Problem A. Apple Division

Time limit: please refer to DOM Judge
Memory limit: please refer to DOM Judge

There are n apples with known weights. Your task is to divide the apples into two groups (each apple must be in one group) so that the difference between the weights of the groups is minimal.

Input

The first input line has an integer n: the number of apples.

The next line has n integers $p_1, p_2, \ldots, p_n$: the weight of each apple.

- $(1 \leq n \leq 100)$
- $(1 \leq p_i \leq 10^4)$

Output

Print one integer: the minimum difference between the weights of the groups.

Examples

Standard Input	Standard Output
5 3 2 7 4 1	1

Explanation: Group 1 has weights 2, 3 and 4 (total weight 9), and group 2 has weights 1 and 7 (total weight 8).

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Problem B. The Hexagram priest of Sun and Moon's Prophecy

Time limit: please refer to DOM Judge
Memory limit: please refer to DOM Judge

Given a simple graph G with N vertices, M edges. The length of edge i is e_i. Vertices are numbered from 0 to $N-1$.

For any two vertices x, y in this graph, we define the *distance* of x, y be the total length of the shortest path between x and y.

According to the Hexagram priest of Sun and Moon's prophecy, starting from day 0, in each day, the length of each edge will decrease by 1 if it is longer than 1. That is, length of edge i will become $max\{e_i - u, 1\}$ on day u for all $u \geq 0$.

The Hexagram priest of Sun and Moon wants to know at which day, the *distance* of $0, N-1$ will be less than or equal to a specific number K for the first time.

Input

The first input line contains three integers N, M, K as mentioned in the problem statement.

For the next M lines, each contains three integers x, y, w, represents an edge between x, y that has length w.

- $1 \leq N \leq 100000$
- $N-1 \leq M \leq 200000$
- $N-1 \leq K \leq 10^{18}$
- $0 \leq x, y \leq N-1$
- The given graph G is guaranteed to be a connected simple graph.

Output

Print one integer: the first day which the distance of $0, N-1$ becomes less than or equal to K.

Examples

Standard Input	Standard Output
7 10 10 0 1 5 2 1 4 1 6 7 0 5 11 3 4 3 3 6 1 1 3 8 4 1 5 0 2 4 4 2 7	1

Explanation: On day 1, the shortest path between $0, 6$ is 0, 1, 6 and has length $5 - 1 + 7 - 1 = 10$.

Note

The Hexagram priest of Sun and Moon means 日月ㄍㄨㄚ、長 in Chinese.

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Problem C. How da de number

Time limit:	please refer to DOM Judge
Memory limit:	please refer to DOM Judge

Given an array a with length n and q following events. Each event is in one of the two following type:

1. Update $a[k]$ with $a[k] + v$, for all $i = l, \ldots, r$
2. For the range $a[l], \ldots a[r]$, answer the maximum value and the number of element who has the maximum value.

Note that "How da de number" means such a big number.

Input

The first input line contains three integers n, q, which is the length of array a and number of event.

The second line contains n integer $a_1, a_2, \ldots, a_n$, represent the each element in array a.

For the next q lines, each line in in one of the two following form:

1. 1 l r v: The event of type 1
2. 2 l r: The event of type 2

- $1 \leq n, q \leq 100000$
- $1 \leq l \leq r \leq N$
- $1 \leq v, a[i] \leq 10^9$, for each $i = 1, 2, \ldots, n$

Output

For each event of type 2, print the answer mentioned in the statement in each line.

Examples

Standard Input	Standard Output
6 6 3 2 1 1 2 3 1 2 4 2 1 1 6 2 2 1 4 2 3 6 1 3 5 3 2 2 5	6 1 5 3 8 2

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Problem D. LCM Tuple

Time limit:	please refer to DOM Judge
Memory limit:	please refer to DOM Judge

Given a number k, find the number of ordered 3-tuples (a, b, c) such that $lcm(a, b, c) = k$. Where lcm is the **least common multiplier**.

Two 3-tuples is the same if the value are the same for every entries.

Input

The first input line contains an integer t, represent the number of testcases.

For the following t lines, each line represent a testcase. And each line contains an integer k mentioned in the statement.

- $1 \leq t \leq 5 \times 10^5$
- $1 \leq k \leq 2 \times 10^6$

Output

For each testcase, output the answer in one line.

Examples

Standard Input	Standard Output
5 13 6 4 30 1	7 49 19 343 1

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Problem E. Do You Want To Play A Game

Time limit: please refer to DOM Judge
Memory limit: please refer to DOM Judge

You are given an undirected weighted tree with n nodes and $n-1$ edges. You may perform the following operations as many times as possible. Each operation can be broken down into two steps:

- First, select an edge that connects **existing nodes** u and v, with weight of w. Here we denote an **existing node** as a node who isn't removed by the second step from all previous operations.
- Then, remove both node u and v from the tree, and add w to your score.

Your initial score is 0. What is the maximum score you can obtain if you can perform arbitrary number (possibly zero) of operations?

Input

The first input line contains an integer n, representing the number of nodes of the tree.

For the following $n-1$ lines, the ith line contains 3 integers u_i, v_i, w_i, meaning that edge i connects node u_i and node v_i with weight of w_i.

- $1 \leq n \leq 10^5$
- $1 \leq u_i, v_i \leq n$
- $u_i \neq v_i$
- $1 \leq w_i \leq 10^9$
- All input values are integers.

Output

Print an integer, the maximum score you can obtain.

Examples

Standard Input	Standard Output
4 1 2 5 2 3 9 3 4 5	10

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Problem F. You can't see me!

Time limit:	please refer to DOM Judge
Memory limit:	please refer to DOM Judge

National Tsing Hua University (NTHU) is out of electricity again! Since Mr. Gao has learn a lesson from the previous disaster, he had set up emergency lights in every buildings in NTHU.

There are n buildings in NTHU. The buildings are connected with $n-1$ roads such that for every pair of buildings, there exists a unique simple path that connects the pair of buildings.

The students want to communicate with each other during the electricity outage. If the emergency light has a strength of w, then two adjacent buildings can communicate if and only if there exists a road between them, and the length of the road between them is not greater than w. Also, if building a can communicate with building b, and building b can communicate with building c, then building a can also communicate with building c.

To prevent students from playing with emergency lights, only Mr. Gao can control the lights, and the light strength for each building are the same.

You have to perform q queries. For each query, you need to answer the minimum strength of light such that the buildings x_j and y_j can communicate with each other.

Input

The first input line contains an integer n, representing the number of buildings in NTHU.

For the following $n-1$ lines, the ith line contains 3 integers u_i, v_i, l_i, meaning that road i between building u_i and building v_i has length of l_i.

The next line has an integer q, representing the number of queries.

For the following q lines, the jth line contains two integer x_j and y_j.

- $2 \leq n \leq 10^5$
- $1 \leq u_i, v_i \leq n$
- $1 \leq l_i \leq 10^9$
- $1 \leq q \leq 5$
- $1 \leq x_j, y_j \leq n$
- $u_i \neq v_i$
- $x_j \neq y_j$
- All input values are integers.

Output

Print q lines, for each line print the answer to that query.

Examples

Standard Input	Standard Output
5 1 2 5 1 3 3 3 4 7 3 5 2 5 4 5 2 3 1 5 3 4 2 5	7 5 3 7 5