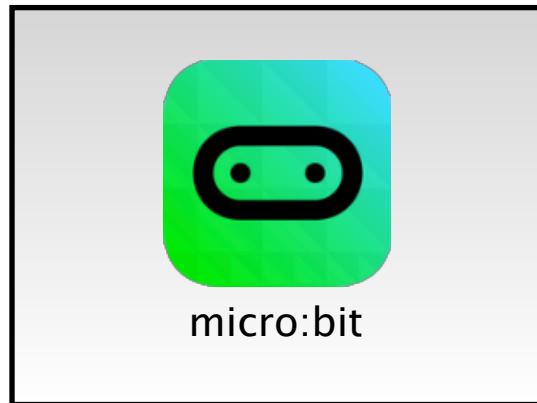
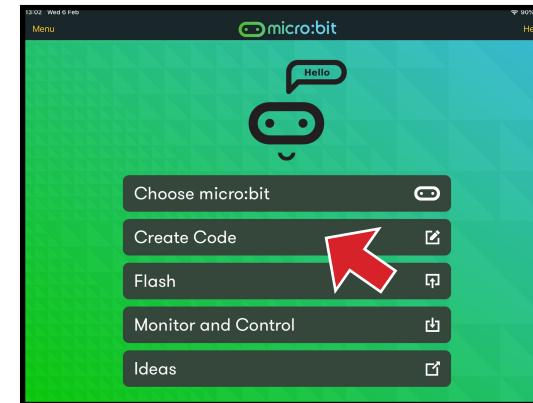


BLOOMING BOTS

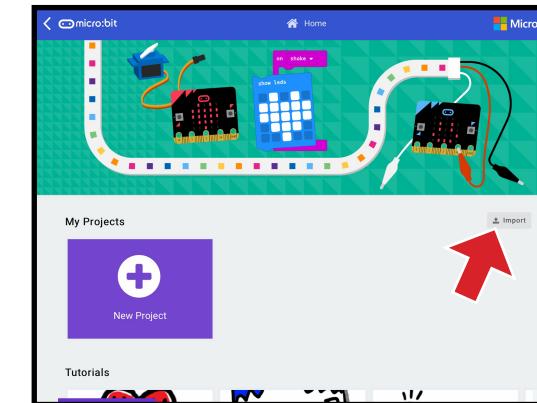
Programming worksheet



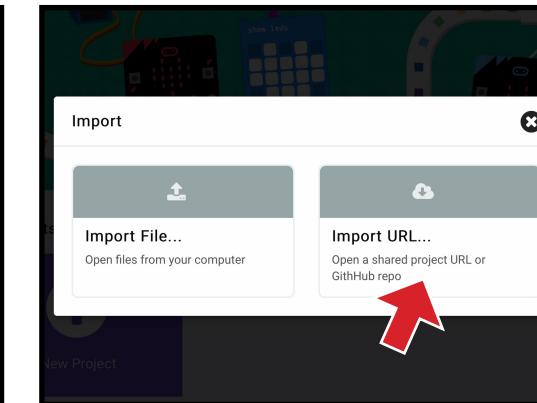
From the iPad home screen, open the **micro:bit** app.



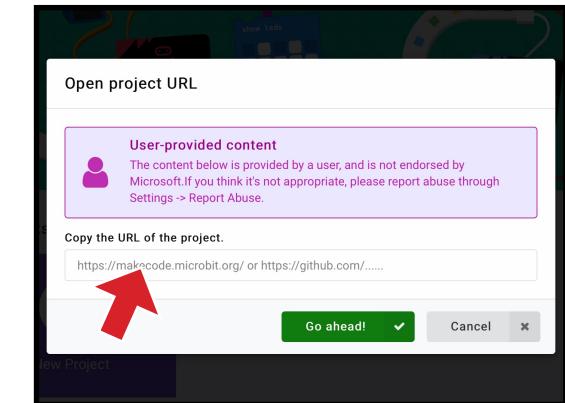
Tap the **Create Code** button from the main menu.



Tap the **Import** button.



Tap the **Import URL...** box.



Tap inside the text entry box and type:

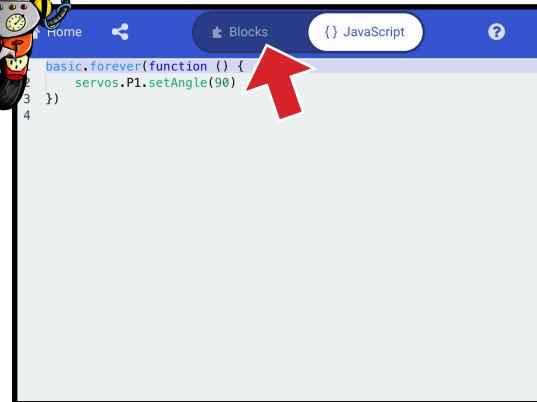
github:LabCentral/blooming-bots

Then tap the **Go ahead!** button.

This will import an example project to get you started.

JavaScript is a language that is used to write all sorts of programs, particularly on the web.

The program is copied to a part of the micro:bit called **flash memory** – this is remembered when the micro:bit is switched off. Writing a program to this memory is called **flashing**.



You will see a short computer program written in a programming language called **JavaScript**.

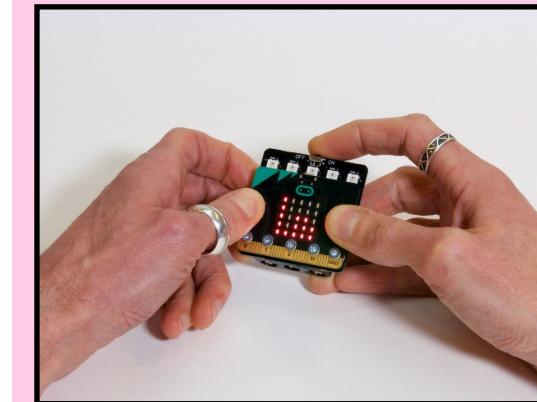
We won't be using this language directly. Instead, tap the **Blocks** slider at the top of the screen.



The screen now shows the same program in a simple visual language called **Blocks**.

Each horizontal block is an instruction to do something. Instructions that are joined together are run one after the other; the surrounding boxes say *when* to run them.

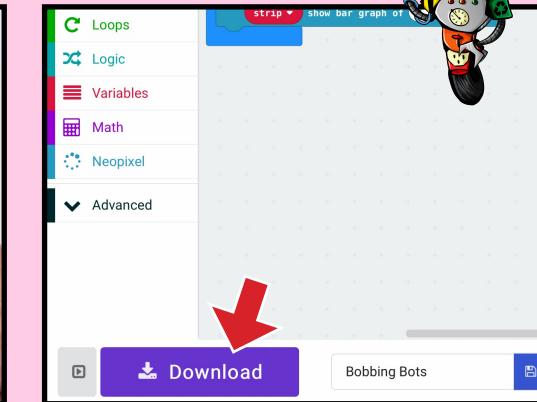
Before we look closely at this program, let's try it out!



To copy a program onto the micro:bit, first make sure that it is switched OFF with the tiny black switch on the top.

Now hold down both the **A** and **B** buttons on the front and switch it on – *keep holding the buttons* until the red LEDs show a pattern of columns. You can then let go of the buttons, but leave the micro:bit switched on.

Your micro:bit is now in Bluetooth programming mode.



Tap the **Download** button on the iPad.

The iPad will connect to the micro:bit wirelessly and copy the program to it. This will take a few seconds.



When you see **Flashing successful**, the micro:bit is ready. Tap **OK** on the iPad to go back to the code screen.

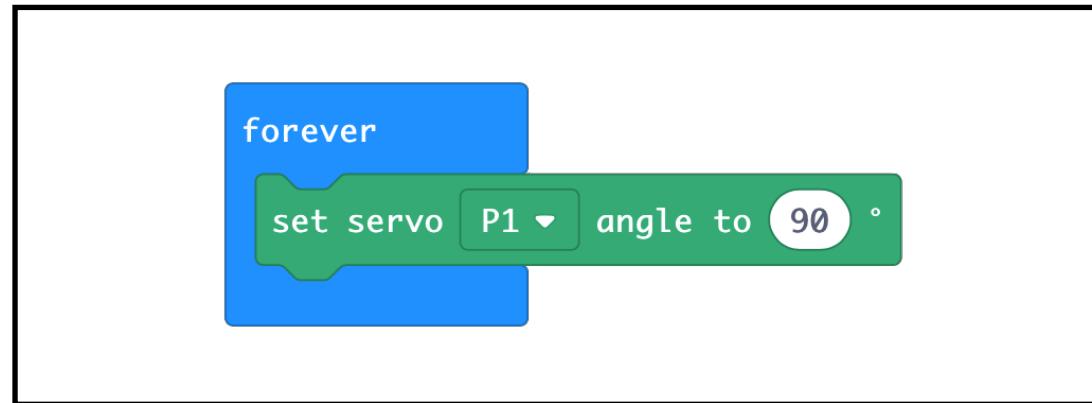
The micro:bit will immediately begin to run the new program.



Repeat these three steps whenever you want to download a new program!



Free to use under Creative Commons CC-BY 4.0 License



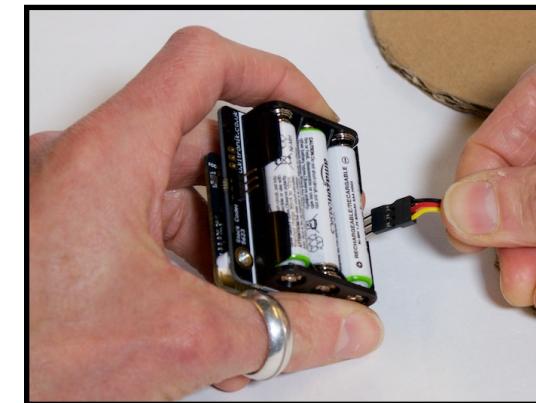
Let's look at the program in more detail.

Instructions in the **forever** box are run *repeatedly* until the micro:bit is switched off.

The instruction in this box tells the micro:bit to set the angle of the **servo** attached to the **P1** connector to 90°.

A servo is a special kind of motor with an arm that can turn to point in a specific direction, like a hand on a clock. The arm can move through 180°, which is half of a clock face.

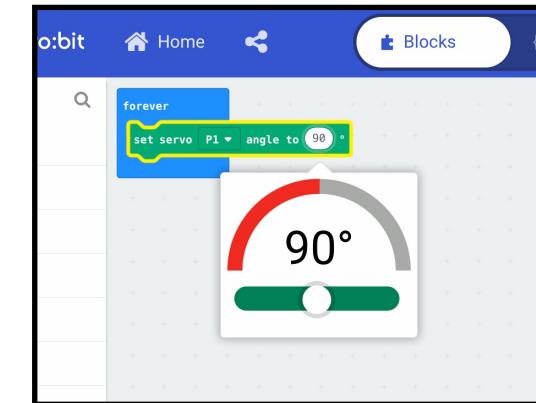
Before we can see what this code does, we will need to attach the servo to the board. You should have a black servo motor marked **HS-422**, with an arm attached to it.



Turn the micro:bit off and then turn it over to the battery side. With the on/off switch at the top, connect the servo cable to the three pins on the right – this is the **P1** servo connector.

The black wire must be at the top and the yellow wire at the bottom!

Turn the micro:bit back on. You should hear the servo buzz and the arm will turn to point to the side. Turn the micro:bit off again to save battery.

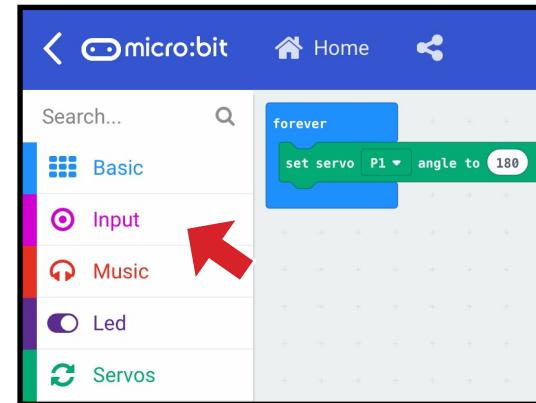


Let's try making a change.

☞ Tap on the **90** and you will see an angle slider appear. Drag the white knob all the way to the right, to **180**.

Now download the new program to your micro:bit (repeat the steps in the pink box on the other side). This time the servo arm will point towards the cable.

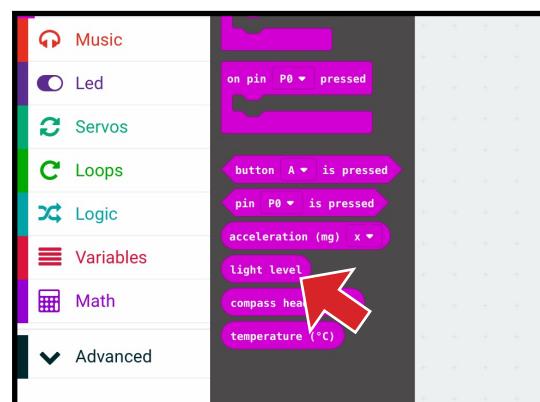
Try other angles to see what happens!



We will use the servo arm to open and close the petals of our flower. To do this we need to get it to move when the amount of light changes.

The micro:bit is able to sense light shining onto it. To do so we will need to add a new block to our program.

☞ Tap on the **Input** button at the left of the screen.

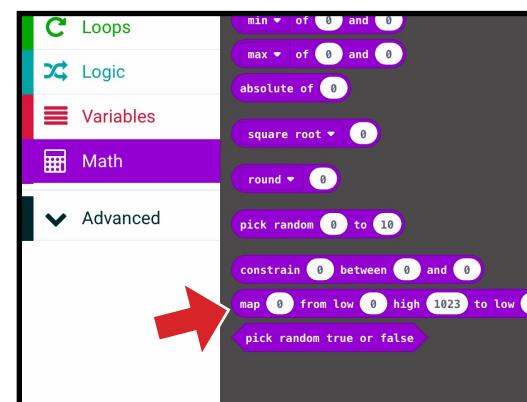


You will see a list of blocks that you can add to your program related to sensing things, which we call **input**.

☞ Tap the **light level** block to add it to your program.

This block senses the amount of light shining onto the front of the micro:bit.

Once this block has been added to the programming window, you can drag it around with your finger.



The **light level** is a number between 0 (dark) and 255 (bright), but we need a number between 0 and 180 to control the servo.

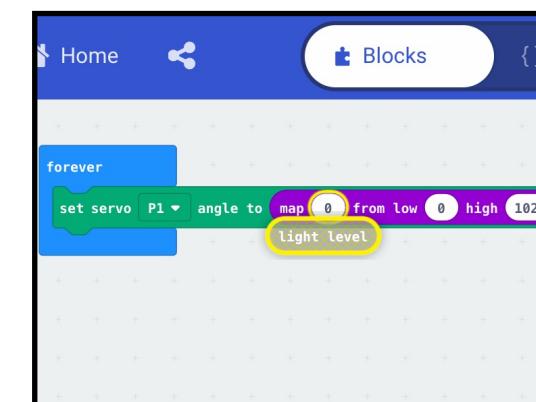
To change the light level to an angle we will use another block.

☞ Tap on the **Math** button at the left of the screen and add a **map** block to your program.



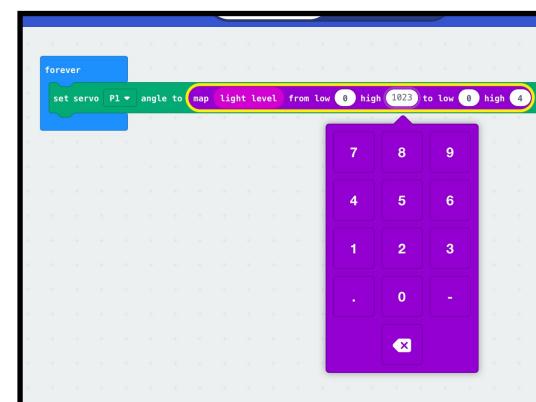
☞ Drag the **map** block over the angle in the **set servo** block until the number highlights with a yellow outline, then let go.

You should hear a click and the **map** block will snap inside the **set servo** one.



☞ Now drag the **light level** block over the first number in the **map** block and let go.

We need to tell the **map** block the lowest and highest light level number, as well as the lowest and highest angle number.



Tapping on a number will show a keypad allowing you to type a new number. Tapping on the grey background will dismiss this keypad.

☞ Tap on the numbers in the **map** block and change them to say:

from low 0 high 255 to low 0 high 180

Download this program to your micro:bit. Try shining a torch on the micro:bit to see what happens to the servo arm.