“今日头条杯”
2018 年首届湖北省大学生程序设计竞赛
(现场赛)

The 2018 Hubei Collegiate Programming Contest (Onsite Round)

2018 年 04 月 22 日

April 22th, 2018

赞助商

Event Sponsor

Special Notice for HBCPC 2018

1. Problem with multiple test cases in one input will have the following line in "input":
   Input contains multiple test cases, please process to the end of input.
   OR
   Input contains multiple but no more than x test cases, the first line of input is an integer T, the number of test cases.
   Problems without one of the lines above have *only one* test case in the input.
2. Problem *Mice* is an interactive problem, you can refer to `APlusB.(c|cpp|py|kt|java)` for various versions of standard program for the problem *A Plus B problem* (*Interactive Version*).
3. For some reasons, we cannot use Windows for Judge you program. So when you are submitting your source code, use `%lld` instead `%I64d`, and `long long` instead of int64, in fact, using `%lld` and `long long` on Windows won't cause `Compile Error`.
4. Compile Commands:
   C
   ```
   gcc main.c -o main -O2 -lm -std=c99 -DONLINE_JUDGE
   ```
   C++98 / C++11
   ```
   g++ main.cpp -o main -O2 -lm -std=c++98 -DONLINE_JUDGE
   g++ main.cpp -o main -O2 -lm -std=c++11 -DONLINE_JUDGE
   ```
   Java 1.8 (Time Limit is Multiplied by 2)
   ```
   Javac -cp .;* {MainClass} / java -Xmx2048M -Xss256M {MainClass}
   ```
   Python 3.6 (Time Limit is Multiplied by 2.5)
   ```
   python3 source.py
   ```
5. Performance of Judger
   Your code will be executed on SINGLE CORE, which can execute an empty loop for 350000000 times in one second.
   The time limit is CPU time, and in case of huge input and output, you can use half more time for input and output. (e.g. if CPU time limit is 1.5 seconds, then your program should finish in 2.25 seconds, but your program can use CPU for no more than 1.5 seconds.)

"你的加入，才是头条"
您可以扫描右面的二维码，
填写您的信息，今日头条将在之后联系您

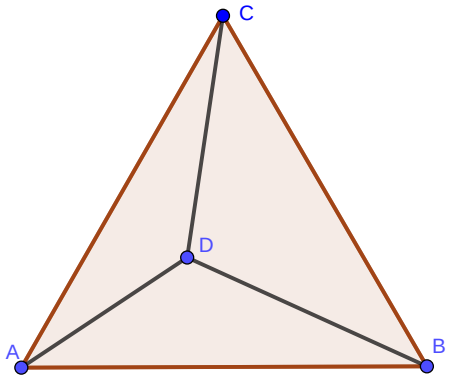
[出题/验题人]

DoveCCL, Srdce, zmf1997, Team Preludes, Team WakeUp, Team SmoothLatte

Problem A. Srdce and Triangle (Triangle)

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 seconds
Memory limit:	512 mebibytes

Let ΔABC be a regualr triangle, and D is a point in the triangle. Given the angle of $\angle CDA, \angle BDC and \angle ADB$. Then let AD, CD and BD form a new triangle, what is the size of the three angles?



Input

Input contains multiple cases, please process to the end of input.

For each line in the input, contains three integers, α, β, γ, which are the size of the angel $\angle CDA$, $\angle BDC$m and $\angle ADB$ in degree. $0 < \alpha, \beta, \gamma < 180, \alpha, \beta, \gamma = 360$

Output

For each line of input, output one line with three numbers in ascending order, the three angles in the new triangle, your answer will be considered as correct if and only if the relative or absolute error is less than 10^{-9}, If the new triangle cannot be formed, output `-1 -1 -1` instead.

Examples

standard input	standard output
120 120 120 120 120 120	60 60 60 60 60 60

Problem B. Salty Fish Go! (Salty)

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 seconds
Memory limit:	512 mebibytes

A few days ago, WRD was playing a small game called Salty Fish Go. We can simplify the rules of the game as follows.

The road can be abstracted into a one-dimensional axis, and the length of the road is L. There are two magic doors at the ends of the road, which can instantly transfer WRD from position L to position 0, or from location 0 to location L, without spending time.

WRD can select the initial position, the initial direction of movement, and the initial speed (from the speed set).

There are some amazing gas stations on the way, whose location is random. At the gas station WRD can change speed to one of the speed set, without spending time. (Do not change direction!)

There are some jewels on the road, whose location is random. WRD needs to take away all the jewels to win the game.

How long does it take WRD to win the game?

It' s an easy game. But considering that WRD has become a salty fish without brain, all his operations are completely random. Can you calculate the expected time for him to win the game?

Input

Input contains multiple test cases, please process to the end of input.

For each test case, the first line of the input contains four positive integers V ($V \leq 10$), L ($L \leq 10^5$), n ($n \leq 10^5$), m ($m \leq 10^5$) to indicate the size of speed set, the length of the road, the number of the gas stations, the number of the jewels.

Then, there are V integers in a line, the speed set, each integer is between 1 and 10^5.

Output

The output is a real number, let your answer be a, and jury's answer be b, your answer will be considered as correct if and only if $\frac{|a-b|}{\max(b,1)} < 10^{-6}$.

Examples

standard input	standard output
2 8 1 1 2 4 2 8 1 1 2 4	1.3333333333 1.3333333333

Problem C. Mice (Mice)

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 seconds
Memory limit:	512 mebibytes

TQM had a bottle of poison mixed with $m-1$ bottles of water ($2 \leq m \leq 131072$), so she bought n mice and was ready to doing experiment to find out the poison.

What is known:

This m bottles of liquid is lined up one by one, numbered from 0 to $m-1$, but TQM doesn't know which bottle contains poison. These n mice are numbered from 0 to $n-1$. If a mouse drinks poison, it will die, otherwise, nothing will happen.

Now you need to give TQM an experimental plan to help her find out the poison.

Interaction Protocol

1. First you should read two integers from standard input (separated by space), stand for n, m
2. Next you should set your plan by writting groups of data to standard output. A group is a pair of integer like `x y`, `x` is the mouse number and `y` is the bottle number, means the NO.x mouse will drink NO.y bottle. Each line for a group of your output. To finish your plan, print `-1 -1` and a new line to standard output, do not forget to flush the buffer of output.
3. Then you can read n space-separated integer from standard input, stand for the status of mice. `0` means `alive`, `1` means `died`
4. Finally you should print a single number with '\n' stands for the answer (the number of bottle contains poison)

Examples

standard input	standard output
10 10 0 0 0 0 0 0 1 0 0 0	0 0 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9 -1 -1 6

Note

We will provide a sample code in some language for the problem, you can write your own code on the basis of the sample code.

Problem D. Who killed Cock Robin? (Who)

Input file:	standard input
Output file:	standard output
Time limit:	1 seconds
Memory limit:	512 mebibytes

```
Who killed Cock Robin?
I, said the Sparrow, With my bow and arrow,I killed Cock Robin.
Who saw him die?
I, said the Fly.With my little eye,I saw him die.
Who caught his blood?
I, said the Fish,With my little dish,I caught his blood.
Who'll make his shroud?
I, said the Beetle,With my thread and needle,I'll make the shroud.
.........
All the birds of the air
Fell a-sighing and a-sobbing.
When they heard the bell toll.
For poor Cock Robin.
March 26, 2018
```

Sparrows are a kind of gregarious animals,sometimes the relationship between them can be represented by a tree.

The Sparrow is for trial, at next bird assizes,we should select a connected subgraph from the whole tree of sparrows as trial objects.

Because the relationship between sparrows is too complex, so we want to leave this problem to you. And your task is to calculate how many different ways can we select a connected subgraph from the whole tree.

Input

The first line has a number n to indicate the number of sparrows. $n \leq 2 \times 10^5$

The next n-1 row has two numbers x and y per row, which means there is an undirected edge between x and y.

Output

The output is only one integer, the answer module 10000007 ($10^7 + 7$) in a line

Examples

standard input	standard output
4 1 2 2 3 3 4	10

Note

For a chain, there are ten different connected subgraphs: (1), (2), (3), (4), $(1-2)$, $(2-3)$, $(3-4)$, $(1-2-3)$, $(2-3-4)$, $(1-2-3-4)$

Problem E. DoveCCL and Resistance (Circuit)

Input file:	standard input
Output file:	standard output
Time limit:	1 seconds
Memory limit:	512 mebibytes

Do you remember Kanna-chan we met last year? She is so cute, and this year, she entered middle school, with Cirno. As we know, Cirno is bad at math, so she had trouble when studying physics.

Today, Kanna-chan's teacher is preparing for mid-term exam, one of the problem looks like follows:

> Please calculate the equivalent resistance of the circuit below.

As Kanna-chan's teacher is too lazy, so he asked you for help, he will give you the answer of the problem, and your task is to generate a valid circuit satisfies that it's equivalent resistance equals to the answer.

Input

Input contains one line with two integers, p and q, means the answer of the problem should be p/q, where $0 < p, q \leq 1000$, $\gcd(p, q) = 1$.

Output

Output a circuit satisfy teacher's request. The first line of your input should be two integers, n and m, n is the number of nodes and m is the number of resistance you used. Where $n \leq 100, m \leq 1000$

Then m lines follows, each line contains three integers, u_i, v_i, w_i, $1 \leq u_i, v_i \leq n$,which means that there is a w_i-Ohm resistance connected between u_i and v_i, $0 \leq w_i \leq 100$, multiple resistances can be used between two nodes. $\sum w_i \leq \max(p, q)$

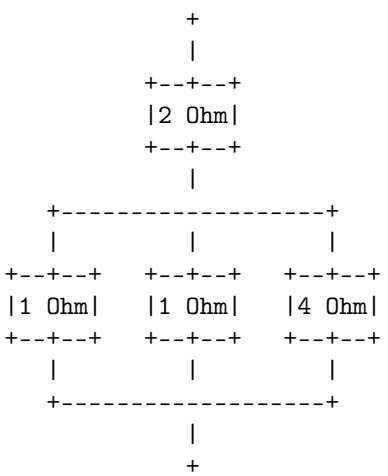
Then output two integers s, t, $1 \leq s, t \leq n$, means that the equivalent resistance between node s and node t equals to p/q.

Sample

standard input	standard output
22 9	3 4 1 2 2 2 3 4 2 3 1 2 3 1 1 3

Note

The circuit looks like the figure below:



Problem F. Flower Road (Road)

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 seconds
Memory limit:	512 mebibytes

Once upon a time, there was a beautiful princess named TQM, and a handsome prince named GSS. One day, the prince would like to visit the princess. While in front of the princess' house, there was a flower-beds with blooming flowers. The prince was supposed to go through the flower-beds choosing the best "Flower Road".

Here is the task. The flower-beds is presented by a $N \times N$ matrix with integers on each grid representing the princess' satisfaction of the flowers on it. Now, the prince was on the top left point $(1, 1)$ and the princess was on the bottom right point (N, N). While the princess didn't want this to be so easy, she operated M times "rotation" on the flower-beds according to the order. Each time, she would choose a $2L_i \times 2L_i$ matrix whose top left point was (x_i, y_i). Then, four disjoint parts of the matrix whose length of size was L_i rotated clockwise. Here is an example to make the "rotation" clearly.

1	2	5	6
3	4	7	8
13	14	9	10
15	16	11	12

$\rightarrow$

13	14	1	2
15	16	3	4
9	10	5	6
11	12	7	8

Then, your task is to help the prince to choose a best "Flower Road" after these operations with the largest sum of the satisfaction. By the way, the prince will take the shortest way, which means he will only go down (from point (x, y) to point $(x + 1, y)$) and right (from point (x, y) to point $(x, y + 1)$).

Input

The first line of input contains two integers, N ($1 \le N \le 2000$) and M ($1 \le M \le 2000$), indicating the numbers N and M described above. Then N lines follow, and each line N integers, representing the matrix. Then M lines follow, each line has three integers x_i, y_i, L_i ($1 \le x_i < N, 1 \le y_i < N, 2 \le 2L_i \le \min(N - x_i + 1, N - y_i + 1)$), where xi and yi are coordinates of the top right point of i-th rotation matrix, $2L_i$ - side length of the matrix.

Output

Output the max sum of the satisfaction.

Examples

standard input	standard output
4 1 1 2 5 6 3 4 7 8 13 14 9 10 15 16 11 12 1 1 2	81

Problem G. Coins (Coins)

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 seconds
Memory limit:	512 mebibytes

In the latest activity in the game, you want to find the most efficient way to collect at least Z coins. There is a battle in this game. Everytime you finish the battle, you can get N coins. To make the activity more interesting, you can spend X coins to exchange a special card. If you carry K cards in the battle, you can get $N + K \times Y$ coins when you finish the battle rather than only N coins. So how many times will you finish the battle at least?

Input

Input contains multiple but no more than 10 test cases, the first line of input is an integer T, the number of test cases.

In the following T lines each line has for integers N, X, Y, Z ($1 \leq N, X, Y, Z \leq 10^9$), and the meaning of them have been mentioned.

Output

For each case, please output the minimum times you should finish the battle.

Examples

standard input	standard output
1 1 10 1 100	39

Problem H. GSS and Simple Math Problem (SimpleMath)

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 seconds
Memory limit:	512 mebibytes

Given n positive integers $a_1, a_2, \ldots a_n$, your task is to calculate the product of these integers. The answer is less than 10^{10^5}.

Input

The first line is an integer n, the i-th of the following n lines contains the integer a_i.

Output

Output one line with the answer, $\prod a_i$.

Examples

standard input	standard output
5 11 12 13 14 15	360360

Problem I. Five Day Couple (MrRight)

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 seconds
Memory limit:	512 mebibytes

Mingming, a cute girl of ACM/ICPC team of Wuhan University, is along since graduate from high school. Last year, she used a program to match boys and girls who took part in an active called *Boy or Girl friend in five days*.

She numbered n ($0 < n \leq 10^5$) boys from 1 to n, by their date of birth, and given i-th boy a number a_i ($0 \leq a_i < 10^9$) in almost random. (We do not mean that a_i in your input is generated in random.). Then she numbered m ($0 < m \leq 10^5$) girls from 1 to m, and given i-th girl a number b_i ($0 \leq b_i < 10^9$) in the same way.

Also, i-th girl said that she only wanted to be matched to a boy whose age is between $[l_i, r_i]$, which means that she should only be matched to a boy numbered from l_i to r_i, ($0 < l_i \leq r_i \leq n$).

Mingming defined a rate $R(i, j)$ to measure the score when the i-th boy and j-th girl matched. Where $R(i, j) = a_i \oplus b_i$ where $\oplus$ means bitwise exclusive or. The higher, the better.

Now, for every girl, Mingming wants to know the best matched boy, or her "Mr. Right"can be found while her . As this is the first stage of matching process and Mingming will change the result manually, two girls can have the same "Mr. Right".

Input

The first line contains one number n.

The second line contains n integers, the i-th one is a_i.

The third line contains an integer m.

Then followed by m lines, the j-th line contains three integers b_j, l_j, r_j.

Output

Output m lines, the i-th line contains one integer, which is the matching rate of i-th girl and her Mr. Right.

Examples

standard input	standard output
4 19 19 8 10 2 1 1 4 5 1 4	18 22

Problem J. Avengers: Infinite War (War)

Input file:	`standard input`
Output file:	`standard output`
Time limit:	3 seconds
Memory limit:	512 mebibytes

As the Avengers and their allies have continued to protect the world from threats too large for any one hero to handle, a new danger has emerged from the cosmic shadows: Thanos. A despot of intergalactic infamy, his goal is to collect all six Infinity Stones, artifacts of unimaginable power, and use them to inflict his twisted will on all of reality. Everything the Avengers have fought for has led up to this moment-the fate of Earth and existence itself has never been more uncertain.

During this war, the battle of the earth takes place in Wakanda, Black Panther and Captain America will lead superheroes to resist the Black Order.The infantry, led by captain, formed a defensive network in which there could be an undirected energy membrane between any two soldiers,because the fighting is so intense, the energy membrane may be destroyed at some point and then reborn at some point.Want to beat Thanos' corporation, at any time Captain America need to know the status of the every soldier on the battlefield, such as how many people are there in the energy area Black widow belongs to,and whether any two soldiers are in the same energy area.Energy area is a subset of soldiers, in which any two soldiers can be connected directly or indirectly through the energy membrane,this task is a bit complicated, so captain wants you, Dr. Banner who has seven doctorates to help him finish this job, you will be fighting the Black Dwarf later, so please solve the problem as soon as possible.

Input

The first line has a number n ($n \leq 2 \times 10^5$) to indicate the number of soldiers.

The second line has a number m ($m \leq 2 \times 10^5$) means there would be m events.

Each of the following m lines will be one of the four types below:

`1 x y` : At this point the energy film appears between x and y. ($x \neq y$)

`2 x y`: At this point the energy film between x and y is destroyed.($x \neq y$)

`3 x` : Captain wants to know how many people are there the energy area x belongs to.

`4 x y`: Whether x and y belong to the same energy area,output "`Yes,cap`" (*no space, and case insensitive*) if the ans is yes,otherwise output "`No`" (*case insensitive*).

Output

Output a line of answer for each query.

Examples

standard input	standard output
5 7 1 1 2 1 2 3 3 1 1 1 4 4 1 5 2 2 3 3 2	3 No 3

Problem K. GSS and Rating Calaulation (Rating)

Input file:	`standard input`
Output file:	`standard output`
Time limit:	4 seconds
Memory limit:	512 mebibytes

The following text is simplily copied from MikeMirzayanov's blog.

The basic idea of Codeforces rating system is to generalize Elo rating to support games with multiple participants.

Each community member is characterized by value $Rating_i$, (we will call it r_i below) — integer number. Roughly speaking, the higher value means better results in the contests. Rating is calculated/recalculated so that the equality strives to be correct:

$$P_{i,j} = \left(1 + 10^{\frac{r_j - r_i}{400}}\right)^{-1}$$

where $P_{i,j}$ is probability that the i-th participant has better result than the j-th participant. Therefore for two participants the probability to win/lose depends on subtraction of their ratings. For example, if the difference of ratings is equal to 200 then stronger participant will win with probability ~0.75. If the difference of ratings is equal to 400 then stronger participant will win with probability ~0.9.

After a contest the values r_i change in a way to satisfy main formula better.

Let's calculate expected place $seed_i$ for each participant before contest. It equals to the sum over all other participants of probabilities to win (to have better place than) the i-th plus one because of 1-based place indices:

$$seed_i = \sum_{1 \le j \le n,\ j \ne i} P_{j,i} + 1$$

For example, before Codeforces Round #318, tourist had rating 3503 and his seed was ~1.7, and Petr had rating 3029 and expected place ~10.7.

General idea is to increase r_i if actual place is better than $seed_i$ and to decrease r_i if actual place is worse than $seed_i$.

Having $seed_i$ and actual place, let's calculate their geometric mean m_i. You can think about it as an something average between $seed_i$ and actual place shifted to the better place. Using binary search find such rating value R which the i-th participant should have to have a $seed_i = m_i$. Obviously the rating should r_i be modified to become closer to R. We use d_i = (R - r_i) / 2 as rating change for the i-th participant.

It's almost all except the phase of fighting against inflation. Inflation works as follows: the rich get richer. We will try to avoid it. If we assume that the rating was already calculated fair (i.e. everybody has perfect statistically based rating) then expected change of rating after a contest is equal to zero for any participant.

Choose a group of the most rated (before the round) participants and decide that their total rating shouldn't change. We use heuristic value $s = \min(n, 4\sqrt{n})$ as a size of such group. Let's find the sum of d_i over participants from group and adjust all values d_i (for all participants) to make the sum to be zero. In other words, $r_i = r_i + inc$, where $inc = -sum_s/s$, sum_s is sum of d_i over s participants from chosen group.

After the round 327 we restricted the effect in following way. Firstly, we do $r_i = r_i + inc$, where $inc = -\frac{sum(d_i)}{n} - 1$, $sum(d_i)$ is sum of all d_i. It makes the sum of all d_i to be near zero and non-positive in the same time. Secondly, we apply idea from the previous paragraph, but $inc = \min(\max(-\frac{sum_s}{s}, -10), 0)$. Thus, the effect of modification can not reduce rating for more than 10 points.

By the way, for any consistent rating the following assertions should be true:

- if the participant A had worse rating than the participant B before the contest and finished the contest on the worse place then after recalculations the the rating of A can't be greater than the rating of B
- if A finished the contest better than B but A had worse rating before the contest then A should have equal or greater rating change than B.

In particular, formulas are tested to satisfy the both items on each ratings recalculation.

Please, read the following text carefully

You should notice that when calculating the rank of someone's score, the rank is defined as the number of contestants who has the score larger than or equal to his score score.

Now, given a list of contestants, and their *Rating* before the contest and their *Score* in the contest, your task is to calculate the rating after a *real* rated codeforces round. **After the round 327**.

> You should notice that, a regular codeforces round (Div. 1) may have atmost 800 contestants.
>
> Every one on the list have made at least one submission. So that all of their ratings should be calculated.

Input

The first line is an integer N, the number of contestants.

The following N lines, each line contains a string $Name_i$ and two integers $Score_i$ and $Rating_i$.

Output

Output containts N lines, the i-th line should be one integer: the new rating of the i-th contestant in the list after the contest.

Examples

standard input	standard output
1 a 1 1500	1500
(see rating.in1)	(see rating.ans1)
(see rating.in2)	(see rating.ans2)

Note

For different people may have the different coding habbits, your answer will be considered as correct if and only if your answer satisify all of the following restrictions:

1. Let $\Delta_1 = \sum |Answer_i - Output_i|$, then Δ_1 should be less than $2n$
2. Let $\Delta_2 = \sum [|Answer_i - Output_i| \geq 3]$, then Δ_2 should be less than $\lceil n/15 \rceil$
3. Let $\Delta_3 = \max \frac{|Answer_i - Output_i|}{Answer_i}$, then Δ_3 should be less than 0.005

Where $Answer_i$ is the i-th number of answer, and $Output_i$ is the i-th number in your output.