TRAINING COMPETITIVE PROGRAMMING

Problem A (Prime):

Given a positive integer N, the task is to write a program to check if the number if Prime or not.

Input:

The input contains a single number N ($N \leq 10^{14}$).

Output:

Output "Yes" if N is prime. Otherwise output "No".

Examples:

Input	***Output***
999983	Yes

Input	***Output***
53047	Yes

Problem B (Divisor):

Given a positive integer N. Your task is to determine its divisor. For instance, $N = 4$ print 3 because (1, 2, 4) are divisors of 4.

Input:

The input contains a single number N ($1 \leq N \leq 10^{14}$).

Output:

Output print the number of divisors of N.

Examples:

Input	***Output***
4	3

Input	***Output***
999933	16

Problem C (Square number):

An integer does not contain a square number if it is not divisible by any integer of the form $\boldsymbol{x}^2$ ($\boldsymbol{x} > 1$).

Input:

The first line of the input contains an integer T ($1 \le T \le 20$).

The only line of each test case contains the positive integer N. Find the greatest divisor that does not contain the square of N. ($1 \le N \le 10^{13}$).

Output:

The results of each test are given on one line.

Examples:

Input	*Output*
2 9 20	3 10

Problem D (Bertrand's postulate):

Bertran's postulate: "For every integer $\boldsymbol{n \ge 2}$, there is always a prime $\boldsymbol{p}$ satisfying $\boldsymbol{n < p < 2n}$". This postulate was proposed by the French mathematician Joseph Bertrand in 1845 after having tested all $\boldsymbol{n \le 3\,000\,000}$. This was proved by Chebyshev in 1850. In 1932 Paul Erdős found a new, simpler proof. Your task is a bit broader: given $\boldsymbol{n}$, determine the number of primes $\boldsymbol{p}$ that satisfy the condition $\boldsymbol{n < p < 2n}$.

Input:

The first line of the input contains an integer T ($1 \le T \le 20$).

The only line of each test case contains the positive integer N ($1 \le N \le 10^7$).

Output:

The results of each test are given on one line.

Examples:

Input	***Output***
3 2 239 3000	1 39 353

Problem E (Clan):

There is a very beautiful island that attracts many tourists to visit. On the island there are ***n*** people of many tribes living. The people on the island are very friendly. Each person belongs to a certain tribe. In the tour group, there is an anthropologist. Taking advantage of the opportunity to visit the island, he did not waste time conducting surveys. He met each person on the island with a single question: "How many people are on the island of your tribe?". From the survey results, he identified the number of different tribes that existed on the island.

For instance, ***n*** = 10 and get the answer as ***5, 1, 2, 5, 5, 2, 5, 5, 2, 2***. We can infer that there are ***4*** different tribes on the island.

Input:

Input the positive integer ***N*** (1 < ***N*** < 3000000) and the responses of people in the tribes. Let's determine the number of tribes on the island. The data ensures the problem has a solution.

Output:

Given a single integer that is the number of different tribes on the island.

Examples:

Input	***Output***
10 5 1 2 5 5 2 5 5 2 2	4

Input	***Output***
20 5 5 5 5 5 1 1 3 3 3 2 2 8 8 8 8 8 8 8 8	6

Problem F (Woods):

In the garden, people grow a long line of trees including *N* trees, each tree has a height of $a_1, a_2, \dots, a_N$.

One needs to get *M* meters of wood by setting the chainsaw so that the saw blade is at a height of *H (meters)* to saw all trees with a height greater than *H* (of course trees with a height not greater than *H* are not affected). saw).

For instance: If the row of trees has trees with a corresponding height of 20; 15; 10 and 18 meters, need to take 7 meters of wood. The saw blade is placed at a reasonable height of 15 meters, the height of the remaining trees after being sawed is 15; 15; 10 and 15 meters. The total number of meters of wood obtained is 8 meters (1 meter extra).

Your task is to find a reasonable position to place the saw blade (the largest integer *H*) so that M meters of wood are obtained and the number of excess wood meters is the minimum.

Input:

The first line of the input contains two positive integers *N* and *M* separated by one space. ($1 \leq N \leq 10^6$, $1 \leq M \leq 2.10^9$).

The second line contains *N* positive integers a_i is the height of each tree in the row.

($1 \leq a_i \leq 10^9$).

Output:

Output a single integer as the answer.

Examples:

Input	*Output*
4 7 20 15 10 18	15

Input	*Output*
5 8 10 20 19 18 17	17

Problem G (String – Find number):

Given a string consisting of only the lowercase letters of the English alphabet and the digits 0 to 9. The sequence of consecutive numeric characters forms an integer. In each consecutive numeric character segment, the largest possible number must be extracted, each number being drawn without non-significant zeros.

For instance, with the string ***05aab21bc3956cde488a*** the extracted numbers are ***5, 21, 3956, 488***.

Given string ***S*** with length no more than 100000 characters consisting of only lowercase letters and numbers. Write a program to find the smallest and the largest of the extracted numbers?

Input:

Input consists of a string ***S*** containing only lowercase letters and numbers.

The only line of each test case contains the positive integer N. Find the greatest divisor that does not contain the square of N. ($1 \leq N \leq 10^{13}$).

Output:

The first line shows the smallest number found.

The second line shows the largest number found.

Examples:

Input	***Output***
05aab21bc3956cde488a	5 3956