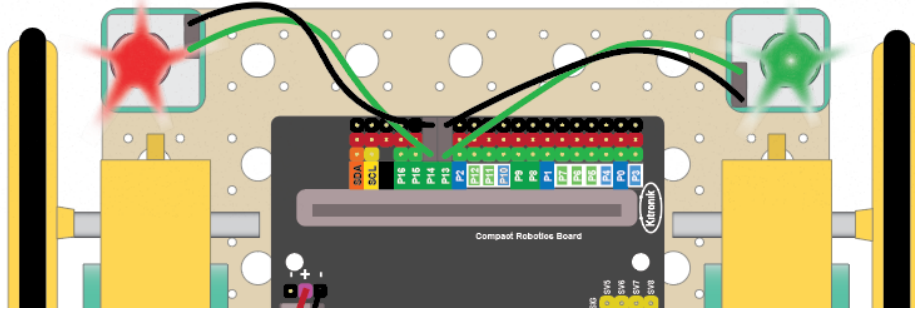# Add Lights to your Robot
Project 1.02

In this workshop you will add some lights to your robot. You can make these lights come on for different purposes. For example, you could use them to indicate when the robot is turning, or to flash as a warning to other robots.

How it Works

The lights we will use are called **LEDs** (Light Emitting Diodes). We will use a **digital output** to turn them on and off. When the output is HIGH, a 3.3 volts current is turned on. This is like switching on a 3.3V battery. The LED will light up. When the output is LOW, the current is turned off.

Each LED will be connected to a **pin** on the Microbit. To turn the LED on will will set the output to HIGH by setting the value of the pin to 1. The turn the LED off we will set the output to LOW by setting the value of the pin to 0.
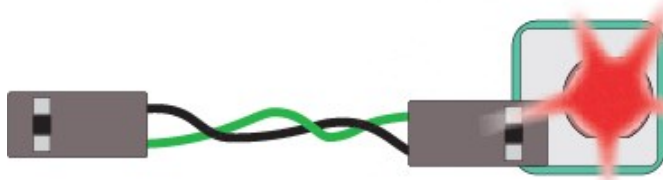
The LEDs need to be connected to the Microbit using GS cables, which have 2 wires. G is ground, which is the black wire. S is signal, which is the green wire and connects to the pin on the Microbit.
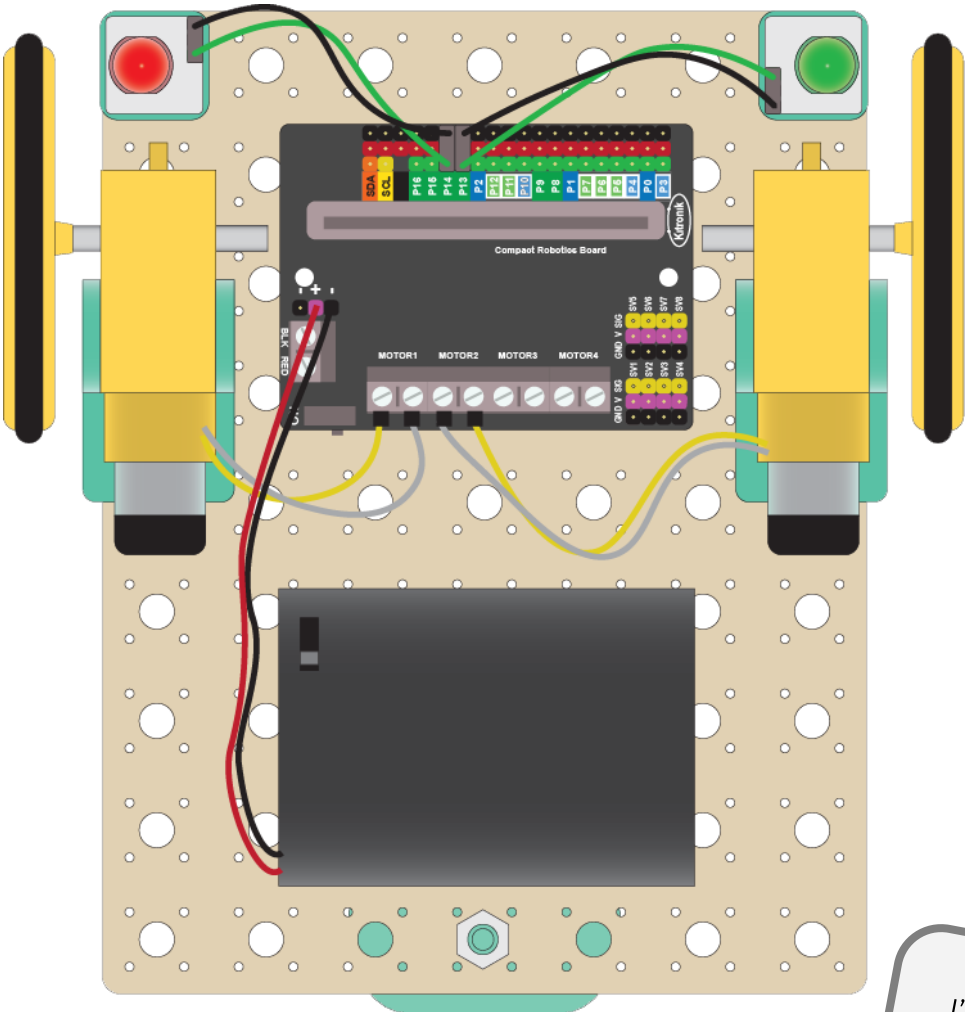
Microbit pin 13 set LOW

Microbit pin 13 set HIGH

What to do

- If you haven't already done so, build and code the robot by referring to the previous worksheets

- Then follow this worksheet to add two LED lights and get them to flash on and off

- Finally, attempt the coding challenges to design your own light (and perhaps sound) show!

Add the LEDs

Connect Two LEDs

1 Add two LEDS to your robot. You can add them anywhere you want!

I've used a red and green LED, but you can use whatever colours you want!

These connections on the Microbit are called **pins**

2 Wire up the LEDs as follows using **GS cables**

Component	Microbit Connections
Green LED	P13
Red LED	P14

Code the LEDs 1

Make One LED Flash

Start with any robot code you created in the last workshop. It could be the code that makes your robot do a square, or the code that makes your robot dance.

```
forever
    digital write pin  P13 ▼  to  1
    pause (ms)  500 ▼
    digital write pin  P13 ▼  to  0
    pause (ms)  500 ▼
```

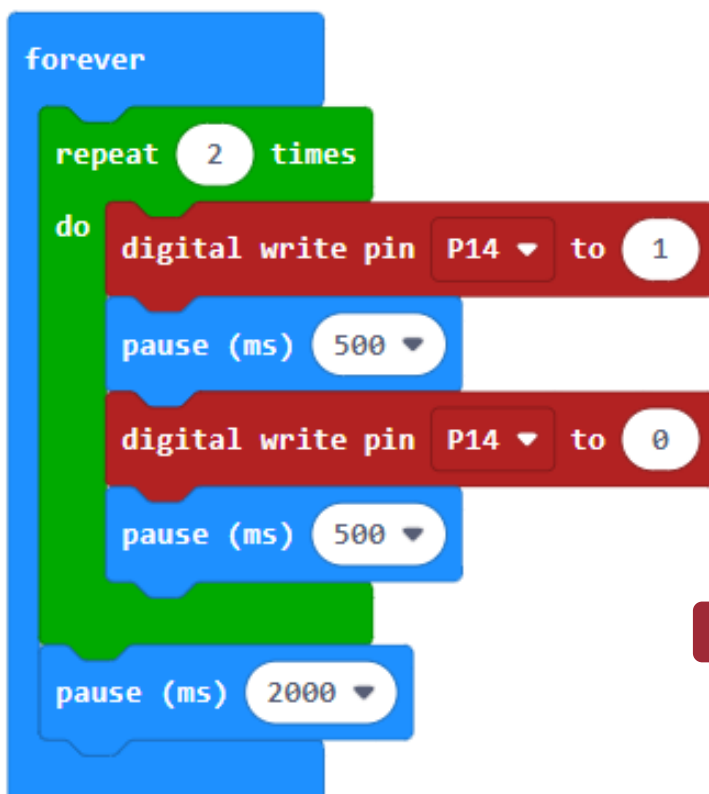**1** Add a new **forever** block with this code

The code sets the pin to HIGH (1), waits for 1/2 second and then sets it to LOW (0)

2 Download the code to the Microbit and watch the LED flash!

Download •••

Make the other LED Flash with a Pattern

For the other LED we will use loops to make a flashing pattern.

```
forever
    repeat  2  times
    do
        digital write pin  P14 ▼  to  1
        pause (ms)  500 ▼
        digital write pin  P14 ▼  to  0
        pause (ms)  500 ▼
    pause (ms)  2000 ▼
```

1 Add a new **forever** block with this code

We have the same approach as we used above, but we repeat the pattern twice, and then wait 2 seconds before doing it again.

2 Download the code to the Microbit and see how the pattern matches the code

Download •••

Code the LEDs 2

Make Alternating Lights

Now let's make the lights alternate, red-green-red-green....

1 Replace the previous **forever** blocks with this one

2 Download the code to the Microbit

Your challenge!

Now try out these challenges

- Create your own light show using different sequences and patterns.

- Add sound to make a flashing siren. You can find sounds in the music block:

  🎧 Music

- Make the lights come on according to different movements of the robot. So the left light comes on when turning left and the right light when turning right.

- Add a third light and make it do something else, for example flashing constantly or turning on when the robot is reversing.
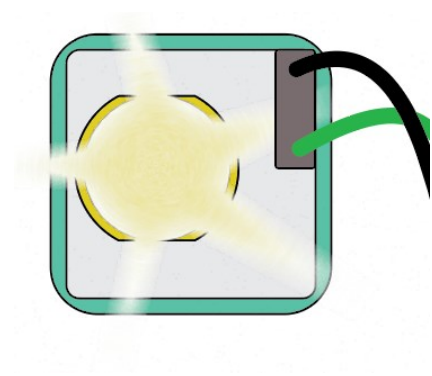
Solutions 1

Siren

This code plays alternating high and low sounds, synchornised with the flahing of the lights

Third LED

Connect up the third LED to pin 15 using a GS cable.

This code will flash the additional LED

Solutions 2

```
on start
    Motor  1 ▼  on direction  Forward ▼  speed  50
    Motor  2 ▼  on direction  Forward ▼  speed  50
    digital write pin  P13 ▼  to  1
    digital write pin  P14 ▼  to  1
    pause (ms)  2000 ▼
    Motor  1 ▼  on direction  Forward ▼  speed  50
    Motor  2 ▼  on direction  Forward ▼  speed  0
    digital write pin  P13 ▼  to  1
    digital write pin  P14 ▼  to  0
    pause (ms)  2000 ▼
    Motor  1 ▼  on direction  Forward ▼  speed  0
    Motor  2 ▼  on direction  Forward ▼  speed  50
    digital write pin  P13 ▼  to  0
    digital write pin  P14 ▼  to  1
    pause (ms)  2000 ▼
    turn off Motor  1 ▼
    turn off Motor  2 ▼
    digital write pin  P13 ▼  to  0
    digital write pin  P14 ▼  to  0
```

> This code turns on the different LEDs according to whether the robot is moving forwards, left or right.