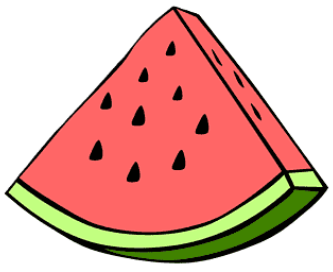
2nd Programming Contest League 2025 - University of Birjand - Yalda Night Special Edition

Date: May 2025

Committee Members

Scientific Team
Technical Team
Executive Team



Problem A : Naneh Sarma

There is a story about **Naneh Sarma** preparing for the long night of winter. As part of her preparations, she fills bowls with pomegranates and walnuts. Let x denote the number of pomegranates and y denote the number of walnuts in a bowl.

To make the night perfect, she follows two simple rules for each bowl:

- The values x and y must both be between 1 and N.
- The two numbers must not share any common divisor other than 1, that is, $\gcd(x, y) = 1$.

The Bowl's Score

For every bowl she prepares, Naneh Sarma calculates a *score*. She first computes the sum $x + y$ and the absolute difference $|x - y|$, and then defines the score of the bowl as:

$$\gcd(x + y,\ |x - y|)$$

Your Task

Find the **total score**, defined as the sum of the scores of all **ordered pairs** (x, y) that satisfy the rules above. Formally, you are asked to compute:

$$\sum_{\substack{1 \le x \le N \\ 1 \le y \le N \\ \gcd(x,y)=1}} \gcd(x + y,\ |x - y|)$$

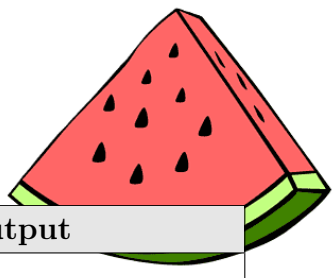
Input

The input consists of a single integer N.

$$1 \le N \le 10^7$$

Output

Print a single integer — the total sum of all scores.



Example

Standard Input	Standard Output
3	10

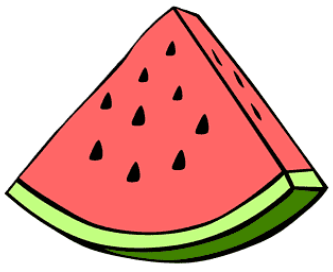
Note

For $N = 3$, all ordered pairs (x, y) with $1 \leq x, y \leq 3$ and $\gcd(x, y) = 1$ are listed below, together with their corresponding scores:

- $(1, 1)$: $\gcd(1 + 1,\ |1 - 1|) = \gcd(2, 0) = 2$
- $(1, 2)$: $\gcd(1 + 2,\ |1 - 2|) = \gcd(3, 1) = 1$
- $(2, 1)$: $\gcd(2 + 1,\ |2 - 1|) = \gcd(3, 1) = 1$
- $(1, 3)$: $\gcd(1 + 3,\ |1 - 3|) = \gcd(4, 2) = 2$
- $(3, 1)$: $\gcd(3 + 1,\ |3 - 1|) = \gcd(4, 2) = 2$
- $(2, 3)$: $\gcd(2 + 3,\ |2 - 3|) = \gcd(5, 1) = 1$
- $(3, 2)$: $\gcd(3 + 2,\ |3 - 2|) = \gcd(5, 1) = 1$

Adding all these values together gives:

$$2 + 1 + 1 + 2 + 2 + 1 + 1 = 10$$



Problem B : Pomegranate Bowls

During a winter gathering in the city of **Neverland**, a long table is prepared for a traditional celebration. On the table, there are N bowls filled with pomegranate seeds, placed in a row and numbered from 1 to N. Each bowl initially contains a certain number of seeds.

Throughout the gathering, several changes are made to the bowls, and from time to time, the balance of seeds on parts of the table is checked. You are asked to process these operations efficiently.

Operations

There are Q operations of the following three types:

- **Add Seeds:** `1 L R X` Add X seeds to each bowl with index from L to R (inclusive).
- **Remove Seeds:** `2 L R X` Remove X seeds from each bowl with index from L to R (inclusive). The number of seeds in a bowl may become negative.
- **Balance Check:** `3 L R` For the segment $[L, R]$, compute the *balance value*, defined as:

$$\max_{L \le i \le R} A_i \; - \; \min_{L \le i \le R} A_i$$

where A_i is the current number of seeds in the i-th bowl.

All operations must be processed in the given order. For each operation of type `3`, output the corresponding balance value.

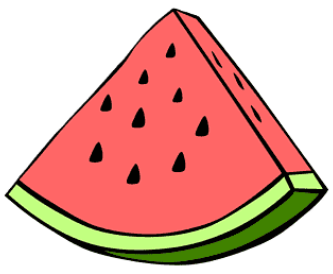
Input

The first line contains two integers N and Q — the number of bowls and the number of operations.

The second line contains N integers, where the i-th integer represents the initial number of seeds in the i-th bowl.

The next Q lines each describe one operation in one of the formats listed above.

$$1 \le N, Q \le 2 \times 10^5$$
$$1 \le L \le R \le N$$
$$-10^9 \le A_i \le 10^9$$
$$1 \le X \le 10^9$$



Output

For each operation of type 3, print a single integer — the balance value for that query. Each result must be printed on its own line.

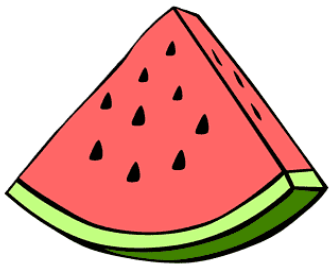
Example

Standard Input	Standard Output
5 6 3 1 4 1 5 3 1 5 1 2 4 3 3 1 5 2 3 5 2 3 3 5 3 1 1	4 4 3 0

Note

In the example above:

- The first balance check computes $\max(3, 1, 4, 1, 5) - \min(3, 1, 4, 1, 5) = 5 - 1 = 4$.
- After adding 3 seeds to bowls 2 through 4, the array becomes $[3, 4, 7, 4, 5]$.
- The second balance check again results in $7 - 3 = 4$.
- After removing 2 seeds from bowls 3 through 5, the array becomes $[3, 4, 5, 2, 3]$.
- The third balance check on segment $[3, 5]$ gives $5 - 2 = 3$.
- The final balance check on $[1, 1]$ gives 0.



Problem C : A Long Winter Night in Neverland

In the city of **Neverland**, there is a special night at the beginning of winter that everyone looks forward to. It is a cold night, but a warm one — a night when people stay awake longer than usual, gather together, share fruit, and talk about the year ahead.

To celebrate this night, many families choose to gather outdoors along the **main street of the city**. Each participant has a fixed position on the street, decided in advance.

However, past experience has shown that if some people stand too close to each other, the gathering becomes crowded and the calm atmosphere of the night is lost. Because of this, the city council of Neverland has introduced the following rule.

Each participant's position on the main street is given as a number, representing the distance (in meters) from the beginning of the street. According to the council's regulation, if two participants **do not have special permission**, the distance between them must be at least L.

The council may grant **special permission** to some participants. Those who receive such permission are exempt from the distance restriction and may remain at their positions regardless of how close others are.

The council now has the complete list of participants and their assigned positions. Its goal is to grant the **minimum possible number of special permissions** so that all remaining participants without permission are at least L meters apart from each other.

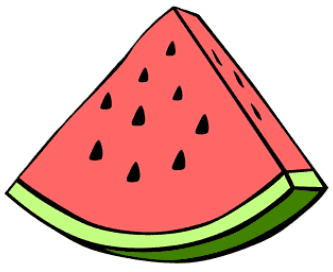
Your task is to determine the minimum number of participants that must receive special permission so that the gathering can be held peacefully in Neverland.

Input

The input consists of two lines. The first line contains two integers n and L — the number of participants and the minimum required distance.

The second line contains n integers, where the i-th number represents the position of the i-th participant on the main street of Neverland.

$$1 \leq n \leq 10^5$$
$$1 \leq L \leq 10^5$$
$$-10^5 \leq a_i \leq 10^5$$



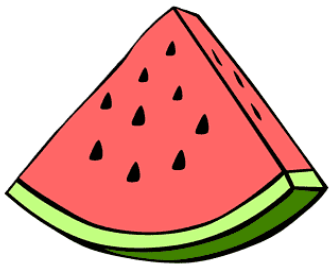
Output

Print a single integer — the minimum number of participants that must receive special permission.

Example

Standard Input	Standard Output
5 2 -1 0 1 2 3	2

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



Problem D : The Cipher of the Deepest Night

In the heart of the year's longest and coldest night, an ancient chest containing the wisdom of the elders and the crimson fruits of the harvest sits locked. To reveal its secrets before the first light of dawn, one must provide a specific emergency code.

The vault's mechanism is unique: it does not wait for a full sequence. Instead, it continuously scans the stream of characters and accepts the very first valid contiguous segment it encounters.

A segment is considered balanced and valid only if it satisfies the following celestial harmony:

- Its length is at least 6.
- It contains at least one uppercase English letter (`A--Z`).
- It contains at least one lowercase English letter (`a--z`).
- It contains at least one decimal digit (`0--9`).

Your Task

Given a string of alphanumeric characters, determine the length of the **shortest contiguous substring** that meets all the requirements above. If no such substring exists, output 0.

Input

The input contains multiple test cases. The first line contains an integer N — the number of scenarios (test cases).

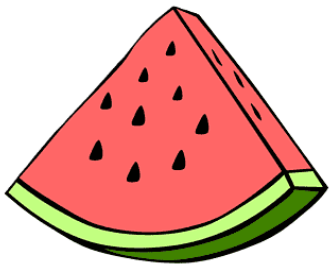
Each of the next N lines contains a string representing the typed input stream.

$$1 \leq N \leq 50$$

$$1 \leq |S| \leq 200$$

Output

For each test case, output a single integer — the minimum length of a valid substring. If no valid substring is found, output 0.



Example

Standard Input	Standard Output
4 AliKam123test AbCdEfG 88syadneerG Windows7released21october2009	6 0 10 8