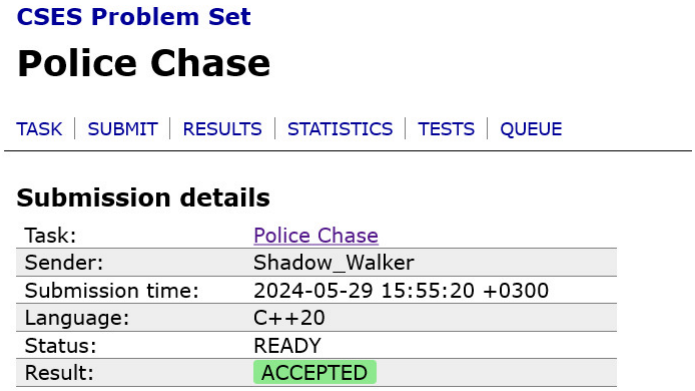
Assignment 1

Instructions:

1. Use C++ only to submit your code.
2. Solve and submit your code on the provided links which can be accessed from the question heading.
3. Upload C++ solutions as .cpp files with appropriate file names in your respective github repository.
4. Upload a screenshot of the submission on the respective websites, showing it is accepted ofr each question. A similar image for a CSES submission is shown.



CSES Problem Set

Police Chase

TASK | SUBMIT | RESULTS | STATISTICS | TESTS | QUEUE

Submission details

Task:	Police Chase
Sender:	Shadow_Walker
Submission time:	2024-05-29 15:55:20 +0300
Language:	C++20
Status:	READY
Result:	ACCEPTED

1. Maximum Subarray Sum

Given an array of n integers, your task is to find the maximum sum of values in a contiguous subarray with length between a and b.

Input

The first input line has three integers n, a, and b: the size of the array and the minimum and maximum subarray length.

The second line has n integers $x_1, x_2, \ldots, x_n$: the array values.

Output

Print one integer: the maximum subarray sum.

Constraints

- $1 \leq n \leq 2 \cdot 10^5$
- $1 \leq a \leq b \leq n$
- $-10^9 \leq x_i \leq 10^9$

Example

Input:

```
8 1 2
-1 3 -2 5 3 -5 2 2
```

Output:

```
8
```

2. Sum of Three Values

You are given an array of n integers, and your task is to find three values (at distinct positions) whose sum is x.

Input

The first input line has two integers n and x: the array size and the target sum.

The second line has n integers $a_1, a_2, \ldots, a_n$: the array values.

Output

Print three integers: the positions of the values. If there are several solutions, you may print any of them. If there are no solutions, print "IMPOSSIBLE".

Constraints

- $1 \leq n \leq 5000$
- $1 \leq x, a_i \leq 10^9$

Example

Input:

```
4 8
2 7 5 1
```

Output:

```
1 3 4
```

3. Range XOR Queries

Given an array of n integers, your task is to process q queries of the form: what is the xor sum of values in range $[a, b]$?

Input

The first input line has two integers n and q: the number of values and queries.

The second line has n integers $x_1, x_2, \ldots, x_n$: the array values.

Finally, there are q lines describing the queries. Each line has two integers a and b: what is the xor sum of values in range $[a, b]$?

Output

Print the result of each query.

Constraints

- $1 \leq n, q \leq 2 \cdot 10^5$
- $1 \leq x_i \leq 10^9$
- $1 \leq a \leq b \leq n$

Example

Input:

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

Output:

```
3
0
6
4
```

4. Calculator

Given a string s representing a valid expression, implement a basic calculator to evaluate it, and return the result of the evaluation.

Note: You are not allowed to use any built-in function which evaluates strings as mathematical expressions, such as eval().

Example 1

Input:

```
s = " 2-1 + 2 "
```

Output:

```
3
```

Example 2

Input:

```
s = "(1+(4+5+2)-3)+(6+8)"
```

Output:

```
23
```

Constraints

- $1 \leq s.length \leq 3 \times 10^5$
- s consists of digits, '+', '-', '(', ')', and ' '.
- s represents a valid expression.
- '+' is not used as a unary operation (i.e., "+1" and "+(2 + 3)" is invalid).
- '-' could be used as a unary operation (i.e., "-1" and "-(2 + 3)" is valid).
- There will be no two consecutive operators in the input.
- Every number and running calculation will fit in a signed 32-bit integer.

5. Matchsticks

Chef Ceil has some matchsticks in his kitchen.

Detail of matchsticks:

There are N matchsticks in total. They are numbered from 0 to $N-1$ inclusive. The ith matchstick takes b_i time to burn when lighted at one end, and it burns at a uniform rate.

If lighted at both ends simultaneously, the matchstick will take only half of the original time to burn down.

Arrangement:

He ties rear end of all the matchsticks together at one point and the front end is kept free. The matchstick numbered i is adjacent to matchstick numbered $i+1$ for all $0 \leq i \leq N-2$.

Bodies of matchsticks do not touch each other, except at the rear end.

Task:

There are Q queries, in each query we ask: If he lights the free end of all matchsticks numbered between L and R inclusive, what will be the time needed for all matchsticks to get completely burnt?

Input

The first line of input contains a single integer N.

The next line contains N space-separated integers, the ith of which is b_i.

The next line contains a single integer Q.

The next Q lines each contain two space-separated integers - L and R. The ith line represents the ith query.

Output

For each query, print the answer on a new line.

Constraints

- $1 \leq N \leq 10^5$
- $1 \leq b_i \leq 10^9$ for all $0 \leq i \leq N-1$
- $1 \leq Q \leq 10^5$
- $0 \leq L \leq R \leq N-1$

Example

Input:

```
1
5
1
0 0
```

Output:

```
5.0
```