Lab04

Note: Please do not use array or pow function, abs function in this lab.

1. Homework Problem I

part 1.

Please write complete programs to calculate, execute and print out the results.

Please read integer x from the keyboard.

(a). S = $1^1 + 2^2 + 3^3 + \ldots + x^x$

(b). S = $\frac{1}{x} - \frac{1}{x^3} + \frac{1}{x^5} - \frac{1}{x^7} + \frac{1}{x^9} - \frac{1}{x^{11}}$ where x > 1

Only one loop in (b), nested loop is not allowed.

part2.

Write a program to approximate the value of π/4 using the formula:

$\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \ldots$

Stop when the added or subtracted term is less than 10^{-6} (1E − 06). (do not add or subtract this term)

(use While Loop)

Only one loop, nested loop is not allowed.

Sample output：

```
------Part1------
x = 8
(a). S = 17650828
(b). S = 0.123077

------Part2------
pi/4 = 0.785398
```

2. Homework Problem II

part1.

Write the program to print the following sequence of numbers and **stop when the sum of the terms exceeds 1000.**

1, 1, 2, 3, 5, 8, 13, 21, . . .

Hint:

(a).Each term is equal to the sum of the two proceeding terms. (第三項的值等於前兩項之和)

(b).可以設 3 個變數, f1, f2, f3. 且 f1, f2 的初值皆為 1

f3= f1+ f2…

part2.

Suppose you can buy a chocolate bar from the vending machine for $1 each.

Inside every chocolate bar is a **coupon**. You can redeem **seven coupons** for one chocolate bar from the machine. You would like to know how many chocolate bars you can eat, including those redeem via coupon, if you have ***n*** dollars.

For example, if you have 20 dollars then you can initially buy 20 chocolate bars. This gives you 20 coupons. You can redeem 14 coupons for **two** additional chocolate bars. This additional chocolate bars give you **two more coupons**, so you now have a total of **eight coupons**. This gives you enough to redeem for **one final chocolate bar**. **As result you have 23 chocolate bars and two leftover coupons.**

Write a program that inputs the number of dollars and outputs how many chocolate bars you can collect after spending all your money and redeeming as many coupons as possible. Also output the number of leftover coupons. The easiest way to solve this problem is use a loop.

Sample output：

```
------Part1------
1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377

------Part2------
Input the number of dollars: 56
Total chocolate bars = 65
The number of leftover coupons = 2
```

3.

part1.

Please write a complete program to print out the result. **Stop when the added or subtracted term is less than 10^{-12} (1E − 12), and print out the answer to the 10th decimal.** Please use while() to complete this program.

$$\pi = 3 + \frac{4}{2*3*4} - \frac{4}{4*5*6} + \frac{4}{6*7*8} + \cdots + (-1)^{n+1}\frac{4}{2n*(2n+1)*(2n+2)}$$

part2.

Write a program that reads integers and then outputs the maximum sum of consecutive value.

Assume that **zero marks the end of the input**.

If all of the numbers in the input are negative, the maximum sum of consecutive values is defined to be 0.

請由鍵盤輸入未知個數的正負整數(由助教當場給予)最後結束的data 為 0. 請印出 the maximum sum of consecutive value.

若 data 全是負整數，則 the maximum sum of consecutive value is defined to be 0 .

Sample output：

```
--------Problem 3--------
------Part1------
pi = 3.1415926536

------Part2------
The input is 27 6 -50 21 -3 14 16 -8 42 33 -21 9 0
Maximum sum of consecutive is : 115
```

4. Please write a program which lets user input an integer n and prints out the first n rows of Pascal's triangle.

Hint：

(a).

Row 0: $\binom{0}{0}$

Row 1: $\binom{1}{0}$ $\binom{1}{1}$

Row 2: $\binom{2}{0}$ $\binom{2}{1}$ $\binom{2}{2}$

Row 3: $\binom{3}{0}$ $\binom{3}{1}$ $\binom{3}{2}$ $\binom{3}{3}$

Row 4: $\binom{4}{0}$ $\binom{4}{1}$ $\binom{4}{2}$ $\binom{4}{3}$ $\binom{4}{4}$

Row 5: $\binom{5}{0}$ $\binom{5}{1}$ $\binom{5}{2}$ $\binom{5}{3}$ $\binom{5}{4}$ $\binom{5}{5}$

Row 6: $\binom{6}{0}$ $\binom{6}{1}$ $\binom{6}{2}$ $\binom{6}{3}$ $\binom{6}{4}$ $\binom{6}{5}$ $\binom{6}{6}$

Row 7: $\binom{7}{0}$ $\binom{7}{1}$ $\binom{7}{2}$ $\binom{7}{3}$ $\binom{7}{4}$ $\binom{7}{5}$ $\binom{7}{6}$ $\binom{7}{7}$

Row 8: $\binom{8}{0}$ $\binom{8}{1}$ $\binom{8}{2}$ $\binom{8}{3}$ $\binom{8}{4}$ $\binom{8}{5}$ $\binom{8}{6}$ $\binom{8}{7}$ $\binom{8}{8}$

Row 9: $\binom{9}{0}$ $\binom{9}{1}$ $\binom{9}{2}$ $\binom{9}{3}$ $\binom{9}{4}$ $\binom{9}{5}$ $\binom{9}{6}$ $\binom{9}{7}$ $\binom{9}{8}$ $\binom{9}{9}$

Row 10: $\binom{10}{0}$ $\binom{10}{1}$ $\binom{10}{2}$ $\binom{10}{3}$ $\binom{10}{4}$ $\binom{10}{5}$ $\binom{10}{6}$ $\binom{10}{7}$ $\binom{10}{8}$ $\binom{10}{9}$ $\binom{10}{10}$

(b). 二項式定理

Sample output：

```
Input an integer n：10
                                    1
                                 1     1
                              1     2     1
                           1     3     3     1
                        1     4     6     4     1
                     1     5    10    10     5     1
                  1     6    15    20    15     6     1
               1     7    21    35    35    21     7     1
            1     8    28    56    70    56    28     8     1
         1     9    36    84   126   126    84    36     9     1
```