Signal Builder: DIY Traffic Lights

Overview

In this exciting project, we will transform everyday materials into a working traffic light system! Using cardboard, copper tape/Aluminium foil, and LEDs connected to a micro:bit, you will build your own traffic light controller from scratch.

What you will Learn

By the end of this project, you will understand:

- ☐ How LEDs work and how to connect them safely
- ☐ How to create circuits using copper tape
- ☐ How to program light sequences using a micro:bit
- ☐ The basics of traffic light systems

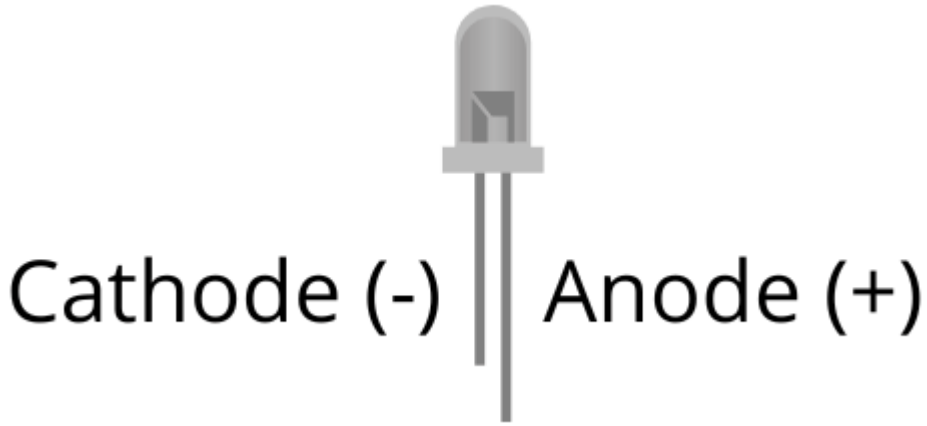
What you will Need

- 1 x Red LED
- 1 x Yellow LED
- 1 x Green LED
- 1 x Piece of cardboard
- Copper tape / aluminium foil and glue
- 4 x Crocodile / alligator leads
- 1 x micro:bit (version 1 and 2 will work)
- 1 x Micro USB cable
- 1 x Battery pack for the micro:bit (optional)

Let's move on and create our circuit.

Designing the Circuit

What is an LED



An LED (Light Emitting Diode) is a small light bulb that lights up when electricity flows through it. It's just like the tiny lights you see on your toys, TV, or Christmas decorations!
Every LED has two legs:

- A longer leg (called the positive or + side)
- A shorter leg (called the negative or - side)

Think of these legs like the LED's feet - they need to be connected the right way around for the LED to work. Just remember: Long leg = Positive (+), Short leg = Negative (-). If you connect them the wrong way around, your LED won't light up!

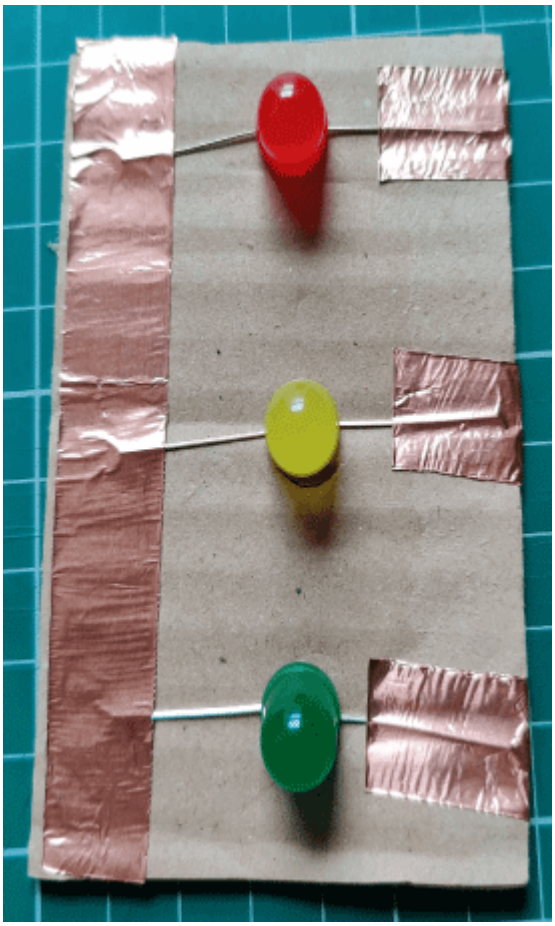
Creating the Circuit

1. Place the bit of cardboard on the desk.
2. Take the red LED and bend the legs out to the sides. Place the LED on the cardboard with the longer leg to the right.

3. Take a bit of copper tape or glue and some aluminium foil over the long leg of the red LED.

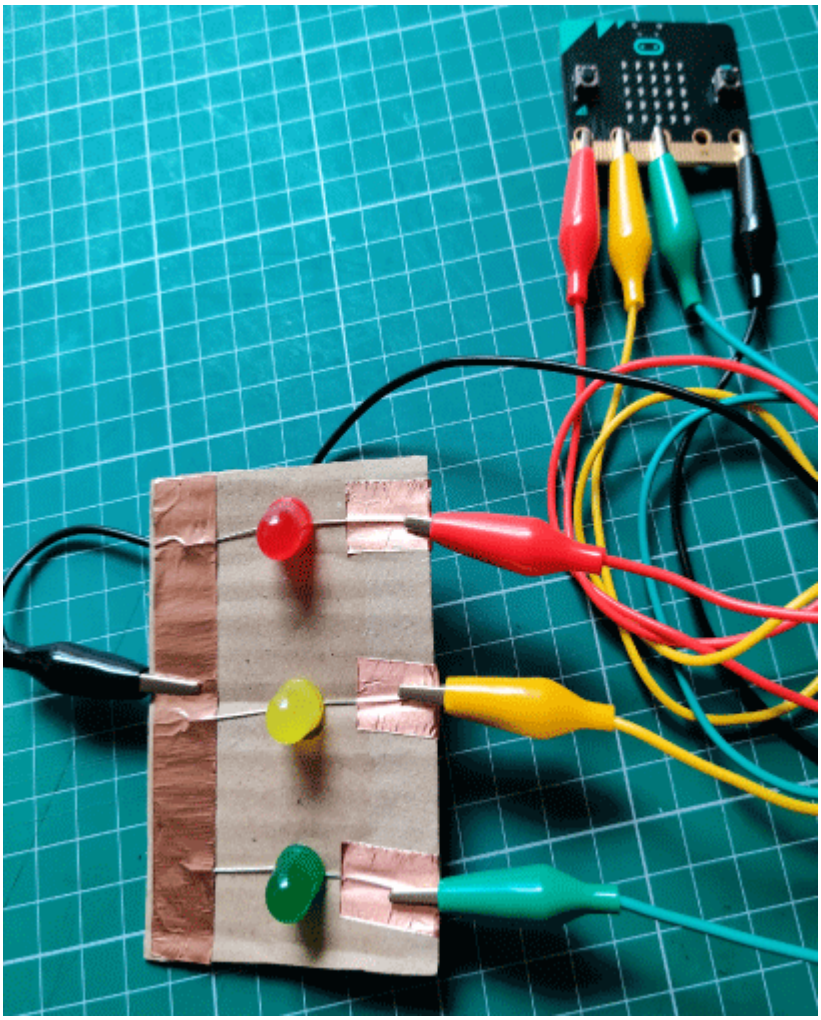
4. Complete steps 2 and 3 for the yellow and green LEDs.

5. Take a longer bit of copper tape or foil and tape/glue all three of the short legs of the LEDs together.



Connecting to the micro:bit

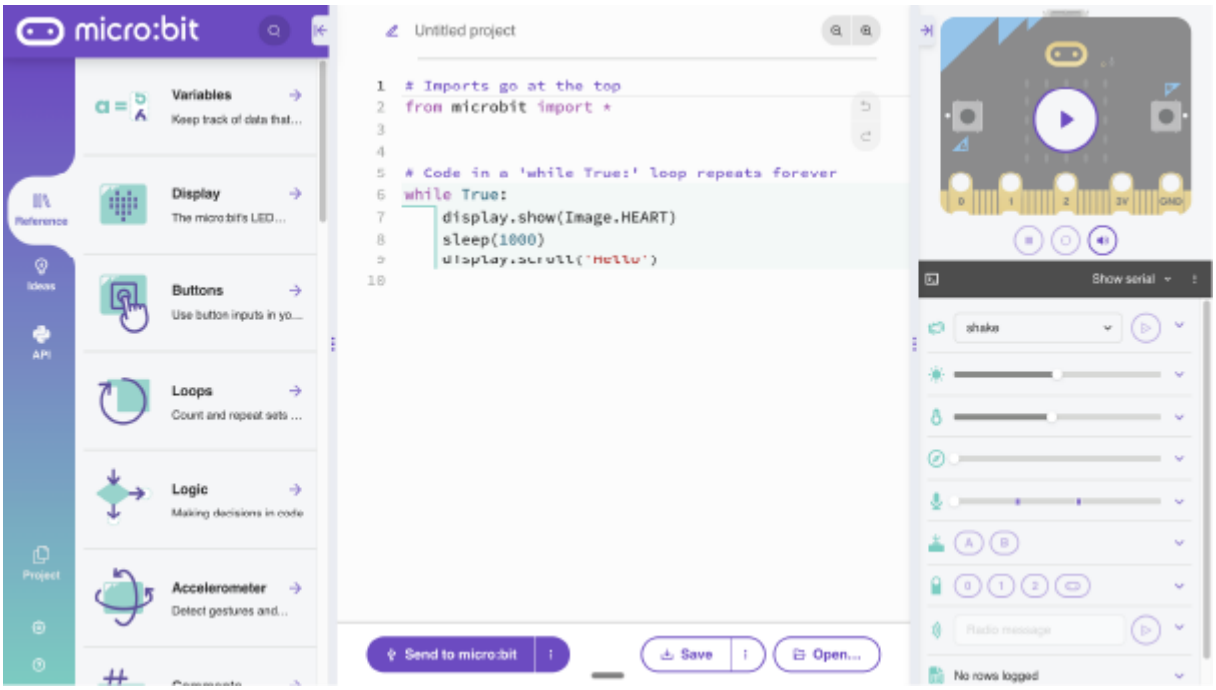
1. Take one of the crocodile/alligator leads and clip one end to the long piece of copper tape/aluminium foil covering the short legs of the LEDs and clip the other end to the GND pin of the micro:bit.
2. Take another crocodile/alligator lead and clip one end to the copper tape/aluminium foil of the longer leg of the red LED and attach the other end to pin 0 on the micro:bit.
3. Take another crocodile/alligator lead and clip one end to the copper tape/aluminium foil of the longer leg of the yellow LED and attach the other end to pin 1 on the micro:bit.
4. Take the last crocodile/alligator lead and clip one end to the copper tape/aluminium foil of the longer leg of the green LED and attach the other end to pin 2 on the micro:bit.



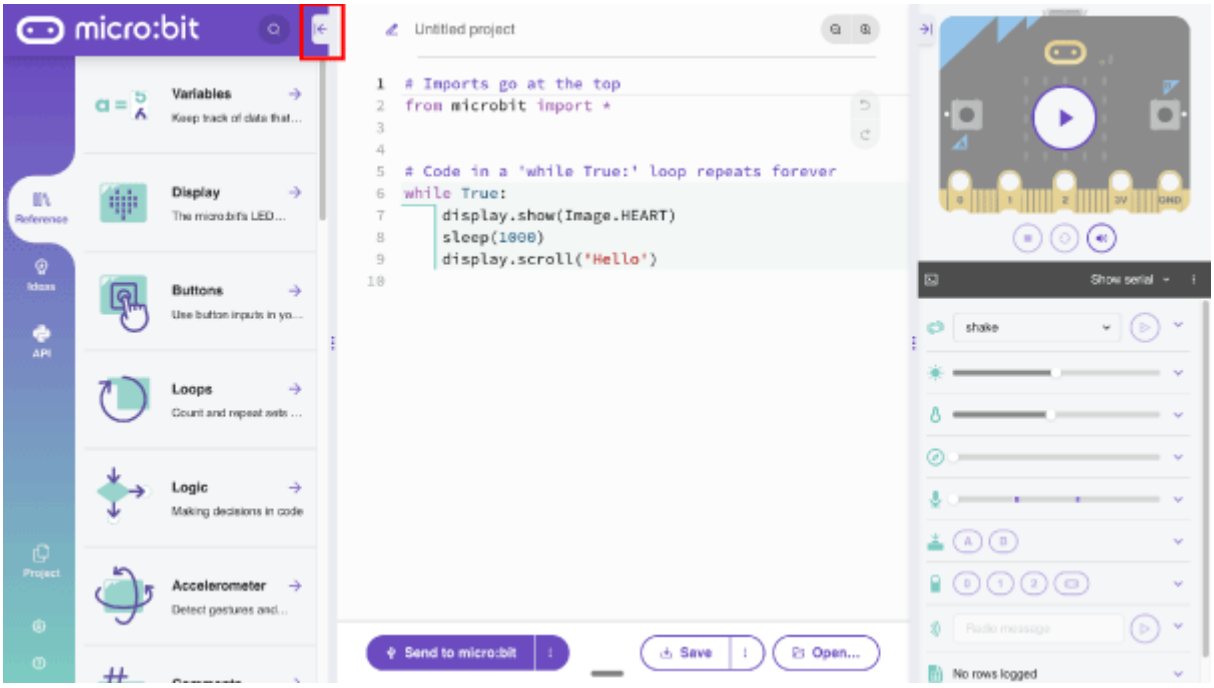
We now have our circuit lets move on to setting up our code editor.

Navigating to the Python Editor

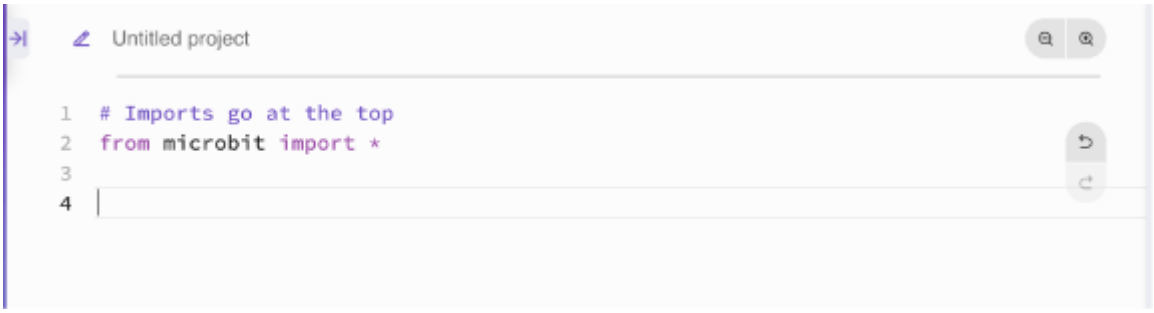
1. Open your favourite browser (we recommend Google Chrome).
2. Within the address bar of the browser type python.microbit.org or on a tablet or phone press create code.



3. Close the left hand panel by selecting the arrow pointing to the left. See the image below.



4. Delete the code from line 5 -9 on the main code area.



We are now ready to start coding!

Coding

Creating the while True loop

Type the following line of code under `from microbit import *`

```
while True:
```

Once you press enter your cursor will automatically indent. Start typing the rest of your code from here.

Turning the Red LED On

Type the following code to turn the red led on for 1 second.

```
pin0.write_digital(1)
sleep(1000)
```

Turning the Yellow LED on

Type the following code to turn the yellow LED on for 1 second. The red LED will also stay on.

```
pin1.write_digital(1)
sleep(1000)
```

Turning the Red and Yellow LEDs Off

The following code will turn the yellow and red LEDs off ready for the green LED to turn on.

```
pin0.write_digital(0)
pin1.write_digital(0)
```

Turning the Green LED On

The following code will turn the green LED on for 1 second.

```
pin2.write_digital(1)
sleep(1000)
```

Turning the Green LED off & Yellow LED On

The following code will turn the green LED off and the yellow LED on for 1 second.

```
pin2.write_digital(0)
pin1.write_digital(1)
sleep(1000)
```

Turning the Yellow LED Off

The following code will turn the yellow LED off.

```
pin1.write_digital(0)
```

Here is our completed code:

```
from microbit import *

while True:
  pin0.write_digital(1)
  sleep(1000)
  pin1.write_digital(1)
  sleep(1000)
  pin0.write_digital(0)
  pin1.write_digital(0)
  pin2.write_digital(1)
  sleep(1000)
  pin2.write_digital(0)
  pin1.write_digital(1)
  sleep(1000)
  pin1.write_digital(0)
```

Well done you have now completed the code for the Traffic Lights. Let's move on to learn how to download it to the micro:bit.

Downloading the code

Pairing the micro:bit to your computer

1. Take the micro USB cable and connect the micro:bit to the computer.
2. Select the **3 little dots** next to **send to micro:bit**.

3. Select **Connect** and follow the on screen prompts.

Downloading code to the micro:bit

1. Select **Send to micro:bit** to download the code to your micro:bt.

Lets move on to see how to play.

How to Play

Well done you have created your very own Traffic Lights circuit for the micro:bit.

Using the micro:bit

Once the code is dowloaded to the micro:bit you should see the LEDs light up in the pattern of traffic lights. If the LEDs aren't lighting up try pushing the copper tape/foil on to the leg to get a better connection.

If you find they are turning on/off in the wrong order check the pin numbering within the code.

- P0 = red
- P1 = yellow
- P2 = green

You can also change the speed that the LEDs turn on and off by changing the timing of the pause blocks.