A. Simple Data Structures

Limit

4s, 256MB

Description

You've got an array a, consisting of n integers $a_1, a_2, \ldots, a_n$. You are allowed to perform four operations on this array:

1. `l r`: Calculate the sum of current array elements on the segment $[l, r]$, that is, count value $a_l + a_{l+1} + \ldots + a_r$
2. `l r x`: Apply the xor (`^`) operation of the given number x to each array element on segment $[l, r]$
3. `l r x`: Apply the or (`|`) operation of the given number x to each array element on segment $[l, r]$
4. `l r x`: Apply the and (`&`) operation of the given number x to each array element on segment $[l, r]$

You've got a list of m operations of the indicated type. Your task is to perform all given operations, for each sum query you should print the result you get.

Input

The first row contains the integer n $(1 \leq n \leq 10^5)$ - the size of the array.

The second line contains the space-separated integers $a_1, a_2, \ldots, a_n$ $(1 \leq a_i \leq 10^6)$ - initial array.

The third line contains the integer m $(1 \leq m \leq 5 \times 10^4)$ - the operands of the array.

The following m rows are four operations, l, r, x $(1 \leq l \leq r \leq n, 1 \leq x \leq 10^6)$

1. `l r`: Calculate the sum of current array elements on the segment $[l, r]$, that is, count value $a_l + a_{l+1} + \ldots + a_r$
2. `l r x`: Apply the xor (`^`) operation of the given number x to each array element on segment $[l, r]$
3. `l r x`: Apply the or (`|`) operation of the given number x to each array element on segment $[l, r]$
4. `l r x`: Apply the and (`&`) operation of the given number x to each array element on segment $[l, r]$ $(1 \leq l \leq r \leq n, 1 \leq x \leq 10^6)$

Output

For each query of type 1 print in a single line the sum of numbers on the given segment. Print the answers to the queries in the order in which the queries go in the input.

Please, do not use the `%lld` specifier to read or write 64-bit integers in C++. It is preferred to use the `cin`, `cout` streams, or the `%I64d` specifier.

Examples

Input

```
5
1 1 1 1 1
7
1 1 5
2 1 2 2
1 1 2
3 1 2 2
1 1 2
4 1 2 2
1 1 2
```

Output

```
5
6
6
4
```

B. Otaku Happy Water

Limit

1s, 32MB

Description

Debu is a big cola drinker, but he can't help it.

In order to drink less cola, he designed the following device:

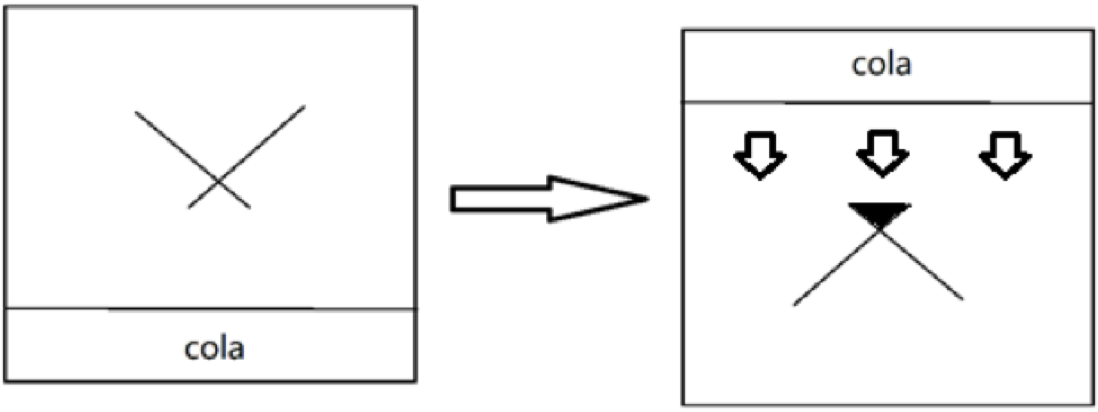
A tank that is nearly infinite in length and height, with an infinite amount of cola at the bottom.

In the middle of the tank there are two planks, The planks are positioned infinitely far from the edge of the tank and the distance between planks and cola is infinite， two planks may intersect,

Debu will turn the tank upside down at noon (completed in a moment), and the cola will fall down vertically, and speed of the cola is quickly, cola reach the bottom in a moment, so some cola may be retained by the planks (because two planks may intersect), and Debu will drink the cola retained by the planks

At night Debu will repeat the process and enjoy the cola again.

Now let's calculate how many volumes of cola Debu can drink in a day. (The width of planks and tank is 1)



Input

The first line is an integer T $(1 \le T \le 10^5)$, represents the number of test case.

Each test case has 8 integers: $x_1, y_1, x_2, y_2, x_3, y_3, x_4, y_4$. (x_1, y_1), (x_2, y_2) are the endpoints of one baffle, and (x_3, y_3), (x_4, y_4) are the endpoints of the other baffle, each integer doesn't exceeding $10,000$.

Output

For each test case output a single line containing a real number with precision up to two decimal places - the volumes of cola.

Examples

Input

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

Output

```
1.00
```

C. Go to work

Limit

1s, 32MB

Description

Now a company has two positions (assumed to be a, b), each of which requires 8 people to be employed. One person can only work in one position . Each person has a competency value for both a and b positions, recorded as a_i, b_i, now assume that there are n people, asking you to choose 8 people for each of the two positions, so that the sum of the competency values of all positions is the largest.

Input

There are multiple sets of data, please use multiple sets of input.

The first line of each group is an integer n $(16 \le n \le 200)$, and $n = 0$ ends. Indicates that there are n people.

Then there are n lines, the $i - \mathrm{th}$ line is the competency value of the $i - \mathrm{th}$ person, each line has 2 integers a_i, b_i $(0 < a_i, b_i \le 100)$; a_i is the competency value of the $i - \mathrm{th}$ person to the position a, and b_i is the competency value of the $i - \mathrm{th}$ person to the position b.

Output

Each group outputs 17 lines, the first line is the maximum value of the sum of the competencies, followed by the number of the selected person, the competency value a_i, the competency value b_i, the post d, $d = 1$ means work in a position, $d = 2$ means work in b position.

Examples

Input

```
100
68 35
1 70
25 79
59 63
65 6
46 82
28 62
92 96
43 28
37 92
5 3
54 93
83 22
17 19
96 48
27 72
39 70
13 68
100 36
95 4
12 23
34 74
65 42
12 54
69 48
45 63
58 38
60 24
42 30
79 17
36 91
43 89
7 41
```

```
43 65
49 47
6 91
30 71
51 7
2 94
49 30
24 85
55 57
41 67
77 32
9 45
40 27
24 38
39 19
83 30
42 34
16 40
59 5
31 78
7 74
87 22
46 25
73 71
30 78
74 98
13 87
91 62
37 56
68 56
75 32
53 51
51 42
25 67
31 8
92 8
38 58
88 54
84 46
10 10
59 22
89 23
47 7
31 14
69 1
92 63
56 11
60 25
38 49
84 96
42 3
51 92
37 75
21 97
22 49
100 69
85 82
35 54
```

```
100 19
39 1
89 28
68 29
94 49
84 8
22 11
18 14
15 10
0
```

Output

```
1527
8 92 96 2
10 37 92 2
12 54 93 2
15 96 48 1
19 100 36 1
20 95 4 1
39 2 94 2
59 74 98 2
69 92 8 1
79 92 63 1
83 84 96 2
85 51 92 2
87 21 97 2
89 100 69 1
92 100 19 1
96 94 49 1
```

D. Li Bai's Boat Ride

Limit

3s, 16MB

Description

All rivers run into sea, tolerance is a virtue.

Streams join rivers and rivers enter the sea.

Any stream can converge into a river. The width of the river is the sum of the width of the original convergent stream.

Many streams will eventually converge into rivers of the same width and go hand in hand.

Li Bai was about to go by boat when he heard the singing of stepping on the shore. Peach blossom pool is thousands of feet deep, not as good as Wang Lun sent me love.

Li Bai was sailing on the river in a boat.

Li Bai hoped that the boat would pass through every river of equal width, which he thought was more poetic.

The width of the river must be greater than or equal to the width of the boat before the boat can pass through.

At least one river can make Li Bai's boat run.

Li Bai hopes to have as many rivers of the same width as possible for the boat to sail, so that he can enjoy more scenery.

Clever you, can you help him do it?

Input

The first line has a positive integer T $(1 \le T \le 30)$, which indicates that there are T cases of test data.

Each case of test data input takes up two lines.

The first line has two positive integers M $(1 \le M \le 65)$ and N $(1 \le N \le 65)$. M represents the width of the boat, N represents the number of streams.

And the next line has N positive integers (each positive integer is no more than 65), representing the corresponding width of the stream.

Output

Each case of test data outputs takes up one line and is a positive integer. Expresses the widths of the largest number of rivers that can be synthesized, these rivers are of the same width and can be passed by boats.

Examples

Input

```
2
5 8
5 2 1 5 1 5 1 4
5 5
1 2 3 4 5
```

Output

```
6
5
```

E. Crypto System

Limit

1s, 32MB

Description

RSA is a well known crypto system. It works as follows. First of all, we have to find two large prime numbers, namely, p and q. Then we set two positive integers, s and t are satisfied $st \equiv 1 \pmod{(p-1)(q-1)}$, that is, $st = (p-1)(q-1)k + 1$, with k being an integer. Now given r $(r = pq)$ and s, we can encrypt all positive integers which are smaller than r. Suppose the number before encryption is n and the number after encryption is m, $m \equiv n^s \pmod{r}$.

Now, giving r, t and m, you are supposed to calculate n.

It is guaranteed that there is exactly one answer for each test case.

Input

Each test case has three integers on a single line. They are given in the order $r\ (4 \le r < 2^{31} - 1), t\ (1 \le t \le 3 \times 10^{10})$ and $m\ (1 \le m \le 3 \times 10^{11})$. The condition below is satisfied: $2 \le p, q \le 5 \times 10^4, 1 \le k \le 100$.

There are multiple test cases. Proceed to the end of file.

Output

For each test case, print the value of n on a single line.

Examples

Input

```
851 317 32
851 233 4273
```

Output

```
2
2
```

Hint

For both test cases, the value of p and q are 37 and 23.

F. Fancy's Game

Limit

3s, 256MB

Description

Fancy is a smart girl. She has known many English words though she is very young. She likes playing such a word game: sticking many words one after another, until the total length is no less than a given constant L. The constraint is that the last letter of the previous word must be the same as the first letter of the next word. Each word can be used more than one time.

Because Fancy knows so many words, she can always finish the game in a minute. To make the game more difficult, she wants to make a lexicographically smallest sequence. Can you help her? Please note the sharing letter of two adjacent words appears only **once** in the result sequence.

Input

There are multiple test cases.

The first line of each test case contain two integers N and L $(1 \le N \le 50, 1 \le L \le 2 \times 10^3)$, indicating the number of words Fancy has known, and the minimum length of the sequence. Then N lines are followed, each contains a word Fancy can use. The length of every word is between 2 and 100. The words contain lower case letters only.

Output

Output a lexicographically sequence for each test case. If there is no solution, output -1 instead.

Examples

Input

```
3 5
aad
cba
abca
2 10
abcde
efghi
```

Output

```
abcaad
-1
```

G. Chicken with cold vegetables can't play with big tree tower

Limit

2s, 128MB

Description

One day, the cold vegetable chicken secretly opened the 4499 Miniclip game to find the joy of childhood.

There's a rooted tree with N nodes and 1 node as roots and M defense facilities. Each defense facility has a defense value X_i, which can provide defense value for descendant nodes whose distance from the defense facility is not more than D_i (of course, the node can also defend itself).

However, the farther the descendant node is from the node where the defense facility is located, the fewer defense values that the defense facility can provide. Assuming that the node where the defense facility is located is A, and that the existing node B is a descendant node and the distance to A node is d_i. And d_i is less than or equal to D, then the defense facility can provide $(X_i - d_i)$ defense values for B node.

When the defense value provided by the defense facility for a node is less than or equal to zero, the value will not be added.

The defense value of a node is the sum of defense values provided by all facilities.

Now the cold chicken wants to know what the defense value of each node is.

Input

The first line contains the single integer N $(1 \le N \le 10^5)$ - the number of nodes of the tree.

Next $N-1$ lines contain two integers u, v - the edge of the tree.

Next line contains M - the number of the defense facilities.

Next M lines contain P_i, D_i, X_i - the node where the first defense facility is located, the defense scope of the defense facility and the defense value that the defense facility can provide.

Output

Print N integers—the defense value of Node i.

Samples

Input

```
6
1 2
2 3
3 4
4 5
4 6
4
1 0 10
2 2 10
5 5 10
1 3 2
```

Output

```
12
11
9
8
10
0
```

H. Clear-Wrong

Limit

2s, 256MB

Description

You're given a string s of length n $(1 \le n \le 10^5)$ consists of only lowercase letters, every char s_i $(1 \le i \le n)$ has a value w_i $(0 \le w_i \le 998344353)$.

The cost of deleting a char s_i is its value w_i.

Please calculate the **minimal** sum of cost of deleting chars in s in order to make sure that there is no subsequence `wrong` in s.

Note that `wrong` is **not necessary** to be consecutive.

Input

The first line contains an integer n $(1 \le n \le 10^5)$ denoting the length of string s.

The second line contains a string s.

The third line contains n integers, the $i - \mathrm{th}$ number denotes w_i $(0 \le w_i \le 998244353)$.

Output

An integer denoting the **minimal** sum of cost.

Samples

Input 1

```
9
qqfwrogng
0 18 48 56 384 448 144 336 36
```

Output 1

```
36
```

Input 2

```
18
musdxxwrongwogownr
0 72 28 70 8 7 0 0 189 42 108 0 180 60 432 0 0 280
```

Output 2

```
0
```