TOKYMAKER TUTORIAL

BLOCKS INDEX

INDEX OVERVIEW

create.tokylabs.com (For China, create.tokylabs.cn, for Version 3 Tokymakers create.tokylabs.cn/v3) has a large number of blocks. They are divided into the following categories:

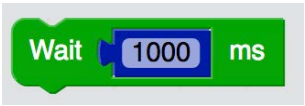
CONTROL

The Control category holds blocks that control whether other blocks placed in their body are run.

REPEAT FOREVER

The simplest "repeat" block runs the code in its body in an endless loop. Will execute the inner instructions continuously, once and again.
These structures are called loops since the body is repeated (possibly) multiple times, reminiscent of a rope containing loops. Each pass through the loop is called an iteration. For more information, see https://en.wikipedia.org/wiki/Control_flow - Loops

WAIT X MS

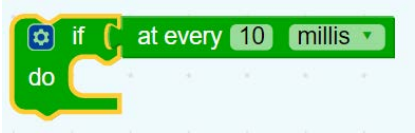


The Wait () ms block is a Control block. The block pauses its code for the specified amount of milliseconds.
This block is one of the most commonly used blocks; it is used whenever the code must wait for another action.

REPEAT X TIMES

This version of the “repeat” block runs the code in its body the specified number of times. For example, the following block will print "Hello!" ten times.

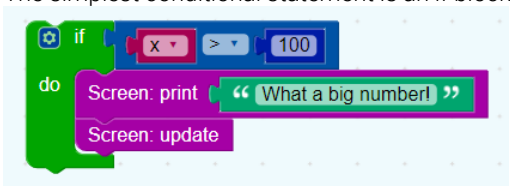
AT EVERY



”at every” block, together with the conditioner if/do, runs the code in each period of time specified in milliseconds or minutes.

IF BLOCKS

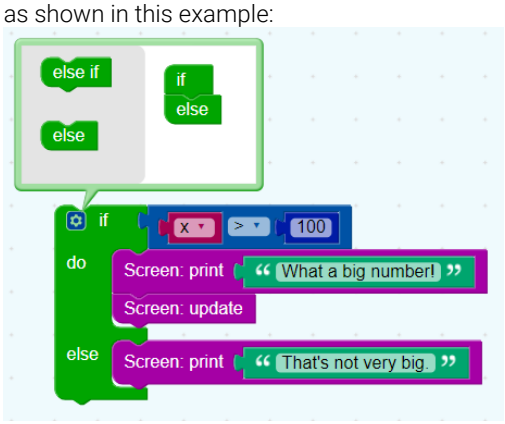
The simplest conditional statement is an if block, as shown:



When run, this will compare the value of the variable x to 100. If it is larger, "What a big number!" will be printed. Otherwise, nothing happens.

IF-ELSE BLOCKS

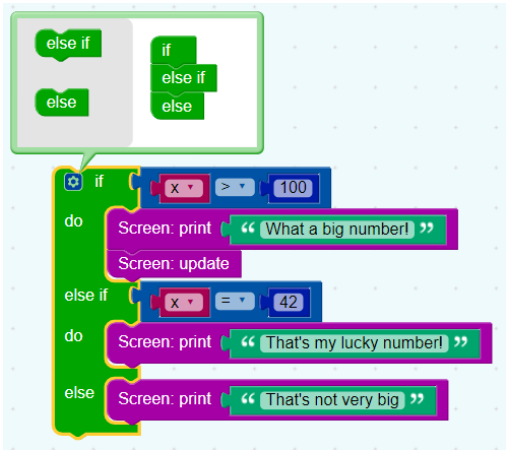
It is also possible to specify that something should happen if the condition is not true, as shown in this example:



As with the previous block, "What a big number!" will be printed if x > 100; otherwise, "That's not very big." will be printed.
An if block may have zero or one else sections but not more than one.

IF-ELSE BLOCKS

It is also possible to test multiple conditions with a single if block by adding else if clauses:



The block first checks if x > 100, printing "What a big number!" if it is. If it is not, it goes on to check if x = 42. If so, it prints "That's my lucky number." Otherwise, nothing happens.

An if block may have any number of else if sections. Conditions are evaluated top to bottom until one is satisfied, or until no more conditions are left.

BLOCK MODIFICATION

To add else if and else clauses, the user needs to click on the gear icon, which opens a new window.
The user can then drag else if and else clauses into the if block, as well as reordering and removing them. When finished, the user should click on the minus sign, which closes the window, as shown in the previous blocks.

Logic

LOGIC

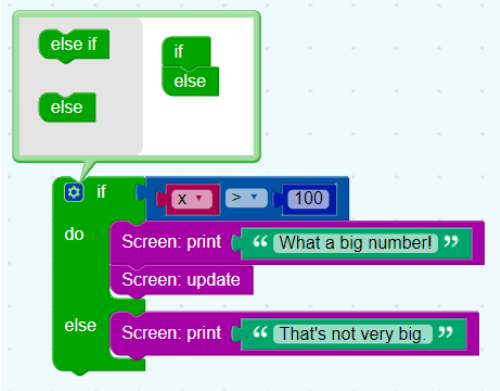
Boolean algebra is a mathematical system that has two values:

- true
- false

Boolean values (also called conditions) are used in these control blocks, which contain examples:

- conditional blocks
- repeat blocks

For example:



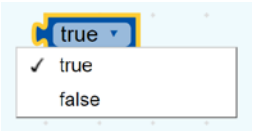
If the value of the variable x is greater than 100, the condition is true, and the text "What a big number!" is printed. If the value of x is not greater than 100, the condition is false, and "That's not very big." is printed.
Boolean values can also be stored in variables and passed to procedures, the same as number, text, and list values.

BLOCKS

If a block expects a Boolean value as an input, it usually interprets an absent input as false. An example is provided below. Non-Boolean values cannot be directly plugged in where Boolean values are expected, although it is possible (but inadvisable) to store a non-Boolean value in a variable, then plug that into the input. Neither of these practices is recommended, and their behaviour could change in future versions.

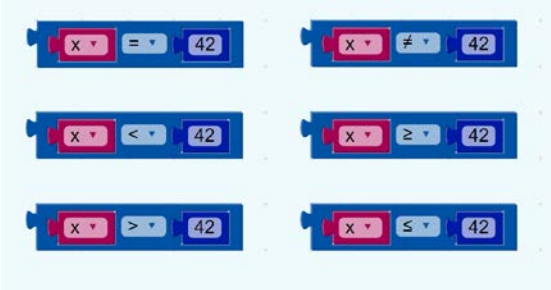
VALUES

A single block, with a dropdown specifying either true or false, can be used to get a Boolean value:



COMPARISONS

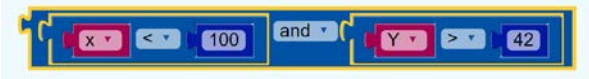
There are six comparison operators. Each takes two inputs (normally numbers) and returns true or false depending on how the inputs compare with each other.



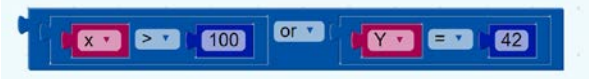
The six operators are: equals, not equals, less than, less than or equal, greater than, greater than or equal.

LOGICAL OPERATIONS

The and block will return true only if both of its two inputs are also true.



The or block will return true if either of its two inputs is true.



NOT

The not block converts its Boolean input into its opposite. For example, the result of:

is false.

As mentioned above, if no input is provided, a value of true is assumed, so the following block produces the value false:

Leaving an input empty is not recommended, however.

Variable

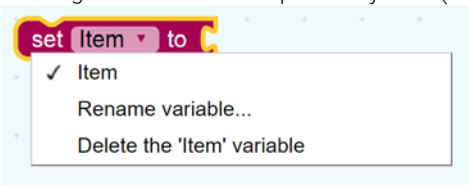
VARIABLE

We use the term variable the same as it is used in mathematics and in other programming languages: a named value that can be changed (varies). Variables can be created in several different ways.

- Every count with and for each block uses a variable and defines its values. These values can only be used within the block. A traditional computer science term for these are loop variables.
- User-defined functions (also known as "procedures") can define inputs, which creates variables that can be used only within the function. These are traditionally called "parameters" or "arguments".
- Users may create variables at any time through the "set" block. These are traditionally called "global variables".

DROPDOWN MENU

Clicking on a variable's dropdown symbol (triangle) gives the following menu:



The menu provides the following options.

- the names of all variables defined in the program.
- "Rename variable...", which changes the name of this variable wherever it appears in the program. Selecting this opens a small window that prompts the user for the new name with the text: "Rename all %1 variables to:", where %1 is replaced by the old name (here "item").
- "New variable...", which enables the user to enter a new name for the variable, without replacing or changing variables with the old name (here "item"). Selecting this opens a small window that prompts the user for the new name with the text "New variable name:".

SET

The set block assigns a value to a variable, creating the variable if it doesn't already exist. For example, this sets the value of the variable named "age" to 12.

GET

The get block provides the value stored in a variable, without changing it.

It is possible, but a bad idea, to write a program in which a get appears without a corresponding set.

EXAMPLE

Consider the following example code:

The first row of blocks creates a variable named "age" and sets its initial value to the number 12. The second row of blocks gets the value 12, adds 1 to it, and stores the sum (13) into the variable. The final row displays the message: "Happy birthday! You are now 13"

NUMBERS

Numbers are mathematical values that play a huge role in programming. In the Tokymaker Integrated Development Environment ("IDE"), they are used for optimizing and making algorithms function properly. Without numbers, addition, multiplication, etc. would not be possible.

MATHEMATICAL FUNCTIONS

The following table lists various mathematical functions and how to perform them in the IDE; it is not inclusive to all functions:

Addition:

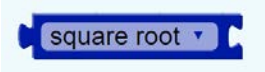
Subtraction

Multiplication

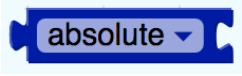
Division

Exponential

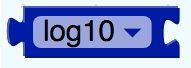
Square root



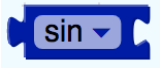
Absolute



Log10



Sin



Cos

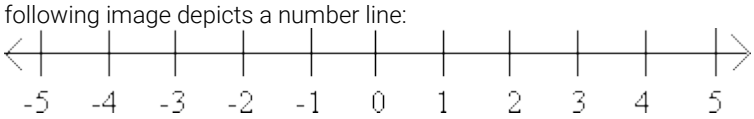
RANDOM NUMBER

This block is conceived to give you the possibility of having a random number.

You can choose the range of variability by changing the numbers. You could include a variable in the second number slot if desired.

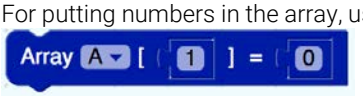
NUMBER LINE

A number line can be used to represent integers and the values in between them. The following image depicts a number line:



ARRAY

An array is an ordered collection of values. It is similar to a list, however, most high-level languages provide first-class data which allows the concept of "an array of arrays" to be feasible. We only can put numbers in the data. An array has numbers numbering every item, usually sequential integers.
More info: https://en.wikipedia.org/wiki/Array_programming
For putting numbers in the array, use this block :



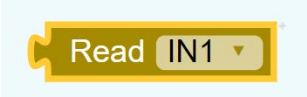
For request the number from a specific array you can use this block :

Input

INPUT

Inputs are blocks that use the information from the environment to be applied in our code. To capture this information we need sensors. Tokymaker has a large variety of sensors to be used in your projects. If you want to know more about what a sensor is, check this useful video: https://www.youtube.com/watch?v=v25PCV_IJCw&t=3s

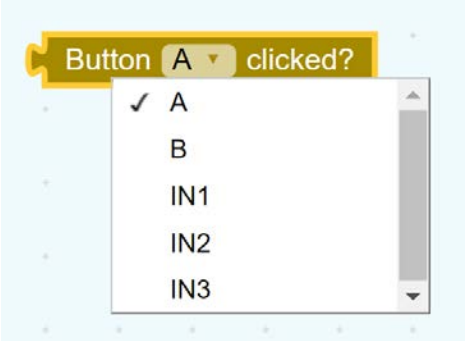
READ IN



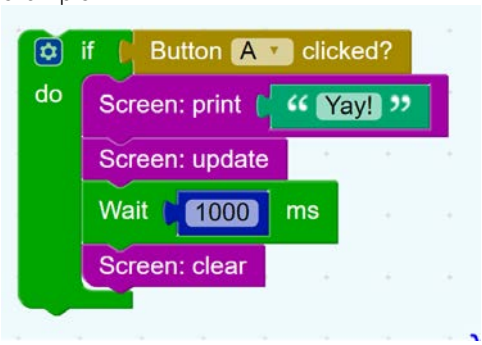
This is probably one of the most important blocks of create.tokylabs.com. This can act as a box to store the information that the sensor is detecting. You can select the port where this sensor is connected: IN1, IN2, or IN3. The value goes from 0 to 100. For example, if you connect a light sensor in the Input 1, this block will store a 0 in total darkness and a 100 when facing a powerful sun.

BUTTON CLICKED

You could connect a button to any of the Inputs, but Tokymaker has already two physical buttons embedded. This block useful when you want to do anything in response to a click of the button. The clicked block is a Sensing and Boolean block. If the user is clicking the selected object, the block returns true; if not, it returns false.



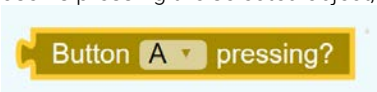
From the drop-down list, you can choose what button to listen to. Let's see a simple example:



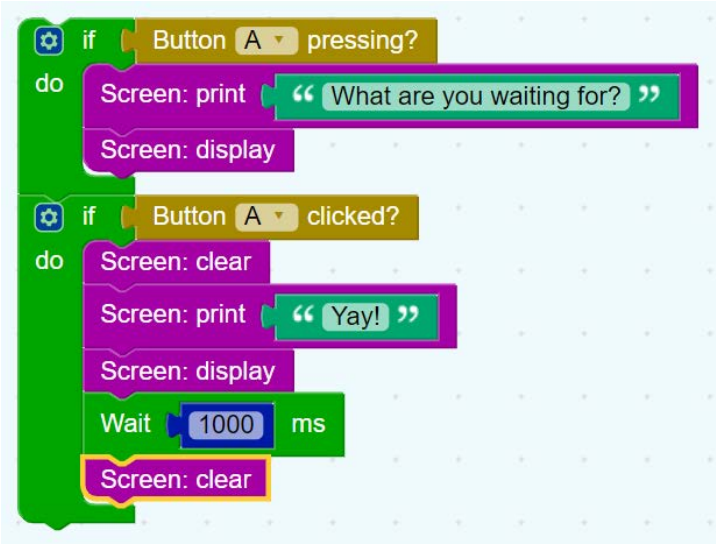
In this code fragment, the screen will show the text "Yay!" once the button is clicked and released. The message will last for one second and then disappear.

BUTTON PRESSING

Alternatively, you might want to do something when the user is pressing but has not yet released the button. The pressing block is a Sensing block and a Boolean block. If the user is pressing the selected object, the block returns true; if not, it returns false.



If we wanted to use it, the code would look something like:

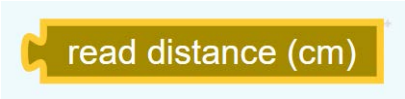


Now, “What are you waiting for?” will be shown on the screen until the user finally releases the button and the text “Yay!” will appear.

TOUCHPAD

Tokymaker also has three touchpads that behave in the same fashion as Buttons A and B.

READ DISTANCE



Read distance is a specific block for an Ultrasonic distance detector that plugs into the 4-pin top of the Tokymaker. This block stores the value of the distance in centimeters, ranging from 0 to 200 cm (2 meters). As this block can give the distance between the Tokymaker and another object, it is very useful in projects that require a great deal of careful sensing and movement.
Since this sensor is getting information from the physical environment, its block has to be an input.

OUTPUT

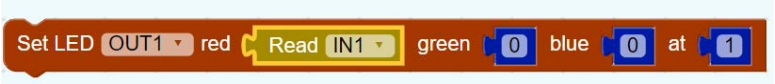
Outputs are the actuators. They create an action based on your code. This is how your Tokymaker interacts with the world!

SET OUTPUT

This block creates an action on OUT1. If you connect one of our actuators (motors, lights, vibrators, relays, etc) it will react based on the numeric block you include in the empty space. It can be any number (constant or variable) that goes from 0 to 100.

For example, if we connected an LED module to the OUT1 and we want it off, it would look like:

But if we want to vary the light intensity (from 0% to 100%) we can connect a potentiometer module (rotation sensor) in IN1 and add this block:



This way we can adjust intensity manually by modifying the Input 1.

Behind the block, there is a Pulse With Modulation (PWM) code that creates an average voltage value that goes from 0 Volts (Duty cycle 0%) to 3.7 Volts (Duty cycle 100%). Follow the next link to know more about PWM. https://en.wikipedia.org/wiki/Pulse-width_modulation

SET SERVO

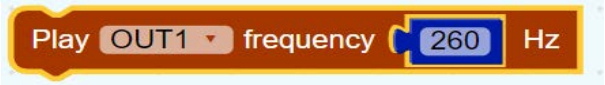
There are two, basic types of servo motors: 180° servos and 360° servos (also known as “continuous rotation motors”). They are controlled differently but use the same output block.

A 180° servo can be set from 0 to 180 degrees by adding that value in a number block to the servo output block.
A 360° servo is also controlled by entering a value from 0-180, but it behaves differently. A value of 90 sets the servo at 0 speed. A value from 0 to 89 continuously rotates the servo in a (when viewed from the “back” of the servo) counter-clockwise direction. The smaller the number, the faster the rotation with 0 being the fastest. Conversely, a value from 91 to 180 rotates the servo in a clockwise direction. The larger the number, the faster the rotation with 180 being the fastest.
Find out more at https://en.wikipedia.org/wiki/Servo_(radio_control)

PLAY TONE

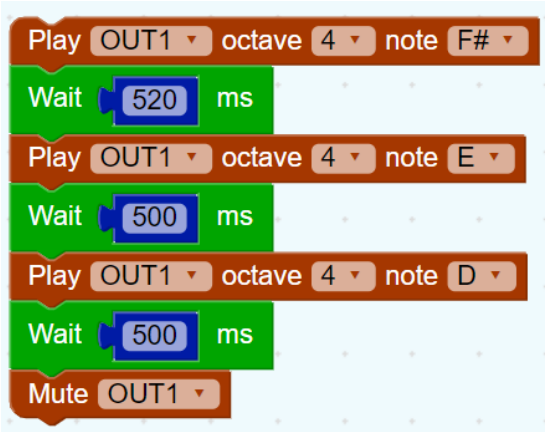
Tokymaker can utilize a large variety of actuators. One of them is a Speaker to produce notes and tones. There are two ways to select the note played. The first is to select the Output where we connected the module and select from the two dropdown menus: Octave and Note.

The second is to set the value with a frequency in Hertz (Hz).



Both will play a continuous tone until the Mute block is inserted.

These blocks, in conjunction with a Wait block, allow you to play tunes. For example, the first 3 notes of “3 Blind Mice” look like this:



Display

DISPLAY

Tokymaker includes a little screen. It is made up of 128 × 64 individual OLED pixels, each of which can be turned on and off and set to various RGB values.

SCREEN: CLEAR

Before we want to display something on the screen, we have to clear the screen.
We can do this with this block.

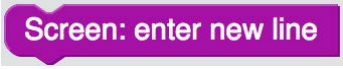
SCREEN PRINT

If we want to display text, we use this block. Between the quotation marks, we can type our text that we want to display on the screen.

SET TEXT SIZE

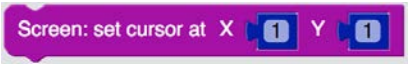
With this block, we can adjust the size of the text that we want to display.

ENTER NEW LINE



This block is similar to an "enter" in a text editor on your computer.

SET CURSOR



With this block we can place the cursor somewhere on the screen.
The horizontal X values range from 0 to 128.
The vertical Y values range from 0 to 64.

DRAW PIXEL

If we want to display a pixel on the screen, we use this block.
With this block we can display a pixel. You must first define where the pixel should be located. We do this with the help of the "Screen: set cursor at X, Y" block.

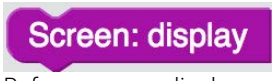
DRAW LINE TO

With this block we can draw a line. You must first define where the line should start. We do this with the help of the "Screen: set course at X, Y" block.

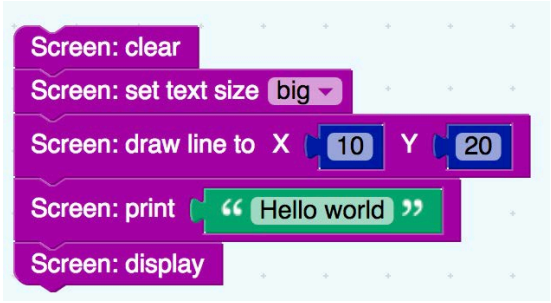
DRAW CIRCLE

With this block, we can draw a circle. You must first define where the center of the circle should be, this is done with the help of the "Screen: set cursor at X, Y" block.

SCREEN: DISPLAY

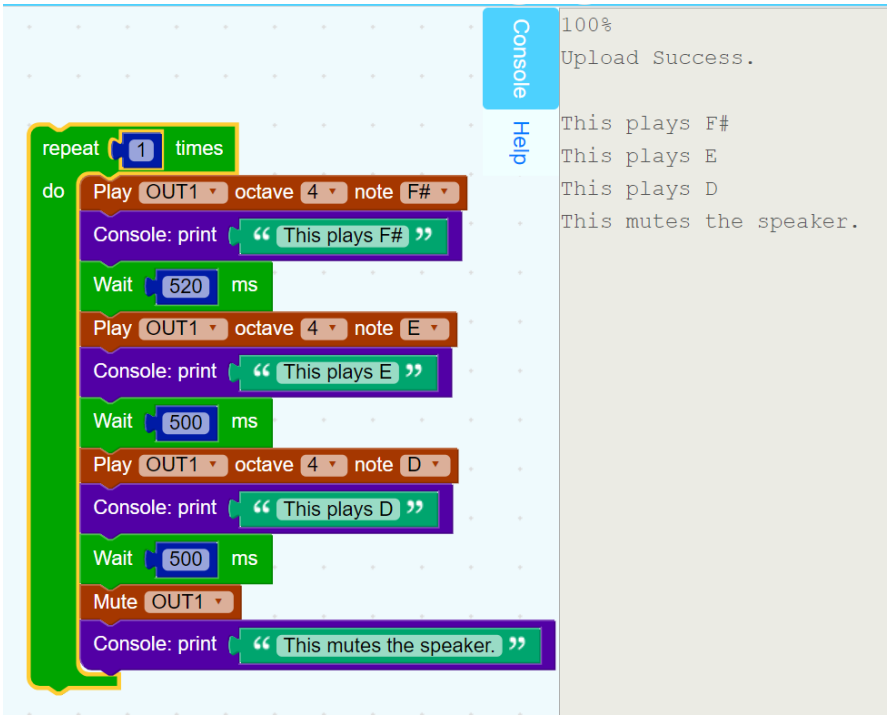


Before you can display something on the screen, you must use the Display block.
If the toymaker executes this block, text or pixels between block: "Screen: clear" and "Screen: display" that you have programmed will be displayed on the screen.
If we want to use it, the example could be something like:



CONSOLE PRINT

To the right in our coding interface, we find the Console. Here we can visualize text or values. This is a good block to visualize things or use as an alternate method to add short comments to your code.



IOT

IOT

The Internet of things is the network of physical devices or items embedded with electronics, software, sensors, actuators, and connectivity which enables these objects to connect and exchange data.

IoT Platform in Tokymaker

To understand what an IoT platform is, first you need to understand a little about the components of a complete IoT system.

Hardware

The Tokymaker is the hardware in the IoT system. The Tokymaker collects data/information from the inputs and/or performs actions in the environment.

Connectivity

The Tokymaker needs a way to transmit all that data to the cloud or needs a way to receive commands from the cloud.

User interface

To make all of this useful, there needs to be a way for users to interact with the IoT system from the Tokymaker.
The interface in our IoT Tokysystem is supported by Adafruit. (www.adafruit.com)

Software

A complete IoT system needs software. This software is hosted in the Tokymaker so the Tokymaker is responsible for analysing the data it's collecting from the sensors and makes decisions.
We can program the Tokymaker to our wishes via the Creator Webpage from Tokylabs.
The blocks in the creator webpage make it very easy to realize this.
Normally it is very difficult to connect 2 items via the internet with each other and let them communicate with each other.
Because of the new IoT blocks in our IDE we have managed to make this simple for the Tokymaker.
The blocks are :

WIFI SET

The connectivity of the Tokymaker or the way to transmit or receive all that data to or from the cloud is with a wireless connection called Wifi.

LOGIN

Create an account on the IoT platform Adafruit via: https://www.adafruit.com
Then log in to Adafruit via the IoT "IOT : loginuser" Block

IS CONNECTED

If we have a WiFi connection then this block will be "true".

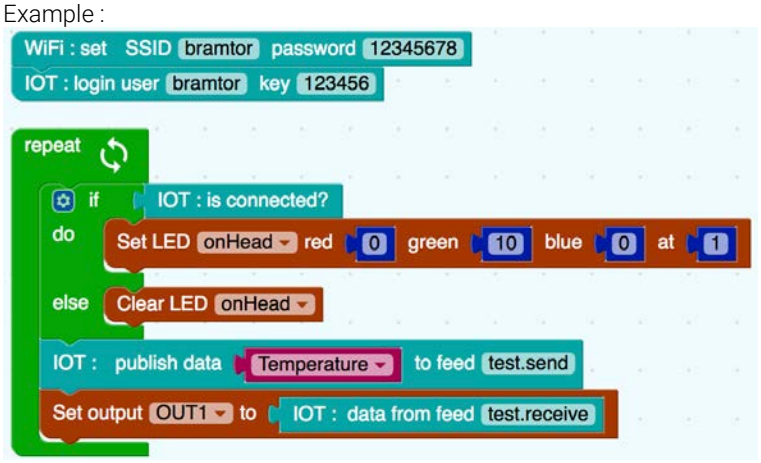
PUBLISH DATA

We can send data from the Tokymaker to Adafruit with the “IOT: publish data” block.

DATA FROM FEED

We can receive data from Adafruit with the “IOT: data from feed” block

Example :



If we are connected to WiFi and IOT the onHead LED of the Tokymaker will be bright green.
Then we send the value from the Variable “Temperature” to the feed “test.send” to the Adafruit platform.
We also receive data from the Adafruit feed “test.receive” and we will set the output 1 to this value.