



Final Exam of ACM Programming Design Fall Semester, 2018



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Programming Contest



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Final Exam of ACM Programming Design

Problem Set

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AFei Loves Magic

TimeLimit: C/C++ 1S, JAVA:2S

MemoryLimit: C/C++ 128.000MB, JAVA:256.000MB

Description

AFei is a trainee magician who likes to study various magical materials. Today, he came to the forest to find rare materials. He was so lucky that he found a piece of high-level magic stone. He knew that this stone always appeared in the pile, so there must be more nearby. Then he went deeper.

As expected, he found many magic stones. These stones were arranged in a row. Just as he was ready to pick up one, a magical circle was triggered. He was petrified and the stones began to move. As mentioned above, the stones were lined up. Now, some stones moved to one end of the line and the other stones moved to the other end. Stones would not change direction of movement unless they collided with other stones. Collision meant that two stones moved to the same position, and then the directions of the two stones would both change. Whether or not a collision occurred, the speed was always 1 m/s. Stone would disappear when it reached one of the ends.

AFei knew that the magical circle would disappear after t seconds. It meant that after t seconds, he could move and the stones would return to immobility. This also meant that AFei would get those stones. He wondered how many magic stones he could get in the end, including the first one he got when he came to the forest.

Input Description

The first line contains three integers n , L , t ($0 \leq n \leq 1000000$, $2 \leq L \leq 1000000000$, $0 \leq t \leq 1000000$) – the number of stones on the line is n , the length of the line is L meter, and the magical circle will disappear after t seconds.

The following n lines contain description of magic stones on the line. Each i -th of these lines contains two space-separated integers $x[i]$ and $d[i]$ ($0 < x[i] < L$, $d[i] \in \{1, 2\}$ for $i \leq n$), which stand for initial position and direction of motion (1 means from 0 to L , 2 means from L to 0.) .

Output Description

Output a number indicating the amount of the magic stones that AFei will eventually be able to obtain.

Sample Input

Output for Sample input

0 10000 3	1
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Sample Input

Output for Sample input

4 10 6 1 1 5 2 6 1 9 2	3
------------------------------------	---

Hint

The stones are A(1,1), B(5,2), C(6,1), D(9,2).

After 1s, they become A(2,1), B(4,2), C(7,1), D(8,2);

After 2s, they become A(3,2), B(3,1), C(7,2), D(8,1);

After 3s, they become A(2,2), B(4,1), C(6,2), D(9,1);

After 4s, they become A(1,2), B(5,2), C(5,1), D reach L and disappears;

After 5s, they become A reach 0 and disappears, B(4, 2), C(6,1), D disappeared;

After 6s, they become A disappeared, B(3, 2), C(7, 1), D disappeared.

AFei finally gets the first one, B and C.

PS:

- 1, Input guarantees that there will not be two magic stones in one location.
- 2, If stone A and stone B are located at 4 and 5, respectively, and A's direction is 1, B's direction is 2. Then next second, the position of the two stones have not changed, but they have gone in the opposite direction.

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bearBaby loves sleeping

TimeLimit: C/C++ 1S, JAVA:2S

MemoryLimit: C/C++ 128.000MB, JAVA:256.000MB

Description

Sleeping is a favorite of little bearBaby, because the wetness of Changsha in winter is too uncomfortable. One morning, little bearBaby accidentally overslept. The result of being late is very serious. You are the smartest artificial intelligence. Now little bearBaby asks you to help him figure out the minimum time it takes to reach the teaching building.

The school map is a grid of $n*m$, each cell is either an open space or a building (cannot pass), and the bedroom of little bearBaby is at (1,1)—— the starting point coordinates. The teaching building is at (x, y)—— the target point coordinates, he can only go up, down, left or right, it takes 1 minute for each step. The input data ensures that the teaching building is reachable.



Input Description

The first line has two positive integers n, m , separated by spaces ($1 \leq n, m \leq 100$), n for the row, m for the column

Next there are two positive integers x, y , separated by spaces ($1 \leq x \leq n, 1 \leq y \leq m$) indicating the coordinates of the teaching building

Next is a map of n rows and m columns, 0 indicate a open space and 1 indicate a

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obstacles.

Output Description

For each test case, output a single line containing an integer giving the minimum time little bearBaby takes to reach the teaching building, in minutes.

Sample Input

Output for Sample input

5 4 4 3 0 0 1 0 0 0 0 0 0 0 1 0 0 1 0 0 0 0 0 1	7
---	---

Hint

For the input example, you could go like this:

(1,1)-->(1,2)-->(2,2)-->(2,3)-->(2,4)-->(3,4)-->(4,4)-->(4,3), so the minimum time is 7.

PS:

First grid in the upper left corner is (1, 1)

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Sleepy Kaguya

TimeLimit: C/C++ 1S, JAVA:2S

MemoryLimit: C/C++ 256.000MB, JAVA:512.000MB

Description

Houraisan ☆ Kaguya is the princess who lives in Literally House of Eternity. However, she is very playful and often stays up late. This morning, her tutor, Eirin Yagokoro was going to teach her some knowledge about the Fibonacci sequence. Unfortunately, the poor princess was so sleepy in class that she fell asleep. Angry Eirin asked her to complete the following task:

This sequence can be described by following equations:

$$1. F[1]=F[2]=1$$

$$2. F[n]=F[n-1]+F[n-2] \quad (n>2)$$

Now, Kaguya is required to calculate $F[k+1]*F[k+1]-F[k]*F[k+2]$ for each integer k that does not exceed 10^{18} .

Kaguya is so pathetic. You have an obligation to help her.

(I love Houraisan Kaguya forever!!!)



image from pixiv,id=51208622

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Input Description:

Input

Only one integer k.

Output Description:

Output

Only one integer as the result which is equal to $F[k+1]*F[k+1]-F[k]*F[k+2]$.

Sample Input

Output for Sample input

2	1
---	---

Hint

$F[2]=1, F[3]=2, F[4]=3$

$2*2-1*3=1$

PS:

$0 < k \leq 1e18$

If necessary, please use %l64d instead of %lld when you use "scanf", or just use "cin" to get the cases.

The online judge of HNU has the above feature, thank you for your cooperation.

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Dandan's lunch

TimeLimit: C/C++ 1S, JAVA:2S

MemoryLimit: C/C++ 64.000MB, JAVA:128.000MB

Description:

As everyone knows, there are now n people participating in the competition. It was finally lunch time after 3 hours of the competition. Everyone brought a triangular bread. When they were going to eat bread, some people found that they solved more problems than others, but their bread was smaller than others. They thought it was very unfair. In this case, they will forcibly exchange bread with the other party (may be exchanged many times, someone can still exchange with others after being exchanged if the above conditions are satisfied, the other party can not refuse).

The description of the bread is given by the coordinates of the three vertices of the triangle. The size of the bread is twice the size of the triangle area, ensuring that there are no two breads of the same size, and the number of problems each person makes is different.

Dandan is also one of the contestants. Now he knows the number of problems solved by each person and the description of the bread they bring. Now he wants to know that after all the exchanges are over (That is, there can be no more exchanges between any two people), The size of the bread he can get.

Input Description:

The first line gives an integer n , which indicates the number of people who participated in the competition.

Lines $2 \sim n+1$, each line gives 7 integers separated by spaces such as:

num x_1 y_1 x_2 y_2 x_3 y_3

num represents the number of the i th personal problem solving. (x_1, y_1) (x_2, y_2) (x_3, y_3) represents the coordinates of the three points of the bread of the triangle with the i -th person. ensure that three points are not in the same line.

Notice that the second line (the first person) represents Dandan's information.

Data guarantee: $0 < n \leq 1e5$, $0 \leq \text{num} < 1e9$, $-1e8 < x_1, x_2, x_3, y_1, y_2, y_3 < 1e8$.

Output Description:

Outputs an integer representing the size of the bread that DanDan eventually gets.

Sample Input

Output for Sample input

1 100000000 0 0 10000 0 0 1000	100000000
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Sample Input

Output for Sample input

4	9
3 0 0 1 0 0 1	
1 0 0 2 0 0 2	
2 0 0 3 0 0 3	
4 0 0 4 0 0 4	

Hint

For the first case: there's only Dandan alone.

For the second case: Dandan solved three problems, ranking second. Ranking first can get the biggest bread, so he can get the second largest bread.

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Easy problem

TimeLimit: C/C++ 1S, JAVA:2S

MemoryLimit: C/C++ 32.000MB, JAVA:64.000MB

Description

Zghh likes number, but he doesn't like writing problem description. So he will just give you a problem instead of telling a long story for it.

Now given a positive integer x and k digits a_1, a_2, \dots, a_k , can you find a positive integer y such that y is the multiple of x and in decimal representation y contains all digits of a_1, a_2, \dots, a_k .

Input Description:

The first line contains an integer T ($1 \leq T \leq 10000$) which is the number of test case. The following T lines each line is a test case, start with two integer x ($1 \leq x \leq 1e8$) and k ($1 \leq k \leq 10$), k integer a_1, a_2, \dots, a_k ($0 \leq a_i \leq 9$ for $i=1..k$ and $a_i \neq a_j$ for $i \neq j$) is following.

Output Description:

For each test case output your answer y . Your answer should be a positive integer without leading zero and should be no more than $1e18$. Every answer that satisfy the conditions described above will be accepted.

Sample Input

Output for Sample input

3	175
5 3 1 5 7	2592576
21 4 2 5 6 9	976543210
10 8 0 1 2 3 4 5 6 7 9	

Hint:

175 is the multiple of 5 and contains 1,5,7

2592576 is the multiple of 21 and contains 2,5,6,9

976543210 is the multiple of 10 and contains 0,1,2,3,4,5,6,7,9

PS:

Constraint of data

$1 \leq T \leq 10000$

$1 \leq x \leq 1e8$

$1 \leq k \leq 10$

$0 \leq a_i \leq 9$, for $i=1..k$

$a_i \neq a_j$ for $i \neq j$

your answer y should satisfy $y \leq 1e18$

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Find the AFei Numbers

TimeLimit: C/C++ 1S, JAVA:2S

MemoryLimit: C/C++ 128.000MB, JAVA:256.000MB

Description

AFei loves numbers. He defines the natural number containing "520" as the AFei number, such as 1234520, 8752012 and 5201314. Now he wants to know how many AFei numbers are not greater than n.

Input Description:

The first line contains an integer T ($1 \leq T \leq 100$).

The following T lines contain an interger n ($0 \leq n \leq 1e18$).

Output Description:

For the last T lines, output the total numbers of AFei numbers that are not greater than n.

Sample Input

Output for Sample input

2	1
1000	16
5520	

Hint:

For the first case, only 520 is AFei number.

For the second case, 520,1520, 2520, 3520, 4520, 5200, 5201, 5202, 5203, 5204, 5205, 5206, 5207, 5208, 5209 and 5520 are AFei number. So there are 16 AFei numbers.

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$$a+b+c+d=?$$

TimeLimit: C/C++ 1S, JAVA:2S

MemoryLimit: C/C++ 32.000MB, JAVA:64.000MB

Description

This is a very simple problem! Your only job is to calculate $a + b + c + d$!

Input Description:

There are several cases.

In the first line, there is a single integer T . ($T \leq 200$)

In the next T lines, each line contains four integers a, b, c and d ($-2^{61} \leq a, b, c, d \leq 2^{61}$)

Output Description:

output T lines.

Each line output one integer represent the answer of $a + b + c + d$

Sample Input

Output for Sample input

1	10
1 2 3 4	

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Kuangyeye and hamburgers

TimeLimit: C/C++ 1S, JAVA:2S

MemoryLimit: C/C++ 256.000MB, JAVA:512.000MB

Description

Kuangyeye is a dalao of the ACM school team of Hunan University. His favorite food are hamburgers. One day, Kuangyeye came to the KFC(or maybe McDonald) and saw n hamburgers on the counter. The weight of the i -th hamburger was w_i . Since he likes hamburgers very much, he would like to buy some hamburgers. Considering his weight or other factors, Kuangyeye only wanted to eat all the hamburgers from the a -th heaviest to the b -th. Since Kuangyeye is fickle, he had k plans before buying hamburgers. The i -th plan gives a_i and b_i . Please help Kuangyeye calculate the maximum weight of hamburgers he can eat among the k plans.

Input Description

the first line of input contains two integer n and k --the number of hamburgers on the counter and the number of plans Kuangyeye had;

the next line contains n integer--the i -th integer represents the weight of i -th hamburger, namely w_i ;

Each the following k line contains two integer a_i and b_i , represents Kuangyeye's strategy in his i -th plan.

Output Description

Output contain a single integer, represents maximum weight of hamburgers Kuangyeye can eat.

Sample Input

Output for Sample input

5 2 4 3 5 2 6 1 1 3 4	7
--------------------------------	---

Hint

Kuangyeye's first plan was to eat the hamburger weighing 6;
and his second plan was to eat the hamburger weighing 3 and 4;
So the maximum weight of hamburgers he can eat was 7.
 $1 \leq n, k \leq 100000, 1 \leq a_i \leq b_i \leq n, 1 \leq w_i \leq 10000$

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II play with GG

TimeLimit: C/C++ 5S, JAVA:10S

MemoryLimit: C/C++ 256.000MB, JAVA:512.000MB

Description

IG won the S championship and many people are excited, ii and gg are no exception. After watching the game, the two of them also want to play a game.

There is now an infinite chessboard with only one piece. Initially the pieces are placed at the (x, y) position (the board coordinates are counted from 0). They took turns to move the pieces. ii moves first.

There are three ways to move

1. Move the piece to the left by one space (from (x, y) to (x-1, y)).
2. Move the piece down one space (from (x, y) to (x, y-1)).
3. Move the piece to the lower left by one space (from (x, y) to (x-1, y-1)).

It should be noted that the pieces cannot be removed from the board.

The first person who can not operate is judged negative (in other words, the first person who moves the piece to (0,0) wins).

Now give the initial coordinates x, y of the piece. Under the premise that both take the optimal strategy, please output the name of the winner (ii or gg).

Input Description

The input contains only one line. Enter two integers x y to represent the initial coordinates of the piece. (0<=x, y<=1000).

Output Description

the winner's name (ii or gg).

Sample Input

Output for Sample input

1 1	ii
-----	----

Sample Input

Output for Sample input

124 654	gg
---------	----

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Less taolu

TimeLimit: C/C++ 1S, JAVA:2S

MemoryLimit: C/C++ 128.000MB, JAVA:256.000MB

Description

Less taolu, more sincerity.

This problem is very easy to solve.

You may be very tired during this contest. So we prepared a gift for you.

You just copy and paste this code and you will get AC!

Ctrl + C && Ctrl + V is a necessary skill for a programming ape.

```
#include<iostream>
using namespace std;
const long long mod = 1e9+7;
long long func(int x){
    if (x==1 || x==0){
        return 1;
    }
    return
(x*func(x-1)+(x-1)*func(x-2))%mod
;
}
int n;
int main(){
    cin>>n;
    cout<<func(n);
    return 0;
}
```


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Input Description

Input only a single integer n.

Output Description

Please output the answer by this code.

Sample Input 1

Output for Sample input 1

3	11
---	----

Sample Input 2

Output for Sample input 2

100	372497045
-----	-----------

Hint

$0 \leq N \leq 1e5$

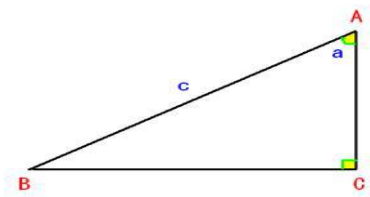
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The Right-angled Triangles with Sides of Integral Length

TimeLimit: C/C++ 1S, JAVA:2S

MemoryLimit: C/C++ 256.000MB, JAVA:512.000MB

Description



Consider the right-angled triangles with sides of integral length.

Give you the integral length of the hypotenuse of a right-angled triangle. Can it construct a right triangle with given hypotenuse c such that the two legs of the triangle are all integral length?

Input Description

There are several test cases. The first line contains an integer $T(1 \leq T \leq 1,000)$, T is the number of test cases.

The following T lines contain T test cases, each line contains one test case. For each test case, there is an integer c , the length of hypotenuse. ($1 \leq c \leq 45,000$).

Output Description

For each case, output Yes if it can construct a right triangle with given hypotenuse c and sides of integral length, No otherwise.

Sample Input

Output for Sample input

4	Yes
5	No
6	Yes
15	Yes
13	

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The Digits String

TimeLimit: C/C++ 1S, JAVA:2S

MemoryLimit: C/C++ 256.000MB, JAVA:512.000MB

Description

Consider digits strings with length n , how many different strings have the sum of digits are multiple of 4?

Input Description

There are several test cases end with EOF. For each test case, there is an integer in one line: n , the length of the digits string. ($1 \leq n \leq 1,000,000,000$).

Output Description

For each case, output the number of digits strings with length n have the sum of digits are multiple of 4 in one line. The numbers maybe very large, you should output the result modular 2019.

Sample Input

Output for Sample input

1	3
2	25
3	249
4	479