EGOI
European Girls' Olympiad in Informatics
21 - 27 July 2024
The Netherlands

A. Mall

The country where Afruza lives can be represented as a straight line. Afruza's house is located at the 0-th point. Afruza has to buy bread from the mall, which is located at X-th point. In one second, Afruza can move one point to the left or to the right. Find the minimum amount of time Afruza needs to go to the mall and come back home.

Input

The only line contains single integer X.

Output

Print the amount of time needed to go to the mall and come back home, in seconds.

Example

Input 1:

```
3
```

Output 1:

```
6
```

Here, during the first 3 seconds, Afruza goes from home to the mall, and during the next 3 seconds, she goes back home. 6 seconds in total.

Input 2:

```
-8
```

Output 2:

```
16
```

Constraints

- $-1000 \leq X \leq 1000$
- $X \neq 0$

Subtasks

1. (40 points) $X > 0$
2. (60 points) No additional constraints.

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B. Skyscraper

There infinitely many stories in a newly-built skyscraper. Malika is currently on floor 1, and she wants to reach floor n, using an elevator or stairs.

Currently, the elevator is on floor m. The elevator needs t_1 seconds to go one floor up or one floor down. Luckily for her, she has a remote controller of the elevator, and no matter at which floor Malika is, she can call the elevator to the any floor she wants.

Also, there are stairs. It takes t_2 seconds for Malika to go up or to go down through the stairs.

Implement a program which calculates the minimum amount of time Malika needs to reach floor n.

Input

The only line of the input contains four integers – n, m, t_1 and t_2.

Output

Print the minimum amount of time Malika needs to reach floor n, in seconds.

Examples

Input 1:

```
6 4 2 5
```

Output 1:

```
13
```

The elevator is on floor 4 and Malika wants to reach floor 6. Malika can call the elevator to the second floor, and through stairs go to the second floor. Elevator takes $2 \cdot t_1 = 4$ seconds to reach the second floor, whereas Malika needs $t_2 = 5$ seconds.

Then, Malika uses the elevator to reach the sixth floor, and it takes $4 \cdot t_1 = 8$ seconds. $5 + 8 = 13$ seconds in total.

Input 2:

```
3 5 7 2
```

Output 2:

```
4
```

Malika does not need to use the elevator. It takes $2 \cdot t_2 = 4$ seconds to reach floor 3.

Constraints

- $1 \leq n, m \leq 10^6$
- $1 \leq t_1, t_2 \leq 10^9$

Subtasks

1. (15 points) $t_1 \leq 100$, $t_2 = 10^9$
2. (15 points) $t_1 = 10^9$, $t_2 \leq 100$
3. (30 points) $n, m \leq 1000$
4. (40 points) No additional constraints.

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C. Beautiful name

Fayoza says that some letters in the alphabet are more beautiful than others. Also, she claims some names are more beautiful than others.

You are given a set of *beautiful* letters. The beauty of a name equals the count of beautiful letters the name has. Among the list of n names, find the most beautiful one. If there are many, print the one which comes first.

Input

The first line contains an integer n – the number of names.

The second line contains a string – the set of beautiful letters. All letters are lowercase English letters.

The next n lines each contain a string – the names. All names consist of lowercase English letters.

Output

On a single line, print the most beautiful name in the list. If there are many of them, print the one that comes earlier in the list.

Examples

Input 1:

```
4
afs
malika
fayoza
gulrux
asila
```

Output 1:

```
fayoza
```

The letters "a", "f", and "s" are beautiful in the sample. Let's calculate the beauty of each name:

- "m**a**lik**a**" – has a beauty of 2.
- "**fa**yoz**a**" – has a beauty of 3.
- "gulrux" – has a beauty of 0.
- "**as**il**a**" – has a beauty of 3.

The names "fayoza" and "asila" have beauty 3. As "fayoza" comes earlier in the list, the answer is "fayoza".

Input 2:

```
2
a
hello
world
```

Output 2:

```
hello
```

In this sample, both "hello" and "world" have beauty equal to 0.

Constraints

- $1 \leq n \leq 10\ 000$
- $|t| \leq 26$, here t is a set of beautiful letters, and $|t|$ is the length of string t.
- $sL \leq 2 \cdot 10^5$, here sL is the total length of all names in the list

Subtasks

1. (35 points) $t =$ "a".
2. (65 points) No additional constraints.

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D. Power

You are given an array consisting of n integers $a[1], a[2], \ldots, a[n]$. For any pair of indices i and j, the power of the pair is calculates as follows:
If $\frac{a[i]}{a[j]} = 2^d$ and d is an **integer**, then the power of the pair equals d. If d is not an integer, then the power equals -1.

Your task is to calculate the maximum power among all pairs (i, j) such that $1 \leq i, j \leq n$ and $i \neq j$.

Input

The first line of the input contains an integer n – the number of elements.

The second line contains n integers – $a[1], a[2], \ldots, a[n]$.

Output

Print the maximum power among all pairs.

Examples

Input 1:

```
5
12 5 3 8 18
```

Output 1:

```
2
```

Here, the pair $i = 1$ and $j = 3$ has power $\frac{a[1]}{a[3]} = \frac{12}{3} = 4 = 2^2$.

Input 2:

```
3
3 4 5
```

Output 2:

```
-1
```

Here, no pair (i, j) has fractions equal to the integer power of 2. Thus, the answer is -1.

Input 3:

```
2
7 7
```

Output 3:

```
0
```

Here, the pair $i = 2$ and $j = 1$ has power $\frac{a[2]}{a[1]} = \frac{7}{7} = 1 = 2^0$.

Constraints

- $2 \leq n \leq 10^5$
- $1 \leq a[i] \leq 131\ 072$, for each $1 \leq i \leq n$

Subtasks

1. (10 points) $a[1] = 1$
2. (25 points) $n \leq 1000$
3. (35 points) $a[i] \leq 1024$, for each $1 \leq i \leq n$
4. (30 points) No additional constraints.

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E. Arrangement

Teacher Komila Sobirovna has n desks in the class. The desks are arranged in a row. When a student seats at the i-th desk, the teacher's pleasure increases (or decreases) by $p[i]$.

There are exactly $\lceil \frac{n}{2} \rceil$ students in the class. Komila Sobirovna should arrange all of the students to the desks. To prevent cheating, there must not be two or more students seating in neighboring desks. Among all arrangements, find the one with maximal total pleasure the teacher gets.

*Note: $\lceil x \rceil$ equals the smallest integer which is greater than or equal to x. For example, $\lceil 3.14 \rceil = 4$ and $\lceil 5 \rceil = 5$.

Input

The first line contains an integer n – the number of desks.
The second line contains n integers $p[1], p[2], \ldots, p[n]$ – the impact of each desk on the teacher's pleasure.

Output

On a single line, print the maximal pleasure the teacher can get.

Example

Input 1:

```
6
5 2 -1 3 -4 7
```

Output 1:

```
15
```

There are $n = 6$ desks and $\lceil \frac{n}{2} \rceil = 3$ students. Komila Sobirovna can arrange the students to

1-st, 4-th, and 6-th desks. The total pleasure equals $p[1] + p[4] + p[6] = 5 + 3 + 7 = 15$.

Input 2:

```
3
-1 -2 -3
```

Output 2:

```
-4
```

There are $n = 3$ desks and $\lceil \frac{n}{2} \rceil = 2$ students. The only option for Komila Sobirovna is to arrange the students to 1-st and 3-th desks. The total pleasure equals $p[1] + p[3] = (-1) + (-3) = -4$.

Constraints

- $1 \leq n \leq 10^5$
- $-10^9 \leq p[i] \leq 10^9$, for each $1 \leq i \leq n$

Subtasks

1. (10 points) n is an odd number.
2. (10 points) $n \leq 5$
3. (35 points) $n \leq 1000$
4. (45 points) No additional constraints.