

# Problem Set 3

1. Fibonacci numbers are given by

- $f(n) = f(n-1) + f(n-2)$

with  $f(0) = 0$  &  $f(1) = 1$ .

first number of series ----- 0 1 1 2 3 5 8 13

Now let's have a new series called "Fibonacci Twist" which is given by

- $ft(n) = ft(n-1) + ft(n-2) + (n-1)$

with  $ft(0) = 0$  &  $ft(1) = 1$ .

with first few number in the series ----- 0 1 2 5 10 19 34 59

Now your task is to find  $ft(n)$ .

Since the number can be Big you have to find the result mod M.

## Input

first line having single number 't' -- number of test cases.

next t lines have 2 number each 'n' and 'M'

## Output

Single number given the n-th term mod M

## Example

### Input:

3  
5 20  
10 77  
15 111

### Output:

19  
45  
69

## Constraints

- $10 \leq t \leq 100$
- $0 \leq n \leq 10^9$
- $100 \leq M \leq 10^9$

## Explanation

1.  $ft(5)$  is 19.  $19 \% 20 = 19$

2.  $ft(10)$  is 276.  $276 \% 77 = 45$
3.  $ft(15)$  is 3177.  $3177 \% 111 = 69$

2.

The aliens have arrived to Earth and everything is in harmony, the two races can live together. However, one specific Female Alien does not want to see humans on her way to the university, the alien must use the train as every human does. But she can choose any train station such she doesn't see more than B humans, however, the Alien wants to go as far as possible with the train. Please, help her in this task.

### **Input**

You will receive one integer T denoting the number of test cases, then, the next line will contain two integers At Bt where At and Bt is the number of stations in the train ( $1 \leq At \leq 100,000$ ) and the number of people that the alien wants to see as maximum ( $1 \leq Bt \leq 10,000,000$ ), after that, one line containing At integers separated by a single space will denote the number of people the Alien can find in the At-i-th station. (For each station there will be as much 100 people)

### **Output**

Your output should consist on T pair of numbers denoting the number of people the alien will see and the number of stations she will pass respectively.

### **Example**

#### **INPUT:**

```
1
5 100
20 15 30 80 100
```

#### **OUTPUT**

```
65 3
```

#### **Output note:**

The alien takes the train at station 1 (with 20 people) and goes to station 2, then the 3rd station, at this point, she has seen 65 people, if she decides to go to station 4 she will see 145 people... Then she exits the station.

The alien, however, can start at station 2 with 15 people, then continue up to the 4th station, then, she would have seen 125 people, but, as she wants to see the minimum people possible and this number of people exceeds what she wants to see, she decides to choose the way from the 1st to the 3rd station.

**Clarification:** The alien will be moving always forward (remember, she can choose any station as a start), NEVER backwards, and you should choose the best path that satisfies the output specification.

3.

John is moving to a different city and he wants to use all his perishable food before doing it, to avoid wasting. Luckily all he has now is eggs, flour, sugar and milk, so he is going to make his famous cakes and give them to his friends as a goodbye gift. John only knows how to make an entire cake and not half a cake, a third of a cake, or any other portion. So, he will buy whatever is needed of each ingredient so that he can make an integer number of cakes and have nothing left. Of course, he wants to spend as little money as possible. You must help John to decide how much he should buy of each ingredient.

### **Input**

The input contains several test cases. Each test case is described in a single line that contains eight integers E, F, S, M, E', F', S' and M' separated by single spaces. Values E and E' are numbers of eggs, F and F' are grams of flour, S and S' are grams of sugar, and M and M' are centiliters of milk. For each ingredient, X is the amount John has ( $0 \leq X \leq 1000$ ), while X' is the amount needed to make a single cake ( $1 \leq X' \leq 1000$ ). The last line of the input contains the number -1 eight times separated by single spaces and should not be processed as a test case.

### **Output**

For each test case output a single line with four non-negative integers separated by single spaces, representing the amount of each ingredient John needs to buy, in the same order and units as the input.

### **Example**

#### **Input:**

```
2 3 4 5 1 1 1 1  
3 6 9 0 1 2 3 4  
-1 -1 -1 -1 -1 -1 -1 -1
```

#### **Output:**

```
3 2 1 0  
0 0 0 12
```

4.

Peter wants to generate some prime numbers for his cryptosystem. Help him! Your task is to generate all prime numbers between two given numbers!

## **Input**

The input begins with the number  $t$  of test cases in a single line ( $t \leq 10$ ). In each of the next  $t$  lines there are two numbers  $m$  and  $n$  ( $1 \leq m \leq n \leq 1000000000$ ,  $n-m \leq 100000$ ) separated by a space.

## **Output**

For every test case print all prime numbers  $p$  such that  $m \leq p \leq n$ , one number per line, test cases separated by an empty line.

## **Example**

### **Input:**

```
2
1 10
3 5
```

### **Output:**

```
2
3
5
7

3
5
```

Note: If you want to try them submitting on OJ, ping me to get the links of the problem