

## Problem A. Cinderella at the pigeon-loft

Input file:           standard input  
Output file:         standard output  
Time limit:          1 second  
Memory limit:       64 megabytes

Evil Stepmother took Cinderella to the pigeon-loft, where there were  $2n \times 2n$  cells, and she required to place from 1 to  $4n^2$  pigeons in the cells so that the number of pigeons in each cell would not repeat. The bigger the number of pigeons in the neighbor cells is, the more they scream and do not let Stepmother sleep. Help Cinderella seat the birds so that the maximum sum of pigeons between neighbor cells will be minimal. The cells are considered to be neighbor if they have a common side.

### Input

The only line of input file has an integer  $n$ , which is required to determine the size of a matrix ( $1 \leq n \leq 100$ )

### Output

The single line of the output file should contain table elements separated by spaces.

### Example

| standard input | standard output |
|----------------|-----------------|
| 1              | 2 3 4 1         |

## Problem B. Sequence

Input file:           standard input  
Output file:         standard output  
Time limit:          4 second  
Memory limit:       64 megabytes

You are given some natural number  $N$ . You want to find longest subsequence  $A$  of sequence  $1, 2, \dots, N$  such that  $A_j$  is a divisor of  $A_i$  for every  $i > j$ .

### Input

First and the only line of the input file contains natural number  $N$ ,  $1 \leq N \leq 10^{(10^4)}$ .

### Output

Output a single natural number — the length of subsequence  $A$ .

### Example

| standard input | standard output |
|----------------|-----------------|
| 14             | 4               |

## Problem C. Maze

Input file:           standard input  
Output file:         standard output  
Time limit:          2 second  
Memory limit:       64 megabytes

You are given a maze of  $N \times N$ , cells, some of them may be blocked. You are also given a path of the robot through this maze. The path is  $k$  cells long, but it does not specify the robot's starting position. However, you know that the robot started its path in one of the unblocked cells. What is the smallest number of steps you can take along this path, after which you can precisely and unambiguously determine the robot's position?

### Input

The first line of input contains two integers  $N$  ( $1 \leq N \leq 100$ ) and  $k$  ( $0 \leq k \leq 10^5$ ), separated by spaces. Next  $N$  lines define a maze map as an array of characters 0 and 1 without any spaces, where 1 defines a blocked cell, and 0 is an unblocked one. The last line contains a sequence of  $k$  ( $0 \leq k \leq 10^5$ ) characters, defining a robot's path through the maze. Each character defines a direction of a single robot's step, where character  $U$  is a step up,  $D$  is a step down,  $R$  is a step right, and  $L$  is a step left. Every character in the last line is guaranteed to be one of the uppercase characters  $U$ ,  $D$ ,  $L$  or  $R$ .

### Output

Output a single nonnegative integer – the smallest number of steps along the path, after which the robot's position can be determined precisely and unambiguously. If there's no solution, or input data is invalid, output -1.

### Example

| standard input                  | standard output |
|---------------------------------|-----------------|
| 2 0<br>11<br>01                 | 0               |
| 2 0<br>11<br>11                 | -1              |
| 2 1<br>11<br>01<br>R            | -1              |
| 3 3<br>000<br>010<br>000<br>RDU | 2               |

## Problem D. Triangular table

Input file:           standard input  
Output file:         standard output  
Time limit:          1 second  
Memory limit:       64 megabytes

Ministry of Negotiations wants to build a new room for negotiations. It is planned to put a large triangular table in it. According to the plan, the room should have a form of a proper  $N$ -gon. Knowing the length of the sides of the table, compute such minimal possible square of the room that the table could be placed in the room.

### Input

The only line of the input contains four natural numbers:  $N$  — number of angles in the new room for negotiations ( $3 \leq N \leq 100$ );  $a, b, c$  — lengths of the table's sides ( $1 \leq a \leq b \leq c \leq 100, a + b > c$ ).

### Output

The output file should contain one real number — the minimal possible square of the room computed with precision  $10^{-4}$ .

### Example

| standard input | standard output |
|----------------|-----------------|
| 4 5 5 5        | 23.325318       |

## Problem E. PublicBank

Input file:           standard input  
Output file:         standard output  
Time limit:          3 seconds  
Memory limit:       64 megabytes

Student Vova has recently graduated from the university. He is now working as a programmer in a big bank called "PublicBank". The bank needs a new database to work with  $N$  records, numbered 1 through  $N$ . When a query for the record  $\#j$  ( $1 \leq j \leq N$ ) arrives, the database needs to find this record and return any data stored with it. Statistically, a query for the record  $\#j$  arrives with some known fixed probability  $p_j$ .

The only programming language that Vova remembers from his courses is Lisp. The main data structure in Lisp is a single-linked list, so Vova used them to built the required database. As you know, the complexity of accessing an element of a single-linked list is proportional to the position of this element in the list. Consequently, when a query for the record  $\#j$  arrives, and the record is now at position  $\#i$  in the single-linked list, the database has to look at  $i$  list elements while looking for the record  $\#j$ . Looking at a single list element takes 1 ms on the PublicBank server.

To reduce this horrendous reaction time, Vova added a heuristics in his program. Every time the database answers a query for any record, it cuts this record from the single-linked list and moves it to the head of the list instead. Vova hopes that with this heuristics often-queried records will require less time.

Suppose that Vova's database is deployed to PublicBank server and is running on it for quite a long time (almost infinite time, in fact: PublicBank won't have any customer shortage no matter what). What is the expected query answer time in this unforeseeable future?

### Input

The first line of the input contains a single integer  $N$  ( $1 \leq N \leq 10^4$ ). The second line contains  $N$  reals  $p_1, \dots, p_N$ , separated by spaces, each with 5 decimal digits of precision – statistical probabilities of querying records  $1, \dots, N$ . It is guaranteed that  $\sum_{i=1}^n p_i = 1$ .

### Output

Output a single real number – the expected query answer time in the future, in milliseconds. The absolute or relative error of your answer should be at most  $10^{-4}$ .

### Examples

| standard input                                  | standard output |
|-------------------------------------------------|-----------------|
| 1<br>1                                          | 1.00000000      |
| 2<br>0.50000 0.50000                            | 1.50000000      |
| 3<br>0.50000 0.25000 0.25000                    | 1.91666667      |
| 5<br>0.14388 0.15583 0.35258 0.21028<br>0.13743 | 2.83404788      |

## Problem F. Airport

Input file:           standard input  
Output file:         standard output  
Time limit:          1 second  
Memory limit:       64 megabytes

Municipal government of Treeland decided to build an airport to provide transport connection to outer world. Treeland consists of  $N$  towns with roads between some of them. Every town has its own number from 1 to  $N$ . It is known that for each pair of towns, there exists a path from one town to another, maybe across other towns, and the total number of roads in Treeland is  $N - 1$ .

Airport can be located in any town or at any place on the road. To make it comfortable, government wants to minimize maximum distance from airport to any town in Treeland. Help them to choose right place to achieve that goal.

### Input

The first line of the input file contains a single integer  $1 \leq N \leq 10^5$  — number of towns in Treeland Each of the next  $N - 1$  lines contain three numbers:  $a$ ,  $b$  and  $d$  separated by spaces. It means that towns  $a$  and  $b$  are connected directly with the road, the length of which is  $d$ .  $1 \leq a, b \leq N$ ,  $1 \leq d \leq 10^9$ . All numbers in the input data are integers.

### Output

If the airport should be located in town, print «IN TOWN» (without quotes, with one space between words), in the first line of output file, and chosen town number in the second line. If, otherwise, the airport should be placed on the road, print «ON ROAD» (without quotes, with one space between words), in the first line of input file. The second line must contain three numbers separated by spaces: numbers of towns between which the airport should be located (in ascending order) and distance from first listed town to the airport with precision not less than  $10^{-2}$ . If there is more than one solution, output any of them.

### Example

| standard input               | standard output     |
|------------------------------|---------------------|
| 2<br>1 2 2                   | ON ROAD<br>1 2 1.00 |
| 4<br>1 3 5<br>2 3 5<br>3 4 5 | IN TOWN<br>3        |