 (index).

The index 0 consist of the information of movement, and the index 1 consist of the information of action.

Let's assign both to the variables accordingly.

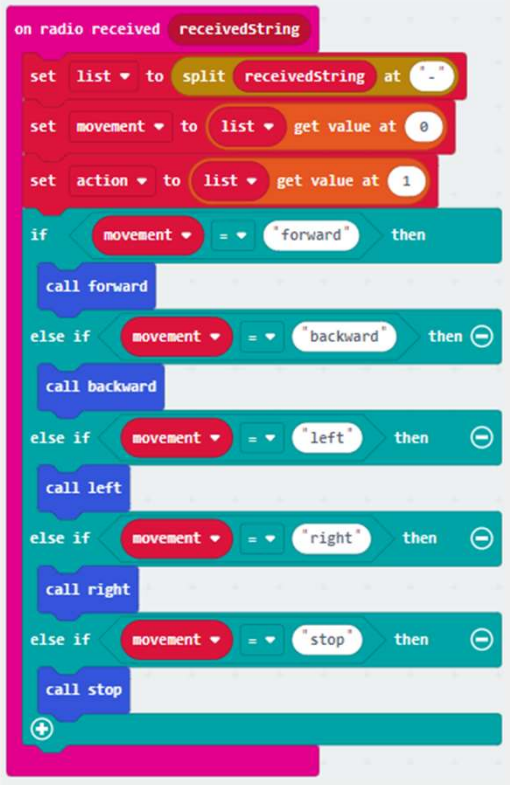
Add in the conditions for response



Now you can compare the information in movement for the movement functions.

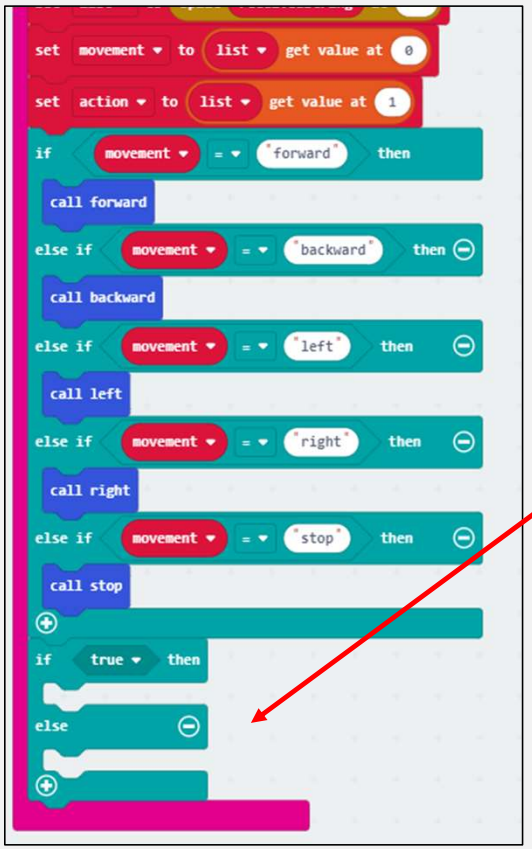
You need to use string comparison operator (“ ” = “ ”) to complete this coding.

Movement functions



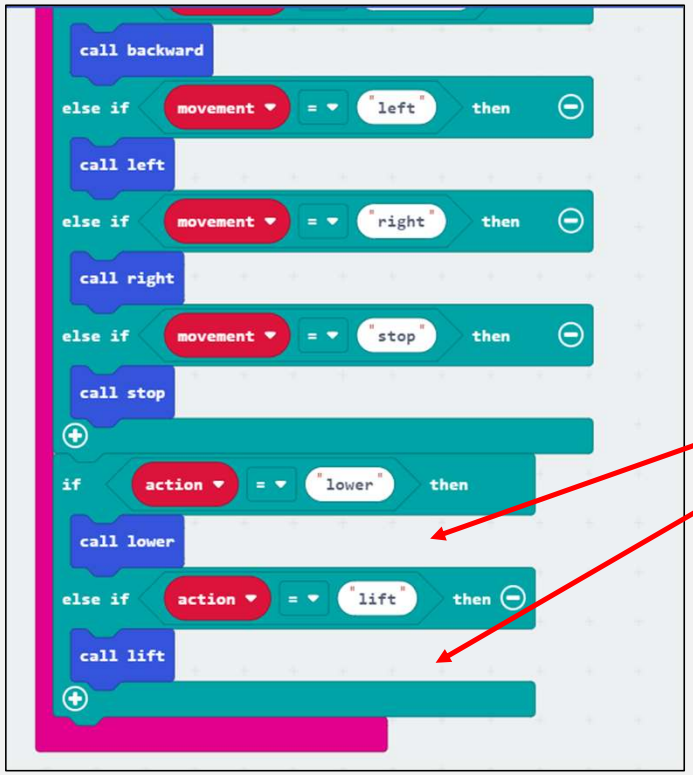
Your movement conditions are set, it should look like the left.

Action functions



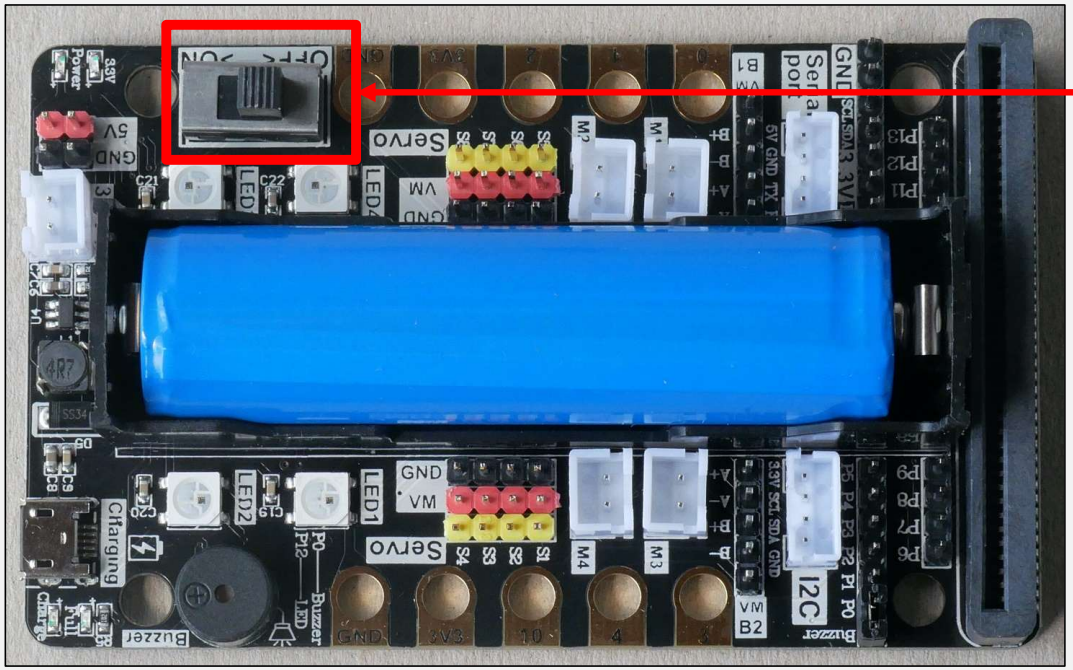
Drag another if else statement for your action function.

Action functions



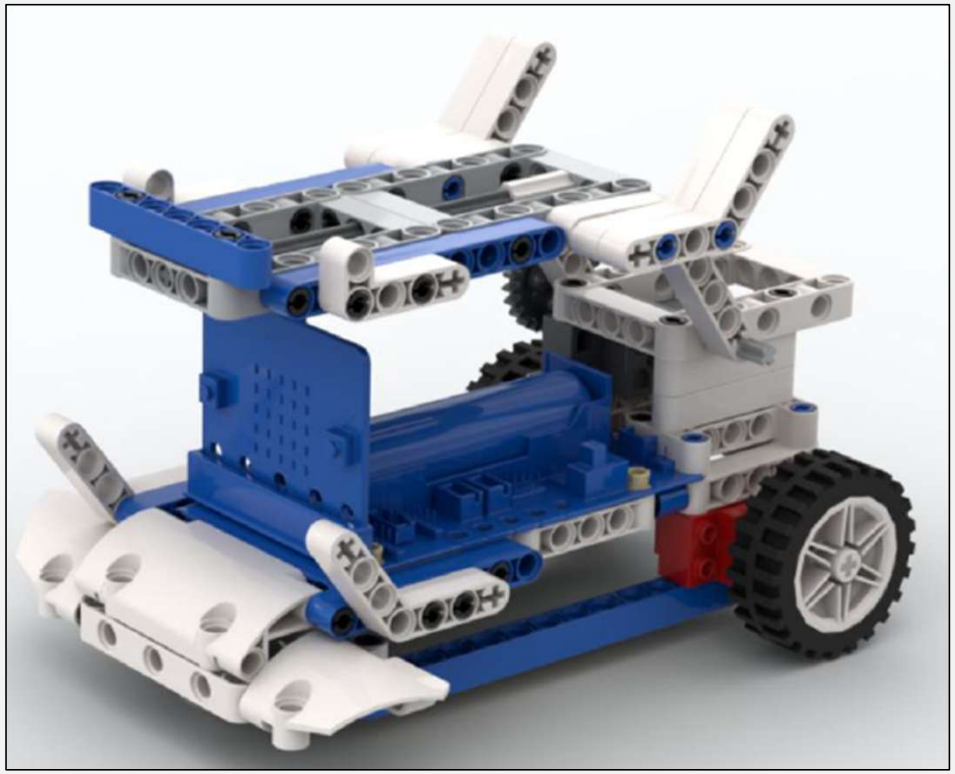
Add in the condition for both lower and lift after the movement conditions.

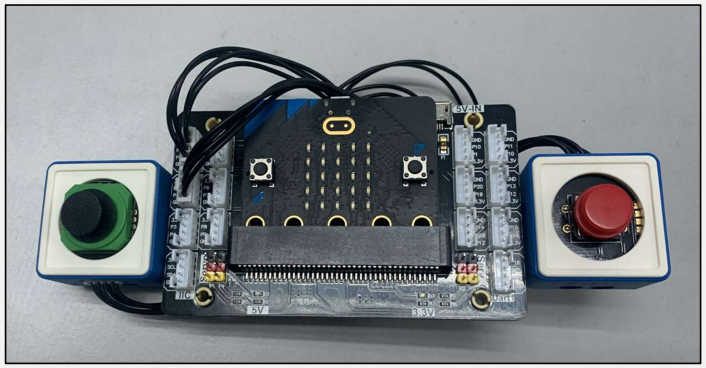
MakeCode Programming



After the program is downloaded, turn on the SuperBit with the power switch to turn on your **Skip Car**.

Phenomenon



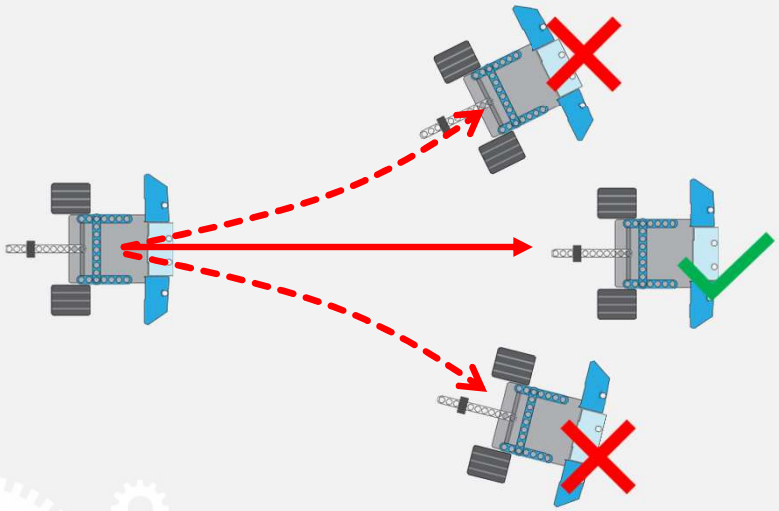


Connect your remote controller to your laptop to power on and try to interact with the Rocker module and the button module.

30 Points

CHALLENGE
for : Lesson 6

L6 – Challenge 1

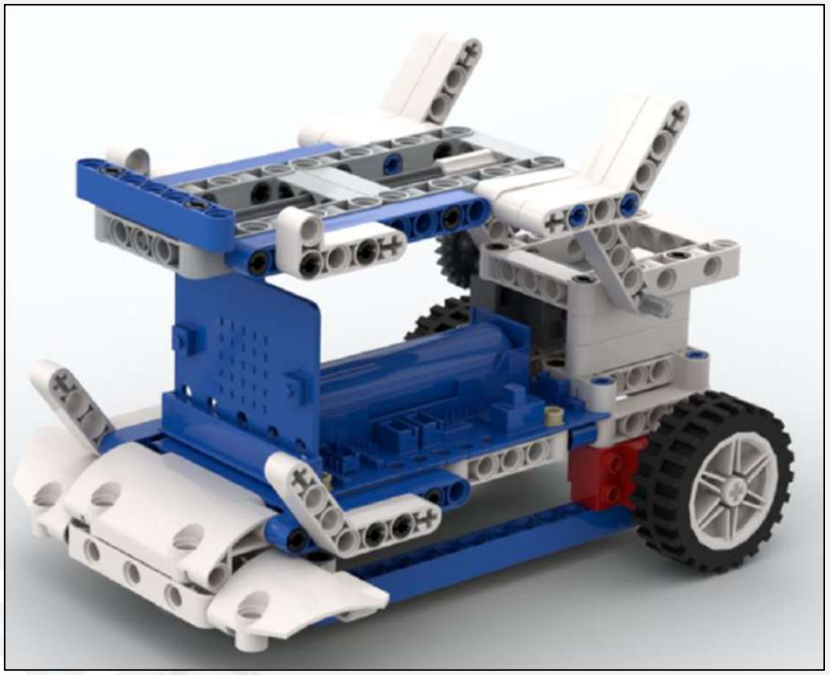


Program your Proficient Carrier to have full movement functions:

1. Move Forward (Tune it to be straight)
2. Turn Right
3. Turn Left
4. Move Backward (Tune it to be straight)

30 Points

L6 – Challenge 2

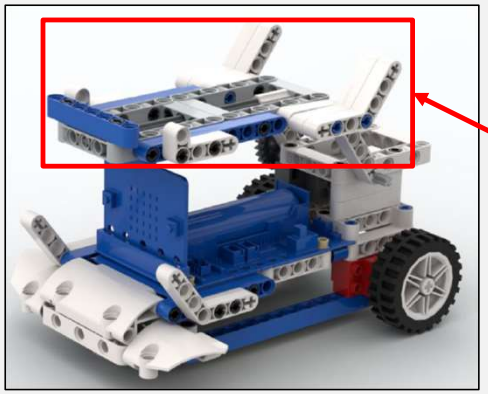


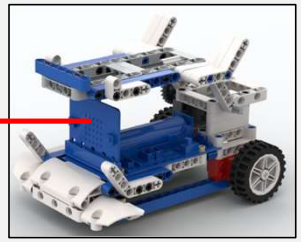
Tune your lift and lower functions for your skip car.

Don't make your S5 servo 270° overturn, it will make your code hang and stop functioning.

30 Points

L6 – Challenge 3





Modify your skip car's handle to make sure the bricks carrier won't fall from it.

And then carrier some bricks and send the bricks to the destination, then eject the bricks to the destination.

Repeat this process to send 3 piles of bricks to the destination.

30 Points