C++基礎語法 Unit-3

- 比較運算
- 邏輯運算
- if 判斷
- switch 判斷

比較運算

© 2021 Yui Huang 演算法學習筆記. All Rights Reserved.

比較運算

比較運算子	用途	(true, 1)	(false, 0)
>	判斷是否大於	5 > 2	2 > 5
>=	判斷是否大於等於	3 >= 2	1 >= 2
<	判斷是否小於	2 < 5	5 < 2
<=	判斷是否小於等於	2 <= 3	1 <= 2
==	判斷是否相等	3 == 3	3 == 2
!=	判斷是否不等	3 != 2	2 != 2

© 2021 Yui Huang 演算法學習筆記. All Rights Reserved.

```cpp
#include <iostream>
using namespace std;

int main() {
    cout << "(1) " << (5 >= 2) << "\n";
    cout << "(2) " << (5 <= 2) << "\n";
    cout << "(3) " << (5 == 2) << "\n";
    cout << "(4) " << (5 != 2) << "\n";
    cout << "(5) " << (5 >= 2) + (5 <= 2) + (5 == 2) + (5 != 2) << "\n";
    return 0;
}
```

```
(1) 1
(2) 0
(3) 0
(4) 1
(5) 2
Program ended with exit code: 0
```


© 2021 Yui Huang 演算法學習筆記. All Rights Reserved.

判斷奇偶數

(Quiz)

```
int x;

(x % 2) == 0 為 true 時
```

x 為奇數

x 為偶數

© 2021 Yui Huang 演算法學習筆記. All Rights Reserved.

邏輯運算

© 2021 Yui Huang 演算法學習筆記. All Rights Reserved.

邏輯運算

邏輯運算子	用途
&&	AND (且)
||	OR (或)
!	NOT (否)

© 2021 Yui Huang 演算法學習筆記. All Rights Reserved.

&& (and)

```
int x = 5, y = 2, z = 3;
```

&&	true	false
true	true	false
false	false	false

© 2021 Yui Huang 演算法學習筆記. All Rights Reserved.

|| (or)

```
int x = 5, y = 2, z = 3;
```

||	true	false
true	true	true
false	true	false

© 2021 Yui Huang 演算法學習筆記. All Rights Reserved.

! (not)

```
int x = 5, y = 2, z = 3;
```

	!A
true	false
false	true

© 2021 Yui Huang 演算法學習筆記. All Rights Reserved.

Example 3-2

```cpp
#include <iostream>
using namespace std;

int main() {
    int x = 5, y = 2, z = 3;

    bool A = (x < y);
    bool B = (z != y);

    cout << "A = " << A << "\n";
    cout << "B = " << B << "\n";
    cout << "A && B = " << (A && B) << "\n";
    cout << "A || B = " << (A || B) << "\n";
    cout << "!A = " << (!A) << "\n";
    return 0;
}
```

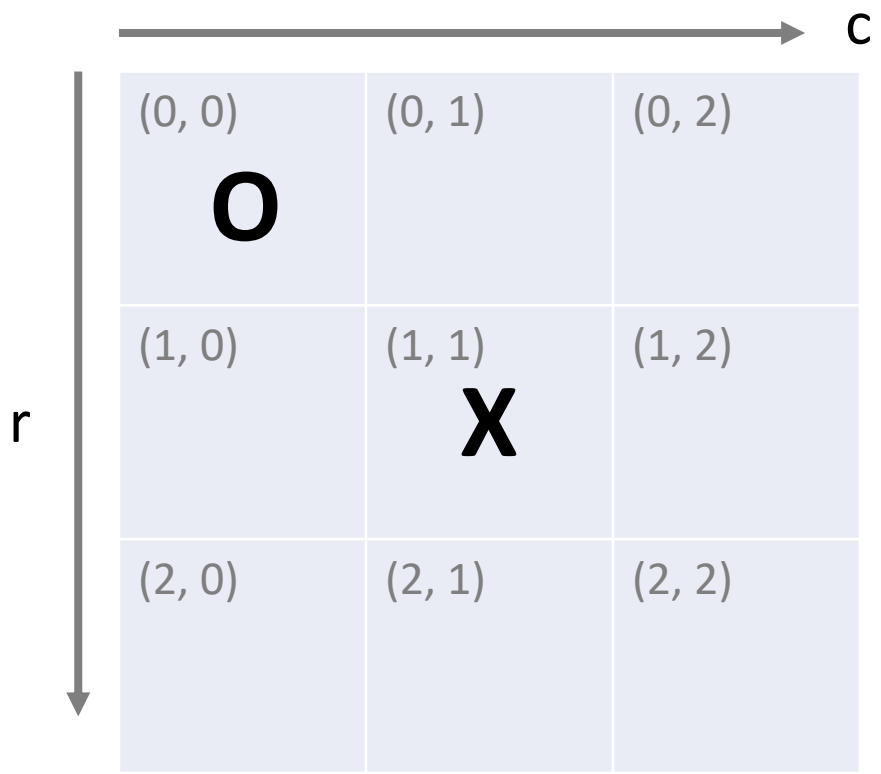
```
A = 0
B = 1
A && B = 0
A || B = 1
!A = 1
```


© 2021 Yui Huang 演算法學習筆記. All Rights Reserved.

判斷邊界

(Quiz)

井字遊戲 或 一個 3 x 3 的棋盤



輸入下一步的合法座標 (r, c)，需滿足：

- 座標(r, c)不能超出棋盤範圍
- 座標(r, c)這個位置還沒有被走過

```
((r >= 0) && (r < 3)) || ((c >= 0) && (c < 3))
```

```
((r >= 0) && (r < 3)) && ((c >= 0) && (c < 3))
```

```
((r >= 0) || (r < 3)) && ((c >= 0) || (c < 3))
```

```
(r >= 0) && (r <= 2) && (c >= 0) && (c <= 2)
```

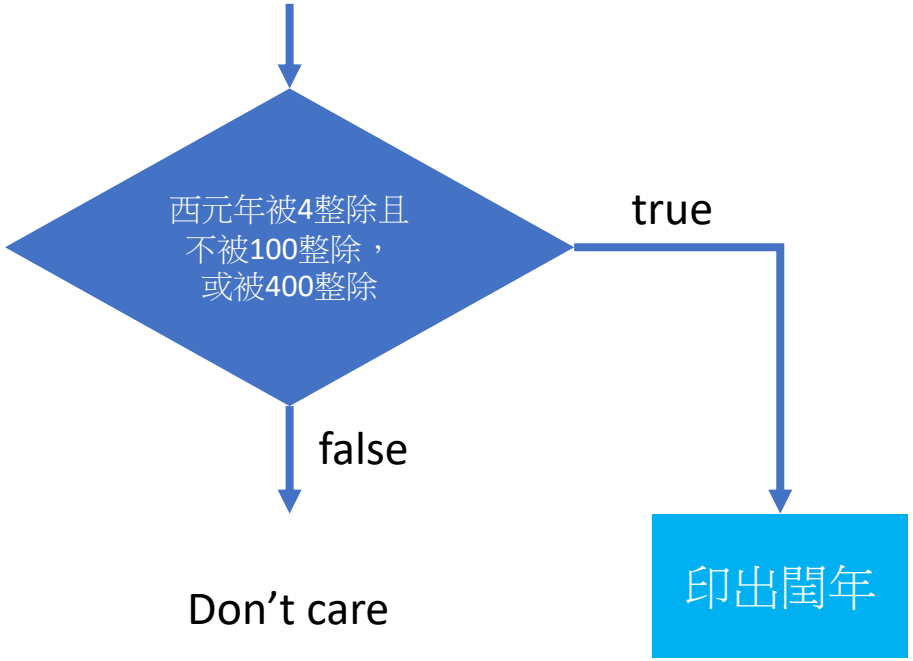

© 2021 Yui Huang 演算法學習筆記. All Rights Reserved.

if 判斷

© 2021 Yui Huang 演算法學習筆記. All Rights Reserved.

單向選擇：if

Example 3-3



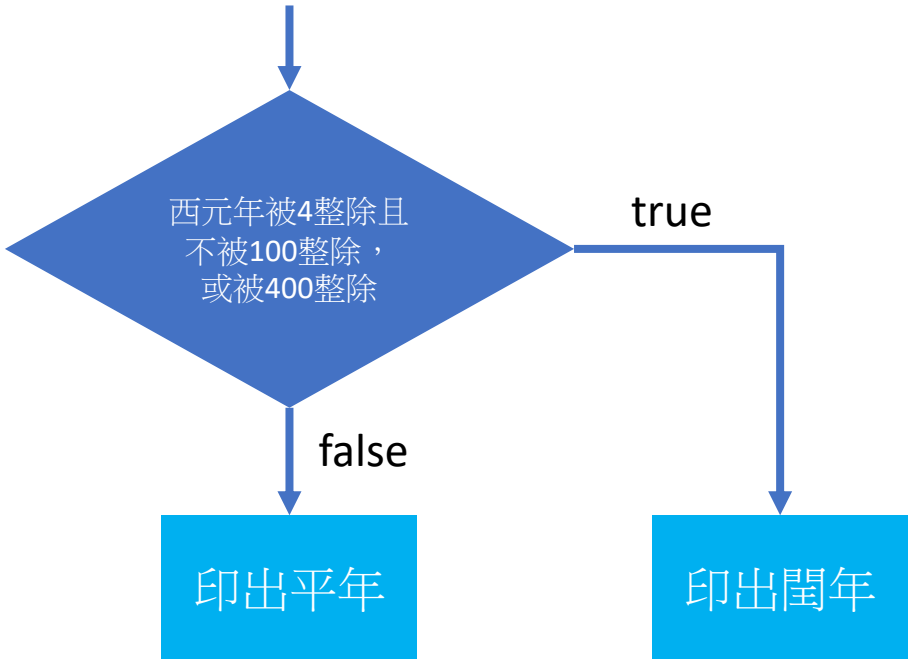
【範例】判斷閏年

```cpp
#include <iostream>
using namespace std;

int main() {
    int y;
    cin >> y;

    if ((y % 4 == 0 && y % 100 != 0) || y % 400 == 0)
        cout << "閏年\n";
    return 0;
}
```


© 2021 Yui Huang 演算法學習筆記. All Rights Reserved.

雙向選擇：if - else

Example 3-3



【範例】判斷閏年

```cpp
#include <iostream>
using namespace std;

int main() {
    int y;
    cin >> y;

    if ((y % 4 == 0 && y % 100 != 0) || y % 400 == 0)
        cout << "閏年\n";
    else
        cout << "平年\n";
    return 0;
}
```

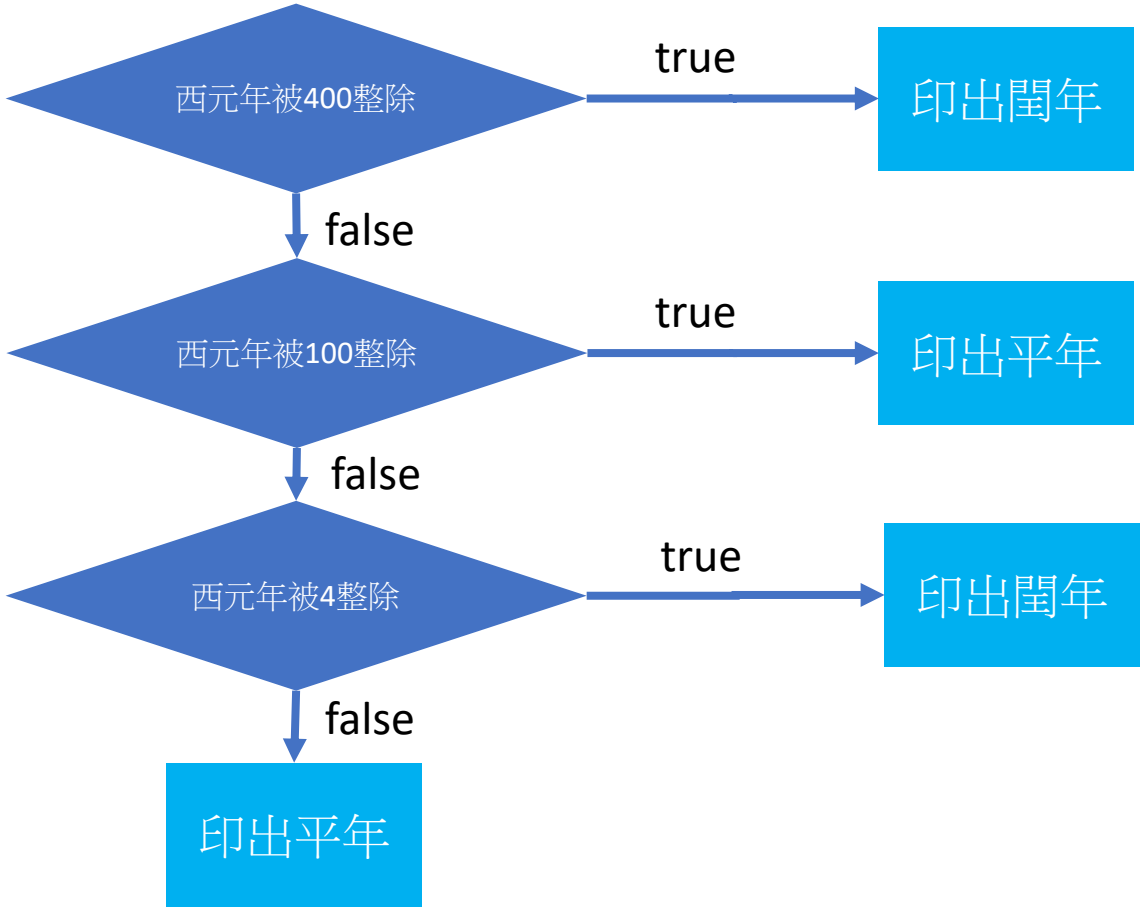

© 2021 Yui Huang 演算法學習筆記. All Rights Reserved.

多向選擇：if – else if - else

Example 3-3

【範例】判斷閏年

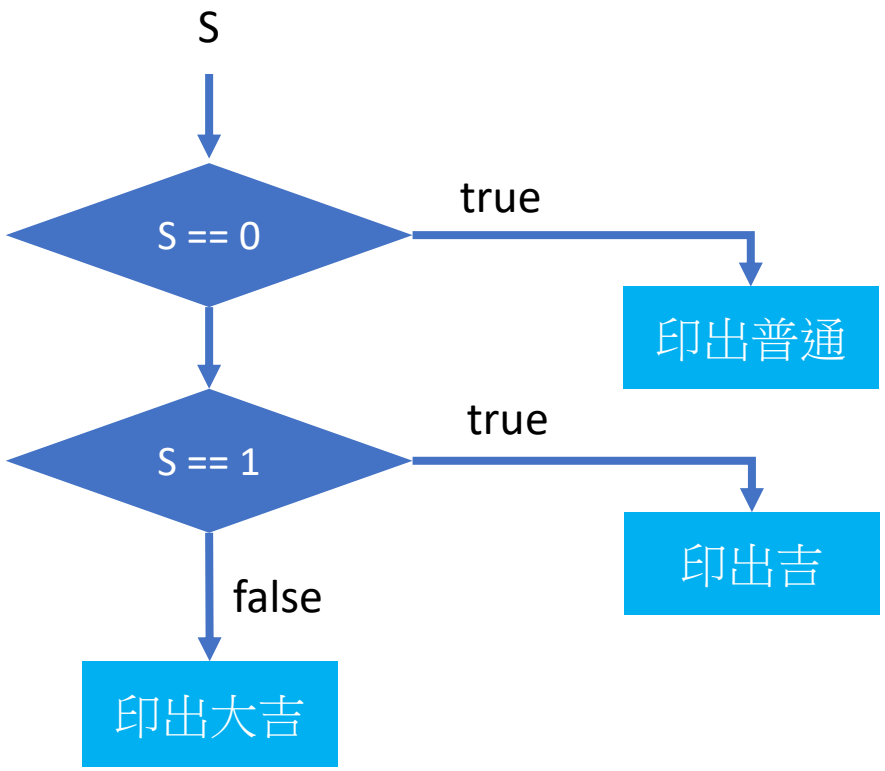
```
1  #include <iostream>
2  using namespace std;
3
4  int main() {
5      int y;
6      cin >> y;
7
8      if (y % 400 == 0) {
9          cout << "閏年\n";
10     } else if (y % 100 == 0){
11         cout << "平年\n";
12     } else if (y % 4 == 0) {
13         cout << "閏年\n";
14     } else {
15         cout << "平年\n";
16     }
17     return 0;
18 }
```



© 2021 Yui Huang 演算法學習筆記. All Rights Reserved.

多向選擇：if – else if - else

Example 3-4



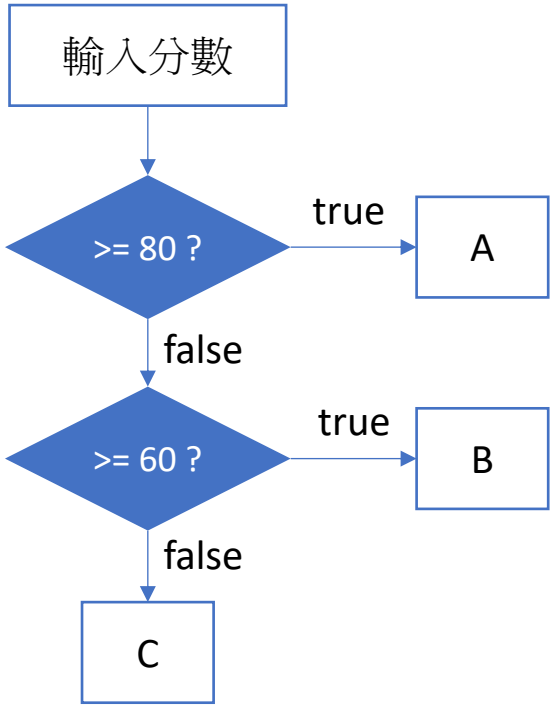
【範例】ZeroJudge a003: 兩光法師占卜術

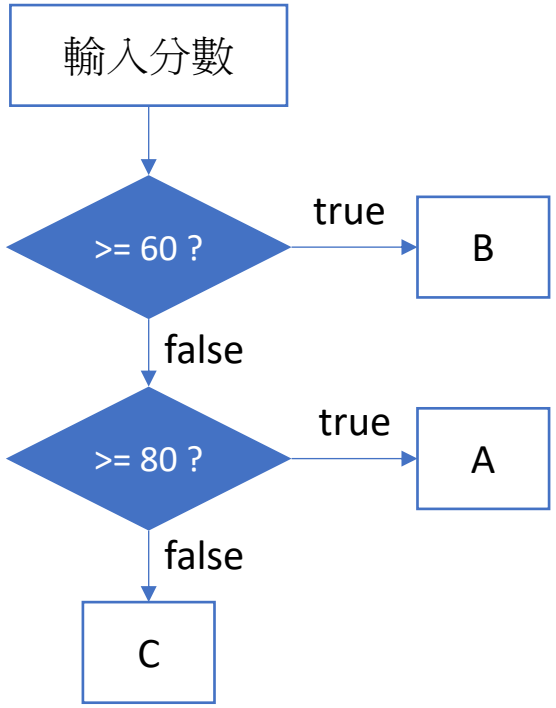
```cpp
#include <iostream>
using namespace std;

int main() {
    int M, D, S;
    cin >> M >> D;
    S = (M * 2 + D) % 3;

    if (S == 0) {
        cout << "普通\n";
    } else if (S == 1) {
        cout << "吉\n";
    } else {
        cout << "大吉\n";
    }
    return 0;
}
```

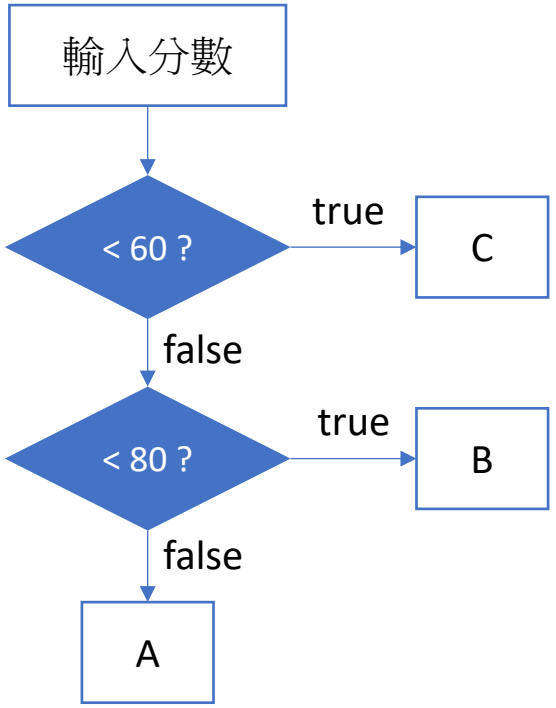

© 2021 Yui Huang 演算法學習筆記. All Rights Reserved.

有什麼不一樣？（把學生成績分成A/B/C級距）

(Quiz)



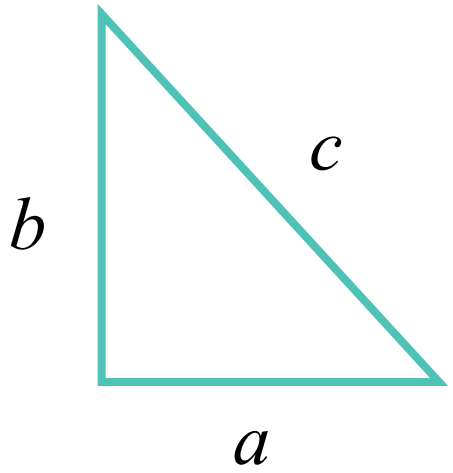




© 2021 Yui Huang 演算法學習筆記. All Rights Reserved.

【練習】判斷直角三角形

Example 3-6




```cpp
#include <iostream>
using namespace std;

int main() {
    int a, b, c; // a <= b <= c
    cin >> a >> b >> c;

    if                                  {
        cout << "是直角三角形\n";
    } else {
        cout << "不是直角三角形\n";
    }

    return 0;
}
```

https://pastebin.ubuntu.com/p/ZGD2HzDnhq/

© 2021 Yui Huang 演算法學習筆記. All Rights Reserved.

【練習】判斷一元二次方程式是否有重根

Example 3-7

$$ax^2 + bx + c = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

```
5  int main() {
6      int a, b, c;
7      cin >> a >> b >> c;
8
9      if                                  {
10         cout << "有重根\n";
11     } else {
12         cout << "沒有重根\n";
13     }
14
15     return 0;
16 }
```

https://pastebin.ubuntu.com/p/WgvsMxJHnr/

© 2021 Yui Huang 演算法學習筆記. All Rights Reserved.

【練習】計算BMI，並輸出判斷結果

Example 3-5

- 寫一個程式讓使用者輸入身高、體重後，計算BMI，並輸出判斷結果。

【Input】輸入資料共一行，包含兩個以空白分隔的整數，
分別為身高(以公分為單位)及體重(以公斤為單位)

【Output】輸出判斷結果 (注意： BMI計算結果不一定是整數)

判斷標準：

- 過重：24 ≦ BMI＜27
- 輕度肥胖：27 ≦ BMI＜30
- 中度肥胖：30 ≦ BMI＜35
- 重度肥胖：BMI ≧ 35

$$BMI = \frac{\text{體重}}{(\text{身高} \div 100)^2}$$

https://pastebin.ubuntu.com/p/YYTyjxHCXj/

© 2021 Yui Huang 演算法學習筆記. All Rights Reserved.

switch 判斷

© 2021 Yui Huang 演算法學習筆記. All Rights Reserved.

case-by-case

Example 3-8

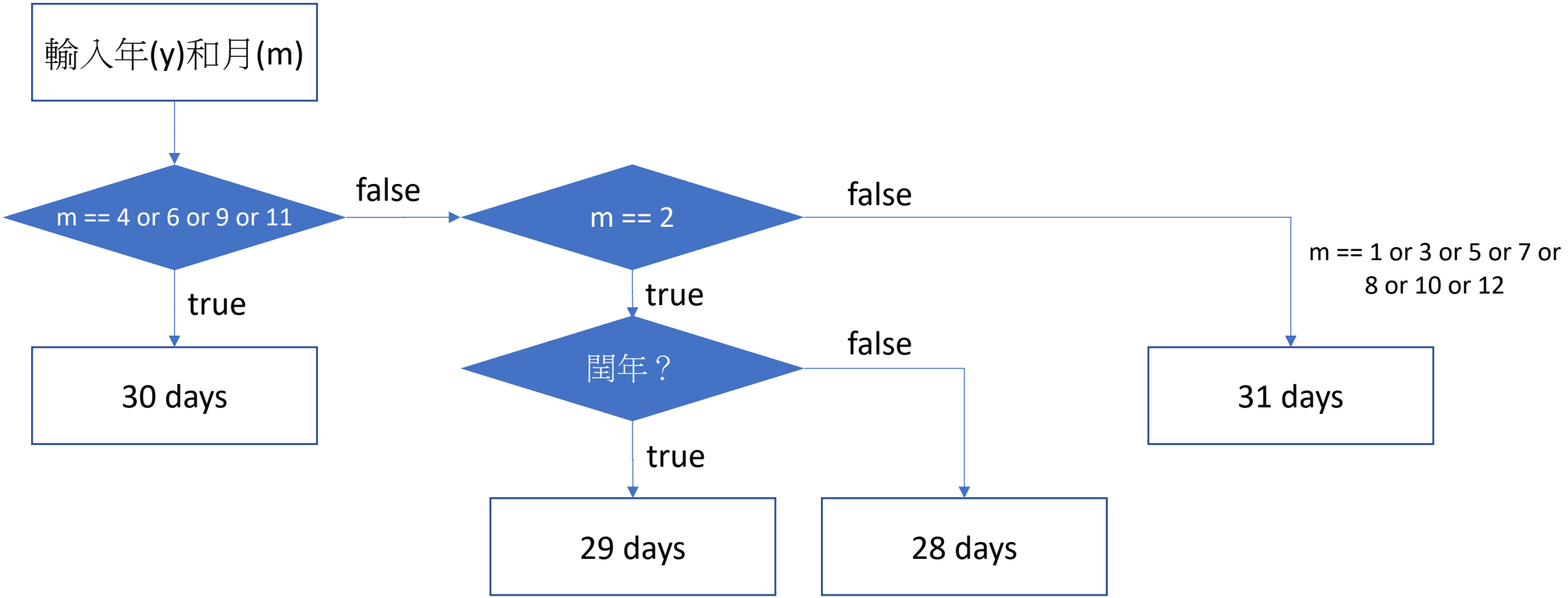
```
5       int x;
6       cin >> x;
7
8       if (x % 2 == 0) {
9           cout << "偶數\n";
10      } else {
11          cout << "奇數\n";
12      }
```

```
14      switch (x % 2) {
15          case 0:
16              cout << "偶數\n";
17              break;
18          case 1:
19              cout << "奇數\n";
20              break;
21          default:
22              cout << "好奇怪\n";
23              break;
24      }
```

畫蛇添足的例子？

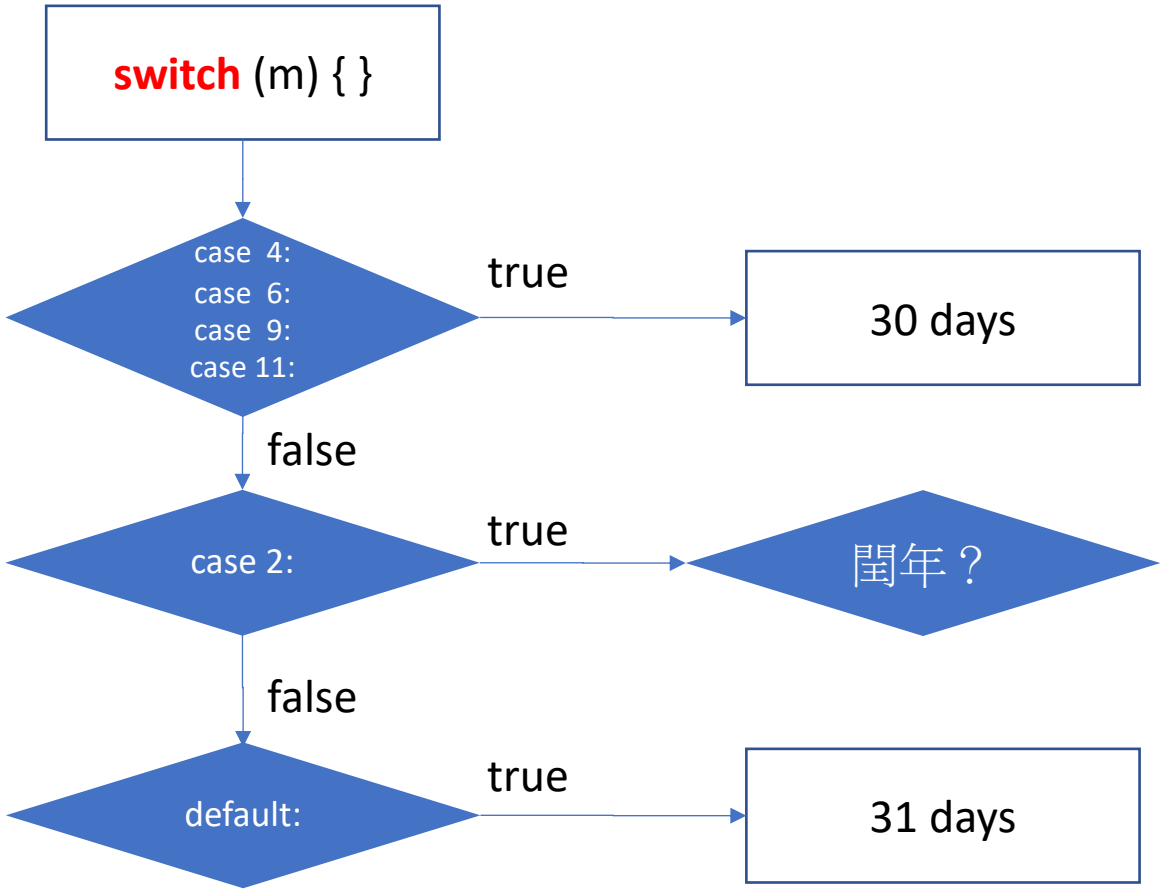
© 2021 Yui Huang 演算法學習筆記. All Rights Reserved.

【練習】判斷對應月份的天數



© 2021 Yui Huang 演算法學習筆記. All Rights Reserved.

【練習】判斷對應月份的天數



© 2021 Yui Huang 演算法學習筆記. All Rights Reserved.

【練習】判斷對應月份的天數

Example 3-9

```
6       int y, m;
7       cin >> y >> m;
8
9       switch [    ] {
10          case 4: case 6: case 9: case 11:
11              cout << "30 days\n";
12              break;
13          case 2:
14              [                                                    ]
15              [                                                    ]
16              [                                                    ]
17              [                                                    ]
18              [                                                    ]
19              break;
20          default:
21              cout << "31 days\n";
22              break;
23      }
```

https://pastebin.ubuntu.com/p/Vy52yFnKRS/

© 2021 Yui Huang 演算法學習筆記. All Rights Reserved.

【練習】簡易計算機

Example 3-11

https://pastebin.ubuntu.com/p/d2R45knSs3/

```
6       int a, b, op;
7       cin >> a >> b >> op;
8
9       switch (op) {
10          case 0:
11              cout << a + b << "\n";
12              break;
13          case 1:
14              cout << a - b << "\n";
15              break;
16          case 2:
17              cout << a * b << "\n";
18              break;
19          case 3:
20              if (b != 0) {
21                  cout << a / b << "\n";
22              } else {
23                  cout << "division by zero\n";
24              }
25              break;
26          default:
27              cout << "invalid operator" << "\n";
28              break;
29      }
```

```
6       int a, b;
7       char op;
8       cin >> a >> op >> b;
9
10      switch (op) {
11          case '+':
12              cout << a + b << "\n";
13              break;
14          case '-':
15              cout << a - b << "\n";
16              break;
17          case '*':
18              cout << a * b << "\n";
19              break;
20          case '/':
21              if (b != 0) {
22                  cout << a / b << "\n";
23              } else {
24                  cout << "division by zero\n";
25              }
26              break;
27          default:
28              cout << "invalid operator" << "\n";
29              break;
30      }
```


© 2021 Yui Huang 演算法學習筆記. All Rights Reserved.