

創意編程

設計大賽

2020/21

Creative Coder Competition

micro:bit
進階工作坊
Advanced Training Workshop

合辦機構
Co-organizer



香港青年協會
the hongkong federation of youth groups



Department of Electrical and
Electronic Engineering
電機電子工程系

贊助
Sponsor



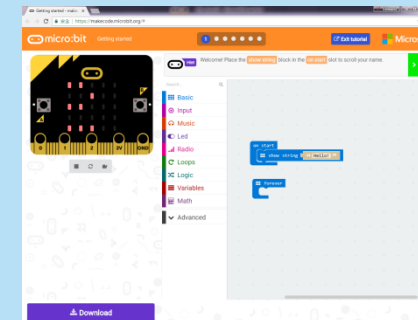
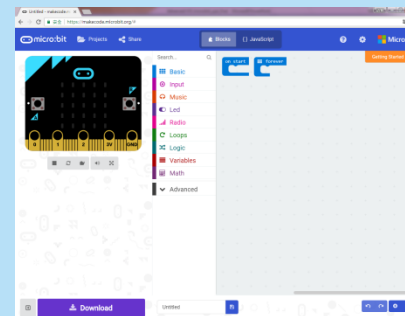
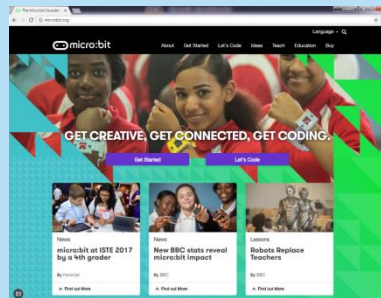
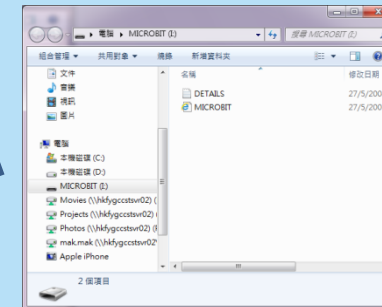
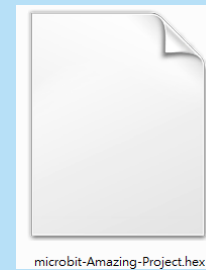
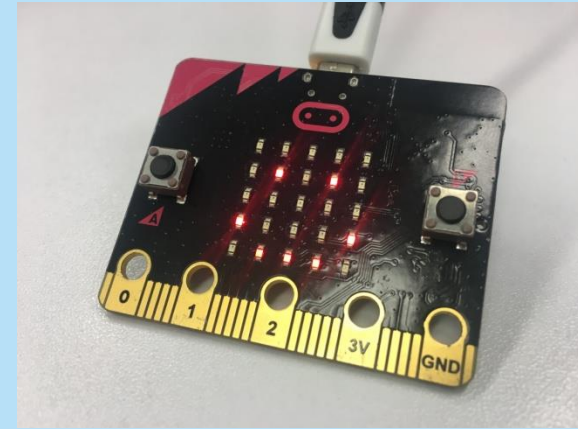
創新科技署
Innovation and
Technology Commission

進階工作坊內容

- 進一步學習各項基本編程結構：
 - 序列、條件、迴圈
 - 混合結構及變數使用
- 使用進階指令：
 - 廣播 (Radio)
 - 遊戲
- 連接外置電子零件
- 擴展功能
- 任務挑戰項目 (Mission Encounter, ME) 模擬試題

重溫

- 1) 登入網址：microbit.org
- 2) 進入MakeCode Editor
- 3) 編寫程式
- 4) 下載.hex檔案
- 5) 連接micro:bit
- 6) 拖曳(Drag & Drop)程式至micro:bit資料夾內



編程結構3：迴圈 (loops)

循環的選題

一遍又一遍地問同一個問題，直到完成某項任務

LOOPS



A screenshot of a search interface. On the left is a search bar with the text '搜尋...' and a magnifying glass icon. Below it is a list of categories: '基本', '輸入', '音效', '燈光', '廣播', '迴圈', '邏輯', '變數', and '數學'. The '迴圈' category is highlighted in green. On the right, a search results panel titled '迴圈' shows three items. The first item is '重複 4 次', with '4' in a white circle, and an '執行' button below it. The second item is '重複 判斷 true', with 'true' in a blue dropdown menu, and an '執行' button below it. The third item is '計次 index 從 0 到 4', with 'index' in a red box and '4' in a white circle, and an '執行' button below it.

活動：倒數器

```
on logo touched
  變數 countdown 設為 5
  重複判斷 countdown ≥ 0
  執行
    顯示數字 countdown
    暫停 1000 毫秒
    變數 countdown 改變 -1
  顯示文字 "Finish"
```

The image shows a Scratch script for a countdown timer. The script starts with an 'on logo touched' event block. It then sets a variable named 'countDown' to the value 5. A 'repeat while' loop is used to count down: the condition is 'countDown ≥ 0'. Inside the loop, the following actions are performed: 'show number' (displaying the current value of 'countDown'), 'wait 1000 milliseconds', and 'change variable' (decreasing 'countDown' by 1). After the loop ends, the text 'Finish' is displayed.



當按鈕 A 被按下

- 暫停 隨機取數 500 到 3000 毫秒
- 演奏 音階 中音 C 持續 1/16 拍
- 變數 start 設為 運行時間 (ms)



當按鈕 B 被按下

- 變數 stop 設為 運行時間 (ms)
- 顯示 數字 $\frac{\text{stop} - \text{start}}{1000}$

反應時間

挑戰題：鬥長氣？

使用micro:bit V2內置的麥克風，紀錄接收聲響的時間(以秒數顯示)

提示：

1. 一開始設置聲音響度
2. 使用2個變數儲存開始時間及有聲響時間數值
3. 運用運行時間變數
4. micro:bit儲存時間數值為毫秒（1秒 = 1000毫秒）

額外活動：

1. 7秒遊戲

2. 鬥靜遊戲

廣播溝通 (Radio)

The image shows a screenshot of the Scratch software interface. On the left is the 'Radio' block palette, and on the right is the script area containing several radio-related blocks.

Radio Block Palette (Left):

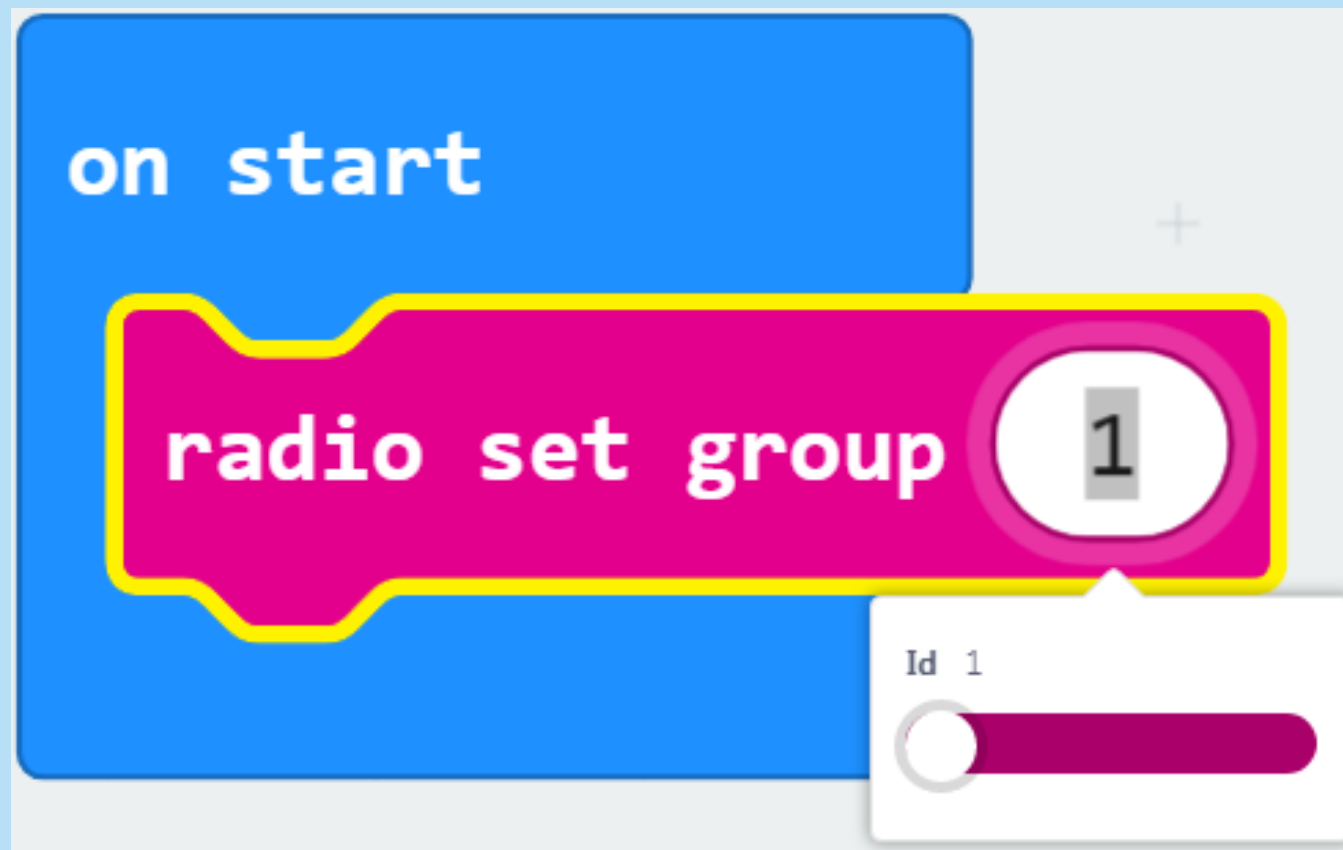
- Search...
- Basic
- Input
- Music
- Led
- Radio** (highlighted)
- more
- Loops
- Logic
- Variables
- Math
- Advanced

Script Area (Right):

Radio

- radio send number 0
- radio send value "name" = 0
- radio send string ""
- on radio received receivedNumber
- on radio received name value
- on radio received receivedString

Step 1 : 廣播群組 radio set group



可以設定0 – 255共**256**個群組

Step 2 : 廣播發送 radio send

 Radio



radio send number

0

radio send value

" name "

=

0



radio send string

" "

發送者程式：

on start

radio set group 1

on button A pressed

radio send string Hello

on button B pressed

radio send string No...

接收者程式：

on start

radio set group 1

on radio received receivedString

show string receivedString

發送圖案

發送者：發送數字訊息

on start

radio set group 1

on button A pressed

radio send number 0

on button B pressed

radio send number 1

發送圖案

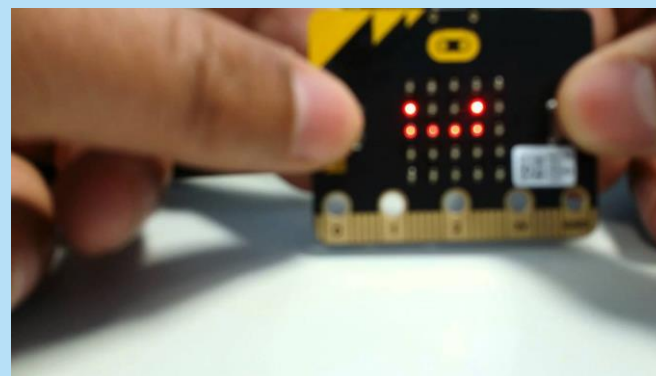
接收者：根據所收到的數字訊息顯示圖案的

```
on start
  radio set group 1

on radio received receivedNumber
  if receivedNumber = 0 then
    show icon [5x5 grid]
  +
  if receivedNumber = 1 then
    show icon [4x4 grid]
  +
```

遊戲製作

- 學習重點：
- 認識坐標系統
- 遊戲設定



什麼是遊戲？

- 目的
- 角色
- 規則
- 操作



Rules of the Game



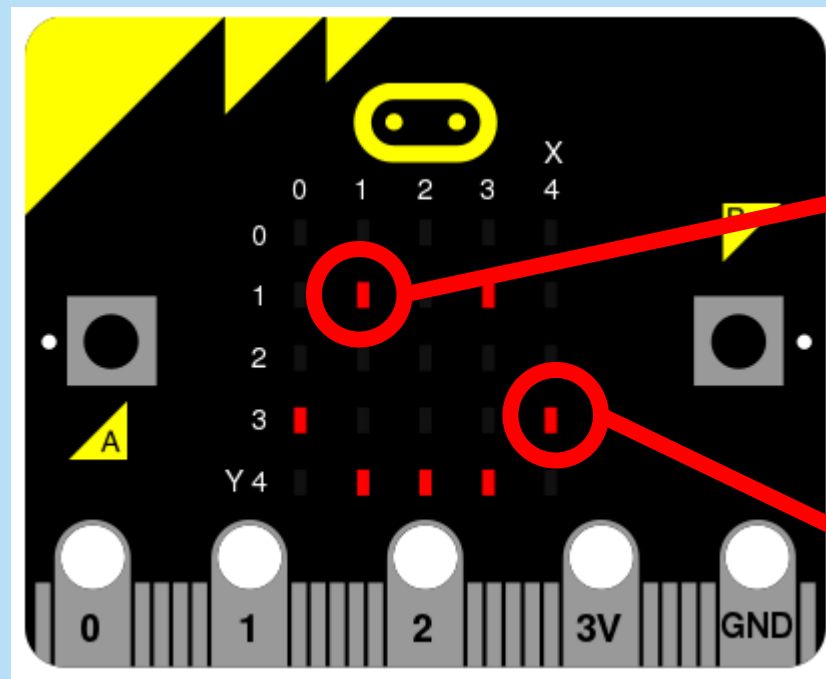
坐標系統

X (0) : 最左

Y (0) : 最上

X (4) : 最右

Y (4) : 最下



(1,1)

(4,3)

- Led
- Radio
- Loops
- Logic
- Variables
- Math
- Advanced
- Functions
- Arrays
- Text
- Game**
- more
- Images
- Pins
- Serial
- Control

Game

```
create sprite at x: 2 y: 2
delete sprite
sprite move by 1
sprite turn right by (°) 45
sprite change x by 1
sprite set x to 0
sprite x
sprite touching ?
sprite touching edge?
sprite if on edge, bounce
```

創建角色

The image displays the Scratch interface for creating a variable and a sprite. On the left, a sidebar lists categories: Led, Radio, Loops, Logic, Variables (highlighted), Math, Advanced, and Functions. The main workspace shows the 'Variables' panel with a 'Make a Variable...' button. Below it, a red block 'set sprite to 0' and another red block 'change sprite by 1' are visible. A green block 'create sprite at x: 2 y: 2' is being dragged from the 'Variables' panel to the workspace. At the bottom, a yellow block 'set Player 01 to create sprite at x: 0 y: 0' is shown, where the 'create sprite' block is nested within the 'set' block.

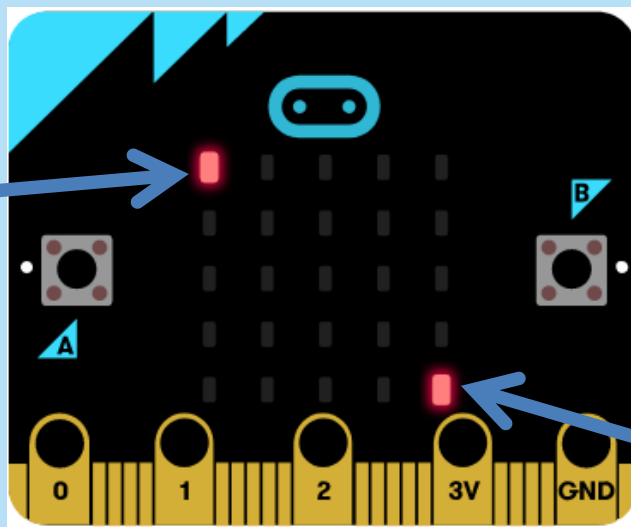
創建角色

on start

set **Player 01** to create sprite at x: 0 y: 0

set **Goal** to create sprite at x: 4 y: 4

Player
01



Goal

編寫遊戲指令

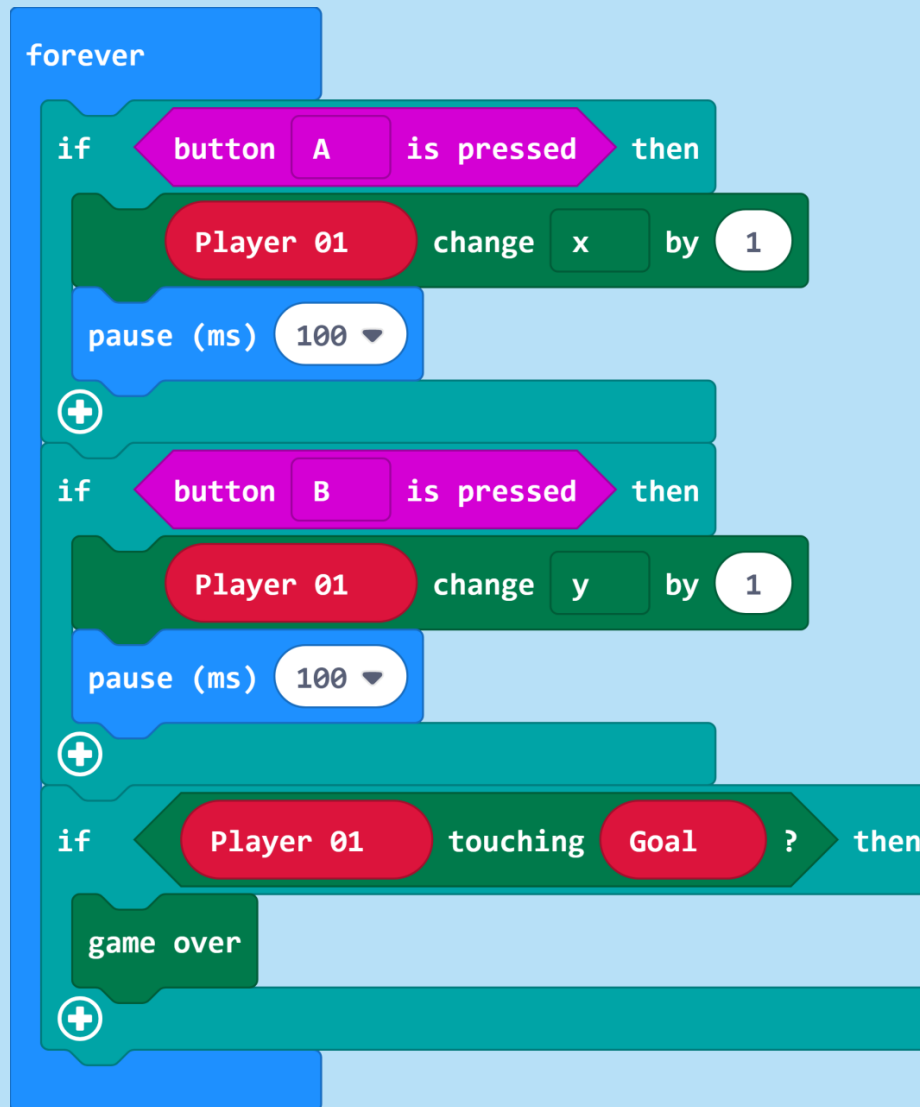
Option A

```
on button A pressed
  Player 01 change x by 1
  pause (ms) 500
```

Option B

```
forever
  if button A is pressed then
    Player 01 change x by 1
    pause (ms) 100
  +
  if button B is pressed then
    Player 01 change y by 1
    pause (ms) 100
  +
```

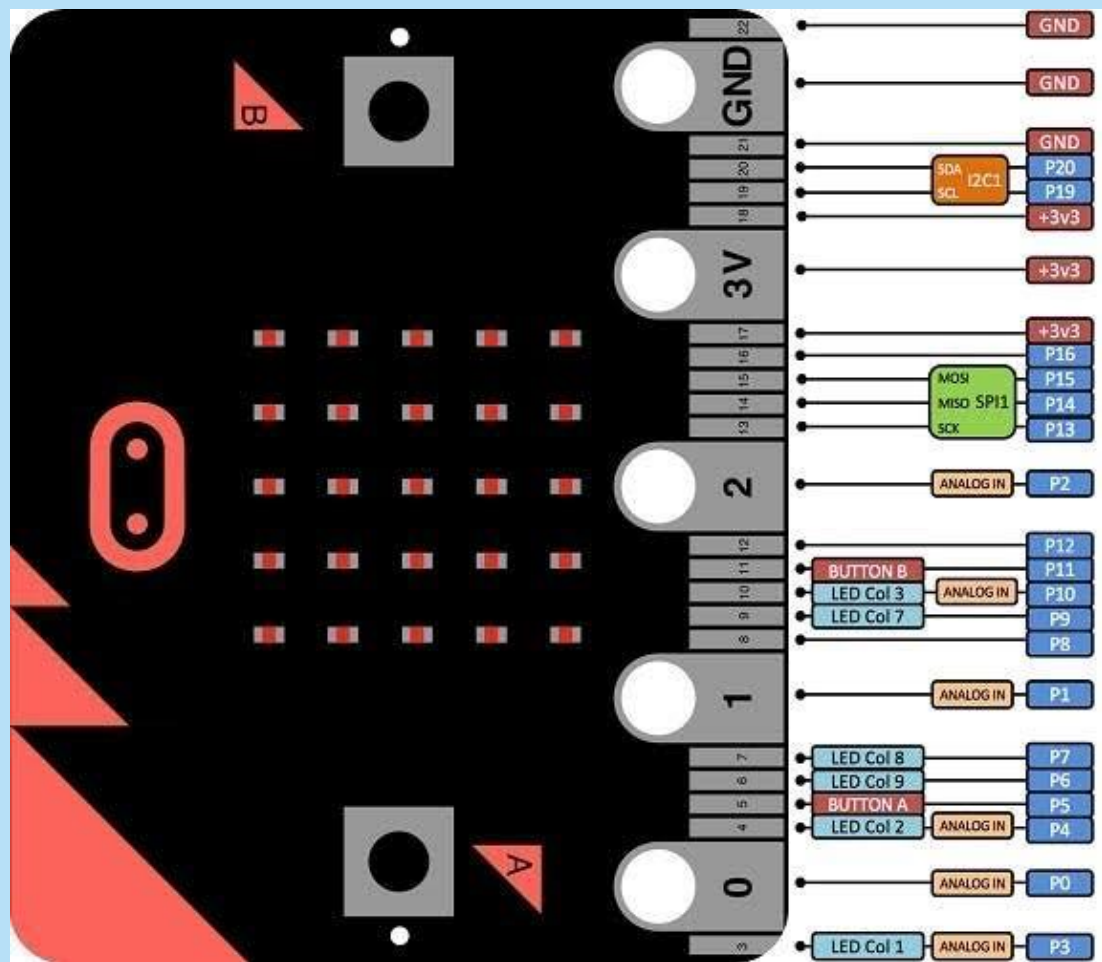
結束遊戲



遊戲：挑戰

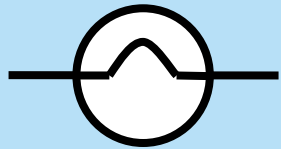
1. 製作一款遊戲，角色起始在micro:bit螢幕最左上角；設定目標於micro:bit螢幕最右下角
2. 擺動micro:bit以控制角色上、下、左、右移動
3. 當角色碰到目標後加1分
4. 然後目標光點隨機出現在螢光幕上
5. 再控制角色接觸目標取分
6. 當取得3分後，遊戲結束

連接其他電子元件



什麼是完整電路？

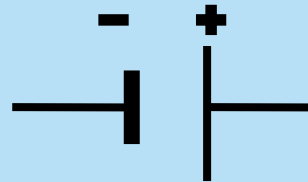
- 由各種不同元件組合而讓電流通過的排列稱為**電路**。



燈泡

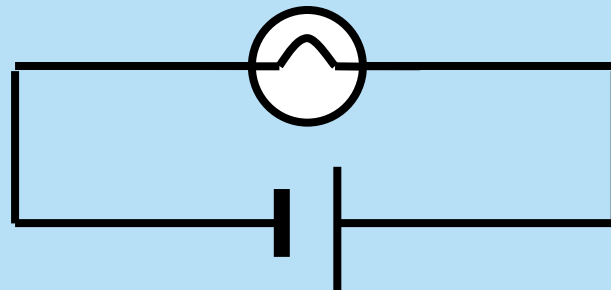


電線

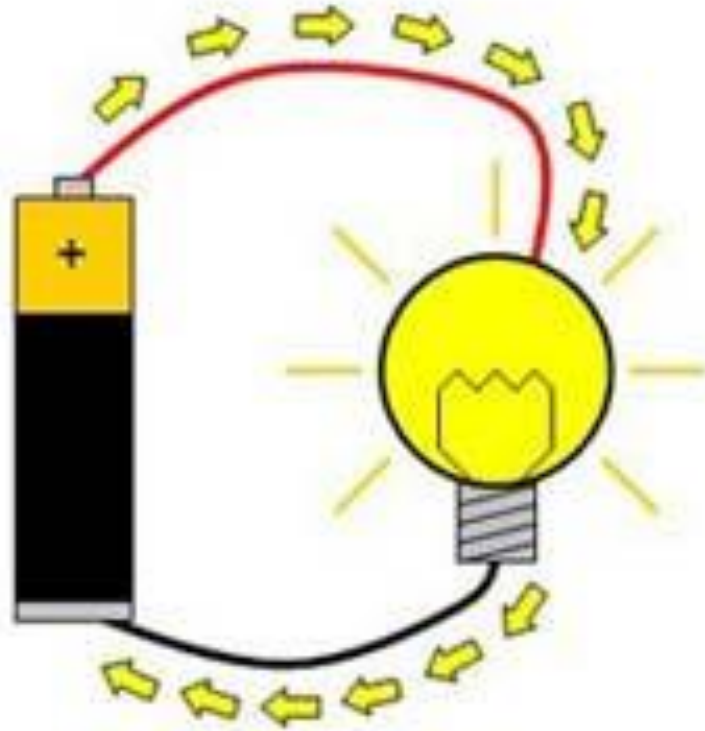


電池

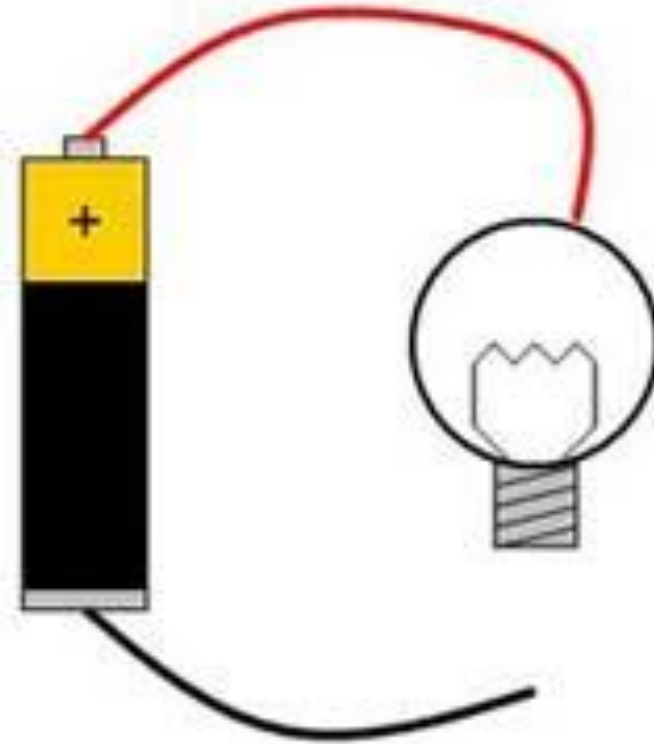
- 當電流通過所有元件而完成一個完整循環，就形成一個**完整電路**。



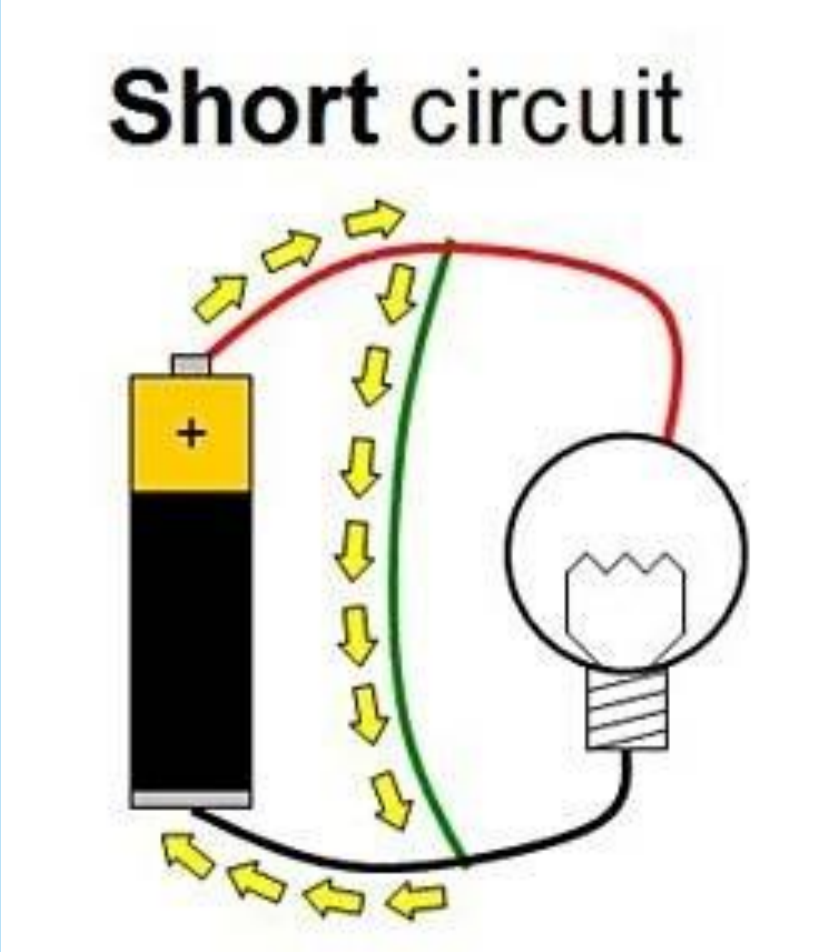
Closed circuit



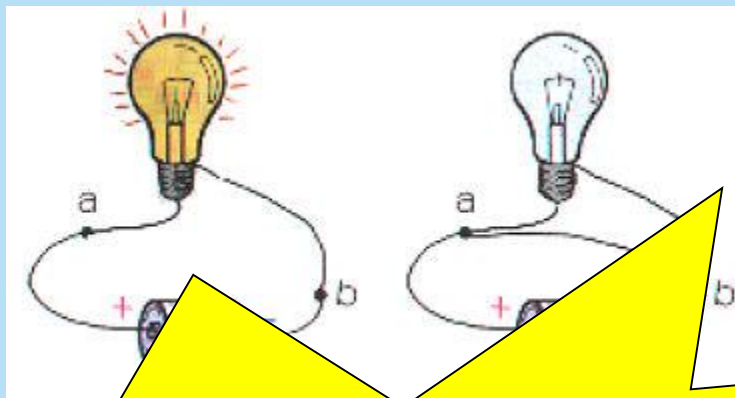
Open circuit



短路(Short Circuit)

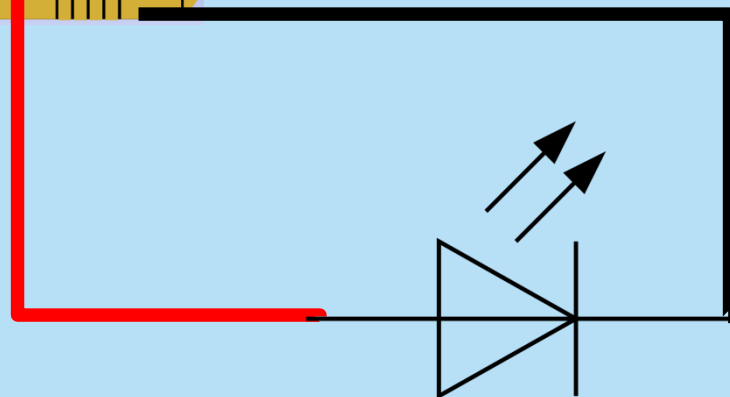
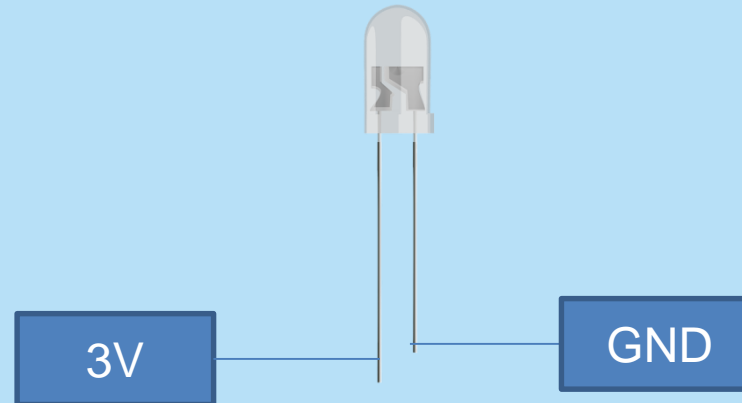
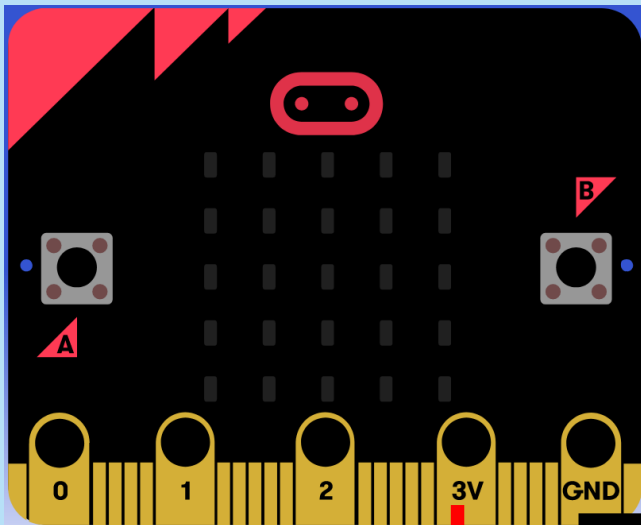


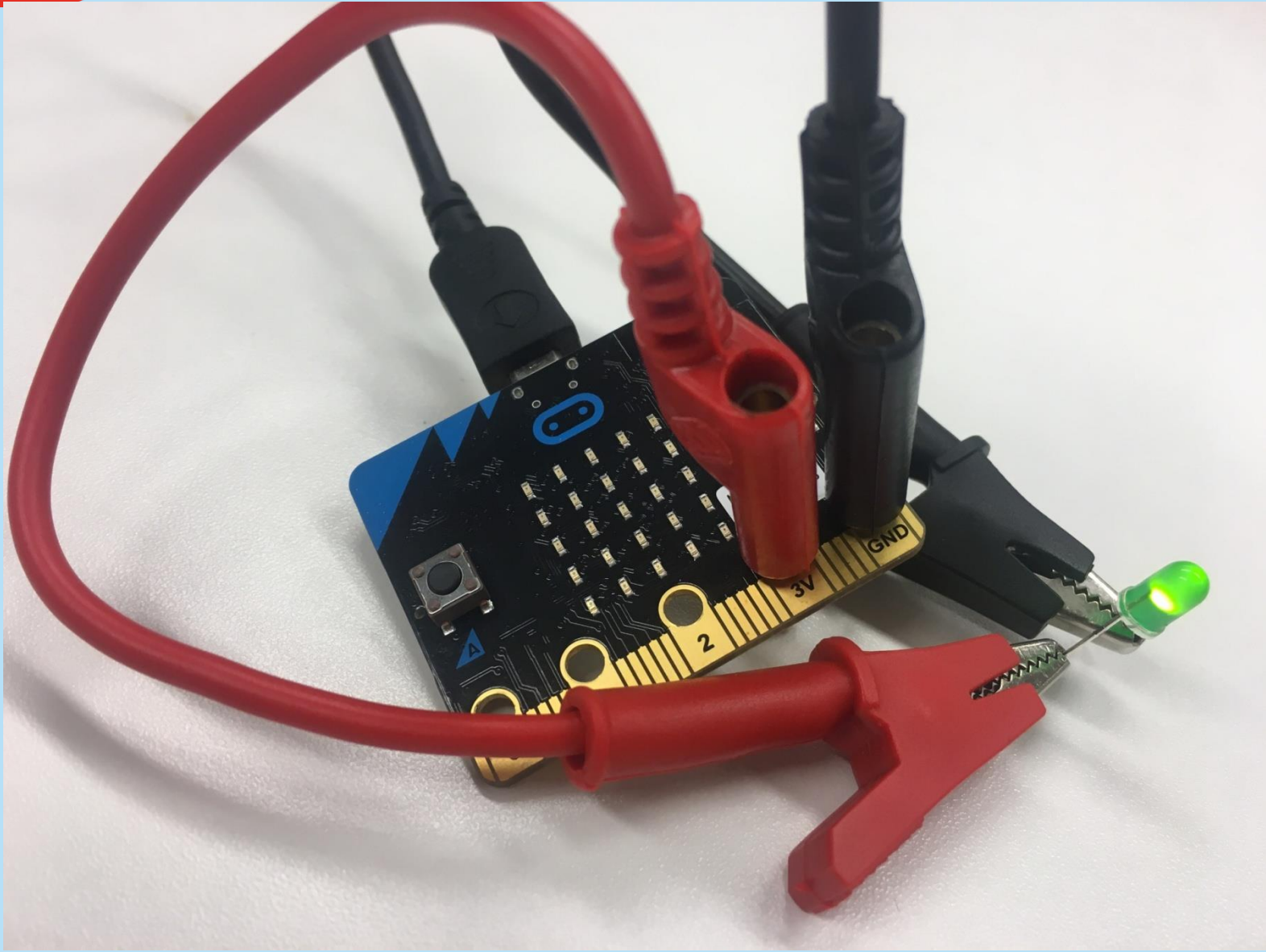
短路



**注意：
短路會使電線發熱，產生火警!!!**

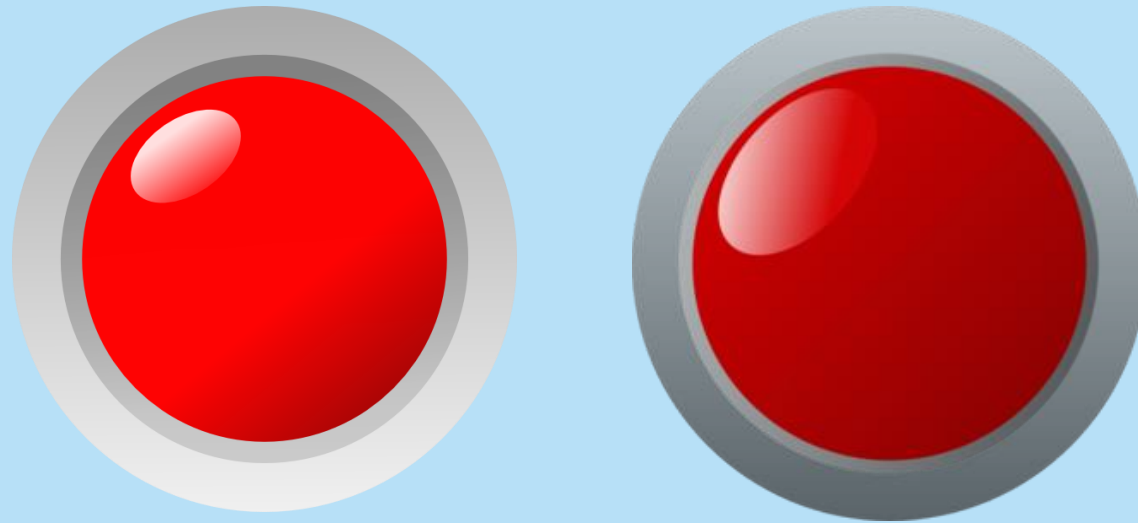
閉合電路





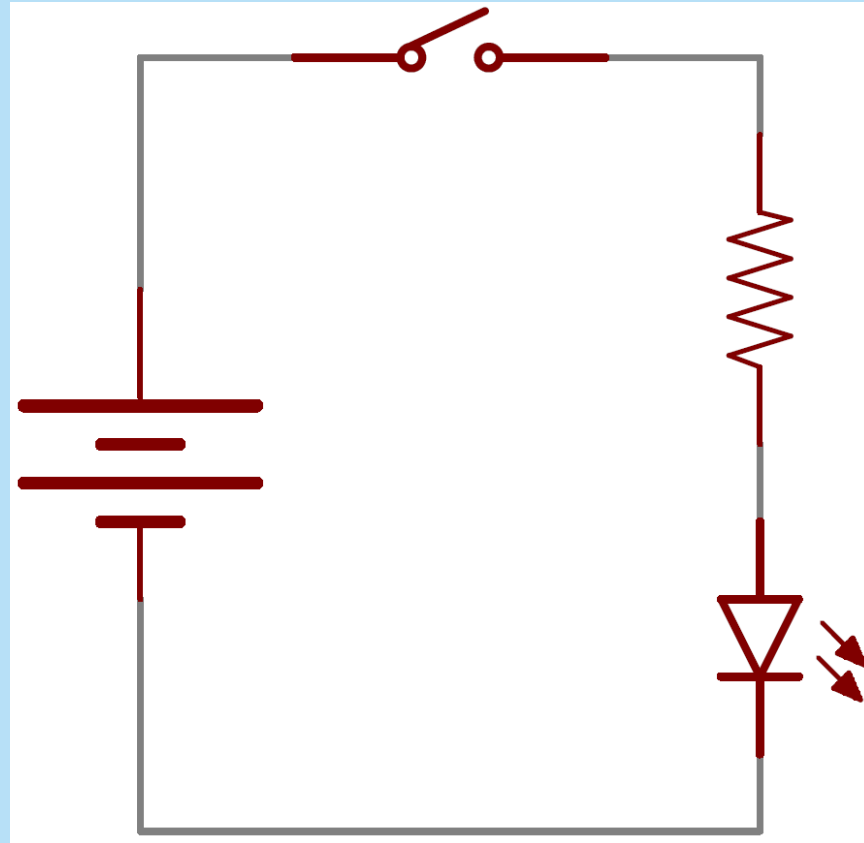
數碼輸入/輸出

- 輸出



數碼輸入/輸出

- 輸入



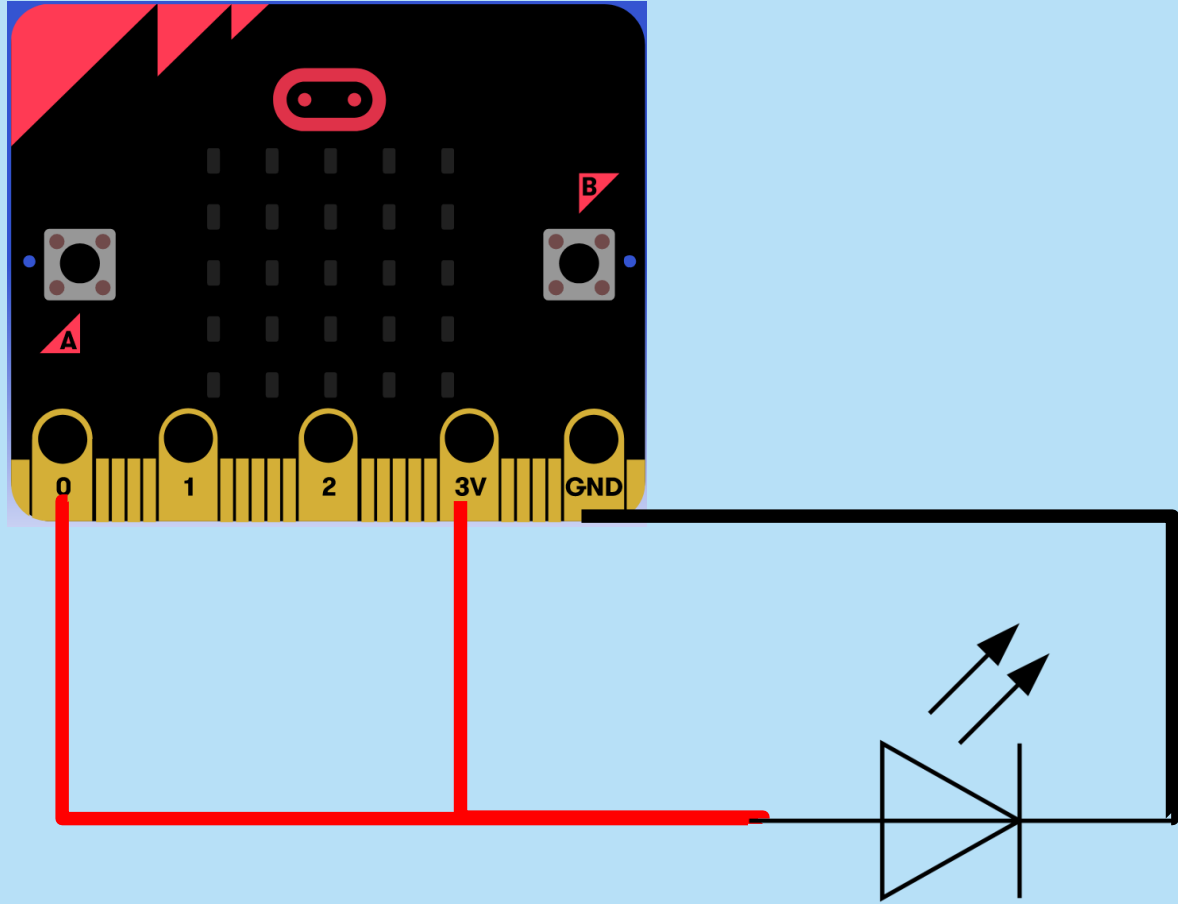
數碼輸入/輸出

The image shows a screenshot of the Arduino IDE's block editor. A search bar at the top left contains the text "digital read pin". Below the search bar is a list of categories: Basic, Input, Music, Led, Radio, Loops, Logic, Variables, Math, Advanced, Functions, Arrays, Text, Game, Images, Pins, and More. The "Pins" category is selected. On the right side, a list of blocks is displayed, with the first two blocks circled in green: "digital read pin P0" and "digital write pin P0 to 0". Other blocks include "analog read pin P0", "analog write pin P0 to 1023", a "map" block with values 0, 0, 1023, 0, and 4, "analog set period pin P0 to (µs) 20000", "servo write pin P0 to 180", and "servo set pulse pin P0 to (µs) 1500".

交通燈

- 學習重點
 - 數碼輸出指令
 - 接駁電子元件





交通燈

digital write pin P0 ▼ to 0

write = 輸出

digital write pin P0 ▼ to 0

Value 0



This block is a Scratch 'digital write pin' block. It has a yellow border and a grey background with a yellow grid pattern. The text 'digital write pin' is on the left, followed by a dropdown menu showing 'P0' with a downward arrow, and the word 'to' followed by a circular input field containing the number '0'. Below the block are five plus signs. A tooltip on the right shows 'Value 0' and a slider with a white knob at the far left.

digital write pin P0 ▼ to 1

Value 1



This block is a Scratch 'digital write pin' block, identical in structure to the one above. It has a yellow border and a grey background with a yellow grid pattern. The text 'digital write pin' is on the left, followed by a dropdown menu showing 'P0' with a downward arrow, and the word 'to' followed by a circular input field containing the number '1'. Below the block are five plus signs. A tooltip on the right shows 'Value 1' and a slider with a white knob at the far right.

活動：閃爍LED燈

forever

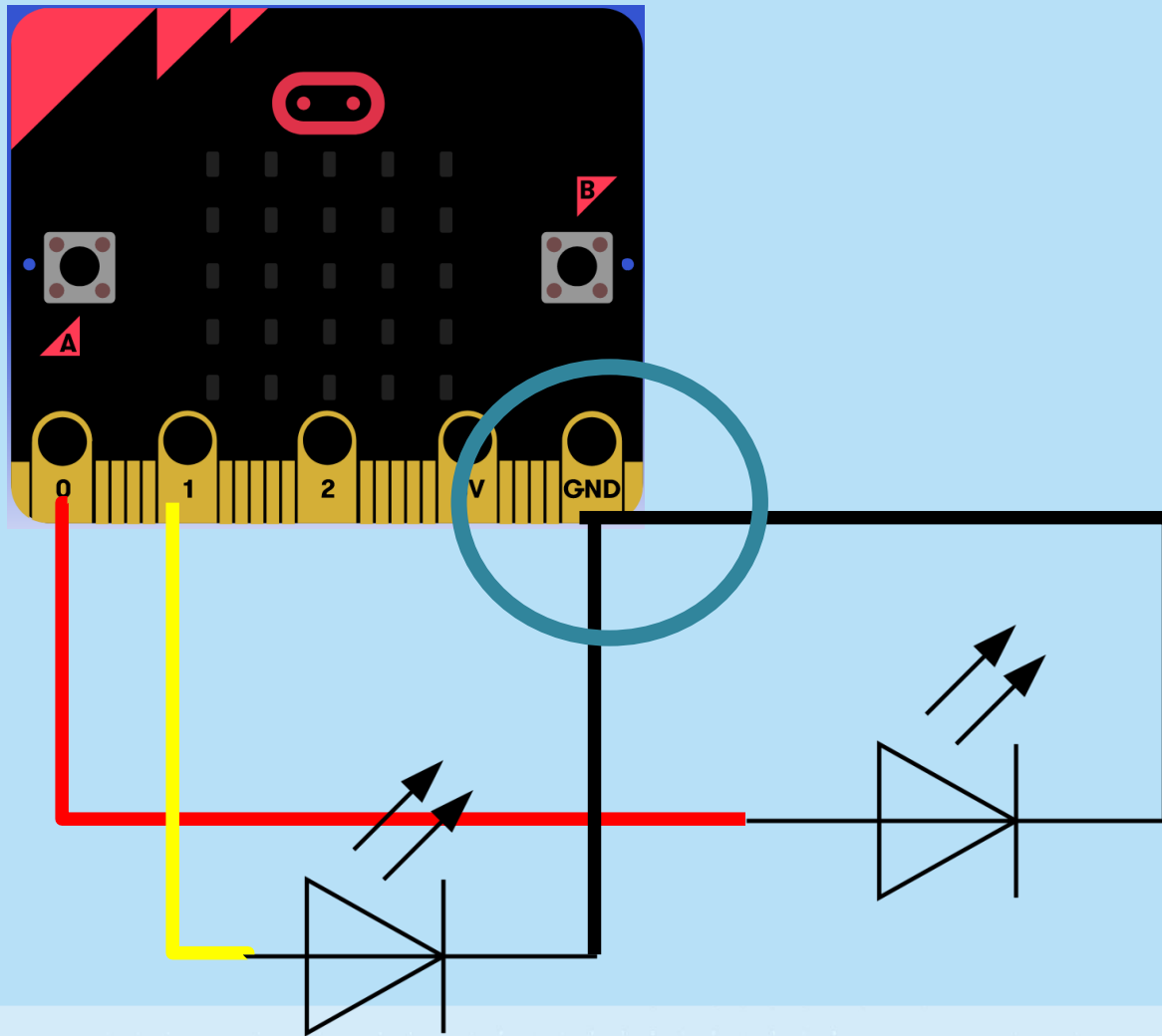
digital write pin P0 to 1

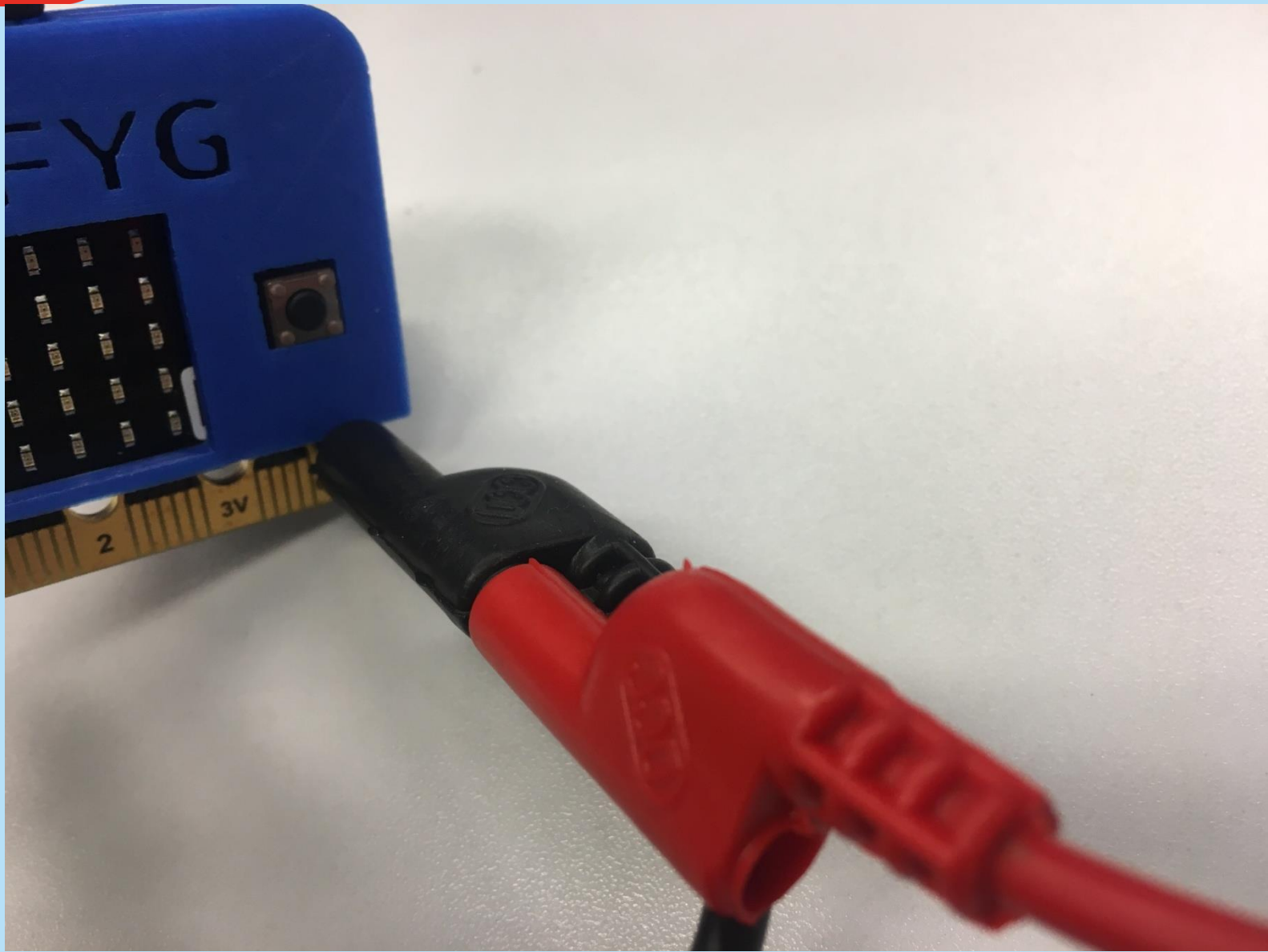
pause (ms) 1000

digital write pin P0 to 0

pause (ms) 1000

交通燈 - 兩顆LED燈





交通燈 兩顆LED燈

forever

digital write pin P0 to 1

pause (ms) 5000

repeat 50 times

do

digital write pin P0 to 1

pause (ms) 100

digital write pin P0 to 0

pause (ms) 100

digital write pin P1 to 1

pause (ms) 10000

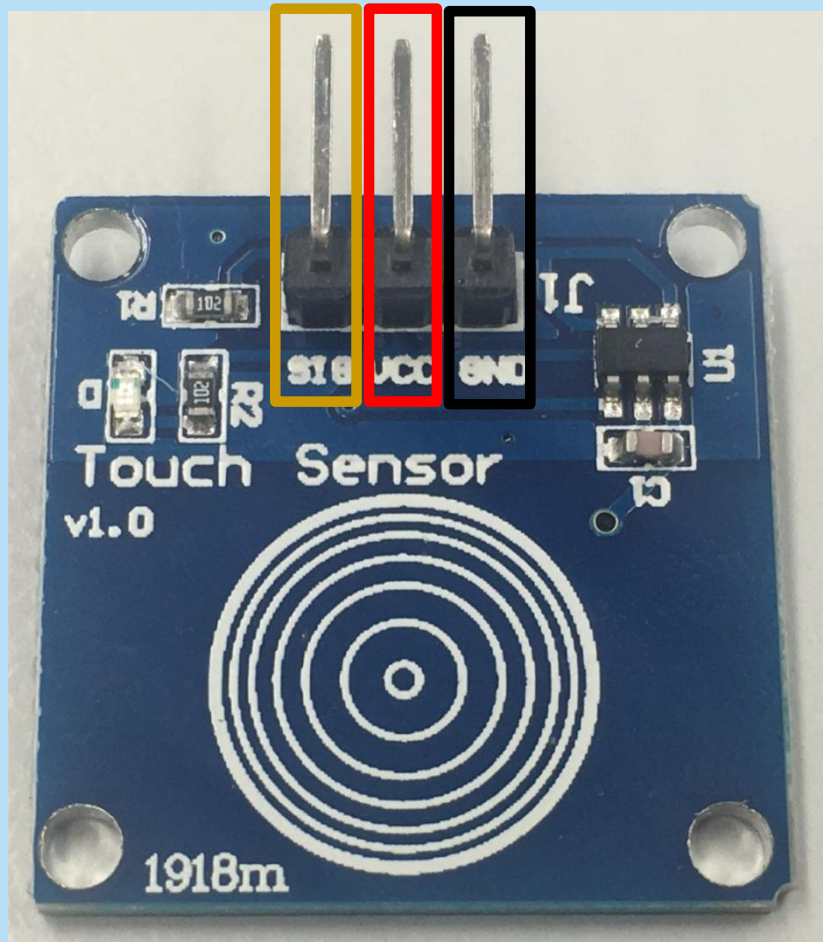
digital write pin P1 to 0

第三個按鈕？

- 學習重點
 - 數碼輸入指令
 - 接駁輸入電子元件



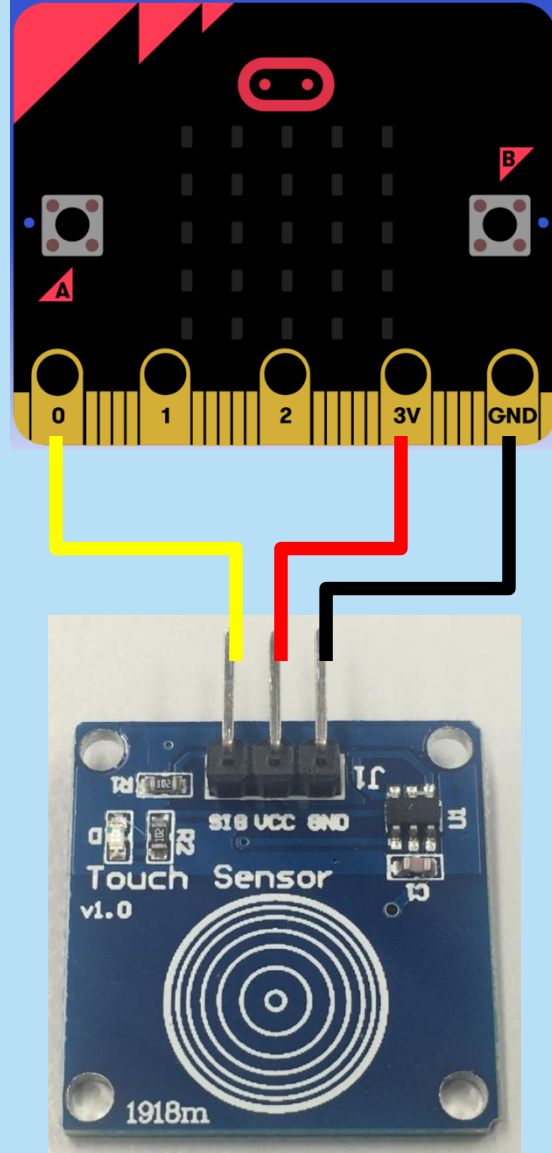
接駁輕觸按鈕



SIG : 訊號接腳

VCC : 電源接腳

GND : 接地接腳

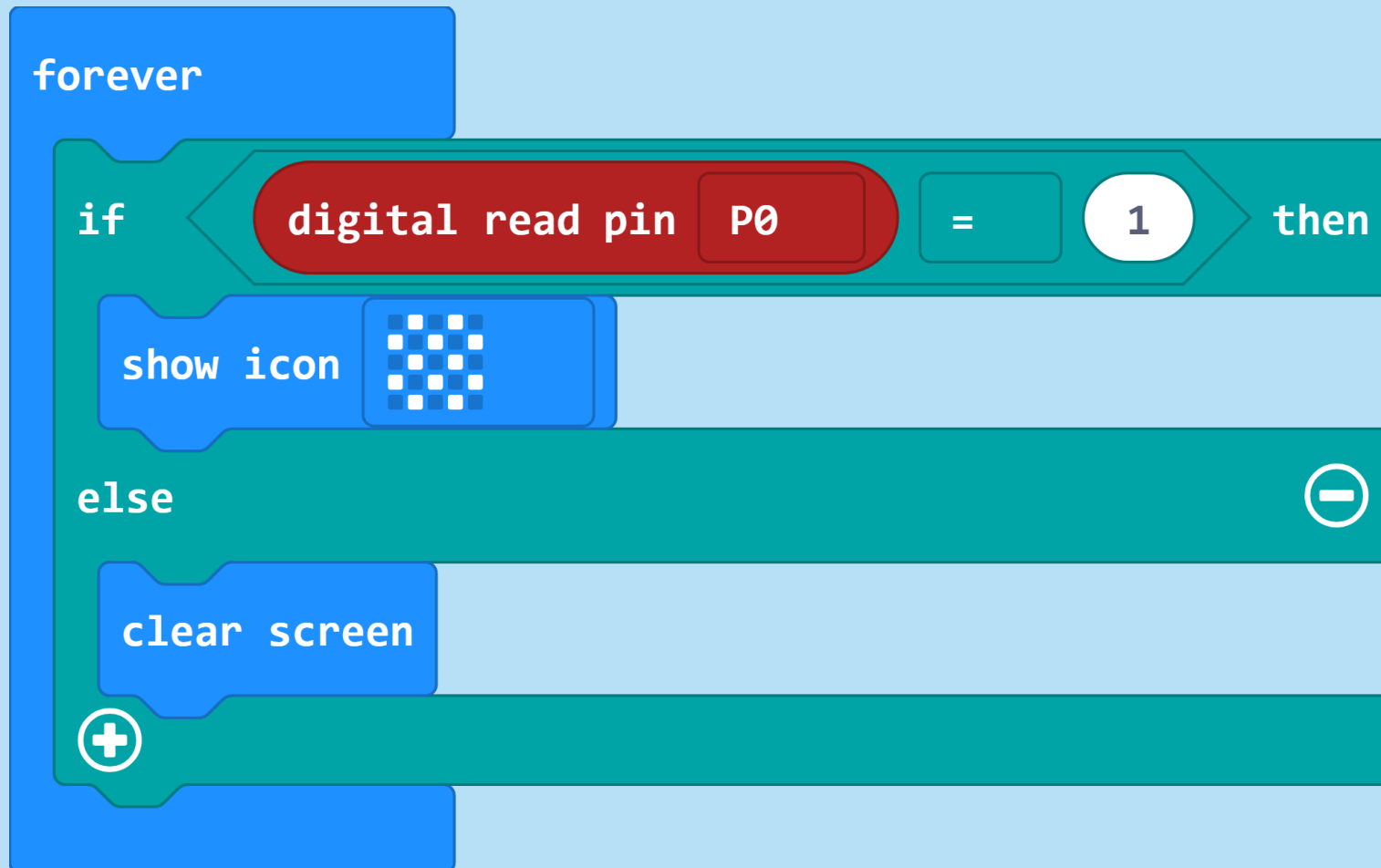


digital read pin P0 ▼

read = 輸入

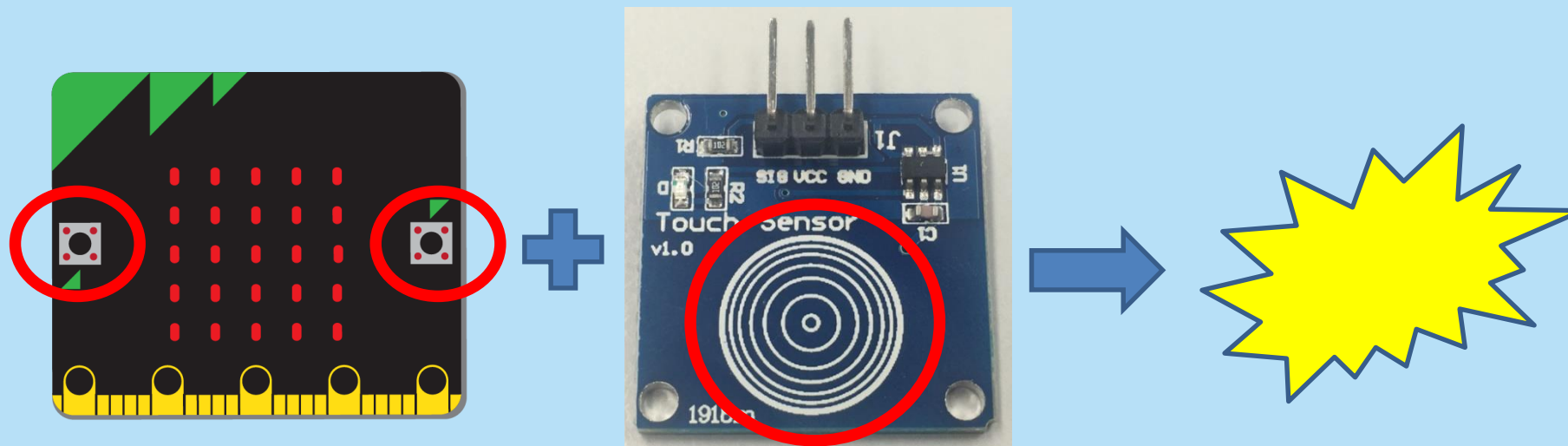
digital read pin P0 ▼ = ▼ 1

使用輕觸按鈕



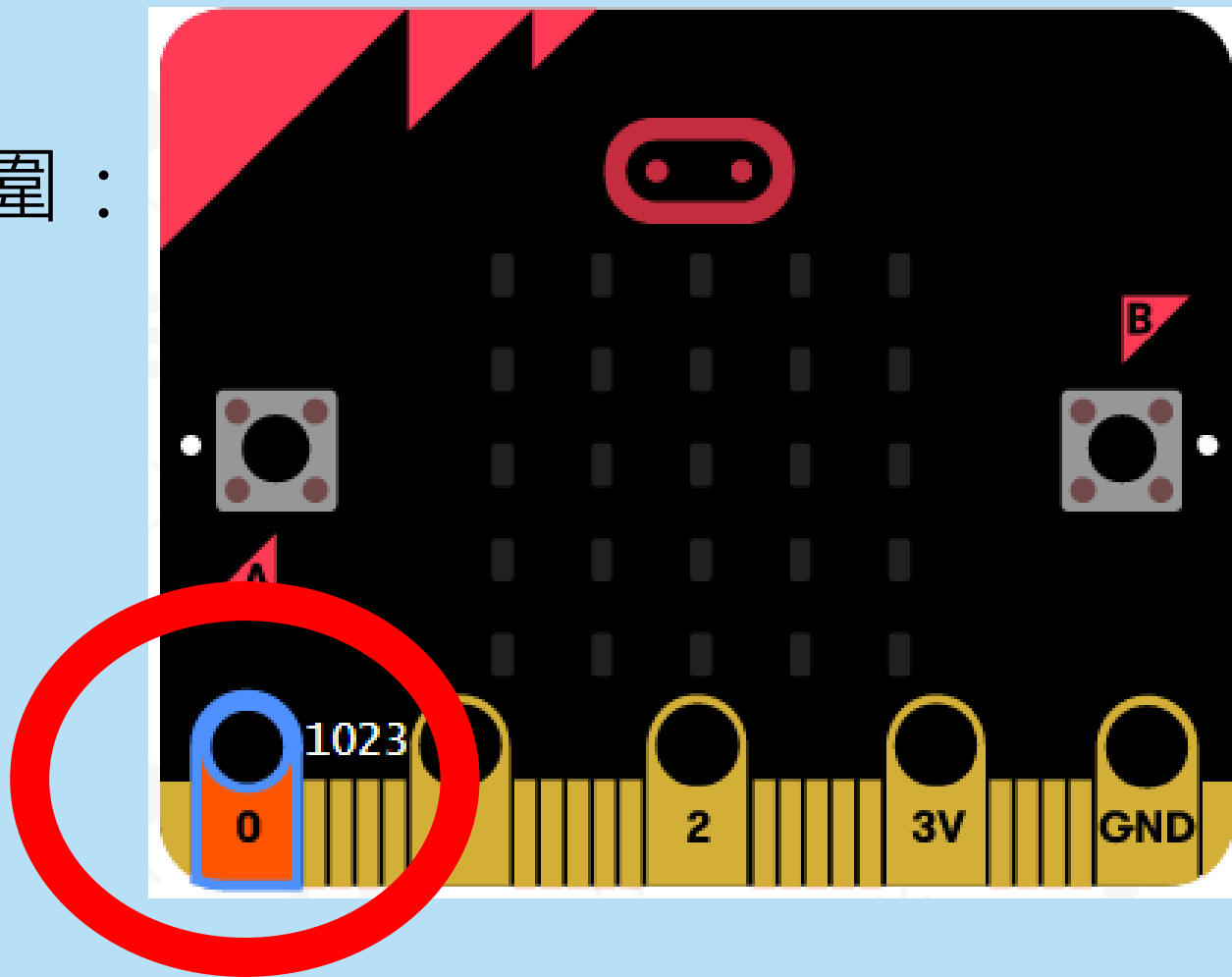
小挑戰！

- 同時按A,B及輕觸按鈕觸發效果

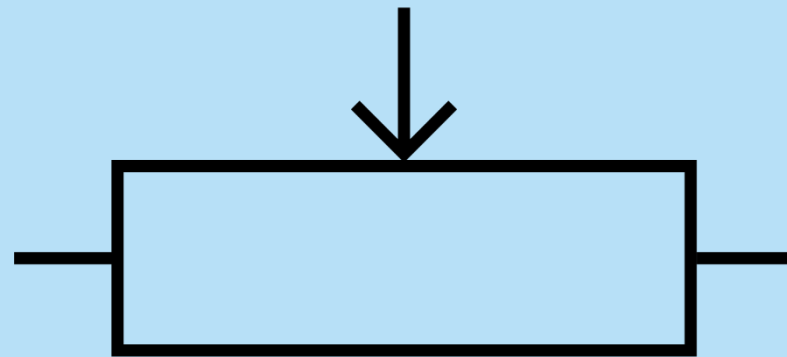
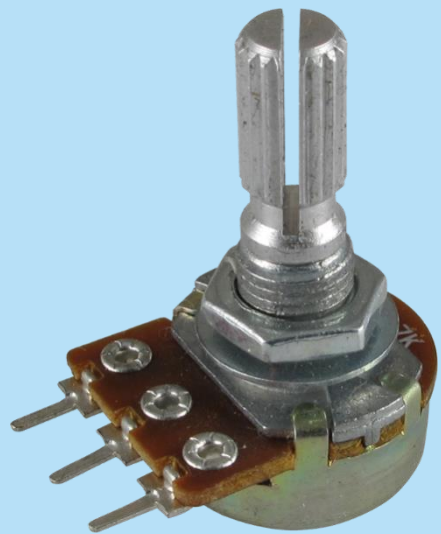


類比輸入

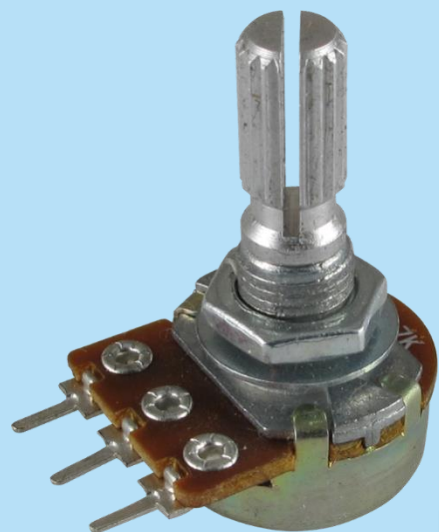
設定數值範圍：
0 -1023



電位器 Potentiometer



使用電位器開啟LED



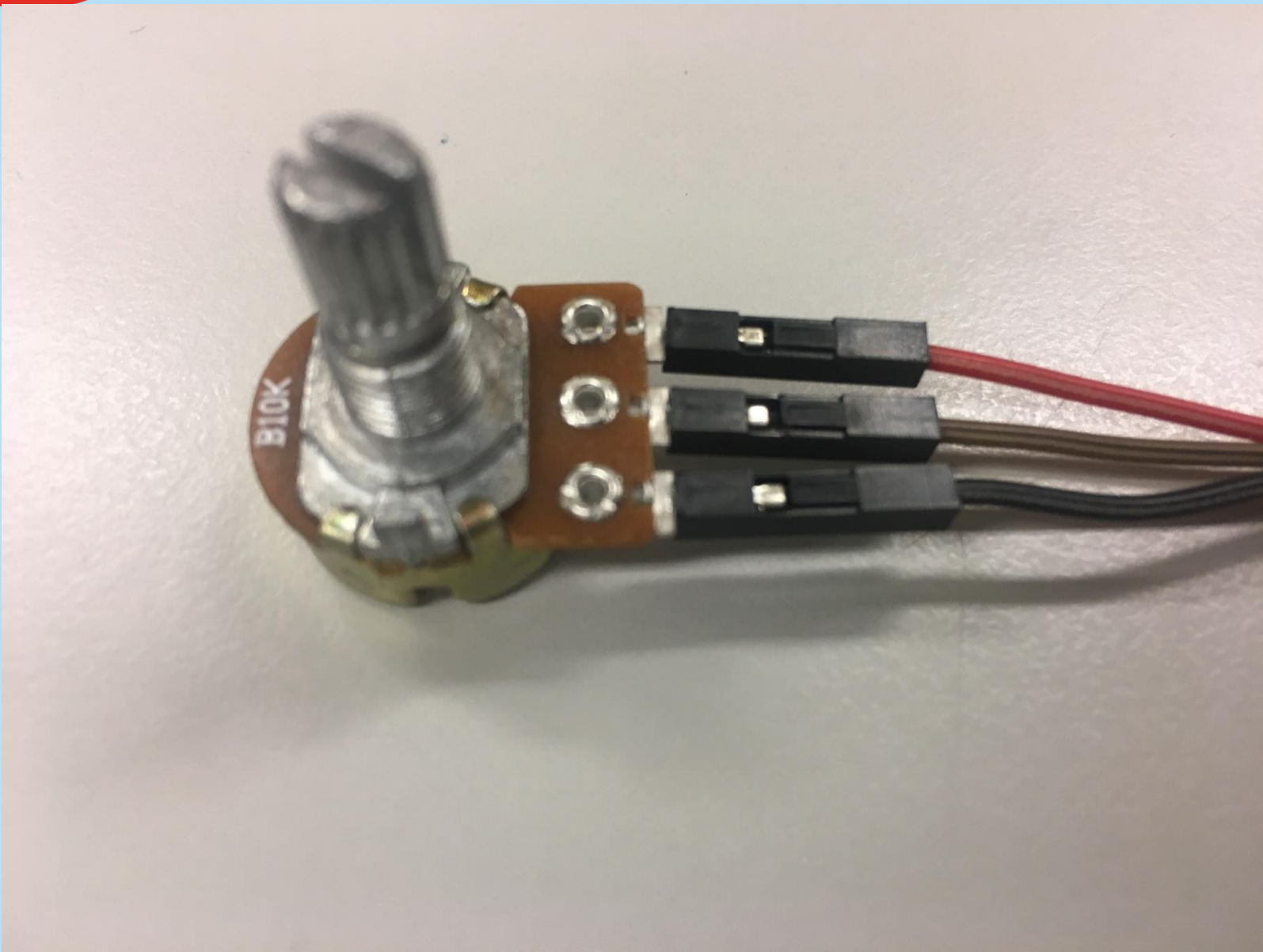
P0

3V

GND




鱈魚夾金屬部份
不可以互相接觸！



forever

if **analog read pin P0** < 512 then

show icon 

else 

show icon 



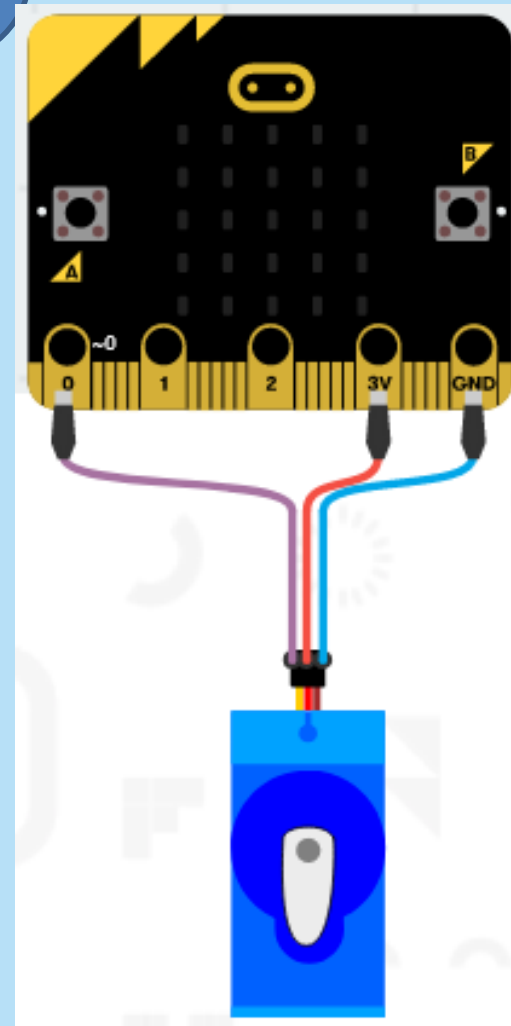
伺服摩打 Servo Motor



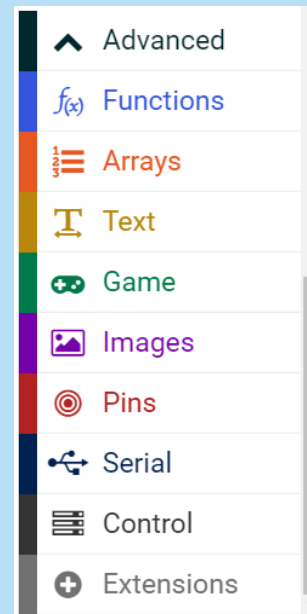
轉動幅度：0 – 180度（建議範圍：30 – 150度）

用接腳連接伺服摩打

- Pin 0接腳：訊號線(黃色)
- 3V電源接腳：電源線(紅色)
- GND接地接腳：接地線(啡色)



編寫伺服摩打程式



編寫伺服摩打程式

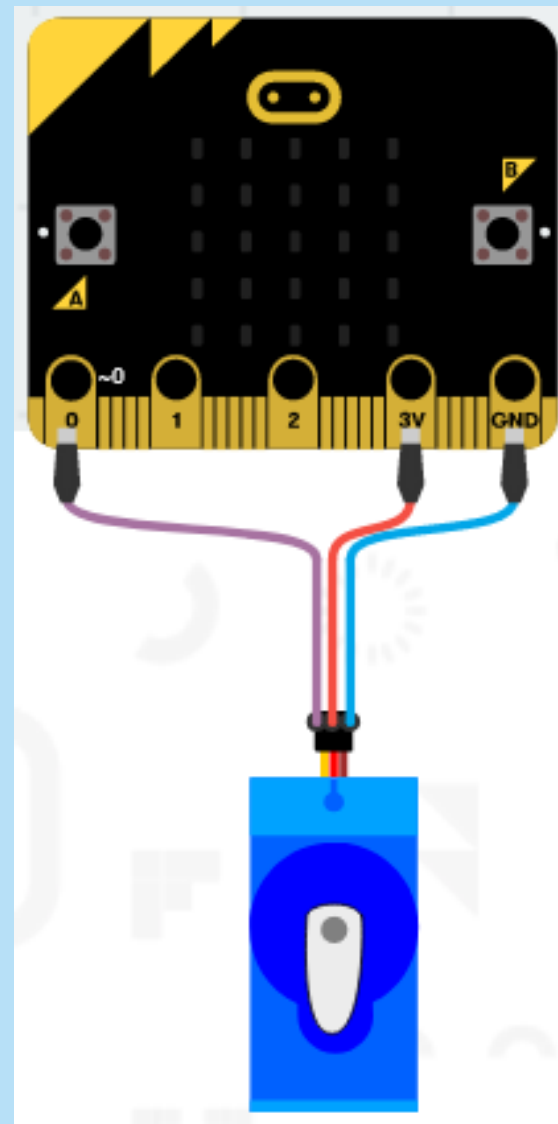
forever

servo write pin P0 to 0

pause (ms) 1500

servo write pin P0 to 180

pause (ms) 1500



光度感應器

學習重點！

1. 連接額外電子元件
2. 伺服摩打
3. 光度感應元件
4. 類比輸入

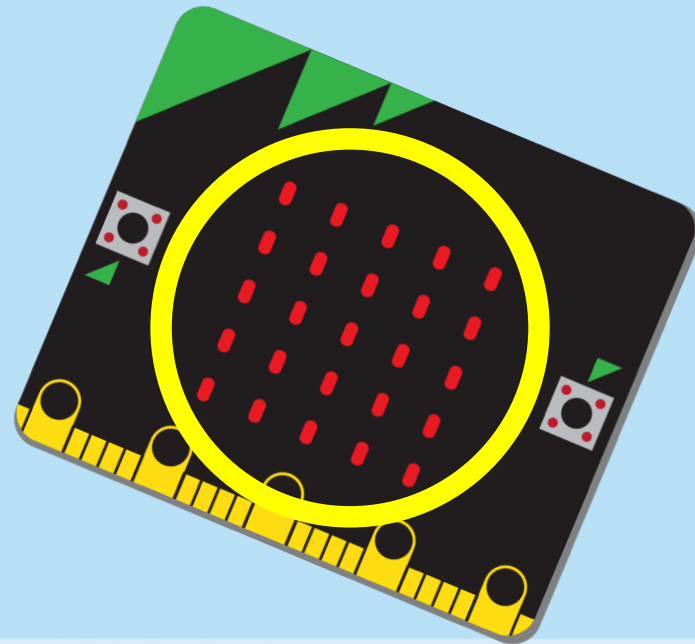
servo write pin P0 ▼ to 180

light level

光度感應器

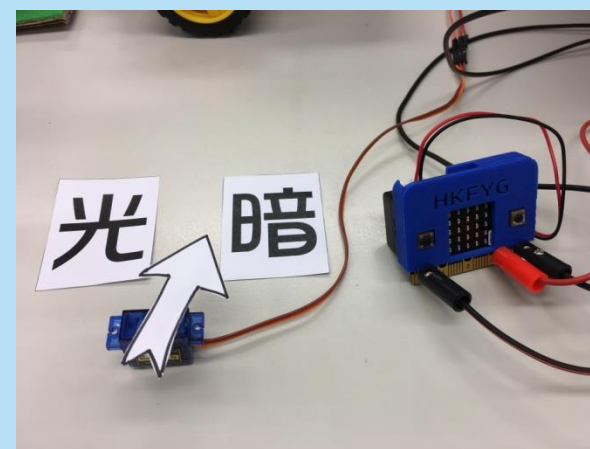
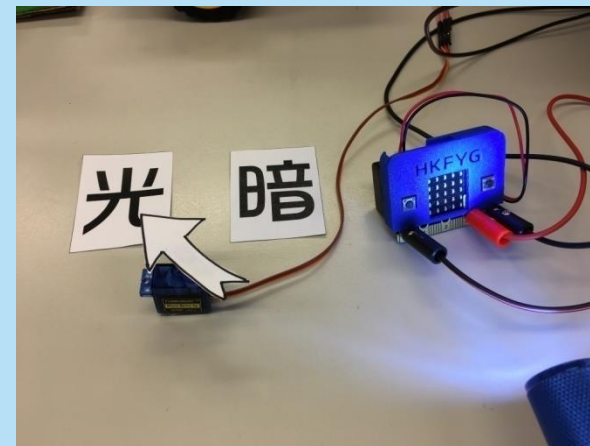
- 使用LED螢幕作為感光元件
- 設定範圍：0 (最暗) / 255 (最光)

我識得感應
光度架！



光度感應器

```
forever
  if light level < 128 then
    servo write pin P0 to 180
  else
    servo write pin P0 to 0
```



擴展功能 – 藍牙 Bluetooth

