



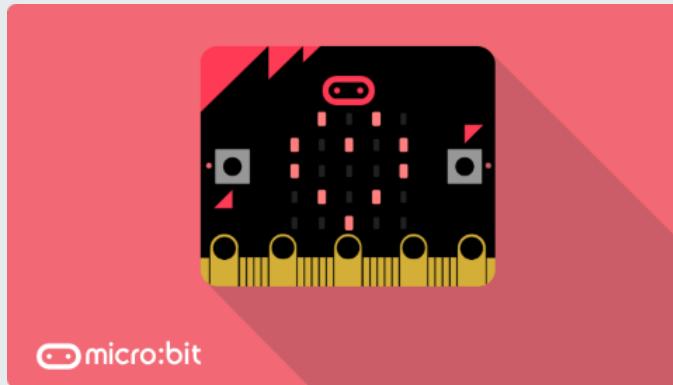
Microsoft Build

May 6–8, 2019





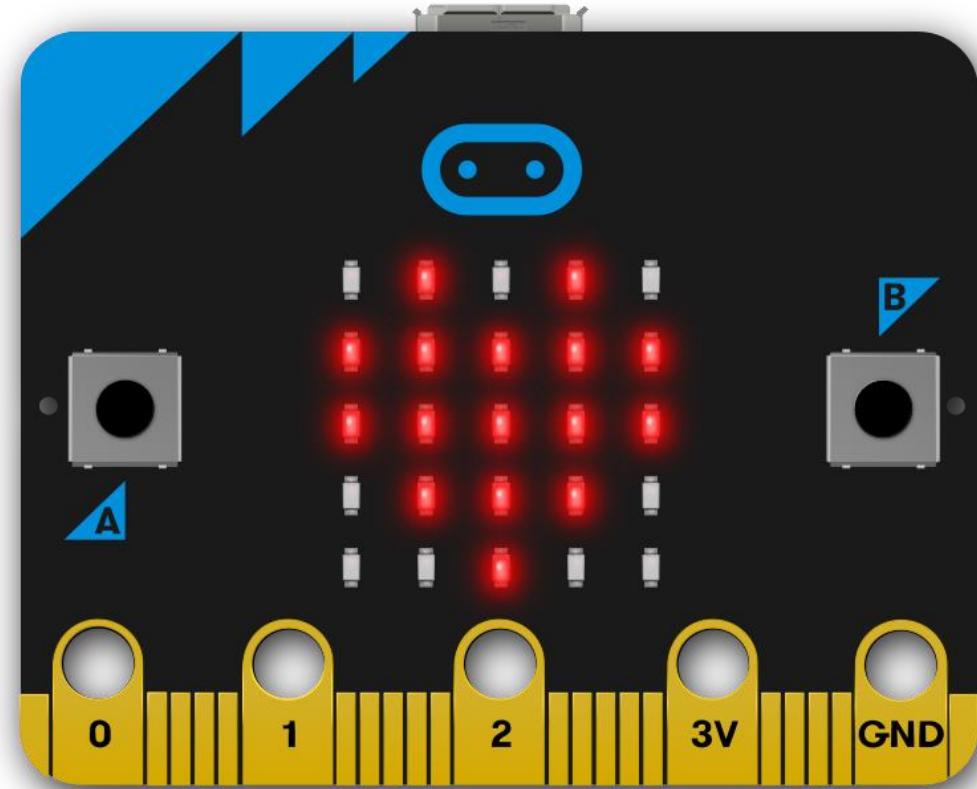
Build a Friend Detector with BBC micro:bit

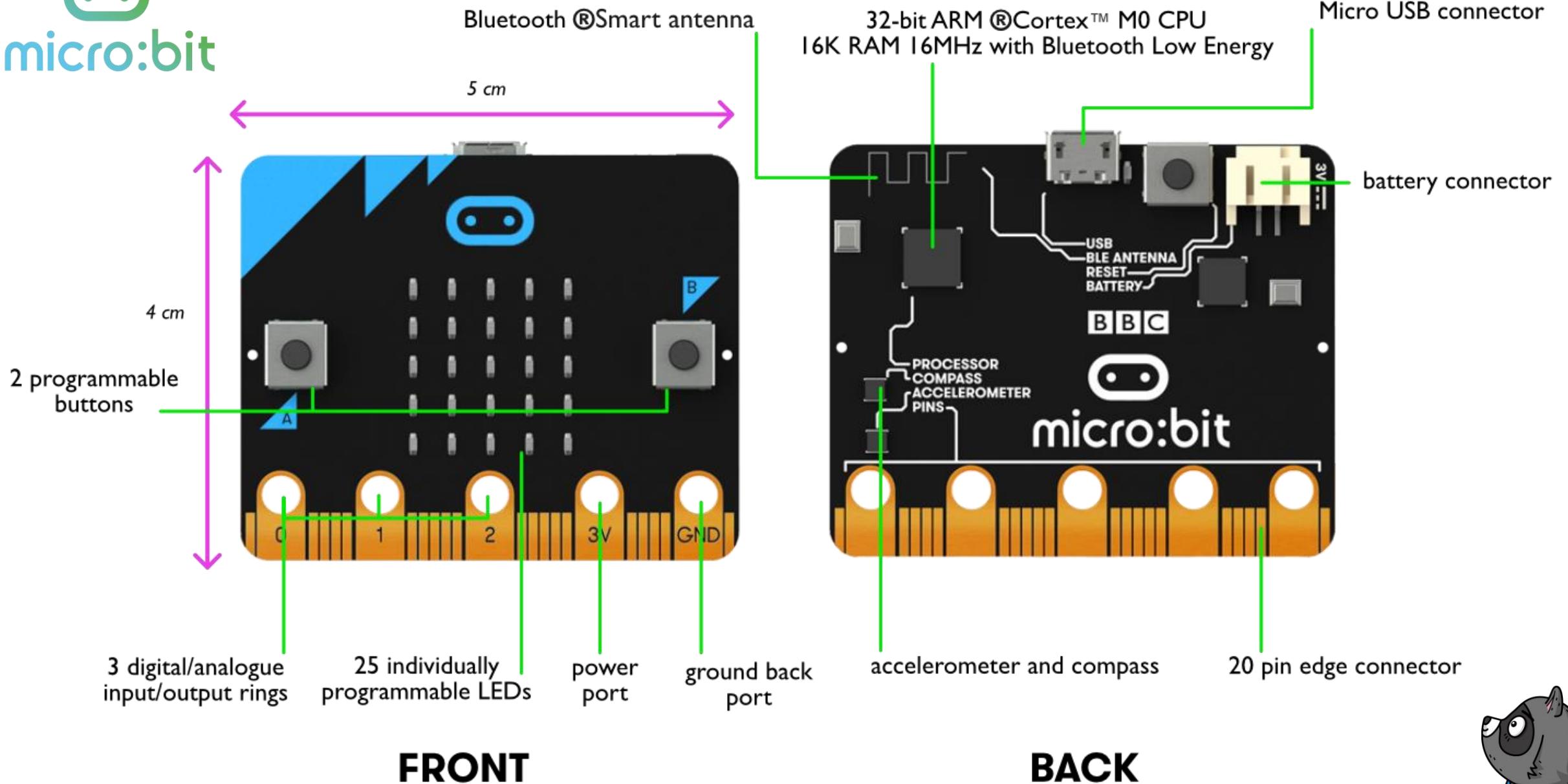


Jim Bennett
@JimBobBennett
aka.ms/FriendDetector



The BBC micro:bit

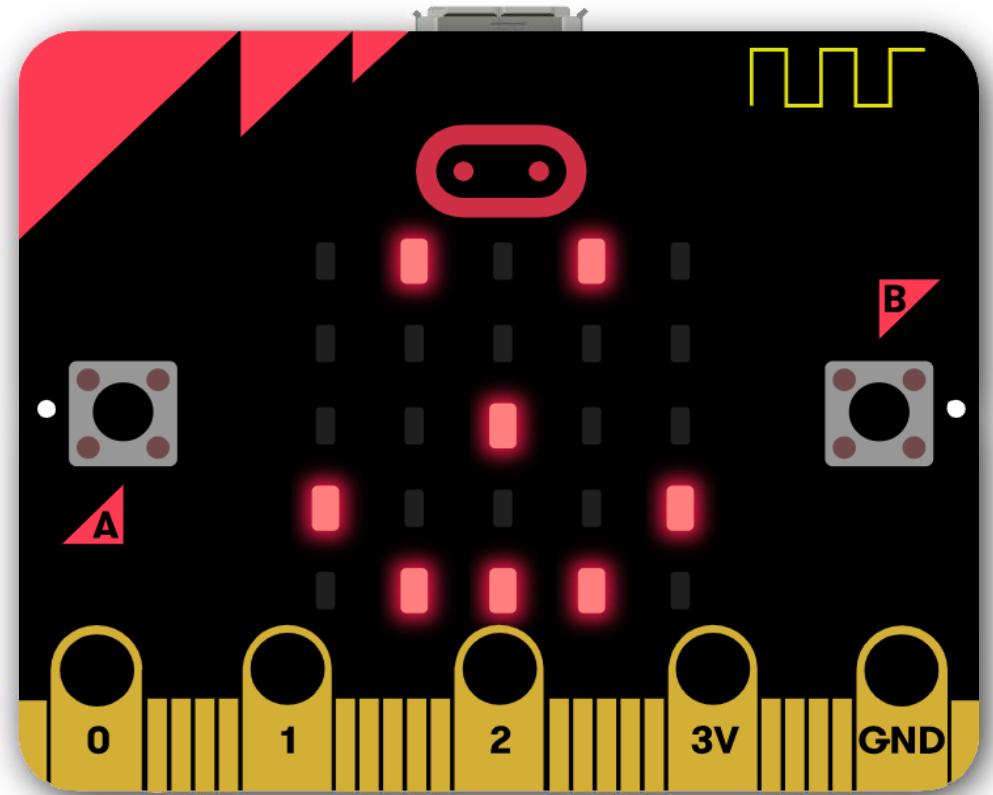




The Friend Detector



The radio



The algorithm

When the secret code is detected, set a counter to 5

Every second:

- Send the secret code to others

- If the counter is more than 0

 - Show a smiley face

 - Decrease the counter

- Otherwise

 - Show an X



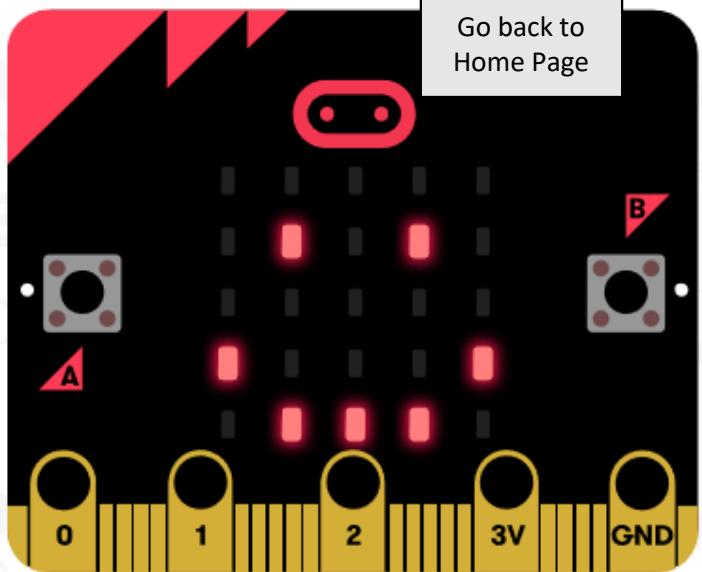
Lets code!



MakeCode for the micro:bit

The screenshot shows the Microsoft MakeCode for micro:bit web interface. At the top, there's a preview of a project with a micro:bit board connected to a servo motor and a breadboard with various components. Below the preview, the main interface includes:

- My Projects:** A section showing recent projects: "New Project" (recently created), "Magic 8ball", "WristCuffRadio", "Serial Data", and "Microbit".
- Import:** A button to import program files (.hex) or shared project URLs.
- Recent projects:** A list of recently used projects.
- Tutorials:** A section featuring step-by-step guides for projects like "Flashing Heart", "Name Tag", "Smiley Buttons", "Dice", and "Love Meter".
- Step-by-step Tutorials, Sample Projects, Curriculum, Videos:** A callout pointing to the tutorial section.



Simulator shows what your program will look like running on a micro:bit



Download your Project to the micro:bit

Download

Search...



Basic

Input

Music

Led

Radio

Loops

Logic

Variables

Math

Advanced

Program in either Blocks or JavaScript

on start

forever

show icon

Block Toolbox

Programming Workspace where you will build your program

Undo/Redo and Zoom Workspace

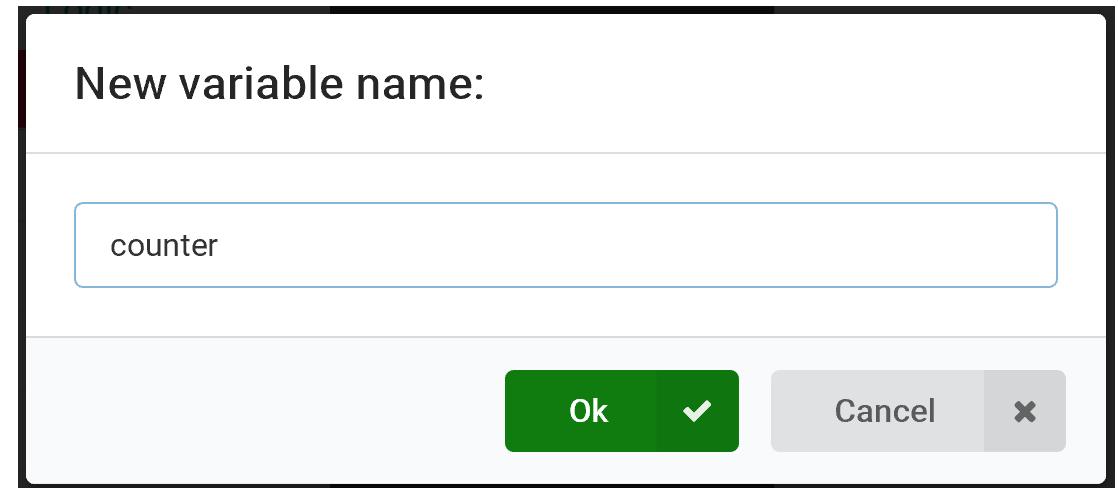
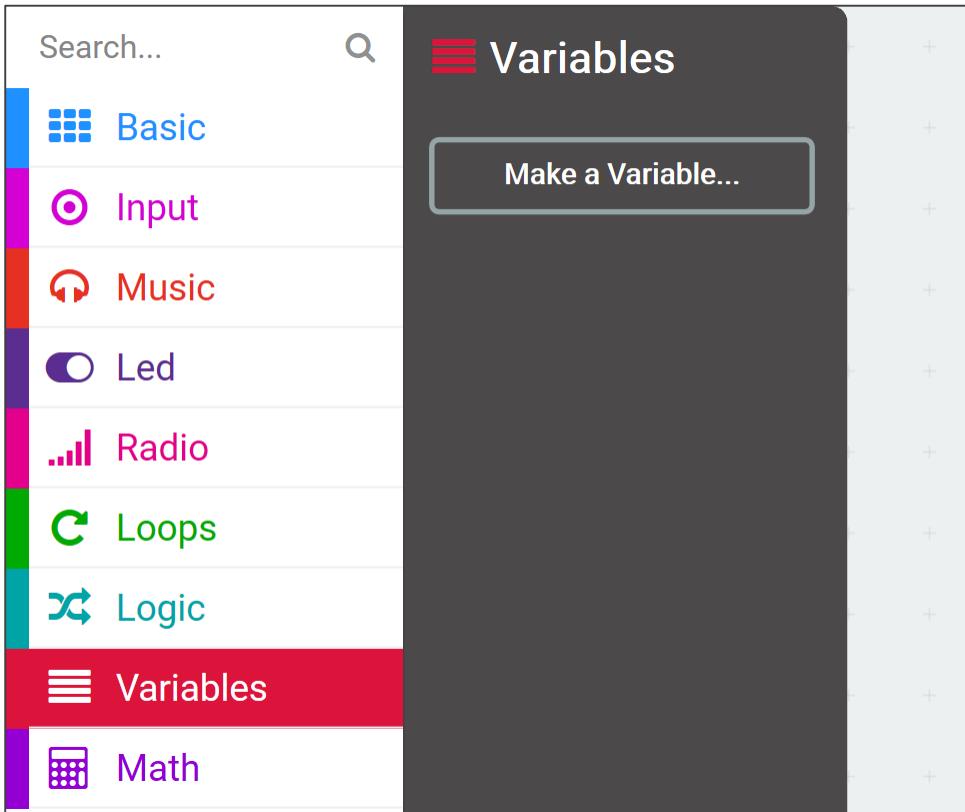
Smiley



Name your Project and Save it on your computer

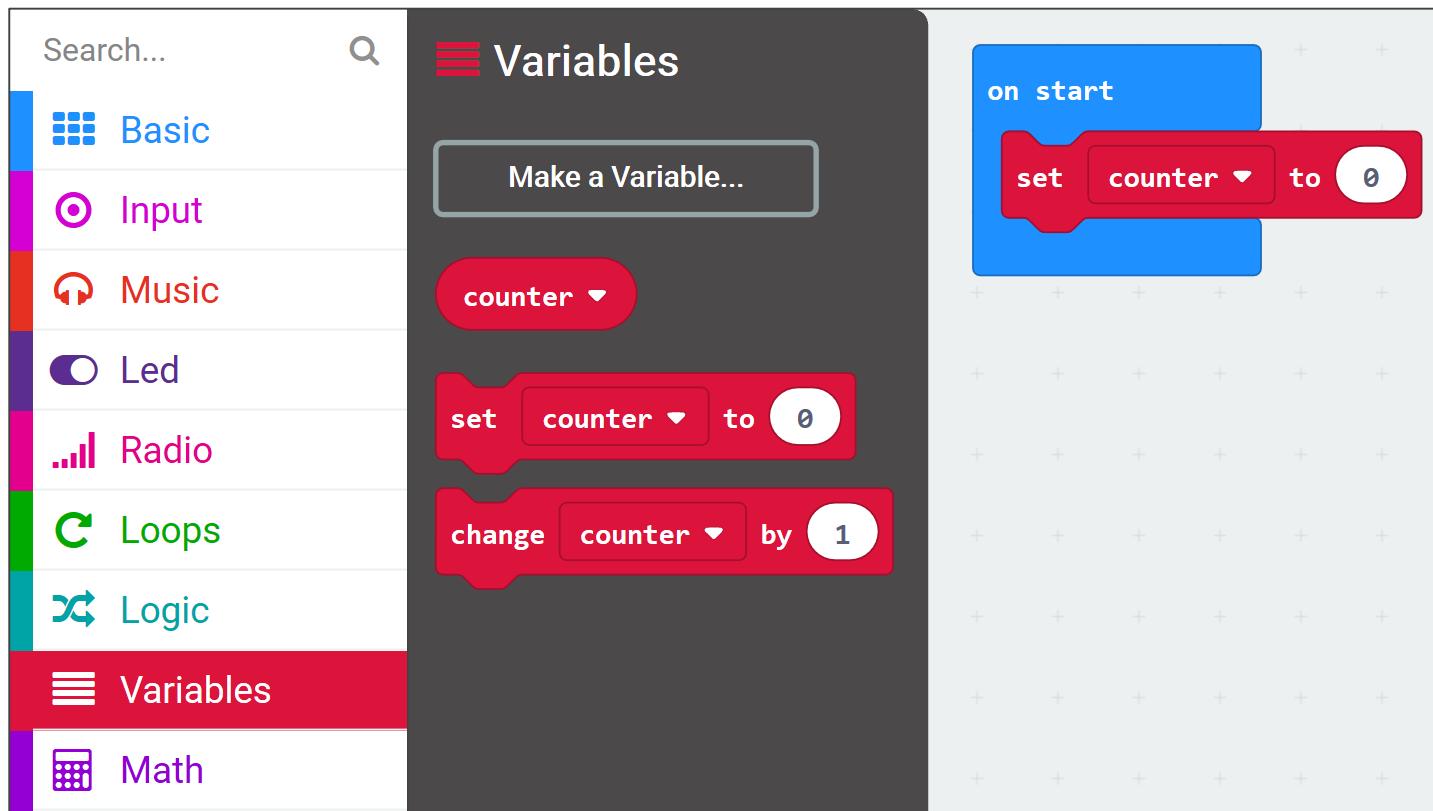
Add a variable

- Open the **Variable** Toolbox drawer
- Select **Make a Variable...**
- Name the variable **counter**
- Select **OK**



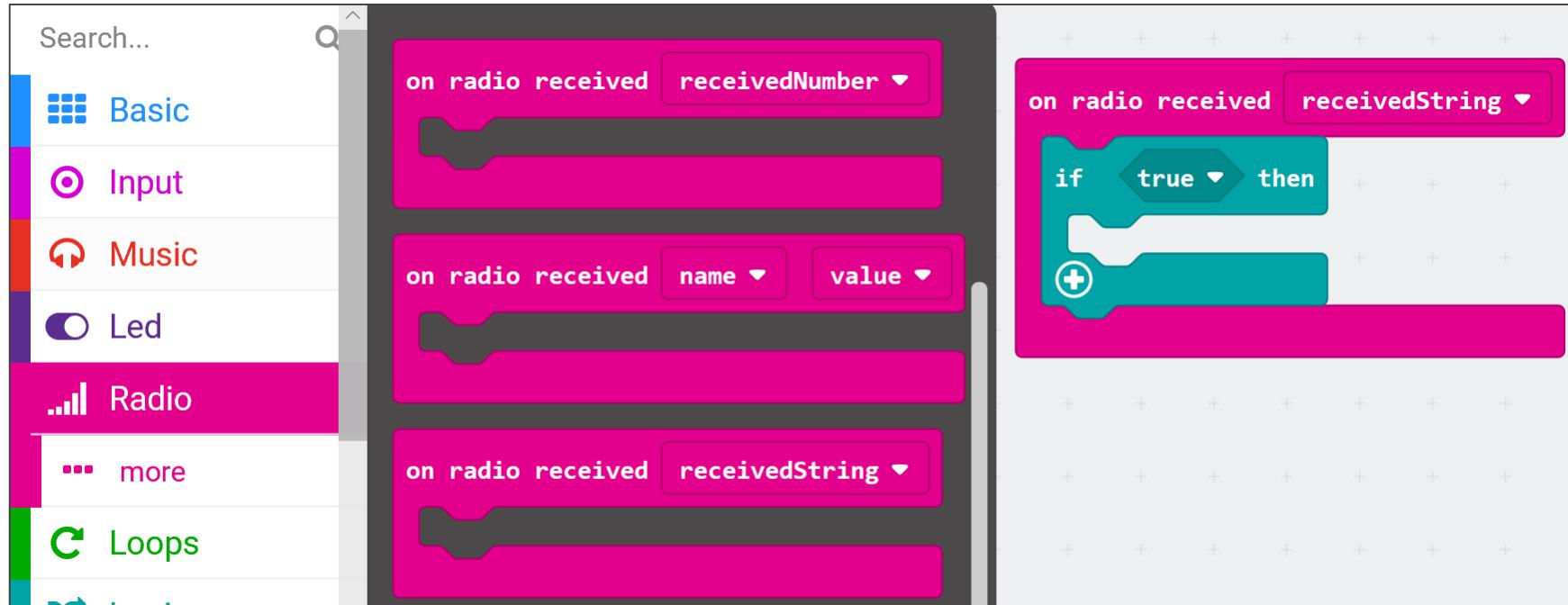
Set the variable on start

- Open the **Variable** Toolbox drawer
- Drag a **Set Counter to 0** block into the **On Start** block



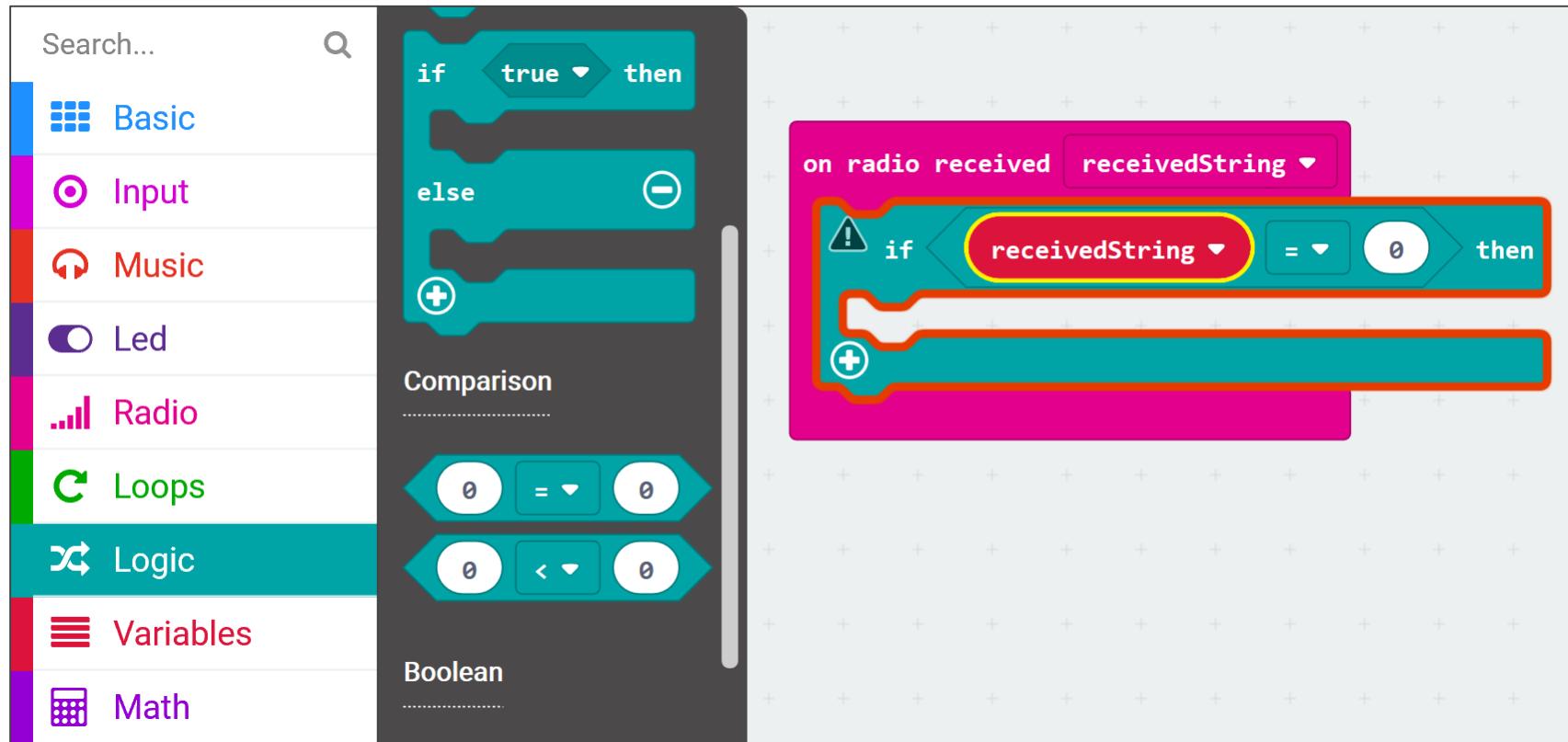
Set the variable to 5 when a radio message is received

- Open the **Radio** Toolbox drawer
- Drag an **On Radio Received receivedString** block onto the workspace
- Open then **Logic** Toolbox drawer
- Drag an **If true then** block into the **On Radio Received receivedString** block



Set the variable to 5 when a radio message is received

- Open then **Logic** Toolbox drawer
- Drag a **0 = 0** comparison block into the **true** part of the **if** block
- Open the **Variable** Toolbox drawer
- Drag the **receivedString** variable into the first part of the comparison



Set the variable to 5 when a radio message is received

- Open then **Text** Toolbox drawer in the **Advanced** section
- Drag a “” block into the second part of the comparison
- Select the “” block and enter a secret code!



The image shows the Scratch workspace. On the left, the **Advanced** section of the **Toolbox** is open, with the **Text** category selected (indicated by a yellow background). The **Text** category contains the following blocks:

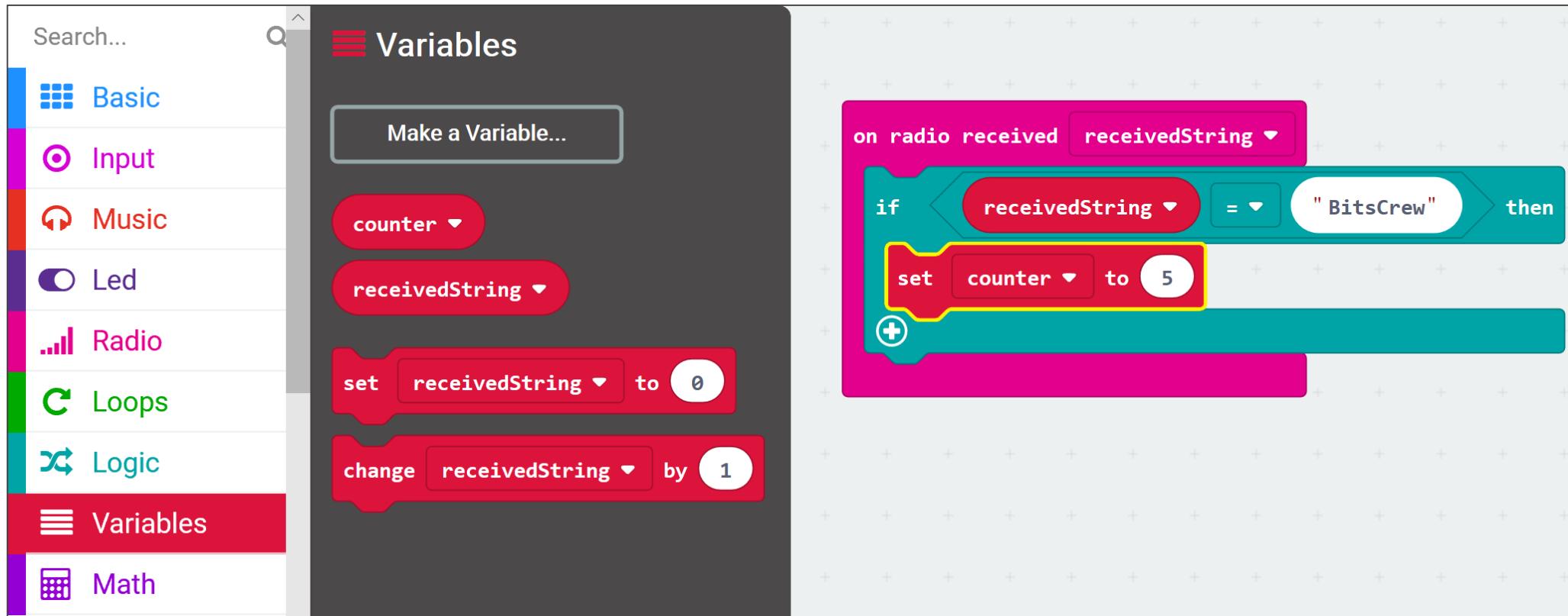
- length of [Hello]
- join [Hello] [World]
- compare [] to []
- substring of [] from [0] of length [10]
- parse to number [123]

On the stage, there is a script starting with the **on radio received** event followed by a **receivedString** variable. The script then checks if **receivedString** is equal to "BitsCrew". If true, it sets a variable to 5.

```
on radio received [receivedString v]
  if (receivedString v) = [BitsCrew v] then
    [set [variable] v to (5)]
```

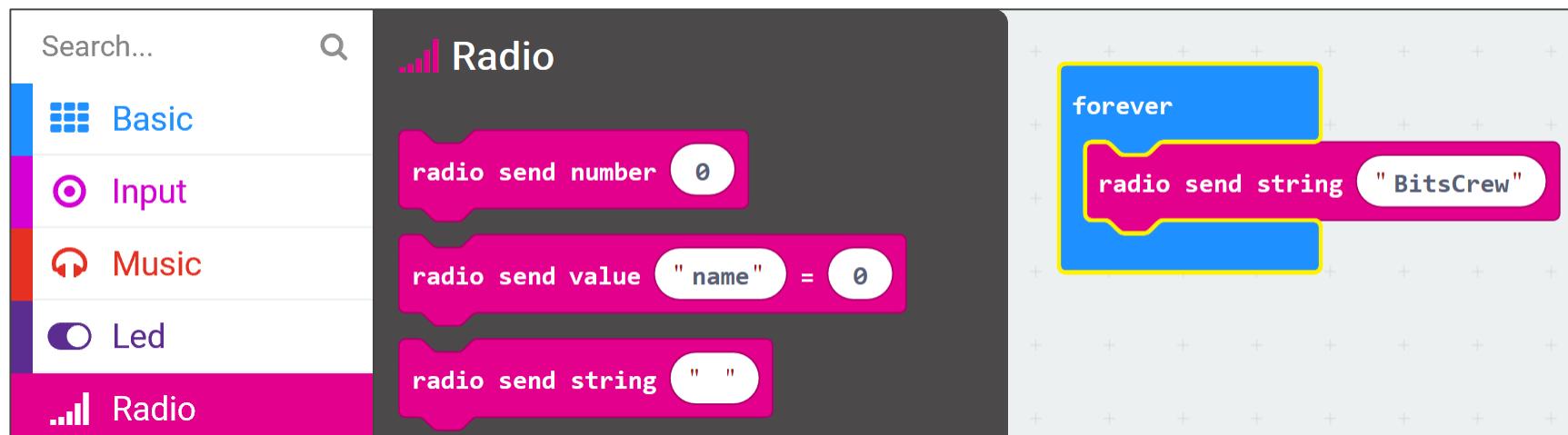
Set the variable to 5 when a radio message is received

- Open the **Variable** Toolbox drawer
- Drag a **Set ... to 0** block into the **If then** block
- Change the variable to **counter** if necessary
- Select the **0** and set it to **5**



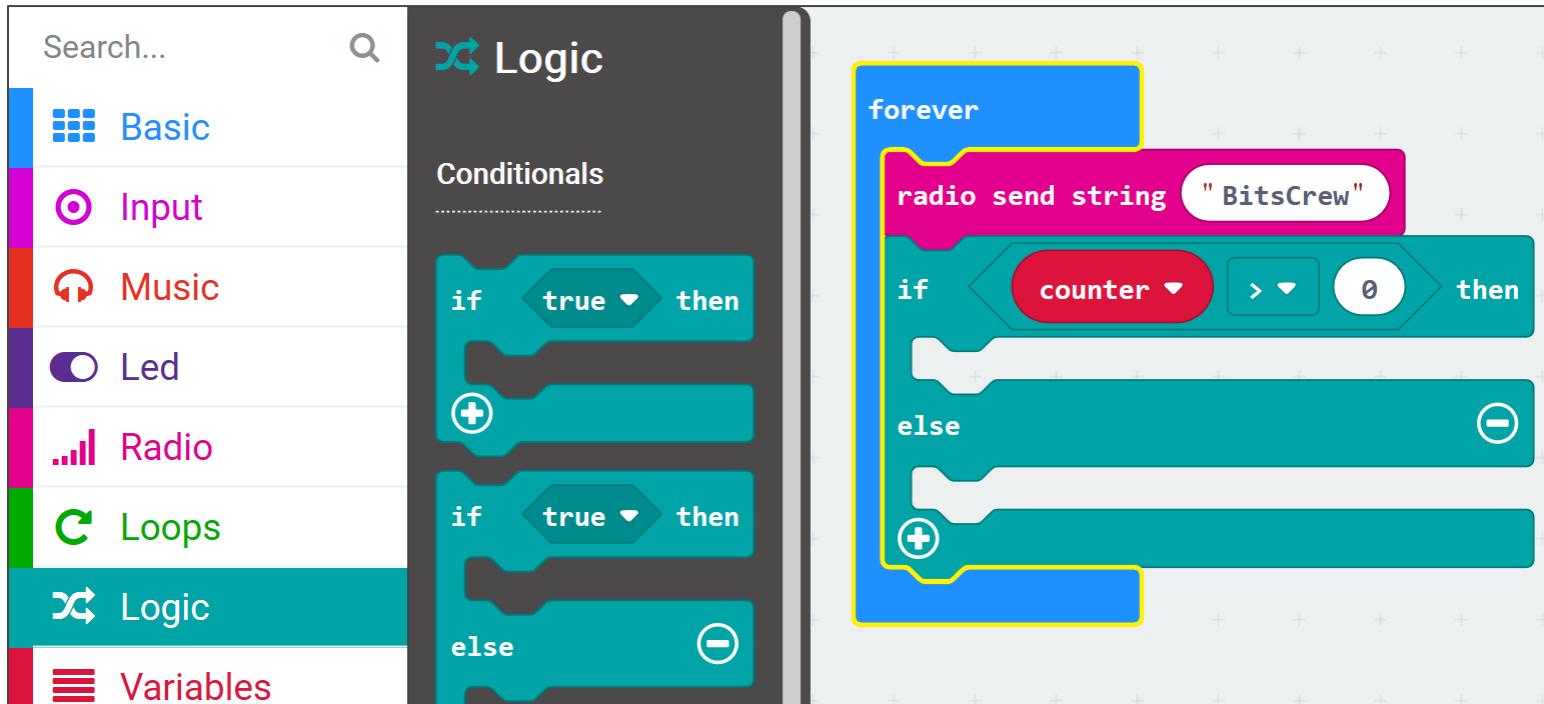
Send the secret code

- Open the **Radio** Toolbox drawer
- Drag a **Radio Send String** block into the **Forever** block on the workspace
- Select the “ ” and set it to your secret code



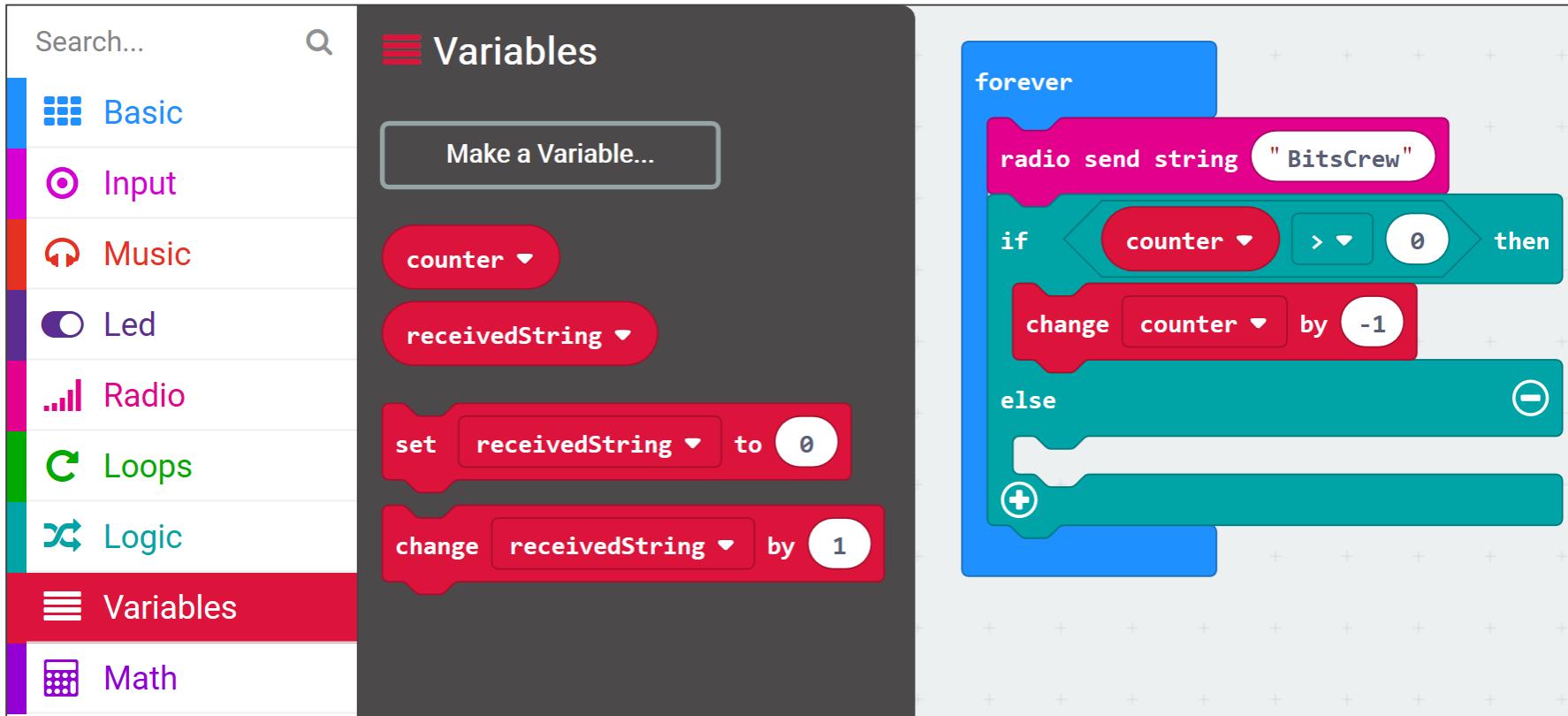
Tick down the counter every second

- Open then **Logic** Toolbox drawer
- Drag an **If true then ... else** block onto the **Forever** block
- Drag a **0 = 0** comparison block into the **true** part of the **if** block
- Change the comparison from **=** to **>**
- Open the **Variable** Toolbox drawer
- Drag the **counter** variable into the first part of the comparison



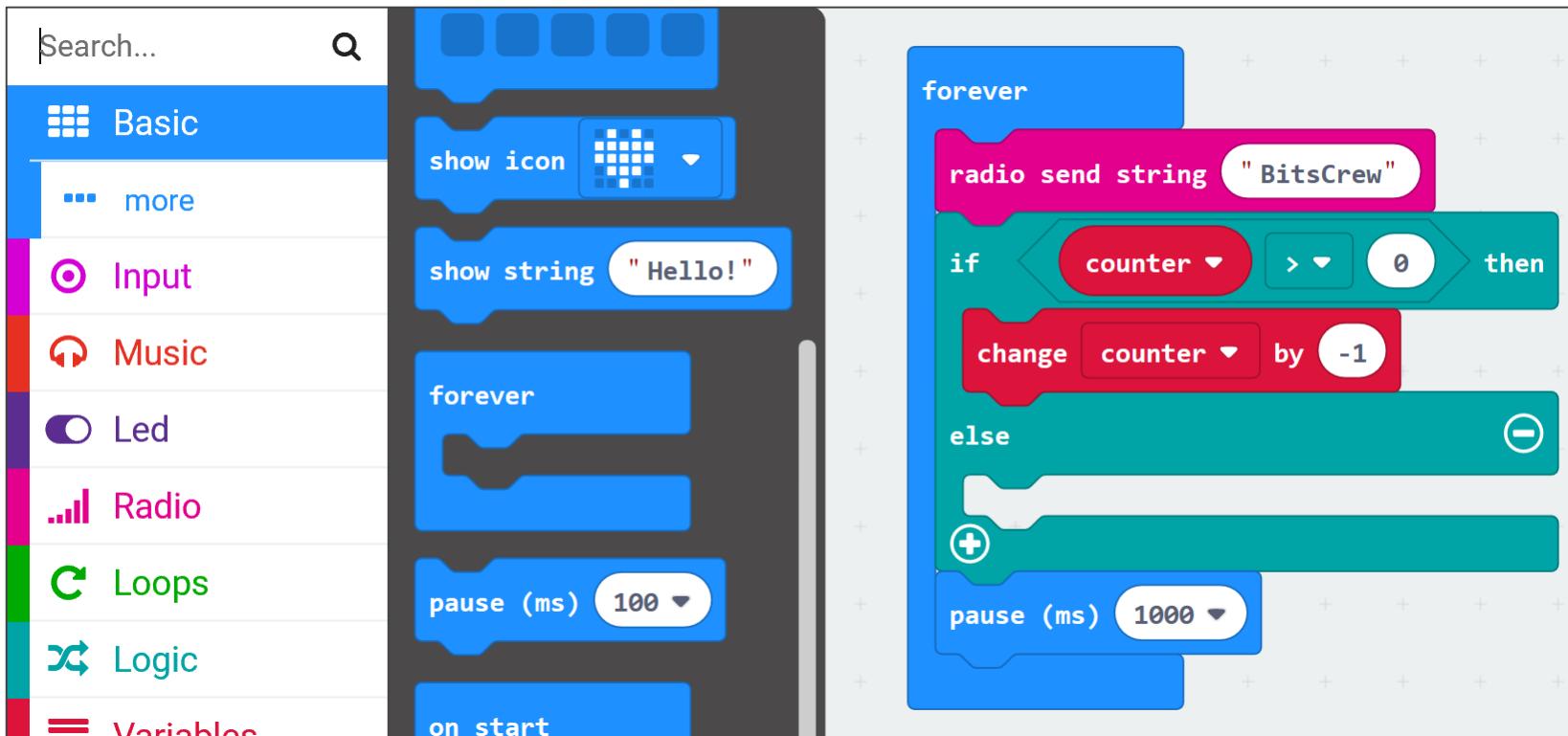
Tick down the counter every second

- Open the **Variable** Toolbox drawer
- Drag a **change ... by 1** block into the **if ... then** part of the conditional
- Change the variable to **counter** if necessary
- Select the **1** and change it to **-1**



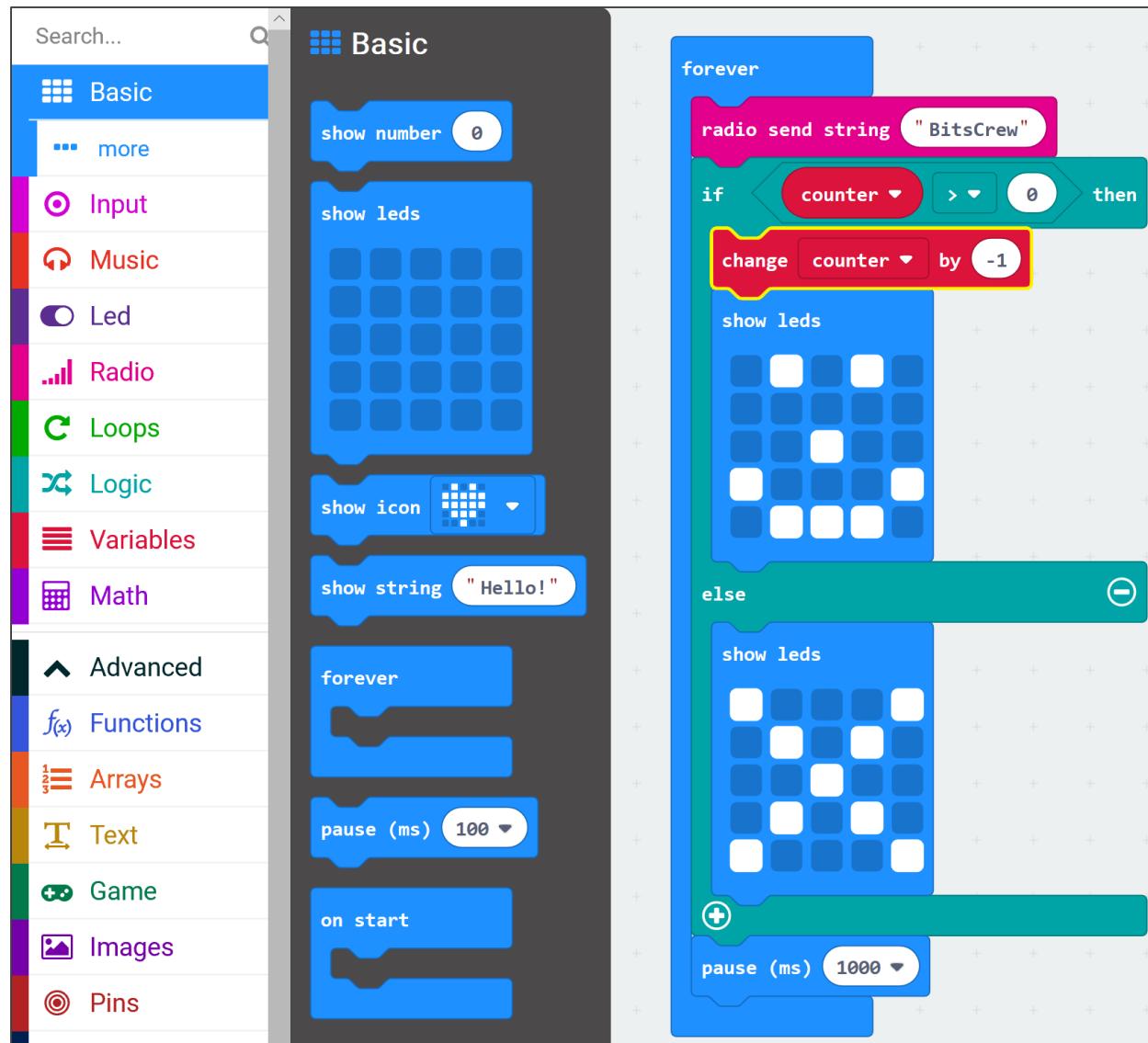
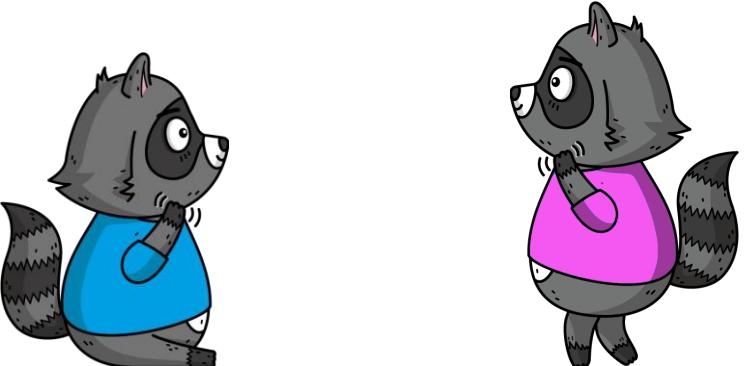
Tick down the counter every second

- Open the **Basic** Toolbox drawer
- Drag a **Pause (ms) 100** block into the **Forever** block below the **If Then Else** block
- Change the time to **1 second**



Light up when a friend is near

- Open the **Basic** Toolbox drawer
- Drag two **Show LEDs** blocks into the **Forever** block – one into the **If Then** block, the other into the **Else** block
- Draw a smiley face in the **Show LEDs** block **If Then** block, and an X in the **Show LEDs** block in the **Else** block



Complete Code

This Scratch script consists of two main sections: an **on start** event and a **forever** loop.

on start:

- Set counter to 0

on radio received [receivedString v]:

- If receivedString = "BitsCrew" then:
 - Set counter to 5

forever:

- radio send string "BitsCrew"
- if counter > 0 then:
 - change counter by -1
 - show leds (pattern shown below)
- else:
 - show leds (pattern shown below)
- pause (ms) 1000

The **show leds** blocks display a 5x5 grid of LEDs. The patterns are as follows:

- Initial Pattern (when counter = 5):** All LEDs are lit (white).
- Pattern when counter = 4:** Top-left LED is off (blue), all others are on.
- Pattern when counter = 3:** Top-left two LEDs are off (blue), all others are on.
- Pattern when counter = 2:** Top-left three LEDs are off (blue), all others are on.
- Pattern when counter = 1:** Top-left four LEDs are off (blue), all others are on.
- Pattern when counter = 0:** All LEDs are off (blue).

A cartoon raccoon wearing a blue shirt is at the bottom of the stage.

Download your program to the micro:bit

1. Make sure your micro:bit is plugged into the computer
2. Click Download Button 

The Yellow light on the back of your micro:bit will flash while your program is downloading



Lets make!

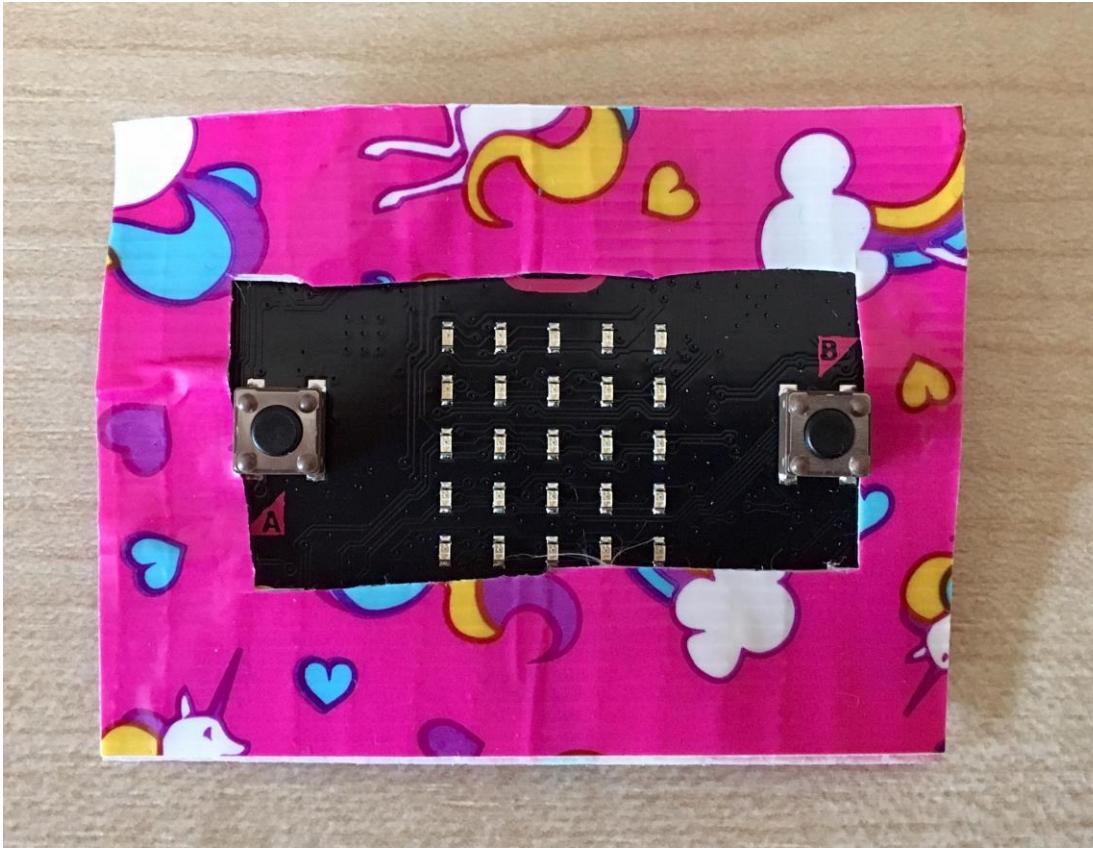


Parts needed

- micro:bit
- Battery pack
- Wrist strap
- micro:bit holder
- Battery pack holder
- 2 Velcro strips
- Duct tape

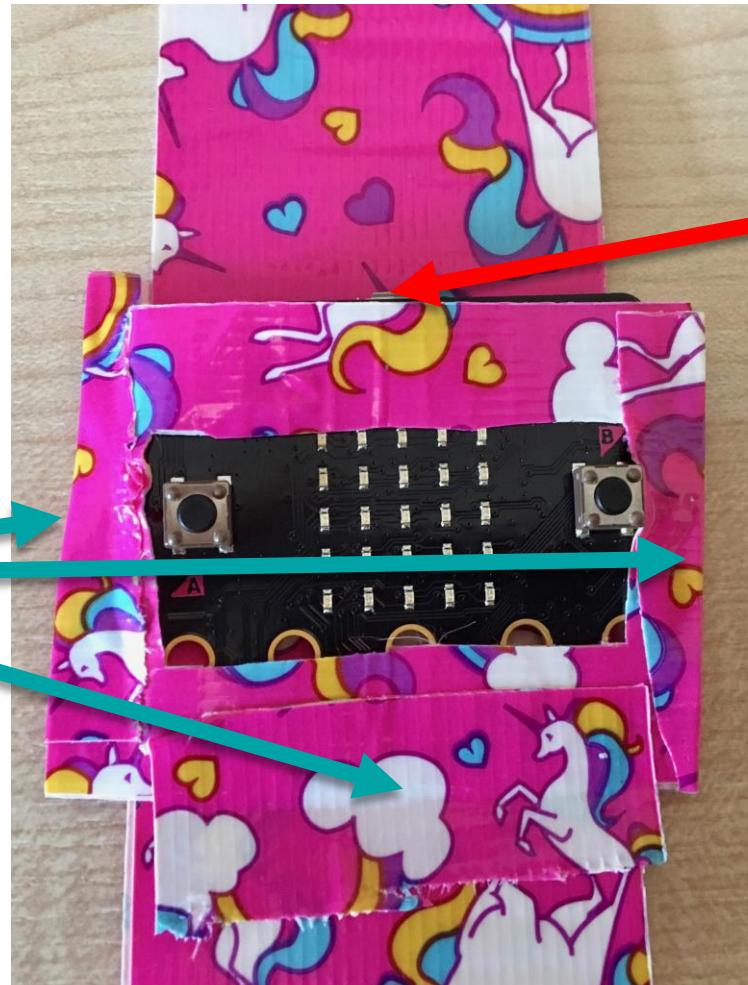


Put the micro:bit into the holder



Fix the holder to the wrist strap with tape. Put one piece on each side, and one at the bottom.
Leave the top open!

Tape these
3 sides



Leave the
top open



Put the battery pack into the holder and tighten it by unsticking the end and re-sticking. Make sure the switch is uncovered



Fix the battery pack to the wrist strap above the micro:bit using a strip of Velcro. Plug the battery pack into the micro:bit.



Attach one side of a piece of sticky Velcro to the wrist strap. Wrap around your wrist and attach the other side



Turn the battery pack on. Once another micro:bit with the same secret code is detected, you should see a smiley face!



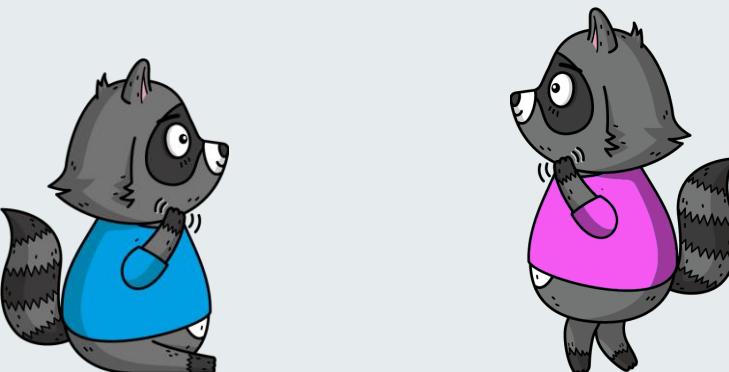
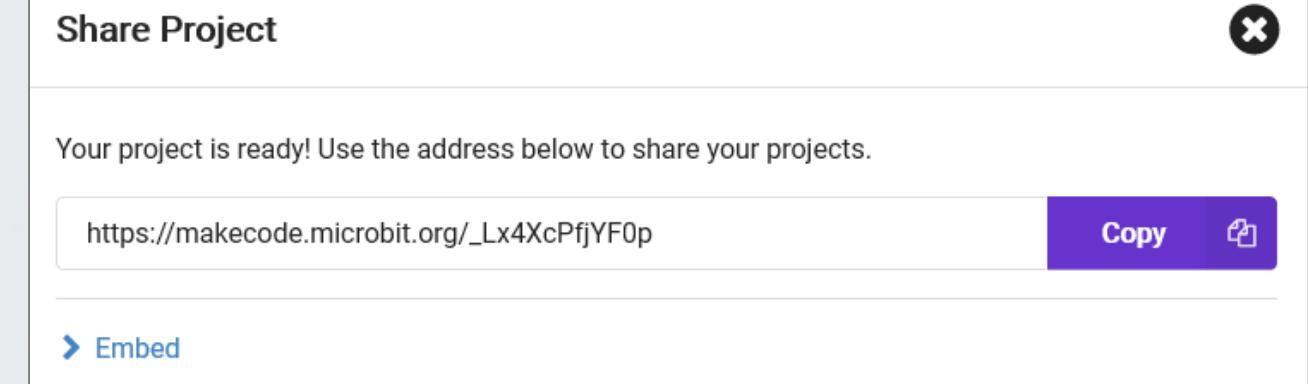
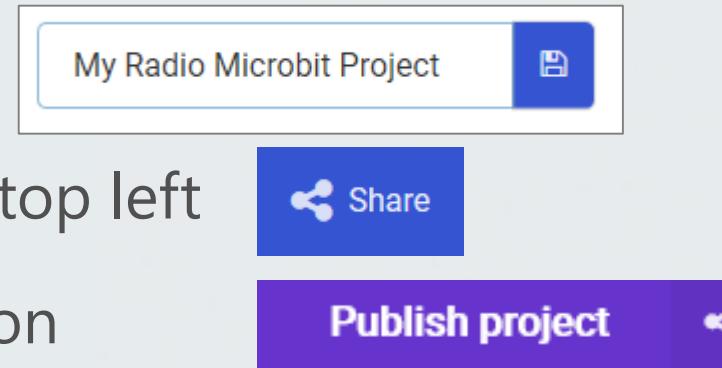
Lets play!





Share your Code

- Give your program a name
- Click the Share button in the top left
- Click the Publish Project button
- Copy the URL somewhere (or take a picture)





MakeCode for the micro:bit

More about MakeCode – makecode.com

More about micro:bit – microbit.org

These instructions – aka.ms/FriendDetector

