

# The Twelve Days of Xmas

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



丁培毅

# Lyrics

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

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

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

On the **fourth** day of Xmas  
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 Xmas  
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 Xmas  
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 Xmas  
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 Xmas  
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 Xmas  
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 Xmas  
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 Xmas  
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 Xmas  
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

# 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
```

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```
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
```

# 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 ...

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**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
```

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```
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
}
(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 ..."});
```

或是 for (j=i; j>=0; j--)  
印出前 i+1 列  
const char \*sentences[] = {"a Partridge ...",..., "12 Drummers..."};

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！