

# The Twelve Days of Christmas

<https://www.youtube.com/v/KQE0BZLx-Z8>



丁培毅

1

## Lyrics

On the **first** day of Christmas  
my true love sent to me:  
**A Partridge in a Pear Tree**

On the **second** day of Christmas  
my true love sent to me:  
**2 Turtle Doves**  
and a Partridge in a Pear Tree

On the **third** day of Christmas  
my true love sent to me:  
**3 French Hens**  
2 Turtle Doves  
and a Partridge in a Pear Tree

On the **fourth** day of Christmas  
my true love sent to me:  
**4 Calling Birds**  
3 French Hens  
2 Turtle Doves  
and a Partridge in a Pear Tree

On the **fifth** day of Christmas  
my true love sent to me:  
**5 Golden Rings**  
4 Calling Birds  
3 French Hens  
2 Turtle Doves  
and a Partridge in a Pear Tree

On the **sixth** day of Christmas  
my true love sent to me:  
**6 Geese a Laying**  
5 Golden Rings  
4 Calling Birds  
3 French Hens  
2 Turtle Doves  
and a Partridge in a Pear Tree

On the **seventh** day of Christmas  
my true love sent to me:  
**7 Swans a Swimming**  
6 Geese a Laying  
5 Golden Rings  
4 Calling Birds  
3 French Hens  
2 Turtle Doves  
and a Partridge in a Pear Tree

On the **eighth** day of Christmas  
my true love sent to me:  
**8 Maids a Milking**  
7 Swans a Swimming  
6 Geese a Laying  
5 Golden Rings  
4 Calling Birds  
3 French Hens  
2 Turtle Doves  
and a Partridge in a Pear Tree

On the **ninth** day of Christmas  
my true love sent to me:  
**9 Ladies Dancing**  
8 Maids a Milking  
7 Swans a Swimming  
6 Geese a Laying  
5 Golden Rings  
4 Calling Birds  
3 French Hens  
2 Turtle Doves  
and a Partridge in a Pear Tree

2

On the ninth day of Christmas  
my true love sent to me:

**9 Ladies Dancing**  
8 Maids a Milking  
7 Swans a Swimming  
6 Geese a Laying  
5 Golden Rings  
4 Calling Birds  
3 French Hens  
2 Turtle Doves  
and a Partridge in a Pear Tree

On the **tenth** day of Christmas  
my true love sent to me:

**10 Lords a Leaping**  
9 Ladies Dancing  
8 Maids a Milking  
7 Swans a Swimming  
6 Geese a Laying  
5 Golden Rings  
4 Calling Birds  
3 French Hens  
2 Turtle Doves  
and a Partridge in a Pear Tree

On the **eleventh** day of Christmas  
my true love sent to me:

**11 Pipers Piping**  
10 Lords a Leaping  
9 Ladies Dancing  
8 Maids a Milking  
7 Swans a Swimming  
6 Geese a Laying  
5 Golden Rings  
4 Calling Birds  
3 French Hens  
2 Turtle Doves  
and a Partridge in a Pear Tree

On the **twelfth** day of Christmas  
my true love sent to me:

**12 Drummers Drumming**  
11 Pipers Piping  
10 Lords a Leaping  
9 Ladies Dancing  
8 Maids a Milking  
7 Swans a Swimming  
6 Geese a Laying  
5 Golden Rings  
4 Calling Birds  
3 French Hens  
2 Turtle Doves  
and a Partridge in a Pear Tree

3

## 題目

- 請設計一個 C 程式，  
列印出聖誕歌謠 **12 Days of Christmas**  
完整的 **12 段**歌詞
  - 請運用 **for** 迴圈、  
**switch** 敘述、及  
字串陣列設計  
(上面 **switch** 的運用可以用迴圈取代)
  - 請注意一定要避免重複的敘述
  - 請小心歌詞中 **and** 連接詞以及  
冠詞 **A** 的大小寫

### 範例輸出

On the first day of Christmas  
my true love sent to me:  
A Partridge in a Pear Tree

On the second day of Christmas  
my true love sent to me:  
2 Turtle Doves  
and a Partridge in a Pear Tree

On the third day of Christmas  
my true love sent to me:  
3 French Hens  
2 Turtle Doves  
and a Partridge in a Pear Tree

On the twelfth day of Christmas  
my true love sent to me:  
12 Drummers Drumming  
11 Pipers Piping  
10 Lords a Leaping  
9 Ladies Dancing  
8 Maids a Milking  
7 Swans a Swimming  
6 Geese a Laying  
5 Golden Rings  
4 Calling Birds  
3 French Hens  
2 Turtle Doves  
and a Partridge in a Pear Tree

4

# Bizarre Obfuscated Non-example

```
main(t,_a)char* a;{ return! 0<t? t<3?main(-79,-13,a+main(-87,1-
_ _main(-86, 0, a+1)+a)):1,t<_?main(t+1, _ a ):3,main(-94, -27+t, a)&&t
== 2 ? _<13 ?main(2, _+1, "%s %d %d\n"):9:16:t<0?t<-72?main(_
t,"@n'+,#'/*{*w+/w#cdnr/+,}{r/*de}+,*{*+/,w{%+/,w#q#n+/,#{l,+,/n{n+,
/+n+/,/#;#q#n+/,+k#;*+/,/r : 'd*'3,}{w+K w'K:'!+}e#';dq# '
q#'+d'K#!/+k#;q#r}eKK#}w'r}eKK{nl}'/#;#q#n')}{#}w')}{nl}'/+n#';d}rw'
i;# }{nl}'/n{n#'; r{#w'r nc{nl}'/#{l,+K {rw' iK;}{nl}'/w#q#n'wk nw'
iwk{KK{nl}'/w{% 'l##w# ' i; :{nl}'/*{q# 'ld;r'}{nlwb!/*de}'c ;;{nl}'-
}{rw}'/+, ""}##* )#nc, '#nw}'/ +kd'+e}+;# 'rdq#w! nr/' ) }+}{rl#}'n'
'# }+}##(!!/"):t<-50?_==*a ?putchar(31[a]):main(-65,_a+1):main((*a ==
'/') + t, _ a + 1):0<t?main(2, 2, "%s"): *a== '/' || main(0,main(-61,*a,
"!ek;dc i@bK'(q)-[w]*%n+r3#l,{}:\nuwloca-
O;m .vpbks,fxntdCeghiry"),a+1); }
```

印出的歌詞裡有兩個地方有錯，好想把它改過來，可是 ☹

# 設計方法與分析

1. 由範例輸出可以看到輸出有 12 個段落，這一定需要一個迴圈，因為在進入迴圈之前就知道需要做 12 次，所以用一個 for 迴圈是很合適的，每一次迴圈內列印出 1 個段落

```
On ... xxx ...
my ...
. . .
```

and a Partridge ...

其中藍色部份是每次迴圈執行時都不同的

2. xxx 代表 first, second, third, fourth, ..., twelfth 這些字串，如果 for 迴圈的控制變數 i 由 0 遞增到 11 的話，需要設計一個字元的指標陣列，例如 const char \*const ordinal[] = {"first", ...}; 然後在迴圈內運用 printf("On ... %s ...", ordinal[i]); 來列印

```
On the first day of Christmas
my true love sent to me:
A Partridge in a Pear Tree
. . .
On the twelfth day of Christmas
my true love sent to me:
12 Drummers Drumming
11 Pipers Piping
10 Lords a Leaping
9 Ladies Dancing
8 Maids a Milking
7 Swans a Swimming
6 Geese a Laying
5 Golden Rings
4 Calling Birds
3 French Hens
2 Turtle Doves
and a Partridge in a Pear Tree
```

3. 迴圈第一次執行時印一列，第二次印兩列，...，第十二次印十二列，這樣的表現看起來需要第二層的迴圈，執行的次數由第一層迴圈的控制變數去算出來，例如：

```
for (i=0; i<12; i++) // 印出 12 段歌詞
{
    印出步驟 2 的結果
    for (j=11-i; j<=11; j++)
        印出最後 i+1 列
    或是 for (j=i; j>=0; j--)
        印出前 i+1 列
    const char *sentences[] = {"a Partridge ...", ...,
                                "12 Drummers..."};
    (可以像步驟 2 中一樣設計一個字元的指標陣列)
    const char *sentences[] = {"12 Drummers ...", ..., "a Partridge ..."};
}
```

4. 和步驟 3 等效的另一種寫法是用 switch 敘述，你可以想一下、測試一下下面這段程式的輸出

```
switch (paragraph)
{
case 12: printf("12 ...");
case 11: printf("11 ...");
}
```

paragraph 為 12 時是不是印出兩列? paragraph 為 11 時是不是只印出一列? 嘗試修改為我們需要的功能

5. 步驟 3 或是步驟 4 中我們沒有特別去處理第 1 段歌詞中是 A Partridge in a Pear Tree，但是在第 2 段到第 12 段歌詞中是 and a Partridge in a Pear Tree 的問題，該怎樣不重複程式碼又能夠只修改這一點點呢?

- a. 第一種方法是
 

```
if (i==0) // 第 1 段
    printf("A Partridge in a Pear Tree\n");
else
    printf("and a Partridge in a Pear Tree\n");
```

 當然這樣還是有一部份重複
- b. 簡單的改一下
 

```
if (i==0) // 第 1 段
    printf("A");
else
    printf("and a");
printf(" Partridge in a Pear Tree\n");
```

 反正相同的部份就不要重複就是了

5. c. 程式可以再改一點點，多運用變數來改變程式的表現，  
char article = 'A';  
...  
if (i>0) article = 'a';  
printf("%c Partridge in a Pear Tree\n", article);  
至於 and 就合併到 2 Turtle Doves\nand 字串的後面，反正  
印出 2 Turtle Doves\n時下一列一定是 and 開頭
6. 在這個程式的設計過程裡，你也許發現我們某種層面上**盡量在避開運用 if 或是 switch 把程式裡面各種選項展開來**(步驟 4, 步驟 5a, 和步驟 5b)，這樣子做當然讓程式可以很快地達成我們要求的表現，但是你可以想像如果今天不是 12 段歌詞，而是 120 段，那麼用 switch 就頭痛了，像這樣的考量其實在設計很多程式時都會不斷出現，基本上不管是 12, 120, 或是 2，其實寫程式的人都會像這樣有兩種考量，有時你也許接到程式的需求時是 10，可是後來付錢的人又改成 100，你還是需要去滿足顧客的需求的，有錢就任性囉！