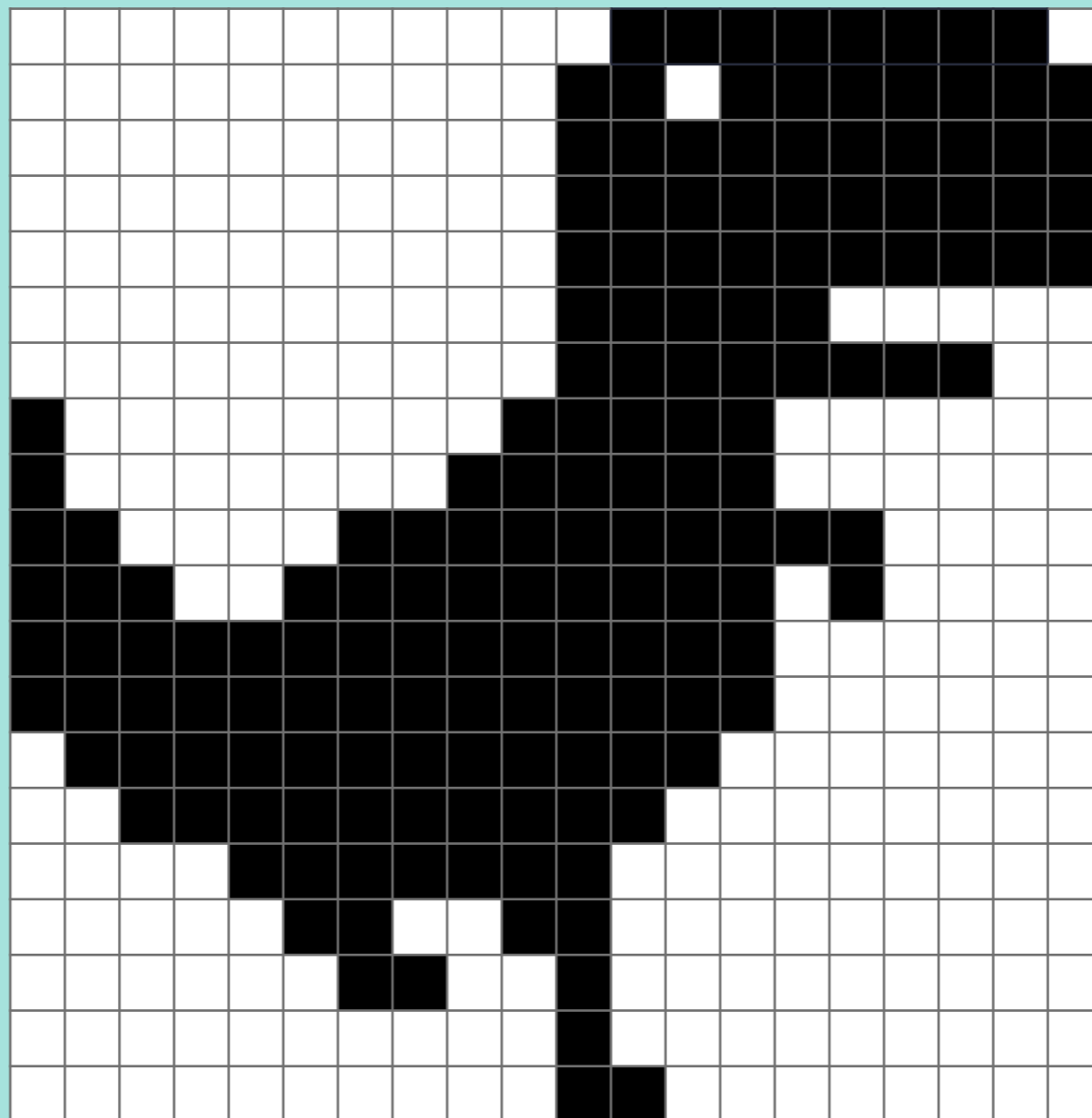


# 如何儲存影像

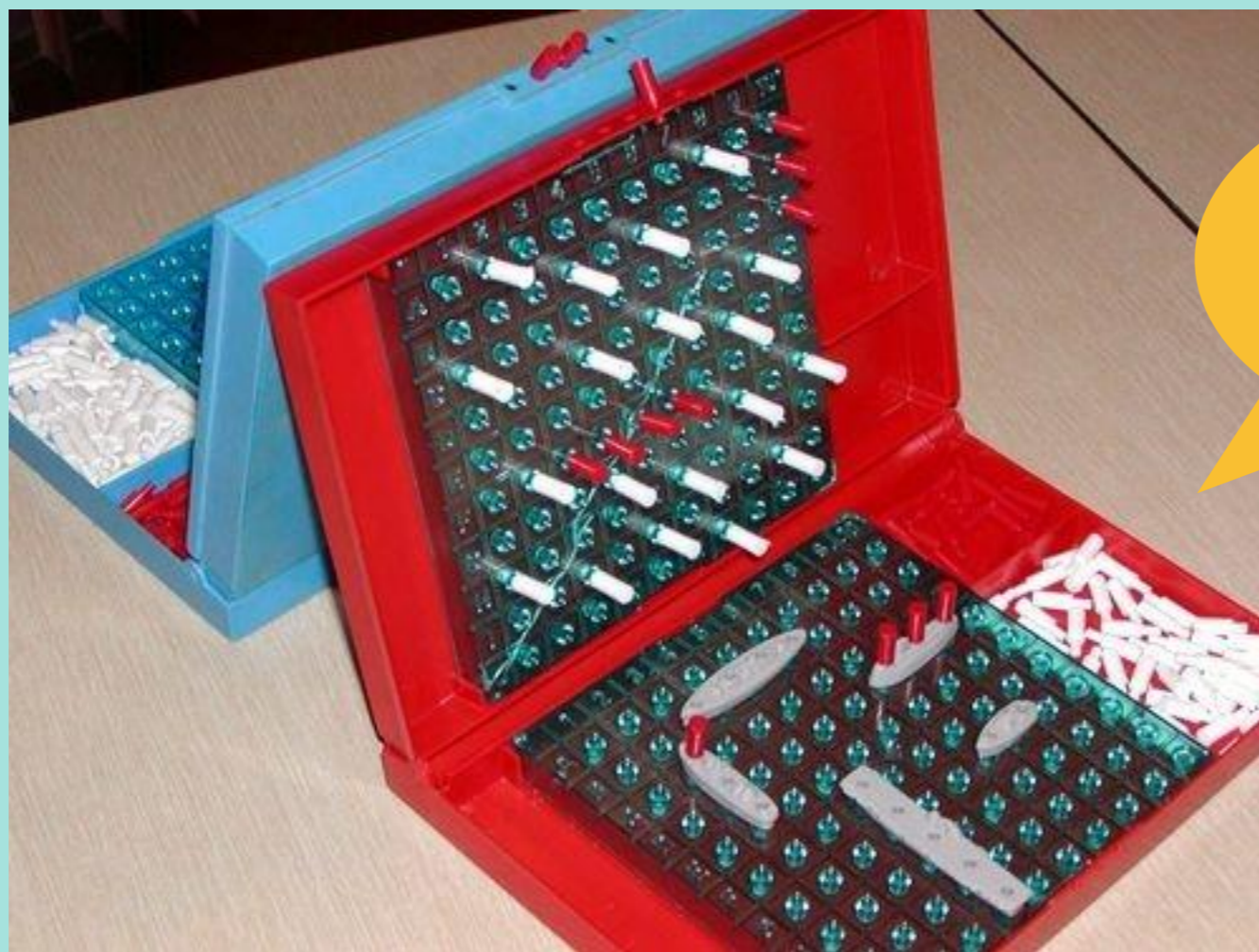
## 二維陣列



# 怎麼告訴別人哪些格子是黑色？



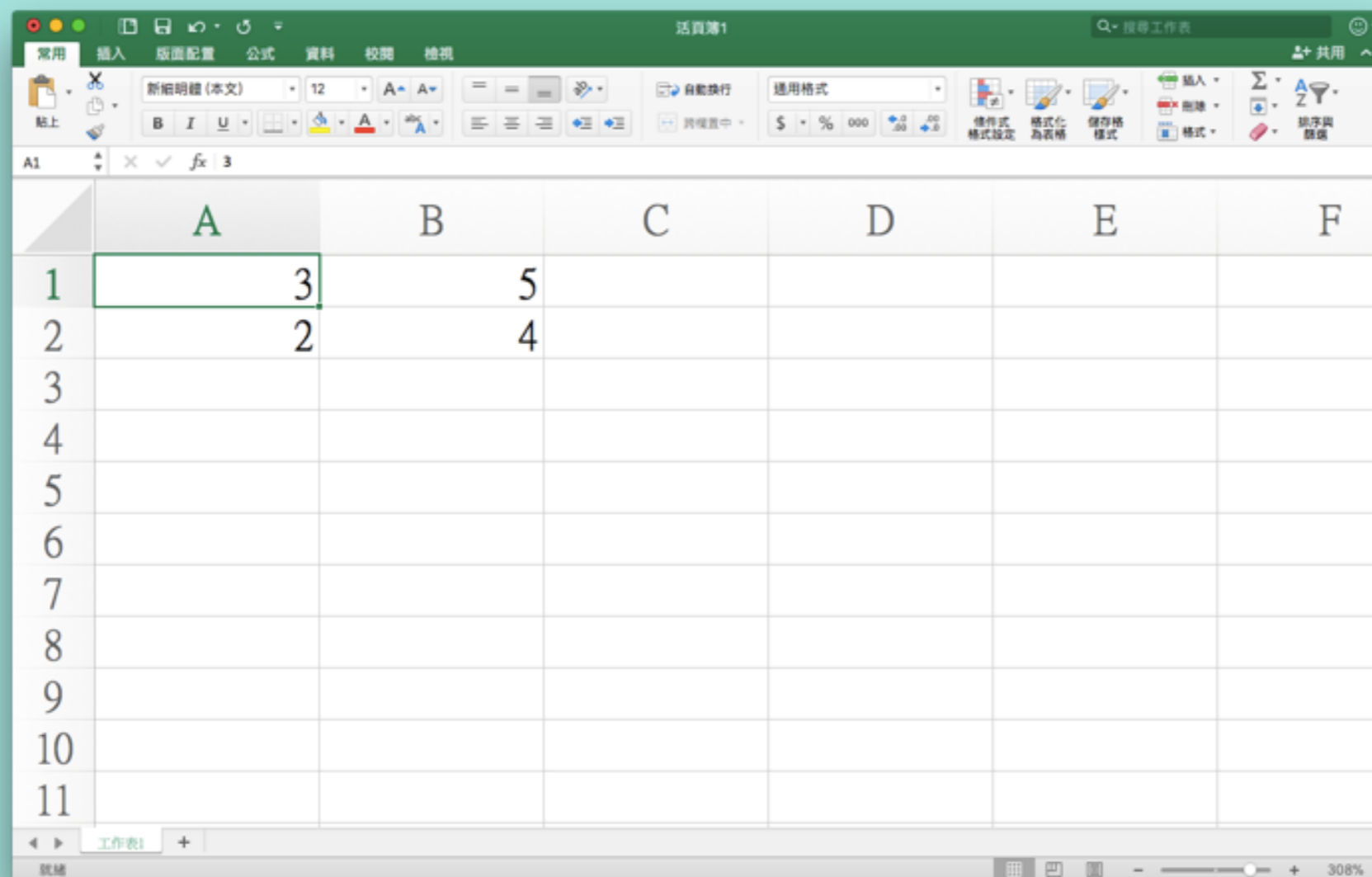
# 想想海戰棋



對戰中喊A1,  
E5...分別代表什  
麼



# Excel的A1+A2=?



The screenshot shows the Microsoft Excel interface. The active cell is A1, which contains the number 3. Cell B1 contains the number 5. Cell A2 contains the number 2, and cell B2 contains the number 4. The rest of the spreadsheet is empty.

	A	B	C	D	E	F
1	3	5				
2	2	4				
3						
4						
5						
6						
7						
8						
9						
10						
11						

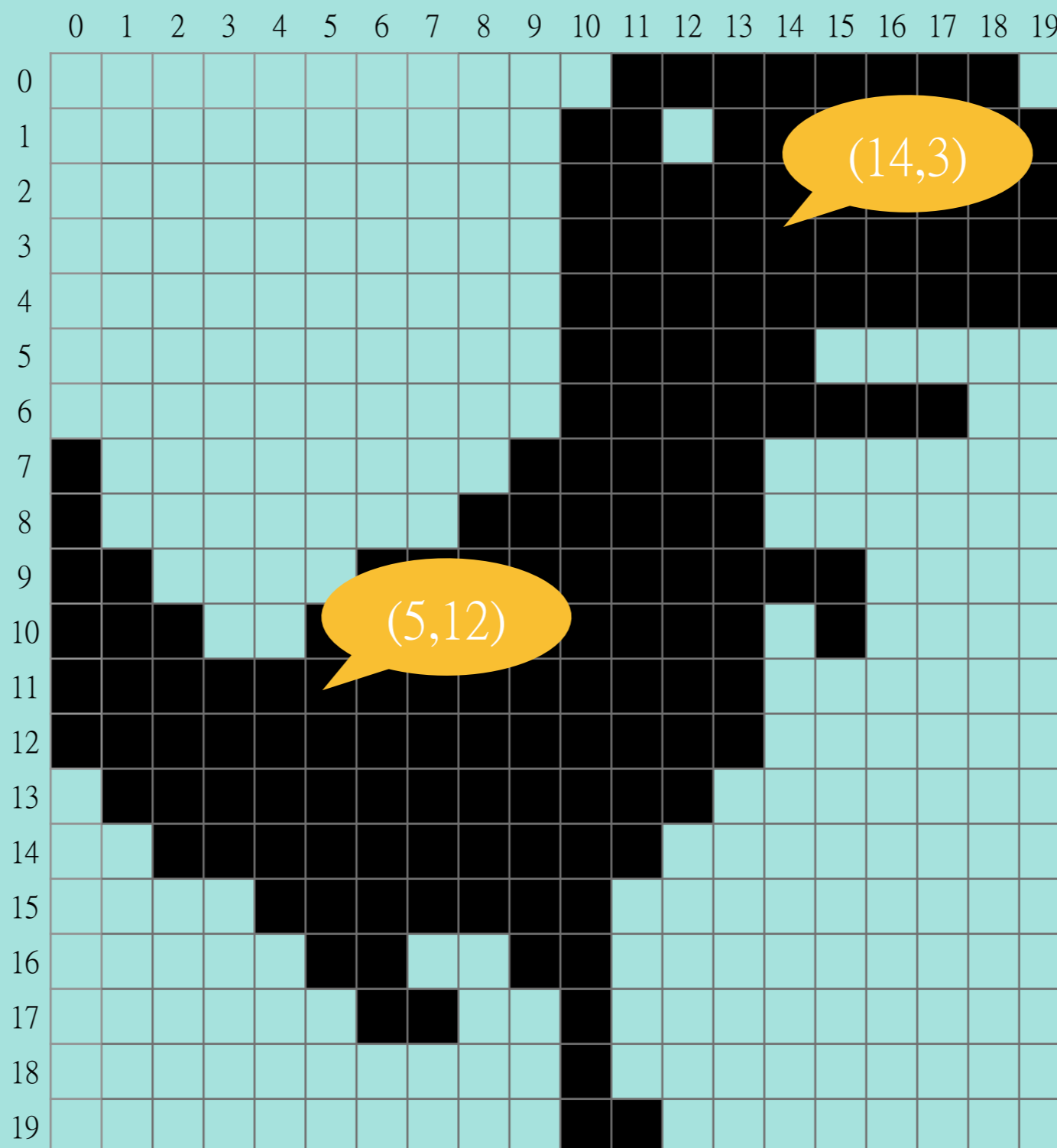


# 或者教室的座位？

- 你坐在第幾排？第幾列？



# 如果格子有編號...



# 程式實作

with Python



# 一維陣列

```
1 import numpy as np
2
3 array=np.zeros(5)
4 for i in range(5):
5     array[i]=i**2
6 print(array)
```

i=4

[0]	[1]	[2]	[3]	[4]
0	1	4	9	16





# 二維陣列

```
1 import numpy as np
2
3 arr=np.zeros((2,3))
4 c=0
5 for i in range(2):
6     for j in range(3):
7         arr[i,j]=c
8         c+=1
9 print(arr)
```

c=6

i=1

j=2

	[0]	[1]	[2]
[0]	0	1	2
[1]	3	4	5



# 想想看...

```
1 import numpy as np
2
3 arr=np.zeros((2,3))
4 c=0
5 for i in range(2):
6     for j in range(3):
7         arr[i,j]=i
8 print(arr)
```

執行結果會長怎樣？

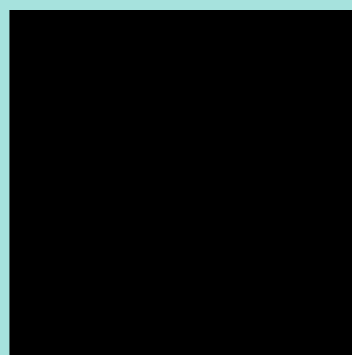
[[ 0. 0. 0.]

[ 1. 1. 1.]]



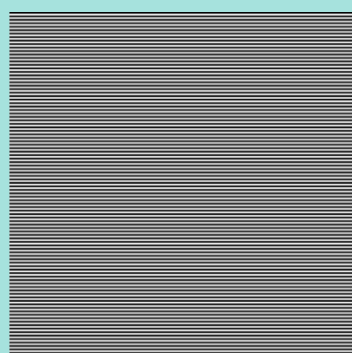
# 動手試試看

- 2-1的程式碼可以產生一張大小為200x200的黑色圖



在程式碼中加入if...else判斷，根據陣列的編號輸出0或1，

使圖形變成黑白橫條紋圖



# 動手試試看

• [Hint]

白色格子的編號  
有什麼特色？

奇數？

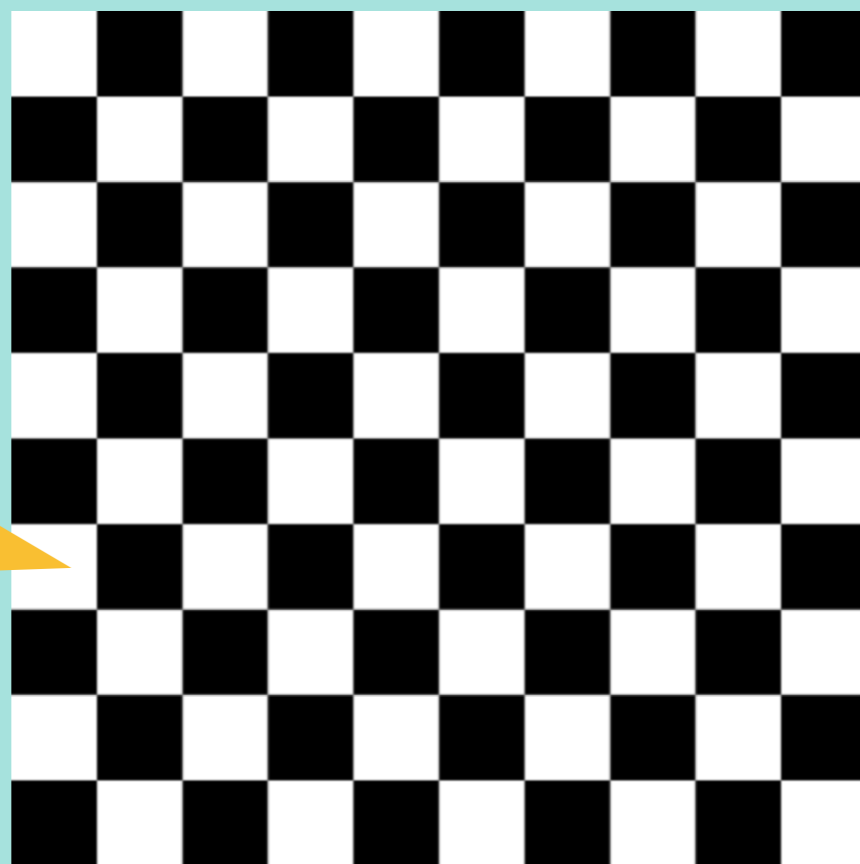
	0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1	1	1	1
2	0	0	0	0	0	0	0	0	0	0
3	1	1	1	1	1	1	1	1	1	1
4	0	0	0	0	0	0	0	0	0	0
5	1	1	1	1	1	1	1	1	1	1
6	0	0	0	0	0	0	0	0	0	0
7	1	1	1	1	1	1	1	1	1	1
8	0	0	0	0	0	0	0	0	0	0
9	1	1	1	1	1	1	1	1	1	1



# 動手試試看(進階題)

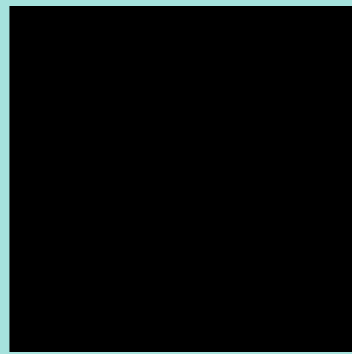
- 請修改2-1的程式，使之產生一張大小為200x200的黑白格紋圖(每個格子大小20x20)

白色格子的編號  
有什麼特色？

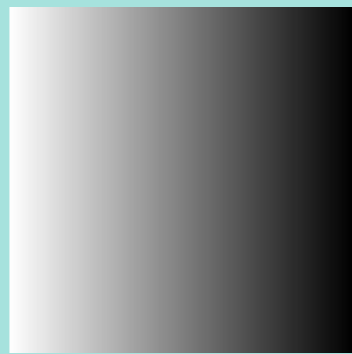


# 動手試試看...

- 2-2的程式碼可以產生一張大小為200x200的黑色圖

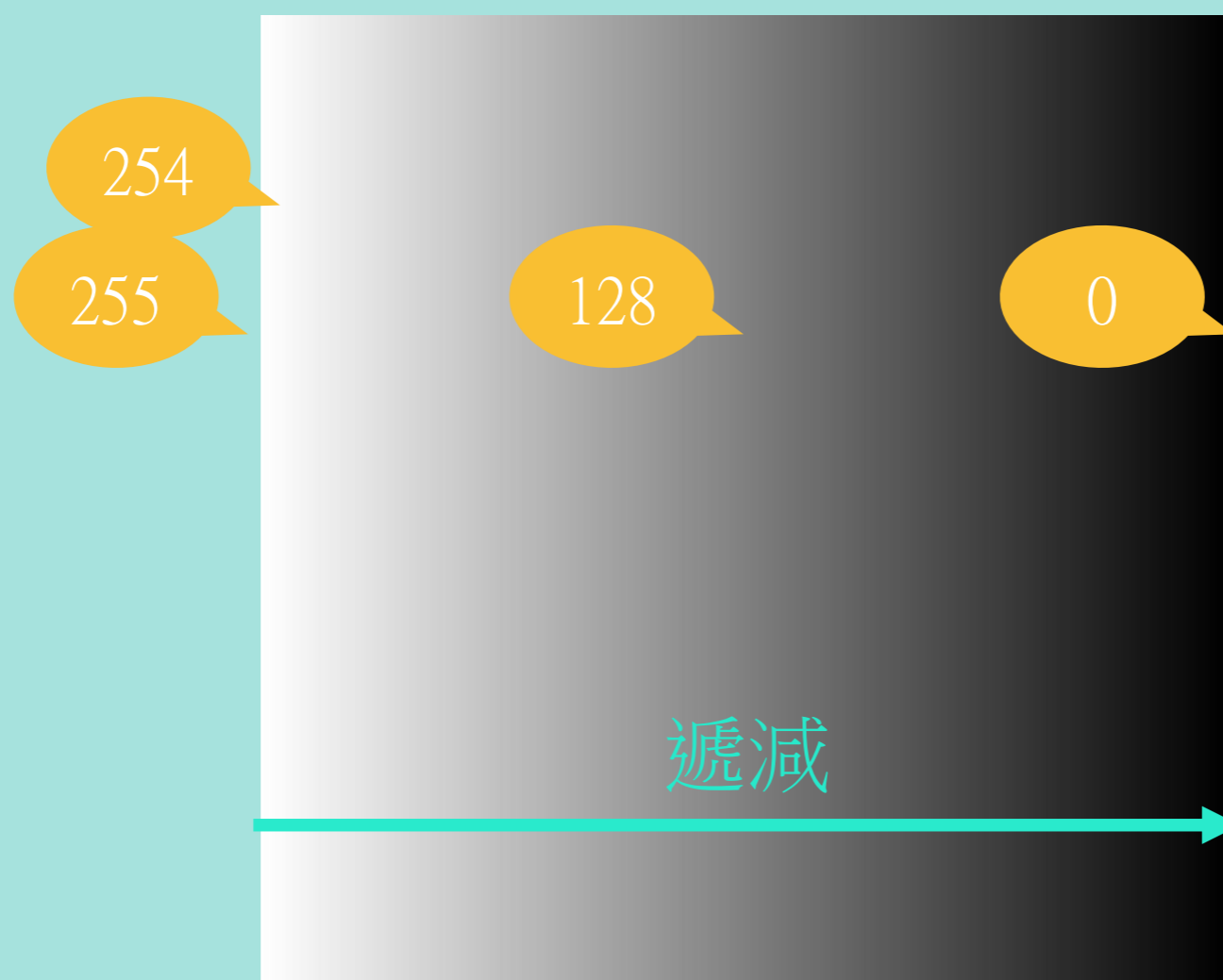


修改陣列的值，讓圖形變成由右至左的黑白漸層



# 動手試試看...

- [Hint]



# 動手試試看...

[Hint]

	0	1	2	3	4	5	6	7	8	9
0	255	254	253	252	251	250	249	248	247	246
1	255	254	253	252	251	250	249	248	247	246
2	255	254	253	252	251	250	249	248	247	246
3	255	254	253	252	251	250	249	248	247	246
4	255	254	253	252	251	250	249	248	247	246
5	255	254	253	252	251	250	249	248	247	246
6	255	254	253	252	251	250	249	248	247	246
7	255	254	253	252	251	250	249	248	247	246
8	255	254	253	252	251	250	249	248	247	246
9	255	254	253	252	251	250	249	248	247	246



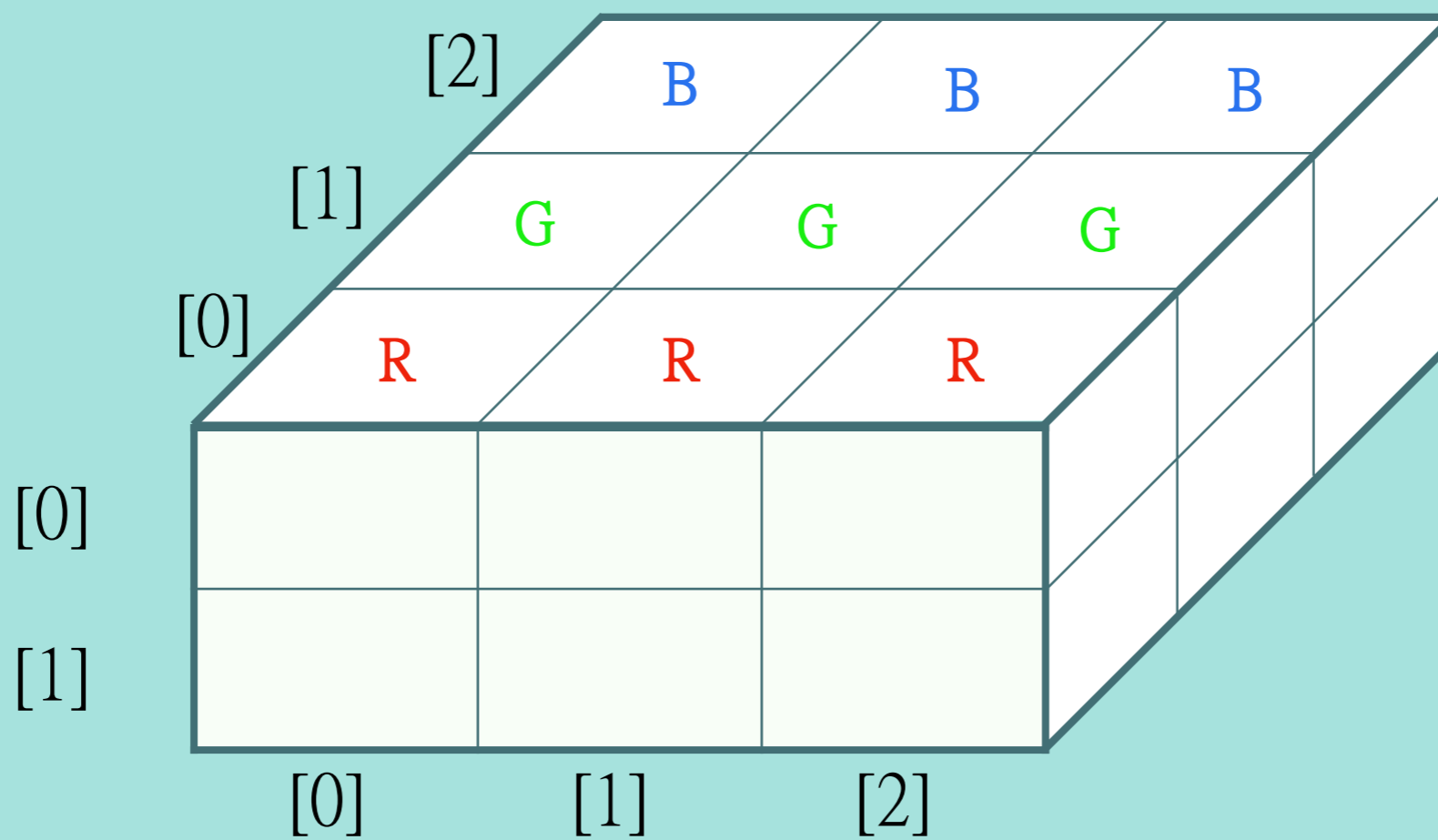


# 如何儲存影像

## 三維陣列

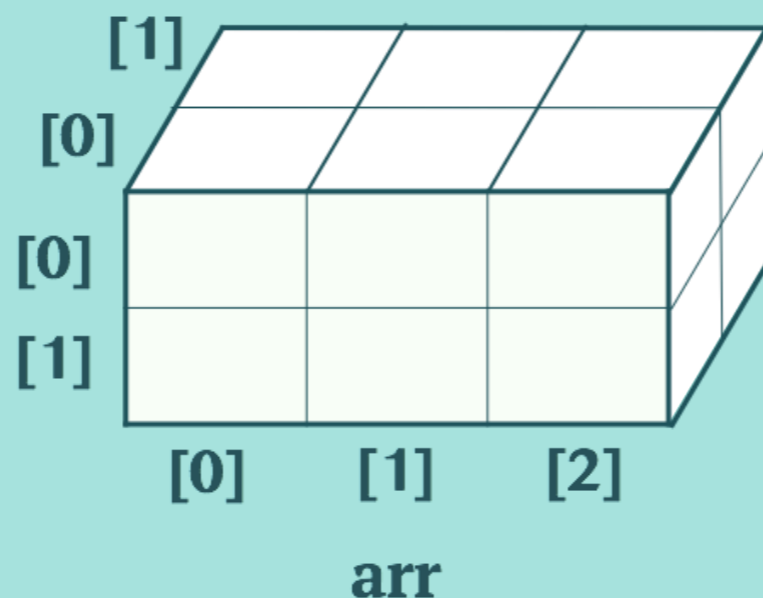


# 怎麼把RGB都塞進陣列？



# 三維陣列

```
1 import numpy as np
2
3 arr=np.zeros((2,3,2))
4 c=0
5 for i in range(2):
6     for j in range(3):
7         for k in range(2):
8             c+=1
9             arr[i,j,k]=c
10 print(arr)
```



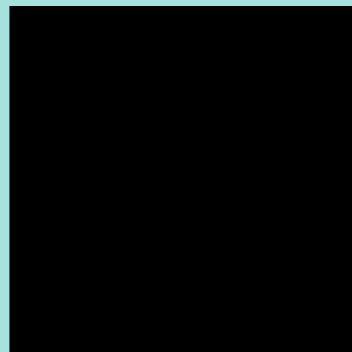
## Output

```
[[[ 1.  2.]
   [ 3.  4.]
   [ 5.  6.]]
 [[ 7.  8.]
   [ 9. 10.]
   [11. 12.]]]
```

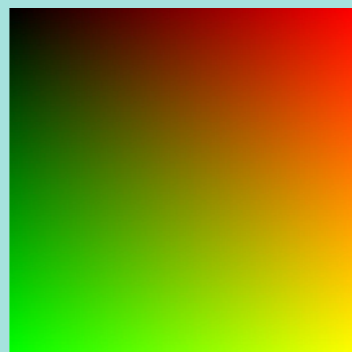


# 動手試試看

- 2-3的程式碼可以產生一張大小為256x256的黑色圖



修改陣列的值，讓圖形變成如下圖所示之彩色漸層圖



# 動手試試看

[Hint]

$(0,0,0)$

$(255,0,0)$

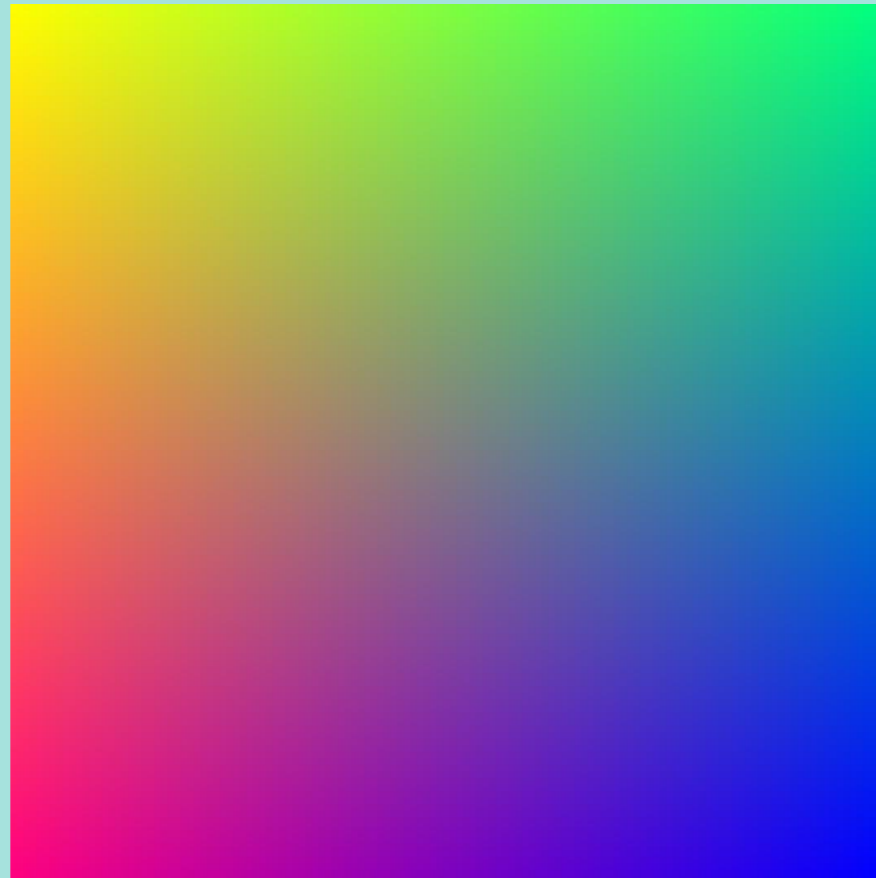
$(0,255,0)$

$(255,255,0)$



# 動手試試看(進階題)

- 要如何產生如下圖所示之彩色漸層圖



# 圖片來源

- 海戰棋(Battleship)

<http://mj9981168.pixnet.net/blog/post/221384943-%E6%B5%B7%E6%88%B0%E6%A3%8B%28battleship%29>

- Freepik

[https://www.freepik.com/free-vector/collection-of-pixelated-students\\_947586.htm#term=pixel%20art&page=1&position=32](https://www.freepik.com/free-vector/collection-of-pixelated-students_947586.htm#term=pixel%20art&page=1&position=32)

