A. Even Sum

2.0 s, 256 megabytes

You are given a natural number n. Determine if it is possible to represent n as the sum of 2 even natural numbers. Formally, check if there exist two distinct natural numbers x and y ($x \neq y$) such that both x and y are even, and $x + y = n$.

Input

The first line contains integer T ($1 \le t \le 10^6$) — the number of test cases.

Each test case consists of one integer n ($1 \le n \le 10^9$).

Output

For each test case in a new line, print "Yes" if n can be represented as the sum of 2 distinct even natural numbers, else print "No".

You may print every letter in any case you want (so, for example, the strings yEs, yes, Yes and YES will all be recognized as positive answers).

input

```
5
7
43
69
82
420
```

output

```
NO
NO
NO
YES
YES
```

In test case 4: $82 = 40 + 42$.

B. Three Sum

1 second, 256 megabytes

Madhav was participating in a competitive programming contest, where he came across an intriguing mathematical puzzle. The puzzle involves a set of three integers: a, b, and c. Given the values: $a + b$, $b + c$ and $c + a$, Madhav has to determine the product of these three values, $a \times b \times c$. Being his wise and dearest friend, you must help him solve this problem.

Input

The first line of input contains a single integer T ($1 \le T \le 10^5$) - the number of test cases.

The first line of each test case contains three integers: $a + b$, $b + c$ and $c + a$, each separated by space. ($1 \le a,\ b,\ c \le 10^4$)

Output

Print the value $a \times b \times c$ in a new line for each test case.

input

```
3
3 5 6
4 4 4
6 17 13
```

output

```
8
8
60
```

Explanation for Test case 1: $a = 2, b = 1, c = 4$ satisfies the condition.

C. Fat Genius

4.0 s, 256 megabytes

Yatharth has a stack of N chocolates. He wants to split this stack into N stacks of one chocolate each.

He can split a stack into two smaller stacks having a natural number of chocolates, but everytime he does this, he burns $P \times Q$ calories, where P and Q are the number of chocolates in the two smaller stacks formed.

Yatharth, being the horizontally-challenged genius he is, develops an optimal strategy to burn the maximum number of calories doing this. How many calories can Yatharth burn splitting the stacks optimally?

Input

The first line contains integer T ($1 \le T \le 10^6$) — the number of test cases.

The first line of each test case contains integer N ($1 \le N \le 10^6$) — the number of chocolates in the original stack for each test case.

Output

Print the maximum possible number of calories Yatharth can burn splitting the stacks optimally, in a new line for each test case.

input

```
2
1
4
```

output

```
0
6
```

D. Total Destruction

3.0 s, 256 megabytes

You are an employee at *XYZ Evil, Inc.* Your company has developed a groundbreaking missile that is the epitome of perfection. Every missile is designed to destroy exactly r consecutive buildings. i.e. your missile can destroy all the buildings in the range

$$a_k, a_{k+1}, \ldots a_{k+r-1}$$

for any chosen k.

Straightylvania is an architectural marvel, a city designed with equally spaced buildings in a straight line. As a loyal employee of *XYZ Evil, Inc.*, you have obtained the plans of Straightylvania and you calculate the market value of each building in the city. You represent the city by an array a, where the market value of each building, in the order they are arranged, is:

$$a_1, a_2, \ldots a_n$$

More formally, calculate the maximum destruction you can perform

$$D_{max} = \sum_{i=k}^{min(k+r-1,\ n)} a_i$$

i.e. the maximum total market value of the buildings destroyed for optimally chosen k.

Input

The first line of the input file contains a single integer - t ($1 \le t \le 10^4$), the number of testcases.

The first line of each testcase contains two space separated integers n ($1 \le n \le 10^6$) and r ($1 \le r \le 10^6$), the number of buildings in the city and the range of the missile explosion.

The second line of each testcase contains n integers a_i ($1 \le a_i \le 10^9$), the market values of each building in the city.

Output

For each testcase, output a single integer, D_{max}, the maximum total market value of Straightvanian buildings destroyed.

input

```
2
5 1
1 1 2 1 1
6 4
1 2 3 4 5 0
```

output

```
2
14
```

E. Extended Fibonacci Sequence

1.0 s, 256 megabytes

A fibonacci number is a number that is part of the series $1, 1, 2, 3, 5, \ldots$.

The Fibonacci series is defined by the recurrence relation

$$F_{n+1} = F_n + F_{n-1}$$

with intial values $F_0 = 1, F_1 = 1$.

Let us define an **extended Fibonacci series** to be any series defined by the relation

$$a_{n+1} = a_n + a_{n-1}$$

with any two natural numbers a_0, a_1 as initial values.

You are given an array of numbers b. Find the smallest possible initial values a_0, a_1 of an extended Fibonacci series a such that b is a **contiguous subsequence** of a. If no such extended Fibonacci sequence exists, output -1.

Input

The first line of the input contains an integer $t (1 \le t \le 10^4)$ - the number of testcases.

The first line of each testcase contains $n (2 \le n \le 10^6)$ - the size of the array. The sum of n over all testcases will never exceed 10^6.

The second line of each testcase contains n integers $b_0, b_1, b_2 \ldots b_n$, $1 \le b_i \le 10^9$.

Output

For each testcase, output a single line containing two-space separated integers, a_0 and a_1. Output -1 if no such sequence exists.

input

```
3
2
1 1
4
2 4 6 12
3
3 4 7
```

output

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

F. Subham and midsems

1 s., 256 MB

Subham is very badly prepared for midsems. He has a target plan for the next n days. The difficulty level of target on day i is a_i. Subham's inital stamina level is q. On day i, Subham will choose whether to follow his plan or not. He can only follow his plan if his current stamina level is strictly greater than 0.

If Subham chooses to follow his plan on day i, the following happens:

- if $a_i > q$, Subham will feel he is not energetic enough, so q decreases by 1;
- otherwise, nothing changes.

If he chooses to not follow his plan on a day, nothing changes. That is if he chooses to take lite on a day, nothing changes.
Subham is a ghot. Subham wants to follow his plan on as many days as possible. Please give Subham a solution.

Input

The input consists of multiple test cases. The first line contains a single integer t $(1 \le t \le 10^4)$ — the number of test cases. The description of the test cases follows.

The first line contains two integers n and q $(1 \le n \le 10^5, 1 \le q \le 10^9)$ — the number of days and Subham's stamina level in the beginning.

The second line contains n integers $a_1, a_2, \cdots, a_n$ $(1 \le a_i \le 10^9)$ — the difficulty level of each target.

It is guaranteed that the sum of n over all test cases does not exceed 10^5.

Output

For each test case, you need to output a binary string s, where $s_i = 1$ if Subham should choose to follow his plan on day i, and $s_i = 0$ otherwise. The number of ones in the string should be maximum possible, and he should never follow his plan when his stamina level is zero or less.

If there are multiple solutions, you may output any.

input

```
5
1 1
1
2 1
1 2
3 1
1 2 1
4 2
1 4 3 1
5 2
5 1 2 4 3
```

output

```
1
11
110
1110
01111
```

In the first test case, Subham follows his plan on the only day. His stamina level doesn't decrease.

In the second test case, Subham follows his plan on both days. His stamina level decreases by 1 after testing contest 2.

In the third test case, Subham follows his plan on day 1 and 2. His stamina level decreases to 0 after following his plan on day 2, so he can't follow his plan on day 3.