

The Twelve Days of Christmas

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



丁培毅

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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
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

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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

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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
```

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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#l
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'
iww{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

```
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
```

- 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
- 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

- 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 ..."};
}
```

- 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

- 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?

- 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
- 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！