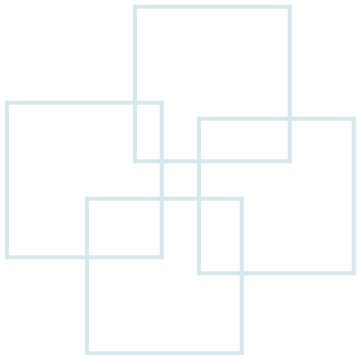


Chapter 14

Large Program

Development

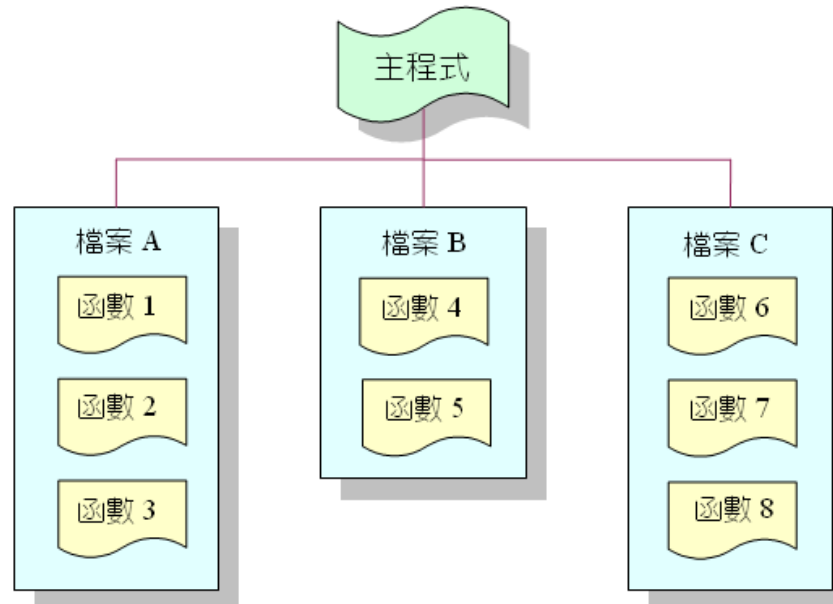




Modulation

• Modulation —

- Group codes and functions of the same functionality in the same program file.
- The concept of modulation can be represented as follows:





Example: One File with Multiple Functions (1/2)

```
01  /* 大型程式的範例 */
02  #include <stdio.h>
03  #include <stdlib.h>
04  #include <math.h>          /* 含括 math.h 標頭檔 */
05  #define PI 3.1416
06  double area(double r);
07  double peri(double r);
08  void show(double r);
09  int main(void)            /* 定義 main() 函數 */
10  {
11      printf("area(2.2)=%5.2f\n", area(2.2));
12      printf("peri(1.4)=%5.2f\n", peri(1.4));
13      system("pause");
14      return 0;
15  }
16
```



Example: One File with Multiple Functions (2/2)

```

17 double area(double r)      /* 自訂函數 area(), 計算圓面積 */
18 {
19     show(r);
20     return (PI*pow(r,2.0)); /* pow(r,2.0)可計算 r 的平方 */
21 }

```

```

22
23 double peri(double r)      /* 自訂函數 peri(), 計算圓周長 */
24 {
25     show(r);
26     return (2*PI*r);
27 }

```

```

28
29 void show(double r)        /* 自訂函數 show(), 可顯示半徑 */
30 {
31     printf("半徑為%5.2f, ", r);
32 }

```

```
/* OUTPUT-----
```

```
半徑為 2.20, area(2.2)=15.21
半徑為 1.40, peri(1.4)= 8.80
```

```
-----*/
```



Example: One File with One Function

```
01 /* 大型程式的範例 (主程式) */
02 #include <stdio.h>
03 #include <stdlib.h>
04 double area(double r);
05 double peri(double r);
06 int main(void)
07 {
08     printf("area(2.2)=%5.2f\n",area(2.2));
09     printf("peri(1.4)=%5.2f\n",peri(1.4));
10
11     system("pause");
12     return 0;
13 }
```

```
01 /* show.c, 自訂函數 show(), 顯示半徑 */
02 #include <stdio.h>
03 void show(double r)
04 {
05     printf("半徑為%5.2f, ",r);
06 }
```

```
01 /* area.c, 自訂函數 area(), 可計算圓面積 */
02 #include <math.h>
03 #define PI 3.1416
04 void show(double);
05 double area(double r)
06 {
07     show(r);
08     return (PI*pow(r,2.0));
09 }
```

```
01 /* peri.c, 自訂函數 peri(), 可計算圓周長 */
02 #define PI 3.1416
03 void show(double);
04 double peri(double r)
05 {
06     show(r);
07     return (2*PI*r);
08 }
```

/* OUTPUT-----

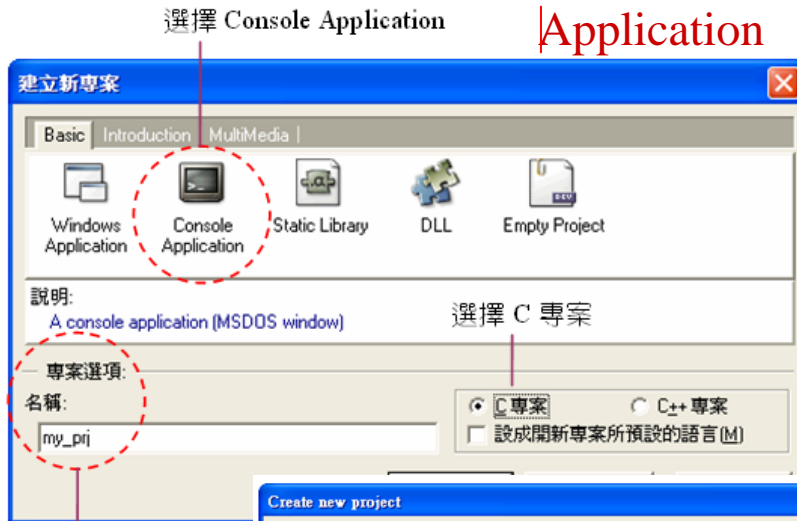
半徑為 2.20, area(2.2)=15.21
半徑為 1.40, peri(1.4)= 8.80

***/**

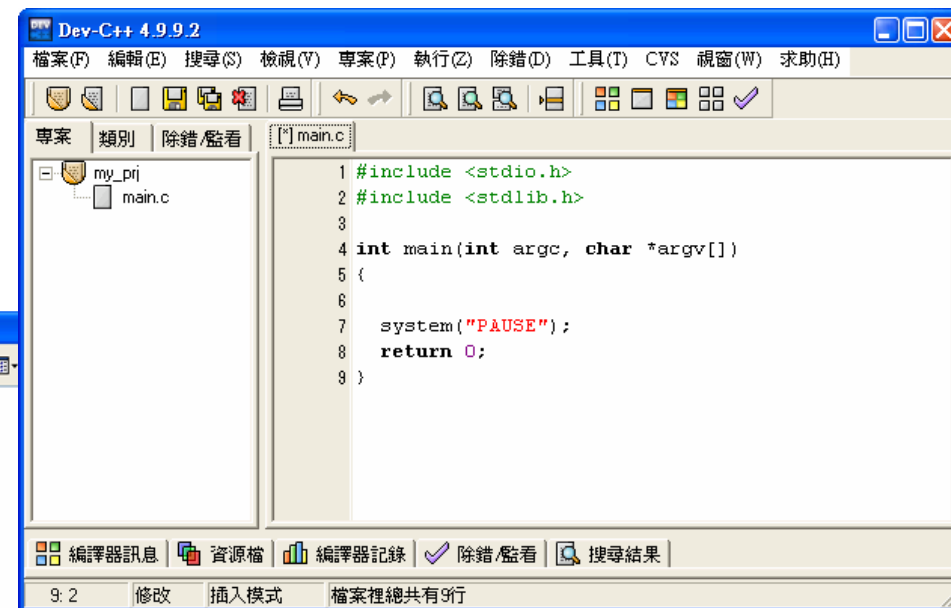


Project Creation for Multiple Files

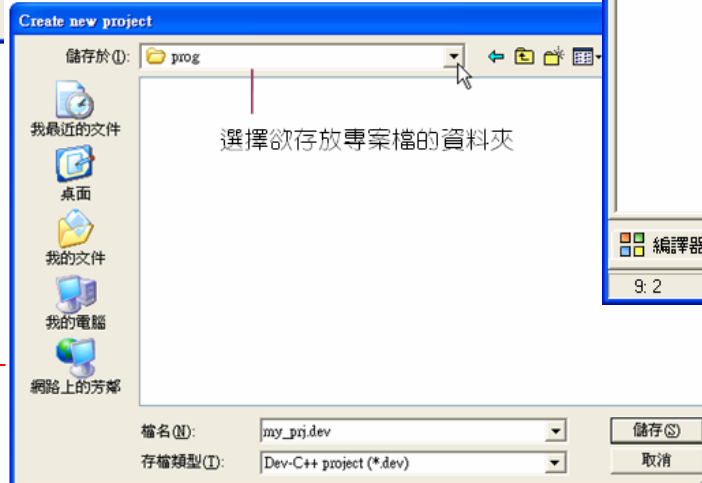
1. Create console
Application



3. Default file



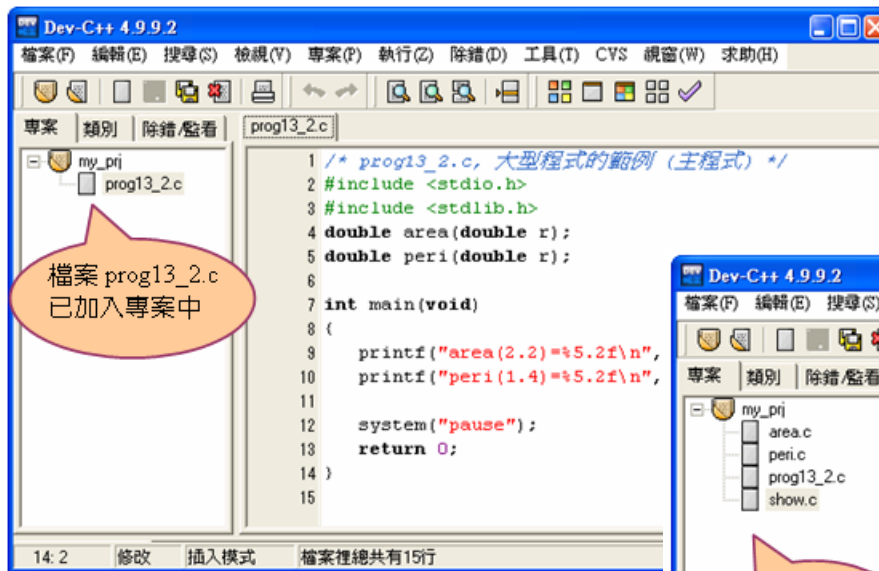
2. Save file



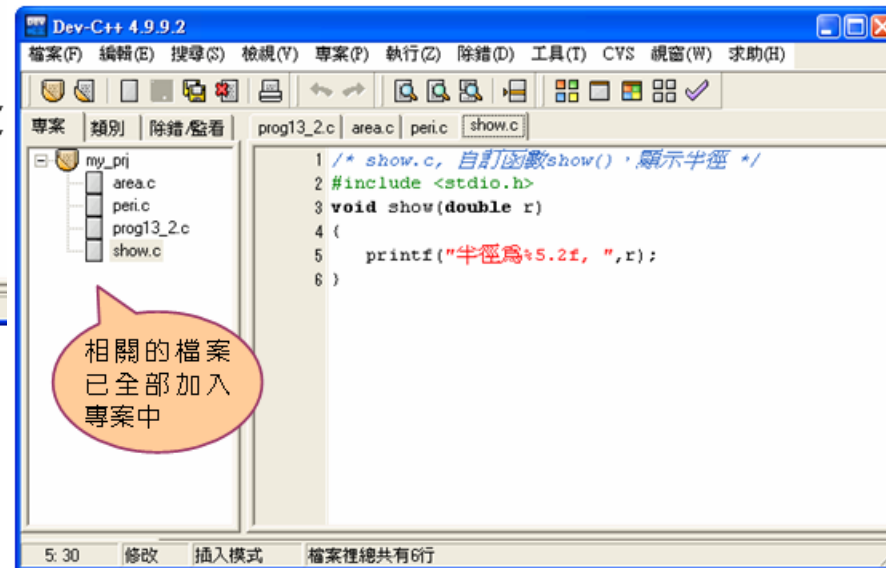


Project Creation for Multiple Files (Cont.)

4. Include main file



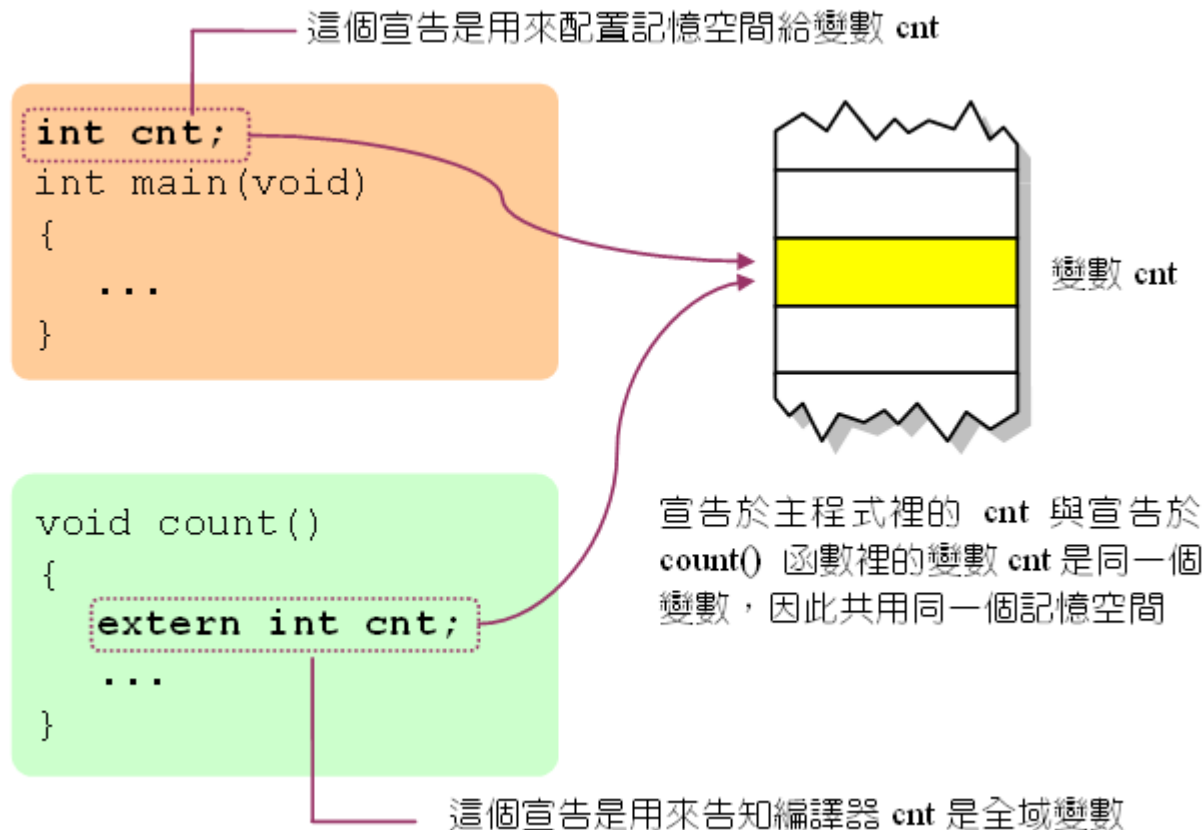
5. Include other files





Global Variables

- Use “**extern**” to share the same variable in multiple files.





Global Variables (Cont.)

- Use “**extern**” to share the same variable in multiple files.

```

01  /* 全域變數的使用範例 (主程式) */
02  #include <stdio.h>
03  #include <stdlib.h>
04  int cnt;          /* 宣告全域變數 cnt */
05  void count(void); /* 宣告 count() 函數的原型 */
06  int main(void)
07  {
08      printf("請輸入 cnt 的初值: ");
09      scanf("%d",&cnt);
10      count();
11      count();
12      cnt++;
13      printf("cnt=%d\n", cnt);
14      system("pause");
15      return 0;
16  }

```

```
/* prog13_3 OUTPUT-
```

```
請輸入 cnt 的初值: 10
```

```
cnt=11
```

```
cnt=12
```

```
cnt=13
```

```
-----*/
```

```

01  /* count.c, 將全域變數的值加 1 */
02  #include <stdio.h>
03  void count(void)
04  {
05      extern int cnt;
06      cnt++;
07      printf("cnt=%d\n", cnt);
08  }

```



Conditional Compilation

- Conditional compilation:
 - Part of the program can choose to be compiled conditionally with `#ifdef`, `#else`, and `#endif`.
 - **Format.**

Format of `#if`, `#else`, and `#endif`

```
#ifdef Identifier
```

```
    /* Compile this part of program if Identifier is defined */
```

```
#else
```

```
    /* Otherwise, compile this part of the program. */
```

```
#endif
```

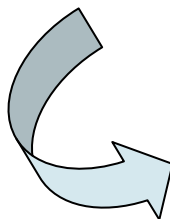


Conditional Compilation: Example

```

01  /* 使用#ifdef、#else 與#endif 指令 */
02  #include <stdio.h>
03  #include <stdlib.h>
04  #define STR "Hello C language.\n"      /* 定義 STR 為一個字串 */
05  int main(void)
06  {
07      #ifdef STR                          /* 如果 STR 已被定義了 */
08          printf(STR);
09      #else                                /* 如果 STR 沒有被定義 */
10          printf("STR 沒有被定義\n");
11      #endif
12
13      system("pause");
14      return 0;
15  }
16  }

```



/* OUTPUT--

Hello C language.

-----*/

```

02  #include <stdio.h>
03  #include <stdlib.h>
04  #define STR "Hello C language.\n"
05  int main(void)
06  {
08      printf(STR);
13      system("pause");
14      return 0;
15  }

```



#if, #else, #elif, and #endif

- #if, #else, #elif, and #endif:
 - Similar to **if-else**
 - When the condition in **#if** is TRUE, compile the part of program right after it. Otherwise, compile the part of program in **#elif** or **#else**.

Format of #if, #else, #endif

```
#if Expression1
    /* Compile this part of program if Expression1=TRUE */
#elif Expression2
    /* Compile this part of program if Expression2=TRUE */
#elif Expression3
    :
#endif
```



#if, #else, #elif, and #endif: Example

```

01  /* 使用#if、#else與#endif指令 */
02  #include <stdio.h>
03  #include <stdlib.h>
04  #define SIZE 15      /* 定義 SIZE 等於 15 */
05  int main(void)
06  {
07      #ifdef SIZE
08          #if SIZE>20
09              char str[SIZE]="Hello C language.";
10          #else
11              char *str="SIZE too small";
12          #endif
13      #else
14          char *str="SIZE not defined";
15      #endif
16
17      printf("%s\n",str);
18      system("pause");
19      return 0;
20  }

```

/* OUTPUT---

SIZE too small

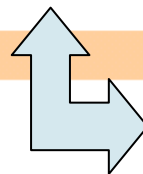
*/

如果有定義 SIZE，則
編譯這個程式區塊

```

01  /* 使用#if、#else與#endif指令 */
02  #include <stdio.h>
03  #include <stdlib.h>
04  #define SIZE 15 /* 定義 SIZE 等於 15 */
05  int main(void)
06  {
07      #ifdef SIZE
08          #if SIZE>20
09              char str[SIZE]="Hello C language.";
10          #else
11              char *str="SIZE too small";
12          #endif
13      #else
14          char *str="SIZE not defined";
15      #endif
16
17      printf("%s\n",str);
18      system("pause");
19      return 0;
20  }

```





#ifndef... #endif (1/2)

/* area.h 的標頭檔 */

```
#define PI 3.14159
```

```
#define CIRCLE(r) ((PI)*(r)*(r))
```

```
#define RECTANGLE(length,height) ((length)*(height))
```

```
#define TRIANGLE(base,height) ((base)*(height)/2.)
```

/* volume.h 的標頭檔 */

```
#define PI 3.1416
```

```
#define SPHERE(r) (4.0/3.0*(PI)*(r)*(r)*(r))
```

```
#define BOX(length,width,height) ((length)*(width)*(height))
```

PI has duplicate definition

Revise volume2.h to remove the duplication by using **#ifndef** and **#endif**.

```
01 /* volume2.h 的標頭檔 */
```

```
02 #ifndef PI
```

```
03     #define PI 3.1416
```

```
04 #endif
```

```
05 #define SPHERE(r) (4.0/3.0*(PI)*(r)*(r)*(r))
```

```
06 #define BOX(length,width,height) ((length)*(width)*(height))
```

} 如果 PI 沒被定義，
則定義 PI 為 3.1416



#ifndef... #endif (2/2)

```
01  /* 同時含括 area.h 與 volume2.h 標頭檔(修正版) */
02  #include <stdio.h>
03  #include <stdlib.h>
04  #include "c:\prog\area.h"
05  #include "c:\prog\volume2.h" /* 含括入標頭檔 volume2.h */
06  int main(void)
07  {
08      printf("CIRCLE(1.0)=%5.2f\n",CIRCLE(1.0)); /* 計算圓面積 */
09      printf("SPHERE(1.0)=%5.2f\n",SPHERE(1.0)); /* 計算圓球體積 */
10
11      system("pause");
12      return 0;
13  }
```

/* OUTPUT---

CIRCLE(1.0) = 3.14

SPHERE(1.0) = 4.19

-----*/



Parameter of main()

- Pass parameters to main() function:

Parameter format

```
int main(int argc, char *argv[])  
{  
    /* main() */  
}
```




Example: Parameter of main()

```

01  /* 命令列引數的使用 */
02  #include <stdio.h>
03  #include <stdlib.h>
04  int main(int argc, char *argv[])
05  {
06      int i;
07      printf("argc 的值为%d\n", argc); /* 印出 argc 的值 */
08      for(i=0; i<argc; i++)
09          printf("argv[%d]=%s\n", i, argv[i]); /* 印出 argv[i] 的值 */
10      system("pause");
11      return 0;
12  }

```

argv[0] → P r o g 1 3 _ 8 \0

argv[1] → T i m e \0

argv[2] → i s \0

argv[3] → m o n e y ! \0

/* OUTPUT

C:\Documents and Settings\wien> **cd c:\prog**

—— 將路徑切換到執行檔的所在位置

C:\prog> **prog13_8 Time is money!**

argc 的值为 4

argv[0]=prog13_8

argv[1]=Time

argv[2]=is

argv[3]=money!

在 Dos 模式下執行 prog13_8

*/



Another Example: Parameter of main()

- Simulate the copy command in MS-DOS mode:

```
01  /* 複製檔案內容 */
02  #include <stdio.h>
03  #include <stdlib.h>
04  int main(int argc, char *argv[])
05  {
06      FILE *fptr1,*fptr2;
07      char ch;
08      if(argc==3)    /* 命令列有 3 個引數輸入時 */
09      {
10          fptr1=fopen(argv[1],"r");    /* 開啟檔案 */
11          fptr2=fopen(argv[2],"w");
12          if((fptr1!=NULL) && (fptr2!=NULL))    /* 檔案開啟成功 */
13          {
14              while((ch=getc(fptr1))!=EOF)    /* 判斷是否到達檔尾 */
15                  putc(ch,fptr2);    /* 一次拷貝一個字元 */
16              fclose(fptr1);
17              fclose(fptr2);
18              printf("檔案拷貝完成!!\n");
19          }
```



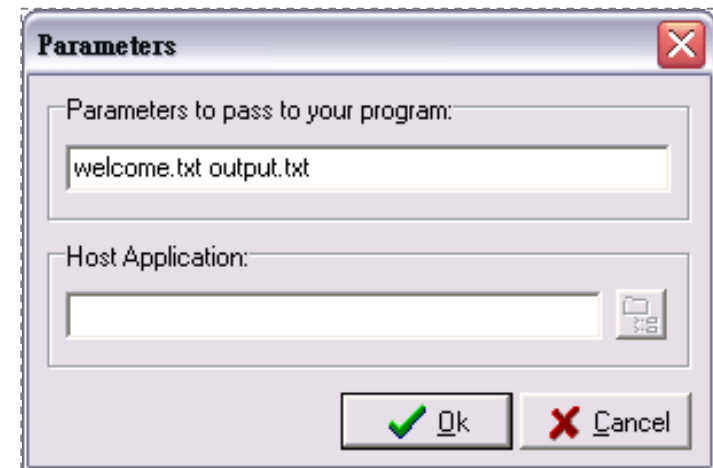
Another Example: Parameter of main() (Cont.)

Dev-C++: Execute → Parameters

```

20     else
21         printf("檔案開啟失敗!!\n");
22     }
23     else
24         printf("請重新檢查輸入!!\n");
25     system("pause");
26     return 0;
27 }

```



/* OUTPUT -----

```
C:\Documents and Settings\wien> cd c:\prog
```

—— 將路徑切換到執行檔
所在的位置

```
C:\prog>prog13_9 welcome.txt output.txt
```

```
檔案拷貝完成!!
```

-----*/



Lab 14

- 開一個專案並包含a.c與b.c兩個檔案。在檔案a.c中宣告一個整個變數x並初始化為10。在檔案b.c中將x的內容輸出在螢幕上。(註:使用extern)
- 試撰寫一程式，可利用命令列引數的方式接收一個整數n與一字串。程式的輸出則可印出n列的該字串。例如: (提示: 可利用字串轉換整數函數atoi()完成)

```
C:\prog> hw13_15 3 Hello  
Hello  
Hello  
Hello
```