JOI '14 - Secret

Contest Day 2 - JOI Open Contest

Anna invented a secret binary operation $\star$. For non-negative integers x, y less than or equal to $1\,000\,000\,000$, a non-negative integer $x \star y$ less than or equal to $1\,000\,000\,000$ is determined. This operation $\star$ is associative. Namely, the equality $(x \star y) \star z = x \star (y \star z)$ holds for non-negative integers x, y, z less than or equal to $1\,000\,000\,000$. This value is simply denoted by $x \star y \star z$.

Anna planned to play a game with Bruno. She asked him to guess the operation $\star$. She showed N integers $A_0, A_1, \ldots, A_{N-1}$ to him. She gave to him a number of queries of the following form: "What is the value of $A_L \star A_{L+1} \star \cdots \star A_R$?"

Bruno said it is difficult to play this game without hints. Anna decided to give hints to him. Each hint is given as follows: he will choose x, y to ask the value of $x \star y$, and she will tell him the value of $x \star y$. He can ask for hints when the integers $A_0, A_1, \ldots, A_{N-1}$ are given in the beginning of the game. He can also ask for hints when she gives a query to him. Of course, he would like to reduce the number of hints. Because he would like to behave as if he knows almost everything about the operation $\star$, he would especially like to reduce the number of hints after a query is given to him.

Task

Write a program which implements Bruno's strategy to ask for hints and answer Anna's queries correctly.

Implementation Details

You should write a program which implements the strategy to ask for hints and answer Anna's queries. Your program should include the header file `secret.h` by `#include "secret.h"`

Your program should implement the following procedures.

- ```
  void Init(int N, int A[])
  ```

  This procedure is called only once in the beginning. The parameter N is the number N of the integers shown by Anna. The parameter A is an array of length N. The elements $A[0], A[1], \ldots, A[N-1]$ are the integers $A_0, A_1, \ldots, A_{N-1}$ shown by her.

- ```
  int Query(int L, int R)
  ```

  This procedure is called when Anna gives a query to Bruno. This means she is asking the value of $A_L \star A_{L+1} \star \cdots \star A_R$ $(0 \leq L \leq R \leq N-1)$.

The following procedure can be called by your program.

- ```
  int Secret(int X, int Y)
  ```

  This procedure is called when Bruno asks for a hint. This means he is asking about the value of $X \star Y$. The parameters X and Y should be integers satisfying $0 \leq X \leq 1\,000\,000\,000$ and $0 \leq Y \leq 1\,000\,000\,000$. If this procedure is called with parameters not satisfying this condition, your program is considered as **Wrong Answer [1]** and terminated.

  This procedure returns the value of $X \star Y$.

Constraints

All input data satisfy the following conditions.

- $1 \leq N \leq 1\,000$.
- $0 \leq A_i \leq 1\,000\,000\,000$ $(0 \leq i \leq N-1)$.
- The number of calls to `Query` is less than or equal to $10\,000$.

Grading

The score will be given to your program if your program terminates successfully for each test case, it is not considered as **Wrong Answer [1]**, and it returns the correct value for each call to `Query`.

Your score is calculated as follows.

1. Your score is 100 if the following two conditions are satisfied for each test case:
   - In `Init`, the number of calls to `Secret` is less than or equal to $8\,000$.
   - In each call to `Query`, the number of calls to `Secret` is less than or equal to 1.
2. Your score is 30 if your program does not satisfy (1), and the following two conditions are satisfied:
   - In `Init`, the number of calls to `Secret` is less than or equal to $8\,000$.
   - In each call to `Query`, the number of calls to `Secret` is less than or equal to 20.
3. Your score is 6 if your program does not satisfy (1) or (2).
  ```