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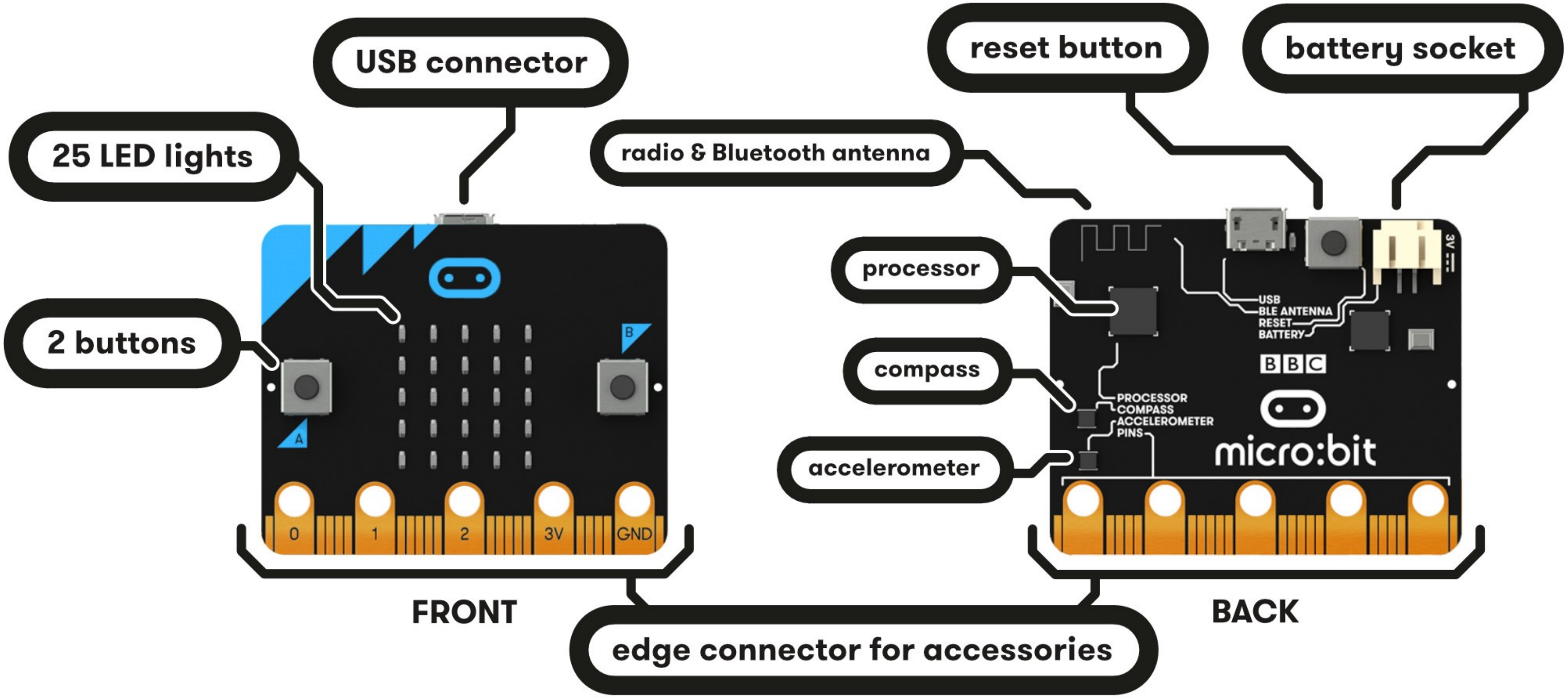
The Electrifying Micro:bit

Intro to micro:bit

What is a micro:bit?



USB connector

25 LED lights

2 buttons

radio & Bluetooth antenna

reset button

battery socket

processor

compass

accelerometer

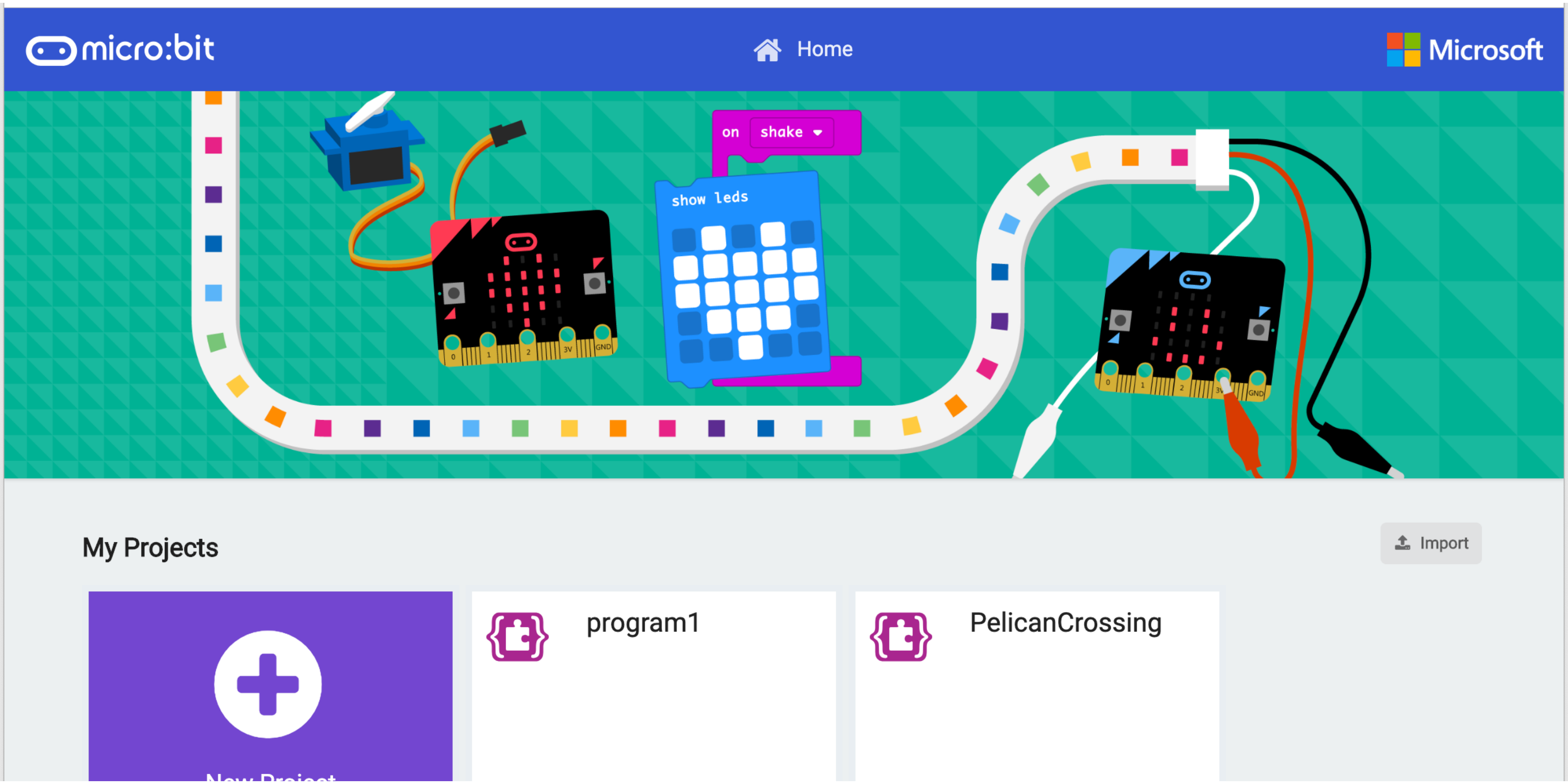
FRONT

BACK

edge connector for accessories

Starting with Makecode

makecode.microbit.org



micro:bit

Home

Microsoft

My Projects

Import

New Project

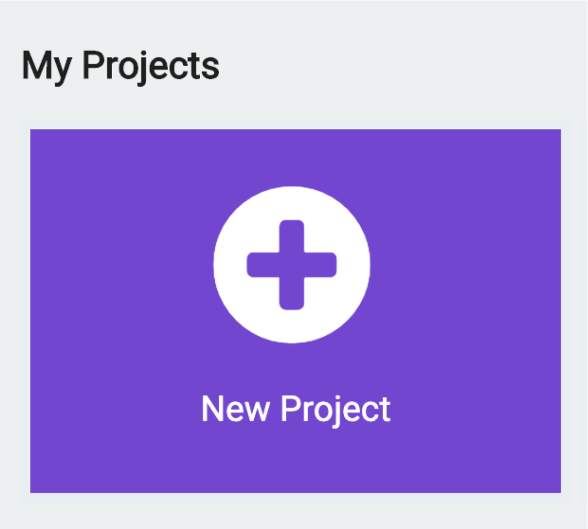
program1

PelicanCrossing

Starting with Makecode

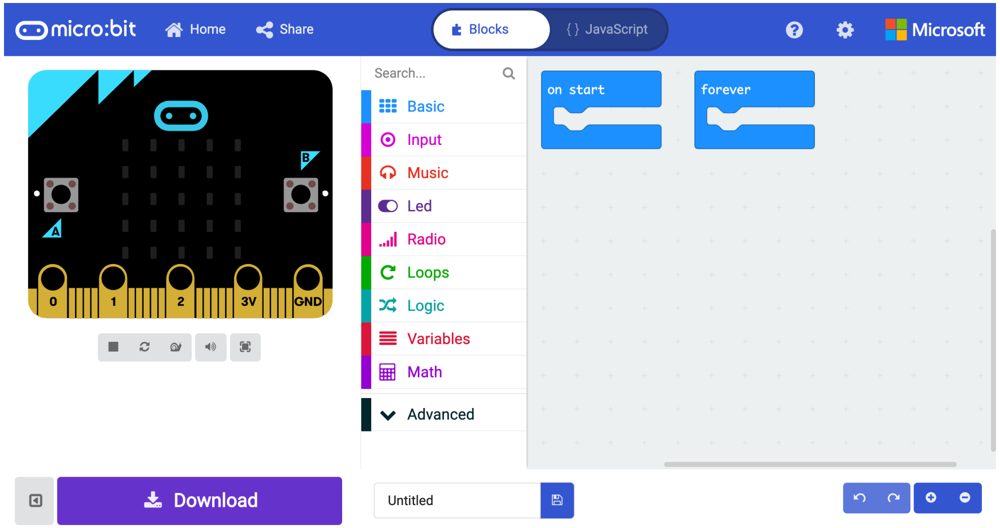
Click New Project

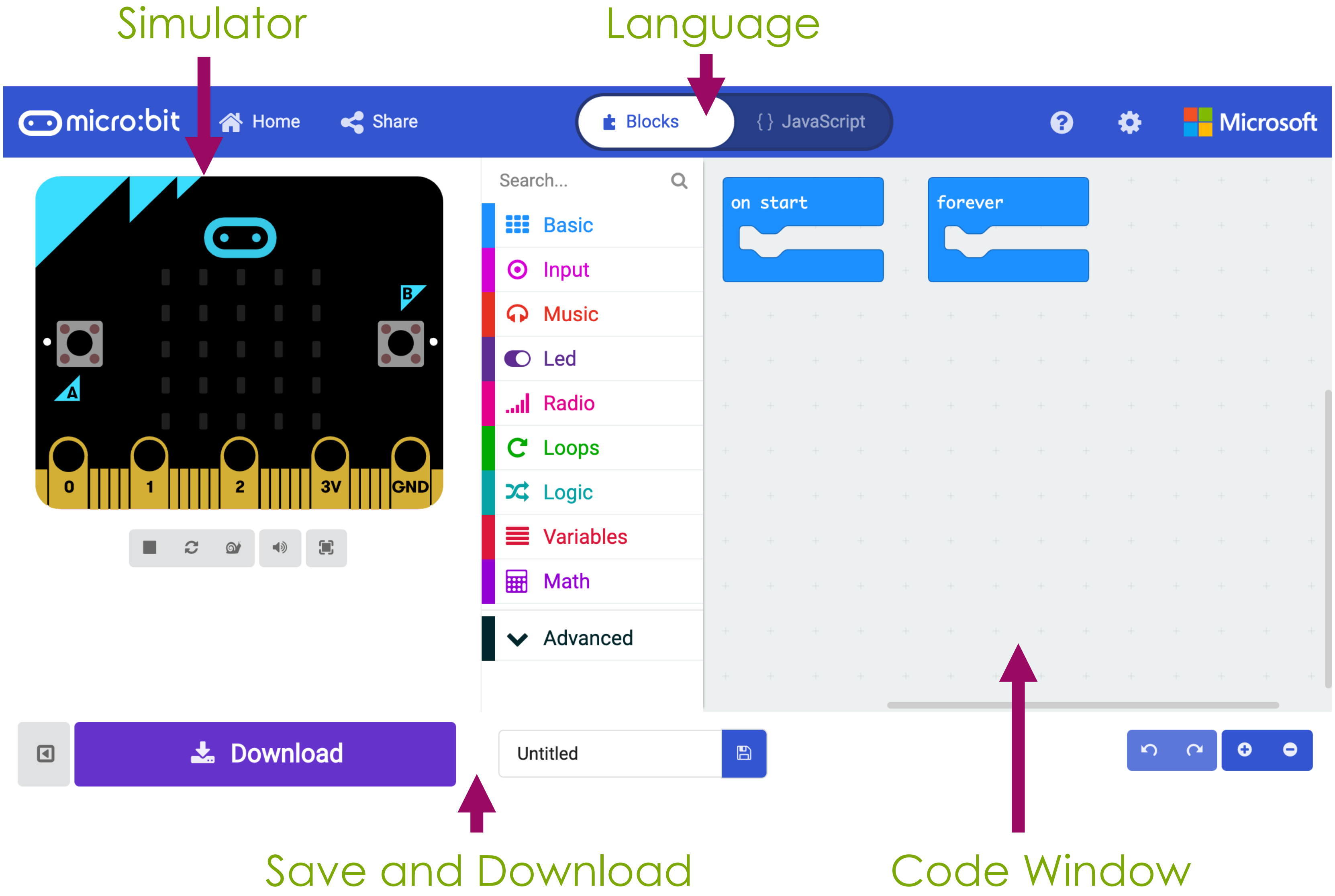
It should look like this!



My Projects

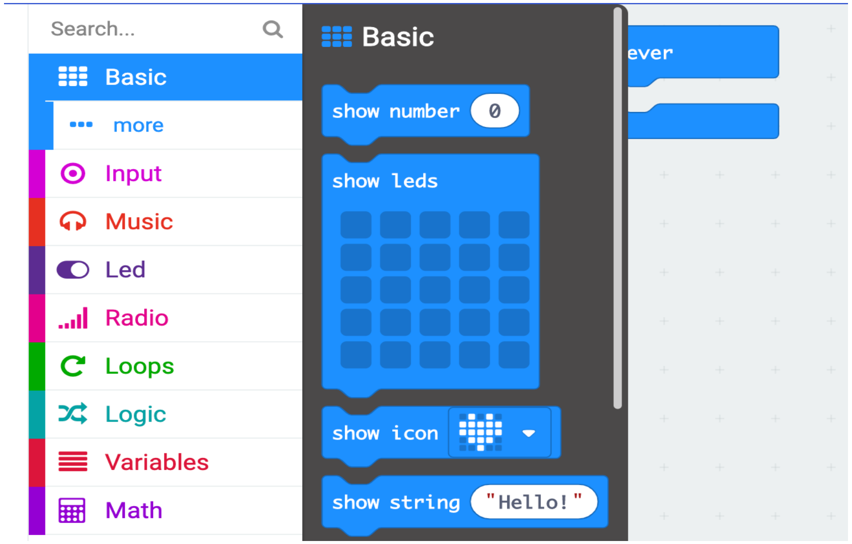
New Project



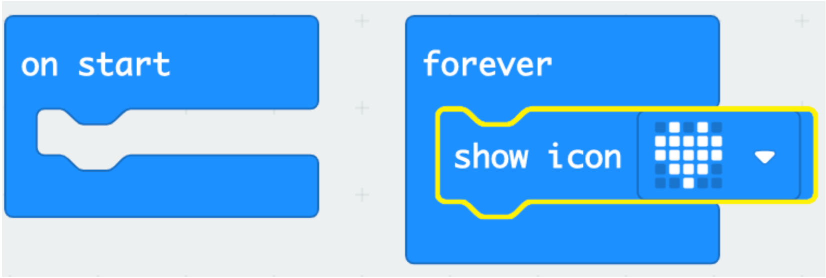

Simulator
Language
micro:bit
Home
Share
Blocks
{ } JavaScript
Microsoft
Search...
Basic
Input
Music
Led
Radio
Loops
Logic
Variables
Math
Advanced
on start
forever
0
1
2
3V
GND
A
B
Download
Untitled
Save and Download
Code Window

Activity: Heart Start

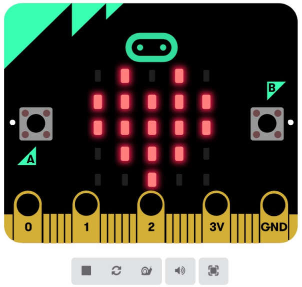
Hearty Start



1. Click on Basic
2. Click the show icon command
3. Drag and drop it into the forever block.
4. What happens to the simulator?



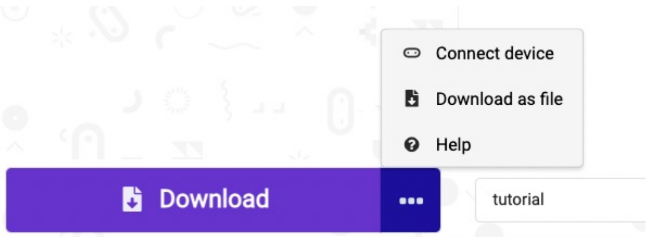
```
on start

forever
    show icon
```



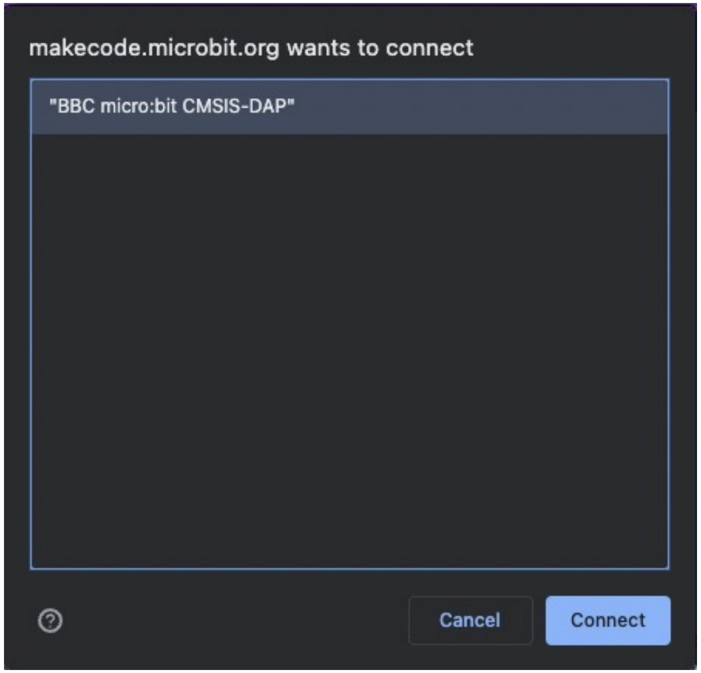
Uploading Code to micro:bit

1. Plug the micro:bit into your computer

2. In the bottom left of your screen, click the 3 dots next to ‘Download’, then click ‘Connect Device’



3. Follow the on screen instructions until you see this popup


makecode.microbit.org wants to connect

"BBC micro:bit CMSIS-DAP"

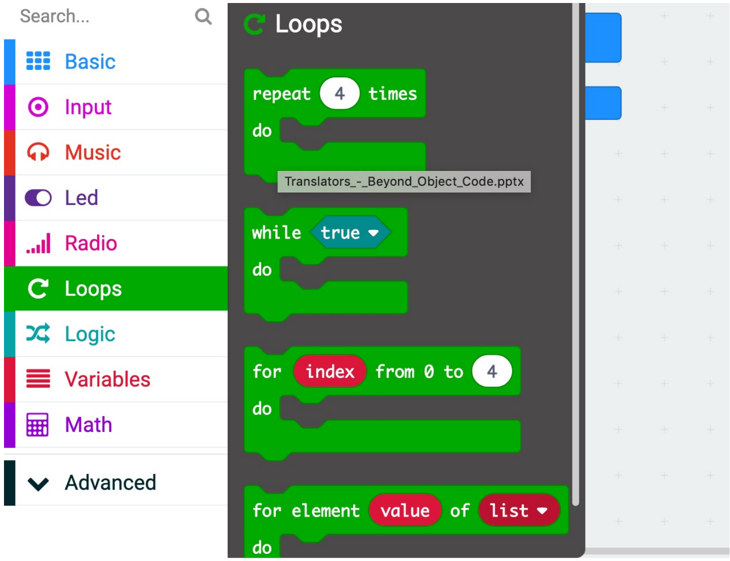
4. Click the name of your device (it should be the only option)

5. Click connect

Activity: Heart Beat

Loops

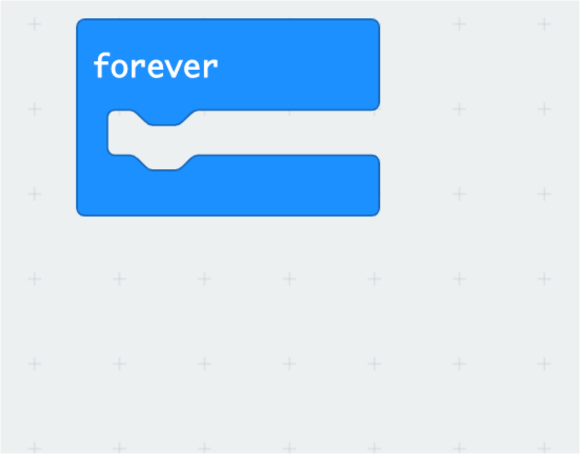
- Feature of a programming language used to repeat a set of commands.
- The commands can be iterated/looped forever, for a specific number of times, or for a given condition.
- We use the commands from the Loops section.



```
repeat 4 times
do

while true
do

for index from 0 to 4
do

for element value of list
do
```

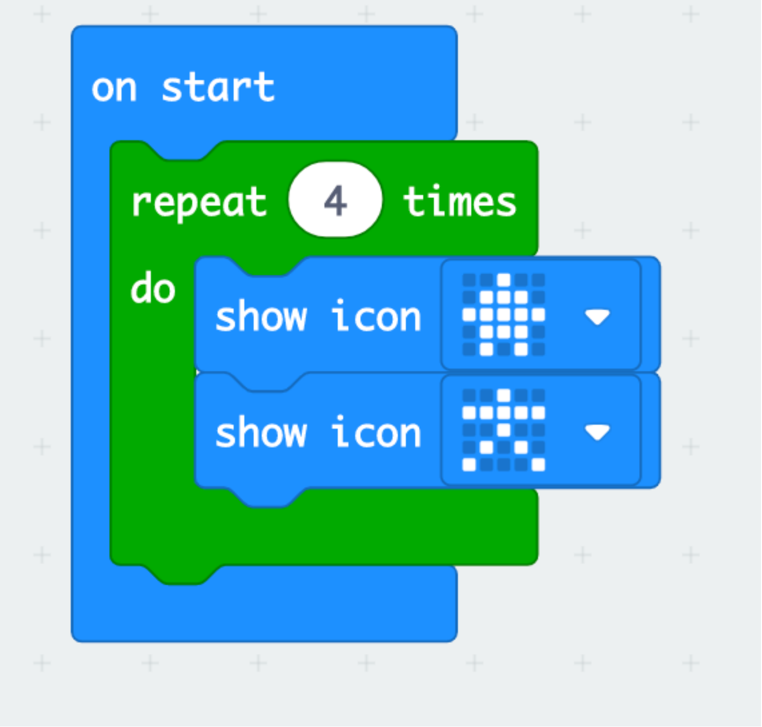
Default Loop

- We have a default loop command when we start micro:bit project.
- The forever command which appears by default runs a set of commands until the micro:bit is unplugged or reset.
- You can have only one forever in the micro:bit code.



On Start vs Forever

- on start will run the code as soon as the micro:bit starts and ends once the code ends.
- In this example, it will show the two icons 4 times and stops.
- forever will run the code well…forever.
- Does it make sense to have a loop inside a forever loop?



```
on start
    repeat 4 times
    do
        show icon
        show icon
```

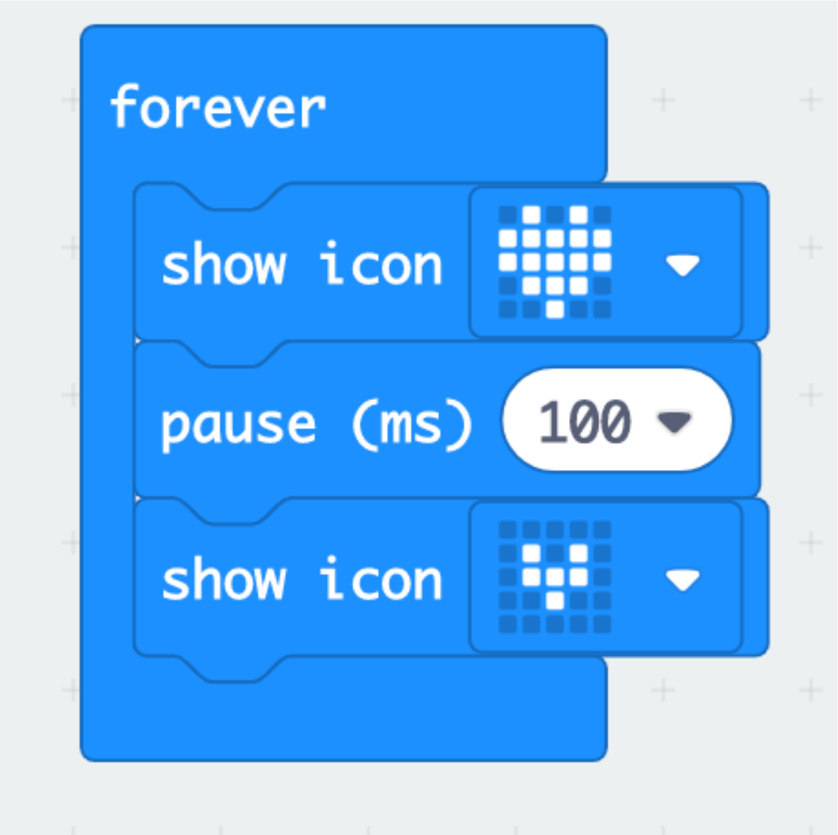
Heart Beat

We have created a simple application which shows the heart icon on the micro:bit

We can extend our app to show an animation

Add a **pause (ms) 100** command and add a miniature heart icon after the pause

Try adding more animation with repeat loops to make a more complex programme



```
forever
    show icon
    pause (ms) 100
    show icon
```

Activity: An Eventful Button Press

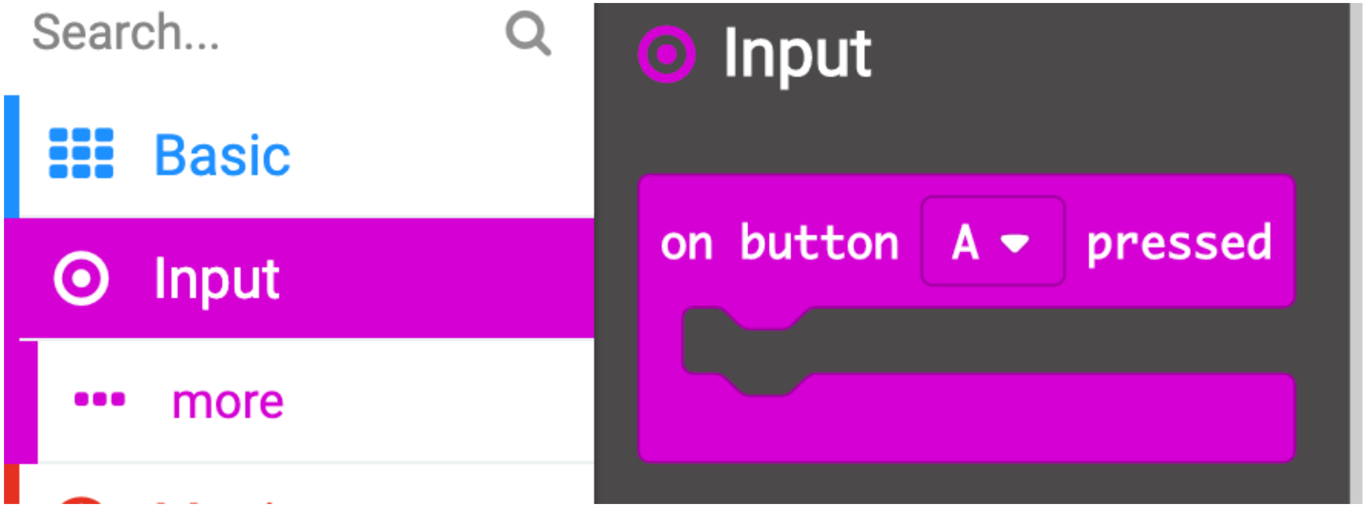
Events

Micro:bit has two buttons, button A and button B

These two buttons help us use event-based programming

For example, we can show a happy face when we press button A and a sad face when we press button B

We need to use the Input commands for our events

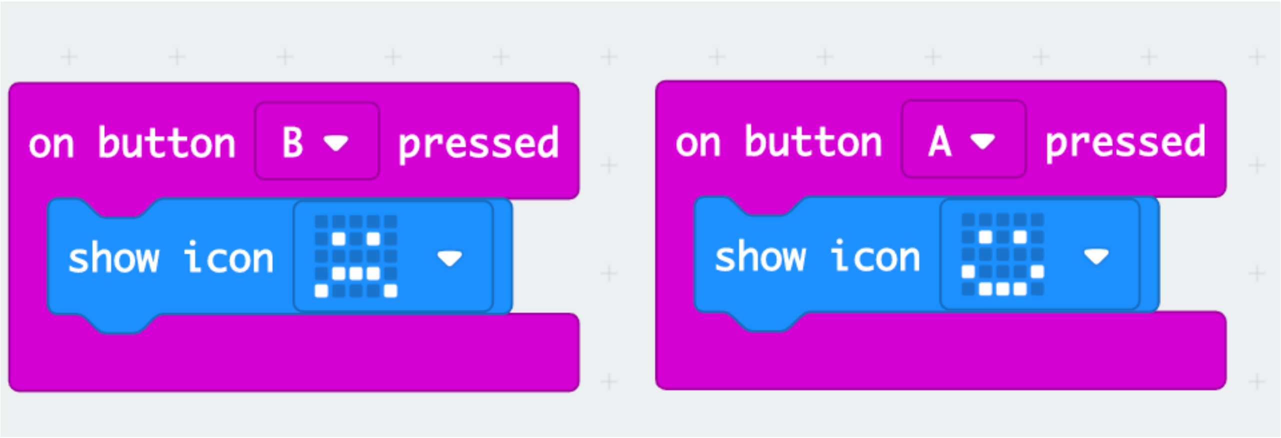


Events

We can use multiple Input commands – one for each button

Remember that if we add two on Button A pressed the micro:bit would not know which one to choose – ensure you use only one button A pressed and one button B pressed event

Have a go!



on button B pressed
show icon

on button A pressed
show icon

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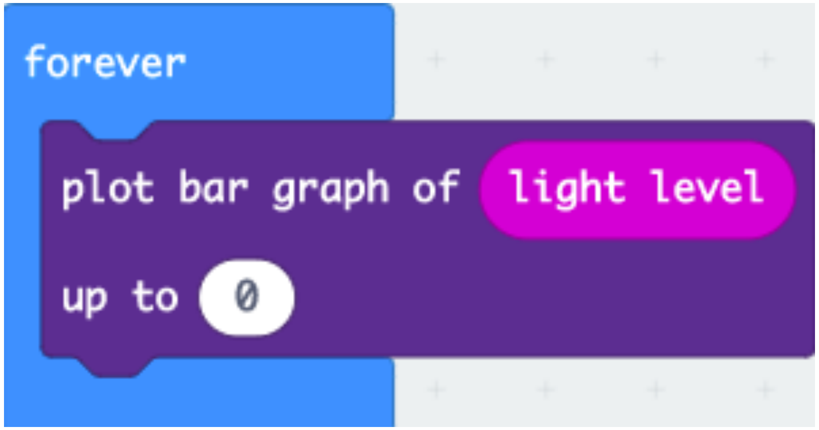
Activity: Sensing the Environment

Activity: Sensing the Environment

We can turn our micro:bit into a light sensor

Use the input block ”light level” and the Led block ”plot bar graph of”



```
forever
  plot bar graph of light level
  up to 0
```

Test the code, and try to work out exactly what is happening here

How can the micro:bit measure light intensity?

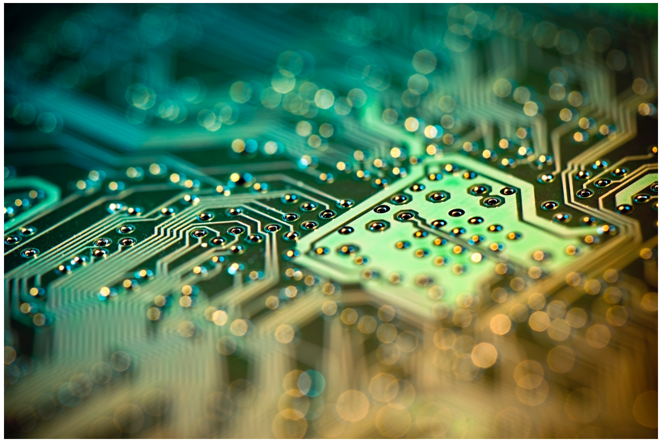
How did your light sensor work?

Electricity

Electricity

The sensor generates an **electrical current** from light – like a solar panel

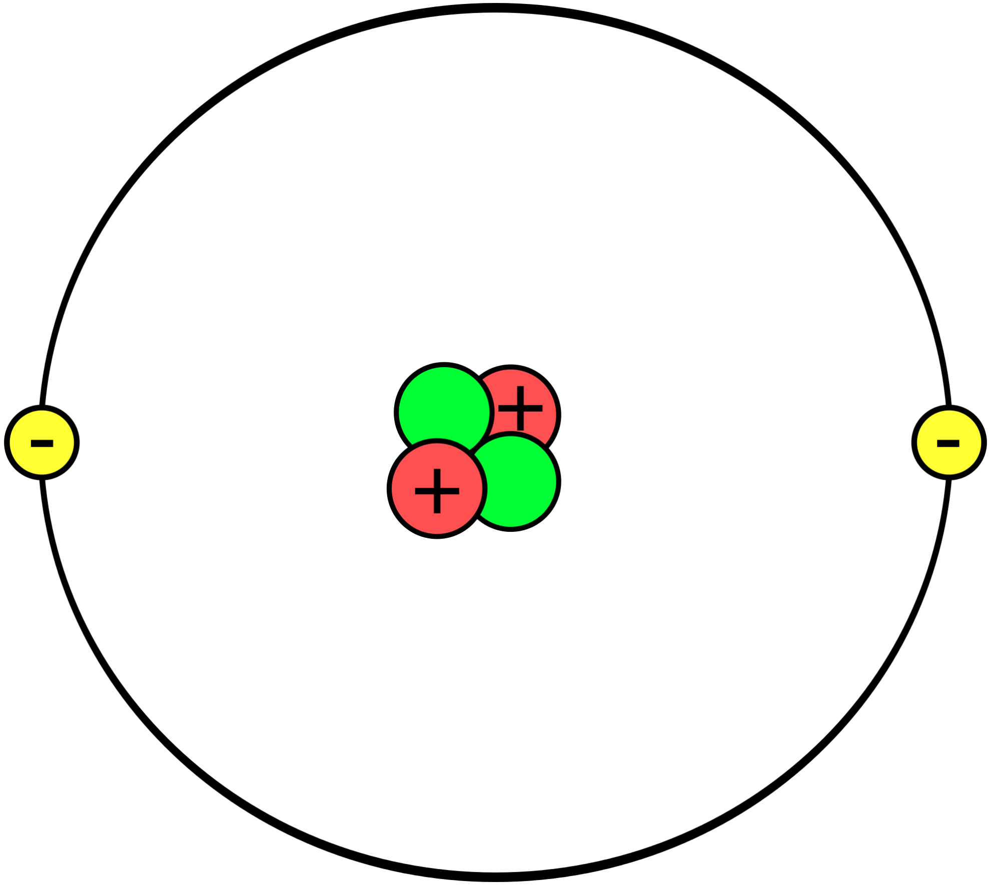
Our micro:bits can understand the strength of this current and show us a visual representation



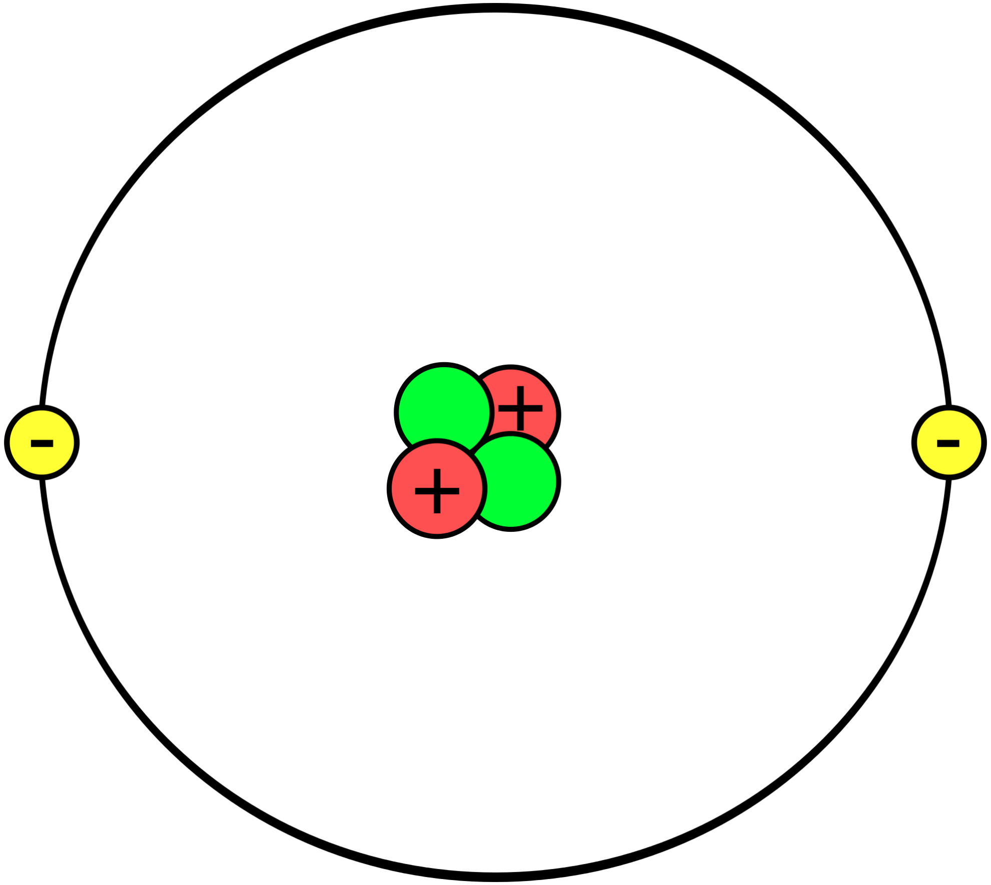
They use electricity to **indirectly** measure brightness of light

How does electrical current move through our micro:bits?

Electricity



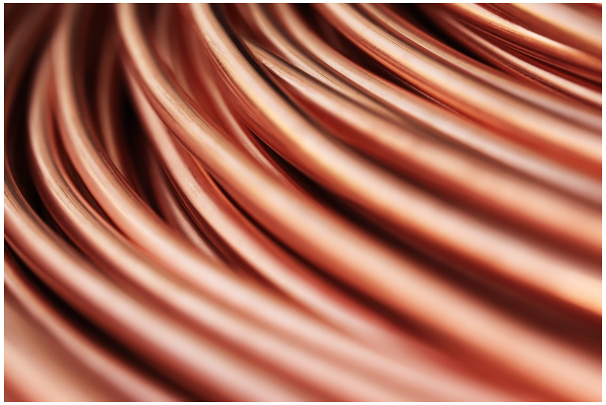
Electricity



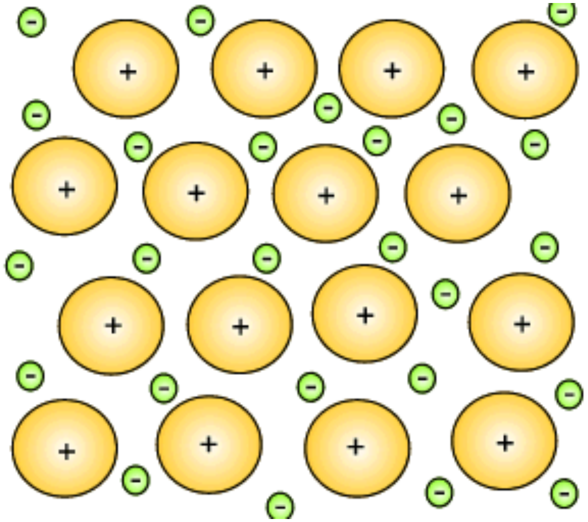
Electricity is the movement of **electrons**

Conduction

Many metals are excellent **electrical conductors**



Metal atoms have a **free electron** that can jump from atom to atom



By sharing electrons in this way metal atoms allow for the **movement of electrons**

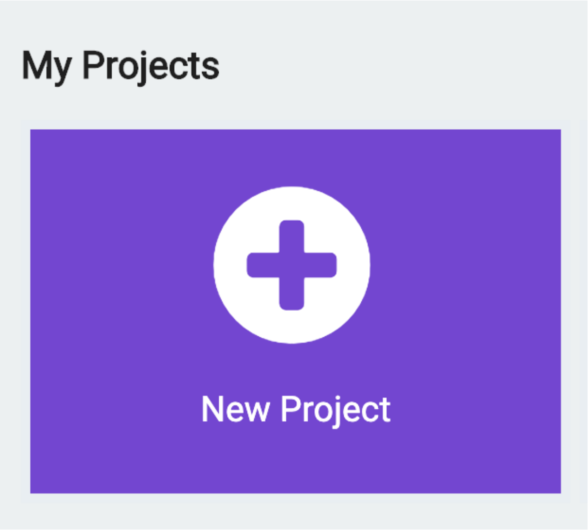
What happens when electrons move?

Activity: Conductivity Checker

Starting with Makecode

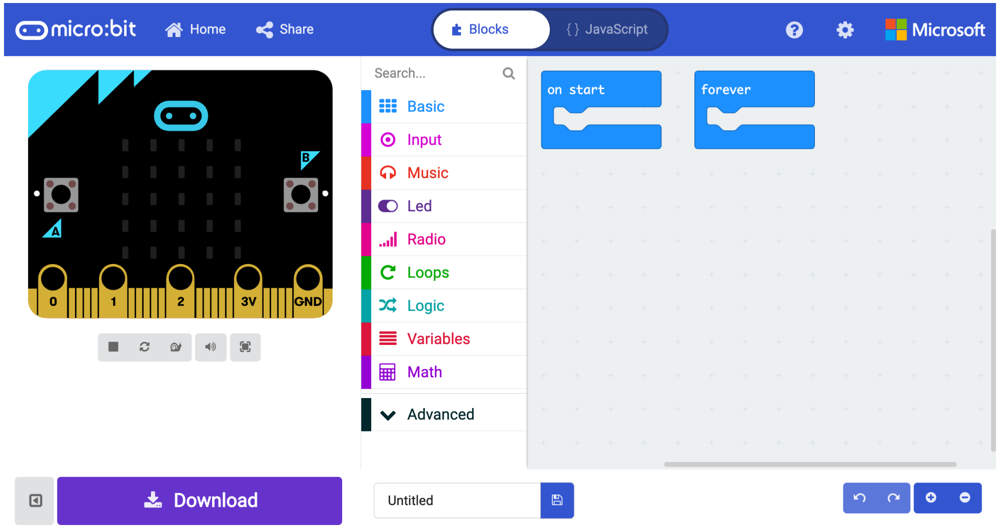
Click New Project

It should look like this!



My Projects

New Project



Conditions

- Feature of a programming language which helps us perform different actions based on different conditions.
- These conditions should always result either in Yes/No or True/False.
- Example:

```
If your age is > 17 then
        You are eligible to drive (given that you have passed your tests).
else
        You have to wait until you are eligible.
```

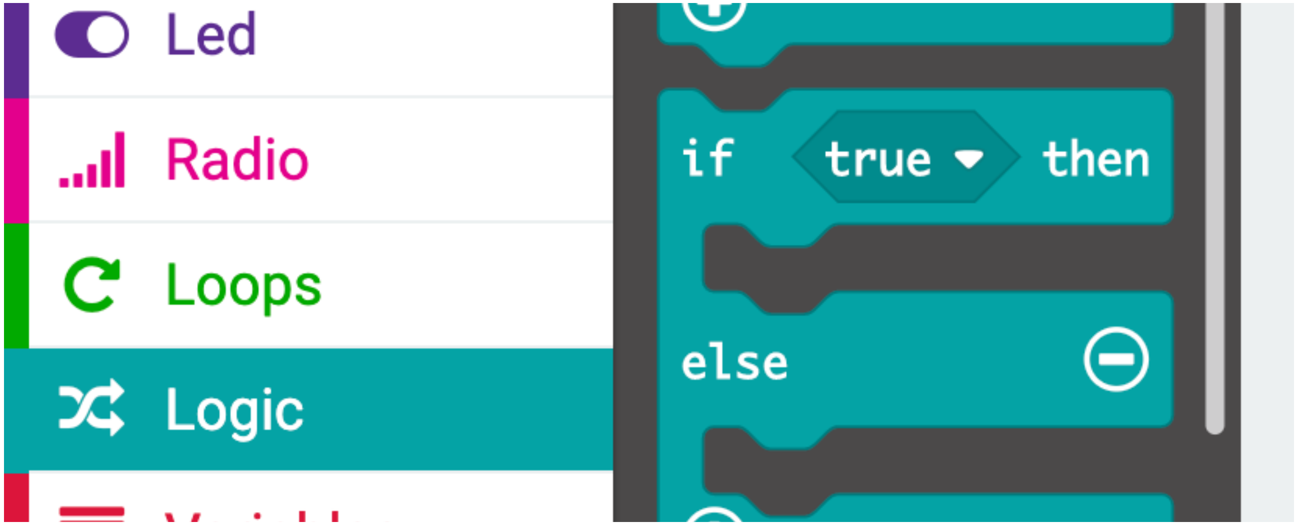
- The condition in the example above can either be true or false. Your age can either be > 17 or less than 17.
- What happens if your age is 17?

Conditional Expressions

- You can create conditions using expressions.
- These expressions use mathematical operators.

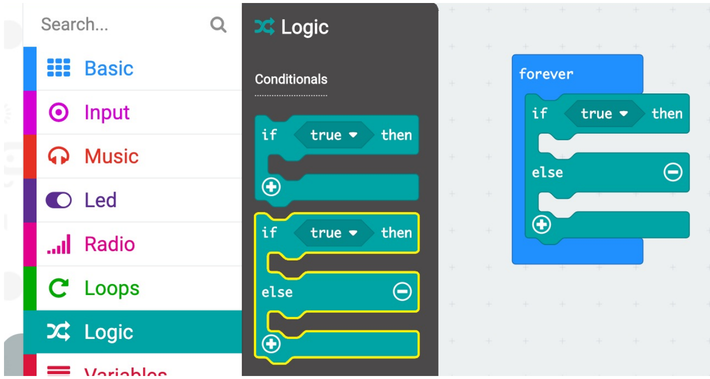
Operator	Meaning
<	Less than
>	Greater than
<= or ≤	Less than or equal to
>= or ≥	Greater than or equal to
=	Equal to
≠	Not equal to

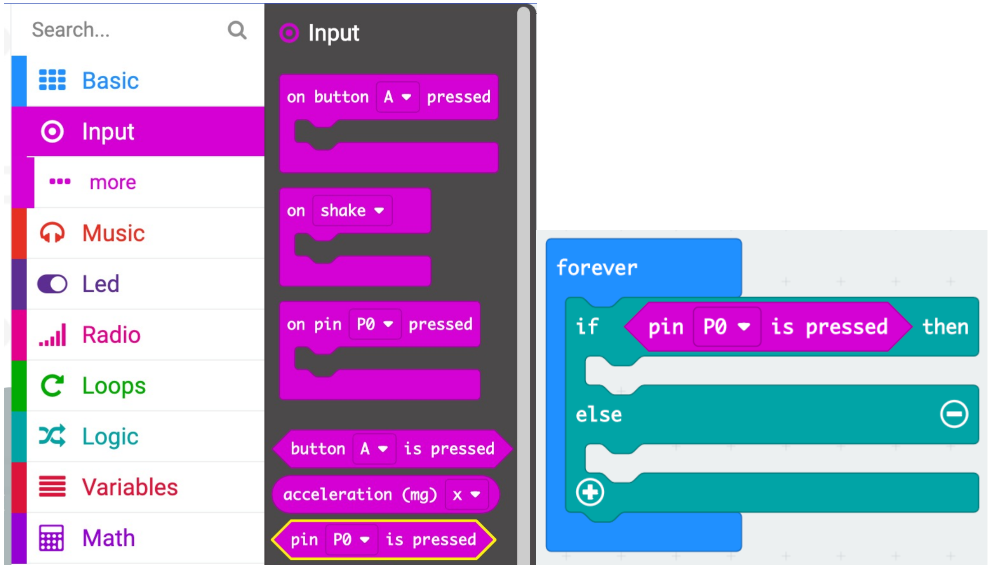
Logic



- In Micro:bit these conditional statements are placed under Logic section.
- It has the conditionals, the comparison operators and the logical operators.

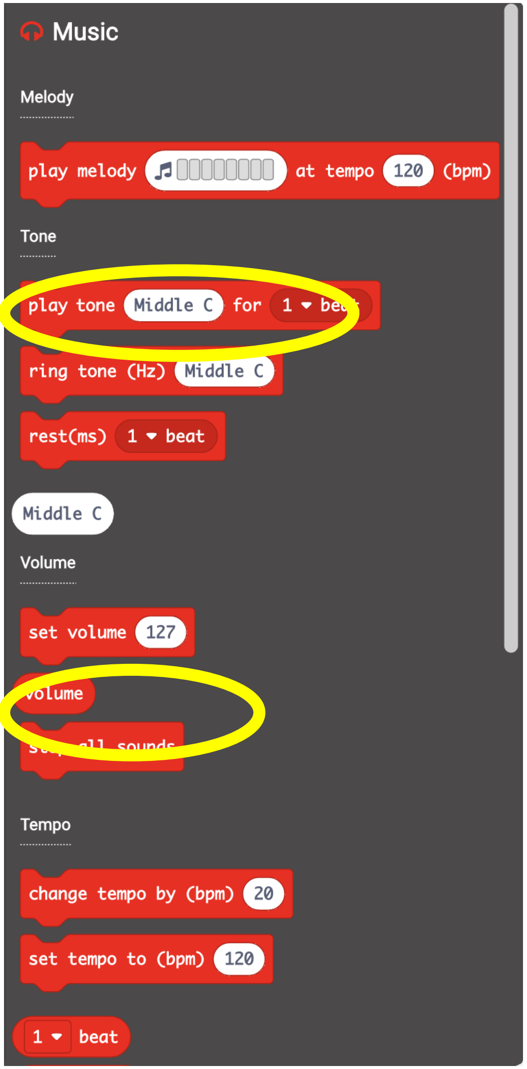
Find the ‘If Else’ Block



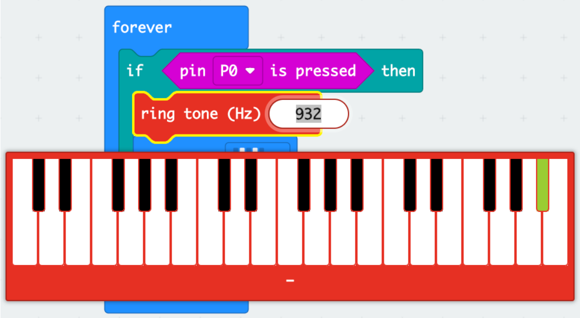


1. Click logic
2. Drag ‘if else’ block into ‘forever’
3. Click input
4. Drag ‘pin P0 is pressed’ block into ‘true’ on the ‘if else’ block
5. Make sure P0 is selected (not P1, P2 etc…)

Set the Sound

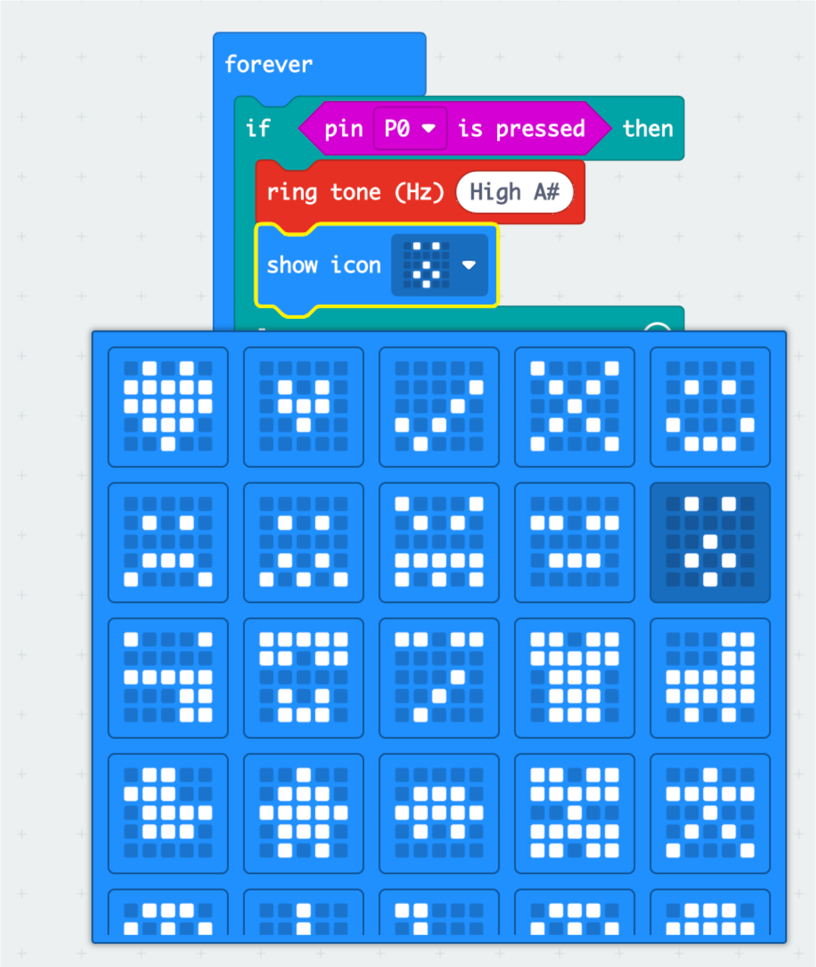


1. Click music
2. Drag ‘ring tone (Hz)’ block
3. Drag ‘stop all sounds’ block into ‘else’
4. Click the note selector on the ‘ring tone (Hz)’ block and choose a note on the keyboard



```
forever
  if pin P0 is pressed then
    ring tone (Hz) 932
```

Set the Icon



```
forever
  if  pin P0 ▾ is pressed  then
    ring tone (Hz) High A#
    show icon ▾
```

1. Click basic
2. Grab the ‘show icon’ block twice
3. Drag one under ‘ring tone Hz’
4. Drag the other under ‘stop all sounds’
5. Choose a different icon for each
6. You could use the ‘show leds’ block instead and draw your own icons.

Finishing Touches

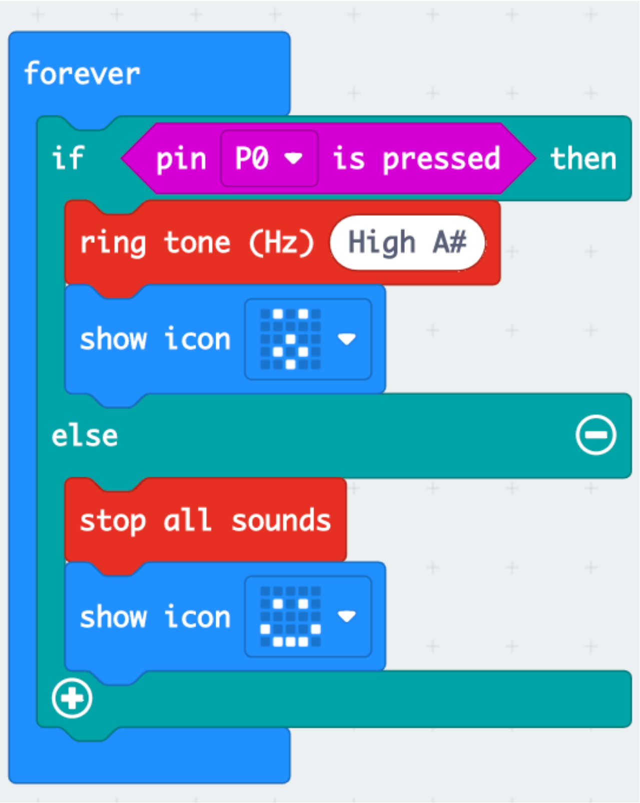
1. Your final code should look like the this

2. Attach your crocodile clips to ‘Pin 0’ and ‘GND’ on your micro:bit

3. Download your code to your micro:bit

4. Touch the loose ends of the crocodile clips together to make sure it works

5. Try holding the end of each crocodile clip in a different hand to see if you are conductive!



```
forever
  if pin P0 is pressed then
    ring tone (Hz) High A#
    show icon
  else
    stop all sounds
    show icon
```

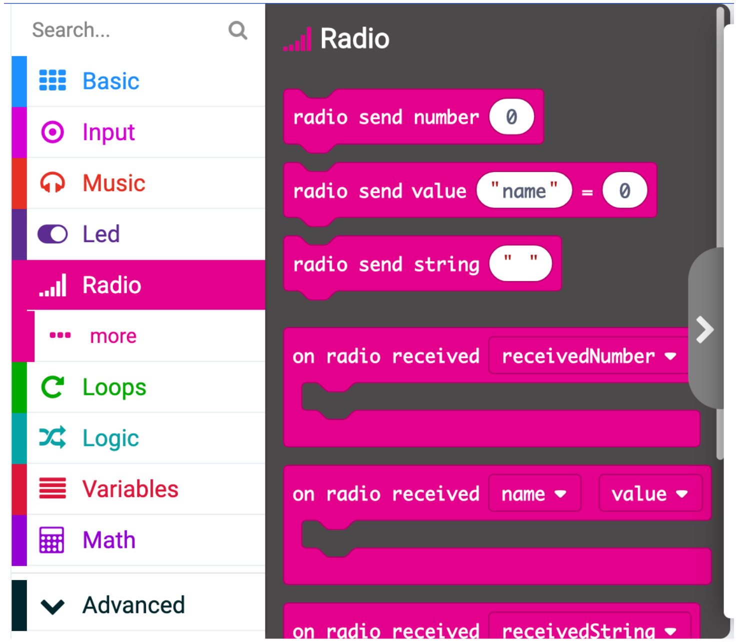
What else conducts electricity?

Extensions!

Activity: Radio Communication

Radio Communication

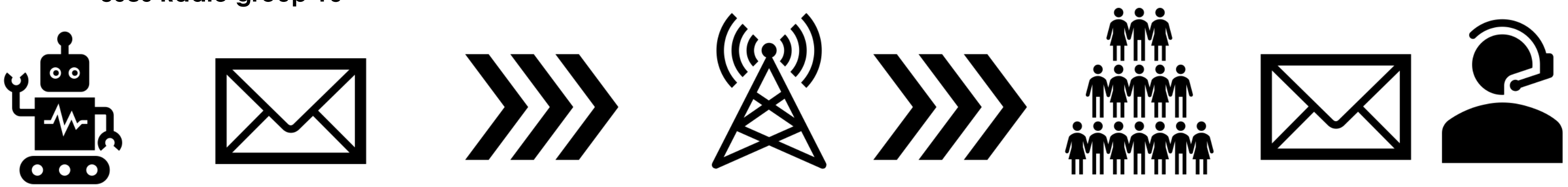
- We can use the Bluetooth feature of micro:bit to communicate with other micro:bits.
- The commands necessary are available in the Radio group.



```
radio send number 0
radio send value "name" = 0
radio send string " "
on radio received receivedNumber
on radio received name value
on radio received receivedString
```

Radio Communication

- The sender uses a radio group (say 10).
- The sender sends the message using that radio number.
- It is transmitted to all micro:bit's.
- The receiver who is listening to the same radio group receives the message.

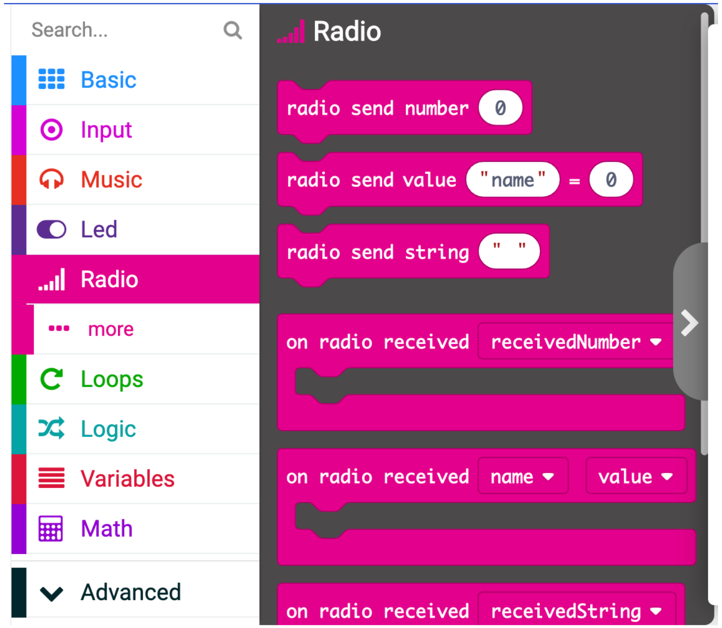


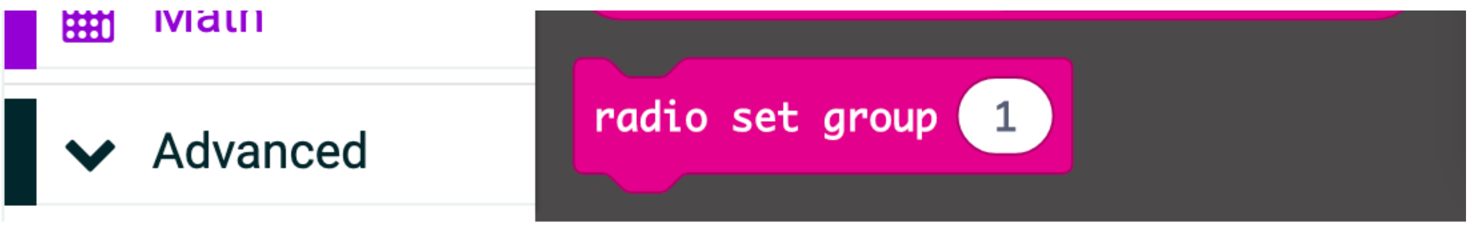
Uses Radio group 10

Listens to Radio group 10

Sending Messages / Numbers

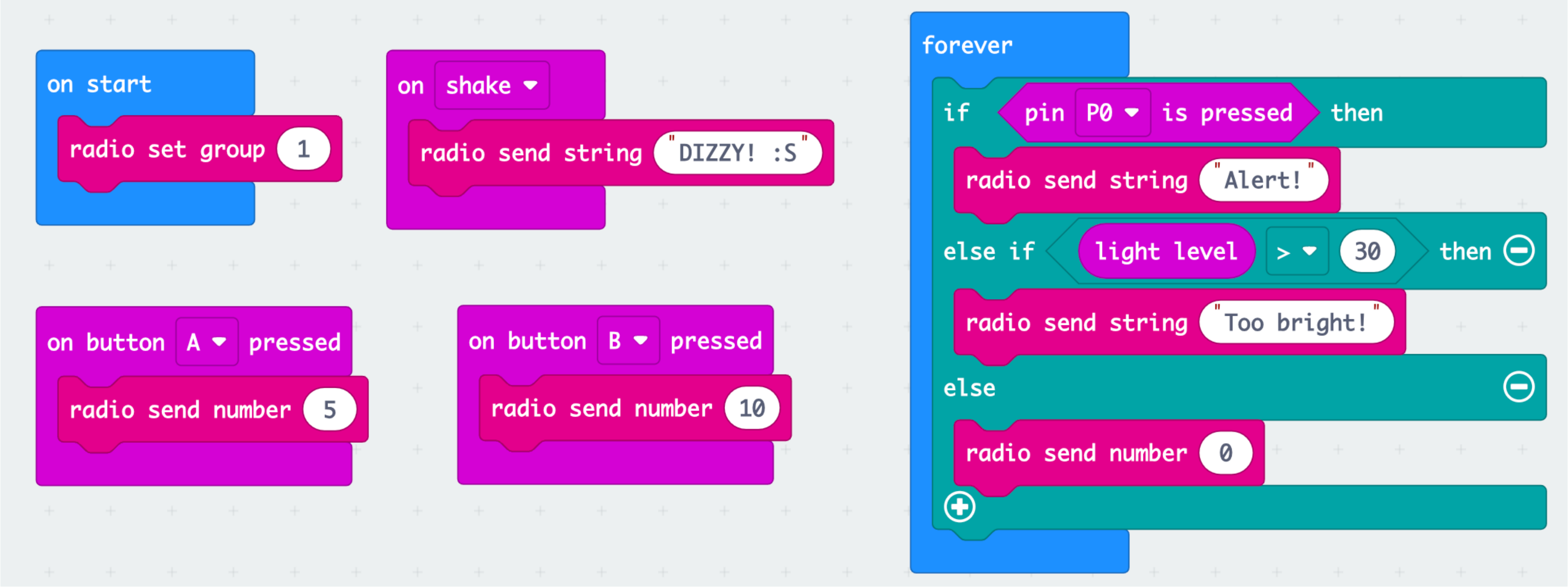
- There are two different commands to send messages and numbers.
- To send numbers we use radio send number.
- To send text messages we use radio send string.
- Do not forget to set the Radio Group.


Search...
Basic
Input
Music
Led
Radio
more
Loops
Logic
Variables
Math
Advanced
Radio
radio send number 0
radio send value "name" = 0
radio send string " "
on radio received receivedNumber
on radio received name value
on radio received receivedString



Radio Communication

You can set the radio to send messages for all kinds of inputs – have a play around and see what you can send to your friends!

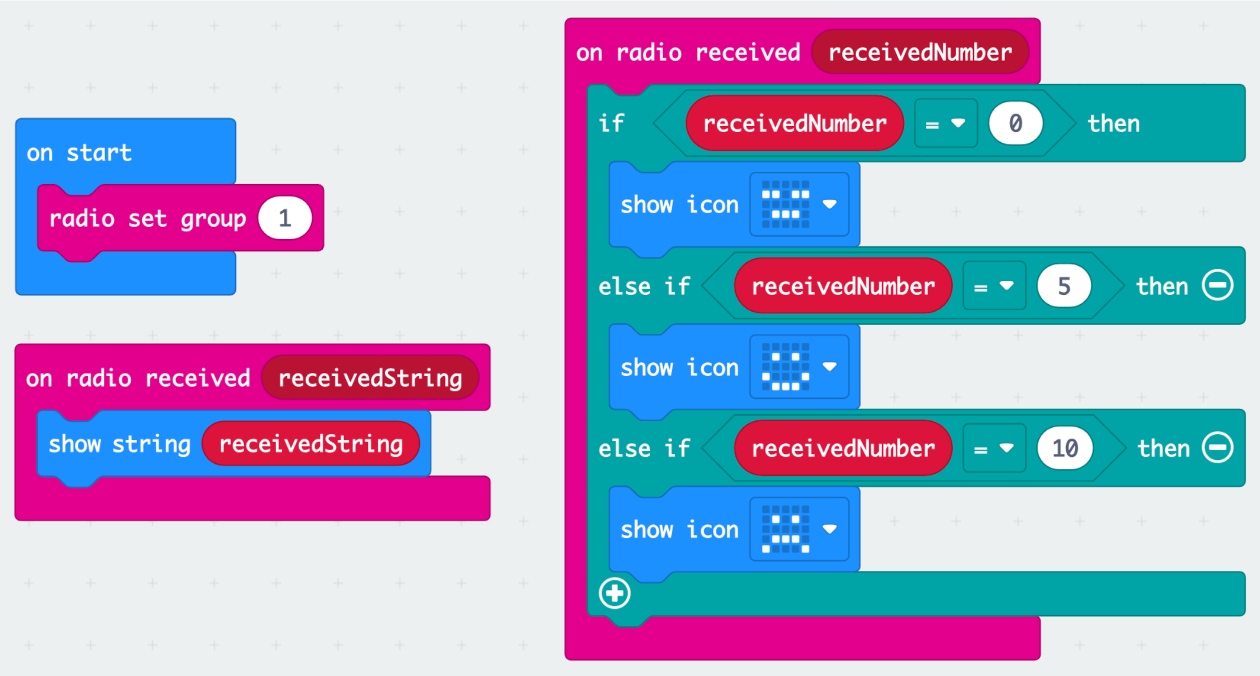


```
on start
    radio set group 1

on shake
    radio send string "DIZZY! :S"

on button A pressed
    radio send number 5

on button B pressed
    radio send number 10

forever
    if pin P0 is pressed then
        radio send string "Alert!"
    else if light level > 30 then
        radio send string "Too bright!"
    else
        radio send number 0
```

Don’t forget to set the radio group first!

Radio Communication

And of course you can set the radio to receive messages for all kinds of signals – have a play around and see what you can send to your friends!



```
on start
    radio set group 1

on radio received receivedString
    show string receivedString

on radio received receivedNumber
    if receivedNumber = 0 then
        show icon
    else if receivedNumber = 5 then
        show icon
    else if receivedNumber = 10 then
        show icon
```

Don't forget to set the radio group first!

Activity: DIY Micro:bit

DIY Micro:bit Project

You can do nearly anything with a micro:bit

Come up with something you'd like your micro:bit to do and try and make it work

Or just play around and see what you can make!

If you can't think of anything, try making a rock paper scissors game.