Problem A. Width

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Given a binary tree, write a program to get the maximum width of the given tree. The width of a tree is the maximum width among all levels. The binary tree has the same structure as a full binary tree, but some nodes are null.

The width of one level is defined as the length between the end-nodes (the leftmost and right most non-null nodes in the level, where the null nodes between the end-nodes are also counted into the length calculation.

Vertex number 1 always will be root.

Input

Given integer n— ($1 \leq |n| \leq 10^3$), number of vertexes. The next n lines has x, y, z, description of binary tree, means that vertex y son of vertex x, if z = 0, it is left son, if z = 1 it is right son.

Output

Print one integer maximum width.

Examples

standard input	standard output
6 1 2 1 1 3 0 3 5 0 3 6 1 2 4 1	4
4 1 2 0 2 3 0 2 4 1	2

Note

sample 1:

Explanation: The maximum width existing in the third level with the length 4 (5,6,null,4).

sample 2:
Explanation: The maximum width existing in the third level with the length 2 (3,4).

Problem B. Greater Sum Tree

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Given the root of a **binary search** tree with distinct values, modify it so that every *node* has a new value equal to the sum of the values of the original tree that are greater than *node.val* and each *node.val* are unique. Print new values in order to the original tree from larger to less.

As a reminder, a binary search tree is a tree that satisfies these constraints:

- The left subtree of a node contains only nodes with keys less than the node's key.
- The right subtree of a node contains only nodes with keys greater than the node's key.
- Both the left and right subtrees must also be binary search trees.

Input

The number of nodes n in the tree is between 1 and 100. Each node will have value between 0 and 1000. The given tree is a binary search tree.

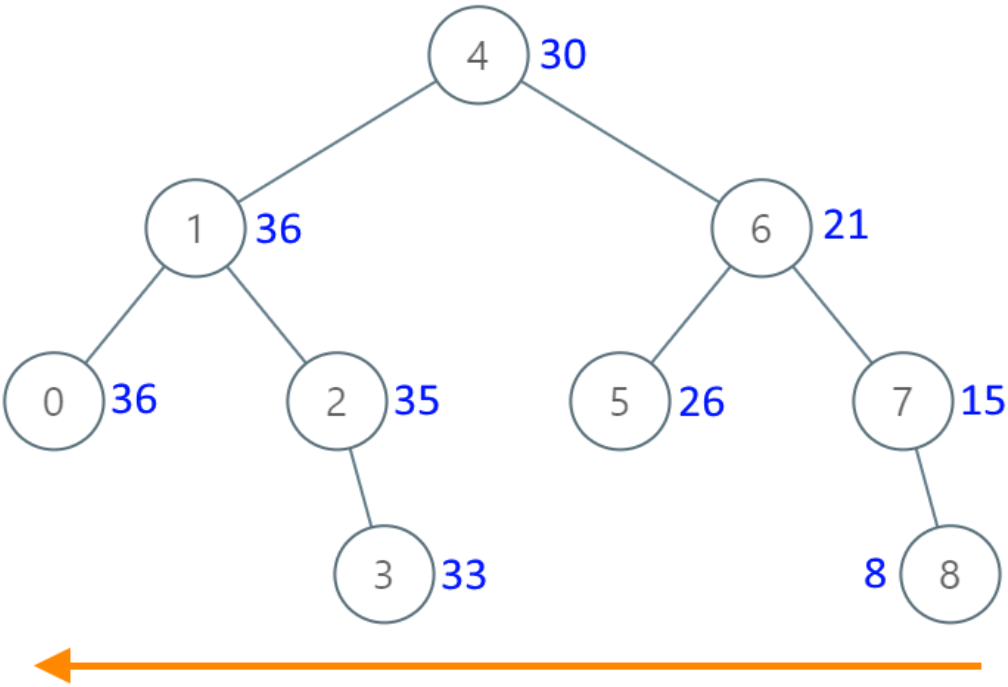
Output

In a single line print the answer.

Example

standard input	standard output
9 4 1 6 0 2 3 5 7 8	8 15 21 26 30 33 35 36 36

Note



NOTE: Solve with **BST**!

Problem C. Every day I'm shufflin'

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Another boring day is going, so you decide to dilute daily routine with playing cards. You have a deck consisting of 52 cards. You start to shuffle this deck N times, each time you pull a_i cards from top and push them to bottom. After that you start the game. You take one card from top of the deck, and your oppenent takes the next card. Your task is to determine which card will be taken by you and by your opponent.

Input

The first line of input consists of 52 cards from the top of the deck to it's bottom. Each card is described by string, where value is either a number from 2 to 10 or 'K' for king, 'Q' for queen, 'J' for jack, 'A' for ace and suit is 'S' for spades, 'D' for diamonds, 'C' for clubs or 'H' for hearts). The second line is the only integer N - number of shuffles ($1 \leqslant N \leqslant 10^5$). The third line contains N integers a_i - amount of cards you will move at the i^{th} time ($1 \leqslant a_i \leqslant 52$).

Output

In the first line print the card you will take first and in the second one print the card that will be taken by your opponent.

Example

standard input	standard output
2H 7H 9C 4C 8S 5D QC KC 9S 7D 8D 9D QS JS AH JC AC KH 4D 10H 5C 10D 10C 2C 8H 3S 7S 3D AD 6S 2S 5H KS 8C JH 3H 10S 6D AS 3C 4S 9H 5S KD 2D 6H 6C JD QD 4H QH 7C 2 5 2	KC 9S

Note

Hint: Think about data structure in which your deck will be stored and then just follow all shuffles.

Problem D. Goldbach's conjecture

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Goldbach's conjecture states that each even number starting from 4 can be represented as the sum of two primes. Your task is to verify this conjecture. You are given even integer N. Find primes A and B such that A + B = N.

Input

You are given the only integer N (4 <= N <= 100000, N is even).

Output

Print two primes A and B such that A + B = N.

Examples

standard input	standard output
12	5 7
56	3 53

Note

If there are several possible answers, print any of them.

Hint: Try to obtain all primes up to N using sieve of Eratosthenes. Then try sum of all pairs and print the needed one.

Problem E. Minimize GCD

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

You are given an integer number N. Your task is to find two integers x and y such that $lcm(x, y) = N$, $gcd(x, y) = 1$ and $x, y > 1$.

Input

Input contatins the only integer N ($1 \leqslant N \leqslant 10^{12}$).

Output

Print two integer numbers x and y such that $lcm(x, y) = N$, $gcd(x, y) = 1$ and $x, y > 1$. If there is no such pair of integers, print "-1" (without quotes).

Examples

standard input	standard output
12	3 4
343	-1

Note

Hint: Try to recall properties of GCD and LCM of (x, y).

Problem F. Team play

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Altynbek, Adilet and Temirlan are engage in sport programming (ACM ICPC). Their skills have rised up since last year, so now they can solve any problem (individually) in A, B and C minutes respectively. To win ACM ICPC semi-final they need to solve N problems. Try to find how many minutes they will spend to solve at least N problems in total.

Input

First line of the input contains one integer N (0 <= N <= 1e12) - number of problems which students must solve. Second line contains three integers A, B, C (1 <= A, B, C <= 1e6) - time that Altynbek, Adilet and Temirlan spend to solve 1 problem individually.

Output

Print the minimum amount of time during which at least N problems will be solved by that team.

Examples

standard input	standard output
100 10 10 10	340
100 1 2 3	55

Note

In the first sample each student solve 34 problem during 340 minutes. 34 + 34 + 34 = 102 which is greater than 100. During 339 minutes each student solve 33 problem which will give 99 in total.

Note, that students can not cooperate to solve any problem.

Hint: Try binary search on the time students will spend (if they can solve in X minutes then they can solve in X + 1 minutes too).

Problem G. Primetopia

Input file:	`standard input`
Output file:	`standard output`
Time limit:	1 second
Memory limit:	256 megabytes

Primetopia is the land where only prime numbers live. Unfortunately, not all citizens can find friends, because two primes can be friends if and only if they differ by 2. You are given the number of citizens in Primetopia. Your task is to find how many primes will be without any friends.

Input

Input consists of the only integer N - population of Primetopia ($2 \leqslant N \leqslant 3 \cdot 10^5$).

Output

Print the only integer x - number of citizens without friends.

Examples

standard input	standard output
2	2
5	2
10	3

Note

In the first sample there are 2 citizens in Primetopia: 2 and 3. They differ by 1, so each of them has no friends and answer is 2.

In the second sample citizens of Primetopia are 2, 3, 5, 7, 11. 2 and 11 have no friends, so answer is 2.

In the third sample 2, 3, 5, 7, 11, 13, 17, 19, 23, 29 live in Primetopia. 2, 23 and 29 have no friends, so answer is 3.

Hint: Use sieve of Eratosthenes to obtain first N primes. Write them out and check neigbouring primes whether their difference is equal to 2 or not.