比較運算子

==	equal to
!=	not equal to
>	greater than
<	less than
>=	greater than or equal to
<=	less than or equal to

條件 Conditions

a number

x	power	MAX_POW	y	item	MIN_ITEM	mom_or_dad	num	SENTINEL
-5	1024	1024	7	1.5	-999.0	'M'	999	999

運算子 Operator	意義 meaning	條件 condition	值 value
<=	小於或等於	x <= 0	1(true)
<	小於	power < MAX_POW	0(false)
>=	大於或等於	x >= y	0(false)
>	大於	item > MIN_ITEM	1(true)
==	等於	mom_or_dad == 'M'	1(true)
!=	不等於	num != SENTINEL	0(false)

條件 → C表示式

1. x 和 y 都大於 z   (_____)

2. x 等於 1.0 或 3.0   (_____)

3. x 在 y 和 z 之間 (y<z)   (_____)

4. x 不在 y 和 z 的範圍以內   (_____)

     已知y<z

if-statement

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比較字符 char

	1(true)	0(false)
'9' >= '0'	1	0
'a' < 'e'	1	0
'B' <= 'A'	1	0
'Z' == 'z'	1	0
'a' <= 'A'	1	0
ch>='a' && ch<='z'	1	0

if-statement

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相反條件
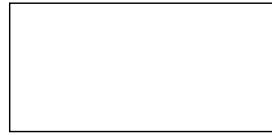
m==n   [   ]   a<=b   [   ]

DeMorgan's Theorem

complement 相反

```
        (age<=25) || (status!='S' && status!='D')
```

```
   !( (age<=25) || (status!='S' && status!='D') )
```

```
    (age<=25)    (status!='S' && status!='D')
```

The **if** statement

- Syntax 語法
  if (條件) 句子1 ;
  else 句子2 ;

Ex-1.
```
if (heart_rate_atrest > 56 )     // 靜止心跳
  printf("keep up your exercise program!\n");
else
  printf("Your heart rate is in excellent health\n");
```

Ex-2.

```
if (x!=0)
    product = product * x;        // product 積
```

```
if (x!=0) average = total / x;
```

Flow Chart 流程圖

- A diagram that shows the step-by-step execution of a control structure
  - A diamond-shape box represents a decision
  - A rectangular box represents an assignment statement or a process.

靜止心跳

if-statement

(a)   (b)
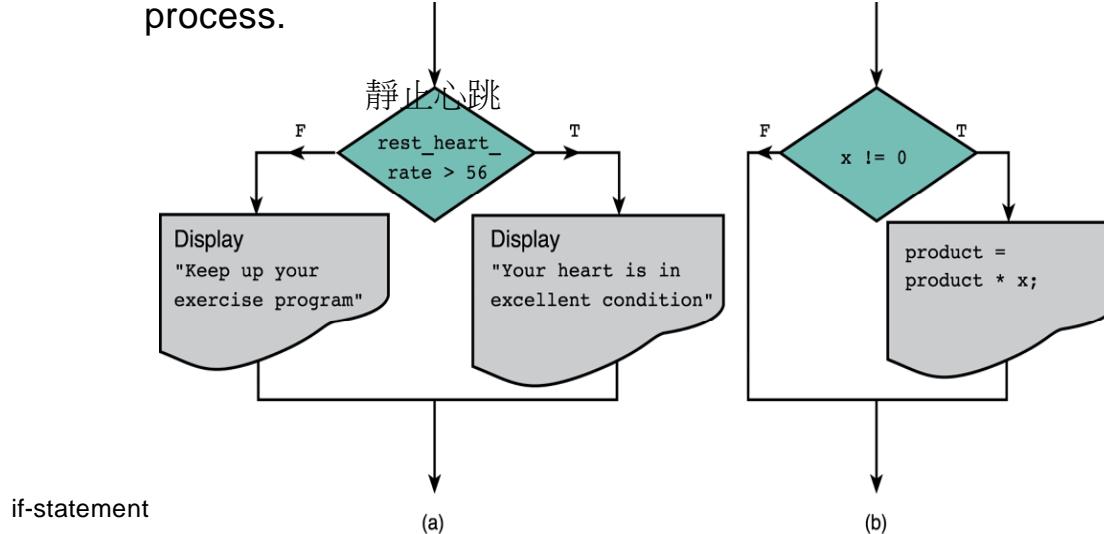
Nested嵌套式if Statements

- if 中有 if
- 嵌套式

```
if (x > 0)
        num_pos = num_pos + 1;         +ve
else

        if (x < 0)
                num_neg = num_neg + 1;    −ve
        else /* x equals 0 */
                num_zero = num_zero + 1;    0
```

- Dangling else

```
if (x > 0)
if (y > 0)
        a = a + 1;
else
        b = b + 1;
```

// else 屬於最　　的 if

if-statement

Nested if嵌套式Example:
Road Sign指示 Decision Process

路面情況
安全safe

road_status
is 'S'

true

氣溫>0

temp > 0

true

false

Drive
carefully
message

小心
駕駛

Wet
roads
message

false

小心
雪地

Icy roads
message

小心
地滑
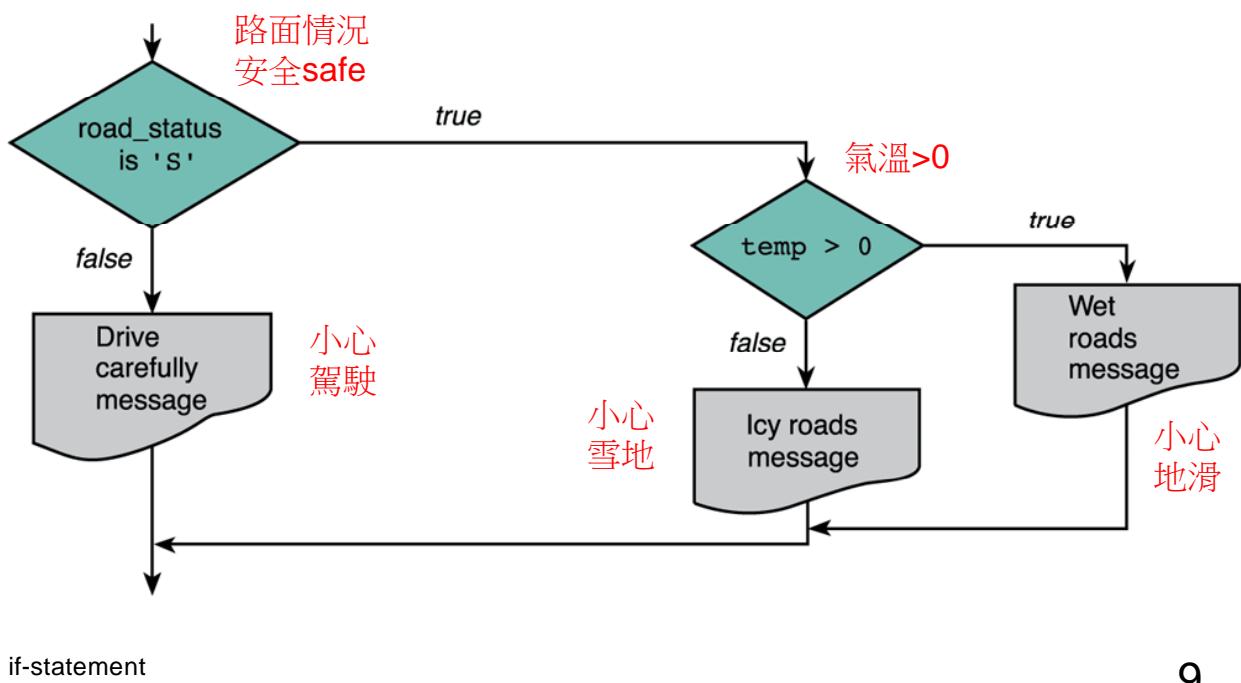
if-statement

Road Sign Decision Process

```
        路面狀況
if (road_status == 'S'){
        溫度
        if (temp > 0) {      前面路滑
                printf("Wet roads ahead\n");
                printf("Stopping time doubled\n");停車時間=2倍
        } else {             路面有雪
                printf("Icy roads ahead\n");
                printf("Stopping time quadrupled\n");
        }                    停車時間=4倍
}else                小心駕駛
        printf("Drive carefully!\n");
```

if-statement

Multiple-Alternative Decision

語法
Syntax

```
if (condition₁)
        statement₁
else if (condition₂)
        statement₂
else if (condition₃)
        statement₃
…
else if (conditionₙ)
        statementₙ
else
    default statement
```

```
if (mm==1)
        maxdays = 31;
else if (mm==2)
        maxdays = 28;
else if (mm==3)
        maxdays = 31;
…
else if (mm==12)
        maxdays = 31;
else
        maxdays = 0;
```

if-statement

✔ Example ✘

```
if (a==b) printf ("Equal.");        if (a=b) printf ("Equal.");
else printf ("Not Equal.");         else printf ("Not Equal.");
```

```
printf ("%s", (a==b) ?"Equal." :"Not Equal.");
```

---

a =

```
b = -10;
a = (b<0) ?-b :b;
printf ("a=%i\n", a);


a = abs(b);
```

if-statement

聘請保安員條件 (Security Guard)
填寫以下偽代碼：

犯罪紀錄：次數	0	0
性　　別：M/F	M	M
年　　齡：歲	31-45	18-30
工作經驗：年	3+	
身　　高：米	1.65+	1.70+

c1 = (犯罪紀錄_____);

c2 = (性別_____);

c3 = (年齡_____)　　　(年齡_____)　　　(身高_____)　　　(工作經驗_____);

c4 = (年齡_____)　　　(年齡_____)　　　(身高_____);

```
if( (c1) && (c2) && ((c3) || (c4)))
        合資格=1;
else
        合資格=0;
```

```
if( (c1) && (c2) ){
    if ((c3) || (c4))   合資格=1;
    else   合資格=0;
} else   合資格=0;
```

if-statement

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1. Compare比較 4 input numbers:
        if (a > b) x = ___; else x = ___;
        if (c > d) y = ___; else y = ___;
        if (x > y) max − ___; else max − ___;

2. Leap Year Test 潤年測試
        int isleapyear = 0; int yy
        if (_____ || _____)
            isleapyear−1;
        else
            isleapyear=0;

4. 年齡age, 星期dow, 收費fare:

if(age< || age>   )
        fare = fare/2;
if(dow== || dow==   )
        fare = fare*2;

3. 某年2月份有多少日：
        max=28;
        if ((mm_____)   (yy_____))
            max=29;

if-statement

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常見錯誤：
1. if(12 < age < 60) …
數學與電腦寫法不同
改正: if(age＿＿＿＿＿＿age＿＿＿＿)

2. if(age < 12 || > 60) …
欠變數名稱 age
改正: if(age＿＿＿＿＿＿age＿＿＿＿)

3. if(age>60); printf("…");
if中間不要加(＿＿)
改正: if(age>60) printf("…");

4. if(age<12 && age>60) …
沒可能
改正: if(age < 12 ＿＿＿ age > 60) …

5. if(age = 12) …
賦值(age=12)；比較(age＿＿＿12)
改正: if(age＿＿＿12) …

6. if(age > 12 || age < 60) …
等同: if(1) …
改正: if(age>12 ＿＿＿ age<60) …

7. if(ans=='y' && ans=='n') puts("ok");
沒可能
改正: if(ans=='y' ＿＿＿ ans=='n') puts("ok");

8. if(ans!='y' || ans!='n') puts("error");
任何輸入都正確
改正: if(ans!='y' ＿＿＿ ans!='n') puts("error");

9. scanf("%c",&ch);
    if(ch=='a'||'b'||'c'||'d')…

改正: if(ch=='a' || ch=='b' || ch=='c' || ch=='d') …
改正: if(strchr("abcd",ch) != NULL) …