

Pacific Northwest Regional Programming Contest

Division P2

25 February 2023

- The languages supported are C, C++ 17 (with Gnu extensions), Java, Python 3 (with pypy3), and Kotlin.
- Python 2 and C# are not supported this year.
- For all problems, read the input data from standard input and write the results to standard output.
- In general, when there is more than one integer or word on an input line, they will be separated from each other by exactly one space. No input lines will have leading or trailing spaces, and tabs will never appear in any input.
- Submit only a single source file for each problem.
- Python may not have sufficient performance for many of the problems; use it at your discretion.

This page is intentionally left blank.

Problem A

Double Password

Time Limit: 1 sec

A computer at ICPC headquarters is protected by a four-digit password—in order to log in, you normally need to guess the four digits exactly. However, the programmer who implemented the password check left a backdoor in the computer—there is a second four-digit password. If the programmer enters a four-digit sequence, and for each digit position the digit entered matches at least one of the two passwords in that same position, then that four-digit sequence will log the programmer into the computer.

Given the two passwords, count the number of distinct four-digit sequences that can be entered to log into the computer.

Input

The input consists of exactly two lines. Each of the two lines contains a string s ($|s| = 4, s \in \{0-9\}^*$). These are the two passwords.

Output

Output a single integer, which is the number of distinct four-digit sequences that will log the programmer into the system.

Sample Input 1

```
1111
1234
```

Sample Output 1

```
8
```

Sample Input 2

```
2718
2718
```

Sample Output 2

```
1
```

This page is intentionally left blank.

Problem B

H-Index

In research, it is tough to determine how good of a researcher you are. One way that people determine how good you are is by looking at your *H-Index*.

Each paper has a certain number of citations. Your *H-Index* is the largest number H such that you have H papers with at least H citations. Given the number of citations on each paper you have written, what is your *H-Index*?



Input

The first line of input contains a single integer n ($1 \leq n \leq 100,000$), which is the number of papers you have written.

The next n lines describe the papers. Each of these lines contains a single integer c ($0 \leq c \leq 1,000,000,000$), which is the number of citations that this paper has.

Output

Display your *H-Index*.

Sample Input 1

5
 7
 1
 2
 1
 5

Sample Output 1

2

Pacific Northwest Regional Contest

Sample Input 2

5
7
1
3
1
5

Sample Output 2

3

Sample Input 3

3
4
2
3

Sample Output 3

2

Problem C

Integer Division

In C++ division with positive integers always rounds down. Because of this, sometimes when two integers are divided by the same divisor they become equal even though they were originally not equal. For example in C++, $5/4$ and $7/4$ are both equal to 1, but $5 \neq 7$.

Given a list of nonnegative integers and a divisor, how many pairs of distinct entries in the list are there that give the same result when both are divided by the divisor in C++?

Input

The first line of input contains two integers n ($1 \leq n \leq 200,000$), the number of elements in the list, and d ($1 \leq d \leq 10^9$), the divisor.

The second line of input contains n integers a_1, \dots, a_n ($0 \leq a_i \leq 10^9$), where a_i is the i^{th} element of the list.

Output

Display a single integer indicating the number of distinct pairs of indices (i, j) with $1 \leq i < j \leq n$ such that $a_i/d = a_j/d$ when using integer division in C++. Note that the numbers in the list are not necessarily distinct (i.e. it is possible that $a_i = a_j$ for some indices $i \neq j$).

Sample Input 1

```
5 4
4 5 6 7 8
```

Sample Output 1

```
6
```

Sample Input 2

```
5 1
4 5 6 7 8
```

Sample Output 2

```
0
```

Sample Input 3

```
6 1
1 2 1 2 1 2
```

Sample Output 3

```
6
```

This page is intentionally left blank.

Problem D

Lost Lineup

Jimmy and his friends were all standing in a lineup for ice cream when a huge gust blew them all around. The friends want to keep things fair and make sure everyone gets their ice cream in the order they started with. The friends do not remember the order, but each of them remember exactly how many people were between them and Jimmy. Jimmy is always the first person in line. Can you help him and his friends remember the order?

Input

The first line contains a single integer n ($1 \leq n \leq 100$), the number of people in the line.

The second line contains $n - 1$ space separated integers, where d_i ($0 \leq d_i \leq n - 2$) is the number of people between the $(i + 1)^{\text{th}}$ person and Jimmy.

Jimmy is always first in the lineup.

Output

Print a single line with n integers, the people in the order of the original lineup. It is guaranteed that there is always a unique solution.

Sample Input 1

2
0

Sample Output 1

1 2

Sample Input 2

4
1 2 0

Sample Output 2

1 4 2 3

This page is intentionally left blank.

Problem E

No Thanks!

Time Limit: 1 sec

In the card game “No Thanks,” the deck of cards consists of 36 cards numbered 1–36, and players collect cards to their score pile as the game is played. A player’s final score is the sum of the numbers on their collected cards, with one exception: if a player has collected any cards with two or more consecutive numbers, only the smallest number of that group counts toward the score. Your job is to compute the score for a single player’s pile of cards, though here we allow play with a deck much larger than 36 cards.

Input

The first line contains one integer, n , representing the number of cards collected. The second line contains n integers representing the numbers on the collected cards. You may assume that $1 \leq n \leq 90\,000$, all card values are in the range $1 \dots 90\,000$ inclusive, and no card value is repeated.

Output

Output a single line containing the score for the given set of cards.

Sample Input 1

```
5
1 7 5 3 4
```

Sample Output 1

```
11
```

Sample Input 2

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

Sample Output 2

```
9
```

This page is intentionally left blank.

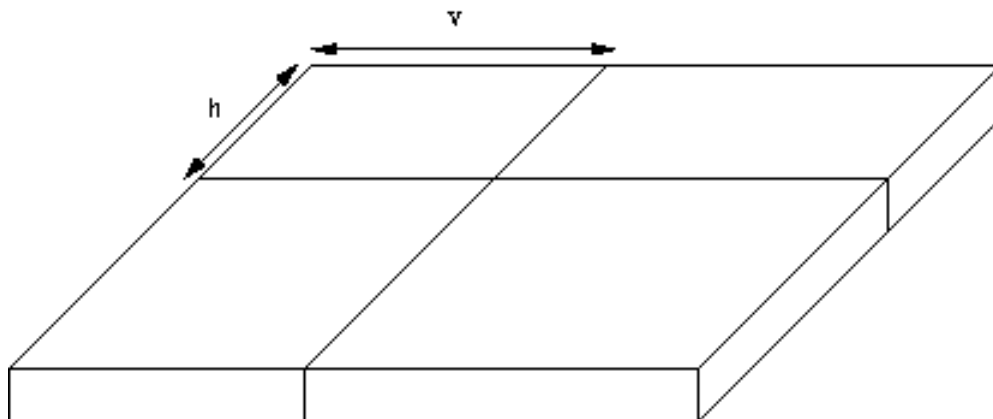
Problem F

Piece of Cake!

It is Greg's birthday! To celebrate, his friend Sam invites Greg and two other friends for a small party. Of course, every birthday party must have cake.

Sam ordered a square cake. She makes a single horizontal cut and a single vertical cut. In her excitement to eat cake, Sam forgot to make these cuts through the middle of the cake.

Of course, the biggest piece of cake should go to Greg since it is his birthday. Help Sam determine the volume of the biggest piece of cake that resulted from these two cuts.



Input

The input consists of a single line containing three integers n ($2 \leq n \leq 10,000$), the length of the sides of the square cake in centimeters, h ($0 < h < n$), the distance of the horizontal cut from the top edge of the cake in centimeters, and v ($0 < v < n$), the distance of the vertical cut from the left edge of the cake in centimeters. This is illustrated in the figure above.

Each cake is 4 centimeters thick.

Output

Display the volume (in cubic centimeters) of the largest of the four pieces of cake after the horizontal and vertical cuts are made.

Sample Input 1

10 4 7

Sample Output 1

168

Pacific Northwest Regional Contest

Sample Input 2

5 2 2

Sample Output 2

36

Sample Input 3

4 2 1

Sample Output 3

24

Problem G

Quality-Adjusted Life-Year

The Quality-Adjusted Life-Year (QALY) is a way to measure a person's quality of life that includes both the quality and the quantity of life lived.

The quality of life lived can be quantified as a number between 0 and 1. If someone is living with perfect health, the quality of life is 1. If someone is dead, then the quality of life is 0. The quality of life may increase or decrease due to medical treatments, sickness, etc.

The QALY for each period in which the quality of life is constant is simply the product of the quality of life and the length of the period (in years). We wish to know the amount of QALY accumulated by a person at the time of death, given the complete history of this person.



Input

The first line of input contains a single integer N ($1 \leq N \leq 100$), which is the number of periods of constant quality of life during the person's lifetime.

The next N lines describe the periods of life. Each of these lines contains two real numbers q ($0 < q \leq 1$), which is the quality of life in this period, and y ($0 < y \leq 100$), which is the number of years in this period. All real numbers will be specified to exactly one decimal place.

Output

Display the QALY accumulated by the person. Your answer will be considered correct if its absolute error does not exceed 10^{-3} .

Sample Input 1

```

5
1.0 12.0
0.7 5.2
0.9 10.7
0.5 20.4
0.2 30.0
  
```

Sample Output 1

```

41.470
  
```

This page is intentionally left blank.

Problem H

Secret Remainder

You are given an integer N . What is the remainder when N is divided by M ?

Note: the value of M will be revealed at the on site practice contest.

Input

There is one line of input containing the integer N ($1 \leq N \leq 1,000,000$).

Output

Output the remainder when N is divided by M .

Sample Input 1

10

Sample Output 1

10

Sample Input 2

47

Sample Output 2

47

This page is intentionally left blank.