2020（ICPC）江西省大学生程序设计竞赛正式赛题目

1. A Simple Math Problem

Timelimit: 1000MS Memorylimit: 64M

Problem Description:

Huanhuan challenges you to a simple math problem.

Define $F(x)$ as the sum of the decimal digits of x.

For example: $F(123) = 1 + 2 + 3 = 6$, $F(700) = 7 + 0 + 0 = 7$.

Huanhuan wants you to calculate the sum of $F(j)$ for every i, j that satisfy $1 \le j \le i \le n$ and i, j are coprime.

More formally, calculate $\sum_{i=1}^{n} \sum_{j=1}^{i} [gcd(j, i) = 1] F(j)$.

Input requirements:

There are only one test case with a single integer $n (1 \le n \le 10^5)$.

Output requirements:

Print one integer, the answer of $\sum_{i=1}^{n} \sum_{j=1}^{i} [gcd(j, i) = 1] F(j)$.

Sample input:

3

Sample output:

5

2. Apple

Timelimit: 1000MS Memorylimit: 64M

Problem Description:

There are a box of apples, which contains N apples. You're going to give them to M person. It is required that everyone must be given a positive integer apple, and no one must have the same amount. If it can be done, output "possible"; otherwise output "impossible".

Input requirements:

The first line contains a positive integer T（1≤T≤5）- the number of test cases.
In each of the following T lines there are two positive integers N,M.(1 ≤N≤1000000， 1 ≤M≤1000).

Output requirements:

For each test case output a line. If it can be done, output "possible"; otherwise output "impossible".

Sample input:

```
3
9 3
12 1
9 4
```

Sample output:

```
possible
possible
impossible
```

3. Charging

Timelimit: 1000MS Memorylimit: 64M

Problem Description:

Xxy is the king of the universe. In order to resist the invasion, he ordered the construction of many space warships. Now, he wants to charge his space ships.

He has N space ships.The N ships are numbered from 1 to N and lined up in order.

Xxy has M charging plans.The i-th plan is describe by two positive integers li,ri.It means in this plan, he will charge the ships numbered from li to ri.

Xxy will choose some of these plan.If he totally choose tot plans,x is the number of ships that charged in every plans. Xxy want to maximize the value of min(tot,x).

Input requirements:

The first line contains two positive integers N and M (N,M≤300000).

The next M lines, each containing two positive integers li and ri.(li≤ri)

Output requirements:

The output contains a positive integer. The maximal value of min(tot,x).

Sample input:

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

Sample output:

```
2
```

4. Chinese Valentine's Vay

Timelimit: 1000MS Memorylimit: 64M

Problem Description:

Recently, God Liu has been so absorbed in the Pac-Man game that he has even neglected his young fans.So before Chinese valentine's day，in order to have time for him to accompany the girls, while God Liu went to the bathroom, Lao Zhao hid his computer, and told him that computer had been hidden near the date place.But Lao Zhao can't tell him where the computer has been hidden.

Lao Zhao tell God Liu n numbers, the answer is the sum of all the numbers that have appeared in n numbers(mod 9982443553).For example, in 123 there are 1,2,3,12,23,123。

Gao Liu are so excited,he decides to pick up the computer after the date night.But he is too busy,sou he ask you to help him。Do you know the answer?

Input requirements:

In the first line there is an positive integer N, which means there are N numbers.

The next N line, each line is contains one number.

The digit sum of all numbers does not exceed 1000000.

Output requirements:

One integer after mod 9982443553.(An occurrence in a number is defined as the number of substrings, and repeated occurrences are counted only once)

Sample input:

```
3
1
12
123
```

Sample output:

```
164
```

Hint:

Of all the numbers that have ever appeared 1,2,3,12,23,123, so the sum is 164.

5. Color Sequences

Timelimit: 1000MS Memorylimit: 64M

Problem Description:

You are given a integer sequence c of length n, c_i denotes the i^{th} color in the sequence c.
We define a color sequence is legal only if it merely contains colors that appear even number of times.
For example, sequence $\{0,1,0,1\}$ is legal because both color 1 and 0 appear 2 times, and 2 is an even number. And sequence $\{0,1,0\}$ is illegal because color 1 only appear 1 time, and 1 is not an even number.
Now, you need to figure out how many consecutive subsequence of c that is a legal color sequence.

Input requirements:

The first line contains one integer $n(1 \le n \le 10^6)$, the length of the sequence c.
The second line contains n integer, the i^{th} integer denotes the i^{th} color, $c_i(0 \le c_i \le 20)$.

Output requirements:

Print one integer as the answer.

Sample input:

```
3
1 1 1
```

Sample output:

```
2
```

6. Magical Number

Timelimit: 1000MS Memorylimit: 64M

Problem Description:

We consider a natural number p with k digits,$\overline{a_1a_2..a_k}$, is magical only when it satisfies:
Every number composed by leading digits of p can be divisible by the number of its digits.
More formally, $\forall i \in [1,k]$，$i|\overline{a_1a_2..a_i}$。
For example, 123 is magical, because $1|1$, $2|12$, $3|123$。
However，124 is not magical, because $3 \nmid 124$。
Every digit can be composed with match sticks in the following ways.

What is the largest posible magical number you can compose with exactly n match sticks?

Input requirements:

The input contains a integer $n(1 \le n \le 10^{100})$, the number of match sticks you have .
Output requirements:
Print the largest posible magical number x that can be possibly composed with exactly n match sticks.
If the number doesn't exist, print -1.

Sample input1:

3

Sample output1:

7

Sample input2:

7

Sample output2:

74

Sample input3:

10000

Sample output3:

-1

7. Mathematical Practice

Timelimit: 1000MS Memorylimit: 64M

Problem Description:

Kamishirasawa Keine always says, "If you don't know what to do, why not give mathematical practice a try."
However, Cirno is way too much talented to work on simple problems. Therefore, you are now tasked to crack one.
We consider one operation on a set S as selecting m subsets of S in order (You can select the same subset multiple times and the selected subset can be empty).
Now you need to figure out how many possible operations that the m selected subsets are pairwise disjoint.
As the answer may get very large, you need to print the answer after modulo 998244353.

Input requirements:

The input contains one line with two integers n and $m(1 \leq n, m \leq 10^9)$, where n is the size of set S and m is the number of subsets to be selected in one operation.

Output requirements:

Print one integer, the number of possible operations above after modulo 998244353.

Sample input1:

3 2

Sample output1:

27

Sample input2:

1000 25

Sample output2:

605425003

8. Sequence

Timelimit: 1000MS Memorylimit: 64M

Problem Description:

Given an array a consisting of n integers, on which you are to perform m operations of two types.
Given two integers x, y, replace the number of index x with number y. That is $a_x := y$.
Given one integer x, print the number of consecutive subsequences of a, whose minimum value equals to a_x.
It's guaranteed that there are no duplicated value in array a at any moment.

Input requirements:

The first line contains two intergers $n, m(1 \le n, m \le 10^5)$, where n is the size of the array and m is the number of operations to perform.
The second line contains n integer, the i^{th} integer is $a_i(1 \le a_i \le 2^{31} - 1)$.
Then, m lines follow, describing m operation you are to perform in order.
Each line start with an integer $opt \in [1,2]$, meaning the type of operation to perform.
If $opt = 1$, two integers $x, y(1 \le x \le n, 1 \le y \le 2^{31} - 1)$ follows, mentioned above.
If $opt = 2$, one integer $x(1 \le x \le n)$ follows, mentioned above.

Output requirements:

For each operation of type 2, print one integer on one line as the answer.

Sample input:

```
10 5
8 3 6 2 10 9 5 7 1 4
2 2
1 9 11
1 5 12
2 4
1 8 18
```

Sample output:

```
4
28
```

9. Simple Math Problem

Timelimit: 1000MS Memorylimit: 64M

Problem Description:

Tongtong is playing math game again. She had come across this square matrix many times,so needless to say, she knows what you want to ask. Now she throws this question to you. You need to look at the following square matrix,then she will give yout hree integers n,x,and y,that means there are an n×n square matrix.

You need to figure out what the value of row x, column y corresponds to.

For example,there are one 5×5 square matrix:

0	1	3	6	A
2	4	7	B	F
5	8	C	10	13
9	D	11	14	16
E	12	15	17	18

Input requirements:

Only a single line contains three integers n,x,y (0≤x≤1000000000, 0≤y≤1000000000, 1≤n≤1000000001)

Output requirements:

A single line with an integer representing the corresponding value.

Sample input:

5 2 2

Sample output:

12

10. Split Game

Timelimit: 1000MS Memorylimit: 64M

Problem Description:

Alice and Bob like to cut paper, but they only have one piece of new paper. Both of them want to use this one, but no one wants to split the new paper. Therefore, Alice and Bob decide to fight...in a game.
Alice find an old rectangular paper that consists of N*M grids. Two players take turns and Alice goes first. In each round of action, the player chooses a piece of paper and splits it horizontally or vertically along the grid line. If one player splits out a piece of paper with a single grid, he or she will lose the game. Alice and Bob are smart, and both of them want to win the game. Now you know the size of paper, please predict who will win.

Input requirements:

Each line contains two integer numbers N and M, Process to end of file. (1<=N, M<=150, N*M>1)

Output requirements:

For each case, output the name of the winner.

Sample input:

1 2
1 6
4 3
3 5

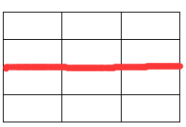
Sample output:

Bob
Alice
Alice
Bob

Hint:

In test case 1: No matter how Alice operates, she will cut out a 1*1 piece of paper.
In test case 2: Alice split the paper along the vertical line between grid (1,3) and grid (1,4) at her first turn.

In test case 3: At first, Alice split the paper along the horizontal line between grid (2,1) and grid (3,1), then there are two 2*3 papers. Then Alice can copy Bob's actions.



In test case 4: Alice can’t win.

The number of test cases is no more than 22499.

11. Travel Expense

Timelimit: 1000MS Memorylimit: 64M

Problem Description:

Huanhuan is always working on fansy programming questions. However, today he decided to give himself a break and travel to a beautiful country. Therefore, another problem arose.

There are totally n cities in the country. There are m two-way roads, each of them directly connects two different cities. As the country has a solid transportation system, there is always a path connects every two cities.

Huanhuan arrives at city S and wants to carry as many items as possible to city T. Everyday he will go through exactly one road. For every road he pass, a fee is to pay. Due to the policy, the fee depends on number of items you carry and the number of days you enter the country. More exactly, the fee for each road is k^d, where k is the number of the items Huanghuan is to carry and d is the number of days he enter the country.

For example, Huanghuan arrives ar city 1, and aim to city 3. The path he chooses is $1->2->3$ carrying 2 items. Then the fee of road $1->2$ will be 2^1 and the fee of road $2->3$ will be 2^2. So the total expense is $2^1+2^2=6$

Now, you are tasked to help him to decide the maximum number of items he can carry since he only have limited budget.

However, Huanhuan is prepared to travel multiple times in the future. There will be totally Q query for you.

Input requirements:

The first line contains two interger $n,m(1 \le n \le 100, m \le \frac{n(n+1)}{2})$, where n is number of cities and m is the number of road. (It's guaranteed that every two cities are connected, and there are no two roads directly connects the same two cities.)

Then, m lines follow, the i^{th} lines contains two integer $u_i, v_i(1 \le u_i, v_i \le n, u_i \ne v_i)$, denoting the i^{th} roads connects city u_i and v_i.

The next lines contains one integer $Q(1 \le Q \le 10^5)$, denoting the number of query.

Then follows Q lines, each line contains 3 integers $S,T,B(1 \le S,T \le n, 0 \le B \le 10^9)$, denoting the city arrived, the city aimed and the budget.

Output requirements:

For each query, print one integer as the maximum item Huanhuan can carry from city S to T.

Sample input:

```
3 2
1 2
2 3
3
1 2 5
1 3 5
2 3 2
```

Sample output:

```
5
1
2
```

12. WZB’s Harem

Timelimit: 1000MS Memorylimit: 64M

Problem Description:

Do you remember N-queens? Today, WZB accompanied his n queens to the cinema……
As the saying goes: Three queens for a play, one harem admits of no two queens…
Cinema uses n rows of seats, each row has n columns.Queens are grumpy, they're not willing to sit in the same row or same column with other queen, if there are two queens in the same row or same column they conflict occurs, so they make WZB arrange seats for them. It stumped WZB to avoid the queen make antinomy. WZB wants to know how many different arrangements there are for the queen, he'd like to choose one for them.
Since WZB and his queens arrived late, some seats had already been reserved by others. Although WZB is a king, he can't infringe on the rights of citizens, so the reserved seats could not be reserved for queens.
Now WZB has ordered you to work out how many ways to arrange the queen. If WZB finds out your calculations are wrong....

Input requirements:

There is an integer n(n<=20) in the first line. The cinema has n rows and n columns of seats.
In the next lines,there are n integers in each line(0 or 1).If the point(i,j) is 1, it means it has been booked.

Output requirements:

One integer.You just need to print the answer Mod 1000000007.

Sample input:

```
2
0 0
0 0
```

Sample output:

```
4
```

13. Zoos's Animal Codes

Timelimit: 1000MS Memorylimit: 64M

Problem Description:

The speed of mail sorting is also known as postal code, or post code. Postal area code system has become one of the standards to measure the level of communication technology and postal service in a country.

The post code is usually composed of Arabic numerals, which represents a special code of the post office where the mail is delivered, and also the communication code of residents and units within the delivery range of the Bureau. Postal code is a special code for postal communication to realize mail machine sorting. It is a necessary tool to realize postal modernization. The ultimate purpose is to improve the speed and accuracy of your mail in the process of delivery. Therefore, it is necessary to write the postal code when delivering and sending letters and parcels.

For the convenience of management, zoos also arrange a code for each animal's residence, which is called animal code. The animal code consists of animal area code and animal species ID number. If the animal area code of the tiger is 008 and the animal species ID number of the South China tiger is 006, the animal code of the South China tiger is 008006. Now given an animal area code and animal species ID number, can you give the animal code of the animal?

Input requirements:

The input is 2 lines, each line is a string of length 3. The first line is animal area code, and the second line is animal species ID number.

Output requirements:

Output the corresponding animal code.

Sample input:

008
006

Sample output:

008006