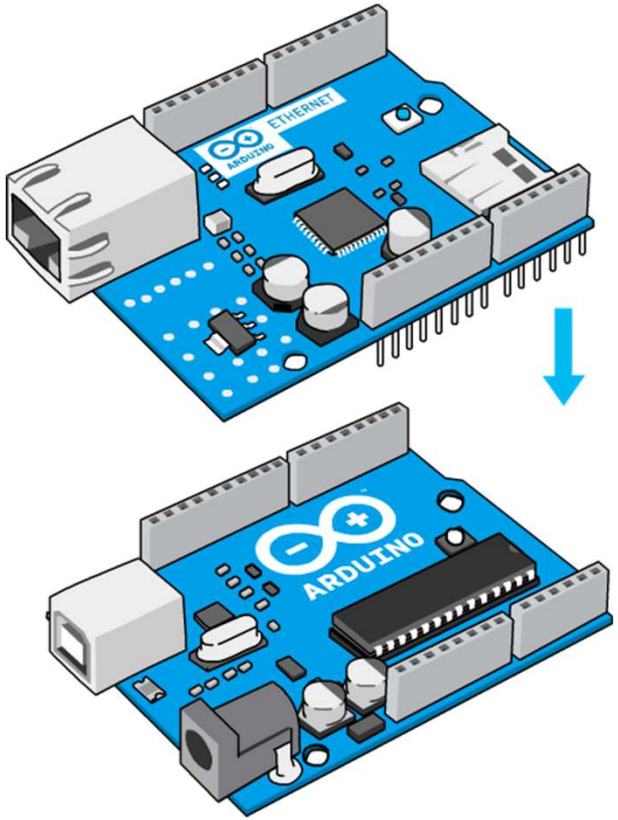
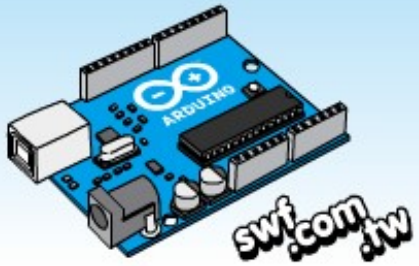
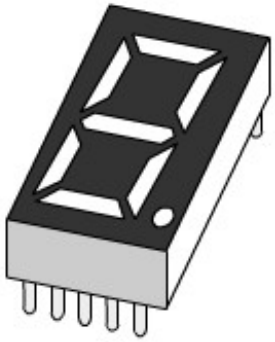
第七章 LED七段顯示器



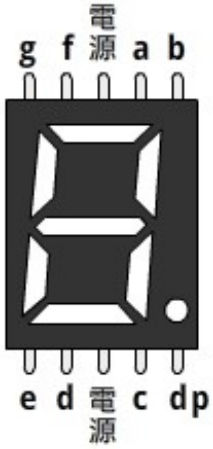


七段顯示器

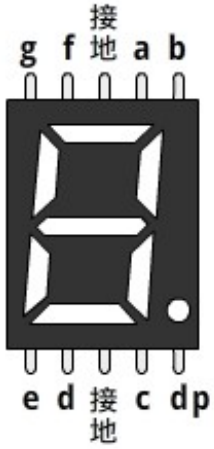
七段顯示器是內建八個LED的顯示元件，為了方便解說，
內部LED分別標上a~g和dp（點）代號。



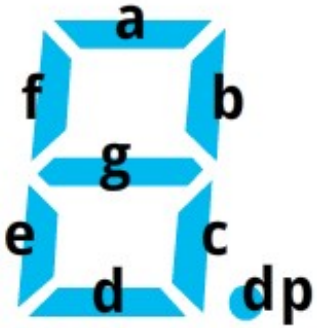
七段顯示器



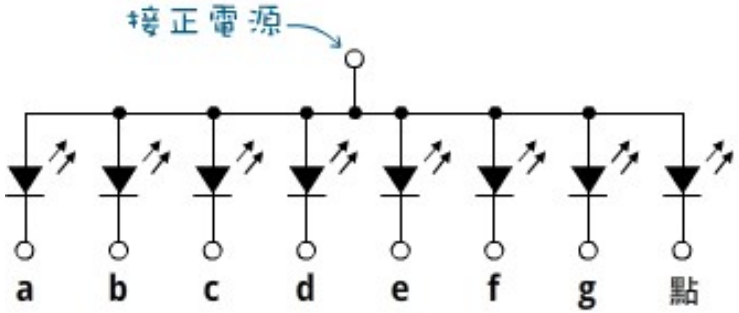
共陽極腳位



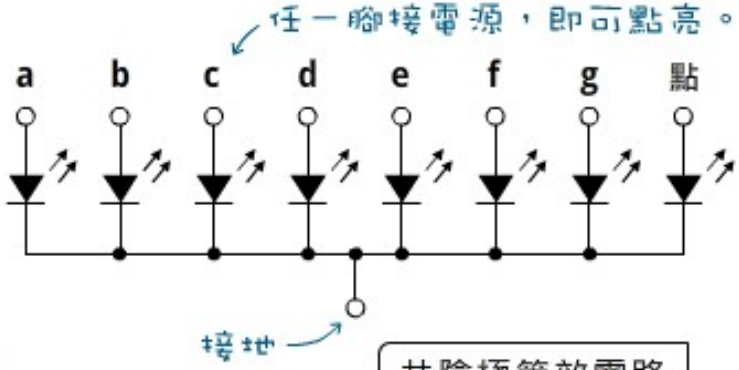
共陰極腳位



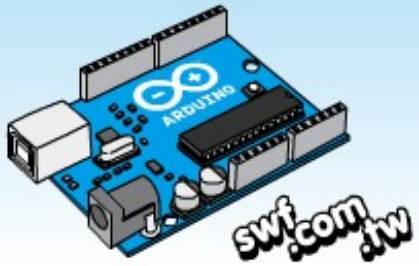
內部LED的編號



共陽極等效電路

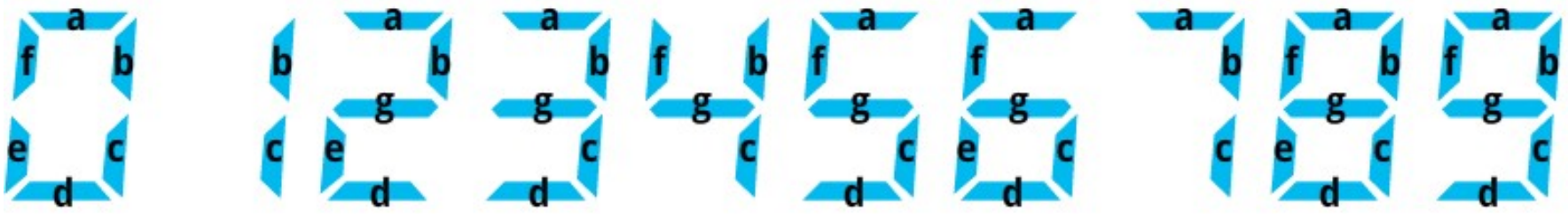


共陰極等效電路



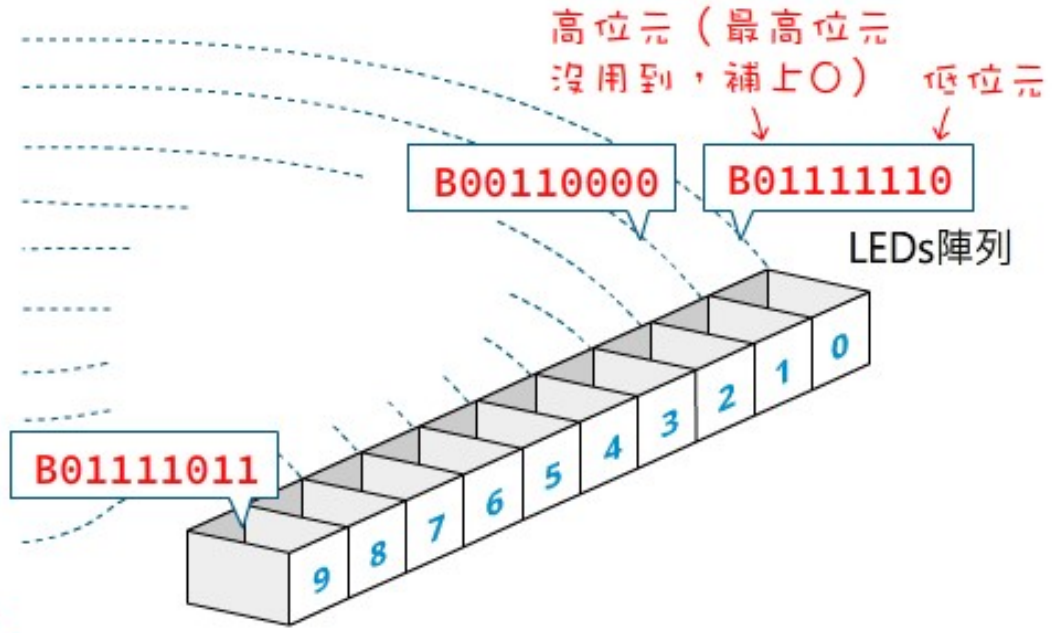
用陣列儲存七段顯示數字

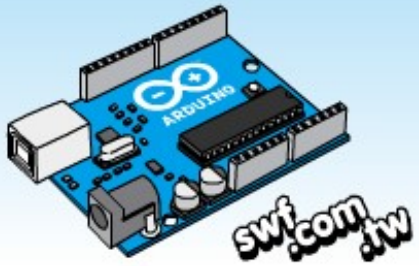
下圖顯示了呈現某個數字所需點亮的LED代號，並用陣列儲存。



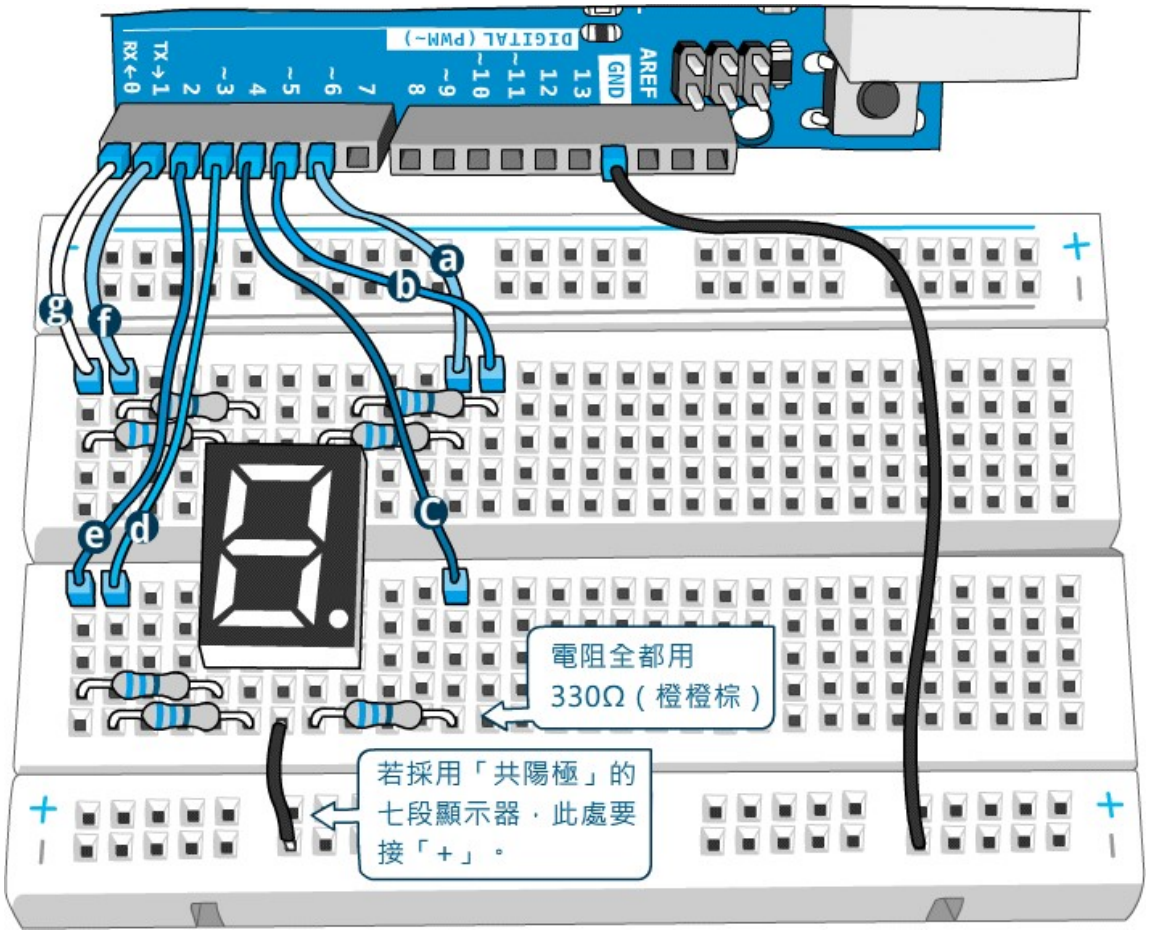
十進位數	a	b	c	d	e	f	g	設定值
0	1	1	1	1	1	1	0	
1	0	1	1	0	0	0	0	
2	1	1	0	1	1	0	1	
3	1	1	1	1	0	0	1	
4	0	1	1	0	0	1	1	
5	1	0	1	1	0	1	1	
6	1	0	1	1	1	1	1	
7	1	1	1	0	0	0	0	
8	1	1	1	1	1	1	1	
9	1	1	1	1	0	1	1	

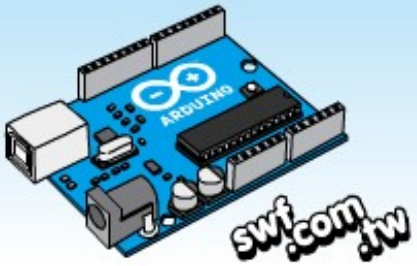
高位元　　低位元



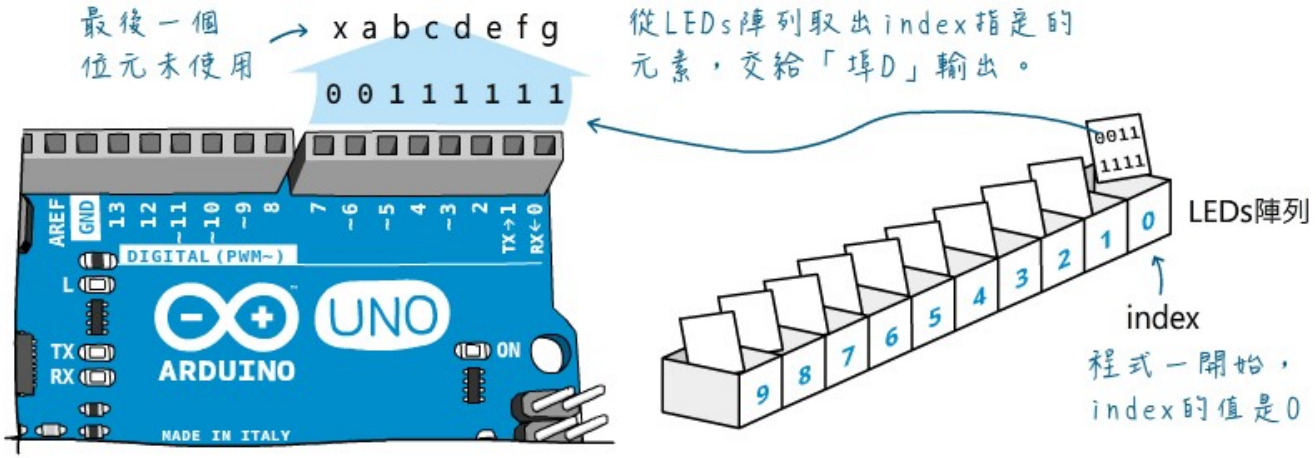


連接LED七段顯示器與Arduino板





顯示數字的程式

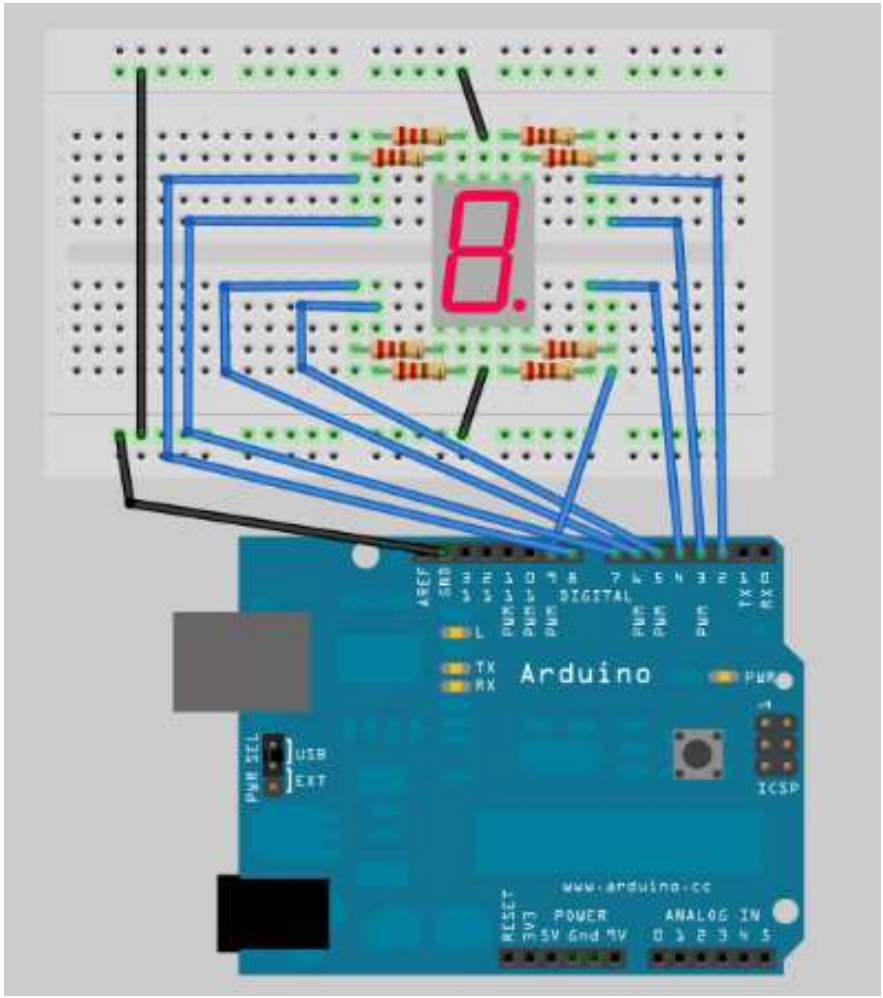


從LEDs陣列，取出數字編碼輸出給「埠D」腳位，傳給七段顯示器。

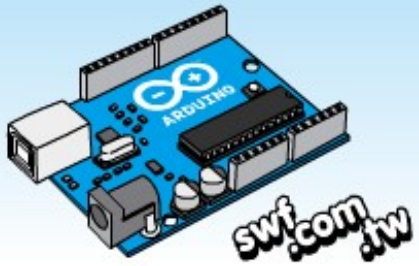
```
void loop() {
  PORTD = LEDs[index];

  index ++;
  if (index == 10) {
    index = 0;
  }
  delay(1000);
}
```

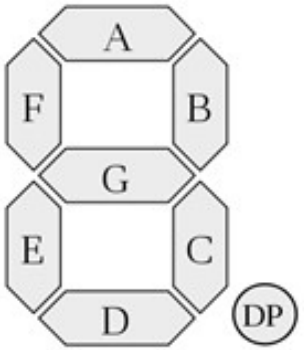
取出陣列裡的數字資料，由「埠口D」輸出。

直接連法



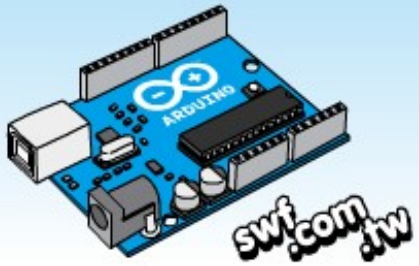
Arduino 腳位	七段示顯器腳位 (筆劃)
2	7 (A)
3	6 (B)
4	4 (C)
5	2 (D)
6	1 (E)
7	9 (F)
8	10 (G)
9	5 (DP)





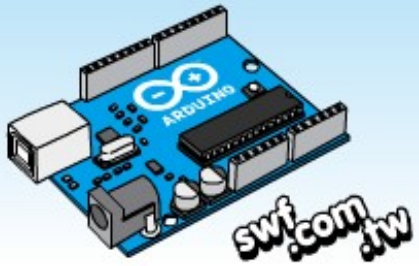
顯示數字	dp	a	b	c	d	e	f	g	十六進制
0	0	1	1	1	1	1	1	0	0x3F
1	0	0	1	1	0	0	0	0	0x06
2	0	1	1	0	1	1	0	1	0x5B
3	0	1	1	1	1	0	0	1	0x4F
4	0	0	1	1	0	0	1	1	0x66
5	0	1	0	1	1	0	1	1	0x6D
6	0	1	0	1	1	1	1	1	0x7D
7	0	1	1	1	0	0	0	0	0x27
8	0	1	1	1	1	1	1	1	0x7F
9	0	1	1	1	1	0	1	1	0x67

上圖為共陰，共陽則1>>0，0>>1



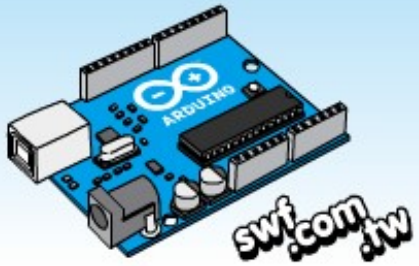
0~9 循環出現

```
#define NUM 8
int pins[NUM] = {2, 3, 4, 5, 6, 7, 8, 9};

#define t true
#define f false
boolean data[10][NUM] = {
  {t, t, t, t, t, t, f, f}, // 0
  {f, t, t, f, f, f, f, f}, // 1
  {t, t, f, t, t, f, t, f}, // 2
  {t, t, t, t, f, f, t, f}, // 3
  {f, t, t, f, f, t, t, f}, // 4
  {t, f, t, t, f, t, t, f}, // 5
  {t, f, t, t, t, t, t, f}, // 6
  {t, t, t, f, f, f, f, f}, // 7
  {t, t, t, t, t, t, t, f}, // 8
  {t, t, t, t, f, t, t, f}, // 9 };

void setup(){
  for(int i = 0; i < NUM; i++){
    pinMode(pins[i], OUTPUT);    }  }

void writeNumber(int n){
  for(int i = 0; i < NUM; i++){
    digitalWrite(pins[i], data[n][i] == t ? HIGH : LOW);
  }
}

void loop(){
  for(int n = 0; n <= 9; n++){
    writeNumber(n);
    delay(1000);   } }
```



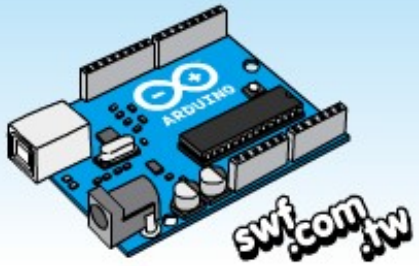
視窗輸入數字，出現在7段顯示器

```
#define NUM 8
int pins[NUM] = {2, 3, 4, 5, 6, 7, 8, 9};
void setup(){
  for(int i = 0; i < NUM; i++){
    pinMode(pins[i], OUTPUT);
    Serial.begin(9600);   }  }
void loop(){
if (Serial.available()) {
char val = Serial.read();
switch (val) {
case ('1'):
digitalWrite(pins[0], 1);
digitalWrite(pins[1], 0);
digitalWrite(pins[2], 0);
digitalWrite(pins[3], 1);
digitalWrite(pins[4], 1);
digitalWrite(pins[5], 1);
digitalWrite(pins[6], 1);
digitalWrite(pins[7], 1);
delay(1000);
break;
case ('2'):
digitalWrite(pins[0], 0);
digitalWrite(pins[1], 0);
digitalWrite(pins[2], 1);
digitalWrite(pins[3], 0);
digitalWrite(pins[4], 0);
digitalWrite(pins[5], 1);
digitalWrite(pins[6], 0);
digitalWrite(pins[7], 1);
delay(1000);
} } }
```



倒數計時器

視窗輸入”S”，
1.(25%)開始倒數計時，黃色LED亮起
2.每個數字間隔1秒，數字由 9 顯示在7段顯示器上；當數字顯示為0 時，即倒數完成
3.紅色LED亮起，黃色滅，閃三下
4.然後長亮。



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- https://goo.gl/forms/0C6jWOW5MTX9paos1