Problem A. Magic Duel

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

Ron always wants to impress *Hermione* by proving his capability of casting spells. Today, he makes up a new one, "Expelliarmus !"; The Disarming spell. *Harry* wants to prove he's even better by doing stronger spells than Ron. They start a fun magic duel. Ron successfully casts the spell S. Now, it's *Harry*'s turn to step up. Help him choose a stronger spell!

Harry spell is considered stronger than *Ron*'s only if its length is greater than *Ron*'s.

Input

The first line contains one integer T $(1 \leq T \leq 10^4)$: the number of test cases.

The first line of each test case contains one integer n $(1 \leq n \leq 10^6)$ – the length of *Ron*'s spell.

The second line of each test case contains a string S consisting of n letters – *Ron*'s spell.

It is guaranteed that the sum of n over all test cases does not exceed 10^6

Output

Output a string P – *Harry*'s spell.

Example

standard input	standard output
3 12 Expelliarmus 9 Alohomora 7 Stupefy	WingardiumLeviosa Impedimenta LoremIpsumDolorSitAmetConsecteturElit

Note

Please don't forget to use fast Input/Output when writing code or you risk getting the "Time Limit Exceeded" verdict. For more information, please refer to the attachments listed under this problem in the problemset tab.

Problem B. Veritaserum

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

Severus Snape is the Potions teacher at *Hogwarts*. He wanted to produce *Veritaserum* : a colorless, odorless potion that forces the drinker to tell the truth. To do so, the potion has to mature for a full lunar cycle. He wanted to know the number of days the cycle lasts but he couldn't find an answer. Instead, he found in one of his books that the duration of the cycle is the **smallest** integer n having at least k **consecutive** numbers less than n and co-prime to it.

Two integers p and q are coprime if the only positive integer that is a divisor of both of them is 1 (that is, their greatest common divisor is 1).

Help *Snape* prepare the *Veritaserum*.

Input

The input contains one integer k ($1 \leq k \leq 10^9$)

Output

Output one integer n, representing the desired answer

Examples

standard input	standard output
3	5
8	11
47326693	47326913
191912783	191913031

Note

In the first example, 5 is the smallest integer having at least 3 consecutive numbers smaller and coprime to it $(2, 3, 4)$

Problem C. Joining Gryffindor

Input file:	`standard input`
Output file:	`standard output`
Time limit:	8 seconds
Memory limit:	256 megabytes

This is an interactive problem.

In *Hogwarts School of Witchcraft and Wizardry*, each year, the students assemble in the Great Hall where the *Sorting Hat* sorts the first-years into four respective houses: *Gryffindor*, *Hufflepuff*, *Ravenclaw*, and *Slytherin*. *Harry* wants to get placed in *Gryffindor* alongside *Ron* and *Hermione*. To do so, he has to solve a riddle from the *Sorting Hat*.

The Sorting Hat has n bags of Floo Powder. The i^{th} bag weighs A_i. *Harry* must know the total weight of the bags. For this, he will have to choose **two different** bags i and j, and the *Sorting Hat* will tell him their weight, in other terms, the value $A_i + A_j$.

Harry can make no more than $2n$ queries in order to guess the **total weight** of the bags. Help him join *Gryffindor*.

Input

The first line contains one integer n ($2 \leq n \leq 10^5$): The size of the array A.

The second line contains n integers denoting the array A ($0 \leq A_i \leq 10^9$). Then, the interaction will start.

Interaction Protocol

After reading the length of the array n, the interaction protocol is as follows :

1. To get $A_i + A_j$, output the query in the format ? `i j` where $1 \leq i \neq j \leq n$. You can make at most $2n$ queries.
2. When you find the sum of A, output the sum s in the format ! `s`. Printing the sum is not counted as one of $2n$ operations.
3. In the first occurrence of a query **not conforming** to the given format, you will receive -1, and you should exit immediately to get a Presentation error verdict.

Example

standard input	standard output
6 13 4 18	? 2 6 ? 5 3 ? 1 4 ! 35

Note

The hidden array in this example is $A = [6, 4, 1, 12, 3, 9]$.

After printing a query or the answer, do not forget to output at the end of the line and flush the output. Otherwise, you will get **Idleness limit exceeded**. Refer to the attachments for more information.

You can test your solution using the interactor. For more information, refer to the attachments under this problem in the problemset tab.