Shreyy’s Birthday Gift (ABS)

Today is Shreyy's birthday :D

Shreyy wanted an array as a gift. He calculates the value of an array as the sum of absolute difference between all successive elements.

For eg: If array comprises of [a1, a2, a3,..... an]

Value of array = |a1 - a2| + |a2 - a3| + |a3 - a4| +.....|a(n-1) - an|, where |x| is absolute value function.

I bought him an array, in which I can rearrange the values. But I dunno what is the maximum value I can get with the array. Can you help me find the maximum value of the array? I would figure out a way to rearrange my array to get that value.

Input:

First line contains N, the size of the array.

Next line contains N integers, representing the array.

Output:

A single integer which is the max value possible from the elements of the array.

Constraints:

1 <= N <= 100_000

1 <= ai <= 1_000_000

Example:

Test 0:

5

1 2 3 4 5

Output 0:

11

This maximum value is achieved when the array is arranged like: [4, 1, 5, 2, 3]

Value of Array = |4 - 1| + |1 - 5| + |5 - 2| + |2 - 3| = 3 + 4 + 3 + 1 = 11

Test 1:

5

45 5 56 29 92

Output 1:

217

Aliens and Invasion (ALIENS)

Aliens have invaded the earth and have set their bases at different locations. There are **N** alien bases that need to be destroyed. "Team GLUG" has taken the responsibilitity to save the earth. Nitish has asked his friend Ashutosh to device a new weapon that can efficiently destroy the alien bases. After a lot of research Ashutosh discovered a new type of grenade. He calls them Bi-grenades.

Each of these Bi-grenades, which are being launched from the “GLUG base”, can fly different distances which are given in an array ‘**range**’ of size **M**. A special property of each of these grenades is that it destroys the enemy base if it is present at a distance ‘**x**’ otherwise it again flies another distance ‘**y**’ and destroys the enemy base (if present). ‘x’ and ‘y’ belong to the array ‘range’; x may or may not be equal to y. After a grenade has landed at a point, it cannot fly back to an enemy base which is at a distance lesser from the “GLUG base” than the current point.

The best part about Team GLUG is that it has resources in abundance, so Ashutosh was able to manufacture an **infinite** number of Bi-grenades.

Help Nitish in finding out the number of alien bases that can be destroyed.

Input:

The first line of the input contains an integer **M**.

Each of the following **M lines** contains an integer belonging to the array ‘range’.

Next line contains an integer **N** denoting the number of alien bases.

Each of the following **N lines** contains an integer $\mathbf{d_i}$ where $\mathbf{d_i}$ represents the distance of the **ith** alien base from the GLUG base.

Output:

The output consists of a single integer denoting the number of alien bases that can be destroyed.

Constraints:

$1 \leq M \leq 200000$

$1 \leq N \leq 200000$

$1 \leq d_i \leq 200000$

1 ≤ elements of array range ≤ 200000

Sample Input:

3

2

4

6

5

1

2

7

10

12

Sample Output:

3

Explanation:

The 2nd base (at distance 2) can be destroyed by the Bi-grenade as it can travel a distance 2 in the first flight.

The 4th base (at distance 10) can be destroyed by the Bi-grenade as it can travel a distance 4 in the first flight and then a distance 6 in the next flight.

The 5th base (at distance 12) can be destroyed by the Bi-grenade as it can travel a distance 6 in the first flight and then again a distance 6 in the next flight.

Mario and Bomb Scare (MARIO)

Princess Peach is captured by Browser again (/-)

This time Browser demanded a ransom from Mario for releasing the princess. Mario has already collected some coins, the rest of the K coins needed for ransom are scattered across N nodes on a tree.

Mario can start from anywhere thanks to the handy tunnels. He chooses the smallest path to cover k nodes. If there are multiple such ways, he chooses a way in which he starts at the lowest possible node and ends at the highest possible node. After which he begins his journey from the lower end of the path.

Unknown to Mario, Browser strapped Peach to a timebomb. Since Mario already fixed the path on his mushroom cart, he can't change it. Tell him the number of coins he will collect when he leaves a certain node for the last time.

Input:

First line has N, number of nodes.

Next line has N values, the ith value indicates number of coins in node i, Ci.

Next N-1 lines contain two integers u and v, to show that there is and edge between the two.

Next line has single integer q, which states number of query nodes.

Last line contains q nodes(q1, q2....qq), for which you have to answer the query.

It is guranteded that the after choosing the path, there is only a single way to exit any of the q nodes for the last time.

Output:

Print q lines, each line consisting the answer for the qth query.

Constraints:

1 <= N <= 100_000

0 <= Ci <= 1

1 <= U, V <= N

1 <= Q <= N

1 <= Qi <= N

Example:

Test 1:

5

1 1 1 1 0

2 4

4 3

4 5

1 5

3

1 5 4

Output 1:

1

1

3

The shortest path is as follows acc to the rules is: 1->5->4->2->4->3

When he leaves 1, he has 1 coin.

When he leaves 5, he has the coin collected at 1.

When he leaves 4 finally, he has the coin collected at 1, 4, 2.

Big Mom and her Rampage (BIGMOM)

Big Mom is in another one of her hunger rages. We need to help her calm down. Even in her insanity, she calculates the amount of food she has eaten while going from one island to another. She never goes back to the island already visited, as the island will be in ruins and

will have no food. She takes the XOR of all the food she has eaten on her path and considers that as her satisfaction. She may start and stop her rampage at any island.

Perospero wants to make Tatto Land foolproof. Hence, he wants to find the maximum satisfaction Mama would ever need. Given that Tatto Land has N islands, all connected using N-1 paths, like a tree. Help Perospero to calculate the maximum amount of satisfaction Mama would ever need.

Input:

The first line consists of single integer N, the number of islands.

Next line contains N values. Vi representing the value of the ith island.

Next N-1 contains 2 integers, U and V, which represent there is an edge between U and V.

Output:

A single integer representing the max path value.

Constraints:

1 <= N <= 100_000

1 <= Vi <= 1_000_000

1 <= U, V <= N

Example:

Test 1:

5

716 464 613 960 652

3 2

5 1

1 4

5 3

Output 1:

1013

The path 1->5->3->2 gives this amount.

The Fibonacci Cup (FIBOCUP)

The IFC (International Fibonacci council) has organised a competition known as 'The Fibonacci Cup' to spread awareness about Fibonacci numbers. Abdullah has reached the final and his opponent is Leonardo Pisano. The rules of the match are as follows:

1. The 2 players alternate moves. Player 1 plays his move, then Player 2 plays his move, then Player 1 plays his move, then Player 2 plays his move and so on.
2. A toss is done at the start and the winner decides if he wants to be Player 1 or Player 2
3. The game consists of **N** empty bags of infinite capacity, each bag has an integer **Ai** written on it.
4. A player in his move can choose a bag **i** and put **x** integers (d1,d2,d3,…..dx) into it such that
    1. **x** is a perfect Fibonacci number
    2. none of the chosen integers are already present in the specific bag.
    3. every **dj** that is to be put in the specific **i** bag is a perfect Fibonacci number.
    4. **fib(a[i])** is divisible by **dj** for every **dj** that is to be put in the specific **i** bag.

The player who is unable to make a move loses.

Note: Fib refers to the Fibonacci sequence generated as follows:

Fib(1)=1

Fib(2)=1

Fib(i)=Fib(i-1)+fib(i-2) i>2

A perfect Fibonacci number is a number that occurs in the above sequence.

Abdullah has won the toss and is wondering whether he should choose to be player 1 and player 2.

Given the details of the **N** bags and the fact that both of them play optimally (Since it's the final!). What choice should Abdullah make to win the trophy?

Input:

First line contains an integer **T** representing the number of test cases. The description of each test case is as follows:

First line contains an integer **N** representing the number of bags.

Next line contains **N** space separated integers denoting the number written on each bag.

Output:

For each test case:

Print ‘Player 1’ if Abdullah should choose to be Player 1 or

Print ‘Player 2’ if Abdullah should choose to be Player 2.

Constraints:

$1 \leq \mathbf{T} \leq 50$

$1 \leq \mathbf{N} \leq 10^6$

$1 \leq$ Sum of N over all test cases $\leq 5*10^6$

$1 \leq \mathbf{A_i} \leq 10^6$

Sample Case:

Input:

1

2

9 3

3

1 5 9

Output:

Player 1

Player 2

Explanation:

fib(3)=2 which is divisible by the following Fibonacci numbers: 1 and 2

fib(9)=34 which is divisible by the following Fibonacci numbers 1,2 and 34

A possible game sequence is as follows:

Player 1 chooses i=1, x=1(fib(1)), d={1}

Player 2 chooses i=1, x=2(fib(3)), d={2,34}

Player 1 chooses i=2, x=2(fib(3)) , d={1,2}

Nothing else can be added to any of the bags now and hence player 2 looses.