2024 NCKU Program Design I Homework 3

> 請不要嘗試攻擊 Judge 系統，否則此堂課將不予以通過
>
> Don't attack judge system otherwise you will fail this course.
>
> 一旦發現作業抄襲或是請人代寫之情形，學期作業成績將 "全部" 以 0 分計算
>
> One instances of severe plagiarism, hiring someone to write assignments, or similar activities are detected, the semester's assignment scores will be calculated as 0 point across the board.

> 對於作業有任何問題可以直接寄信到 f74114744@gs.ncku.edu.tw (mailto:f74114744@gs.ncku.edu.tw)，如果是其他課程上的問題需要處理請利用全體助教信箱 c2024@mail.csie.ncku.edu.tw (mailto:c2024@mail.csie.ncku.edu.tw)
>
> If you have any question about this homework tasks (ex. problem description), please feel free to contact me (資訊 115 陳俊安, f74114744@gs.ncku.edu.tw (mailto:f74114744@gs.ncku.edu.tw)).
>
> Otherwise, the common problem of this homework please send to TAs mail (c2024@mail.csie.ncku.edu.tw (mailto:c2024@mail.csie.ncku.edu.tw))

Homework 3 Information

Deadline: 10/30 23:59:59

> 不接受遲交
>
> Late submissions are not accepted.

Before you start

- Make sure you can login the server by your personal account.

Goals

- if/else statement
- while/for loops
- Expression

Submission

- Server IP: `140.116.246.48` , Port: `2024`

```
ssh 學號@140.116.246.48 -p 2024
```

- Login the system by your personal account. (Use the ssh command)
- Create an directory with name "HW3" in your home directory.
  - You can use the "pwd" command to confirm your current directory.
  - The "mkdir [name]" command can create a directory with the name [name]
- In HW3 directory, you need to create 8 files with name "pA.c", "pB.c", "pC.c", "pD.c", "pE.c", "pF.c", "pG.c" and "pH.c" respectively.
- You can directly use the command `hw3` to check whether the result of each question is correct.

> The command is not available at the moment. We will update it as soon as possible.

> 2024/10/17 早上 5:09 更新: 輸出請記得換行
> 2024/10/17 早上 5:09 更新: 測試腳本我們會盡快釋出

Tasks

Problem A. Sumikko Gurashi and Candy (pA.c) - 10%

The **Fried Shrimp** from **Sumikko Gurashi** loves eating candy. Your service-study (服務學習課) task is to distribute candy to all the Fried Shrimps.

You are given a total of `N` Fried Shrimps, and they are arranged from left to right (numbered consecutively from `1` to `N`). You are also given `C` candies to distribute to these Fried Shrimps. The distribution starts from the leftmost shrimp, and each shrimp receives one candy in sequence from left to right. After the rightmost shrimp receives a candy, if there are still candies remaining, you continue distributing in reverse order, from right to left, with each shrimp again receiving one candy. If there are still candies left after that, you start again from the left, repeating the process of distributing from left to right and then from right to left, and so on.

We want to know how many candies the shrimp with the number `K` will receive in total. Please write a program to help calculate this.

Input Format

```
N C K
```

- $1 \leq N, C, K \leq 100$

> This means that the test data we provide guarantees that these three numbers will not exceed 100, so you don't need to write a separate if statement to check for this.

Sample Input 1

```
5 3 2
```

Sample Output 1

```
1
```

Sample Input 2

```
5 3 4
```

Sample Output 2

```
0
```

Sample Input 3

```
5 6 5
```

Sample Output 3

```
2
```

> The sixth candy will come from the fried shrimp on the far right.

Problem B. Sumikko Gurashi and Three Numbers (pB.c) - 10%

"Is 'miss' thinking of someone or losing something?" In this case, it means losing.

miss 是想念還是失去？在這裡，指的是失去。

Fried Shrimp has another question for you! At first, he had three very special positive integers, which were all between $1 \sim 3$. However, since Fried Shrimp is a very forgetful shrimp, one day he accidentally lost some of these numbers.

Since you helped Fried Shrimp distribute candies last time, he feels that you are a very reliable person. Therefore, he has a new task for you now.

It is known that Fried Shrimp has three numbers, but these three numbers do not necessarily include all the numbers between $1 \sim 3$. Your task is to find out which numbers are missing.

If Fried Shrimp didn’t lose any numbers, output "Oh, Fried Shrimp, you're amazing!"

> If any numbers are missing, please output them in ascending (遞增) order.

Input Format

```
a b c
```

- $1 \leq a, b, c \leq 10$

Sample Input 1

```
1 2 3
```

Sample Output 1

```
Oh, Fried Shrimp, you're amazing!
```

Sample Input 2

```
3 2 4
```

Sample Output 2

```
1
```

Sample Input 3

```
2 2 1
```

Sample Output 3

```
3
```

Sample Input 4

```
4 9 10
```

Sample Output 4

```
1 2 3
```

Problem C. Sumikko Gurashi and Lottery Ticket (pC.c) - 10%

Penguin recently bought a lottery ticket, and there are three positive integers a, b, c on this ticket.

To win a prize, you need to satisfy one of the following conditions:

- $a < b$
- $a + b < c$
- $a = c$
- $a = b = c$

For each of these conditions, you can win different amounts: 50, 150, 100, or 300, respectively (up to down).

> the winnings can be accumulated.

Please design a program to output how much money penguin can win.

▼ **Hint (if you have no idea)**

```
Use variables wisely to record the answers.
```

Input Format

```
a-b-c
```

- $1 \leq a, b, c \leq 100$
- a, b, c are all positive integers.

Sample Input 1

```
10-10-10
```

Sample Output 1

```
400
```

Sample Input 2

```
10-20-10
```

Sample Output 2

```
150
```

Sample Input 3

```
2-2-3
```

Sample Output 3

```
0
```

Problem D. Sumikko Gurashi and Reversing Numbers (pD.c) - 10%

Fried Pork Cutlet loves reversing numbers.

Please design a program that outputs a number in reverse order (any leading zeros must be removed).

Input Format

```
N
```

- $1 \leq N \leq 10^9$

Sample Input 1

```
1234
```

Sample Output 1

```
4321
```

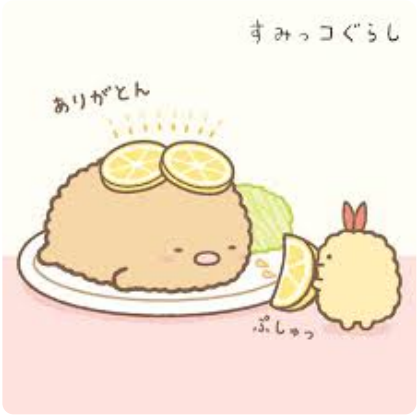
Sample Input 2

```
1000000000
```

Sample Output 2

```
1
```

Problem E. Sumikko Gurashi and Reversing Numbers Again! (pE.c) - 10%



Fried Pork Cutlet is not satisfied with your reversed number result, so the problem has changed:

Given two positive integers a and b, please design a program that appends b to the reversed a.

Input Format

```
a b
```

- $1 \leq a, b < 10000$

Sample Input 1

```
1234 5678
```

Sample Output 1

```
56784321
```

Sample Input 2

```
1000 1234
```

Sample Output 2

```
12340001
```

Problem F. Sumikko Gurashi and Soy Sauce (pF.c) - 15%

Due to Fried Pork asking too many questions, he got fried.
由於炸豬排的問題太多，所以他被炸了

Now, you can eat Fried Pork, but before eating, you want to pour some soy sauce on him.

Each time you pour soy sauce, Fried Pork's magical index increases by k, and when the total magical index exceeds m, Fried Pork will become super delicious!

Please design a program that continuously inputs k until the magical index exceeds m. Once this happens, prompt the user that Fried Pork is now delicious and output the total number of times soy sauce was poured.

Input Format

```
m
k
k
k
k
...
```

- $1 \leq k, m \leq 10^5$

> It is possible that the input file may continue providing values even after the magical index has already exceeded m. In this case, you must forcibly terminate the input process.
>
> Additionally, we guarantee that the sum of all numbers will definitely exceed m

Sample Input 1

```
20
1
1
18
2
10
1234
242
121
```

Sample Output 1

```
Fried Pork!!!!
4
```

Problem G. Sumikko Gurashi and Overflow Checking (pG.c) - 15%

Dinosaur has written a program that can calculate the result of adding two numbers. Here is the code:

```c
#include <stdio.h>

int main()
{
    long long a,b;
    scanf("%lld%lld",&a,&b);
    printf("%lld\n",a+b);

    return 0;
}
```

Design a program to determine if there will be an overflow issue when the values of a and b, both integers, while considering that the storage range for the 'long long' data type is from -9223372036854775808 to 9223372036854775807.

If an overflow issue will occur, output 'Yes'; otherwise, output 'No'.

> If the value of $a+b$ falls outside the range of 'long long,' it indicates an overflow.

Hint 1

You might want to first check whether both a and b have the same sign, as assuming one is positive and the other is negative within this range will definitely not lead to an overflow issue

Hint 2

Use operators to determine how far the result is from overflowing, and then check if the number to be added exceeds that value.

Input Format

- Ensure that both a and b are within the range of the `long long` data type.

> Note that a and b could be negative.

```
a b
```

Sample Input 1

```
1 2
```

Sample Output 1

```
No
```

Sample Input 2

```
-9223372036854775807 -545454541
```

Sample Output 2

```
Yes
```

Problem H. Sumikko Gurashi and Final Problem (pH.c) - 20%

The dinosaur wants you to design a program to calculate the result of adding two numbers together.

> This problem only asks you to output the sum of two numbers, which seems very simple. However, due to some clever design elements, it has become quite challenging. Therefore, many hints are provided. If you're really stuck, it's recommended to follow the steps in the hints to think through the problem.
>
> 這題只是要你把兩個數字相加後輸出，看似非常簡單，但實際上因為設計了一些小巧思變的非常困難，所以給了很多提示，如果真的想不到建議跟著提示的步驟思考。

Input Format

- Ensure that both a and b are within the range of the `long long` data type.

> Note that a and b could be negative.

▼ Hint 1

對於一正一負的 Case，long long 就能搞定

那麼對於兩個都是正數的 Case 呢?

For the case where one number is positive and the other is negative, using long long can handle it.

So what about the case where both numbers are positive?

▼ Hint 2

unsgined long long 型態的範圍介於 0 到 18,446,744,073,709,551,615

The range of the unsigned long long type is between 0 and 18,446,744,073,709,551,615.

▼ Hint 3

但是如果兩個都是負數呢？unsigned long long 無法處理

那就轉成正數相加，輸出的時候負號自己補上就好!

But what if both numbers are negative? unsigned long long cannot handle it.

In that case, just convert them to positive numbers for addition, and then add the negative sign yourself when outputting!

▼ Hint 4

可是最糟糕的情況 unsigned long long 也裝不下... 是哪一個 Case 呢？他的答案會是多少？超出多少範圍呢?

But in the worst-case scenario, even unsigned long long can't hold it... What is that case? What would its result be? And by how much does it exceed the range?

▼ Hint 5

只有這個 Case (-9223372036854775808 -9223372036854775808) 有問題，那就特別用 if 來判定，並輸出正確答案

Only this specific case (-9223372036854775808 -9223372036854775808) has a problem, so use an if statement to handle it specially and output the correct result.

Sample Input 1

```
10 20
```

Sample Output 1

```
30
```

Sample Input 2

```
-9223372036854775808 -9223372036854775808
```

Sample Output 2

```
-18446744073709551616
```