Week 7 Homework

Computer Programming Lab

2020/10/27

Remind

- 抄襲一律 0 分 （包含被抄襲者）

- 繳交期限: 11/01(Sun.) 11:59 p.m.

- 繳交的檔案格式、名稱請符合以下規定

  - 請繳交 zip檔至 Ceiba作業區，名稱為 <student_id>.zip

  - 解壓縮後須符合格式、名稱

  - e.g. b12345678.zip

- 必須完成 Demo 才可以提早離開

- 若沒有完成 Demo 就中途早退，視同缺席

Problem 1 - Recurrence relation (0.25%)

Description

In mathematics, a recurrence relation is an equation that recursively defines a sequence.

Once one or more initial terms are given, each further term of the sequence is defined as a function of the preceding terms.

For this particular assignment, you are asked to implement a program that outputs the i-th term of the given sequence which has a form of :

$$x_n = ax_{n-1} + bx_{n-2} + c, \quad \forall a, b, c \in \mathbb{Z}, \forall n \geq 2$$

Requirement : Please use recursion to solve this problem. All other methods will NOT pass TA's demo, you bet.

Problem 1 - Recurrence relation (0.25%)

Input

Three integers representing coefficient a,b,c

Two more integers representing two initial terms (namely x_0 & x_1)

One last integer representing which term in the sequence to output (namely "n" in x_n)

Output

The correct answer for x_n

Problem 1 - Recurrence relation (0.25%)

Sample Input

```
1 1 1
0 1
5
```

Plain Text ⌄

Sample Output

```
12
```

Plain Text ⌄

File name

{Student_ID}_1.cpp

Problem 2 - Recurrence relation (cont.) (0.25%)

Description

Following the above description, we will introduce another common type of recurrence relation.

We'll call it a "spiral" recurrence relation, which is simply two intertwining regular recurrence relation.

For this assignment, you are asked to implement a program that evaluates a spiral recurrence relation of the form :

$$x_n = ax_{n-1} + by_{n-1} + cn$$
$$y_n = d(e - y_{n-1}) + fx_{n-1}$$

Requirement : Please use recursion to solve this problem. All other methods will NOT pass TA's demo, you bet.

Input

Six integers representing coefficient a,b,c,d,e,f

Two more integers representing two initial terms (namely x_0 & y_0)

Two more integers representing which terms in the both respective sequence to output (i, j for x_i & y_j)

Output

The correct answer for x_i and y_j separated by a single space

Problem 2 - Recurrence relation (cont.) (0.25%)

Sample Input

```
1 1 1 1 1 1
1 2
5 6
```

Plain Text ⌄

Sample Output

```
38 31
```

Plain Text ⌄

File name

{Student_ID}_2.cpp

Problem 3 - Money change (1%)

Description

Given an amount of money N, if we want to make a change, and we have infinite numbers of each element in an array of currency values of coins, how many ways can we make the change?

Requirement : Please use recursion to solve this problem. All other methods will NOT pass TA's demo.

Input

The first line is the number m of currency values of coins in the array, and it will not be greater than 10.

The second line will be the amount of money, as N above in the description.

The next m lines will be the currency values. They will be given from smallest to largest.

All of the numbers in the input are integers.

Problem 3 - Money change (1%)

Output

You should output all the possible combinations from largest to smallest. For every possible combinations, compare the first element. If there are some elements which are the same, compare the second elements, and so on.
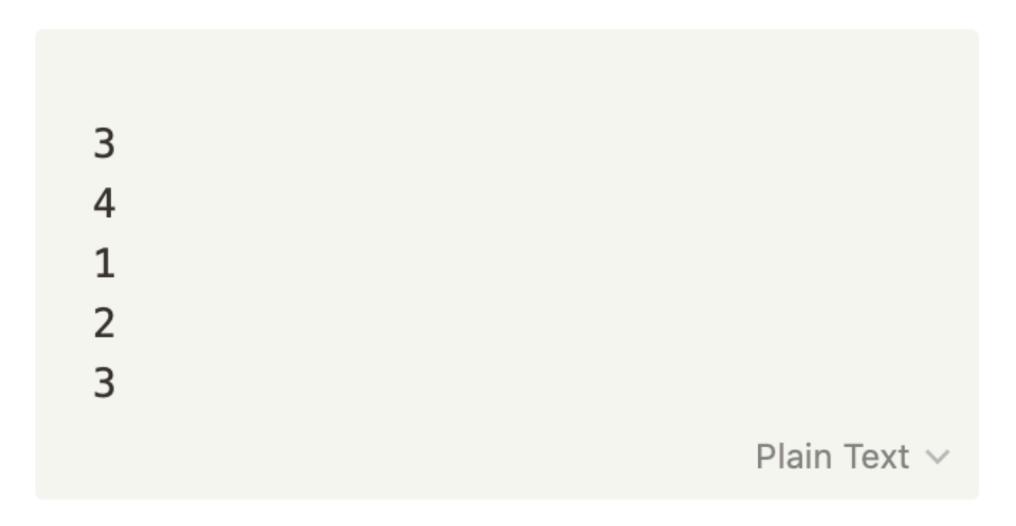
Each line is a possible combination, and all the numbers are separated by a white space. You should also output them from largest to smallest.

The last line should be the total number of possible combinations.

All of the numbers in the output should be integers.

Problem 3 - Money change (1%)

Sample Input

```
3
4
1
2
3
```

Plain Text ∨

Sample Output

```
3 1
2 2
2 1 1
1 1 1 1
4
```

Plain Text ∨

File name

{Student_ID}_3.cpp

Problem 4 - Permutation (1.5%)

Description

For this problem, you have to write a program which output all the permutations of the integers from 1 to N. The permutations should be output in lexicographical order.

Requirement : Please use recursion to solve this problem. All other methods will NOT pass TA's demo.

Input

An integer denotes $N(\leq 100)$.

Output

All the permutations of the integers from 1 to N in lexicographically order.

The numbers in a permutation should be separated by a whitespace and the permutations should be separated by a newline.

Problem 4 - Permutation (1.5%)

Sample Input

```
4
```

Plain Text ⌄

Sample Output

```
1 2 3 4
1 2 4 3
1 3 2 4
1 3 4 2
1 4 2 3
1 4 3 2
2 1 3 4
2 1 4 3
2 3 1 4
2 3 4 1
2 4 1 3
2 4 3 1
3 1 2 4
3 1 4 2
3 2 1 4
3 2 4 1
3 4 1 2
3 4 2 1
4 1 2 3
4 1 3 2
4 2 1 3
4 2 3 1
4 3 1 2
4 3 2 1
```

Plain Text ⌄

File name

{Student_ID}_4.cpp