

PROGRAMMING RESOURCES - ACTIVITY SHEET 1

GET STARTED - BLINK A LED

#R1AS01



Available on

What is it?

A LED is an electronic component that produces light when a current flows through it. It could be used to light up a room, or to indicate something (a tank almost empty, machine turn on, ...). LEDs exist in various forms and colours.

Duration

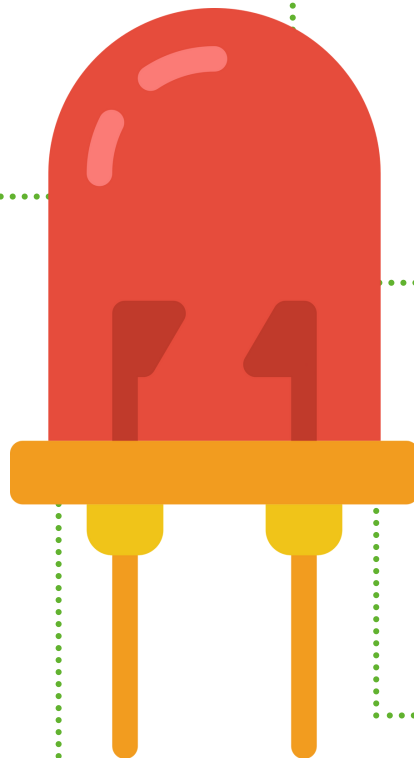
15 minutes

Material

- 1 Programming board "*STM32 IoT Node Board*"
- 1 Micro-B USB Cable

Level of difficulty

Basic



LEARNING OBJECTIVES

- Use block for programming
- Learn the basics of MakeCode
- Use built-in LED





In this getting started activity, you will approach the concept of a **pin**. A pin is a physical wire connected directly to the microcontroller. The state of a pin gives information regarding if the current flows through the pin or not. Specifically:

- **LOW** means there is no current
- **HIGH** means there is a current flow.

To make the current flow visible, we are using a component called led (light-emitting diode) already available on the board, that will light when the current flows through the pin.



STEP 1 - MAKE IT



Connect the board to the computer

With your USB Cable, connect the board to your computer by using the **micro-USB ST-LINK connector** (on the right corner of the board). You should see a new drive called **DIS_L4IOT** on your computer. This drive is used to program the board just by copying a binary file.

Open MakeCode

Go to the **Let's STEAM MakeCode editor**. On the home page, create a new project by clicking on the "New Project" button. Give a name to your project more expressive than "Untitled" and launch your editor.

[Resource: makecode.lets-steam.eu](https://makecode.lets-steam.eu)

Arrange your blocks

From this stage, here are the different steps enabling you to make a led blink using the block editor:

Step 1 - Add an infinite loop

As we want the program to make the led blink indefinitely, the first step consists in adding the forever block. You will find it inside the LOOPS drawer. It might also be already visible in your MakeCode editor.

Step 2 - Light on the LED

Controlling a LED is a simple task as it can only be turned on (the current flows through it), or turned off (the current does not flow). To achieve this, we need to set the state of the pin where the led is connected.

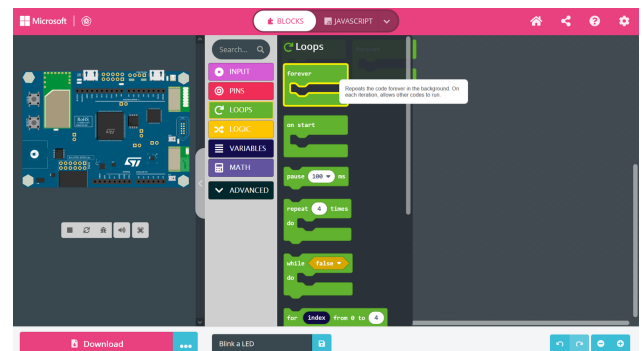
In our case, if we want to turn on the LED, we have to set the pin's state to **HIGH**. Pin's state to **LOW** will then turn it off.

On MakeCode, to control a pin's state, select the **PINS** drawer, then drag the **digital write** pin block inside the forever loop.

1

2

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Add an infinite loop using the FOREVER block



Draft the digital write pin block to light on the LED



STEP 1 - MAKE IT



Step 3 - Create the blink

To create the blink, it is necessary for us to be able to see the led on and off for a similar amount of time. To create this blink, we need to follow the following steps:

1) Create a pause when the led is on to see the light:

Before turning the LED off, we have to wait a little amount of time, half a second (500 milliseconds) for example, with the light on. To do so, add the **pause block** (inside the **LOOPS** drawer), and set the value to 500 (for 500 milliseconds).

i You can pick a **value** inside the list, or directly enter a tailored one by yourself.

2) Switch off the light for a similar amount of time to create the blink:

You have done half of the job until now! Add another **digital write** and **pause** block to turn off the LED and wait 500 ms again, enabling to create this effect of blink. Combined with the infinite loop, we can see this blink repeated forever.

i Instead of picking **blocks** inside drawers, you can right-click on a block and "duplicate" it

Thanks to this easy activity, you have discovered how to create a piece of code using block programming. You can get a look at the Javascript editor to see this code directly as given in the **Code It** section below. In the next activity sheets, feel free to directly, copy/paste the code available inside the MakeCode Javascript Editor to see the result in blocks.

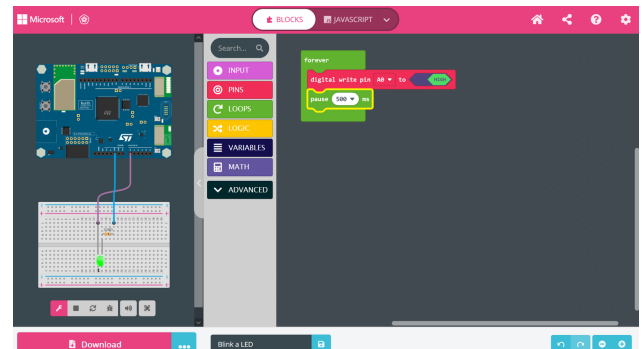
Program your board

If not already done, think of giving a name to your project and click on the "Download" button. Copy the Binary file on the drive **DIS_L4IOT** and wait until the board finishes blinking. Your first program is now running and the built-in LED should be blinking!

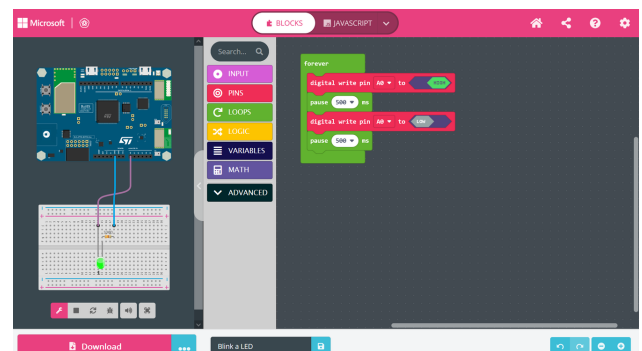
Run, modify, play

Your program will automatically run each time you save it or reset your board (push the button labelled RESET). Try to understand the code and start modifying it by changing the period between two blinks. Feel free to try to blink at several rhythms or make a visual **SOS** in morse code.

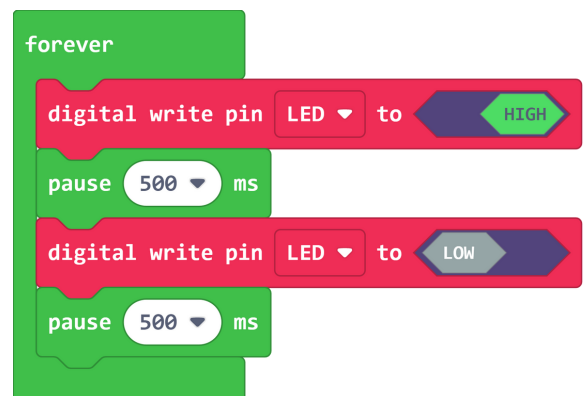
Resource: <https://en.wikipedia.org/wiki/SOS>



Create a pause when the led is on to see the light



Switch off the light for a similar amount of time to create the blink



Full blocks enabling to program the blink a led activity

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STEP 2 - CODE IT



```
forever(function () {
  pins.LED.digitalWrite(true)
  pause(500)
  pins.LED.digitalWrite(false)
  pause(500)
})
```

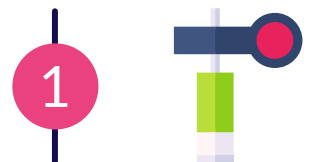
How does it work?

Here is Javascript's translation of our block program. The keyword is a little bit different, the function `digitalWrite` takes a *boolean* parameter (`true` or `false`). But the translation is easy: `true` means **HIGH** & `false` means **LOW**

STEP 3 - IMPROVE IT



Try to make a **train light signal** by using the other built-in LED named **LED2**



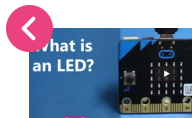
GOING FURTHER



Light-emitting diode - Learn more about LED history, physical principles behind it, typologies and colours. https://en.wikipedia.org/wiki/Light-emitting_diode



Behind the MakeCode Hardware - LEDs on micro:bit - How do the lights work on the micro:bit? Learn all about it with **Shawn Hymel**, Technical Content Creator. <https://www.youtube.com/watch?v=qgBmvHD5bCw>, <https://shawnhymel.com>



Current and Voltage - Basic Electricity - Tutorial for beginners in electronics to explore current, voltage, difference and their working. <https://www.codrey.com/dc-circuits/current-and-voltage/>



Loops - Learn more about the Loops on MakeCode. <https://makecode.st.com/blocks/loops>



Explore other activity sheets

R1AS03 - Button & LED Display



R1AS06 - Morse code

