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The 41th ACM-ICPC Asia Pyongyang Regional Contest

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Problem 1. Array Inversion

Time Limit : 1 second
Memory Limit : 64 megabytes

Description

All of you perhaps know about the inverse number of array.

The inverse number of array $\{a_1, a_2, \ldots, a_n\}$ is defined as the number of (i, j) such that satisfies $a_i > a_j$. (where $i < j$.)

Now Han Min, an interesting boy, is thinking about the new inverse number of array.

If the parity of i and j is the same and $a_i > a_j$ then he thinks that (i, j) is the inverse pair. And if the parity is different and $a_i < a_j$ then he also think (i, j) is the inverse pair.

In other words, an index pair (i, j) is an inverse pair when the parity of i and j is the same, $a_i > a_j$, else $a_i < a_j$.

You, Student Han's best friend, are hired to calculate the number of inverse pairs of array. Can you solve it?

Input

The first line of input file contains one integer $(T1 \leq T \leq 5)$ – indicating the number of test cases.

The first line of each test case contains one integer N $(1 \leq N \leq 5000)$ – indicating the length of array.

The next line of each case contains N real numbers separated by only one space.

Output

You must print one integer – the new inverse number of array.

Sample Input

```
1
5
1 4 3 2 5
```

Sample Output

```
5
```

Problem 2. B_N

Time Limit : 1 second
Memory Limit : 128 megabytes

Description

A bright student, Ri Gi Ung, is good at physics very much but not mathematics.

His friend, Sin Yong Jin, is the reverse – he is good at mathematics and not physics.

So Ri helps Sin's physics homework and Sin helps Ri's mathematics homework.

Unfortunately, today Ri got a very very difficult mathematics problem and he asked Sin to solve the problem.

But today Sin is very busy, so he also asked you to solve it.

You, the best friend of Sin, must solve it.

The problem is follows.

"An integer array $\{A_1, A_2, \dots, A_n\}$ is given.

New integer array $\{B_1, B_2, \dots, B_N, \dots,\}$ is defined as the following formula.

$$B_N = \left(\sum_{\substack{i_1+i_2+\cdots+i_k=N \\ 1\le k\le N}} A_{i_1}A_{i_2}\cdots A_{i_k} \right) \% \ 1000000007$$

Of course, $1 \le i_1, i_2, \cdots, i_k \le n$. It is possible that $u \ne v \ and \ i_u = i_v$.

For example, $B_3 = A_1 * A_1 * A_1 + A_1 * A_2 + A_2 * A_1 + A_3$.

You must calculate B_N for given integer N."

Can you help two boys?

Input

The first line of input file contains one integer T – indicating the number of test cases.

The first line of each test case contains two integers n and N.

$(1 \leq n \leq 100, 1 \leq N \leq 100)$

The next line of each case contains n integers separated by a space.

Output

You must print one integer – result of the problem.

Sample Input

```
1
2 5
3 2
```

Sample Output

```
495
```

Problem 3. Checking Matrix

Time Limit : 1 second
Memory Limit : 512 megabytes

Description

Prof. Jong is a problem setter of the 41th ACM-ICPC Asia Pyongyang Regional Contest.

He has just finished calculating the 100 sets of the multiplication of 2016*1946 matrix and 1946*2016 matrix.

Of course, the results are 2016*2016 matrix.

The calculating takes about 10 days. The result will become the 100 sets IO data of problem C.

After Prof. Jong went to bed, his son scribbled on the result.

He erased last digit of a number and then wrote the digit 1 on the erased position.

Next day, Prof. Jong became very angry.

But his son is only 2 years old, so he can't remember all.

Prof. Jong see the result with detail and talk with his son.

So he get some fact that his son scribbled at most one number for each set and the last digit of scribbled number was 2 or 0 or 1 or 6. And he found out that the row number and column number of scribbled position is less than or equal to 70.

The upper left corner of the matrix is (1, 1). The first id is row number and the second id is column number.

He must send the IO data in today.

So he decide to check the result and find out the changed result.

You are his best student.

Please help Prof. Jong.

Input

The input file contains exactly 100 sets of IO data.

Each set is described as follow;

The first line contains 5 integers a_1, a_2, a_3, a_4, a_5.

You can calculate the matrix A as follow;

$$A_{ij} = (a_1 * i^4 + a_2 * i^3 + a_3 * j^2 + a_4 * j + a_5) \ \% \ 1946002016$$

The second line contains 5 integers b_1, b_2, b_3, b_4, b_5.

You can calculate the matrix B as follow;

$$B_{ij} = (b_1 * i^4 + b_2 * i^3 + b_3 * j^2 + b_4 * j + b_5) \ \% \ 1946002016$$

And then there are 70*70 integer matrix which is the left top region of the result matrix.

You must check this matrix.

When you multiply two matrix, all number of matrix must be modulo by 2016011010.

Output

You must output which IO set is changed by son.

The ID of IO set is from 1 to 100.

Your output must be sorted by increasing order and separated by one white space.

If all IO set is not changed then print 0.

Sample Input and Output

IO data is too large so that we can't show you any sample input and output.

You can guarantee that the IO data format is valid.

Problem 4. Dividing Apple-Pie

Time Limit : 8 second
Memory Limit : 512 megabytes

Description

Hyon Il is a virtuous student.

He always be very kind to his mates and all the friends like him.

One day he brings a delicious and big apple-pie and is going to divide it to his friends.

It is interesting that the apple-pie is shaped ellipse.

He always does two kinds of operations.

The first kind is that he calculates the area of remained apple-pie between the angle L and R.

The second kind is that he gives all the pieces of pie between the angle L and R.

Hyon Il placed the pie on the Cartesian coordinate, so the pie is located inside the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.

You, Hyon Il's brother, want to test younger brother's calculating ability so you must calculate all the queries.

Can you do it? Ok.

Oh, one more condition…

Let $prev$ is a last printed number, then the real L and R is calculated as following formulas.

$$L_{real} = (L_{given} + prev)\ \%\ 360,\ R_{real} = (R_{given} + prev)\ \%\ 360$$

If $L_{real} > R_{real}$ then you must swap two values.

You must operate with two values L_{real} and R_{real}.

Initially $prev = 0$.

Input

The first line of input file contains three integers - $a\ b\ n (1 \le a, b \le 100,\ n \le 300000)$.

a and b is a number described above and n is a number of operations.

Next n lines contains three integers "$type\ L\ R$".

($1 \le type \le 2$, and L and R are random real numbers.)

It is guaranteed that $0 \le L + prev, 0 \le R + prev$.

Output

For each operation 1, you must calculate the result.

Please round to 5 digits after the decimal point.

Sample Input

```
10 10 3
1 10.00000 30.00000
2 40.00000 70.00000
1 10.00000 300.00000
```

Sample Output

```
17.45329

226.89280
```

Note

To make problem easy, L and R are also given with 5 digits after the decimal points.

And $prev$ is a **printed** number of last 1-type query.

For example, $prev = 17.45329$ though the real answer is $17.4532975199432957692369076848 86\cdots$.

Problem 5. Easy Geometry Problem

Time Limit : 1 second
Memory Limit : 32 megabytes

Description

Let $ABCD$ is a tetrahedron and $DA = a, DB = b, DC = c, \angle BDC = \alpha, \angle ADC = \beta, \angle ADB = \gamma$ are given.

You must calculate the radius of inscribed sphere of $ABCD$.

Input

The first line contains one integer $\boldsymbol{T}$ $(1 \leq \boldsymbol{T} \leq 100000)$ – indicating the number of test cases.

Each test case contains six integer $a, b, c, \alpha, \beta, \gamma$.

$(1 \leq a, b, c \leq 100, 0 < \alpha, \beta, \gamma < 360)$

Output

Print the radius of inscribed sphere.

Please round to 6 digits after the decimal point.

Sample Input

```
1
10 10 10 90 90 90
```

Sample Output

```
2.113249
```

Problem 6. Finding the Best Route

Time Limit : 4 second
Memory Limit : 256 megabytes

Description

Bitcity is a capital city of Byteland.

There is a modern highway system in Bitcity and the system is updating frequently – more highways are added to the system.

The system is formed by highways connecting the crossing points.

You, the manager of transporting company, are going to transport computers from one crossing to another.

But in Byteland, the cost of fuel is very expensive so you want to use only one truck to transport.

You want to trasport as much computers as possible, but all the highways has a limit W indicating that the truck which is loaded more than W computers can not pass the highway.

You must calculate the maximum number of computers that you can transport.

It is guaranteed that, you can go from any crossing to any other one on the initial highway system. In other words, original system is connected.

Input

The first line contains one integer $\boldsymbol{T}$ $(1 \leq \boldsymbol{T} \leq 3)$ – indicating the number of test cases.

Each test case begins with one line contains two integers N and M – indicating the number of crossings and highways. $(3 \leq N \leq 70000, N-1 \leq M \leq 150000)$

The next M lines contain three integers $a\ b\ c$ – indicating that there is a highway between a and b, and c is the limit of the highway.

$(1 \leq a, b \leq n,\ \ 1 \leq c \leq 10000)$

The next line contains one integer Q $(1 \le Q \le 105000)$ – indicating the number of queries.

All the queries are one of 2 following forms.

1 a b c : add new highway between a and b, and the limit is c.

2 a b : calculate the maximum number of computers that you can transport from a to b. $(1 \le a, b \le n,\ 1 \le c \le 10000)$

It is possible that there are 2 or more highways between 2 crossing points.

Output

For each second type query, print the maximum number of transportable computers.

Sample Input

```
1
5 6
1 2 2
1 3 3
2 4 7
2 5 1
3 4 6
3 5 5
4
2 2 5
1 4 5 8
2 2 5
2 3 4
```

Sample Output

```
5
7
6
```

Problem 7. Good Days

Time Limit : 1 second
Memory Limit : 64 megabytes

Description

You are given two dates ***y/m/d*** and ***yy/mm/dd*** – one of them is the first good day and the other is the last good day.

All days between them are also good days and the others are not.

You must calculate the number of good days.

Input

The first line contains one integer $\boldsymbol{T}$ $(1 \le \boldsymbol{T} \le 10000)$ – indicating the number of test cases.

Each test case contains six integers $y\ m\ d\ yy\ mm\ dd$. $(1 \le y, yy \le 5000)$

Output

Print the number of good days.

Sample Input

```
1
2016 11 8 2016 11 11
```

Sample Output

```
4
```

Problem 8. Hyosong and Gwangsong

Time Limit : 1 second
Memory Limit : 256 megabytes

Description

There is a long string S and each character of string is a lowercase English alphabets.

Two boys Hyosong and Gwangsong are playing interesting game.

The game rule is followed.

Initially, Hakmyong, the referee of the game, gives them one non-empty substring of S. (Let us write it as P.)

Two players append one English character to the substring alternately such that the result string must be also the substring of S.

If they can not append any character, the game ends.

Hyosong wants to make the final string as short as possible and Gwangsong wants as long string as possible. **Hyosong plays first.**

If they plays optimally, you can guess the **number of appended characters** for each substring. (Let us write it as $f(P)$.)

Substring A is **smaller** than substring B, if $f(A) < f(B)$ holds or $f(A) = f(B)$ and A is smaller than B lexicographically.

You are given the integer K, you must find out the K-th smallest substring of S.

Can you find out?

Input

The first line contains one string that the length is smaller than or equal to 500000.

The second line contains one integer K $(1 \leq K \leq 1000000000)$.

Output

Print the number of appended characters of result substring and the result substring separated by a space.

Sample Input

```
aababb
8
```

Sample Output

```
1 abab
```

Problem 9. International Network Service

Time Limit : 1 second
Memory Limit : 256 megabytes

Description

There are a lot of network servers on the sphere of the Earth.

For each number i, the i-th network server have a characteristic value R_i called "radius" and it can serve all the points that the distance from server to the point is not bigger than R_i.

Then some points can be served from many servers.

Your task is to find the point that can be served from maximum number of servers.

Note that the Earth is a complete sphere with radius 6370, and the distance between two points on the surface of the Earth is not Euclidean distance but distance on the surface.

To make problem easy, all the radius of network servers are between 2012 and 2016 (inclusive).

Input

The first line contains one integer T $(1 \leq T \leq 6)$ – indicating the number of test cases.

The first line of each case contains one N $(1 \leq N \leq 1000)$ – the number of network servers.

The next N lines contains three integers – the longitude and latitude of the position and the radius of servers.

$0 \leq longtitude < 360, -90 < latitude < 90$

Output

Print the answer of the problem.

Sample Input

```
1
2
0 0 2012
0 1 2016
```

Sample Output

```
2
```

Problem 10. Jewel Store

Time Limit : 3 second
Memory Limit : 256 megabytes

Description

Song Yong can solve any mathematical problems very very fast.

His brother, Choe Kwang, has N empty jewel stores which can save expensive jewels.

One day, Choe brings N jewels from the jewel shops.

Choe will save all the jewels to the store one per one store, i.e. he will save only one jewel in every store.

All the jewels have 4 numbers - store number p, the arrival time to the store t, and more 2 characteristic value a and b.

Let us express the jewel as (p, t, a, b).

When the new jewel (p, t, a, b) arrived, Choe must find out the best matched jewel of the arrived jewel.

Best matched jewel (p_1, t_1, a_1, b_1) must satisfy the following conditions.

1. It must be arrived before the new jewel, i.e. $t_1 < t$.
2. Its store number must be smaller than p, i.e. $p_1 < p$.
3. "**Matching effect**" must be maximum. "**Matching effect**" is defined as $a_1 * a + b_1 * b$.

And Choe is willing to write the matching effect of jewels on the door of its store.

Choe instruct Song Yong to calculate and write all the numbers on the door of all stores.

Please help Song Yong.

Input

The first line contains one integer N $(1 \leq N \leq 100000)$ – indicating the number of jewel stores.

And N more lines are followed.

The p-th lines contains three integers $t\ a\ b$ – it means that this jewel is $(p\ t\ a\ b)$. $(1 \le t \le 1000000000,\ 1 \le a, b \le 1000000)$

It is guaranteed that there are no two jewels that arrived simultaneously.

Output

Print N integers.

The p-th number is a number that was written on the p-th door.

Sample Input

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

Sample Output

```
0
4
12
```

Problem 11. K-th Graph Cut

Time Limit : 3 second
Memory Limit : 512 megabytes

Description

Ji Song likes studying graph theory.

The first, he studied about minimum spanning tree.

And next, he studied about shortest path.

And now, he is studying about cutting problem of the graph.

An directed, weighted graph (it is not required to be connected) and the source and destination are given.

Needless to say, source and destination are one of nodes of the graph.

Then you can must remove some edges from the graph so that there is no path from source to destination on the remained graph.

In that time, total sum of all removed edges is called "**cut**".

Ji Song already knows the result that the smallest cut is equal to the maximum flow from source to destination on the original graph.

And now he want to know the K-th smallest cut of the graph.

He can calculate K-th minimum spanning tree and K-th shortest path, but he can't calculate K-th smallest cut.

Please help him.

Input

The first line contains 5 integers $N\ M\ K\ S\ T$.

N $(1 \leq N \leq 100)$ – indicating the number of nodes of the graph,

M $(1 \leq M \leq 1000)$ – indicating the number of edges of the graph,

K $(1 \leq K \leq 100)$,

S $(0 \leq S < N)$ – indicating the index of source,

T $(0 \leq T < N)$ – indicating the index of destination. $(S \neq T)$

The next M lines contains three integers a b c – indicating the edge between a and b, and its weight is c. $(0 \leq a, b < N,\ a \neq b)$

To make problem easy, for every i $(0 \leq i < N,\ i \neq S,\ i \neq T)$, there is at least one edge between i and T.

Output

Print the answer of the problem.

If there is no K-th smallest cut, print -1.

Sample Input

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

Sample Output

```
6
```

Problem 12. Long Integer Factoring

Time Limit : 1 second
Memory Limit : 256 megabytes

Description

I like number theory very much, especially I like factoring integers.

Factoring long integers gives me very exciting pleasure, but it is often hard task.

My teacher gives a new factoring task – "Given integer N, you must factor the big integer $N^4 + 64$."

In the first step, I want to express $N^4 + 64$ as a product of 2 integers a b.

Of course, $1 < a, b < N^4 + 64$ must hold.

I can do it but now I'm very busy.

Can you help me?

Input

The first line contains one integer T $(1 \leq T \leq 10000)$ – indicating the number of test cases.

Each test case contains one integer N $(1 \leq N \leq 10000)$.

Output

Print a and b satisfies $N^4 + 64 = a * b$.

If there are several solutions, print any of them.

Sample Input

```
1
1
```

Sample Output

```
5 13
```