

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

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

```
1  #include <iostream>
2  using namespace std;
3
4  int main() {
5      cout << "(1) " << (5 >= 2) << "\n";
6      cout << "(2) " << (5 <= 2) << "\n";
7      cout << "(3) " << (5 == 2) << "\n";
8      cout << "(4) " << (5 != 2) << "\n";
9      cout << "(5) " << (5 >= 2) + (5 <= 2) + (5 == 2) + (5 != 2) << "\n";
10     return 0;
11 }
```

(1) 1
(2) 0
(3) 0
(4) 1
(5) 2

Program ended with exit code: 0

判斷奇偶數

(Quiz)

```
int x;
```

$(x \% 2) == 0$ 為 true 時

x 為奇數

x 為偶數

邏輯運算

邏輯運算

邏輯運算子	用途
&&	AND (且)
	OR (或)
!	NOT (否)

&& (and)

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

&&	true	false
true	true	false
false	false	false

|| (or)

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

	true	false
true	true	true
false	true	false

! (not)

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

! A	
true	false
false	true

```
1  #include <iostream>
2  using namespace std;
3
4  int main() {
5      int x = 5, y = 2, z = 3;
6
7      bool A = (x < y);
8      bool B = (z != y);
9
10     cout << "A = " << A << "\n";
11     cout << "B = " << B << "\n";
12     cout << "A && B = " << (A && B) << "\n";
13     cout << "A || B = " << (A || B) << "\n";
14     cout << "!A = " << (!A) << "\n";
15     return 0;
16 }
```

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

判斷邊界

(Quiz)

井字遊戲 或 一個 3×3 的棋盤

	→ c		
↓ r	(0, 0)	(0, 1)	(0, 2)
	O		
	(1, 0)	(1, 1)	(1, 2)
		X	
	(2, 0)	(2, 1)	(2, 2)

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))
```

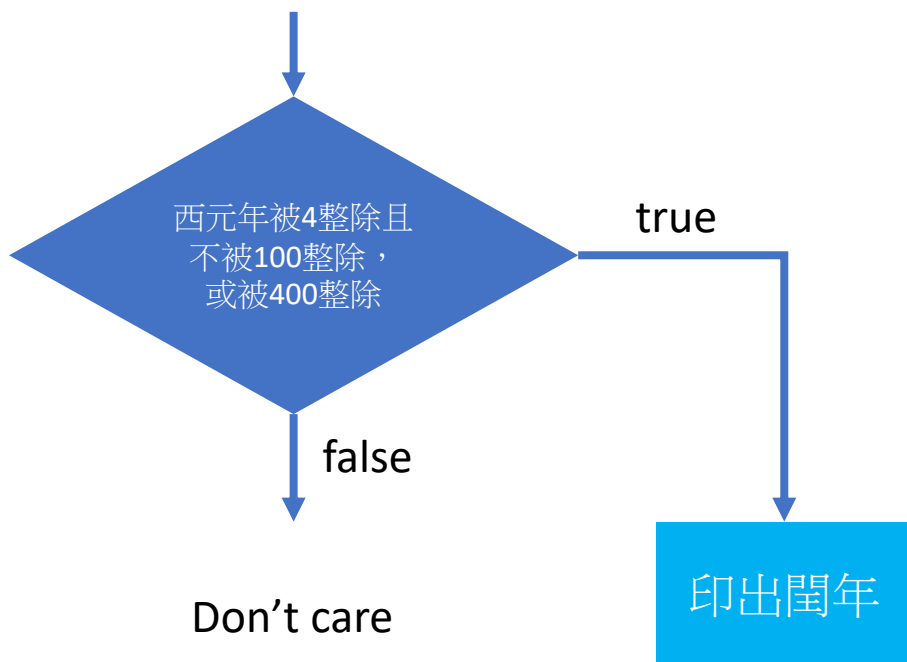
```
(r >= 0) && (r <= 2) && (c >= 0) && (c <= 2)
```

if 判斷

單向選擇：if

Example 3-3

【範例】判斷閏年

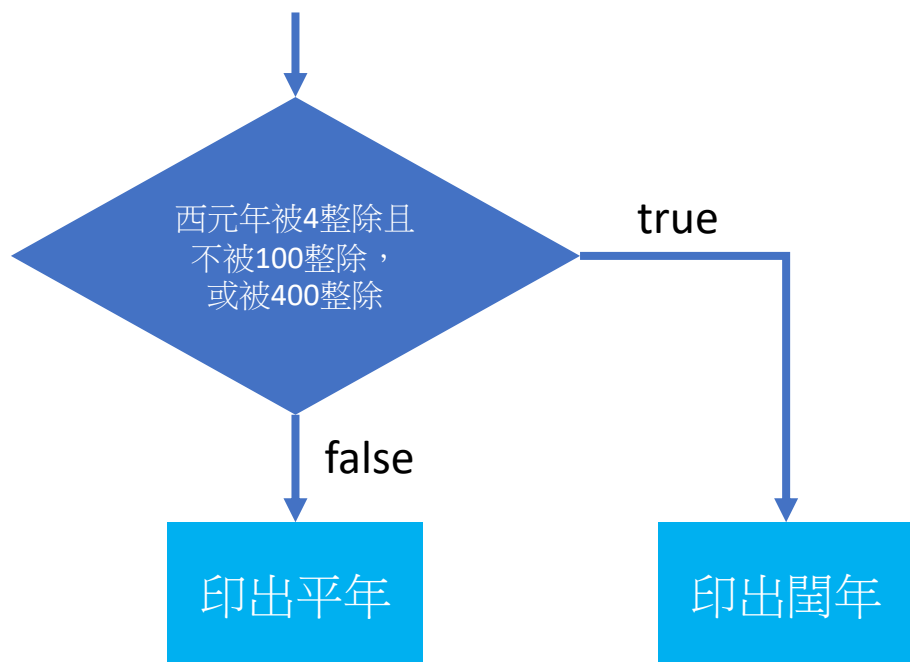


```
1  #include <iostream>
2  using namespace std;
3
4  int main() {
5      int y;
6      cin >> y;
7
8      if ((y % 4 == 0 && y % 100 != 0) || y % 400 == 0)
9          cout << "閏年\n";
10     return 0;
11 }
```

雙向選擇：if - else

Example 3-3

【範例】判斷閏年



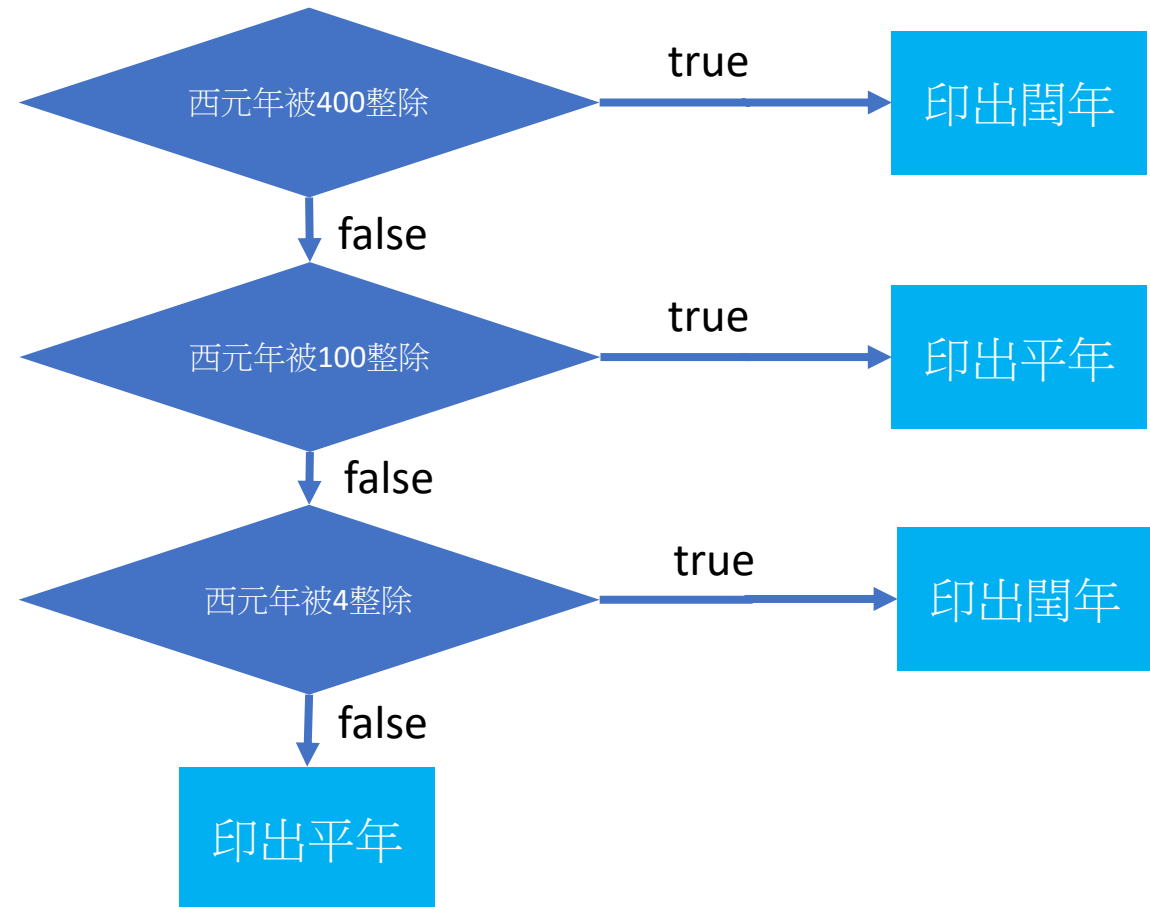
```
1  #include <iostream>
2  using namespace std;
3
4  int main() {
5      int y;
6      cin >> y;
7
8      if ((y % 4 == 0 && y % 100 != 0) || y % 400 == 0)
9          cout << "閏年\n";
10     else
11         cout << "平年\n";
12     return 0;
13 }
```

多向選擇：if – else if - else

Example 3-3

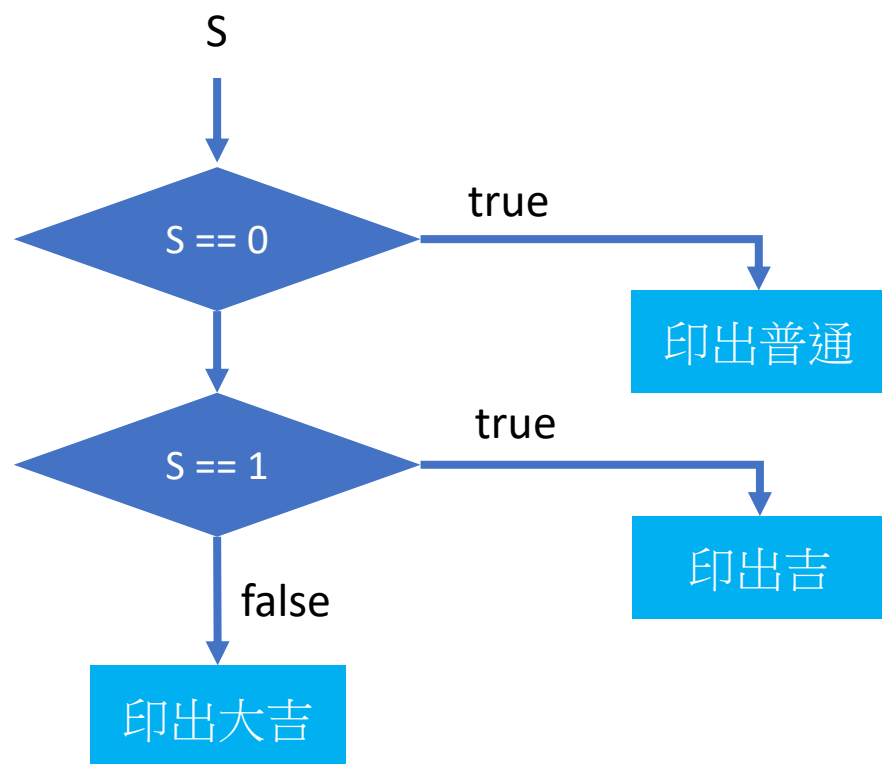
【範例】判斷閏年

```
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 }
```



多向選擇：if – else if - else

Example 3-4

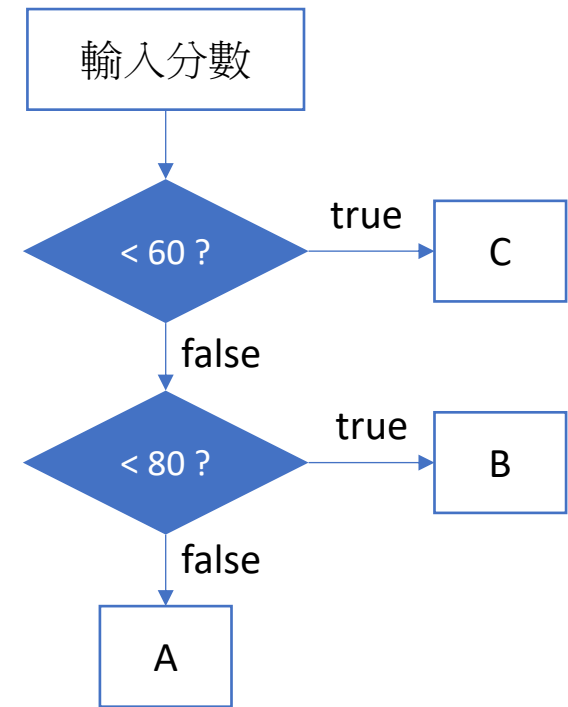
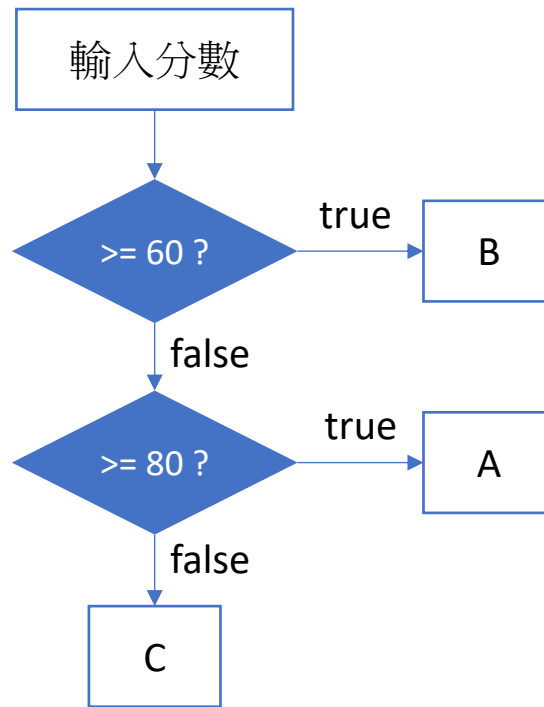
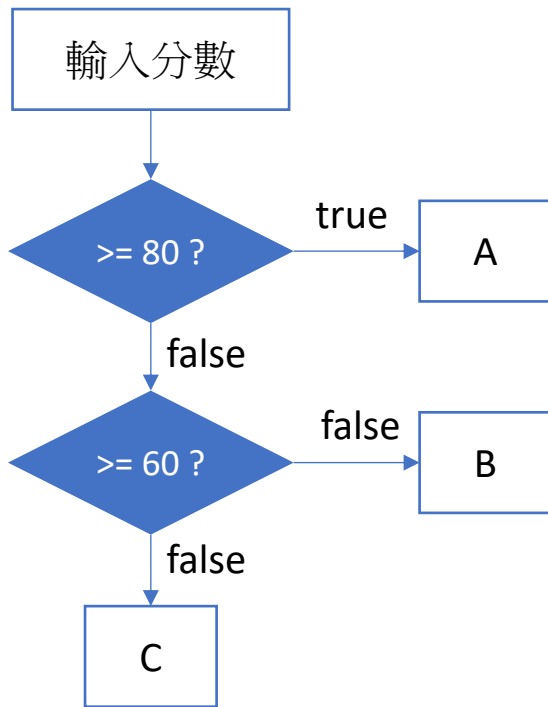


【範例】ZeroJudge [a003: 兩光法師占卜術](#)

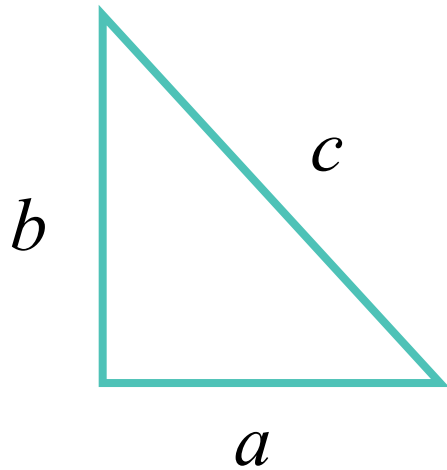
```
1  #include <iostream>
2  using namespace std;
3
4  int main() {
5      int M, D, S;
6      cin >> M >> D;
7      S = (M * 2 + D) % 3;
8
9      if (S == 0) {
10         cout << "普通\n";
11     } else if (S == 1) {
12         cout << "吉\n";
13     } else {
14         cout << "大吉\n";
15     }
16     return 0;
17 }
```

有什麼不一樣？（把學生成績分成A/B/C級距）

(Quiz)



【練習】判斷直角三角形



```
1  #include <iostream>
2  using namespace std;
3
4  int main() {
5      int a, b, c; // a <= b <= c
6      cin >> a >> b >> c;
7
8      if [redacted] {
9          cout << "是直角三角形\n";
10     } else {
11         cout << "不是直角三角形\n";
12     }
13
14     return 0;
15 }
```

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

【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/>

【練習】計算BMI，並輸出判斷結果

- 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： $24 \leq BMI < 27$
- 輕度肥胖： $27 \leq BMI < 30$
- 中度肥胖： $30 \leq BMI < 35$
- 重度肥胖： $BMI \geq 35$

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

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

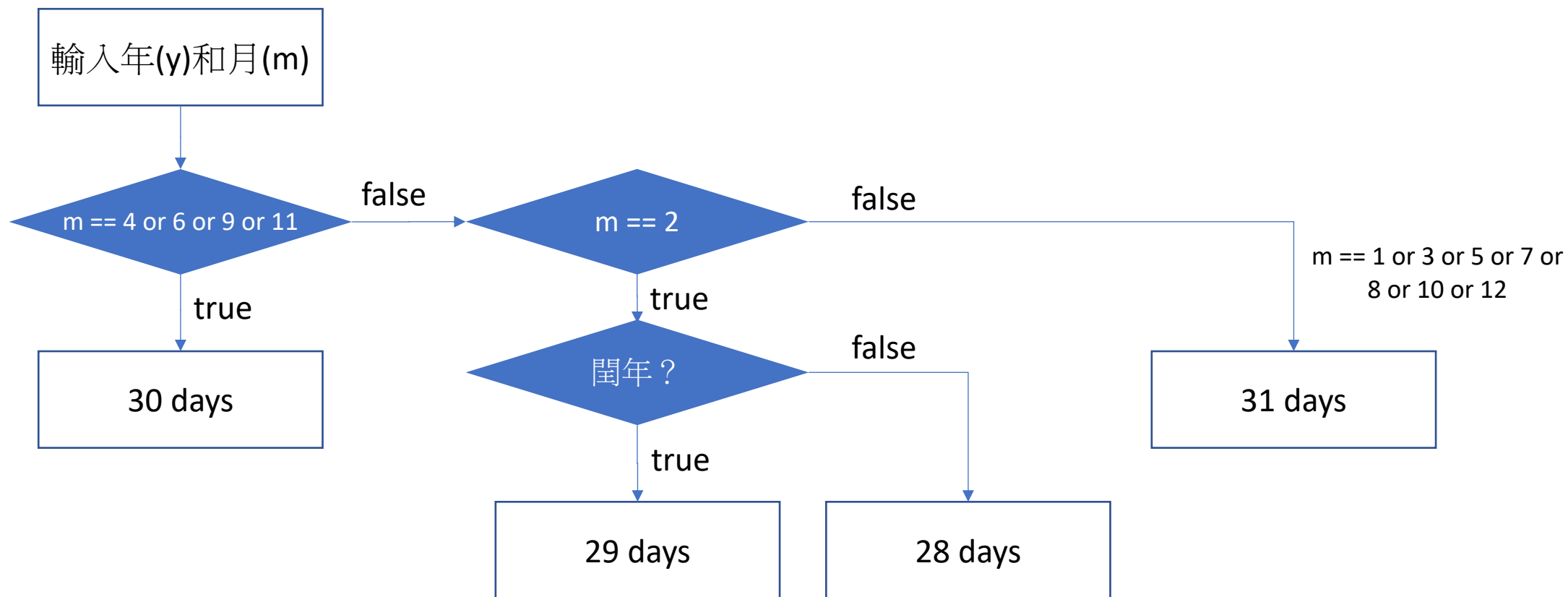
switch 判斷

```
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   }
```

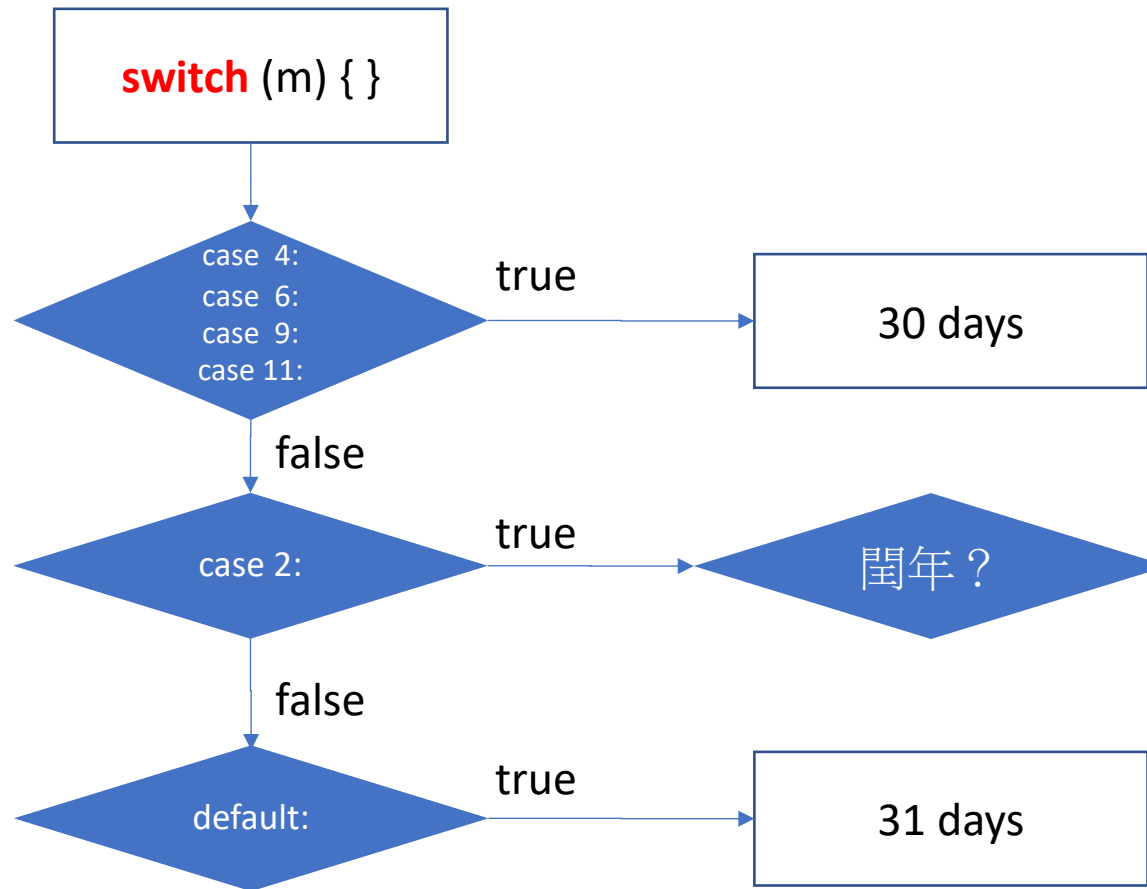
```
14    switch (x % 2) {  
15        case 0:  
16            cout << "偶數\n";  
17            break;  
18        case 1:  
19            cout << "奇數\n";  
20            break;  
21        default:  
22            cout << "好奇怪\n";  
23            break;  
24    }
```

畫蛇添足的例子？


【練習】判斷對應月份的天數



【練習】判斷對應月份的天數



【練習】判斷對應月份的天數

```
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/>

【練習】簡易計算機

<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 }
```