LAB 10/15

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

1. Homework problem

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

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

Stop when the added or subtracted term is less than 10^{-6} (1E－06).

(use While Loop)

Only one loop, nested loop is not allowed.

(B) **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 …

Example:

```
----part A----
pi/4 = 0.785398
----part B----
sum = 1596
```

2. Homework problem

(A) 請寫出完整程式以計算或執行並印出結果:

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

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

(B) 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.

Example :

```
----part A(a)----
input integer x:8
S1 = 17650828
----part A(b)----
S2 = 0.123077
----part B----
How many dollars do you have?34
you can buy 39 bars
4 coupons remains
```

3.

(A) 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.

Example:

The input is 27 6 －50 21 －3 14 16 －8 42 33 －21 9 0

the output is 115 (sum of the 21 －3 14 16 －8 42 33)

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

(B) Please write a program to estimate and print the integer part of $\log_n x$, where n and x are read from the keyboard. Please use only one while() to complete this program.

For example:

n=2 x=10 ➔ log2(10)=3
n=3 x=1024 ➔ log3(1024)=6

Hint: use while loop to find n such that $n^k \le x < n^{k+1}$.

Example :

```
----part A----
input numbers : 27 6 -50 21 -3 14 16 -8 42 33 -21 9 0
maximum sum of consecutive is : 115
----part B----
input x and n :2 100
log2(100) = 6
```

4. **Please write a program to estimate and print out the first n rows of Leibniz triangle, where n is read from the keyboard.**
   L(r, 1) = 1/r and L(r, c) = L(r - 1, c - 1) − L(r, c - 1) where r is the number of the row, starting from 1, and c is the column number, never more than r.
   You can compute each term by $\mathbf{L(r,c) = \frac{1}{r \times \binom{r-1}{c-1}}}$.

$$
\begin{array}{ccccccccccccccccccc}
 & & & & & & & 1 & & & & & & & & & & & \\
 & & & & & & \frac{1}{2} & & \frac{1}{2} & & & & & & & & & & \\
 & & & & & \frac{1}{3} & & \frac{1}{6} & & \frac{1}{3} & & & & & & & & & \\
 & & & & \frac{1}{4} & & \frac{1}{12} & & \frac{1}{12} & & \frac{1}{4} & & & & & & & & \\
 & & & \frac{1}{5} & & \frac{1}{20} & & \frac{1}{30} & & \frac{1}{20} & & \frac{1}{5} & & & & & & & \\
 & & \frac{1}{6} & & \frac{1}{30} & & \frac{1}{60} & & \frac{1}{60} & & \frac{1}{30} & & \frac{1}{6} & & & & & & \\
 & \frac{1}{7} & & \frac{1}{42} & & \frac{1}{105} & & \frac{1}{140} & & \frac{1}{105} & & \frac{1}{42} & & \frac{1}{7} & & & & & \\
\frac{1}{8} & & \frac{1}{56} & & \frac{1}{168} & & \frac{1}{280} & & \frac{1}{280} & & \frac{1}{168} & & \frac{1}{56} & & \frac{1}{8} & & & & \\
 & & \vdots & & & & & \vdots & & & & & \vdots & & & & & & \\
\end{array}
$$

Example:

```
n = 9
                    1
                    1
                1   1
                2   2
            1   1   1
            3   6   3
        1   1   1   1
        4  12  12   4
    1   1   1   1   1
    5  20  30  20   5
1   1   1   1   1   1
6  30  60  60  30   6
    1   1   1   1   1   1   1
    7  42 105 140 105  42   7
1   1   1   1   1   1   1   1
8  56 168 280 280 168  56   8
    1   1   1   1   1   1   1   1
    9  72 252 504 630 504 252  72   9
```