高階語言程式設計實習

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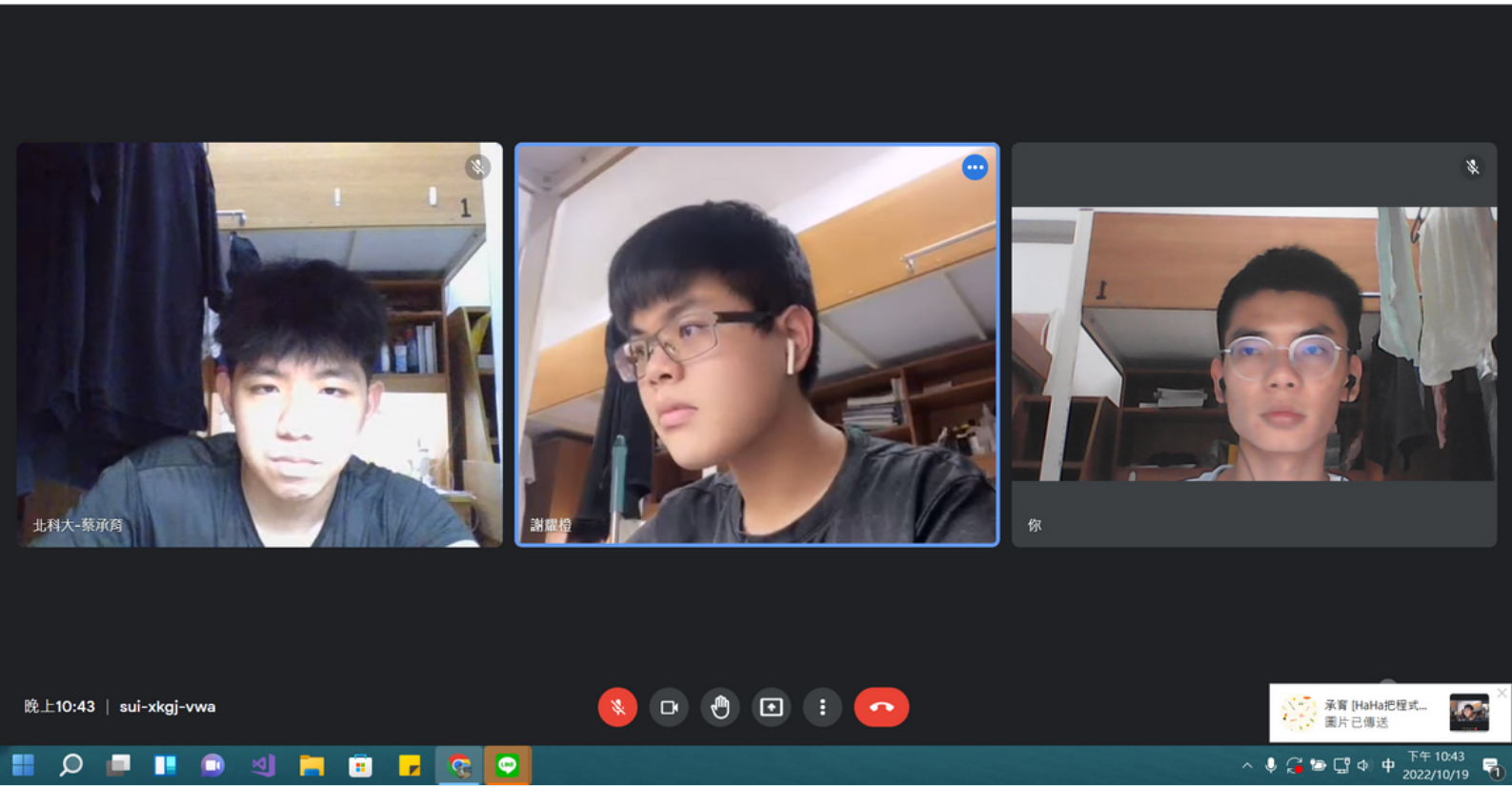
討論時間：2022/10/02

討論地點：線上討論(MEET)



作業說明：

根據題意使用C語言完成目標

本次使用軟體：

GITHUB、VISUAL STUDIO

GITHUB

VISUAL STUDIO

題目3.17:

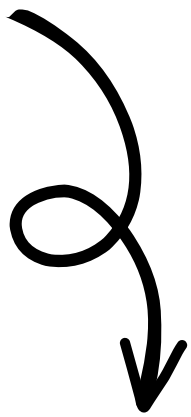
(Credit Limit Calculator) Develop a C program that will determine if a department store customer has exceeded the credit limit on a charge account. For each customer, the following facts are available:

a) Account number
b) Balance at the beginning of the month
c) Total of all items charged by this customer this month
d) Total of all credits applied to this customer's account this month
e) Allowed credit limit

The program should input each fact, calculate the new balance(=beginning balance + charges-credits),and determine whether the new balance exceeds the customer's credit limit. For those customers whose credit limit is exceeded, the program should display the customer's account number, credit limit, new balance and the message "Credit limit exceeded." Here is a sample input/output dialog:

譯:(信用額度計算器)利用程式計算餘額或是否超額

程式及結果如下頁所示(輸入-1即跳出)



```c
#include <stdio.h>
#include <stdlib.h>

int account;
float beginning_balance;
float totoal_charges;
float totoal_credits;
float credit_limit;
float new_bamance;

void main(void)
{
    account = 1;
    while (account != -1)
    {
        printf("Enter account number (-1 to end) :");
        scanf("%d", &account);
        if (account != -1)
        {
            printf("Enter beginning balance:");
            scanf("%f", &beginning_balance);
            printf("Enter totoal charges:");
            scanf("%f", &totoal_charges);
            printf("Enter totoal credits:");
            scanf("%f", &totoal_credits);
            printf("Enter credit_limit:");
            scanf("%f", &credit_limit);
            new_bamance = beginning_balance + totoal_charges - totoal_credits;
        if (new_bamance > credit_limit)
            {
                printf("Account:\t%d\n", account);
                printf("Credit limit:\t%.2f\n", credit_limit);
                printf("Balance:\t%.2f\n", new_bamance);
                printf("Credit Limit Exceed.\n");
            }
        }
        printf("\n");
    }
}
```

Microsoft Visual Studio 偵錯主控台

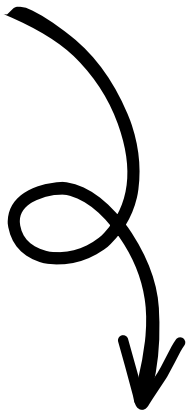
```
Enter account number (-1 to end) :100
Enter beginning balance:5394.78
Enter totoal charges:1000
Enter totoal credits:500
Enter credit_limit:5500
Account:        100
Credit limit:   5500.00
Balance:        5894.78
Credit Limit Exceed.

Enter account number (-1 to end) :200
Enter beginning balance:1000
Enter totoal charges:123.45
Enter totoal credits:321.00
Enter credit_limit:1500

Enter account number (-1 to end) :300
Enter beginning balance:500
Enter totoal charges:274.73
Enter totoal credits:100
Enter credit_limit:800

Enter account number (-1 to end) :-1
```

題目3.18:

(Sales Commission Calculator) One large chemical company pays its salespeople on a com mission basis. The salespeople receive $200 per week plus 99% of their gross sales for that week. For example, a salesperson who sells $5000 worth of chemicals in a week receives $200 plus 9% of $5000, or a total of $650. Develop a program that will input each salesperson's gross sales for last week and will calculate and display that salesperson's earnings. Process one salesperson's figures at a time. Here is a sample input/output dialog;

譯:(銷售傭金計算器)利用程式輸入銷售總額即可得到該銷售人員的薪水

程式及結果如下頁所示(輸入-1即跳出)，利用while使迴圈一直循環，再利用printf呈現結果



```c
#include<stdio.h>
#include<stdlib.h>

float sales;
float salary;

void main(void)
{
    sales = 1;
    while (sales != -1)
    {
        printf("Enter sales in dollars (-1 to end) :");
        scanf("%f", &sales);
        if (sales != -1)
        {
            salary = 200 + sales * 0.09;
            printf("Salary is : %.2f\n", salary);
        }
    }
}
```

Microsoft Visual Studio 偵錯主控台

```
Enter sales in dollars (-1 to end) :5000
Salary is : 650.00
Enter sales in dollars (-1 to end) :1234.56
Salary is : 311.11
Enter sales in dollars (-1 to end) :-1
```

題目3.19:

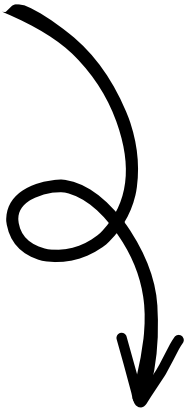
(Interest Calculator) The simple interest on a loan is calculated by the formula

interest = principal rate days / 363;

The preceding formula assumes that rate is the annual interest rate, and therefore includes the division by 365 (days). Develop a program that will input principal, rate and days for several loans, and will calc a. and display the simple interest for each loan, using the preceding formula. Here is a sample input/output dialog:

譯:(利息計算器)利用程式只要輸入貸款的本金、利率和天數，就能算出利息

程式及結果如下頁所示(輸入-1即跳出)，利用while使迴圈一直循環，透過scanf得知本金、利率和天數，再利用printf呈現結果



```c
#include<stdlib.h>
#include<stdio.h>

float loan_principal;
float interest_rate;
int loan_in_day;
float interest_charge;

void main(void)
{
    while (loan_principal != -1)
    {
        printf("Enter loan principal (-1 to end):");
        scanf("%f", &loan_principal);
        if (loan_principal != -1)
        {
            printf("Enter interest rate:");
            scanf("%f", &interest_rate);
            printf("Enter term of the loan in days:");
            scanf("%d", &loan_in_day);
            interest_charge = loan_principal * interest_rate*((float)loan_in_day / 365);
            printf("The interest charge is $%.2f\n", interest_charge);
        }
    }
}
```

Microsoft Visual Studio 偵錯主控台

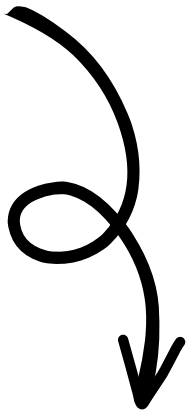
```
Enter loan principal (-1 to end):1000
Enter interest rate:.1
Enter term of the loan in days:365
The interest charge is $100.00
Enter loan principal (-1 to end):1000
Enter interest rate:.08375
Enter term of the loan in days:224
The interest charge is $51.40
Enter loan principal (-1 to end):-1
```

題目3.20:

(Salary Calculator) Develop a program that will determine the gross pay for each of several employees. The company pays "straight time" for the first 40 hours worked by each employee and pays "time-and-a-half" for all hours worked in excess of 40 hours. You're given a list of the employees of the company, the number of hours each employee worked last week and the hourly rate of each employee. Your program should input this information for each employee and should deter mine and display the employee's gross pay. Here is a sample input/output dialog:

譯:(工資計算器)利用程式計算工資，只要工時與時薪就能得到總工資

程式及結果如下頁所示(輸入-1即跳出)，利用while使迴圈一直循環，透過scanf得知工時與時薪，再利用printf呈現結果



```c
#include<stdio.h>
#include<stdlib.h>

int hours_worked;
float hourly_rate;
float salary;

void main(void)
{
    hours_worked = 1;
    while (hours_worked != -1)
    {
        printf("Enter # of hours worked (-1 to end):");
        scanf("%d", &hours_worked);
        if (hours_worked != -1)
        {
            printf("Enter hourly rate of the worker ($00.00):");
            scanf("%f", &hourly_rate);

            if (hours_worked > 40)
            {
                salary = (hours_worked * hourly_rate) + (hours_worked - 40)*(hourly_rate / 2);
                printf("Salary is $ %.2f\n", salary);
            }
            else
            {
                salary = hours_worked * hourly_rate;
                printf("Salary is $ %.2f \n", salary);
            }
        }
    }
}
```

Microsoft Visual Studio 偵錯主控台

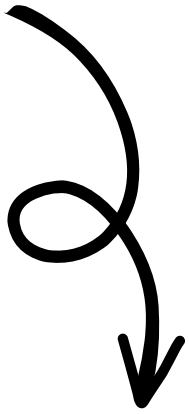
```
Enter # of hours worked (-1 to end):39
Enter hourly rate of the worker ($00.00):10.00
Salary is $ 390.00
Enter # of hours worked (-1 to end):40
Enter hourly rate of the worker ($00.00):10.00
Salary is $ 400.00
Enter # of hours worked (-1 to end):41
Enter hourly rate of the worker ($00.00):10.00
Salary is $ 415.00
Enter # of hours worked (-1 to end):-1
```

題目3.33:

(Hollow Rectangle of Plus Symbols) Modify the program you wrote in Exercise 3.32 so that it prints a hollow rectangle. For example, if your program reads a length of 3 and a breadth of 12, it should print

譯:(加號的空心矩形)利用程式呈現出矩形，可以輸入長與寬就可以得到相對應的矩形。

程式及結果如下頁所示，使用scanf得知長與寬，並利用for迴圈與printf呈現結果



```c
#include<stdlib.h>
#include<stdio.h>

int length;
int breadth;
int length_test;
int breadth_test;

void main(void)
{
    printf("請輸入長度:");
    scanf("%d", &length);
    printf("請輸入寬度:");
    scanf("%d", &breadth);

    for (length_test = 1; length_test <= length; length_test++)
    {
        if (length_test == 1 | length_test== length)
        {
            for (breadth_test = 1; breadth_test <= breadth; breadth_test++)
            {
                printf("+");
            }
        }
        else
        {
            for (breadth_test = 1; breadth_test <= breadth; breadth_test++)
            {
                if (breadth_test == 1 | breadth_test == breadth)
                {
                    printf("+");
                }
                else
                    printf(" ");
            }
        }
        printf("\n");
    }

}
```

Microsoft Visual Studio 偵錯主控台

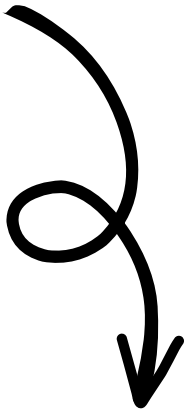
```
請輸入長度:4
請輸入寬度:7
+++++++
+     +
+     +
+++++++
```

題目4.15:

(Modified Compound-Interest Program) Modify the compound-interest program of Sec non 4.6 to repeat its steps for an investment of $5000, for 15 years, and for interest rates of 10.0%, 105% 11.0%, 11.5%, and 12.0%. Use a for loop to vary the interest rate.

譯:(複利程序)利用程式做出複利程式，投資5000美元，為期15年，利用利率10.0%、10.5%、11.0%、11.5%、12.0%來計算。

程式及結果如下頁所示，使用for循環改變利率，再利用printf呈現結果



```c
#include <stdio.h>
#include <stdlib.h>

float investment;
int years;
float rate;


void main(void)
{
    rate = 1.095;
    investment = 5000;
    for (years = 1; years < 16; years++)
    {
        if (years % 3 == 1)
        {
            rate = rate + 0.005;
            investment = investment * rate;
            if (years < 10)
            {
                printf("The  %d year = %5.f \n", years, investment);
            }
            else
            {
                printf("The %d year = %5.f \n", years, investment);
            }
        }
        else
        {
            investment = investment * rate;
            if (years < 10)
            {
                printf("The  %d year = %5.f \n", years, investment);
            }
            else
            {
                printf("The %d year = %5.f \n", years, investment);
            }
        }
    }
}
```

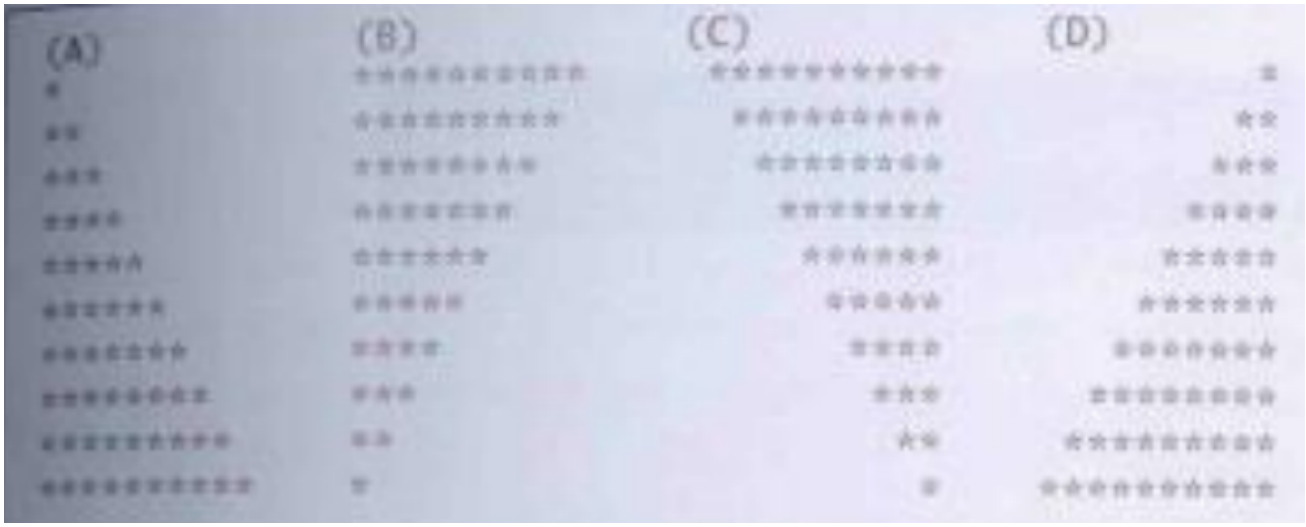
Microsoft Visual Studio 偵錯主控台

```
The  1 year =  5500
The  2 year =  6050
The  3 year =  6655
The  4 year =  7354
The  5 year =  8126
The  6 year =  8979
The  7 year =  9967
The  8 year = 11063
The  9 year = 12280
The 10 year = 13692
The 11 year = 15267
The 12 year = 17023
The 13 year = 19065
The 14 year = 21353
The 15 year = 23916
```

題目4.16:

(Triangle-Printing Program) Write a program that prints the following patterns separately, one below the other. Use for loops to generate the patterns. All asterisks (*) should be printed by a single printf statement of the form printf("%s", "*"); (this causes the asterisks to print side by side). (Hint: The last two patterns require that each line begin with an appropriate number of blanks.)

譯:(三角形打印程式)利用程式打印下列圖形



程式及結果如下頁所示，使用for循環與printf利用*生成圖形，printf形式為printf("%s","*")

```c
#include <stdio.h>
#include <stdlib.h>

int length;
int width;
int t_length;
int t_width;


void main(void)
{
    printf("(A)\n");
    t_width = 1;
    for (length = 1; length <= 10; length++)
    {
        for (width = 1; width <= 10; width++)
        {
            if (width <= t_width)
            {
                printf("%s", "*");
            }
        }
        t_width++;
        printf("\n");
    }

    printf("(B)\n");
    t_width = 10;
    for (length = 1; length <= 10; length++)
    {
        for (width = 1; width <= 10; width++)
        {
            if (width <= t_width)
            {
                printf("%s", "*");
            }
        }
        t_width--;
        printf("\n");
    }
    printf("(C)\n");
    t_width = 1;
    for (length = 1; length <= 10; length++)
    {
        for (width = 1; width <= 10; width++)
        {
            if (width < t_width)
            {
                printf("%s", " ");
            }
            else
            {
                printf("%s", "*");
            }
        }
        t_width++;
        printf("\n");
    }

    printf("(D)\n");
    t_width = 10;
    for (length = 1; length <= 10; length++)
    {
        for (width = 1; width <= 10; width++)
        {
            if (width < t_width)
            {
                printf("%s", " ");
            }
            else
            {
                printf("%s", "*");
            }
        }
        t_width--;
        printf("\n");
    }

}
```

Microsoft Visual Studio 偵錯主控台

```
(A)
*
**
***
****
*****
******
*******
********
*********
**********
(B)
**********
*********
********
*******
******
*****
****
***
**
*
```

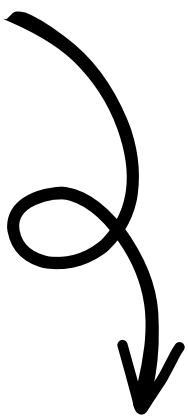
```
(C)
**********
 *********
  ********
   *******
    ******
     *****
      ****
       ***
        **
         *
(D)
         *
        **
       ***
      ****
     *****
    ******
   *******
  ********
 *********
**********
```

題目4.27:

(Pythagorean Triples) A right triangle can have sides that are all integers. The set of three integer values for the sides of a right triangle is called a Pythagorean triple. These three sides must satisfy the relationship that the sum of the squares of two of the sides is equal to the square of the hypotenuse. Find all Pythagorean triples for sidel, side2, and the hypotenuse all no larger than 500. Use a triple-nested for loop that simply tries all possibilities. This is an example of "brute-force" computing. It's not aesthetically pleasing to many people. But there are many reasons why these techniques are important. First, with computing power increasing at such a phenomenal pace, so lutions that would have taken years or even centuries of computer time to produce with the tech nology of just a few years ago can now be produced in hours, minutes or even seconds. Recent microprocessor chips can process a billion instructions per second! Second, as you'll learn in more advanced computer science courses, there are large numbers of interesting problems for which there's no known algorithmic approach other than sheer brute force. We investigate many kinds of problem-solving methodologies in this book. We'll consider many brute-force approaches to vari ous interesting problems.

譯:(勾股定理三段論)利用程式運算小於500的三邊是否能形成直角三角形

程式及結果如下頁所示



```c
#include <stdio.h>
#include <stdlib.h>

void main(void)
{
    int base;//底
    int opposite;//對
    int hypotenuse;//斜
    int t_base;//底
    int t_opposite;//對
    int t_hypotenuse;//斜

    for (base = 1; base <= 500; base++)
    {
        for (opposite = 1; opposite <= 500; opposite++)
        {
            for (hypotenuse = 1; hypotenuse <= 500; hypotenuse++)
            {
                t_base = base * base;
                t_opposite = opposite * opposite;
                t_hypotenuse = hypotenuse * hypotenuse;
                if (t_base + t_opposite == t_hypotenuse)
                {
                    printf("%6d + %6d = %6d\n", t_base, t_opposite, t_hypotenuse);
                }
            }
        }
    }

}
```

Microsoft Visual Studio 偵錯主控台

```
     9 +     16 =     25
    16 +      9 =     25
    25 +    144 =    169
    36 +     64 =    100
    49 +    576 =    625
    64 +     36 =    100
    64 +    225 =    289
    81 +    144 =    225
    81 +   1600 =   1681
   100 +    576 =    676
   121 +   3600 =   3721
   144 +     25 =    169
   144 +     81 =    225
   144 +    256 =    400
   144 +   1225 =   1369
   169 +   7056 =   7225
   196 +   2304 =   2500
   225 +     64 =    289
   225 +    400 =    625
   225 +   1296 =   1521
   225 +  12544 =  12769
   256 +    144 =    400
   256 +    900 =   1156
   256 +   3969 =   4225
   289 +  20736 =  21025
   324 +    576 =    900
   324 +   6400 =   6724
   361 +  32400 =  32761
   400 +    225 =    625
   400 +    441 =    841
   400 +   2304 =   2704
   400 +   9801 =  10201
   441 +    400 =    841
   441 +    784 =   1225
   441 +   5184 =   5625
   441 +  48400 =  48841
   484 +  14400 =  14884
   529 +  69696 =  70225
   576 +     49 =    625
```

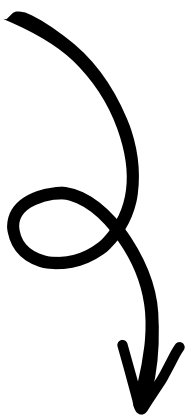
輸出過長只顯示部分結果
呈現的值全為湊成直角三角形的長度

題目4.28:

(Calculating Weekly Pay) A company pays its employees as managers (who receive a fixed weekly salary), hourly workers (who receive a fixed hourly wage for up to the first 40 hours they work and "time-and-a-half-i.e., 1.5 times their hourly wage-for overtime hours worked), com mission workers (who receive $250 plus 5.7% of their gross weekly sales), or pieceworkers (who re ceive a fixed amount of money for each of the items they produce each pieceworker in this company works on only one type of item). Write a program to compute the weekly pay for each employee. You do not know the number of employees in advance. Each type of employee has its own pay code: Managers have paycode 1, hourly workers have code 2, commission workers have code 3 and pieceworkers have code 4. Use a switch to compute each employee's pay based on that employee's paycode. Within the switch, prompt the user (i.e., the payroll clerk) to enter the appro priate facts your program needs to calculate each employee's pay based on that employee's paycode. [Note: You can input values of type double using the conversion specifier with scanf.]

譯:(計算周薪)利用程式計算員工的周薪，因為員工有許多種類，故計算周薪的方式也不同

程式及結果如下頁所示



```c
#include <stdio.h>
#include <stdlib.h>

int profession;
float hours;
float week_hours;
float hours_money;
float earns;
float earns_money;
int item;
float item_money;
float total_item_money;

void main(void)
{
    printf("請輸入您的職業 1是經理 2是小時工 3是業務員 4是計件工 請輸入數字:");
    scanf("%d", &profession);
    switch (profession)
    {
    case 1:
        printf("您周薪是16250");
        break;
    case 2:
        printf("請輸入您一天工作時數:");
        for (int i = 1; i <= 5; i++)
        {
            scanf("%f", &hours);
            if (hours > 8)
            {
                hours_money = hours_money + 168 * 8 + 262 * (hours - 8);
                week_hours = week_hours + hours;
            }
            else
            {
                hours_money = hours_money + 168 * hours;
                week_hours = week_hours + hours;
            }
        }
        if (week_hours <= 40)
        {
            printf("您周薪是:%.f", hours_money);
        }
        if (week_hours > 40)
        {
            printf("您周薪是:%.f(您已過勞)", hours_money);

        }
        break;

    case 3:
        printf("請輸入總銷售額:");
        scanf("%f", &earns);
        earns_money = 7500 + earns * 0.057;
        printf("您周薪是:%.f", earns_money);
            break;

    case 4:
        printf("請輸入一件幾元:");
        scanf("%f", &item_money);
        printf("請輸入件數:");
        for (int i = 1; i <= 5; i++)
        {
            scanf("%d", &item);
            total_item_money = total_item_money + item * item_money;
        }
        printf("您周薪是:%.f", total_item_money);
                break;
    default:
        break;
    }
}
```

```
Microsoft Visual Studio 偵錯主控台
請輸入您的職業 1是經理 2是小時工 3是業務員 4是計件工 請輸入數字:1
您周薪是16250
```

```
Microsoft Visual Studio 偵錯主控台
請輸入您的職業 1是經理 2是小時工 3是業務員 4是計件工 請輸入數字:2
請輸入您一天工作時數:8
9
7
8
8
您周薪是:6814
```

```
Microsoft Visual Studio 偵錯主控台
請輸入您的職業 1是經理 2是小時工 3是業務員 4是計件工 請輸入數字:3
請輸入總銷售額:5000
您周薪是:7785
```

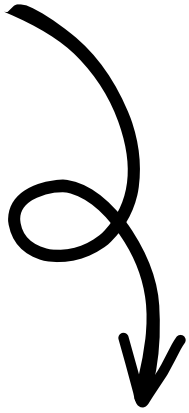
```
Microsoft Visual Studio 偵錯主控台
請輸入您的職業 1是經理 2是小時工 3是業務員 4是計件工 請輸入數字:4
請輸入一件幾元:3
請輸入件數:100
150
125
130
142
您周薪是:1941
```

題目4.31:

(Diamond-Printing Program) Write a program that prints the following diamond shape. You may use printf statements that print either a single asterisk (*) or a single blank. Maximize your use of repetition (with nested for statements) and minimize the number of printf statements.

譯:(打印鑽石程序)利用程式呈現以下圖形

程式及結果如下頁所示，使用for迴圈與printf呈現徒型，並且盡量少用printf的次數



```c
#include <stdio.h>
#include <stdlib.h>

void main(void)
{
    char    a = '*';
    char    b = ' ';
    int i;
    int j;

    int tem1;
    int tem2;

    tem1 = 4;
    tem2 = 4;
    for (i = 0; i < 4; i++)
    {
        for (j = 0; j < 9; j++)
        {
            if (j == 4 || (j >= tem1 && j <= tem2))
            {
                printf("%c", a);

            }
            else
            {
                printf("%c", b);
            }
        }
        tem1--;
        tem2++;
        printf("\n");
    }
    tem1 = 0;
    tem2 = 8;
    for (i = 4; i < 9; i++)
    {

        for (j = 0; j < 9; j++)
        {
            if (j<tem1||j> tem2)
            {
                printf("%c", b);
            }
            else
            {
                printf("%c", a);
            }
        }
        tem1++;
        tem2--;
        printf("\n");
    }
}
```

心得：

這次難度有上升，感覺本次出題重點在於迴圈的應用，如果能妥善利用迴圈同一種類的程式就能大幅減少，但相對來說用迴圈在打成事實就不是直觀的表達，因此難度也比較難

本次學習：

Github上傳、C語言基礎語法學習(for,while)

Github網址：

https://github.com/lei-geng/homework-2022-10-07

GITHUB截圖：